FDOTConnect for OpenBridge Modeler

Bridge Design 3D Modeling & Plans

COURSE GUIDE

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State of Florida
Department of Transportation

FDOTConnect

for

OpenBridge Modeler
Bridge Design
3D Modeling & Plans

Course Guide
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PRODUCTION SUPPORT / CADD OFFICE
TALLAHASSEE, FLORIDA
http://www.fdot.gov/cadd

FDOTConnect OpenBridge Modeler Training: Introduction to Model-Centric Workflows

Bridge Design & Modeling

Description

The training course details 3D bridge modeling workflow using Bentley product OpenBridge Modeler (OBM). To be in compliance with Florida Department of Transportation CADD standard (FDOT CADD), this effort must also be accomplished within FDOTConnect workspace. Starting with laying out a 3D bridge model, following up with plan development and quantity reports, and concluding with advanced topics, the participant is walked through a typical workflow using the tools and features available. Interspersed throughout are real-world detailing and design examples using the concepts in the course. Examples of data migration among different engineering disciplines are represented in the form of hands-on exercises.

Objectives

This course includes but is not limited to:

- OBM and OpenRoad Designer (ORD), Hierarchy and common tools
- FDOTConnect Workspace and OBM Menu
- Software Installation and Data Migration
- WorkSets for Project Management and Discipline Connectivity
- Design Files and Models
- 3D Bridge Modeling Tools and Workflow
- Plans Development
- Quantity and Reporting Tools

Prerequisites

Recommended: Basic knowledge of drawing tools, levels, details skills in MicroStation and understanding of the FDOT workspace for Open Roads Designer and OpenBridge Modeler. An overview of the essential elements of the FDOT design environment (CADD ESSENTIALS-Course Guide) as a prerequisite for this and other FDOT CADD training courses. Completing Bentley OpenBridge Modeler basic training courses for familiarity with tools and interface is also recommended.

For information about this and other CADD training courses, publications, videos, and Frequently Asked Questions, visit the Production Support CADD Office of the Florida Department of Transportation on the world-wide web at http://www.fdot.gov/cadd/

Table of Contents

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1 INTRODUCTION

Florida Department of Transportation (FDOT) 3D modeling initiative was developed in early 2016 and is currently in the active implementation phase. Progress includes release of ORD FDOTConnect CADD software for Roadway, Right of Way, Survey and Geotech in July 2019. The first production version of FDOTConnect OBM was released in July 2020. Data connectivity among different disciplines has always been an integral part of the effort.

Accordingly, this course was developed to introduce Bridge Designers to the OpenBridge Modeler Connect Edition tools for modeling FDOT projects. The current curriculum was developed within the FDOTConnect10.12 Workspace to introduce applicable content and provide sample exercises for this new platform and workflow. This training is based on a sample project data set provided.

COURSE OBJECTIVES

Participants of this course will be introduced to the latest bridge modeling workflows in OpenBridge Modeler for development of 3D BIM digital model, two dimensional (2D) graphic plans, quantity and report generation, and other value-added features in design. At successful completion, users will learn how to:

- Create new files in the FDOTConnect Workspace
- Navigate the software interface
- Reference or import Civil Geometry and Terrain files into bridge model files
- Set up a bridge model with FDOT bridge component templates
- Create design plans directly from the OBM model
- Create a quantities report and other design data reports from the model
- Make modifications to the model to better represent FDOT-specific bridge geometry

EXPECTATIONS – WHAT THIS COURSE PROVIDES

This is an introductory course to get users familiar with the OBM software and creating a bridge model. The user will see examples and techniques to use the model to create value-added content during the design process for typical deliverables. The course provides background and detailed information for the key tools and processes the user will likely use in the software, as well as exercises for practical applications. It is developed primarily as an instructor-led course but can be used for self-paced learning. The manual will use a typical FDOT prestressed girder superstructure bridge as the training model for exercises throughout. The course briefly discusses and provides outside resources for advanced topics including reinforcement, steel superstructure, and parametric cells. This course does not include workflows with OpenBridge Designer which includes links to other Bentley products such as the LEAP structural analysis products and offers additional potential for model-centric design applications.

DOCUMENT STYLE

Style conventions used throughout the course guide are shown in the following table.

Item	Convention	Example
Menu names and commands	Bold (Names separated with > symbol)	• General form is **Workflow** (when applicable) **> Tab > Group > Tool** • **File > Open** • **File > Settings > User > Preferences** • **OpenBridge Modeler** (Workflow**) > FDOT > Actions > Create Fil**e
Window actions	Bold	• Click the **Apply** button. • Click the **Graphic Select** button to the right of the *Horizontal Alignment Include* box. • In the **Segment** Type list, click **Lines**.
Window field names	Italic	• Key in **Hemfield Road** in the *Alignment Name* field. • Click the **Graphic Select** button to the right of the *Horizontal Alignment Include* field. • In the *Segment Type* list, click **Lines**.
Key-ins	Bold	• Key in **Hemfield Road** in the *Alignment Name* field.
File names	Italic	• Open the file *Working Graphics.dgn* in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.
File paths	Underline	• Open the file *Working Graphics.dgn* in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.
New terms or emphasis	Italic or Bold	• The Template Library contains *templates*, which represent typical sections of the proposed roadway. • **The user is not to utilize this tool.**

DEFINITIONS AND KEY TERMS

3D Design: The process of creating 3D Models for a project

3D Model: A digital graphical representation of proposed facility/site data consisting of X, Y, and Z coordinates for producing objects in three dimensions to convey design intent useful for visualization, analysis, animation, simulation, plans, specifications, estimates production, and life-cycle asset management. An accurately designed 3D model is tied to a defined geographic coordinate system.

ByLevel: A setting that, when turned on, causes the element on a specific level to retrieve its definition from the Level Symbology of that layer, such as Color, Line Style, and Line Weight .

CADD: (Acronym for: Computer Aided Design and Drafting) Software and methods used to design and represent objects graphically on the computer. CADD facilitates the visual presentation of Engineering Data.

Create File Application: FDOT application used to create new .dgn files per CADD Standards. Should be used in place of the Bentley "New File" option.

Data Point: A graphic input (left-click on the mouse), depending on the context: designates a point in a design, designates the view in which it is entered, or accepts an operation rather than rejecting it.

Design File: An electronic CADD file that conforms to MicroStation® (DGN) or AutoCAD® (DWG) graphics formats.

Digital Terrain Model (DTM): A DTM is a digital topographic model of the earth's surface minus objects such as trees, vegetation, and structures that can be manipulated through computer-aided design programs. All elements of the DTM are spatially related to one another in three dimensions.

Explorer: An expandable menu with items including File, Items, Resources, Sheet Index, links, OpenBridge Model and OpenBridge Standards. It may be docked for consistent access or floatable based on user preference.

Feature Definition: The OBM Feature Definition Library refers to a component of a DGN Library that contains a level, element, feature symbology and feature definition structure.

Level: A category that data (linework, etc.) in the design file may be segregated into.

Line Style: Part of the symbology of an element: for example, whether a line is represented a solid, composed of dashes, dots and dashes, and so on. Each element has its own line style.

Master Units: The largest unit in common use in a design file, usually represented in US Survey Feet for most of the Department's seed files.

New File: Standard Bentley file creation function that **should not be used** in the FDOT workspace

Project Root Folder: The file system folder that contains all projects' files and folders. The project root folder should not contain files that do not pertain to the project, nor should files that are part of the project reside outside of the project root folder, or one of its sub-folders.

Properties Window: The window for a bridge component that allows the user to see the information about the component and make modifications. This window can be found by clicking the **Properties** tool in the **Primary** group of the **Home** tab. Or, it can be found by selecting an object in the view window and clicking the **Properties** tool.

Reference Files: A design file or other file type that is attached to and viewed simultaneously with the active design file.

Reset: A placement action (right-click on the mouse) that, with most tools, backs up one step. In some cases a Reset operation completes an action; in other cases, it cancels an action or rejects an identified element.

Save Settings: Saves settings in the active design file. This option is enabled only if the Save Settings on Exit preference is set to off in the Preferences dialog Operation category. This allows the user to save settings (including level and reference visibility, viewport settings, etc.), as they are not automatically saved when you exit the file.

Search: The user can use this tool to find the location of a command or tool. It can be found in the upper right-hand corner of the OBM window or by hitting F4.

Seed File: A predefined settings file used to create a new design files or cell libraries.

SupportLine: Term used in OpenBridge Modeler (OBM) to describe the abutment and pier locations in plan view. The placement of these lines are usually at the centerline of piers and at the front face of backwall for abutments and are also used to determine extents of the deck and beams.

Symbology: The settings applied to an element for visualization/printing purposes, such as Color, Line Style, Line Weight, Transparency, etcetera.

Workflow: Drop-down list that controls which tabs are displayed on the ribbon.

Working Area: Size, in working units square, of design plane.

Working Units: The real-world units in MicroStation (or OBM) that the design plane is configured to, such as US Survey Feet.

WorkSet: Collection of files for a certain project.

Workspace: Container for organizational standards.

COURSE SUPPORTING FILES AND ADDITIONAL RESOURCES

The exercises for each chapter are independent of one another and can be used without having to complete the exercises in previous modules. All files used in this course are located at this link, along with MSE Retaining Wall and Florida Slab Beam Modeling workflow documents:

https://www.fdot.gov/cadd/downloads/documentation/fdotconnecttraining/fdotobm

Download the Dataset before beginning this course. For a Workstation installation, copy the dataset (*12345678901* folder, *12345678901.cfg*, and *12345678901.dgnws*) to: C:\Worksets\FDOT folder. For other installations or different drive names, adjust the file path as necessary.

There are additional training resources in the link below to provide supplemental learning opportunities:

https://www.fdot.gov/cadd/main/fdotcaddtraining.shtm

A link to the ORD CADD Essentials training mentioned above is found here:

https://www.fdot.gov/cadd/downloads/documentation/fdotconnecttraining/fdotconnect-cadd-essentials

OBM AND FDOTCONNECT INSTALLATION

The FDOTConnect CADD Software Installation Guide PDF is available at this link:

https://www.fdot.gov/cadd/downloads/software/

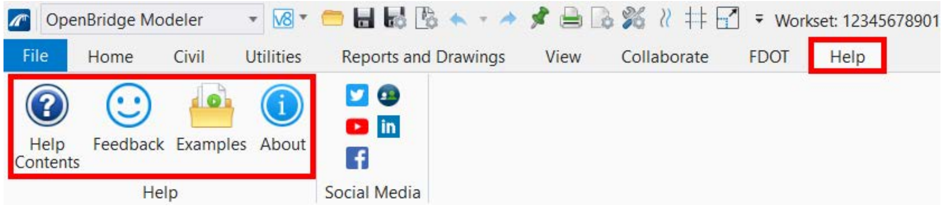
Following the installation instruction is key for a successful installation. The reason is that the process is atypical to common commercial software.

The following are a few items specific to FDOTConnect OBM workspace.

- Save all existing templates XML files, library files and cell files created in earlier version of OBM and FDOTConnect in the customized directory and be prepared with future inclusion via importing tools.
- Install OBM prior to FDOTConnect state kit, similar to ORD installation. Configuration customization is required.
- FDOT OBM shortcut will be available in FDOTConnect folder instead of FDOT ORD shortcut. In the case that both OBM and ORD are installed on a user’s computer, both FDOT shortcuts will be available.
- In the case that Bentley products are updated after FDOTConnect installation, FDOTConnect workspace will stay intact.
- For users with OpenBridge Designer installed on their computer, FDOT OBD shortcuts will also be provided.

OBM HELP AND SUPPORT

OBM provides **Help** and product support through online services, documentation and Tool Tips that can be accessed from the OBM menu bar once a session is opened.



Help Contents

This is a link to online help documents and tutorials from Bentley.

Feedback

This opens a window in which feedback can be shared with Bentley. Sharing issues, bugs and enhancement requests are encouraged to help improve the software.

Examples (Bentley Learning Path)

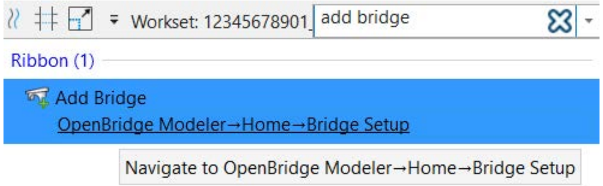
This links to online trainings and references. This is a newly developed tool to provide internet support, online help, training and updates. It is gradually becoming a regular supporting tool for development and advancement.

About

This opens a window that will show which version of the Bentley software is used, along with memory statistics, current file information, and copyright/trademark information.

Search Ribbon

The user can use this tool to find the location of a tool or command or search for help on a specific topic. This is one of the most important tools in OBM. As MicroStation, ORD and OBM tools are developed, it may get cumbersome to remember the locations of each of the tools. Especially since many users have recently migrated to the CONNECT version with the new ribbon menu style and the same tools may be in three different locations in each of the three programs. Many tools are accessible via multiple paths. This search functionality will bring the user directly to the tool as needed. When searching, the user can find the path to the desired tool by hovering over the search result in the ribbon. See the following figure.



Bentley Communities and Product Support

There is a continuously growing community of OpenBridge users around the world. The Bentley Communities site is helpful for troubleshooting issues and finding solutions. You may find help in categories including OpenBridge, OpenRoads, MicroStation, ProStructures, and more.

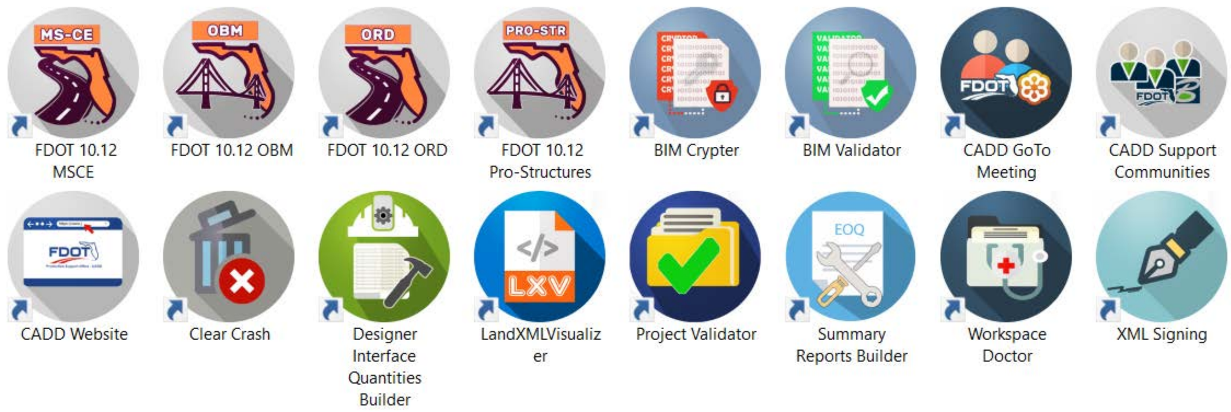
https://communities.bentley.com/

If an issue requires escalation to Bentley, they offer Product Support through their website.

FDOT HELP AND SUPPORT

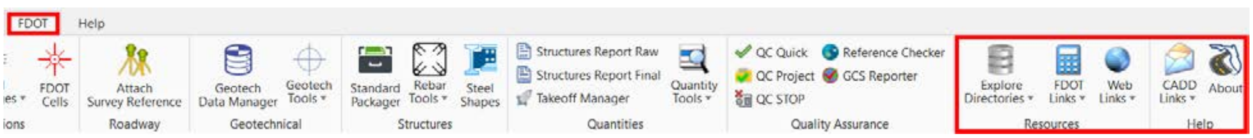
The FDOT Production Support Office | CADD provides many venues of help and support whether one-on-one; self-help; or group assistance. The FDOT Customer Support Guide is published on the CADD website under the Publications link to explain how to get help, who to contact and what to expect.

From the FDOT Desktop folder, the user will find links to join a GoToMeeting for one-on-one support, connect to FDOT's forum on the Bentley Communities website, connect to the FDOT PSO|CADD's website for on-line support, and an option to submit their own Support Request via FDOT PSO|CADD's online support portal.



For detailed instructions on CADD Support, CADD Website, Request CADD Support and FDOT Workspace Doctor applications, see FDOTConnect related training menu. This training focuses solely on FDOT OBM application.

From within an OBM session, the user will find many Help and Support links under the FDOT tab.



The FDOT CADD Office has many links to contact Support staff for assistance or find resource material within the CADD website.

- There is an FDOT CADD Support Forum for users to globally submit issues for any CADD user to respond. This forum is maintained and monitored by the PSO|CADD staff, but also opens the door to many other resources for assistance.

Through the CADD Office's website, the user will have access to much more Help and Support assistance through Publications, Downloads, Training Courses, FDOT Training Manuals, GoTo Webinars, Quick Clips, Frequently Asked Questions (FAQ), Quick Links and links to other offices and outside professional resources.

2 FDOTConnect Workspace Elements and Features

OVERVIEW

This chapter will discuss the different ways that the user can navigate the OBM workspace and organize their model by using the Model Explorer, Levels, Feature Definitions, etc.

OBJECTIVES

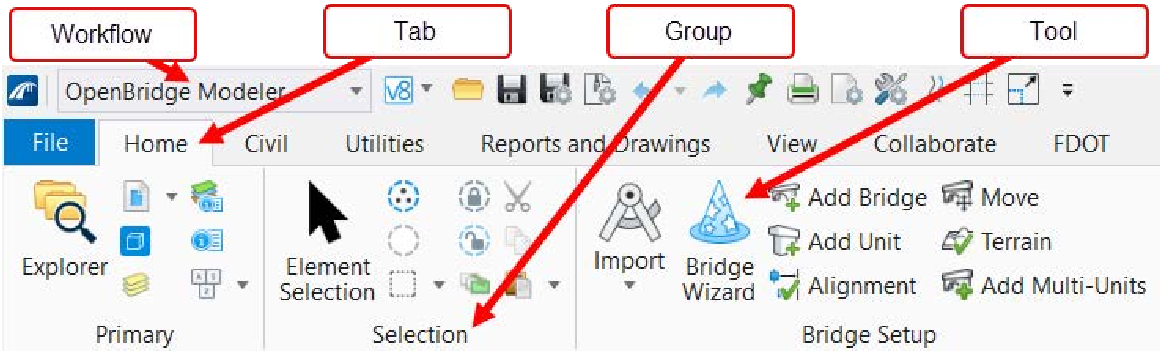
This chapter discusses the design environment within OBM. Highlights of this chapter include:

- FDOTConnect Screen Layout
- Workspace Preferences
- OBM Explorer
- Feature Definitions

FDOTCONNECT SCREEN LAYOUT

FDOTConnect OBM screen layout may be customized to open with components in the same position for every editing session. It may also be reorganized or changed on the fly during an editing session. FDOT has established a default layout that is delivered with FDOTConnect CADD software.

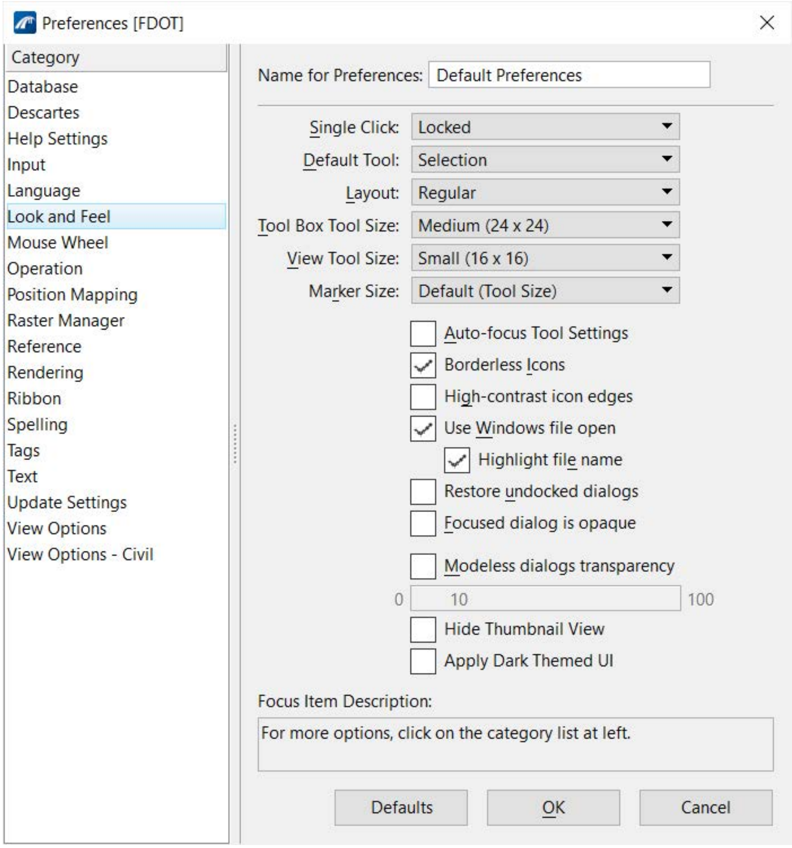
OBM tools are grouped into a family tree from the Workflow, ribbon tabs, groups and tools. If any tool has a triangle next to it, it contains multiple versions of the same tool. Most of the 3D bridge modeling is accessible from OpenBridge Modeler Workflow, while tools in Drawing and Modeling ribbons contain most MicroStation tool to fine tune CADD production.



For detailed MicroStation tools and instructions, see FDOTConnect CADD Essentials training manual for further information. The topics include workspace preferences, views, models, drawing, drawing with precisions, level, changing elements, selecting and grouping, drawing annotation, cells and points, patterning and hatching, placing dimensions, information and measuring tool, reference files, raster images and point clouds. All these functions are still valid in OBM. This document is only covering what's unique to OBM.

WORKSPACE PREFERENCES

The preferences window contains settings that customize the way OBM operates and looks. To access the window, select the OBM menu option: **(Any Workflow) > File > Settings > User > Preferences**.



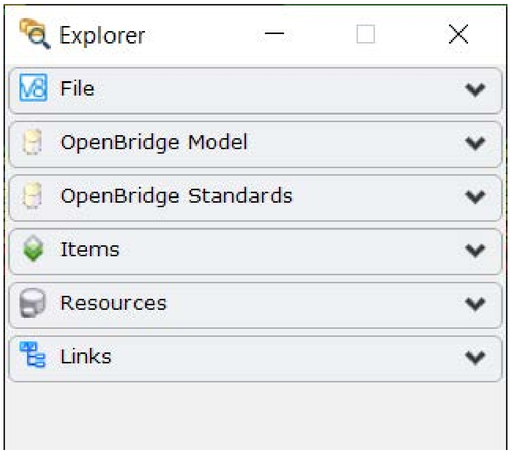
The settings in this window work at the system level, which means that they are not specific to any design file, but are active no matter which design file is being worked in. This window has many options which are referred to throughout this course manual. See Bentley's online Microstation help guide.

PROPERTIES

The *Properties* window is located in the Home tab of any Workflow and may be floatable or docked as wished. It is used to review or modify the properties of any given selection. It can be used in conjunction with the various other OBM tools such as the Element Selection, Explorer, Models, and more.

EXPLORER

Explorer is one of the commonly used tools in Bentley products. OBM has its own version of the Explorer tool that is used to manage and control project content. It is located in the Home tab of any Workflow and may be floatable or docked as wished. It has expandable menu items including File, OpenBridge Model, OpenBridge Standards, Items, Resources, Sheet Index, and Links. Files created per FDOT workspace and Create File tool will have all delivered libraries listed under the OpenBridge Standards tab.



OpenBridge Model

The *OpenBridge Model* menu is used to view the civil and bridge data in hierarchal order. It can be used to toggle on or off the display of various elements within the model. This functionality is helpful because unlike Level Display, it can control individual elements rather than all elements of a given category. For instance, a single pier could be toggled off while keeping the other piers on in the model. Individual elements can also be renamed from their default names by right clicking an element and selecting **Rename**. This can be helpful in organizing elements since they will be labeled as shown in the *OpenBridge Model* menu in various model-generated reports.

LEVEL, ELEMENT TEMPLATE, FEATURE SYMBOLOGY, AND FEATURE DEFINITION

A MicroStation design is made with basic building blocks called elements that are placed in a design space within each model. Each element placed in a model is on a drawing *Level*. Each Level can have its own *color, line style,* and *weight* along with several other attributes. The next step up from Level is *Element Template*. Each Element Template can be assigned a Level, color, line style, weight, *class*, *transparency*, and *priority*. The color, line style, and weight can be set to *ByLevel* or can override the Level settings.

Similar to elements in MicroStation, *Features* were developed for the Connect Edition software, including OBM. When creating an OBM design, the user can use features to intelligently organize model information. *Feature Symbology* is overlaid on top of Element Templates with “shape” information such as point, line, profile, surface and solid. *Feature Definitions* provide an additional overlayer on top of Feature Symbology with “part” information, such as deck, beam, support, etc. The list of shapes and parts are predetermined by OBM and may not be edited.

In addition to providing for the management and display options for levels through Level Manager, Level Filters, and Level Display applications, OBM also provides a list of applicable Feature Definitions through a flyout menu. FDOT Feature Definitions for bridge design projects are delivered with the FDOTConnect workspace in a DGNLIB file. These FDOT Standard Libraries are locked and cannot be modified by the user.

This manual focuses on Features Definitions in OBM, which is comprised of the following:

- Database intelligence developed from Level to Features
- Level Manager, Level Display, Element Templates, Features Symbology & Features
- FDOT delivered Feature Definition Standard

FDOT Feature Definitions

The OBM Feature Definition Library refers to a component of a DGN Library that contains a level, element template, feature symbology and feature definition structure. New libraries can be created; new and existing level libraries can be attached, detached, imported, and exported using the Level Manager window. They may also be delivered in the appropriate directory. A level or definition does not technically attach from the Standard Library to a design file until it is used.

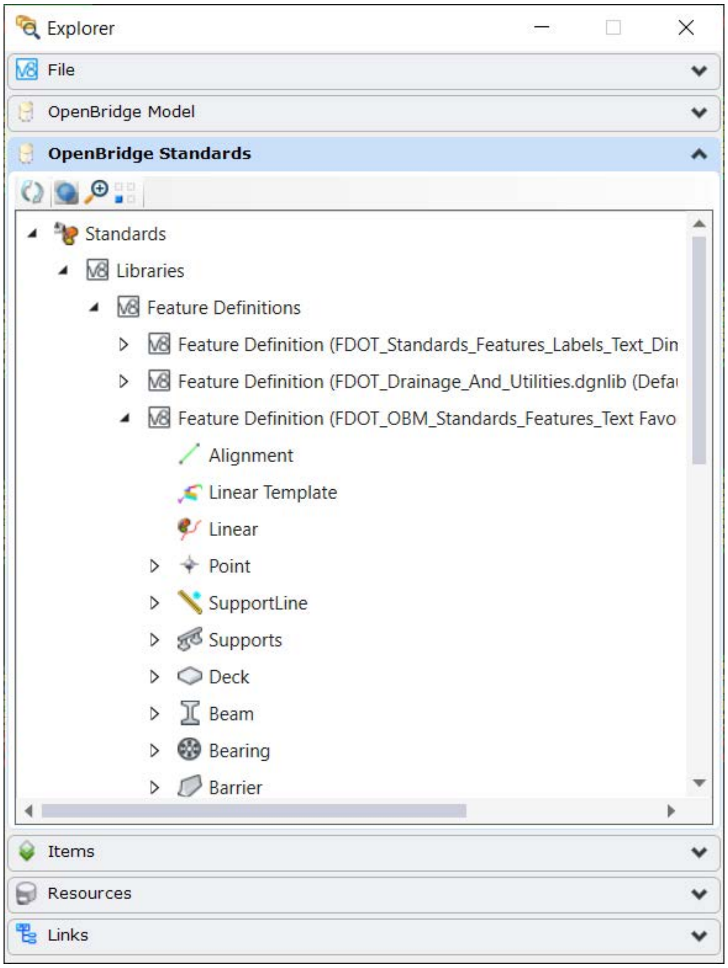
The FDOT Levels and attributes are grouped and translated into specific Rule Files which are associated to each valid Standard Filename of each Discipline for the purpose of performing the Quality Control check for FDOT Standard compliancy of design files. Complete specifications can be found in the CADD Menu (CADD). FDOT QC check will not use Feature Definitions in the near future releases.

When using OBM to create an FDOT drawing, the color, line style and line weight attributes should be set to "**ByLevel**". This setting allows the level to control these active attributes. This ensures that the levels comply with FDOT standards. FDOT levels are predefined and delivered in specific DGNLIB files. FDOT does not recommend overriding the ByLevel settings. To do so would result in non-standard design files that would not be acceptable in FDOT Project submittals.

Note that users should be using the Feature Definitions provided in the FDOTConnect workspace wherever possible. If new Feature Definitions are desired, this should be requested through the **FDOT > Help > CADD Support > Email CADD Support**.

NOTE ***New or modified Feature Definitions may be introduced into an existing DGN for an updated DGNLIB by right clicking on the filename within the OpenBridge Standards menu and selecting "Update Standards from dgnlib." This can be useful when updating an existing file to a new version of the program.***

NOTE ***FDOTConnect OBM will be using the Features Definitions for alignments defined by FDOTConnect for ORD. There will not be a different set of Features Definitions for alignments for bridge modeling in OBM***



3 DESIGN FILES

OVERVIEW

This chapter will cover file creation process in OBM, file connectivity among disciplines and file management in FDOTConnect workspace. FDOTConnect is a workspace developed by FDOT for Bentley Connect Edition software. It includes all necessary resources, tools and customization that are required for FDOT projects. It must be used for compliance with the FDOT Computer Aided Design and Drafting (CADD) Standards. See FDOT CADD Manual for CADD Standard details.

OBJECTIVES

This chapter reviews the OBM design environment within the Florida Department of Transportation (FDOT) FDOTConnect Workspace. Special consideration is given to:

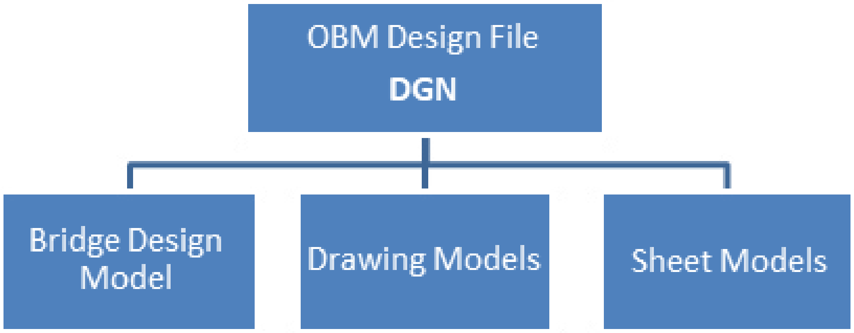
- OBM Structures Design Files
- FDOT ORD and OBM Seed Files
- Launching OBM in FDOTConnect Workspace
- Opening Files in FDOTConnect Workspace
- FDOTConnect Discipline Configurations
- Creating Files in FDOTConnect Workspace
- Design File Settings
- FDOTConnect Preferences

OBM STRUCTURES DESIGN FILES

The OBM CONNECT format is a subset of .DGN and accepts .DWG file formats. This gives OBM native support for both Bentley and Autodesk platform. For other applicable formats, see OBM user guide.

A design file (.DGN) is a container for the data of the project. Note that this term is generic in the Bentley environments; a design file could be "Design File" or "Sheet File" as defined in the FDOT Create File tool in the FDOT tab. The design file can be viewed as a "box" or "container," which contains one or more models, with the first one typically named "Default." Each model is a unique component within the .DGN, which allows multiple drawings to reside in the same design file. For example, design models, drawing models, and sheet models can exist as separate models in a single design file. Note that "Design File" and "design model" are different concepts, so are "Sheet File" vs sheet model. "Design File" and "Sheet File" are FDOT introduced concepts while design models and sheet models are Bentley concepts.

NOTE ***Only one design file is opened at a time in OBM, but other design files may be viewed by attaching them as References, along with their models, to the active model in the open design file. All Dimensioning and annotation are typically done in a drawing model.***



In OBM, generally a *design model* is used when first creating a bridge model or drawing bridge elements, either in 2D or 3D. See chapter 6 for a more detailed explanation of how design models, drawing models, and sheet models work together in the plans production workflow.

When progressing to model-centric workflow, the goal is to generate a 3D design model. The option to create a 2D design model is either as a starting point to aid in the creation of a 3D design or for those who are not using a 3D workflow yet. Regardless of 2D or 3D design file, there should be one governing design file used for the purpose of digital delivery.

FDOTCONNECT SEED FILES

Each OBM design file is created from a seed file. A seed file is a previously stored design file, with user specified settings, used as a template to create a new DGN. FDOT has created seed files for use in production that have standard settings stored within them. Available OBM seed files with FDOTConnect are:

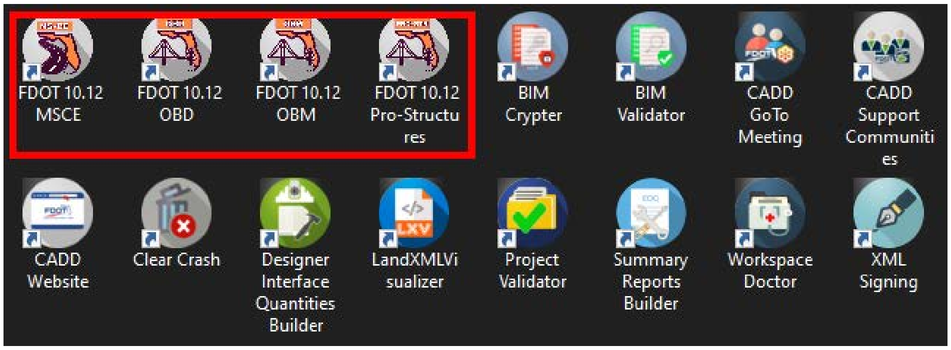
FDOT-OBM-KeySheetSeed.dgn	Contains settings to create a Key Sheet design file in OBM.
FDOT-OBM-StructuresSeed2d.DGN	Contains settings to create a 2D Bridge design file in OBM.
FDOT-OBM-StructuresSeed3d.DGN	Contains settings to create a 3D Bridge design file in OBM.
FDOT-OBM-StructuresSheetSeed3d.dgn	Contains settings to create a 3D “Sheet File” in OBM.

A default seed file will be selected for each design file when using the FDOT Create File tool, but the user can override the seed file if another is needed.

LAUNCHING OBM IN FDOTCONNECT WORKSPACE

FDOT has created and provided a custom workspace FDOTConnect to standardize the OBM environment for agency use. This workspace determines how OBM displays on the screen and sets up certain default files and search paths. FDOT's customized OBM workspace can be launched by the following common avenues:

- Double-click the FDOT-OBM icon from the FDOTConnect desktop folder.



From the Windows Start menu, select **Start > FDOT-ConnectXX.XX > FDOT-XX.XX OBM**.

NOTE ***Opening an OBM session from the Bentley program group or by double clicking on a DGN file will not guarantee opening of OBM in the FDOTConnect workspace.***

Once the program is located, it can be pinned to Start or the Taskbar for easy access.

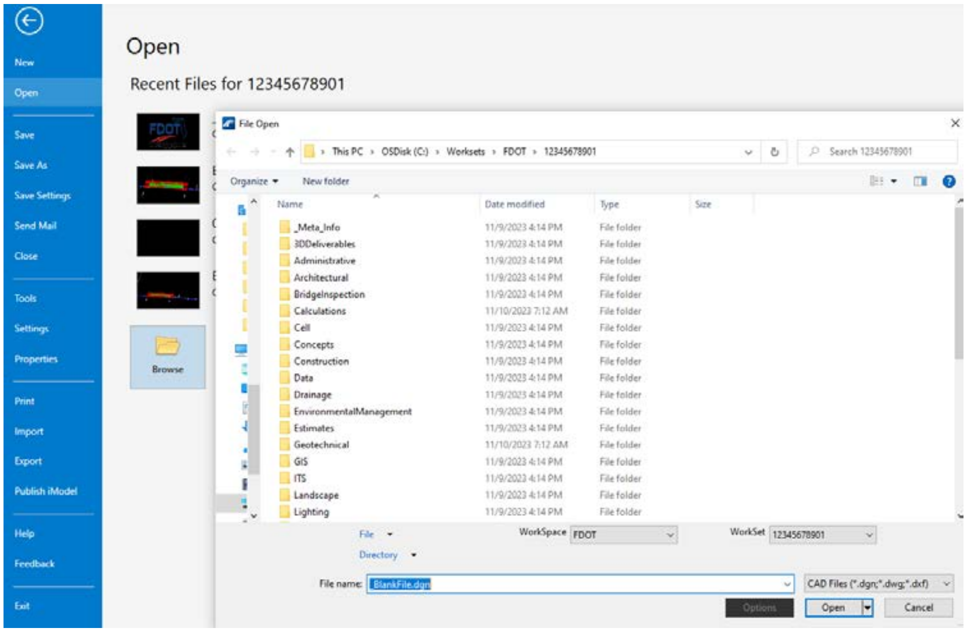
All the utilities presented in the above shown folder are created by FDOT. Workspace Doctor and Clear Crash are two very useful tools. Workspace doctor is provided to fix configuration problems, i.e. remove user preferences and return to program default. User may also manually remove user preferences by removing the file **personal.upf** in the following directory [drive]\users\[username]\appData\local\Bentley\OpenBridgeModeler\XX.X.X\prefs\. FDOT user preference and interface configuration (bar menu) are not part of the OBM settings like how it was in the older versions of Bentley programs.

BENTLEY PRODUCT HIERARCHY

Bentley's CONNECT Edition software include MicroStation, ORD and OBM. OBM is built on top of ORD and ORD on MicroStation. In general, functions and tools that are available in MicroStation are available in ORD and those for ORD are also available in OBM, but not the other way around. That means functions and tools available in OBM may not be used or available in ORD or MicroStation. With all that said, this does not mean that ORD files can be opened in OBM. Neither MicroStation files in ORD nor OBM. Even files created in a different version may not be recognized in the same program. This is true for new version to old version or old version to new version. The next section will discuss further on file management regarding this information.

OPENING FILES IN FDOT CONNECT WORKSPACE

- FDOT OBM File Open tool launches the File Open window. **File > Open** is used to manage design files and open existing drawings. Recent Files will appear when this is first opened. The user can also click on **Browse** at the end of the Recent Files list to open the “File Open” window shown in the image below. If using ProjectWise, you may see a window pop up from that that needs to be closed first.



The File Open window contains standard navigation tools such as a drive list and files list. Right clicking on a file opens a dropdown menu with file options for use on the selected file.

The File name identifies a specific file selection and List Files of Type filters which type of files display in the Files list box. For example, to view DGN files only, change the option to MicroStation DGN Files [*.dgn].

The Options button only displays when selecting DWG file formats. FDOT Software delivery provides preset settings found within this option and does not recommend users to make any changes.

To navigate to a different directory, select the directory from the *Directories* list in the middle of the window. To open a design file, select it from the *Files* list and click OK, <OR> double-click on the file name to open it.

All roadway features are expected to be created in FDOT ORD workspace. They are to be referenced into OBM files. No ORD files should be opened in OBM, nor OBM files in ORD. LandXML or Alignment XML or ConceptStation XML may be imported into OBM and saved as a DGN file. Bridge modeling is expected to be completed within another file that references the above mentioned DGN file.

If any data created from ConceptStation is to be used in OBM, use only XML format exchange. Data transfer from OBM to ConceptStation shall be DGN referenced in ConceptStation. Opening ConceptStation file in OBM is not recommended.

It is clear now that no two DGN files are the same. Double clicking the DGN file in the file explorer is not recommended, as DGN files are affiliated with ORD, OBM, and MicroStation programs. The only recommended way to open a DGN file properly is to open it from the **File > Open** directory in the program and version it was created, otherwise utilizing the reference tool is encouraged.

Switching Design Files

Once a DGN file is open, users may switch to other DGN files by selecting the OBM menu option **File > Open** <OR> hold the Control key down and select the letter ‘O’ (Ctrl+O)**.** The Open window displays with abbreviated options as in the File Open window.

FDOT DISCIPLINE CONFIGURATIONS

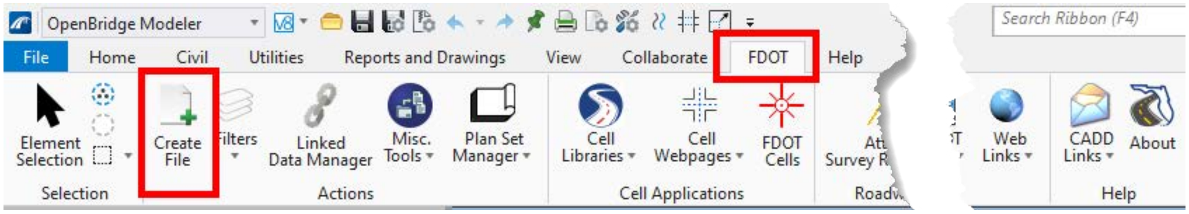
FDOT discipline bar menus are no longer necessary. Instead, tools will be available under the FDOT tab as shown. FDOT tools are strategically organized under multiple groups, such as the Resources group which will include Website Links and Explore Directories tools, and the Create File tool (discussed in detail in the next section) is under the Actions group. Other FDOT tools such as CADD Support and Workspace Doctor tools are also included and discussed in previous chapters in this guide.

Structures specific groups/tools are available, such as a Structures Standards Packager, Rebar Tools (to generate reinforcing bar lists), and the Steel Shapes section generator. Also included are QC checks, Linked Data Manager (LDM), and Plan Set Manager.

CREATING FILES IN FDOTCONNECT WORKSPACE

To create a new file in the FDOT OBM WorkSets, the user should use the FDOT Create File tool in order to be in compliance with the file name Quality Control requirements per FDOT CADD manual. **The user should not use the New File that comes with OBM by default**. Instead, the user is encouraged to create a new WorkSet and open the file ***BlankFile.dgn*** in the newly created WorkSet that comes with FDOTConnect software. As mentioned, FDOT provides an application named Create File to create new files with the correct seed file, file names and folder structure already in place. This FDOT utility may not be accessible outside of an FDOT OBM session. The *BlankFile.dgn* is only needed the first time a file needs to be created, afterward the user can access the tool from existing project DGNs.

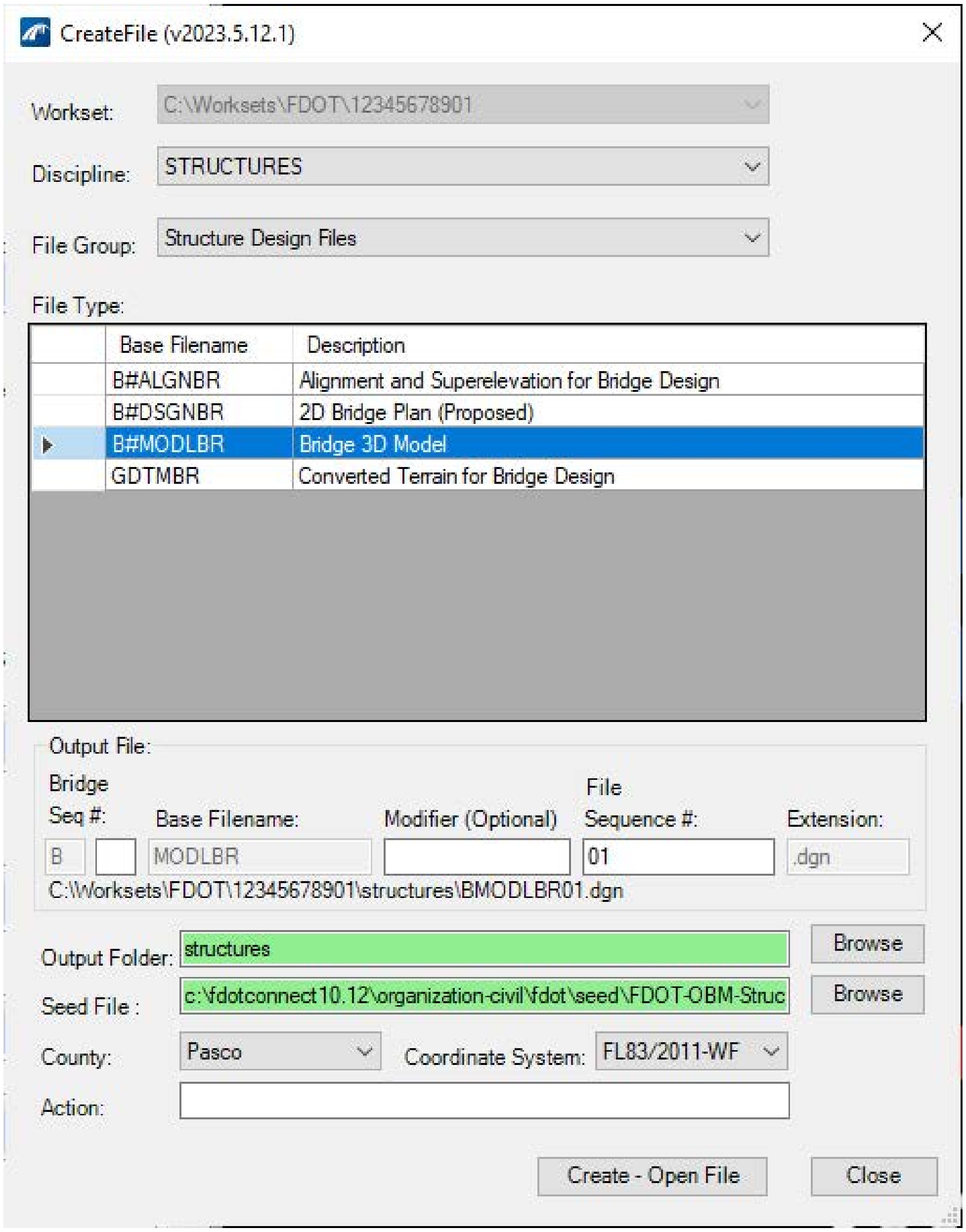
To access this FDOT utility within an OBM session, select the **FDOT > Actions > Create File**.



CREATE FILE TOOL

The Create File tool is used to create FDOT OBM design files in accordance with the FDOT standard file naming conventions. Create File uses an ASCII text file, called a Control File (*.ctl) to perform these task(s).

NOTE ***FDOT's Create File is a separate utility now delivered with FDOTConnect Software. This application may no longer be accessible outside of OBM.***



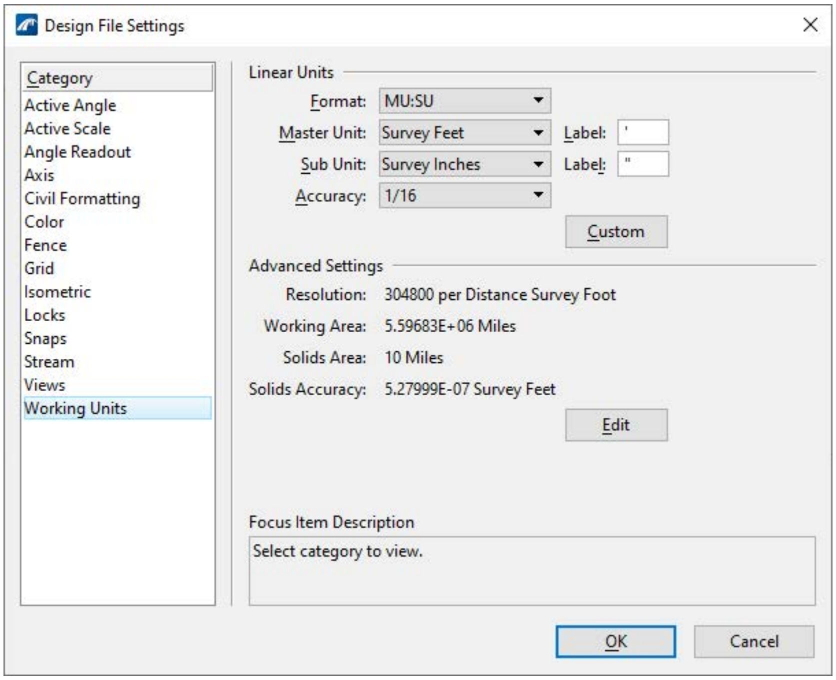
A description of the Create File window is listed below:

Discipline	Defines the control file, which sets all other information in Create File window. Use the *Discipline* dropdown arrow to select the appropriate control file. There are various available disciplines: STRUCTURES, STRUCTURES – NON-BRIDGE SPECIFIC, ROADWAY, UTILITIES, etc. Upon selection of a *Control File*, all other fields automatically populate with FDOT standard information.
File Group	Each control file has several *File Groups* to choose from. Each group is a specific area of design and plans production, with either "Design Files" or "Sheet Files." Selecting a file group automatically loads the file types related to that group into the *File Type* list box.
File Type	Selecting a *File Type* automatically sets all the settings for the *Output File (Name), Output folder,* and *Seed File* fields, of the file to be created. If a file with the same name already exists, the numbering is automatically incremented.
Output File **Output Folder** **Seed File**	These settings are automatically set when the *Discipline*, *File Group* and *File Type* are specified. Only the *Output File* or *Seed File* may be modified directly. **Browse** buttons are provided to change the *Output Folder* or the *Seed Path*, if needed.
Action	When an OBM design file is created and opened, this text field can be used to enter MicroStation/OBM commands, such as **set active scale** to 10 (AS=10). Action functions similarly to the MicroStation Key-in utility.
Create – Open File	Selecting the **Create – Open File** button executes the creation of a new DGN file as specified by the selections made and saves the file to the *Output File* and *Output Folder* specified. Click the button more than once to create multiple new DGN files where needed. The application will automatically increment the numbering of subsequent files with the same file name. This is useful when more than one blank copy of a particular type of DGN file is needed, such as Plan and Profile Sheets.

NOTE ***If any files created in OBM are roadway related features, such as turbidity walls, saving to the \Roadway directory is required. This means there will be ORD and OBM files mixed in the same directory. It may be helpful to organize these files into sub-folders.***

DESIGN (DGN) FILE SETTINGS

When a new design file is created, it is recommended to review the set-up of the design file parameters that control how the drawing functions. The most common file settings are found in the Design File Settings window which provides control over such settings as highlight colors, coordinate readout, working units, and grid settings. To access Design File Settings, select the OBM menu option: **File > Settings > File > Design File Settings**.



NOTE ***It is important to note that, if the proper Seed File is used when the OBM file is created, then there should be only limited reasons to change any of the design file settings. One example may be updating Working Units based on Plans Development needs (see section below).***

WORKING UNITS

Working Units consists of controls that are used to set "real world" units of measurement for design models. OBM recognizes Metric and English units, either of which may be selected. Additionally, users can create their own custom units, by relating them to the standard units (Metric or English). Changing between the units used in a model makes no difference to the size of geometry in the model; alternatively, changing the Resolution setting in the Advanced Settings does change the size of existing geometry in the model. In practice, the Resolution setting will rarely, if ever, have to be changed from the default.

The default Working Units in the FDOTConnect OBM seeds are Survey Feet and Inches with rounding to the nearest 1/16th of an inch. In order to take advantage of some OBM plans development and reporting tools, the user may want to change the Working Units. For example, changing the Working Units to decimal survey feet for creating deck elevation reports so that the values are reported as typically provided in drawings and calculations. Another instance is when the Structures Detailing Manual (SDM) precision requirements vary from the default.

GLOBAL ORIGIN

The global origin for FDOT's standard seed files are set to an XY coordinate of 0, 0. The global origin can be relocated to specific coordinate values to create a custom coordinate system.

When using Create File to create OBM files, a predefined seed file is used to create each design file automatically and thus the global origin is set to FDOT standards.

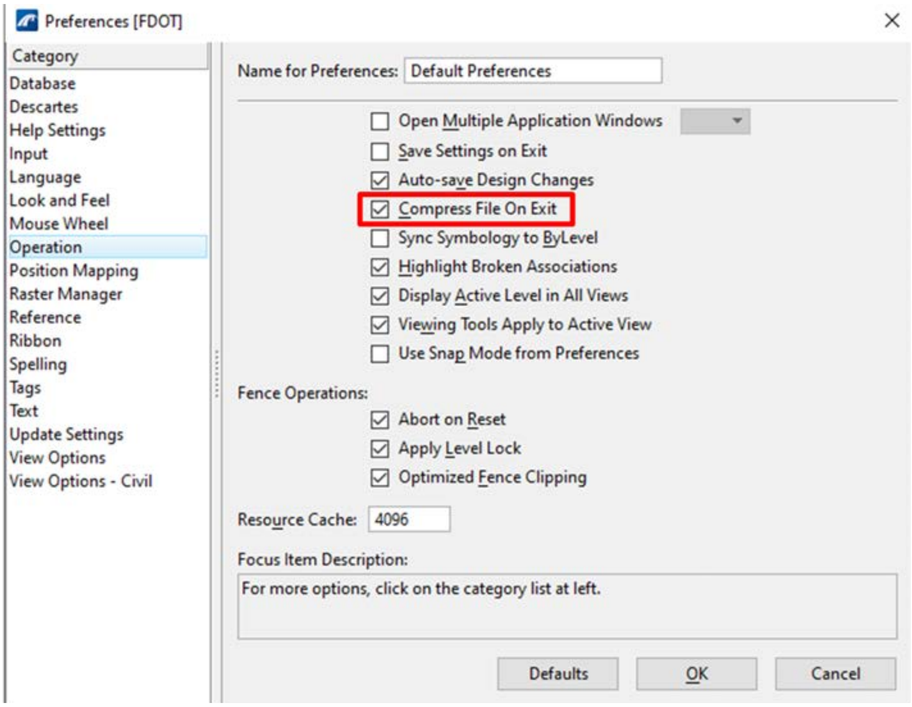
FDOT PREFERENCES

Compressing Design File

When elements are deleted from a OBM design file, the elements no longer display in the design, but a record of the deleted elements remains in the design file. The *Compress Design File* command removes the records, which reduces the file's size.

The undo buffer is cleared when a design file is compressed, so after compressing, the user will no longer be able to undo any previous operations.

It is best to use the *Compress Design File* command at the end of an editing session. This can also be set to happen automatically upon exiting the design file. To enable this setting, select **File > Settings > User > Preferences** from the OBM menu, select the *Operation* category and click the checkbox for *Compress File on Exit*.



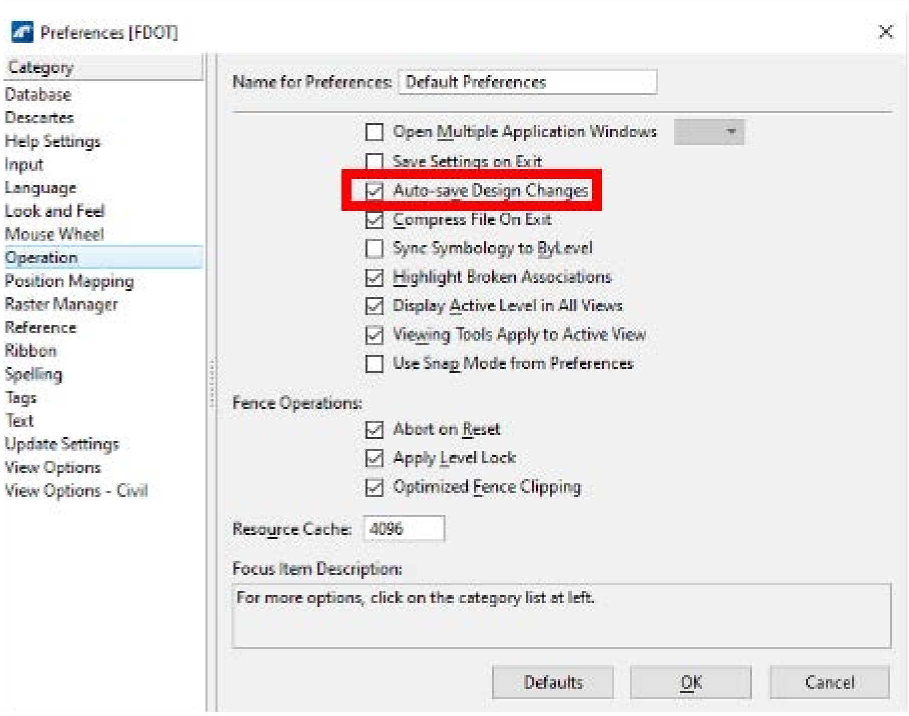
SAVING FILES

By default, OBM saves drawing changes automatically. OBM design files are saved in DGN format.

The fact that the file is saved automatically is a very powerful feature of the software. This gives the user security of knowing that in the event of a computer crash or power failure, the design changes for the last completed command are saved.

Only changes to design elements are saved automatically. File settings (active color, view setup) must be saved using the OBM menu option: **File > Save Settings** <OR> **[Ctrl] + [F]** on the keyboard. This preserves all file settings to ensure reflection of current settings in future openings of the file.

To disable this feature, select the OBM menu option: **File > Settings > User > Preferences** and then select the **Operation** category in the Preferences window. Uncheck the Auto-save Design Changes checkbox.



If Automatically Save Design Changes is disabled, the user must manually save the file by clicking theOBM menu option: **File > Save**. Selecting **File > Save As** allows the user to save the file as a V8, V7, DWG, or DXF file format. The **Save As** command can also be used to create a backup of the design file.

NOTE ***Save Settings can be set to execute automatically from this Operation category of the Preferences window, by checking the Save Settings on Exit checkbox.***

To return to the File Open window during an editing session, select the OBM menu option: **File > Close.**

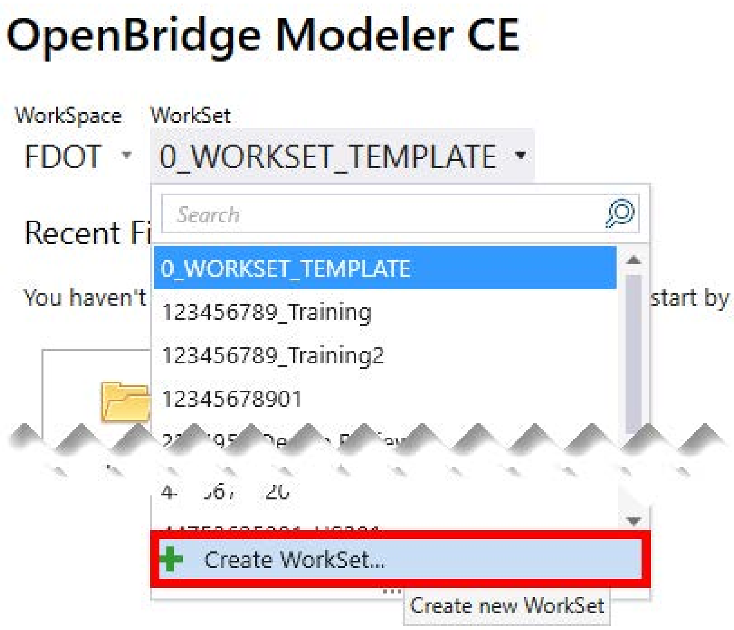
Exercise Overview

EXERCISE 3.1 *Review the Design Environment and Create a New File*

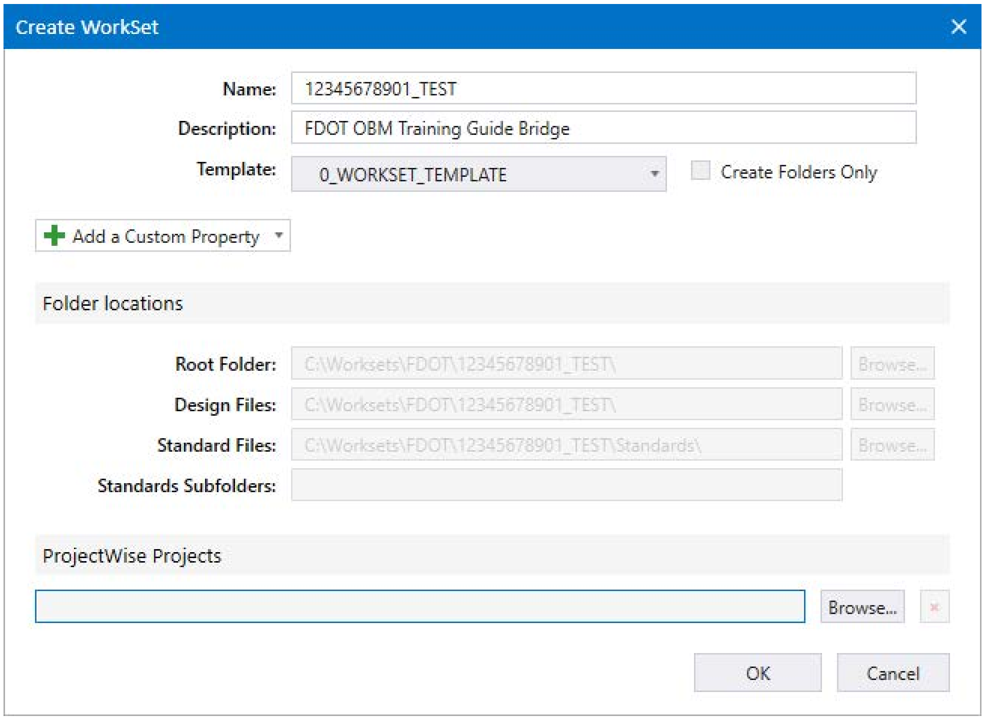
This exercise covers opening the program, creating a WorkSet, and creating a new file. The WorkSet created in the first part of this exercise is used *only as an example* for the purpose of demonstrating the process. The WorkSet for the remaining exercises should be downloaded and copied into the WorkSets folder prior to beginning the course; *see link and instructions in Chapter 1 of this training guide.*

REVIEW FDOTCONNECT WORKSPACE AND CREATE A WORKSET

1. Before we launch the program, locate the FDOTConnect and FDOT WorkSet Directories. The FDOTConnect file directory should be in C:\FDOTConnectXX.XX and a separate directory used for WorkSets, such as C:\Worksets\FDOT. The WorkSets directory is where the **12345678901** folder downloaded from Chapter 1 should be located, along with the corresponding .CFG and .DGNWS files.
2. Next, launch OBM by double-clicking the FDOT-OBM shortcut from the FDOTConnect desktop folder or from the Windows Start menu by select **Start > FDOT Connect XX.XX > FDOT XX.XX OBM**.
3. Under the WorkSet pulldown menu, select **Create WorkSet…**



4. Add the WorkSet name **12345678901_TEST** (also shown below), the *Description* **FDOT OBM Training Guide Bridge**, select the **0_WORKSET_TEMPLATE** as the template and select **OK** to create the new WorkSet



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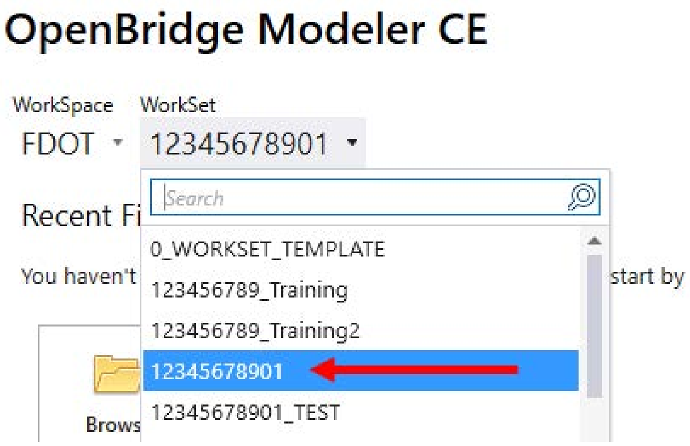
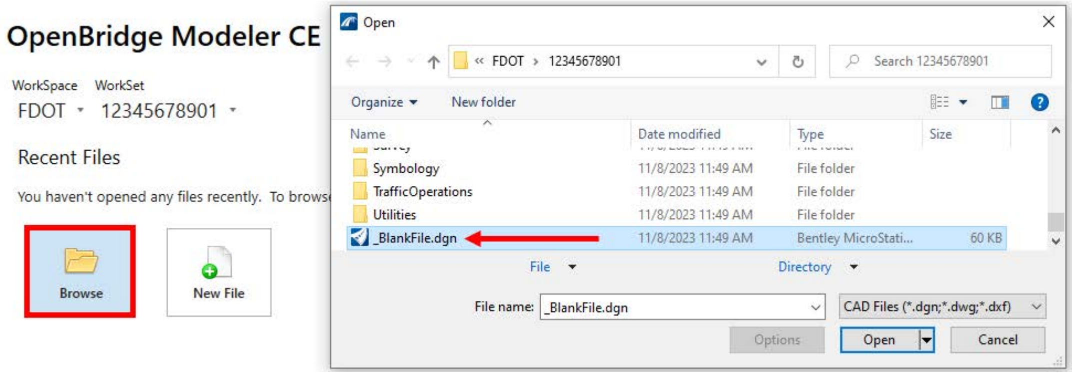
5. Change the active WorkSet from the **12345678901_TEST** that was just created to the WorkSet downloaded with the dataset, **12345678901**.



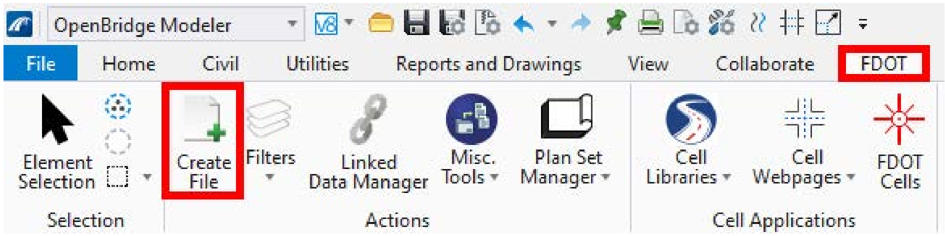
NOTE ***See the*** Course Supporting Files and Additional Resources ***section on page 1-4 for instructions on how to download the dataset and where to copy the files.***

6. Click the Browse button and navigate to the *_BlankFile.dgn* in the 12345678901 WorkSet and select **Open**.



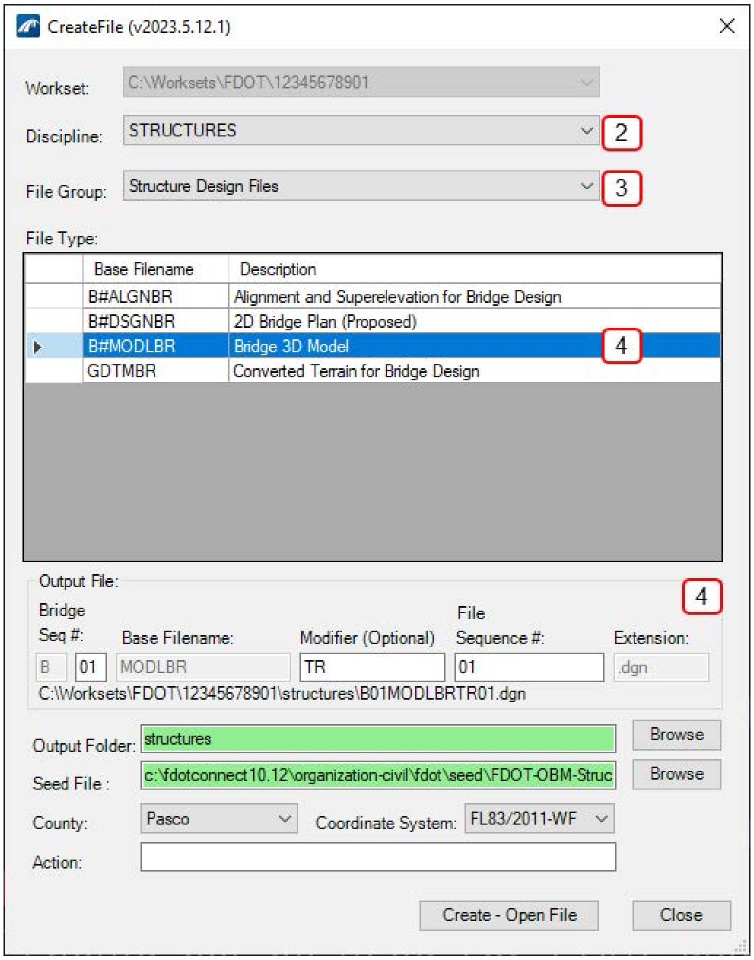
To Create a new Design File

1. Open the Create File window by selecting **FDOT > Actions > Create File**. The Create File window displays.



2. From the Create File window, click on the *Discipline* dropdown arrow to select **STRUCTURES**.
3. Click on the *File Group* dropdown arrow to select the applicable **Structure Design Files**. This will populate the *File Type* window with the associated files for selection.

4. Select the *File Type* of **B#MODLBR: Bridge 3D Model** and add the following information into the *Output File* fields. Note that we are adding a **TR** as a modifier to the file name to designate this as the training model.



5. Select the **Create-Open File** button to open the newly created design file in OBM. The new design file is automatically created and opened as specified and saved under the corresponding Structures discipline folder. The Create File window remains open to continue creating as many new design files as needed. Since we do not need additional new files at this time, close the Create File window.

4 INCORPORATING CIVIL & OTHER DATA

OVERVIEW

Data connectivity among different disciplines has always been the integral part of the FDOT 3D initiative. Specifically in bridge design and modeling workflows, it is important to be able to reference the applicable information from various sources including Roadway, Survey, Geotech, and more. This chapter will introduce the data commonly communicated through different disiplines and how to reference that data into our bridge model file for use. The exercise will provide participants with practice using reference files and managing changes during the course of the project.

Roadway data is especially important in OBM. Alignment and profile data must be created, imported, or referenced first before starting any bridge modeling in OBM. A terrain file is also recommended for modeling to allow for visual confirmation of elements, as well as the usage of additional OBM tools for substructure unit placement.

OBJECTIVES

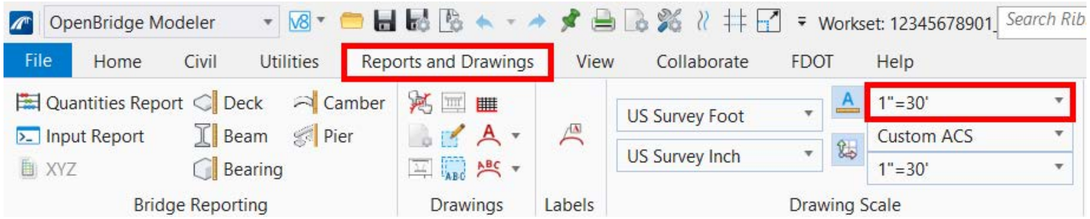
This chapter reviews how to acquire data from other disciplines inside the FDOTConnect environment or outside. Topics include:

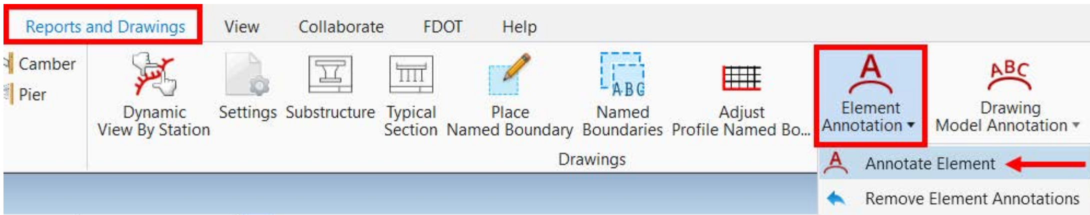
- Roadway alignment from GPK file from earlier versions of Bentley products
- Alignment in LandXML file
- Superelevation in DGN file
- Survey data in TIN file
- Survey data in LandXML
- Alignment and superelevation for Dual Bridges
- GINT file for Geotech

DATA COMMUNICATED FROM OTHER DISCIPLINES

ROADWAY

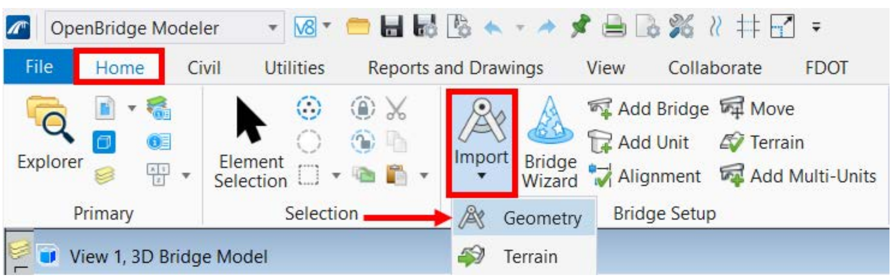
In general, the necessary roadway data is provided in the \Roadway directory for bridge modeling. This file typically follows the *ALGNRDXX.dgn* naming convention, is generated with the ORD FDOTConnect workspace, and contains all necessary alignment, profile, and superelevation features that are necessary to complete the project. Once the *e* is referenced, the user should set the annotation scale as desired and annotate the alignment, if not already annotated directly in the alignment file: **Reports and Drawings > Drawing Scale > Annotation Scale** and **Reports and Drawings > Drawings > Element Annotation.**





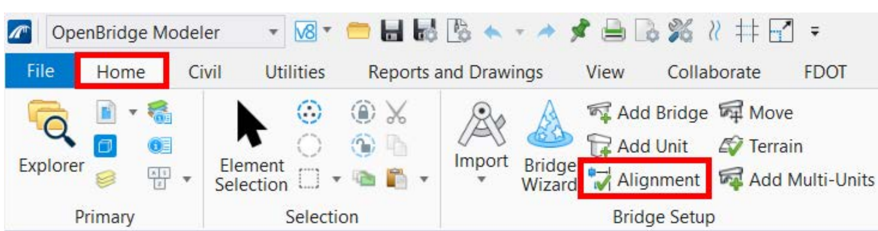
If the alignment and profile are provided via GPK or LandXML file in the \Roadway directory, a file named *ALGNBRXX.dgn* must be created in the \Structures directory. Create this file by using the Create File tool. Once *ALGNBRXX.dgn* is created, use the Import Geometry tool to import data. The **Home > Import > Geometry** tool in the Bridge Setup group is used to import GPK or LandXML geometry. Before annotating the alignment as referenced above, define the Feature Definition as an alignment (right click on the alignment: **Properties > Feature Definition > Alignment > Baseline** <OR> **Centerline**). If alignment data is to be provided for dual bridges for the same centerline of construction, alignment and profile for each bridge needs to be communicated.

Clarification of profile and alignment affiliations must be communicated if importing via GPK file. GPK files generally store information for many alignment and profile chains. The user must ensure the profile(s) and alignment(s) that correspond to one another are selected since the program will not indicate if non-matching chains are selected. To avoid any issues, select the profile first and the corresponding alignment will be automatically selected. If alignment and profile are provided in LandXML in the \Roadway directory, affiliation does not need to be clarified and the files can be used as-is.

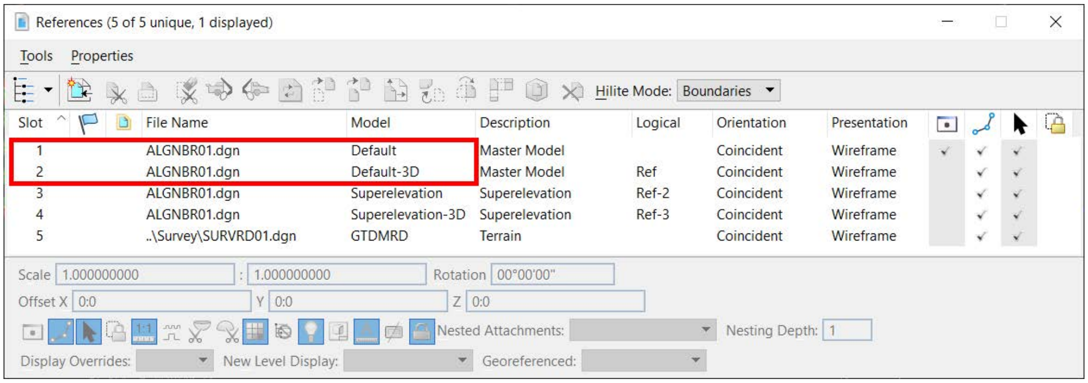


NOTE ***If Alignment is imported from GPK or LandXML files, proper Feature Definition must be assigned and the alignment must be annotated inside the DGN file.***

The alignment associated with the active bridge unit can be updated or changed. Use the **Home > Bridge Setup > Alignment** tool and click on the new alignment after it has been re-imported. See the following image.

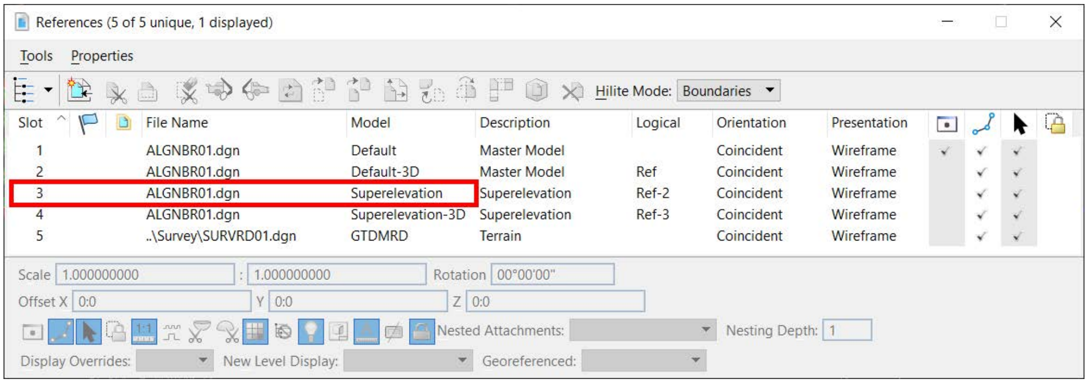


The remaining steps to utilize roadway information are similar for each of the approaches. First, reference the alignment file DGN into the bridge model file. The referenced DGN will have one model with the alignment and one with the profile, "Default" and "Default-3D" respectively in the image below.



NOTE ***If an alignment or other reference file has been updated during a session, the user will see an indication in the "Status" flag and can right click and select "Reload" to update the reference. Depending on the nature and extent of the changes, any bridge elements directly using elements from these reference files (alignment, surfaces for substructure foundation placement, etc.) may update automatically or may need additional manual updates.***

If there is superelevation on the bridge portion of the project, superelevation should be included in the superelevation model that comes with *ALGNBRXX.dgn*.



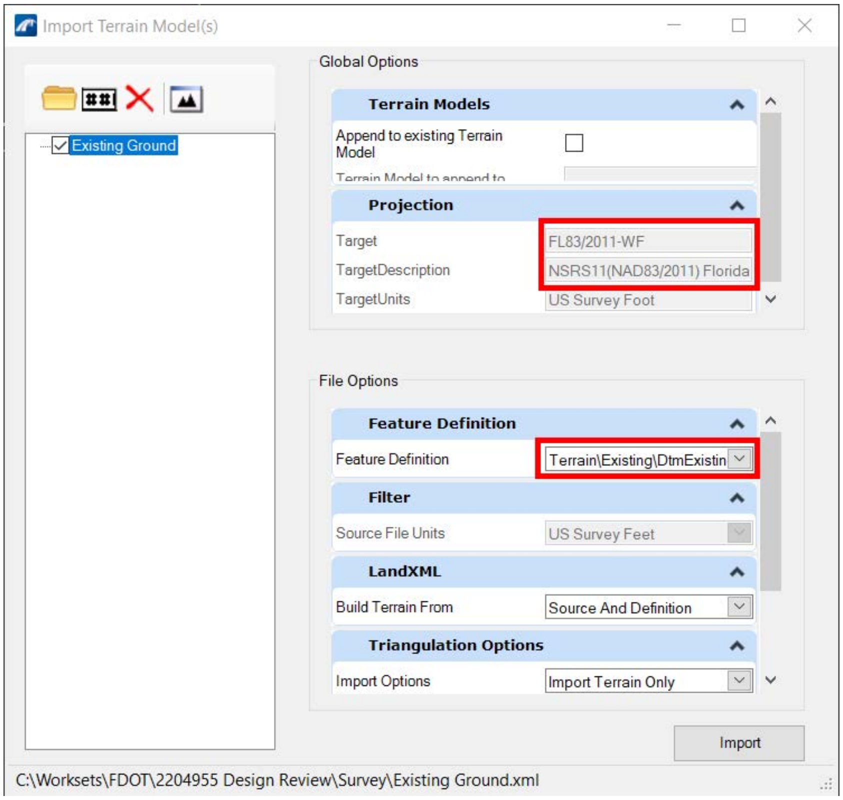
NOTE ***The data needed for the OBM superelevation tools is in the Superelevation model. There is no data in the Superelevation-3D model. It often becomes attached along with the Superelevation model but can be ignored or detached.***

If a superelevation DGN file is provided in the \Roadway directory, a direct reference is sufficient to use the OBM superelevation tools.

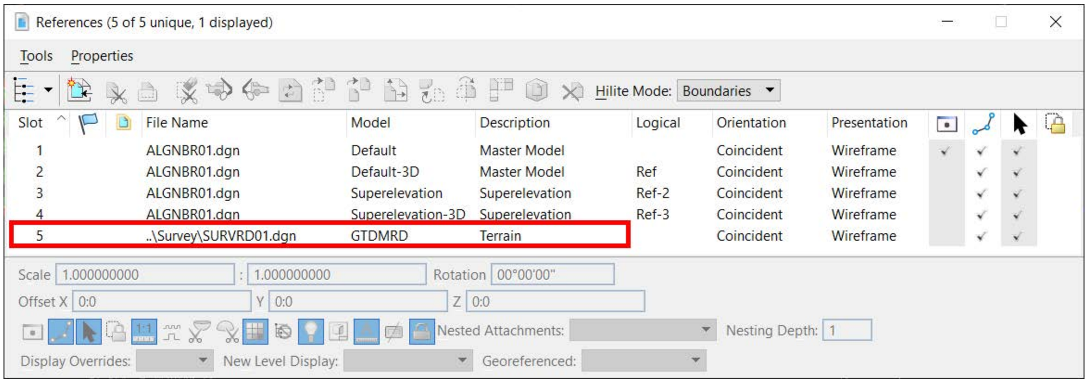
Traditionally in design, all profile grade lines (PGL) are given in reference to the Centerline of Construction and multiple profiles are given at a point left or right to the Centerline of Construction. Currently, OBM cannot accommodate this versatility. A bridge must be created with a unique alignment and a unique profile. The limitation is caused by the fact that alignment may not be paired with multiple profiles. If dual bridges are intended, a separate alignment/profile must be referenced and the second structure created as a separate bridge (see the Add Bridge section in Chapter 5). Alternatively, dual bridges can be modeled in two separate files if referencing a single alignment.

SURVEY

Similarly, survey data from a TIN or LandXLM in the \Survey directory may be imported in a newly created file using the naming convention *GDTMBRXX.dgn* within the \Structures directory. Be aware of the Georeferenced Coordinated System for the project and the ability to add the Feature Definition as part of the import process shown below.

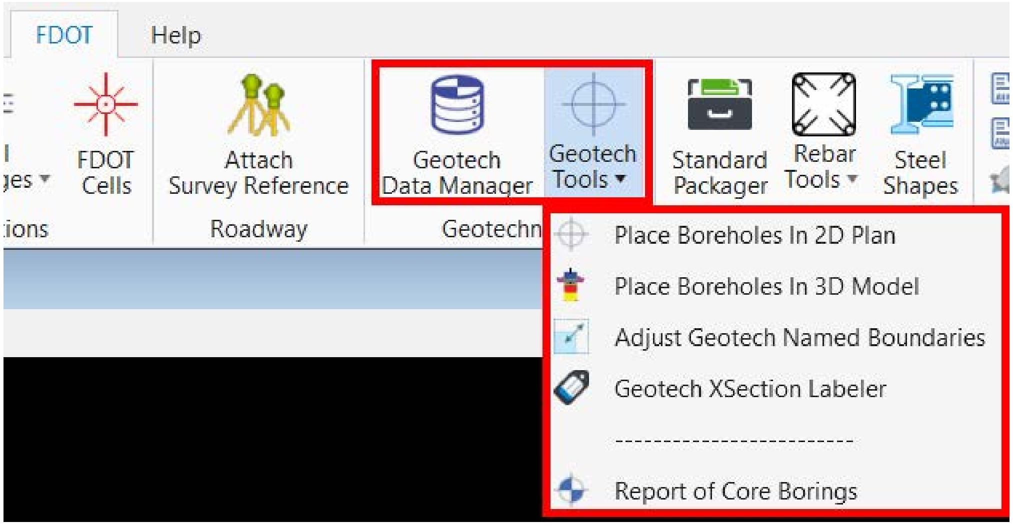


If available, a DGN file can also be referenced (without importing) by the user for existing features. When created as a Design Survey, the SURVRD (Survey Development Model) can serve as a complete survey database, which contains or replaces various legacy files such as GDTMRD, TOPORD, UTEXRD, etc. For more information, see the FDOT CADD Manual. Whether a full Design Survey or legacy files, the data should be available in the \Survey directory.



GEOTECH

FDOT has developed a group of Geotech tools within the FDOT tab that is included in both OBM and ORD. These tools can be used to manage the boring data, plot them in 2D/3D, and generate the Report of Core Borings. The workflow and spreadsheets are currently developed and documented in the Existing Feature Modeling course guide.



Prior to their inclusion in the training guides, users can view the “New Geotech Tools for FDOTConnect” webinar found on FDOT’s Posted Webinar Sessions site:

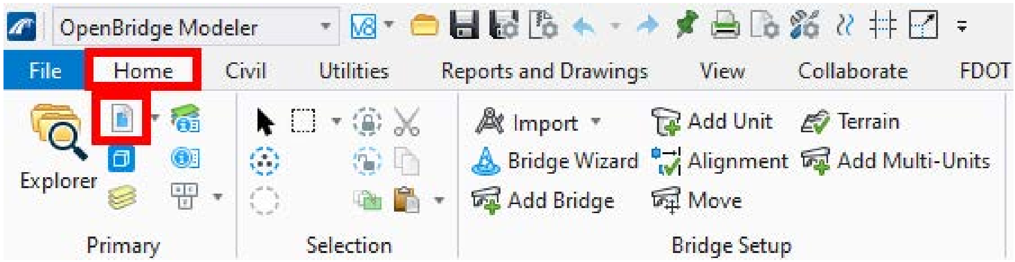
https://www.fdot.gov/cadd/main/webinars

Exercise Overview

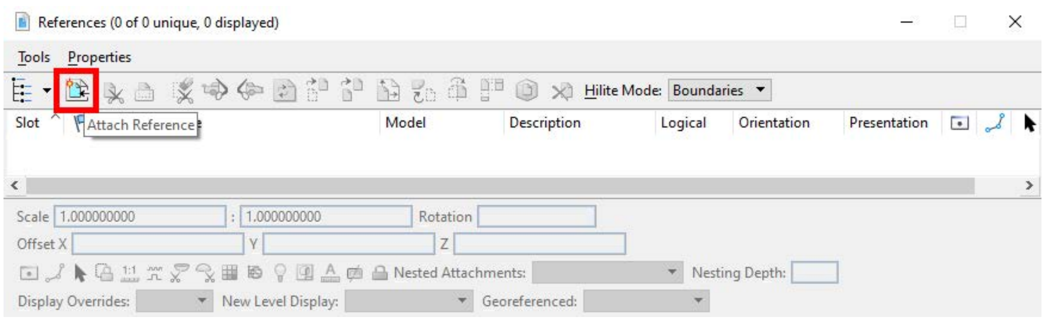
EXERCISE 4.1 *Data Communicated from other Disciplines*

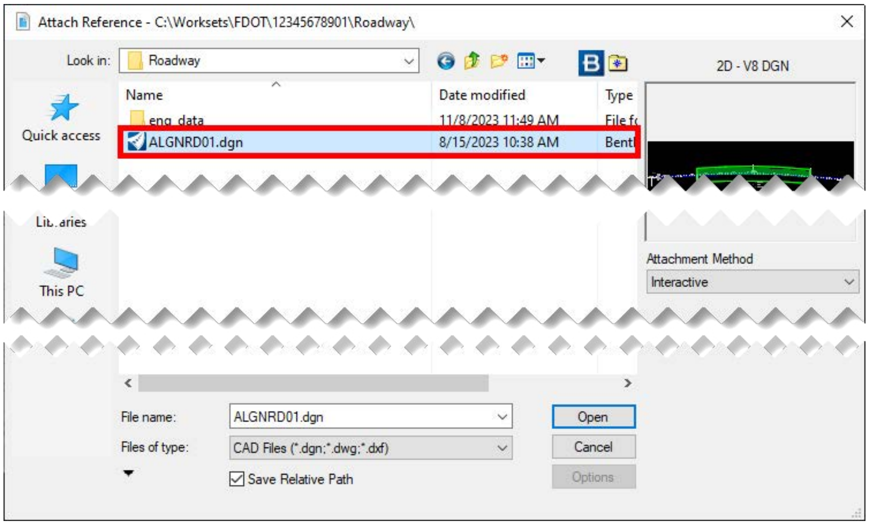
REFERENCE ROADWAY AND SURVEY DATA

1. Open the data set file: *B01MODLBRTR01_4.1_Begin.dgn*
2. Choose the Reference tool from **Home > Primary > References**

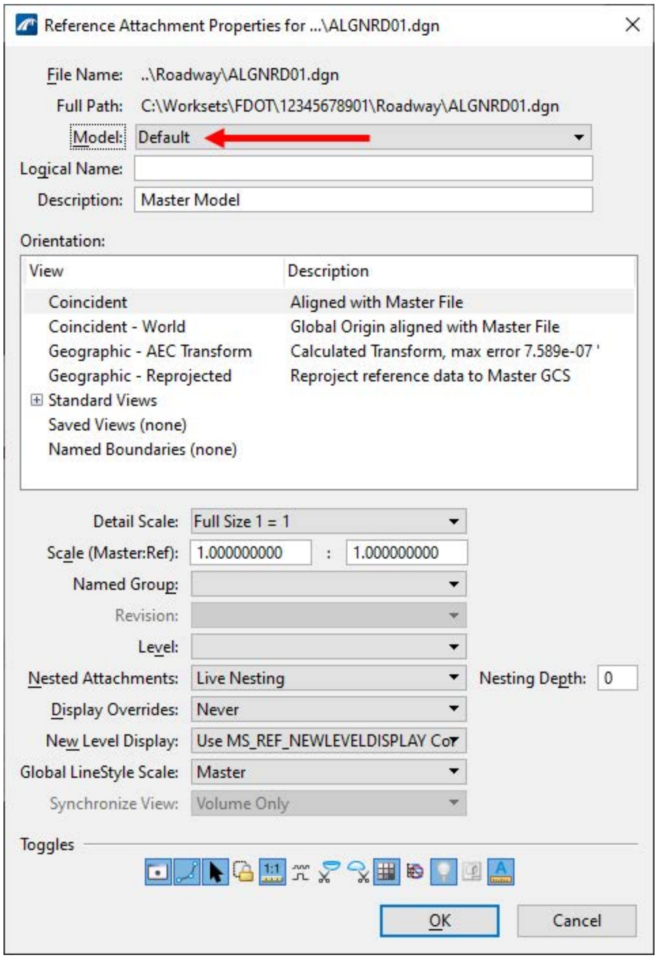


3. Attach the alignment file as a reference. First select the **Attach Reference** button within the *References* window, then select the file(s) to be attached and click **Open**. The alignment file can be found in C:\Worksets\FDOT\12345678901\Roadway.





4. Within the Reference *Attachment Properties for…* window, ensure that the **Default** model is selected, the other settings match the image shown below, and click **OK**.

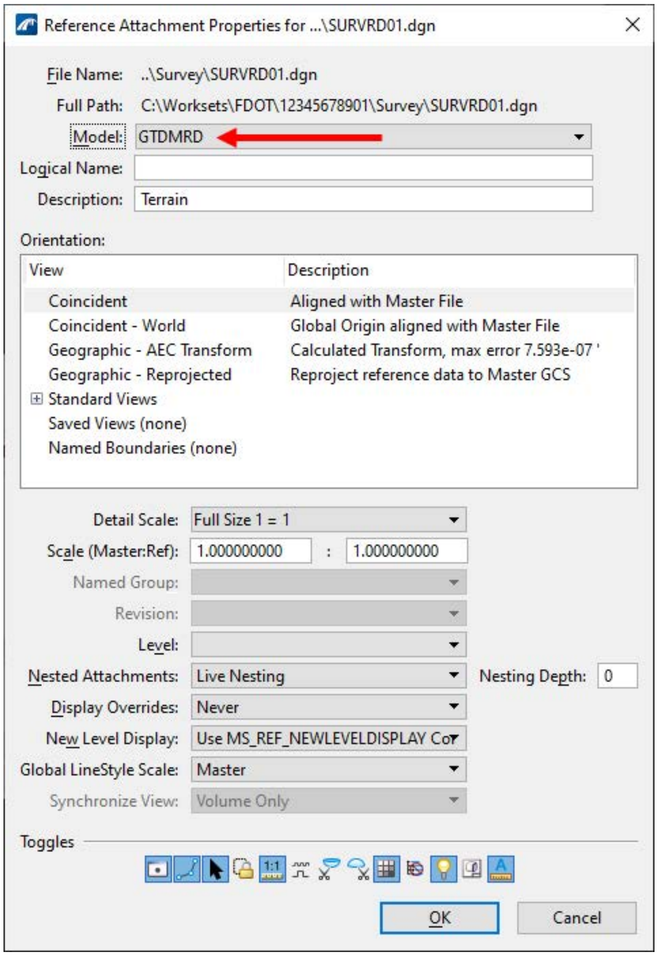


5. Repeat Steps 3 and 4, but in Step 4 select **Superelevation** as the model.

NOTE ***The ALGNRD01.dgn file generally has "…-3D" models for both the Default and Superelevation models. However, for the purposes of bridge modeling, we do not need those models since they do not contain the data we need to target. If they become attached as references, their display should be toggled off by unchecking the***  ***column within the References window.***

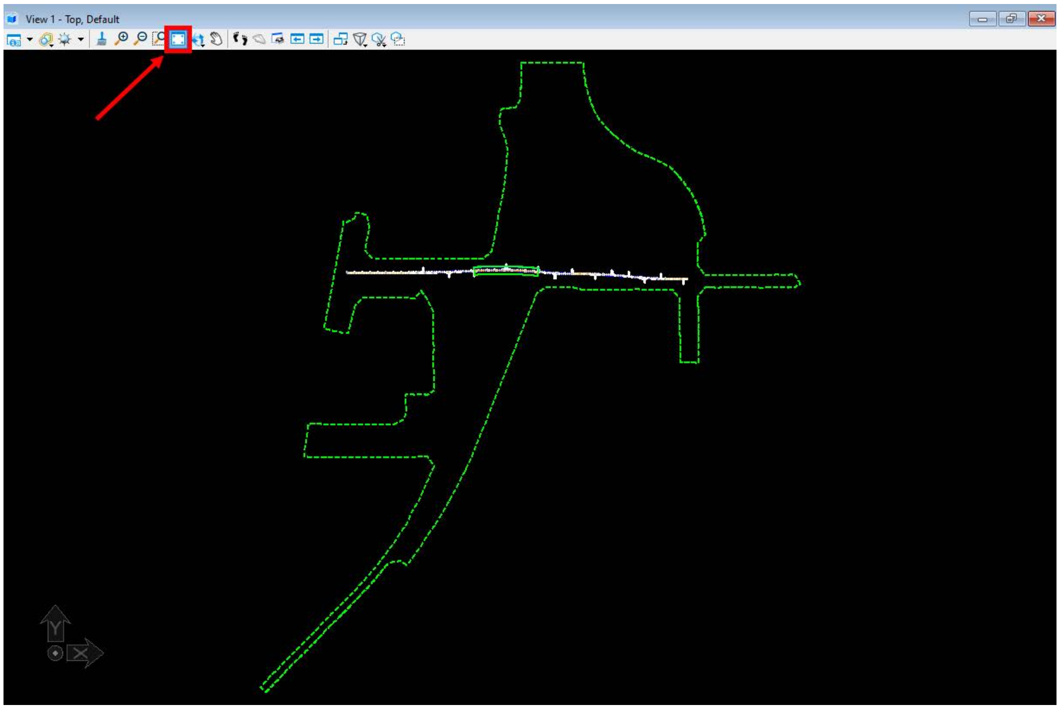
6. Attach the survey file as a reference. First select the **Attach Reference** button within the *References* window, then select the file(s) to be attached and click **Open**. The survey file can be found in C:\Worksets\FDOT\12345678901\Survey.

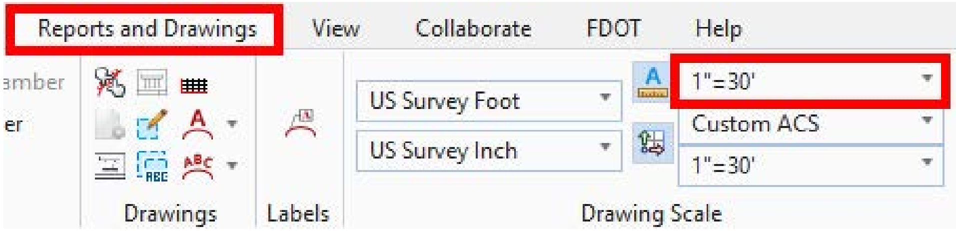
7. Within the *Reference Attachment Properties for…* window, ensure that the **GTDMRD** model is selected, the other settings match the image shown below, and click **OK**.



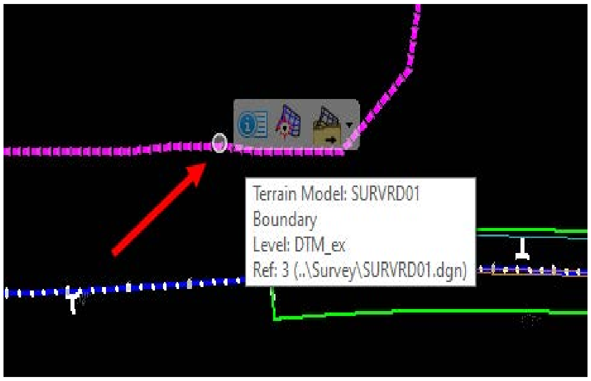
NOTE The terrain model may be a model within an overall SURVRD01.dgn file, or may exist in a separate legacy GDTMRD.dgn file.

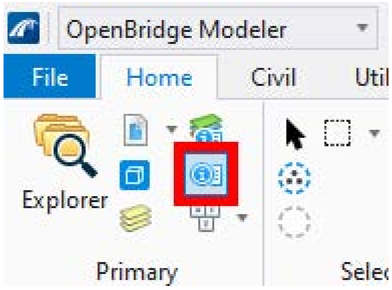
8. Use the **Fit View** tool show the extents of these reference files. Change the Annotation Scale to 1”=30’ by going to **Reports and Drawings > Drawing Scale > Annotation Scale**. Annotation Scales can be adjusted as required for viewing and/or plans production.

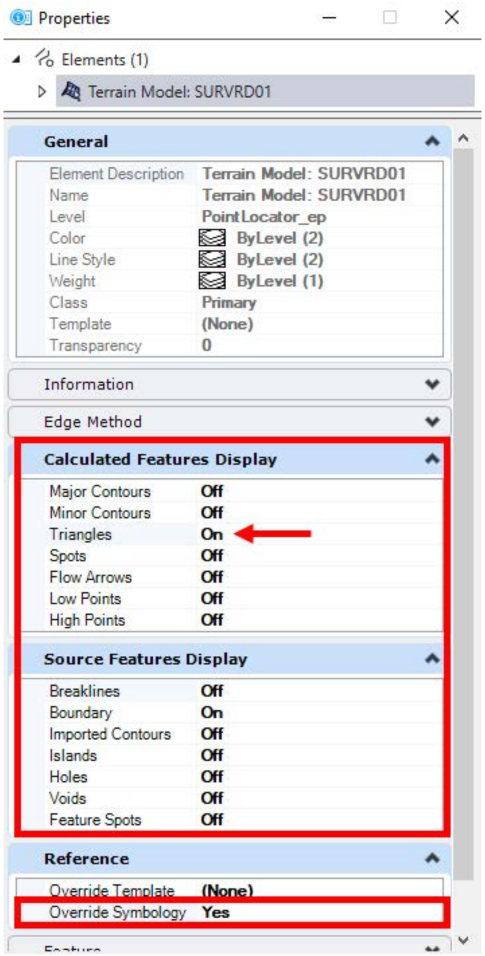




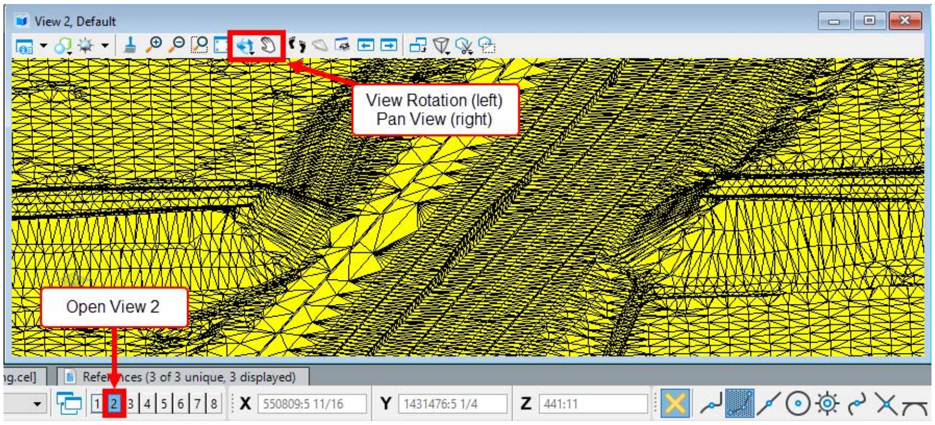
9. Test out different terrain file view options by either clicking the outline of the terrain feature and opening the *Properties* window (**Home > Primary > Properties**). Note that the *Properties* window may either be docking or floating. Once there, change the *Override Symbology* field to **Yes**. This allows you to override the symbology without changing the source file. Change the *Calculated Features Display* and *Source Features Display* fields to see what switching between **On** and **Off** will do to the terrain model. A common Calculated Feature is *Triangles*, which allows the users to visualize the variation of the terrain.







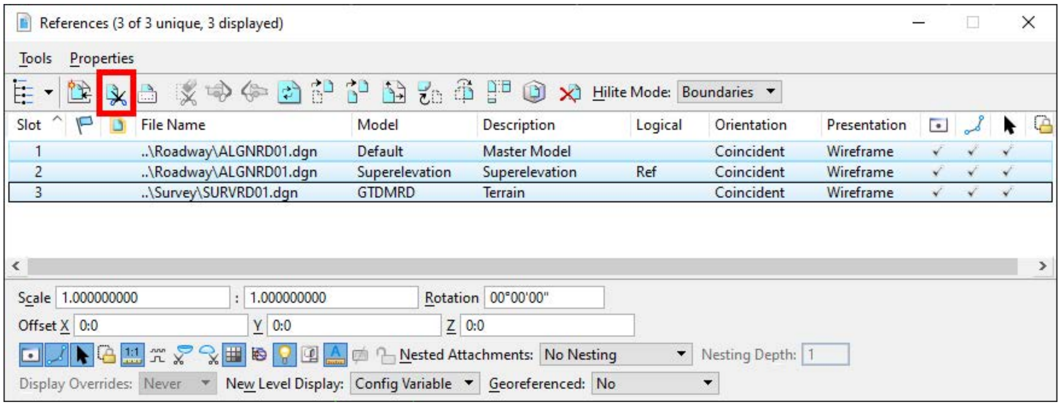
10. Become familiar with these reference files and their content. Rotate and pan through the 3D Survey data provided. It may be helpful to open View 2, which is the isometric view. The reference files can be displayed (turned off or on) individually based on preference.



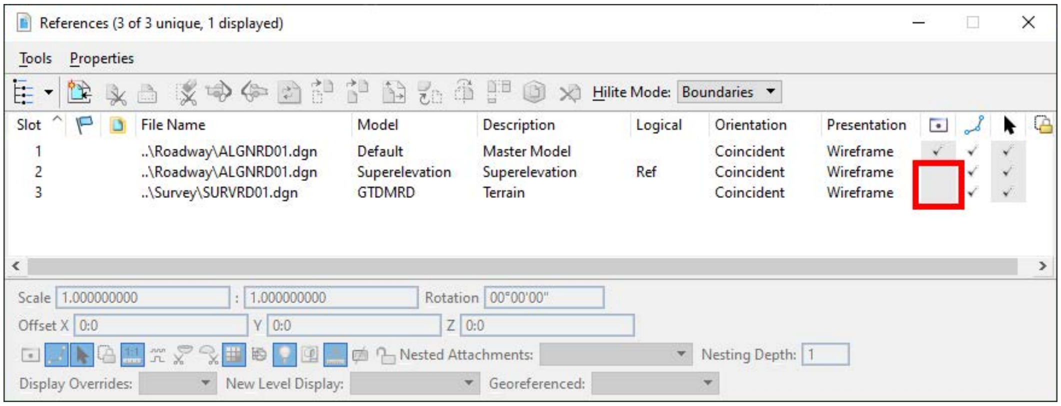
11. When done reviewing the reference files, close View 2, and return to View 1. Select the terrain model boundary, open the *Properties* window and *Set Override Symbology* to **No**.

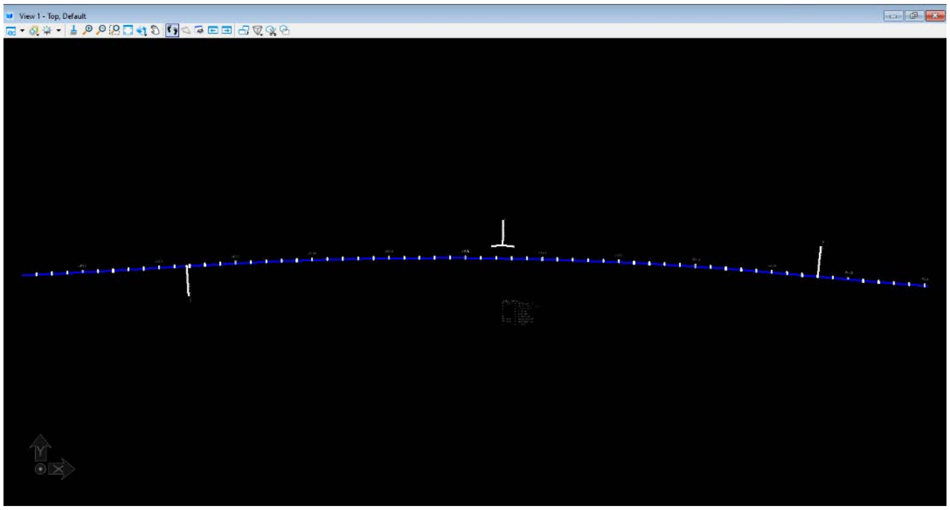
12. To better navigate the model, we will clip the references so that only the area of the bridge is visible. Navigate to **Home > Selection > Place Fence** and draw a fence around the area shown below. The precise area is not important since we are simply clipping the reference for easier viewing of the bridge area.

13. After the fence is placed, open the *References* window, select all of the references, click **Clip Reference**, and select the fence. Now if you fit view, only the area of interest will be visible.



14. Before we begin modeling the bridge, we can turn off all reference displays except the Default model of *ALGNRD01.dgn* by unchecking the boxes shown in the figure below for the open views and save your view settings by selecting **File > Save Settings**.





5 BRIDGE MODELING

OVERVIEW

All of the prior chapters prepare and build our knowledge for the essential effort of this course: 3D bridge modeling. At the end of this chapter, the user will be able to create a 3D model of a typical FDOT bridge structure. The modeling will be accomplished using the FDOTConnect OBM Workspace.

At the time of this training guide release, the following types of structures can be modeled in OBM: Beam-Slab (P/S or Reinforced Concrete Girders), Beam-Slab (Steel Girders), Reinforced Concrete Slab, CIP Concrete Box, and Segmental. This chapter covers how to model the common elements of an FDOT Prestressed Beam-Slab bridge with Approach Slabs. The basics of model creation, as applicable to the FDOTConnect Workspace, are detailed through the exercises. This chapter, and others throughout the manual, also provides commentary and tool tips for additional situations that the user may encounter beyond the scope of this training bridge model development including steel girder superstructures, rebar non-standard bearings, and more.

There is also a **Bridge Wizard** tool in OBM added to quickly generate simple bridge components; however, there are limitations how detailed the user can be in the creation of the model. For example, additional settings and more detailed modeling options like deck breakbacks are not available requiring the user to go back to each element for updates. This chapter follows the traditional OBM modeling workflow as this is more suitable for most situations users are likely to encounter. The user should carefully consider the limitations before proceeding with this approach.

OBJECTIVES

This chapter covers the steps to build a bridge 3D model built around key tools within OBM including:

- Add Bridge
- Place SupportLine
- Place Deck
- Place Barrier and Sidewalk
- Assign Superelevation
- Place Beam Layout and Beam
- Place Abutment
- Place Pier
- Place Bearing
- Place Approach Slab

WORKFLOW INFORMATION

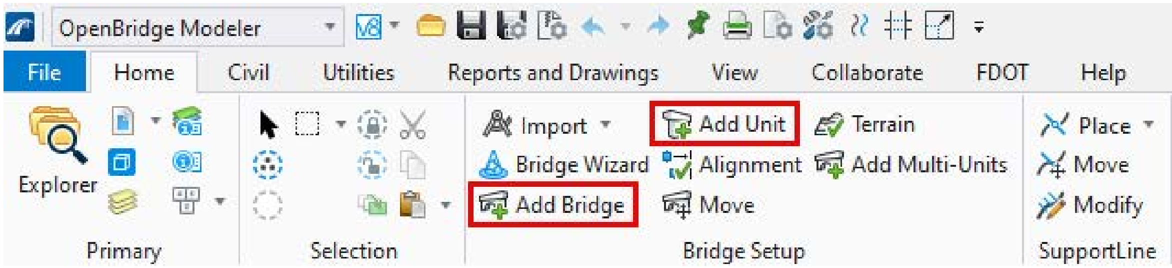
The model-centric approach in this training manual is a shift from traditional CADD and Plans Development workflows. Instead of creating separate views in 2D space, a model is created, element by element, to serve as the central repository of geometric and other data that is linked and referenced for activities and deliverables. The steps to create the model build upon each other using the shared data to streamline the process; therefore, the model progression becomes a critical aspect of the workflow. OBM is built on this model progression and step-wise approach. This chapter outlines not only the tools, but also the order in which to complete these steps for successful model development.

ADD BRIDGE

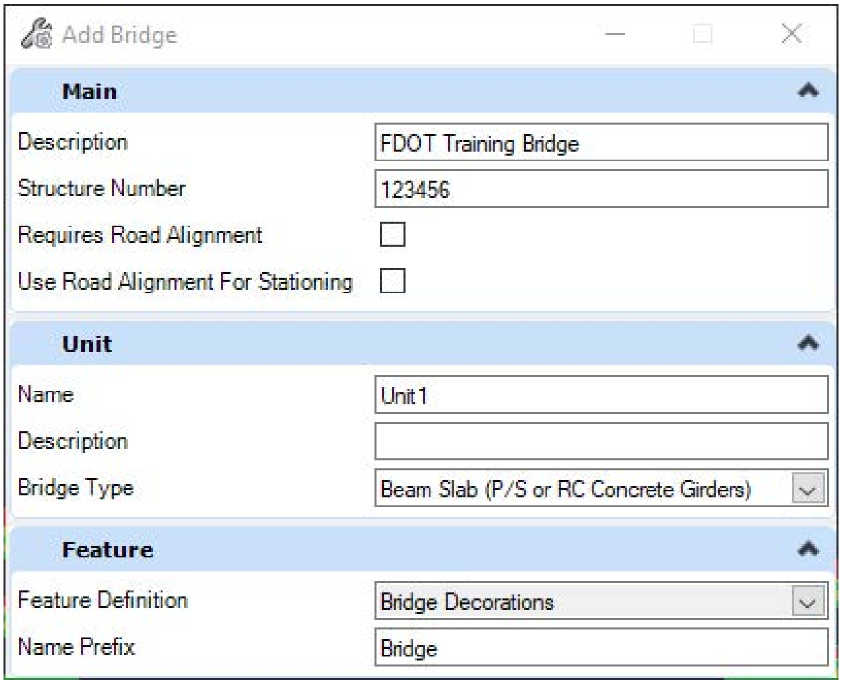
A bridge model must have a file container. The recommended procedure for creating the active bridge model file is with the **FDOT > Create File** tool as described in Chapter 2. Once created, an alignment file needs to be referenced into the active bridge model dgn file prior to any bridge element modeling.

These reference files may be established by acquiring alignment files from Roadway or may be imported and saved in OBM files. See Chapter 4 for more details. The alignment can be annotated with station numbers for orientation with the overall project.
The first step in creating the actual 3D bridge model is to use the **Add Bridge** tool. The tool is accessed from the **Home > Bridge Setup > Add Bridge.** This tool allows the user to add a description for a new bridge as well as define the bridge type (Beam-Slab, Reinforced Concrete Slab, etc.). Multiple bridges can be added in the same file, which may be used for certain situations. However, consideration should be given when determining the number of bridges to add to one file, especially for large projects. The bridge model files can be referenced and opened as read-only by other users, but only one user can be actively working in a file at a time. This has implications for work-sharing and also to the extent of lost data if the file becomes unstable during development.

A method for splitting up longer structures is to use the **Add Unit** tool. This will place another bridge "unit" in the active bridge resulting in a similar workflow and procedure outlined in this section; however, all units in a bridge must use the same alignment/profile.

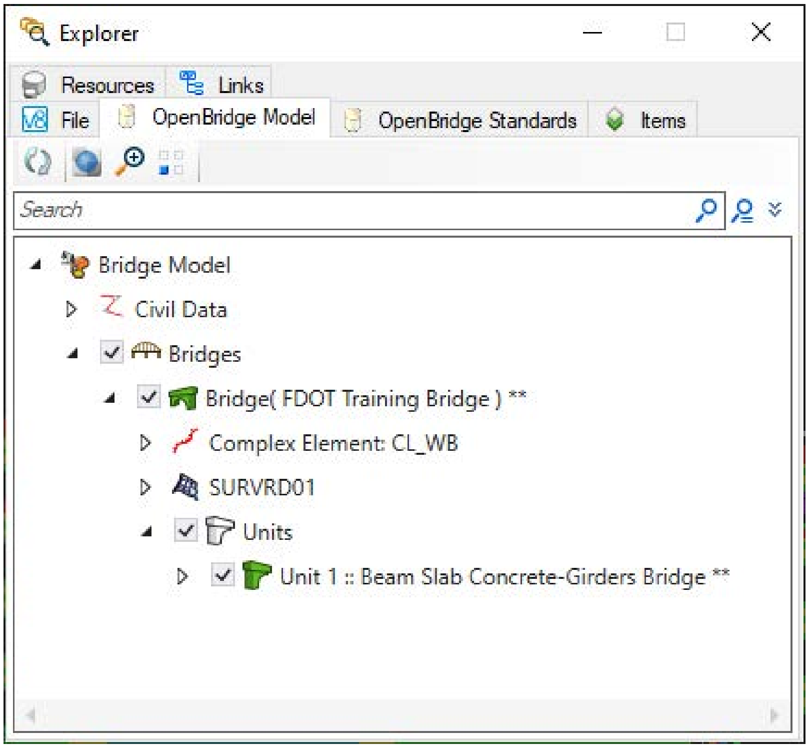


The *Bridge Type* is also an important category in the *Add Bridge* window. The user can select from a drop-down list of currently available bridge types in OBM. **Note that the "Bridge Decorations" Feature Definition is the default and should be utilized when adding any bridge model.** This Feature Definition is specifically created to take advantage of developments for enhancements in annotation scaling for plans production.



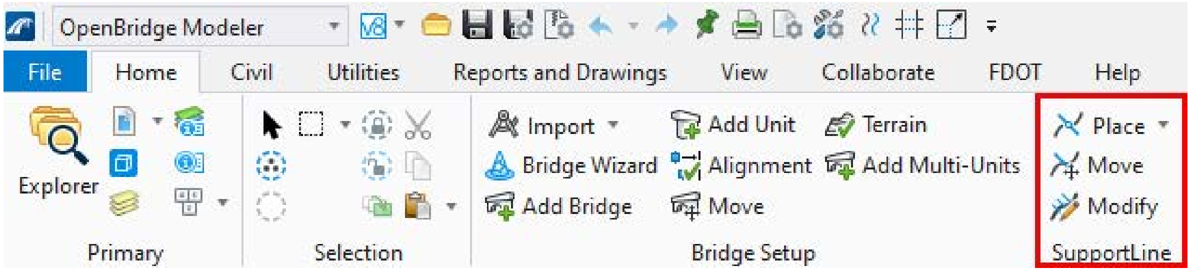
Once the Add Bridge prompts are completed, the new bridge will appear in the **Explorer > OpenBridge Model** window.

NOTE ***The Explorer window can be turned on and off through the*** **Home > Primary > Explorer** ***tool.***

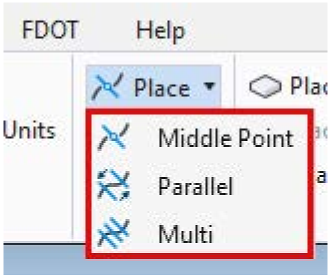


PLACE SUPPORTLINE

SupportLines is the terminology used by OBM to describe the lines used to layout the spans of the bridge. At a minimum, a SupportLine will be needed at every substructure location. For a typical bridge, a SupportLine will be added at the front face of backwall for abutments (begin/end of bridge station) and the centerline of piers. Other situations in which adding more SupportLines is beneficial in the creation of a bridge model include changes in the deck's width or thickness, changes in the beam/girder framing, or any other variation in the cross-sectional properties. **SupportLines are only linked to the bridge that is active at the time of placement**. If a new bridge is created in the model the user must create new SupportLines for that bridge.



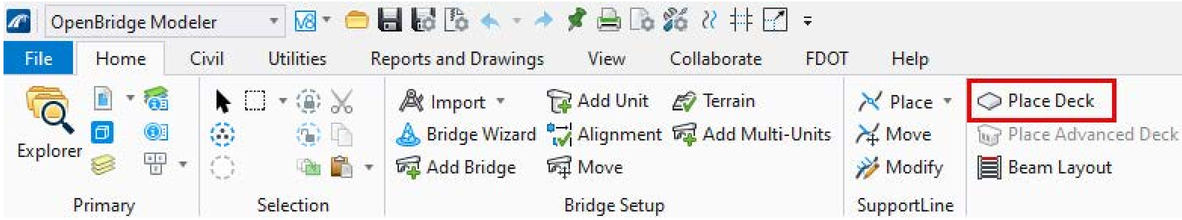
SupportLines can be added by several methods: Place by Middle Point, Parallel, and Multi. These tools are located in the **Home > SupportLine** group and can be accessed in the **Place** drop-down. The **Middle Point** tool creates a single SupportLine centered on the selected alignment of the activated Bridge Unit. The **Parallel** tool creates multiple SupportLines along the alignment that are all parallel to each other. The **Multi** tool allows for the most control when adding multiple SupportLines and modifying them all at once.



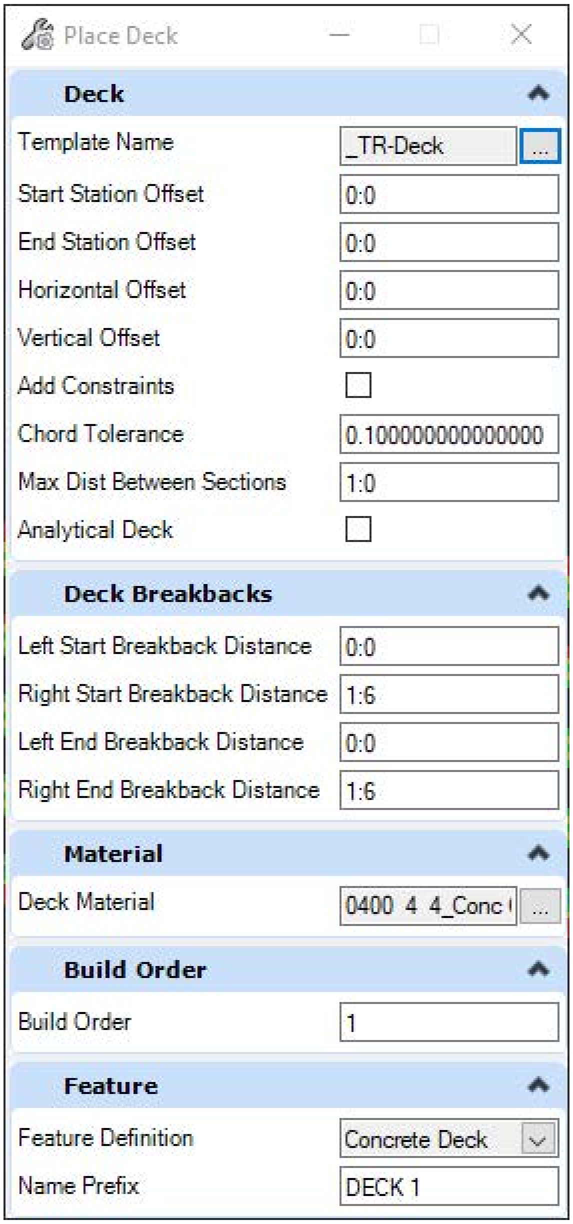
Once SupportLines are created they can be moved by selecting **SupportLine > Move** tool. Only SupportLines created with the **Multi SupportLine** tool can be revised with the selecting **SupportLine > Modify** tool.

PLACE DECK

Once SupportLines are defined, the deck can then be modeled. The deck must be present in the model before beams and other elements can be modeled. To add a deck, select the **Place Deck** tool under the **Home > Superstructure** group.



This brings up the *Place Deck* window which allows for the selection of the deck template, offset values, material, Feature Definition, and other parameters. Below is a description of several fields and the OBM Help Contents material can be consulted for additional information.



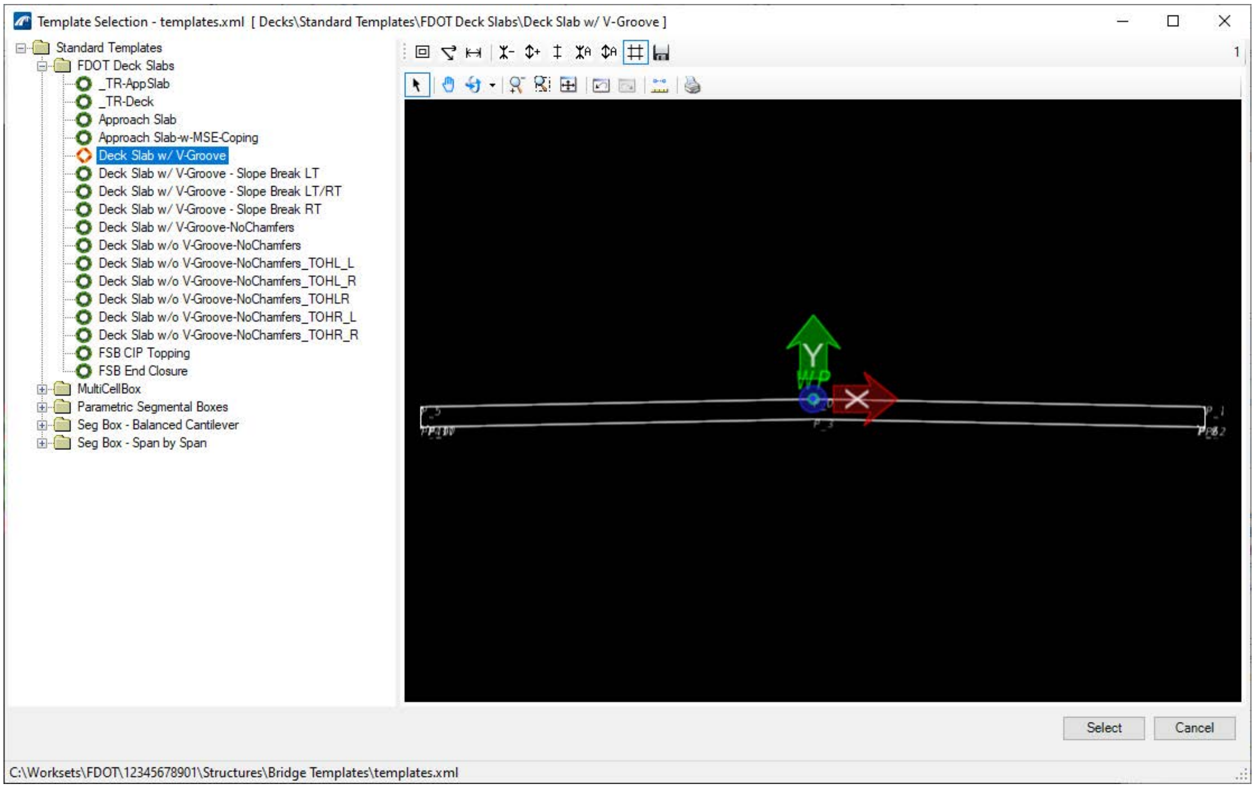
NOTE ***The Feature Definition defines what an element is and controls the attributes of the model linework for the bridge elements for plans production. The Material field will be directly used and reported in the Quantities Report (see Chapter 7 for more details).***

The *Start Station Offset* and *End Station Offset* values allow the user to place deck segments that span from points that are offset from the SupportLines, rather than aligned with them. The *Horizontal Offset* value allows the user to shift the deck template's working point to the left or right of the selected horizontal alignment. The *Vertical Offset* value allows the user to have the top of the deck higher or lower than the vertical profile control point.

The *Max Distance Between Sections* field can be reduced for more refined models with tighter curve radii to increase model accuracy. However, the drawback of reducing this value is that it can slow down the performance of the model. The *Deck Breakbacks* are squared off ends at skewed supports with the defined distances being measured normal to the edge of the slab. Use of the deck breakbacks will be demonstrated in deck placement exercise.

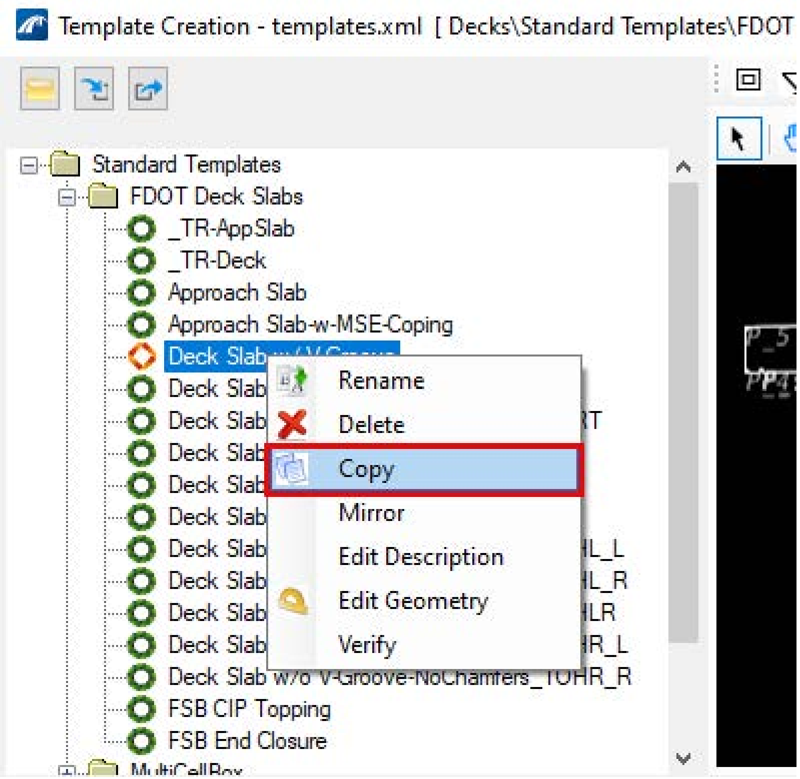
DECK TEMPLATES

Templates are used throughout the OBM elements to quickly generate bridge elements, especially commonly used details. Deck templates are one of the most flexible modeling elements in OBM and many variations can be accommodated. Below is the *Template Selection* window showing the provided deck templates. This is where the FDOT-developed templates for typical decks and approach slabs as well as Bentley-provided templates are available.

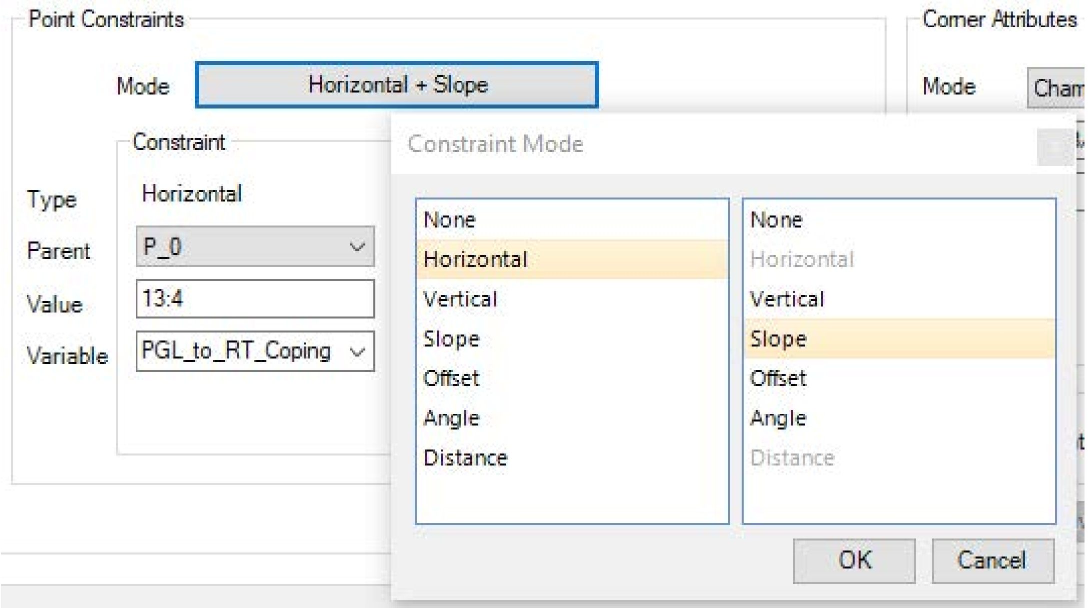


A template provides a single working point used to associate it with the bridge alignment/profile. This may be directly aligned or offset from the specified bridge alignment/profile. Additionally, the cross slope, thickness, and geometric properties are controlled by variables and constraints in the template. The values of these parameters for a anything different than the library template and variations along the length of the bridge are input with the *Variable Constraints* window, discussed in the next section.

To access the deck template library, navigate to **Utilities > Libraries > Decks**. The Template Creation window that opens allows the user to view, copy, and edit any of the existing templates. Templates are stored in an xml file of the WorkSet project folder in **... > Structures > Bridge Templates > templates.xml**. If a template from one project needs to be used on another project, there are options to import and export template libraries via the xml files, see image below. The easiest way to create a deck new template is to make a copy of an existing template that is closest to the desired deck template. This can be done by right clicking on an existing template and selecting **Copy**. The copied template can be renamed as needed, also by right clicking. Alternatively, a new deck template can be created from scratch using Microstation drawing tools. See the Place Barrier section for a discussion of using the Edit Geometry and temporary view feature of the Template Creation window.

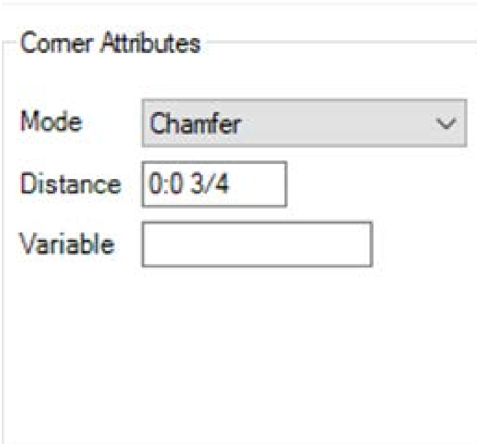


Templates are made up of **Points**, with the relative location of each Point controlled by one or two **Variables**. The **Working Point** (WP in the graphic) that follows along the profile and can either be a unique point or coincide with another point on the template. The other points should be assigned working out from the WP, by assigning the *Mode* of relative location assignment with the *Points Constraints* section. The Mode Options are: **Horizontal**, **Vertical**, **Slope**, **Offset**, **Angle**, and **Distance**.

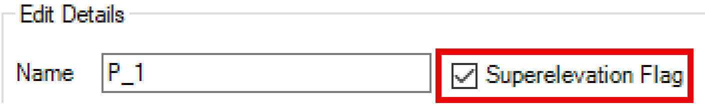


Once the *Mode* is selected, the *Parent* point is chosen. This will be the point that will have the constraint modes applied to determine the next point. Next the *Value* of the constraint is set. For example, if the Working Point is chosen as the Parent for P_1 with a Horizontal constraint Value of 10:0 and a Slope constraint Value of 0.02, P_1 will be placed 10ft to the right of the WP with a slope of 2% upward from the WP. The *Variable* section is optional but can be used to name certain constraint/value relationships that can then be edited using the Variable Constraints before or after placement of the deck.

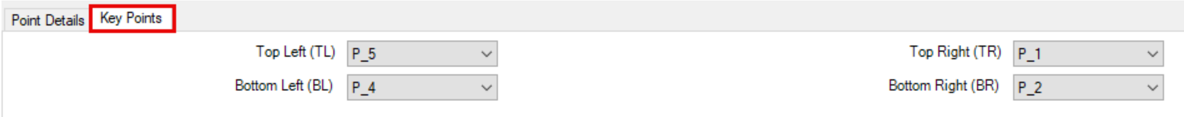
Corner Attributes can be used to set a **Fillet**, **Chamfer**, or **Asymmetrical Chamfer**. Depending on the Level of Detail required for the model, this can be used to modify the corners from being squared off.



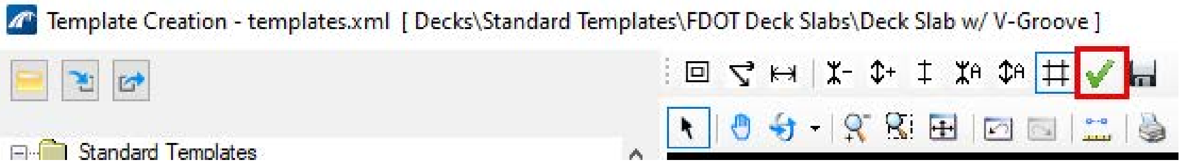
The Superelevation Flag box should be checked for all top deck points, as those are what will be controlled when a Roadway superelevation shape is applied to an OBM deck element.

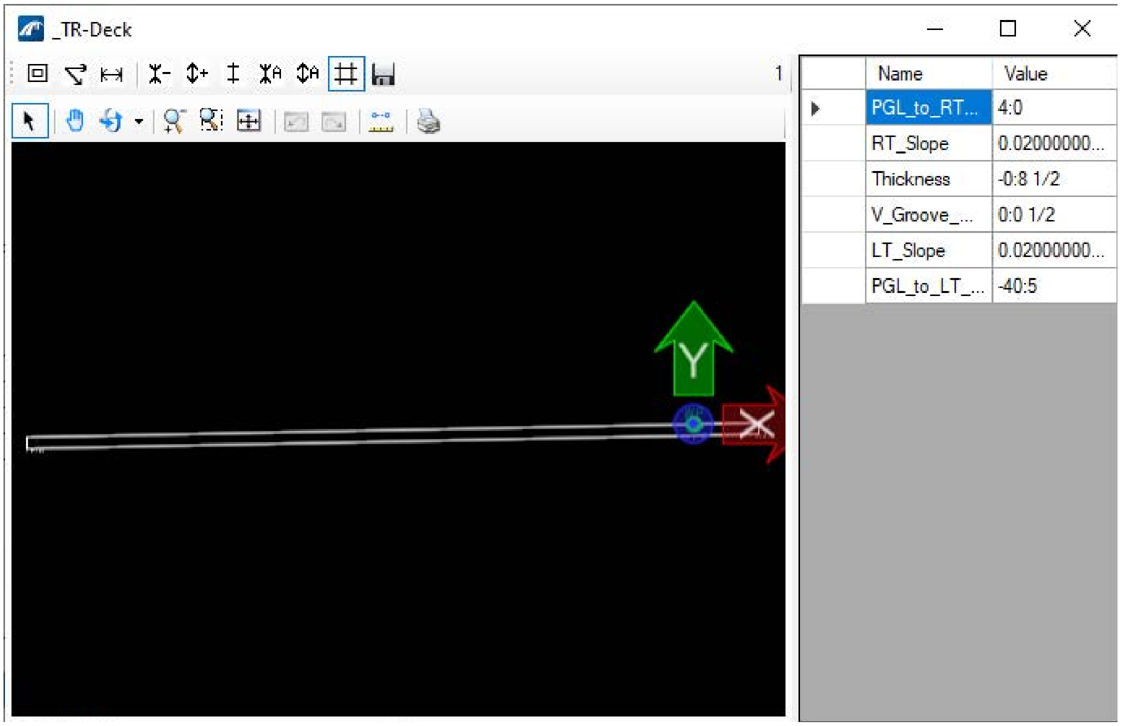


The Key Points tab will display the corner points of the current deck template and are editable if needed.



The green Verify checkbox at the top of the Template Creation window can be used to test the defined Variables within the selected Deck Template. Various values can be entered and the graphical representation of the deck template will adjust based on the input.

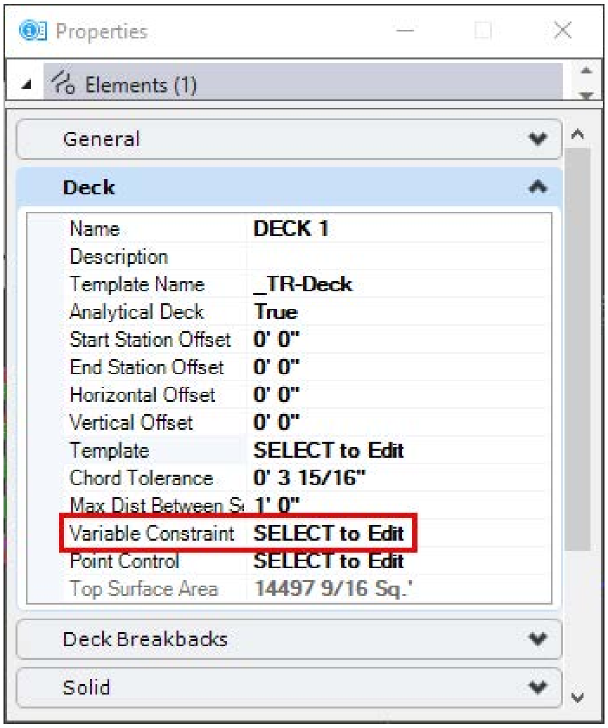




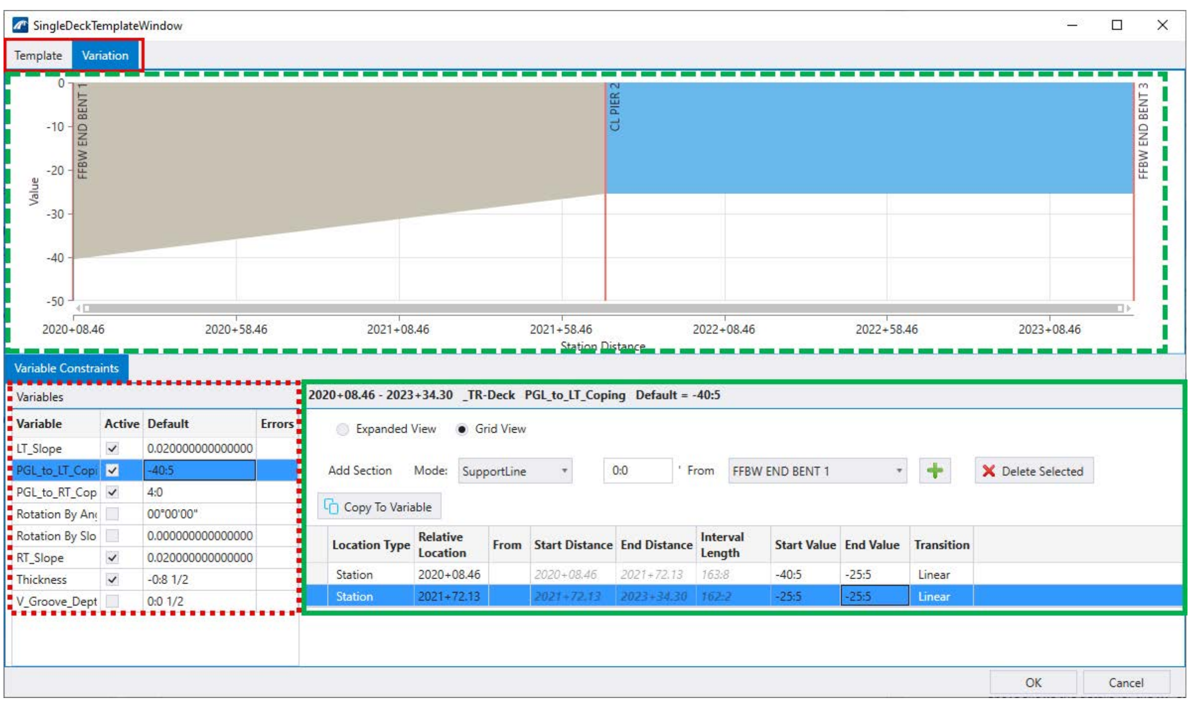
Once the template is completed, it can be used with the **Place Deck** tool.

VARIABLE CONSTRAINTS

The variable constraints window can be accessed while creating a new deck or by selecting a current deck, opening the properties window, and clicking the "…" beside the *Variable Constraints* field. See the following figure.



The image below shows the variable constraints window with boxes calling out the different sections of the window. Descriptions follow the image.



Solid Red Box – Selection between viewing windows. The "Variation" Window is shown in the screenshot displaying the details of the selected variable. The "Template" Window shows the cross section of the selected template.

Dashed Red Box – This **Variable** table has 4 columns. The **Variable** column lists the variable names as defined by the selected template. The **Active** column contains check boxes for each variable, that can be checked if the desired inputs for that variable are different than the values brought in by the template. The **Default** column shows the values given by the template and will be used if the check box is not checked.

Solid Green Box – This window shows the change in the selected variable over the length of the active bridge. Changes can be made only if the checkbox for the selected variable is checked. The screenshot above shows the details for the **PGL_to_LT_Coping** variable, which has a changing deck width from station 2020+08.46 to 2021+72.13. The width is then unchanged until 2023+34.30. The **Mode** controls what method is used to determine the location of the transitions. The options are **SupportLine**, **Ratio by Span**, and **Station**. There is an accompanying input for either the offset values, ratio, or station. **Linear**, **Parabolic**, and **Circular** transitions are accommodated.

Dashed Green Box – This window shows a graphical representation of the information put in the Solid Green Box. The y-axis represents the values for that variable, and the x-axis follows the stationing of the selected deck.

The exercise at the end of this chapter shows the user how to use these features in practice.

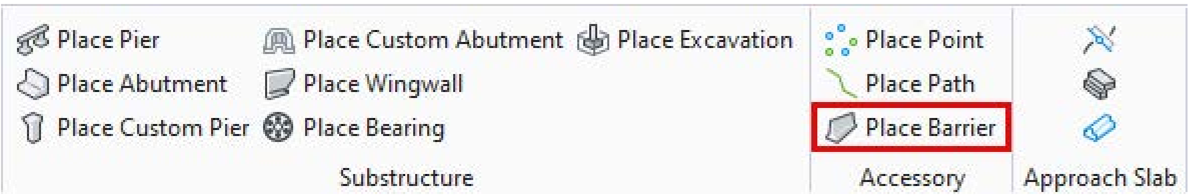
Offsets are used to control the deck location, horizontally and vertically, from the bridge alignment and the Work Point in the deck template. For example, a horizontal offset is required if using a Centerline Alignment for a dual highway structure as the bridge alignment in order to keep the Work Point for the deck template in the correct location for the left and right structures.

There are Feature Definitions provided for both Deck Slabs and Approach Slabs. Selecting the proper Feature Definition will place the elements on the correct FDOT levels in the model space and also any linework in views or sections for plans production purposes.

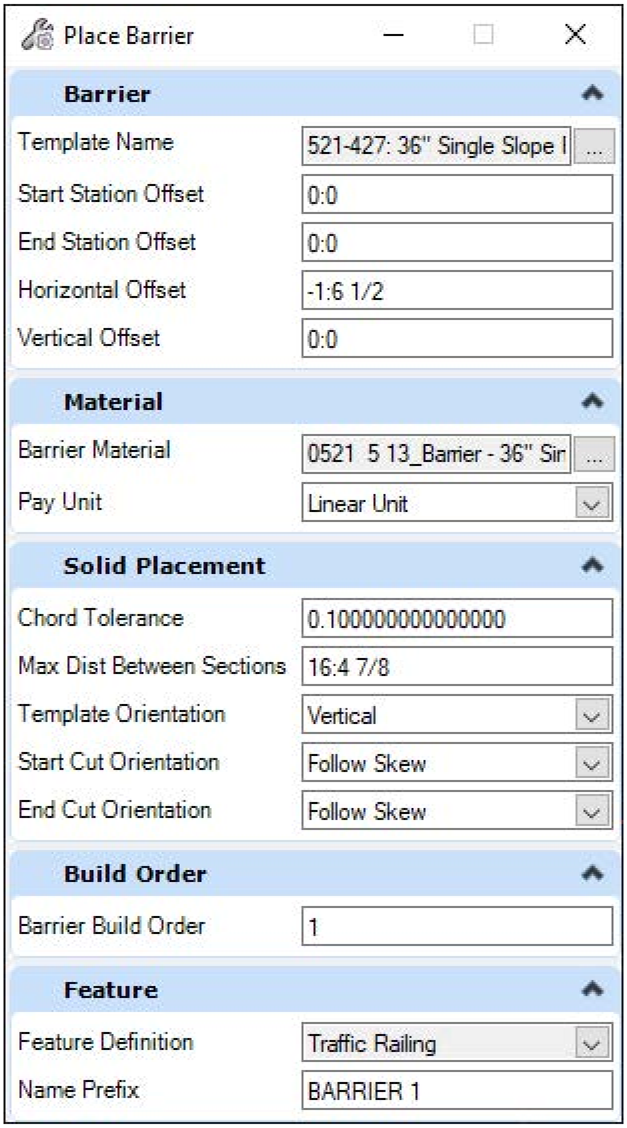
PLACE BARRIER

Barriers are placed directly onto the deck of the active bridge and are referenced either to an alignment or to a point on the cross-section of the deck. The user should be able to add a barrier by selecting one of those alignments or deck points, a barrier template (cross-section) and adding it to the bridge model.

To place a barrier on a deck, go to **Home > Accessory > Place Barrier** (see below)



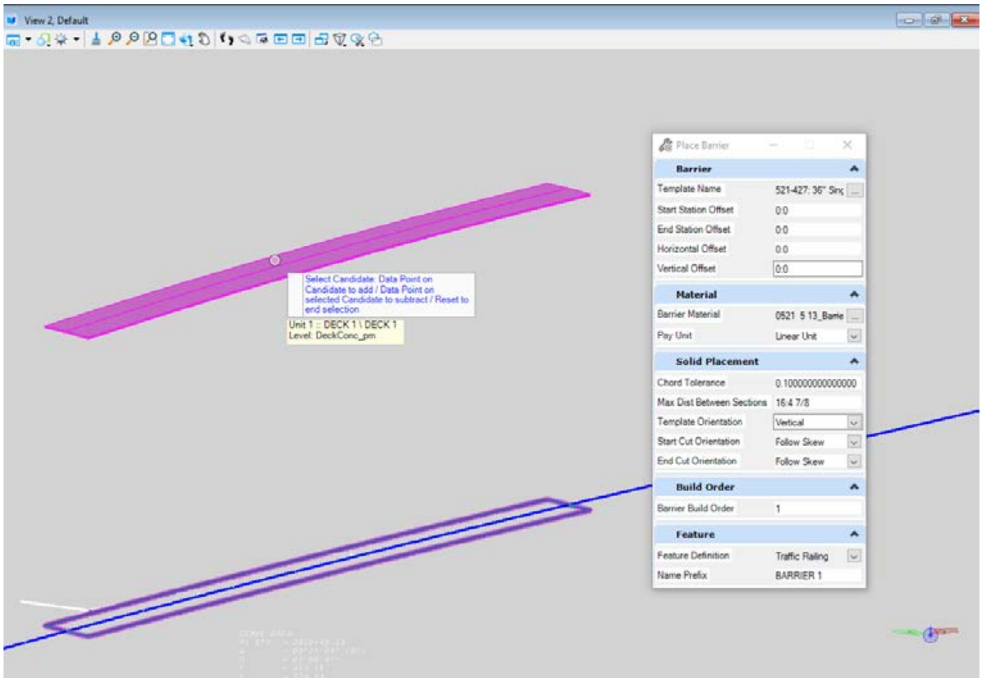
Once the **Place Barrier** tool is selected, the *Place Barrier* window will open, shown below. This box is where the user will choose their inputs for the placement of the barrier. Clicking the "…" beside the *Template Name* field will open a window that will allow the user to choose which template they want. Each side barrier/railing template typically has two versions, a left and a right. The user should be sure to select the correct one for each respective side of the deck. Note that the templates cannot be modified without going back to the Utilities ribbon and changing the template.



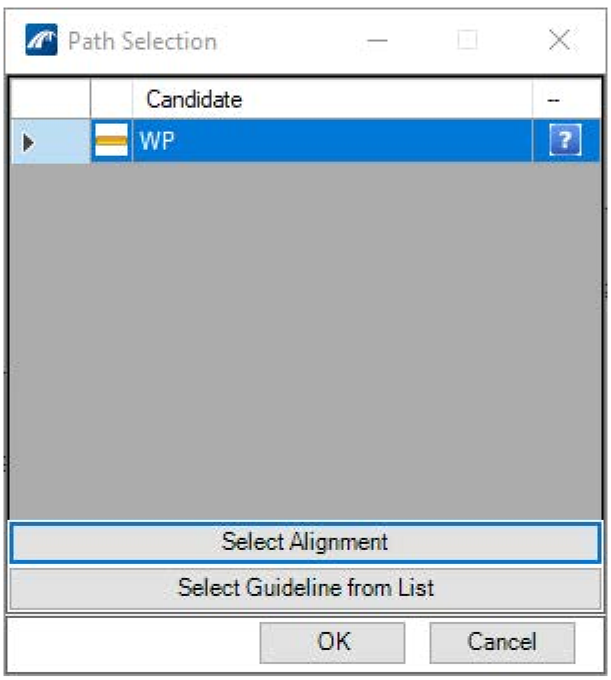
Many of the fields in the *Place Barrier* window are act in a similar fashion to those previously discussed in the *Place Deck* window. *Start Station Offset* and *End Station Offset* values allow the user to place barrier segments that span from points that are offset from the start/end of the selected deck, rather than align with them. The *Horizontal Offset* is where horizontal adjustments should be made to accommodate for a template that has a WP that is not on the coping. A negative offset will move the barrier to the left of the guideline chosen, and a positive offset will move it right. Likewise, the *Vertical Offset* values allow the user to shift the barrier template's working point to the above or below the selected guideline.

The Orientation fields control how the templates are extruded along the bridge. The *Template Orientation* field can be set to **Vertical** if the template faces should be vertical in the Z axis, or it can be **Normal** if the template should be perpendicular to the deck template upon which it is placed. The *Start Cut Orientation* and *End Cut Orientation* fields dictate if the ends of the barrier should be **Normal to Path** or **Follow Skew**.

Once the inputs are correct the user is prompted to select the deck(s) for which they would like to add barriers. Multiple decks can be selected to place the barrier on at the same time.

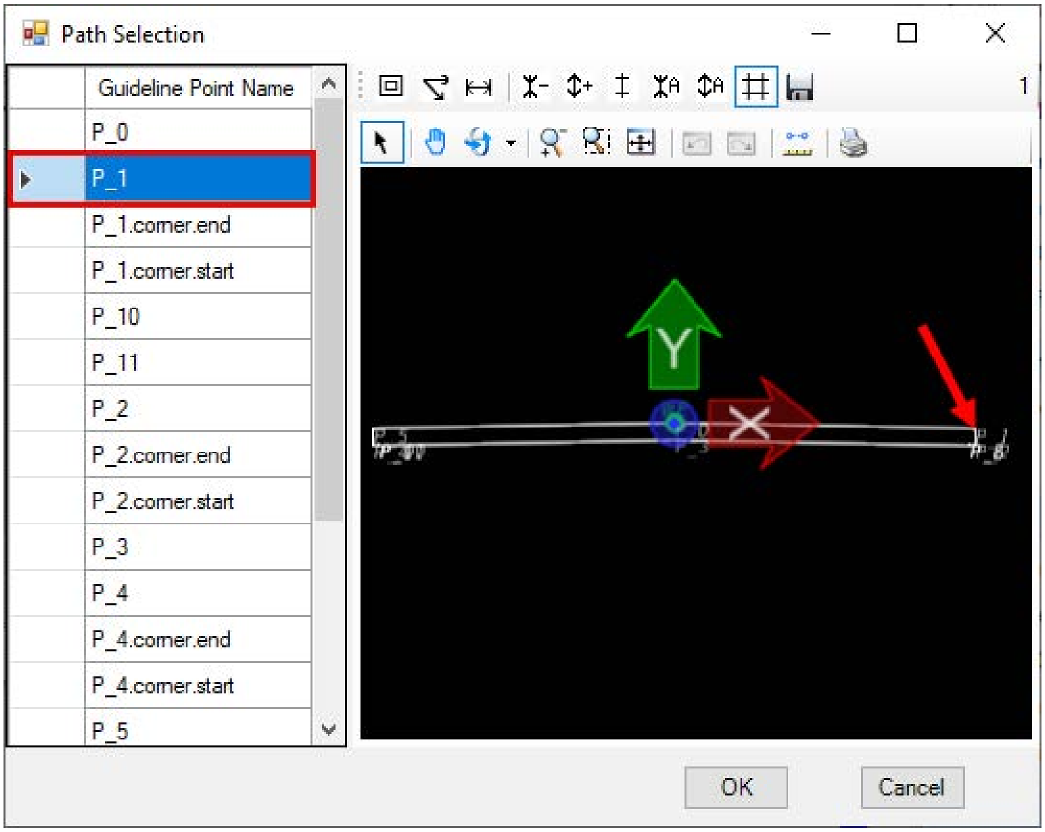


End the selection by right clicking in open space, and then data point in open space to open the *Path Selection* window.

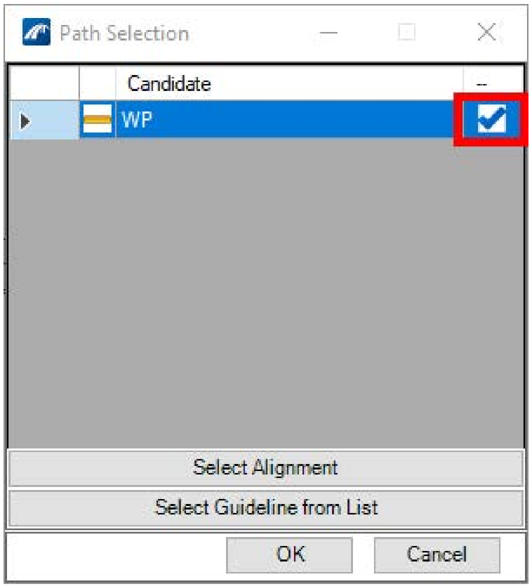


To pick an alignment from the roadway geometry, click **Select Alignment**. The user can create auxiliary alignments if needed for geometrically complex situations such as gore areas. To pick an alignment using one of the control points from the deck template, click **Select Guideline from List**. Either method is valid and will depend on individual situations; however, the **Select Guideline from List** method is more helpful in most applications as it does not depend on individual alignment locations but rather on key points of the deck template such as the top edges or the break points.

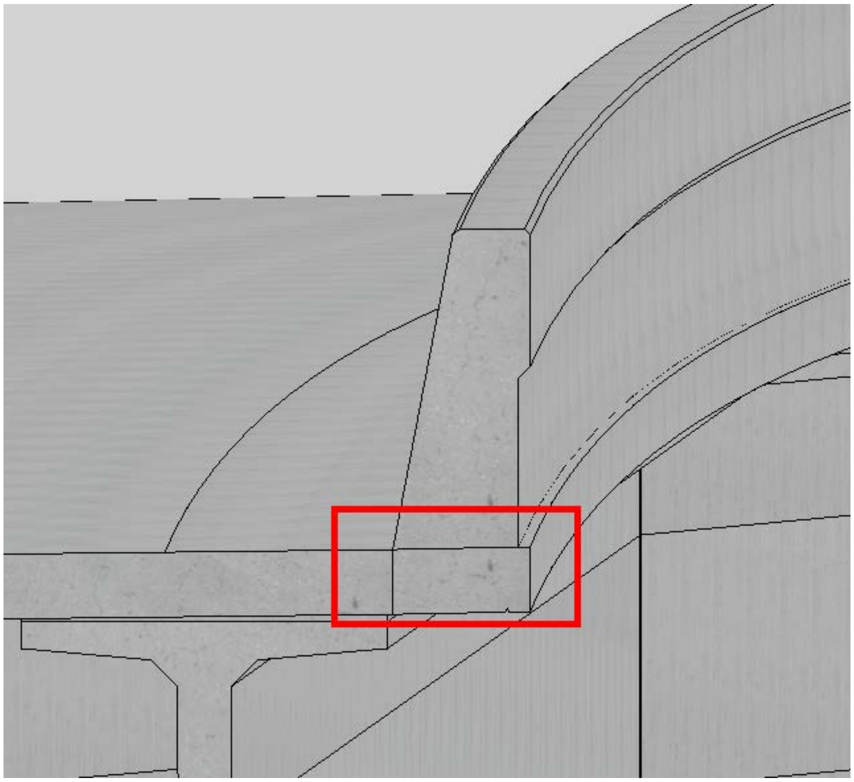
If using the **Select Guideline from List** option another *Path Selection* window will appear with an image of the deck template cross section and a list of the Guideline Point Names. In the previous step the user chose the right barrier template in the barrier template selection with a corresponding deck point at the top right corner. In the figure below, this is **P_1.**



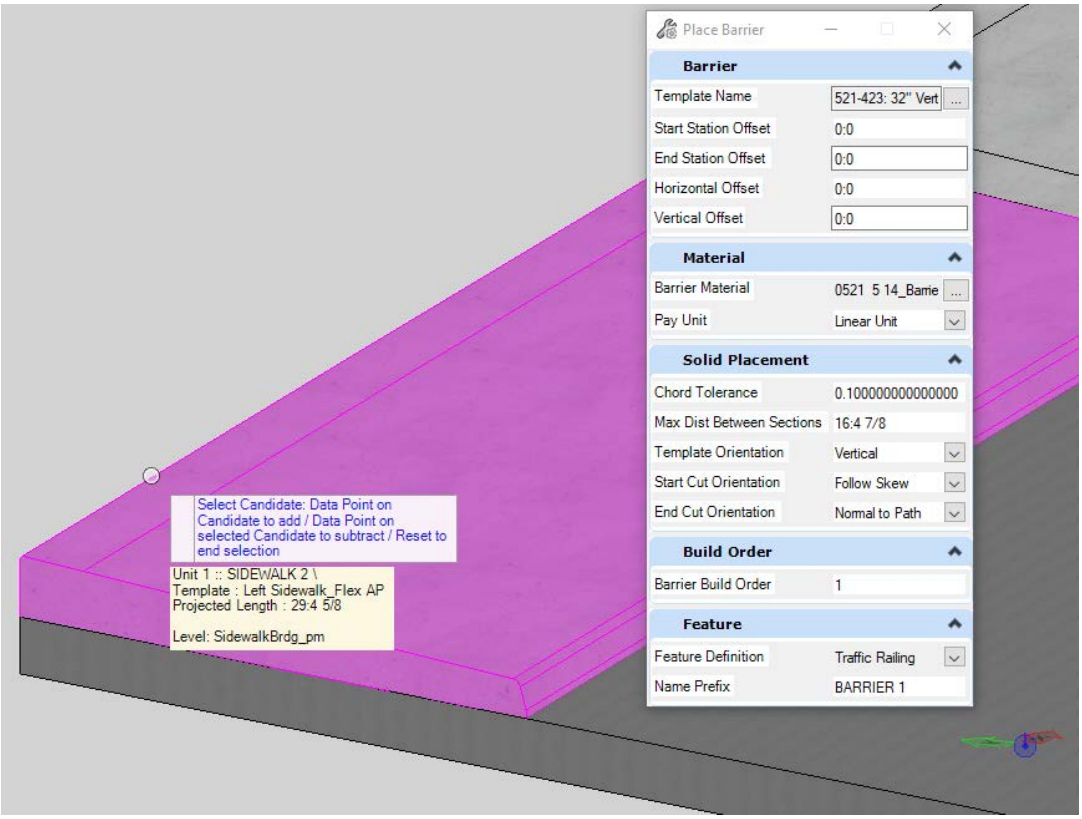
Select **OK** in the second *Path Selection* window and make sure that there is a blue check mark where the question mark used to be (see below)



Click **OK** again to place the barrier. In the image below, take note of the boxed offset.

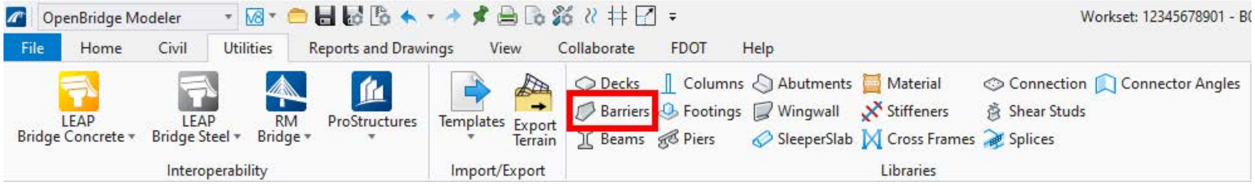


Another element that can be created with the **Place Barrier** tool is a sidewalk. Because they are similar to barriers in that they are linear components that are extruded along a guideline, sidewalk templates are set up with a WP in the same way as a barrier template. FDOT has developed sidewalk templates that can be found in the barrier template library and will be discussed in the following section. Once a sidewalk has been placed in a model with the **Place Barrier** tool, it is also eligible to be selected as a candidate for barrier placement. This will be demonstrated in a later exercise but can also be seen in the following image.

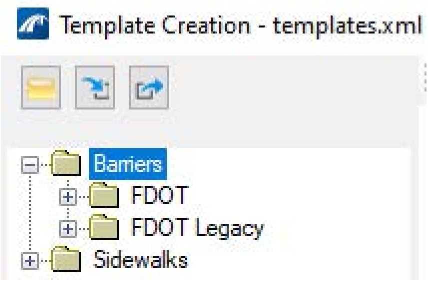


BARRIER TEMPLATES

Barrier templates have already been created and are available to all FDOTConnect users. These templates can be found in **Utilities > Libraries > Barriers.**

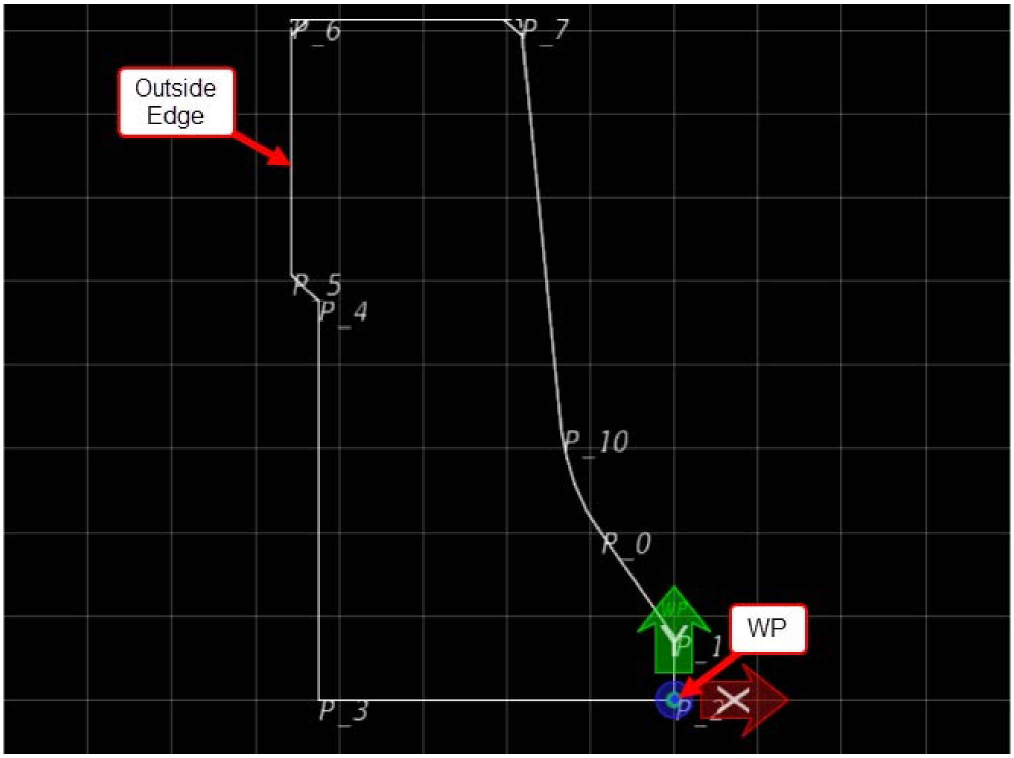


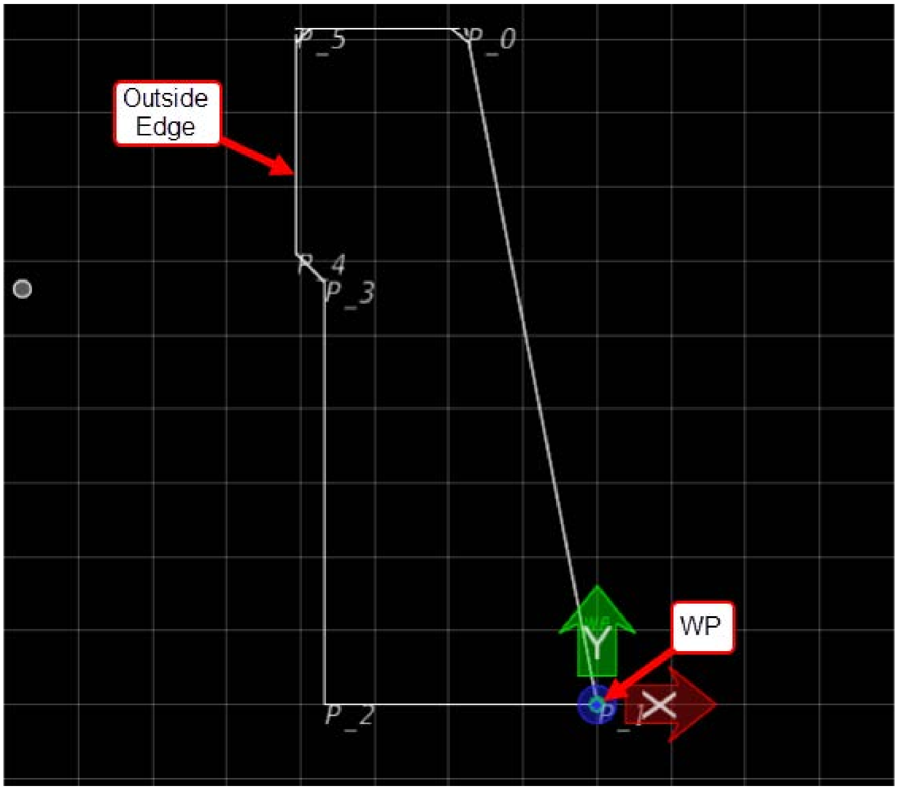
Clicking on this tool will open the barrier *Template Creation* window, showing the folders with the different templates currently in the user's library. The user should have access to current Standards Plans FDOT barrier templates, Legacy FDOT barrier templates, and sidewalk templates. See below.



Before adding a barrier to the model, it is important to know where the working point (WP) is located for the template used in the model. The WP, as discussed in the deck creation section above, is the base point used to orient the object on a certain alignment or control point. Adding a barrier to the model will have the user select a point on the deck to align with the WP on the barrier. To place the barrier appropriately the **Horizontal Offset** is used to offset the working point from the selected deck point (generally the coping).

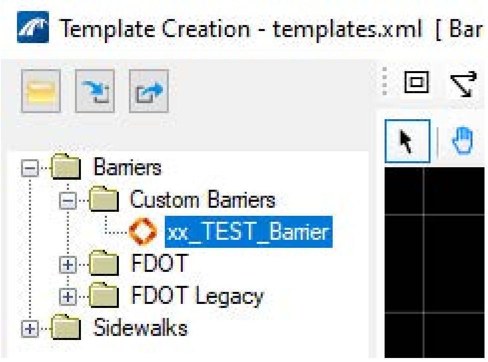
The below image shows an example of a template that needs an offset to fit properly on the deck for both an FDOT Legacy and a typical current FDOT Standard Plans barrier. Because the working point is placed on the curb side of these barriers (gutterline), the **Horizontal Offset** should be the total width of the barrier plus any additional width to match with FDOT standards, or the distance from the gutterline to the coping. Browse the barrier templates to see the various WP locations for each barrier.





The *Template Creation* window can be used to view and modify different templates in the user's library. There are very few occasions where the user will need a custom barrier since the FDOT barrier library encompasses all the standard barriers. If there is a situation where a user needs a barrier outside of the FDOT and OBM barrier library, a new template can be created from scratch or by copying and modifying an existing template. If creating the template from scratch and the geometry of the barrier exists in a dgn at the proper scale, the linework can be used.

Custom barriers should be added to their own folder in the WorkSet template library. This can be done by right clicking the *Barriers* folder and selecting **Add Category**. With the new subfolder created, right clicking on the subfolder and selecting **Add Template** will create a blank barrier template.



Once the name and description are entered for the new template, the *Template Creation* window will go into the background for a view selection. At this point, any view can be selected from the View Toggles at the bottom of the program window to be used for the temporary view; selecting one will not affect the current content.

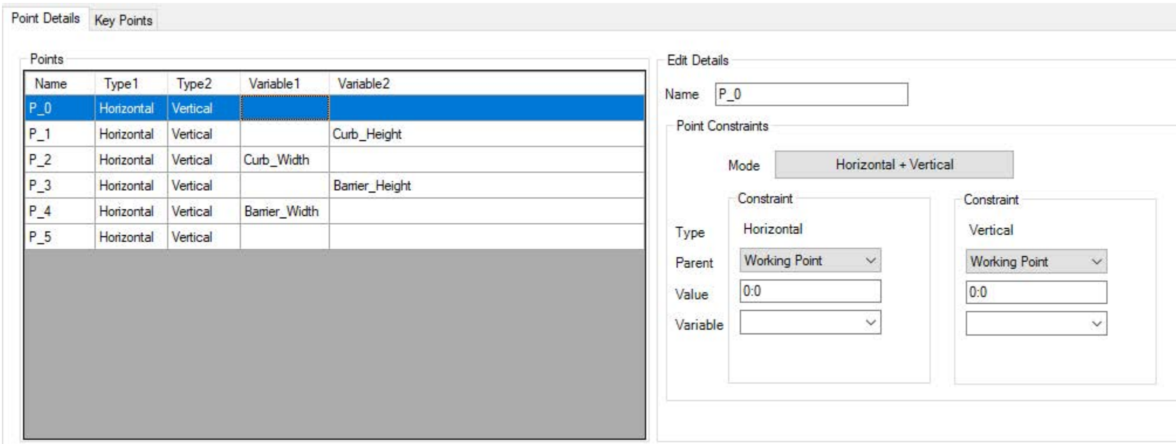
A temporary view opens with nothing but a Working Point (WP). Often the temporary view windows will need the Drawing Scale adjusted from the default. This can be adjusted as needed in the **Reports and Drawings > Drawing Scale > Annotation Scale**.

The temporary view is where the custom barrier shape will either be drawn using the Microstation tools within the **Drawing** workflow or referenced from an existing dgn. Generally, the WP would be the barrier point that defines the gutterline. The order that the segments of the barrier are drawn will determine the automatic sequence of numbering for the Points. If existing linework is referenced and merged from another dgn, the Point numbering can be adjusted afterward if needed.

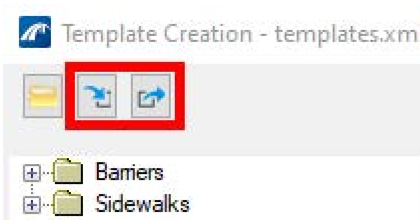
Once the linework for the barrier is completed in the temporary view, click the **Import Template From Model** button on the right side of the view toolbar.

With the barrier geometry defined, the *Point Constraints* can be used to set each point relative to each other. The available constraints are the same as those for the deck templates, with an additional option of **Elevation Provider**.

Whenever a *Mode* is selected for the *Point Constraint*, the point relationship based on the current geometry will be filled in. Since barrier points are generally rigid, the points can often be constrained based on their default *Parent*/*Value* relationship once the *Mode* is selected. If desired, the *Variable* input can be filled in to assign a given dimension to an editable variable.



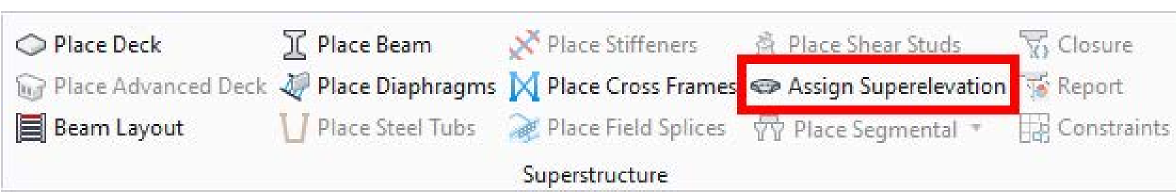
Similar to deck templates, barrier templates are stored in an xml file of the WorkSet project folder in **… > Structures > Bridge Templates > templates.xml**. If a template from one project needs to be used on another project, there are options to import and export template libraries via the xml files.



After the *Point Constraints* are set, the custom barrier can be used with the **Place Barrier** tool.

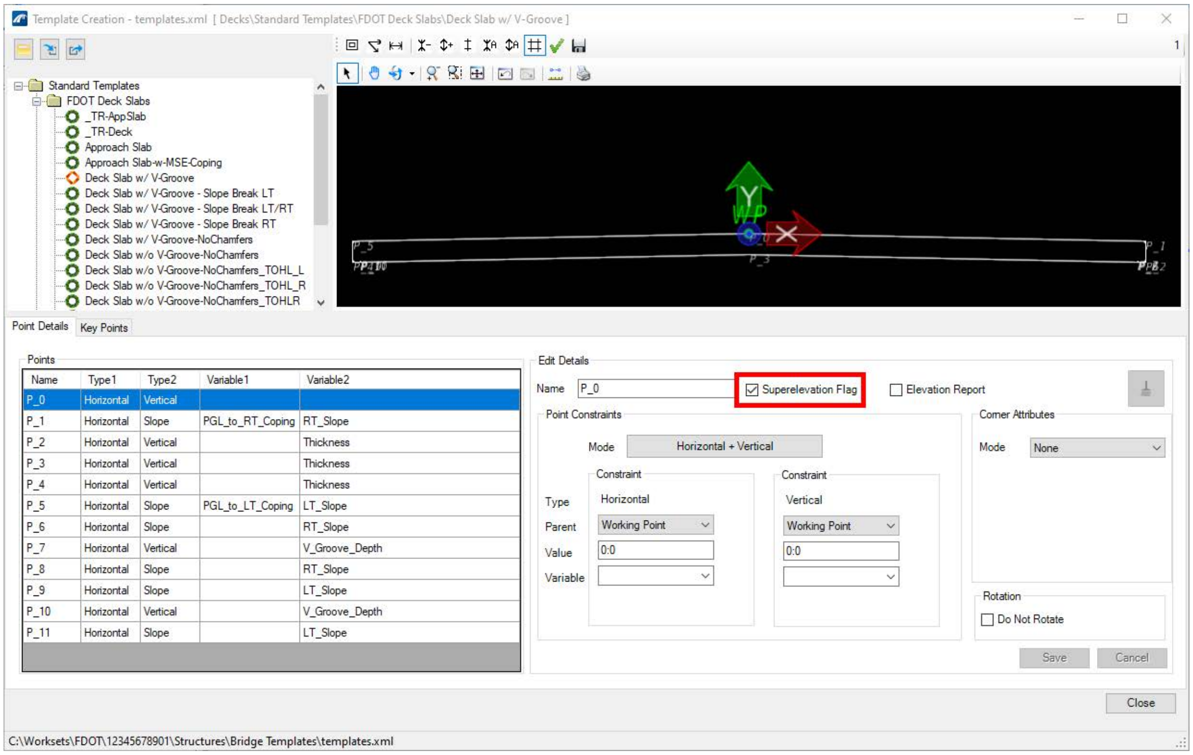
ASSIGN SUPERELEVATION

Superelevation can be assigned in several ways within OBM. The most direct method is to use the **Assign Superelevation** tool found at **Home > Superstructure > Assign Superelevation.**

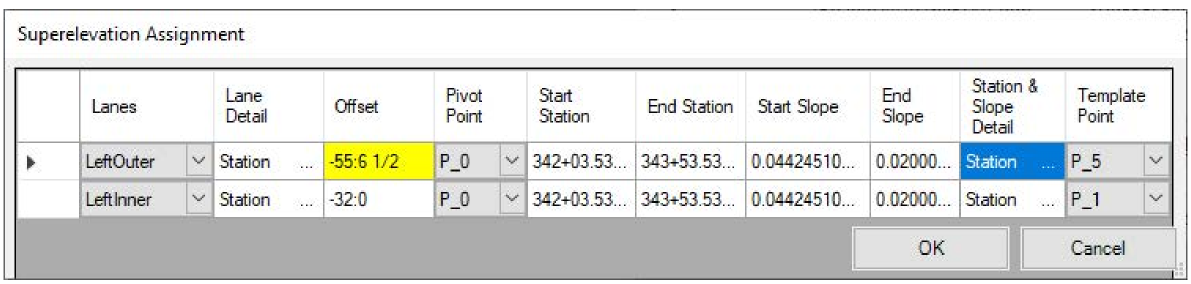


This tool utilizes a referenced roadway dgn file with the Superelevation information already included. In order to use this approach, the correct roadway file must be attached and the reference turned on.

The **Assign Superelevation** tool uses the points in the deck template to assign the cross slope along the length of the deck. The points that should be tied to the Superelevation file need to have the *Superelevation Flag* checked in the Template Creation Window (See below). These points are usually the points along the top of the deck.



After the prompts are followed and the Superelevation section and deck element are selected, the *Superelevation Assignment* window is available.



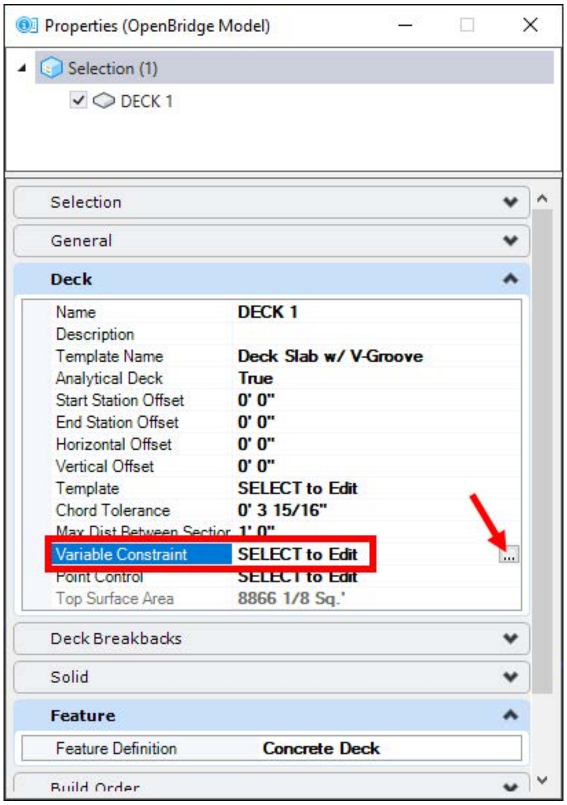
The current version of OBM makes the Superelevation Point selection process slightly cumbersome. The *Pivot Point* and the *Template Point* cannot be the same value in the same row. For example, say that the *Pivot Point* for the **LeftInner** row is desired to be **P_0**. If the *Superelevation Assignment* window automatically brings in **P_0** for the *Template Point* field, the user should:

1. Change the *Template Point* to a value different than the desired *Pivot Point*, chosen from the dropdown arrow.
2. The dropdown window for the *Pivot Point* should now display **P_0** as an option.
3. Go back to the *Template Point* dropdown window and select the desired value.

Note that a positive slope in a Superelevation file from ORD: going from alignment outwards. Slanting upward while looking down station is considered positive slope and slanting downward is negative slope. OBM on the other hand, has positive and negative slope consistent with the slope of a line in a cartesian coordinate. Additionally, in OBM, Superelevation grade and signs are in reference to the Superelevation pivot point, not as assigned in the Superelevation definitions in ORD. Superelevation in OBM will not allow pivoting points outside the deck template.

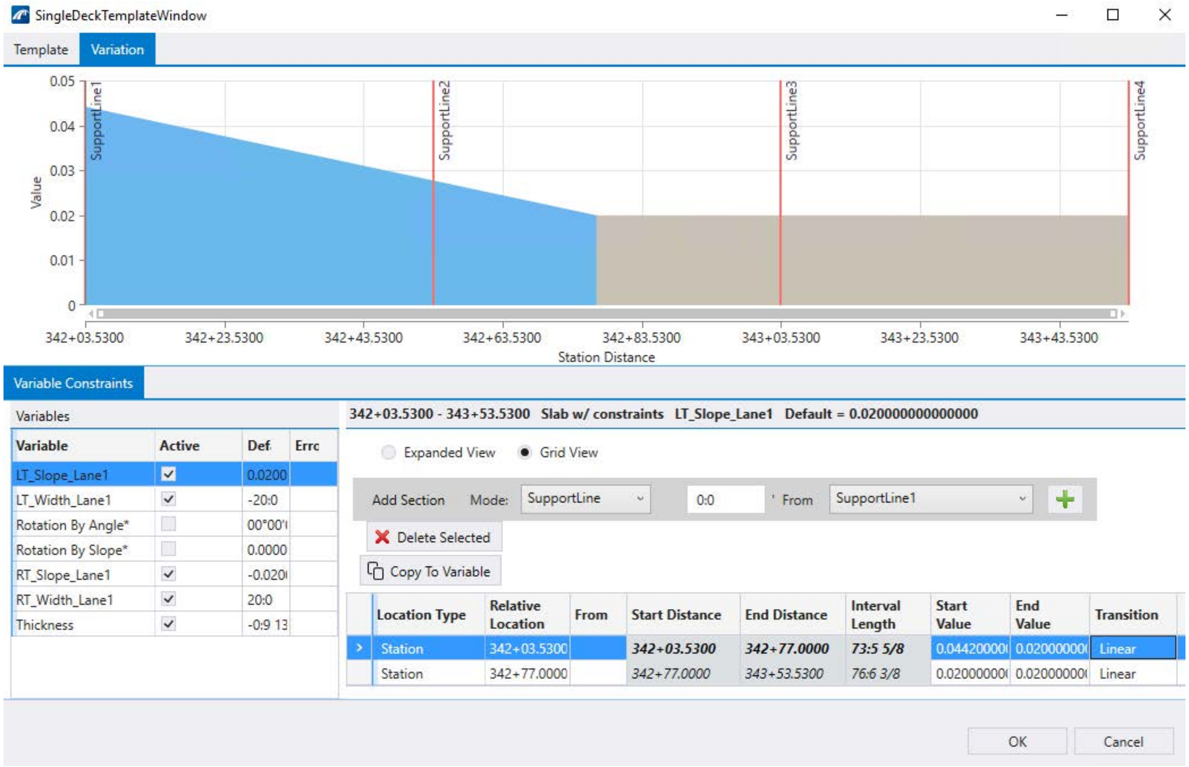
If the user wishes to modify the variable constraints of the deck (other than the cross slope), they must do so after the **Assign Superelevation** tool is used. Using the Superelevation tool will effectively eliminate any modifications to other variable constraints of the selected deck.

Users can also manually assign Superelevation using the *Variable Constraints* window by accessing the properties of a modeled deck component.



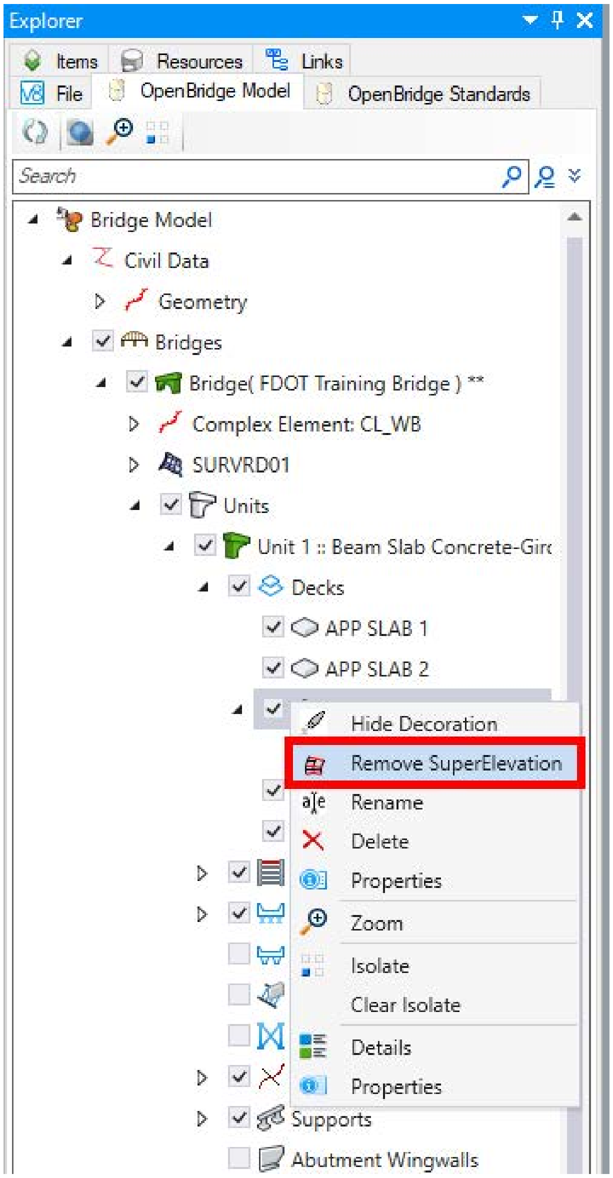
NOTE ***The properties of any model element can be accessed by hovering over the element and selecting the tool or by bringing up the Home > Properties under the Primary group. The user may even want to dock the Properties tool for easy access while creating models.***

From this window, you can select the Variables for deck slope and define the start/end stations and slope values for the Superelevation transition. Additional transition points can be added by clicking the green + in the *Add Section* area.



NOTE ***After the Assign Superelevation tool is used, the Variable Constraints window shows the values used in the model.***

If the **Assign Superelevation** tool is used, the parameters used for the cross-slope transitions can be viewed in the *Variable Constraints* window, as well. However, these parameters cannot be deleted or modified in this case. The only way to remove the superelevation values or modify the parameters after assigning is to right click on the specific deck element in the *Explorer* window and select **Remove SuperElevation** as shown on the following page.

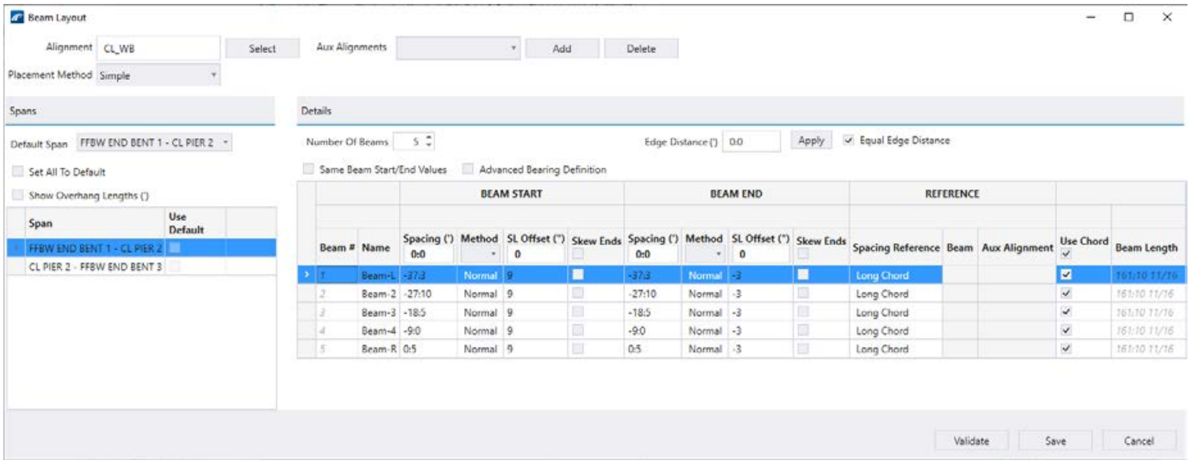

Explorer
Items
Resources
Links
File
OpenBridge Model
OpenBridge Standards
Search
Bridge Model
Civil Data
Geometry
Bridges
Bridge(FDOT Training Bridge) **
Complex Element: CL_WB
SURVRD01
Units
Unit 1 :: Beam Slab Concrete-Gird
Decks
APP SLAB 1
APP SLAB 2
Hide Decoration
Remove SuperElevation
Rename
Delete
Properties
Zoom
Isolate
Clear Isolate
Details
Properties
Supports
Abutment Wingwalls

PLACE BEAM LAYOUT

The beam layout of a model acts as the framing plan for the bridge. To add a beam layout, select the **Home > Superstructure > Place Beam Layout** tool.

The resulting 2D linework in plan view generated by this tool is placed at elevation zero (Z=0) and are placed on a "decoration" level. Note that the beam elements are not modeled in this step (that occurs with the **Place Beam** tool described in the next section). Instead, the number of beams per span, beam spacing, SupportLine offsets, and whether the beam has skewed ends are controlled in this tool. Below is an example of the *Beam Layout* window.

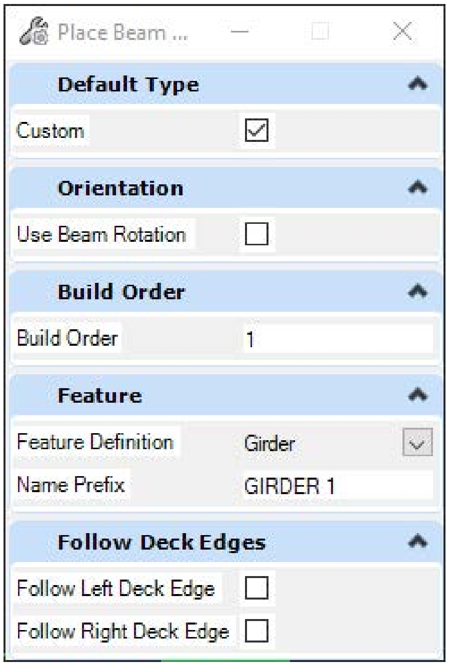
The initial beam spacing can be set by modifying the *Number Of Beams* and the *Edge Distance* (overhang width). Within the table, varying beam spacings or overhangs can be accommodated. The way that the beam spacing is measured is set in the *Method* column of the table and chosen as **Normal** to the deck or **Along Skew**. The *SL Offset* is the distance along the beam centerline from the controlling SupportLine to the end of the beam. With the given options for beam layout, almost every framing plan can be modeled. Clicking **Validate** will allow the user to temporarily view the placement within the model of the current beam layout. Clicking **Save** will finalize the adjustments and close the window.



***NOTE** Using the Set All To Default checkbox or the copy/paste (Ctrl+C & Ctrl+V) functionality can be an efficient way to add the beam layout in multiple spans.*

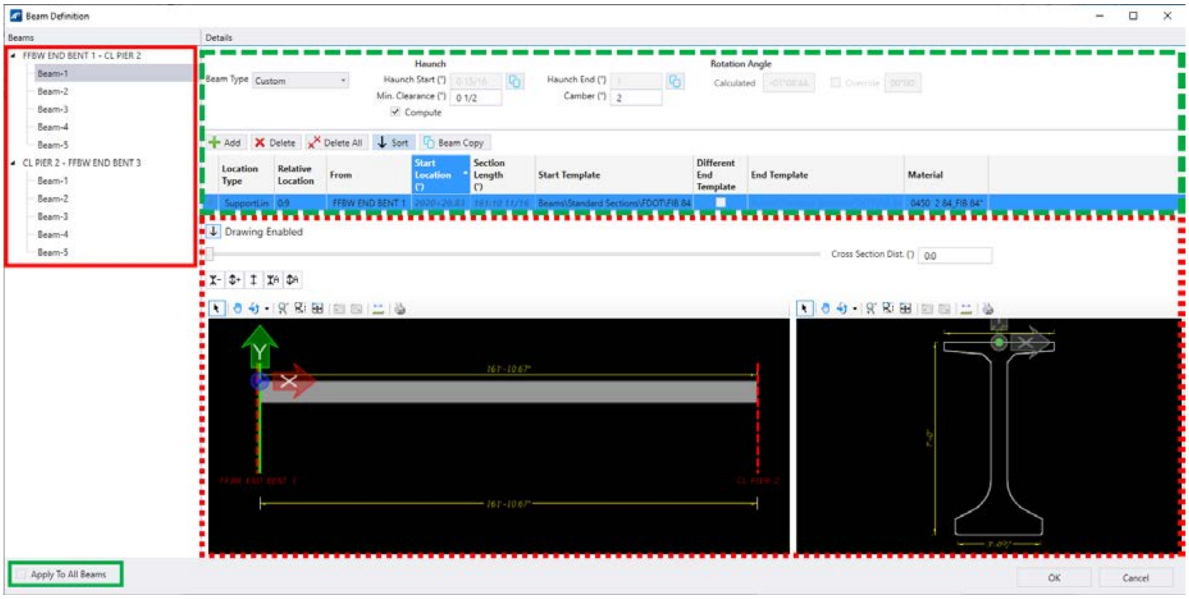
PLACE BEAM

With a beam layout in place, the user is now ready to add 3D beam elements. To model the beams, navigate to and select **Home > Superstructure > Place Beam**. A window will open with different beam placement options.

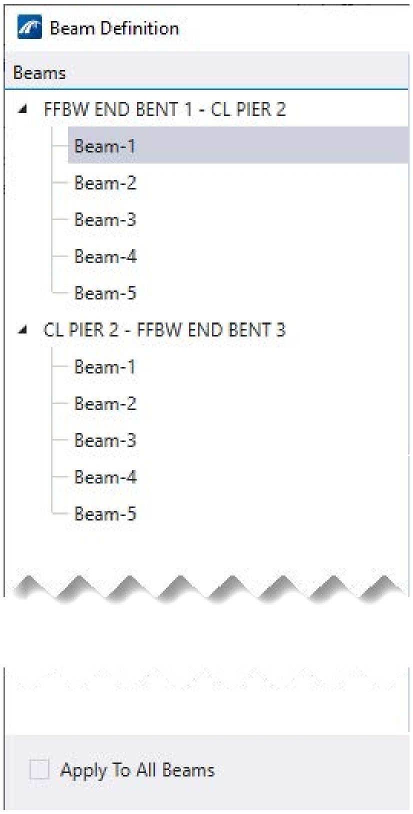


By default, the *Name Prefix* will be set to **GIRDER 1** and each additional beam group will increment up by one number. However, different inputs can be used to describe the beam type based on the material, for example “ConcBeam” or “SteelGirder.” This can be helpful if there are both concrete beams and steel girders on a bridge. In this case, the user would need to use the **Add Unit** tool since different *Bridge Types* would need to be selected.

A beam layout must be selected to open the *Beam Definition* window. This allows for defining minimum haunch thicknesses, beam sections, and beam material. See the *Beam Definition* window and corresponding information.

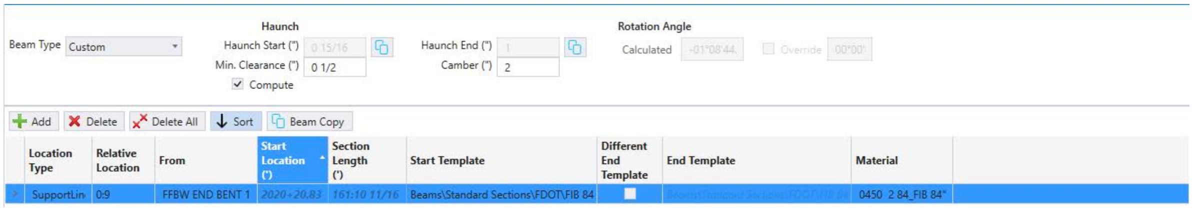


Solid Red Box – This Beam List is determined by the Beam Layout created in the previous section. This particular Beam List contains 2 spans of beams with 5 beams across the width of each span. Using the **Apply To All Beams** check box called out by the Solid Green Box in the bottom left of the window allows the user to make changes to one beam and apply it to all the beams in the Beam List. See the image below.



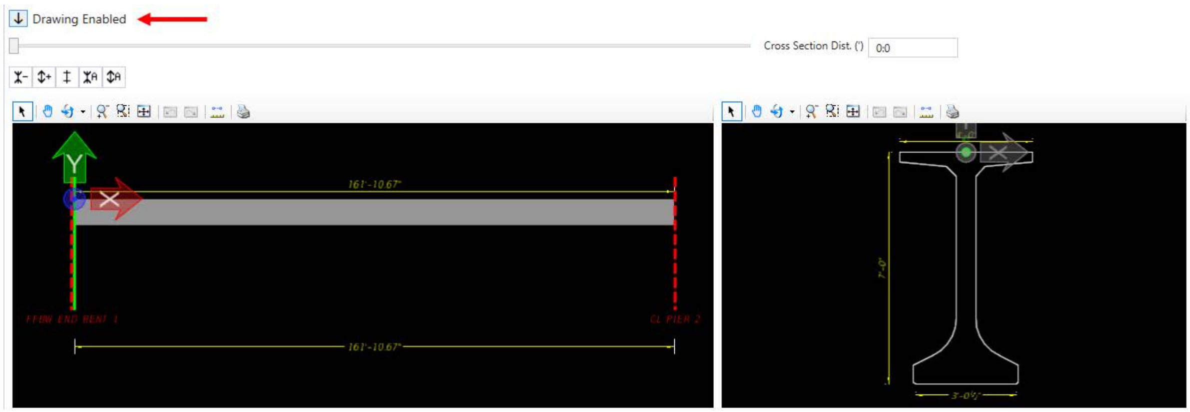
NOTE ***Using the Apply To All Beams checkbox functionality can be an efficient way to add the beam sections and other parameters in multiple spans. The check can always be cleared to make individual beam modification as needed.***

Dashed Green Box – This Details section is where the user can modify the beam type, haunch, beam dimensions, and the chosen template. The Beam Template Library can be found in **Utilities > Libraries > Beams**. This is where the templates can be viewed and modified prior to selection.

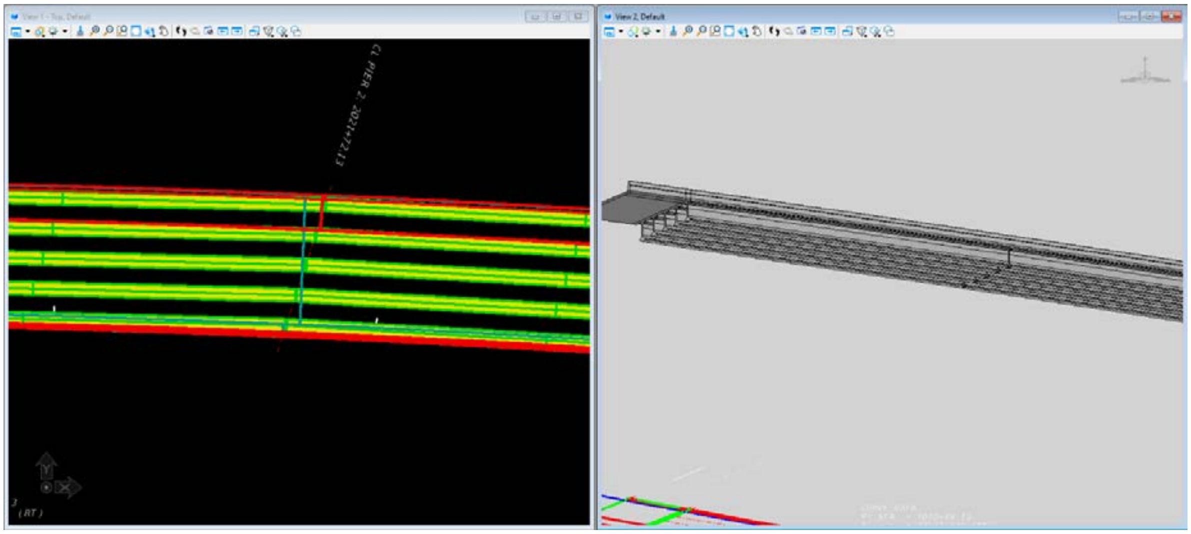


NOTE ***The haunch thickness can be manually entered for both the start and end of the beams. Also, the user can check the Compute box and provide the minimum haunch at the edge of girder and the total net camber at midspan to allow the software to provide the haunch thickness. Note that the camber is not modeled, only used to determine the required haunch thickness.***

Dotted Red Line – This window contains drawing views of the selected beam. The left view window shows the span of the beam, and the right view window shows the cross-section of the selected beam template. Clicking the arrow next to **Drawing Enabled** will enable or disable these drawing views. See the red arrow in the following figure.



After the information for the first beam is changed according to the desired inputs and the **Apply To All Beams** is checked the user can select **OK** to create the beams in the model.



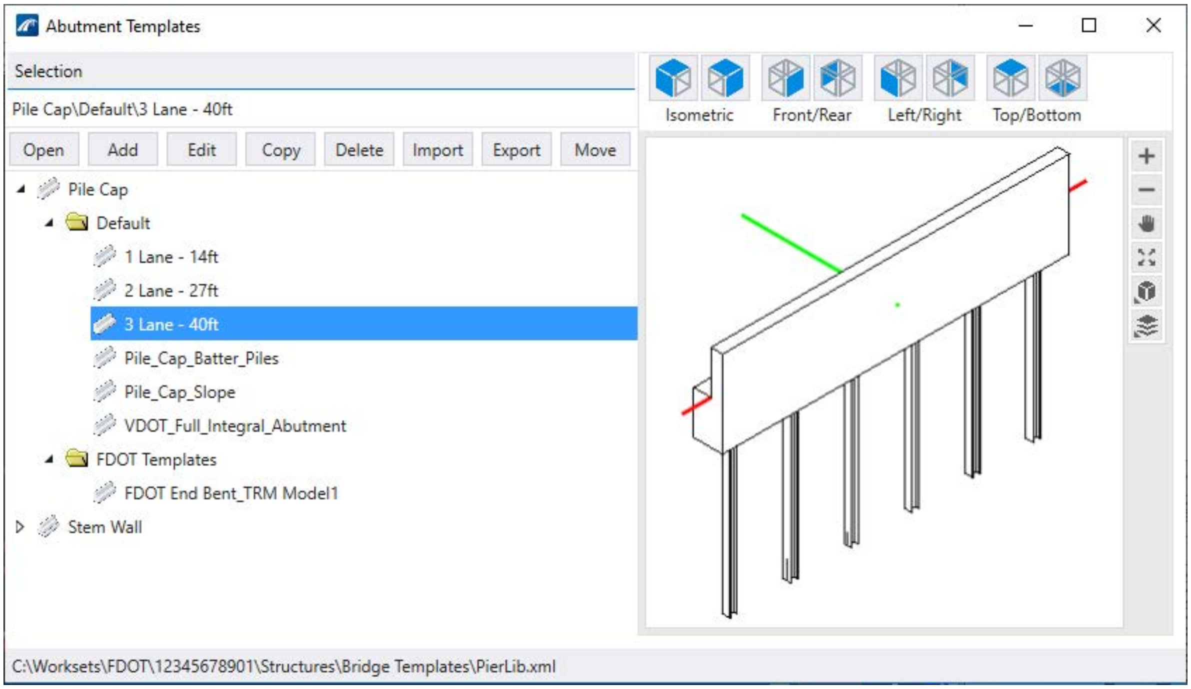
To return to the *Beam Definition* window for the beams just created, the user must select the **Beam Group** for the active bridge in the model space and open the properties window. In the *Beam Definition* field select the "**…**" to open the *Beam Definition*.

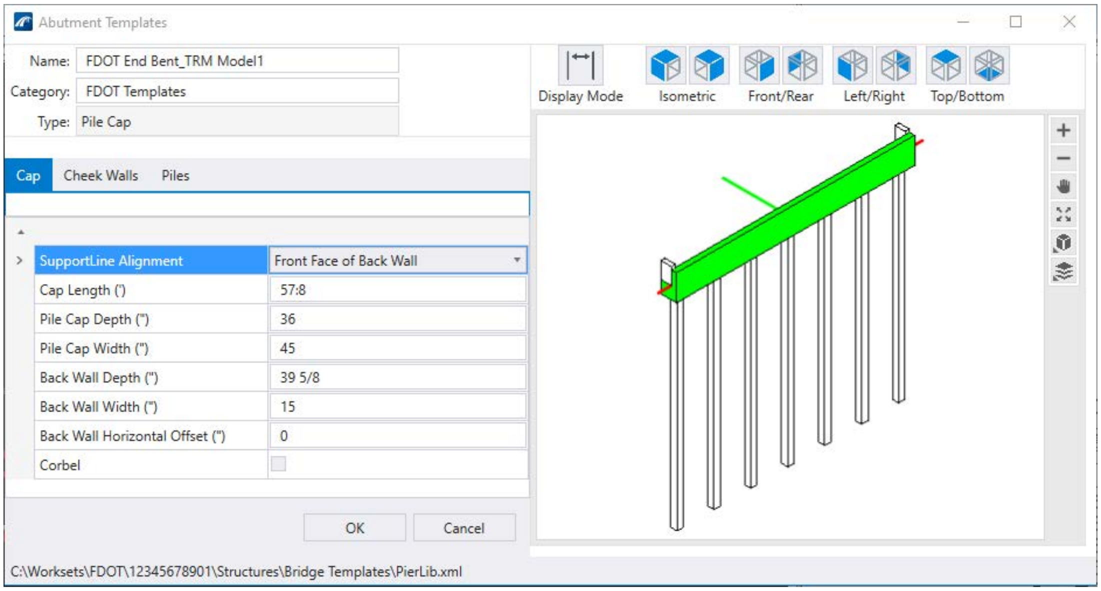
PLACE ABUTMENT

After the beams are created, substructure units can be added to the model. To add an abutment, select the **Home > Substructure > Place Abutment** tool.

Similar to deck elements, templates are used to generate abutment elements. However, the substructure templates, especially for the abutments, are less flexible than the deck templates and the user may not be able to model these elements to a high level of development with the provided tools in OBM. A higher level of development can be accomplished with a Custom Abutment using a parametric cell, and/or using solids modification tools. See the Chapter 5 abutment exercises for parametric cell use and see the Chapter 8 solids modification exercise (EXERCISE 8.1) for some solids modification use cases. FDOT has developed a parametric cell for one of the standard FDOT end bents, but there are several limitations.

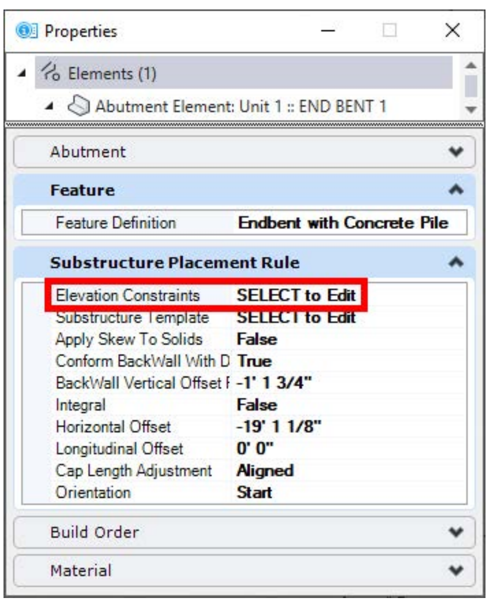
OBM provides templates for two categories of abutments: Pile Caps and Stem Walls. Users can utilize these templates and add piles of different types including square prestressed and steel H-piles. These templates can be edited and copied as needed. New templates can be created from scratch with the **Add** button. The templates can be found in **Utilities > Libraries > Abutments**. Templates are stored in an xml file of the project folder in **... > Structures > Bridge Templates > PierLib.xml**. If a template from one project needs to be used on another project, there are options to import and export template libraries via the xml files.

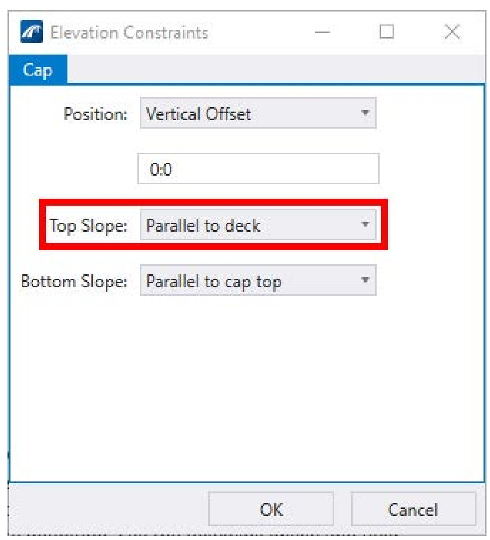




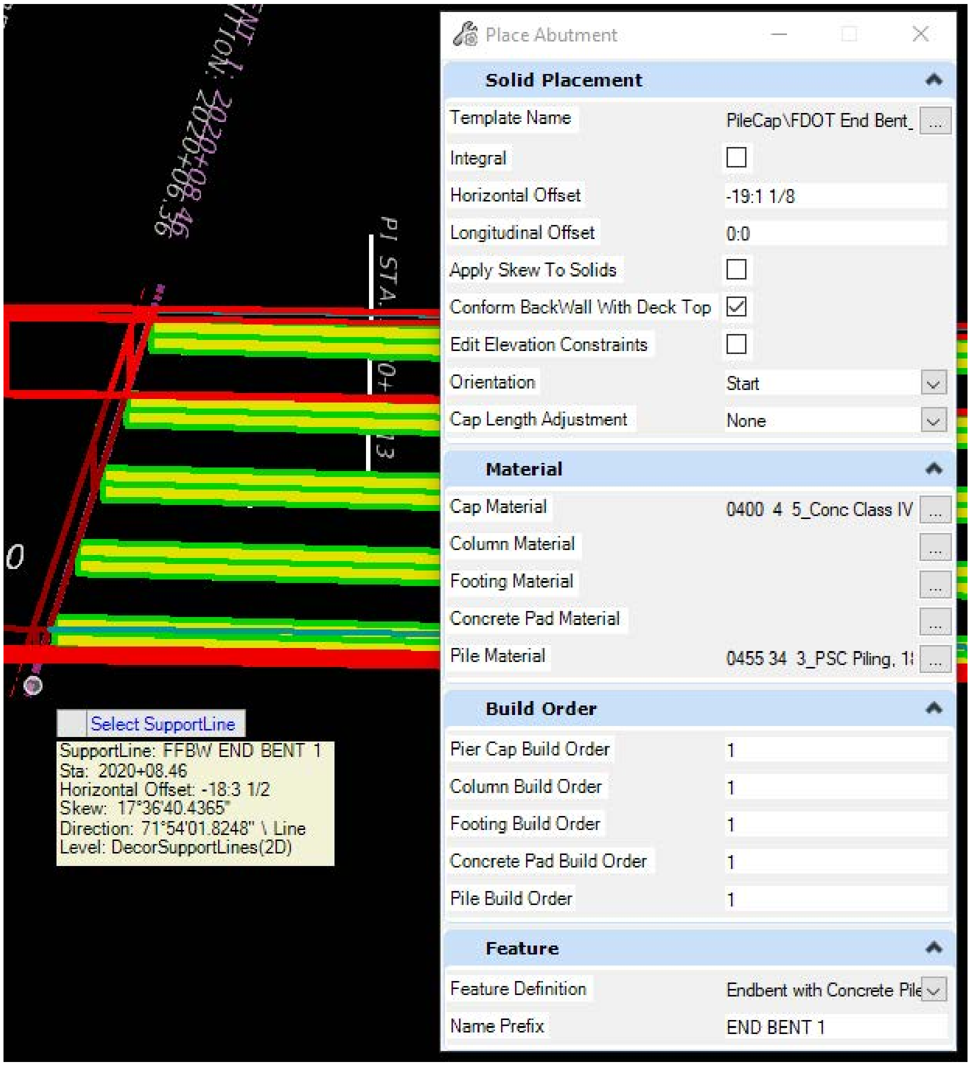
NOTE ***The Back Wall Depth entered can be an estimate. When the abutment is placed, there will be options to conform the backwall with the top of deck and offset the backwall vertically from the top of deck. These options override the value entered for Back Wall Depth from the template.***

The cap is to be stepped or sloped if pedestals are greater than 15” tall. A stepped cap can be created during the bearing placement step (see Place Bearings section). To slope a pile cap, the user will need to utilize the “Elevation Constraints” option and indicate that the top and bottom of the cap are to be sloped.





The abutments are placed on the SupportLines in the active bridge. After selecting the **Place Abutment** tool, the *Place Abutment* window will open. The user will then have the opportunity to select the desired SupportLine for the abutment location and modify the placement details of the abutment. These include offsets, template selection, abutment materials, and feature definition. See the following image and field descriptions for more details.

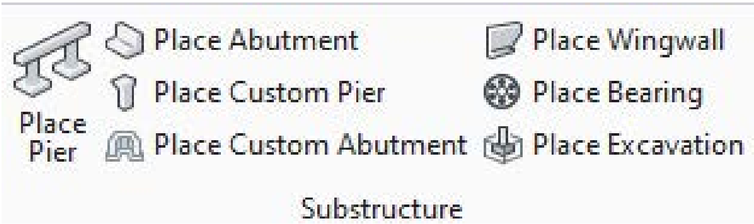


Template Name:	Selecting the "…" in this field will open up the template library where any previously created template will be opened.
Horizontal Offset and *Longitudinal Offset:*	These fields will move the abutment in plan view relative to the selected SupportLine.
Apply Skew to Solids:	This field automatically adjusts the template solids based on the SupportLine skew angle.
Conform BackWall with Deck Top:	If this checkbox is selected, the backwall will follow the slope of the top of deck.
Edit Elevation Constraints:	This checkbox will open the Elevation Constraints window after the substructure unit is placed to allow the user to edit these fields.
Orientation:	Selecting **Start** or **End** will tell the program which abutment this will be relative to the stationing of the alignment curve.
Cap Length Adjustment:	There are five options for this field: **None, Deck, Skew, Aligned,** and **Deck and Aligned**. These will automatically modify the cap horizontal length in the template to whatever is chosen.

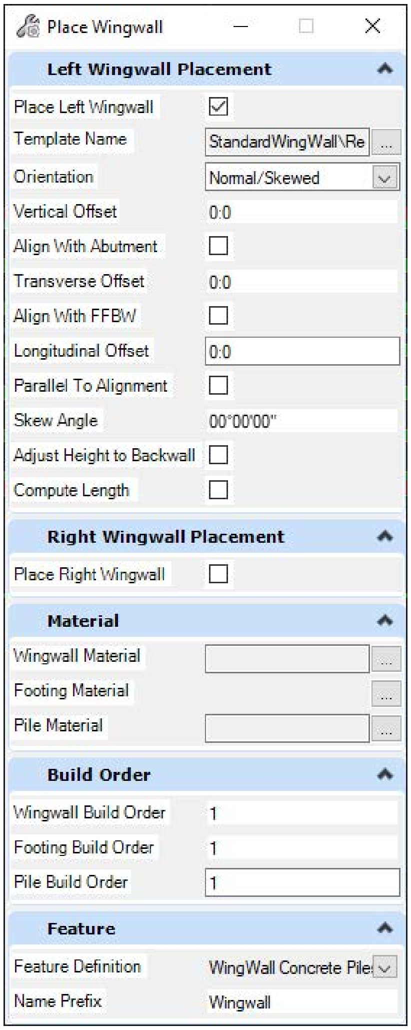
Material:	The materials for each component of the abutment can be added by selecting the "**...**" next to the field. Note that this is then tied to the bridge element and is used in the Material Quantities Report (see Chapter 7).
Build Order:	This refers to the order of construction (if desired). This is only used for RM Bridge and can generally be disregarded.
Feature Definition:	This field will determine the levels the model and any section view linework will use for the individual components, so the user should select the Feature Definition that applies to the desired abutment.

If any part of the abutment must be modified after placement, the user can access the details of the abutment by opening the abutment properties. The *Elevation Constraints* field allows the user to change the top or bottom slope of the abutment cap and to set cap elevations as a hard-entered rather than internally calculated value. The *Substructure Template* field allows the user to change the dimensions and layout of the piles, cheekwalls, cap, etc.

Users can place the wingwalls as individual elements by selecting **Home > Substructure > Place Wingwall**.

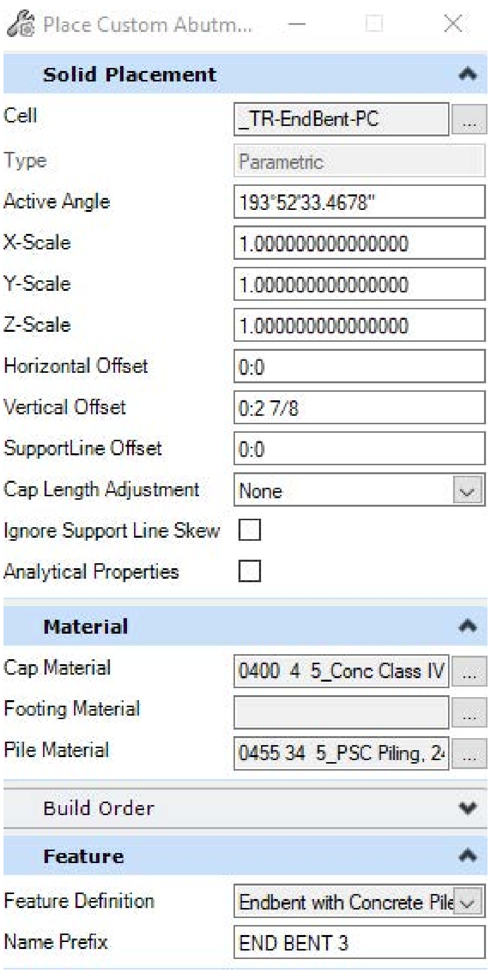


The placement options for this tool can be tricky but can generally be used along with solids modification tools to get the required geometry. Information on solids modification tools can be found in Chapter 8 and the Bentley Help Contents for Microstation. Solids generated by OBM can be modified with the standard Microstation solids modification tools found in the **Modeling** workflow. There are implications at this point in time which need to be considered when modifying OBM solids. First, any modifications to the solids should be reflected in the OBM quantity report tool. Second, the 2D decoration levels will not be updated to reflect modifications to their parent solids. Modifying OBM solids is an advanced topic and may not be required on every bridge model depending on the level of detail required.



The last tool used for the creation of abutments and its components is the **Home > Substructure > Place Custom Abutment** tool.

This tool allows the user to place abutment elements that have been previously generated in a parametric cell on a model's SupportLines. The *Place Custom Abutment* window can be seen below.

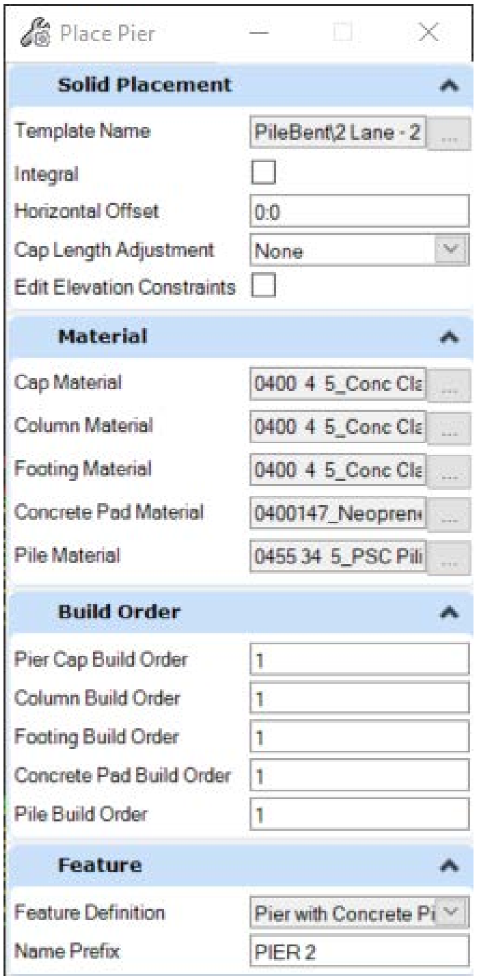


FDOT has developed a parametric cell for use in the FDOTConnect workspace and its usage will be demonstrated in an upcoming exercise.

PLACE PIER

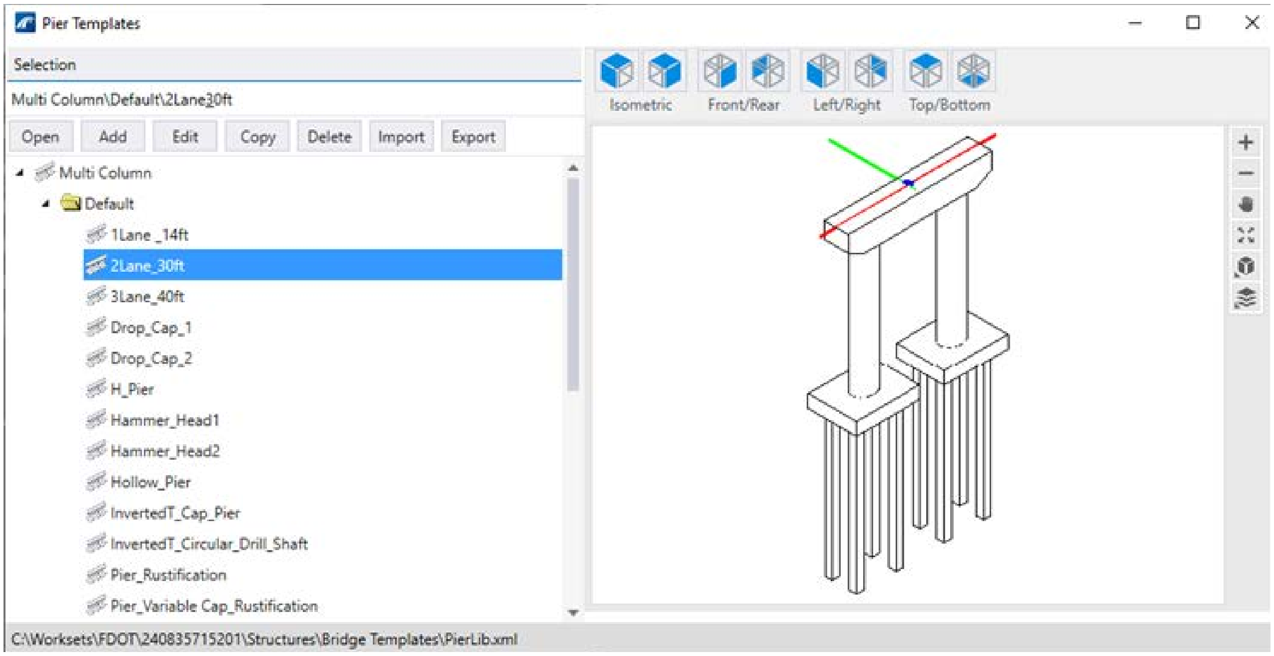
Modeling piers in OBM is very similar to abutments. To add pier, navigate to **Home > Substructure > Place Pier.**

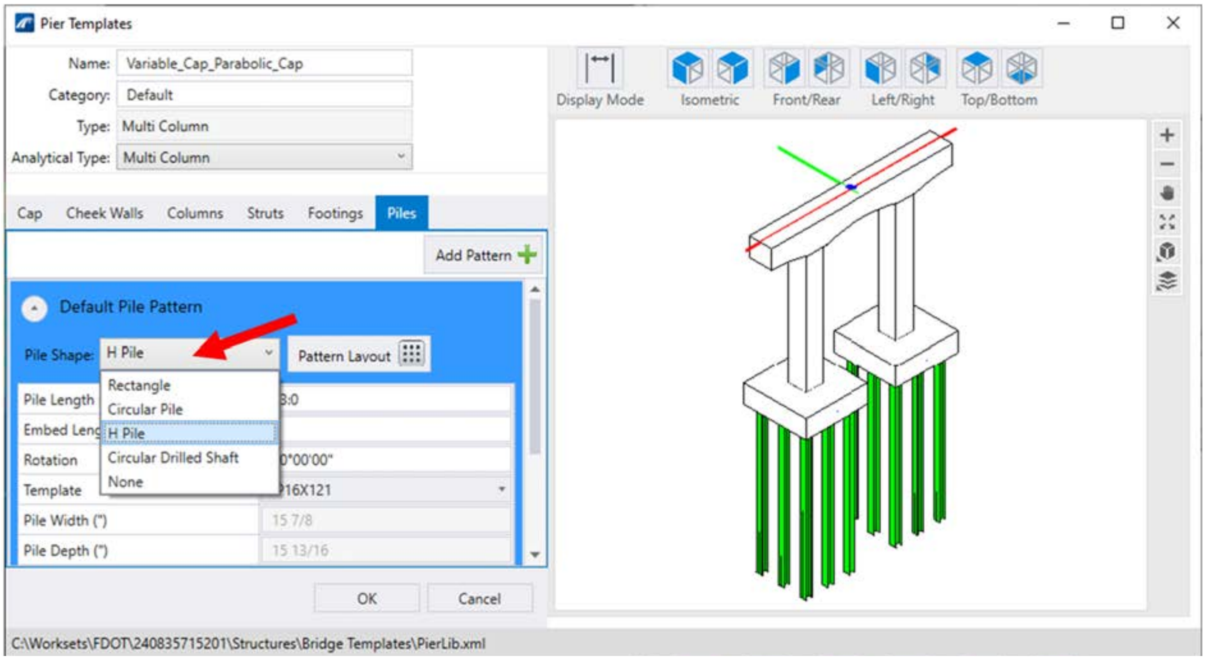
After filling in the input (see Place Abutment section for more information), simply select one or more SupportLines to place the pier(s) as desired. The input is similar to the abutment input, but with less options. The Cap Length Adjustment generally will not be used for pier caps since they often do not run the full width of the deck.



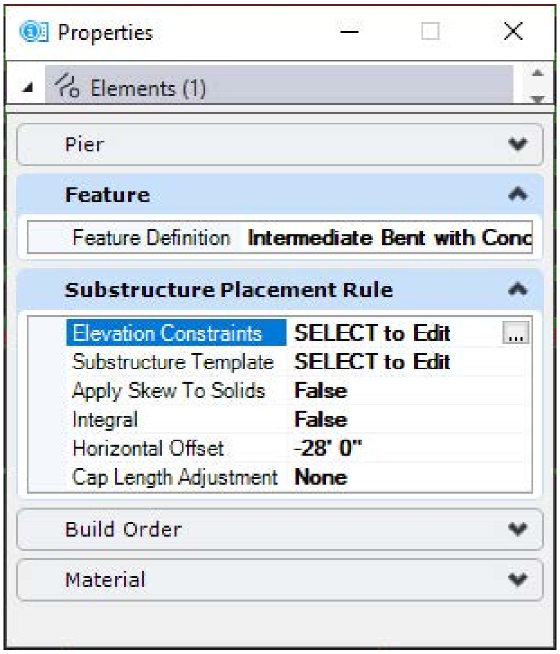
Piers are also template-based and there are additional options for cap shape, variations and tapers, column shape, and footing shape which allows for more pier types to be accommodated. Although the pier templates are extremely robust at this point, an even higher level of development can be accomplished with a Custom Pier or parametric cell. Bentley has information and instructions on how to create and use parametric cells available online.

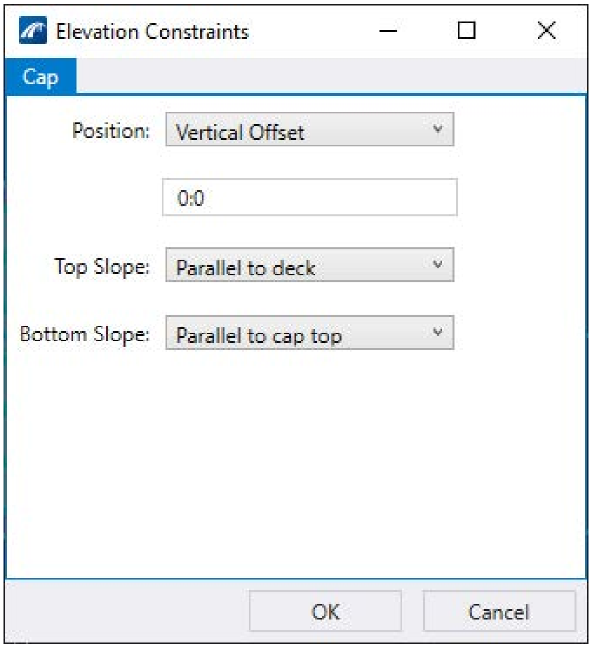
OBM provides templates for two categories of piers: Pile Bents and Multi Columns. Users can utilize these templates and add piles of different types including square prestressed and steel H-piles. These templates can be found in **Utilities > Library > Piers**. Templates are stored in an xml file of the project folder in **... > Structures > Bridge Templates > PierLib.xml**. If a template from one project needs to be used on another project, there are options to import and export template libraries via the xml files. These template can be edited and copied as needed. New templates can be created from scratch with the **Add** button.



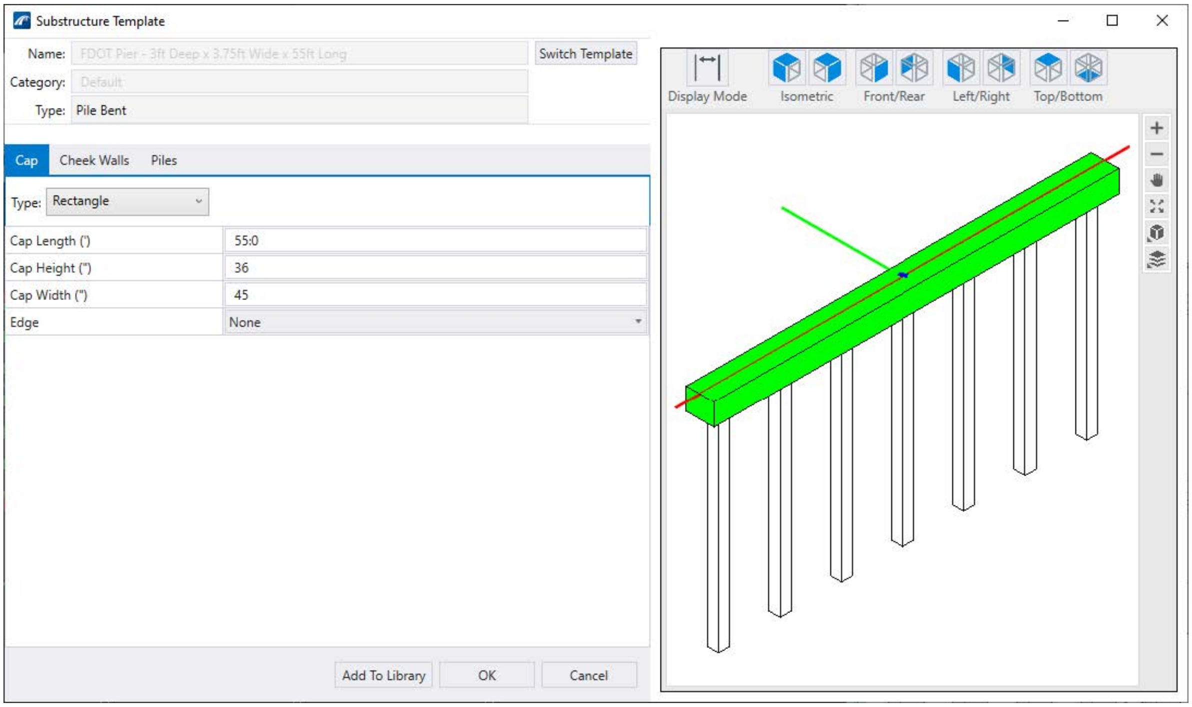


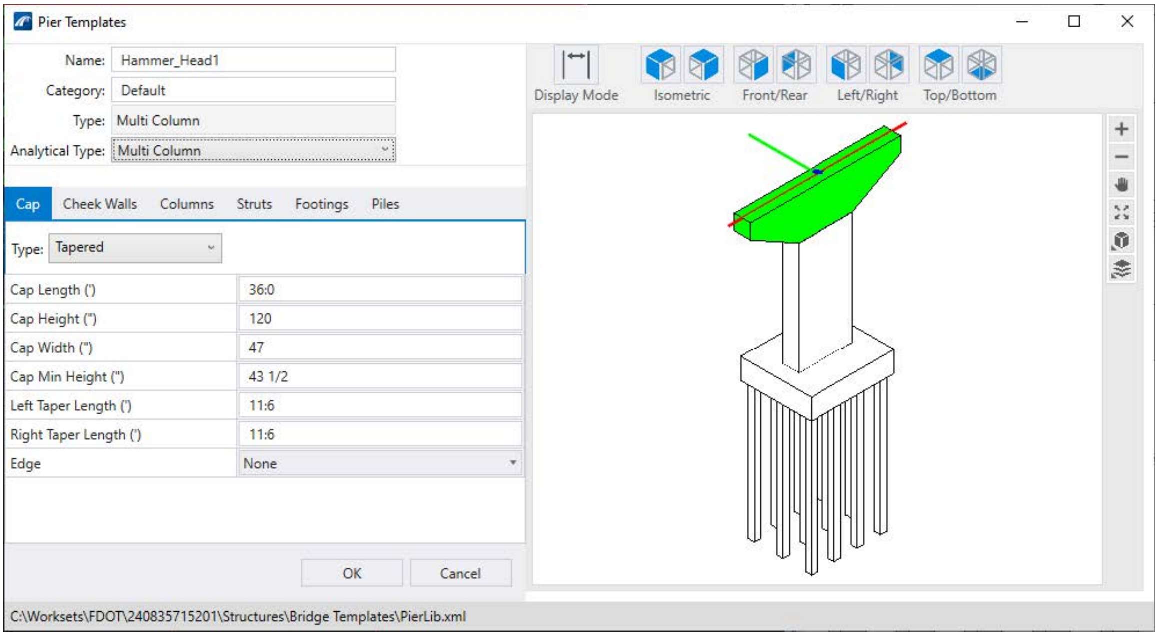
As with abutment pile caps, the pier caps are to be stepped or sloped if pedestals are greater than 15" tall per the SDG. The cap can be stepped by selecting this option in the bearing window (See Place Bearings section). To slope a pier cap, the user will need to utilize the "Elevation Constraints" option and indicate that the top and bottom of the cap are to be sloped.



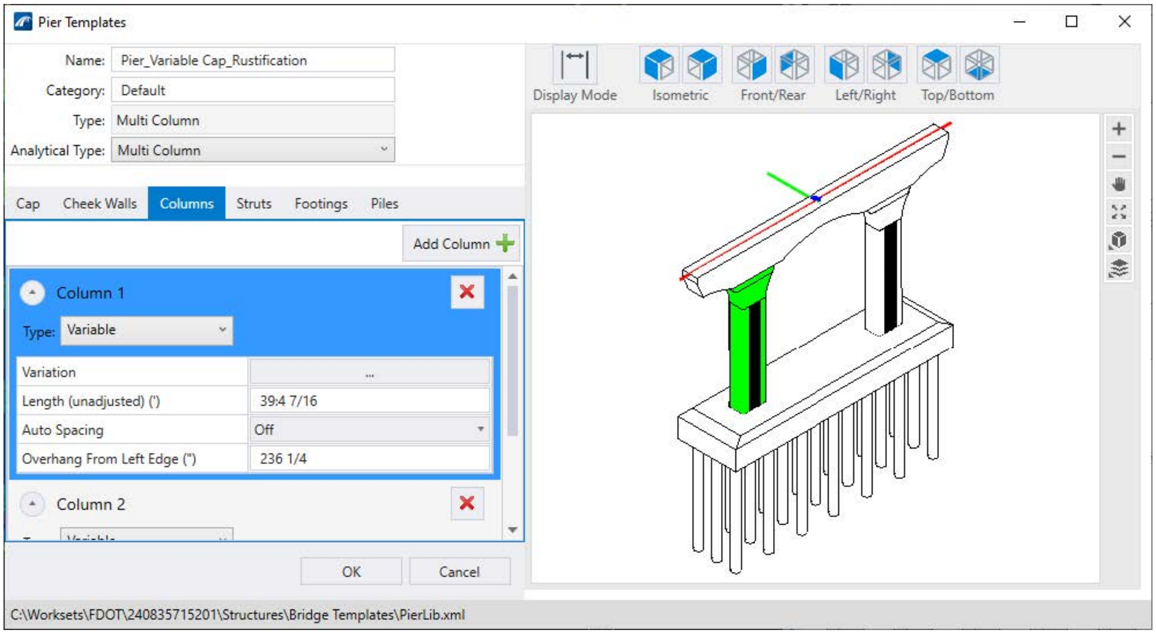


Note that different variables will be available to edit based on the *Type* of pier, cap, column, footing, and piles that are selected.





Pier Templates
Name: Hammer_Head1
Category: Default
Type: Multi Column
Analytical Type: Multi Column
Display Mode
Isometric
Front/Rear
Left/Right
Top/Bottom
Cap
Cheek Walls
Columns
Struts
Footings
Piles
Type: Tapered
Cap Length (') 36:0
Cap Height (") 120
Cap Width (") 47
Cap Min Height (") 43 1/2
Left Taper Length (') 11:6
Right Taper Length (') 11:6
Edge None
OK
Cancel
C:\Worksets\FDOT\240835715201\Structures\Bridge Templates\PierLib.xml

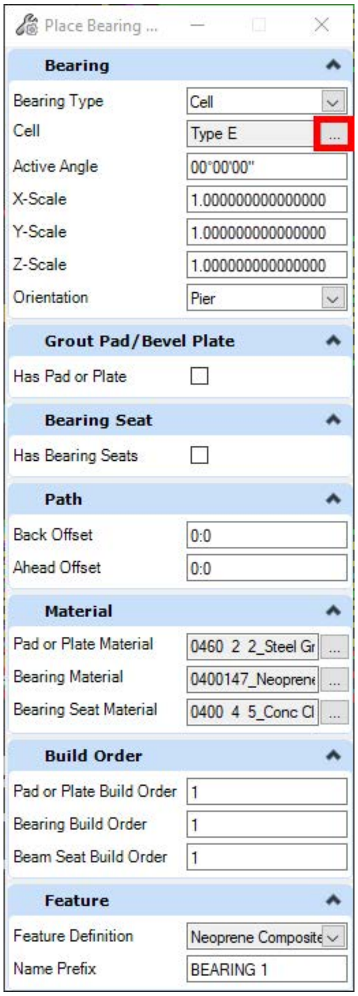


Pier Templates
Name: Pier_Variable Cap_Rustification
Category: Default
Type: Multi Column
Analytical Type: Multi Column
Display Mode
Isometric
Front/Rear
Left/Right
Top/Bottom
Cap
Cheek Walls
Columns
Struts
Footings
Piles
Add Column
Column 1
Type: Variable
Variation
Length (unadjusted) (') 39:4 7/16
Auto Spacing Off
Overhang From Left Edge (") 236 1/4
Column 2
OK
Cancel
C:\Worksets\FDOT\240835715201\Structures\Bridge Templates\PierLib.xml

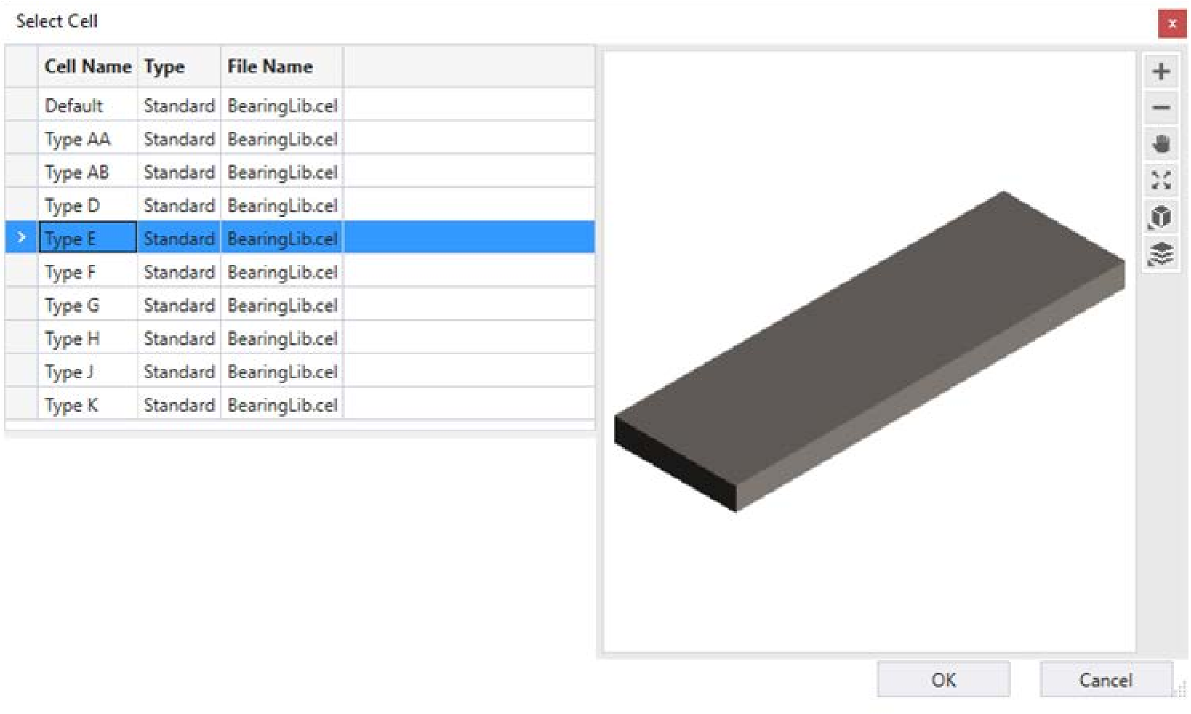
PLACE BEARING

Bearing elements and bearing assemblies are modeled after both beams and substructure units are added. The bearings are inserted underneath the beams and will offset the substructure downwards. The user will have options to create Bearing Seats, create Grout Pads/Bevel Plates, model stepped caps, change the bearing materials, etc. To add a bearing, navigate to and select **Home > Substructure > Place Bearing**.

The *Place Bearing* window will open, along with many placement options. From this point, a *Bearing Type* must be selected out of the three available options: **Cube**, **Cylinder,** and **Cell**. The Cube and Cell options are most commonly used on FDOT projects and will be the focus of this section. The preferred method for bearing placement when working with FDOT standard bearing pads is to use the Cell option. The user must click the "**…**" next to the *Cell* field.

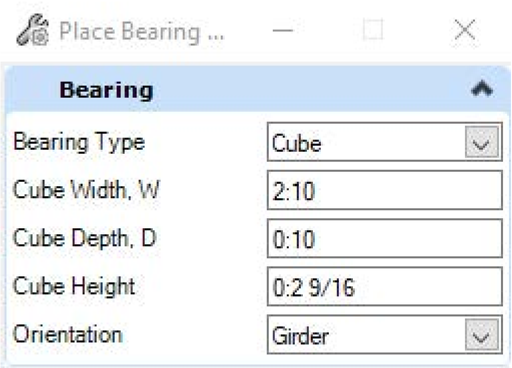


This will open the bearing cell library that contains all of the FDOT standard bearings, as shown in the image below.

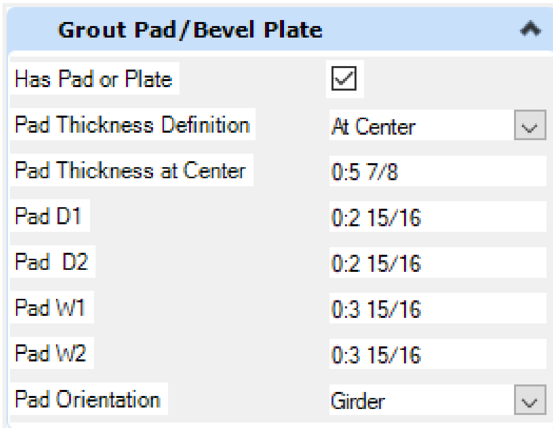


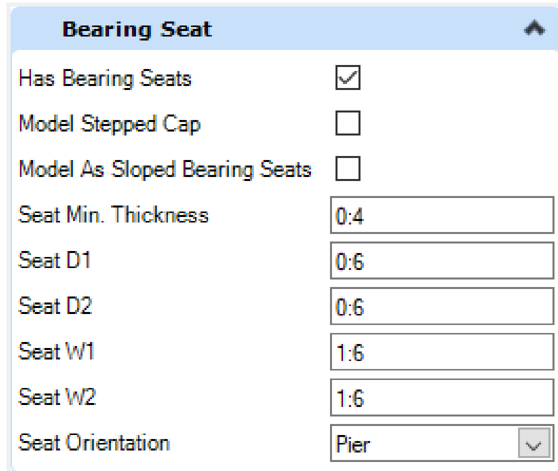
Once a bearing type is selected from the cells, the user does not need to do anything to change the dimensions of the bearing. While this is the preferred option when placing FDOT-standard bearings, using cells in the placement of bearings does have undesired implications when pulling quantities from the model. When using the built-in Bentley quantities report generator, the bearings are pulled as an “each” or “EA” quantity as opposed to a “cubic yard” or “CY” quantity. Additionally, when using the FDOT generated quantities, the program will any bearing information. These issues will be discussed further in Chapter 7.

The other method that can be used if non-standard bearings are being used or if complicated geometry makes it difficult to place the cells, is the Cube option. This option requires that the user input all bearing dimensions before placing the bearings. Bearings are modeled from the centerline of the bearing. *Cube Depth, D* is measured in the longitudinal direction and *Cube Width, W* is in the transverse direction.



After the *Bearing Type* and *Orientation* have been set, the remaining input information is the same for all options. Checking the box next to *Has Pad or Plate* or *Has Bearing Seat* will extend that portion of the window with additional options for that component. The example below shows the fields that display once *Has Pad or Plate* (left image) or *Has Bearing Seats* (right image) is selected. See figures for graphical representations of variables used.

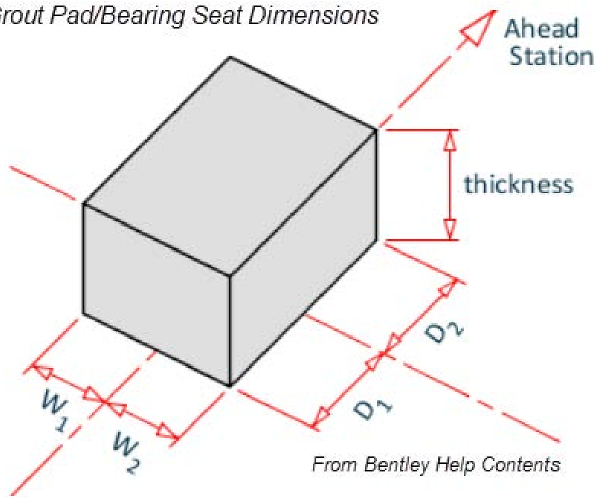




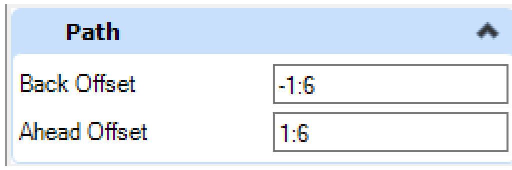
The D dimensions determine the longitudinal distances of the Pad or Plate along the length of the bridge. D1 is the distance ahead of the bearing centerline, and D2 is distance behind the bearing centerline.

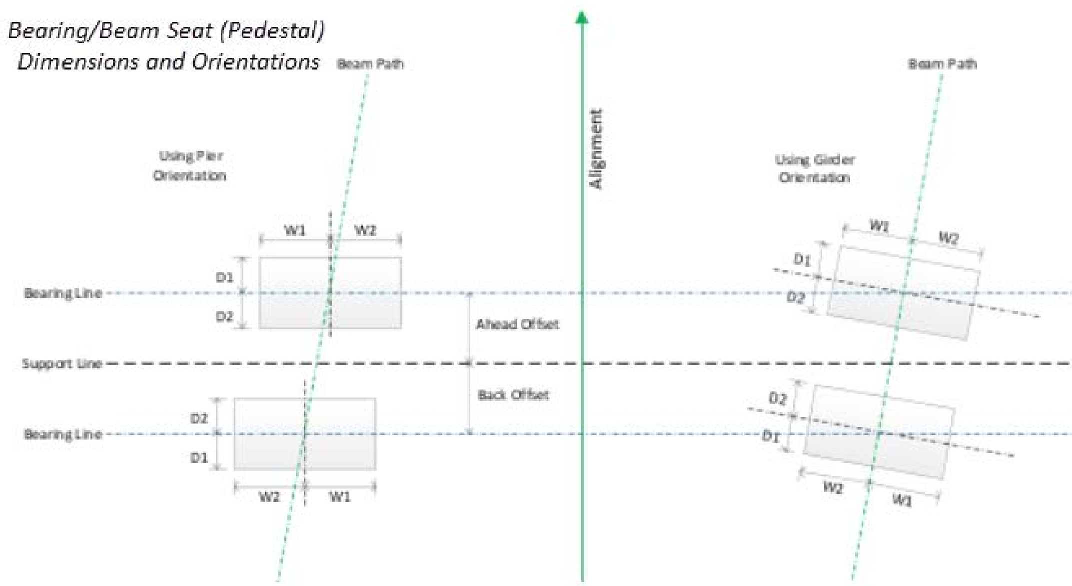
The W dimensions determine the transverse dimensions of the Pad or Plate across the width of the support. W1 is the Pad or Plate dimension left of the centerline of the girder (looking upstation). W2 is the dimension to the right of the centerline of the girder (looking upstation).

Grout Pad/Bearing Seat Dimensions



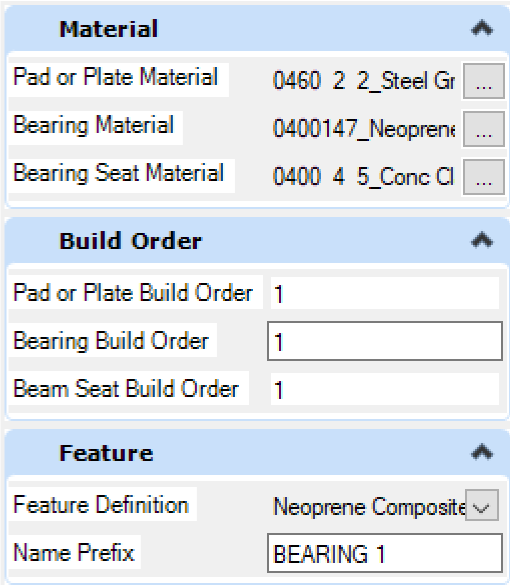
The bearing line offsets are set in the *Path* group. There, the *Back Offset* and *Ahead Offset* from the selected SupportLine can be set for the centerline of the bearings in the back and ahead spans, respectively. If the substructure location has been offset from their respective SupportLines, the bearings must be offset to match.



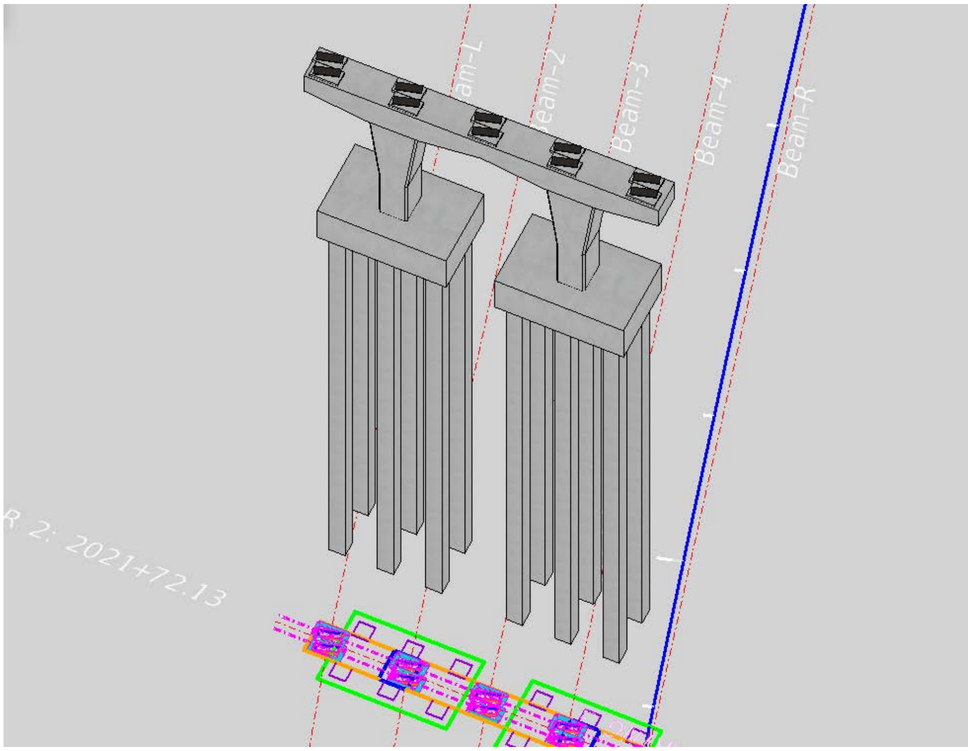


From Bentley Help Contents

The last three groups of the *Place Bearing* window are to those seen in tools described in earlier sections of this manual. In the *Materials* group, the materials for each component of the bearings can be defined by selecting the "**...**" next to the field. *Build Order* group can be used to model construction sequencing, if desired, and can be used in other Bentley software such as RM Bridge and Synchro. The *Feature* group allows for the *Feature Definition* and *Name Prefix* to be defined. Feature Definitions determine the attributes of the bearings and how the components look in the model.



To place the bearings, select the desired Substructure SupportLines and right click to end the selection. Data point in space to place the bearings.



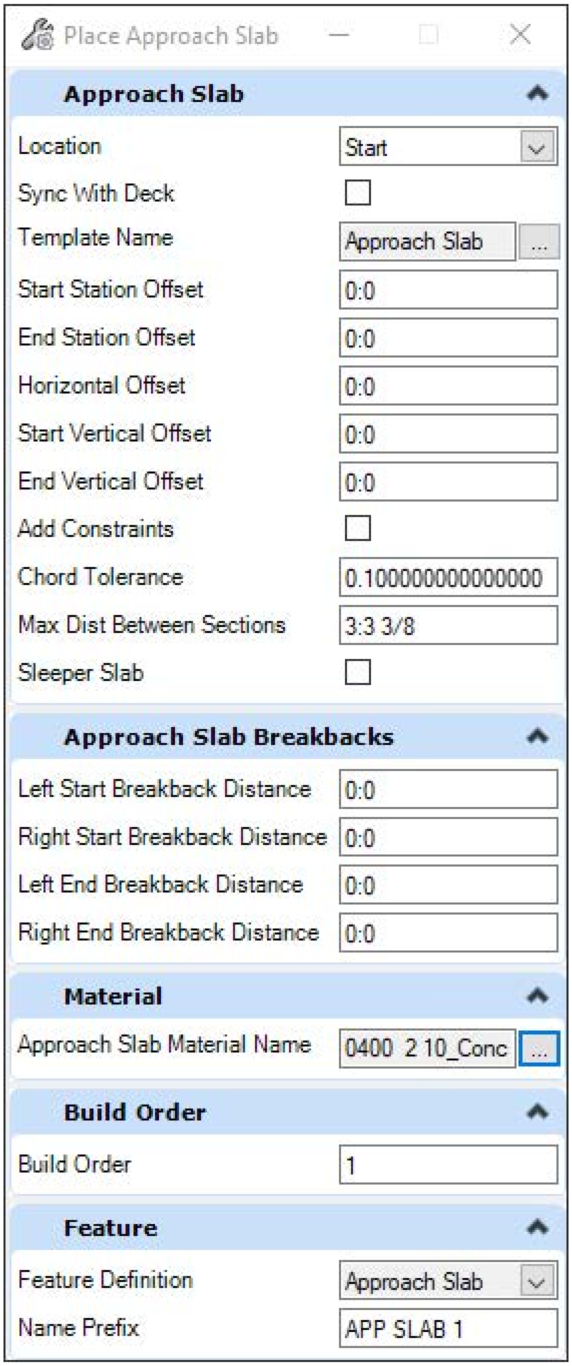
APPROACH SLABS

As described in the Add Bridge section above, there are two ways that approach slabs can be modeled. Most approach slabs can be modeled with the first method which includes using the Approach Slab tools found in the **Home > Approach Slab** group. Similar to the how the deck is modeled between two SupportLines, an approach slab can only be modeled between an Approach Reference Line and the first or last SupportLine.

The user can place these lines with any *Skew* and *Offset* from the nearest SupportLine. Additionally, the approach slab's *Location* must be chosen—whether it is at the **Start** or **End** of the bridge. Note that only one reference line can be placed at either end of the bridge.

With an approach reference line in place, the approach slab can be modeled using the **Place Approach Slab** tool also found in the **Home > Approach Slab** group.

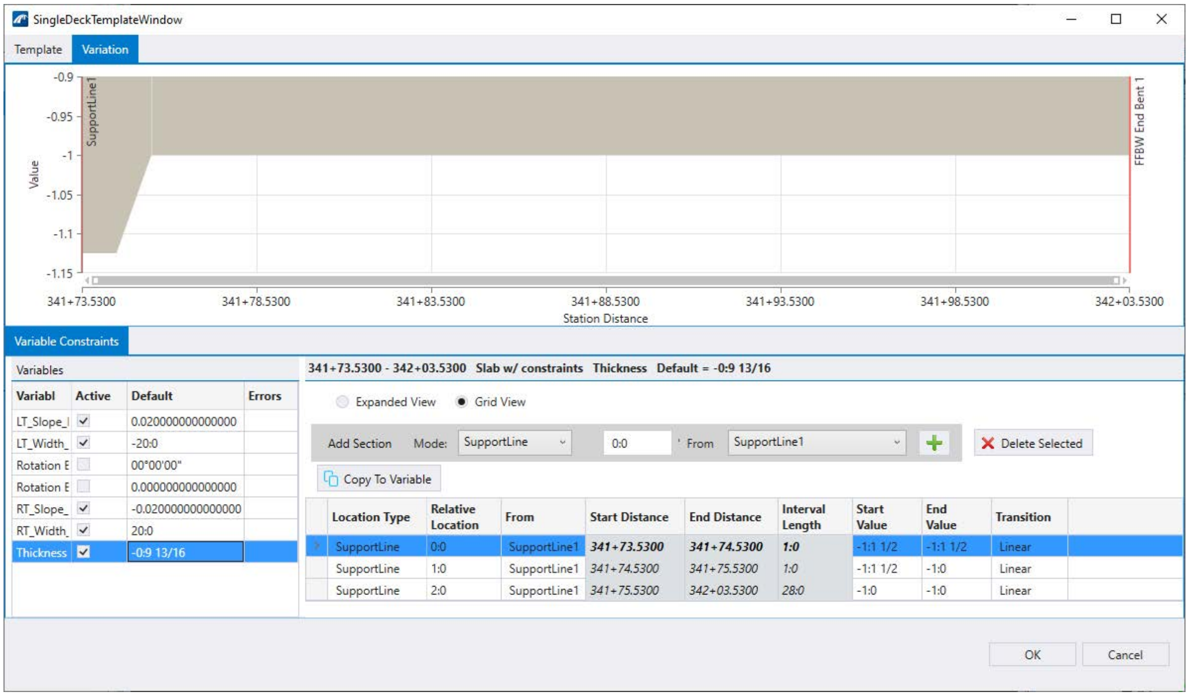
This brings up the *Place Approach Slab* window which allows for the selection of the approach slab template, offset values, material, Feature Definition, and other parameters. This window is nearly identical the *Place Deck* window. As such, the description of many of these fields can be found in the Place Deck section above or the OBM Help Contents material can be consulted for additional information.



The two fields that are unique to the *Place Approach Slab* window are the *Location* and the *Sync With Deck* toggle. The *Location* defines if the approach slab being modeled is meant to be placed at the Start or End of the bridge. *Sync With Deck* option toggled on, the approach slab will be modeled using the same template that is used for the bridge deck and use all the same offsets. This is not an option that is commonly used as the approach slab and deck for a bridge nearly never use the same template.

The alternative method to creating an approach slab is to use the **Home > Superstructure > Place Deck** tool. In this option the user will just create a new section of deck that has no beams. This method is very similar to adding a deck slab discussed in previous sections. Placing barriers and adding superelevation also follows the same workflow.

When the top of slab elevation varies across the length of the approach slab, such as those with an asphalt overlay, a vertical offset from the alignment can be used in conjunction with multiple deck segments/ station offsets to accommodate the stepped approach slab elevations. In cases where the bottom of slab varies, such as those with an increased depth at the backwall, variable constraints can be applied for deck thickness, see below.

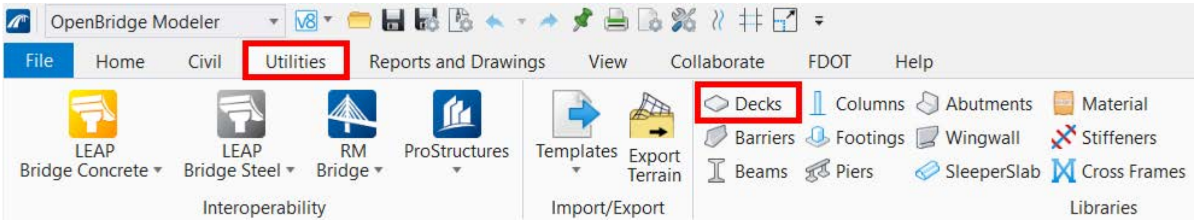


EXERCISE OVERVIEW

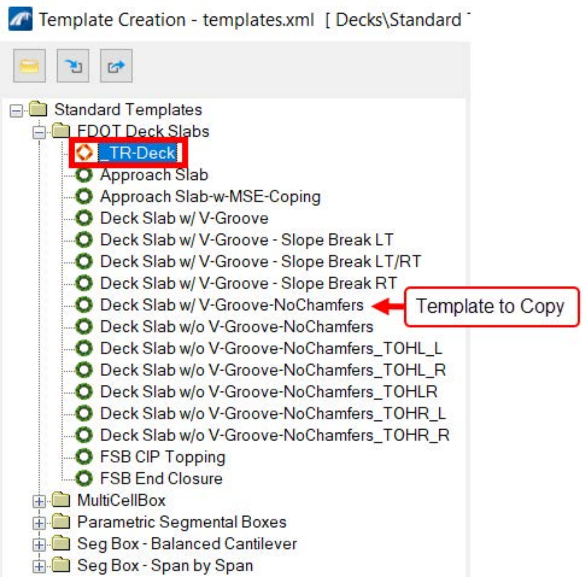
Exercise 5.1 *Create Deck and Approach Slab Templates*

CREATE A DECK TEMPLATE

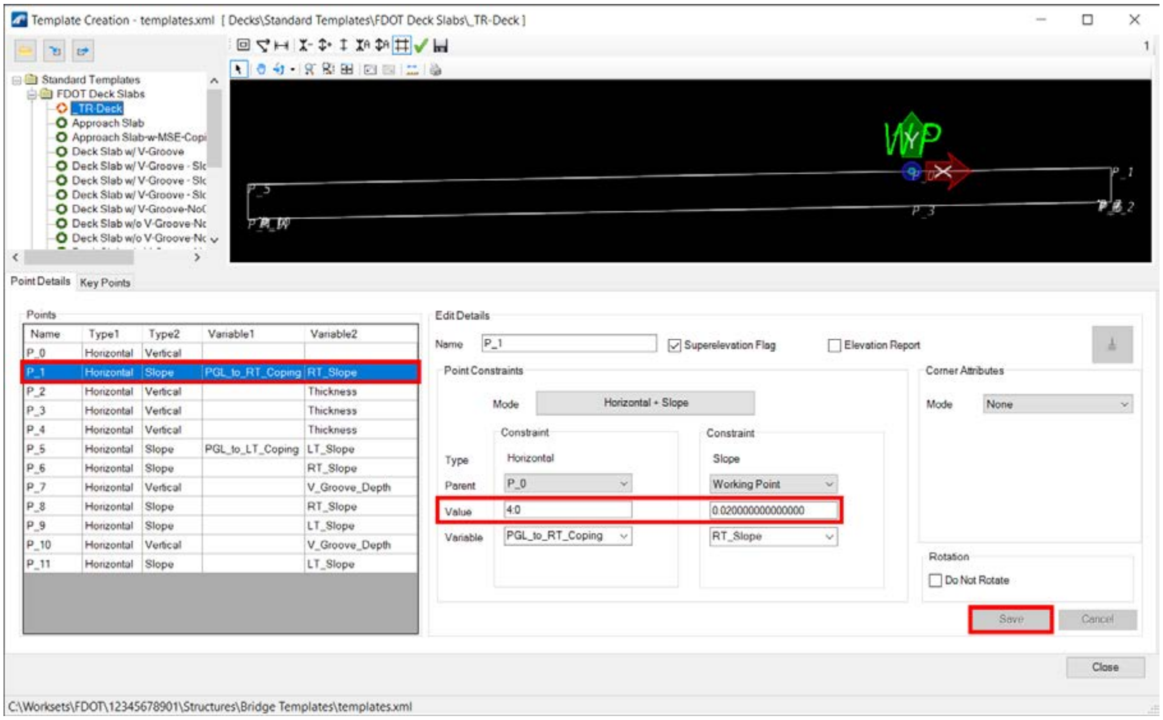
1. Open the data set file: *B01MODLBRTR01_5.1_5.2_5.3_5.4_Begin.dgn*
2. Open the deck template library by navigating to **Utilities > Libraries > Decks**.



3. Expand the **Standard Templates** and **FDOT Deck Slab** folders, right click on **Deck Slab w/V-Groove-NoChamfers** and select **Copy**. Right click the copied template and select **Rename**. Rename the template to **_TR-Deck**.



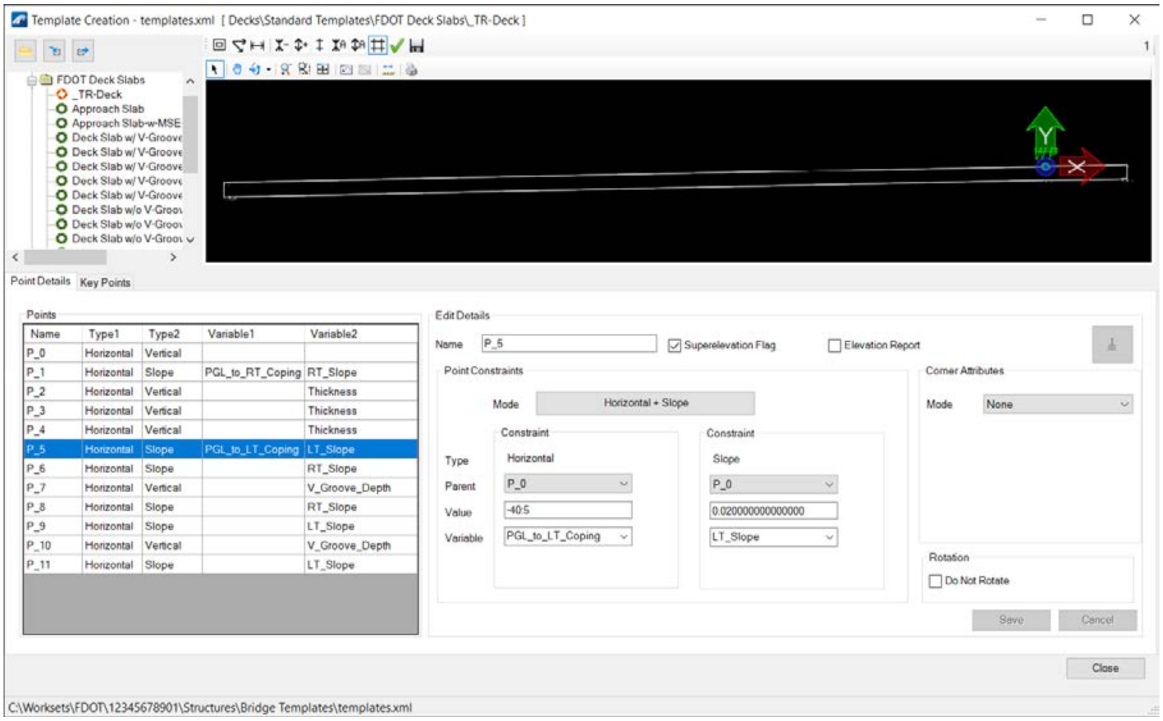
4. Within the newly created deck template **_TR-Deck**, highlight **P_1** in the *Points* section, change the *Horizontal* constraint *Value* to **4:0** for the **PGL_to_RT_Coping** *Variable* and the *Slope* constraint to **0.02** for the **RT_Slope** *Variable*. Click **Save** to update the graphical view.



NOTE ***Since Point P_2 is horizontally constrained to P_1 with a value of 0:0, after the previous step, Point P_2 as well as the points that make up the V-groove (P_6, P_7, and P_8) all adjust automatically to follow P_1.***

5. Highlight **P_5** and update the *Horizontal* constraint *Value* to **-40:5** for the **PGL_to_LT_Coping** *Variable*. Click **Save** to update the graphical view. Notice that the horizontal offset of P_4, P_9, P_10, and P_11 were updated automatically with the change to P_5.

6. Select **Close** to close the *Template Creation* window. The new deck template is now complete and is ready to be used with the **Place Deck** tool. See the Deck Template section of the guide for additional options within the *Template Creation* window.

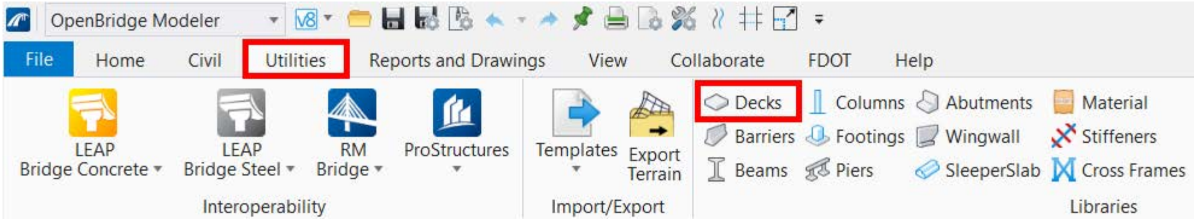


See below for summary of input used in the exercise.

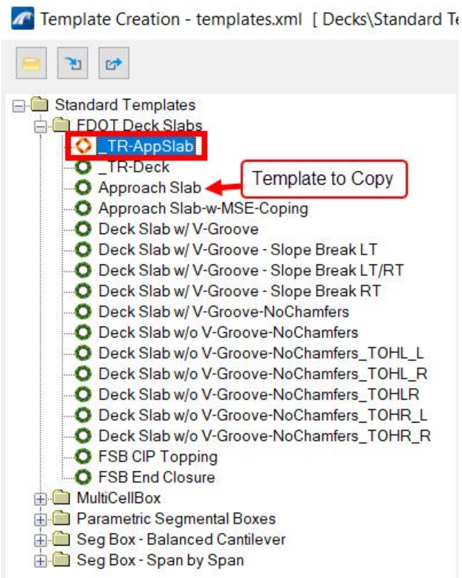
Exercise 5.1 - Create Deck and Approach Slab Templates			
Create a Deck Template			
Step	***Dialog Box***	***Field Name (Section)***	***Field Input***
4	Template Creation	Point	P_1
		Mode	Horizontal
		Parent	P_0
		Value	4:0
		Variable	PGL_to_RT_Coping
		Mode	Slope
		Parent	Working Point
		Value	0.02
		Variable	RT_Slope
5	Template Creation	Point	P_5
		Mode	Horizontal
		Parent	P_0
		Value	-40:5
		Variable	PGL_to_LT_Coping

CREATE AN APPROACH SLAB TEMPLATE

1. Continue with the data set file: *B01MODLBRTR01_5.1_5.2_5.3_5.4_Begin.dgn*
2. Open the deck template library by navigating to **Utilities > Libraries > Decks**.

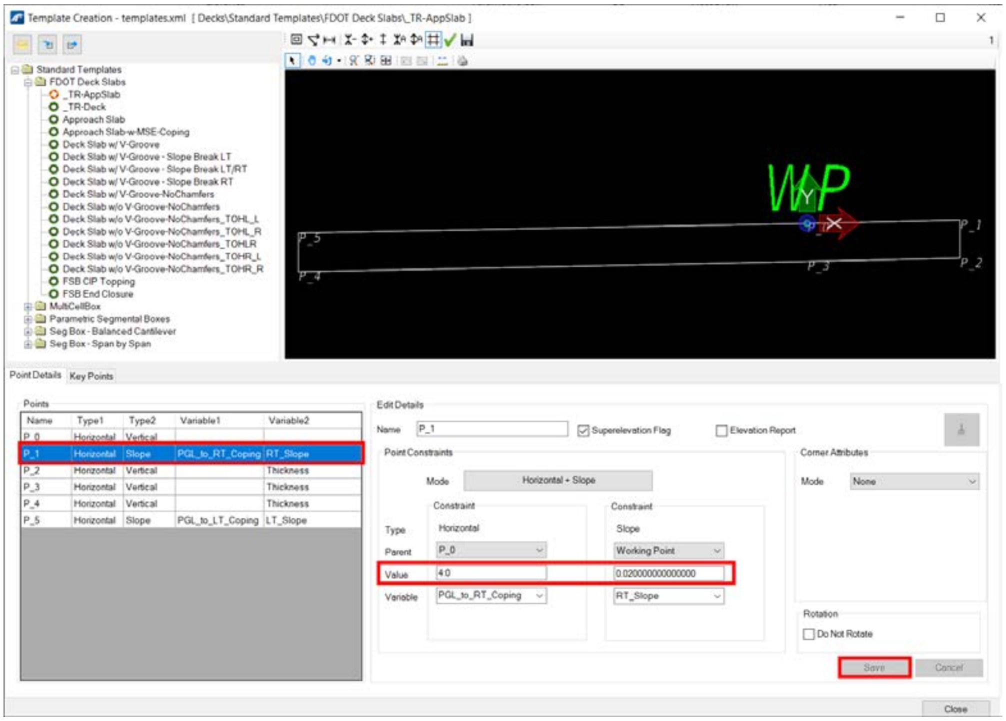


3. Expand the **Standard Templates** and **FDOT Deck Slab** folders, right click on **Approach Slab** and select **Copy**. Right click the copied template and select **Rename**. Rename the template to **_TR-AppSlab**.



NOTE ***For approach MSE walls along both edges, the Approach Slab-w-MSE-Coping template can be used. In this example, an MSE wall is only along one edge, so we will use the approach slab template without the built-in MSE coping. Future releases of FDOTConnect will have templates to accommodate an MSE coping on only the left or only the right side.***

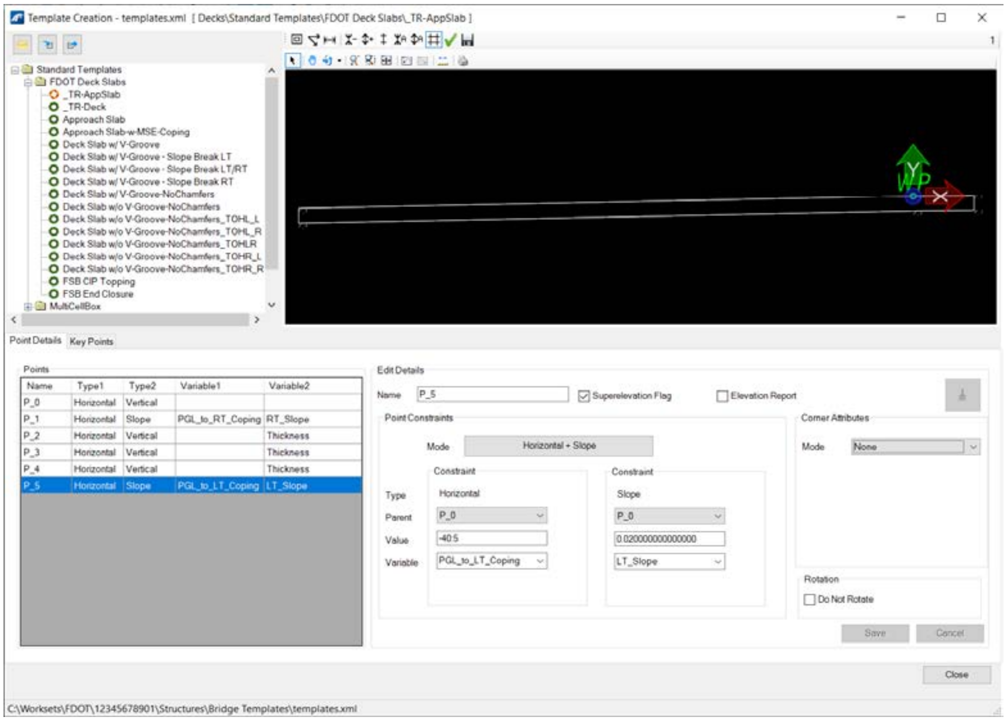
4. Within the newly created deck template **_TR-AppSlab**, highlight **P_1** in the *Points* section, change the *Horizontal* constraint *Value* to **4:0** for the **PGL_to_RT_Coping** *Variable* and the *Slope* constraint to **0.02** for the **RT_Slope** *Variable*. Click **Save** to update the graphical view.



NOTE ***Since Point P_2 is horizontally constrained to P_1 with a value of 0:0, after the previous step, Point P_2 will adjust automatically to follow P_1.***

5. Highlight **P_5** and update the *Horizontal* constraint *Value* to **-40:5** for the **PGL_to_LT_Coping** *Variable*. Click **Save** to update the graphical view. Notice that the horizontal offset of P_4 was updated automatically with the change to P_5.

6. Select **Close** to close the *Template Creation* window. The new deck template is now complete and is ready to be used with the **Place Deck** tool. See the Deck Template section of the guide for additional options within the *Template Creation* window.



7. See below for summary of input used in the exercise.

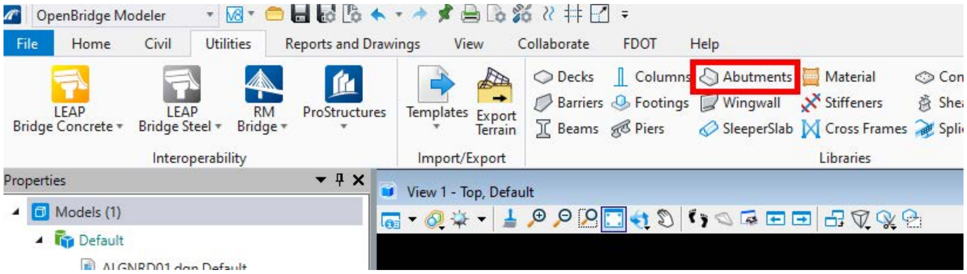
Exercise 5.1 - Create Deck and Approach Slab Templates			
Create an Approach Slab Template			
Step	***Dialog Box***	***Field Name (Section)***	***Field Input***
4	Template Creation	Point	P_1
		Mode	Horizontal
		Parent	P_0
		Value	4:0
		Variable	PGL_to_RT_Coping
		Mode	Slope
		Parent	Working Point
		Value	0.02
		Variable	RT_Slope
5	Template Creation	Point	P_5
		Mode	Horizontal
		Parent	P_0
		Value	-40:5
		Variable	PGL_to_LT_Coping

Exercise 5.2 *Create Substructure Template – End Bent*

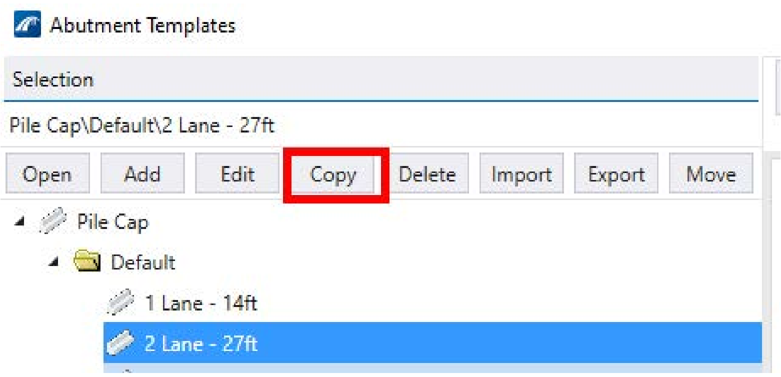
CREATE AN OBM ABUTMENT TEMPLATE

This exercise will demonstrate how to quickly create an end bent (Abutment) template using the out of the box OBM templates. The OBM end bent templates will work fine for end bents with no skew, but they have limitations if they are on a skew. Mainly, the cap and back wall cannot model the break backs (kinks) at the ends to accommodate the skew. Even if the end bent is on a skew, the out of the box templates can still be used for preliminary design to check horizontal clearances, etc. However, if you want to model the true end bent geometry on a skew you will need to use the solids modifications tools in the Modeling workflow or use the FDOT parametric cell end bent template (shown later in this guide).

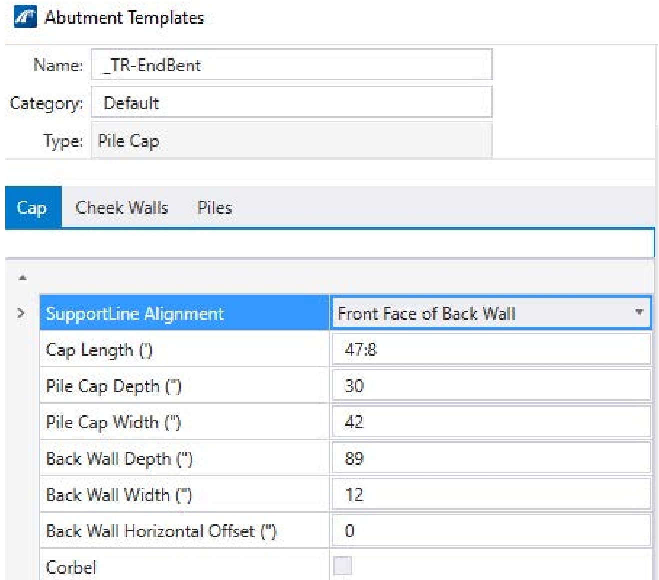
1. Continue with the data set file: *B01MODLBRTR01_5.1_5.2_5.3_5.4_Begin.dgn*
2. Open the abutments template library by navigating to **Utilities > Libraries > Abutments**.



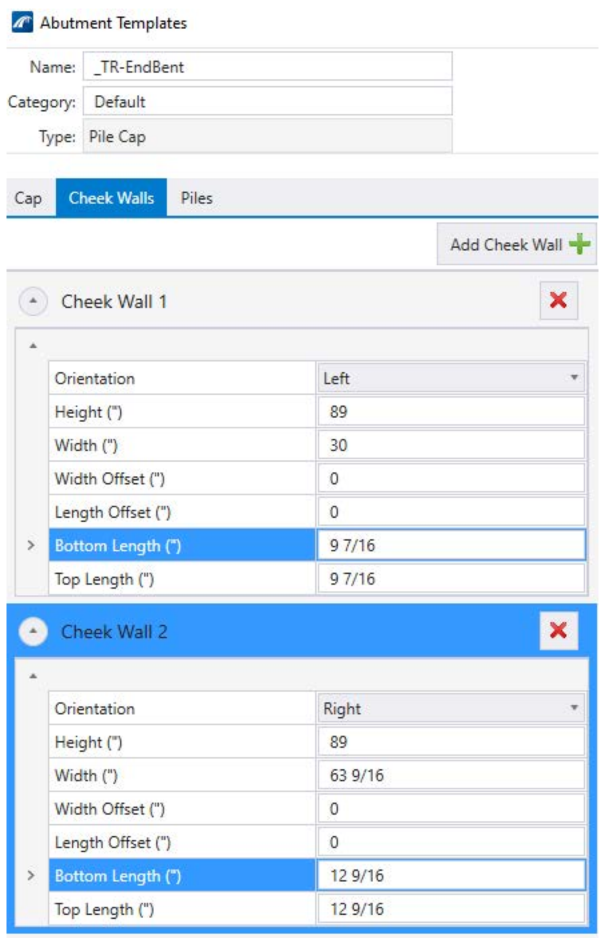
3. Expand the **Pile Cap** and **Default** folders, select **2 Lane – 27ft**, and click **Copy**.



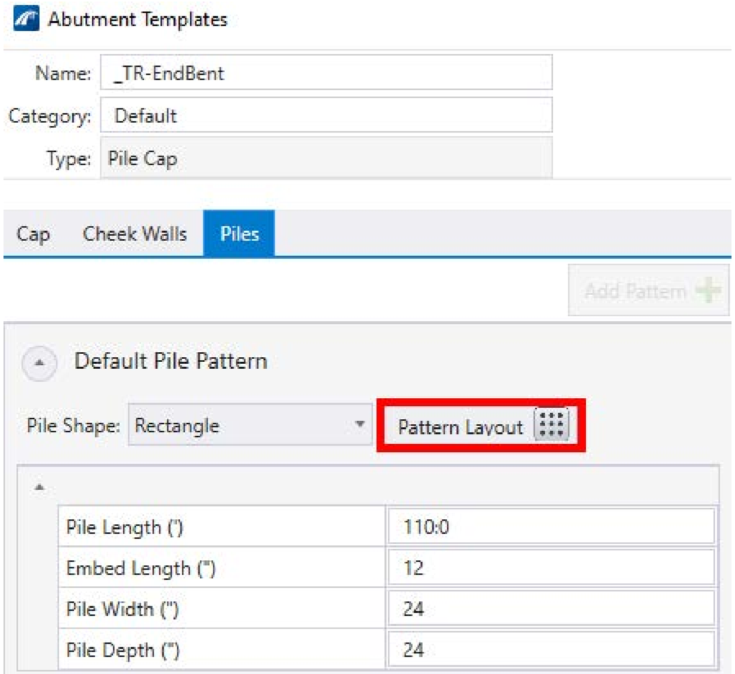
4. In the *Create Template* Copy dialog box, enter **_TR-EndBent** as the *Name*. A copy of the original end bent template will now appear on the list under the new name.
5. Select the **_TR-EndBent** template and click on **Edit** from the top of the *Selection* section. For a pile bent, the available categories are: *Cap, Cheek Walls, & Piles*.
6. In the *Cap* tab, select **Front Face of Back Wall** as the *SupportLine Alignment* since that is what FDOT uses to represent the begin of bridge in terms of stationing. Fill in the rest of the input shown based on the image below. Note that the units vary depending on the input.



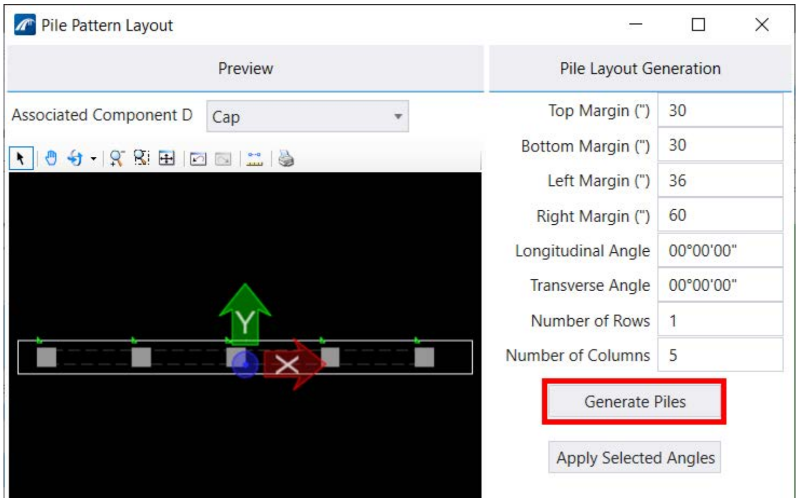
7. In the *Cheek Walls* tab, click **Add Cheek Wall** and enter the information shown below for both cheek walls.



8. In the *Piles* tab, enter the information shown below.



9. Click on the **Pattern Layout** button to edit the pile layout, a new window will open up. In the *Pile Layout Generation* section, enter the input based on the image below. Once filled in, select **Generate Piles** to update the *Preview* section that shows a graphical representation of the cap and pile locations. Note that the margin distances are from the faces of the cap to CL pile.

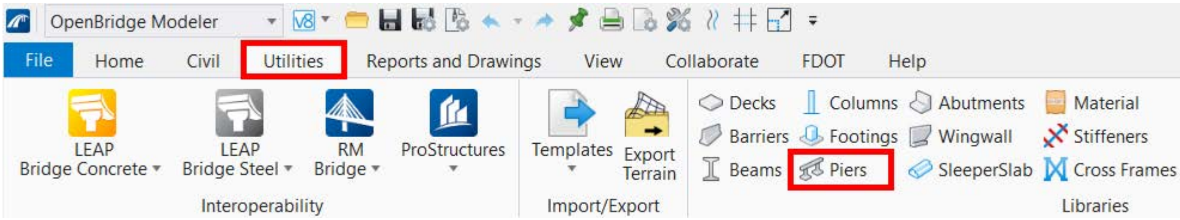


10. Note that the *Pile Positions* section at the bottom is filled in automatically. If the pile spacing was not uniform, or you wish to delete a pile, the **Manual** checkbox could be checked, and the individual pile parameters could be specified. For this example, the pile spacing is uniform, so click OK to save and close the *Pile Pattern Layout* window.

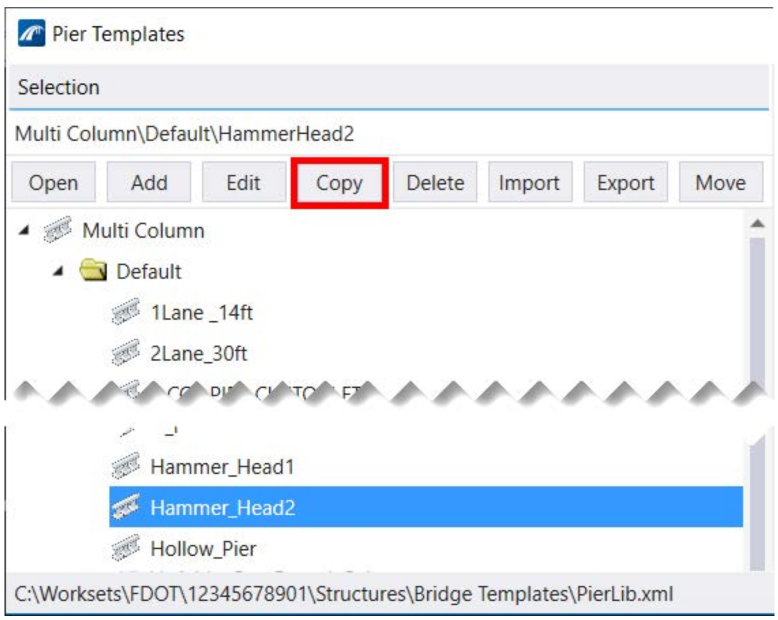
11. Select **OK** to save the template and close the *Abutment Templates* window. The new abutment template is now complete and is ready to be used with the **Place Abutment tool**.

Exercise 5.3 *Create Substructure Template – Pier*

1. Continue with the data set file: *B01MODLBRTR01_5.1_5.2_5.3_5.4_Begin.dgn*
2. Open the pier template library by navigating to **Utilities > Libraries > Piers**.

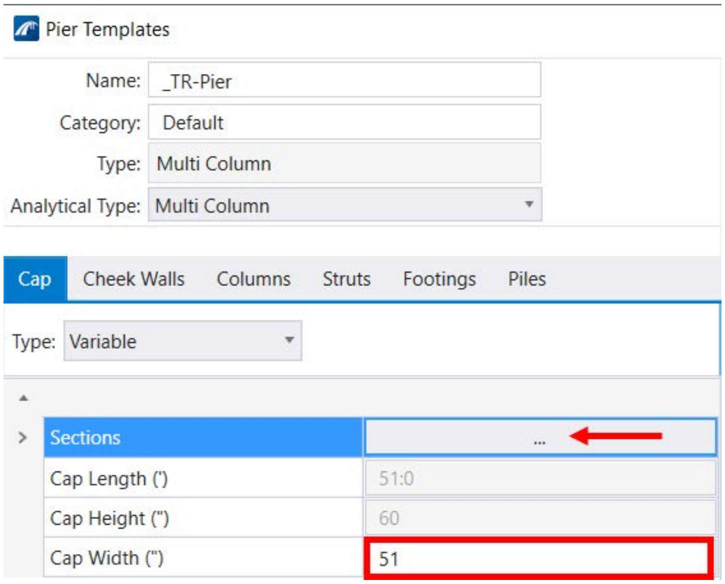


3. Expand the **Multi Column** and **Default** folders, click on **Hammer_Head2** and select **Copy** from the top of the *Selection* section.

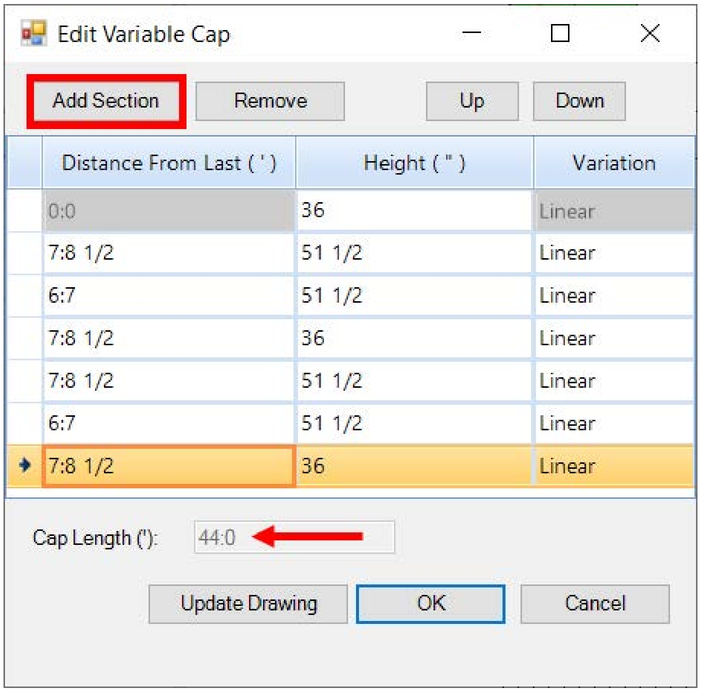


4. In the *Create Template Copy* dialog box that comes up, enter **_TR-Pier** as the *Name*. A copy of the original pier template will now appear on the list under the new name.
5. Select the **_TR-Pier** template and click **Edit** from the top of the *Selection* section. For a Multi Column pier, the available categories are *Cap*, *Cheek Walls*, *Columns*, *Struts*, *Footings*, and *Piles*.

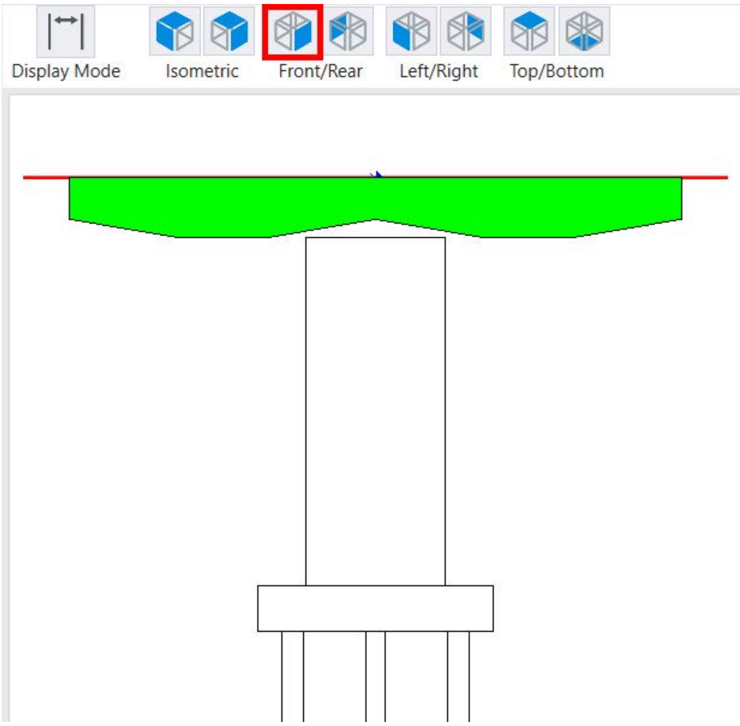
6. In the *Cap* tab, change the *Type* to **Variable** and enter **51** as the *Cap Width*, which is in inches. Click the ellipse (**…**) next to *Sections* to open the *Edit Variable Cap* window.



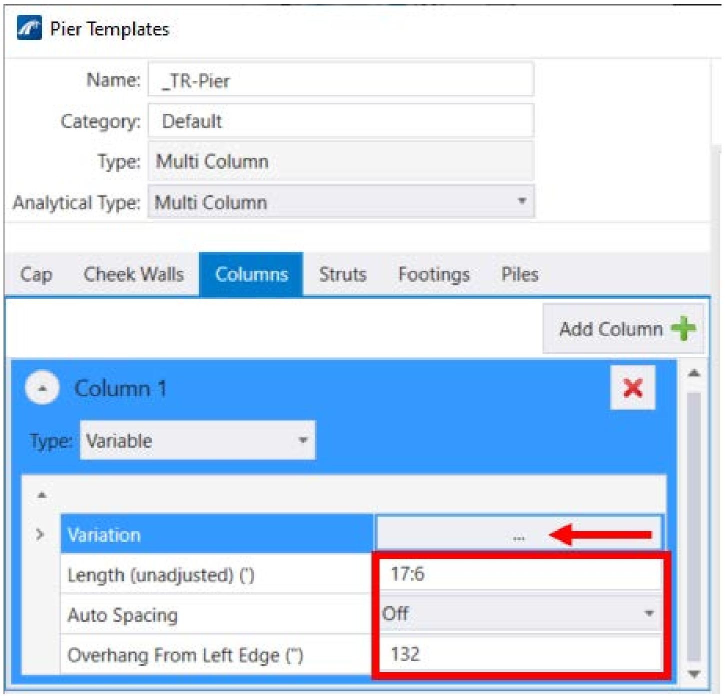
7. In the *Edit Variable Cap* window, enter the information shown in the clip below. Note that there are seven sections, so the **Add Section** button will need to be used to add additional rows. The total cap length should be **44:0**, shown as a calculated value at the bottom of the window. All *Variations* are linear in this example, but other options are available. *Distance From Last* is measured in feet and is the length along the cap to the next height section while *Height* is measured in inches and is the depth of the cap at each section. Click **OK**.



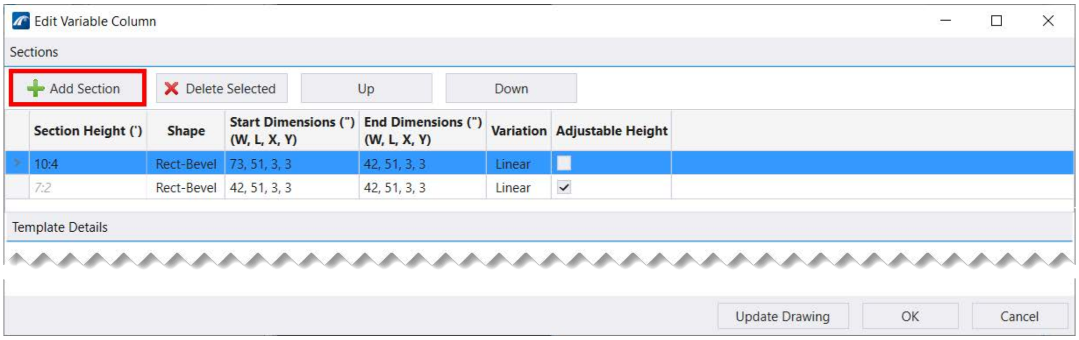
8. In the *Pier Template* window, select **Front**. The variable cap should appear as shown below.



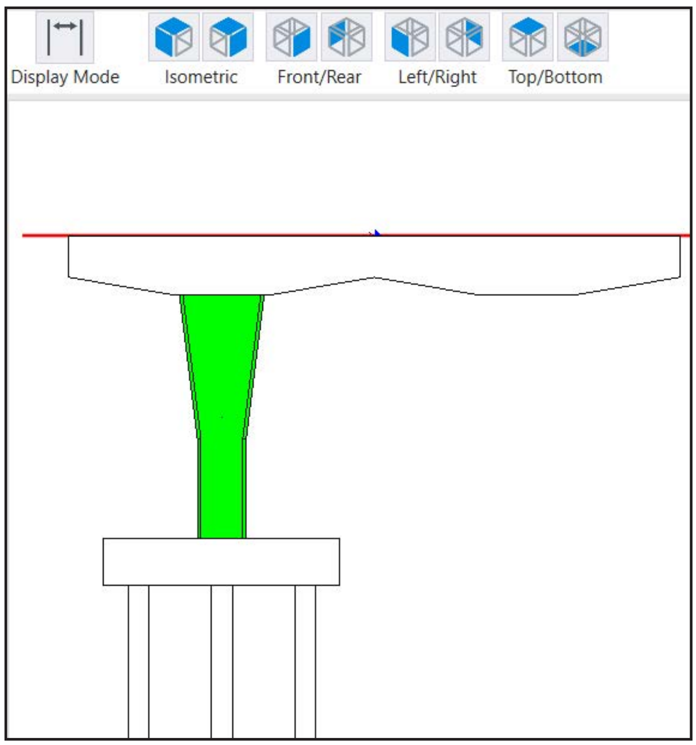
9. In the *Columns* tab, change the *Type* to **Variable.** Enter **17:6** as the *Length (unadjusted)*, set *Auto Spacing* to **Off** and set *Overhang From Left Edge* to **132**, which is in inches. Click the ellipse (**...**) next to *Variation* to open the *Edit Variable Column* window.



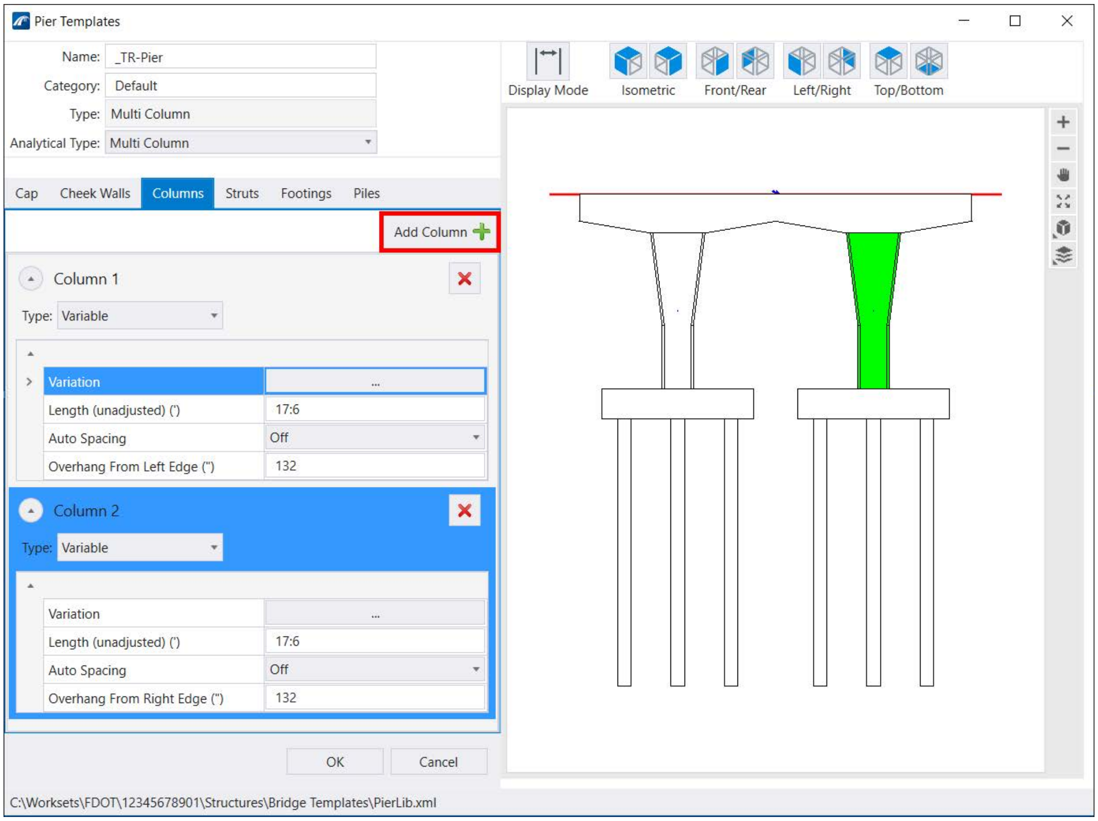
10. In the *Edit Variable Column* window, change the *Shape* to **Rect-Bevel** and change *the Start Dimensions* and *End Dimensions* as shown in the clip below. Note that there are two sections, so the **Add Section** button will need to be used to add an additional row. The *Section Height* is measured in feet and is the length along the column to the next defined column section, with the top row representing the topmost column section. One row must be selected as the *Adjustable Height* so that any changes to column height based on Elevation Constraints can be accommodated within a section. For the *Rect-Bevel* shape, W represents the transverse width of the column, L represents the longitudinal length of the column, and X/Y represent the bevel dimensions in the transverse/longitudinal directions, respectively. Set the *Section Height* of the first row to **10:4** and check the *Adjustable Height* checkbox for the second row. Click **OK**.



11. In the *Pier Template* window, the variable column should appear as shown below.

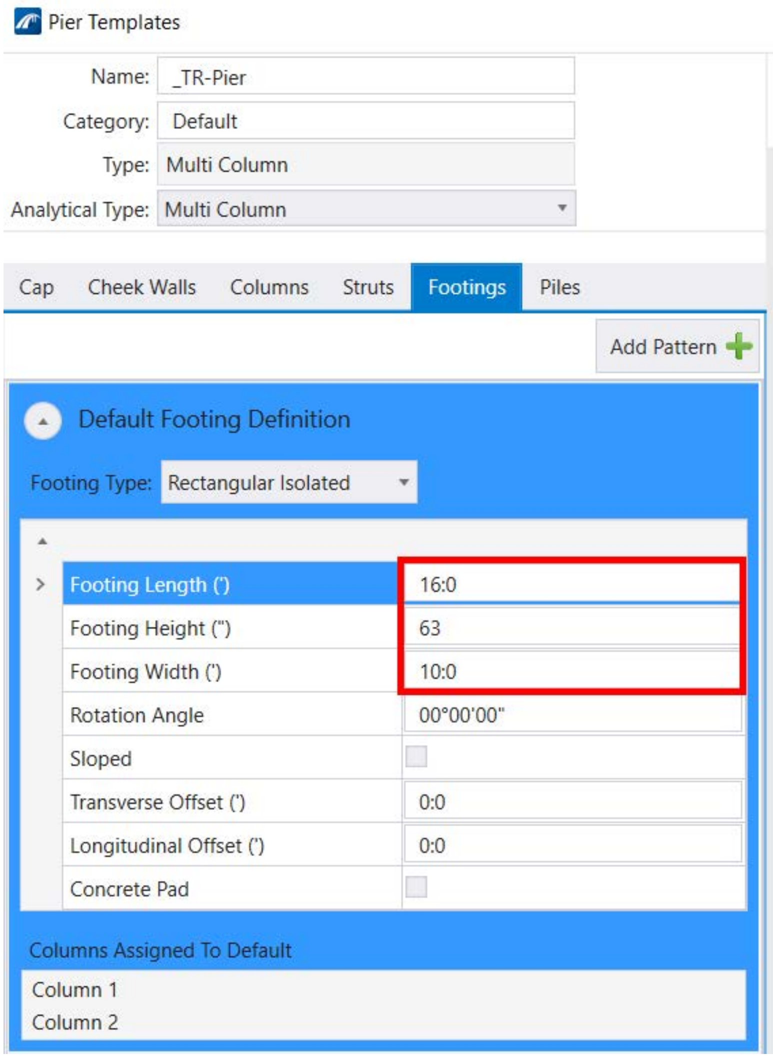


12. In the *Columns* tab, click **Add Column** to add a second column. A second column will be added with the same column variation, length, and overhang.



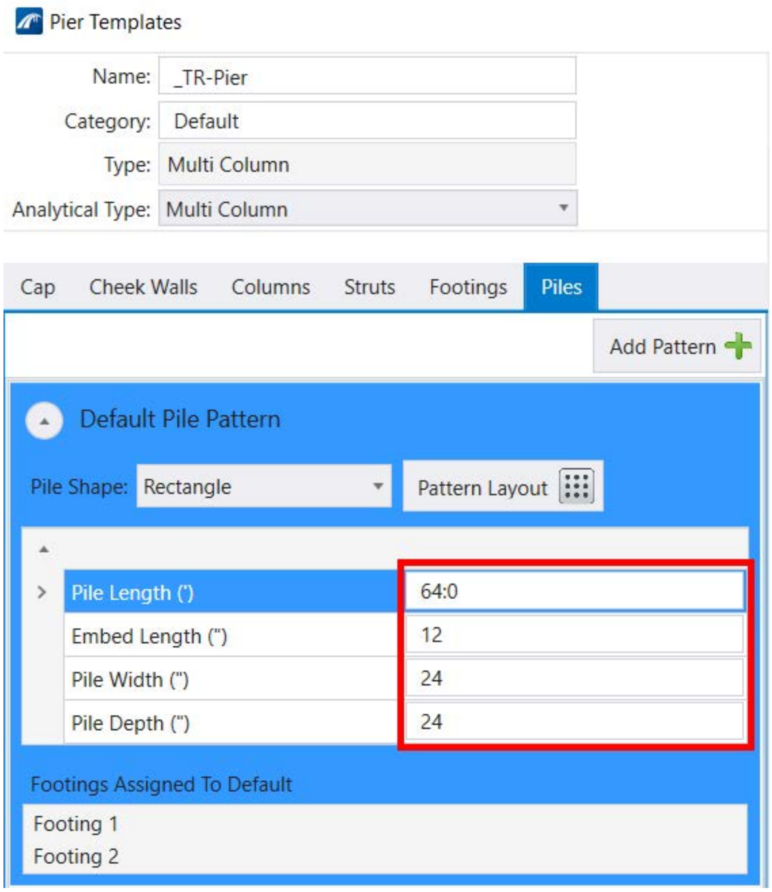
NOTE ***While the unadjusted column length is set as a predefined value in the template, users can later use an Elevation Constraint to set the footing elevation based on the terrain model and therefore override the column length.***

13. In the *Footings* tab, keep the *Footing Type* as **Rectangular Isolated**. Set the *Footing Length* to **16:0**, the *Footing Height* to **63** (inches), and the *Footing Width* to **10:0**.

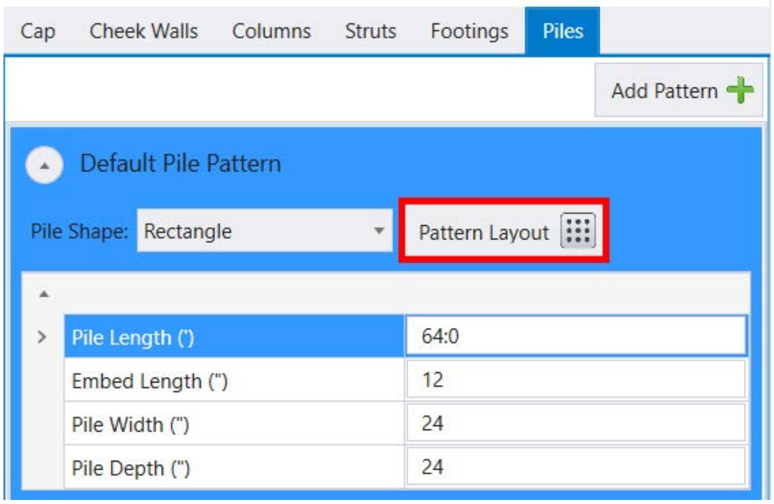


NOTE ***By default, the same footing will be used for both columns. This is the case for this example, but for cases where there are different footings for each column, Add Pattern could be used and separate columns could be assigned to each footing. There are also options for rotated, sloped, or offset footings, as well as an added concrete pad (i.e. seal slab).***

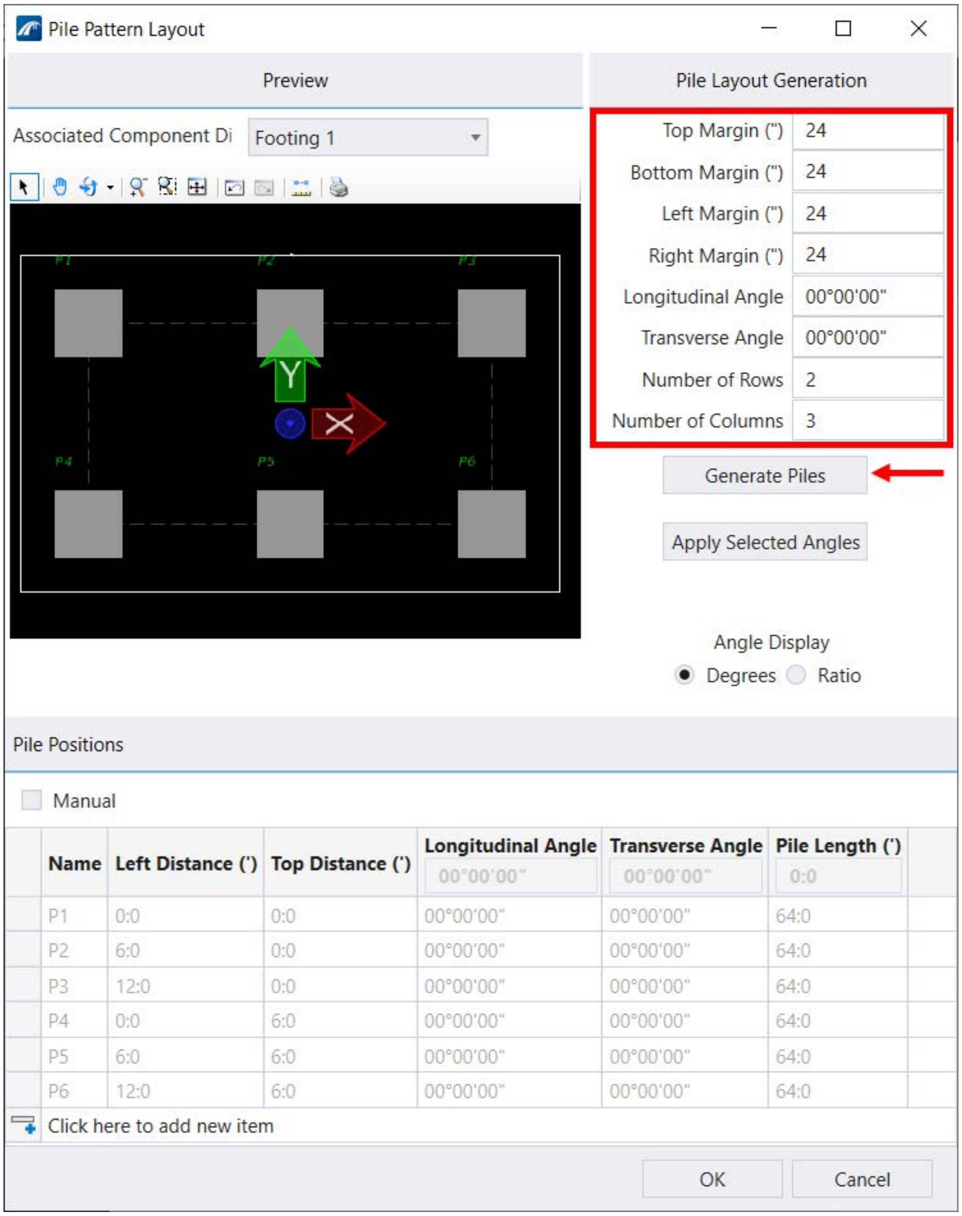
14. In the *Piles* tab, keep the *Pile Shape* as **Rectangular**. Set the *Pile Length* as **64:0**, the *Embed Length* as **12** (inches), and the *Pile Width* and *Pile Depth* both as **24** (inches).



15. To the right of the *Pile Shape* input, click the **Pattern Layout** button to open the *Pile Pattern Layout* window.

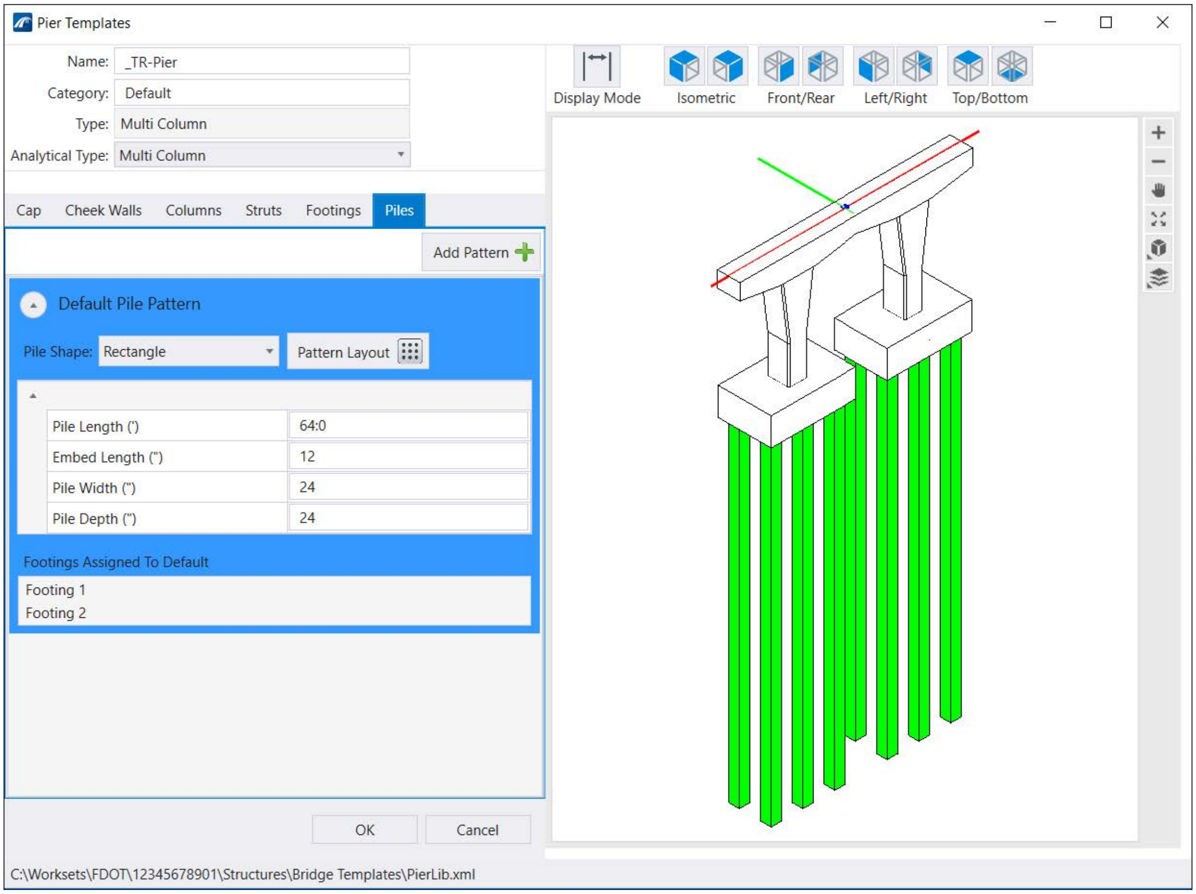


16. In the *Pile Pattern Layout* window, within the *Pile Layout Generation* section, enter the input based on the image below. Once filled in, select **Generate Piles** to update the *Preview* section that shows a graphical representation of the footing and pile locations. Click **OK**.



NOTE ***The Pile Positions section at the bottom is filled in automatically. If the pile spacing was not uniform, the Manual checkbox could be checked and the individual pile spacing could be specified. For this example, the piles are spaced uniformly along the defined pile grid, so the box should remain unchecked. Users can also delete piles from the pile grid by right clicking on the pile in the Pile Position table and selecting Delete.***

17. In the *Pier Template* window, select **Isometric**. The pier template preview should appear as below. Select **OK** to save the template and close the *Pier Templates* window. The new pier template is now complete and is ready to be used with the **Place Pier** tool.



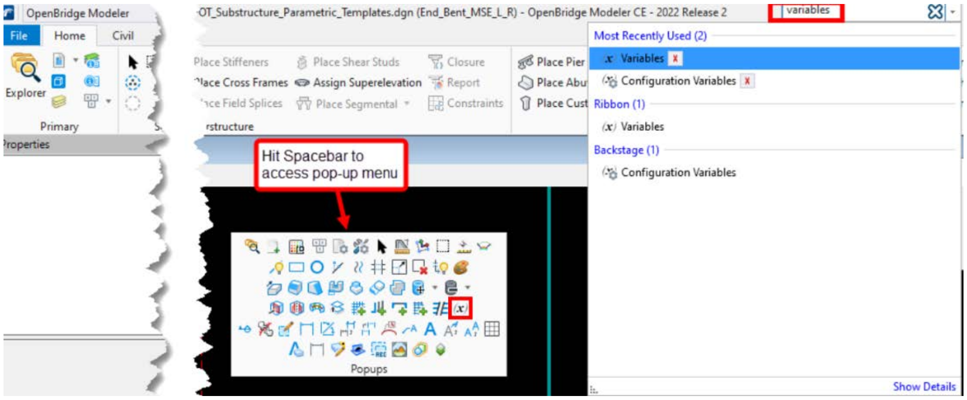
NOTE ***Pier rustication can be accommodated using solids modifications if that level of detail is required. Basic solids modification tools are covered in Chapter 8.***

Exercise 5.4 *Create Parametric Cell End Bent Template*

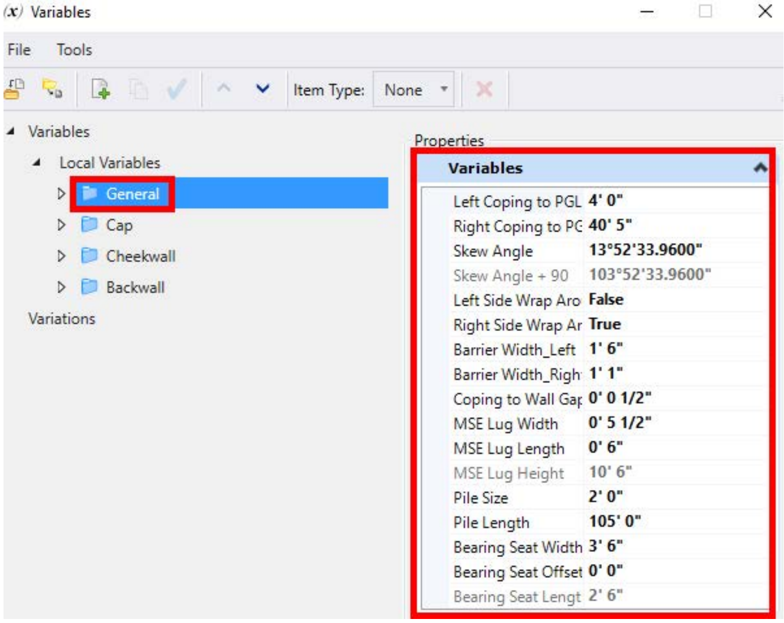
This exercise will demonstrate how to modify the FDOT Parametric Cell End Bent template. This template will need to be used on any bridges which the end bents have a skew unless solids modifications on OBM generated end bents are used. It is built to accommodate end bents with MSE walls and can handle wrap around MSE walls on either or both sides, as well as MSE walls going straight across in front of the end bent on either or both sides. If a wing wall is required, the out of the box wing wall tool could be used or the wing wall could be modeled manually with the regular MicroStation modeling tools within OBM.

1. Copy the *FDOT_Substructure_Parametric_Templates.dgn* file in the following location: C:\Worksets\FDOT\12345678901\Structures\Bridge Templates\Parametric Cells, open that file, and make sure you are in the *End_Bent_MSE_L_R* model.

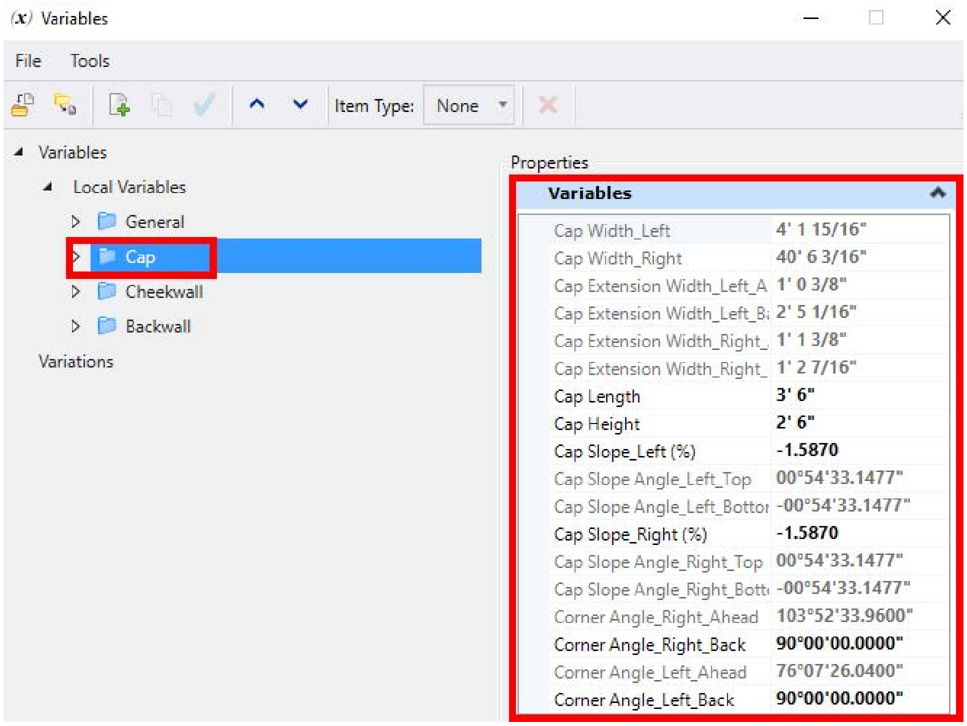
2. Use the pop-up menu (Spacebar) to open the **Variables** dialog or search for **Variables** in the search bar on the top right.



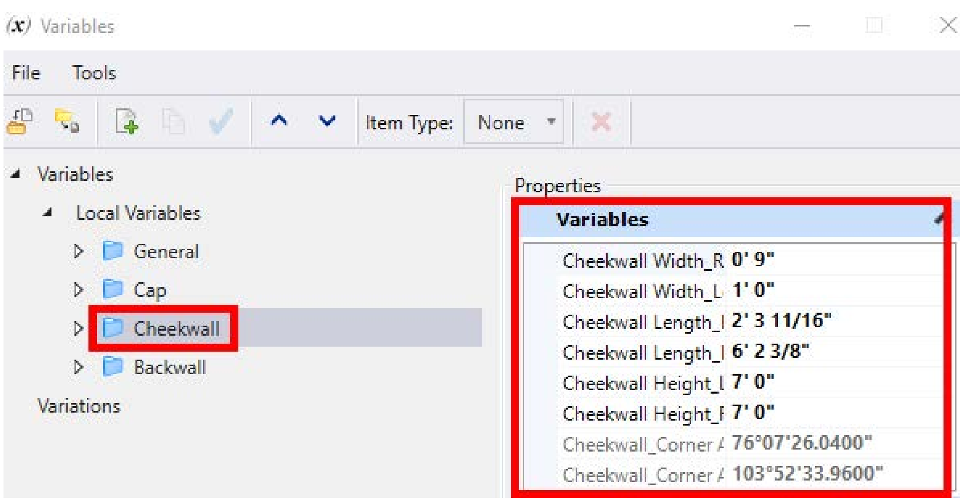
3. Select the **General** folder and update the variables as shown below. Note that the grayed-out inputs are calculated and thus do not need to be entered.



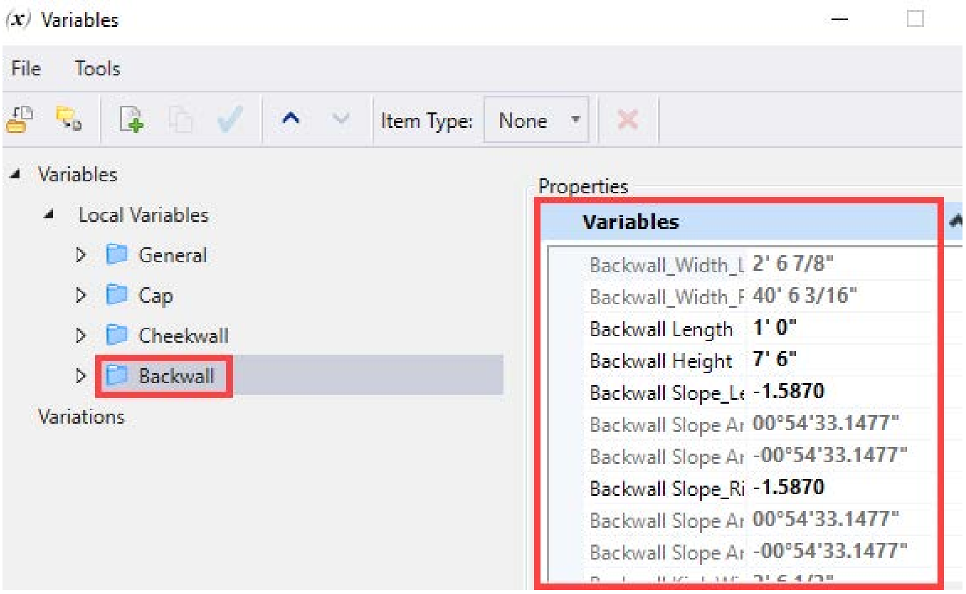
4. Select the **Cap** folder and update the variables as shown below. Note that the grayed-out inputs are calculated and thus do not need to be entered.



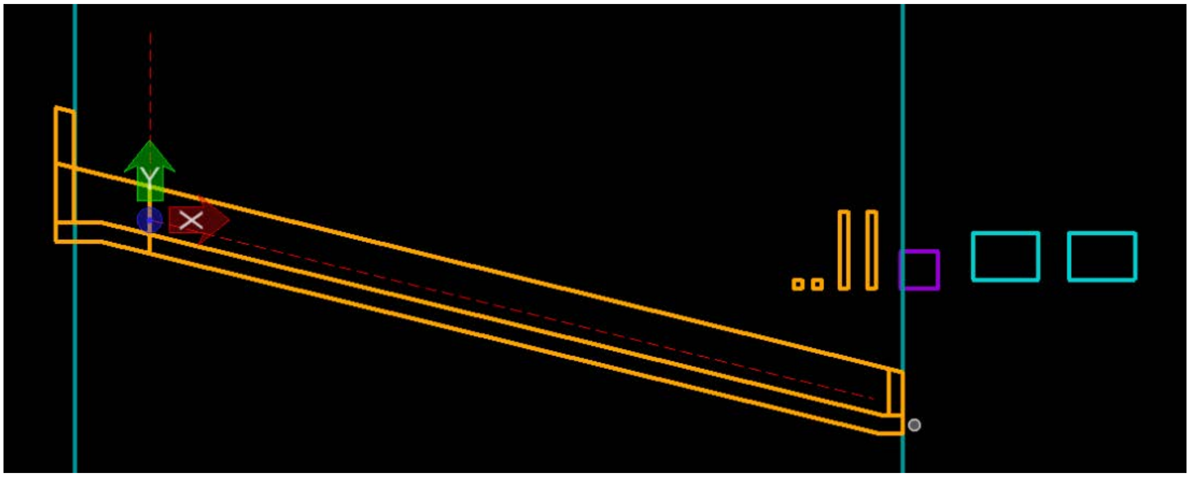
5. Select the **Cheekwall** folder and update the variables as shown below. Note that the grayed-out inputs are calculated and thus do not need to be entered.



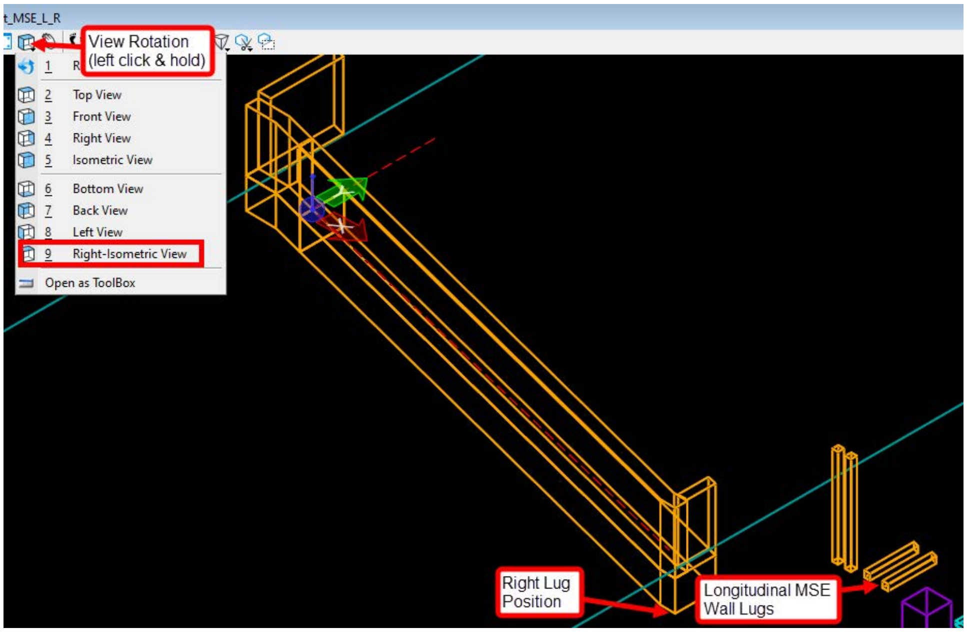
6. Select the **Backwall** folder and update the variables as shown below. Note that the grayed-out inputs are calculated and thus do not need to be entered.

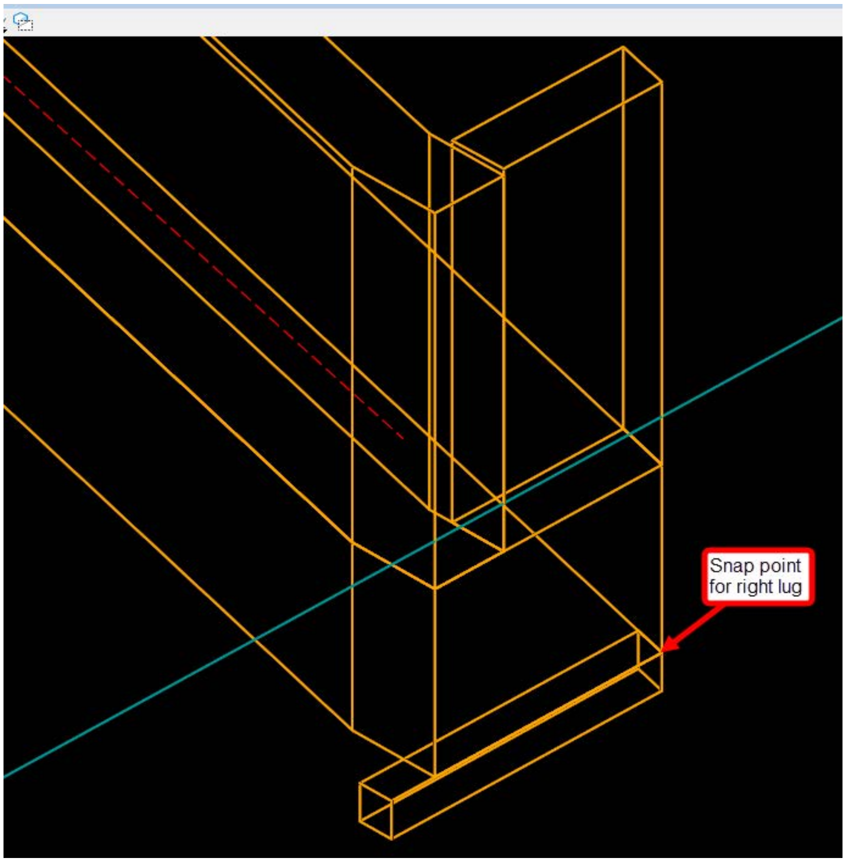


7. When you are done entering the above inputs your end bent should look like what is shown below. Note that some pieces of the end bent will need to be moved into place manually: MSE Wall lugs, beam seats (pedestals), and pile. The DeckConc_pm lines are there to help verify that the end bent's position relative to the coping lines is correct.

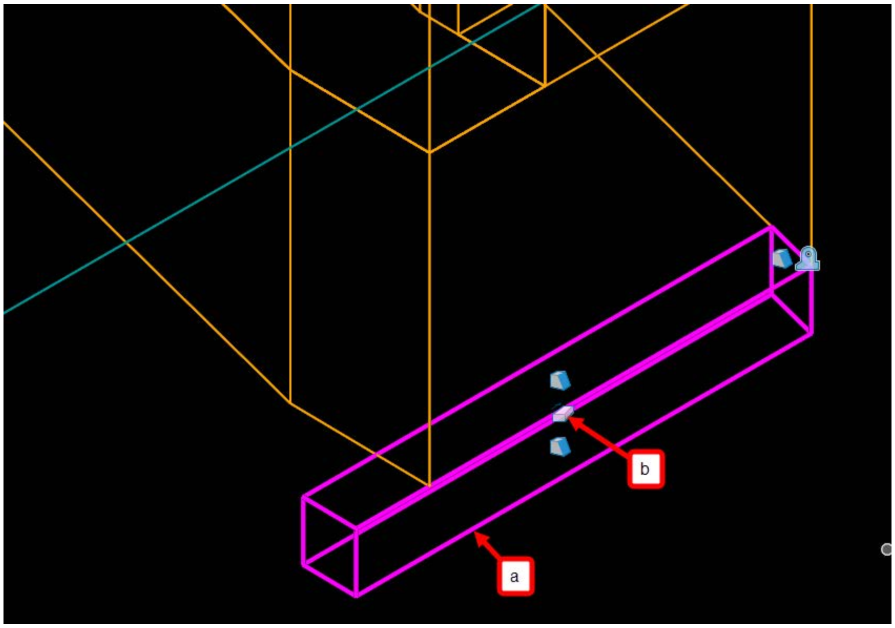


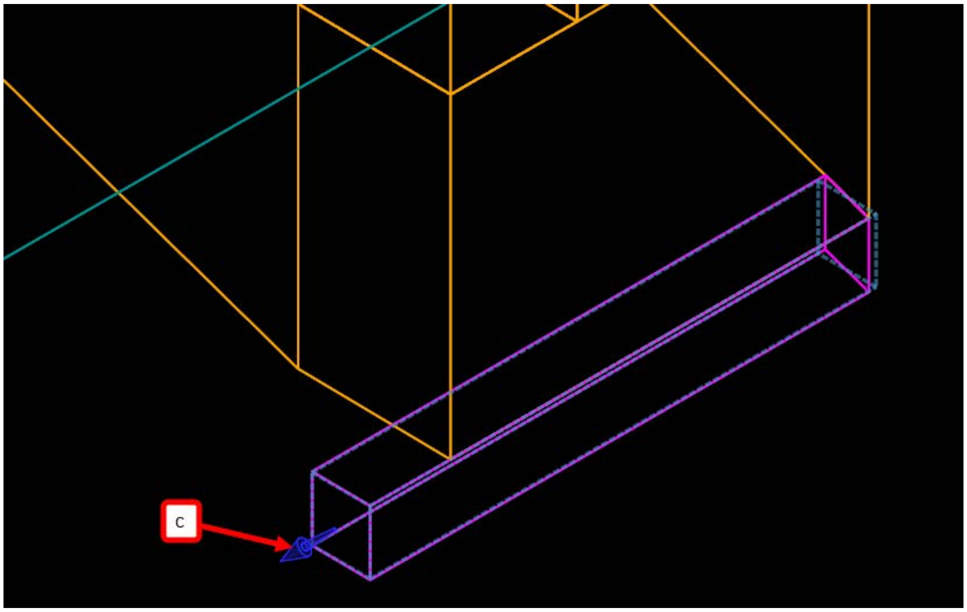
8. Rotate your view to a right isometric view and use the **Copy** command to copy the longitudinal MSE Wall lugs to their position under the cap. Note that there is not a left lug in our example.

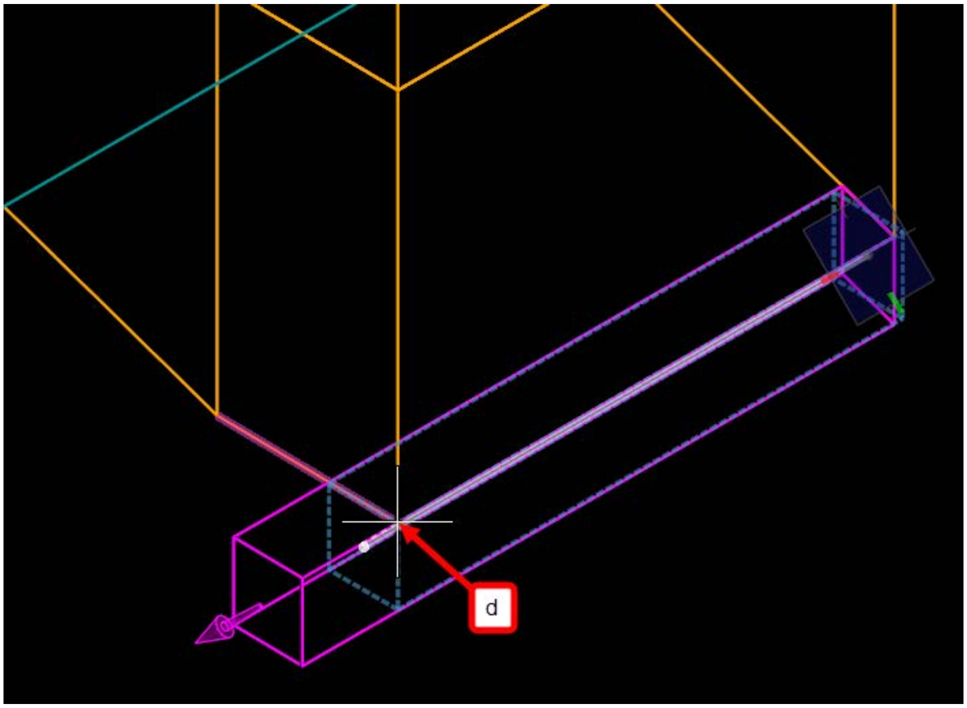


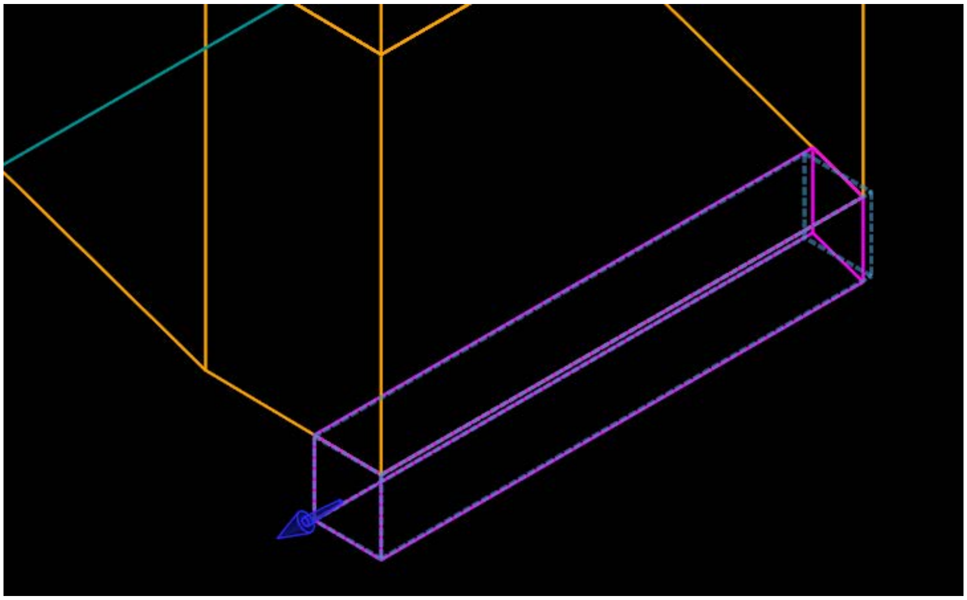


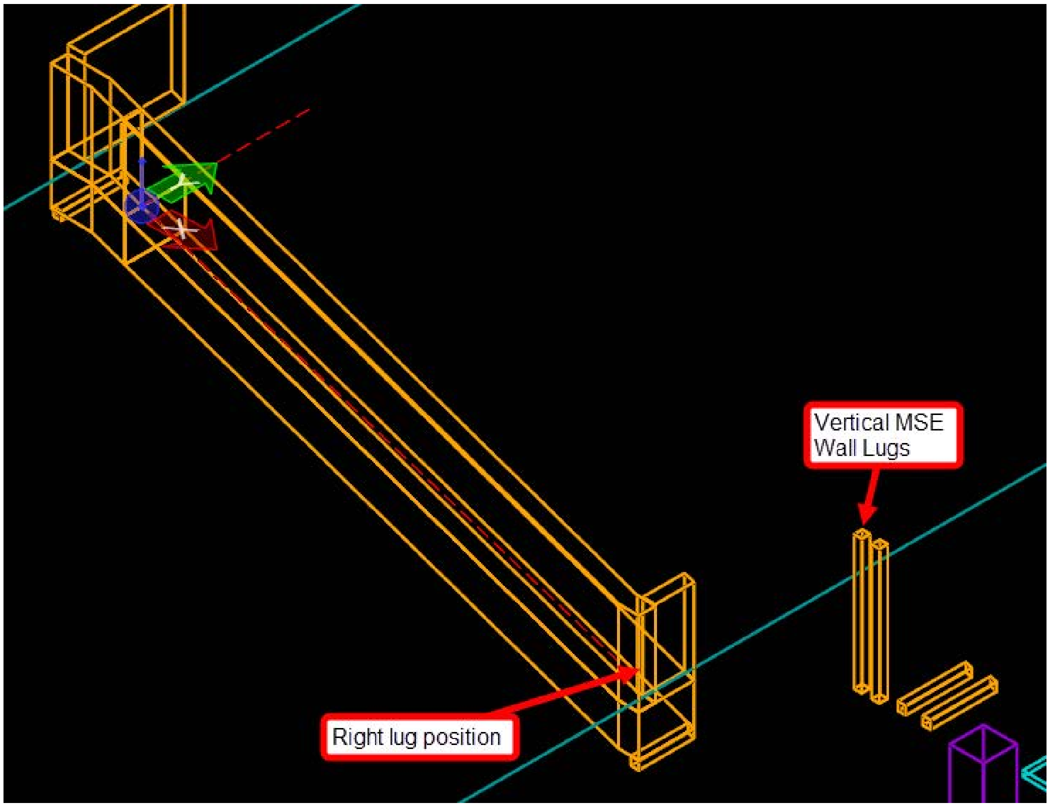
9. Adjust end of right lug:
    a. Select the right lug
    b. Click on the solid extrusion icon
    c. Click the blue extrusion arrow
    d. Snap to the corner of the end bent and left click to accept

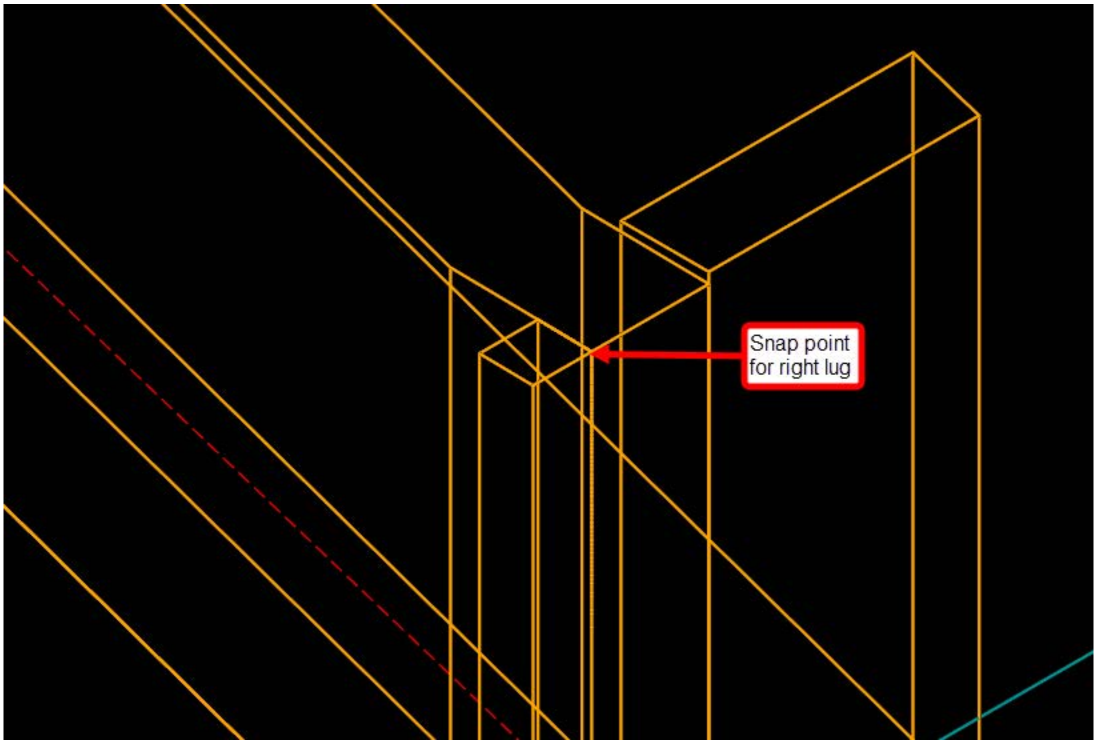




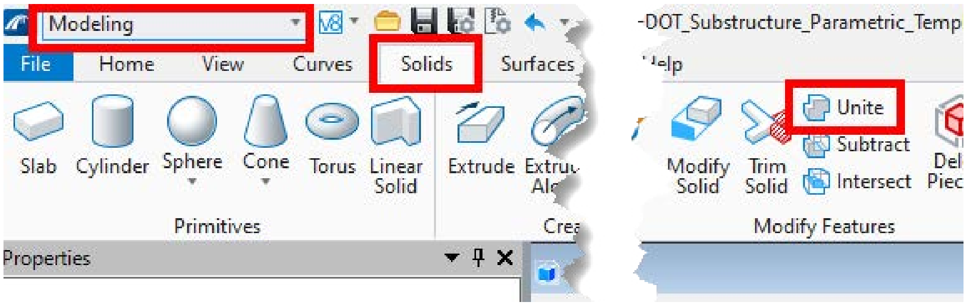

d



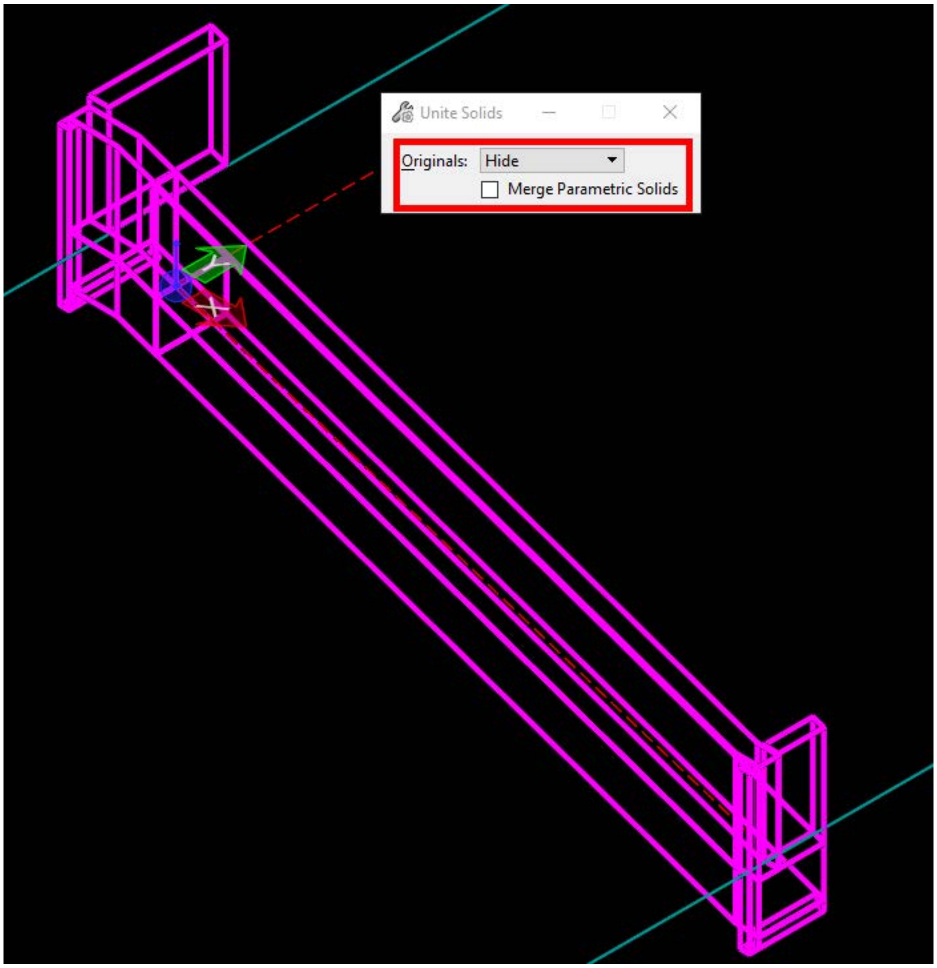

Vertical MSE
Wall Lugs
Right lug position


Snap point
for right lug

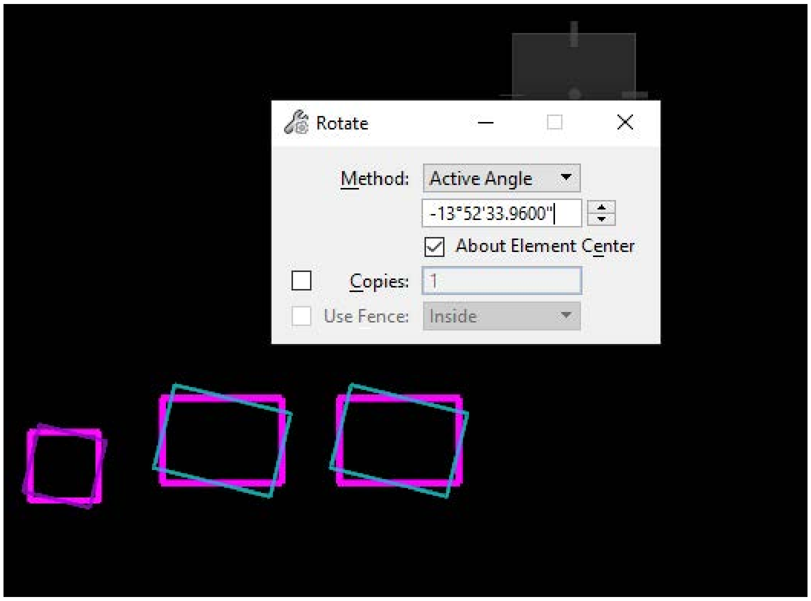
10. Use the **Copy** command to copy the vertical MSE Wall lug to it's position on the back side of the cap.
11. Switch to the **Modeling** workflow, select the **Solids** tab, and click on the **Unite** command.



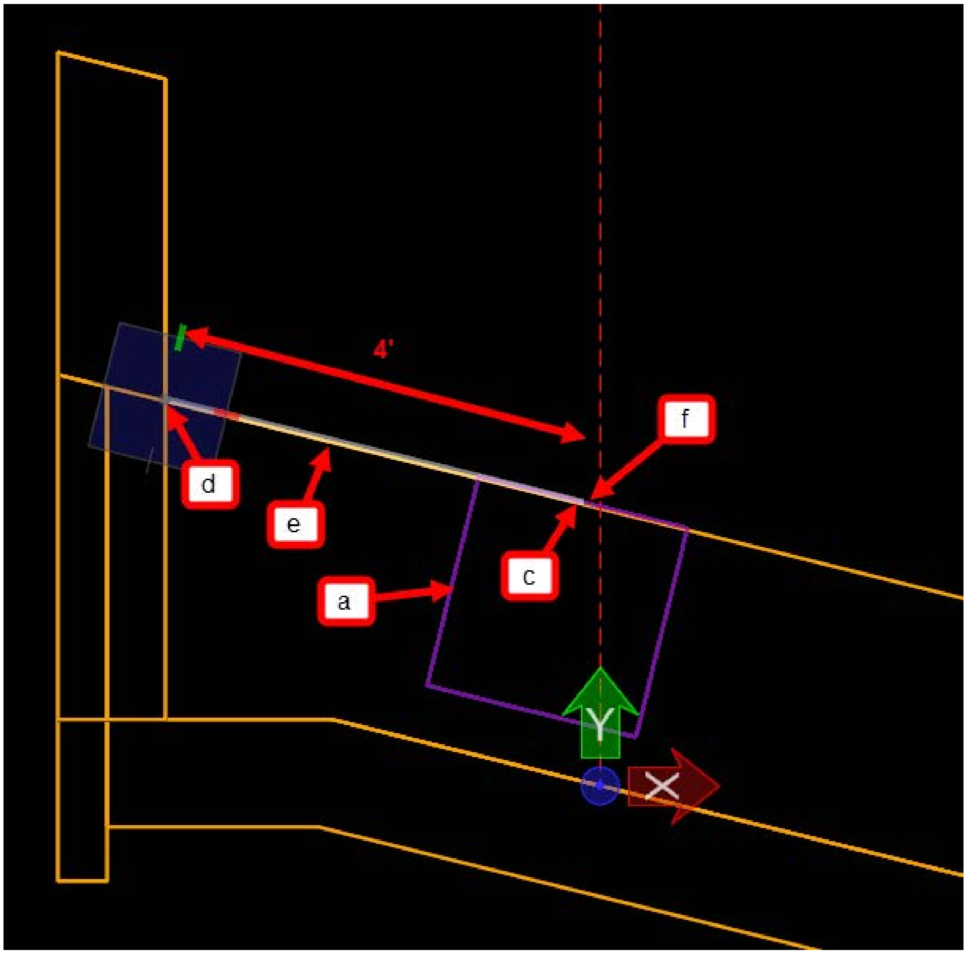
12. Set Originals to Hide and uncheck the **Merge Parametric Solids** box if checked. Select the first cap piece, hold Control (Ctrl) on your keyboard, and select all the cap pieces to merge into a single solid: left cap, right cap, left backwall, right backwall, left cheekwall, right cheekwall, all MSE Wall lugs. Then left click to accept.



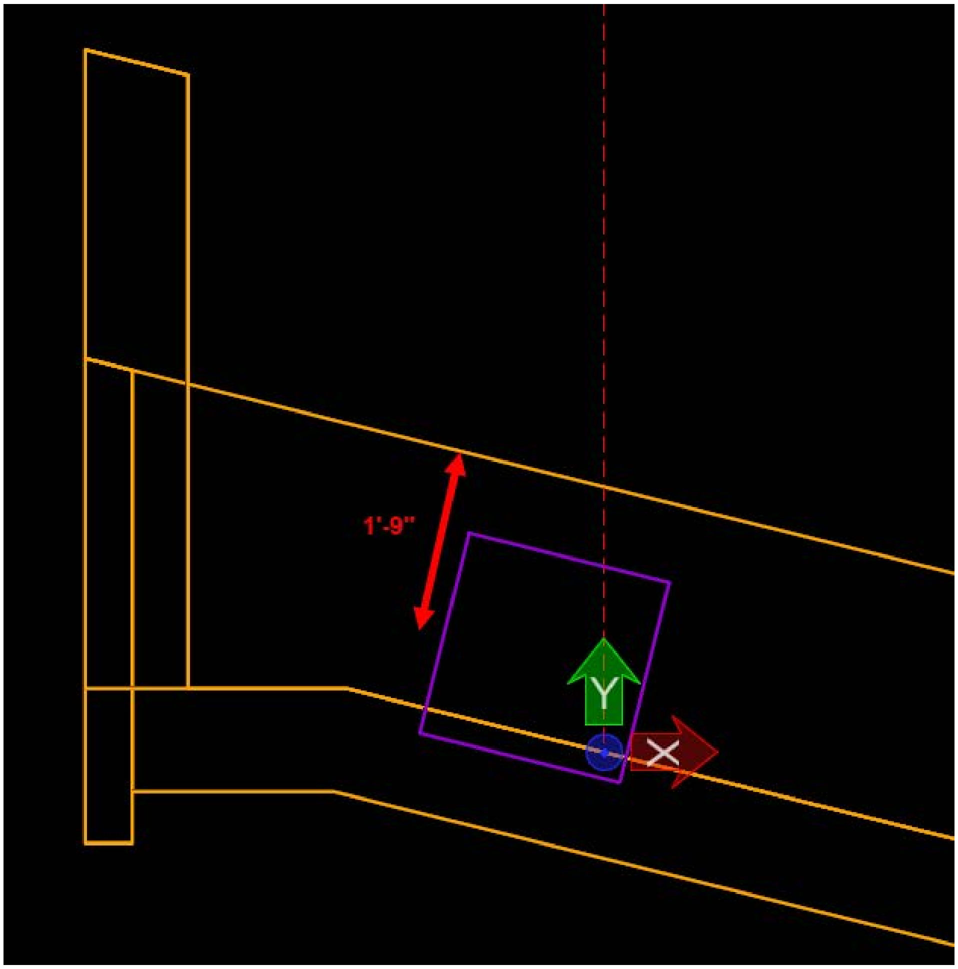
13. Switch to a top (plan) view [**Shift + Right Click, T** on the keyboard], select the beam seats and pile, and rotate them (**Q**, **R** on the keyboard) with the settings shown below. Note that the angle input is the negative of the skew angle we entered earlier.



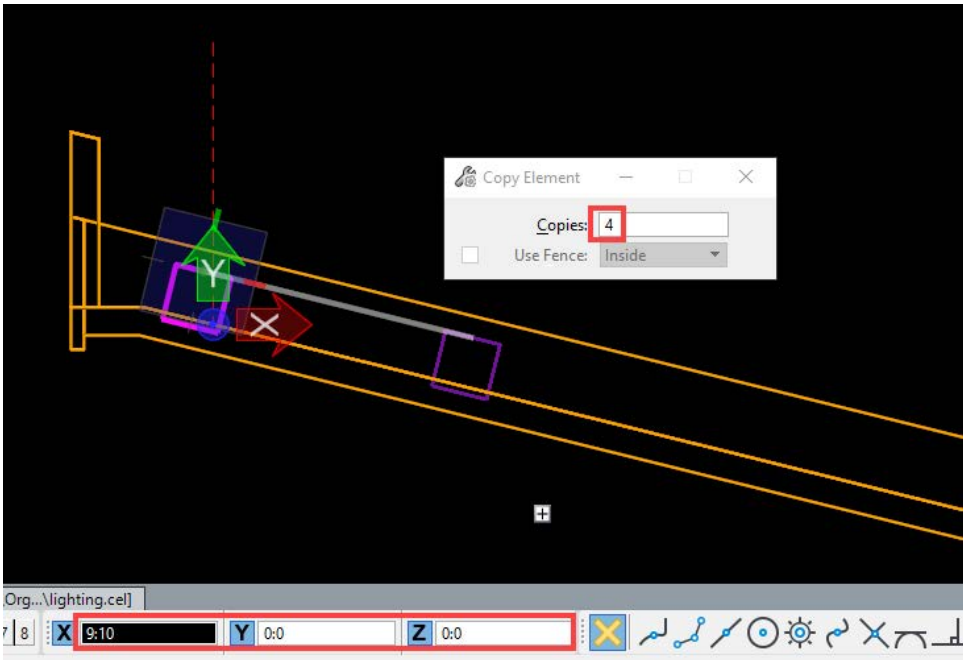
14. Turn off the **DeckConc_pm** level. Move the center of the pile element **4'** away from the front left corner.
    a. Select the pile
    b. Move command (**Q**, **W** on keyboard)
    c. Snap from CL pile
    d. Snap to the inside face of cheek wall & front face of cap
    e. Press **R** then **E** on your keyboard and select the front face of cap to rotate your AccuDraw compass to the same orientation as the cap
    f. Move your cursor over to the right, hit **Enter** on keyboard to lock in AccuDraw compass, type in **4**, and data point to place the pile

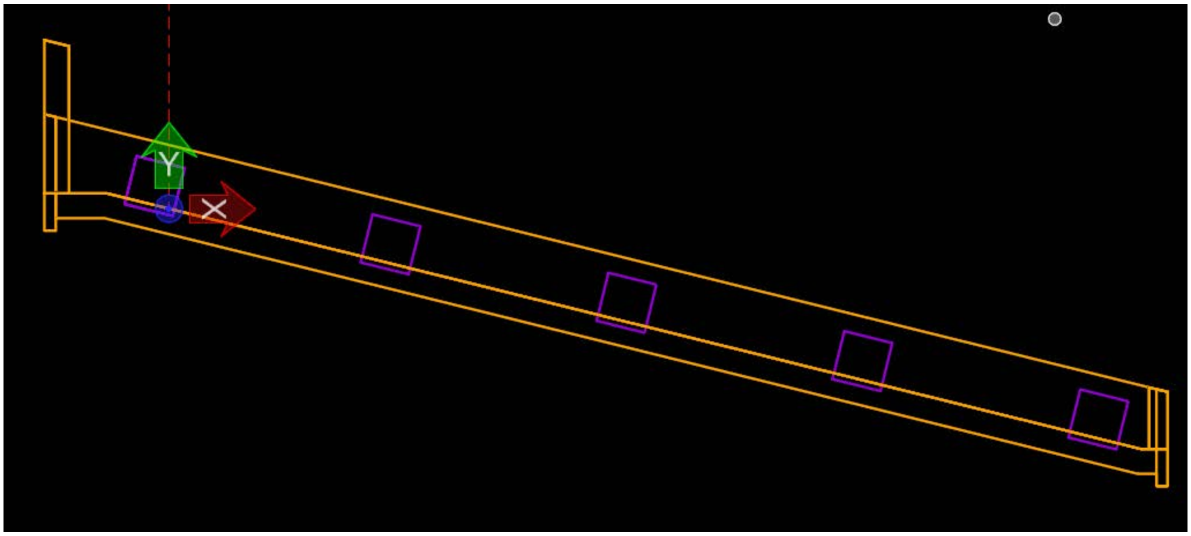


15. Move the center of the pile element **1'-9"** from the front face of cap using similar methods from step 14.



16. Use **Copy** command to Copy the pile element over **9'-10"** in the direction shown below, **4 ea** copies, using similar methods from step 14.



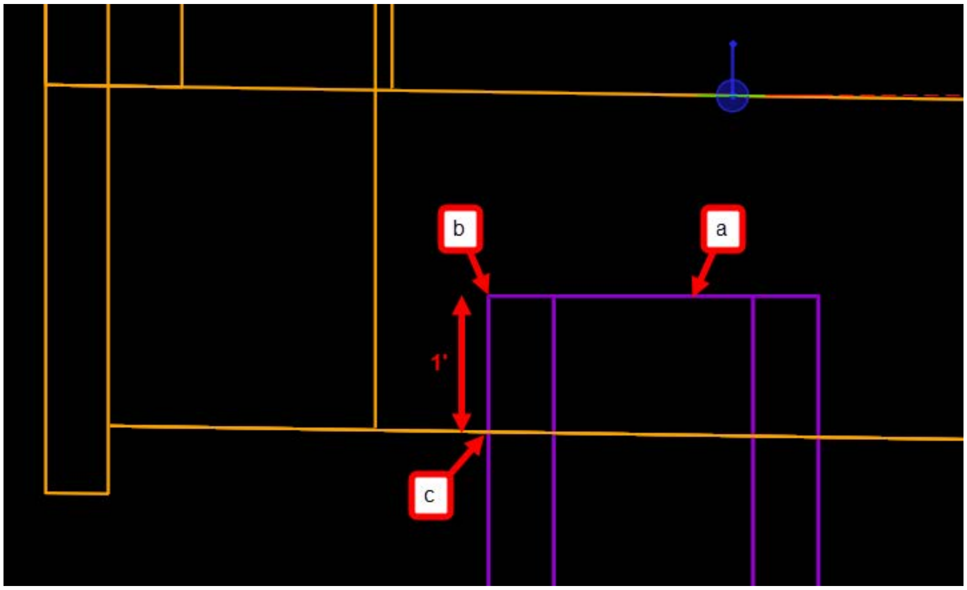


17. Switch to a front view (**Shift** + **Right Click**, **F** on keyboard) and use **Move** command move each pile so that the top of pile is **1'** above the high side of the bottom of the cap.

   a. Select the pile and **Move** command (**Q**, **W** on keyboard)

   b. Snap to top left edge of pile

   c. Move cursor down, hit **Enter** on the keyboard to lock in AccuDraw compass, and snap to the bottom of cap



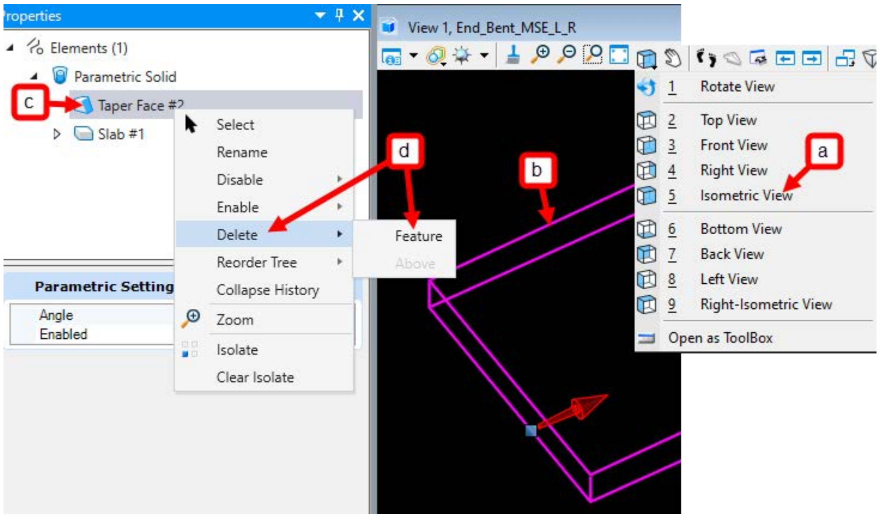
18. Adjust taper point of beam seat

   a. Switch to an isometric view

   b. Select beam seat element

   c. Go to properties and right click on the **Taper Face**

   d. Delete > Feature



19. Apply taper to bottom of beam seat

   a. Switch to the **Modeling** Workflow

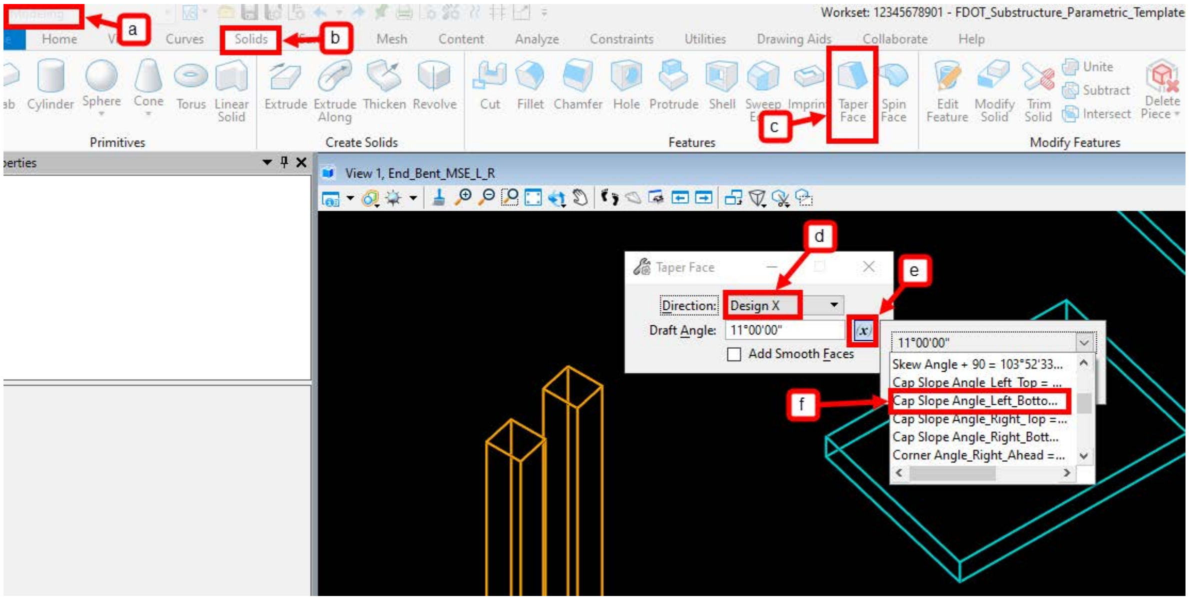
   b. Go to the **Solids** tab

   c. Select **Taper Face**

   d. Choose **Design X**

   e. Click on the variable icon: ***(X)***

   f. Choose “**Cap Slope Angle_Left Bottom**” and click **OK**

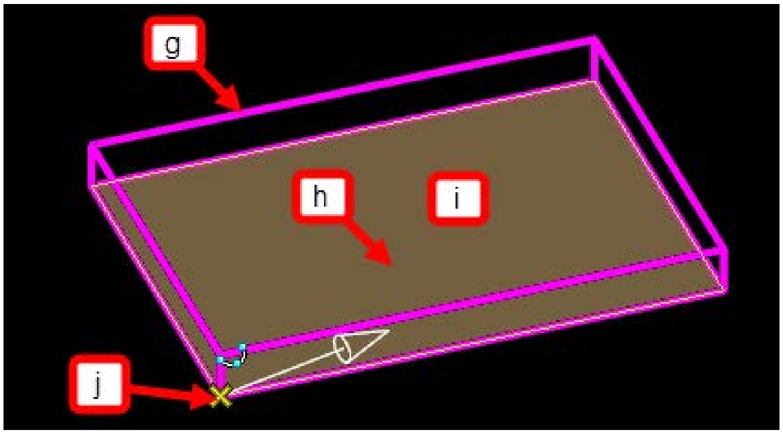


   g. Select the beam seat

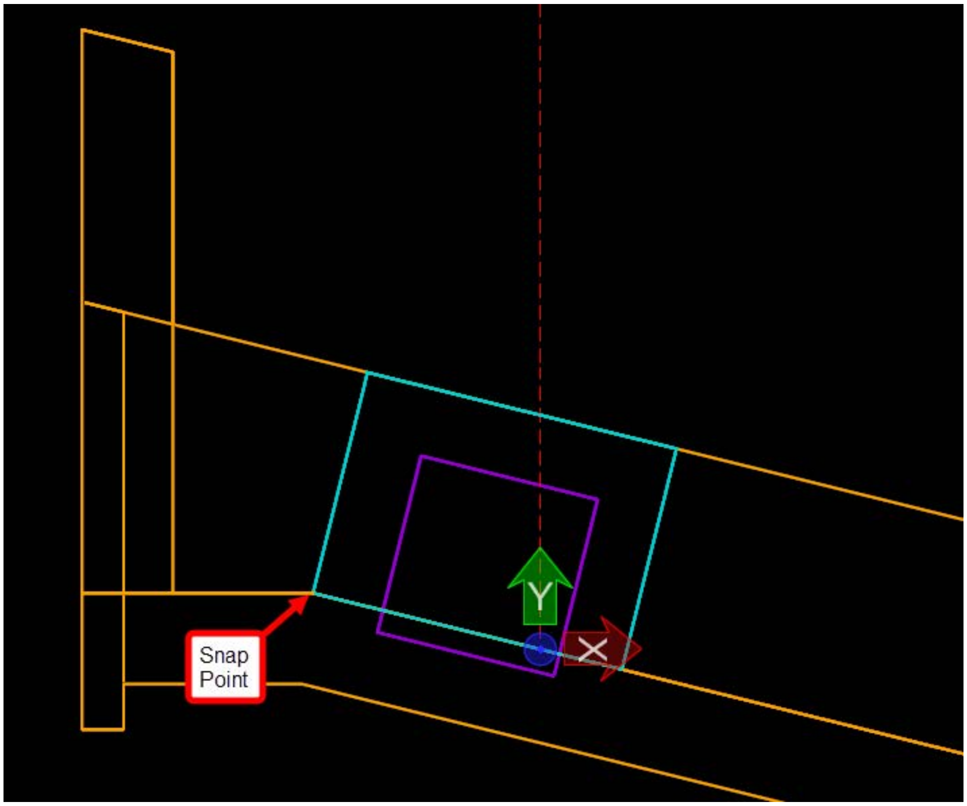
   h. Click inside the boundary of the bottom face

   i. Right click to toggle through face selection to get to the bottom face

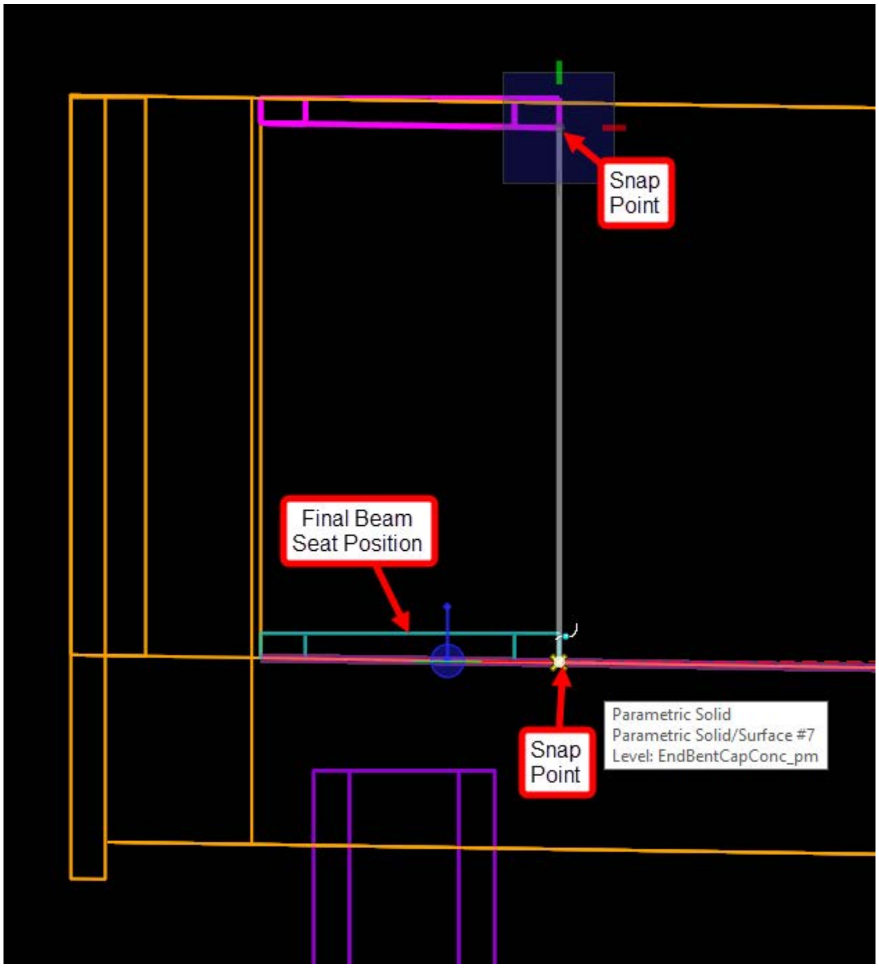
   j. Select the back left corner of the beam seat



20. Switch to a top view and use the **Copy** command copy the beam seat from the bottom left corner to the left corner of the backwall kink



21. Switch to a front view and use the **Move** command to move the beam seat down to the top of the cap, using the AccuDraw compass to lock the movement to the vertical direction (**Enter** on keyboard), snapping from bottom of beam seat to top of cap



22. Copy Beam seat

a. Switch to a top view (**Shift** + **Right** click, **T** on keyboard)

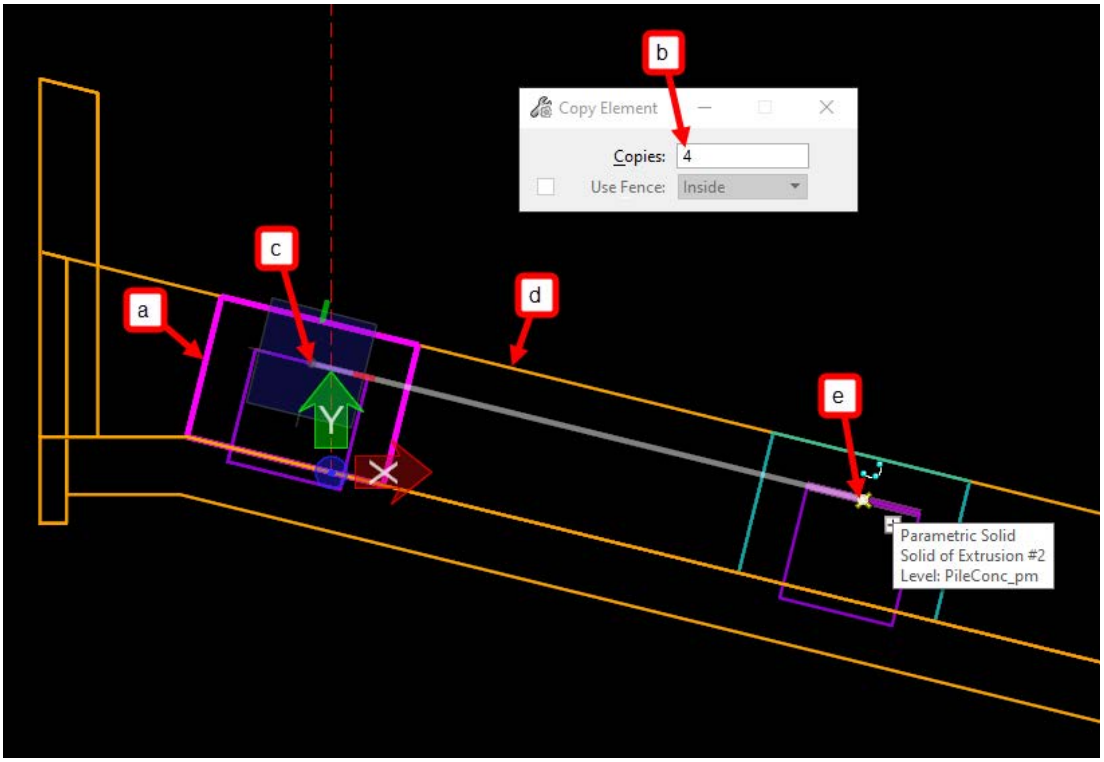
b. Select the beam seat

c. Copy command (**Q, E** on keyboard) and enter **4** for copies

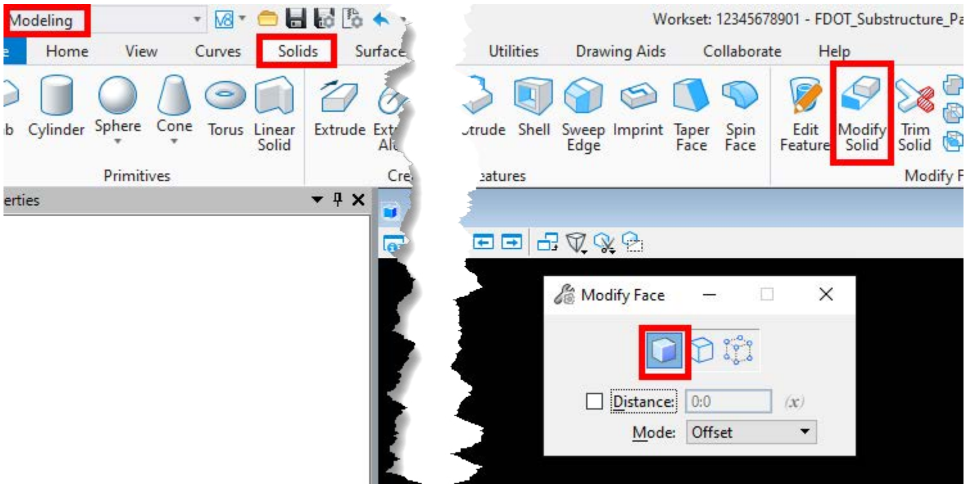
d. Snap from the CL pile

e. Press **R** then **E** on your keyboard and select the front face of cap to rotate your AccuDraw compass to the same orientation as the cap

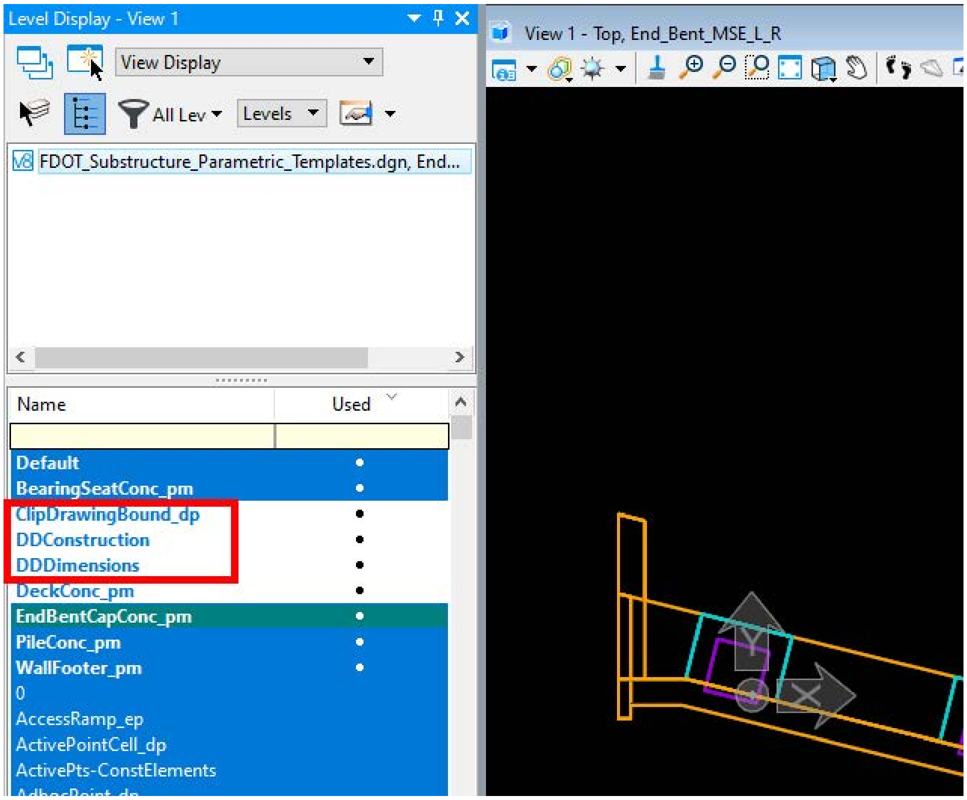
f. Hit **Enter** on your keyboard to lock in the AccuDraw compass in the direction of the cap and snap to the CL of the next pile



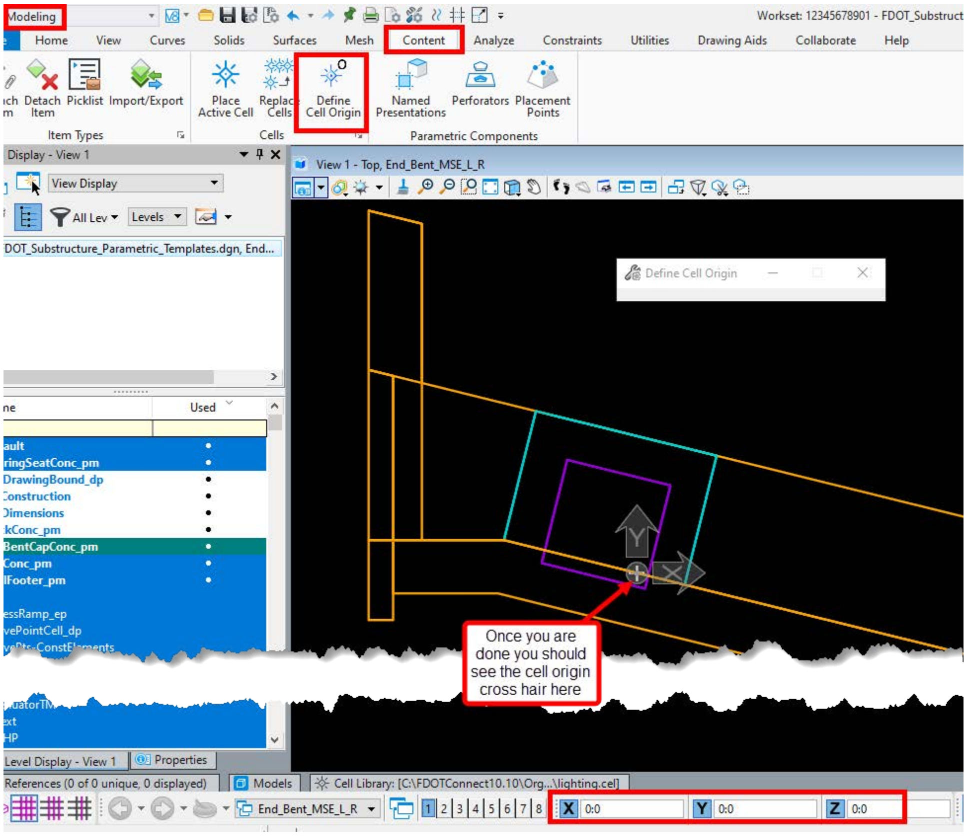
Note, modifying the top of each beam seat to match the bottom of each bearing pad in the model is not part of this exercise. However, to do so you can use the Modify Solid tool to modify (Push/Pull the top face of the beam seat)



23. Now that we are done with the modifications to the parametric end bent model, we need to turn it into a cell. Start by turning off the **ClipDrawingBound_dp** level and others shown below. Note you may have to activate a level other than that to turn it off.



24. Go to the **Content** tab, click on **Define Cell Origin**, and type in **0, 0, 0** in the X, Y, & Z inputs, hit E**nter,** and **Right Click** to finish.



25. Create the Cell

    a. Open the cell library

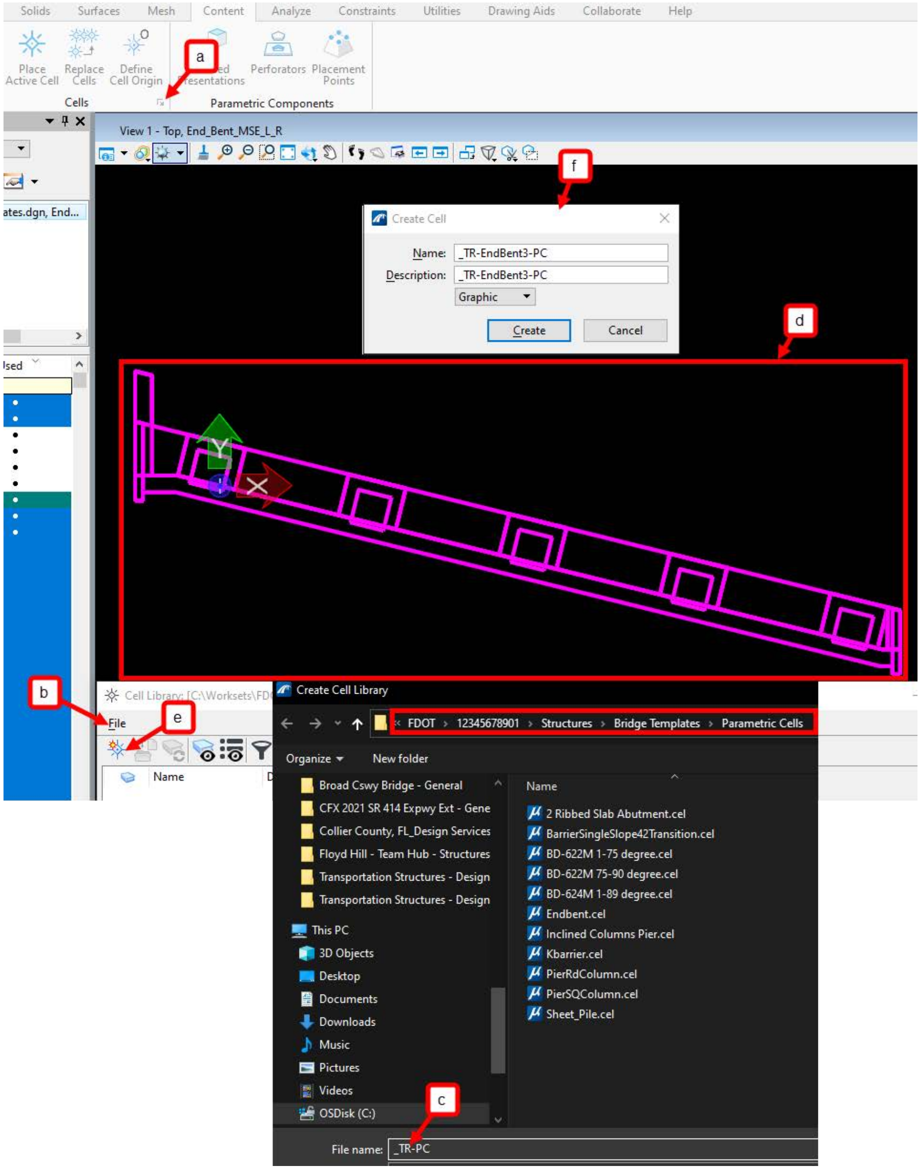
    b. File > New...

    c. Browse to the directory: C:\Worksets\FDOT\12345678901\Structures\Bridge Templates\Parametric Cells, name the cell library: _TR-PC, and click **Save**

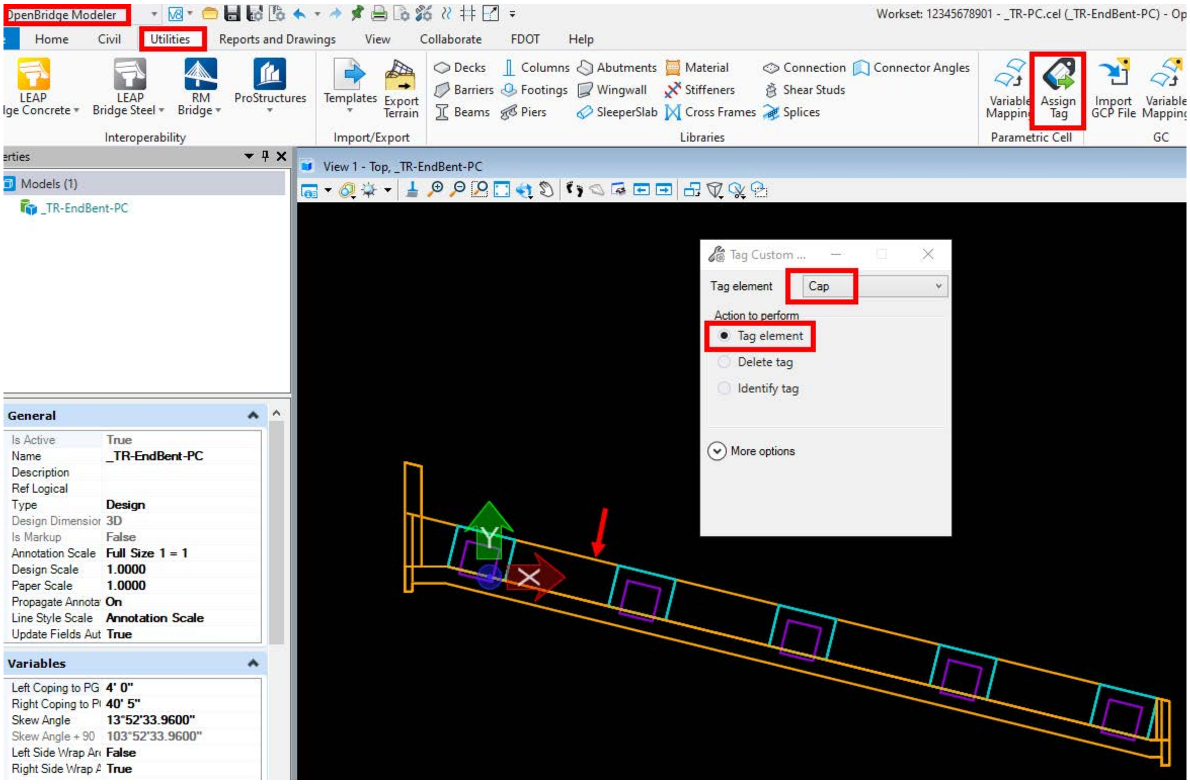
    d. Select all the end bent elements you want to turn into a cell

    e. Click on the **Create Cell** button

    f. Name the cell: **_TR-EndBent3-PC**, select **Parametric**, and click **Create**. This will likely freeze or crash OBM. Close out OBM, re-open OBM, and open the cell file you just created. You will need to make sure file type is set to all in order to see the .cel file.



26. Go to the **OpenBridge Modeler** Workflow, **Utilities** tab, **Assign Tag**, under *Tag Element* select **Cap**, select the cap element, and left click to apply the tag. There is no tag available for beam seat, so you can use the **Cap** tag for those elements as well. Repeat the same steps for the pile elements, making sure to use the **Pile** tag. The parametric cell is now ready to be used in a bridge model.



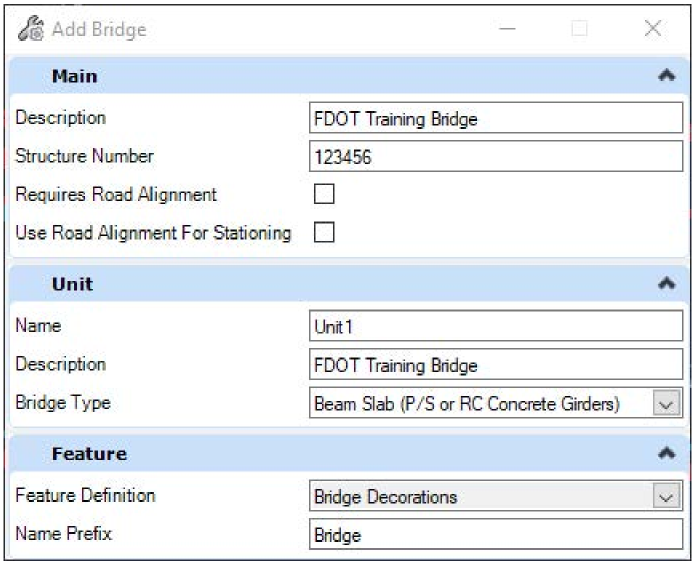
There are some limitations to using a parametric cell as shown in this exercise:

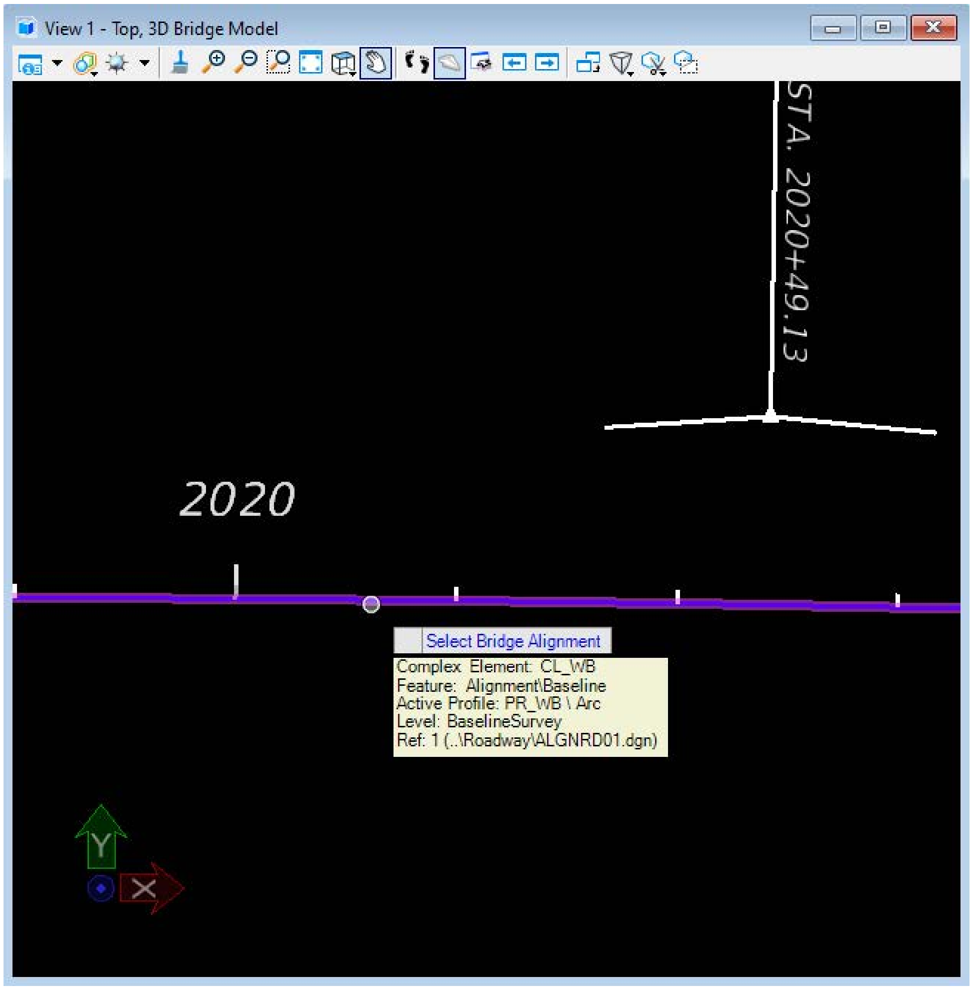
- Does not generate 2D decor levels as of now
- Won't report quantities

CREATE A BRIDGE AND ADD A BRIDGE DECK

1. Open the data set file: *B01MODLBRTR01_5.5_Begin.dgn*

Create Bridge by selecting **Home > Bridge Setup > Add Bridge**. Use the input parameters noted below for the window. The “FDOT Training Bridge” will be created as a result. Note that the **Beam Slab (P/S or RC Concrete Girders)** bridge type is selected here.

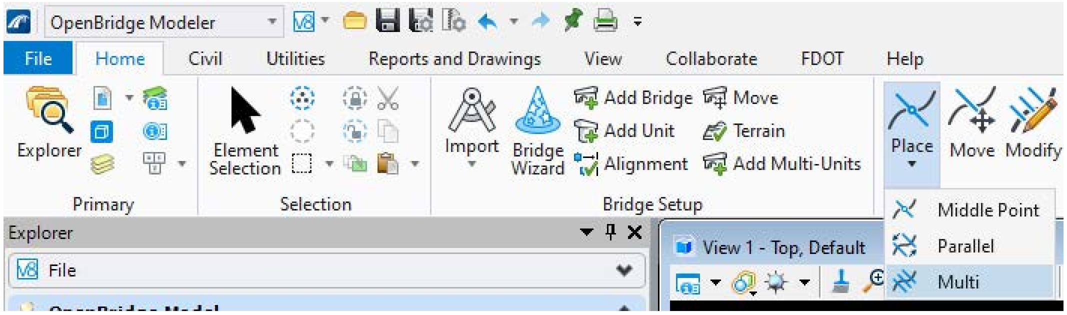




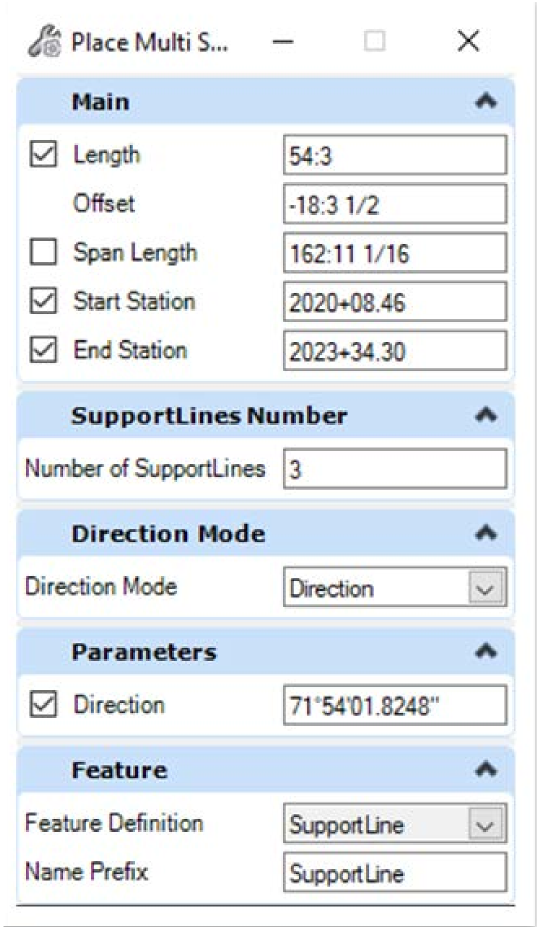
Select the “CL_WB” alignment. Data point to accept the selection.

NOTE ***Which alignment and corresponding profile are selected to use with the bridge model will depend on how Roadway sets up the alignment/profile.***

2. Create the SupportLines by going to **Home > SupportLine > Place (Multi)**.



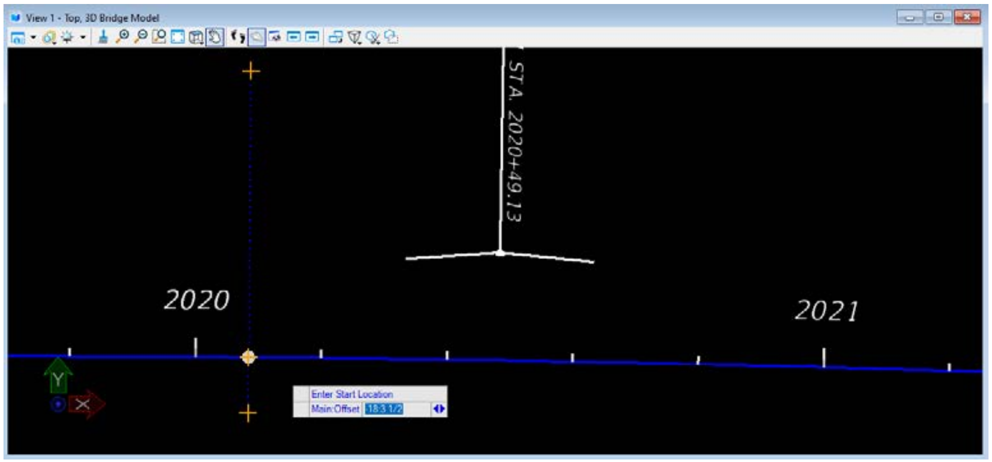
Input the parameters shown below in the window.



NOTE *The length of the SupportLine is important because the width of the deck cannot go outside the limits of the SupportLine. The SupportLine will by default always be centered on the alignment. If used for plans production, the SupportLines can be modified in the Properties after placement.*

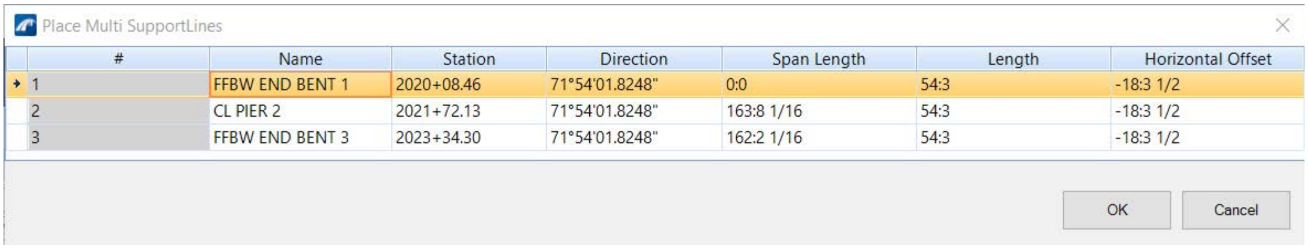
NOTE *Direction Mode "Direction" sets the angle of the SupportLine based on bearing. Direction Mode "Skew" sets the angle of the SupportLine relative to the selected alignment.*

After this information is entered the user can data point in open space to “Enter Start Location.”



Data point again to **Enter Skew**. Data point again to **Enter End Location**.

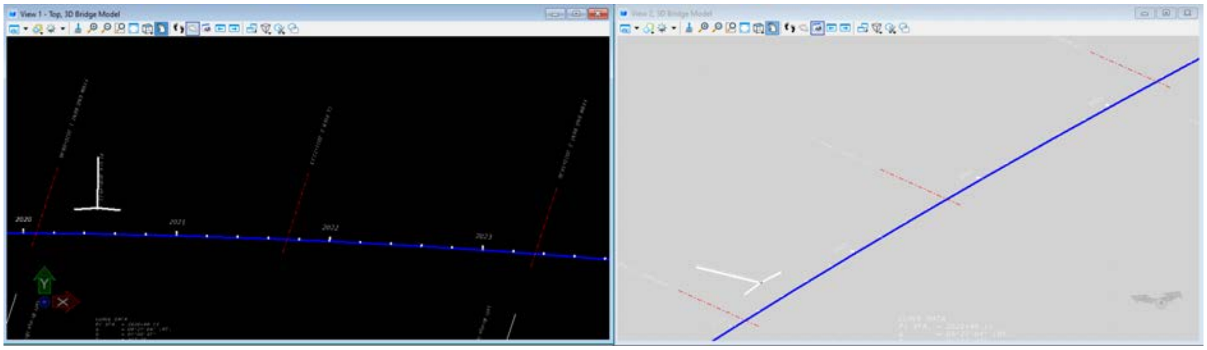
The window in the following figure will open, where the user can modify each characteristic of these SupportLines. For this exercise, update the station of SupportLine # 2 and make sure that all the values match those shown in the figure below. Replace the default “SupportLine#” name to match the FDOT nomenclature for substructure numbering. This will make it easier to identify the SupportLines and match them with the substructure locations.


Place Multi SupportLines

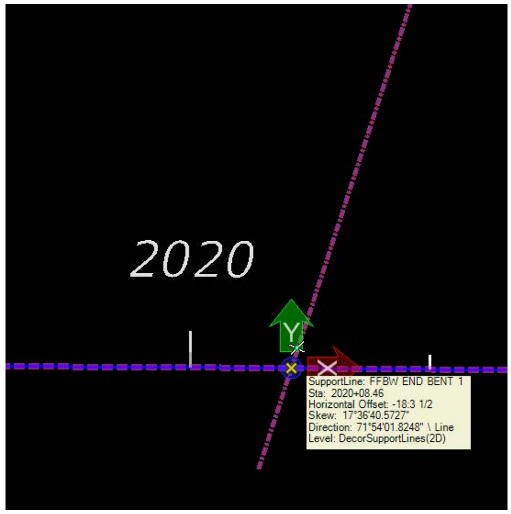
#	Name	Station	Direction	Span Length	Length	Horizontal Offset
1	FFBW END BENT 1	2020+08.46	71°54'01.8248"	0:0	54:3	-18:3 1/2
2	CL PIER 2	2021+72.13	71°54'01.8248"	163:8 1/16	54:3	-18:3 1/2
3	FFBW END BENT 3	2023+34.30	71°54'01.8248"	162:2 1/16	54:3	-18:3 1/2

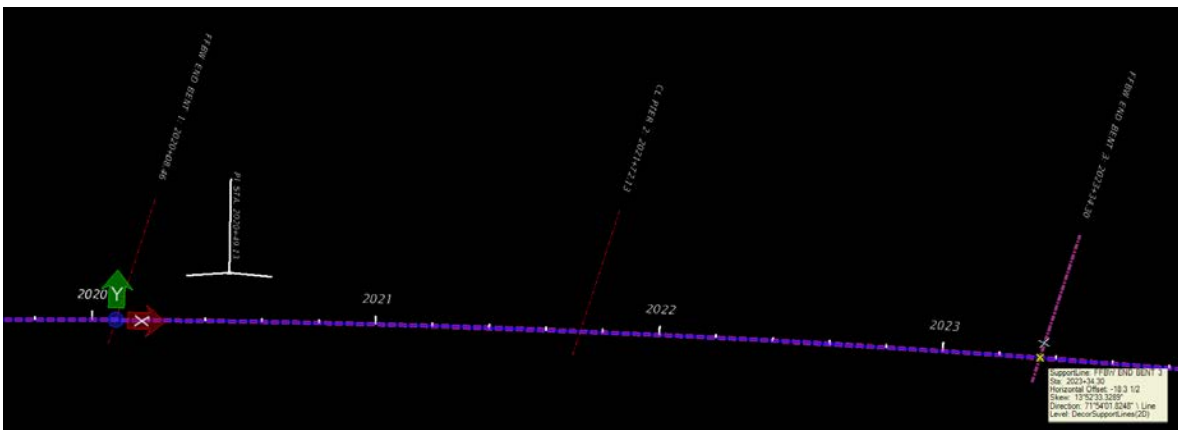
OK Cancel

The SupportLines should show as seen below. The **Place Multi SupportLines** tool will automatically allow the user to start the placement of another set of SupportLines, but the user can end the placement by right clicking in the view window or by selecting another tool.

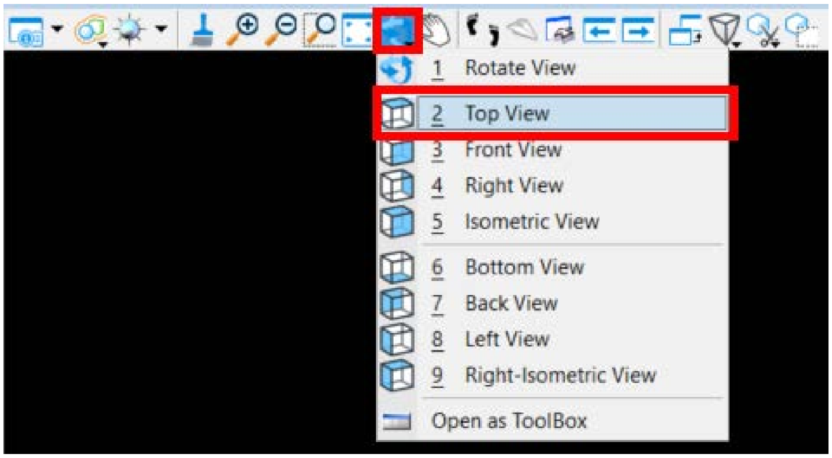


3. Rotate the orientation of View 1 to be parallel with the line connecting Begin Bridge and End Bridge. First set the ACS: **Utilities (tab) > ACS > Define ACS by Points** <OR> **[type] R + [type] A**, then place the ACS at the intersection of alignment and “FFBW END BENT 1”. Select the intersection of the alignment and “FFBW END Bent 3”. Then select the top of the SupportLine to define the y-axis.

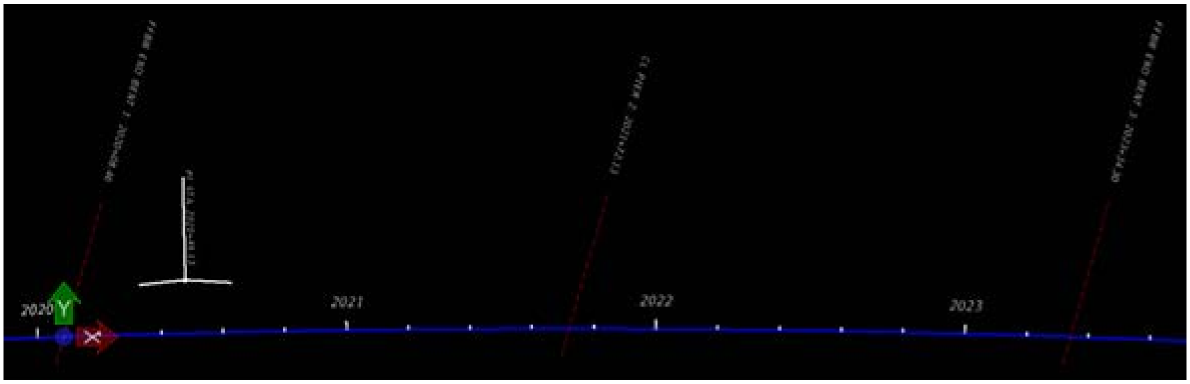




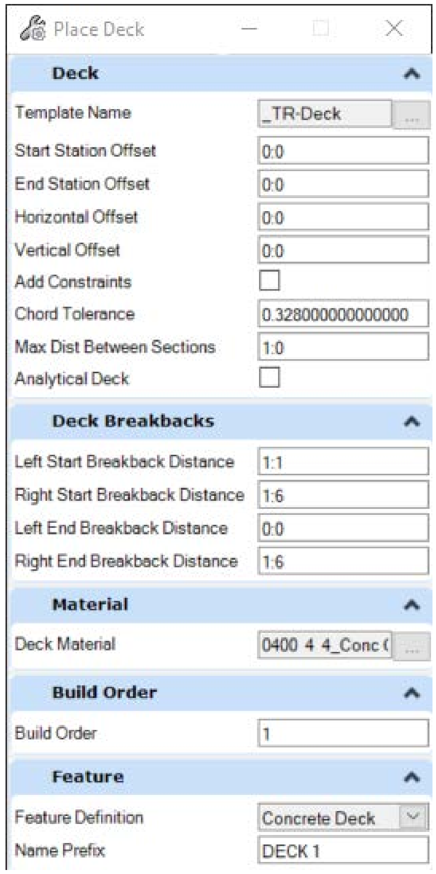
4. On the View toolbar, select **View Rotation > Top View**. <OR> **[Hold Shift] + [Right Click] + [type] T**.



View 1 of the line connecting Begin Bridge and End Bridge should now be parallel with the screen.

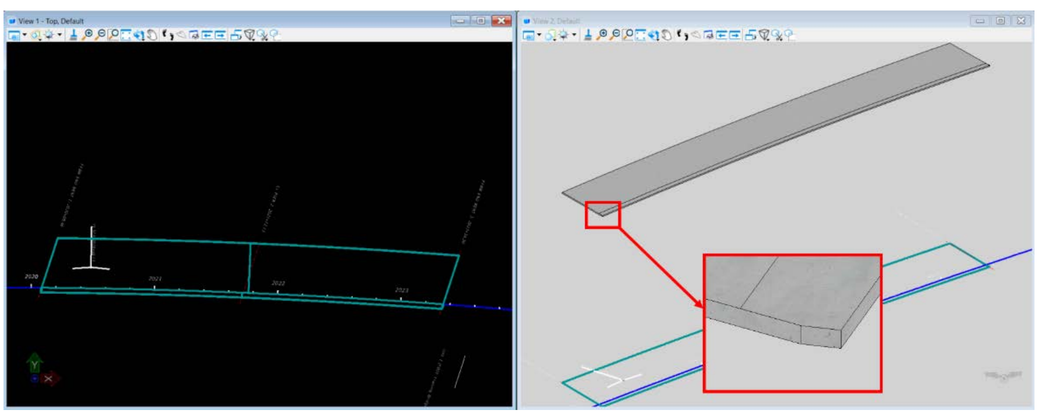


5. Create the deck by selecting: **Home > Superstructure > Place Deck**. Select the **_TR-Deck** deck template created in Exercise 5.1 and use the additional parameters shown below. Note that the *Chord Tolerance* and *Max Dist Between Sections* were changed from the default value to **0.328** and **1:0** respectively. Set the *Right Start Breakback Distance* and *Right End Breakback Distance* to **1:6**. Set the *Left Start Breakback Distance* to **1:1** and set the *Deck Material* to **0400 4 4_Conc Class IV, Bridge Super**. Ensure **Concrete Deck** is selected as the *Feature Definition*.

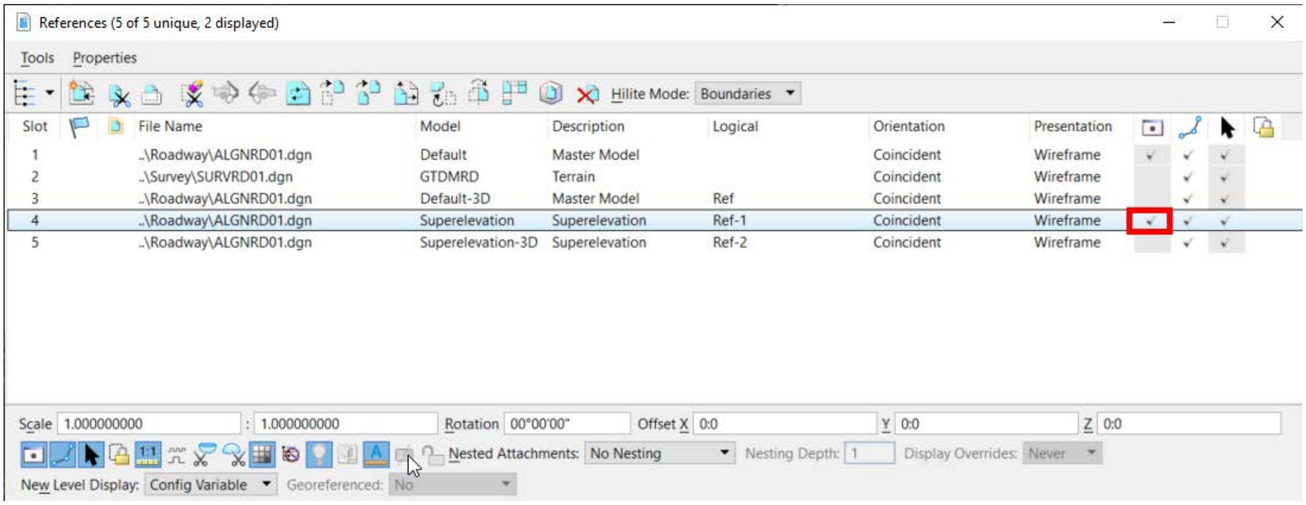


NOTE ***An alternative method to building a new deck template in the library would be to select a default deck template and modify the constraints. See the Variable Constraints section for how to add variable constraints to a default deck template.***

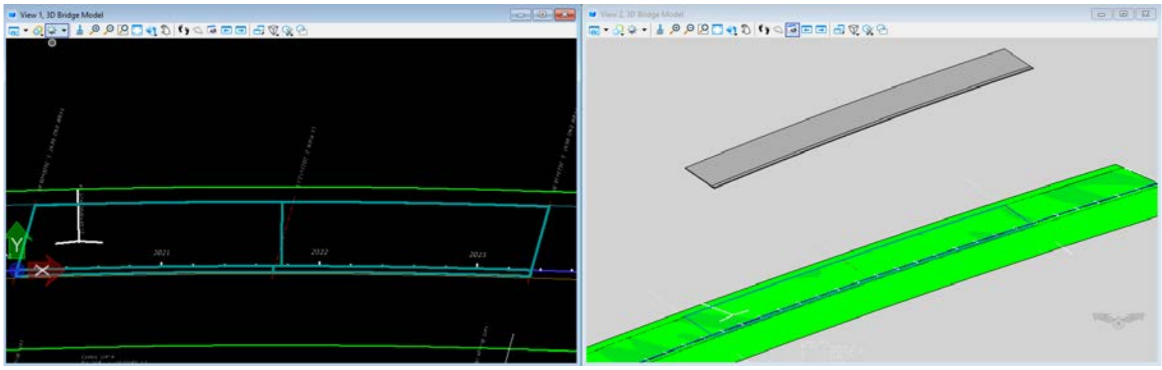
Select "FFBW END BENT 1" as the slab beginning, and "FFBW END BENT 3" as the slab end. Data point to accept. The deck will be created as seen below. The deck will be modified to fit the proper dimensions in the following steps. Notice the breakback on the right side of the deck at Begin Bridge.



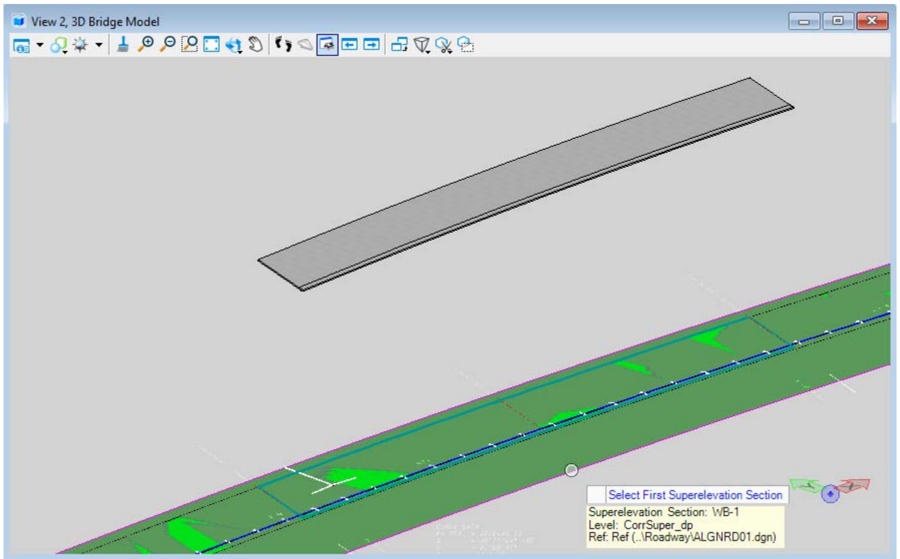
6. Begin the Assign Superelevation process by turning on the Superelevation reference in **References**. See below.



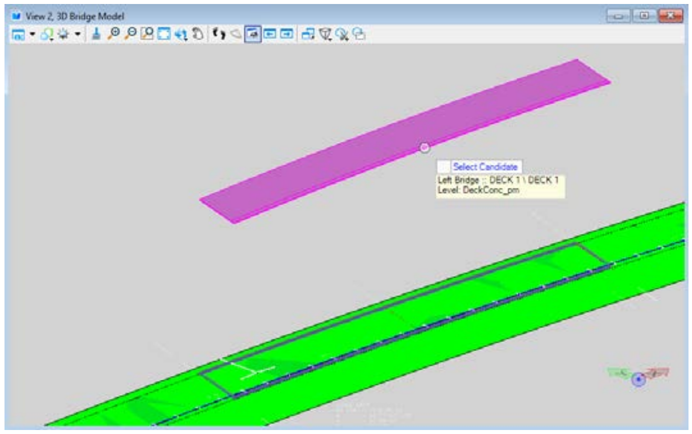
The Superelevation will be displayed in the model view, as shown below.



7. Navigate to and select **Home > Superstructure > Assign Superelevation.**
8. Select **WB-1** as the *First Superelevation Section* and right click to end the selection.



9. Select the Deck created in the previous step as the *Candidate*.



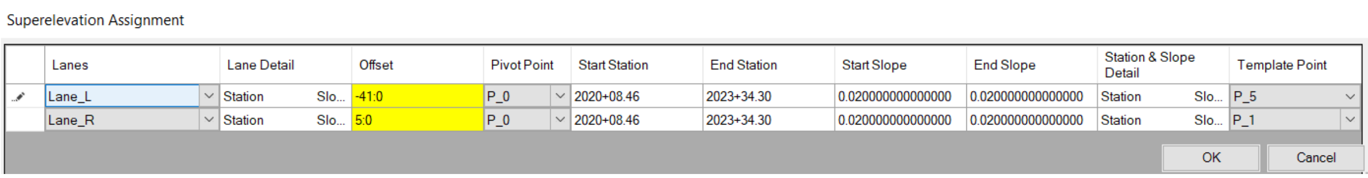
10. The *Superelevation Assignment* window will open. The *Template Point* and *Pivot Point* need to be changed to match the screenshot below. To do this:

    a. Change the *Template Point* in the first row to **P_1.**

    b. Change the *Pivot Point* to **P_0**.

    c. Change the *Template Point* back to **P_5**.

For more information about this step, see the ASSIGN SUPERELEVATION section.


Superelevation Assignment

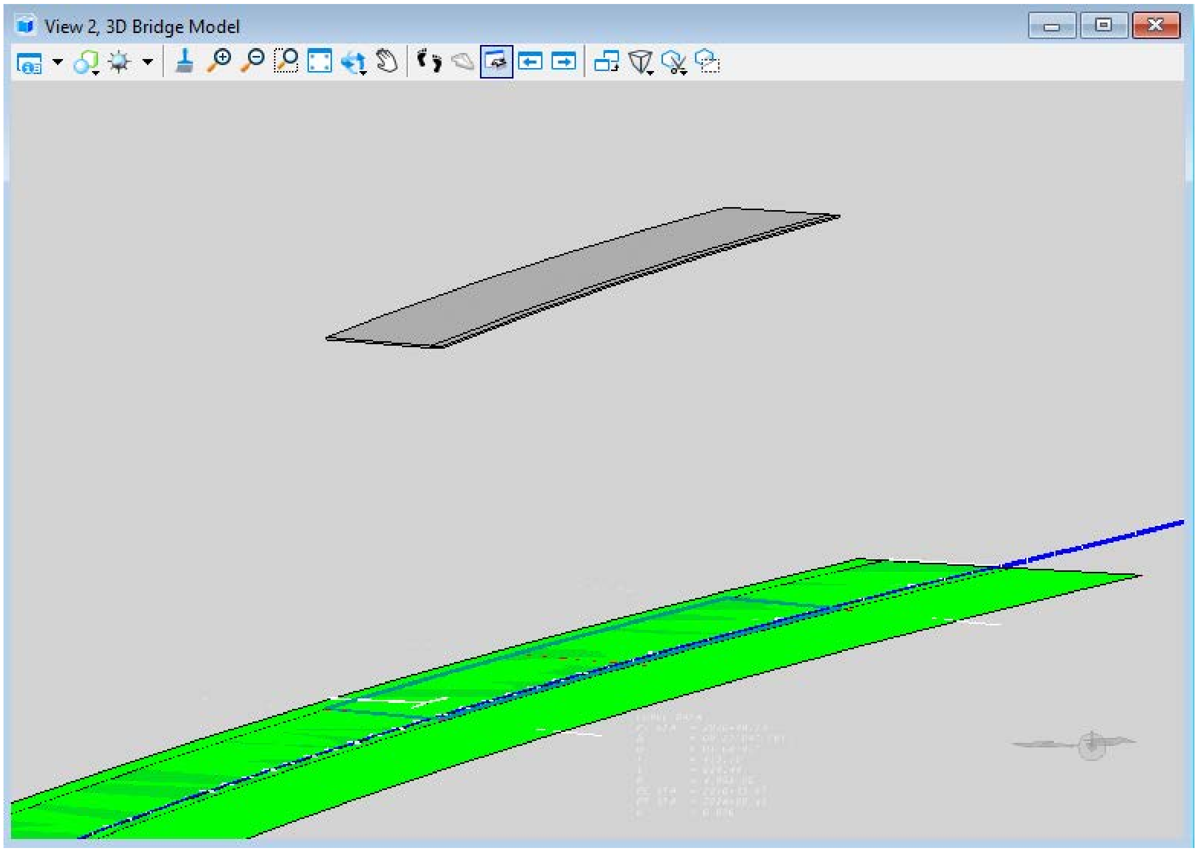
Lanes	Lane Detail	Offset	Pivot Point	Start Station	End Station	Start Slope	End Slope	Station & Slope Detail	Template Point
Lane_L	Station Slo...	-41:0	P_0	2020+08.46	2023+34.30	0.020000000000000	0.020000000000000	Station Slo...	P_5
Lane_R	Station Slo...	5:0	P_0	2020+08.46	2023+34.30	0.020000000000000	0.020000000000000	Station Slo...	P_1

OK Cancel

NOTE ***The Pivot Point can not be the same value as the Template Point. If the user wants to use the default Template Point as the Pivot Point, then the Template Point will need to be given a different value beforehand.***

11. Select **OK** to assign the Superelevation. If a Warning box shows up with a warning about the **superelevation point x value** simply click **Yes** to close it.

12. The result of this exercise is the bridge deck shown below. The Superelevation Reference file is still turned on in the following figure, but it can be turned off to simplify the viewing window.

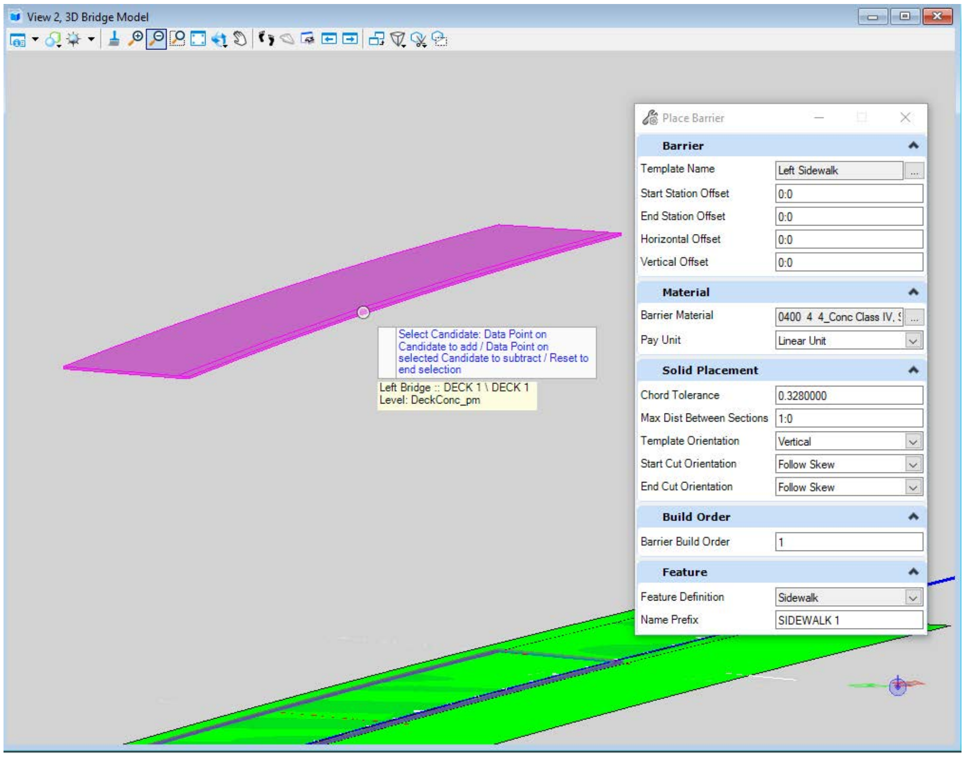


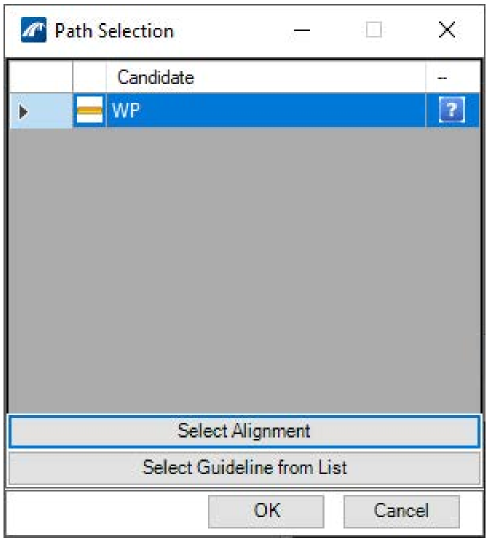
CREATE SIDEWALK

1. Create the bridge sidewalk by navigating to **Home > Accessory > Place Barrier**

2. Next select the deck that was just created as the "Candidate" and fill out the *Place Barrier* window as shown in the figure below. For *Template Name* select the **Left Sidewalk** template under the Sidewalks folder. Set the *Barrier Material* to **0400 4 4_Conc Class IV, Super**. Note that the *Chord Tolerance* and the *Max Distance Between Sections* were changed to **0.328** and **1:0** respectively. Set the *Feature Definition* to **Sidewalk**.

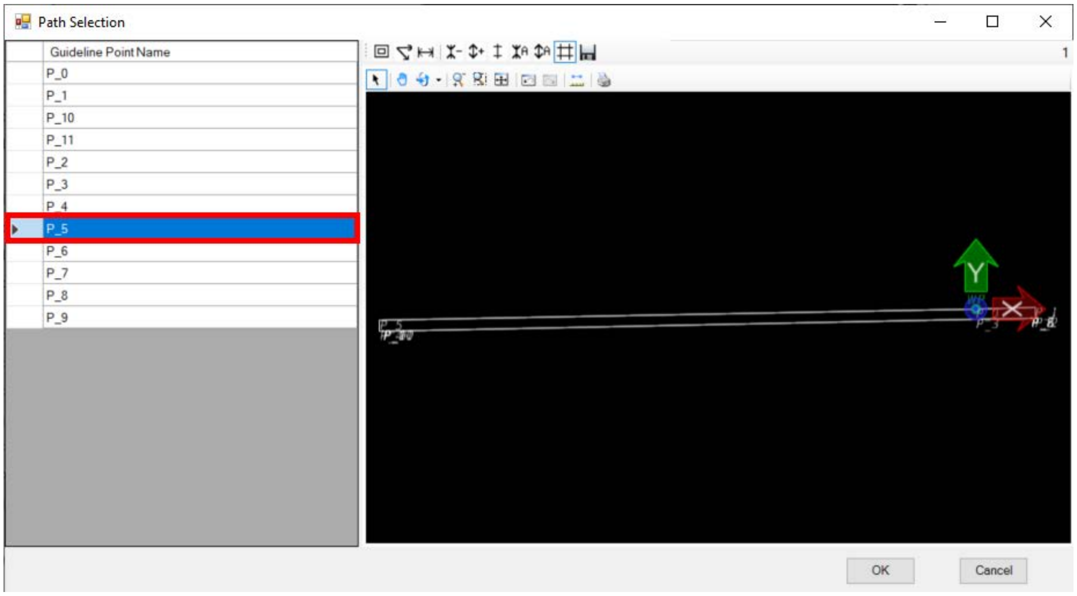
3. End the candidate selection by right-clicking and then data point in open space. This will open the *Path Selection* window.



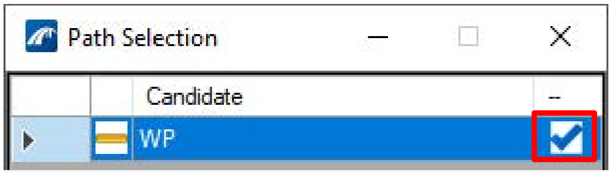


4. Click on **Select Guideline from List** to open the selection window.

5. Select **P_5** from the list and hit **OK**.



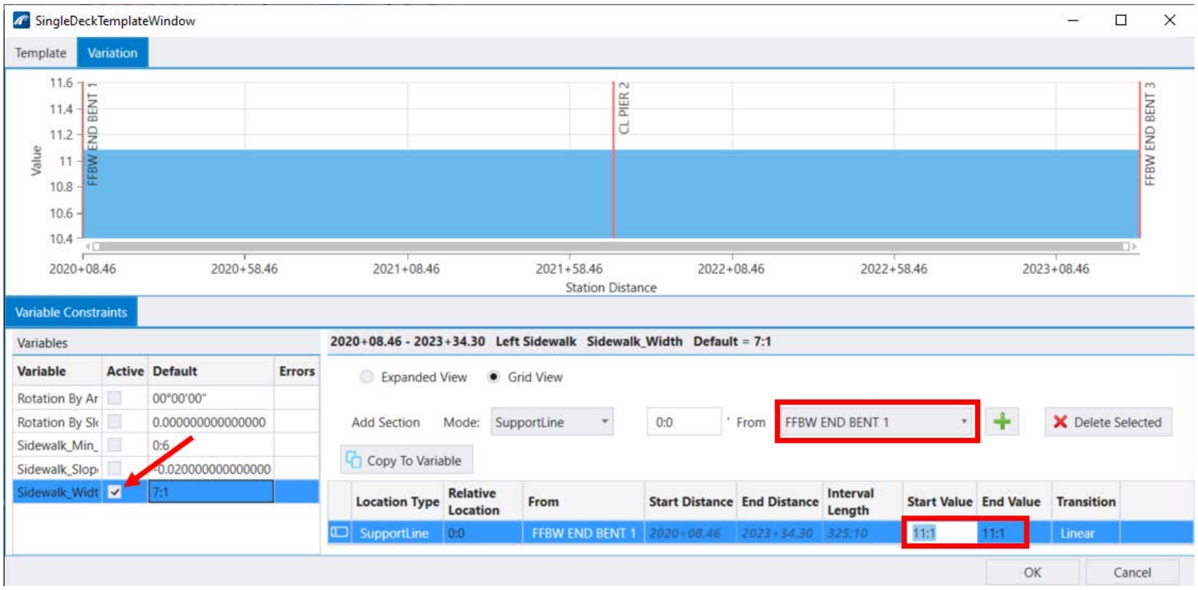
6. Verify that the blue check mark is showing and hit **OK**.



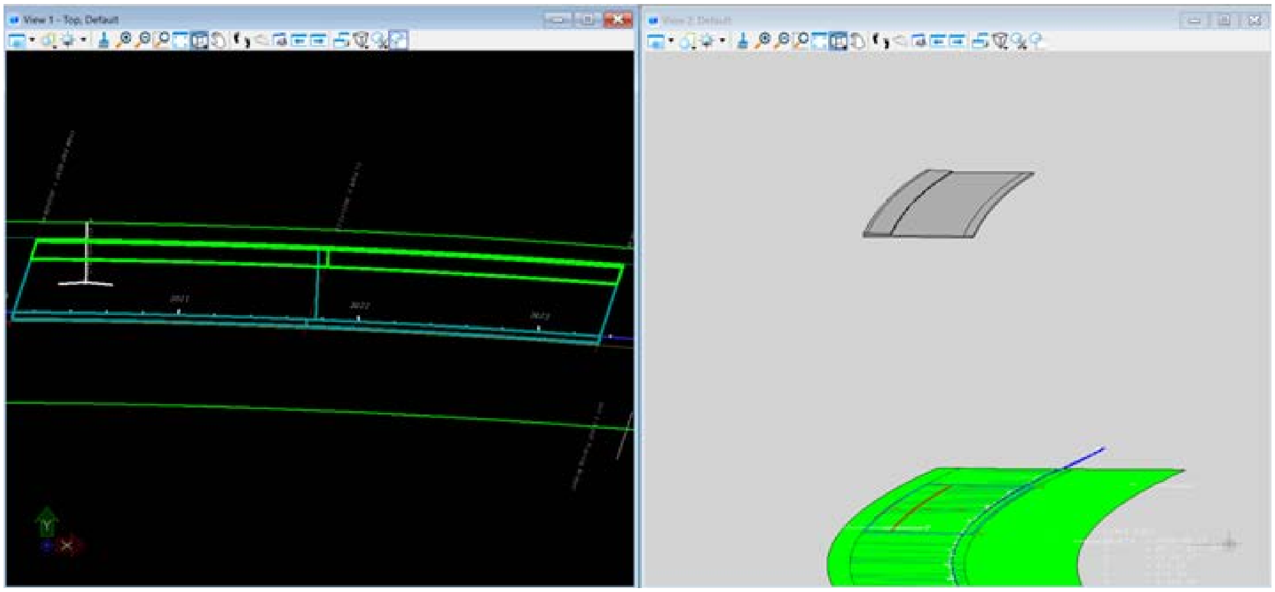
7. The sidewalk will be displayed on top of the deck.

8. Access the component's properties using the **Home > Primary > Properties** tool. Then, click on the "…" next to the *Variable Constraints* field.

9. In the variable constraints of the sidewalk, toggle *Sidewalk_Width* variable to **Active**. Next, add a section with the *Mode* as **SupportLine** and running *From* **FFBW END BENT 1.** Set both the *Start Value* and *End Value* to be **11:1**. Click **OK** to confirm the inputs and update this segment of sidewalk.

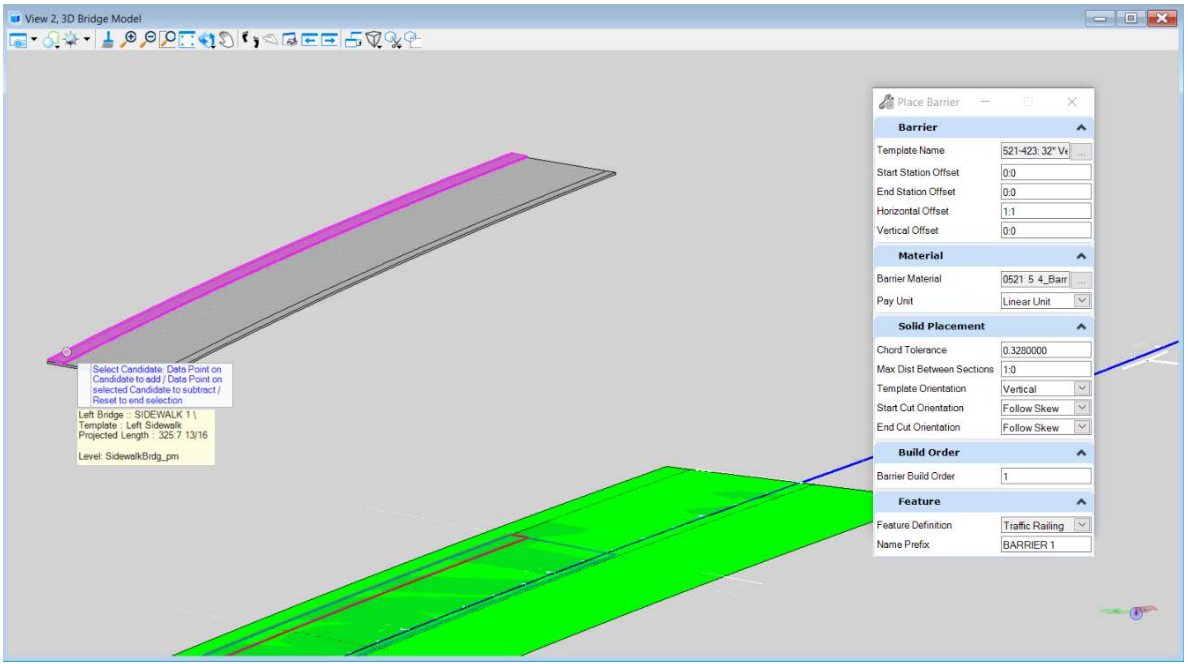


10. The updated sidewalk will be displayed on top of the deck as shown below.

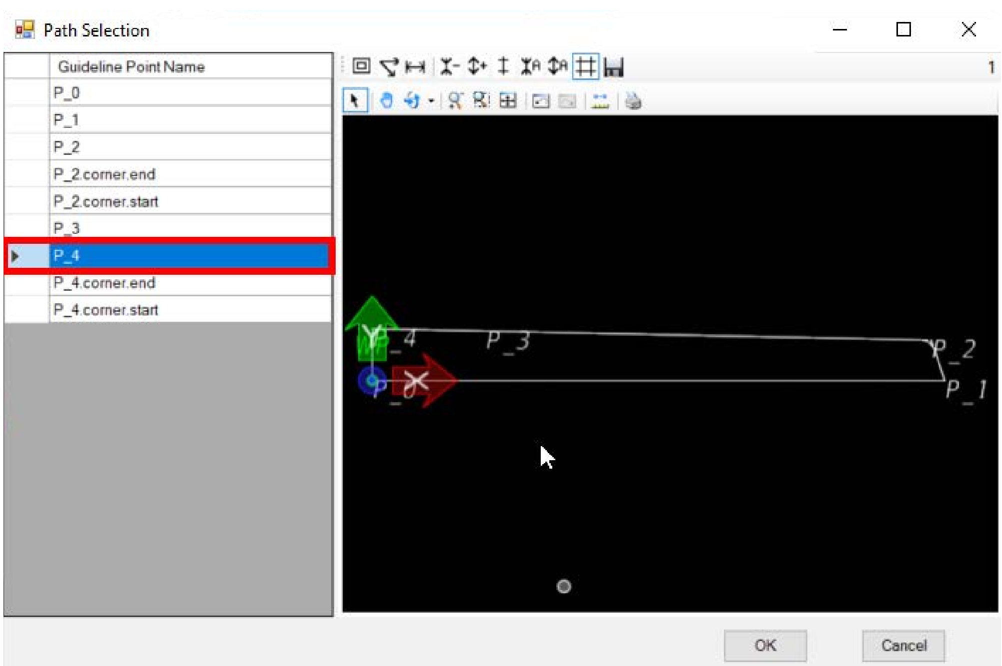


CREATE BARRIERS

1. Create the left bridge barrier by navigating to **Home > Accessory > Place Barrier**
2. Next select the sidewalk that was just created as the “Candidate” and fill out the *Place Barrier* window as shown in the figure below. For *Template Name* select the **521-423: 32” Vertical Shape L** under the FDOT folder. Note that the WP for this barrier is at the gutterline which is why there is a horizontal offset value. For *Barrier Material* select **0521 5 4_Barrier 32” Vertical Face** and select **Traffic Railing** for the *Feature Definition.*

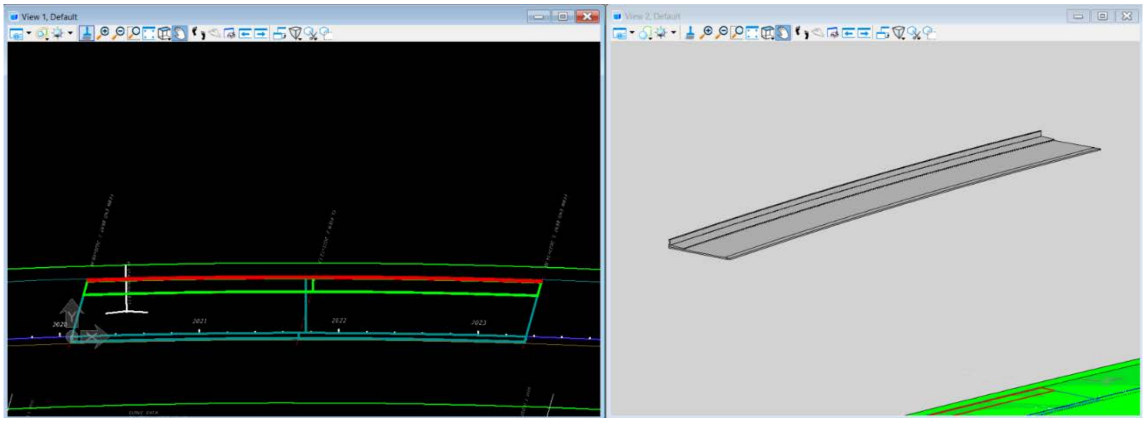


3. End the candidate selection by right-clicking and then data point in open space. This will open the *Path Selection* window
4. Click on **Select Guideline from List** to open the selection window.
5. Select **P_4** from the list and hit **OK**.

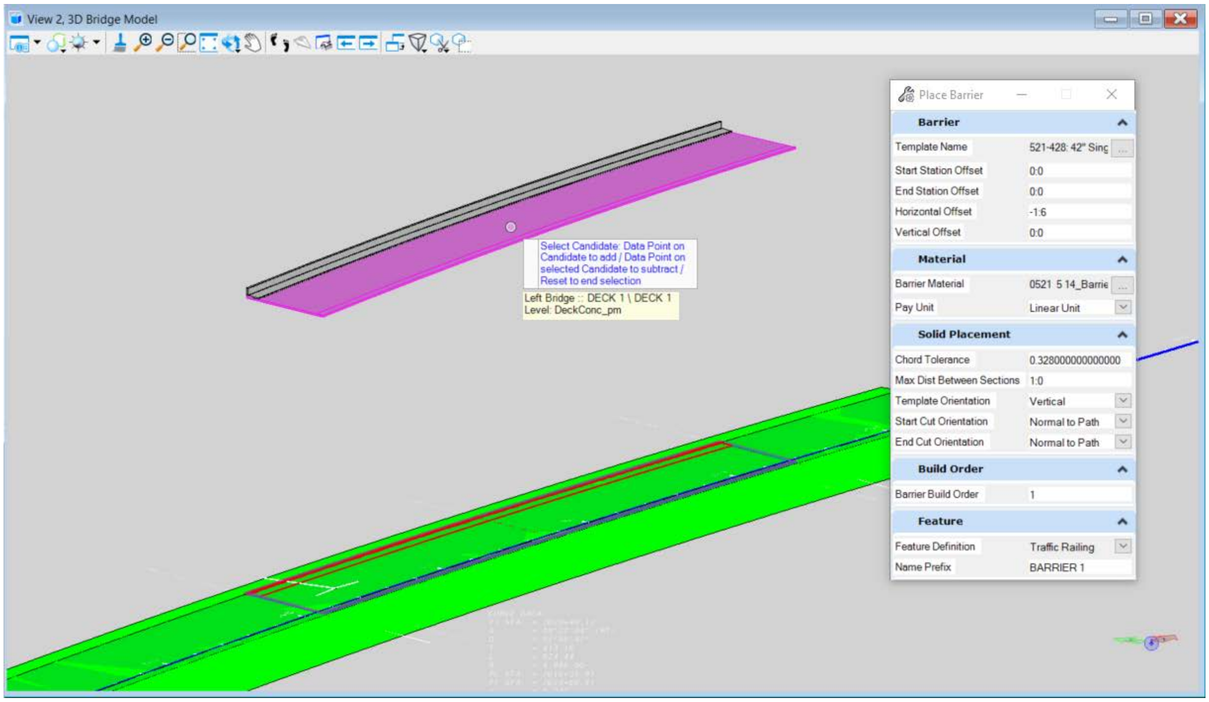


6. Verify that the blue check mark is showing and hit **OK**.

7. The barrier will be displayed on top of the sidewalk.

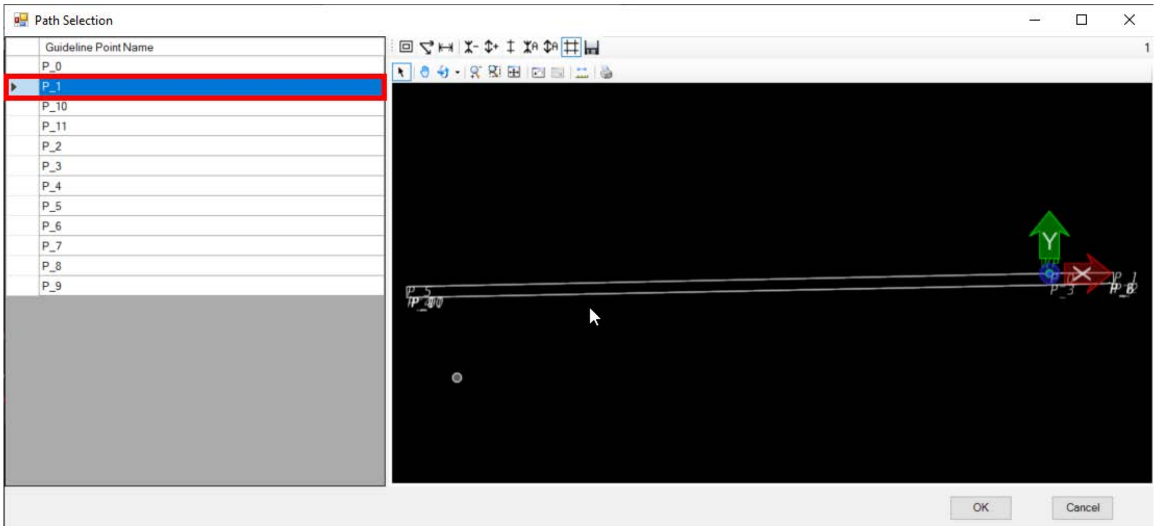


8. Create the right bridge barrier by navigating to **Home > Accessory > Place Barrier**
9. Next select the deck as the “Candidate” and fill out the *Place Barrier* window as shown in the figure below. For *Template Name* select the **521-428: 42” Single Slope R** under the FDOT folder. For *Barrier Material* select **0521 5 14_Barrier 42” Single Slope** and select **Traffic Railing** for the *Feature Definition.* Note that the *Start Cut Orientation* and *End Cut Orientation* were changed to **Normal to Path** to account for the deck breakbacks.

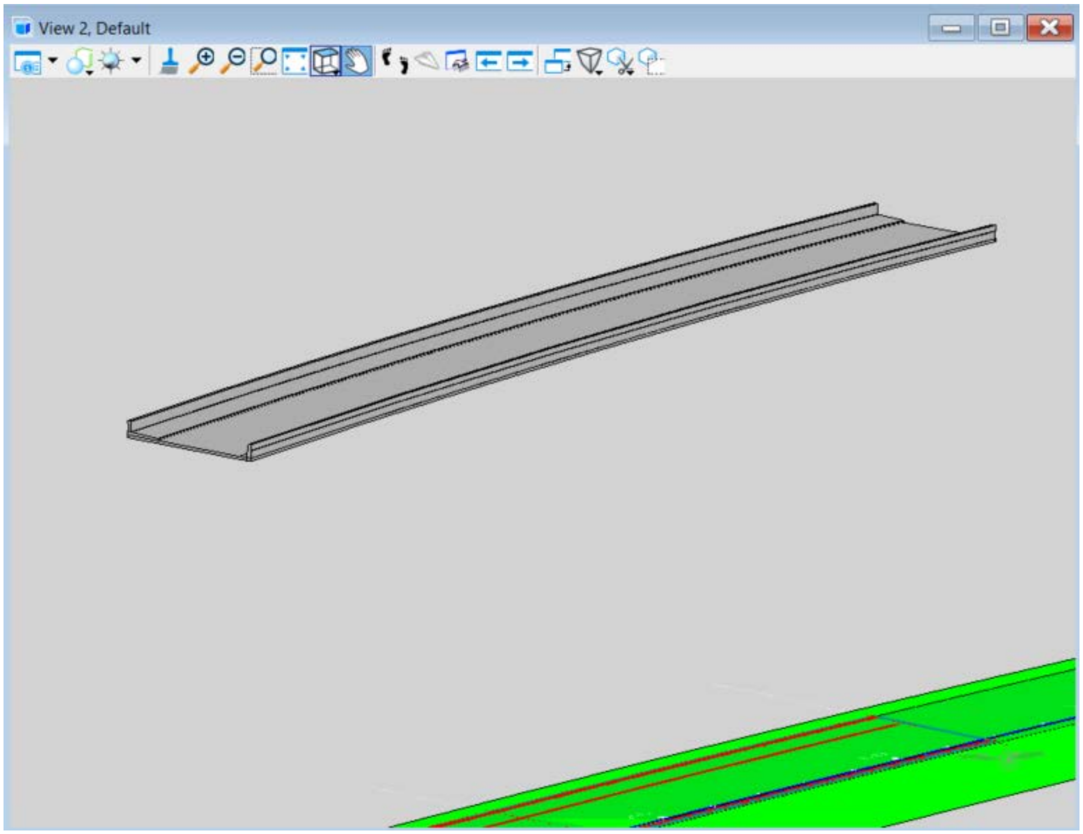


10. End the candidate selection by right-clicking and then data point in open space. This will open the *Path Selection* window.
11. Click on **Select Guideline from List** to open the selection window.

12. Select **P_1** from the list and hit **OK**.



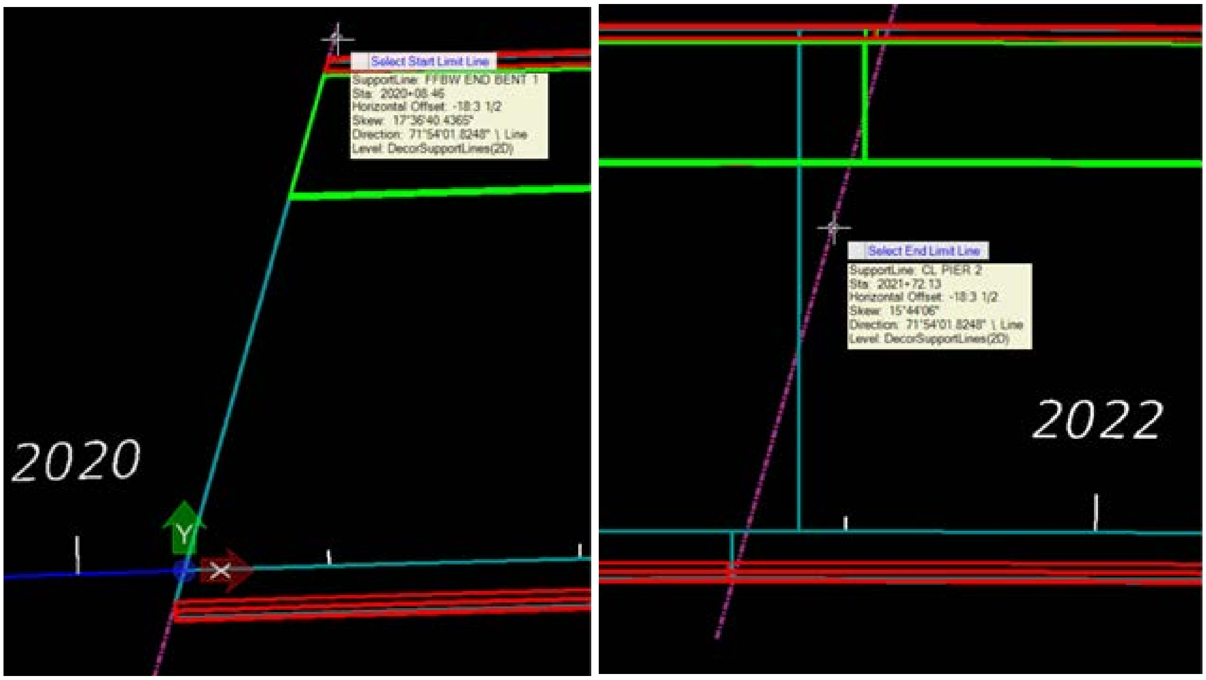
13. Verify that the blue check mark is showing and hit **OK**.
14. The barrier will be displayed on top of the deck.



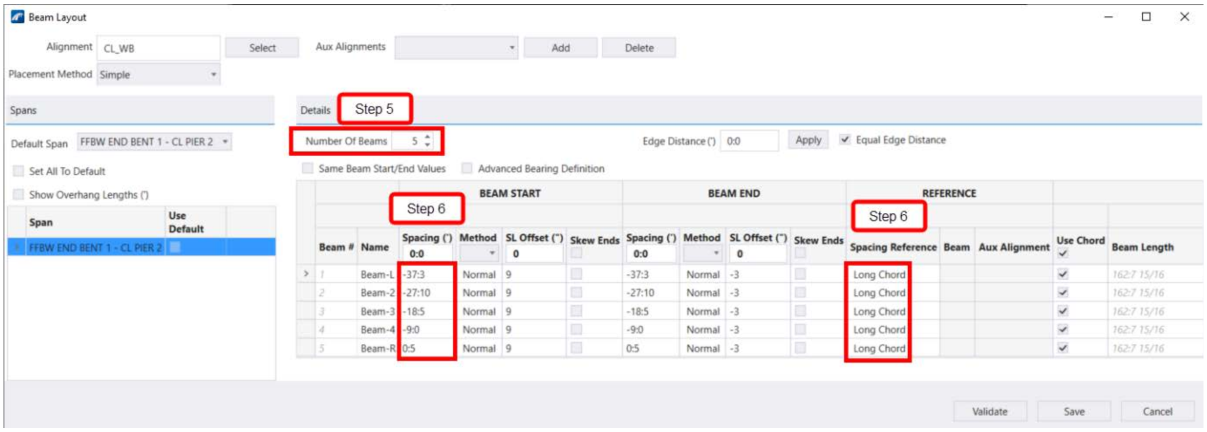
Exercise 5.6 *Create a Beam Layout and Model Beams*

CREATE A BEAM LAYOUT

1. Open the data set file: *B01MODLBRTR01_5.6_Begin.dgn*
2. Create Beam Layout by navigating to and selecting **Home > Superstructure > Beam Layout**.
3. Select “FFBW END BENT 1” and “CL PIER 2” as the **Start Limit Line** and **End Limit Line** respectively.

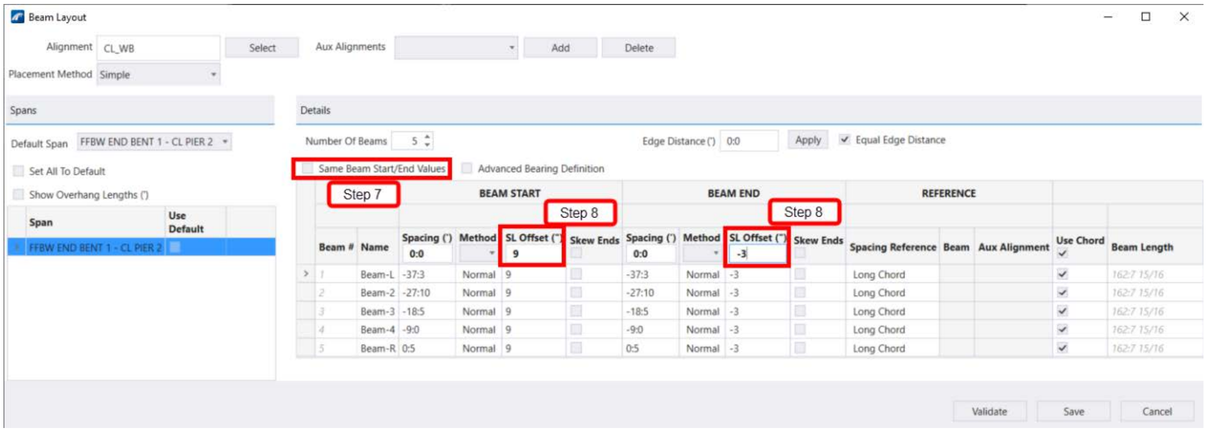


4. Data Point to **Accept** the Limit Lines and open the *Beam Layout* window.
5. In the *Beam Layout* window change the *Number of Beams* to **5**.
6. Notice that there are errors shown in the table of beams. In the **Spacing Reference** section, update the fields for all beams to **Long Chord** and update the beam spacing to the values shown below.

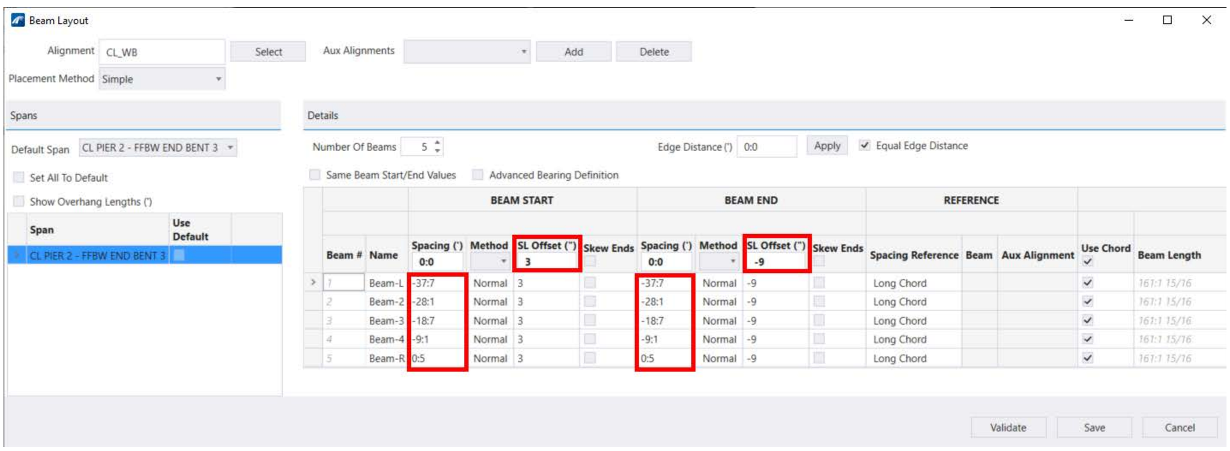


7. Uncheck the *Same Beam Start/End Values* box.

8. In the **Beam Start** section of the table, type **9** into the *SL Offset* and click an empty cell or press [Tab]. The *SL Offset* at the Beam Start should now be **9”** for all 5 beams. Repeat the same process to change the *SL Offset* at the Beam End to **-3”**. See the image below to verify the inputs.

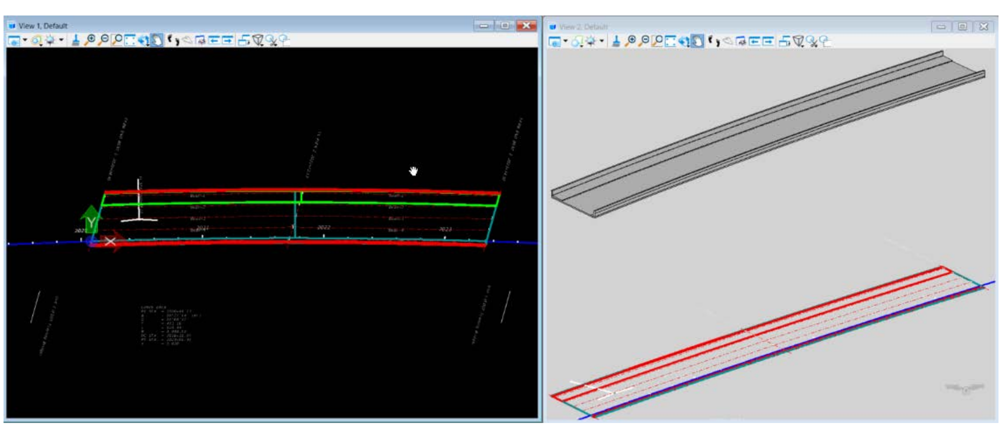


9. Repeat Steps 3-8 using “CL PIER 2” and “FFBW END BENT 3” as the limits for the beam layout of Span 2. The *Spacing* and *SL Offset* will be different. The values used are shown in the figure below.

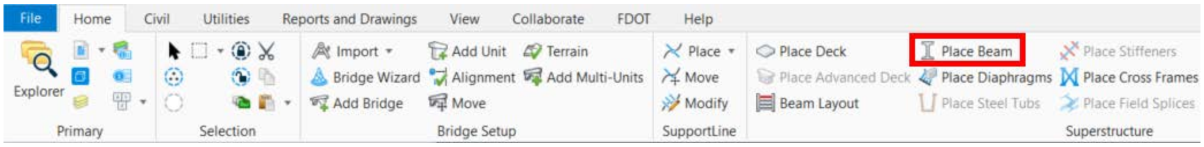


NOTE ***For this example, the Long Chord Spacing Reference is used because the alignment is curved. For bridges with straight alignments, the user can use the Edge Distance and Spacing fields to layout the beams. Also note that users can rename the beams if desired. Future versions of OBM no longer use the Beam-L and Beam-R naming convention.***

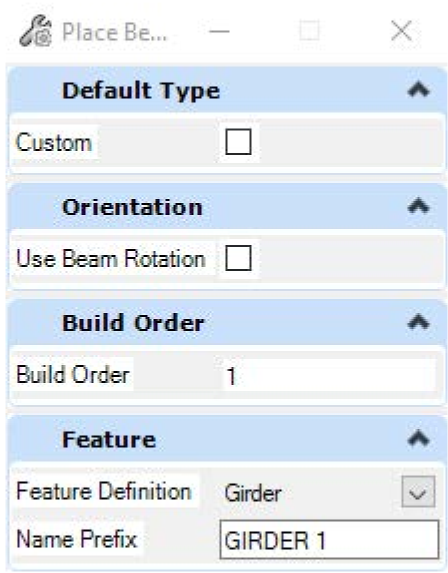
10. Click **Save** at the bottom of the window to place the Beam Layout in the model. Notice that the Layout is placed at a 0 elevation. Placing the beam layout is required before the 3D beam elements can be placed.



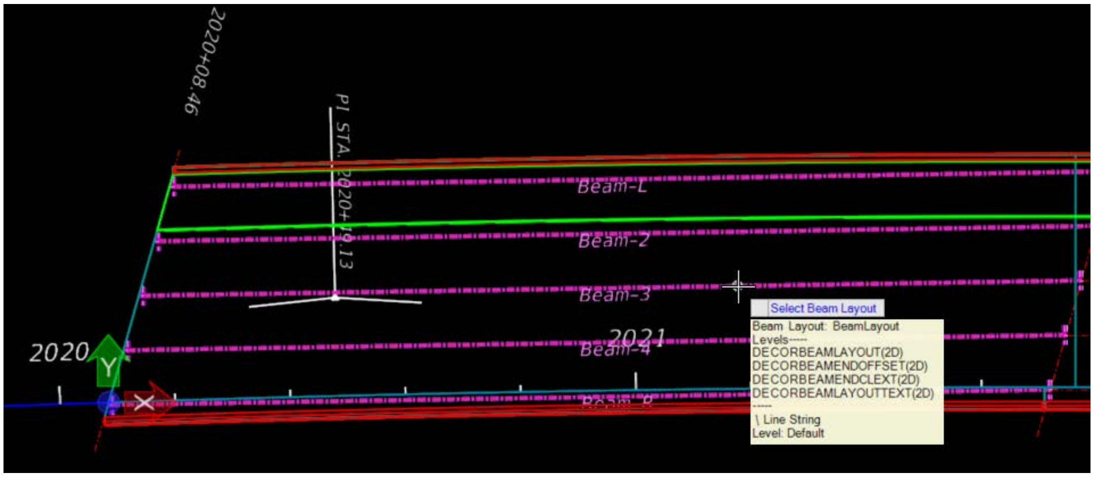
11. Next, add the actual beams to the bridge. Navigate to and select **Home > Superstructure > Place Beam.**



12. Verify that the *Feature Definition* shows **Girder** and use a *Name Prefix* of **GIRDER 1**.



13. Select the beam layout created for Span 1 as the beam layout.



14. Data point to **Accept** the Beam Layout. The *Beam Definition* window will open to allow the user to modify the beam properties.

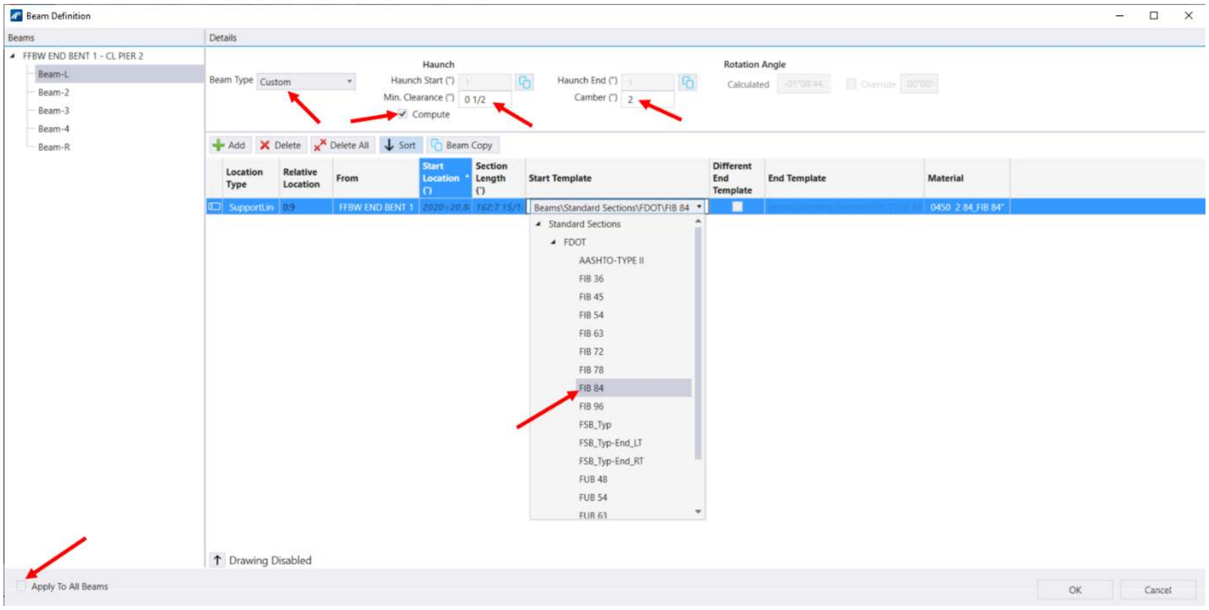
15. Change the *Beam Type* to **Custom**.

16. Make sure the *Compute* box is checked. Change the *Min. Clearance* to **0.5”** and the *Camber* to **2”**. Notice that the haunch at the start and end of beam is automatically calculated.

17. Change the *Start Template* to **FIB 84**.

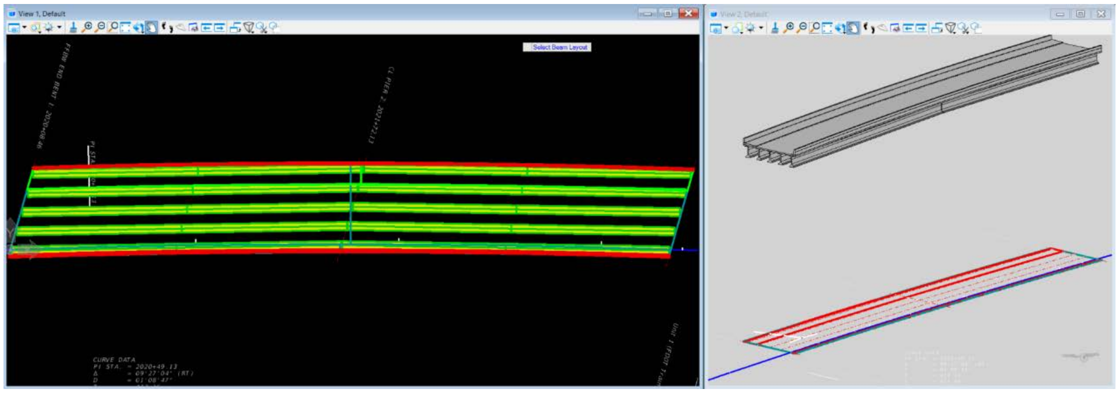
18. Verify that all inputs match with the image below.

19. At the bottom left of the window, verify that the *Apply To All Beams* box is not checked.



20. Repeat Steps 15-17 for the other four beams and select **OK**.

21. Repeat Steps 11-20 to create the beam group for Span 2. Use a Name Prefix of **GIRDER 2** for the new beam group. See the results for this exercise below.



NOTE ***If changes need to be made to the beam group, the user can follow the procedure below to reopen the Beam Group window (a similar procedure can be used to reopen the Beam Layout window):***

Navigate back to the Beam Definition window by selecting the beam group and opening the Properties window.

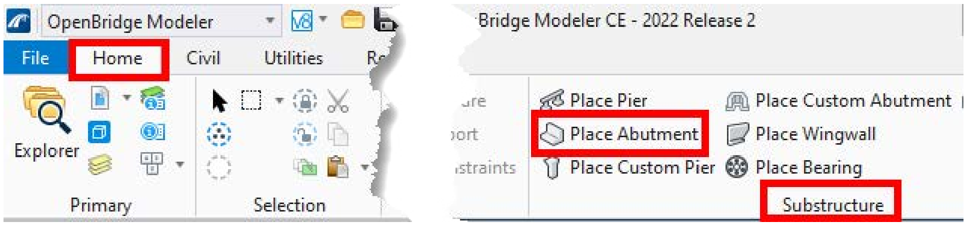
Select the “…” in the Beam Definition field.

Exercise 5.7 *Model Abutments*

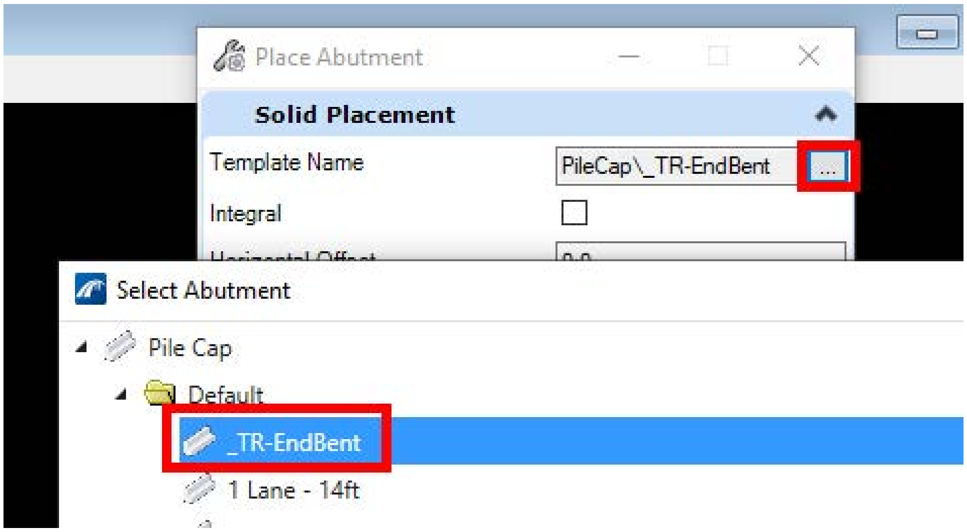
PLACE AN OBM ABUTMENT

1. Open the data set file: *B01MODLBRTR01_5.7_Begin*

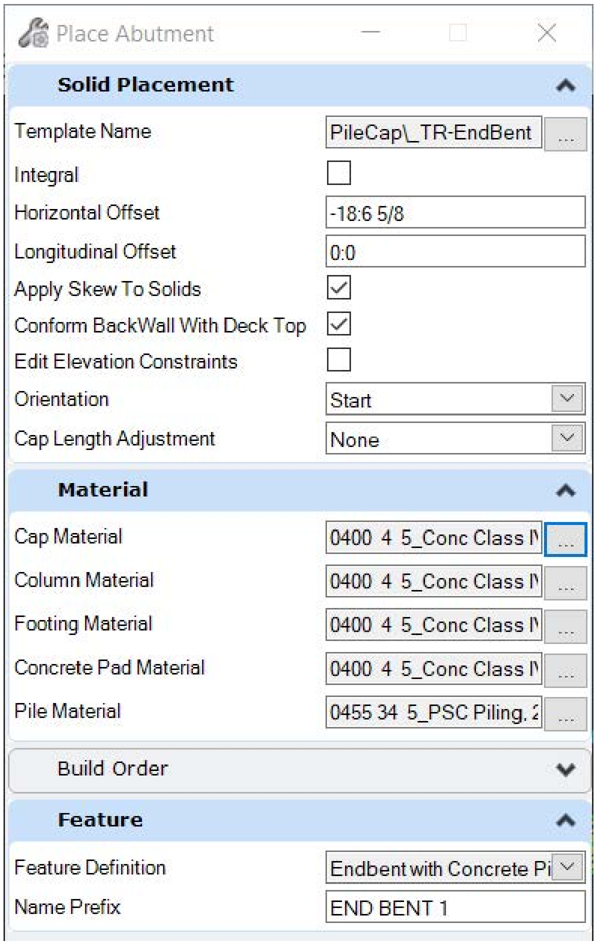
2. To begin the abutment placement, navigate to the **OpenBridge Modeler (Workflow) > Home > Substructure > Place Abutment.**



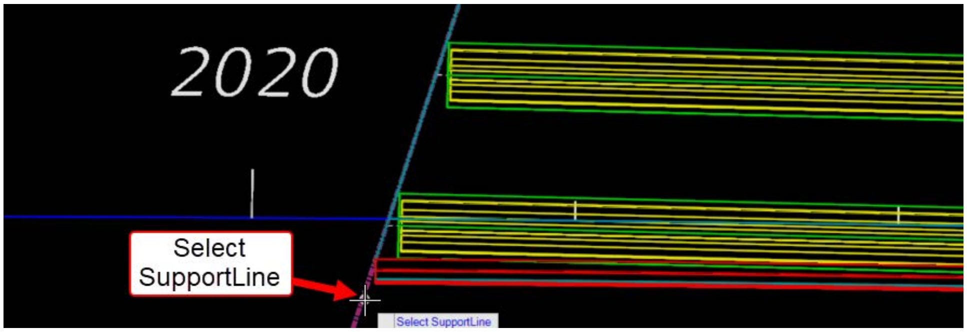
3. In the *Place Abutment* window change the *Template Name* to **_TR-EndBent**.



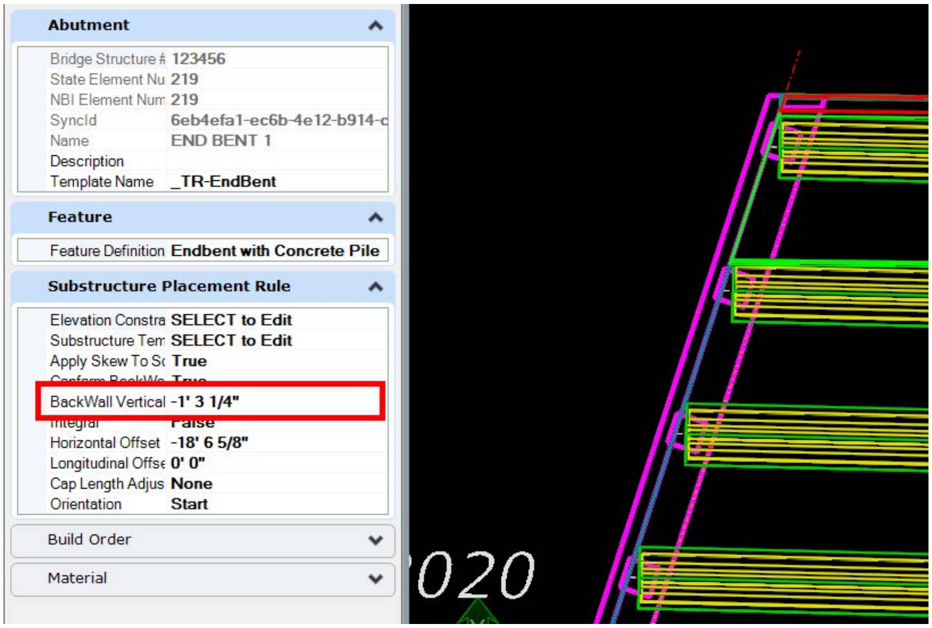
4. Verify that rest of the window inputs match the image below. Note that the *Feature Definition* should be **Endbent with Concrete Pile.** Note that Cap, Column, Footing, and Pile Material options are all available even if not all elements exist in the chosen abutment template. For components not in the selected template, they can be left blank or filled in as placeholders by the user.



5. Select **FFBW END BENT 1** as the abutment location (*Select SupportLine*) and then data point again in open space to accept. The abutment should now be visible in the model view window.

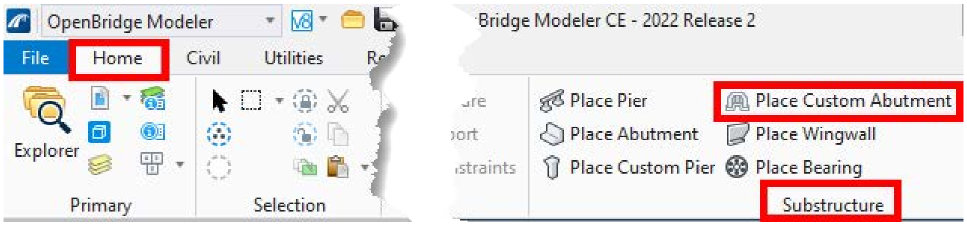


6. Select the abutment and go into the *Properties* window for the abutment and change the *Backwall Vertical Offset From Top of Deck* to -1:1.75 to accommodate the thickened portion of the approach slab resting on the backwall.

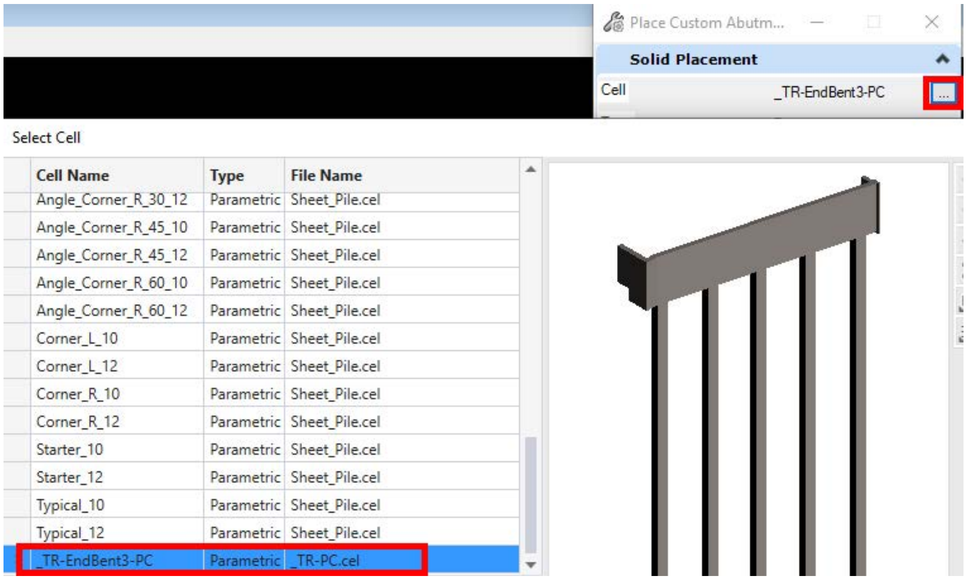


PLACE A PARAMETRIC CELL ABUTMENT

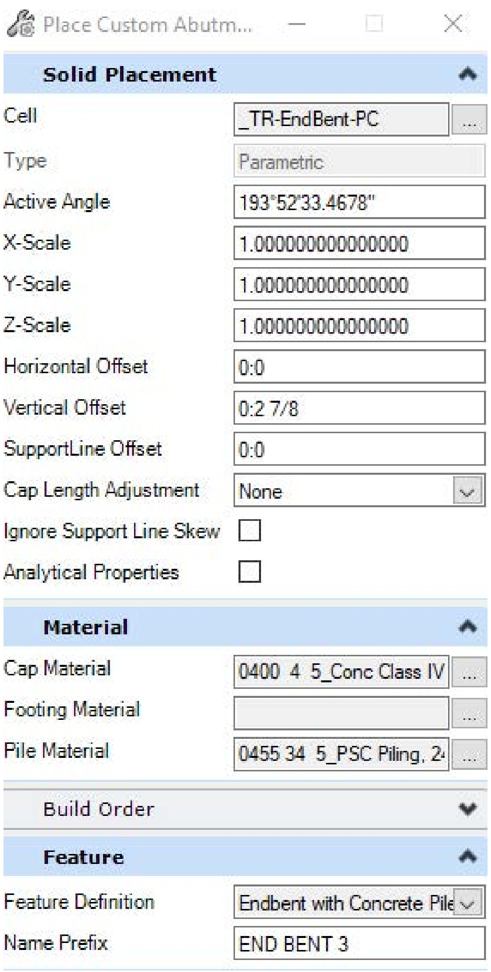
1. To begin the abutment placement switch to a top view and navigate to and select **Home > Substructure > Place Custom Abutment**.



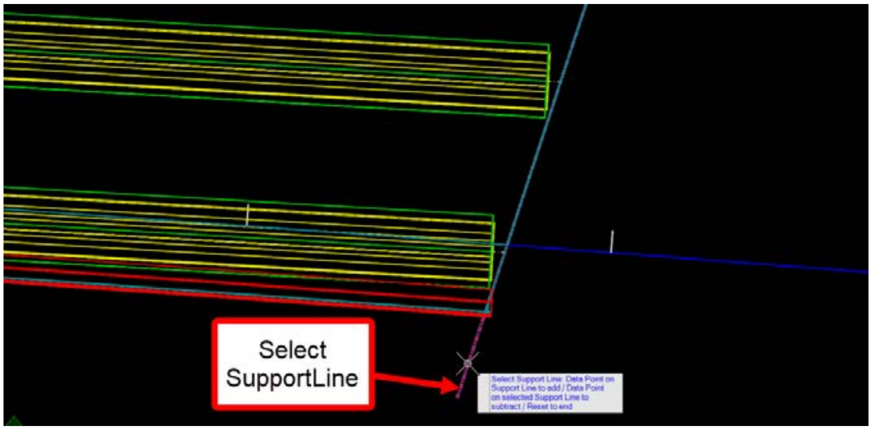
2. In the Place Custom Abutment window change the Cell Name to TR-EndBent3-PC.

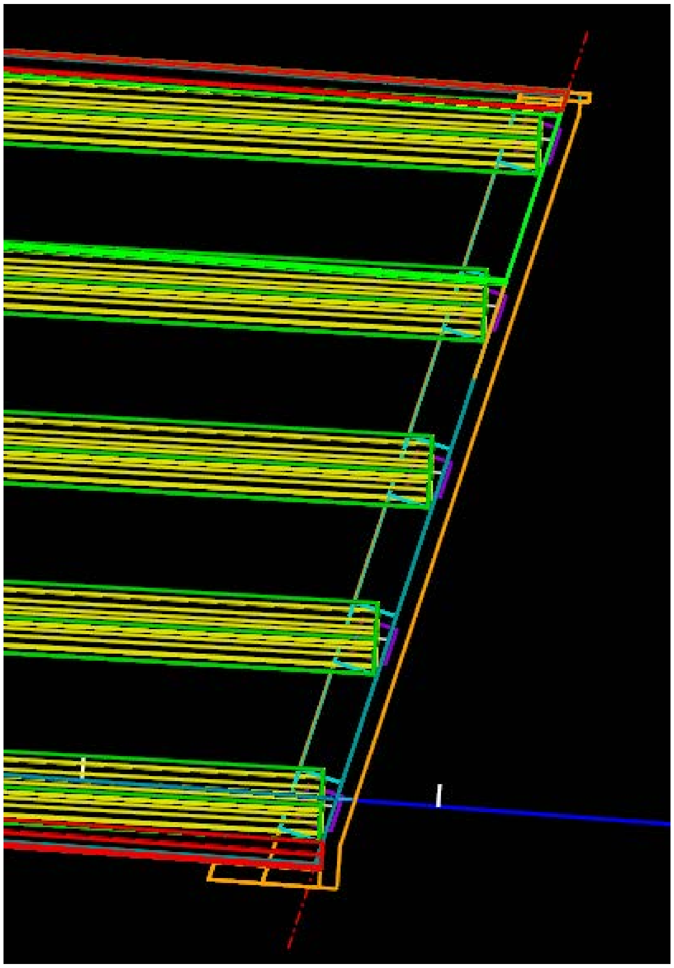


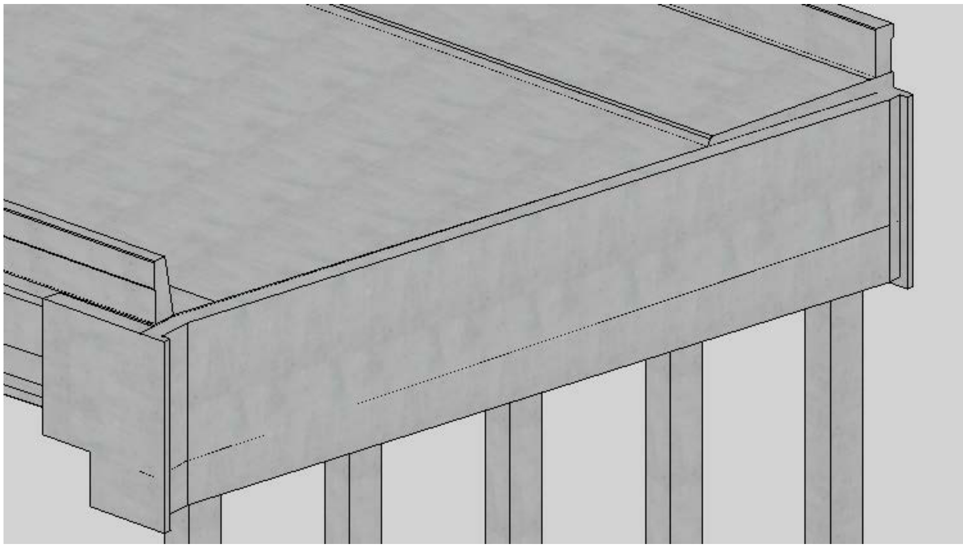
3. Verify that rest of the dialog box inputs match the image below. Note that the *Feature Definition* should be **Endbent with Concrete Pile. Note that Cap, Footing, and Pile Material options are all available even if not all elements exist in the chosen abutment template. For components not in the selected template, they can be left blank or filled in as placeholders by the user**



4. Select **FFBW End Bent 3** as the abutment location (*Select SupportLine*) and then right click again in open space to accept. The abutment should now be visible in the model view window.



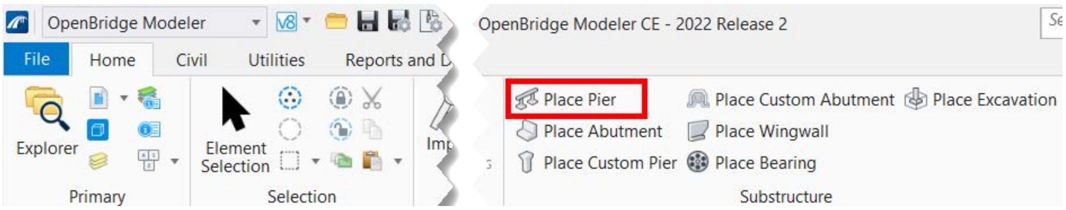




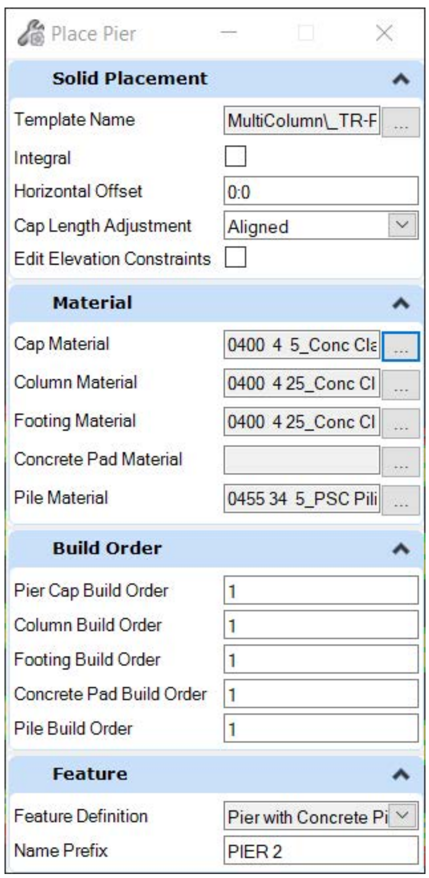
Exercise 5.8 *Model Pier and Bearings*

CREATE A PIER

1. Open the data set file: *B01MODLBRTR01_5.8_Begin*
2. To begin the pier placement for the previously created pier template, navigate to and select **Home > Substructure > Place Pier**.

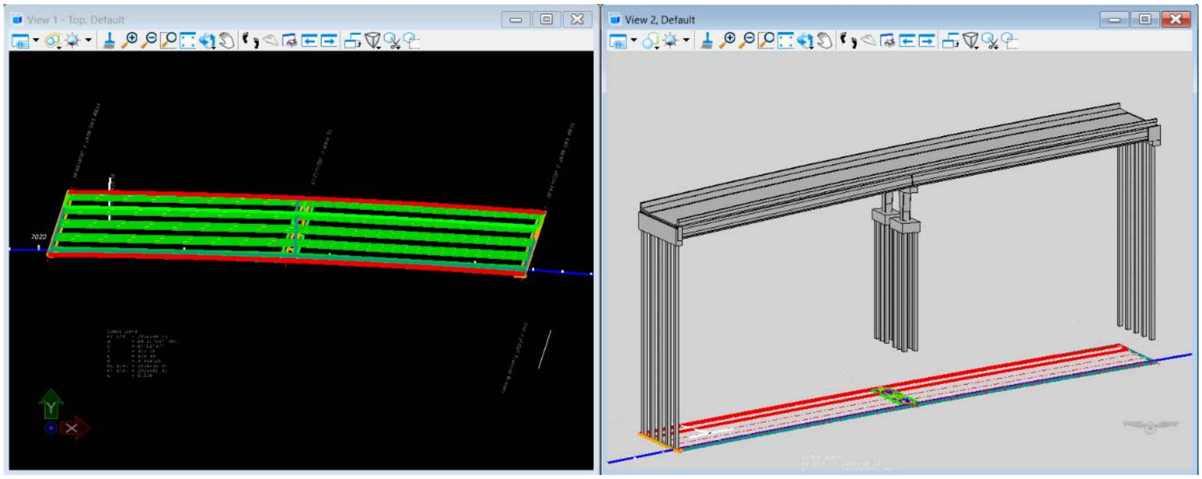


3. In the **Place Pier** window, select "…" next to the *Template Name* field and select the **_TR-Pier** template within the *MultiColumn > Default* folder of the templates library.
4. Fill in the rest of the input shown in the image below. Make sure that the *Feature Definition* is changed to **Pier with Concrete Pile**, the *Cap Length Adjustment* is set to **Aligned**, and the materials are selected as shown below. Note that Cap, Column, Footing, Concrete Pad, and Pile *Material* options are all available even if not all elements exist in the chosen pier template. In this example, *Concrete Pad Material* can be left blank.



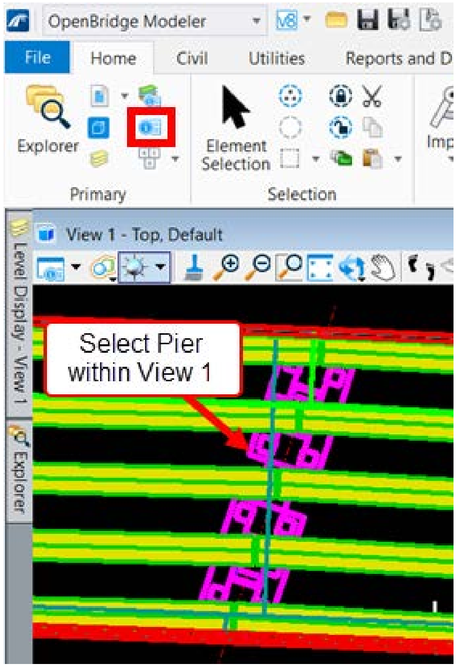
5. Select the **CL PIER 2** SupportLine as the pier location, and then right click to end the location selection. Note that more than one SupportLine can be selected to create multiple identical piers, although not needed in this example.

6. Data point to create the pier.

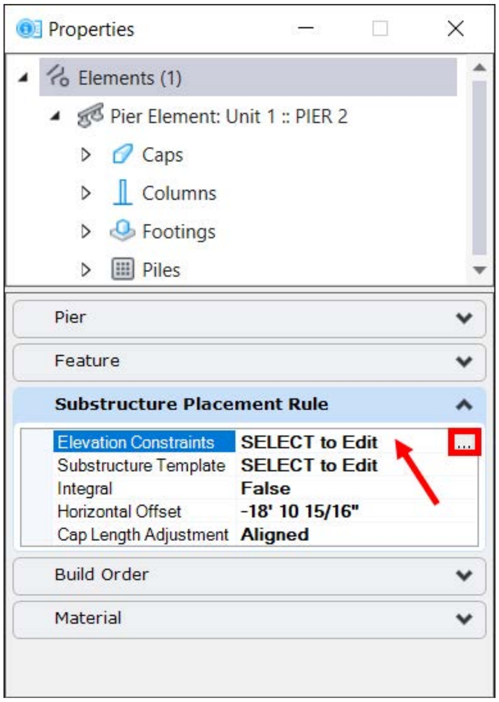


NOTE ***The view on the right can be obtained by opening View 2 and tiling the views by going to View > Window > Tile.***

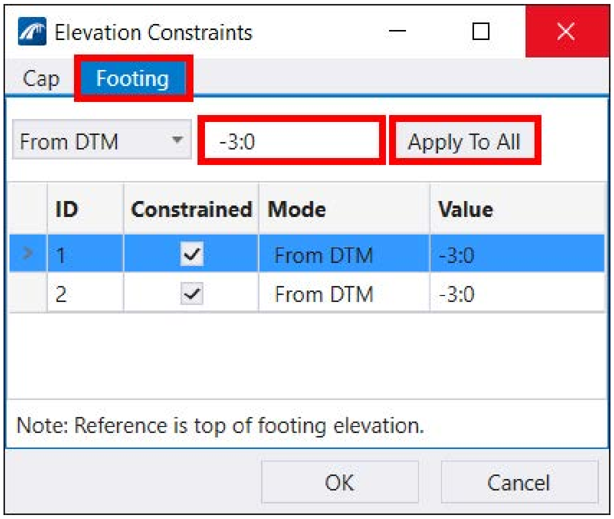
7. Next, we will set footing elevation constraints based on the terrain file. This will override the column length set in the template and elongate it based on the required cover to the footing. Select the pier in View 1 (which will highlight pink) and open the *Properties* window (**Home > Primary > Properties**).



8. Within the *Properties* window under *Substructure Placement Rule*, click **SELECT to Edit** next to *Elevation Constraints* and then click the ellipse (**…**) to open the *Elevation Constraints* window.

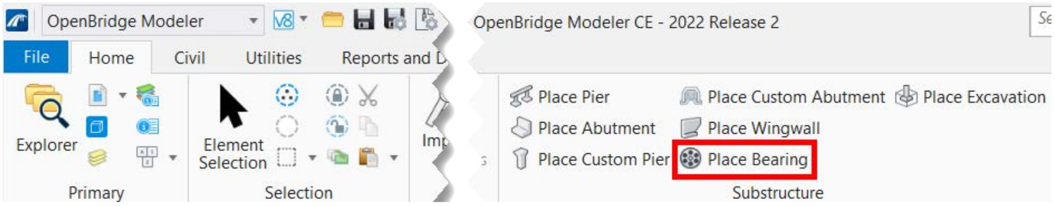


9. Click the **Footing** tab, make sure **From DTM** is selected from the dropdown, enter **-3:0**, and click **Apply to All**. This will set the value for both footings to -3:0 (i.e. 3 feet below the minimum terrain point within that particular footing). Click **OK** to close the window.

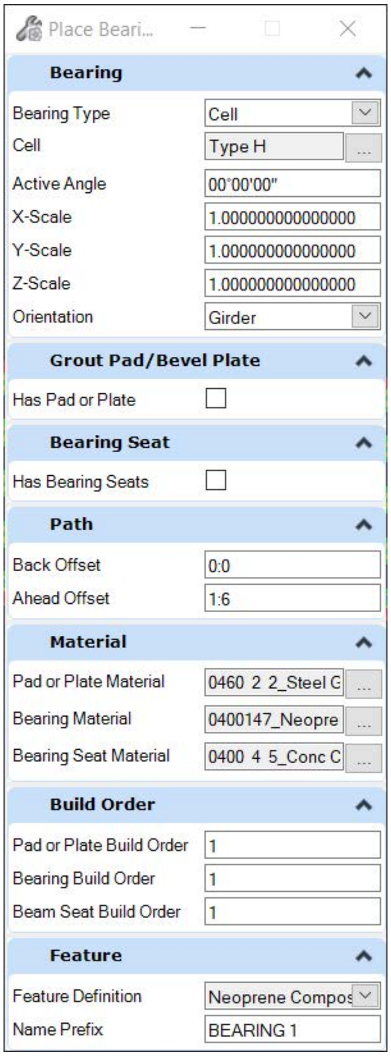


CREATE BEARING ELEMENTS

1. Add bearings to End Bent 1 by navigating to **Home > Substructure > Place Bearing.**

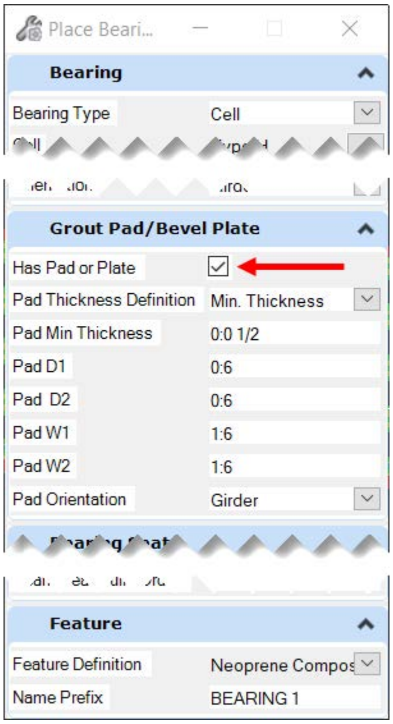


2. Fill in the **Place Bearing** window as shown below.

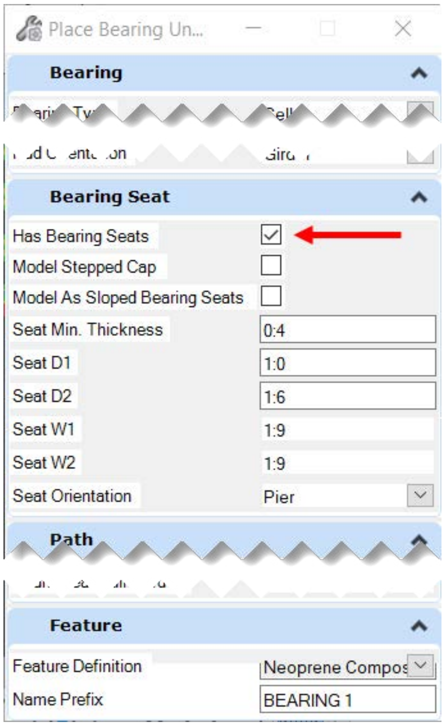


NOTE *In this example, the Bearing Type of Cell is used. The standard FDOT bearing pads (without reinforcement) can be selected. Currently, the cells are not compatible with the FDOT automated bridge quantities. Users can either use the cells and manually add the quantity or use a Bearing Type of Cube or Cylinder, which will also need to be used in the case of non-standard bearing pads.*

3. Check the box next to *Has Pad or Plate* and fill in the following input.

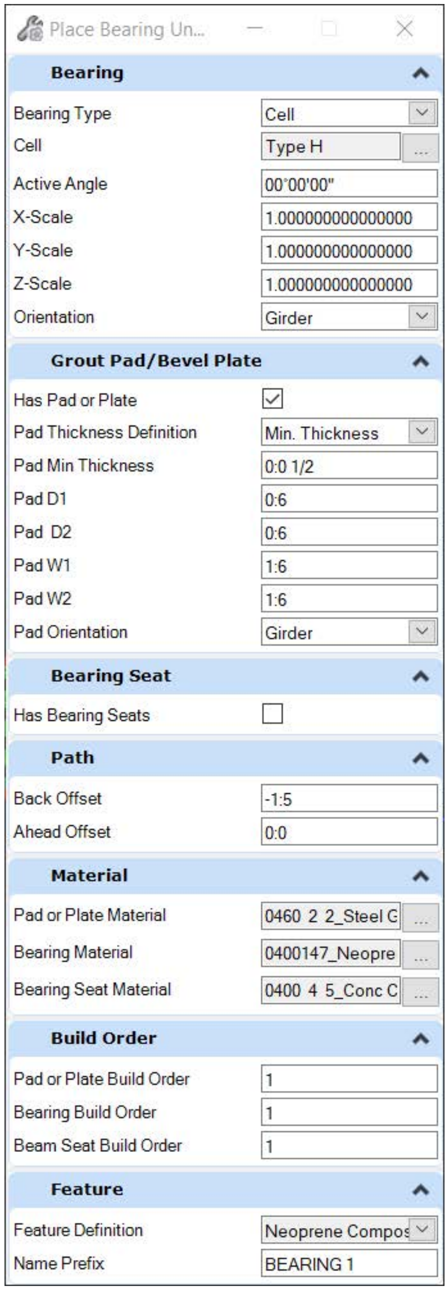


4. Check the box next to *Has Bearing Seats* and fill in the following input.



5. Select the **FFBW END BENT 1** SupportLine as the bearing location.
6. Right click to end SupportLine selection. Data point to place the bearings: bearing pads, beveled bearing plates, and beam seats (pedestals).

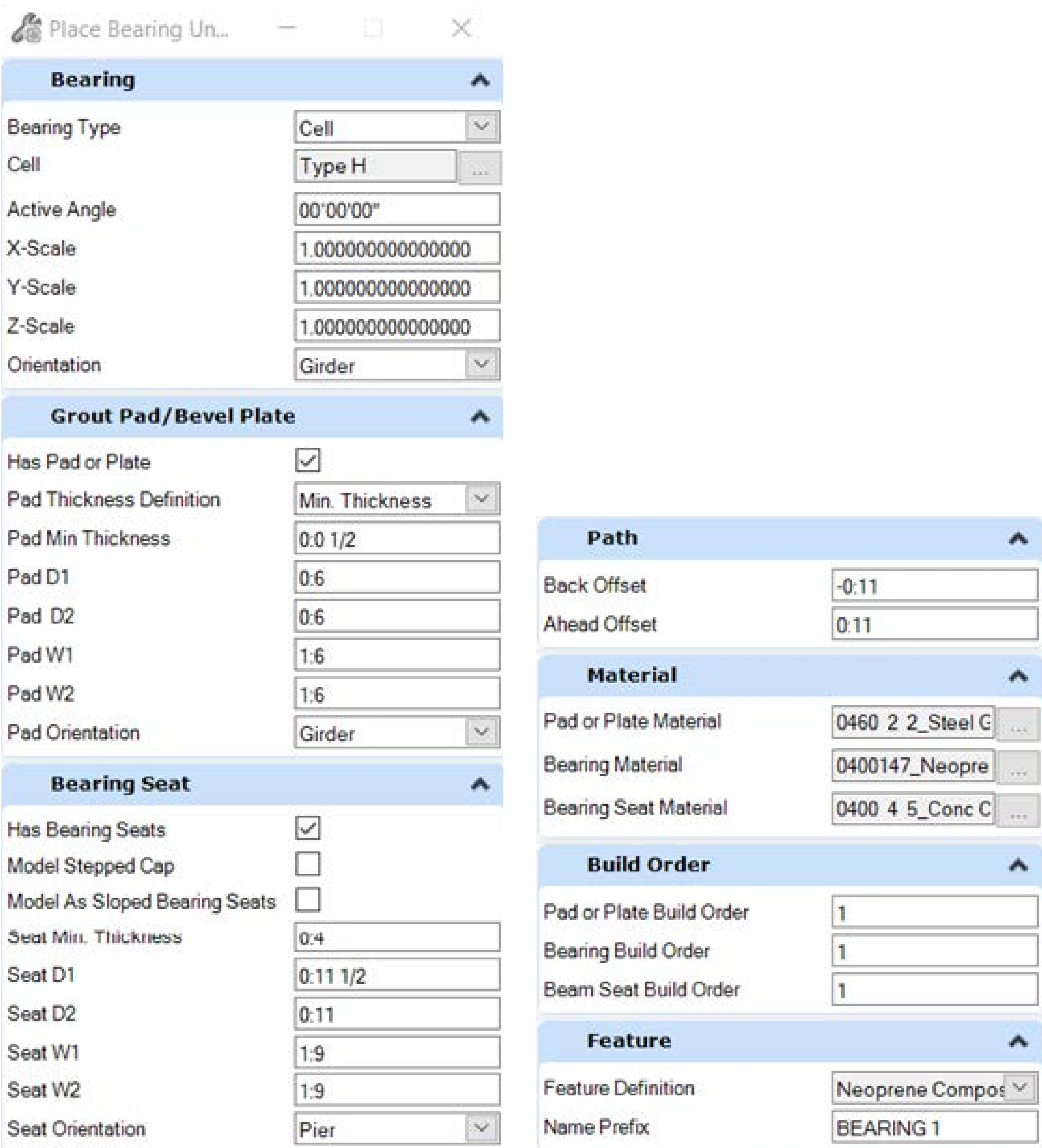
7. Now add the bearing pads and beveled bearing plates to End Bent 3. The pedestals will not be placed with the *Place Bearing* tool since they were incorporated into the parametric cell. Navigate again to **Home > Substructure > Place Bearing**. Fill in the window as shown below. *Has Bearing Seats* is unchecked and the *Back Offset* and *Ahead Offset* are different than End Bent 1.



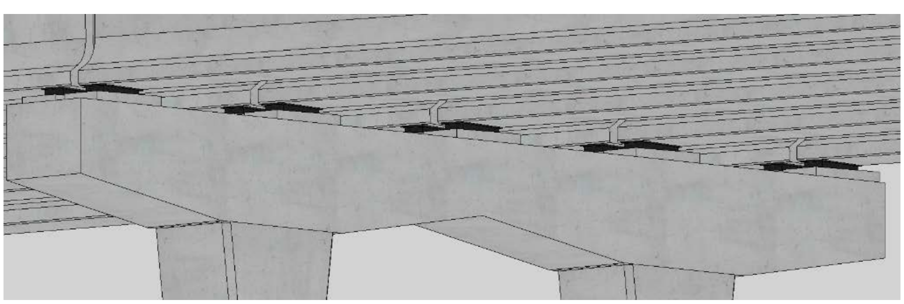
8. Select the **FFBW END BENT 3** SupportLine as the bearing location.

9. Right click to end SupportLine selection. Data point to place the bearings: bearing pads, beveled bearing plates, and beam seats (pedestals).

10. Now add the bearings to Pier 2 by again navigating to **Home > Substructure > Place Bearing**. Fill in the window as shown below.



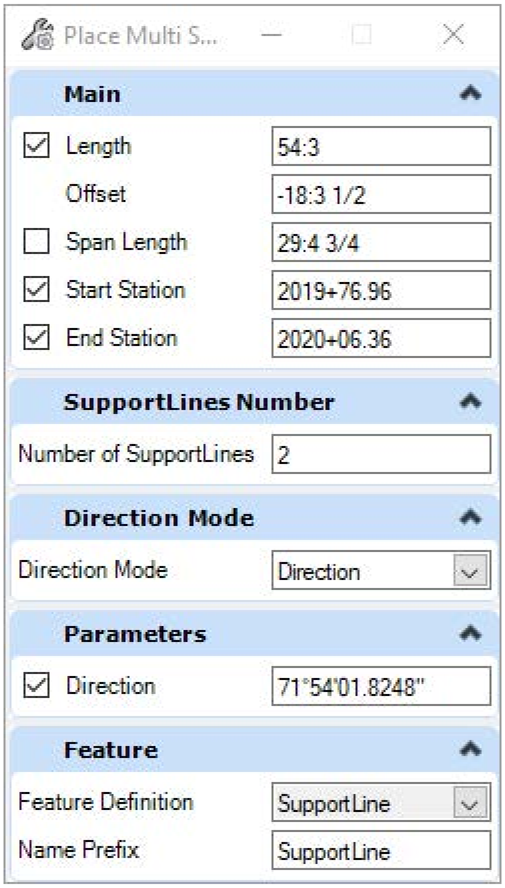
11. Select the **CL PIER 2** SupportLine as the bearing location. Right click to end SupportLine selection. Data point to place the bearings: bearing pads, beveled bearing plates, and beam seats (pedestals).



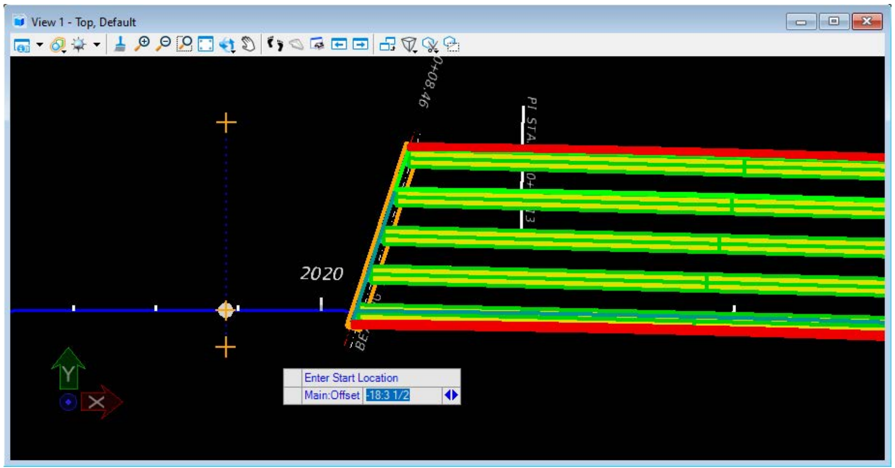
Exercise 5.9 *Create Approach Slabs*

CREATE APPROACH SLABS

1. Open the data set file: *B01MODLBRTR01_5.9_Begin.dgn*
2. Before placing the approach slab in the model at beginning of bridge, SupportLines must be placed to denote the limits of the approach slab. The approach slab requires two sections of deck: one section with a vertical offset required for the asphalt cover and one section for a no offset on top of the backwall. Therefore, two new SupportLines will need to be created by navigating to and selecting **Home > SupportLine > Place > Multi**. Note that if a rigid approach slab is used there is no need for two approach slab sections as no asphalt overlay needs to be accommodated.
3. Use the *Place Multi SupportLine* window with the *Direction Mode* set to **Direction** and verify the SupportLine information below. Input parameters are shown in the window below.

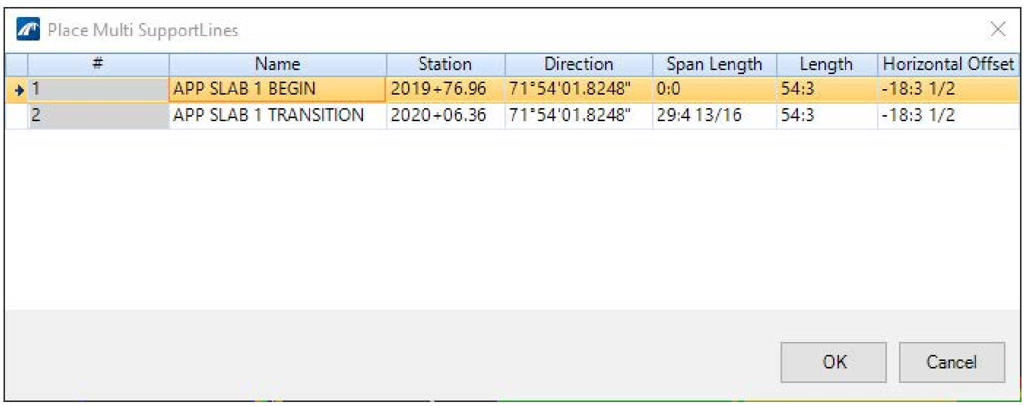


4. Once this information has been entered, the user can data point in open space to **Enter Start Location**.



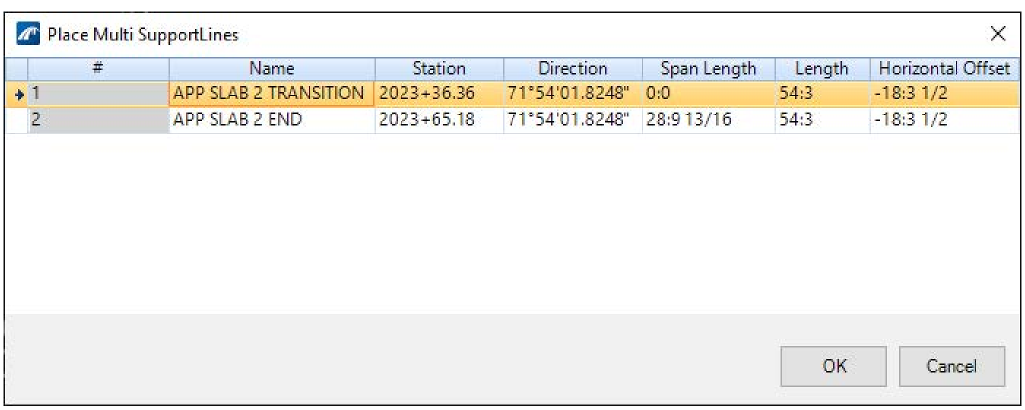
Data point again to **Enter Skew**. Then data point one last time to **Enter End Location**.

5. When the *Modify Multi SupportLines* window comes up, rename the new SupportLines to match what is shown in the image below. Then select **OK** to confirm the SupportLine data and close out of the *Modify Multi SupportLines* window.



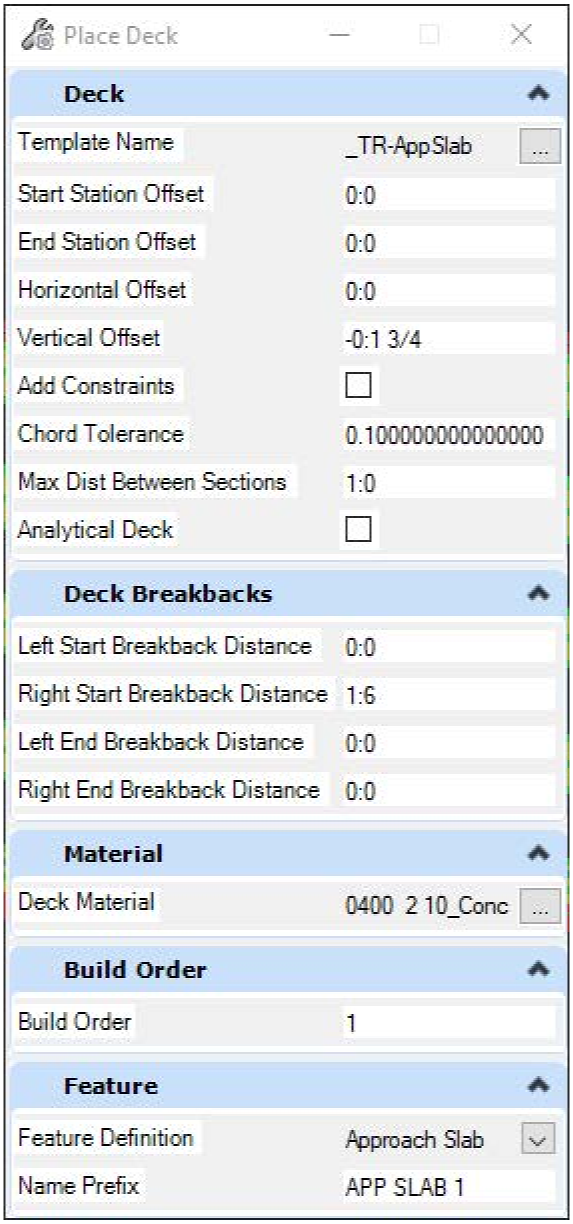
#	Name	Station	Direction	Span Length	Length	Horizontal Offset
1	APP SLAB 1 BEGIN	2019+76.96	71°54'01.8248"	0:0	54:3	-18:3 1/2
2	APP SLAB 1 TRANSITION	2020+06.36	71°54'01.8248"	29:4 13/16	54:3	-18:3 1/2

6. Repeat steps 2 through 5 to create the SupportLines for the approach slab at the end of the bridge. The *Start Station* and *End Station* should be **2023+36.36** and **2023+65.18**, respectively. Once the names are updated to match below, click **OK** to confirm the SupportLine data.

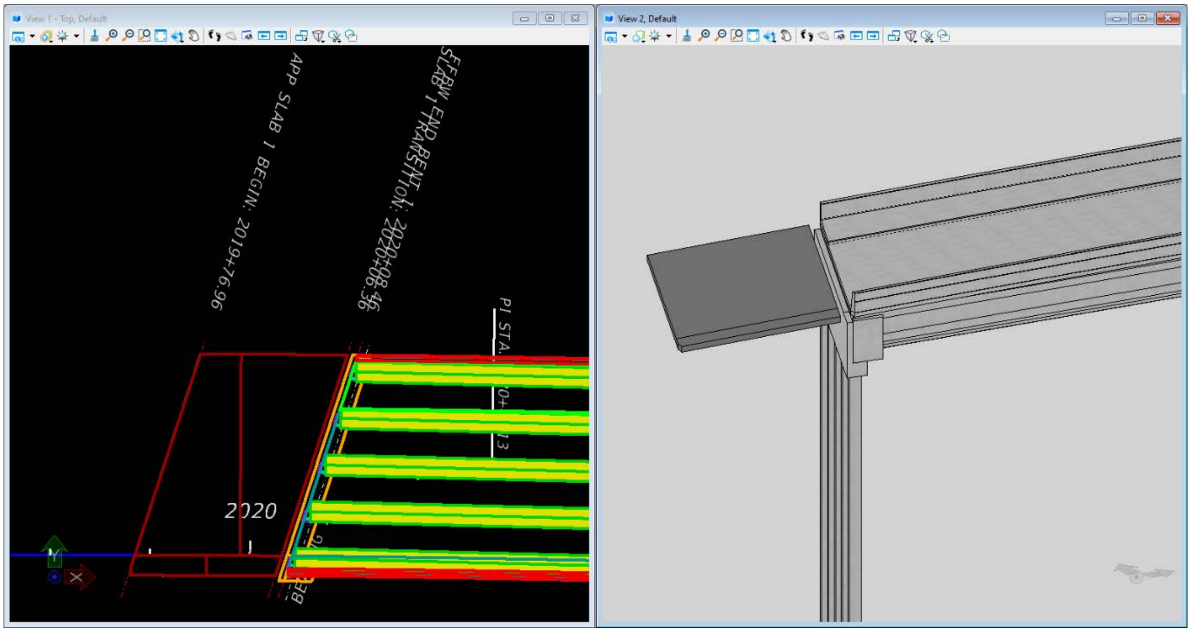


#	Name	Station	Direction	Span Length	Length	Horizontal Offset
1	APP SLAB 2 TRANSITION	2023+36.36	71°54'01.8248"	0:0	54:3	-18:3 1/2
2	APP SLAB 2 END	2023+65.18	71°54'01.8248"	28:9 13/16	54:3	-18:3 1/2

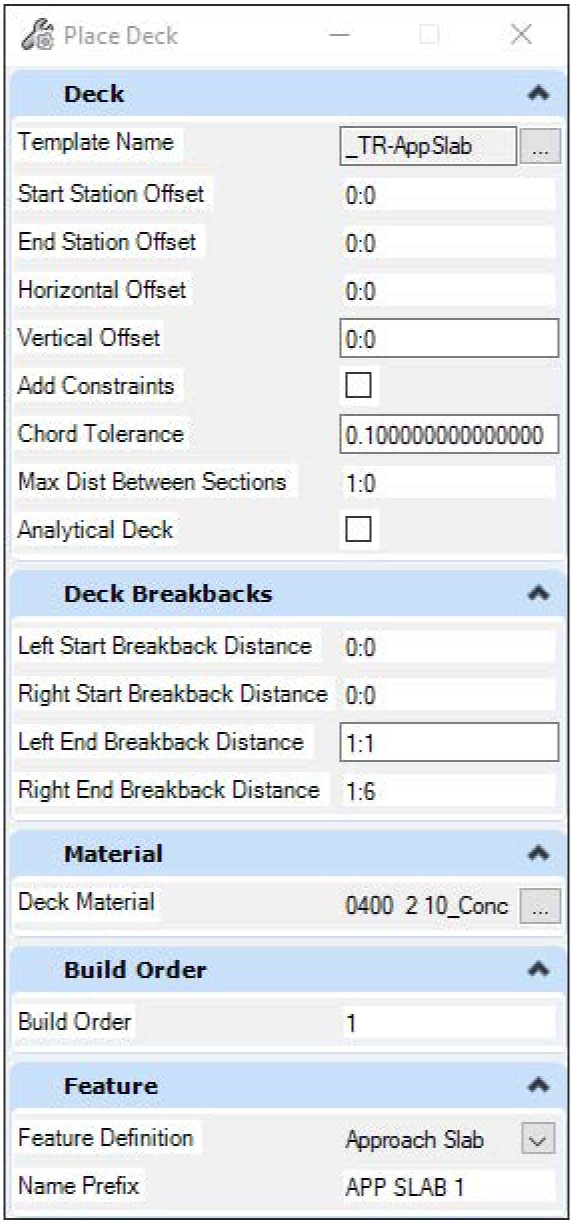
7. With the SupportLines all in place, the approach slabs are ready to be modeled. Using the second method discussed earlier in the APPROACH SLABS section of this manual, the approach slab will be created using the **Place Deck** tool. Navigate to and select **Home > Superstructure > Place Deck**. This approach slab will use a negative vertical offset to account for the 1.75” asphalt layer. Use the **_TR-AppSlab** template that was created in Exercise 5.1 and the **Approach Slab** features definition. Match the information window shown in the image below.



8. Begin placing the approach slab by selecting the limits of the approach slab. Select the first deck boundary by left clicking on the **APP SLAB 1 BEGIN** SupportLine and select the **APP SLAB 1 TRANSITION** SupportLine as the second deck boundary. Data point to accept the orientation, and the approach slab will appear in the model.

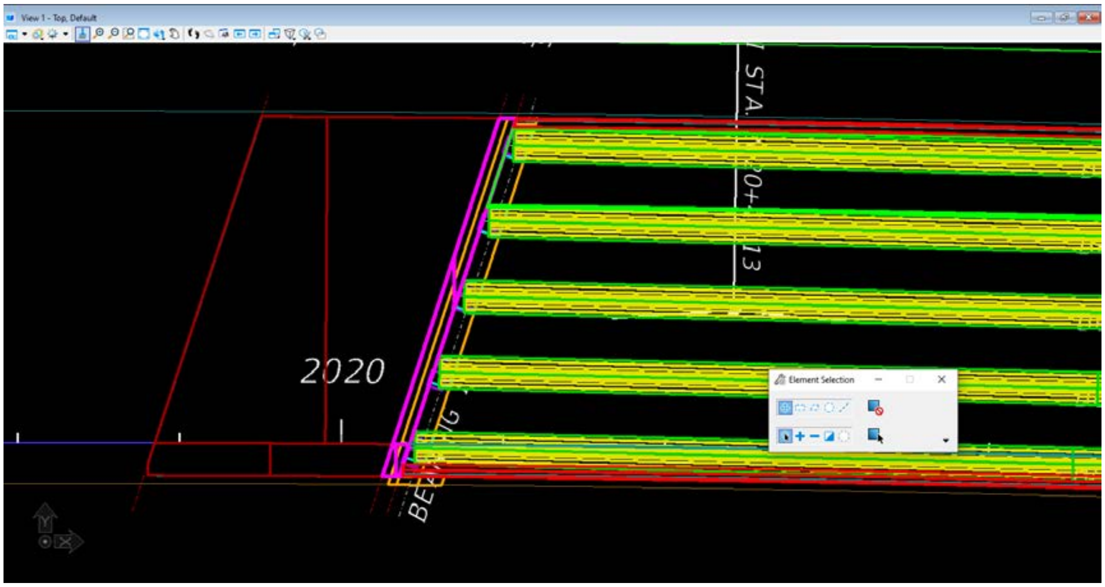


9. Repeat the process for the 2ft approach slab transition segment, selecting the **APP SLAB 1 TRANSITION** and **FFBW END BENT 1** SupportLines as the limits and using the information below.

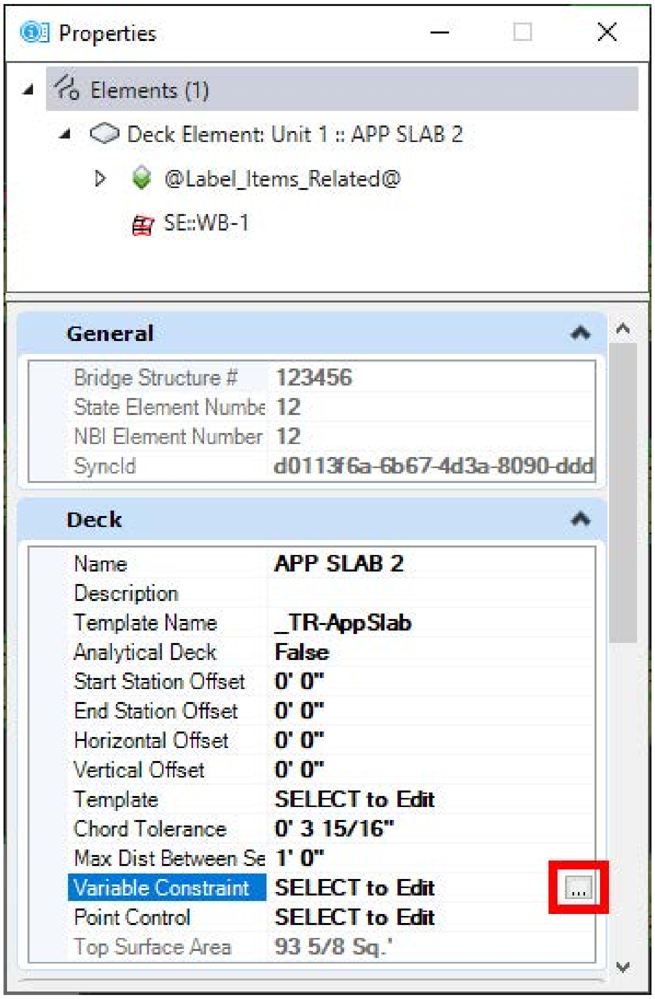


10. The thickness of the 2ft approach slab transition segment needs to be changed 1'-1¾" so that the bottom of slab matches the 28ft segment that was vertically offset for the asphalt. However, the **Assign Superelevation** tool must be used before changing any other variable constraints. Repeat Step 6 through Step 11 in the "Create a Bridge and Add a Bridge Deck" portion of Exercise 5.5 for both segments of the begin approach slab.

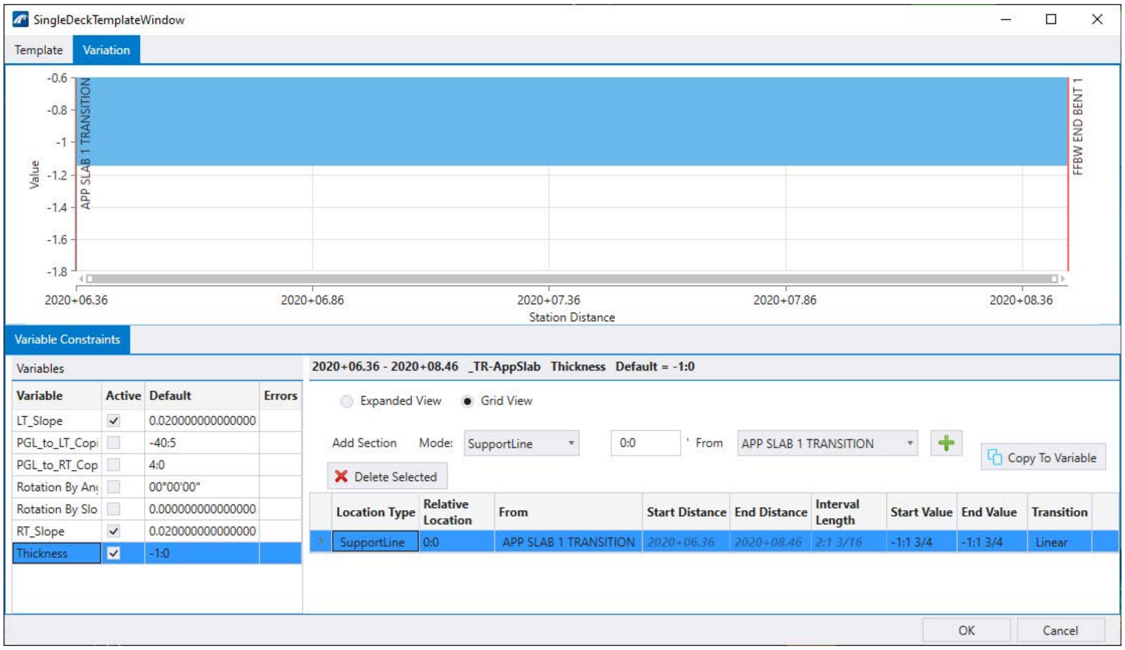
11. Once superelevation has been applied to both segments, turn off the Superelevation reference file and click on the 2ft transition segment of the approach slab so that it is highlighted, as shown in the following image.



12. Access the component's properties using the **Home > Primary > Properties** tool. Then, click on the "**…**" next to the *Variable Constraints* field.



13. Once in the variable constraints of the approach slab, toggle the *Thickness* variable to **Active**. Next, add a section with the *Mode* as **SupportLine** and running *From* **APP SLAB 1 TRANSITION**. Set both the *Start Value* and *End Value* to be **-1:1 3/4**. Click **OK** to confirm the inputs and update this segment of approach slab.



NOTE ***1) Check mark Active indicates that the variable is changed. Highlighted in blue means that the variable is in editing mode.***

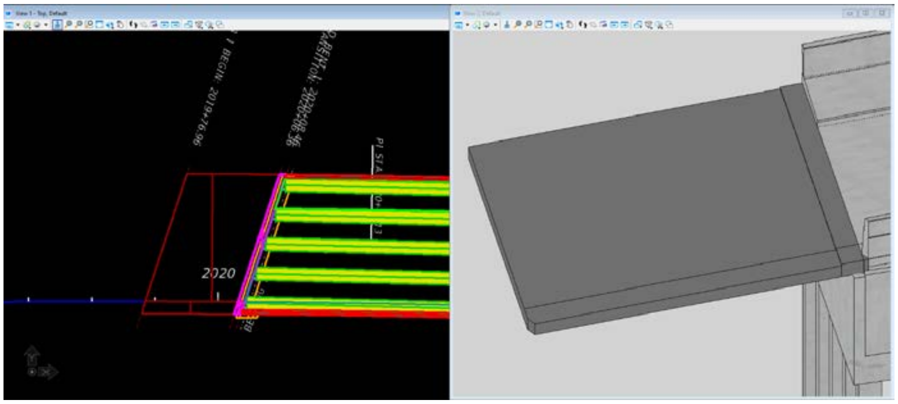
2) Use the green plus button to add additional constraints.

3) Top graphical view verifies accuracy.

14. See below for summary of approach slab data used in the exercise.

	Approach Slab Data (ft)			
Span	Vertical Offset	Thickness	Right Start Breakback Distance	Right End Breakback Distance
28ft Asphalt Overlay Segment	-0:1 3/4	-1:0	1:6	0:0
2ft Transition Segment	0	-1:1 3/4	0:0	1:6

15. The slab segments should appear as shown below.



16. Repeat Steps 2 through 13 for the end bridge approach slab. Use inputs from the table below.

Exercise 5.9 - Create Approach Slabs			
Create Approach Slabs			
Step	***Window***	***Field Name (Section)***	***Field Input***
16	Place Deck (End Approach Slab - 2ft Transition Segment)	Template Name (Deck)	_TR-AppSlab
		Vertical Offset (Deck)	0:0
		Left Start Breakback Distance (Deck Breakbacks)	0:0
		Right Start Breakback Distance (Deck Breakbacks)	1:6
		Left End Breakback Distance (Deck Breakbacks)	0:0
		Right End Breakback Distance (Deck Breakbacks)	0:0
		Deck Material (Material)	0400 2 10_Conc Class II, Approach Slabs
		Feature Definition (Feature)	Approach Slab
		Name Prefix (Features)	APP SLAB 3
		SupportLines	FFBW END BENT 3 to APP SLAB 2 TRANSITION
	Place Deck (End Approach Slab - 28ft Asphalt Overlay Segment)	Template Name (Deck)	_TR-AppSlab
		Vertical Offset (Deck)	-0:1 3/4
		Left Start Breakback Distance (Deck Breakbacks)	0:0
		Right Start Breakback Distance (Deck Breakbacks)	0:0
		Left End Breakback Distance (Deck Breakbacks)	0:0
		Right End Breakback Distance (Deck Breakbacks)	1:6
		Deck Material (Material)	400 2 10_Conc Class II, Approach Slabs
		Feature Definition (Feature)	Approach Slab
		Name Prefix (Features)	APP SLAB 4
		SupportLines	APP SLAB 2 TRANSITION to APP SLAB 2 END

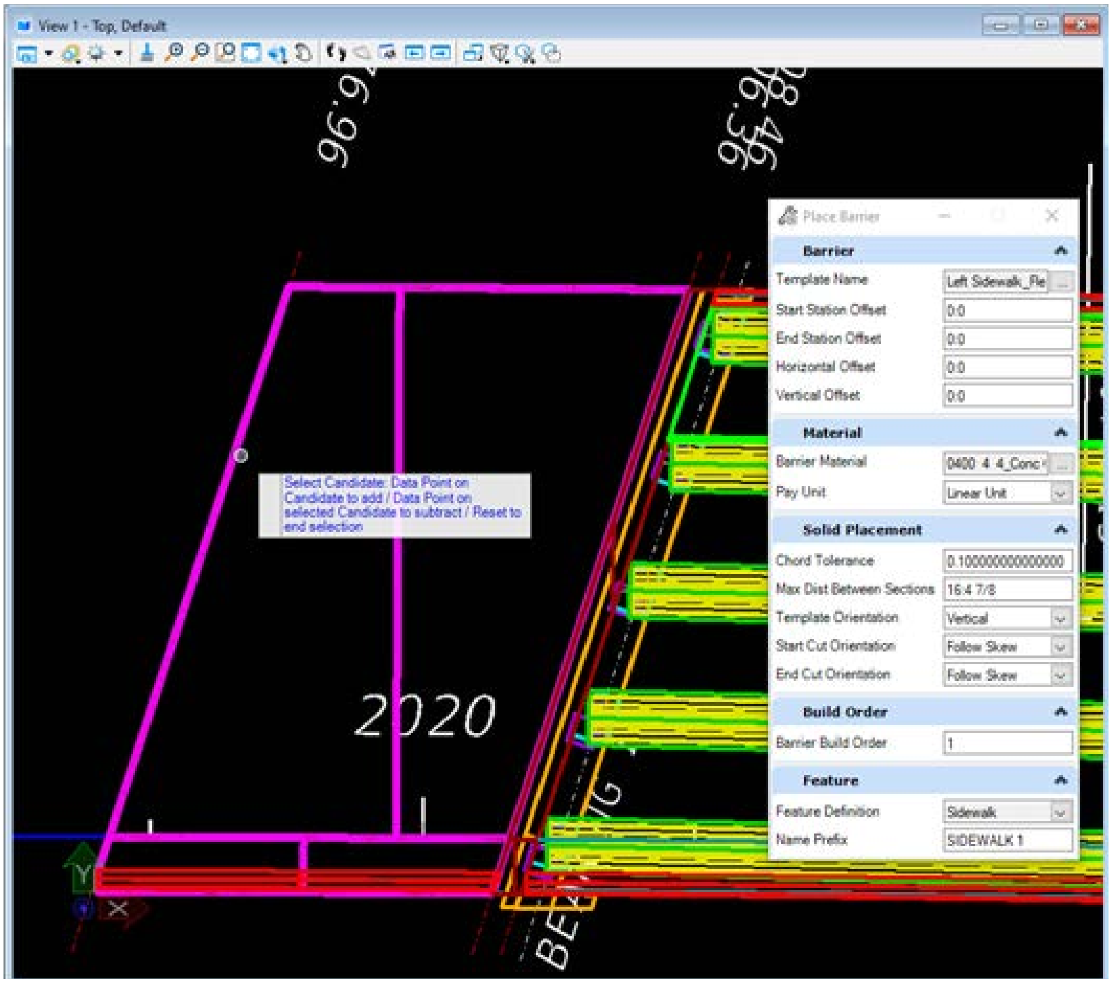
CREATE SIDEWALK

1. The last step is to place the sidewalks and barriers on the approach slabs. To start, Create the bridge sidewalk by navigating to **Home > Accessory > Place Barrier**

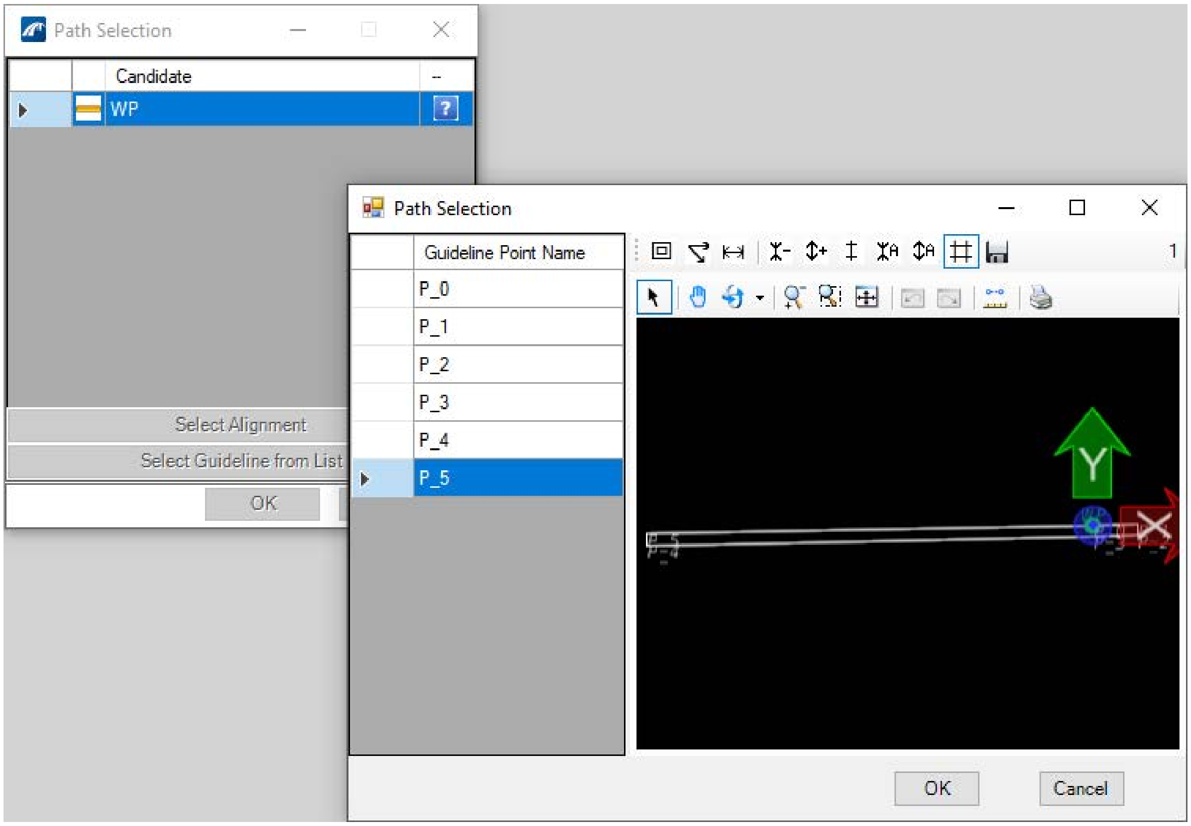
2. Next, select the 28ft asphalt overlay segment of the begin approach slab (APP SLAB 1) that was created as the “Candidate”.

3. To accommodate for the vertical offset of the 28ft segment of the approach slabs, there are special barrier and sidewalk templates created for each side that are slightly thicker at the base. Access the template selection through the *Template Name* field and select the **Left Sidewalk_Flex AP** template under the *Sidewalks* folder.

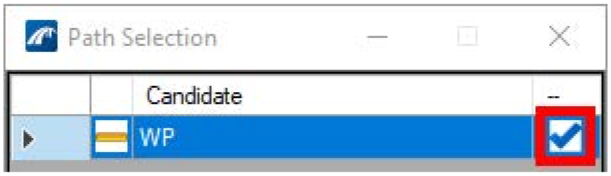
4. Ensure that the *Horizontal Offset* to **0:0**. Update the *Barrier Material* to **0400 4 4_Conc Class IV Super** and *Feature Definition* to **Sidewalk**. Lastly, ensure that the respective *Start Cut Orientation* and *End Cut Orientation* are both set to **Follow Skew**.



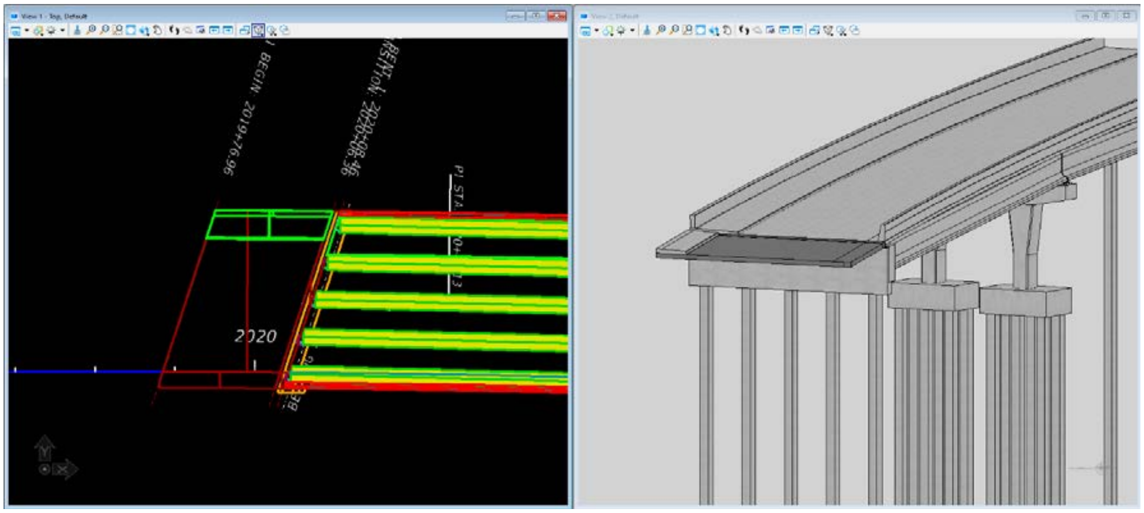
5. Reset (right click) to end selection and then data point to continue.
6. In the *Path Selection* window select **Select Guideline from List**, then select **P_5** from the list of *Guideline Point Names* and click **OK**.



7. Verify that the blue check mark is showing in the *Path Selection* window and then click **OK** to place the barrier.

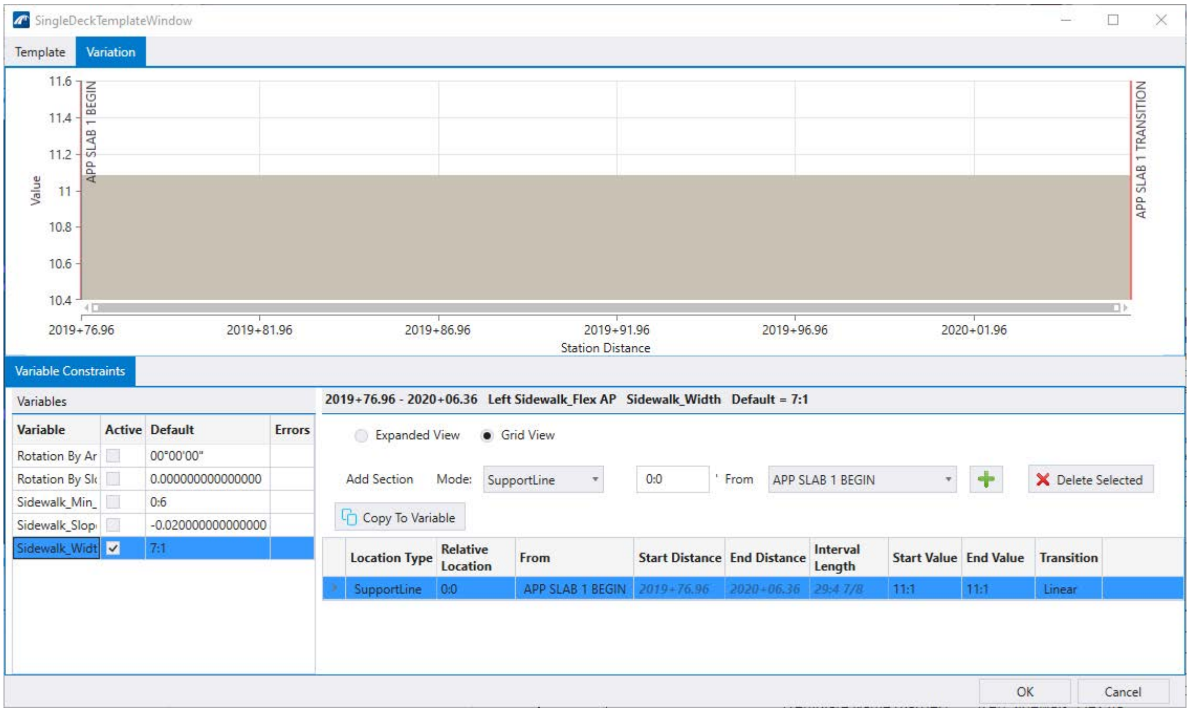


8. The sidewalk will be displayed on top of the approach slab.



9. Select the previously created sidewalk and access the component's properties using the **Home > Primary > Properties** tool. Then, click on the "**…**" next to the *Variable Constraints* field.

10. In the variable constraints of the sidewalk, toggle *Sidewalk_Width* variable to **Active**. Next, add a section with the *Mode* as **SupportLine** and running *From* **APP SLAB 1 BEGIN**. Set both the *Start Value* and *End Value* to be **11:1**. Click **OK** to confirm the inputs and update this segment of sidewalk.



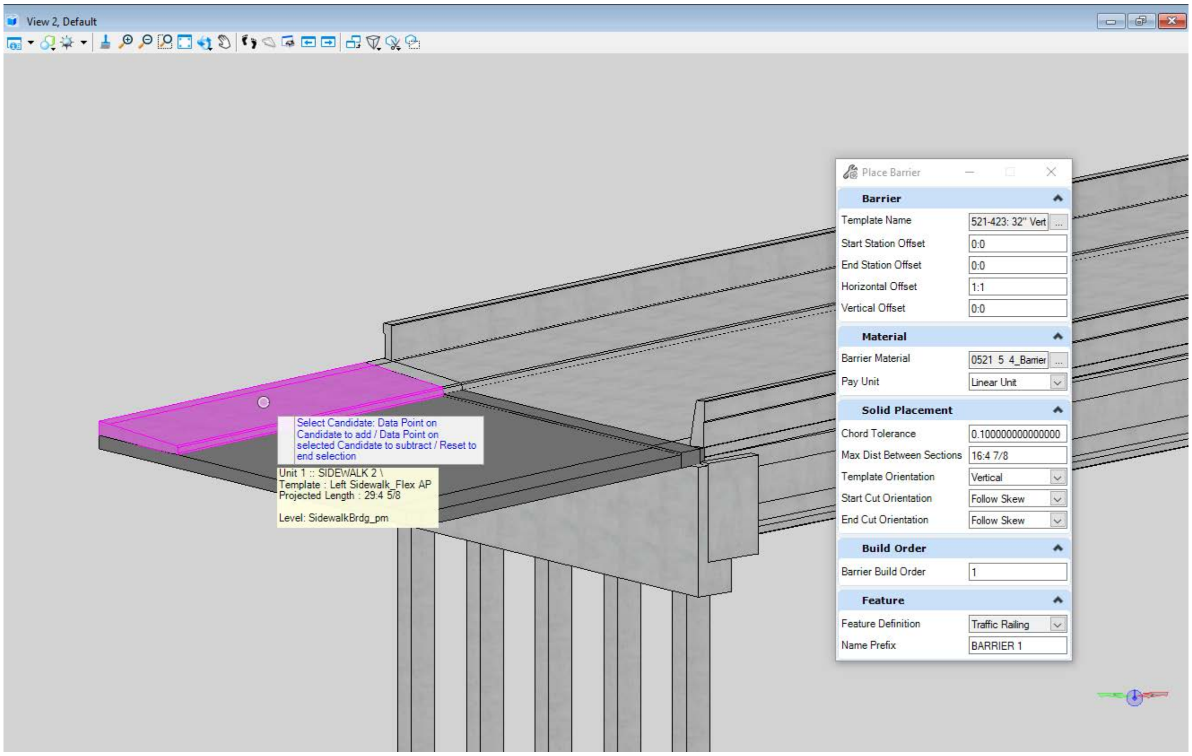
Repeat Steps 1 through 10 for the sidewalk on other segments of the bridge approach slabs. Use inputs from the table below.

Exercise 5.9 - Create Approach Slabs			
Create Sidewalk			
Step	***Window***	***Field Name (Section)***	***Field Input***
11	Place Barrier (Begin Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	Left Sidewalk
		Horizontal Offset (Barrier)	0:0
		Barrier Material (Material)	0400 4 4_Conc Class IV, Super
		Feature Definition (Feature)	Sidewalk
		Name Prefix (Features)	SIDEWALK 3
		Candidate	APP SLAB 2 (Begin Approach Slab - 2ft Segment)
	Place Barrier (End Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	Left Sidewalk
		Horizontal Offset (Barrier)	0:0
		Barrier Material (Material)	0400 4 4_Conc Class IV, Super
		Feature Definition (Feature)	Sidewalk
		Name Prefix (Features)	SIDEWALK 4
		Candidate	APP SLAB 3 (End Approach Slab - 2ft Segment)
	Place Barrier (End Approach Slab - 28ft Asphalt Overlay Segment)	Template Name (Barrier)	Left Sidewalk_Flex AP
		Horizontal Offset (Barrier)	0:0
		Barrier Material (Material)	0400 4 4_Conc Class IV, Super
		Feature Definition (Feature)	Sidewalk
		Name Prefix (Features)	SIDEWALK 5
		Candidate	APP SLAB 4 (End Approach Slab - 28ft Segment)

CREATE BARRIERS

1. Create the left bridge barrier by navigating to **Home > Accessory > Place Barrier**

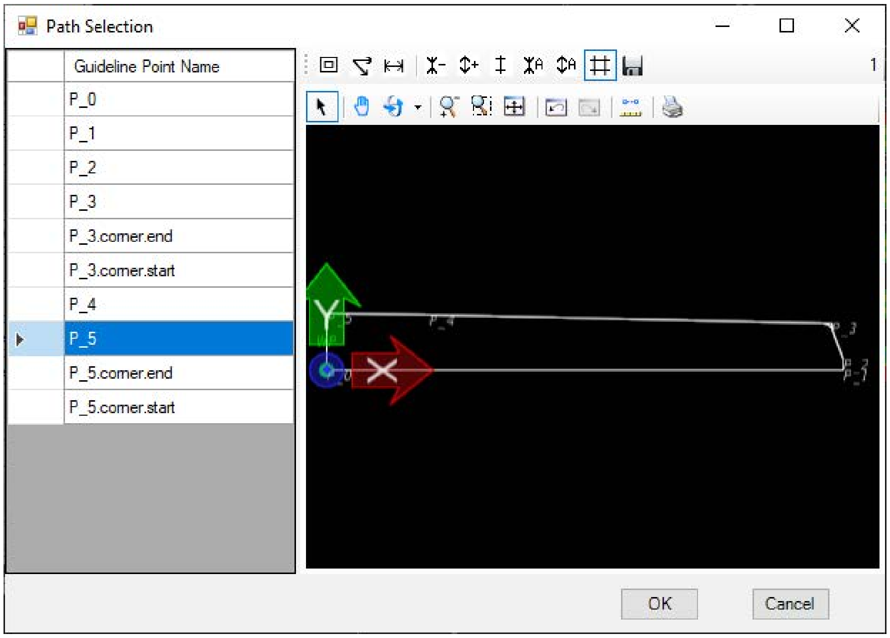
2. Next select the sidewalk on the 28ft asphalt overlay segment of the begin approach slab (SIDEWALK 2) as the “Candidate” and fill out the *Place Barrier* window as shown in the figure below. For *Template Name* select the **521-423: 32” Vertical Shape L** under the FDOT folder. Note that the working point (WP) for this barrier is at the gutterline which is why the *Horizontal Offset* needs to be set to **1:1**. For *Barrier Material*, select **0521 5 4_Barrier 32” Vertical Face** and select **Traffic Railing** for the *Feature Definition.*



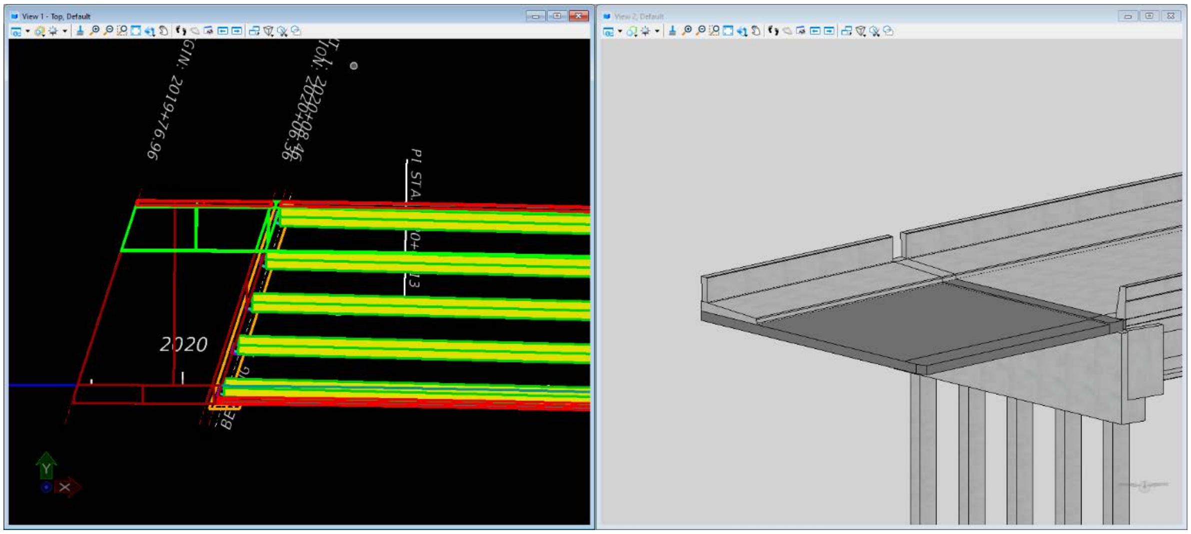
3. End the candidate selection by right-clicking and then data point in open space. This will open the *Path Selection* window.

4. Click on **Select Guideline from List** to open the selection window.

5. Select **P_5** from the list and click **OK**.



6. Verify that the blue check mark is showing next to the **WP** in the *Path Selection* window and click **OK**.
7. The barrier will be displayed on top of the sidewalk.

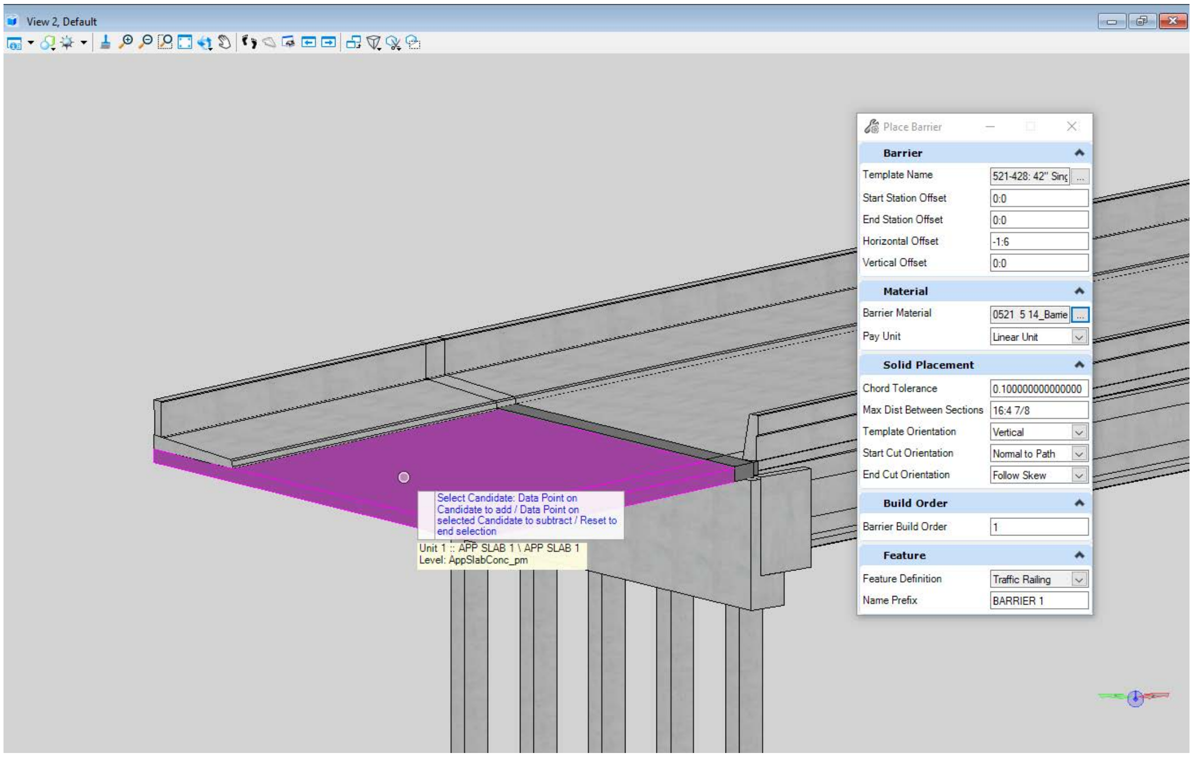


8. Repeat Steps 2 through 6 for the left barrier on other segments of the bridge approach slabs. Use inputs from the table below.

Exercise 5.9 - Create Approach Slabs			
Create Barriers			
Step	***Window***	***Field Name (Section)***	***Field Input***
8	Place Barrier (Begin Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	521-423: 32" Vertical Shape L
		Horizontal Offset (Barrier)	1:1
		Barrier Material (Material)	0521 5 4_Barrier 32" Vertical Face
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 4
		Candidate	SIDEWALK 3 (Begin Approach Slab - 2ft Segment)
		Path Selection Guideline	P_4
	Place Barrier (End Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	521-423: 32" Vertical Shape L
		Horizontal Offset (Barrier)	1:1
		Barrier Material (Material)	0521 5 4_Barrier 32" Vertical Face
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 5
		Candidate	SIDEWALK 4 (End Approach Slab - 2ft Segment)
		Path Selection Guideline	P_4
	Place Barrier (End Approach Slab - 28ft Asphalt Overlay Segment)	Template Name (Barrier)	521-423: 32" Vertical Shape L
		Horizontal Offset (Barrier)	1:1
		Barrier Material (Material)	0521 5 4_Barrier 32" Vertical Face
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 6
		Candidate	SIDEWALK 5 (End Approach Slab - 28ft Segment)
		Path Selection Guideline	P_5

9. The last component to add to the approach slabs is the right bridge barrier. Again, navigate to **Home > Accessory > Place Barrier** if it is not already open.

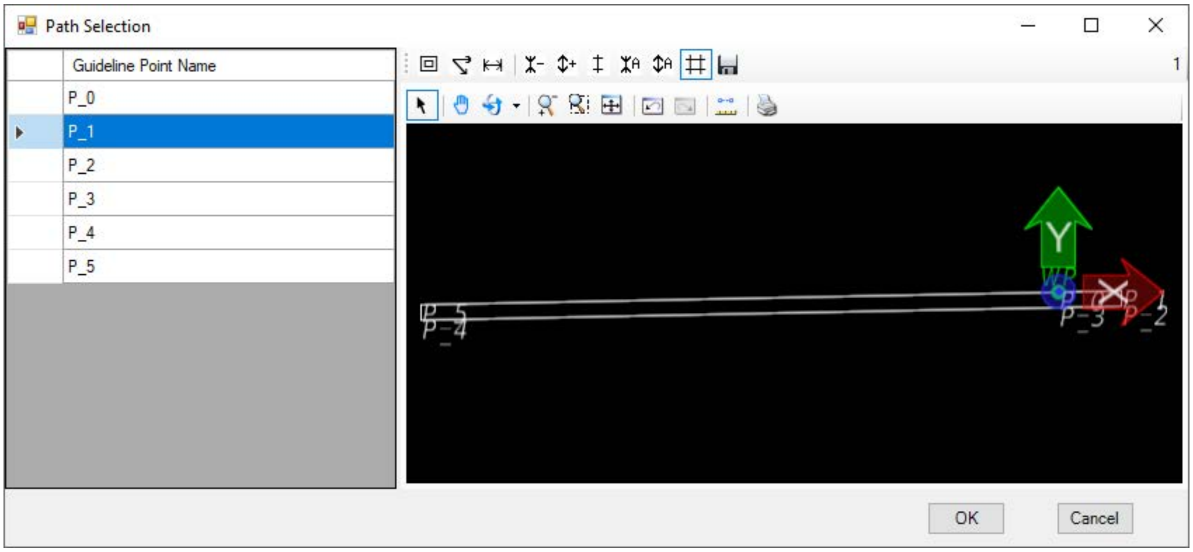
10. Next, select the 28ft asphalt overlay segment of the begin approach slab (APP SLAB 1) as the "Candidate" and fill out the *Place Barrier* window as shown in the following image. For *Template Name* select the **521-428: 42" Single Slope R - Flex AP** under the FDOT folder. For *Barrier Material* select **0521 5 14_Barrier 42" Single Slope** and select **Traffic Railing** for the *Feature Definition.* Note that the *Start Cut Orientation* was changed to **Normal to Path** to account for the deck breakbacks.



11. End the candidate selection by right-clicking and then data point in open space. This will open the *Path Selection* window.

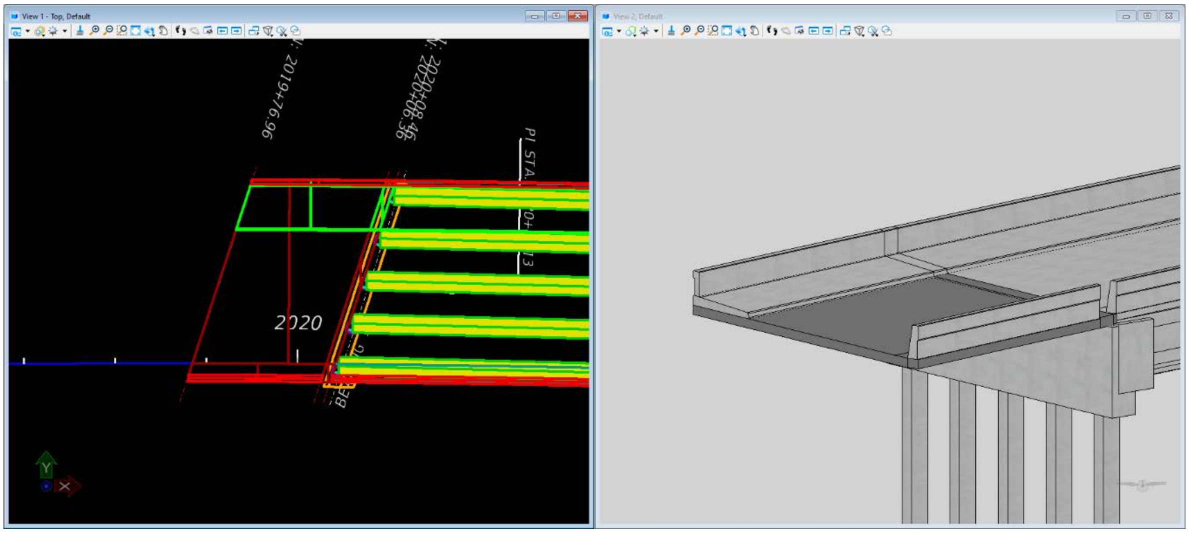
12. Click on **Select Guideline from List** to open the selection window.

13. Select **P_1** from the list and hit **OK**.



14. Verify that the blue check mark is showing next to the **WP** in the *Path Selection* window and click **OK**.

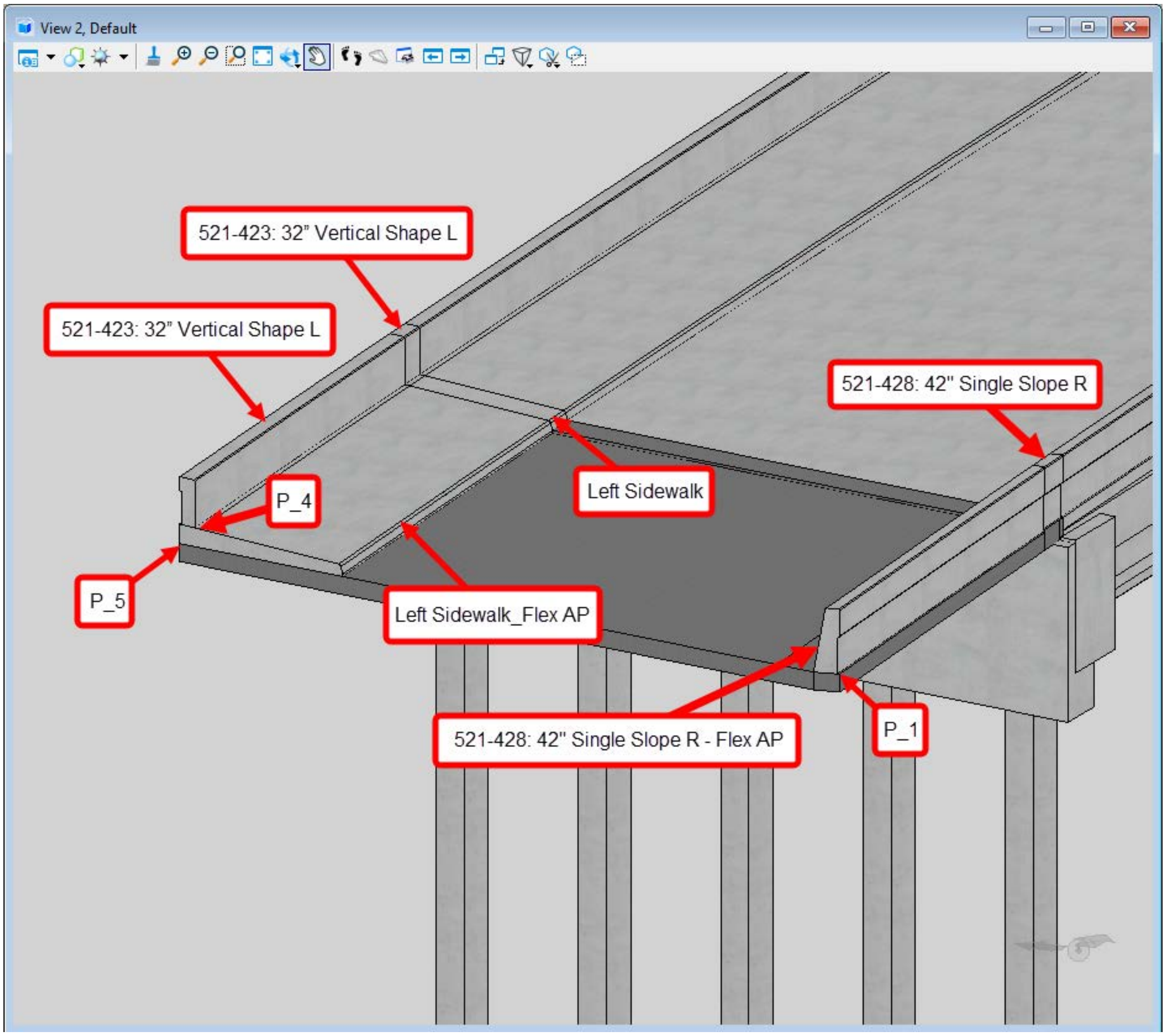
15. The barrier will be displayed on top of the sidewalk.



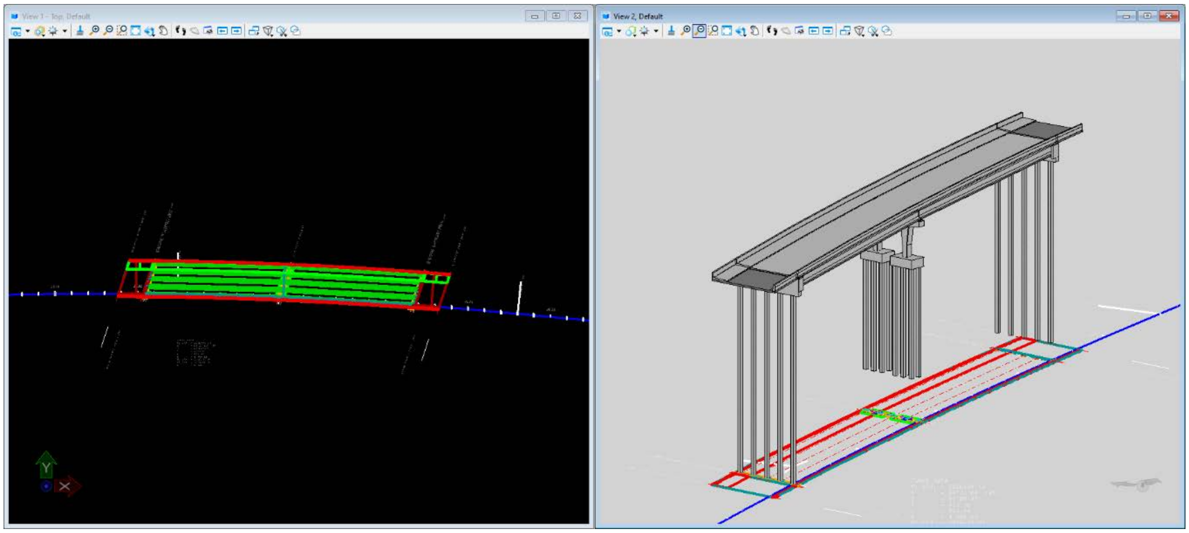
16. Repeat Steps 9 through 14 for the right barrier on other segments of the bridge approach slabs. Use inputs from the table below.

Exercise 5.9 - Create Approach Slabs			
Create Barriers			
Step	***Window***	***Field Name (Section)***	***Field Input***
16	Place Barrier (Begin Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	521-428: 42" Single Slope R
		Horizontal Offset (Barrier)	-1:6
		Barrier Material (Material)	0521 5 14_Barrier 42" Single Slope
		Start Cut Orientation (Solid Placement)	Follow Skew
		End Cut Orientation (Solid Placement)	Normal to Path
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 8
		Candidate	APP SLAB 2 (Begin Approach Slab - 2ft Segment)
	Place Barrier (End Approach Slab - 2ft Transition Segment)	Template Name (Barrier)	521-428: 42" Single Slope R
		Horizontal Offset (Barrier)	-1:6
		Barrier Material (Material)	0521 5 14_Barrier 42" Single Slope
		Start Cut Orientation (Solid Placement)	Normal to Path
		End Cut Orientation (Solid Placement)	Follow Skew
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 9
		Candidate	APP SLAB 3 (End Approach Slab - 2ft Segment)
	Place Barrier (End Approach Slab - 28ft Asphalt Overlay Segment)	Template Name (Barrier)	521-428: 42" Single Slope R - Flex AP
		Horizontal Offset (Barrier)	-1:6
		Barrier Material (Material)	0521 5 14_Barrier 42" Single Slope
		Start Cut Orientation (Solid Placement)	Follow Skew
		End Cut Orientation (Solid Placement)	Normal to Path
		Feature Definition (Feature)	Traffic Railing
		Name Prefix (Features)	BARRIER 10
		Candidate	APP SLAB 4 (End Approach Slab - 28ft Segment)

17. Use the following image to place when confirming barriers on the begin and end approach slab. Note that the begin approach slab is shown and the end approach slab will be the same templates but mirrored longitudinally.



18. The final product of Exercises 5.9 is shown below, with the Superelevation reference turned off. Note that, if required, the asphalt pavement can be modeled as another deck on top of the 28ft segments. Approach Slab Asphalt Pavement has its own Feature Definition.



6 PLANS DEVELOPMENT

OVERVIEW

As modeling bridges in 3D becomes more and more industry standard, many clients and project stakeholders are pushing for the 3D bridge model to be contract deliverable. However, the need for 2D bridge plans will not be going away anytime soon. Traditionally, bridge plans production has been done by drawing in 2D. While this is still a viable and sometimes necessary workflow, having a 3D bridge model gives us the opportunity to use an alternative or supplemental workflow of producing the 2D plans from the 3D model. This 3D to 2D workflow has numerous advantages and is very efficient in that when the 3D model get updated, the 2D plans will update automatically. The majority of the bridge plans can be created from the 3D model, but there will still be instances where drawing in 2D is necessary and more efficient for certain details. However, in the Bentley Connect Edition products, even the normal 2D drawing workflow has changed since the Microstation v8i (SS10 etc) days. This chapter will provide an overview of both the 3D to 2D plans workflow as well as explain how the traditional 2D method has changed.

OBJECTIVES

The objectives of this chapter are to cover the following plans production topics:

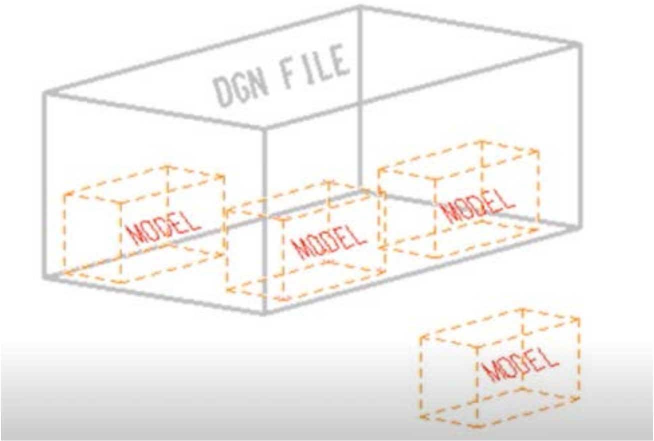
- Model Types
- Dynamic View Workflow
- Starting a New File
- Create Drawing Dialog
- Dynamic View Workflow Tools
- 2D Plans Production Workflow
- Display Styles & Display Rules
- Annotations
- Tables
- Sheet Border Information

MODEL TYPES & KEY TERMS

In the old Microstation v8i 2D plans production workflow, is was most common to start drawing in a 2D design model, reference a sheet border cell into that design model, scale it up, and print. The design model was the only model used for that workflow. However, even then there were two additional model types that were rarely used: drawing models and sheet models. The new dynamic view workflow utilizes all three model types, and even the new 2D workflow uses two out of the three model types. Therefore, it is important to understand the differences between these model types, how they should be used, and some key terms associated with the different model types.

DGN

A DGN is not a model type, but rather it is a box or container of models. A DGN can contain one or many models inside of it. Oftentimes, you will have many models within a DGN of different types. In the dynamic view workflow it is very common to utilize all three model types in a single DGN.



Design Model

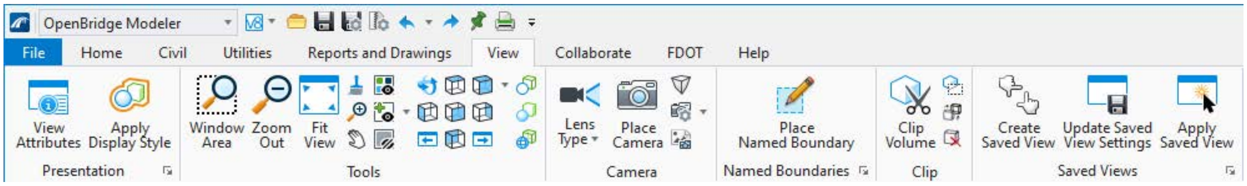
A 2D design model is traditionally what was used in the past for the 2D drawing v8i workflow. Design models can be 2D models or 3D models. It typically has a black background color and is where native geometry & elements are stored. This is where we will use some of the dynamic view workflow tools such as a Section Callout tool or Named Boundary tool.

Clip Volumes

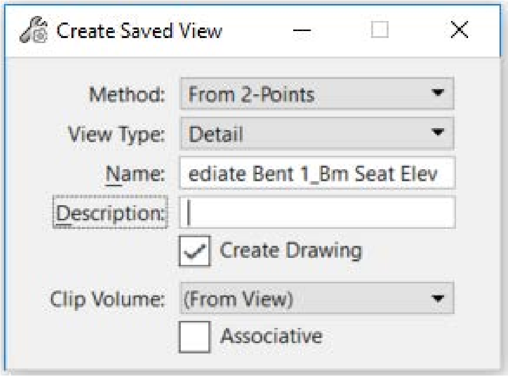
A clip volume is used to define a specific volume within a 3D model that you wish to create a saved view of for placement in a drawing model. Clip volumes are automatically created when you use certain Dynamic View Workflow tools such as a Section Callout tool. Bentley has a good video explaining Clip Volumes which can be found HERE.

Saved View

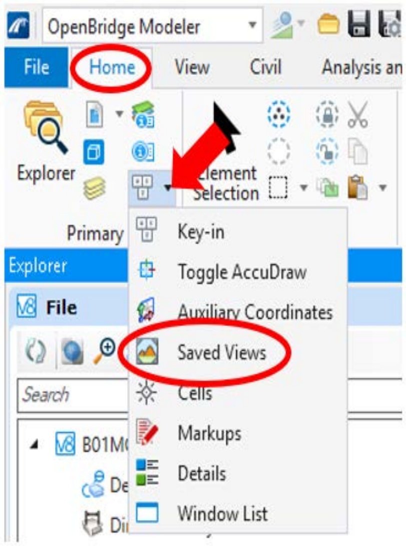
A saved view is a view definition, which includes the level display for both the active model and references, the clip volume, and other view attributes. The view definition is given a name and saved in the DGN file. A saved view is a way to get a 2D view of a 3D model into a drawing model. Saved views get created automatically when using a dynamic view workflow tool, but you can also create them manually by navigating to **View > Saved Views > Create Saved View**.



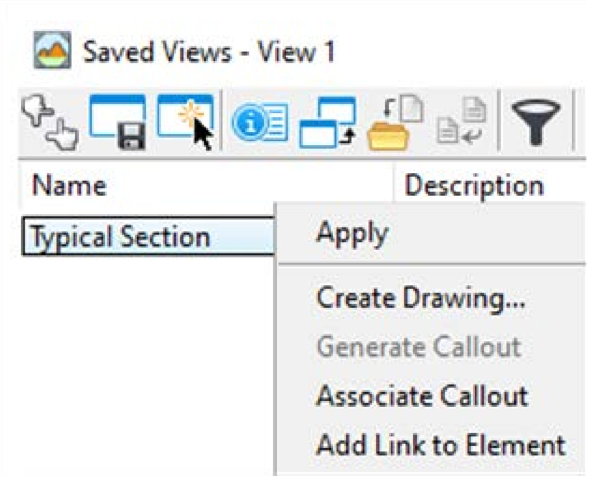
The *Create Saved View* window allows for several inputs including the *Method* (from the current view or 2-Point Box, adding a View Type (including Section, Elevation, Plan, Detail, etc.), naming the view and creating a Drawing Model as the view is created.



The saved views can be accessed through **Home > Primary >** (More) **Saved Views**.



Existing saved views can be used to generate drawings by opening the Saved View dialog box, selecting the desired view, right clicking and selecting **Create Drawing**. This will open the Create Drawing dialog box for drawing and sheet model creation.



A more detailed explanation of Saved Views can be found HERE.

Drawing Model

A drawing model is used to get a 2D view of a 3D model by referencing in a Saved View. All dimensioning and annotations associated with the Saved View are typically stored in the drawing model. Some important properties of a drawing model are:

- A drawing model is always 2D
- It does not have a sheet boundary
- The default color is usually gray
- A reference attached to a drawing model is 1:1 and coincident
- Each drawing model should contain only one attached saved view
- Annotations can be placed in a drawing model. The drawing model acts as a container for annotations specific to that saved view. If you want to place more than one saved view on a sheet, you shoudl create separate drawing models for each saved view.
- Annotation (detail) scale should match the reference scale on the sheet model. If you reference a drawing model into a sheet model at ¼" = 1', then the annotation scale of that drawing model should also be ¼" = 1'.
- When using the Create Drawing dialog, you can pre-specify the detail scale of a drawing model. When a drawing model is attached to a sheet model, the drawing model's annotation scale is used as the attachment's default scale.

Sheet Model

A sheet model is the electronic (virtual) plan sheet. It is a true (virtual) size: 11"x17". Drawing models are referenced into a sheet model for display on the final sheet. When you annotate in the drawing model, those annotations come with the drawing model into the sheet model. When a drawing model is referenced into a sheet model, it utilizes a Drawing Boundary for placement on the sheet model. Generic annotations that are not view specific should be placed directly on the sheet model. An example of a generic annotation would be a sheet note such as: cross reference notes, notes related to multiple views/drawing models, etc.

Drawing Boundary

A drawing boundary is a defined area on a sheet model which may contain a referenced drawing model. You can think of it as an initial target on the sheet model for a drawing model reference. A drawing boundary can be pre-defined and targeted when using the Create Drawing dialog, or it can be created as part of the Create Drawing dialog process. A drawing boundary controls the scale of the drawing model reference. A quick way to change the scale of a drawing model reference on a sheet model is to select the drawing boundary, go to properties, and change the detail scale.

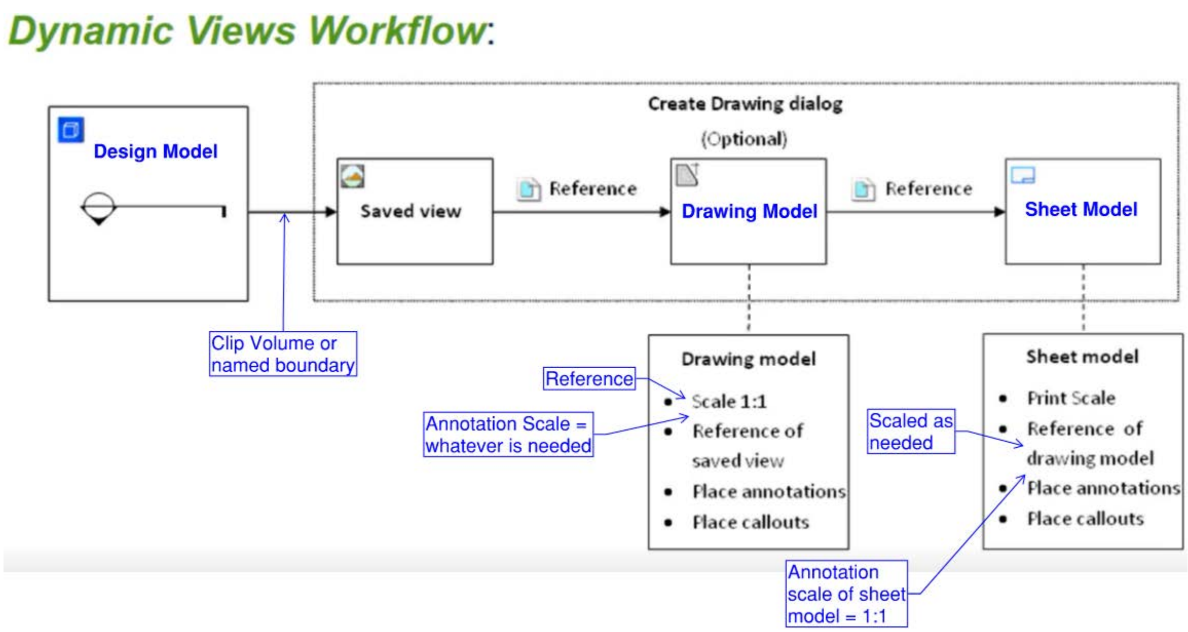
Detailing Symbol Styles

Detailing symbol styles define standards for detailing symbols and placeholder fields. For example, when you use the section callout tool, you get two arrowhead cells with text such as A-A or B-B. The section arrow cells and placeholder text that go with them are part of a detailing symbol style. In the FDOT workspace, the detailing symbol styles have been setup in the drawings seeds so users do not have to choose the correct one manually. For a more detailed explanation of detailing symbol styles, see Bentley documentation HERE.

DYNAMIC VIEW WORKFLOW

The dynamic view workflow is a method to produce 2D drawings from a 3D model. It can also be used in the regular 2D drawing workflow, which will be discussed in a later section. The dynamic view workflow utilizes all the items discussed in the previous section: design models, clip volumes or named boundaries, saved views, drawing models, sheet models, and drawing boundaries. The general steps of the dynamic view workflow are outlined below:

1. Create elements in a 2D or 3D design model
2. Utilize a dynamic view workflow tool such as a Section Callout tool to:
    a. Define clip volume or named boundary
    b. Create a saved view
    c. Reference the saved view into a drawing model
    d. Reference the drawing model into a sheet model (optional, could be done manually later)
3. Adjust scale & placement of drawing model reference on the sheet model
4. Add dimensions and annotations to the drawing model
5. Add generic notes & annotations to the sheet model

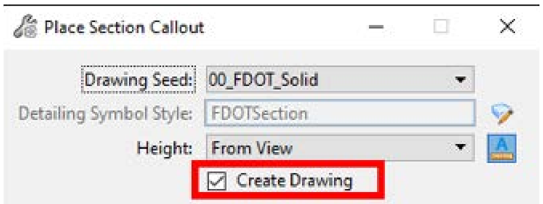


Note that FDOT borders should never be added as a reference or placed as a cell in the design model. The border is setup to be automatically placed within a sheet model.

CREATE DRAWING DIALOG

There are various dynamic view workflow tools within OBM that will be discussed in the next section that utilize the Create Drawing dialog. With these tools, there is either a check box to Create Drawing or the dialog box will open automatically within the course of using the tool. The create drawing dialog is quite powerful as it can do all of the following at the same time:

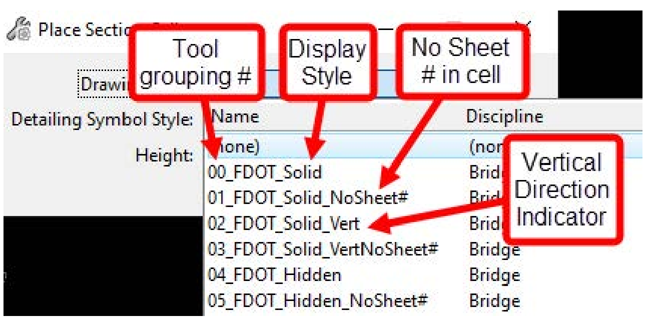
1. Create a saved view
2. Create a drawing model and set the annotation scale in the drawing model
3. Reference the saved view into the drawing model
4. Create a sheet model
5. Reference the drawing model onto the sheet model at a specific scale you define



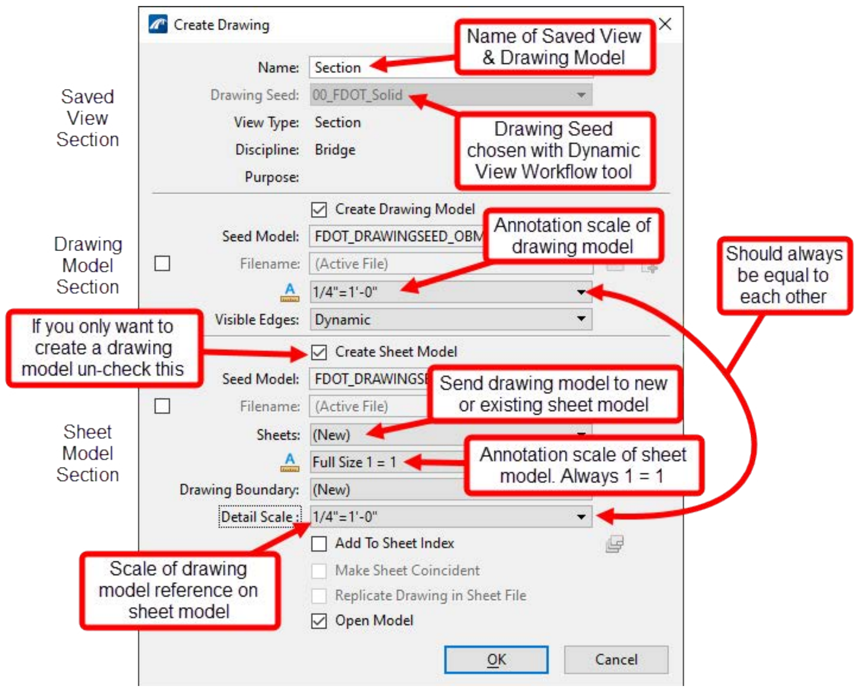
Drawing seeds control several important properties in the drawing model:

- Display Style (of the saved view reference) – Solid, Hidden, Wireframe, etc. These display styles control whether the 2D saved view shows hidden lines, solid lines, or wireframe. Display style of the saved view reference can be found in the Reference Presentation of the Reference dialog.
- Reference Presentation Settings – clip volume settings (including display style), synchronize view settings, etc
- Detailing Symbol Style – Section callout arrows, drawing boundary view titles, etc

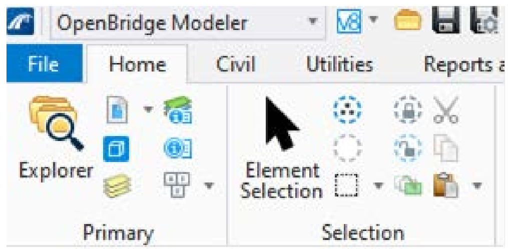
A variety of drawing seeds have been setup in the FDOT workspace. They are grouped together with numbers by tool type for the different dynamic view workflow tools as shown in the screenshot and table below. The direction of tool and sheet # in cell are specific to the section callout tool. If a section callout is drawn in a vertical direction on the sheet, then one of the “Vert” seeds should be used to get the orientation of the section callout text correct. If the sheet number does not need to be included with the section callout arrow cell, then a “NoSheet#” seed should be used.

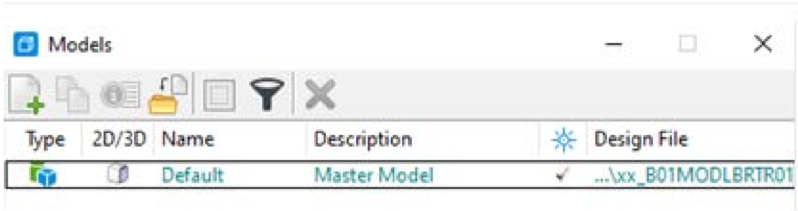


Drawing Seed Name	Tool	Display Style	Direction of Tool	Sheet # in cell?
00_FDOT_Solid	Section Callout	FDOT Solid	Horizontal	Yes
01_FDOT_Solid_NoSheet#	Section Callout	FDOT Solid	Horizontal	No
02_FDOT_Solid_Vert	Section Callout	FDOT Solid	Vertical	Yes
03_FDOT_Solid_VertNoSheet#	Section Callout	FDOT Solid	Vertical	No
04_FDOT_Hidden	Section Callout	FDOT Hidden	Horizontal	Yes
05_FDOT_Hidden_NoSheet#	Section Callout	FDOT Hidden	Horizontal	No
06_FDOT_Hidden_Vert	Section Callout	FDOT Hidden	Vertical	Yes
07_FDOT_Hidden_VertNoSheet#	Section Callout	FDOT Hidden	Vertical	No
08_FDOT_Wireframe	Section Callout	Wireframe	Horizontal	Yes
11_FDOT_Solid	3D Named Boundary	FDOT Solid	NA	NA
12_FDOT_Hidden	3D Named Boundary	FDOT Hidden	NA	NA
13_FDOT_Wireframe	3D Named Boundary	Wireframe	NA	NA
14_FDOT_ByView	3D Named Boundary	By View	NA	NA
15_FDOT_ByView	2D Named Boundary	By View	NA	NA
20_FDOT_Solid	Detail Callout	FDOT Solid	NA	NA
21_FDOT_Hidden	Detail Callout	FDOT Hidden	NA	NA
22_FDOT_Wireframe	Detail Callout	Wireframe	NA	NA



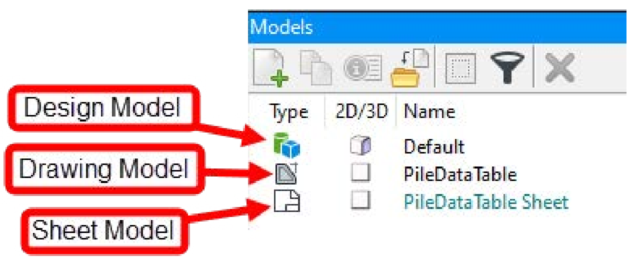
If you already have a sheet model or wish to create a sheet model at a later time, then you only need to do use the create drawing dialog to do steps. In that case, you may need to create models manually. In this situation, the *Models* dialog box can be used to create Drawing Models and Sheet Models. Open the *Models* dialog box by navigating to **Home > Primary > Models**. Once open, select **Create new model** and a *Create Model* window will open. Fill in the information as needed for the new sheet and select **OK**.



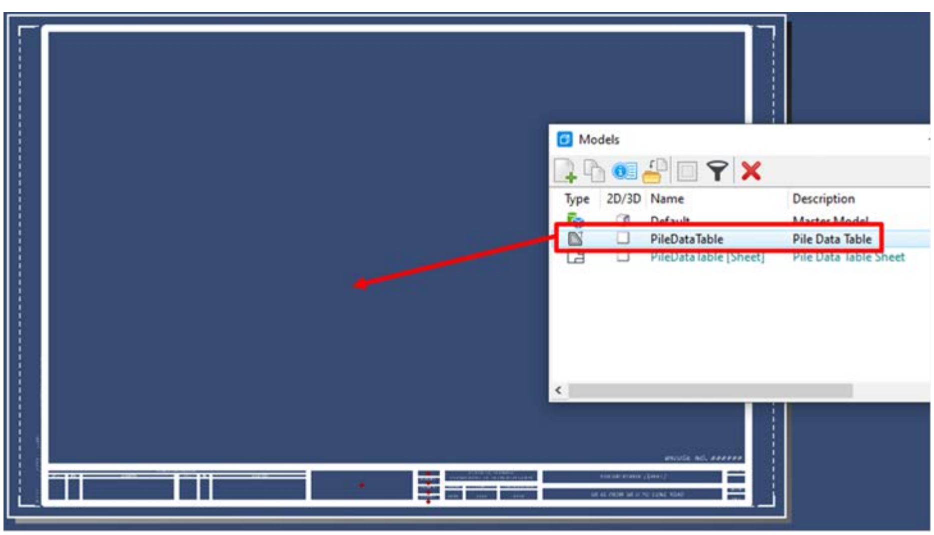


NOTE ***The Type selected should match the required model and should always be XXXXX From Seed, with the XXXXXX being either Design, Drawing, or Sheet. This ensures proper FDOT seed files are used in the creation of the models. Using the Sheet From Seed option will display additional Sheet Properties, which will be filled by the FDOT seed. The Drawing Boundary for sheets can be (New) or can be placed within an existing sheet model.***

This process should be completed one at a time for each drawing model and sheet model. In the FDOTConnect workspace, the background for drawing models is set to a gray color and for sheet models is set to a navy/blueprint color. These colors are part of the user preference file and can be changed if desired as shown HERE. The different models can also be distinguished within the Models dialog box by the symbol under the *Type* column. See below for symbols and the corresponding models.

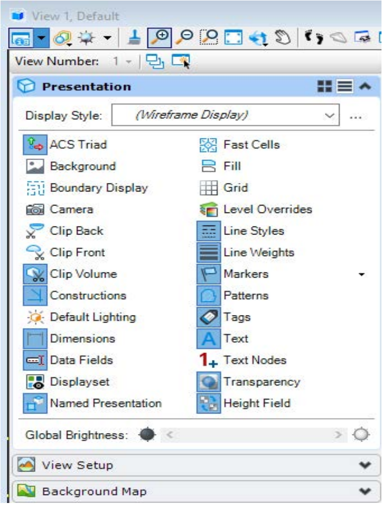


When the models are created using the Models dialog box, they will not be automatically linked together. Once content/linework has been placed in the drawing model, the link to the sheet model can be made from the Models dialog box by dragging and dropping the drawing model into the sheet model.

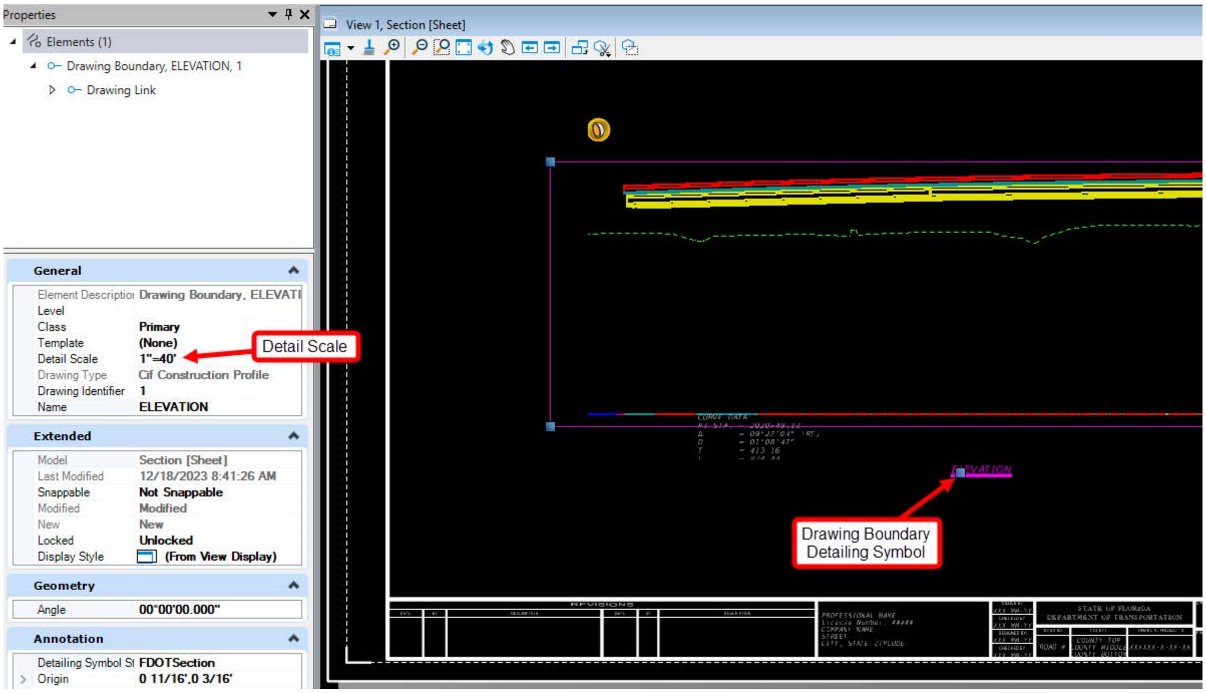


An *Attach Source Files* window will open with various *Attachment Method* options. **Recommended** can be used. Once accepted, the drawing model outline can be used to place the drawing model into the sheet model. With a left click to confirm the location, a reference of the drawing model will be made in the sheet model. The newly created reference can be viewed and manipulated in the References dialog box.

There are display symbols for section and model cut lines produced when creating views in the Design Model, Drawing Model or Sheet Model. The **View Attributes** tool (at the top left of the view window) is a critical tool to control how certain elements are displayed. These attributes include clip volume lines, markers, and dimensions. If the model is brought in as a reference these changes can be made by right clicking on the file in the *References* window and selecting **Presentation** from the drop-down list.



It is very common to need to adjust the scale of the drawing model reference on the sheet model. To do so, select the drawing boundary detailing symbol (View Title), go to properties, and change the detail scale. This is quicker than opening the reference dialog, opening reference properties, and changing it.



A detailed explanation of the Create Drawing dialog can be found in the Bentley documentation HERE.

DYNAMIC VIEW WORKFLOW TOOLS

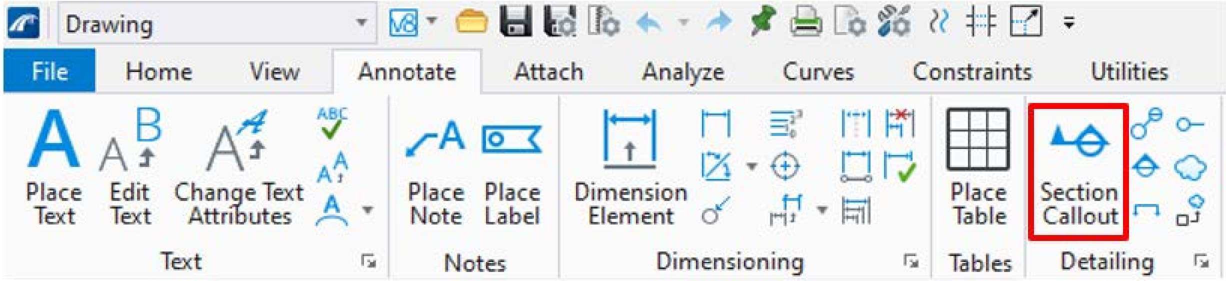
There are various dynamic view workflow tools available in OBM, but the most versatile one is the **Section Callout** tool. This tool can be used to replicate the function of various other dynamic view workflow tools, such as **Plan Callout** and **Elevation Callout**. The tools can be found in **Drawing (Workflow) > Annotate > Detailing**. The detailing tools discussed below have FDOT seeds set up to control the detailing symbol style, display style, and reference presentation. See previous section for a list of FDOT drawing seeds and the tools they are used with.

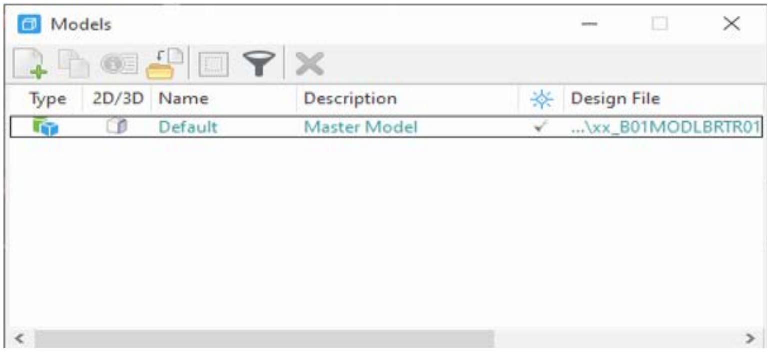
Detailing tools can be used directly in a Design File dgn, but the recommended workflow is to create a sheet file dgn, reference in the bridge model into a design model, and then to use the detail tools to generate the drawing model and sheet model within the sheet file. This process will be demonstrated in the exercises accompanying this chapter.

SECTION CALLOUT

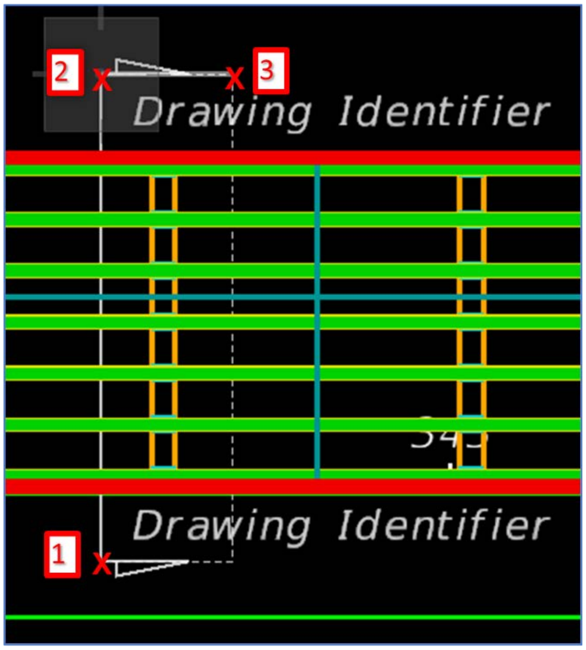
Once the bridge model is referenced into the design model of sheet file dgn (in the Default model, which can be renamed as desired), the **Section Callout** tool can be used to create a section or view with a user-defined depth. This will in turn create a Saved View within the file and provide the option to open a Create Drawing dialog box for plans production as mentioned in the previous section.

To use the **Section Callout** tool, navigate to **Drawing (Workflow) > Annotate > Detailing > Section Callout**. Place Section Callout dialog box will appear for the user to select the *Drawing Seed*, which will be one of the several seeds FDOT has developed. The *Height* settings will allow the user to define a specific height or allow the program to automatically select a height. This can always be adjusted after placement. As discussed previously, the *Create Drawing* box can be checked to create drawing and/or sheet models.

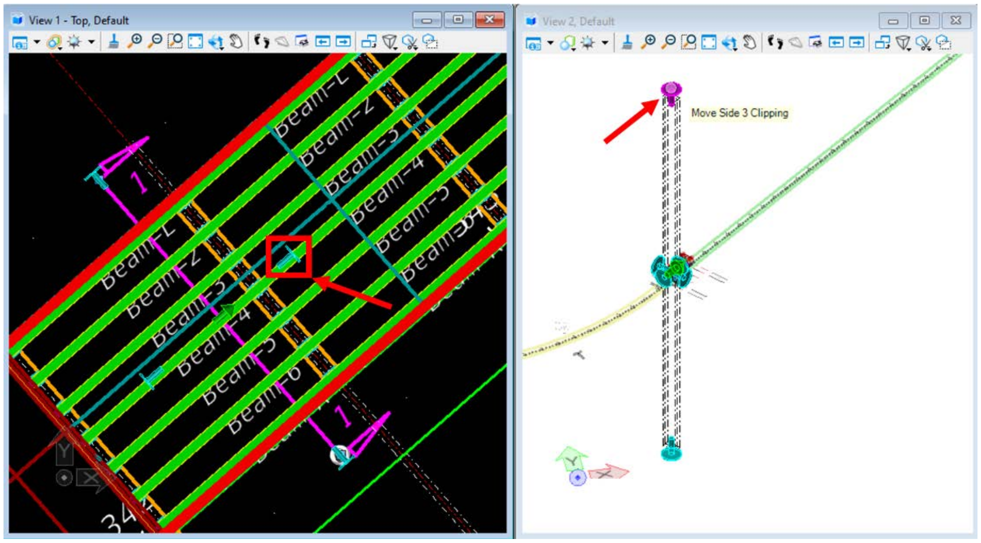




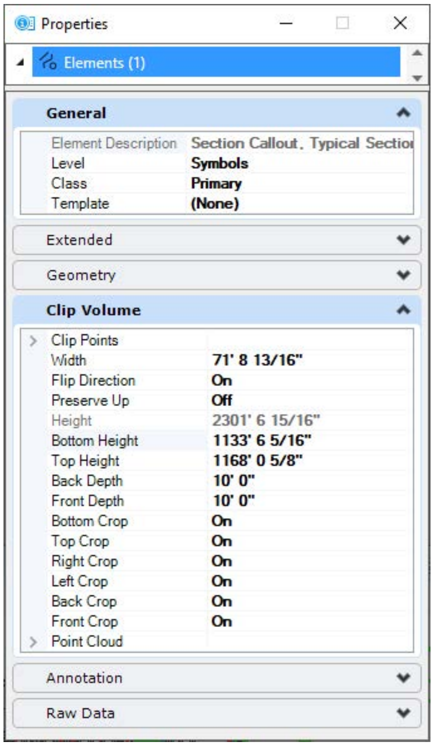
The section cut will show everything that is currently displayed in the view, so the user can control the elements shown by toggling on and off levels. This can also be adjusted afterward within the level display of the drawing and sheet models, if needed. After the settings are selected, the section itself can be placed. Within a top view, the first click will define the start point for the section and the second click will determine the end point. The third point will define the depth, which can also be keyed in. Follow the prompts in the message section at the bottom left of the screen. Following the third click that completes the volume definition, a *Create Drawing* window will appear for the user to select the drawing and sheet model settings if the Create Drawing box is checked, discussed in a previous section.



The Section Callout symbol will be placed in the model. In top view, the plan view limits of the clip volume can be adjusted. In an isometric view, the height of the clip volume can be adjusted. Select the callout symbol to reveal the dashed lines that represent the clip volume, see below.

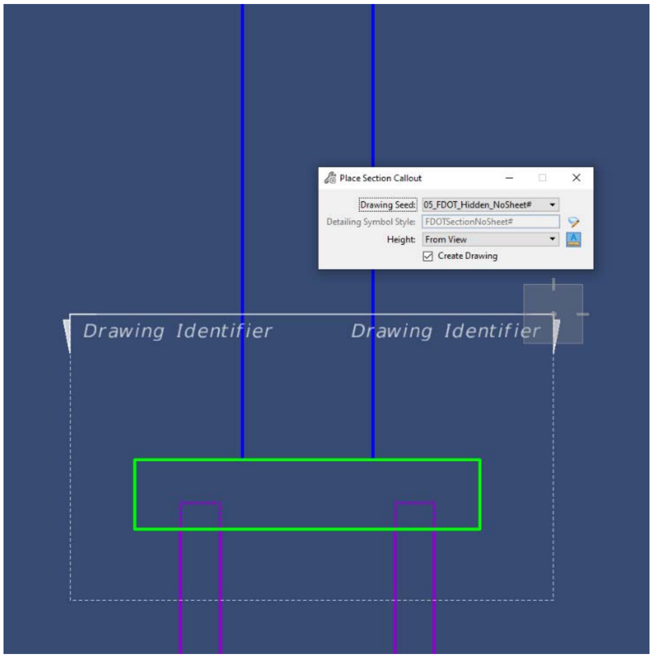


Selecting the callout and opening the Properties will also allow the user to edit various *Clip Volume* settings such as the heights, depths, and direction of the cut. Keep in mind that any linked drawing models will display exactly as the clip captures the elements, which will need to be taken into account for skewed or curved bridges.

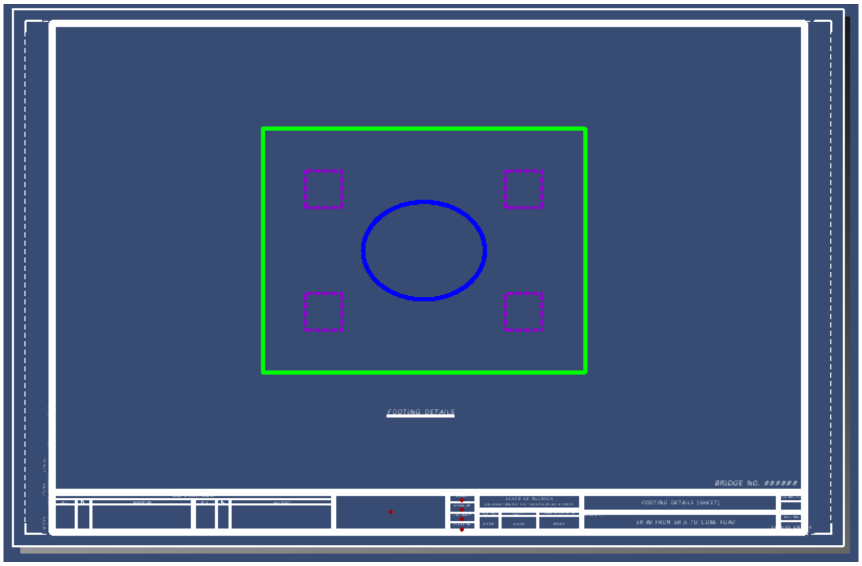


Section callouts can be placed directly in a drawing or sheet model to create additional views. For example, a section callout could be placed above an elevation view (itself created with a section callout) to create a top view, as will be done in a later exercise. One could also be cut through an element, such as through a column and through a footing to create a footing plan. The section callout can be placed in the drawing model or sheet model. If the section callout symbol is to be visible when plotted and the section callout was placed in the drawing model, simply hover over the marker, click, and select Show Callout.

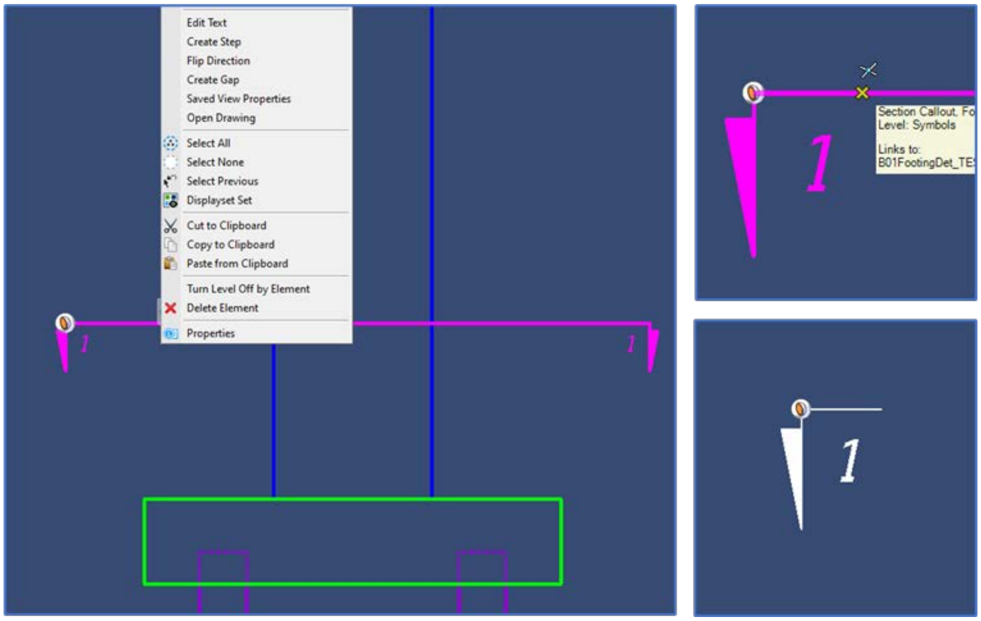
Below is an example of placing a section callout within a sheet model to create a footing plan. Note that the **…_NoSheet#** version of the *Drawing Seed* was chosen, which controls what information is shown on the section callout symbol.



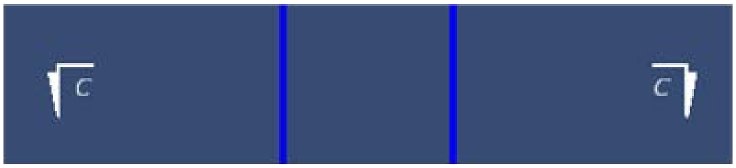
After placement, a Create Drawing dialog will come up. Once all the information is filled in and accepted, the new sheet model with the footing plan will be created.

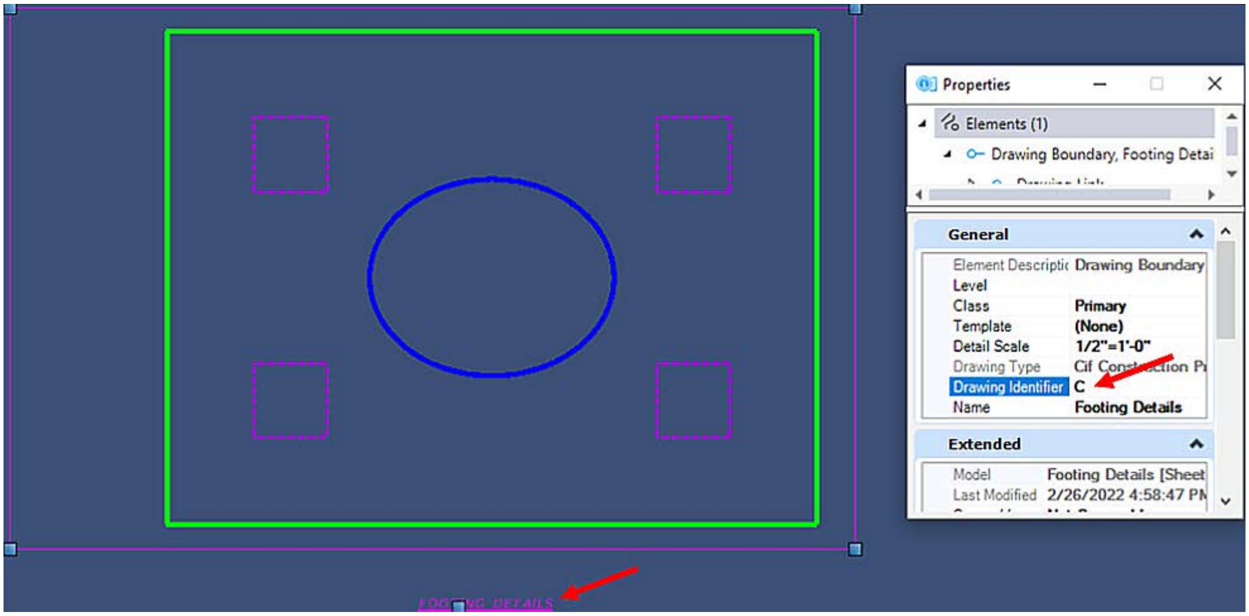


Back in the original sheet model of the pier, by right clicking on the section callout and selecting **Create Gap**, the continuous line can be adjusted to display with the desired gap. Snap to the points at the end of the arrow symbols to control where to start and stop gaps.



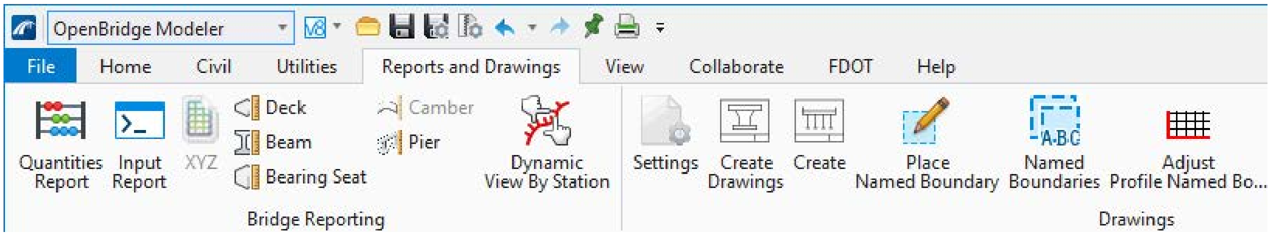
After the gap is created, the drawing identifier text can updated by going into the sheet model created by the section callout, clicking the label to reveal the drawing boundary, opening the properties, and changing the *Drawing Identifier* as needed.





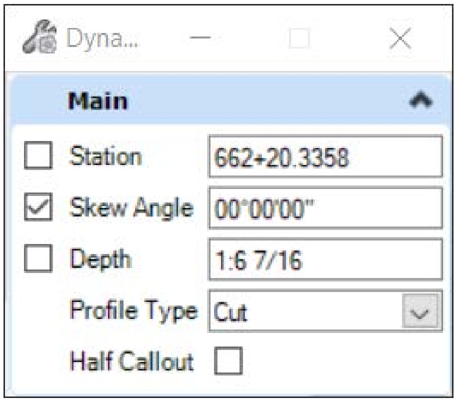
DYNAMIC VIEW BY STATION

The Dynamic View by Station tool is one of the most flexible OBM drawing tools available. Users can take a section view normal to any station point or at any skew angle. The views can even be rotated after creation to create horizontal sections. The tool is accessed from the **Reports and Drawings > Bridge Reporting > Dynamic View By Station**.



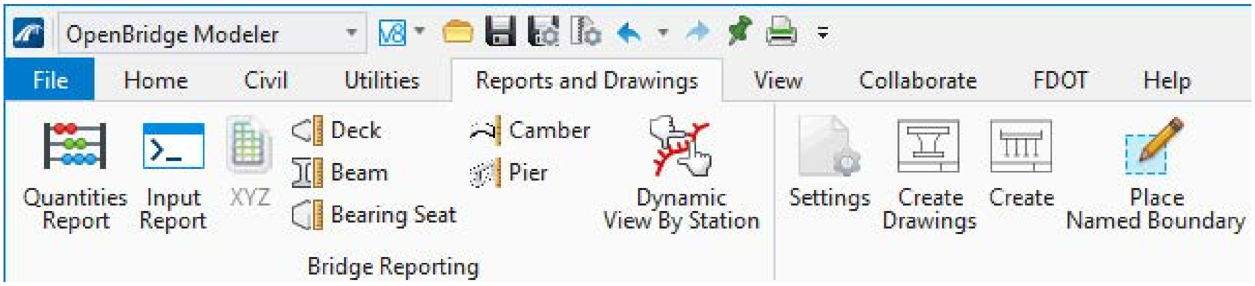
Once an alignment on the bridge is selected, any station can then be entered to cut a section at that location. A skew must then be specified for the section. For a section to be cut longitudinal along the alignment, a skew of 90°-00’-00” would be entered, whereas a transverse section—like a superstructure typical section—would use a 0°-00’-00” skew. With the location and skew set, a direction of the cut (i.e., upstation or downstation) can be set by clicking a data point in the direction the user would like the cut to face.

Depending on what needs to be included in the drawing, the user can either choose for the *Profile Type* to be set as **Cut** (just the section with the elements that are at that cut line) or **Cut With Depth** (includes additional members contained beyond the cut line up to the specified *Depth*.) The **Cut With Depth** selection is useful, for instance, if a longitudinal cut with a beam in view is need, but the selected alignment is not atop a beam.



PLACE NAMED BOUNDARY

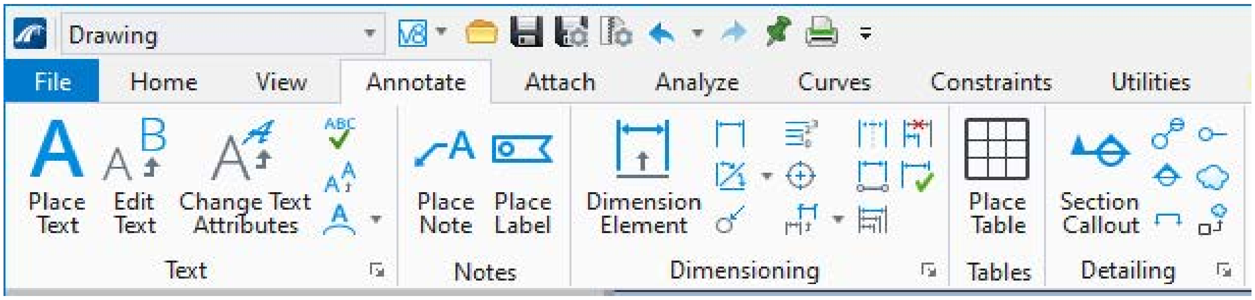
The Place Named Boundary is a flexible plans development tool that is highly used in both 3D and 2D plans production. The tool is accessed from the **Reports and Drawings > Drawings > Place Named Boundary.** It is also available in View Tab of any of the workflows.



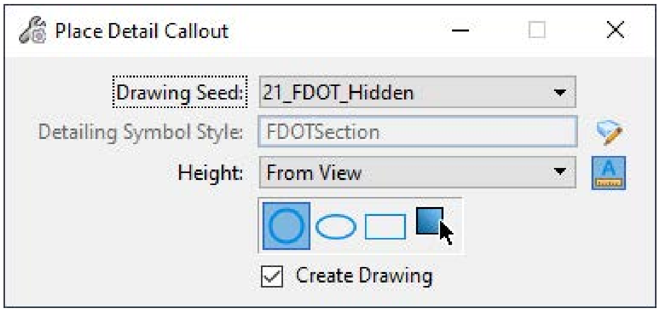
This tool is designed to place one or more named boundaries and automate the dynamic view, drawing model, and sheet model creation process. Boundaries can be placed utilizing the alignment/civil data or they can be placed manually. The process for creating these boundaries and the subsequent drawings using the alignment can be seen in the following exercise.

DETAIL CALLOUT

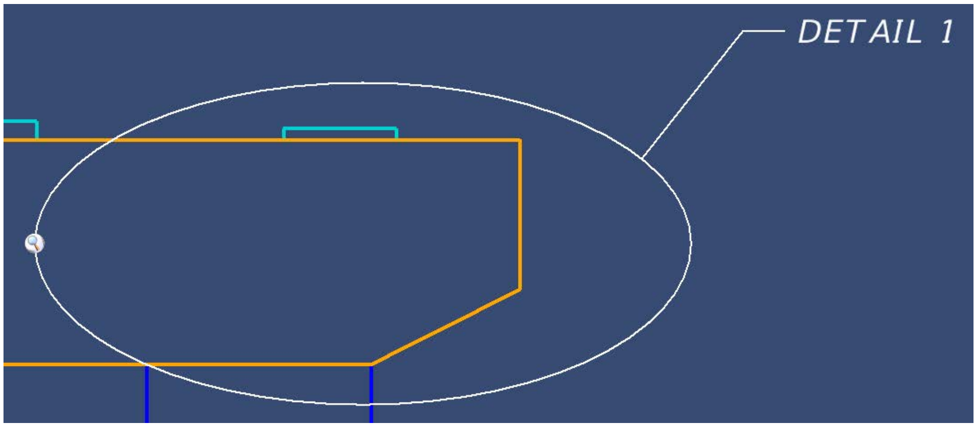
Another helpful detailing tool is the **Detail Callout** tool. This tool can be used to create an enlarged detail if a certain area needs to be isolated for clarification. The tool can be accessed by navigating to **Drawing** (workflow) **> Annotate > Detailing > Detail Callout**.



The *Place Detail Callout* window will appear for selection of the *Drawing Seed*, *Height*, shape, and the option to *Create Drawing* like the **Section Callout** tool. The available shape options are circle, ellipse, rectangle, or to use a previously drawn boundary.

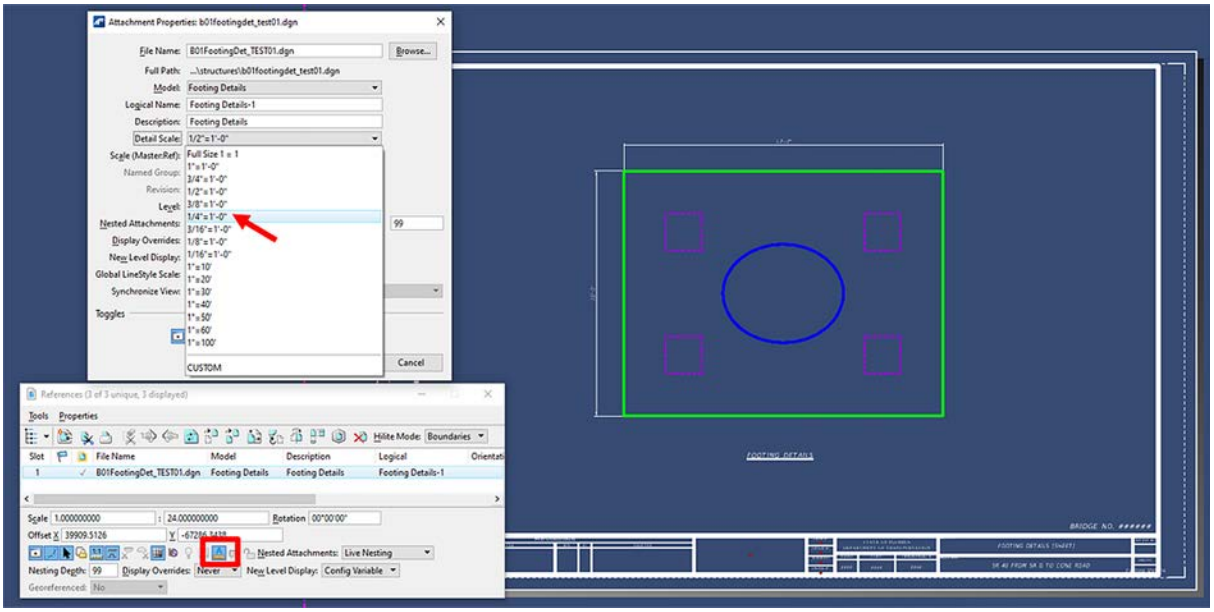


The next click will start to define the detail boundary. For the circle and ellipse options, the first click will be the center of the detail. For the rectangle, the first click will be a corner. The next click will fully define the size and extents of the shape. The final click will be to place the detail callout text with the drawing identifier and any desired leaders. Right clicking will end the placement and bring up the *Create Drawing* window if the corresponding box was checked. The remaining steps are similar to the **Section Callout** tool. See exercise for use of the detail callout.

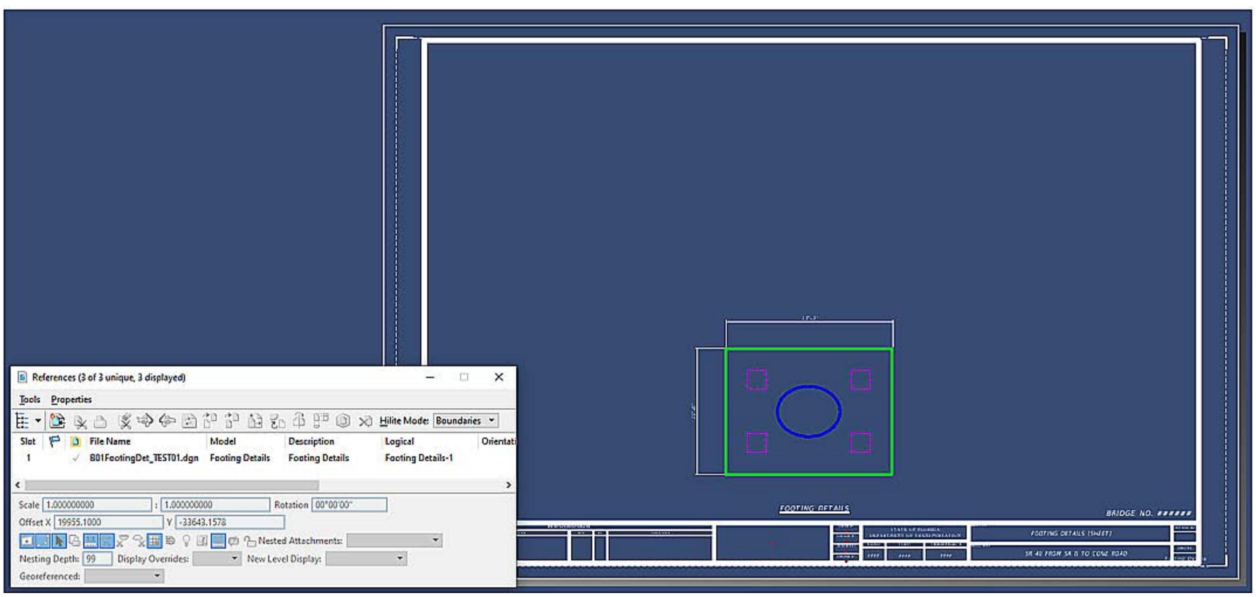


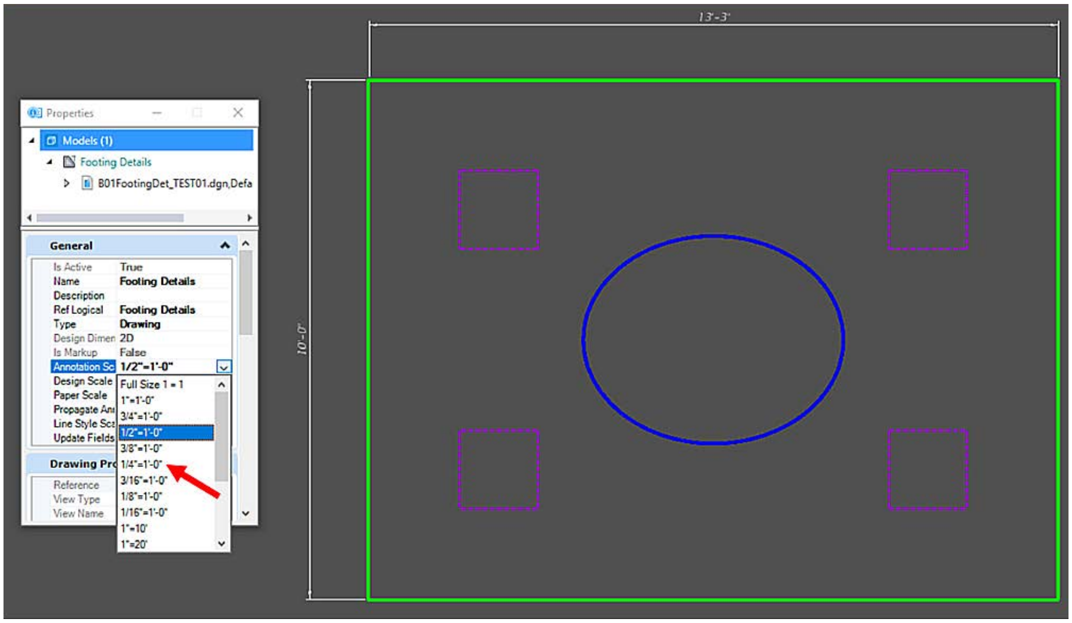
ADJUSTING SCALES

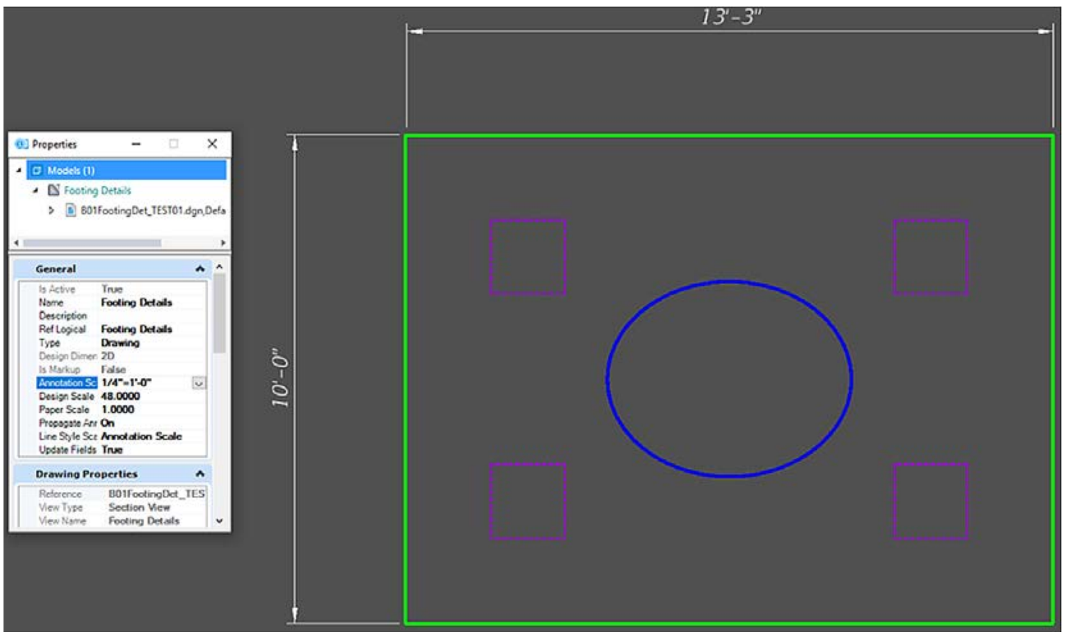
After a drawing or sheet model has been created, the scale can be adjusted, if needed. This can be accomplished by first adjusting the reference detail scale for the drawing model in the sheet model. This will make the drawing model appear smaller or larger in the sheet model border. Once the desired reference scale is updated, the detail scale in the drawing model should be adjusted to match the selected reference detail scale. This will adjust the text and symbols so that they match FDOT requirements for size. The dimension offsets from elements may need to be adjusted when changing scales. See below images for this process.

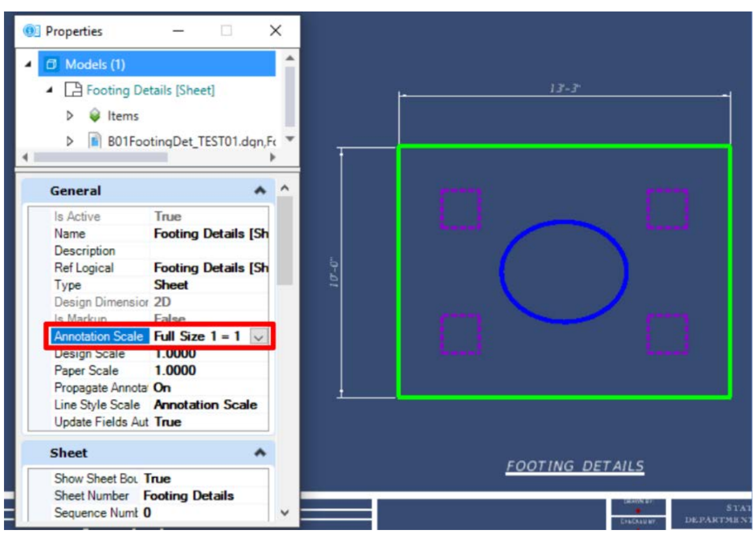


If the reference from the drawing model into the sheet model has **Use Active Annotation Scale** enabled (in the red box above), the text and symbol size in the sheet model will be adjusted with the change to the reference detail scale. However, updating the annotation in the drawing model will allow users to better set the dimension line offsets.









Note that the sheet model annotation scale should always be set as **Full Size 1=1**.

2D PLANS PRODUCTION

As mentioned in the overview of this chapter, there will still be instances where drawing in 2D will be necessary. However, in the Bentley Connect Edition products, even the normal 2D drawing workflow has changed since the Microstation v8i (SS10 etc) days. The biggest difference is that the new Connect Edition workflow and FDOT plans production workflow require the use sheet models. There are a few different routes you can go leading up to the sheet model which will be discussed in this section.

Dynamic View Workflow

The dynamic view workflow mentioned in previous sections can still be used for the 2D drawing workflow. A design model, drawing model, & sheet model would be utilized the same way. All the steps previously mentioned would be the same. The only difference is that you would use a normal (non-civil) Named Boundary tool to designate the area you wish to capture in a saved view. You could skip the Named Boundary tool itself and just create a saved view to create a drawing from, but the benefit of using a Named Boundary is that you have a graphical representation of the saved view that you can manipulate after the fact. While this same dynamic view workflow can be used in the 2D drawing workflow, the drawing model is technically an extra/unnecessary step since you already have a 2D representation of what you want to show on the plans.

Hybrid Dynamic View Workflow

Another option for traditional 2D plans production is a “hybrid” method. With this, you still start drawing in a 2D design model, same as the method mentioned above. The difference with this workflow is that you add dimensions and annotate directly in the 2D design model, which is what we are used to doing in the past. You can create a saved view manually or use the normal (non-civil) named boundary tool to send (reference) the saved view directly onto the sheet model.

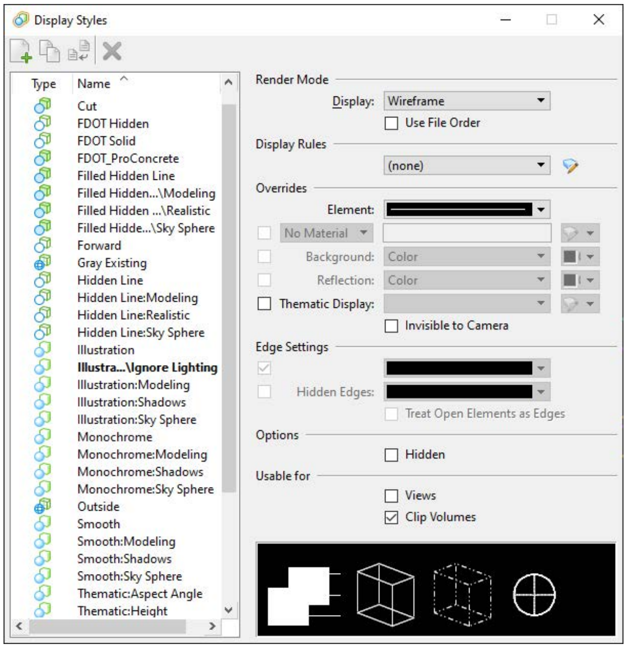
Regular Reference Workflow

The last option for the 2D plans production workflow starts the same way, draw elements in a 2D design model as you have in the past. You can place all annotations and dimensions in the 2D design model, create a sheet model manually, and reference the 2D design model into the sheet model with the reference manager.

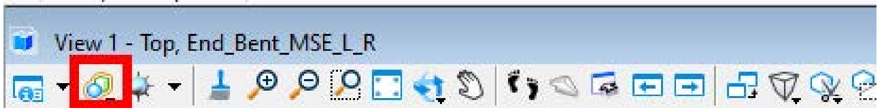
Of the different methods mentioned above, the Hybrid Dynamic View Workflow offers the best of old and new methods and provides the most flexibility. However, workflows preferences are user based, so it is recommended that you try each one and see which workflow suits you best.

DISPLAY STYLES & DISPLAY RULES

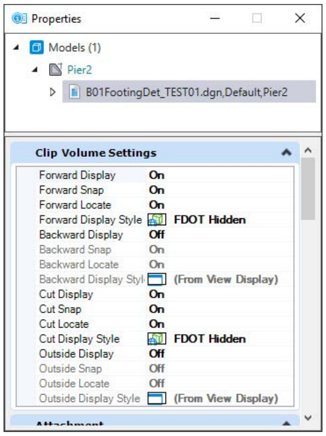
Display Styles are predefined render overrides and optional settings that can be applied to views, sections, or reference attachments. OBM has default display styles and FDOT has developed display styles for use on FDOT projects.



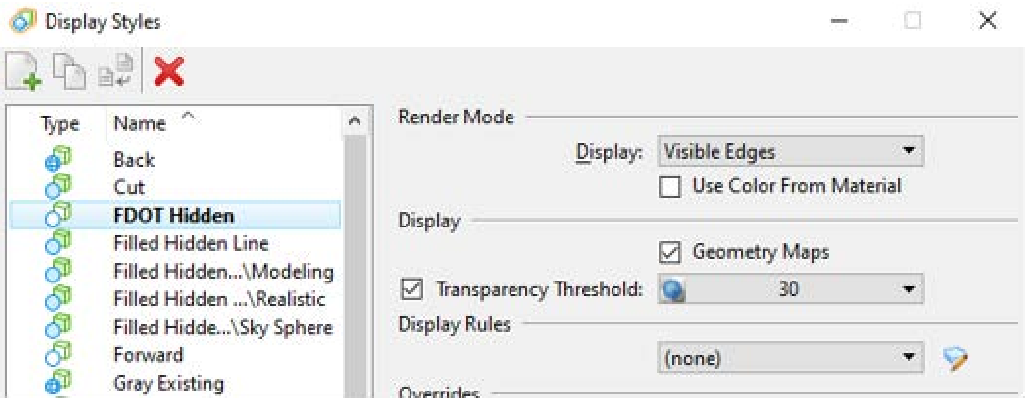
The display style for a design model can be selected directly from the top of the view window by clicking and holding the button indicated below. Clicking the button once will open the Display Styles dialog box.

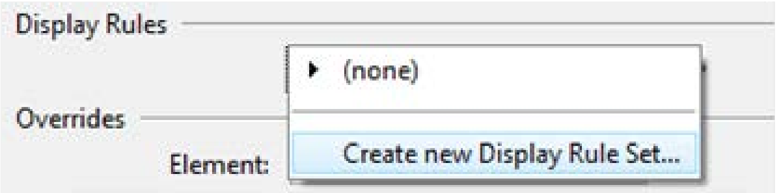


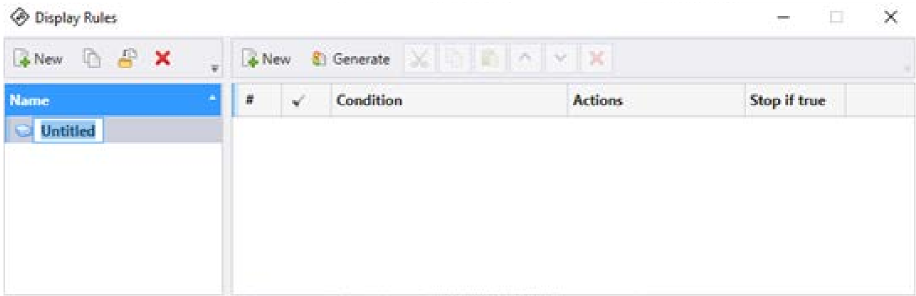
For drawing models, the display style will be set based on the drawing seed selected. If the display style needs to be changed for one or more directions of the clip volume (forward, backward, cut, or outside), it can be adjusted in the model properties. The display style selected for the drawing model will be reflected in the corresponding sheet model.



For a given display style, one or more display rule can be created. Display rules allow the user to specifically control the symbology, appearance, and display of design elements based on the property of an element, named group, view, model reference, or file. They are found within the *Display Styles* window. Display rules are very powerful and can be used to control symbology to get the 2D drawings produced from the 3D model looking how we are used to them looking. Display rules are an advanced topic and outside the scope of this guide, but there is documentation about them in the Bentley Help Content available online HERE.







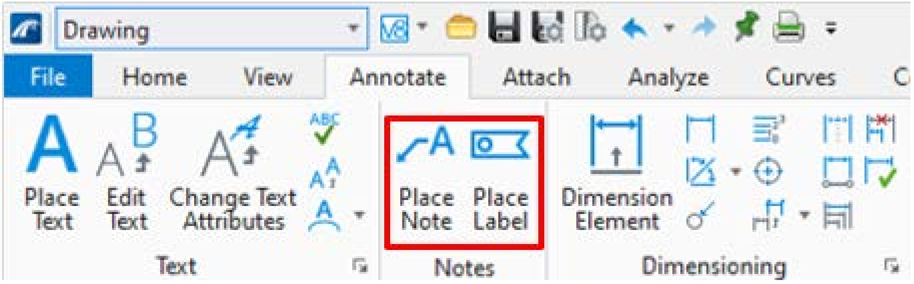
ANNOTATIONS

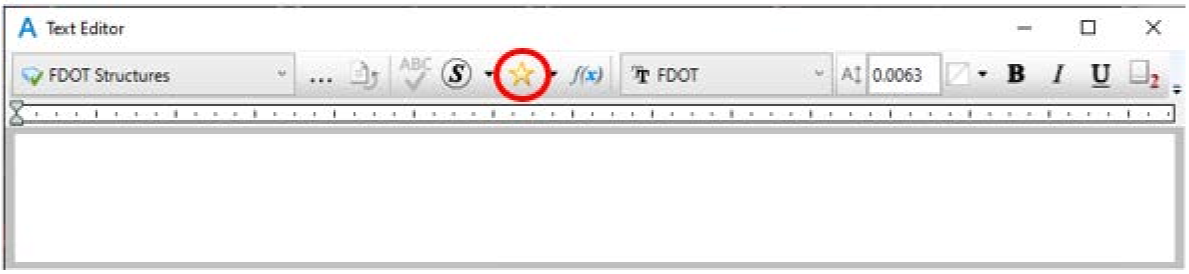
Traditionally, annotations have been thought of as: notes, dimensions, callouts, etc. Those traditional annotations have always been static/unintelligent in the sense that users had to manually input information, i.e. station & offset on a wall control drawing. The Connect Edition products have introduced some new technology related to annotations that make them automated and intelligent so that they populate field data based on element properties. These new types of annotations are dynamic in that they will update if the model or element updates. This is much more efficient and leads to less rework when designs change.

TEXT FAVORITES

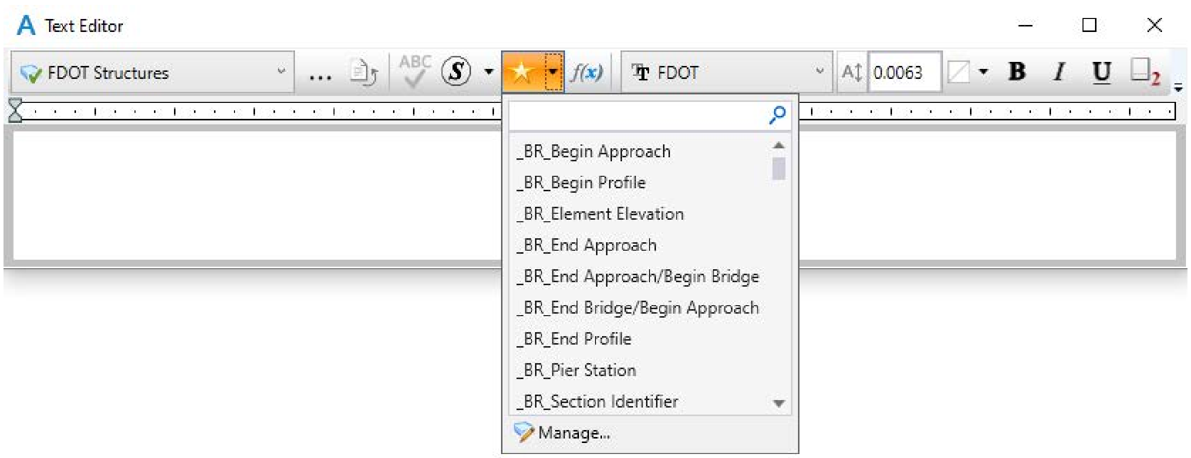
Text Favorites can be utilized to take advantage of annotation automation available when using accurate 3D models for plans production. Common annotations can be saved as “Favorites” and accessed for repetitive annotations using model properties such as elevation values. Text favorites can be static text that gets used frequently such as notes on a key sheet, or they can be dynamic fields that populate a label by pulling data from a model element.

The Text favorites are accessed through the **Text Editor** dialog box when the **Place Note** or **Place Label** tool is selected under **Reports and Drawings > Placement > Place Note** <OR> **Place Label**. For Place Label, either a **Cell** or **Text Favorite** can be used for the *Type* and an *Element* or *DataPoint* must be selected prior to placement.

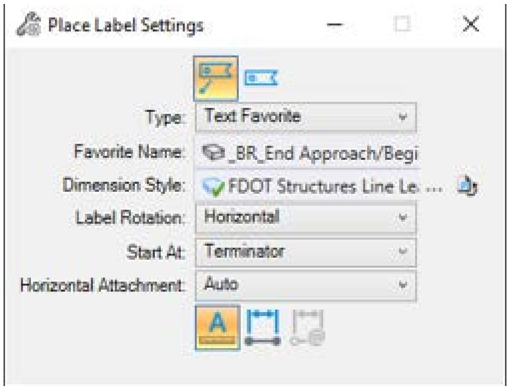


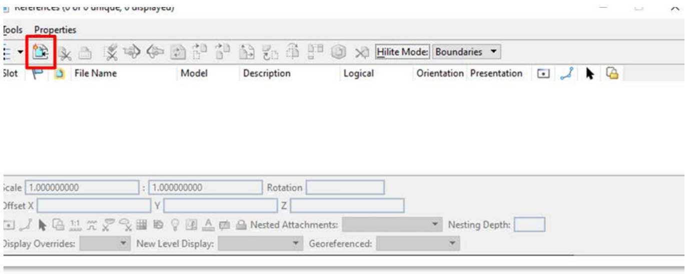


There are several Text Favorites provided in the current workspace for use as shown in the following image.

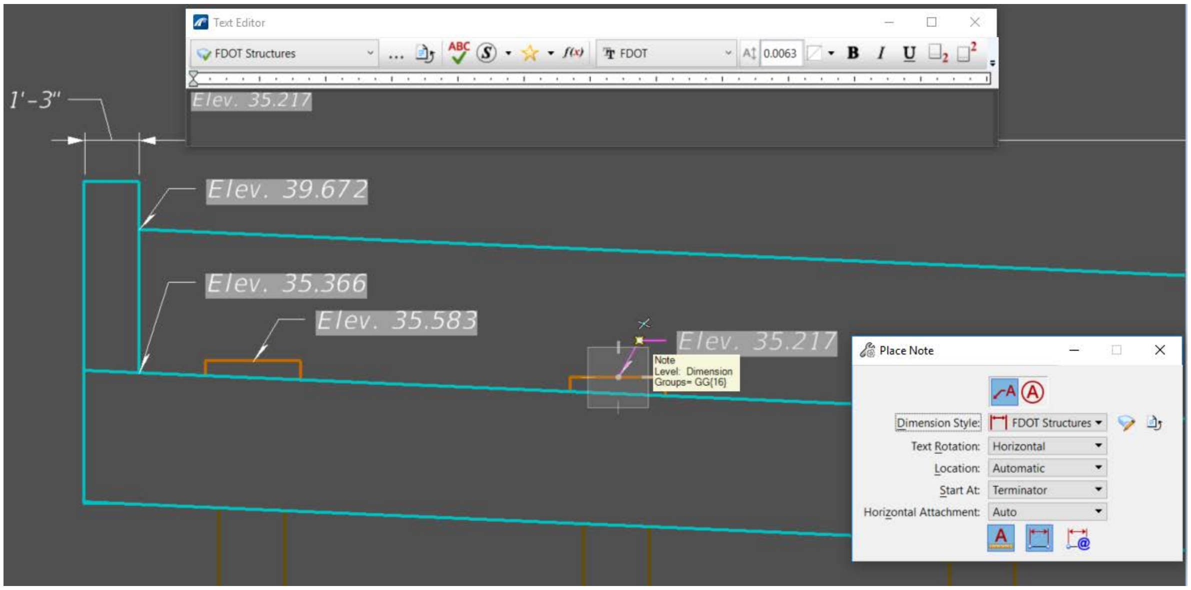


The notes save the text for common labels but also access model properties that can be used to automate actual dimensions or value placement in the note. The example below shows a Begin Bridge station Text Favorite that will automatically input the station based on the point selected in the plan view.





The use of Text Favorites is more common in the ORD workflows. Many Text Favorites are setup and can be taken advantage of, including for stationing of specific points such as start and end of bridge on our General Plan view. Custom Text Favorites can be created for personal use to automate certain note and text placement and will be used more heavily in the future as the tool develops and more model properties are exposed in OBM for plans production use.



CIVIL LABELS

The place Label tool has been somewhat replaced with a better tool for the civil transportation industry called the Civil Label tool. The Civil Labeler tool is extremely powerful and will be demonstrated later on in this chapter in an exercise. For more details on this tool see Bentley documentation HERE.

ANNOTATION GROUPS

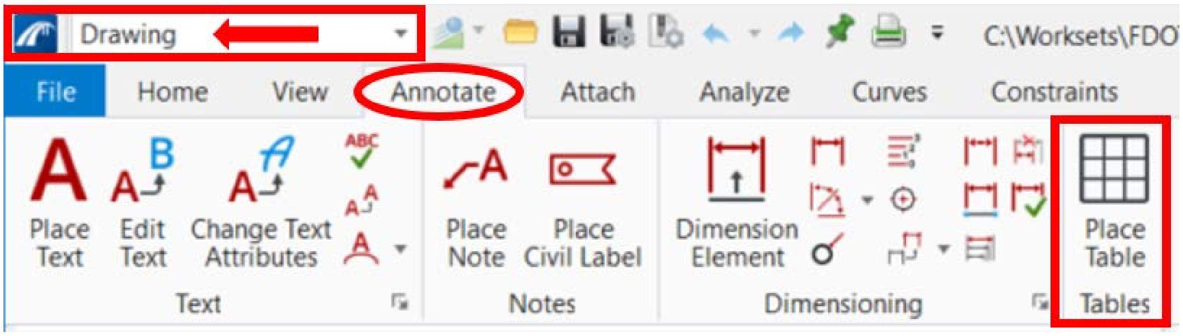
Annotation Groups can be thought of as “automated rule based annotation”. An example of an annotation group in practice is the horizontal alignment. In the past, users had to draw multiple alignment with tick marks and station callouts at different sizes to satisfy different scales. Now when an alignment is created using ORD, users can automatically annotate that alignment with an annotation group to produce all the stations, tick marks, curve data, etc. For more information on annotation groups, see the Bentley documentation HERE.

TABLES

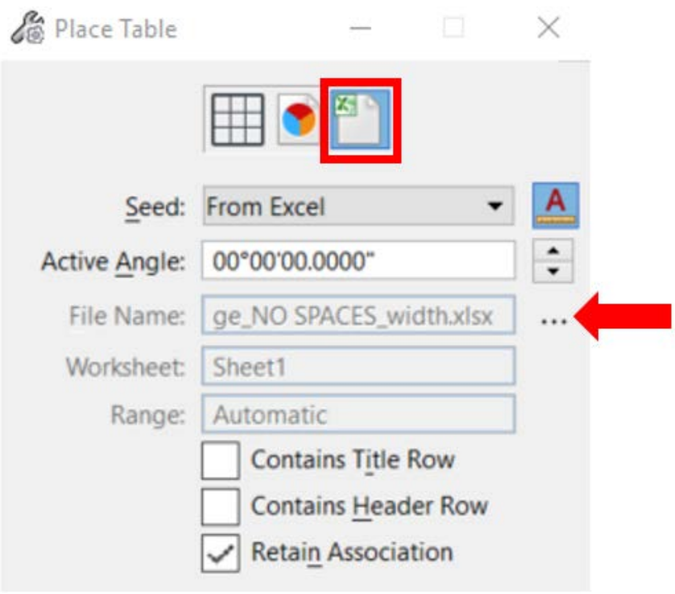
As a basic MicroStation tool, the **Table** tool is very useful for any tables that are commonly found in the plans. It is a MicroStation element that functions like an excel table in terms of formatting, columns, rows, cells, etc. You can place blank tables in a file and fill them out manually or link them to an excel file. These tables keep an active link that can be updated dynamically when changes are made to the spreadsheet.

Prior to placing a table from an excel file, an Excel file with the data must preexist. FDOT has created a standard structures data tables excel for the purpose of linking tables in the plans to that excel file. This excel file can be found in the eng data folder within the Structures folder of a newly created workset: C:\Worksets\FDOT\12345678901\Structures\eng_data\STR_StandardDataTables.xlsx. Detailed instructions for how to use this excel file can be found in the first tab of the excel file.

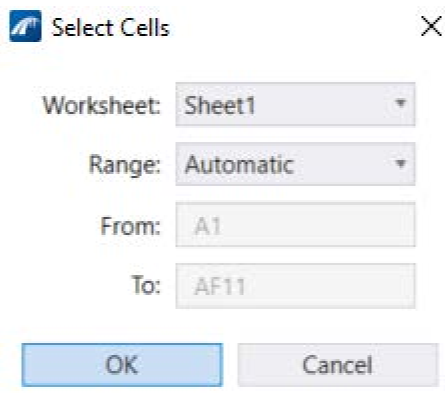
The **Place Table t**ool can be accessed from **Drawing** (workflow) **> Annotate > Place Table** in the Tables group.



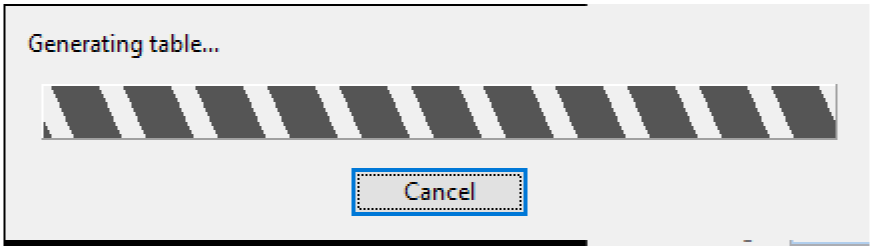
The **Place Table** dialog box is then opened. Select the Excel file tool and navigate to the file with the data that is planned as the table content.



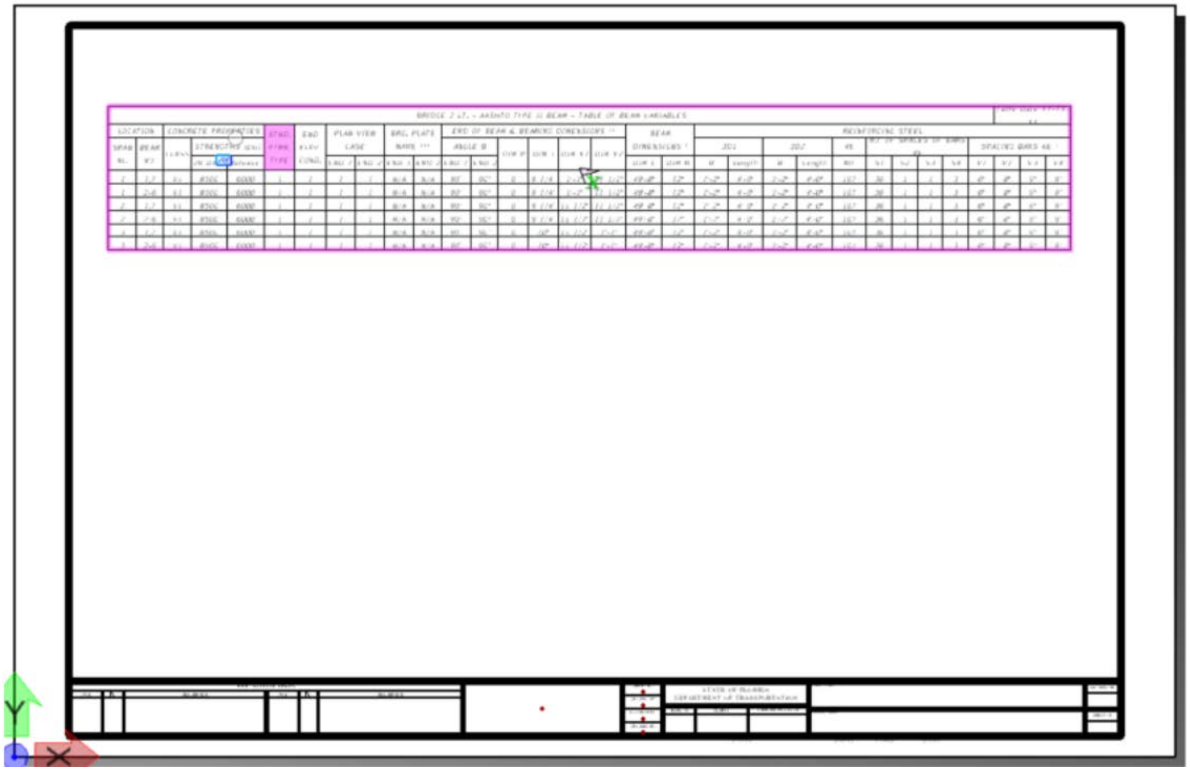
Once the file is selected, the **Select Cells** dialog box is opened. Select the cells for the table by selecting the worksheet and the range of cells to include.



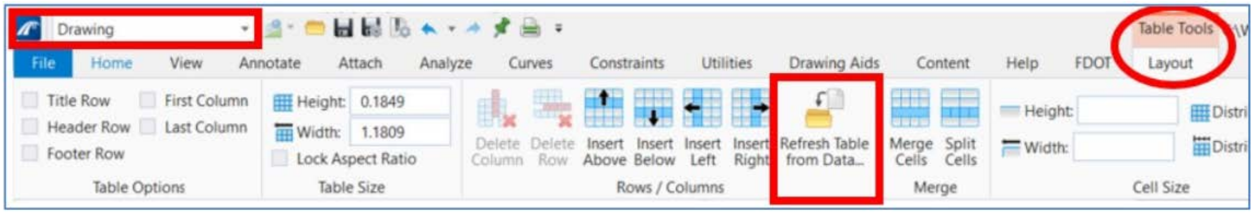
After the user clicks ok, the status window shown below generates the table. Depending on the size of the Excel file, the program may take a minute or more to create the table.



The table can be placed in any model; however, it is recommended that these tables be placed directly onto Sheet Models to ensure formatting and sizing of the table fits. Once the table is placed, conduct additional formatting, e.g. change the text style etc.



The table can be refreshed at any time with updated data by selecting the table and accessing the Table Tools options in the **Layout** > **Refresh Table from Data Source** tool under the Rows / Columns group. However, note that any formatting that was executed after the table was placed in the DGN file will need to be repeated as the settings for the table will also be reset.



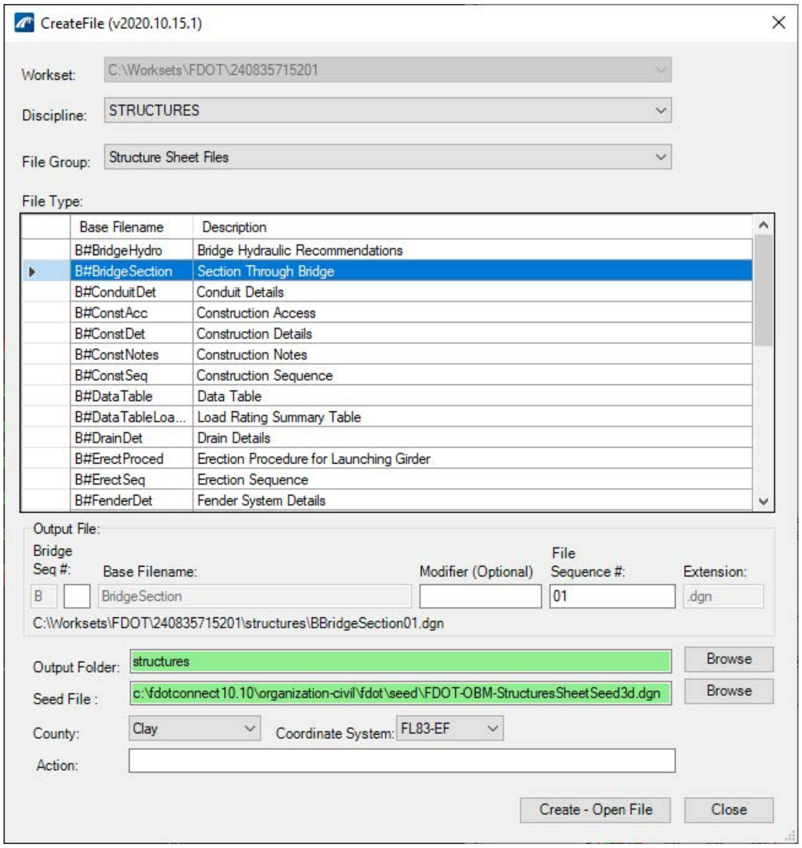
PLAN SET MANAGER (SHEET BORDER INFO)

The Plan Set Manager is a tool developed by FDOT in order to help populate, manage, and update all of information found in the sheet borders. An in depth video explaining all the details of this tool can be found HERE.

STARTING A NEW FILE/DRAWING

Plans production will utilize drawing models and sheet models, which will be contained within a sheet file (dgn). A new Drawing or Sheet Model can either be created directly within a Design file or in a separate sheet file. For the models in a separate file, the OBM model is referenced from the Design file (with the bridge model). This workflow utilizing references allows for several advantages in plans development and is the recommended workflow by FDOT. First, a team of users can work separately on multiple workstations on the model file and the drawing files simultaneously. This can help increase efficiency as one user can be developing plans drawings while another can be developing the model or adding additional detail at the same time. Note that only one user can be editing a single DGN file at a time, but the separate files created in this approach provides a workflow in which multiple users can be developing various content for the same bridge. Second, this separates the sheets and the model files so that if one file becomes unstable or corrupt, loss of data and efforts is likely to be minimized. Alternatively, having all the models and sheets in one file may result in loss of most if not all of the data when corruption occurs.

The **FDOT > Create File** tool should be used to create all sheet files. When **STRUCTURES** is selected as the *Discipline* and _____ **Sheet Files** is selected as the *File Group*, there are many sheet Base Filenames which may be selected for the *File Type*. The user should select the applicable sheet file for the current plans production activity to stay in compliance with FDOT CADD standard per FDOT CADD Manual.



In general, sheet files that would reference the 3D bridge model will use a 3D sheet seed file so that any Saved Views will be able to reside in the sheet file itself. For other sheet files that will not utilize 3D Saved Views, those can use a 2D sheet seed file. Users can change which seed file is used by selecting **Browse** next to the *Seed File*.

Once a sheet file is created, the user can create sections and views from the model directly into these new files. This creates an active reference to the model in which additional detailing and annotation can be generated to prepare for plans development.

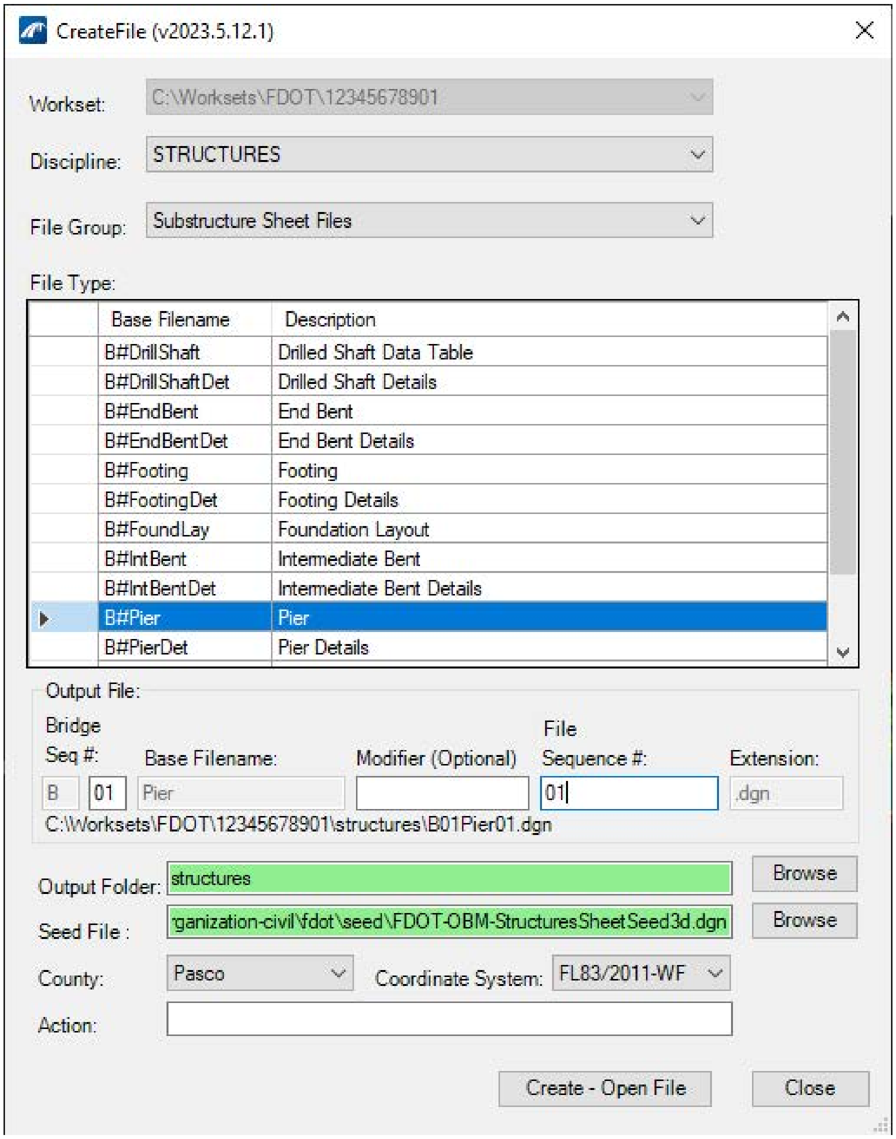
Note that there is some uniqueness in model-centric plans development compared to traditional plan production. First, the linework is essentially a “view” of the model, so it will reflect exactly what is in model as lines are references directly from the design model. Although this is advantageous over traditional methods in many situations for both efficiency and quality, the user must be aware of this, as the tools used and processes followed are likely altered. For example, lines cannot just be simply deleted as they are references from the model; instead, display rules and masking tools must be used if certain linework is to be shown differently or not shown in a particular detail.

EXERCISE OVERVIEW

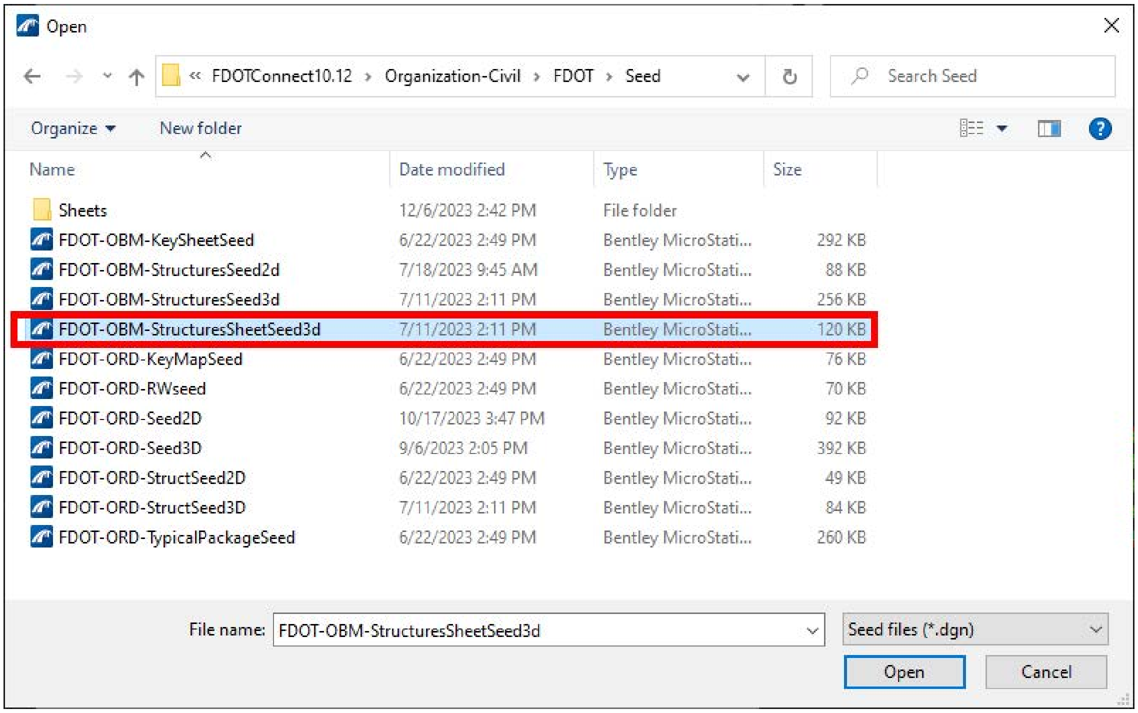
Exercise 6.1 *Use Section Callout Tool to Make Pier Sheets*

CREATE A PIER SHEET

1. Open the data set file: *B01MODLBRTR01_6.1_Begin.dgn*
2. Access the **FDOT > Actions > Create File** tool and create a sheet file with the inputs indicated below.



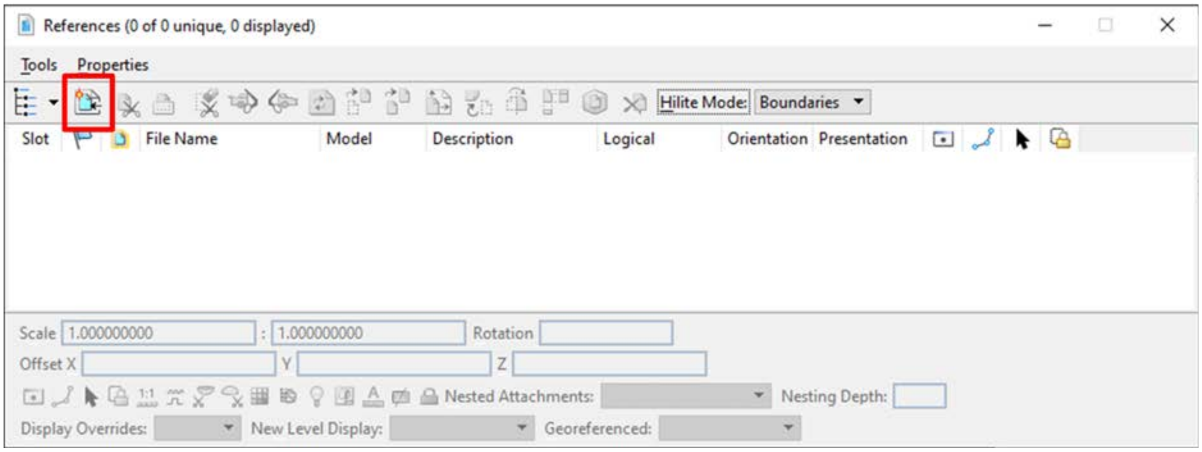
3. Ensure that the seed file being used is the *FDOT-OBM-StructuresSheetSeed3d.dgn* file. If it is not, click the **Browse** button next to the *Seed File* field to navigate to the Seed folder. Select the correct file and click **Open**.



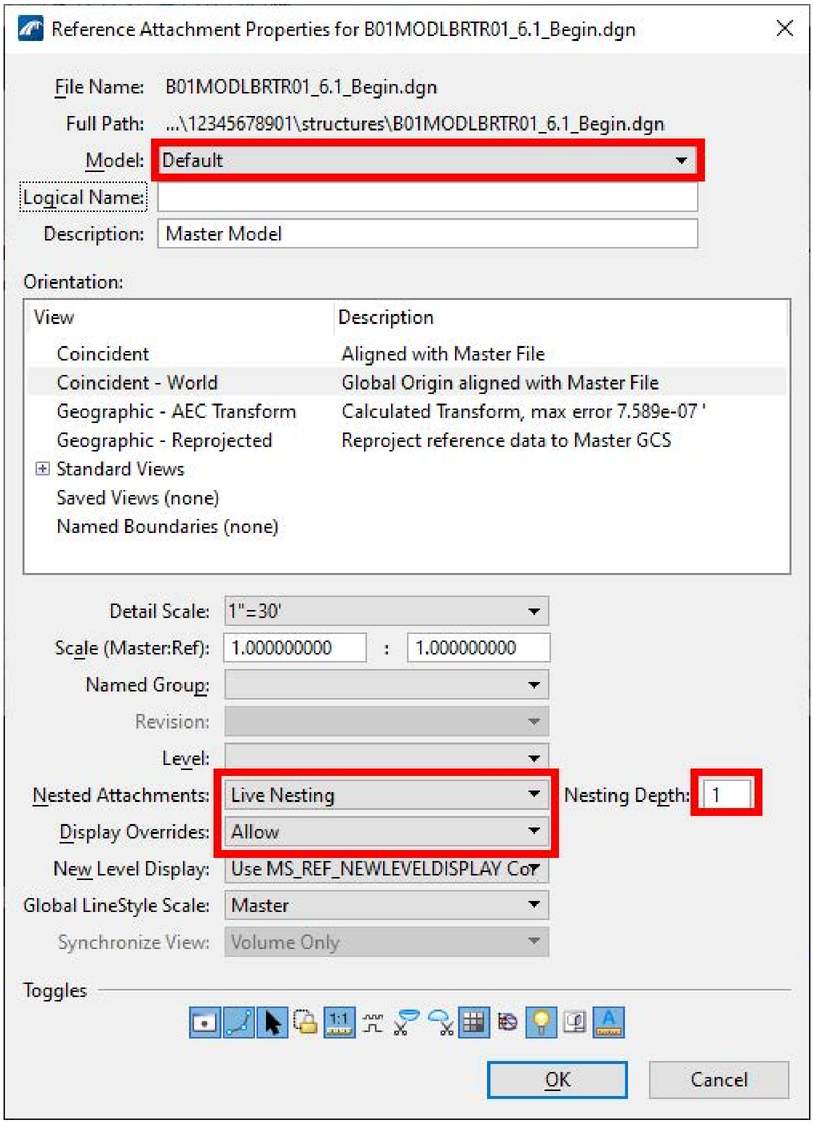
4. Once all inputs are set and the correct seed file is selected, click **Create – Open File** to create the sheet file.

5. The new sheet file will automatically be opened, click **Close** in the *CreateFile* window. In the **Default** model, open the **References** tool by navigating to and selecting **Home > Primary > References**.

6. Attach the *B01MODLBRTR01_6.1_Begin.dgn* file as a reference in the **Default** model by using the **Attach Reference** tool at the top of the *References* window and then selecting the file. Set *Nested Attachments* to **Live Nesting** with *Nesting Depth* = **1** and *Display Overrides* to **Allow**.



7. Once all inputs for the incoming reference are set, click **OK** to attach the reference.



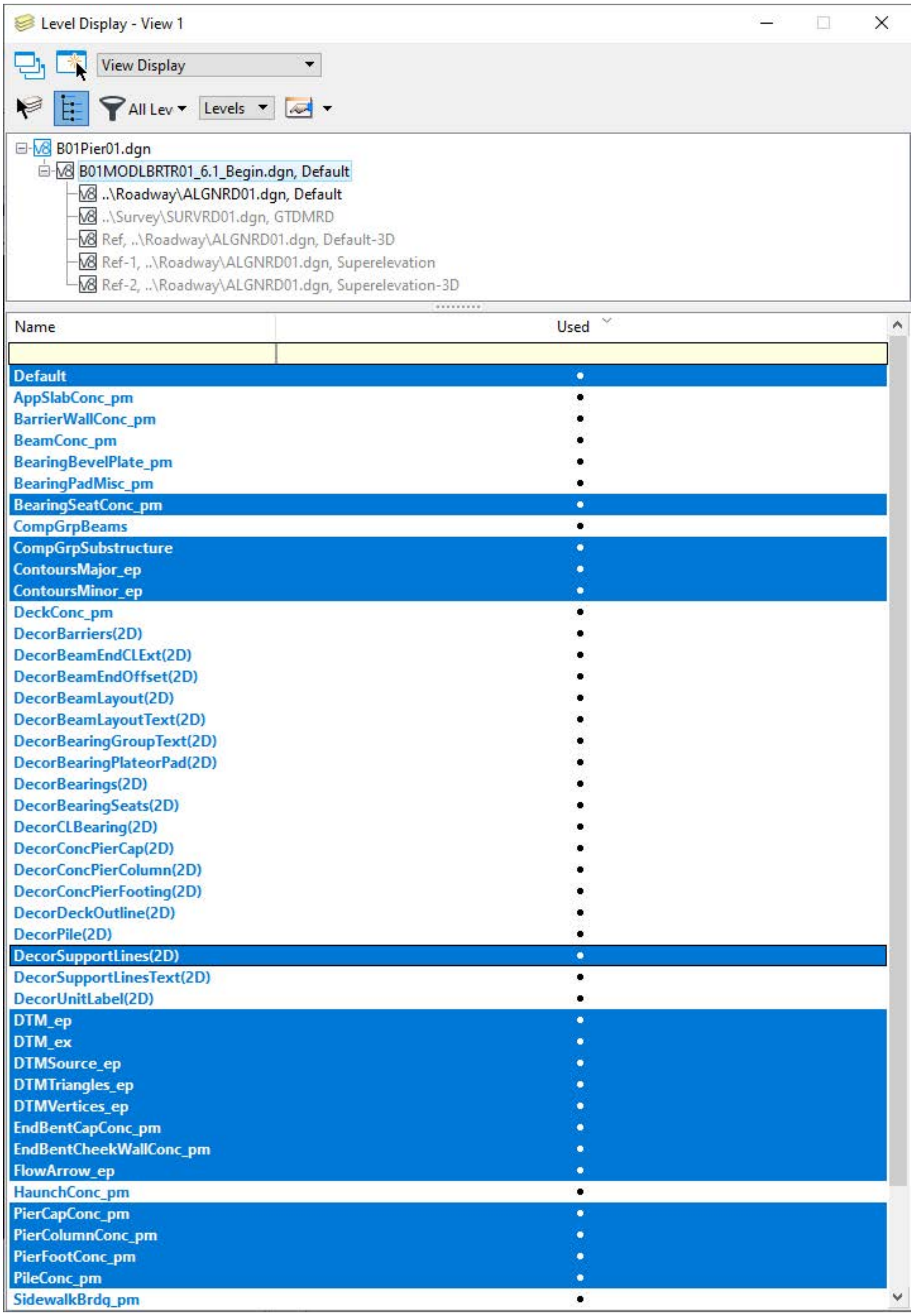
8. Once attached, click the **Fit View** tool at the top of the view window, then click within the view window to fit the reference within the view. Locate the bridge and zoom in.

9. Note that the annotations are difficult to see. To change the annotation scale of the model, access the **Properties** tool at **Home > Primary > Properties**.

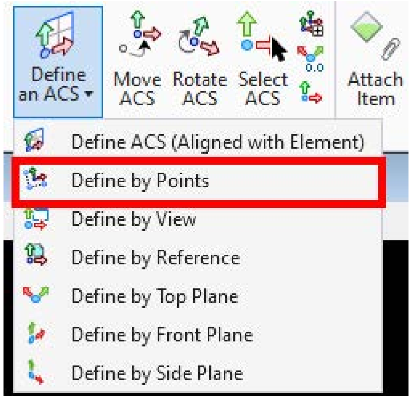
10. Next, open the *Models* window in the same group by selecting **Home > Primary > Models**.

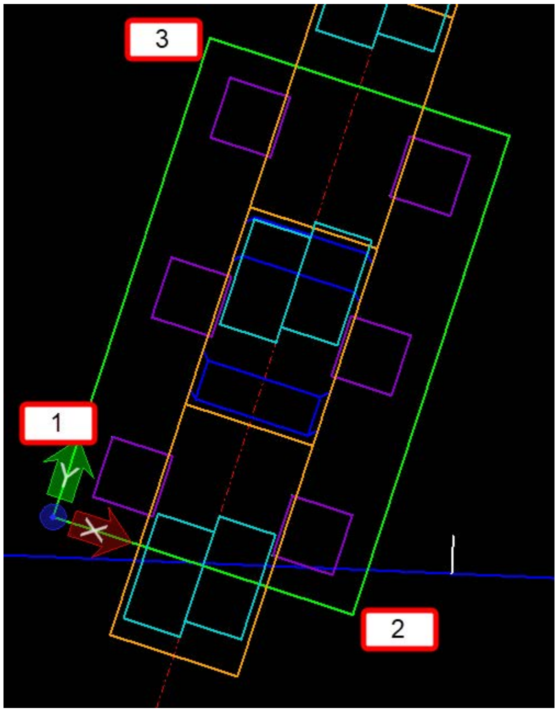
11. Once the *Models* window has opened to show all the models present in the file, highlight the model titled **Default.** The model's properties will all be accessible in the **Properties** window. Here, change the *Annotation Scale* field to **1"=30'**.

12. To turn off any bridge superstructure levels, access **Home > Primary > Level Display**. After selecting *B01MODLBRTR01_6.1_Begin.dgn* and clicking the (**+**) next to the file name. Turn off all barrier, deck, haunch, beam, bearing pad, sidewalk, and all Decor levels (as shown below) to allow for easier placement of the section callouts on Pier 2. Make sure to save settings by clicking the  icon at the top left or (**Ctrl + F**) to keep all level display changes.

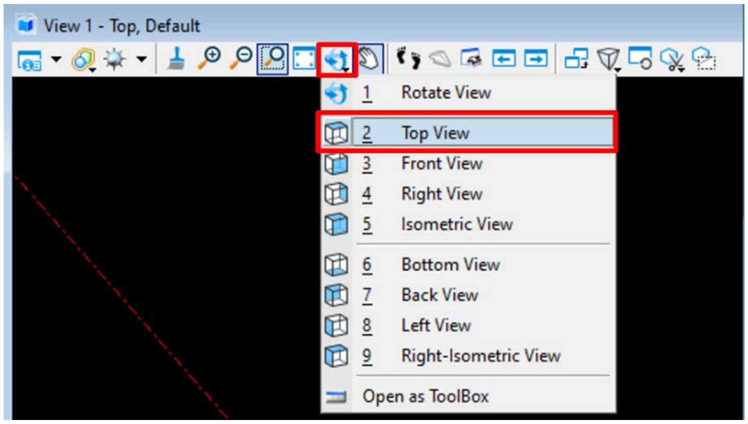


13. Rotate the orientation of View 1 so that the x-axis and y-axis run along the width and length of the footing. First set the ACS: **Utilities > ACS > Define ACS by Points** <OR> **[type] R+ [type] A**, then place the ACS at the southwest corner of the footing. Select the southeast corner of the footing to define the x-axis. Then select the northwest corner of the footing to define the y-axis.

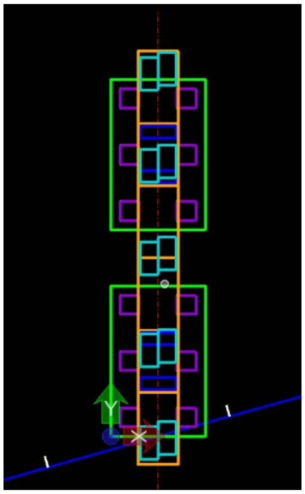




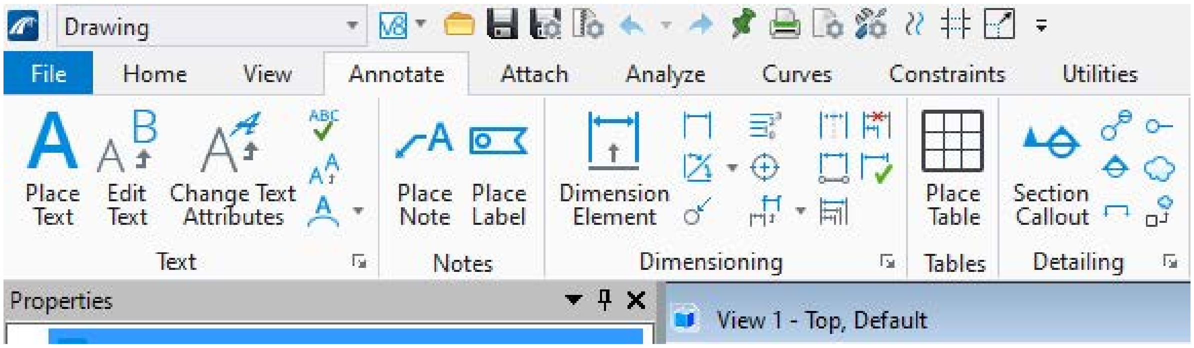
14. On the **View** toolbar, select **View Rotation > Top View** <OR> **[Hold Shift] + [Right Click] + [type] T**. Save Settings (**Ctrl + F**) once the view is rotated.



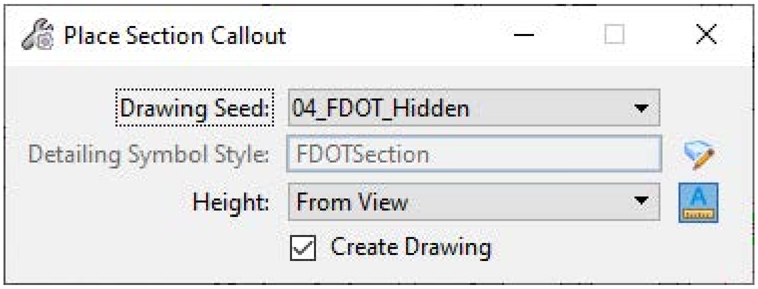
15. The x-axis and y-axis should now run along the width and length of the footing.



16. To begin creating the Pier Sheet, access the **Section Callout** tool found at **Drawing** (Workflow) **> Annotate > Detailing > Section Callout**.

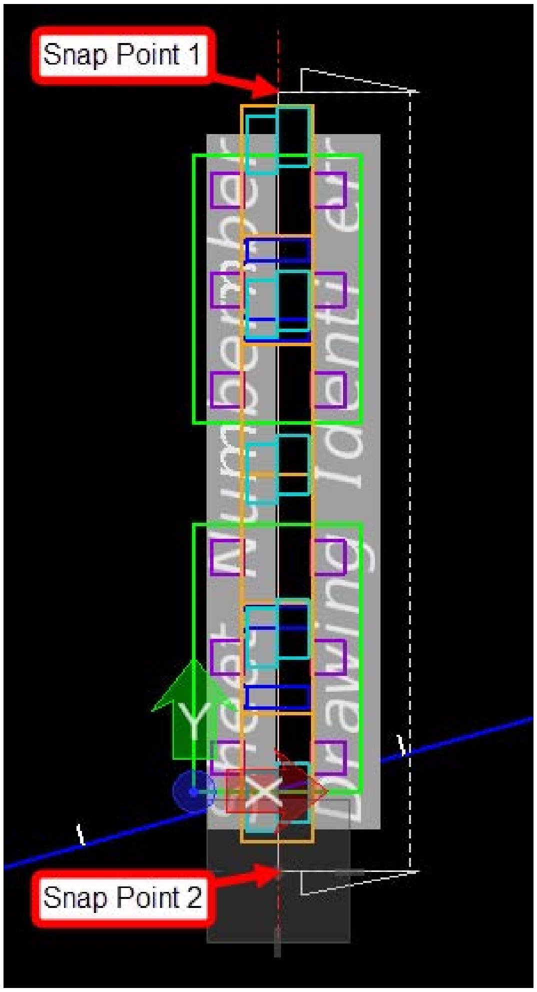


17. Select the **04_FDOT_Hidden** drawing seed. This will allow the pile embedment and any other hidden lines to be shown as dashed in the newly created view.

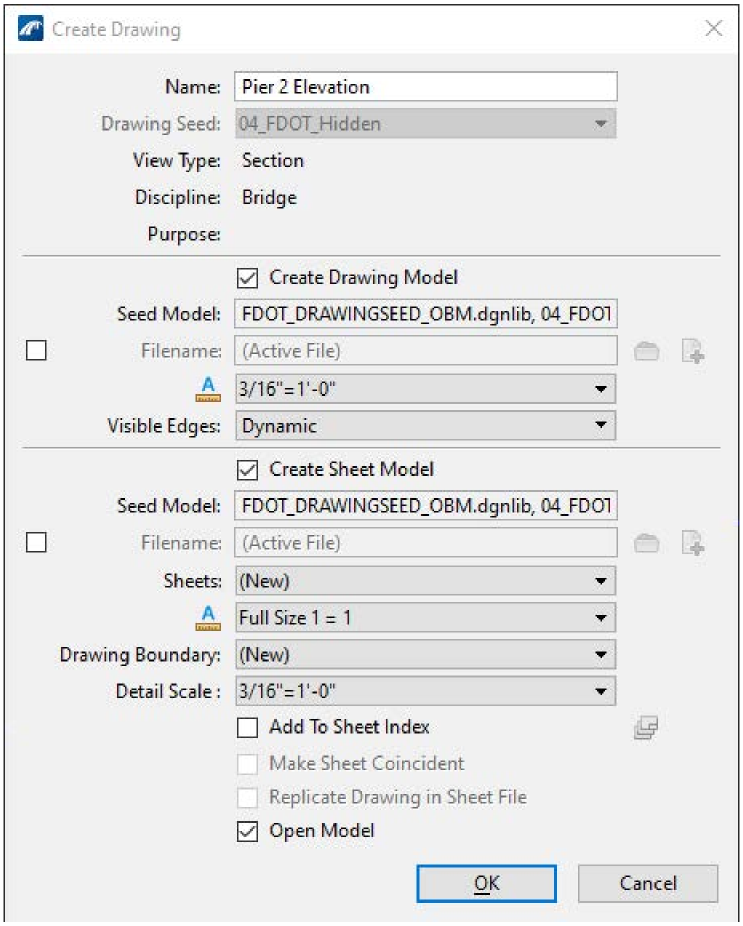


18. Snap to the SupportLine on each end of Pier 2. Make sure the section cut extends past the ends of the pier cap.

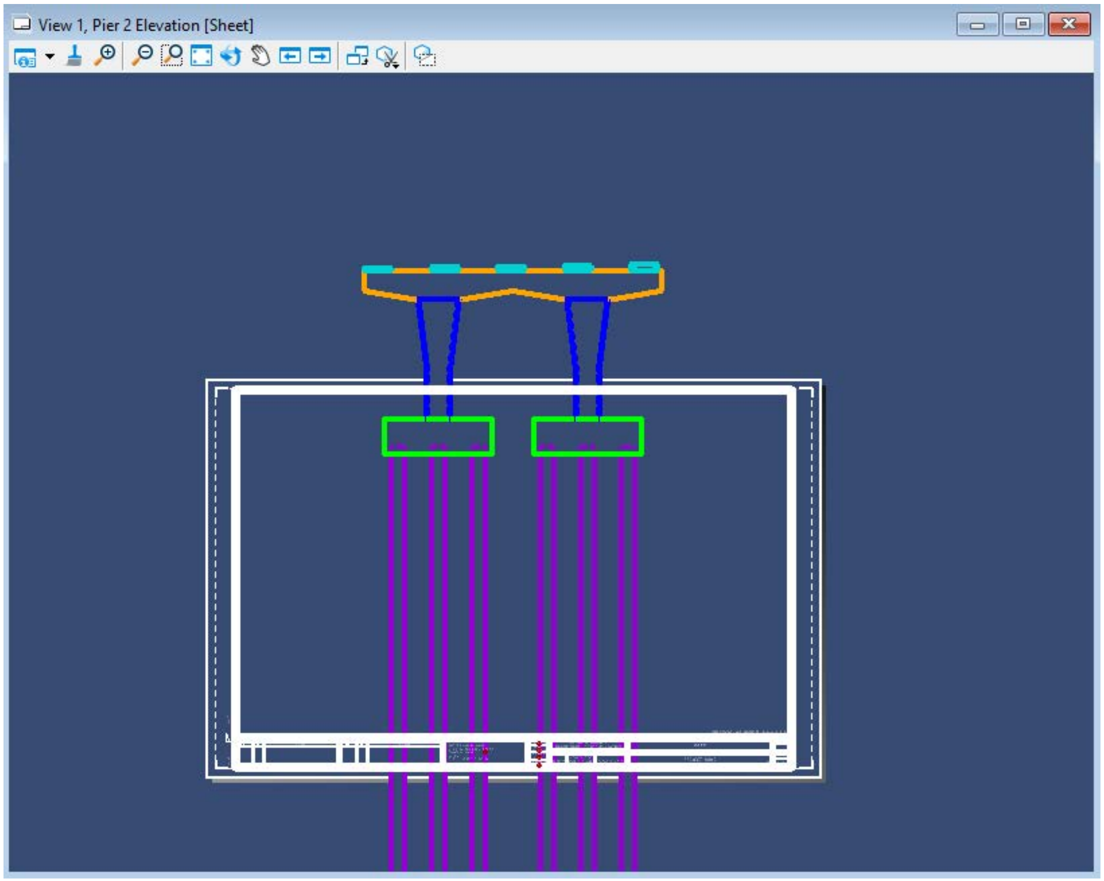
19. Define the direction and depth of the section callout by moving the cursor to the upstation side of the pier and data point to ensure the section boundary fully encapsulates the pier footing.



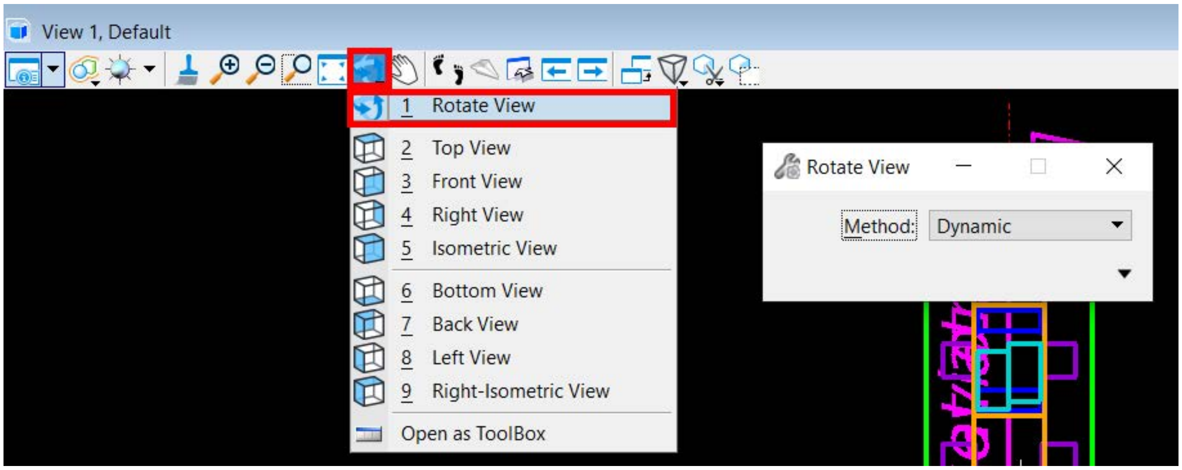
20. Set the name of the view to be **Pier 2 Elevation**. The drawing seed is already set as **04_FDOT_Hidden**. Set the annotation scale for the drawing model and the detail scale of the Sheet Model to **3/16" = 1'-0"**. Note that the annotation scale of the sheet model should be **Full Size 1 = 1**. Verify the rest of the settings match the image below and click **OK**.



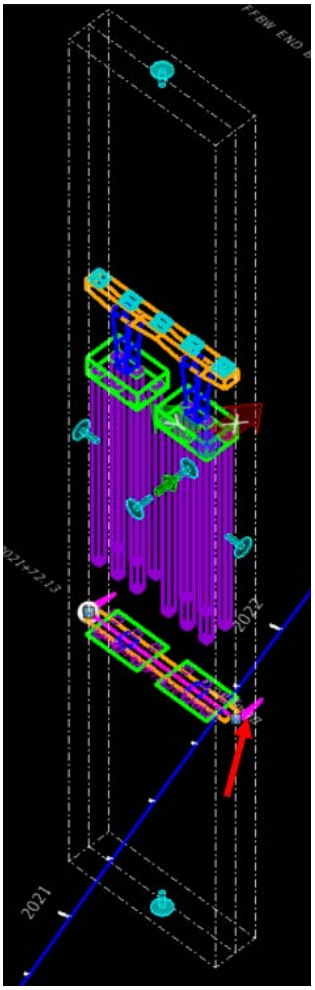
21. The sheet model with the elevation view will automatically open in the active file.



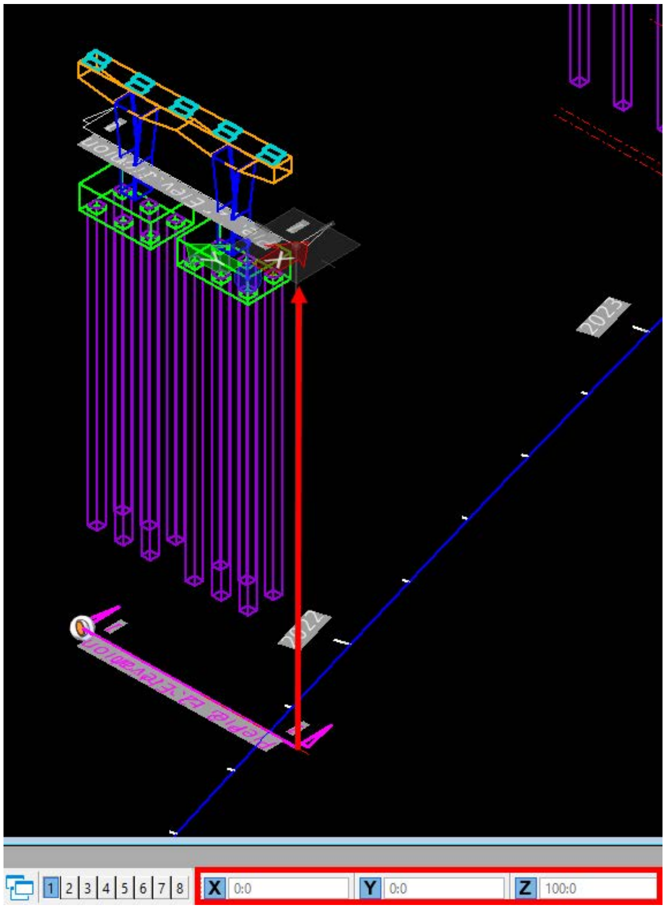
22. To reduce the length of the piles shown, return to the **Default** model by opening the *Models* window and double-clicking **Default**. Rotate the view to clearly see the section cut location relative to the piles using **View Rotation > Rotate View** with the *Method* set to **Dynamic**.



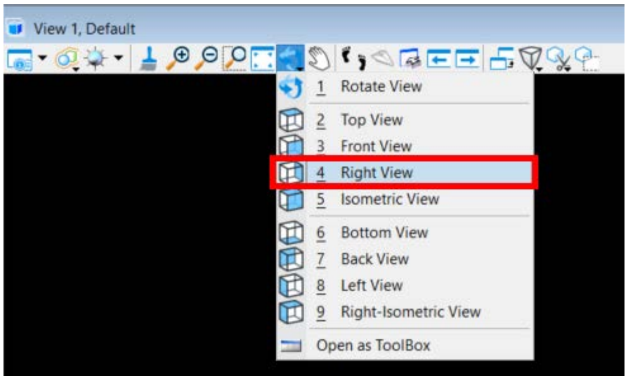
23. Select the Section Callout previously created to see the clip volume for the **Pier 2 Elevation** view. It will be located at the zero elevation (same elevation as the décor levels).

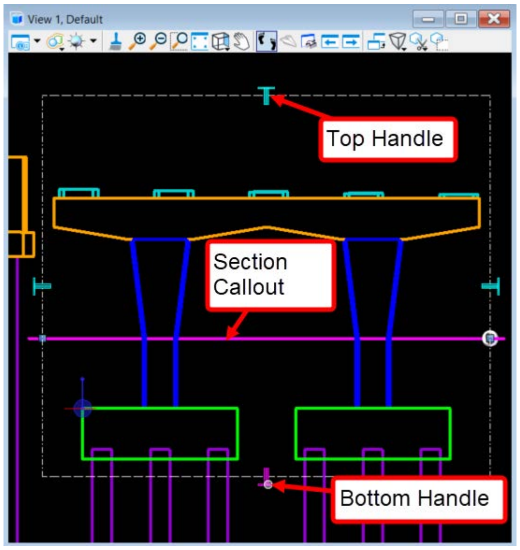


24. Access the **Move** tool at **Drawing** (Workflow) **> Home> Manipulate** and move the Section Callout above the piles by setting movement in the Z-direction to **100:0** and setting the X-direction and Y-direction movement to 0:0. Data point in the view window to accept the move, then right click to exit the move command.

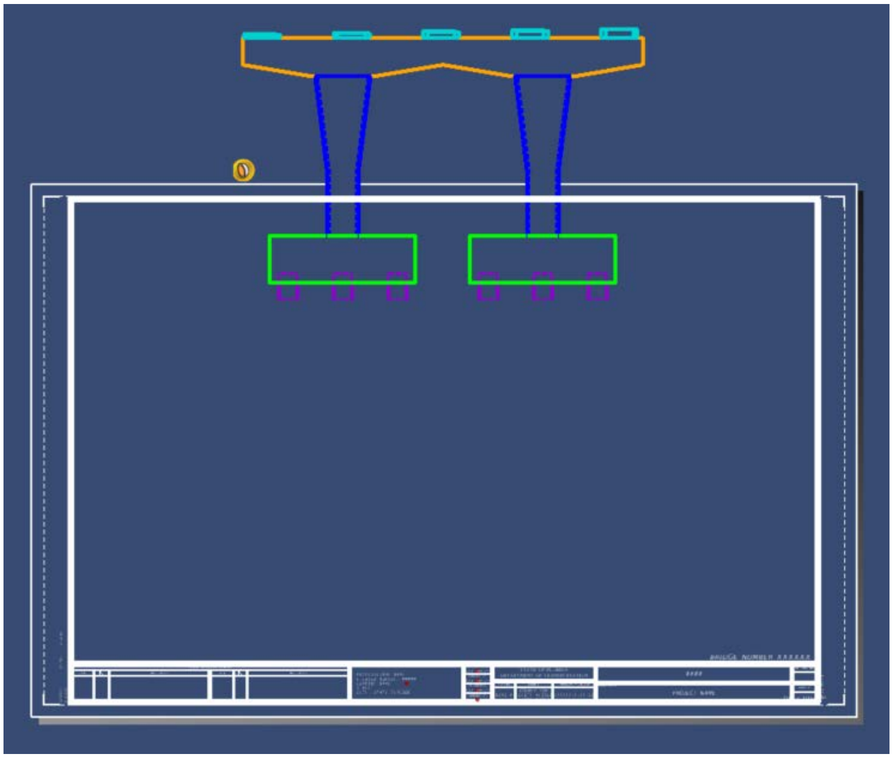


25. Rotate the view again by using **View Rotation > Right View** and select the Section Callout. Adjust the clip volume by selecting the blue handles and moving the top handle closer to the top of the pier cap and the bottom handle just under the footing.

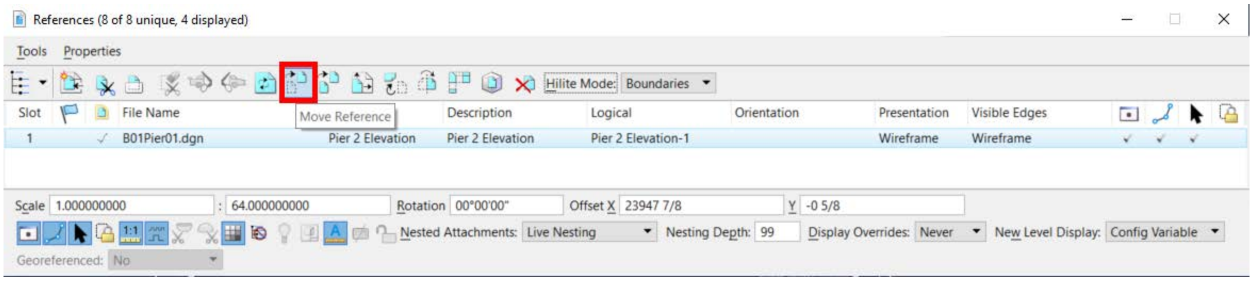


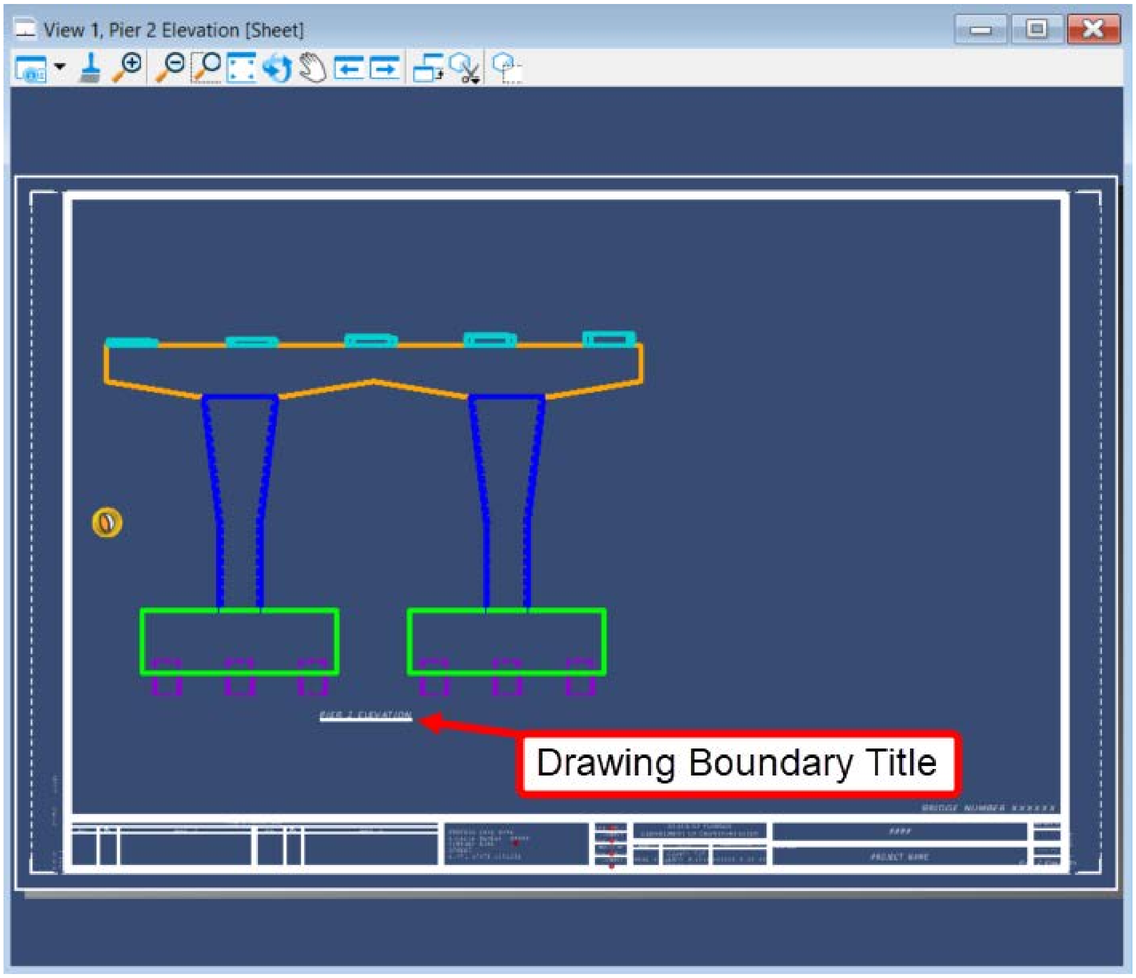


26. After adjusting the clip volume, return to the **Pier 2 Elevation [Sheet]** sheet model by opening the *Models* window and double-clicking the model name. The sheet model should look like the image below.

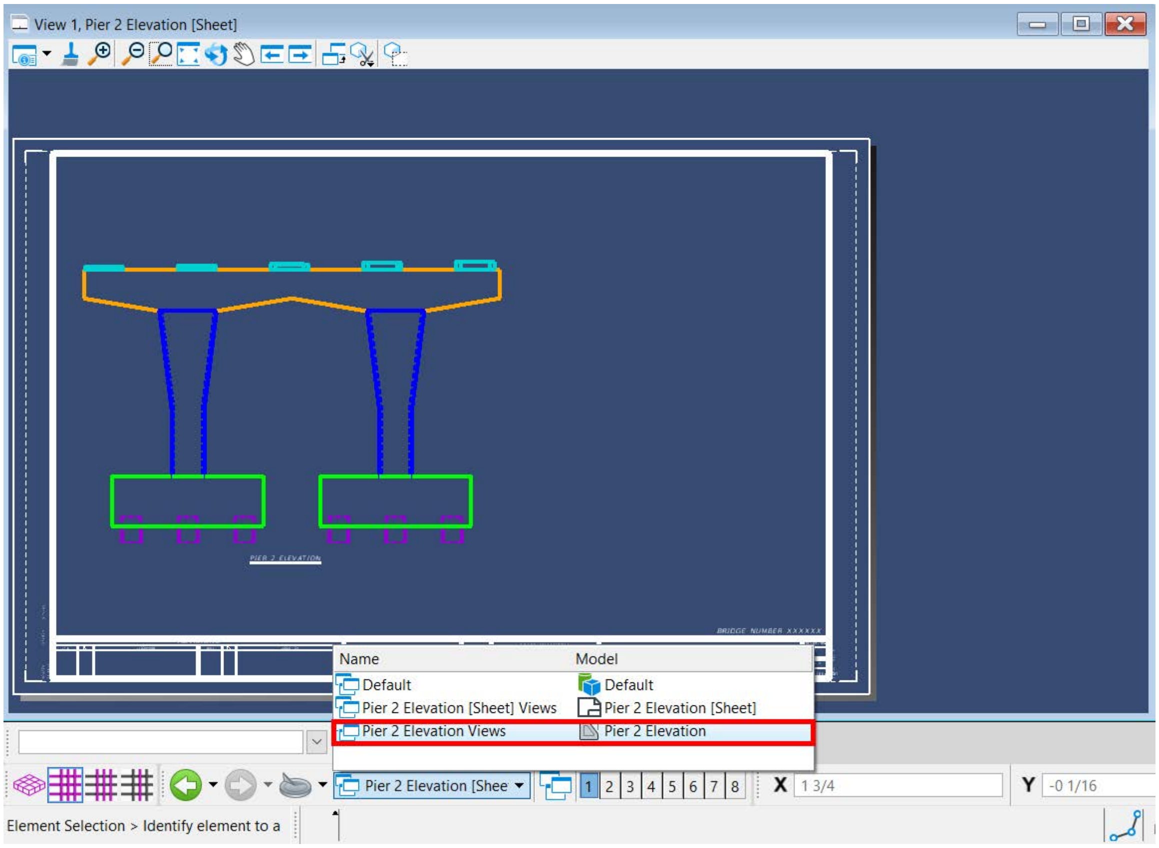


27. Open the *References* window the (**Home > Primary > References**) and select the **Move Reference** tool to move the section within the borders of the sheet. Then, use the **Drawing** (Workflow) **> Home > Manipulate > Move** tool to place the Drawing Boundary title directly below the section.

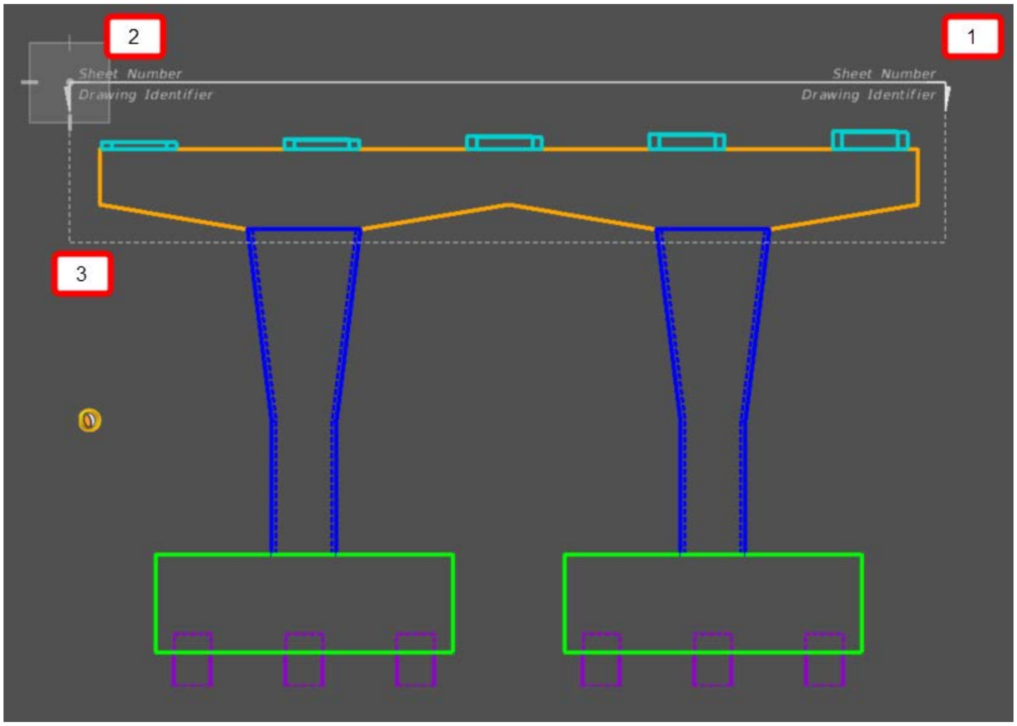




28. To create other views using the **Section Callout** tool without showing the arrow annotations, the additional section cuts should be done in the drawing model. Navigate to the **Pier 2 Elevation** drawing model in the **Active View Groups** drop-down list.

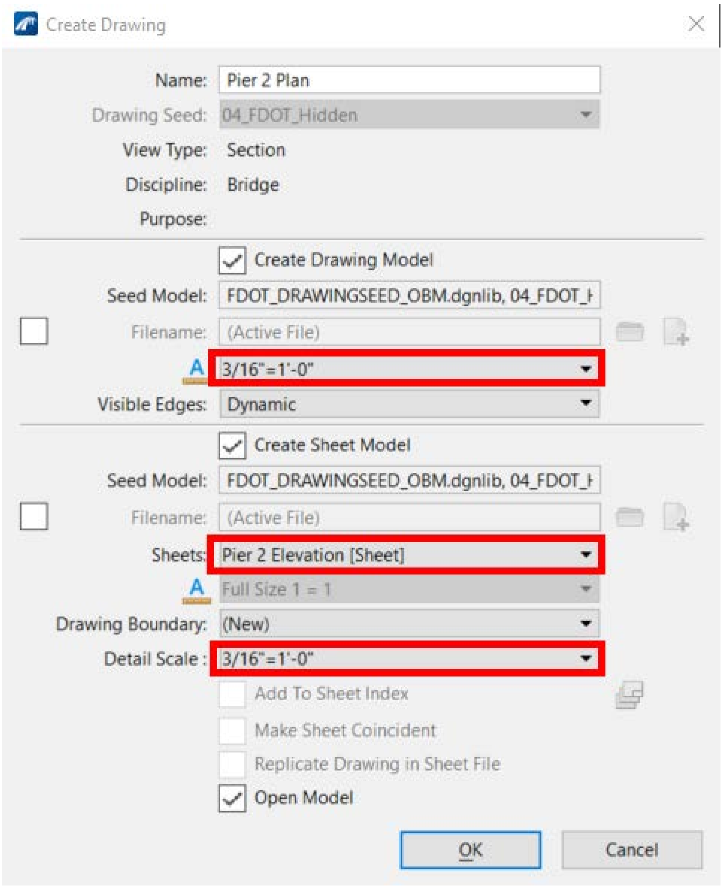


29. Open the **Section Callout** tool again using the **04_FDOT Hidden** drawing seed to create a plan view.
30. Next, click above and to the right side of the pier cap to define a start point for the callout. Then, define an end point for the callout by clicking at a point at the same elevation and beyond the left side of the cap.
31. Define a direction and depth to the callout by clicking at a point below the cap, within the column.

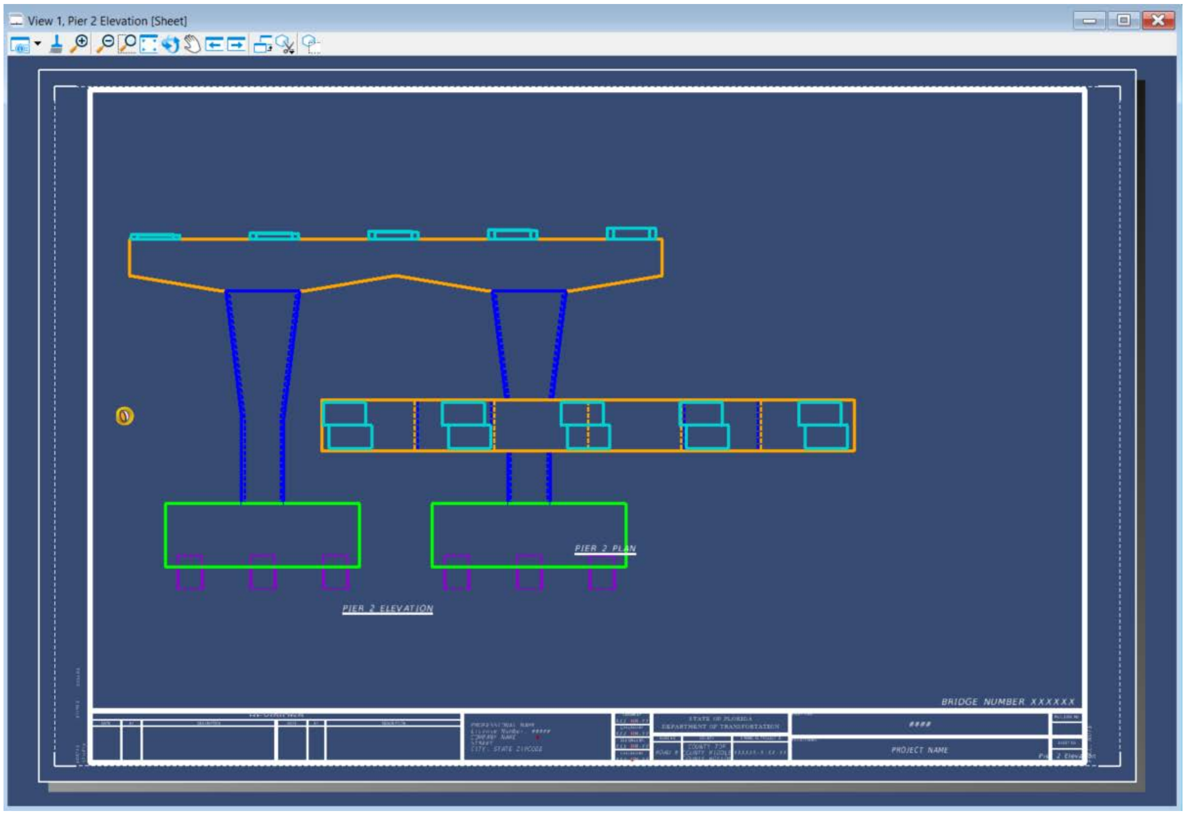


32. Once the **Create Drawing** window opens, set the name of the view to be **Pier 2 Plan**.

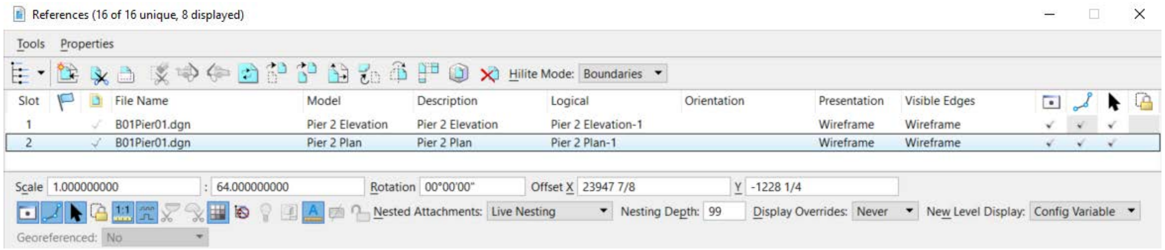
33. Set the *Annotation Scale* for the drawing model and the *Detail Scale* for the sheet model to be **3/16" = 1'-0"**. Additionally, change the *Sheets* drop-down to the existing **Pier 2 Elevation [Sheet]** sheet model. Verify the rest of the settings match the image below and click **OK**.



34. Notice that upon returning to the **Pier 2 Elevation [Sheet]** sheet model, a plan view is now found within the limits of the border. However, the plan view is overlapping the elevation view.



35. Open the *References* window by navigating to and selecting **Home > Primary > References**.

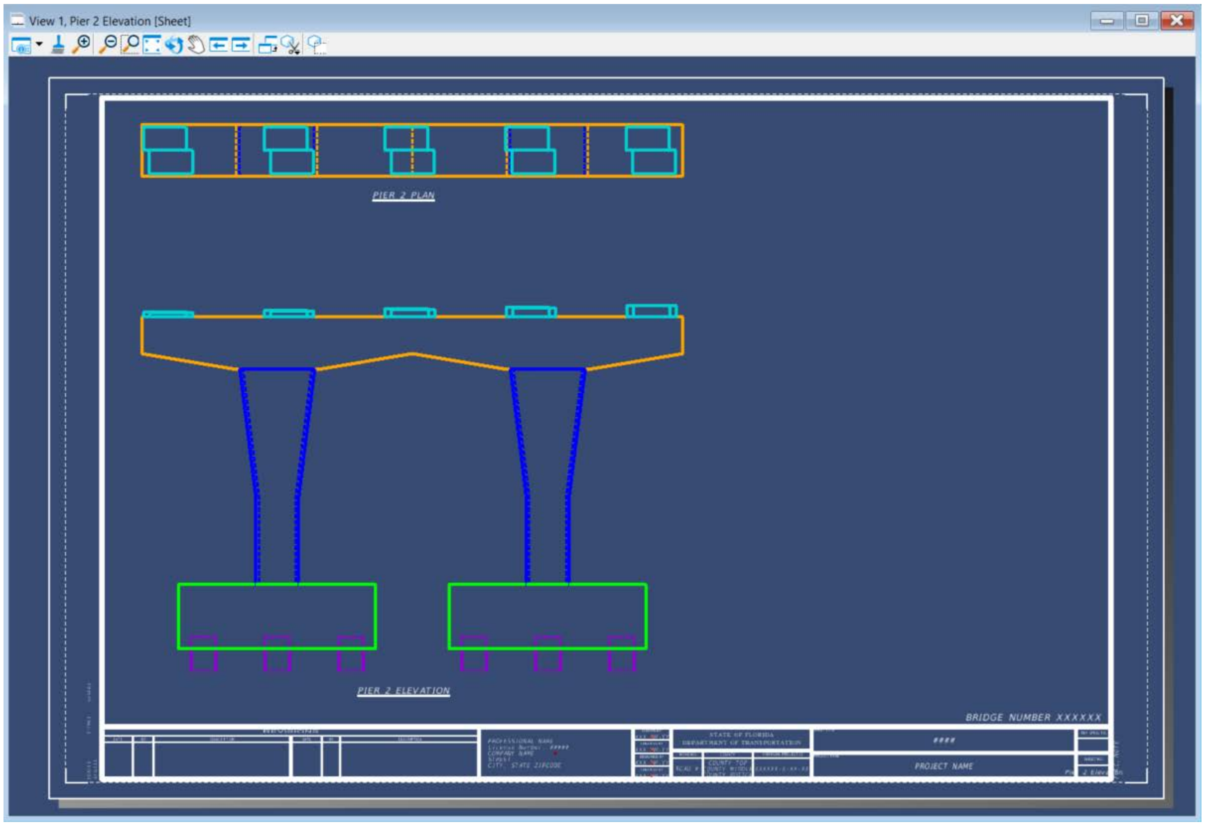


36. In the *References* window, notice that each view has its own reference (Elevation View = Pier 2 Elevation, Plan View = Pier 2 Plan).

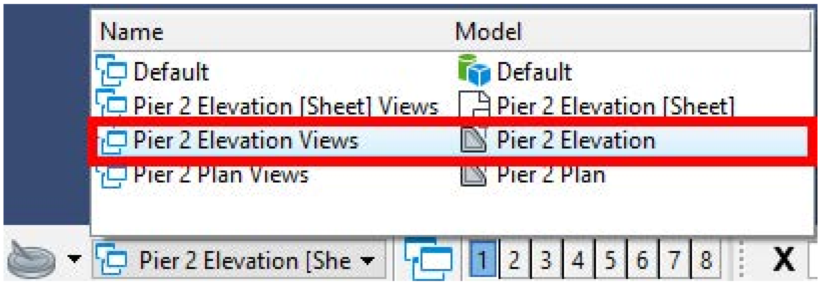
37. To move each view so they are not overlapping, they will need to be moved using **Move Reference** at the top of the *References* window.

38. Highlight the view that will be moved. Then, click **Move Reference** and move the highlighted view. Move the **Plan** model reference to be directly above the **Elevation** model reference so both views are horizontally aligned. This can be done by snapping the corner of the plan view to the corner of the plan view then moving the plan view directly up.

39. Use the **Move** tool to place the Drawing Boundary titles (i.e., PIER 2 PLAN and PIER 2 ELEVATION) directly below their respective views. Navigate to **Home > Manipulate > Move** and then select the text to be moved. The sheet should look like the image below.



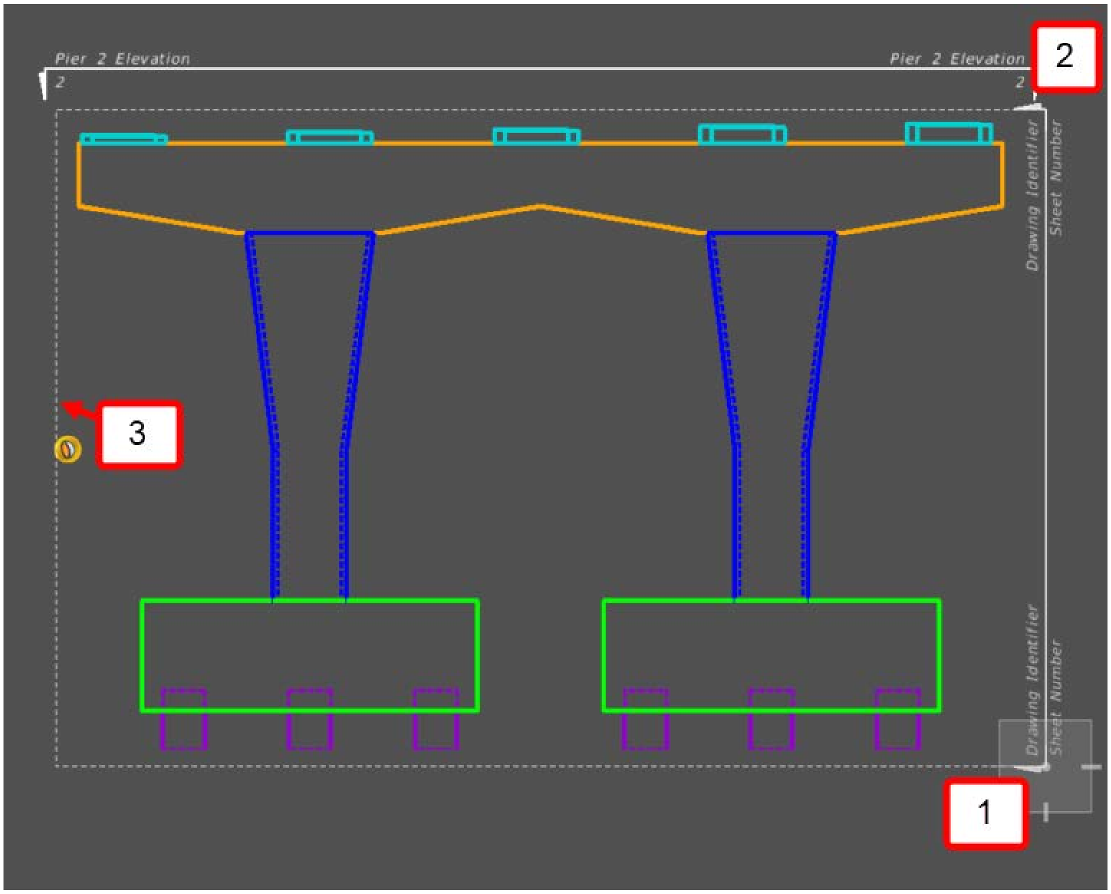
40. Return to the **Pier 2 Elevation** drawing model in the **Active View Groups** drop-down list to create an end view.



41. Open the **Section Callout** tool using the **00_FDOT_Solid** drawing seed and click above and to the right side of the pier cap to define a start point for the callout. Then, define an end point for the callout at a point below the tip of the piles.

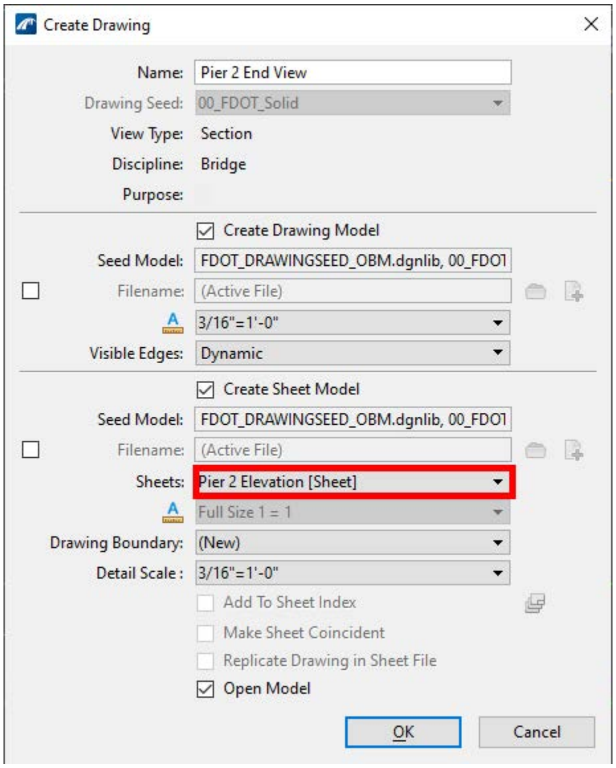
42. Define a direction and depth to the callout by clicking at a point beyond the other end of the cap.

43. Once the *Create Drawing* window opens, set the name of the view to be **Pier 2 End View**. Match the annotation and detail scales used for the previous view, and change the *Sheets* drop-down to the existing **Pier 2 Elevation [Sheet]** sheet model.



NOTE	***In this case the depth of the callout extends past the entire length of the pier. There may be cases where the depth of the callout needs to be adjusted to obtain the desired view (i.e. footings at different elevations may result in additional lines in end view).***

44. Verify that the rest of the window matches the following image and click **OK**.



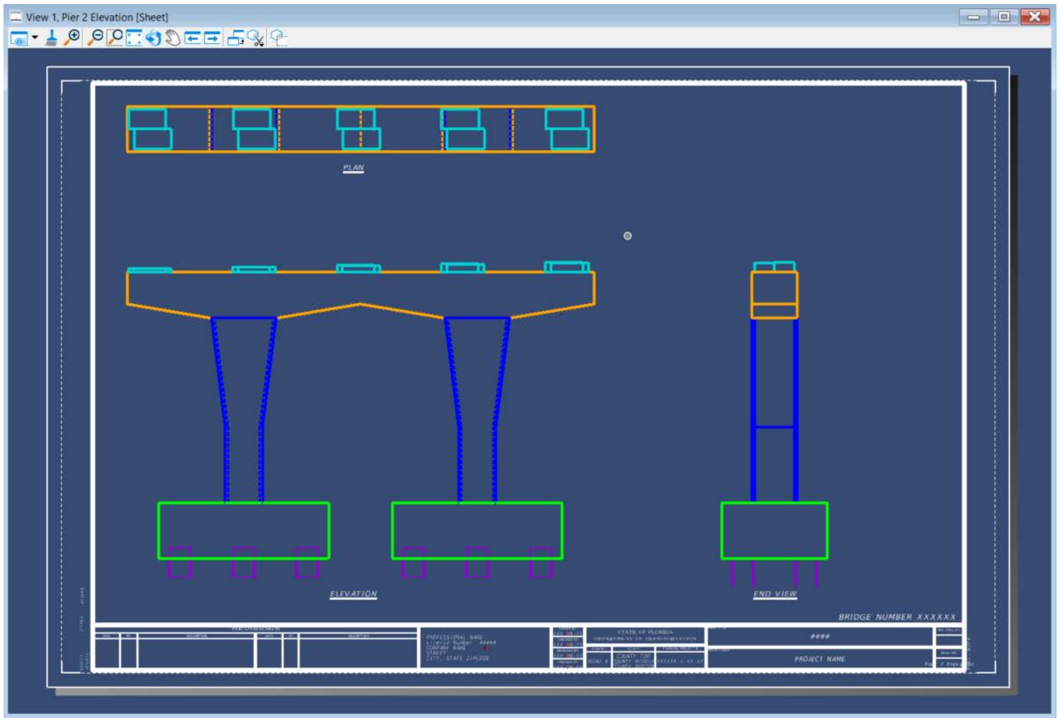
45. When the **Pier 2 Elevation [Sheet]** sheet model is opened, ensure the new end view model reference is now located in the sheet model.

46. Use the **Move Reference** and **Move** tools described in Steps 38 through 40 to place the **Pier 2 End View** model reference and Drawing Boundary title to the right of the Elevation view. The same methodology used for aligning the plan and elevation views can be used. Use a common point in the end view and align it with its corresponding point on the elevation view.

47. Double click on each view title annotations (Pier 2 Plan, Pier 2 Elevation, and Pier 2 End View) and remove the “Pier 2” portion. The view title annotations should now read “PLAN”, “ELEVATION”, and “END VIEW”.

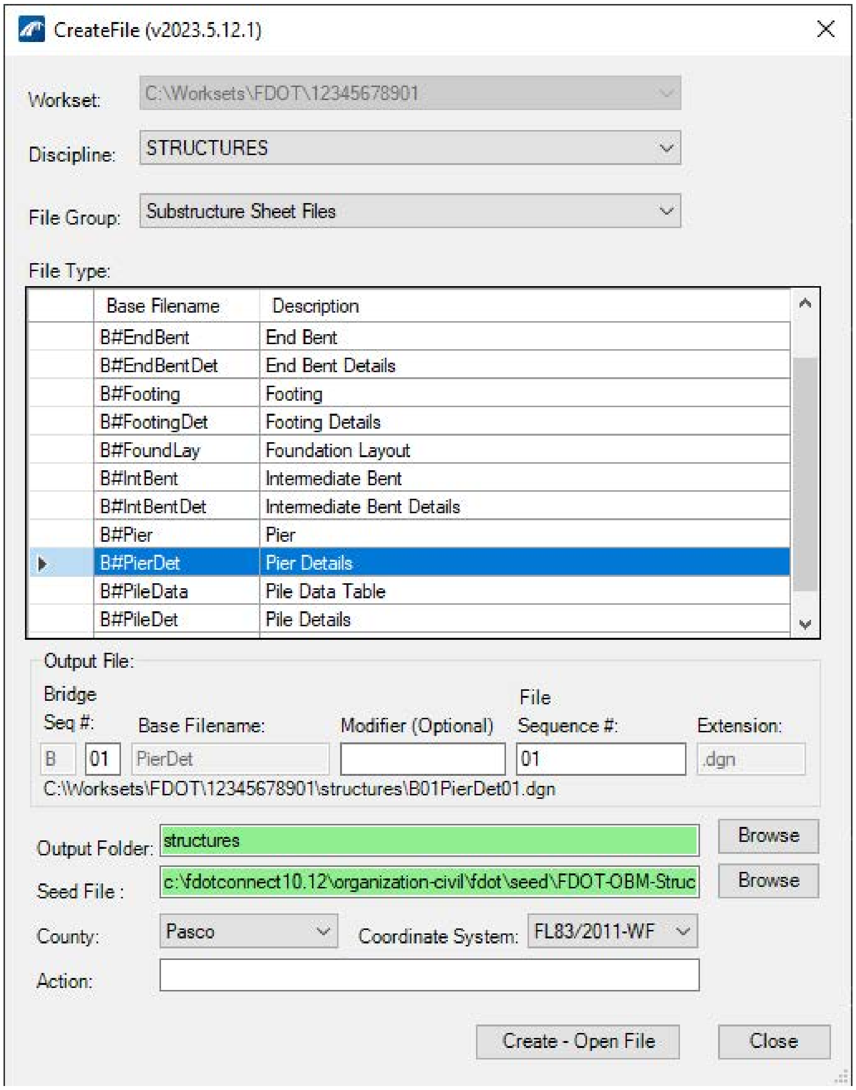
NOTE ***There are some elements in the plan view that can either be drawn in live within the Pier 2 Plan View drawing model or brought in with additional references to the model. For example, the centerline of pier, bearing lines, and centerline of beams will need to be added.***

48. The final view should look like the image below.



CREATE A PIER DETAILS SHEET

1. Access the **Open Bridge Modeler** (Workflow) **> FDOT > Actions > Create File** tool to create another sheet file.
2. Ensure that the seed file being used is the *FDOT-OBM-StructuresSheetSeed3d.dgn* file. If it is not, click the **Browse** button next to the *Seed File* field to navigate to the Seed folder. Select the correct file and click **Open**.
3. Once all inputs are set as shown below and the correct seed file is selected, delete any text in the *Action* field. Click **Create – Open File** to create the sheet file.



4. The new sheet file will automatically be opened. Click **Close** and then re-open the pier sheet file created at the beginning of Exercise 6.1 by selecting **File > Open** and select *B01Pier01.dgn*.

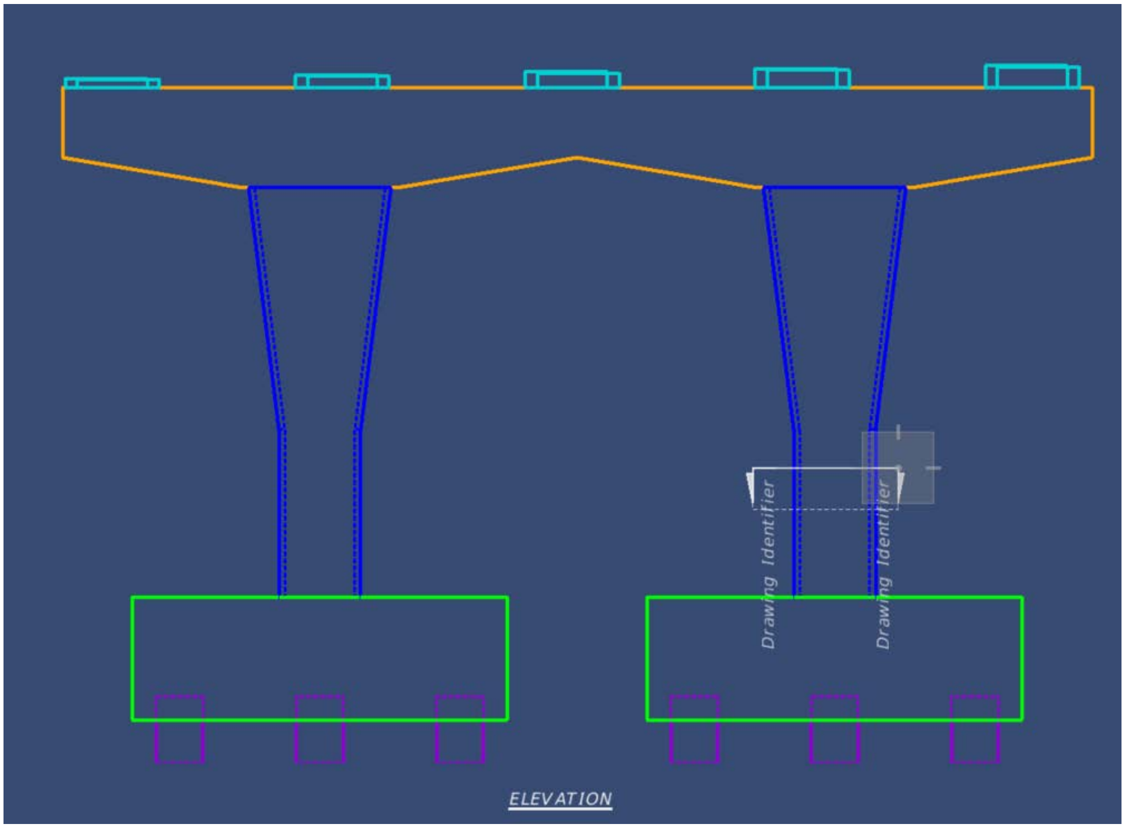
5. To create section views for the newly created details sheet, the **Section Callout** tool will again be utilized. However, in this case, we want to show the arrow annotations to denote where and what direction each section is cut. The subsequent section cuts will be done in the sheet model.

   Navigate to the **Pier 2 Elevation [Sheet]** sheet model in the **Active View Groups** drop-down list.

6. Access the **Section Callout** tool found at **Drawing** (Workflow) **> Annotate > Detailing > Section Callout** and select the **07_FDOT_Hidden_VertNoSheet#** drawing seed. This seed will create a callout that is displayed more as a traditional FDOT section cut annotation.

7. Locate a point in the elevation view within the non-tapered region of the column. At this location, click at a point to the left of the column to define a start point for the callout. Then to create a horizontal section, define an end point for the callout at a point to the right of the column, as shown below.

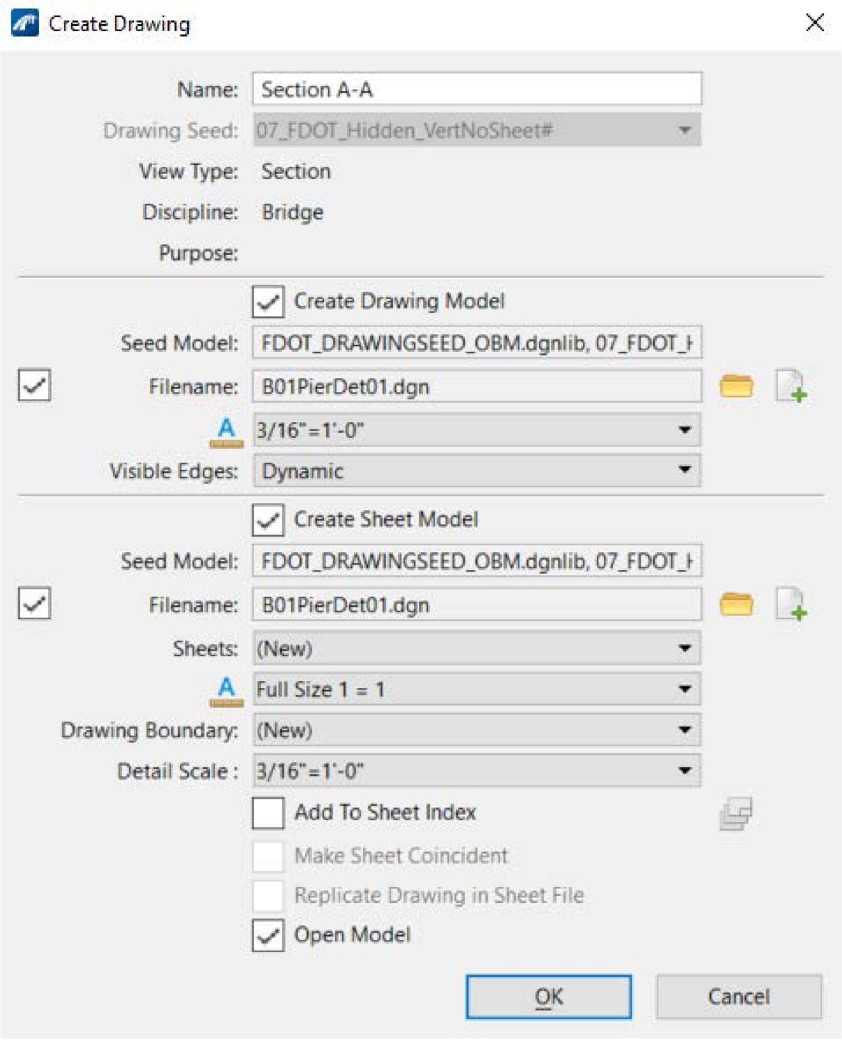
8. Define a direction and depth such that the section arrows point towards the footing and the depth limit is above the footing, as shown below.



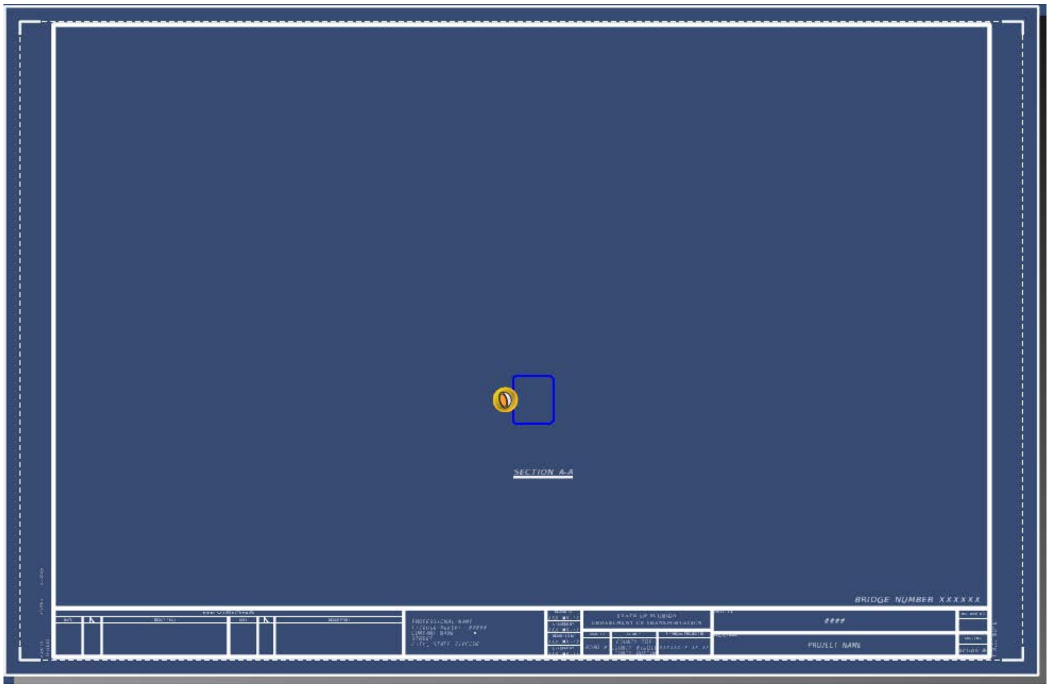
9. Once the *Create Drawing* windows opens, set the name of the view to be **Section A-A**. Then, set the *Annotation Scale* for the drawing model and the *Detail Scale* of the sheet model to **3/16" = 1'-0".**

10. Check the boxes next to the *Filename* fields and click the folder button to select the file created in Steps 1 through 3 (*B01PierDet01.dgn*) to send the new drawing and sheet models to the specified file.

11. Verify that the rest of the window matches the following image and click **OK**.



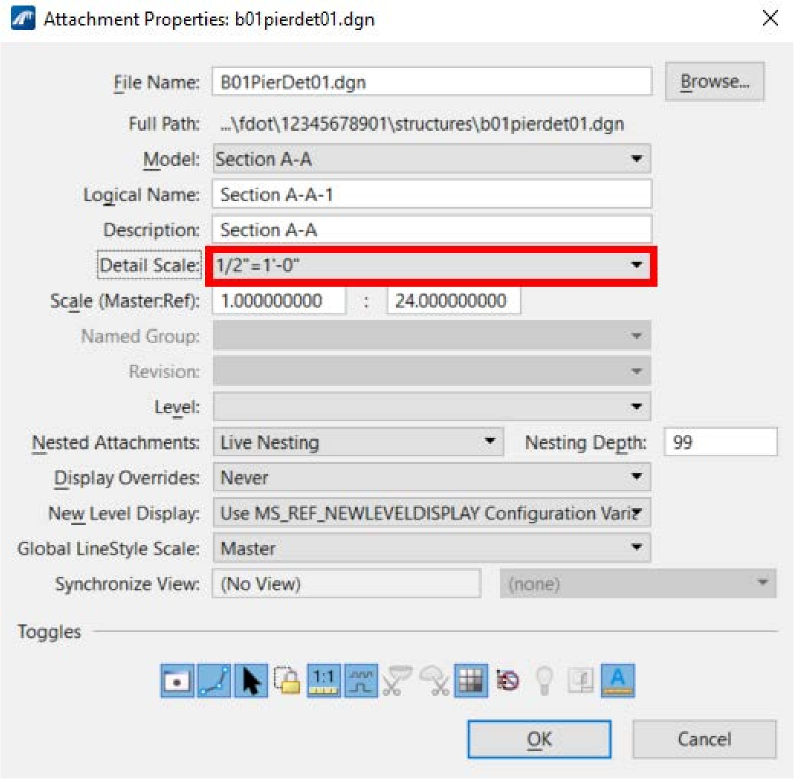
12. Notice that, once the new sheet model has opened, that Section A-A is small in relation to the sheet border. The scale of the section can be changed to increase the section size within the border. However, both the annotation scale for drawing model and the detail scale of the sheet model must be changed for consistency.



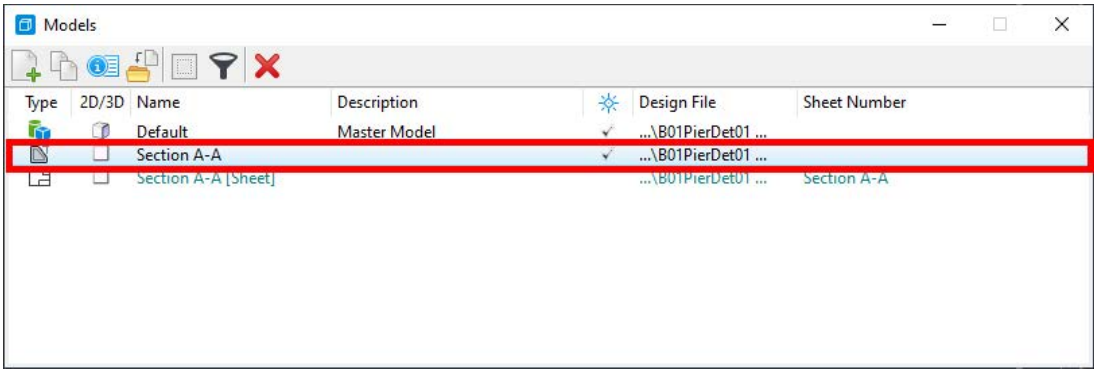
13. To change the detail scale of the sheet model, open the **References** tool by navigating to and selecting **Home > Primary > References**.

14. In the *References* window, highlight the drawing model reference. Then right click and select **Settings**.

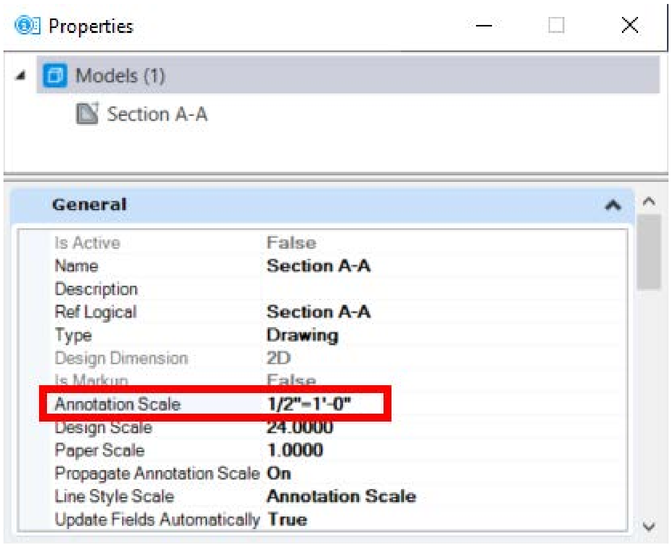
15. This will open the *Attachment Properties* window to open where the *Detail Scale* should be changed to **1/2”=1’-0”**. The *Scale* of the reference is now set to be **1:24**.



16. Now, to change the annotation scale of the drawing model, access the **Properties** tool at **Home > Primary > Properties**.
17. Next, open the *Models* window in the same group by selecting **Home > Primary > Models**.
18. Once the window has opened to show all the models present in the file, highlight the drawing model titled **Section A-A**.

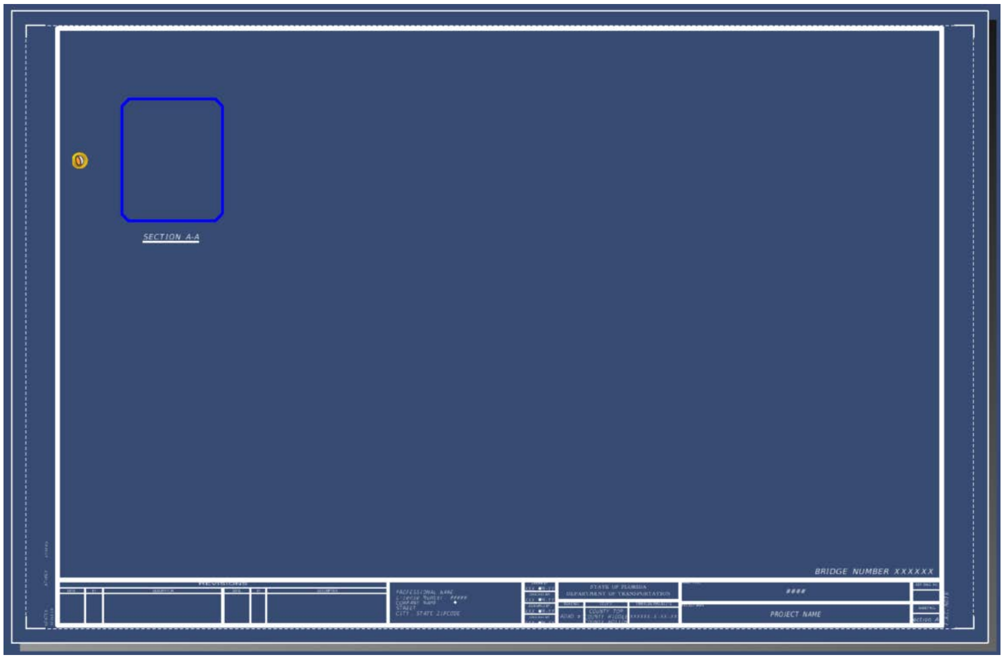


19. With the **Section A-A** drawing model highlighted, the model's properties will all be accessible in the *Properties* window. Here, change the *Annotation Scale* field to **1/2"=1'-0"** as shown below.



20. Now that both scales have been set, Section A-A needs to be moved to make room for additional sections. Returning to the *References* window, use the **Move Reference** tool to move the Section A-A view to the top left side of the sheet.

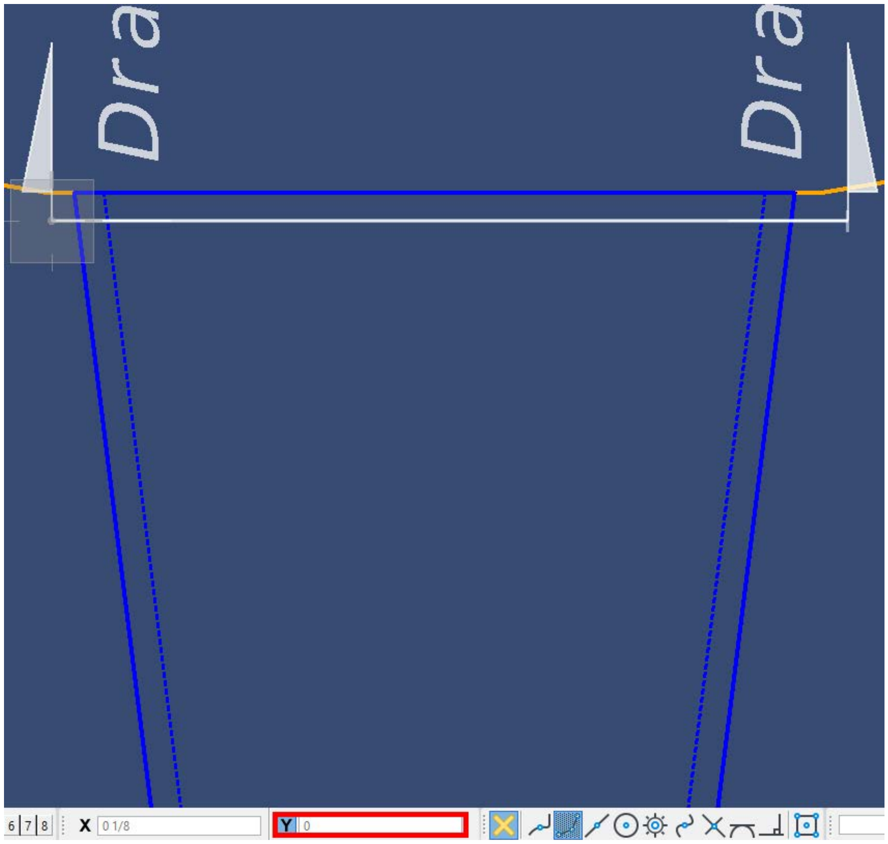
21. Use the **Drawing** (workflow) **> Home > Manipulate > Move** tool to place the Drawing Boundary title (SECTION A-A) directly below the section view. The sheet should look like the image below.



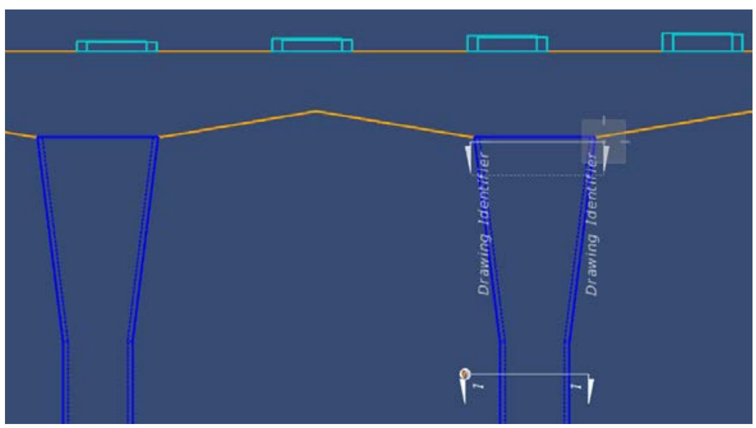
22. Re-open the Pier file by selecting **File > Open** and select **B01Pier01.dgn**. Here we will create an additional section at the top of the column.

23. In the **Pier 2 Elevation [Sheet]** sheet model, access the **Section Callout** tool at **Drawing** (Workflow) **> Annotate > Detailing > Section Callout** and select the **07_FDOT_Hidden_VertNoSheet#** Drawing Seed.

24. This time, locate a point in the elevation view slightly below the pier cap. At this location, click at a point to the left of the column to define a start point for the callout. To ensure the section cut will be perfectly horizontal, click in the *Y-Axis* data field in the **AccuDraw** toolbar, input **0** and hit **Enter**. Then define an end point for the callout at a point to the right of the column.



25. Define a direction and depth by clicking at a point below the cut within the tapered region of the column.

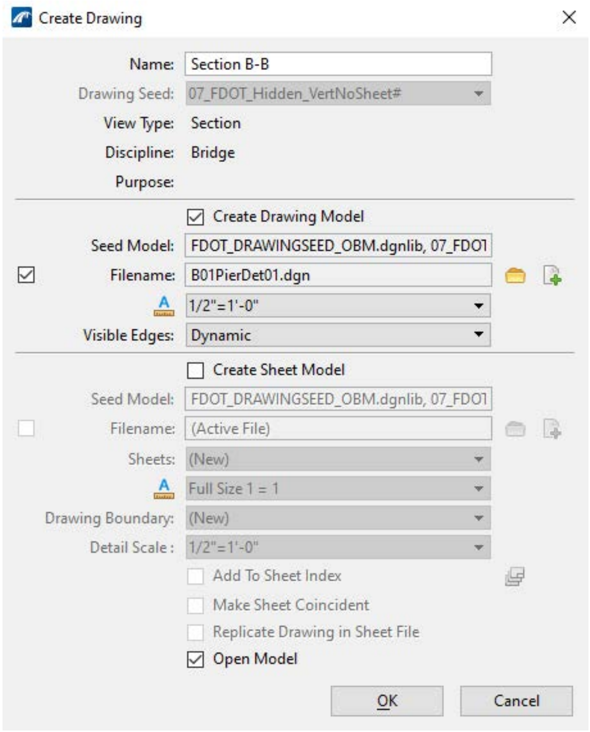


26. Once the *Create Drawing* window opens, set the name of the view to be **Section B-B**. Then, set the annotation scale for the drawing model to **1/2” = 1’-0”** to match the re-scaled Section A-A.

27. Next, toggle off the *Create Sheet Model* box so a sheet model is not automatically created for this section. Instead, the created section will be manually placed into an existing sheet model without the use of the *Create Drawing* window.

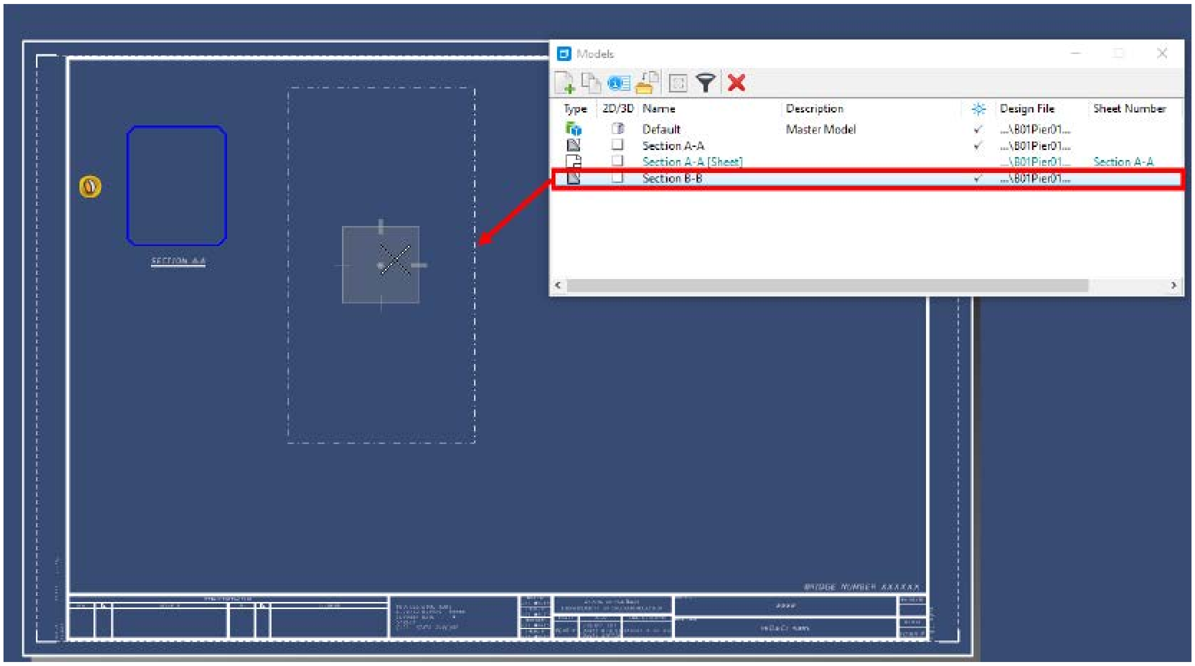
28. Check the box next to the *Filename* field in the Create Drawing Model section and click the folder button to select the file created in Steps 1 through 3 (*B01PierDet01.dgn*) to send the new drawing model to the specified file.

29. Verify that the rest of the window matches the following image and click **OK**.



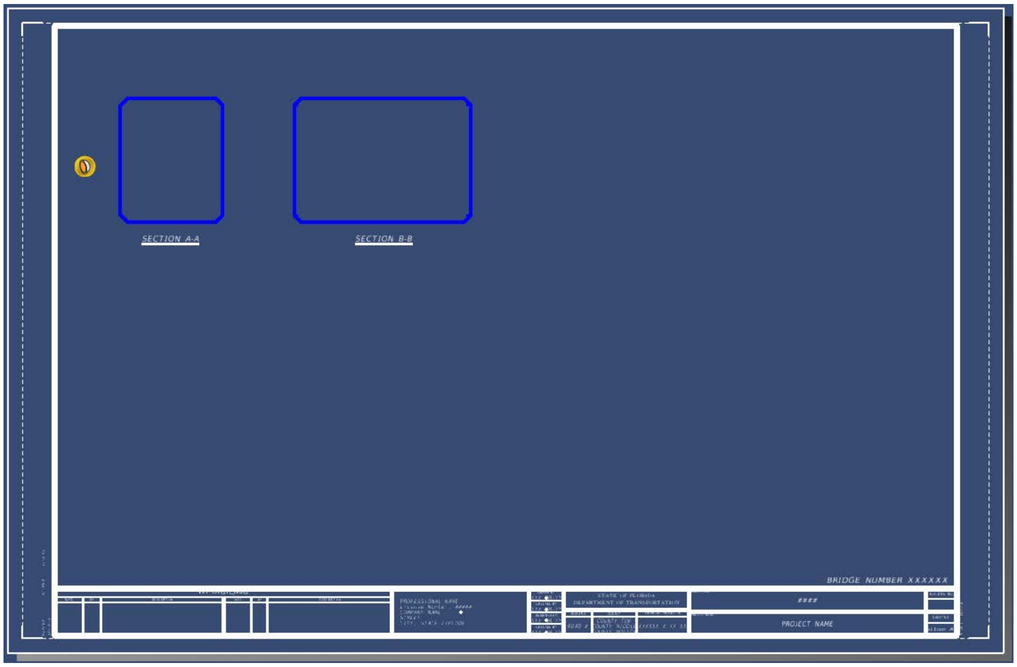
30. The *B01Pier01Det01.dgn* will open where a **Section B-B** drawing model has been created. However, the **Section B-B** model reference has not been included in the **Section A-A [Sheet]** model.

31. To add Section B-B to the Section A-A [Sheet] sheet model, open the Section A-A [Sheet] sheet model by selecting it from the Active View Group drop-down list and then open the Models window. Here click and drag the Section B-B drawing model from the window and into the sheet model border limitsc



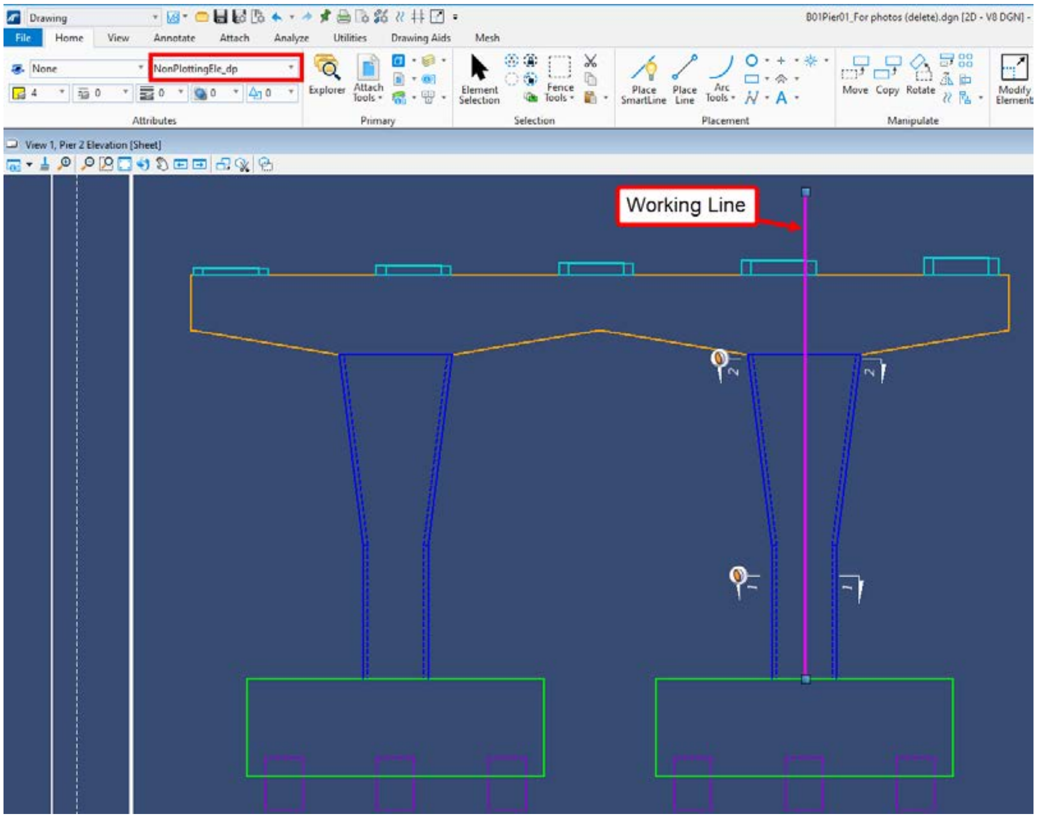
32. Next the *Attach Source* Files window will automatically open. The *Attachment Method* should be set to “Recommended”. Then, click at the point within the border that the section will be placed.

33. Once **Section B-B** has been placed in this sheet model, use the **Move Reference** and **Move** tools to position the new section similar to the following image.



34. Re-open the Pier file by selecting **File > Open** and select *B01Pier01.dgn*. Here we will create a section of the pier cap at the centerline of column.

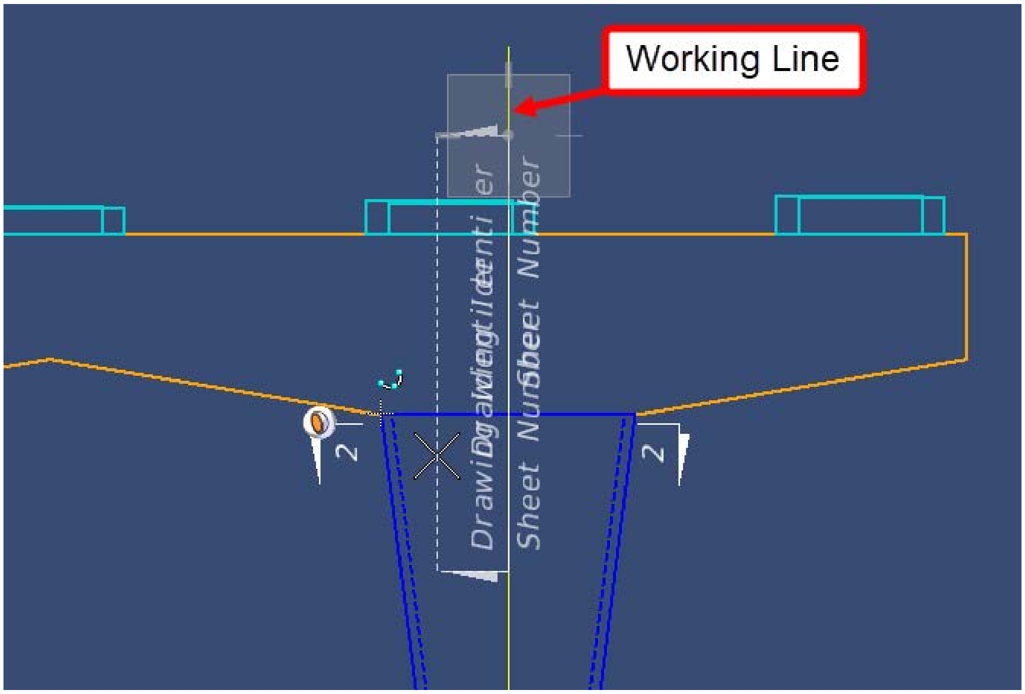
35. In the **Pier 2 Elevation [Sheet]** sheet model, set the active level to **NonPlottingEle_dp** (**Drawing** (Workflow) **> Home > Attributes**) and draw a working line for the centerline of column. Access the line tool at **Drawing** (workflow) **> Home > Placement > Place Line**. Start the working line from the midpoint at the top of footing and end it above the pier cap and pedestals.



36. Access the **Section Callout** tool at **Drawing** (Workflow) **> Annotate > Detailing > Section Callout** and select the **07_FDOT_Hidden_VertNoSheet#** Drawing Seed.

37. This time, locate a point in the elevation view directly above the pier cap. At this location, snap to the working line previously created to define the start point for the callout. Then, define an end point for the callout at a point directly below the pier cap. Make sure to snap to the working line previously created to ensure the section cut will be centered on the column.

38. Define a direction and depth by clicking at a point to the left of the cut within the width of the column.

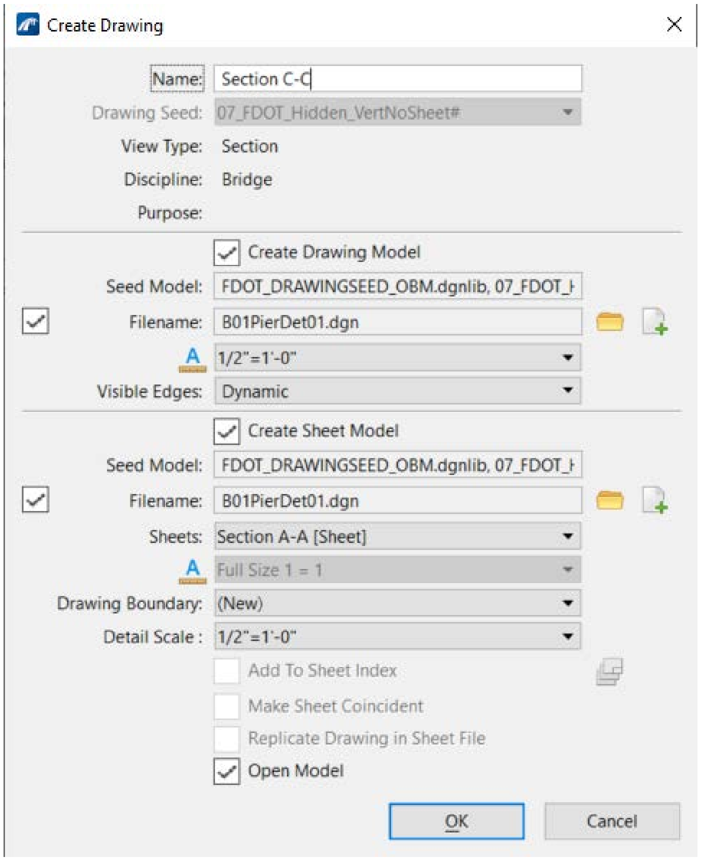


39. Once the *Create Drawing* window opens, set the name of the view to be **Section C-C**. Then, set the *Annotation Scale* for the drawing model to **1/2” = 1’-0”** to match the re-scaled Section A-A.

40. Toggle on the *Create Sheet Model* box so that the section will appear with **Section A-A** and **Section B-B** created in previous steps.

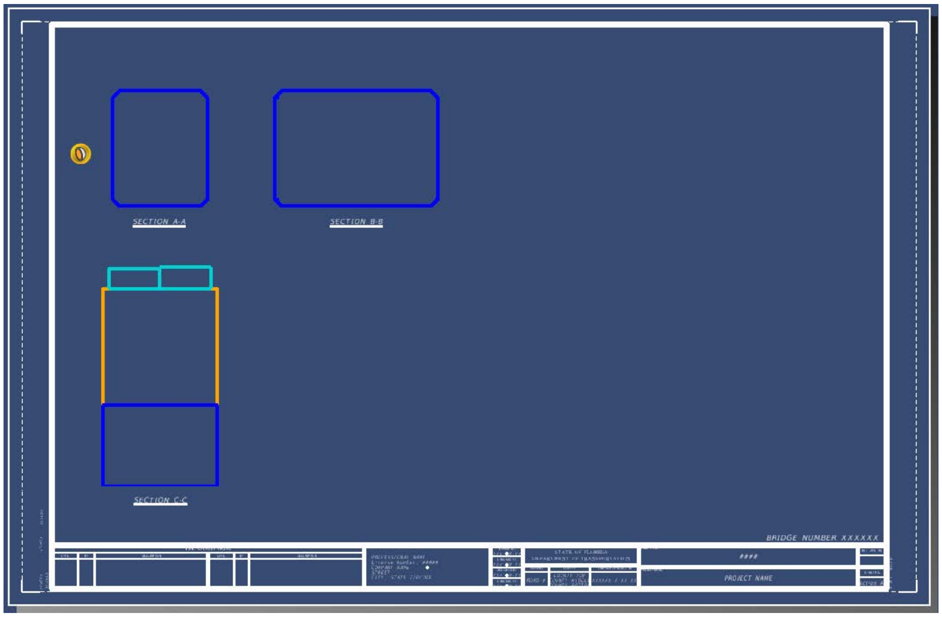
41. Check the boxes next to the *Filename* fields and click the folder button to select the file created in Steps 1 through 3 (*B01PierDet01.dgn*). In the *Sheets* drop down menu, select **Section A-A [Sheet]**.

42. Verify that the rest of the window matches the following image and click **OK.**



43. The *B01Pier01Det.dgn* will open where a **Section C-C** drawing model has been created. **Section C-C** will also be in the **Section A-A [Sheet]** sheet model.

44. Use the **Move Reference** and **Move** tools to position the new section similar to the following image.

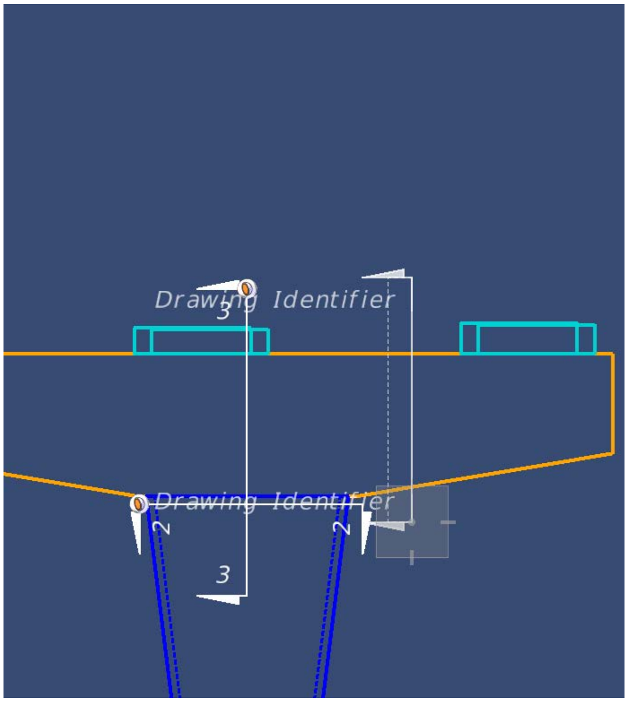


45. Re-open the Pier file by selecting **File > Open** and select *B01Pier01.dgn*. Here we will create a section of the pier cap at the tapered cantilever.

46. In the **Pier 2 Elevation [Sheet]** sheet model, delete the working line that was used to create **Section C-C** and access the **Section Callout** tool at **Drawing** (Workflow) **> Annotate > Detailing Section Callout** and select **07_FDOT_Hidden_VertNoSheet#** drawing seed.

47. This time, locate a point in the elevation view directly above the pier cap within the limits of the tapered cantilever. At this location, click at a point above the pier cap to define a start point for the callout. Then, define an end point for the callout at a point below the pier cap.

48. Define the direction and depth by clicking at a point to the left of the cut within the limits of the tapered cantilever.

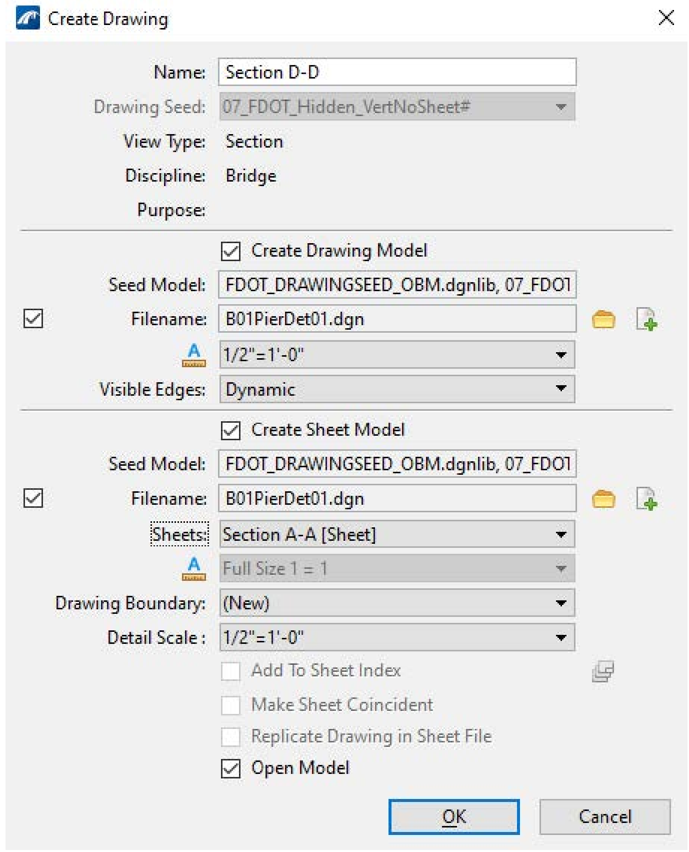


49. Once the *Create Drawing* window opens, set the name of the view to be **Section D-D**. Then, set the annotation scale for the drawing model to **1/2" = 1'-0"** to match the re-scaled **Section A-A**.

50. Ensure the *Create Sheet Model* box is toggled on so that the section will appear with the sections created in previous steps.

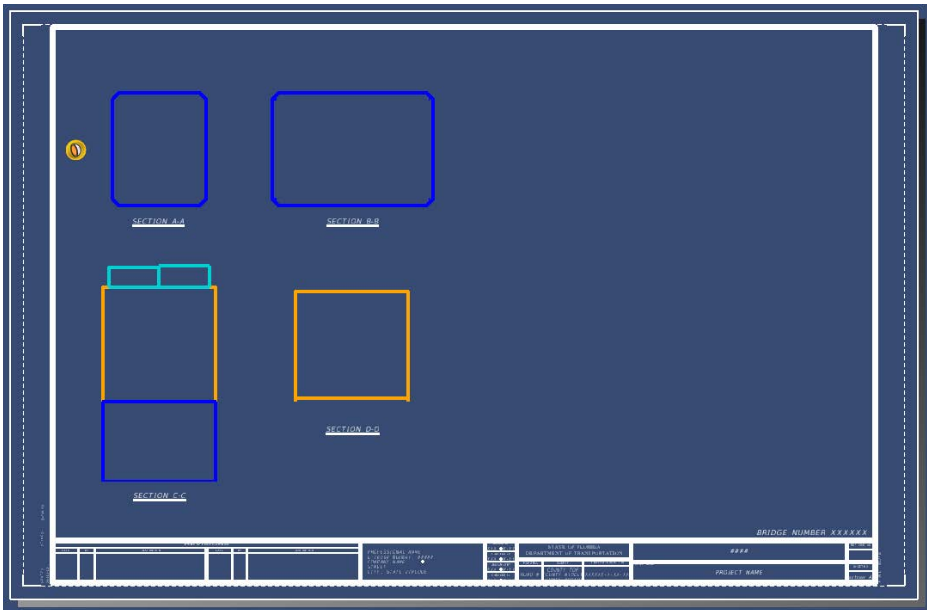
51. Ensure the boxes next to the *Filename* fields are toggled on and *B01PierDet01.dgn* is selected. In the *Sheets* drop down menu, select "Section A-A [Sheet]".

52. Verify that the rest of the window matches the following image and click **OK**.



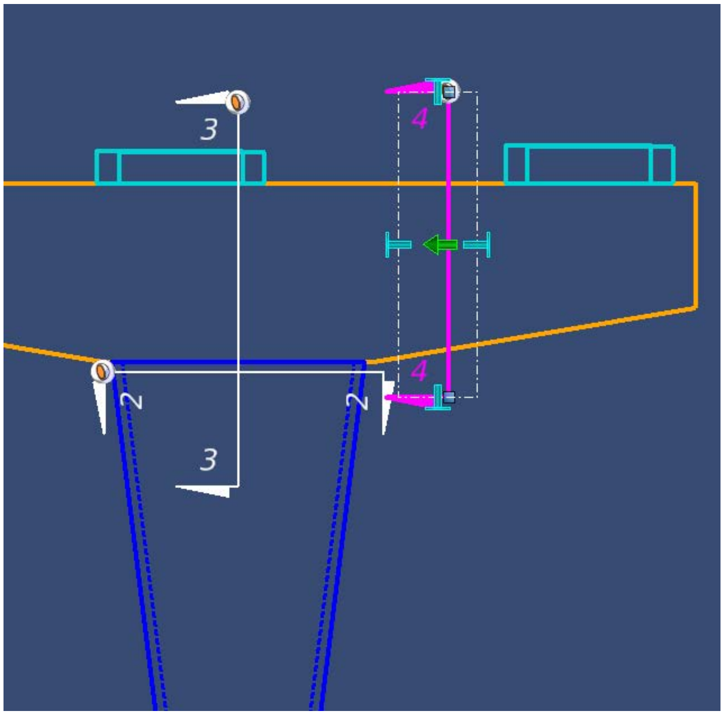
53. The *B01Pier01Det01.dgn* will open where a **Section D-D** drawing model has been created. **Section D-D** will also be in the **Section A-A [Sheet]** sheet model.

54. Use the **Move Reference** and **Move** tools to position the new section similar to the following image.

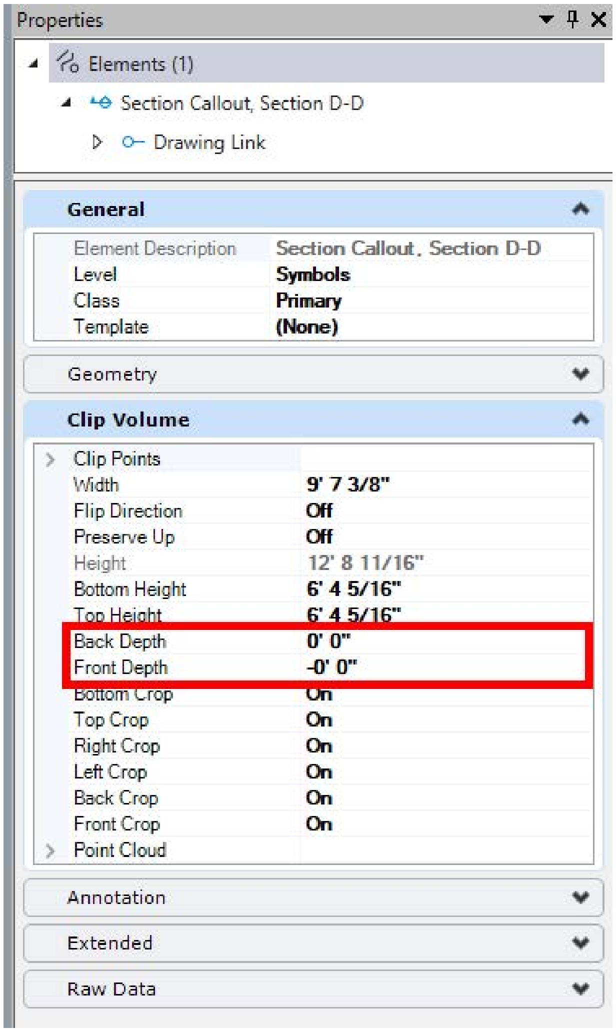


55. While these Sections look like a traditional section included in FDOT plans, they are currently shown with depth. For this exercise, the sections are only meant to be cuts without any depth. Fortunately, these model references are dynamic, and the views can be modified after creation.

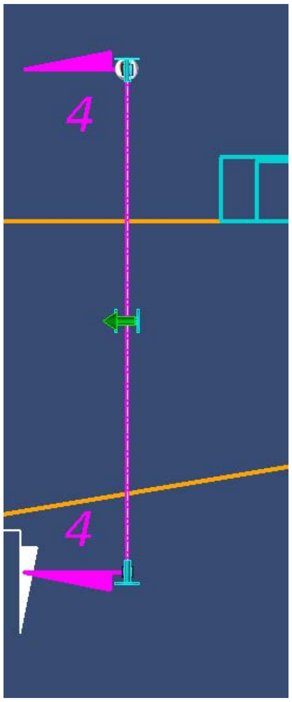
56. To modify the section cuts, return to the *Pier01.dgn* file. Once the file has opened in the **Pier 2 Elevation [Sheet]** sheet model, move the cursor to the **Section D-D** section callout (currently labeled 4-4) and click on it to select it.



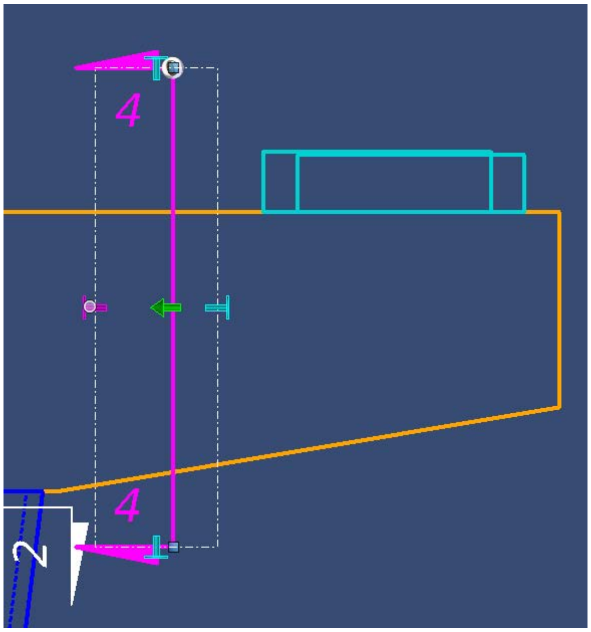
57. The dashed white line denotes the limits of the clip volume. The depth can be manipulated in two ways. The first method is to access the Properties tool by navigating to and selecting **Home > Primary > Properties**. If the section callout is selected, its properties will show up in the window. Scroll down to the *Clip Volume* section of the window and change the *Front Depth* and the *Back Depth* fields to **0' 0"**.



58. Alternatively, the clip volume can be manually manipulated by clicking the horizontal handles on the limits of the clip volume. Once selected, the handle will turn purple.

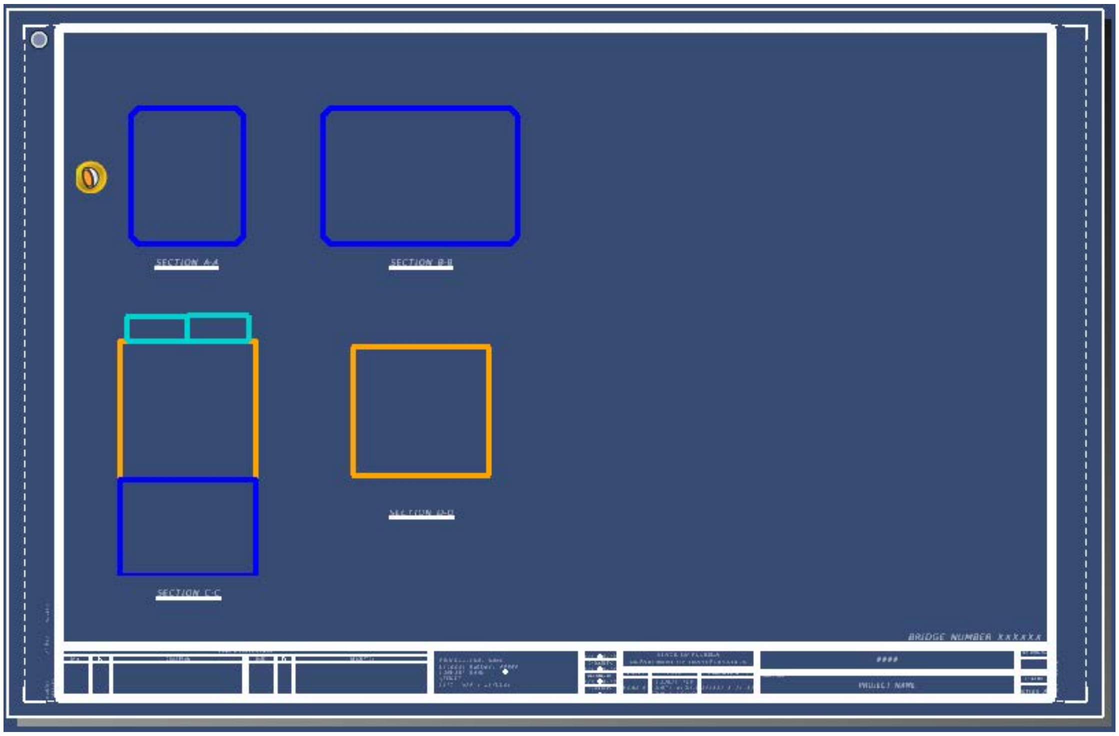


59. Move the handle to the center of the clip volume. Click once more on the section callout line to release the handle. Then repeat for the opposite handle to remove all depth.



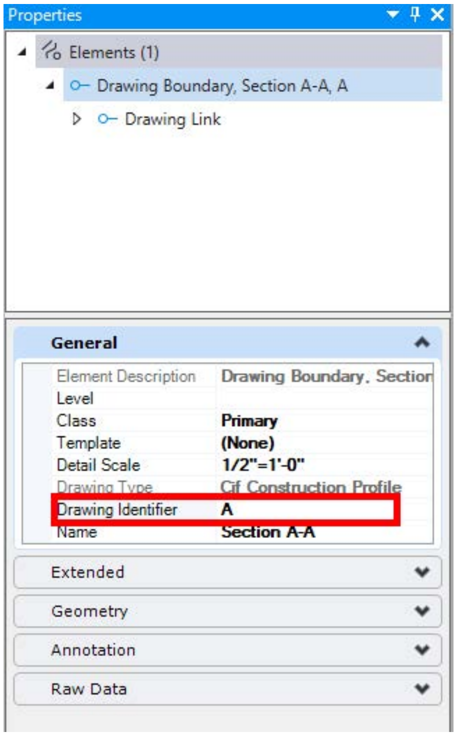
60. Repeat this process for the Section A-A, B-B, and C-C section callouts.

61. These changes will now be reflected in the *B01PierDet01.dgn* sheet file and should look like the following image. Note that reinforcing bars and annotations could be added to the drawing models.



62. Now that Pier Details sheet (*B01Pier01Det01.dgn*) has been completed, the section callout annotations in the Pier sheet (*B01Pier01.dgn*) need to be updated to match the titles of the sections in the details sheet. This is accomplished by changing the properties of the drawing boundary for each section within the sheet model.

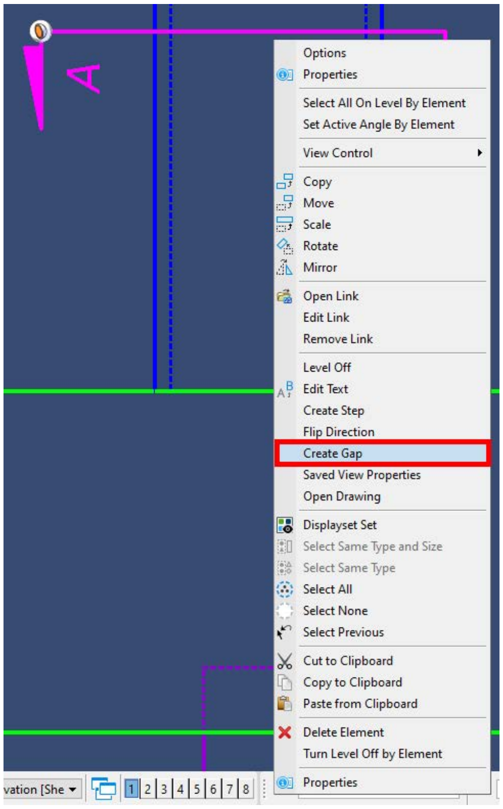
63. In the **Section A-A [Sheet]** model, click on the SECTION A-A view title to select the drawing boundary. Then, access the **Home** > **Primary** > **Properties** tool and change the *Drawing Identifier* field in the *General* section to **A**.



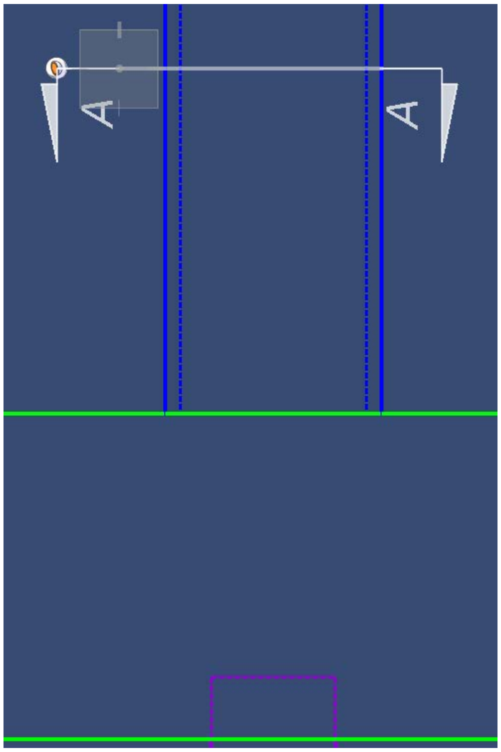
64. Repeat this with the Section B-B, C-C, and D-D section callouts.

65. Re-open the *B01Pier01.dgn* and notice that the section callout annotations found in the **Pier 2 Elevation [Sheet]** model now show the correct section callouts.

66. Lastly to get the section callouts to look like they would in a traditional FDOT plan sheet, there should be a gap between the arrows. To achieve this, first right-click and hold on the **Section A-A** section callout to get a list of options to pop up, as shown in the following image. Select **Create Gap**.

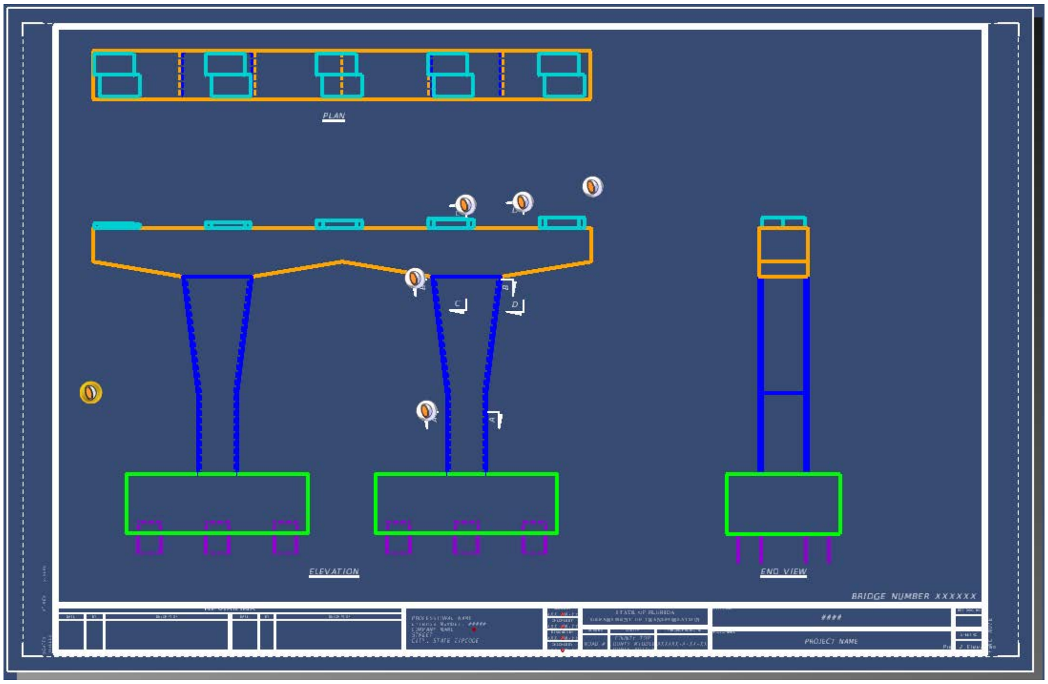


67. Next, click at the tail of the left arrow. Then click again at the tail of the right arrow, as shown in the following image.



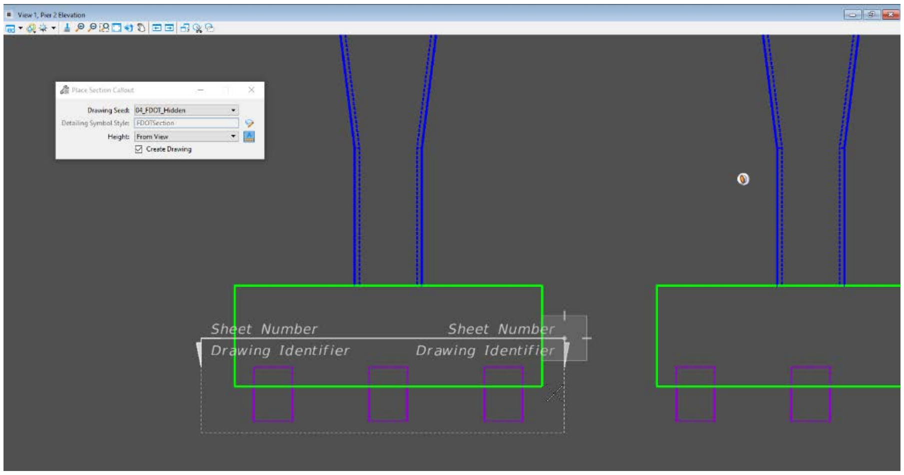
68. Repeat this with the remaining section callouts.

69. The final sheet should look like the image below.



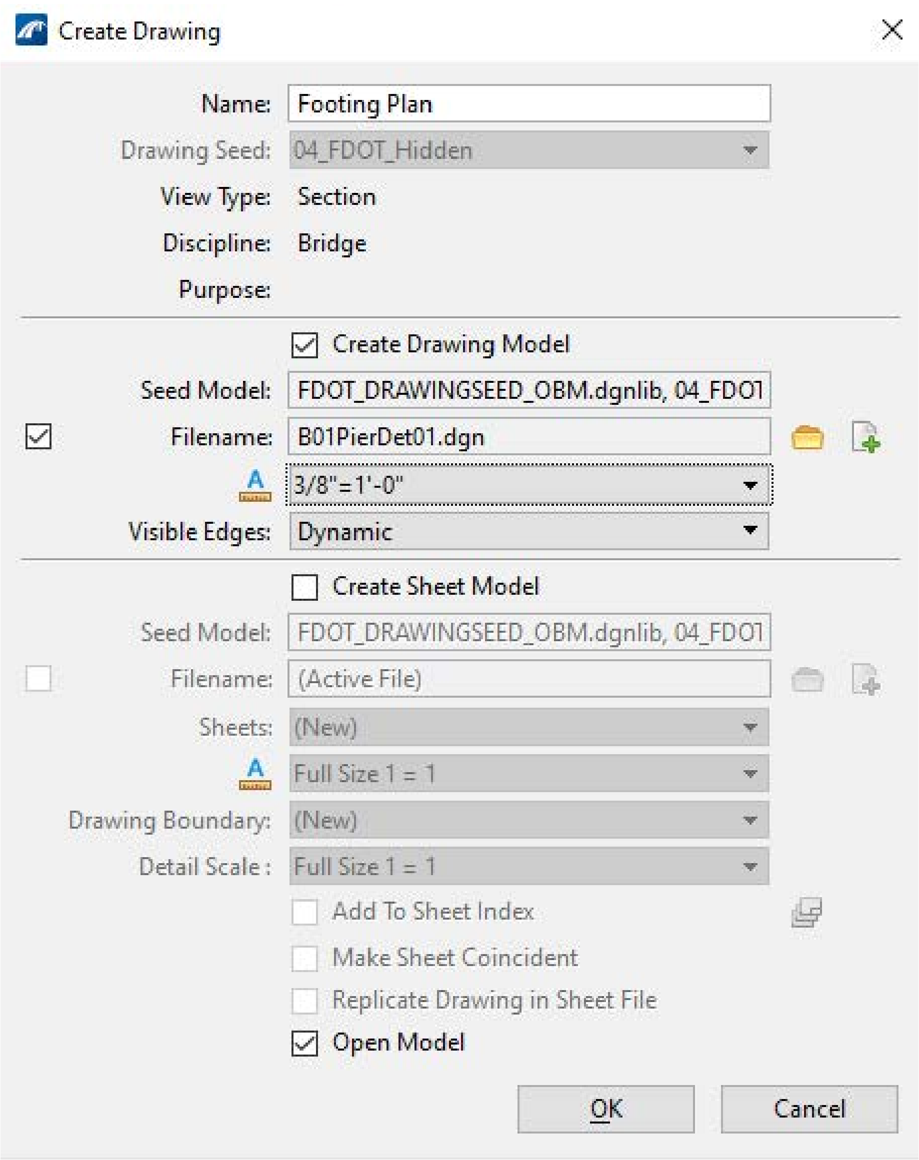
CREATE FOOTING PLAN VIEW

1. In the *B01Pier01.dgn*, open the **Pier 2 Elevation** drawing model.
2. Open the **Section Callout** tool using the **04_FDOT_Hidden** drawing seed to create a footing plan view.
3. Next, click to the left at an elevation around the center of the footing. Then, define an end point for the callout by clicking at the point at the same elevation and beyond the right side of the footing.
4. Define a direction and depth to the callout by clicking at a point below the piles.

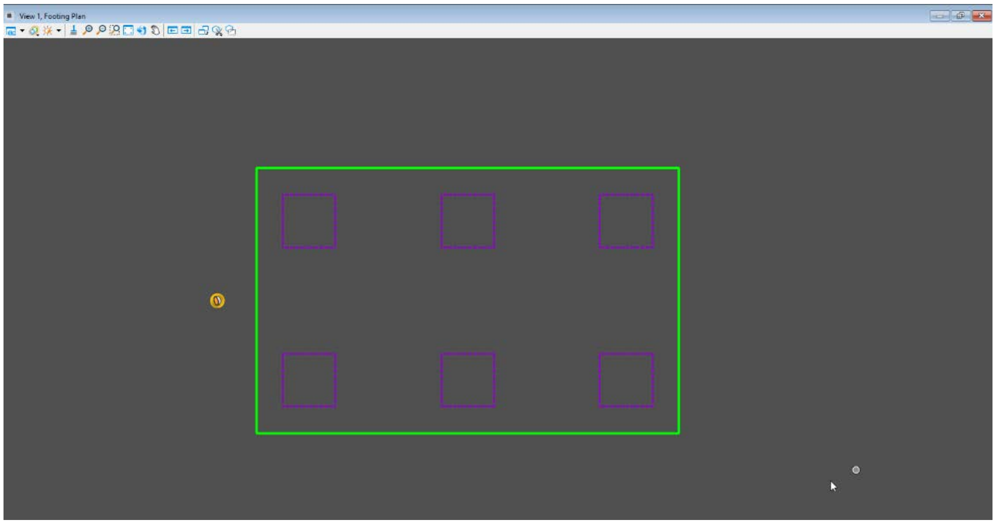


5. Once the *Create Drawing* window opens, set the name of the view to be **Footing Plan**. Then, set the annotation scale for the drawing to **3/8” = 1’-0”**.
6. Next, toggle off the *Create Sheet Model* box so a sheet model is not automatically created for this section.
7. Check the box next to the *Filename* field and click the folder button to select **B01PierDet01.dgn** to send the new drawing model to the specified file.

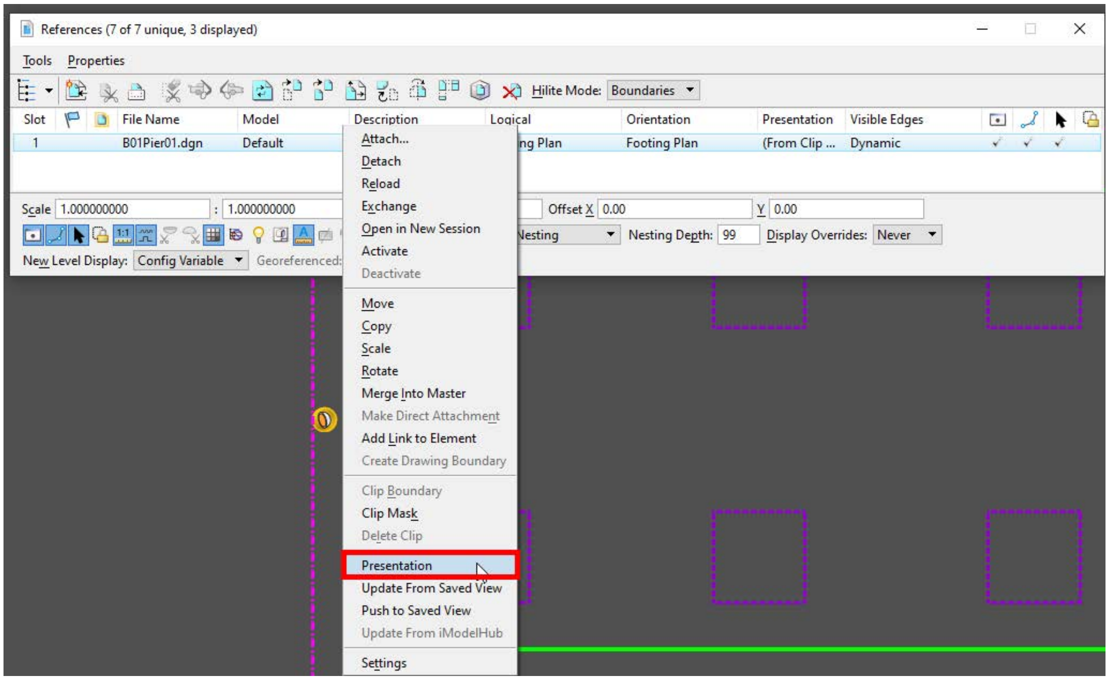
8. Verify that the rest of the window matches the following image and click OK.



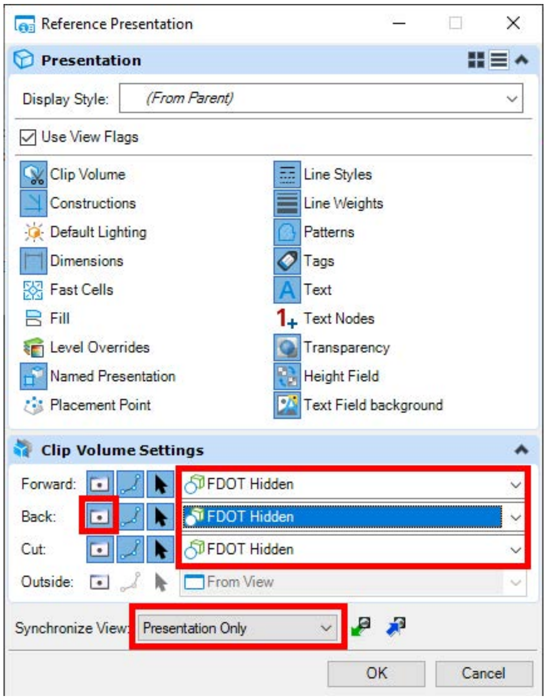
9. The *B01PierDet01.dgn* will open where a footing plan drawing model has been created. Notice that the column does not appear on the footing plan view.



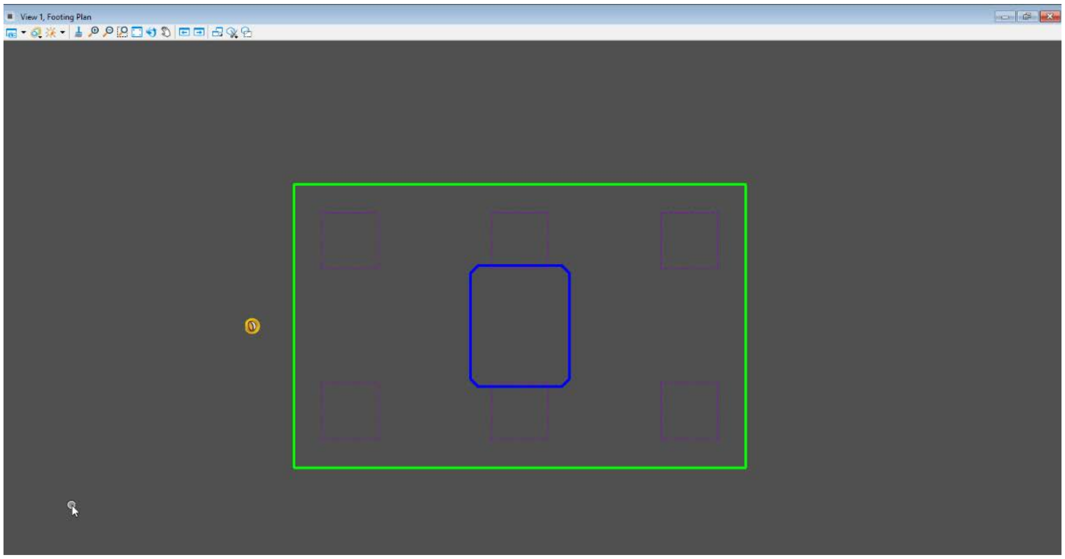
10. Open the *References* window by navigating to and selecting **Home > Primary > References**.
11. In the *References* window, right click *B01PierDet01.dgn* and select **Presentation** from the drop-down menu.



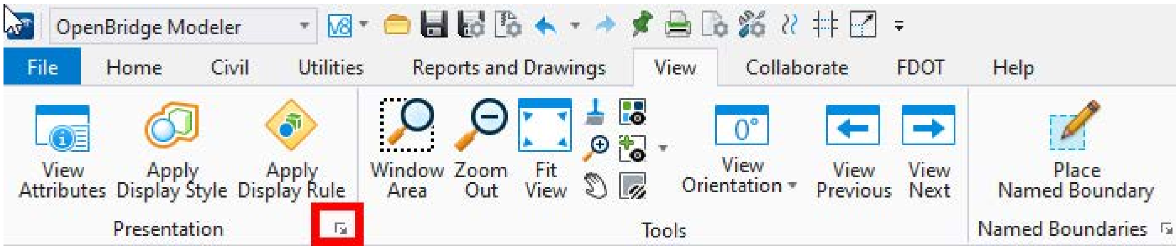
12. Click the *Synchronize View* drop-down menu and select “Presentation Only”.



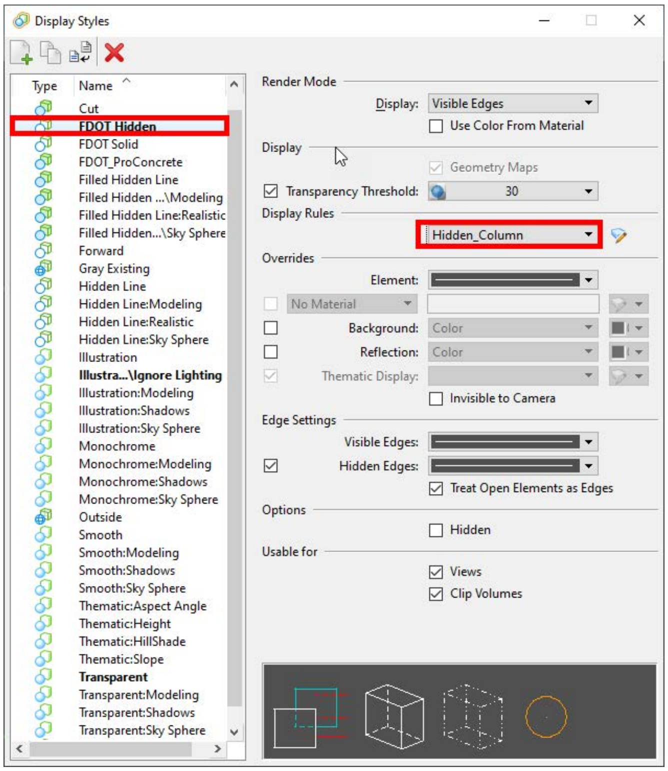
13. In the *Clip Volume Settings*, make sure that the *Back* display is toggled on and that the *Forward*, *Back,* and *Cut* display styles are set to **FDOT Hidden**.
14. After the presentation settings have been adjusted, the footing plan should look like the photo below.



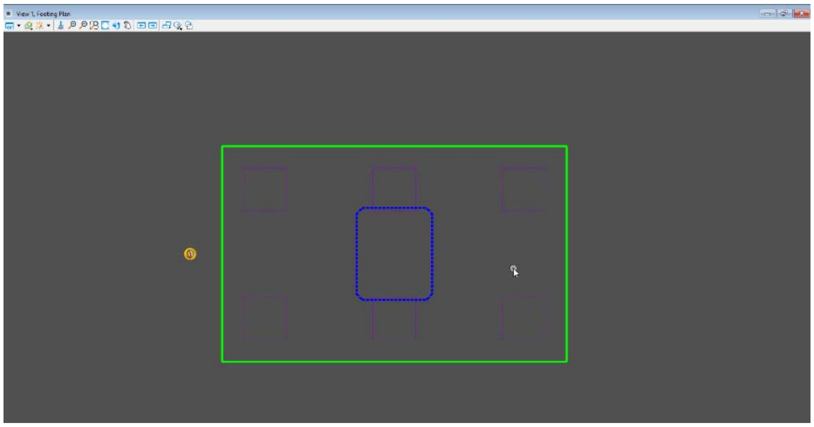
15. To make the column appear as a hidden line, navigate to **Open Bridge Modeler** (Workflow) **> View > Presentation** and select the arrow on the bottom right corner.



16. From the **Display Styles** window, select **FDOT Hidden** and for the *Display Rules* select "Hidden_ Column" from the drop-down menu.



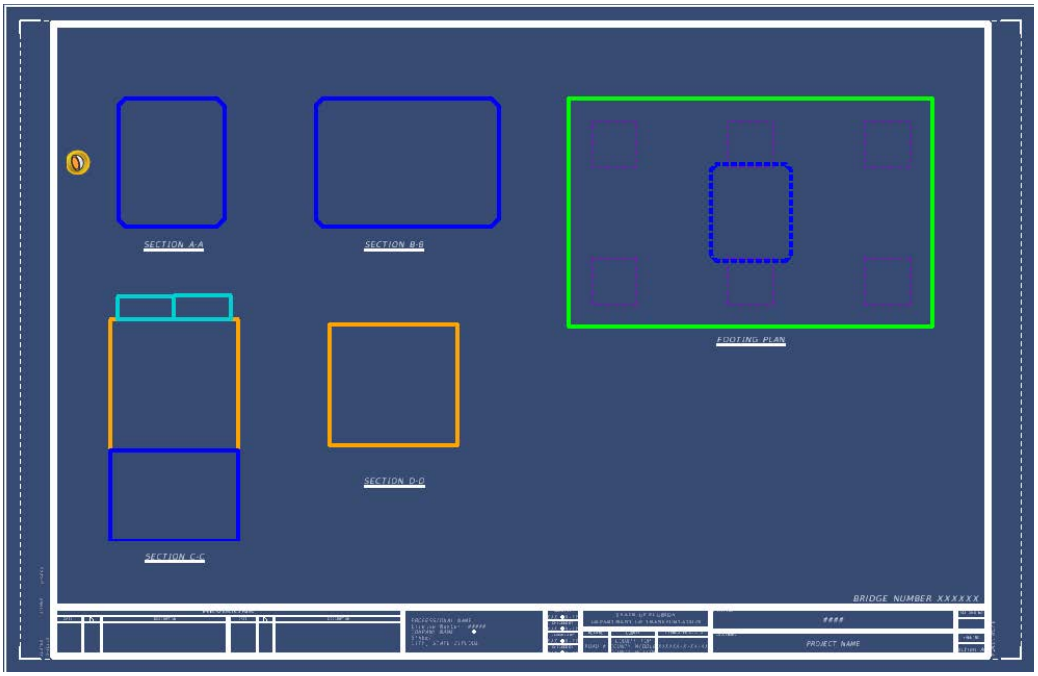
17. After closing the **Display Styles** window, the footing plan should look like the following image.



18. Open the **Section A-A [Sheet]** sheet model and then open the **Models** window. Click and drag the **Footing Plan** drawing model from the window and into the sheet model border limits.

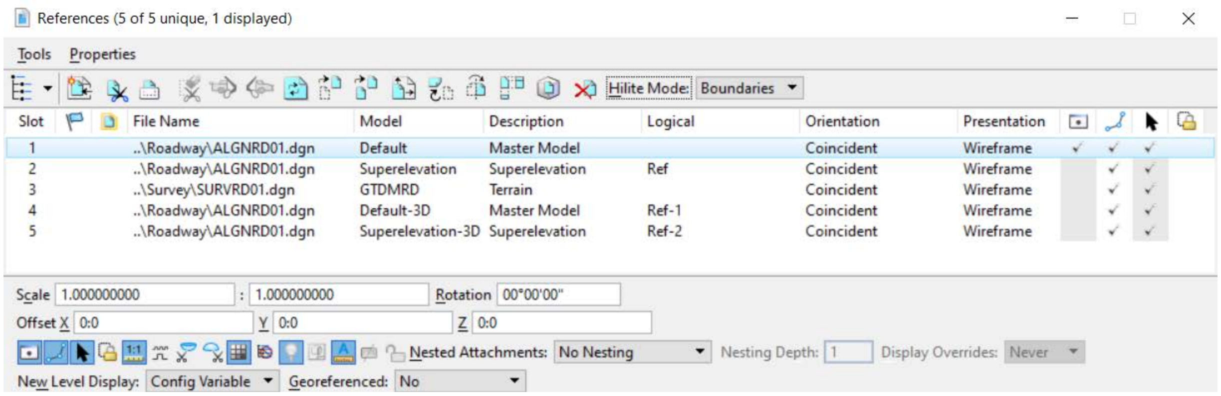
19. Next, the **Attach Source Files** window will automatically open. The *Attachment Method* should be set to "Recommended". Then, click at the point within the border that the section will be placed.

20. Once the **Footing Plan** has been placed in the sheet model, use the **Move Reference** and **Move** tools to position the new section similar to the following image.

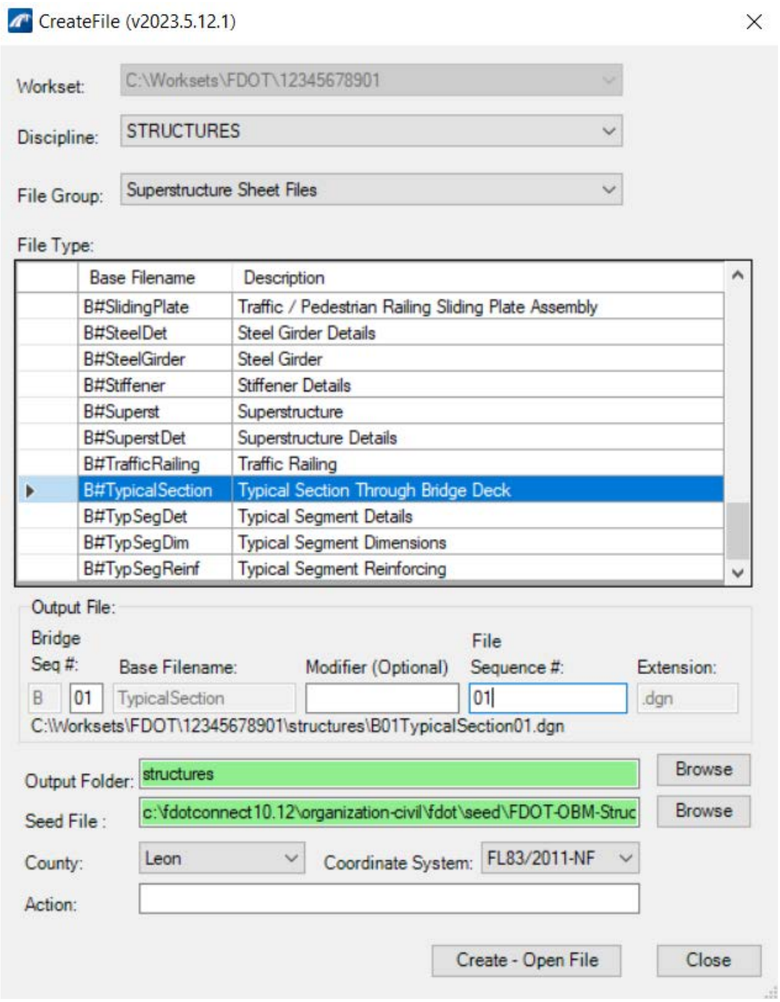


GENERATE A TYPICAL SECTION VIEW

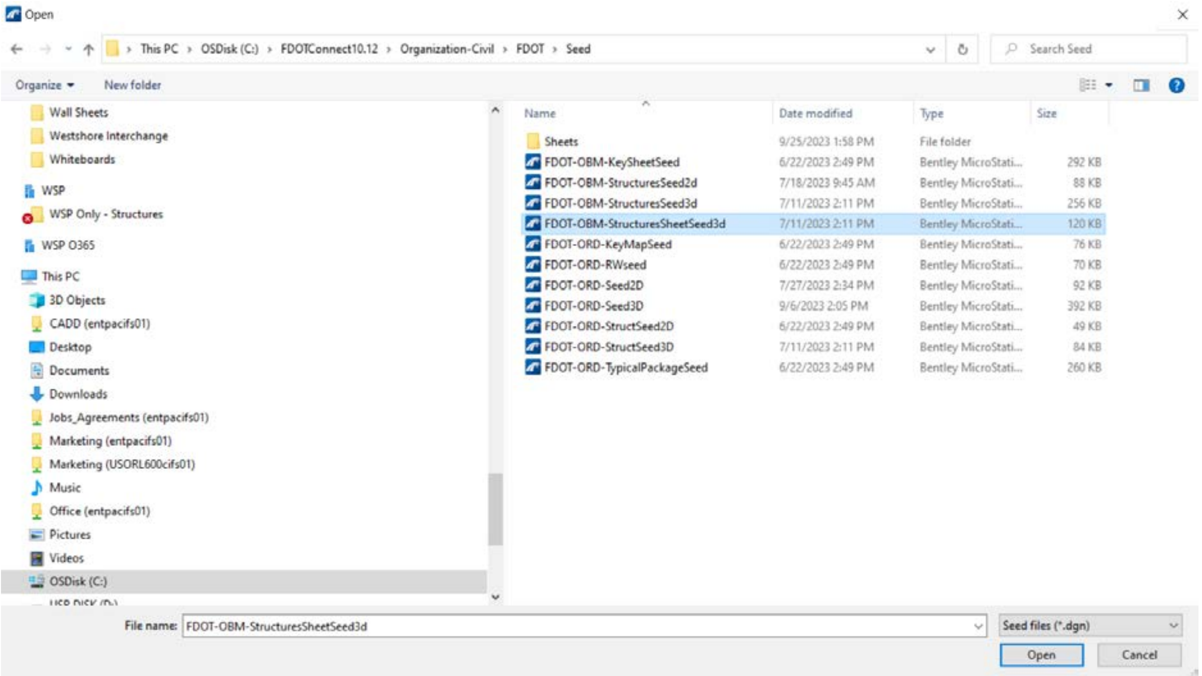
1. Open the data set file: *B01MODLBRTR01_6.2_Begin.dgn*
2. Ensure the 2D Alignment reference is toggled on. The Alignment file for the bridge must be attached and toggled on in order to use the **Dynamic View By Station** tool. This can be turned on inside the References dialog box.



3. Access the **FDOT > Actions > Create File** tool and create a sheet file with the inputs indicated below and delete any text in the *Action* field.



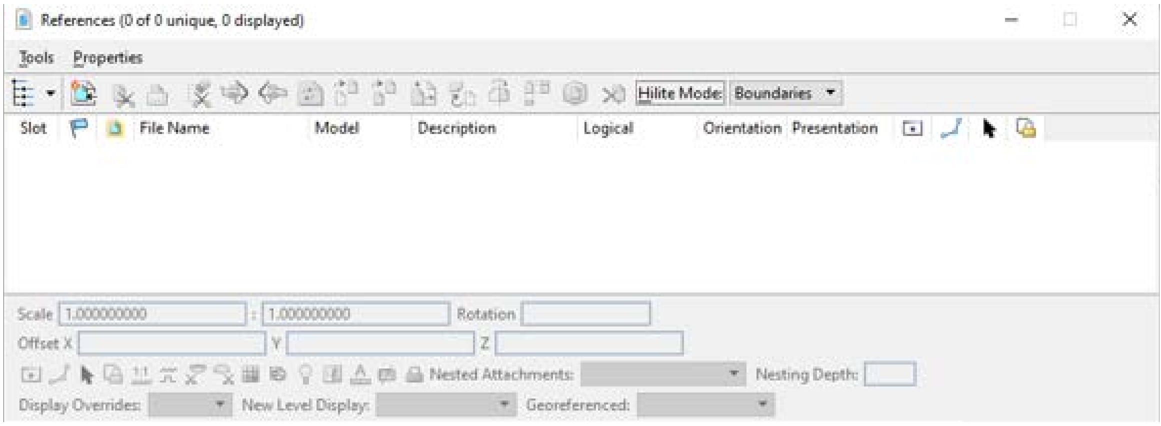
4. Ensure that the seed file being used is the *FDOT-OBM-StructuresSheetSeed3d.dgn* file. If it is not, click the **Browse** button next to the *Seed File* field to navigate to the Seed folder. Select the correct file and click **Open**.



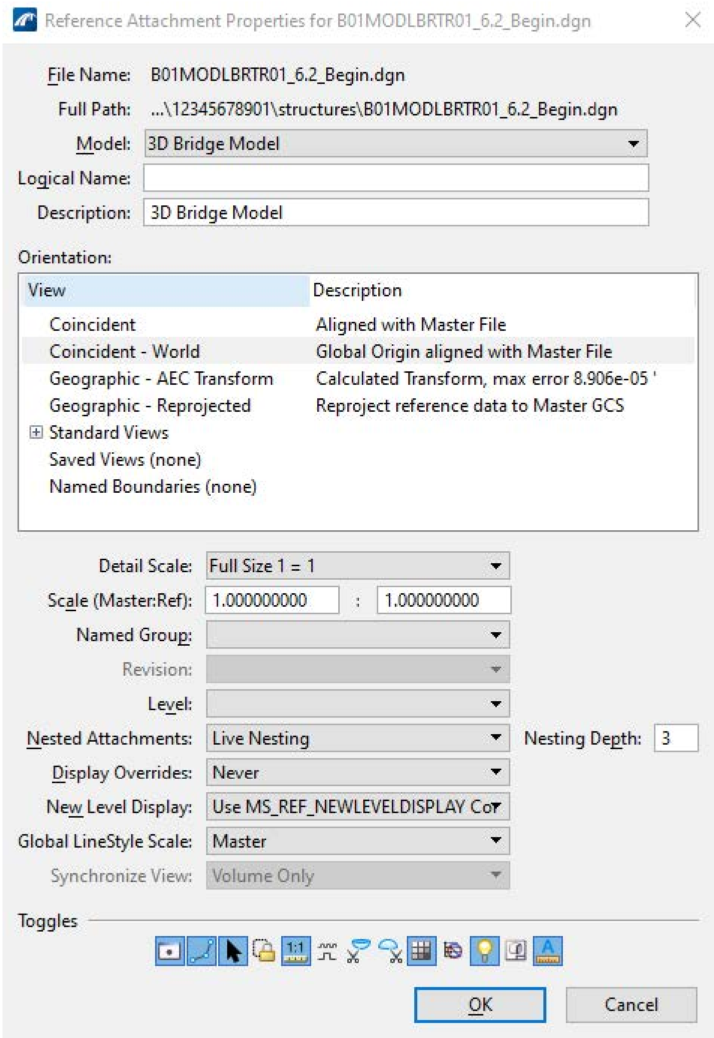
5. Once all inputs are set and the correct seed file is selected, click **Create – Open File** to create the sheet file.

6. The new sheet file will automatically be opened. In the **Default** model, open the **References** tool by navigating to and selecting **Home > Primary > References**.

7. Attach the *B01MODLBRTR01_6.2_Begin.dgn* file as a reference in the **Default** model by using the **Attach Reference** tool at the top of the *References* window and then selecting the file.



8. Once all inputs for the incoming reference are set, click **OK** to attach the reference.



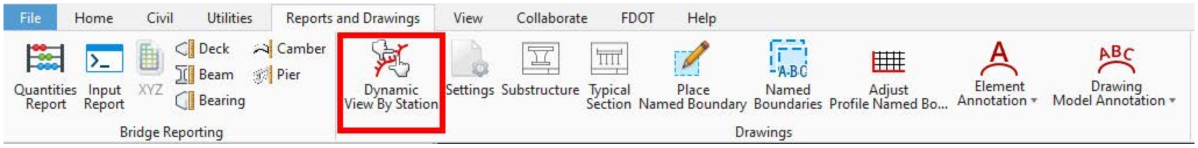
9. Once attached, click the **Fit View** tool at the top of the view window, then click within the view window to fit the reference within the view. Locate the bridge and zoom in.

10. Note that the annotations are difficult to see. To change the annotation scale of the model, access the **Properties** tool at **Home > Primary > Properties**.

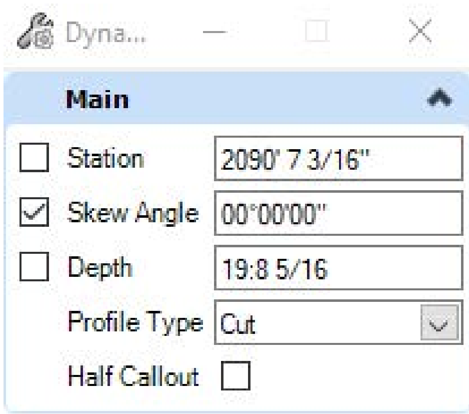
11. Next, open the **Models** tool in the same group by selecting **Home > Primary > Models**.

12. Once the *Models* window has opened to show all the models present in the file, highlight the model titled **Default**. The model's properties will all be accessible in the *Properties* window. Here, change the *Annotation Scale* field to **1"=30'**.

13. Select the **Dynamic View By Station** tool by navigating to and selecting **Reports and Drawings > Drawings > Dynamic View By Station**



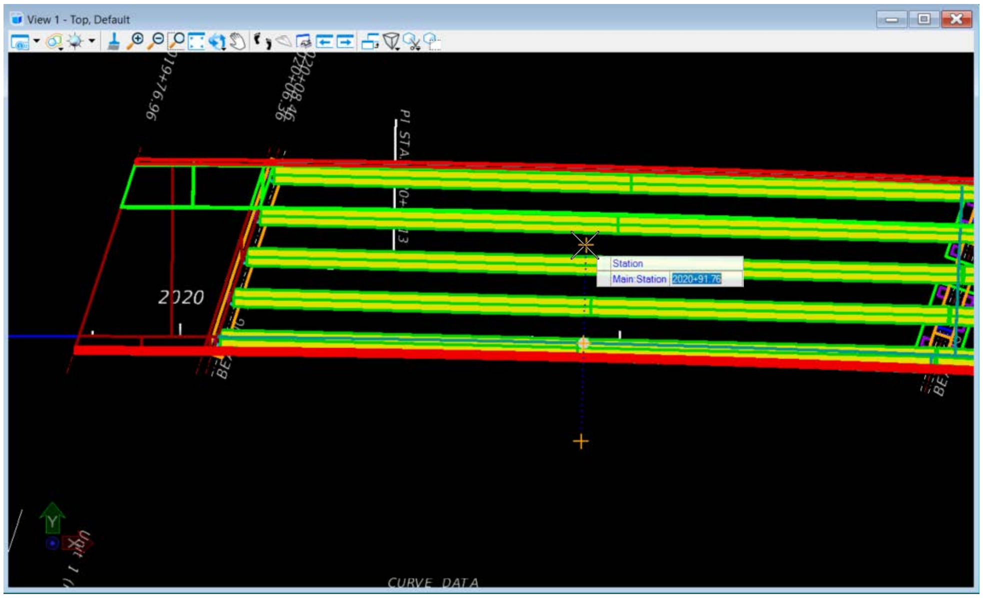
14. In the *Dynamic View Report* window, the *Profile Type* should be set to **Cut** to only show any elements that directly intersect with the cut line. Additionally, only the *Skew Angle* checkbox should be selected with an angle of **00°00'00",** as shown in the following image.



NOTE ***If the Profile Type is changed to Cut with Depth, the section will also be able to show elements not directly intersecting the cut line. Any elements encapsulated by the defined depth will be shown in the created view, as the section will show up more as a volume instead of a plane with no depth.***

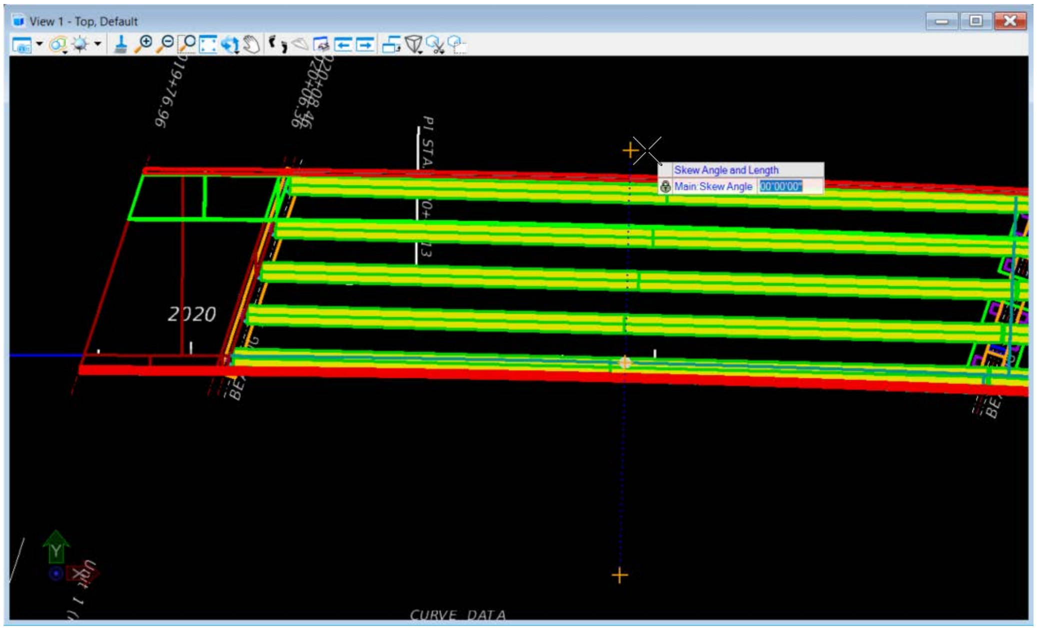
15. To create a view with the **Dynamic View By Station** tool, the alignment where the drawing will be cut must be selected. Select "CL_WB".

16. Next, the location of the section cut must be determined. Move cursor to a point in Span 1 between the "FFBW END BENT 1" SupportLine and the "CL PIER 2" SupportLine, and data point to select this location along the alignment "CL_WB".

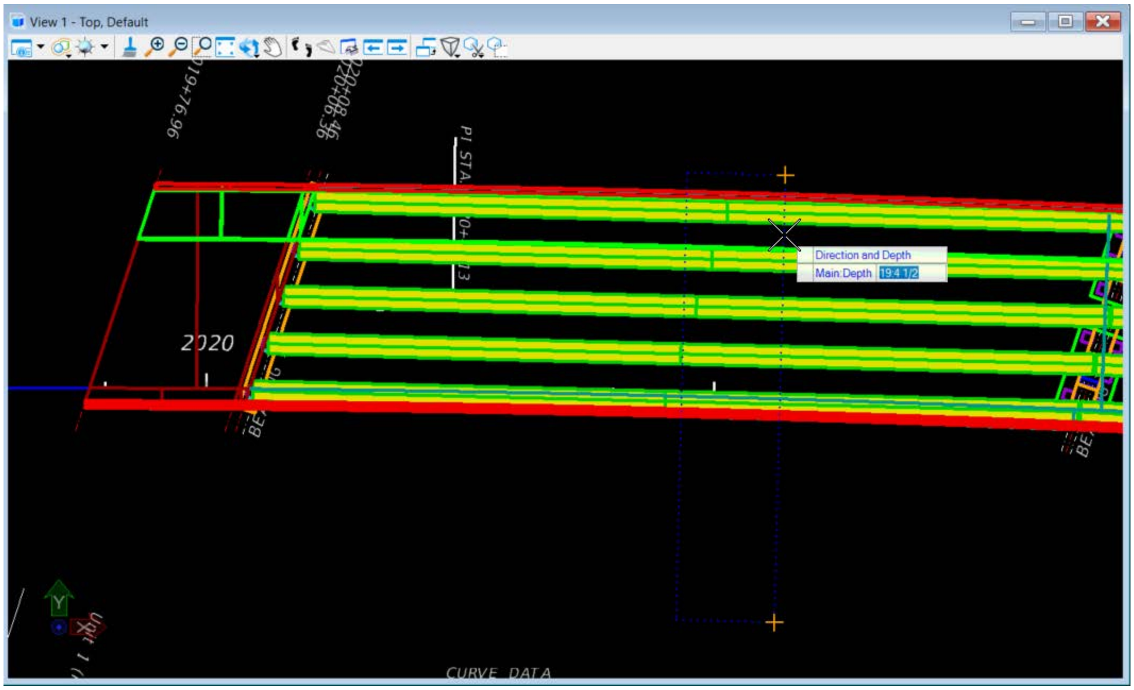


17. Determine Orientation and Length of Section Cut. Position the orange crosshairs outside the limits of the bridge to define the length of the section cut, as shown in the following image. Notice that the *Skew Angle* field is locked because it was already set to **00°00'00"** in the *Dynamic View Report* window.

NOTE ***Note that sections can be cut with different skews. For instance, to create a longitudinal cross section of a bent, a skew of 90°-00'-00" can instead be used.***

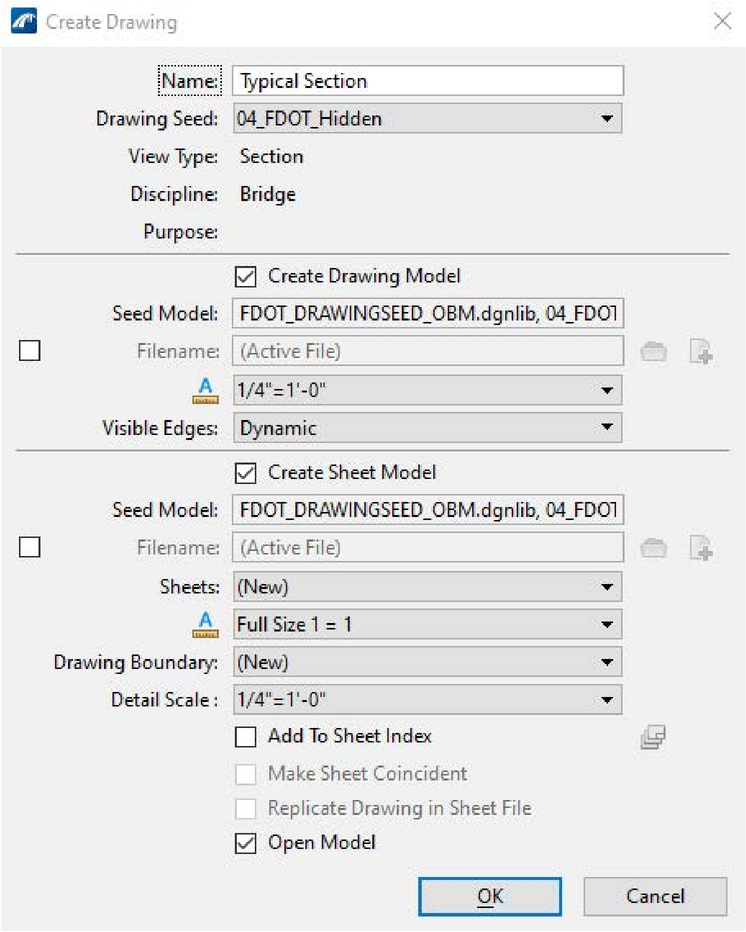


18. Data point at a location upstation from the defined cut line to specify what direction the cut should show.

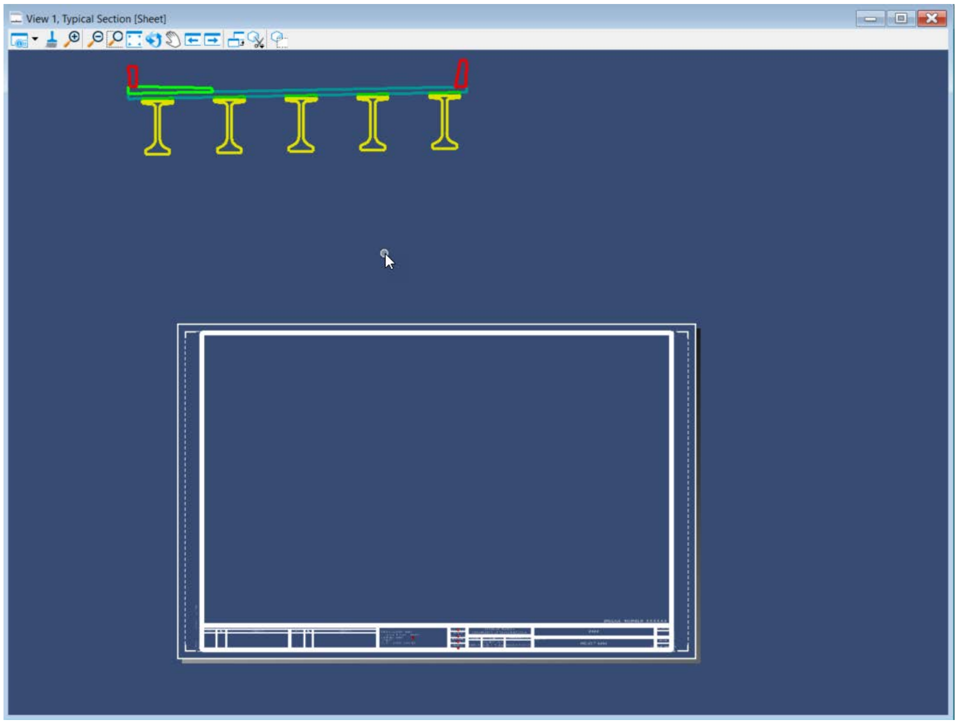


19. After selecting the direction, the *Create Drawing* window will appear. Set the name of the view to be **Typical Section** and the *Drawing Seed* to be **04_FDOT_Hidden**. Set the annotation scale for the drawing model and the detail scale of the sheet model to **1/4" = 1'-0"**.

20. Verify that the rest of the window matches the following image and click **OK**.



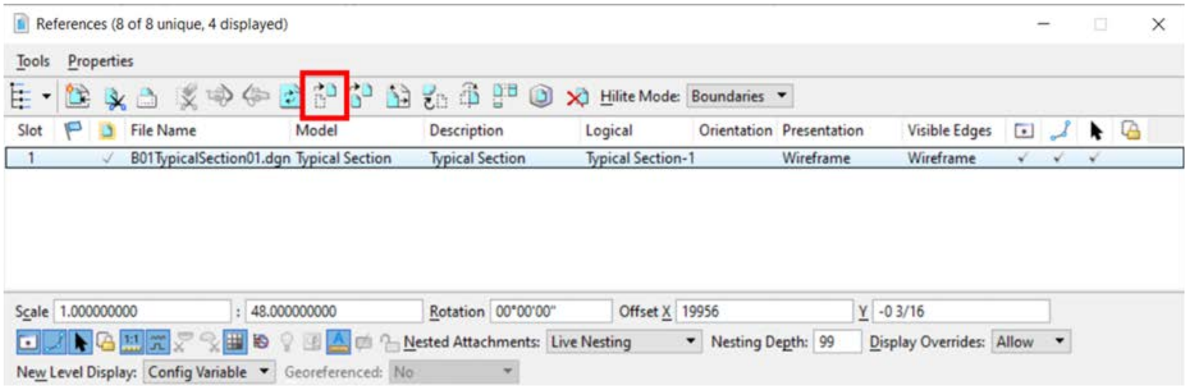
21. The following window should open, showing the section created. The section may appear outside of the border.



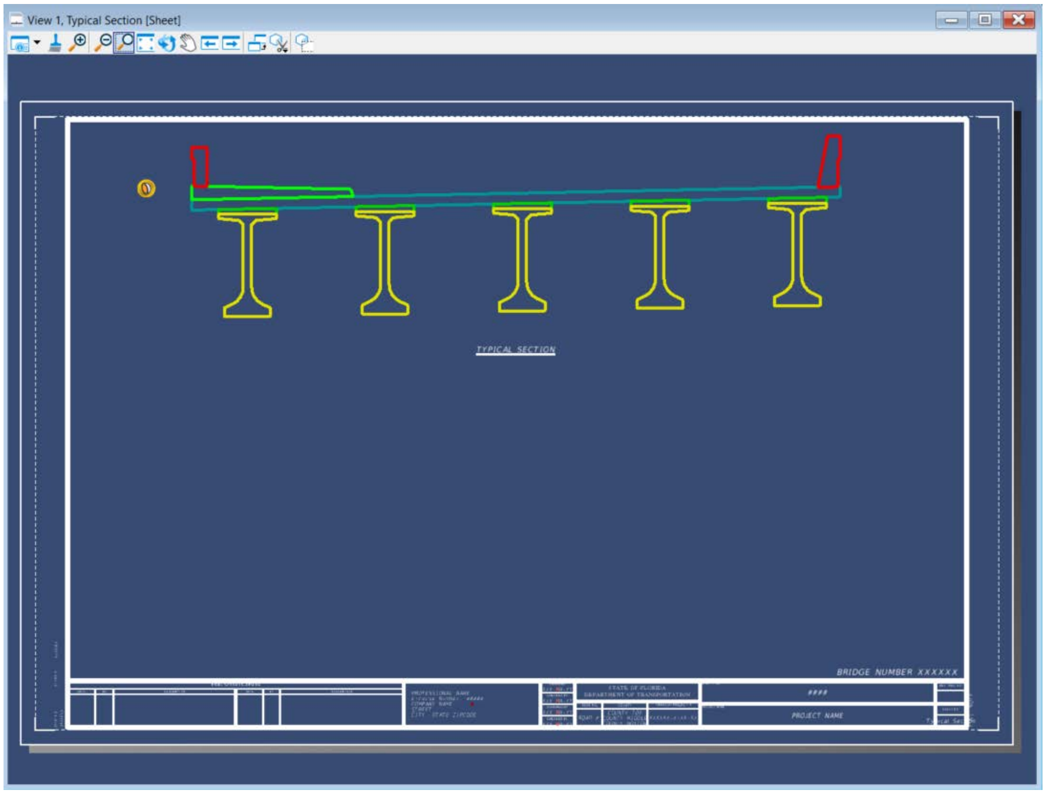
22. In the newly created sheet model, open the **References** tool by navigating to and selecting **Home > Primary > References**.

23. To center the section in the sheet border, the model reference will need to be moved using **Move Reference** at the top of the *References* window.

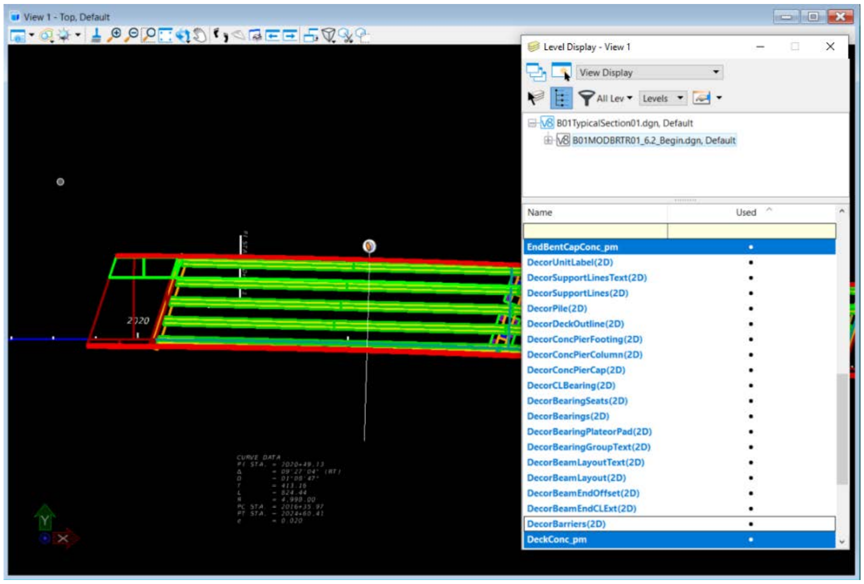
24. Highlight the view that will be moved, as shown below. Then, click **Move Reference** and move the highlighted Typical Section model reference to be centered in the border.



25. Use the **Move** tool to place the view titles (i.e., TYPICAL SECTION) directly below their respective views. Navigate to **Drawing** (workflow) **> Home > Manipulate > Move** and then select the text to be moved. The sheet should look like the image below.



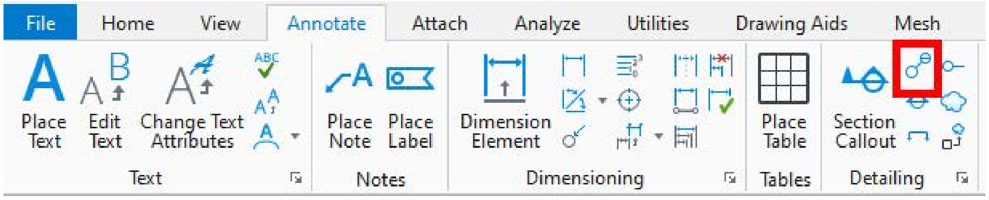
26. For this section, the 2D Decoration levels do not need to be visible. Therefore, these unneeded levels can be toggled off. While in the **Default** model, navigate to **Home > Primary > Level Display**. The dots in the image below show the components that are active in the model. Order the components by clicking on **Used** until all active components are at the top of the list. Undesired items can be hidden by clicking on the list item to remove the blue highlight. Note that this process could also be done prior to using the **Dynamic View by Station** tool.



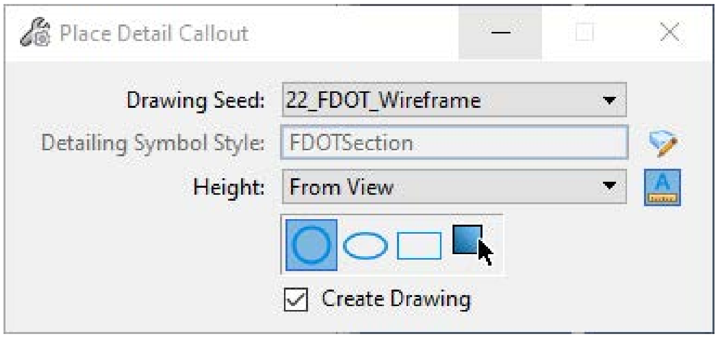
27. To ensure that the levels remain toggled off the next time the file is opened, save the settings by accessing **File > Save Settings** or (**Ctrl + F**).

GENERATE AN OVERHANG DETAIL

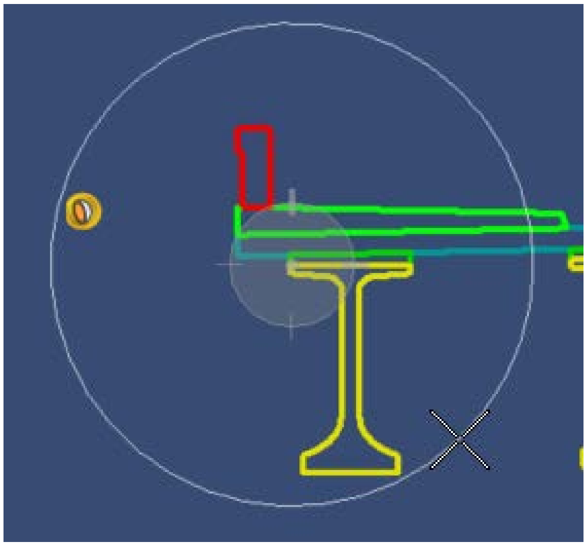
1. Within the **Typical Section [Sheet]** model, access the **Detail Callout** tool by navigating to **Drawing** (workflow) **> Annotate > Detailing > Detail Callout**.



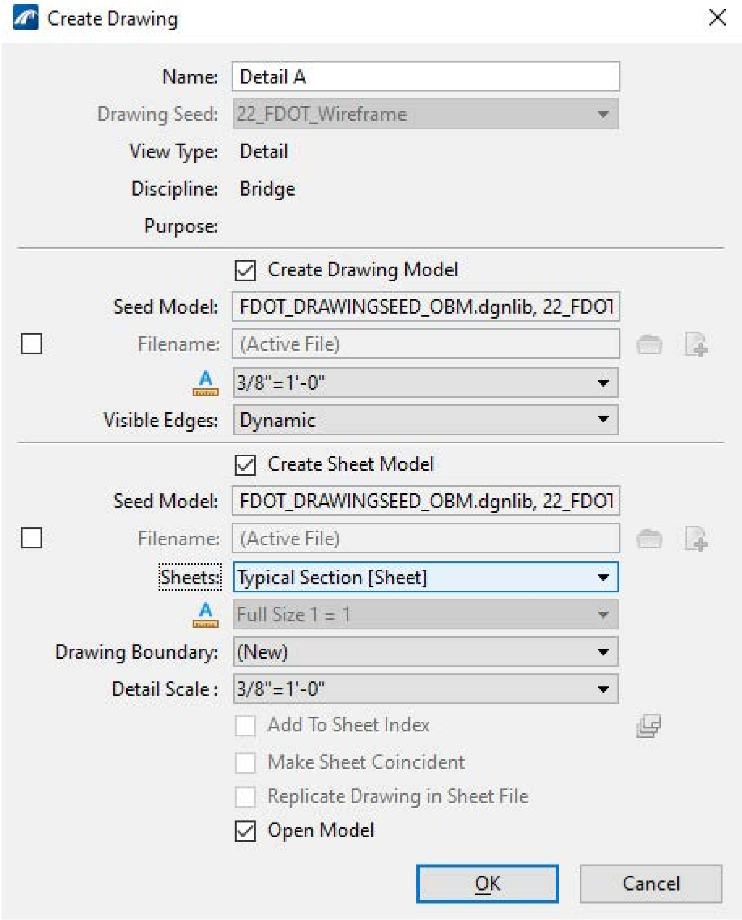
2. Select the **22_FDOT_Wireframe** *Drawing Seed* and use the circle boundary to create the detail.



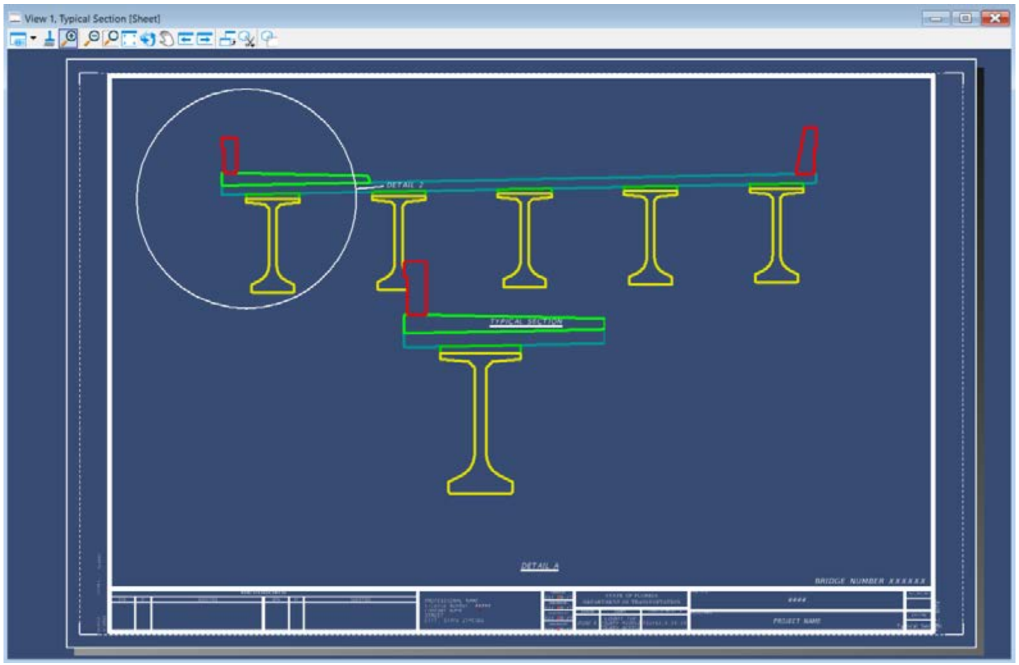
3. Click on the left corner of the top flange to place the center of the circular callout. Then click a point directly above to define the edge of the detail circle so that it fully encompasses the overhang and barrier.



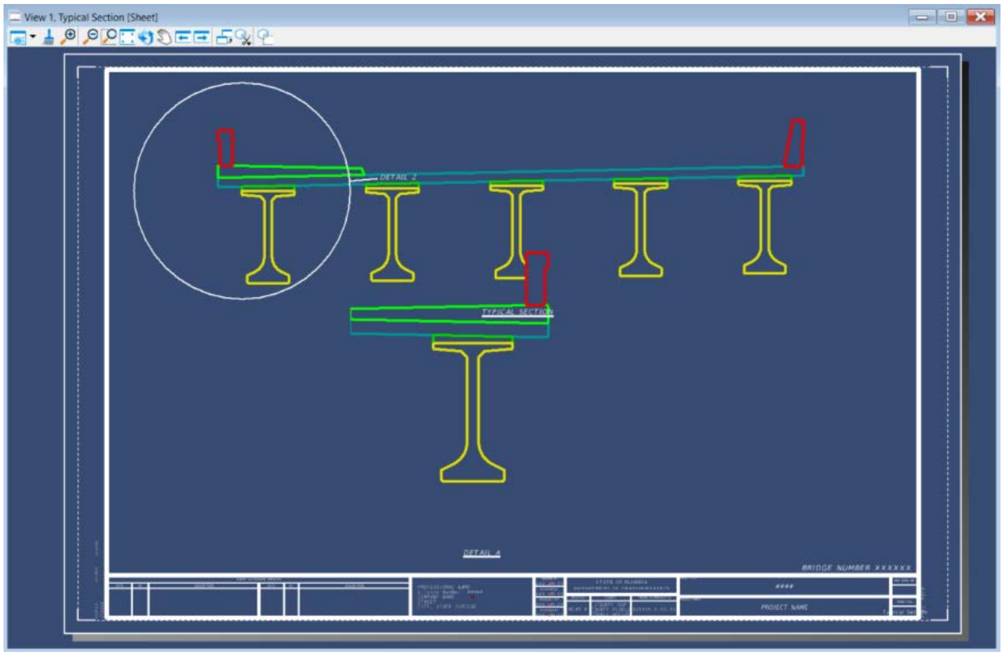
4. Click once more to define the end point for the callout above the circle and to the right. Click one final time to provide a leader for the callout and then, right-click to reset and finish the detail callout placement.
5. Set the name of the view to be **Detail A**. The *Drawing Seed* is already set as **22_FDOT_Wireframe**. Set the annotation scale for the drawing model and the detail scale of the sheet model to **3/8" = 1'-0"**. Additionally, change the *Sheets* drop-down to the existing **Typical Section [Sheet]** sheet model.
6. Verify that the rest of the window matches the following image and click **OK**.



7. The **Typical Section [Sheet]** sheet model now has the Detail A view within the border. Note that the detail shown is a mirror of the area with the detail callout. This issue has been filed with Bentley and will be updated in an upcoming release.

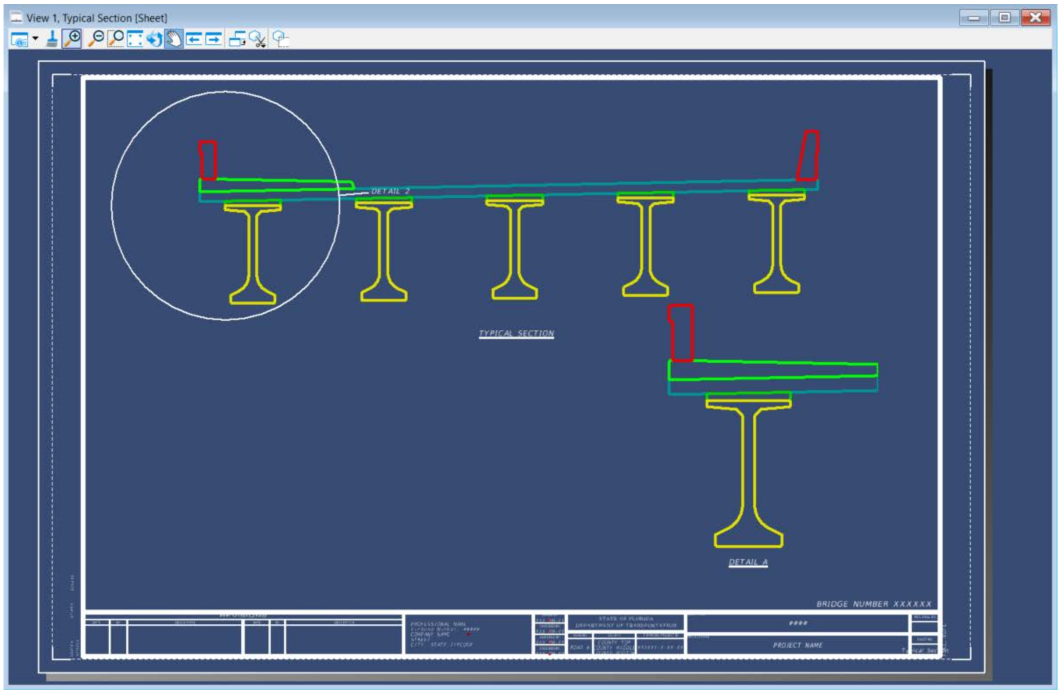


8. Use **Home > Primary > References > Mirror Reference** to mirror the detail so that it is correctly displayed.

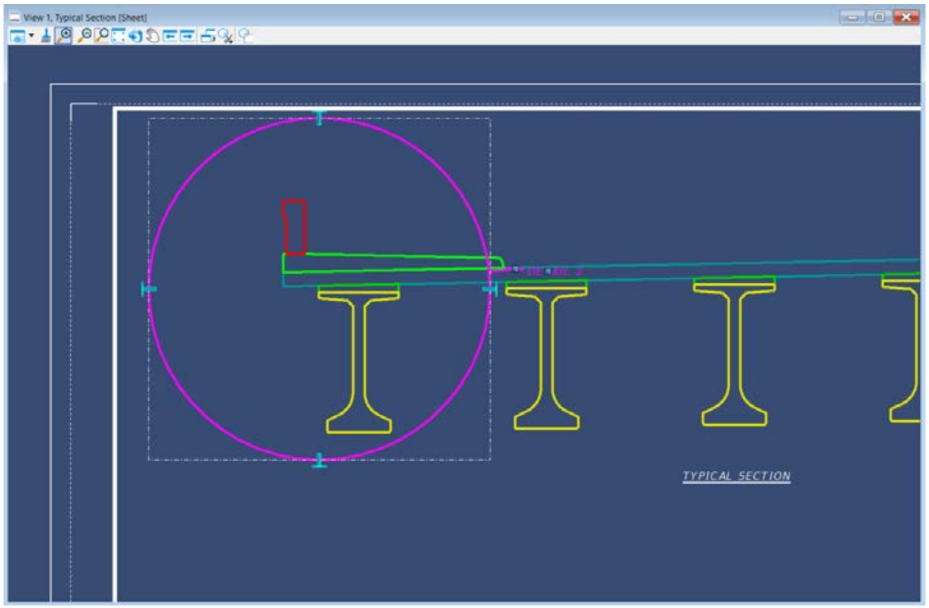


9. Use the **Home > Primary > References > Move Reference** tool to move the different views a bit to avoid any overlapping.

10. Then, use the **Drawing** (workflow) > **Home** > **Manipulate** > **Move** tool to place the view titles (i.e., TYPICAL SECTION and DETAIL A) directly below their respective views. The sheet should look like the following image.



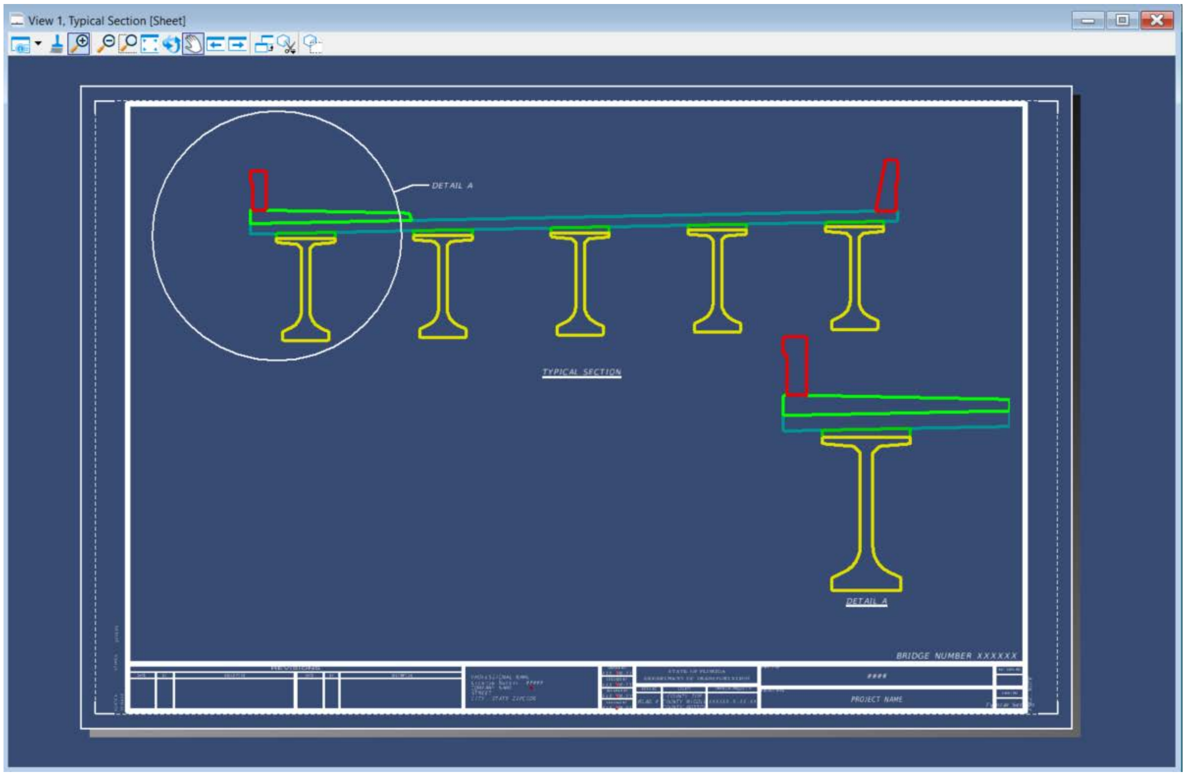
11. Notice that the detail callout text did not move. Click the detail callout text to select the callout.



12. Click once more on the text handle, then move the text up into open space and click one last time to release the text. Do the same with the additional node for the leader line.

13. Lastly, using the **Drawing** (workflow) **> Annotate > Text > Edit Text** tool, change the text in the detail callout to read "DETAIL A"

The final sheet should look like the image below.

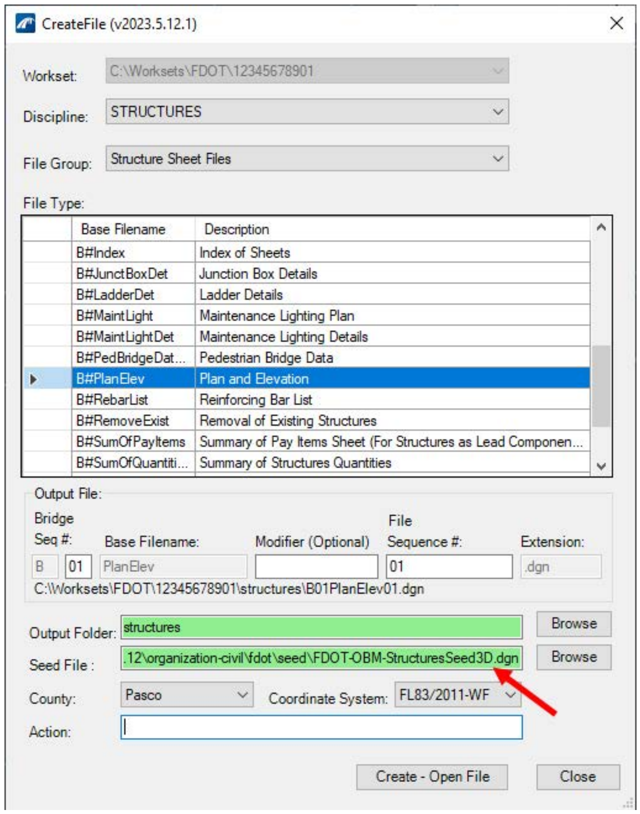


EXERCISE 6.3 *Create a Plan and Elevation View with the Place Named Boundary Tool*

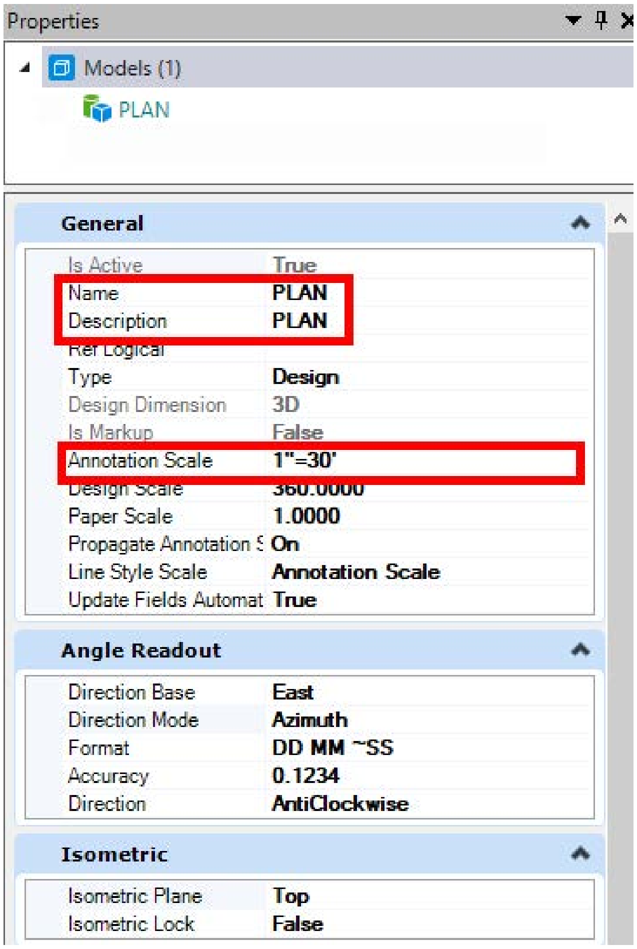
GENERATE A PLAN VIEW

1. Open the data set file: *B01MODLBRTR01_6.3_Begin.dgn*

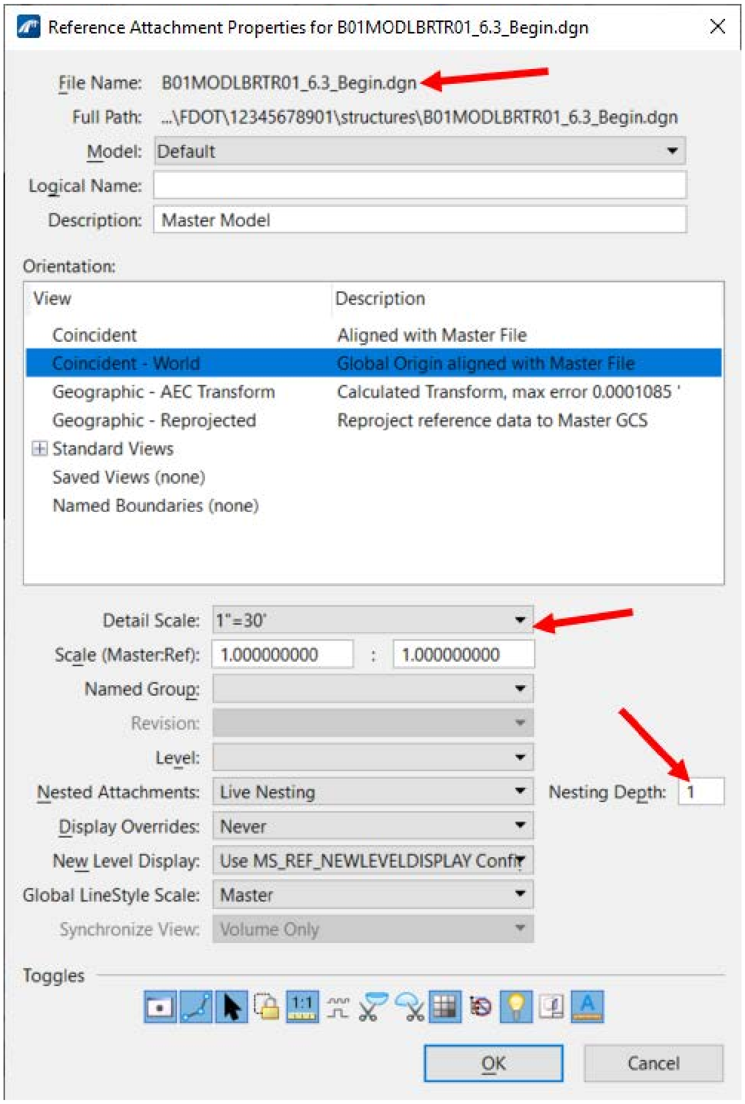
2. Access the **OpenBridge Modeler** (Workflow) **FDOT > Actions > Create File** tool and create a sheet file with the inputs indicated below. Make sure to change the seed file to **FDOT-OBM-StructuresSheetSeed3d.dgn**, located in the same folder as the 2D seed file.



3. Click **Create – Open File**. Once the new file opens, go to **OpenBridge Modeler** (Workflow) > **Reports and Drawings** > **Drawing Scale** and set the *Annotation Scale* to **1"=30'**. Go into the Model properties and change the *Name* and *Description* to **PLAN**.

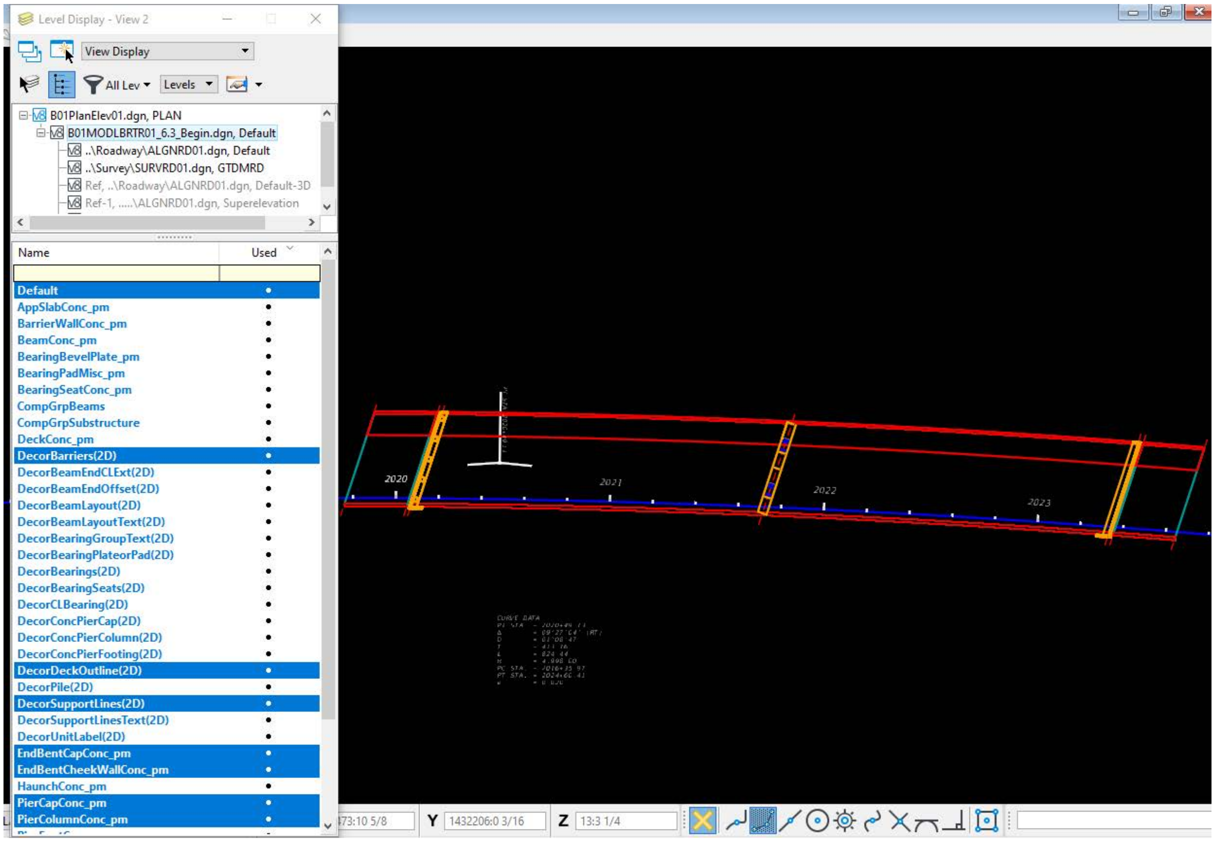


4. Go into the *References* window and attach the main bridge model file *B1MODLBRTR01_6.3_Begin.dgn* with the settings shown below. Set *Nested Attachments* to **Live Nesting** and set *Nesting Depth* to 1.



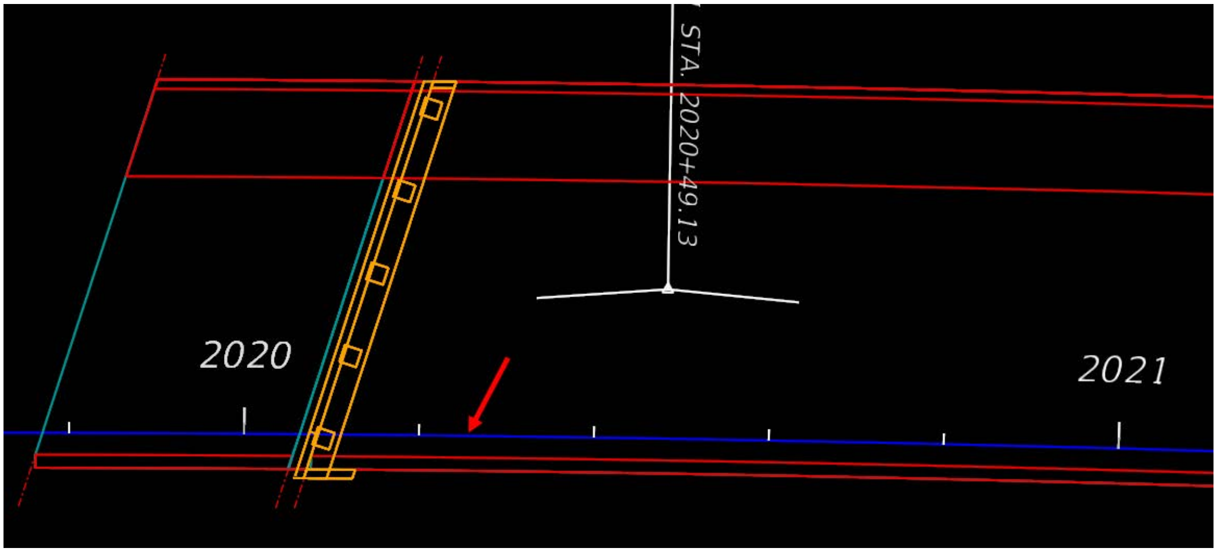
5. Change your active level to **ClipDrawingBound_dp** by navigating to **Drawing** (Workflow) **> Attributes > Level**. This will put the named boundary on a non-plotting level. Use the **Fit View** tool to locate the bridge.

6. Open the *Level Display* window, expand the dropdowns, select the *B1MODLBR01_6.3_Begin.dgn* reference file, and turn off all levels except: Default, DecorBarriers(2D), DecorDeckOutline(2D), DecorSupportLines(2D), EndBentCapConc_pm, EndBentCheekWallConc_pm, PierCapConc_pm, and PierColumnConc_pm. Select the drop down list associated with the *B1MODLBR01_6.3_Begin.dgn* and ensure that all levels are on for *ALGNRD01.dgn*, **Save Settings (Ctrl+F)** once levels are modified. The reason for doing this is because complex 3D elements such as the deck will display internal "lofting" lines in the wireframe display style which we do not want to show up in the plan view. Turning off the superstructure 3D elements and only keeping on the 2D projection elements will yield the desired result for the plan view as seen below. Note that the Default and 3D substructure levels are kept on because parametric cells don't create the 2D projection elements consistently.



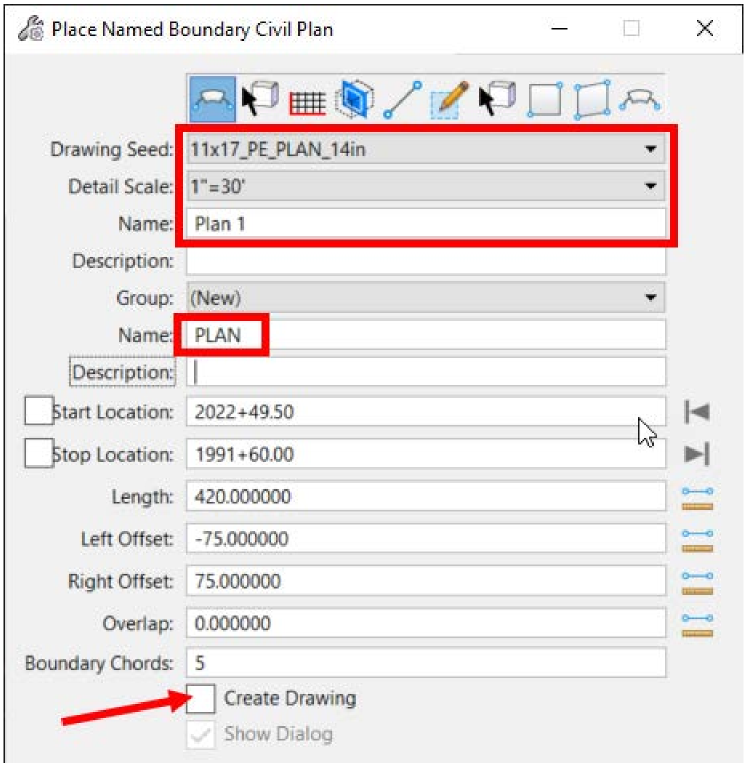
7. Access the **Place Named Boundary** tool through **Reports and Drawings > Drawings > Place Named Boundary** or through the View > Named Boundaries > Place Named Boundary.

8. Select the **Civil Plan** option in the top left of the window and select the **CL_WB** alignment by clicking on the alignment. Notice that this automatically fills the *Name* field, however the name will change in a subsequent step. Note that this is the 2D alignment, not the 3D alignment.

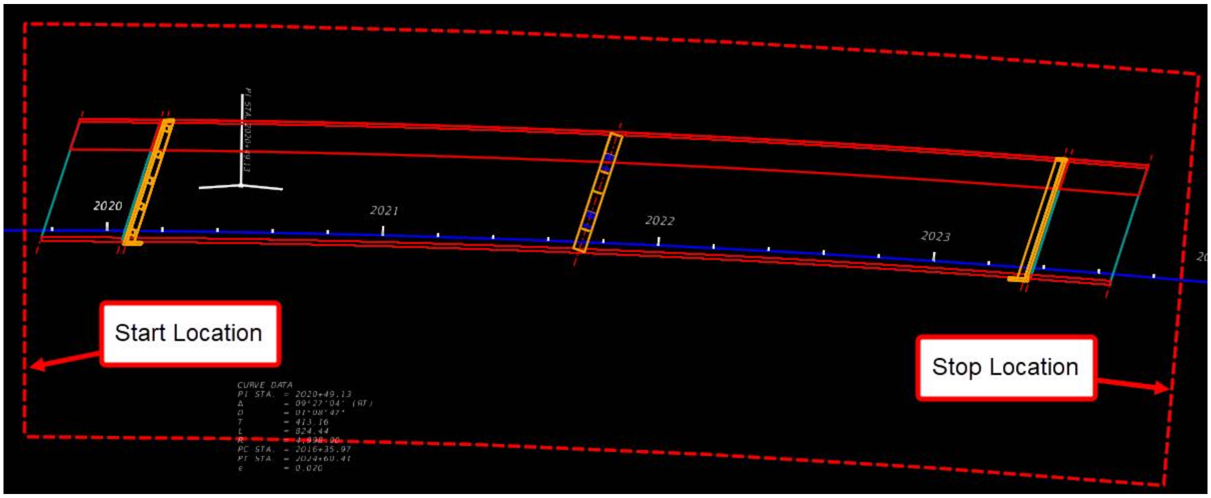


9. Set the *Drawing Seed* to the **11X17_PE_Plan 14in** and the *Detail Scale* to **1" = 30'**. The five seed files for P&E sheets range from **11X17_PE_PLAN 11in** to **11X17_PE_Plan 15in**. These different sizes correlate to the width of the drawing boundary on the sheet model. The *Length*, *Left Offset*, and *Right Offset* values are automatically calculated based on the lengths of the drawing boundaries in the seed file and the Detail Scale selected. Changing the Detail Scale will automatically change those values to maintain the aspect ratio of the drawing boundary in the seed file. However, users can change those values manually if desired.

10. Once the alignment is selected, change the *Name* and *Group Name* as shown below, and uncheck the *Create Drawing* box. For drawings requiring more than one plan sheet, the number at the end of the view name will automatically update on subsequent sheets.



11. The user’s next data point will select the *Start Location* of the boundary. Select a point just before the Start Approach Slab. The **Place Named Boundary** tool is actually set up to create multiple boundaries at the length automated in the *Length* field by the drawing seed. Move the cursor into the Model view to see the preview of the boundaries that can be created depending on where the *Stop Location* is selected. Move the cursor to a location that only creates one boundary and data point.

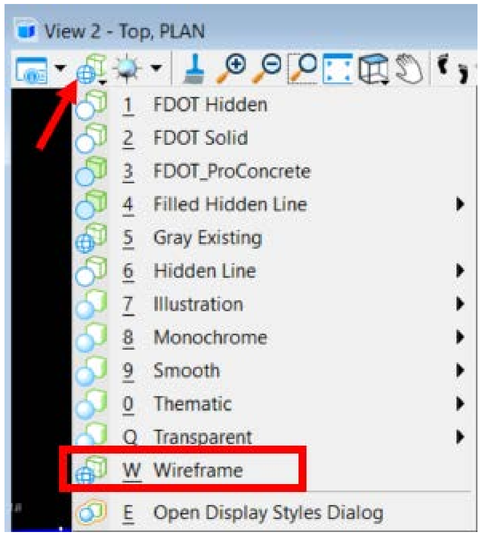


12. Data point one last time in space to confirm your selection. The boundary should appear slightly transparent once placed. Note that if your bridge requires multiple plan sheets an *Overlap* value of 0’ as shown in this example would result in no overlap of the plan views and would require match lines. If a value is entered for *Overlap* then the named boundaries will have an overlap equal to the value entered.

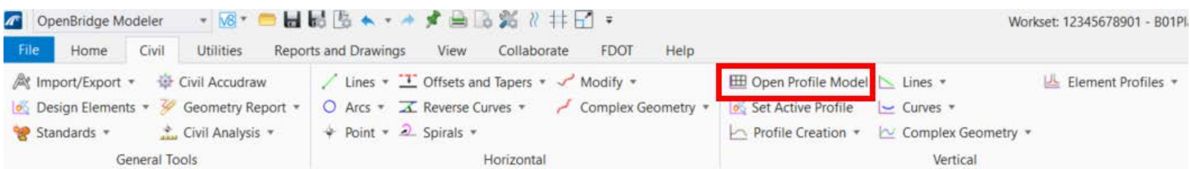
GENERATE TERRAIN ELEVATION VIEW AND CREATE DRAWING & SHEET MODELS

The Named Boundary – Civil Profile tool will be used to create the terrain (existing and/or proposed groundline) and elevation scales shown in the elevation view. The Section Callout tool will be used later in this exercise to create a side elevation view of the bridge.

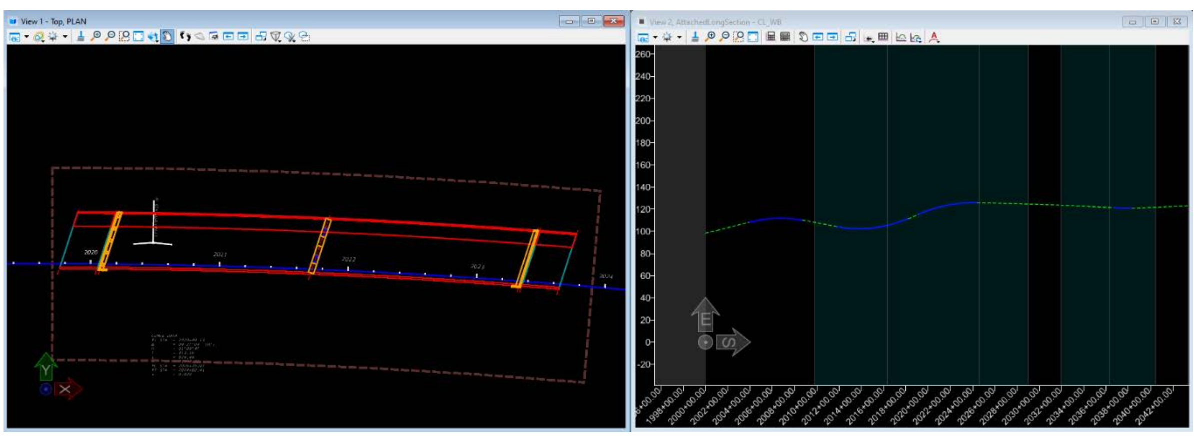
1. Open View 2 and use the **Fit View** tool to locate the bridge. Switch to a Top View and set the *Display Style* to **Wireframe**.



2. Access **Civil > Vertical > Open Profile Model** to start opening the profile model.

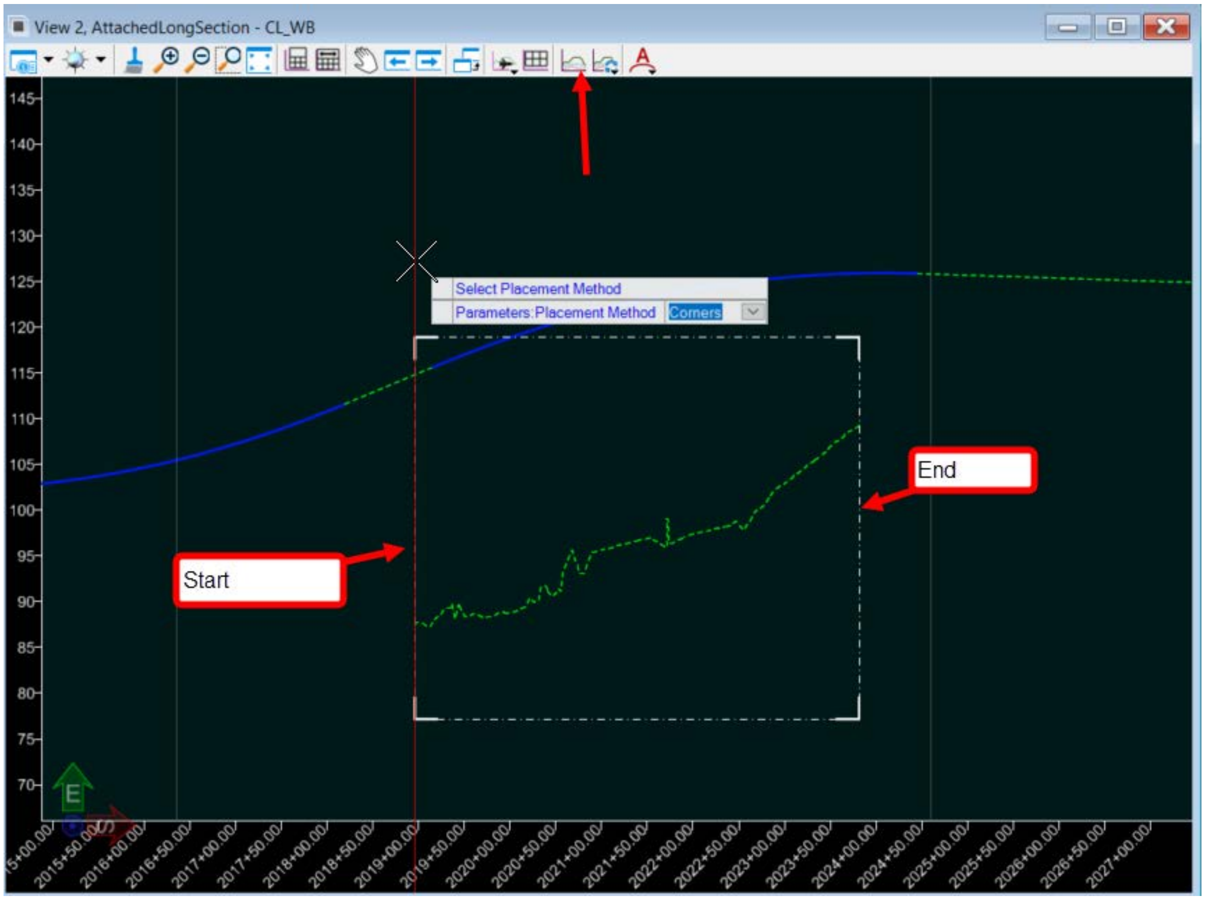


3. Once the tool is active, select the **CL_WB** alignment within the limits of the bridge to *Locate Plan Element*. Data point in an open area of View 2 to confirm and open the profile model.



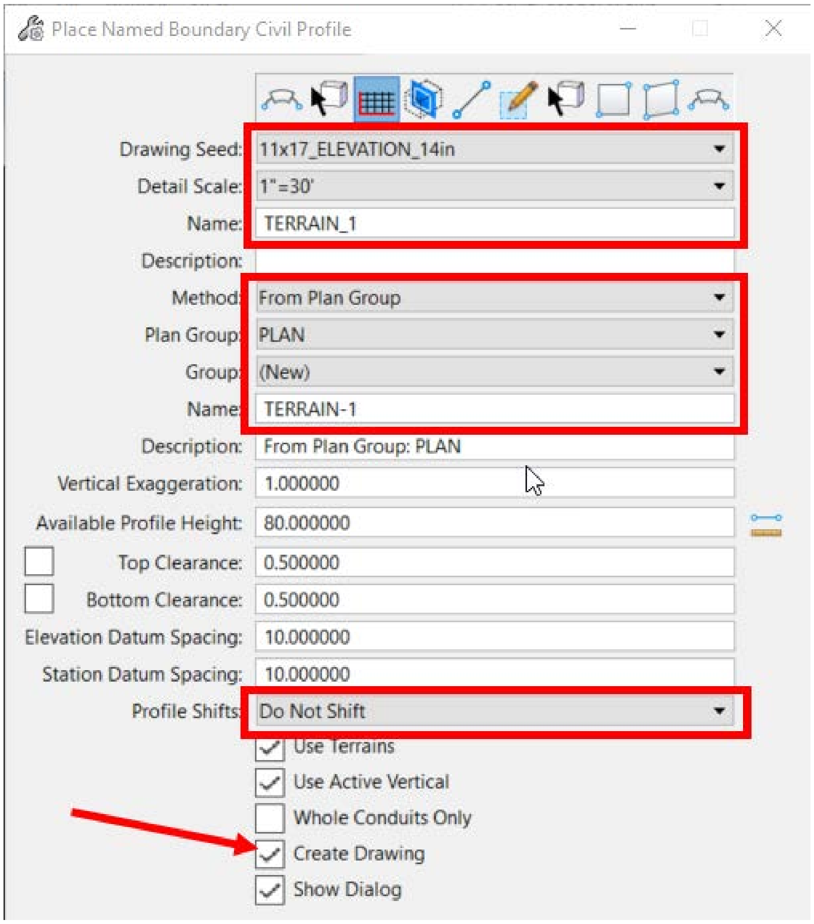
4. In this example the alignment file will have a terrain file referenced in and set active to the alignment. When an alignment has an active terrain associated with it, the terrain will automatically show up in the profile view as it does in this example. However, if the alignment file does not have an active terrain set, you will need to create a 3D slice to generate the terrain profile in the profile view. That scenario is shown below, but can be skipped for this training as our alignment has a terrain associated with it.

To create that 3D cut start by setting the active level to **ClipDrawingBound_dp**. Start the **Create 3D Cut** tool in the top of the profile view and select the **Corners** *Placement Method*. Place the start at a station before the start of the first approach slab (STA. 2019+76.96) and above the profile. Then place the end at a station beyond the second approach slab (STA 2023+65.18) and near elevation 120. Leaving the View 1 plan view open will help show where the 3D cuts are being made relative to the bridge. The position of the cursor in profile view will be shown as a position line in plan view. Once the 3D cut has been made turn off all levels in the profile view except **DTM_ex** and save settings. The resulting view should look similar to the image below.

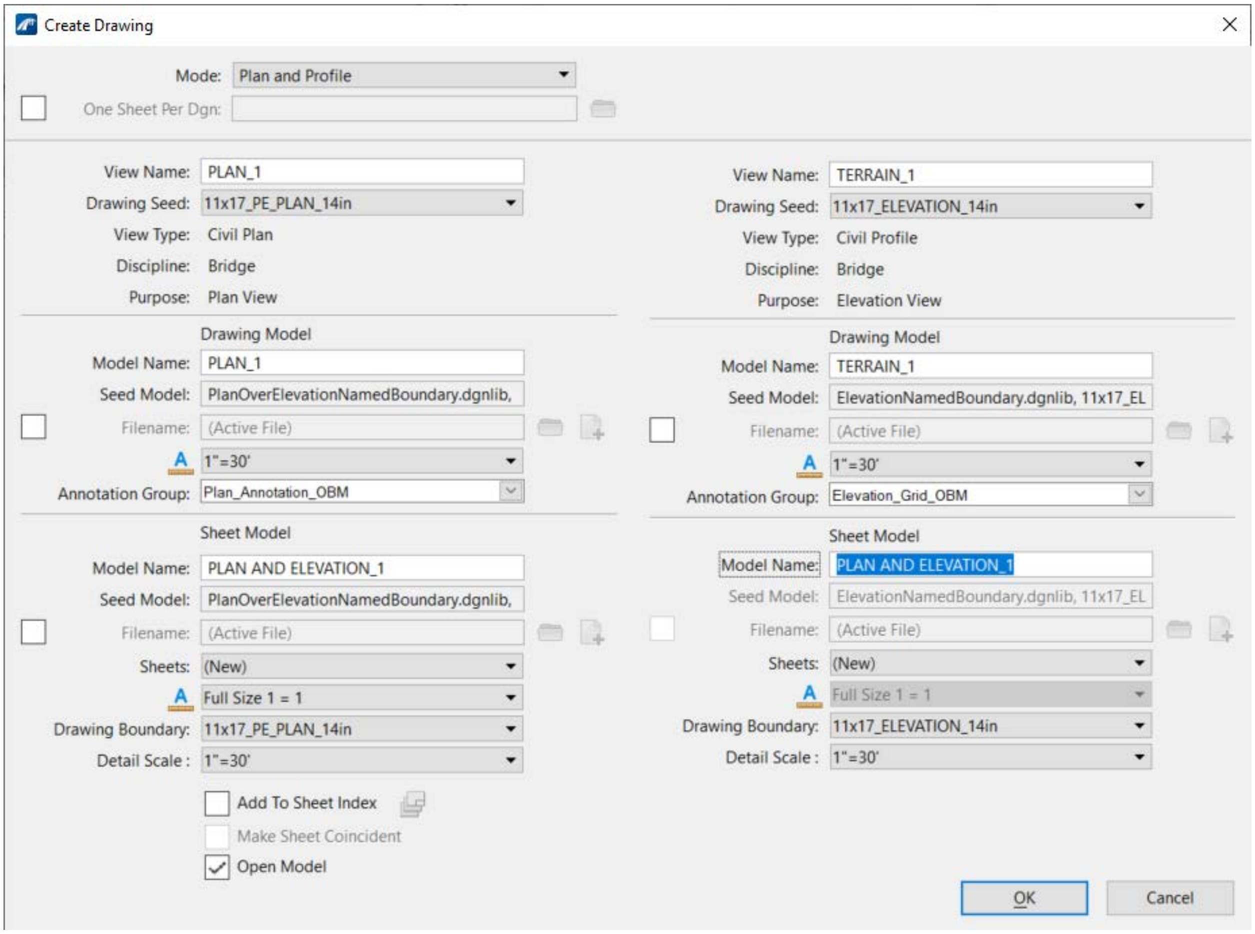


5. Use the **Place Named Boundary** tool through the **Drawing** (Workflow) **> View > Named Boundaries > Place Named Boundary**. Notice that the **Place Named Boundary** tool can be found in either the **Drawing** or the **OpenBridge Modeler** workflow. This time click on the third tool at the top called **Civil Profile** until it is highlighted and click on the **PR_WB** profile in the profile view.

6. Set the *Drawing Seed* to the **11X17_ELEVATION 14in** and the *Detail Scale* to **1" = 30'**. Since this profile tool is mainly being used to create the elevation view of the terrain, change the view *Name* to **TERRAIN_1** and the group *Name* to **TERRAIN_1**. Make sure the *Method* is set to **From Plan Group** so that the elevation will line up with the plan view. The rest of the settings should be automatically populated from the seed file, but can be adjusted by the user as desired. Note that if *Overlap* on the Plan boundaries is used, the "Profile" boundaries will not take that into account automatically and will require manual adjustment in the profile view. Make sure to match the remaining settings as shown below:


Place Named Boundary Civil Profile
Drawing Seed: 11x17_ELEVATION_14in
Detail Scale: 1"=30'
Name: TERRAIN_1
Description:
Method: From Plan Group
Plan Group: PLAN
Group: (New)
Name: TERRAIN-1
Description: From Plan Group: PLAN
Vertical Exaggeration: 1.000000
Available Profile Height: 80.000000
Top Clearance: 0.500000
Bottom Clearance: 0.500000
Elevation Datum Spacing: 10.000000
Station Datum Spacing: 10.000000
Profile Shifts: Do Not Shift
Use Terrains
Use Active Vertical
Whole Conduits Only
Create Drawing
Show Dialog

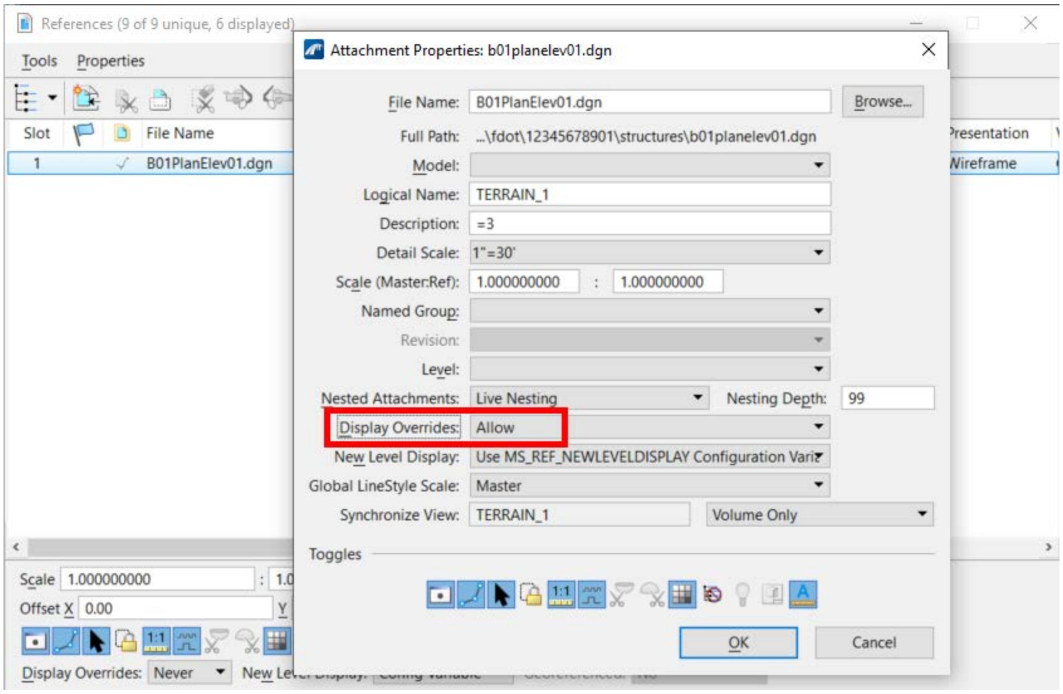
7. Data point within View 2 to accept the boundary. Once the *Create Drawing* window pops up, be sure that all scales and annotation groups are correctly set and the *Open Model* toggle is on. By default, the tool combines the named boundary group name and the view names in this dialogue. You will need to rename them as shown below. Select **OK** and the drawing will be created.

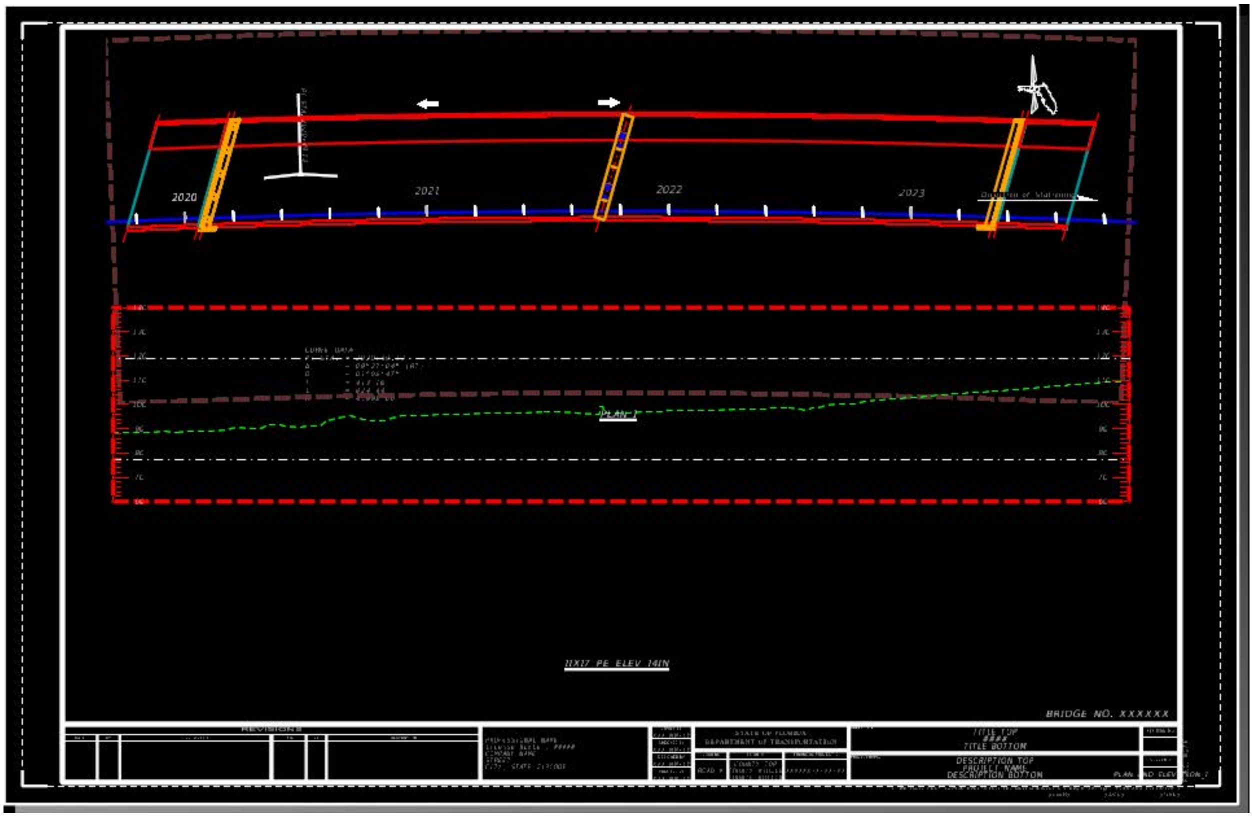


The OBM specific *Annotation Groups* will always have "_OBM" at the end of the name. Some of the automatically placed annotations may need to be removed if not needed.

The following sheet model will be displayed in the view window as shown below. Note that the sheet model background of the image shown below is black because **Preferences > View Options > Sheet Background** was changed to black.

The next step in the typical plans production process, which is not shown in this exercise, is to go into the PLAN drawing models and add annotations and dimensions as you normally would. You may also need to go into the TERRAIN drawing model and move the elevation scales horizontally as needed so that they are positioned where you want them in the sheet model. You may also need to turn of levels you don't want to see in the TERRAIN drawing model. Before you turn levels off in the TERRAIN drawing model make sure the reference settings for *Display Overrides* is set to **Allow**. Once you verify that and turn off the unwanted levels, be sure to Save Settings **(Ctrl+F)**.

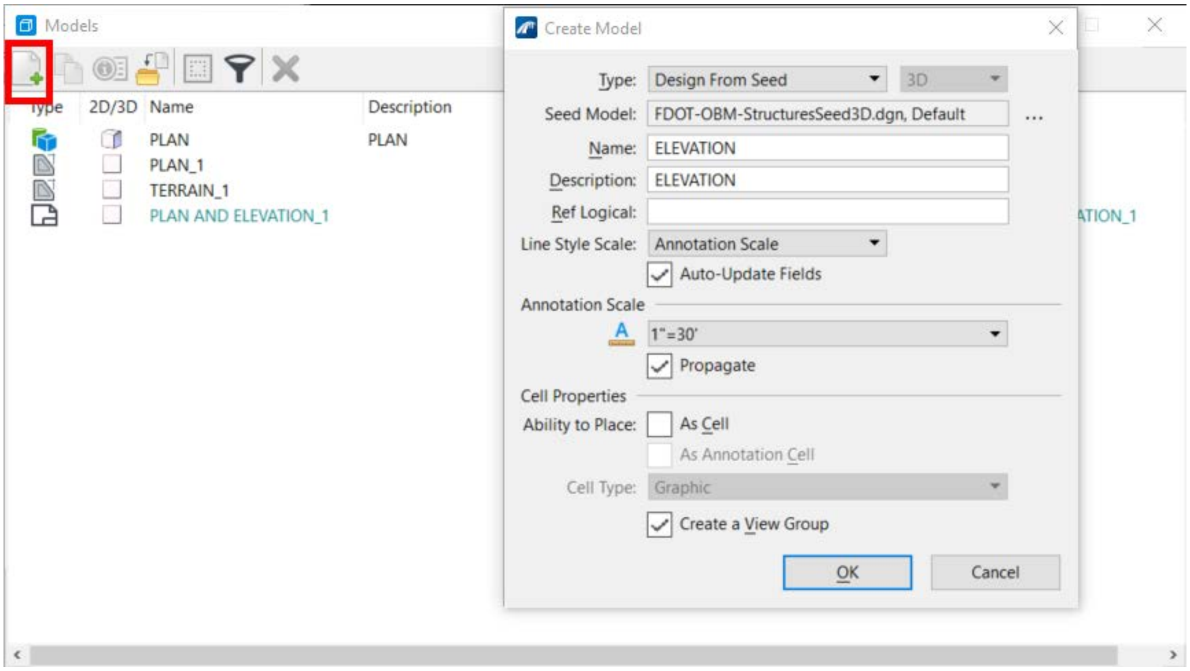




NOTE ***The substructure elements are currently shown as solid lines. A display style that shows the substructure elements has hidden lines will be provided in future FDOT workspace releases.***

CREATE THE BRIDGE ELEVATION VIEW AND COMBINE VIEWS

1. Once the Plan and Terrain Elevation: saved views, drawing models, and sheet models are created, the last step is to create the bridge elevation view using the **Section Callout** tool. Since 3D elements were turned off in the PLAN design model to create the plan view, a new design model will need to be created for the Elevation view with the 3D elements turned on. Open up the *Models* window, **Create Model**, and follow the settings below:

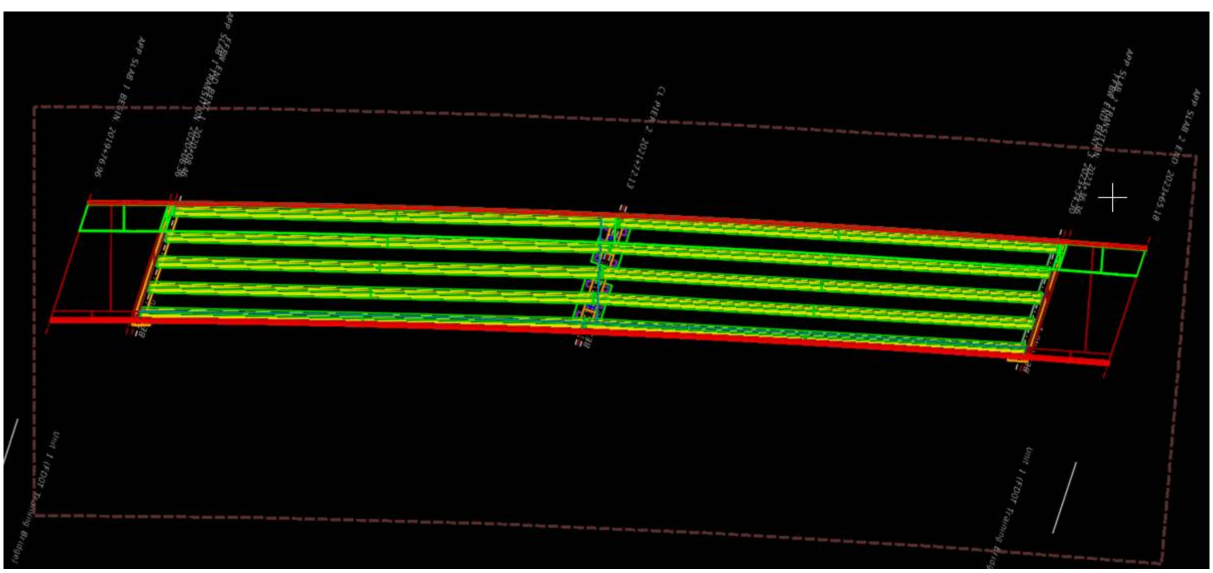


2. Once the ELEVATION design model opens, close View 2 and maximize View 1. Open your *References* window and attach:

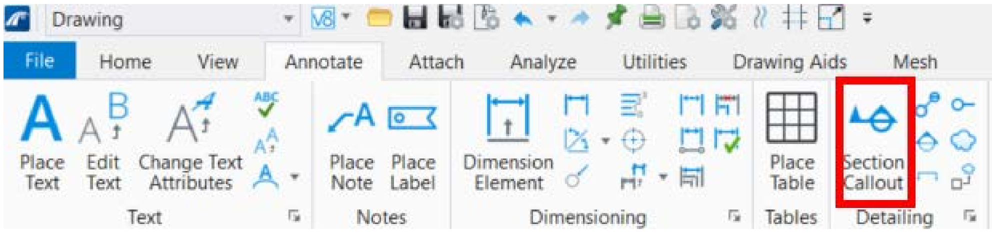
   a. The main bridge model: **B1MODLBR01.dgn_6.3_Begin** with *Nested Attachments* set to **No Nesting** (this will be used for the elevation)

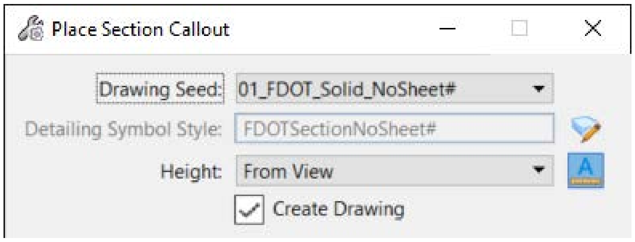
   b. The PLAN model: **B01PlanElev01.dgn** with *Nested Attachments* set to **No Nesting**

Once the files are referenced, make sure top view is set. Then, use the **Fit View** tool.

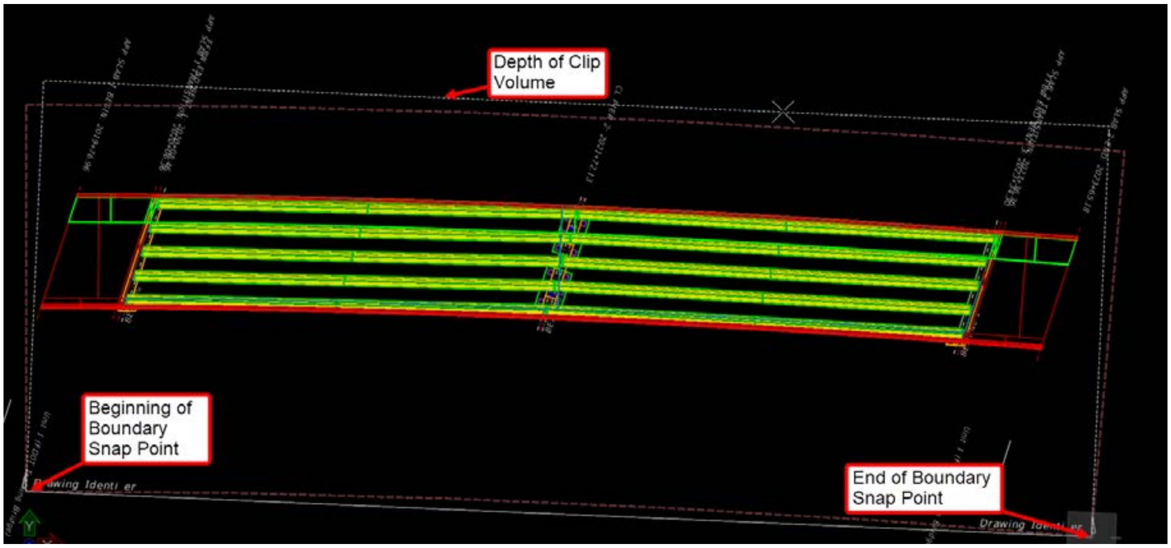


3. A typical bridge elevation view shows the bridge from the side with “solid” elements (elements are not transparent). “Solid” elements can be incorporated into a view by using a section callout seed file that has a “solid” display style. Access the **Section Callout** tool through **Drawing** (workflow) **> Annotate > Detailing > Section Callout**. Select the *Drawing Seed* of **01_FDOT_Solid_NoSheet#** and check the *Create Drawing* box.

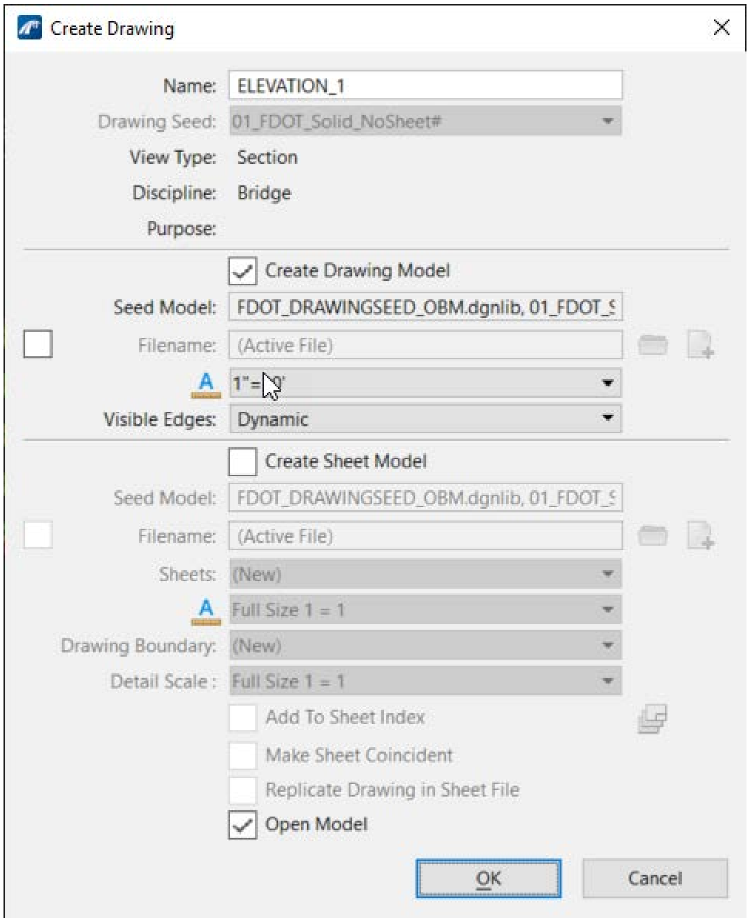




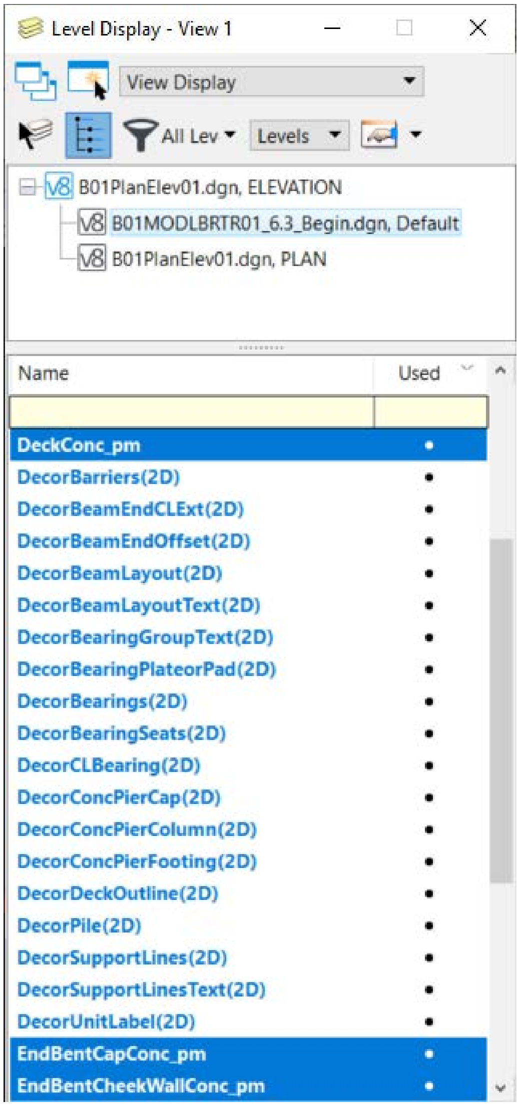
4. Snap to the beginning of the drawing boundary and data point to start the section callout placement, snap to the end of the drawing boundary and data point to end the section callout placement, move your cursor to set the depth of the clip volume past the extents of the bridge, and data point to accept.

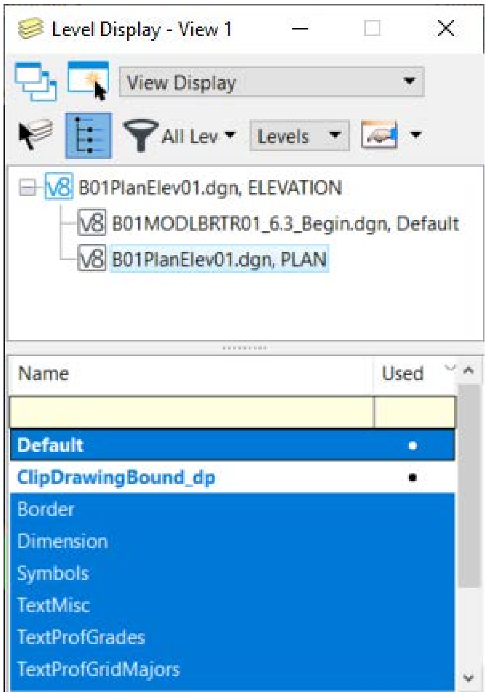


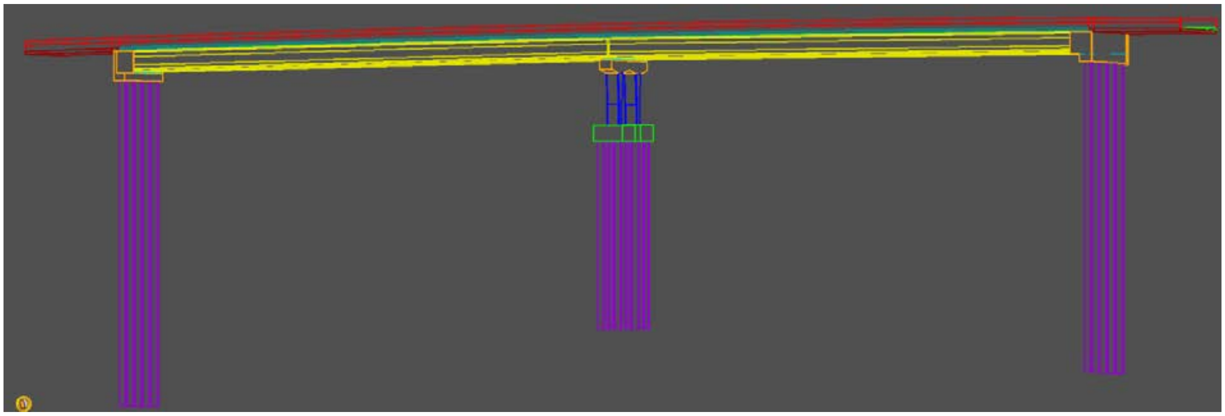
5. Change the view name to ELEVATION_1 to match the plan view naming convention, change the Annotation Scale to **1”=30’**, and uncheck *Create Sheet Model*.



6. Once the drawing model opens, open the ELEVATION design model. Open the **Level Display** tool and turn off all the 2D Decor levels as well ClipDrawingBound_dp level so that you only see the 3D bridge elements you want to see in the elevation view, and save settings. These level settings in the design model will propagate to the drawing and sheet models. The next step in the typical plans production process,which is not shown in this exercise, is to place the typical annotations and dimensions in this elevation view drawing model as you normally would.

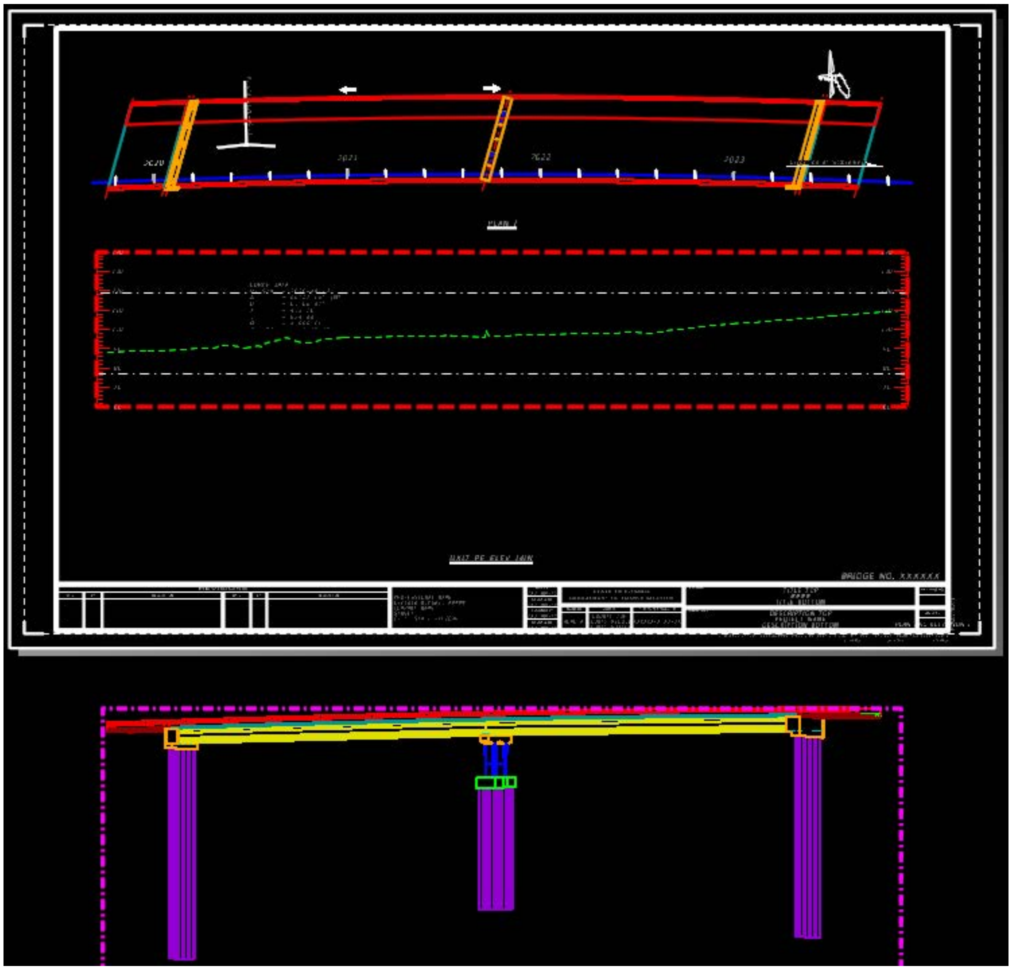






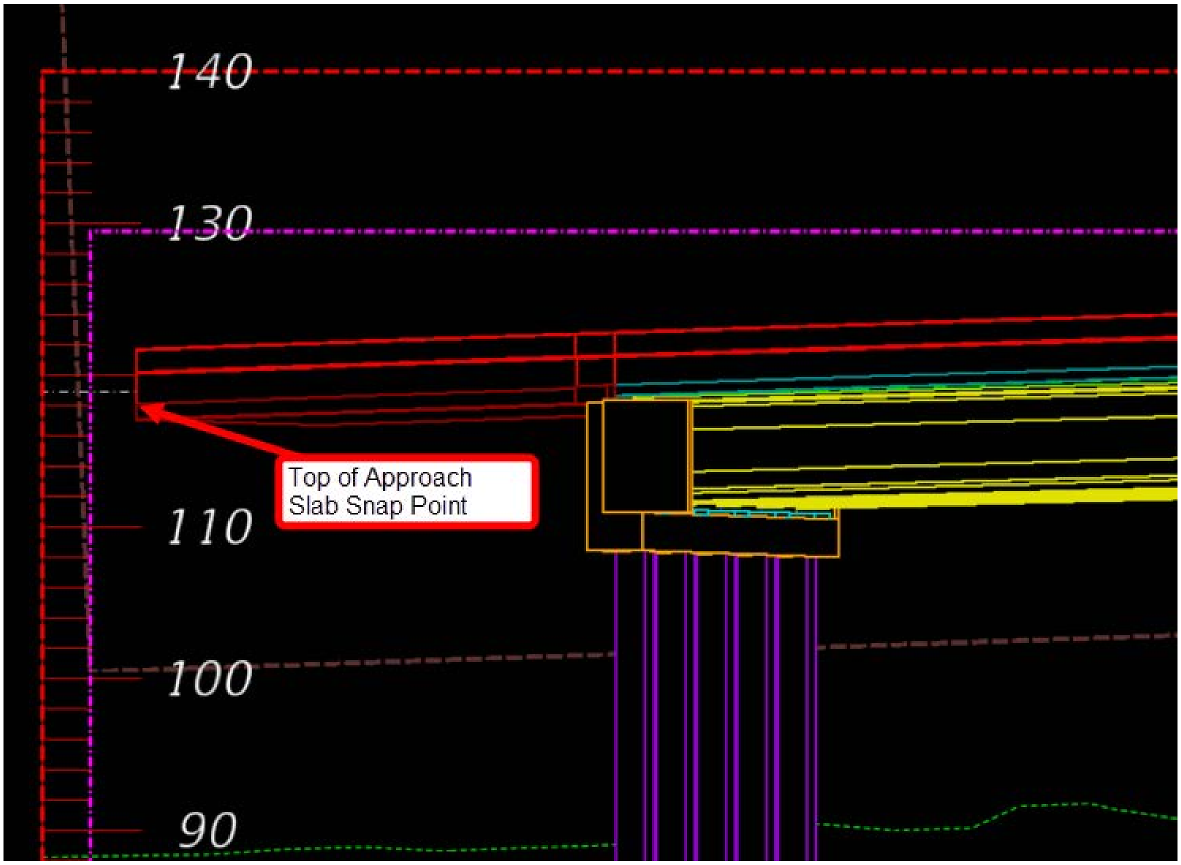
7. Open the PLAN AND ELEVATION 1 sheet model, open the *Models* window, and click & drag ELEVATION_1 drawing model onto the sheet model. Select **Recommended** for the *Attachment Method*, and click below the sheet to initially place it below the sheet.

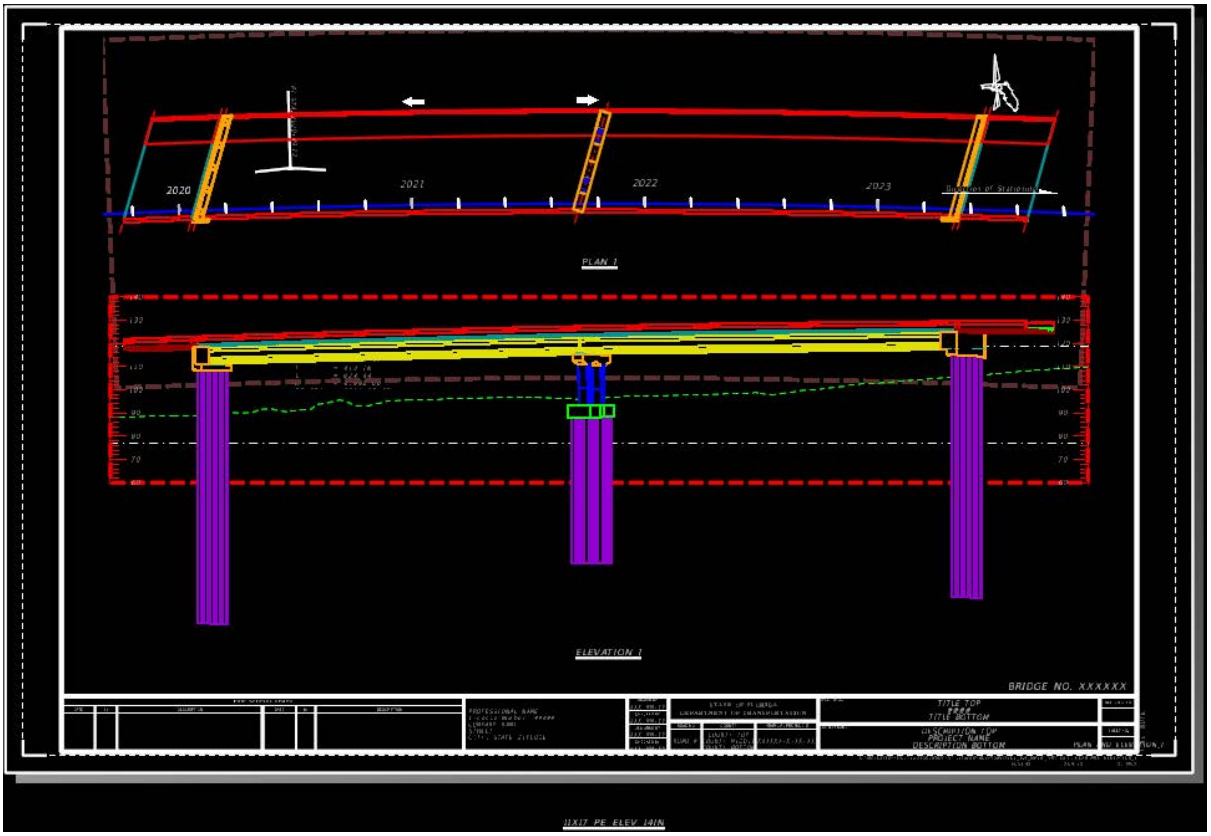
NOTE ***It is common, when first placing a drawing model onto a sheet model, for level displays to look incorrect. Switch to a different model within the dgn and come back to the sheet model to correct this initial graphical bug.***



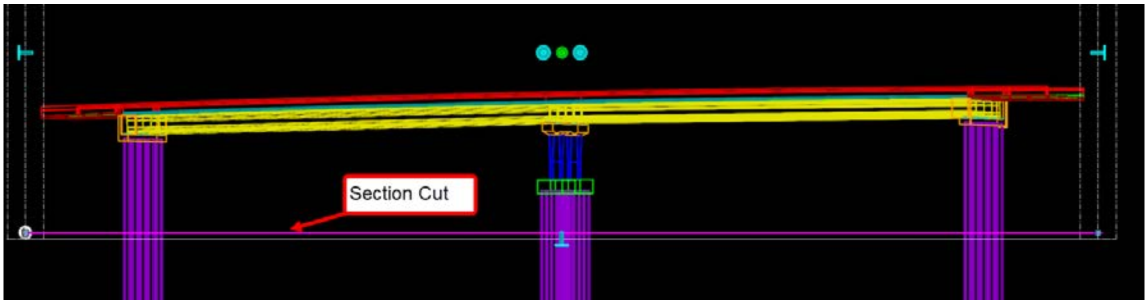
8. Right click and hold on the ELEVATION_1 reference and use the **Move Reference** command, snap to an element on the ELEVATION_1 reference that is in line with the plan view (begin of left/first approach slab), lock in the AccuDraw compass (**Enter**) so that the reference can only be moved horizontally, and snap to the same point on that element in the plan view to line up the elevation view horizontally.

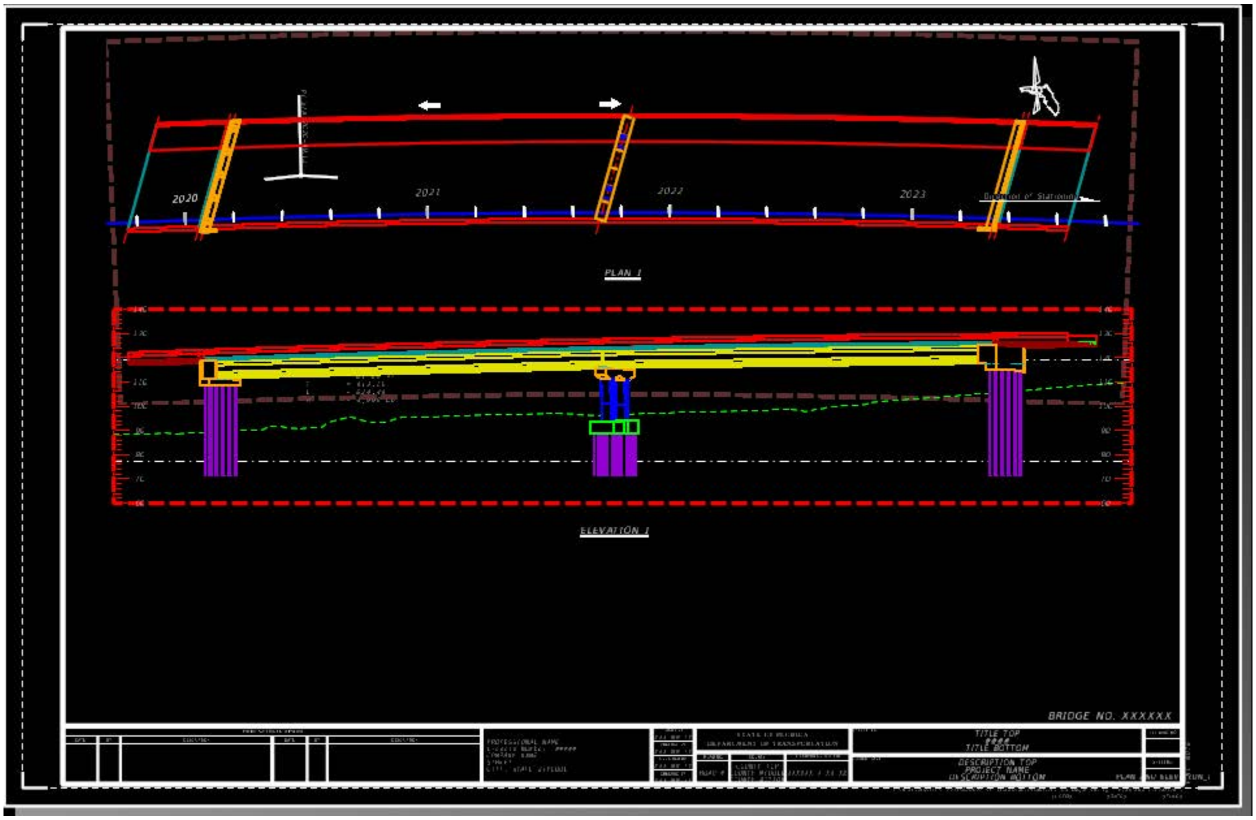
9. Right click and hold on the ELEVATION_1 reference and use the **Move Reference** command, snap to an element on the ELEVATION_1 reference you know the elevation of (Begin Approach Slab at Right Coping = 118.080), lock in your AccuDraw compass (**Enter**) so that the reference can only be moved vertically, and move the reference vertically to the known elevation using the elevation scale from the TERRAIN_1 reference (this may be approximate as the elevation scale is in 5' increments). Adjust the location of the Plan and Elevation boundary view names. Move the 11X17_PE_ELEVATION 14in drawing boundary view name down below the sheet using the **Move** tool (**Drawing** (Workflow) > **Manipulate**).

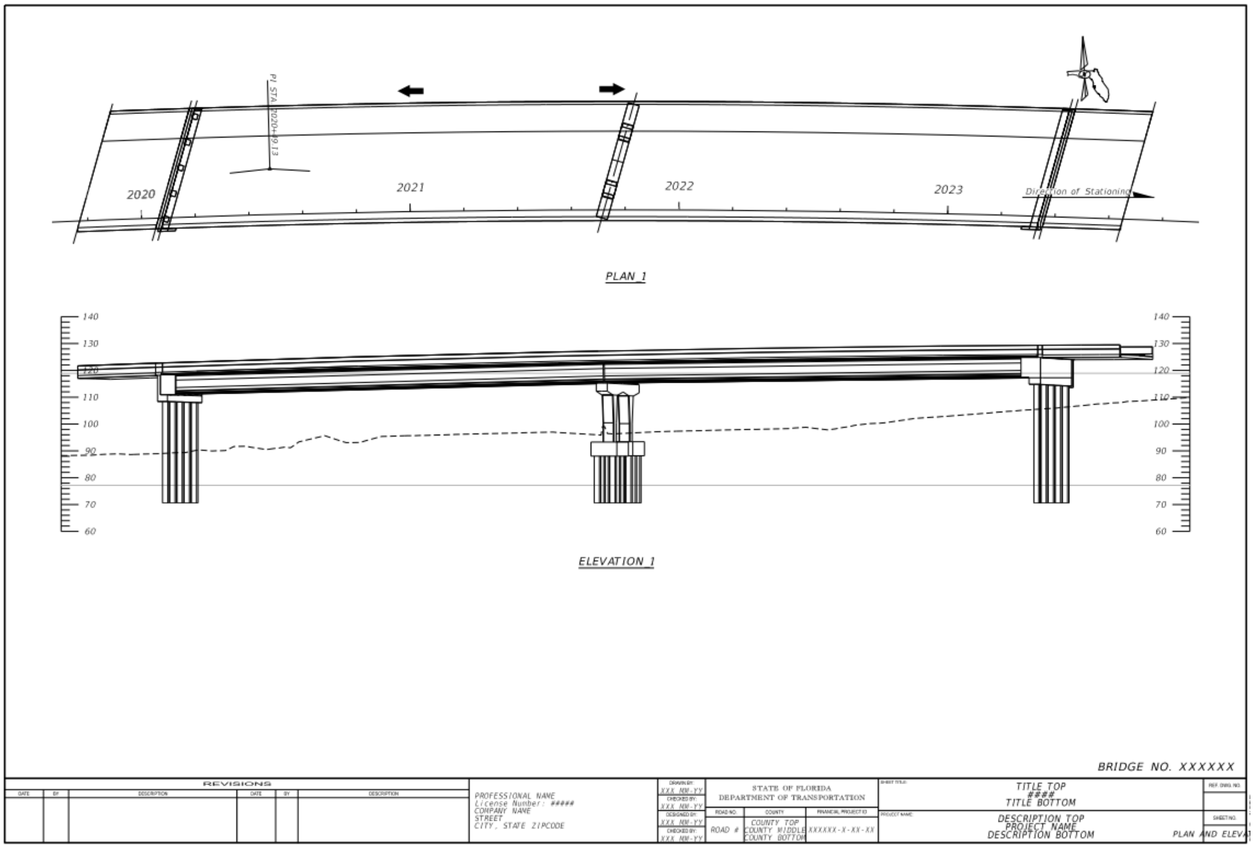

140
130
110
100
90
Top of Approach
Slab Snap Point


2020
2021
2022
2023
PLAN 1
ELEVATION 1
BRIDGE NO. XXXXXX
11X17_PE_ELEV_14IN

10. It may be desirable to adjust the clip volume of the bridge elevation view so that it clips off a portion of the piles. To do this, go back into the ELEVATION_1 design model, click on the section callout that was placed previously, and switch to a front view **(Shift + Right Click, F)**. Use the **Move** tool to move the section cut to the desired location. Navigate back to the sheet model to see the result.



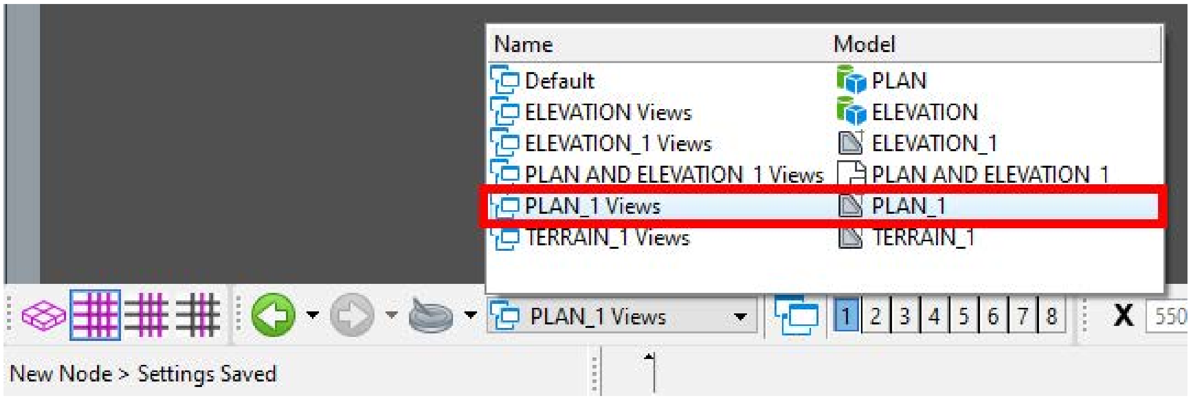



PI STA 2020+49.13
2020
2021
2022
2023
Direction of Stationing
PLAN 1
ELEVATION 1
BRIDGE NO. XXXXXX
REVISIONS
PROFESSIONAL NAME
License Number: #####
COMPANY NAME
STREET
CITY, STATE ZIPCODE
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
TITLE TOP
####
TITLE BOTTOM
DESCRIPTION TOP
PROJECT NAME
DESCRIPTION BOTTOM
ROAD #
COUNTY TOP
COUNTY MIDDLE
COUNTY BOTTOM
XXXXXX-X-XX-XX
PLAN AND ELEVA

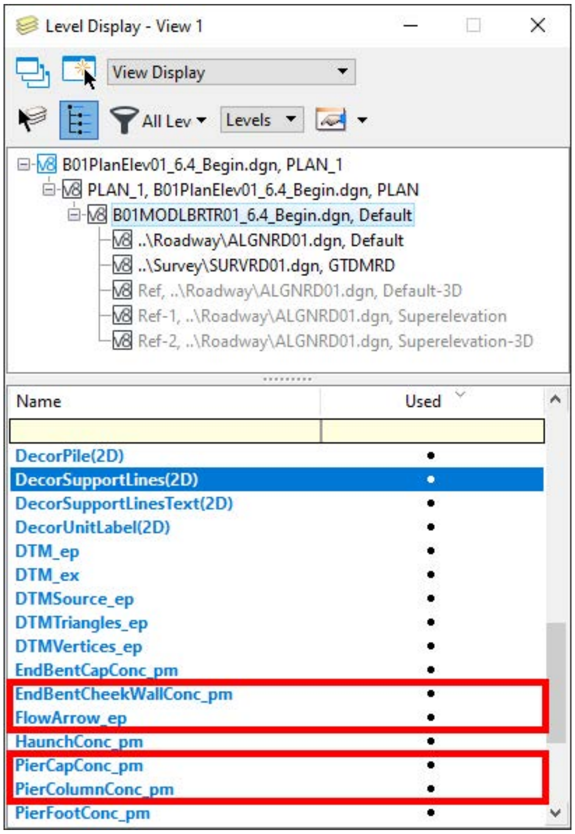
EXERCISE 6.4 *Use Civil Labeler to Add Dynamic Labels*

ADD STATION AND STATION/OFFSET CIVIL LABELS

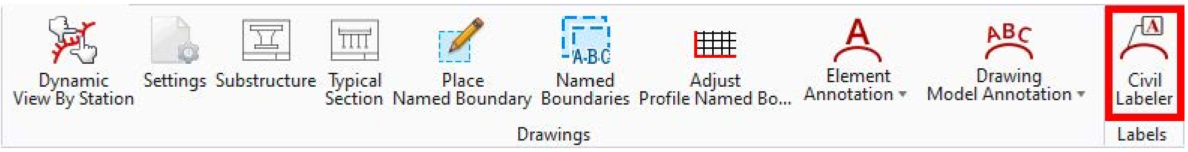
1. Open the data set file: *B01PlanElev01_6.4_Begin*
2. Access the **PLAN_1** drawing model that shows the bridge plan view through the *View Group* dropdown list.



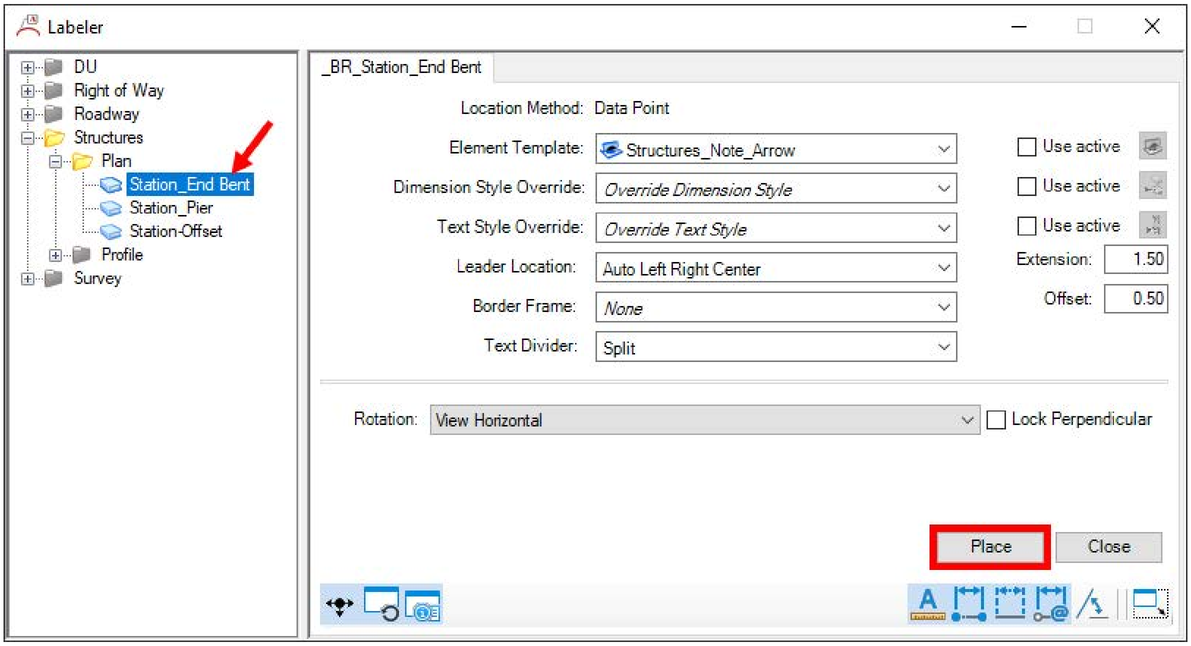
3. Before placing any dynamic labels, all 3D levels displaying the end bents and pier should temporarily be turned off in the drawing model, as shown below. This prevents the labels from being accidentally attached to the 3D components and instead directly link to the SupportLines. The labels will then update if the SupportLines shift within the model.



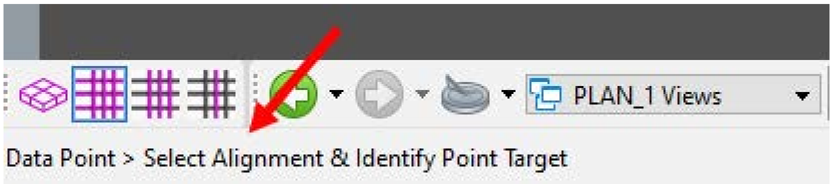
4. Next, begin the dynamic label placement for the plan view, navigate to and select **Reports and Drawings > Labels > Civil Labeler**.



5. Select the **Station_End Bent** label in the *Labeler* window. Ensure that the rest of the fields match what is below and click **Place**.

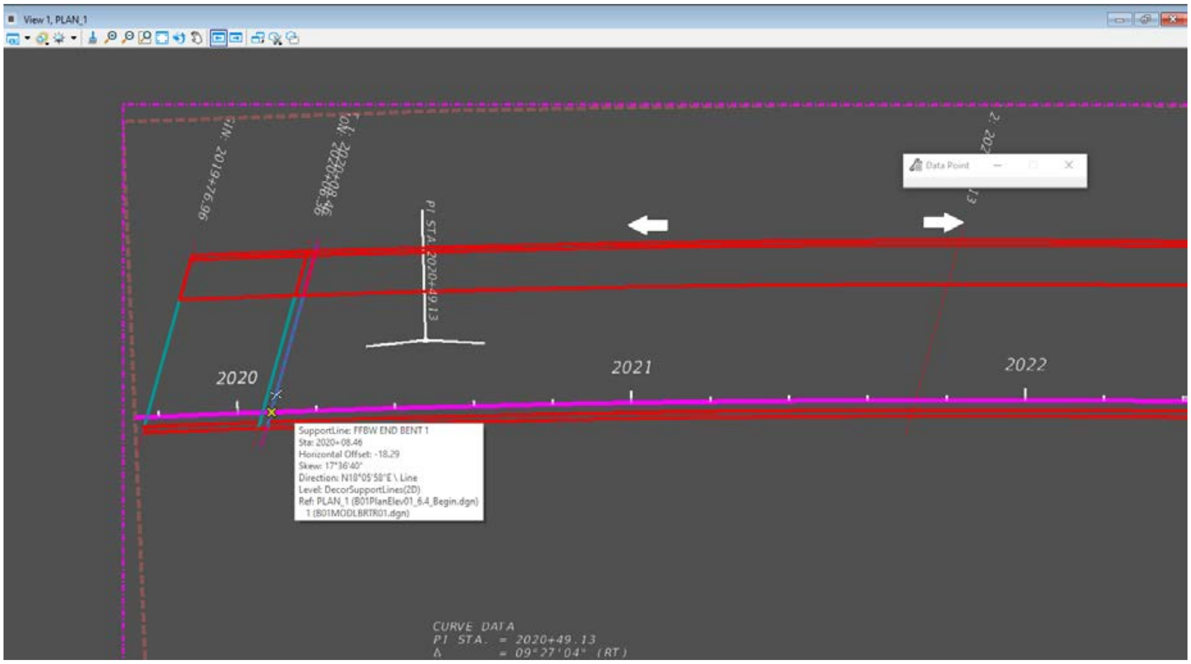


Note that prompts will be visible at the bottom left of the screen providing instructions on how to use the tool.

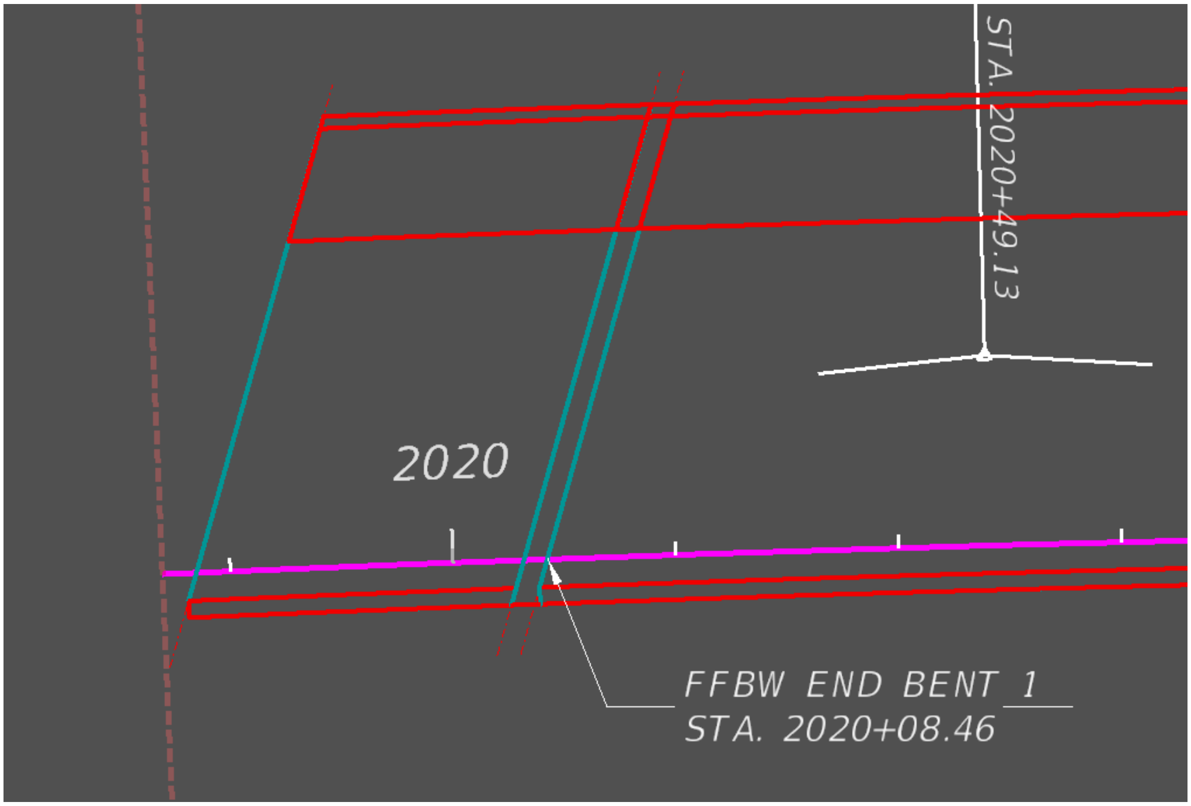


6. Click on the **CL_WB** alignment to select which stationing will be displayed in the labels.

7. With the **Intersect Snap** snap mode toggle on, click on the intersection of the alignment and **FFBW END BENT 1** SupportLine.

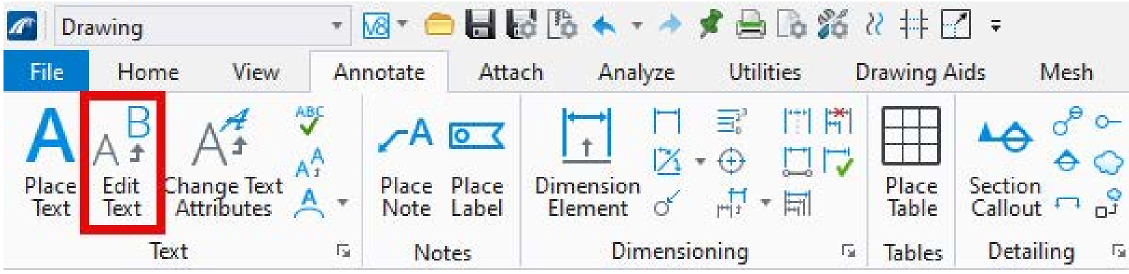


8. Data point at a location below the right barrier to place the label and the station data will populate, as shown.

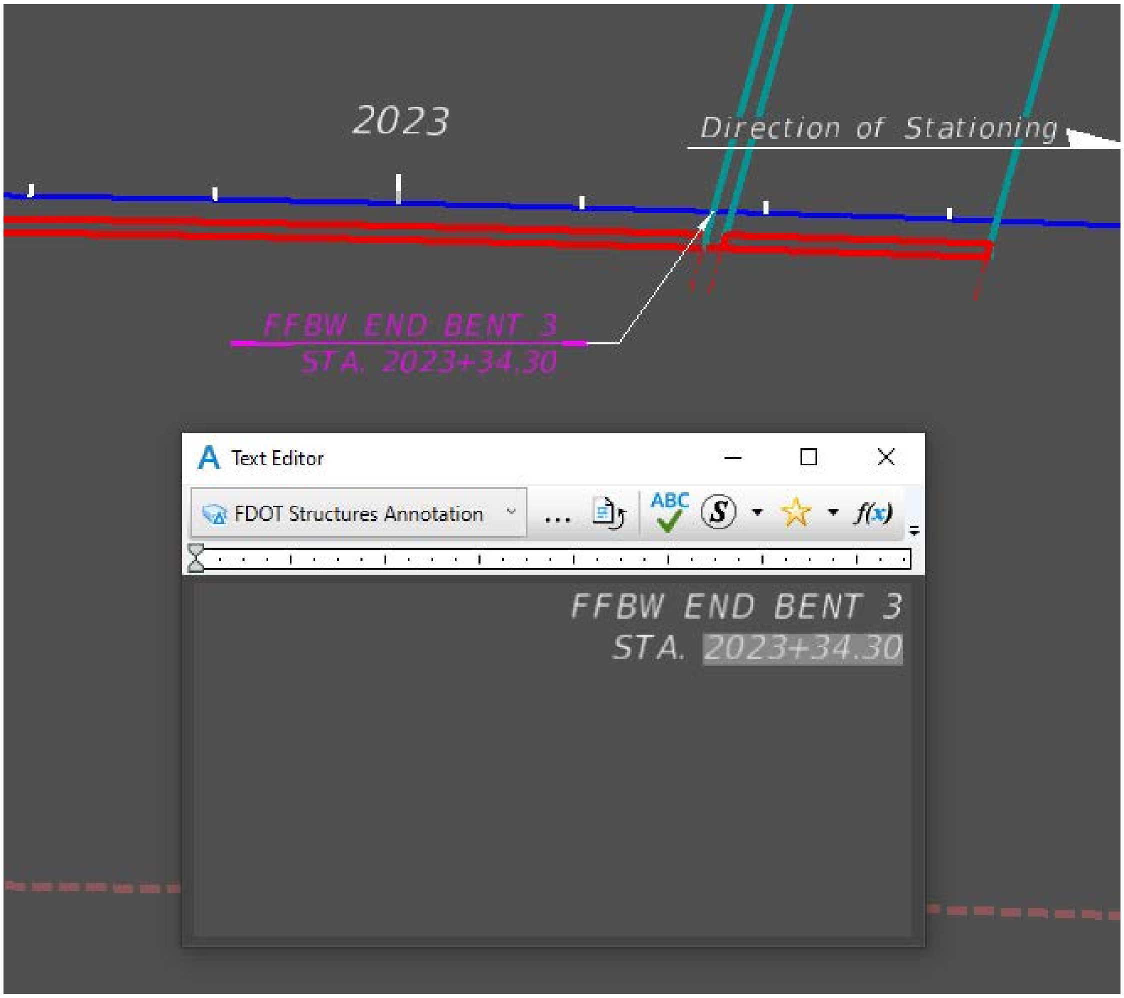


9. Next, repeat the labeling process at the **FFBW END BENT 3** SupportLine.

10. Once the label for **FFBW END BENT 3** has been placed, the text will need to be revised since the default text for the label will read FFBW END BENT 1. Navigate to the **Drawing** (workflow) **> Annotate > Text > Edit Text** tool, then click on the label.

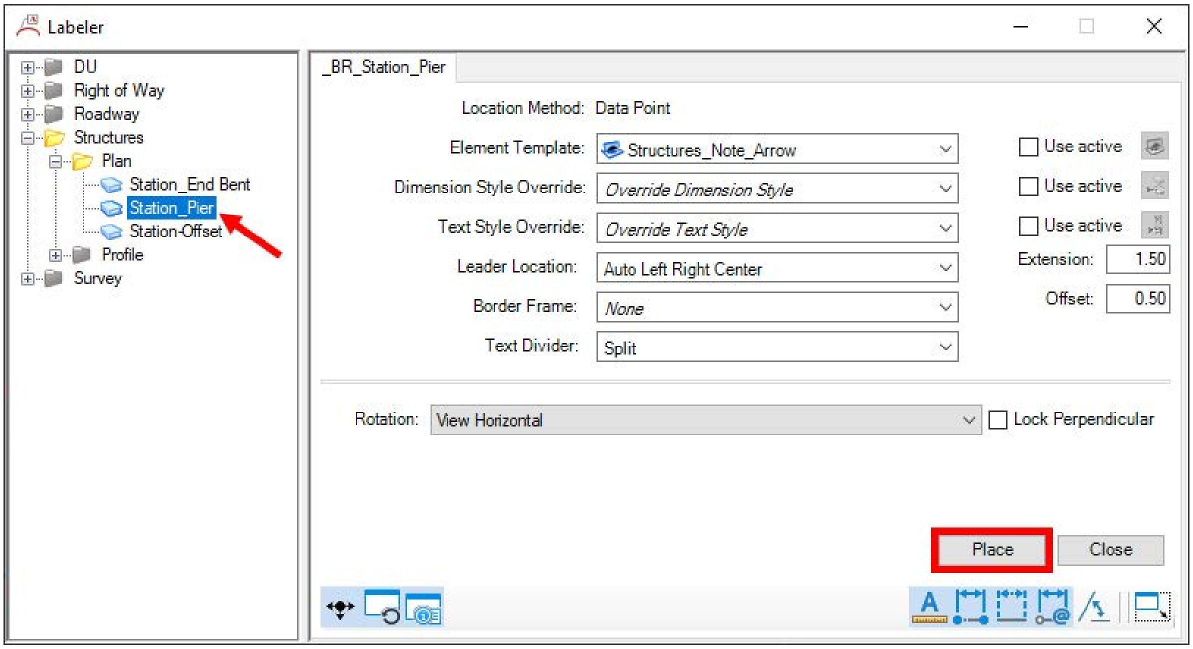


11. When the *Text Editor* window opens, revise only the end bent number to match what is shown below without changing any other text.



NOTE ***When making edits to dynamic labels, users must ensure to only edit the text that is not dynamically linked to the model (stations, offsets, etc.) The dynamic information is a field, which should always have a shaded background, as shown in the previous image. If that text is deleted, the label will lose its link to the model and make the label no different than an annotation note.***

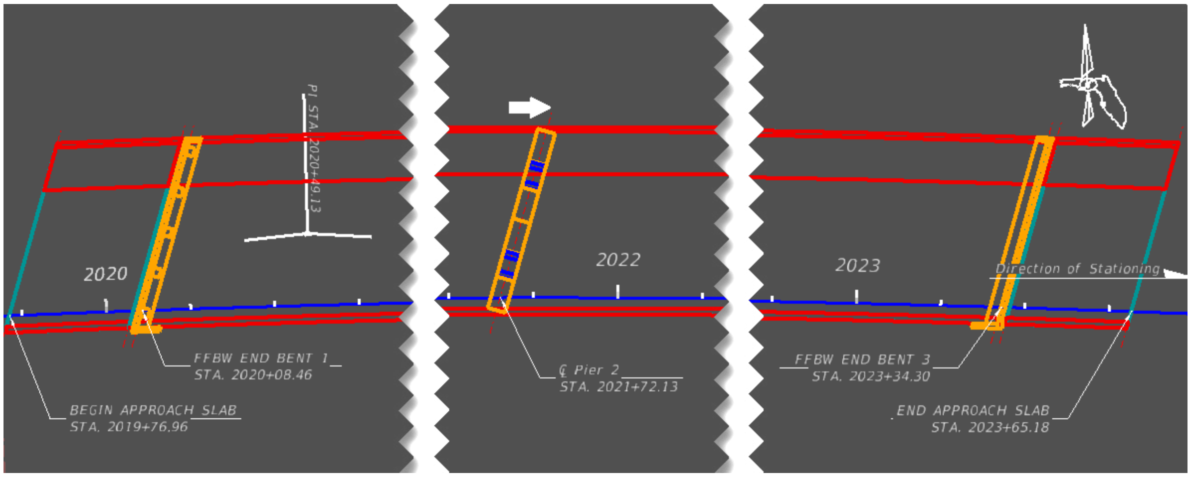
12. Data point outside of the *Text Editor* window to confirm the edit and update the label.
13. Next, reopen the **Reports and Drawings > Labels > Civil Labeler** tool and select the **Station_Pier** label in the *Labeler* window. Ensure that the rest of the fields match what is below and click **Place**.



14. Click on the **CL_WB** alignment. Then, with the **Intersect Snap** snap mode still selected, click on the intersection of the alignment and **CL Pier 2** SupportLine. Data point at a location below the right barrier to place the label, as previously done with the end bent labels.
15. Because there is no approach slab label, the **Station_Pier** label can continue to be used to place the approach slab dynamic labels. Click at the intersection of the alignment and **APP SLAB 1 BEGIN** SupportLine. Data point at a location below the right barrier to place the label.
16. Navigate to the **Drawing** (workflow) **> Annotate > Text > Edit Text** tool, then click on the label. In the *Text Editor* window, change the **CL Pier 2** text to **BEGIN APPROACH SLAB** without making any other changes.
17. Repeat steps 15 and 16 at the **APP SLAB 2 END** SupportLine, changing the **CL Pier 2** text to **END APPROACH SLAB**.
18. Turn on the 3D levels displaying the end bents and pier that were turned off in step 3 in order to show all necessary components in the plan view.

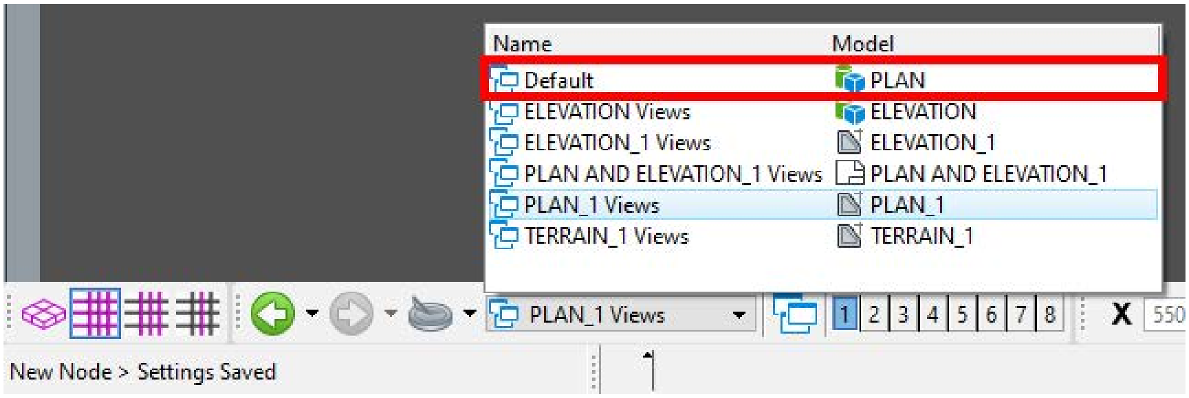
19. The final plan view should appear as shown below.

20. The last portion of this exercise is to demonstrate dynamic nature of these labels and use the **Station-Offset** label.

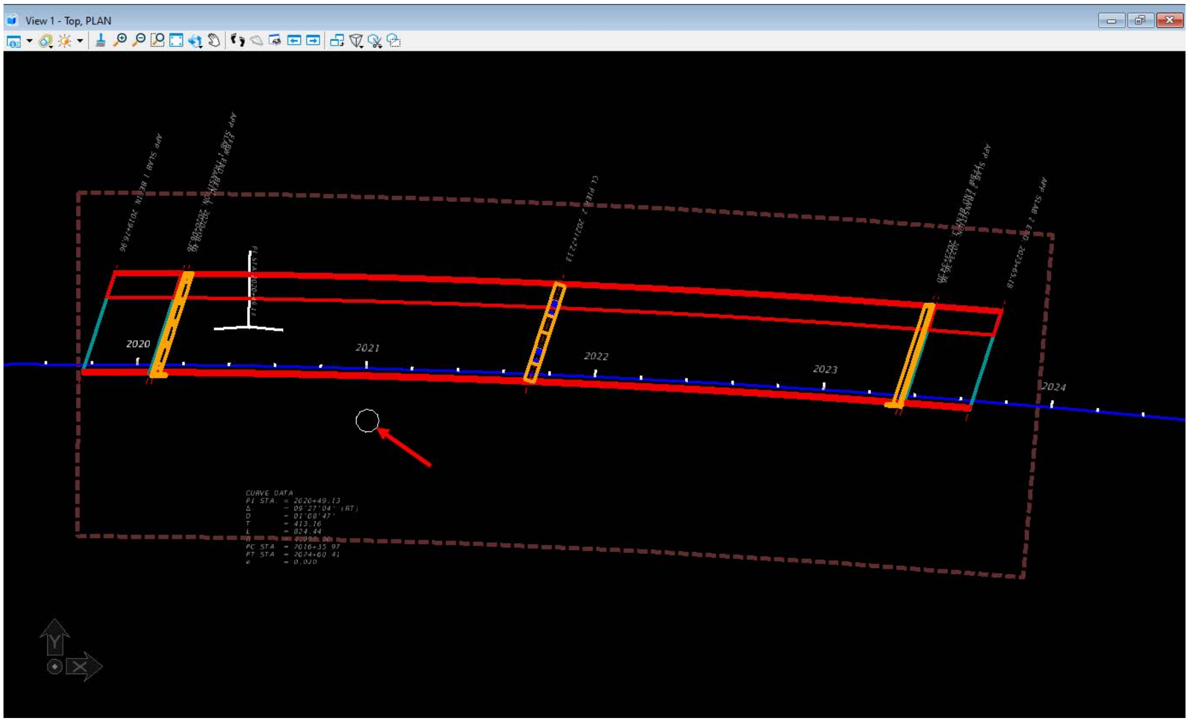


NOTE ***The Station-Offset label has an additional data field within it that will display the labeled object's perpendicular distance from the associated alignment. This label is used more frequently with wall plans to call out the station and offsets of wall limits and bend lines.***

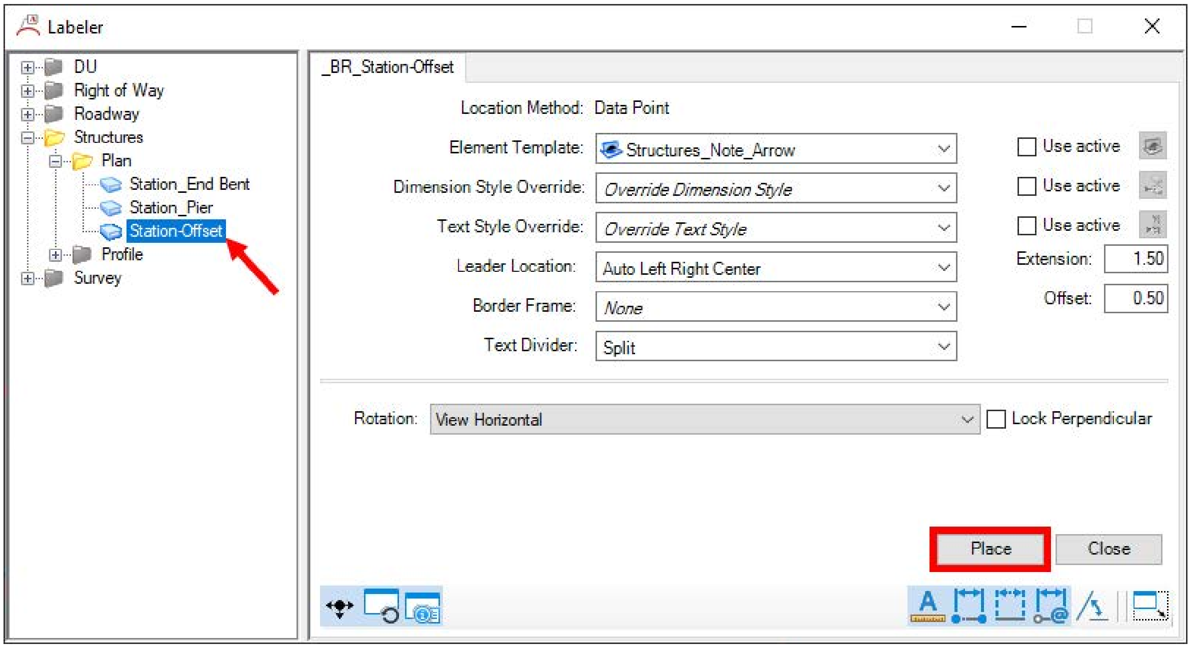
21. Access the **PLAN** design model that shows the bridge plan view through the *View Group* dropdown list.



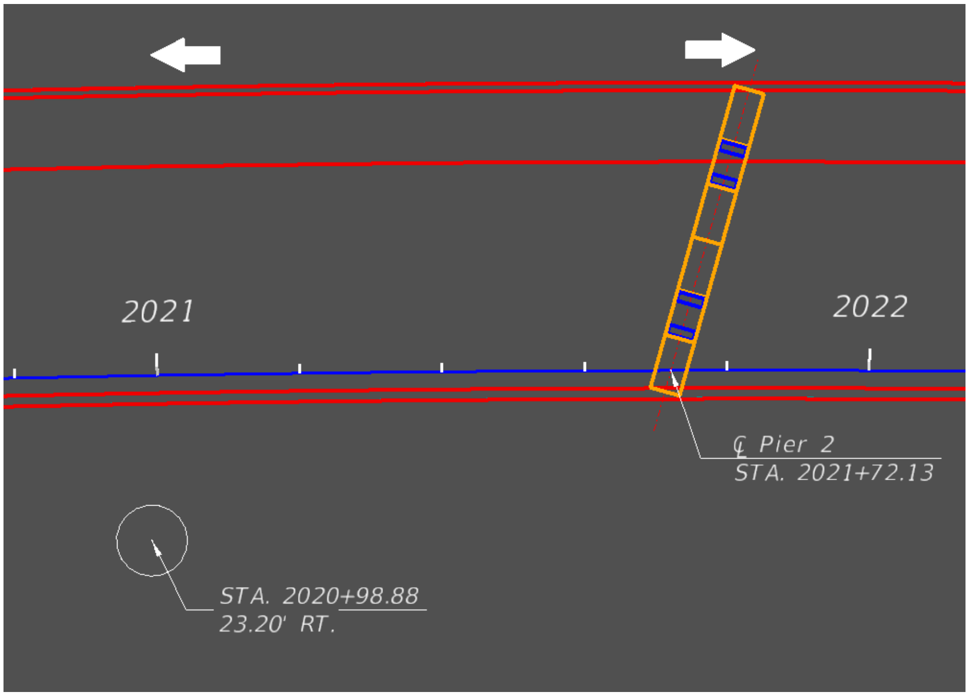
22. Use the **Drawing** (workflow) **> Home > Placement > Place Circle** tool to place a circle of with a radius of 5’-0” below the right barrier around STA. 2021+00.00 as shown in the following image.



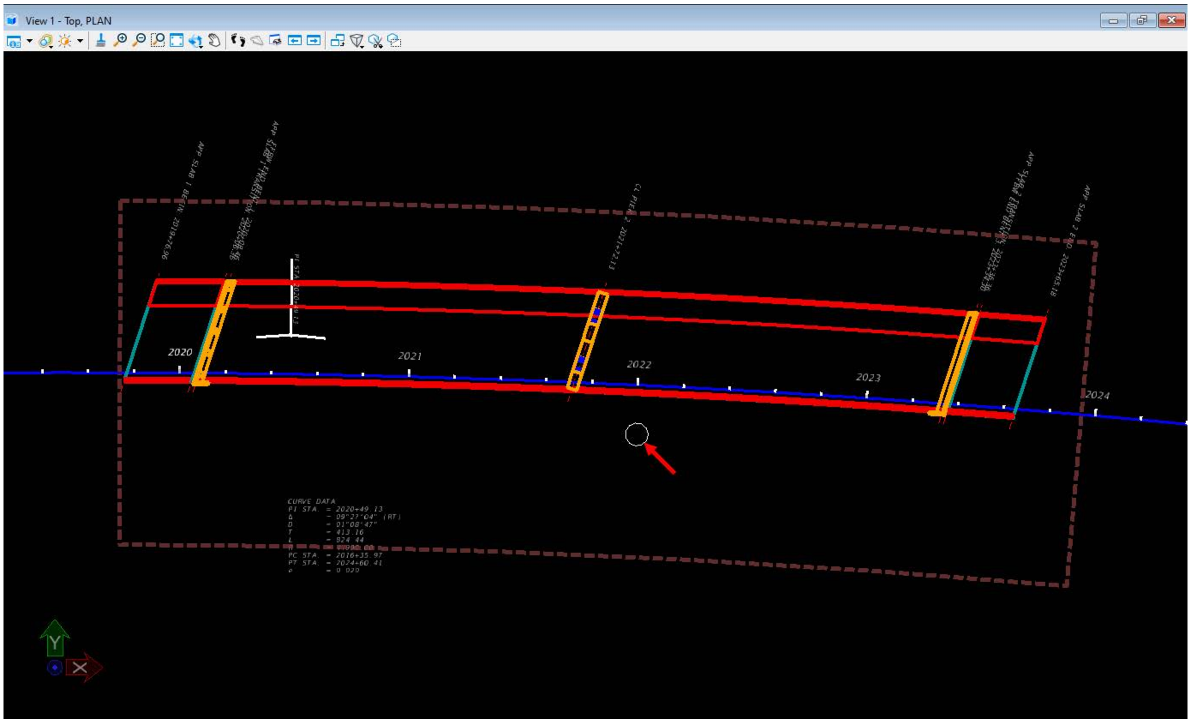
23. Return to the **PLAN_1** drawing model. Access the **Civil Labeler** tool and select the **Station-Offset** label in the *Labeler* window. Ensure that the rest of the fields match what is below and click **Place**.



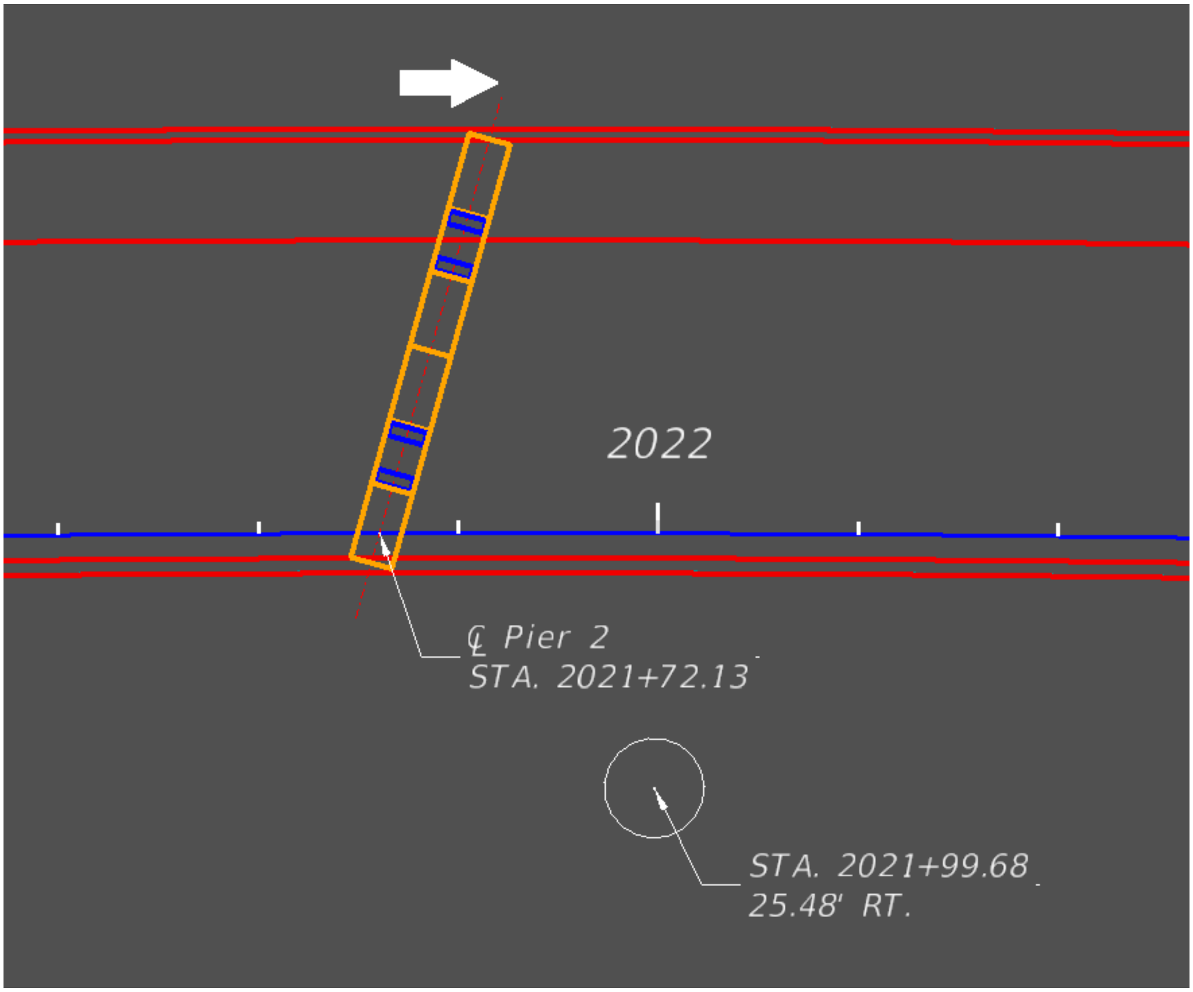
24. Click on the **CL_WB** alignment. Then, with the **Center Snap** snap mode selected, click on the center of the circle that was just placed. Data point at a location below and to the right of the circle. Note that your station and offset will not match exactly which is fine as this is only a demonstration.



25. Return to the **PLAN** design model and use the **Drawing** (workflow) **> Home > Manipulate > Move** tool to move the circle near STA. 2022+00.00 as shown in the following image.

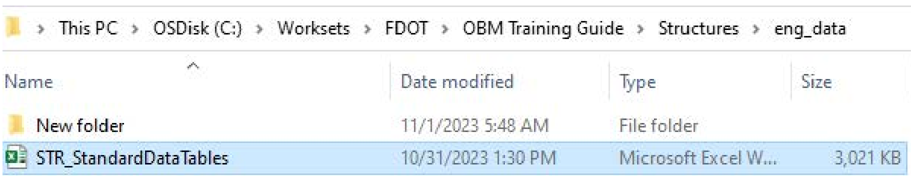


26. Return to the **PLAN_1** drawing model one last time. Notice that the station and offset within the dynamic label has updated.



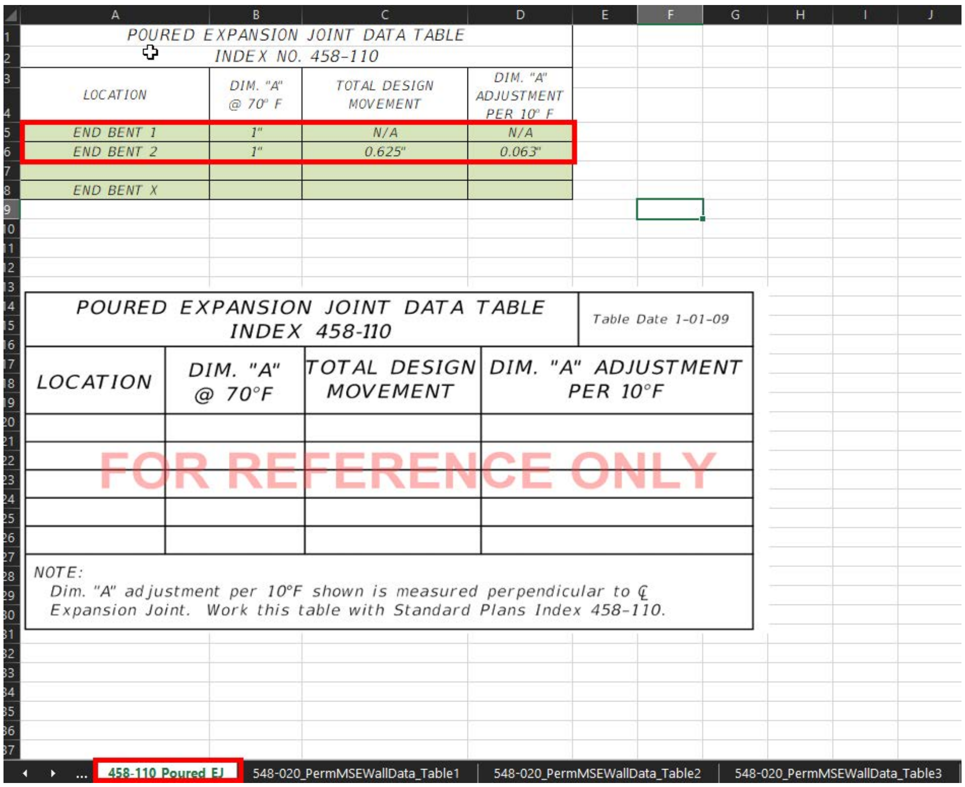
IMPORT FDOT STANDARD TABLES FROM EXCEL

1. Navigate to the “eng_data” folder located in the *Structures* discipline folder and open the *STR_StandardDataTables* excel file.



NOTE ***Instructions for using the STR_StandardDataTables spreadsheet and importing tables into OBM can be found in the Instructions tab within the excel file.***

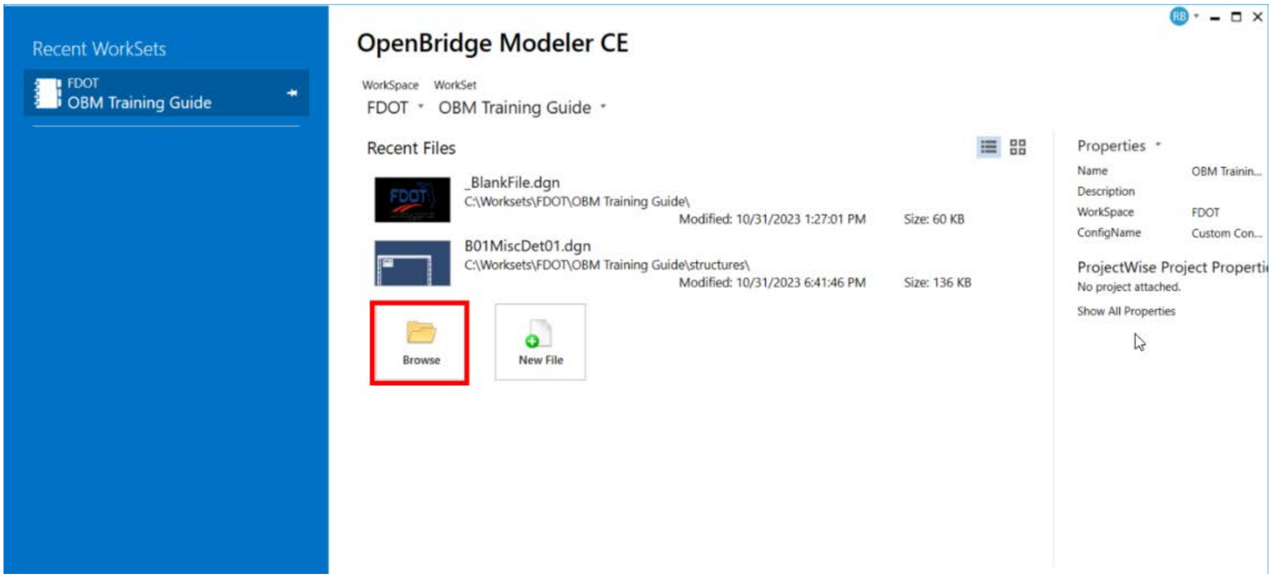
2. Within the excel file, navigate to the tab named “458-110_Poured_EJ” and fill out the table as shown in the figure below.

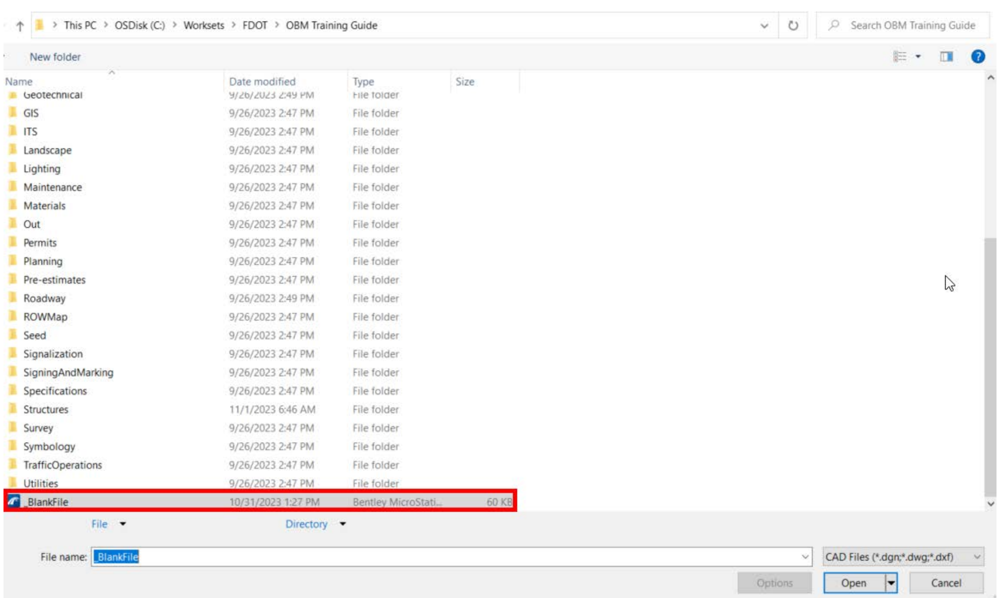


3. Save the excel file and open FDOT Connect 10.12.

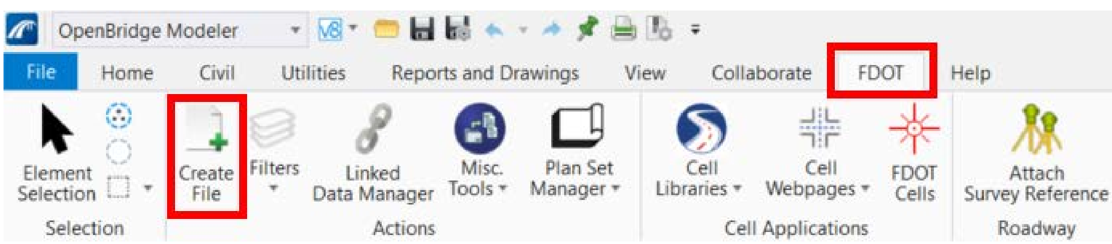
NOTE ***The From File function linking the FDOT standard tables excel to the dgn file does not currently work for FDOT Connect 10.12 but has been fixed in the 2023 release. A workaround utilizing FDOT Connect 10.10 is presented showcasing the workflow used to import FDOT standard tables.***

4. Click **Browse** and navigate to the "_BlankFile.dgn" located in the work set folder.





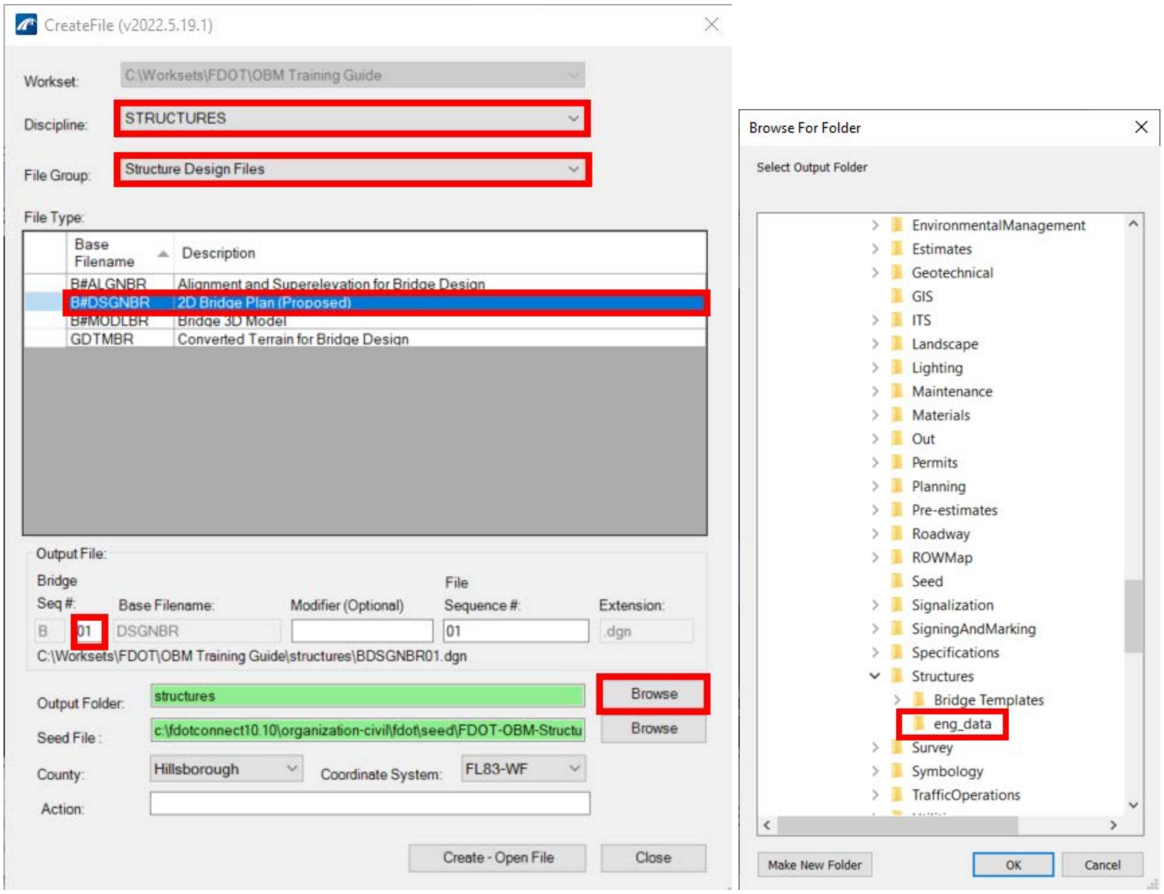
5. Open the **Create File** dialog by selecting the FDOT tab option: **FDOT > Actions > Create File**. The **Create File** dialog displays.



6. From the **Create File** dialog, click on the *Discipline* dropdown arrow to select "STRUCTURES".

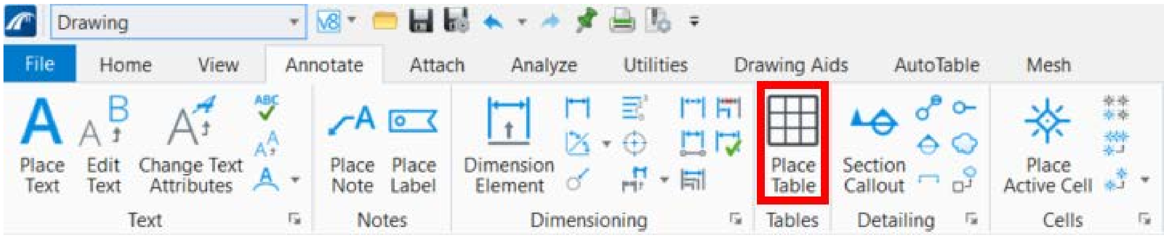
7. Click on the *File Group* dropdown arrow to select "Structure Design Files" and select "2D Bridge Plan (Proposed)" as the *File Type* and set the Bridge Seq # (I) to "01".

8. Click **Browse** next to the *Output Folder* field and select the “eng_data” folder located within the “Structures” discipline folder and click **OK**.



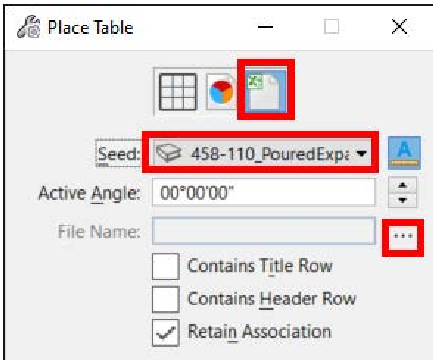
9. Click **Create-Open File** to open the newly created design file in OBM. The new design file is automatically created and opened as specified and saved under the corresponding discipline folder.

10. Open the **Place Table** tool by navigating to **Drawing** (workspace) **> Annotate > Place Table**.

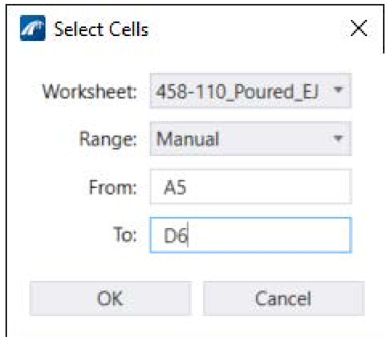


11. Within the Place Table window, select the icon containing the excel logo and set the *Seed* to “458-110_PouredExpansionJoint”.

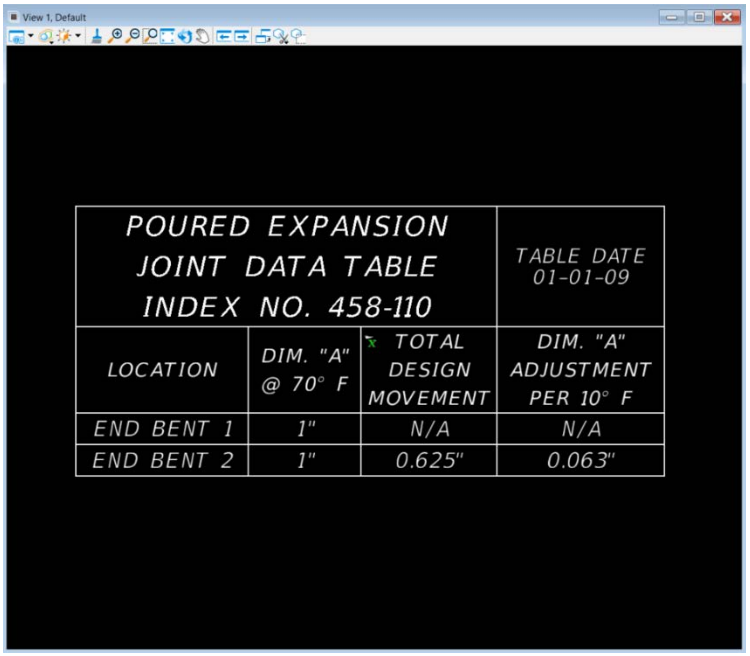
12. Select the “...” button to the right of the *File Name* field and navigate to the previously opened excel file.



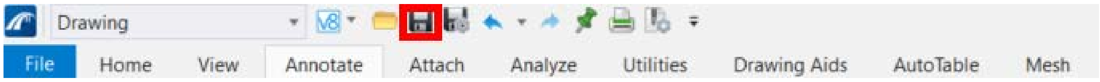
13. Once the **Select Cells** window opens, set *Worksheet* to “458-110_Poured_EJ” and *Range* to “Manual”. Set *From* to “A5” and *To* as “D6”.



14. Click **OK** and data point to place the imported table.



15. Save this file by navigating to the save icon or using **(CTRL +S)** and close FDOT Connect 10.12.

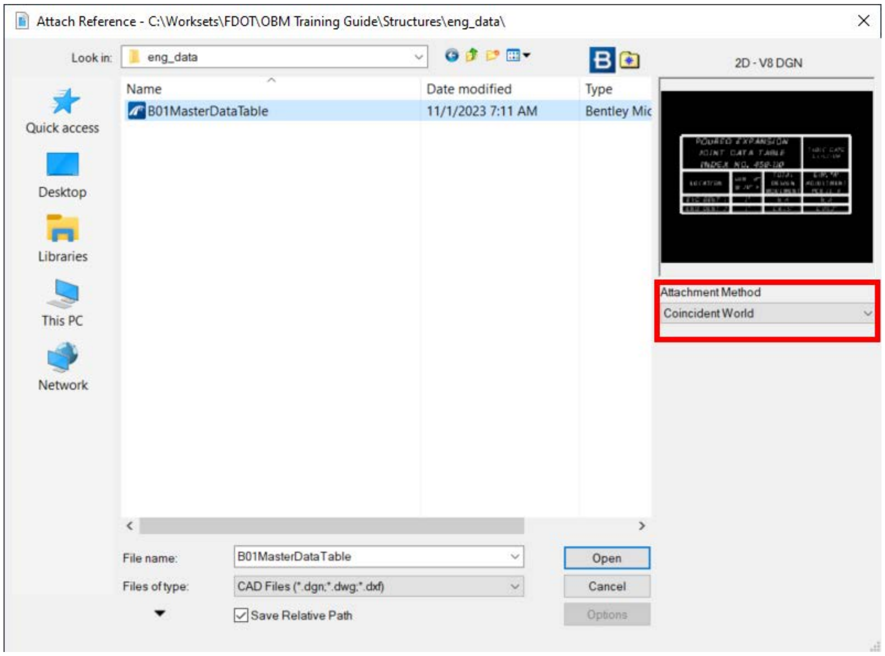


16. Navigate to the recently created file and rename the file to “B01MasterDataTable”.

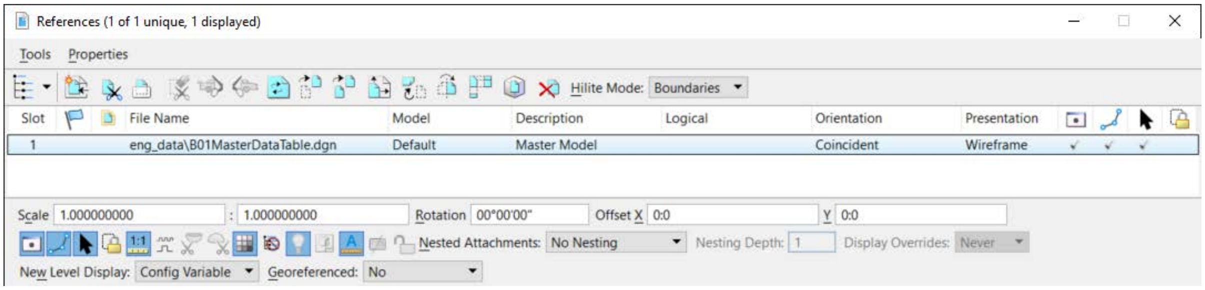
17. Open FDOT Connect 10.12 and click **Browse**. Select the data set file “B01ExpJointDet_6.5.dgn” and click **OK**.

18. Open the **References** window by navigating to **OpenBridge Modeler** (workspace) **> Primary > Attach Tools**.

19. Use *Attach Reference* to select the file previously created. Set the attachment method to “Coincident World” and click **Open**.

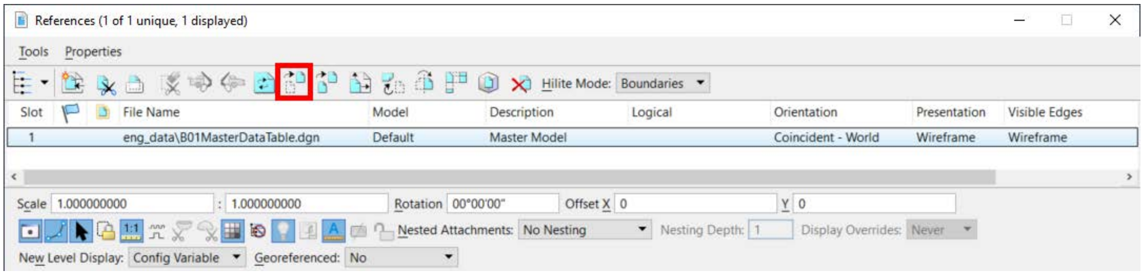


20. Click **OK** on the **Reference Attachment Properties** window.

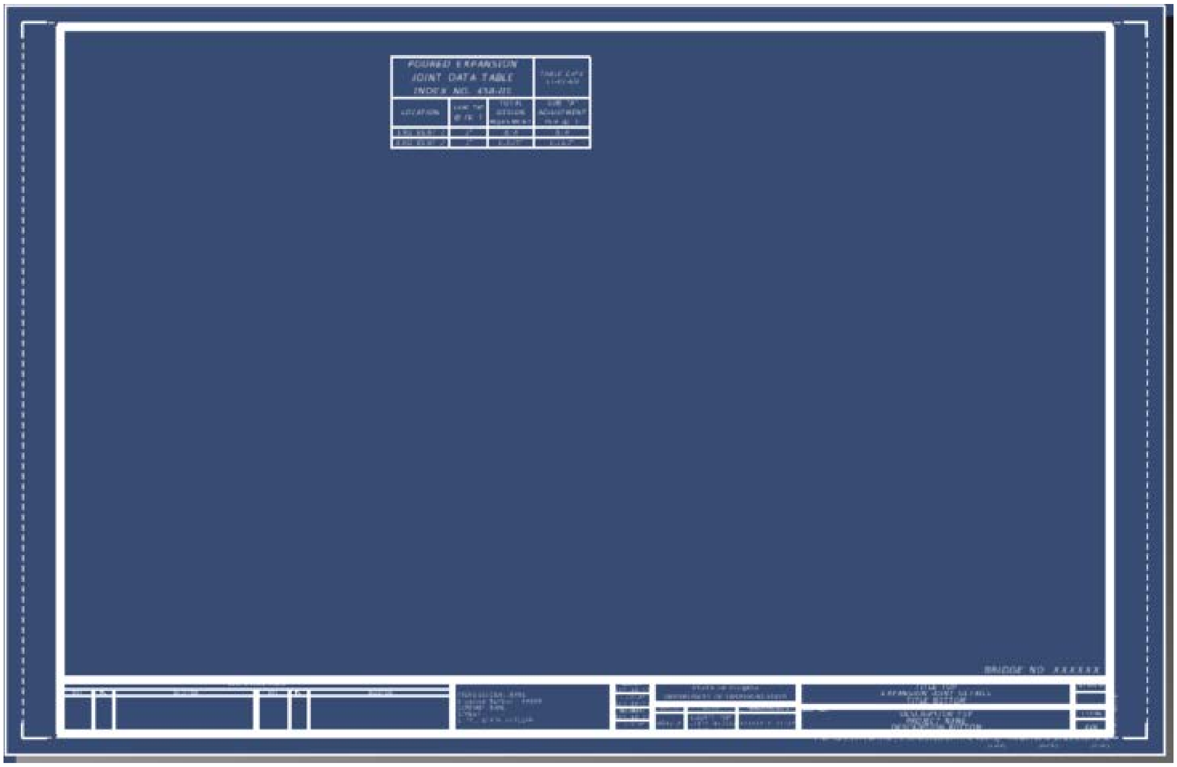


21. Use the **Fit View** tool to locate the previously created table.

22. Highlight the view that will be moved, as shown below. Then, click **Move Reference** and move the highlighted table reference to be within the borders of the sheet.



23. The final sheet should look like the image below.



NOTE ***The method shown in this exercise utilized a single master design model dgn file for all data tables in the plans. However, tables can be placed directly on a sheet model and do not require using a design model.***

7 QUANTITIES AND REPORTS

OVERVIEW

Model-centric bridge workflows produce additional deliverables beyond plans production. Quantities and elevations are a by-product of working in 3D. OBM and FDOTConnect have built-in tools to help create some of these deliverables. There are also reports generated to aid in QA/QC. Value can be added to workflows in terms of both efficiency and quality when using this model-centric process. FDOT continues to develop the FDOT-specific quantity tools to help users generate and format required quantity information.

OBJECTIVES

The objectives of this chapter are to introduce the available tools to generate additional deliverables including:

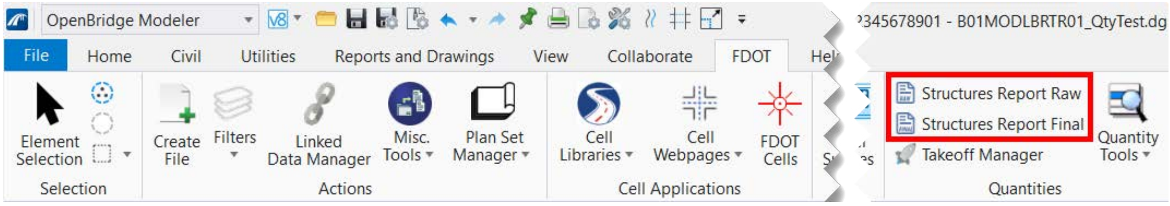
- Quantities
- Elevation Reports
- Input Report
- Geometry Reports

QUANTITIES

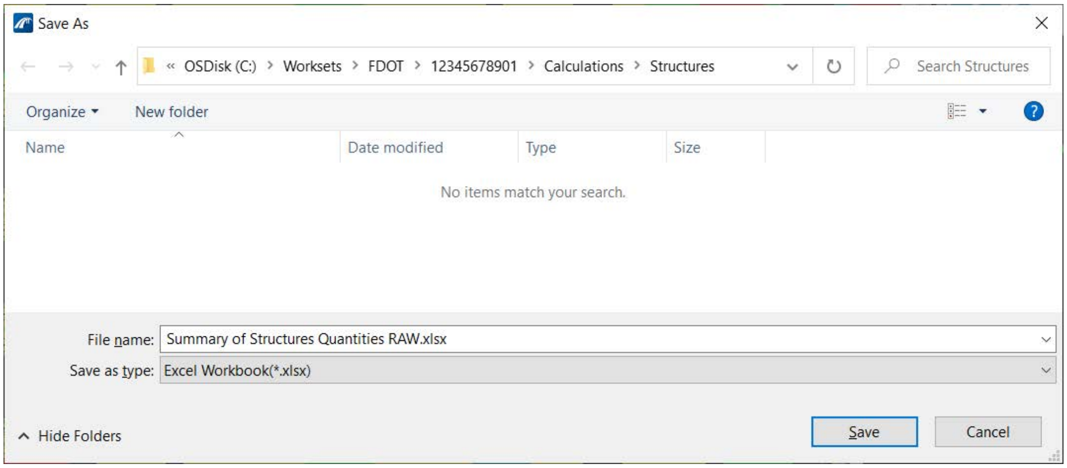
FDOTConnect for OBM has several options for obtaining bridge quantity information. This section will go over the FDOT Structures Quantity Reports that was developed by FDOT as well as the Non-FDOT formatted quantities report that was developed by Bentley. The FDOT Structures Quantity Reports will format the quantities as is required by the FDOT CADD Manual for the project Estimated Quantities Report. The built-in (non-FDOT formatted) quantities report includes superstructure, substructure, and miscellaneous categories. Independently of the quantity report, the volume can be extracted from any solid created in OBM.

FDOT STRUCTURES QUANTITY REPORTS

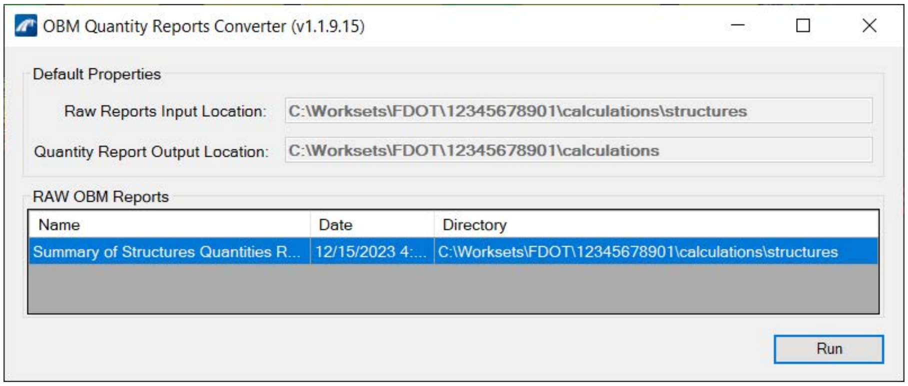
The FDOT Structures Quantity Report tools can be accessed through **OpenBridge Modeler** (Workflow) **> FDOT > Quantities > Structures Report Raw** and **OpenBridge Modeler** (Workflow) **> FDOT > Quantities > Structures Report Final**. As the bridge components are being created, it is important to assign the material according to the FDOT pay item numbers. This the basis for the FDOT Structures Quantity Reports workflow and without properly assigned materials, the reports will not be generated as needed.



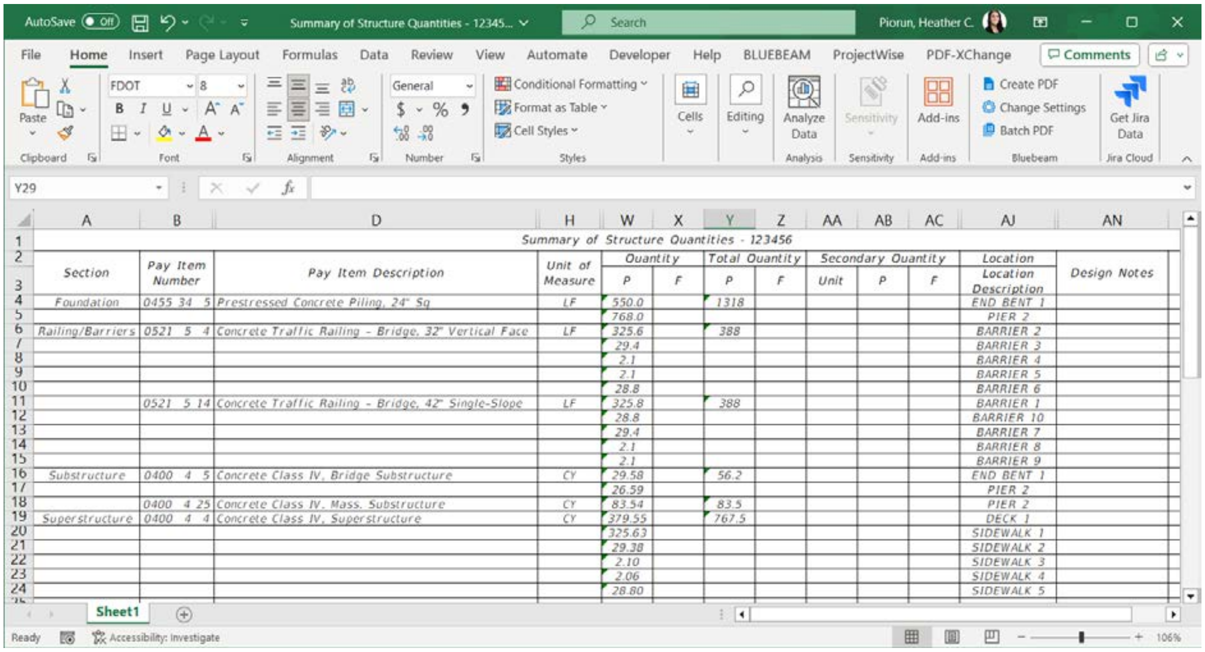
The process for generating the FDOT-formatted bridge quantities involves two steps. First, the **Structures Report Raw** tool must be run to extract the quantities from the bridge model into an unformatted spreadsheet. This spreadsheet should be saved in the C:\Worksets\FDOT\....\Calculations\Structures folder, where the "…." represents the project-specific WorkSet folder name.



Once the raw quantity spreadsheet is saved, the **Structures Report Final** tool must be run to process the raw quantity spreadsheet into its formatted form. The OBM Quantity Reports Converter will look in the C:\Worksets\FDOT\....\Calculations\Structures folder for the raw quantity spreadsheet and will save the Summary of Structure Quantities spreadsheet in the C:\Worksets\FDOT\....\Calculations\ folder.



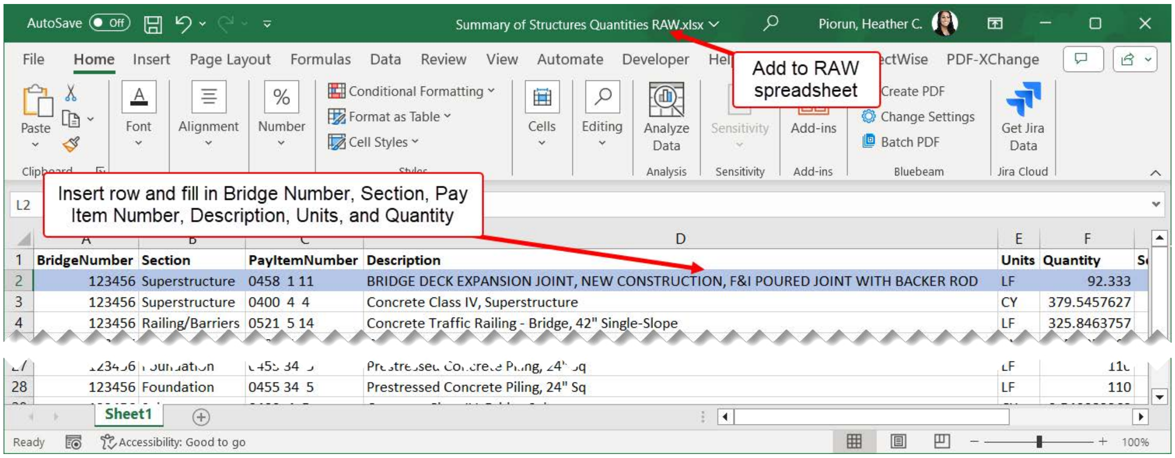
Once the Summary of Structure Quantities is generated, users are responsible for checking that all quantity items expected have been reported. It is very important that the proper OBM material is applied to each bridge element, or it will not be pulled into the FDOT quantity report.



The FDOT Structures Report tools within OBM are continually being improved. Currently, there are several known limitations based on access to back-end data and the overall development of the FDOTConnect for OBM workspace. As of FDOTConnect 10.12, the following limitations are known:

- Bearing pads placed as *Cell* rather than *Cube* or *Cylinder* will not be included
- Pedestal, wingwall, and diaphragm concrete is currently not included
- Grout pads/Bevel plates are not currently included
- Custom Abutments and Custom Piers (i.e. parametric cells) are not included
- Steel tubs, cross-frames, stiffeners, field splices, and shear studs are not included
- Segmental superstructure concrete is not included

The previously listed items will need to be manually added to the quantity report, along with any elements that are not modeled (expansion joints, thickened end slabs, test piles, etc.). This can be accomplished by accessing the raw quantity spreadsheet, inserting a row for each additional item, and entering the corresponding Bridge Number, Section, Pay Item Number, Description, Units, and Quantity.

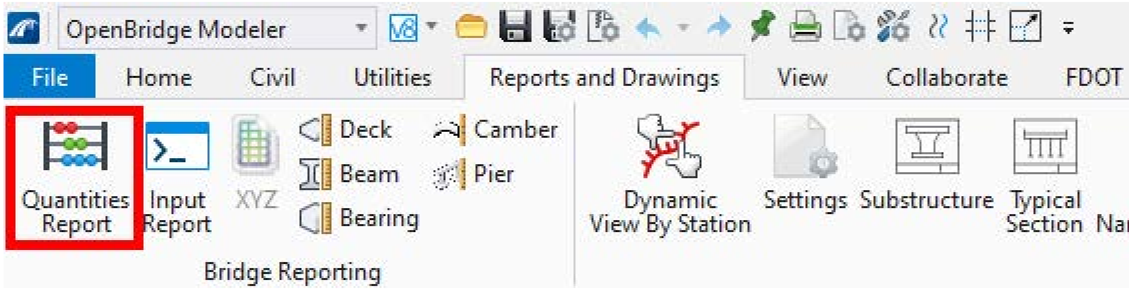


NOTE ***Pay Item Numbers and Descriptions of items added to RAW spreadsheet must be formatted properly and exactly match the FDOT Basis of Estimates. It is recommended that users copy and paste this information from the Master Pay Item website:*** https://fdotewp1.dot.state.fl.us/designquantitiesandestimates/#/payitems

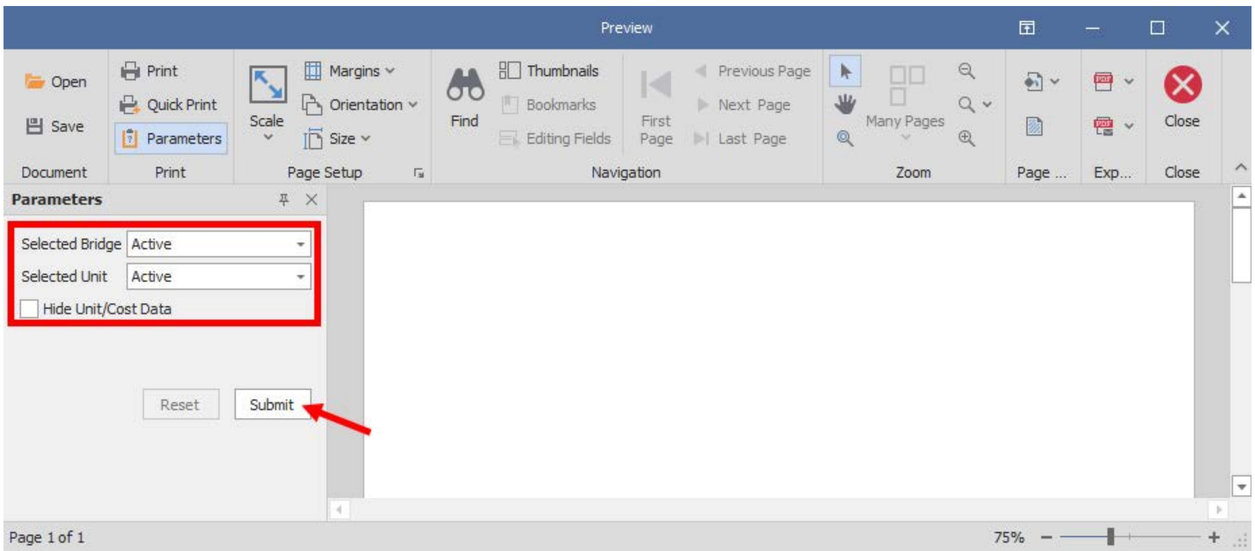
Once the raw report is supplemented, the **Structures Report Final** tool will need to be used again to process the raw quantities and format them as needed. Keep in mind that if the **Structures Report Raw** tool is run again based on updates to the bridge model, it may overwrite the RAW report that includes the supplemental items. It is good practice to maintain the supplemental items in a separate spreadsheet so that they can be copied over to raw quantities spreadsheet if it is updated from the model. It is also good practice to compare the quantities generated through the FDOT Structures Quantity Report tools with the Quantities Report generated from the Bentley-developed tools, which are discussed in the next section. The FDOT Structures Quantity Report tools are intended to give users a starting point, but users are always responsible for the accuracy of the information, as well as performing a thorough QC of the information prior to submitting.

QUANTITIES REPORT (NON-FDOT FORMATTED)

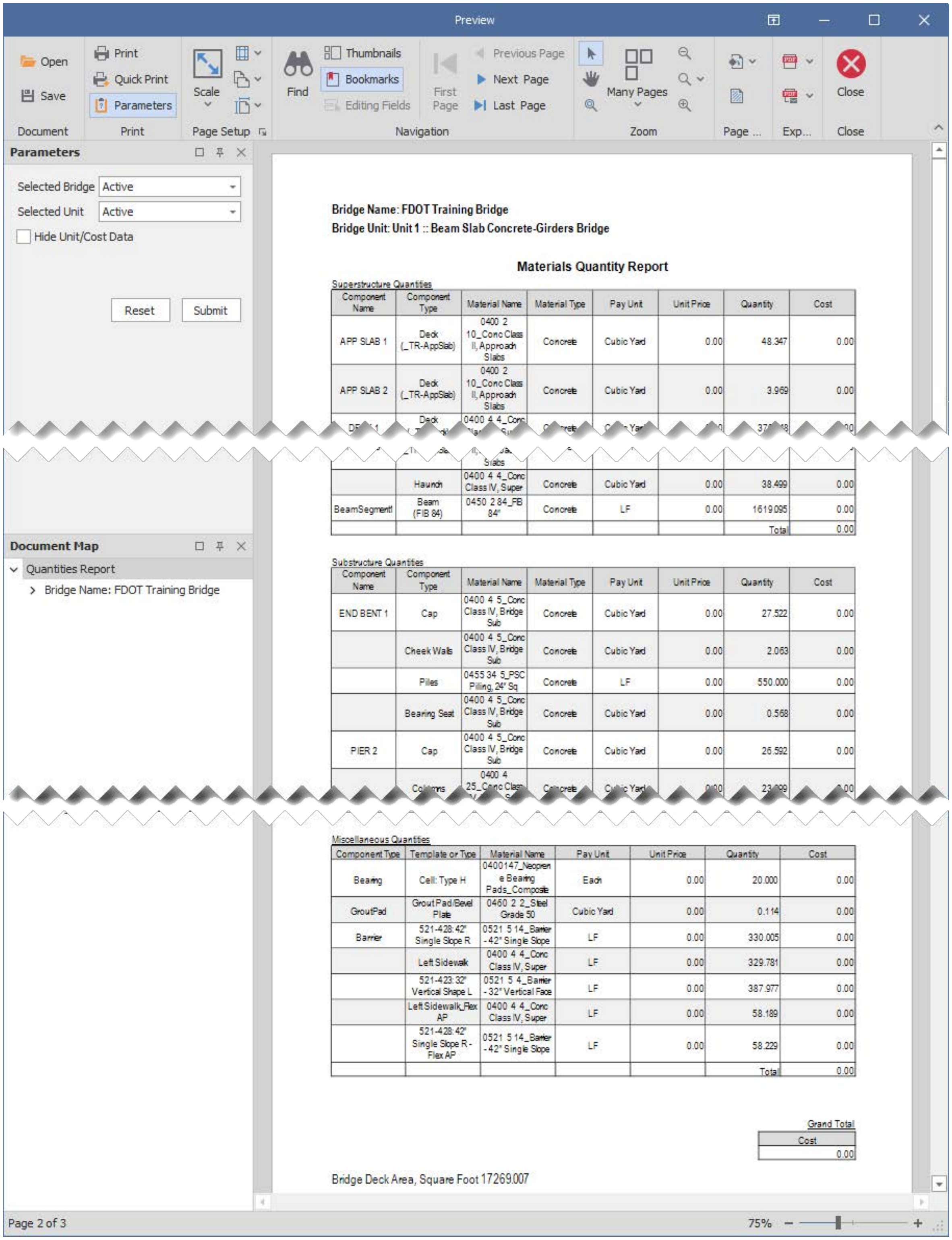
The **Quantities Report** tool can be accessed through **OpenBridge Modeler** (Workflow) **> Reports and Drawings > Bridge Reporting > Quantities Report**.



The resulting *Print Preview* window opens. The report can include only the active bridge or all the bridges in the file, as well as the active or all of the units. The user can also choose to show or hide cost information. The parameters can be selected in the red box below and then click **Submit** to retrieve the print preview of the quantities report.



The Materials Quantities Report is generated for the active bridge or all bridges (listed separately) depending on the parameters selected. The report is broken down by superstructure (approach slab, deck, and beams), substructure (end bents, piers, and foundations), and miscellaneous items (barriers and bearings). The Component Type, Material Name, and Material Type are all linked directly to the model and will reflect the information input into the model through the templates and materials selected when creating the model. Therefore, the user should consider these factors during creation of the model so that the quantities report accurately reflects the desired parameters.



Bridge Name: FDOT Training Bridge
Bridge Unit: Unit 1 :: Beam Slab Concrete-Girders Bridge

Materials Quantity Report

Superstructure Quantities

Component Name	Component Type	Material Name	Material Type	Pay Unit	Unit Price	Quantity	Cost
APP SLAB 1	Deck (_TR-AppSlab)	0400 2 10_Conc Class II, Approach Slabs	Concrete	Cubic Yard	0.00	48.347	0.00
APP SLAB 2	Deck (_TR-AppSlab)	0400 2 10_Conc Class II, Approach Slabs	Concrete	Cubic Yard	0.00	3.969	0.00
	Haunch	0400 4 4_Conc Class IV, Super	Concrete	Cubic Yard	0.00	38.499	0.00
BeamSegment1	Beam (FIB 84)	0450 2 84_FB 84"	Concrete	LF	0.00	1619.095	0.00
						Total	0.00

Substructure Quantities

Component Name	Component Type	Material Name	Material Type	Pay Unit	Unit Price	Quantity	Cost
END BENT 1	Cap	0400 4 5_Conc Class IV, Bridge Sub	Concrete	Cubic Yard	0.00	27.522	0.00
	Cheek Walls	0400 4 5_Conc Class IV, Bridge Sub	Concrete	Cubic Yard	0.00	2.063	0.00
	Piles	0455 34 5_PSC Piling, 24" Sq	Concrete	LF	0.00	550.000	0.00
	Bearing Seat	0400 4 5_Conc Class IV, Bridge Sub	Concrete	Cubic Yard	0.00	0.568	0.00
PIER 2	Cap	0400 4 5_Conc Class IV, Bridge Sub	Concrete	Cubic Yard	0.00	26.592	0.00

Miscellaneous Quantities

Component Type	Template or Type	Material Name	Pay Unit	Unit Price	Quantity	Cost
Bearing	Cell: Type H	0400147_Neoprene Bearing Pads_Composite	Each	0.00	20.000	0.00
GroutPad	Grout Pad/Bevel Plate	0460 2 2_Steel Grade 50	Cubic Yard	0.00	0.114	0.00
Barrier	521-428: 42" Single Slope R	0521 5 14_Barrier - 42" Single Slope	LF	0.00	330.005	0.00
	Left Sidewalk	0400 4 4_Conc Class IV, Super	LF	0.00	329.781	0.00
	521-423: 32" Vertical Shape L	0521 5 4_Barrier - 32" Vertical Face	LF	0.00	387.977	0.00
	Left Sidewalk_Flex AP	0400 4 4_Conc Class IV, Super	LF	0.00	58.189	0.00
	521-428: 42" Single Slope R - Flex AP	0521 5 14_Barrier - 42" Single Slope	LF	0.00	58.229	0.00
					Total	0.00

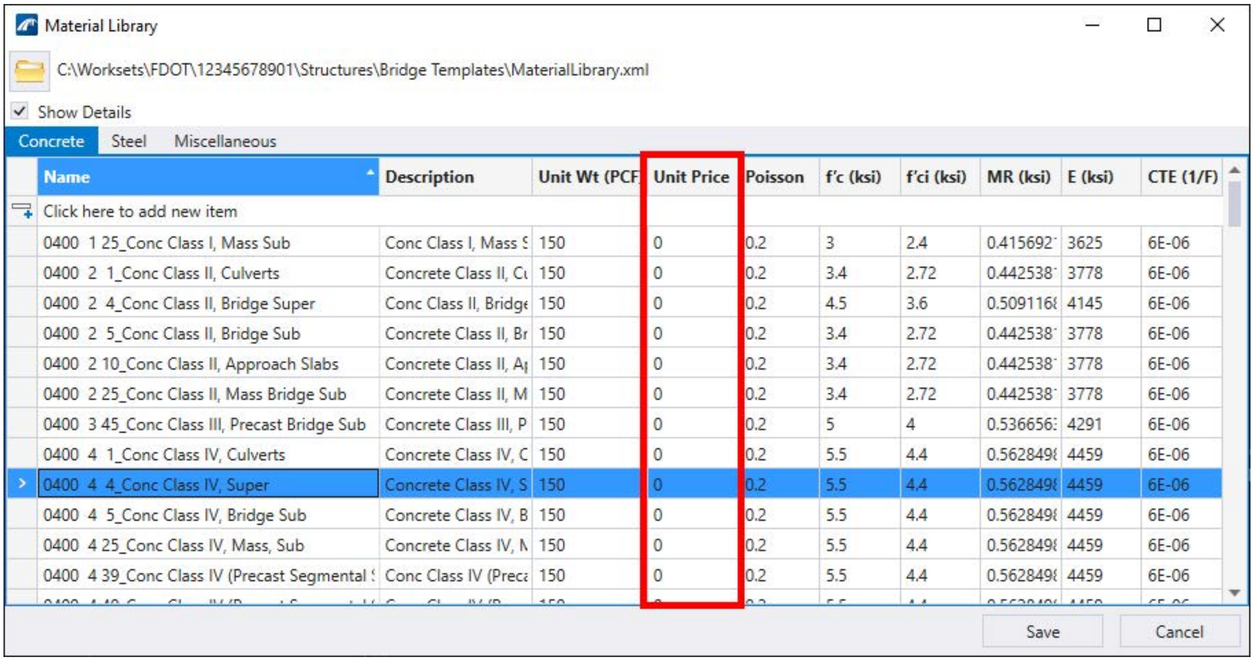
Grand Total

Cost
0.00

Bridge Deck Area, Square Foot 17269.007

NOTE ***The Materials Quantity Report currently assumes the haunch build-up is linear between bearings and does not account for variations from parabolic prestressed beam camber. This is conservative for quantities for every Build-up Case except Case 4. See FDOT Standard Index 450-199 for more information.***

The FDOT OBM Material Library delivered with FDOTConnect does not include default unit prices, as all unit costs are set to zero. To take advantage of the cost estimating portion of the Material Quantities Report, unit costs can be added by accessing **OpenBridge Modeler** (Workflow) **> Utilities > Libraries > Material**. Please note that when users create a new WorkSet, the delivered FDOT Material Library is automatically copied as a starting point, in the form of the *MaterialLibrary.xml*. This file can be found within the *Bridge Templates* folder of the project's designated Workset. If users choose to maintain a material library with unit costs, they will have to ensure that any updates to the FDOT-delivered Material Library in later versions of FDOTConnect are used on new projects or there may be issues with the FDOT automated bridge quantities.



Name	Description	Unit Wt (PCF	Unit Price	Poisson	f'c (ksi)	f'ci (ksi)	MR (ksi)	E (ksi)	CTE (1/F)
0400 1 25_Conc Class I, Mass Sub	Conc Class I, Mass S	150	0	0.2	3	2.4	0.415692	3625	6E-06
0400 2 1_Conc Class II, Culverts	Concrete Class II, Cu	150	0	0.2	3.4	2.72	0.442538	3778	6E-06
0400 2 4_Conc Class II, Bridge Super	Conc Class II, Bridge	150	0	0.2	4.5	3.6	0.509116	4145	6E-06
0400 2 5_Conc Class II, Bridge Sub	Concrete Class II, Br	150	0	0.2	3.4	2.72	0.442538	3778	6E-06
0400 2 10_Conc Class II, Approach Slabs	Concrete Class II, Ap	150	0	0.2	3.4	2.72	0.442538	3778	6E-06
0400 2 25_Conc Class II, Mass Bridge Sub	Concrete Class II, M	150	0	0.2	3.4	2.72	0.442538	3778	6E-06
0400 3 45_Conc Class III, Precast Bridge Sub	Concrete Class III, P	150	0	0.2	5	4	0.536656	4291	6E-06
0400 4 1_Conc Class IV, Culverts	Concrete Class IV, C	150	0	0.2	5.5	4.4	0.562849	4459	6E-06
0400 4 4_Conc Class IV, Super	Concrete Class IV, S	150	0	0.2	5.5	4.4	0.562849	4459	6E-06
0400 4 5_Conc Class IV, Bridge Sub	Concrete Class IV, B	150	0	0.2	5.5	4.4	0.562849	4459	6E-06
0400 4 25_Conc Class IV, Mass, Sub	Concrete Class IV, N	150	0	0.2	5.5	4.4	0.562849	4459	6E-06
0400 4 39_Conc Class IV (Precast Segmental	Conc Class IV (Preca	150	0	0.2	5.5	4.4	0.562849	4459	6E-06

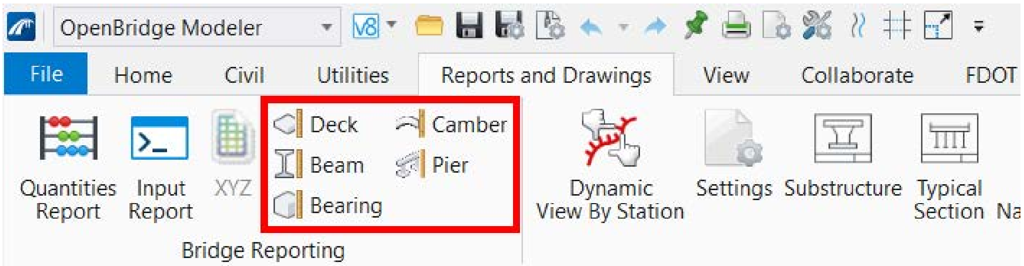
It is important to note that these quantities are dependent on the accuracy of the model. There are certain details, especially with end bents, that cannot be easily modeled using only OBM templates. An example of this would be skewed end bents with "turned back" concrete cap, backwall, and cheekwall/wingwall to eliminate the acute corners. These elements would then need to be supplemented with additional quantity calculations to account for the discrepancies if these portions are not modeled to a high level of detail. Additionally, if any OBM elements are modified with solids modeling tools (outside of the OBM specific modeling tools), the quantities should be closely verified. If elements are placed as custom parametric cells (abutments or piers), this will not be accurately reflected in the quantity report. Below is a list of known situations in which it is recommended that the user verify and supplement the quantity reports as necessary:

- Skewed end bents
- Thickened deck slabs (if not modeled)
- Any element that has been modified outside of the OBM-specific tools (i.e. solids modifications)
- Bearing pads placed as cells (will report as EA item rather than CF volume)
- Substructure units placed as Custom Abutments or Custom Piers

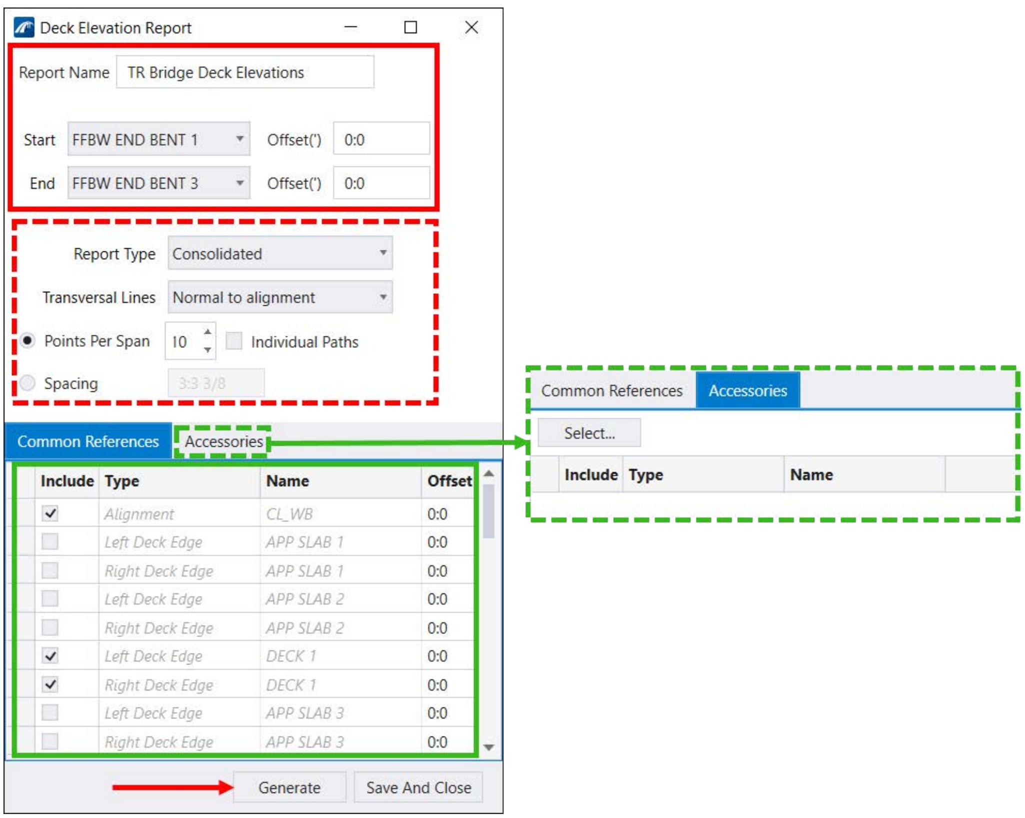
In summary, users can take advantage of both the FDOT Structures Quantity Report and/or the default Quantities Report within OBM but must carefully verify the report is generating the quantities expected and supplement the reports as necessary. Note that all solid elements within a DGN file, generated by OBM or not, can be analyzed and a volume reported. There is currently not a way to incorporate this into the Materials Quantity Report, but the values can be utilized to enhance the quantity calculations.

ELEVATION REPORTS

Another reporting functionality within OBM is automated elevation reports. There are tools available for the following components: Deck, Beam, Bearing Seat, Camber, and Pier. The tools can be accessed by navigating to **OpenBridge Modeler** (Workflow) **> Reports and Drawings > Bridge Reporting**.

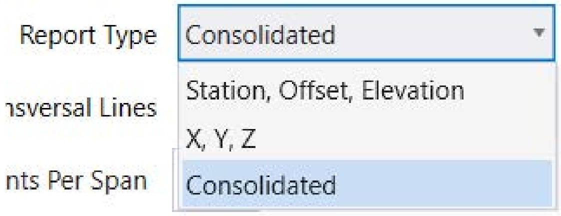


The **Deck Elevation Report** (commonly known as Finish Grade Elevation for FDOT) tool starts with prompts to select the start and end SupportLine for consideration. Note that only the active bridge and unit can be selected. The *Deck Elevation Report* window then is provided. The inputs are shown and described in detail below.



Solid Red Box – This section includes inputs for the Report Name, Start & End SupportLines and Offsets. This can be used to modify the SupportLines selections and to choose a starting point different from the SupportLines. SupportLines are typically at the front face of backwall and centerline of pier, while a starting point may be at the centerline of bearings. Users may enter an offset from the start or end point.

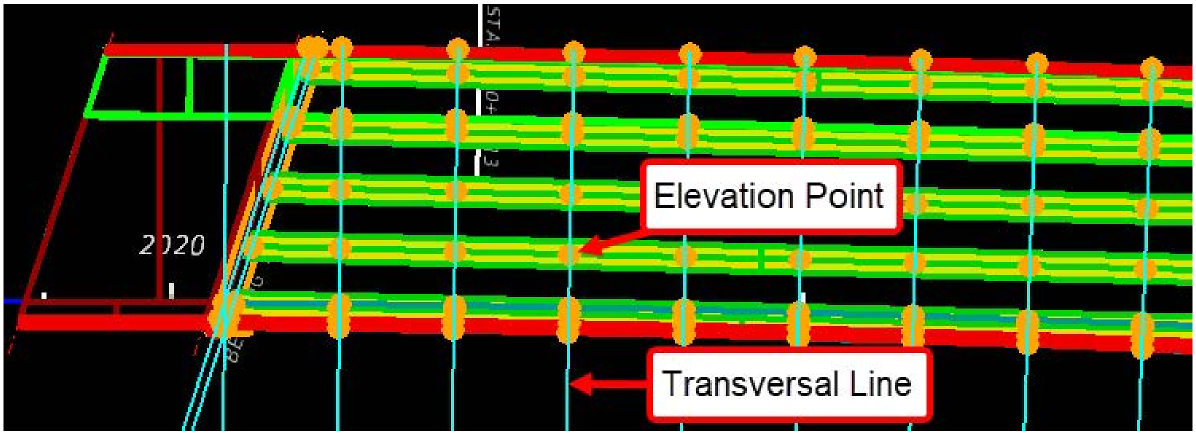
Dashed Red Box – These inputs provide additional reporting variables and formatting. The number of elevations generated can be entered by a number of points in the span or an equal spacing between the start and end points. Additionally, the *Report Type* offers several format and reporting options including **Station**, **Offset**, and **Elevations**; **X, Y, Z** coordinates; and a **Consolidated** report option. The consolidated option is the closest to the FDOT formatting for Finish Grade Elevations.



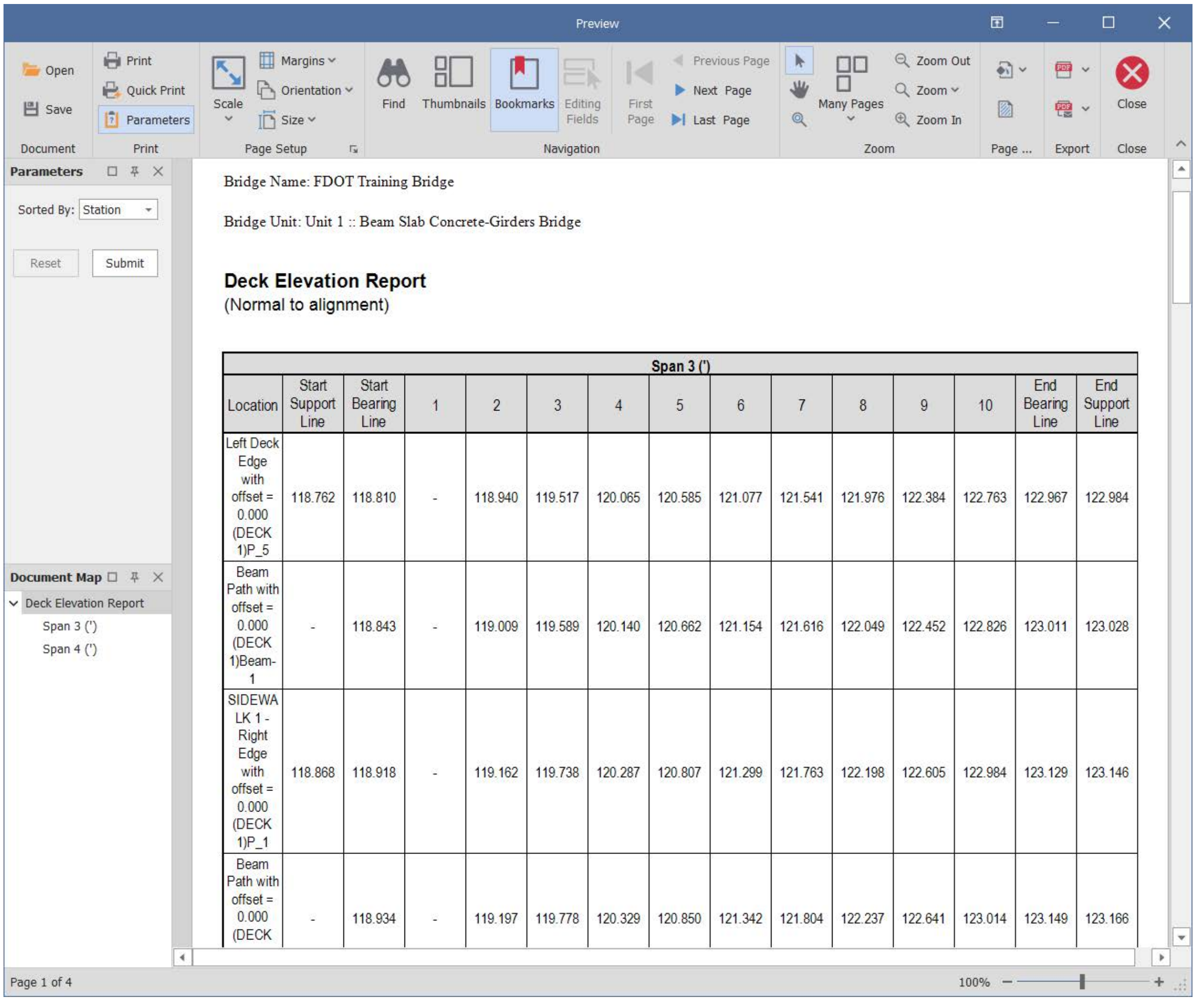
Solid Green Box – This selection input for **Common References** allows the user to select longitudinal lines for which to report the deck elevations. The inputs include the alignments, deck edges, barriers (curb), and beam centerlines. Note that offsets can be added to any of these points to capture additional points such as beam flange edges. Select the checkboxes for the desired points to include them in the report. Note that naming the elements during or after placement can aid in recognizing the reference elements.

Dashed Green Box – The **Accessories** tab allows the user to select additional elements in the model to include in the deck elevation report. This input is not typically used for common bridges and reports.

Clicking **Generate** (indicated with the red arrow) will initiate two actions: showing a temporary view of the transversal lines/points in the model and open the report preview in another window. Note that it is important to set the Working Units within the Design File Settings to survey feet with the accuracy set to three decimal places, as this will be used in the report. See below for the temporary view and see the next page for the report preview. Clicking **Save And Close** will save the report selections and close the window.



The resulting report is generated in the *Print Preview* window. The elevations are grouped by point and sorted by span. The report can be exported as a PDF or Excel spreadsheet, among other options.



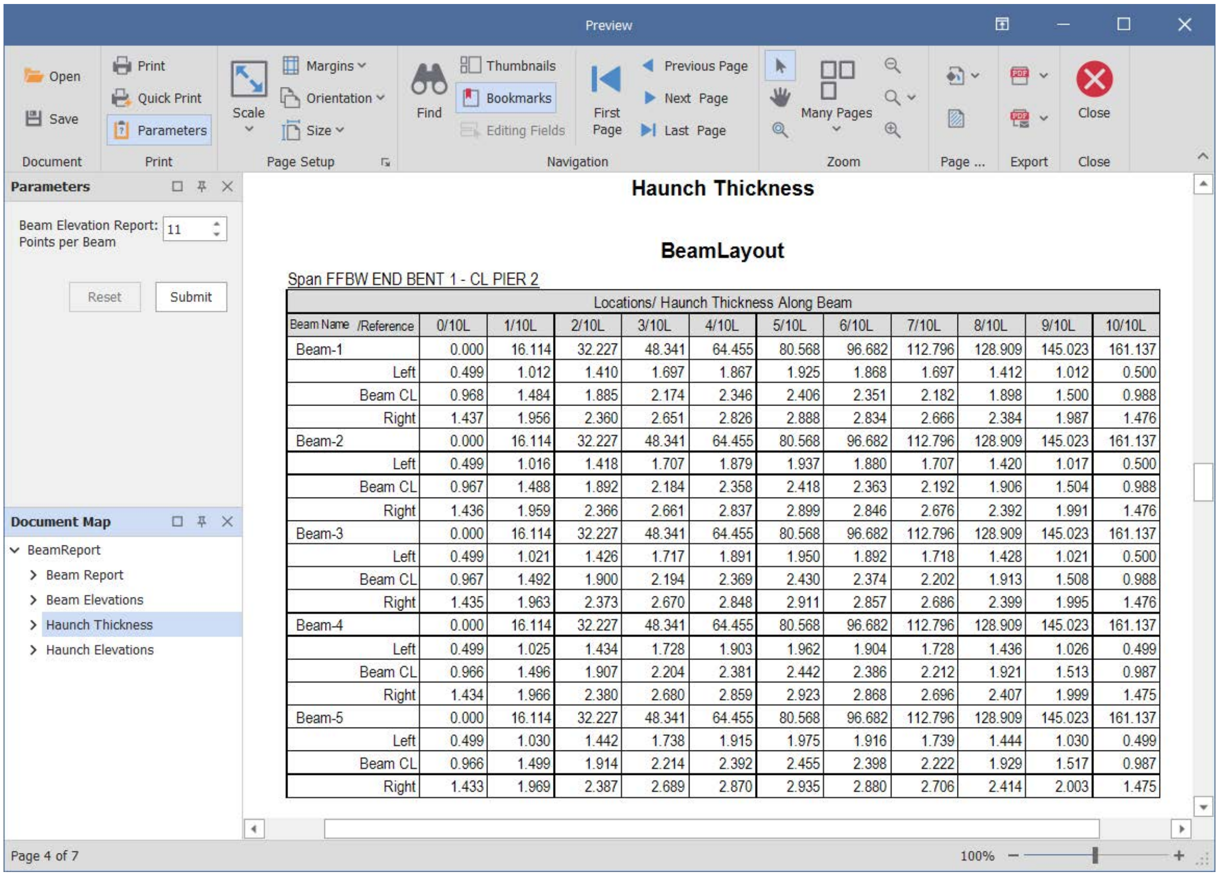
Bridge Name: FDOT Training Bridge

Bridge Unit: Unit 1 :: Beam Slab Concrete-Girders Bridge

Deck Elevation Report
(Normal to alignment)

Span 3 (')														
Location	Start Support Line	Start Bearing Line	1	2	3	4	5	6	7	8	9	10	End Bearing Line	End Support Line
Left Deck Edge with offset = 0.000 (DECK 1)P_5	118.762	118.810	-	118.940	119.517	120.065	120.585	121.077	121.541	121.976	122.384	122.763	122.967	122.984
Beam Path with offset = 0.000 (DECK 1)Beam-1	-	118.843	-	119.009	119.589	120.140	120.662	121.154	121.616	122.049	122.452	122.826	123.011	123.028
SIDEWALK 1 - Right Edge with offset = 0.000 (DECK 1)P_1	118.868	118.918	-	119.162	119.738	120.287	120.807	121.299	121.763	122.198	122.605	122.984	123.129	123.146
Beam Path with offset = 0.000 (DECK	-	118.934	-	119.197	119.778	120.329	120.850	121.342	121.804	122.237	122.641	123.014	123.149	123.166

The **Beam Report** tool provides a set of parameters for each beam line including the length, grade, direction (bearing), and rotation. It provides beam elevations, haunch thickness, and haunch elevations based on selected number of points. Currently, the haunch thickness and elevations include cross slope/ superelevation; however, they do not include camber (even if it is entered in the **Camber Report** tool or read from LEAP Bridge). This limitation is pending enhancements on prestressed beam camber/deflection definitions and elevations at erection.



Haunch Thickness

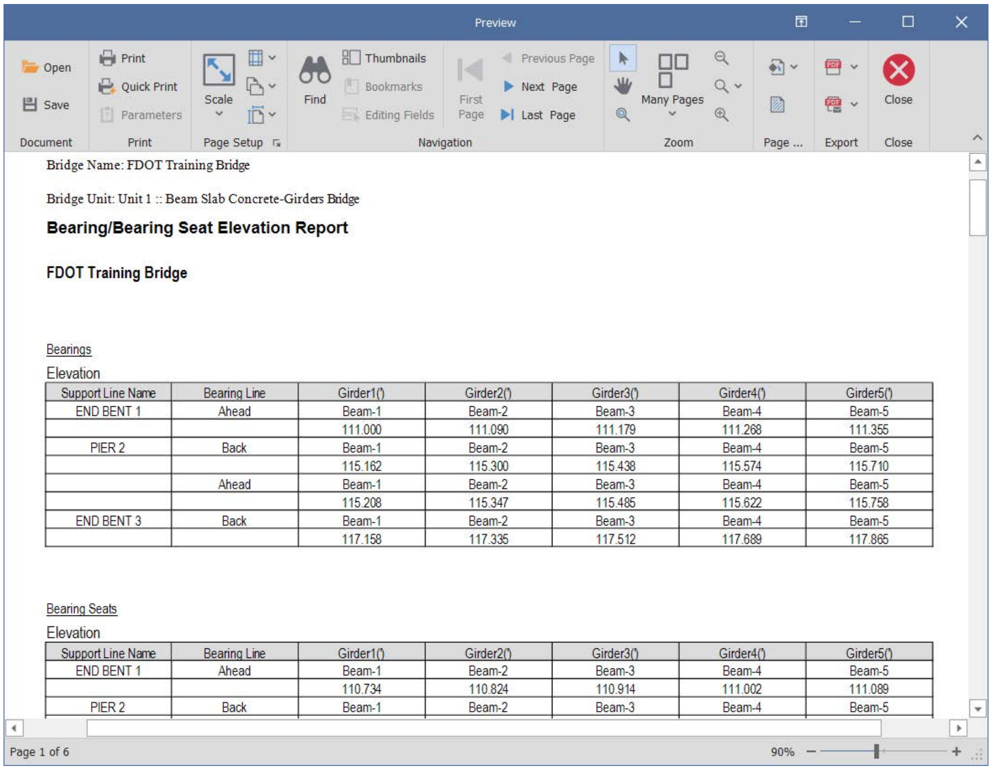
BeamLayout

Span FFBW END BENT 1 - CL PIER 2

Beam Name /Reference	Locations/ Haunch Thickness Along Beam										
	0/10L	1/10L	2/10L	3/10L	4/10L	5/10L	6/10L	7/10L	8/10L	9/10L	10/10L
Beam-1	0.000	16.114	32.227	48.341	64.455	80.568	96.682	112.796	128.909	145.023	161.137
Left	0.499	1.012	1.410	1.697	1.867	1.925	1.868	1.697	1.412	1.012	0.500
Beam CL	0.968	1.484	1.885	2.174	2.346	2.406	2.351	2.182	1.898	1.500	0.988
Right	1.437	1.956	2.360	2.651	2.826	2.888	2.834	2.666	2.384	1.987	1.476
Beam-2	0.000	16.114	32.227	48.341	64.455	80.568	96.682	112.796	128.909	145.023	161.137
Left	0.499	1.016	1.418	1.707	1.879	1.937	1.880	1.707	1.420	1.017	0.500
Beam CL	0.967	1.488	1.892	2.184	2.358	2.418	2.363	2.192	1.906	1.504	0.988
Right	1.436	1.959	2.366	2.661	2.837	2.899	2.846	2.676	2.392	1.991	1.476
Beam-3	0.000	16.114	32.227	48.341	64.455	80.568	96.682	112.796	128.909	145.023	161.137
Left	0.499	1.021	1.426	1.717	1.891	1.950	1.892	1.718	1.428	1.021	0.500
Beam CL	0.967	1.492	1.900	2.194	2.369	2.430	2.374	2.202	1.913	1.508	0.988
Right	1.435	1.963	2.373	2.670	2.848	2.911	2.857	2.686	2.399	1.995	1.476
Beam-4	0.000	16.114	32.227	48.341	64.455	80.568	96.682	112.796	128.909	145.023	161.137
Left	0.499	1.025	1.434	1.728	1.903	1.962	1.904	1.728	1.436	1.026	0.499
Beam CL	0.966	1.496	1.907	2.204	2.381	2.442	2.386	2.212	1.921	1.513	0.987
Right	1.434	1.966	2.380	2.680	2.859	2.923	2.868	2.696	2.407	1.999	1.475
Beam-5	0.000	16.114	32.227	48.341	64.455	80.568	96.682	112.796	128.909	145.023	161.137
Left	0.499	1.030	1.442	1.738	1.915	1.975	1.916	1.739	1.444	1.030	0.499
Beam CL	0.966	1.499	1.914	2.214	2.392	2.455	2.398	2.222	1.929	1.517	0.987
Right	1.433	1.969	2.387	2.689	2.870	2.935	2.880	2.706	2.414	2.003	1.475

NOTE ***The Beam Report tool currently assumes the haunch build-up is linear between bearings and does not account for variations from parabolic prestressed beam camber.***

The **Bearing Seat Elevations Report** tool provides the bearing seat elevations and/or grout pad/bevel plate elevations. The report has no settings and provides the elevations for each beam seat (assumes level beam seats in all situations) and thicknesses at bearing center, minimum, and at each corner. Note that both bearing lines will be reported at interior supports. This report can be beneficial but is only accurate for situations in which the beam seat is to be constructed level as mentioned above. Enhancement has been requested to model sloped bearing seats.



Bridge Name: FDOT Training Bridge

Bridge Unit: Unit 1 :: Beam Slab Concrete-Girders Bridge

Bearing/Bearing Seat Elevation Report

FDOT Training Bridge

Bearings

Elevation

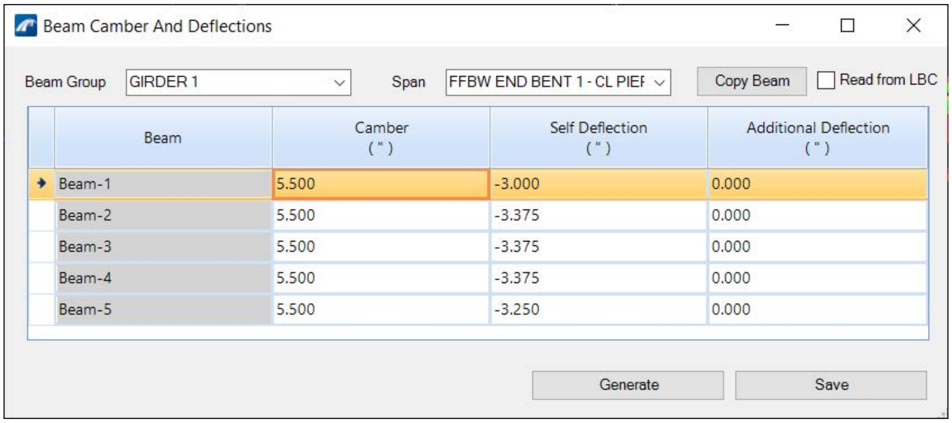
Support Line Name	Bearing Line	Girder1()	Girder2()	Girder3()	Girder4()	Girder5()
END BENT 1	Ahead	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5
		111.000	111.090	111.179	111.268	111.355
PIER 2	Back	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5
		115.162	115.300	115.438	115.574	115.710
	Ahead	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5
		115.208	115.347	115.485	115.622	115.758
END BENT 3	Back	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5
		117.158	117.335	117.512	117.689	117.865

Bearing Seats

Elevation

Support Line Name	Bearing Line	Girder1()	Girder2()	Girder3()	Girder4()	Girder5()
END BENT 1	Ahead	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5
		110.734	110.824	110.914	111.002	111.089
PIER 2	Back	Beam-1	Beam-2	Beam-3	Beam-4	Beam-5

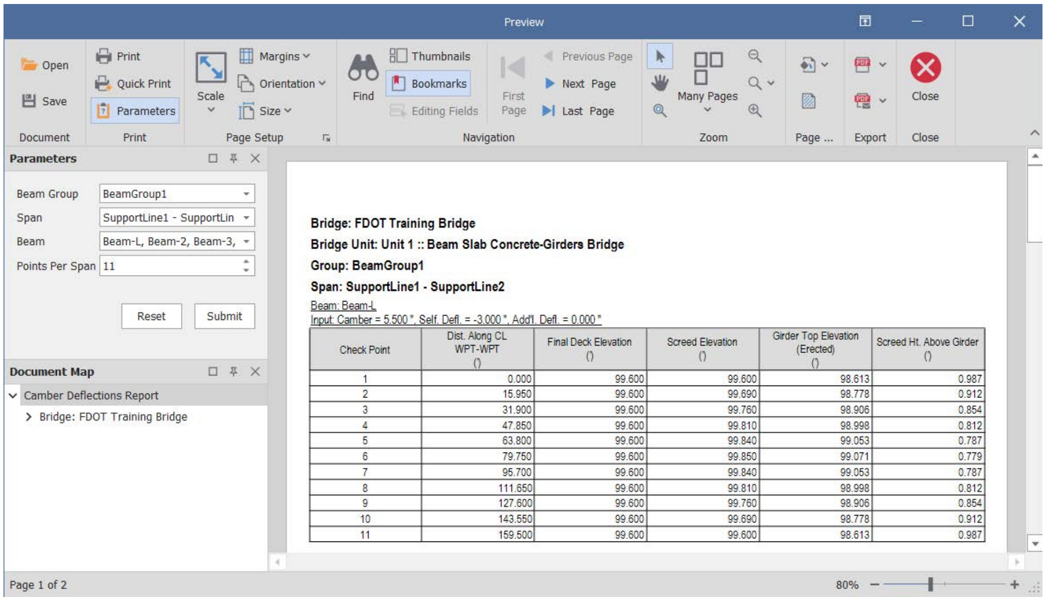
The **Beam Camber Report** tool allows the user to enter the beam Camber (sum of the deflections due to prestress force/strands and downward deflection due to self-weight of the beam), Self Deflection (due to the dead load of the deck slab and haunch) and Additional Deflection (due to all other dead loads) for all beams of the active bridge at midspan. Make sure all beam groups and spans have values entered, which can be expedited for similar spans by using the **Copy Beam** button. Note that this information can be read from a LEAP Bridge Concrete file if the analysis is performed using the Bentley workflow. For construction information, these inputs are used to generate reports of deck elevations and screed elevations at user defined intervals assuming a parabolic profile. Enhancements have been filed to include Net Beam Camber @ 120 days and Dead Load Deflection During Deck Pour @ 120 days for prestressed beams as defined per the FDOT Structures Manual.



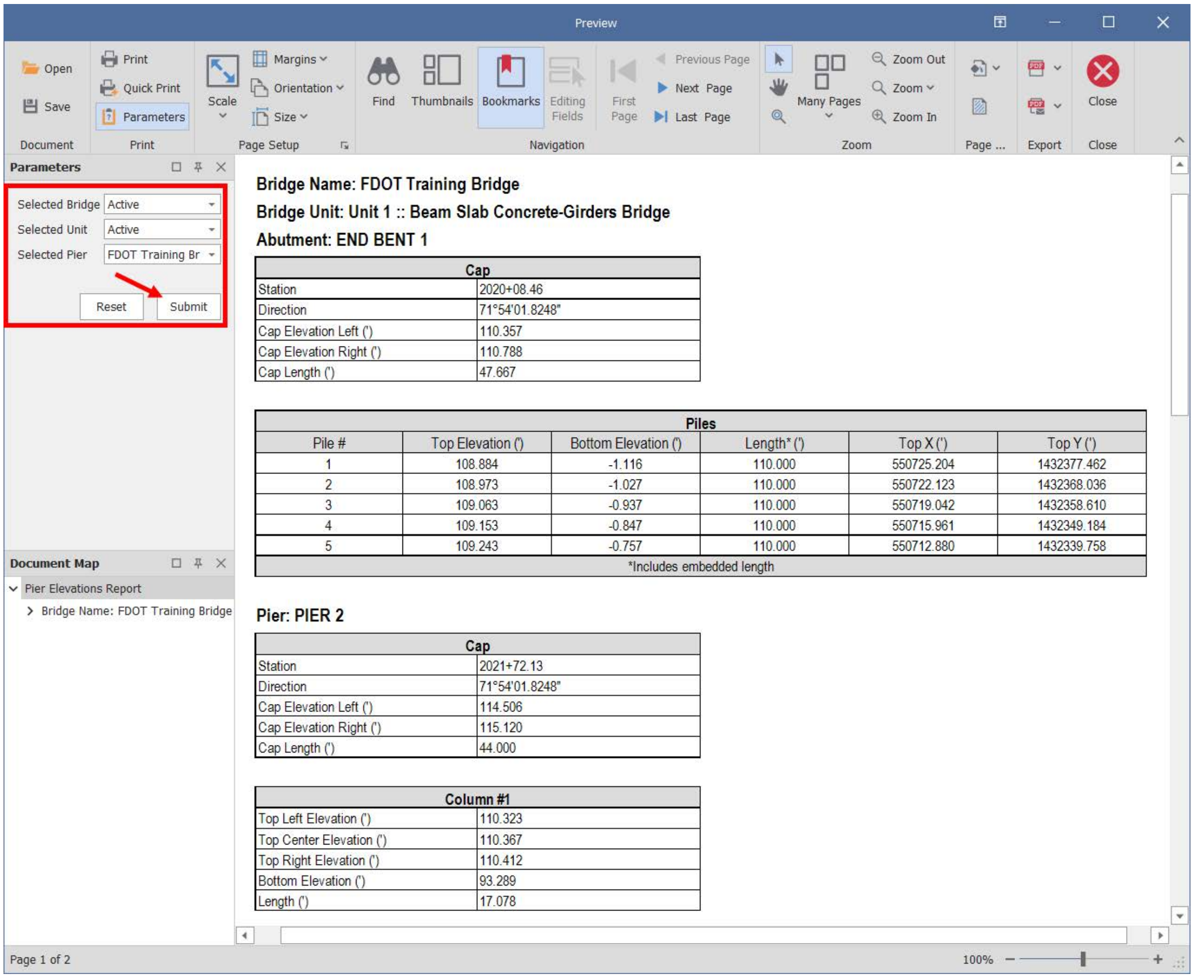
Beam	Camber (")	Self Deflection (")	Additional Deflection (")
Beam-1	5.500	-3.000	0.000
Beam-2	5.500	-3.375	0.000
Beam-3	5.500	-3.375	0.000
Beam-4	5.500	-3.375	0.000
Beam-5	5.500	-3.250	0.000

NOTE ***Sign convention for all entries is upward for position and downward for negative. Camber (i.e. net camber) should be positive and Self Deflection should be negative.***

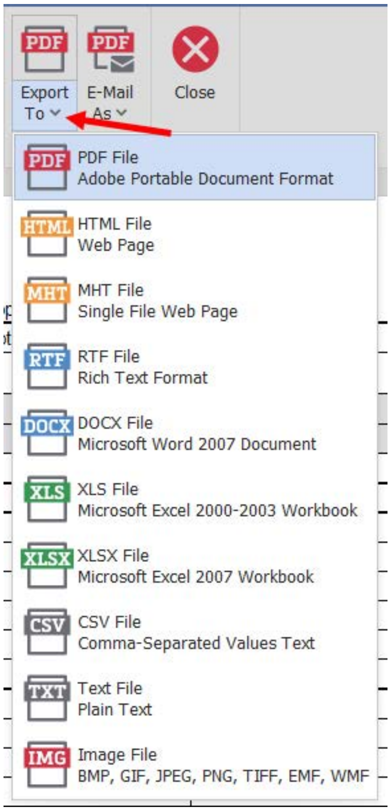
Clicking **Generate** will populate the following report preview. Make sure to select the desired beam group, span, beams, and points per span on the left and click **Submit**.



When the **Pier Elevation Report** tool is selected, all bridges/units in the file, whether active or not, may be options to include in the report. Additionally, the user has the ability to select an individual support (end bent or intermediate supports) or all the substructure units. The list of elevations includes top of cap elevations at the left and right ends, as well as pile cutoff and bottom elevations. If applicable, column and footing elevations at the top and bottom are also reported for piers.



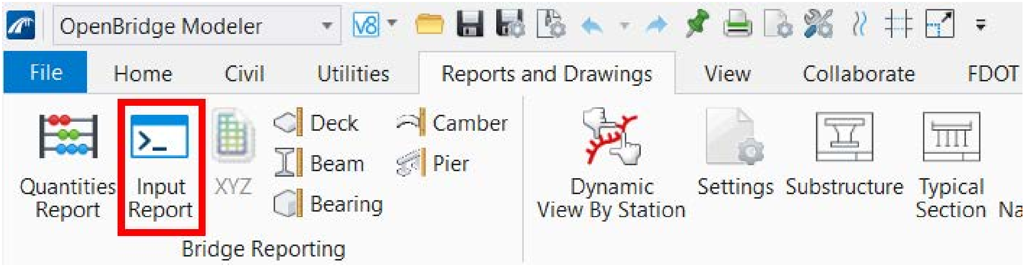
All elevations and associated reports are generated with the OBM report tool and are opened in the *Print Preview* window as shown. These reports can be exported to many common file formats including PDF, XLS, XLSX, TXT, CSV, and more. The **Export To** drop down menu on the **Print Preview** menu group lists all available choices. Note that the *Working Units* set within **File > Settings > File > Design File Settings** controls what units are displayed in the reports.



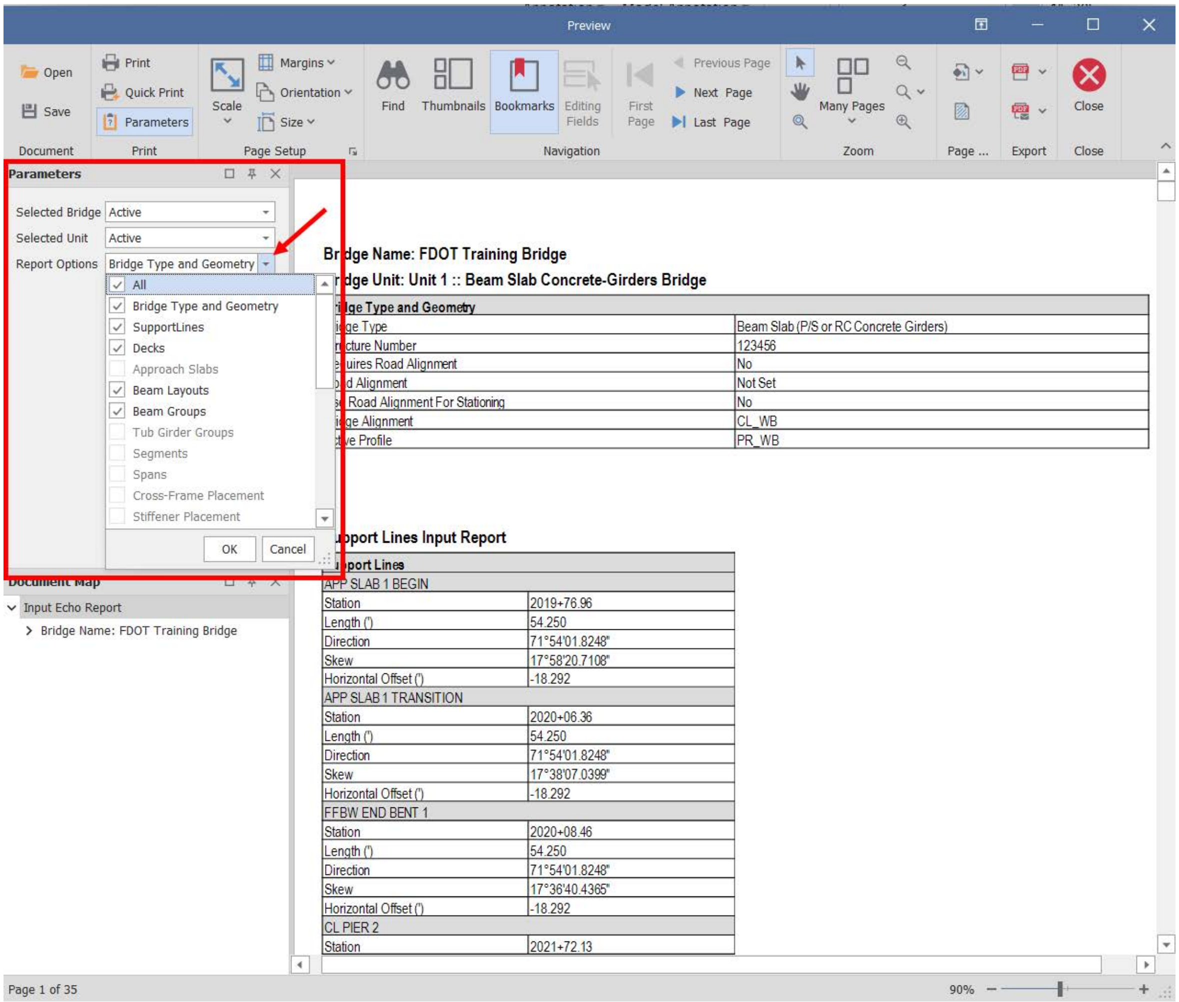
This allows for flexibility to incorporate these report values, especially considering spreadsheet exports, to generate quantities and elevations as needed or for further calculations.

INPUT REPORT

Input Echo Report in OBM lists all input data the user provides. All input data is recorded in the report that may be used for verification and as checkprints for the model creation. This tool may be accessed from the **Reports and Drawings > Input Report** in the Bridge Reporting group.



The resulting *Print Preview* window opens. The report may include only the active bridge or all the bridges in the file, as well as the active or all the units. Also, the user can control which elements are included in the report. These options are shown in the red box below, and the user may view the print preview of the Input Report of the selected elements.



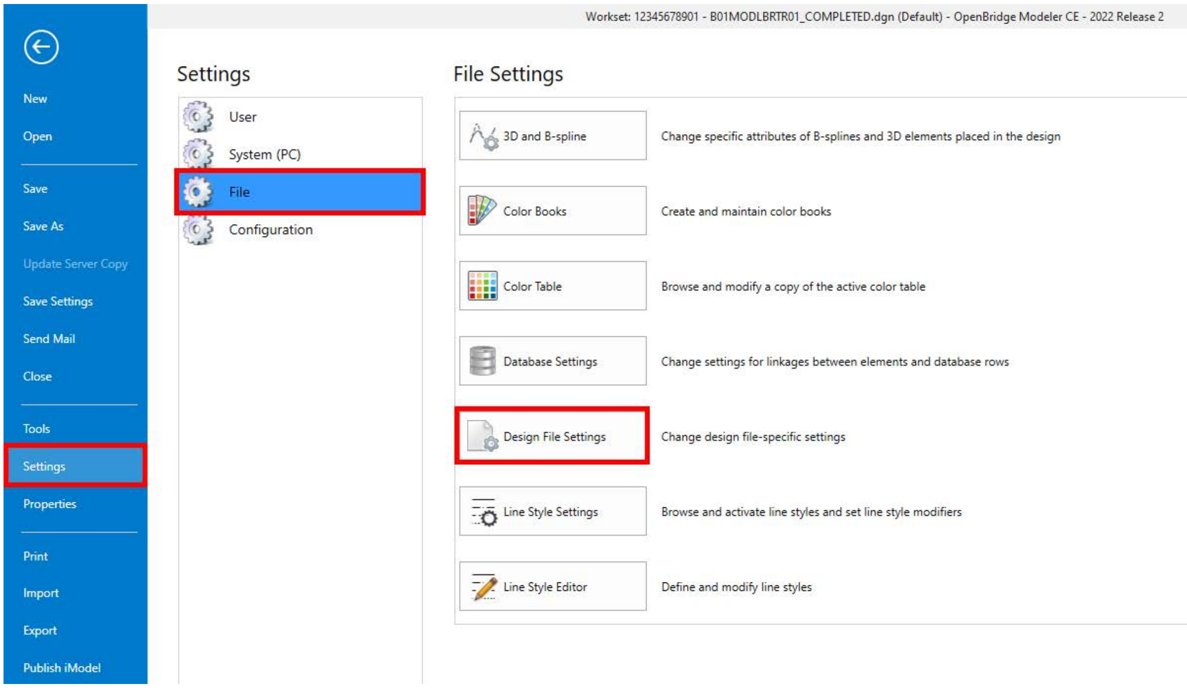
It is recommended that the 3D bridge model be reviewed along with this Input Report. Using this approach, the input can be verified visually as well as numerically.

EXERCISE OVERVIEW

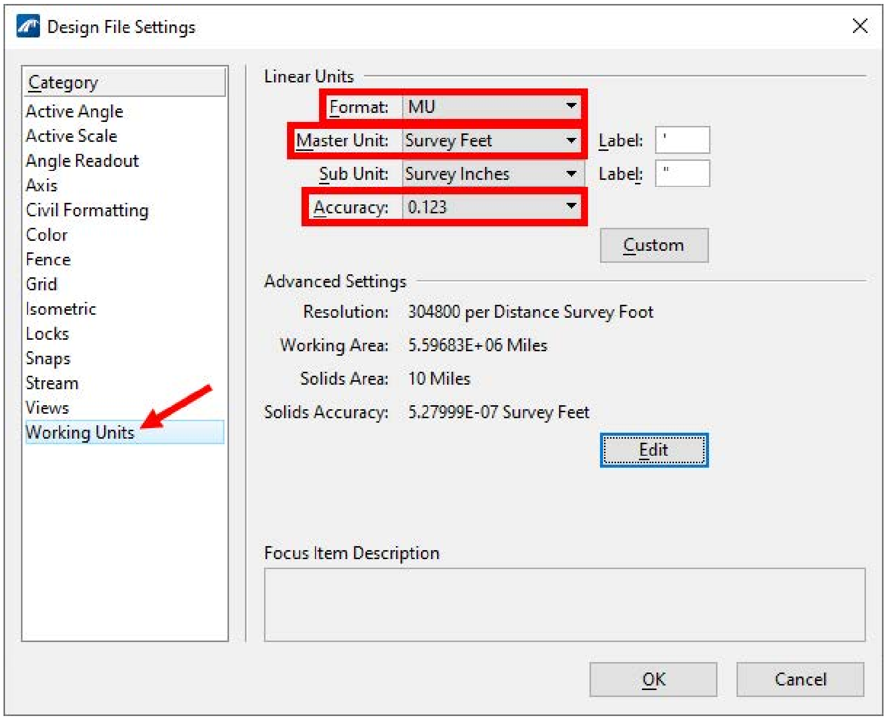
Exercise 7.1 *Generate Quantity, Elevations, and Input Reports*

CREATE A BRIDGE QUANTITY REPORT

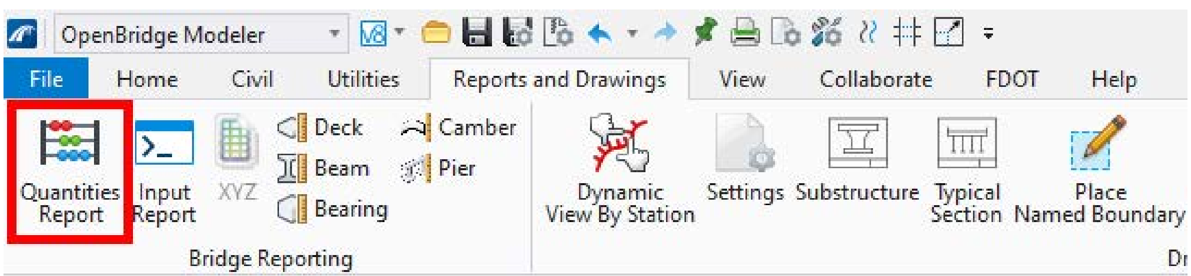
1. Open the data set file: *B01MODLBRTR01_7.1_Begin.dgn*
2. Change the working units to Survey Feet with accuracy to three decimal places via commands **File > Settings > File > Design File Settings.**



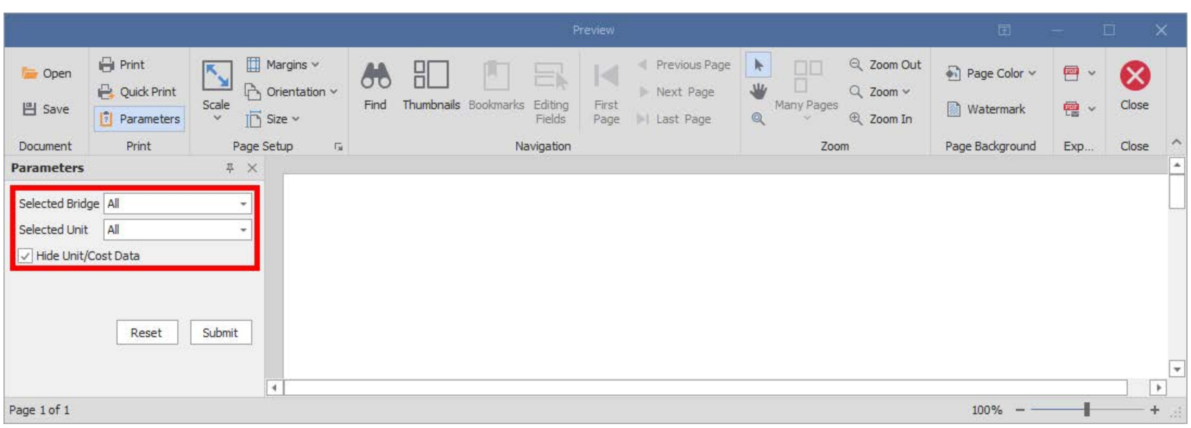
Within the *Design File Settings* window, select the *Working Units* section and change the *Format, Master Unit,* and *Accuracy* fields, as shown below.

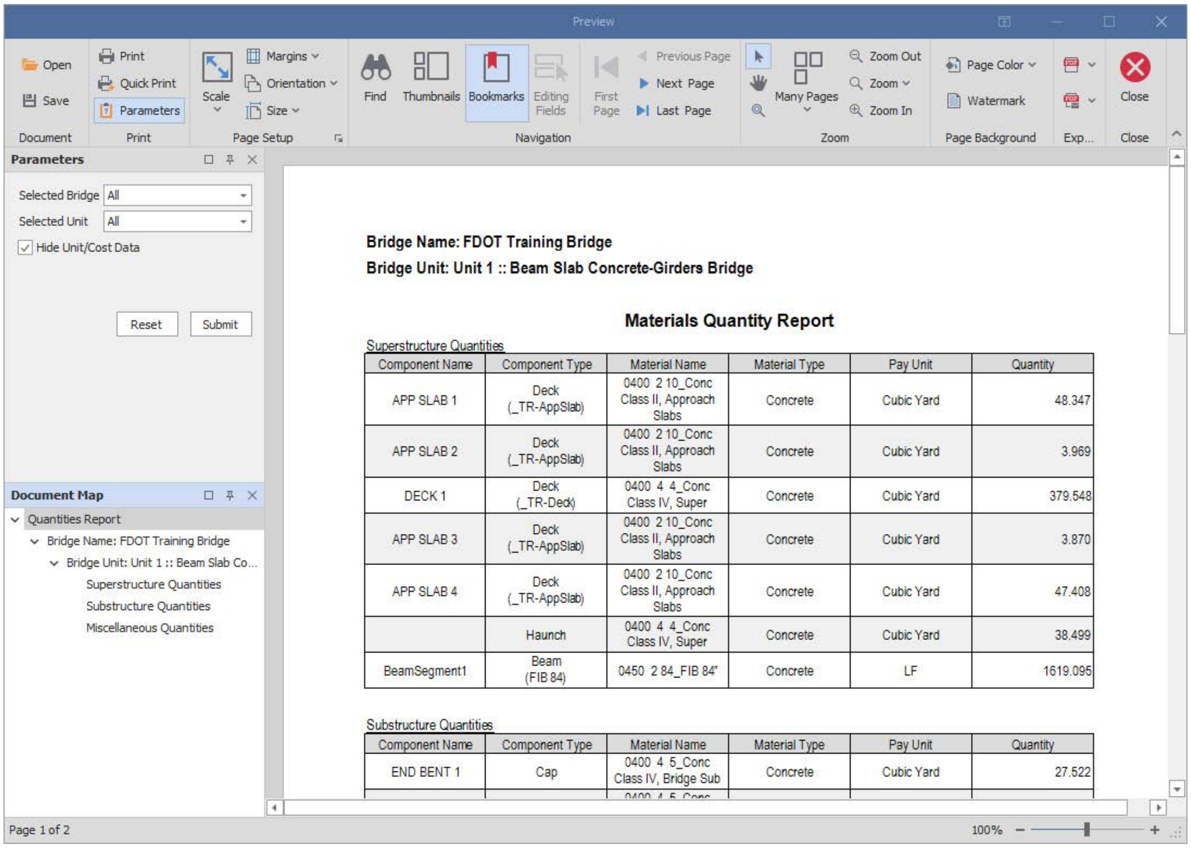


3. Open the Material Quantity Report *Print Preview* window by selecting **Reports and Drawings > Quantities Report** under the Bridge Reporting group.



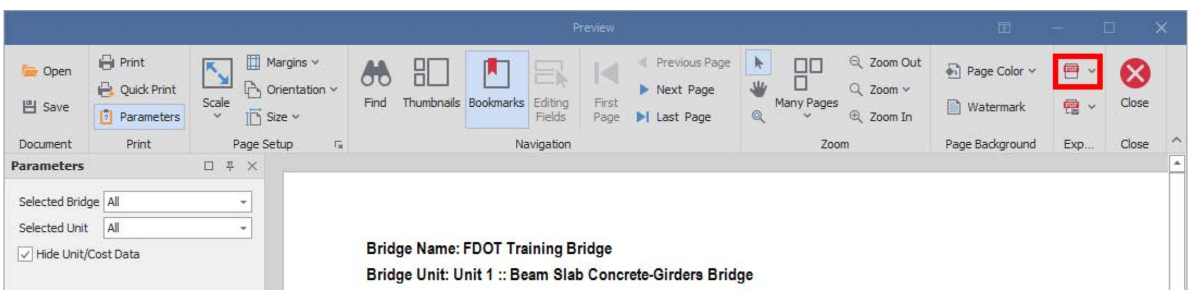
Select **All** under the *Selected Bridge* input in the *Print Preview* window and click **Submit** to generate the report. Note that Hide Unit/Cost Data is toggled off because unit costs are zeroed out in the FDOT workspace. This can be turned on if custom costs are included.

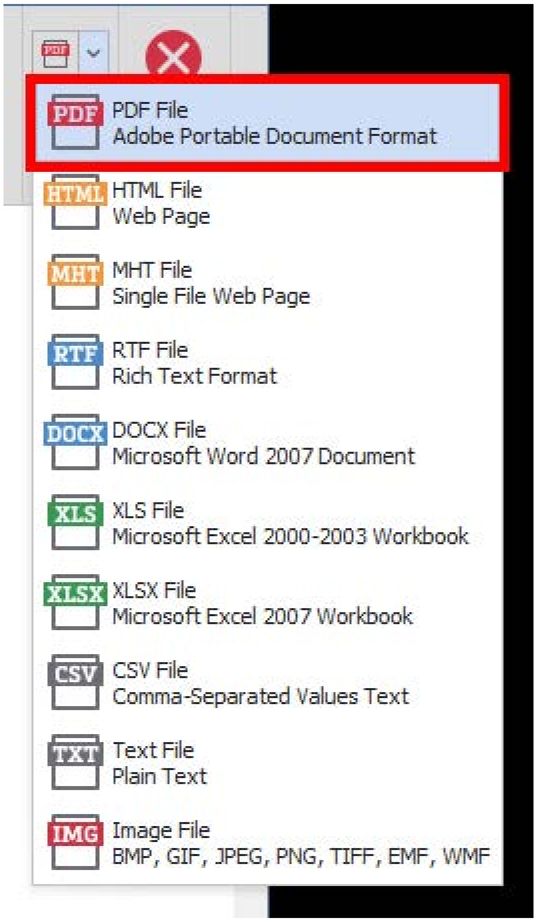




NOTE	***For this example, there is only one active bridge model and one unit present in the dgn. However, if multiple bridge models or units existed within the file, the Selected Bridge or Selected Unit fields can be changed to Active. This will isolate only the active bridge or unit (verified in the Explorer > OpenBridge Model > Bridge Model > Bridges) in the quantities report.***

4. Select the **Export To** drop down menu and select **PDF File** as the file type.

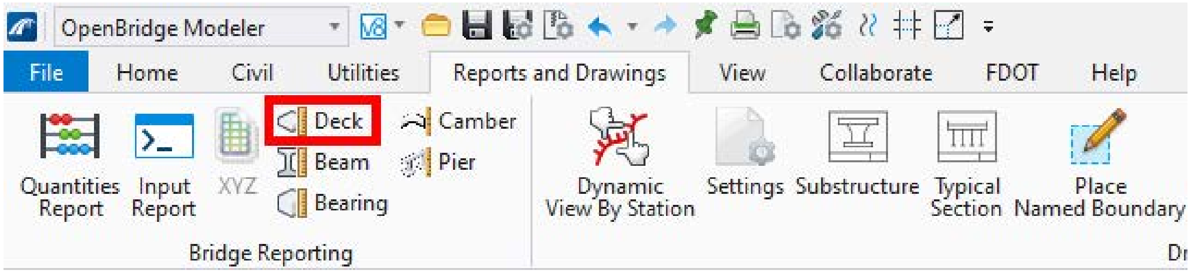




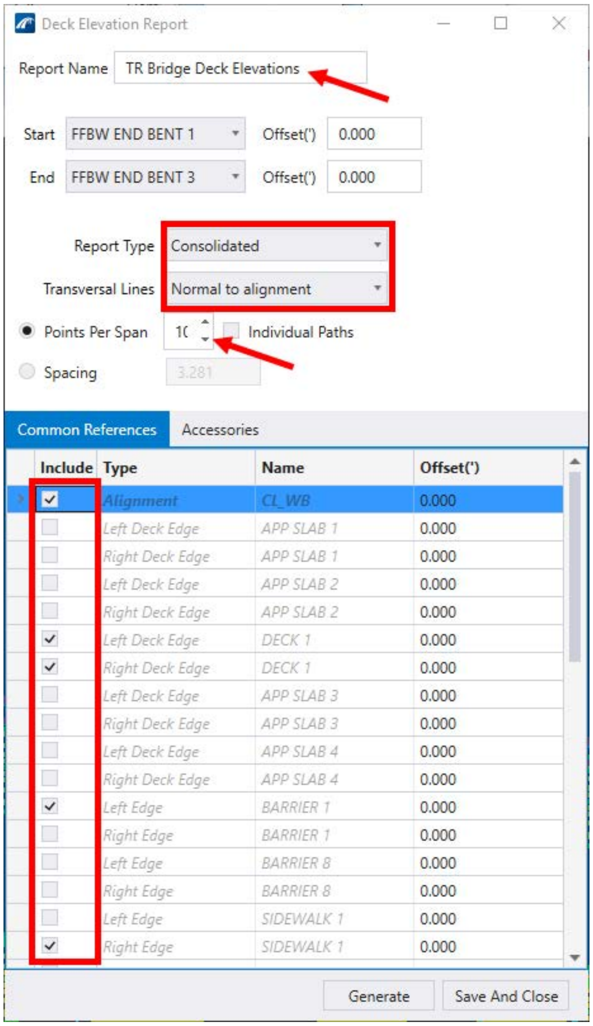
5. Select **OK** in the **PDF Export Options** dialog box and save the file as *QuantitiesReport_TR_Bridge.pdf* in the … Structures\eng_data folder. Open the file and view the results with a PDF viewer to verify.

CREATE A DECK ELEVATION REPORT

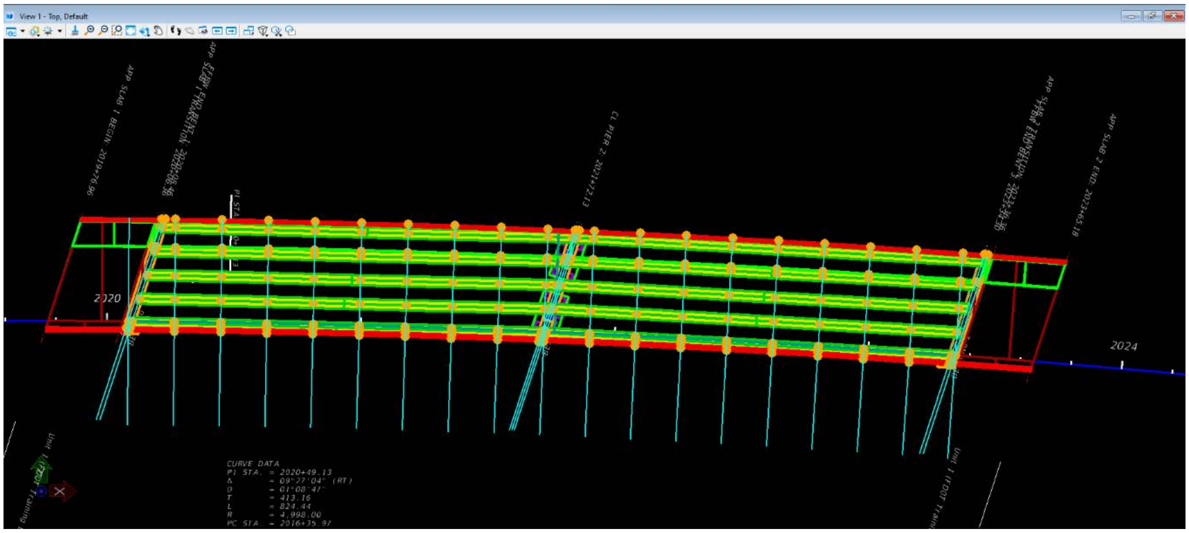
1. Open the *Deck Elevation Report* window by selecting **Reports and Drawings > Bridge Reporting > Deck**. Select **FFBW END BENT 1** and **FFBW END BENT 3** to capture the entire bridge deck then data point to accept the selection.



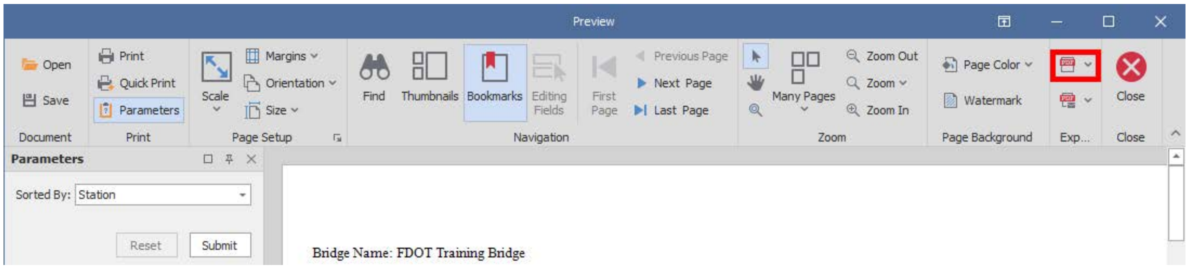
2. Make the selections in the *Deck Elevation Report* window shown in the image below. Set the *Report Type* to **Consolidated** and the *Transversal Lines* to **Normal to alignment**. Then set the *Points Per Span* to **10**. Lastly, toggle on the **CL_WB** (Alignment), **DECK 1** (Left Edge), **DECK 1** (Right Edge), **BARRIER 1** (Left Edge), **SIDEWALK 1** (Right Edge), **BeamLayout** (Beam Path), **BeamLayout1** (Beam Path).

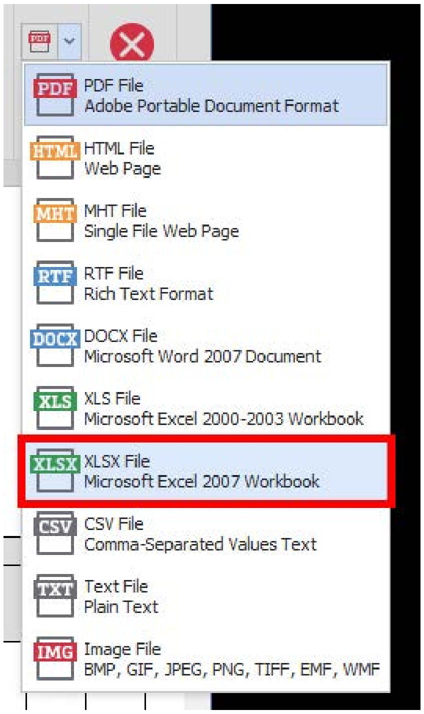


3. Click **Generate** to show the location of the transversal lines and elevation points and to access the Print Preview of the report.

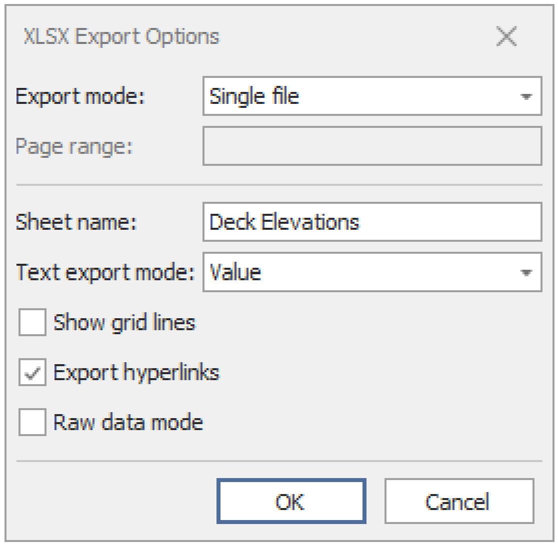


4. Select the **Export To** drop down menu and select XLSX File as the file type.

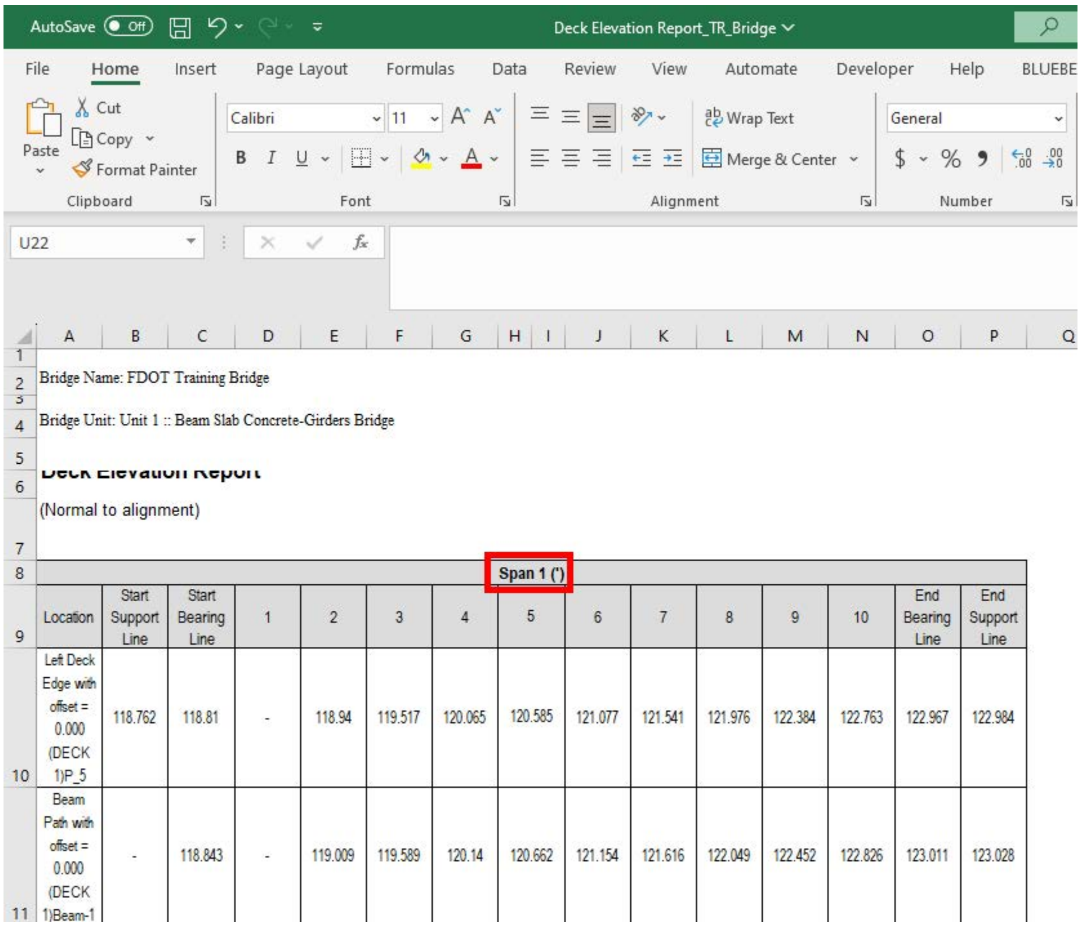




5. In the *XLSX Export Options* window, change the *Sheet name* to **Deck Elevations** and select **OK**. Save the file as *Deck Elevation Report_TR_Bridge.xlsx* in the … Structures > eng_data folder. Open the file and view the results with Microsoft Excel.



6. Because there are SupportLines used for the approach slabs, the program recognizes the deck as Spans 3 and 4. Revise the title of the tables to read **Span 1 (')** and **Span 2 (')**.



7. Delete the last row of the Span 2 deck elevations that shows the elevation on the alignment at the beginning of the end approach slab (APP SLAB 3). This elevation is already accounted for in alignment deck elevations at the end of the deck (DECK 1).

21	Span 2 (')														
22	Location	Start Support Line	Start Bearing Line	1	2	3	4	5	6	7	8	9	10	End Bearing Line	End Support Line
23	Left Deck Edge with offset = 0.000 (DECK 1)P_5	122.984	123.001	-	123.111	123.431	123.723	123.988	124.225	124.434	124.616	124.77	124.896	124.946	124.954
24	Beam Path with offset = 0.000 (DECK 1)Beam-1	123.028	123.045	-	123.172	123.496	123.791	124.058	124.295	124.503	124.682	124.832	124.953	-	-
25	SIDEWALK 1 - Right Edge with offset = 0.000 (DECK 1)P_1	123.146	123.164	-	123.332	123.652	123.945	124.21	124.447	124.656	124.838	124.992	125.118	125.153	125.161
26	Beam Path with offset = 0.000 (DECK 1)Beam-2	123.166	123.184	-	123.362	123.686	123.982	124.248	124.485	124.693	124.872	125.022	125.143	-	-
27	Beam Path with offset = 0.000 (DECK 1)Beam-3	123.304	123.322	-	123.552	123.876	124.172	124.438	124.675	124.883	125.062	125.212	125.333	-	-
28	Beam Path with offset = 0.000 (DECK 1)Beam-4	123.441	123.459	-	123.742	124.066	124.362	124.628	124.865	125.073	125.252	125.402	125.523	-	-
29	Alignment with offset = 0.000 (DECK 1)CL_WB	123.571	123.589	123.571	123.919	124.239	124.531	124.796	125.033	125.243	125.424	125.578	125.705	125.696	125.705
30	Beam Path with offset = 0.000 (DECK 1)Beam-5	123.577	123.596	123.579	123.932	124.256	124.552	124.818	125.055	125.263	125.442	125.592	-	125.704	-
31	BARRIER 1 - Left Edge with offset = 0.000 (DECK 1)P_7	123.607	123.625	123.621	123.969	124.289	124.581	124.846	125.083	125.293	125.474	125.628	-	125.742	125.751
32	Right Deck Edge with offset = 0.000 (DECK 1)P_1	123.622	123.64	123.644	123.992	124.312	124.605	124.869	125.107	125.316	125.498	125.652	-	125.763	125.772
33	Alignment with offset = 0.000 (APP SLAB 3)CL_WB	-	-	-	-	-	-	-	-	-	-	-	125.705	-	-

8. Right-click on the Column B heading and select **Insert** to add a column. Add the location names to the newly created column for Span 1 as shown below.

	A	B	C	D	E	F	G	H	I J	K	L	M	N	O	P	Q
8	Span 1 (')															
9	Location		Start Support Line	Start Bearing Line	1	2	3	4	5	6	7	8	9	10	End Bearing Line	End Support Line
10	Left Deck Edge with offset = 0.000 (DECK 1)P_5	Left Coping	118.762	118.81	-	118.94	119.517	120.065	120.585	121.077	121.541	121.976	122.384	122.763	122.967	122.984
11	Beam Path with offset = 0.000 (DECK 1)Beam-1	CL Beam 1	-	118.843	-	119.009	119.589	120.14	120.662	121.154	121.616	122.049	122.452	122.826	123.011	123.028
12	SIDEWALK 1 - Right Edge with offset = 0.000 (DECK 1)P_1	Left Gutterline	118.868	118.918	-	119.162	119.738	120.287	120.807	121.299	121.763	122.198	122.605	122.984	123.129	123.146
13	Beam Path with offset = 0.000 (DECK 1)Beam-2	CL Beam 2	-	118.934	-	119.197	119.778	120.329	120.85	121.342	121.804	122.237	122.641	123.014	123.149	123.166
14	Beam Path with offset = 0.000 (DECK 1)Beam-3	CL Beam 3	-	119.023	-	119.386	119.966	120.517	121.038	121.53	121.993	122.426	122.829	123.203	123.286	123.304
15	Beam Path with offset = 0.000 (DECK 1)Beam-4	CL Beam 4	-	119.112	-	119.574	120.154	120.705	121.227	121.719	122.181	122.614	123.017	123.391	123.423	123.441
16	Alignment with offset = 0.000 (DECK 1)CL_WB	PGL	119.144	119.195	119.144	119.749	120.325	120.873	121.394	121.885	122.349	122.785	123.192	123.571	123.553	123.571
17	Beam Path with offset = 0.000 (DECK 1)Beam-5	CL Beam 5	-	119.199	-	119.762	120.343	120.894	121.415	121.907	122.369	122.802	123.206	-	123.559	123.577
18	BARRIER 1 - Left Edge with offset = 0.000 (DECK 1)P_7	Right Gutterline	119.167	119.218	119.194	119.799	120.375	120.923	121.444	121.935	122.399	122.835	123.242	-	123.588	123.607
19	Right Deck Edge with offset = 0.000 (DECK 1)P_1	Right Coping	-	119.225	119.217	119.822	120.398	120.947	121.467	121.959	122.422	122.858	123.265	-	123.603	123.622

Copy and paste location names to Span 2.

Revise the column headings as shown below.

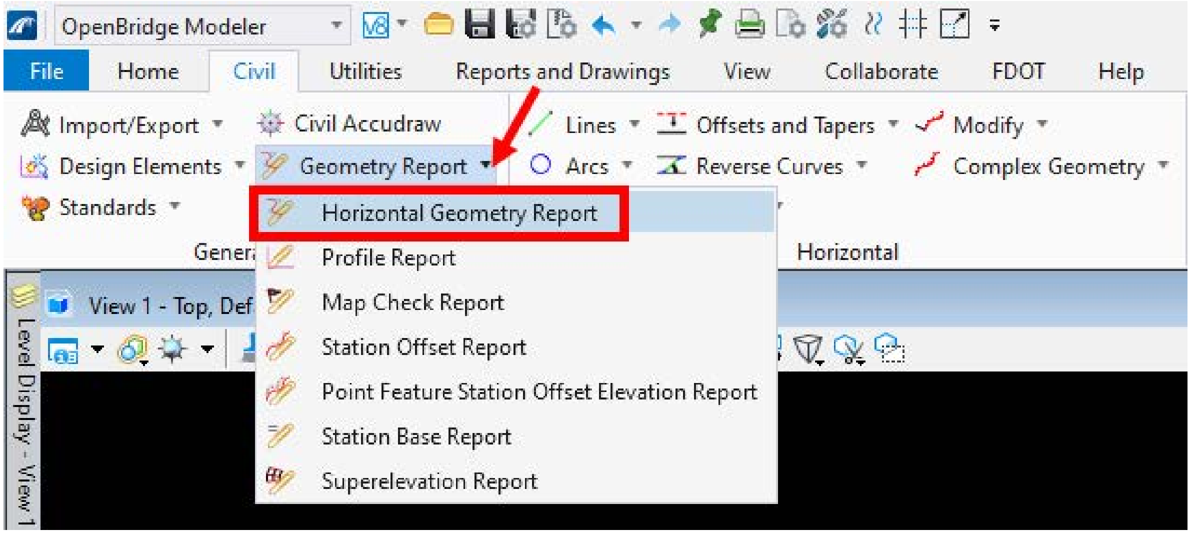
Span 1 (')															
Location	Location	FFBW End Bent 1	CL Bearing	1	2	3	4	5	6	7	8	9	10	CL Bearing	CL Pier 2
Left Deck Edge with offset = 0.000 (DECK 1)P_5	Left Coping	118.762	118.81	-	118.94	119.517	120.065	120.585	121.077	121.541	121.976	122.384	122.763	122.967	122.984
Beam Path with offset = 0.000															

Copy and paste these cells to Span 2 and make the necessary changes for Column C and Q (change the start and end location names per span).

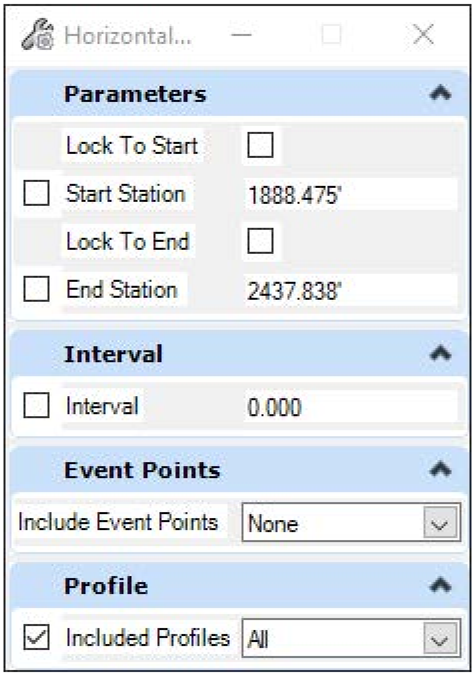
This file now contains the base information needed for the deck elevation tables for plans sheet development. The data can be further manipulated for format (changing the order of the rows if needed, removing merged columns, etc.) and then imported to the proper DGN file using FDOT **Linked Data Manager** tool, the OBM **Place Table** tool (see corresponding section of manual), or other third-party software.

CREATE A GEOMETRY REPORT

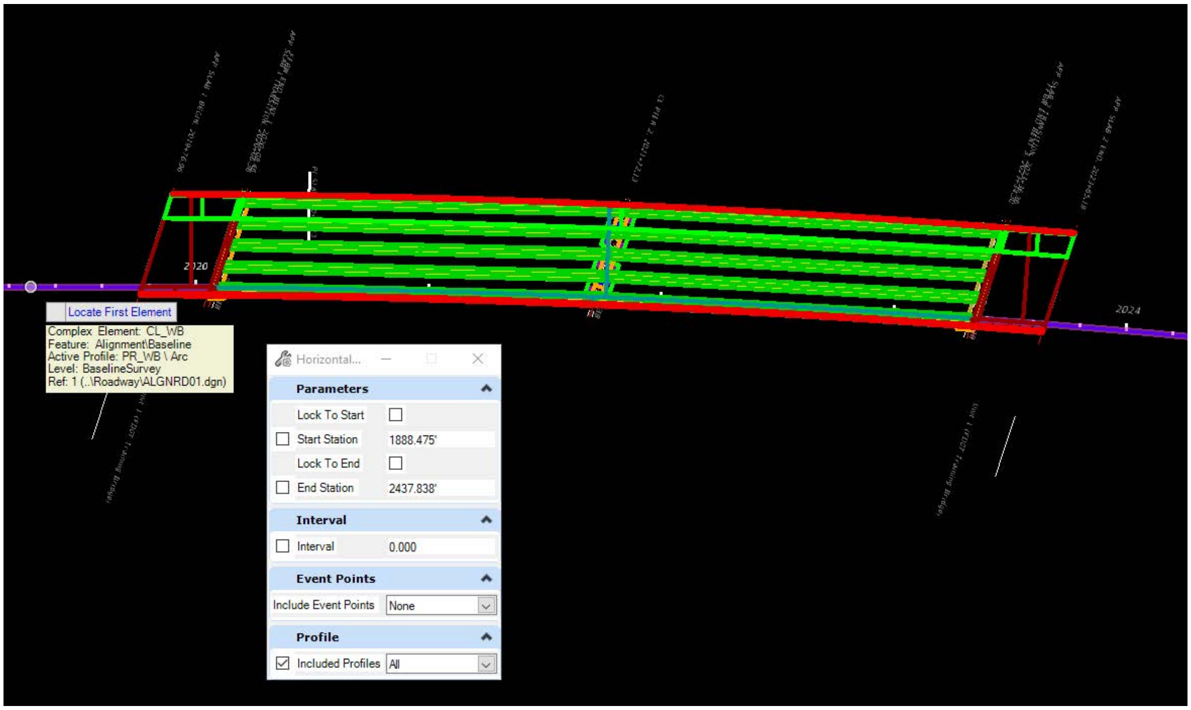
1. Open the *Horizontal Geometry Report* window by selecting **Civil > General Tools > Geometry Report > Horizontal Geometry Report** tool.



2. In the *Horizontal Geometry Report* window, set the toggle on the *Included Profiles* and set the input to **All**. The *Start Station* and *End Station* can remain toggled off as those will be selected in the model.



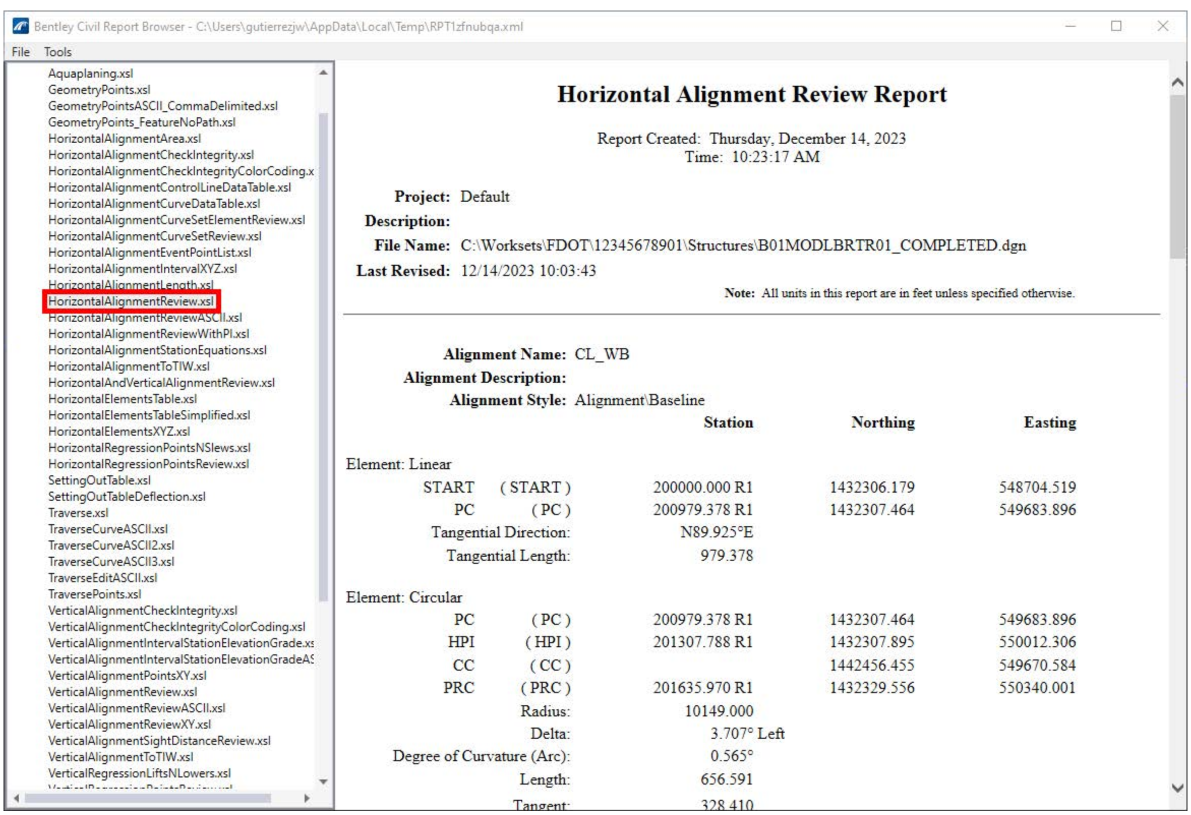
3. Select the **CL_WB** alignment then right-click to complete the selection.



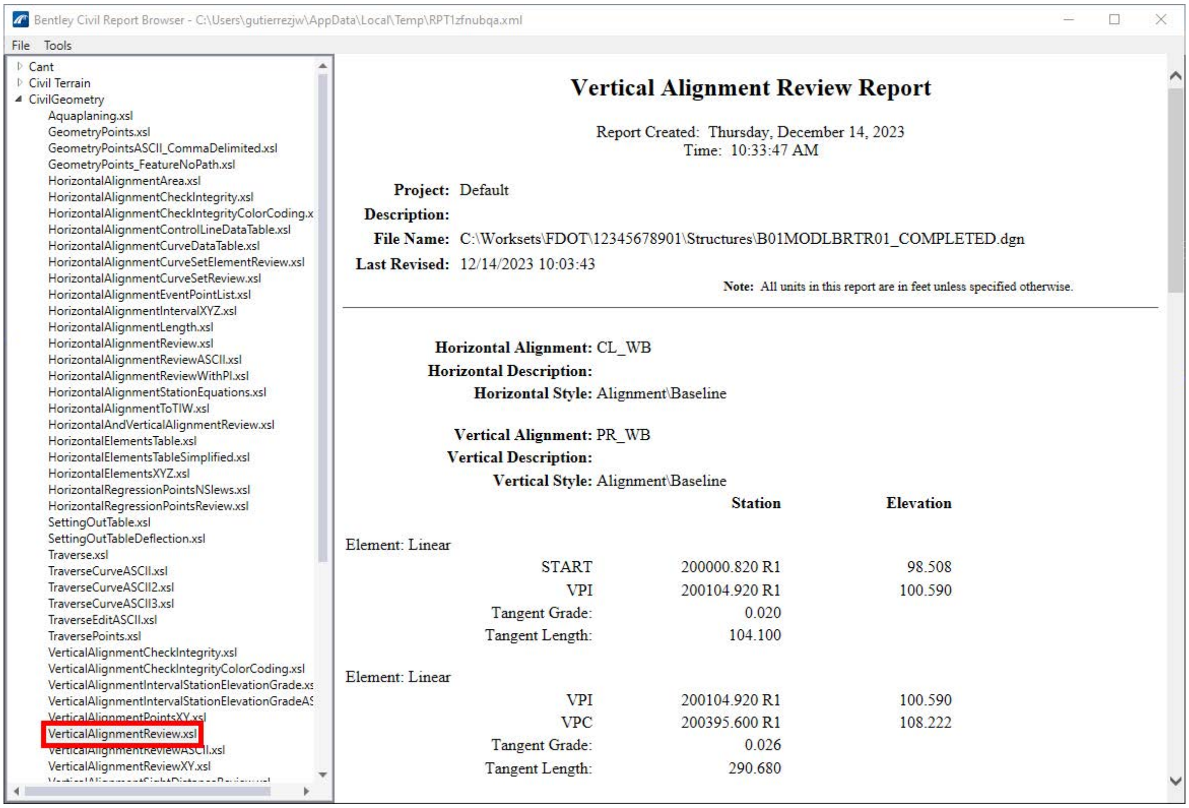
4. Next data point at a location before the begin approach slab to select a *Start Station*. Data point again at a location after the end approach slab to select an *End Station*.

5. Data point to confirm the *Interval* set to **0.000**. Data point again to confirm the *Include Event Points* input as **None**. Then, data point one last time to confirm the *Included Profiles* input as **All**.

6. The *Bentley Civil Report Browser* window will open displaying the horizontal alignment data.

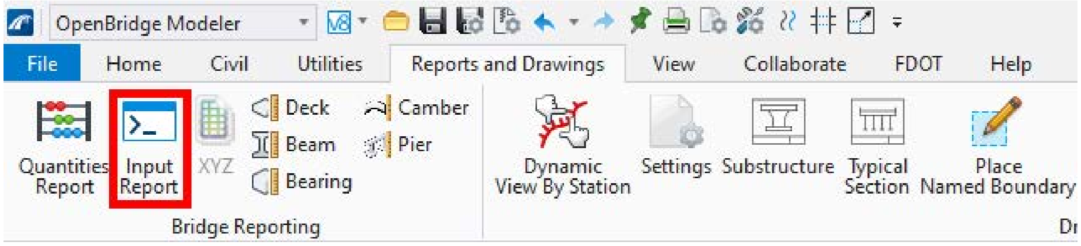


7. Staying within the *Bentley Civil Report Browser* window, click on the *VerticalAlignmentReview.xsl* at left to see the vertical profile information.

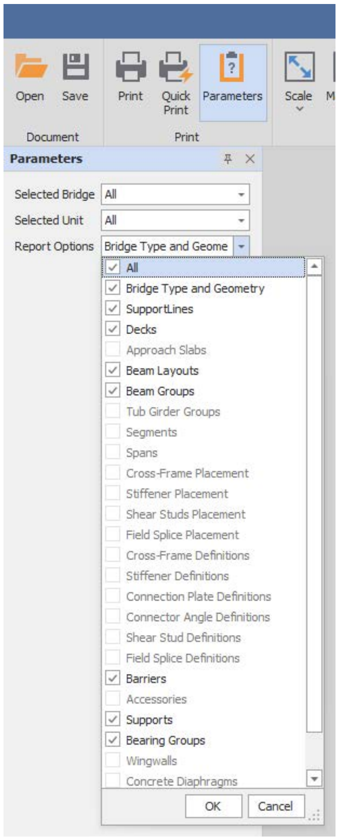


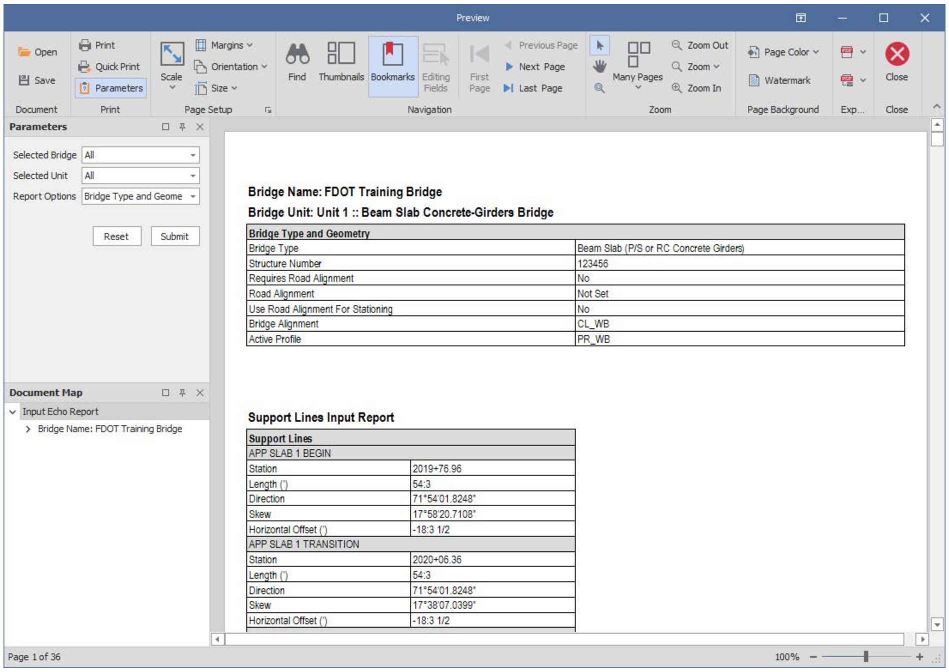
CREATE AN INPUT REPORT

1. Open the Input Report *Print Preview* window by selecting **Reports and Drawings > Bridge Reporting > Input Report** tool.

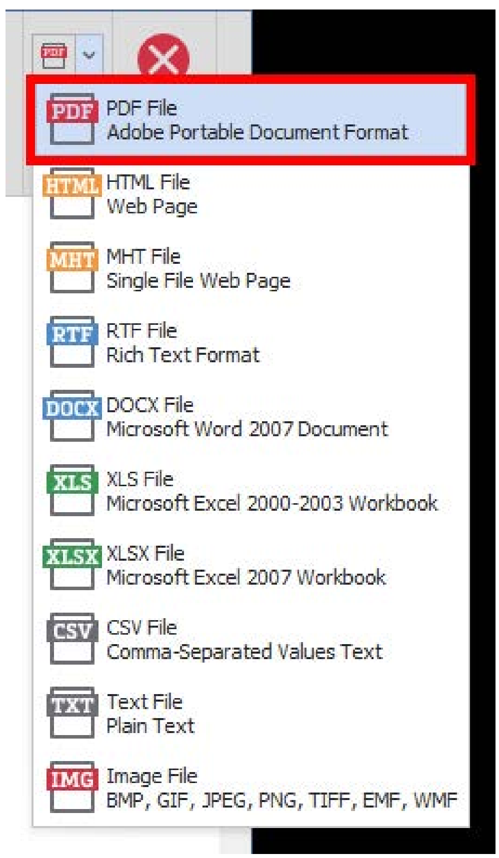


2. In the *Print Preview Parameters*, set the *Selected Bridge* and *Selected Unit* fields to **All** and toggle on **All** in the *Report Options* field. This will show the data that has been input for all of the bridge components. Then, click **Submit** to access the Print Preview of the report.





3. Select the **Export To** drop down menu and select **PDF File** as the file type.

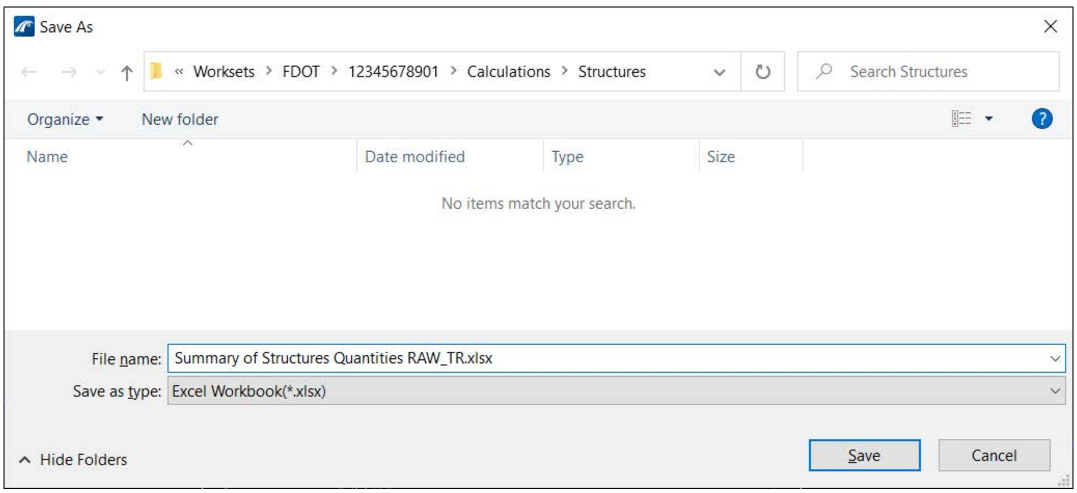


4. Select **OK** in the *PDF Export Options* window and save the file as *InputEchoReportPopulate_TR_Bridge.pdf* in the ... Structures\eng_data folder. Open the file and view the results in a PDF viewer.

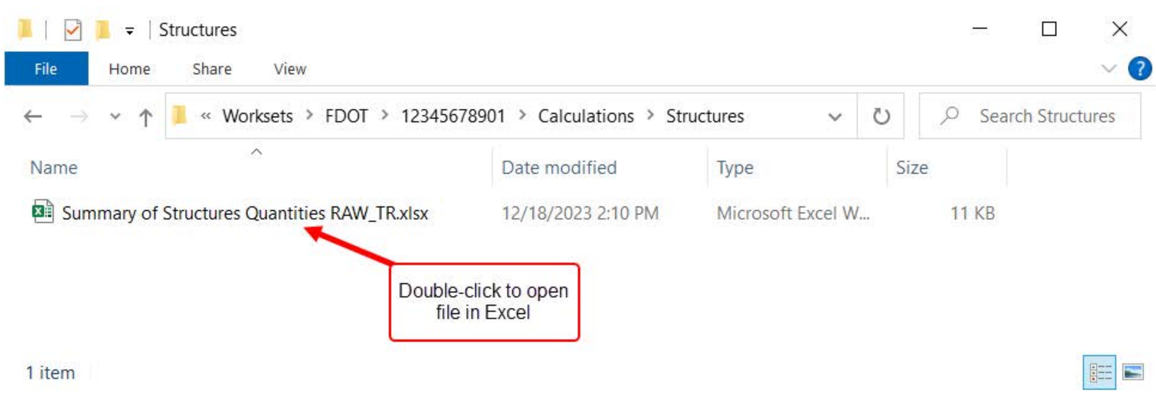
Exercise 7.2 *FDOT Bridge Quantities Workflow*

1. Open the data set file: *B01MODLBRTR01_7.2_Begin*
2. Open the **Structures Report Raw** tool by navigating to and selecting **OpenBridge Modeler** (Workflow) **> FDOT > Quantities > Structures Report Raw**.

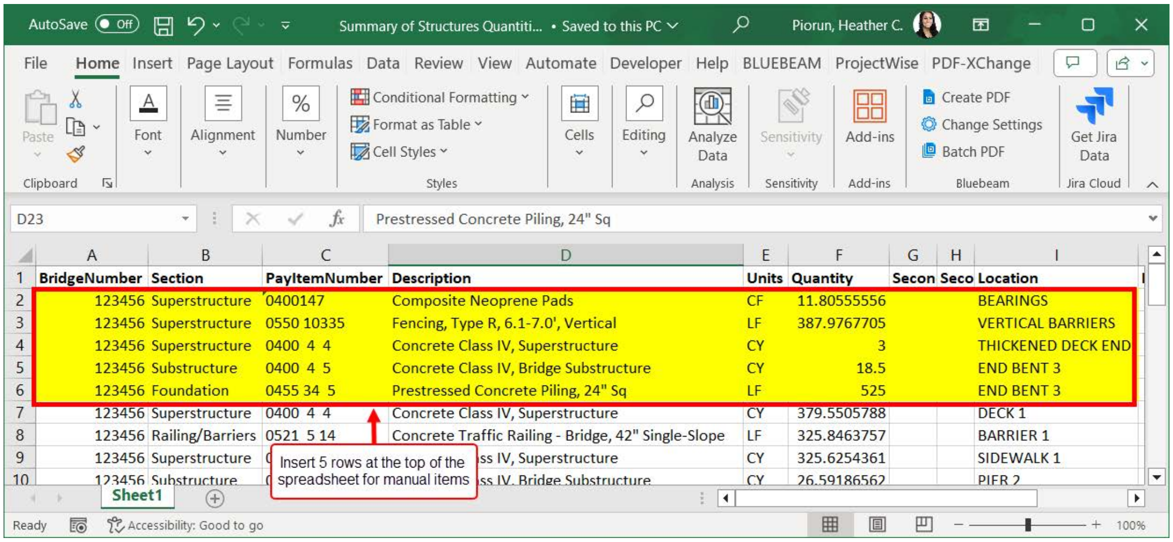
3. In the *Save As* window, update the *File name* to **Summary of Structures Quantities RAW_TR.xlsx** and click **Save**. This will save the spreadsheet in the C:\Worksets\FDOT\12345678901\Calculations\Structures.



4. The file will not open automatically, so we must open a *File Explorer* window (outside of OBM) and navigate to the C:\Worksets\FDOT\12345678901\Calculations\Structures folder to open the spreadsheet in Excel. This spreadsheet contains the raw, unformatted quantity information that was extracted from the bridge model.

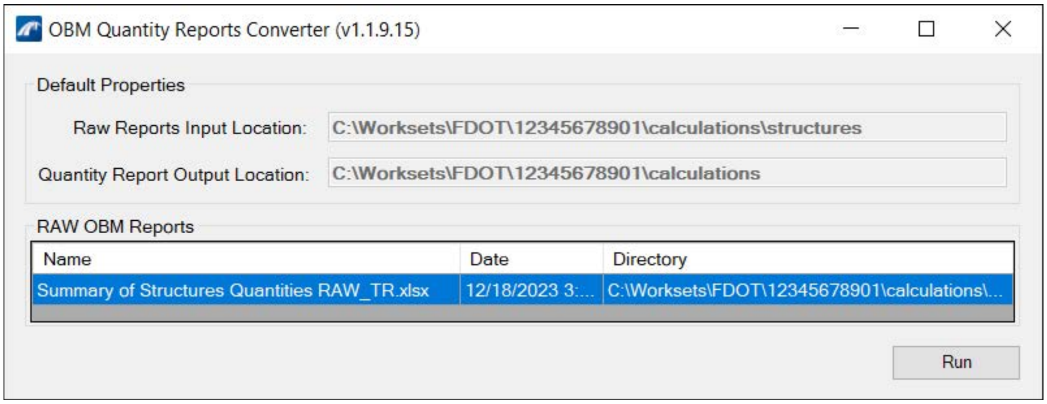


5. In the raw quantity spreadsheet, we can enter some items that do not get generated with the FDOT quantity tool. For example, since we placed the bearing pads using the cell bearing type, they do not get reported in the FDOT quantity report. We know from the previous quantity report that we have 20 bearing pads of Type H, so we can manually calculate and enter the information shown below (the pay item number must be manually formatted as text for the leading zero to display properly). We can also manually enter the bridge fencing quantity, the thickened end slab quantity, and the quantity information for the end bent that was placed with the parametric cell. Make sure to follow upper and lower case formatting for consistency. Save and close the Excel file.

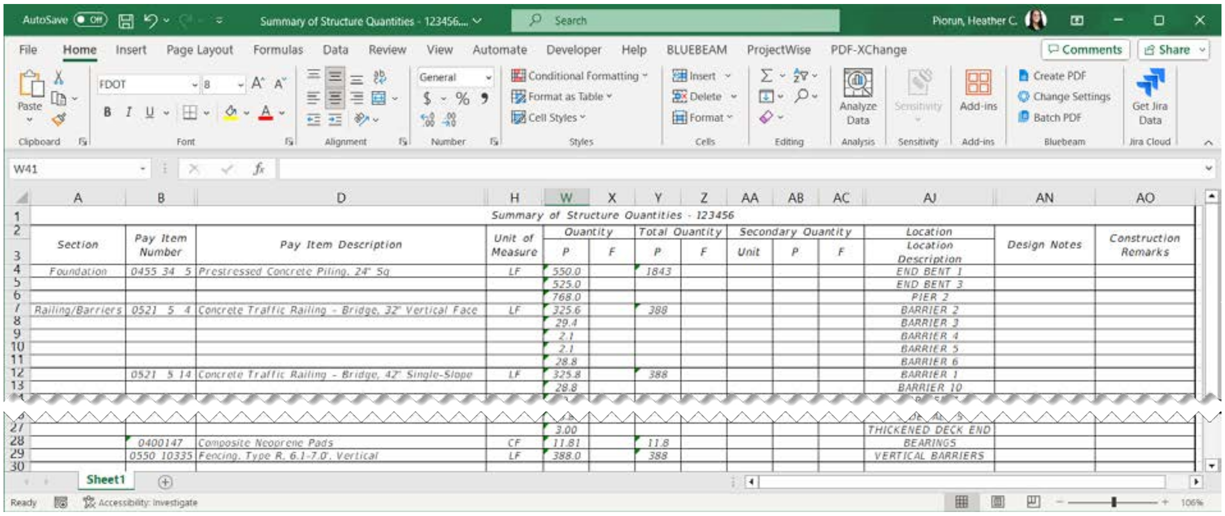


6. Open the **Structures Report Final** tool by navigating to and selecting **OpenBridge Modeler** (Workflow) **> FDOT > Quantities > Structures Report Final**.

7. The *OBM Quantity Reports Converter* window will open and will search for available raw reports. The output location is set to C:\Worksets\FDOT\12345678901\Calculations. Click **Run** to run and open the Summary of Structure Quantity Report. Click **OK** to close the file converted window that opens. The reports converter window can also be closed.



8. Within the new spreadsheet that opens, the column widths can be adjusted to display all the information more clearly.



	Section	Pay Item Number	Pay Item Description	Unit of Measure	Quantity P	Quantity F	Total Quantity P	Total Quantity F	Secondary Quantity Unit	Secondary Quantity P	Secondary Quantity F	Location Description	Design Notes	Construction Remarks
1	Summary of Structure Quantities - 123456													
4	Foundation	0455 34 5	Prestressed Concrete Piling, 24" Sq	LF	550.0		1843					END BENT 1		
5					525.0							END BENT 3		
6					768.0							PIER 2		
7	Railing/Barriers	0521 5 4	Concrete Traffic Railing - Bridge, 32" Vertical Face	LF	325.6		388					BARRIER 2		
8					29.4							BARRIER 3		
9					2.1							BARRIER 4		
10					2.1							BARRIER 5		
11					28.8							BARRIER 6		
12		0521 5 14	Concrete Traffic Railing - Bridge, 42" Single-Slope	LF	325.8		388					BARRIER 1		
13					28.8							BARRIER 10		
27					3.00							THICKENED DECK END		
28		0400147	Composite Neoprene Pads	CF	11.81		11.8					BEARINGS		
29		0550 10335	Fencing, Type R, 6.1-7.0', Vertical	LF	388.0		388					VERTICAL BARRIERS		
30														

NOTE	***In this example, the beams, approach slab, and pedestal concrete quantities are not being pulled into the raw spreadsheet from the bridge model. For any issues with the FDOT Structures Report Raw or FDOT Structures Report Final tools, please contact CADD.Support@dot.state.fl.us.***

8 ADVANCED TOPICS

OVERVIEW

There are a number of topics commonly encountered in bridge model centric workflows which fall outside of the limits of the main scope of this training guide due to their advanced nature. FDOT has already developed supplemental guides for some of these topics and plans to release additional guides in the future. The intent of this section is to provide links to those that are already developed and provide interim guidance until the others are developed.

OBJECTIVES

The objectives of this chapter are to introduce some advanced topics that are commonly encountered including:

- Rebar Modeling
- Options for Modeling Fences
- Thickened Deck Overhang Modeling
- Retaining Wall Modeling Workflow
- Florida Slab Beam Workflow
- OBM Solids Modifications (exercise included at end of chapter)

REBAR MODELING

While rebar modeling is not required at this time, it is highly recommended for complex reinforced concrete elements that have a high level of rebar congestion or interface with other reinforced concrete elements. Examples of this are: pier caps, columns, and footings. Bentley's reinforcement modeling & detailing software is *ProConcrete*. *OpenBridge Modeler* (standalone *OBM* and *OBM* within *OpenBridge Designer*) comes with about 50% of the *ProConcrete* tools. The *ProConcrete* tools that come with *OBM* are the tools needed to model the rebar and apply bar marks. While a rebar modeling training guide has not been developed yet, there are good resources on Bentley's YouTube Channel. Link to their rebar modeling playlist HERE.

OPTIONS FOR MODELING FENCES AND RAILS

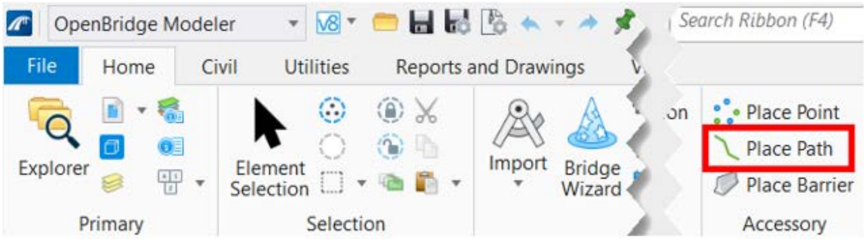
Depending on the level of detail desired for a bridge model, it may or may not be necessary to model bridge fencing or rails. Often, the concrete parapet can be modeled without these elements and the length of parapet can be used for the quantity. In general, there are three options when bridge fencing or rail is present:

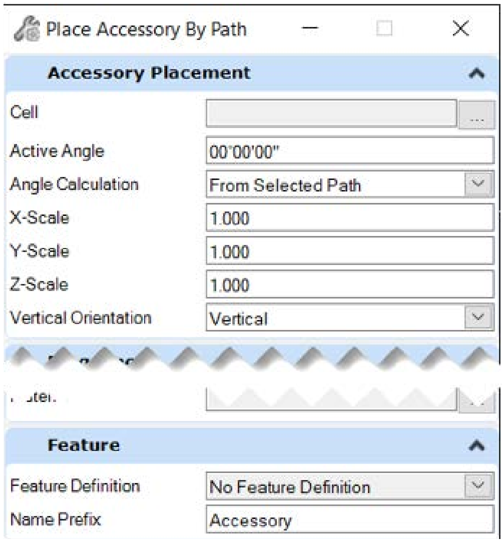
- Do not model the fence – add 2D linework into plans sheet
- Model the fence using 3D linestyles
- Model the fence using 3D cells

The first option is the simplest. Not every detail of a bridge needs to be modeled, and in the case of a fence, there could potentially be more detail required in the bridge fencing than it is worth from a construction perspective since bridge fencing follows the FDOT Standard Plans. With this option, users would simply model the concrete parapet or barrier that the fence is to be mounted on. This way, the quantity for the fence can be extracted from the parapet or barrier length. Once the model-centric plans are created, users can simply add 2D linework on top of the model-centric elements once they are in the drawing model.

The second option involves using 3D linestyles to represent the fence or rail. While this gives a visual representation of the element in 3D, depending how the linestyles are set up, they may not print as desired within the typical section sheet. This method is fairly well documented in OpenRoads Designer workflows, as it is more common for corridor modeling. FDOT is working on developing 3D linestyles for bridge railing.

The last option is the most complex and furthest from inclusion in the FDOTConnect workspace and FDOT bridge modeling workflow. It involves developing full 3D cells for the fence or rail components that can are repeatable and can be placed using the Place Path tool within OpenBridge Modeler, which can be found in **OpenBridge Modeler** (Workflow) **> Home > Accessory > Place Path**.

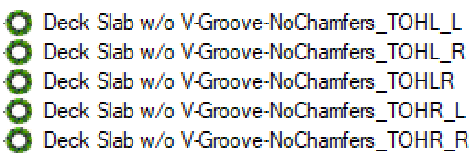




Once the cell is developed, this tool can be used to place the cell along a path. Bridge alignment with offset can be used as the path or a guideline could be used (i.e. barrier or parapet). This option is the most complete in terms of a high degree of modeling detail, but involves the most effort to develop. Some companies have developed project-specific cells for instances like this. FDOT is evaluating the need for 3D cells such as these to be developed and provided as a part of the workspace.

THICKENED DECK OVERHANG MODELING

Per FDOT Structures Design Guidelines, the standard deck thickness for new construction of "Long Bridges" for CIP deck on beams or girders is 8.5". Thickened deck overhangs are required in certain situations if you are using table 4.2.5-1 in the FDOT Structured Design Guidelines for minimum transverse reinforcing. If following that table, the following barrier types will require a 10" thick deck (not including extra thickness required for deck planing): 42" F-Shape, 8'-0" Noise Wall, and 42" Single-Slope. Modeling this thicker deck overhang while maintaining the 8" thick deck elsewhere is possible in OBM. Several deck templates have been setup in the FDOT Connect workspace to accommodate this workflow as seen below.



Additional versions of the thickened overhang templates may be added in the future, but the nomenclature at the end will remain the same:

- TOHL_L (Thickened Overhang Left, Left) – Use when you only have a thickened overhang on the **left** side of the bridge and the thickened overhang terminates to the **left** of the PGL.
- TOHL_R (Thickened Overhang Left, Right) – Use when you only have a thickened overhang on the **left** side of the bridge and the thickened overhang terminates to the **right** of the PGL.
- TOHLR (Thickened Overhang Left & Right) – Use when you only have a thickened overhang on **both** the left & right sides of the bridge.
- TOHR_L (Thickened Overhang Right, Left) – Use when you only have a thickened overhang on the **right** side of the bridge and the thickened overhang terminates to the **left** of the PGL.
- TOHR_R (Thickened Overhang Right, Right) – Use when you only have a thickened overhang on the **right** side of the bridge and the thickened overhang terminates to the **right** of the PGL.

Since the horizontal position of the thickened overhang is controlled by the flange of the girder, the overall workflow for modeling thickened overhangs is as follows:

1. Model the deck with thickened overhang template that applies to your scenario
2. Model the girders
3. Trace the outside edges of girder flanges with Civil Lines (horizontal geometry)
4. Complex the civil lines together & offset them 1/8" away from edge of flange (for haunch modeling tolerance)
5. Update the deck template to use horizontal point control on the thickened overhang stop point, using the offset traced flange lines from step 4

RETAINING WALL MODELING WORKFLOW

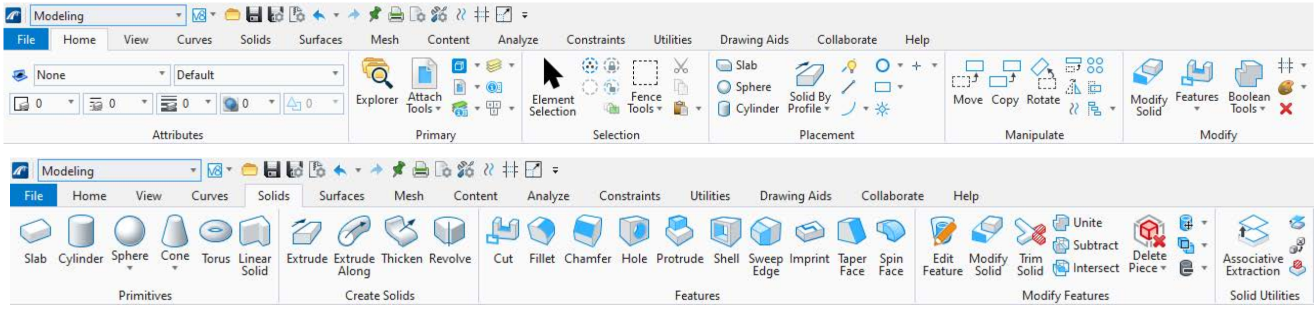
The design and detailing of retaining walls has always been a collaborative effort between the Roadway and Structures disciplines. Modeling retaining walls is no exception. The tools used in the retaining wall modeling workflow are OpenRoads Designer tools, so roadway engineers and designers may be more familiar with them. However, the workflow can be followed by either discipline, depending how each group wants to handle it within a project. While there are many ways to model retaining walls, FDOT has developed an example workflow to help users familiarize themselves with the tools HERE.

FLORIDA SLAB BEAM WORKFLOW

The Florida Slab Beam (FSB) workflow has several nuances that are not covered by this training guide. In the more recent releases of FDOTConnect, the FSB beam and deck templates have been improved. To supplement the OpenBridge Modeler training guide and discuss the workflow required to model FSB bridge superstructures, FDOT has developed an example workflow HERE.

OBM SOLIDS MODIFICATIONS

Depending on a model's level of detail, it may not always be possible to model a bridge exactly as desired with the standard OBM tools. Because OBM is used globally, Bentley is not able to accommodate every agency's standard details and practice. While many FDOT practices have been incorporated into the program, certain aspects of design such as the top flange clips specified in SPI 450-010 and the turnbacks that are typically detailed at either end of end bent caps/backwalls are difficult to build into OBM and cannot be modeled with the standard bridge modeling tools. Therefore, for models that require a higher level of detail, the Modeling workflow, which contains all of MicroStation's 3D drawing and manipulation tools, can be used to modify the bridge model.



There is no one way to complete these modifications. Because the MicroStation library of 3D tools is so vast many different techniques can be used to accomplish the same outcome. The following solids modification exercise provides just one way to incorporate beam clips and end bent turnbacks into a model.

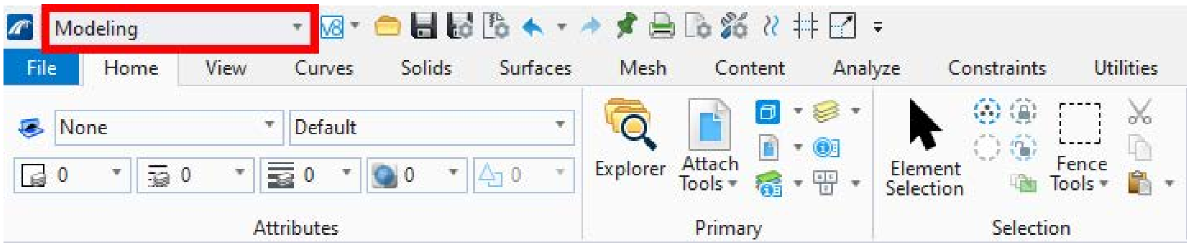
A bridge model must, however, be completely modeled before incorporating and modifications to the bridge components. Often times making changes to the model's elements with the Microstation 3D modeling tools can make those elements unable to be altered with the OBM bridge modeling tools after the fact. Therefore, it is imperative that solids modification in the Modeling workflow be the very last step in one's modeling process.

EXERCISE OVERVIEW

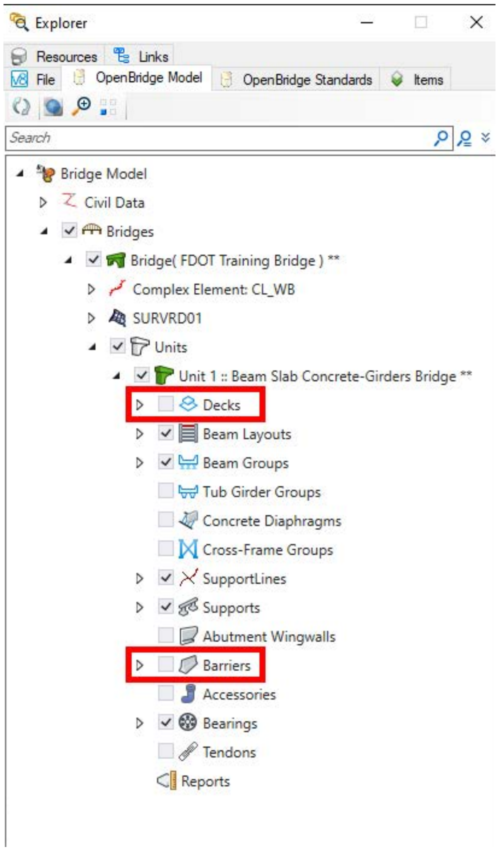
EXERCISE 8.1 *SOLIDS MODIFICATION: BEAM CLIPPING & MODIFYING OBM END BENT*

CLIP TOP FLANGES OF BEAMS

1. Open the data set file: *B01MODLBRTR01_8.1_Begin.dgn*
2. Navigate to the **Modeling** workflow to access the tools needed for solids modification.



3. To allow the beams to be easily viewed and modified, several other bridge components need to be turned off. This can be done in by opening **Home > Primary > Explorer** and clicking on the *OpenBridge Model* tab. There the deck, barriers and approach slabs can be turned off.

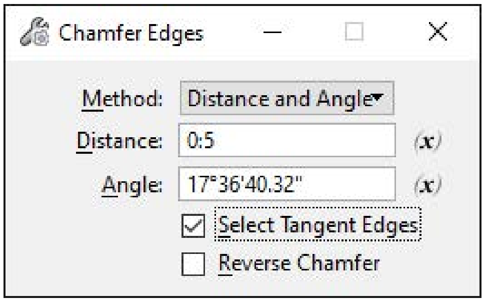


4. Next, click on the **FFBW END BENT 1** SupportLine and open its properties using the **Properties** tool to find the skew that the clip needs to match. For End Bent 1 the skew is **17°36’40.4365”** or about **17.6112°**.

5. While there are several different methods that can be used in the solid modification process, the **Chamfer** tool is one of the most efficient options when looking to clip a beam's flange. Navigate to **Solids > Features > Chamfer** to use the tool and open the *Chamfer Edges* window.

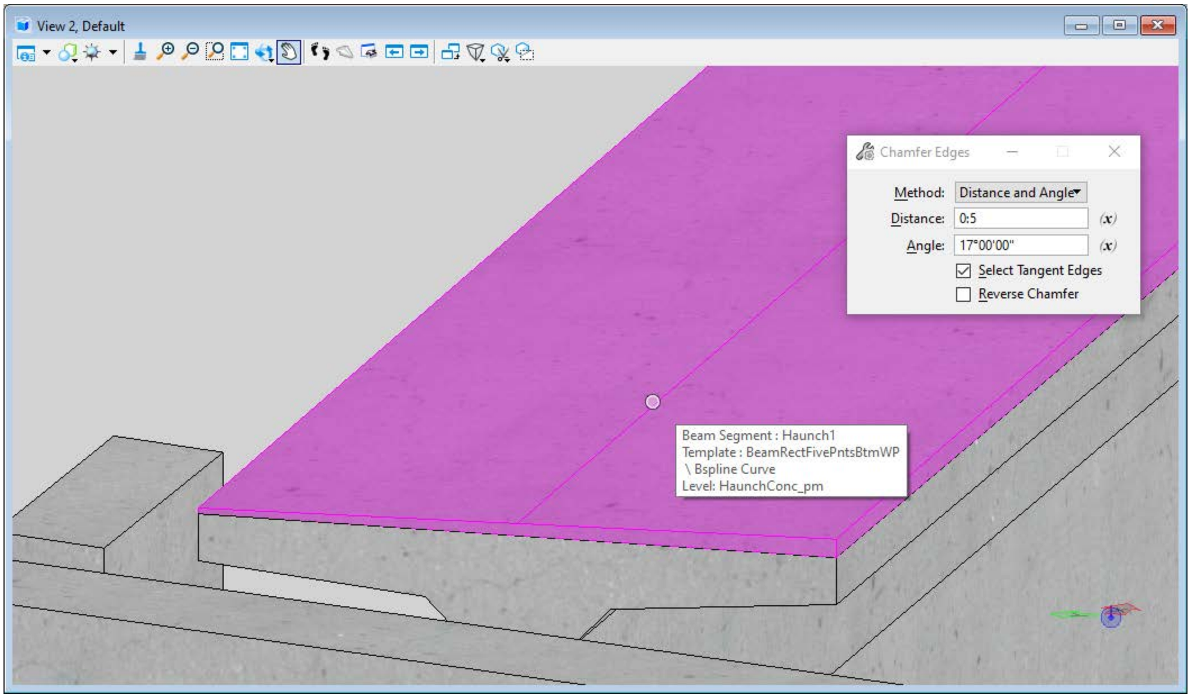
6. Next, in the *Chamfer Edges* window, set the *Method* to **Distance and Angle**.

7. Input **0:5** in the *Distance* field and match the skew from Step 4 in the *Angle* field. Note that the angle should be added in decimal format instead of DD°MM'SS" format. Otherwise the field may only allow a whole degree to be entered (i.e. **17°00'00"**) instead of allowing for the precise skew.



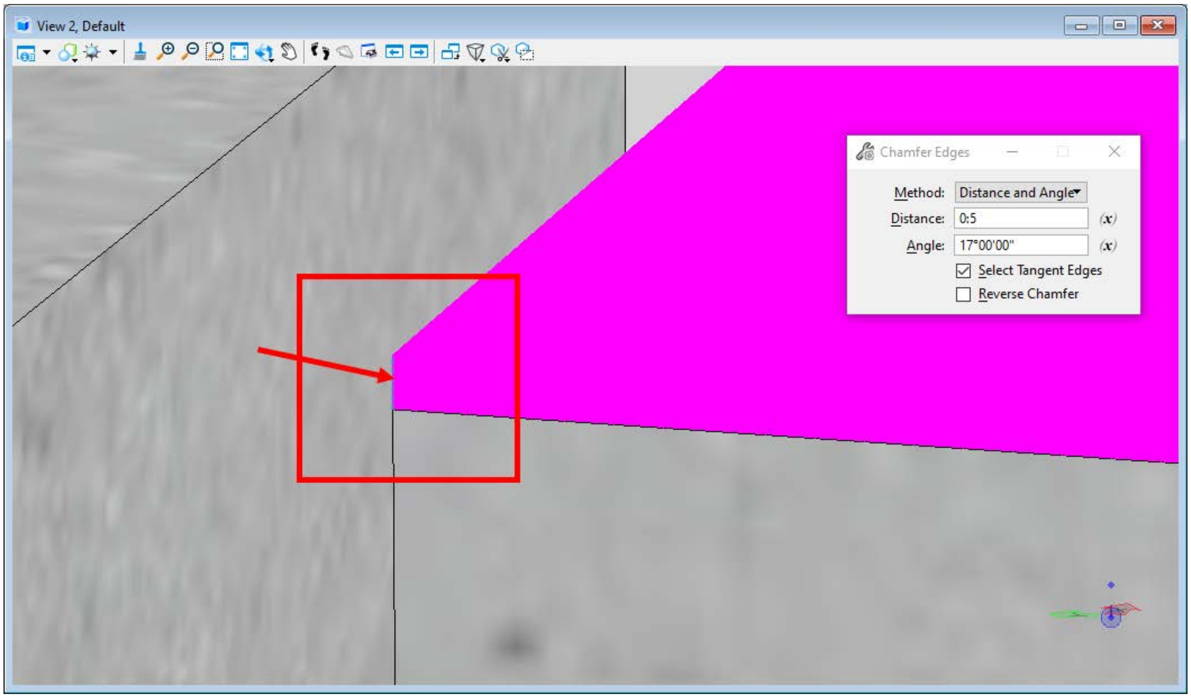
NOTE ***Sometimes when trying to click on an element to modify with the Chamfer tool, an undesired edge can accidentally be selected for chamfer. If this occurs, simply right click and the element will remain selected, but the edge will be unselected or a different edge will be proposed. The correct edge can then be selected and chamfered.***

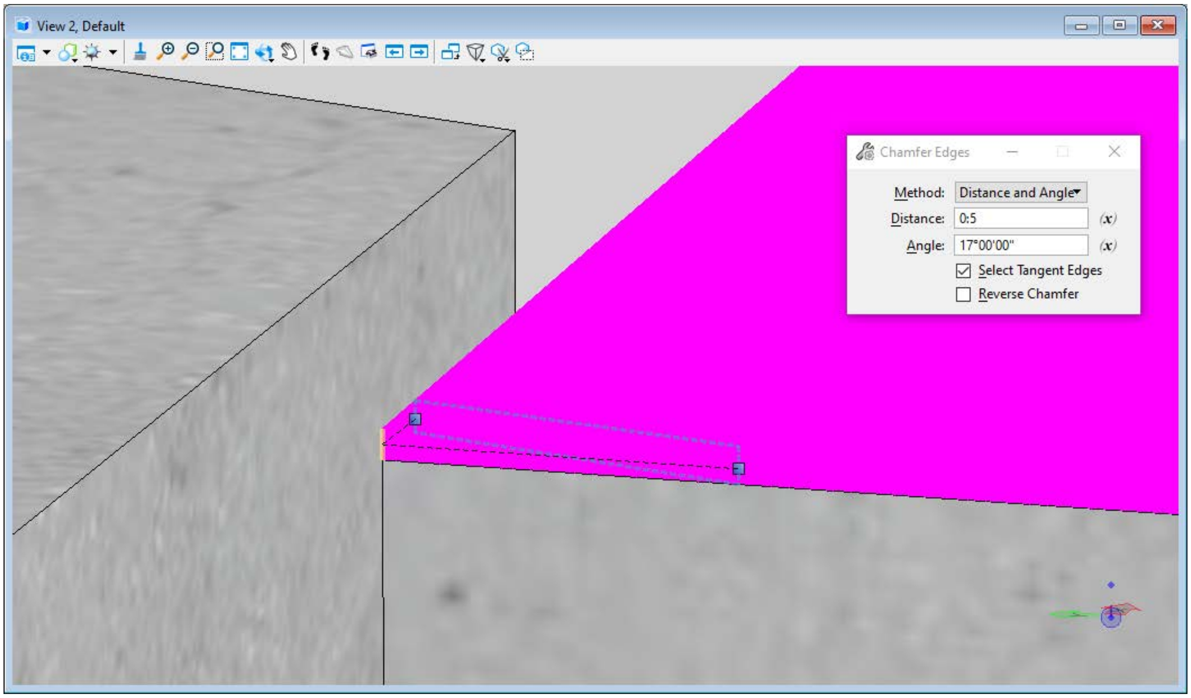
8. Open up the isometric view in View 2 and zoom in on the beginning of Beam-L in Span 1. Click on the haunch to select it for modification.



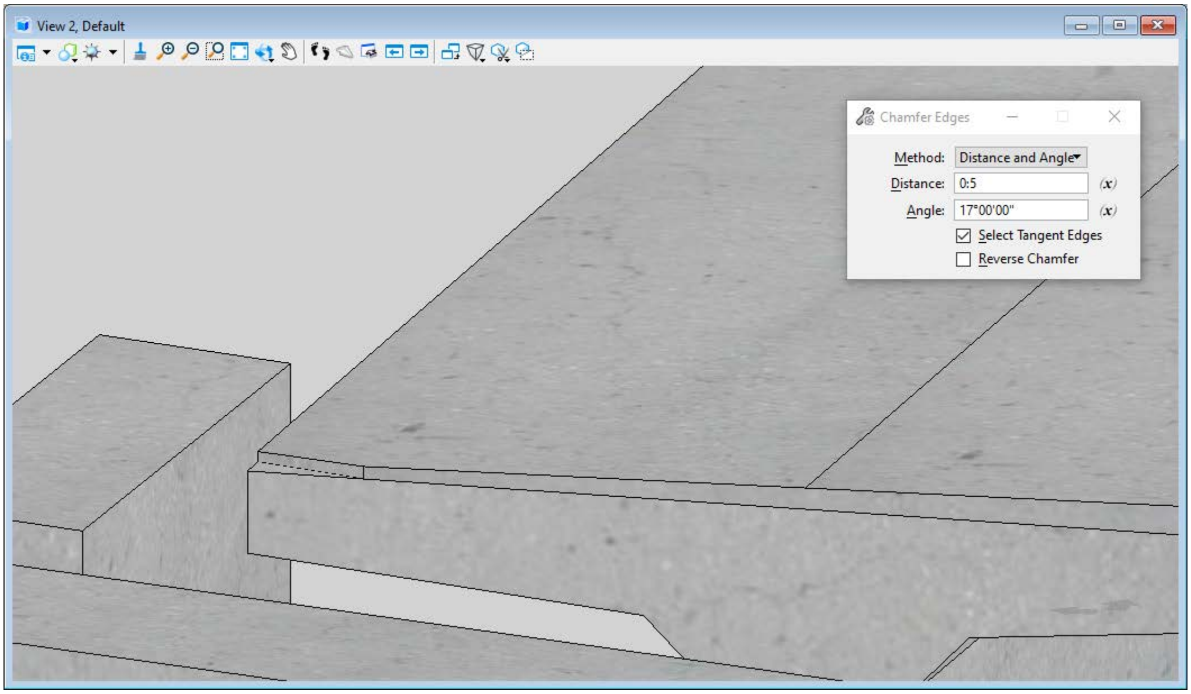
NOTE ***In some cases, it may be easier to select the component to clip in a wireframe view (i.e., View 1). In that case, the user can select the component in View 1 and then return to View 2 to select which edge should be chamfered.***

9. Click the vertical edge that is going to be chamfered (as shown in the red box below) and click one last time to confirm (shown on the following page.)

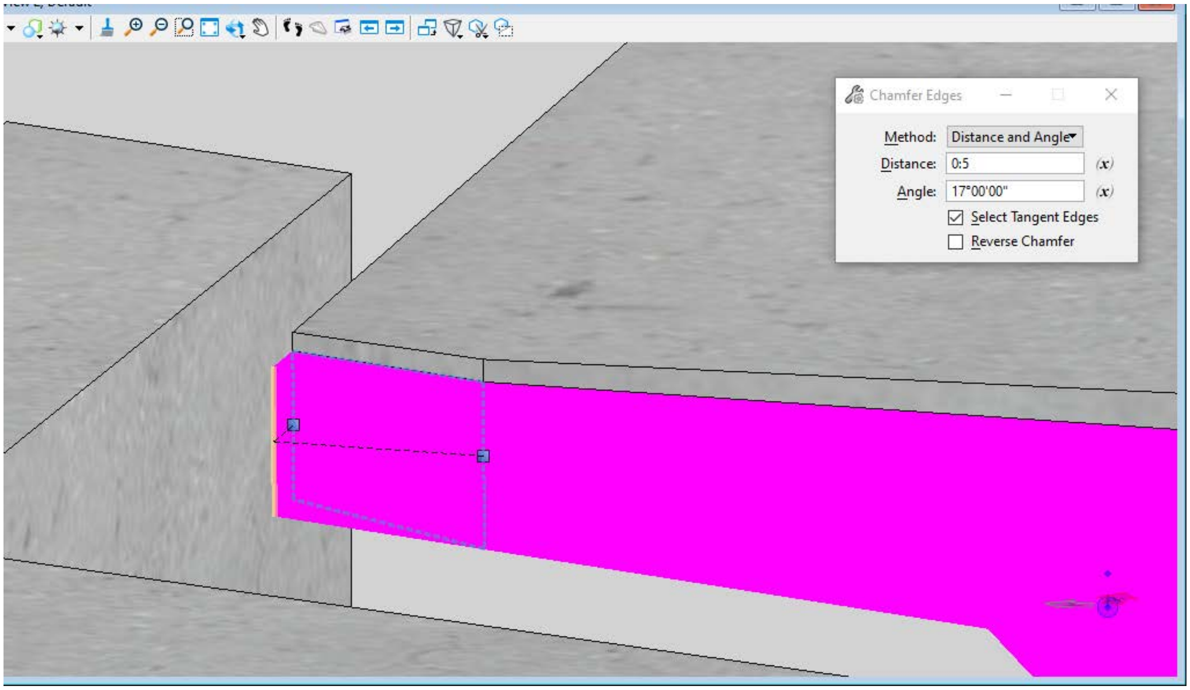




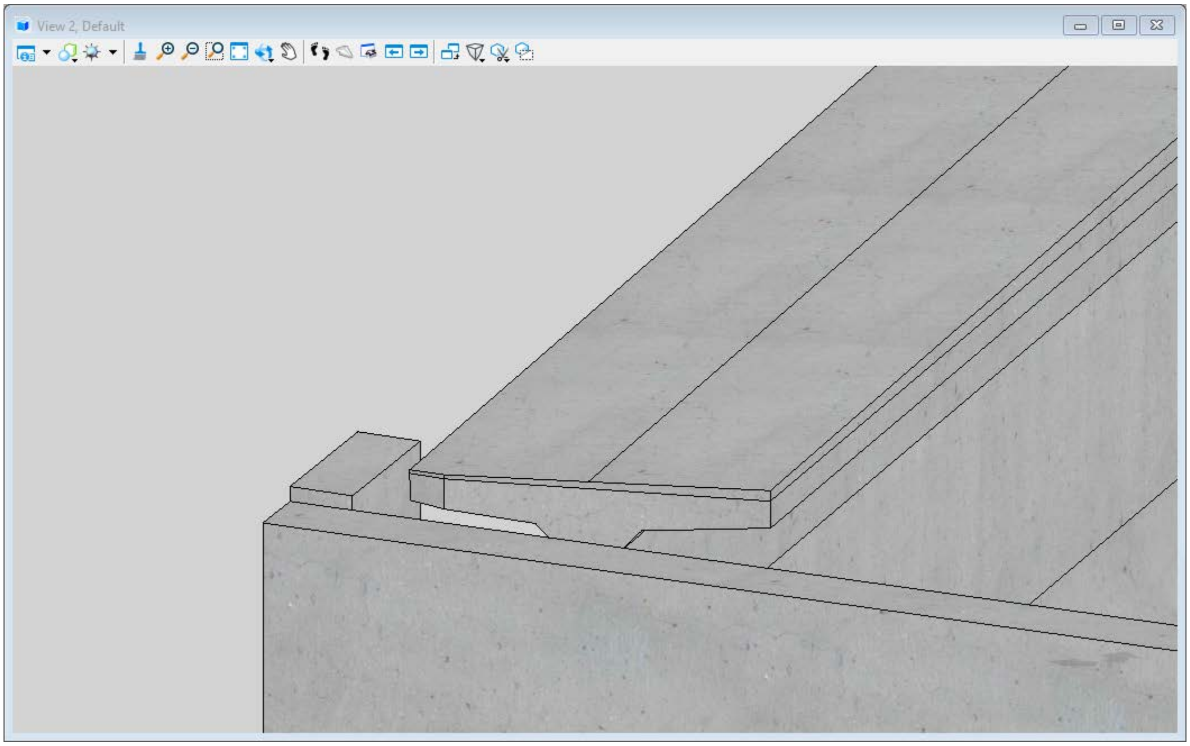
10. The clipped haunch will look like the image below.

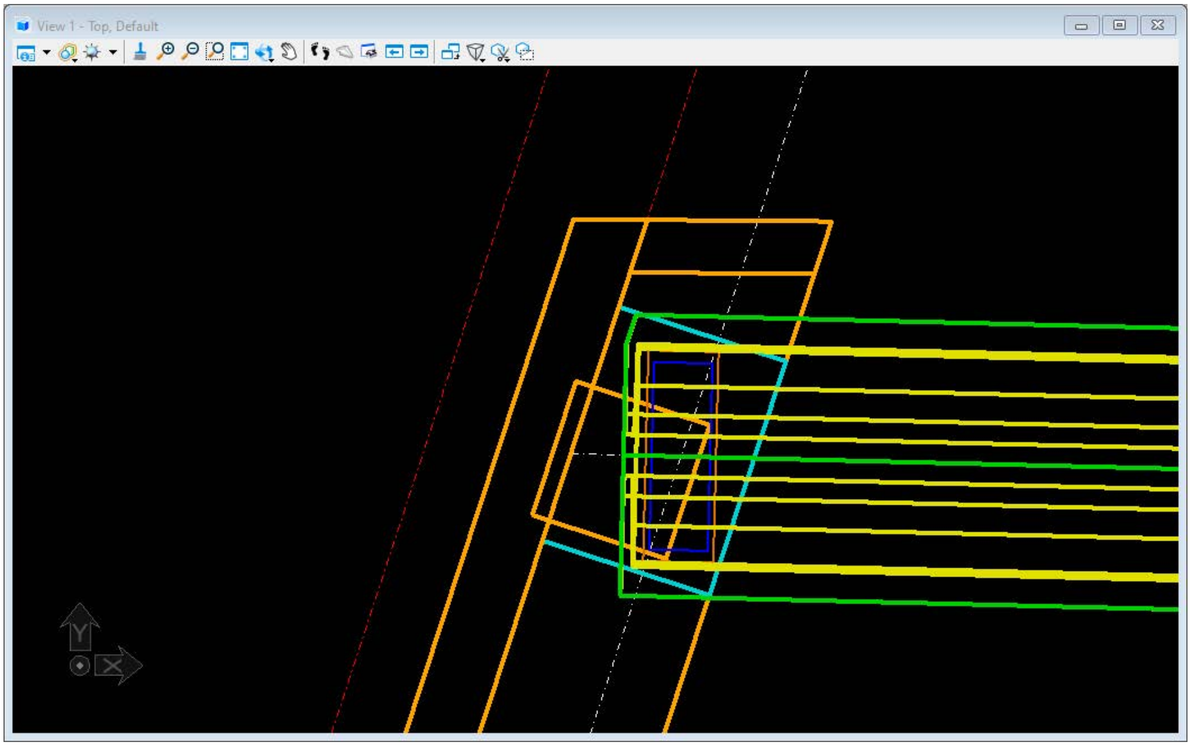


11. Keeping the *Chamfer Edges* window open and with the same inputs, select the beam.
12. Next, select the same edge that was chamfered on the haunch.

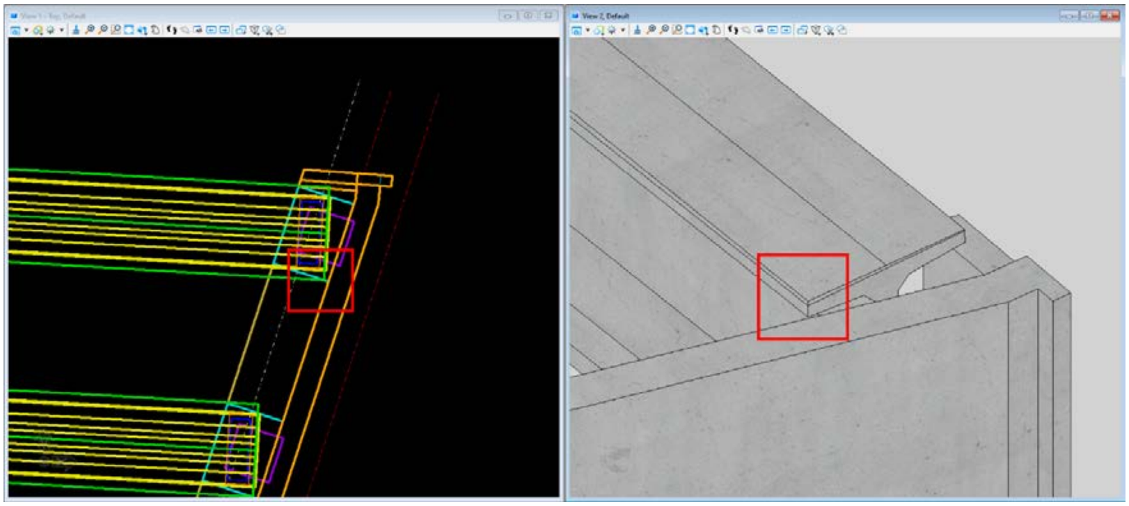


13. Data point once to confirm and complete the beam's clipping. The model will appear as shown in the following images.

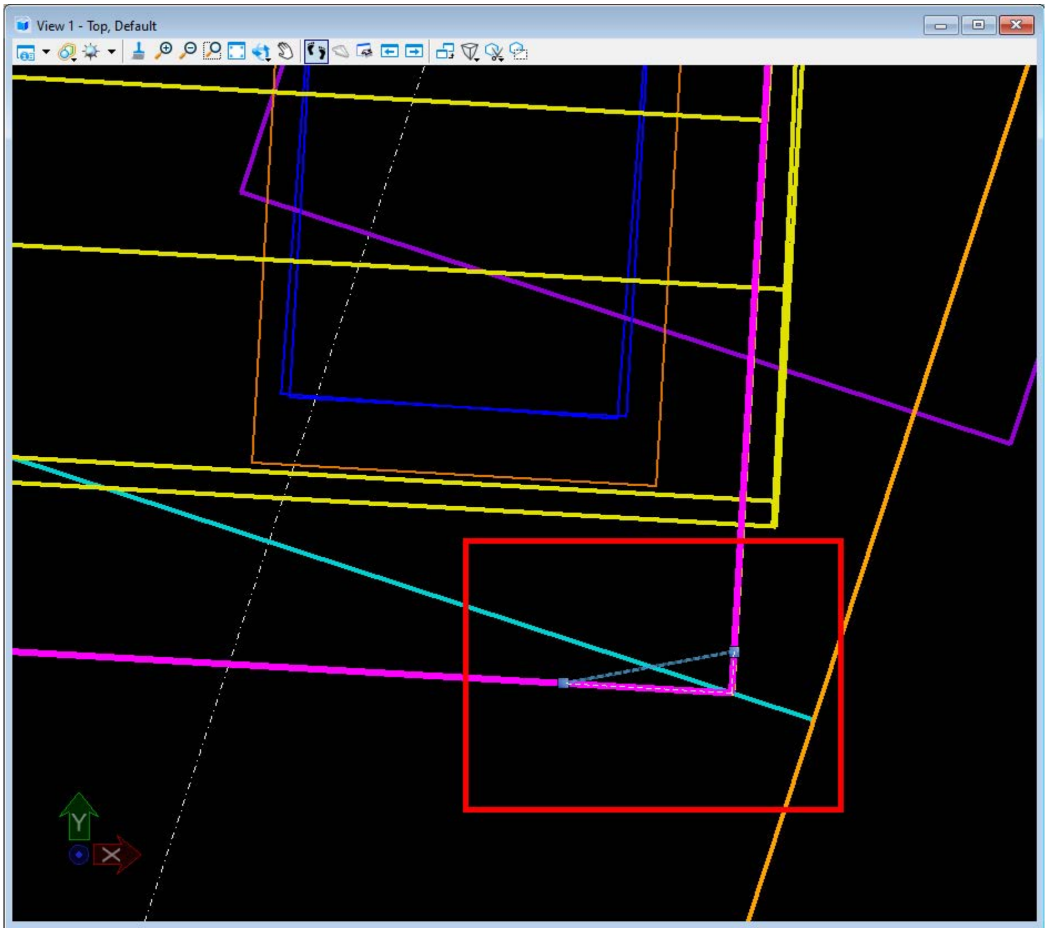


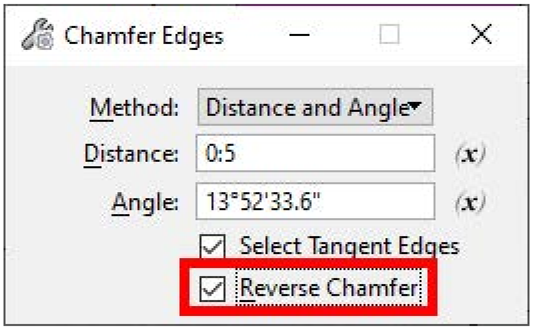


14. Repeat Steps 6 to 13 with the remaining beams at End Bent 1.
15. Next, click on the **FFBW END BENT 3** SupportLine and open its properties using the **Properties** tool to find the skew that the clip needs to match. For End Bent 3, the skew is **13°52'33.4678"** or about **13.8760°**.
16. Zoom in on the end of Beam-1 in Span 2 in Views 1 and 2. Click on the haunch to select it for modification. Then click the edge that is going to be chamfered.

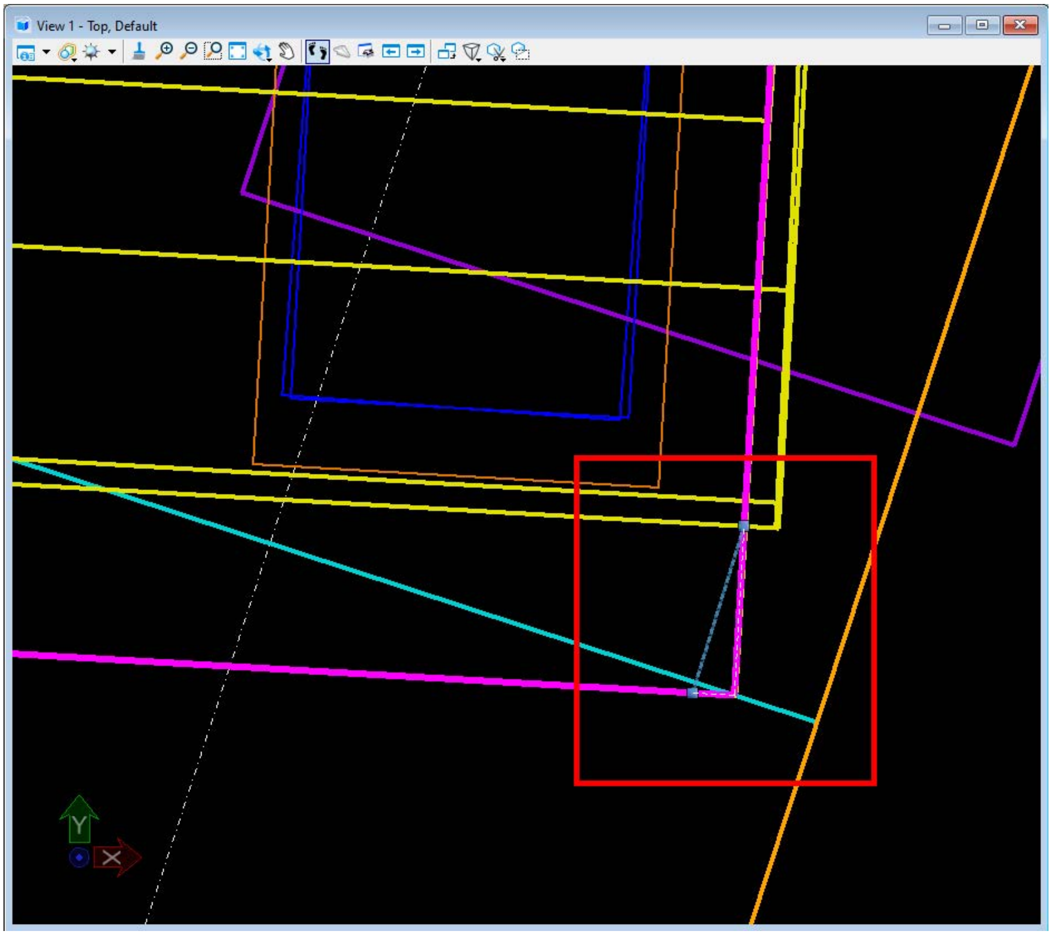


17. Before confirming the chamfer, notice in the first image below that the preview of the chamfer does not run parallel to the front face of backwall of End Bent 3. In that case, the chamfer angle must be reversed by toggling on the *Reverse Chamfer* option in the *Chamfer Edges* window, shown in the second image below.

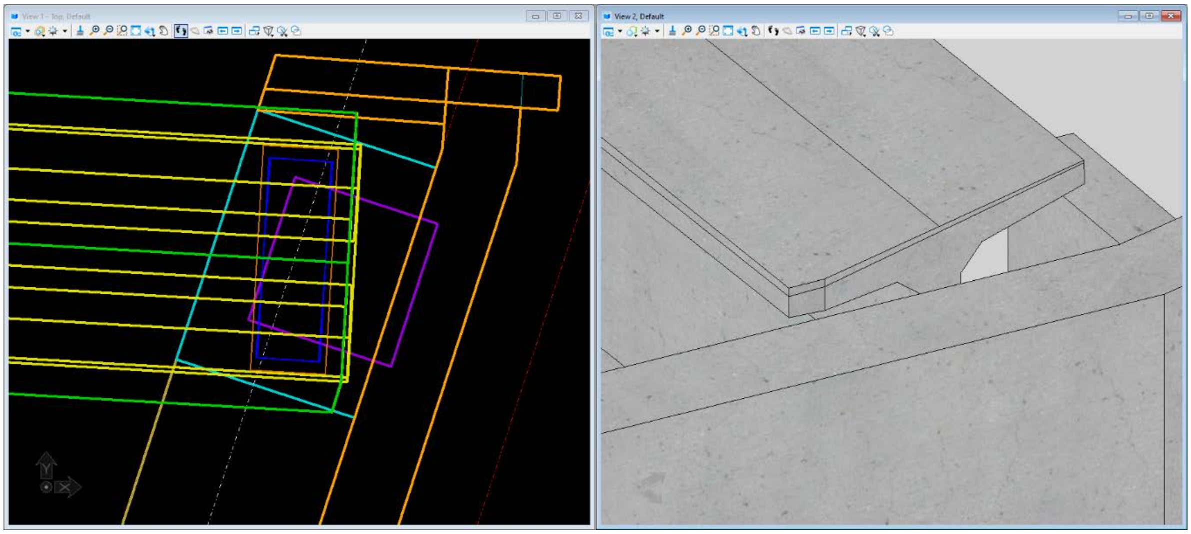




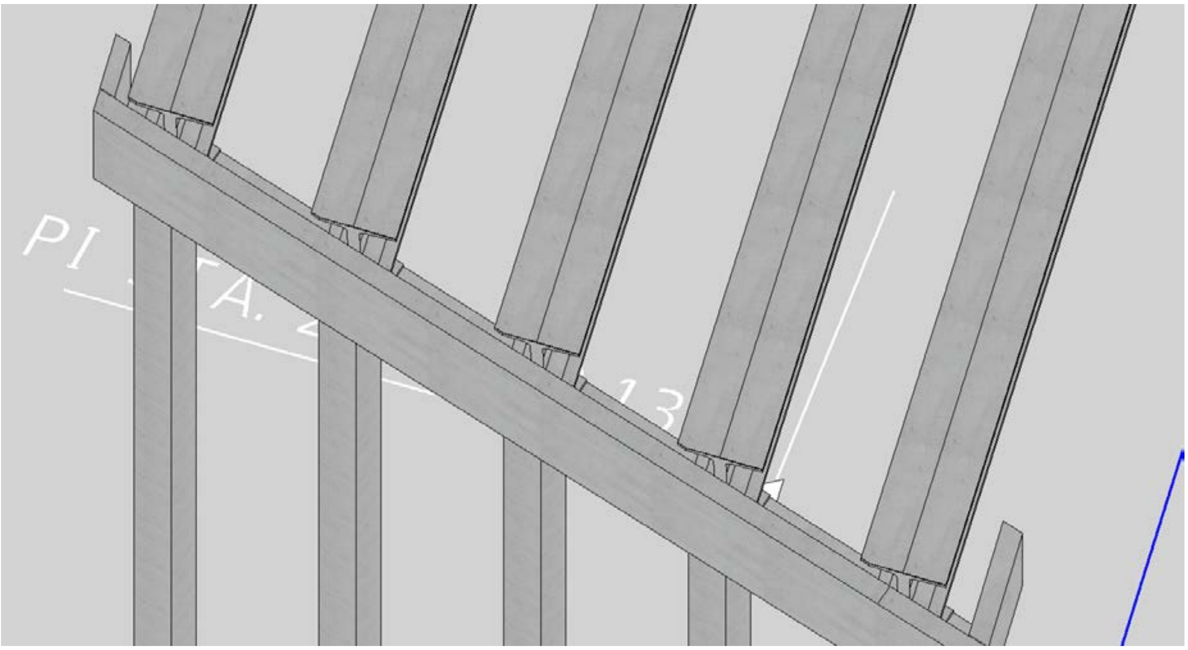
18. This will flip the chamfer and make the angle parallel to the front face of backwall as shown in the image of the chamfer preview below. Data point to accept the chamfer once the reverse of the clip has been confirmed.



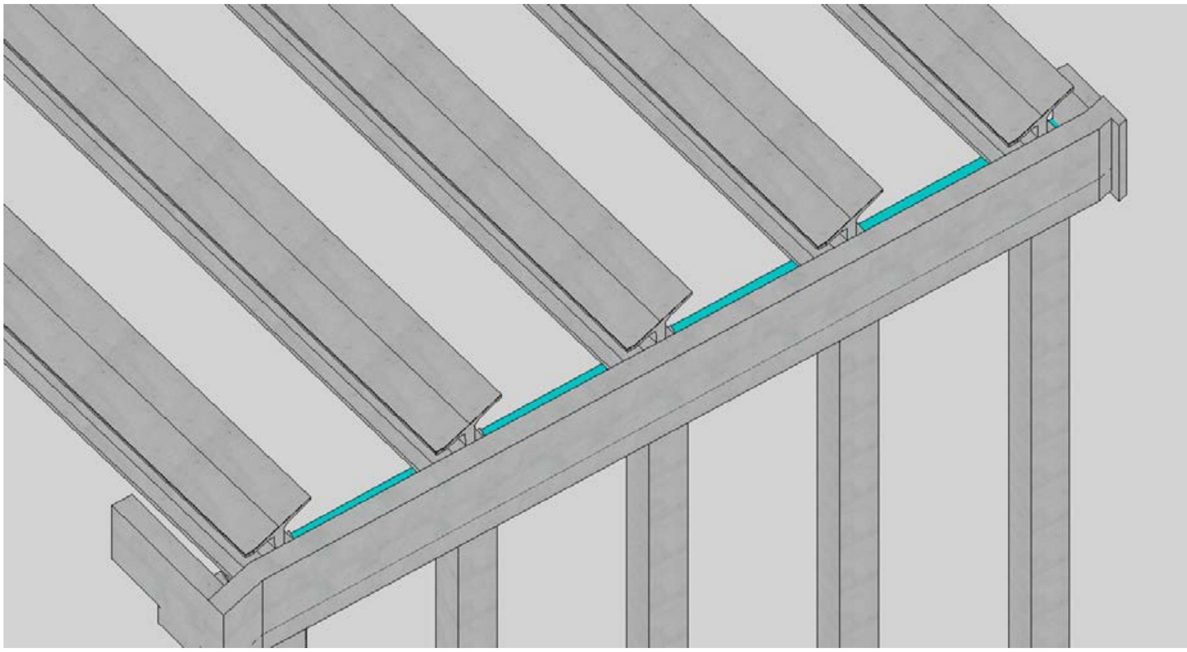
19. Keeping the *Chamfer Edges* window open and with the same inputs, select the beam. Then, select the same edge that was chamfered on the haunch.



20. Using the same inputs, clip the remaining haunches and beams at End Bent 3.
21. The model should now look like the images below.



End Bent 1

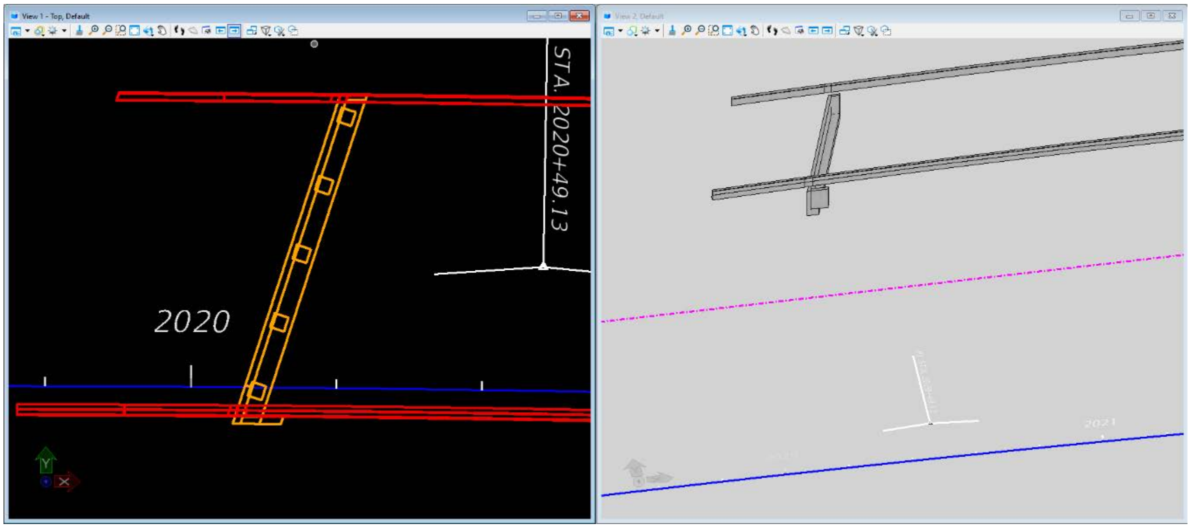


End Bent 3

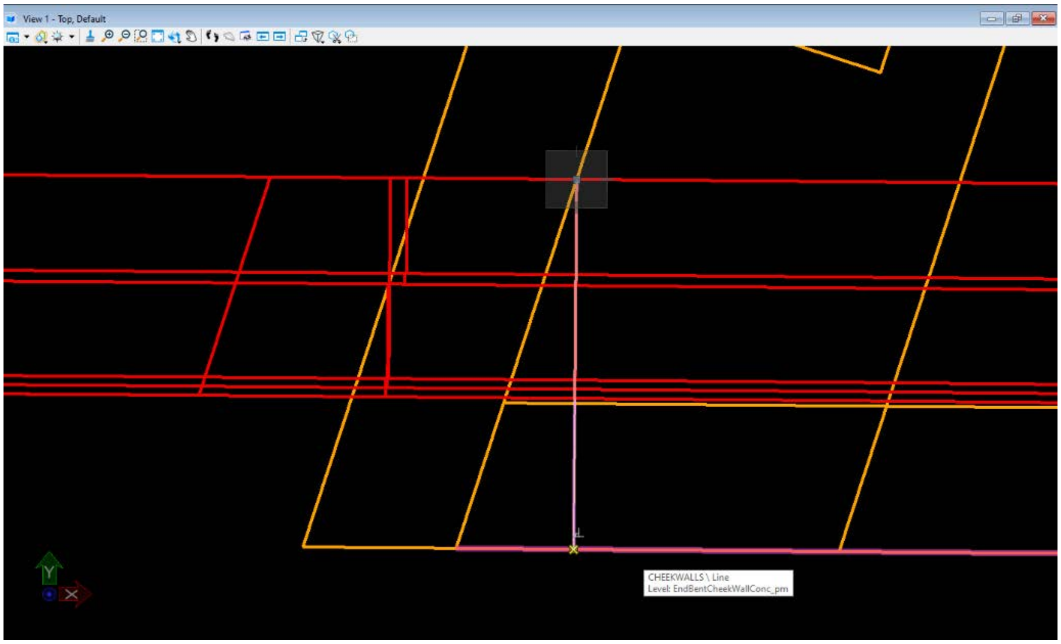
MODIFY AN END BENT

NOTE ***Once the beams have undergone solids modification, they are no longer able to be turned off through the Explorer tool. So, while all other components may be turned off there, the beams must be turned off from the display by turning off their levels in the Level Display tool. So, to avoid going between the Explorer and the Level Display all components should be turned on and off through the Level Display.***

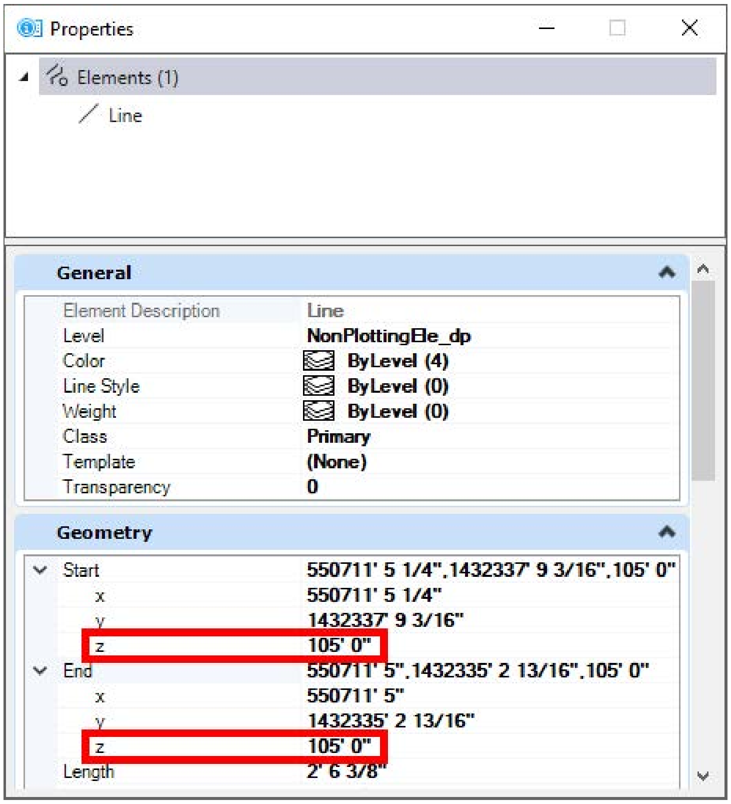
1. In the *OpenBridge Model* tab of the **Home > Primary > Explorer** tool turn all components back on. Open the **Home > Primary > Level Display** tool and turn off all levels except for the BarrierWallConc_pm, EndBentCapConc_pm, and EndBentCheekWallConc_pm. Do this for both View 1 and View 2, then double-click on the NonPlottingEle_dp level in the **Level Display** tool to set it as active. The model should look like the image below.



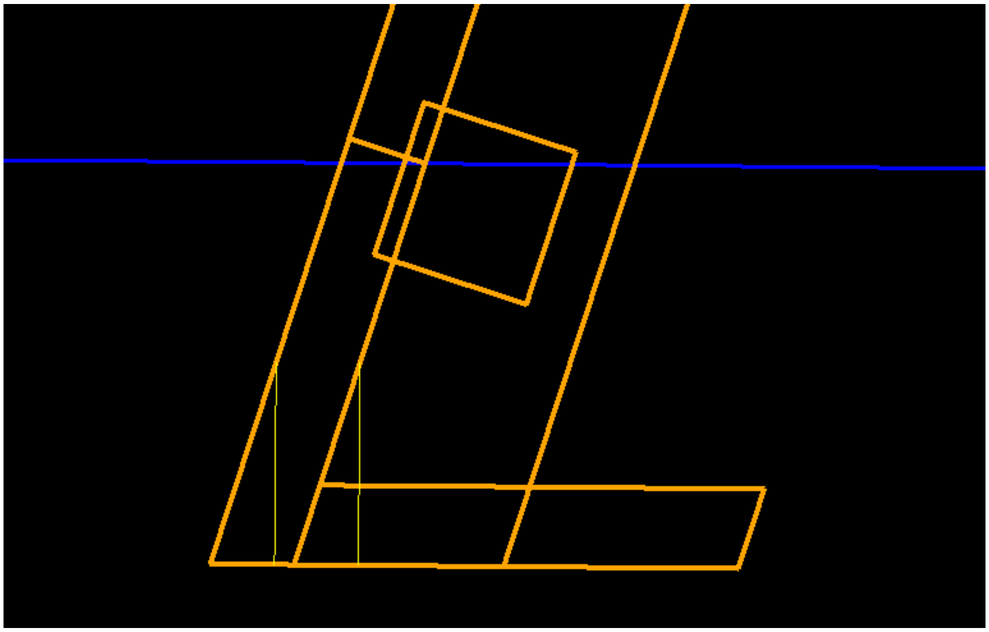
2. Start laying out construction lines for the new backwall layout at the right end of the End Bent 1 by navigating to the **Modeling** (workflow) **> Home > Placement > Place SmartLine** tool. Place the first point where the right gutterline crosses the front face of backwall and then use the **Perpendicular Snap** snap mode to draw a perpendicular line to the end of the end bent, as shown in the image on the following page.



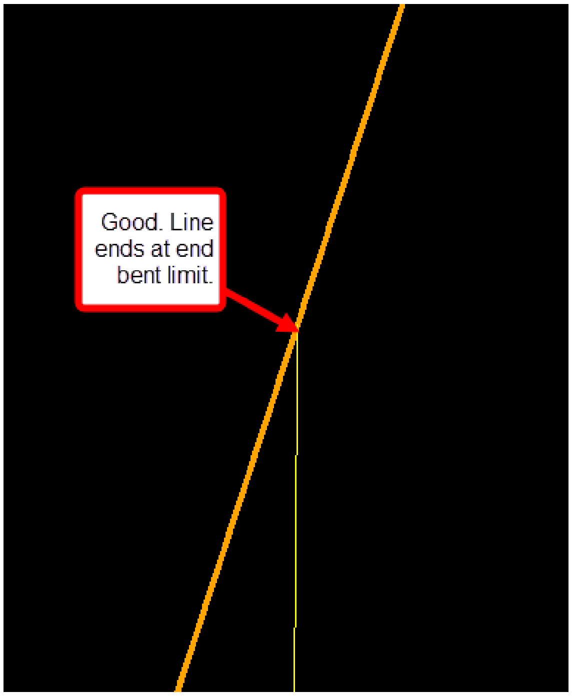
3. Next, use the **Home > Primary > Properties** tool to change the z coordinates of the line's start and end to be 105' as shown below. This will place the line at EL. 105'.



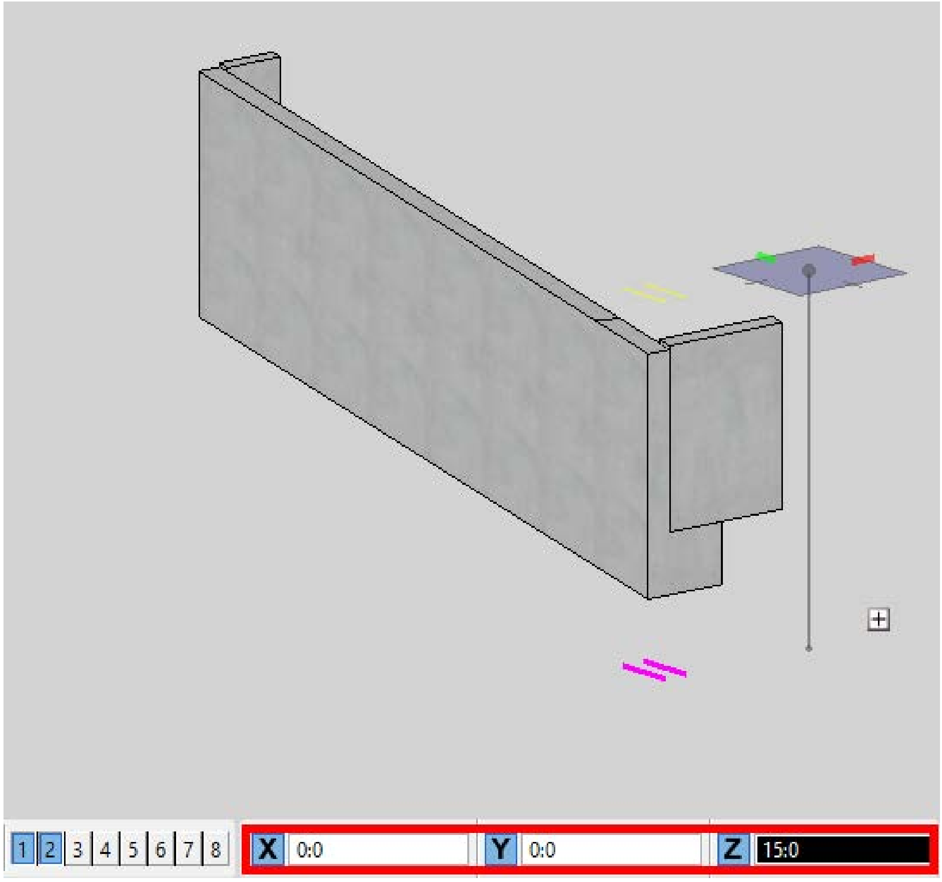
4. Use the **Home > Manipulate > Parallel** tool to copy a line parallel to the one just created but place it at the intersection of the gutterline and the back face of backwall. The BarrierWallConc_pm level can now be turned off in View 1 and View 2 using the **Level Display** tool. The model should now look like the following image.



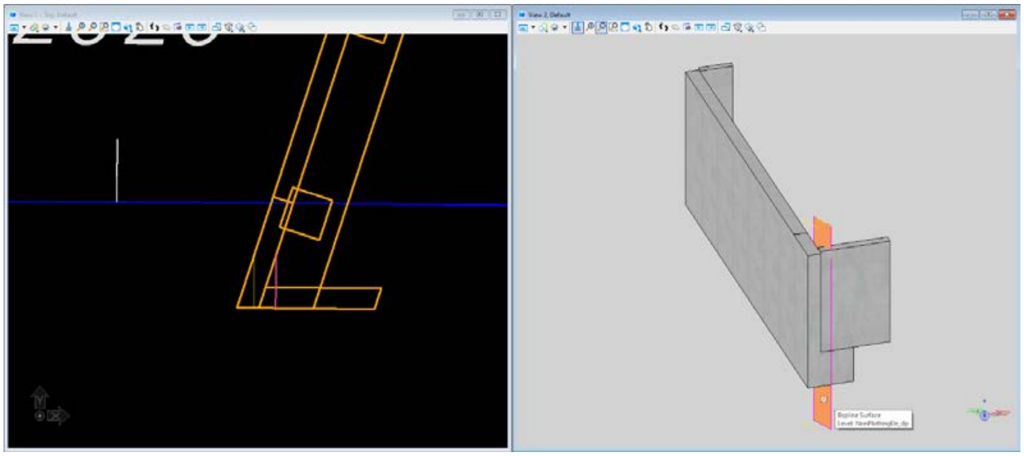
5. Zoom in on the end points of the lines that were just placed to ensure that they terminate on the intersection with the end bent at both ends of the line by clicking on the line's node and moving it to the intersection. Once lengths have been manipulated, check the line's **Properties** again to verify that both ends are at EL. 105'.



6. Select both construction lines and access the **Home > Manipulate > Copy** tool to copy both lines vertically 15'. The newly created construction lines should be at EL. 120'.

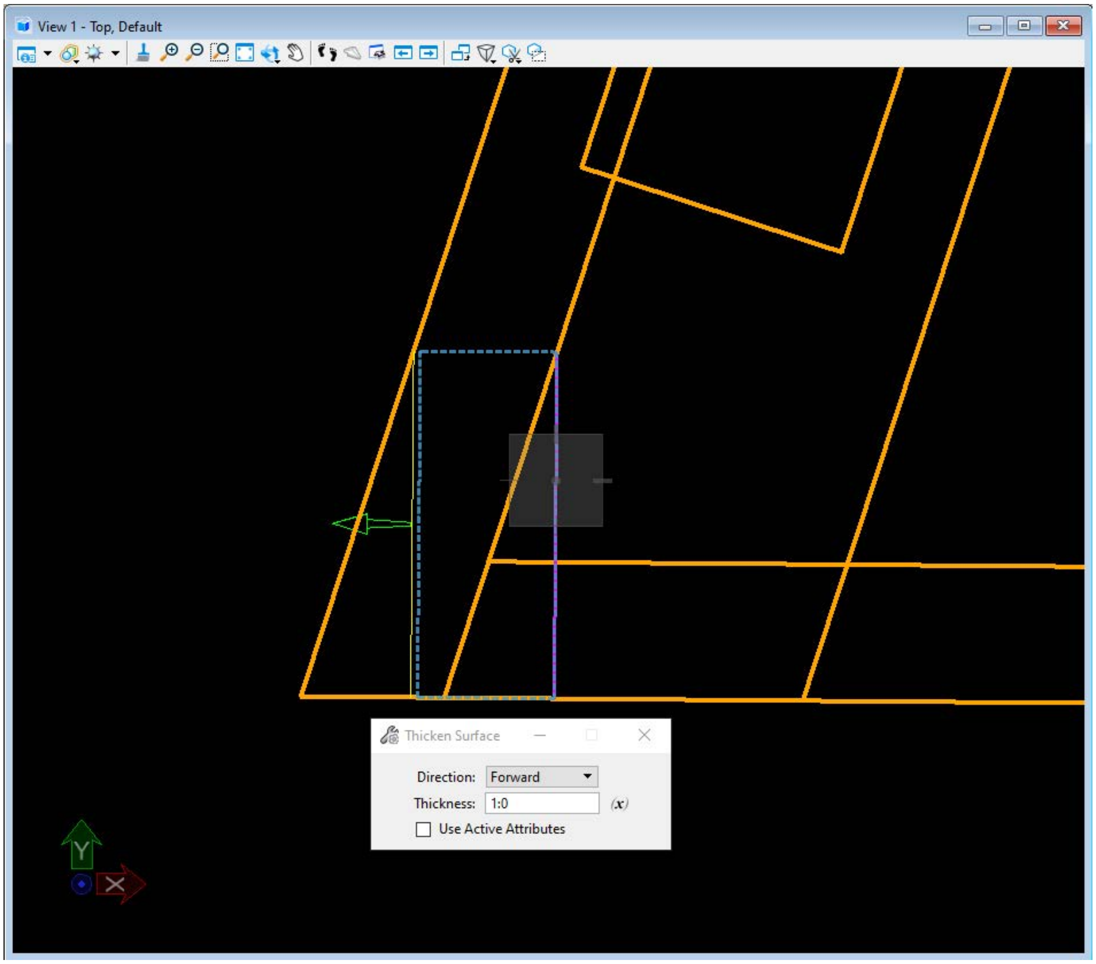


7. Then navigate to and access the **Surfaces > Create Surfaces > Construct Surface > By Edges** tool. Begin forming the first surface by clicking on the EL. 105’ construction line furthest upstation and then click on its EL. 120’ counterpart line. Data point to accept the limits and data point again to form the surface.



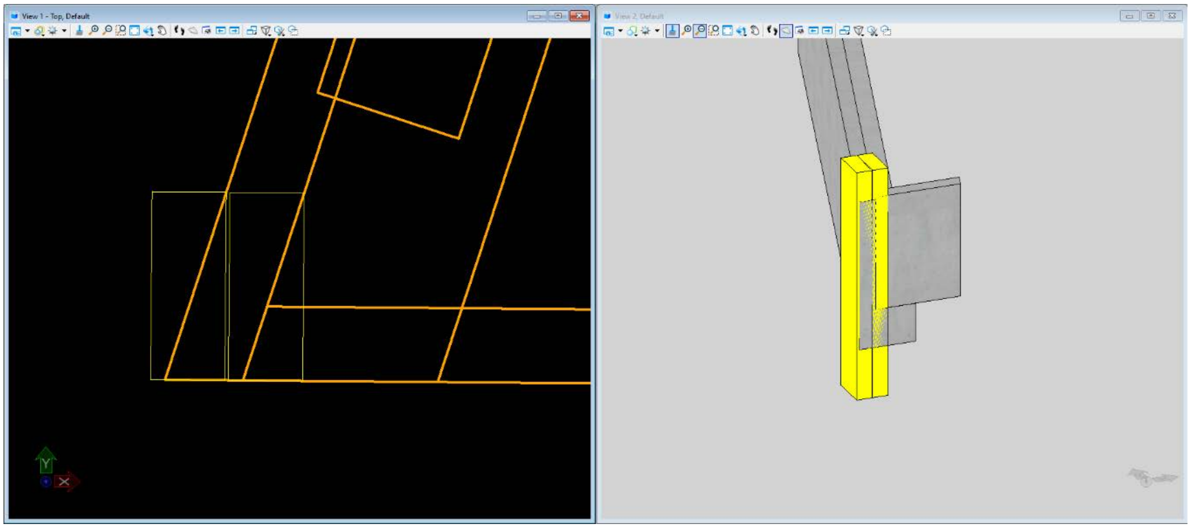
Repeat the surface creation process with the second pair of construction lines to form another surface.

8. Next, access the **Solids > Create Solids > Thicken** tool to create the solids that will be used for trimming. Once the *Thicken Surface* window has opened, set ensure the *Direction* is to **Forward** and the *Thickness* is set to **1:0**. Click on the surface furthest upstation to preview the direction and depth of the thickening in View 1. Note that if the surface was created in a different order that described in the steps prior, the Direction may need to be switched to Backward.

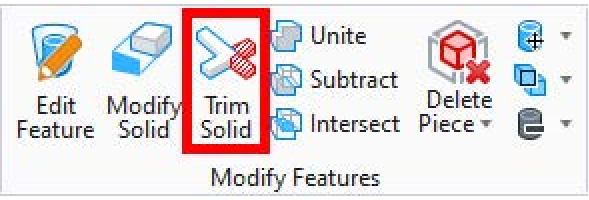


9. Data point to accept and create the solid.

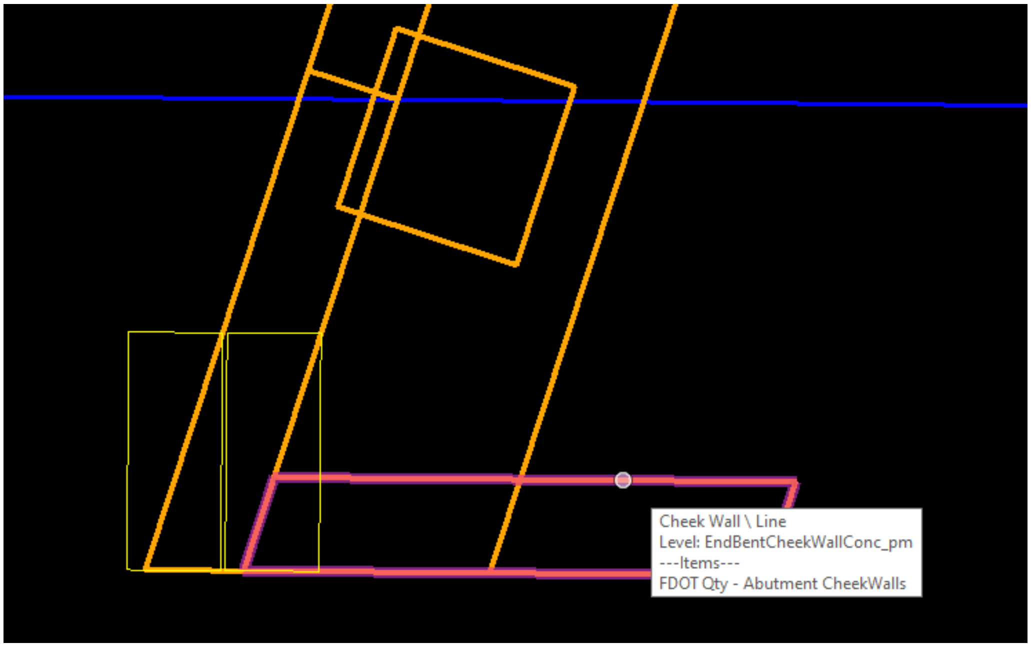
10. Repeat the solid creation process laid out in Step 6 with the second surface. The result should looks like the image below.



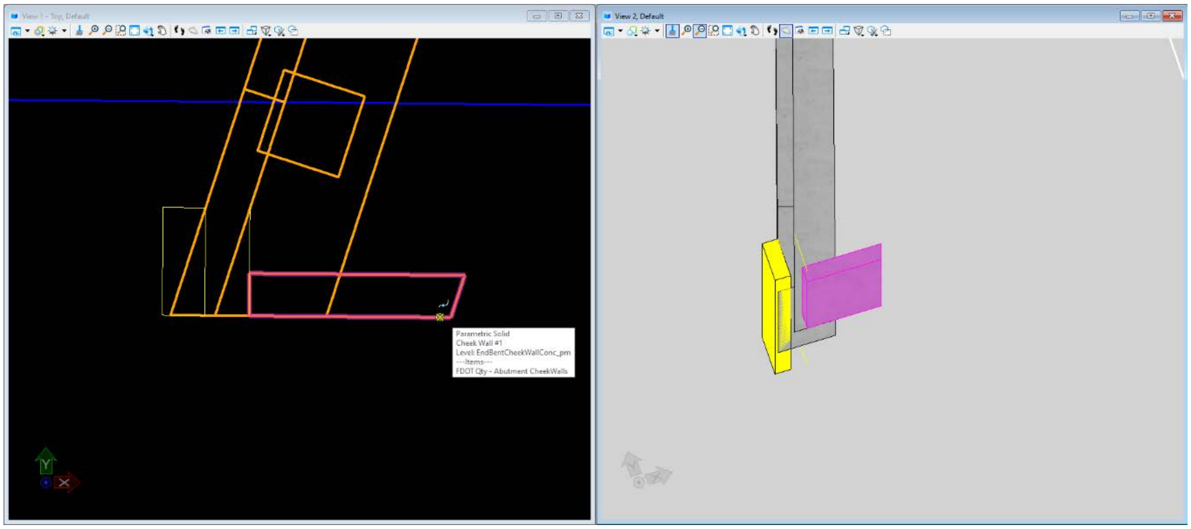
11. These newly created solids can now be used to trim elements on the end bent. First, navigate to **Solids > Modify Features > Trim Solid** to begin the trimming process.



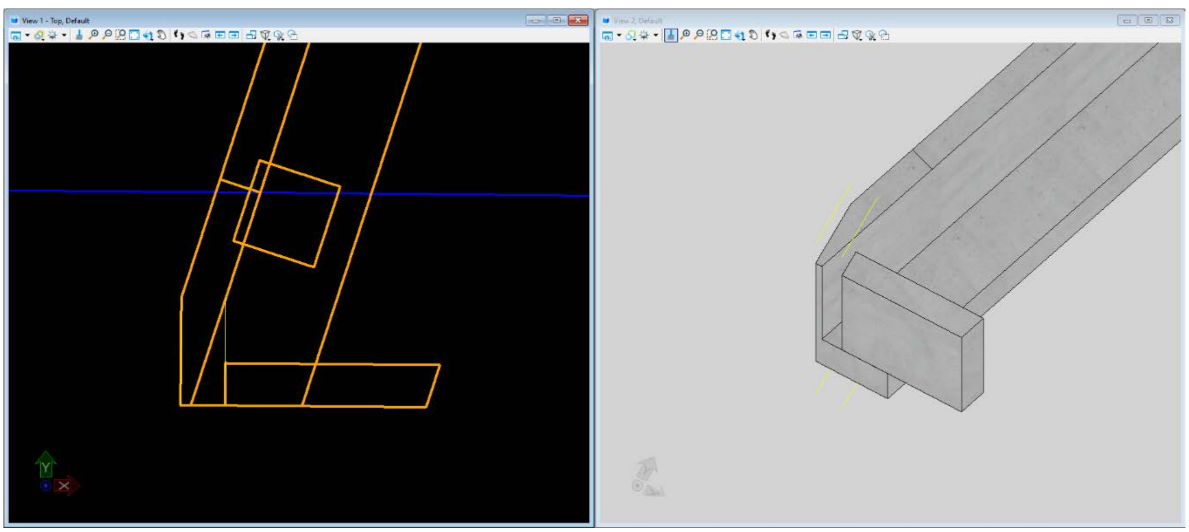
12. Once the **Trim Solid** tool has been accessed, begin trimming the cheekwall by selecting the portion of the element to keep.



Click the trimming solid which is the forward most solid that intersects with the cheekwall. Then data point to confirm the trim. This will trim the cheekwall and cause the trimming solid to be hidden.

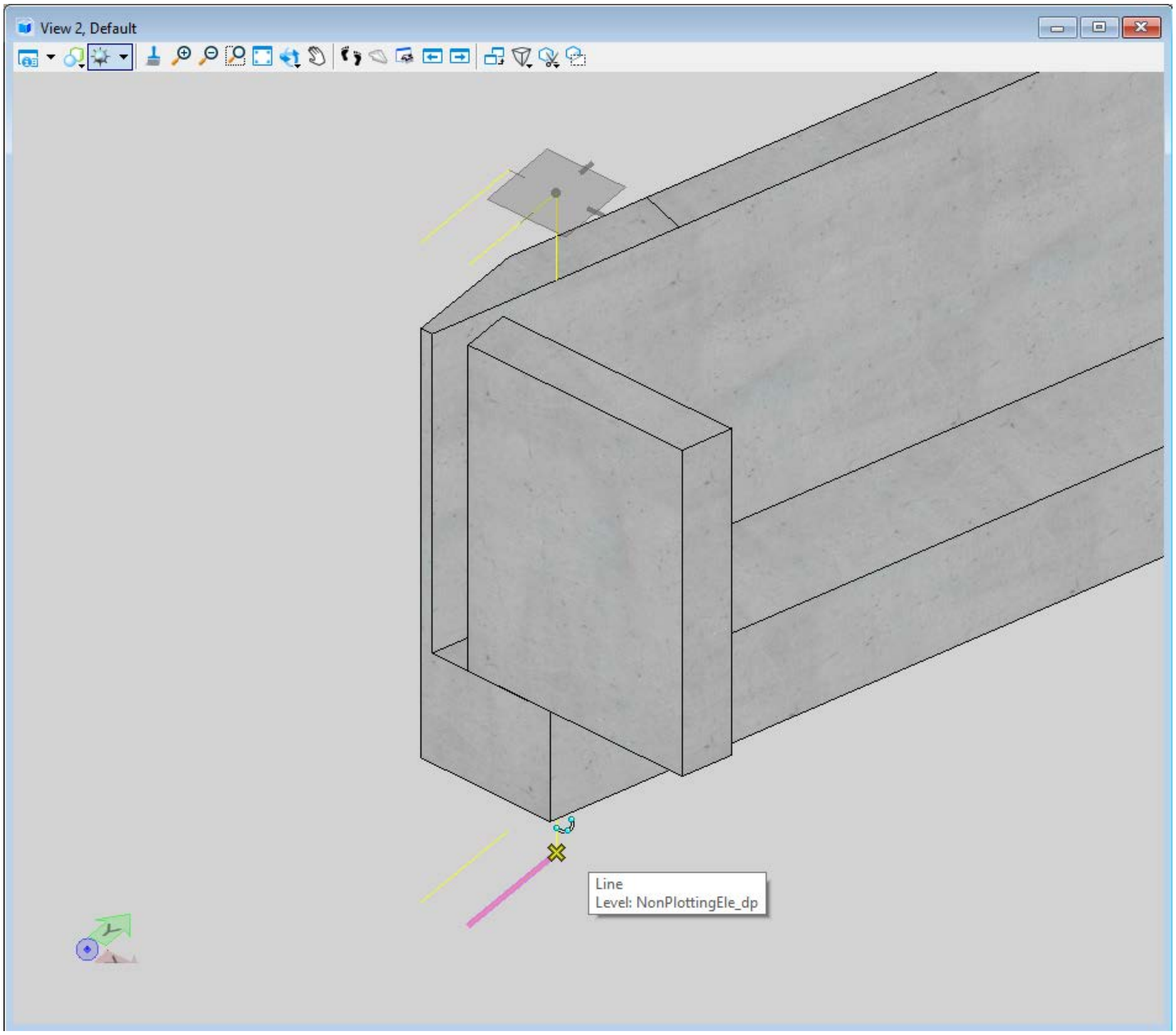


13. After the cheekwall has been trimmed, repeat Step 12 with the end bent backwall and the second trimming solid. The final result should look like the image below.



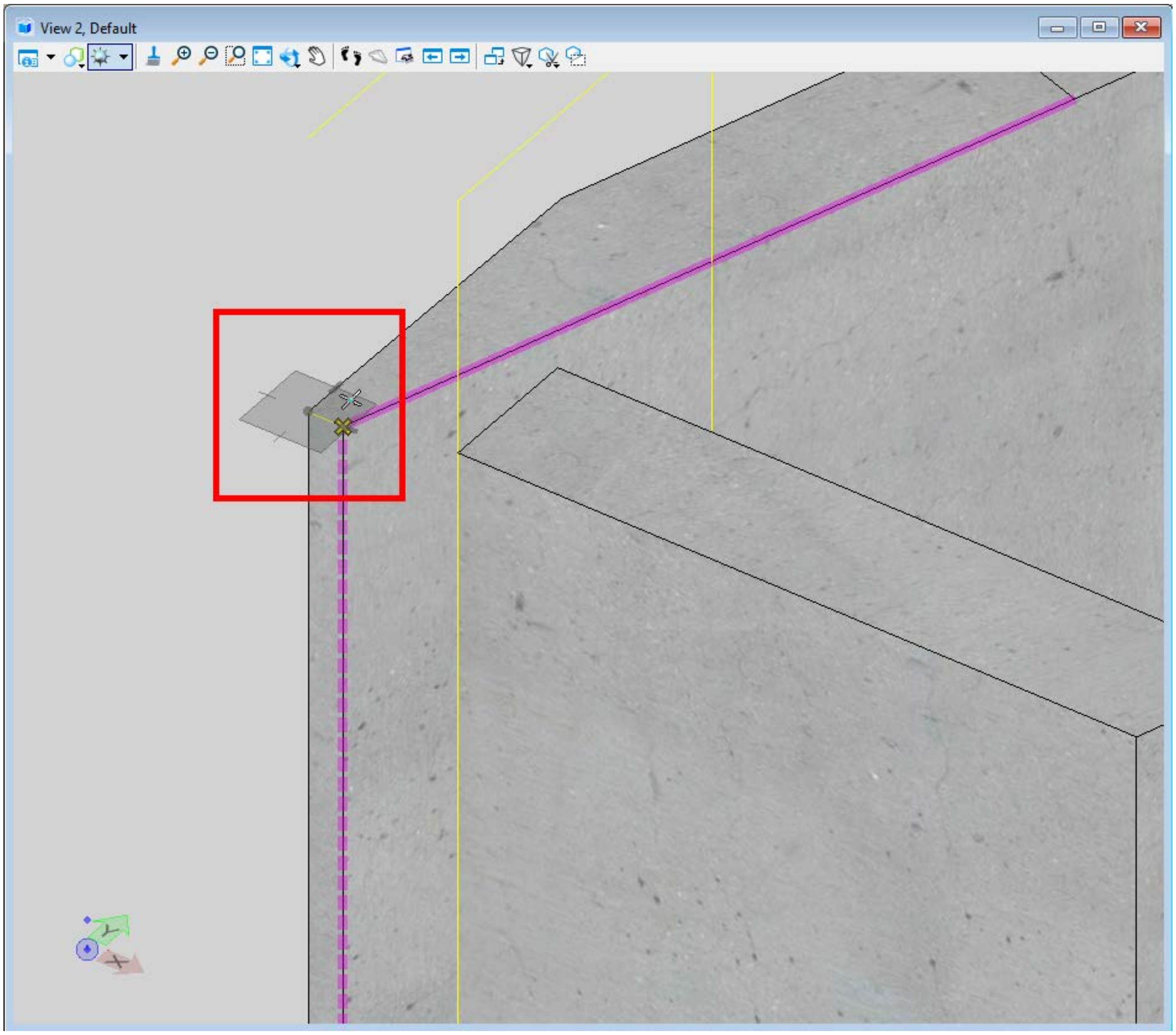
14. The remaining modification that needs to be made on the right side of the end bent is to kink the front face of backwall forward to align with the cheekwall. This will be accomplished by creating a solid to fill the void between the front face of backwall and cheekwall and merging it with the end bent. To create the solid a surface representing the top of this portion of backwall needs will be made and extruded along a vertical path downward.

    So, first place vertical construction lines to make it easier to create the surface. Using the **Place SmartLine** tool, draw a vertical line from the earlier upstation EL. 120' construction line directly 15' down to the corresponding EL. 105' construction.

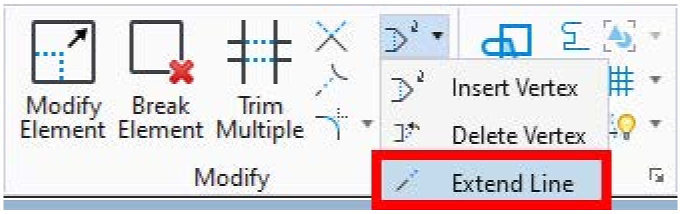


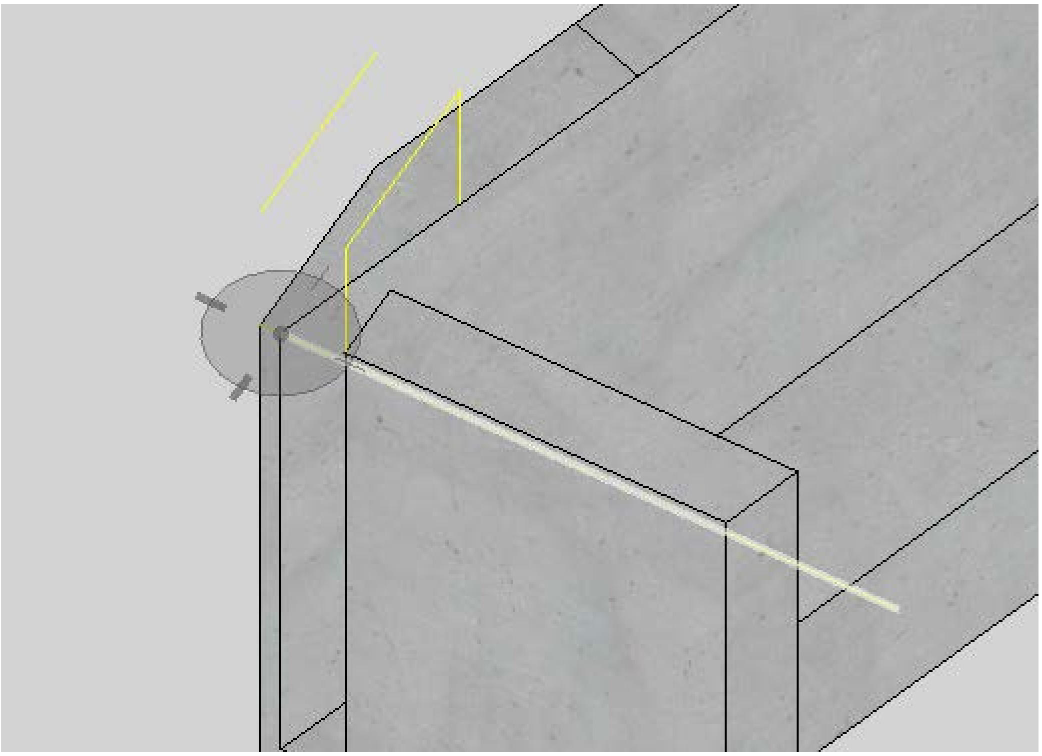
After the first vertical line has been drawn, again use the **Place SmartLine** tool to draw another 15' vertical line down at the other end of the same EL. 120' construction line.

15. With the **Place SmartLine** tool still active, draw one more construction line. This one runs along the rightmost edge of the top of backwall.

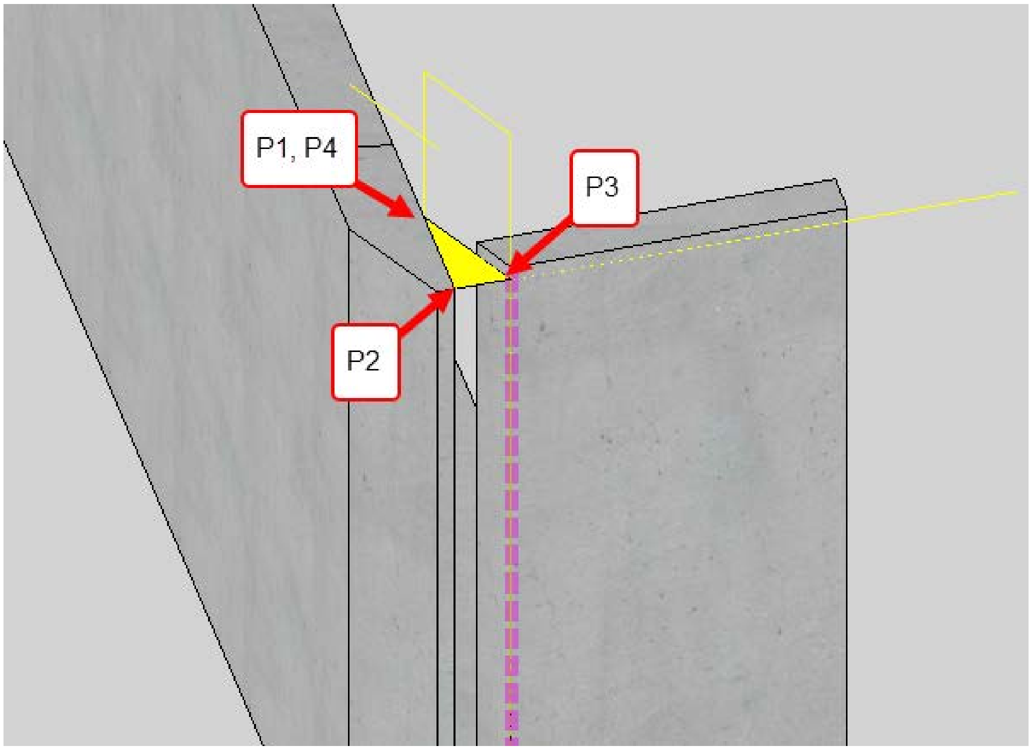


16. Use the **Drawing** (Workflow) **> Home > Modify > Extend Line** tool to stretch the limit of the line out past the end of the cheekwall as shown in the following image.

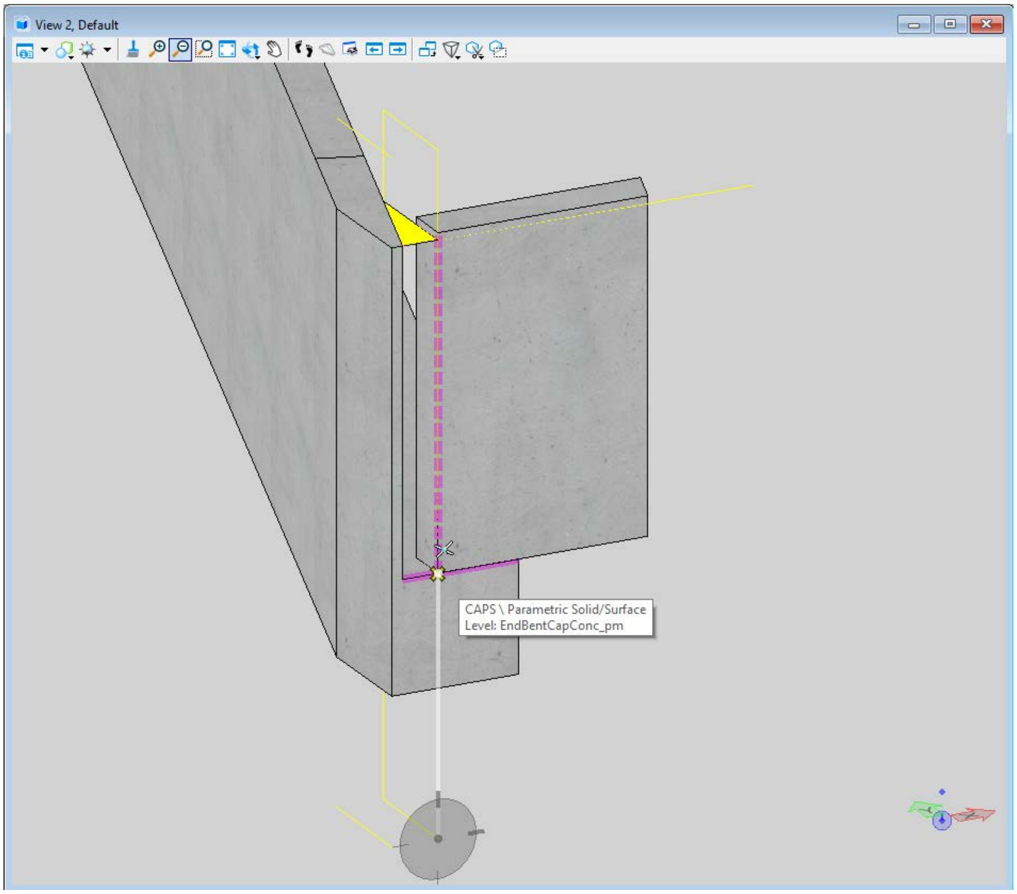




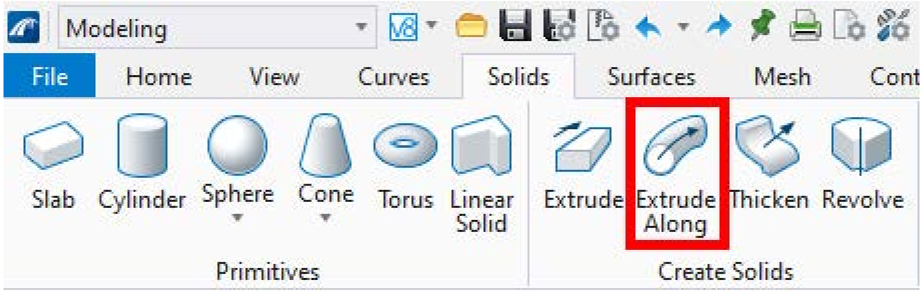
17. With all construction lines now in place, activate the **Place SmartLine** tool so the top of backwall surface can be drawn. Rotate the isometric view as needed to allow for easy placement of linework at each vertex of the surface shown below to create a closed shape/surface.



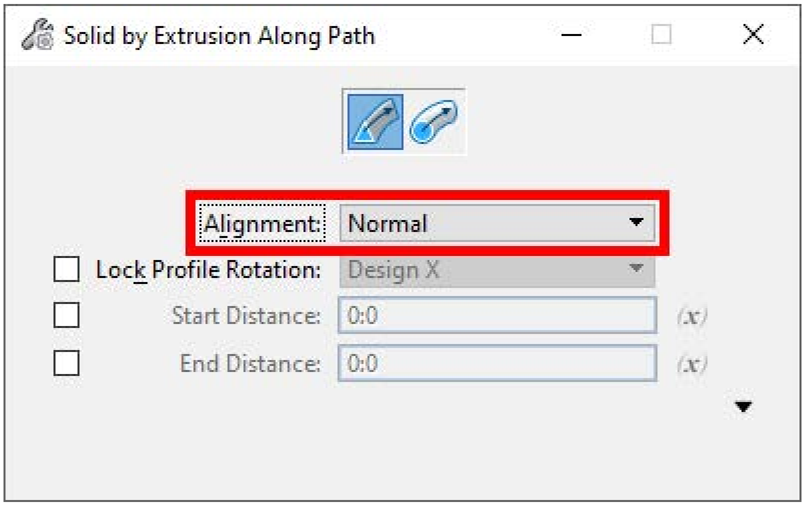
18. Use the **Extend Line** tool to move the bottom of the rightmost vertical construction line to the top of the end bent cap as shown below.



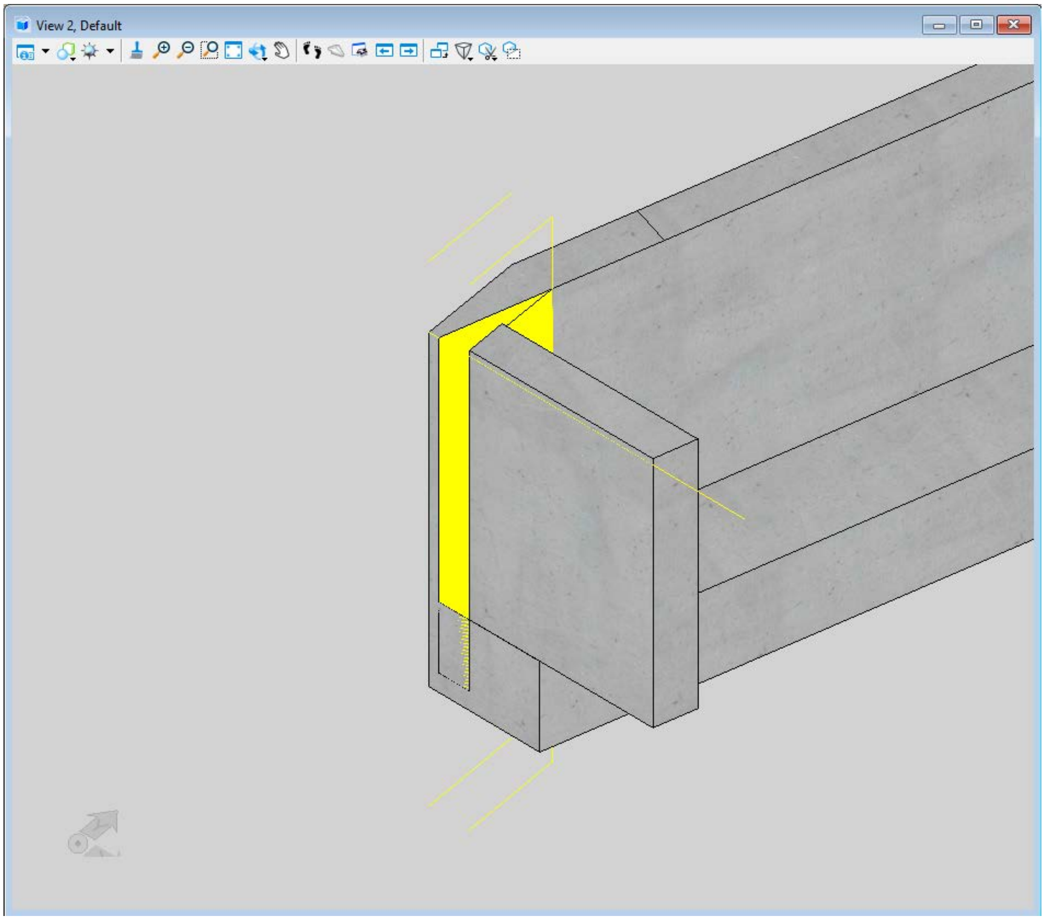
19. Navigate to and select the **Modeling** (Workflow) **> Solids > Create Solids > Extrude Along** tool.



20. When the *Solid by Extrusion Along Path* window opens, ensure that the custom profile is selected and that the *Alignment* is set to **Normal**.

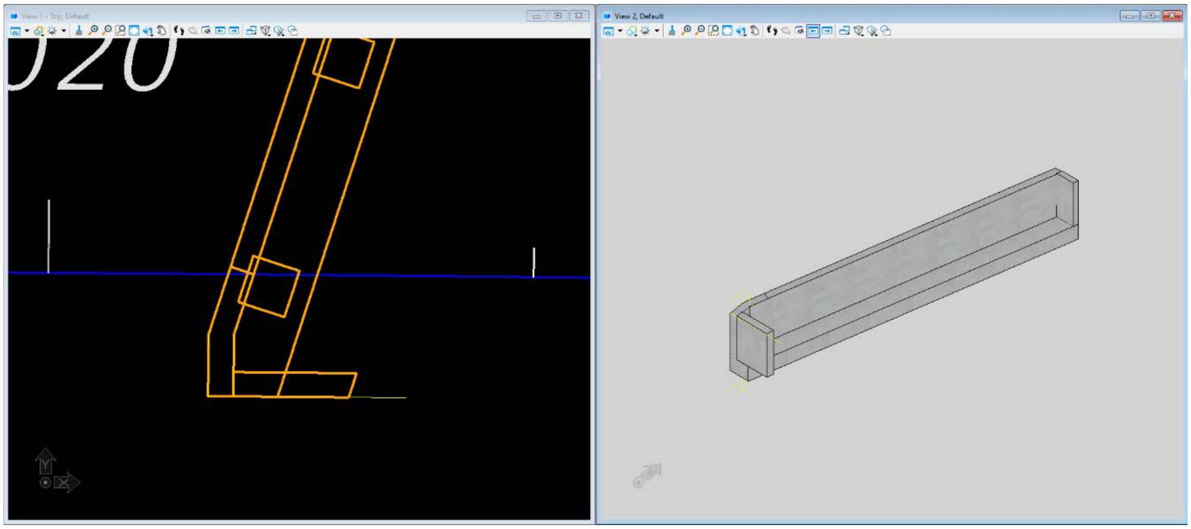


21. With the *Solid by Extrusion Along Path* window still open, click on the vertical line that was shortened in Step 18 to selected it as the path element. Click on the shape that was created in Step 17 to act as the extruded element. Data point once to confirm and create the solid. The result of this action is yellow solid shown in the following image.

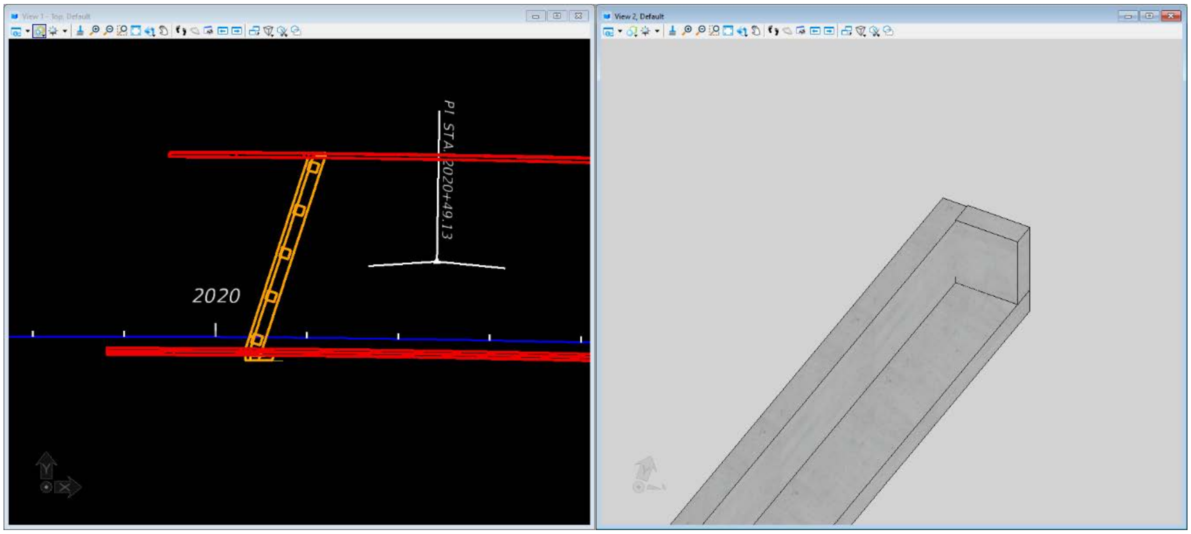


22. Now the new solid needs to be joined to the end bent to fill the gap. Use the **Solids > Modify Features > Unite** tool to accomplish this.

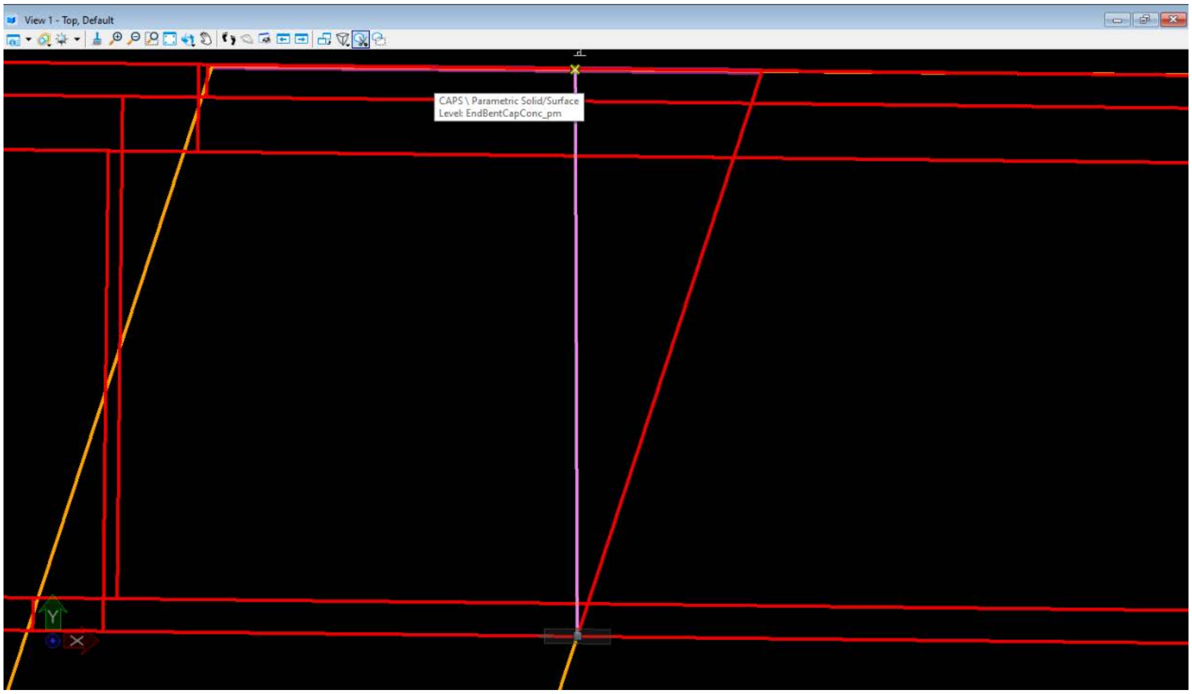
23. Once the *Unite Solids* window opens, click on the end bent to identify it as the first (primary) element. Then click on the yellow solid to identify it as the next element. Lastly, data point in space to accept the union. The right side of the end bent is now complete and will appear as shown in the image below.



24. In the **Home > Primary > Level Display** tool, ensure that the following levels are turned on: BarrierWallConc_pm, EndBentCapConc_pm, and EndBentCheekWallConc_pm. This only need be done for View 1. Keep the NonPlottingEle_dp level as the active level. The model should look like the image below.

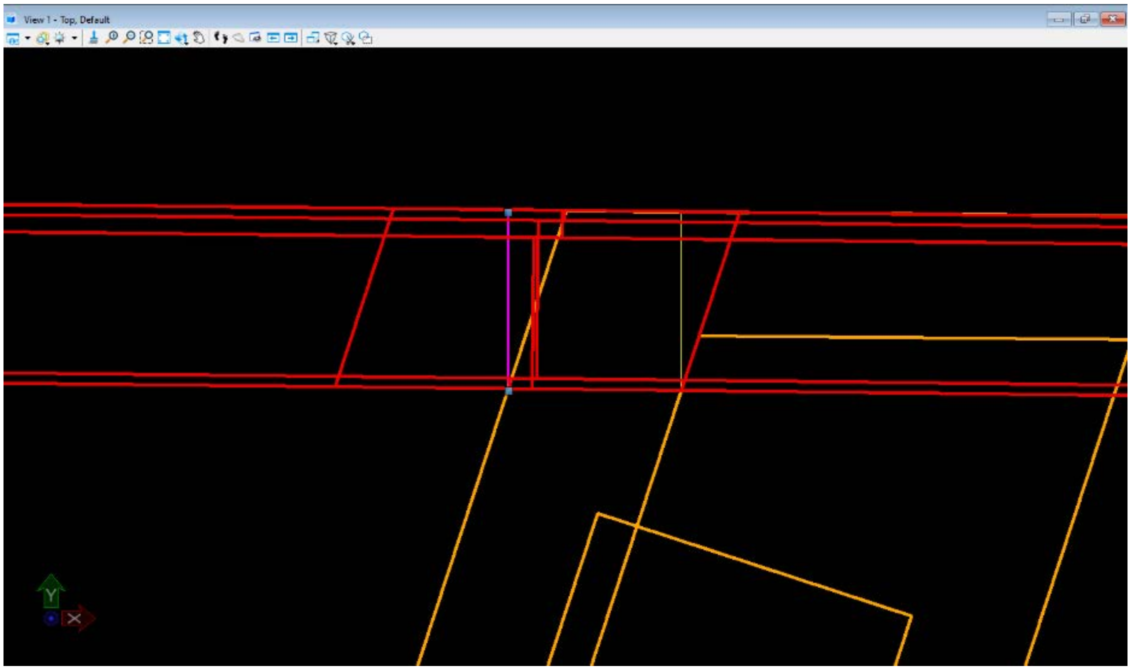


25. In the **Modeling** workflow, start laying out construction lines for the new backwall layout at the left end of the end bent. by navigating to the **Home > Placement > Place SmartLine** tool. Place the first point where the inside of the left barrier crosses the front face of backwall and then use the **Perpendicular Snap** snap mode to draw a perpendicular line to the end of the end bent.



26. Use the **Properties** tool to change the z coordinates of the line's start and end to be 105', as previously done in Step 3, which places the line at EL. 105'.

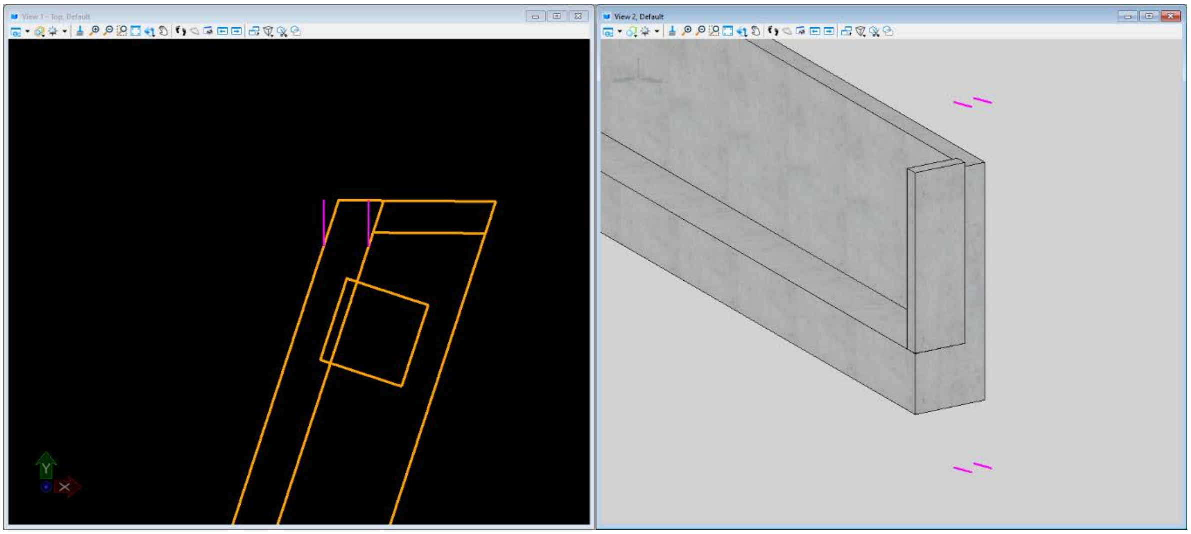
27. Next, use the **Move Parallel** tool to copy a line parallel to the one just created, but place it at the intersection of the back face of backwall and inside edge of the barrier, as shown highlighted purple in the image below.



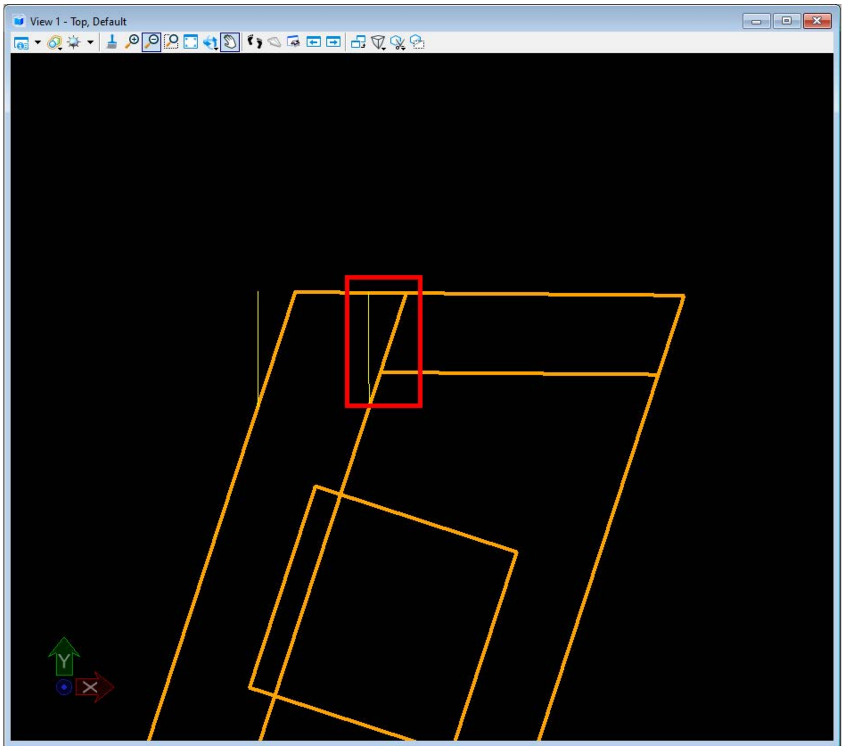
The BarrierWallConc_pm level can now be turned off in the **Level Display**.

28. Zoom in to the end points of the lines that were just placed to ensure that they terminate on the intersection with the end bent at both ends of the line. Once lengths have been trimmed to the end bent line, check the line's **Properties** again to verify that both ends are at EL. 105'.

29. With both construction lines highlighted, access the **Home > Manipulate > Copy** tool to copy both lines vertically upward 15', as was demonstrated in Step 6. All four lines that have been placed are highlighted purple in the image below.

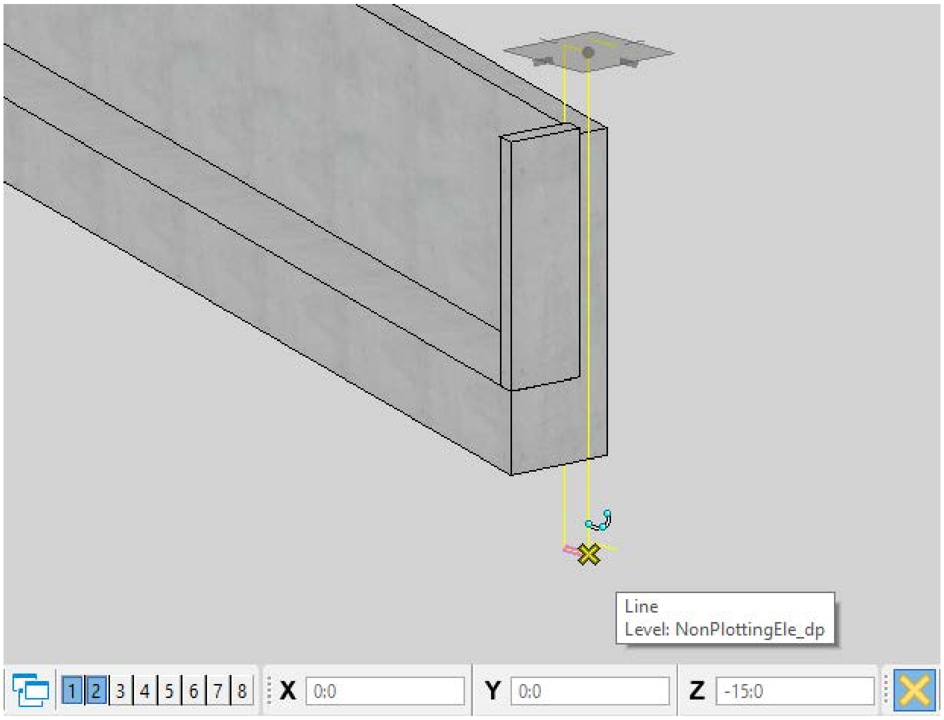


30. The first modification on the left end of the end bent will be to trim the front face of backwall to start forming the breakback (shown in the red box below).

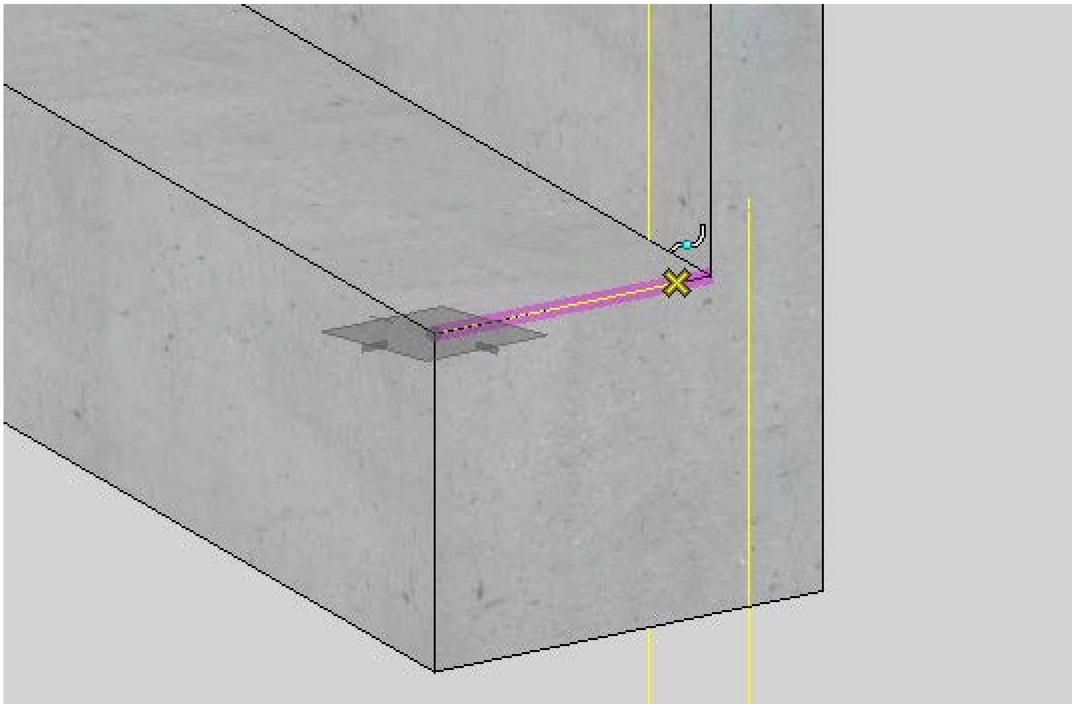


However, this one will need to be performed with more precision since it requires trimming back just the backwall without trimming the end bent cap. To complete this, construction lines will be laid out so that a shape can be drawn directly on top of the end bent cap and then extruded vertically upward.

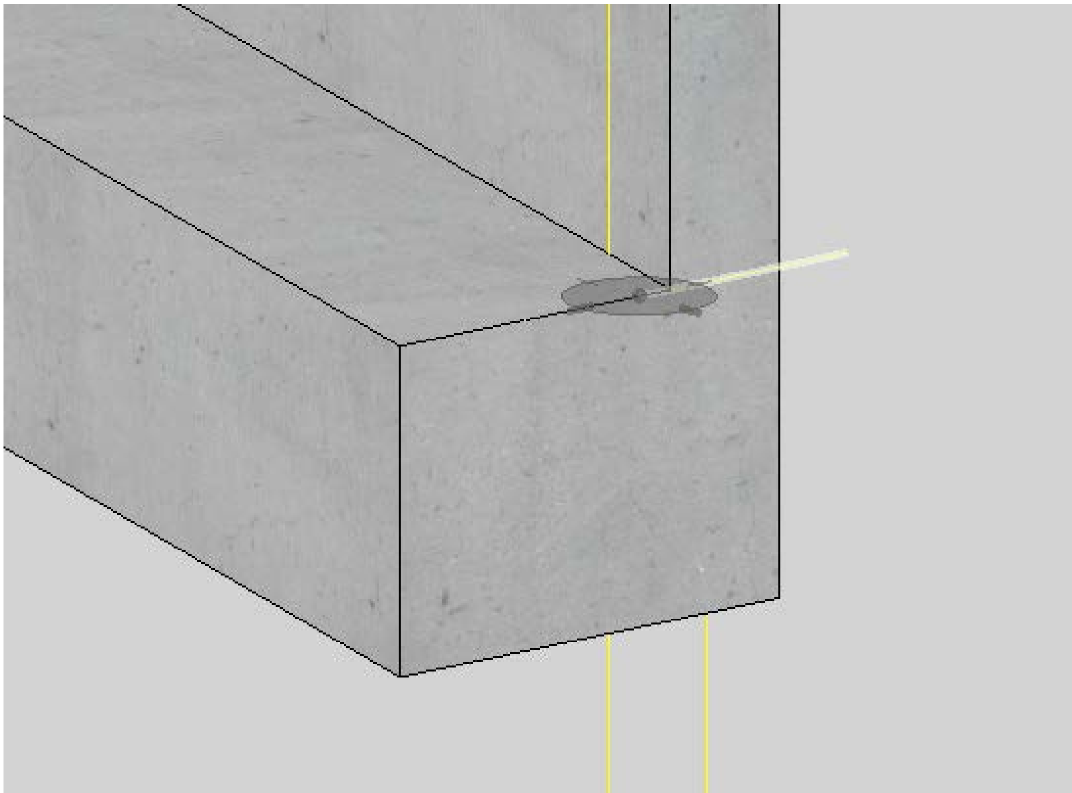
31. Firstly, use the **Place SmartLine** tool to draw vertical construction lines at both ends of the upstation horizontal construction lines as shown below.



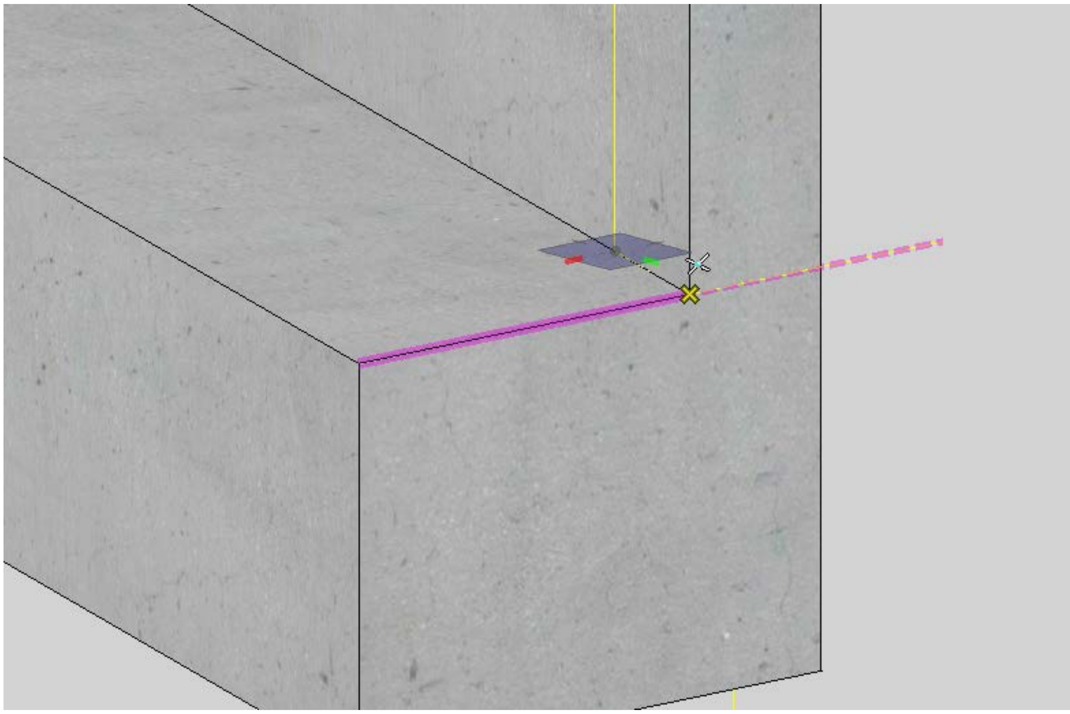
32. Use the **Level Display** to turn off the EndBentCheekWallConc_pm level in View 2. Then, use the **Place SmartLine** tool to draw a construction line from the front corner of the end bent cap along its top edge.



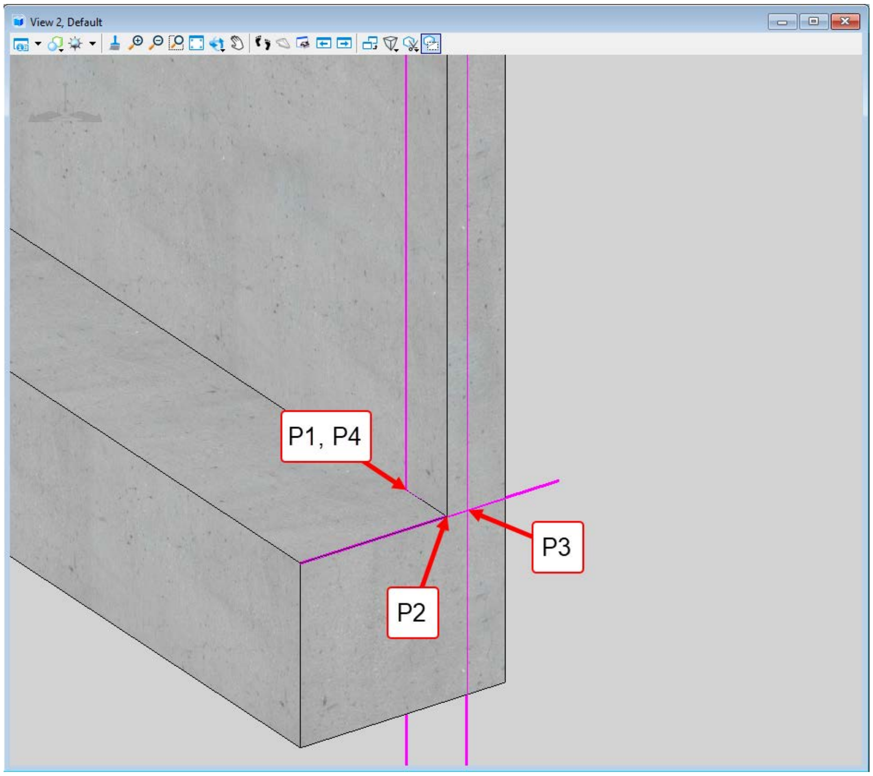
33. Use the **Extend Line** tool to extend the line that was just placed beyond the back face of the backwall as shown below.



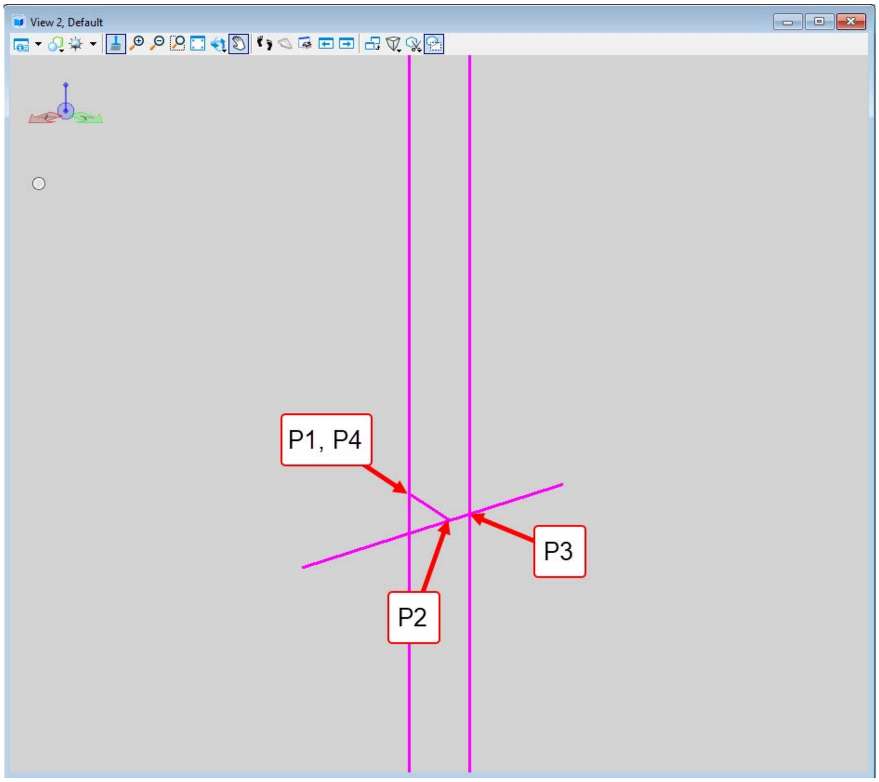
34. Place one more construction line using the **Place SmartLine** tool along the base of the front face of backwall that runs from the vertical construction line to the end of the end bent.



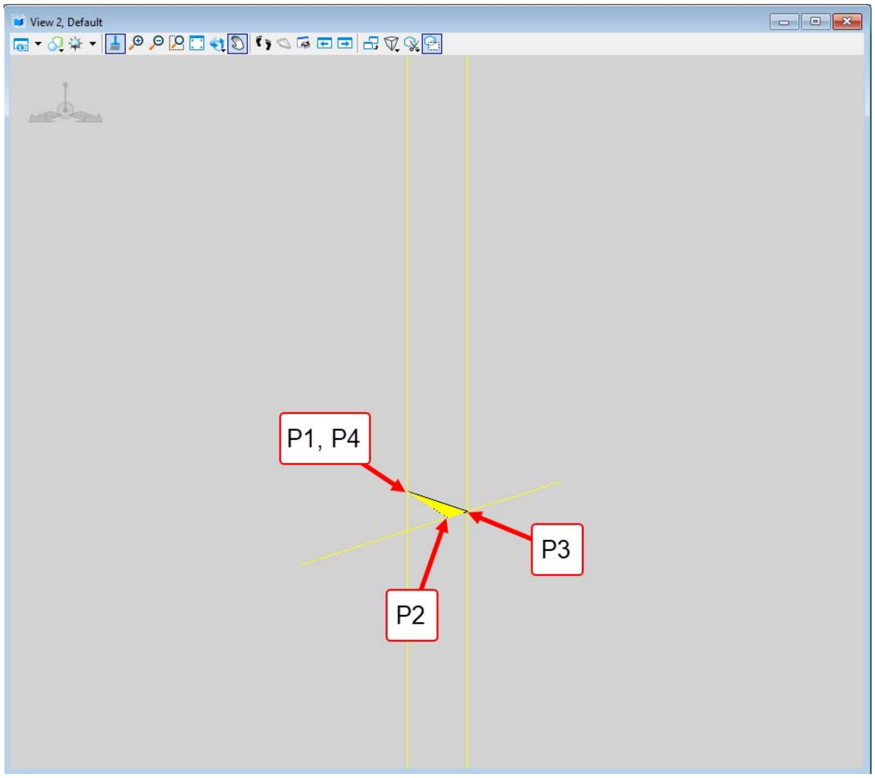
35. Now, use the **Level Display** to turn off the EndBentCapConc_pm level in View 2. This leaves only the construction lines on the NonPlottingEle_dp viewable. A shape to be used for extrusion can now easily be placed. Use the **Place SmartLine** tool to draw the shape by connecting the intersections shown below.



Before Turning off EndBentCapConc_pm Level

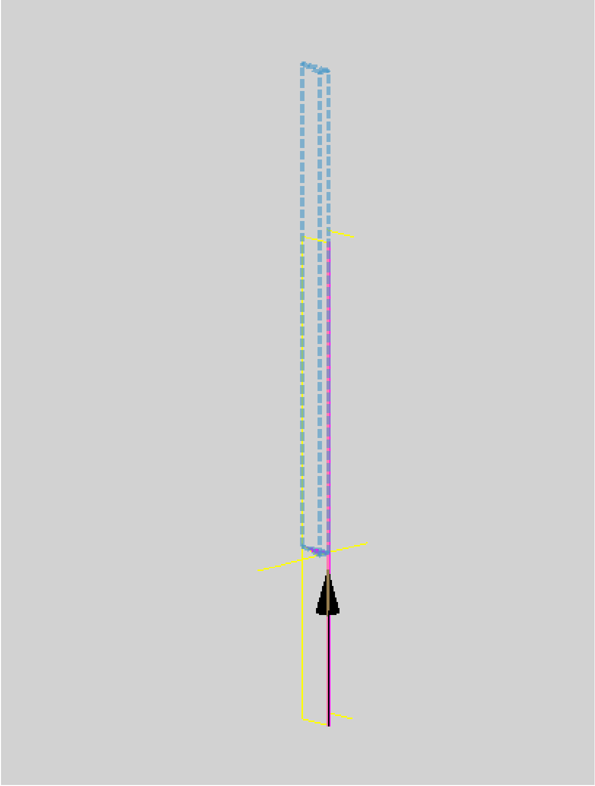


After Turning off EndBentCapConc_pm Level



<u>After Creating Shape</u>

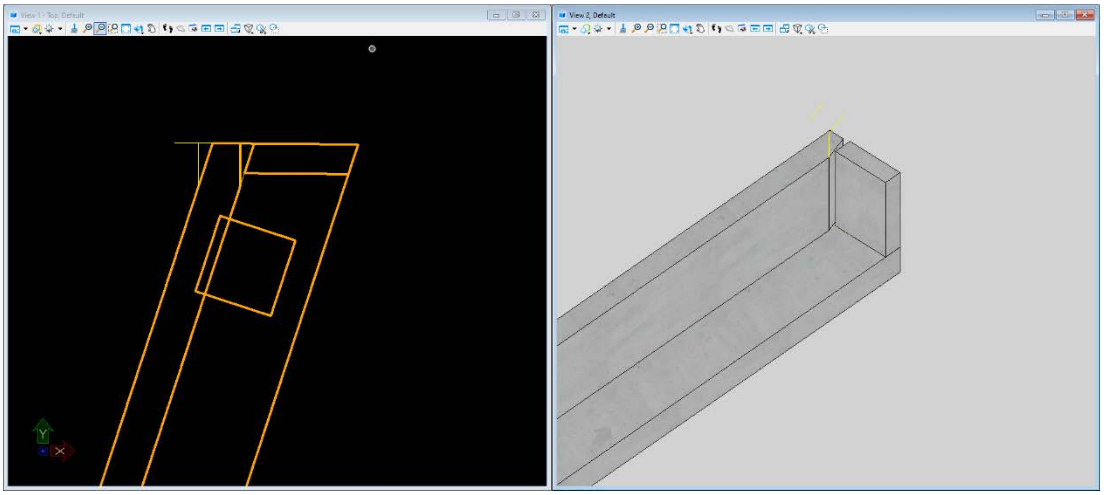
36. Once the shape has been created, navigate to and select the **Extrude Along** tool. Click on one of the vertical construction lines to select it as the path element. Then, click on the shape to select the element to be extruded.



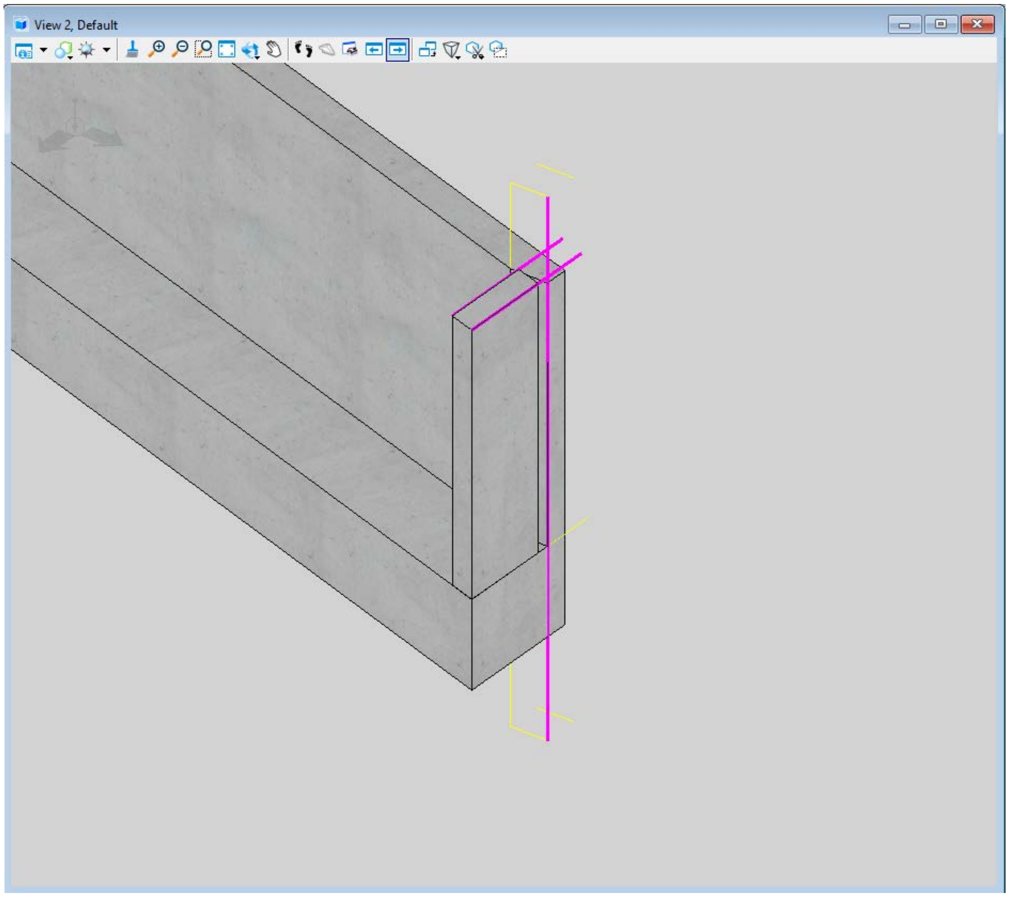
Using the default inputs in the *Solid Extrusion Along Path*, data point once in space to confirm the extrusion and create the solid.

37. Using the **Level Display,** turn back on the EndBentCapConc_pm and EndBentCheekWallConc_pm levels in View 2. The newly created solid can now be used to trim the backwall. First, navigate to and select the **Solids > Modify Features > Trim Solid** tool. Click on a portion of the end bent to keep. Then, click on the trimming element and data point to confirm.

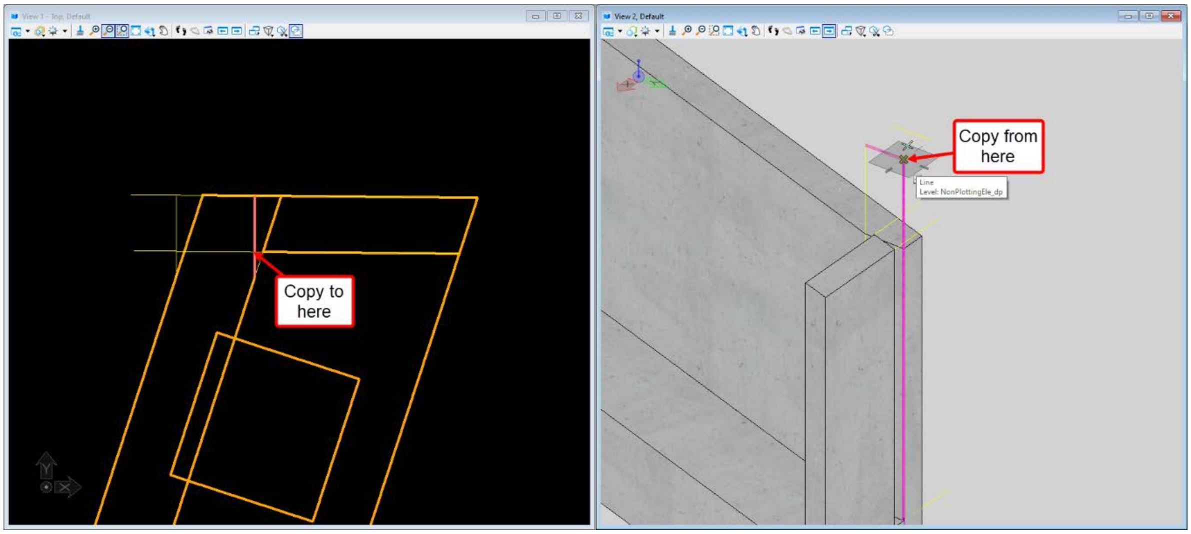
38. The resulting solid should like like the image below.



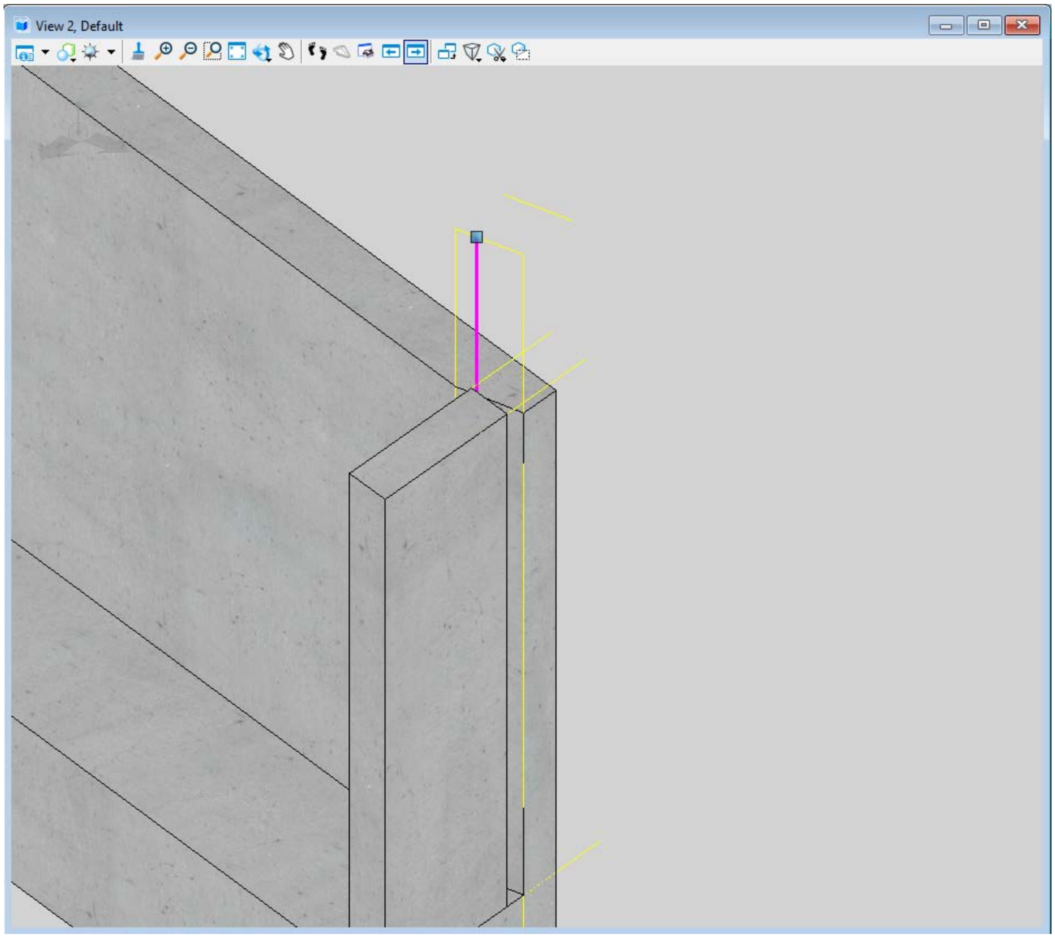
39. Next modification is to extend the cheekwall so that it meets with the new location of the front face of backwall. To start, more construction lines need to be placed. Using a combination of the **Place SmartLine** tool and **Extend Line** tool, place a construction line at the top inside edge and top outside edge of the cheekwall and extend them beyond the back of the end bent. Also replace the vertical construction line that was used as a path element in Step 36. See the new lines in the image below highlighted purple.



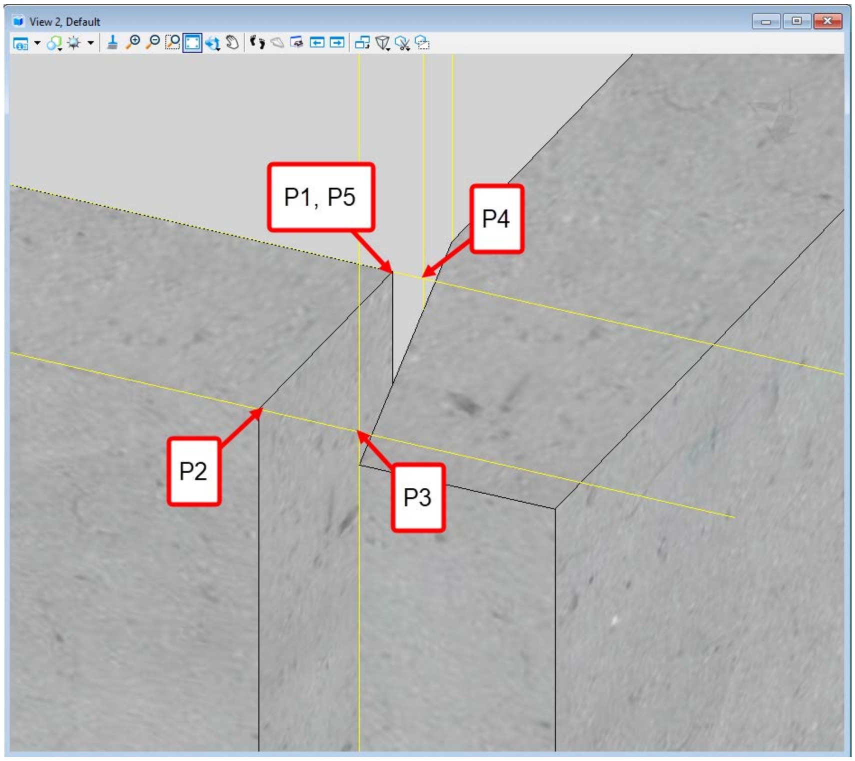
40. Before creating the shape for extrusion, one more line needs to be created. Use the **Copy** tool to copy one of the existing vertical construction lines, grabbing it at its top node in View 2. Copy it into View 1 at the intersection of the front face of backwall and the construction line at the cheekwall's inner top edge.

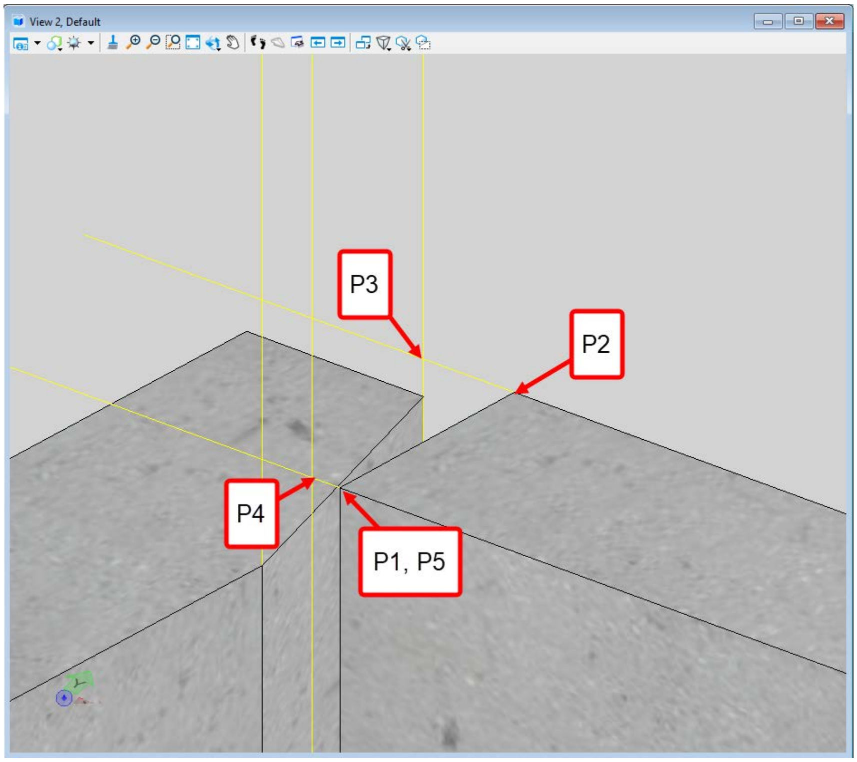


The new construction is highlighted purple below.

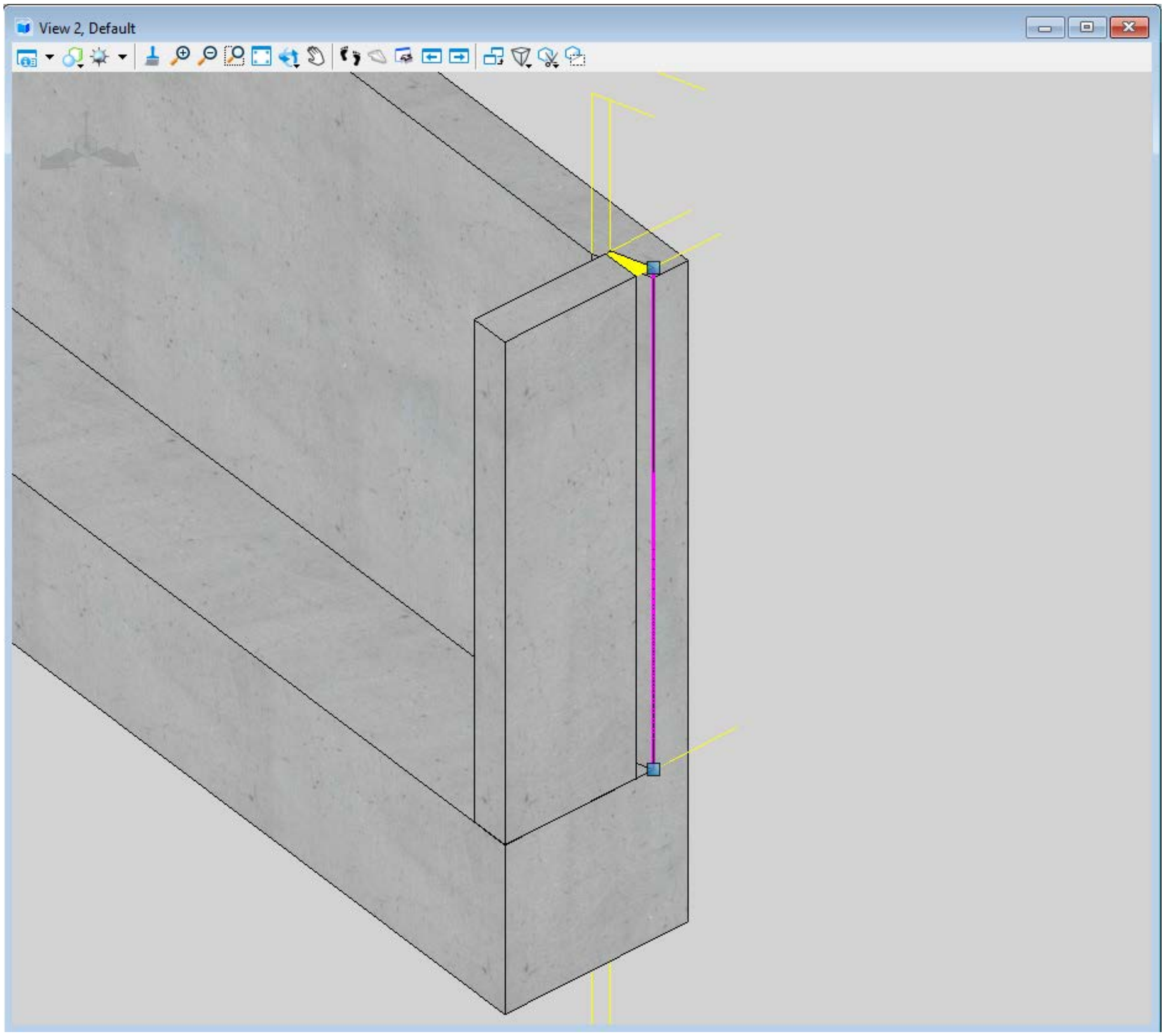


41. Use the **Place SmartLine** tool to create a shape using the points shown in the images below. Note that these images are at the same location. They are just shots taken at different angles to more clearly show each point that makes up the shape.



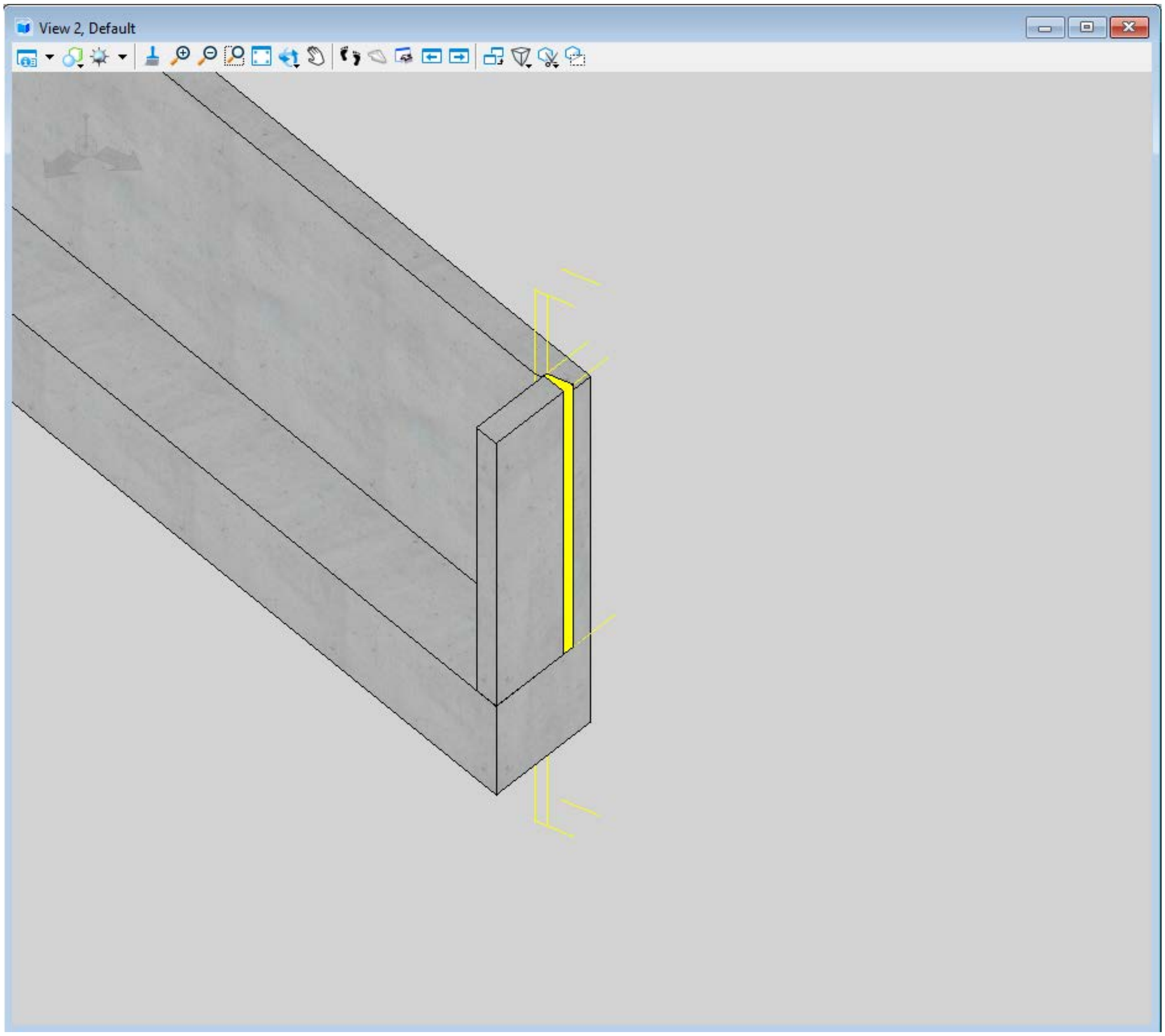


42. If greater precision is needed when extruding a shape into a solid, the path element used in the **Extrude Along** tool follows should be as close as possible to the solid's intended length. Once the shape has been placed, shorten the vertical construction line so that the bottom of the line is at the top of the end bent cap, as shown in the following image.

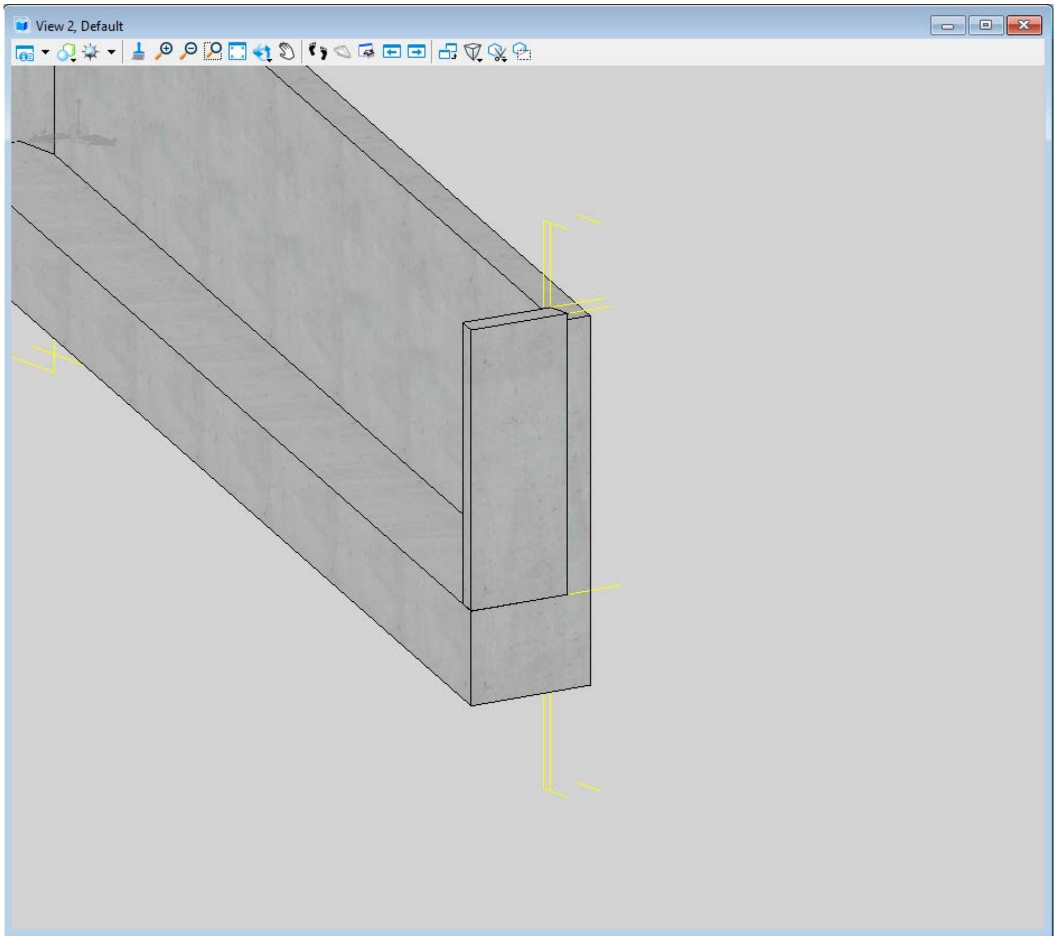


43. Using the **Extrude Along** tool, select the line that was just shortened as the path element and the shape that was created as the extruded element.

44. The new solid should look like the following image once created.

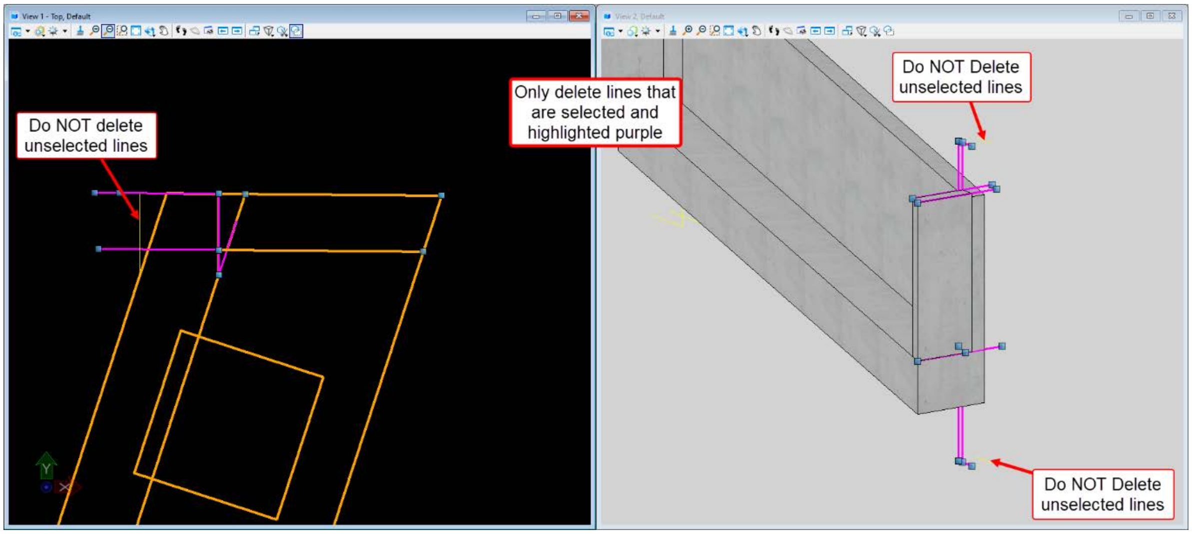


45. Use the **Unite** tool to join the new solid with the cheekwall. Once the *Unite Solids* window opens, click on the cheekwall to identify it as the first element, and then click on the yellow solid to identify it as the next element. Lastly, data point in space to accept the union and complete the cheekwall.



46. The next modification is the breakback on the back face of backwall. This will be accomplished by using the **Unite** tool once again, but additional construction lines will be needed to complete this.

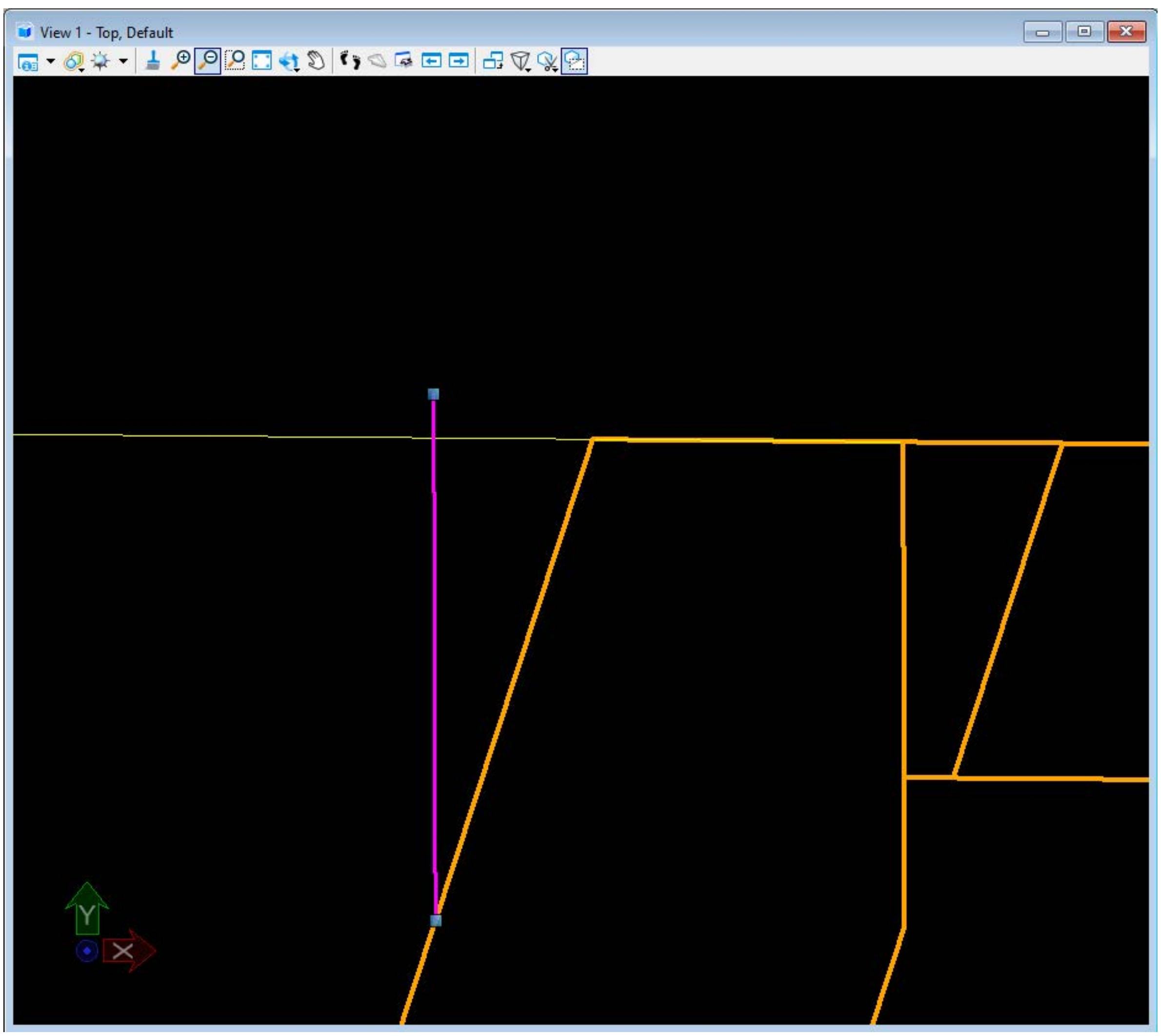
47. First, to clean up the area around the modification, delete the construction lines no longer in use, shown below highlighted in purple.



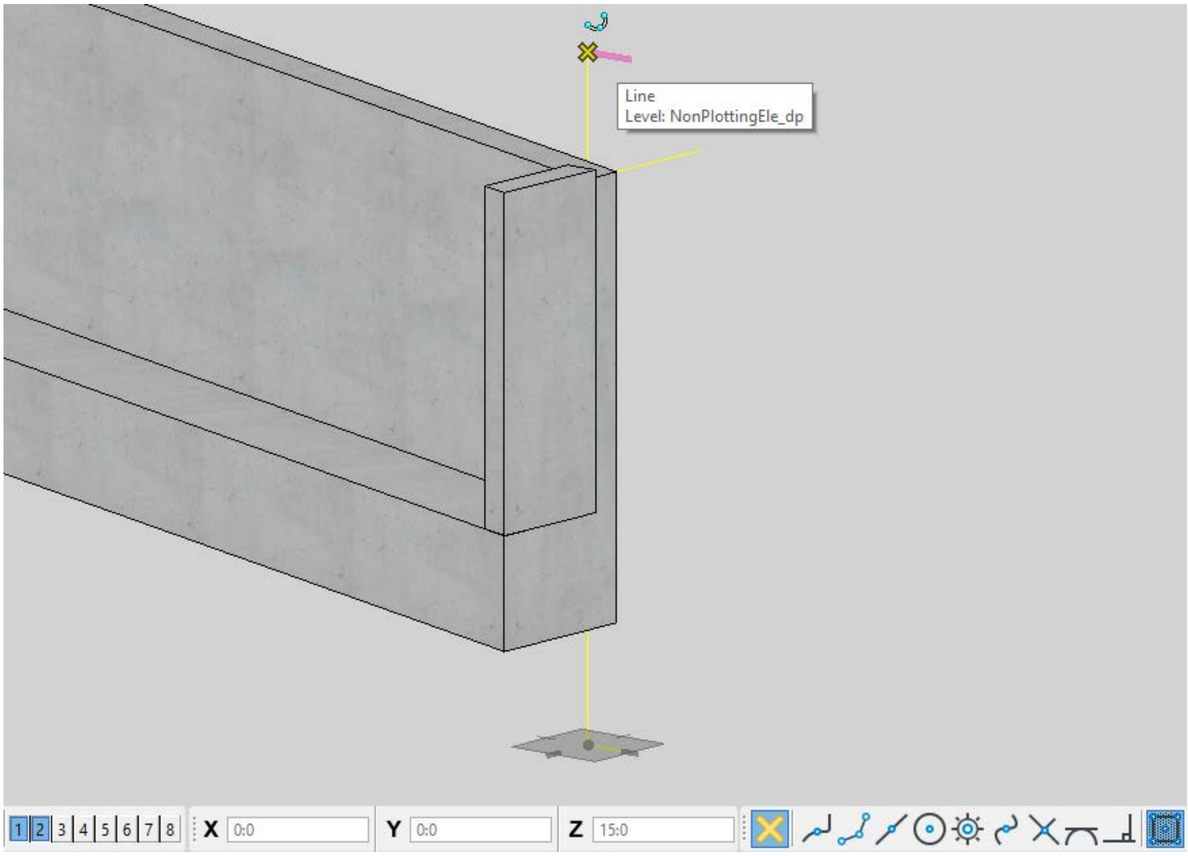
48. Now create a construction line along the side edge of the backwall using the **Place SmartLine** tool.

After the line has been placed, use the **Extend Line** tool to stretch the line several feet beyond the back face of the backwall.

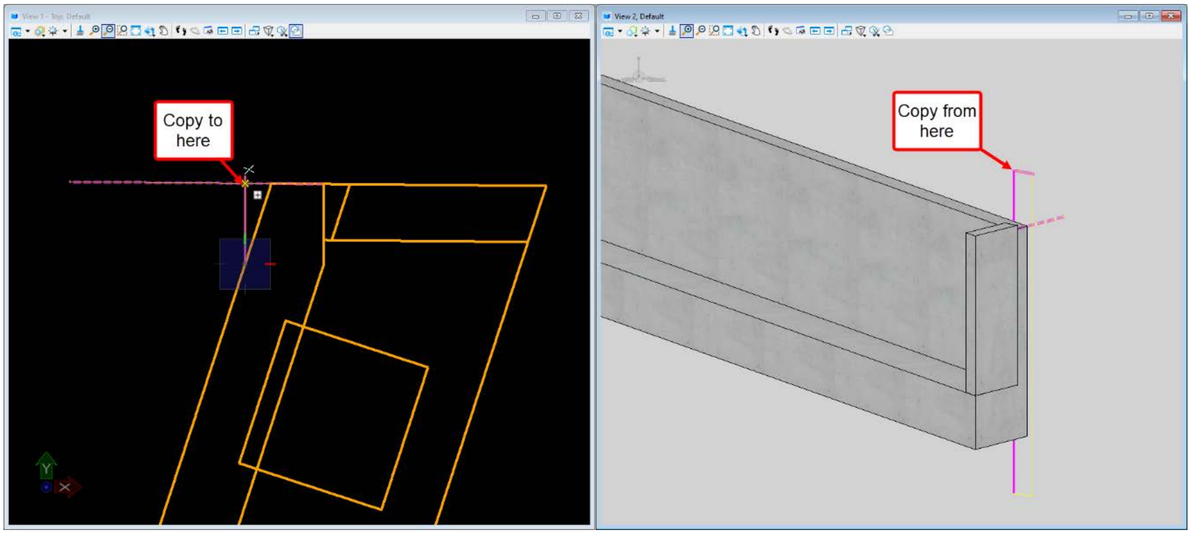
49. Verify that the back face of backwall construction line placed at EL. 120’ in Step 29 of this exercise stretches beyond the newly created construction when looking at the top view in View 1. If it does not, stretch it beyond the line as shown below.



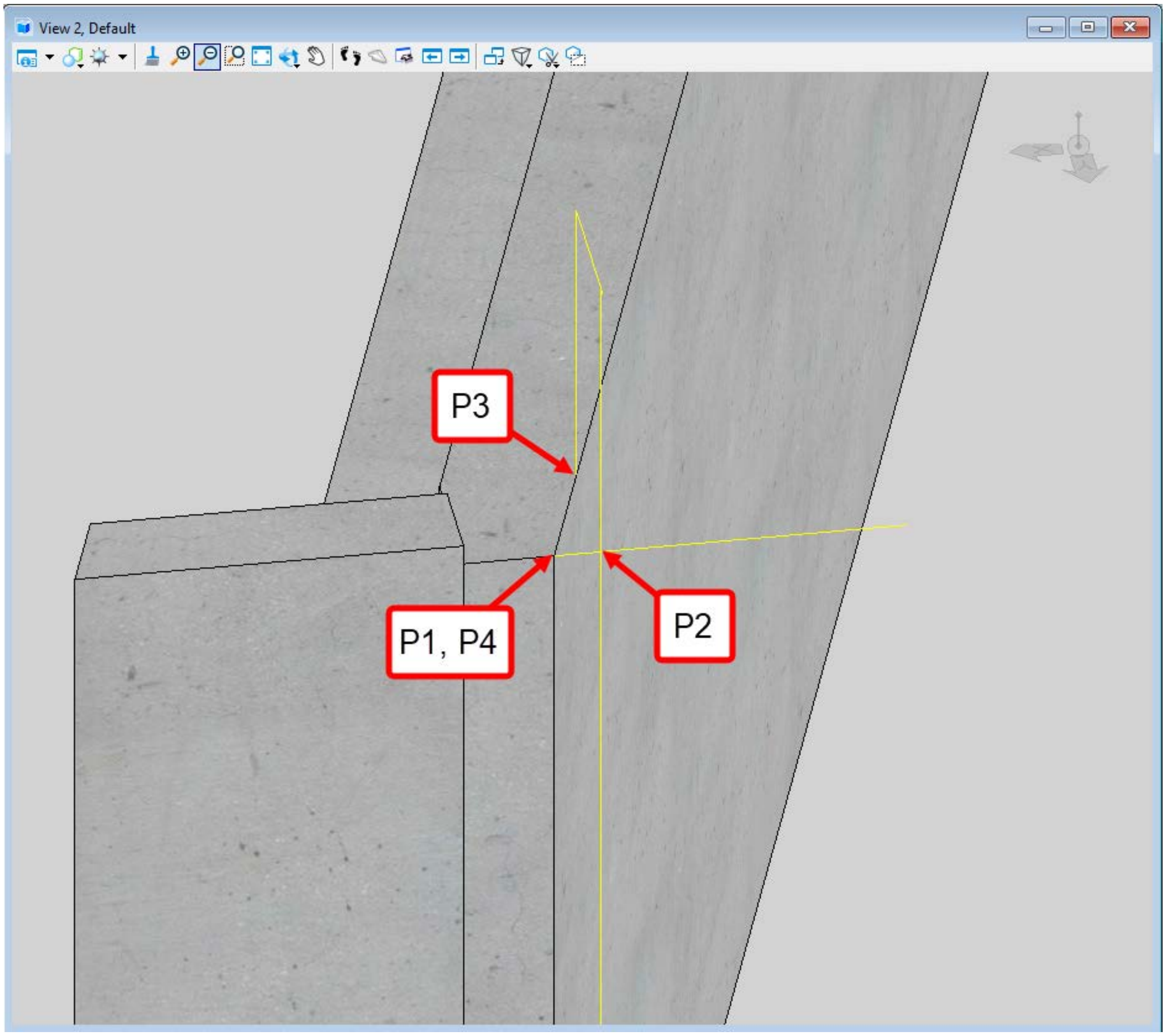
50. Use the **Place SmartLine** tool to draw a vertical construction line from EL. 105' horizontal construction line to the EL. 120' one, as shown in the image below.



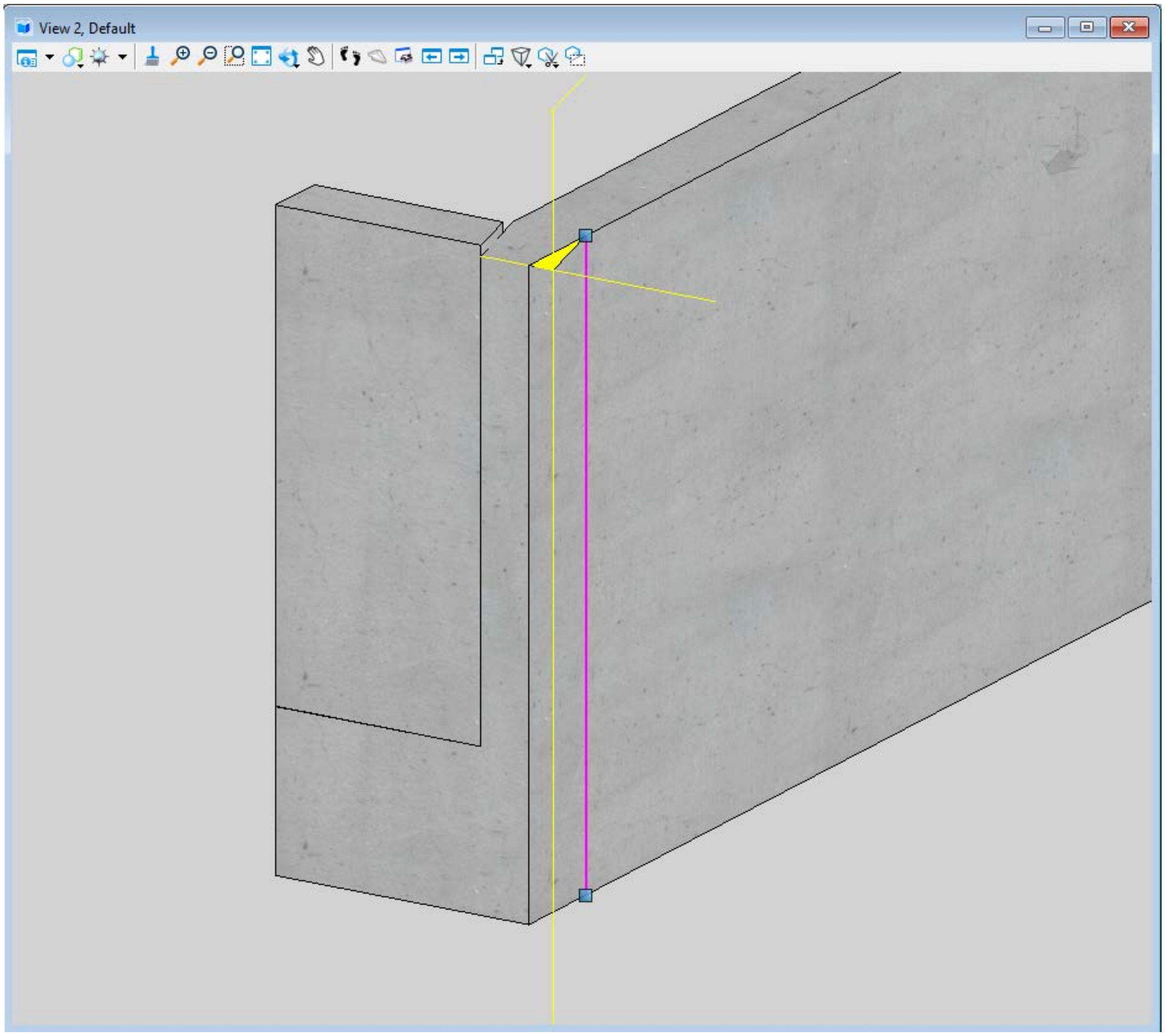
51. Then, use the **Copy** tool to copy the vertical construction line, grabbing it at its top node in View 2. Copy it into View 1 at the intersection of the EL. 120' horizontal construction line and the side of backwall construction line.



52. Use the **Place SmartLine** tool to create a shape using the points shown in the image below.



53. Once the shape has been placed, shorten the vertical construction line so that the top of the line is at the top of the backwall and the bottom of the line is at the bottom of the end bent, as shown in the following image.

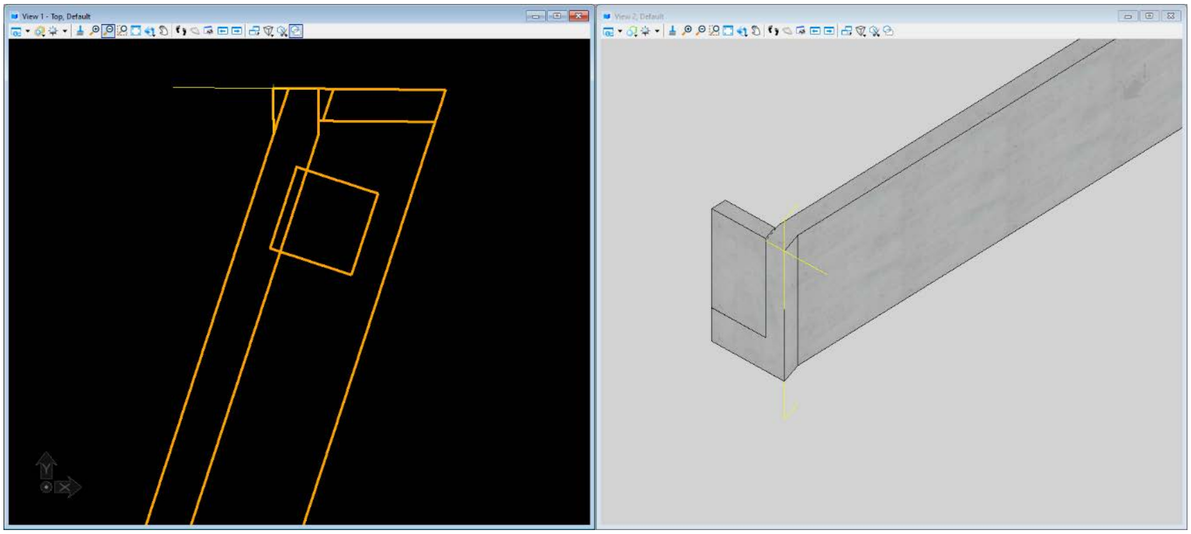


To make the line more visible, turn off all levels except for the NonPlottingEle_dp level in the **Level Display**.

54. Activate the **Extrude Along** tool and click on the shortened vertical construction line to select a path element. Then click on the previously created shape as the extruded element, and data point in space to confirm the selections and create the new solid.

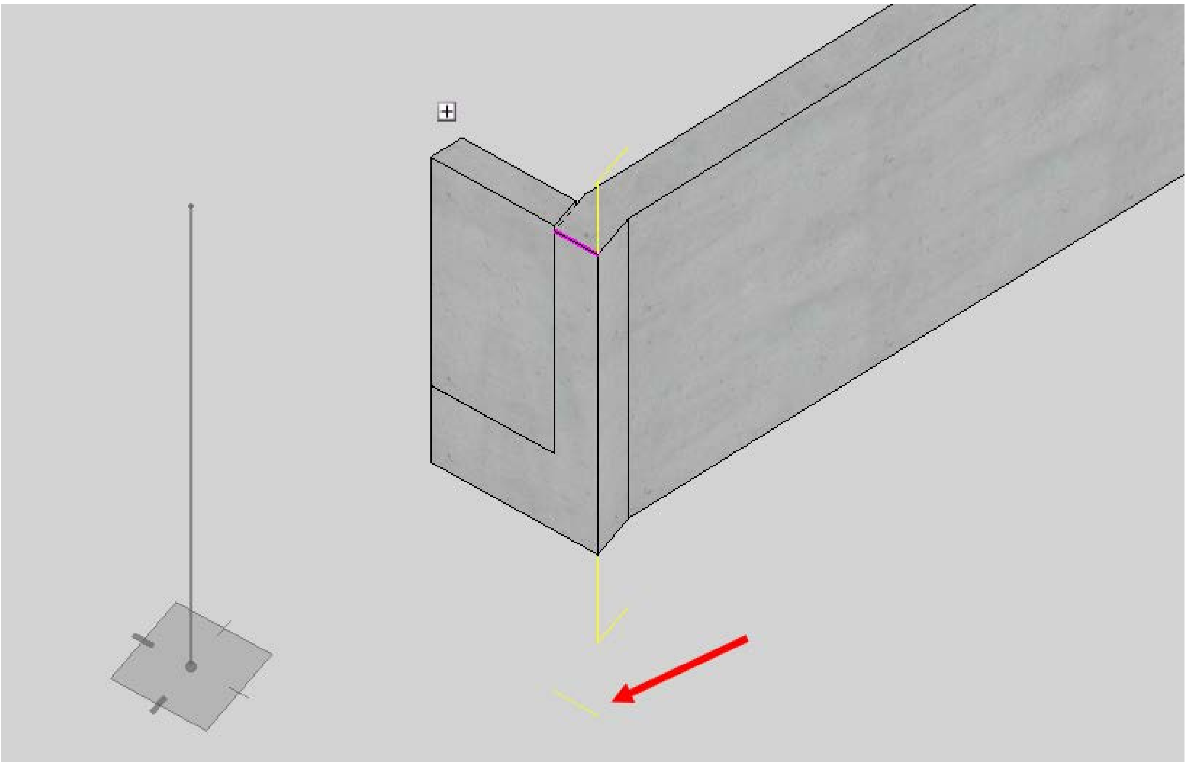
55. With the new solid created, the end bent levels can be turned back on. In the **Level Display**, turn on the EndBentCapConc_pm and EndBentCheekWallConc_pm.

56. Use the **Unite** tool to join the end bent to the new solid. Click on the end bent to select it as the first element, then click on the new yellow solid to select it as the next element. Data point in space to accept the selection and combine the solids.

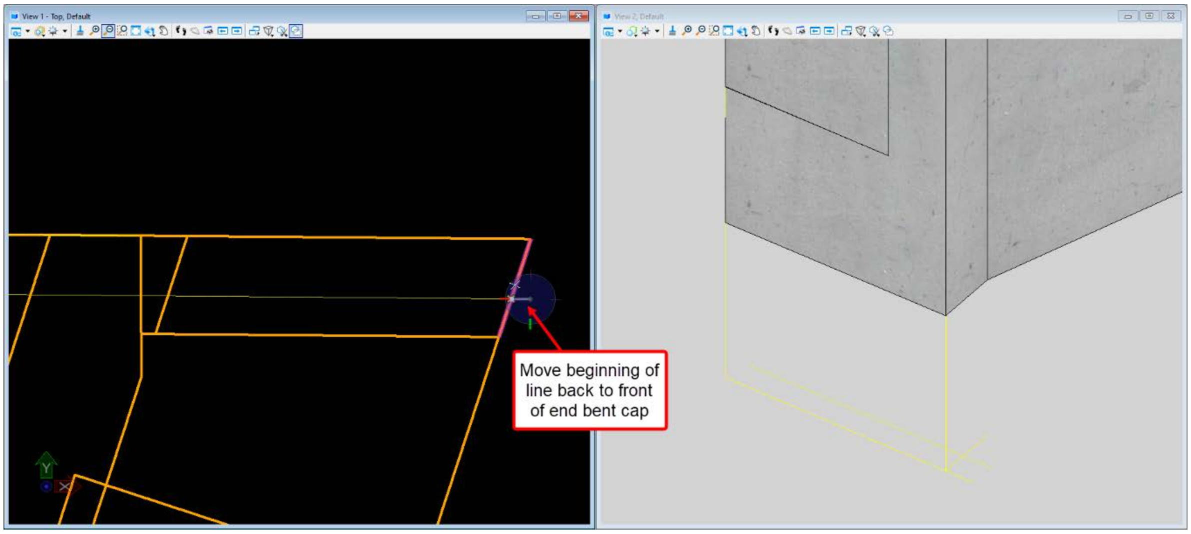


57. The last modification to make to the end bent is to add the lugs used in MSE wall applications. Much like what has been done throughout this exercise, the **Extrude Along** tool is the most effective tool to complete this.

58. Use the **Copy** tool to copy the construction line along the side edge of the backwall down vertically 15'.

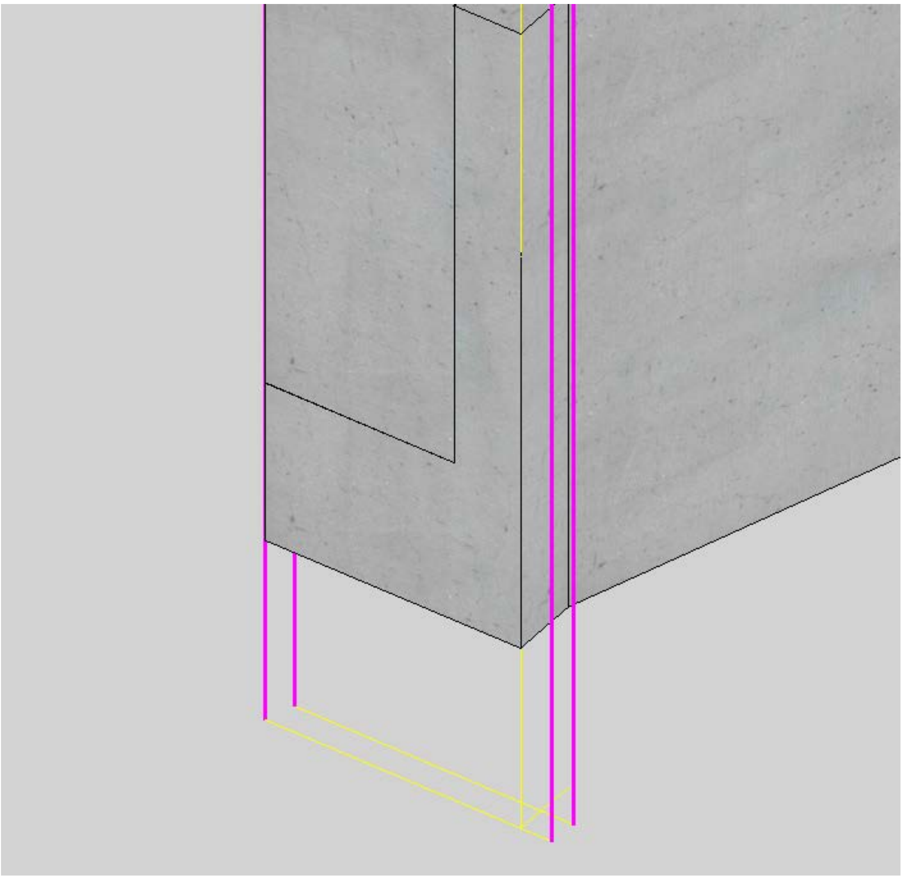


59. Once the construction line has been copied down, access the line's **Properties** and set the z-coordinates of the line's start and end to be 105'. Use the **Extend Line** tool to extend the line 6" beyond the back of the wall when looking at the plan view. Then, extend the line in the other direction to the front of the end bent cap, as shown in the image below.

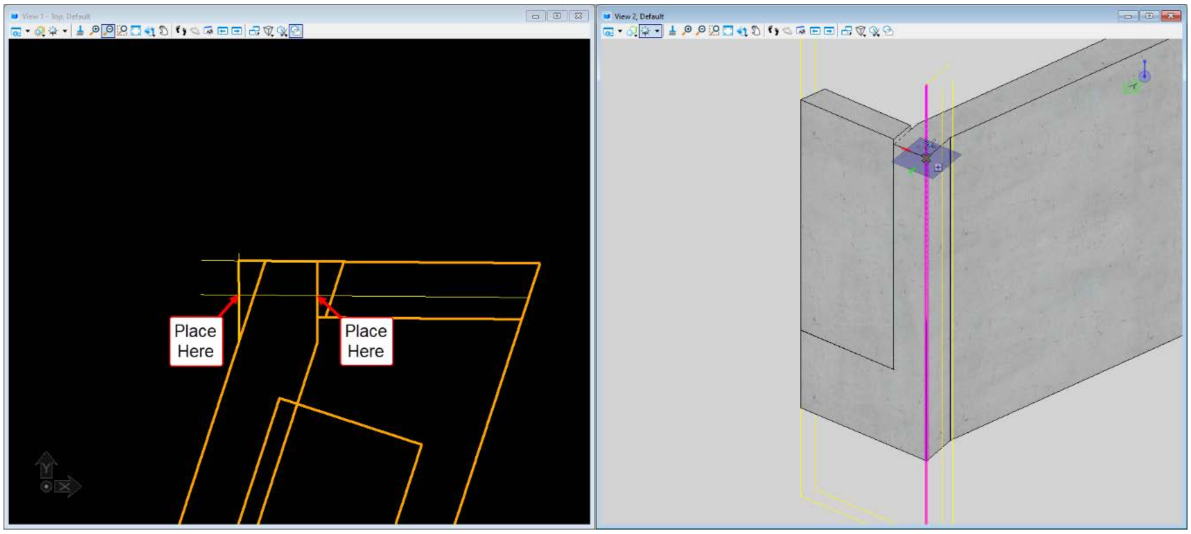


60. Then, use the **Move Parallel** tool to copy a parallel line 5 ½" from the previously created line. Use the **Extend Line** tool again to move the limit of the new line to line up with the front of the end bent as shown below.

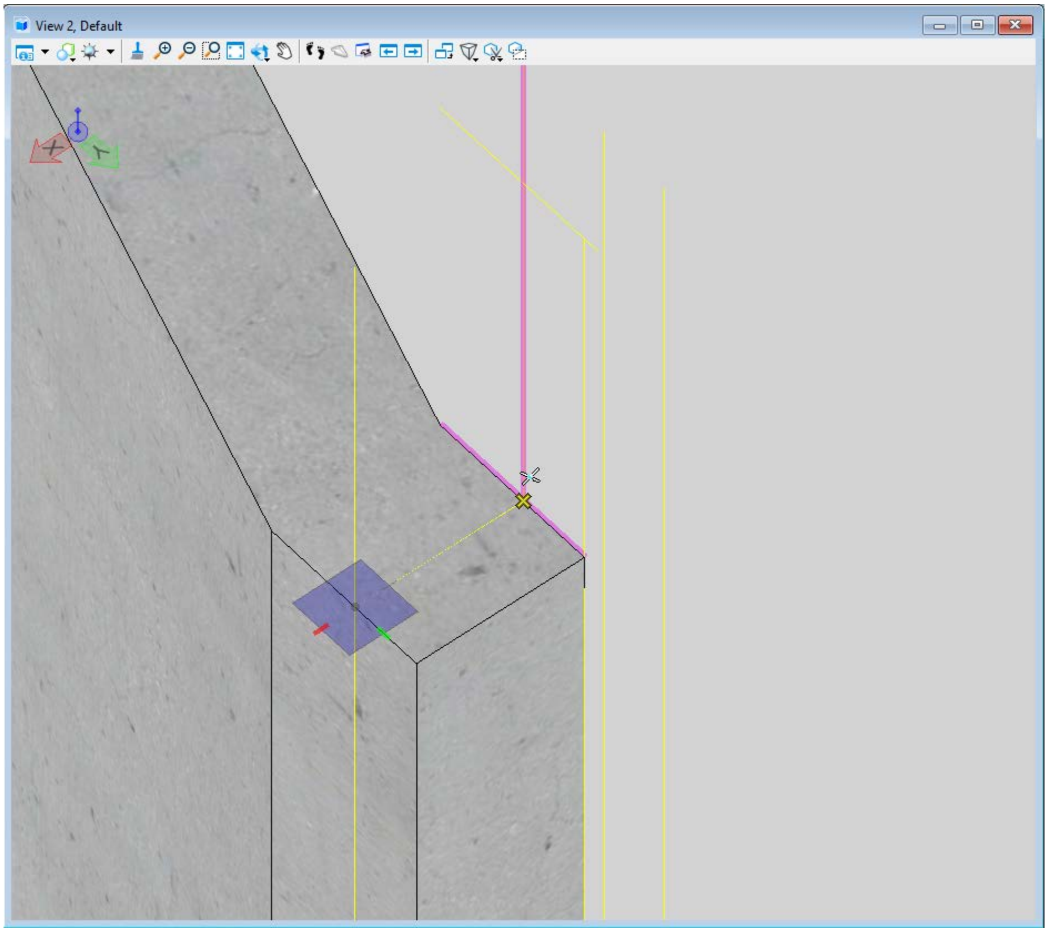
61. Next, copy the vertical construction line located at the vertical edge of back wall back by grabbing it from the bottom node and copying to the ends of both horizontal lines located at EL 105'. The copied lines are highlighted in the image below.



62. Copy the vertical construction line pictured below from the location shown in the View 2 isometric view and place it in the noted location in the View 1 plan view.

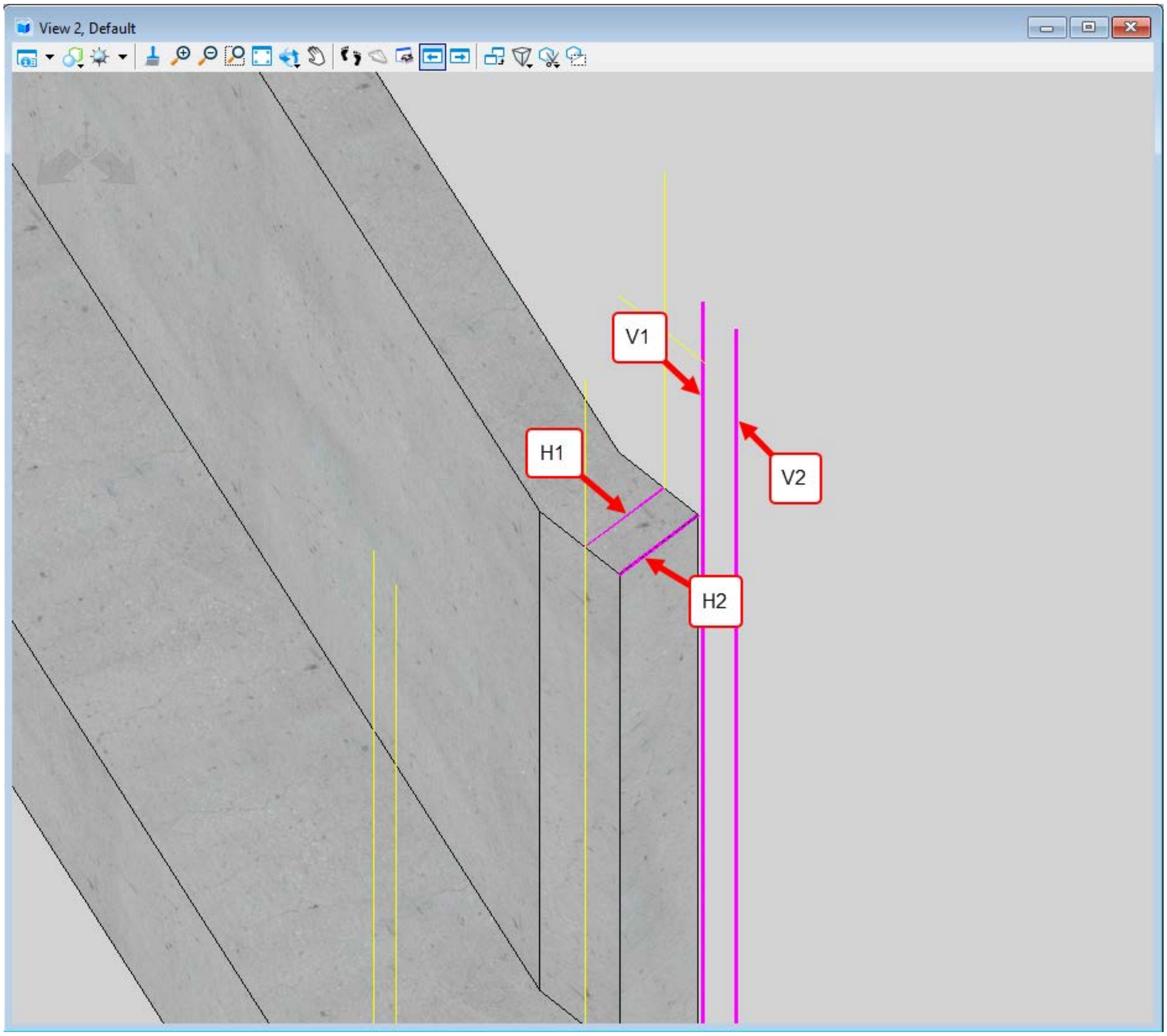


63. Use the **Level Display** to turn off the EndBentCheekWallConc_pm level in View 2. Then draw a construction line along the top of the backwall between the vertical construction line pictured in the image below.

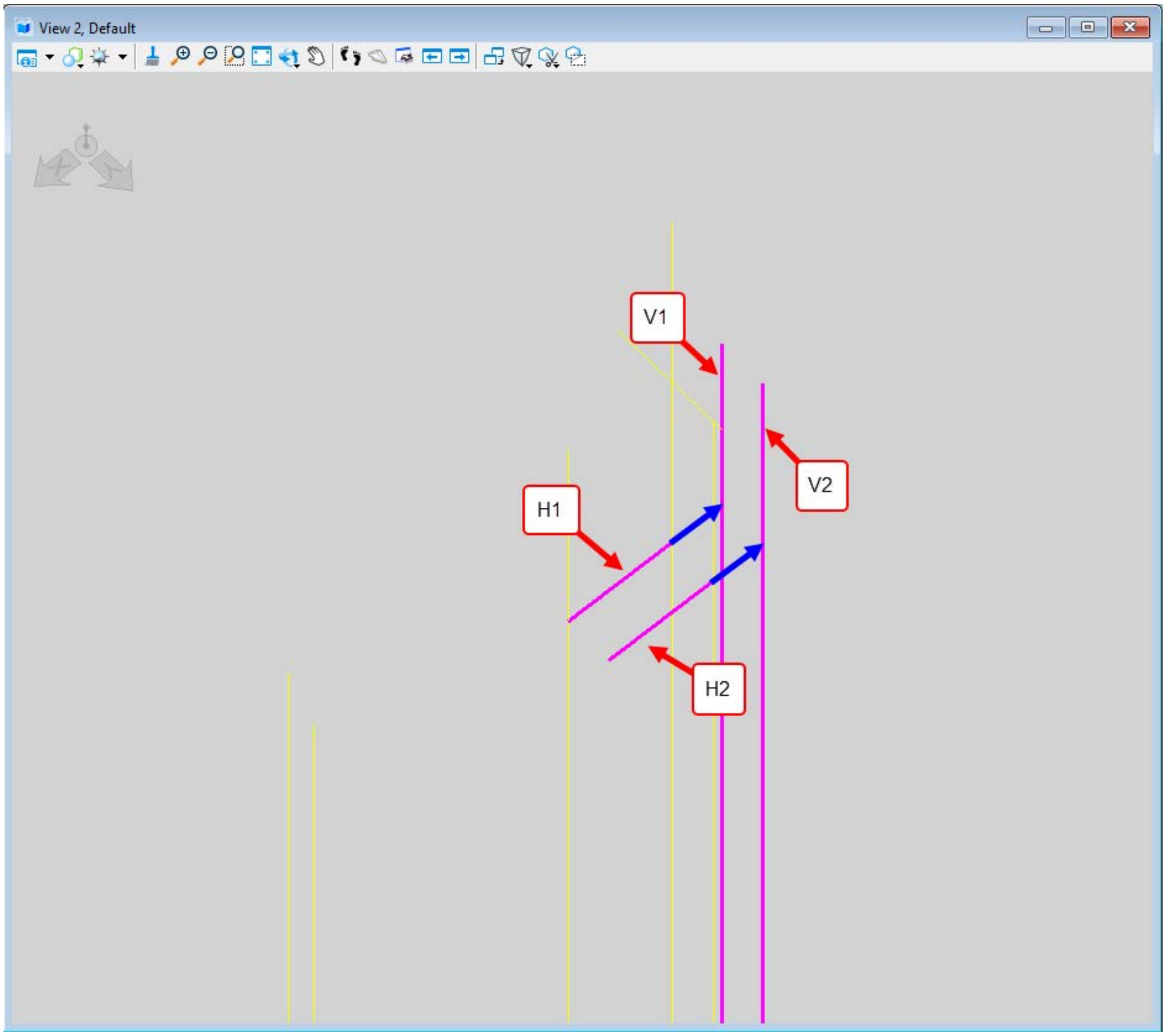


64. Again, use the **Level Display** to turn off the EndBentCapConc_pm level. Use the **Extend Line** tool to extend the horizontal construction lines H1 and H2 to reach vertical construction lines V1 and V2.

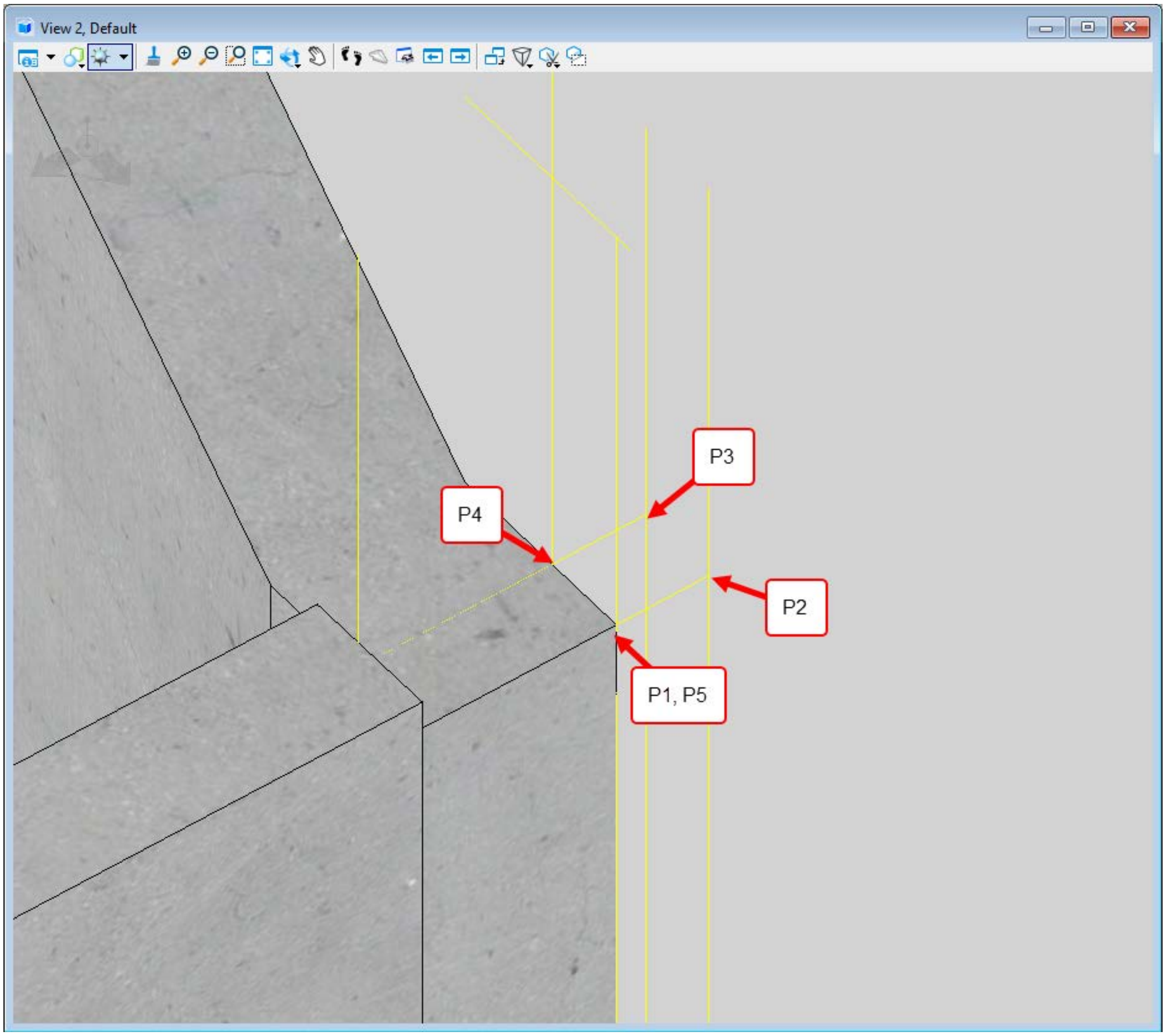
Before Turning off EndBentCapConc_pm Level



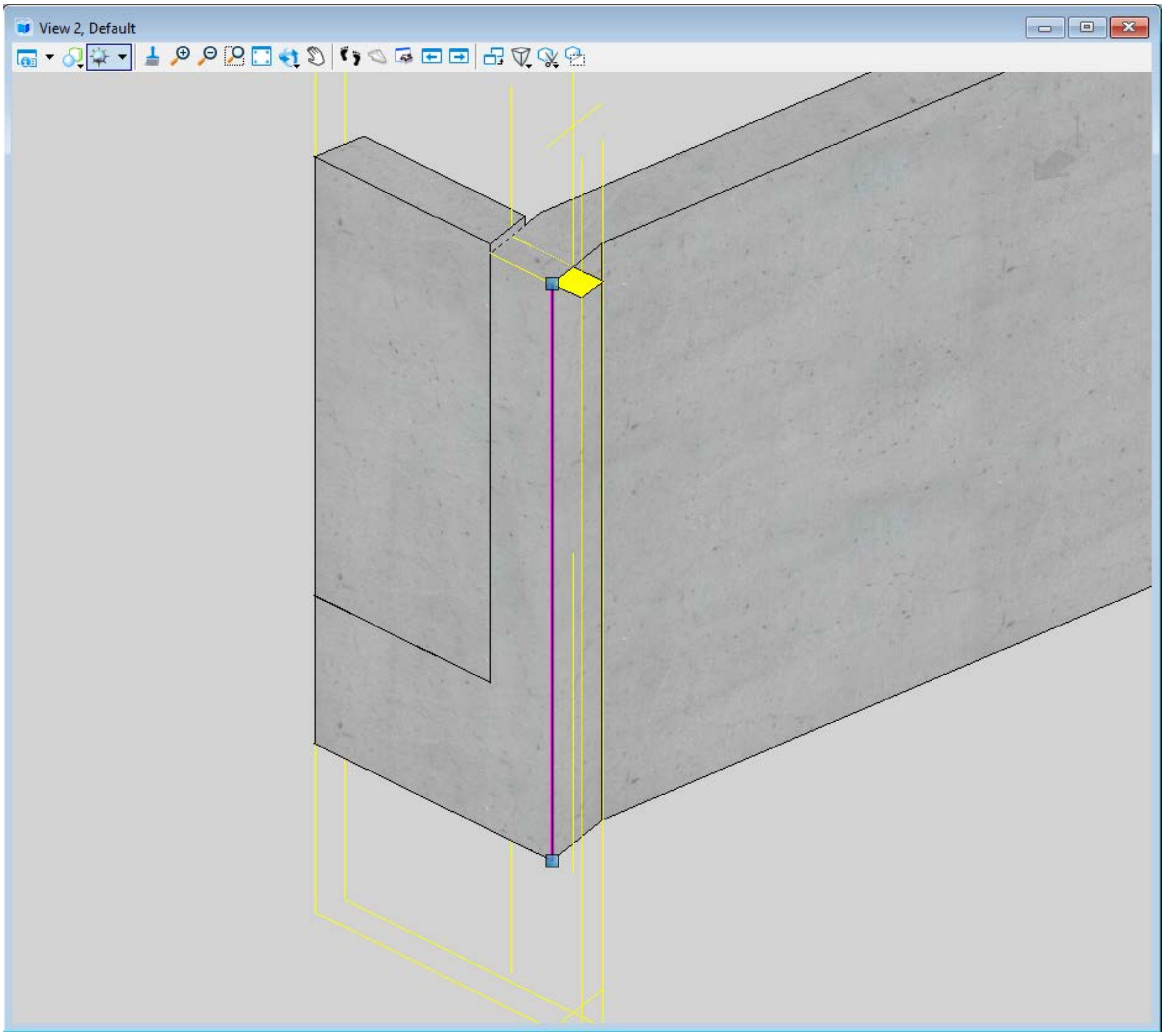
Extend after Turning off EndBentCapConc_pm Level



65. Next, use the **Place SmartLine** tool place shape with the vertices shown in the image below.



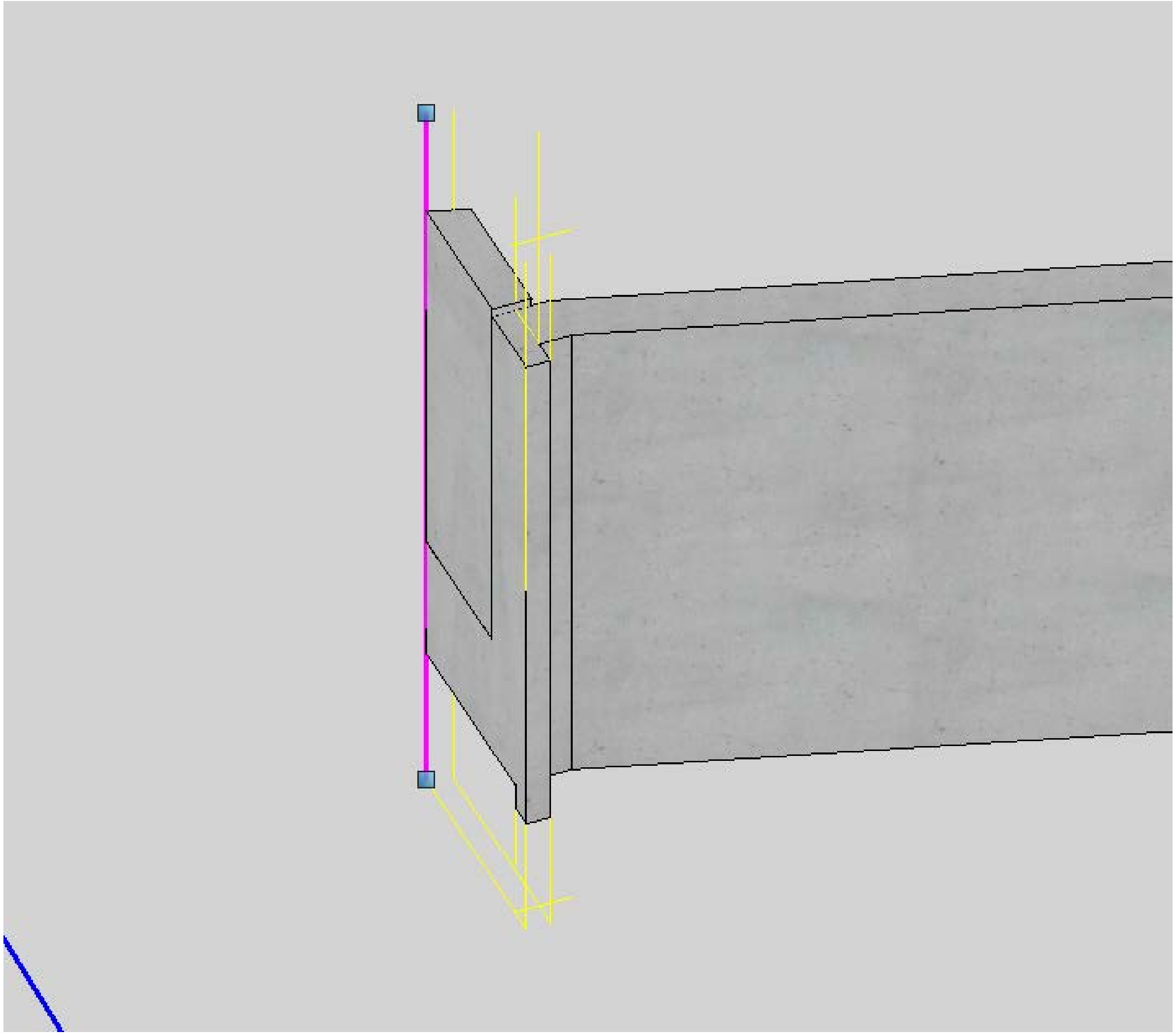
66. Shorten the length of the selected vertical construction line so that the nodes are placed directly on the corners of the end bent as shown in the following image.



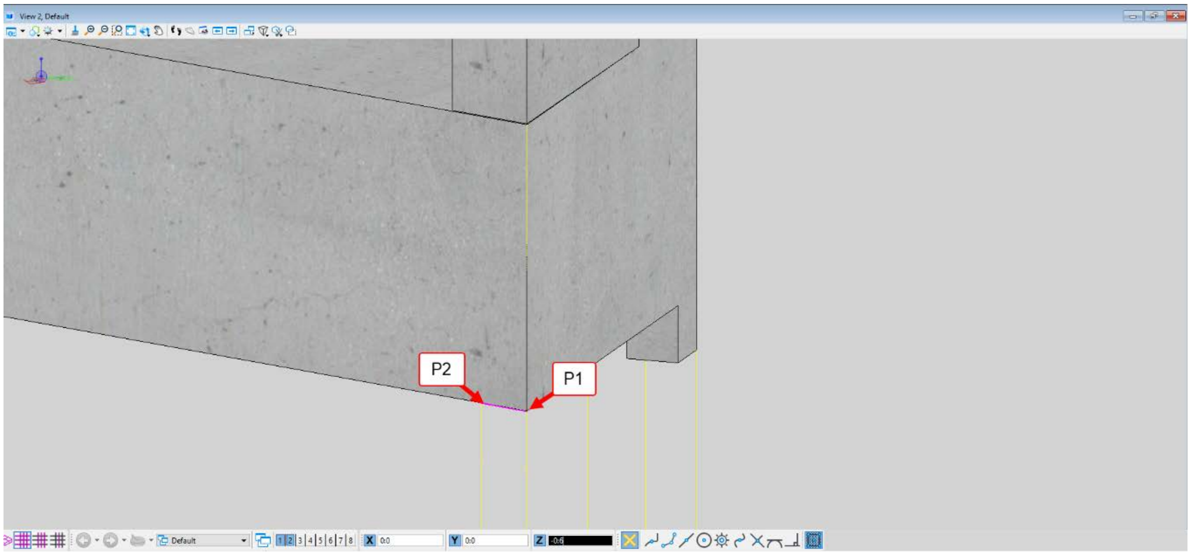
Then use the **Extend Line** tool to extend the bottom of the selected line to go 6” beyond the bottom of the end bent cap.

67. Next, activate the **Extrude Along** tool. Select the vertical construction line that was just modified in the last step as the profile element. Click the shape at the top of the backwall as the extruded element, and then data point in space to create the new solid representing the back MSE wall lug.

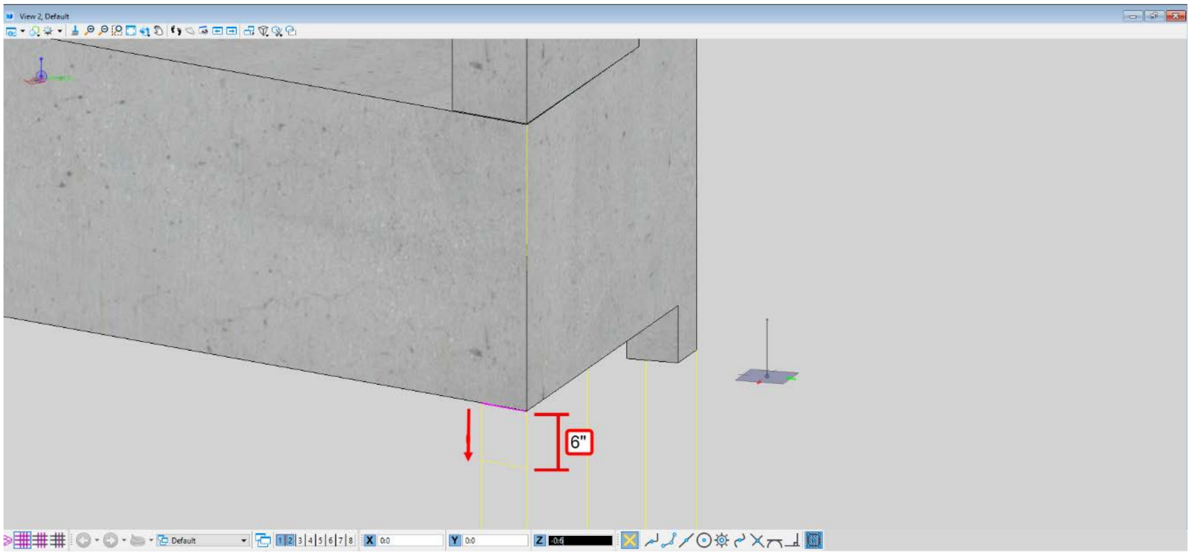
68. Use the **Unite** tool to join the end bent to the new solid. Click on the end bent to select it as the first element, then click on the new yellow solid to select it as the next element. Data point in space to accept the selection and combine the solids. The combined solid is shown below.



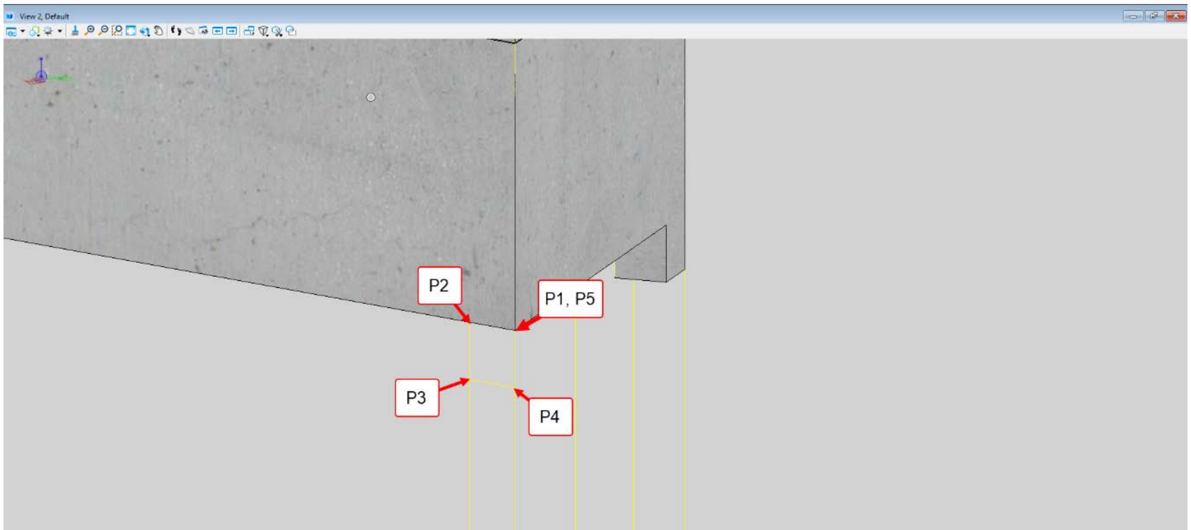
69. Draw a construction line from the bottom corner of the end bent (P1) to the next vertical construction line (P2).



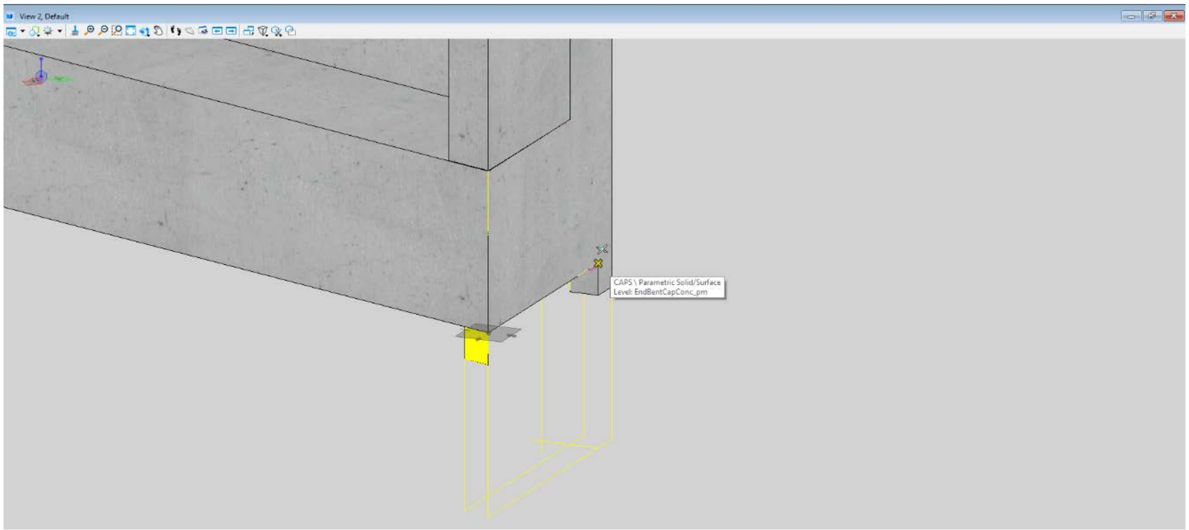
Use the **Move** tool to move the line that was just drawn directly downward in the global z coordinate direction by 6”.



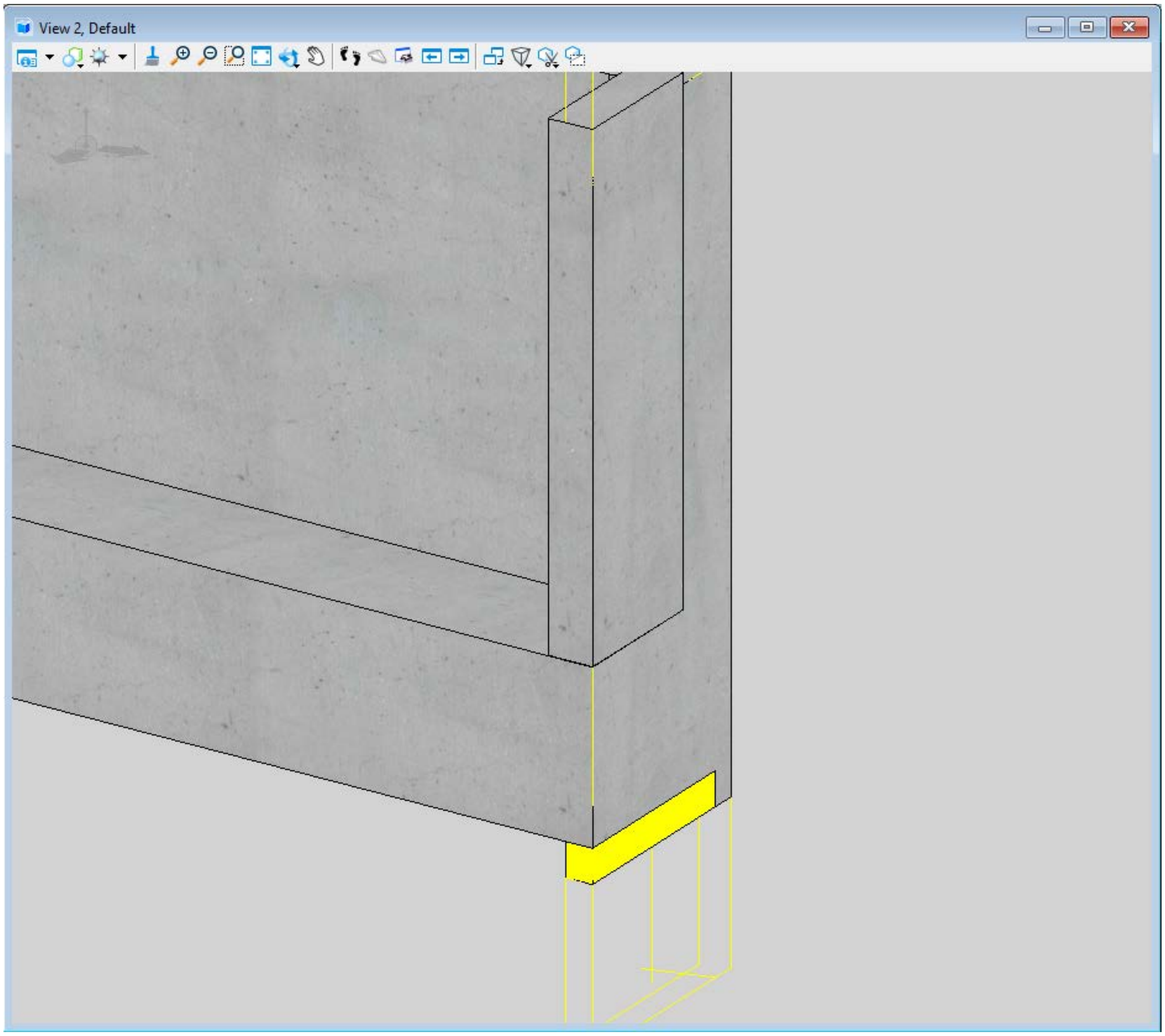
70. Next, use the **Place SmartLine** tool place shape with the vertices shown in the image below.



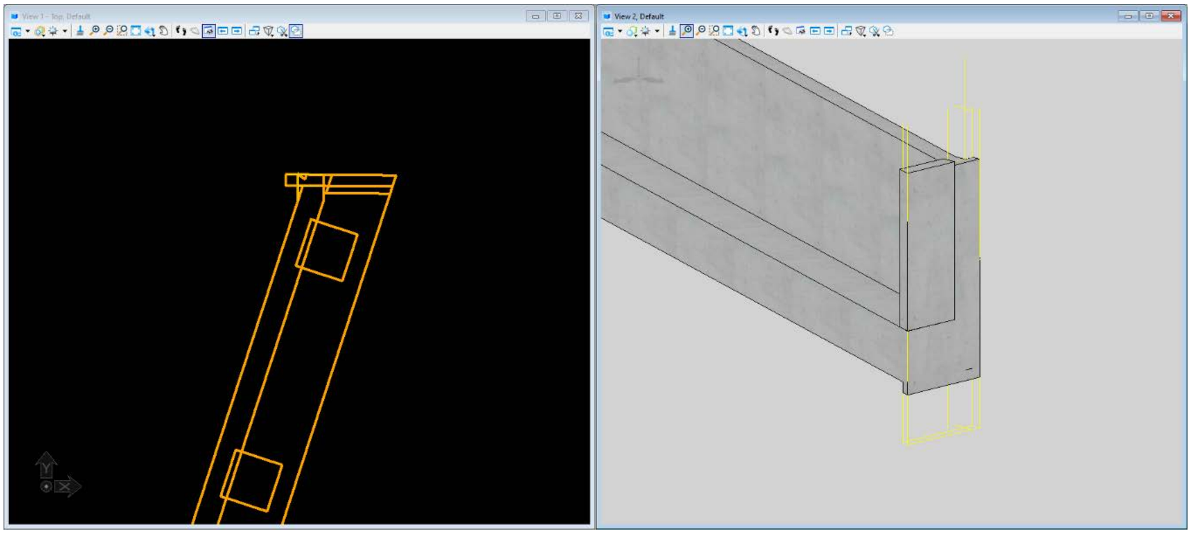
Once the shape has been created, place a construction line from the bottom corner of the end bent to the interface with the MSE wall lug as shown in the image below.



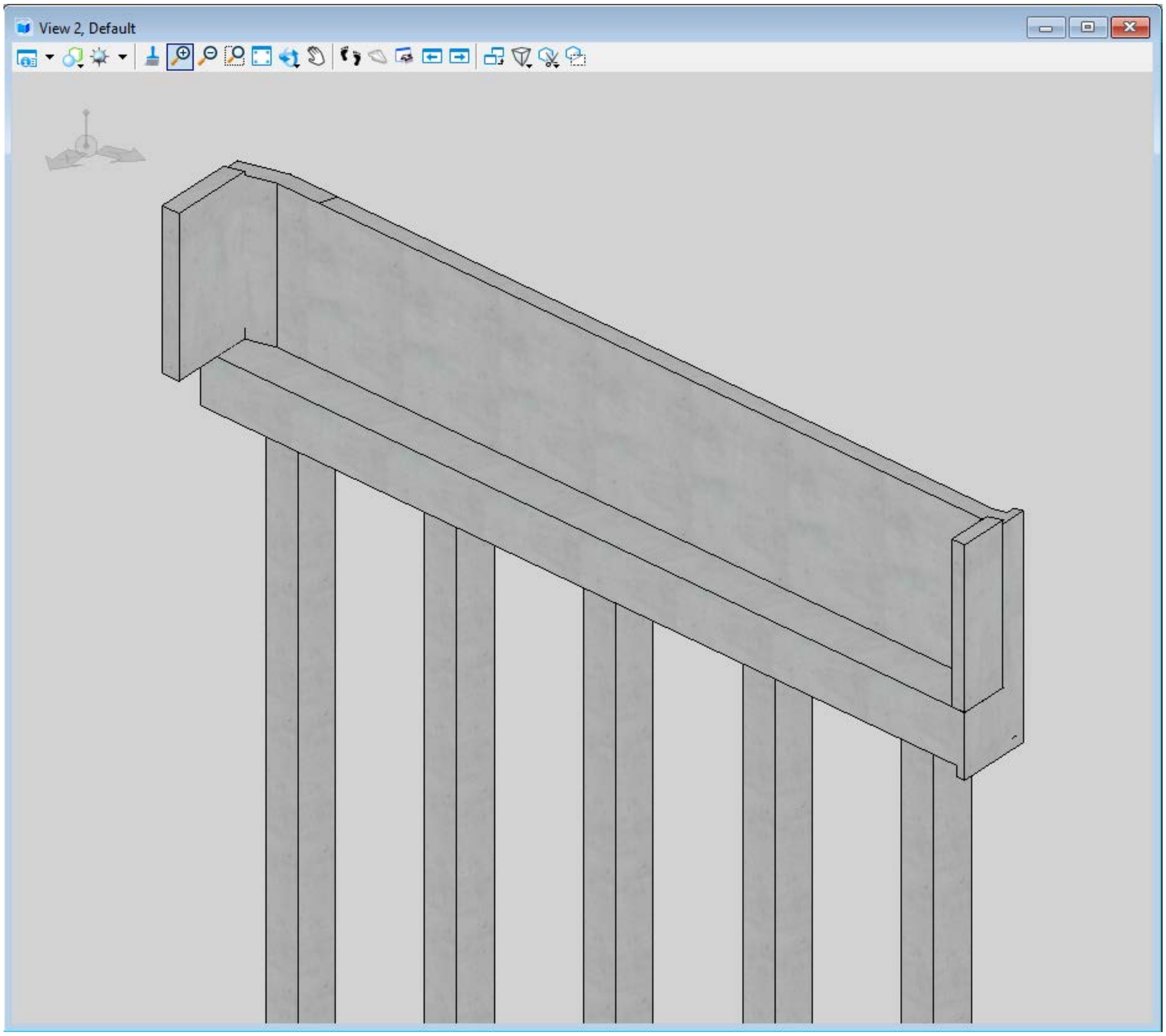
71. Activate the **Extrude Along** tool and select the construction line that was just created in the last step as the profile element. Click the shape at the front of the end bent cap as the extruded element, and then data point in space to create the new solid representing the bottom MSE wall lug.

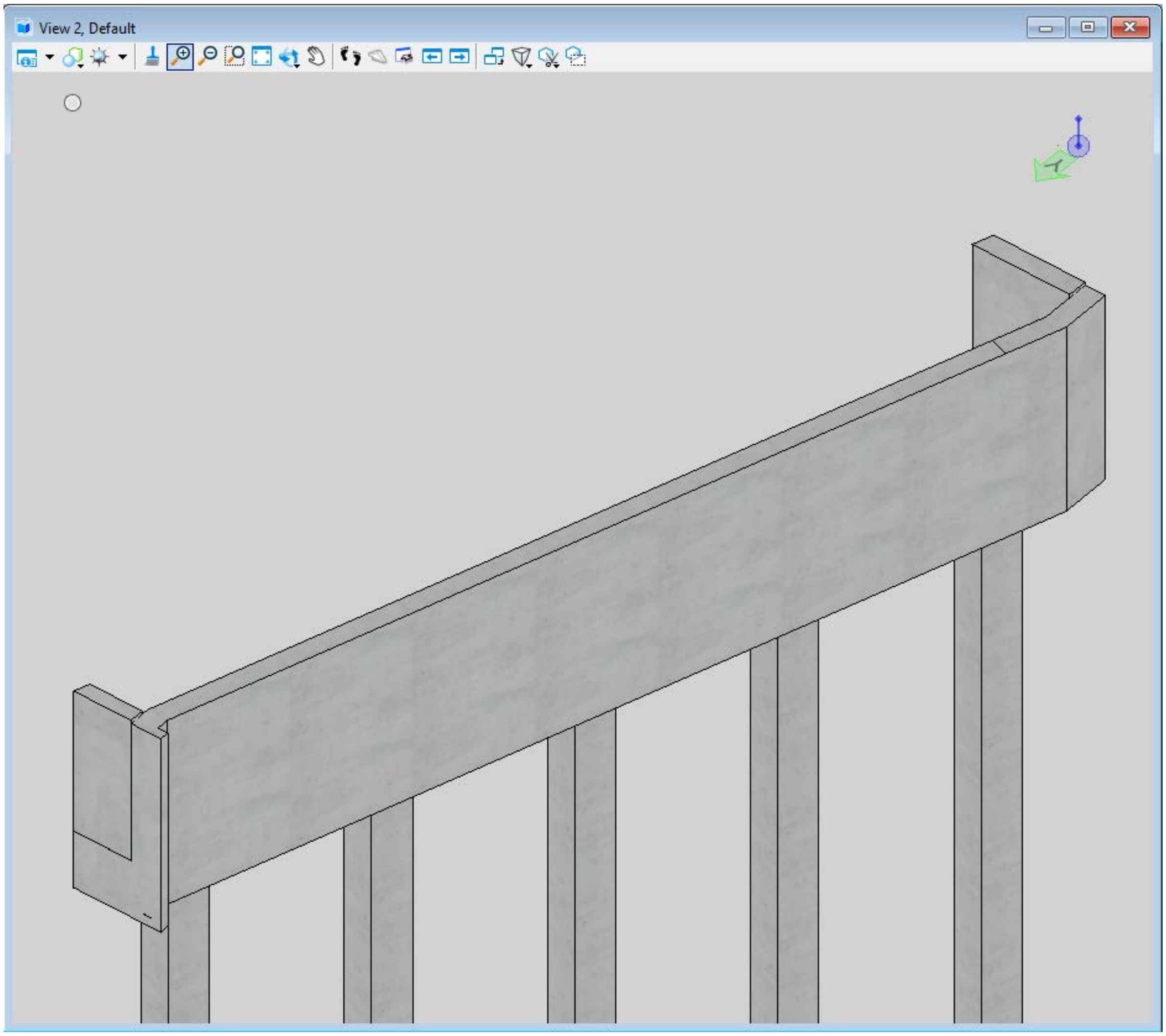


72. Use the **Unite** tool one last time to join the end bent to the new solid. Click on the end bent to select it as the first element, then click on the new yellow solid to select it as the next element. Data point in space to accept the selection and combine the solids. The combined solid is shown below.



73. All construction lines can either be hidden or deleted. And any other levels may be turned on or off at this point to see the final result.




View 2, Default

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