



# FUNDAMENTALS

## OpenRoads Designer

*(Formerly MicroStation)*

*CONNECT Edition*



**TDOT**

**Roadway Design Division**

November 2020





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## Preface

### Purpose & Need



The **FUNDAMENTALS** OpenRoads Designer (ORD) manual is the first document in a series of **six** training manuals released by the Tennessee Department of Transportation (TDOT) that is available through a digital, interactive **flipbook** format. Bentley's ORD software is being adopted and implemented statewide by TDOT as the new **3D modeling** design software, which will ultimately replace both MicroStation V8i and Geopak (SELECT Series 2). This manual provides an introduction to ORD and focuses on the basic **non-modeling** drawing functions of the software.

### Disclaimer

The **FUNDAMENTALS** manual is developed based on OpenRoads Designer CONNECT Edition 2020 Release 2, Version 10.08.01.33. The TDOT ORD workspace (Version **2020**) complies with the latest CADD standards and should be used in conjunction with this manual. It can be downloaded for consultants on the TDOT CADD Support website under **TDOT ORD Info** (<https://www.tn.gov/tdot/roadway-design/tdot-cadd-support/tdot-openroads-designer.html>). Unless specifically directed by TDOT's Roadway Design Director as a pilot project for the software, ORD shall not be used for production purposes. If you have any technical issues or recommendations for this manual, please contact TDOT CADD Support at [TDOT.ORD@tn.gov](mailto:TDOT.ORD@tn.gov).

### Training Videos



The **FUNDAMENTALS** manual has accompanying training videos which are intended to be utilized as you go through the exercises. Video icons have been inserted throughout the flipbook, providing direct access to the applicable video. At a minimum, there is at least one video per chapter. In general, the videos contain instructional guidance and additional tips and tricks, as well as an informational bar at the bottom of the screen to help stay on track.

### Revisions

The **FUNDAMENTALS** manual will be revised over time as a result of future ORD software releases and procedural & workspace updates. All revisions will be documented by WSP/TDOT and included on the **Revision History** page at the end of the manual. TDOT CADD support will announce updated manual versions when they become available via emailed Instructional Bulletins. The updates will also be posted on the ORD TDOT webpage.



## ORD Training Manuals

The **FUNDAMENTALS** manual is one of **six** ORD training manuals available. Each manual has its own icon and color associated with it, which are maintained throughout the applicable manual and videos to help the user with wayfinding.





# Chapter 1. Course Overview

## Course Description and Objectives:

This course introduces users to the OpenRoads Designer (ORD) CONNECT software, which is Bentley's current drafting and civil design platform that is being adopted for use by TDOT.



At the conclusion of this course, participants will be able to:

1. Create and reference files and navigate the ORD product interface.
2. Draw non-civil geometry using TDOT CADD Standards.
3. Create plan and 1:1 sheets (not based on a design model) and print to PDF.
4. Apply coordinate systems and export to Google Earth.

The topics covered in this class are:

1. OpenRoads Designer (ORD) CONNECT Edition
2. Attributes Dialog and Primary Toolbox
3. TDOT Standards and Element Attributes
4. Placing CADD Elements
5. Modifying and Manipulating CADD Elements
6. View Tools
7. Element Selection Tools
8. Annotation Tools (Non-Intelligent)
9. Sheet Index and Placing Named Boundaries (Plan Sheets Only)
10. 1:1 Sheets
11. Plotting Sheets (Creating a PDF)
12. Geographic Tools

## Target Audience:

This course is designed for anyone using the basic non-modeling drawing functions of the software, including the following:

- Construction
- Project Development
- Structures
- Survey
- Traffic Operations

## Pre-Requisites:

- Familiarity with TDOT's design policies, procedures, and standards.
- A working knowledge of Windows 10.



## Chapter 2. Introduction to OpenRoads Designer CONNECT Edition



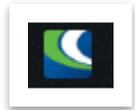
OpenRoads Designer (ORD) CONNECT Edition is a comprehensive modeling application that streamlines and automates traditional 2D plan-centric workflows by dynamically incorporating 3D parametric model designs.

### 2.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Connect to the CONNECTION Client.
2. Launch the ORD product.
3. Locate the TDOT workspace and create a project workset.
4. Locate the TDOT seed files.
5. Create a new file.
6. Navigate the ORD Interface.
7. Navigate File Menu and Locate User and Design Settings.

### 2.2 Lecture: CONNECTION Client



The **CONNECTION Client** is a standalone function of Bentley that provides runtime components required for applications to access Bentley Cloud Services. The components provided through the CONNECTION Client are common across applications and are required to participate in capabilities provided through the CONNECT Edition. **Users must login to the CONNECTION Client for ORD to work.** Depending on how your licensing is setup, you likely will get a No Entitlement error or a trial alert if you do not.



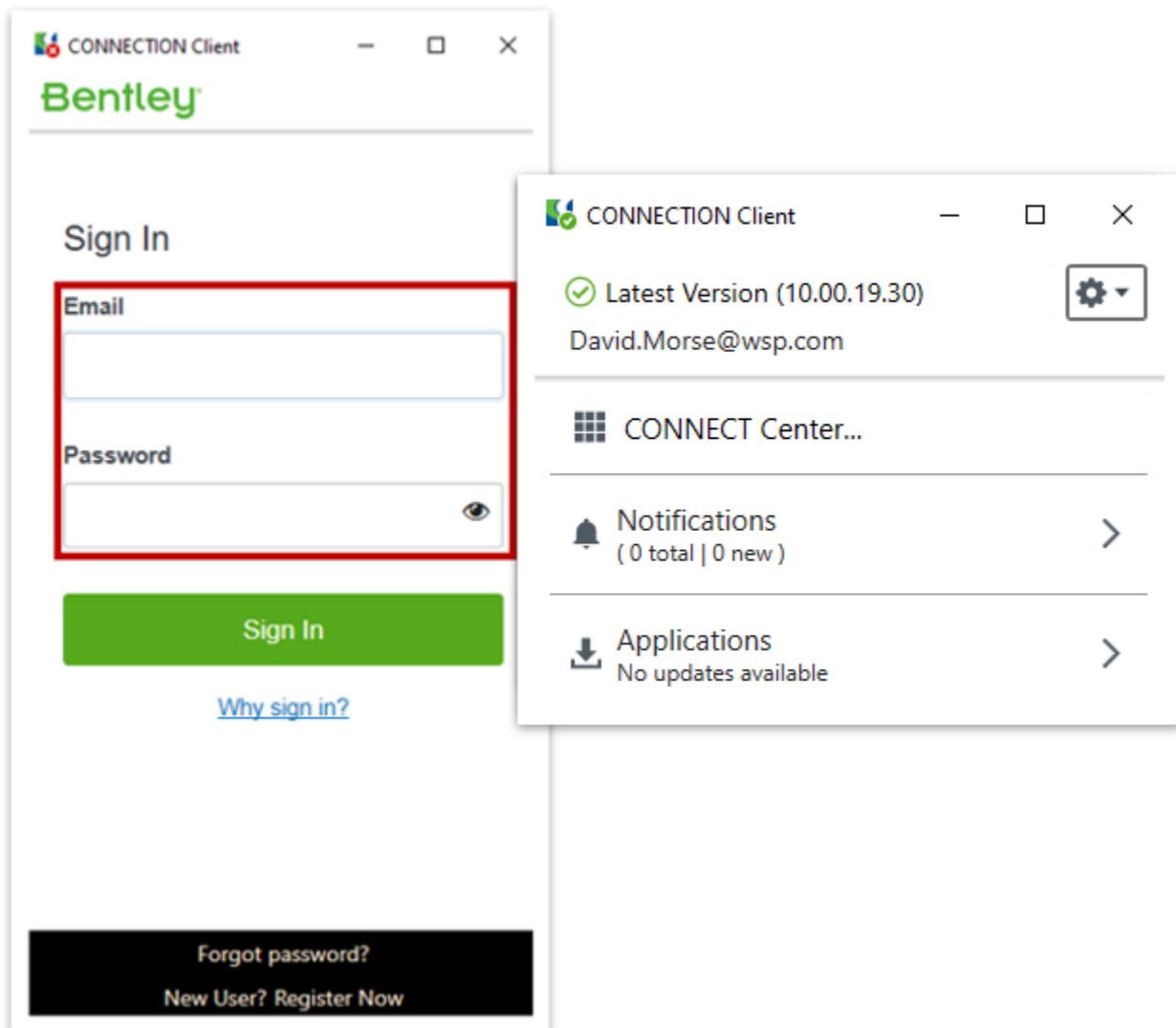
When logging in to your machine (tablet or supercomputer), the CONNECTION Client should automatically launch. You will be prompted for your Bentley login (**email and password**), as shown in Figure 1. After entering your password, click on **Remember Password**. You likely will have to acknowledge the user agreements by clicking OK. Once logged in, you will see a green check mark in the CONNECTION Client window showing the latest version at the time of the class. **Note: Typically, you are only prompted to enter your Bentley email and password the first time on a given machine.**



### Take Note!

*Bentley has released several updated versions of the **CONNECTION Client**. You may have a different version installed on your machine, which will result in differing graphics compared to Figures 1 and 2.*

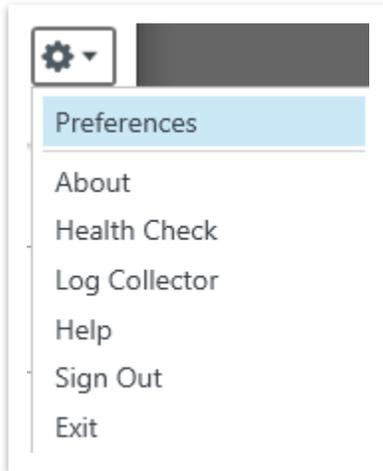
FIGURE 1. CONNECTION CLIENT SIGN-IN





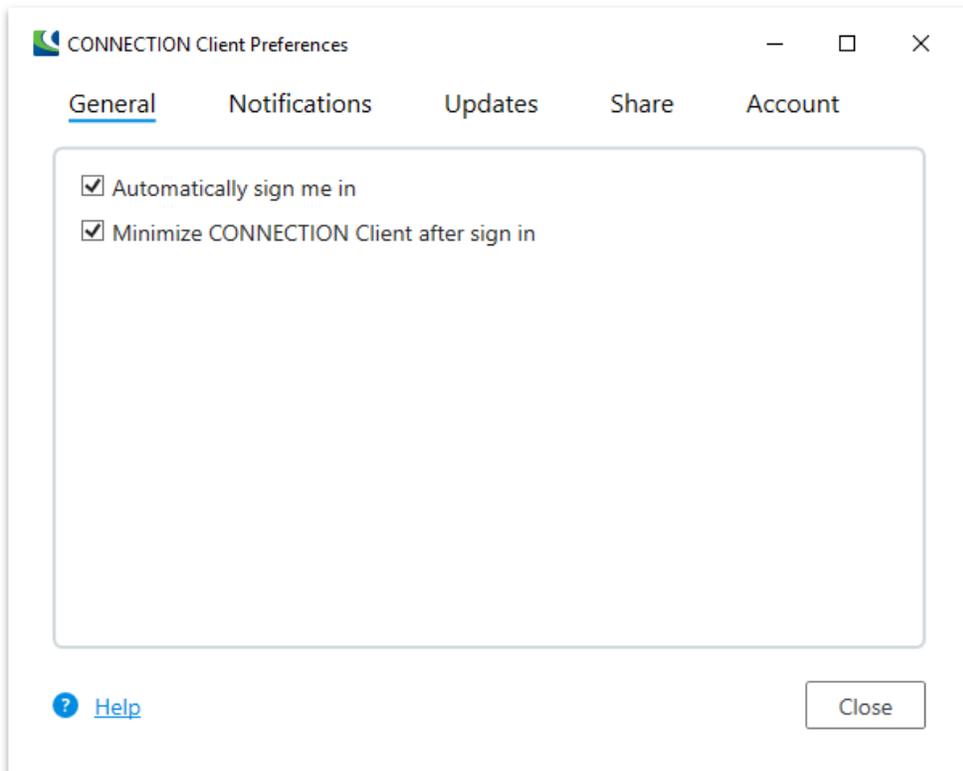
After logging in to the CONNECTION Client, click on the gear icon and select **Preferences** (Figure 2). Again, your version may look slightly different than what's shown below.

FIGURE 2. CONNECTION CLIENT PREFERENCES TOOL



Make sure that both **Automatically sign me in** and **Minimize CONNECTION Client after sign in** are checked and then click **Close** (Figure 3).

FIGURE 3. CONNECTION CLIENT PREFERENCES DIALOG BOX





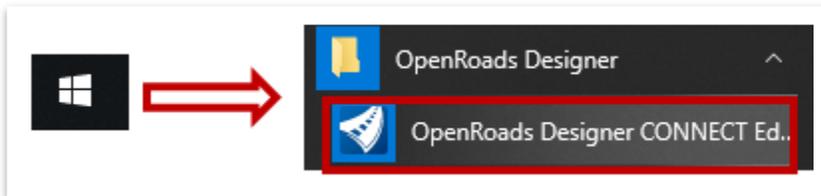
## 2.3 Lecture: Creating a File

In order to complete the exercises in Chapter 2 and all subsequent chapters in this class, we need to launch the software, select the TDOT workspace, setup a project workset and create a new file.

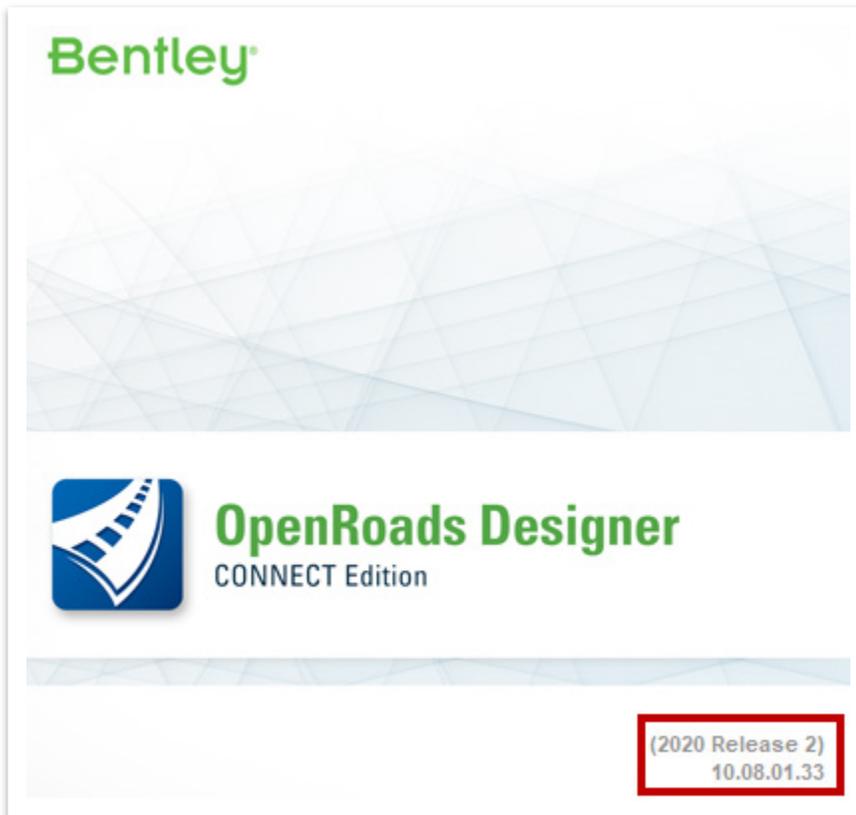
### 2.3.1 Exercise: Launching ORD



1. Launch ORD. You will need to open the Windows menu in the bottom left of the desktop and look for the **OpenRoads Designer** folder. Click on the blue icon. If you right click on the blue icon, you can select **More >> Pin to Taskbar** to create a shortcut at the bottom of the screen.

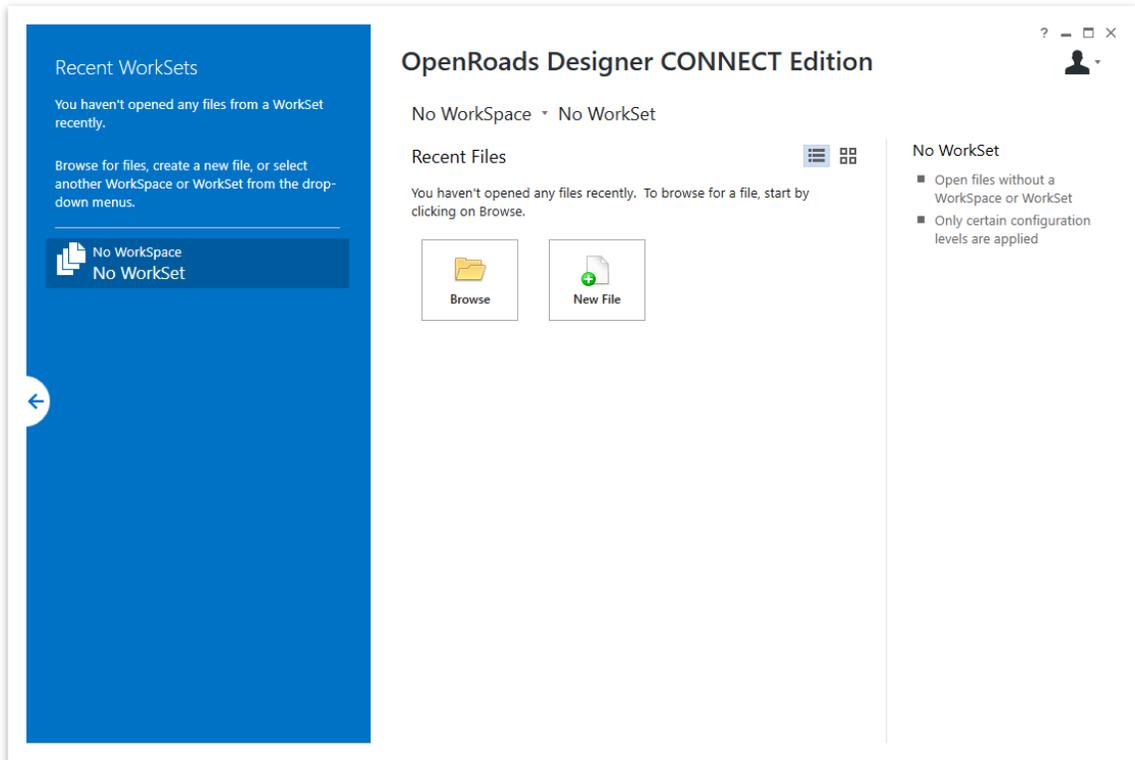


2. After launching ORD, you will see the initial screen below showing the ORD version that is being used: **2020 Release 2**. **Note:** Your version may differ depending on when the class is taken.





3. You will be taken to the **File Selection Manager**. A user will not see any recent files or any workspace or workset selected the first-time opening ORD. However, the next time opening ORD, you will see your recent file(s), the TDOT workspace and last workset used automatically show up. We will discuss the workspace and worksets in the next section.





### 2.3.2 Workspace and Worksets

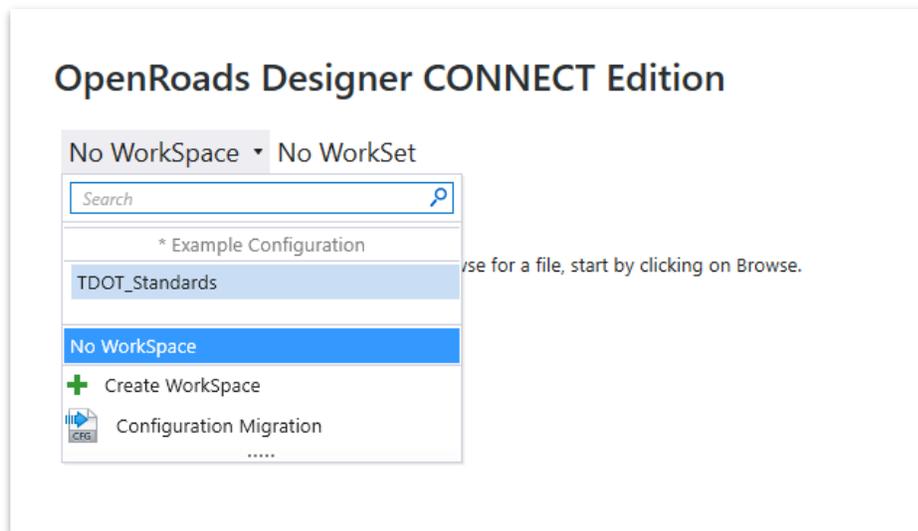
The software is configured in a **WorkSpace** and a **WorkSet**. A **WorkSpace** is a collection of standard settings that control how the program works. TDOT has its own **WorkSpace** with specific TDOT CADD standards, including cells, color tables, dgnlibs, fonts, scales, seed files, sheet borders, model template library, etc.



**Take Note!**

The user will need to select the **TDOT Workspace** to load all TDOT CADD Standards (Figure 4). No other workspace will be used.

FIGURE 4. WORKSPACE SELECTION



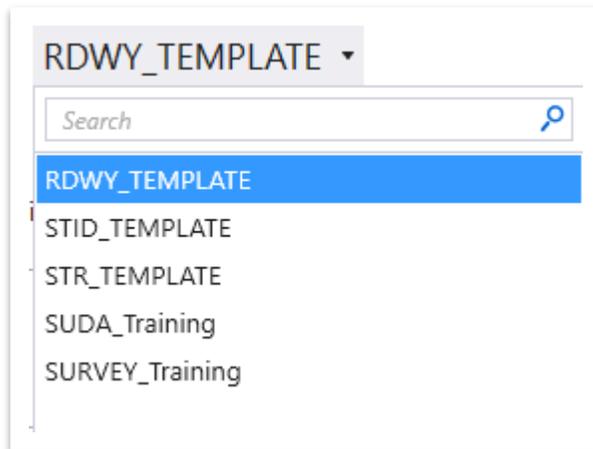


A **WorkSet** is a project folder where the user will store all project files. This folder can also be used to store files that supplement the **TDOT WorkSpace**. For example, the designer may want to save a model template library for a project to allow flexibility for creating new components and templates specific for the project without compromising the integrity of the TDOT model template library.

**Take Note!**

A new **WorkSet** will need to be created for each roadway project and will be based off of the **RDWY\_TEMPLATE**. There is also a **STID\_TEMPLATE** and a **STR\_TEMPLATE** for those respective TDOT divisions. For the purpose of training, there is also a **SURVEY\_TRAINING** and a **SUDA\_TRAINING** workset.

FIGURE 5. WORKSET SELECTION

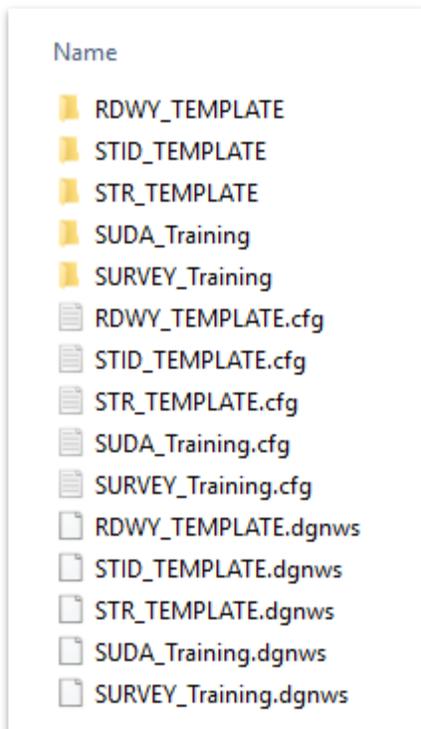




Once a WorkSet is created, it will automatically add **3** files to the ORD folder structure in the following location (Figure 6): **C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\WorkSpaces\TDOT\_Standards\WorkSets\.**

- WorkSet folder (the dgn folder for your design files is located in this folder)
- Workset.cfg (configuration file)
- Workset.dgnws (workset file that contains the sheet index)

FIGURE 6. WORKSET FILES & FOLDERS

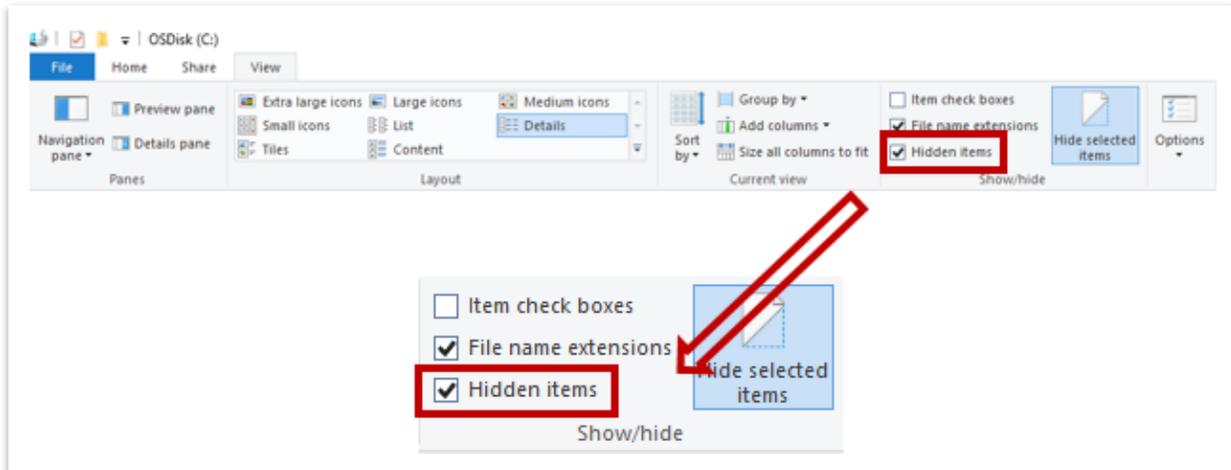


**Take Note!**

The **Program Data** folder is a hidden folder by default. In your C drive folder, make sure that **Hidden Items** is checked under **View >> Show / Hide**, as shown on the next page (Figure 7).

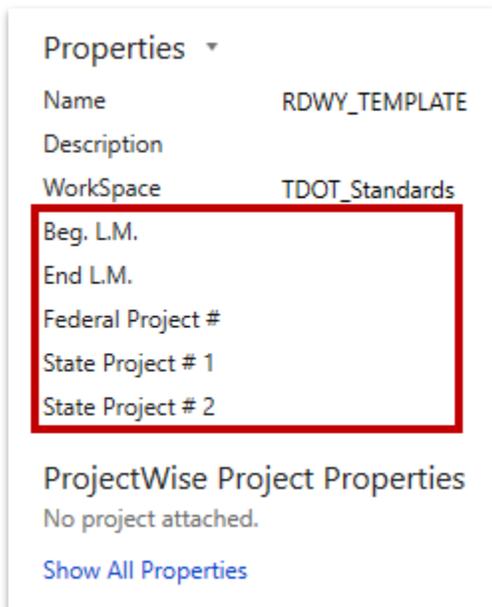


FIGURE 7. HIDDEN ITEMS TOGGLE



Each WorkSet also has its own **Properties**, which can be seen on the right of the screen. The **5** custom properties are highlighted in red (Figure 8) and are linked to specific annotation labels. These fields are now part of the TDOT standard. The other project specific properties (e.g. Year, Type, etc) are sheet index properties, which will be covered later in the class.

FIGURE 8. WORKSET PROPERTIES



**Take Note!**

*If any updates are required to these fields after you have already placed annotation labels in the dgn file(s), the files will need to first be compressed. Then the key-in **Field Update All File** will need to be applied and the labels will update.*

You can also make a copy of a WorkSet from a prior project and use it as the basis for your new project. All printing will be done from within the sheet index setup in each WorkSet.

**Take Note!**

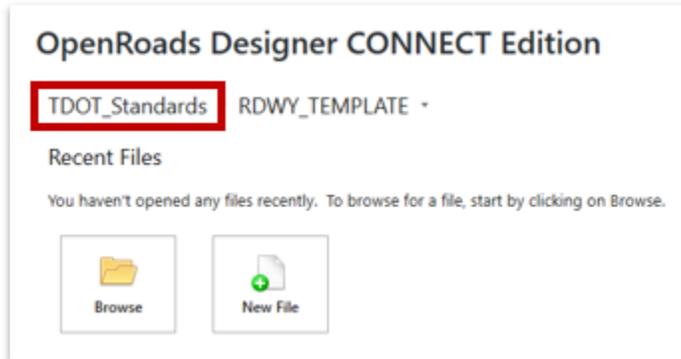
*It is highly recommended to setup WorkSets (or project folders) in a standard network location using TDOT standard naming conventions. Only files stored on the network will be properly backed up every night.*



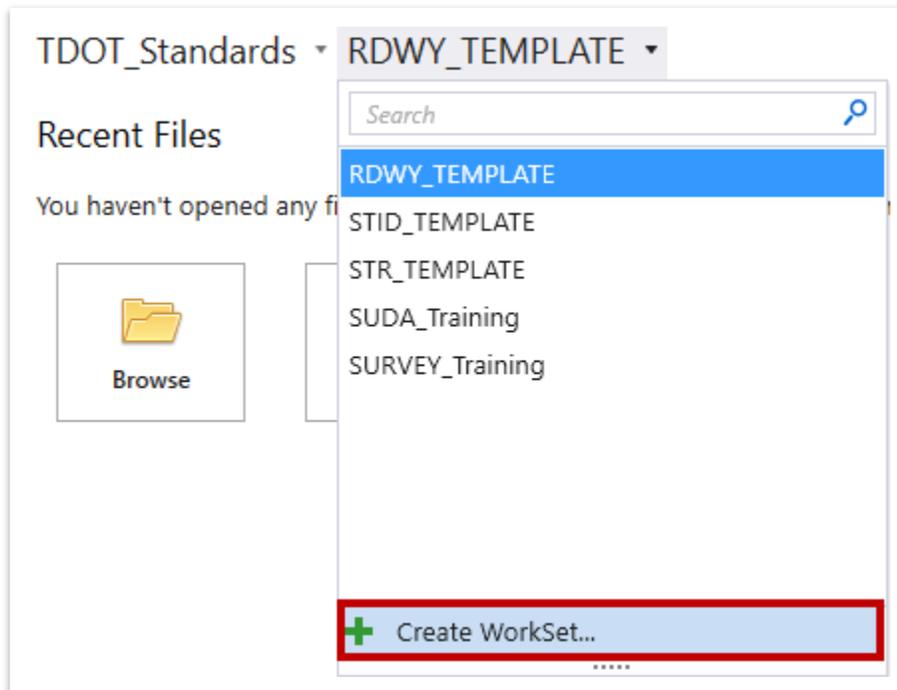
### 2.3.3 Exercise: Selecting a Workspace and Creating a Workset



1. Select the **TDOT\_Standards** Workspace from the drop-down menu. Remember, the first time you open ORD, it will show No WorkSpace by default. Each time thereafter it should remember the TDOT\_Standards Workspace and have it prepopulated. Notice that after selecting the workspace, by default it populates the WorkSet with **RDWY\_TEMPLATE** (alphabetical order)



2. Before we create a new file, we need to create a new **Project WorkSet**.





3. The **Create WorkSet** dialog will appear.
  - a. Type in the name **123456.00\_INITIALS** (enter your initials).
  - b. Select the **RDWY\_TEMPLATE** as the template. This sets up the correct sheet index folders per TDOT Roadway project standards.
  - c. Leave the **Create Folders Only** option unchecked and click **OK**.

**Create WorkSet**

Name: 123456.00\_INITIALS

Description:

Template: RDWY\_TEMPLATE  Create Folders Only

+ Add a Custom Property

Folder locations

Root Folder: C:\ProgramData\Bentley\OpenRoads Designer CE\Configurati Browse...

Design Files: C:\ProgramData\Bentley\OpenRoads Designer CE\Configurati Browse...

Standard Files: C:\ProgramData\Bentley\OpenRoads Designer CE\Configurati Browse...

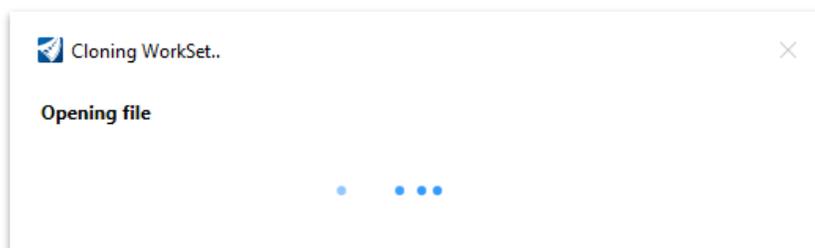
Standards Subfolders: Cell;Data;Dgnlib;Macros;Seed;Sheet Borders;Superelevation;Sy

ProjectWise Projects

(click Browse to attach a Project) Browse...

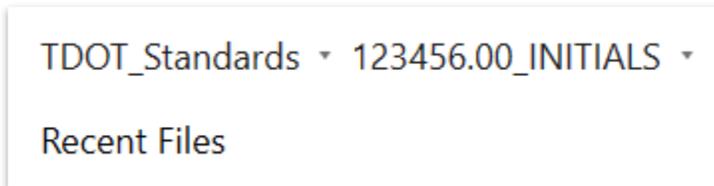
OK Cancel

4. You will see a Cloning WorkSet window popup.

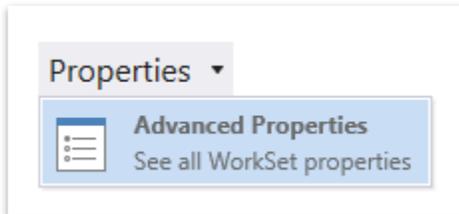




- Notice your new project WorkSet is now populated.



- Let's now fill in the applicable WorkSet properties. Open the properties pull down menu and select **Advanced Properties**.



- Enter the following data and then click **OK**. These fields are directly linked to the Title Sheet annotation which we will cover later in the class.
  - Federal Project # 1:** F123456.00
  - State Project # 1:** S123456.00

Edit WorkSet	
Name:	123456.00_INITIALS
Description:	
Beg. L.M.	Enter value *
End L.M.	Enter value *
Federal Project #	F123456.00 *
State Project # 1	S123456.00 *
State Project # 2	Enter value *
+ Add a Custom Property ▾	

- Now that we have created a workset, the applicable project folders have been created on the **C** drive. Go ahead and download/move the provided **class files** to the following location: **C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS \dgn**. We will utilize them later in the class.



### 2.3.4 TDOT Standard Seed Files

Before creating a new file, let's explore the TDOT standard seed files that have been setup for the ORD CONNECT workspace. You will never need to open the actual seed files but rather select them as the seed depending on the task. Seed files used for creating drawings are summarized in Table 1. Separate seed files used for creating sheets are summarized on the next two pages in Table 2.

**Table 1 Seed File Location: C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\Organization-Civil\TDOT\_Standards\Seed\**

TABLE 1. TDOT DRAWING SEED FILES

Drawing Seed File Name	Description
TDOTSeed2D.dgn	This seed file is used when creating drawings for placing and working with roadway design geometry. This is most likely the default seed file.
TDOTSeed3D.dgn	This seed file is only used for working with survey data, terrain models, and/or lidar data sets.
TDOTSeed3DAerial.dgn	This seed file is only used when working with aerial survey files.



#### Take Note!

Generally, users will need to select a 2D seed file. A 3D seed file is **ONLY** needed when using the Survey, LiDAR and Terrain tools.



**Table 2 Seed File Locations: C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\Organization-Civil\TDOT\_Standards\Seed\Sheets\**

and

**C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\Organization-Civil\TDOT\_Standards\Dgnlib\Sheet Seeds\**

TABLE 2. TDOT SHEET SEED FILES

Sheet Seed File Name	Description
<b>Roadway Sheet Seeds (1:1)</b>	
<b>Roadway Word</b>	Creates a blank sheet formatted for notes linked to Word Documents.
<b>Roadway Excel</b>	Creates a blank sheet formatted for quantities linked to Excel Documents
<b>Roadway Title Sheet</b>	Creates a roadway title sheet.
<b>Roadway and Geotech Sheet Seeds</b>	
<b>Plan 20 Scale</b>	Creates a Plan sheet at 20 scale.
<b>Plan 50 Scale</b>	Creates a Plan sheet at 50 scale.
<b>Plan 200 Scale</b>	Creates a Plan sheet at 200 scale.
<b>Profile 20H 2V Scale</b>	Creates a Profile sheet with a 20 horizontal scale and 2 vertical scale.
<b>Profile 50H 5V Scale</b>	Creates a Profile sheet with a 50 horizontal scale and 5 vertical scale.
<b>Profile 50H 10V Scale</b>	Creates a Profile sheet with a 50 horizontal scale and 10 vertical scale.
<b>XS 10H 5V Scale</b>	Creates a Cross-section sheet with a 10 horizontal scale and 5 vertical scale.
<b>XS 10H 10V Scale</b>	Creates a Cross-section sheet with a 10 horizontal scale and 10 vertical scale.
<b>XS Dual Column 10H 5V Scale</b>	Creates a Cross-section sheet with two columns of cross-sections at 10 horizontal scale and 5 vertical scale.



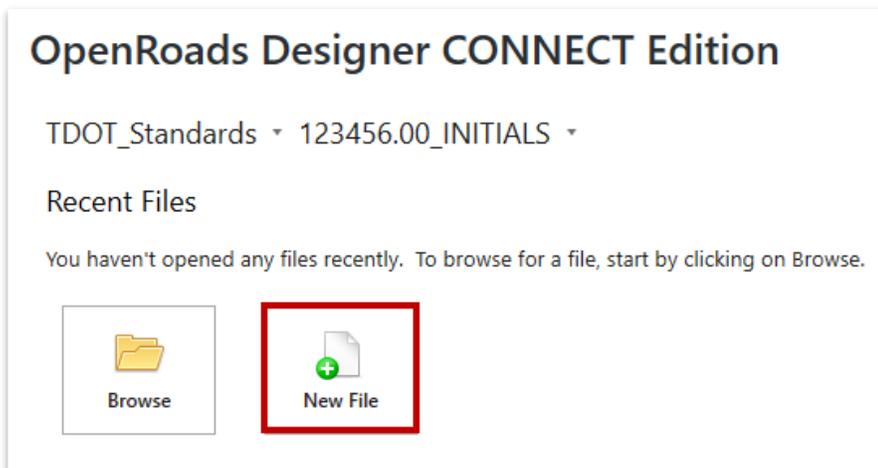
Sheet Seed File Name	Description
<b>XS Dual Column 10H 10V Scale</b>	Creates a Cross-section sheet with two columns of cross-sections at 10 horizontal scale and 10 vertical scale.
<b>STID Sheet Seeds</b>	
<b>STID General</b>	Creates a 1:1-scale sheet for typical section and additional guidance sheets for STID projects.
<b>STID Letter</b>	Creates a letter sized sheet for STID projects.
<b>STID Title</b>	Creates a title sheet for STID projects.
<b>STID</b>	Creates a 1:1-scale sheet for STID projects.
<b>STID Plan 50 Scale</b>	Creates a 50-scale plan sheet for STID projects.
<b>STID Plan 100 Scale</b>	Creates a 100-scale plan sheet for STID projects.
<b>Structures Sheet Seeds</b>	
<b>Structures</b>	Creates a 1:1-scale sheet for Structures projects.
<b>General Sheet Seeds</b>	
<b>Signature Sheet</b>	Creates a blank signature sheet.



### 2.3.5 Exercise: Create a New File



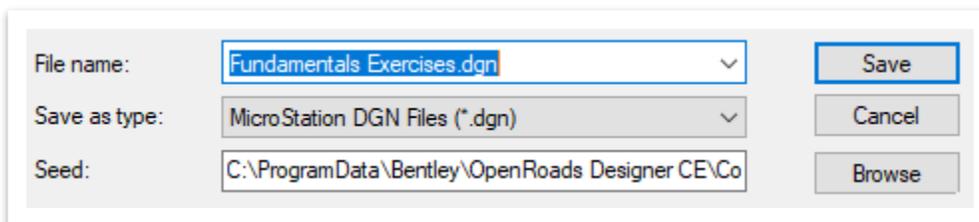
- Let's now create a **New File** to use for this class.



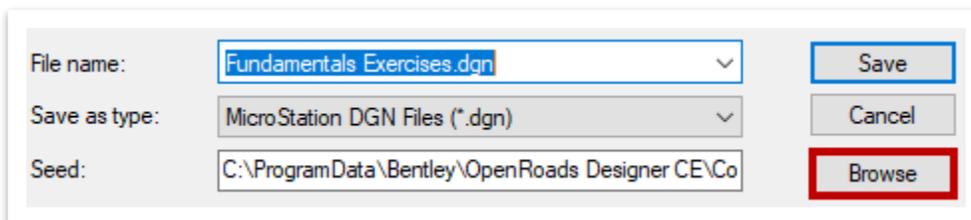
#### Take Note!

To open a previously created file, select the appropriate WorkSpace and WorkSet, and select the Browse button.

- Notice that the default folder location is the dgn folder within the 123456.00\_INITIALS workset that was just created. **C:\ProgramData\Bentley\OpenRoads DesignerCE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**.
- In the File name field, type in **Fundamentals Exercises**.

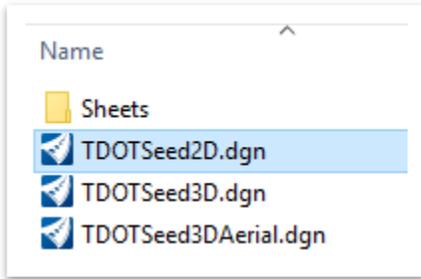


- To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.

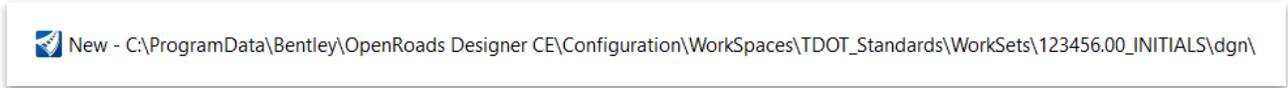




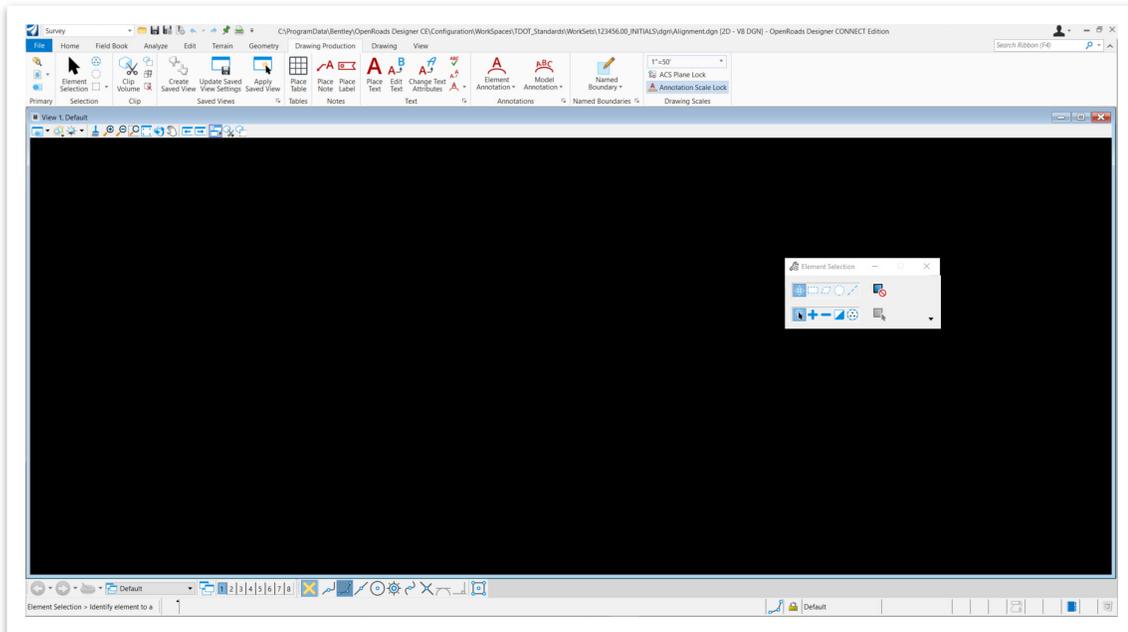
5. Select the **TDOTSeed2D.dgn** seed file and click **Open**.



6. Notice that by default, the **Fundamentals Exercises** file you just created will be saved in the DGN folder under the 123456.00\_INITIALS workset.



7. Click **Save** and the file will open. (**Note: Give it a minute to open**).



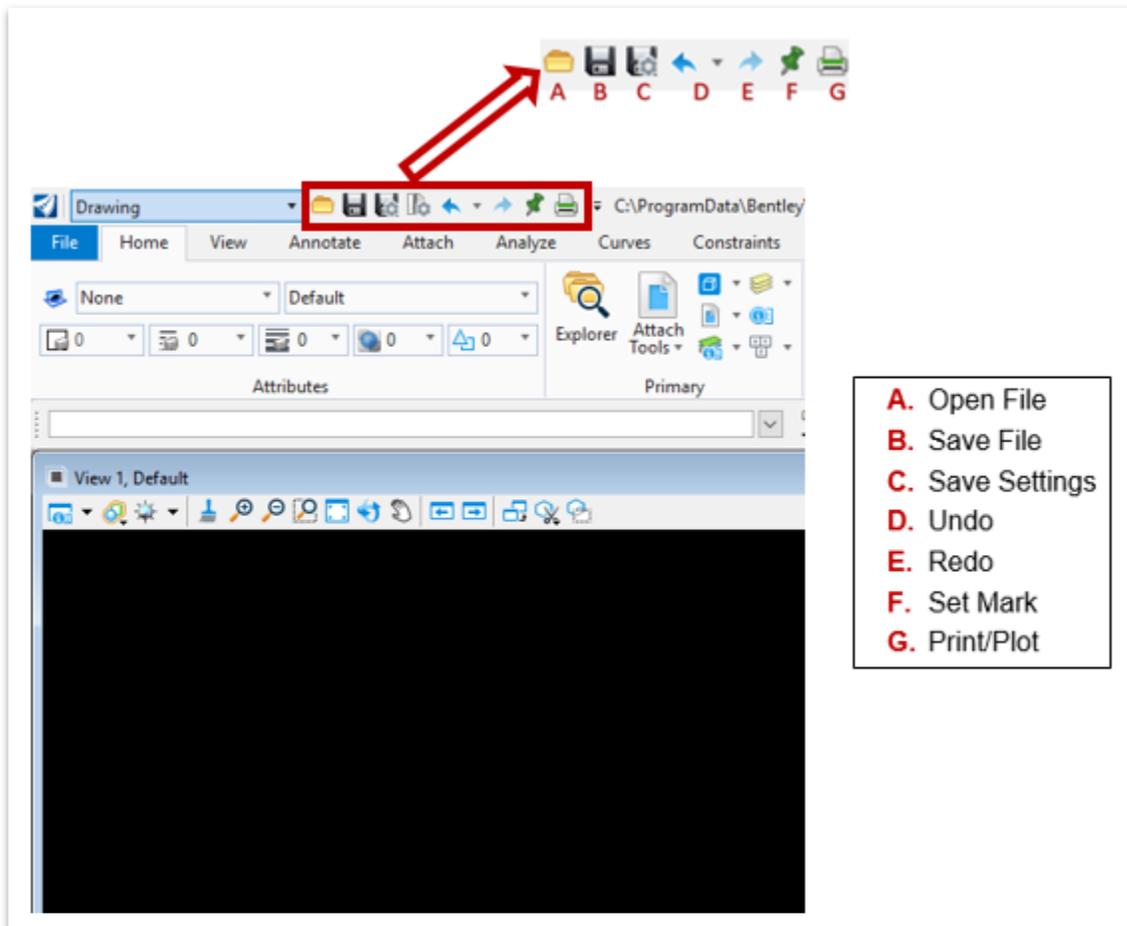


## 2.4 Lecture: Getting Familiar with the Interface



The new ORD interface has a typical Windows-based look that contains basic Windows tools, such as **Open File**, **Save**, **Undo**, **Redo**, and **Print**. Additional tools that are specific to ORD include: **Save Settings**, **Set Mark** (determines the number of undo's), and **Compress File** (Figure 9).

FIGURE 9. WINDOWS-BASED TOOLS





### 2.4.1 The ORD Window Layout

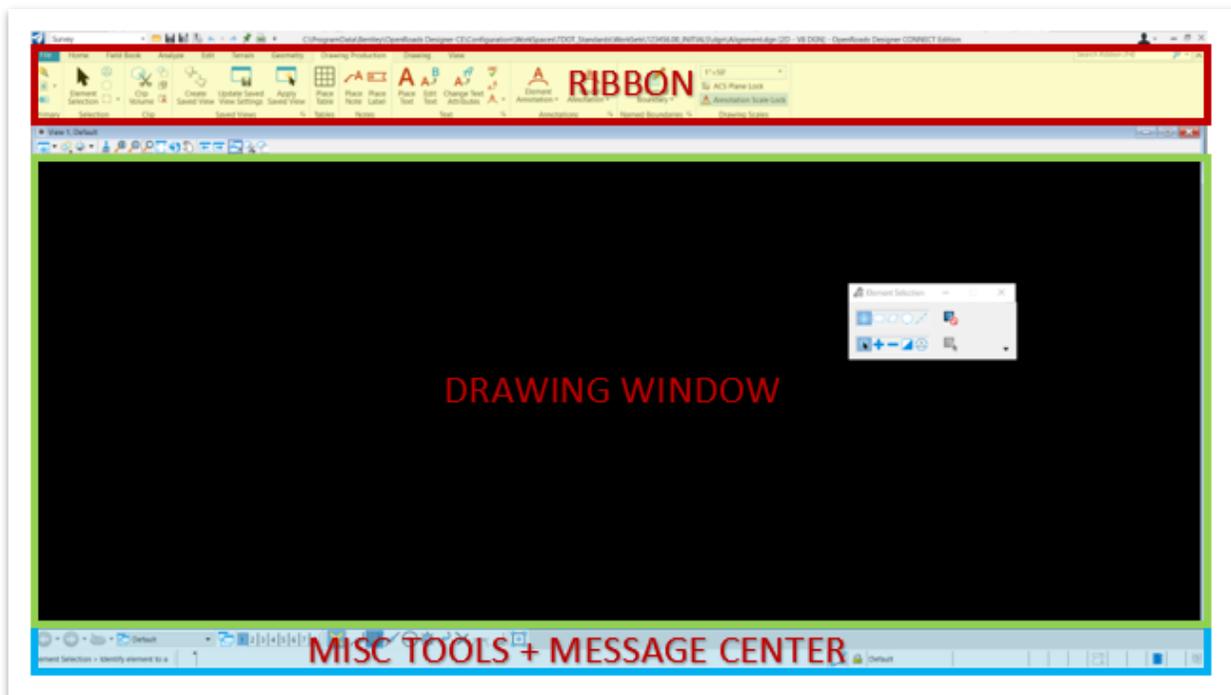
The default view of a DGN drawing has three main areas (Figure 10): the **Ribbon** on the top, the **Drawing Window** in the middle, and a few **Miscellaneous Tools** on the bottom including the **Message Center** in the lower left corner. The message center is critical in ORD as most tools utilize the prompts that the software gives.



#### Take Note!

*Keep an eye on the prompts in the Message Center. If you get stuck, it likely is telling you what the software is looking for.*

FIGURE 10. RIBBON, DRAWING WINDOW AND MESSAGE CENTER

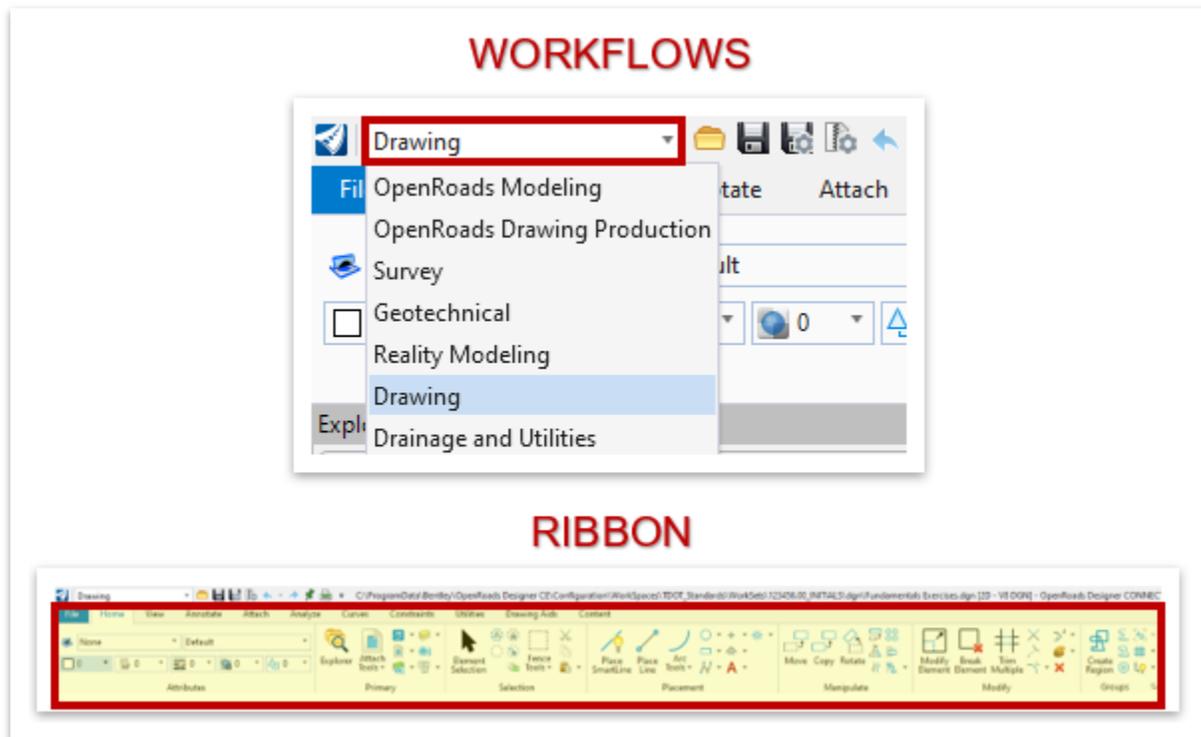




## 2.4.2 Workflows and Ribbon

Two of the most notable changes in ORD are the **Workflow** pull down menu in the top left corner of the interface and the aforementioned **Ribbon** (Figure 11).

FIGURE 11. WORKFLOWS AND RIBBON



A **Workflow** allows the applicable tools to display in a project specific order across the **Ribbon**. For example, if you are drawing a basic, non-civil 2D line, then you would select the **Drawing** workflow to see the applicable tools. The order in which the tools are shown in the Ribbon (left to right) is intended to be the order of which they typically are applied in a design project. Default workflow options include **OpenRoads Modeling**, **OpenRoads Drawing Production**, **Survey**, **Geotechnical**, **Reality Modeling**, **Drawing** and **Drainage and Utilities**. **Note:** If you open a 3D seed file, you will see two additional workflows: **Modeling** and **Visualization**.



## WORKFLOW BASICS

- **OpenRoads Modeling:** Contains all the tools needed for designing a roadway project using a model-centric approach that allows the user to automate plan production. Civil elements have the option to self-annotate based on the type of element they represent.

**NOTE:** This workflow **will** be covered in more detail in the Roadway Design I (ORD) Manual.



### Take Note!

*Design model objects or civil elements have intelligent properties that automate plan production. However, non-civil elements are unintelligent CADD objects that cannot be used to automate any plan production, such as automated annotation.*

- **OpenRoads Drawing Production:** Contains tools such as named boundaries, element attributes, basic zoom in/out and fit view, saved views, window views, level and display manager, project explorer, selection and placement tools, manipulate and modify tools, grouping tools, text, notes and dimensioning, cells and patterns, measuring tools, and utilities. Several of these tools are also in the Drawing workflow.

**NOTE:** This workflow **will** be covered in more detail in the Roadway Design I (ORD) Manual. There will be some drawing production covered in this class, but it will be accessed thru the Drawing workflow.

- **Survey:** Contains all the tools needed to map field survey information as well as editing, analyzing, geometry, terrain, and common drawing production tools.

**NOTE:** This workflow **will** be covered in more detail in the Survey (ORD) and Operations (ORD) Manuals.

- **Geotechnical:** Contains special tools that integrate with the gINT software used by geotechnical staff with the CADD environment. In addition to the gINT and common drawing production tools, 3D modeling and mesh tools can be also found under this workflow.

**NOTE:** This workflow **will not** be covered in any of the TDOT ORD manuals and is typically used along with the Bentley gINT software.



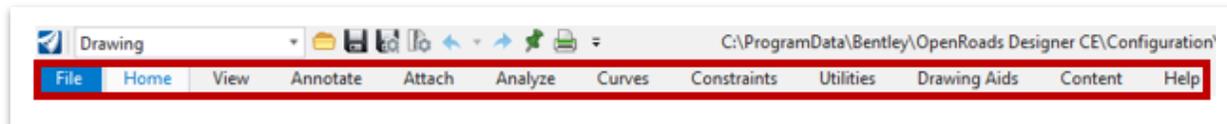
- **Reality Modeling:** A special workflow that contains tools specific to work with MicroStation point cloud (PD), ContextCapture Reality Mesh (3MX) or Scalable Mesh (3SM) files.  
**NOTE:** *This workflow **will not** be covered in any of the TDOT ORD manuals and is typically used along with the Bentley ContextCapture software.*
- **Drawing:** Contains all the basic CADD tools for drawing non-civil elements. Non-civil elements are not based on the model-centric design geometry and cannot be combined with 3D models. Non-civil elements include lines, arcs, shapes, cell, text, notes, and dimensions.  
**NOTE:** *This workflow **will** be covered in this manual.*
- **Drainage and Utilities:** Contains all the drainage tools in addition to all the utility 3D modeling tools.  
**NOTE:** *This workflow **will** be covered in more detail in the Subsurface Utility and Drainage Analysis (SUDA) ORD Manual.*



### 2.4.3 The Ribbon Tabs

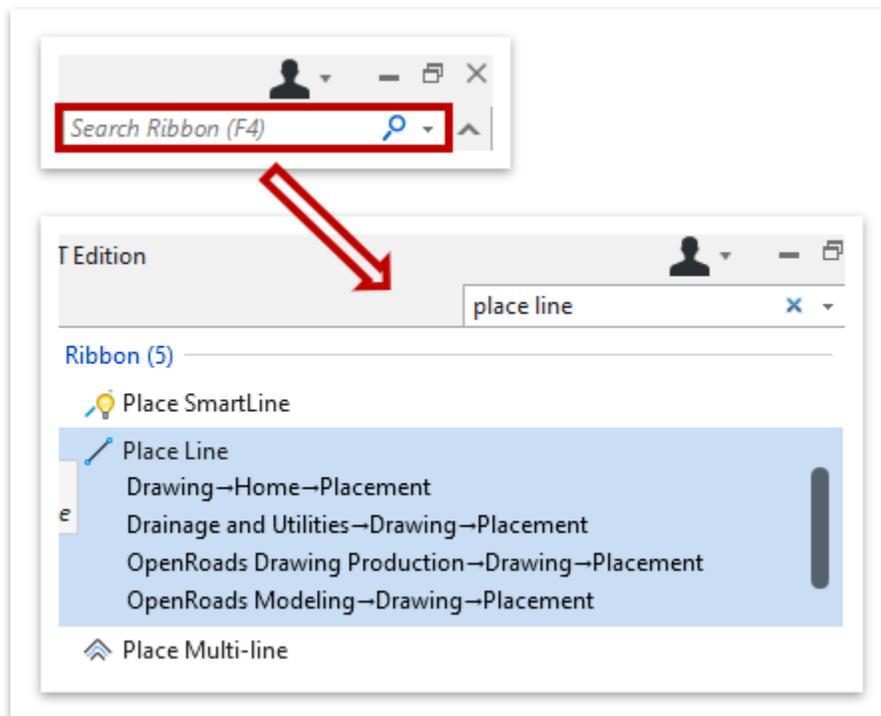
The Drawing Workflow has the File Menu plus **11** tabs on the Ribbon, which include **Home, View, Annotate, Attach, Analyze, Curves, Constraints, Utilities, Drawing Aids, Content** and **Help** (Figure 12). Most of these tools found under these tabs will be covered in more detailed throughout the class.

FIGURE 12. DRAWING WORKFLOW TABS



The ribbon also includes the **Search Ribbon** tool in the upper right corner of the ORD interface (Figure 13). It will be used frequently and is your lifeline if you are ever uncertain on the location of a tool. After typing in a tool (e.g. place line), hover your mouse over a search result and the software will automatically show the paths to all locations where that tool is located, starting with the Workflow. You can also simply click the tool to initiate it right from the search tool.

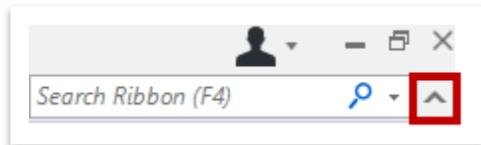
FIGURE 13. SEARCH RIBBON





In addition to the search ribbon, you'll notice a small upwards pointing arrow nearby (Figure 14). This controls the **ribbon visibility** (on/off). If your ribbon ever disappears and all you see are the tabs, then you can turn the ribbon on by clicking on the arrow. **Note:** If the ribbon is off, the arrow will be facing down.

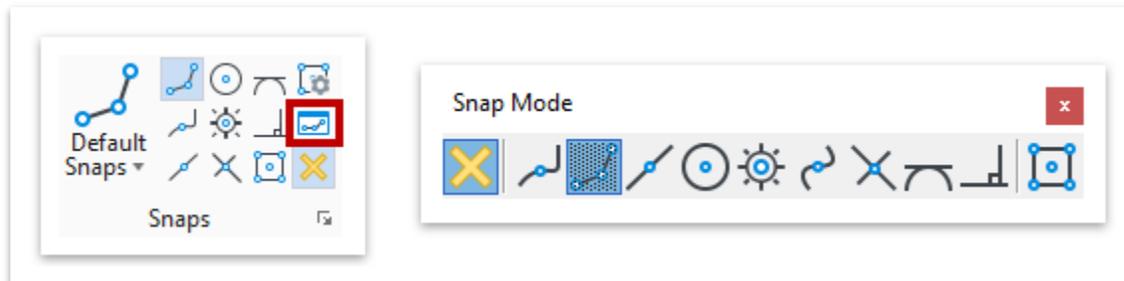
FIGURE 14. RIBBON VISIBILITY TOGGLE



### 2.4.4 Snap Buttons

If the Snap toolbar is not showing by default, it can be found in the **Drawing** Workflow under the **Drawing Aids** tab. You can open the **Snap Mode** option (Figure 15) and dock the toolbar for convenience by left clicking in the toolbar heading and moving it anywhere above or below the drawing window. Snaps are used to precisely place, edit, and modify CADD elements.

FIGURE 15. SNAP BUTTONS



The most commonly used snaps are: **Keypoint**, **Midpoint**, **Center**, **Origin** and **Intersection** modes. A multi-snap mode can be set up to include 2 or more snaps.

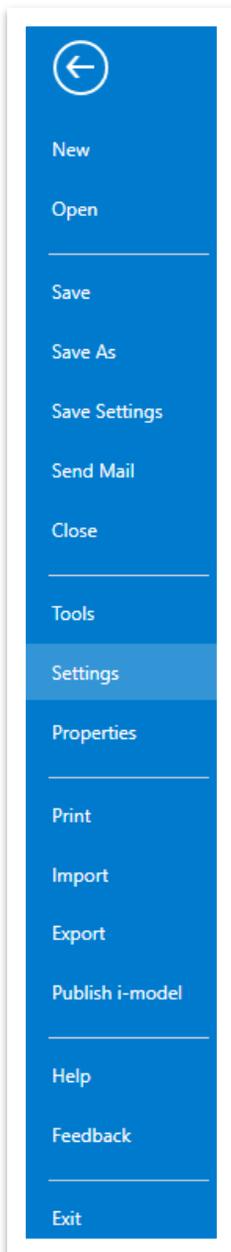


## 2.5 Lecture: The File Menu

The file menu contains the following commands: **New**, **Open**, **Save**, **Save As**, **Save Settings**, **Send Mail**, **Close**, **Tools**, **Settings**, **Properties**, **Print**, **Import**, **Export**, **Publish i-model**, **Help**, **Feedback** and **Exit** (Figure 16).



FIGURE 16. FILE MENU



**Save Settings**: This option saves the active design file settings, such as the current view configuration and level filters. By default, when you close a file, the save settings option is turned off. You can turn it on to save automatically within the User Preferences, under Operation, which is explained in Section 2.5.1.3.

**Send Mail**: When the send mail command is selected, the software will open Outlook, create a new email message, and attach the currently opened ORD file.

**Tools**: This option allows the user to select other tools, such as Compress File, Compress Options, File Associate, Packager, Protection, License Management, Batch Converter, Batch Process, and HTML Author.

**Settings**: This option houses the **User**, System (PC), **File** and Configuration settings. The User and File settings will be explained in detail below.

**Properties**: This option opens the dialog box that summarizes/houses all the properties for the DGN file. This dialog is essentially a database that contains the properties of the file itself, such as file name, size, revision number, date created, etc.

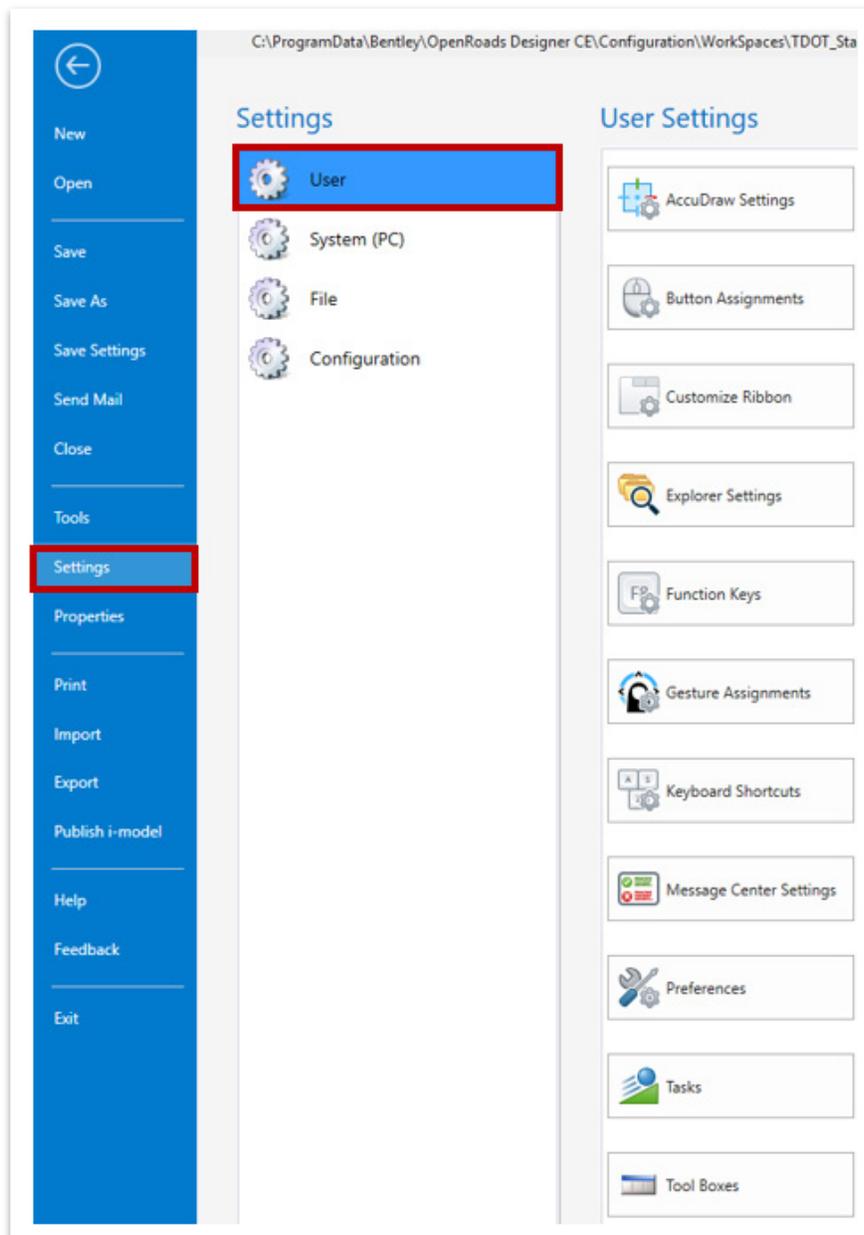


## 2.5.1 Settings - User

**User Settings** are used to customize AccuDraw Settings, Button Assignments, Customize Ribbon, Explorer Settings, Function Keys, Gesture Assignments, Keyboard Shortcuts, Message Center Settings, Preferences, Tasks, and Toolboxes (Figure 17).

The most common user settings are **Button Assignments**, **Customize Ribbon** and **Preferences**.

FIGURE 17. USER SETTINGS



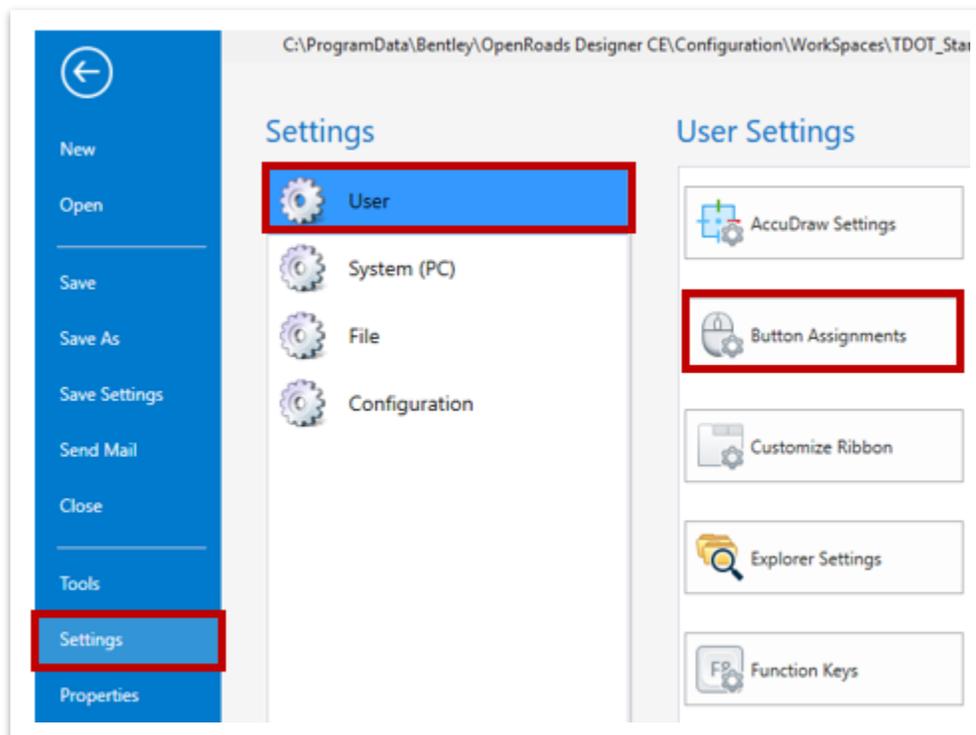


### 2.5.1.1 Button Assignments

The mouse is used to select or data point, reset commands, and tentative select (snaps) an CADD element. By default, the left button is used for data commands and the right button is used for resetting commands. The middle button is used for tentative commands or snaps. **You may set the buttons however you'd like.**

To set up the buttons on a mouse, go to the **File >> Settings >> User >> Button Assignments** (Figure 18).

FIGURE 18. BUTTON ASSIGNMENTS

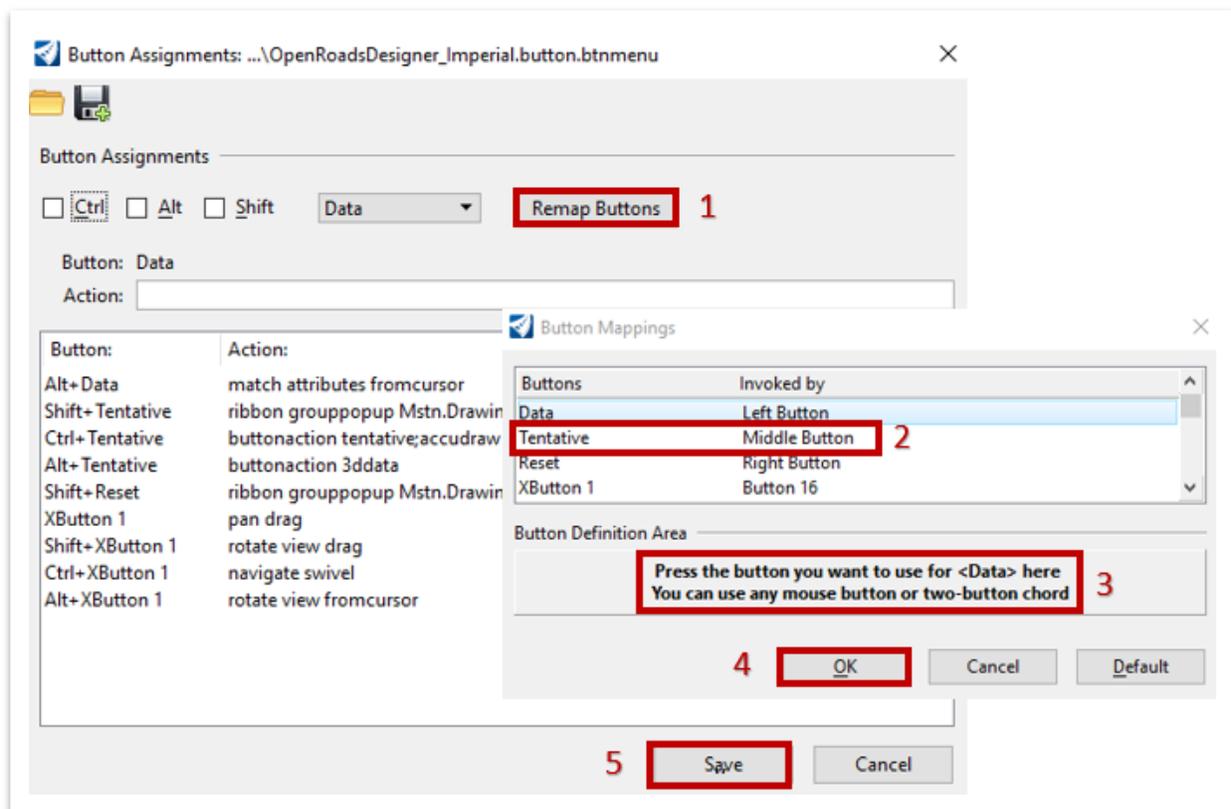




For example, if you wanted to adjust the **Tentative** button, you would follow the steps within the **Button Assignment** dialog box (Figure 19). The same steps would be followed for the other buttons as well.

1. Click Remap Buttons.
2. Select the row called **Tentative**.
3. Go to the Button Definition Area and press the button you want to use for <tentative> here.
4. Click **OK**.
5. Click **Save**.

FIGURE 19. BUTTON REMAPPING TOOL

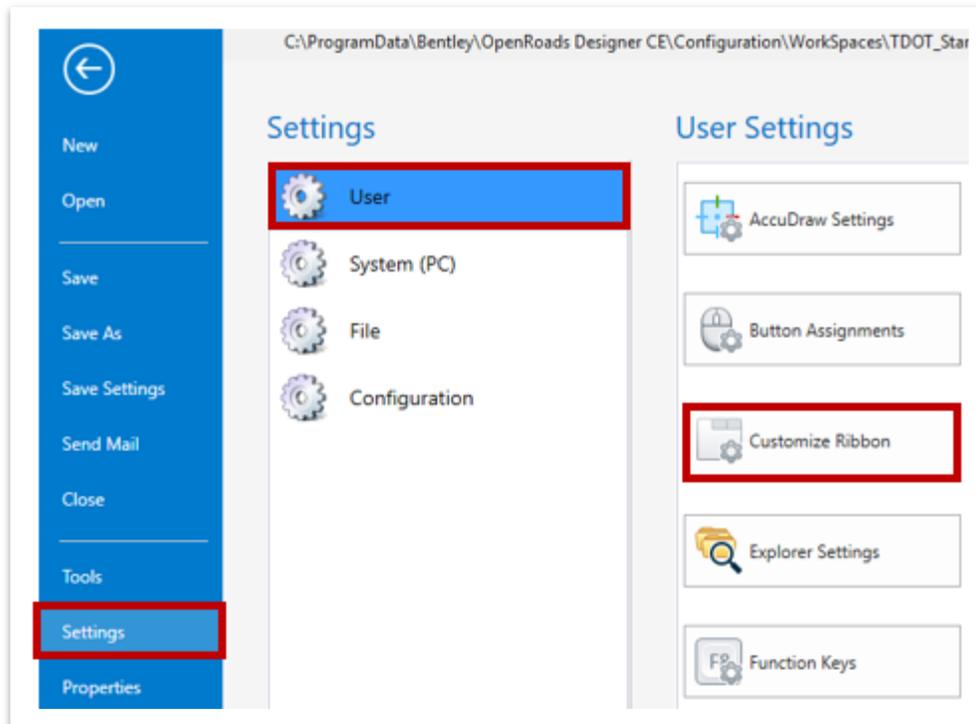




### 2.5.1.2 Customize Ribbon

The User can Customize their Ribbon to turn on and off certain tools. By default, the workflow ribbons are setup to go in common project sequence from left to right. The customization tool can be found here: **File >> Settings >> User >> Preferences** (Figure 20).

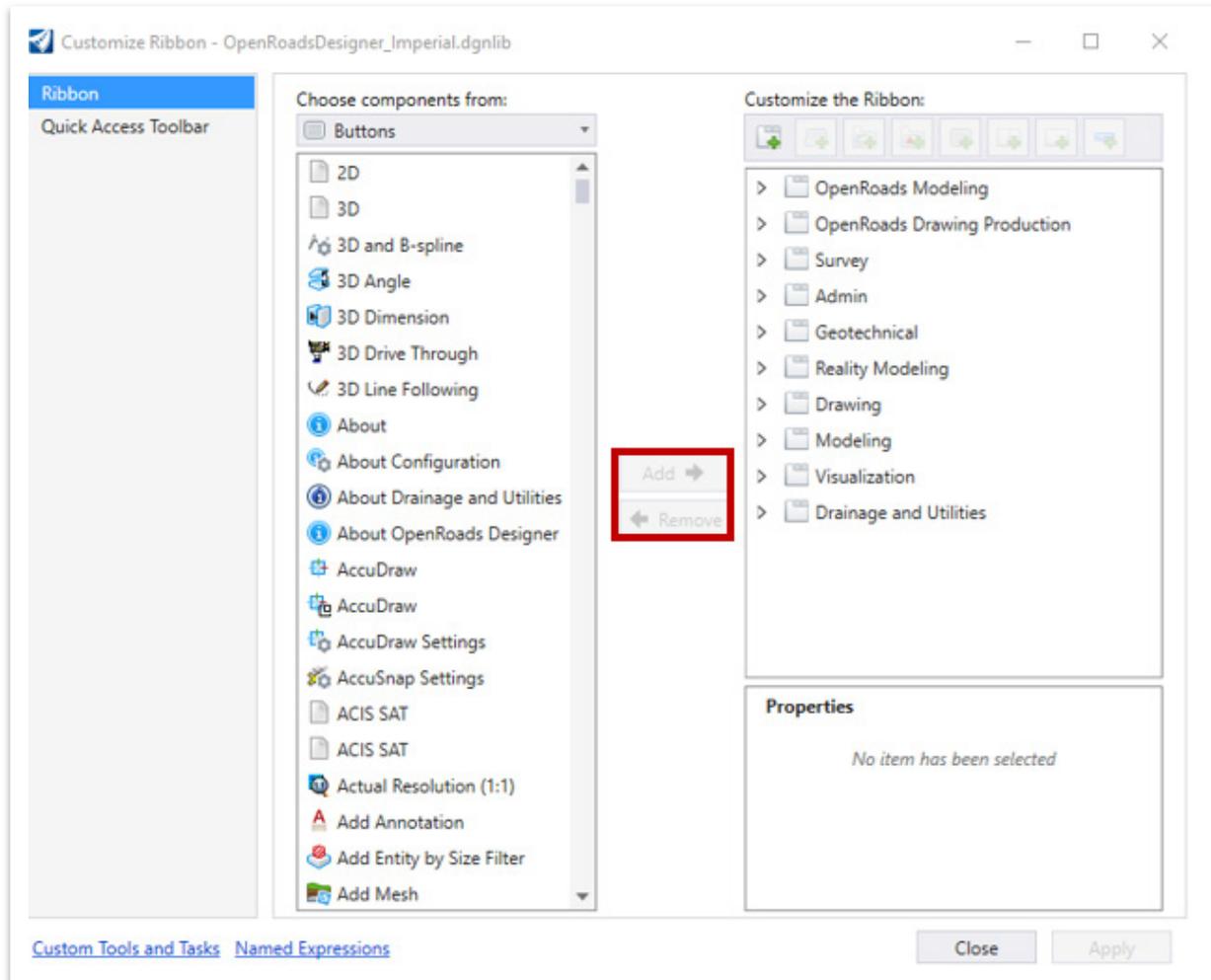
FIGURE 20. CUSTOMIZE RIBBON





You can customize both the **Ribbon** and **Quick Access Toolbar** by Adding and Removing buttons in the interface (Figure 21). **Note:** You must highlight the applicable ribbon in the right column and then highlight the button in the left column that you want to add/remove.

FIGURE 21. CUSTOMIZE RIBBON DIALOG BOX

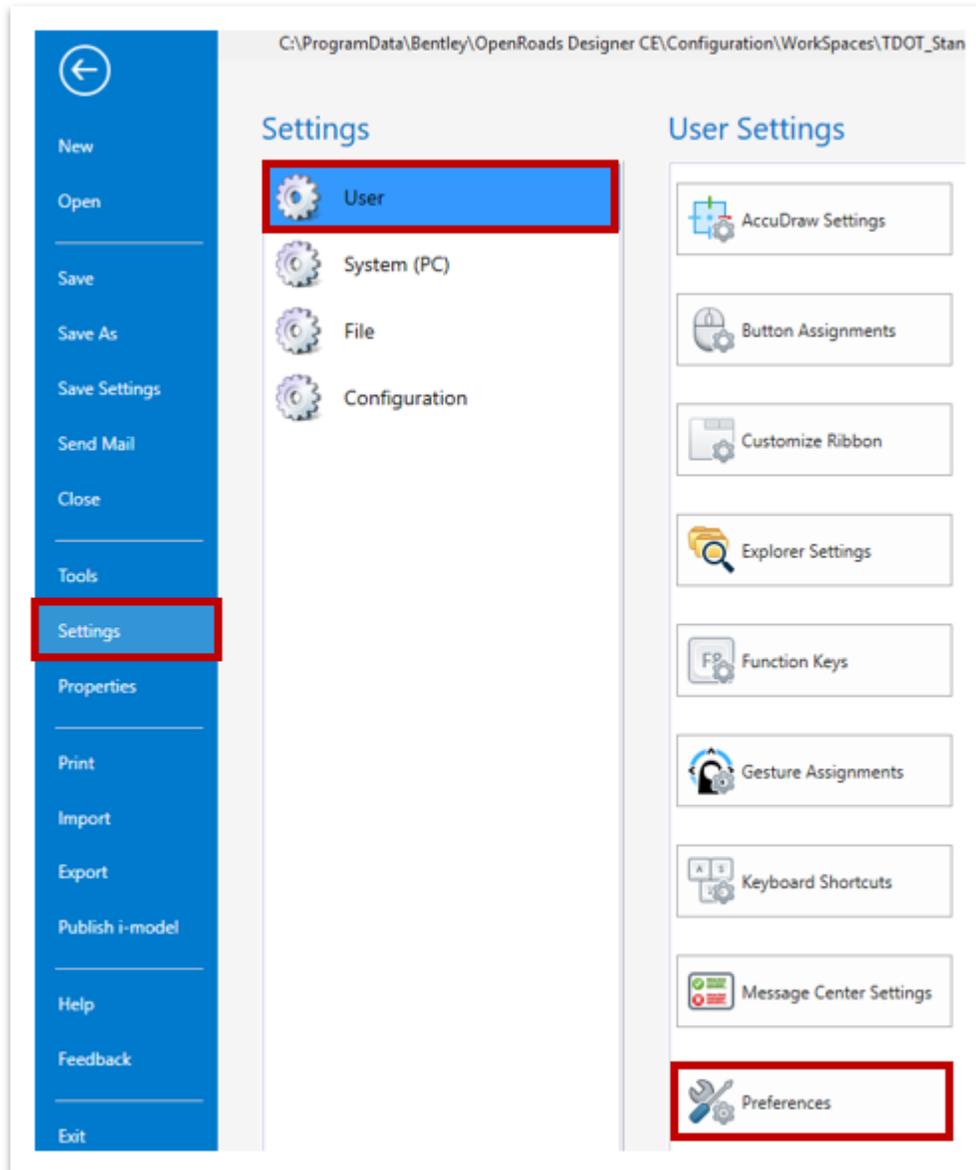




### 2.5.1.3 Preferences

The User Preferences are often utilized to allow for a better look and feel for the user by going to **File >> Settings >> User >> Preferences** (Figure 22).

FIGURE 22. USER PREFERENCES



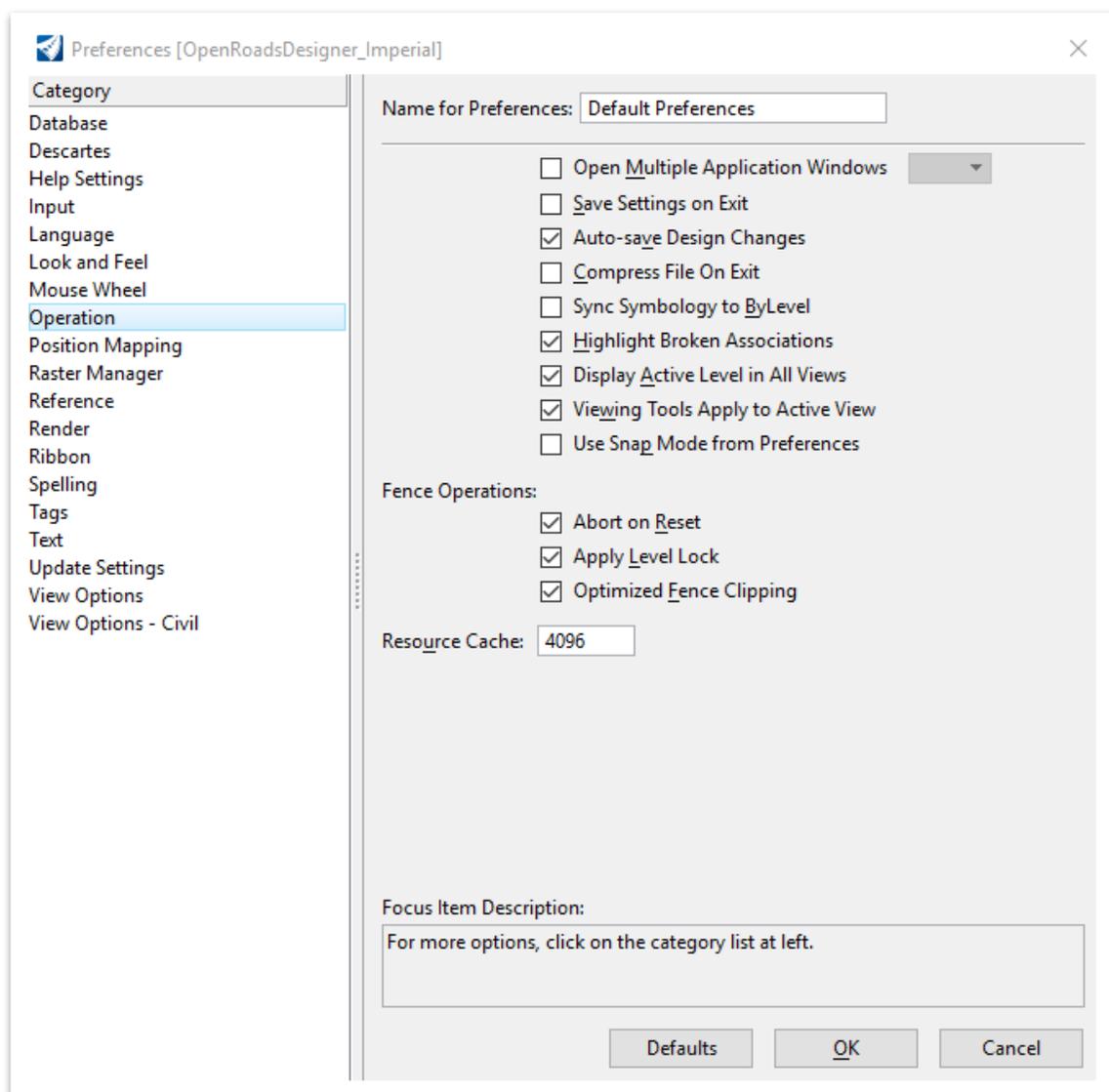
The most common Preferences are:

- **Mouse Wheel:** Allows the user to set the default settings for the mouse wheel such as what function it has.



- **Operation:** Allows the user to set the default settings for commands like Save Settings on Exit (recommended) and Open Multiple Application Windows (Figure 23).
- **Ribbon:** Allows the user to select the Ribbon size and how Ribbon groups are displayed.
- **Text:** Allows the user to hide the field background for all linked data fields as well as set display character limits.
- **View Options:** Allows the user to select the default settings for background color (e.g. Black or White), transparency and toolbox and Navigation displays.

FIGURE 23. USER PREFERENCES: OPERATION



**Take Note!**

*If you ever close out of ORD and reopen the file only to find that the visual look is different, it is likely due to not **saving settings** upon exit. You can always click the option (as shown in Section 2.4) prior to closing a file if you don't toggle the option on in User Preferences.*

#### 2.5.1.4 Clearing User Preferences

The **User Preferences** will sometimes need to be cleared out if certain ORD functions stop working. Three examples where this action would likely fix the issue are:

- If a dialog box does not open after activating a tool.
- If your dialog window goes off the computer screen and cannot be fully accessed.
- If menu options that were previously visible do not appear.

Clearing user preferences essentially resets the ORD interface back to the initial software settings. When re-opening the software, it will open to the welcome screen. You will need to re-select the TDOT\_Standards workspace and the applicable workset. Any toolbar or window that had been previously docked will need to be re-docked. This also effects button assignments which would need to be reset if necessary.

To clear the user preferences, close ORD and browse to the following location on the C drive and delete the **10.0.0** folder (**C:\Users\JJ#\AppData\Local\Bentley\Open Roads Designer\**). The folder will be re-created the next time ORD is opened.

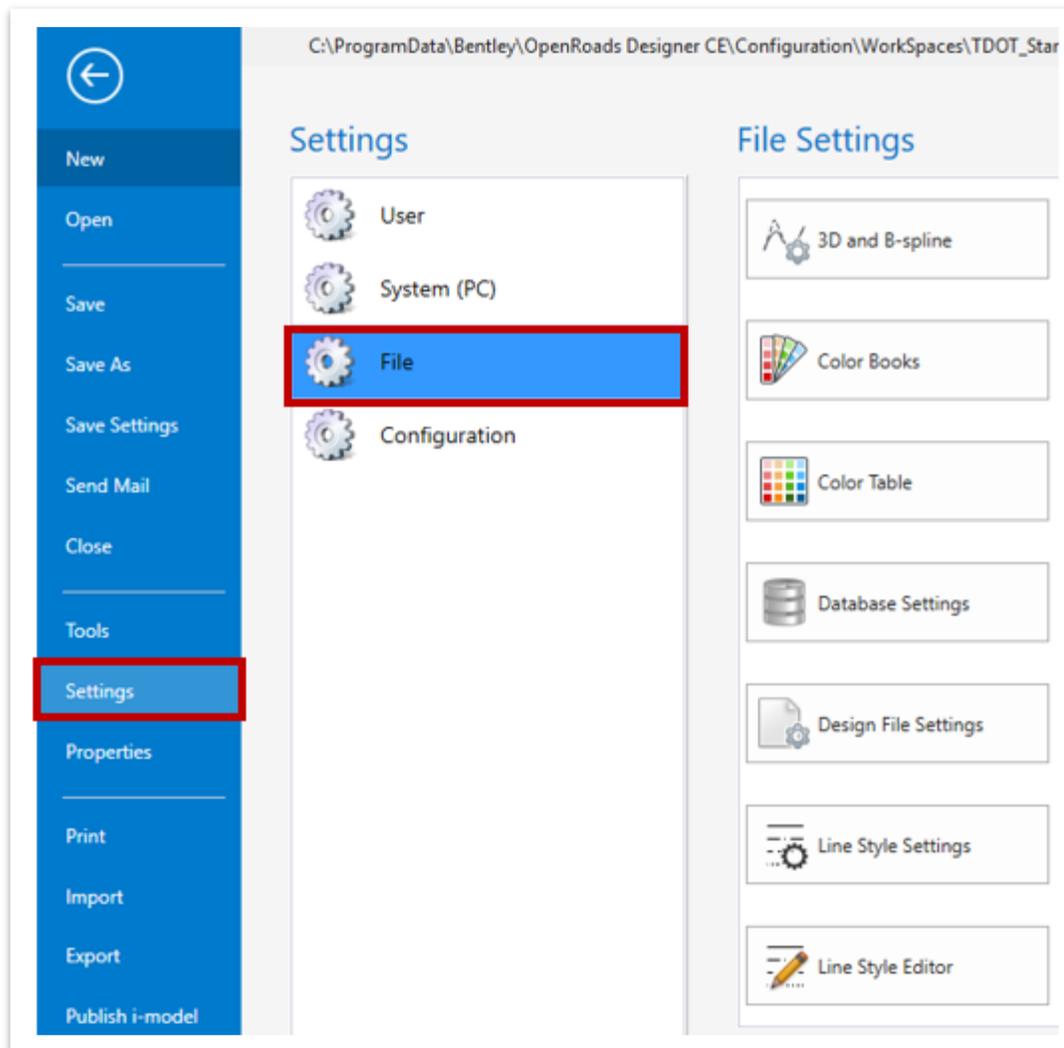


## 2.5.2 Settings - File

**File Settings** are used to control 3D and B-spline, Color Books, Color Table, Database Settings, Design File Settings, Line Style Settings and Line Style Editor (Figure 24).

The most common file settings are **Design File Settings**.

FIGURE 24. FILE SETTINGS

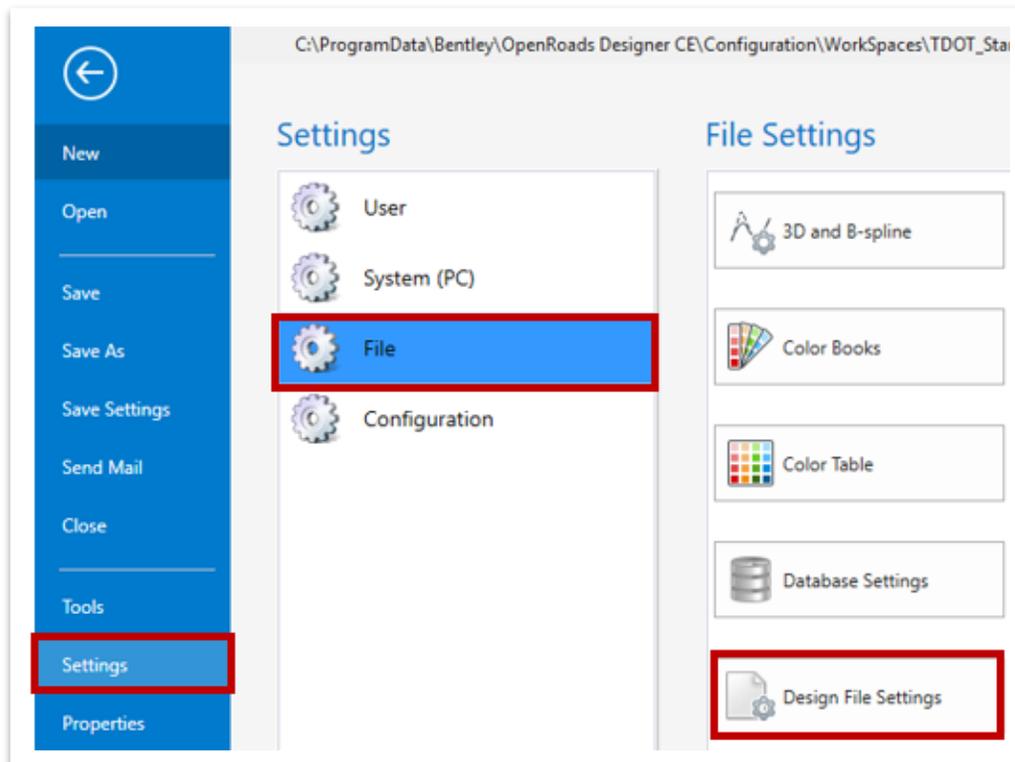




### 2.5.2.1 Design File Settings

The Design File Settings pertain to the active file that is open and can be accessed by going to **File >> Settings >> File >> Design File Settings** (Figure 25).

FIGURE 25. DESIGN FILE SETTINGS

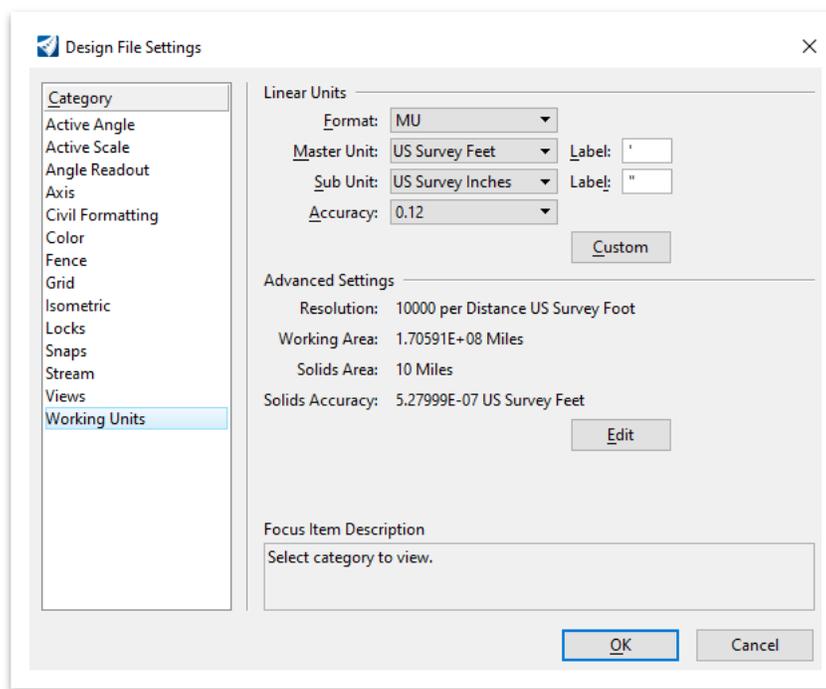


- **Active Angle:** Allows the user to set the active angle. By default, this number is set to 0 degrees and a tolerance of 1. This setting controls the angle used by the software to place geometry on the file.
- **Active Scale:** The active scale is set to 1. Unlike in previous versions of TDOT settings, all sheet seed files have been created with a 1:1 scale for 34" by 22" sheets to allow the software to leverage annotation scales that can be changed in real-time. Model-centric workflows rely on a 1:1 scale relationship for all the geometry being generated. The geometry and annotations are scaled up to the appropriate sheet scale by using the Annotation Scale function, which will be discussed later.
- **Angle Readout:** By default, this setting is set to DD MM SS with an accuracy of 0.1 using "bearing" as the directional mode.
- **Civil Formatting:** Allows the user to change the display format and precision of coordinates, ratios, stations, and radii. By default, this setting should match TDOT standards and should not be changed.



- **Color:** Allows the user to select colors for highlighted elements, selection sets, and the drawing pointer.
- **Fence:** Allows the user to select the default fence selection mode.
- **Grid:** Allows the user to toggle Grid Lock on or off, forcing each data point to lie on a grid with user defined parameters. By default, Grid Lock is turned off.
- **Isometric:** Allows the user to toggle Isometric Lock on or off, forcing each data point to lie on one user defined Isometric Plane. By default, Isometric Lock is turned off.
- **Locks:** Allows the user to toggle Level, Graphic Group, and ASC Plane Locks. When on, Level Lock restricts element selection to the active level, and Graphic Group Lock automatically applies all actions performed on one member of a graphic group to all members.
- **Snaps:** Allows the user to toggle Snap Lock and Association on or off. Snap Lock is on by default, and when Association is turned on, elements gain association points when snapped to with dimensioning tools or the multi-line tool. By default, Snap Lock is on and Association is off.
- **Views:** Allows the user to adjust width, height, and background image for views.
- **Working Units:** These settings are set to TDOT Standard defaults for each of the seed files based on the master unit of Survey Feet. **DO NOT CHANGE – EVER!** (Figure 26).

FIGURE 26. DESIGN FILE SETTINGS: WORKING UNITS





## Chapter 3. Attributes Dialog and Primary Toolbox

Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn about the attributes dialog and the primary toolbox. These tools can be accessed here: **Drawing >> Home**.



### 3.1 Objectives

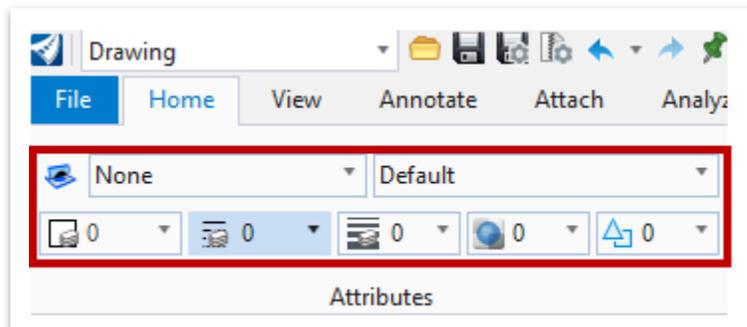
At the conclusion of this chapter, participants will be able to:

1. Access the Attributes and Primary tool locations.
2. Locate the Attach tool options.
3. Attach a reference dgn file (sample corridor).

### 3.2 Lecture: Attributes

The **Attributes** dialog (Figure 27) is used to select **Element Templates**, **Levels**, **Color**, **Line Styles**, **Line Weights**, **Transparency**, and **Priority** for each element to be placed in the drawing. It will be utilized throughout the class. Element Templates will be explained in Chapter 4.

FIGURE 27. ATTRIBUTES

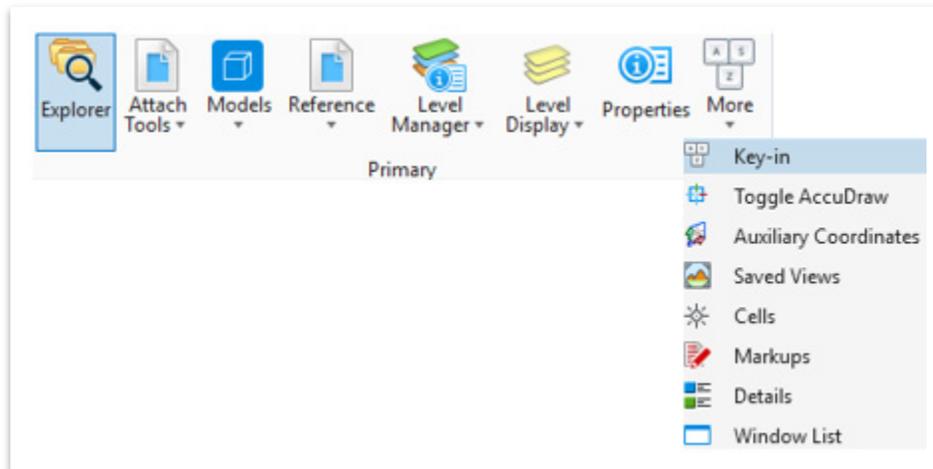




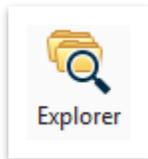
### 3.3 Lecture: Primary Tools

The **Primary** tools (Figure 28) are seen in each Workflow other than Reality Modeling. These tools are described below and will also be utilized throughout this class.

FIGURE 28. PRIMARY TOOLS

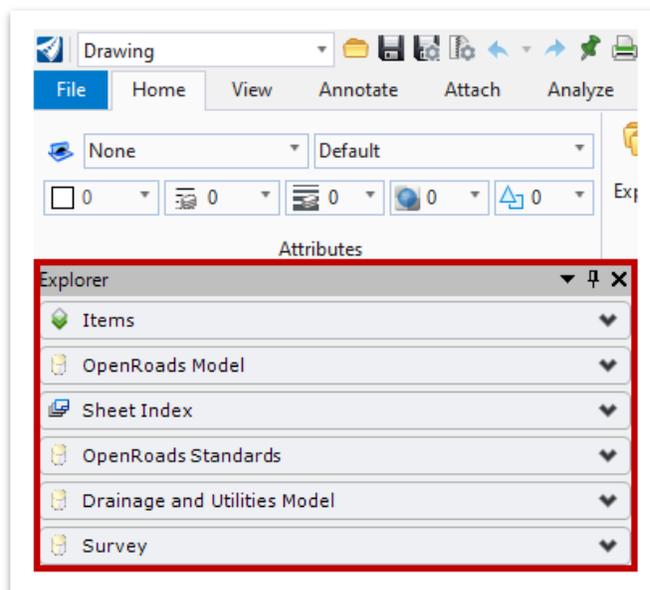


#### 3.3.1 Explorer



The **Explorer** tool (Figure 29) organizes all the information about the file, including the tools available to the user. It is always **strongly recommended to dock the Explorer tool for access**. This can be docked by simply clicking on the Explorer icon.

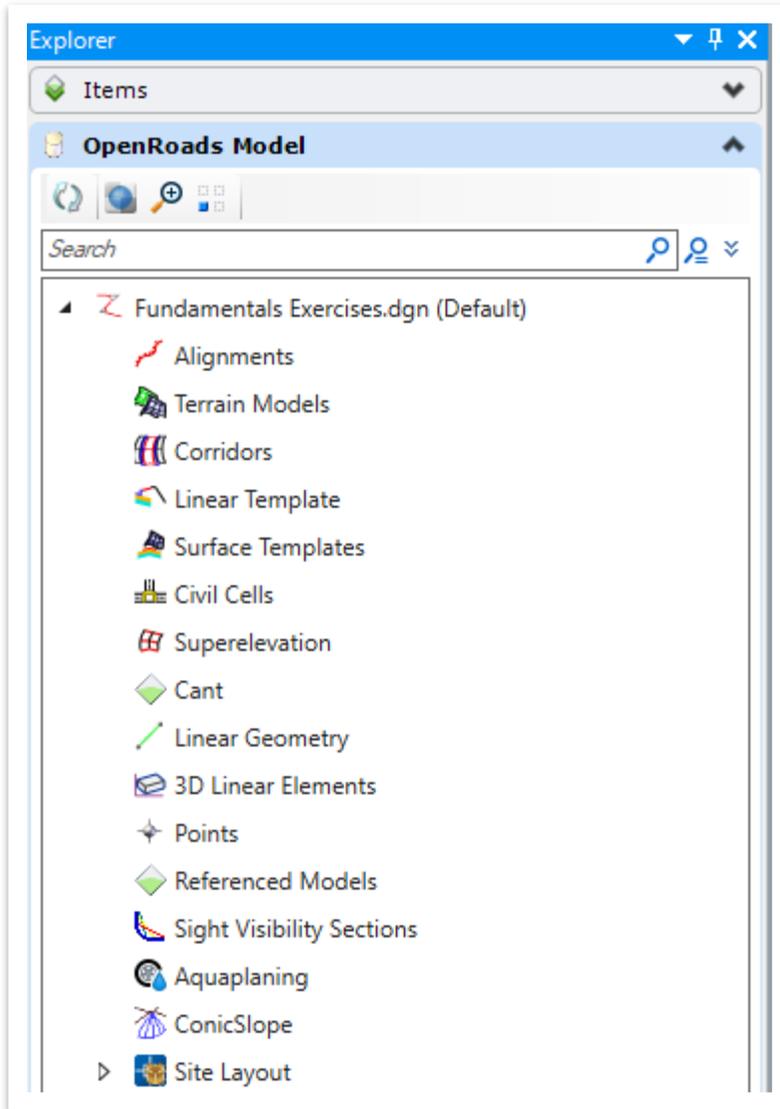
FIGURE 29. EXPLORER TABS





Each tab can be expanded (Figure 30) to show more information contained in that category. The **OpenRoads Model** tab, for example, lists the civil information placed in the file.

FIGURE 30. OPENROADS MODEL MENU UNDER THE EXPLORER TOOL

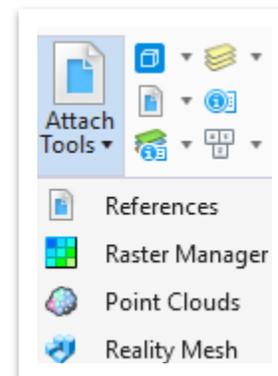




### 3.3.2 Attach Tools

The **Attach** tools include Reference, Raster, Point Cloud, and Reality Meshes (Figure 31). These tools allow the user to attach a different type of file to the current drawing. The attach tools covered in this class will include **Reference Files** (other CADD files), **Raster File** (images), and **Point Cloud Files** (lidar data).

FIGURE 31. ATTACH TOOLS



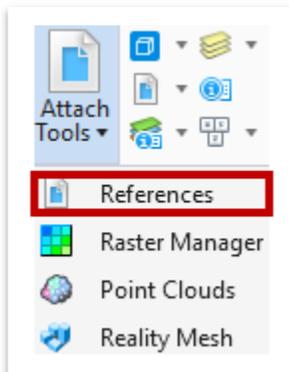
#### 3.3.2.1 Reference Files

This tool allows the user to attach other CADD drawings to the current file as **read-only** references. Drawings are most commonly attached as **Coincident-World**, which aligns the attached drawing to the active drawing's master units, global origin, and design plane coordinates. From the reference manager window, the user can perform various actions such as turning references on or off and clipping or masking references.

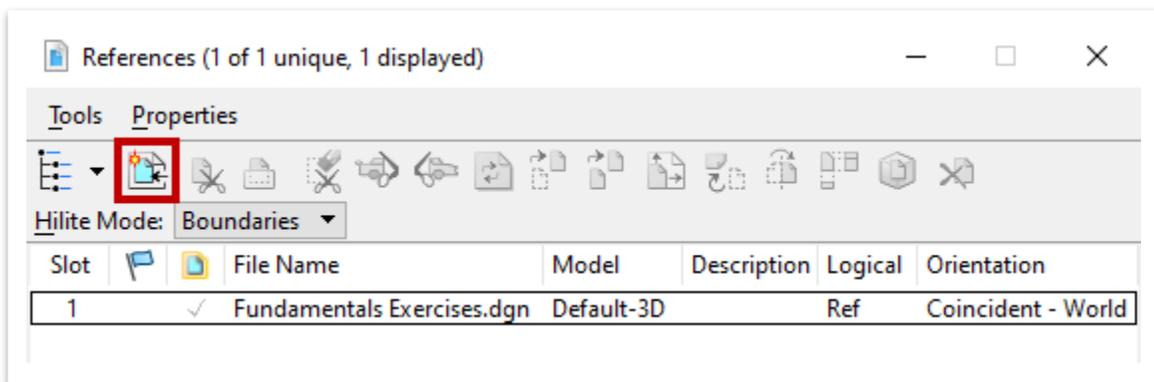


## 3.3.2.2 Exercise: Attach Reference

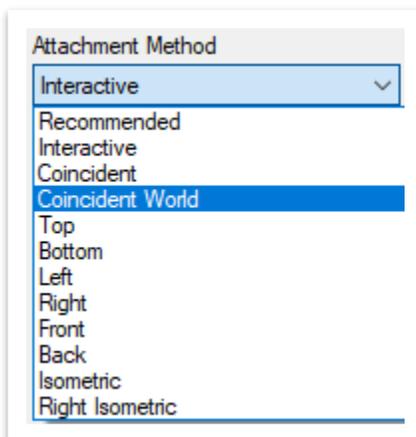
1. Click the **References** button to open the Reference window.



2. Click the **Attach Reference** button and browse to the **Fundamentals Reference.dgn** file located here: **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**. It should open to this folder by default.

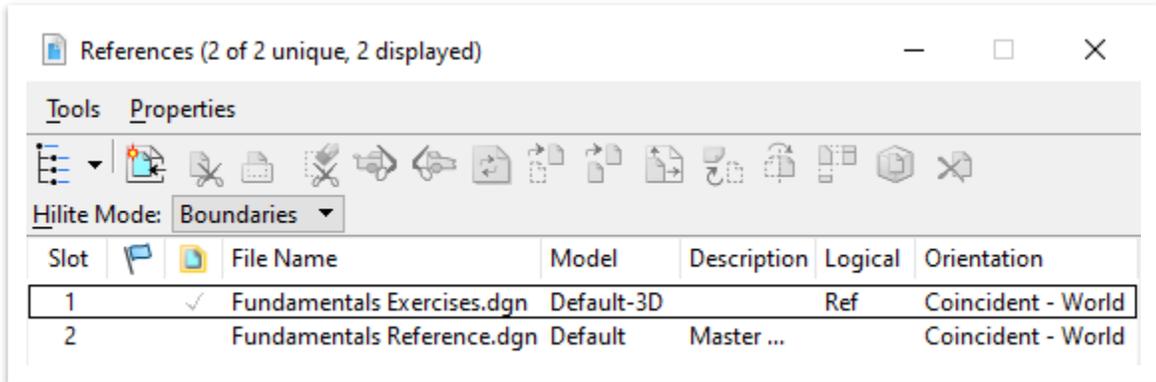


3. Before clicking Open for the Reference file, make sure that the Attachment Method is set to **Coincident World**.

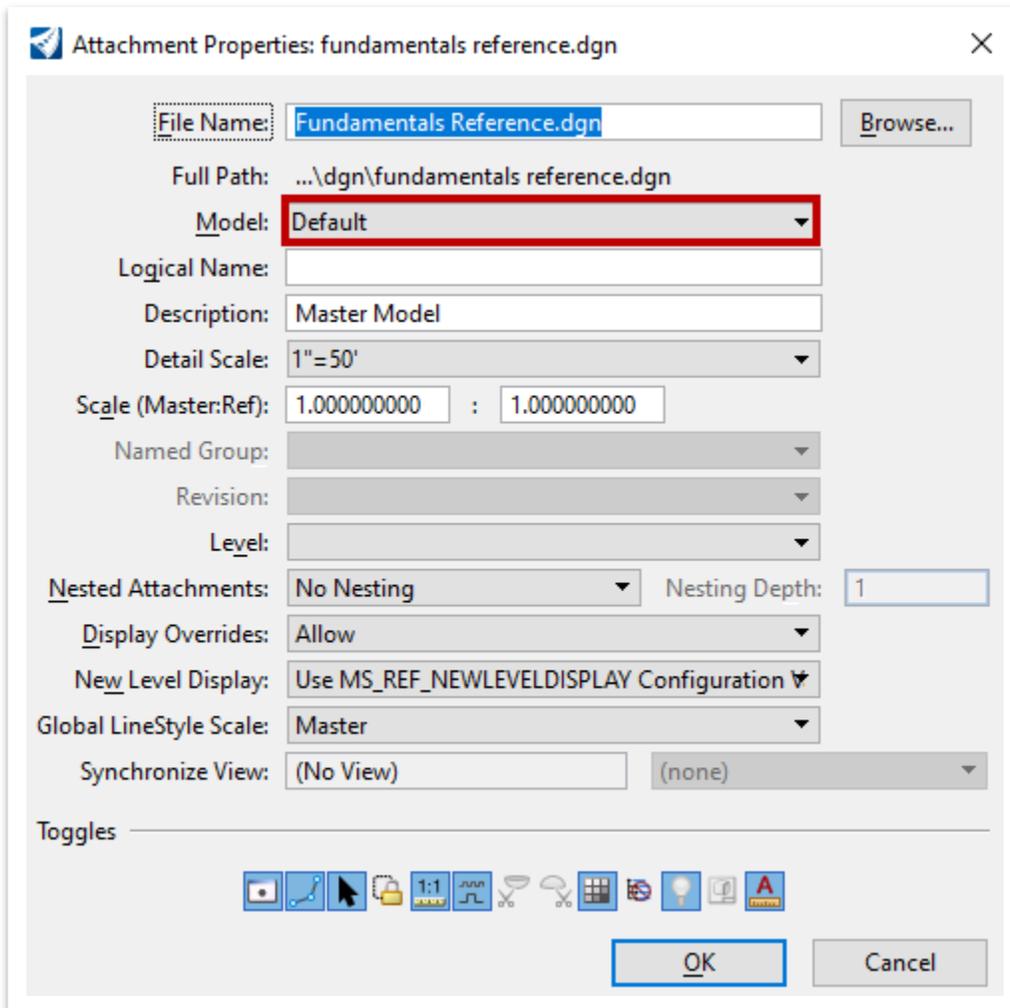




- The **Fundamentals Reference.dgn** should now be attached.



- Double click the reference file name to see the **Attachment Properties**. Change the model to **Default-3D** to view the 3D components of the corridor. Return to the **Default** model after reviewing the differences.

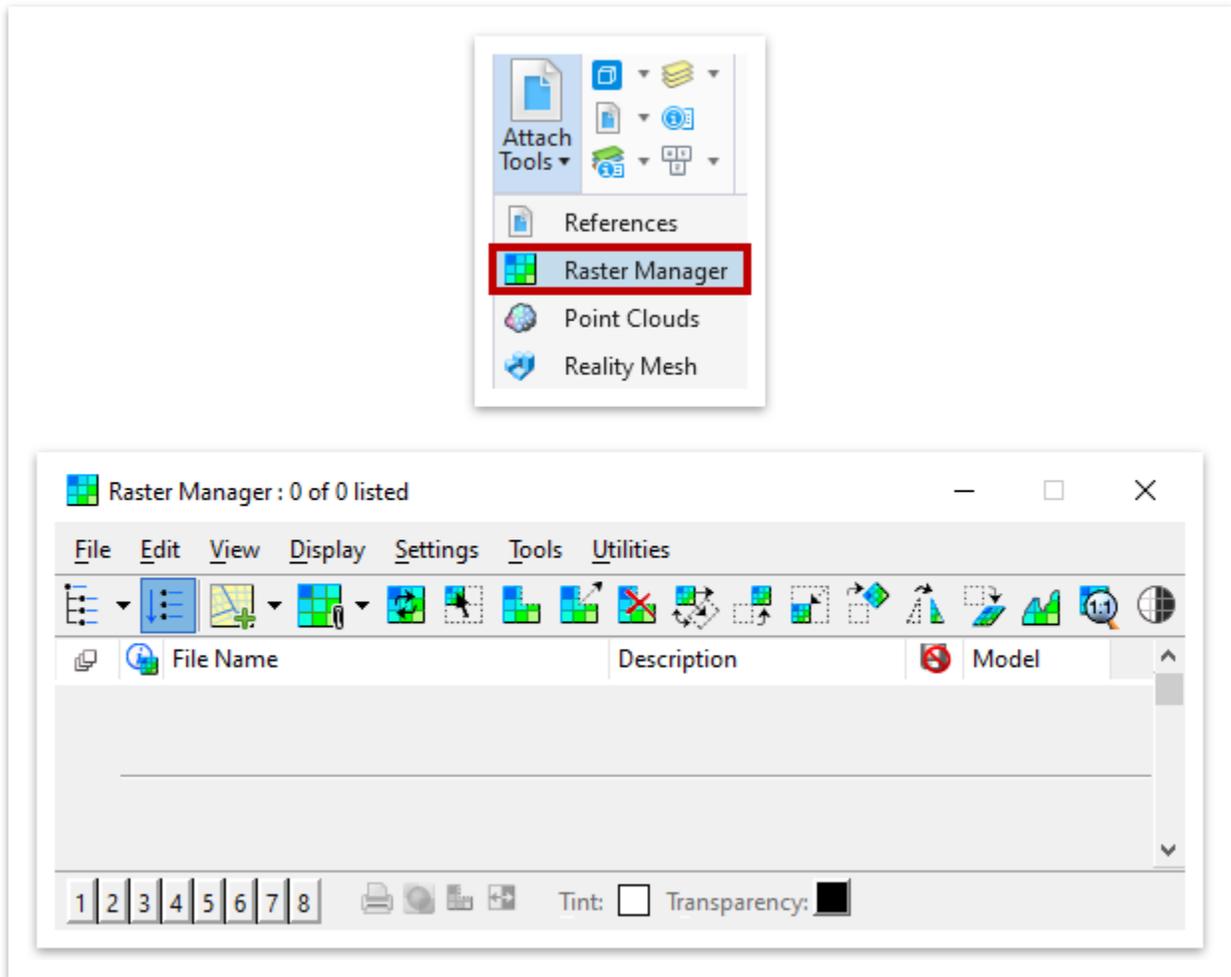




### 3.3.2.3 Raster Manager

This tool allows the user to attach various image files to the current file (Figure 32). Images can be moved and scaled manually by the user, or the image can be placed based on its coordinate system, if applicable.

FIGURE 32. RASTER MANAGER

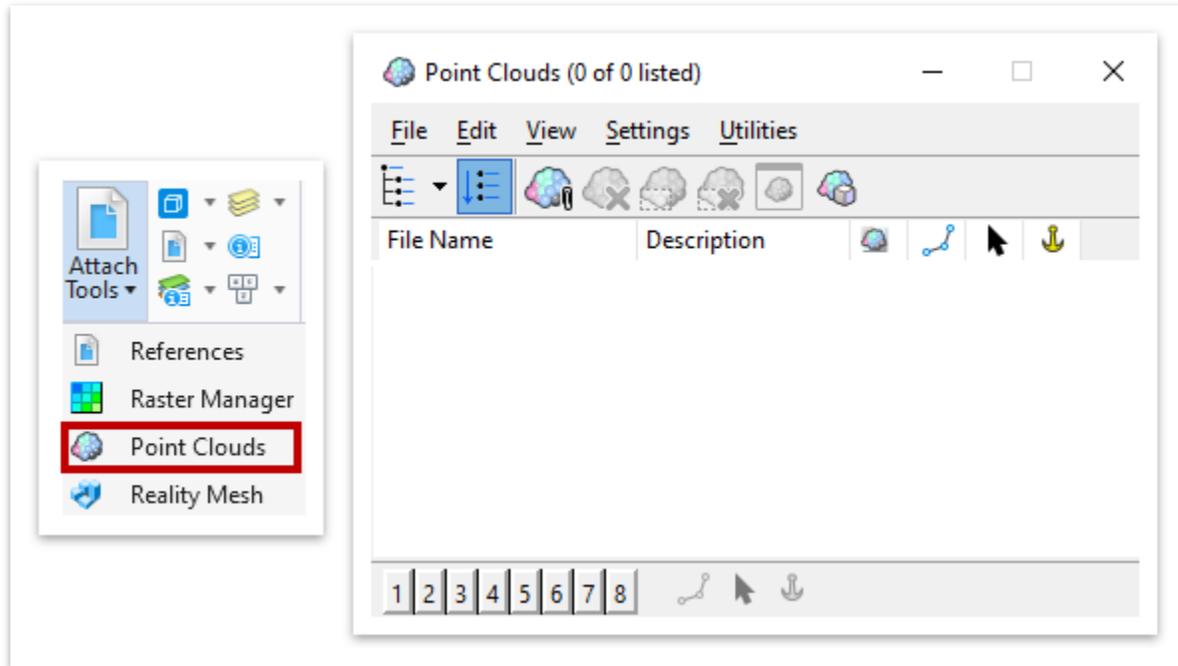




3.3.2.4 Point Cloud Manager

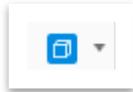
This tool allows the user to attach and edit point clouds, as well as edit the point cloud's display properties (Figure 33). There is also an export clipped point cloud feature. Point clouds can **only** be attached to drawings created with a **3D** seed file.

FIGURE 33. POINT CLOUD MANAGER



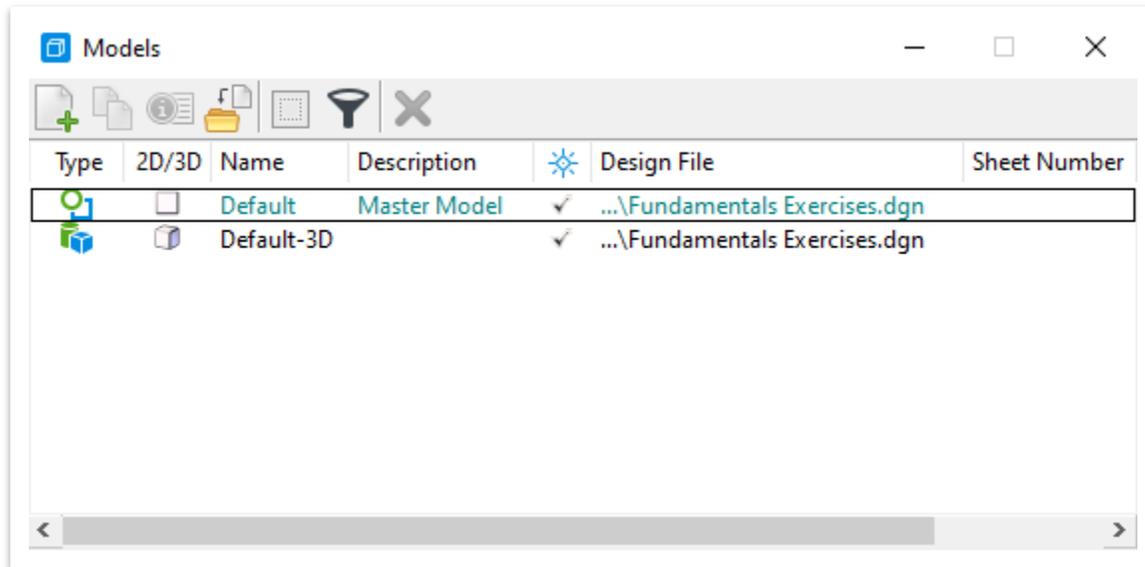


### 3.3.3 Models



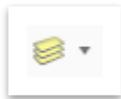
This tool allows the user to create, manage, and switch between models in the drawing (Figure 34). Models are either 2D or 3D views accessible in the DGN file. Most of the time, the user will be working with 2D models. The use of 3D models is mostly seen in corridor roadway design and survey processes. Models can also be imported from other drawing files.

FIGURE 34. MODEL DISPLAY



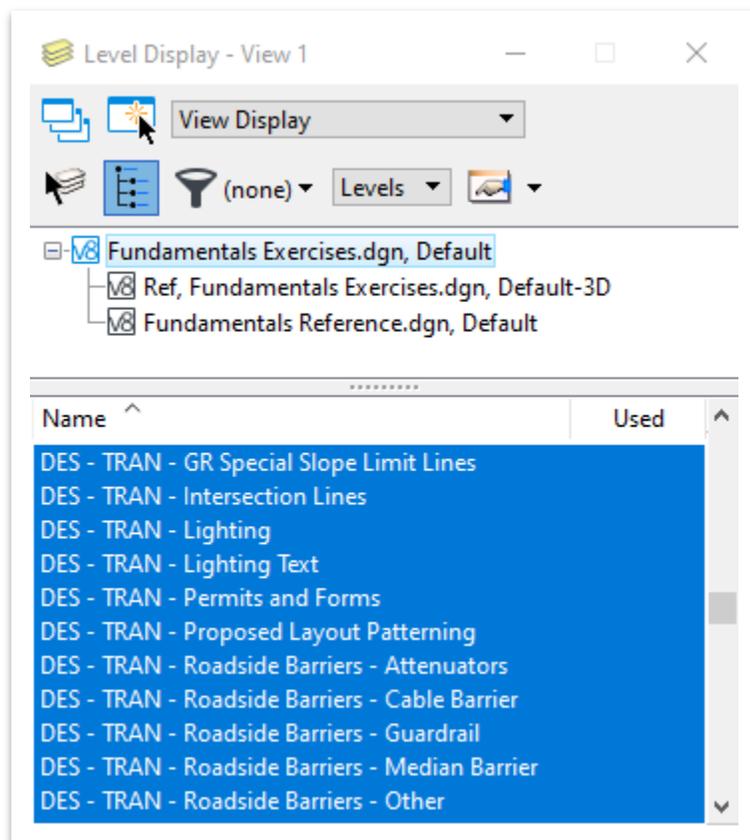


### 3.3.4 Level Display and Level Manager



**Level Display:** This tool allows the user to turn individual levels on and off as well as apply filters to displayed levels (Figure 35). Other features within the Level Display include **View Display**, **Global Display** and **Global Freeze** which will change the level state in the Active View. **All TDOT levels have been updated and renamed for use with ORD.**

FIGURE 35. LEVEL DISPLAY



**Level Manager:** This is a **CADD administrator tool only**, which is used to setup level properties such as level color, line style, and line weight, for the drawing and attached reference files. This has been setup to conform to TDOT standards and **should not be edited by the user.**

### 3.3.5 Properties Tool



This tool shows the user information about the currently selected element and can be docked to the side of the window. Additionally, the user can edit most of the displayed element properties through this menu via the drop-down tabs.



### 3.3.6 Exercise: Show Properties

1. Left click and release to select the **GENESCO\_TEST** centerline from the **Fundamentals Reference.dgn** file that was referenced earlier in the chapter. Once the centerline is selected, hover your mouse over the centerline to see the heads-up display and then select the blue information icon (highlighted in red) to open the **Properties**. Opening the Properties in this manner is dynamic, so the information will disappear once you move your mouse off the white box below.



> Start Point	1851315.19',670207.74'
> End Point	1851399.92',666890.78'
Length	3489.38'
<hr/>	
Feature Name	GENESCO_TEST
Feature Definition	Prop HA Mainline
<hr/>	
Curve Stroking	0.07'
Profile Stroking	0.07'
Stroking Step Method	Increment
Linear Stroking	10.00'



- There is a second option to view the **Properties**, which shows more details and is not dynamic. With the centerline still selected, click on the blue information icon (highlighted in red) within the ribbon (**Drawing >> Home >> Primary**). Your window should match what is shown below but could vary in size or shape based on the user's preferences.

The screenshot displays the Properties dialog box for a selected element. The dialog is organized into several sections: General, Geometry, Feature, and Extended. A secondary window shows the Primary ribbon with the information icon highlighted in red.

**Primary Ribbon:**

- Explorer
- Attach Tools
- Primary (Information icon highlighted in red)

**Properties Dialog - Elements (1)**

- Complex Element: GENESCO\_TEST

**General**

Element Description	Complex Element: GENESCO_TEST
Level	DES - CL - Proposed
Color	<span style="color: red;">■</span> 6
Line Style	<span style="border-bottom: 1px solid black;">   </span> 0
Weight	<span style="border-bottom: 2px solid black;">   </span> 10
Class	Primary
Number of elements	5
Template	(None)
Transparency	0
Priority	0

**Geometry**

> Start Point	1851315.19',670207.74'
> End Point	1851399.92',666890.78'
Length	3489.38'

**Feature**

Feature Definition	Prop HA Mainline
Feature Name	GENESCO_TEST

**Extended**

Model	Default
Last Modified	4/23/2020 5:03:59 PM
Modified	Modified
New	Not New
Locked	Locked
Display Style	<span style="border: 1px solid blue;">   </span> (From View Display)

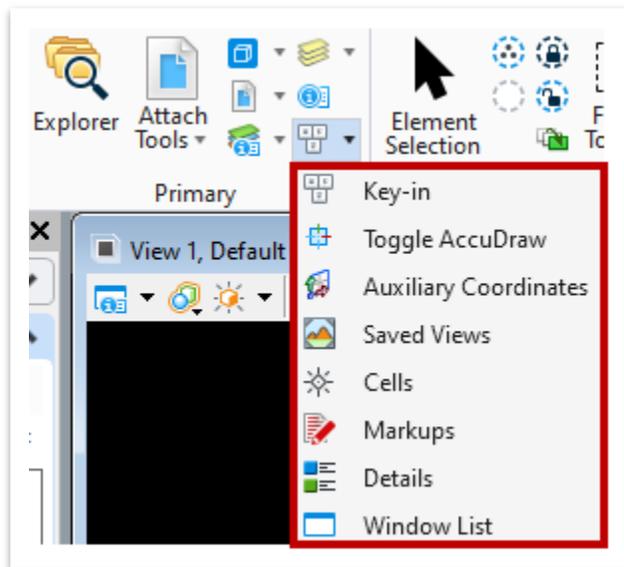
Stroking Definition



### 3.3.7 Additional Tools

The following tools can all be found under the **More** down arrow of the Primary Tools (Figure 36). Note that the icon changes depending on which tool was used last.

FIGURE 36. PRIMARY TOOLS – MORE



#### 3.3.7.1 Key-in

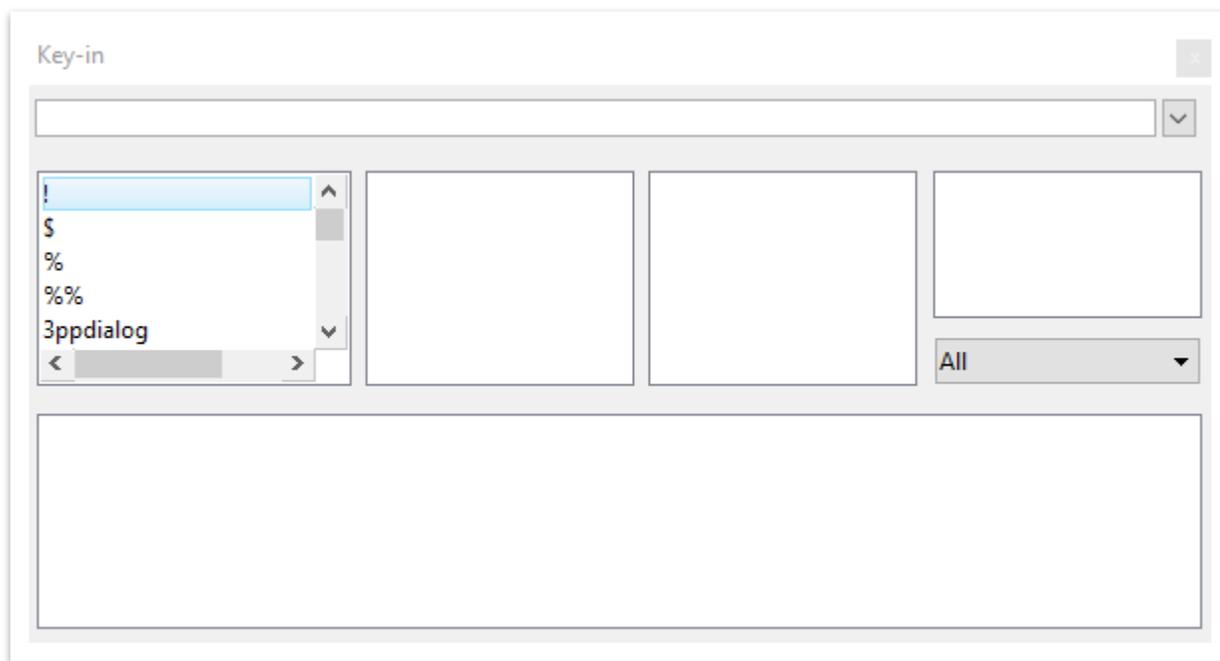


This tool, shown on the next page in Figure 37, allows the user to type in any of the commands available in ORD with the corresponding keyword(s). The drop-down menu can also be accessed to see the available key-ins. After typing in a Key-in, clicking **Enter** will process the command. Some examples are:

- **xy=0,0** to set the 0,0 orientation
- **corridor create** (to create a new corridor)
- **copy parallel keyin** (enter distance) to offset an element
- **view \_\_\_** (e.g. view top) will switch to that view



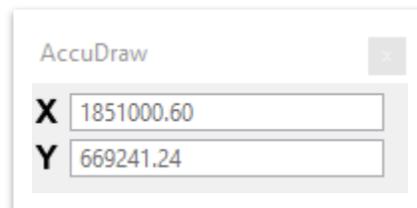
FIGURE 37. KEY-IN WINDOW



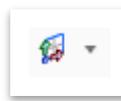
### 3.3.7.2 Toggle AccuDraw



This tool brings up a window with the current coordinates of the cursor. **Note:** The XY fields may be docked at the bottom of your ORD interface. When a tool such as Place SmartLine is open while the AccuDraw window is open, the user can define X and Y coordinates for the next data point.

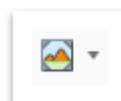


### 3.3.7.3 Auxiliary Coordinates



This tool allows the user to define new coordinate systems that can be toggled on or off in addition to the default coordinate system. Auxiliary Coordinate Systems can be defined by points, aligned with elements, aligned with views, or aligned with references.

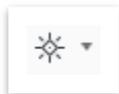
### 3.3.7.4 Saved Views



This tool allows the user to save specific views as well as import views from other files. These views are helpful when sharing files with other users where a specific zoomed in view is advantageous (e.g. an intersection). Saved Views are used a lot when dealing with special detail drawings. We will create a saved view in Chapter 5.



### 3.3.7.5 Cells



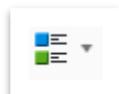
This tool allows the user to attach different cell libraries and set the active cell, point cell, terminator cell, or pattern cell.

### 3.3.7.6 Markups



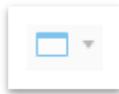
This tool allows the user to review markups made in the drawing file.

### 3.3.7.7 Details



This tool creates a sortable table with all the property information for the selected element. Like the Properties Menu, the user can change certain properties of the selected element through this window.

### 3.3.7.8 Window List



This tool opens a window with a list of all windows currently open in the program. The user can select a window from the list and click OK to bring that window to the front.



## Chapter 4. TDOT Standards and Element Attributes



TDOT has updated the CADD standards to support a more model-centric design workflow. The main purposes of the CADD standards are to:

- Provide consistency in the appearance of drawings across the state.
- Have the capability to automate as many functions as possible.
- Create models for construction applications.

This section presents an overview of the changes made by TDOT and some new terminology. Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn about Element Templates.

### 4.1 Objectives

At the conclusion of this chapter, participants will be able to:

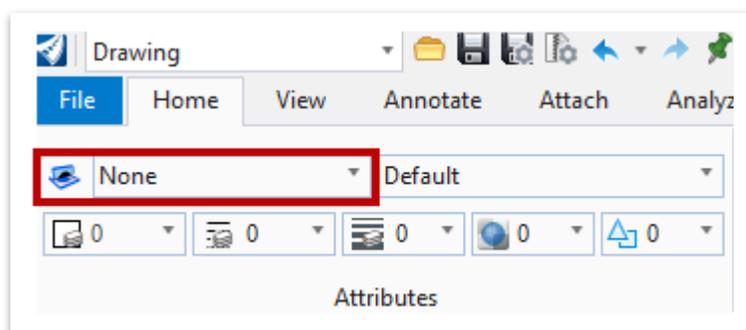
1. Understand what element templates are.
2. Understand the level display.
3. Understand how to access and adjust the drawing scale.

### 4.2 Lecture: Element Templates



**Element Templates** are used by the software to manage CADD standards (Figure 38). They are used to set up the symbology (level, color, line style, line weight, cell linkage, etc.) for **all** CADD objects. The Element Templates are stored in a DGNLIB file and can be accessed in the following location: **Drawing >> Home >> Attributes**.

FIGURE 38. ELEMENT TEMPLATE





TDOT has updated the level library and created a standard library for element templates specific to each discipline.



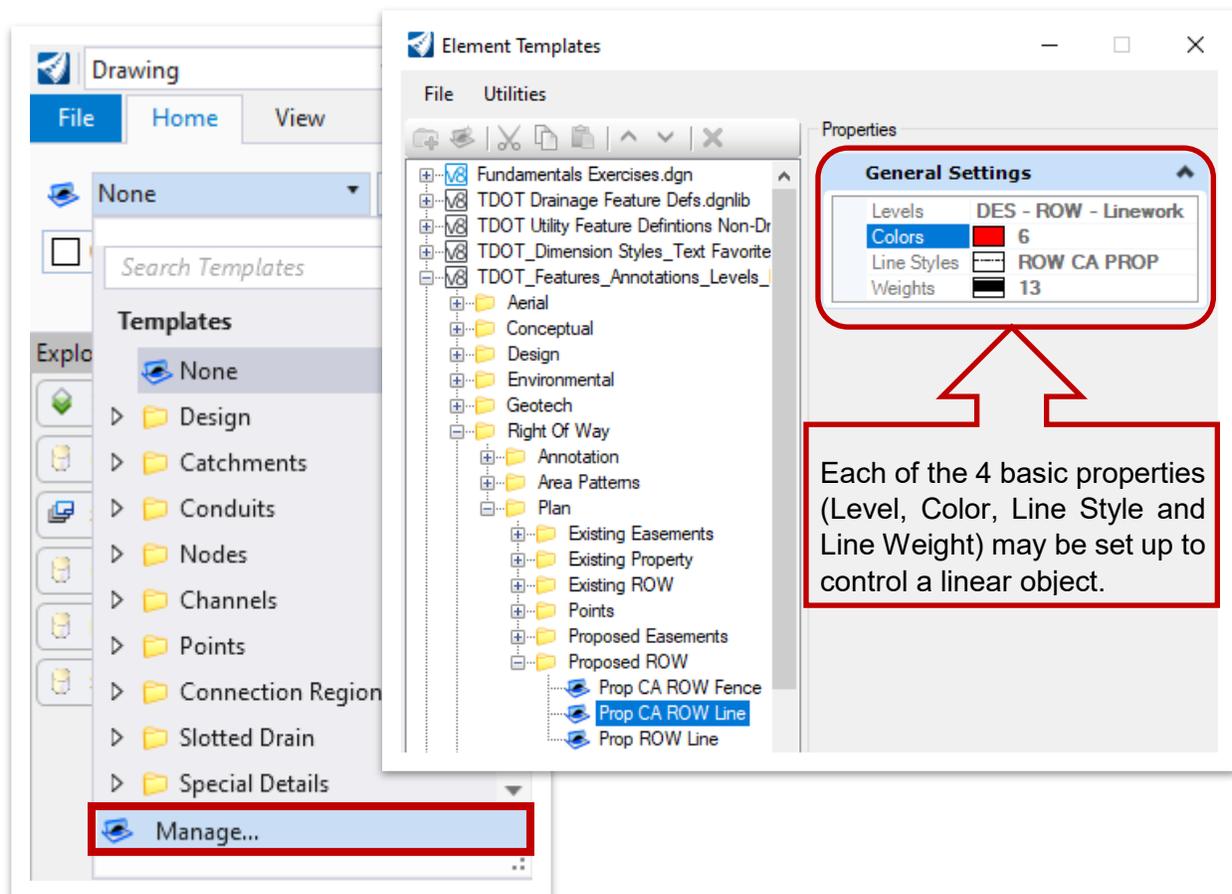
### Take Note!

A full list of both the level and element template libraries can be found in the TDOT CADD Manual.

Selecting **Manage** will allow all properties of each element template to be seen. **These should not be changed by the user.** We will apply element templates to the exercises starting in Chapter 5, but first let's explore the element template folders.

Go to **Drawing >> Home >> Attributes** and select the first drop menu **None** to see the list of template folders. Click on **Manage** and the element template dialog box will appear. Go to **TDOT\_Features\_Annotation\_Levels\_Elem Temp.dgn** and expand the folders. Then go to **Right of Way >> Plan >> Proposed ROW >> Prop CA ROW Line**. You should see the image below (Figure 39).

FIGURE 39. PROP CA ROW LINE ELEMENT TEMPLATE

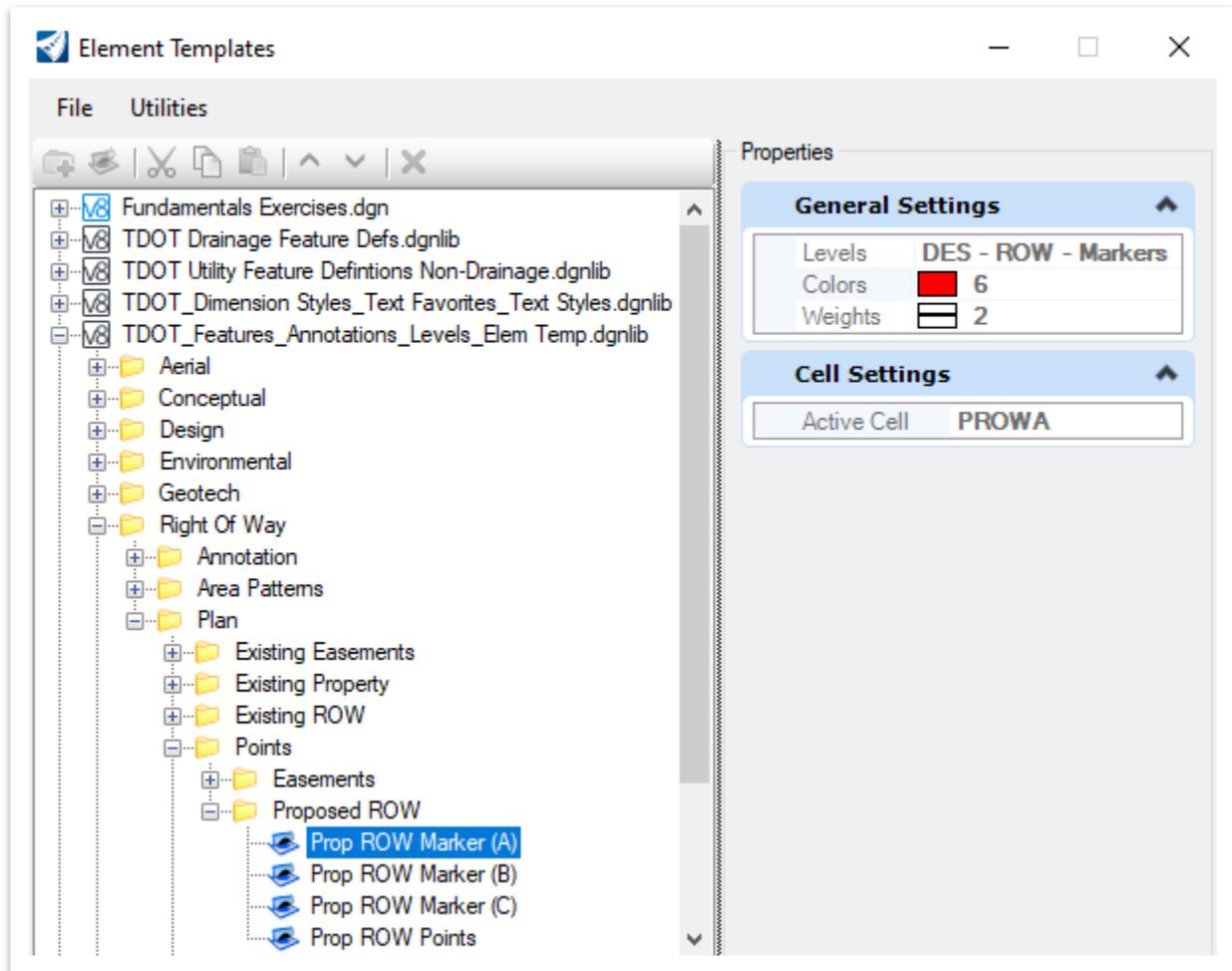




### 4.2.1 Point Element Templates

Point element templates have the option to call out a specific **cell** (e.g. Prop ROW Marker (A)) to represent the point, in addition to the general visual settings. Points can also be set up to look like a symbol. Browse to the **Prop ROW Marker (A)** element template shown below (Figure 40).

FIGURE 40. POINT ELEMENT TEMPLATE PROPERTIES - PROP ROW MARKER (A)

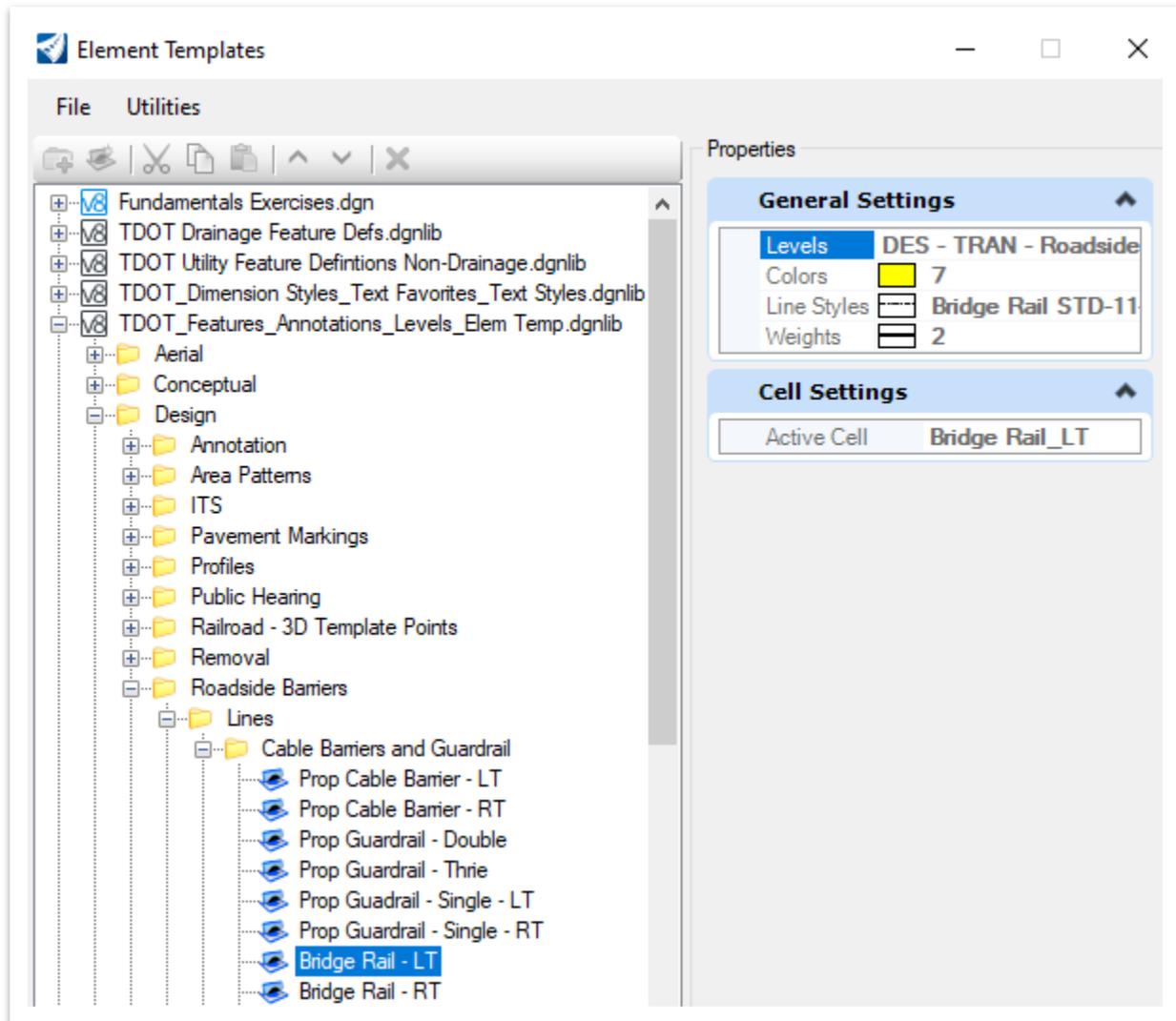




## 4.2.2 Linear Element Templates

Linear element templates are used to set the CADD standards for all lines to be placed in a drawing. The linear element templates set level, color, line style (standard or custom) and line weights. The element template window is accessed by selecting the **Manage** button. Browse to the **Bridge Rail - LT** element template shown below (Figure 41).

FIGURE 41. LINEAR ELEMENT TEMPLATE PROPERTIES – BRIDGE RAIL – LT

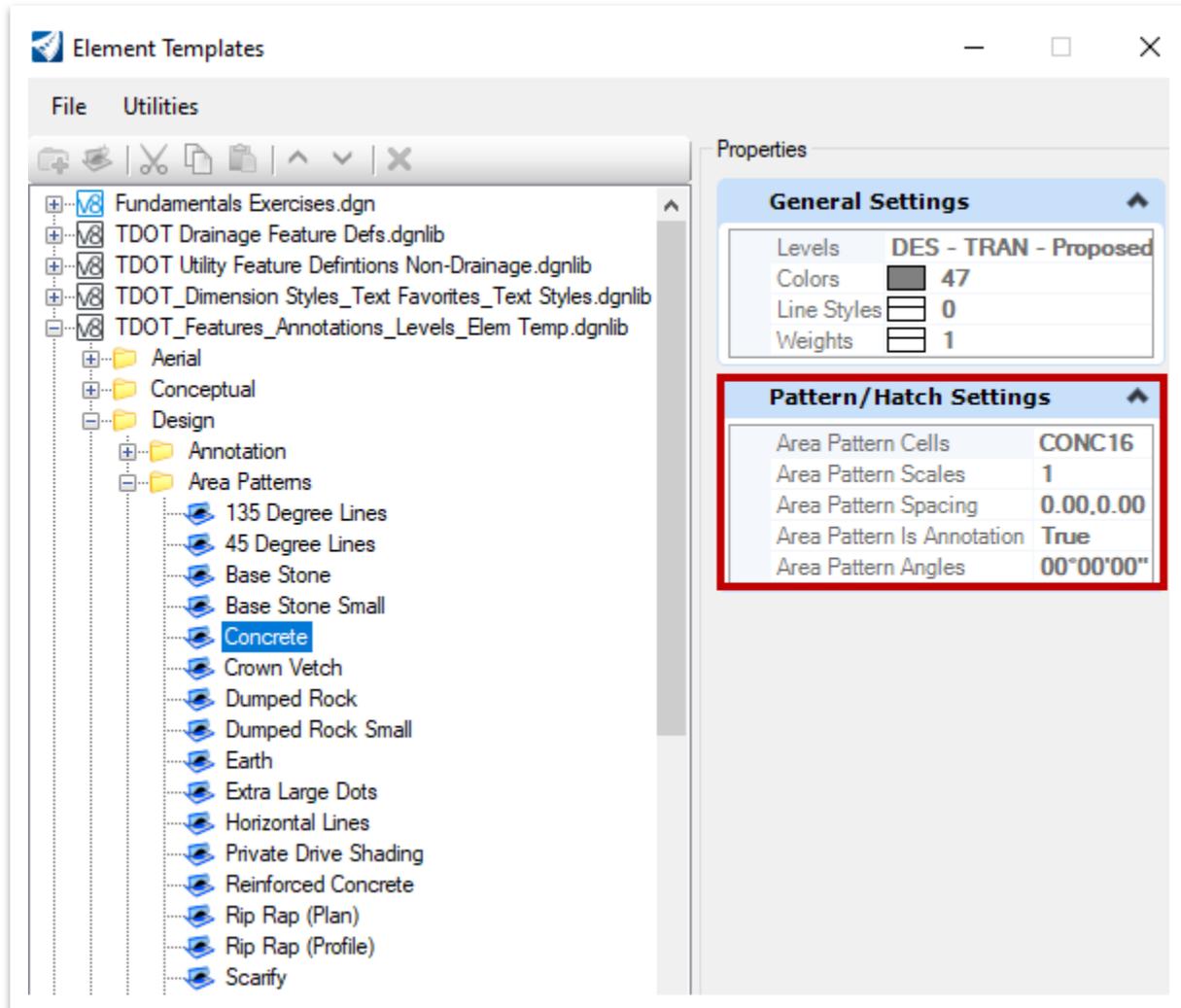




### 4.2.3 Pattern/Hatching Element Templates

Similarly, element templates created specifically for area patterns set all the CADD standards for patterns to be placed in a drawing, including level, color, weight, and area pattern. Browse to the **Concrete** element template shown below (Figure 42).

FIGURE 42. PATTERN/HATCHING ELEMENT TEMPLATE PROPERTIES – CONCRETE





### 4.3 Lecture: Level Display and Filters

Level Filters allow the user to quickly toggle the display of levels on and off. This is helpful for ensuring the correct levels are displayed on various sheet types. Level filters in Table 3 have been created based on TDOT standards.

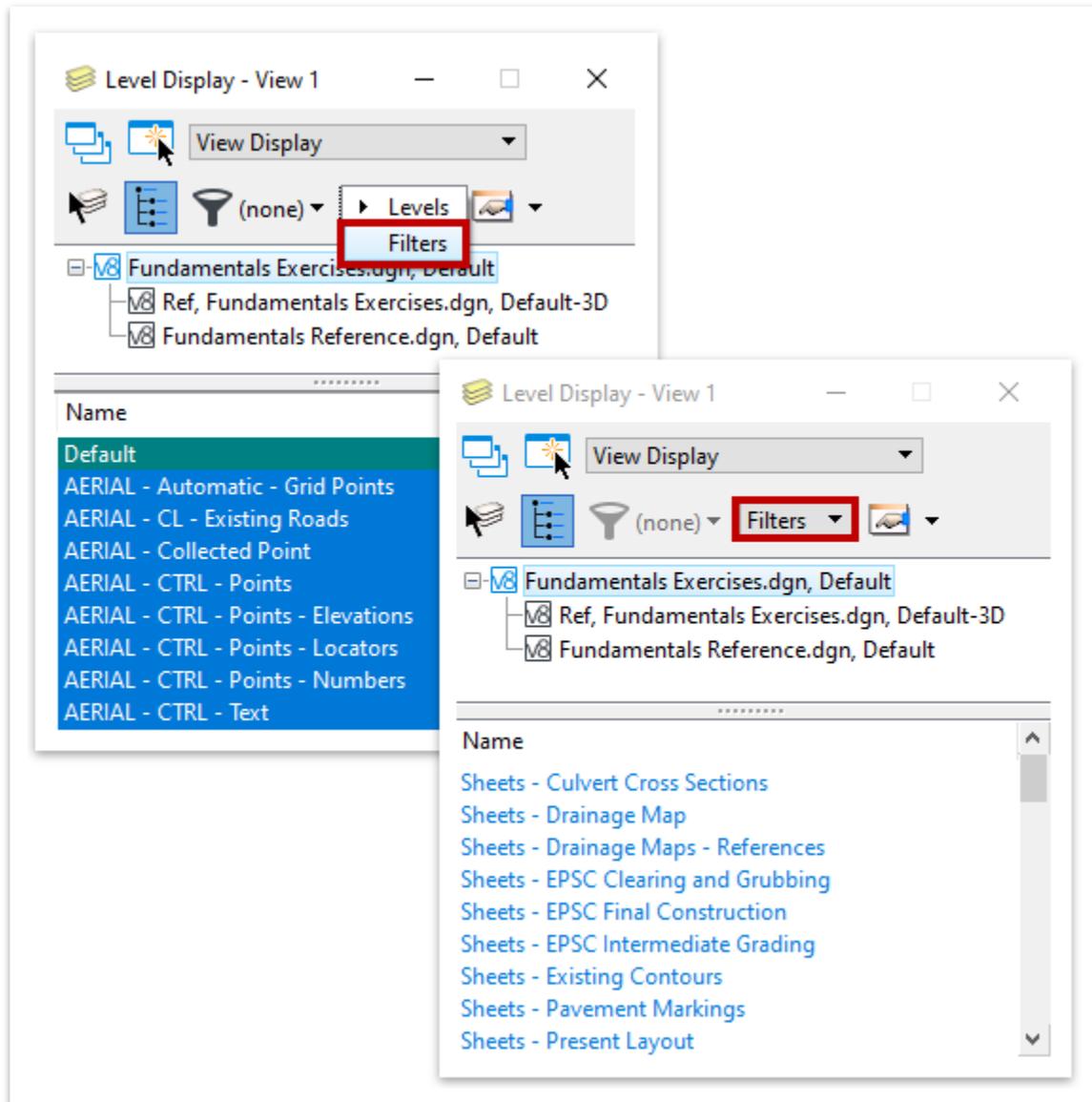
TABLE 3. DESCRIPTION OF TDOT LEVEL FILTERS

Level Filters	
<i>Sheets - Culvert Cross Sections</i>	<i>Sheets - Title Consultant ROW</i>
<i>Sheets - Drainage Map</i>	<i>Sheets - Title Resurfacing</i>
<i>Sheets - Drainage Maps - References</i>	<i>Sheets - Title Resurfacing &amp; Safety</i>
<i>Sheets - EPSC Clearing and Grubbing</i>	<i>Sheets - Title ROW Utilities Only</i>
<i>Sheets - EPSC Final Construction</i>	<i>Sheets - Title TDOT Construction</i>
<i>Sheets - EPSC Intermediate Grading</i>	<i>Sheets - Title TDOT Construction #2</i>
<i>Sheets - Existing Contours</i>	<i>Sheets - Title TDOT Preliminary</i>
<i>Sheets - Pavement Markings</i>	<i>Sheets - Title TDOT ROW</i>
<i>Sheets - Present Layout</i>	<i>Sheets - Traffic Control</i>
<i>Sheets - Present Layout no ROW PL Text</i>	<i>Sheets - Traffic Control - References</i>
<i>Sheets - Profiles Private Drive</i>	<i>Sheets - Utilities</i>
<i>Sheets - Property Map</i>	<i>Survey - All with Pt Locators</i>
<i>Sheets - Property Maps - References</i>	<i>Survey - Drainage</i>
<i>Sheets - Proposed Contours</i>	<i>Survey - DTM</i>
<i>Sheets - Proposed Layout</i>	<i>Survey - Field Topo</i>
<i>Sheets - Roadway Cross Sections</i>	<i>Survey - Non-Transportation</i>
<i>Sheets - ROW Details</i>	<i>Survey - Profile</i>
<i>Sheets - Signalization Existing</i>	<i>Survey - Property</i>
<i>Sheets - Signalization Proposed</i>	<i>Survey - Property Development</i>
<i>Sheets - Title Consultant Construction</i>	<i>Survey - Transportation</i>
<i>Sheets - Title Consultant Construction #2</i>	<i>Survey - Utilities</i>
<i>Sheets - Title Consultant Preliminary</i>	



The level filters are accessed thru the **Level Display** window (**Drawing >> Home >> Primary**) (Figure 43). We will apply level filters when creating the Title Sheet in Chapter 12.1.6.

FIGURE 43. TDOT LEVEL FILTERS WINDOW



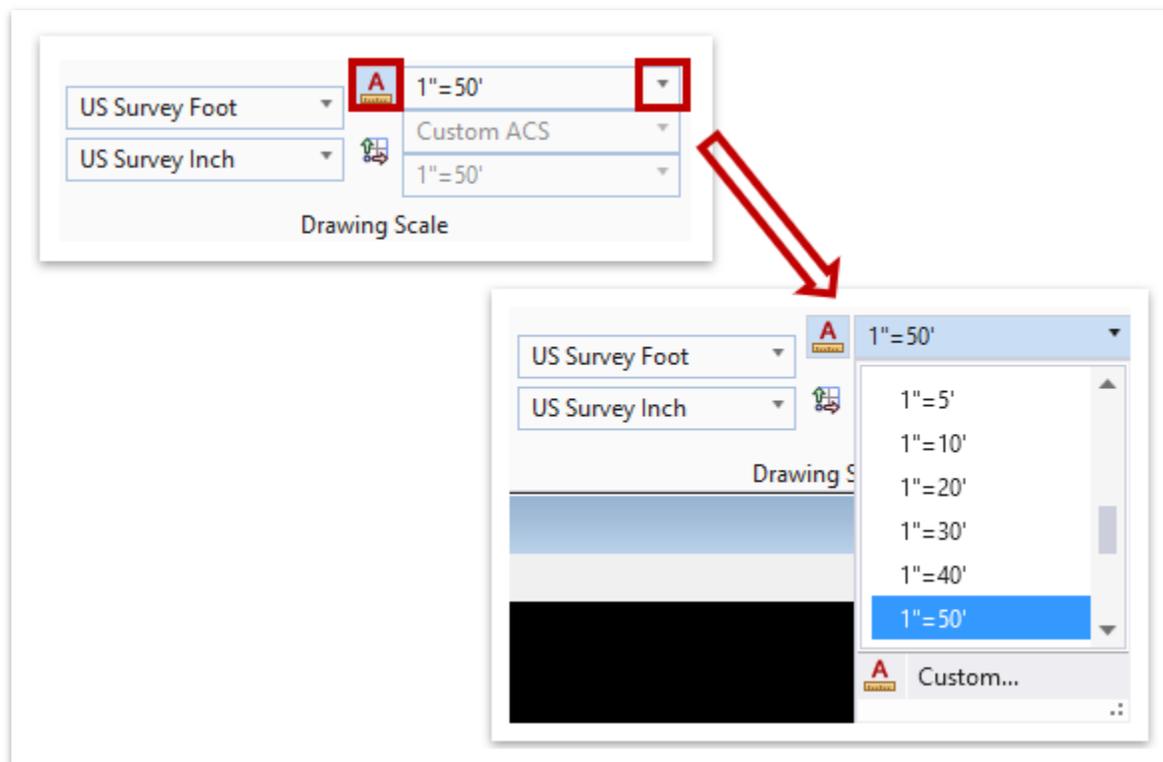


## 4.4 Lecture: Drawing Scale

The **Drawing Scale** section contains tools for changing working units, Annotation Scale, Annotation Scale Lock, Auxiliary Coordinate System (ACS), ACS Scale, and ACS Lock (Figure 44). It can be accessed here: **Drawing >> Utilities >> Drawing Scale**.



FIGURE 44. ANNOTATION SCALE OPTIONS



The **Drawing Scale** can be selected from a list when **Annotation Scale Lock** is turned **on** and the Annotation Scale should match the desired scale for the drawing when plotted. Changing the Annotation scale will change the size of **smart elements** such as labels, linestyles, cells, and dimensions. **Text that is manually placed at True Scale and not classified as an Annotation will not be scaled by this tool.** We will utilize the annotation scale in the next chapter.



### Take Note!

*Element Templates will mostly be used when not using the modeling tools. For example, placing text, notes and patterns, detailing sheets, and creating geometry for structures and special details.*



## Chapter 5. Placing CADD Elements



Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will place CADD elements using **AccuDraw**. In the next chapter, the user will modify those elements.

### 5.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Place a smartline and a stop sign cell.

### 5.2 Lecture: AccuDraw

**AccuDraw** allows the user to draft precisely and accurately by providing a basic interface for defining the X and Y coordinates or offsets for data points. There is also a Civil AccuDraw tool that provides a whole toolbox useful for placing civil elements, which will be covered in the Roadway Design I (ORD) Manual.

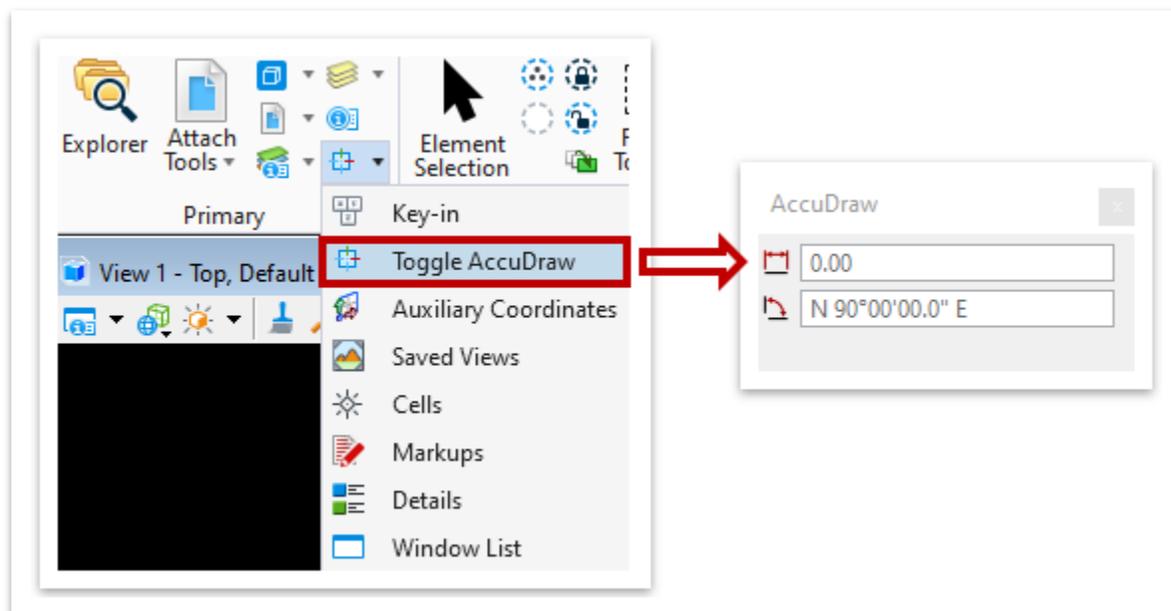
If you do not see the AccuDraw window or do not have AccuDraw docked already, then you can toggle it on by opening the **Toggle AccuDraw** tool (Figure 45). This tool will be applied later in the chapter and can be accessed here: **Drawing >> Home >> Primary**.



**Take Note!**

*If your AccuDraw window has XY instead, simply hit the **M** key to toggle between XY and linear/angular.*

FIGURE 45. TOGGLE ACCUDRAW

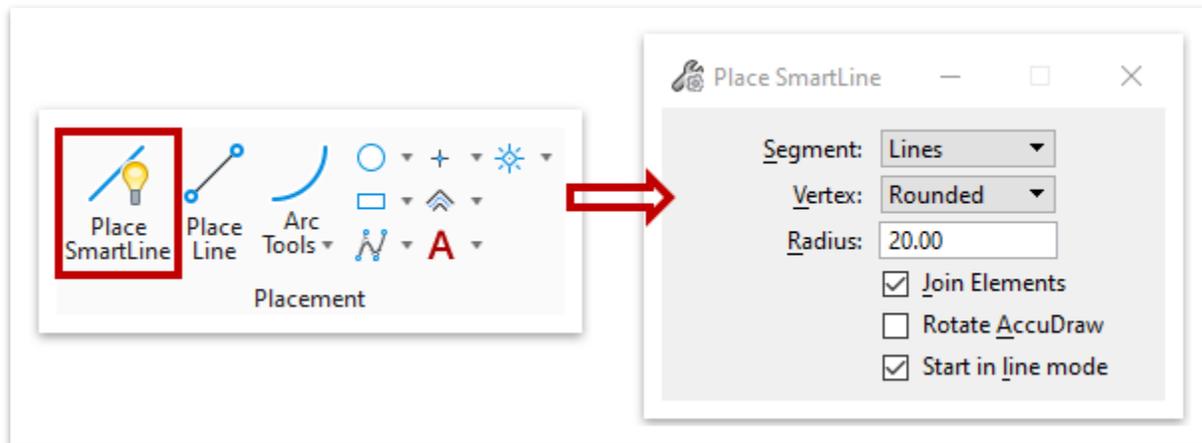




## 5.3 Lecture: Place SmartLines

This tool allows the user to place **line** or **arc** segments, with the option to join them (Figure 46). It can be accessed here: **Drawing >> Home >> Placement**. If the user chooses **Rounded** or **Chamfered** Vertices instead of Sharp, the user can define the radius or offset for the joints.

FIGURE 46. PLACE SMARTLINE

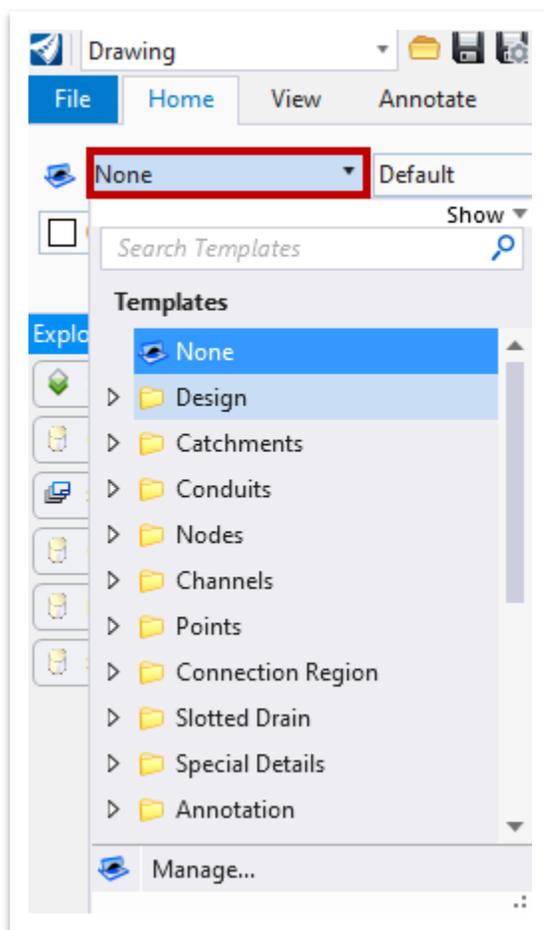




## 5.4 Exercise: Place SmartLines



1. Before placing any geometry, we need to set the **Element Template** so that the symbology will be correct.
2. For this exercise, we will use the **Design Scratch User 1** element template.
3. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Design Scratch User 1** element template (**Design >> Roadway - 2D Plan >> Misc >> Design Scratch User 1**). **Note:** Your order of Template folders may be in a different order than shown below.

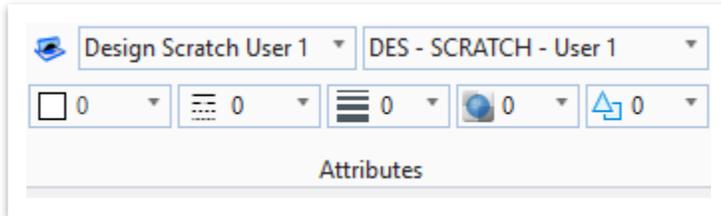


### Take Note!

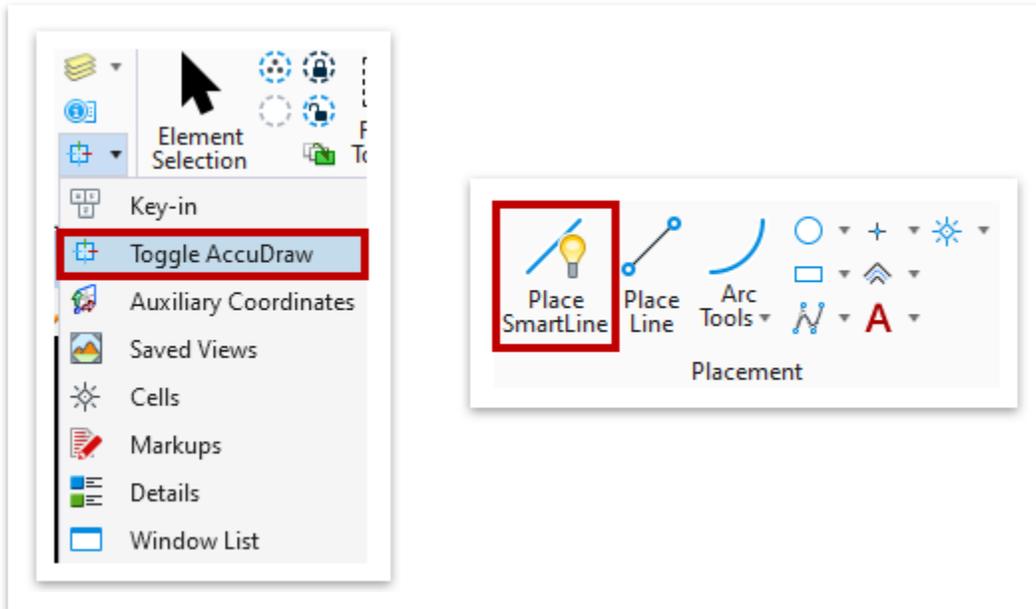
*If you know the Element Template you are looking for, you can use the Search Templates field to type it in instead of browsing through the folder tree. You can then select the correct Element Template in the list.*



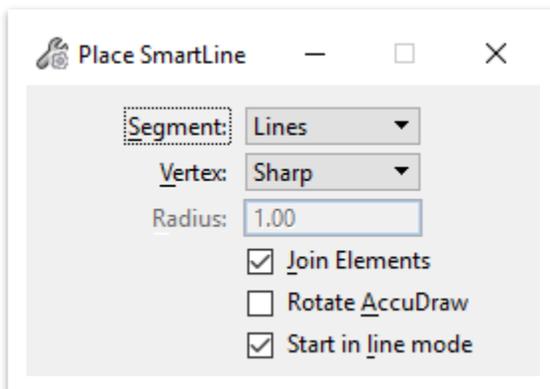
- Once the element template is selected, notice that the Attributes updated automatically.



- Make sure **AccuDraw** is turned on (**Drawing >> Home >> Primary >> More**). Select the **Place SmartLine** tool, which will open the corresponding window.

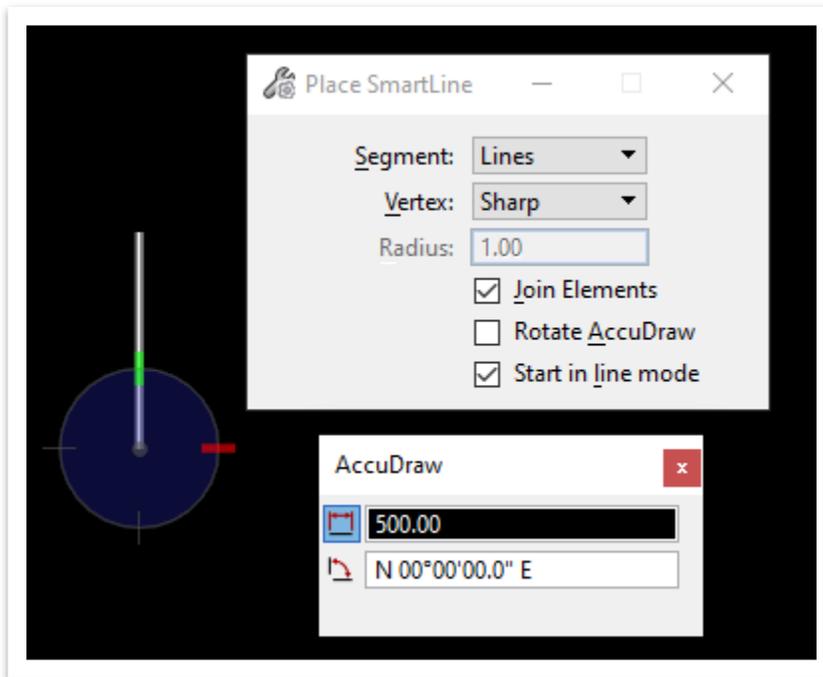


- In the **Place SmartLine** window, match the following settings:

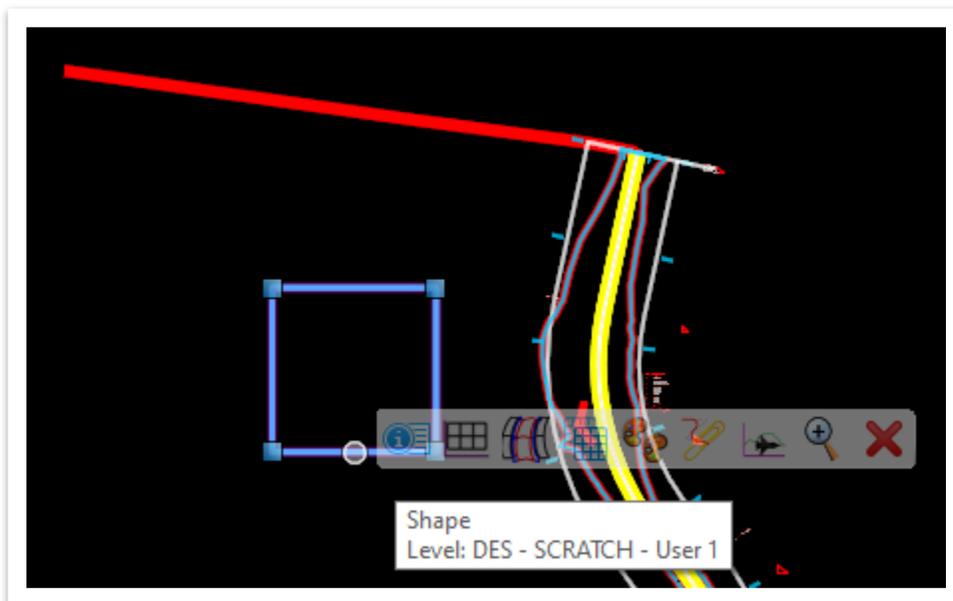




7. Draw a square with **500'** x **500'** side lengths in the blank space to the left of the referenced corridor. Remember, hit the **M** key if you have XY on your AccuDraw window.

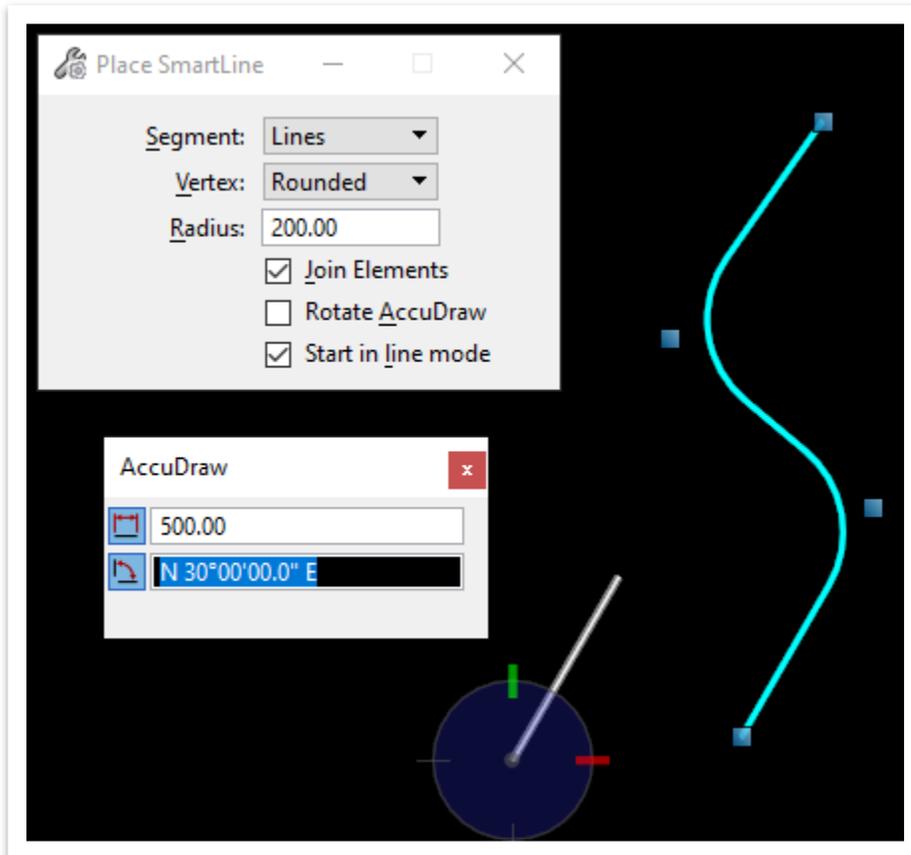


8. Notice that when the square is closed using the SmartLine tool, it is automatically classified as a closed shape by ORD.





9. Now we will create another SmartLine to the left of the square, except this time with rounded vertices at **200'** radii.
10. Using AccuDraw, create three **500'** line segments at **S 30°00'00.0" W**, **S 50°00'00.0" E**, and **S 35°00'00.0" W** respectively. Since these bearings are whole degrees, they can be entered in the form **S30W** in the AccuDraw dialog. The final smartline should look like the highlighted one below.

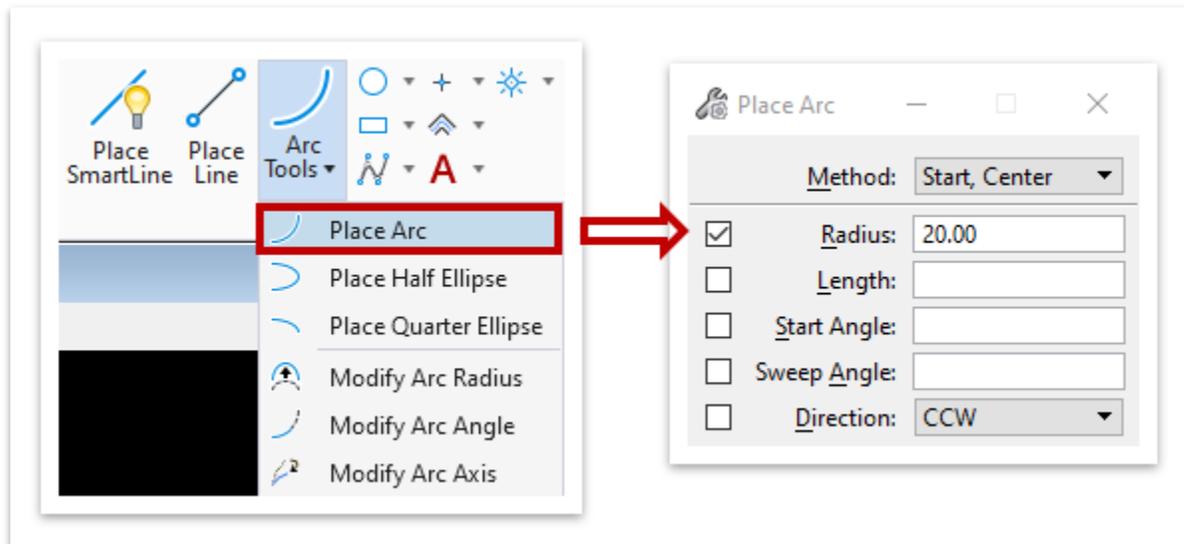




## 5.5 Lecture: Place Arcs

This tool allows the user to place **arcs** by points or by defining criteria such as Radius and Length (Figure 47). It can be accessed here: **Drawing >> Home >> Placement**. The user can change the Method to choose the order in which points are defined. The **Arc Tools** drop-down menu also allows for the placing of ellipses and modification of arc properties.

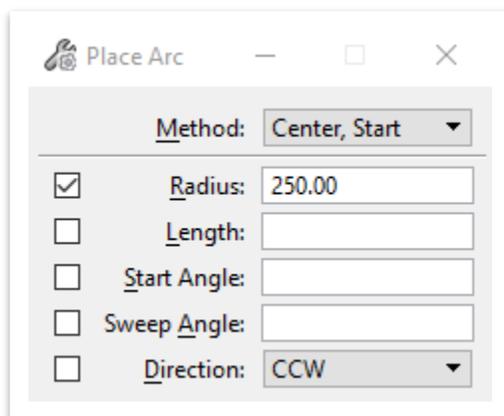
FIGURE 47. PLACE ARCS



## 5.6 Exercise: Place Arc

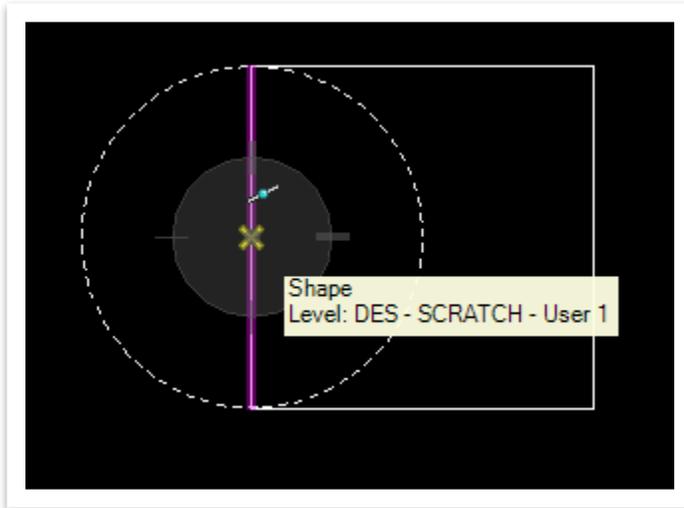


1. The same element template (**Design Scratch User 1**) should still be active from the previous exercise.
2. Select the **Place Arc** tool (**Drawing >> Home >> Placement**) and change the method to **Center, Start**, and set the radius to **250'**.

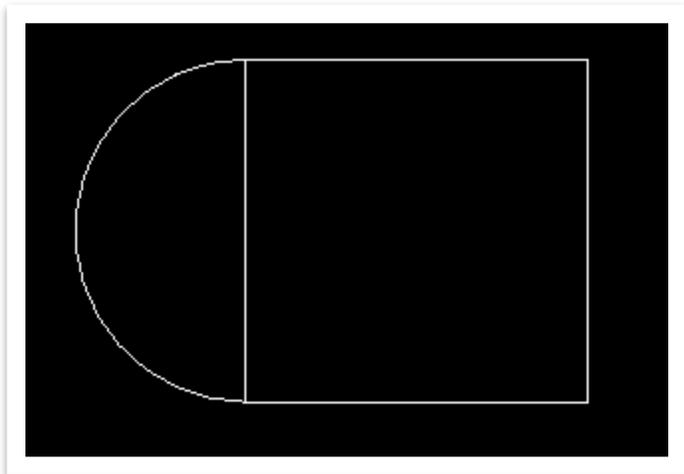




- Using the **midpoint** snap (highlighted in red), place the center of the arc on the midpoint of the left side of the square.



- Start the arc on a corner and end the arc on the adjacent corner.

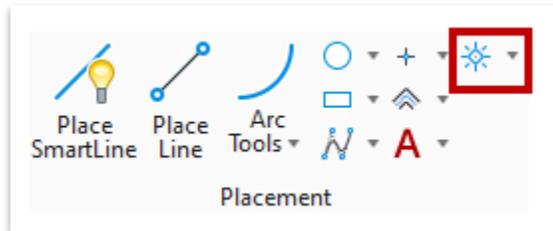




## 5.7 Lecture: Place Cells

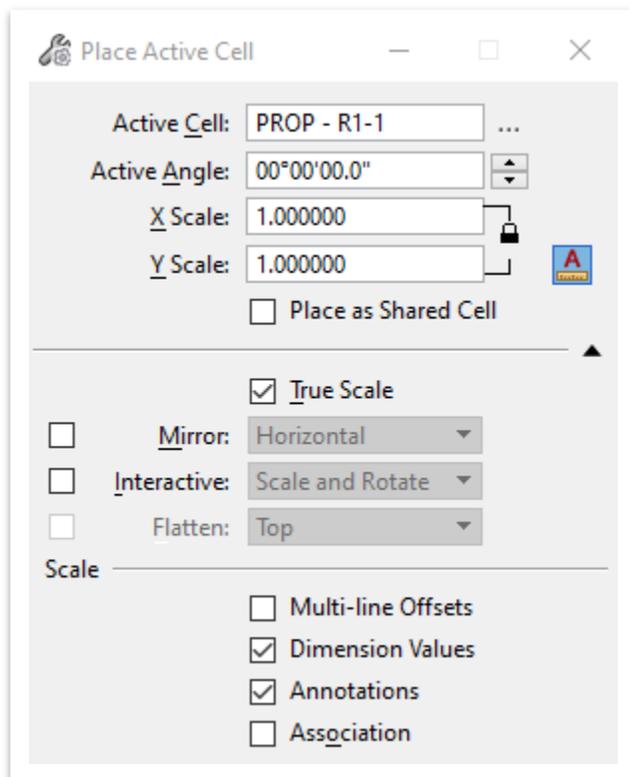
The placing of most basic cells will be done using the **Place Active Cell** tool located here: **Drawing >> Home >> Placement** (Figure 48). If the icon is different then what's highlighted in red, simply click on the drop-down arrow and select **Place Active Cell** (1<sup>st</sup> option). It remembers the last tool used. **Note:** You could also select the element template first, which is linked to the correct cell, and then open the **Place Active Cell** tool.

FIGURE 48. PLACE ACTIVE CELL TOOL



Within the dialog box (Figure 49), you will browse to the applicable cell library to locate the cell you wish to place. All sign cells have been updated to be true size so will need to be scaled accordingly based on the project scale.

FIGURE 49. PLACE ACTIVE CELL DIALOG BOX

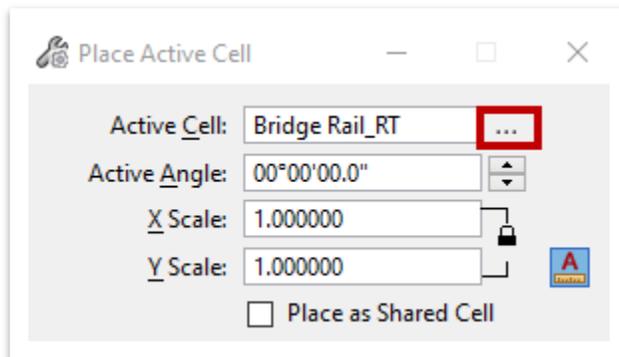




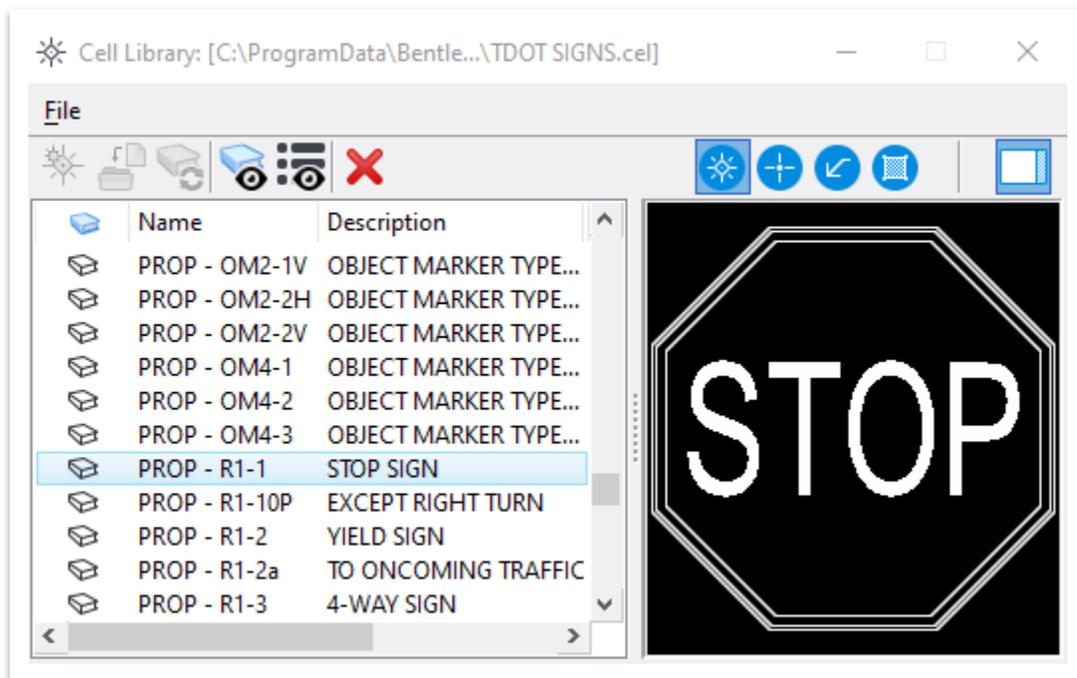
## 5.8 Exercise: Place Cell



1. In this exercise, we will place a **Stop Sign** cell. This sign cell will be one example of what you would see on a signing and marking plan set.
2. Go to **Drawing >> Home >> Placement** and select the **Place Active Cell** tool. Click on the **browse** button next to the Active Cell field and browse the Cell libraries.

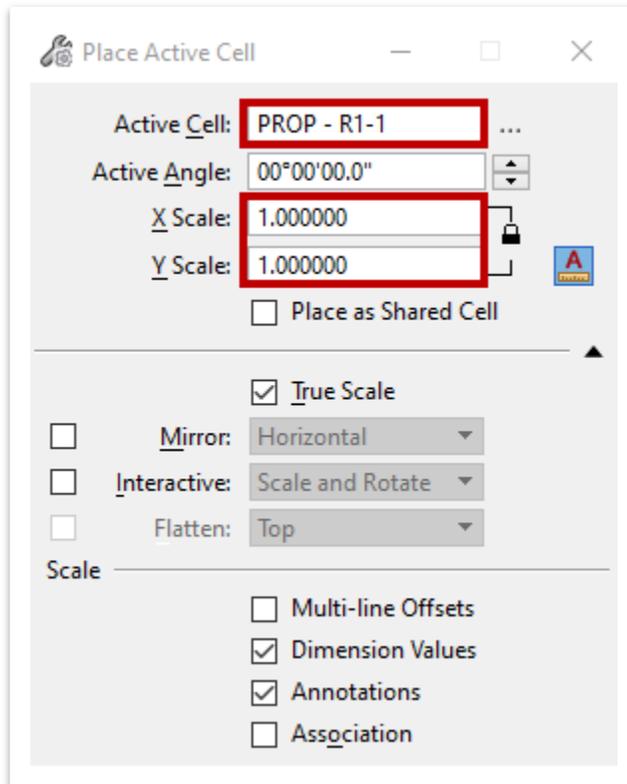


3. Go to **File >> Attach File** and open the **TDOT SIGNS.cel** library.
4. Scroll to **PROP - R1-1** for the stop sign and double click on the cell name.

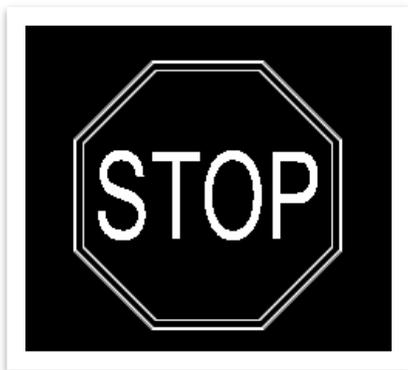




- This will change the Active Cell to **PROP - R1-1** in the **Place Active Cell** dialog box. All signs in ORD are true physical dimension and should be placed at a 1:1 scale.



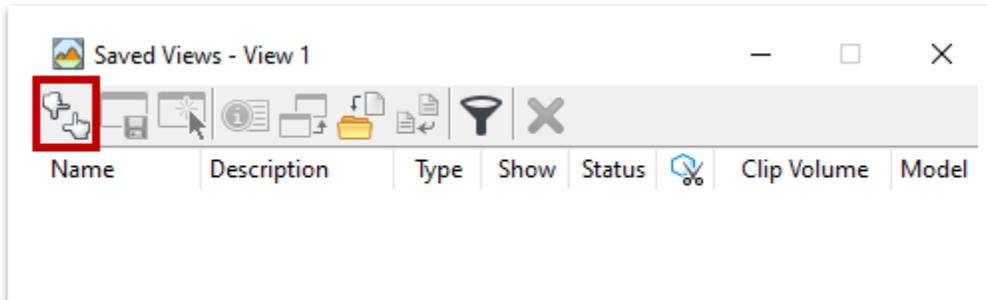
- Place the Stop Sign anywhere within the semi-circle. You will need to zoom in to see the sign. This sign has the approximate dimensions of **30" x 30"**.



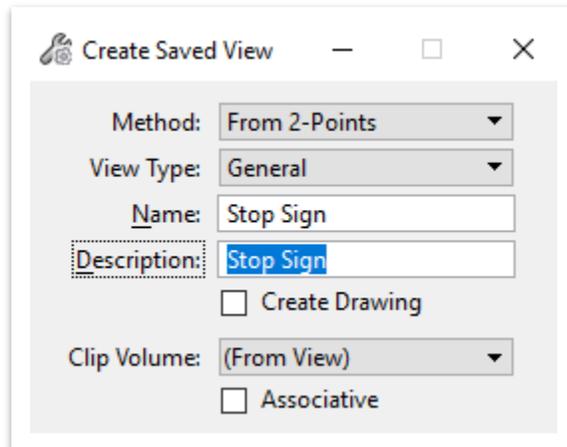


## 5.9 Exercise: Create a Saved View

- Let's now create a **Saved View** called: **Stop Sign**. Go to **Drawing >> Home >> Primary >> More >> Saved Views**. Click on **Create Saved Views**.

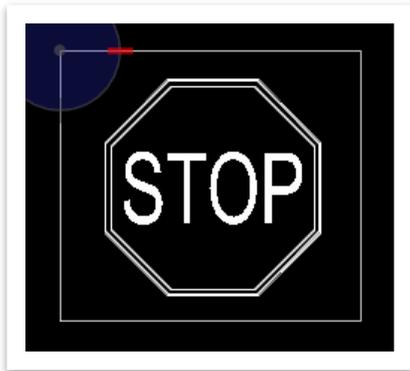


- Fill in the settings:
  - Method:** From 2-Points
  - View Type:** General
  - Name:** Stop Sign
  - Description:** Stop Sign
  - Create Drawing:** Unchecked
  - Clip Volume:** (From View)

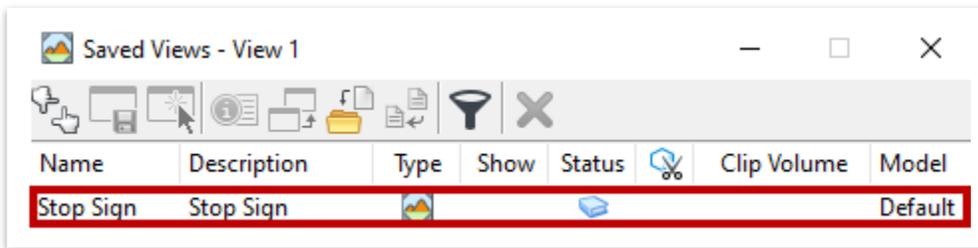




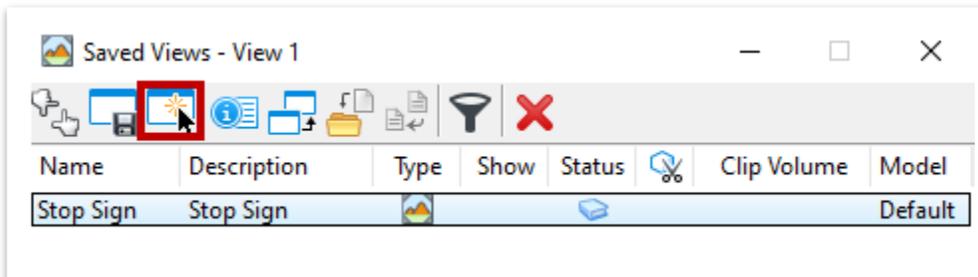
3. Draw a **2-point** square around the stop sign. Left click to accept.



4. Notice the new Stop Sign view was added to the **Saved Views**.

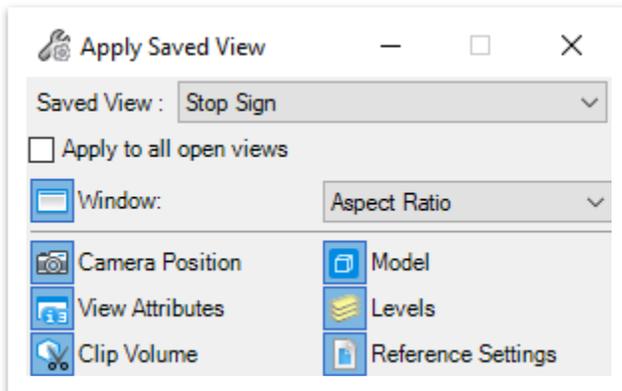


5. To apply the view, highlight the Stop Sign view and select the **Apply Saved View** option.

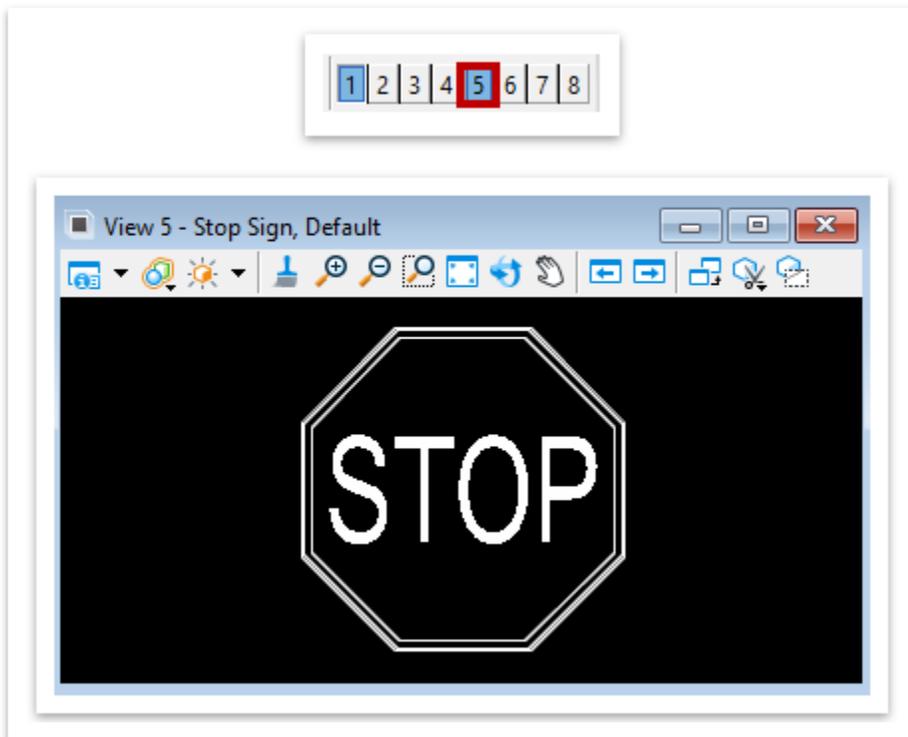




6. Make sure the **Window**, **Camera Position**, **View Attributes**, **Clip Volume**, **Model**, **Levels** and **Reference Settings** are all highlighted.



7. Open any new view (in this exercise, **View 5** was selected) and left click anywhere in the view to see the zoomed in stop sign.



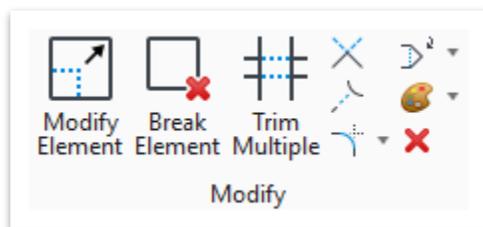


## Chapter 6. Modifying and Manipulating CADD Elements



Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will practice modifying, patterning, and measuring the elements we created in Chapter 5 utilizing the **modify** tools (Figure 50). These tools can be accessed here: **Drawing >> Home >> Modify**.

FIGURE 50. MODIFY TAB



### 6.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Understand how to modify and change element attributes.
2. Understand graphic groups.
3. Understand basic element manipulation, including copy, scale, rotation and mirror functions.
4. Understand the pattern and measure tools.

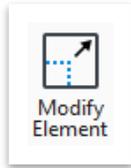
### 6.2 Lecture: Deleting Elements



The user can delete elements by selecting an element or multiple elements and clicking on either the red X icon under the **Modify** tab or by pressing the **Delete** key on the keyboard.

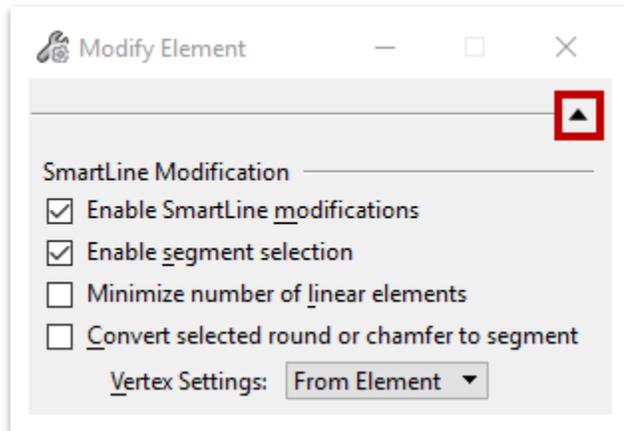


## 6.3 Lecture: Modifying Elements



This tool allows the user to modify the vertices of elements with multiple segments. Once the **Modify Element** dialog box is expanded (highlighted in red), you will see the SmartLine Modification settings (Figure 51).

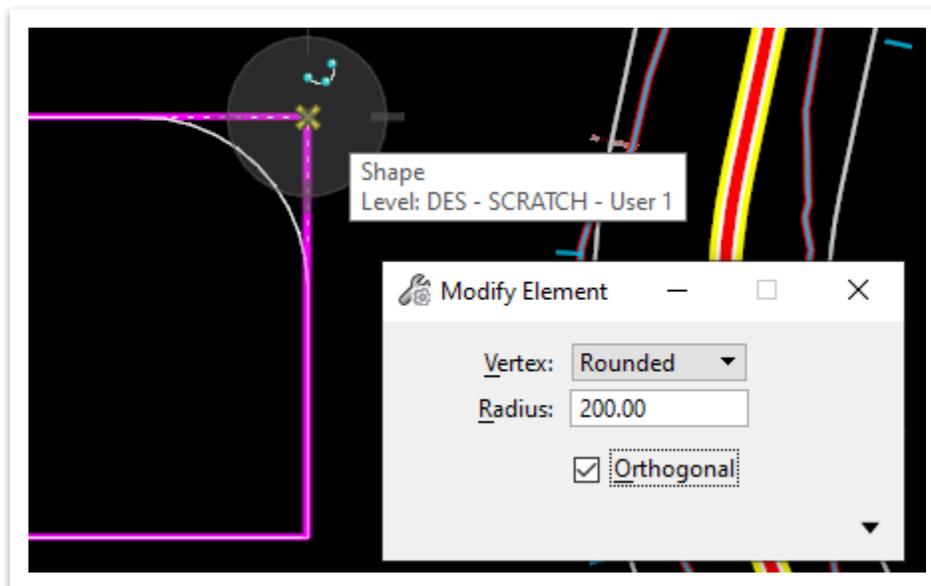
FIGURE 51. MODIFY ELEMENT



## 6.4 Exercise: Modifying Elements

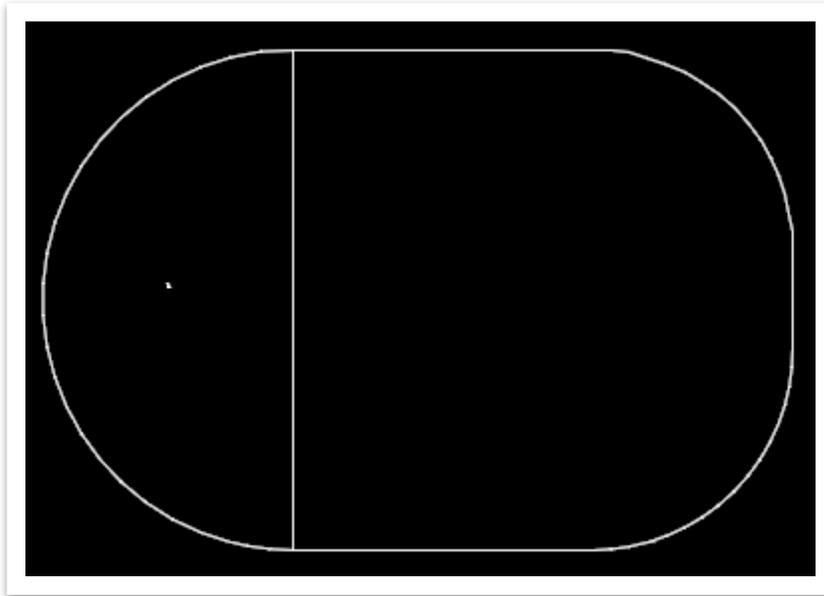


1. Select the **Modify Element** tool, then select the square that was drawn in Chapter 5 on one of its corners. Notice that the dialog box changes once an element is selected. Set the **Vertex** option to **Rounded** with **200'** radius. The drop-down arrow can be expanded to see additional options for the smartline modification.





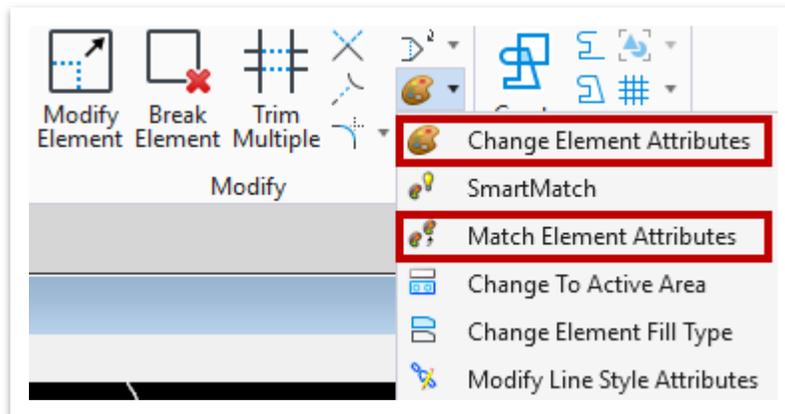
2. Repeat this process to round the opposite vertex.



## 6.5 Lecture: Changing and Matching Element Attributes

These tools allow the user to **change** or **match** the attributes of the selected element (Figure 52).

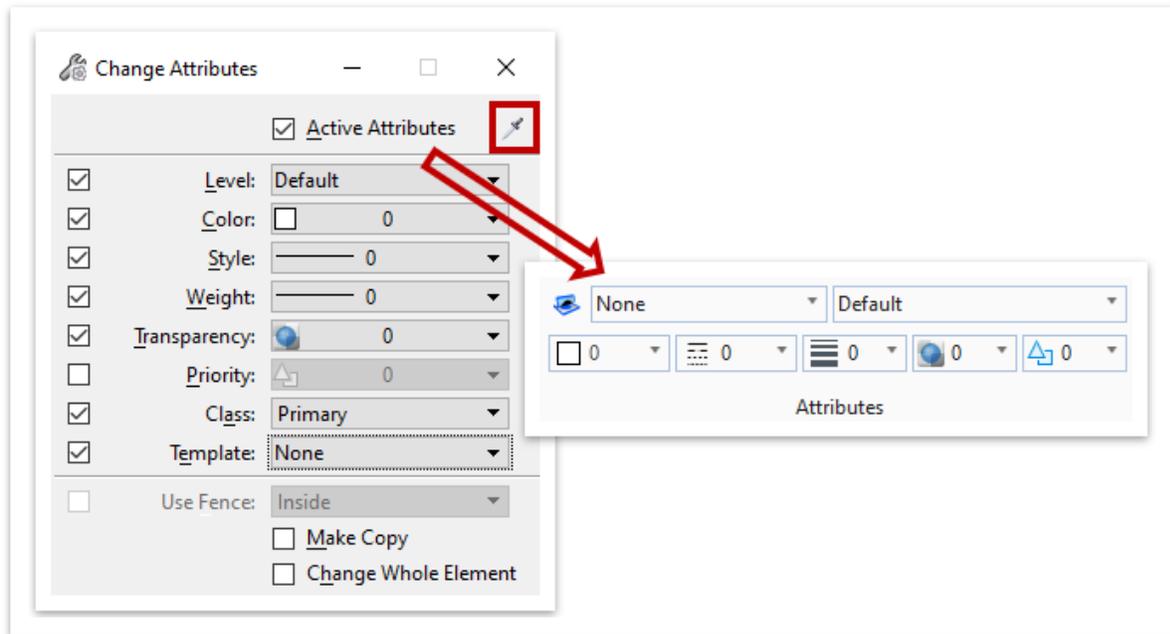
FIGURE 52. GENERAL ATTRIBUTE TOOLS





The user can select the eyedropper tool (highlighted in red) at the top right of the **Change Attributes** menu (Figure 53) to update the Active Attributes to match those of an element in the drawing. If the Active Attributes box is checked, the tool will use the **Active Attributes** (located in the top left of the ORD interface under the Home tab) instead of user selected attributes. By checking and unchecking boxes next to symbology fields, the user can select which attributes are changed or matched.

FIGURE 53. CHANGE ATTRIBUTES MENU

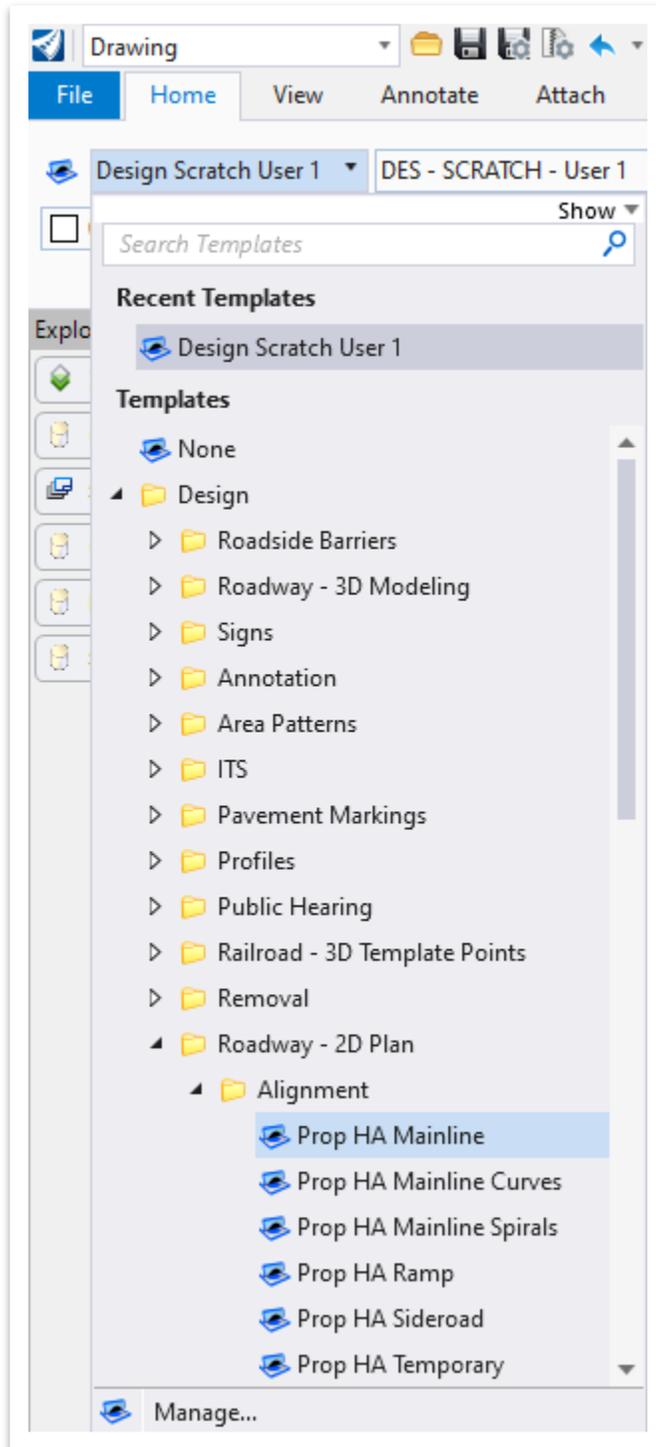




## 6.6 Exercise: Change Attributes

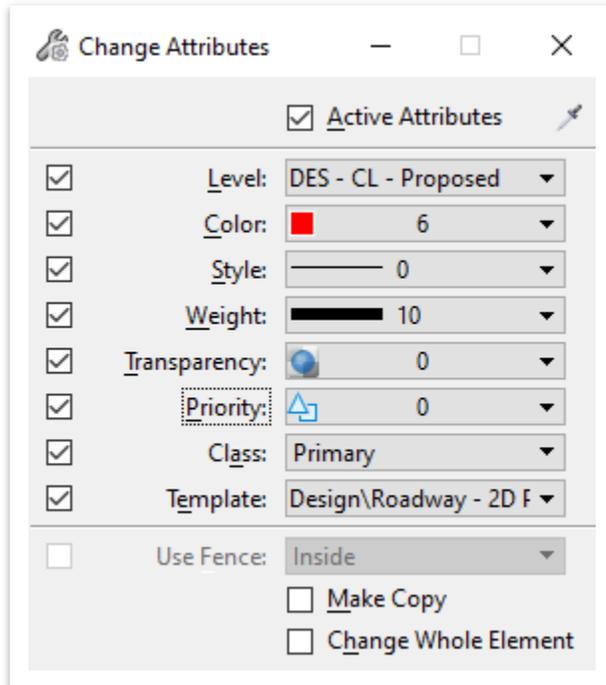


1. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Prop HA Mainline** element template (**Design >> Roadway - 2D Plan >> Alignment**) to update the active attributes.

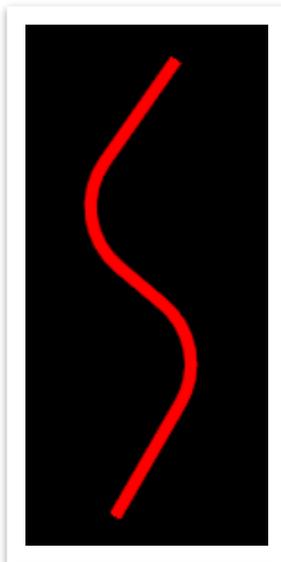




2. Select the **Change Element Attributes** tool (**Drawing >> Home >> Modify**) and check the Active Attributes box as well as all the element symbology boxes.



3. Select the SmartLine element we drew earlier and change its attributes to match the active attributes. Notice after you click on the element that it changes visually.

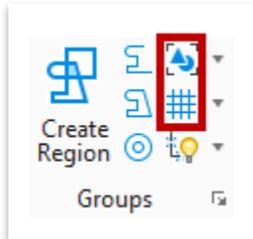




## 6.7 Lecture: Grouping Elements

These tools allow the user to group existing elements or create a graphic group for multiple elements (Figure 54) and can be accessed here: **Drawing >> Home >> Groups**.

FIGURE 54. GROUPS TOOLS



### 6.7.1 Group



This tool allows the user to combined selected elements into a group, which functions like a cell. The **Ungroup** tool (Figure 55) and **Drop Element** tool (Figure 56) can separate grouped elements. The **Group** tool is only available if at least one element is already selected, otherwise it will be greyed-out.

FIGURE 55. UNGROUP TOOL

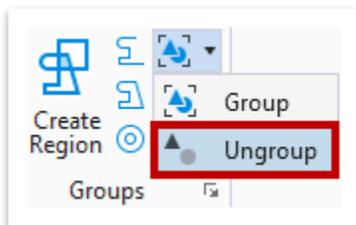


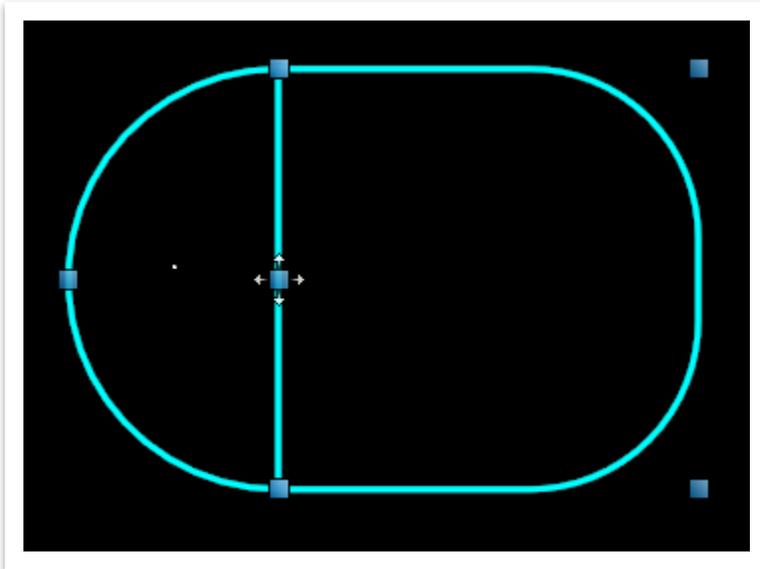
FIGURE 56. DROP ELEMENT TOOL



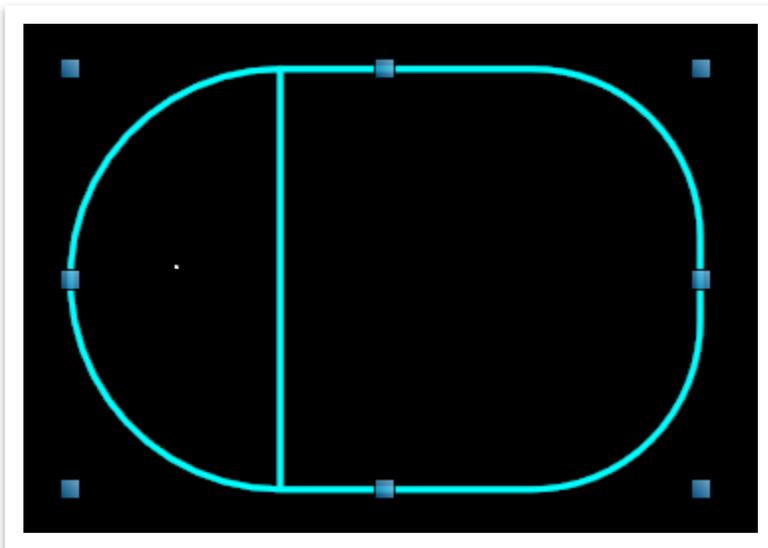


### 6.7.2 Exercise: Group Elements

1. Select both the arc and modified square that were previously drawn in the file. You can do this by clicking one element and holding down the CTRL button while clicking the other or draw a selection shape around all elements.



2. Select the **Group** tool to group the elements. Notice that the handles and properties change once the elements have been grouped.



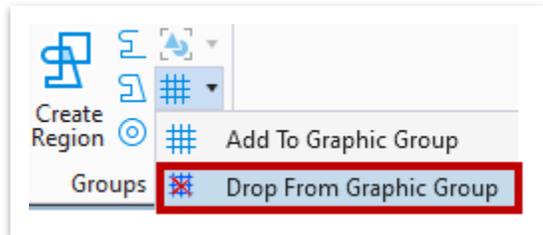


### 6.7.3 Add to Graphic Group



This tool allows the user to create a **Graphic Group** and add elements to that graphic group. The **Drop From Graphic Group** tool (Figure 57) is accessed by clicking the triangle next to the **Add To Graphic Group** icon.

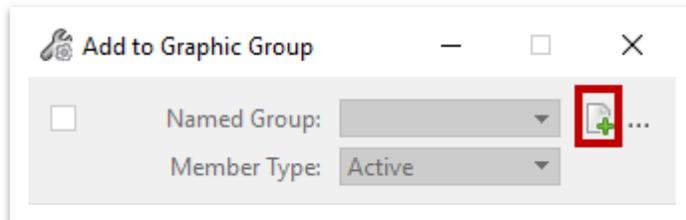
FIGURE 57. DROP FROM GRAPHIC GROUP TOOL



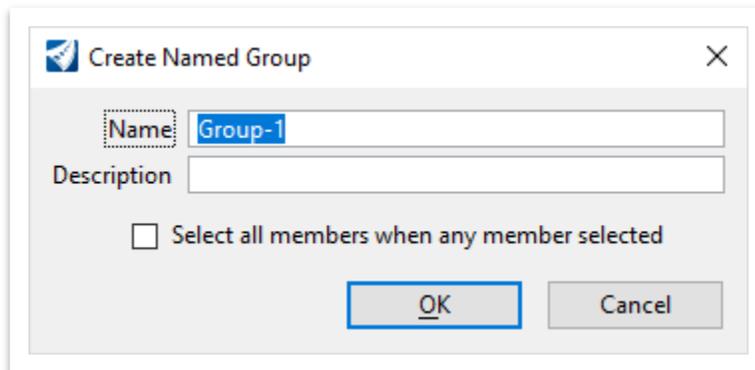
### 6.7.4 Exercise: Create a Graphic Group



1. Open the **Add to Graphic Group** tool (**Drawing >> Home >> Groups**) and click on the **Create New Named Group** option (highlighted in red).

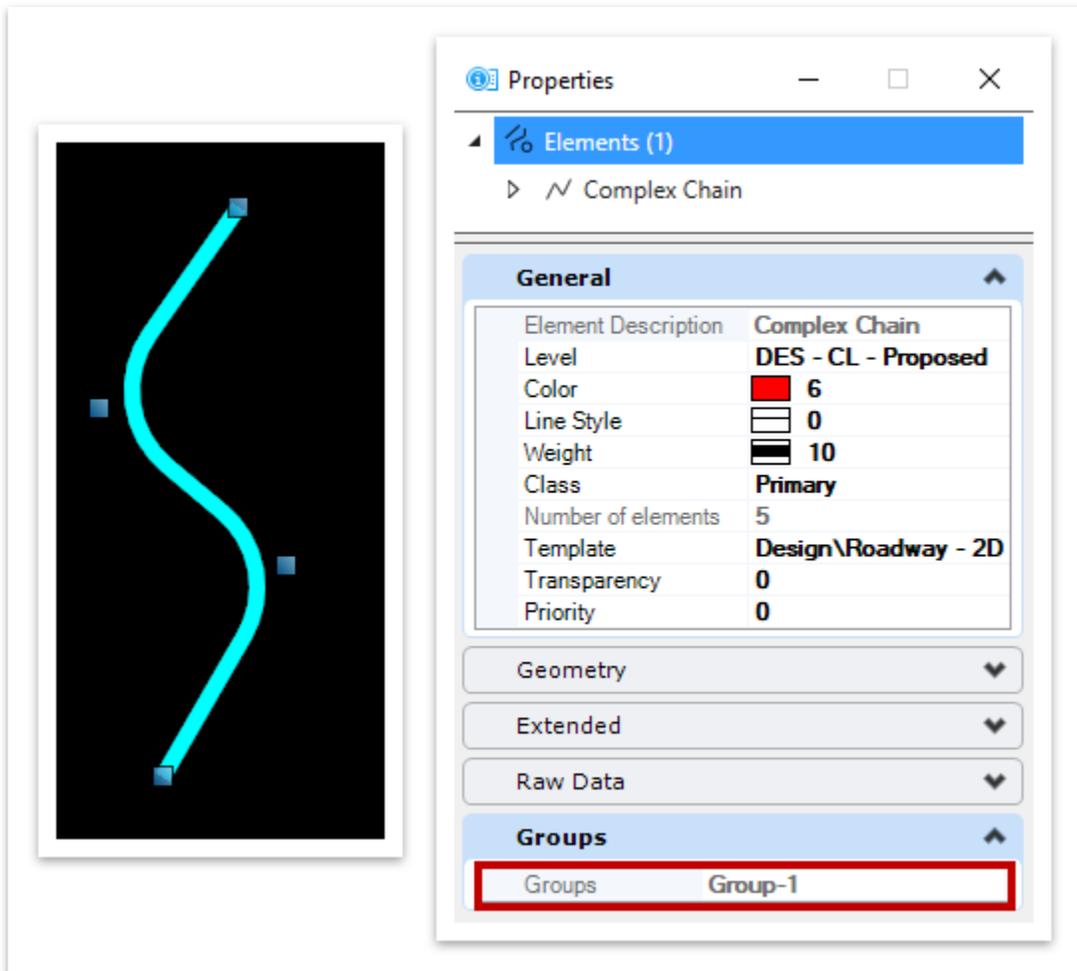


2. Name the group: **Group-1**.





- Left click the grouped elements and the Smartline to add them to the graphic group. The **Properties** will update with a Group tab showing that they belong to the graphic group we just created, as shown below.

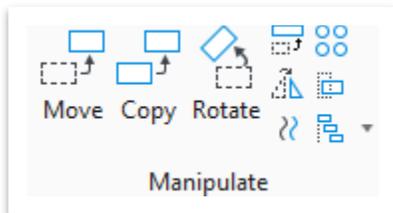




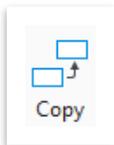
## 6.8 Lecture: Manipulating Elements

The element manipulation tools include Copying, Moving, Scaling, Rotating and Mirroring (Figure 58) and can be accessed here: **Drawing >> Home >> Manipulate**.

FIGURE 58. MANIPULATE TOOLS

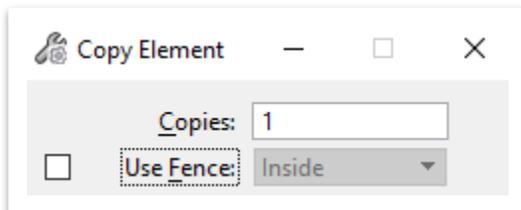


### 6.8.1 Copy



This tool allows the user to create a copy of the selected element (Figure 59). Multiple copies of the element can be created at equal spacing. If there is an active fence and the Use Fence option is selected, everything selected within the fence will be copied.

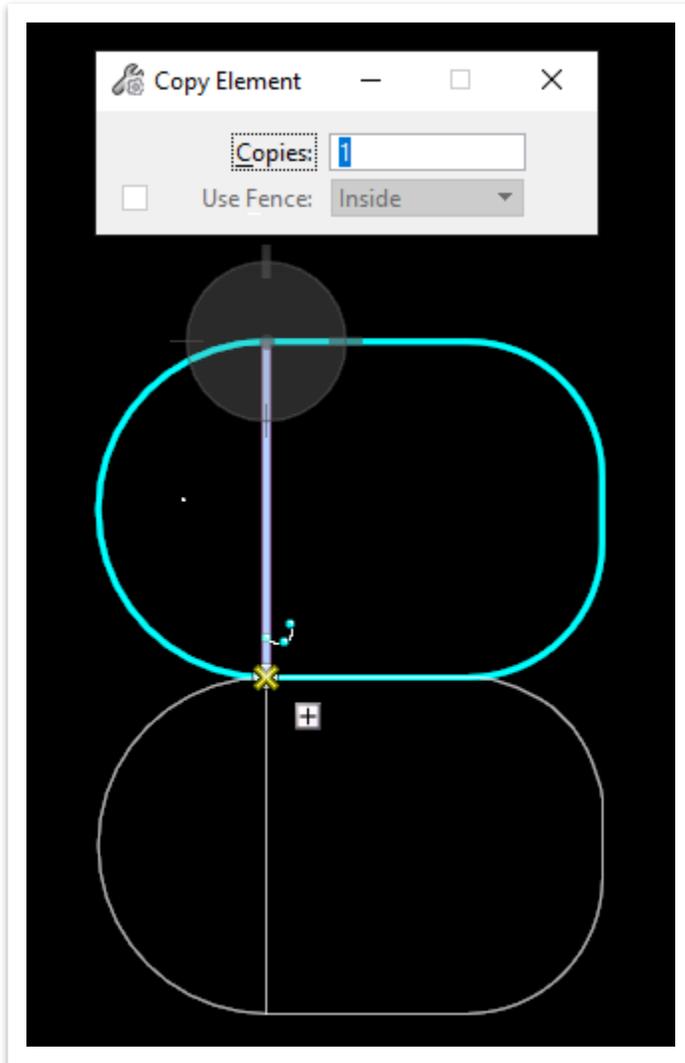
FIGURE 59. COPY ELEMENT DIALOG BOX





### 6.8.2 Exercise: Copy Element

1. Select the grouped elements we created earlier and click on the **Copy** button. Copy them below the original by selecting the element first. Then select a point to define where the copied element is placed in relation to the original.



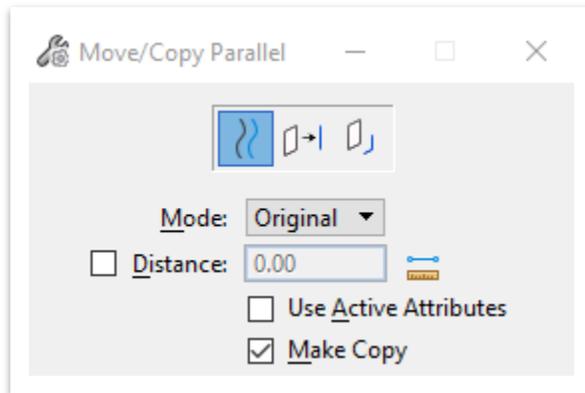


### 6.8.3 Move/Copy Elements Parallel



This tool allows the user to **move** or **copy** an element parallel to its original position (Figure 60). The user can choose to copy the entire element, a segment of the element, or a portion of the element. By changing the **Mode**, the user can change how vertices in an element are treated when it is copied.

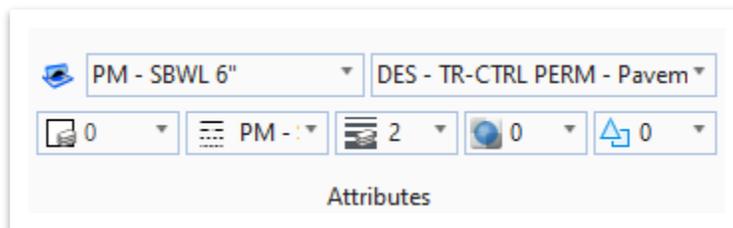
FIGURE 60. MOVE/COPY PARALLEL DIALOG BOX



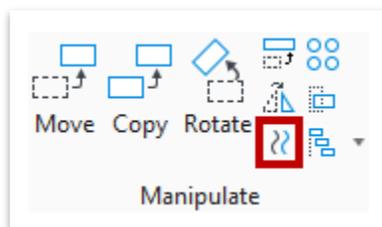
### 6.8.4 Exercise: Move/Copy Parallel



1. Go to **Drawing >> Home >> Attributes** and select the Element Template dropdown menu. We will be adding pavement striping at an offset from the centerline. Select the **PM – SBWL 6"** element template (**Design >> Pavement Markings >> Lines >> Striping**).

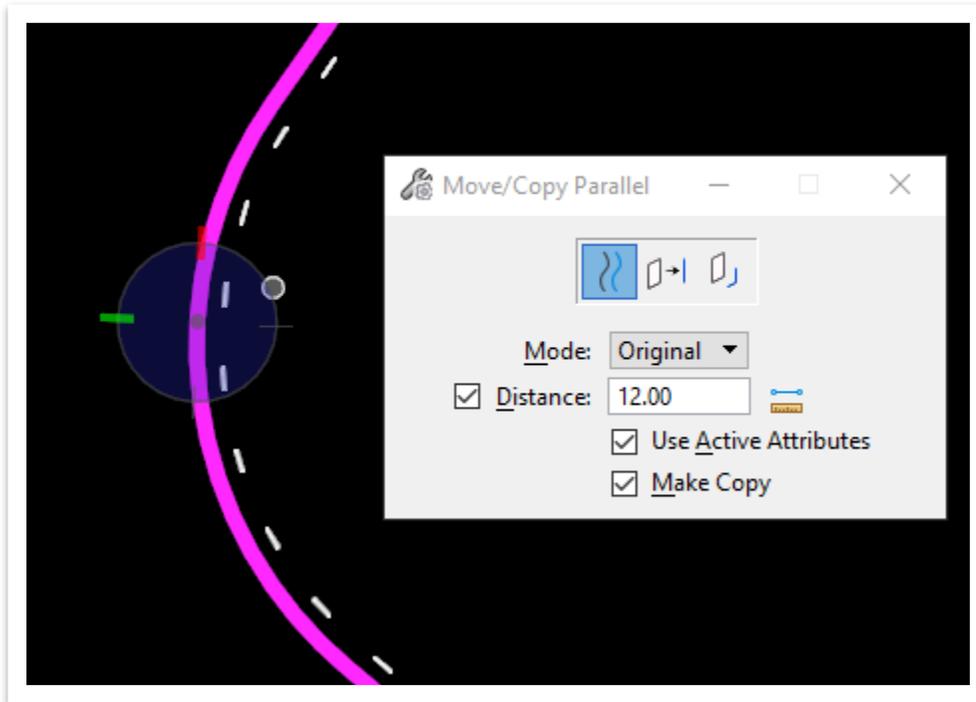


2. Select the **Move Parallel** tool.

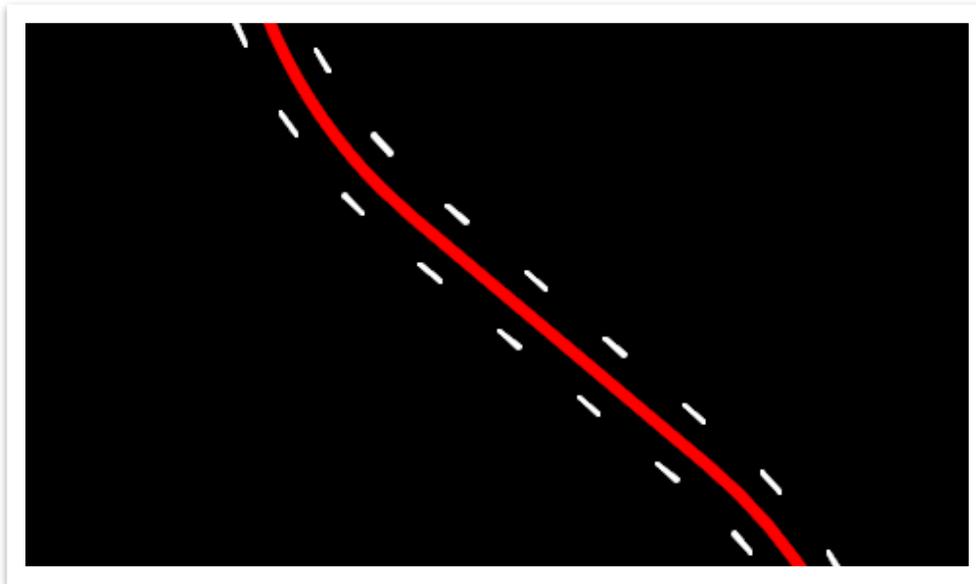




3. Set the Mode to **Original**, set the Distance to **12'**, and check both the **Use Active Attributes** and **Make Copy** boxes. Select the centerline (smartline) and offset it to one side. **Note:** The offset will occur on whichever side of the copied element that you have your mouse cursor on.

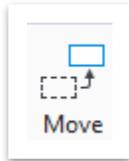


4. Repeat the previous step to add a **12'** offset line on the other side of the centerline.



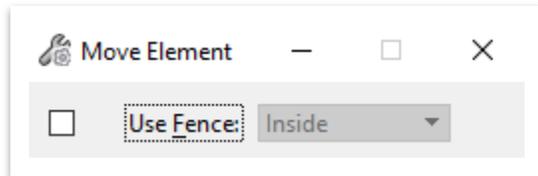


### 6.8.5 Move



This tool allows the user to move the selected element (Figure 61). If there is an active fence and the **Use Fence** option is selected, everything selected by the fence will be moved.

FIGURE 61. MOVE ELEMENT DIALOG BOX

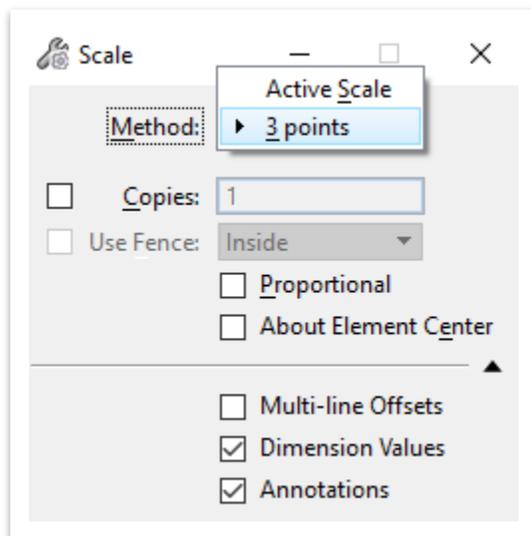


### 6.8.6 Scale



This tool allows the user to scale the selected element (Figure 62). With the **Active Scale** method, the X and Y Scales are defined by numeric inputs. With the **3 Points** method, the user picks three data points to define the scale for the object. If the dialog box is extended, the user can toggle whether Multi-line Offsets, Dimension Values, and Annotations are scaled.

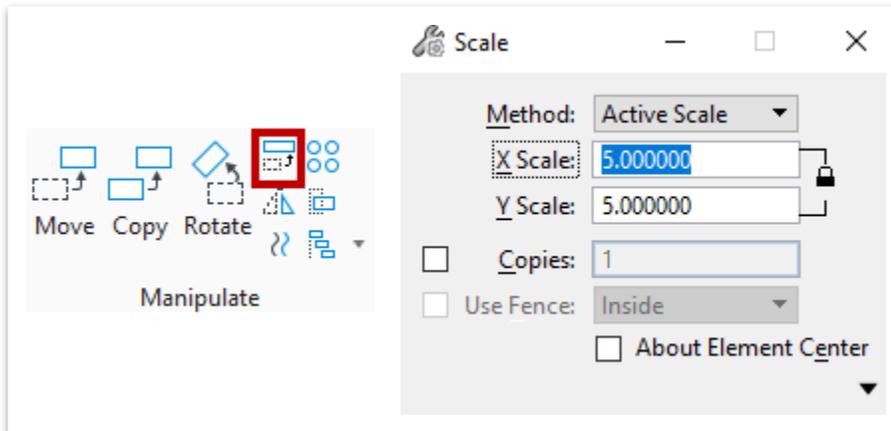
FIGURE 62. SCALE DIALOG BOX





### 6.8.7 Exercise: Scale Element

1. Select the **Scale** tool. (**Drawing >> Home >> Manipulate**) Set the X and Y scale to 5 and check the **About Element Center** option.

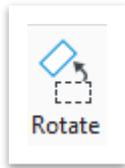


2. Select the **Stop Sign** cell that was placed earlier. ORD will give a preview of the scaled cell. **Left** click to accept.



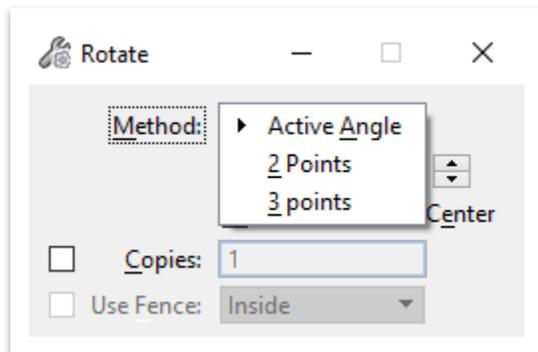


### 6.8.8 Rotate



This tool allows the user to rotate the selected element by defining an angle (Figure 63). With **Active Angle**, the user can enter a degree value to rotate the element. Clicking the arrows next to the data field will increase or decrease the angle in 90° increments. With the **2 Point** and **3 Point** methods, the user defines the angle of rotation by following the prompts in the lower left corner of the ORD interface and selecting the applicable points in the drawing.

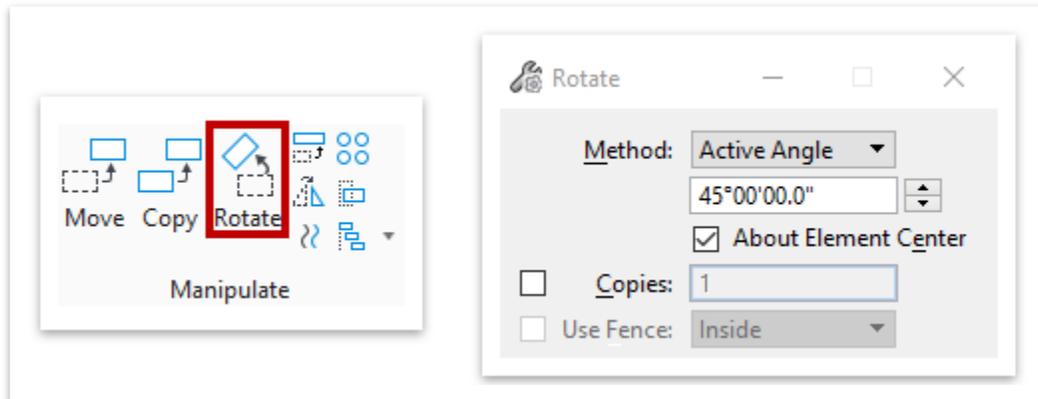
FIGURE 63. ACTIVE ANGLE DIALOG BOX





### 6.8.9 Exercise: Rotate Element

1. Select the **Rotate** tool. (**Drawing >> Home >> Manipulate**) Set the Active Angle to **45°** and check the **About Element Center** Box.



2. Select the **Stop Sign**. Once the cell has been selected, ORD will show a preview of the rotation. **Left** click again to accept.

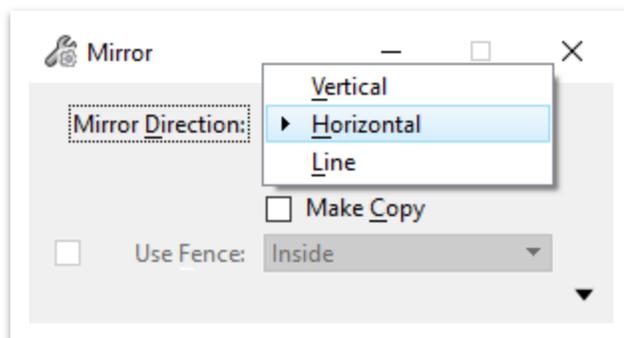


### 6.8.10 Mirror



This tool allows the user to mirror the selected element about the **vertical** axis, **horizontal** axis, or a **line** (Figure 64).

FIGURE 64. MIRROR ELEMENT DIALOG BOX

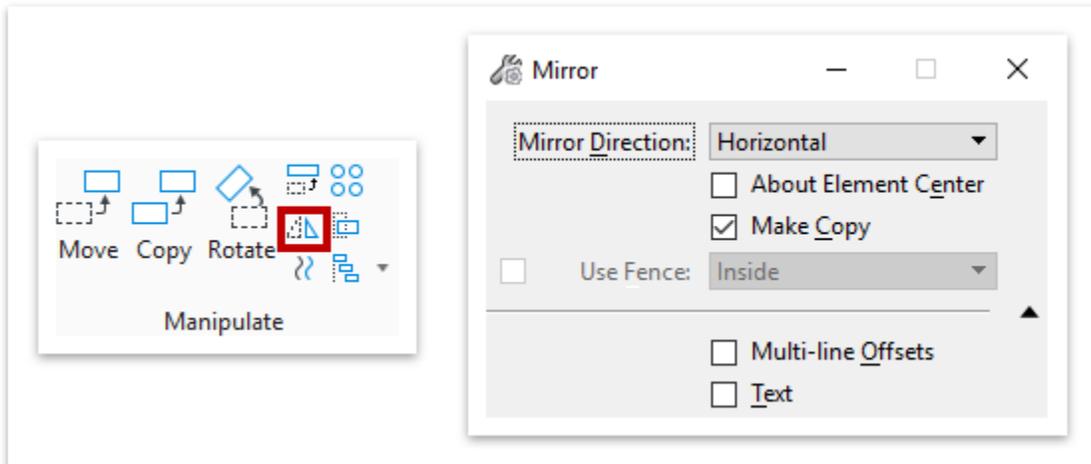




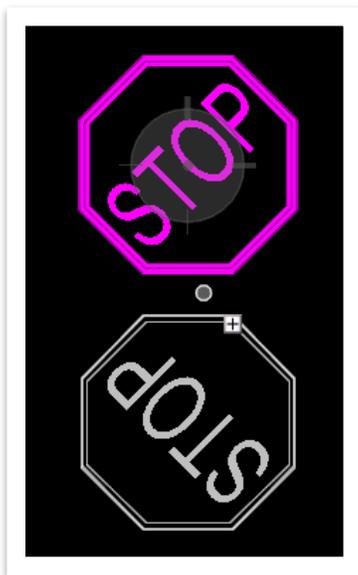
### 6.8.11 Exercise: Mirror Element



1. Select the **Mirror** tool. (**Drawing >> Home >> Manipulate**) Set the Direction to **Horizontal** and check the **Make Copy** option.



2. Select the **Stop Sign** cell. ORD will show a preview of the mirrored element. **Left** click again to accept.

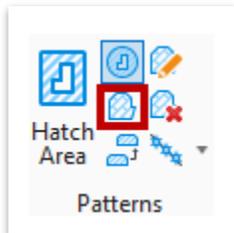




## 6.9 Lecture: Patterning Elements

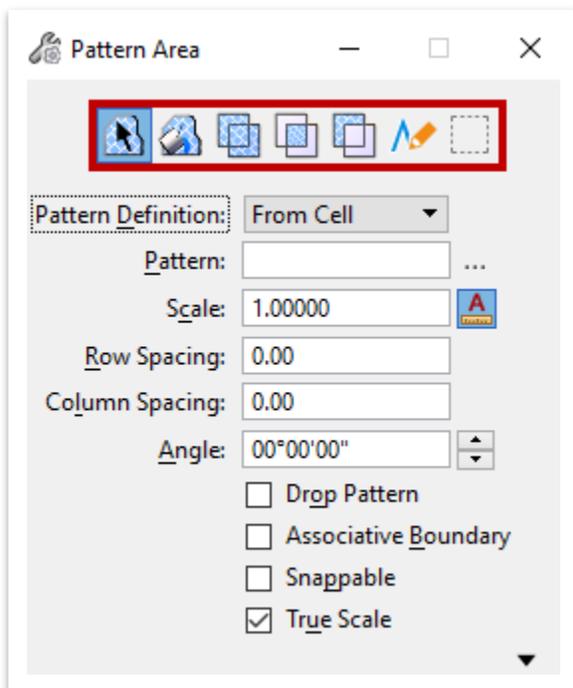
The **Pattern Area** tool (Figure 65 highlighted in red) allows the user to fill an enclosed element with a pattern, usually defined by a TDOT cell, and can be accessed here: **Drawing >> Annotate >> Patterns**.

FIGURE 65. PATTERN TOOLS



The user has several methods available to define the pattern region: selecting a **closed element**, **flooding an area**, **union**, **intersection**, **union**, **difference of elements**, polygon defined by **points** or the **active fence** (Figure 66 highlighted in red). If a pattern is made with the **Associate Boundary** option turned on, the pattern will update itself to fill the boundaries of the elements that it was initially created within as they are edited.

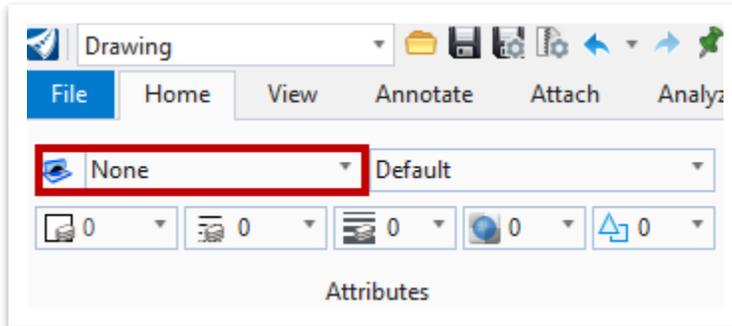
FIGURE 66. PATTERN AREA DIALOG BOX





Prior to placing any pattern, the user must select the correct **Element Template** (Figure 67). This will ensure the correct symbology and link to the correct pattern cell automatically.

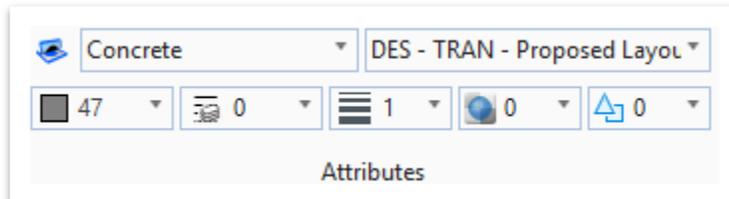
FIGURE 67. SELECT ELEMENT TEMPLATE



## 6.10 Exercise: Patterning Element

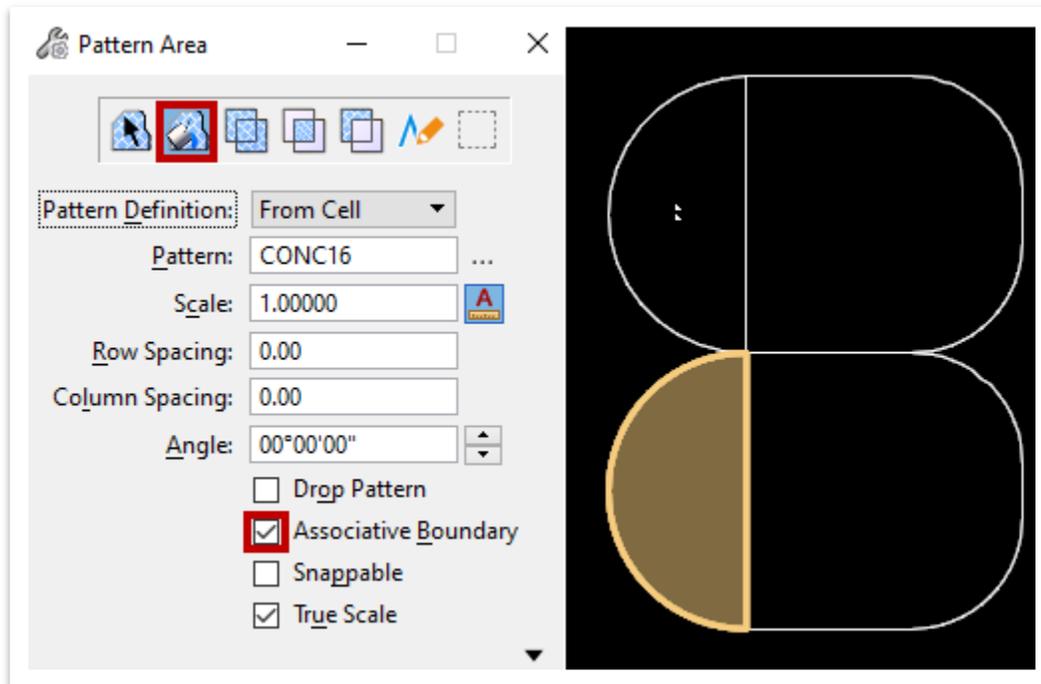


1. Go to **Drawing >> Home >> Attributes** and select the Element Template dropdown menu. Then, select the **Concrete** area pattern element template (**Design >> Area Patterns >> Concrete**). Notice that the attributes updated.

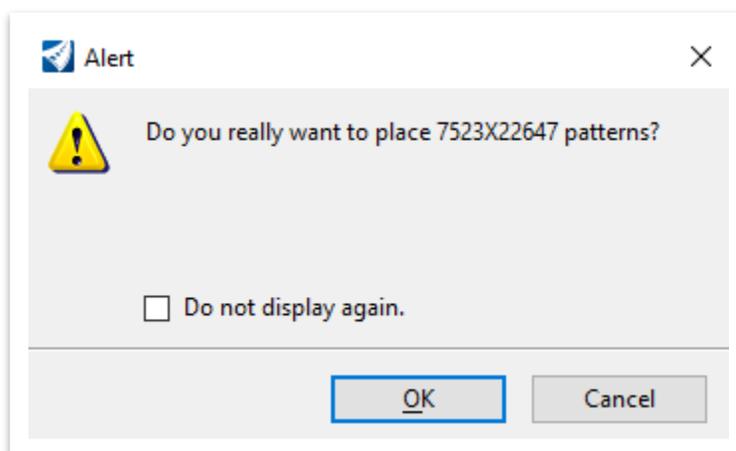




2. Select the **Pattern Area** tool (**Drawing >> Annotate >> Patterns**) and the **Flood** method for placing the pattern. The Pattern cell should automatically be set to **CONC16** since we chose the Concrete element template in the first step. Make sure the **Associative Boundary** is toggled on. Select the inside of the arc from earlier. ORD will highlight the proposed pattern area. **Note:** By default, the pattern scale is set to **1** which is correct in ORD. All patterns are set to adjust based on the annotation scale.

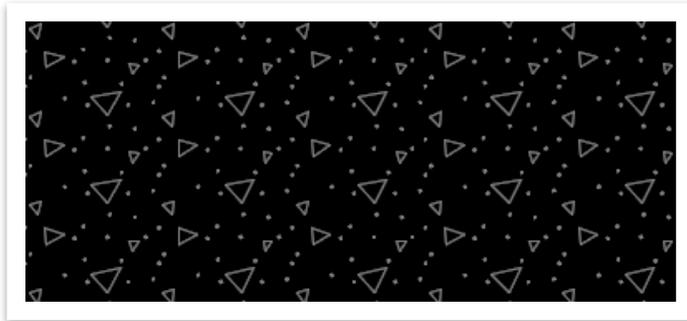


3. **Left** click to accept. ORD will give a warning asking if you really want to place the patterns. For now, click **OK**. This warning can be helpful to avoid potential crashes.





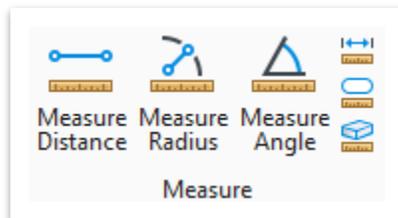
4. Notice the concrete pattern now fills in the inside of the arc.



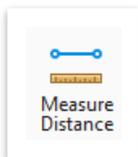
## 6.11 Lecture: Measuring Elements

There are several tools available for measuring elements in ORD (Figure 68) which can be accessed here: **Drawing >> Analyze >> Measure**.

FIGURE 68. MEASURE TOOLS

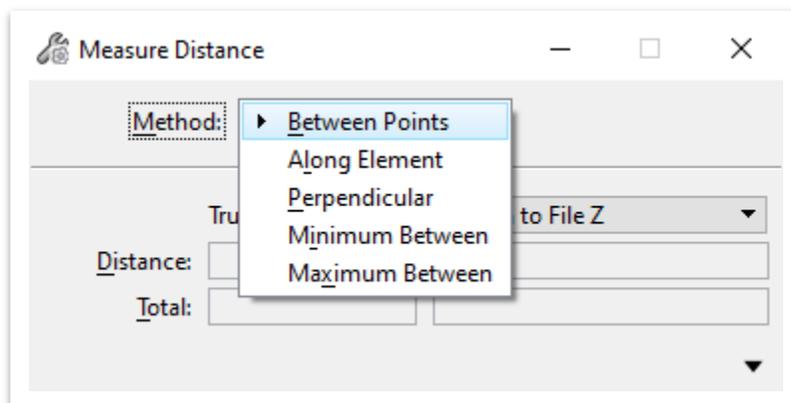


### 6.11.1 Measure Distance



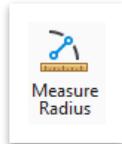
This tool allows the user to measure the distance **between points**, **along an element**, **perpendicular** to an element, or to find the **minimum** or **maximum** distance between elements (Figure 69). When using the between points method, the user can measure multiple points, and the tool will report the **total** distance.

FIGURE 69. MEASURE DISTANCE DIALOG BOX



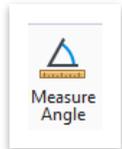


### 6.11.2 Measure Radius



This tool allows the user to measure the radius of a curve.

### 6.11.3 Measure Angle



This tool allows the user to measure the angle between two lines.

### 6.11.4 Measure Length



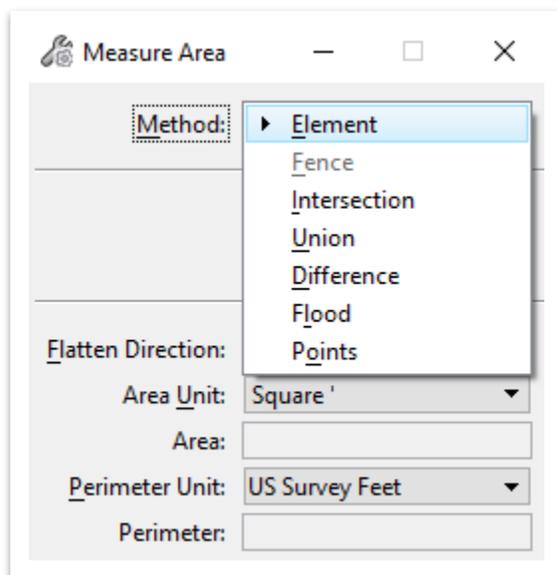
This tool allows the user to measure the length of all selected elements. If a single, linear element is selected, the tool will also provide the direction.

### 6.11.5 Measure Area



This tool allows the user to measure areas through several methods: **Element**, **Fence**, **Intersection**, **Union**, **Difference**, **Flood**, and **Points** (Figure 70).

FIGURE 70. MEASURE AREA DIALOG BOX





### 6.11.6 Measure Volume

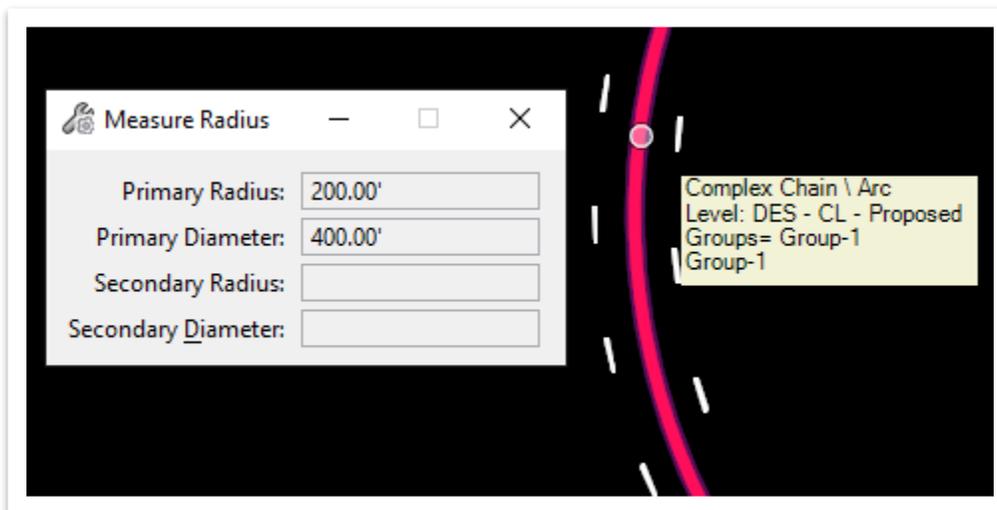


This tool allows the user to measure the volume of an element.

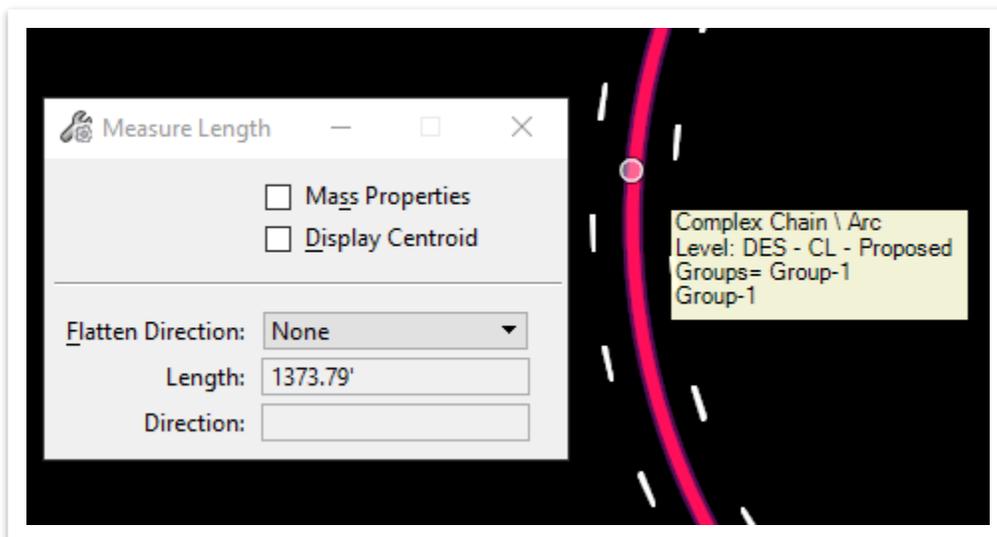
### 6.11.7 Exercise: Measure Element



1. Open the **Measure Radius** tool. (**Drawing >> Analyze >> Measure**) and measure the curve radii of the centerline.

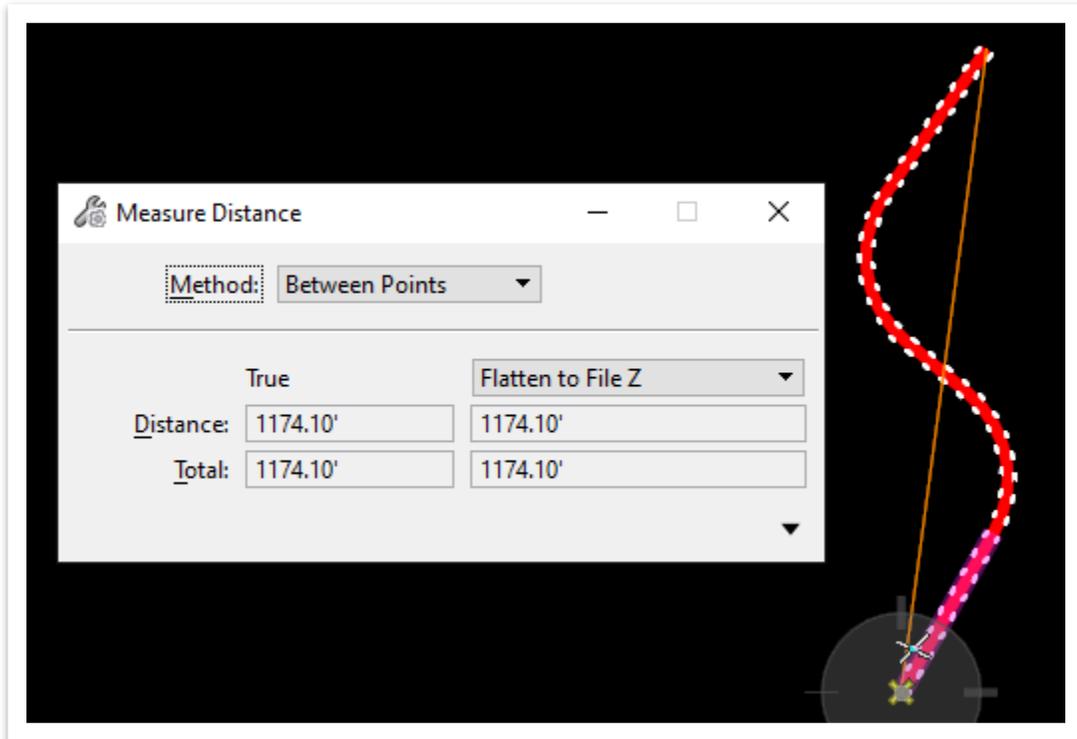


2. Open the **Measure Length** tool (not to be confused with Measure Distance) and measure the length of the centerline.





3. Open the **Measure Distance** tool and measure the distance between the ends of the centerline.



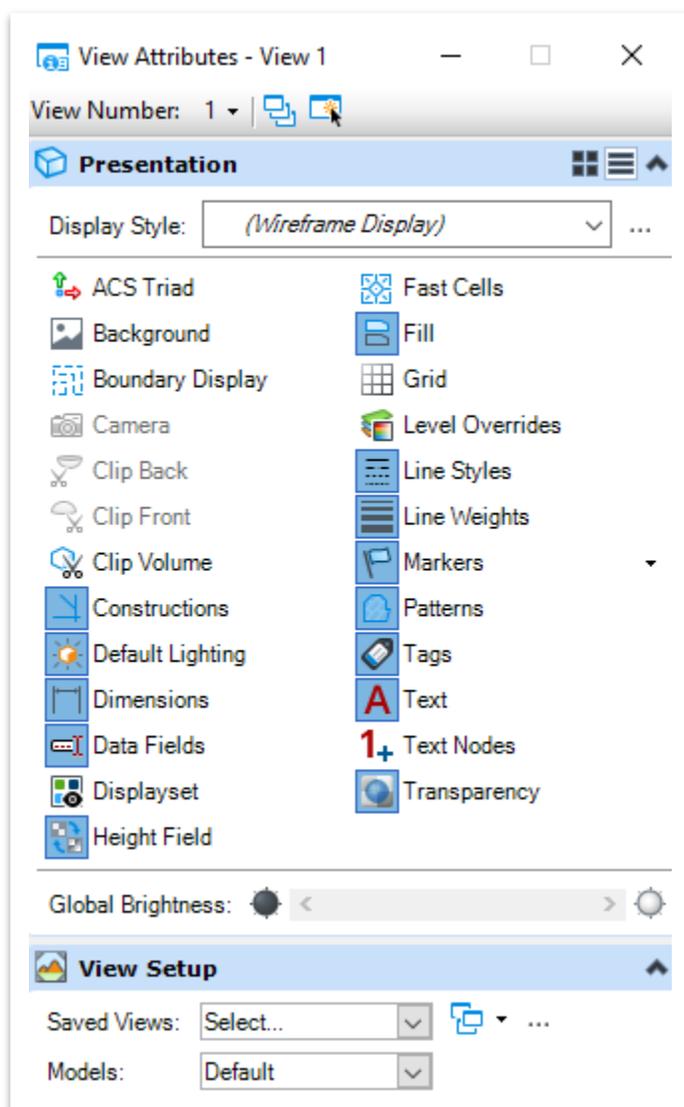


## Chapter 7. View Tools



Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn the new view tools available in ORD for navigating in 3D (Figure 71), which can be accessed here: **Drawing >> View >> Presentation**.

FIGURE 71. VIEW ATTRIBUTES



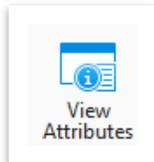
### 7.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Understand the different view tools.
2. Understand view groups.



## 7.2 Lecture: View Attributes

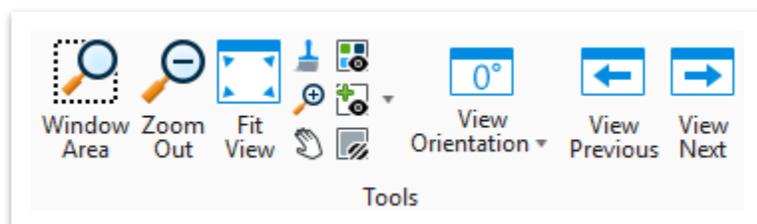


This tool allows the user to toggle ORD **display settings** for each view such as Line Styles, Line Weights, and Level Overrides. The user can also change the Display Style. By default, the Display Style is set to **Wireframe**.

## 7.3 Lecture: View Tools

These tools allow the user to adjust the view within the ORD display window when working on a project (Figure 72). The tools can be accessed here: **Drawing >> View >> Tools**.

FIGURE 72. VIEW TOOLS



### 7.3.1 Window Area



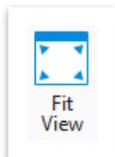
This tool allows the user to select a rectangular area in the drawing and assign it to any view.

### 7.3.2 Zoom In/Zoom Out



These tools allow the user to zoom in and out of the drawing at a defined **Zoom Ratio**. Zoom Out zooms from the center of the window and Zoom In creates a rectangular overlay showing the new window area.

### 7.3.3 Fit View



This tool allows the user to fit the extents of the window to **All** (everything in the drawing), **Active** (everything active), **Reference** (only referenced files), or **Raster** (only raster files). **This tool is extremely useful.**



### 7.3.4 Update View



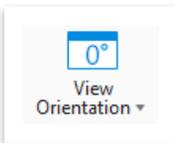
This tool refreshes the contents of the view windows. This can be helpful to force ORD to redraw elements in the case of a graphical glitch.

### 7.3.5 Pan View



This tool allows the user to move the viewport around the drawing without changing the zoom level.

### 7.3.6 View Orientation



This tool allows the user to rotate the view or reset the window to an unrotated view.

### 7.3.7 View Previous/View Next

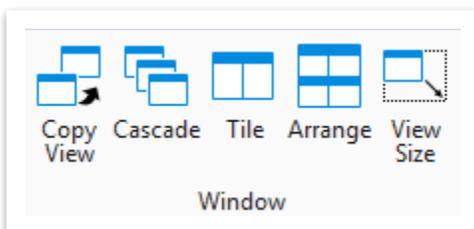


These tools allow the user to **undo** and **redo** changes to the view window.

## 7.4 Lecture: Window

These tools allow the user to rearrange the open view windows (Figure 73), which can be accessed here: **Drawing >> View >> Window**.

FIGURE 73. WINDOW TOOLS



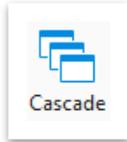
### 7.4.1 Copy View



This tool allows the user to copy one view's parameters to another.

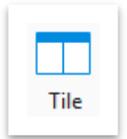


### 7.4.2 Cascade



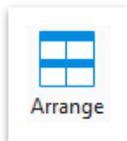
This tool allows the user to stack view windows in numerical order.

### 7.4.3 Tile



This tool allows the user to tile view windows.

### 7.4.4 Arrange



This tool allows the user to re-size all view windows so that they fit tightly within the available space without overlapping.

### 7.4.5 View Size

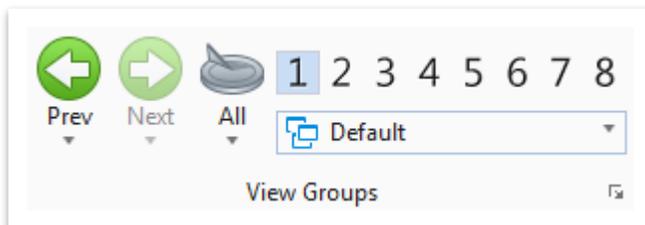


This tool allows the user to set the size of a view based on a source view.

## 7.5 Lecture: View Groups

These tools allow the user to open more view windows and activate different **View Groups** (Figure 74), which can be accessed here: **Drawing >> View >> View Groups**. The Previous and Next buttons function like Undo and Redo buttons for the views.

FIGURE 74. VIEW GROUPS

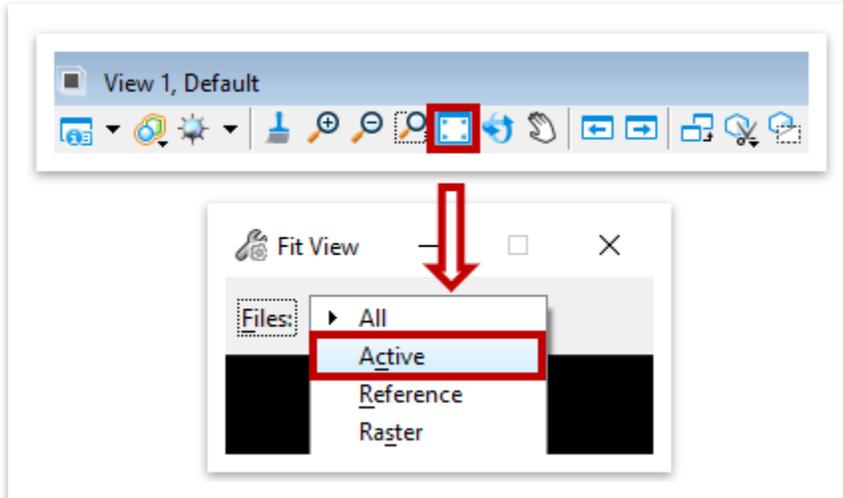




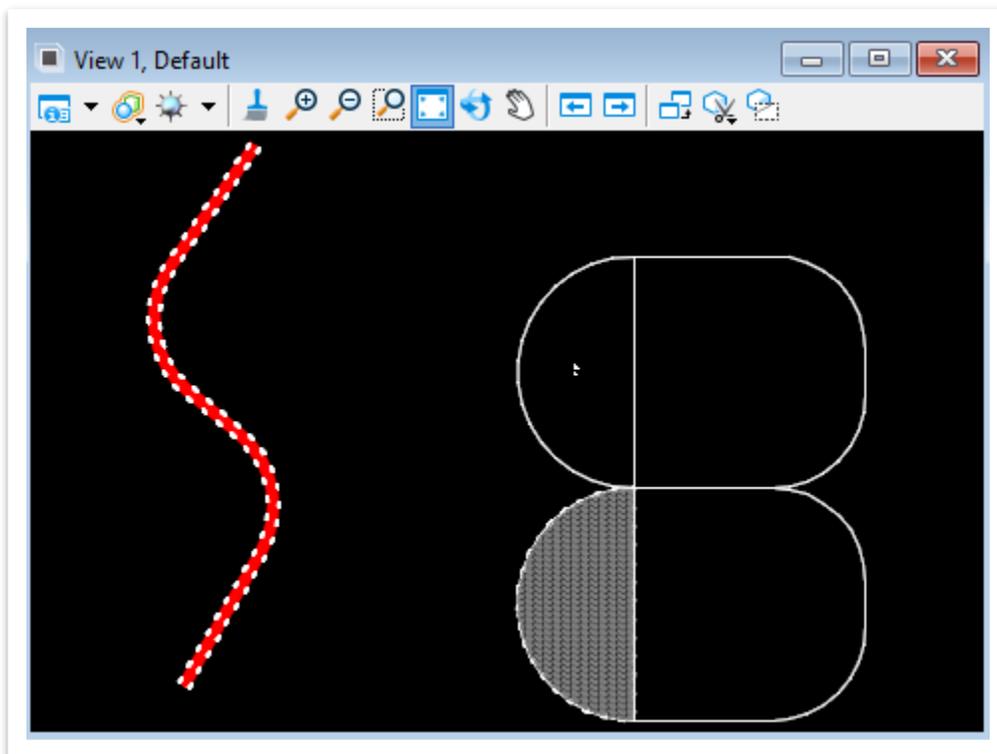
## 7.6 Exercise: View Tools



1. Click **Fit View** and fit the view to the **Active** file. This tool is located within the view window in the upper left corner.

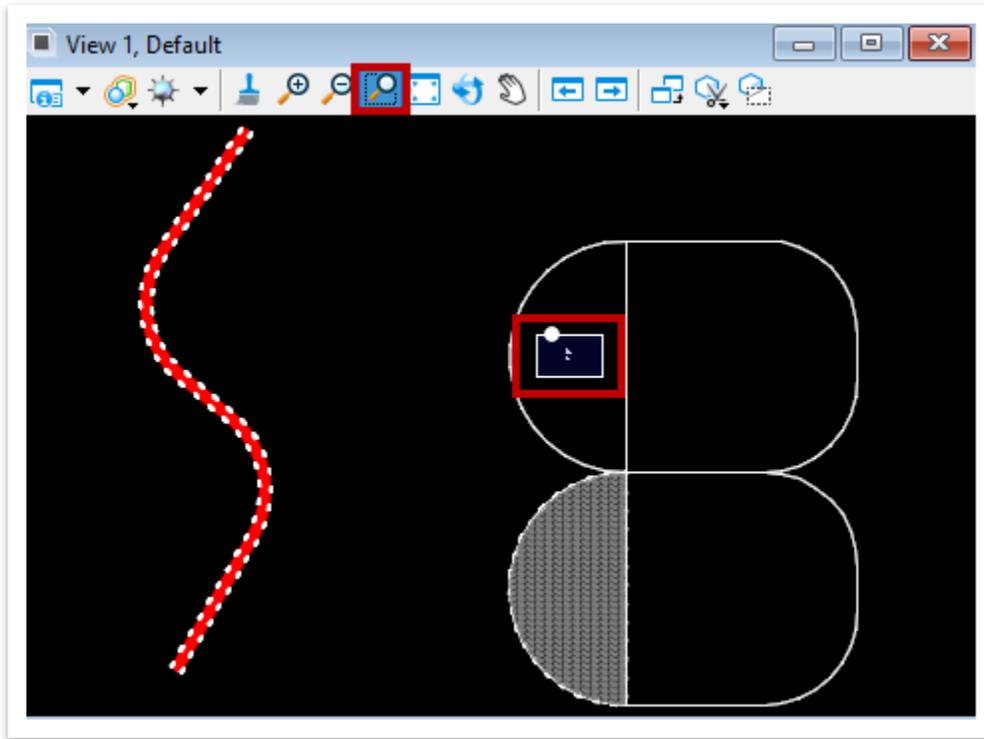


2. Notice that this will zoom to the elements we placed in the file and not the referenced file. **Note:** Your Stop Sign's will likely be in a different location than what's shown.

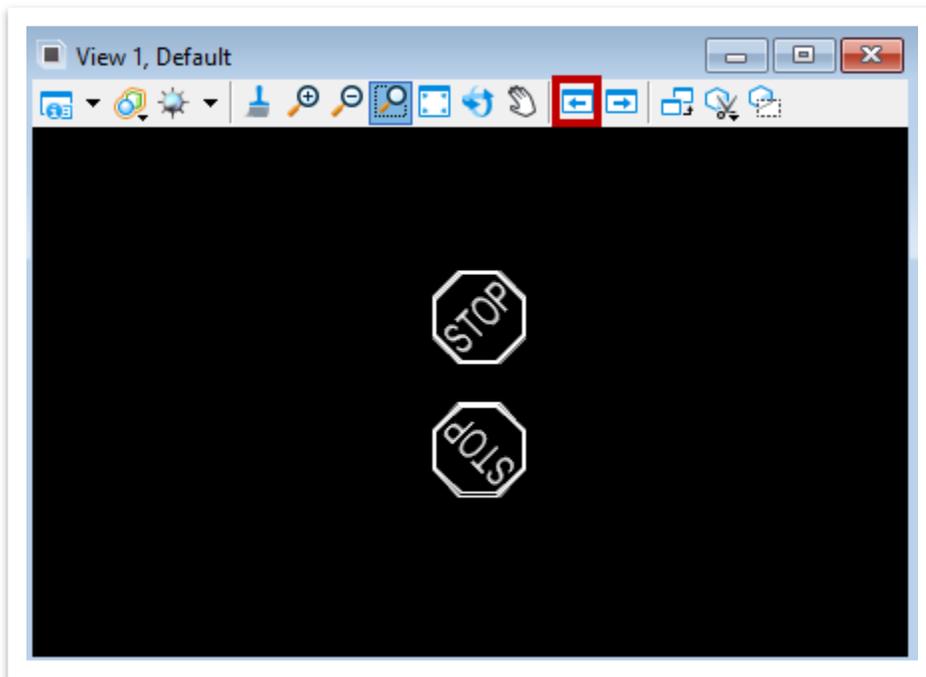




3. Open the **Window Area** tool and draw a rectangle around the two **Stop Sign** cells.



4. Select the **View Previous** button to return to the Fitted View after zooming in on the cells.



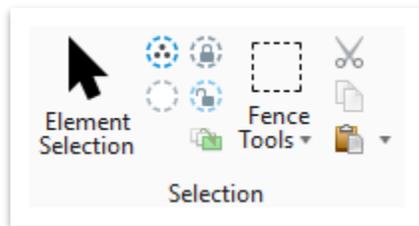


## Chapter 8. Element Selection Tools



Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn how to use the Element Selection and Fence tools (Figure 75), which can be accessed here: **Drawing >> Home >> Selection**.

FIGURE 75. SELECTION TOOLS



### 8.1 Objectives

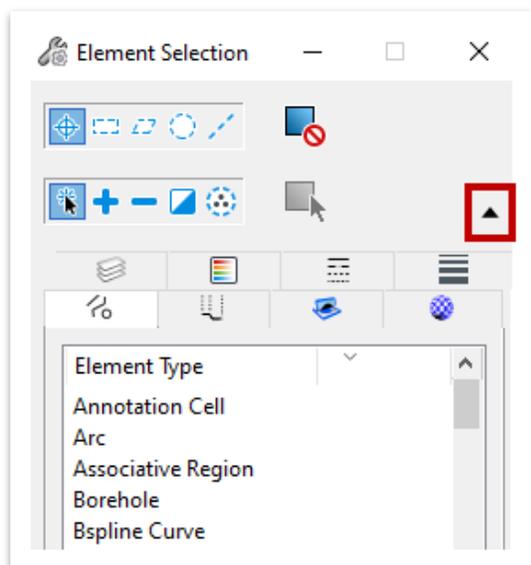
At the conclusion of this chapter, participants will be able to:

1. Understand the element selection tool.
2. Understand the fence tool and manipulability.

### 8.2 Lecture: Element Selection

This tool allows the user to select elements in the drawing by clicking on individual elements, by drawing selection shapes around elements, or by drawing lines through elements. When the **Element Selection** menu is expanded, the user can select elements by their symbology (Figure 76).

FIGURE 76. ELEMENT SELECTION DIALOG BOX

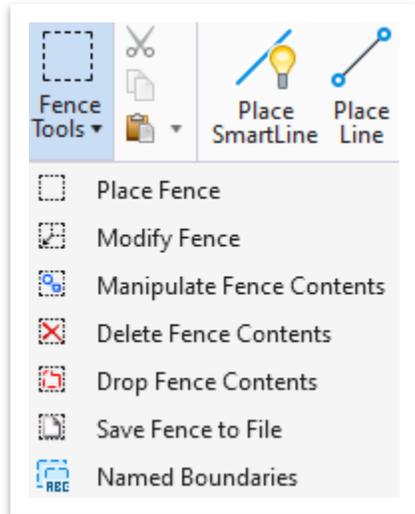




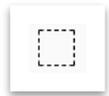
## 8.3 Lecture: Fence Tools

These tools allow the user to place and manipulate Fences (Figure 77), which can be accessed here: **Drawing >> Home >> Selection**.

FIGURE 77. FENCE TOOLS

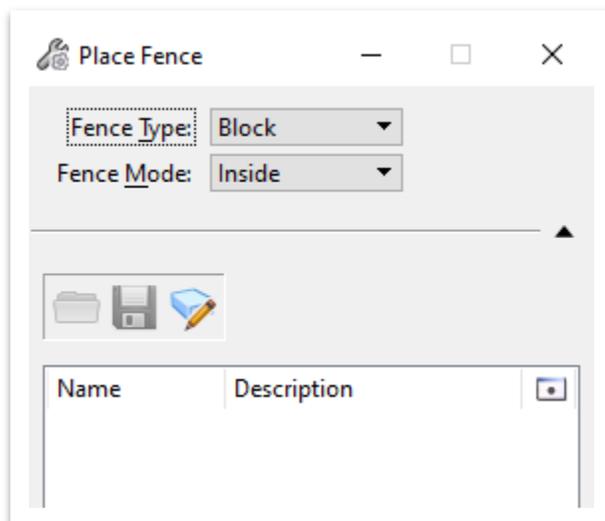


### 8.3.1 Place Fence



This tool allows the user to place a fence in the drawing. The user can select from several Fence Types and Fence Modes. If the menu is expanded, the user can load named fences or save their created fence with a name and optional description (Figure 78).

FIGURE 78. EXPANDED PLACE FENCE DIALOG BOX





### 8.3.2 Modify Fence



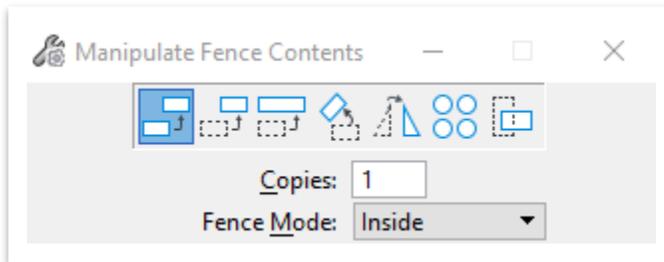
This tool allows the user to modify a fence in the drawing. The tool can only be used if there is an active fence.

### 8.3.3 Manipulate Fence Contents



This tool allows the user to perform certain actions on elements selected by the active fence. Users can copy, move, scale, rotate, mirror, array, and stretch fence contents (Figure 79). You must have a fence already drawn before this tool will work.

FIGURE 79. MANIPULATE FENCE CONTENTS DIALOG BOX

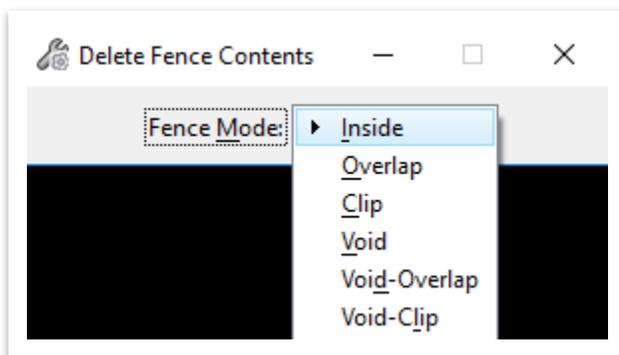


### 8.3.4 Delete Fence Contents



This tool allows the user to delete elements selected by the active fence. Notice there are 6 different methods that determine how and what is deleted: **Inside**, **Overlap**, **Clip**, **Void**, **Void-Overlap** and **Void-Clip** (Figure 80).

FIGURE 80. DELETE FENCE CONTENTS



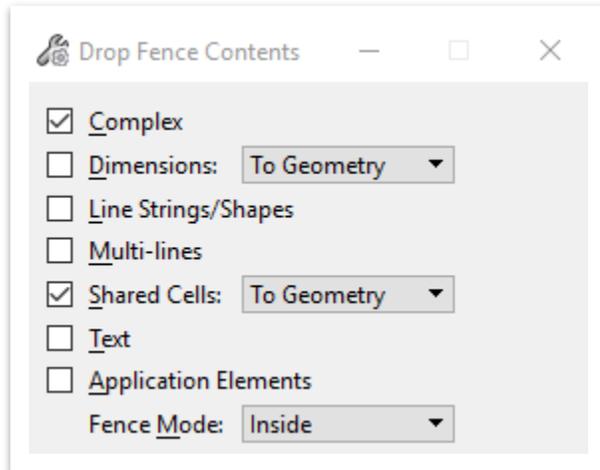


### 8.3.5 Drop Fence Contents



This tool allows the user to drop elements selected by the active fence. Like the Drop command, the user can select which categories of elements are dropped (Figure 81).

FIGURE 81. DROP FENCE CONTENTS DIALOG BOX

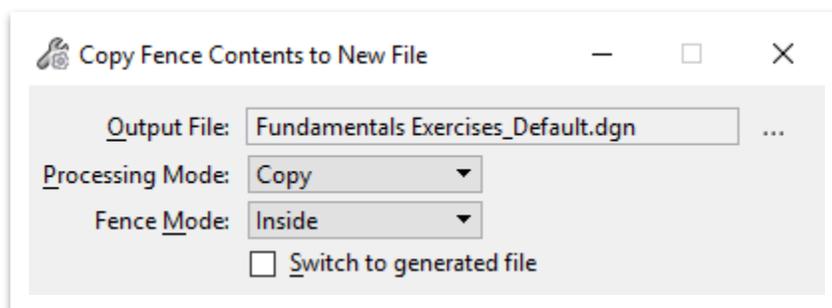


### 8.3.6 Save Fence to File



This tool allows the user to move or copy the contents of the active fence to a new drawing file (Figure 82).

FIGURE 82. COPY FENCE CONTENTS TO NEW FILE DIALOG BOX

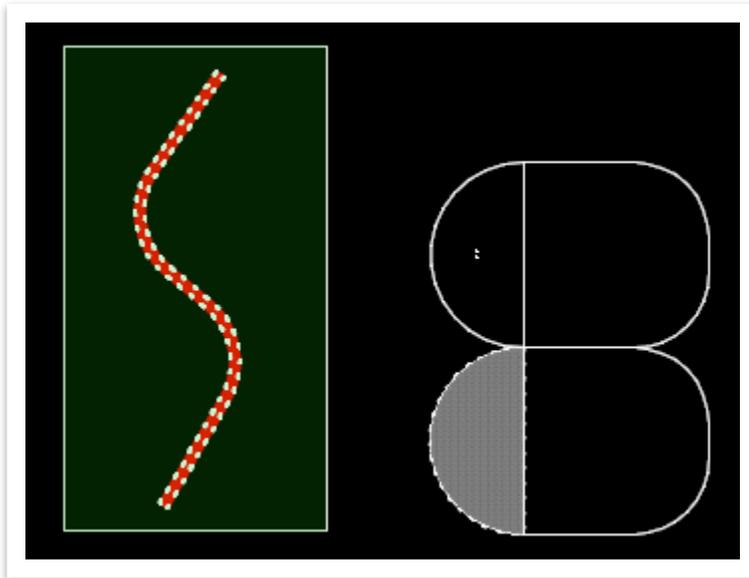




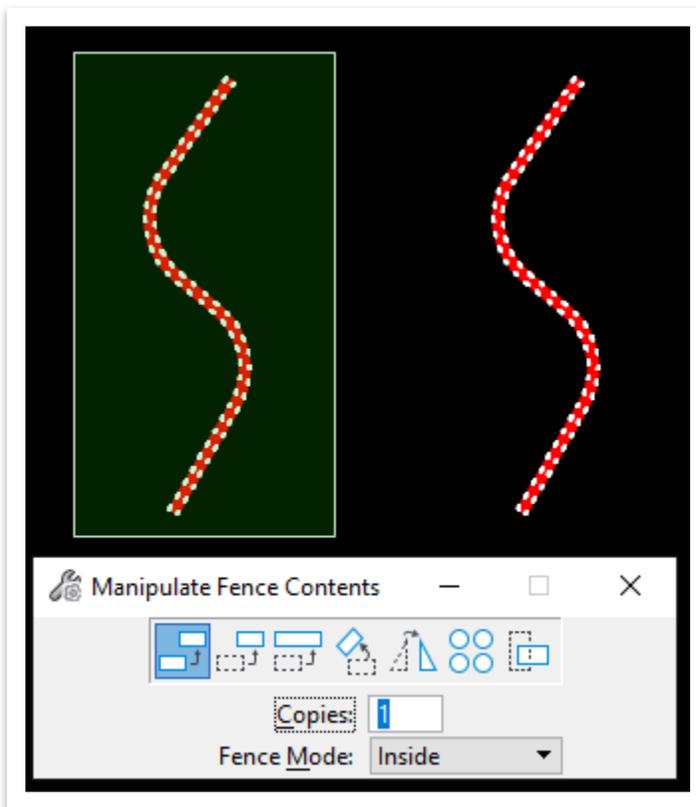
### 8.3.7 Exercise: Fence Tools



1. Open the **Place Fence** tool (**Home >> Selection >> Fence Tools**) and draw a fence around the centerline. The **Fence Type** should be **Block** and the **Fence Mode** should be **Inside**.

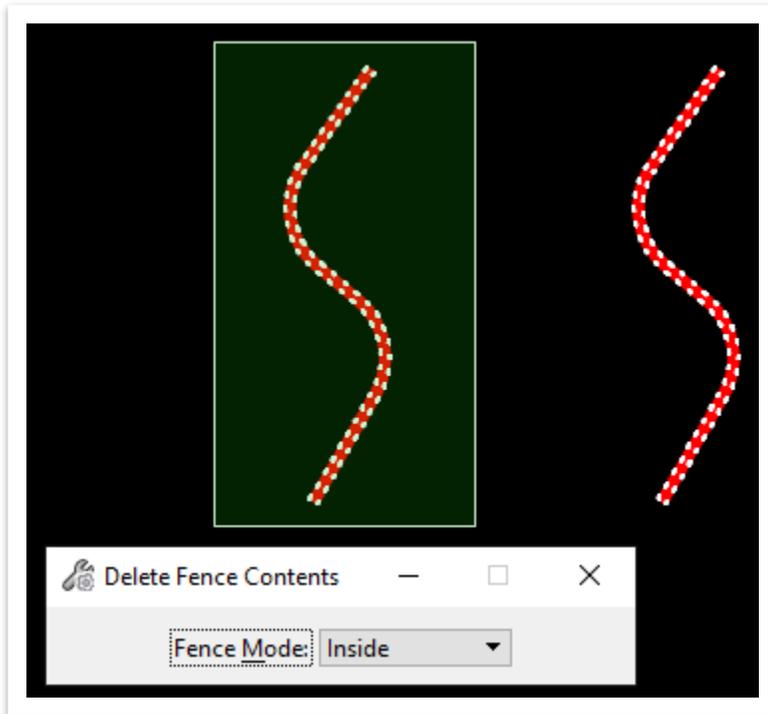


2. Open the **Manipulate Fence Contents** tool and create a copy of the centerline.





- Using the **Delete Fence Contents** tool, delete the copy of the centerline.





## Chapter 9. Annotation Tools



Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn how to place text, notes and dimensions for non-intelligent linework (Figure 83). The tools can be accessed here: **Drawing >> Annotate**.

FIGURE 83. ANNOTATION TOOLS



### 9.1 Objectives

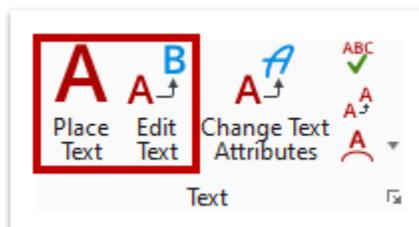
At the conclusion of this chapter, participants will be able to:

1. Place and edit text, while understanding the different TDOT text styles.
2. Place notes and dimensions.

### 9.2 Lecture: Placing and Editing Text

The **Place** and **Edit** text tools (Figure 84) are used to place non-intelligent text (**Drawing >> Annotate >> Text**)

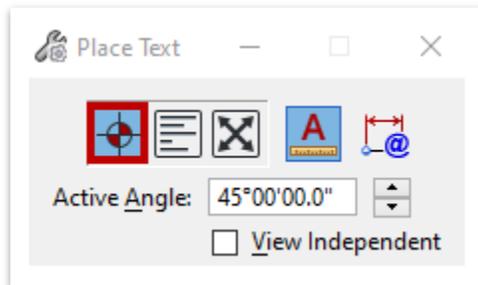
FIGURE 84. TEXT TOOLS





The user has the option to change text placement parameters through the **Place Text** dialog box (Figure 85). The angle of the text can be changed, and annotation scale lock can be toggled on or off. The default text placement option is to place **By Origin** (highlighted in red). However, the user can also create a box within which the text will wrap (**Word-Wrap**) or place the text to fit between two points (**Fitted method**).

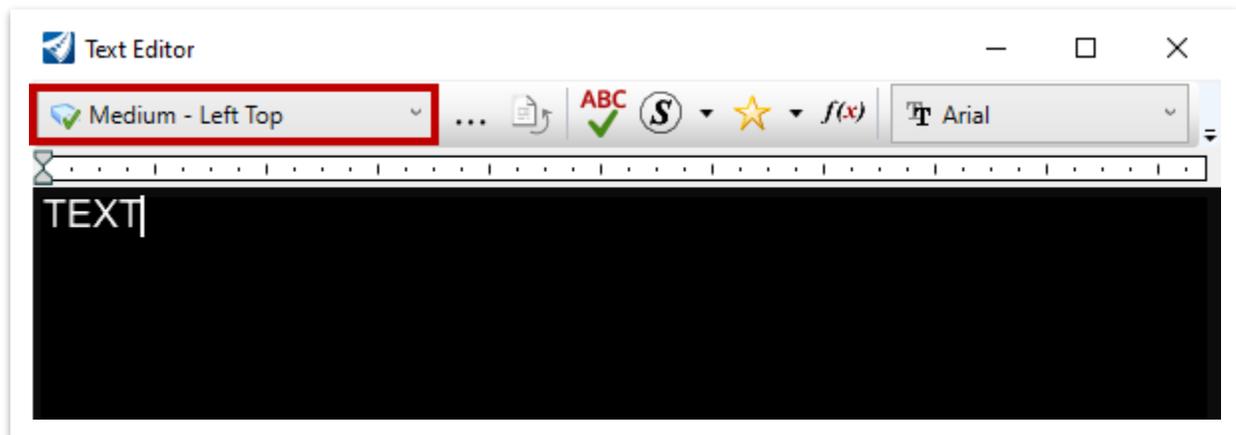
FIGURE 85. PLACE TEXT DIALOG BOX



If the **View Independent** option is turned on in the **Place Text** dialog, the text will rotate with the View. Before placing any text, the user should select the applicable **Element Template** that best represents the text that is about to be placed.

Multiple **Text Styles** have been created for ORD per TDOT standards. They should be utilized to label plan elements. When placing, or editing text, the user can select from different Text Styles by using the drop-down menu in the upper left corner of the Text Editor (Figure 86). The Text Editor also has tools for **Spell Check**, **Inserting Symbols**, and basic text formatting.

FIGURE 86. TEXT EDITOR FOR PLACING AND EDITING TEXT

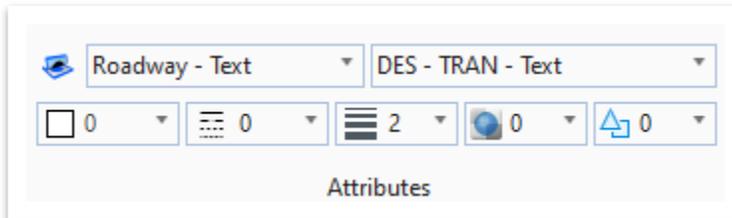




### 9.3 Exercise: Place and Edit Text



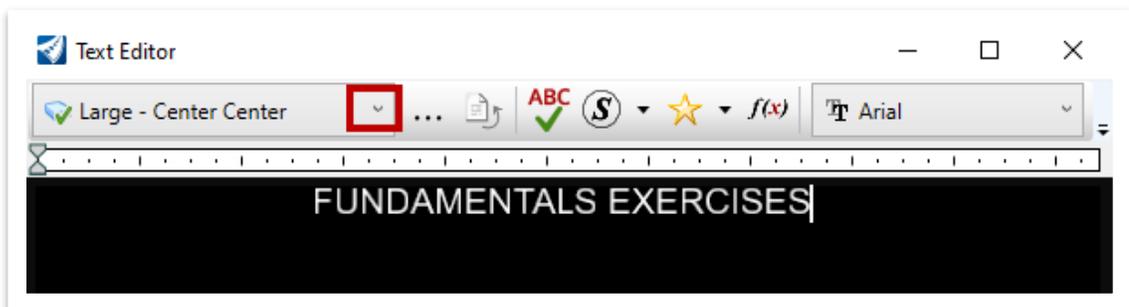
1. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Roadway - Text** element template (**Design >> Annotation >> Plan Sheets >> Proposed**). This will assure the text is placed on the correct symbology.
2. Once the element template is selected, notice that the Attributes updated automatically.



3. Open the **Place Text** tool (**Drawing >> Annotate >> Text**). Type in **FUNDAMENTALS EXERCISES**.

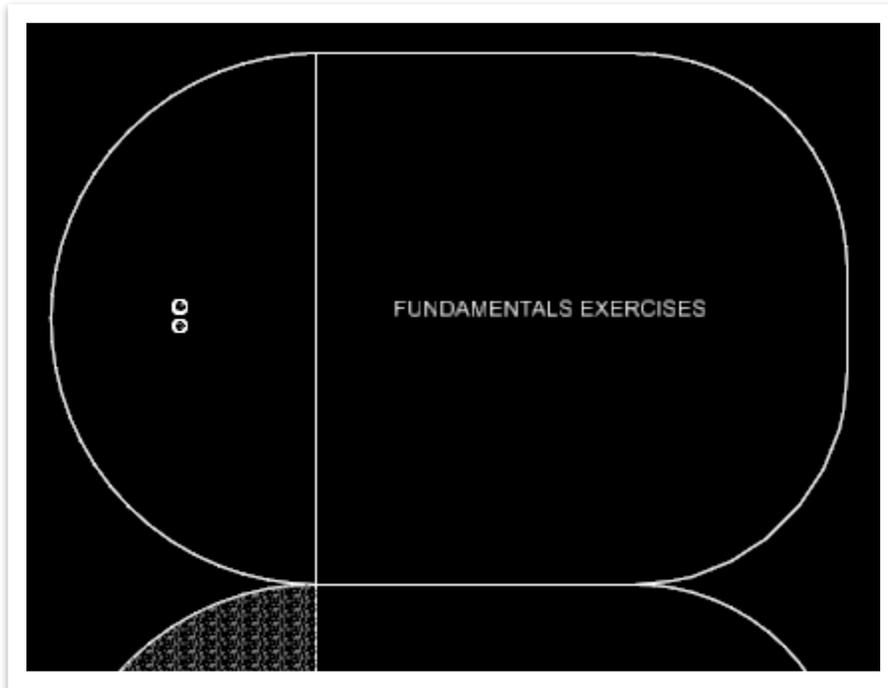


4. Notice that there is no **Text Style** in the upper left. Click the drop-down arrow and select **Large - Center Center**.

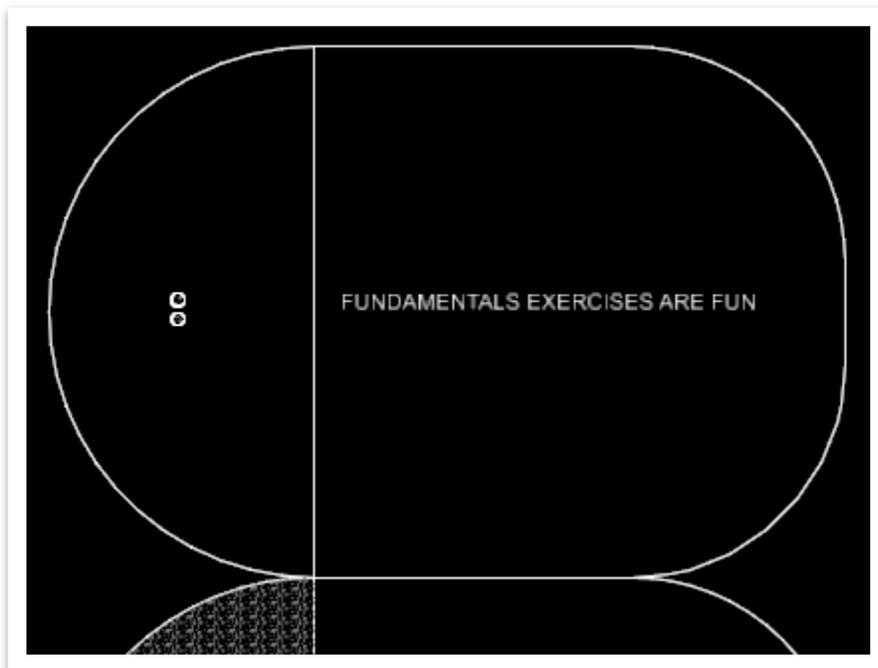




5. Place the text within the upper shape by **left** clicking within the shape. **Right** click to clear the placement and then close the **Text Editor** once you are done.



6. Now, let's edit the text. Open the **Edit Text** tool (**Drawing >> Annotate >> Text**) and add **ARE FUN** to the end of the text and then **left** click outside the **Text Editor** to see the update.

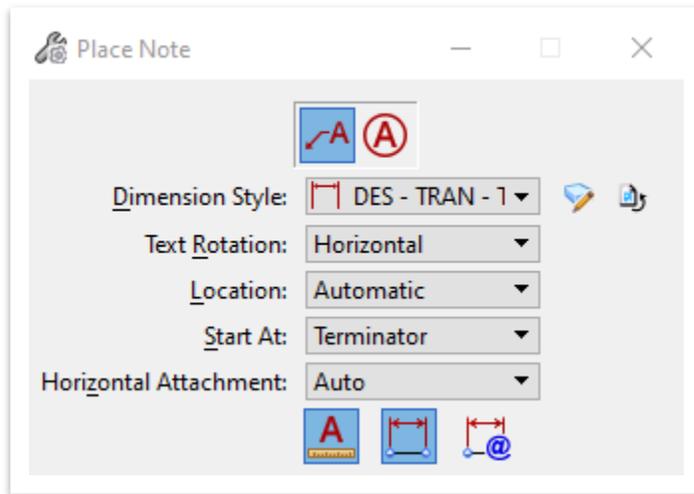




## 9.4 Lecture: Placing Notes

The **Place Note** tool uses the same Text Editor as Place Text but has different options and styles available. Notes use **Dimension Styles** to define their text and linework symbology. Notes are **non-intelligent** and will **not** update as the user edits geometry. Text rotation allows the user to specify rotation in relation to the current view, or in-line with the leader (Figure 87).

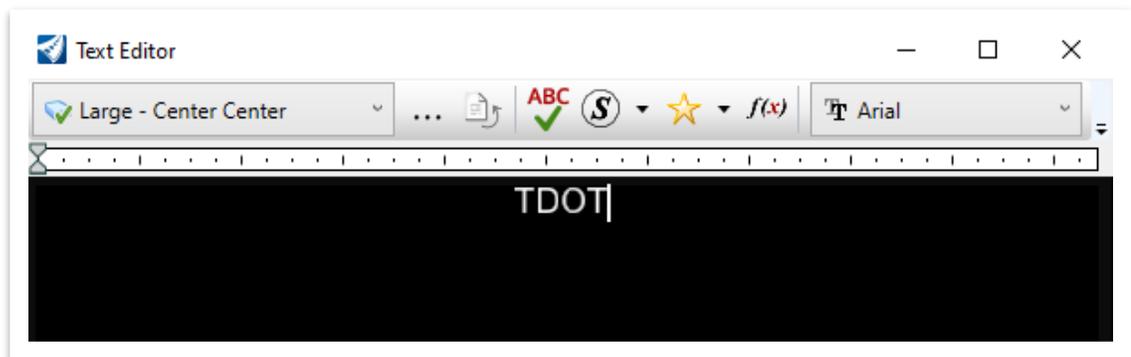
FIGURE 87. PLACE NOTE DIALOG BOX



## 9.5 Exercise: Place a Note

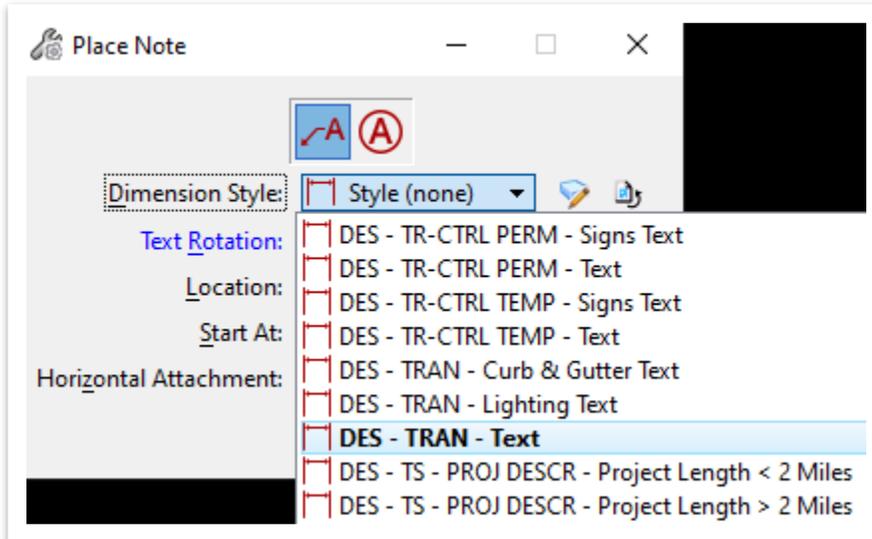


1. Open the **Place Note** tool (**Drawing >> Annotate >> Text**). Type in **TDOT**. Notice it is the same text editor as if you selected the Place Text tool.

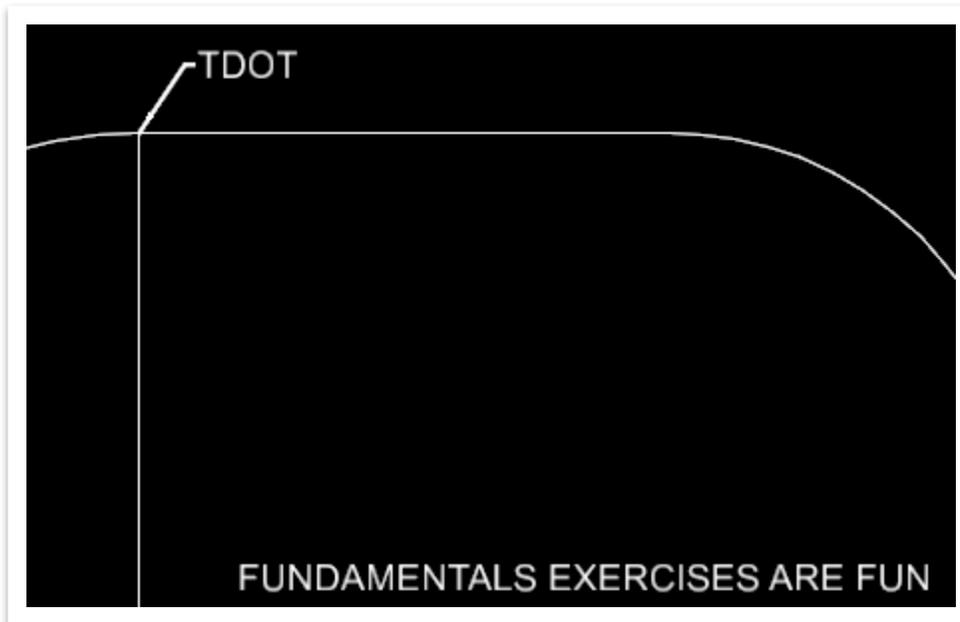




- Before placing the note, let's look at the settings. Select the **DES - TRAN - Text** dimension style. Leave all other settings the same.



- Snap the arrowhead to the point shown below to define the **Origin Point** and **left** click again to define its location. Close the **Text Editor** once you are done.

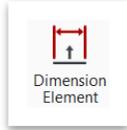




## 9.6 Lecture: Placing Dimensions

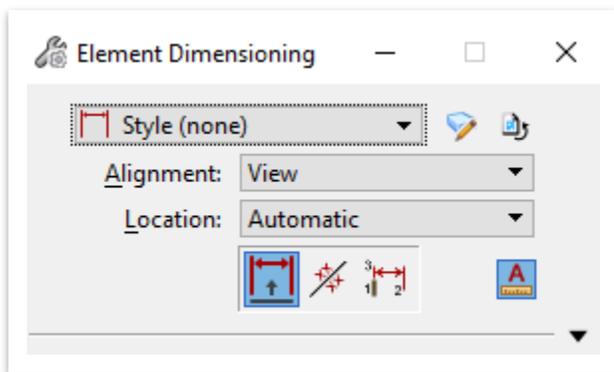
There are various ways in which the user can dimension an element ranging from element selection to angular dimensioning.

### 9.6.1 Dimension Element



This tool allows the user to dimension an entire element shown in Figure 88 (**Drawing >> Annotate >> Dimensioning**).

FIGURE 88. ELEMENT DIMENSIONING DIALOG BOX

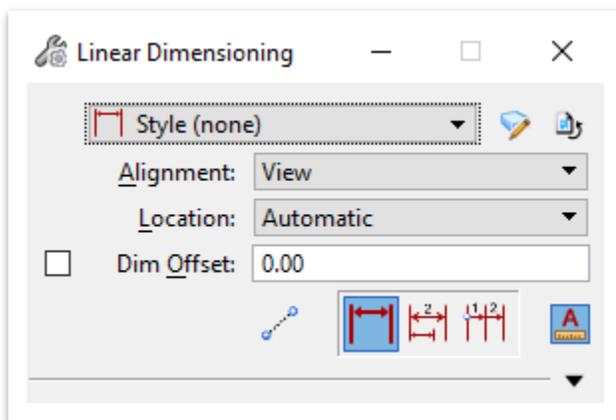


### 9.6.2 Dimension Linear



This tool allows the user to create a dimension between two data points shown in Figure 89 (**Drawing >> Annotate >> Dimensioning**).

FIGURE 89. LINEAR DIMENSIONING DIALOG BOX



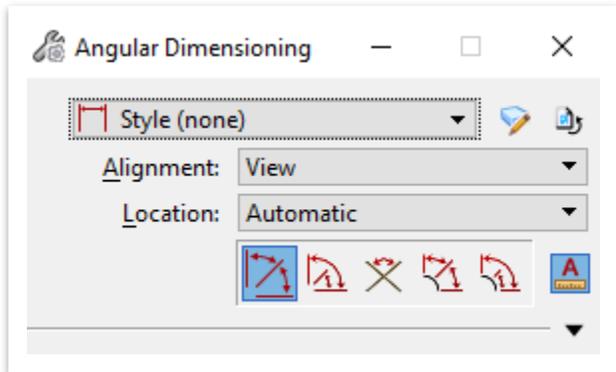


### 9.6.3 Dimension Angle



This tool allows the user to create a dimension for the angle between two points or elements shown in Figure 90 (**Drawing >> Annotate >> Dimensioning**).

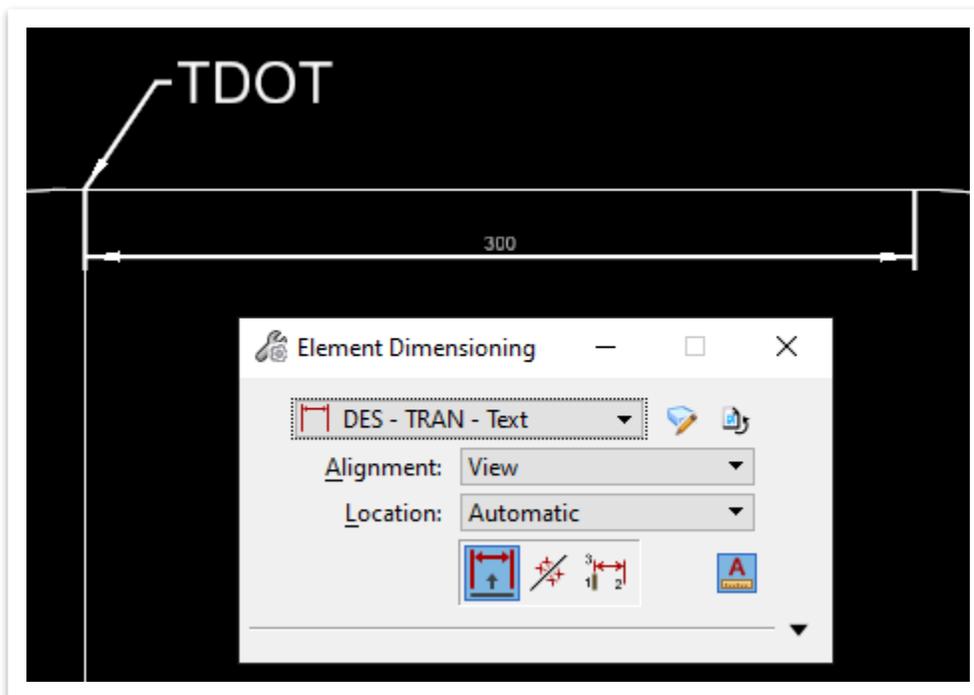
FIGURE 90. ANGULAR DIMENSIONING DIALOG BOX



### 9.6.4 Exercise: Place a Dimension

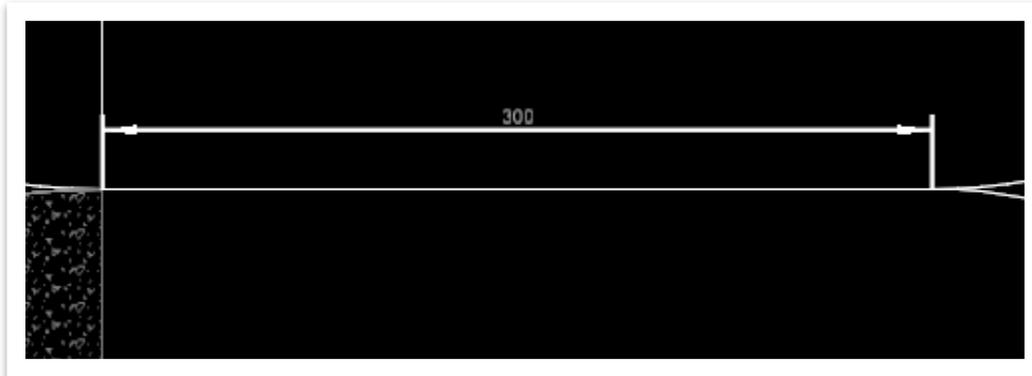


1. Open the **Dimension Element** tool (**Drawing >> Annotate >> Dimensioning**). Make sure the **DES - TRAN - Text** dimension style is selected in the dialog box. Select the line just to the right of the TDOT note arrowhead. Then you can move the mouse to assign the dimension offset. The dimension should be **300'**.





2. Select the **Dimension Linear** tool (**Drawing >> Annotate >> Dimensioning**). We will dimension the horizontal line between the two-arc shapes. Pick the left extent of the line and then the right extent of the line. Once again move your mouse to assign the offset distance of the label. The dimension should be **300'**.





## Chapter 10. Sheet Index and Placing Named Boundaries (Plan)

Re-open the **Fundamentals Exercises.dgn** file if it is not already open. In this chapter, the user will learn how to fill in **Sheet Index** properties and how to create Plan sheets through the **Placing Named Boundaries** tool.



### 10.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Understand the purpose of the Roadway sheet index and be able to add properties.
2. Understand the Roadway plan sheet seed files.
3. Create plan named boundary for proposed layout sheets and add them to the sheet index.
4. Manipulate the sheet data fields and titles post-sheet creation.
5. Understand how to adjust clip shapes, if necessary.

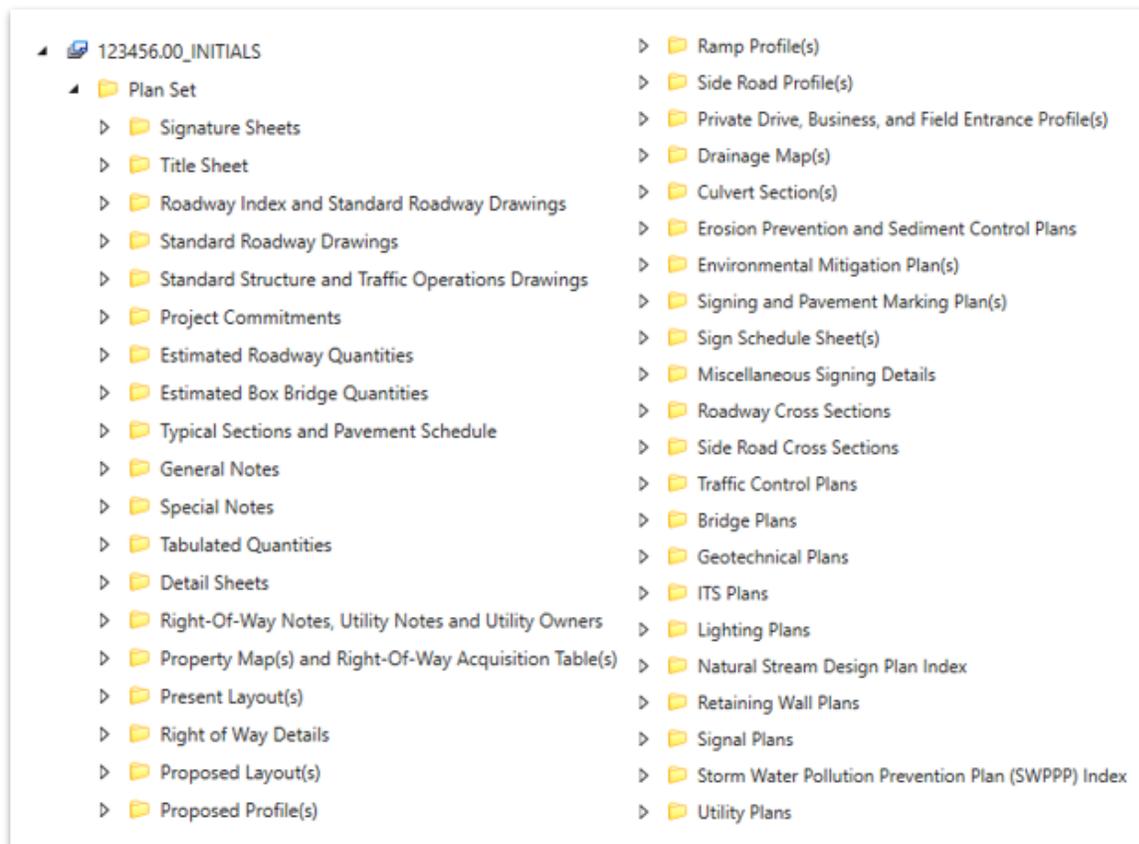
### 10.2 Lecture: Sheet Index



The **Sheet Index** is an organized and named collection of sheet models from one or more design files which also contains controls to manage automation. Once the user cuts sheets, they will be added to the **Sheet Index** which can be found under the **Explorer** menu. Only sheet models can be added to the index, not design or drawing models. The sheet index will be used to plot **all sheets** in ORD. The subfolder(s) within the sheet index are aligned with the applicable TDOT divisions in the required order for plan submittals. There is a sheet index setup for the **Roadway**, **STID** and **Structures** divisions. The workset template that the project workset is based on will determine which sheet index you see. For example, if you select **RDWY\_TEMPLATE** as your base, you will see the **Plan Set** subfolder, which when expanded shows the following subfolders seen on the next page. (Figure 91). The subfolders are in the correct order for a TDOT plan submittal.

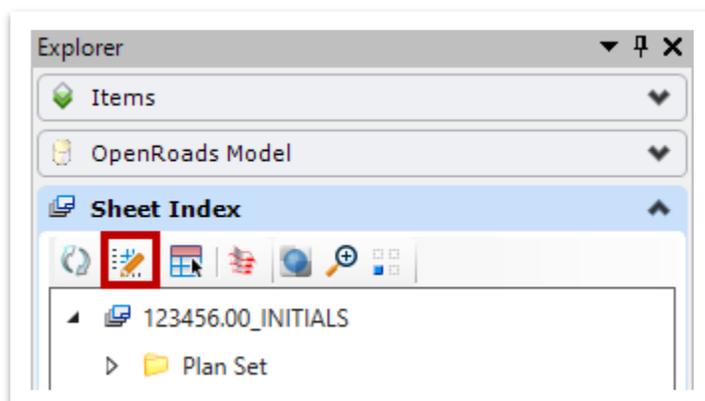


FIGURE 91. PLAN SET SUBFOLDERS



When a new project is started, the user should fill in all applicable **Sheet Index** properties. You will be able to edit and fill in additional property fields later as needed. The Sheet Index properties are linked to the sheet index and will be used to automatically populate certain fields on the sheets. Before you can fill in the properties OR add any sheets, the user must first click the **Open Sheet Index for Editing tool** (Figure 92).

FIGURE 92. OPEN SHEET INDEX FOR EDITING TOOL





If you see more options for the Sheet Index than shown above, it means that the Sheet Index is already **Open for Editing** (Figure 93).

FIGURE 93. SHEET INDEX ALREADY OPENED FOR EDITING



After opening the Sheet Index for Editing, the user will highlight the **WorkSet** (Figure 94) and then fill in the applicable properties (e.g. Type, Year, Project No, etc). As a reference, the **Title Row 1, 2 and 3** fields refer to the top right box for **all sheets** (Figure 95).

FIGURE 94. HIGHLIGHTING WORKSET

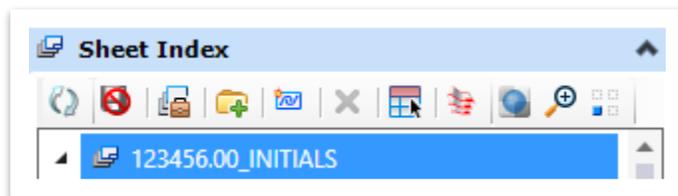


FIGURE 95. TOP RIGHT BOX - SHEETS

	TYPE	YEAR	PROJECT NO.	SHEET NO.
TITLE ROW 1				
TITLE ROW 2				
TITLE ROW 3				



If you do not see the properties window after selecting the WorkSet, it means the properties window has been closed out previously. The Properties window can be opened by going to **Drawing >> Home >> Primary**.



Within the **Sheet Index Properties** (Figure 96), the user will fill in **Row 1** fields for Preliminary Plans, **Row 2** fields for ROW plans and **Row 3** fields for Construction plans. The **Sheet No.** field is handled by Model Properties and is already setup in the WorkSet. Some of the properties seen are specifically for the Title Sheet (e.g. Designer, Drawn By, etc).

FIGURE 96. SHEET INDEX - PROPERTIES

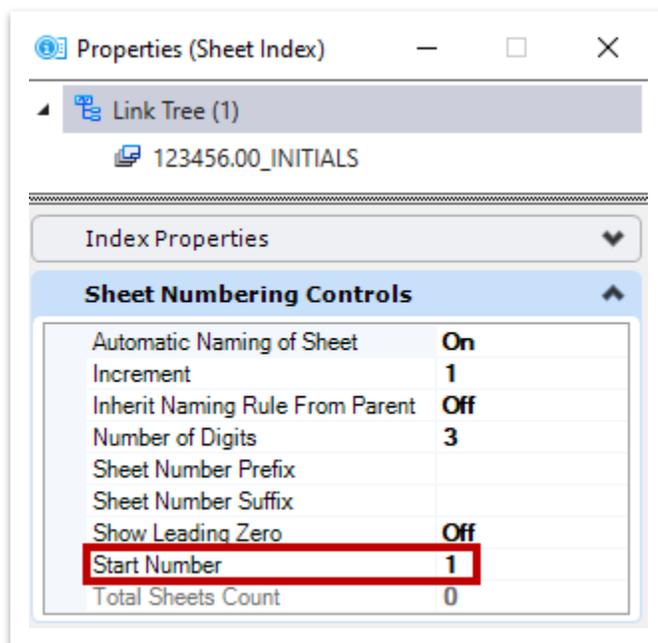
Index Properties	
Beg. L.M.	
Box Bridge Length #1	
Box Bridge Length #2	
Bridge Length	
Checked By	
Designed By	
Designer	
End L.M.	
Federal Project #	
Lane Mi Resurfaced	
PIN #	
Project Length	
R.O.W. Length	
Roadway Length	
State Project # 1	
State Project # 2	
TDOT CE/Trans Mang. 1	
TDOT Road Sp. Sv. 2	
Title Row 1 Project #	
Title Row 1 Type	
Title Row 1 Year	
Title Row 2 Project #	
Title Row 2 Type	
Title Row 2 Year	
Title Row 3 Project #	
Title Row 3 Type	
Title Row 3 Year	
TS Year	

Once the applicable fields have been populated, they will automatically fill in when the sheets are cut or when you place any 1:1 sheet into the Sheet Index. If you have already placed at least one sheet in the index, you will notice the updates the next time ORD is re-opened.



The Sheet Index is configured to automatically number the sheets when placing them in the subfolders. The **Start Number** can only be configured accurately up thru the **Proposed Profile(s)** subfolder because all projects have a varying number of plan sheets. Before sheets are added to the index beyond the Proposed Profile folder, the user will have to adjust the **Start Number** for the next folder and so forth so that the page numbers continue to update in sequence. If the Sheet Index is open for editing, you can simply click on any subfolder to see the **Sheet Numbering Controls** (Figure 97). All sheet index subfolders past Proposed Profile(s) start at **1** by default.

FIGURE 97. SHEET INDEX - SHEET NUMBERING CONTROLS



For some of the sheets, the user will have to manually edit the sheet number due to software configurations. The first sheet for the following subfolders will be automatically named as shown. The user will simply have to edit and remove the “0”.

- Estimated Roadway Quantities (2-0)
- Estimated Box Bridge Quantities (2A0)
- Typical Sections and Pavement Schedule (2B0)
- General Notes (2C0)
- Special Notes (2D0)
- Tabulated Quantities (2E0)
- Detail Sheets (2F0)



There is not a way to automatically increase letter suffixes for the following two subfolders. The user will need to add the A, B, C after the sheet number manually.

- Property Map(s) and ROW Acquisition Table(s) (3A, 3B, etc.)
- Environmental Mitigation Plan(s) (XXA, XXB, etc.)



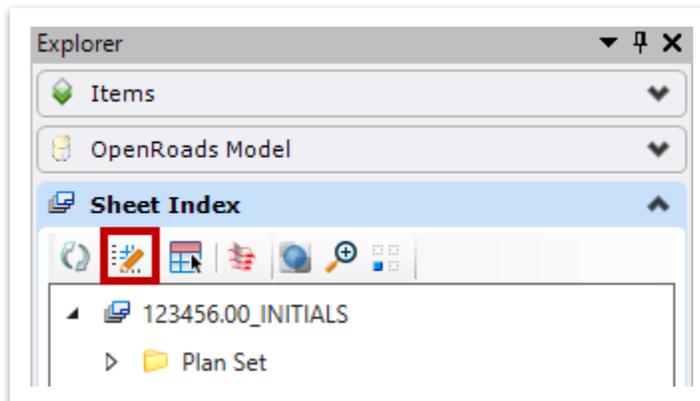
### Take Note!

*When moving from one project phase to another (e.g. Preliminary to ROW), the user will utilize the same workset and add the additional files to the sheet index.*

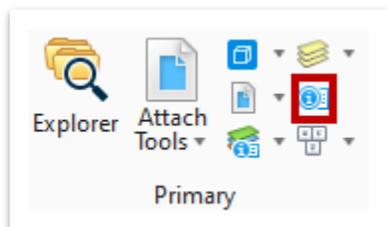
## 10.3 Exercise: Add Sheet Index Properties



1. Within the same **Fundamentals Exercises.dgn** file, we are going to setup some of the Sheet Index properties so you can see them applied when cutting the sheets later in the class.
2. First, open the **Sheet Index** for Editing.

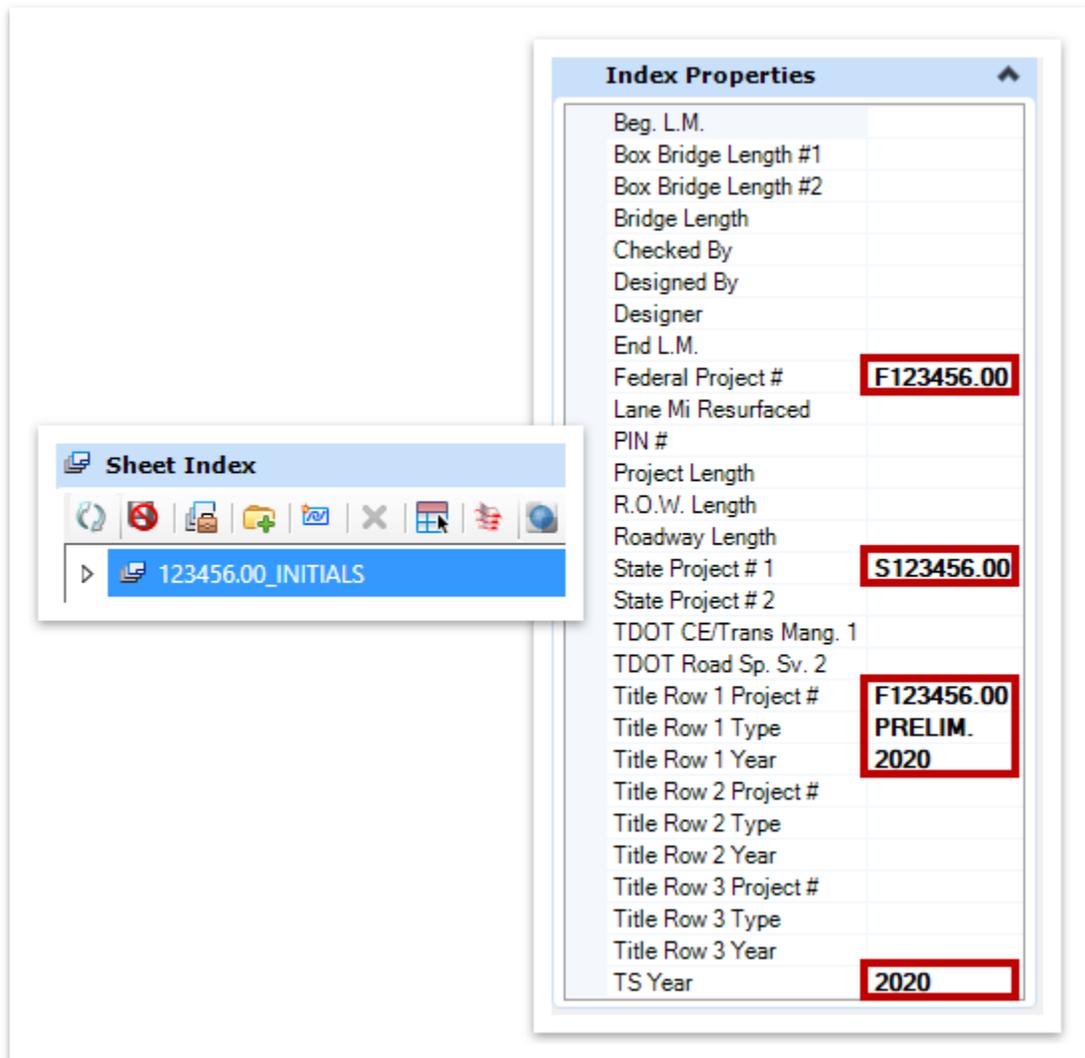


3. You also need to have the **Properties** window open if you have not already done so. (you can dock this if you'd like)





4. Highlight the workset folder and you will see the **Index Properties** appear. Fill in the **6** fields as shown below:
- **Federal Project #:** F123456.00
  - **State Project #1:** S123456.00
  - **Title Row 1 Project #:** F123456.00
  - **Title Row 1 Type:** PRELIM.
  - **Title Row 1 Year:** 2020
  - **TS Year:** 2020





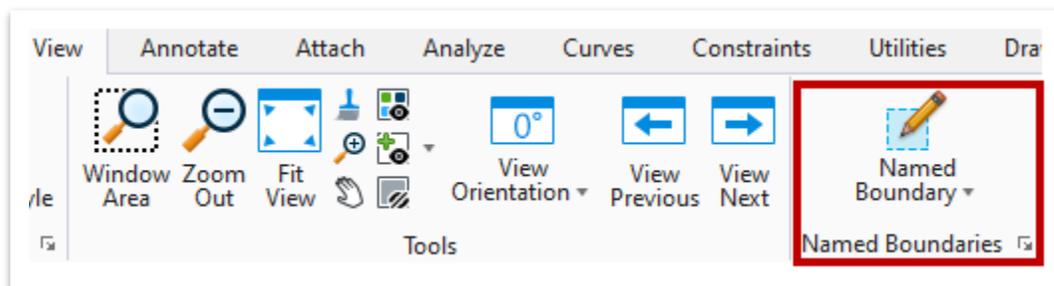
## 10.4 Lecture: Placing Named Boundary for Plan Sheets

The **Place Named Boundary** tool is used for automatically creating **plan**, **profile** and **cross-section** sheets along an alignment. Only the plan sheet application of this tool will be covered in the ORD Fundamentals class. The profile and cross-section sheet application will be covered in the Roadway Design I (ORD) Manual. The plan sheet application is used for creating:

- **Property Maps**
- **Present Layouts**
- **Right of Way Details**
- **Proposed Layouts**
- **Drainage Maps**
- **EPSC Plans**
- **Signing and Pavement Marking Plans**
- **Traffic Control Plans**
- **Geotechnical / ITS / Lighting / Natural Stream Design / Retaining Wall / Signal / SWPPP / Utility** – Typically utilize plan sheets already created from Design

The tool can be accessed here: **Drawing >> View >> Named Boundaries** (Figure 98).

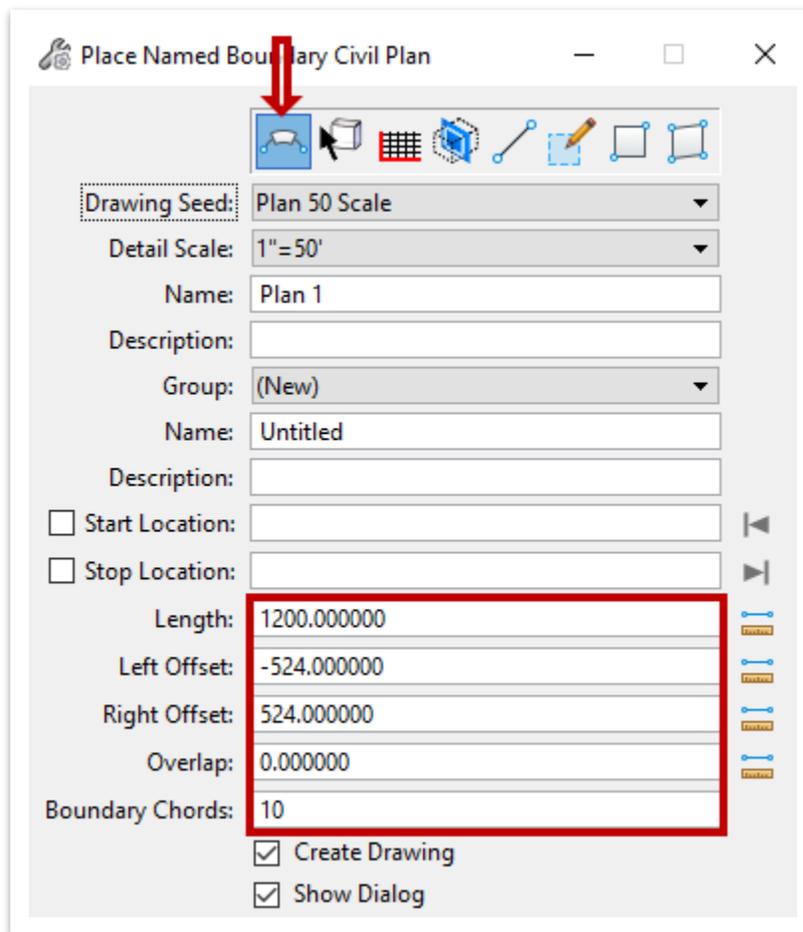
FIGURE 98. NAMED BOUNDARY TOOL





After activating the tool, the **Place Named Boundary** window will open. The user will select the **Civil Plan** tool at the top of the Place Named Boundary window (Figure 99). After the drawing seed is selected (**Plan 20 Scale**, **Plan 50 Scale** or **Plan 200 Scale**), the user will be prompted in the bottom left corner of the ORD window to identify the path element (centerline).

FIGURE 99. PLACE NAMED BOUNDARY - CIVIL PLAN

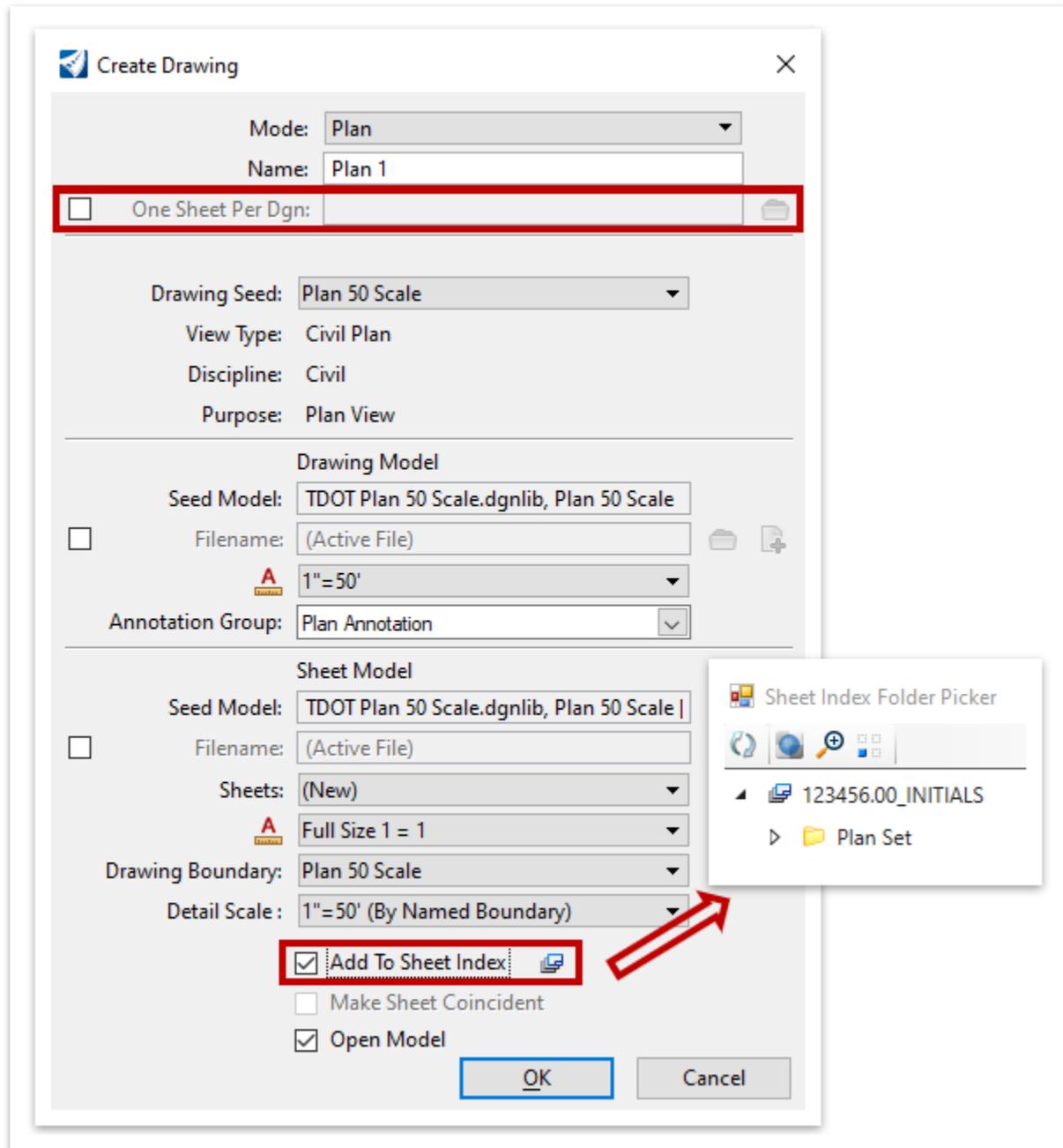


Once you select the path element, the two **Name** fields will automatically populate. You can manually key in whatever name you'd like after that. The user also needs to pick the start and stop locations of the clip boundaries. You can either key in stations or manually select the extents with your mouse. If you want the clip shape to extend prior to the start or beyond the end of a project, you can control that by applying the offset into the station location. For example, if the project starts at Sta. 10+00 and you want the clip boundary to start 100' before, you can key in 9+00 as the Start Location if your alignment extends that far. The clip extents (outlined in red above) are part of the sheet seed settings and should only be adjusted if you need to create a smaller clip length around curves.



When creating the clip boundary, you should have **Create Drawing** checked. It will open the **Create Drawing** dialog box (Figure 100) after following the prompts in the bottom left of the ORD screen to accept settings. By default, all sheet models will be stored in one dgn file. However, you can set the program to create individual dgn files for each sheet model. Toggle on the option highlighted below and browse to the folder location in which you want to save the files.

FIGURE 100. CREATE DRAWING DIALOG BOX





Once you check mark **Add To Sheet Index** it will allow you to browse to the correct subfolder that the sheets need to be placed in. Click **OK** once selected.

If you have already established the clip boundaries in your dgn file, then you do not need to recreate the Named Boundaries. You can click the expand button (outlined in red) in the Named Boundaries option, which will then show the clipped sheets under **Plan Groups** (Figure 101). Toggle the **Show the Create Drawing Dialog** option on (outlined in red), and then right click on your selected sheets and select **Create Plan Drawing**. You will then add the sheets to the index thru the Create Drawing dialog box in the same manner as described above.

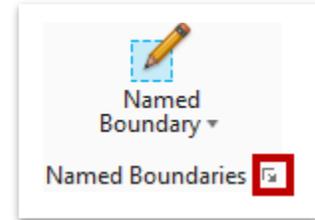
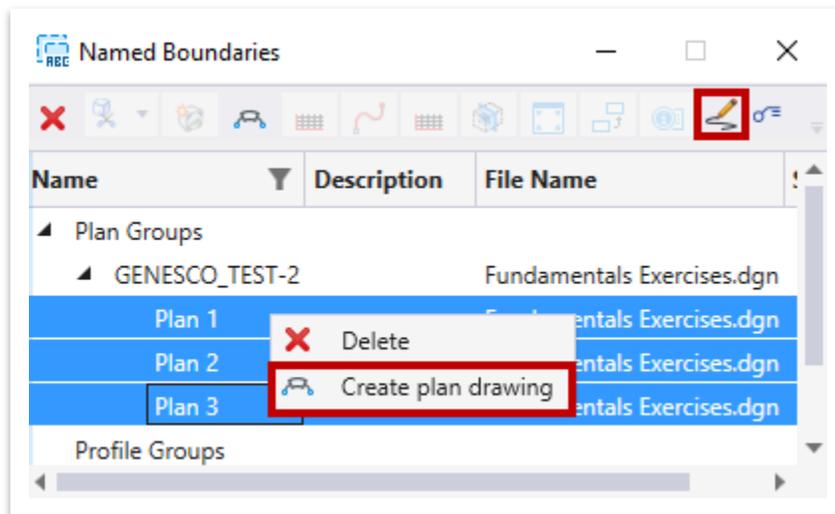


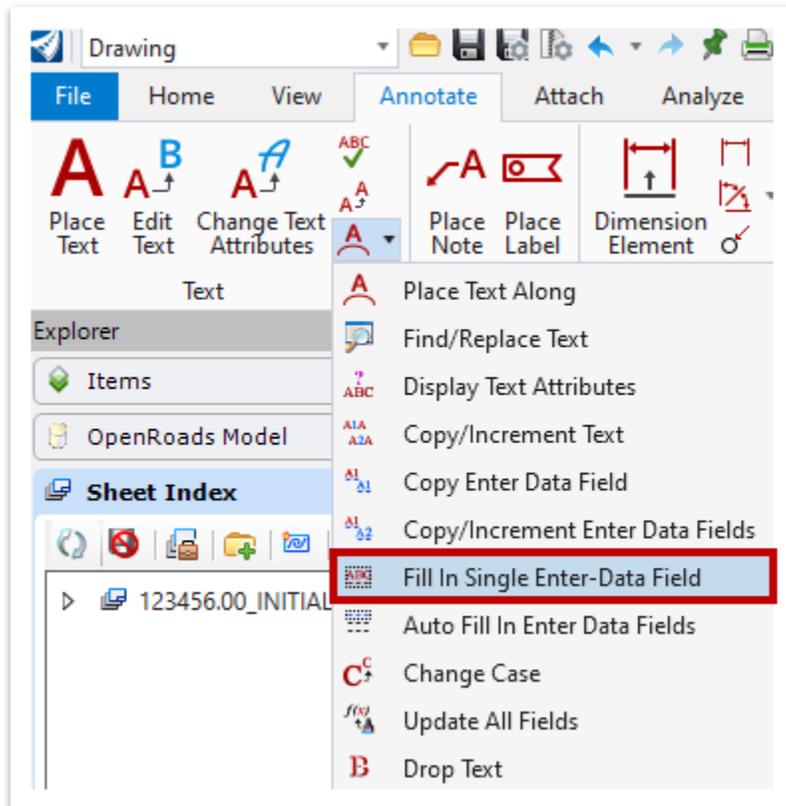
FIGURE 101. NAMED BOUNDARIES DIALOG BOX





Once sheets are created, the user must continue to manually place the sheet title cell in the lower right corner (snap to the blue dot). If the sheet has a station range or scale in it, the user must also manually key in the values in the data field for now. A future workspace enhancement may allow for these title cells to be automated. All text can be entered using the **Fill in Single Enter-Data Field** command, found here: **Drawing >> Annotate >> Text >> More** (Figure 102). All data fields in the top right of each sheet will be automatically linked and updated.

FIGURE 102. FILL IN SINGLE ENTER-DATA FIELD



The **matchlines** will be placed automatically in both the drawing and sheet model files when going through the Named Boundary creation. The matchline data will also automatically populate, as shown below (Figure 103).

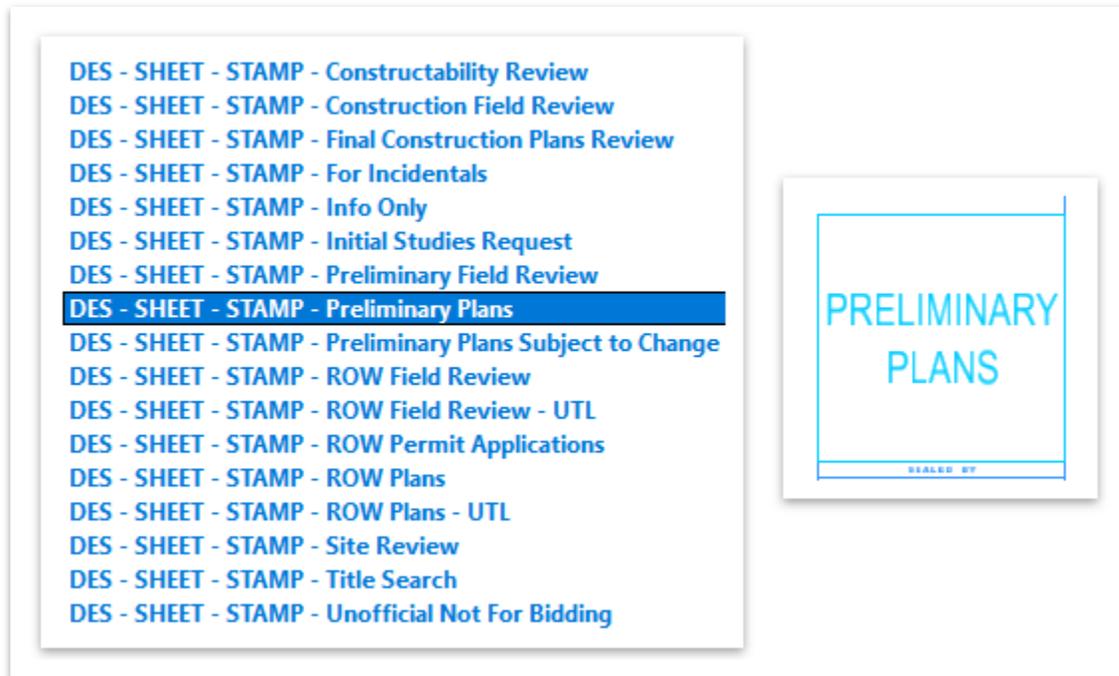
FIGURE 103. MATCH LINE TEXT

**MATCH LINE STA. 39+00.00 SEE SHEET NO. 6B**



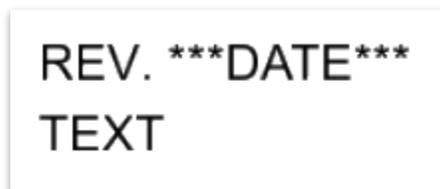
The **phase stamps** have been embedded into the sheet seeds so you can simply select the one you need in the level display within the sheet model and turn the others off. You can see the **17** options in the image below, which are all turned off (Figure 104).

FIGURE 104. PHASE STAMP LEVELS



There is another new embedded function in the sheet seeds involving **revision notes**. If you need to apply a revision note, simply turn on the revision note level (**DES - SHEET - Revision Text**) and edit the text in the top right of the sheet as necessary (Figure 105).

FIGURE 105. REVISION NOTE TEXT

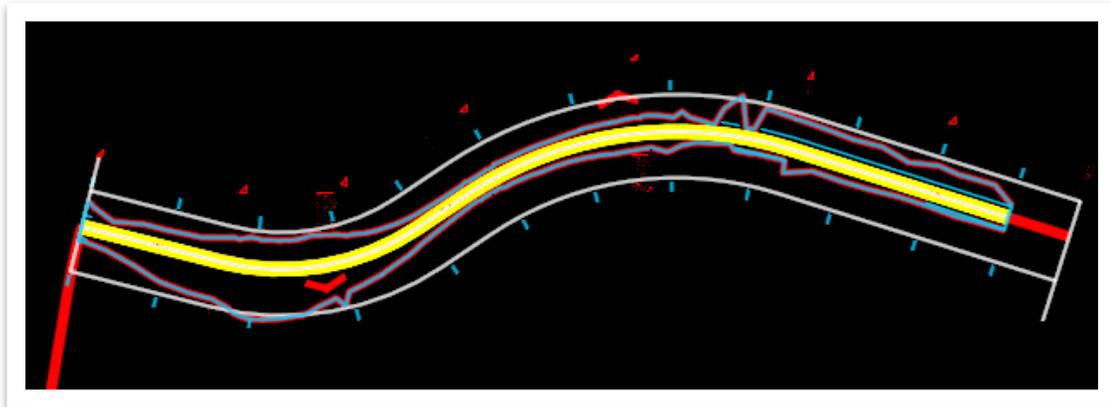




## 10.5 Exercise: Placing Named Boundary for Plan Sheets



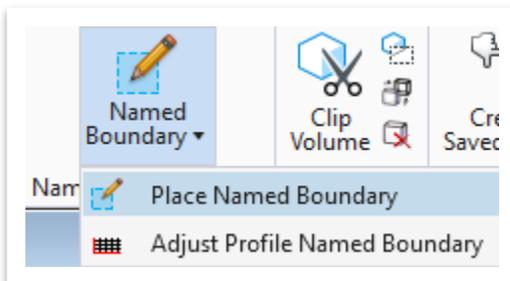
1. The **Fundamentals Reference.dgn** file should still be referenced to your current **Fundamentals Exercises.dgn** file. Let's review the contents of the reference file once again. It should have the **GENESCO\_TEST** alignment along with the corridor. Go ahead and rotate your view, as shown below.



2. Make sure you are in the **Default (2D)** model.

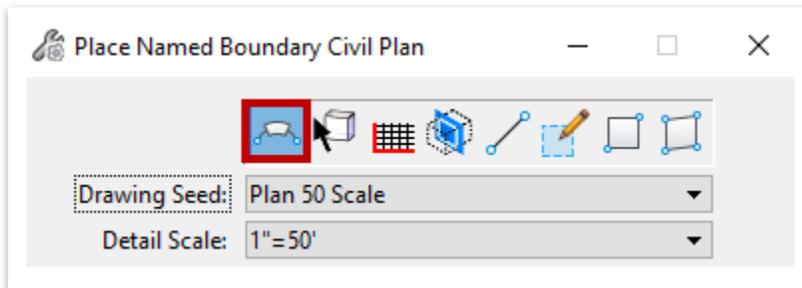


3. Open the **Place Named Boundary** tool (**Drawing >> View >> Named Boundaries >> Named Boundary**).

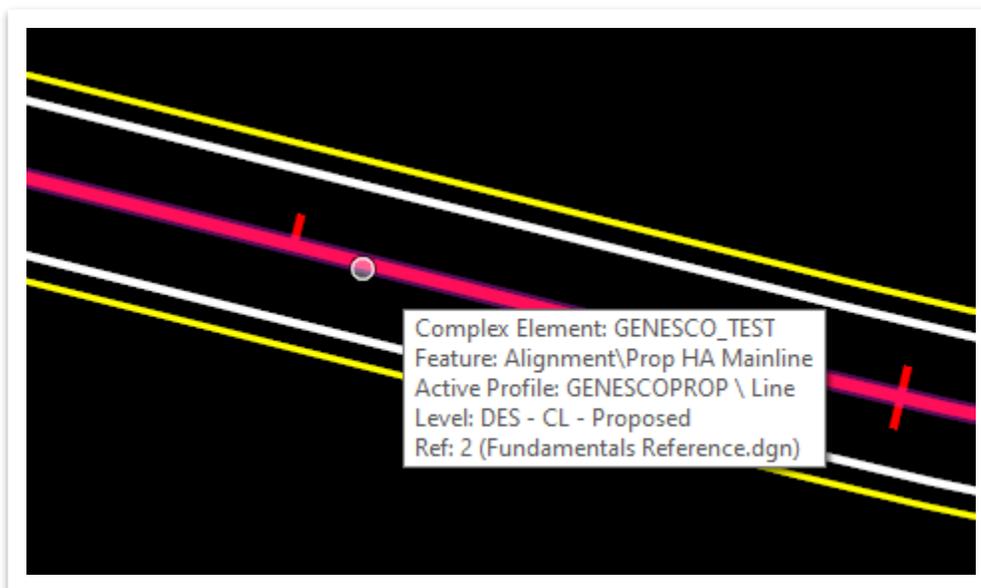




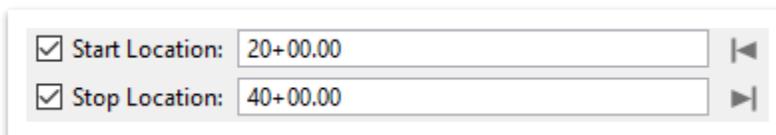
- Make sure that the **Civil Plan** option is toggled on. Select **Plan 50 Scale** for the Drawing Seed.



- Follow the prompts in the lower left corner of the ORD window. Identify the path element (**GENESCO\_TEST** centerline) by selecting it with your mouse.



- Key-in the Start Location of **20+00.00** and hit Enter. Key-in the Stop Location of **40+00.00** and hit Enter. The checkmark on the left indicates those 2 stations have been locked in. **Note:** You cannot key-in stations until the path element has been selected in Step 5.





7. Key-in **Genesco Plan-1** for both the Named Boundary name and the Group name.

Name: Genesco Plan-1  
Description:  
Group: (New)  
Name: Genesco Plan-1

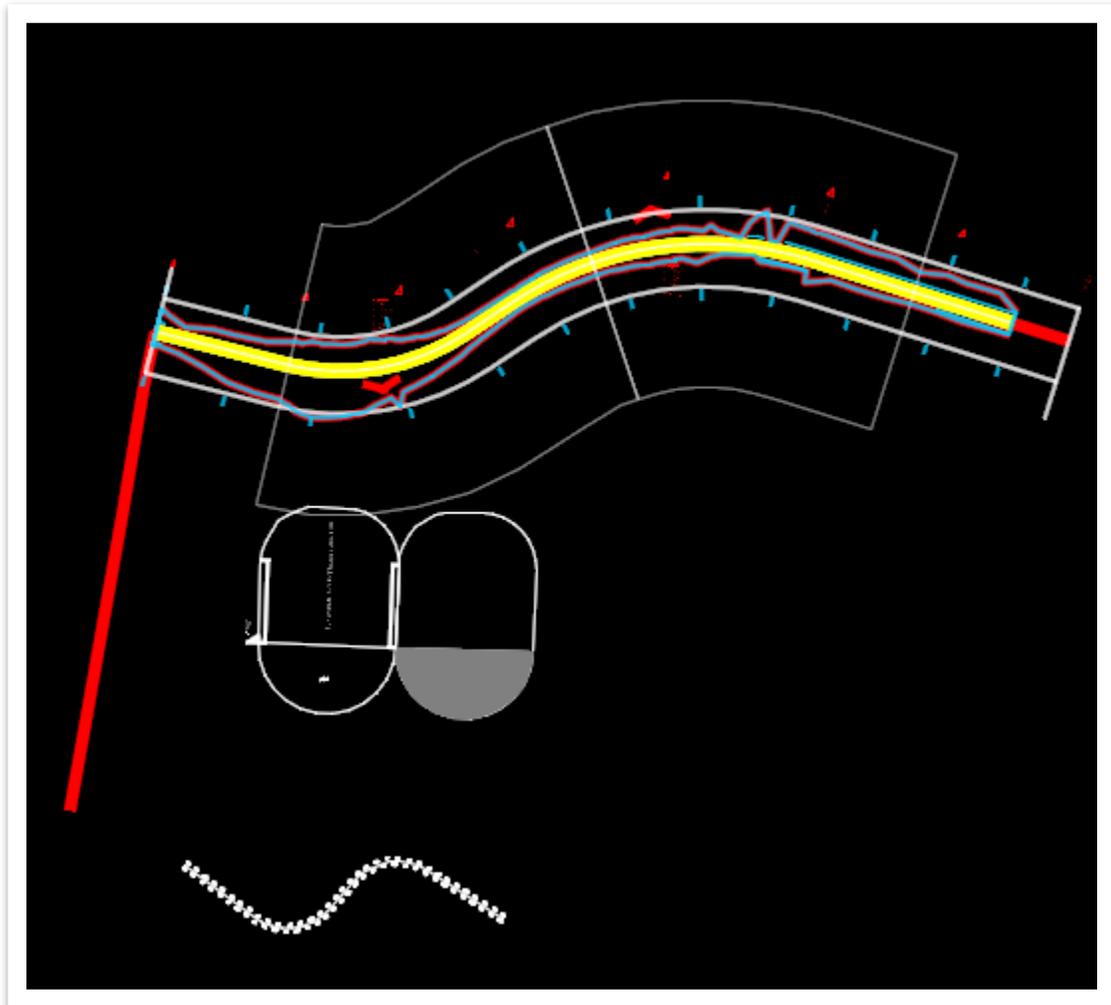
8. Make sure that the **Create Drawing** and **Show Dialog** boxes are checked.

Place Named Boundary Civil Plan

Drawing Seed: Plan 50 Scale  
Detail Scale: 1"=50'  
Name: Genesco Plan-1  
Description:  
Group: (New)  
Name: Genesco Plan-1  
Description:  
 Start Location: 20+00.00  
 Stop Location: 40+00.00  
Length: 1200.000000  
Left Offset: -524.000000  
Right Offset: 524.000000  
Overlap: 0.000000  
Boundary Chords: 10  
 Create Drawing  
 Show Dialog



9. Left click out in space **3 times** to accept the settings and notice **2** clip shapes are drawn in in the file.





10. The **Create Drawing** window will appear automatically after creating the named boundary shapes. Make sure that the **Add To Sheet Index** box is checked. Click the browse button next to Add To Sheet Index.

**Create Drawing**

Mode: Plan

Name: Genesco Plan-1

One Sheet Per Dgn:

Drawing Seed: Plan 50 Scale

View Type: Civil Plan

Discipline: Civil

Purpose: Plan View

Drawing Model

Seed Model: TDOT Plan 50 Scale.dgnlib, Plan 50 Scale

Filename: (Active File)

Annotation Group: Plan Annotation

Sheet Model

Seed Model: TDOT Plan 50 Scale.dgnlib, Plan 50 Scale |

Filename: (Active File)

Sheets: (New)

Drawing Boundary: Plan 50 Scale

Detail Scale: 1"=50'

Add To Sheet Index

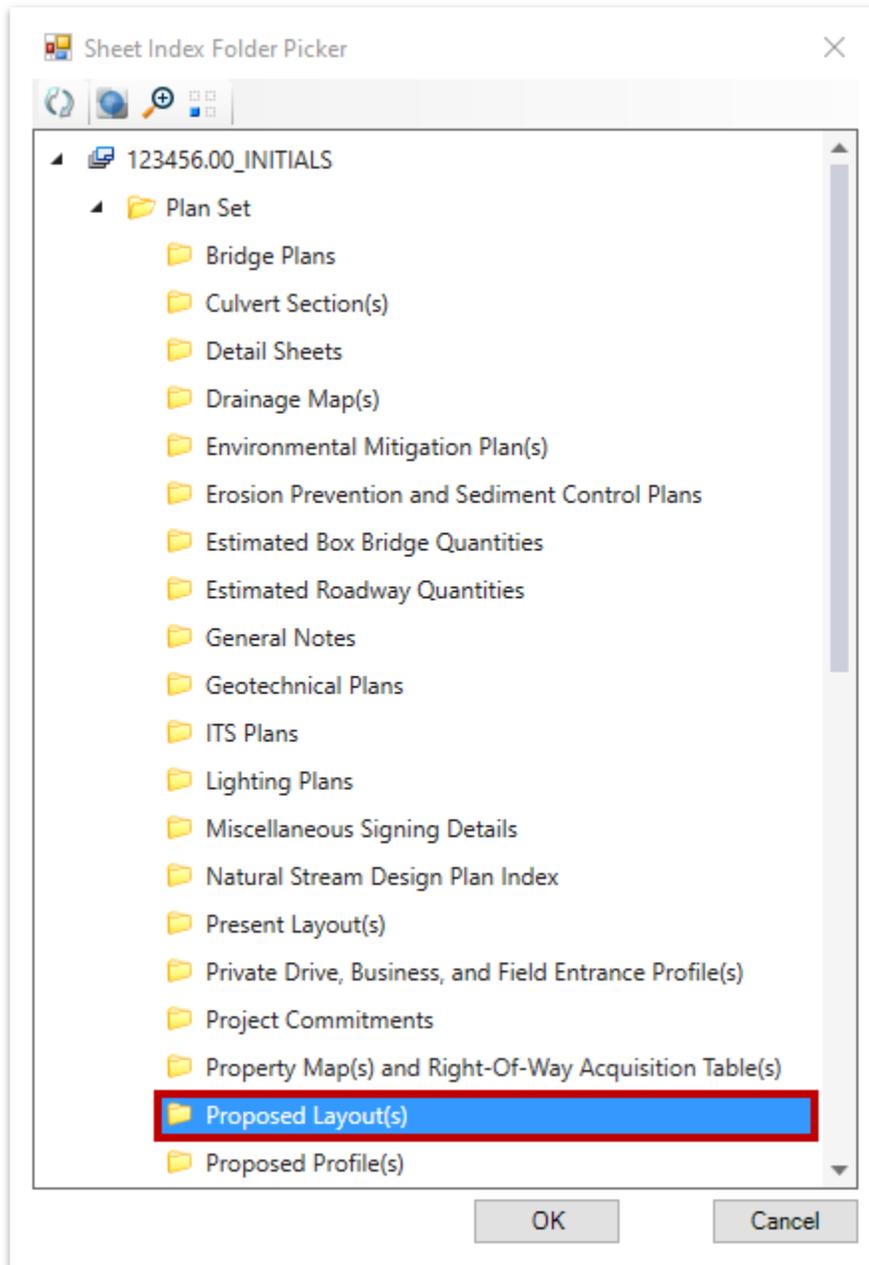
Make Sheet Coincident

Open Model

OK Cancel

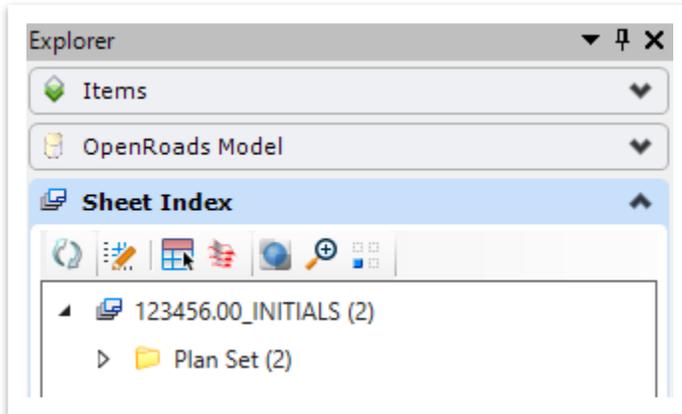


11. Select the **Plan Set >> Proposed Layout(s)** folder for the 2 plan sheets to go into. Please note that it may take a few seconds for the folder to expand.

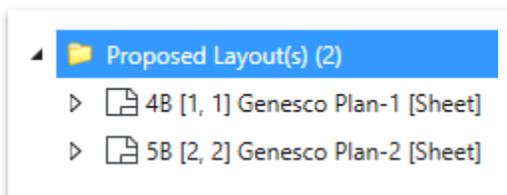




12. Click **OK** to close the Sheet Index Folder Picker and then **OK** to accept the Create Drawing dialog box. Notice that the sheet index now has **2** files in it: **123456.00\_INITIALS (2)**.



13. Expand the **Proposed Layout(s)** subfolder and notice Sheets **4B** and **5B** have been created. You can double click on a sheet in the index to open it.

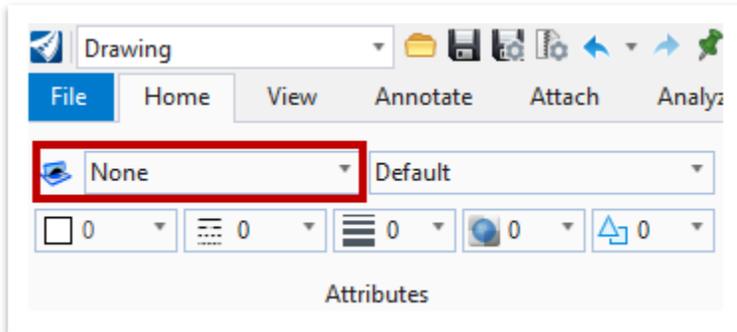


14. Zoom in and notice that the upper right corner of the sheet has automatically populated. **Note:** We are working with Bentley on getting only the applicable Sheet No. line to populate. In the meantime, manually delete the 2<sup>nd</sup> and 3<sup>rd</sup> **4B** and **5B** labels.

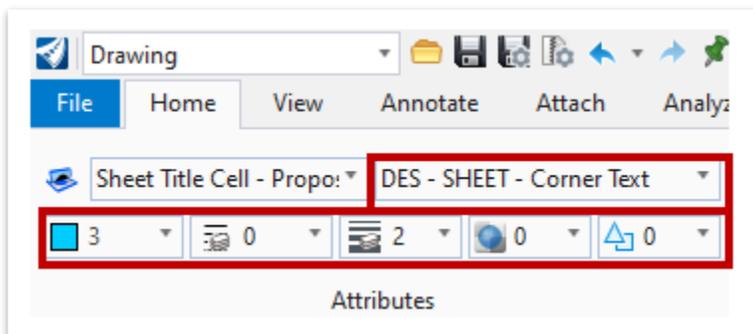
TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	4B



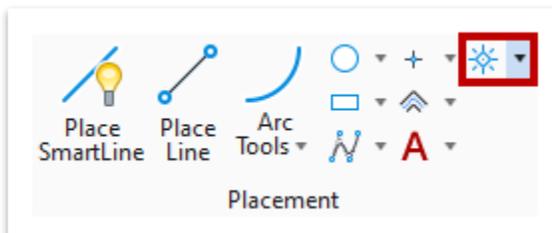
15. The next step is to place the **Sheet Title** cell in the lower right corner of the sheet. For Sheets 4B and 5B, we will place the **Proposed Layout Sta Scale** cell. As a reminder, before placing the cell, we need to select the correct element template, which will apply the correct symbology. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Sheet Title Cell - Proposed Layout Sta Scale** element template (**Design >> Annotation >> All Sheets**).



16. Once you browse to the element template, select it. Notice how the symbology has updated.

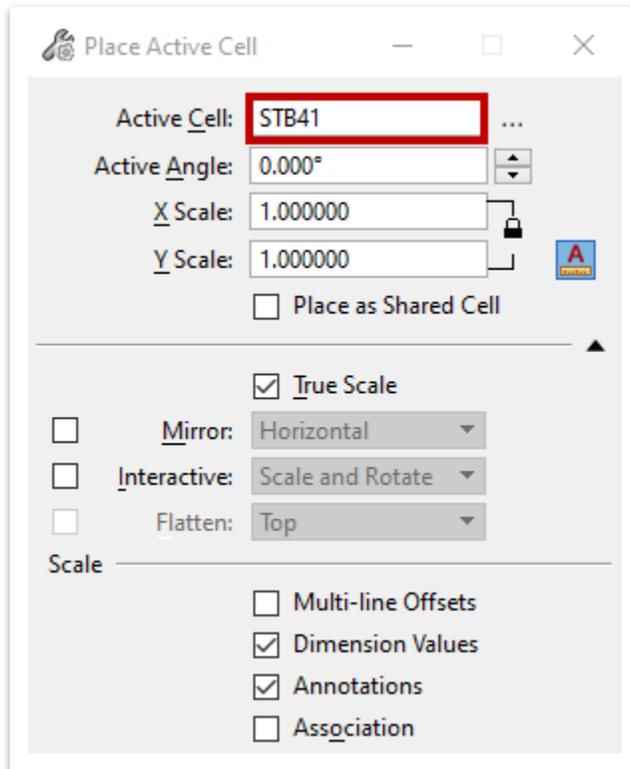


17. Setting the correct element template also calls the correct cell automatically. We now need to use the **Place Active Cell** tool to physically place the cell in the lower right corner. As a reminder, the Place Active Cell tool can be accessed here: **Drawing >> Home >> Placement**.

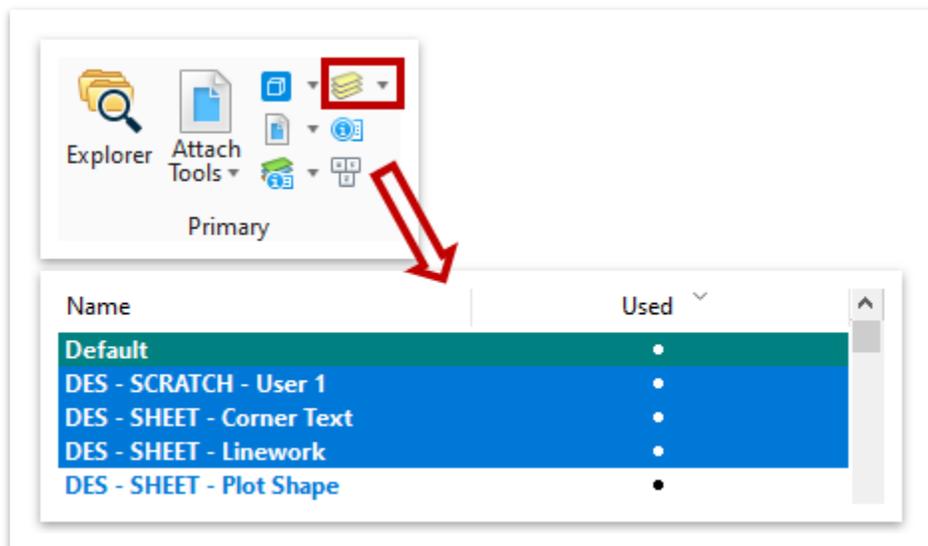




18. Notice in the **Place Active Cell** window it automatically calls the correct **Active Cell (STB41)**. All cells in ORD are to be placed at a 1:1 scale so there is no need to adjust any settings.

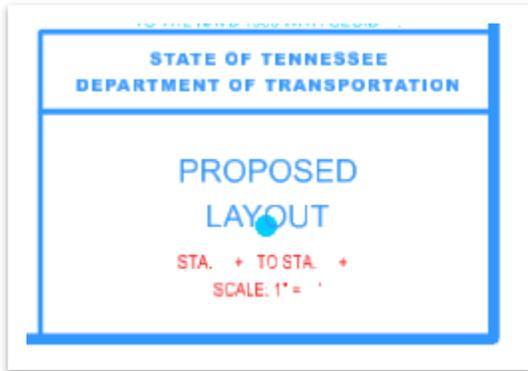


19. The **DES - SCRATCH - User 1** level should be turned on by default, but if not go ahead and turn it on in the **Level Display (Drawing >> Home >> Primary)**. We will snap the center point of the cell to the blue dot in the lower right corner.

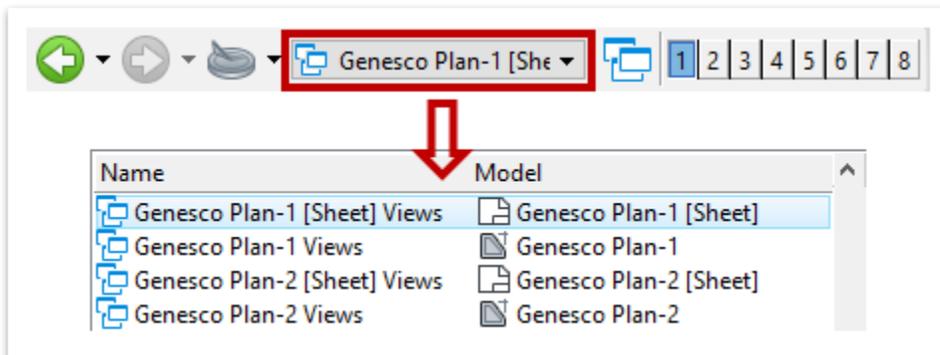




20. Place the cell on Sheets **4B** and **5B**.

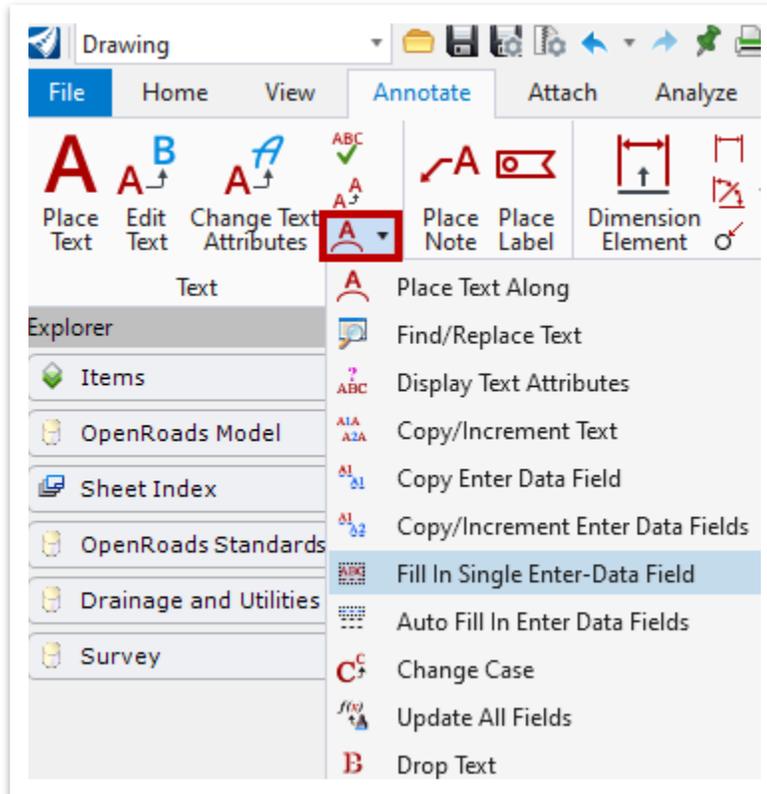


21. To switch between sheets, you can select the applicable sheet model at the lower left corner of the ORD window.





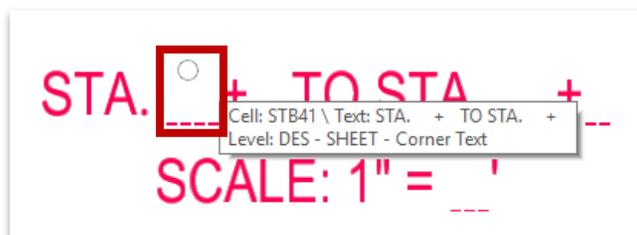
22. Once both cells have been placed, the data fields need to be manually filled in. Open the **Fill In Single Enter-Data Field** tool, which can be accessed here: **Drawing >> Annotate >> Text >> More**.



23. The **Edit Enter Data Field** window will pop up only after successfully clicking on the first data field in the label (e.g. STA. \_\_). **Note:** This can be tricky so click in the **upper area** of the data field to get the window to pop up. If you don't see the dashes, it means the data fields are turned off.



INCORRECT



CORRECT



24. Update the **Length** field to the total number of digits. In this example, the 20 in STA 20 is two digits so change the **Length** field from 4 to 2 and then key-in 20 for the Value. Each data field of the station range and scale within the sheet title cell is a separate click using the **Fill In Single Enter-Data Field** tool.

Dialog box titled "Edit Enter Data Field" with the following fields:

- Length: 2
- Value: 20
- Justification: Right

Buttons: Drop, OK, Cancel

25. Fill in the remaining data fields for each sheet as shown below.

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

PROPOSED  
LAYOUT

STA. 20+00 TO STA. 32+00  
SCALE: 1" = 50'

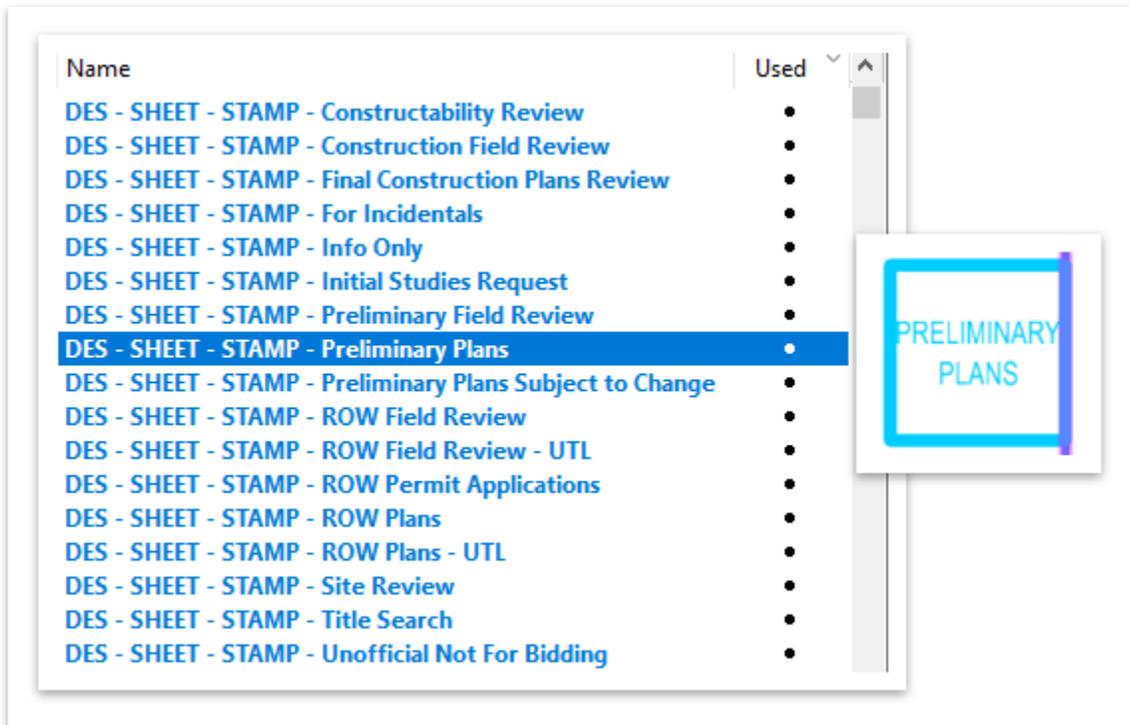
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

PROPOSED  
LAYOUT

STA. 32+00 TO STA. 44+00  
SCALE: 1" = 50'



26. Let's now look at the phase stamps, which have all been built into the sheet seed. For this exercise, let's use **Preliminary Plans**. Simply turn off all **DES - SHEET - STAMP** levels except the one with Preliminary Plans, as shown below.

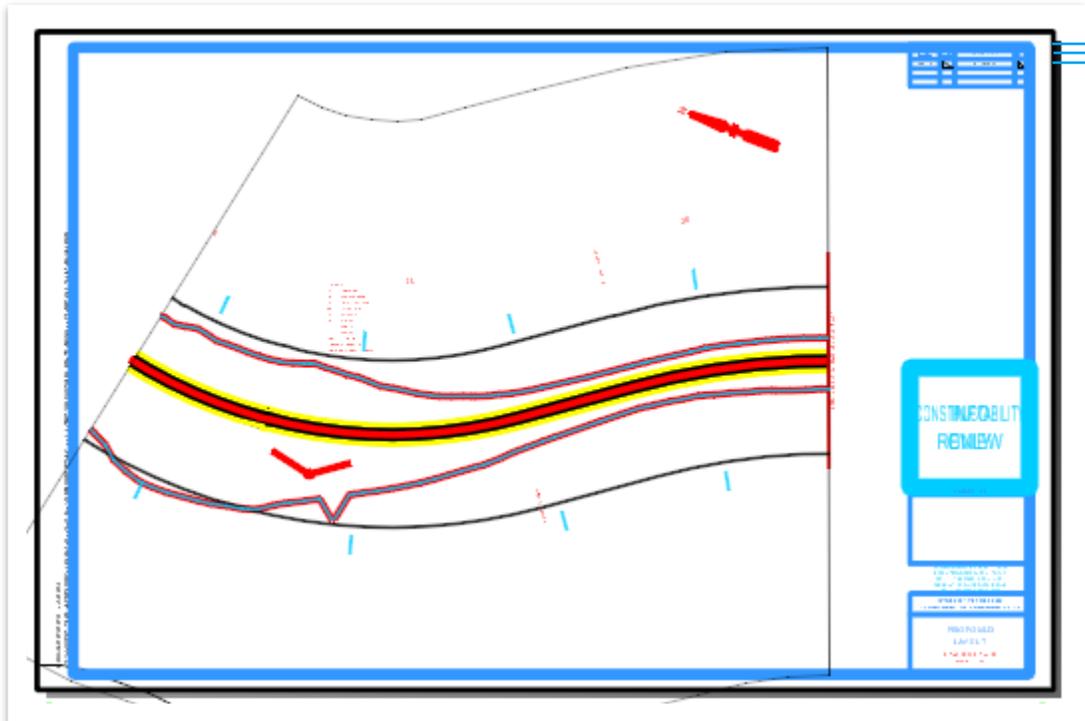


27. Next, zoom into the matchlines and notice that all the data automatically populated.





28. The final plan sheet should look like this. You may not have the seal box level turned on. You could also turn off the corridor if so desired. The black clip shape is setup not to print once the PDF is created.



29. The **date** and **time stamp** in the bottom left corner will not populate until the PDF is created. This will be discussed later in the class. The file path stamp should automatically be updated in each sheet file.

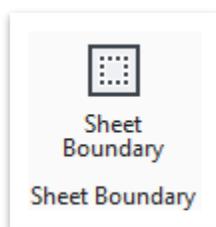


## 10.6 Lecture: Named Boundary & Sheet Border Adjustments

In some cases, after creating the sheet and drawing models, you may notice that the clip shape for a given sheet extends beyond the sheet border. The sheet seeds are setup with a default horizontal and vertical extent depending on the scale. The following are ways that you can get the clip shape within the sheet border:

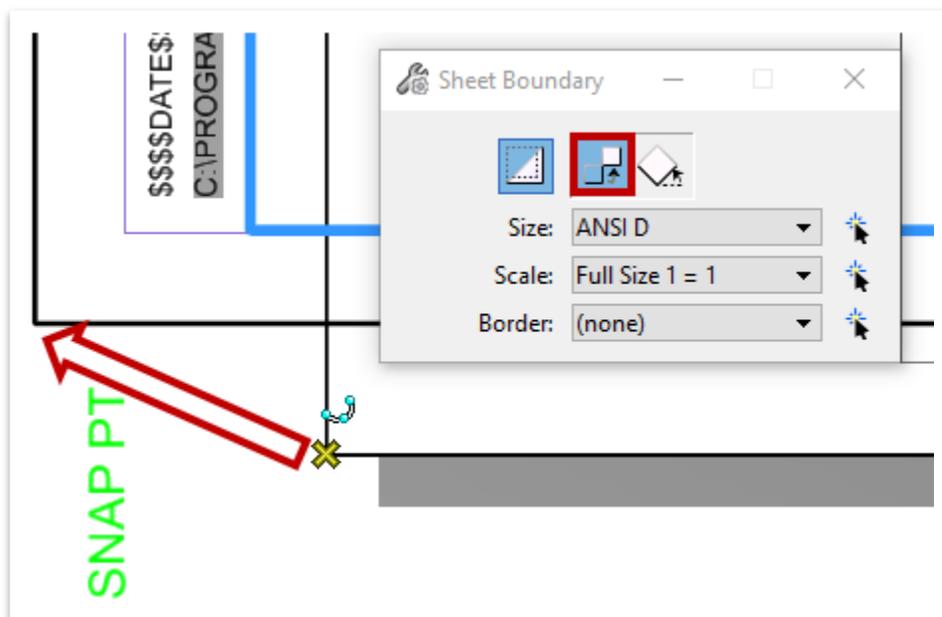
- **If the clip shape overhangs the sheet border but can easily fit within the sheet:** Within the sheet model, turn off all reference files, highlight everything in the live sheet model, turn back on the reference files and move the sheet border accordingly using the basic **Move** tool. You will also need to move the **Sheet Boundary** by opening the tool located here: **Drawing >> View >> Sheet Boundary** (Figure 106).

FIGURE 106. SHEET BOUNDARY TOOL



Once opened, make sure the **Move** icon is toggled on within the dialog box (highlighted in red) and left click the sheet boundary and snap to the bottom left yellow corner of the sheet border (Figure 107).

FIGURE 107. SHEET BOUNDARY DIALOG BOX





- **If the clip shape overhangs the sheet border but cannot easily fit within the sheet:** If this only applies to a single sheet AND is only a vertical issue, then you could manually adjust the clip shape in the **Default** model and that would fix the problem. There is no way to reference the sheet border automatically in the Default model so you would need to draw a shape to represent the extent.

The automatic method is to re-create the named boundary and adjust the horizontal and/or vertical dimensions within the **Place Named Boundary** dialog box (Figure 108). First, delete the clip shapes starting with the one of concern, as well as the applicable sheet and drawing models, because all clip shapes thereafter will need to be re-cut. If the issue only applies to one sheet, you can place one named boundary keying in a specific station range and then open the tool again and use the default settings to place the remaining sheets. It will be a bit of an iterative process but will allow the match lines to line up correctly.

FIGURE 108. PLACE NAMED BOUNDARY HORIZONTAL/VERTICAL DIMENSIONS

Length:	1200.000000	
Left Offset:	-524.000000	
Right Offset:	524.000000	



## Chapter 11. 1:1 Sheets



All sheets that are not plan, profile or cross-section sheets will be created using the methods discussed in this chapter. As a reminder, the 1:1 sheets seeds that have been set up are listed in Chapter 2.

**Note:** Within the sheet seed folder, The Seed2D Imperial Drawing and Seed 2D Imperial Sheet DGN files must stay in the folder for other ORD purposes.

### 11.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Understand 1:1 Roadway sheet seed files.
2. Create a title sheet, an estimated roadway quantities sheet, a general notes sheet, a typical section sheet and a signature sheet.

### 11.2 Lecture: Title Sheet

The creation of all Preliminary, ROW, Construction and Resurfacing title sheets will utilize the **Roadway Title Sheet** seed file. The seed has all text embedded other than the Begin and End labels, which are intelligent labels. The applicable level filter must also be applied. The county map, as well as the geometry file, are true scale and will be referenced in at **1:1**. Because the all seed files are true paper size (**34"x22"**), it will require the user to scale up the Roadway Title sheet seed once the file is created. Suggested scales:

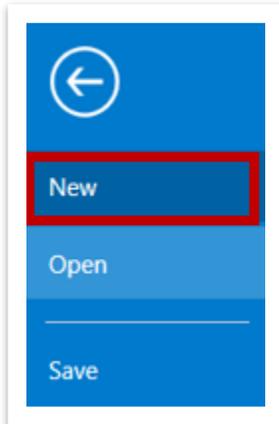
- For projects less than 2 miles: **1" = 2640' (1/2 mile) scale**
- For projects over 2 miles: **1" = 5280' (1 mile) scale**

It is also important to understand how the data fields are setup in the Title Sheet. Those fields highlighted on the next page in red (Figure 109) are controlled by the sheet index properties and were keyed in in Chapter 10. Any data field not highlighted is either a manual entry or already controlled by levels.





- Click on **New**, which will open another window where you will name the file and select the seed.



- In the File name field, type in **Title Sheet**.

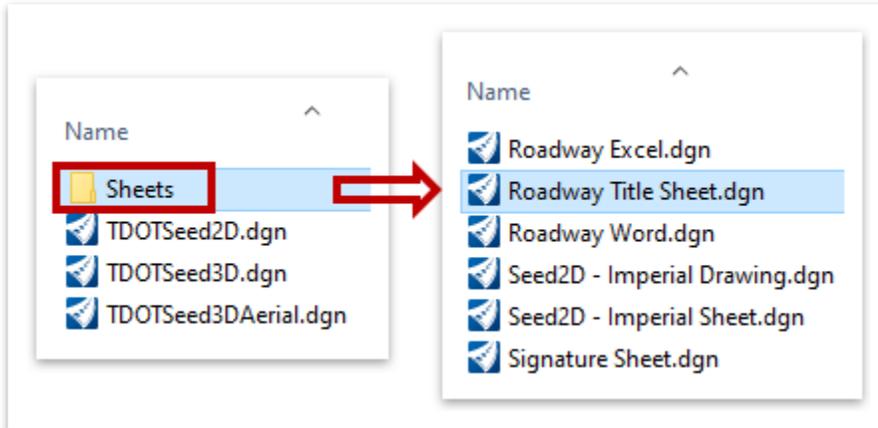
File name:	<input type="text" value="Title Sheet"/>	<input type="button" value="Save"/>
Save as type:	<input type="text" value="MicroStation DGN Files (*.dgn)"/>	<input type="button" value="Cancel"/>
Seed:	<input type="text" value="C:\ProgramData\Bentley\OpenRoads Designer CE\Co"/>	<input type="button" value="Browse"/>

- To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.

File name:	<input type="text" value="Title Sheet"/>	<input type="button" value="Save"/>
Save as type:	<input type="text" value="MicroStation DGN Files (*.dgn)"/>	<input type="button" value="Cancel"/>
Seed:	<input type="text" value="C:\ProgramData\Bentley\OpenRoads Designer CE\Co"/>	<input type="button" value="Browse"/>



- Click on the Sheets folder. Select the **Roadway Title Sheet.dgn** seed file and click **Open**.



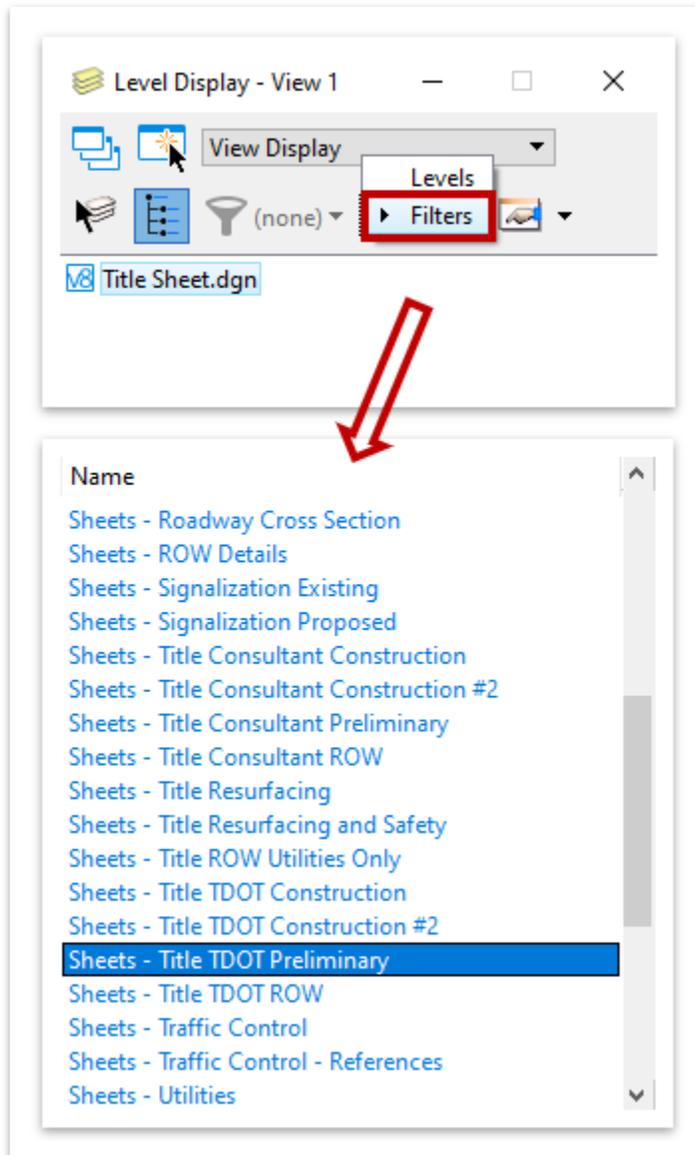
- Notice that by default, the Title Sheet file you just created will be saved in the DGN folder under the 123456.00\_INITIALS workset.

 New - C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\

- Click **Save** and the file will open. Notice that there is overlapping text. We will take care of that in the coming steps thru the level manager.

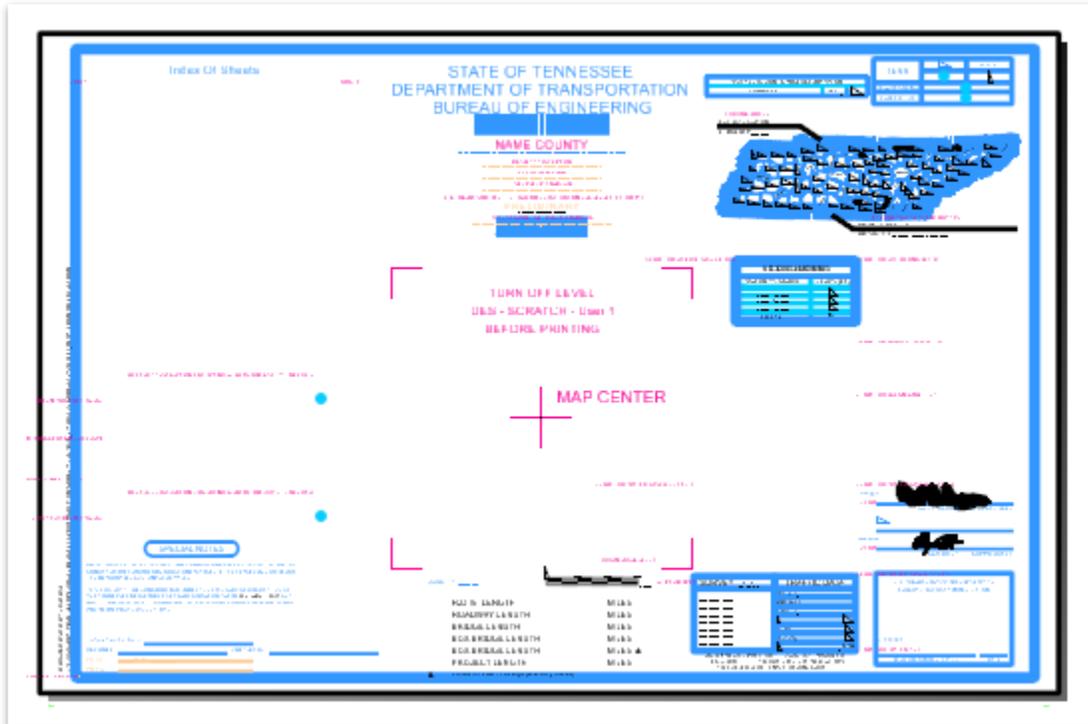


9. For this exercise, we will apply the **Sheets - Title TDOT Preliminary** level filter to turn off the levels that do not apply. Open the **Level Display** window (**Preliminary >> Home >> Primary**) and select the filter.

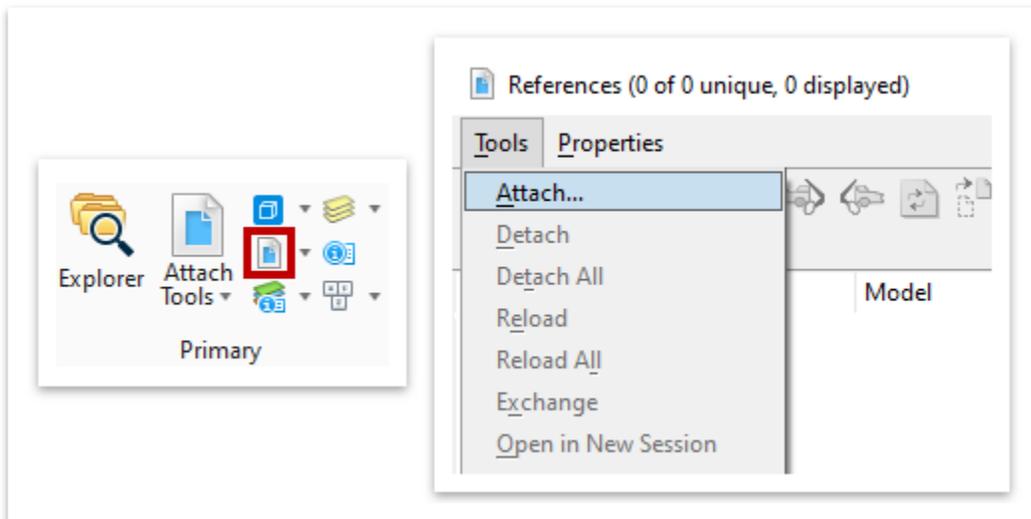




10. Notice all levels other than those needed for a **Preliminary** title sheet are turned off.

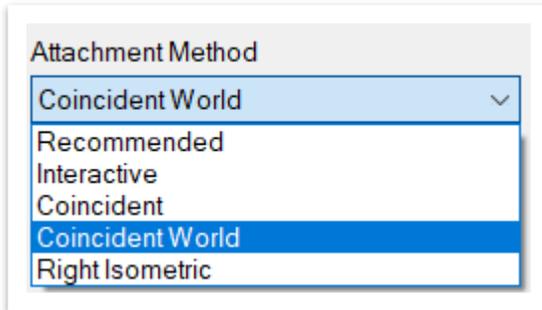


11. Attach the **Fundamentals Reference.dgn** file. By default, it should open to the dgn folder in the 123456.00\_INITIALS workset (C:\ProgramData\Bentley\Open Roads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\). This will allow us to place the Begin/End labels accurately later in this exercise.

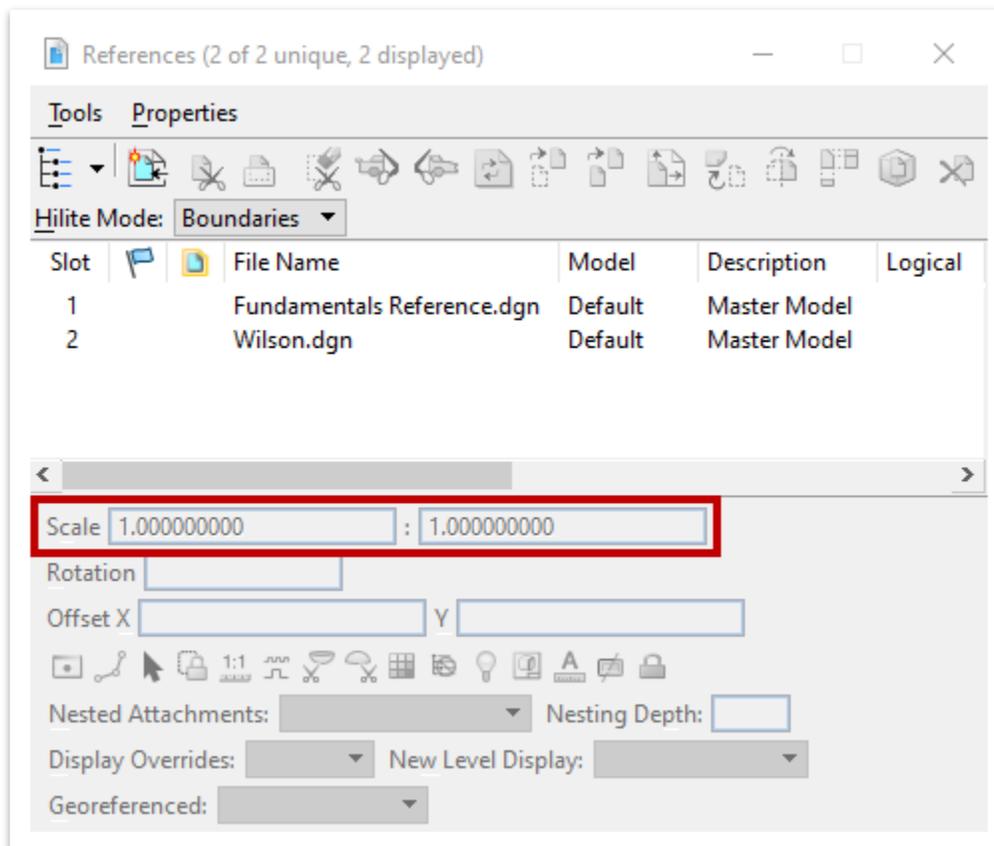




12. Make sure that the Attachment Method is **Coincident World**.

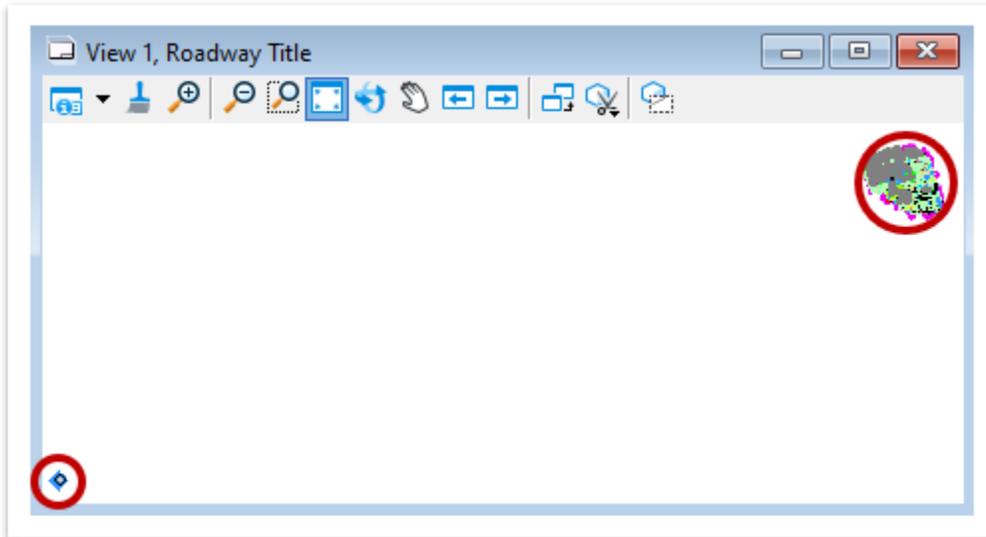


13. Reference the county map to the new title sheet. Again, select **Attach** in the Reference window. Select the **Wilson.dgn** file and **Coincident World** as the Attachment Method. The file path is the same as Step 13. Make sure the scale is **1:1**.

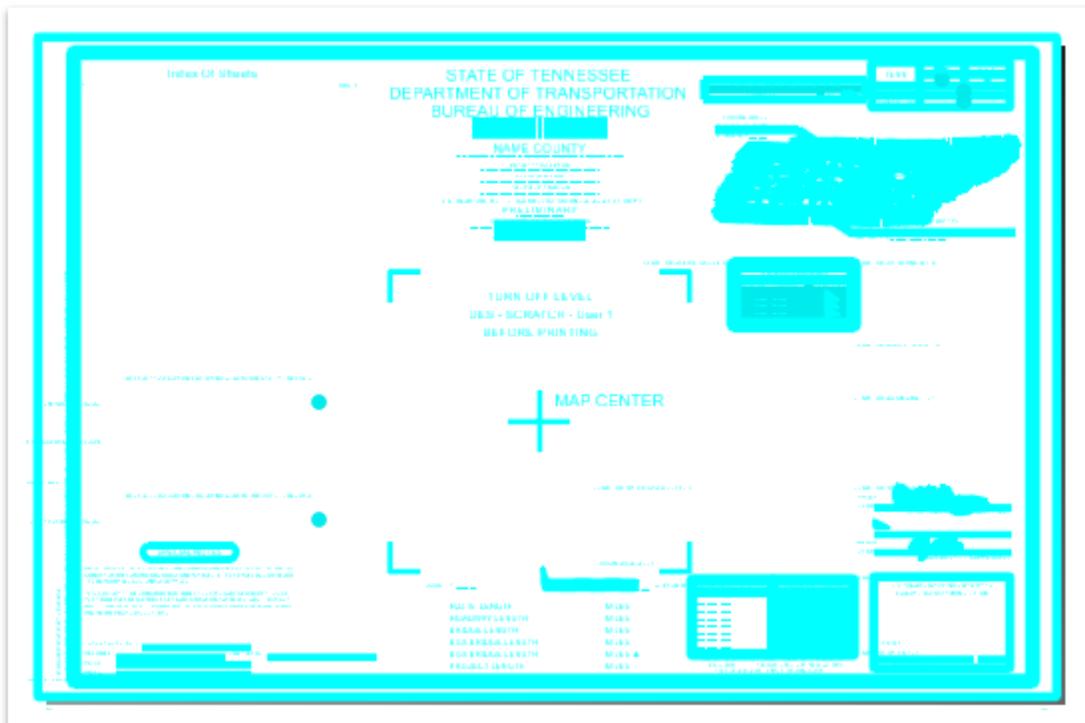




14. Click **Fit View** to see where the 2 reference files came in relative to the Title Sheet.

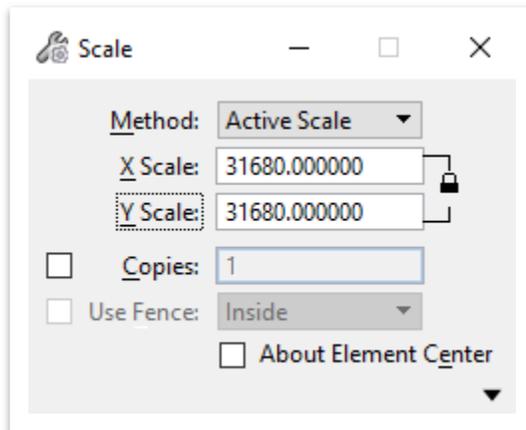


15. Since the title sheet seed is 1:1, it will need to be scaled up and moved to the location of the project geometry. ORD has been configured to label the title sheet for two different sizes: **1" = 1/2 mile (Half)** and **1" = 1 mile (Full)**. Since the example project is approximately 3400' in length, the **Half** scale will be used. First, zoom back in and select the whole title sheet. You can do this by using the **Element Selection** tool and drawing a box around the Title Sheet to highlight it.

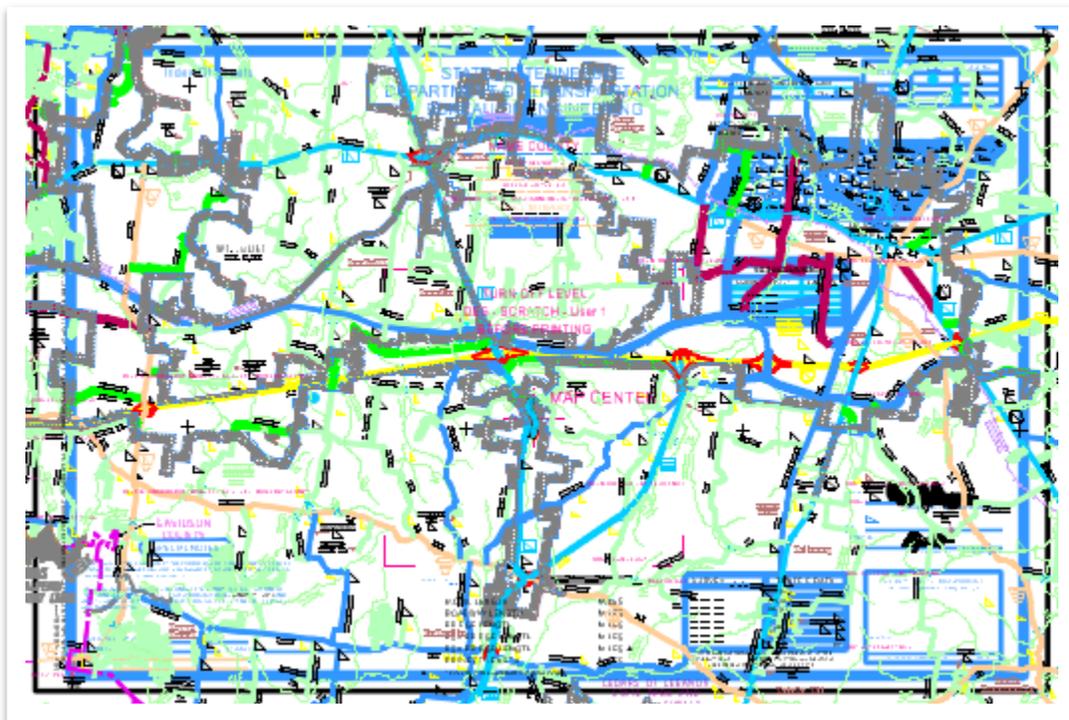




16. Open the **Scale** tool (**Drawing >> Home >> Manipulate**) and key-in **31,680** ( $12 * 2640$ ) as the X Scale. The Y Scale will automatically update if the lock symbol on the right is on. **Note:** If the title sheet map was to be 1" = 1 mile, you would use a scale of 1:63,360. Follow the prompt in the bottom left of the ORD interface and left click to accept the origin point that you choose (e.g. you can choose the bottom left corner as your snap point to accept).

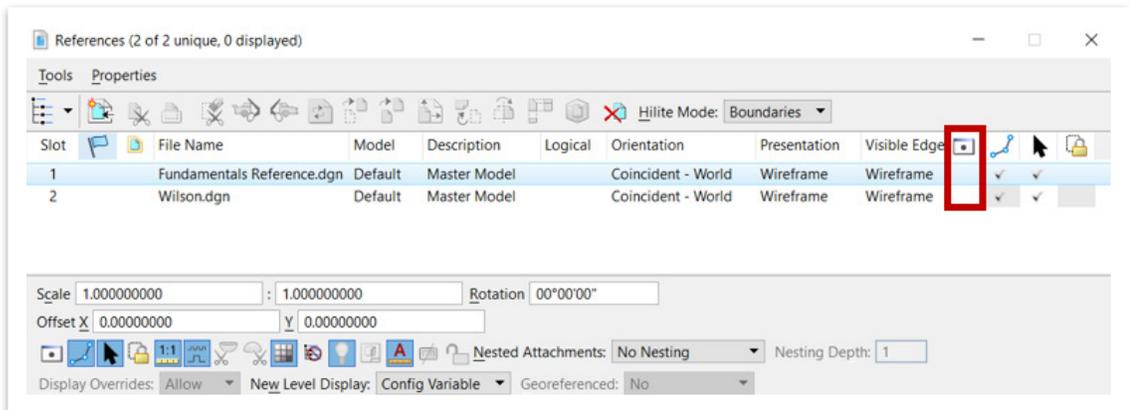


17. Now that the title sheet is scaled, open the **Move** tool (**Drawing >> Home Manipulate**). Make sure the entire title sheet is selected like in Step 15. Snap to the Map Center and move the title sheet over the referenced files to center the geometry in the Map box. **Note:** You may need to click **Fit View** to visually see where the 2 reference files are located out in space. **Left** click to accept the move.

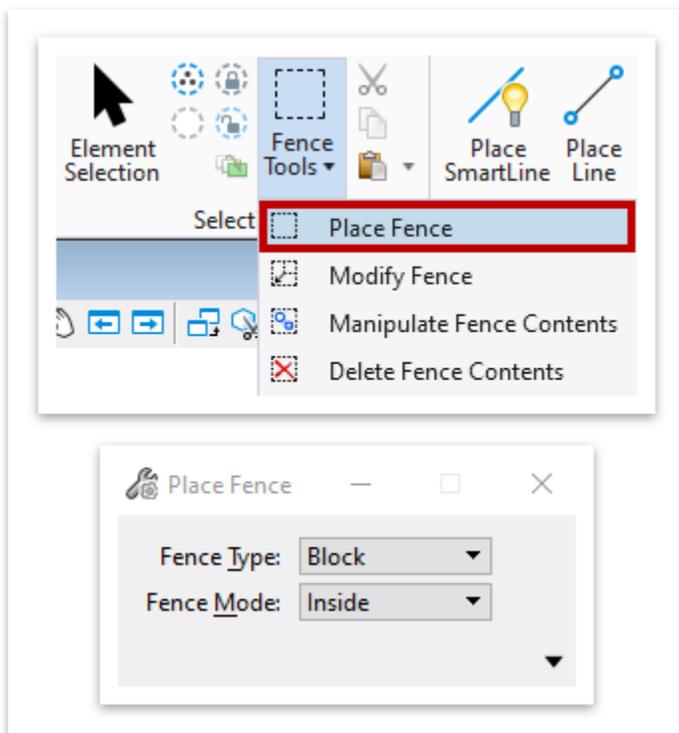




18. Turn off both reference files (uncheck like shown) so it is easier to see (**Drawing >> Home >> Primary**).

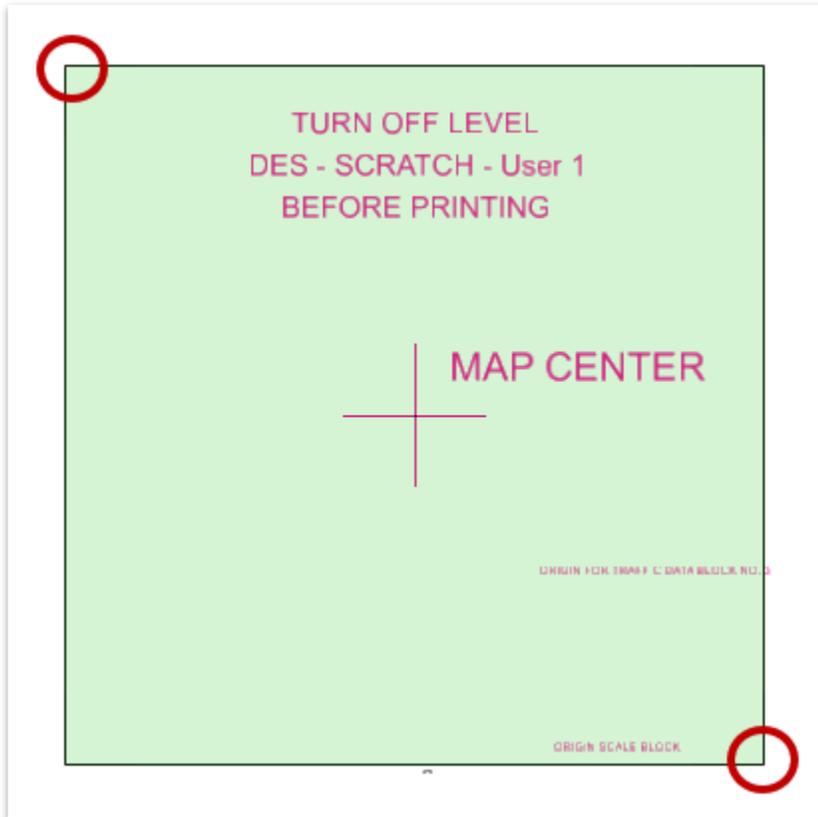


19. Next, select the **Place Fence** tool (**Drawing >> Home >> Selection**).



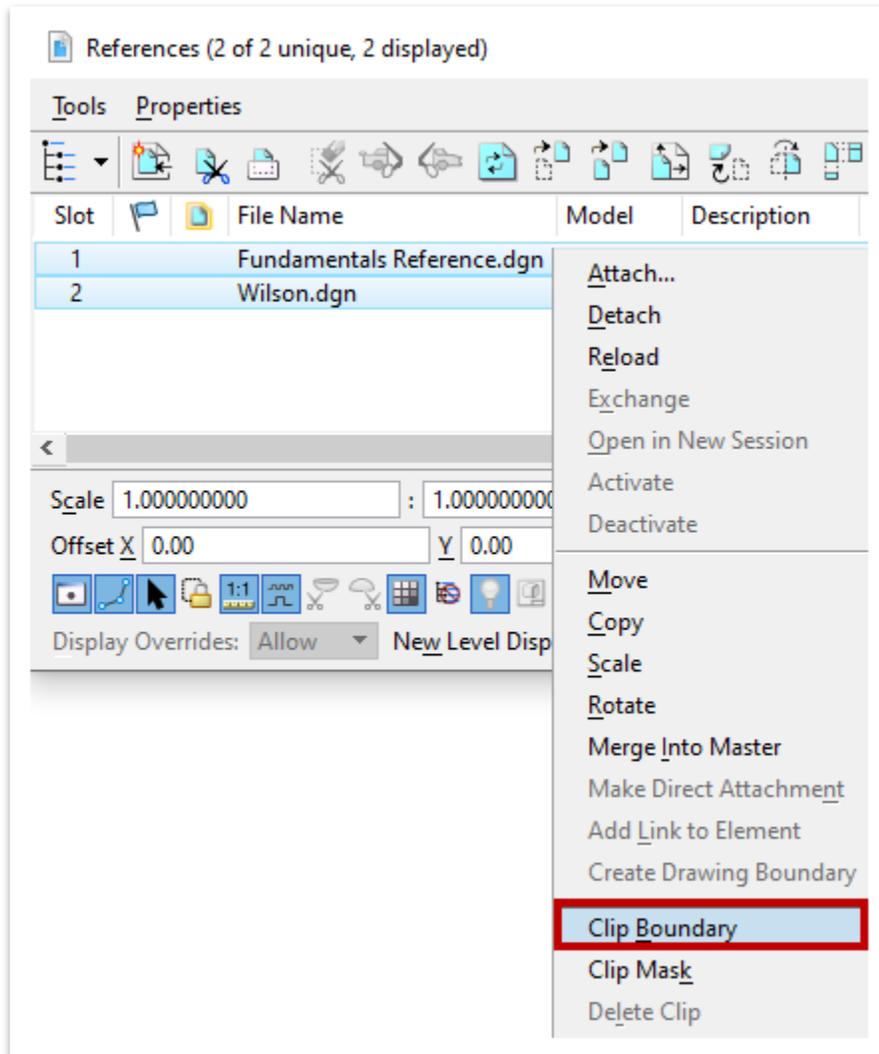


20. Draw a fence around the pink Map border. Snap to the upper left corner and then the lower right corner to draw the square fence. You will notice a green shaded box indicating the extents of the fence.



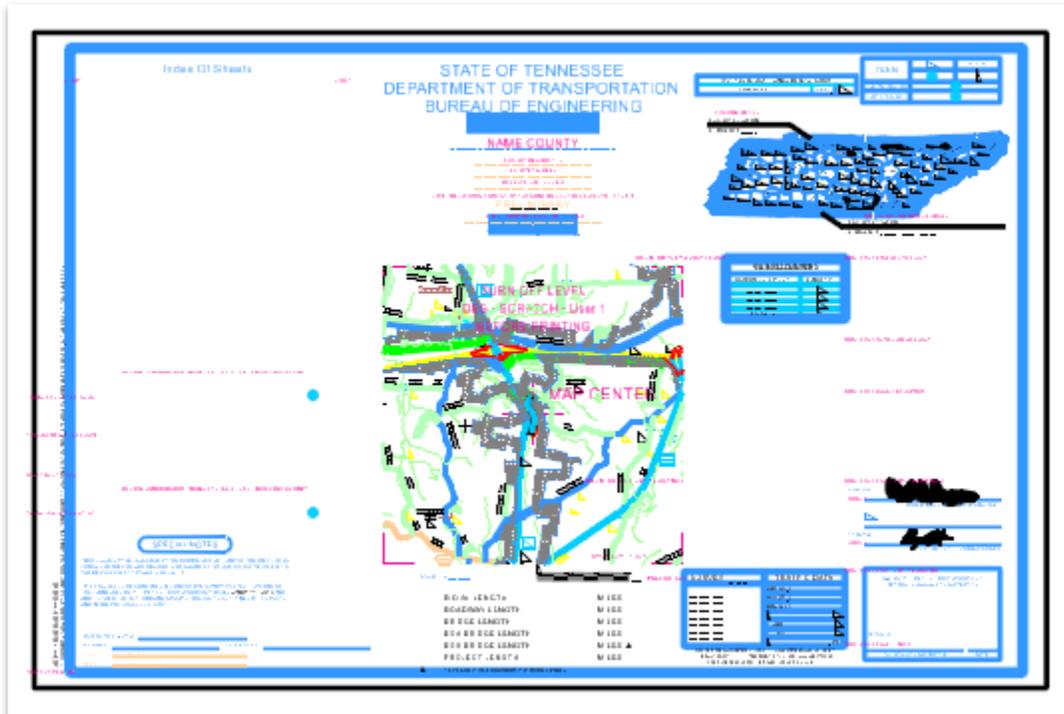


21. Now open back up the reference window (if not still open). Turn back on the reference files. We now need to clip both references to the fence extents that were created in the previous step. Highlight both reference files and **Right** click. Select the **Clip Boundary** option.

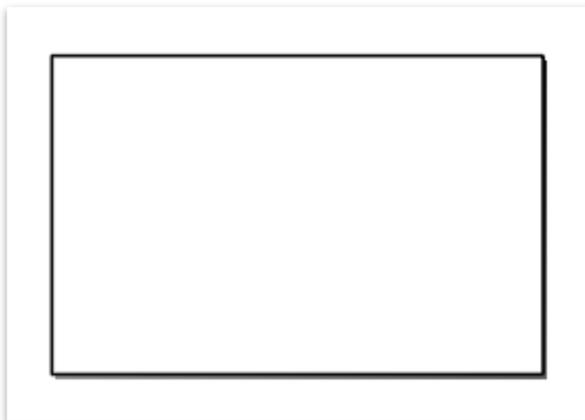




22. Everything in the reference file will then turn purple. Make sure the Method is set to: **Active Fence**. Click anywhere on the screen to accept the clipping. Click once more to get rid of the green shaded clip extent. Notice everything outside of the square disappeared.

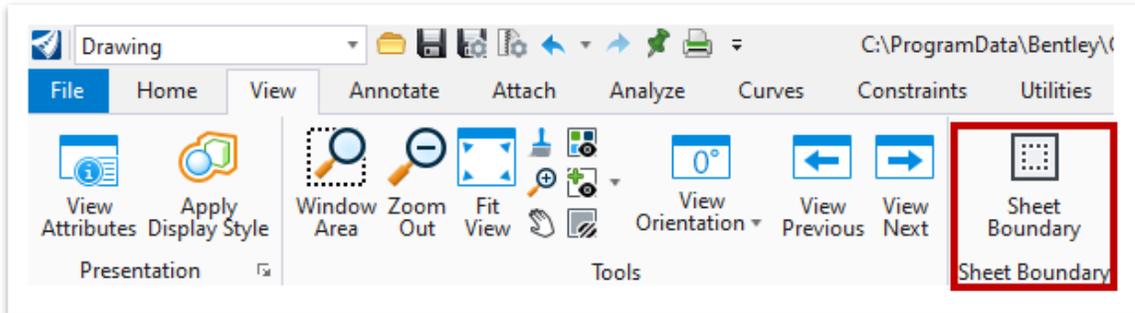


23. In ORD, there is a **Sheet Boundary** attached to all sheet seeds, which is necessary for them to print correctly. (Click **Fit View** to find the sheet boundary. It will be in the same location as the initial Title Sheet location before it was scaled and moved.)

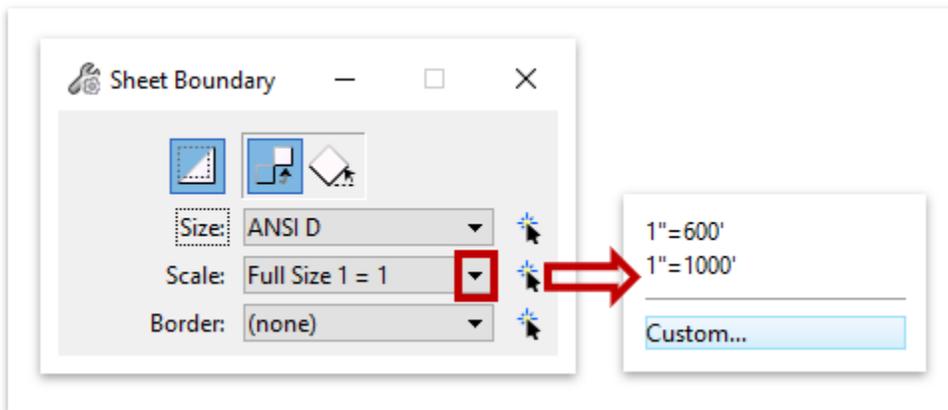




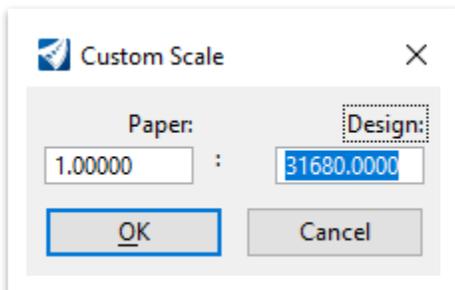
24. We must now scale and move the sheet boundary to be in line with the Title Sheet seen in Step 23. Open the **Sheet Boundary** tool (**Drawing >> View >> Sheet Boundary**).



25. Expand the **Scale** option and select **Custom**.

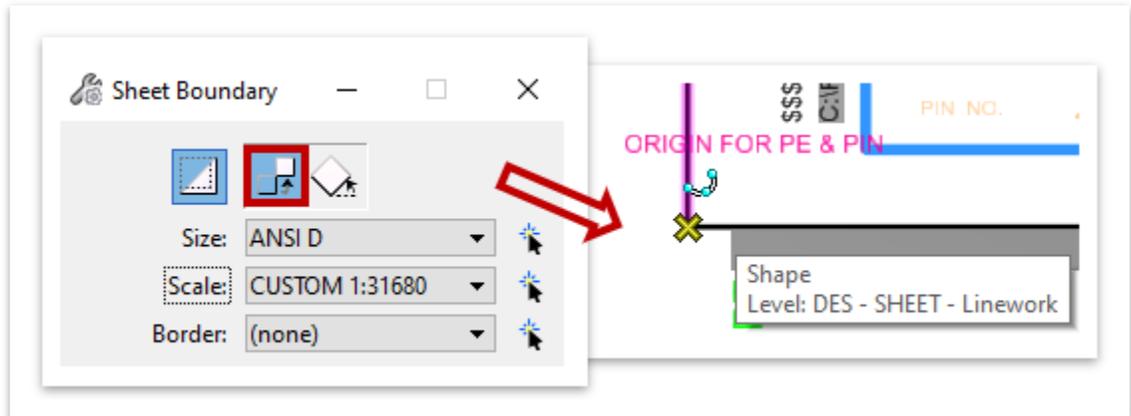


26. Change the scale to the same scale that the title sheet was changed to which is **31,680**, and then click **OK**. Notice the sheet boundary size updates.





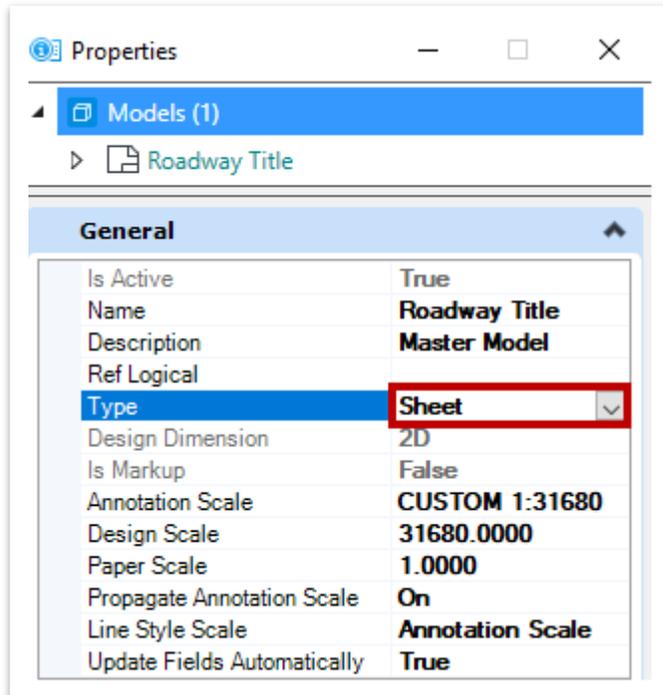
27. Click on the Sheet Boundary **Move** tool so we can move it to the border of the title sheet. Snap to the lower left corner of the sheet boundary. If you still see the original sheet boundary size on your cursor, clear the tool and then click on the Move tool again. You want to make sure you are moving the correct size sheet boundary to avoid any scaling issues later. Then snap to the lower left corner of the Title Sheet, as shown below. **Left** click to accept and then **Right** click to clear.



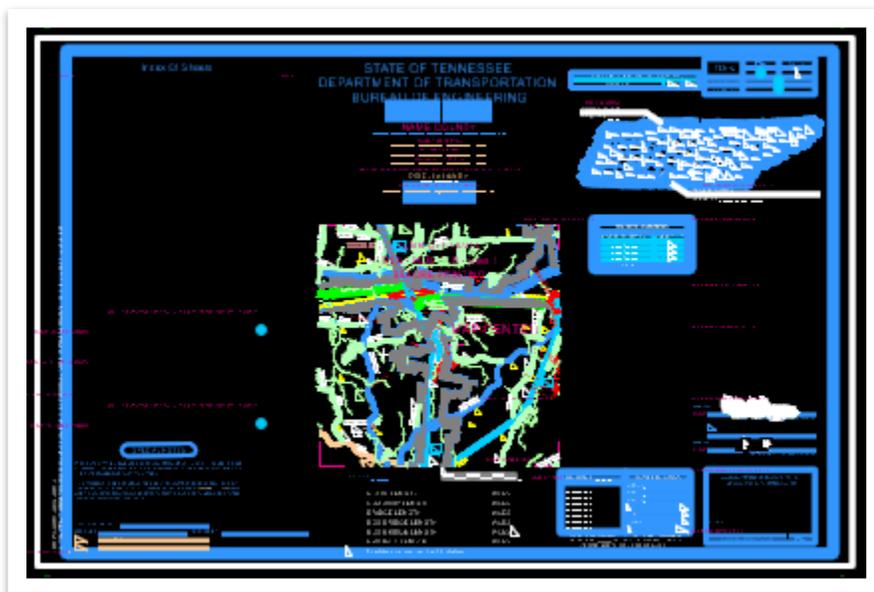
28. We now need to add the **Begin** and **End Project Preliminary** labels. Remember, these are the only labels you need to add because all other labels are embedded in the title sheet.



29. Before we can add any labels, we must change the model from **Sheet** to **Design**. No labels can be placed in the sheet model. Open the **model** window (**Drawing >> Home >> Primary**). Within the model window, right click on the **Roadway Title** model and select **Properties** if you did not already have the properties window open. **Note:** Your annotation and design scales should reflect the 31,680 scaling.

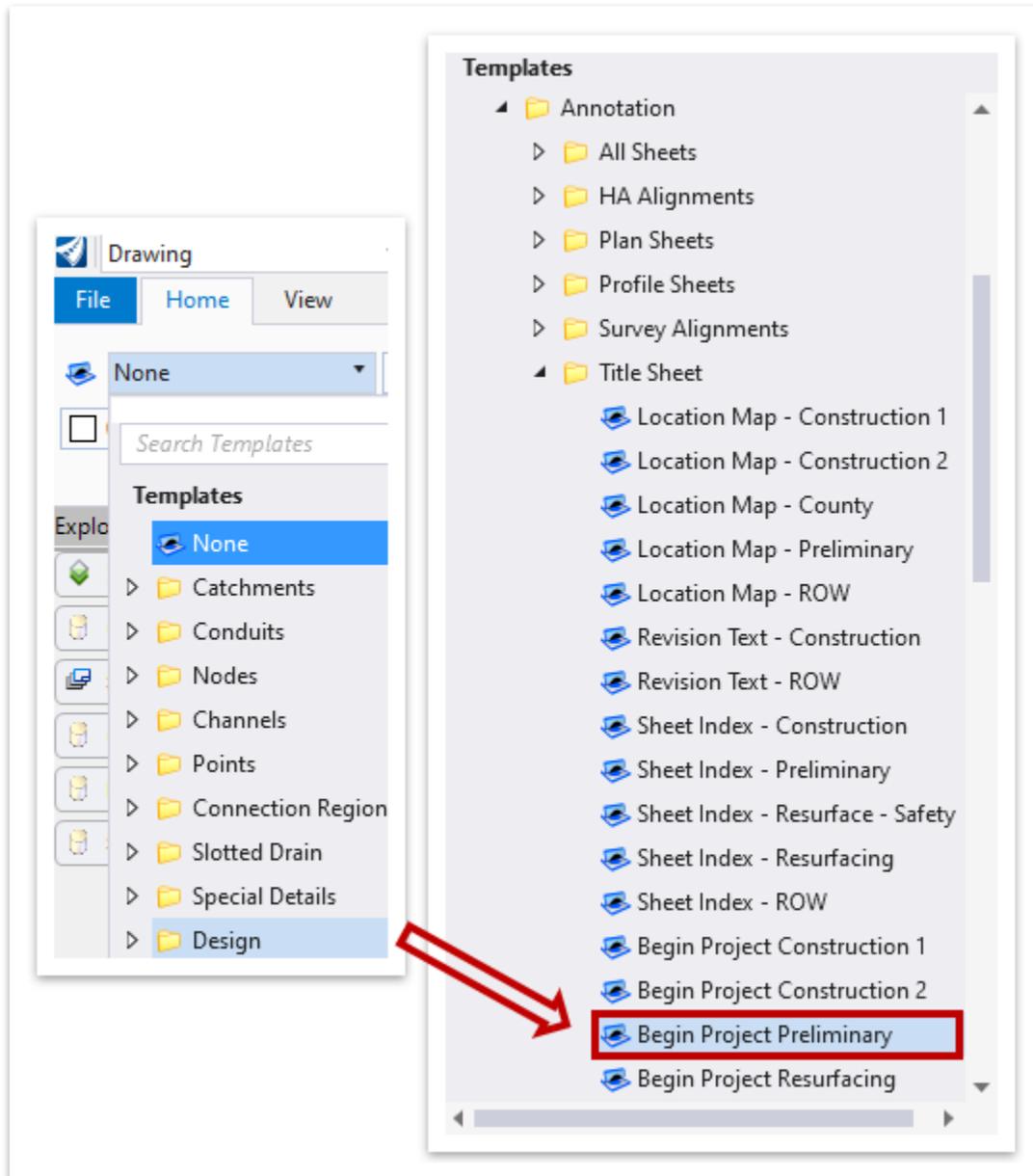


30. Notice the design model has a black background.



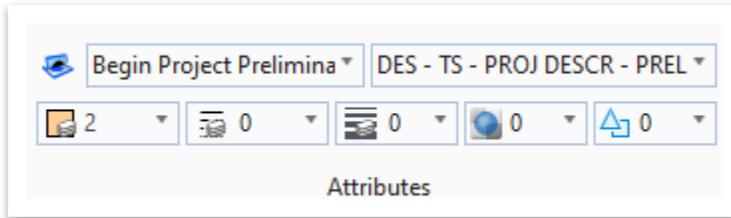


31. Next, go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Begin Project Preliminary** element template so the labels will have the correct symbology (**Design >> Annotation >> Title Sheet**).

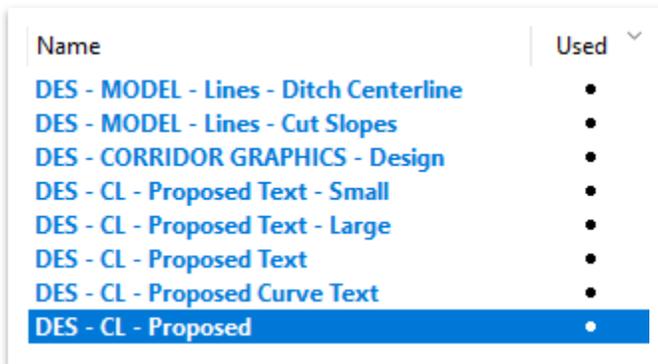




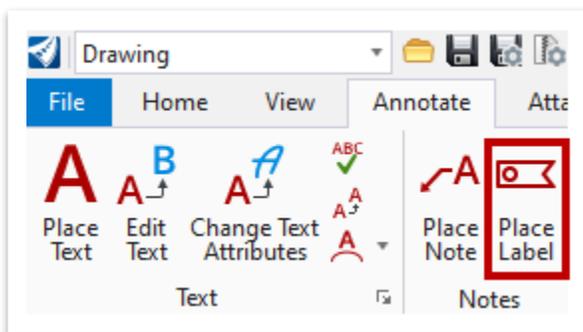
32. Notice that the symbology updated.



33. Before we place the label, turn off all levels in the **Fundamentals Reference.dgn** file except **DES - CL - Proposed**. This will make it easier to snap to the begin and end points.



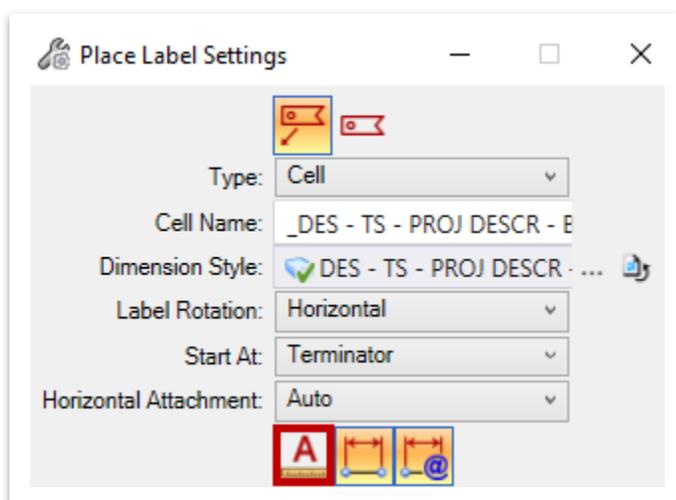
34. Now, open the **Place Label** tool (**Drawing >> Annotate >> Notes**) to place the **Begin Preliminary** label.



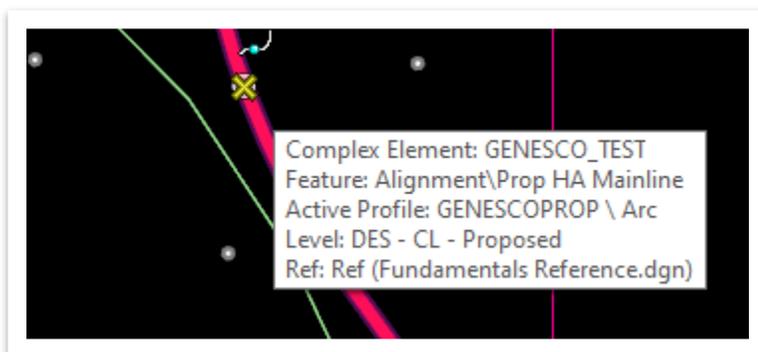


35. Select the following settings for the label. **Note:** The indication of **Less than 2 Miles** in both the cell name and dimension style indicates a **1" = 1/2 mile** title sheet.

- **Type:** Cell
- **Cell Name:** \_DES - TS - PROJ DESCR - Begin - PRELIM - Proj Less Than 2 Miles
- **Dimension Style:** DES - TS - PROJ DESCR - Project Length < 2 Miles
- **Label Rotation:** Horizontal
- **Start At:** Terminator
- **Horizontal Attachment:** Auto
- Make sure the Annotation Scale (highlighted in red) is toggled **OFF**.

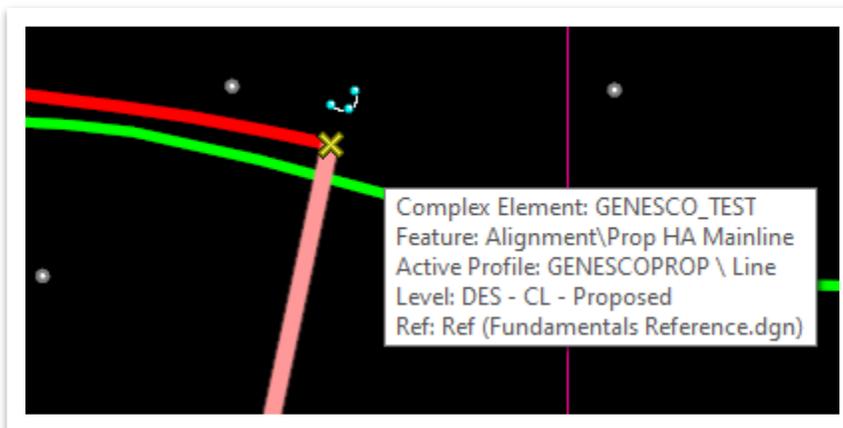
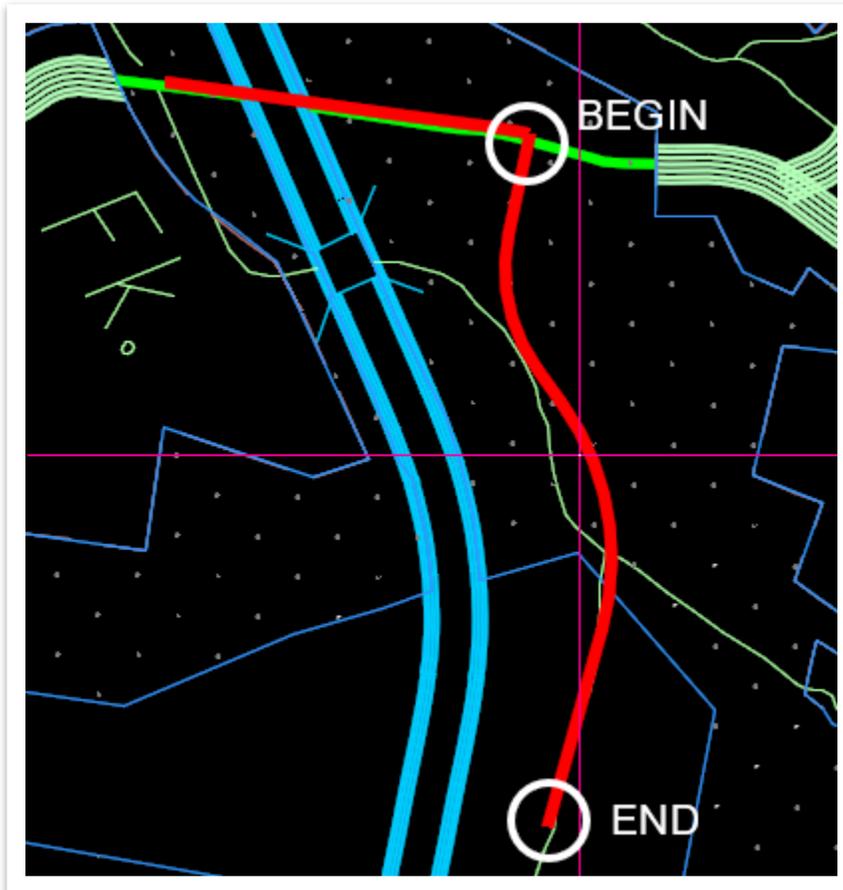


36. To place the label, zoom in and first **Identify Element (GENESCO\_TEST centerline)**. **Left** click to select. Make sure to select the entire complex element and not just a segment. The whole alignment should be highlighted otherwise your stationing will not be correct. Pay attention to the prompts in the lower left of the ORD interface. **Note:** You may turn the **Wilson.dgn** reference file off temporarily for clarity, if necessary.





37. Then **Left** click again on the **Beginning** point of the alignment. The first image is a begin/end project reference.





38. Now place the label on the left side of the map by snapping to the **upper** blue dot above the Special Notes. Notice the stationing, route name and northing and easting should display. The State and Federal project numbers will not populate until the sheet is added to the index. We will do that at the end of the exercise. **Note:** The grey boxes were turned on below in **User Preferences** under (**Text >> Hide Field Background**). It is simply a visual representation of any annotation fields that are linked. The boxes do not print.

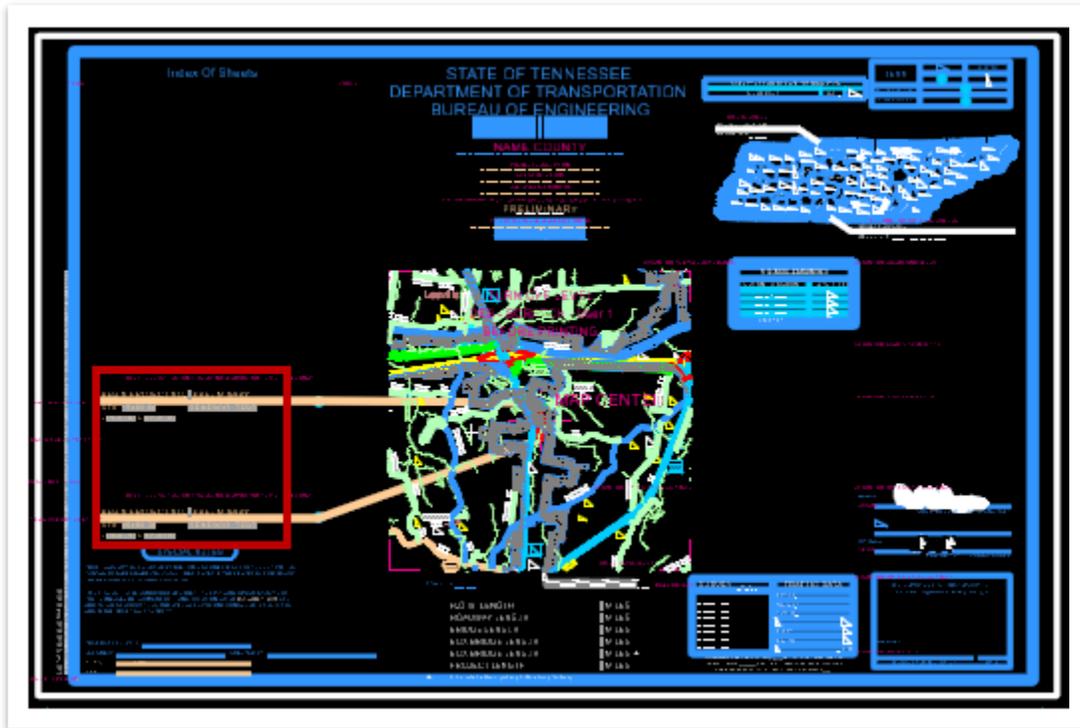


39. Repeat steps **31-38** to place the **End Preliminary** label. This time select the Element Template: **End Project Preliminary** and when placing the label, select **Cell Name:** `_DES - TS - PROJ DESCR - End - PRELIM - Proj Less Than 2 Miles`. Snap to the **lower** blue dot above the Special Notes.

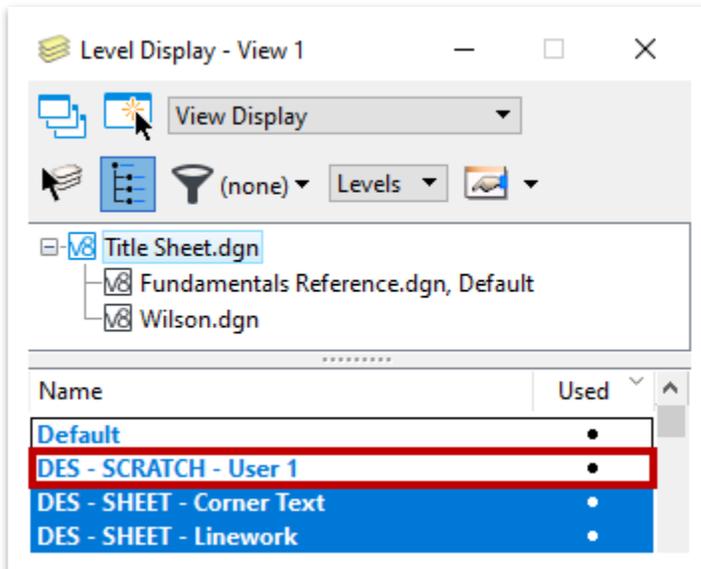




40. You should now have 2 tan colored Begin/End labels.

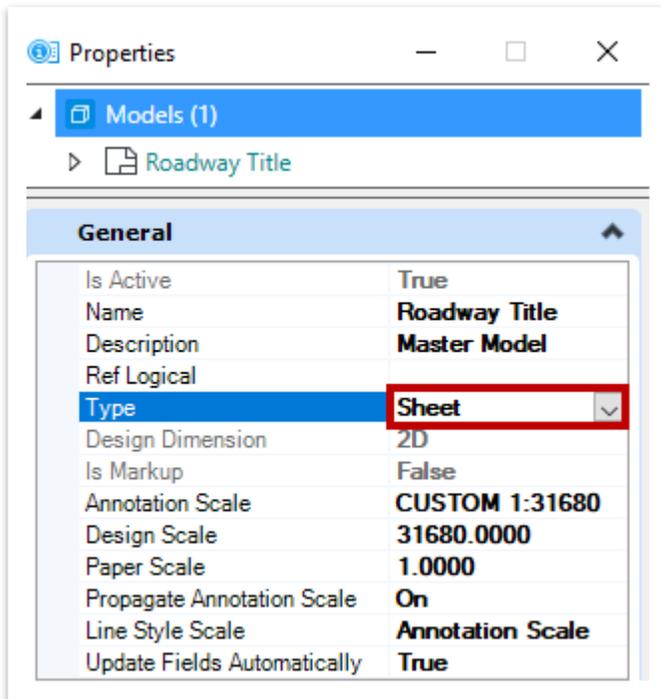


41. Turn off the **DES - SCRATCH - User 1** level (**Drawing >> Home >> Primary**).



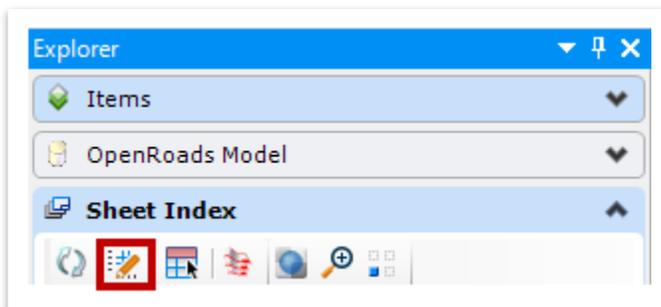


42. Now switch the Model Type back to **Sheet**.



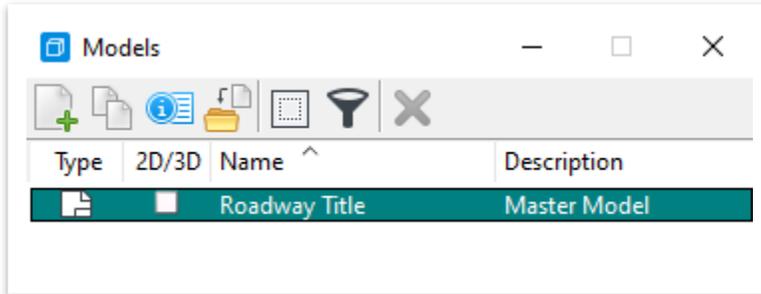
43. The next step is to add the Title Sheet to the sheet index for the **123456.00\_INITIALS** project workset. There are **2** ways this can be done (Add Sheet option or drag the sheet model into the index). We will use the method of **dragging the sheet model into the index** in this exercise.

44. Open the Sheet Index for editing if not already open.

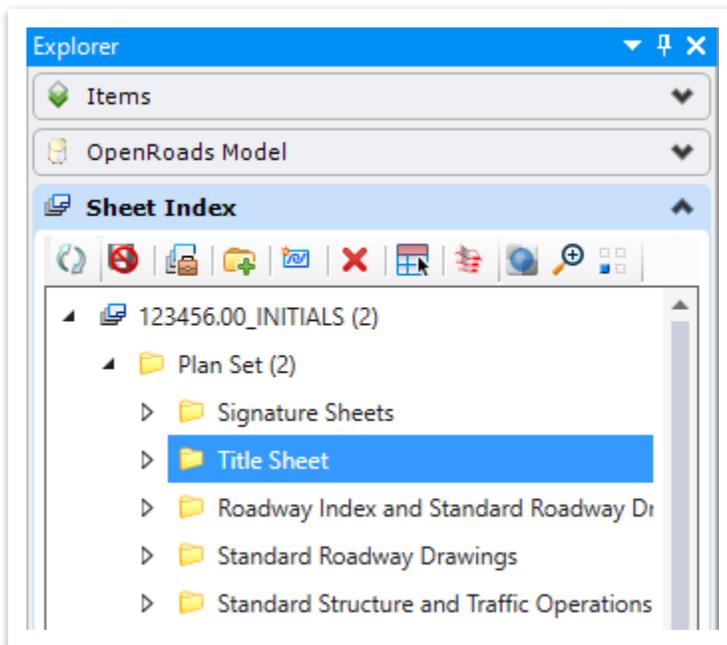




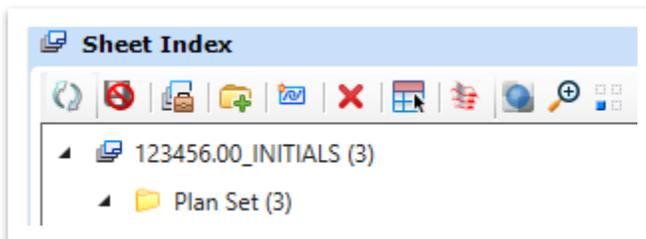
45. Open the **Models** window (**Drawing >> Home >> Primary**) and highlight the **Roadway Title** model.



46. Once the **Roadway Title** model is highlighted, hold the left mouse button down and drag the model into the **Title Sheet** folder in the sheet index (**Plan Set >> Title Sheet**).

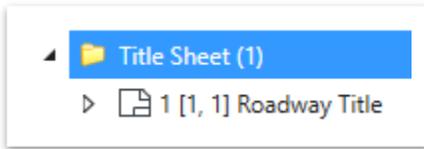


47. Notice that the sheet index now has 3 files in it: **123456.00\_INITIALS (3)**.



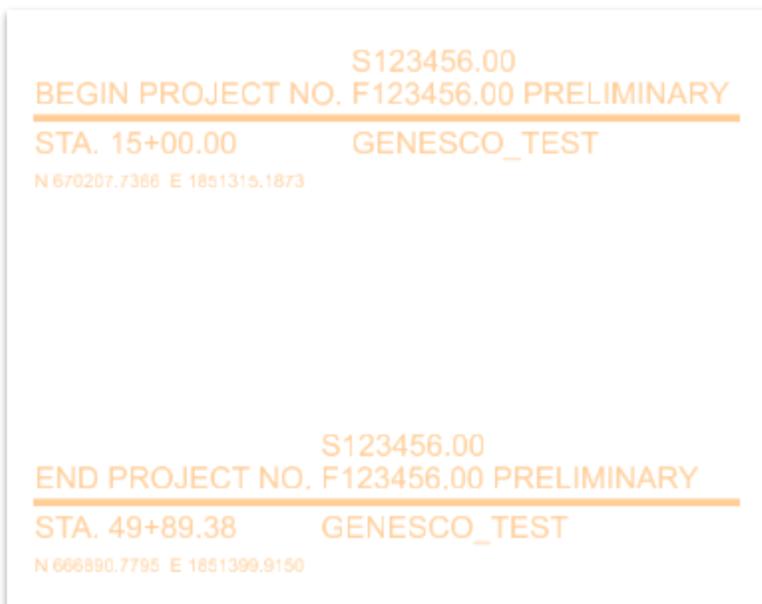


48. Notice you will now see the sheet in the sheet index under Title Sheet.



49. By adding the Title Sheet into the index, all the automatic Labels that we filled in at the beginning of Chapter 10 are linked. **Note:** If necessary, close out of the **Title Sheet.dgn** file and re-open.

50. Notice that the **State** and **Federal** project numbers populated within the **Begin/End** labels. Also, the upper right corner of the sheet automatically populated. **Note:** The grey boxes have now been turned off.



TENN.	YEAR	SHEET NO.
	2020	1
FED. AID PROJ. NO.	F123456.00	
STATE PROJ. NO.	S123456.00	

51. For this exercise, not all fields were filled in (e.g. Designer, L.M., R.O.W. Length, etc). Those would also populate automatically.



## 11.4 Lecture: Excel Based Sheets

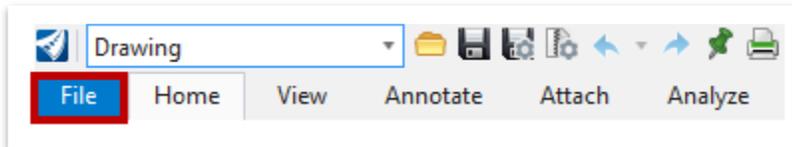
The creation of all project sheets that are solely based on a **linked** excel document will utilize the **Roadway Excel** seed file and be created in the same manner. The only difference between these sheets will be the **snap points** and the **folder location** that each sheet is placed within the sheet index. The sheets that fall under this category are:

- **Estimated Roadway Quantities**
- **Tabulated Quantities**
- **ROW Acquisition Table**

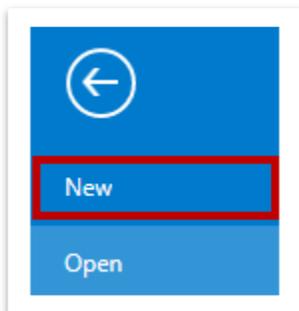
## 11.5 Exercise: Create an Estimated Roadway Quantities Sheet



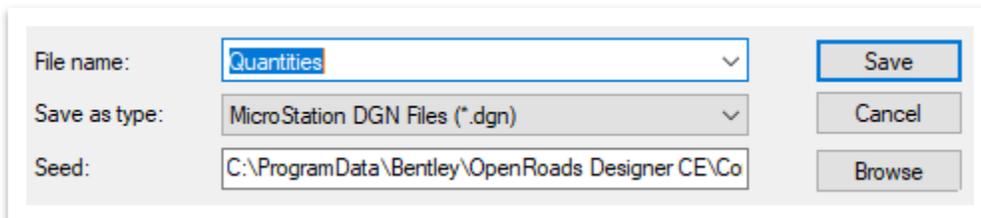
1. Click on **File** in the upper left corner.



2. Click on **New**, which will open another window where you will name the file and select the seed.



3. In the File name field, type in **Quantities**.





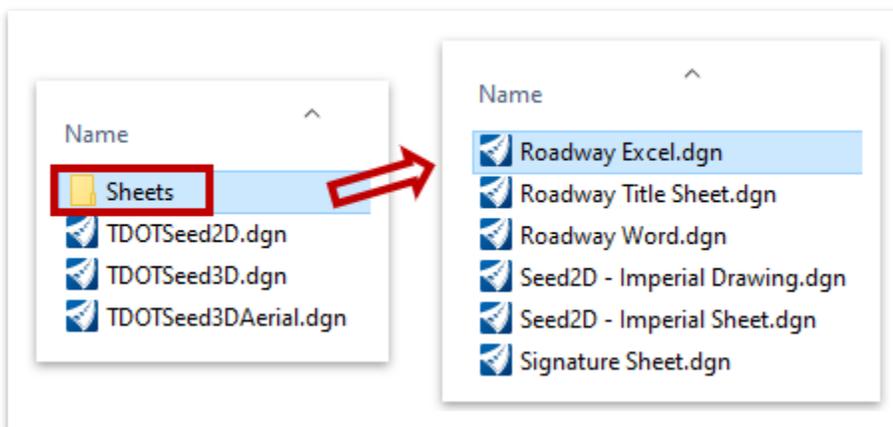
- To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.

File name:  Save

Save as type:  Cancel

Seed:  **Browse**

- Click on the Sheets folder. Select the **Roadway Excel.dgn** seed file and click **Open**.

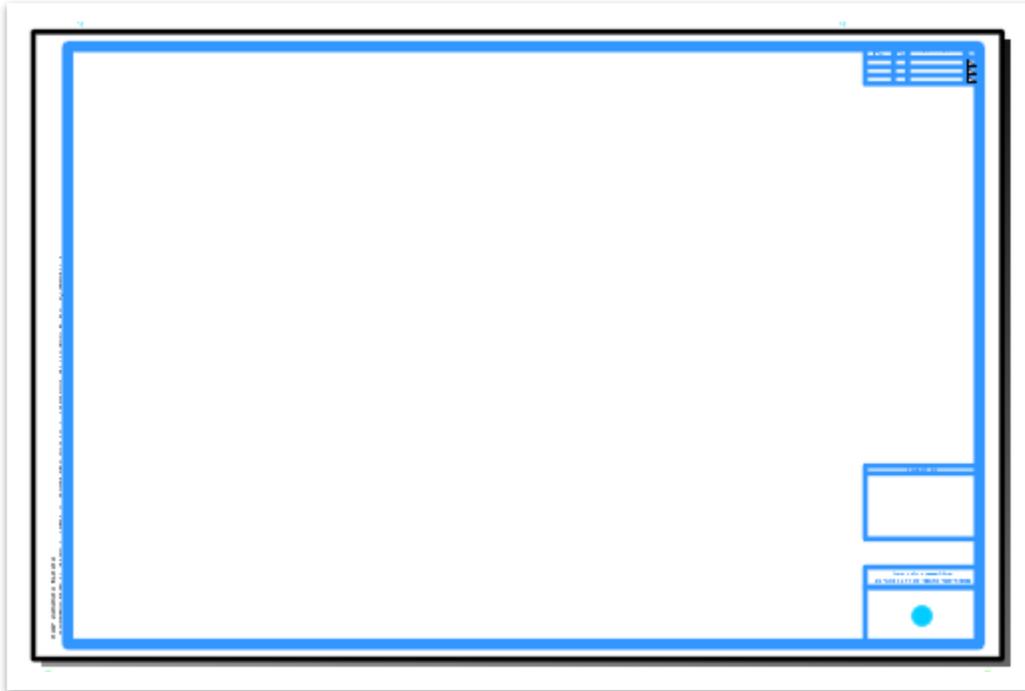


- Notice that by default, the Quantities file you just created will be saved in the DGN folder under the **123456.00\_INITIALS** workset.

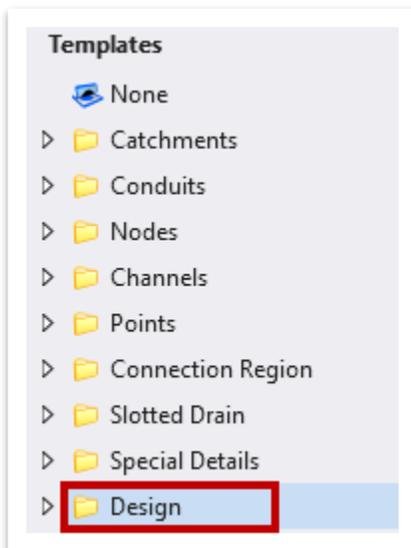
New - C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\



- Click **Save** and the file will open.

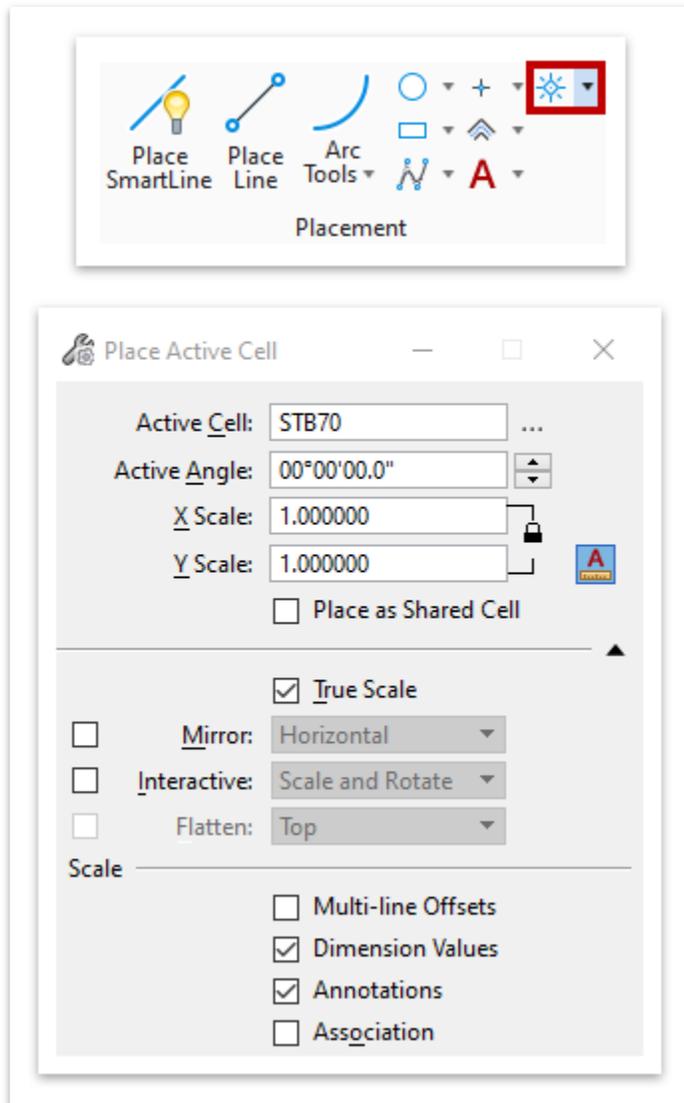


- To place the **Sheet Title** cell (Est Rdwy Quantities) in the lower right corner, the correct Element Template must first be selected. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Sheet Title Cell - Est Rdwy Quantities** element template (**Design >> Annotation >> All Sheets**). This will assure the cell is placed on the correct symbology and link to the correct cell. **Note:** Your element template folder order might be different.





- Once the element template is selected, use the **Place Active Cell** tool (**Drawing >> Home >> Placement**) to place the sheet title in the bottom right of the sheet. Notice that it is automatically linked to the correct cell (**STB70**).

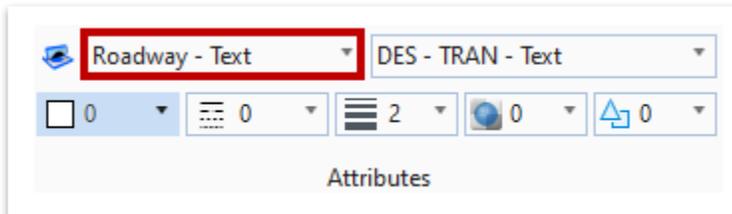




10. Snap the cell to the blue dot. If you do not see the blue dot, make sure the **DES - SCRATCH - User 1** level is turned on (**Drawing >> Home >> Primary**).



11. Before the actual Estimated Roadway Quantities excel document is placed in the dgn file, let's select the applicable Element Template. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Roadway - Text** element template (**Design >> Annotation >> Plan Sheets >> Proposed**). **Note:** If you forget to set the element template, the excel data will come in on the **Default** level and not print based on the setup of the TDOT print style.



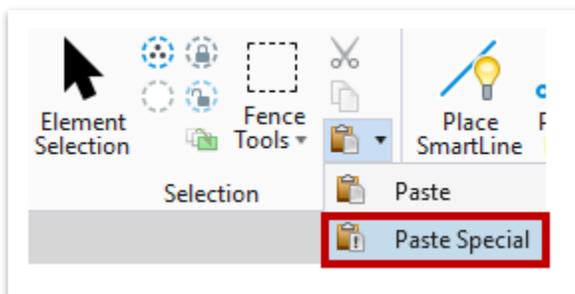
12. Open the **Estimated Roadway Quantities** excel document in the dgn folder. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Work Spaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**. The Project Data tab has already been filled in for you. **Note:** The excel document is to be opened separately and not thru ORD. Once opened, you may get an **Enable Editing** alert at the top of the screen, which you can simply click.



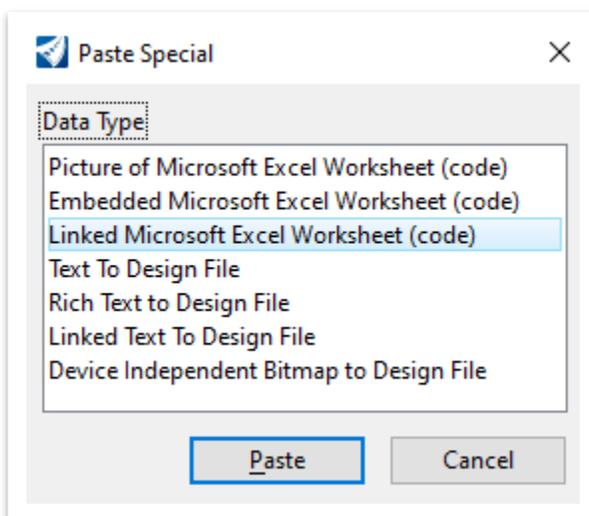
13. Open the **Rdwy. Quantity Block 1** tab and copy the first **12** lines thru pay item **303-01** into the sheet file.

ESTIMATED ROADWAY QUANTITIES				
ITEM NO.	DESCRIPTION	UNIT	QUANTITY	
			S123456.00	
303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON		XXX

14. With the rows selected, minimize the excel document and open the **Paste Special** option in ORD (**Drawing >> Home >> Selection**).

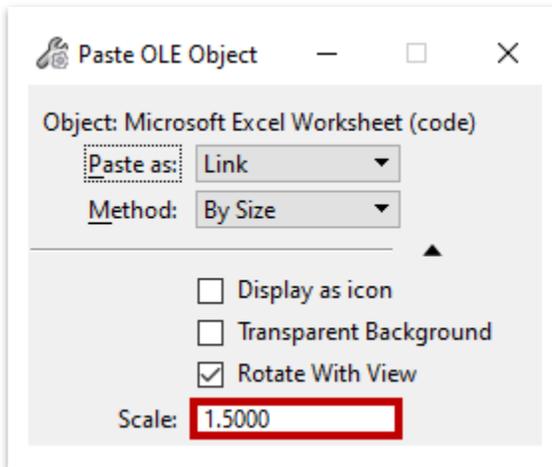


15. Select the **Linked Microsoft Excel Worksheet (code)** option and then click **Paste**.

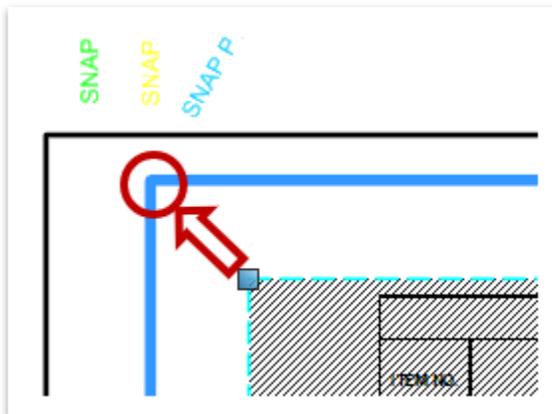




16. This will bring up the **Paste OLE Object** dialog box. Select the **By Size** method and set the **Scale** to **1.5**. This will be applied for all excel data, including the tabulated data. Left click to place the excel document anywhere within the sheet.



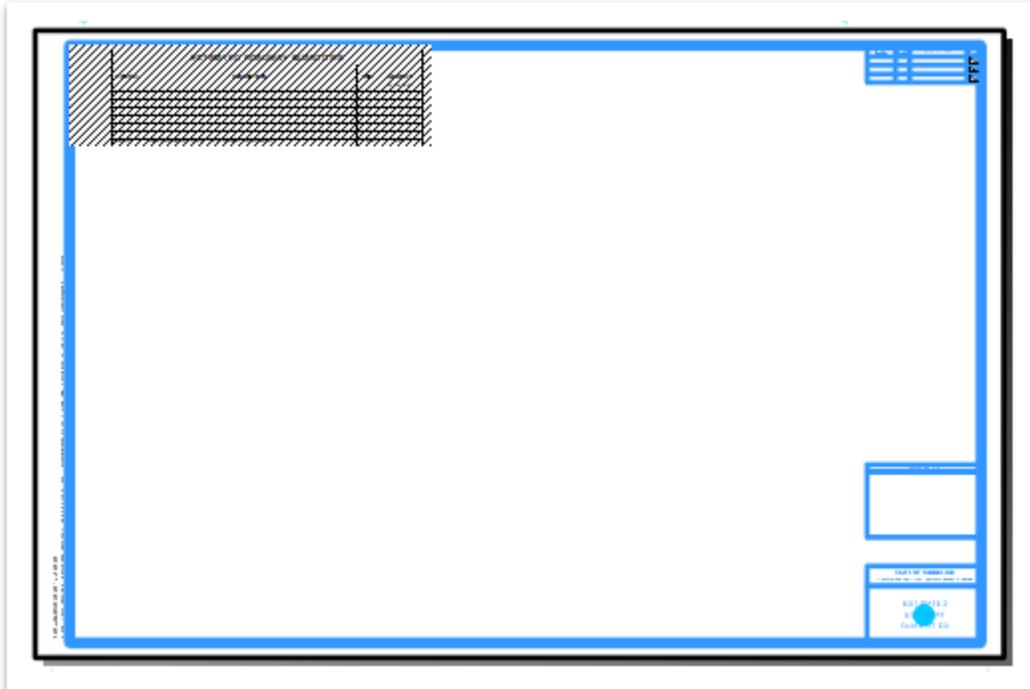
17. Now, select the excel document and open the **Move** tool (**Drawing >> Home >> Manipulate**). Click on the upper left corner of the excel document and snap to the upper left origin point (blue dot) under the yellow vertical text, as shown below. **Note:** You will need to zoom in to see the blue dot.



18. You could also use the **By Corners** method. First, snap the excel document to the upper left origin point (blue dot) under the yellow vertical text. Then, center snap the right extent of the excel document to the upper right blue dot under the **yellow** vertical text. This forms the 1<sup>st</sup> column. If you had more quantities, a 2<sup>nd</sup> column could be placed on this same sheet under the **purple** vertical text.



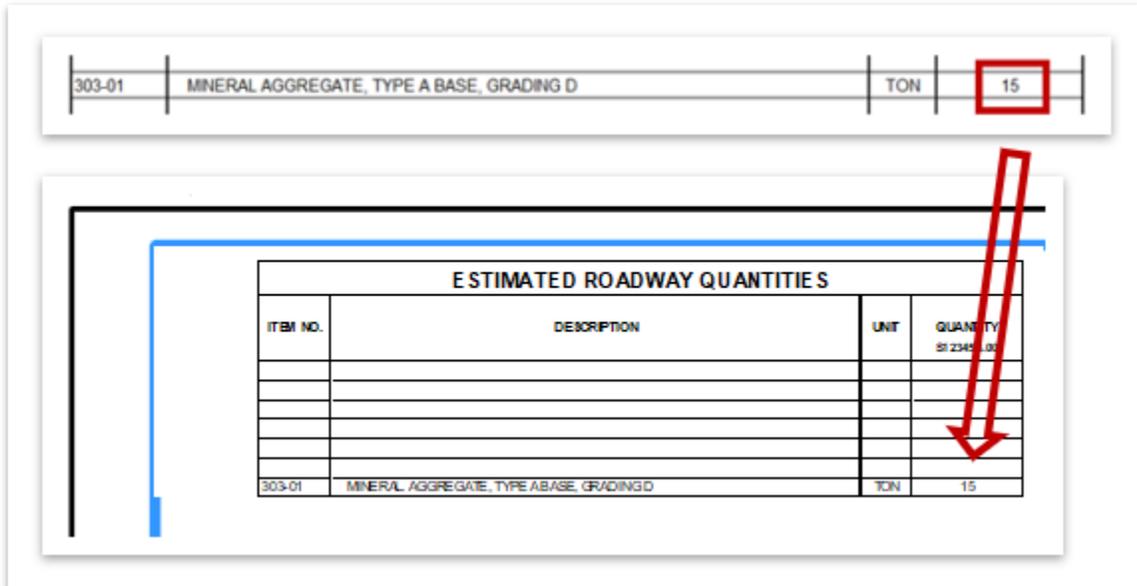
19. After placing the excel document in the sheet file, there will be a grey color over the entire excel document until you SAVE and close out of Microsoft Excel. Saving the **Estimated Roadway Quantities** excel file is important so that it remains linked to the sheet file in ORD.



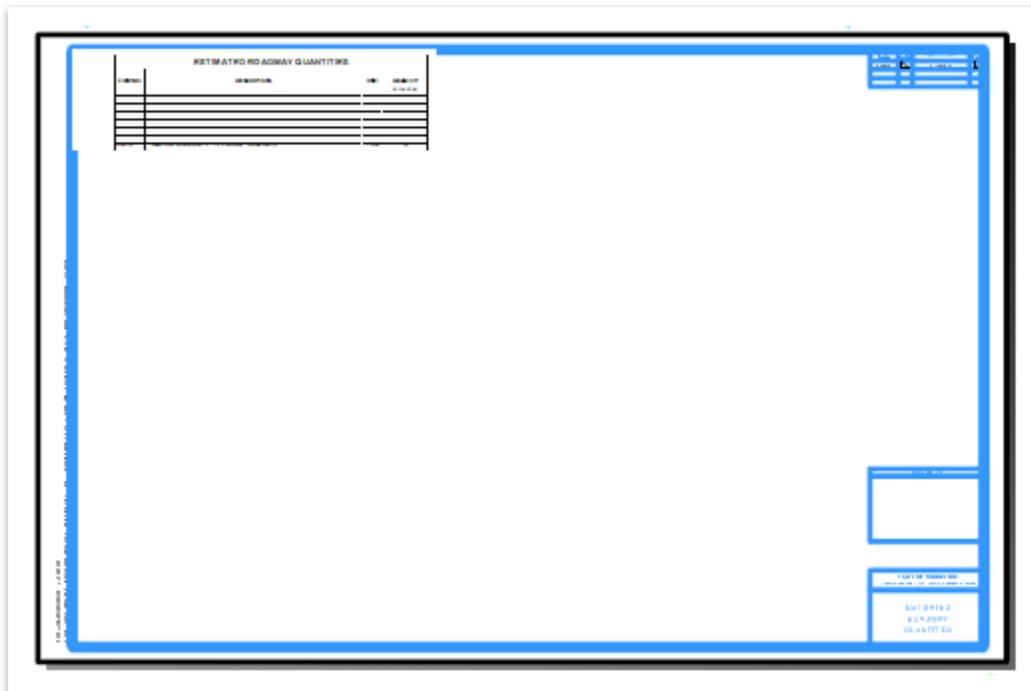
20. Let's now make an update in the **Estimated Roadway Quantities** excel file and see how the update is applied automatically in ORD. If you closed the excel file after the previous step, double click anywhere within the linked document in the **Quantities.dgn** file and it should open in excel in the default location: **C:\Program Data\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**.



21. Update the **303-01** quantity to **15** tons. **SAVE** and then close out of the excel document. Notice how it updates automatically in the ORD sheet. The blue border thickness will print correctly on the PDF because of graphic prioritizations.



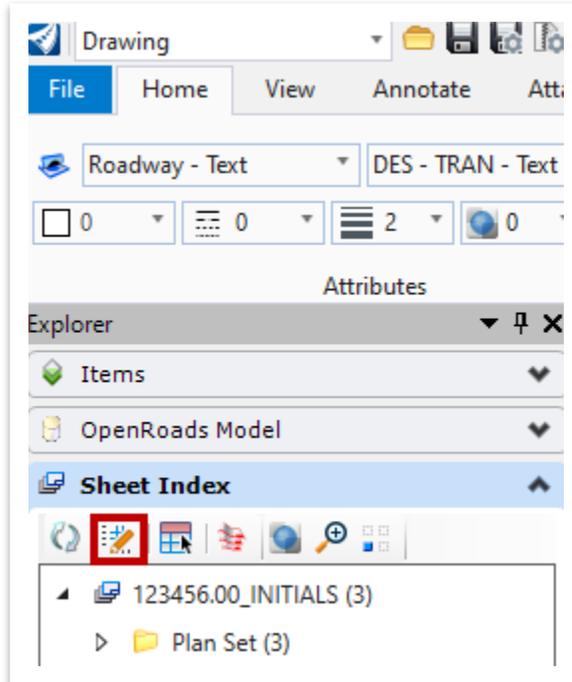
22. Your Estimated Roadway Quantities sheet should look like this. Go ahead and turn off the **DES - SCRATCH - User 1** level.



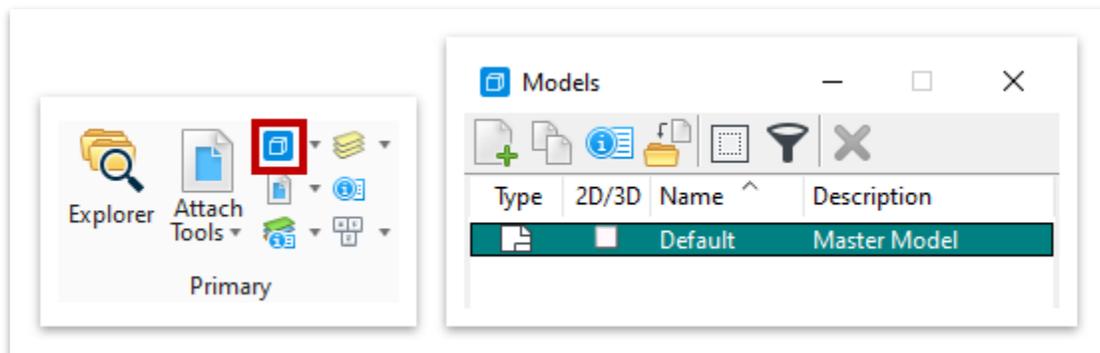


23. The next step is to add the Estimated Roadway Quantity sheet to the overall sheet index for the **123456.00\_INITIALS** project workset. We will **drag the sheet model into the index**.

24. Open the Sheet Index for editing.

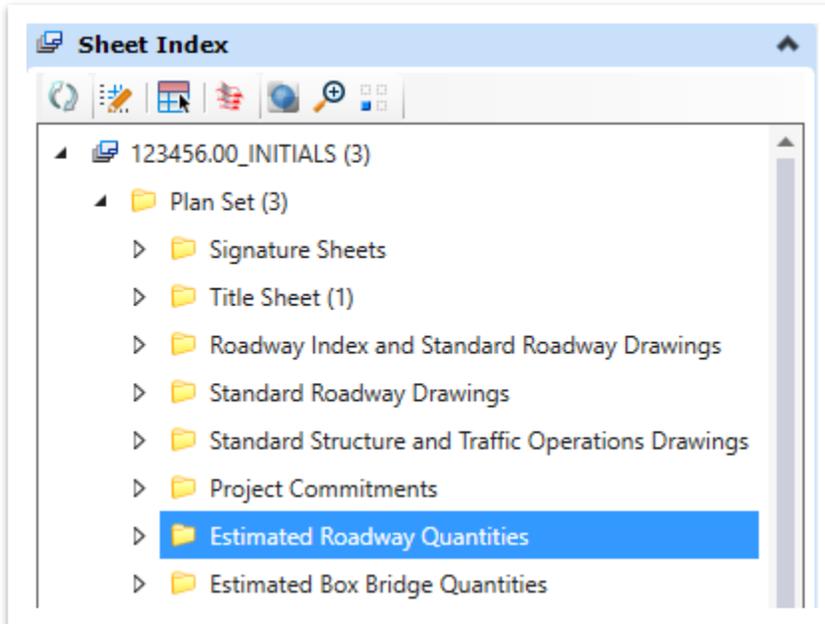


25. Open the **Models** window and highlight the **Default** model (**Drawing >> Home >> Primary**).

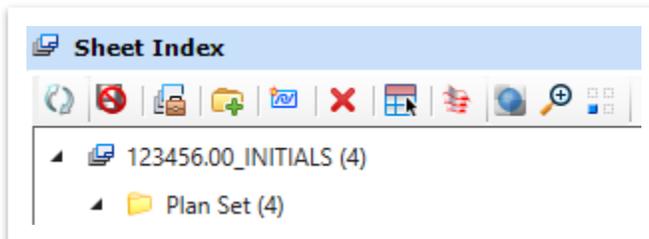




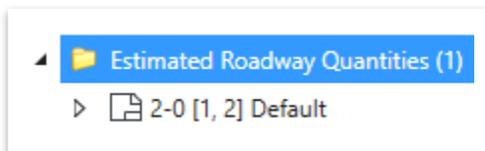
26. Once the **Default** model is highlighted, hold the left mouse button down and drag the model into the Estimated Roadway Quantities folder in the sheet index (**Plan Set >> Estimated Roadway Quantities**).



27. Notice that the sheet index now has **4** files in it: **123456.00\_INITIALS (4)**.



28. Notice also that you will now see the sheet in the sheet index under **Estimated Roadway Quantities**.





29. Now we need to edit the sheet number on the 1<sup>st</sup> row in the top right corner. Also, the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet numbers must be deleted manually. These fields were automatically populated once the sheet was added to the index.

TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2-0
			<del>2-0</del>
			<del>2-0</del>

30. The sheet number needs to be **2**. To delete the **-0** in the first row, you must double click the text field, delete the whole field and then type in **2**. Follow the same procedure to delete the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet number text fields. **Note: The sheet number will still show as 2-0 in the sheet index.**

TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2



## 11.6 Lecture: Word Based Sheets

The creation of all project sheets that are solely based on an **embedded** word document will utilize the **Roadway Word** seed file and be created in the same manner. The only difference within this category will be the folder location that each sheet is placed within the sheet index.



### Take Note!

*The only difference between the **Roadway Excel** and the **Roadway Word** seed files are the **snap point locations**.*

The sheets that fall under the Roadway Word category are (**Regular** and **Local Programs**):

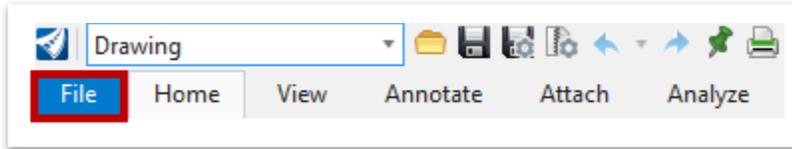
- **EPSC Notes**
- **General Notes**
- **Index and Standard Drawings**
- **Pavement Edge Drop-Off Traffic Control Notes**
- **ROW Notes Utility Notes Utility Owners**
- **Special Notes**
- **Standard Roadway Drawings**
- **Standard Traffic Operations Drawings**
- **Typical Section / Pavement Schedule**



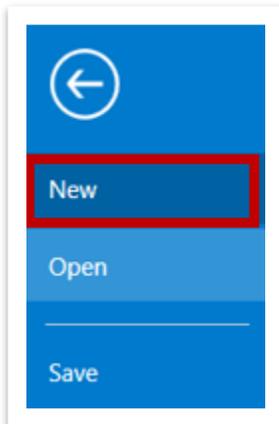
## 11.7 Exercise: Create a General Notes Sheet



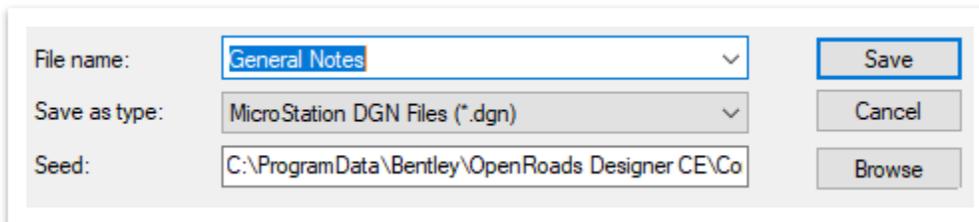
1. Click on **File** in the upper left corner.



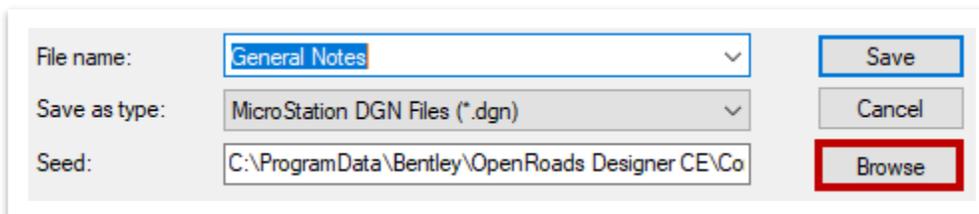
2. Click on **New**, which will open another window where you will name the file and select the seed.



3. In the File name field, type in **General Notes**.

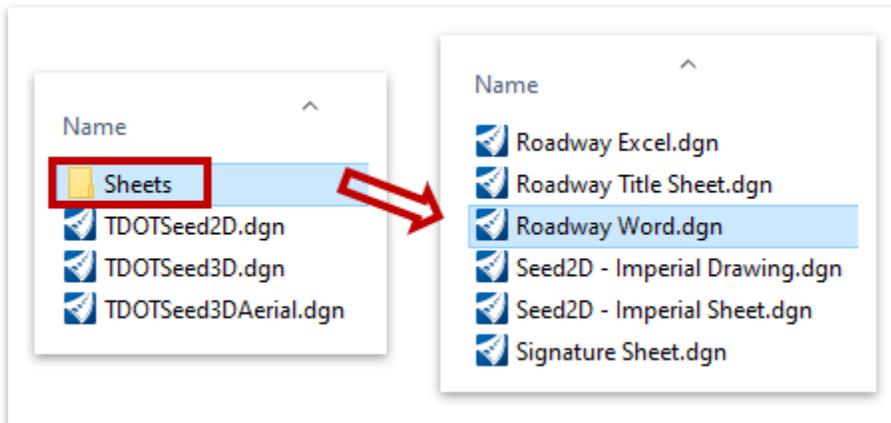


4. To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.





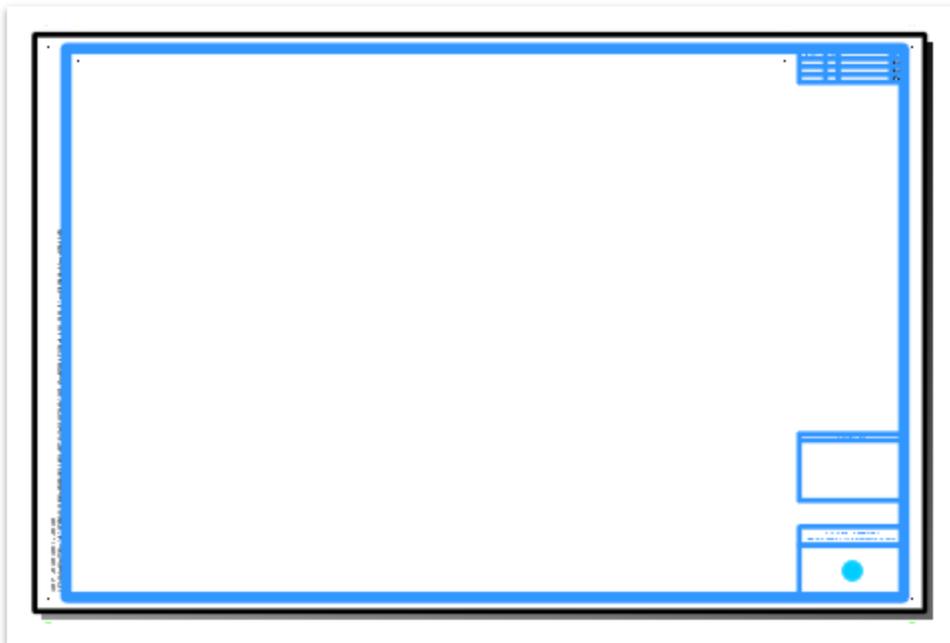
- Click on the Sheets folder. Select the **Roadway Word.dgn** seed file and click **Open**.



- Notice that by default, the General Notes file you just created will be saved in the DGN folder under the **123456.00\_INITIALS** workset.

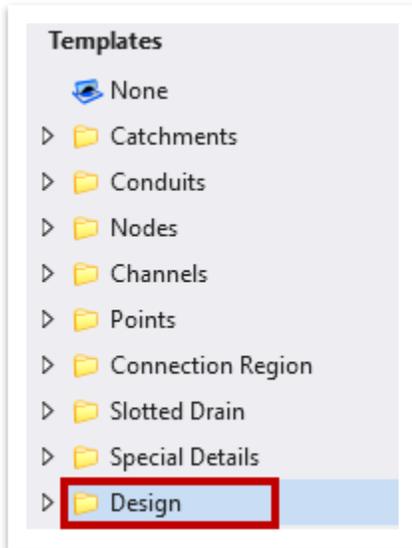
 New - C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\

- Click **Save** and the file will open.



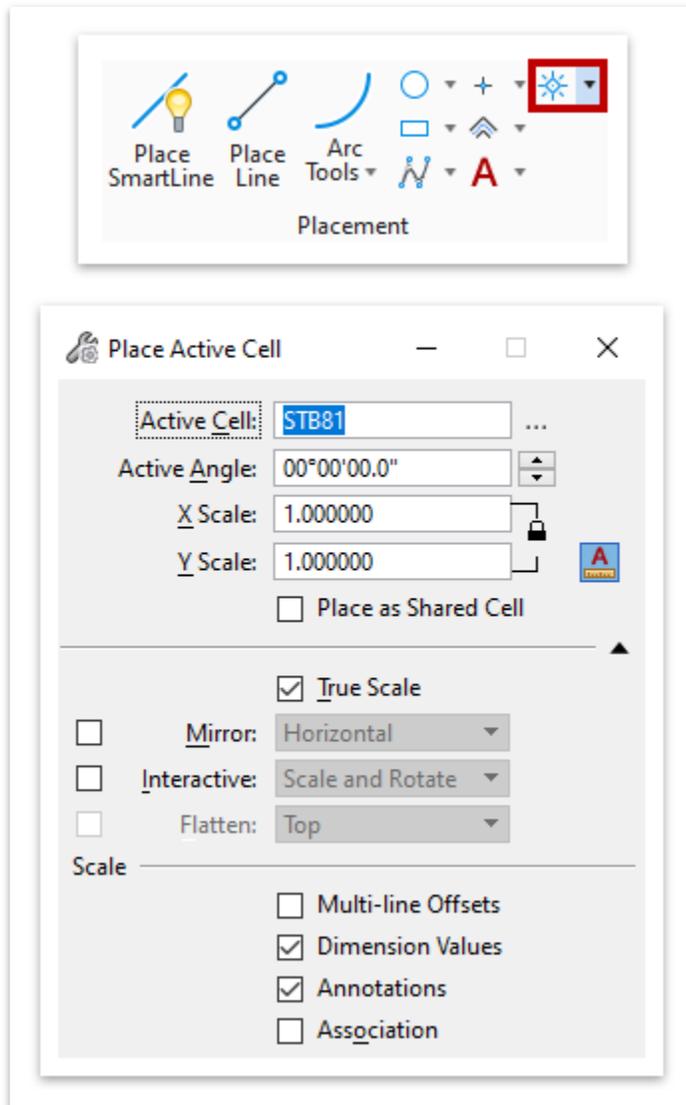


- To place the Sheet Title cell (General Notes) in the lower right corner, the correct Element Template must first be selected. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Sheet Title Cell - General Notes** element template (**Design >> Annotation >> All Sheets**). This will assure the cell is placed on the correct symbology and will link to the correct cell. **Note:** Your order of Template folders may be in a different order than shown below.



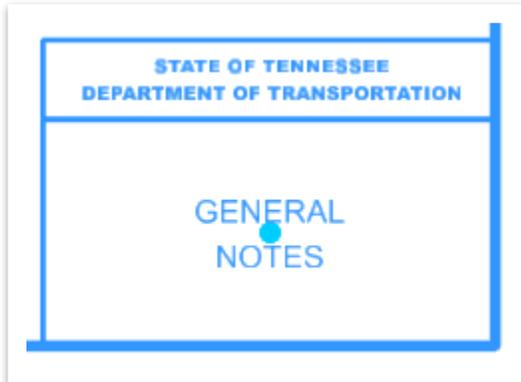


- Once the element template is selected, use the **Place Active Cell** tool (**Drawing >> Home >> Placement**) to place the sheet title in the bottom right of the sheet. Notice that it is automatically linked to the correct cell (**STB81**).

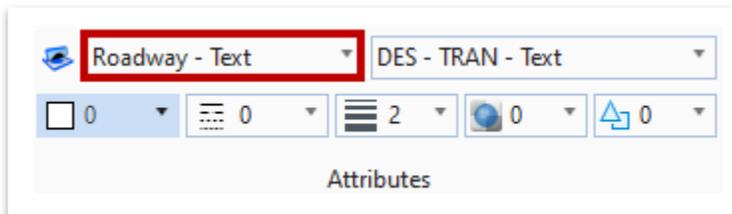




10. Snap the cell to the blue dot. If you do not see the blue dot, make sure the **DES - SCRATCH - User 1** level is turned on (**Drawing >> Home >> Primary**).



11. Before the actual General Notes word document is placed in the dgn file, the applicable Element Template needs to be selected. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Roadway - Text** element template (**Design >> Annotation >> Plan Sheets >> Proposed**).



12. Open the **GENERAL NOTES** word document in the dgn folder. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Work Spaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**. We will copy only the 1<sup>st</sup> page of the document into the sheet file. **Note:** The word document is to be opened separately and not thru ORD.



13. Select all the text on the first sheet, as shown below, and **copy**. **Note:** For a regular project, you would delete out the light blue text and any notes that do not apply to the project.

Updated: 04/30/20, IB 20-11

NOTE: (1) IS USUALLY REQUIRED BEFORE USE. (THE BLUE TEXT IS FOR YOUR INFORMATION ONLY)

### GENERAL NOTES

**S-100.00**

**GRADING**

(1) ANY AREA THAT IS DISTURBED OUTSIDE LIMITS OF CONSTRUCTION DURING THE LIFE OF THIS PROJECT SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.

(2) CERTIFICATION FOR ALL BORROW PITS MUST BE OBTAINED IN ACCORDANCE WITH SUBSECTION 107.06 OF THE STANDARD SPECIFICATIONS.

(3) THE CONTRACTOR SHALL NOT DISPOSE OF ANY MATERIAL EITHER ON OR OFF STATE-OWNED R.O.W. IN A REGULATORY FLOOD WAY AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) WITHOUT APPROVAL BY FEMA. ALL MATERIAL SHALL BE DISPOSED OF IN UPLAND (NON-WETLAND) AREAS AND ABOVE ORDINARY HIGH WATER OF ANY ADJACENT WATERCOURSE. THIS DOES NOT ELIMINATE THE NEED TO OBTAIN ANY OTHER LICENSES OR PERMITS THAT MAY BE REQUIRED BY ANY OTHER FEDERAL, STATE OR LOCAL AGENCY.

(4) ARCHAEOLOGICAL SITE NO. \_\_\_\_\_ MUST BE AVOIDED AS A SOURCE OF FILL OR HEAVY MACHINERY STAGING AREA. EARTH FILL WILL BE REQUIRED FROM AREAS OUTSIDE THE PROPOSED RIGHT-OF-WAY. CERTIFICATION MUST BE OBTAINED IN ACCORDANCE WITH SUBSECTION 107.06 OF THE STANDARD SPECIFICATIONS.

**S-105.00**

**SEEDING AND SODDING**

(1) ALL EXISTING ROADS WITHIN THE RIGHT-OF-WAY AND NOT IN THE GRADED AREA THAT ARE TO BE ABANDONED SHALL BE SCARPED, COLLECTERATED, TOPSOILED AND SEEDED. SCARPING AND COLLECTERATING THE PAVEMENT WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS. TOPSOIL, IN ACCORDANCE WITH SECTION 203 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 203.04 AND/OR 203.07. SEEDING, IN ACCORDANCE WITH SECTION 807 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 805.01.

(2) SOD SHALL BE PLACED AT LOCATIONS SHOWN ON THE PLANS TO PREVENT DAMAGE TO ADJACENT FACILITIES AND PROPERTY DUE TO EROSION OR ALL NEARLY GRADED CUT AND FILL SLOPES AS WORK PROGRESSES.

NOTE: SOD SECTION 480T.05, NOTE (2) SHALL BE PLACED IN THE GENERAL NOTES WITH THE BLANK SOILING HELLS IN WITH THE 1500001 ITEM NUMBER.

(3) ITEM NO. \_\_\_\_\_ SHALL BE USED ON SLOPES 3:1 OR STEEPER AND OTHER AREAS AS INDICATED IN THE PLANS THAT ARE INACCESSIBLE FOR MOWING.

(4) ITEM NO. 801.01 SEEDING (WITH MULCH) SHALL BE USED WHERE EROSION CONTROL BLANKET OR SOD ARE NOT APPLIED.

(5) ITEM NO. 801.02 SEEDING (WITHOUT MULCH) AND EROSION CONTROL BLANKET SHALL BE PLACED AT LOCATIONS SHOWN ON THE PLANS AS WELL AS LOCATIONS DIRECTED BY THE ENGINEER.

**S-106.00**

**GUARDRAIL**

(1) THE CONTRACTOR SHALL NOT REMOVE ANY SECTIONS OF EXISTING GUARDRAIL TO REPAIR SHOULDERS OR FLATTEN SLOPES UNTIL THE ENGINEER CONSIDERS IN THE NECESSITY OF REMOVAL DUE TO CONSTRUCTION REQUIREMENTS AND THE APPROPRIATE WARNING DEVICES ARE INSTALLED. THE PROPOSED GUARDRAIL, INCLUDING ANY ANCHOR SYSTEM, SHALL BE INSTALLED QUICKLY TO MINIMIZE TRAFFIC EXPOSURE TO ANY HAZARD. NO PAYMENT WILL BE MADE FOR A SECTION OF PROPOSED GUARDRAIL, INCLUDING ANCHORS, UNTIL IT IS COMPLETE IN PLACE.

NOTE: (1) IS USUALLY REQUIRED BEFORE USE.

(2) THE PROPOSED GUARDRAIL, INCLUDING ANY ANCHOR SYSTEM, SHALL BE INSTALLED QUICKLY TO MINIMIZE TRAFFIC EXPOSURE TO ANY HAZARD. NO PAYMENT WILL BE MADE FOR A SECTION OF PROPOSED GUARDRAIL, INCLUDING ANCHORS, UNTIL IT IS COMPLETE IN PLACE.

NOTE: (2) IS USUALLY REQUIRED BEFORE USE.

(3) IF ANY APPROACH END OF A SECTION OF GUARDRAIL OR BRIDGE RAIL MUST TEMPORARILY BE LEFT INCOMPLETE AND EXPOSED TO TRAFFIC THE CONTRACTOR SHALL USE TWO (2) TEMPORARY BARRICADES OR DRUMS WITH TYPE 'A' LIGHTS AND ROUNDED END ELEMENTS AS MINIMUM MEASURES TO PROTECT TRAFFIC FROM THE HAZARD OF AN EXPOSED END. ALL COST OF FURNISHING AND INSTALLING TEMPORARY BARRICADES OR DRUMS WITH TYPE 'A' LIGHTS TO DELINEATE GUARDRAIL END AND A TEMPORARY ROUNDED END ELEMENT SHALL BE INCLUDED IN THE COST OF THE PROPOSED GUARDRAIL END TERMINAL.

NOTE: (3) IS USUALLY REQUIRED BEFORE USE ONLY ON THE HEADWAY HAS BEEN CLOSED (1) TRAFFIC DURING CONSTRUCTION.

(4) GUARDRAIL IS TO BE COMPLETE IN PLACE BEFORE THE MAINLINE ROADWAY IS OPENED TO TRAFFIC.

**S-115.00**

**DRAINAGE**

(1) THE CONTRACTOR SHALL SHAPE DITCHES TO THE SPECIFIED DESIGN. THIS WORK WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

NOTE: SOD SECTION 428A.06.

(2) EXCAVATION FOR \_\_\_\_\_ WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT WILL BE INCLUDED IN THE PRICE BID PER LINEAR FOOT OF PIPE (EXCEPT THE APPLICABLE ITEMS) FROM THE FOLLOWING: PIPE CULVERTS, STORM SEWERS, CONDUITS, ALL OTHER CULVERTS AND MINOR STRUCTURES.

(3) CULVERT EXCAVATION FOR CONCRETE BOX OR SLAB TYPE CULVERTS OR BRIDGES WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

(4) THE CUTTING OF INLET AND OUTLET DITCHES WHERE SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER WILL BE MEASURED AND PAID FOR AS ITEM NO. 203.01 ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED).

(5) WHERE A CULVERT (PIPE, SLAB OR BOX) IS MOVED TO A NEW LOCATION OTHER THAN THAT SHOWN ON THE PLANS, INCREASING OR DECREASING THE AMOUNT OF CULVERT EXCAVATION WILL NOT RESULT IN AN INCREASE OR DECREASE IN THE AMOUNT OF PAYMENT THAT WILL BE MADE DUE TO SUCH CHANGE.

(6) DURING CONSTRUCTION OF DRAINAGE STRUCTURES ALL COST ASSOCIATED WITH MARKING THE FLOW OF WATER AND TRAFFIC AT THESE STRUCTURES, DURING THE PHASE CONSTRUCTION OF THIS PROJECT ARE TO BE INCLUDED IN THE UNIT PRICE OF THE DRAINAGE STRUCTURES AND TRAFFIC CONTROL ITEMS.

(7) ALL EXISTING PILES AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER THAT ARE TO BE LEFT IN PLACE AND ABANDONED MUST BE BACKFILLED AND PLUGGED. ALL COST FOR THIS WORK SHALL BE INCLUDED IN ITEM NO. 203.02.11. BACKFILL MATERIAL (PILONGIBLE FILL) C.Y.

**S-120.00**

**FENCING**

(1) LOCATION OF THE FENCE SHALL BE ONE FOOT INSIDE THE RIGHT-OF-WAY EXCEPT WHERE SHOWN OTHERWISE ON THE PLANS.

(2) FENCES SHALL BE TURNED IN AT DRAINAGE STRUCTURES, STOCK PASSES AND BRIDGES WHERE DIRECTED BY THE ENGINEER SO AS TO AVOID MINOR WALLS AND/OR ABUTMENTS.

(3) THE CONTRACTOR SHALL GIVE THE AFFECTED PROPERTY OWNERS A TWO-WEEK NOTICE PRIOR TO CUTTING FENCES.

(4) THE CONTRACTOR SHALL BE REQUIRED TO INSTALL ACCESS CONTROL FENCES PRIOR TO CUTTING EXISTING STOCK FENCES IN AREAS UTILIZED BY DOMESTIC LIVESTOCK OR OTHER AREAS AS DIRECTED BY THE ENGINEER.

**S-125.00**

**MISCELLANEOUS**

(1) ALL DETOUR, ACCESS, SERVICE AND FRONTAGE ROADS SHALL BE CONSTRUCTED WITH A MINIMUM OF ONE (1) COURSE OF BASE MATERIAL BEFORE TRAFFIC IS INTERRUPTED ON EXISTING ROADS.

(2) THE CONTRACTOR SHALL BE REQUIRED TO REMOVE AND RESET MAILBOXES AND POSTS WHERE AND AS DIRECTED BY THE ENGINEER. COST TO BE INCLUDED IN PRICE BID FOR OTHER CONSTRUCTION ITEMS.

(3) NOTHING IN THE GENERAL NOTES OR SPECIAL PROVISIONS SHALL RELIEVE THE CONTRACTOR FROM HIS RESPONSIBILITIES TOWARD THE SAFETY AND CONVENIENCE OF THE GENERAL PUBLIC AND THE RESIDENTS ALONG THE PROPOSED CONSTRUCTION AREA.

**S-130.00**

**ROAD CLOSURE**

(1) NO LESS THAN SEVEN (7) DAYS PRIOR TO THE CLOSURE OF THE ROAD, THE CONTRACTOR SHALL NOTIFY THE FOLLOWING INDIVIDUALS OR AGENCIES COMPLETELY DESCRIBING THE AFFECTED ROADS AND THE APPROXIMATE DURATION OF THE CONSTRUCTION. THESE PARTIES INCLUDE, BUT ARE NOT LIMITED TO: (1) LOCAL LAW ENFORCEMENT OFFICE, (2) LOCAL FIRE DEPARTMENT, (3) AMBULANCE SERVICE, (4) LOCAL SCHOOL SUPERINTENDENT, (5) UNITED STATES POSTAL SERVICE, AND (6) LOCAL ROAD SUPERINTENDENT.

**S-135.00**

**PAVEMENT MARKINGS**

NOTE: SOD SECTION 471.05 THROUGH 471.06.

**TEMPORARY PAVEMENT MARKINGS ON INTERMEDIATE LAYERS**

(1) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 715.05.01. PAINTED PAVEMENT MARKING OF LINE, L.M.

(2) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 715.05.02. PAINTED PAVEMENT MARKING OF BARRIER LINE, L.B.

(3) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 715.05.02. PAINTED PAVEMENT MARKING OF BARRIER LINE, L.B.

(4) WIDE (8 INCH) TEMPORARY PAVEMENT MARKING LINE WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 715.05.02. PAINTED PAVEMENT MARKING (BARRIER LINE), L.B.

**S-136.00**

**FINAL PAVEMENT MARKING**

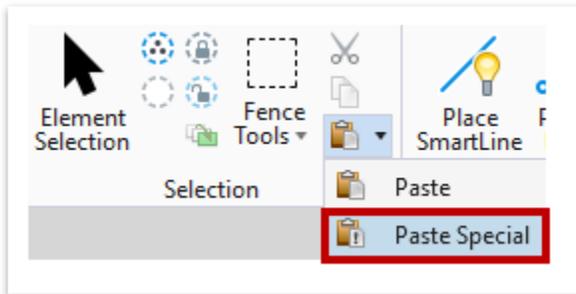
NOTE: (1) SHOULD BE ADDED FOR ALL RESURFACING PROJECTS AND PROJECTS WITH RESURFACING OR REPAVING (WHICH IS DETERMINED AT THE CONSTRUCTION FIELD REVIEW THAT SHOWING/DECRASSING WILL BE INCLUDED IN THE PROJECT BIDDING/ISSUES/NOTES/PERFORMANCE/ISSUES/ISSUE).

NOTE: (2) SHOULD BE ADDED FOR ALL RESURFACING PROJECTS AND PROJECTS WITH RESURFACING OR REPAVING (WHICH IS DETERMINED AT THE CONSTRUCTION FIELD REVIEW THAT SHOWING/DECRASSING WILL BE INCLUDED IN THE PROJECT BIDDING/ISSUES/NOTES/PERFORMANCE/ISSUES/ISSUE).

(3) THE CONTRACTOR WILL BE REQUIRED TO PERFORM THE FOLLOWING WORK:

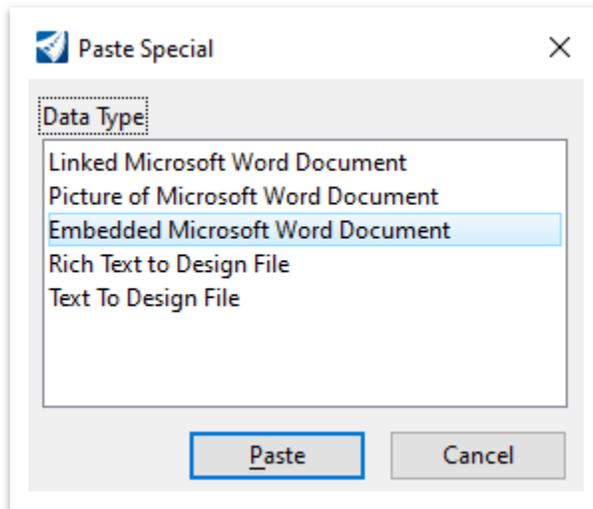
- SHOULDERS SHALL BE BROOMED AND DE-CRASSED AND MATERIAL SHALL BE PICKED UP AND REMOVED. THIS WILL BE PAID FOR UNDER ITEM NO. 203-01.06.
- REMOVE ALL GARBAGE AND CONSTRUCTION DEBRIS FROM PROJECT. THE COST FOR THIS WILL BE INCLUDED IN THE PRICE BID FOR OTHER ITEMS OF CONSTRUCTION.

14. With the text selected, minimize the word document and open the **Paste Special** option in ORD (**Drawing >> Home >> Selection**).

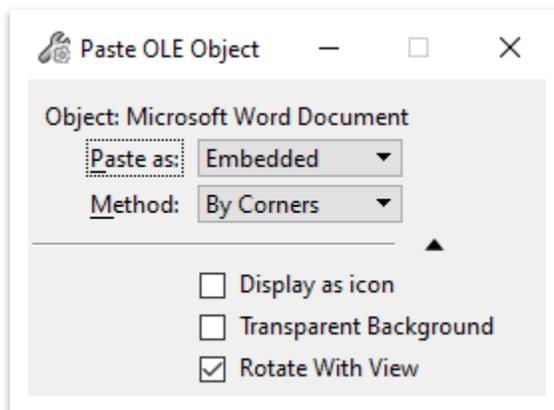




15. Select the **Embedded Microsoft Word Document** option. All word documents should utilize this option.

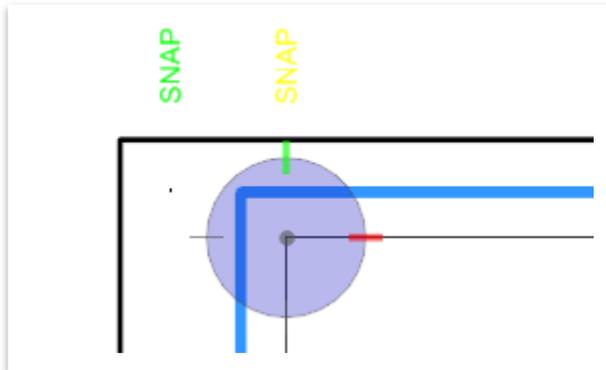


16. This will bring up the **Paste OLE Object** dialog box. Select the **By Corners** method, which will be applied for all word data. **Note:** Due to the variation of word documents, it is not recommended to use the By Size method.

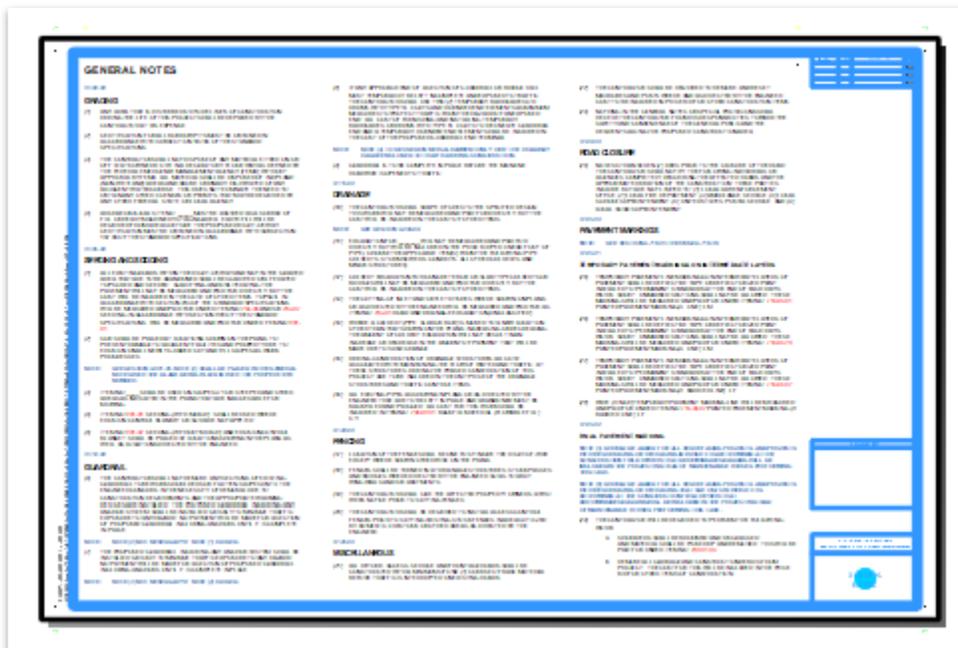




17. First, snap the word document to the upper left blue dot in the sheet file. You will have to hit your tentative mouse button to snap to the midpoint of the dot. You will need to zoom all the way in to see the snap point. Then, center snap the right extent of the word document to the upper right blue dot.



18. You should now have a **general notes** embedded sheet. Go ahead and close the word document (.docx file).



19. Let's now make an update in the embedded word file and see how the update is applied automatically in ORD. Double click anywhere within the embedded document in the ORD file and it should open in word. Notice that the file name in the word header is **Document in General Notes.dgn**.

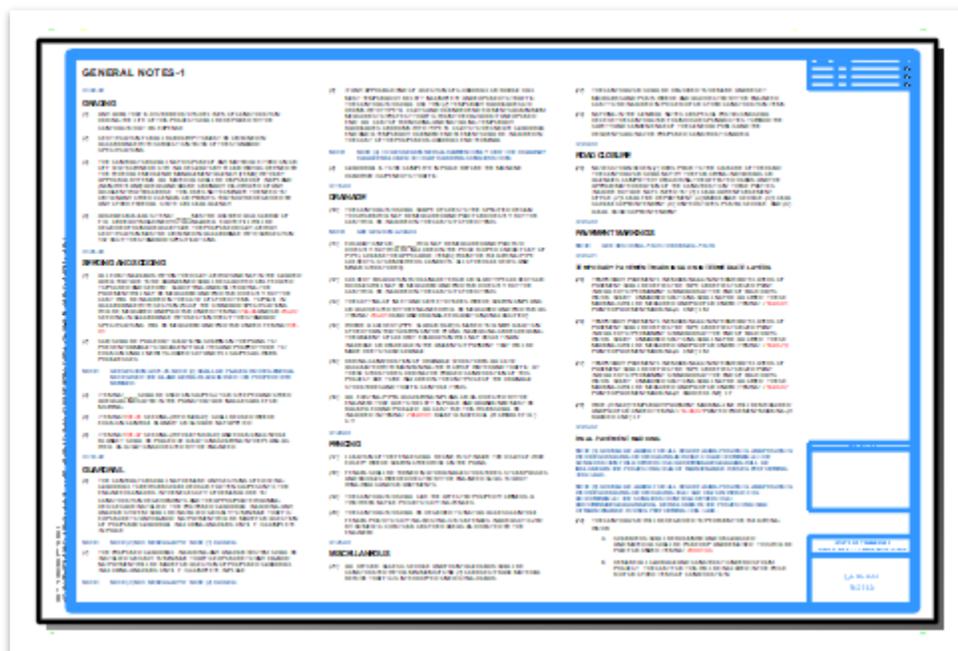




20. Update the heading to read **GENERAL NOTES-1** and then close out of word. Notice how it updates automatically in the ORD sheet.



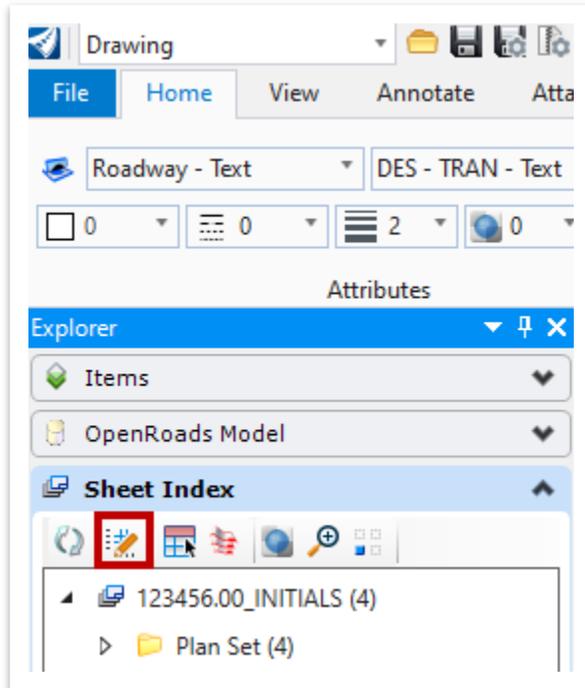
21. Your General Notes sheet should look like this. Go ahead and turn off the **DES - SCRATCH - User 1** level.



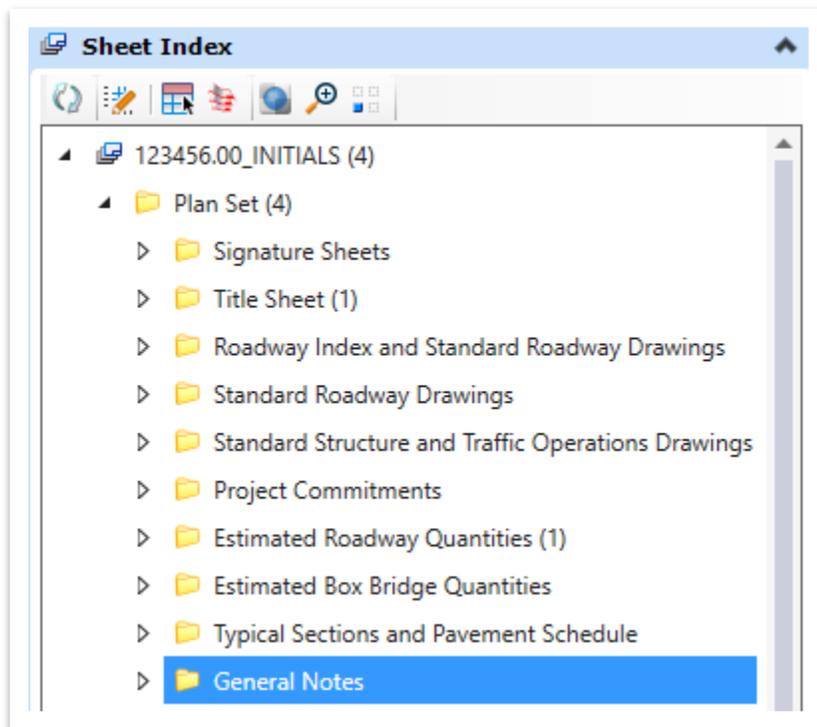
22. The next step is to add the General Notes sheet to the overall sheet index for the **123456.00\_INITIALS** project workset. As mentioned earlier, there are **2** ways this can be done (Add Sheet option or drag the sheet model into the index). We will use the **Add Sheet** option for this exercise.



23. Open the Sheet Index for editing, if not already open.



24. Highlight the correct folder in the sheet index so that the sheet will be placed in the correct location (**Plan Set >> General Notes**).

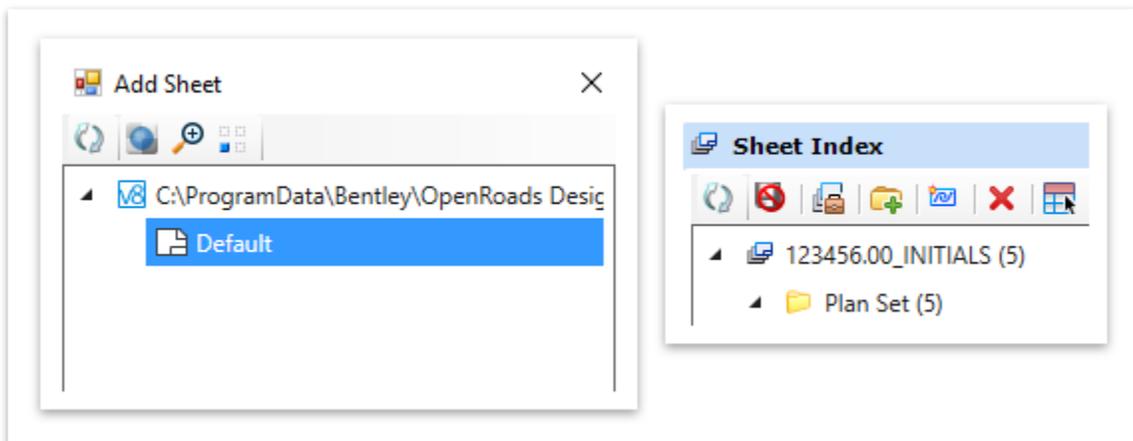




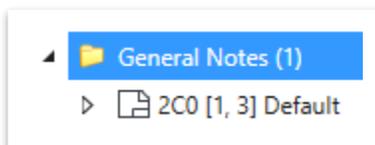
25. Since the Sheet Index is open for editing, you will see additional options. Select the **Add Sheet** option.



26. Once the Add Sheet window opens, select the **General Notes.dgn** file. By default, the correct folder should already be open. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**.
27. Highlight the **Default** sheet and click **OK**. Notice that the sheet index now has **5** files in it: **123456.00\_INITIALS (5)**.



28. Notice also that you will now see the sheet in the sheet index under General Notes.





29. Now we need to edit the sheet number on the 1<sup>st</sup> row in the top right corner. Also, the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet numbers must be deleted manually. These fields were automatically populated once the sheet was added to the index.

TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2C0
			<del>2C0</del>
			<del>2C0</del>

30. The sheet number needs to be **2C**. To delete the **0** in the first row, you must double click the text field, delete the whole field and then type in **2C**. Follow the same procedure to delete the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet number text fields. **Note: The sheet number will still show as 2C0 in the sheet index.**

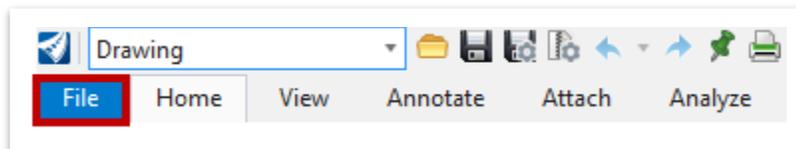
TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2C



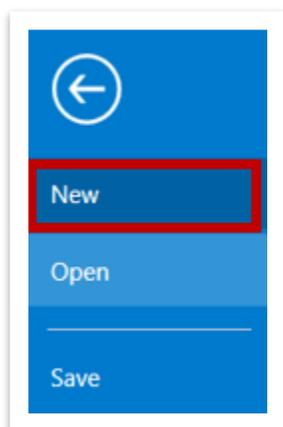
## 11.8 Exercise: Create a Typical Section Sheet



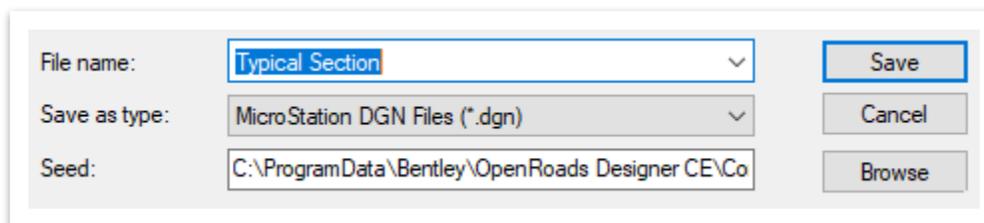
1. Click on **File** in the upper left corner.



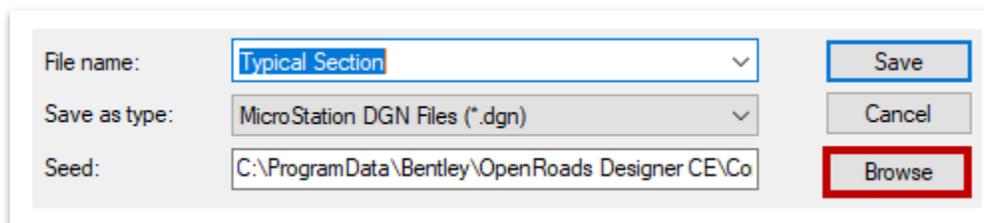
2. Click on **New**, which will open another window where you will name the file and select the seed.



3. In the File name field, type in **Typical Section**.

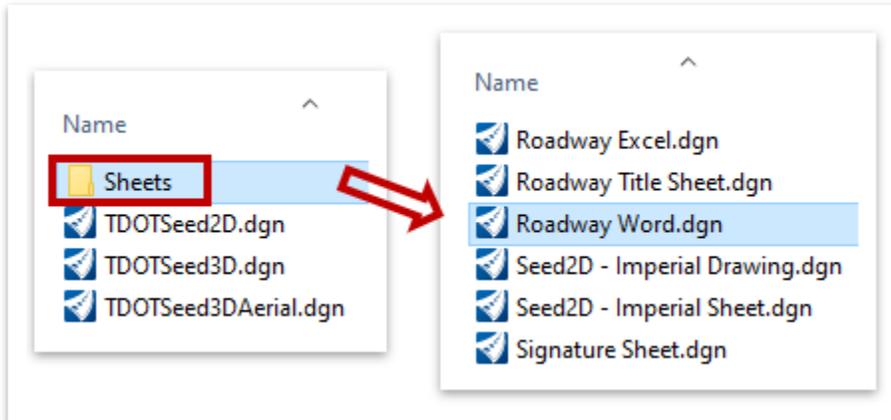


4. To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.





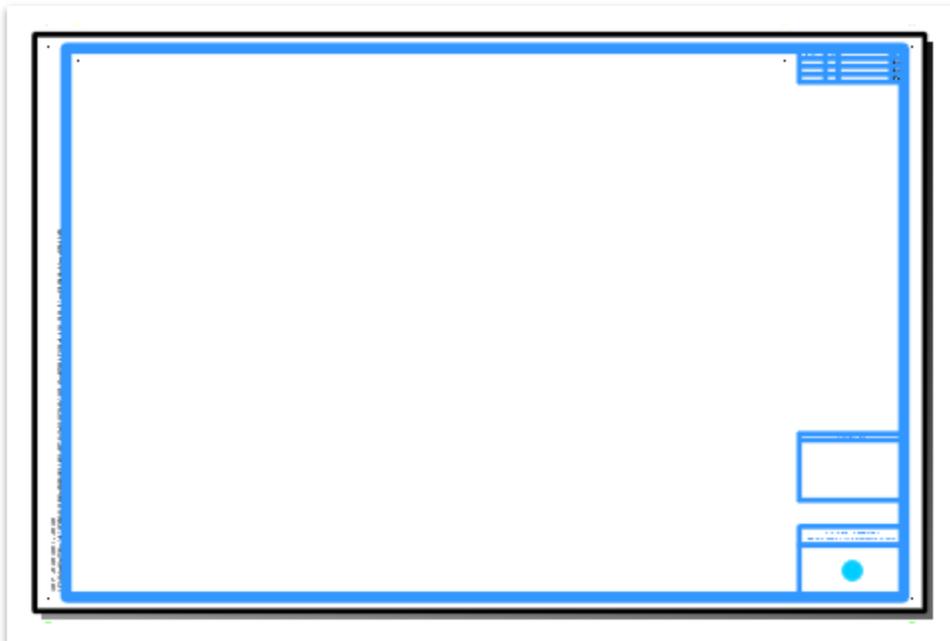
- Click on the Sheets folder. Select the **Roadway Word.dgn** seed file and click **Open**. (Remember you could also use the Roadway Excel.dgn seed file if you wanted to.)



- Notice that by default, the Typical Section file you just created will be saved in the DGN folder under the **123456.00\_INITIALS** workset.

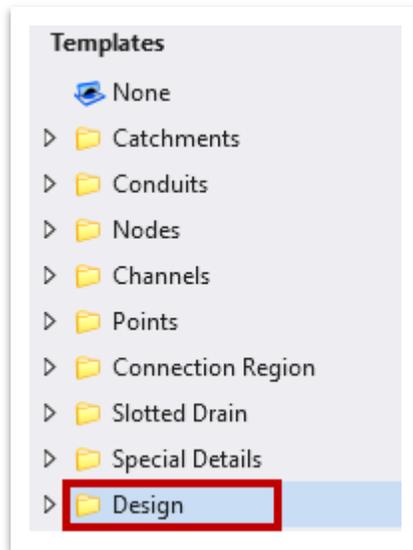
New - C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\

- Click **Save** and the file will open.



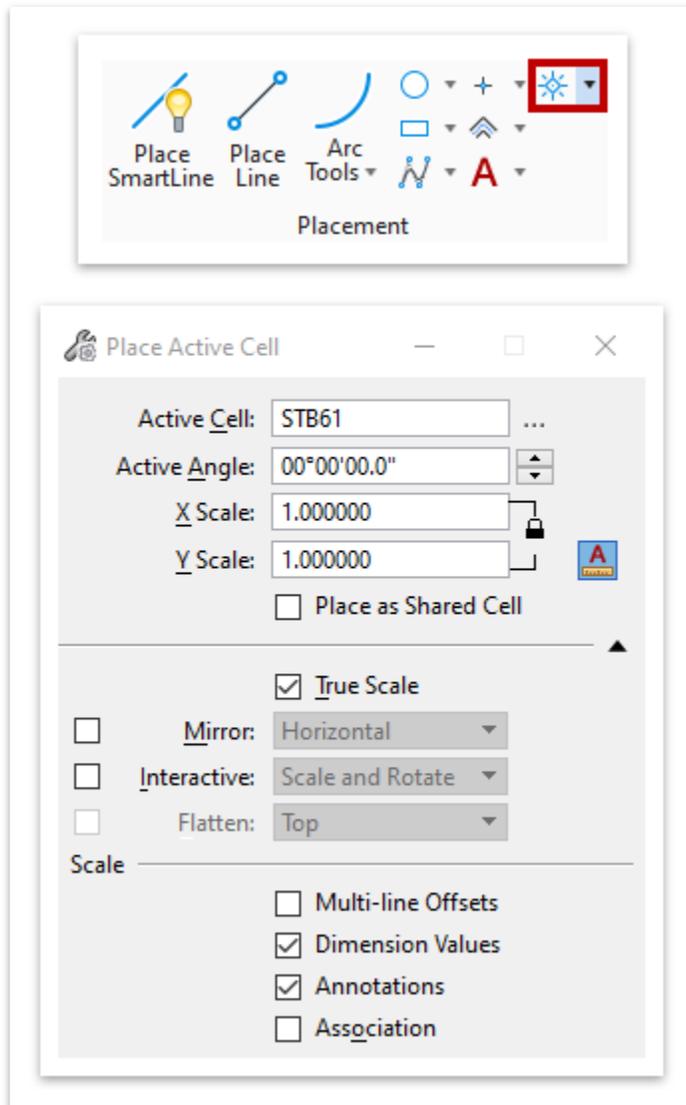


- To place the Sheet Title cell (Typical Sections & Pvmt Schedule) in the lower right corner, the correct Element Template must first be selected. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Sheet Title Cell - Typical Sections & Pvmt Schedule** element template (**Design >> Annotation >> All Sheets**). This will assure the cell is placed on the correct symbology and will link to the correct cell. **Note:** Your order of Template folders may be in a different order than shown below.





- Once the element template is selected, use the **Place Active Cell** tool (**Drawing >> Home >> Placement**) to place the sheet title in the bottom right of the sheet. Notice that it is automatically linked to the correct cell (**STB61**).

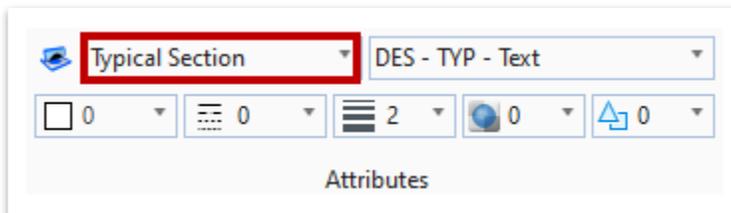




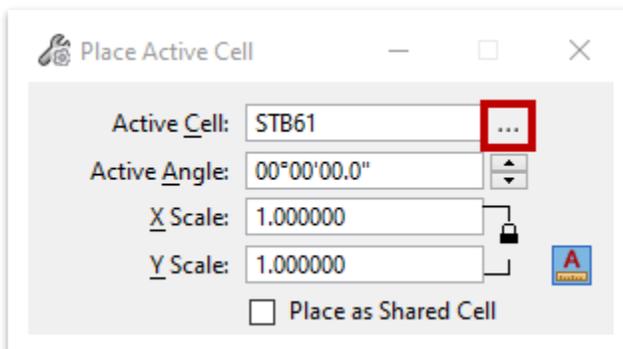
10. Snap the cell to the blue dot. If you do not see the blue dot, make sure the **DES - SCRATCH - User 1** level is turned on (**Drawing >> Home >> Primary**).



11. Before the actual Typical Section is placed in the dgn file, the applicable Element Template needs to be selected. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Typical Section** element template (**Design >> Typical**s).

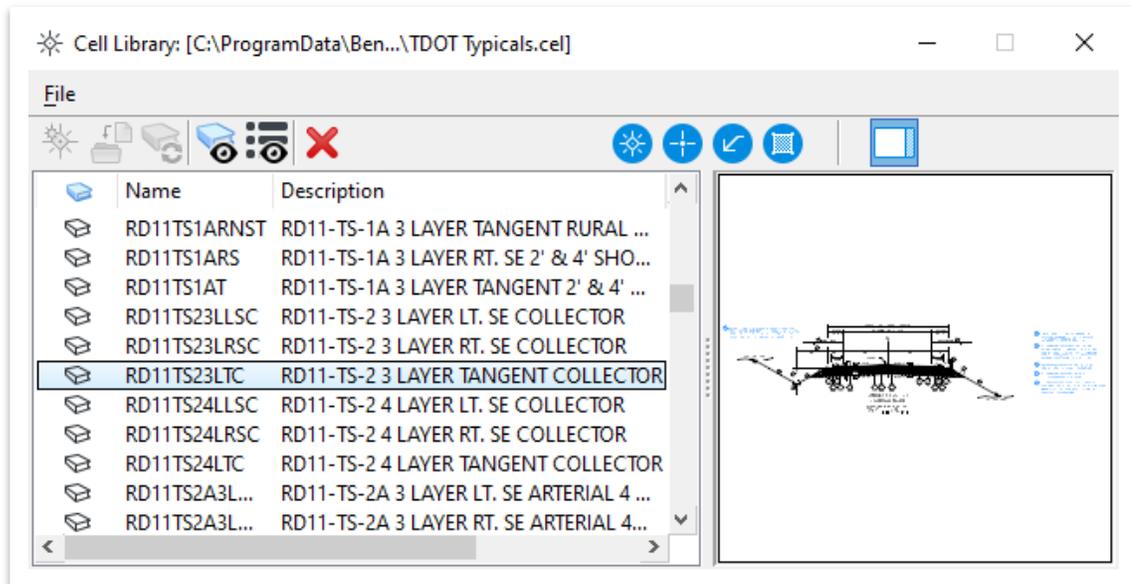


12. Open the **Place Active Cell** tool once again (**Drawing >> Home >> Placement**) so we can place the applicable typical section. Notice that even though the Element Template was selected in the previous step, there is no typical section cell linked automatically when opening the Place Active Cell tool. We will need to browse to the correct cell library and select the cell.
13. Click on the **browse** button next to the Active Cell field. **Note:** You may still have the previous cell used shown in the active cell field, as shown below.

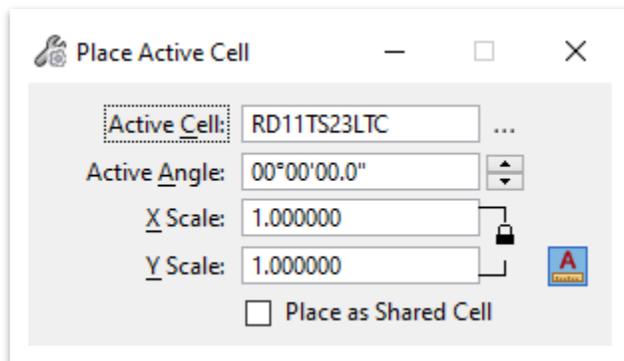




14. Go to **File >> Attach File** and open the **TDOT Typical.cel** library. By default, the correct folder containing the cell libraries should open. If not, you can browse to the cell library here: **C:\ProgramData\Bentley\OpenRoads Designer CE\ Configuration\Organization-Civil\TDOT\_Standards\Cell\**.
15. Scroll down and select the **RD11TS23LTC (RD11-TS-2 3 LAYER TANGENT COLLECTOR)** cell by double clicking on it. **Note:** We will only place the tangent cell for this exercise.

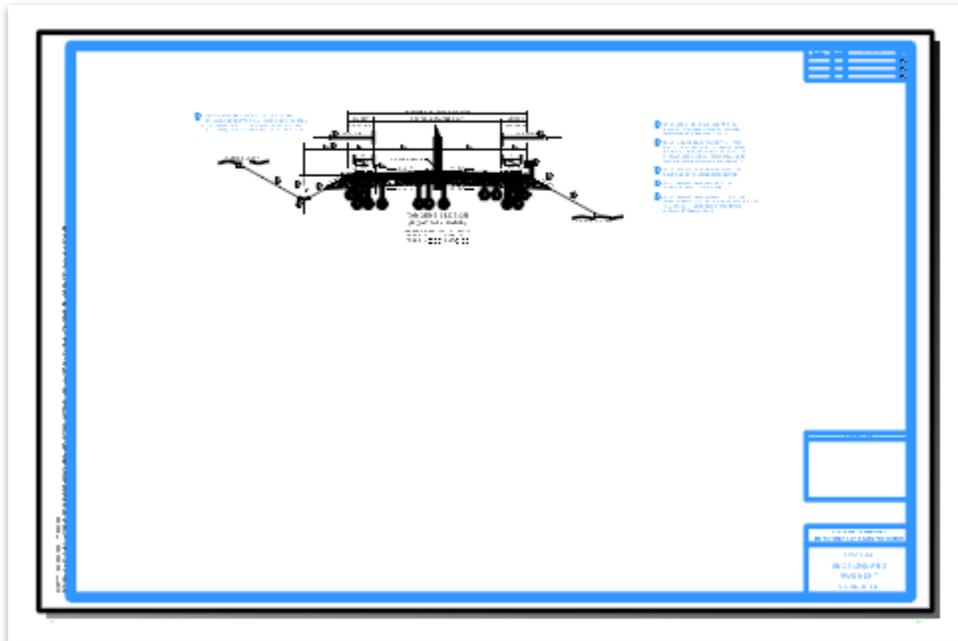


16. Close the Cell Library dialog window and notice the Active Cell field is now populated.

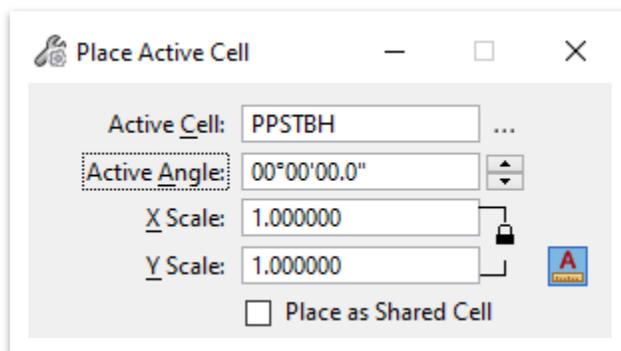




17. Go ahead and place the cell anywhere in the upper half of the sheet. Notice that the typical section notes are in blue. Go ahead and turn off the **DES - SCRATCH - User 1** level.

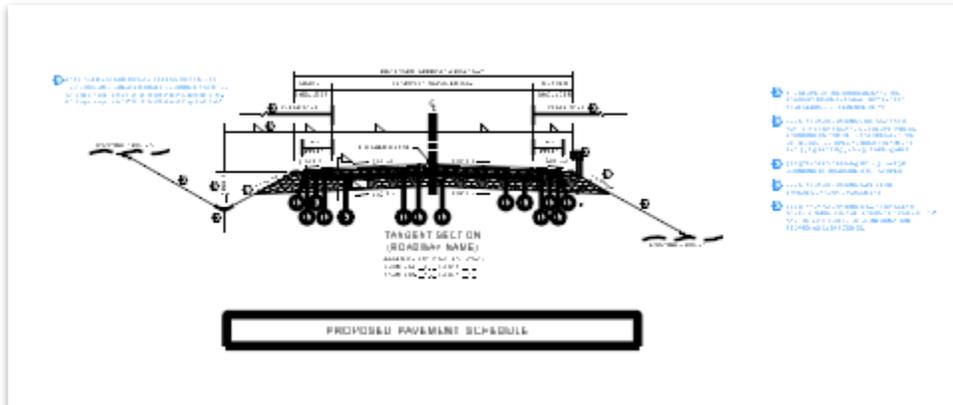


18. Before filling in the necessary data fields within the typical section, let's build the **Pavement Schedule**. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Pavement Schedule - Title (Half)** element template (**Design >> Typical**s).
19. Select the **Place Active Cell** tool and notice the cell is already linked.





20. Place the cell anywhere below the typical section.



21. Now we need to select the **Pavement Schedule - Item** element template so we can build the pavement layers. Go to **Drawing >> Home >> Attributes** and select the Element Template drop-down menu. Then, select the **Pavement Schedule - Item** element template (**Design >> Typical**s).

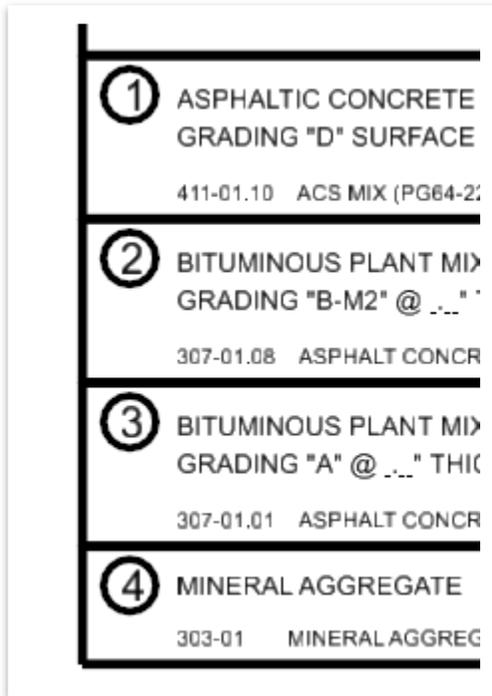
22. Open the **Place Active Cell** tool once again. The Pavement Schedule – Title (Half) cell will likely still be linked (PPSTBH). Browse to the **TDOT Typical**s.cel library once again and select the following **4** cells in order, one at a time. Place each one below the next by snapping to the bottom left corner of the cell above.

- 411-01.10
- 307-01.08
- 307-01.01
- 303-01

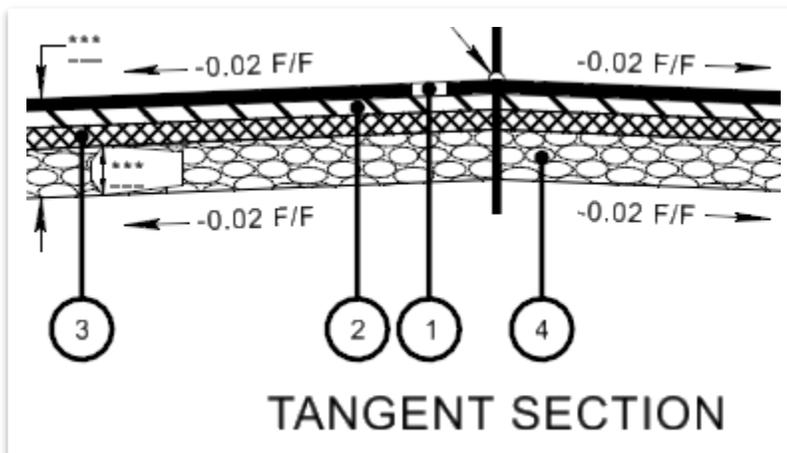
PROPOSED PAVEMENT SCHEDULE	
①	ASPHALTIC CONCRETE SURFACE (HOT MIX) PG64-22 GRADING 'D' SURFACE @ ..." THICK (APPROX. ... LB./S.Y.) 411-01.10 ACS MIX (PG64-22) GRADING 'D'
②	BITUMINOUS PLANT MIX BASE (HOT MIX) PG64-22 GRADING 'B-M2' @ ..." THICK (APPROX. ... LB./S.Y.) 307-01.08 ASPHALT CONCRETE MIX (PG64-22) (BPM-B-HM) GRADING 'B-M2'
③	BITUMINOUS PLANT MIX BASE (HOT MIX) PG64-22 GRADING 'A' @ ..." THICK (APPROX. ... LB./S.Y.) 307-01.01 ASPHALT CONCRETE MIX (PG64-22) (BPM-B-HM) GRADING 'A'
④	MINERAL AGGREGATE 303-01 MINERAL AGGREGATE TYPE 'A' BASE, GRADING 'D'



23. The same process would be done to add the shoulder pavement layers as well as the tack and prime coat layers.
24. Zoom in and double click on the asterisk within each circle to open the **Text Editor** and key-in numbers **1-4** in order. You would also need to fill in the thicknesses of your actual pavement design and LB./S.Y. For this exercise, we will leave those blank.

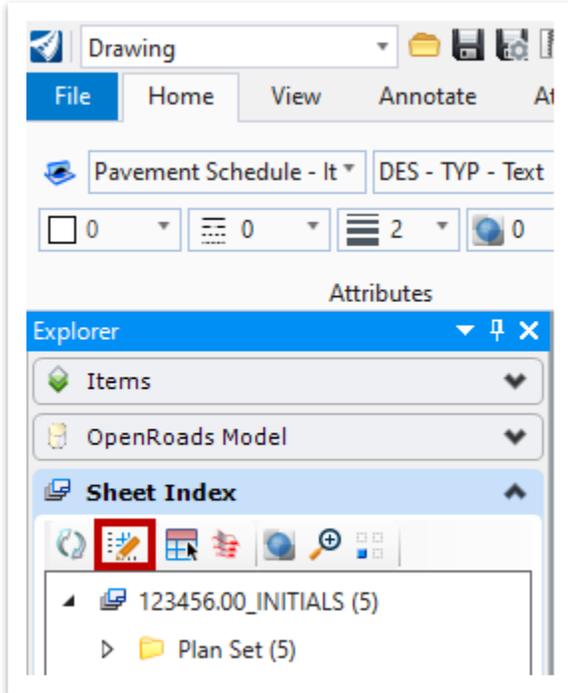


25. Once again, double click on the asterisk within each circle on the typical section to open the **Text Editor** and fill in the numbers to match the pavement schedule. You would also need to fill in the remaining circles, slopes and station ranges using the same procedure but for this exercise, we will stop here. **Note:** You could also use the **Fill In Single Enter-Data Field** tool to fill in the numbers.



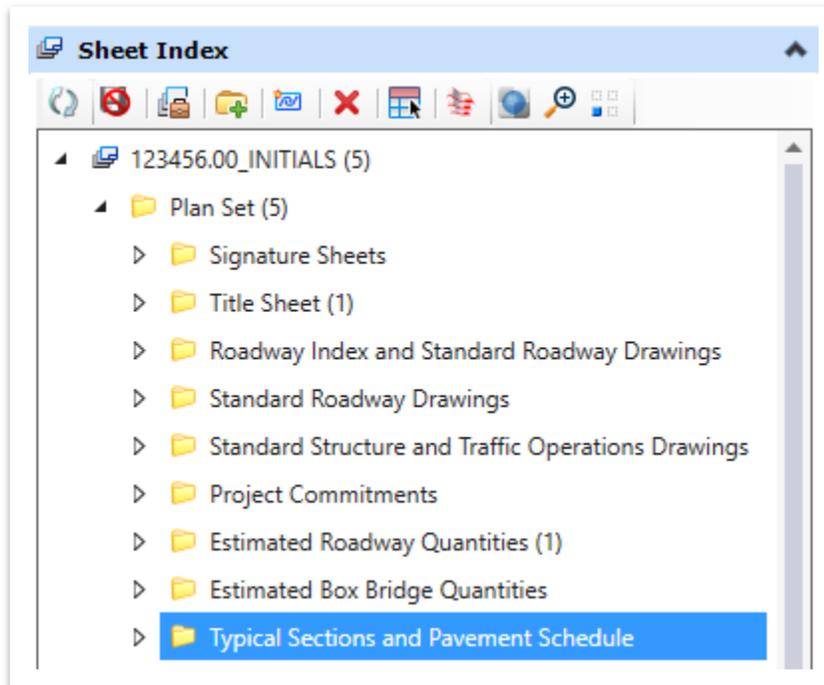


26. We must now add the **Typical Sections and Pavement Schedule** sheet to the **Sheet Index**. We will **drag the sheet model into the index**.
27. Open the Sheet Index for editing, if not already open. Remember, the Sheet Index must be Open for Editing before you can add any sheets to it.

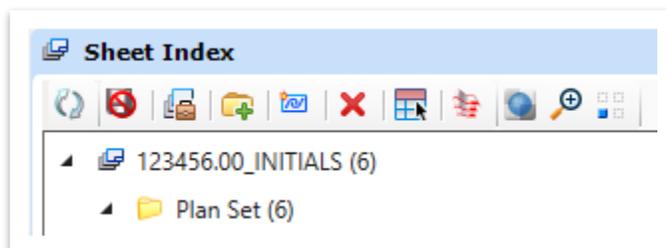




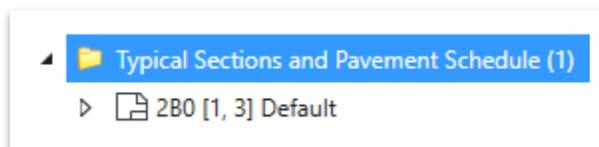
28. Open the **Model** window, if not already open (**Drawing >> Home >> Primary**). Once the **Default** model is highlighted, hold the left mouse button down and drag the model into the Typical Sections and Pavement Schedule folder in the sheet index (**Plan Set >> Typical Sections and Pavement Schedule**).



29. Notice that the sheet index now has **6** files in it: **123456.00\_INITIALS (6)**.



30. Notice also that you will now see the sheet in the sheet index under **Typical Sections and Pavement Schedule**.





31. Now we need to edit the sheet number on the 1<sup>st</sup> row in the top right corner. Also, the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet numbers must be deleted manually. These fields were automatically populated once the sheet was added to the index.

TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2B0
			<del>2B0</del>
			<del>2B0</del>

31. Go ahead and update the sheet number to be **2B**. To delete the **0** in the first row, you must double click the text field, delete the whole field and then type in 2B. Follow the same procedure to delete the 2<sup>nd</sup> and 3<sup>rd</sup> row sheet number text fields.

**Note: The sheet number will still show as 2B0 in the sheet index.**

TYPE	YEAR	PROJECT NO.	SHEET NO.
PRELIM.	2020	F123456.00	2B



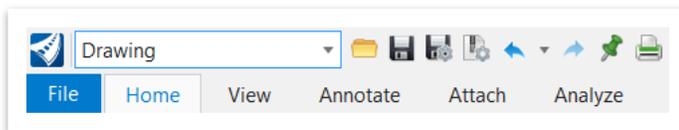
## 11.9 Lecture: Signature Sheet

All signature sheets will utilize the **Signature Sheet** seed, regardless of the discipline. It includes the electronic signature data fields as well as an embedded Word document containing the sheet index. Like the other sheets in this chapter, the signature sheet will also be placed in the sheet index.

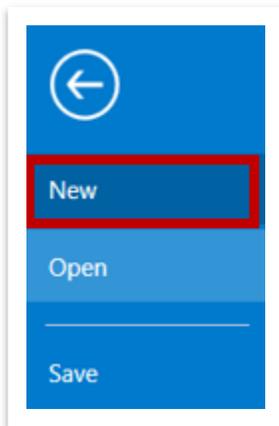
### 11.10 Exercise: Create a Signature Sheet



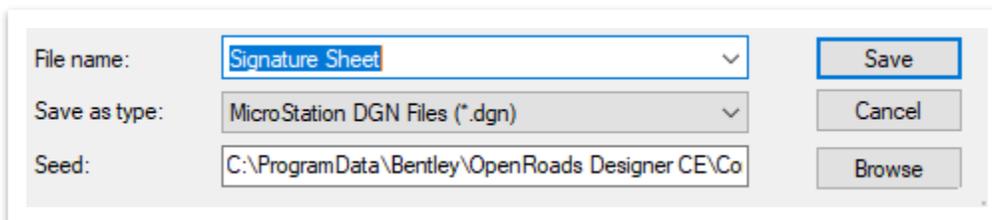
1. Click on **File** in the upper left corner.



2. Click on **New**, which will open another window where you will name the file and select the seed.



3. In the File name field, type in **Signature Sheet**.





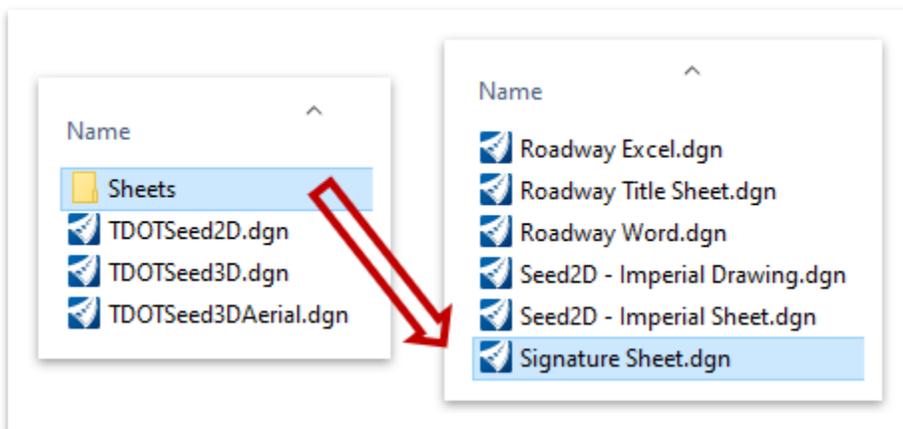
- To select the seed, click **Browse**. This will open another window showing the default folder where the 1:1 seed files are located. **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Organization-Civil\TDOT\_Standards\Seed\**.

File name:  Save

Save as type:  Cancel

Seed:  **Browse**

- Click on the Sheets folder. Select the **Signature Sheets.dgn** seed file and click **Open**.



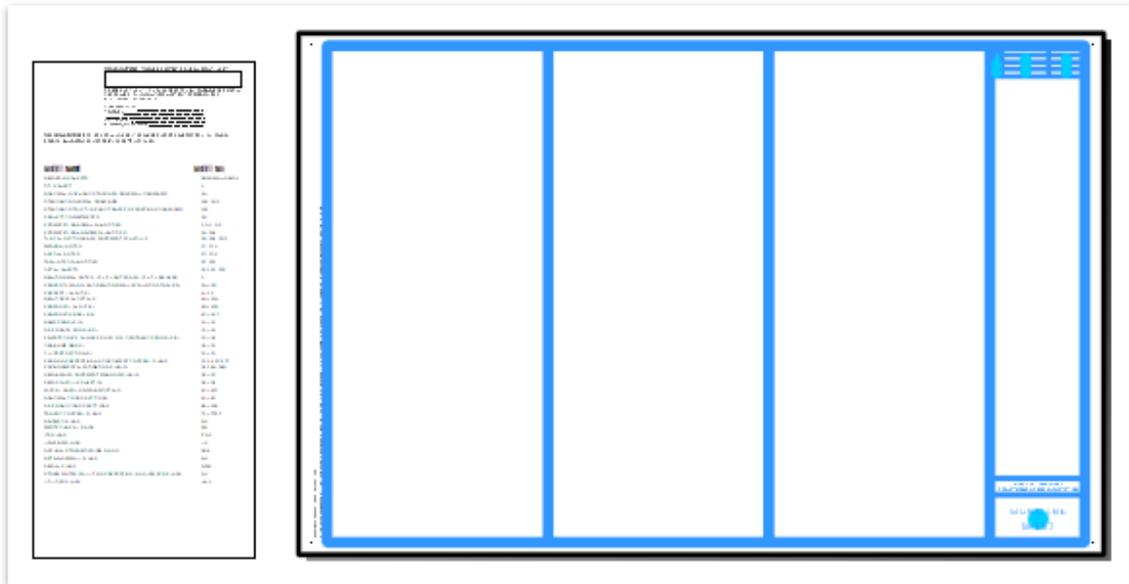
- Notice that by default, the signature sheet file you just created will be saved in the DGN folder under the **123456.00\_INITIALS** workset.

New - C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\

- Click **Save** and the file will open.



- The formatted signature information box will be on the left side of the sheet, which is where all information will be placed. Within this box is an embedded word document that the user will edit as necessary.

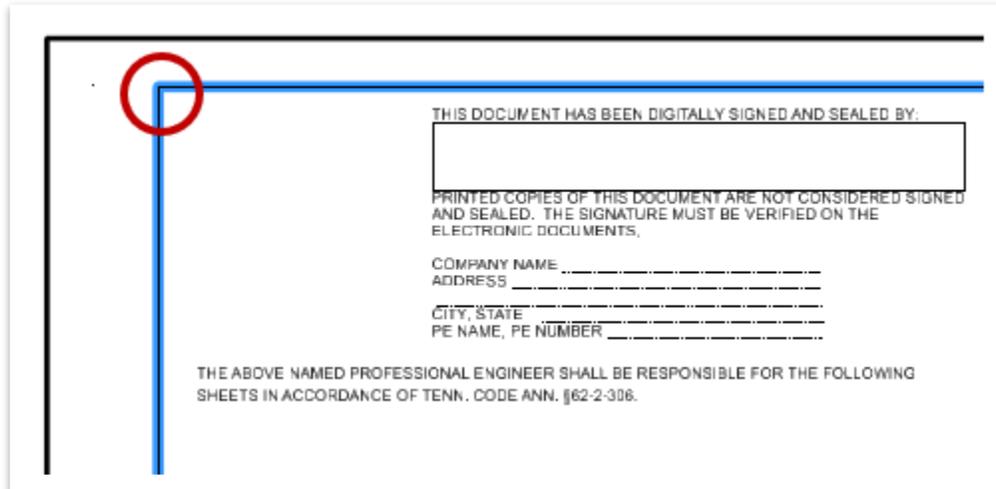


- Highlight the entire signature information box by using the element selection tool and drawing a box around it.





10. Open the **Move** tool (**Drawing >> Home >> Manipulate**) and snap to the top left corner. Then, with a 2<sup>nd</sup> mouse click, snap to the top left corner of the 1<sup>st</sup> blue column on the sheet (highlighted with a red circle). The signature information box should fit into the first blue column on the sheet. **Note:** If more than one signature information box was needed, you would copy the box to the 2<sup>nd</sup> and 3<sup>rd</sup> columns respectively and fill in the applicable data.



11. Next, double click within the upper part of the embedded word document which will open the **Text Editor**. Fill in the **Company Name**, **Address**, **City/State** and **PE Name/PE Number**, as shown below, by double clicking each text field within the text editor. Once the fields are filled in, left click anywhere within **View 1** to accept the updates. For this exercise, the user will not need to place an electronic signature or a stamp.
- Company Name:** TDOT
  - Address:** 505 Deaderick Street
  - City/State:** Nashville, TN
  - PE Name/PE Number:** Your Name / 123456

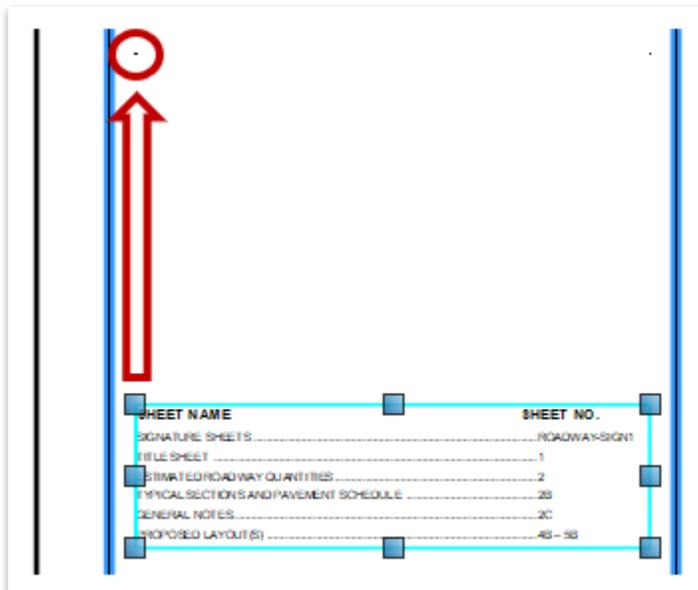
COMPANY NAME TDOT  
 ADDRESS 505 Deaderick Street  
 -----  
 CITY, STATE Nashville, TN  
 PE NAME, PE NUMBER Name / 123456



12. Now, double click anywhere within the sheet index, which will open the embedded word document in a separate window. Edit the sheet index to align with the sheets that have been created in the class. The applicable sheet numbers are in parenthesis, which need to match in the word document. Delete all other unused line items.
- Signature Sheets (ROADWAY-SIGN1)**
  - Title Sheet (1)**
  - Estimated Roadway Quantities (2)**
  - Typical Sections and Pavement Schedule (2B)**
  - General Notes (2C)**
  - Proposed Layouts (4B-5B)**

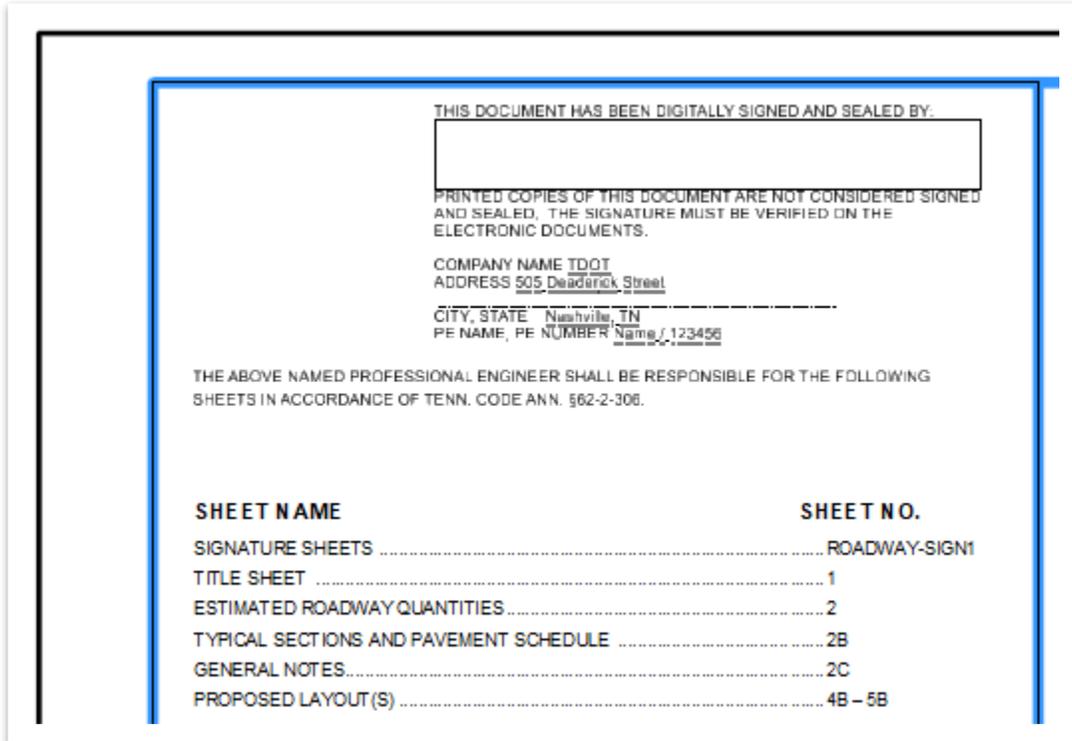
SHEET NAME	SHEET NO.
SIGNATURE SHEETS .....	ROADWAY-SIGN 1
TITLE SHEET .....	1
ESTIMATED ROADWAY QUANTITIES .....	2
TYPICAL SECTIONS AND PAVEMENT SCHEDULE .....	2B
GENERAL NOTES.....	2C
PROPOSED LAYOUT(S).....	4B – 5B

13. Close out of the word document and notice the updates within the ORD file.
14. Next, we need to move the sheet index further up the column. Open the **Move** tool, snap to the upper left corner of the sheet index and then snap to the left blue dot, as highlighted below. You will need to zoom in to see the snap point.

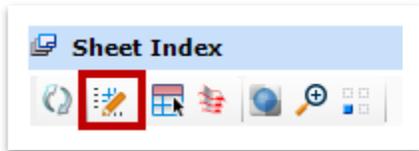




- Once moved, the signature sheet should look like this. Go ahead and turn off the **DES - SCRATCH - User 1** level.

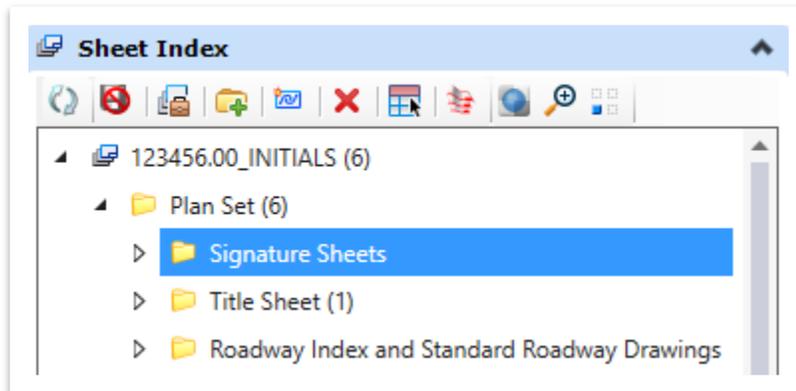


- We must now add the **Signature** sheet to the **Sheet Index**. We will **drag the sheet model into the index**.
- Open the Sheet Index for editing, if not already open. Remember, the Sheet Index must be Open for Editing before you can add any sheets to it.

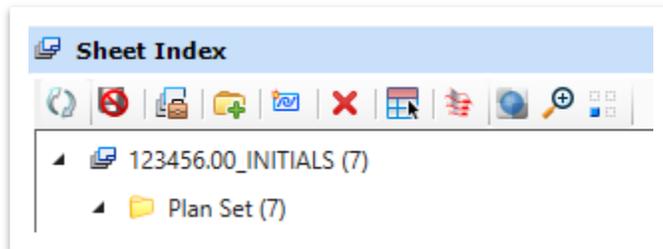




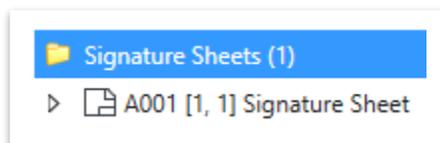
18. Open the **Model** window, if not already open (**Drawing >> Home >> Primary**). Once the **Signature Sheet** model is highlighted, hold the left mouse button down and drag the model into the Typical Sections and Pavement Schedule folder in the sheet index (**Plan Set >> Signature Sheets**).



19. Notice that the sheet index now has **7** files in it: **123456.00\_INITIALS (7)**.



20. Notice also that you will now see the sheet in the sheet index under **Signature Sheets**.



21. Now we need to manually add the sheet number in the top right corner. It is not linked because the sheet will be used by multiple disciplines within TDOT. Since this is a roadway signature sheet, key-in: **RDWY SIGN1** as the sheet no. It will go on 2 lines, as shown. You can turn off the Data Fields once you are done in the View Attributes menu.

YEAR	PROJECT NO.	SHEET NO.
2020	F123456.00	RDWY SIGN1



## Chapter 12. Plotting Sheets

In this chapter, we will learn how to utilize the sheet index to plot individual sheets or an entire plan set.



### 12.1 Objectives

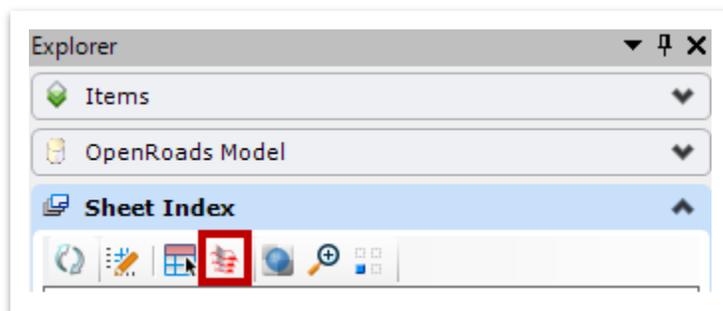
At the conclusion of this chapter, participants will be able to:

1. Plot an overall PDF via the print organizer.

### 12.2 Lecture: Creating a PDF with Print Organizer

Plotting of all sheets will be done thru the Sheet Index via the **Print Organizer** (Figure 110). Please note that the Sheet Index does not have to be open for editing to plot. You can select a single sheet, an entire subfolder(s) or the entire project. If you want multiple subfolders, highlight the subfolders you want first and then open the Print Organizer. **There will no longer be individual SHT files.** All sheets will be stored within the **dgnws** (workset) sheet index that is created for each project. Remember that by default, all sheet models will be stored in one dgn file. However, you have the option as discussed earlier to create individual dgn files for each sheet model if desired. Also, you may still use the **File >> Print** option to print individual sheets if you'd like. The key will be to make sure and apply the **TDOT PDF** print style, which is described on the next page.

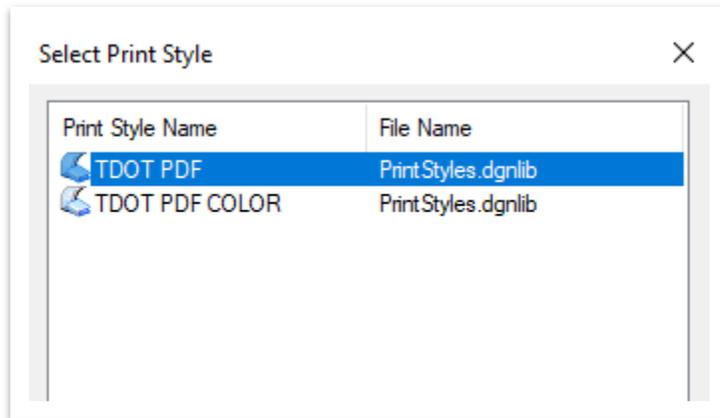
FIGURE 110. PRINT ORGANIZER TOOL





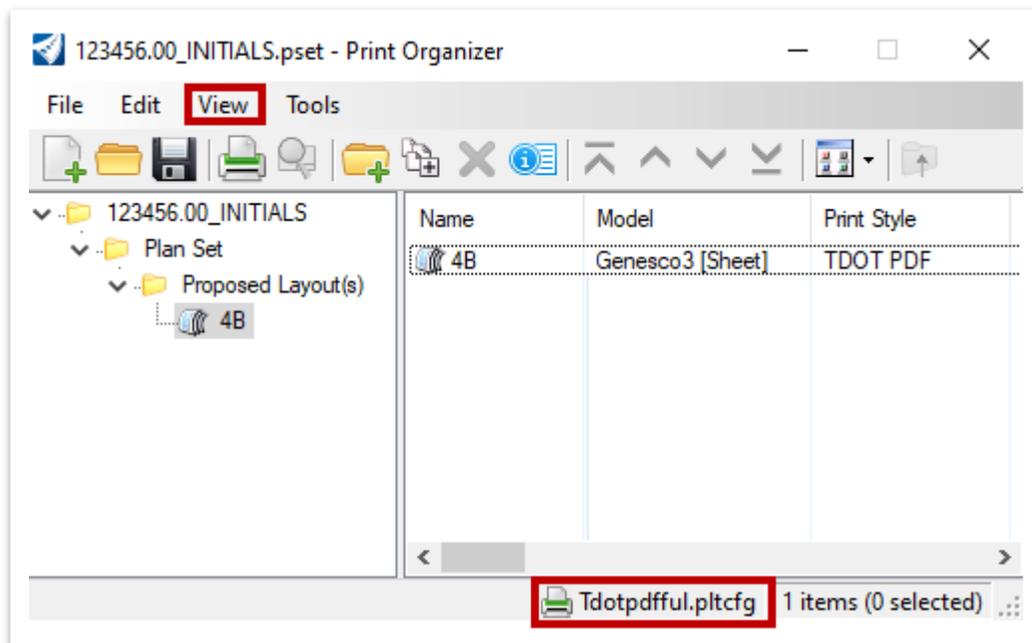
The user will then be prompted to select a **Print Style** (Figure 111). Both **TDOT PDF** (black and white) and **TDOT PDF COLOR** are setup to plot at full size (34"x22"). **Note:** Additional print styles may be added in the future.

FIGURE 111. PRINT STYLE OPTIONS



This will open the **Print Organizer** (.pset) dialog box (Figure 112). You can select either a single sheet, an entire subfolder or the entire plan set folder to print. The applicable TDOT plot configuration file (**Tdotpdfful.pltcf**) is linked automatically to the print style. **Note:** You can control the toolbar/status bar and what columns you see in the **View** menu.

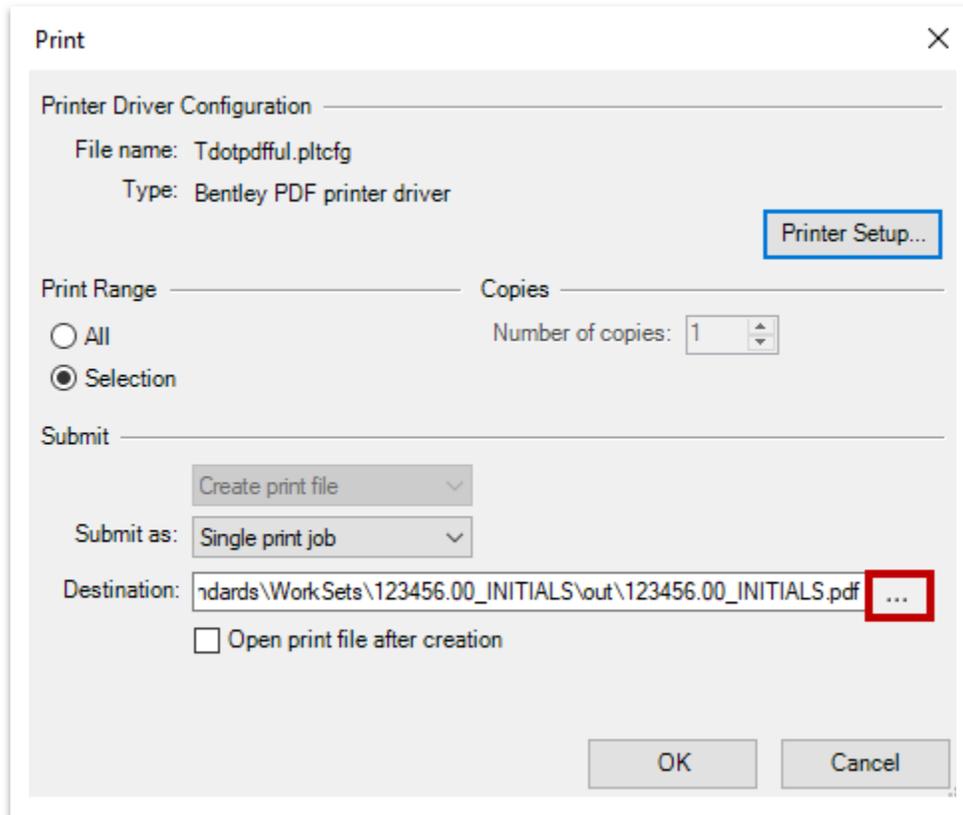
FIGURE 112. PRINT ORGANIZER DIALOG WINDOW





Once the file(s) or folder(s) are highlighted, the user will select **Print** (4<sup>th</sup> icon from the left or **File >> Print**) which opens the **Print** dialog box (Figure 113) and then browse to the destination folder. The TDOT plot configuration file is automatically linked to the print style.

FIGURE 113. PRINT DIALOG BOX



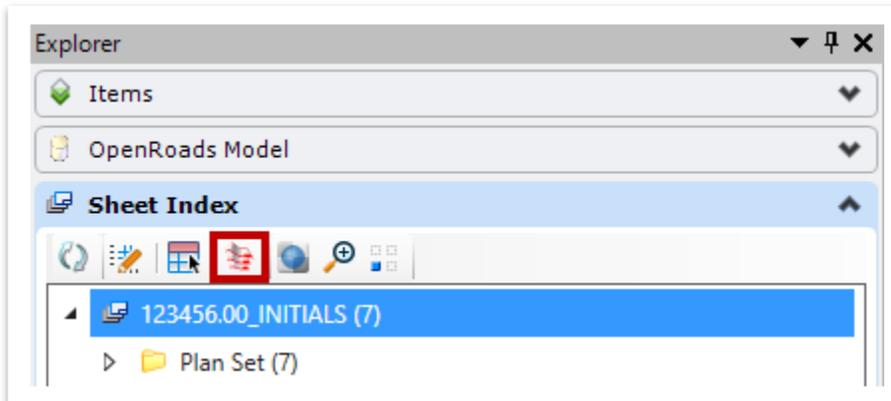
Browse to select the correct Destination folder of where you want to save the PDF file. If you select the **Open print file after creation** option, your PDF application will automatically open the file once it's done.



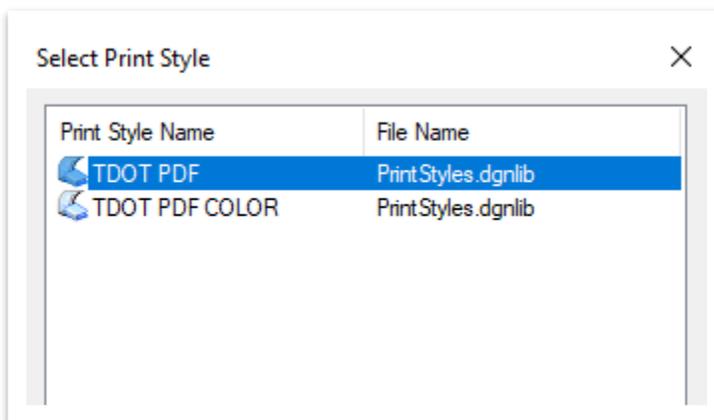
## 12.3 Exercise: Creating a PDF with Print Organizer



1. Keep the **Signature Sheet.dgn** file open. The sheet index should still have 7 sheets total.
2. Highlight the 123456.00\_INITIALS workset and open the **Print Organizer** by clicking on the icon highlighted in red. Please note that the Sheet Index is open for editing in the screenshot below but does not have to be in order to print. You will see the icon regardless.

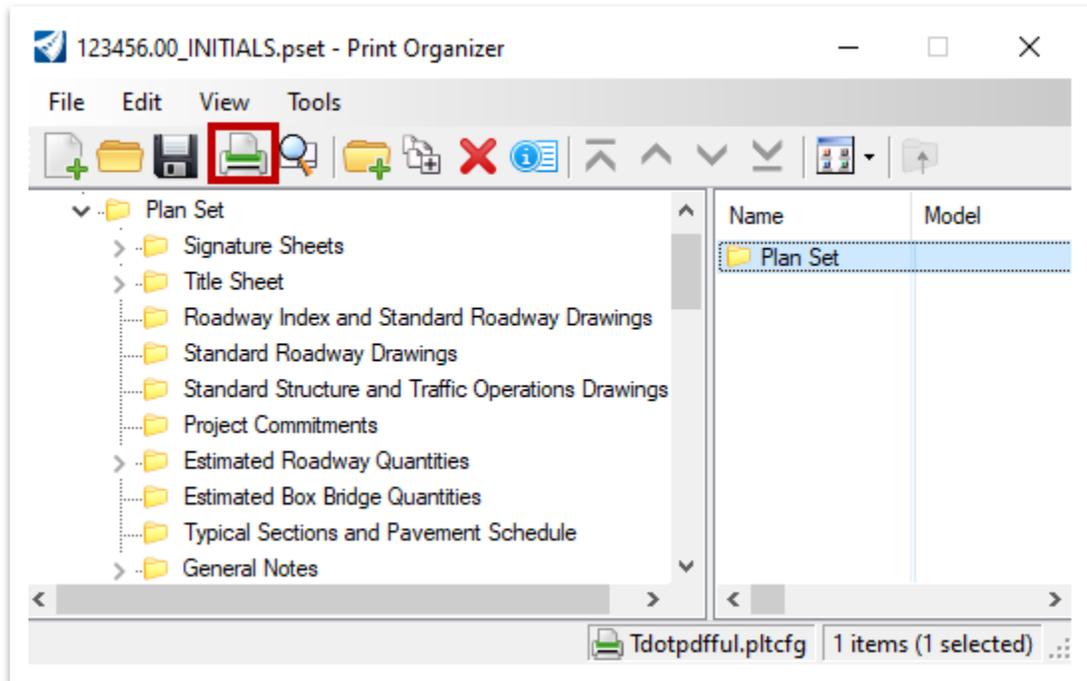


3. Once the Print Organizer is selected, a new window will open prompting you to **Select Style Name**. Select the **TDOT PDF** print style (full size Black & White) and click OK.



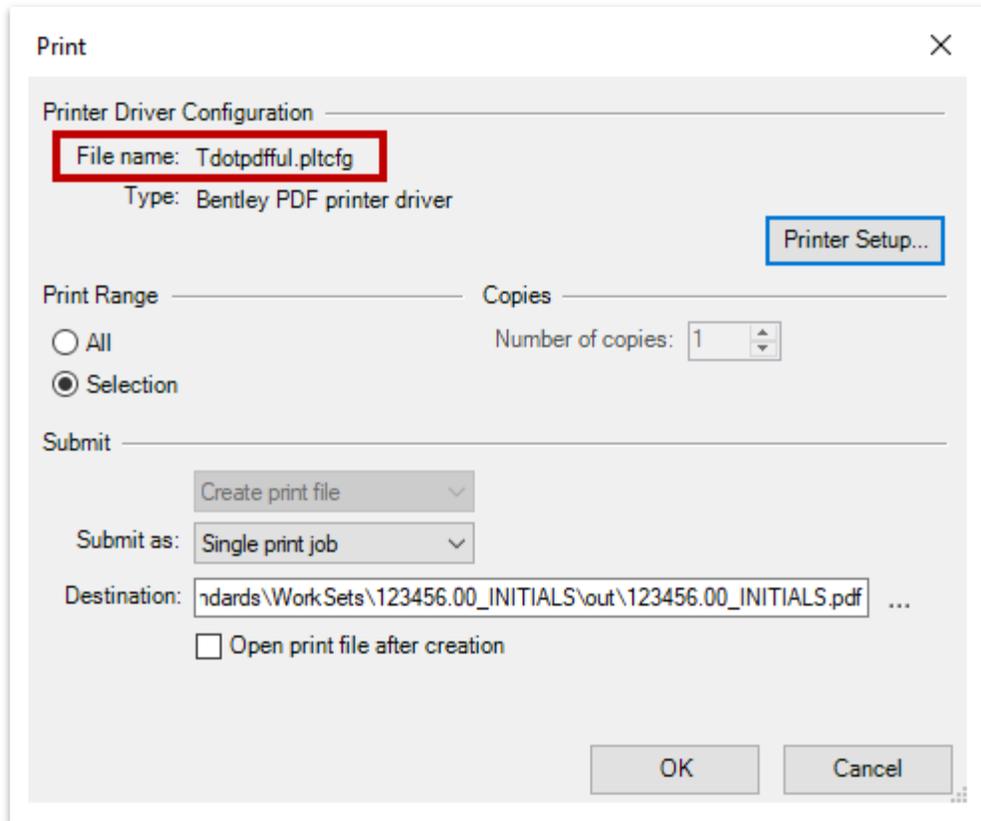


- This will open the **Print Organizer** (.pset) window. Select the **Plan Set** folder, as shown below, and click **File >> Print** at the top of the Print Organizer window (or the 4<sup>th</sup> icon highlighted in red). By selecting the folder as opposed to an individual file, it will print all sheets in the Sheet Index under **Plan Set**.

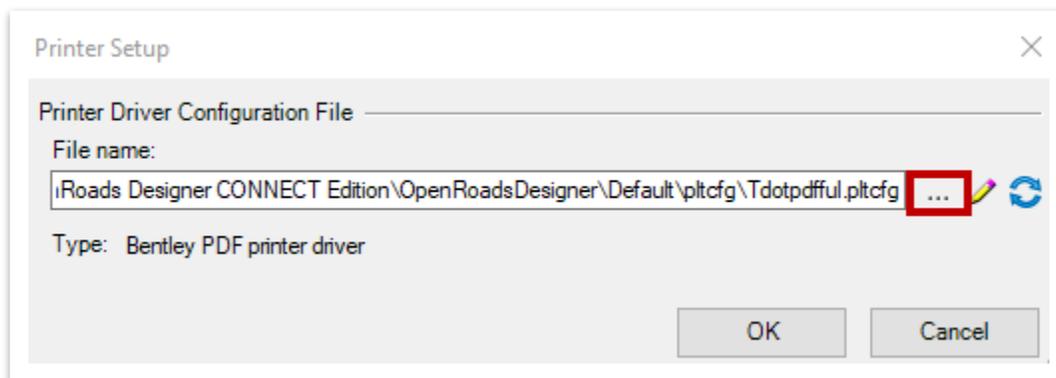




- The **Print** window will open next. The TDOT plot configuration file is automatically linked to the print style. If it is not, see **Steps 6-7**. If the plot configuration file is already selected, then skip to **Step 8**.



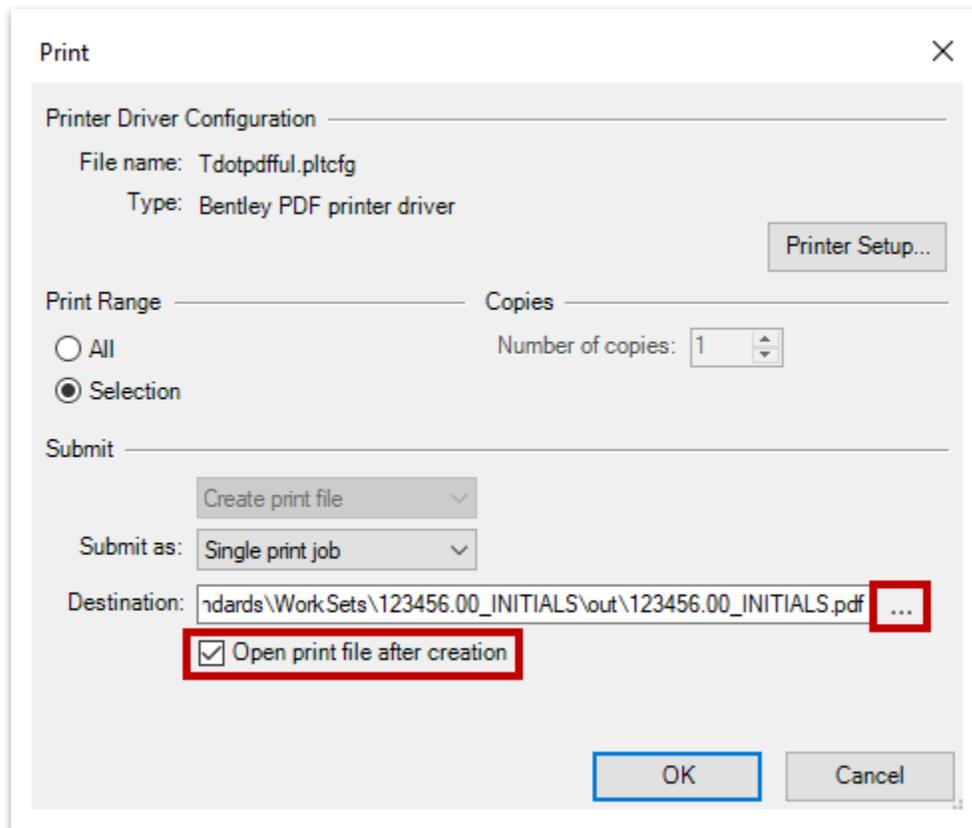
- Click on **Printer Setup** which will open a 2<sup>nd</sup> window and then click **Browse** (highlighted in red below).



- By default, it should open to the configuration folder: **C:\Program Files\Bentley\OpenRoads Designer CONNECT Edition\OpenRoadsDesigner\Default\pltcfg**. Select the **Tdotpdful.pltcfg** file and click Open. Then click **OK**.



- Notice that by default, the Destination folder for the PDF that is about to be created is: **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\Work Spaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\out**.



- You can save the PDF elsewhere by hitting Browse (highlighted in red above) and selecting the folder location you desire. For this exercise, however, save the PDF as **123456.00\_Preliminary.pdf** in the default destination location. Toggle on the **Open print file after creation** option.
- After the print file has opened, examine the **7-page** PDF. There should be a Signature Sheet, a Title Sheet, 1 Roadway Quantities sheet, 1 Typical Sections and Pavement Schedule sheet, 1 General Notes sheet, and 2 Proposed Layout sheets. Also notice that the date and time stamp on each sheet in the lower left corner have automatically populated as well.

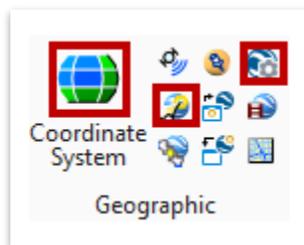


## Chapter 13. Geographic Tools



The **Geographic Tools (Drawing >> Utilities >> Geographic)** allow the user to convert the data from one coordinate system to another while processing data for other tasks. These tools also allow for the exporting of a KML file to be used in Google Earth. The most commonly used Geographic Tools are **Coordinate System** , **Export Google Earth (KML) File**  and **Google Earth Settings**  highlighted in red (Figure 114).

FIGURE 114. GEOGRAPHIC TOOLS



### 13.1 Objectives

At the conclusion of this chapter, participants will be able to:

1. Apply a coordinate system to a dgn file.
2. Apply a datum adjustment factor.
3. Export a kmz file and examine in Google Earth.

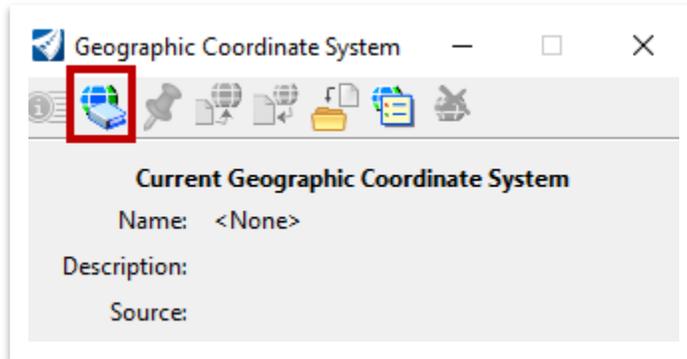
### 13.2 Lecture: Coordinate Systems

In ORD, it is important to assign a coordinate system to every drawing. The current coordinate system used for TDOT Survey Standards is **State Plane NAD83 (2011)**. The **Coordinate System** tool provides the user with information about the drawing's coordinate system (if applicable), and it allows the user to set the coordinate system.



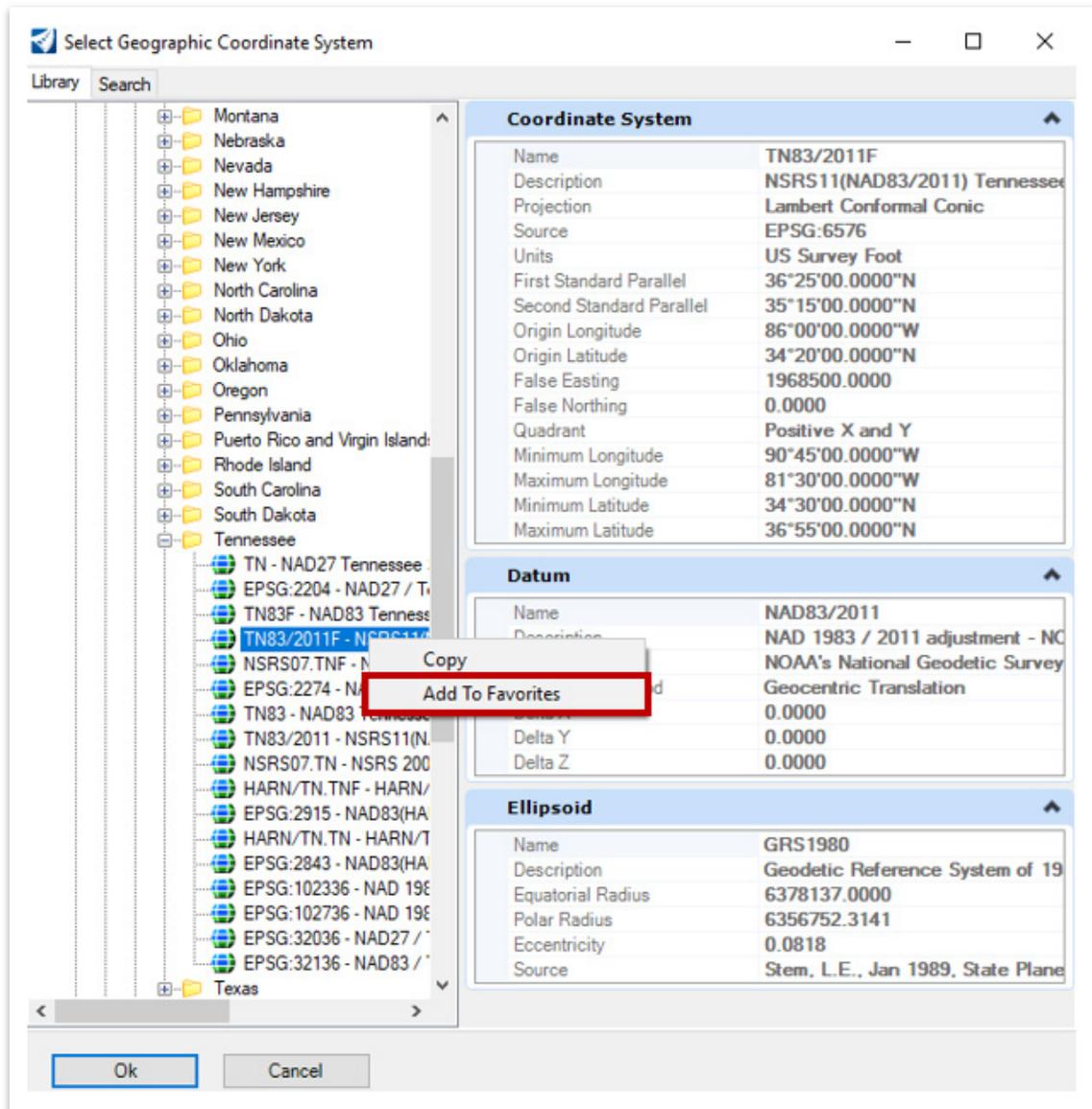
## 13.3 Exercise: Apply a Coordinate System

1. Open the **Fundamentals Reference.dgn** file
2. Select the **Geographic Coordinate System (GCS)** tool (**Drawing >> Utilities >> Geographic**) and click the **From Library** option (second icon from the left). Notice that by default there is not coordinate system associated with the file.





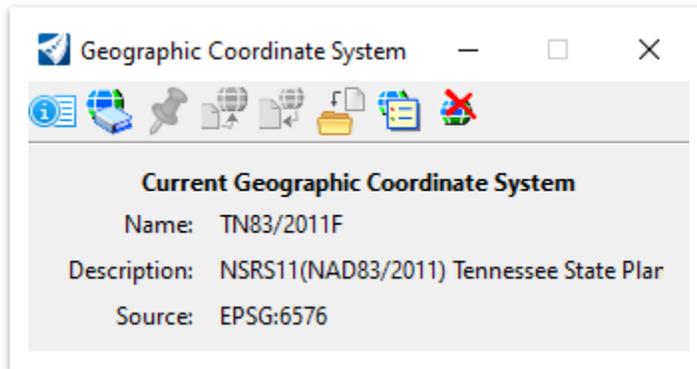
- Set the Geographic Coordinate System. Navigate to: **Library >> Projected (northing, easting, ...) >> North America >> United States of America >> Tennessee >> TN83/2011F – NSRS11 (NAD83/ 2011) Tennessee State Plane Zone, US Foot**. Before clicking on OK, let's save this coordinate system as a **Favorite** so you will not have to browse every time. Right click on the coordinate system and select **Add To Favorites**.



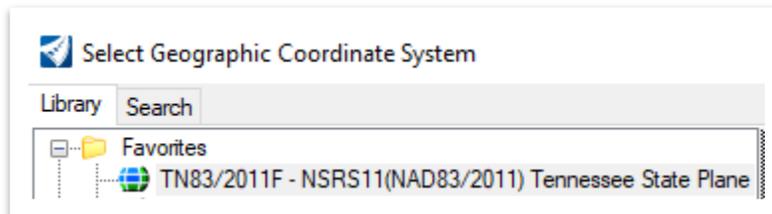
- Click **OK**.



5. Once the **GCS** is set, you should see the following image:



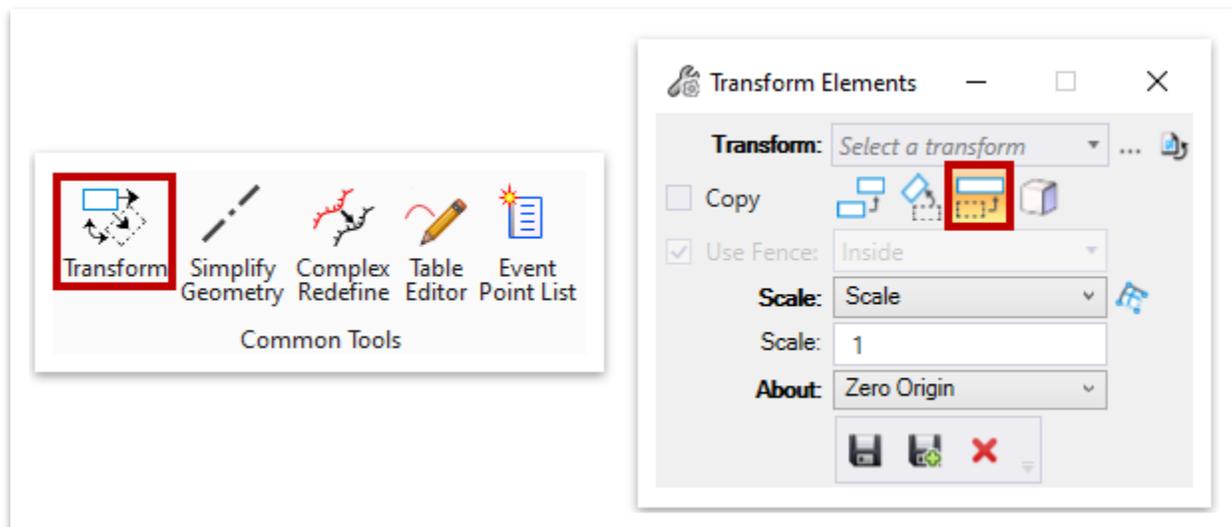
6. If you open back up the Coordinate System tool, notice that the **TN83/2011F** coordinate system is now at the top under Favorites.



## 13.4 Lecture: Datum Adjustment Factors

Before we can export to Google Earth, we need to take into consideration whether a **datum adjustment factor** needs to be applied so that the linework will align with the google earth imagery. This process will utilize the **Scale** option within the **Transform** tool located here: **OpenRoads Modeling >> Geometry >> Common Tools**. (Figure 115).

FIGURE 115. TRANSFORM TOOL



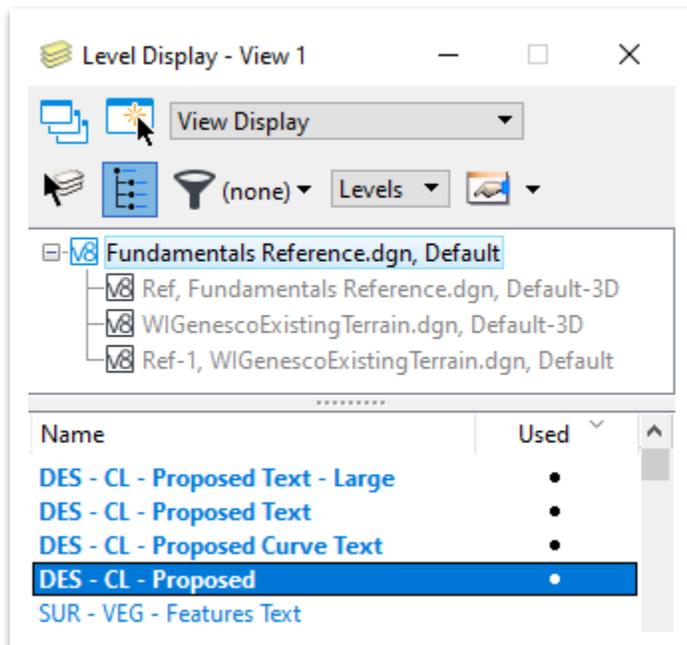


If applied, the datum adjustment factor should be the **inverse** of what was applied in the survey and scaled about the **Zero Origin** (0,0). For example, if the survey had a factor of 1.00006, the scale key-in would be 1/1.00006. It is important to click only **once** to process because it will look as if none of the linework moves.

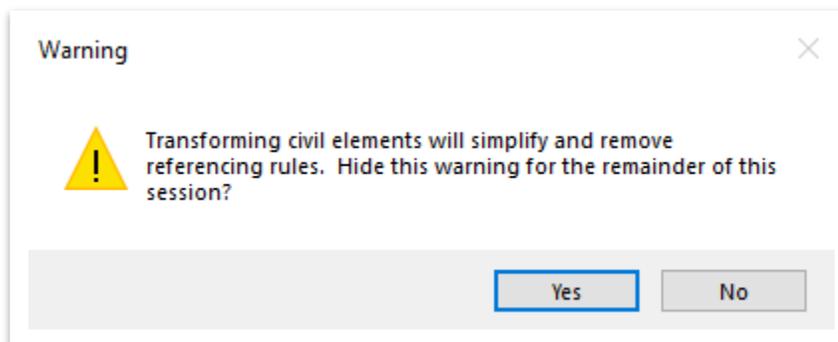
### 13.5 Exercise: Apply a Datum Adjustment Factor



1. Within the same **Fundamentals Reference.dgn** file, turn all reference files off and keep only the **DES - CL - Proposed** level turned on in the active file. The intelligence of the corridor is tied to the alignment so the corridor will transform as well.

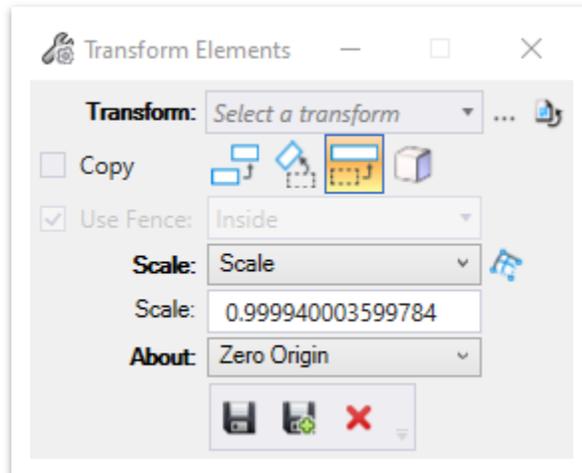


2. Select both centerlines using the **Element Selection** tool.
3. Open the **Transform Elements** tool. (**OpenRoads Modeling >> Geometry >> Common Tools**). You should get a warning if applying any transformation for the first time within a given file. Click **Yes**.

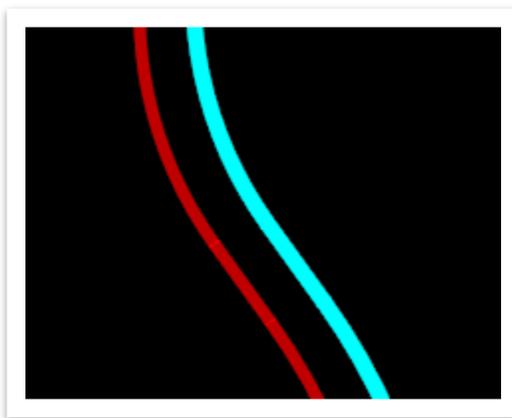




4. We will assume a datum adjustment of **1.0006** for this exercise. Select the options as shown below:
  - a. **Scale:** Scale
  - b. **Scale:** 0.999940003599784 (1/1.00006)
  - c. **About:** Zero Origin



5. Now, notice the command prompt in the bottom left corner: **Accept transform.** Before accepting, notice the 2<sup>nd</sup> relocated alignment in red. ORD is giving you a preview of the updated location once you accept the transformation. Left click **once** in space to accept.



6. Go ahead and turn back on all levels in the active design file other than **DES - CL - Proposed Text - Small**. We will export to Google Earth in Exercise 13.7.



## 13.6 Lecture: Export a Google Earth File

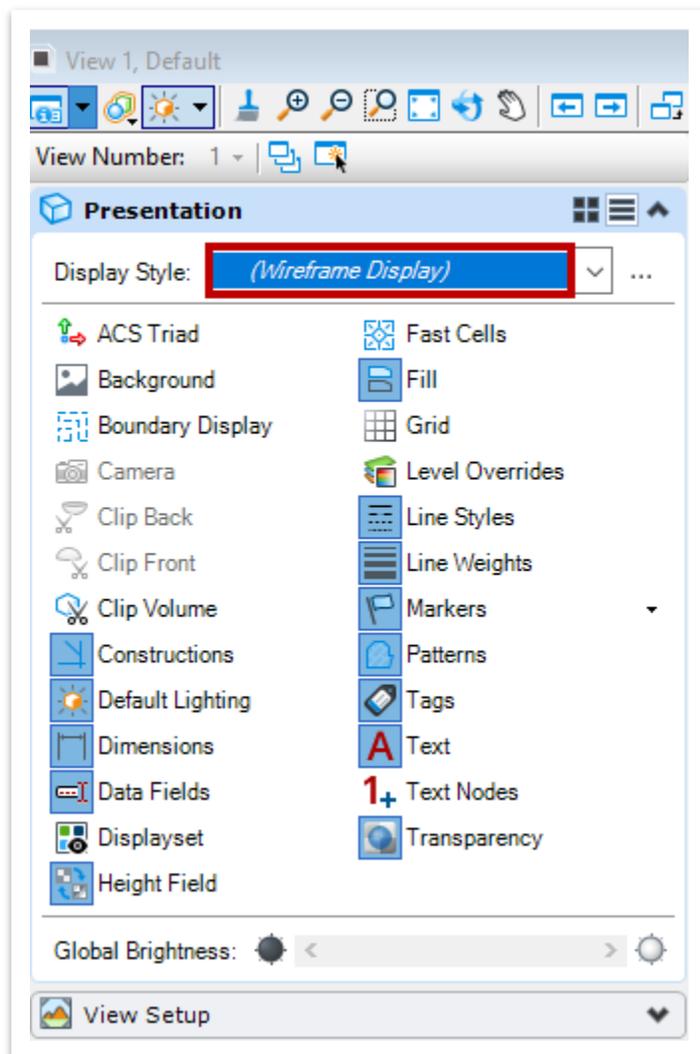


This tool is used to export ORD geometry to Google Earth graphics in either a KMZ or **KML** file format. The export settings can be modified through the **Google Earth Settings** dialog box, which is described in Section 13.8.

When geometry is exported, it is exported with all the view attributes and level symbology settings in the active view. To minimize clutter in the exported file, only necessary data should be included in the active view. Unnecessary and unused levels and labels should be turned off or disabled.

With 2D models, **Wireframe** display mode (Figure 116) is typically appropriate for exporting, and **Smooth** display mode should be used for 3D models.

FIGURE 116. DISPLAY STYLE



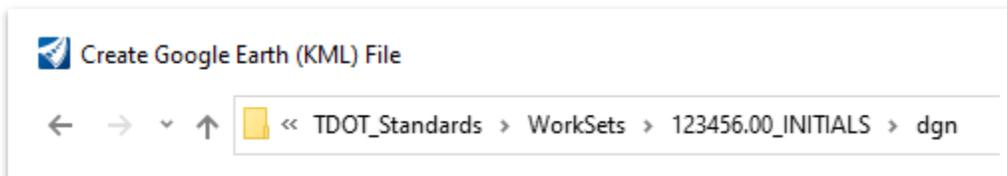


## 13.7 Exercise: Export a Google Earth File

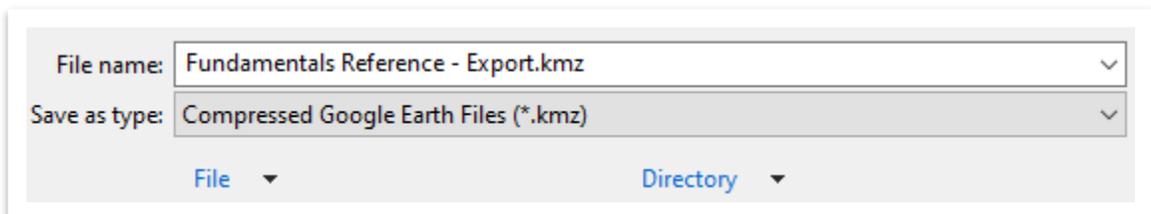
1. Within the same **Fundamentals Reference.dgn** file, switch to the **Drawing** workflow and open the **Export Google Earth File** tool. (**Drawing >> Utilities >> Geographic**).



2. A second window will open automatically asking to name and save the file. Notice that the default folder location is: **C:\ProgramData\Bentley\OpenRoads Designer CE\Configuration\WorkSpaces\TDOT\_Standards\WorkSets\123456.00\_INITIALS\dgn\**.

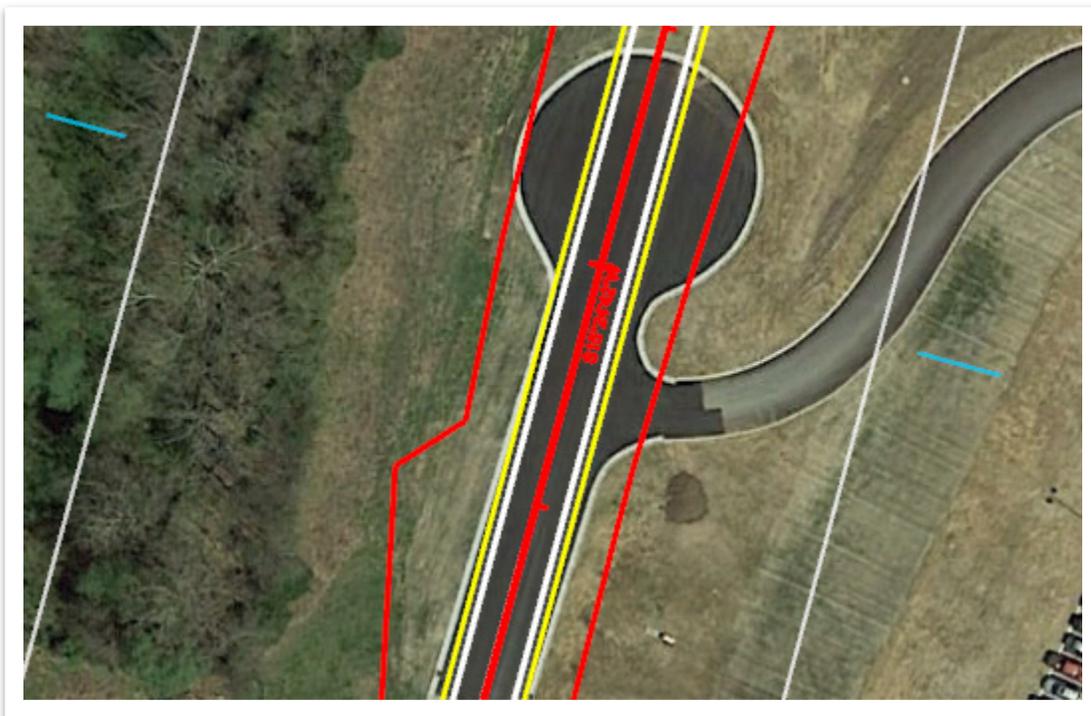


3. Name the file: **Fundamentals Reference - Export**. For the Save as type option, you have a choice between a **KML (Uncompressed)** or **KMZ (Compressed)** file extension. For this exercise, choose the **KMZ** file option and click **Save**.





- Once the file has been created, Google Earth will automatically open and zoom to the extents of the file. Notice how the proposed alignment and corridor align with the existing road. You can turn levels on or off within Google Earth as you choose. **Note:** The first image below is at the northern end (beginning) of the project and the second image is at the southern end of the project.

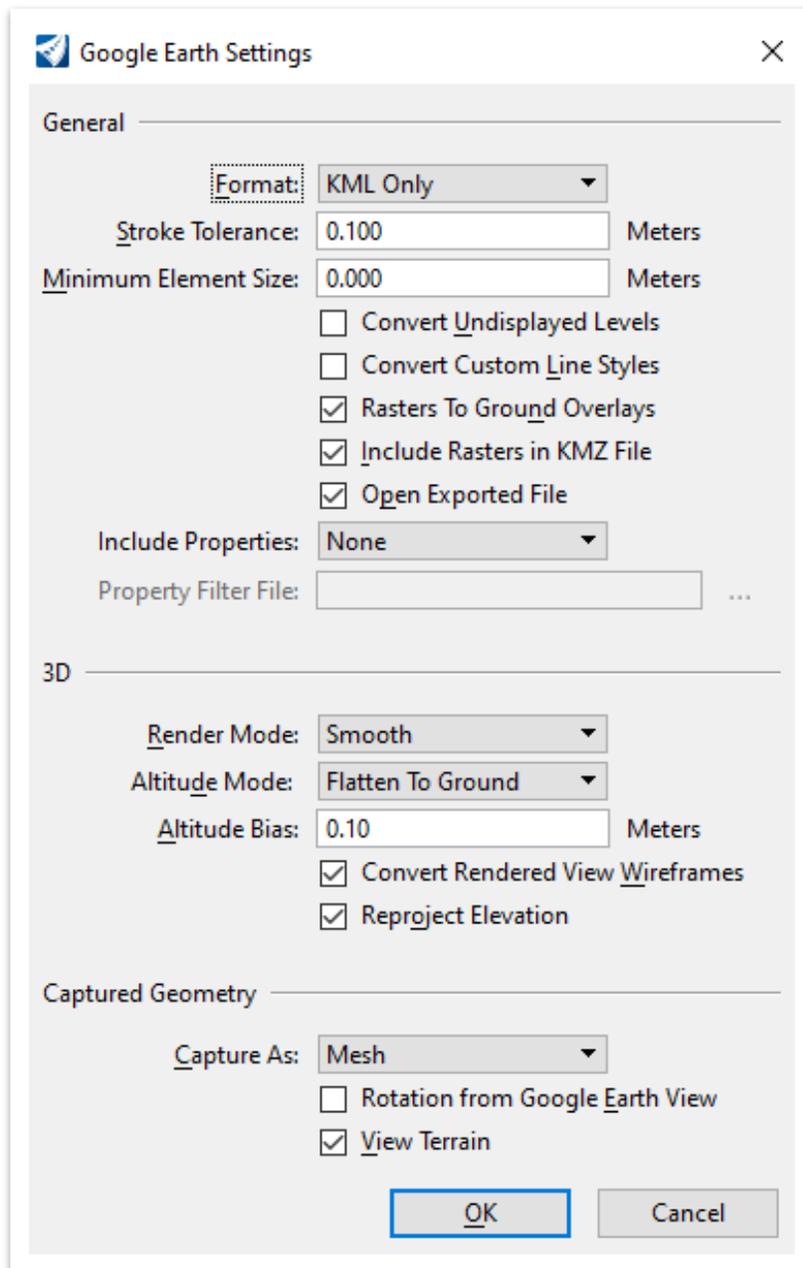




## 13.8 Lecture: Google Earth Settings

This tool allows the user to edit the settings for the Google Earth tools (Figure 117). These settings determine how the KML file gets created when exporting geometry and whether Google Earth automatically opens once the file is created. The default settings should not need to be changed unless the user has other preferences. The **Flatten To Ground** option works best if projecting 3D data. **Note:** The 3D section within the settings will be greyed out if in a 2D file.

FIGURE 117. GOOGLE EARTH SETTINGS DIALOG BOX





# Revision History

DATE (MONTH/YEAR)	AUTHOR/EDITOR	IB #	SECTIONS MODIFIED