



# FDOTConnect for OpenRoads Designer

## CADD Essentials **COURSE GUIDE**

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*State of Florida*  
*Department of Transportation*

**FDOTConnect**  
*for*

**OpenRoads Designer**  
**CADD Essentials**  
**Course Guide**  
2024

PRODUCTION SUPPORT / CADD OFFICE  
TALLAHASSEE, FLORIDA  
<http://www.fdot.gov/cadd>

# FDOTConnect

for

## *OpenRoads Designer*

### *CADD Essentials*

#### **Description**

This course is an overview of the FDOT Connect WorkSpace for OpenRoads Designer. The goal of this course is to provide the user with an understanding of the FDOT WorkSpace for OpenRoads Designer and an overview of the essential elements of the FDOT design environment as a prerequisite for further FDOT CADD training courses.

#### **Objectives**

This course includes but is not limited to:

- FDOTConnect Suite for OpenRoads Designer
- FDOTConnect desktop folder resources
- FDOTConnect design environment in OpenRoads Designer
- OpenRoads Designer worksets
- Navigating the OpenRoads Modeling Workflow and Ribbon
- Levels and Features in OpenRoads Designer
- Cells and Cell tools
- Reference Files in FDOT Connect for OpenRoads Designer

#### **Prerequisites**

No prior CADD experience required, but some manual drafting or related CADD product experience is recommended.

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## **DOCUMENT STYLE**

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

| Item                                        | Convention                              | Example                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Menu names, Commands, and Ribbon Navigation | Bold<br>(Names separated with > symbol) | <ul style="list-style-type: none"> <li>• General form is <b>Workflow</b> (when applicable) &gt; <b>Tab</b> &gt; <b>Group</b> &gt; <b>Tool</b></li> <li>• <b>File</b> &gt; <b>Open</b></li> <li>• <b>File</b> &gt; <b>Settings</b> &gt; <b>User</b> &gt; <b>Preferences</b></li> <li>• <b>OpenBridge Modeler</b> (Workflow) &gt; <b>FDOT</b> &gt; <b>Actions</b> &gt; <b>Create File</b></li> </ul> |
| Window actions                              | Bold                                    | <ul style="list-style-type: none"> <li>• Click the <b>Apply</b> button.</li> <li>• Click the <b>Graphic Select</b> button to the right of the <i>Horizontal Alignment Include</i> box.</li> <li>• In the <b>Segment</b> Type list, click <b>Lines</b>.</li> </ul>                                                                                                                                  |
| Window field names                          | Italic                                  | <ul style="list-style-type: none"> <li>• Key in <b>Hemfield Road</b> in the <i>Alignment Name</i> field.</li> <li>• Click the <b>Graphic Select</b> button to the right of the <i>Horizontal Alignment Include</i> field.</li> <li>• In the <i>Segment Type</i> list, click <b>Lines</b>.</li> </ul>                                                                                               |
| Key-ins                                     | Bold                                    | <ul style="list-style-type: none"> <li>• Key in <b>Hemfield Road</b> in the <i>Alignment Name</i> field.</li> </ul>                                                                                                                                                                                                                                                                                |
| File names                                  | Italic                                  | <ul style="list-style-type: none"> <li>• Open the file <i>Working Graphics.dgn</i> in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.</li> </ul>                                                                                                                                                                                                                                |
| File paths                                  | Underline                               | <ul style="list-style-type: none"> <li>• Open the file <i>Working Graphics.dgn</i> in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.</li> </ul>                                                                                                                                                                                                                                |
| New terms or emphasis                       | Italic or Bold                          | <ul style="list-style-type: none"> <li>• The Template Library contains <i>templates</i>, which represent typical sections of the proposed roadway.</li> <li>• <b>The user is not to utilize this tool.</b></li> </ul>                                                                                                                                                                              |

# 1 FDOT AND OPENROADS DESIGNER

## **INTRODUCTION**

This course was developed to introduce OpenRoads Designer Connect Edition users to the FDOT Connect WorkSpace for the design and development of Florida Department of Transportation (FDOT) projects. The intent is to cover the basics and give the user general knowledge of ORD with FDOT's customization to assist the user in producing a product that is in compliance with the FDOT Computer Aided Design and Drafting (CADD) Standards.

## **OBJECTIVES**

This chapter reviews FDOT Connect as a set of custom tools developed by FDOT for use with OpenRoads Designer and other Connect Edition applications.

- OpenRoads Designer and Connect Edition Applications
- The FDOT Connect suite
- FDOT Connect desktop folder
- FDOT Connect launch shortcuts
- Clearcrash and WorkSpace Doctor
- FDOT Connect support
- Additional FDOT Connect tools

## **OPENROADS DESIGNER AND CONNECT EDITION APPLICATIONS**

Bentley OpenRoads Designer Connect Edition is the Bentley CADD platform chosen by FDOT for production of designs, plans, and models. Much like the previous platform MicroStation and Power GEOPAK, ORD uses the DGN file format.

**NOTE** *While DGN extension is still used, the ORD and Select Series DGN files are not compatible.*

## **FDOTConnect SUITE AND DESKTOP FOLDER**

FDOT has created and provided a custom WorkSpace to standardize the OpenRoads Designer environment for FDOT projects to meet CADD standards. This WorkSpace determines how ORD displays on the screen and sets up certain default files and search paths. This WorkSpace, called FDOT Connect is also compatible with certified versions of OpenBridge Modeler, OpenBridge Designer and MicroStation Connect Edition.

The FDOT Connect Suite includes custom tools created

FDOT Connect creates a desktop folder and Windows menu application group. The desktop folder and menu group contain the same selection of launch shortcuts and shortcuts for FDOTConnect-related custom tools and applications.

Depending on what Connect Edition applications you have installed, FDOT Connect will create launch shortcuts for each of your installed applications to launch them in the FDOT WorkSpace mode.



## **FDOTConnect LAUNCH SHORTCUTS**

The FDOT Connect launch shortcuts allow the user to launch OpenRoads Designer, OpenBridge Designer, OpenBridge Modeler or MicroStation Connect Edition in the FDOT Connect WorkSpace mode depending on what applications are currently installed. It is important to consult the list of application versions that FDOT has certified for use with FDOTConnect. The example below shows the launch icons for all four of the supported applications. Double-clicking these shortcuts will launch the selected application in FDOT mode.



## **FDOTConnect SUPPORT**

The FDOT desktop folder and Windows menu application group also include icons for obtaining support for FDOT Connect and the FDOT workflow.



**CADD GoToMeeting** – When requesting support from the FDOT CADD office, it is sometimes necessary to connect via GoToMeeting for screen sharing and troubleshooting. This shortcut provides access to a website where the user can enter a GoToMeeting ID number provided by a Support Specialist at the CADD Office.

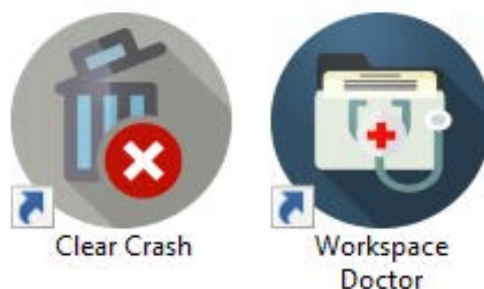
**CADD Support Communities** – Bentley Communities is a web-based forum hosted by Bentley. Users can find community-based support and training information at this forum. This shortcut provides access to the FDOT CADD Support forum of Bentley Communities.

**CADD Website** – This shortcut provides access to the FDOT CADD Office website. The CADD Office website includes software downloads, training videos and training course guides.

**Request CADD Support** – This shortcut provides access to the FDOT CADD Office Issue Log portal. At this portal, the user can enter support request information and submit a support ticket. The dashboard for this portal is monitored throughout the day. An FDOT CADD Support Specialist will follow-up with the user to assist in resolving the support request.

## **CLEAR CRASH AND WORKSPACE DOCTOR**

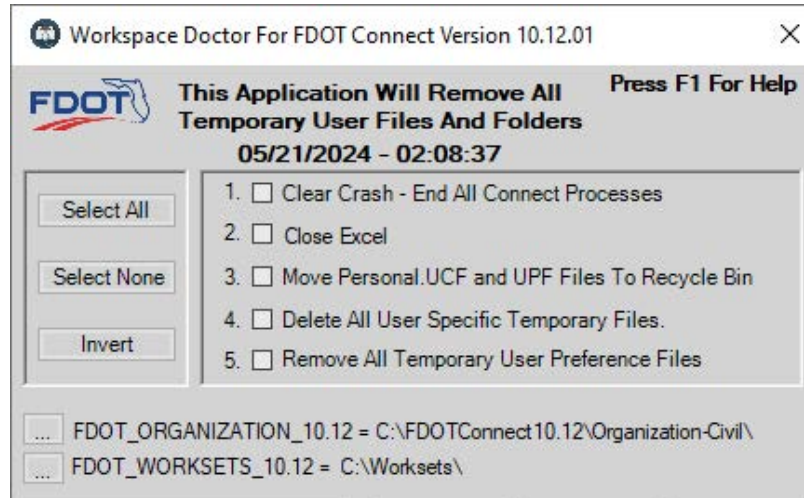
Clear Crash and WorkSpace Doctor are two custom applications created by the FDOT CADD Office for assisting in resolving CADD related issues.



**Clear Crash** – Clear Crash runs a batch file that ends process on any open Connect Edition applications. The intent of this tool is to expedite the closing of applications which may have become frozen or are in the process of crashing. This tool does not delete or remove any user data in the process.

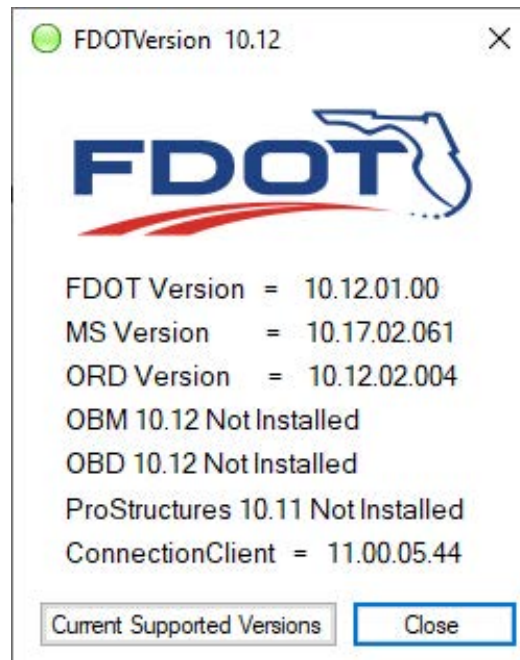
**WorkSpace Doctor** - WorkSpace Doctor dialog displays the different options you can select such as **Clear Crash** which closes any open instances of Connect Edition applications like ORD, OBM or OpenRoads Designer. You can also choose to have WorkSpace Doctor close Excel which sometimes gets stuck in the background when there is a problem with Linked Data Manager.

The remaining three options on the dialog are concerned with user-level settings files and temporary data. Clearing these files out can help to resolve some issues caused by file corruption.



Below the selection options, the values for the System Environment Variables for **FDOT\_ORGANIZATION** and **FDOT\_WORKSETS** are listed. Selecting the ellipsis buttons to the left of these values will open these locations in Windows File Explorer.

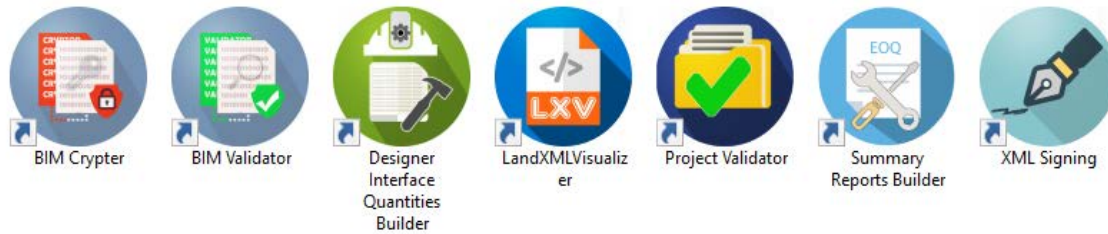
To the left of the RUN button, there is an ellipsis button to access a dialog displaying the versions of the Connect Edition applications you have installed and give access to the configuration files for these applications.





## **ADDITIONAL FDOTConnect DESKTOP FOLDER TOOLS**

FDOT also provides a number of additional shortcuts to custom tools that are commonly used in the FDOT workflow. These tools are *Create Project*, *Designer Interface Quantities Builder*, *LandXML Visualizer*, *Project Validator*, *Summary Reports Builder*, and *XML Signing*.



**Create Project** – This tool creates the *ProjectProperties.XML* file, a required deliverable for FDOT projects. Create Project populates the project information by accessing the FDOT Financial Management (FM) System. To access this system, the user must be connected to FDOT's network. As a result, outside consultants are not able to access this system and create the *ProjectProperties.XML* file. To this end, the FDOT CADD Office has delegated this task to the District CADD Managers. Upon request, District CADD Managers will email the *ProjectProperties.XML* to a consultant.

**Designer Interface Quantities Builder and Summary Reports Builder** – These tools are part of the FDOT Automated Quantities workflow. For more information on how these tools are used, please see the FDOT Automated Quantities training guide.

**LandXML Visualizer** – This tool is used for on-screen visualization of the contents of LandXML files. LandXML Visualizer can be a useful part of the 3D model QC process.

**Project Validator** – Project Validator has replaced FileChecker as the project-level QC tool. With an intuitive interface and workflow, Project Validator creates an HTML-based report summarizing the QCProject report. For more information on this tool, see the *General Resources* section of the FDOT CADD Office website's *Posted Webinars* page.

**XML Signing** – The FDOT XML Signing tool is used for applying digital signature certificates to XML files. For example, if a professional of record needs to sign a LandXML file, the FDOT XML Signing tool can be used.

# 2 FDOTConnect FILES AND WORKSETS

## **OBJECTIVES**

This chapter discusses launching FDOT Connect for OpenRoads Designer, creating Worksets and creating files. Highlights of this chapter include:

- Launching FDOT Connect for OpenRoads Designer
- Selecting the FDOT WorkSpace
- Creating Worksets and the Worksets folder
- Creating DGN files
- Opening and closing DGN files
- Switching from one Workset to another

## **INTRODUCTION**

The previous chapter discussed the FDOT Connect desktop folder. This chapter explores using the launch icons to launch OpenRoads Designer and selecting the FDOT WorkSpace from the WorkSpace selection dropdown in the OpenRoads Designer backstage.

OpenRoads Designer organizes DON files into projects called **Worksets**. These Worksets are stored in the designated Workset folder. Inside the Workset folder, the OpenRoads Designer Worksets are further organized into subfolders based on WorkSpace. For example: the FDOT WorkSpace stores Worksets in a subfolder called FDOT inside the worksets folder. Inside this FDOT subfolder, you will find Worksets organized typically by FPID number. For each workset, there is a corresponding .DGNWS file and .CFG file. These two critical files have two main purposes: associating DGN files in the Workset with the Workset itself, and also Workset properties and sheet indexing.

Worksets are created using a Workset Template. FDOT delivers with FDOT Connect a Workset template called 0\_WORKSET\_TEMPLATE. This template is automatically copied to the FDOT subfolder of the Worksets folder during installation of FDOTConnect.

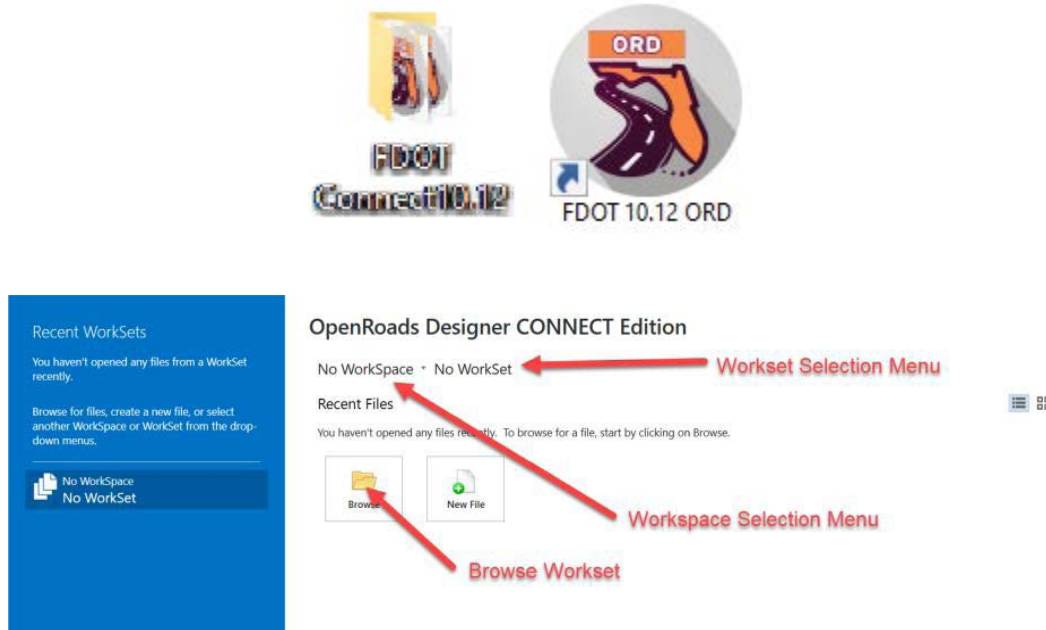
When creating a Workset using the 0\_WORKSET\_TEMPLATE, the standard FDOT folder structure is created, along with corresponding .DGNWS and CFG files and a \_BlankFile.DGN at the root of the new Workset.

After selecting a Workset from the Workset selection dropdown menu in the backstage, the user can browse the Workset to select a DGN file to open. Only one DGN file can be opened at a time, and OpenRoads Designer provides a standard intuitive Windows-style interface for switching from one file to another inside of the Workset.

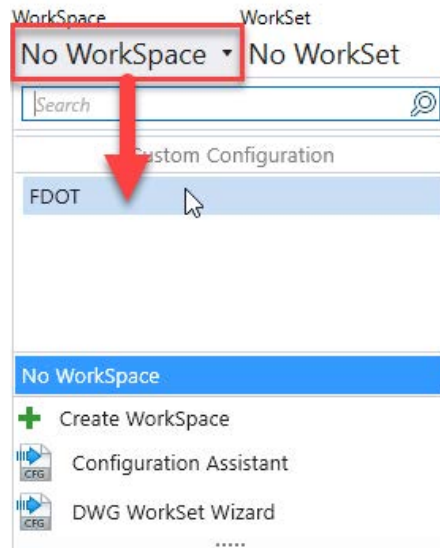
# LAUNCHING FDOTConnect FOR OPENROADS DESIGNER

To Launch FDOT Connect for OpenRoads Designer, double click the **FDOT Connect for OpenRoads Designer** shortcut on the desktop or inside the desktop folder.

OpenRoads Designer will launch, and the backstage will be displayed.

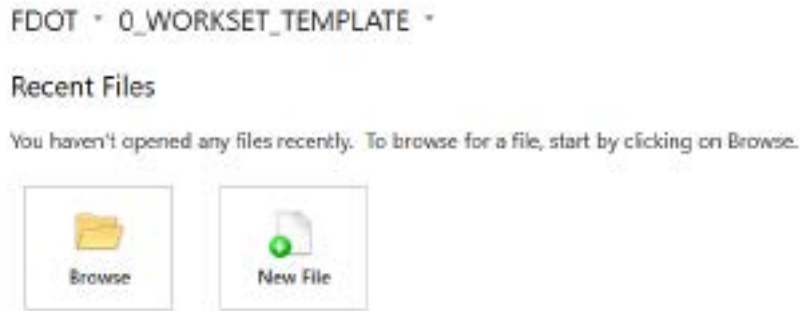


In the OpenRoads Designer backstage, the user can select the **FDOT WorkSpace** from the WorkSpace selection menu. The FDOT WorkSpace will appear under the Custom Configuration section of the WorkSpace selection menu as shown below.

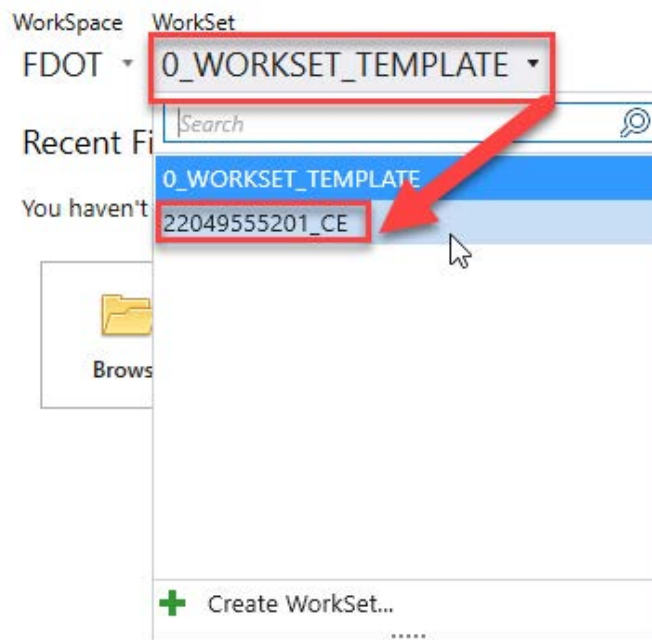




After selecting the **FDOT WorkSpace**, the Worksets Selection menu will populate with a list of all worksets located in the Worksets folder. On the first launch of FDOT Connect for OpenRoads Designer, this means that the active workset shown will likely be the 0\_WORKSET\_TEMPLATE itself as shown below.



Selecting the Workset Selection menu will display the list of Worksets. To be displayed in the list of Worksets, a Workset must be located in the FDOT subfolder of the Worksets folder and must also have a corresponding .DGNWS and .CFG file located in the FDOT subfolder of the Worksets folder.



Selecting a Workset from the Workset Selection menu will change the current active workset to the selected workset.

FDOT ▾ 22049555201

The user can now select the **Browse** button to Browse the current Workset. If any files in this Workset have been opened recently, they will display in the Recent Files section of the Backstage.

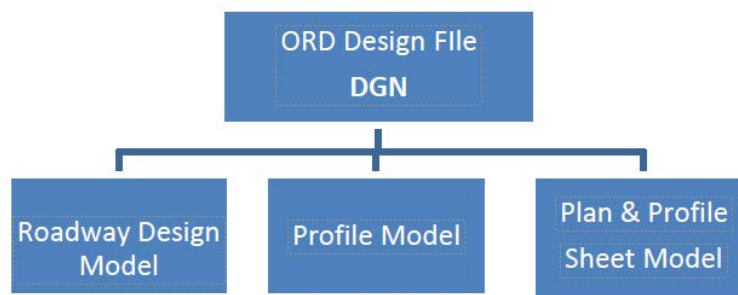
## **OPENROADS DESIGNER DGN FILES AND FDOT SEED FILES**

Each design file (DGN) is created from a seed file. A seed file is a previously stored design file, with user specified settings, used as a template to create a new DGN. The Florida Department of Transportation (FDOT) has created seed files for use in production that have standard settings stored within them. Available seed files for the FDOT's purposes are:

|                                        |                                                                 |
|----------------------------------------|-----------------------------------------------------------------|
| <i>FDOT-ORD-SEED2D.DGN</i>             | Contains settings to create a 2D design file.                   |
| <i>FDOT-ORD-SEED3D.DGN</i>             | Contains settings to create a 3D design file.                   |
| <i>FDOT-ORD-KEYMAPSEED.DGN</i>         | Contains settings to create a Key Sheet.                        |
| <i>FDOT-ORD-RWSEED</i>                 | Contains settings to specific to Right of Way.                  |
| <i>FDOT-ORD-TYPICALPACKAGESEED.DGN</i> | Contains settings to create a Typical Section Package.          |
| <i>FDOT-ORD-STRUCTSEED2D,DGN</i>       | Contains settings to create a 2D Structures design file.        |
| <i>FDOT-ORD-STRUCTSEED3D.DGN</i>       | Contains settings to create a 3D Structures design file.        |
| <i>FDOT-OBM-KEYSHEETSEED.DGN</i>       | Contains settings to create a Key Sheet in OpenBridge (OBM)     |
| <i>FDOT-OBM-STRUCTURESSEED2D.DGN</i>   | Contains settings to create a 2D Structures design file in OBM. |
| <i>FDOT-OBM-STRUCTURESSEED3D.DGN</i>   | Contains settings to create a 3D Structures design file in OBM. |

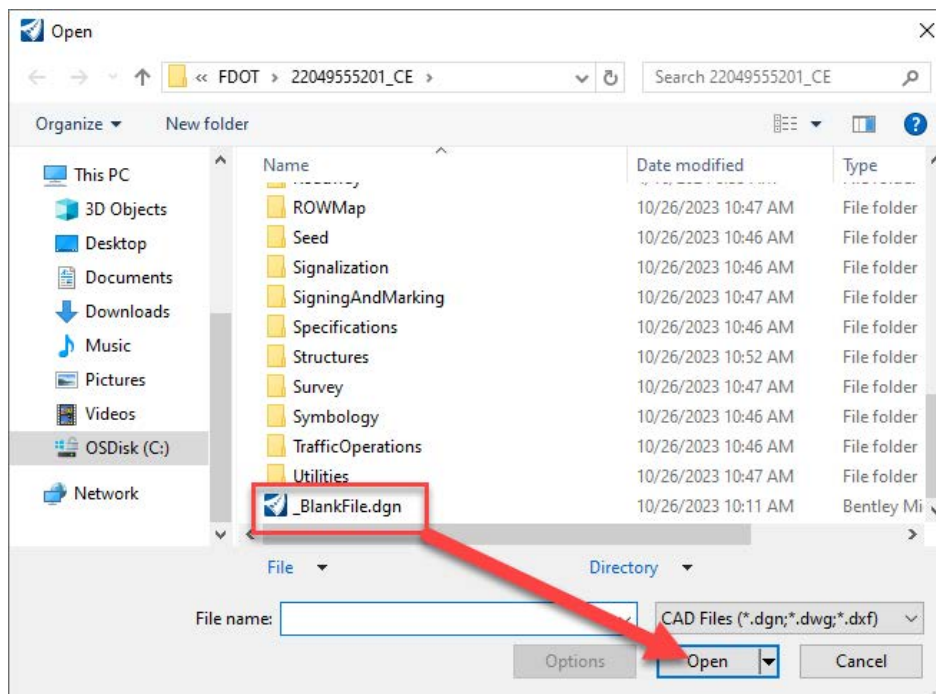
The DGN format contains smaller containers called models (not to be confused with 3D models which can be contained in these models). Each model consists of graphical elements such as arcs, lines and circles and is a unique drawing within the design file. Multiple models can exist within a DGN file, for example: roadway design profiles, plan and profile sheets and 3D models can all reside in separate models within the same design file.

Only one DGN file can be opened at a time in ORD, but other design files may be viewed by attaching them as reference files in the active design file.



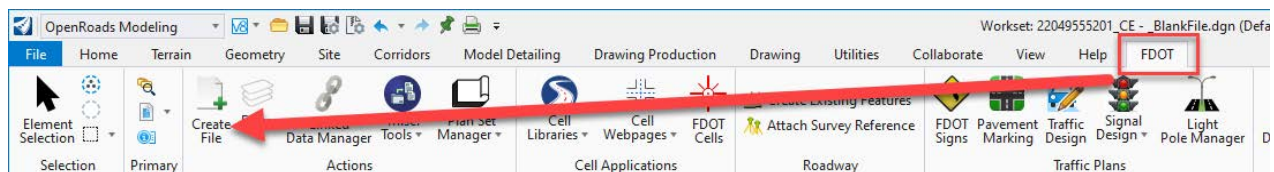
## **FDOTConnect CREATE FILE TOOL**

FDOT has created a custom tool for creating new DGN files called the Create File tool. This tool can only be launched inside the OpenRoads Designer environment. New files should **NOT** be created by selecting “New File” from the backstage. Instead, the user should select a Workset, select Browse and locate the *\_BlankFile.DGN* at the root of the active Workset folder structure.

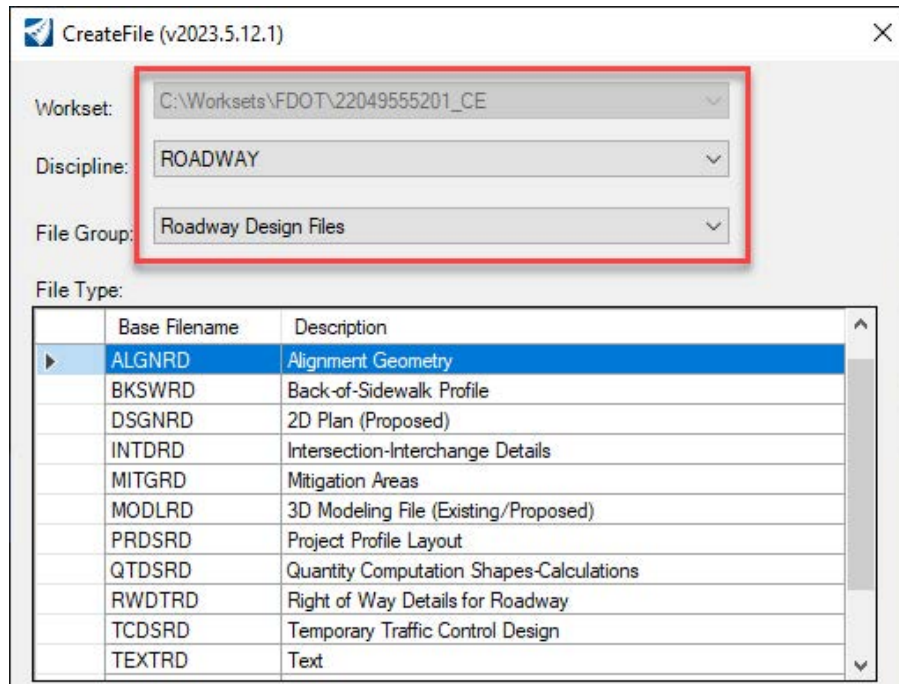


Opening the *\_BlankFile.DGN* allows the user to enter the FDOT WorkSpace in OpenRoads Designer and access the Create File tool.

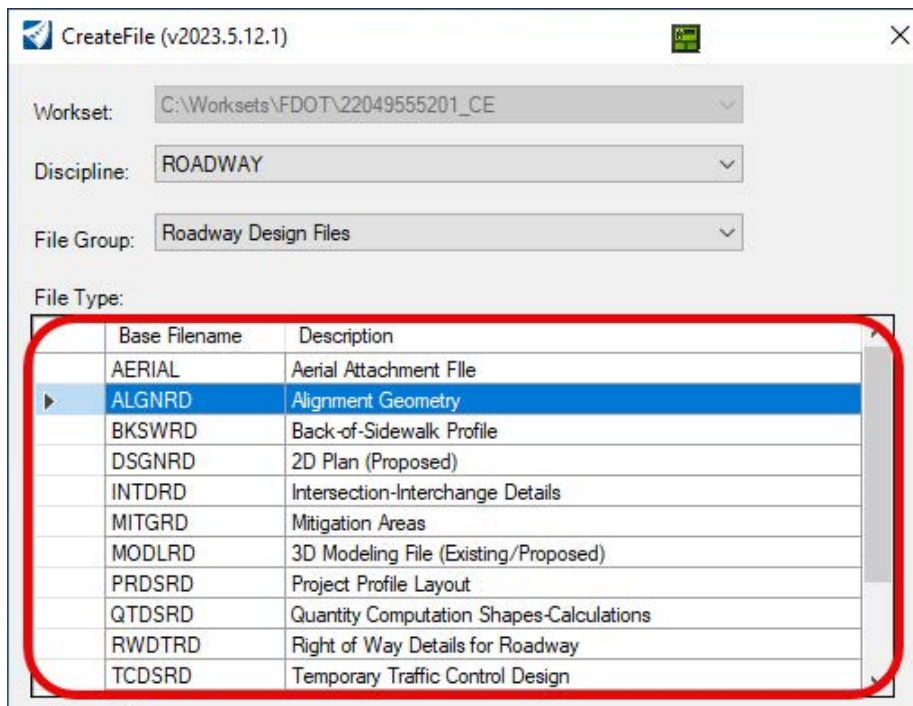
The **FDOT Create File** tool is located on the FDOT Ribbon which can be accessed by selecting the OpenRoads Modeling workflow from the Workflow selection menu at the top left corner of the application Window and selecting the **FDOT** tab on the far right of the row of tabs on the Ribbon. Subsequent chapters will discuss the Workflow selection and the Ribbon in more detail.



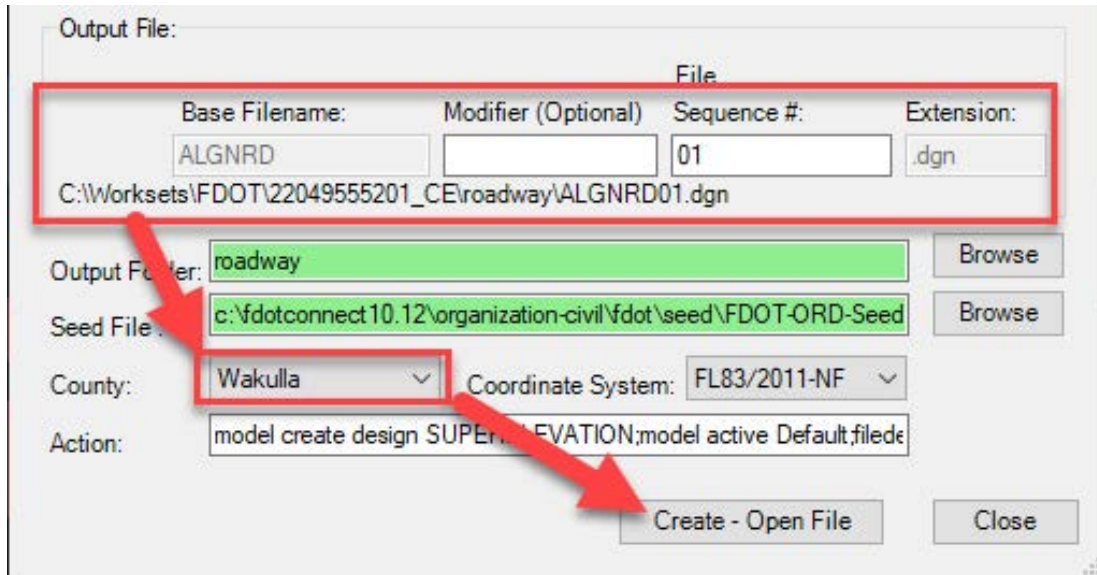
The Create File tool dialog displays the location of the current workset and has dropdown menus for selecting Discipline and File Group which allow the user to navigate different disciplines and create files in the proper location with the correct FDOT standard file naming convention.



File names for the selected discipline and file group are displayed in the middle portion of the Create File dialog as shown.



Create File displays the output file name, allows for the addition of a file name modifier and automatically applies the correct sequence number to the end of the file name.



The dialog also displays the output folder (discipline folder) and the seed file used to create the file. There are dropdown menus for setting the Geographic Coordinate System based on the county. Finally, the Create File tool displays any additional actions that will be performed upon creation of the file, such as creating additional models in the file.

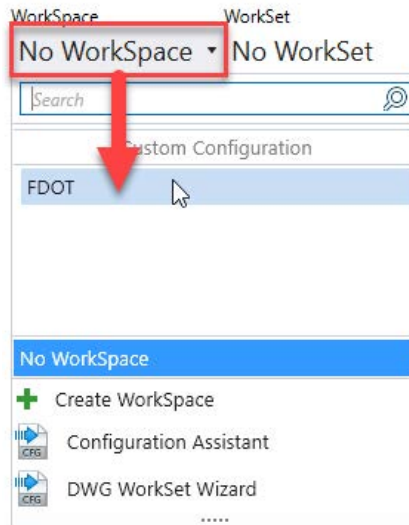
To create a design file, the user simply selects the **Create-Open File** button at the bottom of the dialog. The new file is created and opened in the FDOT WorkSpace. The dialog can now be dismissed by selecting the **Close** button at the bottom right of the Create File dialog.

## **LAUNCHING FDOTConnect AND SELECTING A WORKSET**

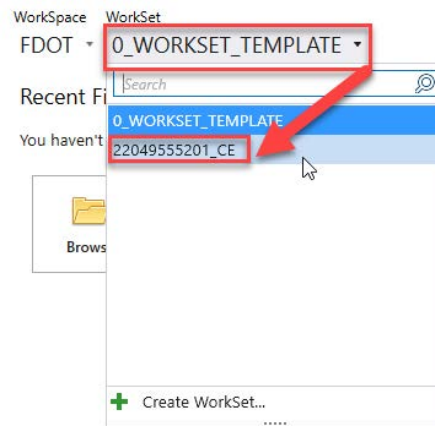
Locate the FDOT Connect desktop folder and double-click the shortcut for **FDOT Connect for OpenRoads Designer**.



The OpenRoads Designer backstage appears. From the Workspace selection menu, select **FDOT**.



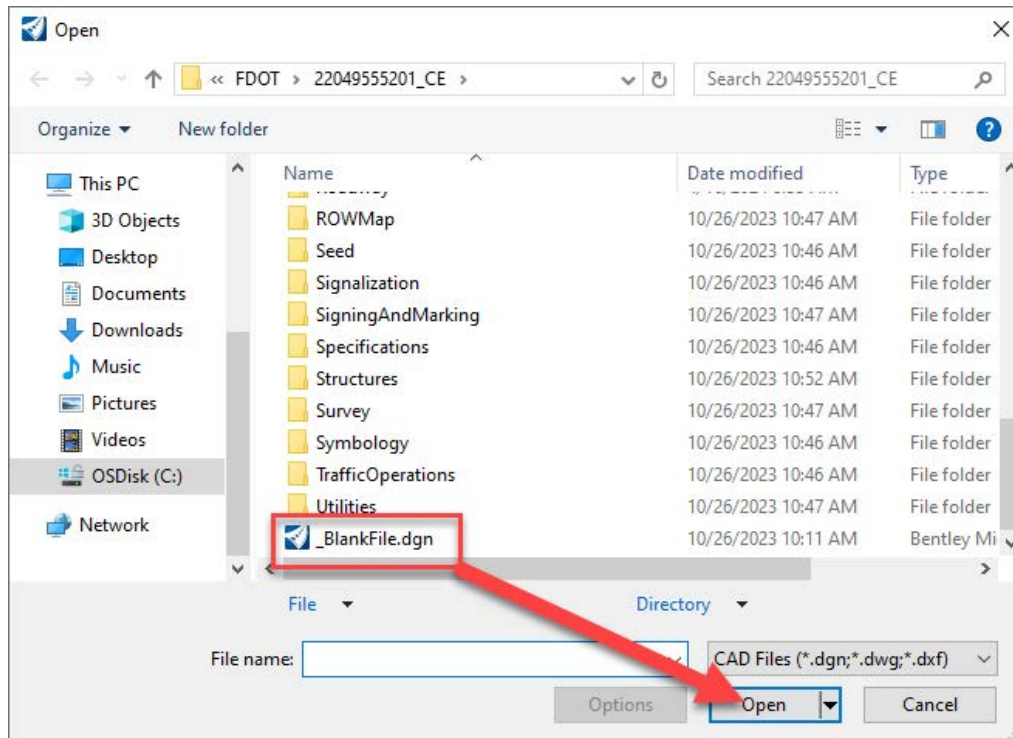
The workset selection menu populates with 0\_WORKSET\_TEMPLATE. Select the workset selection menu and select the workset **22049555201**.



Select the **Browse** button. The Open File dialog appears.



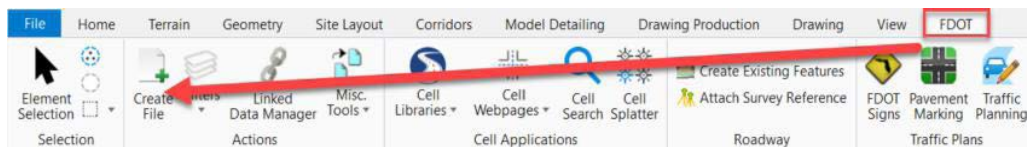
Scroll to the bottom of the Workset folder structure and select *\_BlankFile.DGN*. Select **Open**.



Locate the Workflow selection menu at the top left corner of the application window. Set the active workflow to *OpenRoads Modeling*.

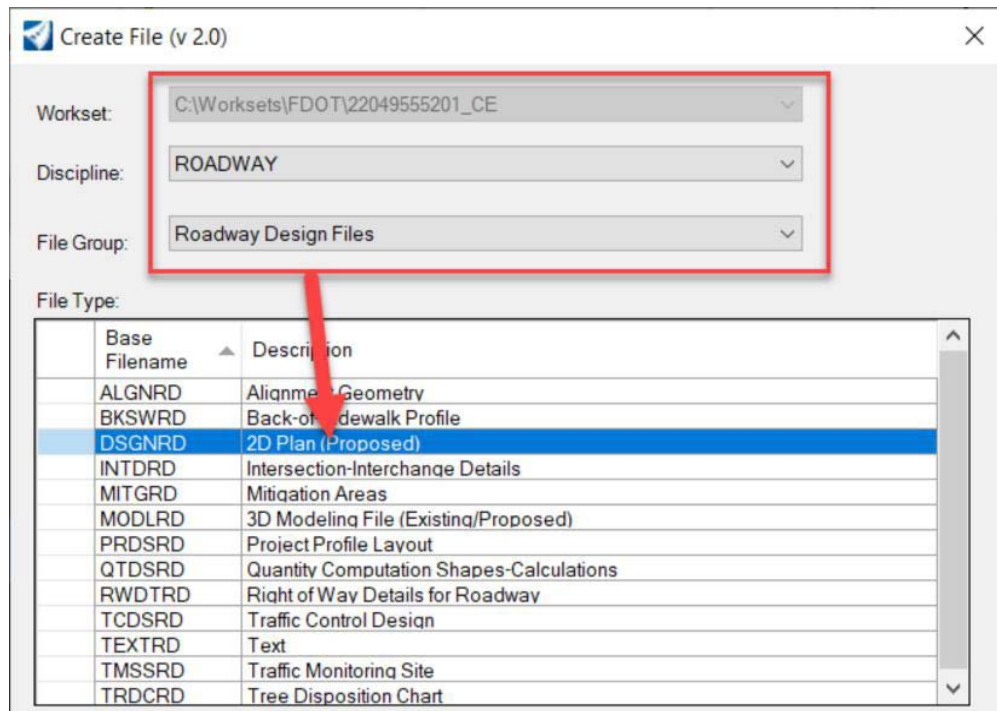


On the row of tabs at the top of the OpenRoads Modeling Ribbon, select the **FDOT** tab and launch the **Create File** tool, located on the left side of the FDOT Ribbon.

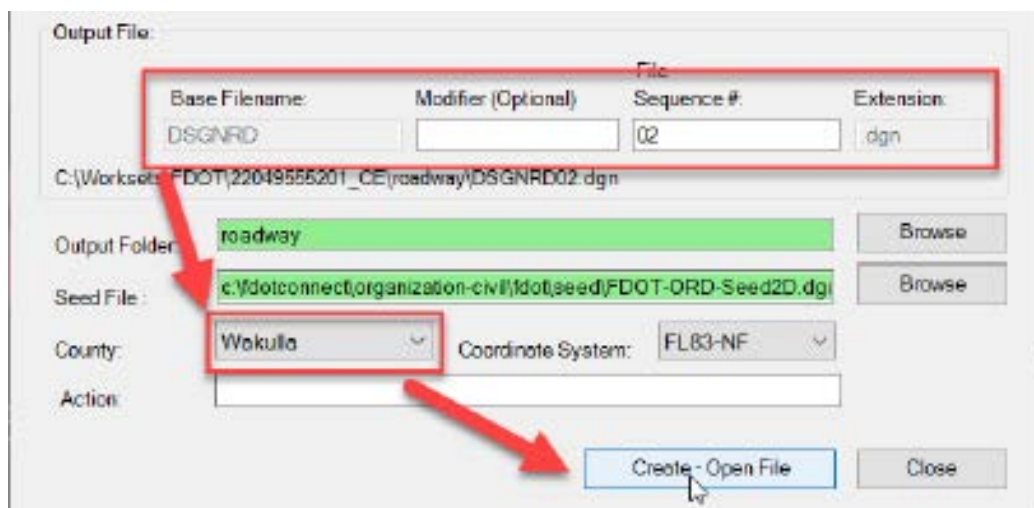


The Create File dialog appears. Note the current active workset location displayed in the *Workset* field of the Create File dialog.

Select **ROADWAY** discipline and **Roadway Design Files** group. Select the file name **DSGNRD** for 2D plan (Proposed) from the File Type portion of the dialog as shown below.



**NOTE** The output file name automatically selects the next available sequence number to append to the end of the file name *DSGNRD02.DGN* since our Workset already contains a *DSGNRD01.DGN* file. Set the county name to *Wakulla* and select the *Create – Open File* button at the bottom of the dialog.



Create File now creates the *DSGNRD02.DGN* and opens the new file in the FDOT WorkSpace. Select **Close** to dismiss the Create File dialog.

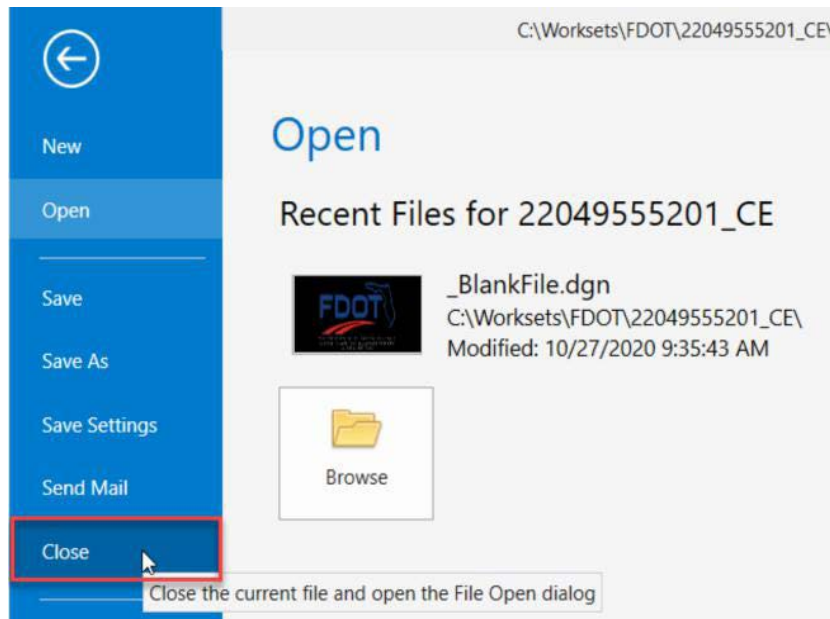


# CREATING A NEW WORKSET IN FDOTConnect FOR OPENROADS DESIGNER

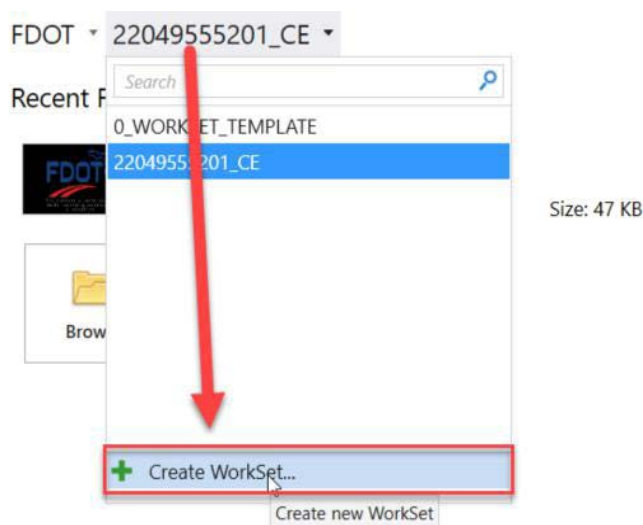
Starting from the previous exercise, select the **File** menu from the top left corner of the application window.



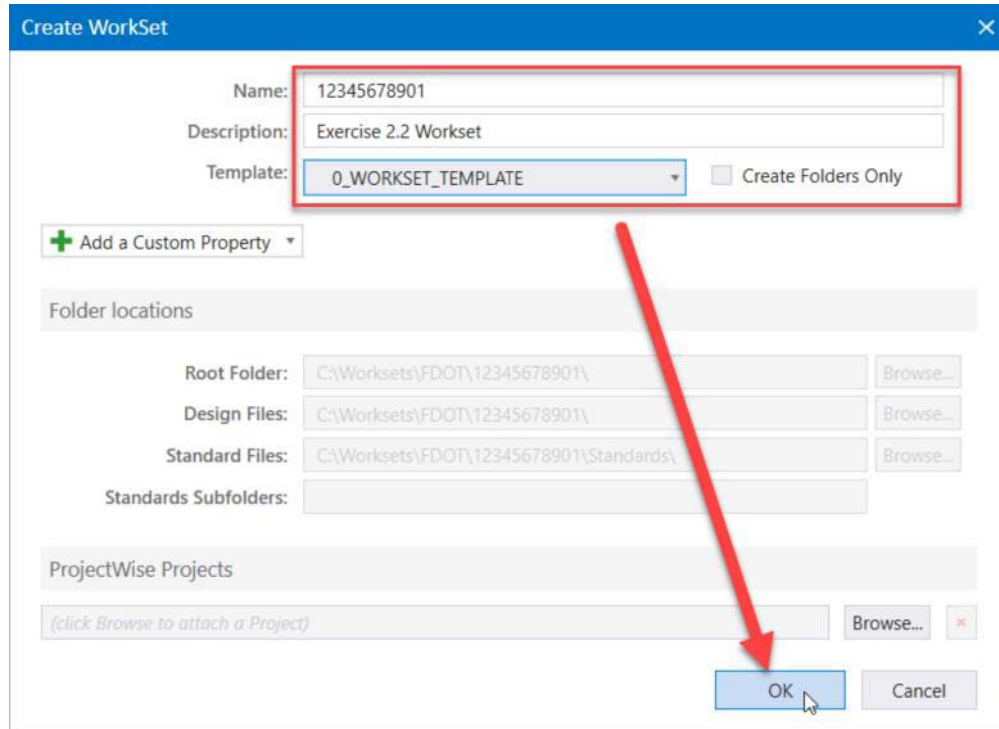
Select **Close** from the column that appears on the left side of the application window to close the current file.



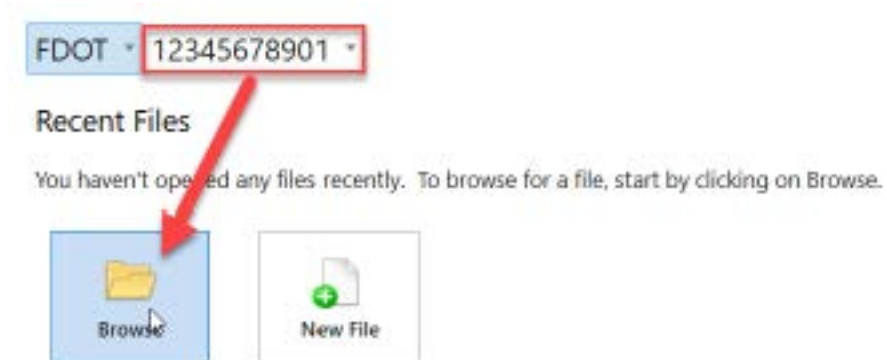
The OpenRoads Designer backstage appears. Select the **Workset** menu and select **Create Workset**.



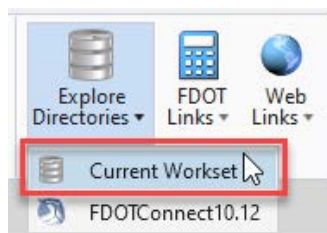
The Create Workset dialog appears. Populate the *Name*, *Description*, and *Template* fields as shown, being sure to select the **0\_WORKSET\_TEMPLATE** as the template. Select **OK** at the bottom of the dialog to create the new Workset.



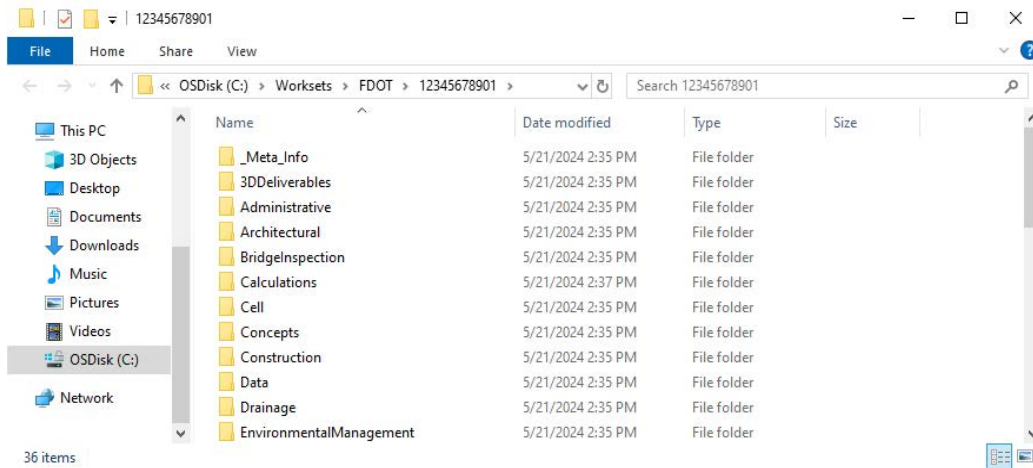
The new Workset is created and set active in the Workset selection menu. Once again, select the **Browse** button to browse to the root of the active Workset folder and open the *\_BlankFile.DGN*.



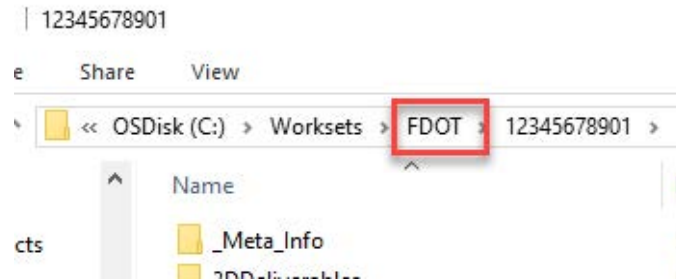
Accessing the FDOT Ribbon using the same steps from the previous exercise, locate the *Explore Directories* split button under the *Resources* section of the FDOT Ribbon and select **Current Workset**.



A Windows File Explorer window displays with the contents of the current Workset location.



Select **FDOT** from the address bar in the Windows File Explorer window to navigate up one level to the *FDOT* subfolder in the Worksets folder.



Note the contents of the FDOT subfolder of the Worksets folder, including Workset folders and corresponding .DGNWS and .CFG files for each Workset.

| Name                     | Date modified       | Type        | Size  |
|--------------------------|---------------------|-------------|-------|
| 0_WORKSET_TEMPLATE       | 5/21/2024 1:27 PM   | File folder |       |
| 12345678901              | 5/21/2024 2:35 PM   | File folder |       |
| 22049555201_CE           | 10/26/2023 10:47 AM | File folder |       |
| 0_WORKSET_TEMPLATE.cfg   | 7/27/2023 7:42 AM   | CFG File    | 6 KB  |
| 0_WORKSET_TEMPLATE.dgnws | 3/28/2023 11:18 AM  | DGNWS File  | 72 KB |
| 12345678901.cfg          | 7/27/2023 7:42 AM   | CFG File    | 6 KB  |
| 12345678901.dgnws        | 5/21/2024 2:37 PM   | DGNWS File  | 72 KB |
| 22049555201_CE.cfg       | 10/26/2023 10:11 AM | CFG File    | 6 KB  |
| 22049555201_CE.dgnws     | 4/16/2024 8:33 AM   | DGNWS File  | 75 KB |

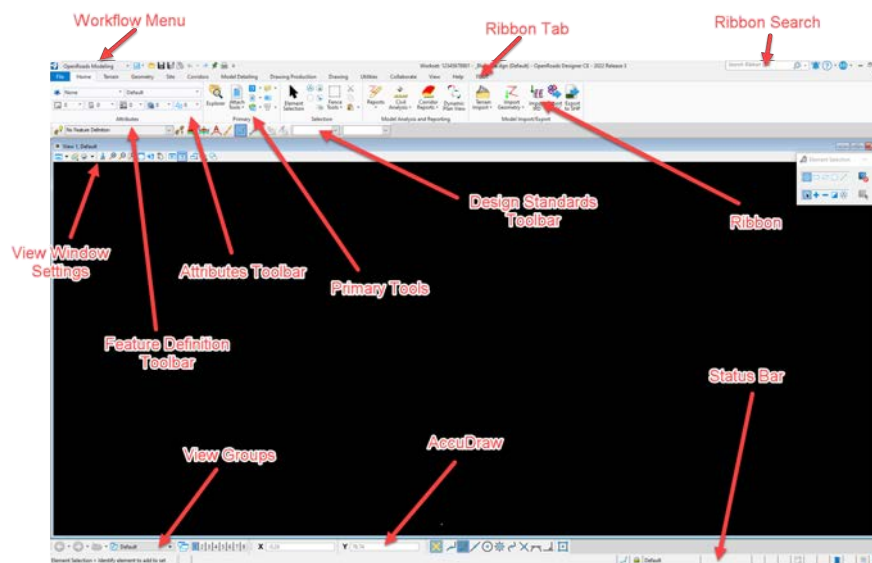
**Close** Windows File Explorer and OpenRoads Designer.

# 3 FDOTConnect DESIGN ENVIRONMENT

Unlike previous versions of the Bentley CADD software such as MicroStation Select Series or Power GEOPAK, OpenRoads Designer makes use of a Ribbon interface to access tools and applications. The Ribbon, situated along the top of the application window, can be configured for different workflows by selecting different options from the workflow selection menu.

FDOT has created a custom Ribbon configuration located under the FDOT tab when the Ribbon is set to OpenRoads Modeling workflow. The FDOT Ribbon displays a number of custom tools and resources that are used in the FDOT workflow.

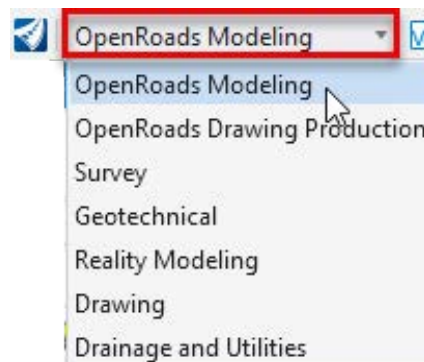
To better understand the FDOT Connect and OpenRoads Designer design environment, it is important to familiarize yourself with the location of various common toolbars and menus. The diagram below will help you better navigate the design environment.



## OPENROADS DESIGNER WORKFLOW SELECTION

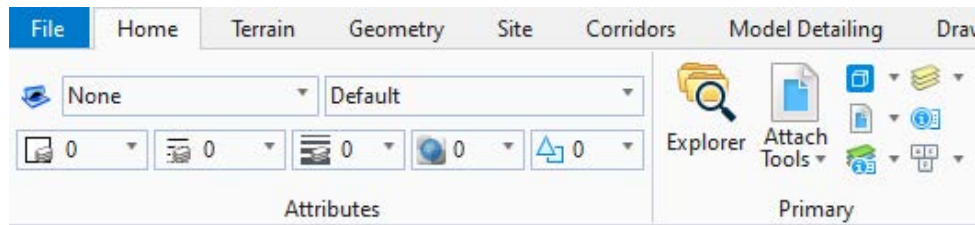
As mentioned above, the OpenRoads Ribbon can be set for different workflow configurations by selecting a workflow from the menu located at the top left corner of the application window. For the purpose of this course, we will be focusing on the OpenRoads Modeling workflow setting as it provides access to both the FDOT tab as well as the majority of the tools used in the FDOT modeling process.

Additional workflows include OpenRoads Drawing Production, Survey, Geotechnical, Reality Modeling, Drawing, and Drainage and Utilities.



## THE HOME RIBBON

The OpenRoads Designer Home Ribbon tab includes basic tools for navigating the design environment and accessing information and settings related to the current active design file.



Accessed from the *OpenRoads Modeling* workflow, the Home Ribbon has two important groups to become familiar with.

**Attributes** – This group includes dropdown menus for setting the active element attributes (Level, Color, Weight, Linestyle, etc.). Selecting attributes in the **Attributes** section before using a drawing tool in OpenRoads will cause the element drawn to be placed on the selected active level with the selected attributes. FDOT CADD standards specify ByLevel attributes for each level. The user need only select the desired level name, and the rest of the attributes will be automatically set for ByLevel.

**Primary** – This group includes the **Primary** tools or the tools that were previously located on the Primary Toolbar in Select Series and earlier versions of MicroStation and Power GEOPAK. These tools include:

- **Explorer** – A dialog that displays information about the contents of the active design file and any reference files that are attached to the active design file.
- **Attach Tools** – These tools include Reference files and Raster attachments. Selecting one of these tools will provide access to the respective References and Raster dialogs which display any attached files and allow the user to modify settings or attach additional files.
- **Models** – The models dialog displays the list of Models contained in the active design file. Models are containers inside a design file, and can be 2D or 3D and come in three different varieties: Design, Drawing and Sheet. Each DGN file can contain multiple models.
- **Level Manager and Level Display** – Level Manager displays the currently available levels in the active WorkSpace. Levels are attached through the FDOT WorkSpace configuration and stored in Level Library in DGNLIB format. Level Manager provides access to information about these levels. Level Display provides the user with a tool to turn levels on and off, changing how the elements in the active design file appears on screen.
- **Properties** – The properties tool provides the user with access to information about elements within the active design file. The user can either select an element and then select Properties, or select Properties first and then select an element. The result is a dialog box displaying the element's properties.
- **Key-In Browser** – The Key-In Browser is used for entering commands into OpenRoads Designer by typing the commands into a window. The browser will populate all available commands which can be browser alphabetically.

## FDOT RIBBON

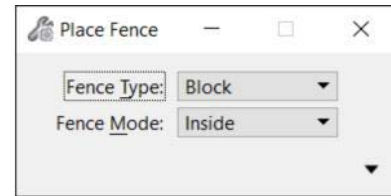
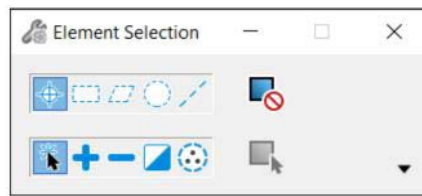
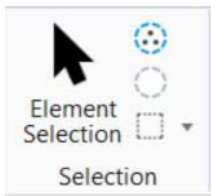
The FDOT Ribbon is part of FDOT's delivered customized WorkSpace. It is a custom ribbon configuration accessible from the FDOT tab under the *OpenRoads Modeling* workflow in OpenRoads Designer. The FDOT Ribbon displays useful tools and customized applications used for the FDOT design workflow.





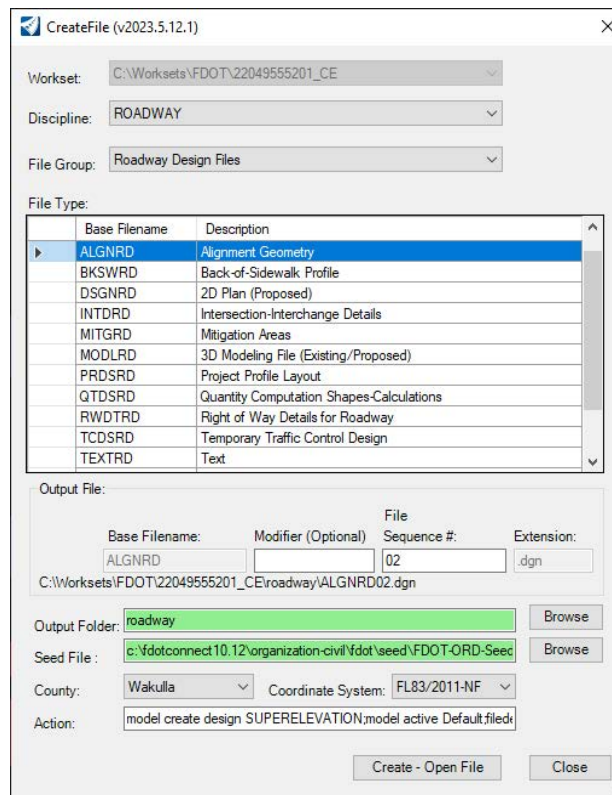
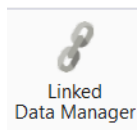
The FDOT Ribbon is organized into different groups: Selection, Actions, Cell Applications, Roadway, Traffic Plans, Quantities, Quality Control, Resources, and Help.

**SELECTION** - This group of the FDOT Ribbon includes selection tools such as the Element Selection tool and the Place Fence tool.

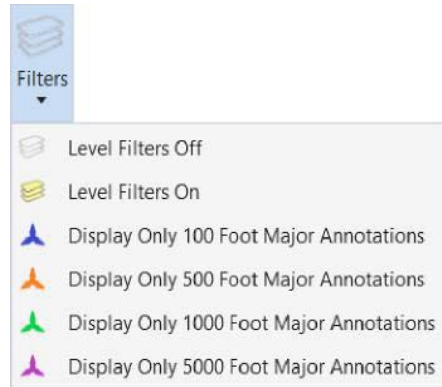


**ACTIONS** - This group of the FDOT Ribbon includes the Create File tool, Level Filter settings, Linked Data Manager, and a Miscellaneous Tools split button, providing access to a number of custom FDOT tools.

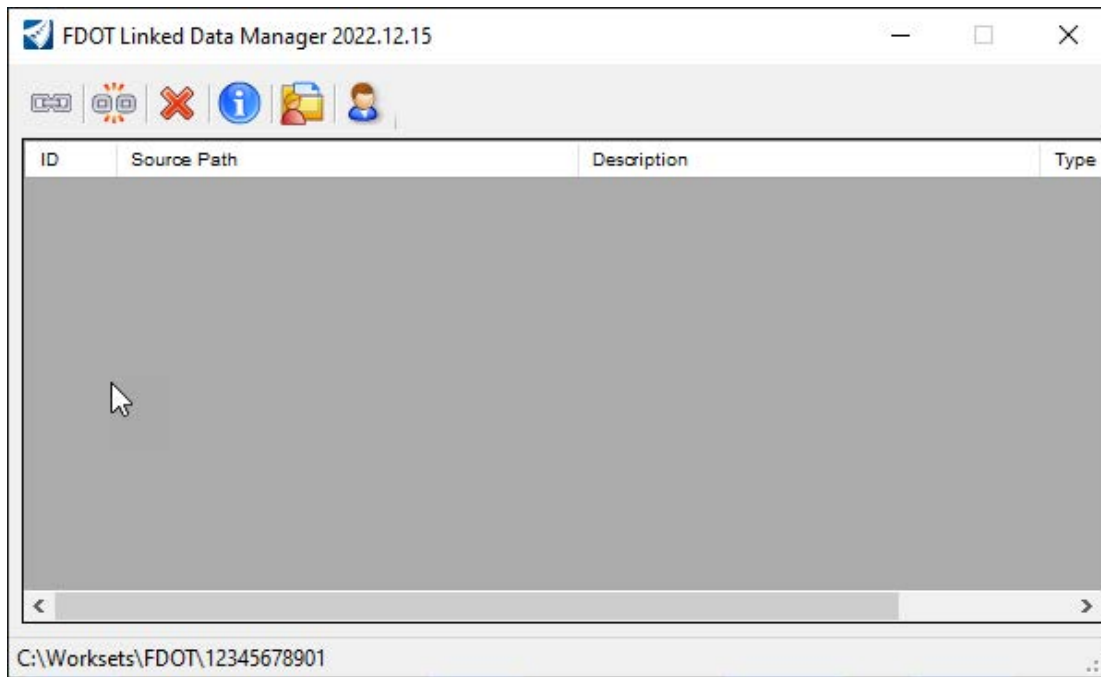
**Create File** - This mentioned earlier in this training guide is used for creating DGN files according to FDOT standards with FDOT standard file names, seed files and proper discipline folder placement.



**Filters** - This split button allows the user to toggle the Level Filters on and off as well as toggle alignment annotations.

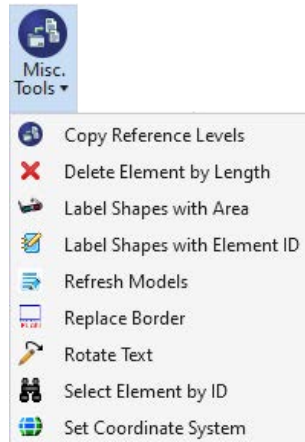


**Linked Data Manager** - This feature is used for linking spreadsheets and text from external Excel and Word documents. This tool is part of the Automated Quantities process for populating summary boxes.

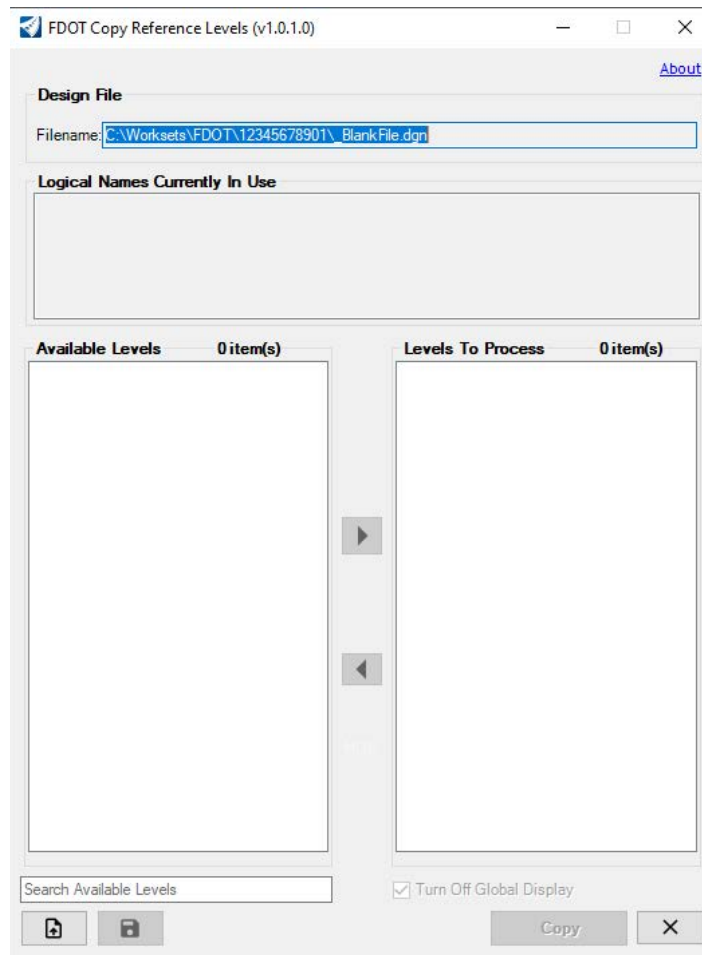


**Miscellaneous Tools** - This split button provides access to Copy Reference Levels, Delete Element by Length, Place Professional Of Record, Rotate Text, Select Element by ID, and Set Coordinate System tools.

These are tools developed by FDOT to enhance the FDOT design process.

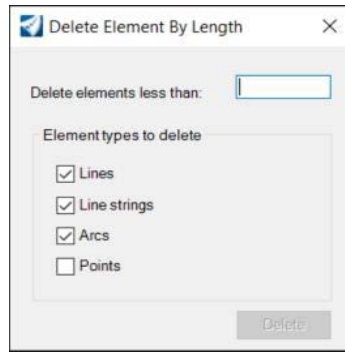


**Copy Reference Levels** - This is used to copy elements from selected references based on level. This is part of the 2D design process.

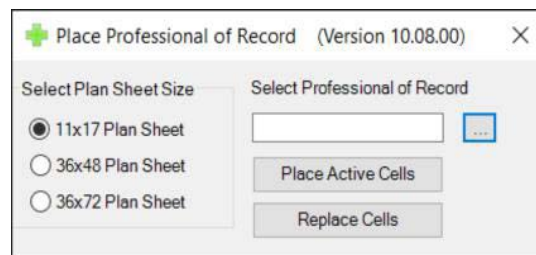




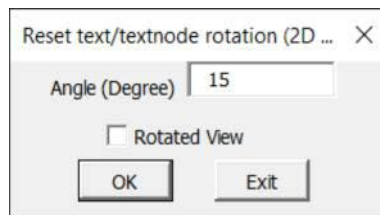
**Delete Element By Length** - This is used to delete short elements below a specified length. Additional options allow the deletion of elements by specific element type.



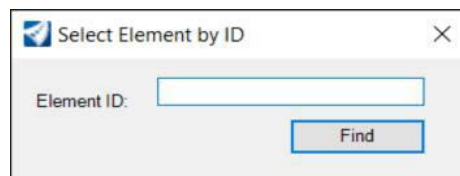
**Place Professional of Record** - This places the Professional of Record or EOR information in the title block of a standard FDOT sheet border of standard sizes



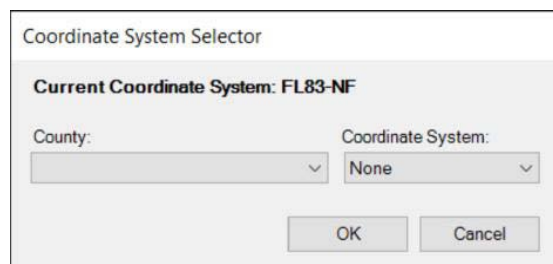
**Rotate Text** - This allows the user to select and rotate text at a specified angle



**Select Element By ID** - This is used for locating and selecting elements by their element ID number.



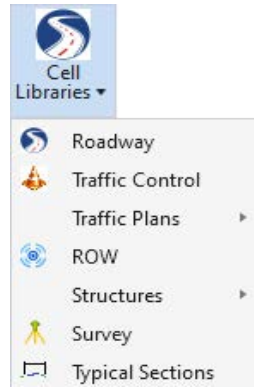
**Set Coordinate System** - This sets the geographic coordinate system for the active DGN file. The user can select the coordinate system based on county name. Typically the geographic coordinate system for a file is set at the time of file creation by the Create File tool.



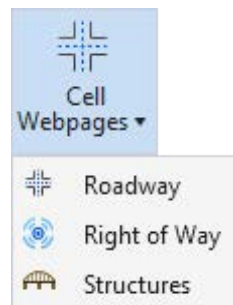
**Cell Apps** - This group of the FDOT Ribbon provides access to tools related to placing cells in OpenRoads Designer. Cells are pre-designed named groups of elements representing commonly placed items. Cells are stored in cell libraries delivered with the FDOT software.



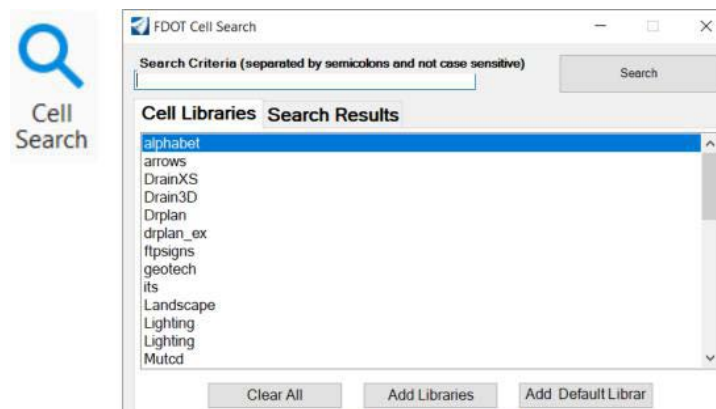
**Cell Libraries** - This split button displays the cell libraries dialog, populated by the selected FDOT cell library, such as Roadway, Traffic Control, Traffic Plans, Right of Way, Structures or Survey. From the cell libraries dialog, a cell can be selected for placement as active cell or other methods of cell placement.



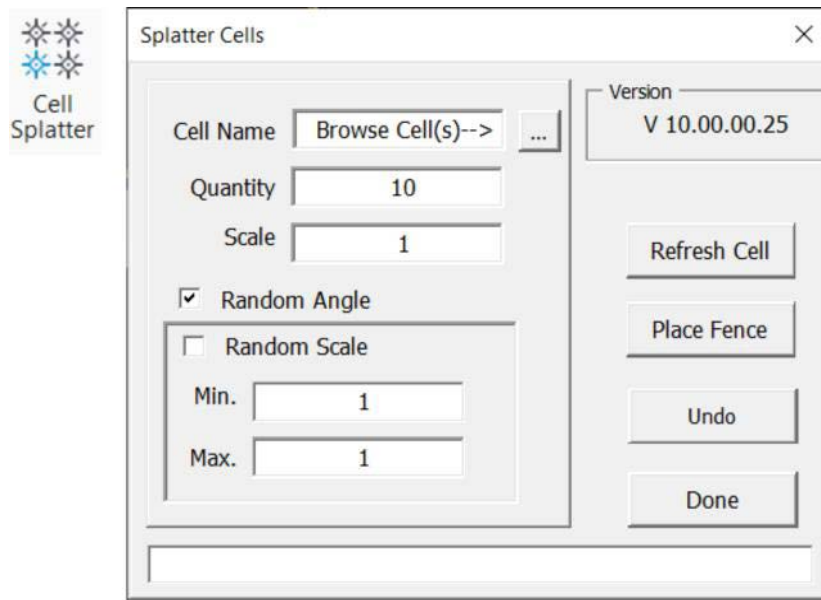
**Cell Webpages** - This split button provides access to the FDOT cell webpages. The FDOT Cell Webpages allow for placement of cells by selecting a cell through a graphical interface in a web-type browser.



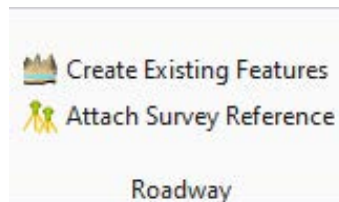
**Cell Search** - This is a custom FDOT tool used for searching cell libraries based on a key word.



**Cell Splatter** - This is used to create a random distribution of the active cell within a defined area.



**ROADWAY** - This group of the FDOT Ribbon includes the FDOT Existing Features tool and the Attach Survey Reference Files tool.

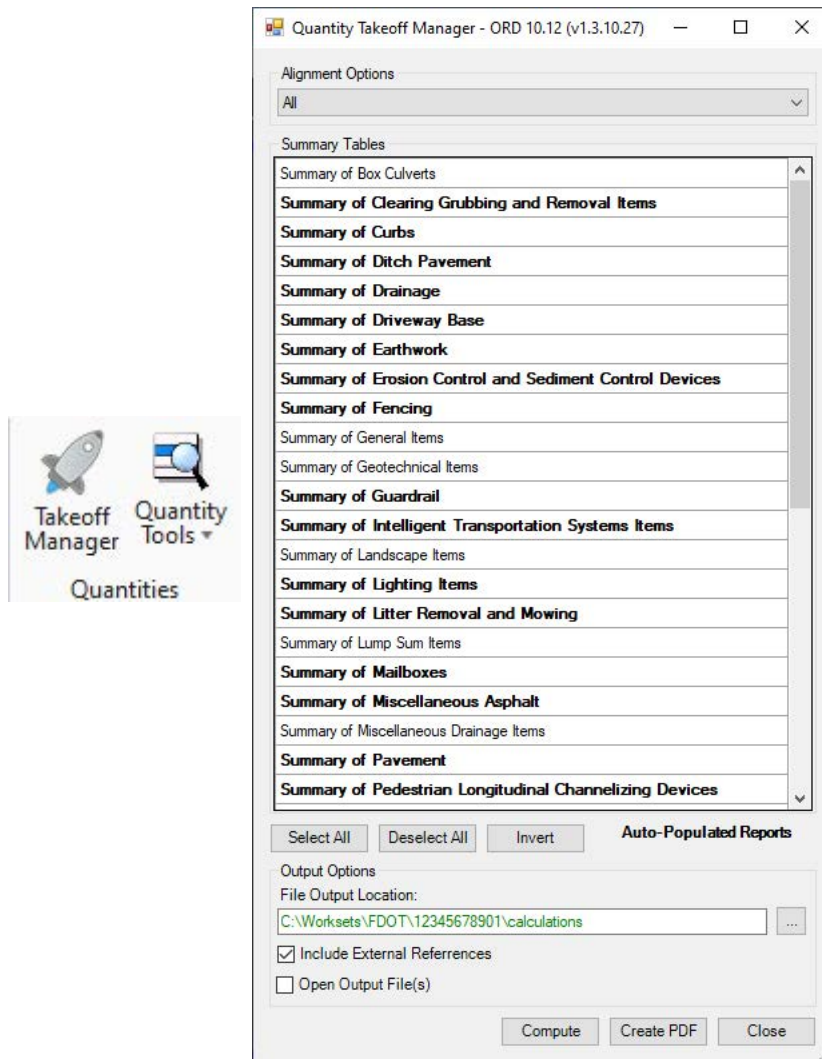


These tools are covered in the Survey and Existing Features Modeling training.

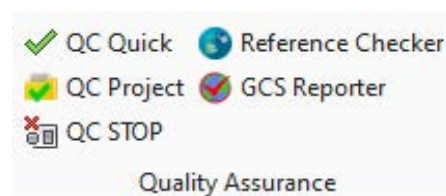
**Traffic Plans** - This group of the FDOT Ribbon includes the FDOT Signs tool, the FDOT Pavement Marking tool and FDOT Traffic Planning tool. These tools are covered in the FDOT Traffic Plans training.



**Quantity Takeoff Manager** - This is FDOT's tool for automating quantities. This tool is covered in the FDOT Automated Quantities Workflow training guide.



**Quality Assurance** - This group of the FDOT Ribbon includes the FDOT QC tools. These tools are used to ensure compliance with FDOT CADD standards.

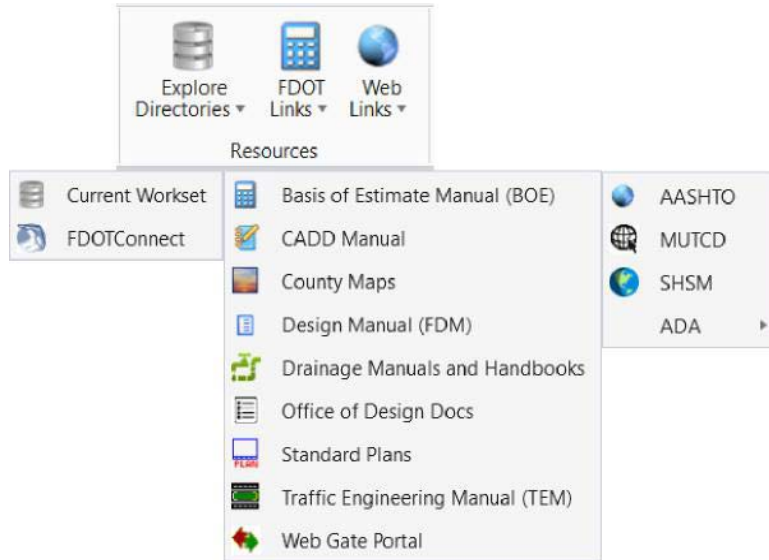


**QC Quick** - Launches the QC Quick tool which returns a percentage of compliancy for the active file. If the file is below 100% compliant, QC Quick will display a dialog allowing the user to navigate non-compliant elements and correct their level or symbology to meet compliance.

**QC Project** - Runs a batch QC process on a project or workset and generates a QC Project Report which is used by Project Validator to validate the compliancy of the project.

**QC Stop** - Turns of the automatic QC process that runs each time a file is closed in FDOTConnect. After selecting QC Stop, the QC tool will not run for the current session. Closing FDOT Connect and relaunching will reactivate QC.

**RESOURCES** - This group of the FDOT Ribbon provides the user with access to many useful resources both locally and online.



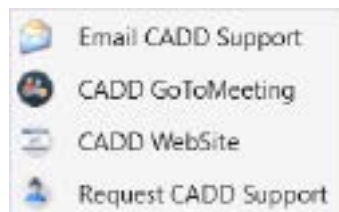
**Explore Directories** - This split button provides access to the Current Workset folder and the FDOT Connect folder. Selecting either of these options will open the respective folder in a Windows File Explorer window.

**FDOT Links** - These consists of links to useful FDOT resources on the FDOT website including the CADD Manual, Design Manual (FDM) and other useful pages.

**Web Links** - Provides access to useful transportation related information outside of FDOT, such as AASHTO, the Manual for Uniform Traffic Control Devices, SHSM and ADA. The **HELP** group of the FDOT Ribbon provides access to CADD support and other troubleshooting resources.



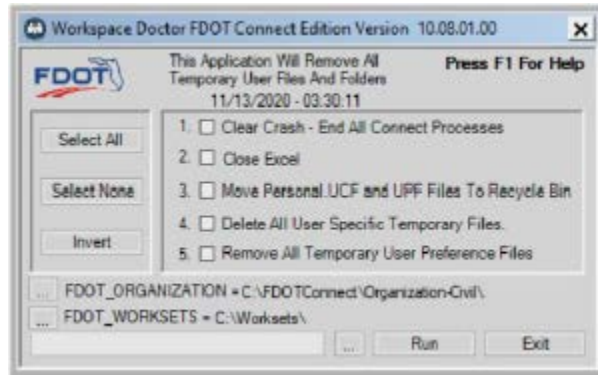
**CADD Support** - Button includes links to email the FDOT CADD Office for CADD Support. This email goes to a number of support specialists in the CADD Office who can assist you with your CADD-related inquiries. There is also a link for CADD GoToMeeting which takes you directly to a website where you can enter a GoToMeeting ID number to connect with one of our CADD Support Specialists. Once you contact one of the CADD Support Specialists, they can provide you with an ID number to connect.



There is also a link to the CADD Website and a link to Request CADD Support which takes you directly to our web-based CADD Support portal where you can log a ticket to request support.

**Workspace Doctor** - is a tool developed by FDOT that can help resolve some CADD-related issues that are caused by corruption of temporary user data configurations and preference files. If you are experiencing unexpected performance issues in OpenRoads Designer, Workspace Doctor may be able to resolve the issue.

**NOTE** (WorkSpace Doctor can also be launched from the shortcut in the FDOT Connect desktop folder).



**WorkSpace Doctor dialog** - Displays the different options you can select such as Clear Crash which closes any open instances of Connect Edition applications like ORD, OBM or OpenRoads Designer. You can also choose to have WorkSpace Doctor close Excel which sometimes gets stuck in the background when there is a problem with Linked Data Manager.

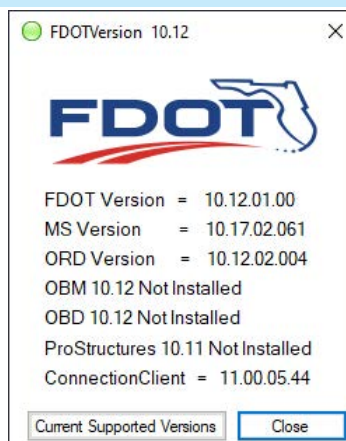
The remaining three options on the dialog are concerned with user-level settings files and temporary data. Clearing these files out can help to resolve some issues caused by file corruption. Below the selection options, the values for the System Environment Variables for FDOT\_ORGANIZATION and FDOT\_WORKSETS are listed. Selecting the ellipsis buttons to the left of these values will open these locations in Windows File Explorer.

To the left of the RUN button, there is an ellipsis button to access a dialog displaying the versions of the Connect Edition applications you have installed and give access to the configuration files for these applications.



**About** - This button on the far right of the FDOT Ribbon displays the contents of the *VERSION.TXT* file which is stored at the root of the FDOT Connect installation folder. This text lists the current installed version of FDOTConnect, the release data and the versions of the software that this release is certified for use with.

**NOTE** (Versions displayed in this dialog are the certified versions, and this dialog does not necessarily reflect the versions that are currently installed on the machine in question).





For a list of currently supported software [Current Supported Versions \(fdot.gov\)](http://fdot.gov)

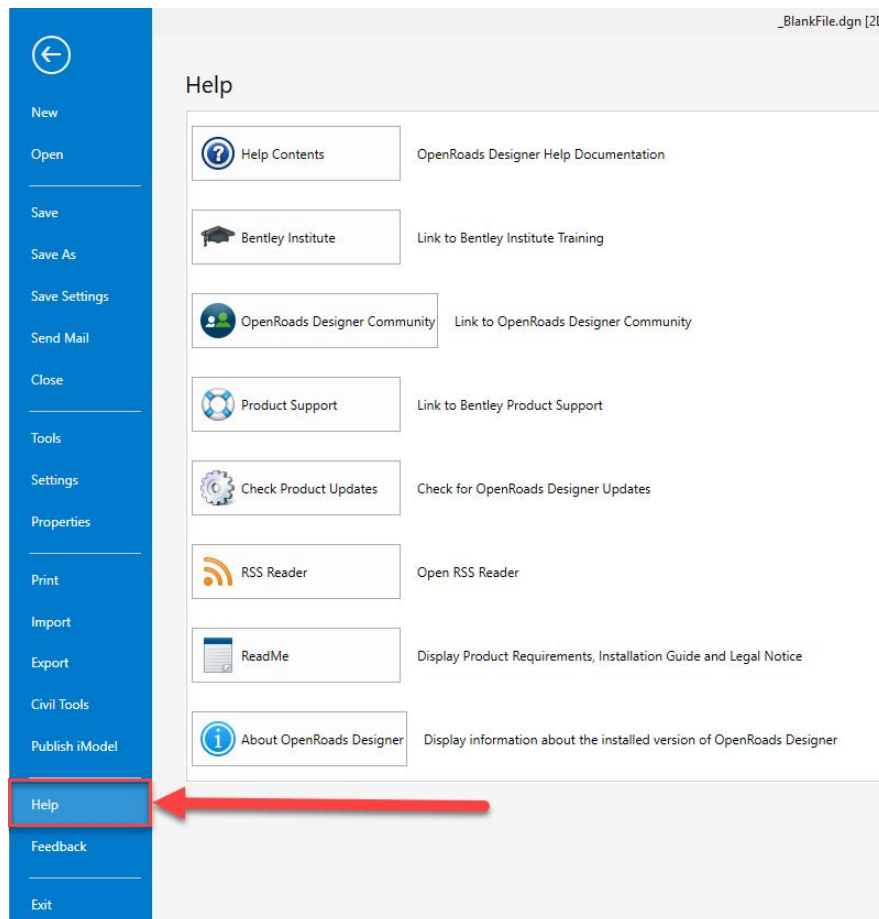
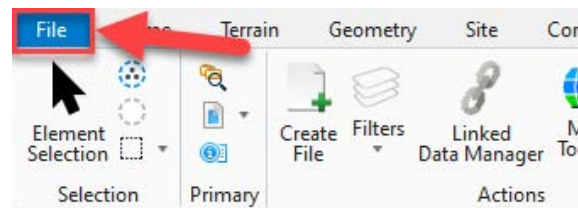
Above the FDOT Ribbon on the far right of the application window is a search field. This search field can be used to search for tools included in the OpenRoads Designer application if they are not immediately accessible from the current ribbon configuration. This can be very useful for users who know the name of the tool that they need, but do not know where it is located within the application.



**NOTE** Do not use the F4 as shown in the FDOTConnect WorkSpace, it is used for another function.

## **OPENROADS DESIGNER HELP AND SUPPORT**

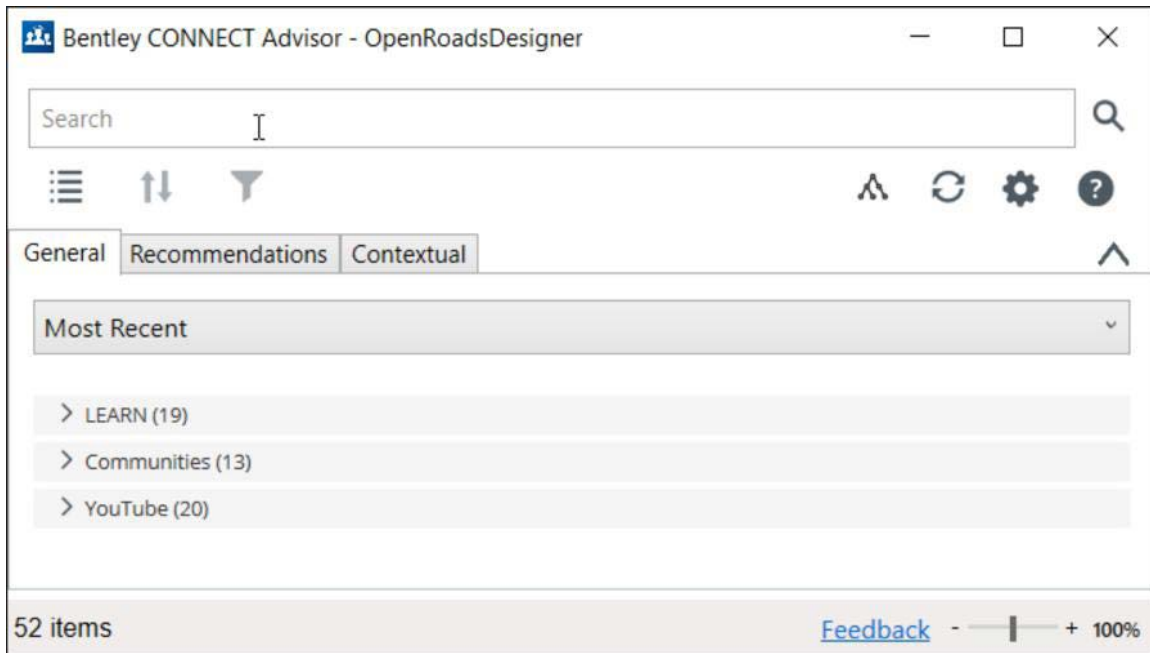
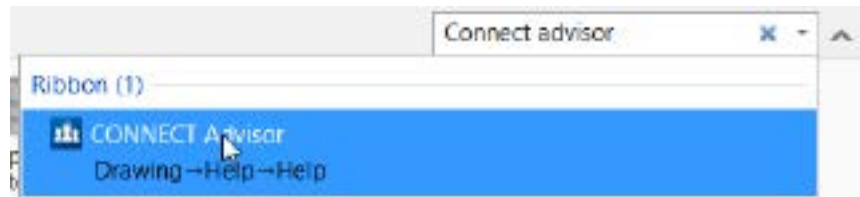
To access OpenRoads Designer Help, select **FILE** from the top left corner of the OpenRoads Designer application window. The backstage appears. Locate the **HELP** link towards the bottom left of the screen.



This launches the OpenRoads Designer Help screen which provides access to the Help Contents, CONNECT Advisor, Bentley Institute, Bentley Communities, Product Support and other options.

## **CONNECT ADVISOR**

Another helpful application that launches from within OpenRoads Designer is CONNECT Advisor. CONNECT Advisor can be accessed from the Help screen as previously mentioned, or by using the OpenRoads Designer Ribbon search field at the top right of the application window.

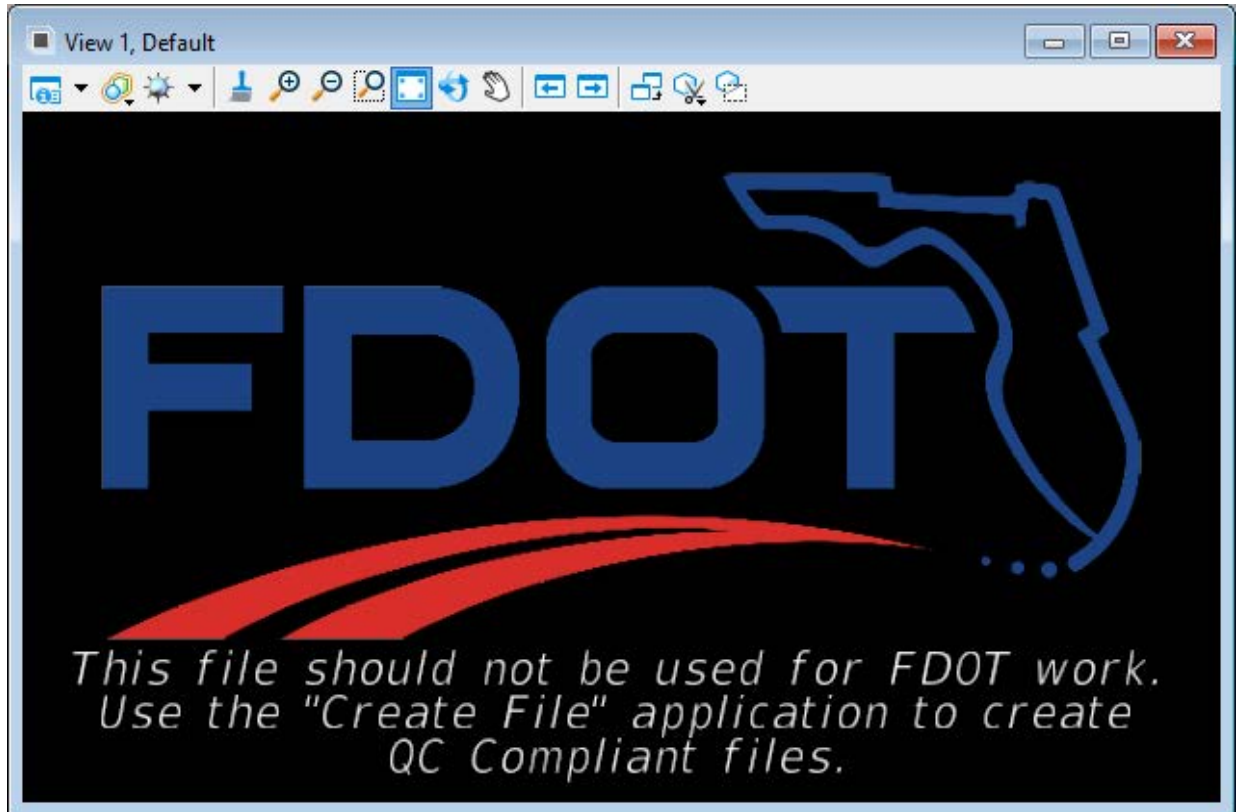


CONNECT Advisor provides searchable help, access to recent online information from Bentley, links to Bentley LEARN and training videos on YouTube as well as Contextual Help that allows the user to find help with whatever tool they are currently using.



## VIEW/APPLICATION WINDOW

The View Window is the area where the design elements are displayed. OpenRoads Designer allows a maximum of eight view windows to be open at any one time. The arrangement of the view windows can be customized within the application window.



## VIEW CONTROLS

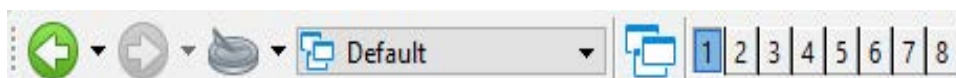
Each view window has its own view controls to View Attributes, Update View, Zoom In/Out, Window Area, Fit, Rotate, Pan, View Previous and Next, Copy, Display Mode, Clip Volume and Mask. By default these are located at the top left of the OpenRoads Designer view window.

**NOTE** *View controls are discussed in detail in Chapter 4.*



## VIEW GROUP TOOLBOX

A View Group is a named collection of eight view windows which allows for the set up of the desktop to display preferences including number of open view windows, window size and view orientation. Each view group is associated with a model making it easy to access and navigate through different models in the active DGN file, via the View Group drop-down menu. By default this is docked at the bottom of the Layout Dialog above the Status Bar.



## ACCUDRAW TOOL SETTINGS

This is used to facilitate data point entry. The AccuDraw Tool Settings opens or closes when clicking the AccuDraw icon on the Primary Tools toolbox. If using the default Function key menu, pressing <F11> opens the AccuDraw Tool Settings. If it is already docked or open, pressing <F11> sends focus to the AccuDraw Tool Settings.

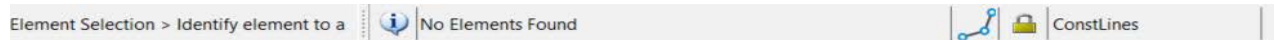


(AccuDraw Floating)

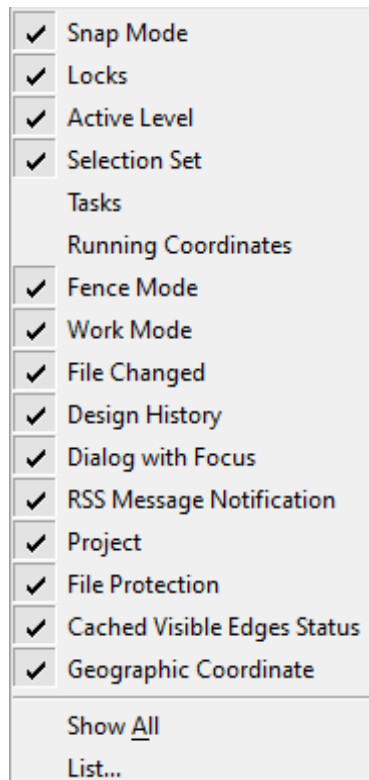


(AccuDraw Docked)

## STATUS BAR

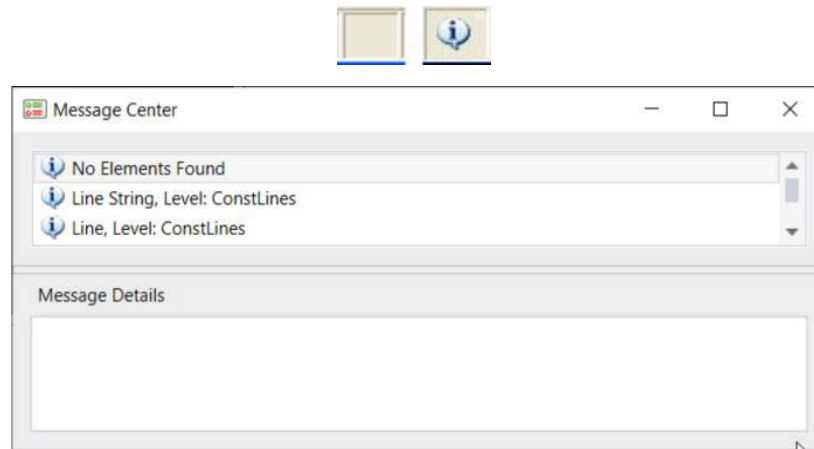


The Status Bar is located across the bottom of the screen layout and provides prompts, context-sensitive assistance, and some interactive functionality, which are described next. The label for the Status will display by hovering the cursor over any box. The user may customize the Status Bar by **right-clicking** on it to open a check list of options to check on or off for display.

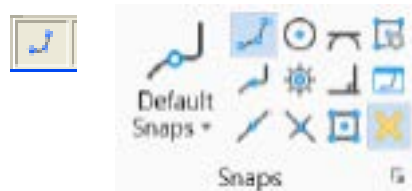


**Selected Tool > Prompt** - Shows the name of the selected tool or view control and (usually) a prompt for the next step in the normal procedure for using it.

**Message Center** - Shows the system message information. Clicking in the Message Center portion of the status bar (field following the >Prompt) opens the Message Center window. This window contains a running log of system messages and any further description about the message if applicable.



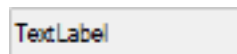
**Snap Mode** - Shows the type of snap selected with the associated icon. Clicking the Snap Mode field displays the available snap modes.



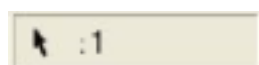
**Active Locks** - This icon provides access to the Locks submenus. (It does not indicate status information.)



**Active Level** - This area indicates the Active Level setting. Clicking the Active Level field opens the Level Manager dialog, which is used to control level display and level symbology for the open DGN file and attached references.



**Selection Set** - If shown, indicates elements are selected and displays the number of selected elements. If no elements are selected, this field on the Status Bar is blank. Clicking the status bar when it shows the number of selected elements opens a pop-up menu containing the following items:



# 4 VIEWING & ZOOMING

## OBJECTIVES

This chapter covers all the viewing tools available in OpenRoads Designer including:

- View Windows
- View Preferences
- View Groups
- View Controls
- Saved Views
- Dynamic Views

## INTRODUCTION

As a drawing becomes more and more complex, it may be useful to open multiple view windows. OpenRoads Designer can have as many as eight drawing view windows open at one time. Opening multiple view windows allows users to focus on details, as well as an overview of the design, without getting lost in between. The view currently being worked in is known as the *Active View* and indicated by a highlighted title bar.

## VIEW WINDOWS

A *View window* in OpenRoads Designer is commonly referred to as a view. Each view functions independently without affecting other views. They contain their own attribute settings with independent zoom, pan and rotate capabilities. Each can be resized or relocated independently by **Clicking and Dragging** the cursor at any edge of the view or on the title bar.

View controls are located at the top left of each view window.



These tools include zooming, panning and rotating tools as well as View Attributes tools.

## VIEW CONTROL TOOLS

**View Attributes** - Opens the View Attributes dialog to adjust view attribute settings.



**View Display Mode** - Sets the view display mode from the list of display styles or from the Display Styles dialog.



**Adjust View Brightness** - Applies scene lighting to a view and adjust brightness of shaded views.



**Update View** - Refreshes (redraws) the current view to display elements correctly.



**Zoom In** - Increases the magnification of a design by a user specified Zoom Ratio.



**Zoom Out** - Decreases the magnification of a design by a user specified Zoom Ratio.



**Window Area** - Magnifies an area of the design by a user defined window.



**Fit View** - Display all displayable elements in the active design and attached references in a view.



**View Rotation** - Opens the View Rotation toolbox and rotates/un-rotates the view.



**Pan View** - Views a different part of the design without changing the view magnification.



**View Previous** - Undoes the last viewing operation.



**View Next** - Redoes the last undone viewing operation.



**Copy View** - Copies content from one view window to another.



**Apply or Modify Clip** - Opens the Clip Volume toolbox and applies a clip volume to a view.  
Volume

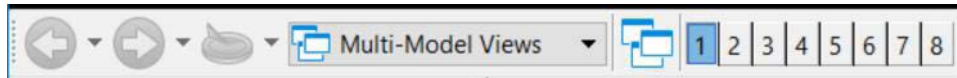


**Clip Mask** - Applies a clip mask to a view.



## **VIEW GROUPS**

A *View Group* is a named collection of eight view windows which allows for the setup of the desktop to display preferences including number of open view windows, window size and view orientation. Each view group is associated with a model making it easy to access and navigate through different models in the active DGN file. The View Groups dialog is located at the bottom left of the application



Tools on the View Groups tool bar include:

**Previous Model** - Accesses the previous model in the session history by clicking the left arrow. Alternatively, clicking the down arrow and selecting a previously accessed model from a drop-down list.



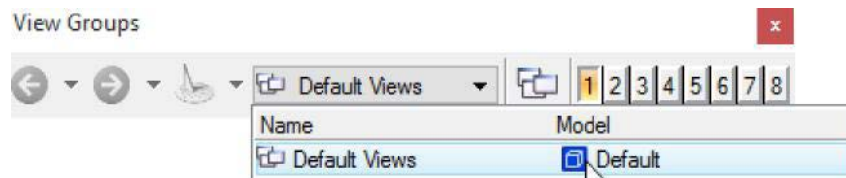
**Next Model** - Accesses the next model in the session history by clicking the right arrow. Alternatively, clicking the down arrow and selecting the next model from a drop-down list.



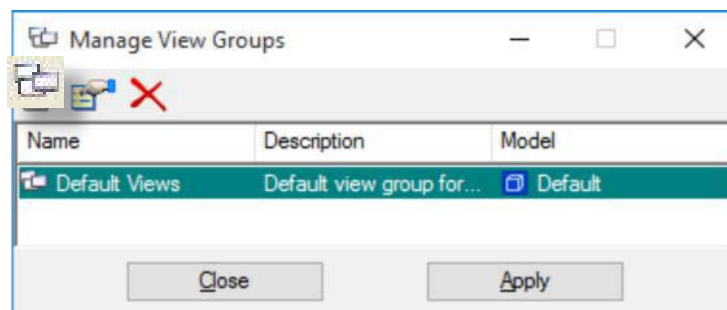
**All Models Visited** - Clicking the down arrow displays a drop-down list of all models accessed, from which a model can be selected to open.



**View Groups** - Drop-down list that displays the name of the view group as well as the model with which it is associated and allows for the selection of different view groups.



**Manage View Groups** - Creates, manages, edits, and deletes view groups. OpenRoads Designer allows an unlimited number of view groups to be saved. When users create a model, they are prompted to create a view group associated with that model by populating the *Create a View Group* checkbox in the Create Model dialog.



**Create View Group** - Opens the Create View Group dialog to specify a name and description for the new view group.

**Edit View Group Properties** - Opens the View Group Properties dialog to edit the name and description of the selected view group.

**Delete View Group** - Deletes the currently selected view group.

**List Box** - Displays a complete list of all view groups for all models in the design file. The active view group is highlighted in green.

**Apply** - Applies the selected view group to OpenRoads Designer, opens the views in that view group and activates the model associated with the view group.

**Close** - Closes the Manage View Groups dialog.

**Toggles** - Click the numbered buttons to open or close individual view windows (equivalent to choosing the numbered items in the Window menu's Views submenu.) The numbered button grouping is also present in various other dialogs, such as the References and the Level Manager dialog (Settings > Level > Manager).




## **VIEW ATTRIBUTES**

The View Attributes dialog contains a series of toggles that allow users to set view attributes that affect whether and how certain types and classes of elements are displayed and whether certain drawing aids are displayed.

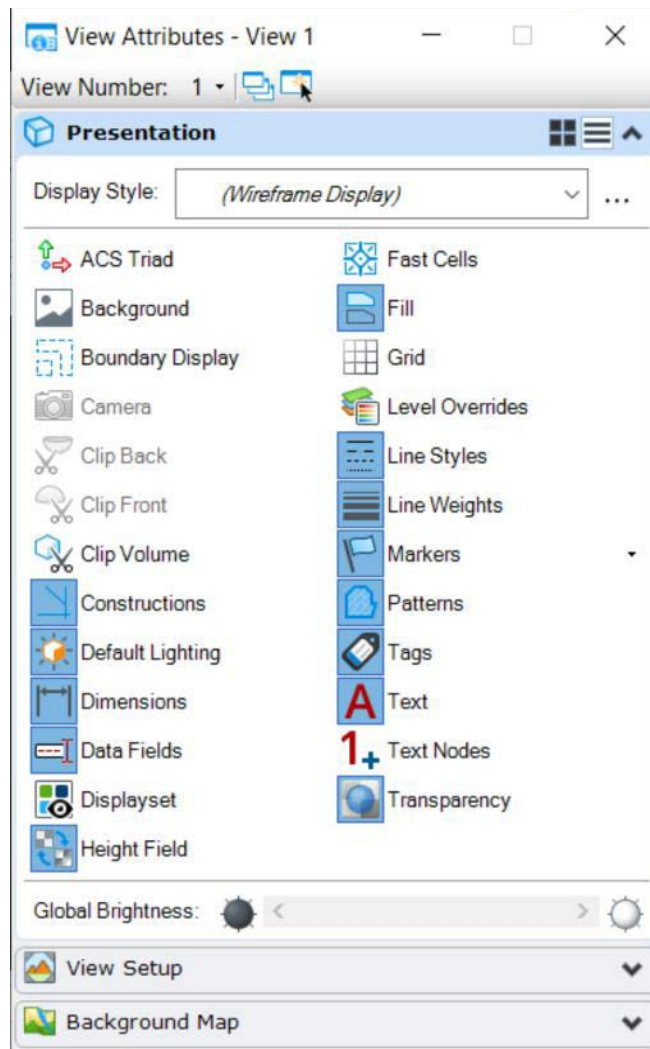
Each view can have its own view attributes settings and the view number at the top of the View Attributes dialog determines which view window the settings are applied to when the *Apply to selected view* button is selected. Selecting the **Apply to open views** button applies the current settings to all open view windows.

View Attributes are saved with the design file settings. To save changes to the View Attributes, select the menu option *File > Save Settings*.

The View Attributes dialog can be invoked from the View Control toolbox. Select the down arrow of the

**View Attribute**  icon to display a temporary popup of the View Attributes <OR> click on the **View Attribute** icon to open a floating **View Attributes** dialog.





**View Number** - Sets the view for which attribute settings are displayed.



**Apply to Open Views** - If on, any settings changes are applied to all the open views.



**Apply to Selected Views** - If on, any settings changes are applied to selected open views.



**ACS Triad** - If on, a coordinate triad representing the Active Auxiliary Coordinate System (ACS) displays. The ACS is controlled using the Auxiliary Coordinates dialog, which is opened by choosing Auxiliary Coordinates from the Utilities menu.

**Background** - If on, the background displays.

**Boundary Display** - Controls whether the boundaries of the clip volume are displayed for a given view, as well as reference clip boundaries

**Camera** - If on, the view camera is on for the view. Applies to 3D designs only. This control is disabled (dimmed) if the active DGN file is 2D.

**Clip Back** - Toggles the display of elements and parts of elements located outside a 3D view's clipping planes. If on, a back clipping plane is active in a view.

**Clip Front** - Enables toggling the display of elements and parts of elements located outside a 3D view's clipping planes. If on, a front clipping plane is active in a view.

**Clip Volume** - Toggles the display of elements and parts of elements located outside a defined Clip Volume for a given view. If on, and a clip volume has been applied to the view, the view volume is restricted to the defined volume. If no clip volume has been applied to the view, it has no effect.

**Constructions** - If on, construction elements (those with the Class attribute of Construction) display. Constructions typically are turned off in a view before plotting or rendering.

**Dimensions** - If on, dimension elements display. Turning Dimensions off can decrease view update time.

**Data Fields** - If on, enter data fields are displayed.

**Display Set** - If on, display of elements is restricted to only those elements in the current display set.

**Fast Cells** - If on, cells display as outlines. Turning Fast Cells on decreases view update time.

**Fast Curves** - If on, curve elements display as line strings (with line segments connecting the vertices). If off, curves are smooth.

**Fill** - If on, solid, closed elements with Fill Type of None or Opaque and text characters in a filled font display with color fill.

**Grid** - If on, the grid displays. Its uniformly placed dots (grid points) and crosses (grid references) provide an indication of distances as a visual aid and a means of facilitating drawing precision with Grid Lock.

**Level** - If on, level symbology overrides — the override color, numbered line style, line

**Overrides** - weight, and material associated with each level — display in the view, instead of the color, numbered line style, and line weight of each element.

**Line Styles** - If on, elements display with their custom line style, if they have one. If off, all elements with custom line styles display with the standard solid line style (0). Turning Line Styles off can decrease view update time.

**Line Weights** - If on, elements display with their line weight. If off, all elements display with a line weight of zero. Turning Line Weights off can decrease view update time.

**Patterns** - If on, pattern elements display. Turning Patterns off can decrease view update time.

**Pattern/Bump** - If off, pattern and bump maps are not displayed for Phong or Smooth rendering.

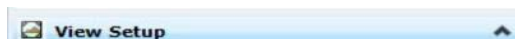
**Maps** - can reduce rendering times.

**Tags** - If on, tags display in the selected view(s).

**Text** - If on, text elements display. Since text elements take longer to display than most other elements, turning Text off can decrease view update time.

**Text Nodes** - If on, empty text nodes displayed as small crosses with numeric identifiers. However, in most cases displaying text nodes is unnecessary.

**Transparency** - If on, applies transparency to elements, references, and levels.



**Saved Views** - Allows the recall of a saved, predefined view definition to a destination view window and allows use of the selected attributes in the saved view.

**Models** - Displays the name of the model to which these settings are applied.

## **VIEW RIBBON**

All of the View tools are also available from the Ribbon. In OpenRoads Modeling workflow, select the **View** tab to access the View tools ribbon.



# 5 MODELS

## **OBJECTIVES**

This chapter focuses on the use of Models and incorporating them into the FDOT environment. Topics include:

- Model Properties
- FDOT's Use of Models
- Models Dialog
- Creating a Model

## **INTRODUCTION**

OpenRoads Designer offers many features designed to facilitate the production of engineering information. One of the most beneficial of these features is *Models*.

Not to be confused with modeling or *3D models*, the models referred to in this chapter are like containers within a DGN file. A design file is composed of models. When users draw or place elements in a design file, the elements are added to the active model. A model can be either 2D or 3D and is stored within the design file. When a design file is created from a seed file, an empty container setup is provided with a default model ready to create a design. If a 2D seed file is used, then the default setup is 2D, while a 3D seed file defaults to a 3D setup.

In 2D drafting, the OpenRoads Designer equivalent of a sheet of drafting paper is the design plane. Unlike a sheet of drafting paper, the design plane in a design file is extremely large and allows the user to draw models at full scale. To draw various elements in a model, the user enters *data points*. Each data point placed in the design plane has associated X (horizontal) and Y (vertical) positions or coordinates. The design plane is simply a Cartesian coordinate system upon which a model resides.

## **MODEL PROPERTIES**

Each model also contains its own unique set of properties. Every model has its own set of eight views. The model whose views are displayed or available for display at a given time is the active model.

There are three types of models: Design Model, Sheet Model and Drawing Model.

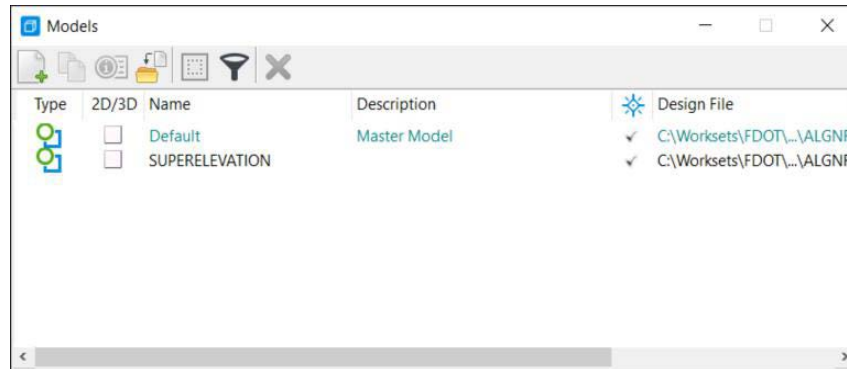
***Design Models*** - are model space in which the design is drawn and consists of design geometry which can be either 2D or 3D. A Design Model can also be used as a reference or placed as a cell. In OpenRoads Designer, an unlimited number of design models can be created in a design file. By default, the view windows of these models have black backgrounds.

***Sheet Models*** - are used by FDOT to compose finished and annotated printable drawings. OpenRoads Designer allows an unlimited number of sheet models to be created in a design file. By default, the view windows of these models have white backgrounds.

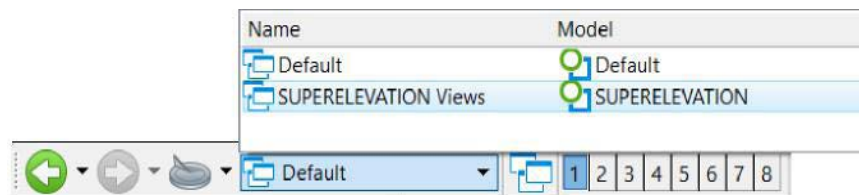
***Drawing Models*** - are a subset of a 2D or 3D design model, used to apply annotations, dimensions, callouts, and other embellishments to a design. By default, the view windows of these models have gray backgrounds.

## **FDOT'S USE OF MODELS**

FDOT has implemented the use of models for combining dependent data into a single design file on a specific limited basis. Each type of model is used for its intended purpose. One example of the use of models in the FDOT WorkSpace is with FDOT alignment files. The Create File tool creates an additional model for superelevation when creating the alignment file. Once an alignment file is opened the models are readily available via the Models dialog.



**View Groups**- are predefined for each model within the alignment file These are created automatically in conjunction with the models and allow easy access to and switching between models.

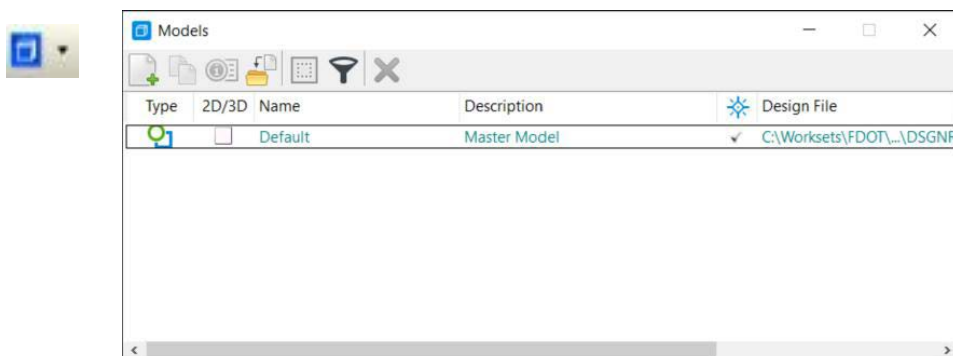


In design files designated for sheets and plans development, additional sheet models are created during the creation of named boundaries. These additional models are based on the information stored in the sheet seed

## **MODELS DIALOG**

When a design file is first created, it has a built-in Default design model described as Master Model ready to place elements. The OpenRoads Designer Models dialog allows users to create, edit, manage, and quickly switch between any model (including this Default model) in the design file.

This dialog can be accessed from the *Home* ribbon under the *Primary tools* section by selecting the **Models** dialog icon.



**NOTE** This dialog can be docked at the top or bottom of the applications window.

The Models dialog contains several tools to allow the user to create, modify and manage models. These tools are outlined in the table below.



**Create A New Model** - Opens the Create Model dialog, which is used to create a new Design or Sheet model in the open DGN file. Design models generally contain design elements, while sheet models are used for plotting.



**Copy A Model** - Opens the Copy Model dialog, which is used to make a copy in the open DGN file of the existing model selected in the list.



**Edit Model Properties** - Opens the Model Properties dialog, for the model selected in the list box. This dialog is used to modify properties of models contained in the open DGN file.



**Delete Models** - Deletes the model selected in the list box. The default model is present in every design file and cannot be deleted.



**Import Model** - Opens the Import Model From File dialog, which is similar to the Open dialog that allows selection of a DGN or DWG file from which to select the model to import. After clicking OK, the Select Models dialog opens allowing selection of the model to import into the open DGN file.



**Define Sheet Layout** - (Sheet Models only) Opens the Define Sheet Layout dialog, allowing to set the Display status, and define the Size, Origin, and Rotation sheet layout parameters.



**List Filter** - If on, displays a filter row in the list box that allows for defining a filter for any of the list columns. To define a filter, click on the required filter field and enter the filter parameters. For information on defining filters by string, integer or Boolean expressions, refer to the tables in Defining and Deleting Filters.



**List Box** - Lists the models in the open DGN file. An icon displays next to the model name indicating whether the model is 2D or 3D. Double-clicking a model here makes it the active model.

The model name and description can be edited by triple-clicking on the selected model name in the list box. To copy, delete, or adjust properties of a model, it must first be selected here.

The columns displayed in the list box can be customized by right-clicking in the title row of the list box and using the menu to select which options are displayed.

## **CREATING A MODEL**

**Design Models** - The user can create one or more discrete models within a design files and move between various models using the Models dialog. Where a design file contains many models, filters can be set to display only particular models, but filters are not saved from one design session the next.

**Sheet Models** - Use to compose design drawings which typically consist of references of the design models. References can be from the open design file or from other design files on disk. As with the Design Models, the user can switch between Sheet Models using the Models dialog. In OpenRoads Designer, the Plans Development workflow discusses sheet model creation using the Named Boundary tools.

**Drawing Models** - Are the intermediates between the 3D design model and a printable Sheet Model. It is an unbound white space that contains one or more views of the design model. The Drawing Model can be used for centralizing annotations that need to be shared across multiple sheets. When a Drawing Model is attached to a sheet, the drawing model's annotation scale is used as the attachment's default detail scale.


FDOT supports the use of all three of these types of models for various purposes. For more information, please see the Plans Development Workflow training guide.

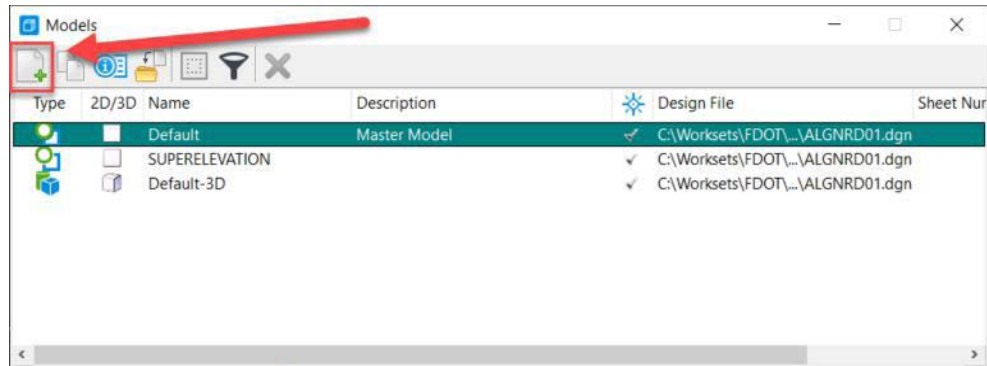
When creating models in a design file, the user has an option to specify whether or not that model *Can be placed as a cell*. If this option is turned on, the model can be referenced as a model <OR> placed as a cell within another model. When referencing a model, the link to the original is maintained and any modifications to the original will reflect in the reference. When a model is placed as a cell, the link to the original is removed.



## Creating Models (Manually)

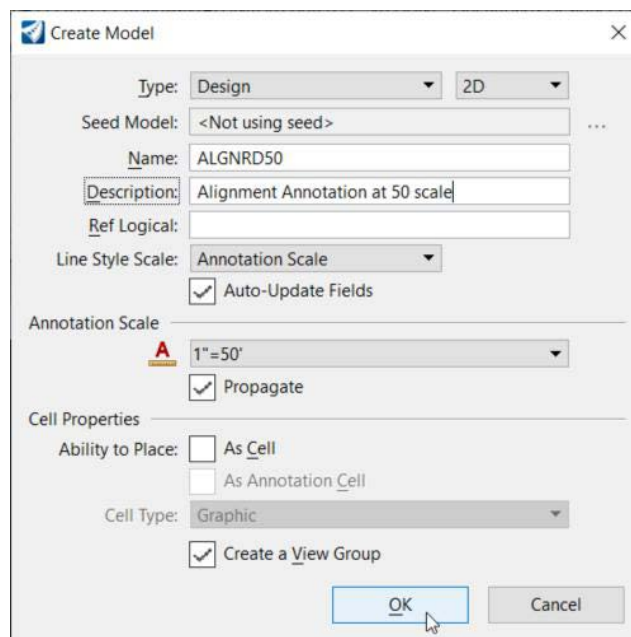
Open the file <c:\worksets\FDOT\22049555201\roadway\alnrd01.dgn>.

From the *Primary Tools* toolbox located at the top of the applications window, click the **Models**  icon to open the Models dialog.

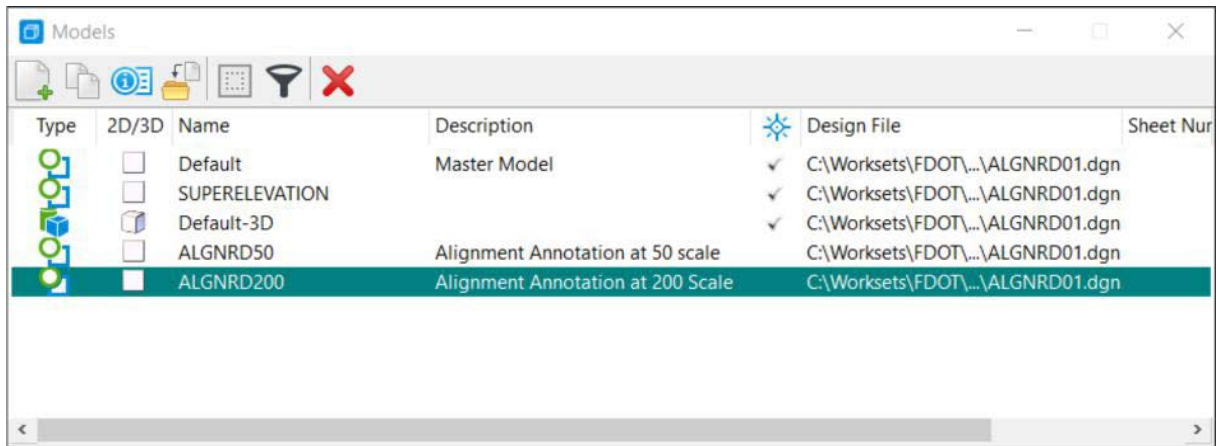


From the Model dialog, select the **Create a New Model**  icon to open the Create Model Dialog.

Fill in the dialog as shown below. Click **OK**. Notice in the Models dialog that the list window updates with the new model named **alnrd40**. At the same time the model was created, OpenRoads Designer switched the design environment to the new model for work to begin.

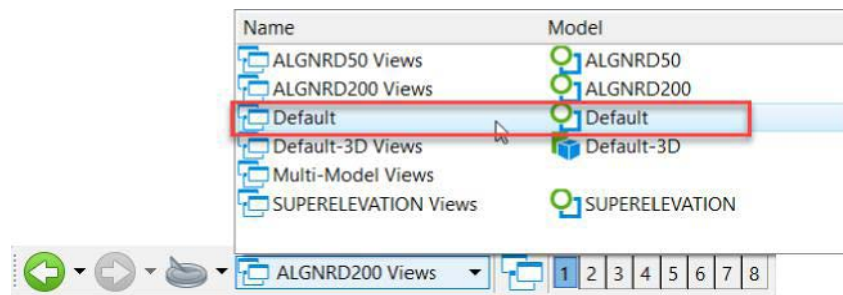


Repeat the sequence to create the *Model Name* **algnrd200** with the *Description: Alignment at 200 Scale*. Click **OK**.



From the Models dialog, double-click the **Default** listing to switch back to the **Default Model**.

From the *View Groups* toolbox located at the bottom of the applications window, notice there is a new corresponding **view group** with names corresponding with each *model* created.



Close the Models dialog.

# 6 LEVELS

## **OBJECTIVES**

This chapter focuses on leveling functionality in OpenRoads, which is comprised of the following:

- Setting the Active Level
- Level Libraries
  - By-Level Names
  - By-Level Symbolology
  - Level Filters
- Level Manager
- Level Display

## **INTRODUCTION**

A design file is made with basic building blocks called elements that are placed on a design plane within each model. Each element placed in a model is on a drawing *Level*. Levels are analogous to transparent overlays which can be combined in different ways to visualize different parts of a model. When creating a design, the user can use many Levels to organize drawing information intelligently. Each Level can have its own *color*, *style*, and *weight symbolology* along with a number of other attributes.

FDOT has adopted a By-Level system utilizing FDOT Standard Level Libraries that define discipline specific *Levels* and associated *color*, *style*, and *weight symbolology* for the production of all FDOT projects. These FDOT Standard Level Libraries are locked and cannot be modified by the user.

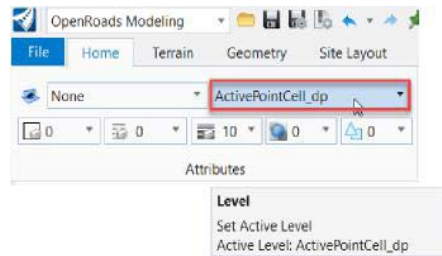
ORD provides for the management and display options for levels through Level Manager, Level Filters and Level Display applications. FDOT has utilized these options in the setup of their CADD Standards as discussed in the following sections.


## **SETTING THE ACTIVE LEVEL**

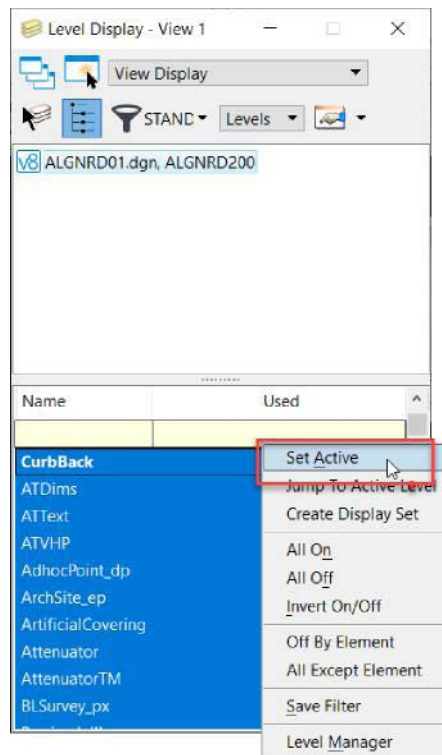
While a design file has many levels available to the user, only one level is open for modification at any given time. This open level is referred to as the *Active Level*. All elements are created on the Active Level. It is important to change the Active Level to the desired level before placing elements. The level an element resides on may be changed later, but the best practice is to create it on the desired level to start with. The Active Level is the same in all views.

The following are ways to set the Active Level:

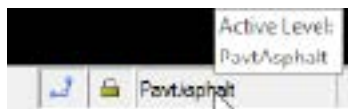
The easiest way to set the Active Level is to click the **Active Level** combo box on the Attributes portion of the Ribbon under the Home tab. Click the **Active Level** combo box to display available levels. Choose the desired level to be set as the Active Level.

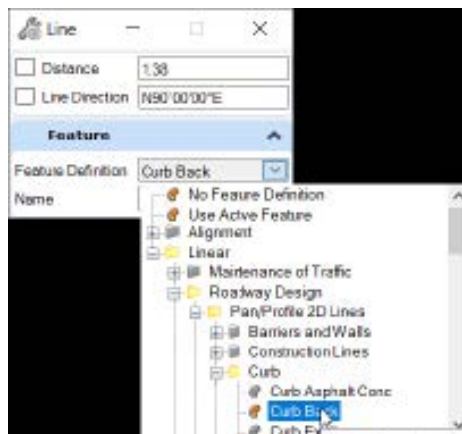


From the Level Display dialog, the user can also set the Active Level. The user can click on the **Level Display**  icon on the Primary Tools toolbox to open the *Level Display* dialog. The *Active Level* is highlighted in the Level list and can be changed by double-clicking on any other level <OR> by right-clicking on the desired level and select **Set Active** from the popup menu.



From the *Level Manager* dialog, the user can also set the *Active Level*. The user can double-click the **Active Level** box in the OpenRoads Designer *Status Bar* to open Level Manager and then double-click on any level to set the *Active Level*.





**NOTE** *If you are using the civil geometry drawing tools, which will be discussed later, selecting a Feature Definition from the Feature menu on the tool settings dialog will place new elements on the appropriate level; however, it will not change the Active Level set in the Attributes toolbox.*

## **LEVEL LIBRARIES**

An OpenRoads Designer *Level Library* refers to a component of a DGN Library that contains a level structure; that is, one or more level definitions. New level libraries can be created; and new and existing level libraries can be attached, detached, imported, and exported using the Level Manager dialog. A level definition does not technically attach from the Level Library to a design file until it is used.

FDOT has created standard FDOT DGN Libraries (DGNLibs) within FDOT Connect to store FDOT Standards for: cells, levels, level filters, line styles, multi-line styles, text styles, dimension styles, element templates, menu customizations, customized tools, tool boxes, and tasks. Each FDOT DGNLib contains data that is shared throughout files and among users.

When a design file is opened in the FDOT WorkSpace in ORD, the corresponding FDOT Standards Level Libraries are automatically attached with preset FDOT Standard Filters activated. Only the valid levels from the attached libraries associated with the specific active design file are displayed for use.

## **BYLEVEL NAMES**

Each FDOT Standard defined in a Design Library (DGNLib) is identified by a unique **Level Name**. When used from a DGNLib, it is copied into the active design file and is given the same name. This allows for comparison of the local resource to the FDOT DGNLib resource for compliancy to FDOT CADD Standards.

## **BYLEVEL SYMBOLOGY**

The standard FDOT Level Libraries define the CADD Levels for each Discipline with the associated ByLevel Color, ByLevel Line Style, and ByLevel Line Weight symbology. Designers are to use these standard FDOT Levels to assign each element within FDOT CADD design files.

The FDOT Levels and symbology are grouped and translated into specific QC Rules which are associated to each valid Standard Filename of each Discipline for the purpose of performing the Quality Control check for FDOT Standard compliancy of design files.

When using FDOT Connect and OpenRoads Designer to create an FDOT drawing, the color, line style and line weight attributes should be set to “ByLevel”. This setting allows the level to control these active attributes. This ensures that the levels comply with FDOT standards. FDOT levels are predefined and delivered in specific .dgnlib files. FDOT does not recommend overriding the ByLevel settings. To do so would result in non-standard design files that would not be acceptable in FDOT Project submittals. Additionally, when drawing using the civil geometry tools, selecting the appropriate feature definition for an element is the recommended method to ensure that the element meets both By-Level compliancy as well as having the correct Feature information. This will be covered later in the training guide.

## LEVEL FILTERS

OpenRoads Designer levels can be filtered at any time to make only specific levels within a Level Library available during the design process. FDOT utilizes the OpenRoads Designer level filters to combine level definitions within the FDOT Level Libraries into **Filter** groups.

FDOT created a Filter group called **Standards** that match the FDOT Standard Rule Files. Each **Standard** sub-filter is associated with an FDOT Standard filename. When a design file with an FDOT Standard filename is opened in OpenRoads Designer, only the FDOT Levels approved for use in that design file are displayed for selection.

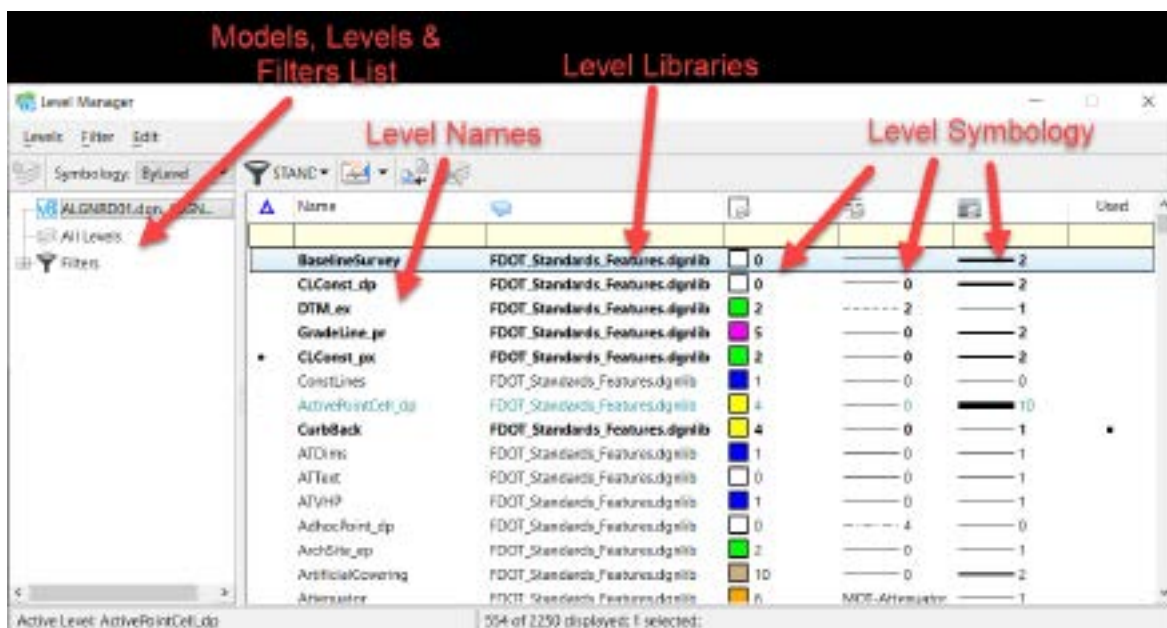
As mentioned earlier, these level filters can be turned on and off from the FDOT Ribbon.

## LEVEL MANAGER

Level Manager is used to control level display and level symbology for the open DGN file and attached references. By default, the Level Manager includes a list of models, levels, and filters on the left, and a detail section of levels on the right. Multiple design files and/or reference attachments can be selected from the tree by holding the left mouse button down and dragging the cursor over the desired files. The levels for all the selected files display in the level list.

As previously stated, FDOT has established and delivers Standard CADD Symbology Levels within a set of DGNLIBs. FDOT's WorkSpace disables the Level Manager's modification/creation functions of levels and does not allow users to create, delete, import, or export levels to ensure consistency in products submitted for FDOT Projects. Every level needed for creating FDOT drawings should already exist, including miscellaneous levels for "scratch" drawing. If a new level is desired, a request must be submitted to be addressed through the CADD Technical Advisory Committee (TAC) of the appropriate discipline.

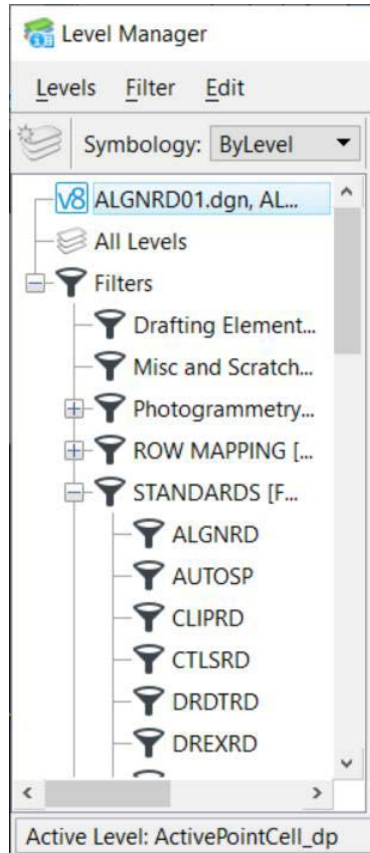
The Level Manager is accessed by selecting the Level Manager icon from the Primary section of the Home Ribbon.



The Level Manager functions go beyond level editing, but provide much information to the user:

## **MODEL, LEVELS, AND FILTERS LIST**

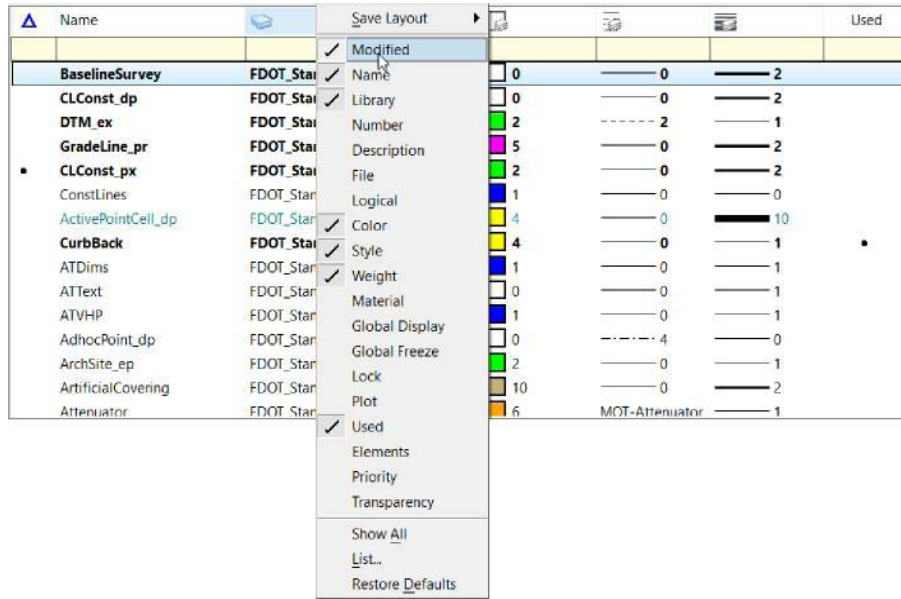
In the pane to the left of the dialog, the Level Manager displays the *Active Design File, Model* with all the references; the *All Levels* attached and used within the open design file and all *Filters* available for use by the user. FDOT has developed many filters from the various level libraries to match the FDOT CADD Standards and delivers them with the FDOT CADD Software. Upon opening of any FDOT Standard filename within the FDOT WorkSpace, an associated standard filter will be automatically applied, displaying only those levels valid for the active design file. The filter function can be disabled and / or utilized by the user to further customize other filters to best aide in the design process.





# LEVELS LIST

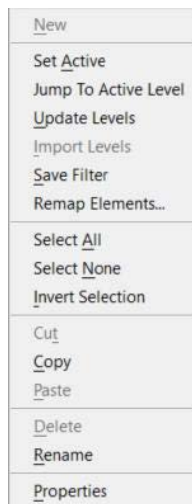
As previously stated, FDOT associates each FDOT Standard Filename with a Standard Filter. This listing displays the attributes and properties of individual levels allowed for the selected file or reference. The highlighted level indicates the Active Level. Bolded items represent levels that have been used within the design file. The listing can be sorted by double-clicking any of the titles. The columns in this listing can be customized by right-clicking on the title bar and checking or un-checking available options.



**NOTE** To display all levels used, regardless of validity, the user must turn off all filters by selecting none from the dropdown.

# RIGHT-CLICK POPUP


Level Manager has a right-click option to allow the user to Set Active Level, Jump To Active Level, and view Properties.

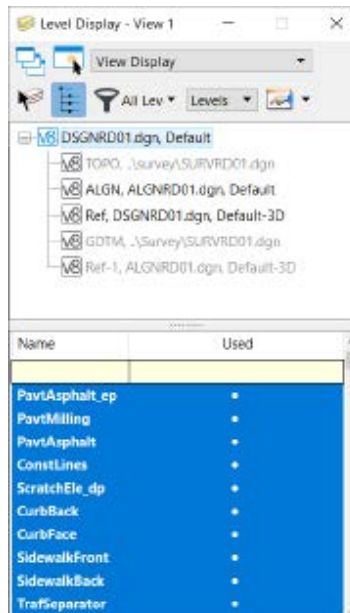


## LEVEL DISPLAY

The Level Display dialog provides the ability to turn on and turn off levels in a model and to apply filters created in the Level Manager dialog.

This dialog can be accessed from the *Primary* section of the Home Ribbon. Select the *Level Display*

 icon. Note the down arrow next to the icon allows the Level Display to open in popup mode and automatically close when the cursor is moved away from the dialog.



**Apply to Open Views** – If on, level display settings adjustments will apply to open views.



**Apply to Selected Views** – If on, level display settings adjustments will apply to the selected



**Change Level** – Opens the Change Level tool, used to display or lock a level.



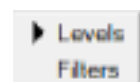
**Show Target Tree** - Changes the display of the Target Tree, used to set the target mode for level display settings changes or sets the model as a target.



**List Filter** – If the Show Level Name or Filters option menu is set to Level, this option will allow the user to set a Filter, named or defined on-the-fly, applied to level display.



**Show Level Name or Filters** – Determines the contents of the List box.



**Filters** - Lists level filters defined in the open file (and in reference attachments if they are selected in the target tree).

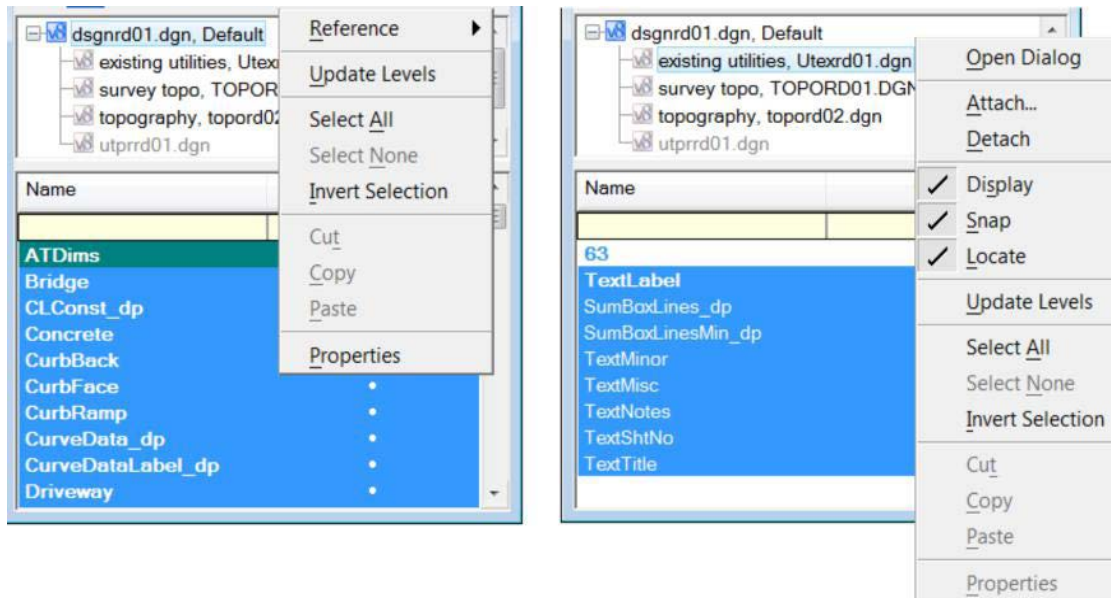
**Levels** - Lists the levels in the open file (and in reference attachments, if they are selected in the target tree).

**Dialog Properties** – Pops up a Level Display dialog, used to set the properties of the Level Display dialog.



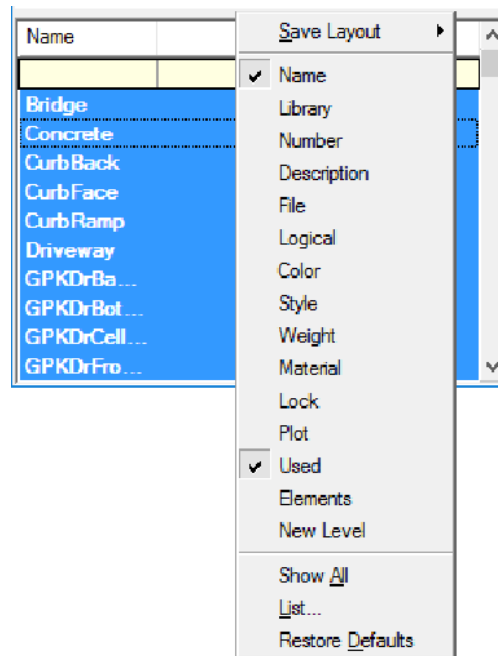
**Target Tree** – Used to select the target model for level display settings changes. This tree control enables selection of the active model, another model in the open DGN file, or an attached reference in the open file or another file, as the target.

Right-clicking on the active file or the reference files in the target tree area opens popup menus with the following options:

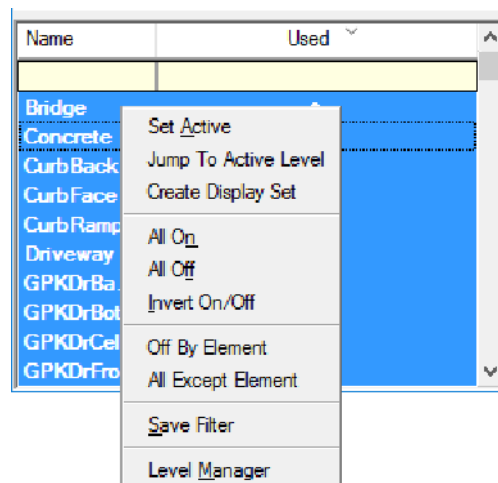


**Levels (List box)** – Lists the Levels (or filters if *Show Level Names or Filters* is set to **Filters**) in the target model. This listing has the same display, sorting, and function capabilities as the Level Manager.

Right-clicking on the title bar opens a popup menu to customize the list display columns with the following options:



Right-clicking within the listing opens popup menu with the following function options:

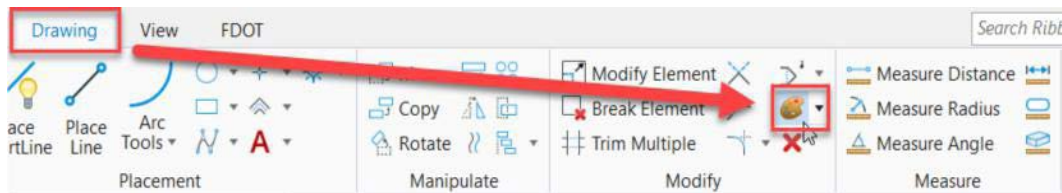


# WORKING WITH LEVELS

## CHANGE ATTRIBUTES

Once an element is placed, the level on which it has been drawn or the symbology with which it was drawn can be changed if necessary. One tool that can be used to change the level on which an element is placed or the attributes with which it was placed is the Change Attributes tool.

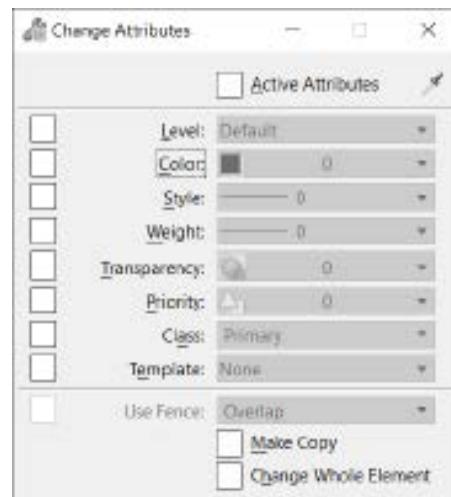
The Change Attributes tool is accessed by selecting the icon shown below from the Modify section of the Drawing tab on the OpenRoads Modeling Ribbon.



**Change Element Attributes** - Used to change an element(s) level, color, line style, line weight, or class. This tool may also be used to match one element's attribute to another's.



From the *Change Element Attributes* tool setting dialog, the user can control what properties of an elements' symbology are changed.



**Use Active Attributes** - If on, active attributes are affected when the user changes or matches attribute settings. If off (default), the active attributes settings are not affected when the user changes or matches attribute settings.

**Eyedropper icon (Match Element Attributes)** - Used to match the element attributes of the element selected, and then use these settings to change the attributes of the next element(s) selected.

If *Use Active Attributes* is on when clicking the eyedropper, the active attributes will change to match the element selected.

If *Use Active Attributes* is off when clicking the eyedropper, only the settings in the tool settings window change to match the element selected. The active attributes do not change.

**Level** - If on, level is included when changing or matching settings.

**Color** - If on, color is included when changing or matching settings.

**Style** - If on, line style is included when changing or matching settings.

**Weight** - If on, line weight is included when changing or matching settings.

**Transparency** - If on, element transparency is included when changing or matching settings.

**Priority** - (2D only) If on, element priority, is included when changing or matching settings.

**Class** - If on, element class is included when changing or matching settings.

**Use Fence** - If on, the tool will modify the element(s) based on the fence and fence setting used. Note that this option is grayed out unless there is an active fence placed in the design file.

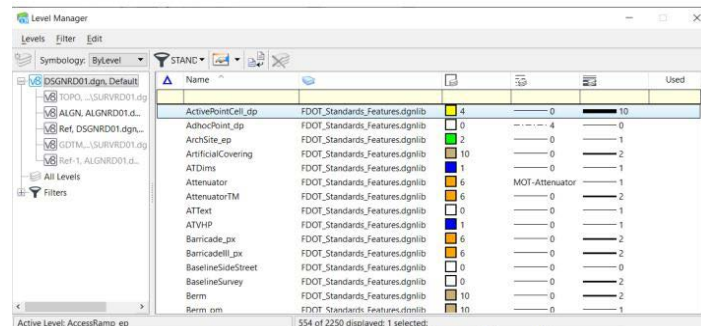
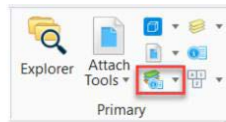
**Make a Copy** - If on, the element(s) are copied and the attributes of copy(s) are changed, but the attributes of the original are not changed. Turn this setting on in conjunction with the Level setting to copy an element from one level to another or from a reference to a master file level.

**Change Entire Element** - If on, the attributes for the entire element are changed.

# EXERCISE OVERVIEW

## Exercise 6.1 Reviewing Level Manager

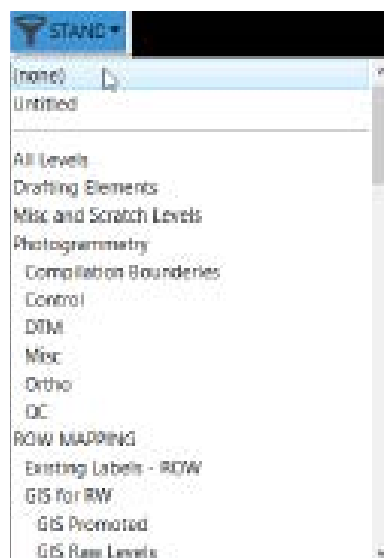
1. Open the OpenRoads Designer file: `c:\worksets\FDOT\22049555201\roadway\dsgnrd01.dgn`.
2. From the Primary section of the Home tab on the OpenRoads Designer Ribbon, select the **Level Manager** icon.



3. The FDOT CADD Software delivery includes an FDOT WorkSpace with a preset Level Library that is locked, disallowing the user from creating new levels. Also included are preset FDOT Connect Level Filters that are automatically associated to all FDOT Standard Files.
4. From *Level Manager*, move the cursor to hover over the **Filter List** icon. Note the Standards filter, DSGNRD that has been automatically associated and displayed.



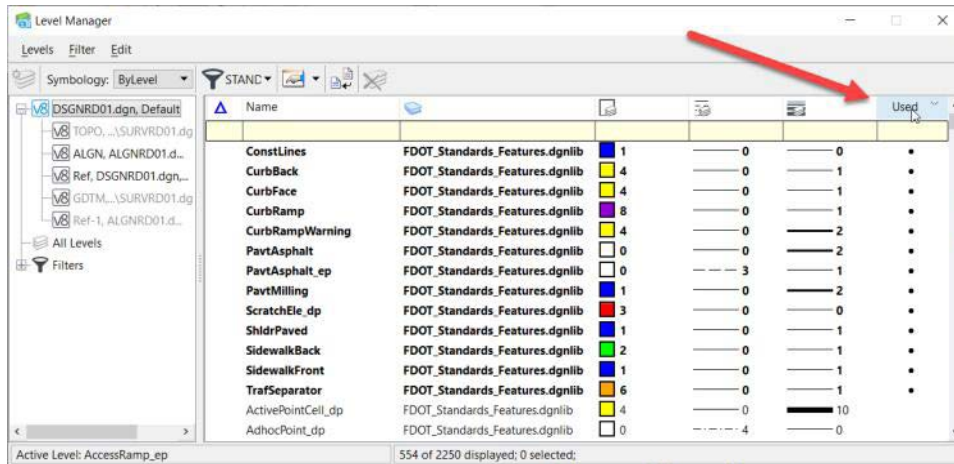
6. Select the **Down Arrow** to open the popup listing and then scroll to the top to select (none). The Level list pane updates with all available levels from the Level Libraries attached to the design file.



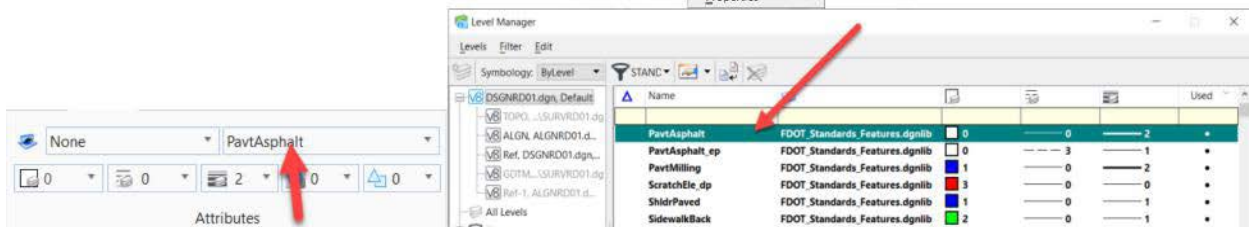
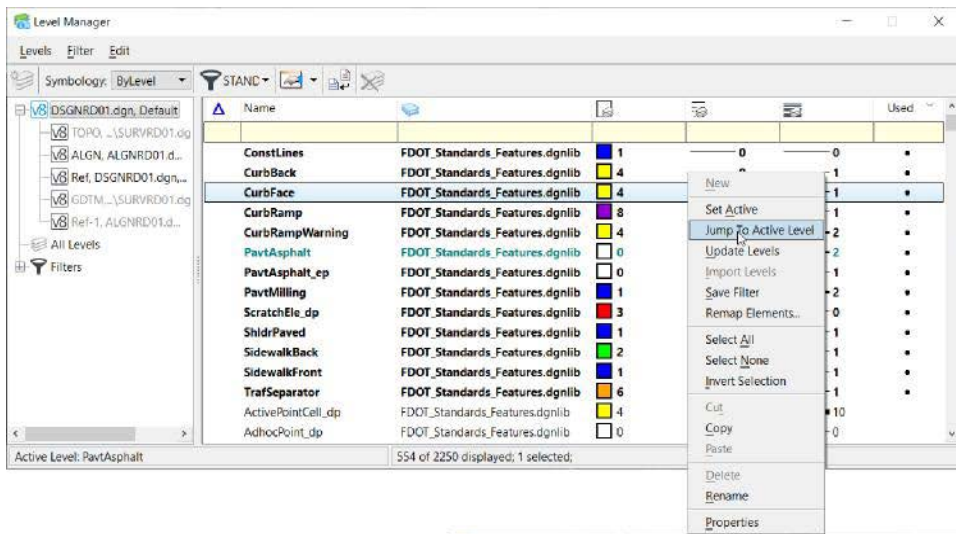



**NOTE** Not all levels are embedded into the design file, only the levels used displayed in bold in the Level Manager.

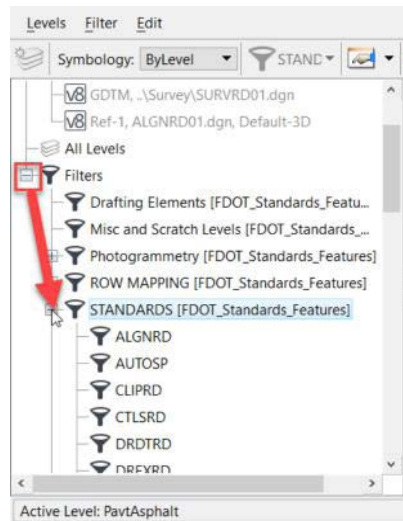
- From the *Level List*, click on the column titled **Used** to sort all the Levels used within the design file to the top of the list. The title may have to be toggled twice as the list can be sort ascending or descending. Select other column title headers and note how each sort ascending or descending.




- Right-click the *Level List* and select **Jump to Active Level** from the *popup* menu. The *Level List* moves to and highlights the current Active Level as displayed in the Attributes toolbar.



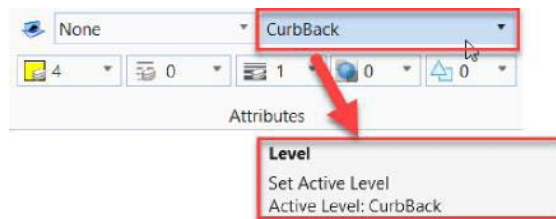
- From *Model, Levels, and Filters List* pane to the left of the window, expand the **Filter** sections by clicking the  icons. Note the listing of preset *FDOT Filters* and what [Level Library] they are drawn from.



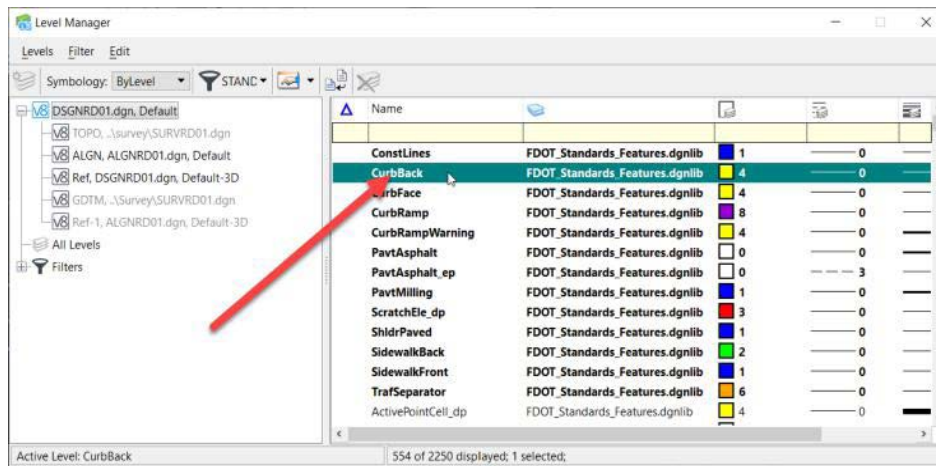
- Expand the *STANDARDS [FDOT\_Standard\_Features]* parent filter by clicking the  icon. All the filters displayed match directly to the FDOT Standard Rules. Select the **DSGNRD** to display the FDOT Standard Levels allowable for use in the current active design file, *dsgnrd01.dgn*.

## SETTING THE ACTIVE LEVEL

1. Continuing with the *dsgrnd01.dgn* file and Level Manager
2. From the Attributes tools located on the Ribbon, set the *Active Level* to **CurbBack**.



3. Note in Level Manager that the Active Level is now displayed as **CurbBack**.

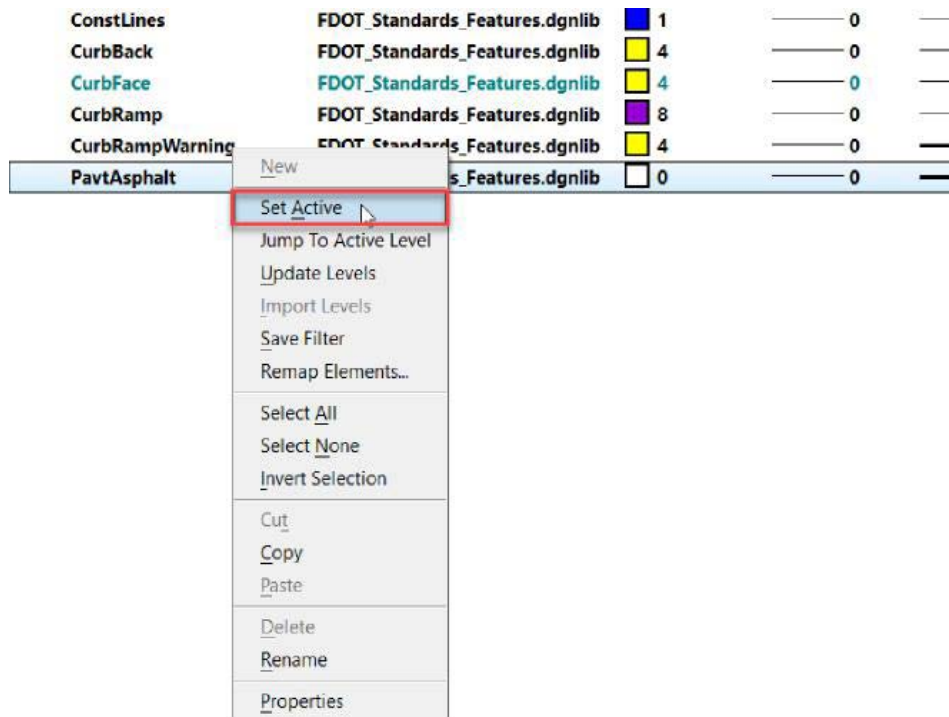


4. In Level Manager, double-click on the level **CurbFace**. The Active Level is now **CurbFace**.

A close-up screenshot of the Level Manager table. The 'CurbFace' level is highlighted in blue, and a red arrow points to it. The 'Active Level' at the bottom left is now 'CurbFace'.

|                 |                                |        |   |   |
|-----------------|--------------------------------|--------|---|---|
| ConstLines      | FDOT_Standards_Features.dgnlib | Blue   | 1 | 0 |
| CurbBack        | FDOT_Standards_Features.dgnlib | Yellow | 4 | 0 |
| CurbFace        | FDOT_Standards_Features.dgnlib | Yellow | 4 | 0 |
| CurbRamp        | FDOT_Standards_Features.dgnlib | Purple | 8 | 0 |
| CurbRampWarning | FDOT_Standards_Features.dgnlib | Yellow | 4 | 0 |
| PavtAsphalt     | FDOT_Standards_Features.dgnlib | White  | 0 | 0 |

5. Finally, right-click on the level **PavtAsphalt** and select *Set Active* from the right-click pop-up menu.



**NOTE** *PavtAsphalt is now the current active level.*

6. Close Level Manager and Exit OpenRoads Designer.

# 7 BASIC DRAWING TOOLS

## **OBJECTIVES**

This chapter reviews the understanding of the basic drawing tools provided in OpenRoads Designer, including:

- Placing Elements
- Tool Settings
- Basic Workflow
- Linear Task
- Polygons Task
- Arcs Task
- Ellipsis Task
- Undo and Redo

## **INTRODUCTION**

OpenRoads Designer has many drawing tools (or tools, for short). These tools are grouped for convenient selection on the Ribbon in their respective workflows.

Each open toolbox is either floating in its own window or docked to an edge of the application window. The arrangement of tools in a floating toolbox can be changed by resizing its window. Tools are represented in toolboxes by icons. For simplicity, the term **Tool** is used to refer both to a tool and its icon.

Only one tool can be selected at a time, for example, the Place Line tool or the Element Selector tool.

The basic drawing tools that are discussed in this training guide are located under the OpenRoads Drawing Production workflow under the Drawing tab on the Ribbon. These tools place, manipulate and modify basic linework elements placed with only symbology attributes. As discussed in the previous chapter, many of the elements used in the FDOT workflow include additional Feature Definition (or Feature) attributes for use in modeling and automated quantities. These featurized elements are placed using a different set of drawing tools. This course gives the user an introduction to the basic drawing tools with the understanding that the feature-driven Geometry tools function in a similar manner.

The featurized Geometry tools are covered in the FDOT Basic 2D Roadway Design training guide.

## **PLACING ELEMENTS**

In OpenRoads Designer and MicroStation Connect Edition, the objects drawn, or placed, in a model, lines, polygons, circles, text, etc., are called **Elements**. Each element has several attributes that define the element:

- Level
- Color
- Line weight
- Line style
- Fill color (for closed elements)
- Class
- Transparency
- Priority (2D only, for display)

FDOT defines the CADD level/symbology Standards for Level, Color, Line Weight and Line Style and has incorporated these standards in the FDOT tools delivered within the FDOT WorkSpace. The users need only to utilize these tools to create elements set to the required level/symbology to pass compliancy with the FDOT CADD Standards.

In OpenRoads Designer the left mouse button is mapped to a logical button called the *Data* button, which sends a type of graphic input called a *data point* when pressed. The right-hand mouse button is mapped to the *Reset* button, which is used for resetting and for accessing Reset pop-up menu and View Control pop-up menu. The pressing of both right and left hand mouse buttons at the same time, called a button "chord", invokes the *Tentative* button, which is used to enter tentative snap points. If a three button mouse is available, it can have the center button mapped as the tentative button.

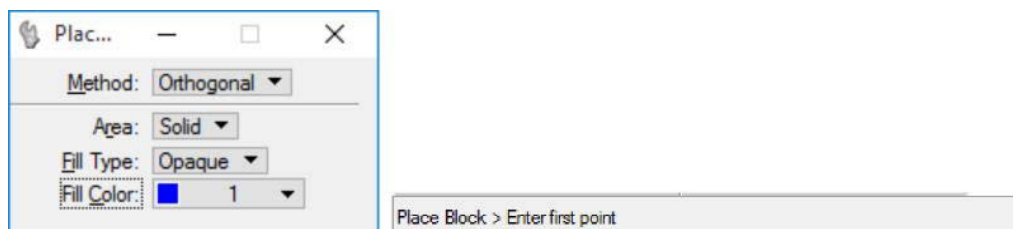
When selecting an element within a design file <OR> or when placing the cursor into the design plane of a design file to create or manipulate an element, an element is being *positioned* to a specific location. These positioning locations are called *data points*. A data point is a graphic input that, depending on the context:

- Designates a point in a design (for element placement or selection, for example).
- Designates the view in which it is entered (for fitting or updating, for example).
- Accepts an operation (deleting an element, for example), rather than rejecting it.

While dragging to enter data points is fast and easy, the preferred technique is clicking to enter each data point for more precise accuracy.

## **TOOL SETTINGS**

OpenRoads Designer has several aids to help to use tools. Notice a floating dialog whose title and contents change each time a tool or view control is selected. This dialog is the *Tool Settings* window. Almost every OpenRoads Designer tool has settings that affect how the tool works and can be controlled in this Tool Settings window. If closed, the window opens automatically when a tool with settings is selected. The status bar along the bottom border of the application window displays prompts and messages about the selected tool.



Rather than forcing the adjustment of a tool's settings each time the tool is selected, tool settings remain in effect until changing them. This makes the product more efficient to use, but also means the active tool's settings must be kept in mind or displayed on the screen.

Ordinarily upon selecting a tool, the settings are adjusted before entering any data points. However, some tool settings are not applicable until data points are entered.

For example, while using Place SmartLine, after entering three or more data points and then move the pointer near the location of the first data point, a check box labeled Closed Element will appear in the tool settings window, enabling to the placement of a polygon.

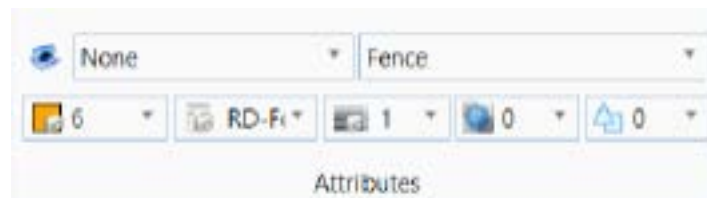
## **BASIC WORKFLOW**

OpenRoads Designer has a basic workflow as a simple foundation to follow and remember when using drawing tools:

### **SIMPLE STEPS TO FOLLOW WHEN CREATING NEW DRAWING ELEMENTS**

**Set the Active Element Attributes** - The recommended practice is to set the active element attributes first, even though, these can be changed after placement. It is advisable to always be aware of the active element attribute settings when placing elements.

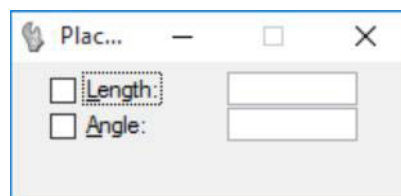
FDOT CADD Standards are based on pre-determined By-Level settings. For FDOT projects, the Level attribute need only to be set and the Color, Line Style and Line Weight will automatically set to the By-Level settings.



This step can be skipped if not placing an element or using a tool that does not rely on element attribute selection.

**Select the Tool** - All tools are located on the OpenRoads Designer Ribbon. Throughout the learning process, experiment with different tools and utilize the *Undo* and *Redo* functions as needed.

**Adjust the Tool Settings** - When selecting different tools, review each of the Tool Settings functions as the window changes. The OpenRoads Designer help document contains descriptions of all tool settings. Connect Advisor can also be consulted for contextual help on any of these tools.

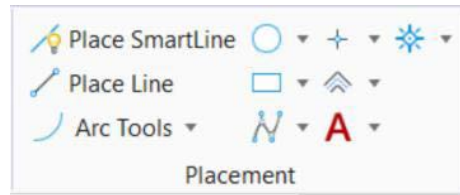


**Follow the Status Bar Prompts** - In the beginning, remember to follow the prompts in the OpenRoads Designer Status Bar located in the lower left corner of the application window. These tell how to proceed from step to step.



## **ELEMENT PLACEMENT TOOLS**

Lines are the most basic element in any design file. No matter what discipline is involved, linear elements play a large role in the basic geometry. The Linear Elements toolbox contains many tools that place linear elements into a design file.



**Place SmartLine** - Used to place a line, line string, shape, arc, or circle or a combination thereof as a complex element.



**Place Line** - Used to place or construct a line.



**Arc Tools** - Contains tools for placing and modifying arcs and ellipsis.



**Ellipse Tools** - Tools used for placing circles and ellipsis



**Polygon Tools** - Tools used for placing blocks and other polygons



**Create Curves Tools** - Tools used for creating B-splines and other types of curves



**Points Tools** - Tools for placing points by various methods



**More Tools** - Tools for placing multi-lines, stream lines, curves and other types of lines elements.



**Text Tools** - Tools for placing text and notes



**Cell Tools** - Tools for placing and modifying cells.

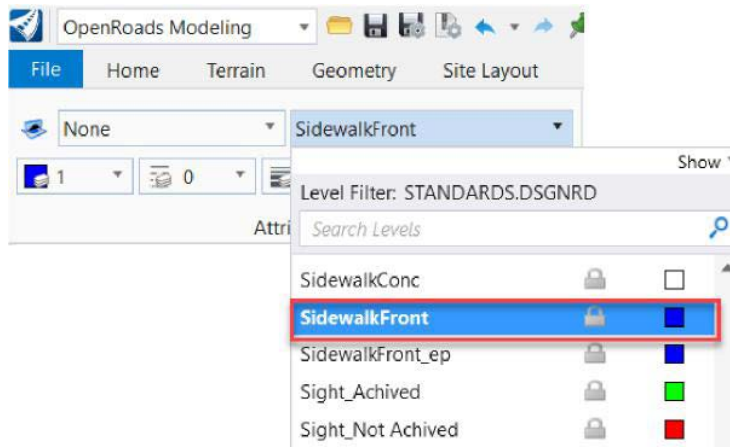


# EXERCISE OVERVIEW

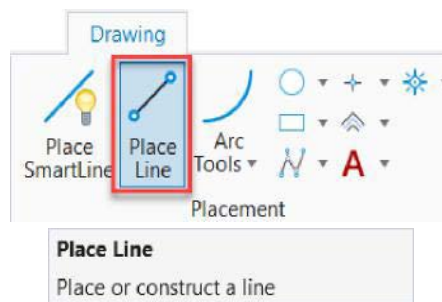
## Exercise 7.1 Placing Linear Elements

### PLACE LINE

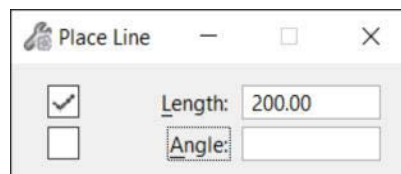
1. Open the File [c:/le/projects/22049555201/DSNGRD01.dgn](file:///c:/le/projects/22049555201/DSNGRD01.dgn).
2. Set the Workflow to **OpenRoads Modeling** and select the **Drawing** tab on the Ribbon.
3. Zoom into the location of **Station 32+00 to 34+00** near the intersection of the design. This is the location where a sidewalk will be placed along the left side of the roadway. (**Note:** *In the standard FDOT workflow for 3D modeling, this line would be placed with the OpenRoads Designer Geometry Tools. For the purpose of this exercise, we will be using the basic drawing tools*).
4. Set the Active Element Attributes from the *Attributes* dialog on the OpenRoads Designer Ribbon, change the *Active Level* to **SidewalkFront**.



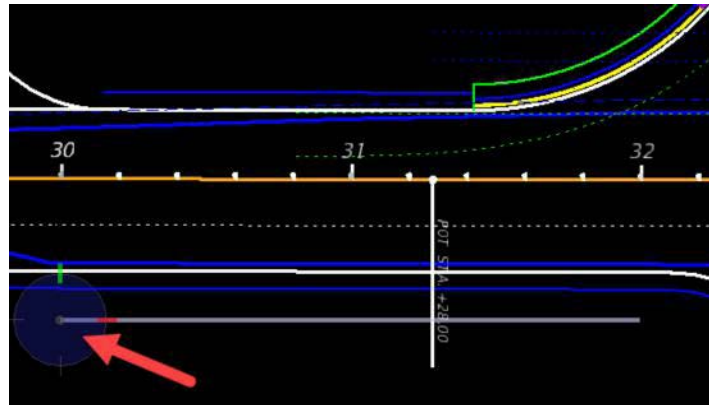
5. Select the Place Line Tool from the Placement Tools section of the Ribbon



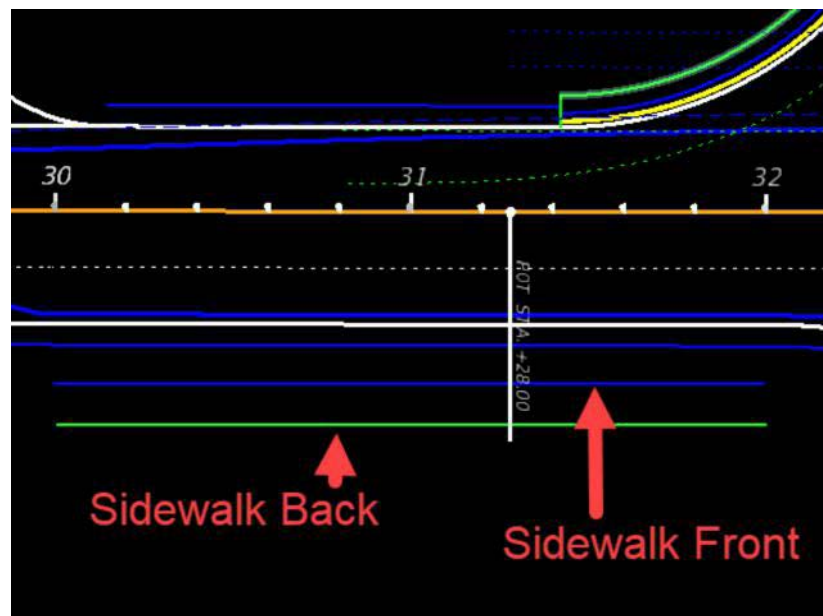
6. Adjust the Tool Settings from the *Place Line* Tool Settings box by selecting the *Length* checkbox and enter **200** as shown below.



7. Follow the OpenRoads Designer Status Bar Prompts at the bottom left of the application window to place a line along the shoulder along the left side of the roadway between **Stations 30+00 and 32+00**.
  - ✓ *Place Line > Identify start of line* – place a data point next to the shoulder starting the line at **Station 30+00**.
  - ✓ *Place Line > Identify end of line* – place another data point to end the line at **Station 32+00**.
8. Right click on the mouse to reset and end process.



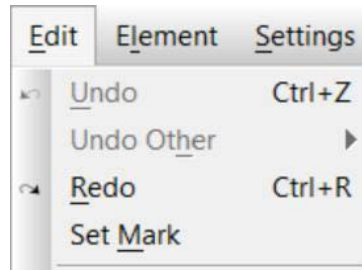
9. Repeat steps 3 – 7 to set the Back of Sidewalk. From the Attributes toolbar, change the *Active Level* to **SidewalkBack** and place another line offset from the front of the side walk.



No matter how meticulous a user is, errors occur when creating a design. OpenRoads Designer stores commands in an **Undo** buffer that goes back a single step or multiple steps when a mistake is made. Redo is the opposite of undo.

There is no limit to the number of **Undos** that can be performed. After making the selection to **Undo** a drawing operation, the operation previous to the negated operation can be undone. A series of previous operations can be undone by repeatedly choosing Undo. Undo function cannot be used for settings changes.

More advanced undo functions can be accessed through the OpenRoads Designer menu option *Edit*:



**Undo** - Negates the last drawing operation. Identifies the last *placed* element in the menu option.

**Undo Other > All** - Opens an alert box that lets the user negate all of the drawing operations recorded in the Undo buffer.

**Undo Other > To Mark** - Negates drawing operations performed after a mark was set by choosing Set Mark from the Edit menu.

**Redo** - Negates the last Undo operation. Identifies the last *undone* element in the menu option.

**Set Mark** - Sets a mark in the undo buffer back to which subsequent drawing operations can be undone.

**HINT** *Each undo operation is a single re-doable operation regardless of the number of negated drawing operations.*

**NOTE** *Any Compression done on the design will delete the Undo/Redo buffers.*

# 8 CHANGING ELEMENTS

## OBJECTIVES

Refining designs usually requires manipulating elements after they have been created. This chapter discusses the manipulation and modification tools provided in OpenRoads Designer.

- Identifying Elements
- Selecting Elements
- Manipulate Elements
- Modify Elements
- Deleting Elements

## INTRODUCTION

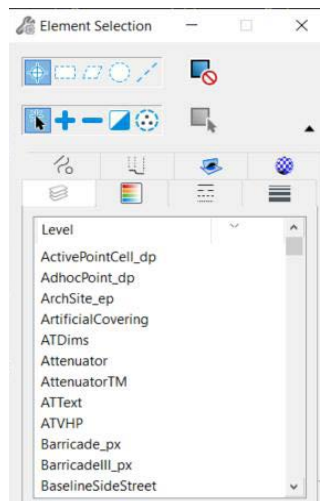
Many times OpenRoads users are not called on to create new designs, but edit existing ones. The user needs tools that allow manipulation and modification of existing geometry. OpenRoads Designer provides many tools dedicated to changing existing graphic elements.

## SELECTING ELEMENTS

For operations performed on existing elements within a design file, the user must have the ability to select those elements. This can be done using the **Element Selection Tool**. This tool is located at the far left end of the FDOT tab on the OpenRoads Designer Ribbon and other logical locations in different Workflows on the Ribbon.

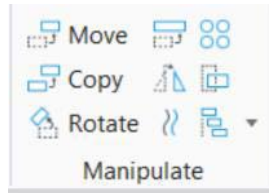
After activating the Element Selection Tool, the cursor can be placed over an element, and the element can then be selected by entering a data point.

The *Element Selection* tool allows for the selection of multiple elements to be worked on as a temporary group by a variety of means. Using this method, for example, move, copy, rotate, or scale multiple elements together. By default, selected elements are bracketed with squares called *handles*. If any elements are selected, an *arrowhead* icon is displayed in the status bar. The number to the right of the icon is the number of selected elements.



## **MANIPULATE ELEMENTS**

The OpenRoads Designer Manipulate Tools are located on the **Drawing** tab of the OpenRoads Modeling Workflow on the Ribbon. This section contains tools that are used to copy, move, resize, rotate, mirror, and perform other manipulations on elements. These tools can be used in conjunction with the *Element Selection* tool, to manipulate groups of elements simultaneously. Of course, they can also be used by themselves to manipulate single elements.



**NOTE** *Used with the Element Selection tool, an element needs only to be right-clicked on to open a menu with options to copy, move, scale, rotate, mirror, delete, or display the properties for the selected element.*

**Move Element** - Moves an element(s)



**Copy Element** - Copies an element(s).



**Rotate Element** - Rotates an element(s).



**Scale Element** - Resize an element(s) by the Active Scale factor or by points.

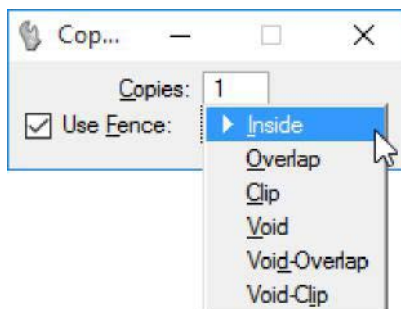


**Mirror Element** - Mirrors an element(s).



## **COPY ELEMENT**

The *Copy Element* tool creates a duplicate of an existing element without affecting the original. It identifies the element to be copied with a data point and then enters a second data point at the location where the copy or copies should appear. *Tool settings for Copy Element are listed below:*

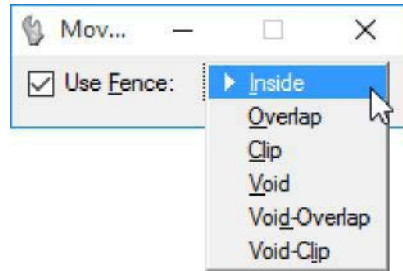


**Copies** - The number of copies created is defined by the entered value.

**Use Fence** - The fence contents are copied. This option is grayed out until an active fence is placed in the file. The fence option dropdown list sets the Fence (Selection) Mode.

## **MOVE ELEMENT**

**Move Element** - The Move Element tool relocates an element. After identifying the element to be moved, enter a second data point to define its new location. Additional data points continue to move the element until the reset command is issued.



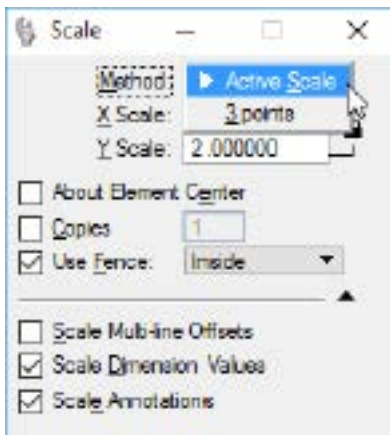
The Tool settings for moving an element are described below.

**Use Fence** - If on, the fence contents are moved. This option is grayed out until an active fence is placed in the file. The fence option dropdown list sets the Fence (Selection) Mode.

## **SCALE ELEMENT**

The *Scale Element* tool is used to resize (scale) an element(s) individually, as a selected group, or within a fence. Scaling an element can be useful for changing the size of an element without having to redraw the element. Elements can be scaled in any or all of the three axis directions (X, Y and Z).

**NOTE** *Elements may be selected individually, or multiple elements selected to scale in a selection set or by using the fence.*





**Method** - Defines how the elements are scaled

**Active Scale** - Method by which an existing element is scaled by the active scale factors (*X Scale*, *Y Scale* and *Z Scale*). If a scale factor is between 0 and 1 (for example, 0.25), the size in that direction is decreased; if a scale factor is greater than 1, the size in that direction is increased.

**3 points** - Method by which an existing element is scaled graphically, through the entry of three data points. The scale factors are computed by dividing the distance between the first and third points by the distance between the first and second points.

**X Scale** - Scale factor along view x-axis (horizontal), when method is **Active Scale**.

**Y Scale** - Scale factor along view y-axis (vertical), when method is **Active Scale**.

**Proportional** - If on, the element(s) proportions are maintained, when the **3 points** method is used.

**About Element Center** - If on, in the Extended Information section of the *Tool settings* dialog, the selected element(s) is scaled about its center point instead of a selected point. Cells and text elements are scaled about their origins.

**Copies** - If on, the element(s) are copied, and the copy(s) are scaled; the original(s) are not manipulated. The adjacent field sets the number of scaled copies to create.

**Use Fence** - If on, the fence contents are scaled. This option is grayed out until an active fence is placed in the file and the tool is selected. The fence option menu sets the Fence (Selection) Mode

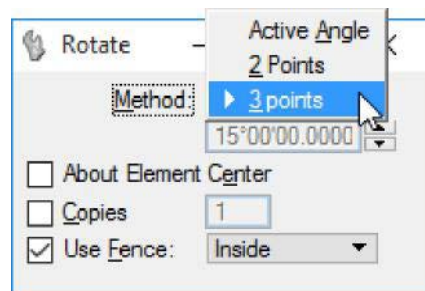
**Scale Multi-line Offsets** - If on, multi-line offsets are scaled (i.e., scaling the wall thickness when resizing a room).

**Scale Dimensions** - If on, dimension values are modified to reflect the size of the scaled dimension. If off, only the dimension elements are scaled, while the dimension value remains unchanged.

**Scale Annotations** - If on, annotations are scaled. If off, size of annotations remains unchanged.

## **ROTATE ELEMENT**

The *Rotate Element* tool is used to rotate. Elements can be rotated individually, as a selected group or within a fence.



**Method** - Defines how the elements are rotated.

**Active Angle** - Rotates elements by the Active Angle value, which can be keyed in.

**2 Points** - Rotates elements by an angle of rotation defined by entering two data points.

**3 Points** - Rotates elements by an angle of rotation defined by entering three data points.

**About Element Center** - If on, in the Extended Information section of the *Tool settings* dialog, the selected element(s) is rotated about its center point instead of a selected point. Cells and text elements are rotated about their origins.

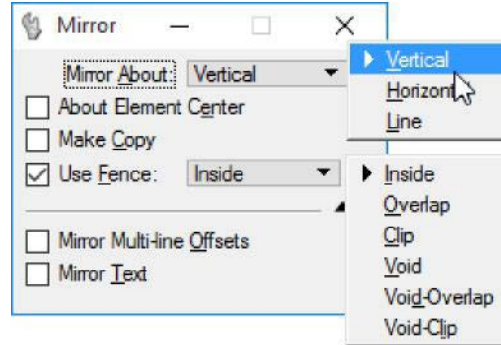
**Copies** - If on, the element(s) are copied, and the copy(s) are rotated; the original(s) are not manipulated. The adjacent field sets the number of rotated copies to create.

**Use Fence** - If on, the fence contents are rotated. This option is grayed out until an active fence is placed in the file. The fence option menu sets the Fence (Selection) Mode

**NOTE** *Elements may be selected individually, or multiple elements selected to rotate in a selection set or by using the fence.*

## **MIRROR ELEMENT**

This tool mirrors an element about one of three axes. Rather than manipulating the original element, enabling the **Make Copy** toggle creates a second occurrence of the element.



***Mirror About*** - Sets direction in which element(s) are mirrored:

***Horizontal*** - Elements are mirrored about the horizontal, or X, axis.

***Vertical*** - Elements are mirrored about the about vertical, or Y, axis.

***Line*** - Elements are mirrored about a line defined by two data points.

***About Element Center*** - If on, the selected element(s) is mirrored about its center point instead of a selected point. Cells and text elements are mirrored about their origins.

***Make Copy*** - If on, the element(s) are copied, and the copy(s) mirrored; the original(s) are not manipulated.

***Use Fence*** - If on, the fence contents are mirrored. This option is grayed out until an active fence is placed in the file. The fence option menu sets the Fence (Selection) Mode.

***Mirror Multi-line Offsets*** - If on, multi-line profile offsets are mirrored.

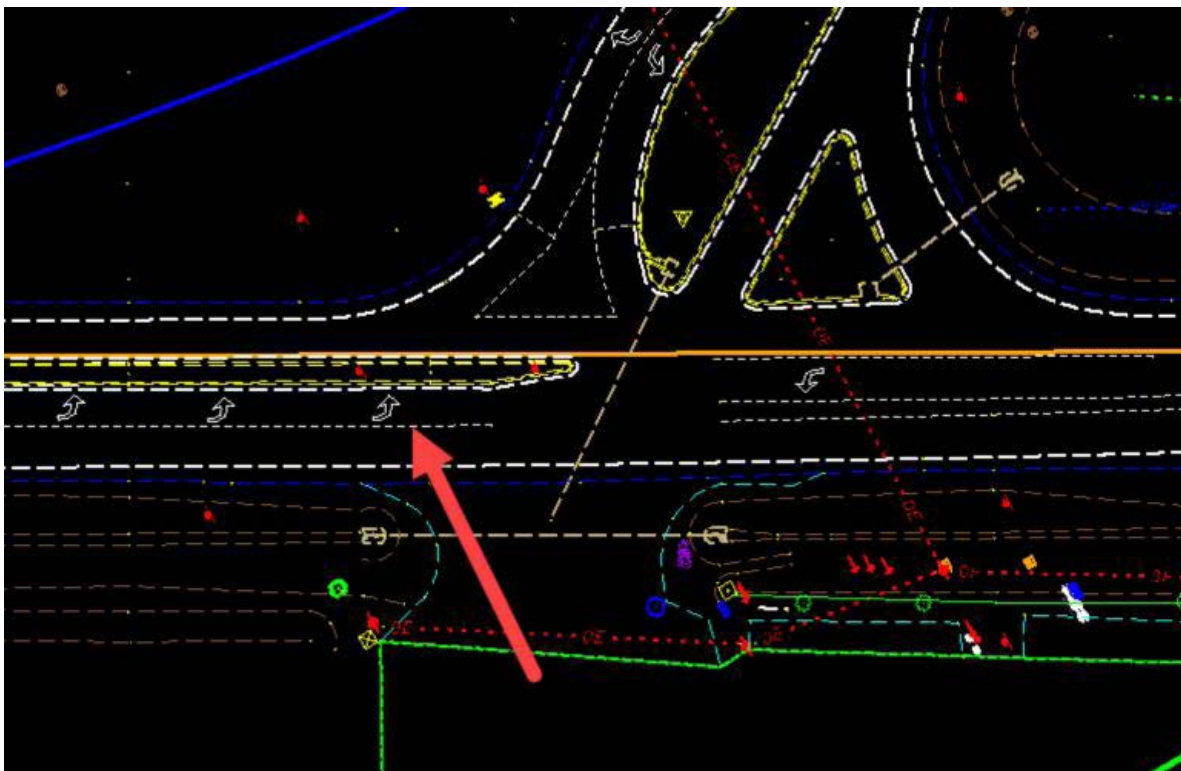
***Mirror Text*** - If on, text is mirrored.

# EXERCISE OVERVIEW

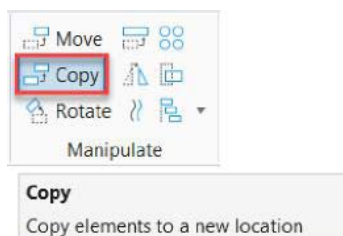
## **Exercise 8.1** *Manipulate Tools*

### **COPY ELEMENT**

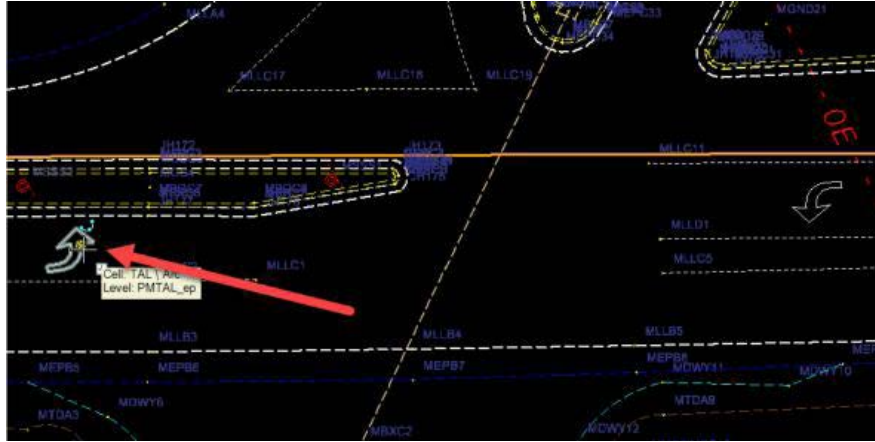
1. Construct an edge of pavement line.
2. Open the OpenRoads Designer file *c:\e\projects\22049555201\SURVRD01.dgn*.
3. Using the View Tools, rotate and zoom the view as shown and locate the left turn to the west of the main intersection in the design.



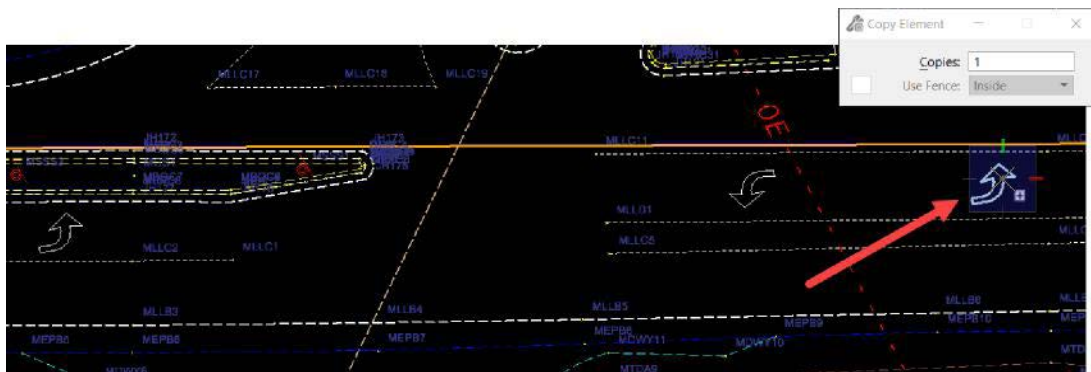
4. Locate the *Manipulate Tools* on the Ribbon and select **Copy Element**.



- Using the *Copy Element Tool*, select one of the left turn arrow pavement markings from the left turn lane west of the intersection. A copy of the element attaches to the cursor.

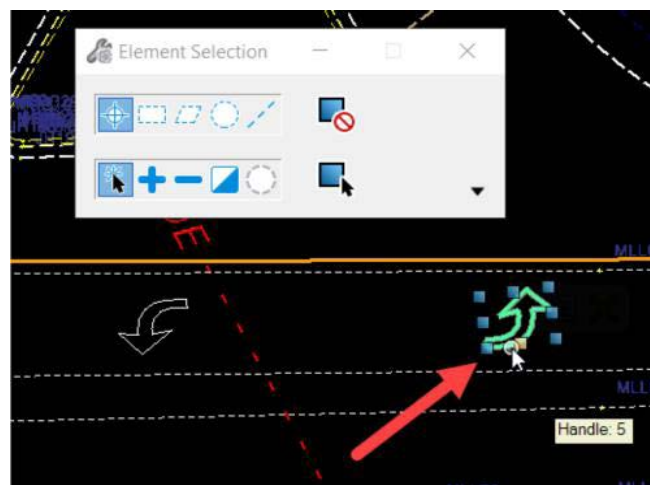


- Place the copy adjacent to the left turn arrow located in the left turn lane east of the intersection, entering a data point to complete this action and selecting the Reset button to end the action.

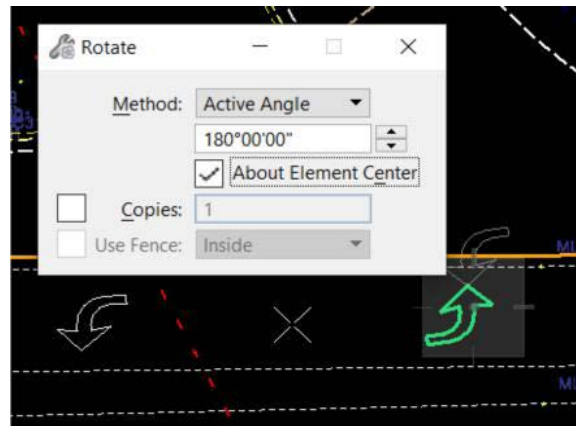


## **ROTATE ELEMENT**

- Continuing at the same location, use the *Element Selection Tool* to select the copy of the left turn arrow that was placed in the previous exercise.



2. Select the **Rotate Element Tool** from the Manipulate Tools on the Ribbon. Populate the dialog as shown below.

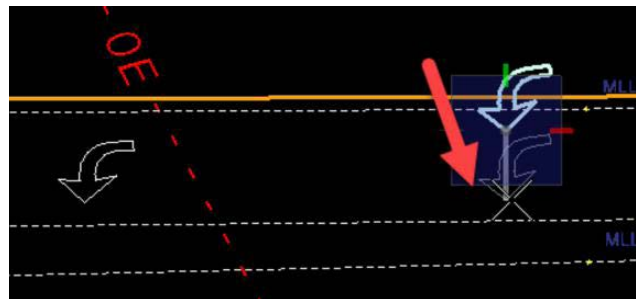


3. Enter a data point to accept. The left turn arrow will rotate 180 degrees.

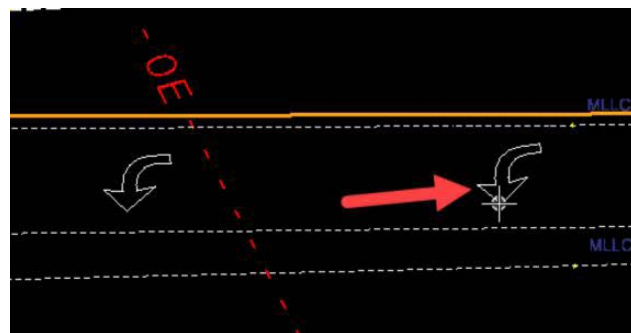


## **ROTATE ELEMENT**

1. Continuing at the same location, select the **Move Element Tool**. Enter a datapoint on the arrow that was rotated in the last exercise, and move the cursor downward to move the pavement marking into the desired location.



2. Enter a data point to accept the new location.



# 9 CELLS

## **OBJECTIVES**

This chapter reviews OpenRoads Designer Cells and Points. Topics include:

- Cells
- Cell Libraries
- Cells and the FDOT Ribbon
- Dropping Cells
- FDOT Cell Webpages

## **INTRODUCTION**

As project designs are created, users often have to place points to construct elements from or place multiple instances of the same symbol in the design file. OpenRoads Designer stores such points and symbols efficiently. The symbols are referred to as Cells. OpenRoads Designer stores cells in cell libraries so that they may be recalled as needed. Florida Department of Transportation (FDOT) has utilized this function and developed many Standard Cell libraries for specific use by each FDOT Discipline in the production of FDOT Projects. These Standard Cell Libraries are delivered within the FDOT CADD Software package and will be discussed in more detail later in this chapter.

## **CELLS**

Typically, a Cell is a small 2D drawing, or a 3D object. Cells can represent complex elements that are used regularly in designs. Rather than redraw them each time, they can be saved in a cell library to recall for repeated use. Cell libraries are really DGN files that contain one or more models, one for each cell. The cells are simply design models that have the option 'Can be placed as a cell' enabled. Cells created in this fashion have the model's origin as their origin.

FDOT has created many cells as a part of the CADD Software delivery to assist the user in the production of FDOT projects and adhering to the CADD Standards.



*Sample Cells*



## CREATING CELLS

This chapter, thus far, has discussed utilizing existing cell libraries containing pre-defined cells. In actual working environments, users will likely have to create cells and then use those cells in their drawings.

If a cell is needed, but one cannot be added to a cell library (because, for example, a system administrator is in charge of the cell libraries in the company), consider using a Group to place the same elements repeatedly in a design. A Group is complex element whose component elements need not be connected (an unnamed cell that is not defined in a cell library). A number of elements can be selected and grouped for manipulation as a single element.

When a cell is created, define the cell origin (the location around which the cell is placed).

A Graphic Cell is a type of cell in which the symbology (color, line style, and line weight) is determined when it is created. They are stored with symbology settings and are always placed with their original attributes. A graphic cell rotates when a view is rotated. A graphic cell is level independent. That is, it can be placed on levels relative to the Active Level or on the same levels as when created, depending on whether Relative is on.

## CELL LIBRARIES

Cell libraries are commonly stored as a DGN with the extension .CEL instead of .DGN, and can be opened as a DGN file. Each model in these cell libraries file becomes a separate cell. When a cell library is created, a blank default model is created. This blank model displays when first opening the cell library as a DGN file. Change to different models with the Models dialog (**File > Models**).

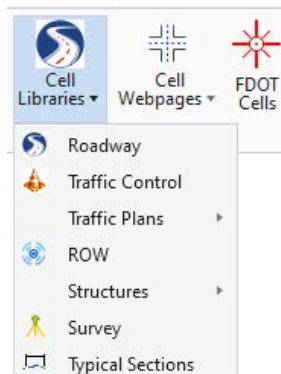
With OpenRoads Designer there is no limit for the size of a cell library or individual cells. This means that the requirements of the operating system set the limit, including the maximum number of characters allowed in a cell name. Both 3D cells and 2D cells can be stored in the same library.

The FDOT CADD Software delivers an extensive array of cell libraries containing standard FDOT cells associated with all Discipline functionality, that are required to produce FDOT design files. The FDOT Ribbon includes access to the FDOT cell libraries in the Cell Library dialog as well as Cell Webpages for accessing the FDOT cells in a web-browser interface.

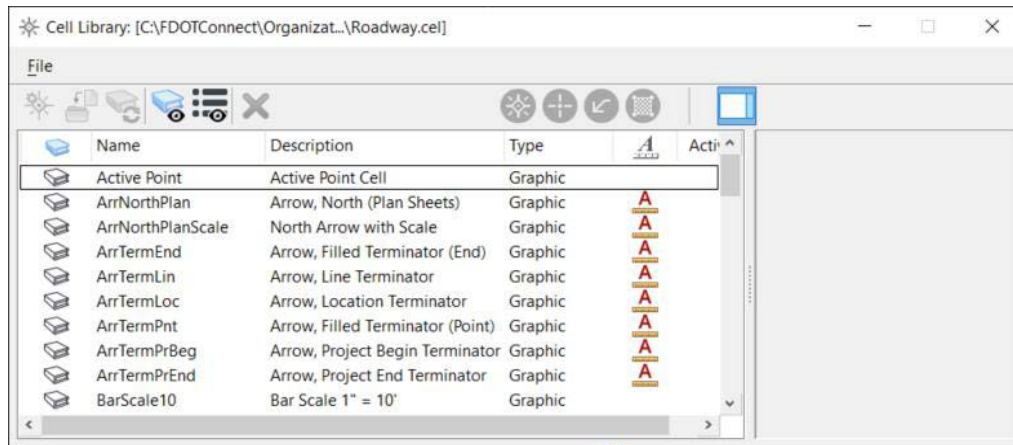
## CELL LIBRARY DIALOG

To utilize any cell within a design the associated Cell Library containing the cell must be *attached* to the active design file. The Cell Library dialog is used to **Attach** Cell Libraries and activate different types of cells, and to create, delete, and rename cells in the attached cell library, if one is attached. The name and path of the attached cell library, if one is attached, are displayed in the title bar.

The *Cell Library* dialog can be accessed from the Cell Applications section of the FDOT Ribbon. Selecting the Cell Libraries split button provides access to commonly used FDOT cell libraries.



Selecting one of the cell libraries will attach that cell library and display the cell library dialog.



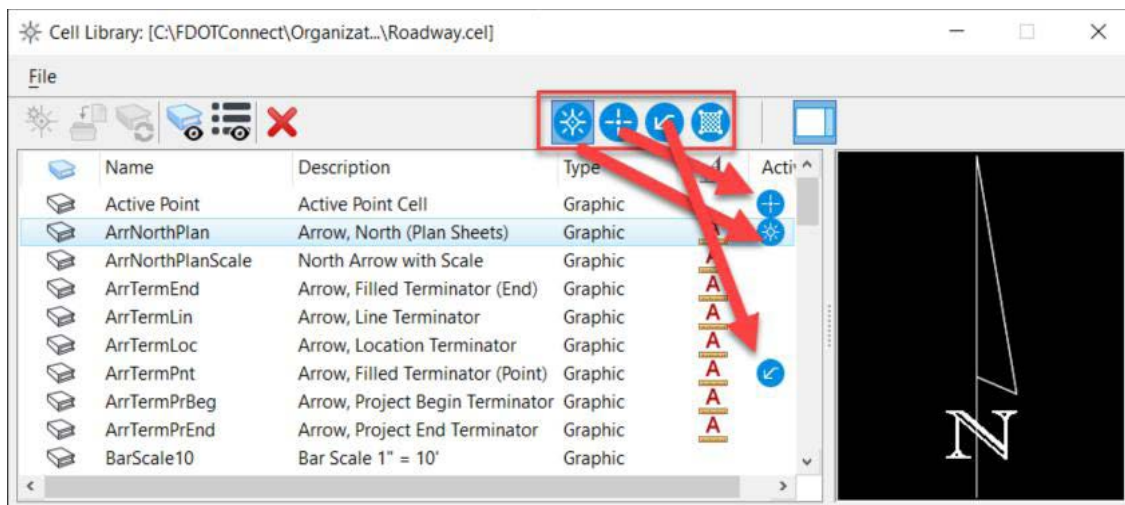
## File Menu Options

- **New** - Opens the Create Cell Library dialog, which is used to create a cell library and attach it to the open DGN file.
- **Attach File** - Opens the Attach Cell Library dialog, which is used to attach an existing cell library to the open DGN file.
- **Attach Folder** - Opens the Browse For Folder dialog, which is used to attach a folder containing cell libraries to the open DGN file.
- **Detach** - Detaches the attached cell library. Attaching a different cell library automatically detaches the currently attached cell library, if one is attached.
- **Compress** - Compresses the open cell library. Compression reorganizes the cell DGN file to occupy the minimum disk space.

**List Box Headings** - The *List Box Headings* set the order in which the cell list is sorted. All columns are sorted alphabetically. Clicking a column's heading sorts the list in ascending or descending order by that column.

- **Name** - Cell Name
- **Description** - Cell Description
- **Type** - Cell type: Graphic (*Grph*), Point (*Pnt*), or Menu
- **Annotation** - The annotation icon appears if the cell is an annotation cell.
- **Where** - Cell location: cells in AutoCAD DWG block file (*BLCK*), cells in an attached cell library (*Lbry*), shared cells in the attached cell library (*LbSh*), or shared cells in the active DGN file (*Shrd*).

**List Box** - The *List Box* lists the name, description, type, annotation, and location of cells that are available for placement from the attached Cell Library. They are listed in the order specified by the selected list box heading. To work with a cell, select its list item. When selecting a cell, it is displayed to the right of the list box with its name, type, and size. For a 3D cell, the isometric, top, front, and right views are shown.




**Active Cells Toolbar** – The Active Cells Toolbar allows the selection of cells for various purposes. Active Cell, Point Cell, Terminator Cell and Pattern Cell. To set an active cell, select the cell from the list box and then select the corresponding button on the toolbar to activate that cell. A symbol is placed to the right of the cell in the List Box to indicate that it is active.

**Active Cell** – This cell can be placed with the Place Active Cell tool

**Point Cell** – This cell can be placed as a point using tools that place point cells such as the Import XYZ text tool

**Terminator Cell** – This cell can be placed as a terminator arrow for a line by tools that place terminator arrows on lines

**Pattern Cell** - This cell can be used for patterning areas using the Pattern Area tool.

**Create** - The *Create*  button opens the [Create New Cell dialog](#), which is used to add a cell to the attached cell library. This button is dimmed unless the following conditions are met:

- ✓ A cell library is attached (**File > Attach**) with write access.
- ✓ The elements to be included in the cell are selected or fenced.
- ✓ A cell origin is defined with the *Define Cell Origin* tool.

## **PLACING CELLS**

Users insert cells in a drawing in much the same way as other OpenRoads Designer elements. The size (scale) and rotation angle are specified at the time of insertion. To place a cell into a drawing:

- Attach a Cell Library
- Select a Cell
- Make the Cell Active
- Select a Cell Placement Tool
- Adjust the Scale and Rotation of the Cell as needed
- Identify a Location for the Cell

## **CONTROLLING THE LEVEL**

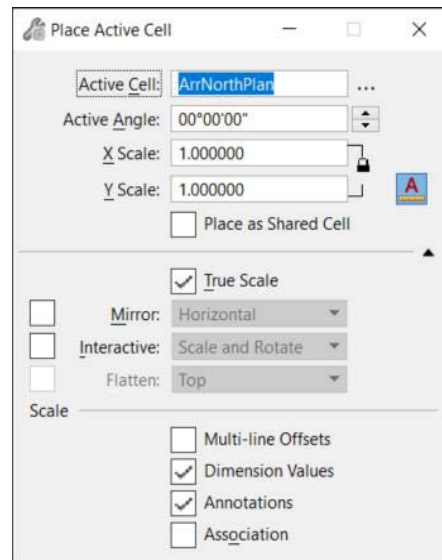
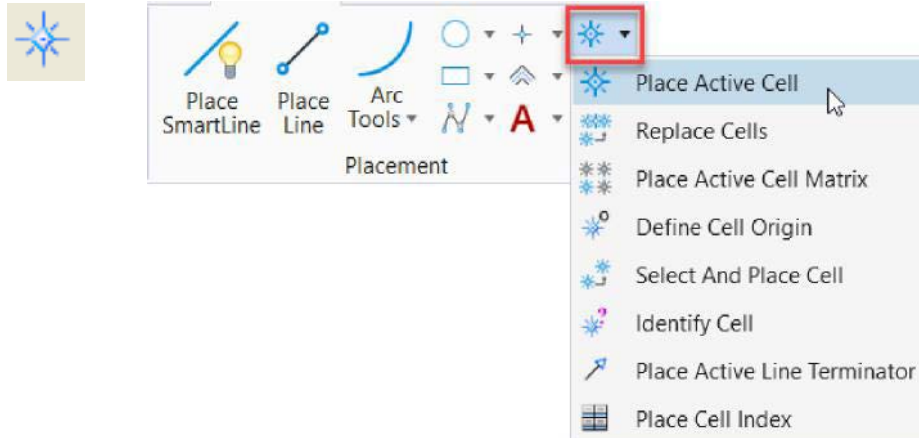
When placing a graphic cell with the *Place Active Cell* tool or *Select and Place Cell* tool, the level(s) on which the graphic cell are placed in the open DGN file are determined by first evaluating the level(s) on which the elements in the graphic cell resided when the graphic cell was created and then applying the Relative tool setting.

If Relative is *off*, the *Name* of the level(s) on which elements in the graphic cell resided when the cell was created determine the level(s) on which the graphic cell is placed, as follows:

- **Level Existing** - If the graphic cell has elements on a level with the same name as an existing one in the DGN file, the elements in the graphic cell on that level are placed on the corresponding level in the DGN file, even if the level settings are not the same.
- **Level Non-existing** - If a level with the same name does not exist in the DGN file, the level is copied from the cell library into the DGN file. However, any elements in the graphic cell on the Default level in the cell library are placed on the Active Level.
- If Relative is *on*, the *Number* of the level(s) on which elements in the graphic cell resided when the cell was created determine the level(s) on which the graphic cell is placed, as follows:
  - **Level Existing** - The graphic cell is placed on a level(s) relative to the Active Level's number. For example, consider a graphic cell that was created with elements on levels with the numbers 5, 7, and 8. If the Active Level's number is 1, the cell is placed on levels with the numbers 1, 3, and 4. If the Active Level's number is 45, the cell is placed on levels with the numbers 45, 47, and 48.
  - **Level Non-existing** - However, if the graphic cell has elements on any level whose number is not an attribute of a level in the DGN file, the placement operation fails.

# CELLS

Cells are placed primarily using the *Place Active Cell* tool. This tool is located on the *Drawing* tab in the OpenRoads Modeling workflow under the Placement group of the Ribbon.



**Active Cell** - Can be keyed-in here or set in the Cell Library dialog (Element > Cells).

**Browse Cells** - Opens the Cell Library dialog to allow for selection of an active cell.

**Active Angle** - Set the angle by which the cell is rotated, if Interactive is off, or if Interactive is on and Scale Only is selected.

**X, Y, Z Scale** - X - Horizontal scale factor (along x-axis). Y - Vertical scale factor (along y-axis). Z - Depth scale factor (along z-axis).

If scale lock is **on**, then all scales will hold the same value. 

If scale lock is **off**, then each value is independent of the other. 

**Annotation Scale Lock** - (Applies only to cells that have Can be placed as an annotation cell enabled in their Model Properties.)



If display highlight is on, the current annotation scale is applied to the cell. Later, if the annotation scale is modified, the option is given of having the new scale applied to previously placed annotation cells.

**True Scale** - If on, cells that were created in a model with different units from those of the active model are scaled to adjust them to the units of the active model

**Relative** - If the active cell is a graphic cell and **Relative** is ON, the *Number* of the level(s) on which elements in the graphic cell resided when the cell was created determine the level(s) on which the graphic cell is placed. The graphic cell is placed on a level(s) relative to the Active Level's number.

If the active cell is a graphic cell and **Relative** is OFF, the *Name* of the level(s) on which elements in the graphic cell resided when the cell was created determine the level(s) on which the graphic cell is placed.

**Mirror** - If on, when placing a cell it can be mirrored about the horizontal axis, about the vertical axis, or about both the horizontal and vertical axes by selecting one of these options from the list box.

**Interactive** - If on, the cell's scale, rotation angle, or both scale and rotation are defined graphically by data points.

*Rotate and Scale* — If on, both the scale and rotation angle are defined graphically by data points.

*Rotate Only* — If on, the rotation angle is defined by placing a data point. The scale is defined in the X Scale, Y Scale, and Z Scale text boxes.

*Scale Only* — If on, the scale is defined by placing a data point. The rotation angle is defined in the Active Angle text box.

**Flatten** - If on, 3D cells can be flattened, or projected, on to one of the standard view projections — Top, Front, Right, Isometric, Bottom, Back, Left, Right Isometric — which is selected from the option menu. Allows for placement of a view of a 3D cell into a 2D model.

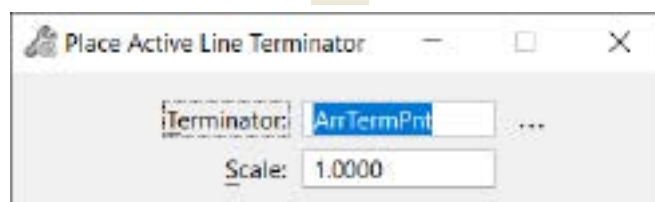
**Scale Multi-line Offsets, Dimension Values and Annotations** - If on, applies the active scale to multi-line offsets, dimension values and annotations.

If off, the active scale is not applied. This setting does not affect multi-line offsets, dimension values and annotations in shared cells; elements in shared cells always scale. This setting is also available in the *Scale* tool.

**The Define Cell Origin** - tool is used to define the cell origin (the point about which the cell is placed). When creating a cell, the cell origin and cell type is defined. Notice the OpenRoads Designer message in the lower left status bar.

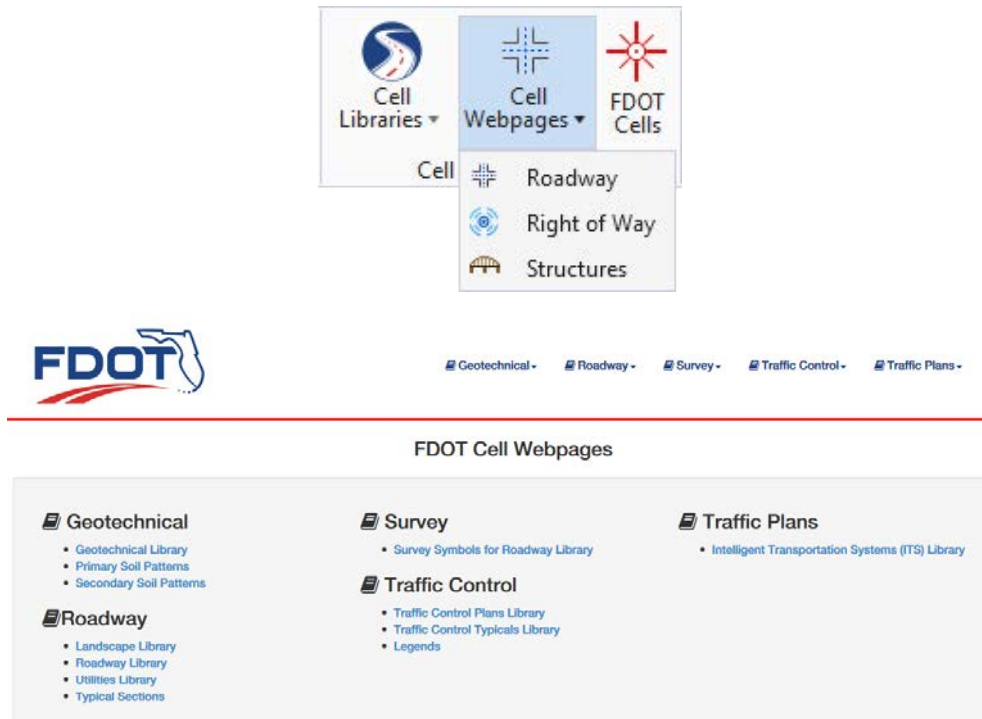


**The Place Active Line Terminator** - tool is used to place the Active Line Terminator cell on a line, line string, arc, or complex chain, primarily to place arrowheads.



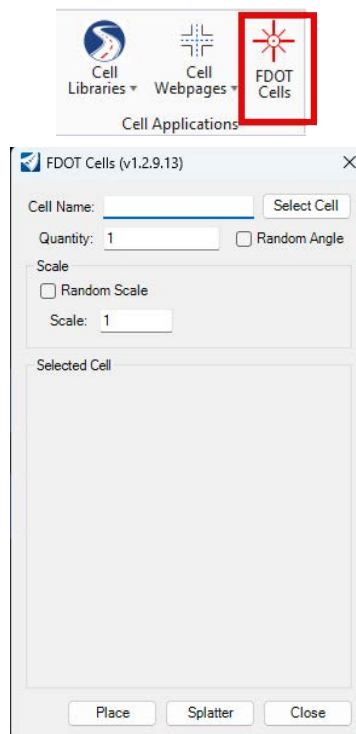
## CELLS WEBPAGES

Also located in the Cell Applications on the FDOT Ribbon are the FDOT Cell Webpages. The Cell Webpages provide a web-browser interface for previewing, selecting, and placing cells. The Cell Webpages are intuitively organized by Cell Library name.



## CELL SEARCH

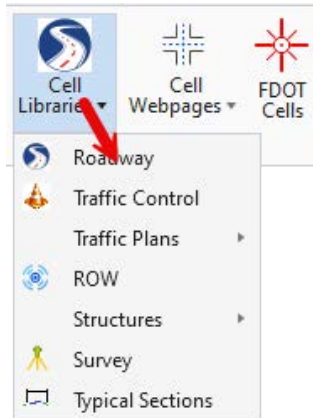
This utility searches selected cell libraries for a text string and returns the matching cells in a second dialog from which the cells can be placed. It searches the cell name and/or description of each cell in the selected cell library.



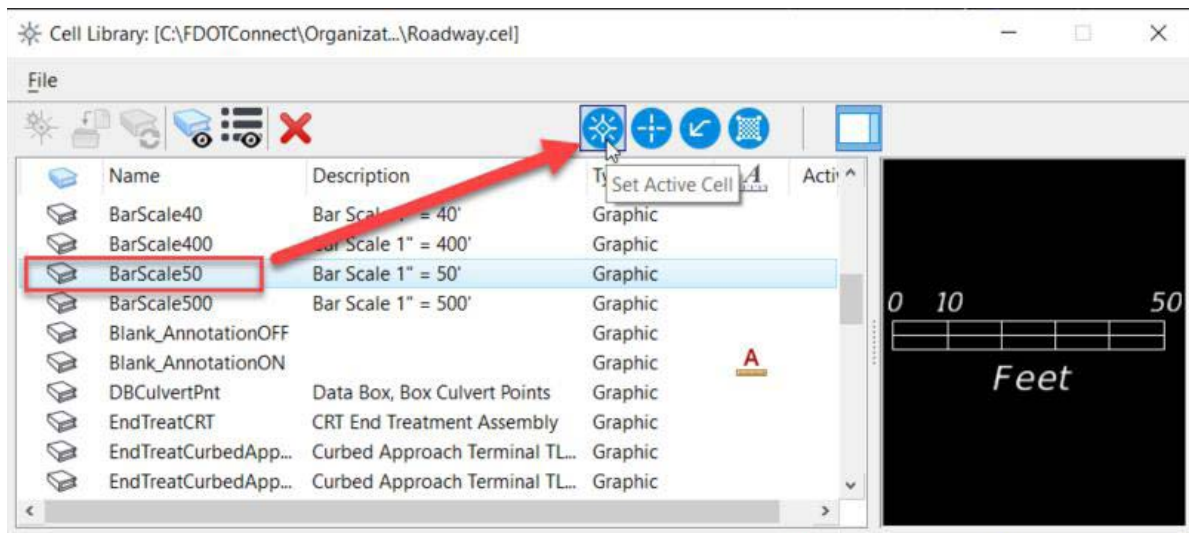


## Attach a Cell Library and Place a Cell

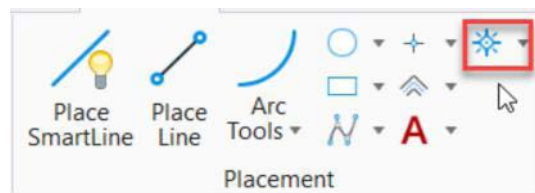
From the FDOT Desktop folder launch FDOT Connect for OpenRoads Designer and open *c:\worksets\FDOT\roadway\dsgnrd01.dgn* within the FDOT WorkSpace. Select the FDOT tab on the Ribbon and select the Cell Libraries split button from the Cell Applications section. Select **Roadway**.



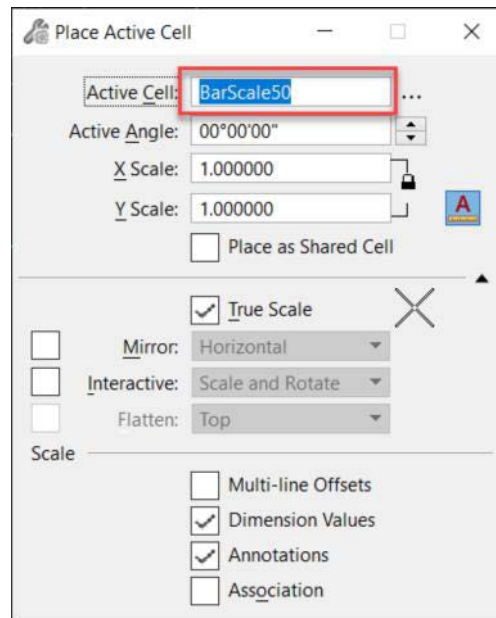
The Cell Library dialog appears, and the FDOT Roadway Cell Library is attached. Select the cell **BarScale50** and select the **Set Active Cell** button as shown.



Navigate to the *Place Active Cell* tool on the Drawing tab under the Placement section.



Review the settings in the *Place Active Cell* tool settings dialog.

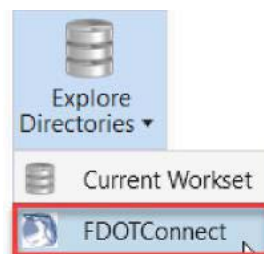


Enter a datapoint anywhere in the design to place the **BarScale50** cell.

## **CREATING AN PROFESSIONAL OF RECORD SEAL CELL**

One common use of cells is the Professional of Record Seal cell that appears on signature sheets and key sheets adjacent to the digital certificate appearance of the professional of record. FDOT delivers several different cells in the Seals.CEL library for the user to modify and use.

From the FDOT Ribbon, select the Explore Directories split button and select **FDOTConnect**.



A Windows File Explorer window opens at *C:\FDOTConnect\Organization-Civil*

Navigate to *C:\FDOTConnect\Organization-Civil\FDOT\Cells* and locate the Seals.CEL library.

Right-click on **Seals.CEL** and select **Copy** from the right-click pop-up menu.

# 10 REFERENCE FILES

## **OBJECTIVES**

This chapter reviews the Referencing tools. Topics include:

- What is a Reference File?
- References
- Attaching References
- Working with References

## **INTRODUCTION**

In the past designers were often asked to use an existing drawing as a backdrop as they created new drawings. They taped the existing drawing down onto their drafting table, and then taped a clean sheet (new design file) on top of the existing drawing (reference). This procedure of working over a backdrop is still used today with automated techniques. In today's industry, individual members of a project team share electronic data files rather than the actual drawing sheets they used to share.

Several companies may be involved in producing a design which includes many information types such as Survey (existing topography), Proposed Construction, Drainage and Right of Way. Design files are passed back and forth between all team members and all the pieces of the puzzle must fit together. Assume the responsibility for the Proposed Roadway construction portion of the plan. Since the design must fit within the Right of Way and meet the Existing Construction at the beginning of the project, the location of these elements must be known. In this case, the topographical plan must be seen in the background as a reference while designing the roadway plan. OpenRoads Designer does this with references.

OpenRoads referencing tools allow the user to view other models as work is done on the active model, much the way overlays are used in the real world. With overlays, work is done on the top overlay, while referring to the information on one or more overlays below.

## **WHAT IS A REFERENCE FILE?**

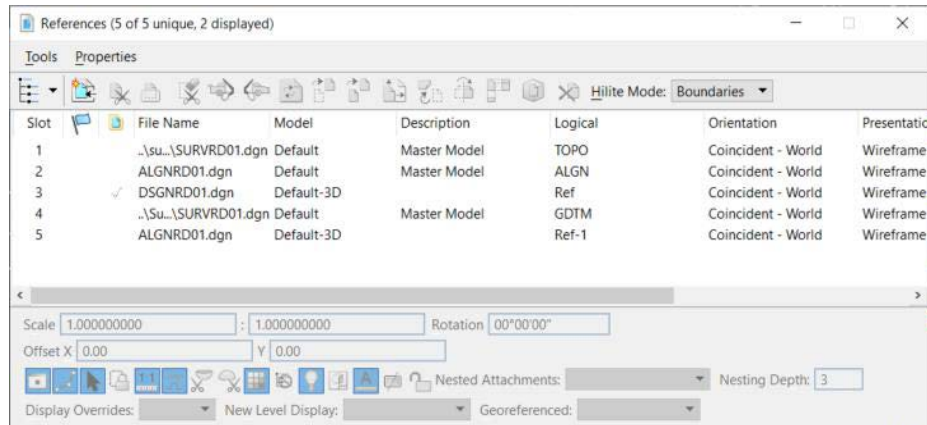
A Reference File is a model attached to and displayed with the active model for printing or construction purposes. A model that resides in the open DGN file, or another DGN file can be attached as a reference file. Elements in a reference file display as though they are in the active model. Although elements cannot be manipulated in a reference, users can snap to and even copy elements in a reference into the active model. Reference files cannot be modified.

OpenRoads Designer allows for an unlimited number of files to be referenced to a design file, as the operating system and hardware limit the number of reference files allowed. When a file is referenced, a link is established to it. If the referenced file is edited, then the file that it is referenced to updates to reflect those changes.

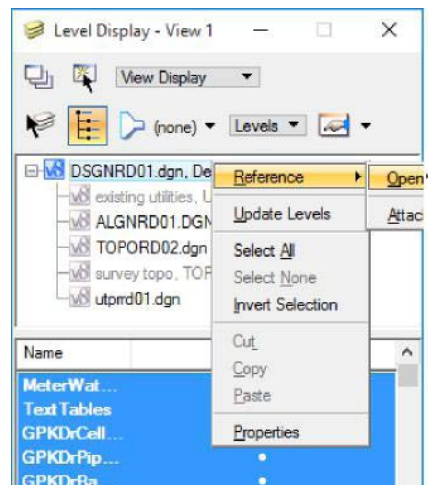
## **REFERENCES**

The References dialog attaches and detaches referenced models to an active design model, has a number of settings that control the attachments and displays of references in a model and allows for the selection of reference tools.

The *References* dialog can be accessed from the Primary tools on the Home tab of the Ribbon under the OpenRoads Modeling workflow from the Attach Tools split button.

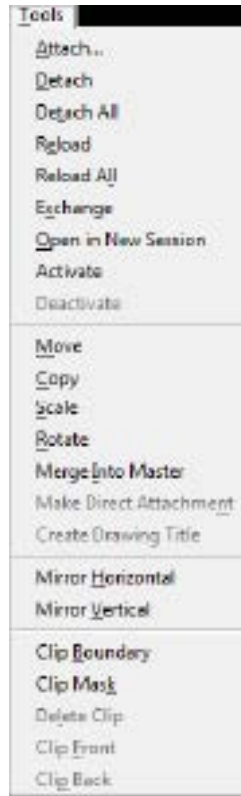


The *References* dialog can also be accessed by right clicking on the active file listing in the Level Display dialog, also located in the Primary tool bar.



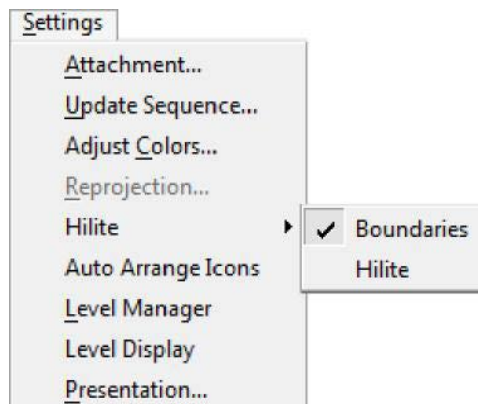
## **TOOLS MENU**

The *References Tools* menu option provides tools for working with references. Many of these tools can also be accessed by selecting the Tool icons below the References menu bar.



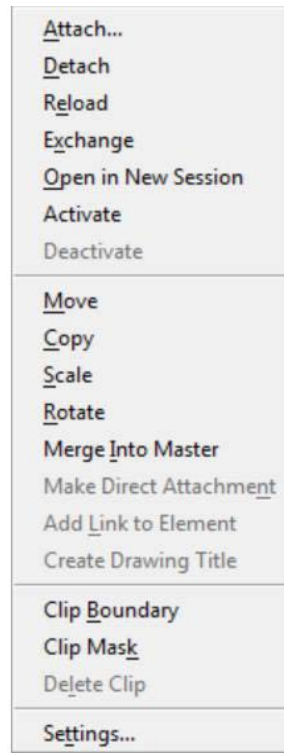
## **SETTINGS MENU**

The References Settings menu option provides links to adjust settings for the attached reference files.

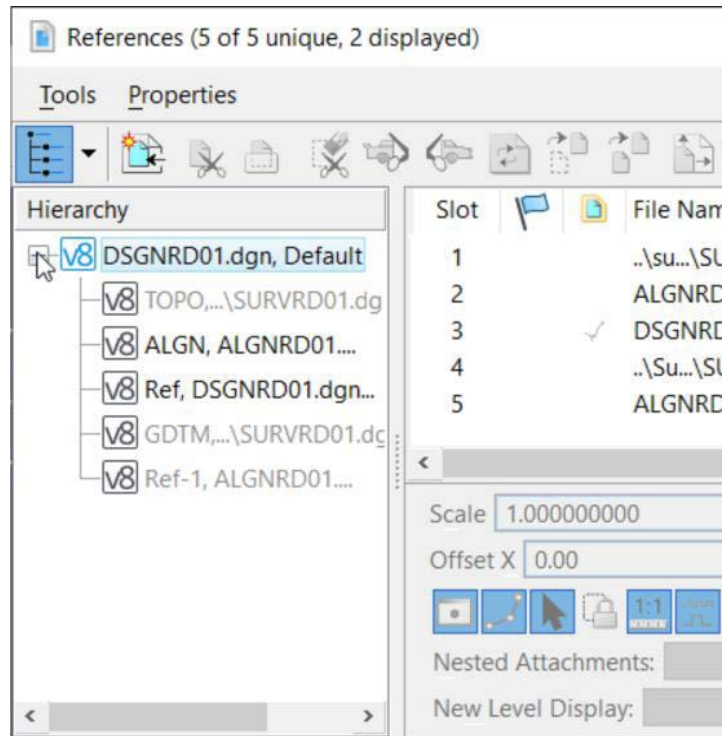



## **LIST BOX (RIGHT-CLICK) MENU**

Right-clicking on a file name in the References List Box opens a popup menu that directly accesses options available in the Tools and Settings menus:



## SHOW HIERARCHY AND LIST BOX



The *Show Hierarchy* icon  is a toggle to display a tree showing the active design file with all attached references. References that have other references attached to them (nested references) are listed in black text, while references with no attached references are listed in gray text.

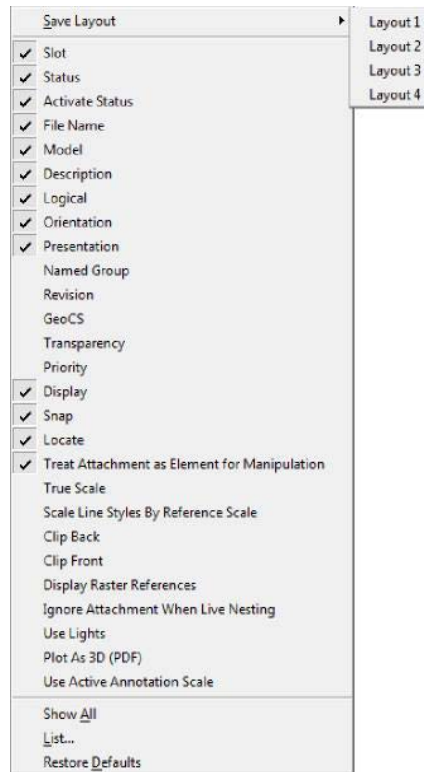
If a reference in the hierarchy has a nest depth value of 1 or more, the reference can be selected to update the References List Box to include only the references that are attached to the selected reference.

When toggled off, the arrow button next to the *Show Hierarchy* icon can be used to list the active file and any attached references for selection to update the *References List Box*.

The *References List Box* displays columns containing many settings. The columns can be modified by the user, either by clicking them (for toggle settings) or by clicking them and selecting a new setting or value.

The columns displayed can be modified by right clicking on the column header and selecting or deselecting column options as shown.





## **REFERENCE DIALOG ICONS**



The References dialog icons are used to: Attach referenced models to the active model; Control the positioning, scaling, clipping, and orientation of attached referenced models; and Detach referenced models from the active model.

***Attach Reference*** - Opens the Attach Reference dialog, which allows for the attachment of a model to the active model.



***Clip Reference*** - Uses a boundary, such as an element or fence, to clip a reference. The area of the reference outside the boundary is not displayed.



***Mask Reference*** - Covers a portion of a reference that is inside a boundary. More than one clipping mask can be specified for a model.



***Delete Clip*** - Deletes an existing clipping mask.



**Set Ref Back Clip Z (3D Files Only)** - Sets the back clipping plane, a boundary used to clip a referenced 3D model. The position of the clipping plane is measured along the z-axis. Only the area in front of the back clipping plane is displayed.



**Set Ref Front ClipZ (3D Files Only)** - Sets the front clipping plane, a boundary used to clip a referenced 3D model. The position of the clipping plane is measured along the z-axis. Only the area behind the front clipping plane is displayed.



**Reload Reference** - Reloads and redraws a reference, allows the user to view changes made to the referenced model since it was last attached or reloaded.



**Move Reference** - Moves the location of the reference file in the design file.



**Copy Reference** - Copies the reference file.



**Scale Reference** - Resizes the reference file.



**Rotate Reference** - Rotates the reference file.



**Mirror Reference** - Reflects a reference file about a horizontal or vertical axis.



**Copy/Fold Reference** - Copies the selected reference file, and then attaches a view by folding it about an orthogonal axis or a defined line.



**Set Reference Presentation** - Sets options for displaying a reference file, such as Wireframe, Hidden Line, Filled Hidden Line and three types of shading.

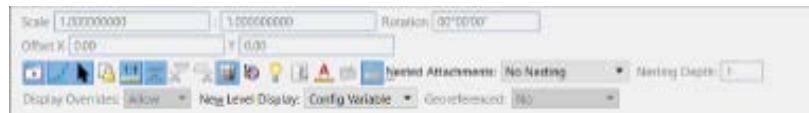


**Detach Reference** - Detaches the reference file from the active model.



## **INFORMATION PANEL**

The References Information Panel, located at the bottom of the References dialog, displays the various settings for an attached reference selected in the References List Box. The options displayed in the Information Panel can be modified by right clicking anywhere on the panel and selecting or deselecting any option from the popup menu. The table below describes each option.



**SCALE**- Displays and sets the ratio of master units in the active model to the master units in the attached model.



**ROTATION** - Displays and sets the rotation for the selected reference. For 2D files, enter the rotation angle for the z-axis only. In 3D, enter the rotation angles for the x-, y- and z-axes.



**OFFSET** - Displays and sets the distance between the global origin of the reference from the global origin of the parent file, measured in units of the parent file. If the parent is 2D, Offset X and Y values are displayed. If the parent is 3D, Offset X, Y, and Z values are displayed.



**NESTING** - Nesting displays and sets how nested references (references attached to references) are handled for the selected attachments. When working in a DWG or DXF file, live nesting is always on with no limit to nest depth. Therefore, the nested attachment and Depth items are disabled. To control the display of nested attachments, use the Ignore Attachment When Live Nesting icon.

Overrides controls how override settings are saved for nested references. For a specific nested reference, overrides controls the settings for reference display, locate, snap, raster reference display, and level display.

Depth sets the number of levels of nested references that are displayed. Models can have their own referenced models, which, in turn, can have more referenced models. If Depth is set to 0, only the selected model is attached to the master model; models referenced to the selected model are ignored.



**NEW LEVEL DISPLAY** - Specifies whether a reference displays new levels. The setting also applies to new levels in nested references that are attached to the reference.



**TOGGLES** - These toggles are Attachment Settings icons that correspond to columns in the References List Box, as well as to icons on the Reference Attachment Settings dialog. If an icon is highlighted, the setting is on. Click the icons to toggle the settings on or off.

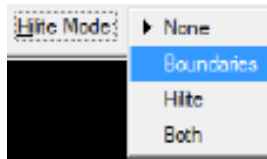


**GEOREFERENCED** - Sets the georeference mode. When a reference is attached in Reprojected mode, the current Reference Reprojection Settings are copied into the reference attachment and stored so every user who opens the master file uses the same Reprojection settings and thus, gets the same results.



## HILITE MODE

The Hilite Mode controls whether the selected references are highlighted and/or surrounded by a border.



**None** – Selected references are not highlighted in any way.


**Boundaries** – Places a dashed border around selected references.

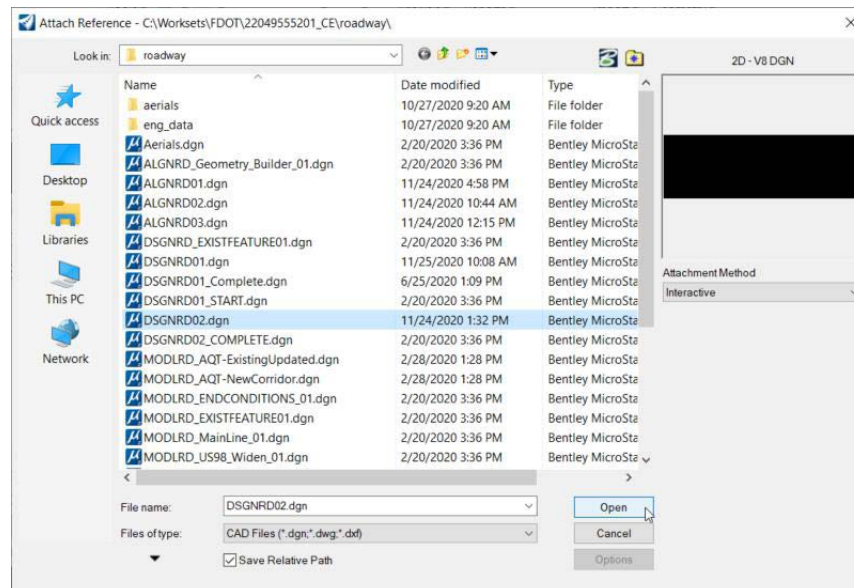
**Hilite** – Highlights selected references.

**Both** – Places a dashed border and highlights selected references

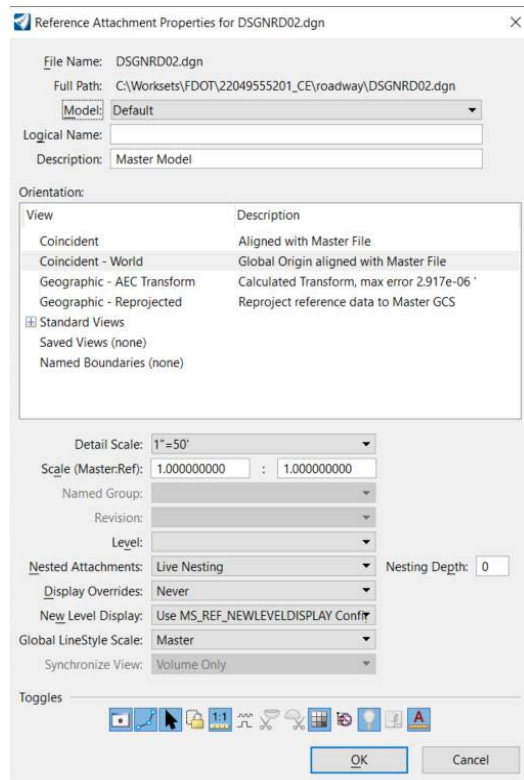
## ATTACHING REFERENCES

OpenRoads Designer referencing tools allow viewing of other models while working on the active model, much the way overlays are used in the real world. With overlays, work is done on the top overlay, while referring to the information is done on one or more overlays below. Models can be referenced from the open DGN file, or from other DGN's that may or may not currently be opened by other users. Similarly, other users can reference the active model. Referencing is a powerful tool in a multi-discipline office, in particular, where many people are working on different aspects of the same project.

The References menu option: **Tools > Attach**, <OR> clicking the Attach Reference  icon, opens the Attach Reference dialog for selecting model(s) to attach to the active model. Multiple files from multiple locations may be attached at the same time by selecting and adding to the Selected Files box.



Upon completing the selection of attachments the Reference Attachment Settings dialog opens to set the attachment settings for the reference(s) selected. If multiple files were selected, this dialog will open for each one to set the attachment settings.



**File Name** - Shows the reference's name.

**Full Path** - Shows the full file path for the reference.

**Model** - Drop down list of the models contained in the reference. This is used to select the model to be attached to the master model.

**Logical Name** - Sets the logical name of the model. Since the same model can be attached many times, the logical name helps distinguish between references.

**Description** - Sets the optional description for the model. The maximum valid description is 40 characters.

**Orientation** - Sets the view of the model being attached. The list may also include saved views and named fences. More than one orientation can be selected to attach.

*Coincident* - Aligns the references with regard to design plane coordinates only.

*Coincident World* - Aligns the references with the active model with regard to both Global Origin and design plane coordinates. FDOT recommends using the *Coincident World* option when attaching reference, to ensure files from an older standard line up correctly when attached to a file with the current working units. FDOT CADD files created in OpenRoads Designer have different resolutions than OpenRoads Designer V8.

*Standard Views* - Identifies the views that can be used to display the reference: Top, Front, Right, Isometric, Bottom, Back, Left, or Right Isometric. If the file being attached is 2D, only the Top view can be selected.

*Saved Views* - Identifies the saved views that are available in the reference.

*Named Fences* - Identifies the named fences that are available in the reference. When a named fence is used to attach a reference, all levels are on. If a particular level is desired, then use the named fence as a clip volume for a saved view in the reference and select the saved view.

**Detail Scale** - Represents the Master:Ref scale in terms of the sheet scale. For example, if the sheet scale (annotation scale) is  $1/8" = 1'$  and a detail reference of scale  $1/4" = 1'$  is to be placed, select the new scale from the Detail Scale drop-down list. It automatically computes the Master:Ref scale as 2:1.

When attaching a reference (a design or drawing model) into a sheet model, the referenced model's annotation scale is applied as the detail scale, and the Reference Scale (Master:Ref Scale) is calculated from the referenced model's annotation scale and the active model's annotation scale.

**Scale (Master: Ref)** - Sets the ratio of the master units in the active model to the master units in the attached model.

**Named Group** - Identifies a named group used to limit the elements displayed in the reference.

**Revision** - If Design History is on in the referenced model, allows for the choice of the revision to reference.

**Level** - (*DWG Work Mode only*) Sets the level for the reference to be attached. In an AutoCAD DWG or DXF file, each XREF or layout viewport is placed on a specific layer. When a DWG file is opened in OpenRoads Designer, XREFs and layout viewports are treated as references, and placed on the same level (layer). To modify a reference's level, open the References dialog, double-click on the reference to open the Attachment Settings dialog and modify the *Level* setting. If a level is frozen, references on that level are not displayed.

**Nested Attachments** - Determines how nested references (the references attached to the model selected as the reference) are handled for this reference attachment.

*No Nesting* - Nested references are ignored for this attachment.

*Live Nesting* - The hierarchical structure of any nested references are maintained when attaching the reference. The child references are displayed if the nest Depth is set high enough and it does not have the *Ignore Attachment When Live Nesting* setting turned on.

All of the nested attachments display in the view window; however only the parent reference in the References list box. To see the hierarchy of nested references, use the Show Hierarchy icon on the References dialog.

**Depth** - Sets the number of levels of nested references that are displayed. Child references can have their own referenced models, which, in turn, can have more referenced models, and so on.

If Depth is set to 0, only the model is attached to the master model; referenced models in the referenced model are ignored.

**Display Overrides** - Controls how overrides are saved for nested references. For each nested reference, overrides allow for the control of the settings for reference display, locate, snap, raster reference display, and level display.

**New Level Display** - Specifies whether a reference displays newly created levels. The setting also applies to new levels in nested references that are attached to the reference.

**Global Line Styles** - Controls the scaling of custom line styles. Every model can have a global line style scale factor that is applied to every line style within the model. This factor is set in the Element Attributes category of the DGN File Settings dialog (**Settings > Design File**).

Alternatively, use the ACTIVE LINSTYLESCALE key-in to set the global scale factor for custom line styles. The specified scale factor has the same effect as the Scale Factor setting in the Line Styles dialog.

**Synchronzie with Saved View** - This check box, when turned on, will synchronize saved view attachments with the original saved view. In order to change the appearance of a reference, the saved view that it is synchronized with must be modified. This is to ensure fidelity of display properties such as view attributes, level masks, clip volume, display styles and others.

**Toggles** - Defines settings for the reference. The icons correspond to columns in the References List box and Information Panel. If an icon is pressed, the setting is on. Click the icons to toggle the settings on or off. These are the same toggles found on (and described earlier) the References *Information Panel*.

**Drawing Title** - When attaching a reference on a sheet, a drawing title can optionally be created. A drawing title describes a drawing on a sheet.

*Create* – Toggle to turn on the option to create a drawing title.

*Name* – Enter a name for the drawing title, when Create is toggled on.

# WORKING WITH REFERENCES

## CLIPPING AND MASKING REFERENCES

The user can control the reference display more precisely by using the clipping tools:

**Clip Reference** - This tool allows the use of a boundary, such as an element, cell, or fence, to clip a reference. When a reference is clipped, the area of the reference outside the selected boundary is not displayed.

**Clip Mask** - This tool allows the use of a fence to cover or not display a portion of a reference.

Reference elements display only inside the clipping boundary and outside all clipping masks. Both clipping boundaries and clipping masks are on the same reference tool to control the display more precisely. With the Boundary Display attribute turned ON in the View Attributes dialog, reference clip and clip volume boundaries display for that view. Reference clipping is defined relative to the world coordinates, and the clipped volume will therefore remain the same in all views. The boundaries of a saved view can be used as the clipping boundary when a reference is attached.

## MANIPULATING REFERENCES

Users can manipulate references with the standard manipulation tools, or perform these tasks with tools specifically designed for reference manipulation. Whichever method the user employs, the manipulation is for the reference attachment as a whole. Individual elements cannot be manipulated in a reference unless it is changed to the active model.

When changing the active model to a referenced model, it will appear as it was saved (Save Settings). There are two simple methods to activate a reference while maintaining the current view orientation:

- Temporarily activate the referenced model in-place. Use this method when snapping to elements in the active model.
- Make the referenced model the active model by exchanging to it. Use this method when focusing only on that model.

## USING REFERENCE TOOLS TO MANIPULATE REFERENCES

Tools in the *Reference* Dialog toolbar allow for manipulation of references directly. The user can use these tools whether or not the Treat Attachment as Element for Manipulation setting is enabled.

Every reference manipulation tool can contain any or all of the following tool settings.

- If *Move Boundary with Reference* is on, then any clip boundaries/masks are manipulated with the reference. If this setting is off, then the reference is manipulated, while the clip boundaries/masks remain static.
- If *Use Reference Dialog List* is turned on, the manipulation works on the models selected in the References dialog.
- If a fence exists and *Use Fence* is turned on, any models that are in the fence are manipulated. If a selection set has been created, manipulation works on the models in that set.

## EXCHANGING TO A REFERENCES

There may be times when the current view orientation needs to be maintained, but focus exclusively on the referenced model. In this situation, the *Exchange* option may be preferable.



To exchange the referenced model for the active model:

- In the *References* dialog, select the reference then choose **Tools > Exchange**.
- Right-click the reference in the *References* dialog, then select **Exchange** from the pop-up menu.
- With the *Element Selection* tool, point at the referenced element and choose **Exchange** from the *Reset* pop-up menu.
- Use the key-ins REFERENCE EXCHANGE <file\_name, model\_name>, or XD= <file\_name, model\_name>.

When using the key-ins, including the file name, model name, is optional. When using a key-in to exchange to a reference:

- Select the reference graphically (by not specifying a file name, nor selecting a reference in the *References* dialog).
- Include the reference filename and, where necessary, model name.
- Select the reference in the *References* dialog, prior to using the key-in.

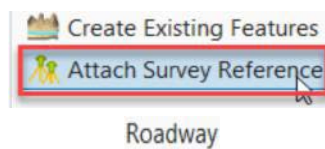
## **MERGING REFERENCES INTO THE ACTIVE MODEL**

The contents of one or more references can be merged into the active model. The levels of elements in the attached reference are copied to the merged file only if they do not exist in the active model.

**NOTE** Only the displayed elements in the reference are merged into the active model

## **ATTACHING SURVEY REFERENCES**

FDOT has created a custom tool to attach the SURVRD file which contains the existing features (TOPO), existing drainage (DREX), existing utilities (UTEX) and digital terrain model (GDTM) information. The Attach Survey Reference tool, located on the Ribbon under the FDOT tab in the Roadway section, is designed to locate the SURVRD file, attach it four times, and apply logical names and level filters to each attachment. The result is that the four aspects of the SURVRD are effectively attached individually for easier manipulation.

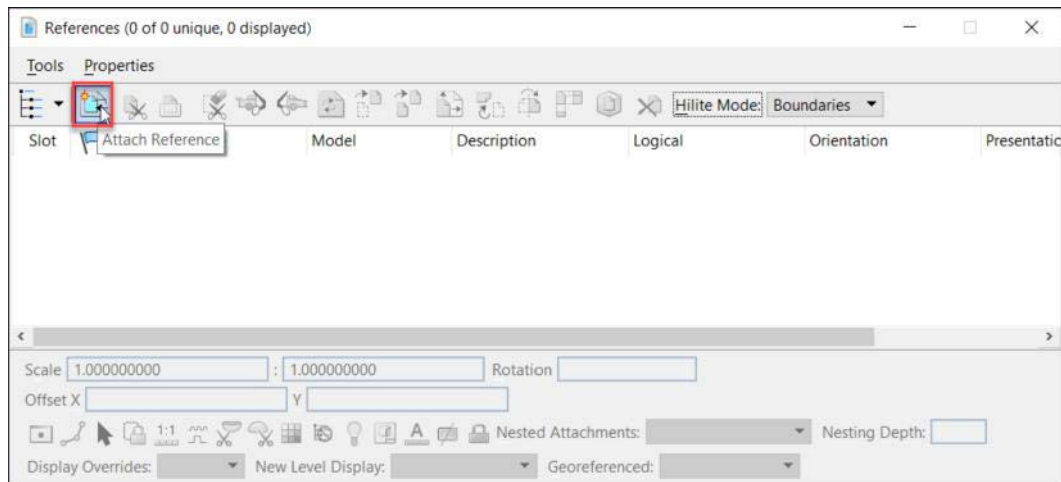
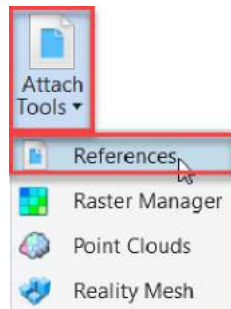


These four attachments can now be turned on and off individually. The logical names allow the FDOT Gray Existing pen table and plot configuration to apply a 50% halftone shade to the contents of the SURVRD file for sheet composition and printing.

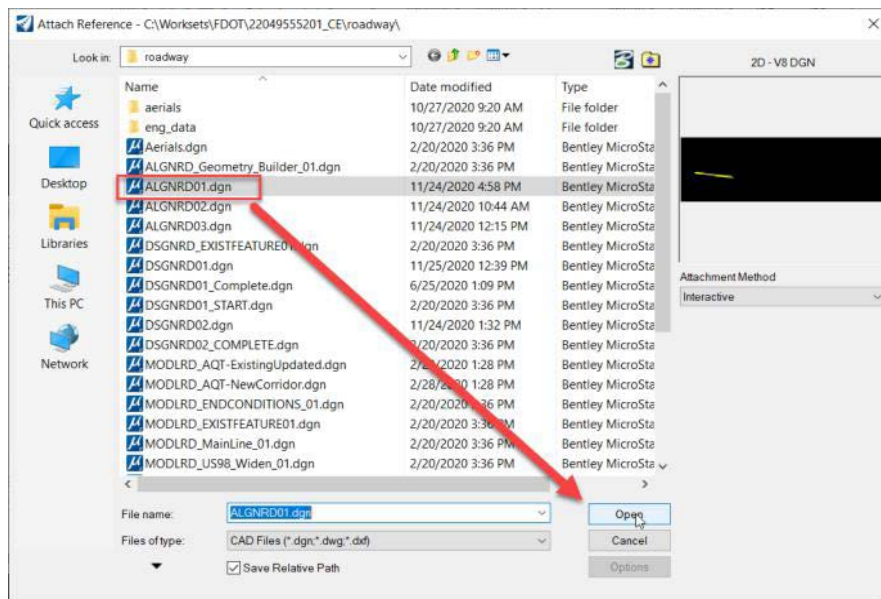
# EXERCISE OVERVIEW

## **Exercise 10.1** Reference File Attachment

1. Open the file named <c:\worksets\FDOT\22049555201\roadway\dsgnrd02.dgn>, which is a blank file created earlier in this training guide.
2. From the Primary Tools on the Ribbon, open the References dialog by selecting the **Attach Tools** split button and selecting **References**.

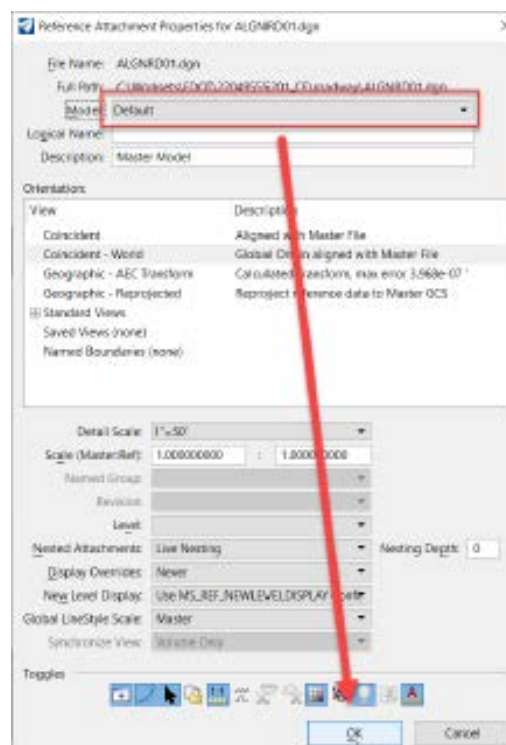


- In the References dialog, select the **Attach Reference** icon..
- In the Attached Reference dialog, ensure that the *Files of type:* is set to **CAD Files (\*.dgn;\*.dwg;\*.dxf)**; expand the *Select Files* list box by clicking the **arrow** below the *Files of type*; set the *Attachment Method* to **Interactive**; navigate to the <c:\worksets\FDOT\22049555201\roadway> directory and select the **algnrd01.dgn** file to attach as a reference. Click **Open**

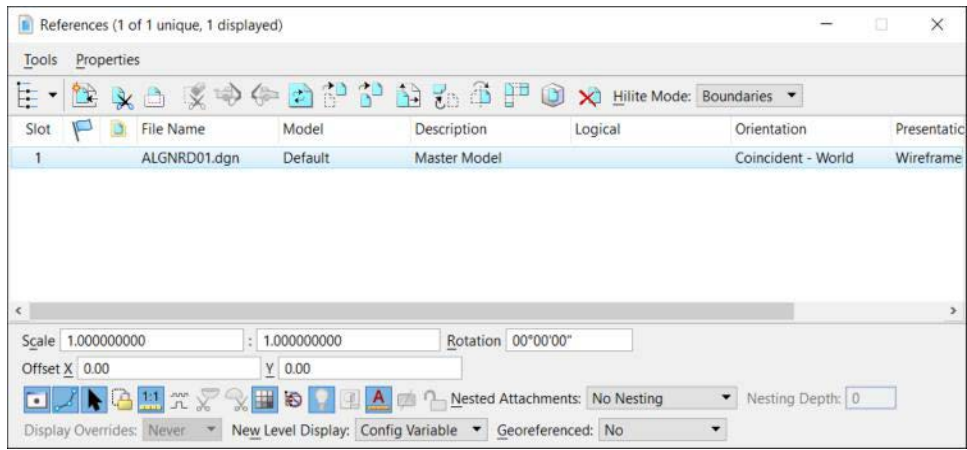


- From the Reference Attachment Settings dialog, set the *Model* to **Default** from the drop down arrow; enter **Alignment** for the *Logical Name*; and ensure the remaining settings are set as shown below.

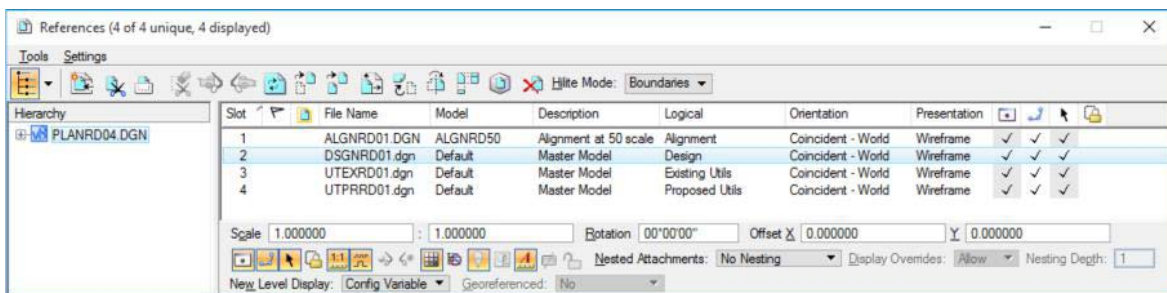
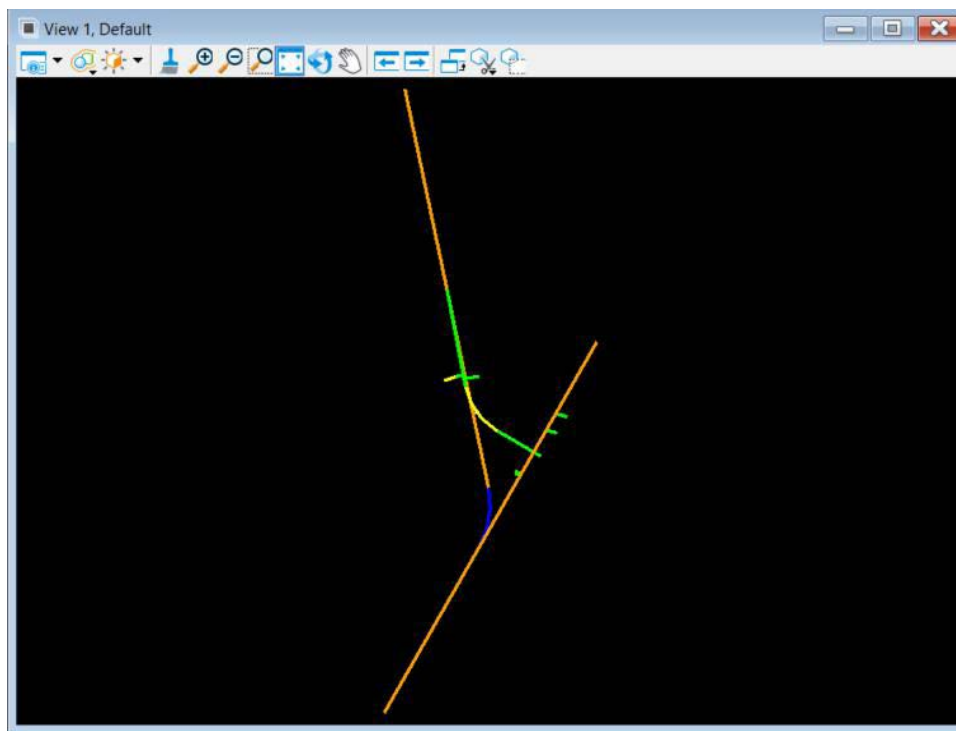
**NOTE** The *Model* dropdown list is populated based on the file selected.



- Click **OK** to accept.



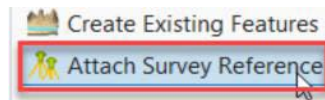
- From the View Control at the top of View 1, select the **Fit View** icon. Notice the elements that were added to the file.



- Close the References dialog.

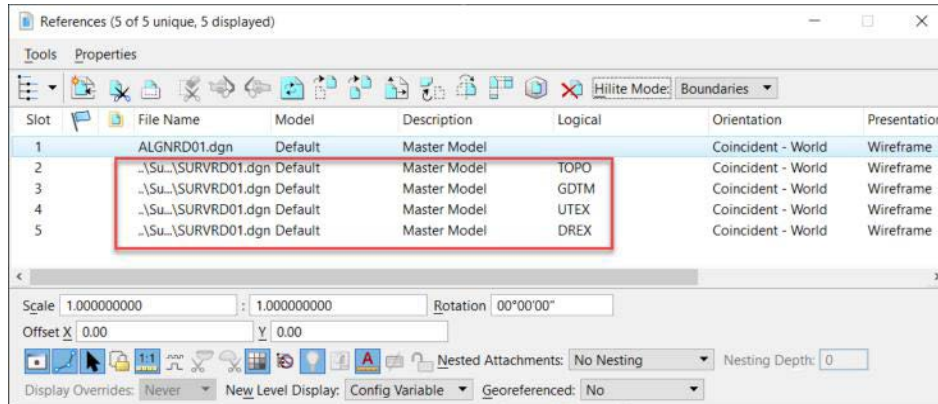
## Exercise 10.2 Attach Survey Reference Files

1. Continuing in the same file, locate the Attach Survey Reference tool on the Roadway section of the FDOT Ribbon.



Roadway

2. Select **Attach Survey Reference**. This tool may take a moment to complete the process.



3. When the process is complete, inspect the References dialog to see the four attachments of the SURVRD file and the applied logical names.
4. Close the References dialog and exit OpenRoads Designer.

## Contact

[CADD.Support@dot.state.fl.us](mailto:CADD.Support@dot.state.fl.us)

## Address

605 Suwannee St  
Tallahassee, FL. 32399

**CADD Essentials**