

*State of Florida*  
*Department of Transportation*



# **FDOT C3D Traffic Plans**

Signing & Pavement Markings

Signalization

Lighting

**User Training Guide**

April 2021

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

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# Signing & Pavement Markings

## Description

This course teaches students fundamental use of Autodesk AutoCAD Civil 3D State Kit, and the Florida Department of Transportation (FDOT) Computer Aided Drafting and Design (CADD) standard resources and applications for Traffic Plans and Signing & Pavement Markings design based on a typical traffic plans design workflow to produce and present Traffic Plans and Signing & Pavement Markings design required for Digital Delivery.

This course includes but is not limited to:

- General topics on Traffic Plans and File Creation
- Exploring the FDOT20xxC3D Desktop Folder
- Create File Application for Creating Project Base Files
- FDOT Traffic Palette
- Layers and Layer Filters
- Text Styles & Annotation Scale
- Plan Labeling
- Model & Paper Space
- Creating a Key Sheet
- Signing & Pavement Markings Tools

## Objectives

After this course, the student will use the FDOT Civil 3D State Kit and the FDOT CADD standard resources and applications for traffic plans, signing & pavement markings design, work with and understand a typical traffic plans design workflow to produce and present traffic plan design required for Digital Delivery.

## Audience

Students involved in preparation of the FDOT Signing & Pavement Markings Plans at the Beginner, Intermediate and Advanced Levels. The complete Traffic Plans course includes the FDOT Signalization course and the FDOT Lighting course, but students can choose from the three courses as per their job.

## Prerequisites

- Some manual drafting or related CADD product experience
- AutoCAD Essentials (R Guides)

## Duration: 16 Hours

## Professional Credit Hours: 12 PDHs

**Note** PDH Credit will only be available with Instructor lead or Computer Based Training (CBT) thru Learning Curve.

# Signalization

## Description

This course teaches students fundamental use of the Autodesk AutoCAD Civil 3D State Kit, and the Florida Department of Transportation (FDOT) Computer Aided Drafting and Design (CADD) standard resources and applications for Traffic Plans and Signalization design based on a typical traffic plans design workflow to produce and present Traffic Plans and Signalization design required for Digital Delivery.

This course includes but is not limited to:

- General topics on Traffic Plans and File Creation
- Exploring the FDOT20xxC3D Desktop Folder
- Creating File Application for Creating Base Project Files
- FDOT Traffic Palette
- Layers and Layer Filters
- Text Styles & Annotation Scale
- Plan Labeling
- Model & Paper Space
- Creating a Key Sheet
- Signalization Tools
- Creating Sheet Layouts

## Objectives

After this course, the student will use The FDOT AutoCAD Civil 3D State Kit, and the FDOT CADD standard resources and applications for Traffic Plans and Signalization design and work in and understand a typical Traffic Plans design workflow to produce and present Traffic Plans design required for Digital Delivery.

## Audience

Students involved in preparation of the FDOT Signalization Plans at the Beginner, Intermediate and Advanced Levels. The complete Traffic Plans course includes the FDOT Lighting course and Signing and Pavement Marking course, but students can choose from the three courses as per their job.

## Prerequisites

- Some manual drafting or related CADD product experience
- AutoCAD Essentials (R Guides)

## Duration: 8 Hours

## Professional Credit Hours: 6 PDHs

# *FDOT Traffic Plans - Lighting*

## **Description**

This course teaches students fundamental use of the FDOT AutoCAD Civil 3D State Kit, AutoCAD, and the Florida Department of Transportation (FDOT) Computer Aided Drafting and Design (CADD) standard resources and applications for Traffic Plans and Lighting design based on a typical Traffic Plans design workflow to produce and present Traffic Plans and Lighting design required for Digital Delivery.

This course includes but is not limited to:

- General Topics on Traffic Plans and File Creation
- Exploring the FDOT20xxC3D Desktop Folder
- Create File Application for Creating Base Files
- FDOT Traffic Palette
- Layers and Layer Filters
- Text Styles & Annotation Scale
- Plan Labeling
- Model & Paper Space
- Creating a Key Sheet
- Lighting Tools
- Creating View Frames and Sheet Layouts

## **Objectives**

After this course, the student will use The FDOT AutoCAD Civil 3D State Kit, AutoCAD and the FDOT CADD standard resources and applications for Traffic Plans and Lighting design and work in and understand a typical Traffic Plans design workflow to produce and present Traffic Plans design required for Digital Delivery.

## **Audience**

Students involved in preparation of the FDOT Lighting Plans at the Beginner, Intermediate and Advanced Levels. The complete Traffic Plans course includes the FDOT Signalization course and the FDOT Signing and Pavement Marking course, but students can choose from the three courses as per their job.

## **Prerequisites**

- Some manual drafting or related CADD product experience
- AutoCAD Essentials (R Guides)

## **Duration: 8 Hours**

## **Professional Credit Hours: 6 PDHs**

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TABLE OF CONTENTS

**1 INTRODUCTION ..... 1-1**

*Objective* ..... 1-1

*General Information* ..... 1-1

*Exploring the FDOT20xxC3D Desktop Folder* ..... 1-1

    Exercise 1.1 Setting Data Shortcut Working Folder ..... 1-3

*CADD Standards & File Creation* ..... 1-4

    Creating the Project Base Files ..... 1-4

        Exercise 1.2 Create the Base Files for a Project ..... 1-5

        Exercise 1.3 Create Additional Files ..... 1-5

        Exercise 1.4 Starting Civil 3D through the FDOT20xxC3D Desktop Folder ..... 1-6

*FDOT Traffic Palette* ..... 1-7

*Attributes, Text and Models* ..... 1-8

    Layers ..... 1-8

        Rules & Filters ..... 1-8

        Exercise 1.5 Layers and Filters ..... 1-10

    Entity Manager ..... 1-13

    Text Styles ..... 1-13

        Text Styles Dialog ..... 1-13

        True Type Fonts ..... 1-13

        Style Organization ..... 1-13

    Model & Paper Space ..... 1-14

    Annotation Scale ..... 1-15

        Exercise 1.6 Annotation Scale and Text Styles ..... 1-16

**2 DESIGN TOOLS ..... 2-1**

*Objective* ..... 2-1

*Introduction* ..... 2-1

*Exploring Entity Manager (EMX)* ..... 2-2

    Entity Manager Menu Buttons ..... 2-3

    Design Settings ..... 2-3

    Design Mode ..... 2-4

    Adhoc Attributes ..... 2-5

*Defining Adhocs for Quantities* ..... 2-6

*Place Block Group* ..... 2-6

    Block Group Tab ..... 2-7

    Location Tab ..... 2-7

*Pavement Marking Tool* ..... 2-8

*FDOT Multi-Line Tool* ..... 2-10

**3 CREATING A KEY SHEET ..... 3-1**

<i>Objective</i> .....	3-1
<i>General Information</i> .....	3-1
<i>Project Location Map</i> .....	3-2
<i>Create Traffic Design Key Sheet</i> .....	3-2
Key Sheet Without Map.....	3-2
Index Of Plans .....	3-3
Components Of Contract Plan Set .....	3-3
Strung Projects Note.....	3-4
Township and Range Map Label .....	3-4
Florida map.....	3-4
Exercise 3.1 Create Key Sheet for Sub-component (No Map).....	3-5
Exercise 3.2 Creating a Key Sheet with a Location Map (Optional).....	3-11
<b>4 VIEW FRAMES AND LAYOUTS</b> .....	<b>4-1</b>
<i>Objective</i> .....	4-1
<i>Introduction</i> .....	4-1
The Output Ribbon .....	4-1
Exercise 4.1 Creating Clip file and View Frames .....	4-2
Exercise 4.2 Using 2 Point Twist to Rotate View Frames.....	4-9
<b>5 PAVEMENT MARKING TOOLS</b> .....	<b>5-1</b>
<i>Objective</i> .....	5-1
<i>Introduction</i> .....	5-1
<i>Drawing Pavement Markings</i> .....	5-2
Draw Striping .....	5-2
Pattern – Single Stripe or Double Stripe .....	5-3
Reference Entity .....	5-5
Exercise 5.1 Create Signing & Pavement Markings General Notes Sheet .....	5-6
Exercise 5.2 Adding Sheet Layout to FDOT Traffic Plans Sheet Set .....	5-8
<i>Strain Pole Schedule</i> .....	5-9
Exercise 5.3 Setting up the Design File with References .....	5-9
Exercise 5.4 Create a Project Specific database .....	5-12
Exercise 5.5 Draw Crosswalk Markings.....	5-12
Exercise 5.6 Draw Solid Yellow Striping.....	5-17
Exercise 5.7 Draw Solid White Turn Lane Line Stripe Part (1) .....	5-20
Exercise 5.8 Draw 2/4 White Dotted Stripe (Part 3).....	5-21
Exercise 5.9 Draw Bike Lane Striping.....	5-22
Exercise 5.10 Offsetting Striping for solid Bike Lane .....	5-23
Exercise 5.11 Draw Lane Line – Solid & 10/30 Skip Stripe .....	5-24
Exercise 5.12 Adding Island Striping.....	5-27
Separation Mode .....	5-28
Exercise 5.13 Draw Separation.....	5-29

Chevron Diverge/Merge .....	5-31
Exercise 5.14 Draw Chevron Diverge .....	5-32
Chevron Merge .....	5-33
Exercise 5.15 Draw Chevron Merge .....	5-33
<i>Fix Entities Using Entity Manager Append Mode</i> .....	5-34
Exercise 5.16 Append Pay Item data to objects .....	5-34
Exercise 5.17 Placing Reflective Pavement Markers using Place Block Group.....	5-35
Exercise 5.18 Placing a Painted Pavement Message using EMX .....	5-36
Exercise 5.19 Placing a Multi Message Pavement Marking using Place Block Group .....	5-37
<b>6 SIGNING TOOLS</b> .....	<b>6-1</b>
<i>Objective</i> .....	6-1
<i>Introduction</i> .....	6-1
<i>FDOT Signs Application</i> .....	6-2
Assembly Creation .....	6-3
Assembly Creation - Panel .....	6-4
Assembly Creation - Post .....	6-5
Assembly Creation – Placement .....	6-6
Labels .....	6-7
Labels – General Settings.....	6-7
Labels – Panel .....	6-7
Labels - Post .....	6-8
Labels – Save/Recall Label Settings .....	6-8
Tools & Settings .....	6-8
Tools & Settings – Connector .....	6-8
Tools & Settings – Placement .....	6-9
Tools & Settings – modification .....	6-9
Tools & Settings – Quickbar .....	6-10
User Settings .....	6-10
User Settings – general .....	6-10
User Settings – files .....	6-11
User Settings – admin only .....	6-11
Exercise 6.1 Referencing in The Signing View Frame Group .....	6-12
Exercise 6.2 Place Single Post Sign Assembly .....	6-12
Exercise 6.3 Saving the Sign Assembly .....	6-15
Exercise 6.4 Update Sign Panel Location .....	6-15
Exercise 6.5 Place Multi-Panel Sign Assembly .....	6-16
Exercise 6.6 Creating and Placing a Sign Assembly using 3 methods (Part 1) .....	6-19
Exercise 6.7 Placing same sign assembly using a saved xml file (Part 2) .....	6-20
Exercise 6.8 Copying placed sign assembly to new location (Part 3) .....	6-21
<i>GuidSIGN Program</i> .....	6-22
Exercise 6.9 Creating the GuidSIGN Work sheet (Part 1) .....	6-23
Exercise 6.10 Creating the GuidSIGN Work Sheet (Part 2).....	6-36
Exercise 6.11 Place Guide Sign Assemblies into Design File.....	6-41

Exercise 6.12 Using FDOT Signs with Guide Sign Blocks.....	6-42
<b>7 SIGNALIZATION TOOLS.....</b>	<b>7-1</b>
Objectives .....	7-1
Introduction .....	7-1
FDOT Traffic Palette.....	7-1
Review Entity Manager Signals Items.....	7-2
Creating View Frames For Signal Plan Sheets.....	7-3
Create View Frames Wizard .....	7-3
Alignment Page.....	7-4
Sheets Page.....	7-5
view frame group page .....	7-6
Match Lines page .....	7-7
Create Sheets.....	7-7
View Frame Group and layouts page.....	7-8
View Frame Group and layouts page.....	7-9
Exercise 7.1 Creating Signal Design file .....	7-9
Exercise 7.2 Creating Signal Key Sheet and Adding it to a Signal Sheet Set .....	7-10
Exercise 7.3 Create View Frame and Sheet Layout .....	7-12
Exercise 7.4 Mast Arm Assemblies Sheet .....	7-18
Exercise 7.5 Mast Arm Tabulation Sheet.....	7-19
Strain Pole Schedule.....	7-22
Exercise 7.6 Place Signal Poles using the FDOT Traffic Palette.....	7-22
Place Signal Head .....	7-24
Exercise 7.7 Place Signal Head on Mast Arm.....	7-25
Loop Assemblies.....	7-29
Exercise 7.8 Place Loop Assemblies.....	7-29
Placing Pull Boxes .....	7-34
Exercise 7.9 Place Pull Box.....	7-34
Exercise 7.10 Place Controller Assembly.....	7-36
Exercise 7.11 Draw Loop Lead in Wire .....	7-36
Design Settings .....	7-38
Exercise 7.12 Place Conduit.....	7-38
Placing Text Labels.....	7-39
Exercise 7.13 Place Pole Location Label .....	7-39
Exercise 7.14 Place Pay Item Number Box .....	7-42
Exercise 7.15 Signal Head Detail .....	7-44
<b>8 LIGHTING TOOLS .....</b>	<b>8-1</b>
Objective.....	8-1
Introduction .....	8-1

<i>Drawing Light Poles</i> .....	8-1
<i>Review Light Pole Item in Entity Manager</i> .....	8-2
Exercise 8.1 Creating Lighting Design File .....	8-3
Exercise 8.2 Creating Lighting Key Sheet .....	8-4
Exercise 8.3 Creating Lighting Clip File, View Frames, & Data Shortcut .....	8-5
Exercise 8.4 Place Light Poles Using Place Block Group .....	8-8
Exercise 8.5 Place Light Poles Using Entity Manager .....	8-11
Exercise 8.6 Place Pull Box Item Using Place Block Group (Part 1) .....	8-12
Exercise 8.7 Place Pull Box Item Using Entity Manager (Part 2) .....	8-12
Exercise 8.8 Place Pull Box Item Using Entity Manager at a Station Offset (Part 3) .....	8-13
Exercise 8.9 Draw Conduit under Ground between Light Poles .....	8-13
Exercise 8.10 Creating a Lighting Text File and Labeling Project Limits .....	8-14
Exercise 8.11 Labeling Light Poles and Conduit .....	8-19
Exercise 8.12 Creating, Editing, and Linking a Report to Pole Data Sheet .....	8-21
<b>9 ANNOTATION TOOLS</b> .....	<b>9-1</b>
<i>Objective</i> .....	9-1
<i>Introduction</i> .....	9-1
<i>Accessing the Annotation Ribbon</i> .....	9-1
Exercise 9.1 Create a Text File & Add References .....	9-5
Exercise 9.2 Adding a Striping Pattern Label .....	9-6
Exercise 9.3 Adding a Station Label for Striping .....	9-8
Exercise 9.4 Editing a Label .....	9-9



# 1 INTRODUCTION

## OBJECTIVE

This chapter divides into three sections:

- Computer Aided Drafting and Design (CADD) Standards & File Creation:
  - FDOT20xxC3D Desktop Folder
  - File Creation
  - Base Project File Setup
- FDOT Traffic Palette
- AutoCAD Features/Concepts:
  - Layers
  - Civil Features
  - Text Styles
  - Annotation Scale
  - Model & Paper Space

## GENERAL INFORMATION

This chapter reviews the FDOT20xxC3D working environment including how to create design files properly that meet Florida Department of Transportation (FDOT) CADD standards and introduces concepts and tools used to make producing plans more efficient. This manual refers to xx as being the latest version of the State Kit.

## EXPLORING THE FDOT20xxC3D DESKTOP FOLDER

The FDOT CADD software installer installs a folder named FDOT20xxC3D on the desktop. This folder contains shortcuts to applications used when working on the FDOT projects.

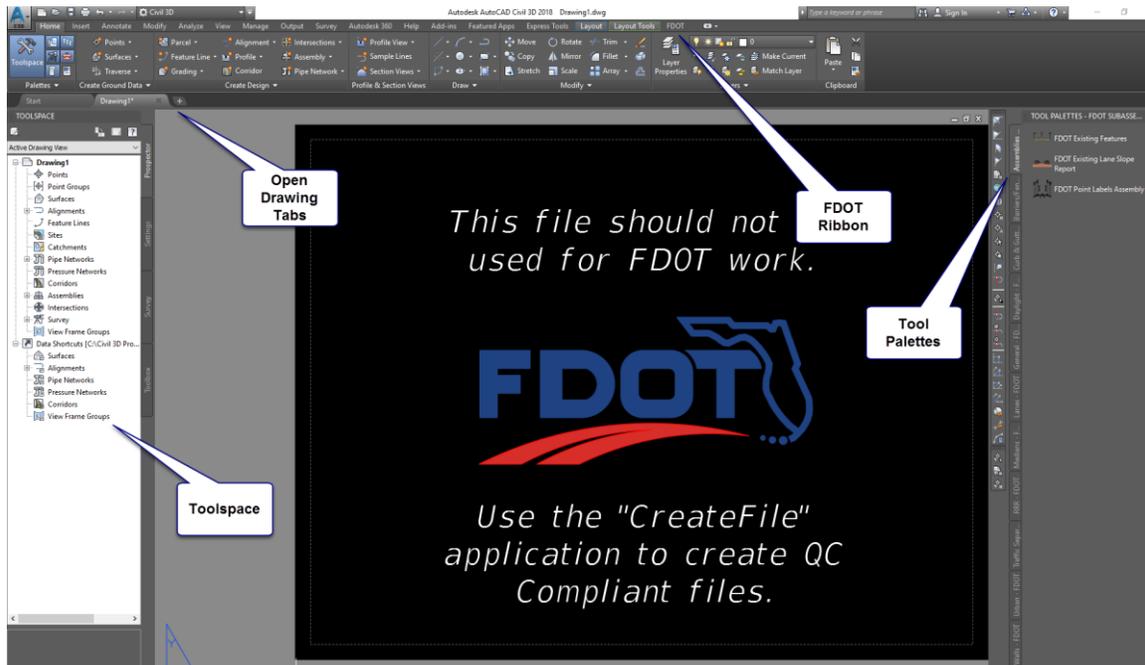
The figure below shows the contents of the FDOT20xxC3D folder.



Using these shortcuts to start the applications will provide the designer with the environment properly set with the FDOT CADD standards. The installer will place a shortcut on the desktop to start the State Kit. The shortcut icon is shown in the image above located on the top left.

**Note** When systems have AutoCAD Civil 3D installed along with The FDOT Civil 3D State Kit Suite installed, it is recommended the user start the State Kit with the desktop icon.

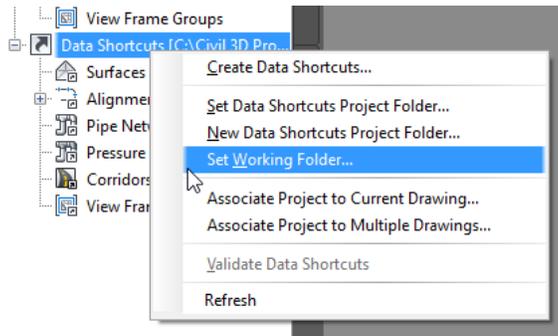
Double Clicking on the C3D20xx desktop shortcut starts Civil 3D in the FDOT environment. Selecting the FDOT Ribbon shows all the applications and commands available to the designer. As shown below.



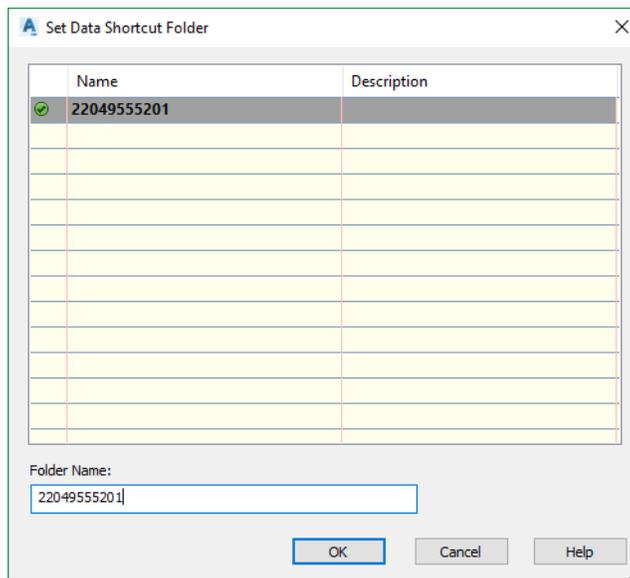
### Exercise 1.1 Setting Data Shortcut Working Folder

If this is the first time you have opened the FDOT Civil 3D State Kit you will need to set the data shortcut working folder to point to your project folder location.

1. Hover your mouse over the word **Data Shortcuts** located in the tool space and **Right Click** to bring up the following options.



2. Select **Working Folder** to browse to the Root folder location of your project, be careful not to select the actual folder of your project. In this exercise select the **Civil 3D 2019 Projects** folder.
3. Repeating the previous step, right click on the *Data Shortcuts* path again and select **Set Data Shortcuts Project Folder**. A list of projects will appear, select the following.



4. Select **OK** to Close the dialog.

## CADD STANDARDS & FILE CREATION

Traffic Plan projects are normally a component of a Roadway plans package. Therefore, the project directory structure usually exists prior to beginning work on a Traffic Plans component. If this is not the case, the same directory structure and file standards that apply to Roadway apply to any other lead component. The FDOT *CADD Manual* defines the naming convention used to create the different types of design files required in a project.

### CREATING THE PROJECT BASE FILES

The FDOT workflow uses the Create File application to create AutoCAD design files and other files in accordance with the FDOT standard file naming conventions. Create File uses an .xlsx Spreadsheet, called the Master Standards that is included when the State Kit is installed. The file contains all design file naming conventions along with the appropriate symbology (Layers, Colors, Line Types, etc.). The application can only be launched from inside Civil 3D. It is located on the Top Left of the FDOT Ribbon.



W:\FDOT Training Events\Flug\2018 Flug\03 Quantities 2hr Wk

Discipline: ROADWAY

File Group: Signing and Pavement Marking Files

File Type:

Base Filename	Description
AUTOSP	Auto Turn Turning Radius Data
BDPLSP	Border Sheet Reference File for Plan Sheet
BDXSPP	Border Sheet Reference File for Cross Section Sheet
CESSSP	Summary of Pay Item Sheets
CLIPSP	Clip Borders
DSGNP	Proposed Design
GNNTSP	General Notes
GSWKSP	Guide Sign Work Sheet and Details
KEYSSP	Key Sheet
MSARSP	Mast Arm Detail for Signing
MTPLSP	Motif File for Plan Sheets

Output File:

Base Filename: DSGNP    Modifier (Optional):    File Sequence #: 02    Extension: .dwg

Output File: W:\FDOT Training Events\Flug\2018 Flug\03 Quantities 2hr Workshop Wed 9\_45E

Output Folder: signing    Browse

Template: fdotmaster.dwt    Browse

County: Wakulla    Coordinate System: FL83-NF

Create - Open File    Close

**Note** When the Create/Open File button is selected the file is created and opened. The user can make as many files as needed in one session of the application. When all files are created select Close to exit the dialog.

## Exercise 1.2 Create the Base Files for a Project

- **In this exercise, you will create Signing and Pavement Marking design files.**

**Note** This process is the same for any Traffic Plans discipline.



1. Double click on the **FDOT20xxC3D** Icon on the desktop. At the time of this manual the 2019 version is the most current. Your version may vary, but the process is the same.
2. When Civil 3D is loaded click on the **FDOT Ribbon**.



3. Click on the **Create File** icon to launch the application.
4. With the *Data Shortcut Folder* already set it is automatically filled in on the Project portion of the **Create File** application. If not, you can either **Exit** and **set it <OR>** you can select the **Select Project** button to navigate to it.
5. The Coordinate system and County are already set to FL North and Wakulla, this is because you set your data shortcut folder before creating your files.
6. Select the *Discipline* pull down and select **ROADWAY**. This sets the discipline to work in. Traffic Plan files are part of the Roadway Discipline. It is important to know how to do this in case it is required to use a different option in the future or if the standards ever change.
7. In the *File Group* category, use the drop-down arrow to select **Signing & Pavement Marking Files**. (This sets the file types to Signing & Pavement Marking files and sets the output folder to Signing.)
8. In the *File Type* category select the file **Proposed Design**. (This selection populates the *Output File and Template File* with the correct information.)

**Note** *Create File/Project allows the designer to browse to a different Output Folder if needed.*

9. Click the **Create/Open File** button at the bottom of the dialog to start the file creation process; then click the **Close** button to exit the dialog box.

**Note** *Notice below the Create and Open File buttons that the file name is shown. If the file Dsgnsp01 already exists in the project, the application will increment the file name to Dsgnsp02 and will not overwrite the existing file.*

## Exercise 1.3 Create Additional Files

Use the same File Group to create additional design files.

1. Using the **Create File** application select the **Clip Borders** file.
2. Click the **Create/Open File** button.
3. Click **Close** to exit the application.
4. Save all files and Close Civil 3D.

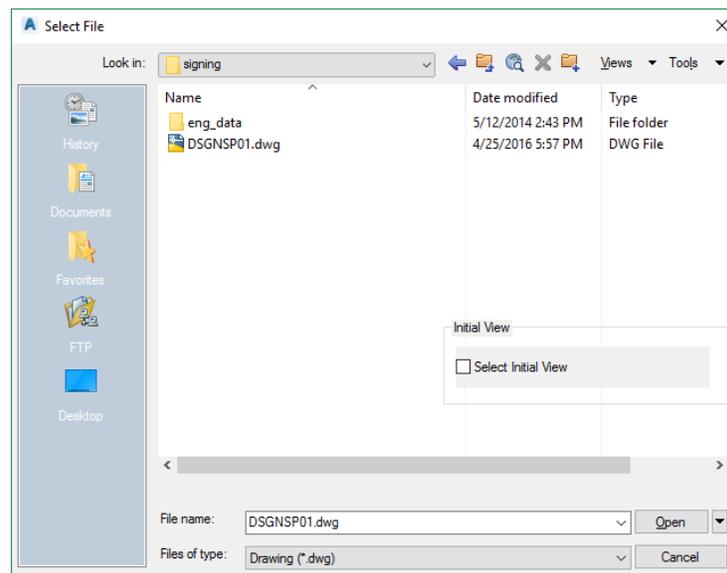
### Exercise 1.4 Starting Civil 3D through the FDOT20xxC3D Desktop Folder

In this exercise, use the FDOT20xxC3D folder located on the desktop like the previous exercise. This folder contains several shortcut icons. It is important to review and understand the use of each icon.

1. Inside the *FDOT20xxC3D* folder  double click on the **C3D20xx** icon. (This opens the FDOT Civil 3D State Kit.)



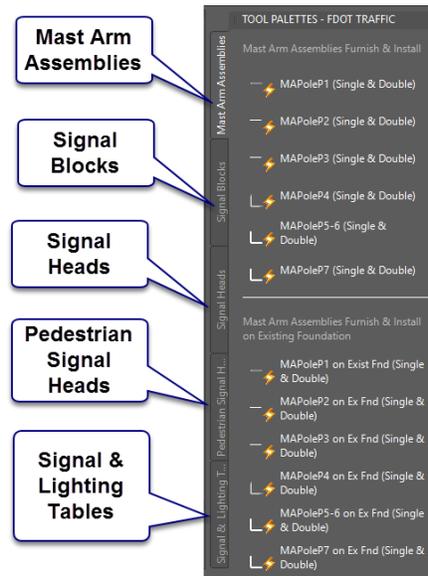
2. Once the State Kit loads click the **Open** icon 



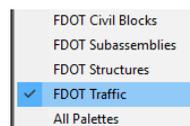
3. Navigate to the *Signing* folder within your project.
4. Select the **Dsgnsp01.dwg** file and click **Open**.
5. Once the drawing opens select the FDOT Ribbon and note the custom applications and tools available. Take a moment to become familiar with this workspace environment.

# FDOT TRAFFIC PALETTE

As seen in the last exercise, The FDOT Ribbon loads when Civil 3D is loaded through the FDOT delivered icon. The FDOT State Kit, by default, opens in the Civil 3D workspace. The default visible Palette is the FDOT Subassemblies, to change the visible palette hover your mouse over the word TOOL PALETTES – FDOT SUBASSEMBLIES and Right Click. Select FDOT Traffic. Doing FDOT Traffic plan designs will utilize parts of this palette. A brief description of the tabs is shown below.



The figure below shows the FDOT Palette groups available. Once the user saves and exits Civil 3D the last visible palette used will display as the default.



The other applications and tools used to produce Traffic plans can be located on the FDOT Ribbon in the Pay Item Tools panel.



**Note** For additional information on the use of any tool located on the FDOT Ribbon, hover your mouse over the designated tool and press F1. A help document will load and provide a brief description of the tool and a link directing the user to a quick clip video that will show a demonstration on how to use the tool.

## ATTRIBUTES, TEXT AND MODELS

### LAYERS

FDOT has created six Standard Layer libraries: Common, Survey, Right of Way, Roadway, Photogrammetry and Structures. There are approximately 2037 Layers. The appropriate Layers and Layer Filters load upon the creation or opening of a FDOT Design file using the Create File application. The Layer name is a maximum of 18 characters and has three components: Layer Name, State and View with the format: *object\_sv*

Where: (**object** = Layer) (**s** = State) (**v** = View)

#### (S)tate Designations

**p** (proposed)

**d** (drafting entity)

**e** (existing)

#### (V)iew Designations

**p** (plan)

**r** (profile)

**x** (cross section)

**m** (model)

An example of a plan view Layer is: **PavtMessage\_ep**, where: *Layer* = **PavtMessage**, *State* = **e** and *View* = **p**

**Note** *Some Layers do not show a State or View in their name. These Layers are by default set to be a proposed plan view entity. An example is the Layer (RPM1), created for proposed RPM's in the plan view.*

The Layers symbology (color, weight and Line Type) are set to *ByLayer*, which means each Layer has a color, weight and style associated to it and controls all objects placed on that particular layer. It is recommended that Designers not create additional Layers since they will not QC.

#### RULES & FILTERS

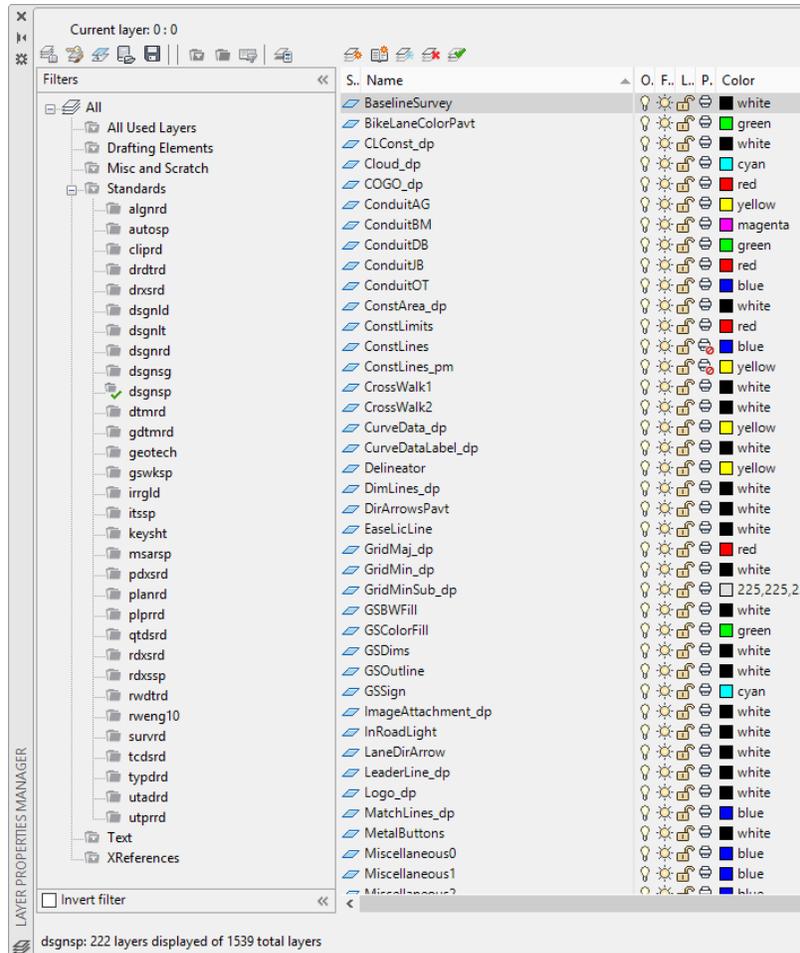
FDOT has also created a set of Layer Filters that group the Standard Layers together for Quality Control (QC) checking of the FDOT Standard design files ensuring compliance with the FDOT CADD Standards. FDOT delivers Layer Filters to reflect each of these Standard Rules to assist in users searching through the Layer menu. Discussion on these filters continues later in this section. The Standard Layer Filters do not turn Layers on or off, but they reduce the number of Layers visible in the layer properties dialog box.

To switch a Standard Layer Filter, open the Layer Properties Manager dialog on the Home Ribbon.



There is an expandable Standards drop-down menu as seen in the figure below to load Layer filters, click on the desired filter, notice how the number of displayed layers updates for each filter.

**Note** *FDOT presets Standard Layer Filters to each Standard File Name. The filters automatically set by default to those specific file names upon opening of the design file.*



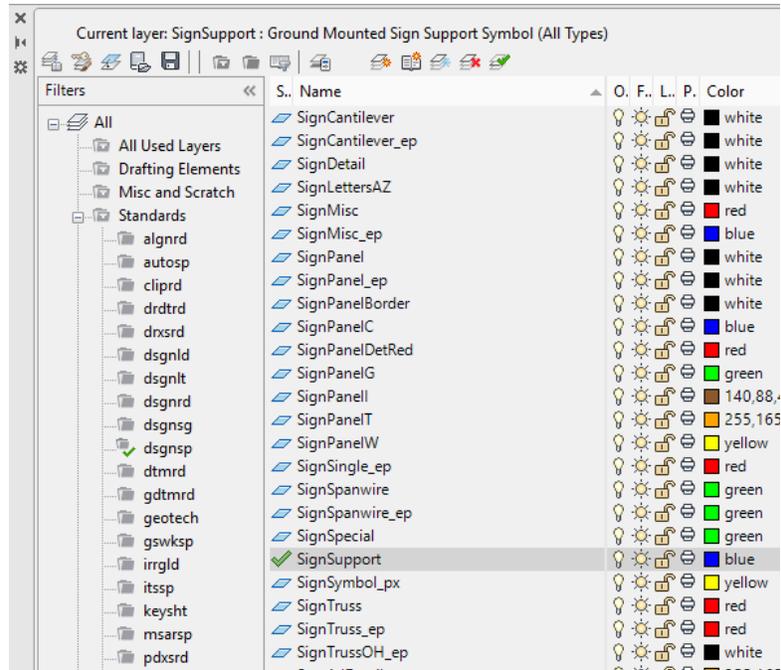
## Exercise 1.5 Layers and Filters

This exercise will cover investigating Layers and Layer Filters delivered by FDOT. The entities placed in this exercise are not part of the final design; they are for experimenting and practicing only.

- Continuing with *DSGNP01.dwg*, select **Layer Properties** from the *Home Ribbon* to open the Layer Properties Manager dialog.

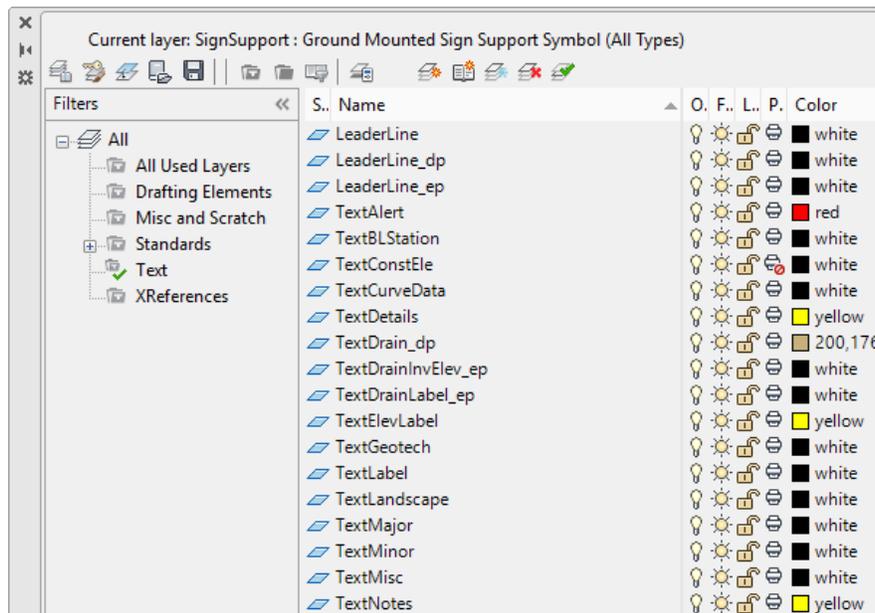
**Note** As a refresher, a Layer filter isolates the Layers seen in the Layer dialog so it is easier to navigate. FDOT groups the Layer filters by discipline and sets them by the filename.

- Expand the *Standards* folder in the *Filters* section of the dialog.



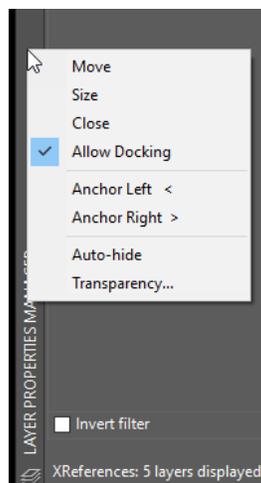
- Scroll down and double click the **Layer SignSupport**. That sets the active Layer and sets the *Color*, *Weight* and *Style* to **ByLayer** which means all entities drawn or placed will be under the influence of the layers properties. Note the Green checkmark next to the layer name which denoted the current Layer.
- Collapse the *Standards* folder and click on the **Text** filter. Note all the Layers that contain text are now visible.

- Click on the other filters to get familiar with what they offer.



**Note** You can also type in *LAYERP* on the command line to open the Layer Properties Manager.

- Hover & right click on the *Title Bar* and examine the options to control the behavior of the dialog, you can dock it on either side of your screen or move it to another monitor. Refer to Civil 3D help for further information regarding the Layer Properties Manager.



- Click on the **X** located in the top left corner to close the dialog. Layer filters can save time when going from Line work to Text and so on.

## MODEL & PAPER SPACE



The Model tab located on the bottom left corner allows the user to view the overall project as it resides in real time coordinates. The Layout tabs represent an individual sheet as it will be printed. The sheet border with all applicable fields will be added via the Plan Production workflows.



A sheet, when present, has two additional buttons called Model & Paper. The default, when created, is called Paper, which represents Paper Space. Paper Space is a visual representation of how a sheet will print and any text or line work drawn in Paper space is equivalent to drawing on a sheet of paper. It is recommended that details and notes that are not part of a dynamic design or tied to any coordinate zone be placed in Paper space.

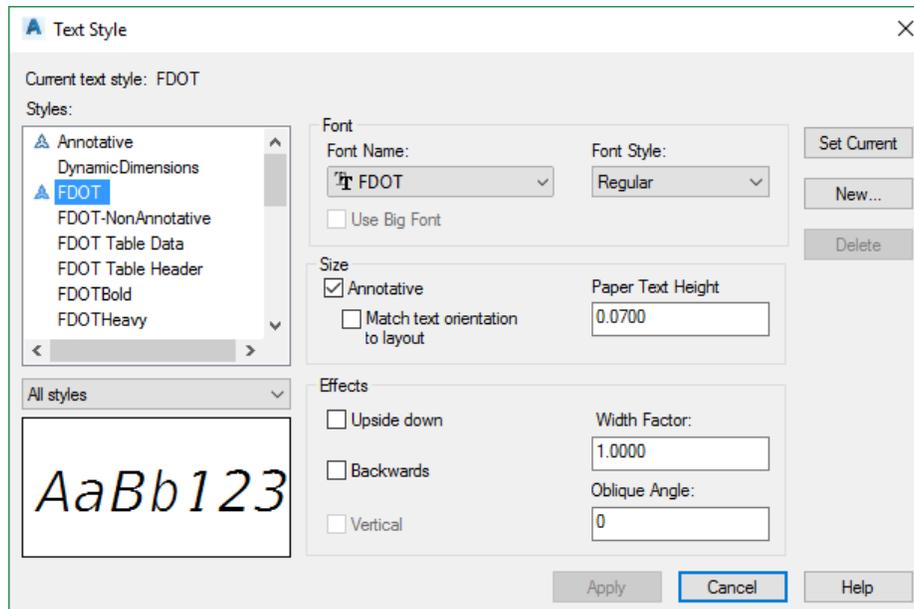
If you click on the word Paper or double click within the View Frame itself the Model becomes active and the word paper is replaced by the word model. An active viewport is denoted by a thick red border around the view frame as shown above. A view frame is created for looking at a portion of the drawing model at an exact scale that will be printed as a sheet, think of it as a window through your sheet border at an exact scale with the correct coordinates. View Frame rotation angles can be manipulated without rotating your project, which makes labeling and the layout look perpendicular to your border.

## TEXT STYLES

A text style is comprised of a group of text attributes, such as font, width, height, spacing and so on. Text styles take away the burden of having to set all the individual text parameters. FDOT delivers predefined text styles for use whenever possible. The text styles delivered by FDOT are at a scale of 1 to 1. This is important to remember placing text using Annotation Scale. A more detailed discussion of Annotation Scale comes later in this section.

### TEXT STYLES DIALOG

**Note** The Text Styles dialog can be accessed by typing *ST* on the command line.



The Text Styles dialog shows all the text styles that exist in the design file, and all the parameter settings for each style. When a new file is created and opened using the Create File Application it reads the Fdotmaster template file which will load all the appropriate text styles. FDOT expects no changes made to the delivered text styles.

### TRUE TYPE FONTS

FDOT has integrated the use of True Type Fonts and restructured the Text Styles. The following implements the True Type Fonts:

- Block Libraries
- Entity Manager
- All Civil 3D Label Styles
- Civil 3D Note Styles
- Spreadsheets

True Type Fonts will ignore AutoCAD weights. The best method to show thicker text is to use the Bold font. The FDOT CADD Software delivers and installs the True Type Fonts in the FDOT20xx.C3D\Support\Font folder on the server and in the Windows\Fonts folder on the client.

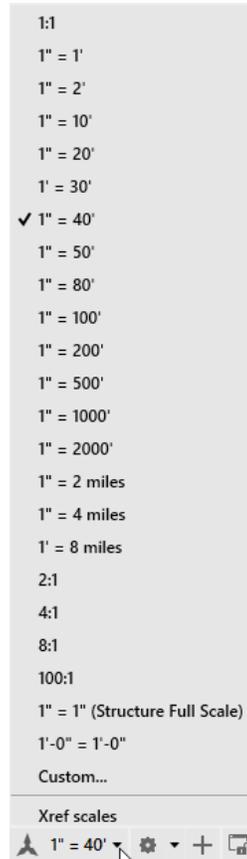
### STYLE ORGANIZATION

Fonts at Common Sizes	40 Scale	50 Scale
-----------------------	----------	----------

Large = .15 x Scale	5.0	6.25
Medium = .1 x Scale	4	5
Small = .07 x Scale	2.8	3.5

## ANNOTATION SCALE

*Annotation Scale* associates text and Linestyles placed in the model to a specific scale so if the drawing scale changes in that model the text and Linestyles dynamically change with it. The Annotation Scales are preset within the State Kit. The image below shows the available scales. The default scale is 1" = 40'.



Using Annotation Scale removes the burden of calculating text height used at specific scales when placing text.

The annotation scale options can be found along the bottom of your screen. See image below. A tooltip is available to describe each button, just hover over with your mouse.



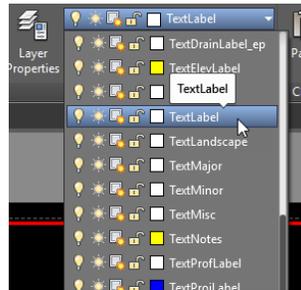
Important items to remember regarding Annotation Scale:

- Layout Specific
- Annotation Lock must be toggled on for Sheet Layouts
- Can be set in the Model properties
- Can be changed using the Drawing Scale
- Do Not switch Annotation Scale ON and OFF

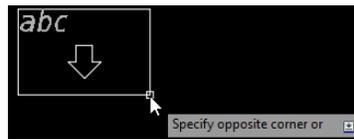
### Exercise 1.6 Annotation Scale and Text Styles

This is a brief introduction to placing text using FDOT delivered Text Styles. This discussion is in more detail later in this course.

1. Continuing with *DSGNP01.dwg* set the active Layer to **TextLabel**. You can use the *Layer* pulldown on the *Home* tab to change the layer or type in *Textlabel* on the command line



2. On the *Command Line* type in **Mtext**. The command line asks you to draw a text box from top left to bottom right.



**Note** Remember with *Annotation Scale* set there is no need to calculate what text height and width to use; this feature automates the calculation.

3. After drawing an area box for the text, the *Text Editor contextual ribbon* appears along the top. Notice the preset font and annotative height (0.07). Get familiar with the capabilities of the robust text editor.



4. In the MText Text dialog, enter a sample text string and place it in the design file.



5. After entering the text, left click your mouse outside the text box to exit the *mtext* command.
6. Change the *Annotation Scale* from **1:40** to **1:50**. Note the change in size of the previously placed text.
7. Take time to familiarize yourself with the *Mtext* dialog and other delivered *Text Styles*.
8. Delete the test text and Close and do not save the *dsgnsp01.dwg* file. Exit Civil 3D.

# 2 DESIGN TOOLS

## OBJECTIVE

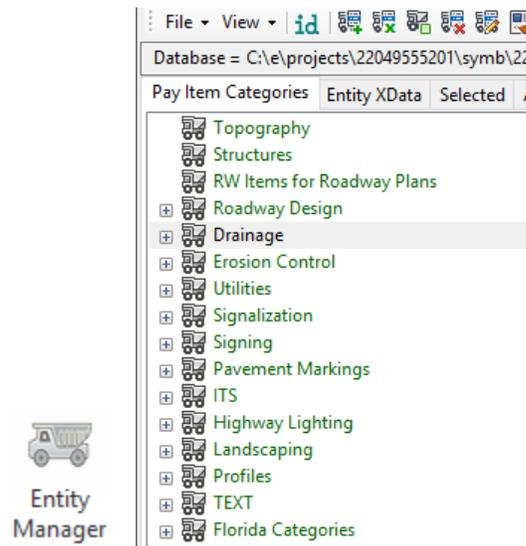
The objective of this chapter is to introduce common design tools used by all the Traffic Plans disciplines. These include the Entity Manager (EMX), Pavement Marking Tool, FDOT Multiline, and Place Block Group. All the listed tools read the same Pay Item database.

## INTRODUCTION

This chapter introduces several applications that are very useful to the designer to create Traffic Plans:

- **Entity Manager (EMX)**                      The FDOT AutoCAD Civil 3D State Kit installs an application that is used to help designers draw and place entities with pre-set symbology, which will allow the takeoff manager to compute quantities. The FDOT CADD office provides a database set up with the correct symbology, blocks, formulas and pay items needed to meet the FDOT standards.
- **Place Block Group**                      The FDOT AutoCAD Civil 3D State Kit installs a tool called Place Block Group which is used to place single or multiple blocks at once in the file along an alignment or AutoCAD entity. It uses the Entity Manager database to insure the placement of blocks with the correct symbology and pay item data for quantity calculations.
- **Pavement Marking Tool**                      The FDOT AutoCAD Civil 3D State Kit installs a tool called Pavement Markings that will allow the designer to draw Striping accurately in the drawing along entities or alignments. It uses the Entity Manager database to insure the striping has the correct symbology and pay item data for quantity calculations.
- **FDOT Multi-Line**                      The FDOT Multi-Line tool allows the user to draw 2D linework on the correct layer based on the object. A pattern consists of several sub patterns selected using the tool. The sub patterns can also contain Pay Item xdata attached, an example being Curb & Gutter or Pavement Striping just to name a few.
- **FDOT Signs**                      This application will be covered in Chapter 6.

## EXPLORING ENTITY MANAGER (EMX)



The Entity Manager application is located on the FDOT Ribbon on the Pay Item Tools panel. Entity Manager uses a proprietary database provided by FDOT. The installation of the FDOT Civil 3D State Kit software places the latest Entity Manager database on the local hard drive in the install folder. For new projects, FDOT recommends starting the EMX application and let it build a new Payitemdb.xml file and save it the project SYMB folder and rename it to the eleven-digit Financial Identification Number (FIN) number. For the 22049555201-**project** used as the example in this manual, the Payitemdb.xml file is renamed to 22049555201.xml. This allows the designer to modify the file for specific parameters, and protects it from any future maintenance updates overwriting the file. The latest FDOT Database file is found in the \FDOT20xxC3D\apps\entitymanager\EntityManagerPayitemDatabase.txt.

It is highly recommended that every user that works on projects becomes very familiar with Entity Manager, which sets symbology and automates quantity calculations for linear, each, volume, and area quantities.

FDOT specifically set the database to create entities with the correct Layer symbology according to the FDOT CADD Standards. The database file is set up with discipline folders called categories. Inside of each category are items.

- **Pay Item Categories** - The basic component of the hierarchical tree is the Category, represented by a tab. The categories are divided by discipline. The figure above shows the Categories with an expandable + symbol.
- **Items** - The other database component is the item. An item could be a drafting item, a compute item or a default item. *Items* contain specific functions related to defined entity symbology or quantity calculations. *Items* are represented by one of three icons:
  -  **Default Icon** - This icon means items contain formulas and adhoc data used to set drafting standards that can be drawn in the file using the EMX drawing tools.
  -  **Drafting Standards Icon** - This icon means a formula is not assigned, but can still be drawn with the correct symbology.
  -  **Calculator Icon** - This icon means items have symbology attached and a formula or compute method. The item has no adhoc data.

## ENTITY MANAGER MENU BUTTONS

Entity Manager has a toolbar for easy access of different functions. Summarized below are the functions of each button. A later section in this chapter covers in more detail the tools used to create Pavement Marking plans.



 - **Identify** Allows user to select an object in your file to read all the Xdata attached. You can also click in the link to get the adhoc data for editing.

 - **Append** The append button allows user to select an item from the categories and append the pay item data to an object in the drawing.

 - **Replace** The Replace button allows the user to make a selection from the categories and when the object is selected in the file the existing pay item data on an object will be removed and the new selection be added.

 - **Hatch.** The hatch button is used to hatch shapes for area computations. An area id label is also placed when using this command.

 - **Remove** The Remove button allows the user to remove all Pay item data from an object in the drawing file.

 - **Edit.** The Edit button allows the user to select an object to edit pay item data such as adhoc information or add notes.

 - **Match Properties** The Match properties button behaves like the AutoCAD version with the added benefit of matching pay item data and symbology from a source object to a target object.

 - **Label Properties** The Label properties button controls the shape label options such as font, size, rotation, suffix, prefix, & layers.

 - **Highlight Options** The highlight options button control how objects are highlighted so viewing objects with or without pay item data is easier.

## DESIGN SETTINGS

Settings used while using EMX are based on how your Civil 3D environment is set up. The department has set the State Kit up to be a Bylayer standard, meaning that all Colors, Linetypes, and Line weight are controlled by the Layer Property. All symbology is set by the Master Standard spreadsheet that resides in the state kit install folder.

## DESIGN MODE

*Design Mode* is the default mode when the EMX is opened. *Design Mode* is used for the following functions:

- Sets Symbology Standards by use of the **Drawing Tools** on EMX for the placement of AutoCAD entities.
- Place Adhoc Attributes on an entity.

Items are placed in the file by generic AutoCAD commands using the EMX Drawing tools, the items can be placed as pay items for future tabulation.

The Drawing tools as shown below are used to **Place Entities with Influence**, which is another way of saying it attaches the Xdata used to extract quantity reports.

When a command is started using the drawing tools the FDOT Civil 3D Layer symbology is set.

It cannot be stressed enough how important it is to NOT use regular AutoCAD commands to draw or place Entities, they will not have the required Xdata attached and you will have to append appropriate Xdata to them.



**EMX Drawing Tools** These tools provide the user ability to use AutoCAD drawing commands to draw entities while having the selected pay item data attached while also using the correct symbology. The drawing Tools from Left to Right.

- Line
- Polyline
- Polygon
- Rectangle
- Arc
- Circle
- Ellipse
- Ellipse Arc
- Insert Block
- Offset
- Multi Lines

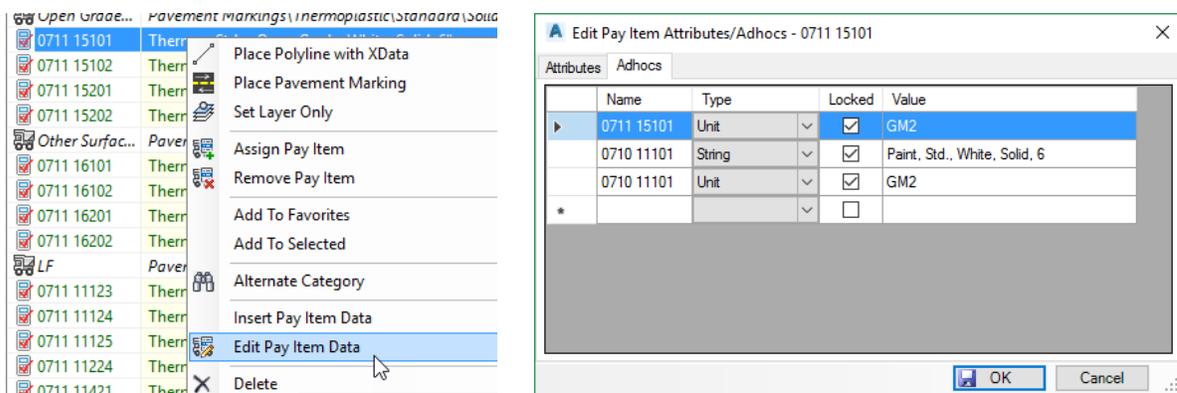
## ADHOC ATTRIBUTES

An Adhoc Attribute is additional information about an entity. Look at it as another property for the AutoCAD entity, i.e. *Layer, Color, Weight, and Style*.

By placing an Adhoc on the line, the designer is giving that line additional information. That information could be a chain name, cross slope, profile name, thickness, etc. It is almost limitless as to what can be associated to an entity with Adhocs. Other down-stream applications use these Adhocs.

Some Adhocs are placed in the background and the designer does not interact with them.

The figure below shows the Adhocs that are associated with an item from **Entity Manager**. These Adhocs are part of the item and are set by default. To open the adhoc editor, select a pay item in the category list and Right Click and select Edit Pay Item Data. Another way to get to the editor is to use the ID button on EMX and select an already placed object, a blue link will appear in the EMX interface you can click to open the editor.



Other Adhocs are interactive meaning the designer must fill in the parameters. An example is placing guardrails. There are adhocs added to the line that must be defined by the designer.

**Note** Adhocs with values displayed in red are locked for modification.

Adhoc Attributes are comprised of three types of information that must be defined:

- **Name** - The *Name* is an identifying term such as the pay item number used that will be picked up by the takeoff manager.
- **Type** - The *Type* identifies the nature of the information, and has various options: Numeric, String, Unit, Quantity, and Remarks.
- **Value** - The *Value* is the actual information used by EMX and takeoff manager picks up, and is determined by the Type. For example, if the Type setting is Numeric then the Value must be a number and will use it as a number.

## DEFINING ADHOCS FOR QUANTITIES

FDOT has set up Adhoc Attributes for many of the Items in the Entity Manager. The functionality of these Adhocs range from setting variables used in the calculation of quantities to adding notes for later retrieval. It is important to note that in many cases specific projects may require modifying these Adhoc values. The creation process of design entities using EMX will assign the default. FDOT recommends the review of these entities to ensure the correct values are set.

To calculate a quantity using adhocs, the Compute Parameters must be set to Adhoc Attributes and adhocs must consist of 1 to 3 set on an entity. As a minimum, an adhoc using the pay item as the name, type set to Unit, and the value set to either the Standard Unit or an equation. If this is the only adhoc set, then takeoff manager will use the item description. If this should be different, a second string adhoc, using the same name as the unit adhoc, can be set with the desired description. A third adhoc type, Quantity, may be used to override the calculated quantity from the design file.

**Note** Place these adhocs on the entities BEFORE running takeoff manager.

For more detailed information please reference the user guide located in the Entity Manager folder or view the quick clip video.

## PLACE BLOCK GROUP



Place Block group is located on the FDOT Ribbon in the Pay Item Tools Panel, this application is used to place single or multiple blocks at once. An example being Reflective pavement markers or a multi part pavement message such as Right Turn Only. The pavement messages complete with Payitem data can be saved as an xml file for future use to save time in constructing them. The application accesses the same database as Entity Manager which means the blocks used are under influence of the payitem data. The Place Block Group tool can be loaded from the FDOT Civil 3D Ribbon on the **Pay Item Tools** panel. This tool can also be loaded from the **Command Line** by typing **blkgrp**.

## BLOCK GROUP TAB

Can save and/or recall patterns

By default the middle block selector is active, toggle the top or bottom check boxes to activate

When toggled on, the placed blocks can be selected as one entity in the file

Upstream and Downstream Spacing is measured from center to center of Blocks

Preview Window(s)

The Red Search button will launch the database window, which will allow you to select the desired block

Offset from Alignment or AutoCAD Entity

Executes the Block Placement

## LOCATION TAB

Begin or End Station can be either selected in the Drawing or Stations typed in

Entity can be either Alignment or AutoCAD Entity

Buffer Distance is measured from the begin point to the first or last block

Spacing is used to designate if the block placed is a single or multiple and distances between

Angle Selection, Default setting is relative, other angles options will be covered in the Lighting section

Default Justification is Centered

When toggled on, the placed blocks can be selected as one entity in the file

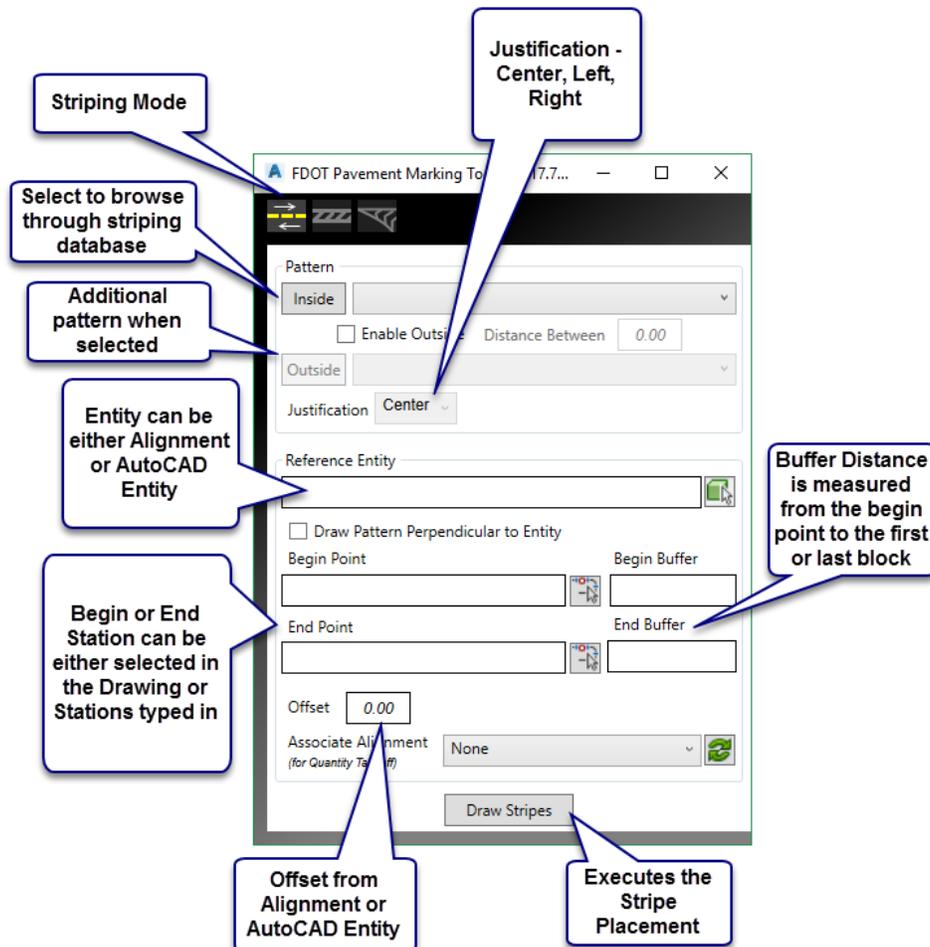
Executes the Block Placement

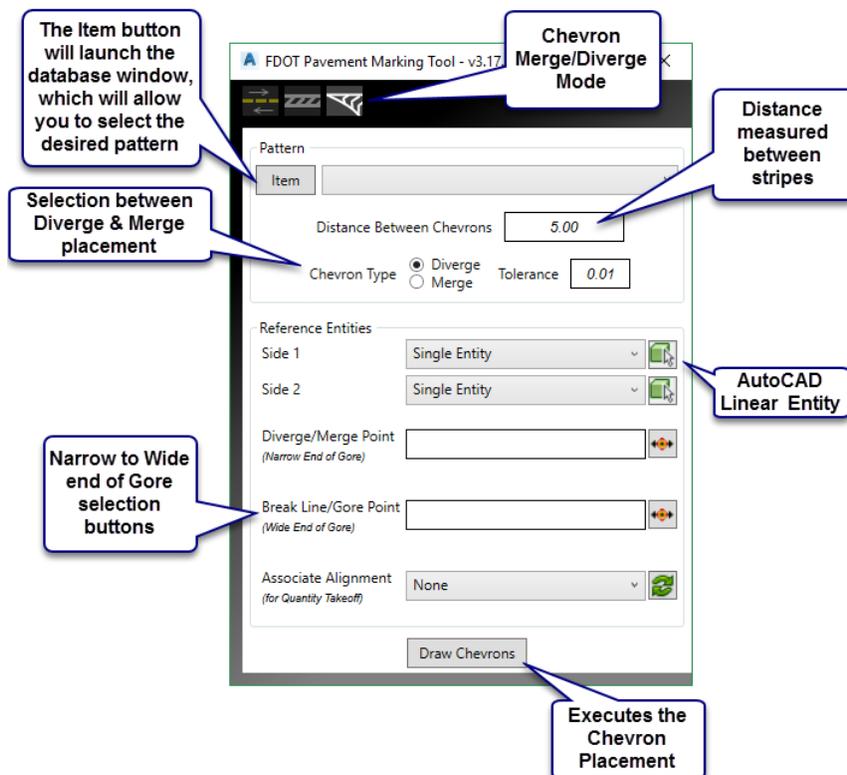
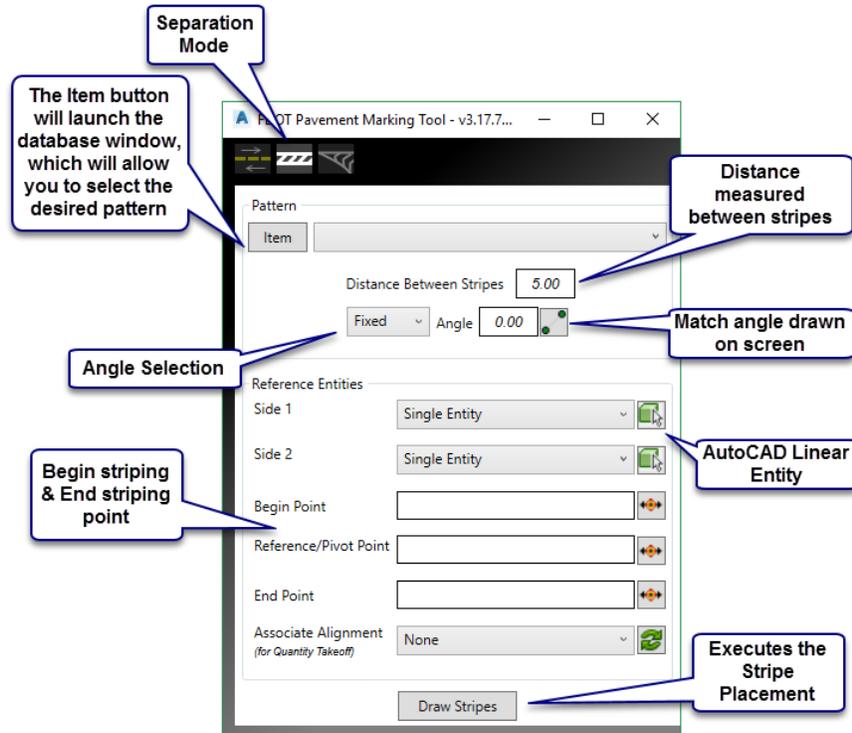
**Note** For detailed information please reference the quick clip video accessible from hovering over the tool and pressing F1.

## PAVEMENT MARKING TOOL

### Pavement Markings

Pavement Marking Tool is located on the FDOT Ribbon in the Pay Item Tools Panel. This application aids the designer in drawing striping for Signing & Pavement Marking plans. The Application uses the Entity Manager database which will allow the user not only to select the correct pattern, but also have the correct pay item data attached. A brief overview of the three modes of the application is below.



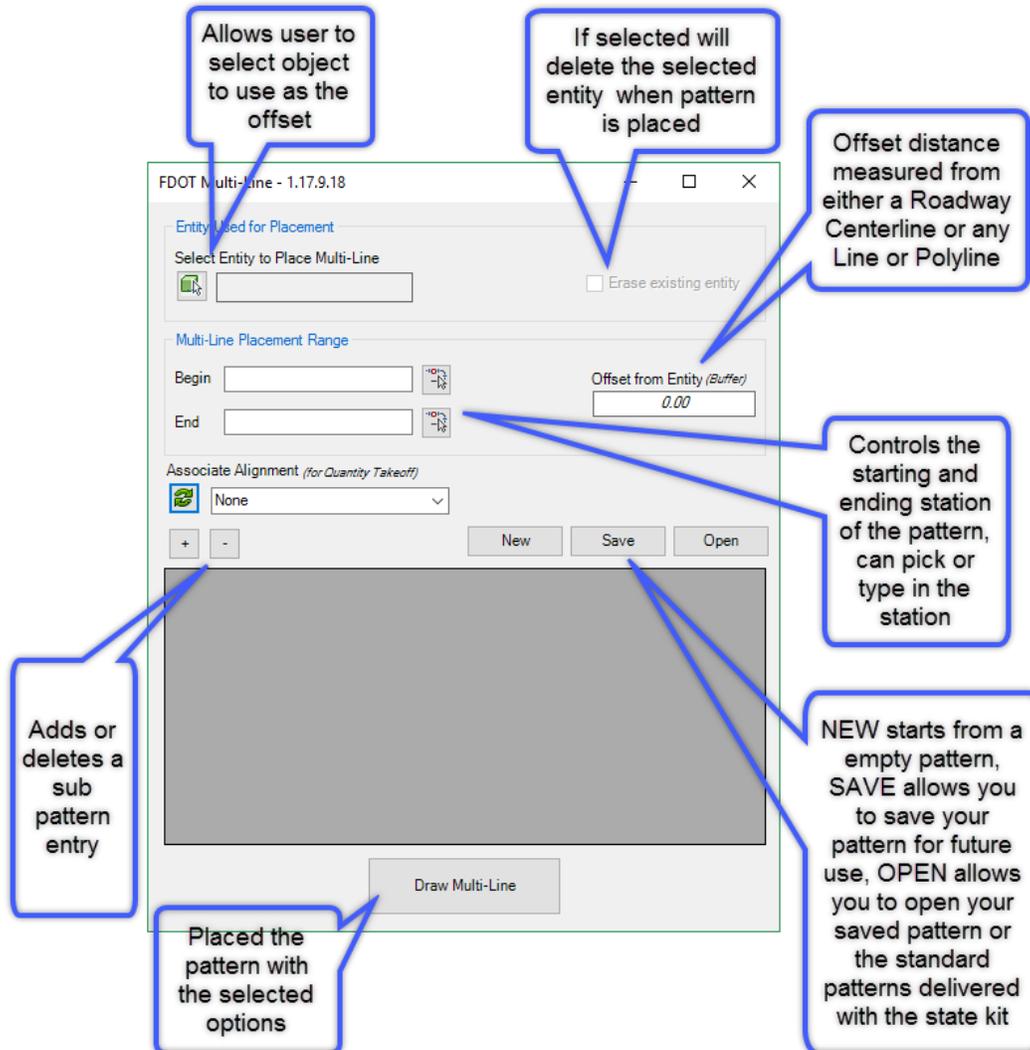


**Note** For detailed information please reference the quick clip video accessible from hovering over the tool and pressing F1.

## FDOT MULTI-LINE TOOL



FDOT Multi-Line Tool is located on the FDOT Ribbon in the Pay Item Tools Panel. This application aids the designer in drawing 2D Line work such as complete roadways including Curb and Gutter, Sidewalks, and striping for Signing & Pavement Marking plans if desired. The Application uses the Entity Manager database which will allow the user not only to select the correct pattern, but also have the correct pay item data attached. A brief overview of the application is below.



# 3 CREATING A KEY SHEET

## OBJECTIVE

The objective of this chapter is to teach the student how to create a Key Sheet that meets the FDOT CADD standards and criteria defined in the Plans Preparation Manual. The Signing and Pavement Marking Key Sheet is used as the example for this chapter. The Signal and Lighting Key Sheet creation process can be found in their respective chapters. This chapter has additional detail on the process.

## GENERAL INFORMATION

The key sheet is the first sheet of a component set of the construction plans. The information shown on the key sheet varies depending on whether the component is the lead for the project. Traffic Plans components in most cases are not the lead and therefore do not require all the information that a lead key sheet requires. Refer to Chapter 3 Volume 2 of the *Plans Preparation Manual* for more information.

The following list contains the requirements for a Key Sheet.

- Use Create File application, which will insert the Key Sheet FDOT border.
- Fill in the Financial Project ID, Federal Funds (if applicable), County Name/Roadway Section Number, & State Road Number via Sheet Set Properties.
- Fill in the Construction Contract Number, Fiscal Year, & Sheet Number.
- Place the project location map & North arrow (Lead Key Sheet Only).
- Label project location on the Florida map block (optional for sub-components).
- List Contract Plans Components (Lead Key Sheet Only).
- Place an Index of Sheets.
- Include “Early Works” Note under Index (if applicable).
- Place the Engineer of Record (EOR) information block & fill out.
- List the Project Manager.
- Place the Governing Standards & Specification Notes (Lead Key Sheet Only).
- Place Design Standards Revision Note (if applicable).
- List Developmental Design Standards Note (if applicable).
- Complete Revision Box (if applicable).
- Complete Key Sheet Revision Box (if applicable).
- Place Goes-with Note for Strung Projects. (Lead Key Sheet Only).

## PROJECT LOCATION MAP

Florida county maps are available for download from the FDOT Surveying & Mapping web page. <http://www.dot.state.fl.us/surveyingandmapping/countymap.shtm>. The county maps are available in PDF file format. Download the pdf file into the appropriate project directory.

Insert the pdf like you would insert a Xref, a view frame is included on the Key Sheet where the map will reside. Unlock the view port and edit the map to the proper position and lock the view port, scale is no longer important so make sure to include enough of the project vicinity as to be clear. Its purpose is to provide enough information to understand easily the project location. Township, Range, and County lines and numbers are shown to make the location clear.

The following list contains the requirements for the Location Map.

- Place the Section, Township and Range line labels.
- Label Begin & End Project Limits (Milepost - correct to three decimal places & Station - to 2 decimal places).
- Label Begin, End Bridge, & Bridge Culvert Limits.
- Label Station Equations.
- Label Project Exception Limits.
- Label Rail Crossings within Construction Limits.

## CREATE TRAFFIC DESIGN KEY SHEET

Create File application will create Key Sheets for all disciplines and place them in the appropriate folder. The advantage of using Civil 3D is there are Sheet Layouts along the bottom of the newly created Key sheet representing every Discipline and variation simply delete the Layouts not needed.

When a Key Sheet is created notice all the layouts on the bottom of the screen, there are options for (FF) Federal Funds or without, with maps or without. To delete the unwanted layouts either right click on them individually and select delete or holding the ctrl key select the layouts and right click to delete a group.



**Note** *No matter what discipline of key sheet you will need it will always be this base file as a starting point. If you were creating a key sheet with a map you would delete all but the ones with a map designation in the layout name. If you needed a map with your signal key sheet you would simply copy and paste the viewport and other map text to the appropriate discipline sheet layout.*

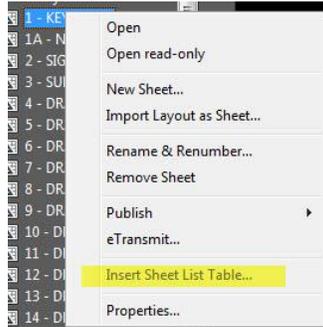
## KEY SHEET WITHOUT MAP

The method to create a *Key Sheet without Map* is identical to creating one with a map, The Key Sheet design file is created using the Create File application. The user would right click on the unwanted layouts and delete them.

Once the Key Sheet file is created and open, the sheet can be filled out with the required information for a sub-component set of plans.

## INDEX OF PLANS

The *Index of Plans* is used to describe what sheets and corresponding sheet numbers are in the set of plans. There is an *Index of Plans* table on each key sheet which the user will type in the sheet numbers and descriptions. There is a tool in Civil 3D called Sheet Set Manager (SSM) that you will use to assemble your set of plans. To aid in the data entry of the Index of plans the user can select their sheet set > right click > Insert Sheet List Table and then copy and paste the data into the Index of Plans.



## COMPONENTS OF CONTRACT PLAN SET

The *Components of Contract Plan Set* is a list of all disciplines that are a component to the lead project. The order of the component plans is:

1. Roadway
2. Signing and Pavement Marking
3. Signalization
4. Intelligent Transportation Systems (ITS)
5. Lighting
6. Landscape
7. Architectural
8. Structures

**Note** *If your project includes Signing and Pavement Markings, Signalization or other component sheets as part of the Roadway Plans and those sheets are numbered consecutively within the Roadway Plans then these are not to be shown as components of the contract plans set.*

The *Component Set* is populated by double clicking on the COMPONENTS OF CONTRACT PLANS SET in the key sheet to activate Mtext mode and fill in the information. As another alternative, you could create a word document and link it to the key sheet. If the word document is updated the link updates the key sheet.



This file is set up for the lead key sheet in the set of plans. If a Signalization Key Sheet without a map is created, this file will not be used because there are no components; hence, there is no *COMPONENTS OF CONTRACT PLANS SET* option on the key sheet.

## STRUNG PROJECTS NOTE

Projects that are independently prepared, but are let in the same construction contract shall have the additional Financial Project IDs noted on the right side of the key sheet below the Plans Prepared By block. This block can be placed from FDOT Menu.

The Strung Projects Note is already placed in the key sheet located on the bottom right.

**NOTE: THIS PROJECT TO BE LET TO CONTRACT WITH FINANCIAL PROJECT ID 000001-1-52-04**

**Note** The FPID numbers in this note are part of a data field; It will automatically fill in the FPID #.

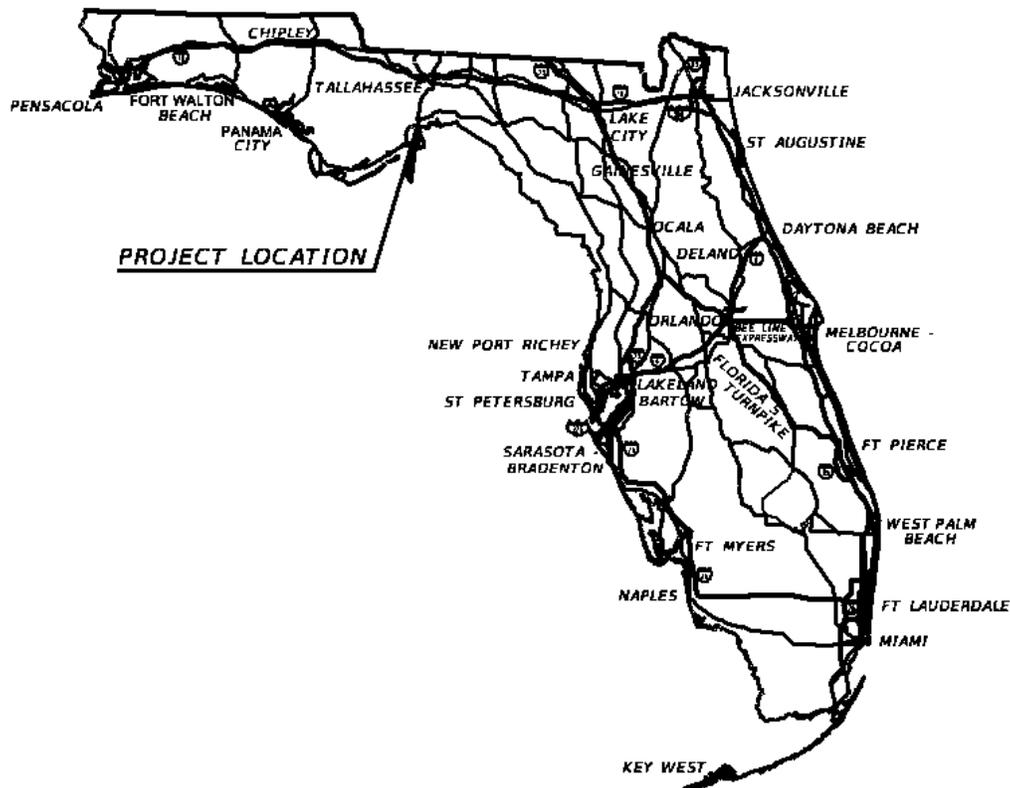
## TOWNSHIP AND RANGE MAP LABEL

The *Township and Range* are used to better describe the area of the project and are found in the Key Sheet file as a block. To insert the block for editing simply type **Insert or (I)** on the command line > Enter and use the Name pulldown to find the correct block.

## FLORIDA MAP

The Florida map is a block within the Key Sheet file that is already placed on every sheet layout in the newly created Key Sheet. The Florida Map block is to be placed in the upper right-hand corner of the key sheet. Refer to the *Plans Preparation Manual Volume II - Chapter 23.2* for more detail.

A leader line and text label pointing at the general location of the project are also required.



### Exercise 3.1 Create Key Sheet for Sub-component (No Map)

In this exercise, the recommended workflow will be used to create a Key Sheet for a sub-component set of plans.

#### ➤ Create the Key Sheet DWG file

1. Open the file DSGNSPxx.dwg located in the *Signing* folder.
2. From the *FDOT Ribbon* select **Create File** application. See earlier exercises if you need a refresher using **Create File**. You will match the dialog below.

Create File (v2018.0.3.9)

Project: C:\e\projects\22049555201 Select Project

Discipline: ROADWAY

File Group: Signing and Pavement Marking Files

File Type:

- Auto Turn Turning Radius Data
- Clip Borders
- General Notes
- Guide Sign Work Sheet and Details
- Key Sheet**
- Layout as a Typical Design or Passing Zone
- Mast Arm Detail for Signing
- Motf File for Plan Sheets
- Motf File for Profile Sheets
- Plan Sheet
- Proposed Design
- Roadway Cross Sections
- Special Details - Miscellaneous
- Special Sign Details for Overhead
- Summary of Pay Item Sheets
- Tabulation of Quantity Sheets

Output File: KEYSSP01.dwg

Output Folder: signing\ Browse

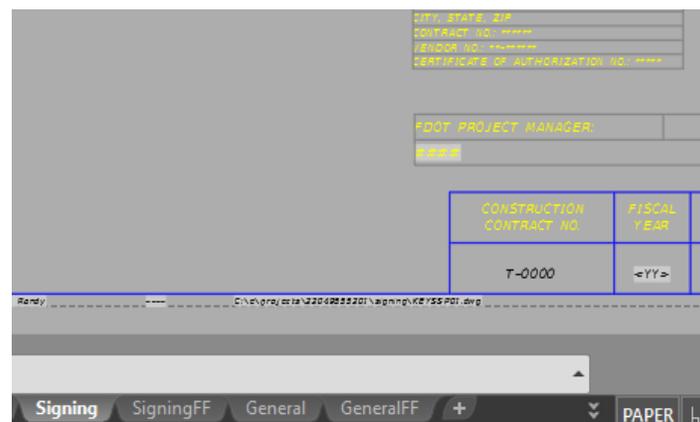
Template: keysht.dwt Browse

Template Path: data/templates/

Coordinate System: FL North

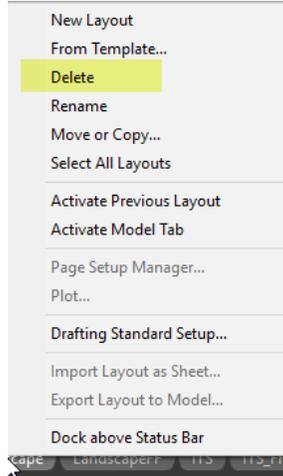
Create/Open File Close

3. Set the *File Group* to **Signing & Pavement Marking Files**.
4. Under *File Type* select **Key Sheet** and click the **Create/Open** button at the bottom of the dialog.
5. Click **Close** to exit the dialog box. The file has been successfully created.
6. Select the *Signing Layout* tab on the bottom which is a non-federally funded key sheet, notice the drawing is in *Paper Space*. Since there is not a location map used, the *scale* is  $1'' = 1''$ .

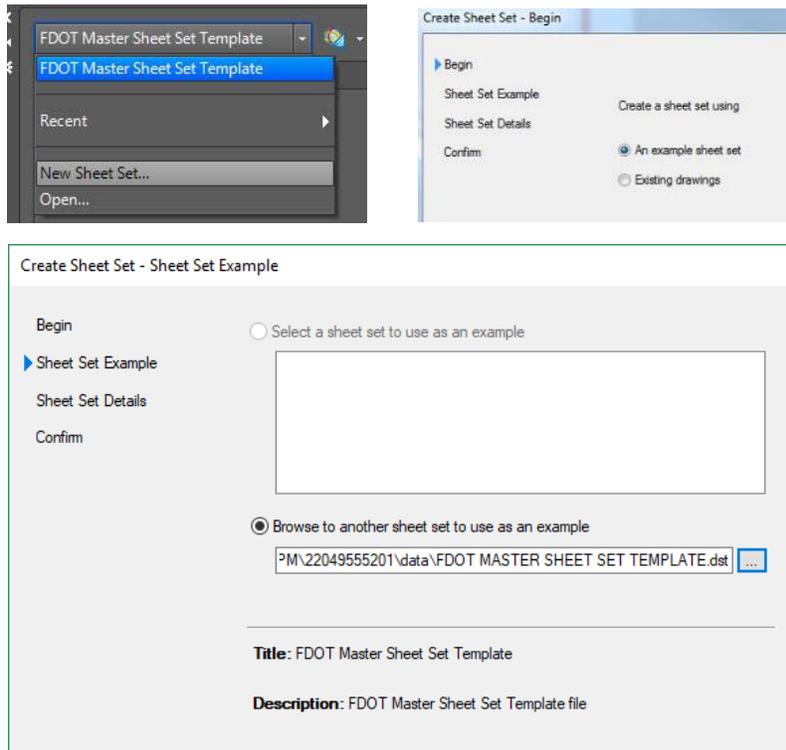


➤ **Using Sheet Set Manager to fill in Information**

1. Since this project IS federally funded, select the **SigningFF** *Layout* tab.
2. Delete all other layouts: Select another layout and hold down the *Control* key, select all *Layout tabs*, except the (SigningFF), right click to open the dropdown menu, and then select **Delete**.

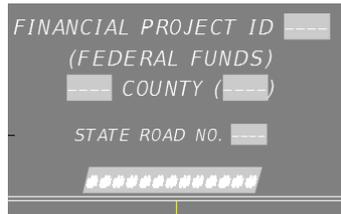


3. Right Click on the *SigningFF* layout and select Rename. Type in **S-1 KEYSHEET**.
4. Save File before continuing.
5. Type **SSM** on the *Command Line* and click **Enter** to launch Sheet Set Manager.
6. Create a **New Sheet Set**. The Create Sheet Set wizard opens. Select an **example sheet set**, click **Next**, browse to the *data folder* in your project and open the **FDOT MASTER SHEET SET TEMPLATE.dst** file to use as the example.





- The fields on the Key Sheet will populate with the data created when you created the project. If they don't automatically, either **Regen** the drawing <OR> close and reopen the file.

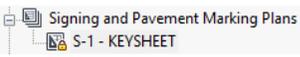


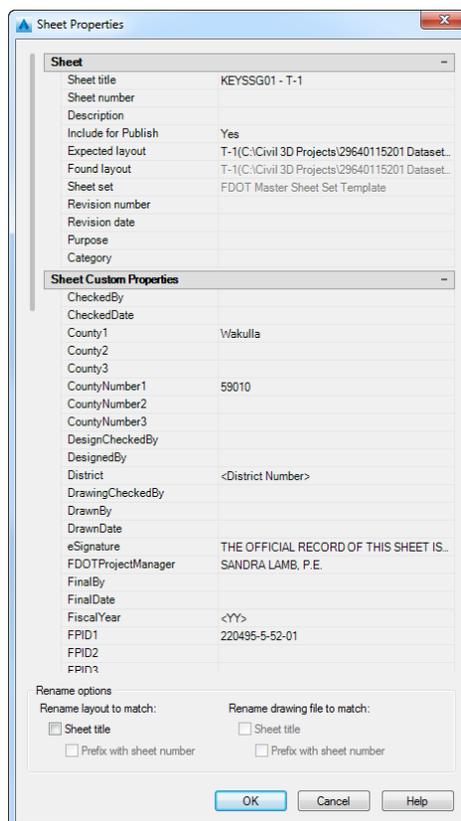
*Before*

FINANCIAL PROJECT ID 220495-5-52-01  
 (FEDERAL FUNDS)  
 WAKULLA COUNTY (59)  
 STATE ROAD NO. 61

## SIGNING AND PAVEMENT MARKING PLANS

*After*

- To add information to the additional fields to propagate to the Key Sheet, right click on the **S-1** in the subset  and select **Properties**.
- The list has a scroll bar on the left side, simply fill in the required data, click **OK** and type in **Regen** on the *command line* for the fields to fill in.



➤ **Edit the Engineer of Record Information**

The Engineer of Record information is already placed in the file as a table with fields that can be edited with the engineer’s information. The lighter gray highlight indicates fields that are automatically filled in either by editing the sheet set properties or by reading the FDOT Master Sheet set.

SIGNING AND PAVEMENT MARKING PLANS
ENGINEER OF RECORD:
<NAME>
P.E. NO.:<LICENSE NUMBER>
COMPANY NAME
ADDRESS
CITY, STATE, ZIP
CONTRACT NO.: *****
VENDOR NO.: **_*****
CERTIFICATE OF AUTHORIZATION NO.: *****

1. If **SSM** is not open, type it on the *command line*, right click on the **S1- KEYSHEET** sheet and select **Properties**.

POR1Name	<Name>
POR2LicenseNumber	<License Number>
POR3Address	<Address>
POR4City	<City>
POR5State	<State>
POR6Zip	<Zip>
POR7Phone	
POR8Email	

2. Scroll down to *POR1Name* and type in **LUKE S. WALKER, P.E.** and for *License number* enter **99991**.
3. To update the *fields*, type **RE** to regen the drawing.
4. To update the rest, click in the block and type in the following information as shown below:

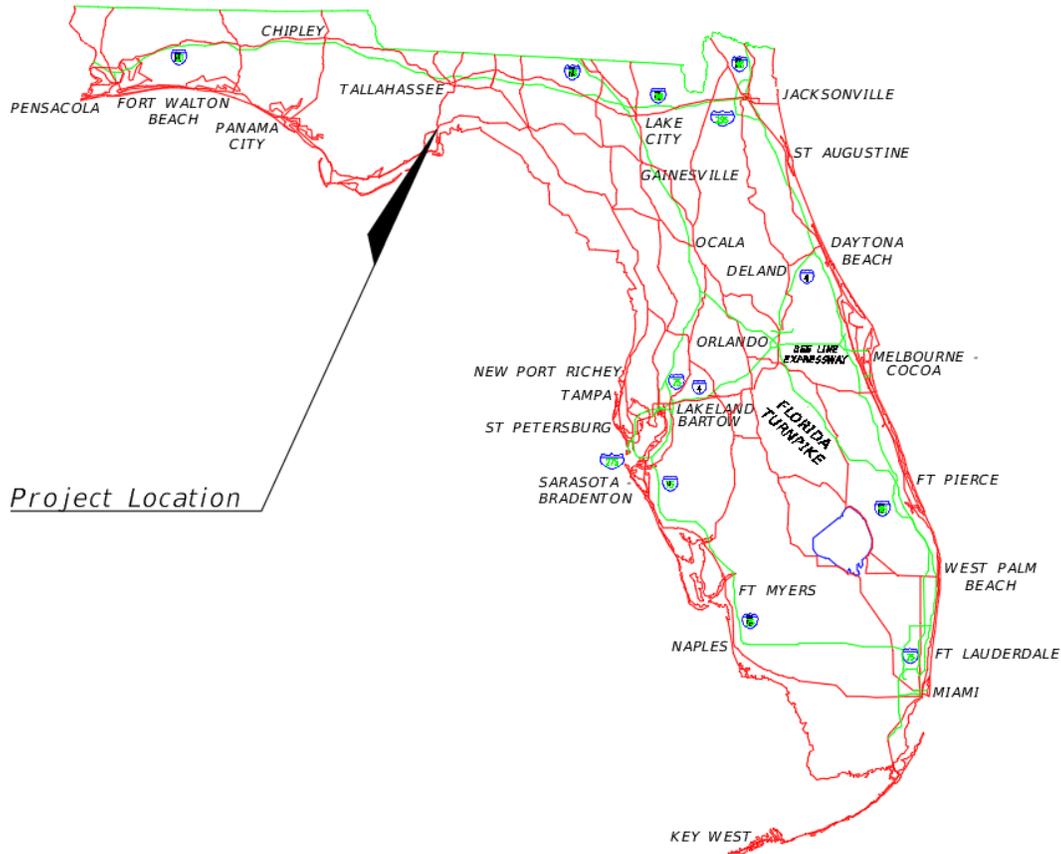
SIGNING AND PAVEMENT MARKING PLANS
ENGINEER OF RECORD:
LUKE S. WALKER
P.E. NO.:99991
ROADWAY ENGINEERS, INC.
123 MAIN STREET
TALLAHASSEE, FL 32301
CONTRACT NO.: C0000
VENDOR NO.: 99-999999
CERTIFICATE OF AUTHORIZATION NO.: 12345

➤ **Label the Project Location on the Florida Map**

The Florida Map is optional for sub-component key sheets, however they are included on all Layout tabs.

The *Project Location* label that goes on a Key Sheet points to the project location on the Florida map. The block is already included and is located on the top right corner of the drawing.

1. Using the AutoCAD **Move** command move the arrow and label to the project location as shown below.



➤ **Editing the Key Sheet Index**

The Sheet Index is already placed in all Layout tabs, like the EOR table click in a block to make it active and manually enter in the sheet numbers and descriptions. The field for the Index Of will automatically update based on the Sheet Set properties. The reason not to use the Sheet Sets index creation tool is due to the limitation of the tool not recognizing a sheet range, it will create an entry for each individual sheet an example being if sheets 3-5 are designated as details it will create an individual entry for sheets 3, 4, & 5 instead of 3-5.

➤ **Additional Key Sheet Information**

As the need arises, other items may be required on the Key Sheet. These include the Contract Plans Revision Note, the Key Sheet Revision Box, Developmental Design Standards list, Applicable DSR's Note, and Early Works Note. These items can be placed as blocks or tables which are already in the drawing file, which are accessible by typing I for insert to see the blocks available.

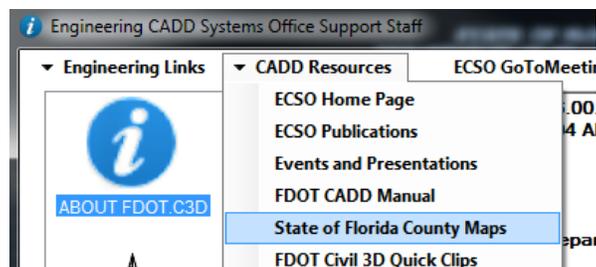
Save and close your file before continuing.

### Exercise 3.2 Creating a Key Sheet with a Location Map (Optional)

This optional exercise is provided to show how to use the PDF maps.

#### ➤ Create the Key Sheet

1. Open **Dsgnsp01.dwg** in the *signing* folder.
2. Refer to previous exercises if needed for detailed steps on using Create File application. From the FDOT Ribbon launch the Create File application and, using the same project as before, create a Key sheet with the following settings:
  - a. *Discipline* – **Roadway**
  - b. *File Group* – **Signing and Pavement Marking Files**
  - c. *File Type* – **Key Sheet**
  - d. *Output File* – **KEYSSPXX**
  - e. *Output Folder* – **Signing\**
  - f. *Template* – **keysht.dwt**
  - g. *Template Path* – **data/templates/**
  - h. *Coordinate System* – **FL North**
3. Click **Create/Open**
4. With the KEYSSP01.dwg open, delete all layouts except **FF w\_Map** 
5. Right click on the remaining *Layout* and rename to **T-1**.
6. On the FDOT Ribbon click on the **Links/Contacts** button
7. From the *CADD Resources* pull down and select **State of Florida County Maps**.

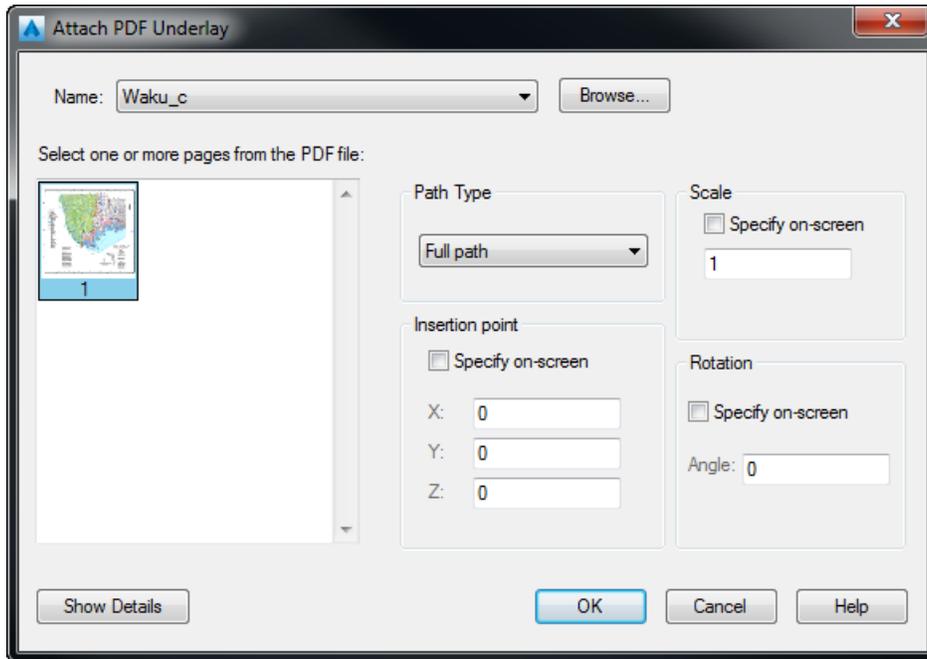


8. Click on the following *pdf* file:

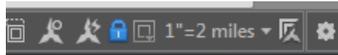
**Waku\_c.pdf**    0.6 MB

9. Save it to your *data* folder in your project.
10. Select the **Model** tab next to your sheet layout.

11. The **Attach PDF Underlay** dialog opens. Your dialog input should look like below. Click **OK**.



12. Since being to scale is no longer required, you can zoom into or out to make the image the desired size. The purpose of this map is to provide a vicinity location.
13. Switch back to the *T-1 Layout* and select the **Blue Viewport**. With the Viewport selected click the **Blue Lock** to *unlock* the view port and double click inside the viewport to make it **active**. Zoom **Extents** so you can see the entire map and manually zoom into the vicinity of the project location. When the project location looks centered click on the **Blue lock** to *lock* the viewport.



**Note** Notice we didn't clip the PDF image. We let the Viewport act as the clipping frame.

14. Double click on the **End and Begin Project** arrows to *edit* the text. Move the arrows by selecting the label and select the blue grip on the arrow end to stretch it to the appropriate location.

**Note** The folder location for the county map may vary at each office. It may also be saved to the discipline directory of the lead component.

# 4 VIEW FRAMES AND LAYOUTS

## OBJECTIVE

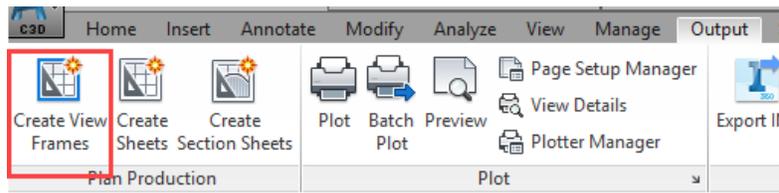
The objective of this chapter is to teach the designer how to create a clip drawing file that will contain View Frames, a data short cut will be created and then referenced into additional design files as needed. The process in this chapter is the same for all disciplines.

## INTRODUCTION

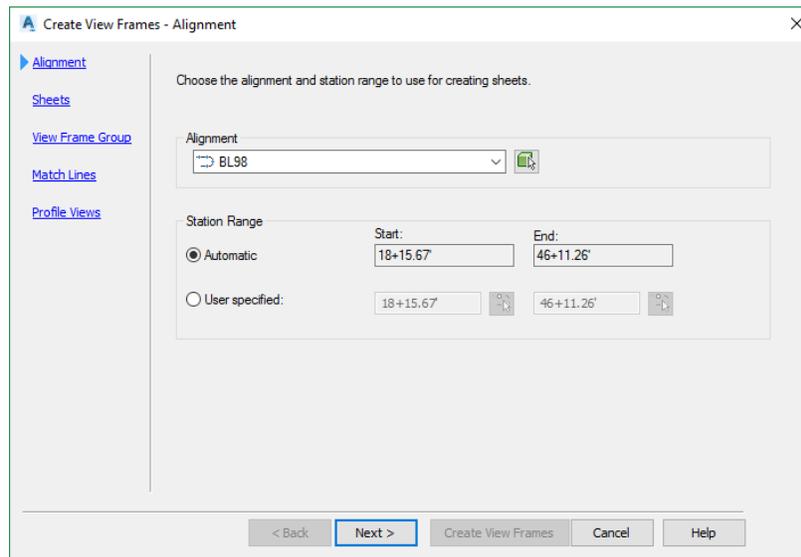
View Frames are, simply, a method to get the information that is in the design file onto a plan sheet. The CADD office recommends using The FDOT AutoCAD Civil 3D State Kit's **Create File** tool to create the appropriate CLIPxx.dwg file which will contain the View frames. The View frames can be Data Referenced into the appropriate design file. The workflow to create view frames are a native Civil 3D process, FDOT has provided default styles that are delivered in the State Kit to assist the designer in matching FDOT Standards.

## THE OUTPUT RIBBON

The Output Ribbon is the location of the Plan Production tools within Civil 3D. On the Plan Production panel are the tools used to Create View Frames, Create Section Sheets, & Create Sheets.



Once you click on Create View Frames a Wizard opens to walk you step by step through the process.as shown below.



The blue links on the left side are pages in the wizard, you can either select the link or the Next button to proceed to the next page. The Pages and their descriptions are below.

- **Alignment** – Use this page to select the Alignment and station range along which the view frames will be created.
- **Sheets** – Use this page to establish the sheet type and the orientation of the view frames along the alignment. A plan production sheet is a layout tab in a drawing file. To create the sheets, Civil 3D references a predefined FDOT drawing template.
- **View Frame Group** – Use this page to define creation parameters for your view frames and the view frame group to which they'll belong. The is divided into two areas: the top for the view frame group and the bottom for the view frames themselves.
- **Match Line** – Use this page to establish settings for match lines. The FDOT State Kit has the correct match line styles set as defaults, if not select a style that begins with FDOT from the pull down.
- **Profile Views** – This page will be disabled if the designer chooses Plan only as a sheet option on the sheets page. If the designer selects Plan and Profile from the sheets page this page will allow the designer to select the correct profile sheet with labels.

Once all options are selected click on **Create View Frames** to finish the process. The drawing will now have view frames placed along the alignments. If you have additional alignments you will need to repeat the process of view frame creation. Once all view frames are created and adjusted if necessary the designer can save the file and create data shortcuts of the View Frame Groups that can be referenced into the design file. It is advantageous to have the View frame groups referenced in the design files as it aids in labeling as you will see later in this chapter.

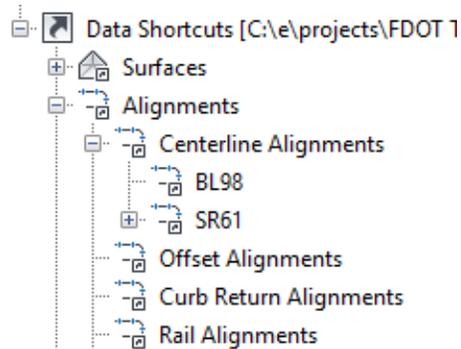
**Note** *If you need additional help on this subject you can access the Autodesk Knowledge help section or refer to the Mastering Civil 3D book series*

### **Exercise 4.1 Creating Clip file and View Frames**

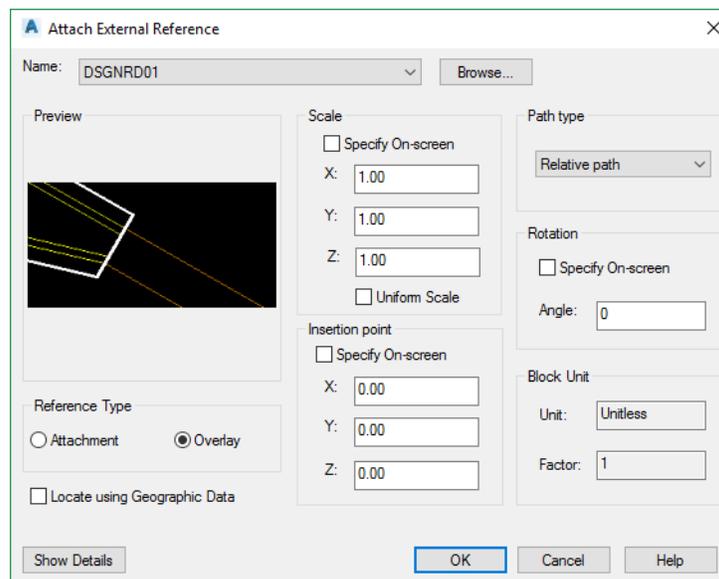
#### **➤ Creating Clip File and References (Part 1)**

In this exercise, the student will go through the process of creating the Clip file, View Frames, and creating Data Shortcuts. For this example, we will create the View Frames for the Signing & Pavement design files.

1. Launch Civil 3D using the FDOT State Kit Icon if not already open.
2. Open the previously created *CLIPSPxx.dwg*, located in your Signing Folder.
3. In toolspace under the data shortcut section, expand the Alignments category.
4. Right Click on the following Alignments and select **Create Reference**.



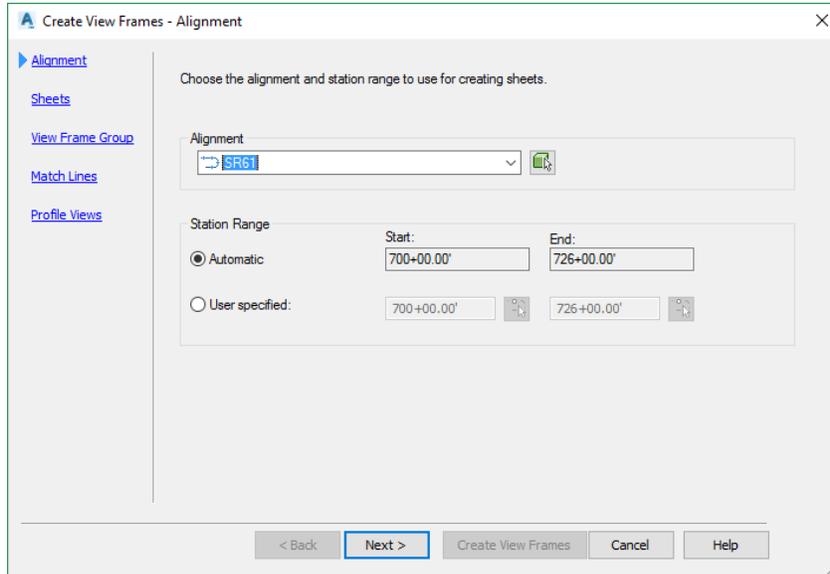
5. Accept the default settings and select **OK**. The drawing file should have two alignments visible now, if not zoom extents to bring them into the drawing space.
6. Type in **XREF** to open the xref manager. Click on the DWG button and browse to the *dsgnrddx.dwg* located in the Roadway folder within the project. We bring this file in as a reference to see the intersection and limits of the design.
7. Make sure the Reference Type is set to Overlay and remaining r options match image below and select **Ok**.
8. Close Xref Manager and Save your file.



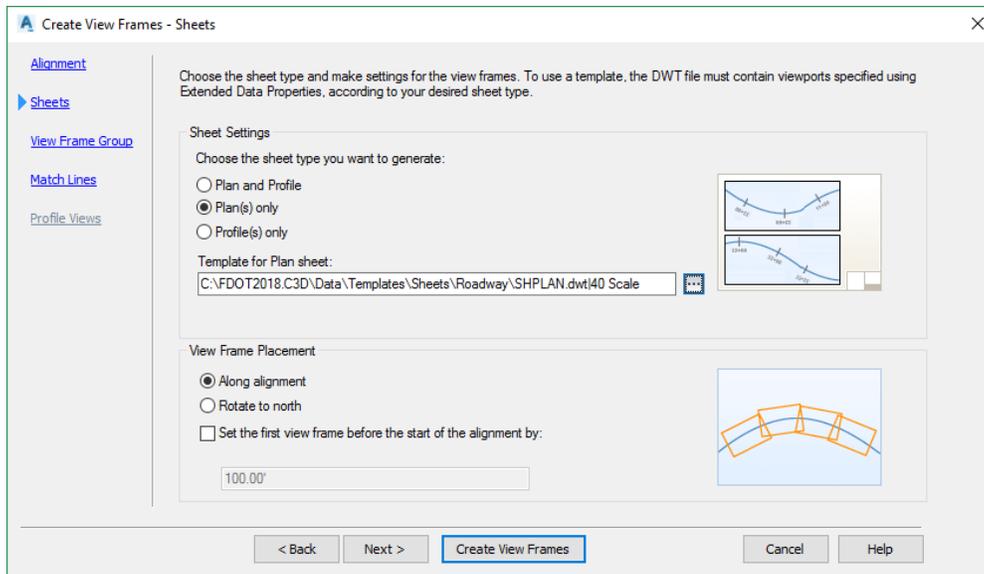
➤ **Creating View Frames along S.R. 61 (Part 2)**

In this part of the exercise the designer will create View Frames along the two different Alignments.

1. Switch to the Output Ribbon and select the **Create View Frames** icon.
2. On the Alignment page change the Alignment to **SR61** and select Next.



3. On the Sheets page, Set the settings to **Plan(s) only** and browse to the *SHPLAN.dwt* template, set scale to **40**, see below. Select Next when ready.



4. On the View Frame Group page give the View Frame Group the following name and make sure your default settings match image below. Press Next when ready.

Specify object creation criteria for the view frame group and view frames.

View Frame Group

Name: Signing & Pavement Marking SR61

Description: Signing & Pavement Marking View Frames along SR 61

View Frame

Layer: ClipBorder\_dp

Name: <[Next Counter]>

Style: FDOT View Frame

Label style: FDOT View Frame-No Plot

Label location: Top left

< Back Next > Create View Frames Cancel Help

5. On the Match Lines page, set the overlap to 125 and match the image below for other settings and select **Create View Frames** to finish the process.

You can choose to insert match lines automatically and define how they are placed.

Insert match lines

Positioning

Snap station value down to the nearest:  Allow additional distance for repositioning (increases view overlap): 125

Match Line

Layer: MatchLines\_dp

Name: MATCHLINE STA - <[Match Line Station]

Style: FDOT MatchLine

Labels

Left label style: FDOT Match Line Left

Right label style: FDOT Match Line Rig

Left label location: Alignment Intersection

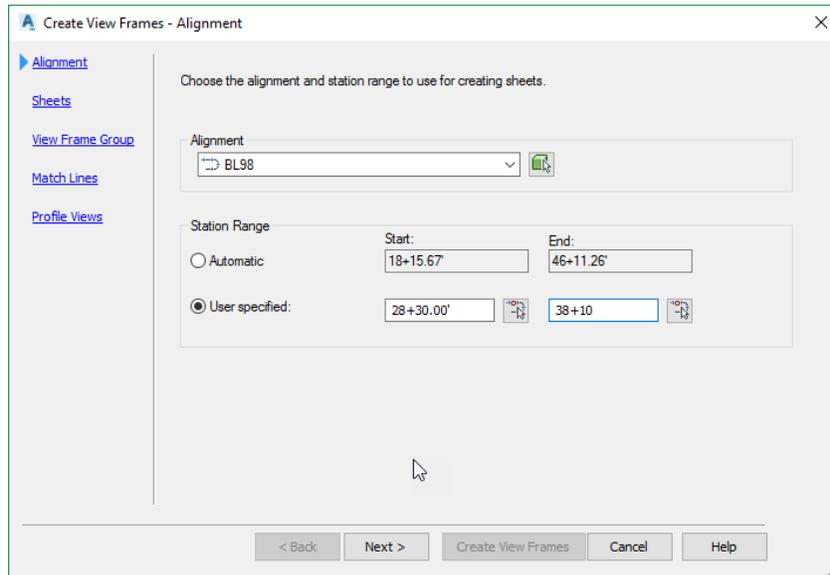
Right label location: Alignment Intersection

< Back Next > Create View Frames Cancel Help

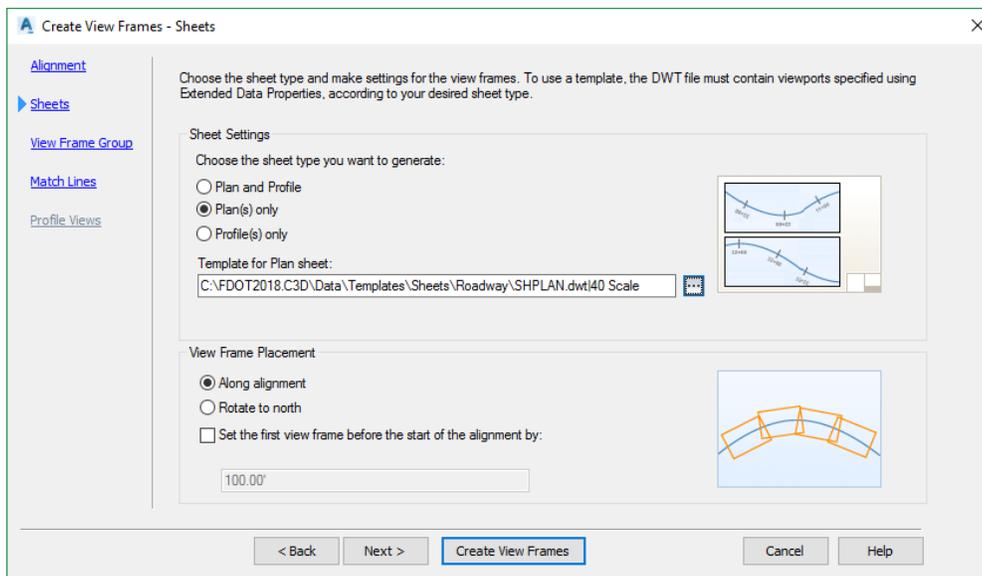
6. The drawing now contains rectangles that represent the View Frames along the SR 61 Alignment.
7. Save your file.

➤ **Creating View Frames along S.R. 98 (Part 3)**

1. Click on the **Create View Frames** icon. We don't need View Frames along the entire length of the alignment, so a few different steps than the previous exercise will be needed.
2. On the Alignment page select the **User Specified** Station Range and type in the Start and End stations as shown below, press **Next** to continue.



3. The Sheets page should match below. Notice the Template for Plan Sheet remembers your previous Sheet and Scale. Press **Next** to continue.



4. The View Frame Group page should match image below. Press **Next** to continue.

**Create View Frames - View Frame Group**

Specify object creation criteria for the view frame group and view frames.

**View Frame Group**

Name: Signing & Pavement Marking BL98

Description: Signing & Pavement Marking along U.S. 98

**View Frame**

Layer: ClipBorder\_dp

Name: <[Next Counter]>

Style: FDOT View Frame

Label style: FDOT View Frame-No Plot

Label location: Top left

< Back   Next >   **Create View Frames**   Cancel   Help

5. On the Match Lines page in the Positioning section, change the overlap to **25**, which will allow the Intersection to be better captured in a sheet layout. When ready press **Create View Frames** when ready to complete the process.

**Create View Frames - Match Lines**

You can choose to insert match lines automatically and define how they are placed.

Insert match lines

**Positioning**

Snap station value down to the nearest:    Allow additional distance for repositioning (increases view overlap):

1   25

**Match Line**

Layer: MatchLines\_dp

Name: INE STA - <[Match Line Station Value]>

Style: FDOT MatchLine

**Labels**

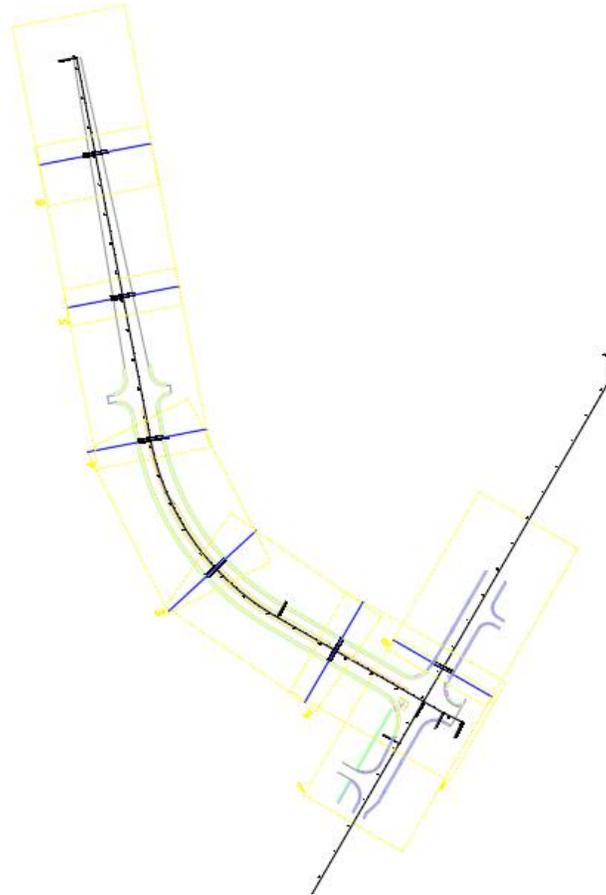
Left label style: FDOT Match Line Left   Right label style: FDOT Match Line Rig

Left label location: Alignment Intersection   Right label location: Alignment Intersection

< Back   Next >   **Create View Frames**   Cancel   Help

6. Your Drawing should now look like image below.

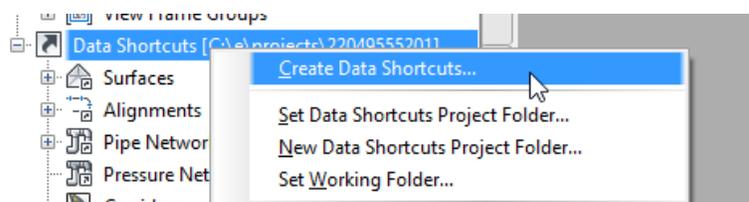
7. Save your File.



#### ➤ **Creating Data Shortcuts (Part 4)**

The final step in the View Frame process is to create a data shortcut of the View Frame Group, which can then be referenced in the *dsgnspxx.dwg* design file. Continue working in the *clipspxx.dwg*

1. Save the drawing file
2. Right Click on the Data Shortcuts in toolspace. Select **Create Data Shortcuts**



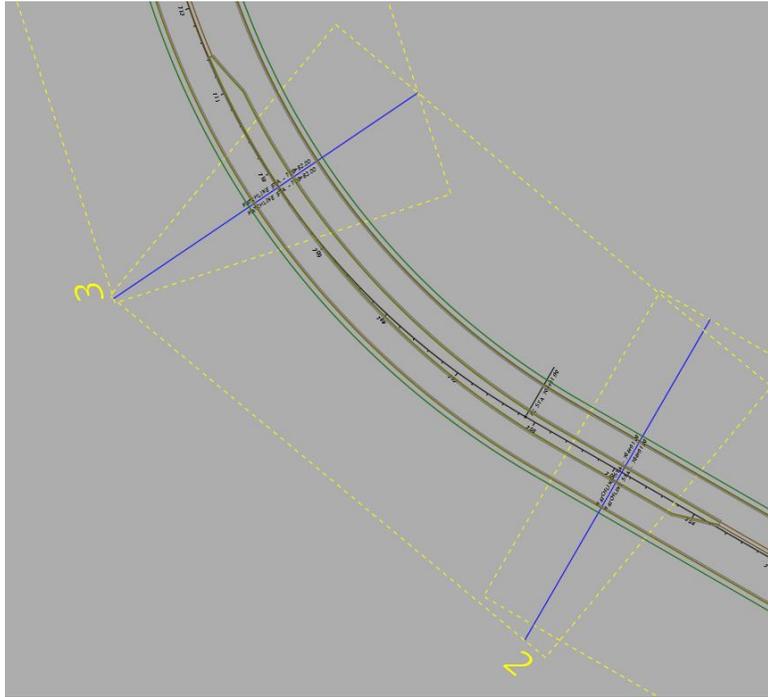
3. The Create Data Shortcut dialog opens and all available civil 3d objects that can be data shortcut are visible.
4. Select the **View Frame Groups** and select **OK**.

**Note** *The advantage of referencing the view frames in the design files for labeling is to use the **2 Point Twist** command on the FDOT Ribbon to rotate the sheet to resemble for printing. FDOT has label styles that are set to be rotated to view the text when placed is rotated correctly. To practice this the next exercise will cover the steps.*

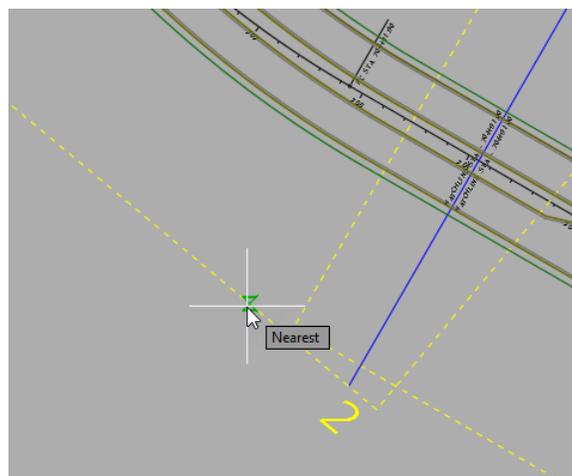
### **Exercise 4.2 Using 2 Point Twist to Rotate View Frames**

If you are new to using Civil 3D, just remember that a view frame is the same as looking at the finished sheet without the border. A future step when you are ready to print is to select the Create Sheets icon from the Output tab. This will allow you to merge the Sheet Border to the View Frame.

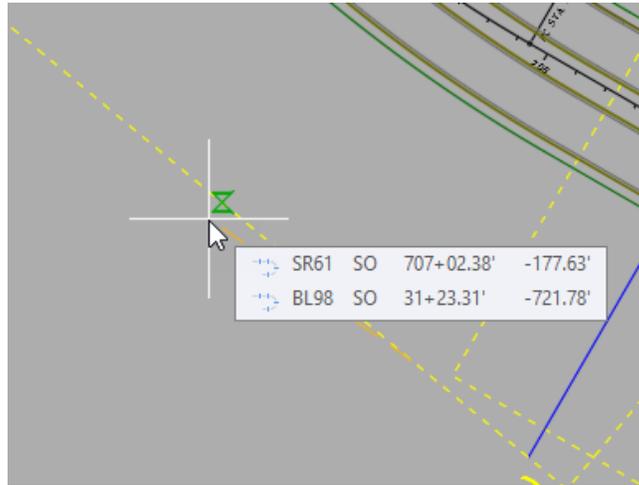
1. Continue in the *clipspxx.dwg* file.
2. Zoom into the area of View Frame 2.



3. On the FDOT Ribbon select the **2 Point Twist** command.
4. The **nearest** osnap is already active, click anywhere on the yellow border.



5. For the second click select somewhere to the left of the first click.



6. Notice how the sheet is rotated properly as it will be printed. It is recommended that you label your file utilizing this technique. You can continue using the 2-point twist as you work your way down the design. When complete click on the **Untwist View** to restore the file to its original rotation.
7. Click on **Untwist View** to return the drawing to its native rotation.
8. Save and Close your file.

**Note** *Keep in mind that when the drawing is restored to its original rotation in the model tab the text and labels will rotate also. Don't worry because the text is still rotated correctly and will still print correctly, this is due to the rotation setting in the label style set to rotate to view.*

# 5 PAVEMENT MARKING TOOLS

## OBJECTIVE

The objective of this chapter is to create Proposed Pavement Marking Features using a combination of the Pavement Markings tool and Entity Manager within The FDOT AutoCAD Civil 3D State Kit. For reference to complete additional workshop tasks you can Xref as an overlay the completed *DSGNP01\_Complete.dwg*.

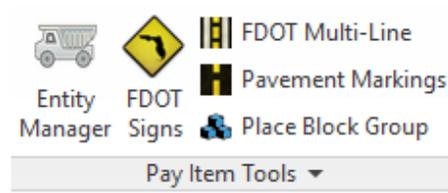
## INTRODUCTION

This chapter demonstrates several applications that help to create a Pavement Marking set of plans:

- **Entity Manager-** An application within The FDOT AutoCAD Civil 3D State Kit used to help designers draw entities, set symbology, and compute quantities. The FDOT CADD office provides a database set up with the correct symbology, blocks, formulas and pay items needed to meet the FDOT standards.
- **Pavement Markings tool-** An application within the State Kit that is used to draw pavement markings in accordance with the FDOT (CADD) standards.
- **Place Block Group-** An application within the State Kit that places multiple blocks along entities or alignments. It uses Entity Manager to insure the placement of blocks, arrows and messages is with the correct symbology and pay item information for calculations.

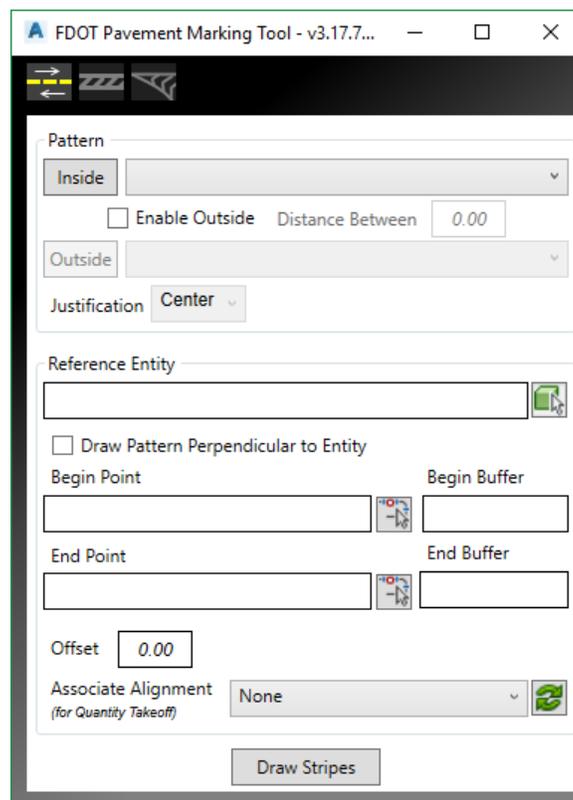
Refer to in the Plans Preparation Manual, Volume 2, Chapter 23 for more detail on developing the Signing and Marking set of plans. Refer to the Design Standards indexes and the *Plans Preparation Manual*, Volume I, chapter 7 for design criteria.

## DRAWING PAVEMENT MARKINGS



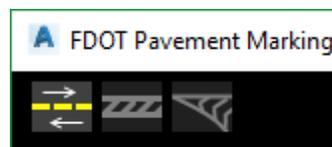
Many of the Traffic Plan items are simple 2d blocks or line styles drawn and quantified using the Takeoff Manager. The Pavement Striping component of the State Kit facilitates the production of pavement striping plans. To draw pavement markings with the tool, select the Pavement Markings icon on the Pay Item Tools panel on the FDOT Ribbon.

**Note** As a best practice, start the pavement marking design by placing one of the solid edge lines and build from that. This will give the designer a solid starting point to create the entire remaining parallel pavement marking lines.

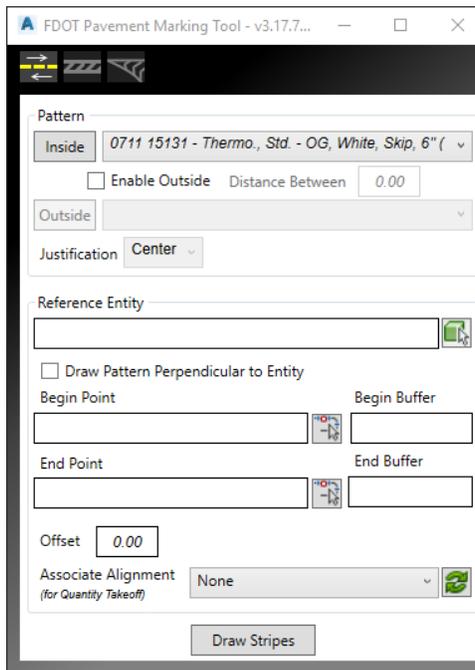


As discussed earlier there are three modes in the Pavement Markings tool to aid in the design and layout of pavement markings. *Striping, Separator, & Merge/Diverge Chevrons.*

### DRAW STRIPING



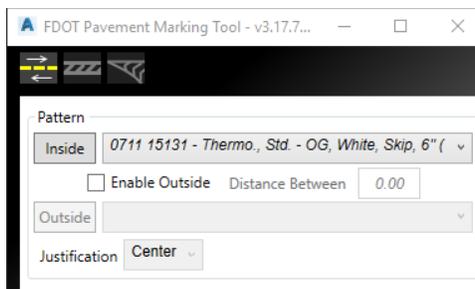
The Pavement Markings tool draws all solid or skip pavement markings. The striping tool can use an Alignment, Line, & Polyline linear entities for length and offsets. The AutoCAD entities can be in the current source file or in a reference file.



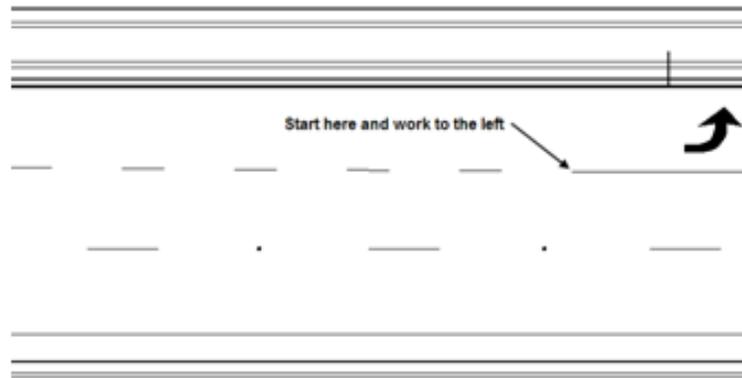
The Pavement Markings tool has two parts, Pattern and Reference Entity, with several preferences for you to set in each of the two parts. The following pages detail the Pavement Markings tool.

*PATTERN – SINGLE STRIPE OR DOUBLE STRIPE*

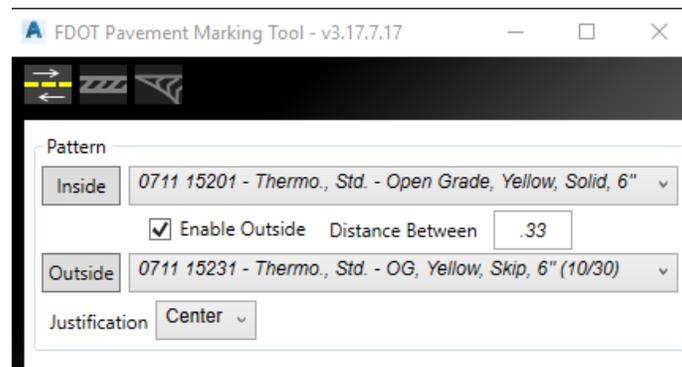
There is an Inside pattern which by default is active draws a single stripe, if you toggle on Enable Outside a second stripe will be drawn along with the Inside pattern. The designer can enter in the distance between stripe patterns, the distance is measured from the center as a default, however the justification can be changed. There is a history list that the designer can quickly change patterns, the history list contains the last 10 patterns the designer has selected, to access the history list click on the pulldown button in the pattern name.



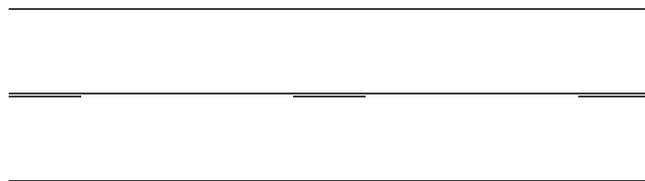
**Note** *To improve accuracy of skip patterns there are two types of Linestyles in the state kit. One Line style starts on a Skip and one starts on a Solid Stripe.*



*Enable Outside (Double Stripe)* allows for four possible configurations set up with a combination of Solid/Solid, Skip/Skip, Solid/Skip and Skip/Solid markings. The figure shows the *Double Stripe* Pattern set up to draw a 6" solid yellow line on the Inside and a 6" 10/30 Skip line on the Outside with a 0.33' or 4" Distance Between Stripes.



This is a typical set up for a two-lane roadway with a passing zone on one side, as depicted in the figure below.



- **Distance Between Stripes** – It is the space between two striping lines. This distance is expressed in terms of master units. There will be times when the designer will need to use a larger distance between lines than what the design standards call for. Example, if the signing and marking plans are at 100 scale a 4" separation between two 6" lines is not enough, the two lines appear like one thick line.
- **Justification** – Justification is used to measure the distance from inside and outside patterns, Center splits the distance between patterns and adds on both sides, Left and Right designates either pattern as the entity to offset from.

### REFERENCE ENTITY

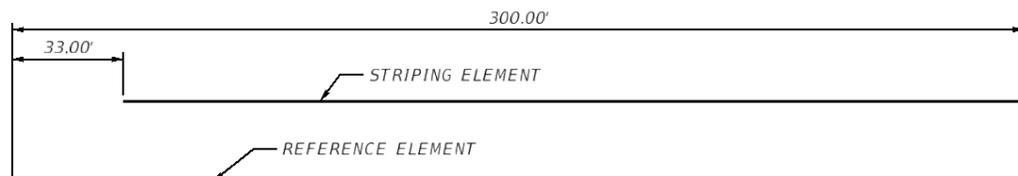
The Pavement Markings tool uses Reference Entities to create/draw parallel lines and arcs.

- **Reference Type** – Options to select the type of reference entity to use, **Alignment** or **Line work**.
  - **Alignment** – This can be any Civil 3D Alignment in the drawing. The designer selects the Green selection box to pick the reference entity in the drawing file. The stationing begins at 0+00 and the total length of the entity selected determines the end.
  - **Line Work** – AutoCAD Line work can be selected, example being Lines, Polylines, Arcs, & Line work in Xref files. Use the Green selection box to select. The stationing begins at 0+00 and the total length of the entity selected determines the end.

**Draw Pattern Perpendicular to Entity** – Draws selected striping pattern at a 90-degree angle from reference entity.

- **Begin Point** – Identifies the beginning of the striping, this field will start at a value of 0+00 or the value of the length of the line selected depending on how the entity was created. Enter a station value in the field to start the striping at a point other than the beginning of the Alignment.

The figure below shows the reference line used which is 300' long along with the new line created 33' to the right of the beginning point. The reference line is, a reference, it does not have to control the length of the new striping line created.



- **End Point** – Identifies the end of the striping. If using a linear entity, this field will start at a value equal to the length of the line or 0.00 depending on how the entity was created. Enter a value in the field to end the striping at a point other than the end of the line. If Station is used the end station of the Alignment will the value.

The figure shows the Chain option. Notice the Begin and End values are populated with the beginning and ending station values of the selected chain.

- **Offset** – This is the offset from the selected entity, either the **Alignment** or **Linear** entity, to the new striping line. It is not necessary to use plus or minus values, simply graphically indicate the side by moving the cursor to the left or right.
- **Draw Stripes** – This attaches the new striping to the cursor at the defined parameters. Just move the striping to the desired side of the reference entity to place the new striping in the design file. The new striping entities are placed as a polyline for easy editing or deletion.

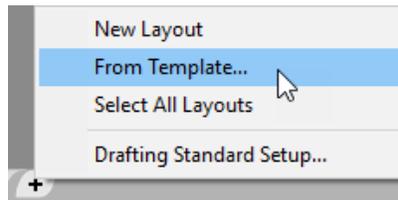
### **Exercise 5.1 Create Signing & Pavement Markings General Notes Sheet**

In this exercise, the student will create the General Notes design file, place the standard plan sheet border and place general notes on the sheet.

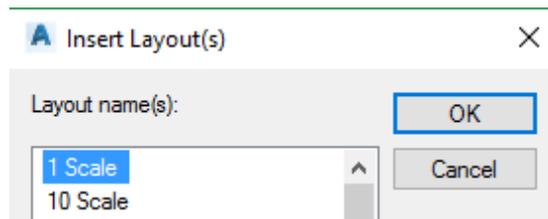
1. Open the FDOT State Kit if not already open.
1. From the FDOT Ribbon, select **Create File** and make the following selections.

2. Select **Create/Open File** which will open the **GNNTSP01.dwg** and save it in the *signing* folder.

3. Select the **Close** button to exit the Create File Application.
4. Right click on the + next to the sheet layouts on the bottom left and select **From Template**.



5. Double click on the **Sheets** folder, then the **Roadway** folder, select the **SHPLAN.dwt**. and press open.
6. Select the **1 Scale** and select **OK**.

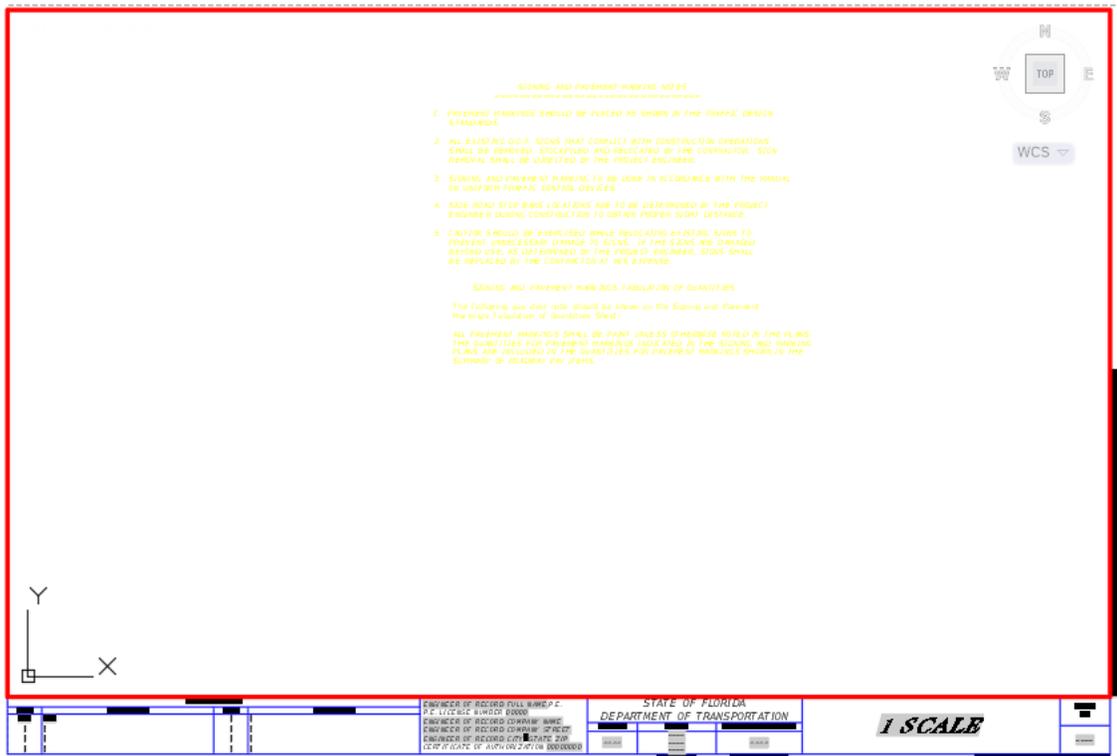


7. A new sheet layout is now visible named **1 Scale**.
8. Right Click on the Layout name and select **Rename**. Type in **S-3 GENERAL NOTES**.
9. Click in the layout viewport and delete the North Arrow.
10. Click on the **Annotate** Ribbon.



11. Click on the top half of the Add Labels button.
12. From the **Note Label Style** pull down, select the **Sheet Notes-Signing and Pavement Marking** style.
13. Click **Add**.
14. Left click in the sheet border to place the notes.
15. Click the **Close** button to exit the add label dialog.

16. Save the file. You can do the next exercise with the current file open or closed.



### Exercise 5.2 Adding Sheet Layout to FDOT Traffic Plans Sheet Set

In this exercise, the student will add the General Notes Layout to the previously created FDOT Traffic Plans Sheet Set and fill in information that will propagate to the fields.

1. Continuing with the State Kit open type in **SSM** if it is not already open.
2. Right Click on the *Signing and Pavement Marking Plans* and select **Import Layout as Sheet**.
3. Browse to the *GNNTSP01.dwg* file and select open.
4. Select the **S-3 GENERAL NOTES** layout and select **Import Checked**.
5. Right Click on the General Notes Layout and select **Properties**.
6. Make the following changes and select **OK**.

Sheet	
Sheet title	GENERAL NOTES
Sheet number	S-3
Description	
Include for Publish	Yes
Expected layout	S-3 GENERAL NOTES(C:\e\projects\FDOT Traffic Plans\FDO...
Found layout	S-3 GENERAL NOTES(C:\e\projects\FDOT Traffic Plans\FDO...
Sheet set	FDOT Traffic Plans
Revision number	

7. If the file is open type RE for regen to update fields, or if not open the next time it is open the fields will update as shown below.



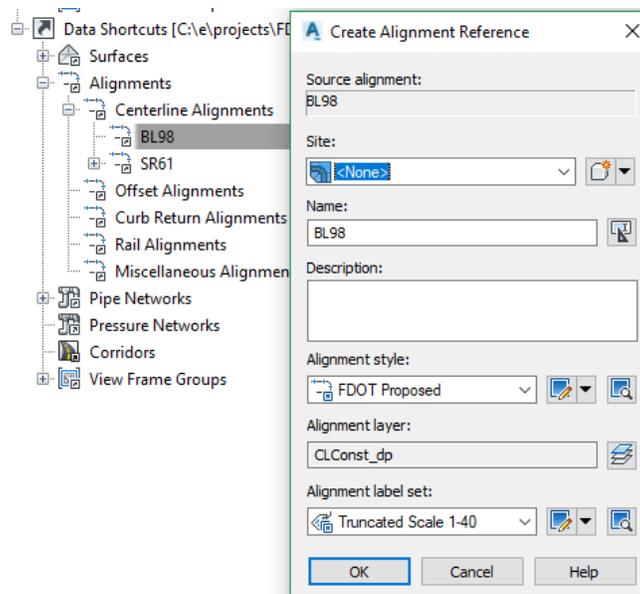
## STRAIN POLE SCHEDULE

The Sheet Creating the *Strain Pole Schedule* sheet is a little different in Civil 3D, since you can have multiple sheet layouts in one drawing it is easier to copy the **Standard Mast Arm Tabulation** Layout the same way you would copy a tab in Excel. And using what you have already learned place the Tabulation/Summary Boxes that would be linked to the Excel spread sheet with the Strain Pole Schedule data. After the data is link to the Tabulation/Summary Boxes, the designer would place the Strain Pole Schedule Details & Notes block (SHStrainPoleSchedule) on the Strain Pole Schedule sheet. Finally, the designer would update the Strain Pole Schedule sheet layout with Sheet Set Manager.

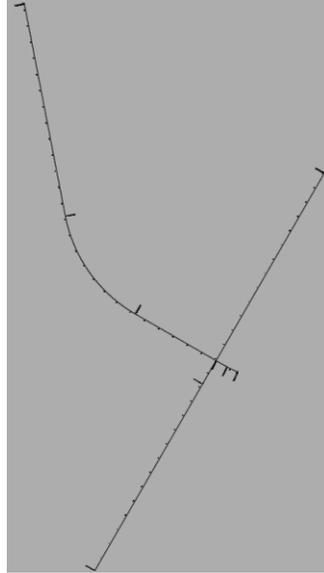
### Exercise 5.3 Setting up the Design File with References

In a Previous exercise, you created the *dsgnsp01.dwg* design file, now we will data reference in objects and Xref in additional drawing files before we start with placing striping patterns in the design file.

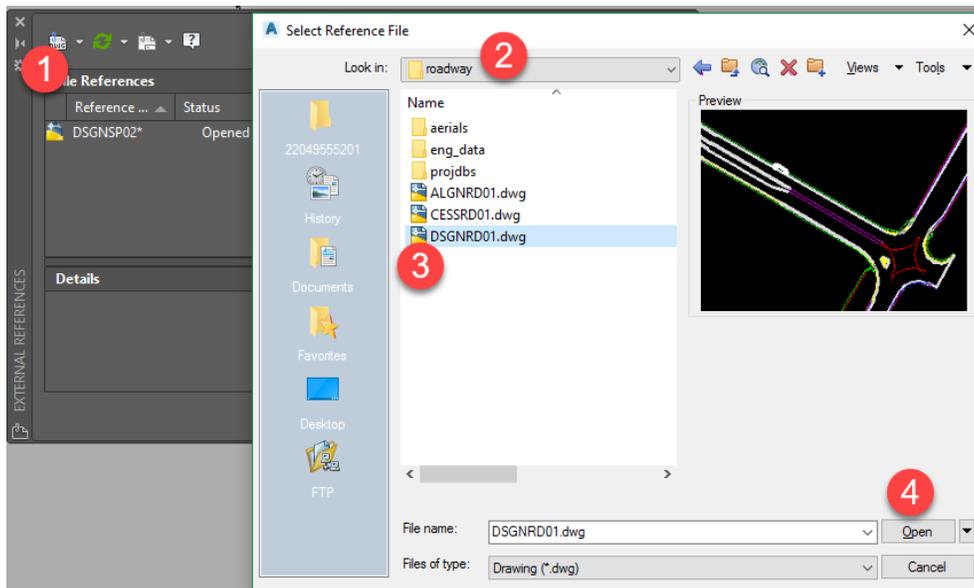
1. Open the **dsgnsp01.dwg** located in the C:\e\projects\22049555201\signing\ directory.
2. In the *Data Shortcuts* section, expand the *Alignments* folder, expand *Centerline Alignment*, select *BL98*, right click to open the popup menu and select **Create Reference**. The Create Alignment Reference dialog opens with default FDOT settings already filled in as shown below.



3. Click **OK**.
4. Repeat steps 2 & 3 to create an *Alignment Reference* for **SR61**. Your drawing should match image below at this point. Zoom Extents to see the Alignments.

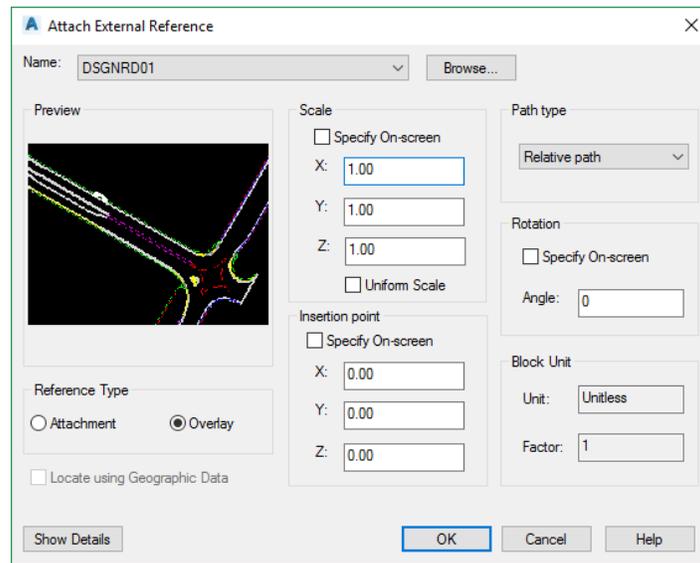


5. To references in a drawing file, on the *command line* type in **Xref** to bring up the XREF Manager.
6. Click on the **DWG** icon located in the top left corner, browse to the *Roadway* folder of your project, select the **dsgnrd01.dwg** and click **Open**.



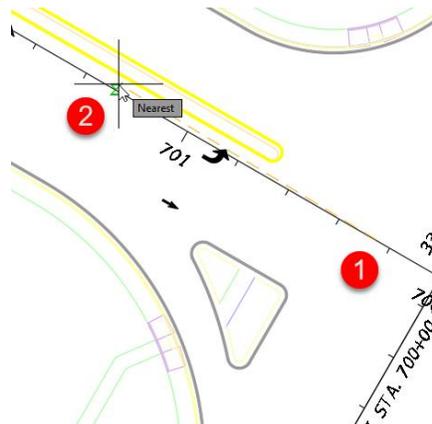
7. The Attach External Reference dialog opens. Match options as shown below, make sure to change the *Reference Type* to **Overlay**. Click **OK**.

8. Close the Xref Manager and Save your File.



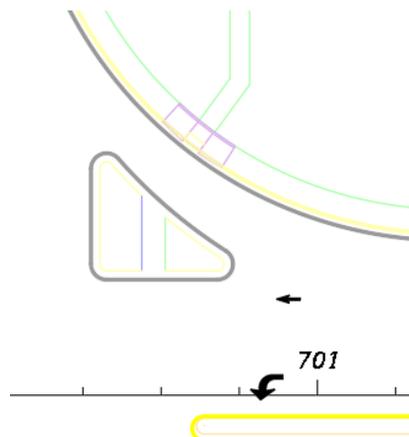
9. We need to twist the view to mimic how our final sheets will look. On the FDOT Ribbon select **2 Point Twist** from the *Tools* panel. Select the **Alignment** by clicking in the order as shown below.

10. By default, the **Nearest** osnap is turned on for this tool.



11. Zoom into the intersection, your drawing should match as shown below.

12. Save and Close your file or continue to next exercise.



### Exercise 5.4 Create a Project Specific database

In this exercise, Entity Manager will be used to create a project specific database. A project specific database gives the designer the capability to modify database items for their specific project, if necessary, providing flexibility and advantages in production, multi-designer/discipline usage and project to project portability for common District/job related items.

1. Open Civil 3D using the **FDOT C3D Logo Shortcut** located on your desktop.
2. Open the file *C:\e\projects\22049555201\signing\Dsgnsp01.dwg*. (This is the main design file for all Signing and Pavement Marking entities.)
3. From the *FDOT Ribbon*, select the **Entity Manager** icon. If this your first time launching EMX it will ask if you want to the details as it builds a project specific file, click **No** to save time.



When the file is ready a **Save As** dialog box opens. Browse to the *Symb* folder in your project, rename the file as **22049555201.xml** and click **OK**.

**Note** You can also click in the Database location bar on the top of EMX to browse to another project location or to open this payitem file.

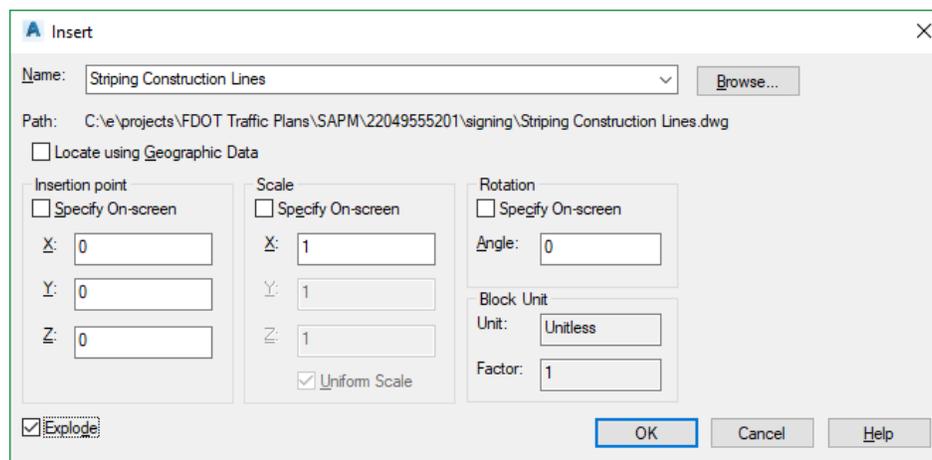
### Exercise 5.5 Draw Crosswalk Markings

#### ➤ Placing Special Emphasis Crosswalk Markings (Part 1)

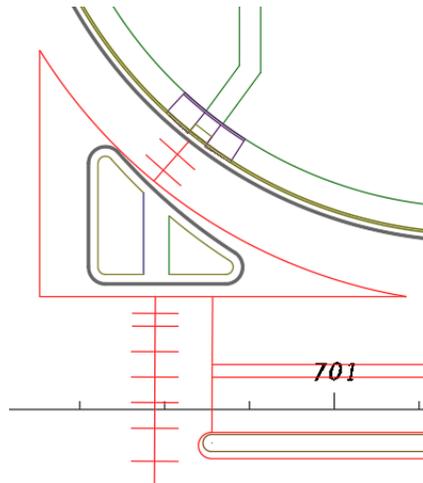
In this exercise, use Entity Manager to draw the solid pavement markings for the Special Emphasis Crosswalks. The process will start by inserting a block with construction lines into the design file and then placing the outside edge lines. Use Entity Manager and other AutoCAD tools to place the longitudinal lines. This exercise utilizes Thermoplastic items as well.

**Note** For the expediency of the class, with the use of AutoCAD tools, the construction lines are drawn for all Pavement Marking for the new NW corner of the intersection with the curb island.

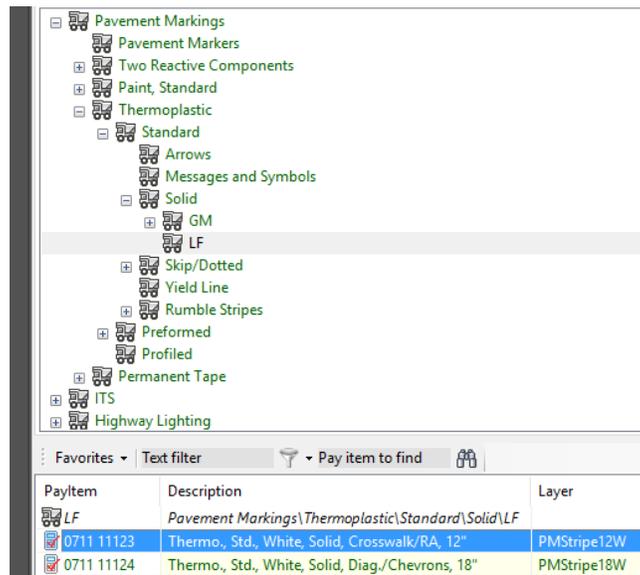
1. Continuing in the *Dsgnsp01.dwg*, insert the block drawing file **Striping Construction Lines.dwg** from the *Signing* folder. The Construction lines were created in the Miscellaneous layer and should be red.



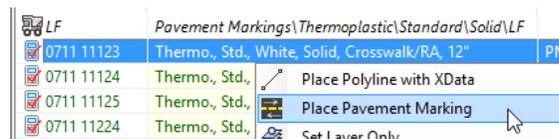
- Zoom into the island on the left side of the **SR61 Alignment** between *Stations 700+00.00* and *701+00.00*.



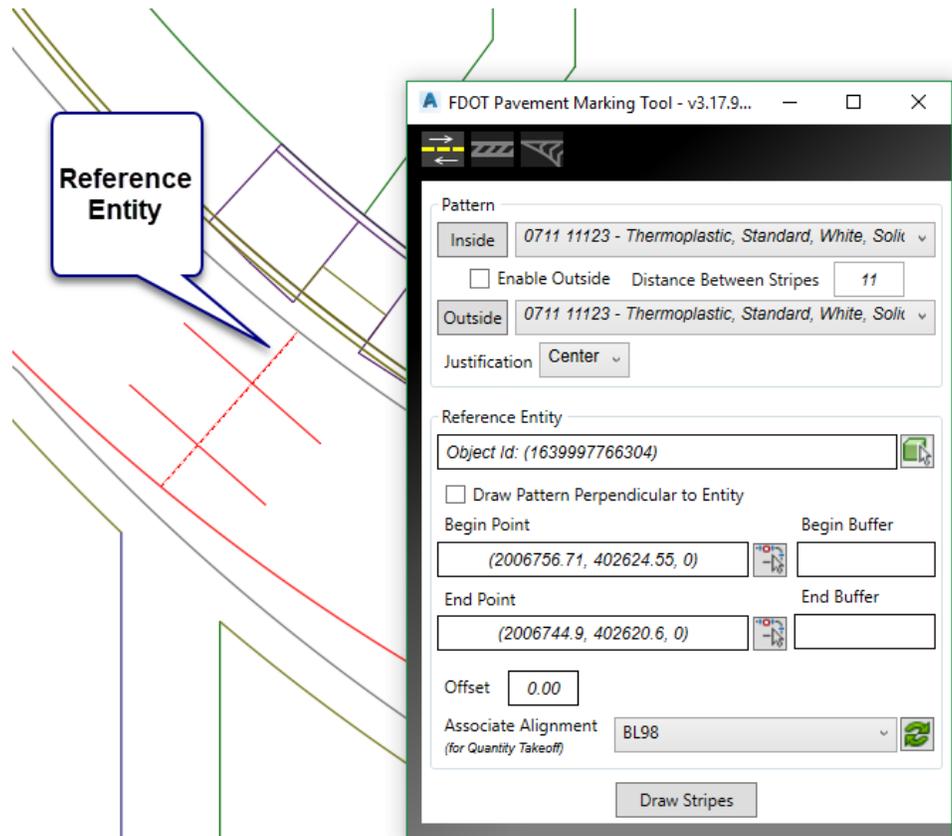
- You can close the Tool Palettes and Tool Space at this point to gain more screen real estate. You won't need them for this chapter.
- Open Entity Manager by clicking the icon <OR> typing EMX on the *command line*. Make sure to open the *Project ddb, 22049555201.ddb*, file saved in the *Symb* directory.
- From Entity Manager, select *Pavement Markings > Thermoplastic > Standard > Solid > LF > 0711 11123 Thermo., Std., White, Solid, Crosswalk/RA, 12"*.



- Right click on the *Pattern* in EMX and select **Place Pavement Marking**. This will populate the pattern in the Pavement Markings tool.

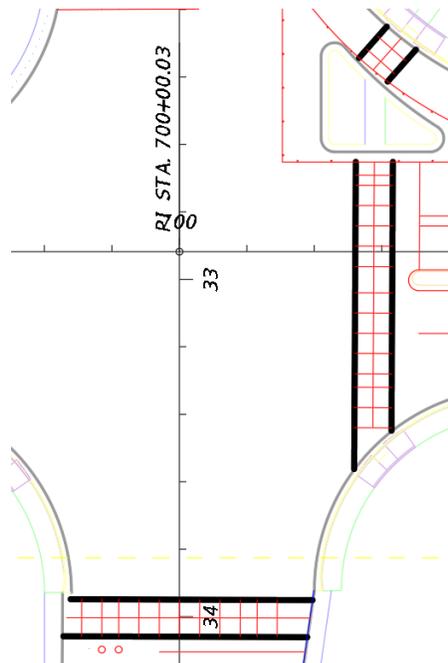


7. Make the following changes to the Pavement Marking tool. You will have to browse to the same pattern for the Outside pattern. Click on **Outside** to open the Pavement Marking database.



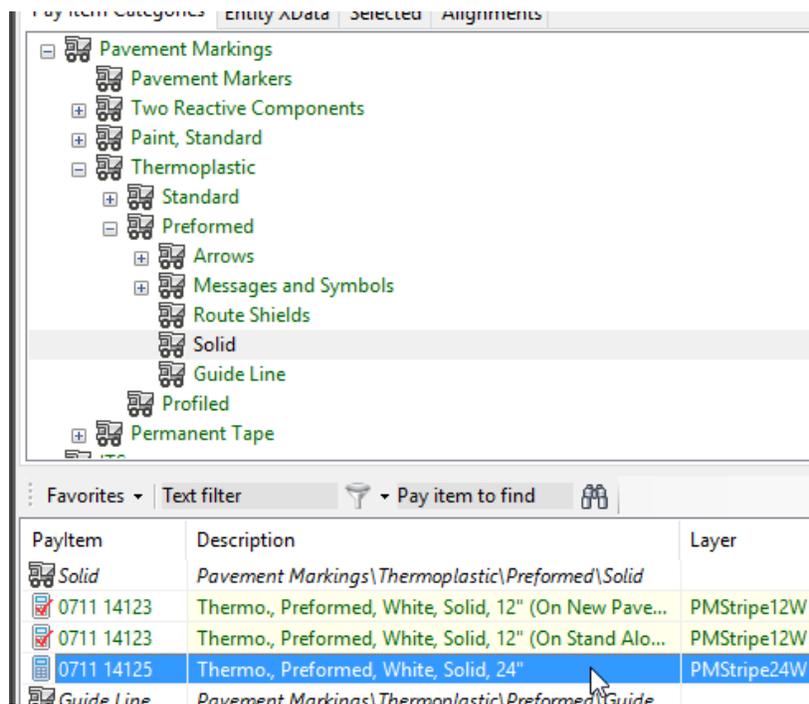
- a. *Enable Outside* - toggle **On**.
  - b. *Distance Between Stripes* – set to **11.00**. (Standard width = 10' + 6" x 2 to centerline of striping each side. See Design Standards, Index 17346.)
  - c. *Justification* - set to **Center**.
  - d. *Reference Entity* - select the green pick box and select the Red *construction line* going from the island to the sidewalk in the turn lane.
  - e. Click the **Draw Stripes** button.
8. **Do Not Close** the Pavement Marking Tool. Perform some cleanup work on the 2 lines just placed with the AutoCAD **Trim** and/or **Extend** commands.
9. With the *Striping* selections, still set in the tool, add the same *Pattern* to the other 2 cross walk locations. Make sure to select the new *Reference Entity* for each location. Perform the required cleanup.

10. Your drawing should look like image below.

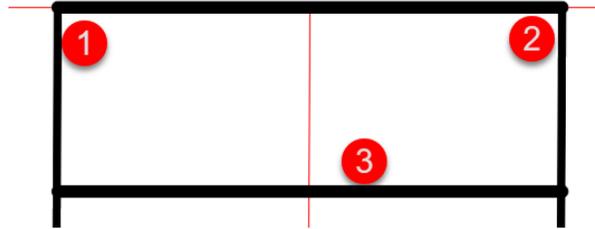


➤ **Placing Special Emphasis Crosswalk Markings (Part 2)**

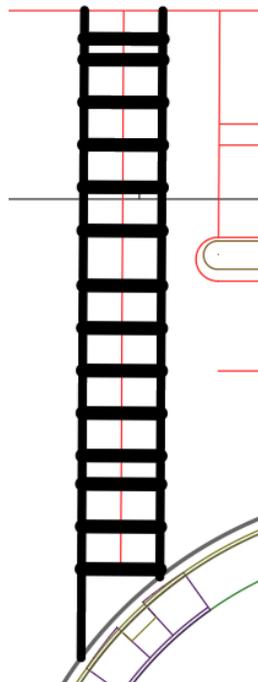
1. Zoom to the large crosswalk crossing SR 61.
2. In EMX browse to the following pattern by way of *Categories list Pavement Markings > Thermoplastic > Preformed > Solid > 0711 14125 Thermo., Preformed, White, Solid, 24"* for the longitudinal crosswalk pavement markings. Double click on the *Pattern* to start the *Polyline* command.



**Note** Double clicking on a database item sets *Place Influence* and starts the draw polyline command in Entity Manager. You can also select draw polyline  using the EMX drawing tools located on the bottom of the EMX dialog



- a. Using the *ENDpoint Osnap*, (1) snap to the *end of crosswalk line* at the furthest station at the island.
  - b. (2) *Snap* to the *end of crosswalk line* at the closest station at the island. Click **Escape** to exit the command.
  - c. Using the EMX *Offset* command, (3) set the *Distance* to 4', select the line just drawn and *Offset* it within the crosswalk. This distance matches the bike lane width. **Delete** the first line drawn, since we only used it to *Offset* the second line.
3. For purposes of this exercise, red construction lines are drawn to represent the crosswalk lines. Using the same *Pattern* from EMX, draw a polyline snapping to the end points of the construction lines. You can also *Offset* the lines, noting that the offset distance varies depending on location.
  4. The longitudinal crosswalk lines have been drawn at the lane line locations per the standard index. The longitudinal crosswalk lines are drawn ½ way between the lane lines with maximum of 60" (5') between the edges of paint. This equates to a maximum of 7' between the centerline of the markings. For 12' lanes the lines are parallel 6". Your drawing should reflect the image below.
  5. Continue to draw the crosswalk lines at the other 2 locations at the intersection.



## Exercise 5.6 Draw Solid Yellow Striping

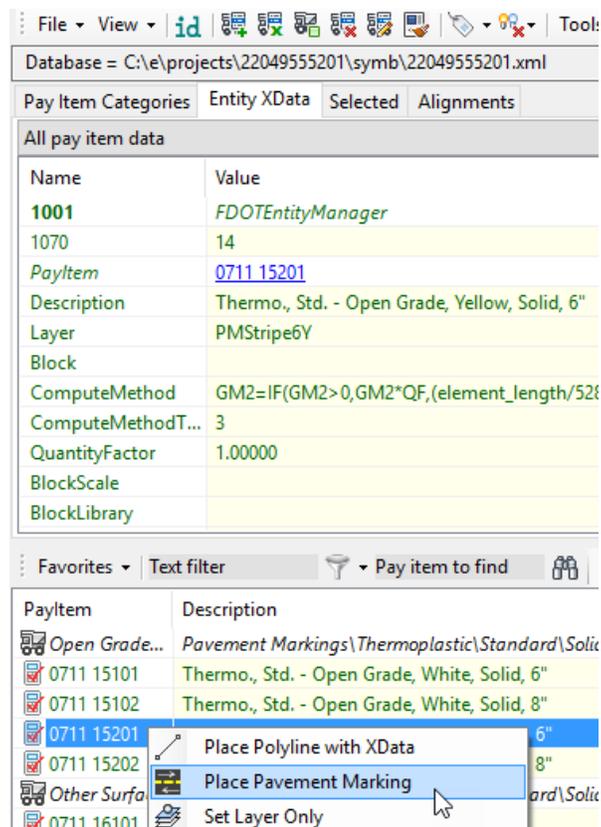
### ➤ Placing Solid Yellow Striping (Part 1)

In this exercise, use Entity Manager to select the pattern and then load it into the Pavement Marking Tool to draw the solid pavement marking. The process will start by placing the right inside edge line using the right inside traffic separator line and the right inside curb face line as the reference entities. Thermoplastic items will be used in this exercise.

1. Continuing in the *Dsgnsp01.dwg* file, zoom in near **STA. 704+00** where the median merges down to the traffic separator.
2. In Entity Manager navigate to the *Pavement Markings > Thermoplastic > Standard > Solid > GM > Open Graded Asphalt* category.

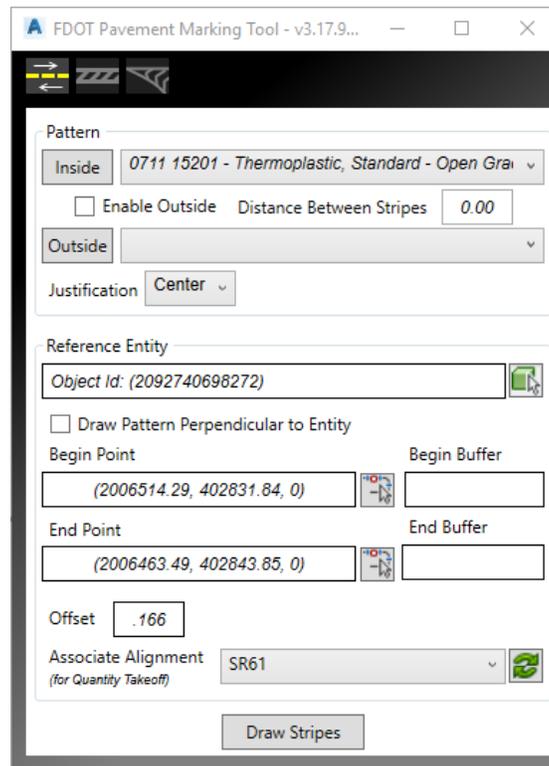
**Hint** You can also use the **text filter** or the **pay item to find** search boxes to find pay item objects.

3. Select the **Item 0711 15201 Thermo., Std. - Open Grade, Yellow, Solid, 6"**.

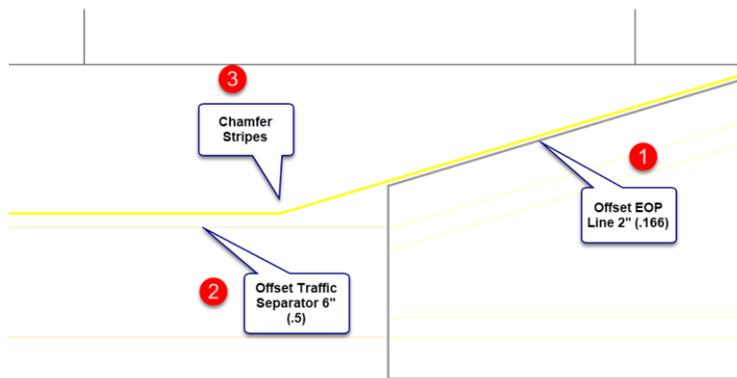


4. Right click to open the popup menu and select **Place Pavement Marking**. The Pavement Marking tool opens with the pattern already populated.
5. There are red construction lines present in the location, use these as guides to the proposed striping.

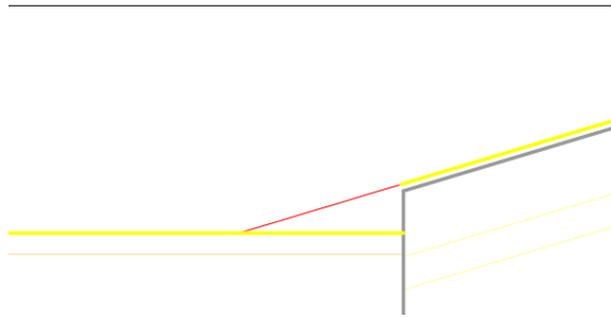
6. Make changes as shown below, make sure to set *Offset* to **0.166'** which is 2" per the design standards.



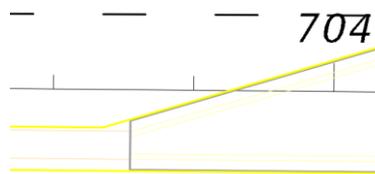
7. For *Reference Entity* select the **EOP** shown as point 1 below.
8. Change the *Associate Alignment* to **SR61**.
9. Click **Draw Stripes** and select the North side of the EOP to place the Stripe.
10. Change the Offset to **.50** and select the Traffic Separator as the *Reference Entity*.
11. Click **Draw Stripes** and select the North side of the Separator to place the Stripe.



12. Your drawing at this point should look like image below.



13. Use the AutoCAD *Chamfer* command  *Chamfer* to join the two stripes.



14. **Do Not Close** the Draw Striping dialog.

15. (Optional) Continue to place the inside edge line pavement markings throughout the rest of the project, if class time permits.

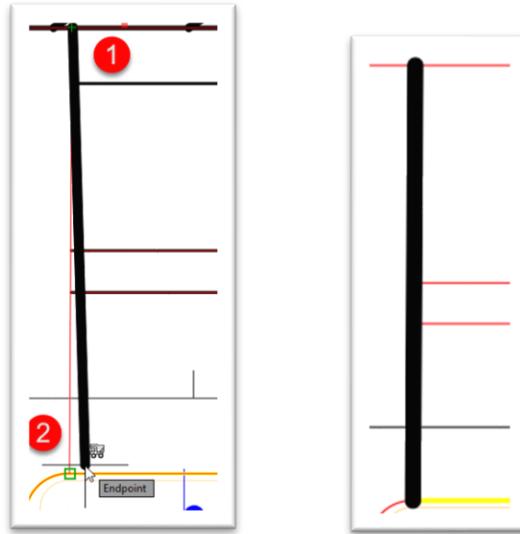
### ➤ **Draw Stop Line (Part 2)**

In this exercise, the student will use Entity Manager (EMX) to place a stop bar. You will use the draw Polyline command within EMX. When using the Entity Manager, drawing tools always read the AutoCAD command line for feedback.

1. Continuing in *Dsgnsp01.dwg*, zoom to near **Sta. 700+60** at the intersection.
2. Open **Entity Manager** and navigate to the category *Pavement Markings > Thermoplastic Pavement Markings > Standard > LF*.
3. Double click on **Item 0711 11125 Thermo., Std., White, Solid, 24"**. Read the *command line* for instructions.  **PLINE Specify start point:**
4. **Snap** to the endpoint of the *red construction line* near the island and then other endpoint on the *red line*. Moving the cursor will show the direction in which the line will be drawn.

**Note** *The construction line is drawn 5.5' from the 12" cross walk line. This accounts for the 4' gap required between the stripes plus the distance from centerline of the stripes to the edge of stripe.*

5. The figure below shows the stop bar placed.



- (Optional) Finish placing the *Stop Bar* in other areas throughout the class dataset.

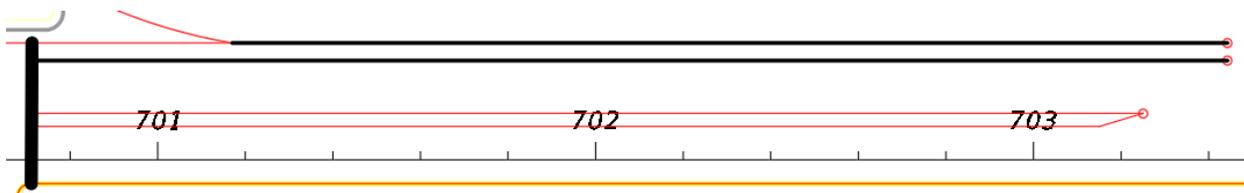
### Exercise 5.7 Draw Solid White Turn Lane Line Stripe Part (1)

In this exercise, Entity Manager will be used to draw the 6" solid white lane line for the left turn lane.

- Continuing in *Dsgnsp01.dwg*, zoom into the area of the left turn lane (*station 701+00 to 704+00*) to see the entire turn lane.



- In Entity Manager, select *Item 0711 15101 Thermo., Std. - Open Grade, White, Solid, 6"* from categories.
- Double click on the *Pattern* to start the *polyline command*.
- Using the *CENTER osnap*, select the center of **circle (1)** and then snap to the **END point** on the *Island* marked as **point (5)** in the drawing above.
- Using the AutoCAD Offset command offset the previously drawn stripe 4' which will make up the Bike Lane.
- Extend the Stripe to the Stop Bar. Your drawing should look like below so far.



- (Optional) Continue to place the **Turn Lane Line Pavement Marking** throughout the rest of the project if class time permits.

### ➤ Draw 6/10 White Dotted Stripe Part (2)

In this exercise, you will complete the turn lane striping by placing a 6" white 6/10 skip line from the beginning of the turn lane to the 6" solid lane line using the circles 6 and 7. Refer to image above for circle location.

1. In Entity Manager, select *Item 0710 11141 Paint, Std, White, Dotted Ext, 6" (6/10)* located in the category *Pavement Markings > Thermoplastic > Guide Lines*. Make sure you select the *Pattern* on layer **PMSkip6W(6-10)**, which means this *line type* begins on a skip.
2. Double click on the *Pattern* to initiate the draw *Polyline* command.
3. Snap to the center of **Circle (6)** from the previous exercise to start the *polyline*, snap to the center of the **circle (7)**.

**Note** There are 2 Line types for each skip striping pattern. The pay item number is the same but the name is different. They are PMSkip & PMStripe. The name designates what the line starts on.

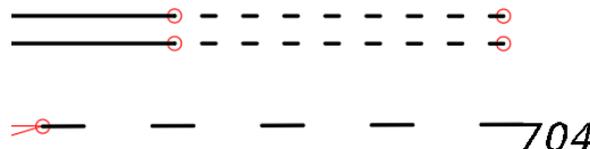


4. Continue to place the **6" white 6/10 skip stripe** throughout the rest of the project if class time permits.

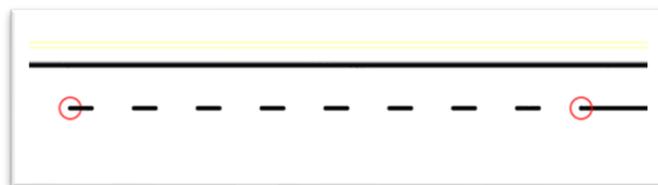
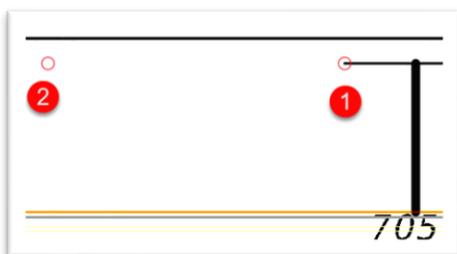
### Exercise 5.8 Draw 2/4 White Dotted Stripe (Part 3)

In this exercise, the designer will add the 6" 2/4 Guide Lines for the Bike Lane approaching the Intersection close the Station 704+00. You will utilize Circles 1, 2, 3, & 4.

1. In Entity Manager, select *Item 0710 11141 Paint, Std, White, Guide Line, 6" (2/4)* located in the category *Pavement Markings > Paint, Standard > Guide Lines*. Make sure you select the *Pattern* on layer **PMSkip6W(2-4)**, which means this *line type* begins on a skip.
2. Double click on the *Pattern* to initiate the draw *Polyline* command.
3. Snap to the center of **Circle (1)** from the previous exercise to start the *polyline*, snap to the center of the **circle (3)**.
4. Repeat the process and Draw from **Circle (2)** to **Circle (4)**



5. Continuing with the same pattern zoom to the area around 705+00. Draw a EMX polyline from **Circle (1)** to **Circle (2)** as shown below.



## Exercise 5.9 Draw Bike Lane Striping

### ➤ Placing Solid White Striping for the Bike Lane (Part 1)

In this part of the exercise, Entity Manager will be used to draw the solid white Bicycle Lane line. Use the Design Standards for guidance on bike lane marking criteria. This Striping will be placed on the opposite side of the previous strip you just placed.

1. Continuing in *Dsgnsp01.dwg*, browse to the Entity Manager *item 0711 15101 Thermo., Std. - Open Grade, White, Solid, 6"*
2. With the selection highlighted right click and select Place Pavement Marking to open the tool with the pattern already loaded.
3. Make the following entries in the tool dialog box.

FDOT Pavement Marking Tool - v3.17.9...

Pattern

Inside **0711 15101 - Thermoplastic, Standard - Open Gra**

Enable Outside Distance Between Stripes **0.00**

Outside

Justification **Center**

Reference Entity

Object Id: (2092740698208)

Draw Pattern Perpendicular to Entity

Begin Point **(2005654.37, 404814.88, 0)** Begin Buffer

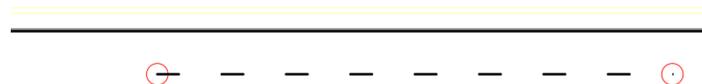
End Point **(2006737.76, 402524.93, 0)** End Buffer

Offset **.166**

Associate Alignment **SR61** (for Quantity Takeoff)

**Draw Stripes**

4. Select Draw strips and select the side of the EOP you want the stripes drawn on.



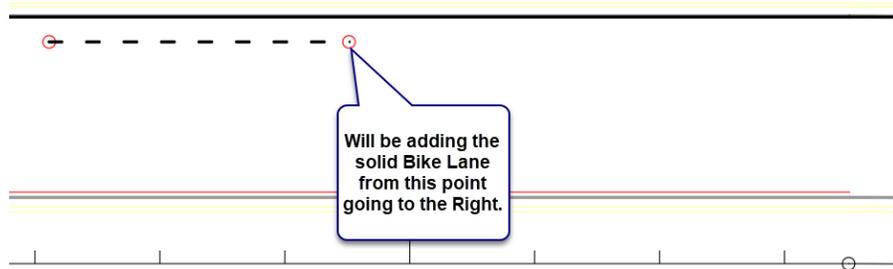
5. If you are offsetting a polyline it will draw the striping along the entire length, you may have to explode the striping polyline to delete unwanted segments.
6. Repeat the previous steps for the other locations in the project dataset.
7. If at any time your striping doesn't contain Pay Item Data you can add it as follows:
  - a. In EMX with the same pattern selected, pick the append truck symbol along the top.



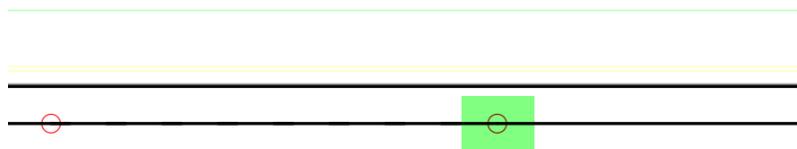
- b. select the Entity and press enter.

**Exercise 5.10**      *Offsetting Striping for solid Bike Lane*

In this exercise, you will offset the Striping on the north side 4' to tie into the 2/4 dotted stripe as shown below near station 705+00.



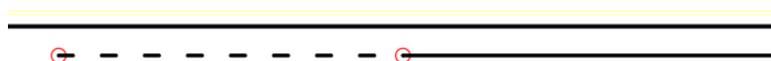
1. On EMX select the id button.
2. Select the Striping opposite the 2/4 dotted and press enter. This sets the 0711 15101 6" White current.
3. Select the **Offset** command on the EMX drawing toolbar.
4. Select **4'** for the distance and select the solid 6" striping.
5. For the side pick inside the lane to place the new striping. At this point your drawing should look like below.



6. We need to trim the striping at the circle so the 2/4 dotted striping is visible again. Using the AutoCAD Line command, draw a line from the center of the highlighted circle to anywhere as shown below.



7. Using the AutoCAD Trim command select the just drawn line first, then the solid striping to be removed. Press enter.
8. Delete the Temporary drawn line. Drawing should look like image below.

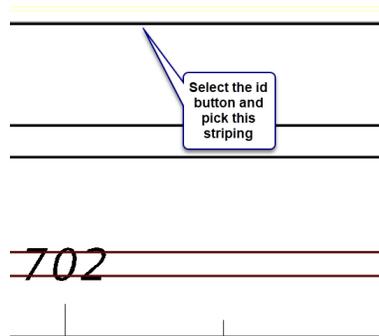


### Exercise 5.11 Draw Lane Line – Solid & 10/30 Skip Stripe

#### ➤ Placing Solid 6" White Stripe (Part 1)

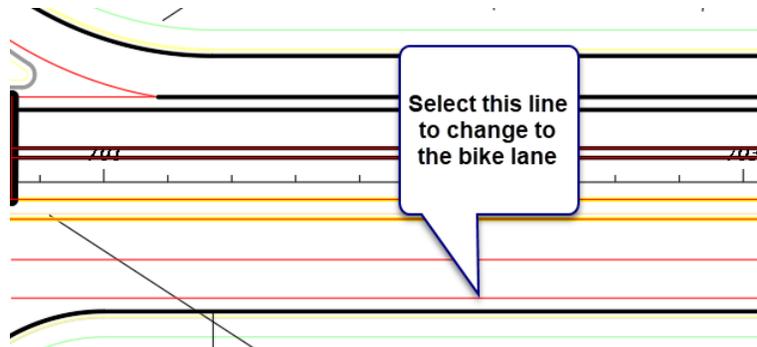
In this exercise, you will use the match properties option in Entity Manager to create the Bike Lane Striping on the other side of the road at the intersection.

1. Continuing in *Dsgnsp01.dwg* zoom to near **Sta 701+00**.
2. With EMX open, click on the **id** button and pick the *white striping* that you Offset .166 in a previous exercise representing the bike lane on the other side of the road and click **Enter**.

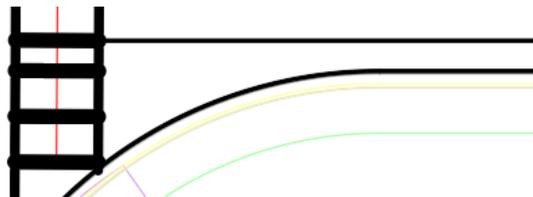


**Note** EMX goes to that striping so you don't have to browse to it.

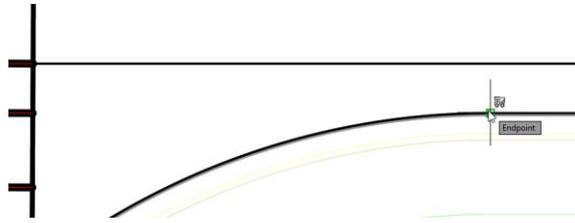
3. Select the Match Properties icon along the top of EMX .
4. For *Source Object* select the Bike Lane Striping from a previous exercise on the other side of the road.
5. For *Target Object* select the Red construction line as shown below.



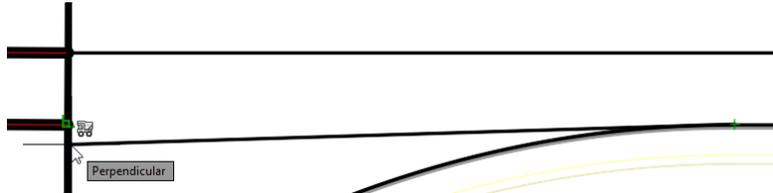
6. Select **Extend** to extend the Bike Line to the Cross Bar. Your drawing should look like image below.



7. With the pattern still selected in EMX, select the **Polyline** command on the drawing tools. Snap to the **END** point as shown.



8. For the second point snap to the **END**point of the crosswalk line as shown.

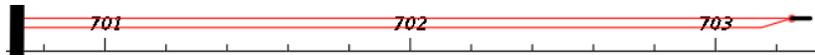


9. Your drawing should look like below.

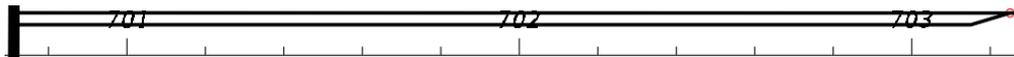


➤ **Placing 6" Solid Striping (Part 2)**

In this exercise, the designer will add Striping to the Left Turn Lane buffer zone. Zoom to the intersection as shown below.



1. In EMX type in or browse to Pay Item **0710 11101** 6" White Striping.
2. Double Click to start the EMX Polyline Command.
3. Using the Red construction line as a guide, snap to the end points to place the striping.
4. Your drawing should look like image below.

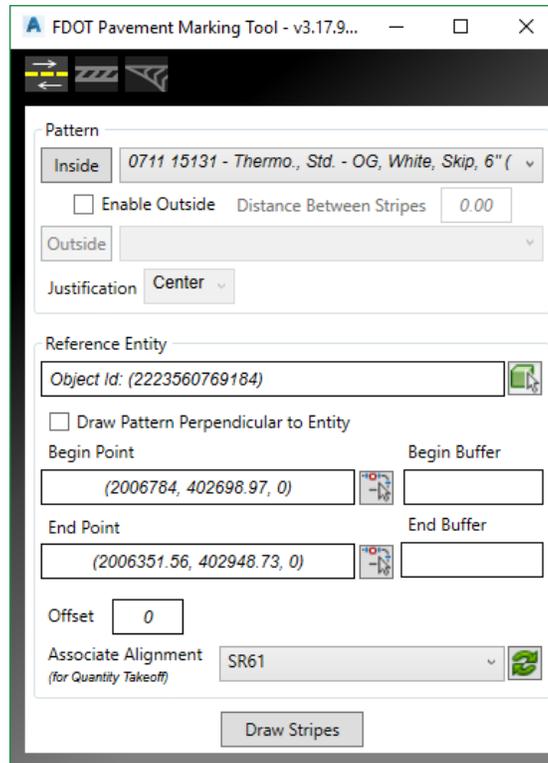


➤ **Placing 10/30 Skip Stripe (Part 3)**

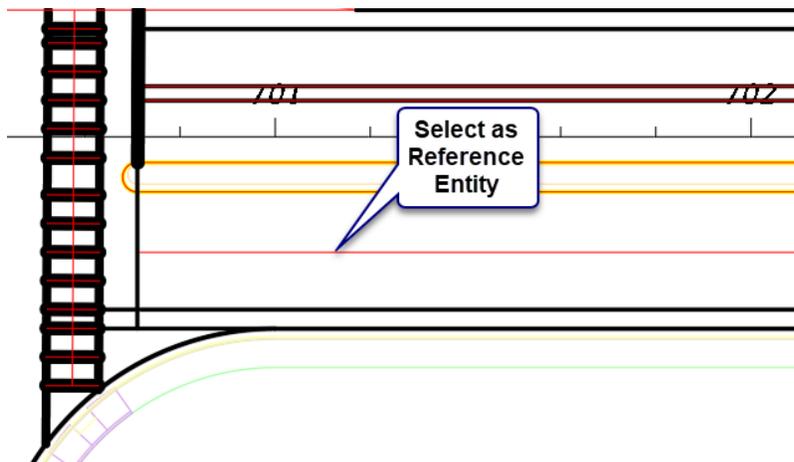
In this exercise, the bike lane will be used as the reference entity to place the single white 6" 10/30 Skip.



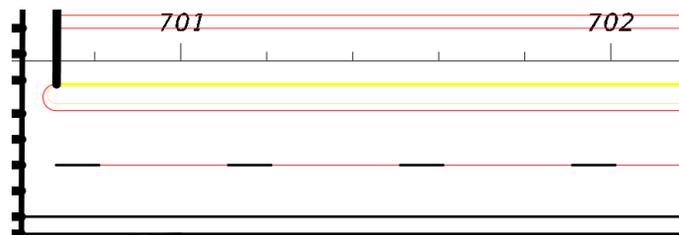
1. In EMX type in the *pay item number* **0711 15131** to quickly find the **10/30 stripe pattern**, right click and load it into the *Pavement Marking* tool.



2. *Reference Entity* - select the Red Construction Line representing the pattern.



3. *Offset* – Leave at 0.
4. *Associate Alignment* – Set to **SR61**
5. Click **Draw Stripes**.



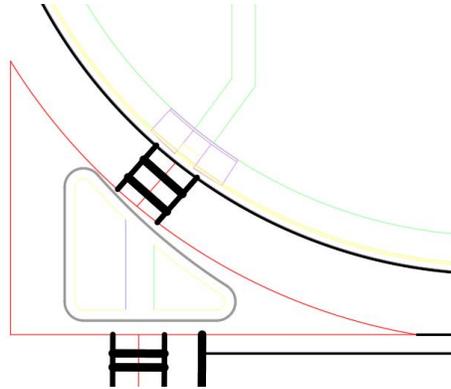
6. Your 10/30 pattern should resemble the image above. Continue placing **10/30 striping** where appropriate.

**Note** Notice how the pattern ends before the end of the Red Line, this is because it can't place another full pattern.

### Exercise 5.12 Adding Island Striping

In this exercise, the designer will add striping around the island located at the intersection.

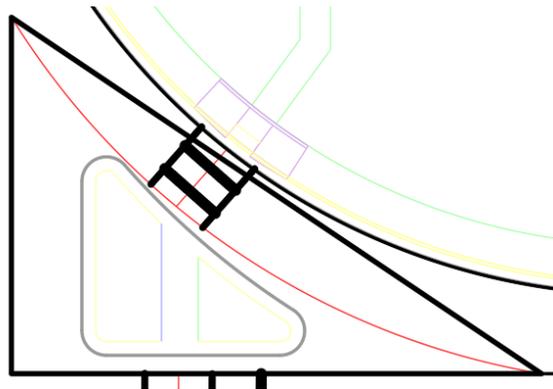
1. Zoom to the intersection where the island is located.



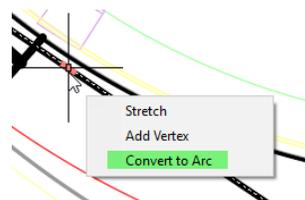
2. Using EMX type in **0710 11102** on the Pay Item search box. This will bring up the following selection.



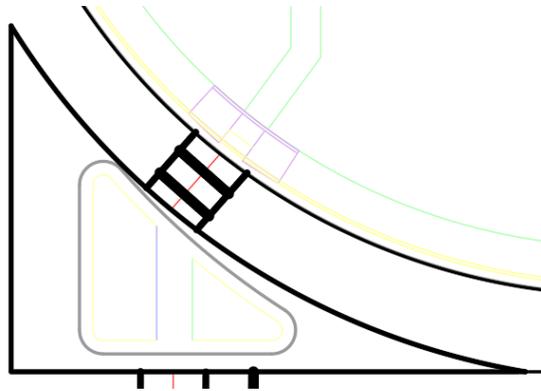
3. Double Click to start the EMX Polyline command.
4. Using the **ENDpoint** osnap draw the striping on the three end points.



5. Select the Polyline and hover over the grip on the segment that should be an arc representing the turn lane. Select **Convert to Arc**.

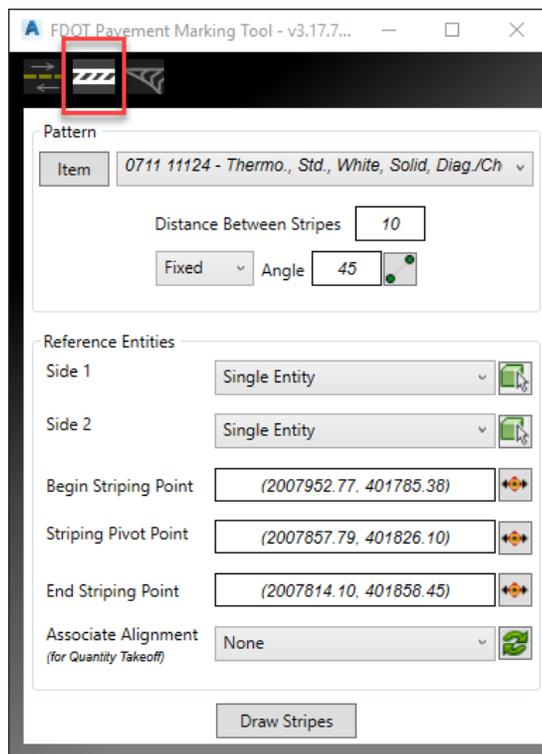


6. Using the **NEArest** osnap snap to the red arc. The island should look like below.



## SEPARATION MODE

Another Mode in the Pavement Marking tool is the Separation Mode. This mode allows you to draw stripes at an angle between entities such as a center turn lane where it approaches a left turn condition.



- **Item** – This is the pattern with a pay item number attached. You can select it in Entity Manager. Like the others or you can browse to it by clicking the *Item* button.
- **Distance Between Stripes** - Refer to the indexes for the correct distance between stripes.
- **Angle** – Allows the user to enter a known angle or to select the pick box to pick two points in the drawing to designate the angle used.
- **Side 1** - To place the pavement markings correctly, you must understand the difference between Side 1 and Side 2. Side 1 is the termination side of the stripe or where the marking stops.
- **Side 2** - Side 2 is utilized when turning the Slash Stripe Angle. The software begins on Side 2, and draws the marking at the specified angle until it intersects the Side 1 entity, where the marking stops. It is also desirable to have the total length of the Side 2 entities longer than the Side 1 entities; however, it is not

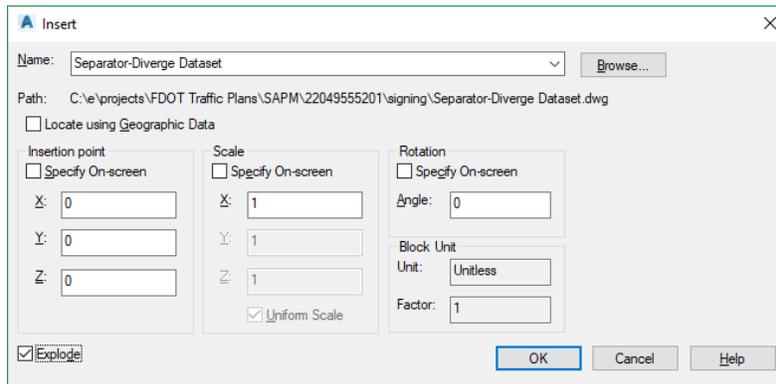
mandatory. Three methods are supported to define the entities. It is not necessary to use the same method on both sides.

- **Single Entity** – When the Green selection box is selected, you are prompted on the command line to select the linear entity.
- **Begin Striping Point** - Identifies the beginning of the striping. Note: Begin does not have to be on the entity (but inside the striping area) as the software constructs perpendicular to the entity and utilizes the projection by utilizing Begin (and End), the length of the striping is determined by the designer, not the length of the entities. Note: If the beginning area is in a gore, DO NOT snap to the gore itself, as the point must be inside the striping area.
- **Striping Pivot Point** – Picks the starting point for the first stripe, then draws the pattern to the left and right until it fills the area based on the parameters.
- **End Striping Point** – Serves the same function as Begin, but at the opposite end.
- **Draw Stripes** - By moving the cursor on the screen and clicking, the patterns are placed. The striping is placed in a group for easy deletion, if desired.

### Exercise 5.13 Draw Separation

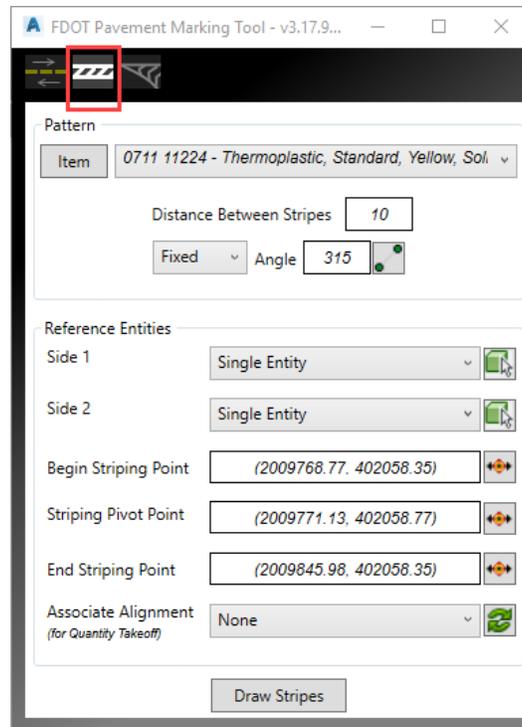
In this exercise, you will draw an 18” Yellow separation lines using the *Pavement Marking Tool* Draw Separation mode.

1. Continue in the *Dsgnsp01.dwg*.
2. Insert the block *Separation-Diverge Dataset.dwg* located in the Signing folder.

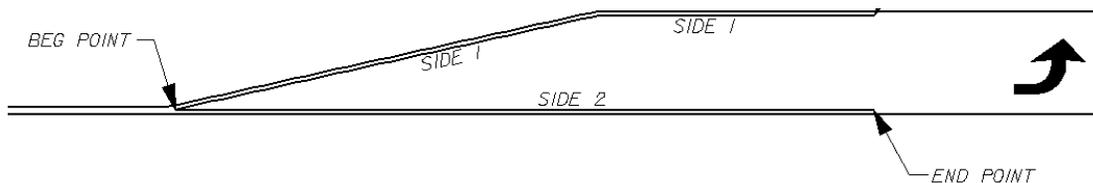


3. On the FDOT Ribbon select untwist view.  Untwist View
4. Zoom to the area where three striping diagrams are shown. Zoom to the bottom one first. You will work your way up for each part of the following exercises
5. Open the Pavement Marking dialog from the FDOT Ribbon and select the **Separation Mode** and make the following changes.





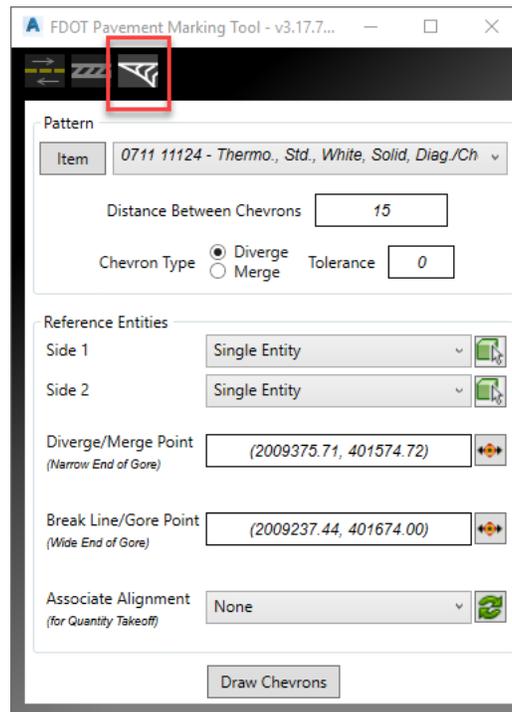
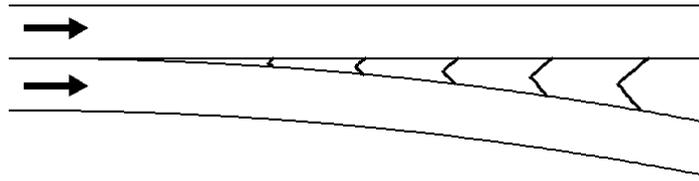
- a. Click the **Item** button, browse to *Pavement Markings > Thermoplastic > Standard > Solid > LF* and select **Item 0711 11224 Thermo., Std., Yellow, Solid, Diag./Chevrons, 18"**.
- b. *Distance Between Stripes* – **10**.
- c. *Angle* - enter **315**.
- d. *Side 1* and *Side 2*, refer to the image below to see side one and two designations.
- e. *Begin Striping Point* and *End Striping Point* – set as shown. Use the *End Osnap* to select the end point of each line.
- f. *Striping Pivot Point* – For this example select near point one, you may have to cut the osnaps off. This option controls where the first pattern is drawn.



- g. Click **Draw Stripes** and pick inside the striping area to place the pattern. The stripes are placed in a group for easy deletion.
6. **Do Not Close** the Pavement Marking tool.
  7. There are areas in the class project that require *Separation Pavement Striping*. If time permits, try this technique on the class dataset.



## CHEVRON DIVERGE/MERGE



The Chevron Diverge/Merge Mode is used for traffic channelization at a gore when traffic flows in the same direction as seen in the figure below. Refer to Design Standards for specific design criteria.

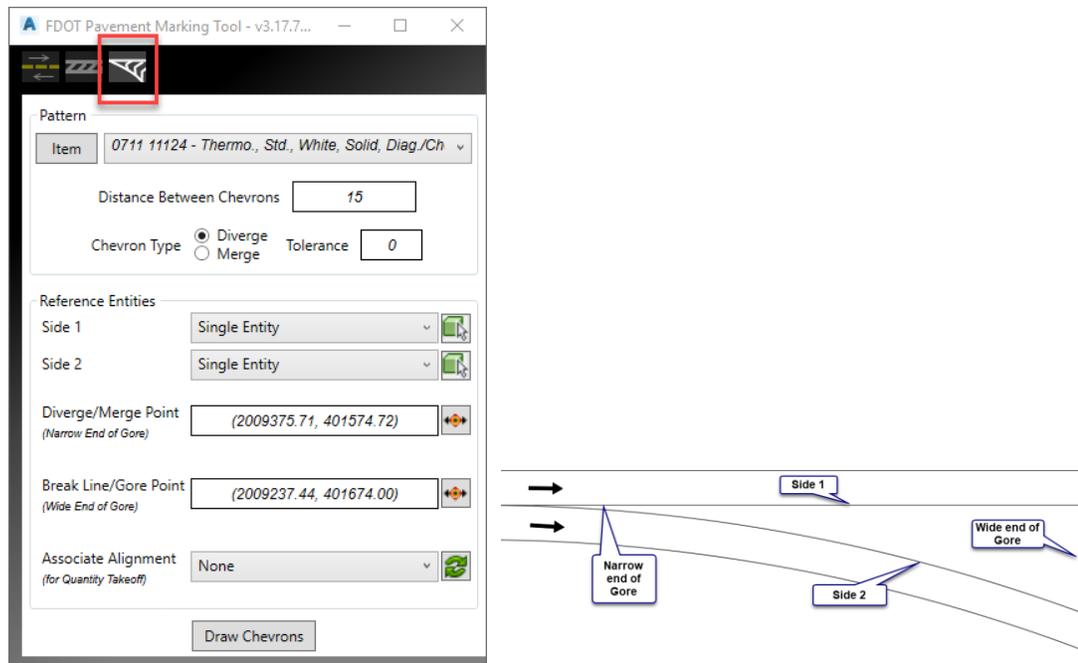
- **Item** – This is the pay item selected in Entity Manager. Clicking the *Item* button loads the selected item from Entity Manager.
- **Distance Between Chevrons** – Refer to the indexes for the correct distance between stripes.
- **Tolerance** - If the length of a segment of pavement marking is less than the **Tolerance**, the line will not be placed. It will only be utilized at the ending point, to determine where the final piece of marking is placed.
- **Side 1** – Is the intersecting side where the stripe stops.
- **Side 2** – Is utilized when turning the **Slash Stripe Angle**. The software begins on **Side 2**, and draws the marking at the specified angle until it intersects the **Side 1** entity, where the marking stops. It is also desirable to have the total length of the **Side 2** entities longer than the **Side 1** entities; however, it is not mandatory.
- **Selection Options** – There are three options for selecting the side entities in AutoCAD:
- **Diverge Point (Narrow End of Gore)** – Identifies where the chevron stops at the narrow end of the gore.
- **Gore Point (Wide End of Gore)** – Identifies the wide end of the gore.
- **Draw Chevrons** – Displays the striping and the diverging line. The Striping is placed as a group for easy deletion, if desired.

### Exercise 5.14 Draw Chevron Diverge

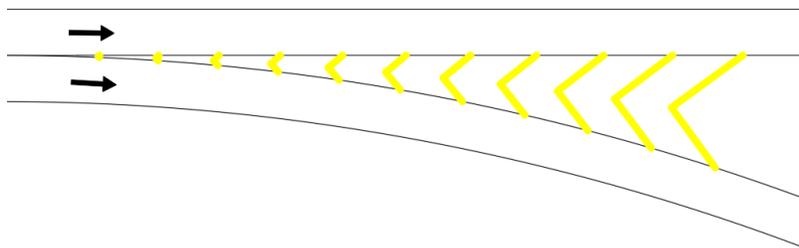
In this exercise, you will draw 18" Yellow chevrons in gore area. Refer to Design Standards for specific design criteria for your specific project requirements.

When selecting the wide and narrow parts of the gore in the drawing cut Osnap's off and select within the striping area only.

1. Continue in the *Dsgnsp01.dwg*, type **View** on the *command line*.
2. Zoom out until you see the middle striping diagram and then zoom into the vicinity.
3. Select the correct *Mode* on the Pavement Marking tool and select **Diverge** from the *Chevron Type* of pattern to draw.
4. Click the **Item** button, browse to *Pavement Markings > Thermoplastic > Standard > Solid > LF* and select *Item 0711 11224 Thermo., Std., Yellow, Solid, Diag./Chevrons, 18"*.
5. Set the *Distance Between Chevrons* to **15**.



6. Select the *Side 1* and *Side 2* and *Narrow* and *Wide end of Gore* as per image above.
7. Click **Draw Chevrons** to place pattern. The stripes are placed in a group for easy deletion.
8. The figure below shows the finished product.

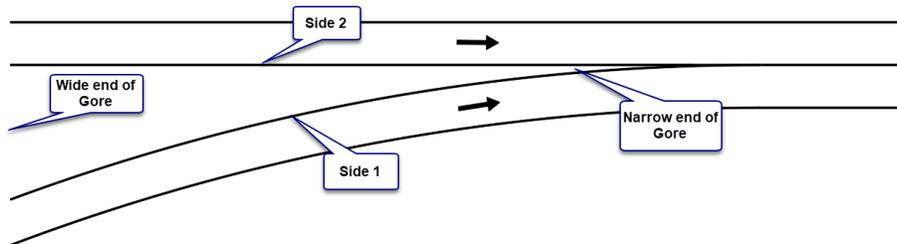


## CHEVRON MERGE

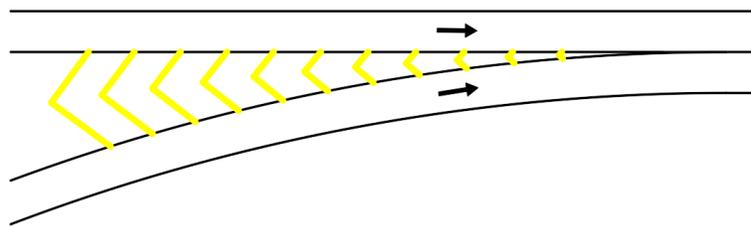
### Exercise 5.15 Draw Chevron Merge

In this exercise, the student will draw 18" Yellow chevrons in gore area in a lane merge scenario. Refer to design standards for specific design criteria.

1. Continue in the *Dsgnsp01.dwg*, type **View** on the *command line*.
2. Zoom out and into the top striping diagram.
3. Select the correct *Mode* on the Pavement Marking tool, select **Merge** from the *Chevron Type* of pattern to draw.
4. You should have a history list of this pattern, if not, select the **Item** button, browse to *Pavement Markings > Thermoplastic > Standard > Solid > LF* and select **Item 0711 11224 Thermo., Std., Yellow, Solid, Diag./Chevrons, 18"**.
5. Set the *Distance Between Chevrons* to **15**.



6. Cut Osnaps off and select the *Side 1 & Side 2* and *Narrow & Wide end of Gore* as per image above.
7. Click **Draw Chevrons** to place pattern. The stripes are placed in a group for easy deletion.
8. The figure below shows the finished product.



9. Close the Pavement Marking tool and **Save** your file.

## FIX ENTITIES USING ENTITY MANAGER APPEND MODE

The Entity Manager has an Append Mode used to fix entities not drawn with the Entity Manager. Example: a project that contains pavement marking items and the designer is trying to run quantities but nothing happens. All entities are on the correct Layer but there is no Pay Item information on them.

Once the desired object is selected you can press the append button as seen below. This allows the designer to set the appropriate data to an Object.



The workflow of this tool is:

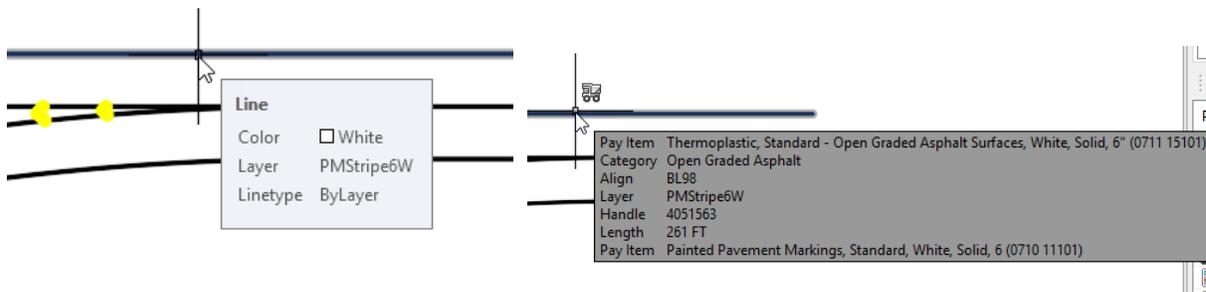
1. Select the item in Entity Manager.
2. Start the **Append** command.
3. Select the entity in the file and click **Enter** to accept.

**Note** You can select multiple items at the same time.

### Exercise 5.16 Append Pay Item data to objects

In this exercise, the student will set Striping lines to have Entity Manager attributes on them. These lines are 100% CADD compliant but they will not quantify. This scenario is common when users in an office do not use Entity Manager to draw entities into the design file. No one must redraw the lines, only to set them to the appropriate Entity Manager item.

1. Continue in the *Dsgnsp01.dwg* at the same location as the previously placed Merge Striping.
2. Type **EMX** on the *command line* to start Entity Manager, browse to *Pavement Markings > Thermoplastic > Standard > Solid > Open Grade* and select **Item 0711 15101 Thermo., Std., White, Solid, 6"**.
3. With the *Pattern* selected, click the **Append** button  on EMX.
4. Select the **Northern most Stripe** and click **Enter**. You can also window multiple objects to apply data.

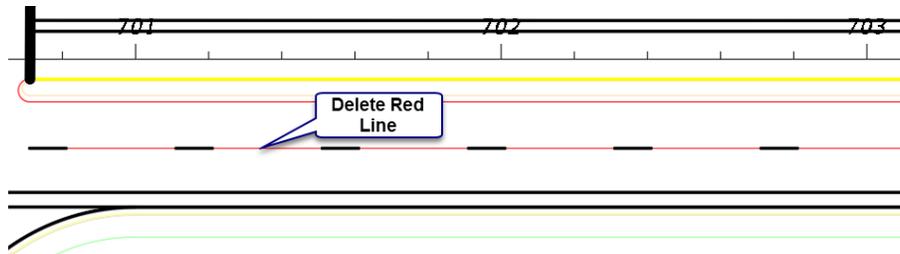


The image above shows the data on an object before and after you use the append function. The truck symbol will tell you that it contains data that will quantify.

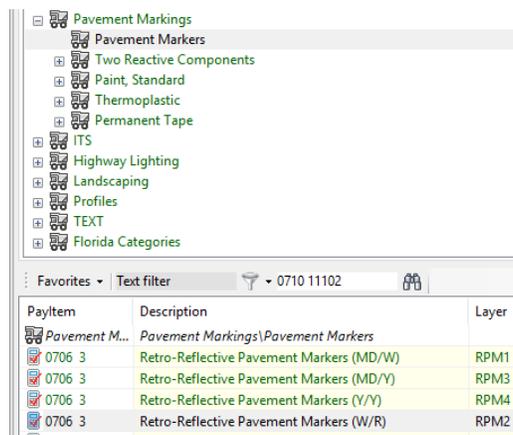
### Exercise 5.17 *Placing Reflective Pavement Markers using Place Block Group*

In this exercise, the designer will place RPM's using Place Block Group

1. Zoom to the area shown below. Delete the Red Construction line.



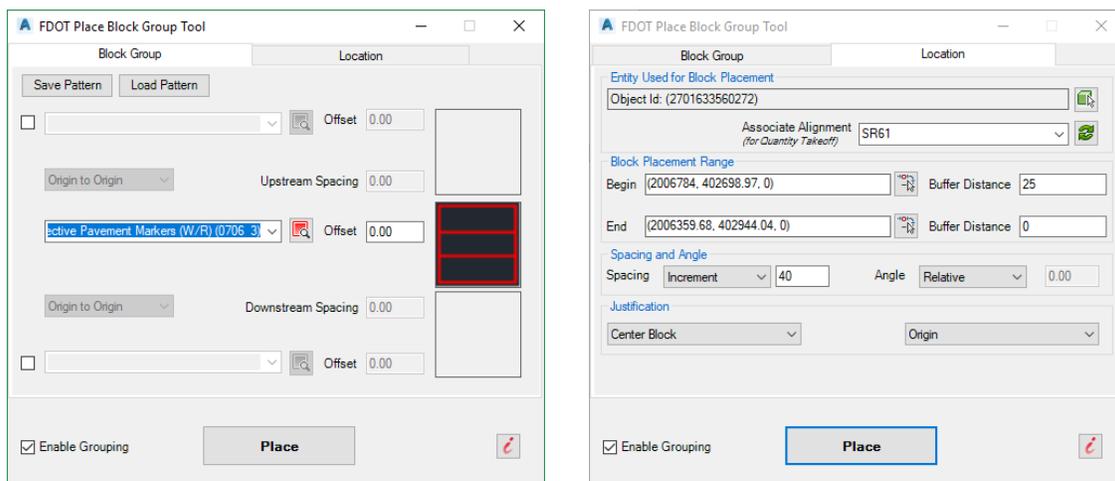
2. In EMX browse to the Pavement Markers and select the White/Red RPM (0706 3).



3. Right Click on the selection and select **Place Block Group**.

**Note** You could also select the red search button and browse to the pavement markers directly in Place Block Group independently of using EMX.

4. Make the following changes in the dialog. For reference entity select the 10/30 striping.



5. Select **Place** to draw the blocks in the correct spot. Your drawing should look like image below.



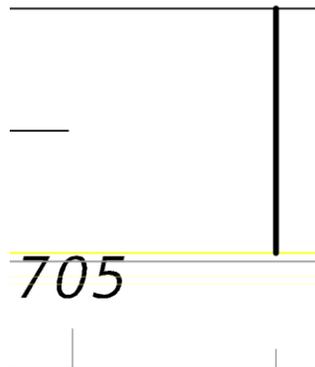
6. Since Enable Grouping was selected, the RPM's are part of one group, this makes it easy to delete the entire placement if needed.

**Note** Sometimes it is necessary to delete a RPM on the end or beginning of the placement, to do this type in **Pickstyle** and change to 0 to turn grouping off. You can delete or move what needs to be edited. When editing is done type in **Pickstyle** and change back to 1 to turn grouping back on. The objects are selectable as one again.

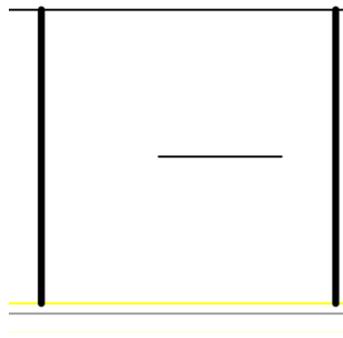
**Exercise 5.18**      *Placing a Painted Pavement Message using EMX*

In this exercise, the designer will place a painted pavement message (School) using a combination of Place Block Group and EMX.

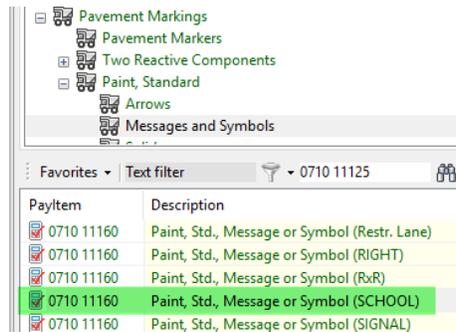
1. Zoom into the vicinity of station 705+20.
2. In EMX browse or type in **0710 11125** and select the 24" Solid White Stripe pattern.
3. With the pattern highlighted, double click to start the polyline command. Snap to the **NEArest** point on the Yellow striping near station 705+20.
4. Snap to the **PERpendicular** point across the roadway to the Bike Lane as shown below.



5. Click on the EMX Offset command.
6. Select 24 as the distance. Select the Striping.
7. Pick to the right side of the original striping. Drawing should look like image below.



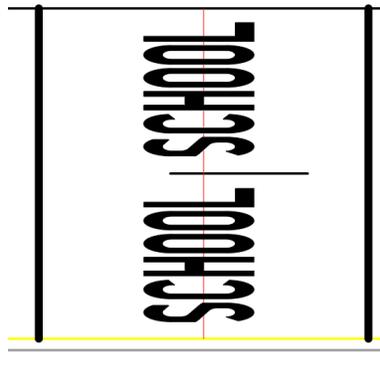
- Using the categories in **EMX**, browse to the following.



- With the School message highlighted, Select the Insert block command on the **EMX** drawing tools



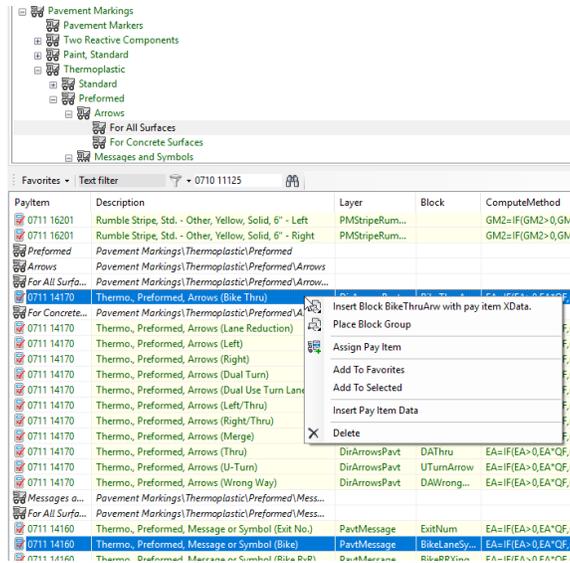
- The command line is asking for user input for instructions. Type **R** for rotate.
- For angle snap to the endpoints of the striping going across the lane.
- Place the **School** message in the middle of the lane. You may have to draw a temporary line marking the middle distance between the striping.
- Using the AutoCAD **Copy** command copy the **School** message and place it in the other lane. Your drawing should look like image below. You can delete the temp construction line, in this diagram it is red.



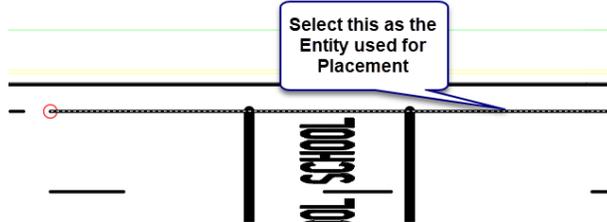
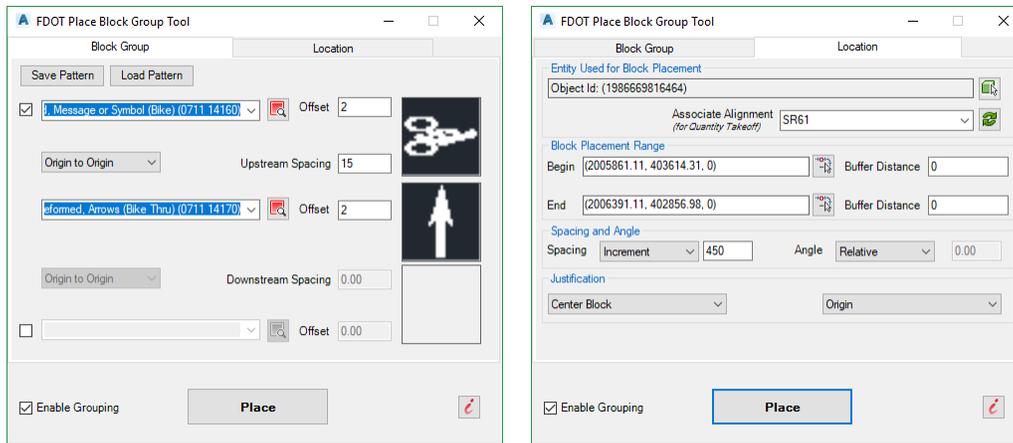
**Exercise 5.19**      *Placing a Multi Message Pavement Marking using Place Block Group*

In this exercise, the designer will use EMX to select an Arrow and a Bike Symbol to mark the Bike Lane every 460’

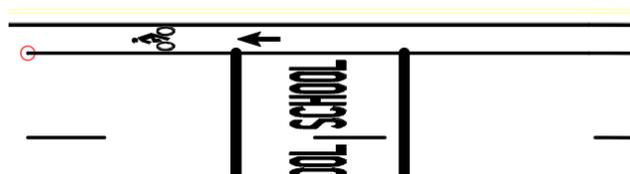
- Remain in the same area as the School Message you just placed.
- In **EMX** browse to the following area as shown below.



3. Select the **Bike Arrow** first, then while holding the control key select the **Bike Symbol**, then Right Click and select **Place Block Group**.
4. In Place Block make the following changes.



5. Select **Place** and pick inside the Bike Lane for the side. The drawing should now have a repeating pattern of the Bike Lane Marking as shown.



# 6 SIGNING TOOLS

## OBJECTIVE

This chapter covers the sign applications available in the FDOT Civil 3D State Kit. There are Block drawing files included, containing all sign blocks from the *M.U.T.C.D.* and *Standard Highway Sign* book. These blocks can be placed anywhere within the design file.

In this chapter, the following topics will be covered:

- FDOT Signs application
- Guide SIGN 7.0

## INTRODUCTION

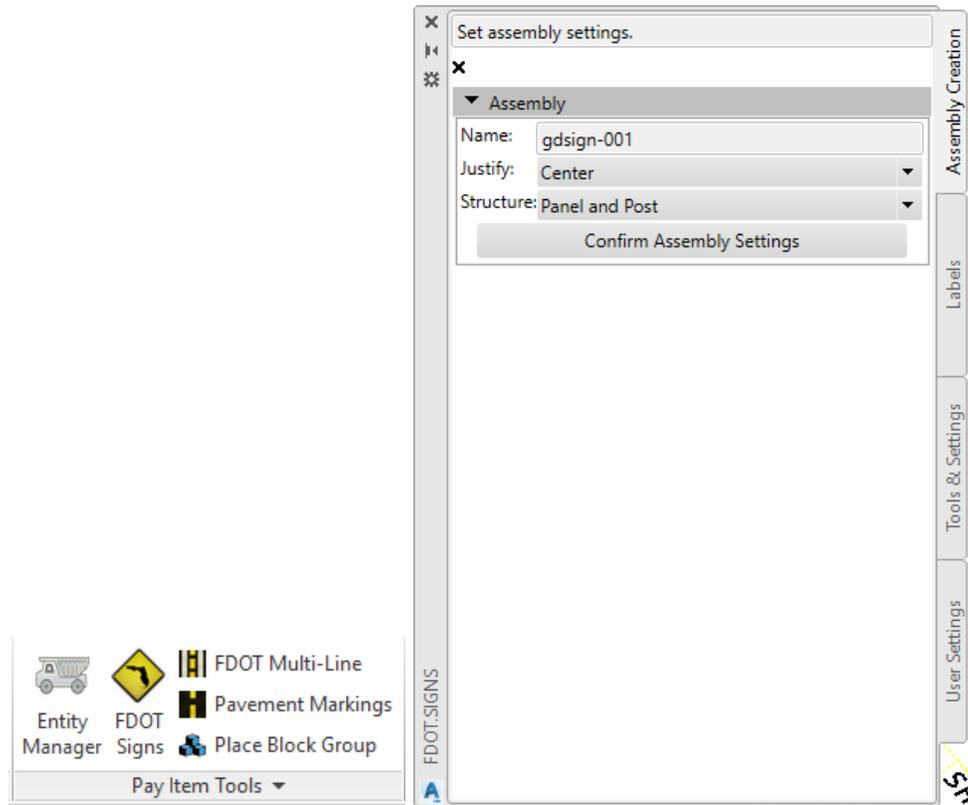
At this point, the designer may have an inventory of existing signs for their project. The designer must decide which signs need to be removed, relocated, or replaced. This work should be done in the proposed design file, *DSGNP01.dwg*.

The FDOT Signs program is another source for placing proposed and existing sign blocks. It allows the designer to build sign assemblies and place them in the design file. The sign post contains the pay item data required to be quantified., the panel contains no pay item data.

GuidSIGN, is a sign design program available from Transoft Solutions, and is included in this section and briefly explained.

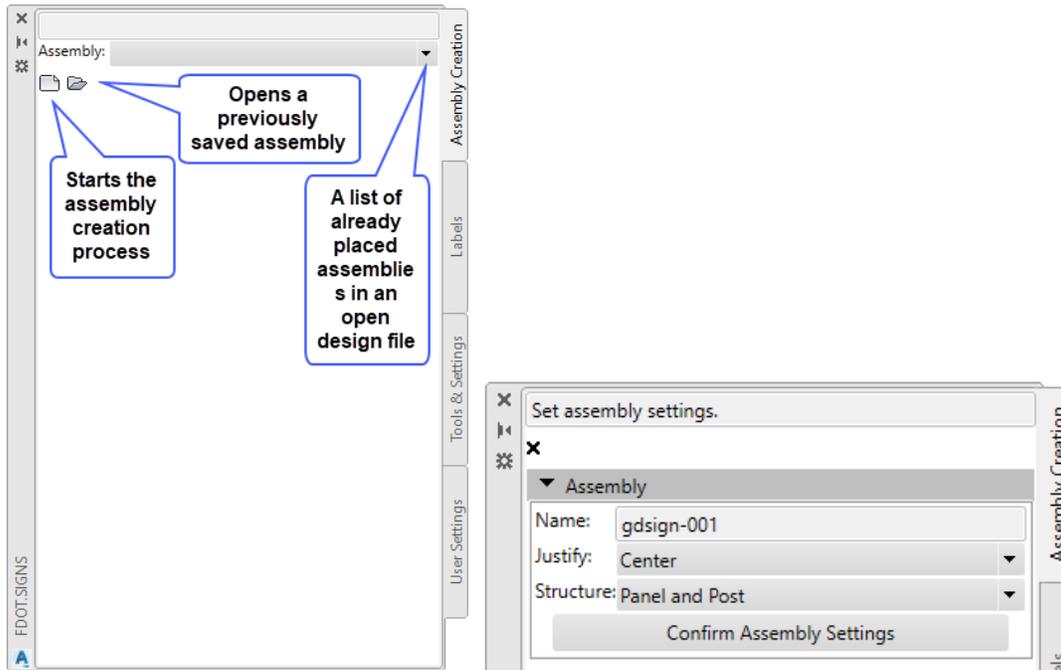
## FDOT SIGNS APPLICATION

Accessible from the FDOT Ribbon on the Pay Item Tools panel, the FDOT Signs Application is designed to assist in the placement of standard sign panels and posts in the signing and marking plans. This tool uses a separate xml file that contains all pay item data required to quantify correctly, it does not use the Entity Manager database. All the signs that are in the *Standard Highway Sign Book* and the *Florida Roadway and Traffic Design Standards* have been included. The application is a palette based program that behaves like other Civil 3D palettes.



The FDOT Signs App has four tabs: **Assembly Creation, Labels, Tools & Settings, & User Settings**

## ASSEMBLY CREATION



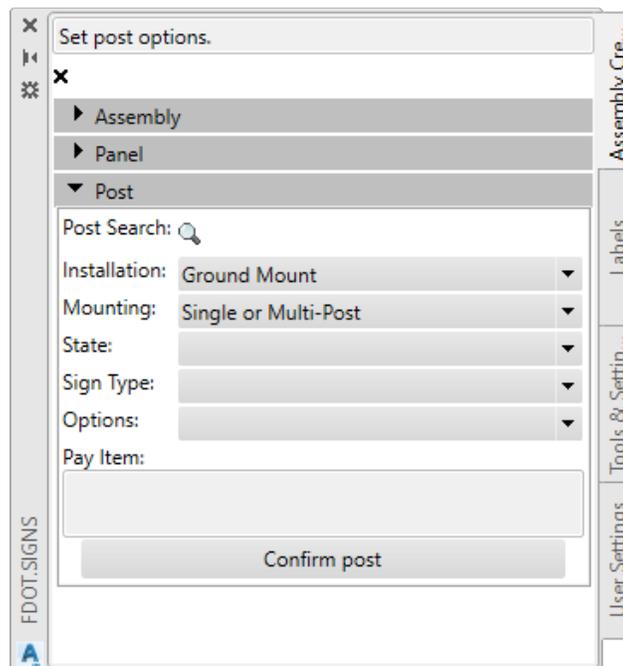
We will start when the start assembly button is selected. The image above right opens.

- **✕ Cancels Assembly Creation:** When selected it cancels the assembly creation process and returns to the default dialog as shown above left.
- **Name:** User can assign a name or an automatic default name will be used. A 3-digit counter is added at the end, this allows same named assemblies to exist in the design file without being over written.
- **Justify:** Allows the panel(s) to be set either Left, Center, or Right in the assembly.
- **Structure:** The user can designate the assembly structure as Panel and Post, Post Only, or Panel Only.
- **Confirm Assembly Settings:** This is selected when the assembly parameters are set and the designer is ready to move on to the next step.

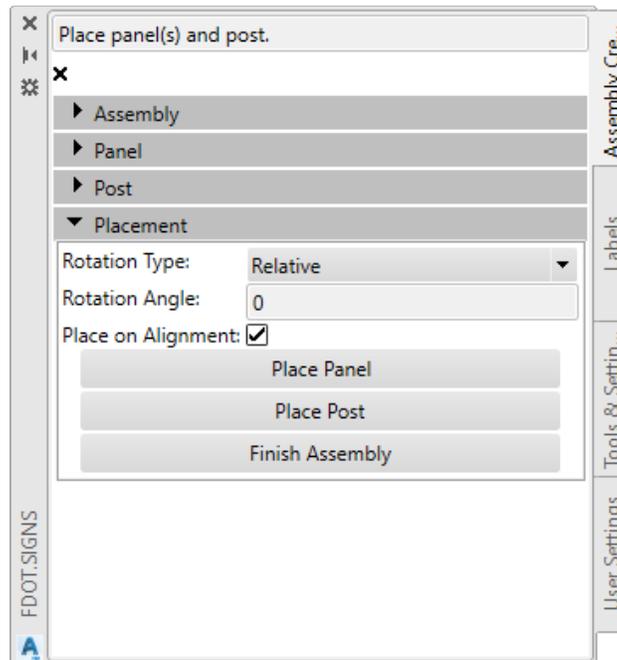
### ASSEMBLY CREATION - PANEL

The panel assembly portion of the process is where you pick the panel(s) to add to the assembly and preview your work before moving on to the next step.

-  **Location** – When selected a grid box opens showing where the panels are in relation to each other in the assembly. The user can also change locations from here by right clicking on the populated grid box for options. The grid box also contains the back side of the assembly if it is a double-sided assembly.
-  **Panel Search** – Allows the user to search for a panel by name and bypasses the navigation to the desired panel.
- **Application** - This gives the designer the ability to select from the list of options including; Conventional, Expressway, Freeway, Minimum, or Oversized. The selections made upstream effect what's available downstream in the selection process of other options.
- **Panel Class** – Panel Class is another way to shrink down the panels to choose from, it contains a big list of classes; Regulatory (R), Route Markers (M) and more, the letters in parenthesis designate the panel name. Example being Route Markers (M) = M1-7 panel name.
- **Panel Name** – With the previous selections made the list is culled down to the available panels and will populate with the panel name.
- **Size** – The user can select the Search icon to select the available sizes that go with the panel selected, if a size is not preset you can enter in a custom size. An example entry being 24x36 which will equal 6 S.F. It is the designer's responsibility to know what size sign to use, do not assume this tool has the intelligence built in to determine the correct size to set for the sign panels of the project.
- **State** – The user has 4 states to choose from; Proposed, Existing to Remain, Remove, and Relocate. The **All** button will force the state chosen to all panels in the assembly.
- **Panel Preview** – When a panel is selected it displays a preview of how the panel(s) will look before placement.
- **Add First Panel** – The user must select this button to add it to the assembly, if another panel needs to be added the user will repeat the previous steps to add it.
- **Confirm Assembly** – When all panels have been added to the assembly and the user is ready to move on to the post options click on Confirm Assembly.

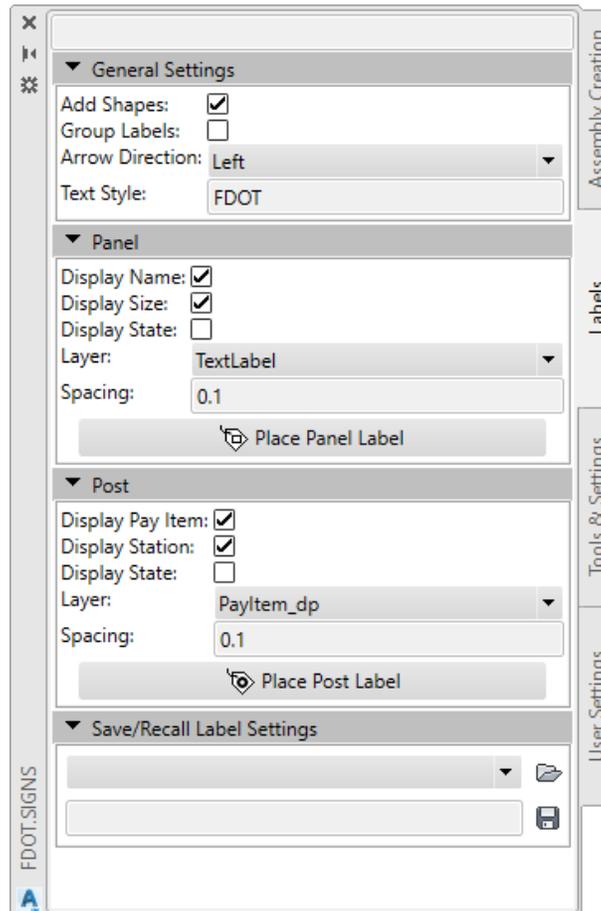
ASSEMBLY CREATION - POST

- **Post Search** – Allows user to search for a specific post which will avoid the pulldown navigation to choose the post.
- **Installation** – The user selects which installation method to use. The following are available; Ground Mount, Panel Only, and Overhead.
- **Mounting** – This allows the user to select the type of sign mounting, options being; Single or Multi-Post, Sign Beacon, Delineator, Highlighted Sign, Object Marker, Internally Illuminated Sign, Dynamic Message Sign Support Structure, or Electronic Display Sign.
- **State** – There are several states available; Proposed, Existing to Remain, Relocate, Remove, and Proposed/Remove.
- **Sign Type** – The options displayed to choose from is dependent on the type of State selected.
  - **Options** – This pull down gives the user ability to pick whether the sign is one sided, two sided, or single post or multiple posts. The options available are based on the previous selections made.
- **Panel Custom Label Fields** – This is where to fill in any open fields on a sign panel. Example, the Speed Limit sign has one field that needs to be filled in. When the Speed Limit sign is selected Field 1 becomes active to enter the speed. This will change the preview display to show the new speed. If a sign is selected with more than one field in it the FDOT Signs tool will recognize this and the appropriate number of fields will become active.
- **Pay Item** – This will show a preview of the post block used and the Pay Item information assigned.
- **Confirm Post** – When selected the assembly is ready for placement and the tool moves to the placement process.

ASSEMBLY CREATION – PLACEMENT

- **Rotation Type and Angle** – There are two options for Rotation, Relative and Absolute, Relative allows the assembly to be rotated parallel to the roadway alignment and the flow of traffic, for this reason it is the default. Absolute allows the user to enter in a fixed rotation angle.
- **Place on Alignment** – This toggle when on will place the assembly along an alignment with a Station, if toggled off it will be placed freely with no association to the alignment.
- **Place Panel** – Starts the process of placing the assembly starting with the panel first.
- **Place Post** – Starts the process of placing the post to go with the previously placed panel.
- **Finish Assembly** – Once the assembly is placed this should be selected before moving on to the Label options.

## LABELS



### LABELS – GENERAL SETTINGS

- **Add Shapes** – When toggled on, the Pay Item Number Label has a Rectangle shape and the Sign panel name has an Oval shape.
- **Group Labels** – When toggled on, all labels are set as a group along with the panel.
- **Arrow Direction** – The designer has an option to which way the label can be dragged off the object. Left means the arrow will remain pointing to the left and the label will move to the right. Right means the arrow will point to the right while the label will move left.
- **Text Style** – Controls which font is used for the labels, default is set to FDOT.

### LABELS – PANEL

- **Display Name** – Controls if the Panel name is part of the label or not.
- **Display Size** – Controls if the Size of the panel is part of the label or not.
- **Display State** – Controls if the state is labeled, default is proposed. If toggled on the “Existing to Remain” or “To Be Relocated” state will be part of the label.
- **Layer** – Provides a layer override if needed, the default is TextLabel for Panel labels.
- **Spacing** – Controls the vertical spacing between lines of text for the label, the default should be .10.
- **Place Panel Label** – Executes the place panel label command, user picks the panel to label and then the location of the label.

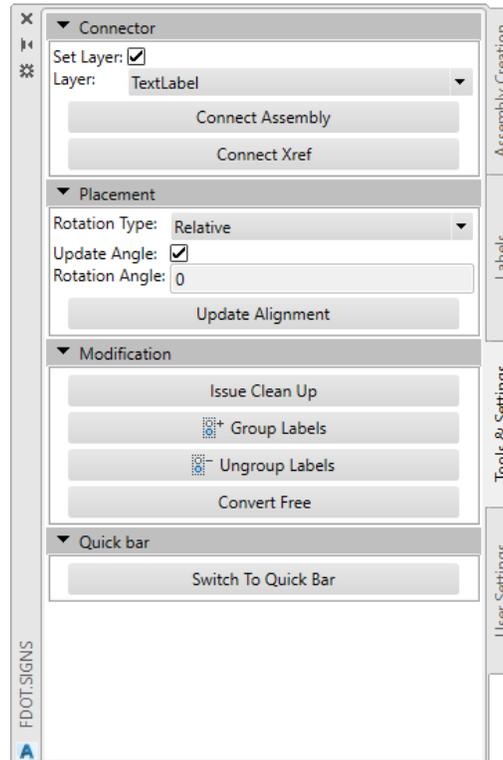
LABELS - POST

- **Display Pay Item** – Controls if the Post label contains the Pay Item Number.
- **Display Station** – Controls if the Station location is part of the label or not.
- **Display State** - Controls if the state is labeled, default is proposed. If toggled on the “Existing to Remain” or “To Be Relocated” state will be part of the label.
- **Layer** - Provides a layer override if needed, the default is PayItem\_dp for Panel labels.
- **Spacing** - Controls the vertical spacing between lines of text for the label, the default should be .10.
- **Place Post Label** - Executes the place post label command, user picks the post to label and then the location of the label.

LABELS – SAVE/RECALL LABEL SETTINGS

- **Recall or Save** – Allows users to save and recall their label settings for future sessions.

## TOOLS &amp; SETTINGS

TOOLS & SETTINGS – CONNECTOR

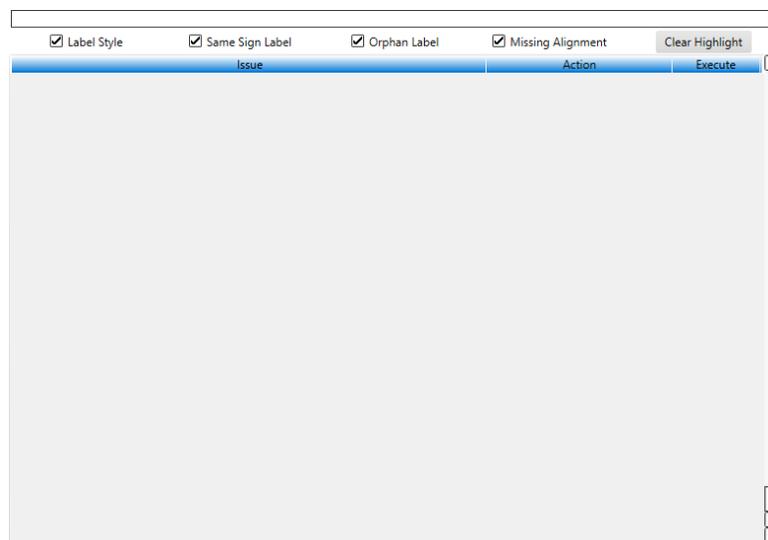
- **Set Layer** – When toggled on it will override the default layer allowing the user to select a layer, the default layer is set to TextLabel.
- **Connect Assembly** – The connector line is the leader line between the post and panel and will dynamically stay connected if panel or post is moved. If the design file has assemblies that are not connected the user can use this command to add them after they are placed.
- **Connect Xref** – This behaves like the Connect Assembly command except it functions to place the connector line from a panel in the current file to a post in a xref.

TOOLS & SETTINGS – PLACEMENT

- **Update Angle** – Allows user to update angle of placed assemblies
- **Rotation Type** – There are two options for Rotation, Relative and Absolute, Relative allows the assembly to be rotated parallel to the roadway alignment and the flow of traffic, for this reason it is the default. Absolute allows the user to enter in a fixed rotation angle.
- **Rotation Angle** – When rotation type is set to Absolute, the desired angle can be typed in here.
- **Update Alignment** – When an assembly is copied to another roadway with an alignment this command will associate the copied assembly to the new alignment, giving it Station and Offset information while maintaining the Pay Item Data.

TOOLS & SETTINGS – MODIFICATION

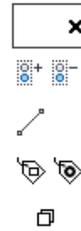
- **Issue Cleanup** – Allows user to delete unused sign assembly data from drawing file. Each cleanup option can be controlled with a check toggle.



- **Label Style** – FDOT Signs uses Civil 3D labels and when an assembly is deleted it is possible that a label style will remain in the drawing file. When toggled the cleanup tool will scan and delete the style.
- **Same Sign Label** – This will delete duplicate sign labels that are in the file.
- **Orphan Label** – If an assembly has been deleted and the label somehow remains, this will delete the label that is not associated to any assembly.
- **Missing Alignment** – If an alignment that has Sign Assemblies associated to it is deleted, this will delete all signs that are still associated to the deleted alignment.
- **Clear Highlight** – When the list is populated with scan results of selected criteria, this is used to clear the list which will remove the data from the file.
- **X** – This closes the Cleanup tool.
- **Group Labels** – If labels have been placed without being grouped, the user can use this command to group the assembly together.
- **UnGroup Labels** - This command ungroups labels, an example of use is if the labels were placed grouped and they need to be moved in the file you would ungroup, then move the labels and use the Group Labels command to return them to a grouped state.
- **Convert Free** – Converts already placed assemblies to a free state which has no association to an alignment.

TOOLS & SETTINGS – QUICKBAR

- **Switch To Quick Bar** - When selected the Sign Tool application will minimize and the most common commands will be visible, see image below for detail



From top to bottom the options are as follows;

- **X** – Closes the FDOT Signs Application
- **Groups & Ungroups Labels** - Allows user to control when the labels are grouped together with the assembly or when to ungrouped already placed labels. You can regroup labels after edits are done.
- **Add Connector** - Allows user to place a connector after assemblies have been placed.
- **Add Labels to Panels and Post** – Allows user to either place the Panel Label and Post Label
- **Opens Main Box** - Closes the Quick Bar and reopens the main FDOT Signs Application

## USER SETTINGS

USER SETTINGS – GENERAL

- **Highlight Assembly When Selected** – Controls when an already placed assembly is selected from the assembly pull down list is highlighted or not.
- **Apply Twist on Placement** – Applies a twist when placing labels.
- **Show Label Removal Warning** – When relabeling an already placed assembly, when toggled on a warning will display telling you that you are about to delete and relabel an assembly.
- **Add Connector on Placement** – When toggled on it will automatically place the connector line as the assemblies are placed.
- **Remove Signs with Alignment** – When toggled on it will delete the Sign Assembly along with labels if the alignment it is associated with is deleted.
- **Show Alignment Warning** – When toggled on it will warn the designer if they are about to change alignment association.
- **Zoom Assembly When Selected** – When toggled on it will zoom to the selected assembly from the list.
- **Zoom Factor** – Controls how far the selected assembly is zoomed in.
- **Decimal Places** – Controls how many decimal places are displayed in the station label, default is set to 0 to match standards.
- **Sorting** – The assembly list can be sorted by name or by creation date. The default is name.

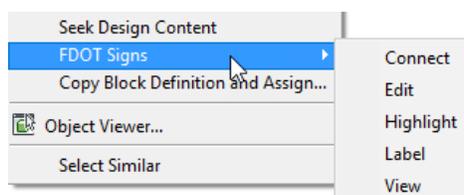
USER SETTINGS – FILES

- **Browse Folder** – This will be the location of your saved assemblies, once set it will remember the location when you either open or save.
- **Custom Guide File** – When using Guide sign to create assemblies they are saved as blocks, set this folder to point to the guide sign file that contains your blocks, which you can use to place in your file using the sign tool.
- **Panel Block Folder** – This point to the path of all the panels that are in the Block folder in the state kit
- **Post Block Library** – This point to the Block file that contains the Post Blocks used by the sign tool.
- **Label Panel Block Library** – This points to the location of the file that contains the label style.
- **Label Post Block Library** - This points to the location of the file that contains the label style

USER SETTINGS – ADMIN ONLY

- **Application Folder** - Opens the location of the FDOT Signs folder within the State Kit Installation location
- **FDOT.Signs.xml File** – Opens the FDOT.Signs.xml file for editing. It is recommended that that the user not edit this file, however if it is necessary use this command.
- **Settings Default.xml File** – This file should already be set; however, the user can change this file and then Select the Load Default Settings to load settings into the application.
- **Error Log File** – When selected this will open the Error Log File to determine what error has occurred that can then be passed to the CADD office for the developer to evaluate.
- **Load Default Settings** – This loads the Settings.Default.xml File discussed above.
- **Validate FDOT.Signs.xml** – This will validate the blocks and block files that are necessary for the Sign Tool to function correctly. It will report what is missing.
- **FDOT Sign Assembly Tool Version** – Identifies the version of the sign application, this is useful when reporting bugs or issues with the program.

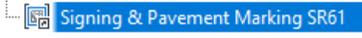
**Note** *There is also a Right Click menu: Select an assembly and Right Click to get to the menu shown below;*

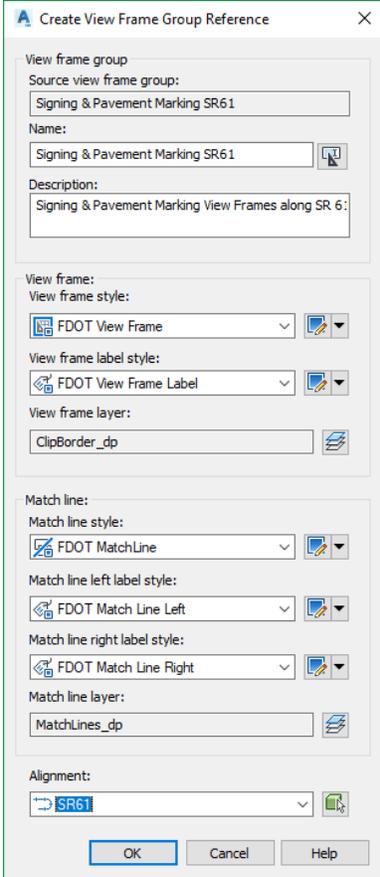


**Note** *Each district has their own preference on how the signs are to be labeled, make sure to communicate with your project manager prior to setting up the label features.*

### Exercise 6.1 Referencing in The Signing View Frame Group

In this exercise, the designer will create a data reference of a previously created view frame group for the purpose to aid the designer in labeling the assemblies as they go down the Alignment.

1. Open the previously created *DSGNP01.dwg*.
2. Open Toolspace and In the Data Shortcut section expand the view frame groups folder.
3. Right Click on the following and select **Create Reference** 
4. Make the following changes and select **OK**.



The drawing should now contain yellow dashed borders representing sheets.

### Exercise 6.2 Place Single Post Sign Assembly

In this exercise, the designer will build, place, and label a simple sign assembly.

1. Open the *Dsgnsp01.dwg* file and zoom in near **Station 702+20**.
2. From the FDOT Ribbon select the **2 Point Twist** command and using the SR61Alignment as the object select anywhere near station 701+00 for the first point and anywhere neat station 702+00 for the second point.
3. From the FDOT Ribbon, select the **FDOT Signs** icon to open the FDOT Signs application.

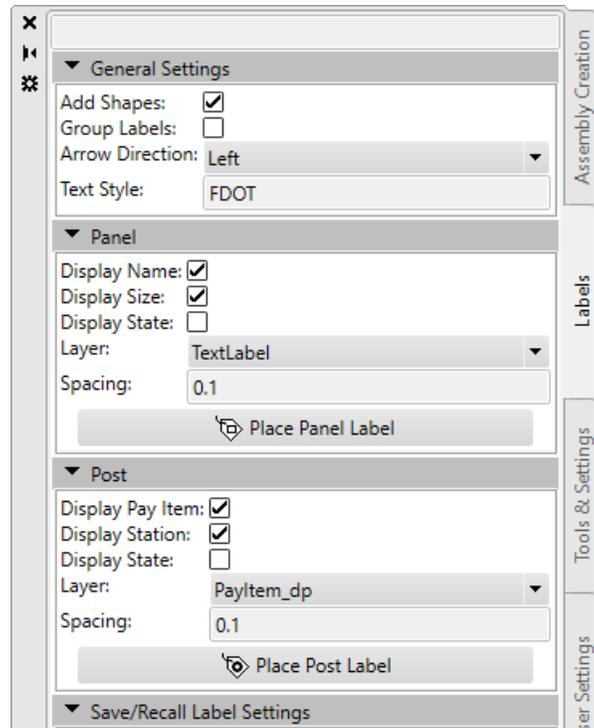


4. From FDOT Signs, select the **Create New Assembly**  icon.
5. For *Name* enter **M1-4**, notice the name has added -001 to the end.
6. Set *Justify* to **Center**.
7. Make sure **Panel** and **Post** is selected, then select **Confirm Assembly Settings**.
8. Click on the *Location* icon to change the location of the panel on the grid.
9. Click on **Block F(1,0)**. This will be the *Route Marker Panel* location.



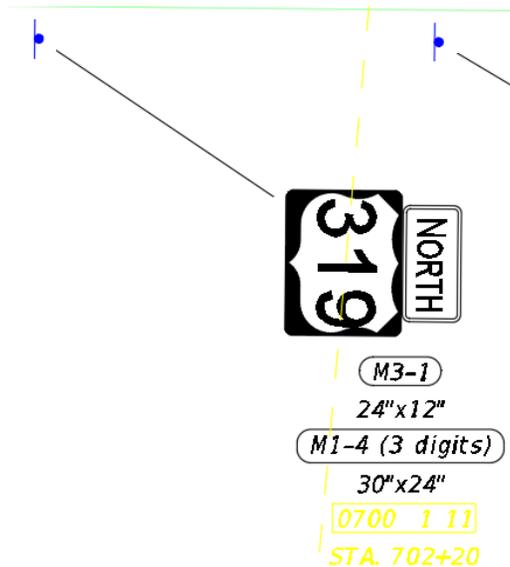
10. In the *Panel Section*:
  - a. Set the *Application* to **Conventional**.
  - b. Set *Panel Class* to **Route Markers(M)**
  - c. For *Panel Name* Select the **M1-4 (3 Digits)**.
  - d. *Size* is preset with one option, select **30"x24"**.
  - e. Set *State* to **Proposed**.
  - f. For *Field 1* type in **319** the panel preview shows the text, ignore the text not being centered in the panel it will be centered when the panel is placed in the file.
  - g. Click **Add First Panel**,
11. On the *Location Grid* select the one above the panel already created, **F(0,0)**.
12. Select another *Route Marker*, **M3-1** which is the *NORTH* panel.
13. For size select **24"x12"** from the available options.
14. Set State to **Proposed**.
15. Select **Add Next Panel**, then **Confirm Assembly**. You should see a preview of the 2-panel assembly.
16. For the *Post Parameters* enter the following.
  - a. Set the *Installation* to **Ground Mount**.
  - b. Set *Mounting* to **Single** or **Multi-Post**.

- c. Set *State* to **Proposed**.
  - d. Set *Sign Type* to **Furnish and Install Ground Mount**.
  - e. Set *Options* to **1 Sided**.
  - f. Click on **Confirm Post** to continue to the *Placement* section.
17. Select **Place Panel** to start the *panel placement command*.
  18. The command line asks to select the *Alignment*, select the **SR61 Alignment** and select an area in the drawing on the south side of the alignment away from the sidewalk to allow room for labels and connector line.
  19. Select **Place Post**, notice how the tool remembers the Alignment. Place the Post near Station 702+20
  20. Select **Finish Assembly** to proceed to placing Labels.
  21. Select the **Labels** tab and make sure to match the following settings as shown below.



22. Click **Place Panel Label**, click the **NORTH panel**, select the *label location* below the assembly, click on the **Route Marker panel** and place the label below the previous label.

23. Click **Place Post Label**, click the *post*, for *label location* pick below the previous labels. Your drawing should look like below.



24. Notice the rotation of the text it is always set to orientation to view to appear right reading. This is built into the Civil 3D label style being used.

**Note** Label placement is a personal preference. Be consistent with how you place sign labels so the plans look professional. Use AutoCAD commands to move the **Sign Names** and **Sizes** so they are centered under the sign panels and are stacked from top to bottom.

### Exercise 6.3 Saving the Sign Assembly

In this exercise, the designer will save the previously placed sign assembly as an xml file, so that it can be recalled, placed, and labeled in a future instance.

1. Switch to the User Settings tab on the Sign tool and change the folder used for saving and recalling

assemblies as shown.

2. Switch back to the Assembly Creation tab and select the Save Icon

3. Name it M1-4\_M3-1.xml.

### Exercise 6.4 Update Sign Panel Location

In this exercise, the student will use the **Group Labels** command to move the panels and labels to a new location.

1. Continuing in *Dsgnsp01.dwg* with the Sign tool open, select the **Tools & Settings** tab.
2. Click on **Group Labels** and select the *Labels* individually you just placed on the sign assembly.
3. Click **Enter** when complete.
4. Select the **Sign Panel**. You can now move the Panel along with all labels, move the panel a few feet to see the result.
5. Select **Ungroup Labels** and select the labels to return the assembly to its original state.

### Exercise 6.5 Place Multi-Panel Sign Assembly

In this exercise, the student will use the same process as in the previous exercise to place a multi panel sign assembly. Refer to the previous exercises to refresh yourself on the steps used.

1. Continuing in *Dsgnsp01.dwg*, zoom to the vicinity of **Station 703+00**. This sign will be added on the North side.
2. Open the Sign tool, if closed, select **Start New Assembly**.
3. *Name* the new assembly **M1-4** and select **Confirm Assembly Settings**.
4. In the *Panel Section*, make selections for **Panel 1 of 4** as shown below.

Assembly

Panel

Location: F(0,1)

Panel Search:

Application: Conventional

Panel Class: Route Markers(M)

Panel Name: M1-4 (2 digits)

Size: 24"x24"

State: Proposed All

Field 1: 98

5. Select **Add Panel**.
6. Select **Add Next Panel**.
7. Make the following selections for **Panel 2 of 4**.

Assembly

Panel

Location: F(0,1)

Panel Search:

Application: Conventional

Panel Class: Route Markers(M)

Panel Name: M1-4 (3 digits)

Size: 30"x24"

State: Proposed All

Field 1: 319

8. Select **Add Panel**.
9. Select **Add Next Panel**.
10. Click on the Location icon and select the location that is marked yellow in the diagram below.

Panel

Location: F(1,0)

Panel Search: F(0,0) F(0,1) F(0,2)

Application: F(1,0) F(1,1) F(1,2)

Panel Class:

Panel Name:

Size:

11. Make the following selections for **Panel 3 of 4**.

The screenshot shows the 'Panel' configuration window. The 'Location' field is set to 'F(1,0)'. The 'Application' dropdown is set to 'Conventional', 'Panel Class' is 'Route Markers(M)', and 'Panel Name' is 'M6-4'. The 'Size' is '21"x15"' and the 'State' is 'Proposed'.

12. Select Add Panel.  
 13. Select Add Next Panel.  
 14. Click on the Location icon and select the location that is marked yellow in the diagram below.

The diagram shows a grid of location options. The 'Location' field is set to 'F(1,1)'. The 'Application' field has two options: 'F(0,0)' and 'F(0,1)'. The 'Panel Name' field has two options: 'F(1,0)' and 'F(1,1)'. The 'F(1,1)' option in the 'Panel Name' field is highlighted in yellow.

15. Select Add Panel.  
 16. Select Add Next Panel.  
 17. Make the following selections for Panel 4 of 4.

The screenshot shows the 'Panel' configuration window. The 'Location' field is set to 'F(1,1)'. The 'Application' dropdown is set to 'Conventional', 'Panel Class' is 'Route Markers(M)', and 'Panel Name' is 'M6-1R'. The 'Size' is '21"x15"' and the 'State' is 'Proposed'.

18. Select Confirm Assembly.

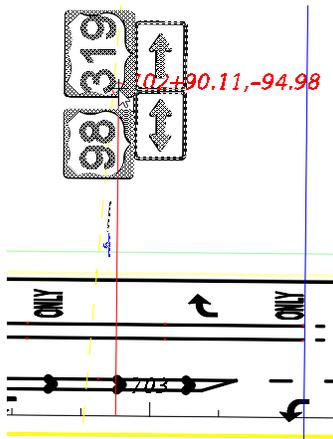
19. In the *Post* section make the following selections.

▶	Assembly
▶	Panel
▼	Post
Installation:	Ground Mount
Mounting:	Single or Multi-Post
State:	Proposed
Sign Type:	Furnish and Install Ground Mount
Options:	1 Sided
Pay Item:	SINGLE POST SIGN [1 SIDED], FURNISH and INSTALL GROUND MOUNT, UP TO 12 SF

20. Select Confirm Post.

21. Make sure *Rotation* is set to Relative and *Place on Alignment* is checked.

22. Select Place Panel and click near the *Station 703* as shown below.

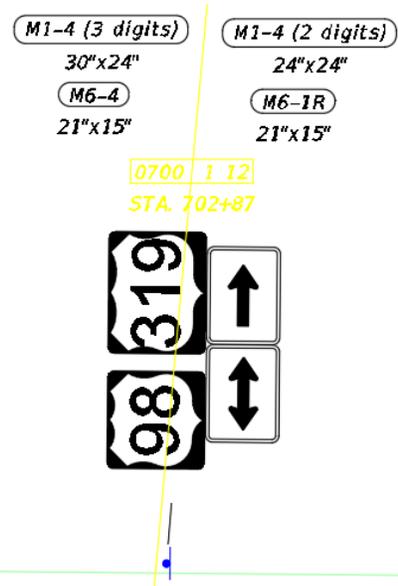


23. Select **Place Post** and Select close to Station 703+00 just outside the Sidewalk.

24. Click **Finish Assembly**, then select the **Labels** tab.

25. Select **Place Panel Label**, select the **319 panel** & click above it, select the **98 panel** & click below the previous label. Repeat placing the label for the bottom roll of panels.

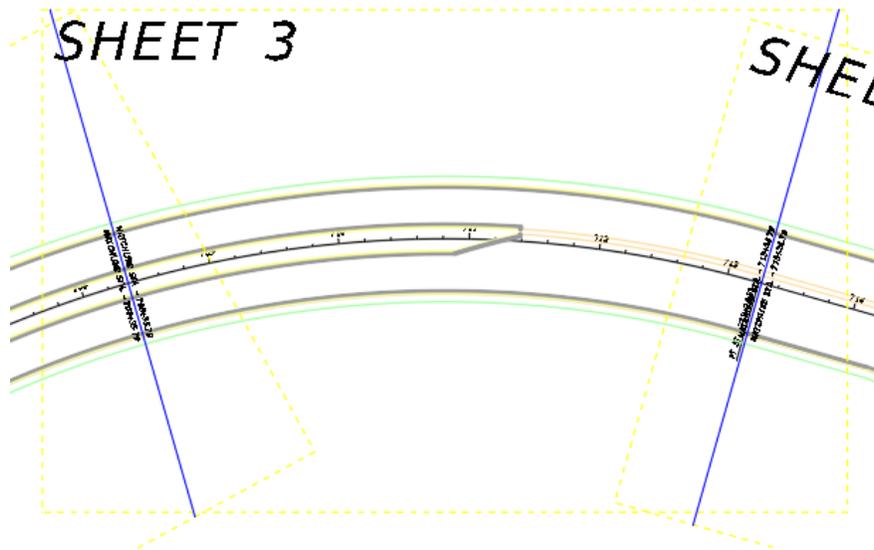
26. Select **Place Post Label** and select below the previously placed labels. The completed assembly is shown to the right.



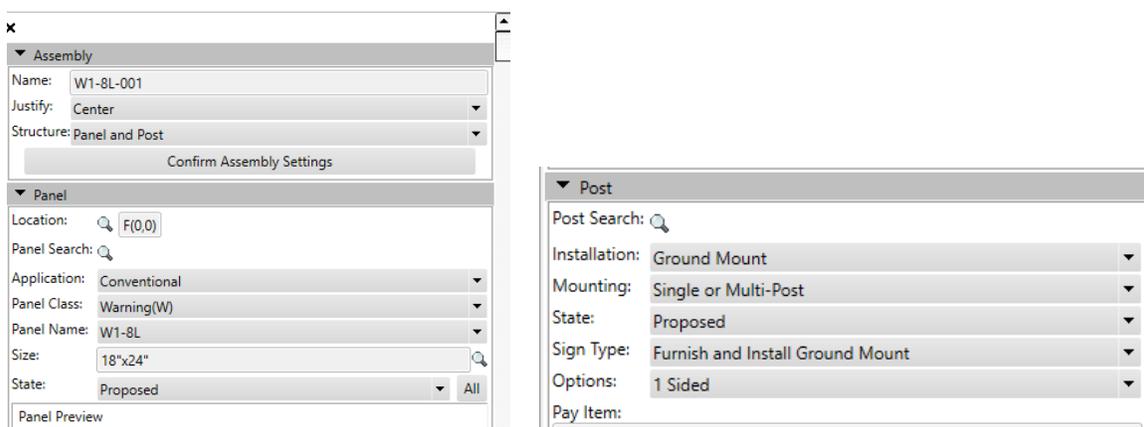
### Exercise 6.6 Creating and Placing a Sign Assembly using 3 methods (Part 1)

In this exercise, the designer will create and place a warning arrow sign assembly three times using different techniques. The designer will first place it like previous steps, then the designer will recall a previously saved version of the assembly, and the third method will be copying the assembly to its new location.

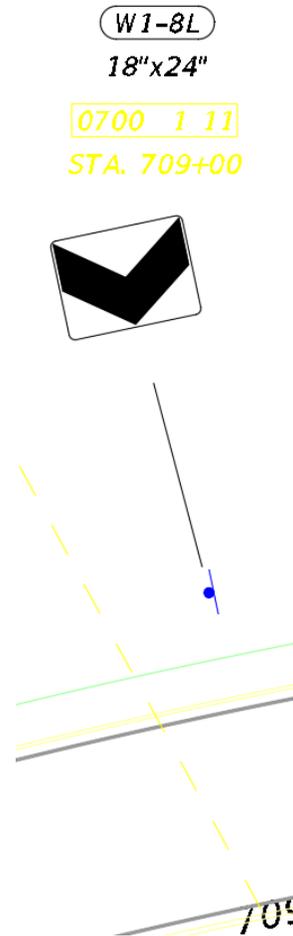
1. Continuing in the *DSGNP01.dwg* switch to the FDOT Ribbon and select the **2 Point Twist** command.
2. For the first point select anywhere along the top border of Sheet 3 of the view frames you just referenced. The second point should be anywhere to the right of the first point. In short you are picking left to right to rotate the view to make the sheet 3 view frame perpendicular, just like how it will print.



3. You can close **EMX** and **Toolspace** to gain screen real estate, since you won't need to use these in this exercise.
4. Open **FDOT Signs** if not already open. Create the following assembly using the steps from earlier exercises.



5. Place the panel and post around Station 709+00 and label the panel and post as shown below.



- Using what you have learned in an earlier exercise, save the assembly and name it **W1-8L**.

### **Exercise 6.7** *Placing same sign assembly using a saved xml file (Part 2)*

In this exercise the designer will recall the previously saved sign assembly and place in the design file.

- Click on **Opens assembly from XML file** button in the FDOT Signs app.

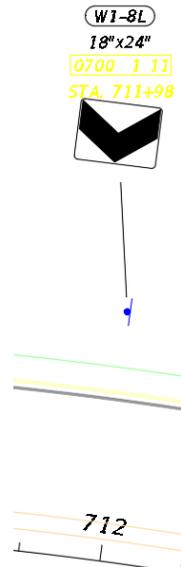


- Using the list pulldown find the **W1-8L** assembly. A preview is shown to verify the selection.
- Select **Load**.
- The sign tool pre loads all settings based on how it was saved. If no changes are needed select **Confirm Assembly** and then **Confirm Post**.
- At this point it is identical to previous steps for placing and labeling sign assemblies. Place the assembly near station 710+40.
- Label Panel and Post.

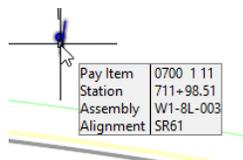
**Exercise 6.8 Copying placed sign assembly to new location (Part 3)**

In this exercise, the designer will copy the previously placed sign assembly to a new location and the labels will dynamically update, along with the relative rotation of the panel and post.

1. Using the AutoCAD copy command select the previously placed assembly including labels at near the station at 710+40.
2. Left click near station 712+00 for the location for the copy.
3. Press enter to exit the command and for the assembly to update.



4. If you hover over the post, notice how the name for this assembly has changed to **W1-8L-003** designating that a third assembly of the same type has been placed.

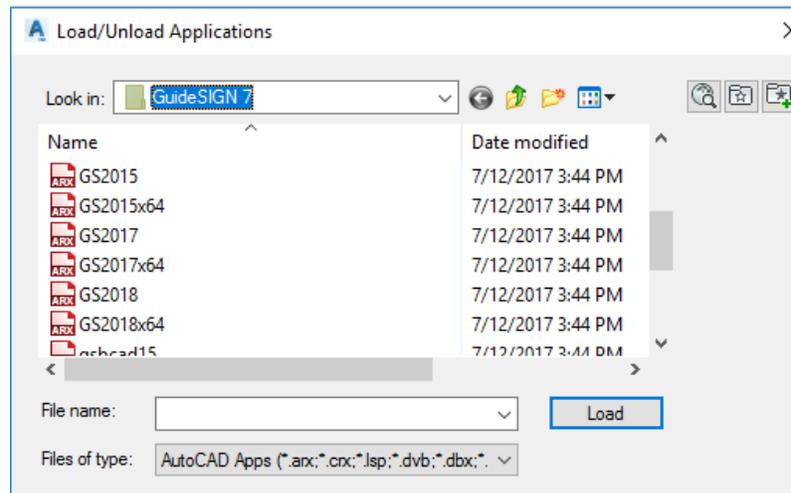


## GUIDSIGN PROGRAM

GuidSIGN is an intuitive, user-oriented software program that automates the process of designing roadway signs. The program incorporates many user-suggested features and allows users to quickly create finished shop drawings, complete with title block, sign layout, and letter location tables. The designer can create Sign Panels with very little input. However, knowledge of sign standards is required. Letter shapes, spacing, sign sizes and symbols used in GuidSIGN are based on the following publications: *Standard Alphabets for Highway Signs and Pavement Markings*, *Standard Highway Signs (1979) (2004)* and *Manual on Uniform Traffic Control Devices (1988) (2003) and (2009)*.

GuidSIGN enables the designer to create signs with minimal input, using standard sizing controls, or by specifying controlling size parameters. Select a sign style, and the program automatically calculates the appropriate border, margins, fonts, layout, shape and size for the selected lettering.

GuidSIGN is loaded by typing **appload** on the command line in Civil 3D and browsing to **C:\Program Files\Transoft Solutions\GuidSIGN 7** and selecting **GS20XXx64** file, then selecting load. The XX represents the version of Civil 3D you have. The image below shows the different versions available in the GuideSIGN 7 application.



When the file is loaded a GuideSIGN Ribbon is loaded in the Civil 3D workspace. At the time of this writing, GuidSIGN version 7 was used for this training guide.



**Hint** Always design the largest sign panel first when using GuidSIGN.

It is ok to stop at practically any point of the Sign Design process and finish the sign design at a later time. It is not necessary to complete the process in one session. All sign panel preferences are stored with the sign panel, which allows the designer to start and stop, as needed.

For correct sheet placement and scaling please see the following **GuidSIGN Scale Conversion Factor table** (0.109 x sheet scale).

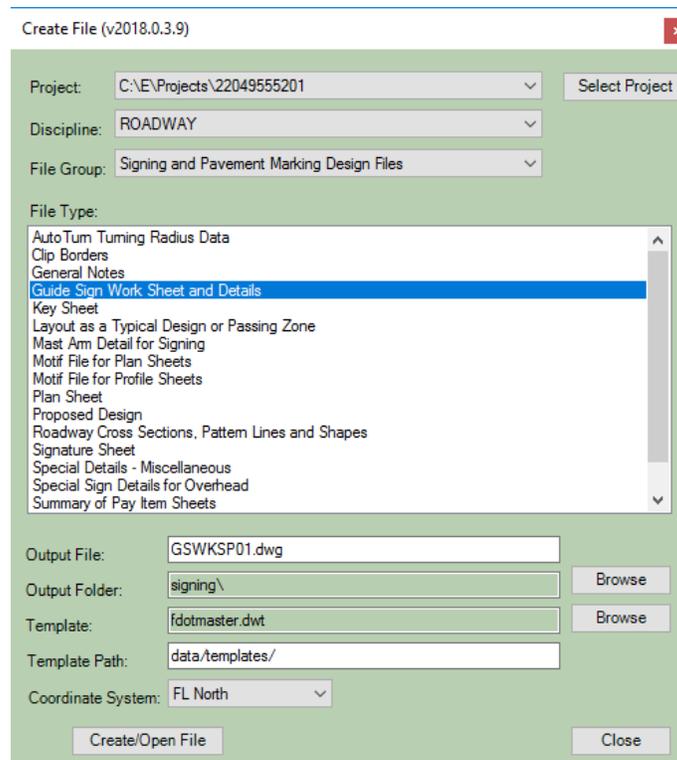
GuidSIGN Scale Conversion Factor	
Sheet Scale	Plot Scale
10	1.09
20	2.18
25	2.72
30	3.25
40	4.35
50	5.43
60	6.5
75	8.16
80	8.7
100	10.85

### Exercise 6.9 Creating the GuidSIGN Work sheet (Part 1)

#### ➤ Create a new design file and load GuidSIGN

In this exercise, the student will create a new design file using the FDOT Create File application and then load the GuidSIGN program.

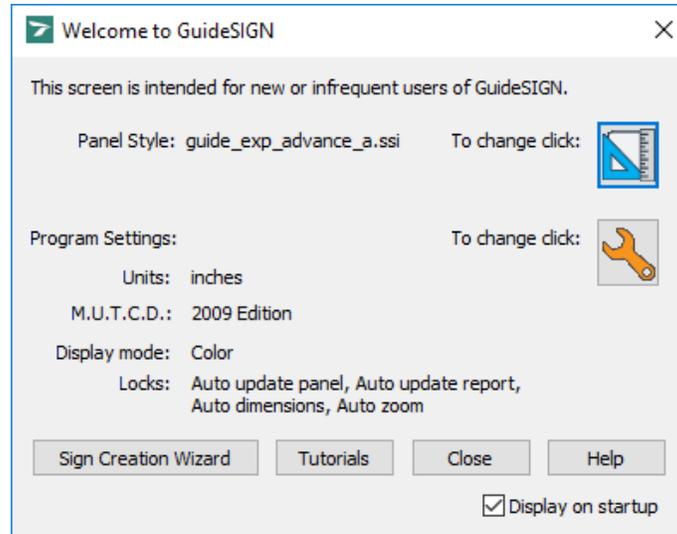
1. From the FDOT Ribbon, select the **Create File** icon. Select the option for Guide Sign Work Sheet and Details from the Signing & Pavement Marking Files (DWG) File Group. See image below for input.



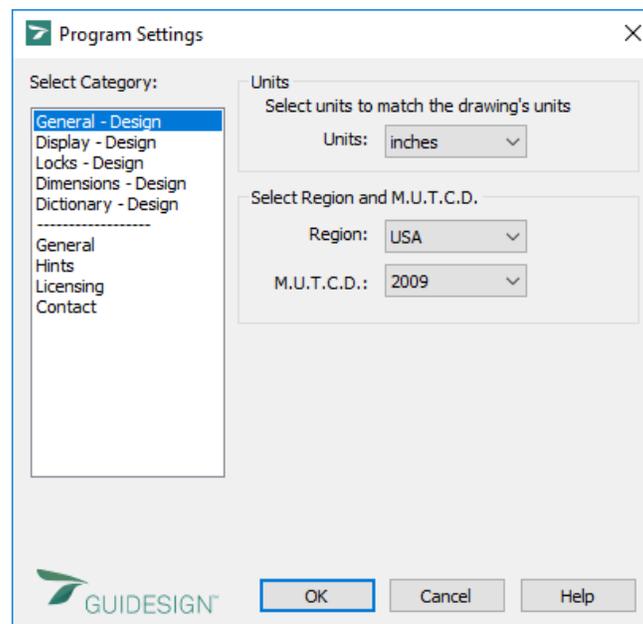
2. Select the Create/Open button, the file **GSWKSP01.dwg** is now open and in the *signing* folder.
3. Close the Create File application.

4. If the GuideSIGN Ribbon is not already loaded, type in **APPLOAD** on the command line.
5. Refer to the location described at the beginning of the GuideSIGN section to load the appropriate version of the application.

**Note** *If this is the first time GuidSIGN is loaded the Welcome to GuidSIGN will open.*

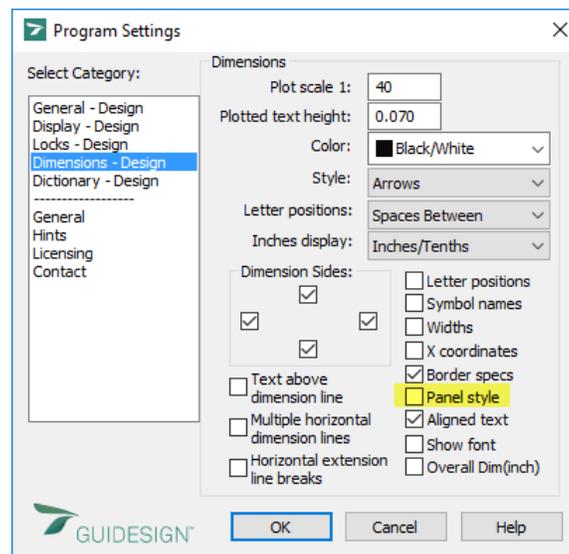


6. On the Welcome screen, click the **Program Settings** icon . This opens Program Settings dialog.



7. Under the *General* category set *Units* to **Inches** if not already.
8. Set *M.U.T.C.D.* to **2009 Edition**.
9. Under the *Display Design* category set the *Display Mode* to **Color**.
10. Under the *Locks Design* category ensure all **Locks** are toggled on.
11. Under the *Dimensions* category toggle off the option for **Panel style**.

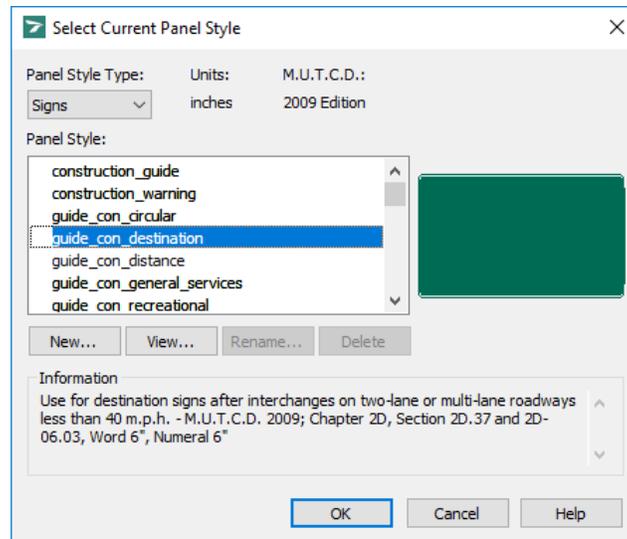
12. Make sure the scale is set to **40** and the *plotted text height* is set to **0.70**.



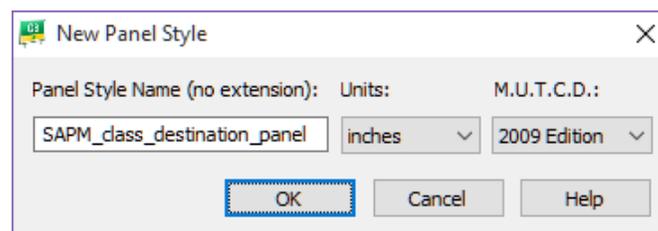
13. Close the Program Settings dialog.

➤ **Set the GuidSIGN Preferences and Panel Style**

1. On the Welcome screen, click the **Panel Styles** icon . This opens Select Current Panel Style dialog. Select the **guide\_con\_destination** style.



2. Click the **New** button. This opens the New Panel Style dialog.



**Note** A panel style represents a set of parameters that specify the characteristics of a sign (sign shape, color, border radius, thickness, fonts, size of arrows and shields, and spacing between text and symbols). The highlighted panel style is used to create new panels.

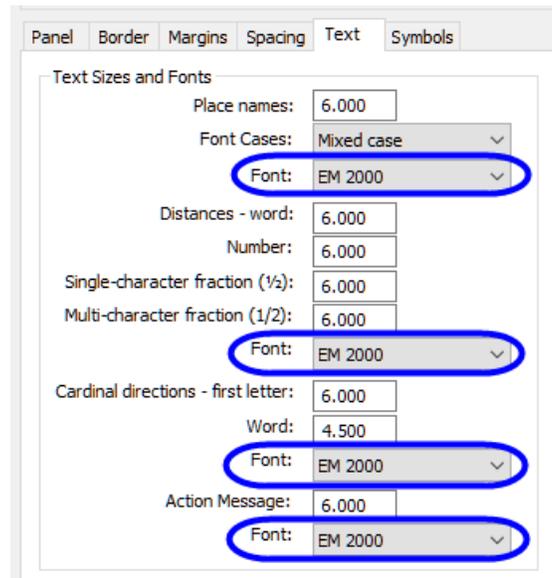
3. Type **SAPM\_class\_destination\_panel** in the Panel Style Name field.
4. Click the **OK** button to save the new *Panel Style* and open the Edit Panel Style dialog.

5. On the **Panel** tab, set the following:

**Note** The Height and Width fields throughout the GuidSIGN program accepts the user input in inches.

- a. Width: **92.00** (7' 8") displayed in inches.
- b. Height: **48.00** (4') displayed in inches.
- c. Round: 6 (Will round to the nearest six-inch increment.)
- d. Lock: Toggle On. (Locks the sign size as set in the Height and Width fields.)
- e. Set the colors to the name of the color for the Legend, Border and all the Panels. (**Green [MUTCD]** and **White [MUTCD]**.)

6. Go to the **Text** tab:
  - a. Set all the *Font* drop down lists to the **EM 2000 Series Font**.



7. Click the **OK** button on the Edit Panel Style dialog.
8. With the new *SAPM\_class\_destination\_panel* style highlighted, click the **OK** button on the Select Current Panel Style dialog.

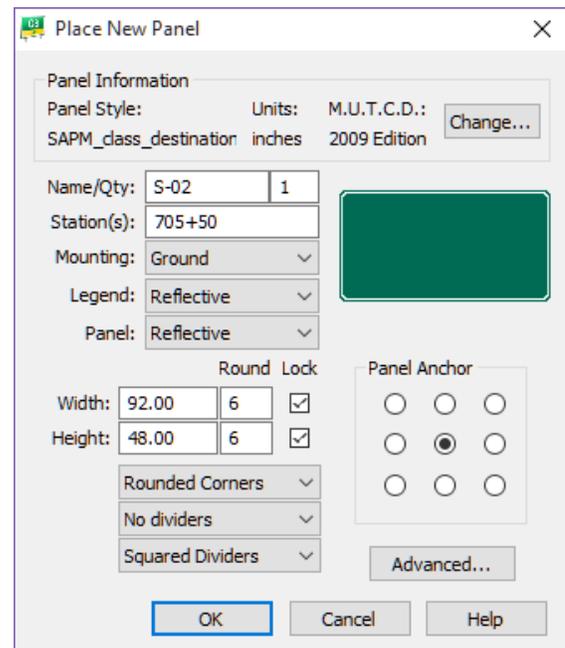
### ➤ **Place New Panel**

It is important to note that you should always start the sign design process with the largest sign that will be placed on the sheet. This sign will dictate the scale of the sheet.

1. Dismiss the Welcome to GuidSIGN dialog by clicking the **Close** button. (This is to have the maximum amount of screen real estate.)
2. Continuing with GuidSIGN, click the **Place New Panel**  button. This opens the Place New Panel dialog.
3. Set the *Name* to **S-02** and *Quantity* to **1**. The name entered here will be the name that appears in the report on the Guide Sign Worksheet. This is typically a number.
4. Set the *Station(s)* to **705+50**.

**Hint** If you have multiple locations for this sign i.e. quantity more than 1, you use the Advanced option on this dialog to set multiple stations and these stations will show up on the report.

5. Set *Mounting* to **Ground**. (The options are **Overhead** or **Ground**.)
6. *Legend* to **Reflective**.



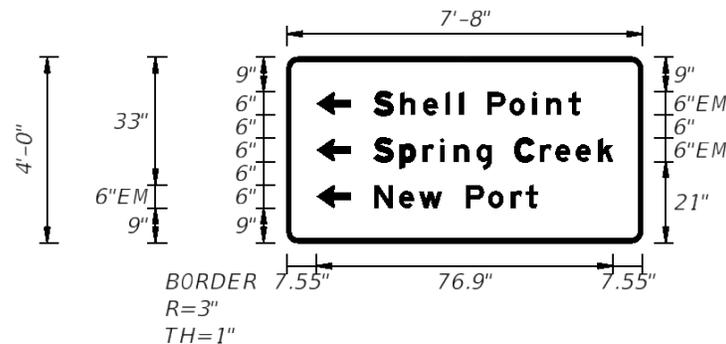
7. Panel to **Reflective**.
8. Panel *Width* and *Height* are already set by the style selected, the new *SAPM\_class\_destination\_panel* style.
9. Set the *Panel* to **Round Corners and No Dividers**. (If your sign has dividers, there are other options on how to display the dividers.)

**Note** This data is stored with the sign and can be included in reports. The sign panels will dynamically resize, if the lock toggles are not checked, as text and symbols are added to the sign. You may have to come back and re-set the Rounding to 6" after the sign is placed in the sheet.

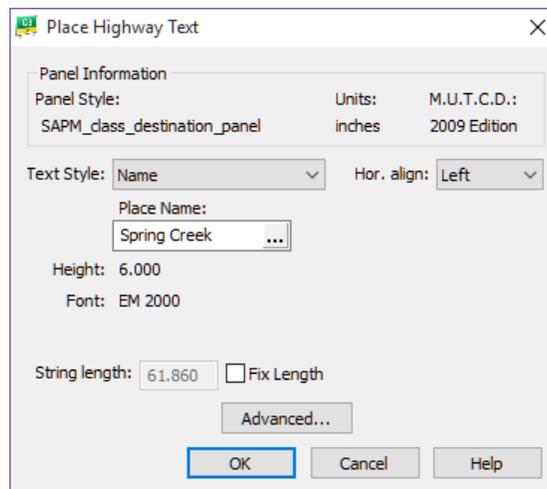
10. Click **OK**. The Sign Panel will be attached to the cursor.
11. Left click in the drawing to place the empty sign panel in the design file.

### ➤ Place Highway text

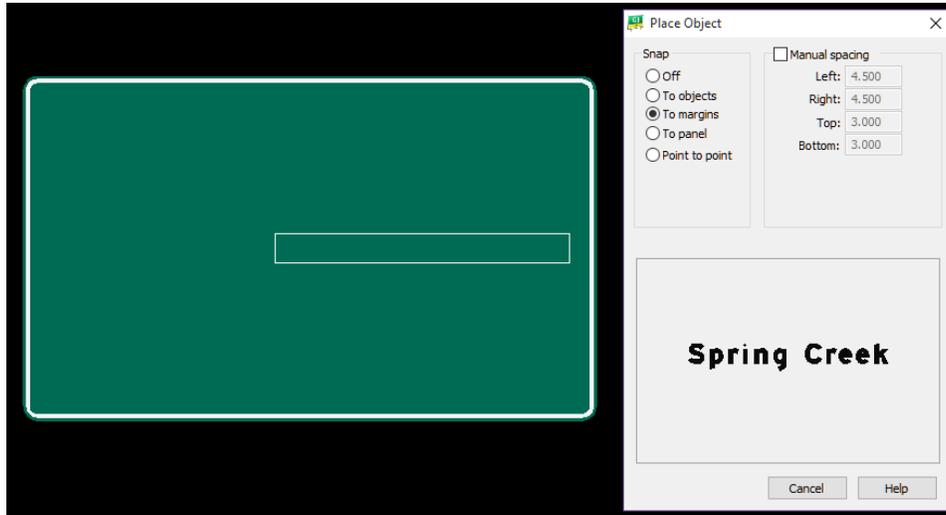
In this part of the exercise, the student will place text in the sign panel. When complete the sign will look like that shown in the figure below. Keep in mind that each district may have specific sign standards, which need to be followed. Be sure to communicate with the Traffic Design personnel prior to starting the design process, this will save having to redo signs after a review.



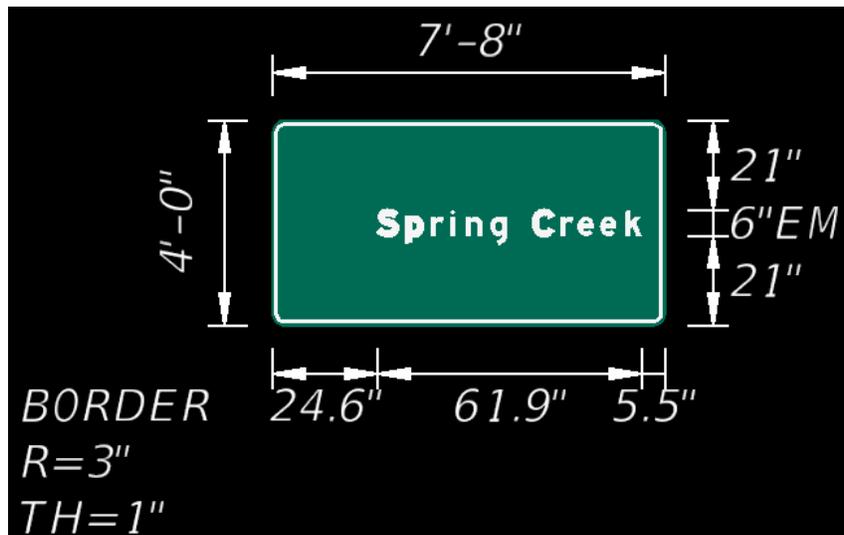
1. In the GuidSIGN, click **Place Highway Text** . (This prompts to select a point inside the sign panel. Watch the Command Line for prompts.)
2. Select inside of the sign panel. (This opens Place Highway Text dialog.)



3. Set the *Style* to **Name**. (This should be set by default.)
4. Set the *Hor. Align* to **Left**.
5. Under *Place Name* key-in **Spring Creek**.
6. Click **OK**. The text box will be attached to the cursor and **Place Object** dialog opens.

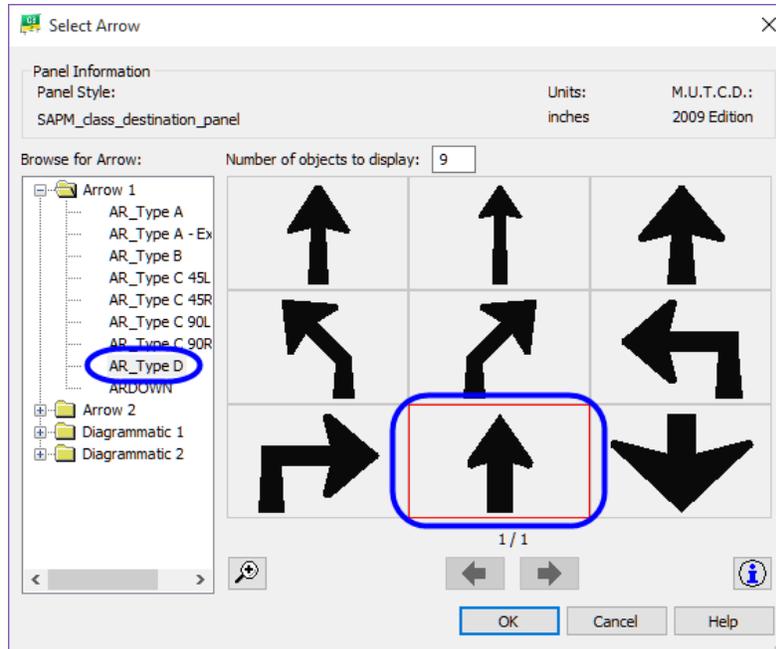


7. Under *Snap* set the option **To margins**.
8. Line the **Text Object** box to the center right of the Panel.
9. Left click inside of the sign panel when the box is in the correct spot. The figure below shows what the sign should look like at this point.

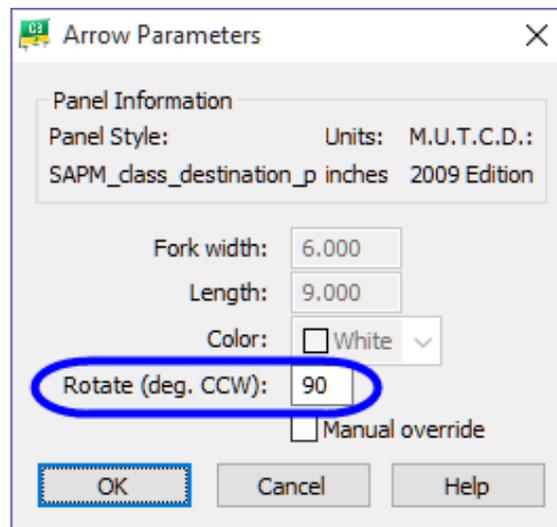


➤ **Place and Adjust Text and Arrow**

1. Click **Place Arrow** .
2. Select inside of the sign panel. This opens Select Arrow dialog.

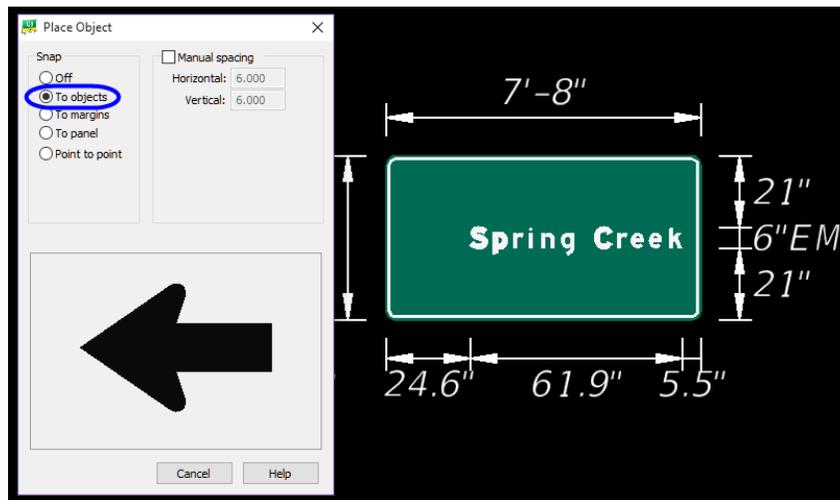


3. Select **Arrow 1 > AR\_Type D** and click the **OK** button to set up the *Arrow Parameters*.

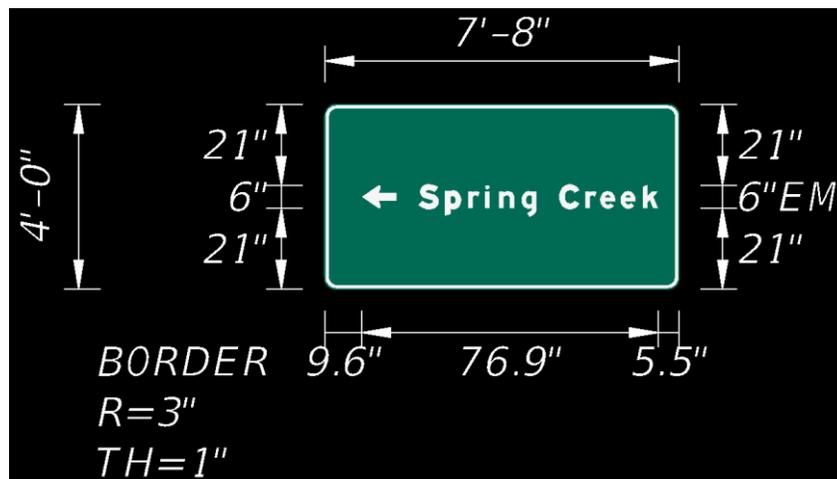


4. Set the Rotate (deg.CCW) to **90**.
5. Click the **OK** button.

6. On the Place Object dialog, **Snap** should be set on **To Objects**.



7. Place the cursor inside of the sign panel and click when the yellow box is lined up with the text. The figure below shows what the sign should look like at this point.

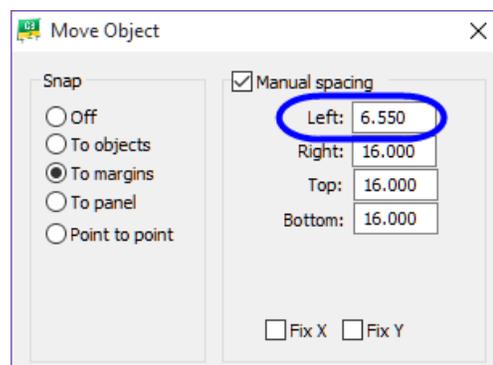


8. Next, adjust the text and arrow object to the margins of the sign panel.

9. Click the Move Single Object tool  from the GuidSIGN toolbar.

10. Select the **Arrow** placed on the sign panel.

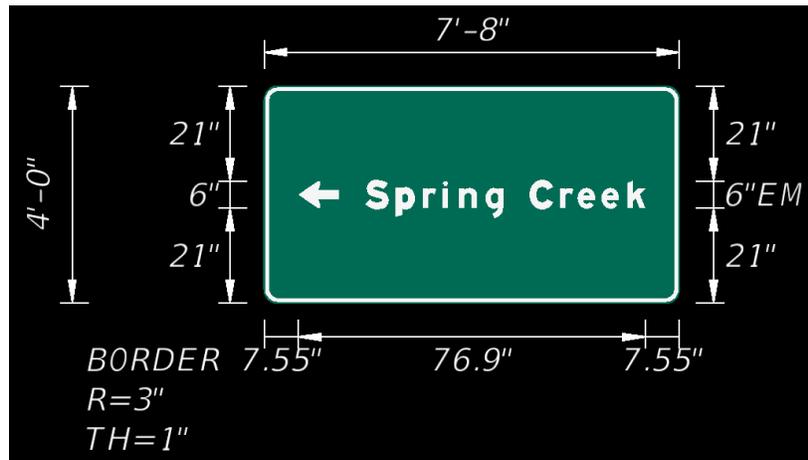
11. On the **Move Object** dialog, check on the **Manual spacing** toggle.



12. Type **6.55** in the Left field. (All other fields do not matter. This is just to get the left margin (right side of the sign panel) correct before placing the rest of the objects on the sign panel. This is calculated by the 1" border thickness and 6.55 for the left margin.)

13. Click twice in the yellow box to accept the new location of the arrow.

14. Click the Move **Single Object** tool  from the GuidSIGN toolbar.
15. Select the **Spring Creek** highway text placed on the sign panel.
16. On the Move Object dialog:
17. Check on the **Manual spacing** toggle.
18. Type **6.55** in the **Right** field. (All other fields do not matter. This is just to get the right margin (left side of the sign panel) correct before placing the rest of the objects on the sign panel. This is calculated by the 1" border thickness and 6.55 for the left margin)
19. Click the yellow box in the sign panel to accept the new location of the **Highway Text**. The figure below shows what the sign should look like at this point.



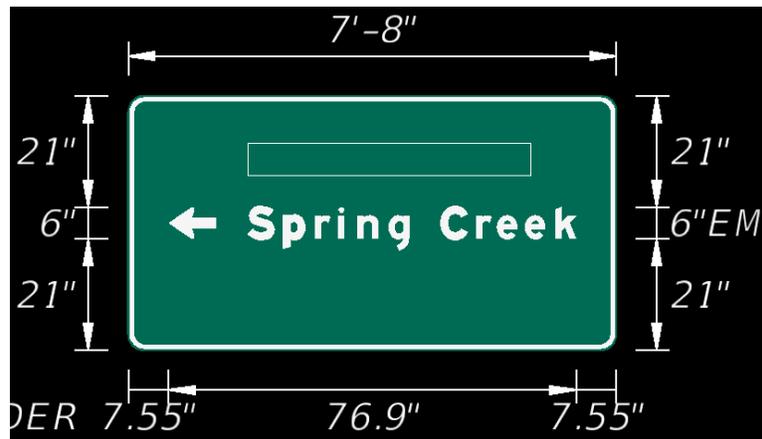
20. Now, since the margins for the largest sign panel objects (the arrow and highway text) are set correctly, the rest of the arrow and text objects can be easily placed and already aligned. Remember, the best method for placing objects on a sign panel with the GuidSIGN program is to start with the largest object first. When placing subsequent objects, again use the same concept. Place next largest object and so on.

### ➤ **Place Highway text**

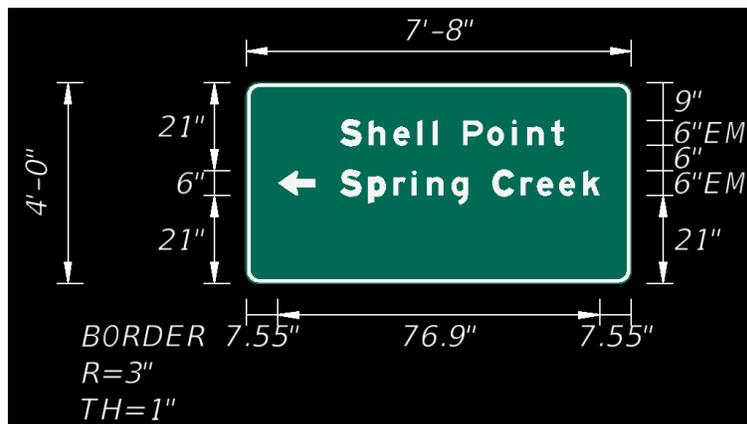
In this part of the exercise, the student will place the next largest text object in the sign panel.

1. On the GuidSIGN toolbox, click Place Highway Text . This prompts you to select a point inside the sign panel.
2. Select inside of the sign panel. This opens Place Highway Text dialog.
3. Set the *Style* to **Name**. This should be set by default.
4. Set the *Hor. Align* to **Left**.
5. Under *Place Name* key-in **Shell Point**.
6. Click **OK**. The text box will be attached to the cursor and Place Object dialog opens.
7. Under *Snap* set the option **To Objects**.

8. Line the **Text Object** box to the **top** left side of the *Spring Creek Highway* Text Object.



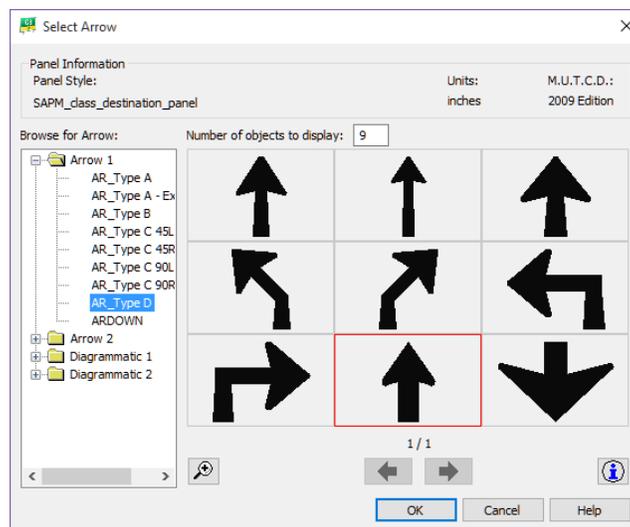
9. Left click inside of the sign panel. The figure below shows what the sign should look like at this point.



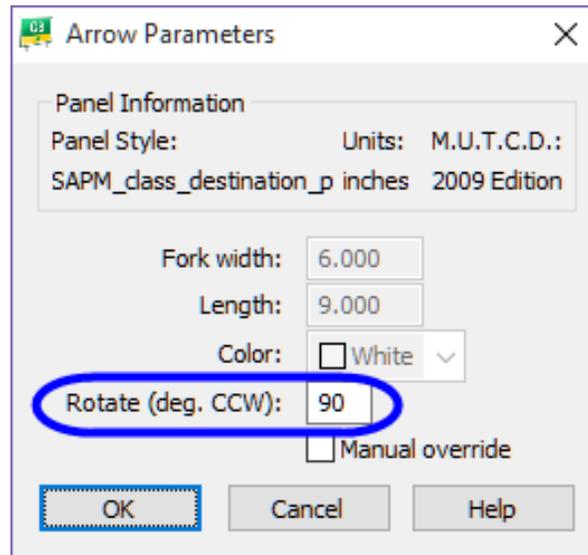
### ➤ Place Arrow

Next, you will place the direction arrow object on the sign panel.

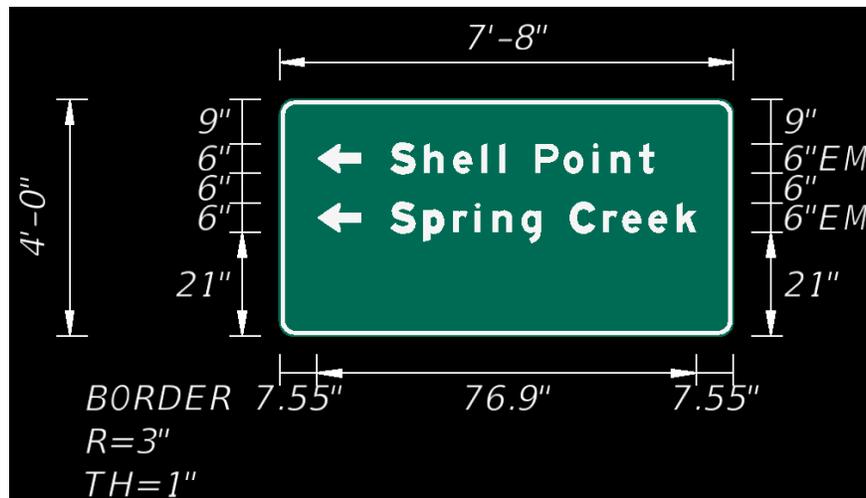
1. Click **Place Arrow**  and select inside of the sign panel. This opens Select Arrow dialog.



2. Select **Arrow 1 > AR\_Type D** and click the **OK** button to set up the *Arrow Parameters*.
3. Set the Rotate (deg.CCW) to **90**.



4. Click the **OK** button.
5. *Place Objects* should be set on **To Objects**.
6. Place the cursor inside of the sign panel in front of the line of the **Shell Point** text object and click when the yellow box is lined up with the previous arrow. The figure below shows what the sign should look like at this point.



### ➤ **Place Highway text**

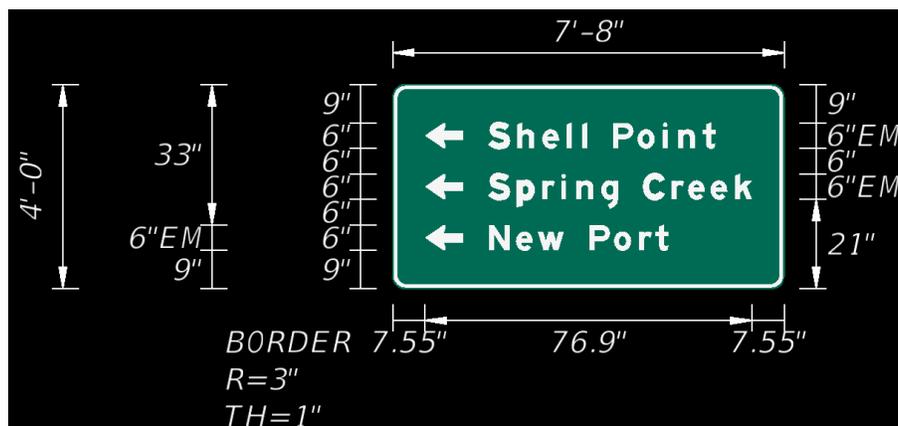
In this part of the exercise, the student will place the last (smallest) text object in the sign panel.

1. On the GuidSIGN toolbox, click **Place Highway Text** . This prompts you to select a point inside the sign panel.
2. Select inside of the sign panel. This opens Place Highway Text dialog.
3. Set the *Style* to **Name**. This should be set by default.
4. Set the *Hor. Align* to **Left**.
5. Under *Place Name* key-in **New Port**.
6. Click **OK**. The text box will be attached to the cursor and Place Object dialog opens.
7. Under *Snap* set the option **To Objects**.
8. Line the **Yellow Text Object** box to the **bottom** left side of the *Spring Creek Highway Text Object*.
9. Click inside of the sign panel to place text.

### ➤ **Place Arrow**

Next, you will place the direction arrow object on the sign panel.

1. Click Place Arrow .
2. Select inside of the sign panel. This opens Select Arrow dialog.
3. Select **Arrow 1 > AR\_Type D** and click the **OK** button to set up the *Arrow Parameters*.
4. Set the Rotate (deg.CCW) to **90**.
5. Click the **OK** button.
6. *Place Objects* should be set on **To Objects**.
7. Place the cursor inside of the sign panel in front of the line of the **New Port** text object and left click to place the arrow. The figure below shows what the sign should look like at this point.

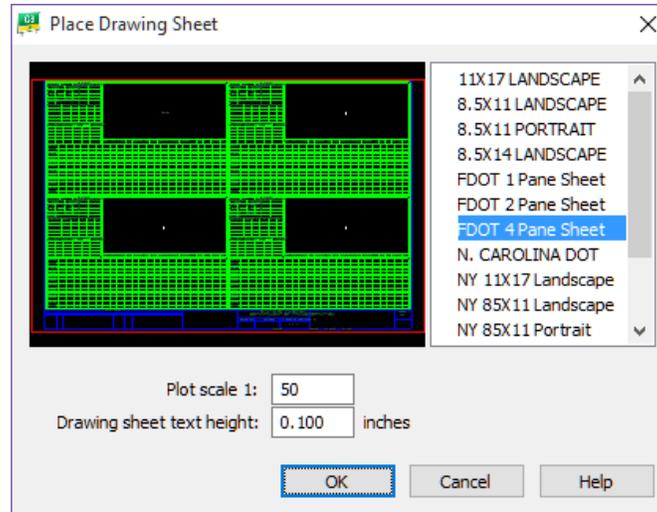


## Exercise 6.10 Creating the GuidSIGN Work Sheet (Part 2)

### ➤ Place Sheet Border

In this part of the exercise the student will place the FDOT standard sheet border using GuidSIGN. There are several standard sheet borders delivered with the GuidSIGN program. Continue working in the GSWKSP01.dwg

1. On the GuidSIGN tool bar, click **Place Drawing Sheet** . This opens **Place Drawing Sheet** dialog.
2. Select inside of the sign panel. This places the sheet border.



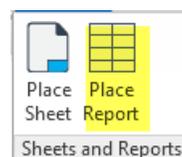
3. On the right side of dialog, select the sheet **FDOT 4 Pane Sheet**.
4. Set the *Plot Scale* to **40**.
5. Set the Drawing sheet text height to **0.07**.
6. Click **OK**.

**Note** The sheet will be placed at the Sign Panel Origin which is set in the style. In the class example, the sign panel origin is in the center of the sign panel. The FDOT Sheets blocks and Report blocks are designed to be placed on the center of the sign panel. The user does not have to snap to the center of the panel. Just simply left click anywhere inside the sign panel for proper placement.

### ➤ Place Report

In this part of the exercise you will place the report associated to the selected border.

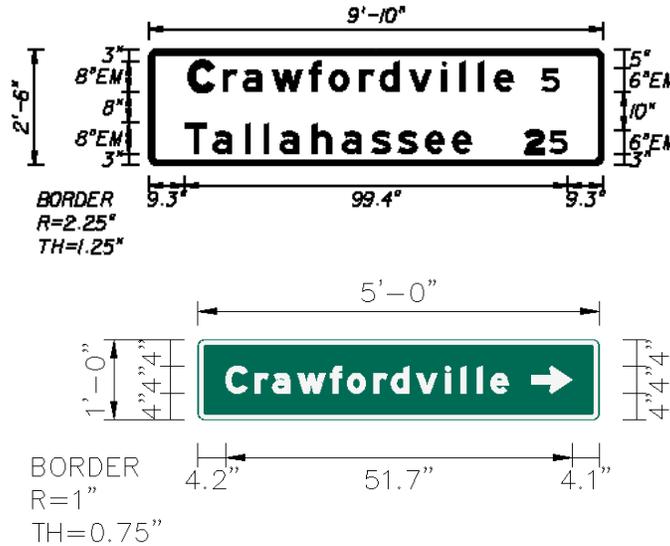
1. On the GuidSIGN tool bar, click and hold the down arrow on the **Place Drawing Sheet** icon  and select the **Place Report** selection from the menu.



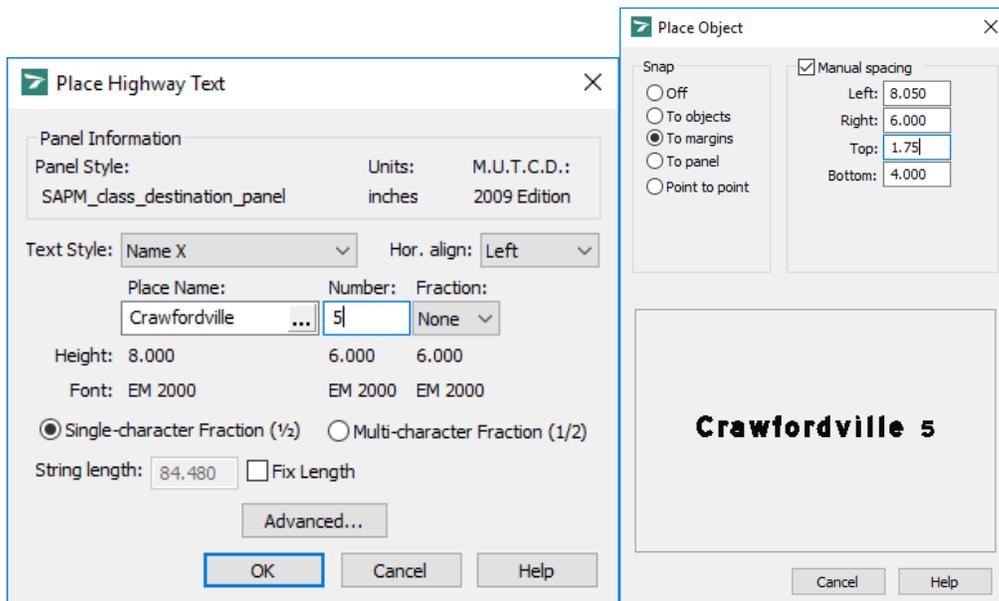


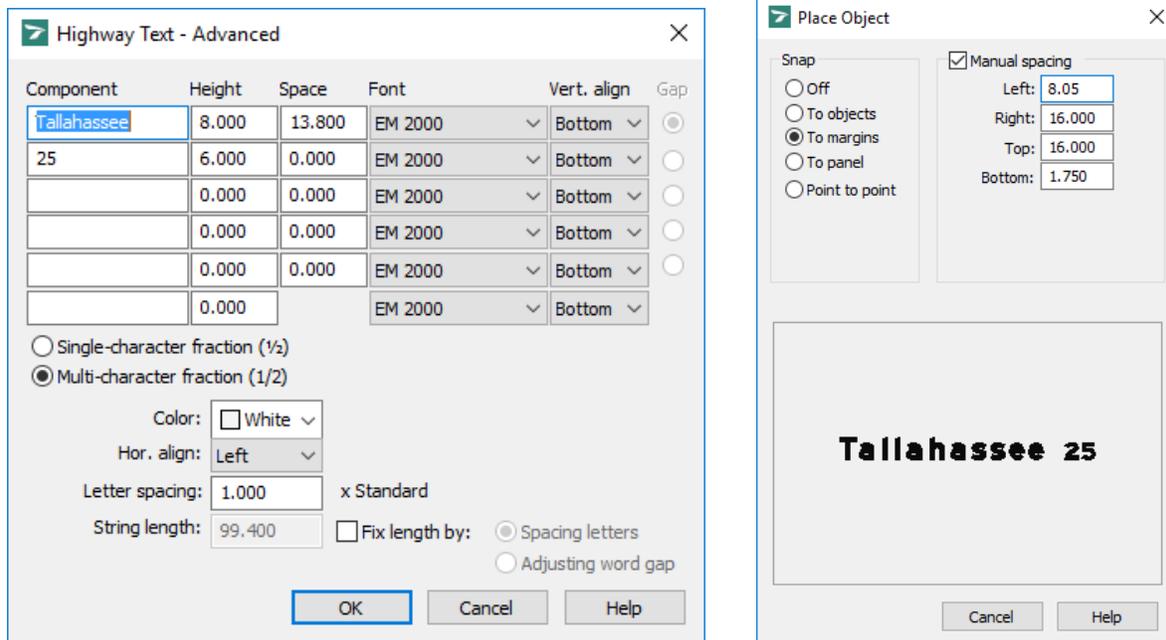
➤ **Additional GuidSIGN Panels to Create for the Classroom Dataset**

1. If time permits, complete the following Sign Panels using the techniques learned in the previous exercises and by utilizing other GuidSIGN tools: Place the panels out in space in your drawing as you create them. You will add them to the worksheet border later in this exercise.

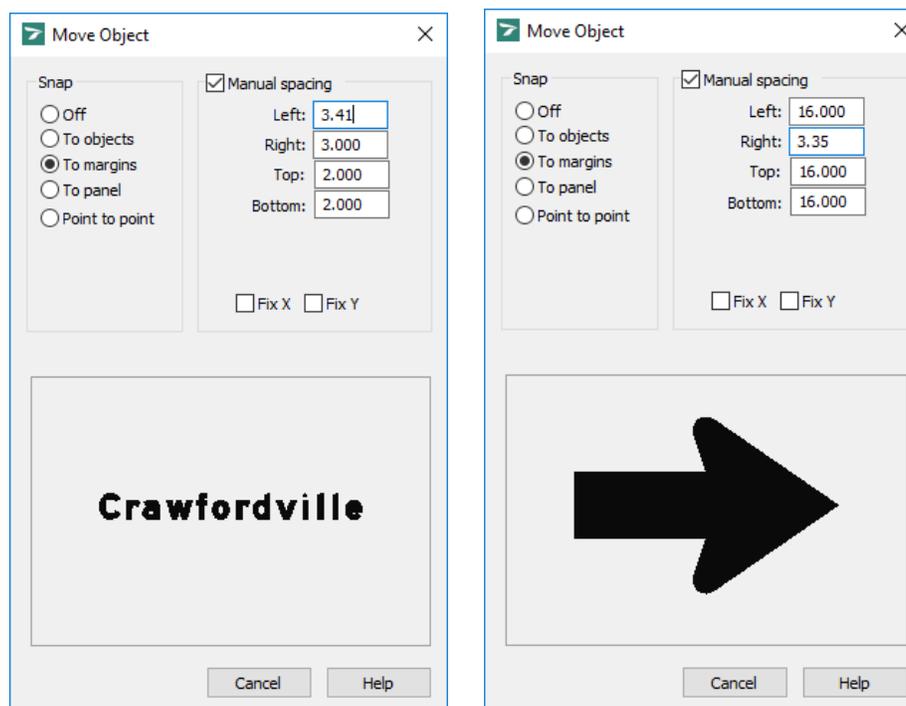


- a. *Sign Name:* S-03 *Sign Name:* S-06
  - b. *Alignment:* SR61 *Alignment:* BL98
  - c. *Station:* 705+50 *Station:* 36+20
2. Use the **SAPM\_class\_destination\_panel** style to create the new sign panel for S-03 and as a reference to create a new style for the new sign panel S-06.
  3. For the S-03 sign panel the border radius should adjust to the above dimensions automatically, however, the first letter in the text objects will need to be adjusted in the advanced dialog when placing the highway text.





4. The border thickness and the font changes for the S-06 sign panel which will need to be configured in a new style. See below for a few hints.



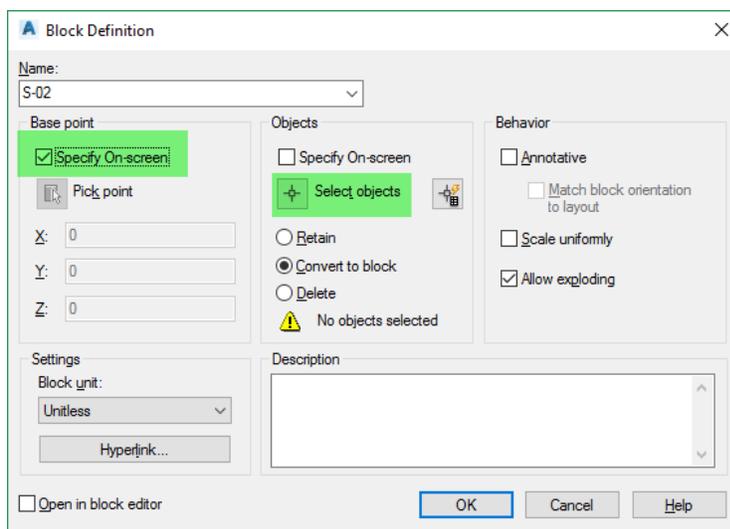


### Exercise 6.11 *Place Guide Sign Assemblies into Design File*

In this exercise, the student will create a block for each of the three sign panels that were created in the previous exercise, then using the FDOT Signs application will build, place, and label the assembly in the signing and pavement marking design file.

#### ➤ **Create Guide Sign Blocks**

1. Continuing in *GSWKSP01.dwg* zoom into the top left sign and type **Block** on the command line.
2. The Block definition dialog opens.
3. For name type in **S-02**.
4. For Base Point toggle on **Specify on Screen** and select **Pick Point**, Select the insertion point of the block as the Base Point, which is the center.



5. Pick the Select objects button and window just the panel from bottom left to upper right as shown above.
6. Select **OK** to close Block Definition box.
7. Repeat the above steps for the other two panels. Name them as shown.

8. S-03



9. S-06



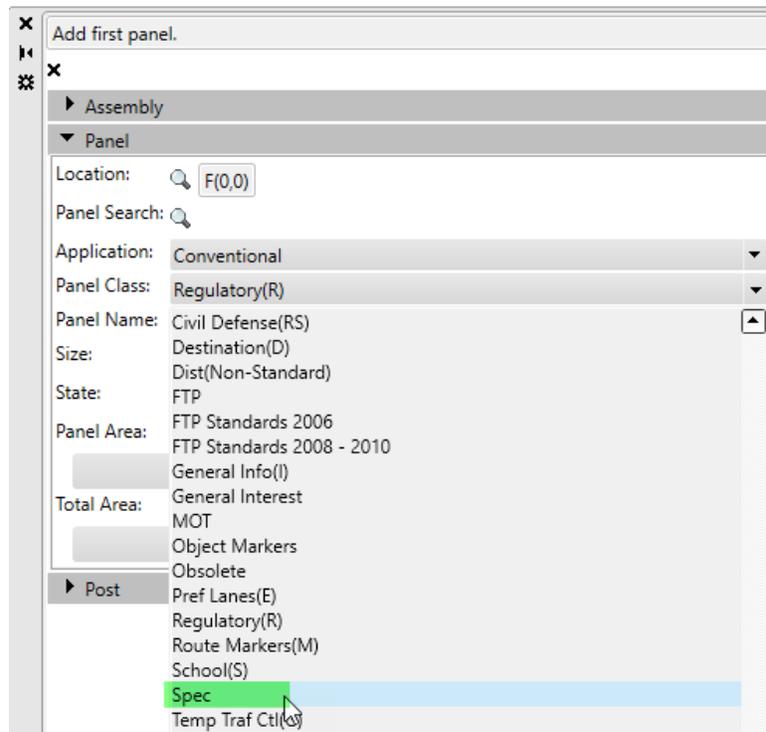
10. Save and Close the *GSWKSP01.dwg*

## Exercise 6.12 Using FDOT Signs with Guide Sign Blocks

### ➤ Building and Placing Guide Sign Assemblies

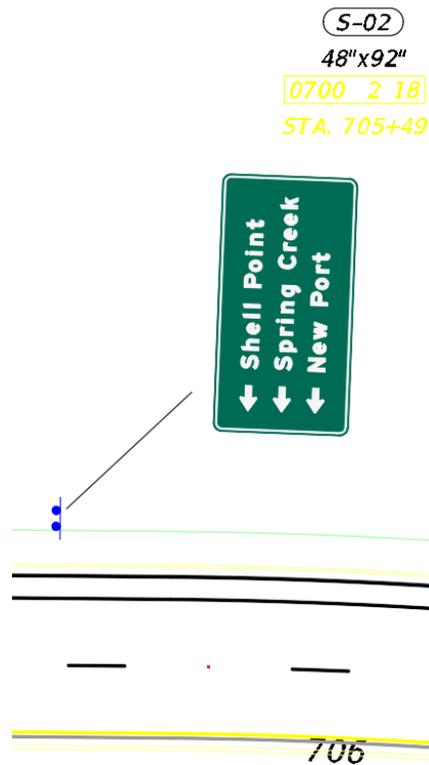
In this exercise, the designer will use the blocks that were created in the previous exercise to build sign assemblies using the FDOT Signs application. The steps are similar for placing and labeling assemblies as shown earlier in the chapter.

1. Open the *DSGNSPxx.dwg*.
2. On the FDOT Ribbon select the **FDOT Signs**.
3. Select the **User Settings** tab and pick the browse button for **Custom Guide File**.
4. Browse to and select the **GSWKSPxx.dwg** file. This will allow the sign tool to read the blocks that reside in the file.
5. Switch back to the **Assembly Creation** tab and select **create new assembly**.
6. Click **Create New Assembly** and name the sign **S-02**.
7. Select **Confirm Assembly Settings**.
8. For Panel Class select **Spec**.



9. For Panel Name select **S-02**. The Panel Name lists all the blocks that are in the Custom Guide file that you set in the settings earlier
10. For size type in **30x118**, which will generate the correct pay item based on square footage of the panel. Note the size automatically changes to inches.
11. From here the steps are the same as shown earlier in the chapter on using FDOT Signs, refer to earlier exercises if needed to complete placing and labeling this sign assembly. Make sure to select a **2-Post** option for this sign.

12. When placed your drawing should look like image below.



13. If time permits place the other two panels and posts near where the designated stations were set in guide sign.

**Note** At the time of this writing to get the Guide Sign block to appear as it does above the designer will have to use Design Center to browse to the block in the drawing used to create the guide sign, Right Click on block and select insert and redefine block, at that point the block displays properly in the design file. You **DO NOT** have to insert the block to fix the issue. When block displays properly press escape to exit the insert block command.



# 7 SIGNALIZATION TOOLS

## OBJECTIVES

The objective of this chapter is to teach the student how to use the FDOT Traffic Palette, Entity Manager, and other AutoCAD Civil 3D State Kit tools to create a proposed Signalized Intersection.

## INTRODUCTION

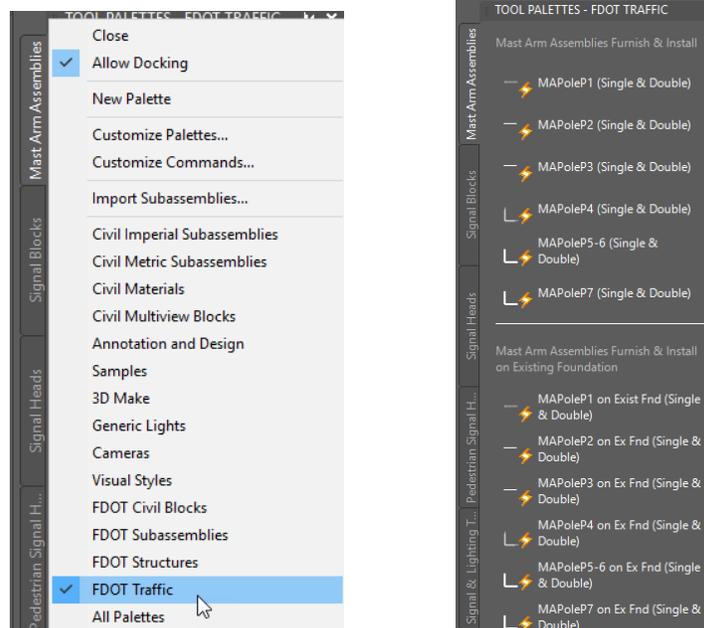
This section discusses several tools and resources that help the designer in the creation of proposed signal features to meet FDOT criteria and CADD standards. These include the FDOT Traffic Palette, FDOT Entity Manager, & Block libraries.

Refer to the *Plans Preparation Manual*, Volume II, chapter 24 for more detail on developing the Signalization plans. Refer to the Design Standards indexes and the *Plans Preparation Manual*, Volume I, chapter 7 for design criteria.

## FDOT TRAFFIC PALETTE

The FDOT Traffic Palette group was developed to assist in the placement of blocks needed during the development of the Signalization Plan Sheets. These blocks are placed in the DSGNSG.dwg file. It is recommended to data reference the View Frame group from the CLIPSGXX.dwg file to insure placement within the area of the plan sheet clip borders.

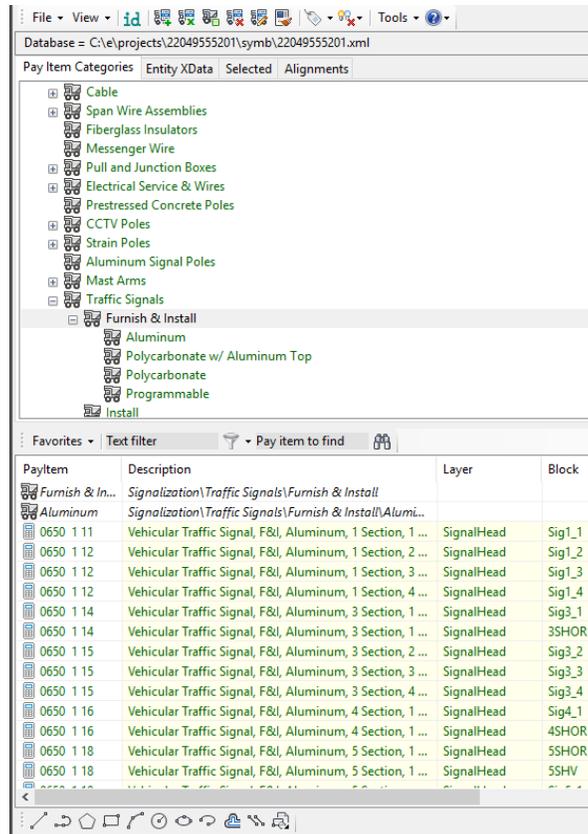
The FDOT Traffic palette can be accessed by Right Clicking on the Palettes and selecting FDOT Traffic.



**Note** Refer to Chapter 1 to reference what's available on the FDOT Traffic Palette.

## REVIEW ENTITY MANAGER SIGNALS ITEMS

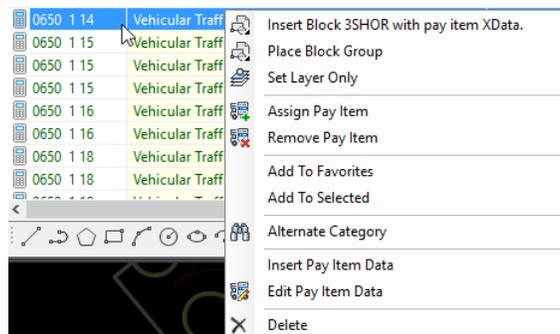
Before placing the Signals items, it is important to understand how they are set up. The PayItem Database file that FDOT delivers with the State Kit will have blocks assigned to the Signal items to assist in the production of plan entities. Knowing how the item is set up prior to placing it will alleviate having to experiment, delete and redraw. One advantage to using Entity Manager & the Traffic Palette to draw or place the mast arms and other Signal entities is that the entities can be automatically quantified. The figure below shows the Traffic Signals category in Entity Manager.



Selecting and then right-clicking on an item offers the options to place, review, or modify the pay item data.

The bottom portion of the dialog shows information about the selected item such as pay item number, description, layer and Block Name. The bottom portion includes the drawing tools that can be used for Blocks or Linear entities.

For more information on Entity Manager, see the Quick Clip videos available and refer to the User guide located in the Entity Manager folder in the State Kit install location.



## CREATING VIEW FRAMES FOR SIGNAL PLAN SHEETS

Creating View Frames for Signal Plan Sheets is different than for Roadway or Signing and Pavement Marking Sheets. Unlike Signing and Pavement Marking plans there may only be one Signal Plan sheet depending on the number of intersections. The user will use Civil 3D to Create View Frames and then create a data shortcut of the View Frame that can be data referenced into the design file to layout and clip the sheet(s). The scale should not be smaller than 1" = 50'.

If a Motif file is used, this should be set up prior to starting the clipping process. A Motif file is basically a Civil 3D file with all the reference files attached that the user wants attached to each plan sheet.

In this section, the student will learn an overview on how to use the Create View Frames Wizard to create view frame(s) and create data shortcuts to bring in the view frames to the *clipsg.dwg*. As with any process, it is important to communicate with the Department's Project Manager to make sure that all district specific requirements are addressed i.e. Match Lines or no Match Lines, Grey Scaling existing features and so on.

### CREATE VIEW FRAMES WIZARD

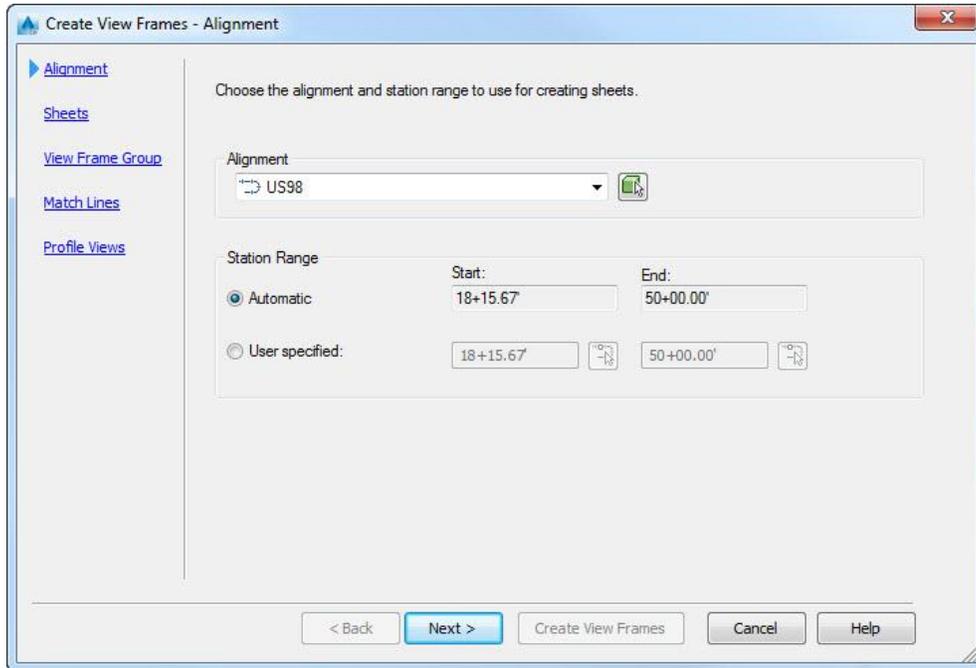
From the Civil 3D Output Ribbon in the Plan Production Panel there is a Create View Frames button. This wizard will not start unless you have an alignment in your current file. This is the first of two steps in creating a finished Layout sheet with the FDOT Border that you will add to your plan set.



Once activated, the View Frame Wizard opens. As you can see on the left pane of the wizard it has pages that you walk through and input required parameters. The Blue arrow indicates which page you are on.

ALIGNMENT PAGE

The first page is the Alignment Page. There is an alignment list pull down bar to choose from a list or you can pick the green select in drawing button. The default Station Range is the entire length; however, you also switch to user specified to type in the station or using the pick button select from the drawing the station range.

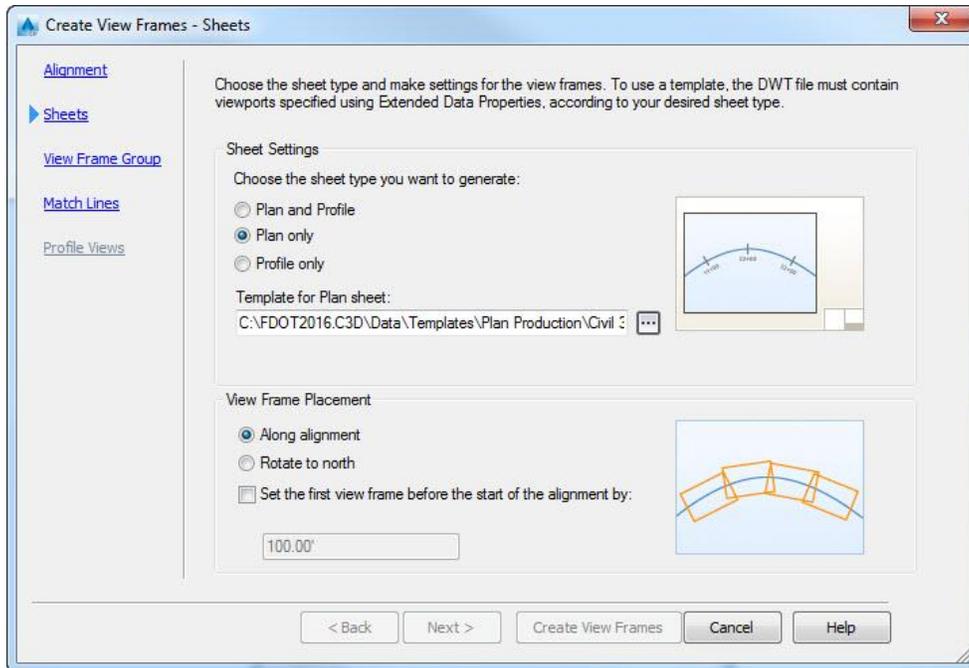


SHEETS PAGE

The second page is the Sheets Page where you select either Plan or Plan & Profile. The department provides a folder of ready to use template files that contain Plan, Profile, Plan & Profile, Section sheets, Etc. They are located here:

OSDisk (C:) > FDOT2018.C3D > Data > Templates > Sheets > Roadway

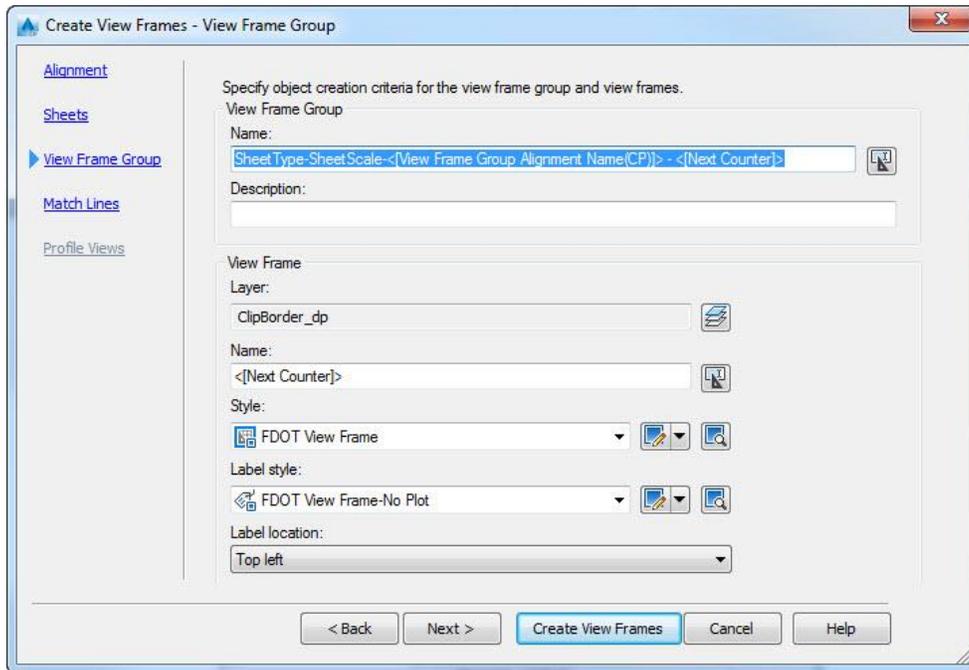
The second part of the page is the View Frame Placement where you select how the view frames will be rotated along the alignment. FDOT workflow recommends you rotate **Along Alignment**.



VIEW FRAME GROUP PAGE

The View Frame Group page is where you give your View Frame Group a name and description. To edit how and what is labeled you can edit the naming template by clicking on the drafting graphic to the right of the Name box.

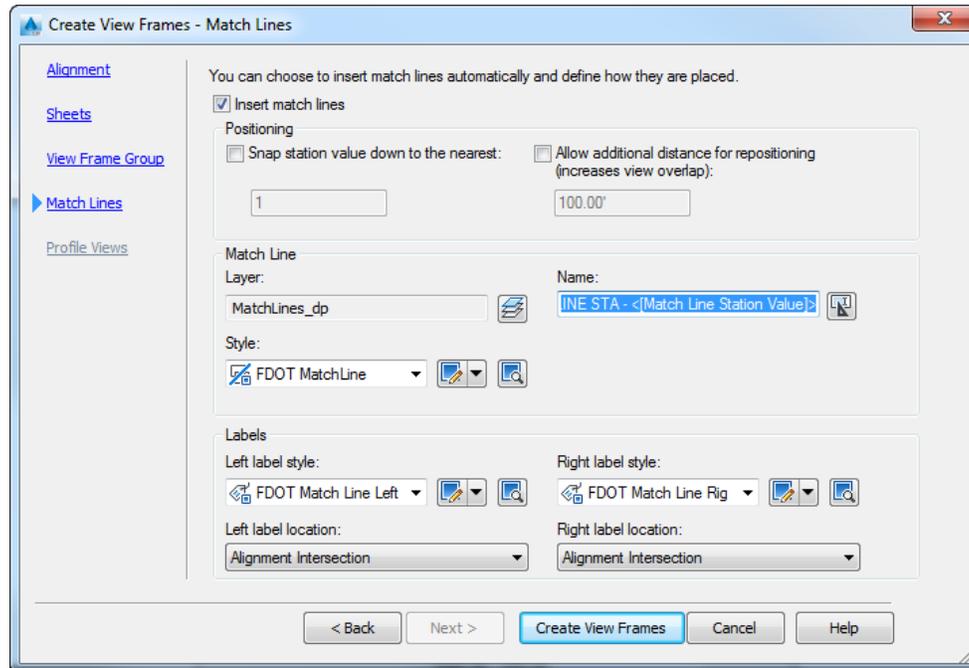
The rest of the page deals with styles that will be used for your View Frame Group. The department provides pre-set styles that will auto populate your wizards which are set through command settings.



### MATCH LINES PAGE

The Match Lines Page deals with how you want your match lines to overlap or not, Layers, Match Line Styles and Match Line Label Styles.

When all missing parameters are filled in select **Create View Frames** and the frames will be placed along the alignment in the drawing file.



## CREATE SHEETS

*Create Sheets* provides the method to take the view frame and combine it to a FDOT Sheet Border to make a layout sheet to add to your plan set.

Once activated, the Create Sheets Wizard opens. As you can see on the left pane of the wizard it has pages that you walk through and input required parameters. The Blue arrow indicates which page you are on. The Grayed-out pages represent not used or available.

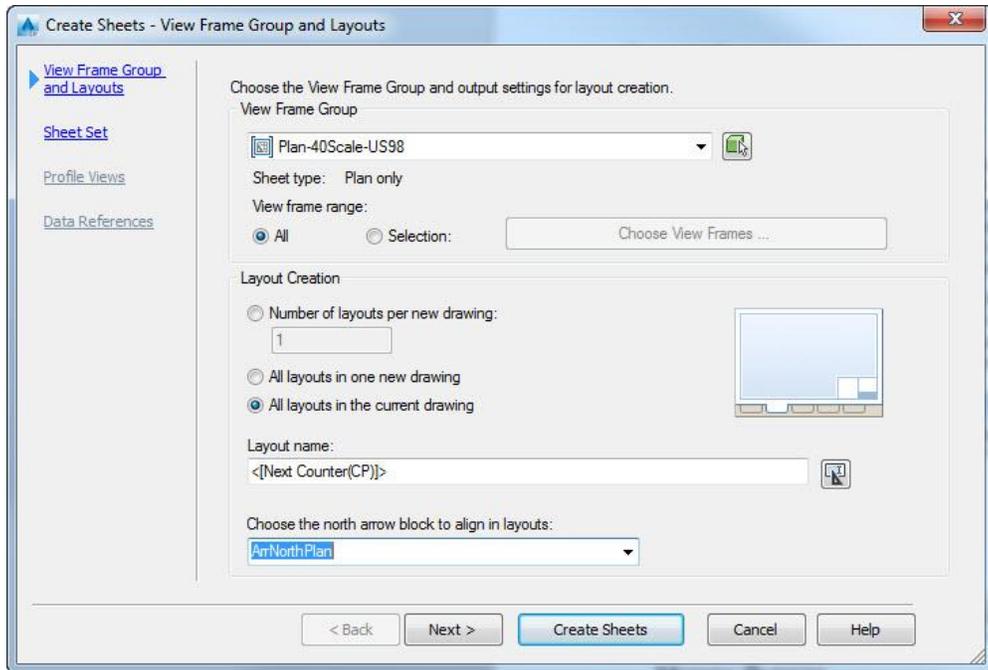


Create  
Sheets

VIEW FRAME GROUP AND LAYOUTS PAGE

**View Frame Group** – Chose the view frame group that exists in your drawing either created in the drawing or from a data shortcut. You can use the pull down or select from the file. The sheet type selected when the view frame was created is displayed. You have a choice of selecting all view frames or manually selecting frames.

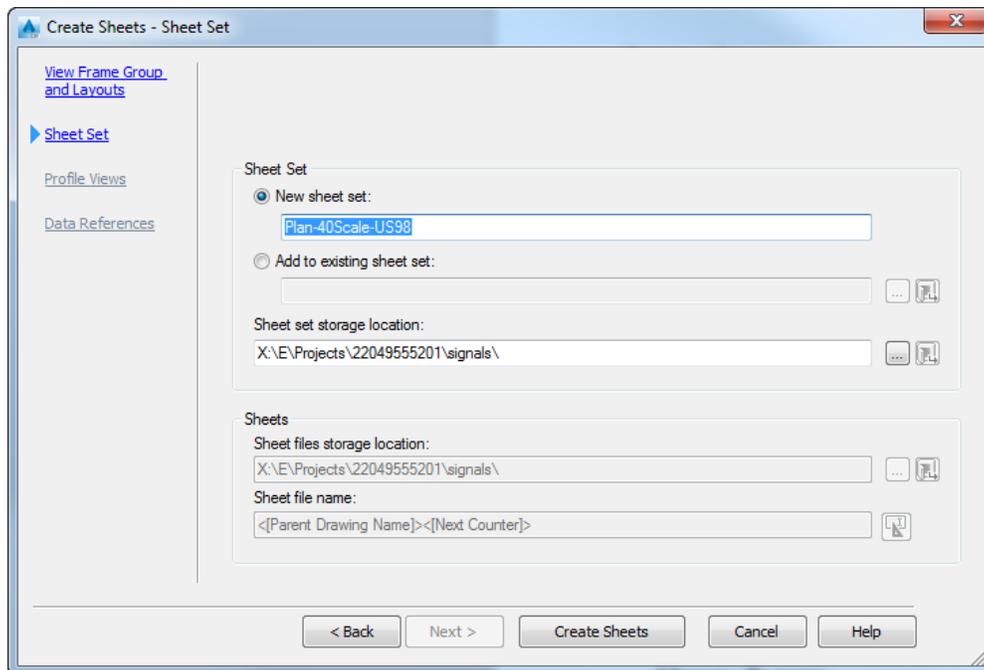
**Layout Creation** - From here you can control the number of layouts per drawing, put them in a new drawing, or in the current drawing. You can name your layouts now or you can rename after you create them. IF a North Arrow is required chose the block to use here.



VIEW FRAME GROUP AND LAYOUTS PAGE

**Sheet Set** – You can either create a new sheet set (dst) or add to an existing sheet set, make sure you specify the location within your project for the sheet set, they should be stored in your eng\_data folder.

**Sheets**- This area is only active if you are creating layouts in new drawings. If you chose to create layouts in the current drawing, the area will be inactive. Type the path or browse to the folder where the sheet files will be located. If you are using Autodesk Vault the Vault Icon will be highlighted for use. The Sheet File Name controls the naming template of the sheet files.

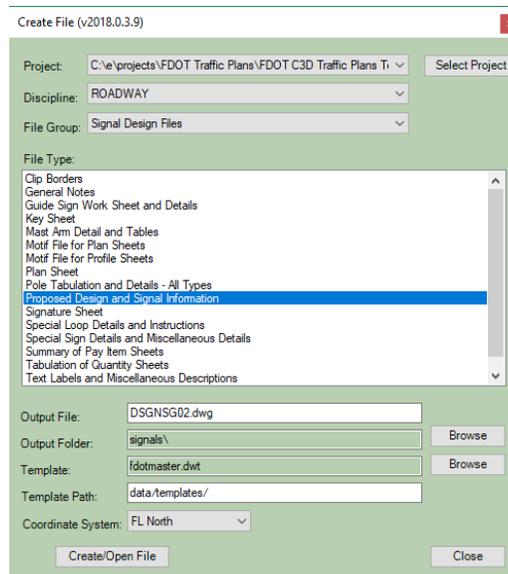


**Note** When all options are filled in select **Create Sheets** to create your new layout(s)

### **Exercise 7.1 Creating Signal Design file**

In this exercise, the designer will create the *DSGNSG01.dwg* that will be used for the proposed signal design at the Intersection.

1. Open the FDOT Civil 3D State Kit.
2. Switch to the FDOT Ribbon and select the **Create File** application and set the following settings.



3. Select **Create/Open File**.
4. Click on **Close** to exit dialog
5. Data Reference in the **BL98**.
6. Xref in the *DSGNSP01.dwg*, *DSGNRD01.dwg*

**Note** You can freeze layers that are not needed on Xrefs by using the Freeze icon on the



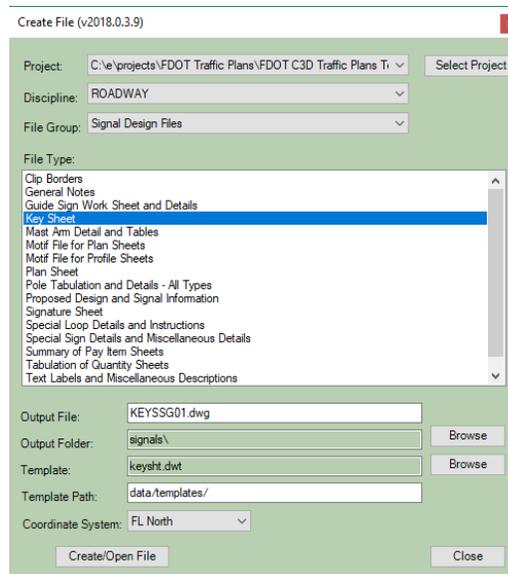
7. Save and Close the *DSGNSG01.dwg*

## Exercise 7.2 Creating Signal Key Sheet and Adding it to a Signal Sheet Set

### ➤ Creating Signal Key Sheet (Part 1)

In this exercise, the designer will create a Key Sheet that will be used for the Signal Design sub set. The Key Sheet will then be added to the Signal Sheet Set and propagated with information about the project. For a more detailed description of creating Key sheets, refer to Chapter 3.

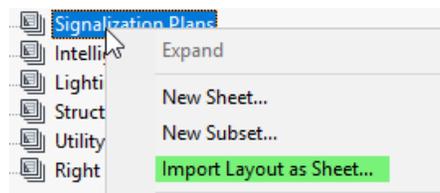
1. From the FDOT Ribbon click on **Create File**.
2. Fill in the following options.



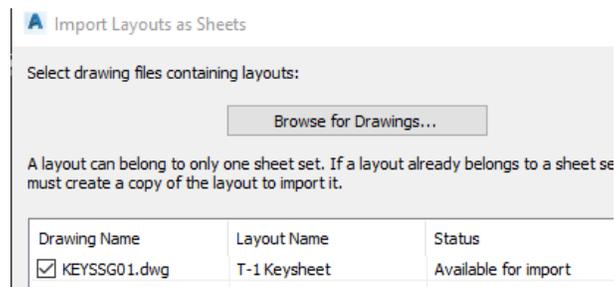
3. Click **Create/Open File**. Click **Close** to exit dialog.
4. Delete all Layouts EXCEPT the **SignalFF**.
5. Right Click on the Layout and Rename Layout to **T-1 Keysheet**.
6. Save the File, but leave open to continue to next exercise.

#### ➤ **Adding Layout to a Sheet Set (Part 2)**

1. Type in **SSM** on the command line.
2. Open the FDOT Traffic Plans Sheet set.
3. Right Click on the *Signalization Plans* and select **Import Layout as Sheet**.



4. Browse to the *KEYSSG01.dwg* located in the Signal folder.
5. There should be one available layout to import, select it and click on **Import Checked**.



6. Type **RE** to regenerate the KeySheet drawing file, notice the fields update with project information.
7. Save and Close the Keysheet file.

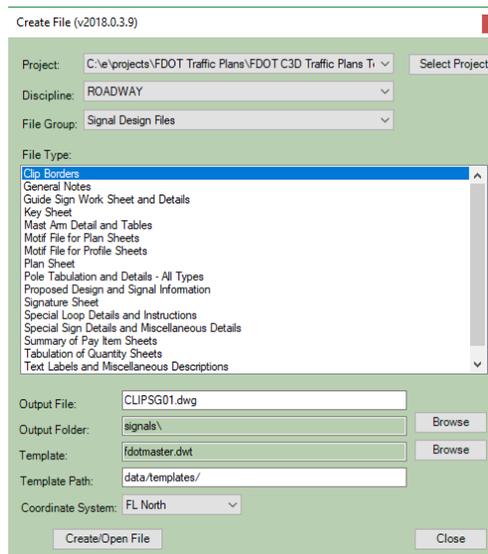
**Note** As you create additional drawing files with layouts, you will be adding them to the sheet set using the same steps as above.

### Exercise 7.3 Create View Frame and Sheet Layout

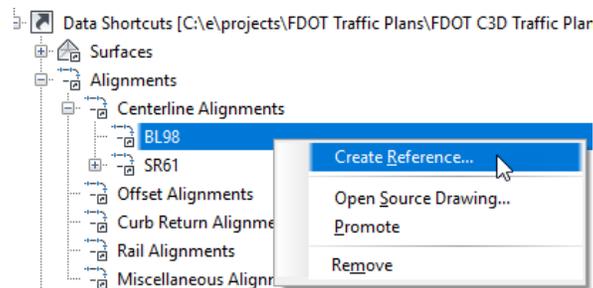
#### ➤ Create View Frame (Part 1)

In this exercise, the student will create the View Frame and save it as a data shortcut. Create and Set up the Clips design file.

1. Open the FDOT Civil 3D State Kit and/or continue working with the DSGNSG.dwg
2. Starting from the default drawing, from the FDOT Ribbon, select **Create File** to open the Create File application.
3. Using what has been learned in this course guide, create the *Clip Borders* file. Create/Open the file in the *Signals* folder using the *Signal Design Files* group. Close the Create File application.

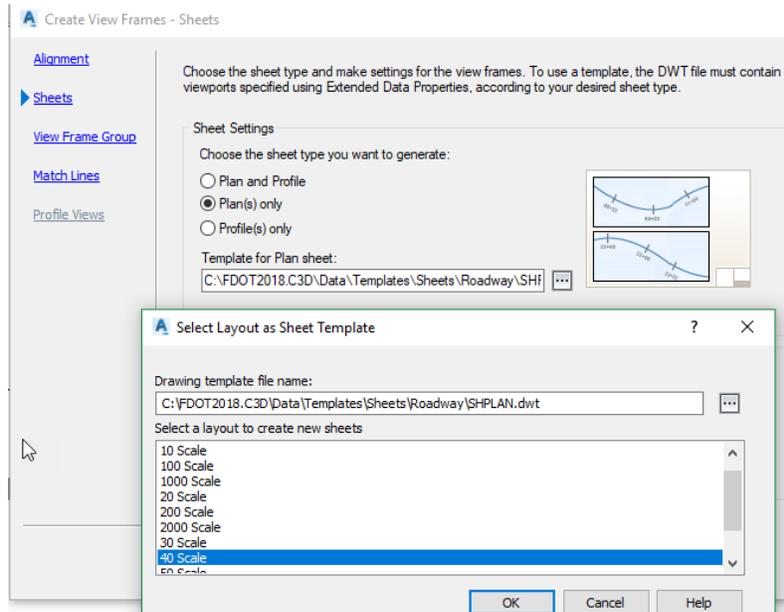


4. In the *Data Shortcuts on Prospector*, expand the *Alignments*, right click on **BL98** to open the pop up menu and select **Create Reference**. The default styles that will be used are already set. Click **OK**.

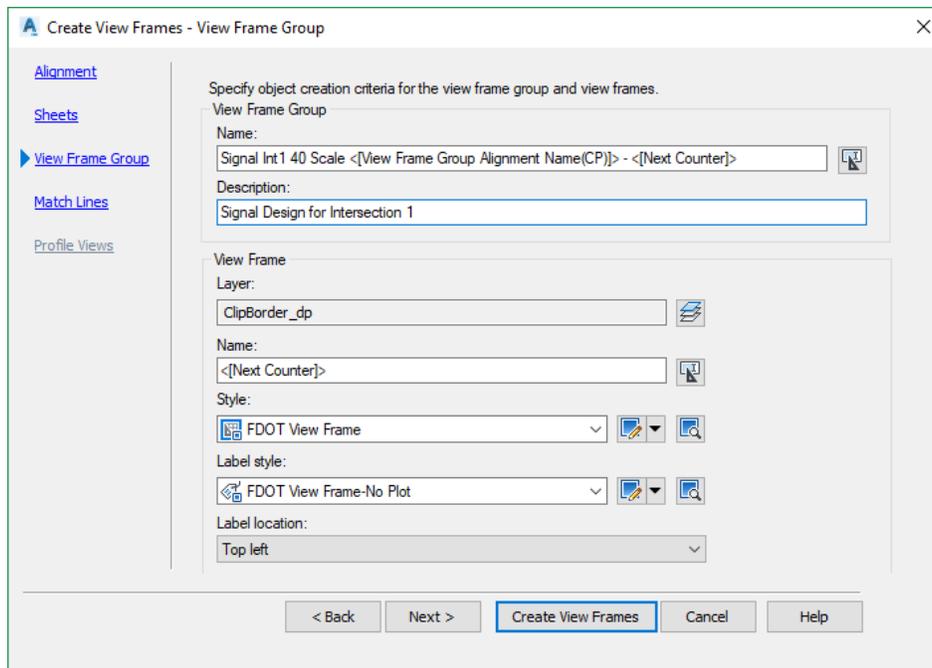


5. Using what you have already learned in creating Xref's, type **Xref** in on the *command line* and reference the following files as *Overlays*: **dsgnrd01.dwg, dsgnsp01.dwg**. Zoom **Extents** to see the references.
6. Switch to the *Output Ribbon* and start **Create View Frames**.

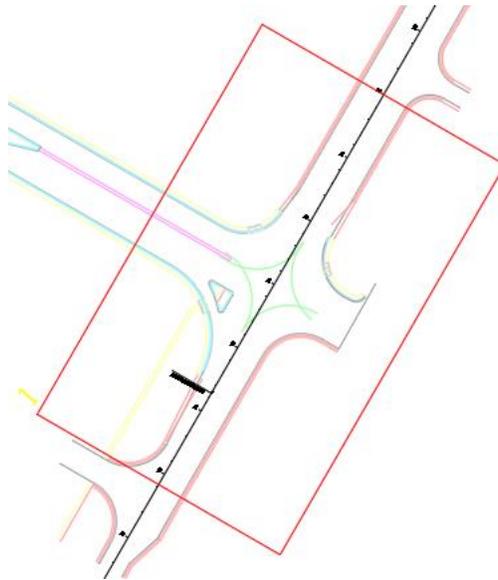
7. On the *Alignment Page* set the *Station Range* to **User Specified** and either type in **30+50 to 35+40** <OR> you can roughly pick in that range as well.
8. Since we only want one View Frame, we don't want to use the default Alignment length that would put multiple View Frames in our drawing file. Keep in mind you can edit the View Frame after placement.
9. Click **Next** to advance to the *Sheets Page*. Select **Plan Only** for *Sheet Type*. For *Template for Plan Sheet* select the **Ellipse** button to browse to the following location and select the **SHPLAN.dwt**. When the *Scale* dialog displays, select **40 Scale** as shown in image below.



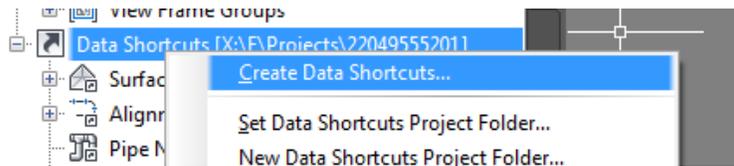
10. Continuing on the *Sheets Page*, toggle **On** *Along alignment* for *View Frame Placement*. You can also control, if you need the view frame to start before the alignment. Click **Next**.
11. From the *View Frame Group* dialog, complete the *Name* and *Description* as shown below.



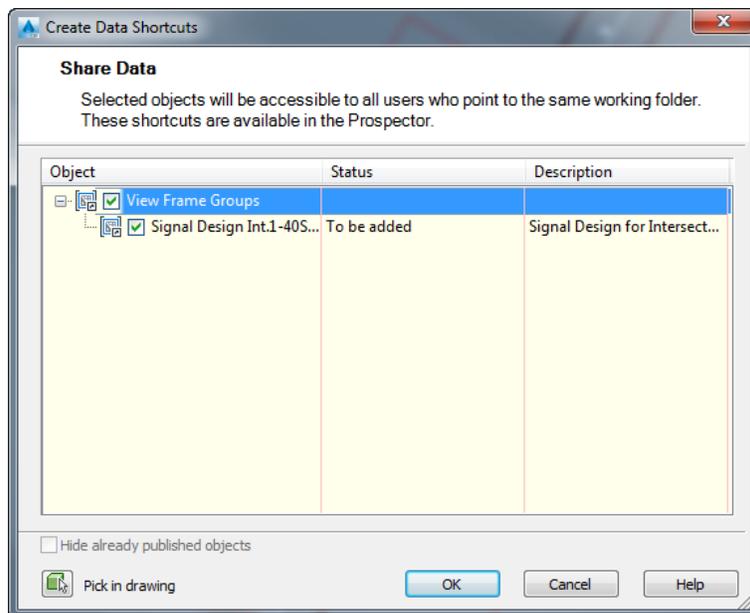
- Click **Next** to advance to the Match Lines. Since we don't have any match lines, toggle **Off** the *Insert Match Lines*. Notice all options are now grayed out. Click **Create View Frames**. Your *clips01.dwg* should look like below.



- Save** your file, right click on **Data Shortcuts** to open the popup menu and select **Create Data Shortcuts**.

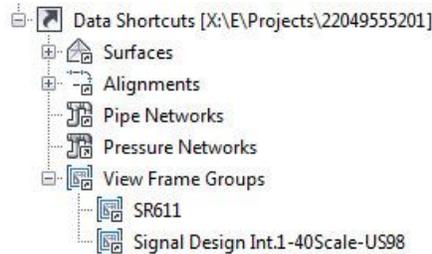


- Select the **View Frame Group** listed. This dialog will populate with all available Shortcuts that can be saved to the *\_Shortcuts* folder in your project. Select **Ok** to execute.

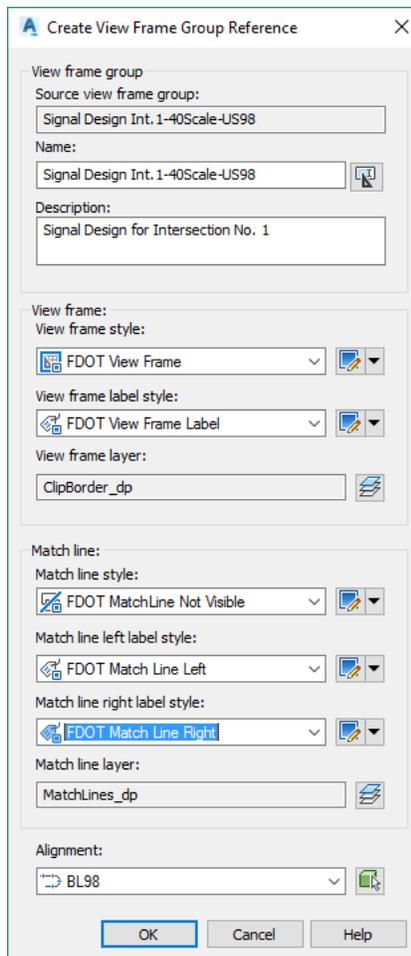


➤ **View Frame Setup - Data Reference or Dref's (Part 2)**

1. Open or switch back to *dsgnsg01.dwg*. On Prospector expand the **View Frame Groups** located in the *Data Shortcuts* tree. Right click on the *Signal Design Int.1-40Scale-BL98* to open the popup menu and select **Create Reference**.



2. The Create View Frame Group Reference dialog opens. Take a moment to look at the settings and available styles in the image below. Your dialog should match.

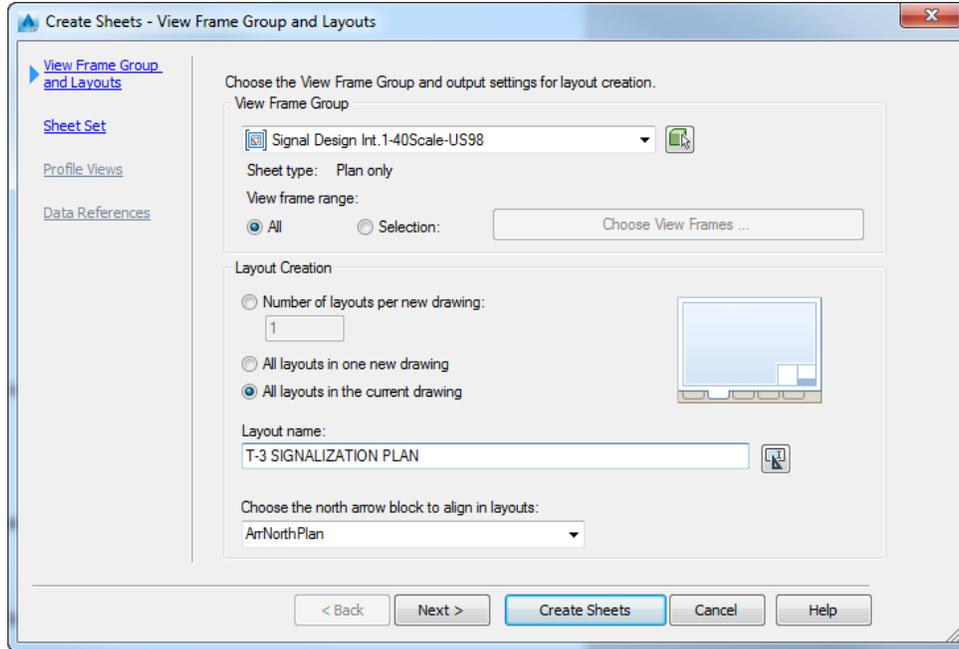


3. Click **OK**. After a moment, you should see the *View Frame* that you created previously at the intersection.

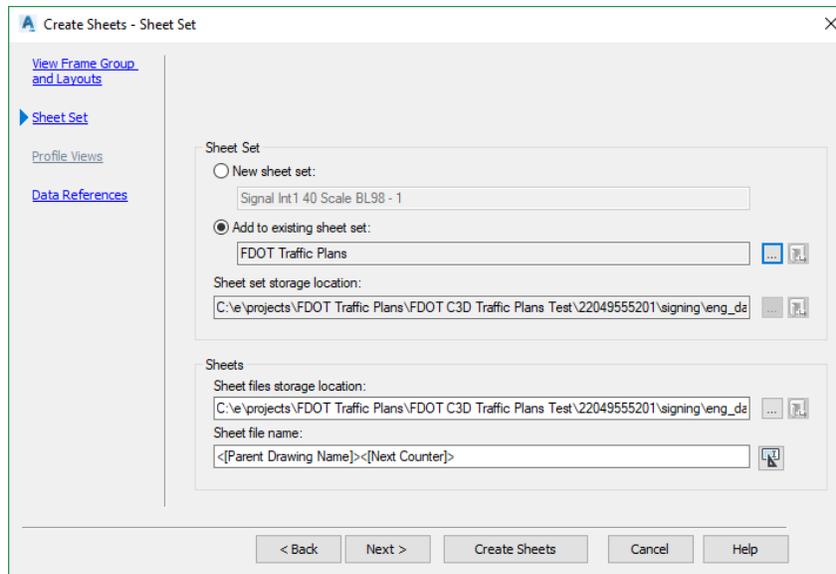
➤ **Create Sheet Layout and Adding to Sheet Set (Part 3)**



1. Start **Create Sheets** from the Output Ribbon. **Create Sheets** <OR> load by typing it in on the command line.

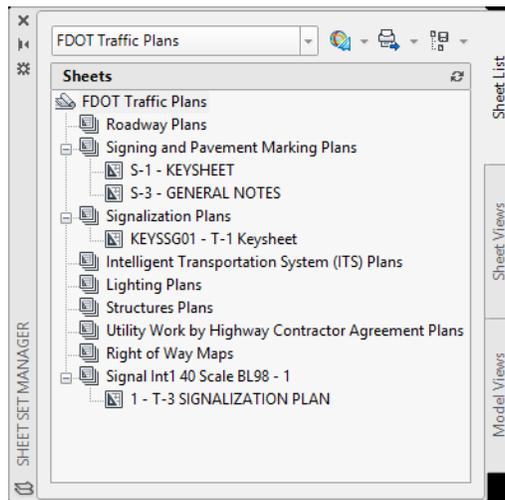


2. From the **View Frame Group and Layouts** dialog, make sure you have the correct *View Frame Group* selected, select *All layouts in the current drawing*, and enter in the *Layout name*. If you don't know the *sheet number* you can always edit the properties after creation.
3. Select the *Block* used as the **North Arrow**. The North Arrow will rotate in each sheet to orient to North. Click **Next**.

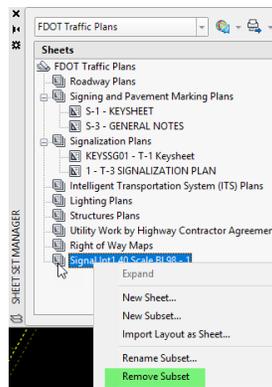


4. From the **Sheet Set** dialog, browse to the already created *DST file* as shown above.
5. Click **Create Sheets**.

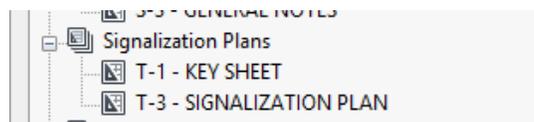
6. The **FDOT Traffic Plans** sheet set should look like the image below. We need to make some obvious edits.



7. Left click on the *new sheet* and drag it up to the **Signalization Plans** sheet set underneath the Key Sheet. Then right click to open popup menu and select **Remove Subset** as shown below



8. Right click on the *new sheet* and select **Properties** to make the changes as shown below. So far, the new sheet set has 2 separate drawing files that can be accessed in one convenient spot.



9. Switch to the new **Sheet Layout** Tab. Double click inside the *Viewport* to make it active. Notice the following items:
  - The North Arrow is already rotated and scale is listed.
  - The view inside the viewport is already rotated (click on the model tab to compare).
  - The scale is already set to 1" =40'.
  - The fields in the sheet border are already filled in.

## Exercise 7.4 Mast Arm Assemblies Sheet

### ➤ Create Mast Arm Assemblies Sheet (Part 1)

In this exercise, the user will create the Mast Arm Assemblies sheet (*MSSGSGxx.dwg*) and place the standard notes and table.

1. From the FDOT Ribbon, select **Create File** and fill in your options matching the image below.

The screenshot shows the 'Create File' dialog box with the following settings:

- Project: X:\E\Projects\2204955201
- Discipline: ROADWAY
- File Group: Signal Design Files
- File Type: Mast Arm Detail and Tables (selected)
- Output File: MSSGSG01.dwg
- Output Folder: signals\
- Template: planrd.dwt
- Template Path: data/templates/
- Coordinate System: FL North

2. Click **Create/Open**. Close dialog when file opens in the background.
3. The file is already created with a sheet border and is set to 1 Scale since we will be working with details which will be placed in paper space.
4. Right Click on the Layout and select **Rename**, type in T-MSSGSG. Don't worry about not having a sheet number. We will add it later when we bring the sheet into the signal sheet sub set and rename it accordingly.

### ➤ Use the Traffic Palette to Place the Standard Mast Arm Assemblies Data Table (Part 2)

1. Change the *Layer* to **Tables\_dp**, then from the FDOT Traffic Palette, select the **Signal & Lighting Tables** tab and select the **Mast Arm Assemblies Data** table.
2. Insert in the top center of the sheet.

➤ **Fill in Table (Part 3)**

The AutoCAD table can be filled in with data. An AutoCAD Table behaves like an Excel File.

1. Zoom to the table, enter the appropriate data and **Save** the file.

Structure	(1) Assembly Numbers	First Arm/Arm Type	Pole/Pole Type	Pole/UB (ft.)
1	E3-T2	E3	T2	20
2	E5-T3	E5	T3	20
3	E6-T4	E6	T4	20
4	E5-T3	E5	T3	21

2. Notice when you insert the *Mast Arm* table the **Mast Arm Assembly Data Notes** are already included as a block within the table. You can edit the notes by double clicking in the block. The Gray border on the table does not print.

STANDARD MAST ARM ASSEMBLIES DATA TABLE																
STRUCTURE TO NUMBER	ASSEMBLY NUMBER	FIRST ARM			SECOND ARM			H/P (ft.)	H/L (ft.)	POLE				SPECIAL DRILLED SHAFT		GROUT PAD
		ARM TYPE	FAA (ft.)	FEA (ft.)	ARM TYPE	FAA (ft.)	FEA (ft.)			POLE TYPE	USA (ft.)	UCS (ft.)	DA (ft.)	DE (ft.)	SA	
1	E3-T2	E3								T2	20					
2	E5-T3	E5								T3	20					
3	E6-T4	E6								T4	20					
4	E5-T3	E5								T3	21					

**TABLE NOTES:**

1. Assembly Number Legend  
 Single Arm:  
 Arm Type - Pole Type - DA - SA  
 = E3 - T2  
 = E5 - T3  
 = E6 - T4

Double Arm:  
 First Arm Type - Second Arm Type - Pole Type - DA - SA  
 = E3 - E5 - T2  
 = E5 - E6 - T3

2. If an entry appears in columns "FAA" and "FEA", a shorter arm is required. This is obtained by removing length from the arm tip. For these cases the mast arm length shall be shortened from "FA" to "FAA" and the tip diameter shall be increased from "FB" to "FBA".

3. If an entry appears in columns "USA" and "UCS", a shorter pole is required. This is obtained by removing length from the pole top. For these cases the pole height shall be shortened from "UA" to "USA" and the pole top diameter shall be increased from "UC" to "UCS".

4. The Foundations for Standard Mast Arm Assemblies are pre-designed and are based upon the following conservative soil criteria which covers the great majority of soil types found in Florida. Only complete the "Special Drilled Shaft" data information if site conditions dictate drilled shafts with additional foundation capacity.  
 Classification = Cohesionless (fine Sand)  
 Friction Angle = 30 Degrees (30°)  
 Unit Weight = 120 lbs./cu. ft. (assumed saturated)

**GENERAL NOTES:**

1. Work this sheet with the Signal Designer's "Mast Arm Tabulation". See "Mast Arm Tabulation" for special instructions that include non-standard foundation location, point color, terminal compartment requirement, and substation features.

2. Work with Index Nos. 12743 and 12745.

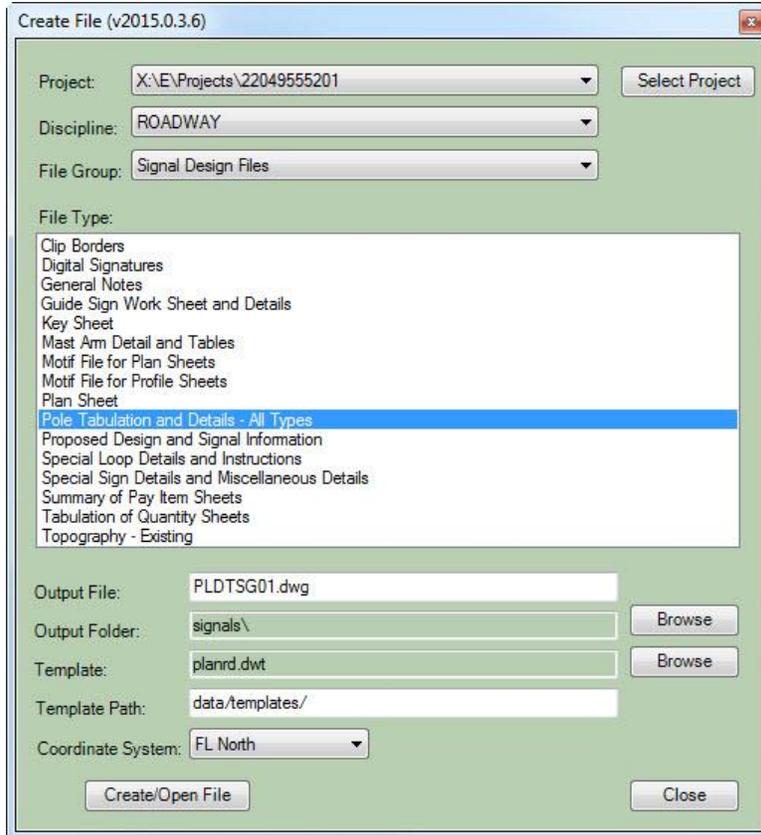
DESIGNER	DATE	PROFESSIONAL OF RECORD	STATE OF FLORIDA	SHEET NO.
			DEPARTMENT OF TRANSPORTATION	
			BUDGET	
			PROJECT	
			FORMAL NUMBER	

**1 SCALE**

**Exercise 7.5 Mast Arm Tabulation Sheet**

➤ **Create New File (Part One)**

1. Using the Create File application from the FDOT Ribbon, select **Create File**.



2. Click **Create/Open File** to create the **Pole Tabulation and Details - All Types** file.
3. Select **Close** to exit dialog.
4. Like the other detail sheet, the current drawing file has a 1 Scale Layout and is set in Paper Space.

➤ **Using the Traffic Palette to Insert the Standard Mast Arm Tabulation Table (Part 2)**

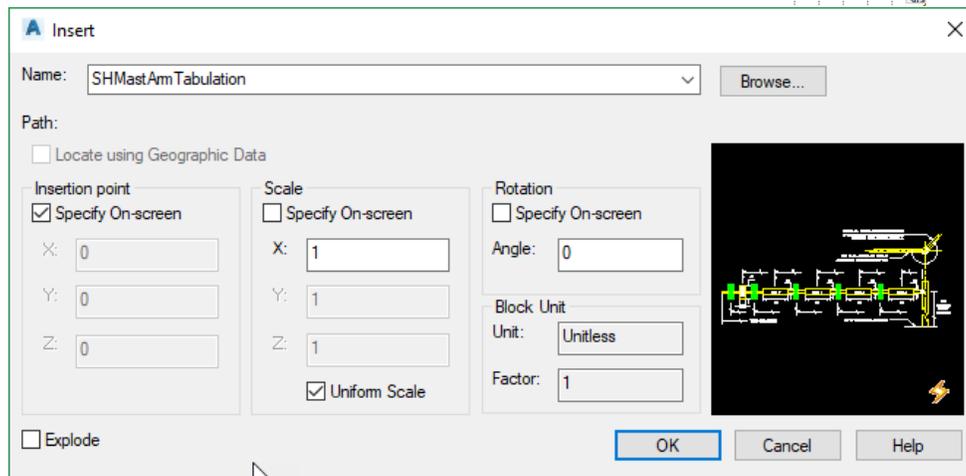
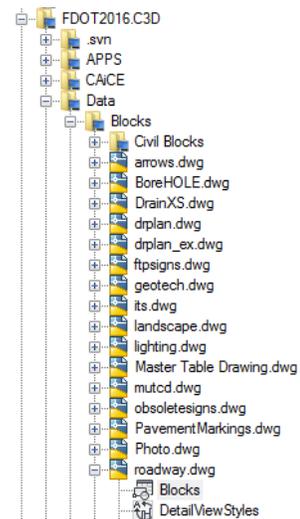
1. Change the current *Layer* to **Tables\_dp**.
2. With *FDOT Traffic* tool palette selected, select the **Signal & Lighting Tables** tab.
3. Select the **Mast Arm Tabulation** table to insert it in the lower left corner of the drawing.
4. In the drawing file, enter the *appropriate data* and **Save** the file. Please see images below.

ID NO.	SHEET NO.	LOCATION BY STA.	TOP OF FOUND. ELEVATION	RDWY ARM NO.	CROWN ELEV.	SIGNAL V/H	BACK PLATES Y/H	PED. SIGNAL Y/H	SIGNAL DATA				
									DISTANCE				
									1	*	2	*	:
1		32+58.00	37.00	1	37.30	H	N	Y	20.0	3	34.0	5	
---	---	-----	-----	2									
2		33+59.00	36.80	1	37.00	H	N	N	38.0	3	54.0	5	
---	---	-----	-----	2									
3		33+48.00	36.70	1	37.00	H	N	N	40.0	3	55.0	5	
---	---	-----	-----	2									
4		32+36.00	36.00	1	36.00	H	N	N	30.0	3	45.0	5	
---	---	-----	-----	?									

			SIGN DATA									
TOTAL ARM LENGTH	ARM M.H.	ANGLE BETWEEN DUAL ARMS 90/270	DISTANCE FROM POLE / HEIGHT AND W.									
			A	H1	W1	B	H2	W2	C	H3	W3	
46	20		9	1	3.5							
		-----										
60	20		19	1	3							
		-----										
70.5	20											
		-----										
60	20		15	1	6				65	1	3.5	

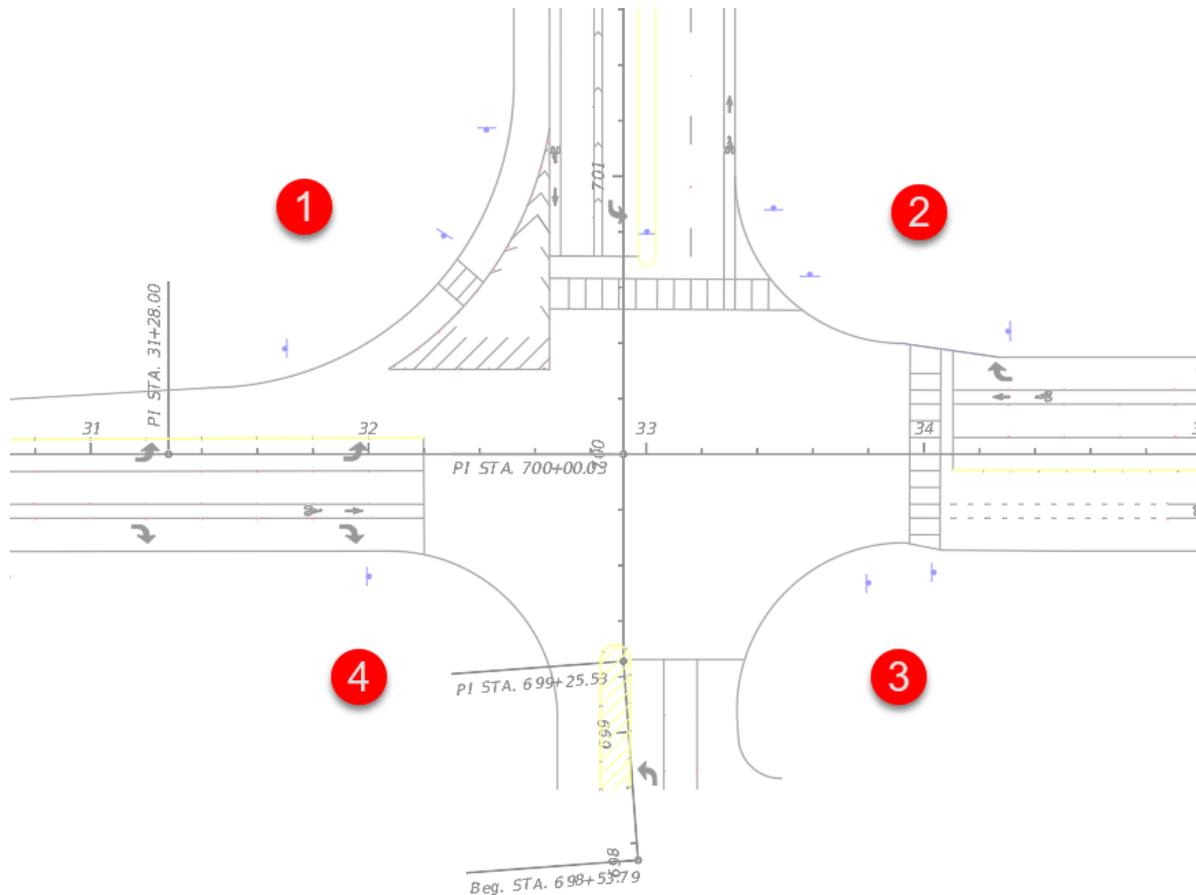
➤ **Place the Standard Mast Arm Assembly Data Table Notes Block (Part 3)**

1. From the *command line* type in **Design Center (DC)** and click **Enter**. Make sure you are still in *Paper Space*.
2. Using *Design Center*, browse to the *Blocks* folder within the state kit, expand the *roadway.dwg* and select **Blocks**.
3. Locate the **SHMastArmTabulation** block, right click to open the popup menu, and select **Insert Block**.



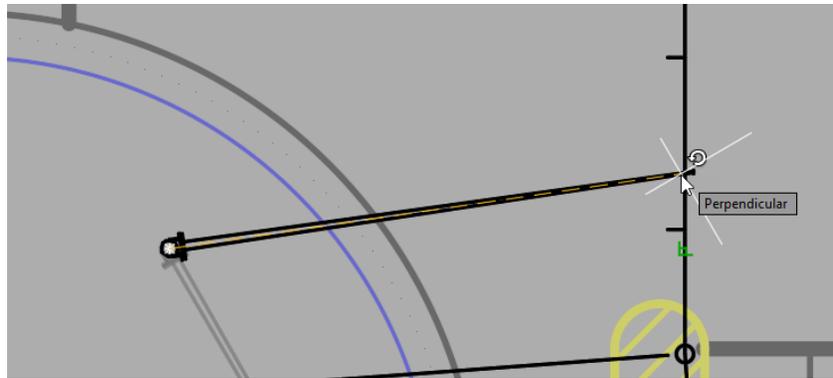
4. The origin of this block is positioned at the top left corner of the plan sheet.
5. Your drawing should now look like image below. Save and Close the File.





➤ **Load EMX database**

1. Continue working in the *DSGNSG01.dwg*, select the **T-3 SIGNALIZATION PLAN Layout** tab.
2. From the FDOT Ribbon, select the Entity Manager and make sure to use the correct **Project Pay Item database file**. `Database = C:\e\projects\22049555201\symb\22049555201.xml`
3. Notice by clicking the Sheet Layout that the drawing rotates correctly.
4. Double click in the *Sheet* to activate the model.
5. Open the FDOT Traffic Palette to make sure the **Mast Arm Assemblies** tab displays as the current one.
6. Using the *Mast Arm Assemblies Furnish & Install* panel, the first pole to be setup is **Pole 4**.
7. Select the **MAPoleP5-6 (Single & Double)** on the *Mast Arm Assembly Palette*.
8. With the *Block* attached to the Cursor, select the **StaOff Transparent** command.
9. Select the **BL98 Alignment**.
10. For *Station* enter **3231.70**. (do not enter + when typing stations with the transparent command.)
11. For *Offset distance* enter **62.28**.
12. To Rotate the Mast arm, type in **RO** on the *command line*, select the **Mast Arm block**, for *Base Point* select the **Geometric Center** of the pole using the Osnap, then use the **Perpendicular** osnap to snap to the Alignment as shown below.



- With the rotation of the Mast arm correct, select the *Block* and pick the blue drop down grip. Notice the options available, leave the default selection set. **(0649 21 15 Mast Arm Assembly, FI, 70' Single)**.

**Note** If you change the selection on the Blue Pulldown grip the size of the block changes along with the Pay Item Number.

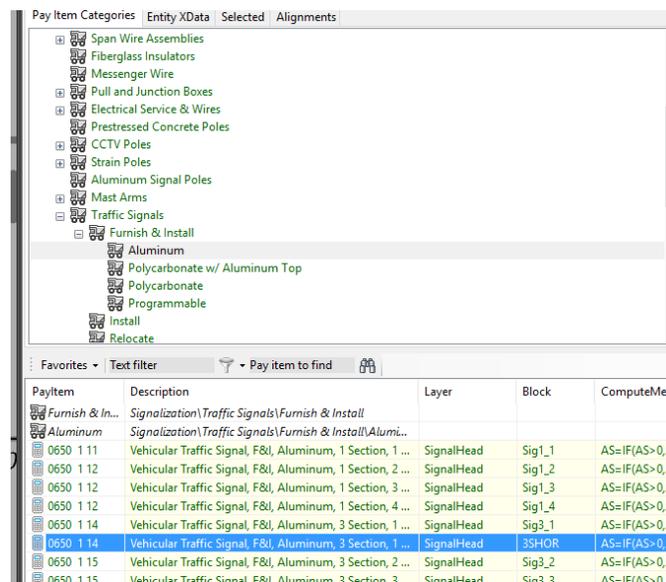
- Refer to the *Pole Placement* diagram at the beginning of the exercise for *Pole Number* designation.
- Repeat the previous steps for **Poles 1-3**. Rotate Mast Arm direction as needed.

(See BOE for Pay Item Detail):

Pole	Block Name	Pay Item	Station	Offset (Direction)	Angle
Pole 1	MAPoleP3	0649 21 6 (50' Single Arm)	3257.68	-48.89 (Left)	270
Pole 2	MAPoleP4	0649 21 10 (60' Single Arm)	3353.19	-71.59 (Left)	180
Pole 3	MAPoleP5-6	0649 21 15 (70' Single Arm)	3353.24	63.40 (Right)	90

## PLACE SIGNAL HEAD

The Traffic Signals or Signal Head blocks must be placed using Entity Manager since they have Pay Item Information on them. The figure below shows the Signal head item in Entity Manager.

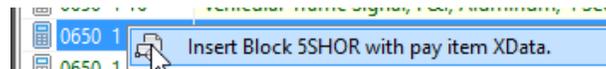


### Exercise 7.7 Place Signal Head on Mast Arm

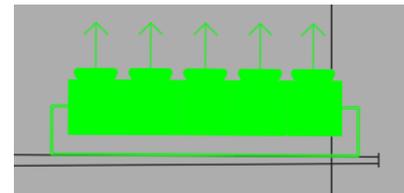
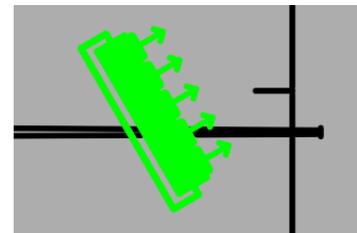
In this exercise, the designer will place a **Signal Head** on the **Mast Arm** using **Entity Manager**.

#### ➤ Place Signal Head 5 section 1 Way

1. Continuing in *DSGNSG01.dwg*, **Pole 4**, zoom out so the entire intersection is in the view.
2. In Entity Manager, navigate to *Signalization > Traffic Signals > Furnish & Install*.
3. Scroll to find *Traffic Signal > Furnish & Install > Aluminum > Vehicular Traffic Signal, F&I, Aluminum, 5 Section, 1 way*.
4. Right click on *Item 0650 1 18*, which uses the **5SHOR** block, and select **Insert Block**.

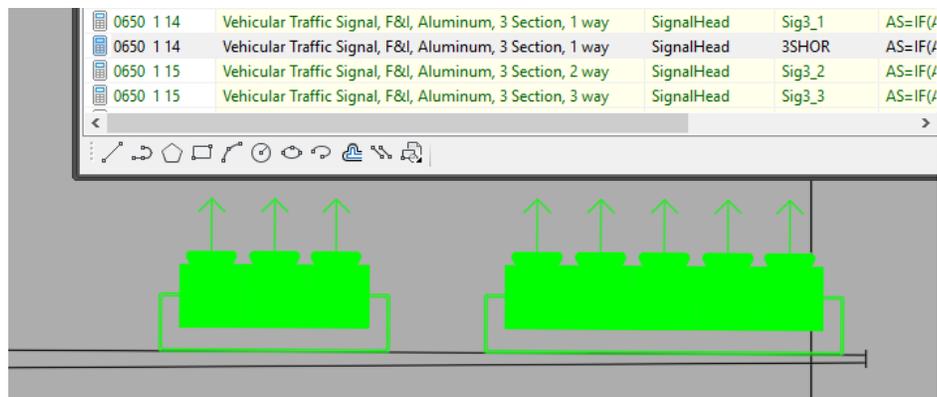


5. Using the *NEArest osnap*, click on the **Mast Arm (Pole4)**.
6. Select the *Block* and click on the *Blue Grip*, right click to open popup menu and select **Rotate**.
7. Using the *NEArest osnap* again, select the **Mast Arm** as the angle to rotate to.
8. Select the *Block* again, if not already selected, select the *Blue Grip* and move along the **Mast Arm**. Notice the Nearest osnap icon. Select the new location as shown to the right.
9. Click **Escape** to un highlight the block.

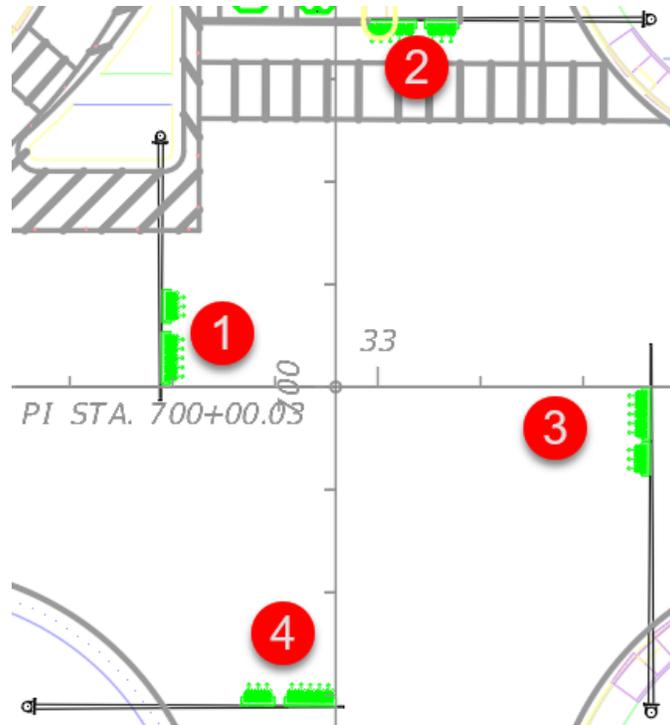


#### ➤ Place Signal Head 3 Section 1 Way

1. Using Entity Manager, repeat the above steps to insert the *Signal head block (3Shor)* with the *Pay Item number of 0650 1 14*. The correct placement is shown below.

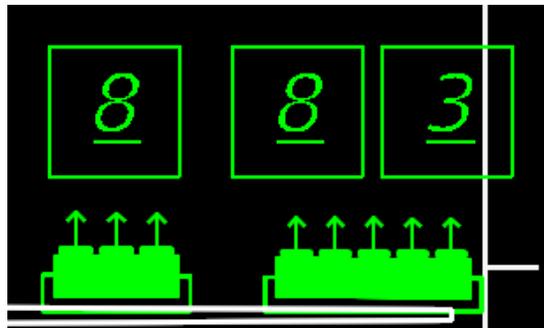


2. Repeat the previous steps using the same *Signal Head* selections to complete placing signals heads on **Mast Arm Assembly Poles 1-3**. Refer to the diagram below for the finished placements for Poles 1-4.

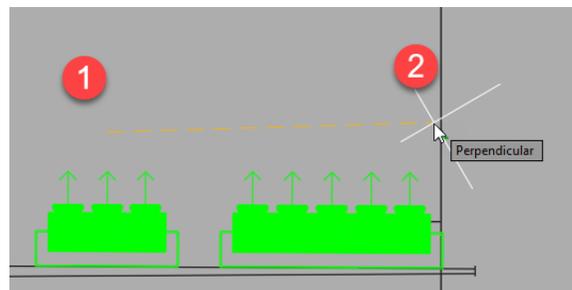


### ➤ Place Signal Head Number

In this part of the exercise the designer will complete the **Signal Heads** by placing a signal number. The next figure shows the finished product. Make sure the current layer is still set to SignalHead.

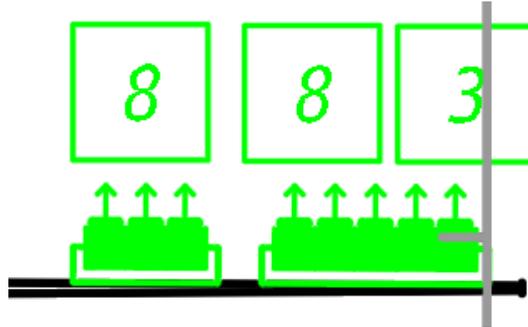


1. From the *Signal Blocks* tab in the FDOT Traffic Palette select the **SignalHdNo** Block.
2. The command line gives you options before you place the block, type in **R** and click **Enter** to rotate the block. Select the *first point* as shown below, then using the *PERpendicular osnap*, snap to the *Alignment*.



3. With the rotation set, click near **Point 1** for the location of the block, upon placement an **Attribute** dialog opens, type in **8** in *Field1* and click **OK**.

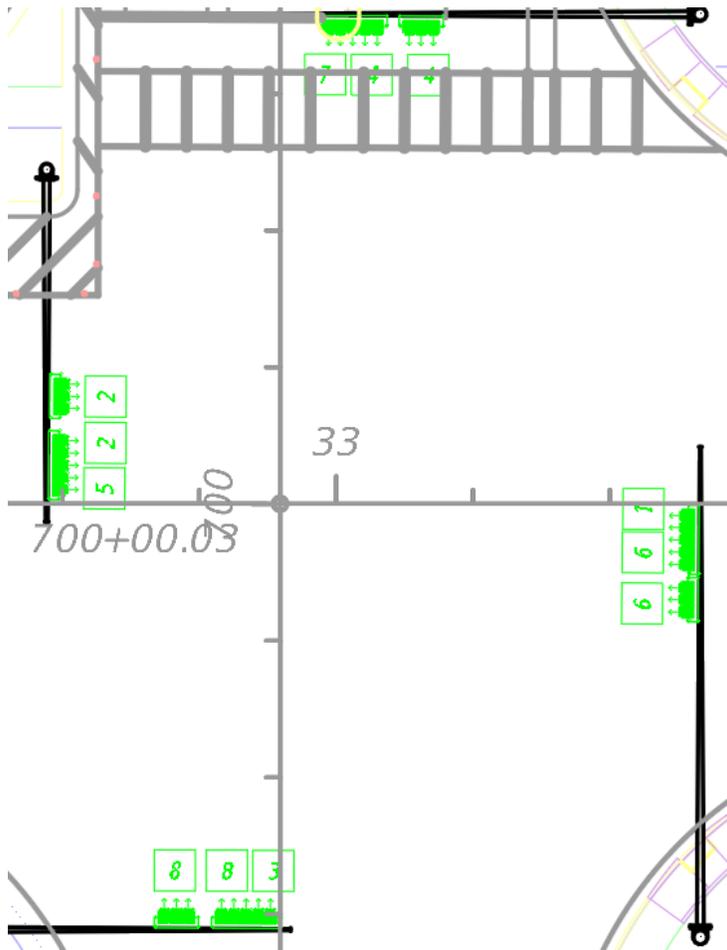
4. Using the AutoCAD **Copy** command, select the previously placed block.
5. For *Base Point* use the *NEArest osnap* and snap anywhere on the **Mast Arm**, by sliding along the mast arm you are maintaining the same angle for all blocks. The placement should look like image above.
6. You will need to make an edit to one of the blocks. Double click the far-right **Block**. The **Edit Attribute** dialog opens. Type in **3** for the *value* and click **OK**. The finished Signal Heads at Pole No. 4 should look as shown below.



- Repeat the same steps to place the **Signal Head Number Boxes** on the other *Mast Arms*, Fill in the **Signal Heads Number Boxes** for each pole with data in the table below:

Pole	Mast Arm	Signal Heads	Box 1	Box 2
Pole 1	3 Section,	1 Way	2	
Pole 1	5 Section,	1 Way	2	5
Pole 2	3 Section,	1 Way	4	
Pole 2	5 Section,	1 Way	4	7
Pole 3	3 Section,	1 Way	6	
Pole 3	5 Section,	1 Way	6	1

- Your Intersection should now look like image below.

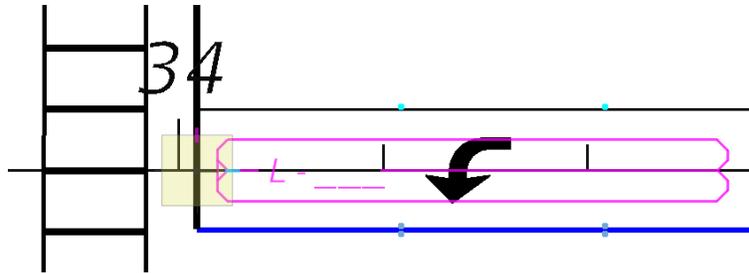


## LOOP ASSEMBLIES

The loops, like the signal heads, should be placed with EMX, due to the Pay Item data attached. The Figure below shows the Loop Assembly for a *Type F* loop. Like the other Block placements, you will need to rotate the Loops.

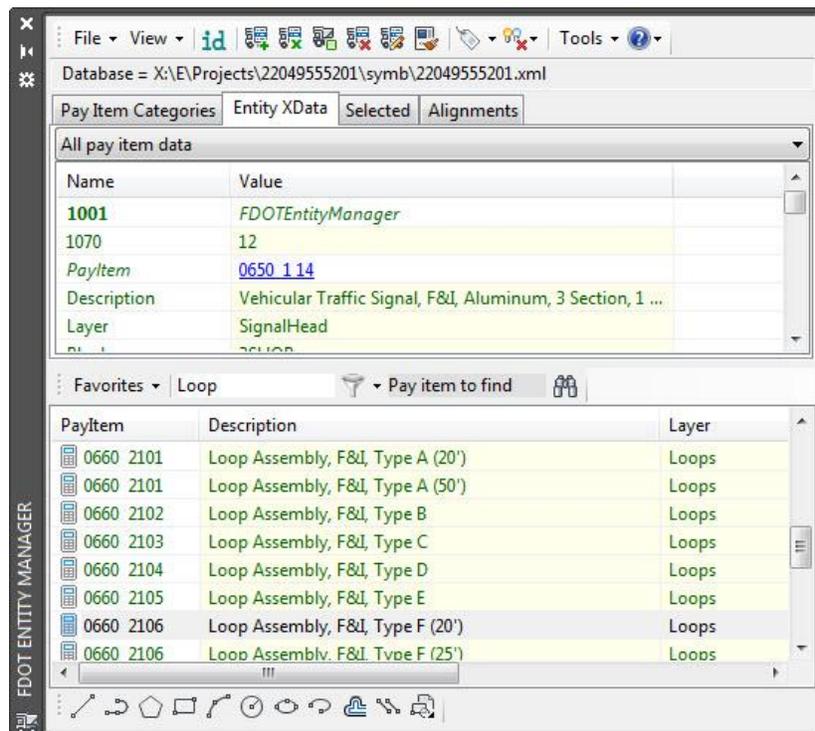
### Exercise 7.8 Place Loop Assemblies

In this exercise, the designer will continue working in the same intersection and place the Loop Detectors, using EMX, that correspond to the Signal Heads placed in the previous exercise. The figure below shows the Loop placed 2' behind the stop bar centered in the turn lane.



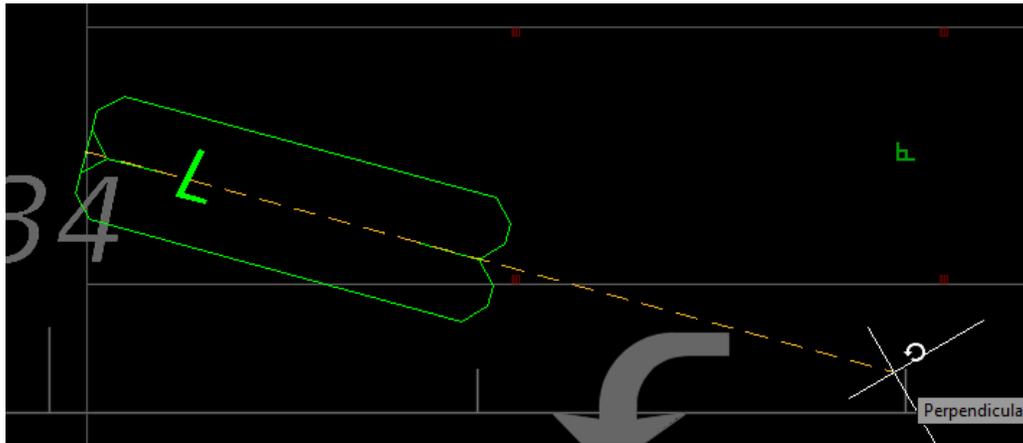
#### ➤ Place Loop Type F

1. Continuing in **Dsgnsg01.dwg**, zoom in near *Station 34+00*.
2. Open EMX and navigate to *Signalization > Loop Assemblies > F&I*.



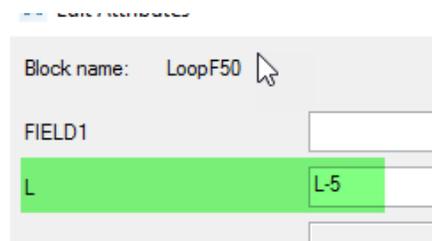
3. Scroll to find **0660 2106 Loop Assembly, F&I, Type F > LoopF50 Loop Assembly F&I, Type F (50')**, right click to open popup menu and select **Insert Block**.
4. Snap to the **Intersection** of the *Alignment* and the Stop bar, which is the center of the Turn Lane.

5. Rotate the Loop Block > Use the **PERpendicular snap** to any of the alignment tics. See Image below for snap graphics.

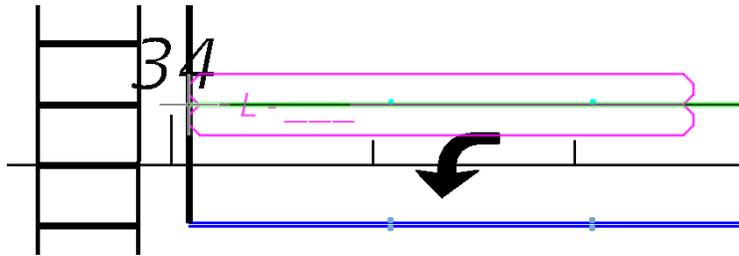


**Note** If you accidentally rotate it to the wrong angle, you can always type *U* for Undo.

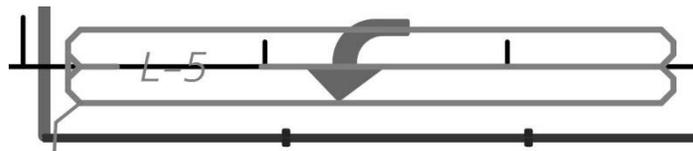
6. When the Edit Attributes dialog opens enter **L-5** as shown.



7. Move the **Loop Block 2'** behind the **Stop Bar** by selecting the **Block**, select the **Blue Grip**, Zoom in & move it until the **NEArest osnap** highlights on the Loop itself, Type **2** > Enter.

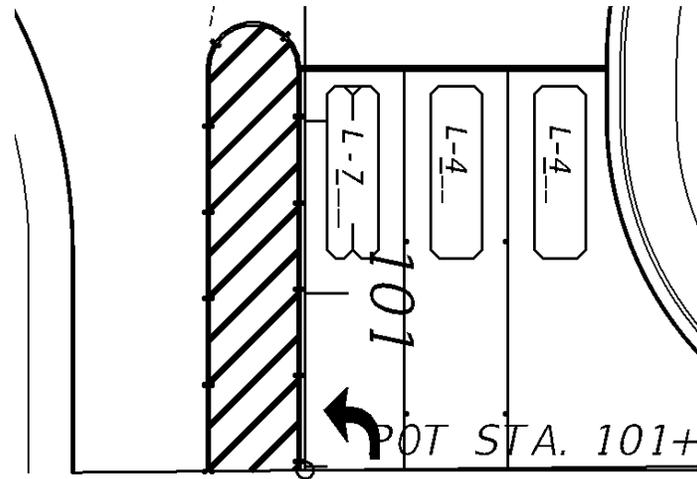


8. Loop should look like below.

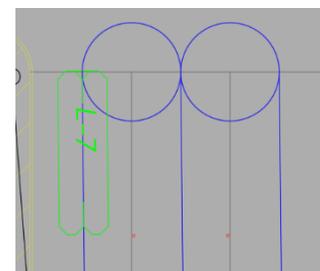
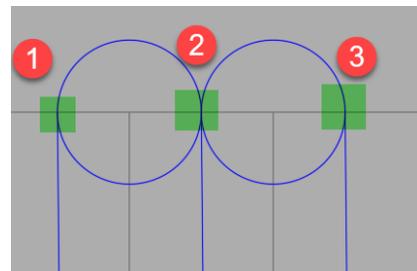


### ➤ Place Multiple Loop Assemblies

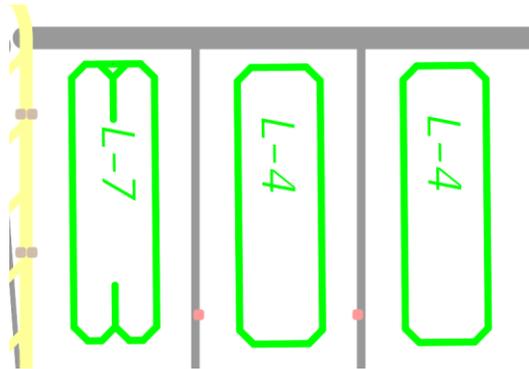
In this part of the exercise the designer will place multiple loop assemblies to complete a leg of an intersection using a different technique. When complete your drawing should look like below.



1. Continuing in *Dsgnsg01.dwg* zoom in near the south side of the Intersection. Change your current layer to anyone of the unused miscellaneous layers.
2. First draw 2 temporary circles 6' in diameter with the center at the end of the lane lines at the stop bar.
3. Draw a Line **Perpendicular** to the Lane Lines. We will use these objects as references. The green highlighted areas will be the insertion point of the loop blocks.
4. Open EMX and navigate to Signalization > Loop Assemblies > Furnish & install.
5. Scroll to find 0660 2106 Loop Assembly, F&I, Type F > LoopF20 Loop Assembly F&I, Type F (20') and Right Click on item LoopF20 Loop Assembly F&I, Type F (20') and select Insert Block.
6. For Insertion Point Select Point 1 as shown above at the Intersection of the first circle and the Stop Bar (The Green highlighted intersections shown above).
7. For Rotation snap using the **NEArest** osnap to the blue perpendicular lines you drew.
8. The Edit Attribute box comes up, enter in **L-7** and press **OK**.
9. Scroll to and Insert the **0660 2101 Loop Assembly, F&I, Type A (20')** The insertion point is point 2 as shown above.
10. When the Attribute dialog opens type in **L-4** and press **OK**.
11. Repeat the above step and insert the same block at point 3, The attribute entry should be **L-4**.
12. Select all of the loops and move them down 2' snapping to the **NEArest** osnap along the blue line.



13. Delete your temporary blue circles and lines. The drawing should look like image below.



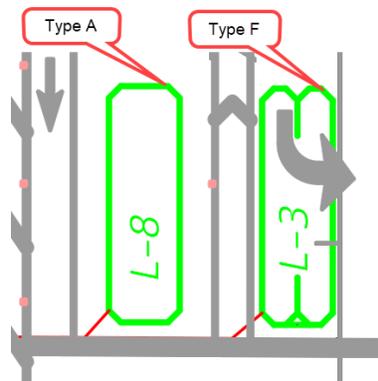
**Note** If you haven't noticed yet, there is a visual difference between the two images above. The bottom one which is thicker and realistic to how the drawing will publish has the

**Line Weight**  option turned on. What this means is that it will display the assigned Line Weights that are assigned through the Layer Properties when you created your file which meets the Department Standards.

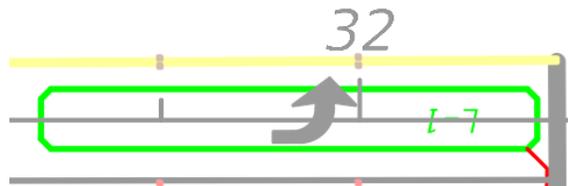
14. Repeat steps to place the **0660 2101 Loop Assembly, F&I, Type A (20')** & **0660 2106 Type F (20')** in the Lanes on the North Side of the Intersection.

You can also copy and mirror the already placed Loops.

15. Enter **L-8** and **L-3** in the Loop Fields. The North Side of Intersection when complete as shown below.

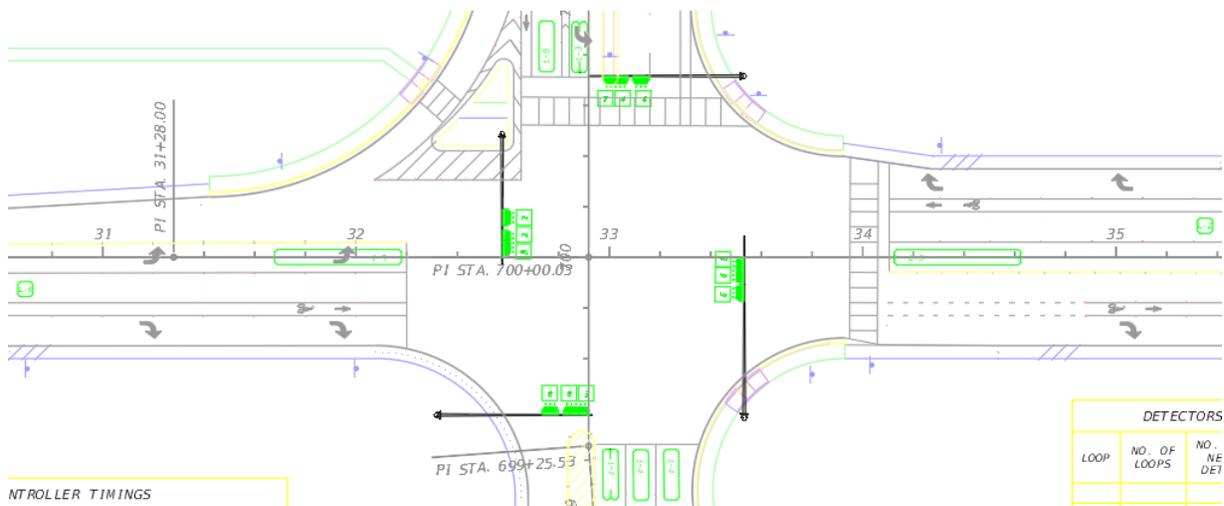


16. Insert the **0660 2101 Type A (50')** Loop in the turn lane on the West side of the Intersection.  
17. Enter **L-1** in the Loop Field. The West Side of Intersection when complete as shown below.



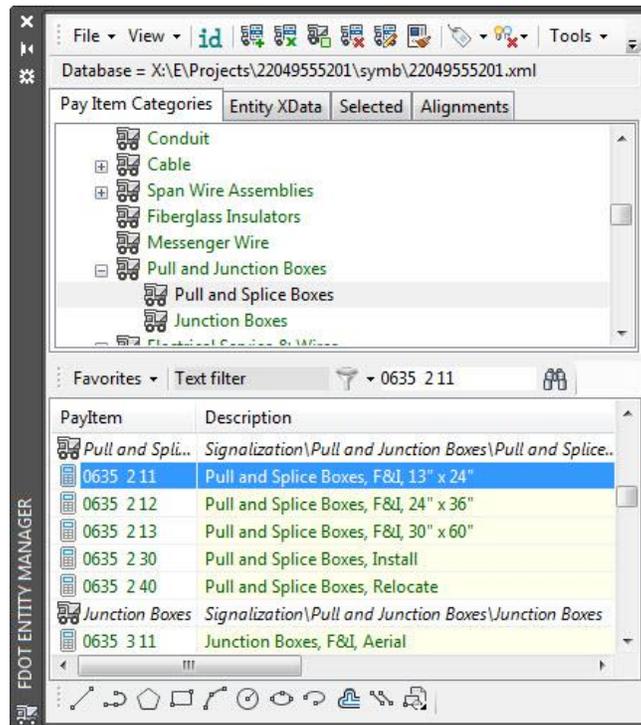
18. Next using **EMX** browse to Pay Item Number **0660 2102 Loop Assembly, F&I, Type B** and select the Insert Block Icon  on the Drawing Tools Tool bar along the bottom of EMX.  
19. The Insert Block Icon on EMX allows the user to insert blocks using the Transparent commands, if you right click and select insert block transparent commands will not work.

20. Select the **Station Offset**  Transparent Command located along the right side of your drawing screen. Transparent commands are used inside another command to allow the user to place objects with precision using Civil 3D Objects.
21. The command line will ask for you to select an Alignment. Select **BL98**.
22. A Red Jig will appear on the screen locked to the Alignment. The Command Line will ask for the Station. Type in **3066.42**. Note that you don't enter in the + symbol when typing in stations.
23. Notice the Red Jig is now locked on the Alignment at the Station you entered. For offset enter **12.56**.
24. Keep pressing Enter until the Rotation option appears, snap to the **PER**pendicular point on a Station Tick. Press enter again to accept the placement. Enter **L-6** for the attribute data.
25. Using the above steps insert the same block at **Station 3532.09, Offset -12.46** and enter **L-2** for the attribute. Note that the negative offset denotes Left Side placement.
26. Your intersection should look like image below. The Mast Arm poles, Signal Heads, & Loops have been inserted.



## PLACING PULL BOXES

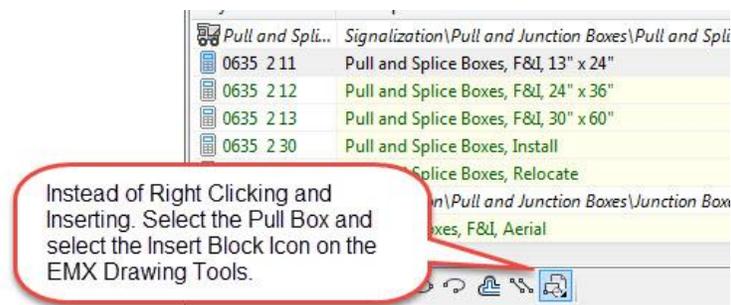
Inserting the Pull Box items using EMX works much like the Loop Assemblies. As with any item being placed with EMX it is good practice to review the item to better understand how the item is placed. If the designer places the Pull Boxes using AutoCAD inserting methods the items will not have the appropriate Xdata attached to allow for Quantities reporting.



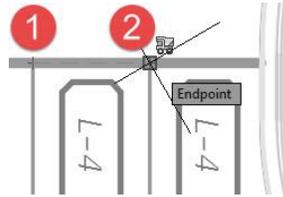
### Exercise 7.9 Place Pull Box

In this exercise, the designer will use EMX in conjunction with *AutoCAD Commands* to place several pull boxes around the intersection. By using EMX, the designer will be able to generate automated quantities.

1. Continuing in *Dsgnsg01.dwg*, zoom in near **Pole 3**.
2. Open EMX if it is closed. Make sure the correct **Payitemdb** file is loaded.
3. In the Pay Item Categories Navigate to **Signalization > Pull and Junction Boxes**. As Shown above.
4. Click on Item 0635 2 11 Pull and Splice Boxes, F&I, 13" x 24".
5. Click on the **Insert Block** as shown on Image to Right.



- Type **R** for rotate and using your **NEA**rest osnap select Left to along the Stop bar as shown.



- Select the **Station Offset Transparent Command**  on the Transparent Command Toolbar located on the Right Side of your Drawing screen.
- The command line will ask for the Alignment, Pick the **BL98** Alignment.
- The command line now asks for the **Station**, enter in the following without the plus symbol. **3342.57**.
- For **Offset** enter **66.02** and select enter.
- Press **Enter** twice to place the Block.



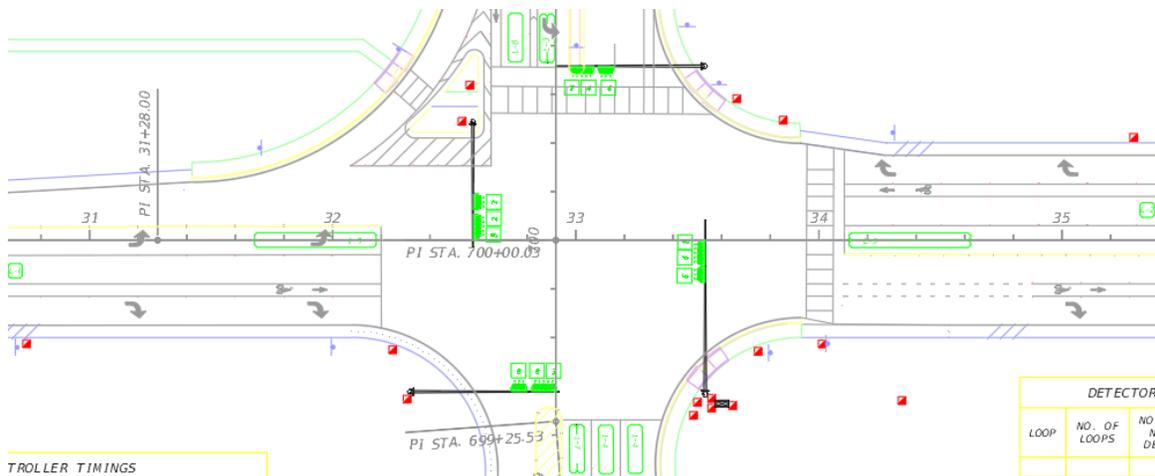
- Since the Pull Boxes are all the same size and Pay Item numbers you can select the AutoCAD Copy command and using the center of the block as a base point select the **Station Offset** Transparent Command to place the remaining blocks with the location data as shown below.
- Repeat steps to place **Pull Boxes** at the following *offsets* and *stations*: **Do not to enter the stations with the + symbol.**

Offset	Station/Side	Offset	Station/Side	Offset	Station/Side	Offset	Station/Side
42.53'	30+74.08 RT	-63.77'	32+56.40 LT	71.97'	33+48.39 RT	42.60'	34+01.34 RT
45.00'	32+24.67 RT	66.61'	33+50.03 RT	-54.22'	33+66.22 LT	65.89'	34+34.12 RT
65.30'	32+30.58 RT	64.96'	33+55.90 RT	45.68'	33+74.94 RT	-42.24'	35+29.48 LT
-48.87'	32+53.15 LT	69.00'	33+55.83 RT	-49.35'	33+82.27 LT	67.98'	33+64.50 RT

### Exercise 7.10 Place Controller Assembly

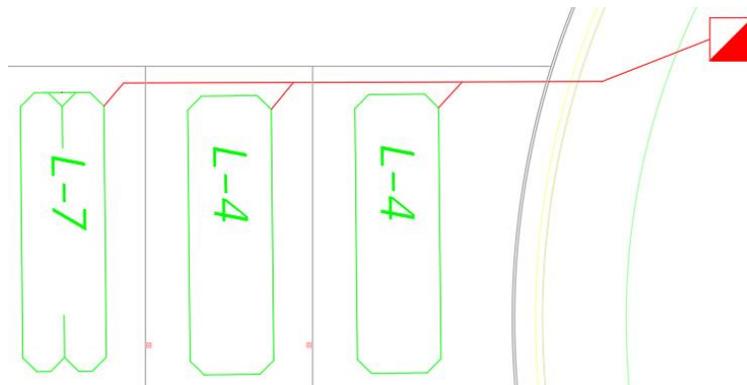
In this exercise, the designer will use EMX to place a Base Mounted Controller.

1. Continuing in *Dsgnsg01.dwg*, zoom in near **Pole 3 (South East)** side of intersection.
2. Open EMX if it is closed. Make sure the correct **Payitemdb** file is loaded.
3. In EMX, navigate to Signalization > Controllers and Cabinets > Traffic Controller Assembly > Furnish & Install.
4. Select item 0670 5110 Traffic Controller Assembly, F&I, NEMA.
5. Select the **Insert Block Icon** located on the bottom of the EMX drawing Tools.
6. Type **R** in the drawing to rotate the block like the Pull Box was rotated. Use the Stop Bar to Rotate to View. See the previous exercise for steps if necessary
7. Using the **Station Offset Transparent** Command Select **BL98** as the Alignment.
8. Type in *Station* as **3360.13** and press enter.
9. Set the *Offset* to **67.21** and press enter until block is visible.
10. Your drawing so far should look like image below.



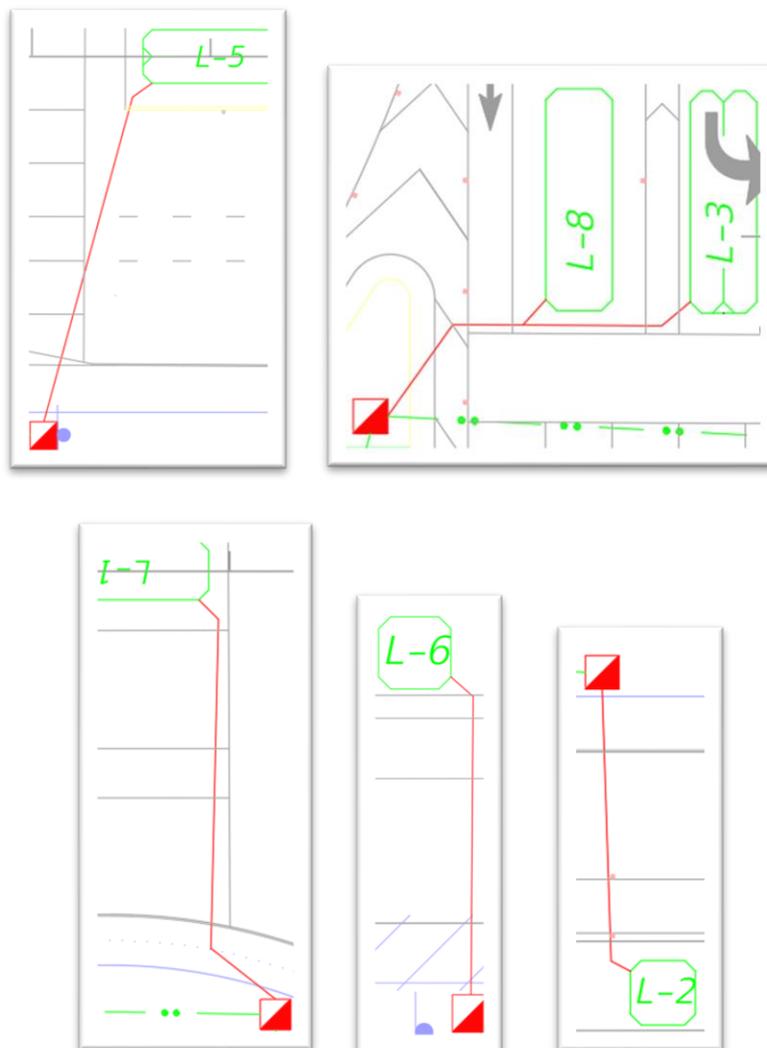
### Exercise 7.11 Draw Loop Lead in Wire

In this exercise, the designer will draw the Loop Lead-In wire from the end of the Loop Detectors to the Pull Box. The lead-In is paid for under the Loop Detector so the designer will draw this line using the AutoCAD PolyLine command. The figure below shows the Loop Lead-In drawn from Loop Detectors to the Pull Box.



➤ **Draw Loop Lead-In**

1. Zoom in near the *Loop Detectors* placed earlier on the Southern Side of the Intersection
2. In Civil 3D, set the *Current Layer* to **LoopLI**. Hint: You can type in the layer name on the command line to set it current.
3. Type **PL** at the command line to start the Polyline command.
4. Snap to the end points as shown in images.
5. Repeat this process on the remaining two **Loop Detectors** at the intersection. Connect to the midpoint of the pull box. Drawing should resemble Image above.
6. Using the *Poly Line* command, draw a line for the other **Loop Detectors**. The five images below represent the other connections that need to be drawn.



**Note** The location of the Pull Boxes will be dependent on each individual project. The placement of Loops, Types of Loops used and Loop Lead-In wire placement may vary from district to district, consult with the district traffic engineers regarding these issues

## DESIGN SETTINGS

The conduit Lines are special Linestyles that are delivered in the State Kit and created to match the PPM examples.

### Exercise 7.12 Place Conduit

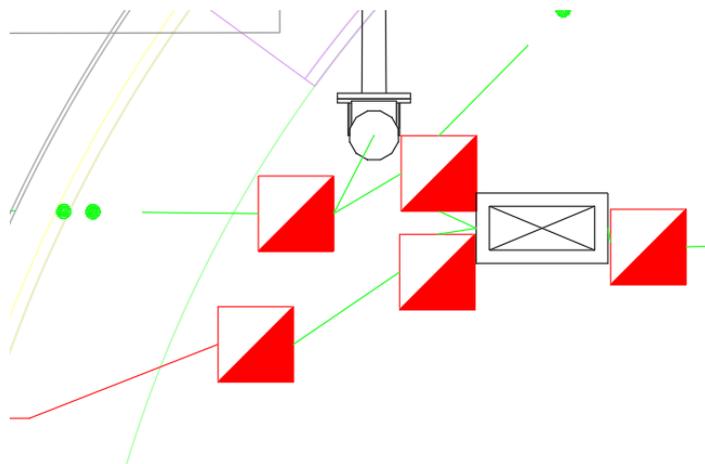
In this exercise, the designer will draw conduit from Pull Box to Pull Box and then to the Controller Cabinet. This exercise will use the Polyline command within EMX to draw the conduit.

#### ➤ Place Conduit Underground

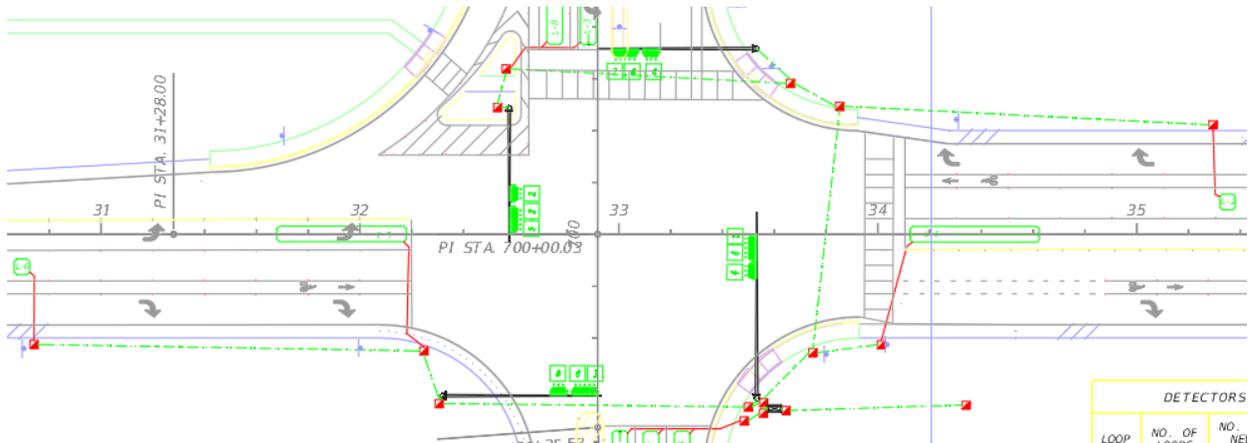
1. Continuing in *Dsgnsg01.dwg*, zoom in near the **Pull Box** at Station **30+74.08** placed in a previous exercise.
2. Open EMX, if closed. Make sure the correct **Payitemdb** file is loaded.
3. In EMX, navigate to Signalization > Conduit.
4. Select item 0630 2 12 Conduit, Furnish & Install, Underground or Underpavement- Directional Bore.
5. Select the Polyline Command  from the EMX drawing tools. This will set the Civil 3D Layer symbology and draw with influence.
6. Using your Midpoint Osnap Snap to the midpoints of the Pull Boxes. See figure below.



7. Continue to place the rest of the *Conduit item 0630 2 12 Conduit, Furnish & Install, Underground or Underpavement- Directional Bore* around the intersection and down the **BL98** Alignment. Complete the conduit from the Pull Box to the Controller Cabinet.
8. Zoom to the area near the *Signal Poles* and draw a line from the **Signal Pole** to the **Pull Box**.



9. Drawing should resemble image below.

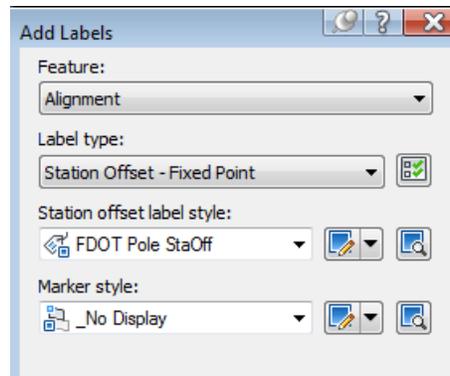


## PLACING TEXT LABELS

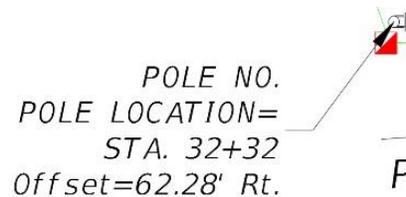
There are several different types of notes and labels that are placed on Signal Plans that are not used in other components. For example, the **Pole location label** and the **Pay Item number box**. These are handled with a combination of Civil 3D label styles and from the FDOT Traffic Palette.

### Exercise 7.13 Place Pole Location Label

- To start lets label Pole No. 4. Switch to the **Annotate Ribbon** > select **Add Labels** (top half of button) from the ribbon select the following options

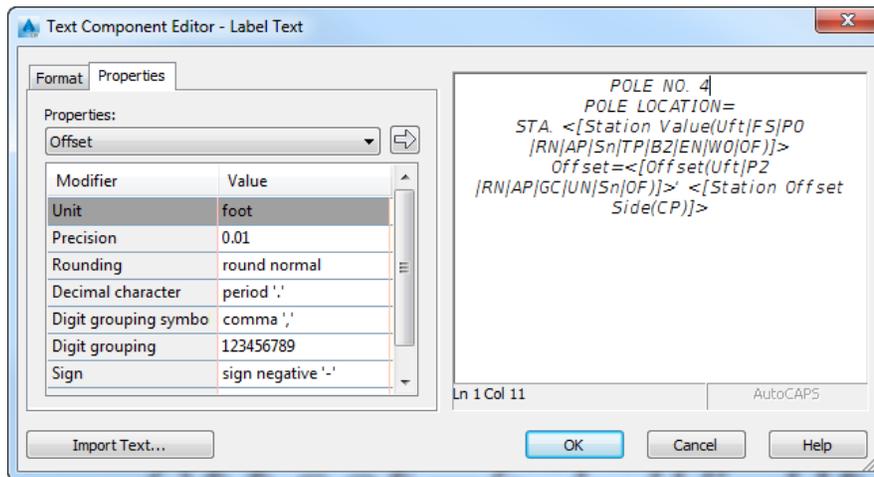


- Select **Add > Select the BL98 Alignment** and then the center of the Signal Pole. Drag the label off Pole to remove the box and show the Leader Line. Currently your drawing should look like image below.



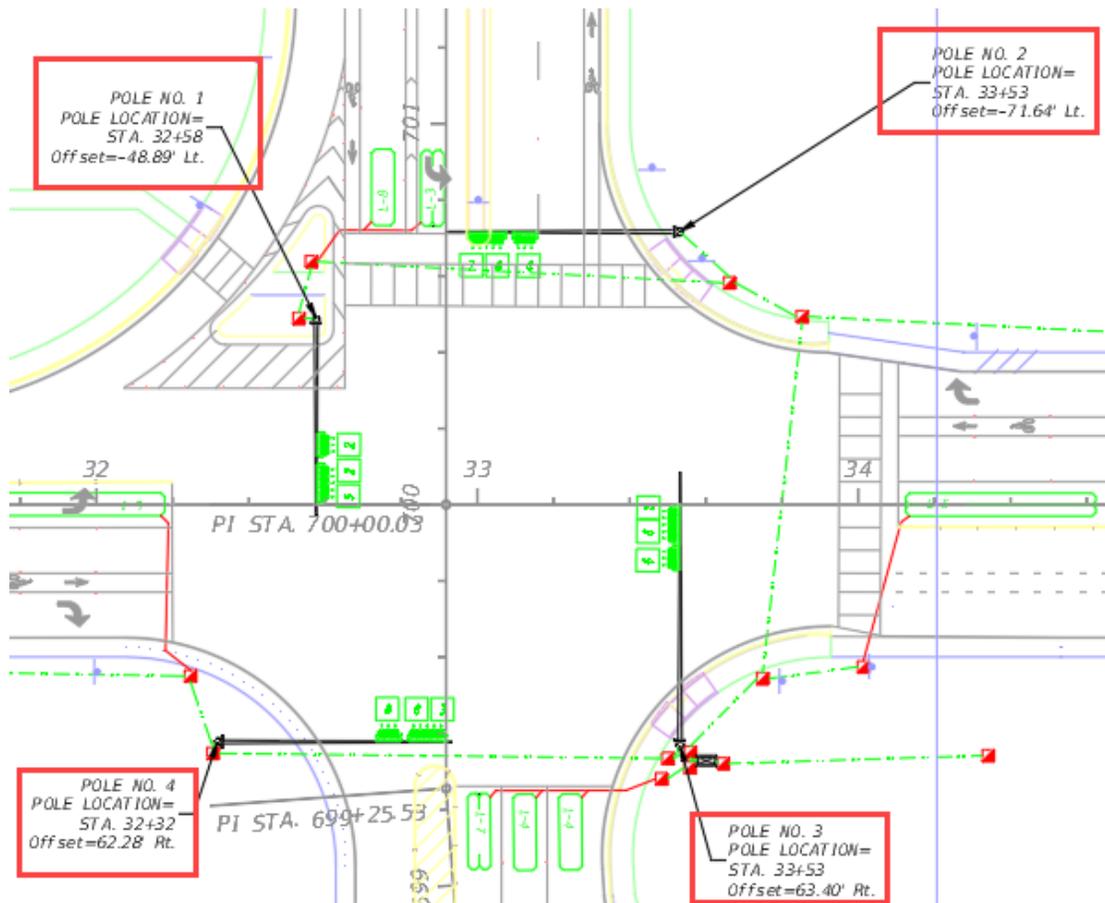
- Select the Label and select **Edit Label Text** from the Contextual Ribbon.

- Click in the Text Preview box and add the number **4** to the Pole Number as shown below and select **OK**. The label should update and look like image below right.



POLE NO. 4  
 POLE LOCATION=  
 STA. 32+32

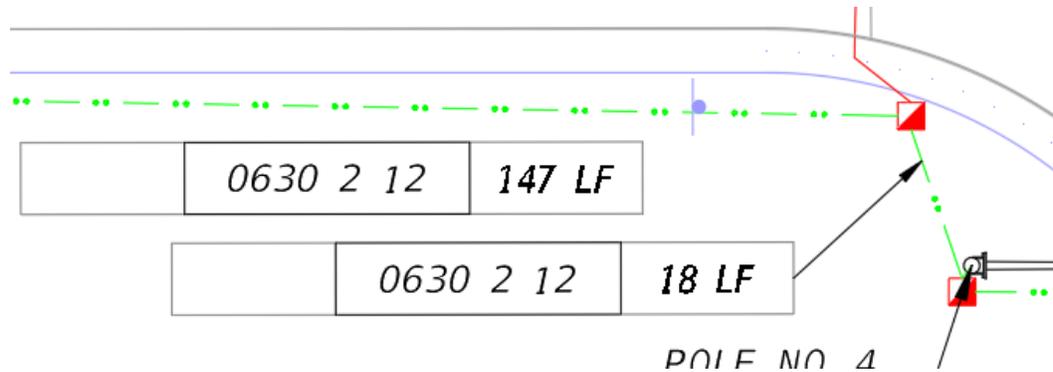
- You could Place the label again for the other 3 Poles like the above steps but this time use the Copy command and select the center of the Pole as the base point and select the other the center points on the poles. Notice how the label updates with the Station, Offset, & Side, this is because the Labels are dynamic.
- The drawing should look like below.



- As the Pole Location label is the Pay Item Number box, this block can be placed from the palette previously mentioned. Once this block is placed, it turns into an AutoCAD table and can be edited by clicking in the individual blocks and type the data in, there are also blocks with a gray border (which will not print) around this table which represents where the lengths of the conduit gets filled in.

	0630 2 12	
--	-----------	--

- This block is placed in the general location of the item it is referring to and a leader line if needed is drawn from the Pay Item box to the item. Next to the pay Item Number box the designer will add a piece of text with the quantity and unit as shown below. See Chapter 10 for more information on Labeling.

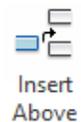


### Exercise 7.14 Place Pay Item Number Box

In this exercise, the designer will place the Pay Item Number Box then add a leader line and arrow head as shown above.

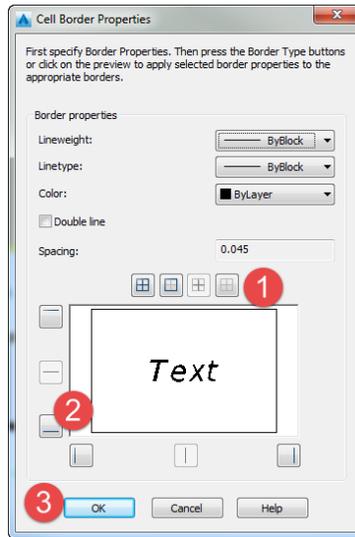
1. Continuing in the *Dsgnsg01.dwg*.
2. Make the Layer **TextLabel** current.
3. from the FDOT Traffic Palette select **Signal Blocks** tab.
4. Select the **SignalPayItem** block, type **R** on the command line and with the **NEA**rest osnap select two points that are parallel to the Viewframe (BL98 Alignment)
5. Insert underneath the conduit as shown above. You can copy the block from here to put in the other locations.
6. Click inside the block to make it active and type the Pay Item Number **0630 2 12**.
7. On the FDOT Ribbon there is a tool called **Line Calculator**  that will allow you to measure the conduit so that you can enter it in the SignalPayItem block. Click on the tool to launch it.
8. Select the **Select Entity** button and then pick the long conduit above the label box, press enter to bring the box back with the value. Select the block to the right of the pay item number and type in **147 LF** for the length. You can delete the un needed values in the block by selecting the desired block and pressing delete.
9. Copy the Pay Item Table and move it closer to the conduit connecting the pull boxes.
10. Get the distance of the conduit and enter it in the box to the right which is **18 LF**.
11. Type in **Leader** on the command line and select a point on the conduit and the top right midpoint of the pay item box as shown above.
12. Next Copy a Pay Item Table and place it above the conduit in the Intersection as shown below

		116 LF	
	3	0630 2 12	



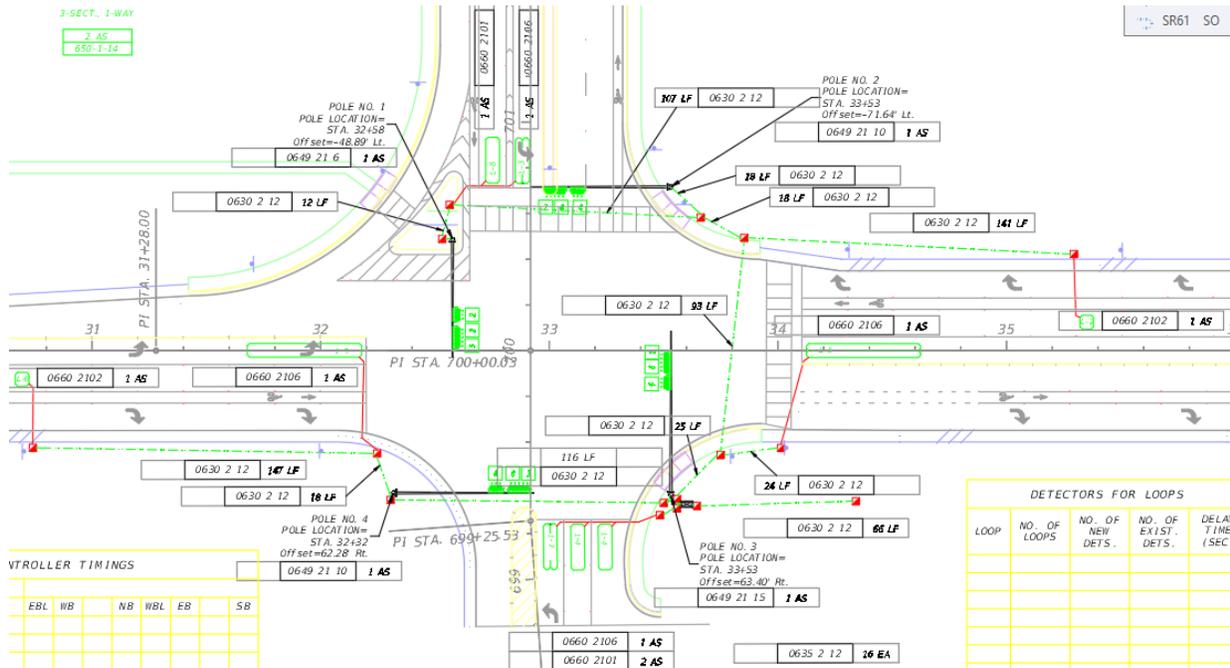
13. We must add a top Row to the table with no border to enter in the Length of the conduit. Select the Table and on the Contextual Ribbon select Insert Above.
14. Select the block above the Pay Item Number. We need to turn the border gray so it won't print. Select Edit Borders. 

15. Click in the following order.



16. Type in the Length (**116 LF**).

17. Using what you have learned copy and enter in the appropriate data. Your drawing should look like image below. Remember the grayed-out block borders will not print, so disregard if they lay on top of objects, also label the Mast Arms, Loop Detectors, and Pull Boxes as shown.



**Note** Drawing a Leader Line is optional when the labeling is obvious. However, when the label is placed a considerable distance from the item being labeled, a leader line is required, but the arrowhead is optional depending on the Districts internal preference.

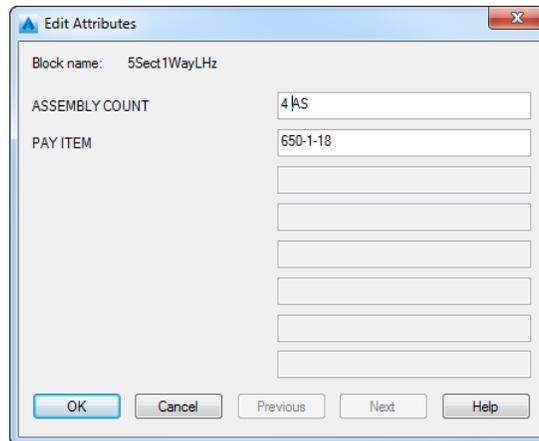
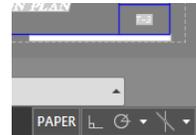
You can always select the block you are not using on the Pay Item Number Table and select Delete Columns to remove, if your drawing gets too busy. Remember the gray borders will not show on a print.

### Exercise 7.15 Signal Head Detail

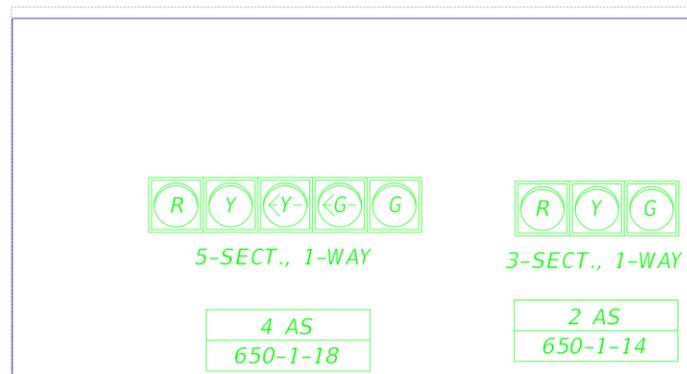
#### ➤ Place Signal Head Details (Part 1)

In this exercise, the student will use the FDOT Traffic Palette to place the Signal Head Detail.

1. Continuing in *dsgnsg01.dwg*,
2. On the Home Ribbon select **Tool Palettes** if they are not already on.
3. Right Click on the Palette Name and select **FDOT Traffic**.
4. Select the **Signal Heads** tab.
5. Make **TextLabel** the current layer.
6. Make sure your Sheet Layout is in **Paper Space**.
7. Scroll down the palette and select the block (5Sect1WayLHz) 5 Section 1 Way Left Horizontal (650-1-18)
8. Left Click to place anywhere in the top left corner of the sheet.
9. The **Edit Attributes** dialog opens. Enter in **4** for the assembly count. You can always edit this later by double clicking on the block or selecting and right click > Properties. Select OK.



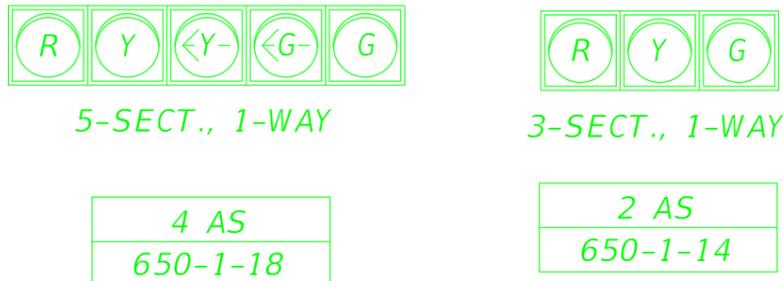
10. On the palette select the block (3Sect1WayHz) 3 Section 1 Way Horizontal (650-1-14).
11. Place it next the previously placed signal head detail. For Assembly count enter **2**.
12. Drawing should look like below.



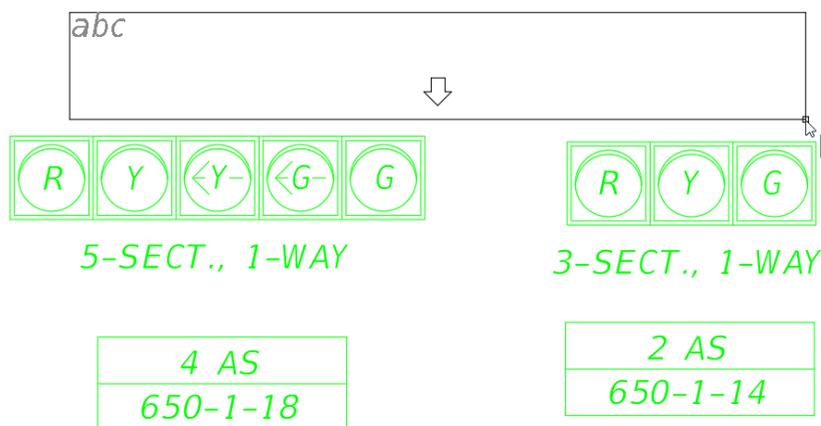
➤ **Place Detail Text (Part 2)**

In this exercise, the designer will place the description text “SIGNAL HEAD DETAIL” above the two signal heads placed in the previous exercise. This note is bigger than normal text so the user will have to set the text height manually.

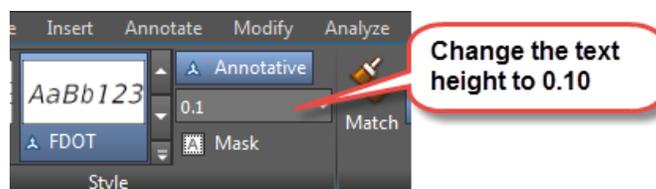
SIGNAL HEAD DETAIL



- Continuing in *dsgnsg01.dwg*, type in Mtext on the command line and draw the text box as shown below.



- You can set the text height before typing or highlight the text and make edit using the Text Editor contextual ribbon. In this case change the text height to **.10** and toggle on the **underline** symbol. The font is still annotative as you can see the blue drafting triangle in the text style pick box.



- In the Text box type in **SIGNAL HEAD DETAIL** and left click outside the text box to exit the Mtext editor and place the text.



# 8 LIGHTING TOOLS

## OBJECTIVE

The objective of this chapter is to teach the designer how to use the tools available in the FDOT Civil 3D State Kit to create proposed lighting plans that meets FDOT Standards.

## INTRODUCTION

This chapter discusses several applications and resources that help the designer in the creation of proposed lighting features to meet FDOT criteria and CADD standards. These include the Create File, Block libraries, Entity Manager, and Place Block Group.

Refer to the *Plans Preparation Manual*, Volume II, chapter 25 for more detail on developing the Lighting plans. Refer to the Standard Plans for Road and Bridge Construction indexes and the *Plans Preparation Manual*, Volume I, chapter 7 for design criteria.

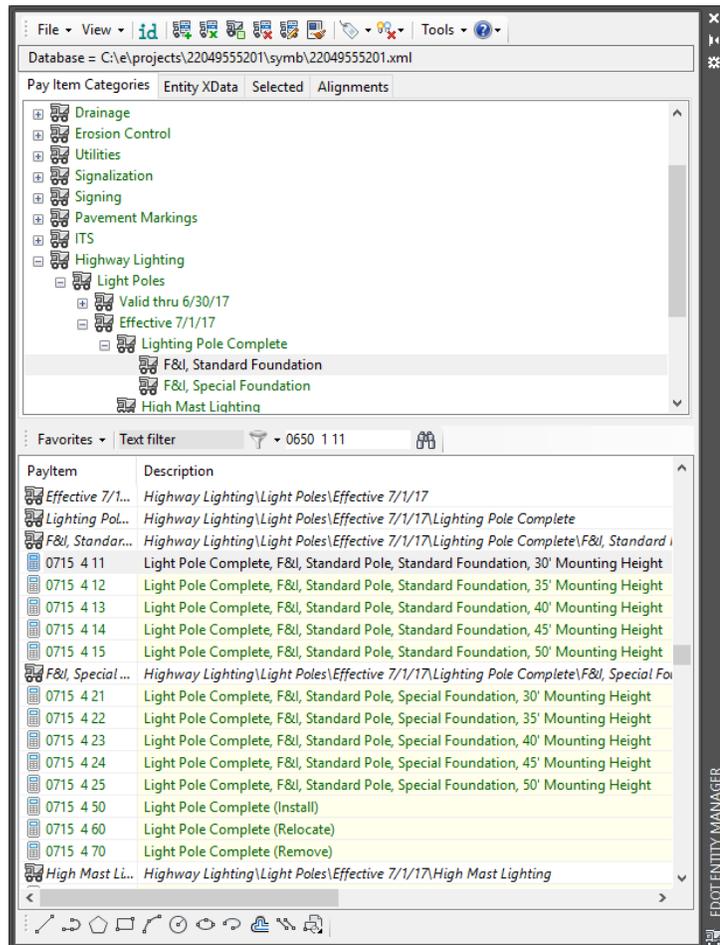
## DRAWING LIGHT POLES

Generating the proposed lighting design is the responsibility of the engineer. It is also the engineer's responsibility to make sure an acceptable program is used to generate the proposed design. Currently FDOT uses AGI 32 when the design is done in-house. It is possible that the proposed design is done by the lighting manufacturer or Power Company; however, they will have to generate an acceptable report that is to be submitted to FDOT for review. This report can be used by the in-house designers to create the lighting design files i.e. light pole spacing.

There are a couple of ways to approach drawing the Light poles in Civil 3D, one is to import the entities from the AGI 32 lighting program into Civil 3D and then place the light pole block on top of the AGI 32 entity. Another way is to reference the AGI 32 file into the lighting design file then place the light pole block on top of the AGI 32 entity. A third option is to take the report generated from AGI 32 or another acceptable lighting program which details the spacing of the light poles then use Entity Manager in conjunction with Place Block Group to draw the light poles at the specified spacing.

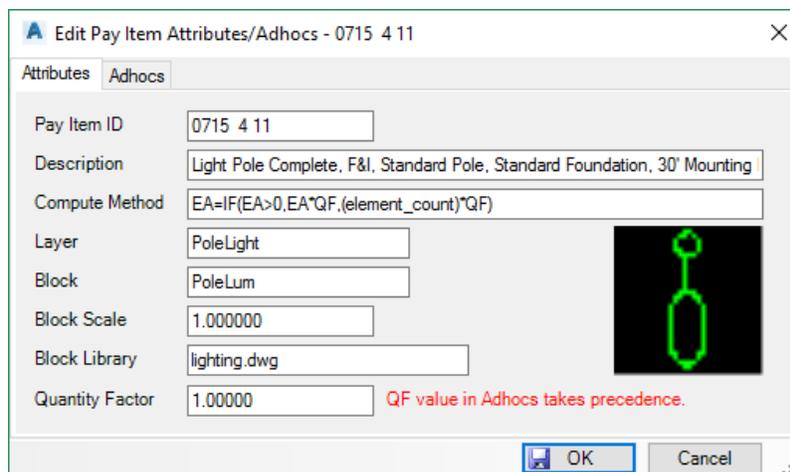
## REVIEW LIGHT POLE ITEM IN ENTITY MANAGER

Before placing the *Light Poles*, it is important to understand how the Light Pole items are set up. The figure shows the Light Pole item in Entity Manager.



Selecting and then right-clicking on an item offers the options to edit the item. The Edit PayItem dialog allows the designer to review how an item will work when placed with Entity Manager.

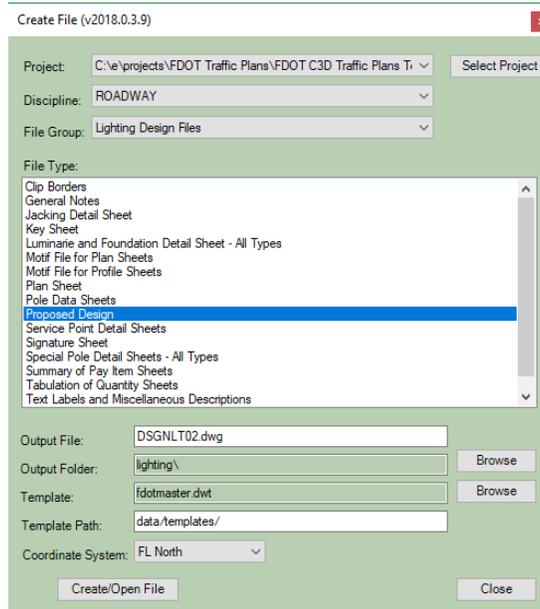
The dialog displays information about the item, such as, payitem number, description, symbology and Block Name.



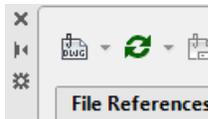
### Exercise 8.1 Creating Lighting Design File

In this exercise, the designer will create the *DSGNLT.dwg* and Xref in the required files, along with creating data references for the Alignments.

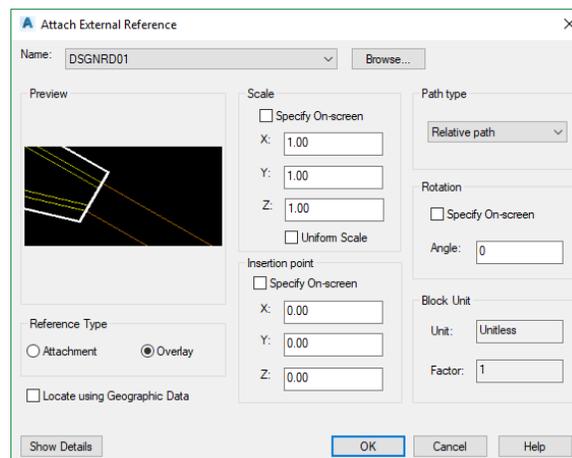
1. On the FDOT Ribbon click on the **Create File** application.
2. Make the following selections in the dialog.



3. Select **Create/Open File** to create the design file.
4. Click **Close** to exit dialog.
5. Type in **XREF** on the command line to open the Xref manager.



6. Select the attach DWG icon.
7. Browse to the Roadway folder and select the *DSGNRD01.dwg*.
8. Make sure to select **Overlay** and leave all other options **Untoggled** as shown below.



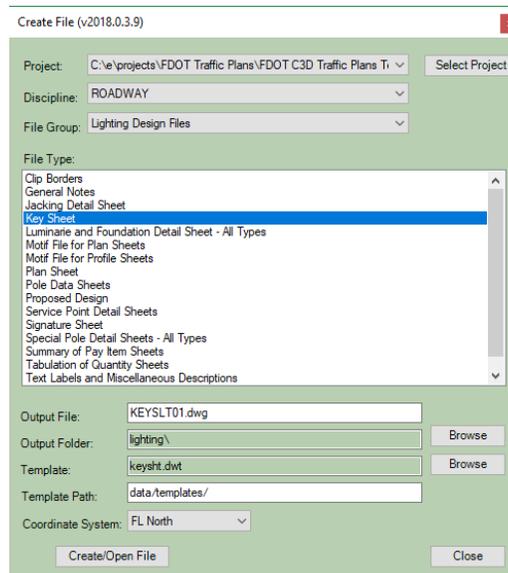
9. Select **OK** to bring in the reference file.
10. Repeating the above steps, attach the *DSGNSG01.dwg* using the same settings.
11. Repeating the above steps, attach the *AGI32Lighting.dwg* located in the Lighting folder in your project, using the same settings.
12. In Toolspace under the Data Shortcut options, expand the Alignment folder and Right Click on **SR61** and select **Create Reference**.
13. The default entries do not need to be modified, select **OK** to place the Alignment. You may need to Zoom Extents to see the Alignment and References.

## Exercise 8.2 Creating Lighting Key Sheet and adding it to a Sheet Set

### ➤ Creating Lighting Key Sheet (Part 1)

In this exercise, the designer will create a Key Sheet that will be used for the Lighting Design sub set. The Key Sheet will then be added to the FDOT Traffic Plans Sheet Set and propagated with information about the project. For a more detailed description of creating Key sheets, refer to Chapter 3.

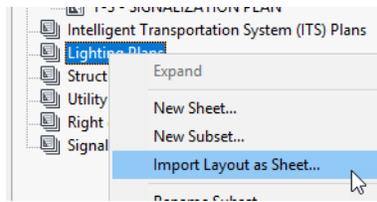
1. From the FDOT Ribbon click on **Create File**.
2. Fill in the following options.



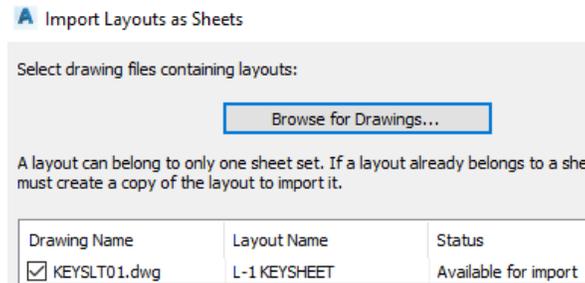
3. Click **Create/Open File**. Click **Close** to exit dialog.
4. Delete all Layouts EXCEPT the **LightingFF**.
5. Right Click on the Layout and Rename Layout to **L-1 Keysheet**.
6. Save the File, but leave open to continue to next exercise.

### ➤ Adding Layout to a Sheet Set (Part 2)

7. Type in **SSM** on the command line.
8. Open the *FDOT Traffic Plans* Sheet set.
9. Right Click on the *Lighting Plans* and select **Import Layout as Sheet**.



10. Browse to the *KEYSLT01.dwg* located in the Lighting folder.
11. There should be one available layout to import, select it and click on **Import Checked**.

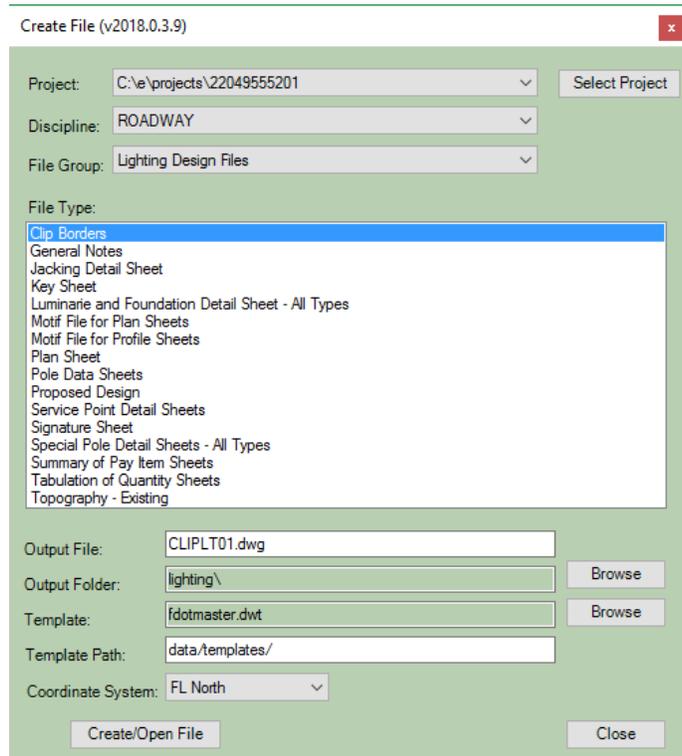


12. Type **RE** to regenerate the KeySheet drawing file, notice the fields update with project information.
13. Save and Close the Keysheet file.

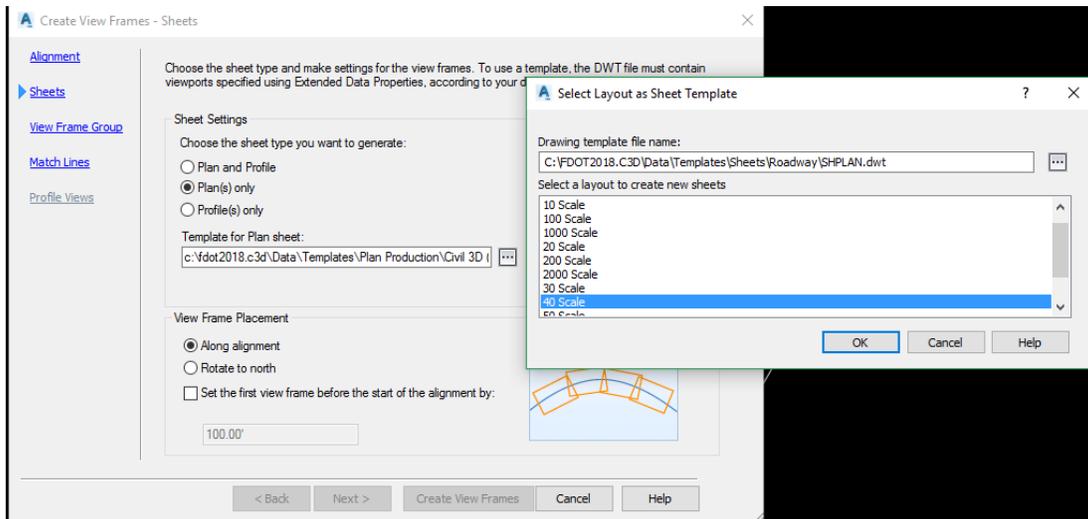
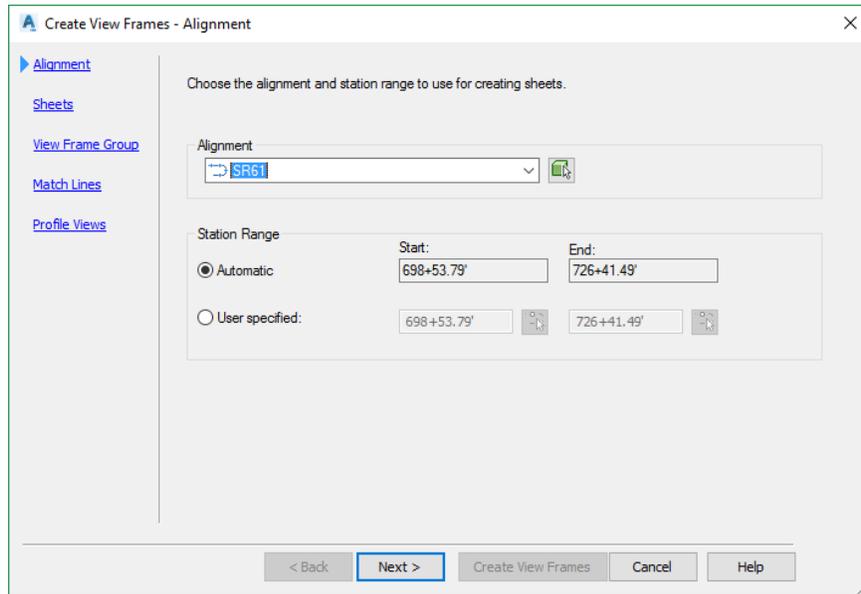
### Exercise 8.3 Creating Lighting Clip File, View Frames, & Data Shortcut

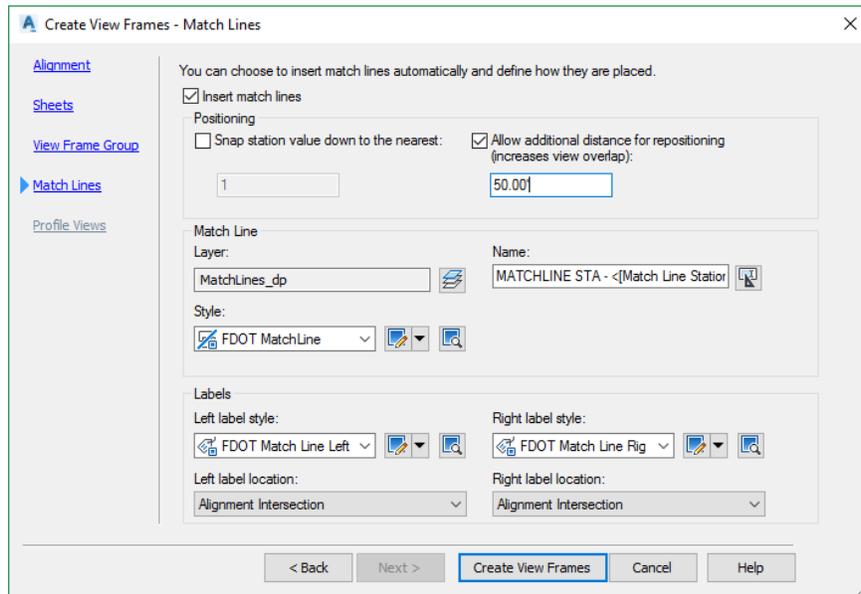
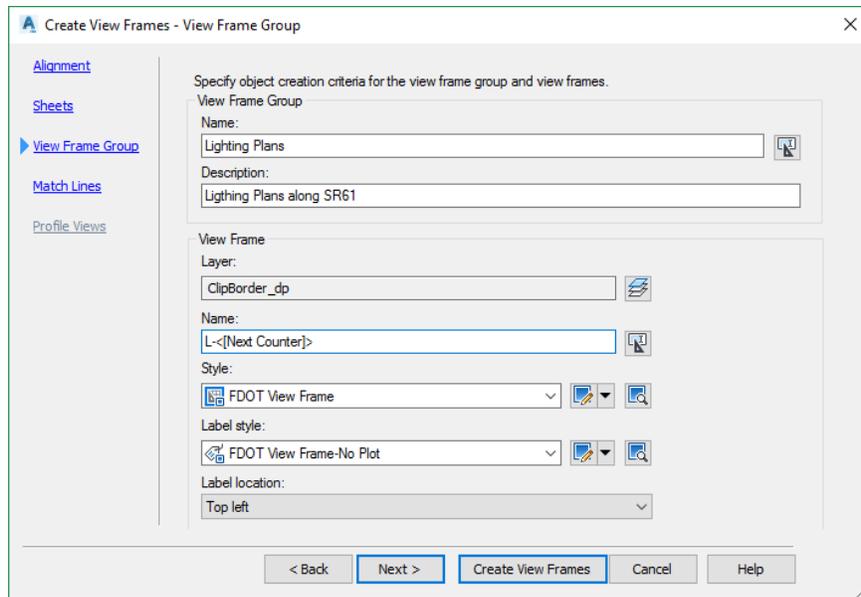
In this exercise, the designer will create a Clip file that will contain the View frames that will be used to create the final plan sheets. The designer will also create a data shortcut of the view frame group that can be referenced in the design file.

1. Launch the FDOT Civil 3D state kit if not already open.
2. On the FDOT Ribbon open the Create File Application and match the dialog.
3. Click **Create/Open File**, once file is open select **Close**.
4. In the new *CLIPLT01.dwg* attach the following files as Xref's:
  - **Dsgnrd01.dwg** from the *roadway* folder.
5. Data Reference in the Following:
  - **SR61** Alignment
6. On the Output Ribbon select **Create**

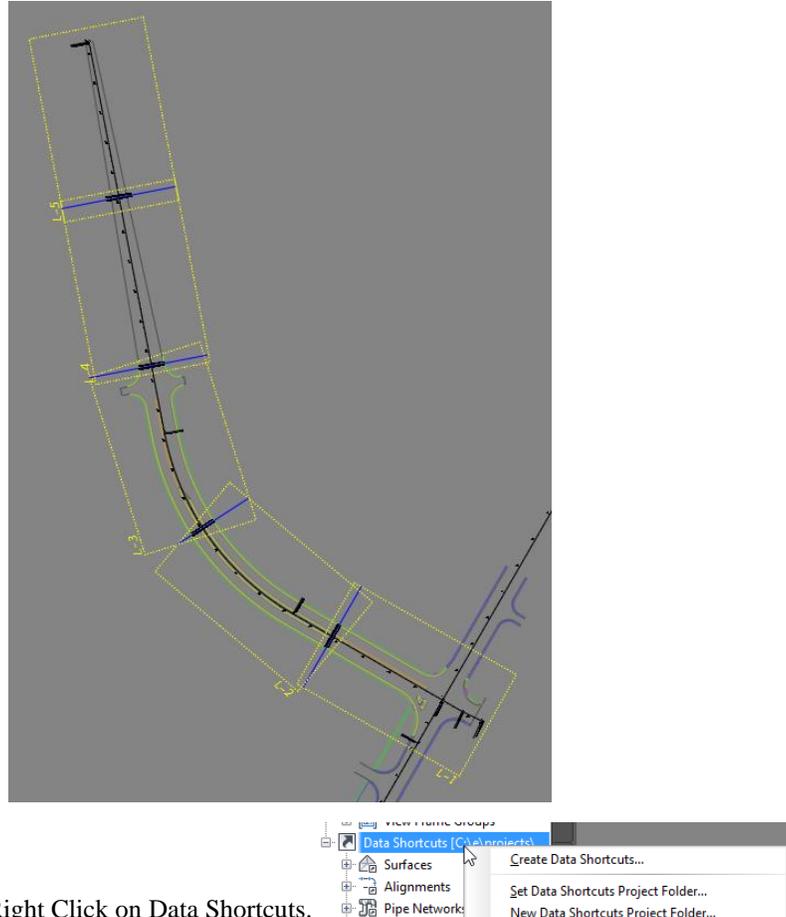


7. Match the following diagrams and select Next.





8. Select **Create View Frames**. Your drawing should look like image below.



9. In the Toolspace Right Click on Data Shortcuts.
10. Toggle the **Available Viewframe group** and select **OK**, notice the View Frame Groups is now expandable, expand it to see the new group just created. Save and Close *CLIPLT01.dwg*.

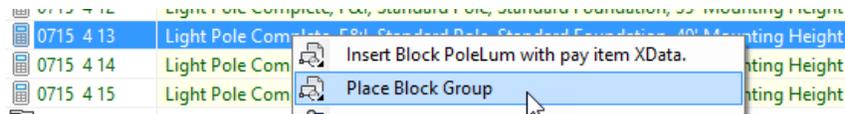
### ***Exercise 8.4 Place Light Poles Using Place Block Group***

In this exercise, the designer will place Light Poles at a specified spacing and offset supplied from a referenced AGI 32 Lighting dwg file.

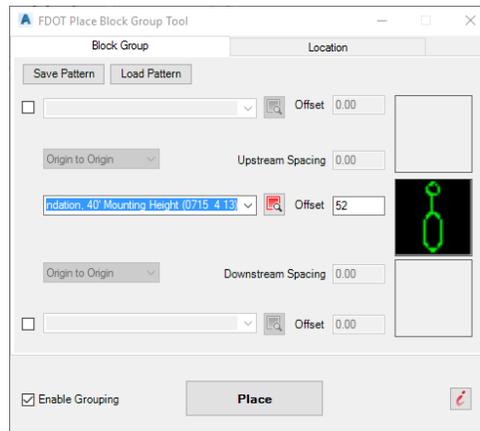
- 1.
2. Zoom into *station range 702+00 to 706+00*.
3. From the FDOT Ribbon, click on **Entity Manager**.
4. Make sure the project specific *database (22049555201.xml)* is loaded. If not, click on the Database path in EMX and browse to the following location.

Database = C:\e\projects\22049555201\symb\22049555201.xml

5. Navigate to the **Highway Lighting > Light Poles > Light Pole Complete > F&I, Standard Foundation** category.
6. Select the **0715 4 13** Light Pole Complete, F&I, Standard Pole, Standard Foundation, 40' Mounting Height.
7. Right Click on the item and select **Place Block Group**. (This will load the item in Place Block Group complete with the Pay Item data attached.) You can close **EMX** for now.



8. On the **Block Group** tab, Set the *Offset* to **52.0**. This will be the offset from the **SR61** to the center of the light pole origin. Typically, this information would come from the lighting design software.



9. Select the **Location** tab:
  - a. Select the *Entity Used* to **SR61**.
  - b. Set the *Begin station* to **702+00**.
  - c. Set the *End station* to **706+00**.
  - d. Begin and End Buffer Distance should be **0.00**.
  - e. From the Spacing drop down, set placement spacing option to **Increment** and the *Value* to **200.00**. (Typically, this value would come from the lighting design software.)
  - f. The *Angle* should be **0.00** and set to **Perpendicular**.
  - g. Set the *Justification* to **Center Block** and **Origin**.
10. Make sure **Enable Grouping** is set.

11. Select **Place** and left click anywhere on the **Left** side of the Alignment. Three Light Poles are placed.
12. On the Place Block Group modify the Begin/End station values to **701+00** to **713+00**.
13. Change the offset to **55**.
14. Click the Place button. Select a point on the right side of the alignment to place the blocks. Six Light Poles are placed.
15. Close **Place Block Group**.

**Note** The designer could also stagger the placement of the poles by adding 100' to the Begin and End Station Buffer Distances.

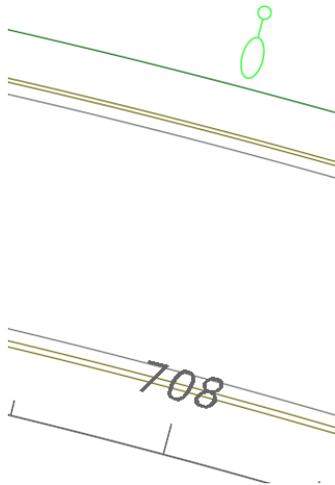
### Exercise 8.5 Place Light Poles Using Entity Manager

In this exercise, the designer will place Light Poles using the Entity Manager insert block and the Station Offset Transparent command, so the designer can place the poles at specified stations and offsets.

1. Continuing in *DSGNLTxx.dwg*, zoom in to the area around **station 707+00** to **station 714+00**.
2. From the FDOT Ribbon, click on Entity Manager.
3. Navigate to the **Highway Lighting > Light Poles > Light Pole Complete > F&I, Standard Foundation** category.
4. Select the **0715 4 13** Light Pole Complete, F&I, Standard Pole, Standard Foundation, 40' Mounting Height.
5. With the selection highlighted, select the **Insert Block** command using the EMX drawing tools.



6. The command line is waiting on user feedback. On the Transparent command tool bar select the **Station Offset** icon. 
7. The command line is now asking for the Alignment, select the **SR61** alignment.
8. A red jig is now visible and attached to the alignment, for station enter **70800**. Do not enter a + when typing stations.
9. Now the command line is asking for the offset distance, enter **-52** since it is on the Left side.
10. Select enter three times for the block to place. You will need to rotate the block to a perpendicular angle.
11. Type in **RO** for rotate and select the light pole, for base point select the insertion point. Then snap **PER**pendicular to an Alignment tick mark along the curve. See below for finished placement.

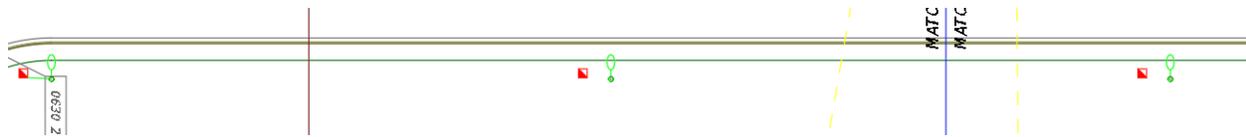
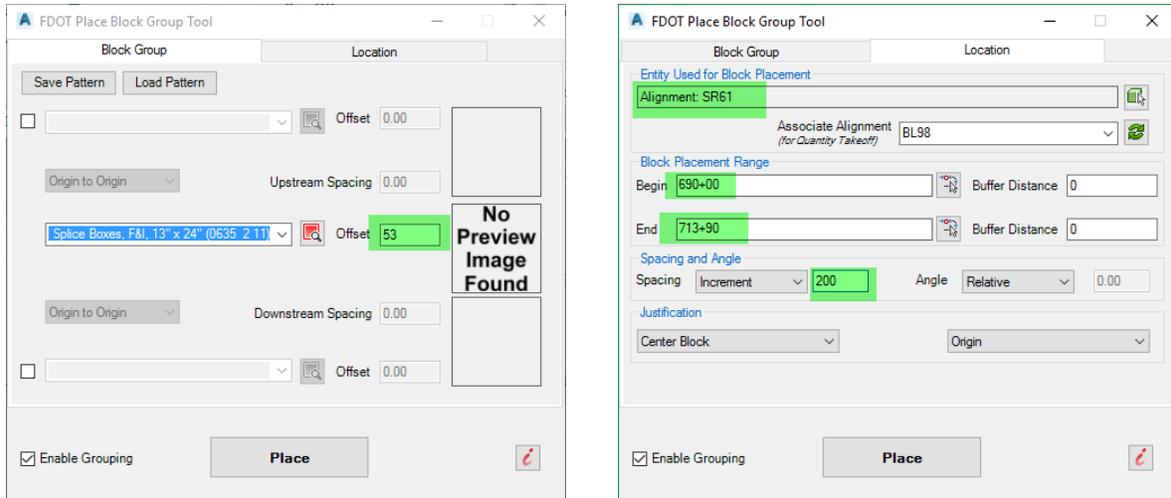


12. Continue placing the remaining light poles on the left of the centerline, every 200' to Station 714+00.
13. Close **EMX**.

### Exercise 8.6 Place Pull Box Item Using Place Block Group (Part 1)

In this exercise, the designer will use Entity Manager to select the item and then use Place Block Group to place Pull Boxes at the side of each Light Pole.

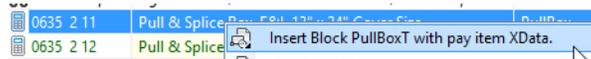
1. Open the Entity Manager.
2. Navigate to the Signalization > Pull and Junction Boxes > Pull and Splice Boxes category and select the item **0635 2 11 Pull and Splice Boxes, F&I, 13" x 24"**.
3. Right Click and select **Place Block Group**. Make the following changes and select **Place** on the Right side of the Alignment.



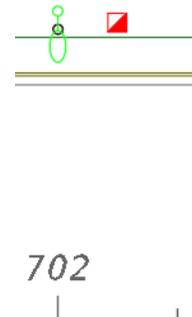
### Exercise 8.7 Place Pull Box Item Using Entity Manager (Part 2)

In this exercise, the designer will use Entity Manager to place Pull Boxes at the side of each Light Pole.

1. Using EMX select item **0635 2 11**.
2. Right Click and select **Insert Block PullBoxT with pay item Xdata**, this will just place one instance of the block.



3. Pick to the side of the light pole near Station 702+00 on the Left side of the alignment.
4. We need to rotate the block to match the other ones. Type in **RO** for rotate.
5. Select the Block > Press Enter. For Base Point select the Insertion point of the block.
6. Snap using the **PER**pendicular osnap to anyone of the Alignment Tick Marks.



### Exercise 8.8 Place Pull Box Item Using Entity Manager at a Station Offset (Part 3)

In this exercise, the designer will place a single instance of the block using EMX and the Station Offset transparent command to place it with precision.

1. Using **EMX** select the same pull box as in the previous exercises.
2. Select the **Insert Block** from the EMX drawing tools.
3. The command line is seeking user input, Type **R** for rotate, using the **NEA**rest osnap select 2 points along the alignment.
4. The Block is now rotated and still attached to the cursor. Select the **Station Offset** Transparent command. 
5. Select the Alignment.
6. For Station enter **70410** (704+10), for Offset enter **-50**.
7. Press Enter 3 times to accept and place.

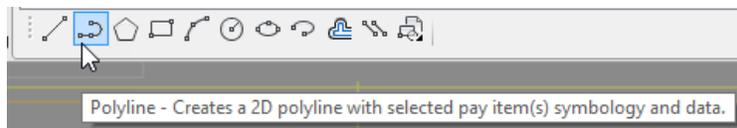


**Note** You can now Copy the block and place it at other locations if needed. The Pay Item data will still be attached to the placed copies.

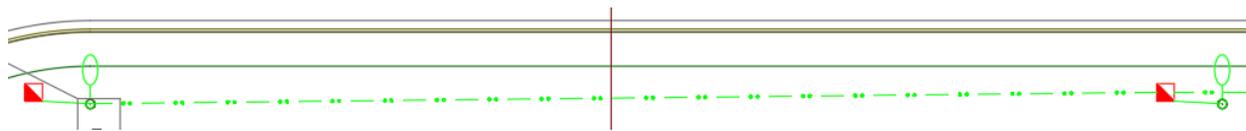
### Exercise 8.9 Draw Conduit under Ground between Light Poles

In this exercise, the designer will use Entity Manager to draw the conduit between the light poles and pull boxes with Pay Item Xdata attached.

1. Continuing in *DSGNLT01.dwg*, zoom in near one of the **Pull Boxes** placed near one of the light poles near the signalized intersection on the Right side of the Alignment (Station 701+00).
2. Open **EMX** and navigate to **Signalization > Conduit**.
3. Select *item 0630 2 12 Conduit*, Furnish & Install, Open Trench.
4. Select the Polyline command from the EMX drawing tools.



5. Using the EMX Polyline command, draw a line from the pull box to the light pole and from the pull box to the next pull box. See figure below.



6. Continue to place the rest of the *Conduit item 0630 2 11 Conduit*, Furnish & Install, Open Trench and *0630 2 12 Conduit*, Furnish & Install, Directional Bore to connect all light poles.

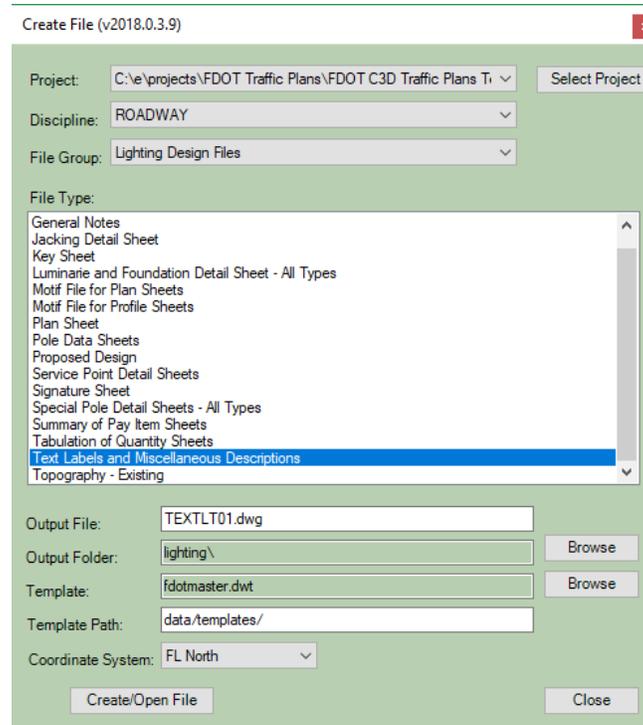
**Note** These same tools can be used to place the load center, electrical service & wires, other poles that may be required, etc.

### Exercise 8.10 *Creating a Lighting Text File and Labeling Project Limits*

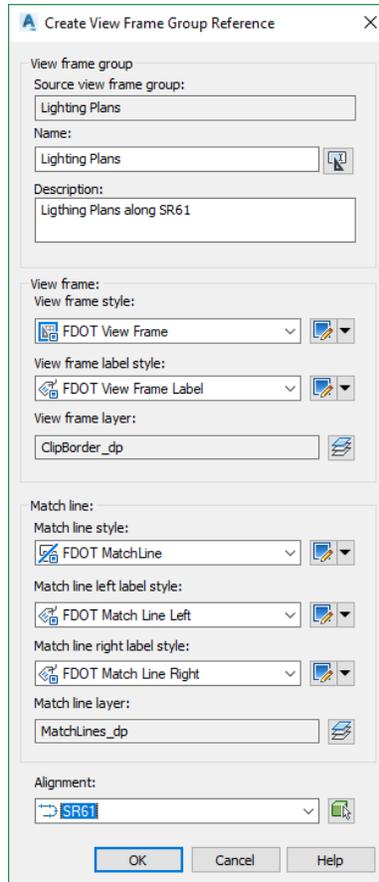
In this exercise, the designer will create a Text file for the Lighting plan and reference in required data. The designer will then use dynamic labels to label Light Pole using the built-in styles available. For additional detail on annotation refer to Chapter 10.

#### ➤ *Creating and Setting up a Lighting Text File (Part 1)*

1. Launch the FDOT Civil 3D State Kit and open the Create File application located on the FDOT Ribbon.
2. Match the settings from the Image below and select **Create/Open File**. Select **Close** to exit dialog.



3. Using what you have learned in previous exercises Xreference in the *dsgnrddx.dwg*, *dsgnly01.dwg*, and *dsgnspxx.dwg* as an overlay.
4. Data Reference in the following Alignment **SR61**.
5. Data Reference in the **Lighting Plans** View Frame Group. Match Image below before clicking OK.

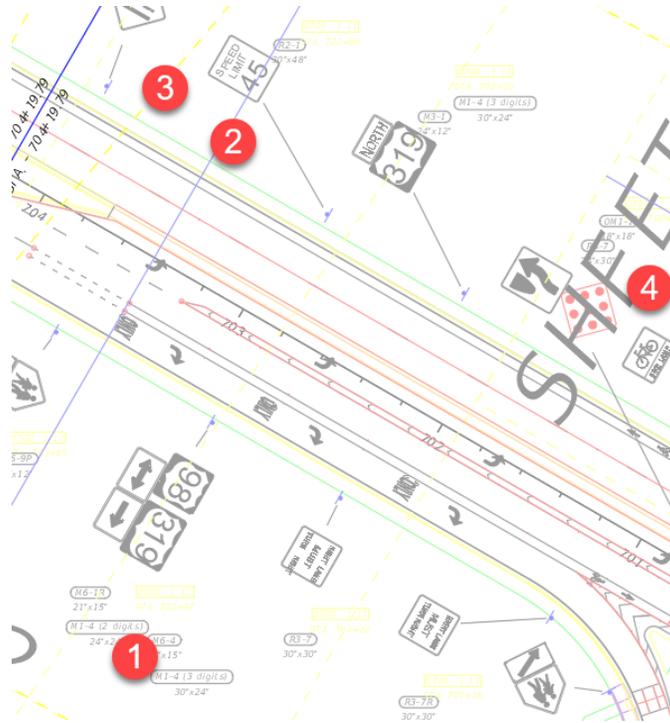


6. Click **Save**.
7. Before starting the Labeling process, some cleanup is required, On the Home ribbon select the Freeze

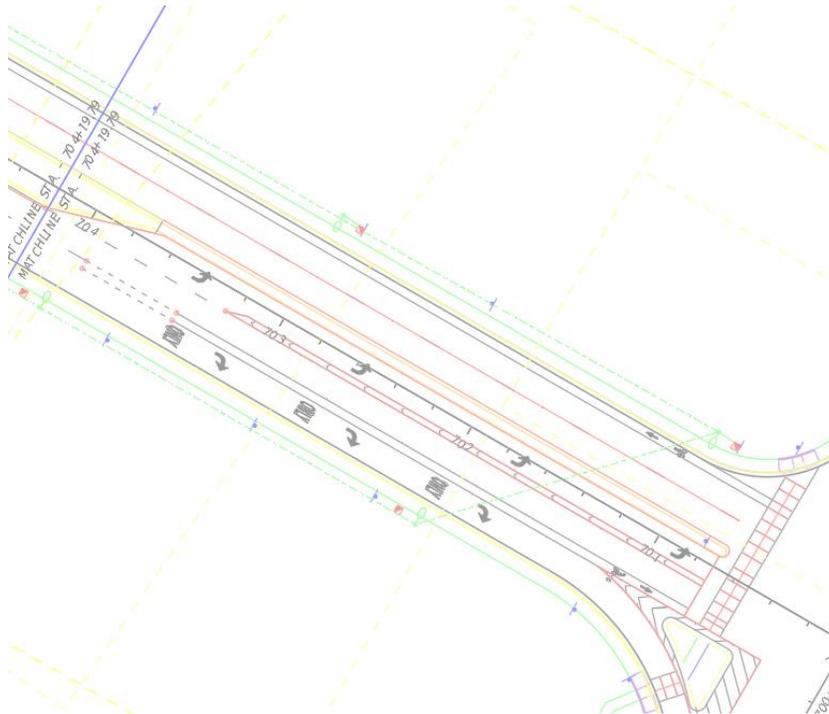


icon.

8. Using the image below click on the Signage labels, Sign Panels, Matchlines, Sheet numbers as shown in the image below.



9. Your image should look like below after freezing the layers.



10. Save the file.
11. Click on the **2 Point Twist** button located on the FDOT Ribbon.
12. Using the Alignment click on the tangent portion avoiding tick marks for the first point. For the second point select a point along the alignment at a higher station value, in other words you are picking a lower station then a higher station along the alignment.

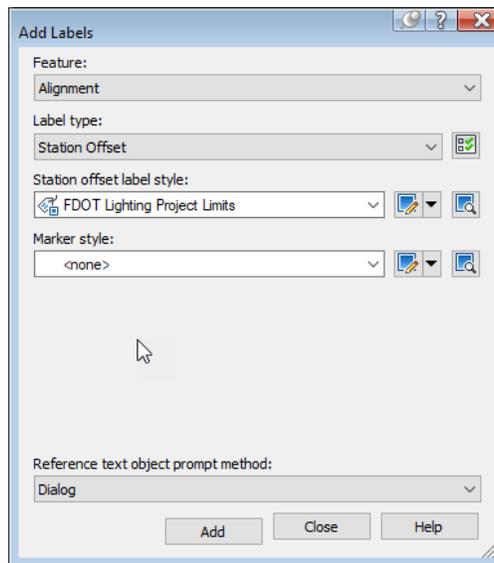
13. Your drawing should look like image below.



➤ **Adding Project Limits Label (Part 2)**

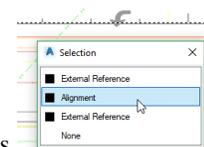
14. Switch to the **Annotate** Ribbon and select the top rocker of **Add Labels**.

15. The first label will be the Project Limits label. Match the selections shown in the dialog below.



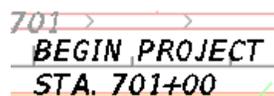
16. Select **Add**. The Command line is asking to select the Alignment. You will need to cut your Selection Cycling  on since some of the Xreferences contain the same Alignment.

17. Pick the **SR61** alignment and the selection box opens showing you the options Alignment.

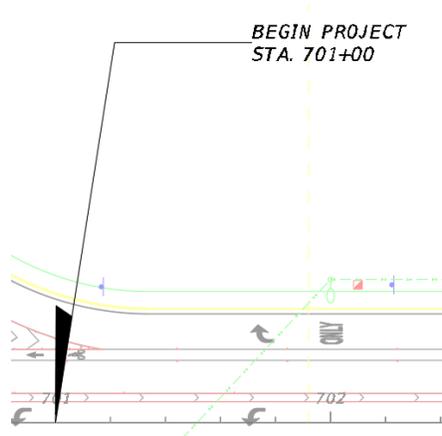


Pick

18. A Red Jig should now be visible along the alignment, snap to Station 701+00.



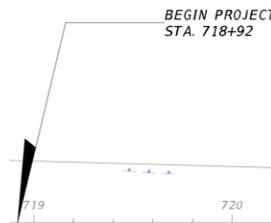
19. Click on the Label and select the blue grip that has the *Move Label*. Drag the label off and above the insertion point until the Leader arrow appear.



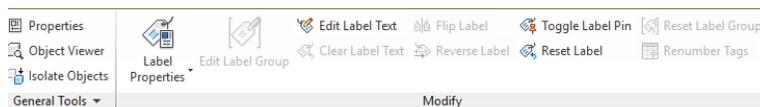
20. Pan and Zoom to Sheet 4, near Station 719+00.  
 21. Using the **2 Point Twist** command, twist using the alignment to make sheet 5 centered on the screen.  
 22. Click **Add** and select the **SR61** alignment, for station using NEArest osnap move along the alignment

and click on Station 718+92.

23. Drag label off insertion point.



24. We need to edit the label to say **END PROJECT**. Click on the Label. A Label context ribbon appears along the top.



25. Click on **Edit Label Text**.  
 26. The *Text Component Editor dialog* opens. Highlight the word **BEGIN** and change it to **END** and select **OK**.

**END PROJECT**  
**STA. 718+92**

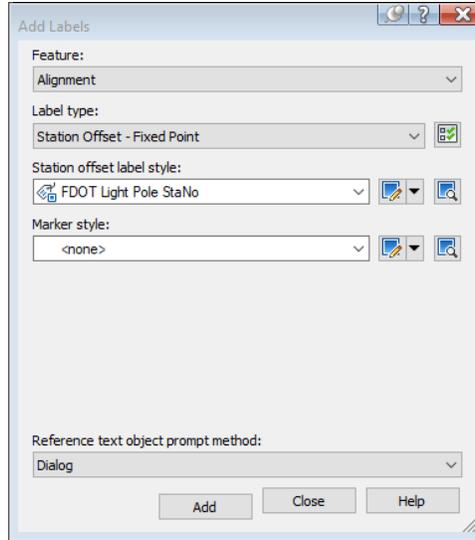
27. Save your file before continuing.

**Exercise 8.11 Labeling Light Poles and Conduit**

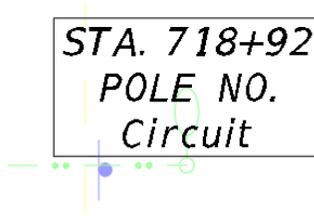
In this exercise, the designer will label the Light Poles and edit them to add the Pole Number and Circuit designation. Using a Custom Text Label-Drag style the designer will create a material label for the conduit.

➤ **Labeling Light Poles (Part 1)**

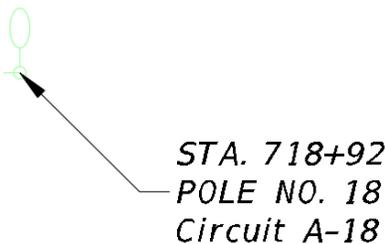
1. Continuing in the same area as the previous exercise. You will be labeling the last Pole at the end of project. Click on the **Add Labels** top rocker if not already open.
2. Set the settings to the following.



3. Select **Add** and select the Alignment.
4. For insertion point of the label select the Block Insertion point on the Light Pole (Center of Pole).

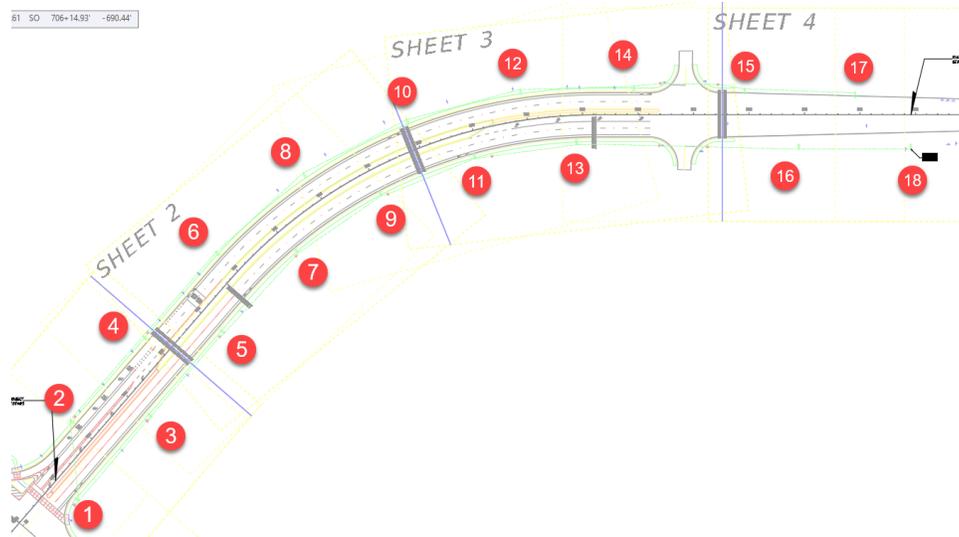


5. Drag Label off below the pole to move it out of the way.
6. Click on the label and on the Context Ribbon select **Edit Label Text**.
7. For Pole No tyoe **18**, for Circuit type **A-18**.
8. Select **OK**. The label should look like below.



- Continue labeling the rest of the Light Poles, for this exercise the Circuit Number is the same as the pole number. See image below for the Pole Numbers.

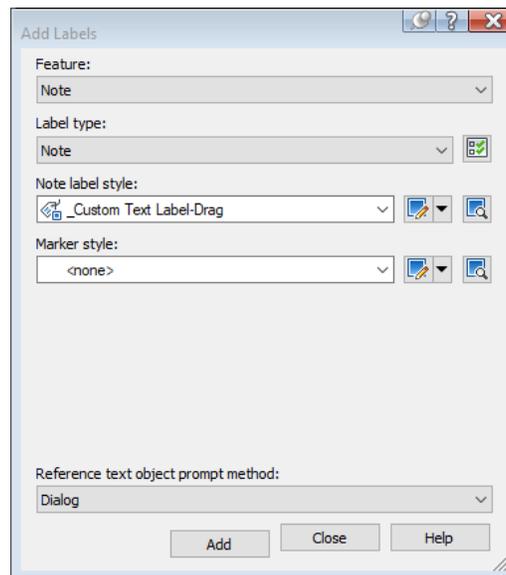
**Note** Use the 2 point twist to turn the view frames straight as you navigate down the alignment labeling the poles.



- Save your file.

### ➤ Labeling Conduit (Part 2)

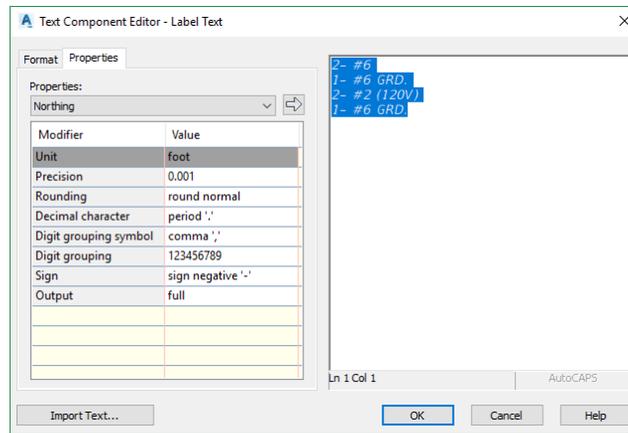
- You should be at the intersection with the view twisted, if you did the previous part of the exercise. Click on Add Labels if closed. Make the following selections.



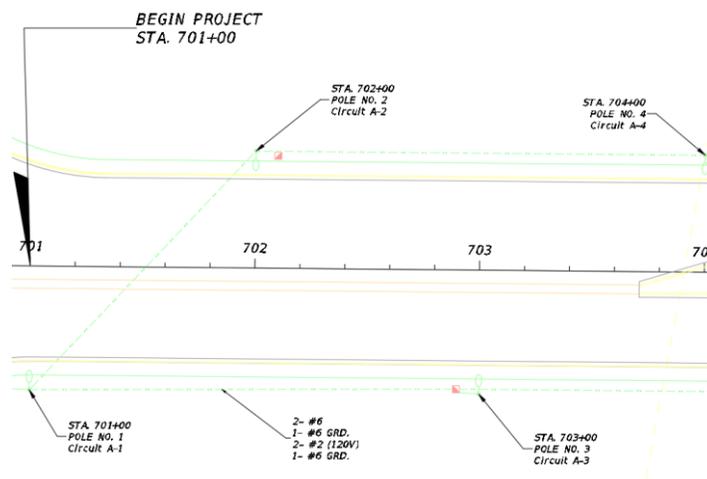
- Select **Add** and using the NEArrest osnap select the conduit between Pole 1 and 3.

*-Custom Text Label*

- Select the label and drag it off below the conduit.
- Type in the following replacing the default text.



5. Select **OK**. Your drawing should look like below near the intersection.



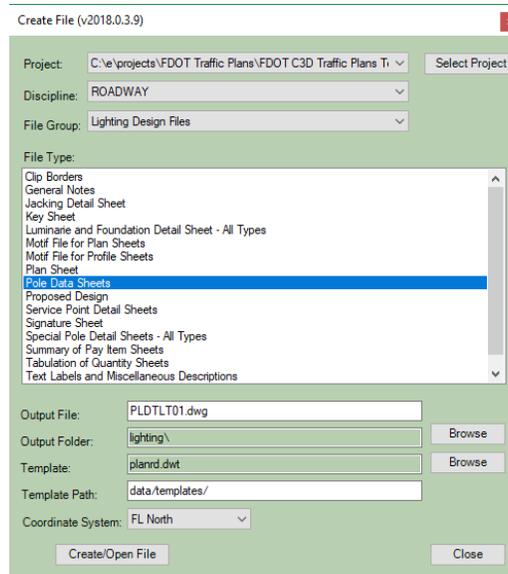
6. Copy the conduit label to other locations in each viewframe so it is on each sheet, it is not necessary to place and edit the label each time.
7. Save your file.

### **Exercise 8.12**      *Creating, Editing, and Linking a Report to Pole Data Sheet*

In this exercise, the designer will create a Pole Data Sheet drawing file and using Takeoff manager run a report showing the Light Poles location along an Alignment. The designer will save the report as an XLS format and using excel will copy and paste the required data into the formatted Pole data spreadsheet, then the designer will link the final pole data spreadsheet into the Pole data file.

➤ **Creating the Pole Data Sheet (Part 1)**

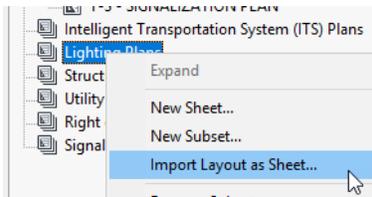
8. From the FDOT Ribbon click on **Create File**.
9. Fill in the following options.



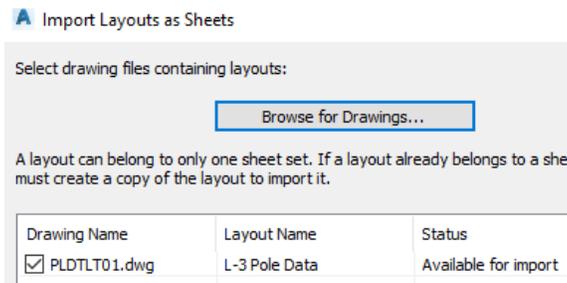
10. Click **Create/Open File**. Click **Close** to exit dialog.
11. Right Click on the Layout and Rename Layout to **L-3 Pole Data**.
12. Don't worry about the Sheet number, you can change it through **SSM** if necessary
13. Save the File, but leave open to continue to next exercise.

➤ **Adding Layout to a Sheet Set (Part 2)**

14. Type in **SSM** on the command line.
15. Open the *FDOT Traffic Plans* Sheet set.
16. Right Click on the *Lighting Plans* and select **Import Layout as Sheet**.



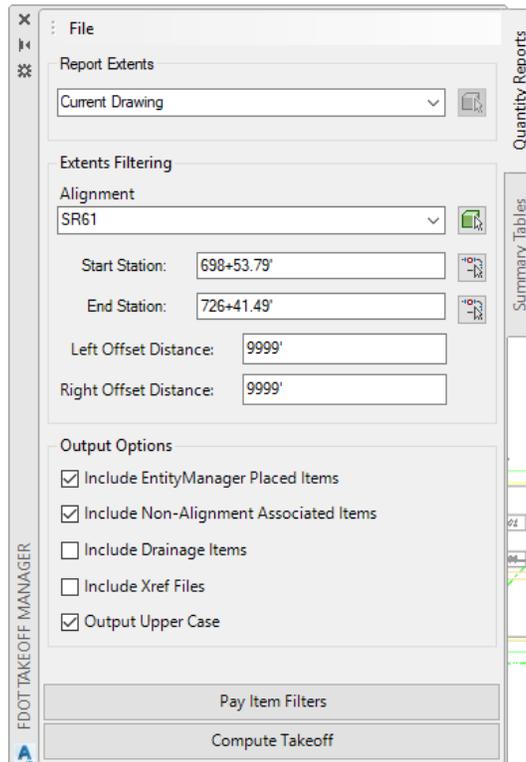
17. Browse to the *PLDRTL01.dwg* located in the Lighting folder.
18. There should be one available layout to import, select it and click on **Import Checked**.



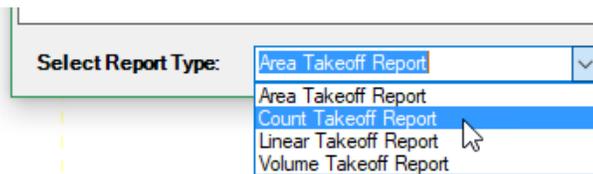
19. Type **RE** to regenerate the KeySheet drawing file, notice the fields update with project information.
20. Save the file.

➤ **Creating a Pole Data Report with Takeoff Manager (Part 3)**

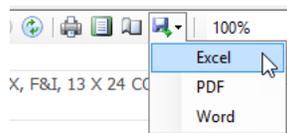
1. Open the *DSGNLT01.dwg* file.
2. On the FDOT Ribbon select **Takeoff Manager**.
3. Set the Alignment to **SR61**, match other settings as shown below.



4. Select **Compute Takeoff**.
5. Change the *Select Report Type* to **Count Takeoff Report**.



6. Under Export options select **Excel**.

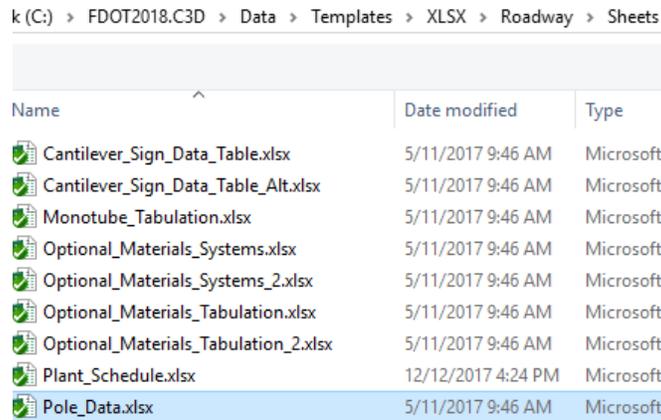


7. Save it as *Pole Data Temp* in the Calculations folder within your project.

➤ **Editing the Pole Data Report (Part 4)**

1. Open Microsoft Excel.

- Open the *Pole Data Temp* spreadsheet you saved earlier.
- Open the Formatted *Pole\_Data* spreadsheet located as shown below.



**Note** Some of the data is not needed that the report generates, so you will copy and paste the Station and Offset into the appropriate columns of the formatted spreadsheet.

- We are only concerned with the 18 Poles (Pay Item 0715 4 11). First Copy the station values from the report and paste them in the Station column in the formatted spreadsheet as shown below.

STATION	DIST. OR ARM	LUMINAIRE WATTAGE
701+00.00		
702+00.00		
703+00.00		
704+00.00		
705+00.00		
705+98.34		
707+04.54		
707+98.08		
708+98.06		
709+95.63		
710+90.84		
711+95.52		
713+92.68		

- Copy the Offset column into the Pole Setback column.

JUNTING HEIGHT	POLE SETBACK
	55.00 RT
	52.00 LT
	55.00 RT
	52.00 LT
	55.00 RT
	52.00 LT
	51.71 RT
	57.55 LT
	50.01 RT
	55.52 LT
	49.63 RT
	55.53 LT
	51.44 LT

- Manually type in the other required information, since most of it is the same you can type it once and drag it down to copy to the other cells. Your formatted pole data spreadsheet should look like image below.

POLE DATA

POLE NO.	CIRCUIT	STATION	DIST. OR ARM	LUMINAIRE WATTAGE	MOUNTING HEIGHT	POLE SETBACK	PAY ITEM
1	A-1	701+00.00	10'	250	40'	701+00.00	0715 4 11
2	A-2	702+00.00	10'	250	40'	702+00.00	0715 4 11
3	A-3	703+00.00	10'	250	40'	703+00.00	0715 4 11
4	A-4	704+00.00	10'	250	40'	704+00.00	0715 4 11
5	A-5	705+00.00	10'	250	40'	705+00.00	0715 4 11
6	A-6	705+98.34	10'	250	40'	705+98.34	0715 4 11
7	A-7	707+04.54	10'	250	40'	707+04.54	0715 4 11
8	A-8	707+98.08	10'	250	40'	707+98.08	0715 4 11
9	A-9	708+98.06	10'	250	40'	708+98.06	0715 4 11
10	A-10	709+95.63	10'	250	40'	709+95.63	0715 4 11
11	A-11	710+90.84	10'	250	40'	710+90.84	0715 4 11
12	A-12	711+95.52	10'	250	40'	711+95.52	0715 4 11
13	A-13	712+86.94	10'	250	40'	712+86.94	0715 4 11
14	A-14	713+92.68	10'	250	40'	713+92.68	0715 4 11
15	A-15	715+91.95	10'	250	40'	715+91.95	0715 4 11
16	A-16	716+89.73	10'	250	40'	716+89.73	0715 4 11
17	A-17	717+91.30	10'	250	40'	717+91.30	0715 4 11
18	A-18	718+91.58	10'	250	40'	718+91.58	0715 4 11

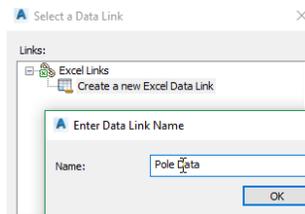
- Delete the **A** column so the report moves all the way to the left.
- Since the report is also too long to fit on a 11x17 sheet, select and delete Rows 30-45
- Save the file as *Pole\_Data.xlsx* and put in the Calculations folder in your project.
- Close Excel before continuing to next part of the exercise.

➤ **Linking Pole Data Spreadsheet to Design File (Part 5)**

- Open the *PLDTLT01.dwg* file, on the FDOT Ribbon select the **Create Table** button.



- From the *Insert Table* dialog, toggle From a data link and click on the Data Link Manager.
- From the *Links* dialog, select the **Create a new Excel Data Link**



- Enter the name **Pole Data** and click **OK**.
- Click the Ellipse button to browse to the *Pole Data.xlsx* located in the Calculations folder.



# 9 ANNOTATION TOOLS

## OBJECTIVE

The objective of this chapter is to introduce the designer to the annotation tools available in the FDOT AutoCAD Civil 3D State Kit, which allows the designer to label the proposed design to match FDOT design Standards.

## INTRODUCTION

The FDOT AutoCAD Civil 3D State Kit delivers Fonts, Label Styles, & Notes to aid in the placement of plan labels. These labels can be simple callouts or complex labels that are dynamic, which means they update when you move them. It is possible to create additional or edit existing styles in the design or text file. Complex expressions can also be added to Label Styles. Note Styles can be placed in the design file and the designer will find that it is simple to edit the text contents as you will see in the chapter. Annotation is a native Civil 3D function, however FDOT has already created a vast library of styles and content that is delivered in the State Kit.

Label styles can be accessed in the settings portion of toolspace. Annotation is a much larger subject than will be covered in this chapter, for additional information please use the Autodesk resources for a more in depth look at the capabilities.

## ACCESSING THE ANNOTATION RIBBON

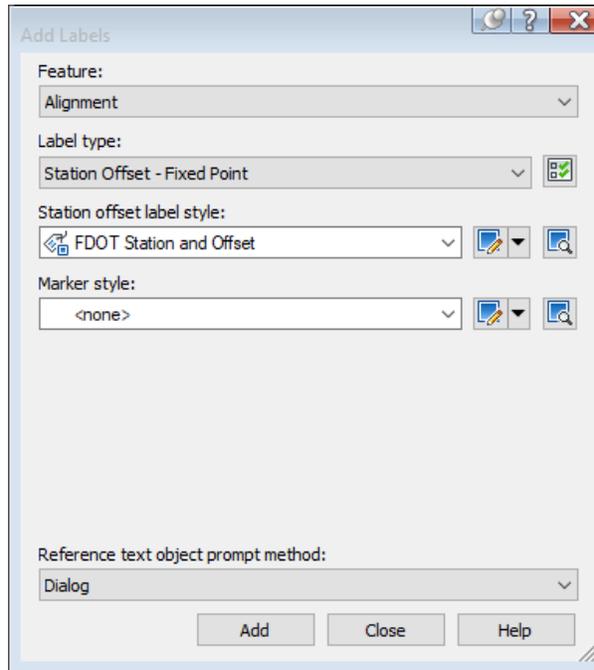
The annotation options can be found by clicking on the Annotation Ribbon, this ribbon has controls and settings for the following;

- Labels & Tables
- Text Styles & Multiline Text
- Dimensions
- Leaders
- Tables and Linking Data
- Markup options
- Annotation Scaling

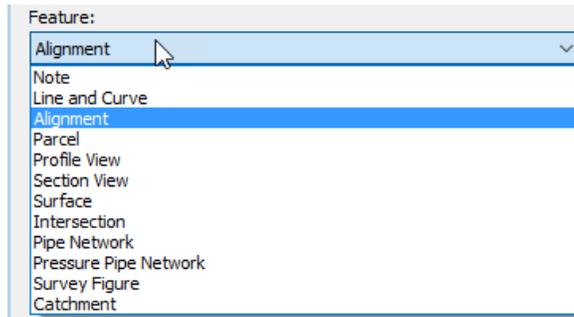


The main component that will be used in FDOT workflow is the **Add Labels** rocker button, it is called a rocker because it has a top button and a lower button that will give you different functionality.

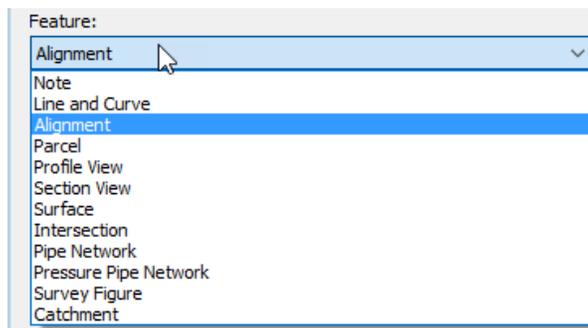
The top half opens the **Add Labels** dialog. The options are described below.



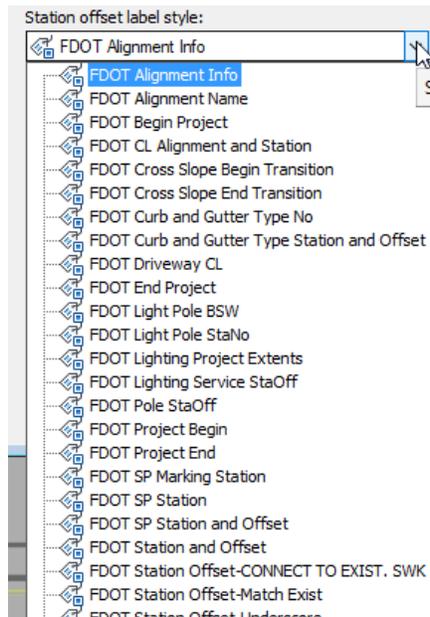
- **Feature** – Any Civil 3D object that can have a dynamic label attached.



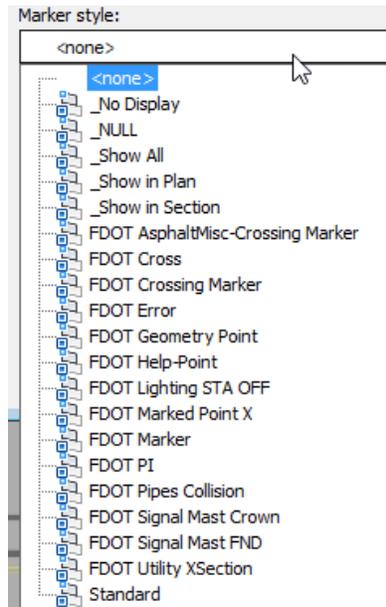
- **Label Type** – Gives you control over the object you are labeling and how it is handled.



- **Station Offset Label Style** – This is where all the FDOT Label Styles reside that are delivered with the State Kit.



- **Marker Style** – This is where the Object Marker styles reside, an example of a marker style is the X part of a point label style.

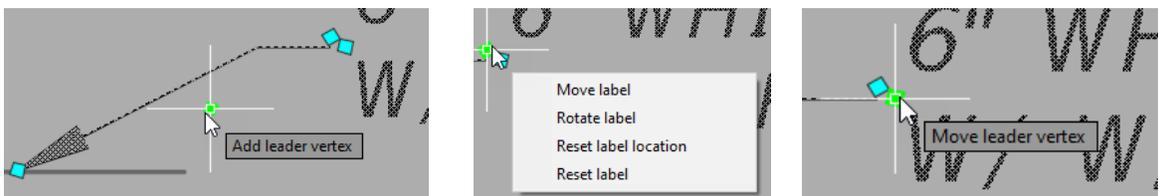
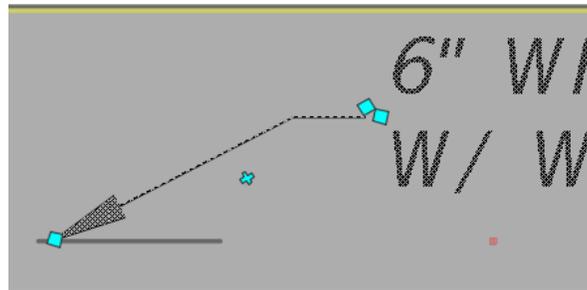


All Text styles and text in general have been set up to be annotative, which means as the drawing scale changes the text size changes to match the desired printing height on paper. When a label is placed it is in its original style state, meaning it doesn't have a Leader Line. If you click on the label and move the label it turns into its dragged state style which could contain an arrowhead or just a line or any other style that is associated with the label.

A Label or Note behaves like this in the drawing file, when placed if you select it has two blue grips that have different functions. If you hover over the grips it will give you a tool tip of what it does.



- **Move Label** – Allows user to move the label including the insertion point.
- **Rotate Label** – Allows the user to rotate the Label using the insertion point as the rotation base point.
- **Move** – Allows the user to move the Label while keeping the insertion point in the same location, this is called a dragged state. When a label is moved into a dragged state a few more grips appear.

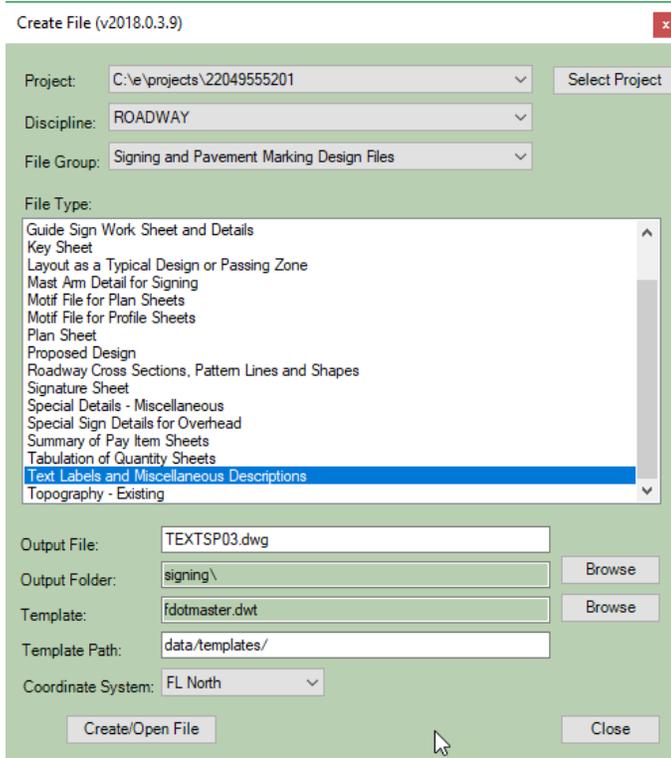


- **Add Leader Vertex** – Allows user to add additional Vertices on the leader line to make it read clearer in a busy drawing environment. If vertices are added a new grip will appear allowing users to remove vertices.
- **Reset Label Location** – Allows user to put the label back to its original placement setting, it removes all vertices.
- **Reset Label** – Allows user to re set label back to original state.
- **Move Leader Vertex** – Allows user to move the Leader only while leaving the Insertion point and the label location in the same location.

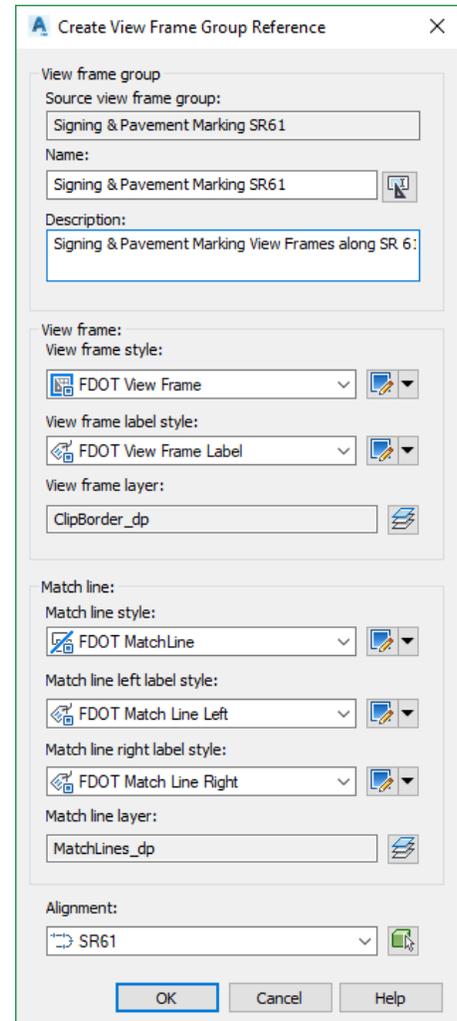
**Exercise 9.1 Create a Text File & Add References**

In this exercise, the designer will create a Text file for the Signing & Pavement Marking plan and reference in required data. The designer will then use a non-dynamic note to label a striping pattern using the built-in styles available.

7. Launch the FDOT Civil 3D State Kit and open the Create File application located on the FDOT Ribbon.
8. Match the settings from the Image below and select **Create/Open File**. Select **Close** to exit dialog.



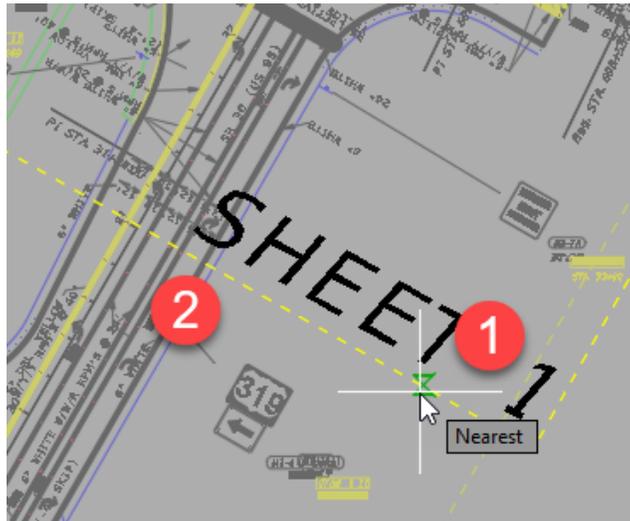
9. Using what you have learned in previous exercises Xreference in the *dsgnrddx.dwg* and *dsgnspxx.dwg* as an overlay.
10. Data Reference in the following Alignments **BL98 & SR61**.
11. Data Reference in the **Signing & Pavement Marking SR61** View Frame Group. Match Image below before clicking OK.
12. Click **Save**.



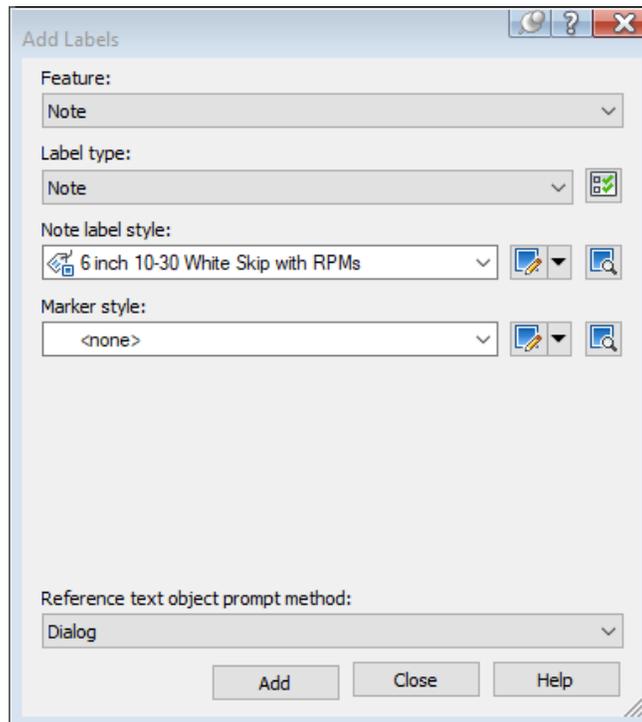
### Exercise 9.2 Adding a Striping Pattern Label

In this exercise, the designer will add a Striping pattern note and get familiar with the options available.

1. Zoom into the vicinity of the yellow Sheet 1 view frame.
2. Switch to the FDOT Ribbon and select the 2 Point Twist command.
3. Click on the long side of the border for the first click, then another spot to the left. Refer to image below.



4. The drawing is now rotated to the Sheet 1 viewport which will allow our labels to be perpendicular to the sheet.
5. Switch to the Annotate Ribbon and select the top rocker of the **Add Labels** icon.
6. Make the following selections and select **Add**.



7. Left click to place it below the median around station 702+00.



8. Select the Label and select the **Move Label** grip, remember you can hover over the grips for the tool tip.
9. Drag the label and adjust it to look like the image below.

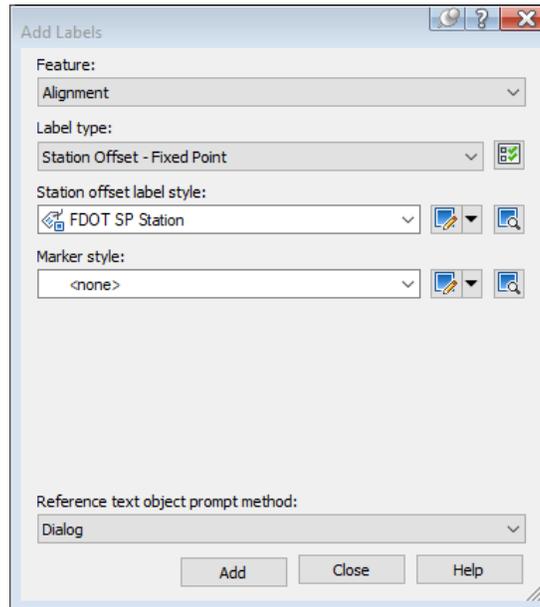


10. In a production environment, the designer would use the 2-point twist to rotate each view frame before labeling the plan view. When complete with labeling click on the un twist view to return the drawing to the original origin.

### Exercise 9.3 Adding a Station Label for Striping

In this exercise, the designer will add a dynamic label that is associated with an alignment, which means you can place one and use the AutoCAD copy command to move it to a new location and the station values will update automatically.

1. Click on the **Add Labels** top rocker.
2. Make the following selections and select **Add**.



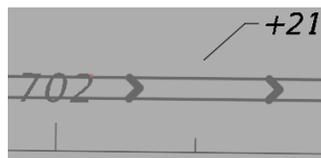
3. Select the SR61 Alignment. A Red Jig is now attached to the alignment. Select near station 702+20 as shown below.



4. Select the label and pick the **Move** grip, notice how the label updates its station value. The label is set up to not include the main station value such as **702** it just reads **+21** representing 702+21.



5. Select the Label and select the **Move Label** grip to drag the label off the insertion point.
6. A leader line with a landing is added, notice the value doesn't change since the insertion point was not moved.



**Note** Remember if you accidentally add vertices or change the leader you can use the **Reset Label** grip to change it back to its original position.

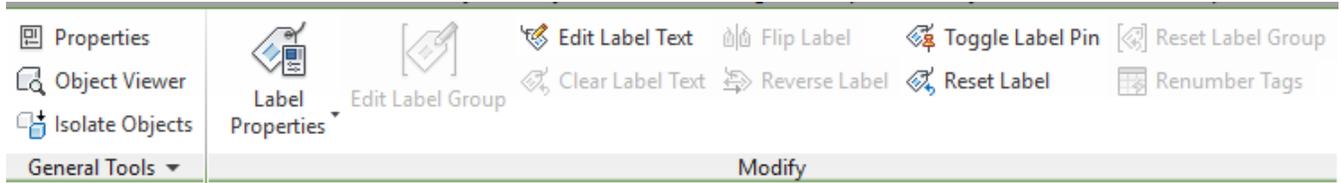
### Exercise 9.4 Editing a Label

In this exercise, the designer will edit an already placed label.

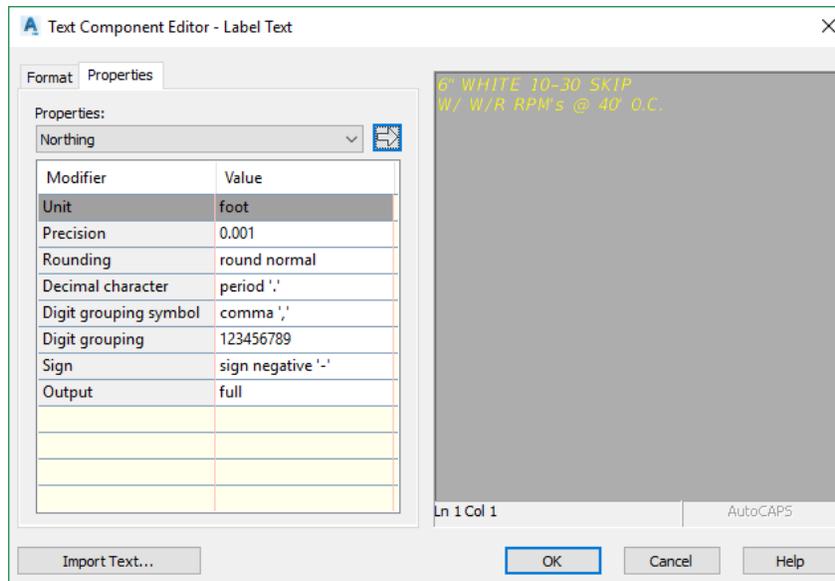
1. Zoom to the label that you first placed in the chapter.



2. Select the Label, notice there is a context ribbon now available with label editing functions. The ribbon will go away if you un select the label.



3. Select the **Edit Label Text** icon.
4. The Text Component Editor opens.



5. Left click in Text preview pane and spell out the word WITH instead of the current abbreviation.
6. Select **OK** to close.
7. Your edited label should look like below.



8. Take some time and experiment with the other label styles available and place them in the drawing file.

**Note** Keep in mind that editing label text is different than editing a label style. Editing label text will only change that one instance, however if you edit a label style it will change every instance.