*State of Florida*

*Department of Transportation*


# FDOT Civil 3D Quantities

## User Training Guide

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http://www.fdot.gov/cadd

# *FDOT C3D Quantities*

***Description***

This workshop teaches students fundamental use of the FDOT Civil 3D State Kit, and the Florida Department of Transportation (FDOT) Computer Aided Drafting and Design (CADD) standard resources and applications to generate Quantity reports.

This workshop includes but is not limited to:

- General topics on Civil 3D
- Exploring the FDOT20xxC3D Desktop Folder
- Setting up Data Shortcuts Working Folder and Creating Data References
- Create File Application for Creating Project Base Files
- FDOT Entity Manager (EMX)
- Using Model and Paper Space
- Using FDOT Takeoff Manager (FTM) to generate different reports
- Editing Reports in Excel.
- Linking Created Reports into the design file
- Creating a Summary of Pay Items

***Prerequisites***

- Some Cad drafting or related AutoCAD Civil 3D experience
- Experience with working with Entities that contain Pay Items

***Duration: 16 Hours***

***Objectives***

After this course, the student will use the FDOT Civil 3D State Kit and the FDOT CADD standard resources and applications to generate Quantity reports, which will then be linked to the design files necessary to complete a typical FDOT project.

***Audience***

Students involved in preparation of FDOT Quantity reports for all disciplines of a typical FDOT project at the Beginner, Intermediate and Advanced Levels.

***Prerequisites***

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

***Duration: 12 Hours***

***Professional Credit Hours: 12 PDHs***

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

TABLE OF CONTENTS

# 1 INTRODUCTION

## OBJECTIVE

This chapter divides into two sections:

- Computer Aided Drafting and Design (CADD) Standards & File Creation:
  - FDOT20xxC3D Desktop Folder
  - File Creation
  - Base Project File Setup
- AutoCAD Features/Concepts:
  - Layers
  - Feature Lines
  - 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.

Abbreviations used in this manual;

- EMX – Entity Manager
- FTM – FDOT Takeoff Manager
- BOE – Basis of Estimates
- DLM – Data Link Manager
- Xdata – Pay Item Data
- Xref – External Reference Drawings
- Dref – Data Reference of Civil 3D objects

## EXPLORING THE FDOT20XXC3D DESKTOP FOLDER

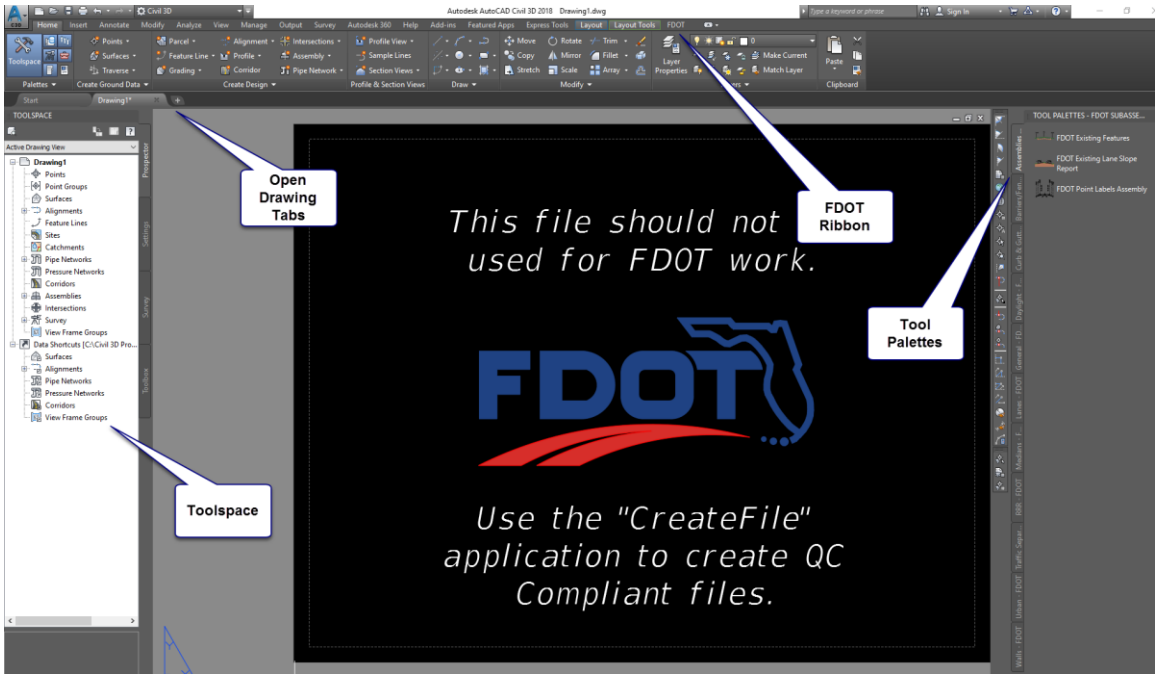
The FDOT CADD software installer installs a folder named FDOT20xxC3D on the desktop. This folder contains shortcuts to applications used when working on the FDOT projects.

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.*

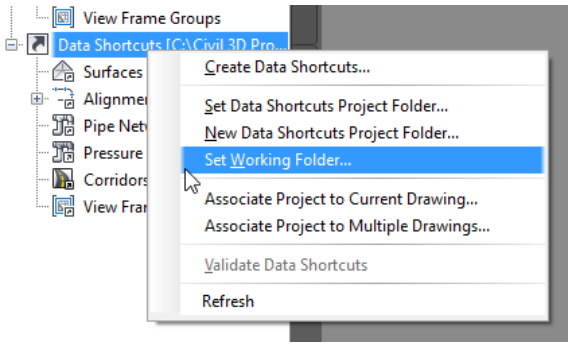
Double Clicking on the C3D20xx desktop shortcut starts Civil 3D in the FDOT environment. Selecting the FDOT Ribbon shows all the applications and commands available to the designer. As shown below.



### *Exercise 1.1 Setting Data Shortcut Working Folder*

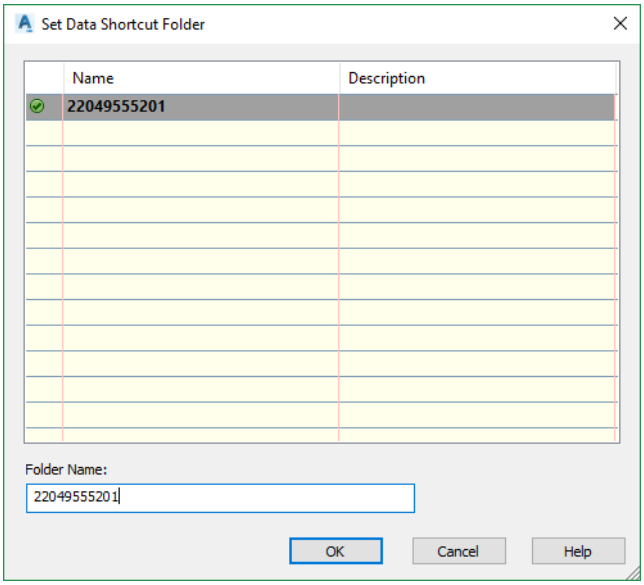
If this is the first time you have opened the FDOT Civil 3D State Kit you will need to set the data shortcut working folder to point to your project folder location.

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.

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.

## DATA SHORTCUTS

A data shortcut is a link between drawings that allows specific types of Civil 3D data to be shared. The shortcut itself does not contain data, but it is a pointer, directing Civil 3D to read information from a common pool of data. A data shortcut is created in the source drawing, and a data reference is the manifestation of the data in a recipient drawing. There are many situations in which you need data or information to link between drawings. Connections between drawings can be in the form of external references (Xref's), data references, or a combination of the two. These two options are similar but not the same. The following table compares them.

## XREF VS. DATA REFERENCE

| EXTERNAL REFERENCE (XRef) | DATA REFERENCE |
|---|---|
| For most objects, an Xref is a graphic-only representation of objects created in another drawing | A data reference is an information/graphic-only link to Civil 3D data created in another DWG file. |
| | |
| Any objects (base AutoCAD or Civil 3D) can be displayed in XRefs | Only specific types of Civil 3D data can be used as data references |
| | |
| Visibility of objects is controlled by original drawing styles and layers | Visibility of data is controlled by host drawing styles and layers |
| | |
| With the exception of Catchment and Intersection objects, you can use the Civil 3D Add Labels commands on items in an Xref. All other objects (e.g., Surfaces, Alignments, Pipes, Profile Views, etc.) can be labeled through an XRef | To use Civil 3D object data in design (i.e., using a surface to create and existing ground profile or using an alignment as a corridor baseline), the object must be data referenced |

Civil 3D objects that can be Data Referenced;

- Corridor
- Alignments
- Surfaces
- Profiles
- Pipe Networks
- Pressure Networks
- View Frame Groups

## FDOT STANDARDS

FDOT provides several resources to instruct and aid designers in computing pay item quantities. The Estimates Office publishes the ***Basis of Estimates Manual***, the governing document that specifies how to compute each pay item. The Estimates Office also provides a ***Master Pay Item*** list containing every pay item available for use in Florida. The FDOT Civil 3D State Kit provides tools to simplify the process of generating quantities. The Entity Manager Application uses a database (PayItemdb.xml) and several Report styles are delivered with the FDOT State Kit. The EMX database is pre-set to comply with both drafting standards specified by the ***CADD Manual*** and the Pay Item Computation Methods supplied by the ***Basis of Estimates Manual***.

FDOT recommends the use of Civil 3D Feature Lines for linear features, since they can easily be extracted from the corridor model. FDOT also recommends the use of EMX for all quantity shape hatching. The *AECmerge.xml* database that is supplied by FDOT includes nearly all items that will be used on a FDOT project.

# FDOT STANDARD FILES

FDOT has two standard File Names, that are to be in the discipline directory, for storing quantities:

- DSGN** – for Linear/Each Features (where ** indicates the 2-letter characters for the discipline)
- QTDSRD – for Area/Tonnage/Cubic Yard Features

## SETTING UP THE QTDSRD FILE

The QTDSRD is the file used to create the shapes required to calculate the area quantities. FDOT recommends the use of sheet layouts within this file instead of creating a separate DWG file for each pay item and its shapes. Each sheet layout uses the same references. The shapes are then controlled by manipulating the layers on each sheet layout.

## 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 a database file. that is included when the State Kit is installed, this file is maintained by the CADD office and isused in the FDOT ORD State Kit. 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.


***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.*

You will need to save the open files if you want to keep them, otherwise if you don't they won't be saved at all.

## *Exercise 1.2 Create the Base Files for a Project*

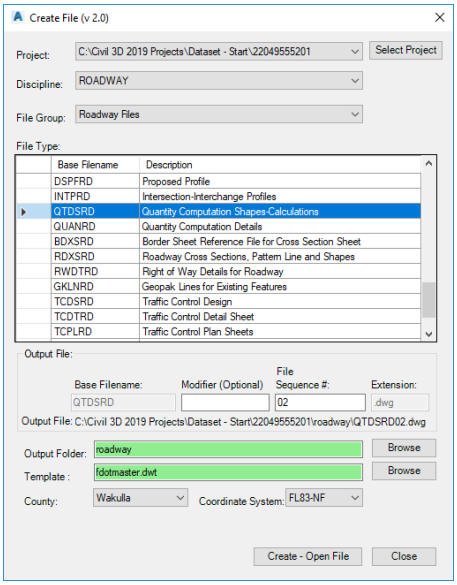
➢ ***In this exercise, you will create The QTDSRDxx.dwg for shapes and areas.***

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

1. Double click on the **FDOT20xxC3D** Icon 

on the desktop. At the time of this manual the 2020 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 in Civil 3D it is automatically filled in on the Project portion of the Create File application. If not, you can either **Exit** and **set i**t <OR> you can select the **Select Project** button to navigate to it.
5. The Coordinate system is already set to FL North, this is because you set your data shortcut folder before creating your files.

***Hint*** If you change the County, notice how the coordinate system updates. This is due to the relationship Create File has with the Database.

6. Select the *Discipline* pull down and select **ROADWAY**. This sets the discipline to work in. Quantity 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 **Roadway Files.**
8. In the *File Type* category select the file **Quantity Computation Shapes-Calculations.** (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; you can click Close to exit the dialog, but leave the application open as you will create additional files.

***Note*** *Notice below the Create and Open File buttons that the file name is shown. If the file QTDSRD01 already exists in the project, the application will increment the file name to QTDSRD02 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 **Summary of Quantities Sheets (SUMQRD)** file.
2. Click the **Create/Open File** button.
3. Click **Close** to exit the application.
4. Save the file and Close Civil 3D.

# ATTRIBUTES, TEXT AND MODELS

## LAYERS

FDOT has created six Standard Layer libraries: Common, Survey, Right of Way, Roadway, Photogrammetry and Structures. There are approximately 1500 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** | **(V)iew Designations** |
|---|---|
| **p** (proposed) | **p** (plan) |
| **d** (drafting entity) | **r** (profile) |
| **e** (existing) | **x** (cross section) |
| | **m** (model) |

An example of a Existing 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.

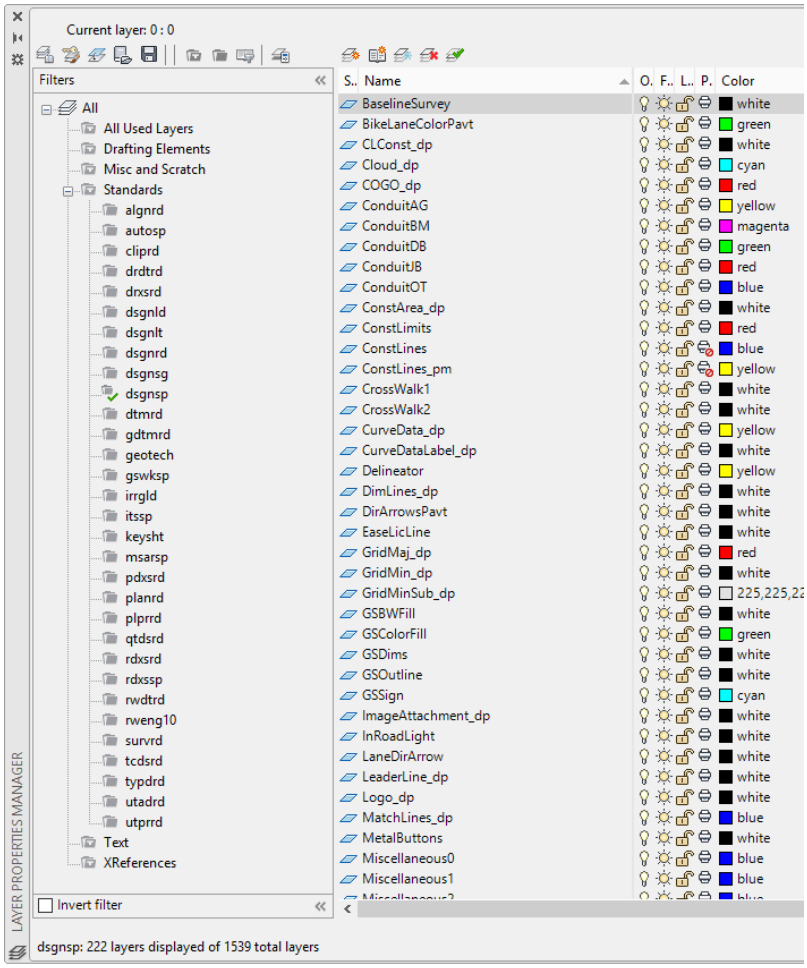
### *RULES & FILTERS*

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.

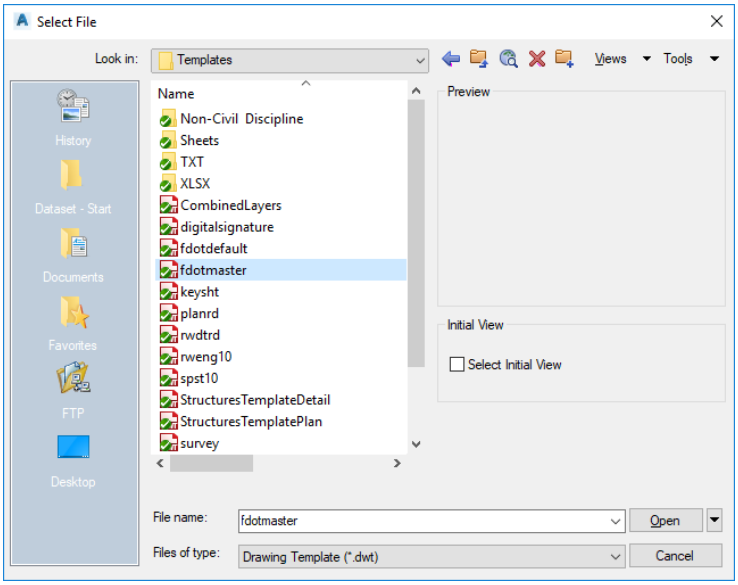
***Note*** *FDOT presets Standard Layer Filters to each Standard File Name. The filters automatically set by default to those specific file names upon opening of the design file.*



## *Exercise 1.4 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.

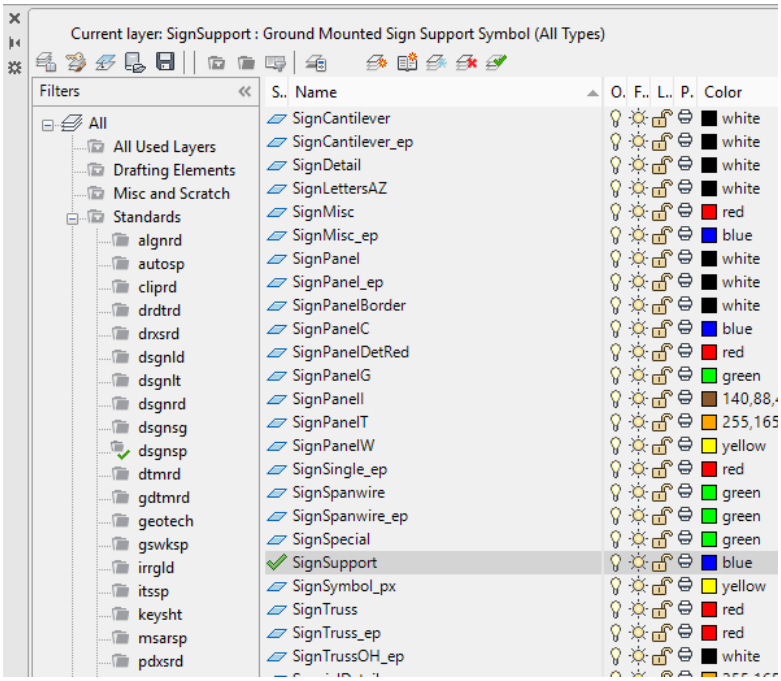
1. Open the fdotmaster.dwt as shown below.




2. From the *Home Ribbon* select **Layer Properties** 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.*

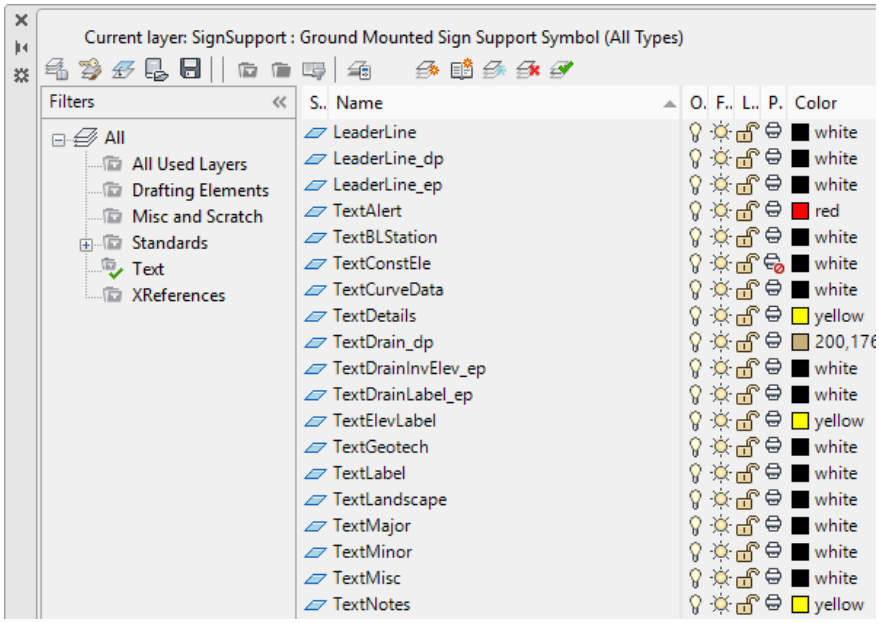
3. Expand the *Standards* folder in the *Filters* section of the dialog.



4. 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.

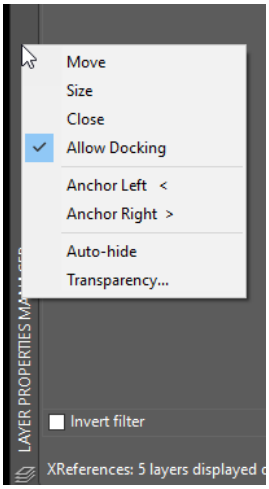
5. Collapse the *Standards* folder and click on the **Text** filter. Note all the Layers that contain text are now visible.

6. 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.*

7. 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.



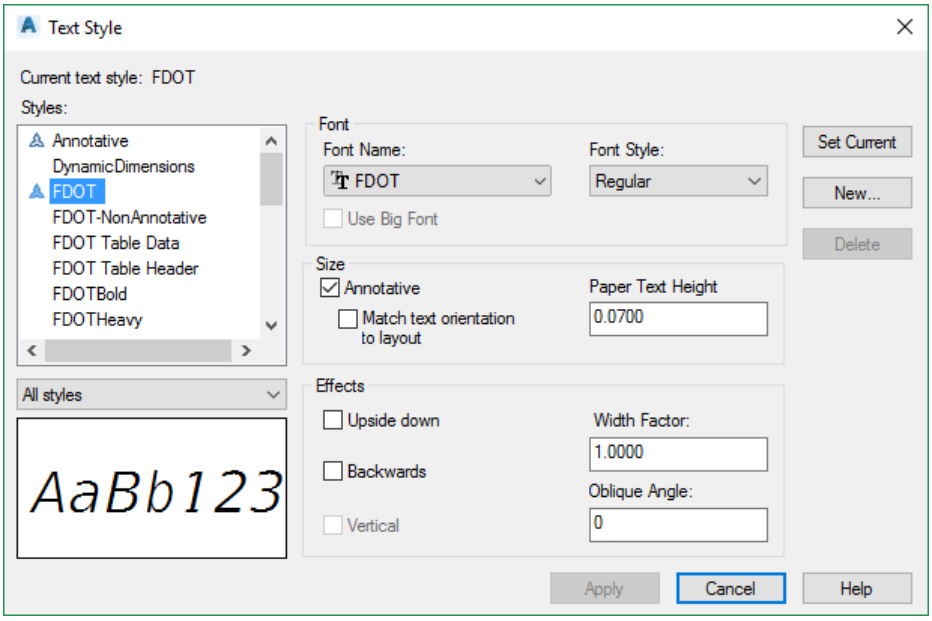

8. Click on the **X** located in the top left corner to close the dialog. Layer filters can save time when going from Line work to Text and so on.

## 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
- Civil 3D Label Styles
- Civil 3D Note Styles
- Spreadsheets

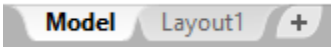
True Type Fonts will ignore AutoCAD weights. The best method to show thicker text is to use the Bold font. The FDOT CADD Software delivers and installs the True Type Fonts in the FDOT20xx.C3D\Support\Font folder on the server and in the Windows\Fonts folder on the client computer.

***Note*** *If you uninstall older State Kits you may run into an issue where the new State kit can't find the correct FDOT fonts and will substitute. If this happens browse to the font folder in the install location and select all of the TTF Fonts > Right Click and select Install.*

*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 |

## 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.

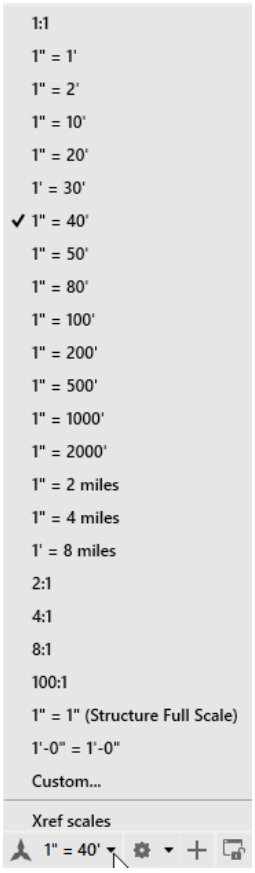

A sheet, when present, has two additional buttons called Model & Paper. The default, when created, is called Paper, which represents Paper Space. Paper Space is a visual representation of how a sheet will print and any text or line work drawn in Paper space is equivalent to drawing on a sheet of paper. 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 by using the 2 Point Twist command on the FDOT Ribbon, which makes labeling and the layout look perpendicular to your border.

***Note*** *If you use 2 Point Twist make sure to untwist view when labeling is complete. You can un twist a view even if you open a previously saved file that is twisted.*

## 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.

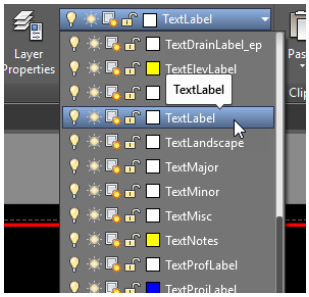

Important items to remember regarding Annotation Scale:

- 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

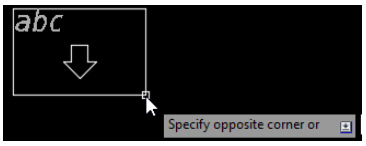
## *Exercise 1.5 Annotation Scale and Text Styles*

This is a brief introduction to placing text using FDOT delivered Text Styles.

1. Continue working in the *FDOTMASTER.dwt* set the *active Layer* to **TextLabel.** to set a layer current you can use the *Layer* pulldown on the *Home* tab to change the layer, type in *Textlabel* on the command line, or Double Click on the layer in Layer Properties dialog box.

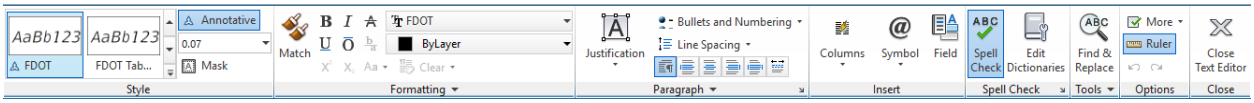



2. On the *Command Line* type in **Mtext**. The command line asks you to draw a text box from top left to bottom right.




***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 *fdotmaster.dwt*** file. Exit Civil 3D.

For more information on Text and Text Styles see the Autodesk online Help for additional information.

# 2 DESIGN TOOLS

## OBJECTIVE

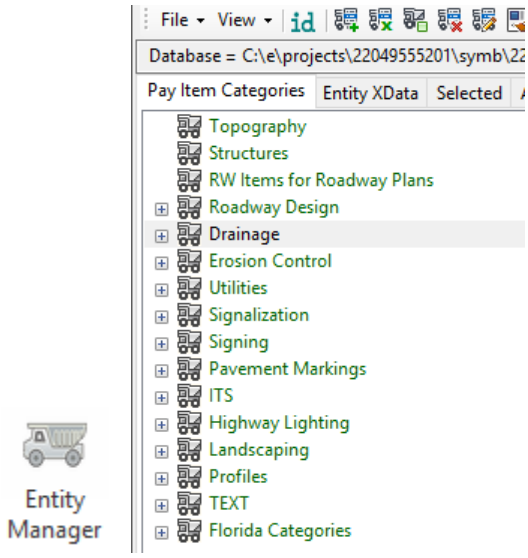
The objective of this chapter is to introduce the designer to all of the design tools used to create FDOT plans that can be quantified and reported accurately. The tools covered are;

- EMX
- FDOT Signs
- FDOT Multiline
- Pavement Markings
- Place Block Group

## FDOT TOOLS USED TO DRAW OR PLACE PAY ITEM DATA

Let's take a tour and examine the tools that are available in the FDOT Civil 3D state kit that can be used to draw, place, edit Pay Item Data on AutoCAD Entities.

### 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 based on Basis of Estimates (BOE) 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. *Item*s contain specific functions related to defined entity symbology or quantity calculations. *Item*s 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.

***Note*** *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

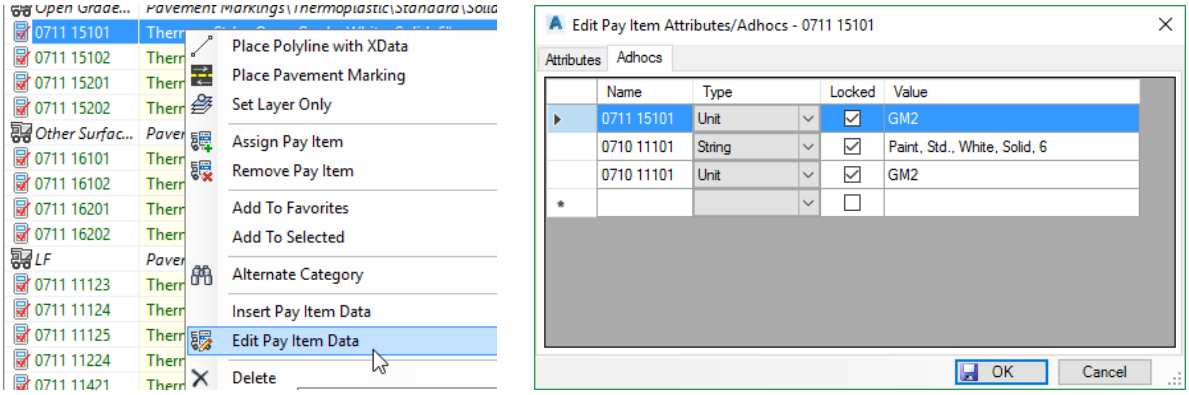
### ADHOC ATTRIBUTES

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 from 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.

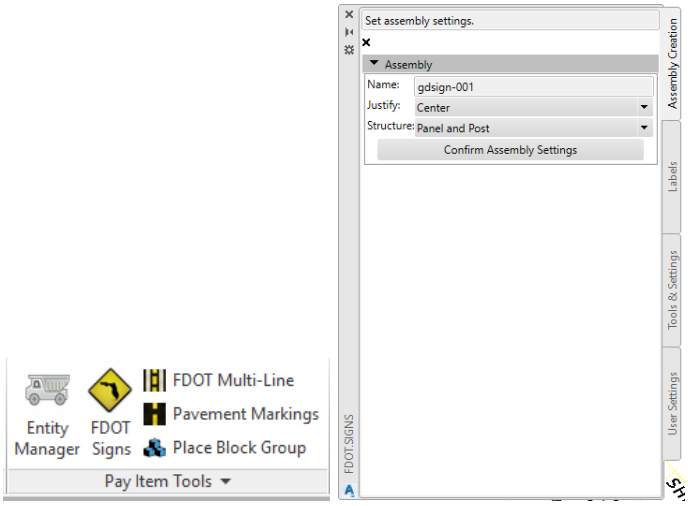
To calculate a quantity using adhocs, the Compute Parameters must be set to Adhoc Attributes and adhocs must consist of 1 to 3 set on an entity. As a minimum, an adhoc using the pay item as the name, type set to Unit, and the value set to either the Standard Unit or an equation. If this is the only adhoc 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.

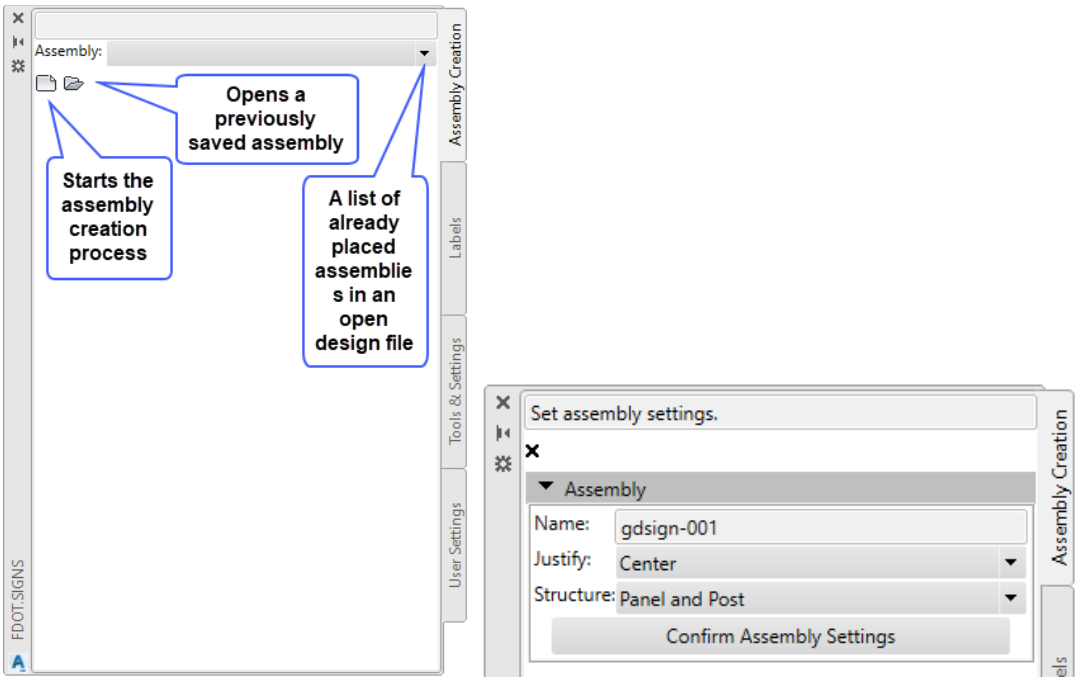
## FDOT SIGNS

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*

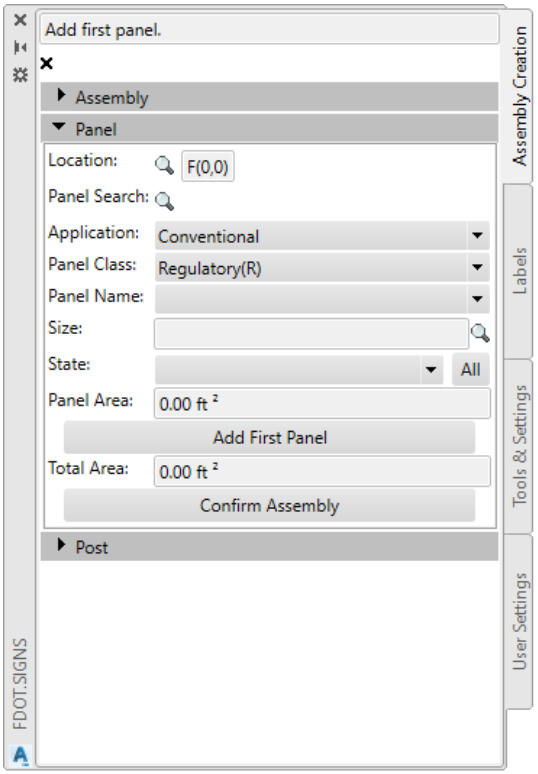



Starting the process of Creating an Assembly begins when the start assembly button is selected. The image above right opens.

- **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.

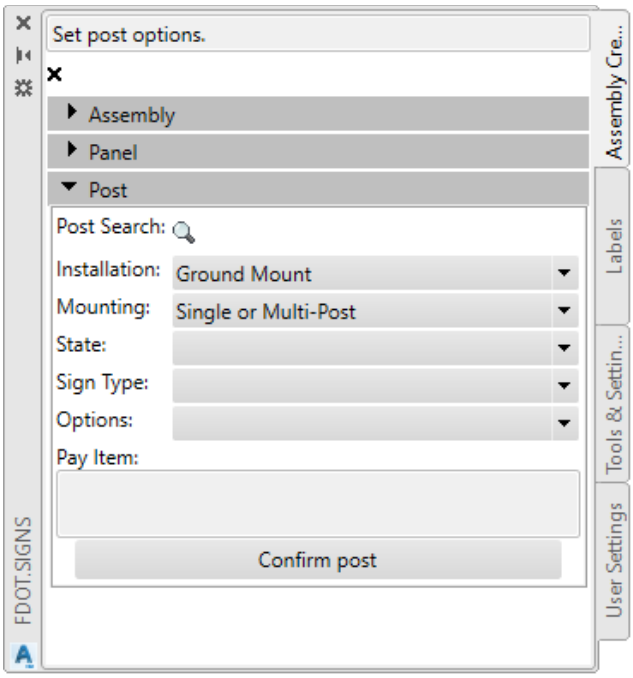
## *ASSEMBLY CREATION - PANEL*

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.



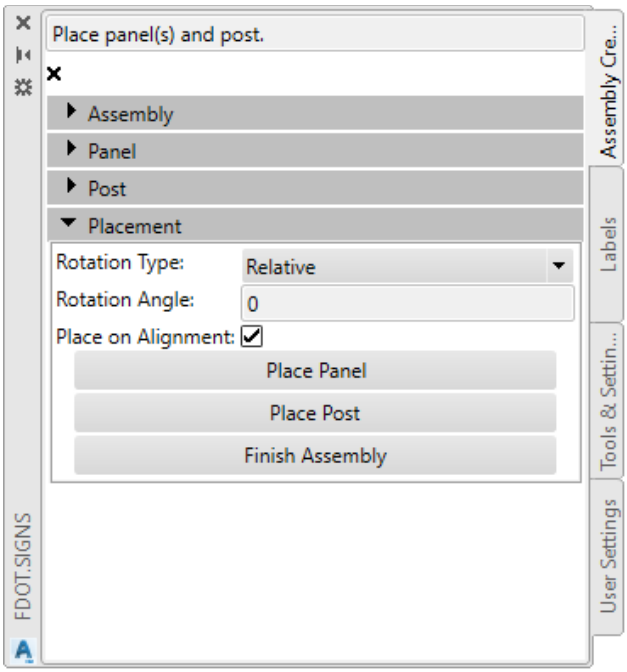

- **Location** – When selected a grid box opens showing where the panels are in relation to each other in the assembly. The user can also change locations from here by right clicking on the populated grid box for options. The grid box also contains the back side of the assembly if it is a double-sided 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*



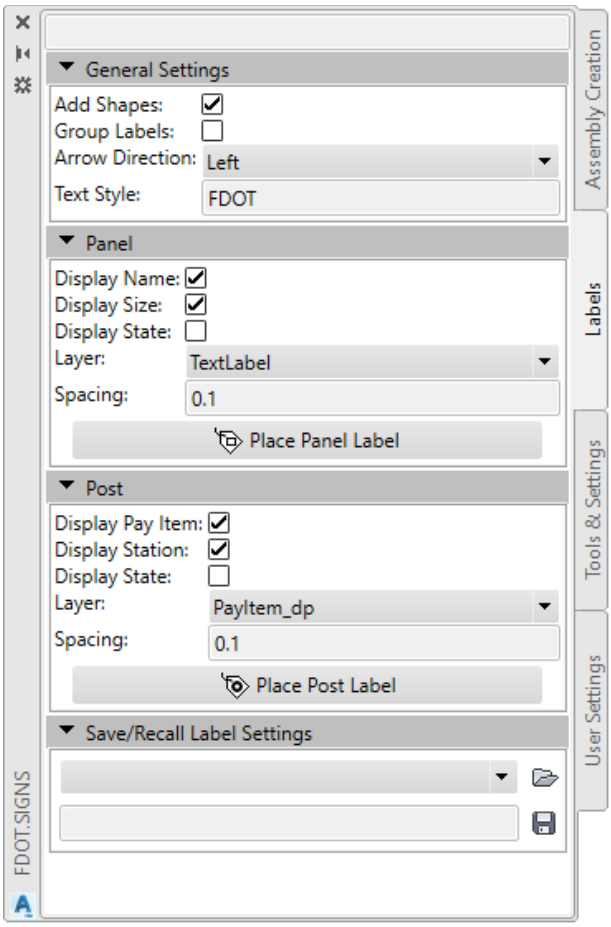

- **Post Search** – Allows user to search for a specific post which will avoid the pulldown navigation to choose the post.
- **Installation** – The user selects which installation method to use. The following are available; Ground Mount, Panel Only, and Overhead.
- **Mounting** – This allows the user 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.

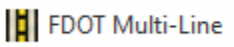
### LABELS – PANEL

- **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.

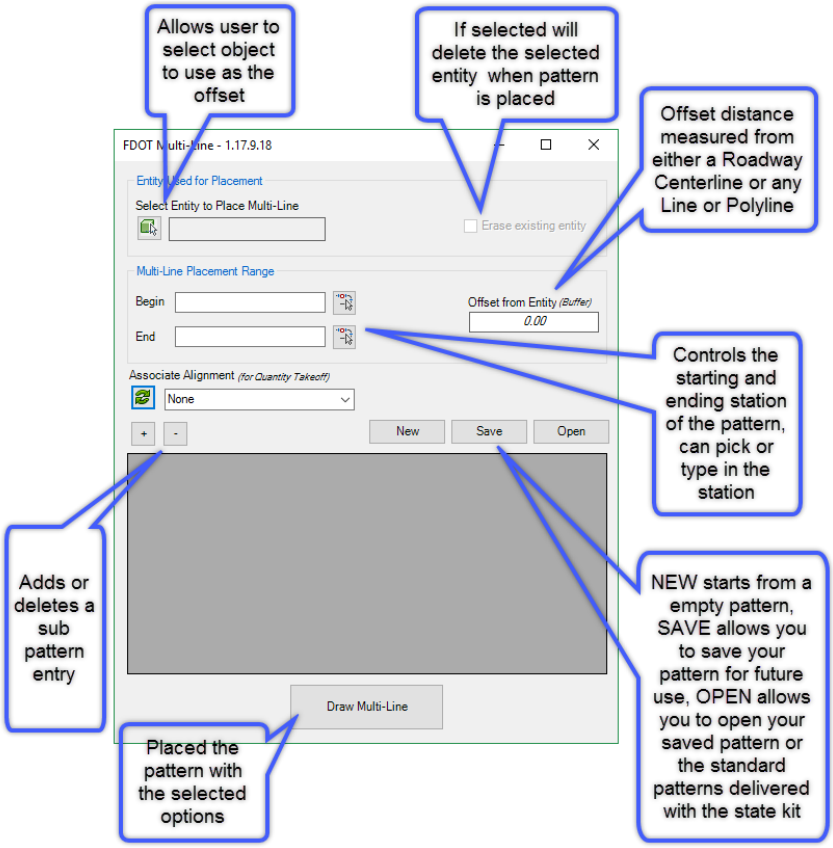
*LABELS - POST*

- **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.

## FDOT MULTI-LINE



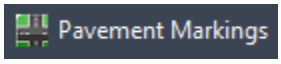

FDOT Multi-Line Tool is located on the FDOT Ribbon in the Pay Item Tools Panel. This application aids the designer in drawing 2D Line work such as complete roadways including Curb and Gutter, Sidewalks, and striping for Signing & Pavement Marking plans if desired. The Application uses the Entity Manager 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.




***Note*** *The State kit is delivered with already created patterns the user can open and place. The patterns can be found in the C:\FDOT20xx.C3D\Data\Multi Line Patterns.*

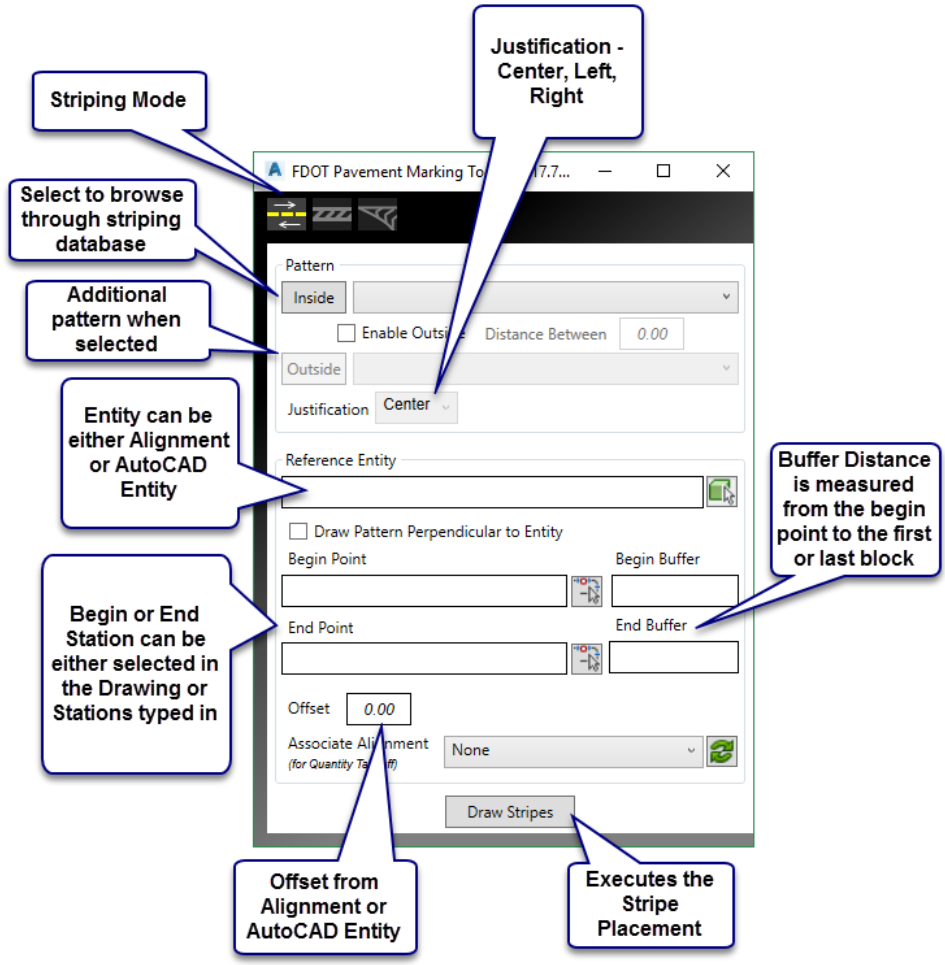
***Note*** *For more information on the FDOT Multi Line tool please reference the quick clip video accessible from hovering over the tool and pressing F1.*

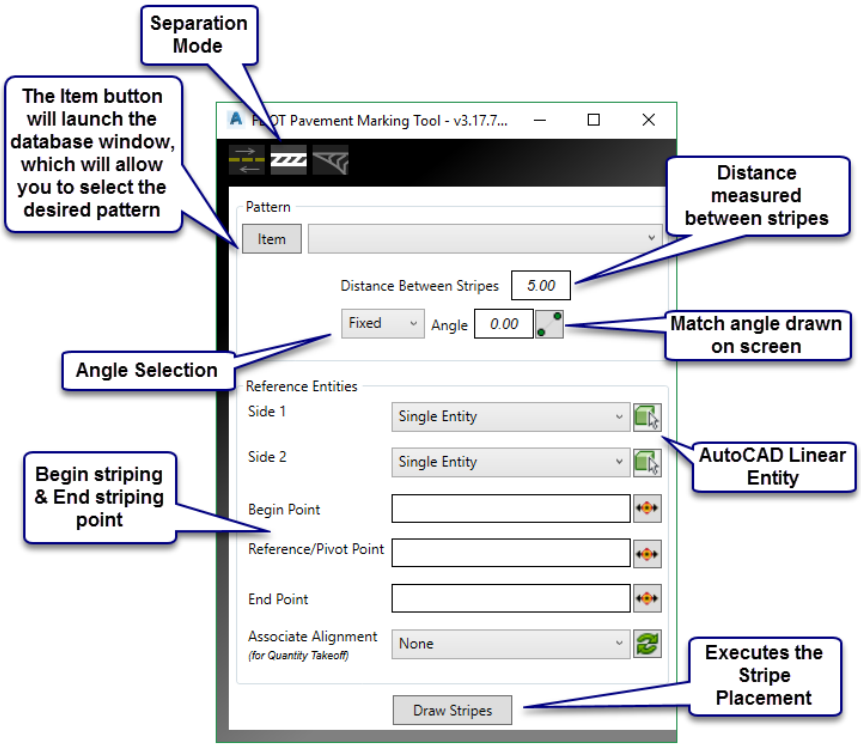
## PAVEMENT MARKINGS

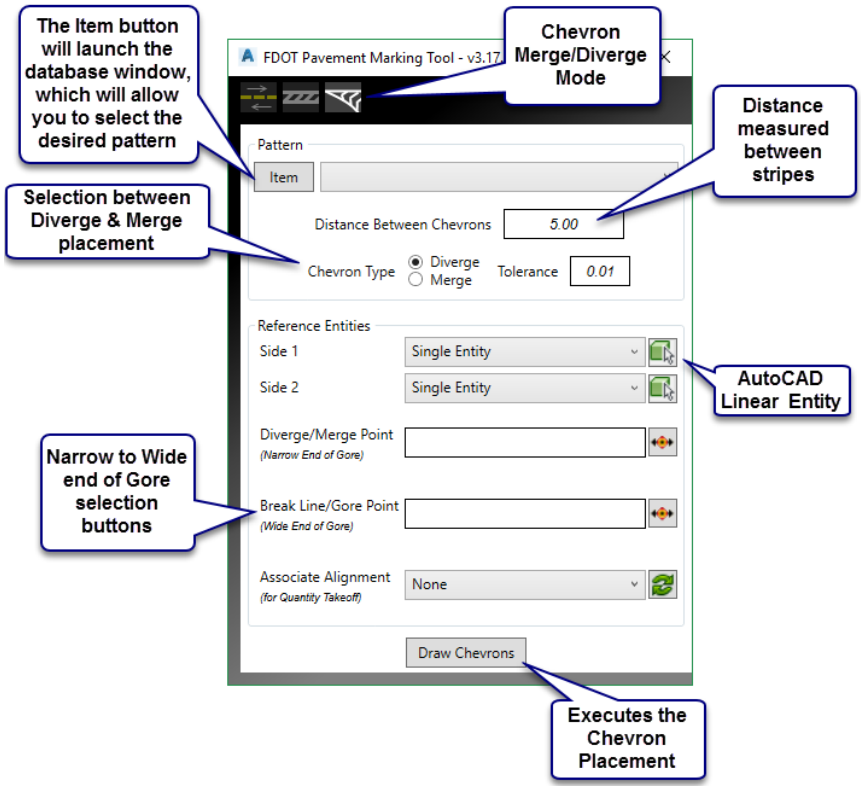



Pavement Marking Tool is located on the FDOT Ribbon in the Pay Item Tools Panel. This application aids the designer in drawing striping for Signing & Pavement Marking plans. The Application uses the Entity Manager database which will allow the user not only to select the correct pattern, but also have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

***Note*** *You have an option to select the pattern in EMX > Right Click > Select Place Pavement Marking. The pattern will load and is ready to place with the PM tool.*





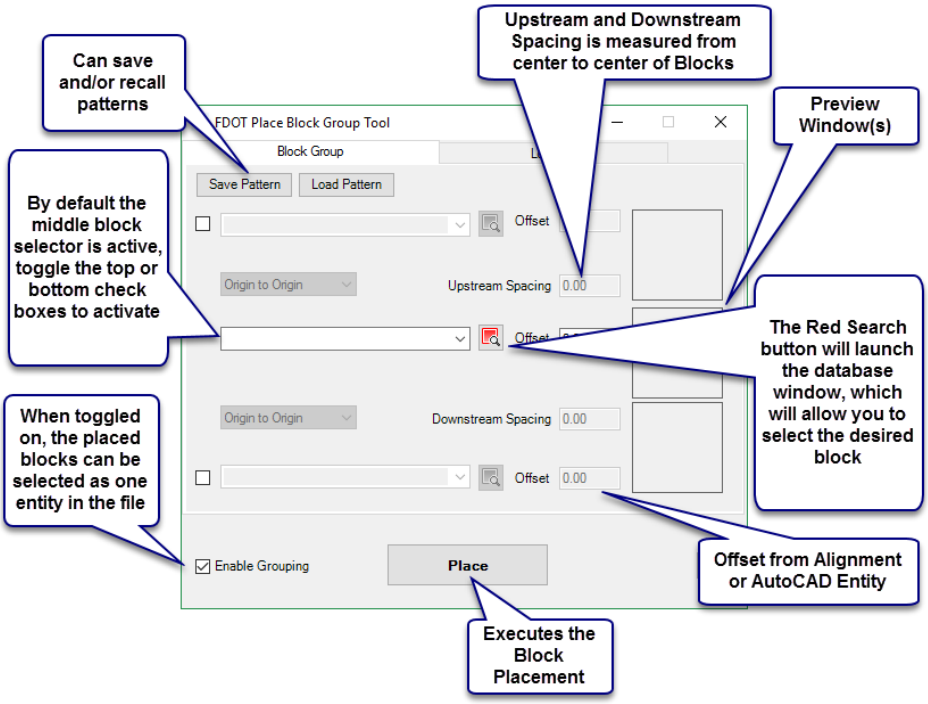

***Note*** *For more information on the Pavement Markings tool please reference the quick clip video accessible from hovering over the tool and pressing F1.*

## PLACE BLOCK GROUP

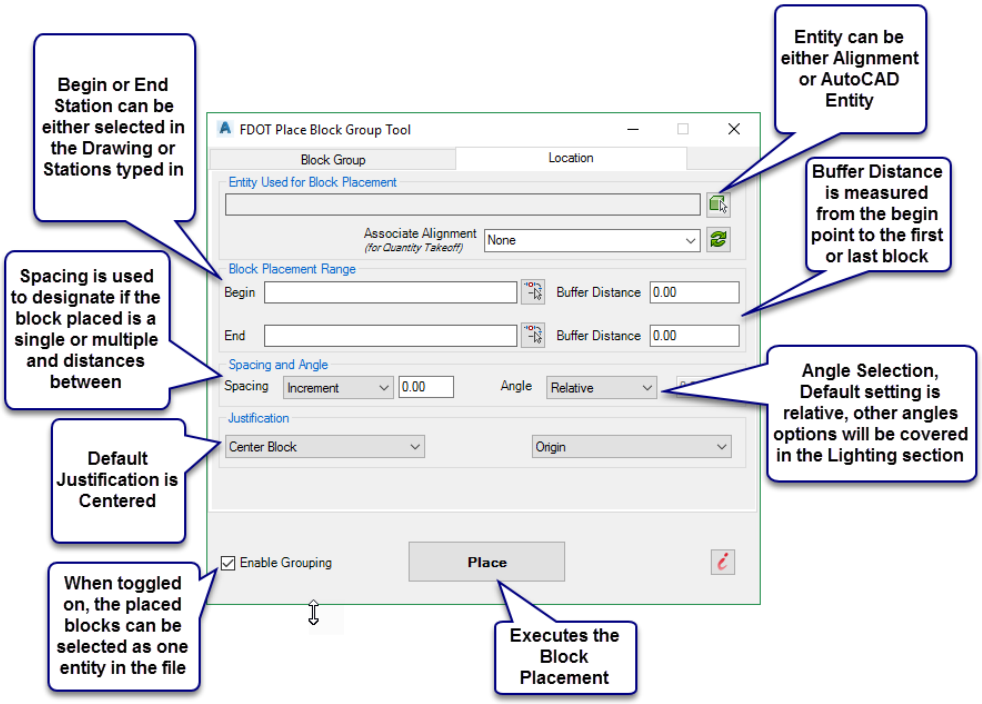

Place Block group is located on the FDOT Ribbon in the Pay Item Tools Panel, this application is used to place single or multiple blocks at once. An example being Reflective pavement markers or a multi part pavement message such as Right Turn Only. The pavement messages complete with Payitem data can 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 **blckgrp.**

***Note*** *You have an option to select the pattern in EMX > Right Click > Select Place Block. The pattern will load and is ready to place with the PBG tool.*

### *BLOCK GROUP TAB*



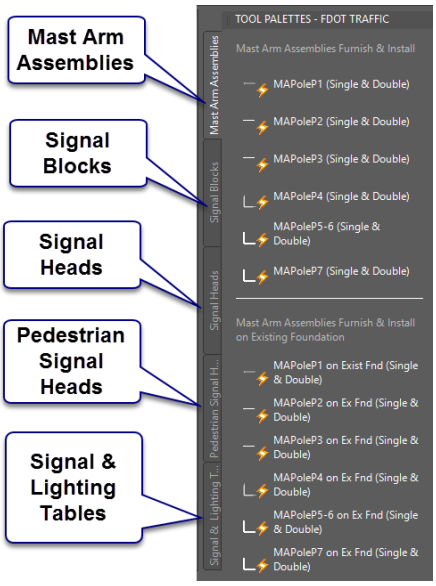
*LOCATION TAB*



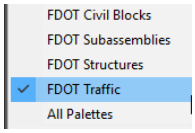

***Note*** *For detailed information please reference the quick clip video accessible from hovering over the tool and pressing F1.*

## FDOT TRAFFIC PALETTE

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.

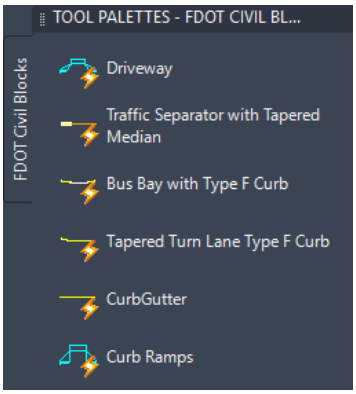



The FDOT Traffic palette allows the designer to place blocks that already have Pay Item data attached, such as the mast arm assemblies, which are dynamic blocks meaning they have multiple blocks and pay item data depending on the assembly configuration. Using EMX alone for the mast arm placement would not give you the same result as the powerful dynamic blocks on the traffic palette.

***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.*

## FDOT Civil Blocks

The FDOT Palette groups also contain a palette named FDOT Civil Blocks. These blocks when placed allow the designer to modify parameters such as curb types and dimensions that are controlled via constraints. The different curb options contain the pay item number pertaining to the selected curb type.



Once the user saves and exits Civil 3D the last visible palette used will display as the default the next time Civil 3D is launched.

***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.*

***Note*** *Keep in mind when you close Civil 3D the program remembers the last palette group that was open, so you may need to change it back if needed.*

# 3 WORKING WITH SHAPES

## OBJECTIVE

The objective of this chapter is to teach the student how to set up the design file that will contain shapes, such as sod and asphalt. The designer will use EMX for placement and label placement, along with adhoc additions. The designer will be exposed to the use of Sheet Layouts to mimic the use of different models in Microstation.

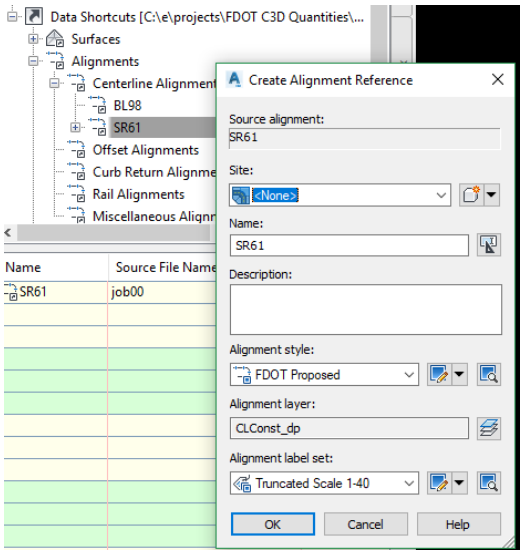
## INTRODUCTION

Creating and labeling shapes is a key component of being able to generate accurate quantities. The FDOT Civil 3D state kit is delivered with the latest Pay Item information based on the Basis of Estimates list of items. EMX reads the database list which allows the designer to place items with the correct symbology.

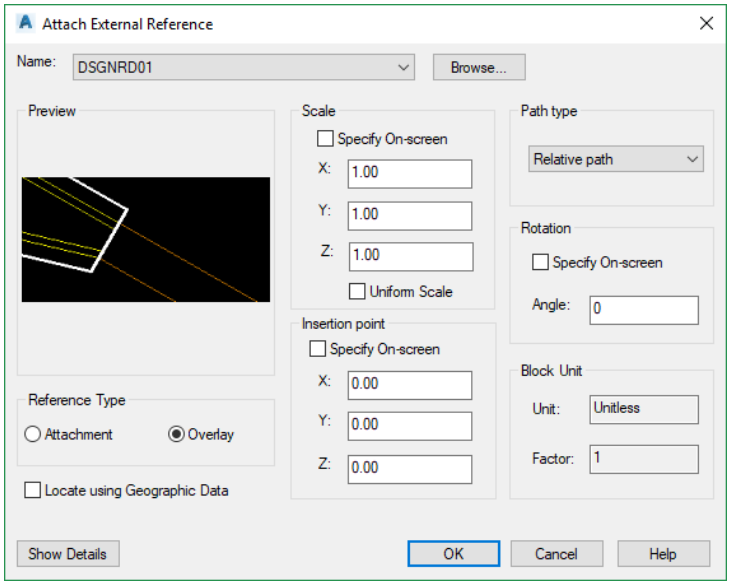
### *Exercise 3.1 Setting up the design file*

In this exercise you will data reference in one Alignment and Xref in one design file.

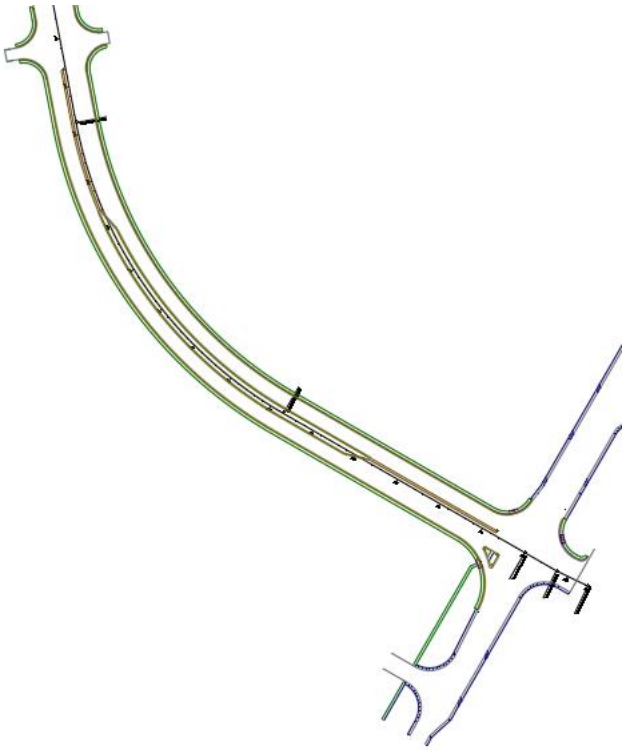
1. Open the *QTDSRD01.dwg* design file that was created in an earlier exercise.
2. Expand the Alignments folder in the Data Shortcut section, right click on **SR61** and select **Create Reference.**




3. The Create Alignment Reference dialog opens, accept the default settings and select **OK.**
4. Type in Xref to open the Xref manager, Select the attach Dwg button on the upper left corner of the dialog.
5. Browse to the roadway folder and select the *DSGNRD01.dwg*.




6. Make sure you set reference type to Overlay. Untoggle all other boxes as shown above.
7. Select **OK.**
8. Type **ZE** for Zoom Extents, or double click your mouse wheel to see the references.
9. Save your drawing and leave open to continue for the next exercise.

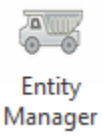


## *Exercise 3.2 Create a Project Specific database*

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. Continue using the QTDSRD01.dwg for this exercise.
2. Open the file *C:\e\projects\22049555201\roadway***Qtdsrd01.dwg.** (This is the main design file for all Shapes and area calculations.)
3. From the *FDOT Ribbon*, select the **Entity Manager** icon. If this your first time launching EMX it will ask if you want to see 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.*

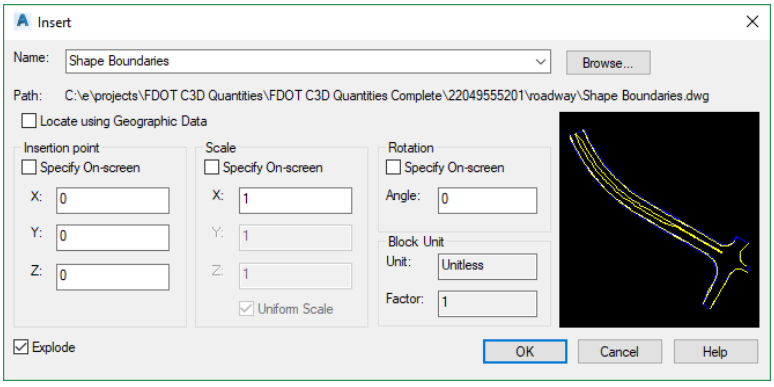
## *Exercise 3.3 Creating Pavement Shapes and Sheet Layouts as Models*

In this exercise, the designer will insert a block representing the pavement shapes and hatch them with the appropriate pavement type, then the layouts will be renamed and copied so as the desired pavement type is visible only. The block also contains a sidewalk shape. You will also be introduced to using Layout Tabs as models.

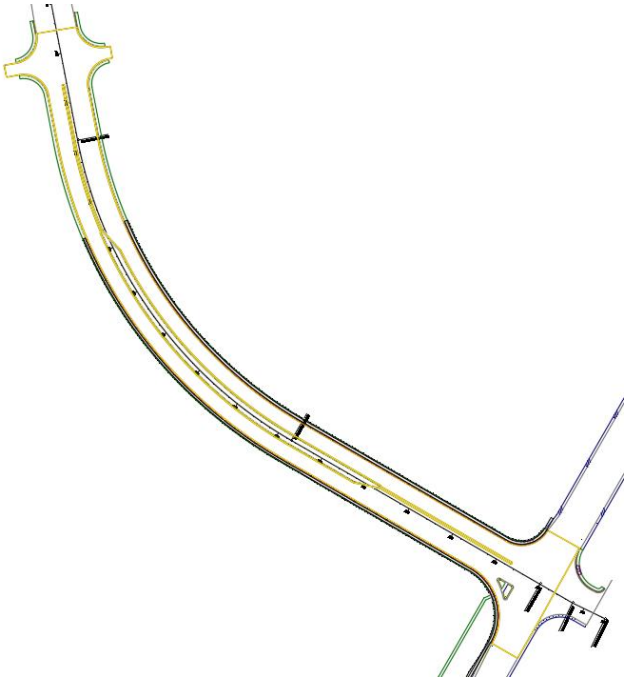
### ➢ *Inserting Pavement Shape Block (Part 1)*

1. Open or continue in the *QTDSRD01.dwg* file.
2. Type **I** for insert, or you can click on the Insert button on the Insert Ribbon 

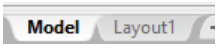
3. Browse to the Roadway folder of your project and select the *Shape Boundaries* drawing.
4. In the insert dialog toggle on **Explode**, and match diagram below.

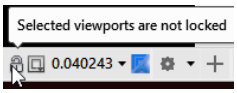


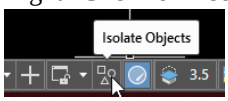

5. Select **OK**
6. Your drawing should look like image below.



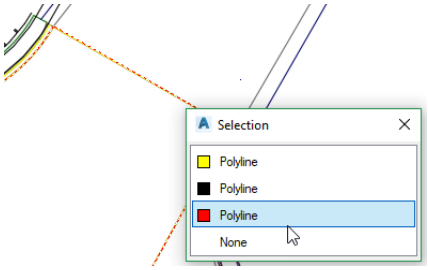
- ***Hatching Pavement Shapes (Part 2)***

1. Open EMX if not already open, make sure the database location is correct. It should reside in your Calculations folder within your project.
2. Click on the default Layout1 tab on the bottom of the screen next to model. 

3. Type in **Viewport** on the command line then press enter to make it the current layer.
4. On the Layout Tools Ribbon, select the **Rectangle** view port option.
5. Select the viewport and pick the Triangle grip, select the **1"=40'** scale.
6. Double click in the viewport to make it active, type **RE** to regenerate the screen to make the text look correct (this is the annotative text adjusting to the scale).
7. Select the lock icon, which will lock the view port in place, 

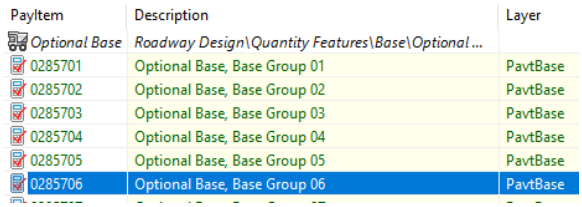
You can always grip edit the viewport itself to make it bigger or smaller.
8. Turn on Selection Cycling if not already on. 
9. Right Click on isolate objects and select Isolate Objects along the bottom of your screen. 

10. Select the boundary representing the pavement and pick the **Red Polyline** in the Selection dialog.




11. Press **Enter.** Notice the only objects visible is the Red Pavement boundary representing the pavement Base.

12. On EMX in the Pay Item Search box, type in **0285706.**



| PayItem | Description | Layer |
|---|---|---|
| *Optional Base* | *Roadway Design\Quantity Features\Base\Optional ...* | |
| 0285701 | Optional Base, Base Group 01 | PavtBase |
| 0285702 | Optional Base, Base Group 02 | PavtBase |
| 0285703 | Optional Base, Base Group 03 | PavtBase |
| 0285704 | Optional Base, Base Group 04 | PavtBase |
| 0285705 | Optional Base, Base Group 05 | PavtBase |
| 0285706 | Optional Base, Base Group 06 | PavtBase |

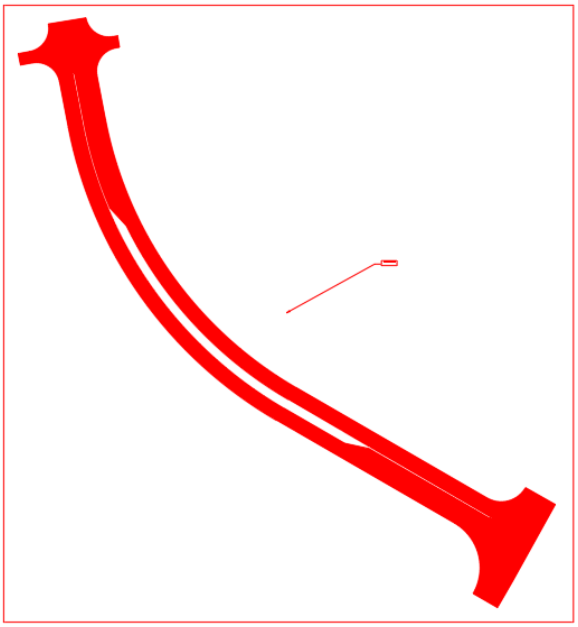
Since this is the only Alignment we have referenced in, EMX will by default associate all entities to the **SR61** Alignment. If there were multiple alignments you would have to set the desired alignment current in EMX before placing Pay Item Entities.

13. Select the Label Tag Button.  on EMX.

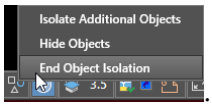
14. Toggle on the **Auto-Layer** option, this will place the labels on the same layer as the hatch. You will see the advantage of this later in this section. Select **Exit** to close the Hatch Area Labels dialog.

15. Select the fill region with hatch button.  , with the pick inside boundary option active, left click inside the boundary.

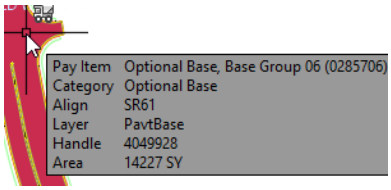
16. The boundary is flooded with red, press enter to see the label. Place the label off to the right as shown below.



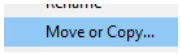
17. Right Click on Isolate Objects and select **End Object Isolation**




18. If you hover over the newly placed hatching it shows the following.




19. Right Click on the **Layout1** layout and rename it to *Pavement Base*

20. Right Click on the newly renamed Pavement Base Layout and select **Move or Copy.** 


21. Toggle on **Create a copy** and double click (move to end).

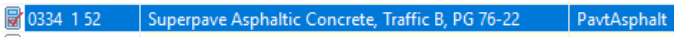
22. Right Click the copied layout and rename it *Super Pave***.** Double click in the view port to make it active. Make sure the viewport is locked (Lock icon is Blue)

23. Select the freeze button 

and select the red pavement base hatch you just placed.

24. Select the Isolate Objects button and select the white polyline, which represents the Super pave asphalt layer.

25. In EMX search, type in pay item number **0334 1 52.**



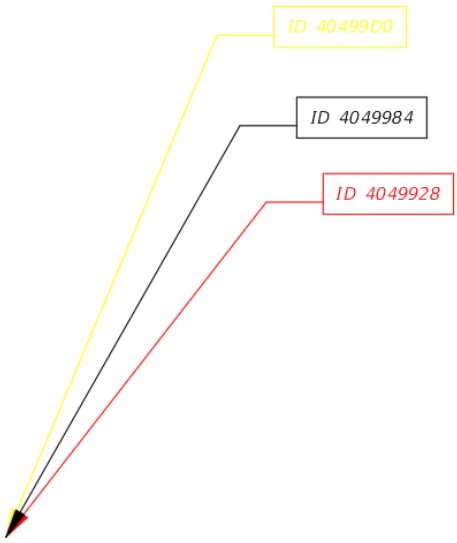

26. Select the Fill region with hatch button, a adhoc dialog opens, change the thickness to **1.5** representing 1.5” thickness of pavement. Select Ok to continue.

27. Pick the inside of the Pavement Boundary, press enter to place the label. Place the label to the right as before.

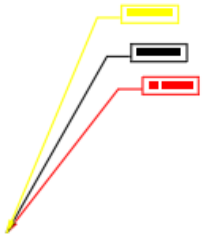
28. **Unisolate Objects** to turn all layers back on.

29. Repeating the same process as above copy the layout and rename it **Friction Course** the polyline color is yellow; the pay item number is **0337 7 25**.

30. When complete switch back to the model tab and grip edit the location of the labels as shown below.



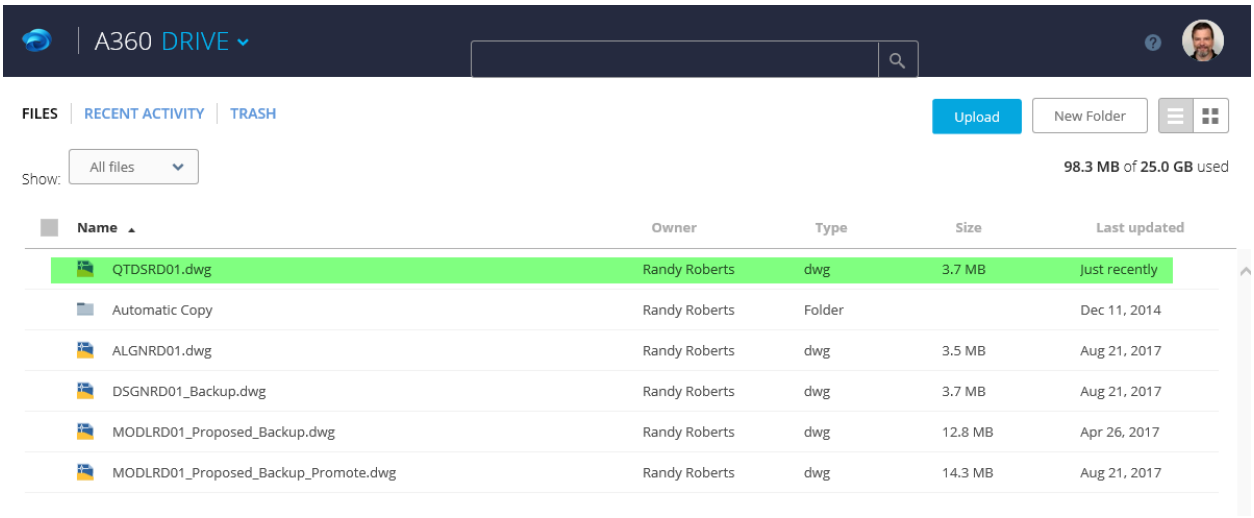

31. Click on the **Pavement Base** tab, you will need to freeze the Friction Course and Super Pave layer. Click on the **freeze** icon and select the Yellow and White label, this will turn off the label along with the associated hatch. This is why the auto layer option in the label dialog is important.



32. Switch to the **Super Pave** tab and **freeze** the yellow (Friction Course Label). The Friction course tab should already be set with the other 2 pavement layers turned off.
33. Switch between the Tabs now, notice how only the desired pavement layers are displayed in the model.
34. Save your file before continuing.

*AUTODESK A360 DRIVE*

You can upload this file to your built in A360 account so contractors or construction can view the model without having to have Civil 3D installed. A360 is a cloud based storage, which means the drawing file can be accessed from any location using a browser. The drawing can be viewed, shared or downloaded.




The same sheet layout tabs are available and behave like they do in the drawing file you just created.

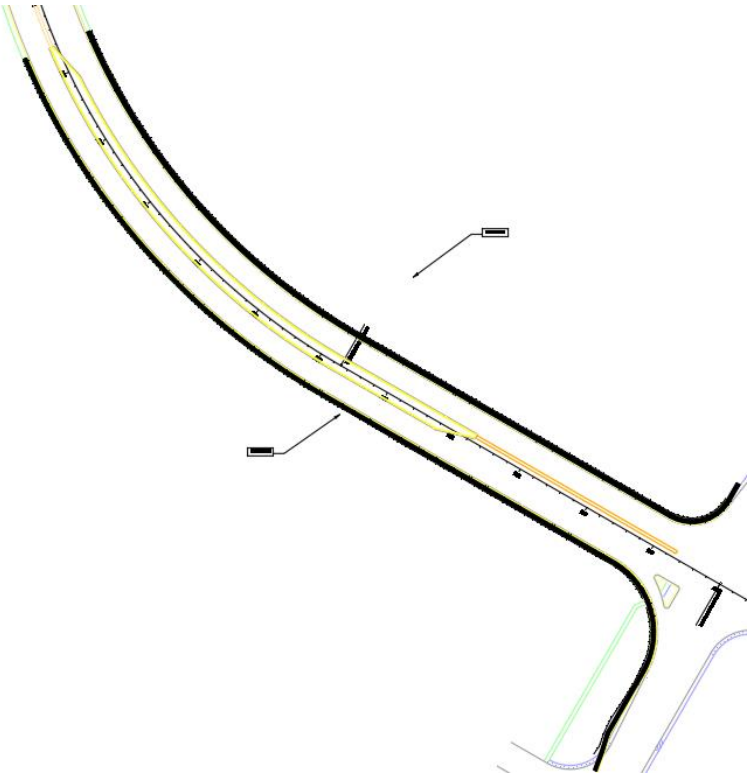
## *Exercise 3.4 Creating Sidewalk Shape*

In this exercise, the designer will apply a hatch with Pay Item data to the sidewalk shape and create a separate layout for easy visibility.

1. Continuing in the *QTDSRD01.dwg* file. Right Click on the Friction Course layout and create a copy moving it to the end. Refer to the previous exercise for help on this step if needed.
2. Right Click on the new copy and **rename** it *Sidewalk*.
3. Double Click inside view port to make it active.
4. Freeze the Friction Course Layer by clicking on the yellow label.
5. Select the **Isolate Objects** command to show only the Sidewalk shapes.
6. In EMX type in the pay item search box **0522 1** for a 4" thick sidewalk.
7. Make sure the Auto Label option is selected in the label style first and then Select the Fill Region with hatch icon.
8. The command line has options for selection type, type **S** for select object, this is because the boundary is too small to pick the inside of the object.
9. Select the sidewalk on one side only first and press enter, place the label to the outside of the sidewalk.
10. Select the other sidewalk boundary and place the label on the outside of the sidewalk.

***Note*** *It is important to only select or pick one closed boundary at a time to hatch and label. Even though you have the capability to hatch more than one boundary at a time there will only be one label placed for all of them, which means only one area id that will show up in the report. The rule of thumb is one area id for one hatched boundary.*

11. Select **Unisolate Objects** to turn other layers back on. Your drawing should look like image below.
12. Save your file.

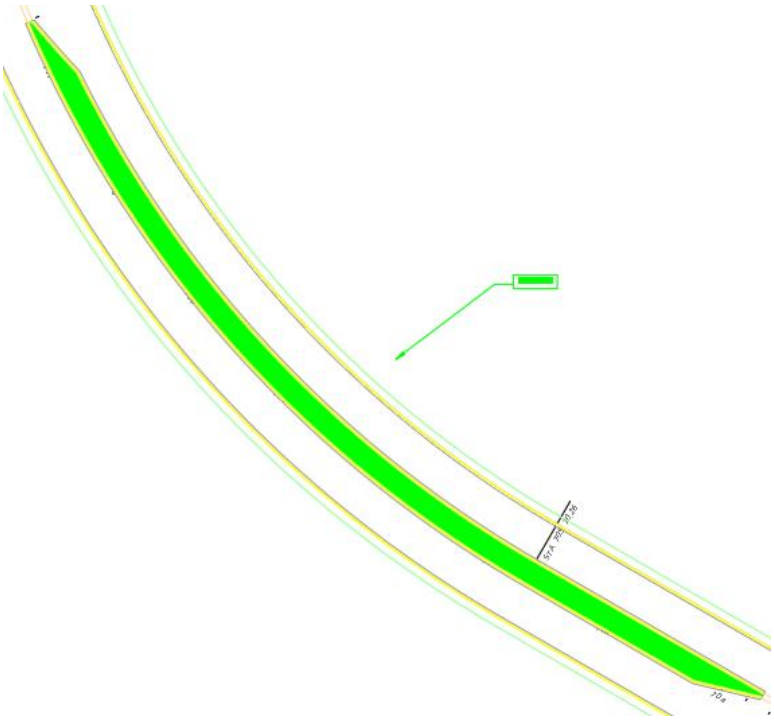


## *Exercise 3.5 Creating Sod/Turf Shapes*

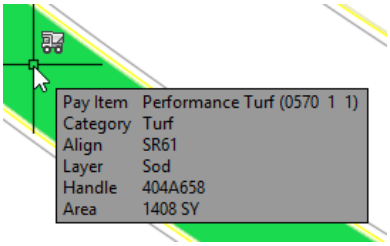
- ***Hatching an Internal Island (Part 1)***

In this exercise, the designer will place shapes for sod in the design file, along with labels. Different techniques will be used for this exercise.

1. Continue working in the *QTDSRD01.dwg*.
2. Using previous steps in this chapter, **copy** and **rename** the Sidewalk layout to **Sod**.
3. Make sure the Viewport scale is still at **1"=40'** and is locked.
4. Freeze the Alignment Layer, don't worry about the Tick marks and the station values.
5. Freeze the Sidewalk Layer.
6. Open EMX if not already open and type in the Pay item search box **0570 1 1** for *Performance Turf.*
7. Click the Fill Region Icon on EMX 
8. Make sure pick internal point is noted on the command line and select inside the grassed median of the roadway. Press enter to move and place the label to the side. Your drawing should look like below.

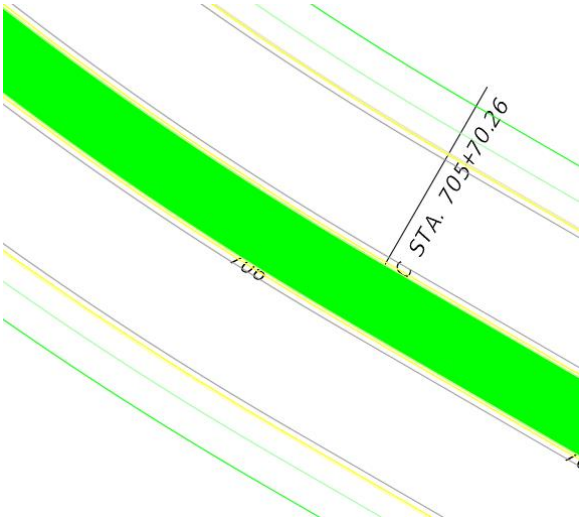


9. Hovering over the hatch reveals Pay Item x data. If you don't see the truck symbol, then there is no Pay Item data attached.

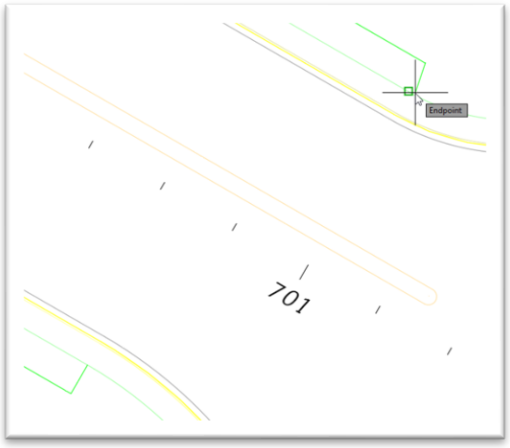



➢ ***Creating and Hatching a Boundary (Part 2)***

1. Select the Offset Command on the Home Ribbon .
2. For offset distance enter **8**.
3. For object select the back of sidewalk on both sides of the road.




4. Near the intersection draw a line from the endpoint of the offset line to the back of sidewalk end points as shown on both sides of the road.

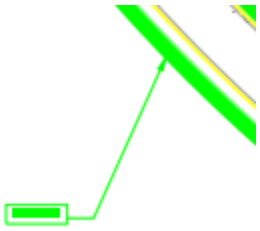



5. Do the same step at the other end, near station 714+20.


6. With a boundary created, select the fill region icon and select the southern sod boundary along the road, press enter and place the label to the southern side.

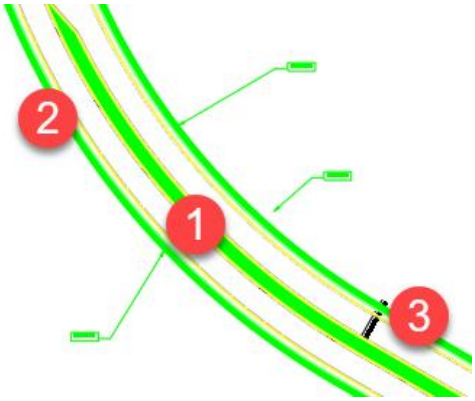
***Note*** *You will have to zoom out until you see the entire boundary before it will hatch if you are using the pick internal point option.*

7. The Arrow head is automatically placed in the centroid of the shape, select it and move it by its grip to the shape so it makes more sense. Keep in mind that the leader line will interact with any new hatching, so try to keep it from crossing a shape.



8. Select the *Performance Turf, Sod* Pay Item **0570 1 2** and select the northern side of the road.

   You should now have 3 areas hatched with Sod.




9. Save the file.
10. Using what you have learned earlier, go through the named layouts and freeze shapes that do not pertain to the layout title. Since you have the Auto Layer option turned on for labeling, just select the label to freeze both the hatch and label.
11. Save the *QTDSRD01.dwg* file before continuing.

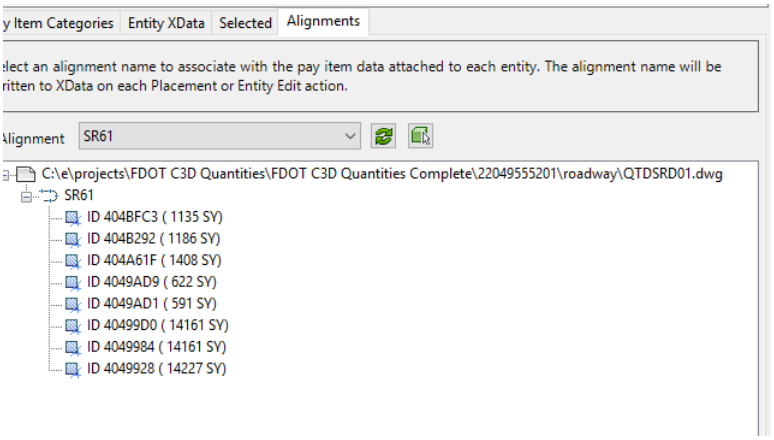
Keep in mind anything crossing a boundary you want to hatch will interact with it and cause you to have multiple regions instead of one, such as a label leader line or other line work. It is a good practice to examine the area to hatch before starting the process, so you can move leaders or freeze unnecessary layers. Once the hatch is placed and labeled no new or existing linework will interact with the region

## *Exercise 3.6 Working with Shapes in EMX*

In this exercise, the designer will learn how to utilize the tools available in EMX to locate and zoom to shapes based on their area id. The Area id is a unique value that AutoCAD assigns to every object drawn or placed in a drawing file to AutoCAD it is called a handle, it is how AutoCAD keeps track of every object that is in the drawing. If an object is deleted and redrawn it is assigned a new handle from the program. EMX picks up that handle and uses it to identify the shape hatch as an area id. And makes it a part of the shape label.

1. Continue working in the *qtdsrd01.dwg*.
2. Open EMX if not already open.
3. In EMX switch to the Alignments tab.

4. Expand the Alignment **SR61** folder, each alignment that resides in any drawing file will be listed here. If a new alignment is either created or referenced in you can click on the update button to refresh the list.




5. Move EMX so you can see the drawing area, left click on different area id's, notice how the drawing zooms to the selected id, this is useful with many small shapes that are hard to find in the drawing screen.

6. Save and Close the *qtdsrd01.dwg* file.

You will see later when we run shape reports, such as sod that the area id in the report can then be identified here in EMX and can be zoomed to by just a click.

# 4 WORKING WITH LINEAR ENTITIES

## OBJECTIVE

The objective of this chapter is to teach the student how to set up the design file that will contain linear entities, such as curb, guard rail, traffic separators, etc. The designer will use EMX for placement and to append data to already placed linework, along with adhoc additions.

## INTRODUCTION

This chapter covers Linear entities that are either already placed or need to be placed in the design drawing file. The entities that are already placed will either have the pay item data (Xdata) attached or will need the Xdata to be attached using EMX. Using the EMX drawing tools the designer can draw linework with the xdata attached and have confidence it is on the correct layer and using the correct linetype, using the append function in EMX will force the target linetype to take on all of the settings of the selection you make in EMX, in other words it will change a linetype, layer, color (Symbology) to the FDOT standard along with the appropriate Xdata that will then QC and also Quantify in reports. For detailed information on EMX refer to Chapter 2.

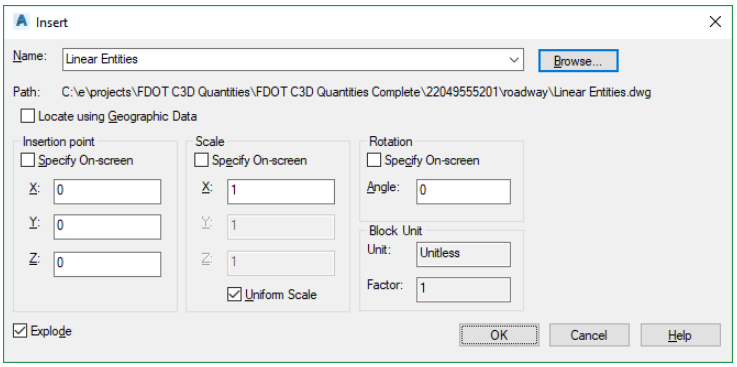
The advantage of Civil 3D is some of the Linework will come from the Corridor Model in the form of Feature Lines, which are either 3D or 2D. The roadway designer should keep this in mind when the model is complete, that the linework should be Extracted for use with quantities.

### *Exercise 4.1 Drawing New Guardrail and Appending to Existing Guardrail*

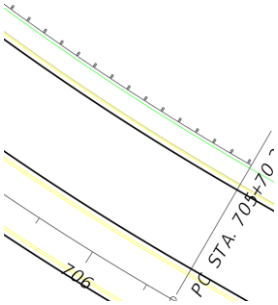
- ***Drawing New Guardrail (Part 1)***

In this exercise, the designer will draw new Guardrail linework using the EMX drawing tools utilizing different techniques.

1. Open the FDOT Civil 3D State Kit or continue if already open.
2. Open the *dsgnrd01.dwg* located in the Roadway folder of your project.
3. Next you will insert a block that contains already drawn Linear entities, Type **I** for insert and browse to the file named *Linear Entities.dwg* located in the Roadway folder.
4. Make sure **Explode** is toggled on, match dialog box below and press **OK.**



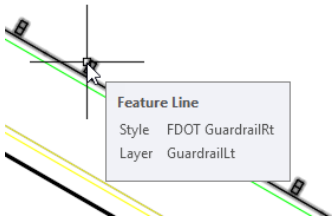

5. Open **EMX** and make sure the project database is set to your *Symb* folder in your project.
6. On EMX left click in the Pay Item to find search box and type in Pay Item number **0536 1 0** which is Guardrail, Roadway TL-2.
7. Select the **Guardrail, Roadway TL-2 (Left).**
8. Zoom into Station 706+00, you will be adding Guardrail behind the sidewalk along the curve.
9. With the selection still highlighted in EMX, select the **Offset** command  from the EMX drawing tools.
10. For distance type in 1, Select the Back of sidewalk (Green Line) along the curve, for side select behind the sidewalk. Your drawing should look like below.

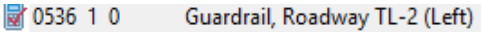



11. Save the drawing before continuing.

➢ ***Appending Xdata to already placed Guardrail (Part 2)***

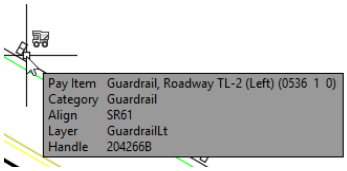
1. Continue working in the *dsgnrd01.dwg*.
2. Zoom to near the intersection, you will append Xdata to the guardrail that starts at station 701+00 and wraps around the curb return on the North side of the roadway.
3. Before you append the Xdata to it, hover over the guardrail and notice its attributes.



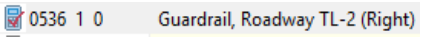

4. Make sure the 

is still selected in EMX

5. Select the **Append** button  on EMX.
6. Select the Guardrail and press enter.
7. Now hover over the Guardrail and look at the new attributes attached including the Pay Item data.




8. Continue appending the same Xdata to the next segment of Guardrail.
9. Save the drawing.
10. In EMX change the selection to the **(Right)** guardrail.



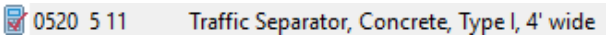

11. Using the previous steps append the Xdata to the remaining Guardrail on the South side of the roadway.
12. Save the drawing before continuing.

## *Exercise 4.2 Drawing and Appending Xdata to Traffic Separators*

### ➢ *Drawing Traffic Separator with Xdata (Part 1)*

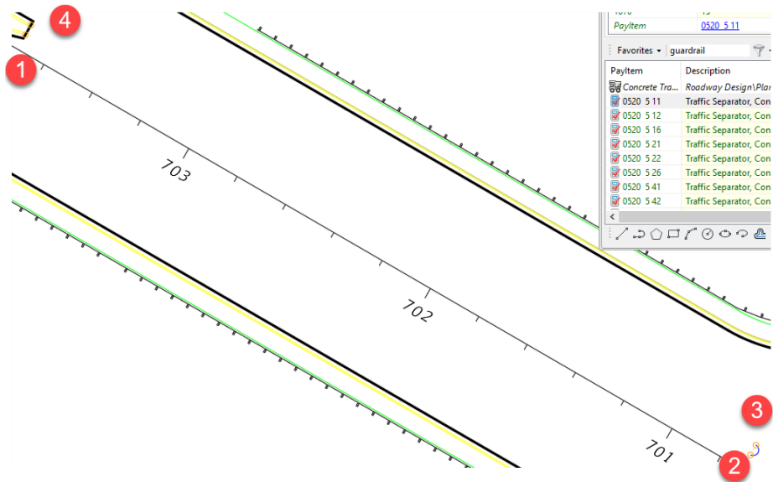
In this exercise, the designer will draw linework representing a traffic separator in the first part and then append xdata to an already placed segment.

1. Continue working in the *dsgnrd01.dwg* file.
2. In EMX type in Pay Item number **0520 5 11** representing

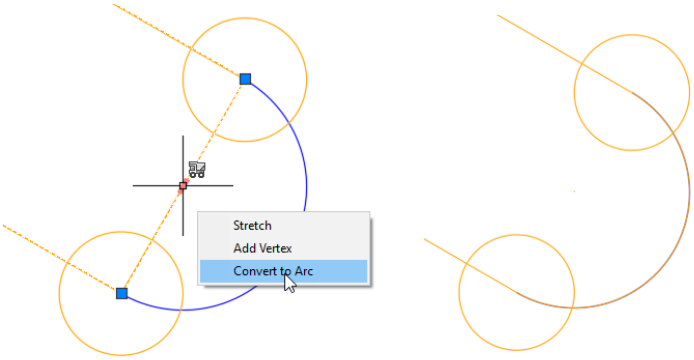



3. Using the EMX drawing tools, select the polyline command.

4. Using the image below as a guide draw the line.



5. With your CENter osnap active pick the center of circle 1 and draw a line to the center of circle 2, then to circle 3 and 4. Do not close the polyline from circle 4 to 1.
6. Zoom into the nose of the separator and select the line you drew, hover over the middle grip and select **Convert to Arc.**

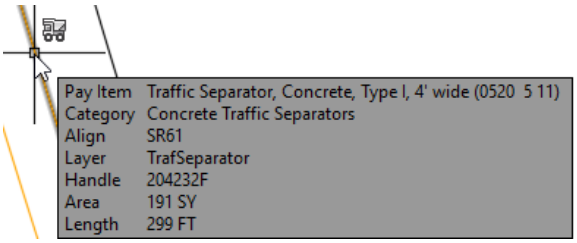



7. Using the NEArest osnap snap anywhere along the arc.
8. Erase the 4 temporary circles.
9. Save the drawing before continuing.

### ➢ *Appending Xdata to Traffic Separator (Part 2)*

In this part of the exercise the designer will append the appropriate Xdata to an already placed traffic separator linework.

1. Continuing in the *dsgnrd01.dwg* file, zoom to the other side of the median to the other traffic separator location.
2. In EMX with the 0520 5 11 pay item selected, select the Append button  .
3. Select all three segments and press enter.
4. Hover over the newly appended linework to see if the Xdata attributes are present.




***Hint*** You can always tell if an entity has Xdata attached by the truck symbol that is present when hovering over an object.

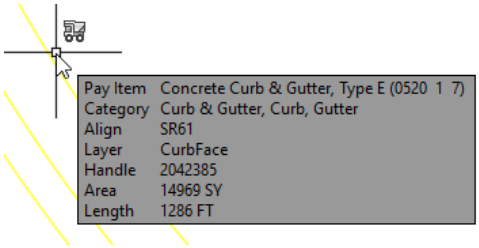
5. Save your file.

## *Exercise 4.3 Appending Xdata to Curb and Gutter*

In this exercise, the designer will append xdata to the curb face all at once, using EMX.

1. Continue working in the *dsgnrd01.dwg* file.
2. Open EMX if not already open.

3. In the Pay Item Number search box type in **0520 1 7** for Type E Curb & Gutter.
4. Select the Isolate button  located on the Layers panel.
5. Select a Face of Curb line and press enter.
6. Notice the only layer that is visible is the Face of Curb.
7. On EMX click on the Append button  .
8. Up to this point you have appended xdata to one object at a time, now left click your mouse and window the entire selection of visible curb and press enter.
9. Hover over the curb face and check its attributes.



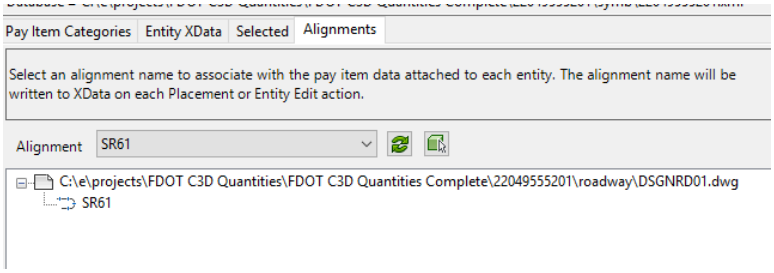

10. Press the Un isolate button  to return to the previous layers visible.
11. Save the file before continuing.

***Note*** *Utilizing tools such as Isolate and Un isolate can make selection processes a breeze. If not doing so already try to incorporate some of these tips into your everyday usage of Civil 3D.*

## *Exercise 4.4 Associating an Alignment to Entities*

In this exercise, the designer will associate the correct alignment that EMX uses before appending Xdata to a Guardrail, although there is only one default alignment in this file the steps are the same and the designer will need to be aware of this scenario.

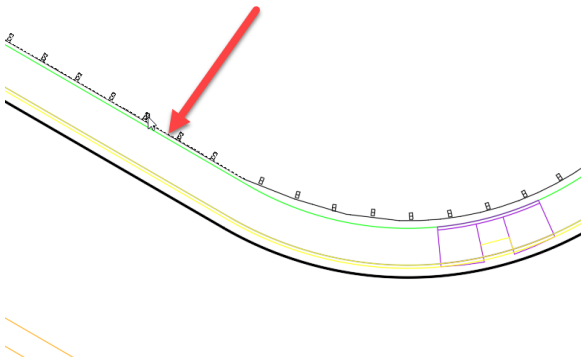
1. Continuing in the *dsgnrd01.dwg* file.
2. In EMX switch to the *Alignments* tab.



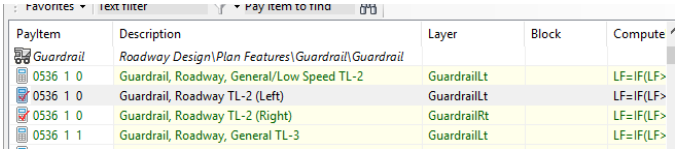

Currently the Alignment that is listed is correct, since it is the only one in the file. If there where multiple alignments in the design file they would be listed in alpha numeric order, meaning that you would have to set it. You can either use the pull down or the selection box to pick the alignments.

3. With the Alignment correct, switch back to the *Pay Item Categories* tab.
4. Click on the id button  along the top of EMX.

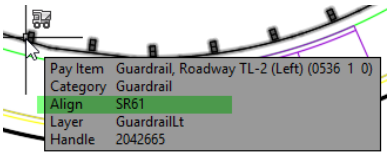
5. Pick the Guardrail as shown below at the intersection and press enter.



6. The correct guardrail is now current, this is a shortcut to quickly get to the desired entity without searching or browsing to.




7. Select the Append button and select the Guardrail behind the sidewalk on the Curb Return.
8. Hover over the Guardrail to make sure it has the correct Xdata and Alignment listed.

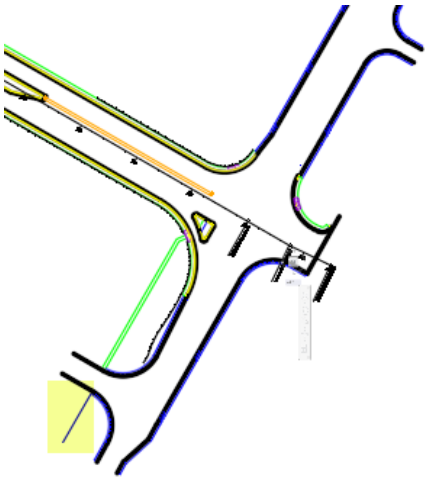



9. Save file before continuing.

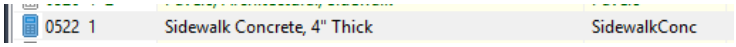
## *Exercise 4.5 Using EMX Offset command*

In this exercise, the designer will use the offset feature in EMX to offset a front of sidewalk to create the back of sidewalk. The advantage of using the offset feature it automatically puts the offset linework on the correct layer with correct xdata, regardless of what the source lines symbology is.

1. Continuing in the *dsgnrd01.dwg* file.
2. Zoom to the highlighted area shown in the image below.

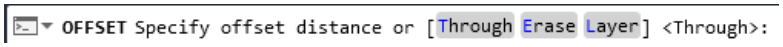


3. Open EMX if not open, in the text filter search box, type in sidewalk.
4. Left click in the 4” thick sidewalk, Pay item number 0522 1.

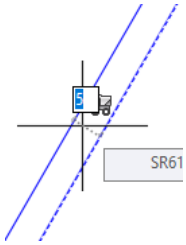



5. Select the Offset command in the EMX drawing tools  .

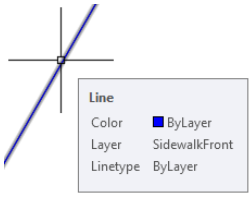
6. Notice the command line is seeking input, it now behaves identically to the AutoCAD offset function.

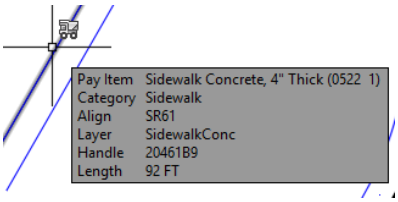



7. Enter in 5 to offset the first sidewalk line 5’.
8. Select the sidewalk line as shown and left click behind the line.




9. Let’s compare the data on the two lines, notice they are on separate layers, this is because EMX assigns the correct symbology of the selection you made.



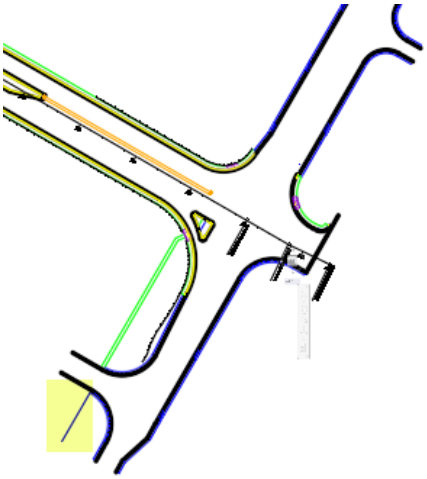




10. Save file before continuing.

## *Exercise 4.6 Using EMX Match Properties command*

In this exercise, the designer will use the Match Properties command in EMX to copy from a source line and assign selected symbology to a target line. The new linework will then assume the layer, line type, color, and Xdata of the source line work. There are two arcs offset 3 feet behind the sidewalk at the driveway entrance in the same area as the previous exercise that will need to be converted to guardrail.

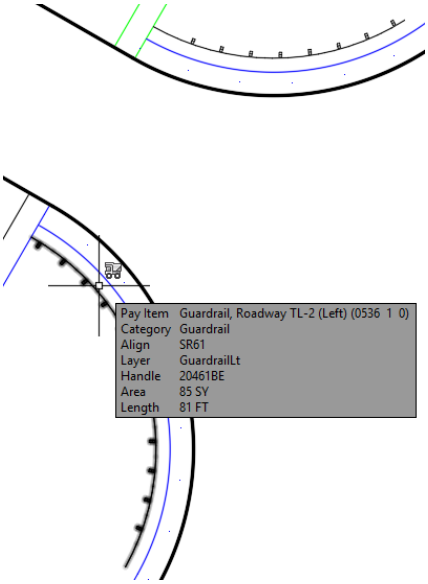
1. Continuing in the *dsgnrd01.dwg* file.
2. Zoom to the highlighted area shown in the image below.



3. Open EMX if not already open.
4. Select the Match Properties icon along the top of the EMX dialog box  .
5. Using the image below select the guardrail line where the 1 is located, this is your source line.

6. Following the image select your two arcs, then press enter.
7. Your drawing should look like image below.

Notice all the information that was added to the new guardrail. You can think of the match properties command as a copy and paste for cad entities.




8. Save and close file.

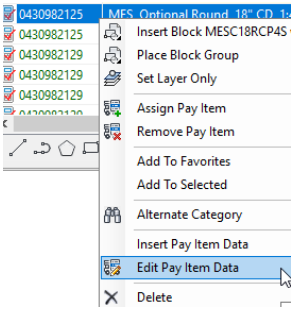
# 5 DRAINAGE NETWORKS

## OBJECTIVE

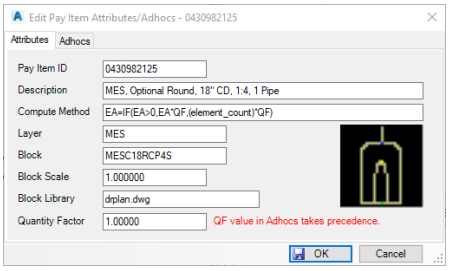
The objective of this chapter is to teach the designer additional steps that are required for certain drainage parts to quantify correctly. The designer will get a basic understanding on how drainage parts are set up in the FDOT Civil 3D State Kit with Pay Item Numbers already attached, which allows the designer to layout the drainage network and not have to worry about attaching Pay Item Information except for End Walls/Sections. The Pay Item information for all other pipes and structures are built into the FDOT Drainage parts list.

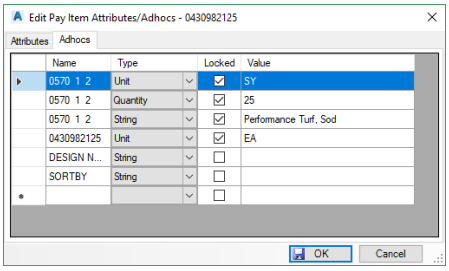
## INTRODUCTION

A brief overview of Drainage Parts and Networks is included in this chapter. The reason that EMX is needed to add additional Xdata is due to adhocs that a part of EMX. Using a Mitered End Section as an example, it not only contains the pay item number for the structure itself, it also contains a predetermined amount of sod based on the size of the structure. In EMX if you right click on the structure and select Edit Pay Item Data the *Edit Pay Item Attributes/Adhocs* dialog box opens.




The Attributes tab shows general information about the symbology of the structure. The Adhocs tab displays the additional Sod quantity that must be appended to the structure, so it can be quantified. The reason being that even though a drainage part can have multiple pay item numbers, it can only have one compute method or formula attached. In the case of the extra sod quantity which doesn't contain a formula, just a set Square Yardage amount




This issue is not limited to just Sod, some structures have Steel and Sod amounts as adhocs. It is good practice to keep this in mind when laying out a network to append the appropriate EMX part to the actual Civil 3D part, this in no way

effects the 3D drainage part or changes any drainage information that already exists. It simply adds additional attributes that can be read by Takeoff Manager. If you run a report and it shows 0 qty for sod that is an indicator that the adhoc data has not been applied.

## DRAINAGE COMPONENTS

Pipe Network catalogs *(*.xml)* - The Pipe Network catalogs is utilized for numerous projects, as it contains the standards for an entire organization. The Department provides Pipe Network catalogs as part of the FDOT Civil 3D State Kit.

Civil 3D organizes the components of a drainage system according to their spatial characteristics. Spatial information is stored as *Structures*, *Pipes* and *Pipe Networks*.

- **Structures:** Structure (inlets, manholes, end sections, etc.)
- **Pipes:** Pipes represents a linear feature depicting a path connecting two structures, traversing upstream to downstream. The path may be straight line or curvilinear (along a graphic element).
- **Pipe Networks**: A network is a system of interconnected structures and pipes that form a system through which water can flow to a single outlet. A drainage project using civil 3d can accommodate any number of Pipe Networks.

## HOW THE PARTS CATALOG WORKS

When pipe networks are created or edited, Civil 3D references the parts catalog for information about each part (pipe or structure).

The FDOT Civil 3D State Kit installs the default pipe network parts catalog at:

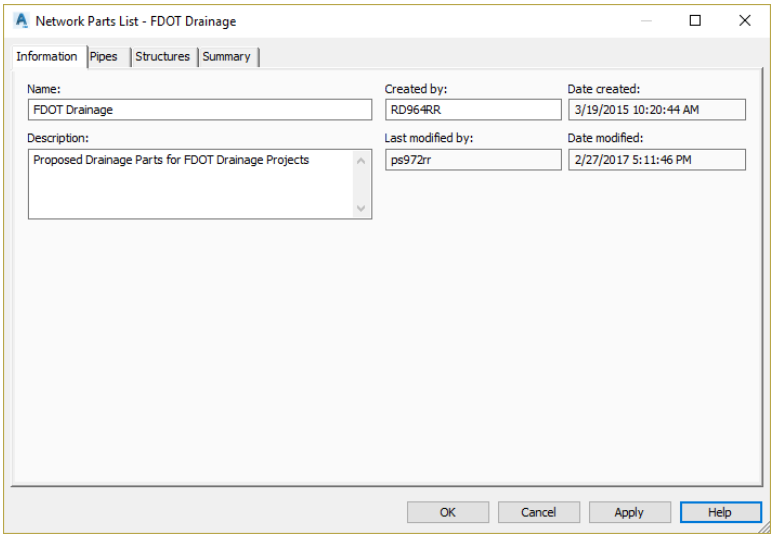
C:\FDOT20xx.C3D\Data\Pipes Catalog.

## DRAINAGE PART LIST INFORMATION

The FDOT Drainage parts list resides in the fdotmaster.dwt template that is used every time a design file is created using the Create File application. The path to the parts list is already set when you open Civil 3d using the FDOT State Kit icon.

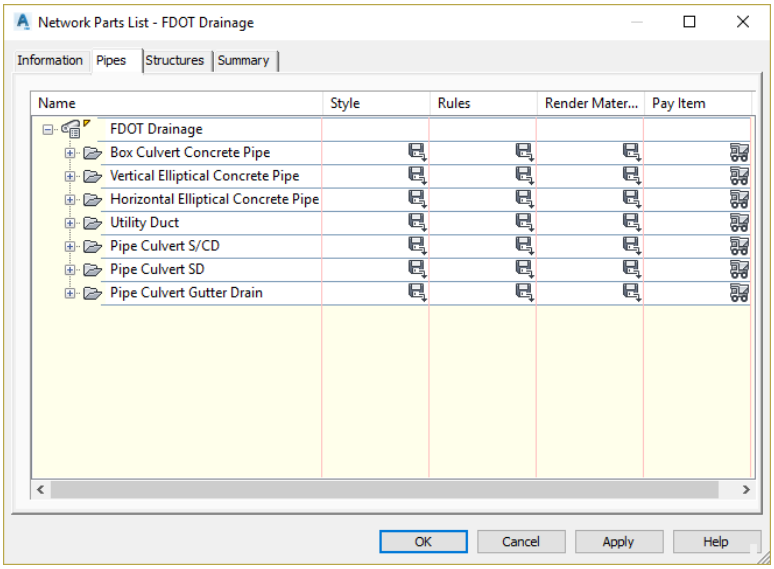
### *INFORMATION TAB:*

Use this tab to view or change general information for the pipe network parts list. The Name specifies the name of the current parts list. The Description specifies the description for the current parts list.




## *PIPES TAB:*

Inside the Parts list there are several styles that reside controlling the appearance of the parts to match FDOT standards. The image below shows what is contained within the Pipes tab of the parts list.

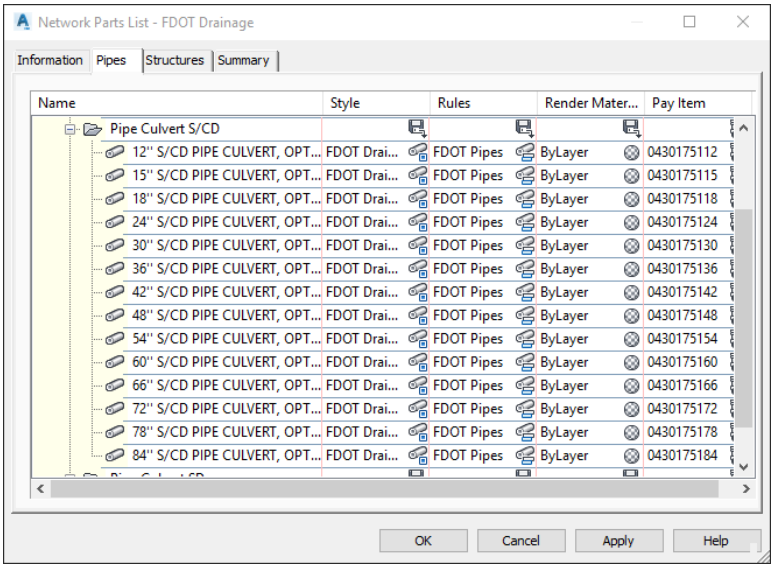



You can add new pipe sizes to the parts list or remove pipe sizes from the parts list. Each size selection matches a part size from an FDOT part family in the part catalog. Optional properties may also be set on the part size. The combined set of selected and optional properties is assigned to the pipe when it is inserted into the drawing.

- **Name:** This tree view displays the name of the FDOT parts list at the top level, and then the names of the FDOT part families included in the parts list, and then the names of the part sizes included in each part family. Note when a new size is added to the parts list, it is assigned a default unique name. The size name can be edited (renamed) to any unique name within the part family size list.
- **Style:** Specifies the default FDOT style assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected FDOT style to all part sizes within that family.
- **Rules:** Specifies the default rules assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.

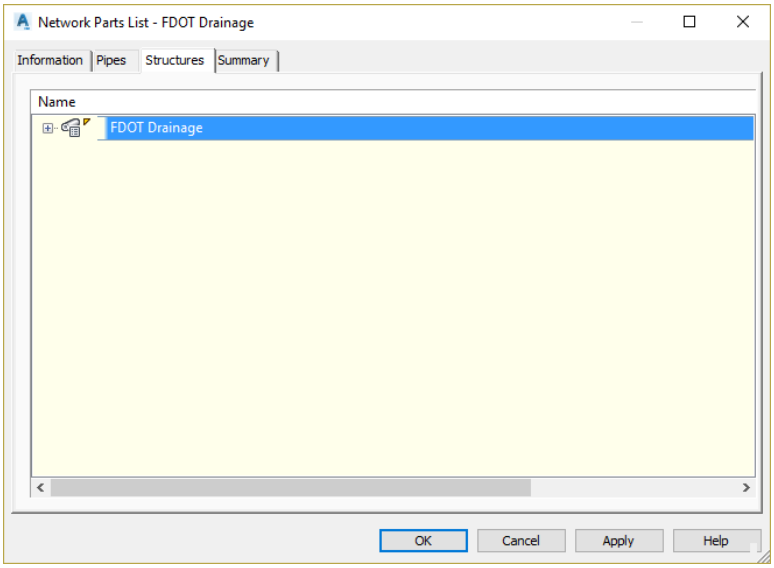
- **Render Material:** Specifies the default render material assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Pay Item:** Specifies the FDOT pay item ID assigned. Select a part family, or a part size within a FDOT part family, and then click to view the already assigned pay item to all part sizes within that family, or to an individual part size within that family.

Click on the + sign to the left of FDOT Drainage style to expand the list Pipe families.




Click on the + sign to the left of Pipe Culvert S/CD family to expand the list and display Round Pipe sizes.

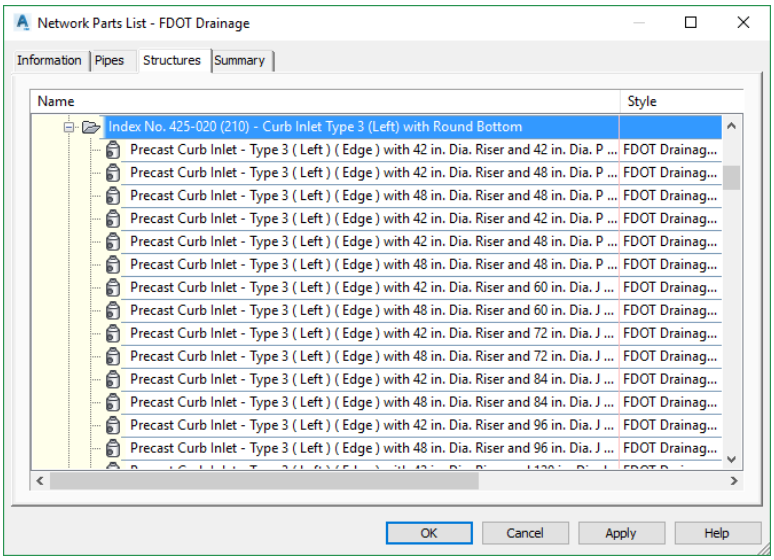
*STRUCTURES TAB:*




The Structure tab contains all the Structure families added from the Structure catalog: FDOT Imperial Structure Catalog. Use this tab to view or change the FDOT structure sizes included in the parts list.

You can add new FDOT structure sizes to the parts list or remove structure sizes from the parts list. Each size selection matches a part size from a part family in the part catalog. Optional properties may also be set on the part size. The combined set of selected and optional properties is assigned to the structure when it is inserted into the drawing.

- **Name:** This tree view displays the name of the FDOT parts list at the top level, and then the names of the FDOT part families included in the parts list, and then the names of the part sizes included in each part family. Note when a new size is added to the parts list, it is assigned a default unique name. The size name can be edited (renamed) to any unique name within the part family size list.
- **Style:** Specifies the default FDOT style assigned to the structure when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Rules:** Specifies the default FDOT rules assigned to the structure when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Render Material:** Specifies the default render material assigned to the FDOT structure when it is inserted into the drawing.
- **Pay Item:** Specifies the FDOT pay item ID assigned. Select an FDOT part family, or a part size within an FDOT part family, and then click to view the already assigned pay item to all part sizes within that family, or to an individual part size within that family.



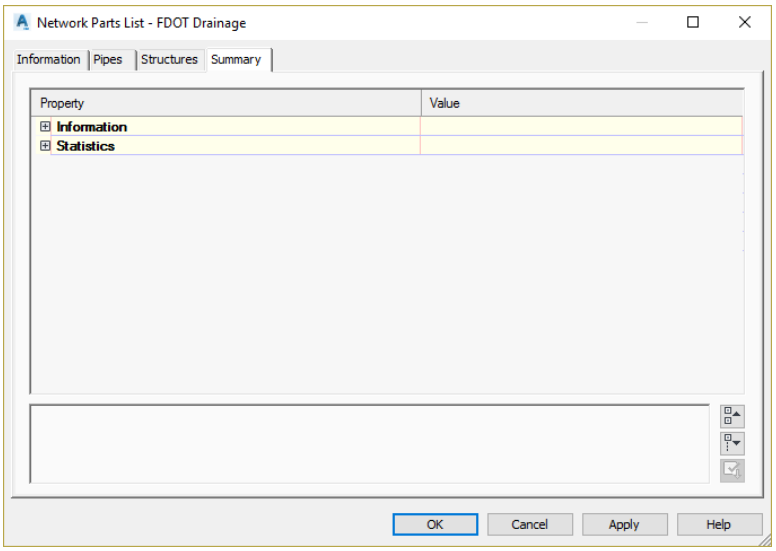

Click on the + sign to the left of FDOT Drainage style to expand the list of Structure families

Using the vertical slider button on the right side of the dialog box, scroll down to the structure family: Index No. 425-020 (210) - Curb Inlet Type 3 (left) with Round Bottom.

Click on the + sign to the left of Index No. 425-020 - Curb Inlet Type 3 (left) with Round Bottom family to expand the list and display the part sizes within the part family.

*SUMMARY TAB:*

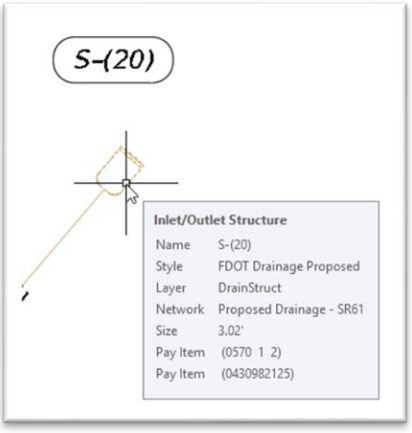
The Summary tab is used for information and statistics related to the part list, such as number of structures or pipes used.

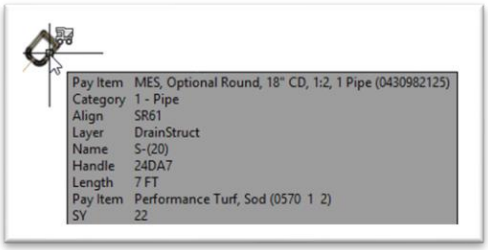



## *Exercise 5.1 Appending additional Pay Item Information to Drainage Parts*

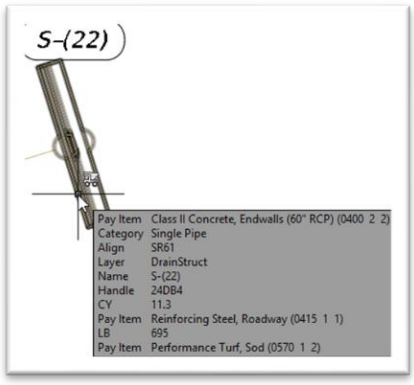
In this exercise, the designer will append additional Pay Item information contained as an Adhoc to the parts that currently do not contain the required material that needs to be quantified. The designer will use EMX and will become familiar with the drainage parts that require this extra step. For this exercise, a Proposed Drainage file has been created with a Drainage network Data referenced in.

1. Open the FDOT Civil 3D State Kit if not already open.
2. Open the *drprrd01.dwg* located in the drainage folder.
3. Zoom to station 707+00, you will be working with Structure S-(20) a MES.
4. From the FDOT Ribbon click the **Entity Manager** button.
5. In the Pay Item search box, type in **0430982125** and press enter.
6. Click on the Append Button located along the top of EMX and then select Structure S-(20) and press enter. Below shows a before and after.



7. Let's append data to two more structure, Zoom to Station 712+00 where there are two Concrete Endwalls.
8. In the Pay Item search box type in **0400 2 2** and press enter.
9. Using the Append button select the Endwalls, you can append to multiple structures at one time, then press enter to complete the command. Below shows a before and after.


10. Save and Close file.

***Note*** *You can add additional Pay Item numbers to parts, however you can only have one compute method or formula for quantifying per part.*

# 6 FDOT TAKEOFF MANAGER

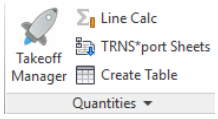
## OBJECTIVE

The objective of this chapter is to introduce you to the functions of the FDOT Takeoff Manager (FT located on the FDOT Ribbon. The designer will become familiar with the settings and the options with the report viewer, along with the location of the formatted spreadsheets that are delivered with the State Kit.

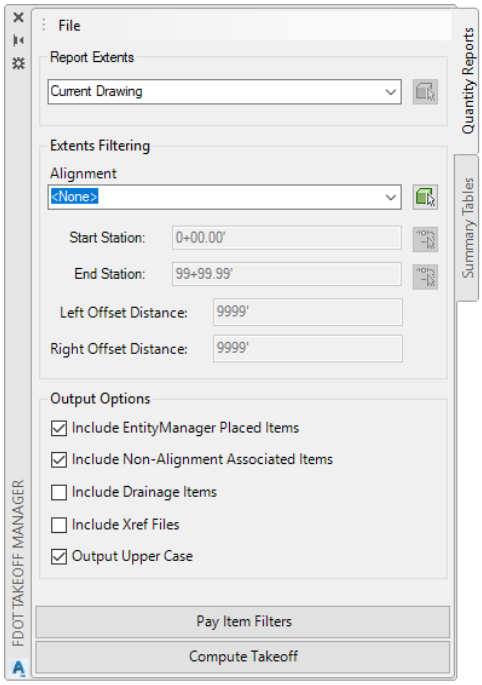
## INTRODUCTION

The Takeoff manager is used to generate quantity reports that can then be linked to the appropriate design file using Autodesk's Data Link Manager. The designer up to this point has used all the FDOT tools available to place, draw, edit entities with Pay Items. The following is an overview of the application

### TAKEOFF MANAGER



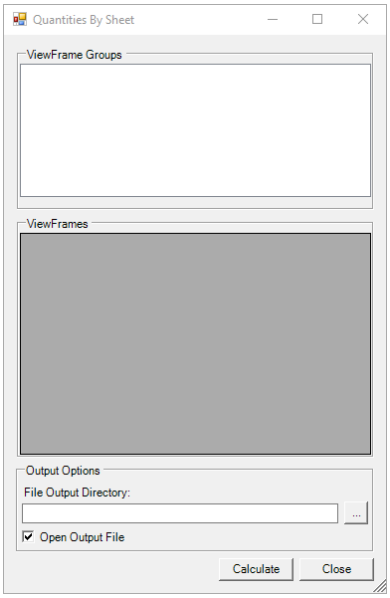

Located on the FDOT Ribbon in the Quantities panel is the Takeoff Manager icon. When selected the dialog box opens. As shown below.



## QUANTITY REPORTS TAB

When opened this is the default tab, this tab will let you run generic reports for Area, Count, Linear, & Volume. Let's look at each option available on this tab.

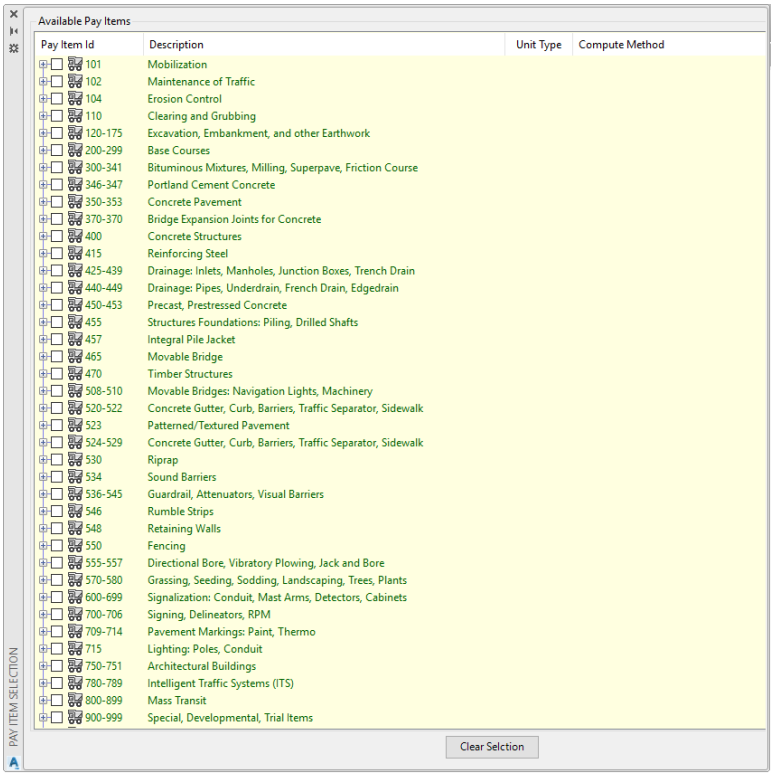
- **Report Extents** – This pulldown has two options available. You can use the default *Current Drawing* which will generate a report in the current drawing. The second option is *Sheet Extents* which will open the Quantities by Sheet option that is used to generate Traffic Plan quantities which is covered in a later chapter. A image of the dialog is shown below.




- **Extent Filtering** – This section allows you to select the Alignment used for the quantity takeoff. The Alignment is used to determine the station and offset side of the entity. You can either select from the pulldown or use the selection button to pick the alignment. The default is the total length of the alignment, but you can either type in a station range manually or use the pick button to select a starting point or ending point along the alignment. The offset distance options allow you to choose how far the search distance is that the application uses to find entities with pay item information. The default is 10,000' Left and Right.

- **Output Options** – This section allows the designer to choose the options used to determine what is reported. By default, the *Include Entity Manager Placed Items & Include Non-Alignment Associated Items* are turned on. This will assure that any items placed by EMX and items that are not associated to an alignment will show in the report. You have an option to report Drainage Networks independently if desired or included in your report (as of this writing a Summary of Drainage Structures report process is being developed). You can also toggle on the *Include Xref Files* if you want to include the quantities that are on an xref file in the background of your source design file. The *Output Upper Case* is set by default since it is a FDOT Standard that the report text be in Upper Case.

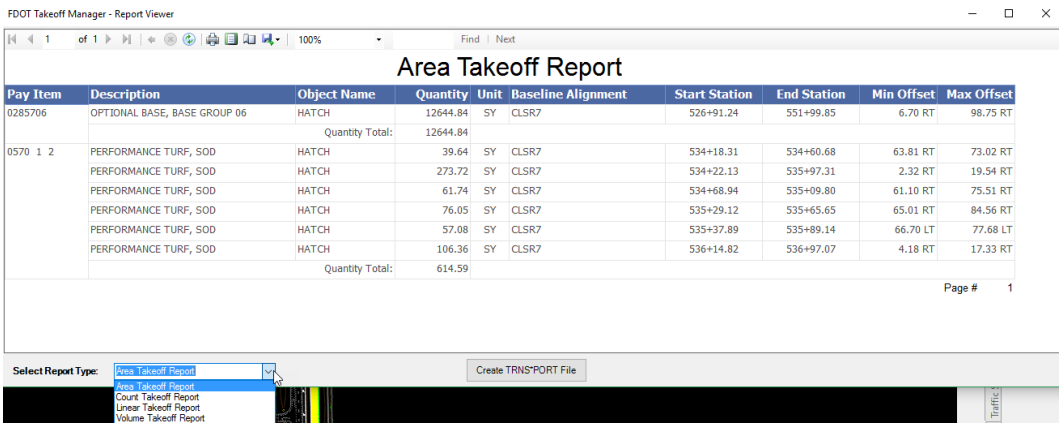
## PAY ITEM FILTERS



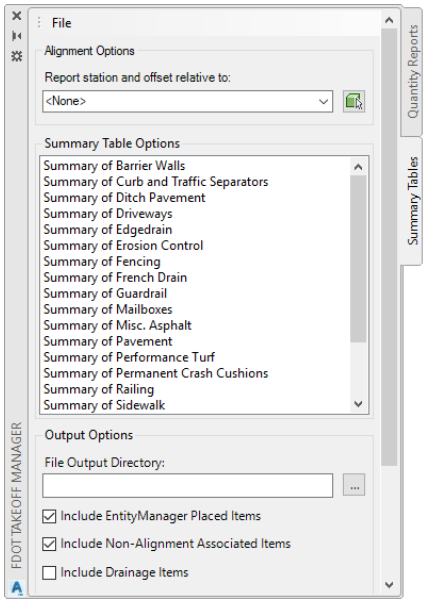

Pay Item Filters are used to select a specific category that you want to run a report against. The dialog box is set up in tree mode that you can either select a whole category number or expand and select individual items, when complete with the report open the Filter dialog box and select **Clear Selection.**

## COMPUTE TAKEOFF

Clicking this will execute the report generation process which looks like image below.



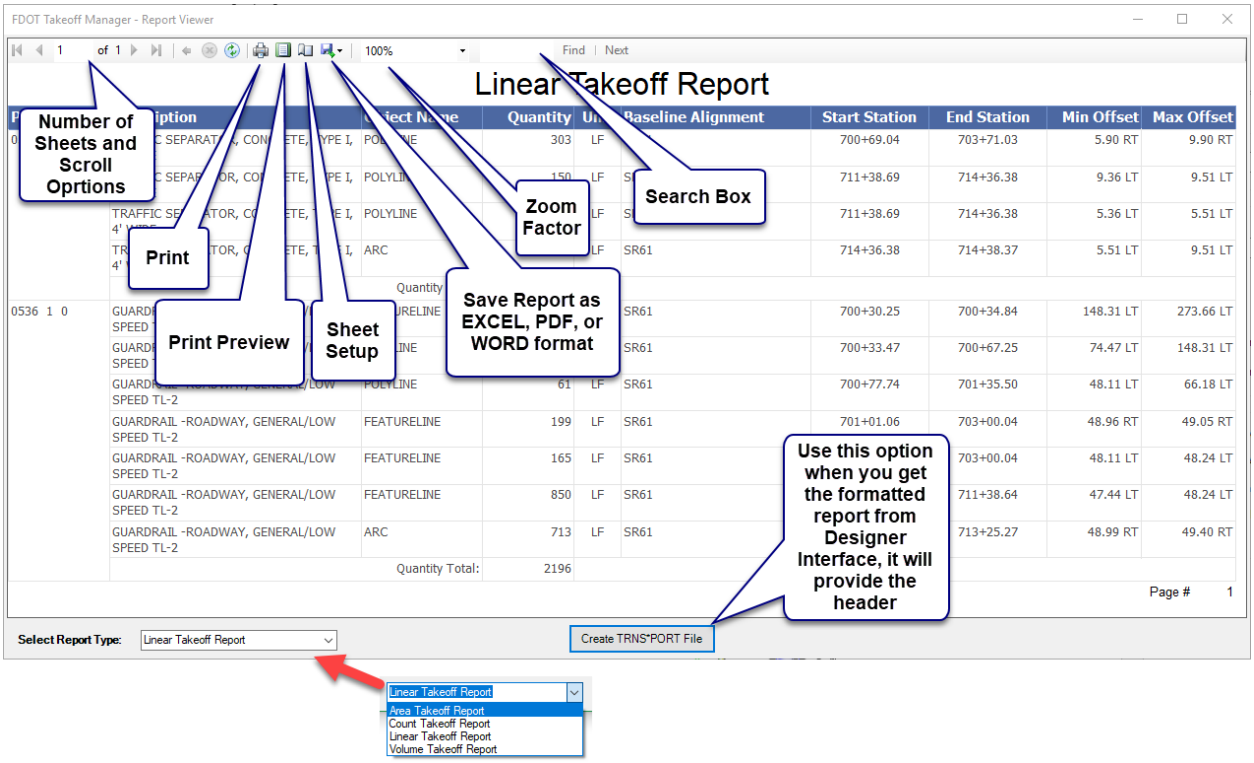
## SUMMARY TABLES TAB

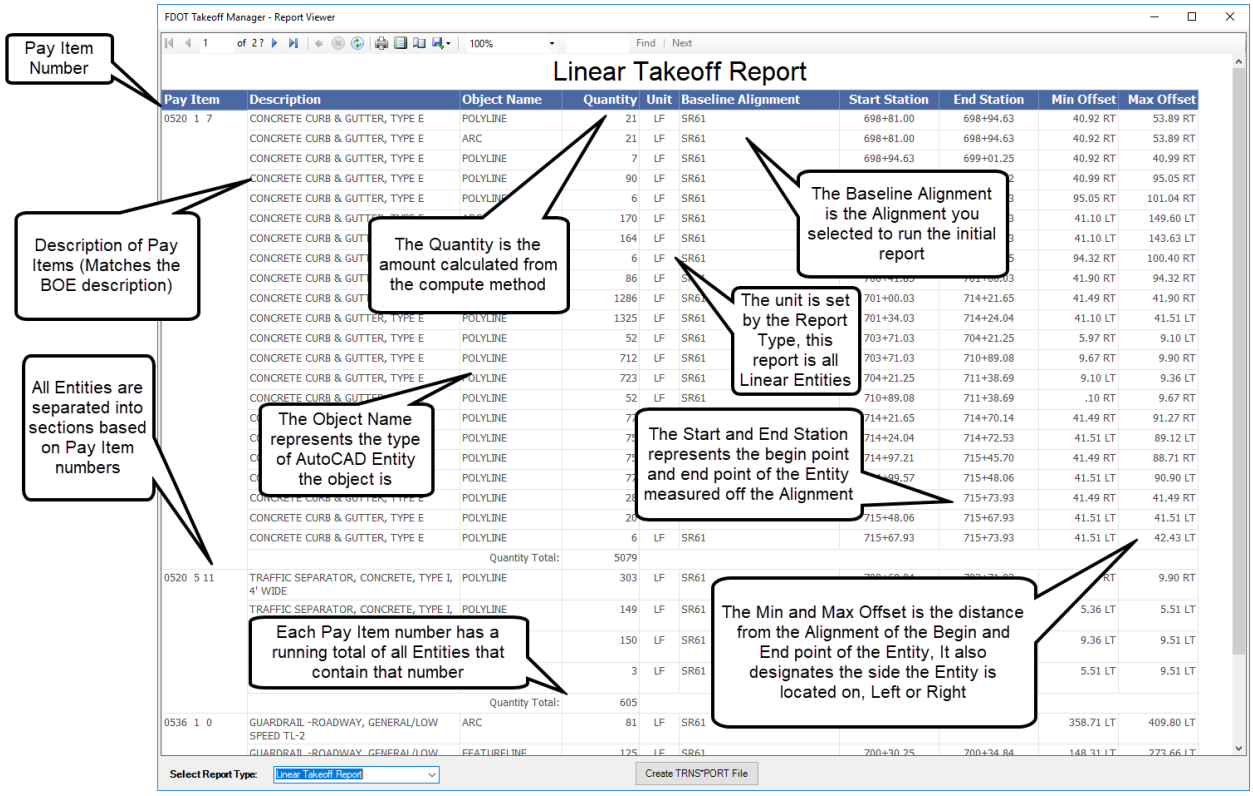



- **Alignment Options –** The *Report station and offset relative to:* section allows you to select the Alignment used for the quantity takeoff. The Alignment is used to determine the station and offset side of the entity. You can either select from the pulldown or use the selection button to pick the alignment. The default is the total length of the alignment, but you can either type in a station range manually or use the pick button to select a starting point or ending point along the alignment.
- **Summary Table Options –** This section contains the automated reports, meaning that when the report is run the data is automatically transferred to the spreadsheet and opened in excel for viewing and is ready to be linked to the drawing file. You can run multiple reports at one time or run them one at a time.
- **Output Options –** This is where you can control where the reports are saved, typically they are located in the Calculations folder within your project. The other options here are like the output options on the *Quantity Reports* tab with the exceptions of *Create Corresponding CSV File(s)* which will create a separate CSV (Comma, Separated, Value file) along with the formatted spreadsheet report and the *Open Output File(s)* which will launch Excel and open the Automated report(s) when complete.
- **Create Summary Tables** – Executes the command to generate the reports that were selected to run, when complete Excel will open and if you run multiple reports at once a separate session of excel will open for each report.

## REPORT VIEWER

When a report is run from the Quantity Reports tab a generic report viewer opens with the following options, see image below for details.


FDOT Takeoff Manager - Report Viewer
Linear Takeoff Report
Number of Sheets and Scroll Oprtions
Print
Print Preview
Sheet Setup
Save Report as EXCEL, PDF, or WORD format
Zoom Factor
Search Box
Use this option when you get the formatted report from Designer Interface, it will provide the header
Select Report Type:
Linear Takeoff Report
Create TRNS*PORT File
Area Takeoff Report
Count Takeoff Report
Linear Takeoff Report
Volume Takeoff Report


FDOT Takeoff Manager - Report Viewer
Linear Takeoff Report
Pay Item Number
Description of Pay Items (Matches the BOE description)
All Entities are separated into sections based on Pay Item numbers
The Quantity is the amount calculated from the compute method
The Object Name represents the type of AutoCAD Entity the object is
The Baseline Alignment is the Alignment you selected to run the initial report
The unit is set by the Report Type, this report is all Linear Entities
The Start and End Station represents the begin point and end point of the Entity measured off the Alignment
Each Pay Item number has a running total of all Entities that contain that number
The Min and Max Offset is the distance from the Alignment of the Begin and End point of the Entity, It also designates the side the Entity is located on, Left or Right
Select Report Type:
Linear Takeoff Report
Create TRNS*PORT File

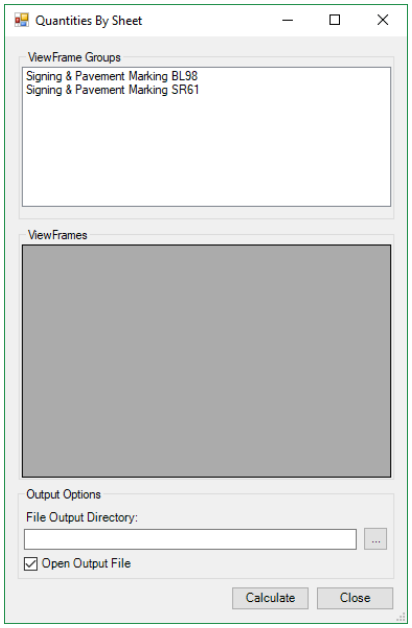
# 7 QUANTITIES BY SHEET

## OBJECTIVE

The Objective of this chapter is to provide the designer an over view of the workflow to generate reports of Traffic Plan quantities, which are reported per sheet and automatically transferred to a formatted spreadsheet which is ready to be linked to the appropriate design file.

## INTRODUCTION

A new function that has been added to Takeoff manager is called Quantities by Sheet, which works when you have View Frame Groups in a design file. You can be in Model space and run the application on an unlimited number of view frame groups and frames at once, unlike before where you had to be in an individual sheet and run a per sheet report that produced an unformatted report for each sheet layout that the drawing contained. It is important to note that the sheets (view frames) should be numbered as they would be in the plans (S-1,S-2,etc), since you could have duplicate view frame numbers on multiple alignments, which will create an error. Below is an overview of the options available.




- **View Frame Groups –** This will display the available view frame groups in the drawing file. They can either be in the source file itself, or Data referenced in. You can select and run all View Frame Groups at once. The application will not function without a View Frame Group present.

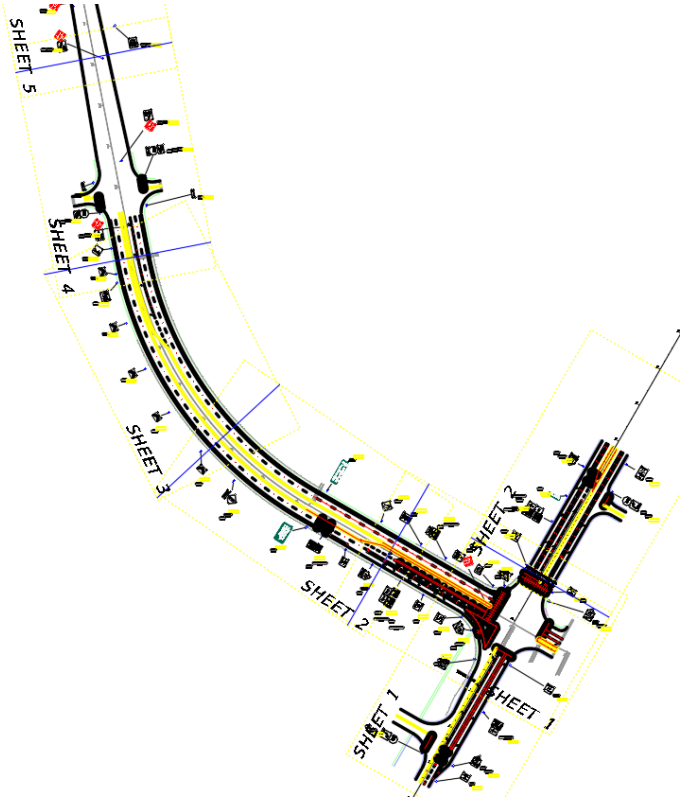
- **Viewframes –** This list contains the individual View Frames that are in the View Frame Group. You can select the entire list by dragging the mouse over the left side of the list or by holding the 'Ctrl' key and left clicking your mouse.
- **Output Options –** This is where you tell the application to save your report, you should save it in your calculations folder in your project.
- **Calculate –** This executes the report generation. Upon completion, a message box opens informing you that the report was created successfully and without errors, after clicking OK Microsoft Excel will launch and open the report.
- **Close –** This button closes the Quantities by Sheet application, it is recommended that you also close Takeoff Manager after use. If FDOT applications are left open and the designer opens another drawing file you run the risk of crashing Civil 3d.

## *Exercise 7.1 Running a Report using Quantities by Sheet and Linking to file*

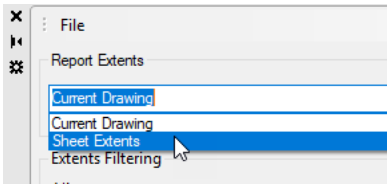
In this exercise, the designer will use an already set up file that contains View Frames, Alignments, and Signing & Pavement Marking information and run a report of Traffic Plan Tabulation of Quantities report. The designer will then use Data Link Manager to link the report to the appropriate design file.

### ➢ *Running a Report (Part 1)*

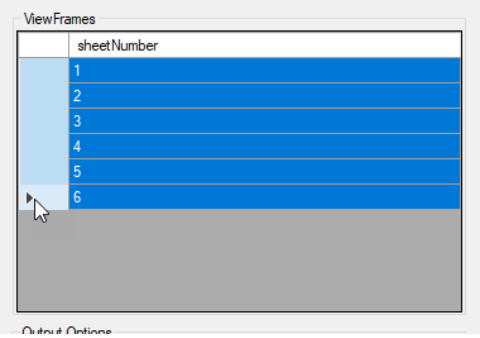
1. Open the FDOT Civil 3D State Kit if not already open.
2. Open the *dsgnsp01.dwg* located in the Signing folder within your project.




3. On the FDOT Ribbon, click on the Takeoff Manager icon located on the Quantities panel.
4. Under the Report Extents pulldown select *Sheet Extents*



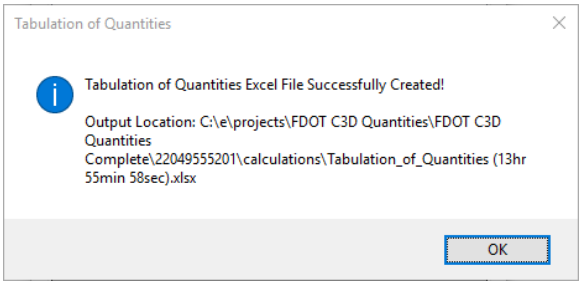

5. The Quantities by Sheet dialog box opens, select the **Signing & Pavement Marking SR61** View Frame Group.
6. Left Click your mouse and drag inside the left column from top to bottom selecting all View Frames.




7. Click on the Ellipse button on *File Output Directory* and browse to your **Calculations** folder as the save location.
8. Leave *Open Output File* toggled on and click on **Calculate**.

At this point on your screen you see the application highlight individual view frames as it processes.

9. The report information box opens, Click **OK.**




10. The Report opens in Excel as shown below.

| PAY ITEM NO. | DESCRIPTION | UNIT | SHEET NUMBERS 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | | | TOTAL THIS SHEET | | GRAND TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL | PLAN | FINAL |
| 0700 1 11 | Single Post Sign, F&I Ground Mount, Up To 12 SF | AS | 13 | | 4 | | 6 | | 7 | | 8 | | 1 | | | | 39 | | 39 | |
| 0700 1 12 | Single Post Sign, F&I Ground Mount, 12-20 SF | AS | 1 | | 1 | | | | 1 | | 1 | | | | | | 4 | | 4 | |
| 0700 1 13 | Single Post Sign, F&I Ground Mount, 21-30 SF | AS | | | 1 | | | | | | | | | | | | 1 | | 1 | |
| 0700 2 18 | Multi- Post Sign, F&I Ground Mount, 301-400 SF | AS | | | 1 | | | | | | | | | | | | 1 | | 1 | |
| 0706 3 | Retro-Reflective Pavement Markers | EA | 121 | | 23 | | 33 | | 8 | | | | | | | | 185 | | 185 | |
| 0710 11101 | Painted Pavement Markings, Standard, White, Solid, 6" | GM | .573 | | .253 | | .312 | | .248 | | .186 | | .126 | | | | 1.698 | | 1.698 | |
| 0710 11102 | Painted Pavement Markings, Standard, White, Solid For Interchange And Urban Island, 8" | GM | .027 | | | | | | | | | | | | | | .027 | | .027 | |
| 0710 11123 | Painted Pavement Markings, Standard, White, Solid For Crosswalk And Roundabout, 12" | LF | 340 | | | | | | | | | | | | | | 340 | | 340 | |
| 0710 11124 | Painted Pavement Markings, Standard, White, Solid For Diagonal Or Chevron, 18" | LF | 233 | | | | | | | | | | | | | | 233 | | 233 | |
| 0710 11125 | Painted Pavement Markings, Standard, White, Solid For Stop Line Or Crosswalk, 24" | LF | 158 | | 48 | | | | 50 | | | | | | | | 256 | | 256 | |
| 0710 11131 | Painted Pavement Markings, Standard, White, Skip, 10-30 Or 3-9 Skip, 6" Wide | GM | .105 | | .268 | | .275 | | .054 | | | | | | | | .702 | | .702 | |
| 0710 11141 | Painted Pavement Markings, Standard, White, 2-4 Dotted Guideline/ 6-10 Dotted Extension, 6" | GM | .032 | | .042 | | .015 | | | | | | | | | | .089 | | .089 | |
| 0710 11160 | Painted Pavement Markings, Standard, White, Message Or Symbol | EA | 3 | | 3 | | | | | | | | | | | | 6 | | 6 | |
| 0710 11170 | Painted Pavement Markings, Standard, White, Arrows | EA | 13 | | 1 | | 3 | | 2 | | | | | | | | 19 | | 19 | |
| 0710 11201 | Painted Pavement Markings, Standard, Yellow, Solid, 6" | GM | .248 | | .186 | | .187 | | .070 | | | | | | | | .692 | | .692 | |
| 0711 11123 | Thermoplastic, Standard, White, Solid, 12" For Crosswalk And Roundabout | LF | 340 | | | | | | | | | | | | | | 340 | | 340 | |
| 0711 11125 | Thermoplastic, Standard, White, Solid, 24" For Stop Line And Crosswalk | LF | 158 | | 48 | | | | 50 | | | | | | | | 256 | | 256 | |
| 0711 11160 | Thermoplastic, Standard, White, Message Or Symbol | EA | | | 2 | | | | | | | | | | | | 2 | | 2 | |
| 0711 11170 | Thermoplastic, Standard, White, Arrow | EA | 6 | | | | | | | | | | | | | | 6 | | 6 | |
| 0711 14125 | Thermoplastic, Preformed, White, Solid, 24" For Crosswalk | LF | 296 | | | | | | | | | | | | | | 296 | | 296 | |
| 0711 14160 | Thermoplastic, Preformed, White, Message | EA | 4 | | 2 | | 2 | | 1 | | | | | | | | 9 | | 9 | |
| 0711 14170 | Thermoplastic, Preformed, White, Arrow | EA | 4 | | 2 | | 5 | | 3 | | | | | | | | 14 | | 14 | |
| 0711 15101 | Thermoplastic, Standard-Open Graded Asphalt Surfaces White, Solid, 6" | GM | .526 | | .253 | | .312 | | .248 | | .186 | | .126 | | | | | | 1.652 | |
| 0711 15131 | Thermoplastic, Standard-Open Graded Asphalt Surfaces, White, Skip, 6", 10-30 Skip Or 3-9 Lane Drop | GM | .105 | | .268 | | .275 | | .054 | | | | | | | | | | .702 | |
| 0711 15201 | Thermoplastic, Standard-Open Graded Asphalt Surfaces, Yellow, Solid, 6" | GM | .248 | | .186 | | .187 | | .070 | | | | | | | | | | .692 | |

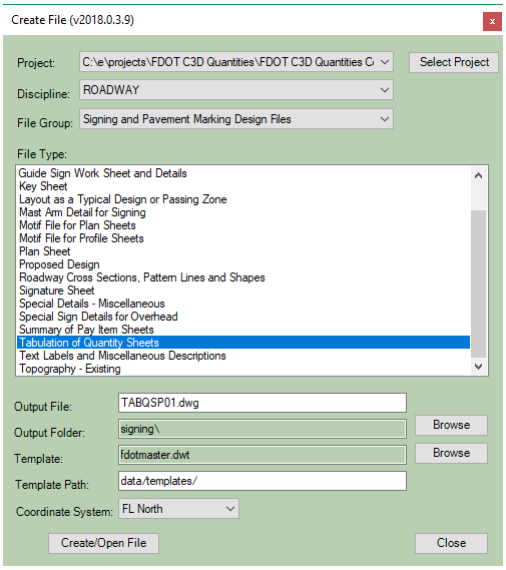
Notice the Sheet numbers in the report. Depending on how many view frames you have the report could have many sheets, each report sheet contains up to 7 plan sheets, which means if you have 21 View Frames you will have 3 report sheets listing 7 pages each. The quantities are added together from each sheet and will give you a Grand Total of the entire project.

11. Save and Close the Excel File.

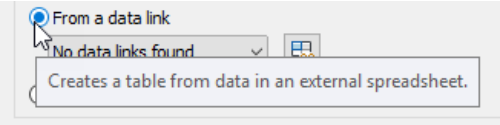
### ➢ *Linking Report (Part 2)*

In this part of the exercise, the designer will create a new file that will contain the Linked spreadsheet file that was created in the previous steps.

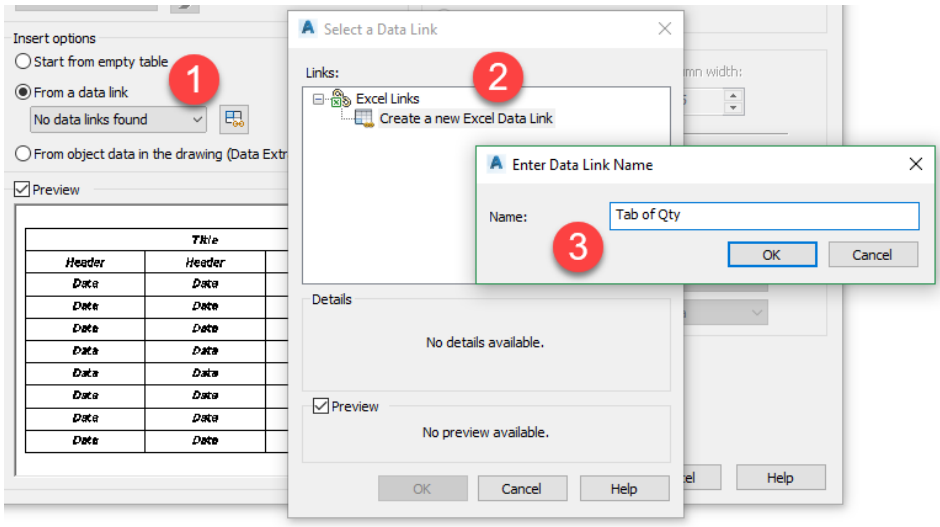
1. Continuing with the *dsgnsp01.dwg* open, switch to the FDOT Ribbon and select **Create File**.
2. Fill in the following as shown below, you will be creating a *tabqsp01.dwg*



3. Click on **Create/Open File**.
4. After file is opened, click on **Close** to exit dialog.
5. Close the *dsgnsp01.dwg* if still open.
6. Make **Tables_dp** the current layer.
7. Select the Model Layout Tab.
8. On the FDOT Ribbon click on the **Create Table** icon, located on the Quantities Panel.
9. Click on the **From a data link.**

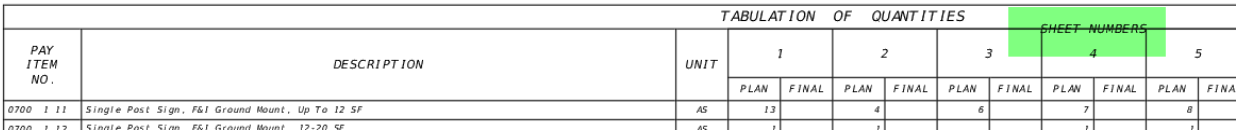



10. Step 1 as shown in the diagram below, click the Link button to open the **Select a Data Link** dialog.
11. Step 2, click on the **Create a new Excel Data Link**.
12. Step 3, For name type in **Tab of Qty** and select **OK.**

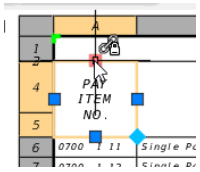



13. Click the Ellipse button and browse to the Calculations folder and select the **Tabulation of Quantities** report. Each report will have a time stamp on it to prevent you from over writing a report by mistake.
14. Select **Open** to start the loading process.
15. Press **OK** on all open dialog boxes one at a time to close them all.
16. On the command line the word **Table** is visible, this is the indication that it is working, be patient it may take a minute. If you don't see the word Table then a step above has been missed.

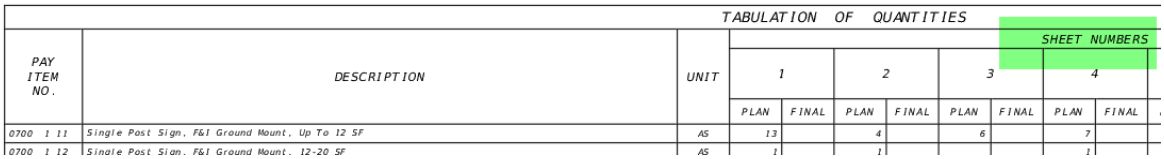

17. After a Minute or so a report is attached to your cursor, left click anywhere in the screen, since you are in Model Space.
18. AutoCAD has a bug when linking a report and this is the fix for it, notice in the image below the row *Sheet Numbers* is collapsed.




19. Left click in the Pay Item No. cell and click on the top blue grip of the cell and with osnaps turned off, drag it slightly above its current selection and left click.




20. The result is it un collapses the Row as shown below.

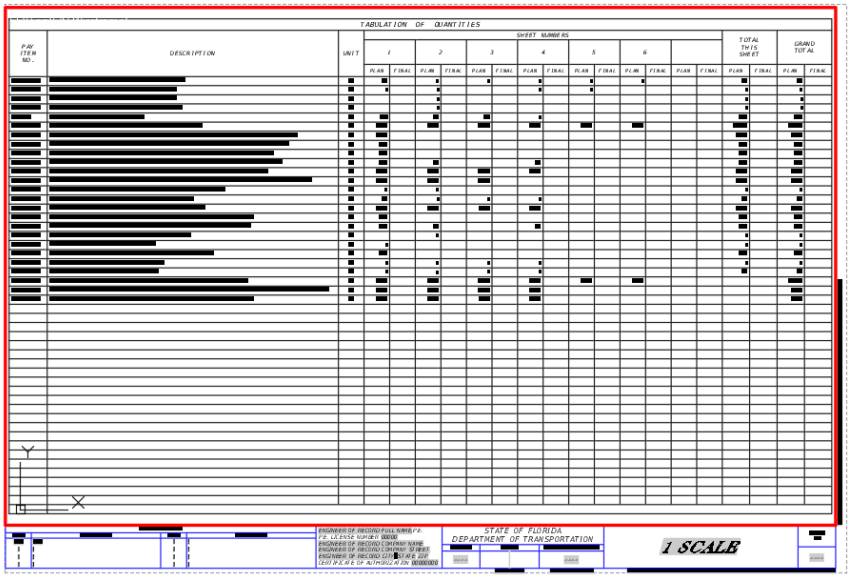



21. Click the blue lock to un lock it, double click inside the view port to make it active.
22. Zoom Extents to fill the View port Border with the report.
23. Click on the Lock again to lock the viewport.

From here you could Right click on the layout and rename it to the proper name and add the sheet to the project sheet set, which will fill in information on the Sheet Border. See the Traffic Plans Manual for additional steps and details to accomplish that task if needed.

Your drawing should look like below.

24. Save and Close your file.



# 8 QUANTITY REPORTS

## OBJECTIVES

The objective of this chapter is to teach the designer how to use the FDOT Takeoff Manager (FTM) to run the various reports that are required to meet the departments established workflows.

## INTRODUCTION

This chapter covers the detailed functionality of using the FDOT Takeoff manager to generate the reports based off the pay item entities that were added in earlier chapters, for a detailed description of options on FTM refer to Chapter 6. The location of the formatted spreadsheets that are in the State Kit is also covered.

### *Exercise 8.1 Run a Linear Report*

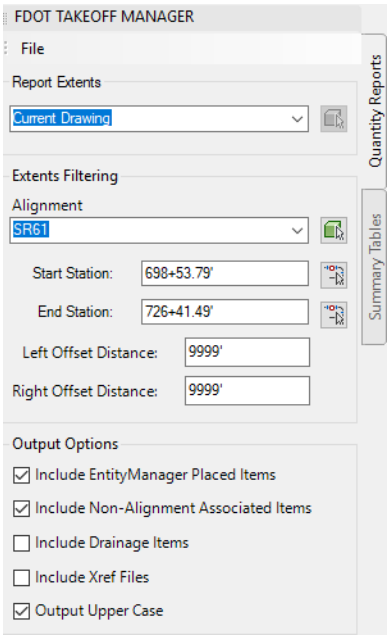
- ***Running a Linear Report on the Quantity Reports tab (Part 1)***

In this exercise, the designer will run a series of Linear reports with FTM, utilizing the *Quantity Reports and Summary Tables* tab.

1. Launch the FDOT Civil 3D State Kit if not already open.
2. Open the *dsgnrd01.dwg* located in the Roadway folder of your project.
3. On the FDOT Ribbon click on the **Takeoff Manager** icon.

***Note*** *You can close Toolspace and dock the FTM dialog in its place to gain screen real estate.*

4. Use the pull down to select the alignment **SR61** and match the image below.



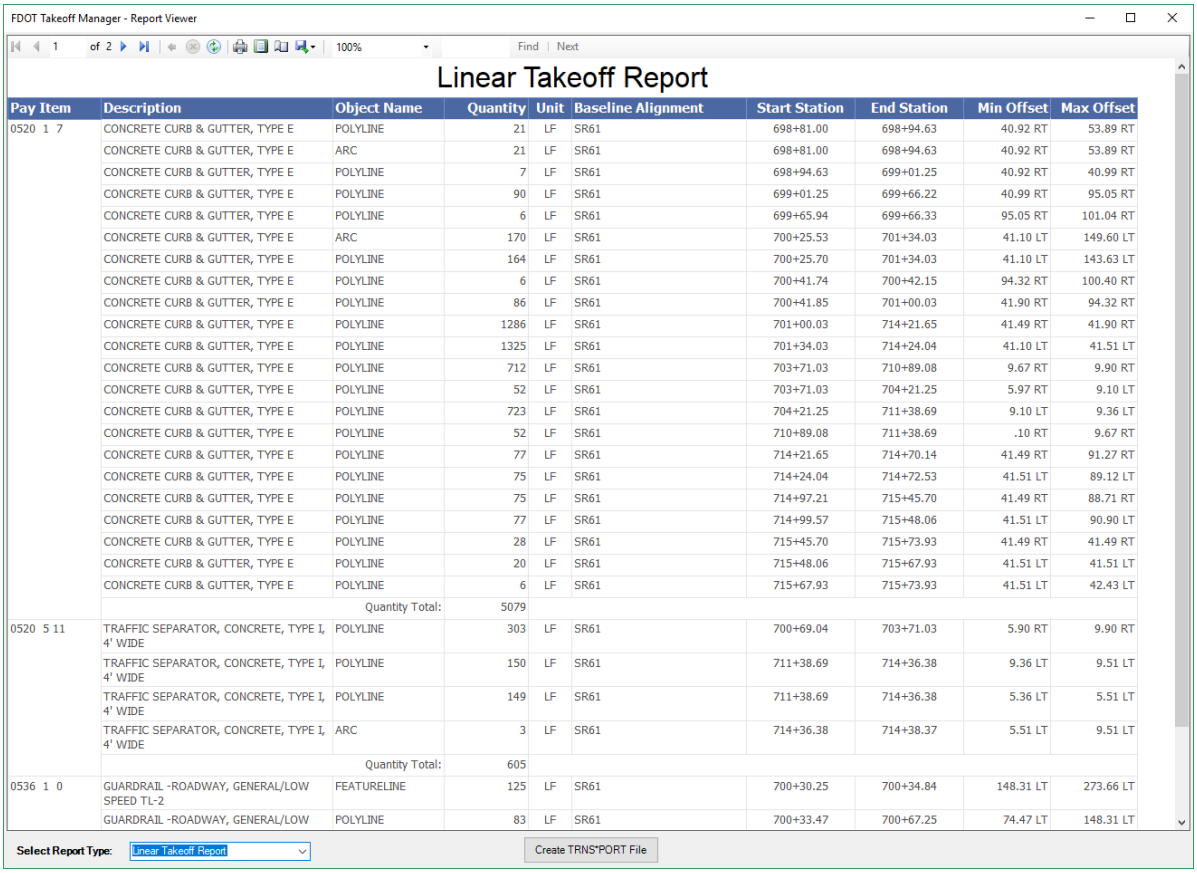

5. Select **Compute Takeoff.** The drawing will be read for all objects that contain Xdata. A report viewer will open when complete.


6. The *Area Takeoff Report* is displayed by default. which is blank, since no areas exist in this file.
7. Change the report type to the *Linear Takeoff Report*. Let's look at the report viewer and what is being reported.

## REPORT VIEWER

- **Pay Item –** This column displays the Pay Item number associated with the objects.
- **Description -** The description matches what is in the EMX database and BOE.
- **Object Name -** The object type displays what each object type it is, Line, Polyline, Arc, Featureline, etc.
- **Quantity –** This column displays the total length of each segment the application found.
- **Unit –** This column displays how the Item is quantified, LF, EA, SY, etc.
- **Baseline Alignment** – This column displays what alignment the objects are associated with.
- **Start/End Station** – These columns display the start and/or the end station of the object along the associated alignment.
- **Min/Max Offset** – These columns display the offset and side of the object along the selected alignment.

The report shows individual objects of the same Pay Item number, but provides a Quantity total for each number.




| Pay Item | Description | Object Name | Quantity | Unit | Baseline Alignment | Start Station | End Station | Min Offset | Max Offset |
|---|---|---|---|---|---|---|---|---|---|
| 0520 1 7 | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 21 | LF | SR61 | 698+81.00 | 698+94.63 | 40.92 RT | 53.89 RT |
| | CONCRETE CURB & GUTTER, TYPE E | ARC | 21 | LF | SR61 | 698+81.00 | 698+94.63 | 40.92 RT | 53.89 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 7 | LF | SR61 | 698+94.63 | 699+01.25 | 40.92 RT | 40.99 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 90 | LF | SR61 | 699+01.25 | 699+66.22 | 40.99 RT | 95.05 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 6 | LF | SR61 | 699+65.94 | 699+66.33 | 95.05 RT | 101.04 RT |
| | CONCRETE CURB & GUTTER, TYPE E | ARC | 170 | LF | SR61 | 700+25.53 | 701+34.03 | 41.10 LT | 149.60 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 164 | LF | SR61 | 700+25.70 | 701+34.03 | 41.10 LT | 143.63 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 6 | LF | SR61 | 700+41.74 | 700+42.15 | 94.32 RT | 100.40 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 86 | LF | SR61 | 700+41.85 | 701+00.03 | 41.90 RT | 94.32 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 1286 | LF | SR61 | 701+00.03 | 714+21.65 | 41.49 RT | 41.90 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 1325 | LF | SR61 | 701+34.03 | 714+24.04 | 41.10 LT | 41.51 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 712 | LF | SR61 | 703+71.03 | 710+89.08 | 9.67 RT | 9.90 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 52 | LF | SR61 | 703+71.03 | 704+21.25 | 5.97 RT | 9.10 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 723 | LF | SR61 | 704+21.25 | 711+38.69 | 9.10 LT | 9.36 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 52 | LF | SR61 | 710+89.08 | 711+38.69 | .10 RT | 9.67 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 77 | LF | SR61 | 714+21.65 | 714+70.14 | 41.49 RT | 91.27 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 75 | LF | SR61 | 714+24.04 | 714+72.53 | 41.51 LT | 89.12 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 75 | LF | SR61 | 714+97.21 | 715+45.70 | 41.49 RT | 88.71 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 77 | LF | SR61 | 714+99.57 | 715+48.06 | 41.51 LT | 90.90 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 28 | LF | SR61 | 715+45.70 | 715+73.93 | 41.49 RT | 41.49 RT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 20 | LF | SR61 | 715+48.06 | 715+67.93 | 41.51 LT | 41.51 LT |
| | CONCRETE CURB & GUTTER, TYPE E | POLYLINE | 6 | LF | SR61 | 715+67.93 | 715+73.93 | 41.51 LT | 42.43 LT |
| | | Quantity Total: | 5079 | | | | | | |
| 0520 5 11 | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | POLYLINE | 303 | LF | SR61 | 700+69.04 | 703+71.03 | 5.90 RT | 9.90 RT |
| | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | POLYLINE | 150 | LF | SR61 | 711+38.69 | 714+36.38 | 9.36 LT | 9.51 LT |
| | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | POLYLINE | 149 | LF | SR61 | 711+38.69 | 714+36.38 | 5.36 LT | 5.51 LT |
| | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | ARC | 3 | LF | SR61 | 714+36.38 | 714+38.37 | 5.51 LT | 9.51 LT |
| | | Quantity Total: | 605 | | | | | | |
| 0536 1 0 | GUARDRAIL -ROADWAY, GENERAL/LOW SPEED TL-2 | FEATURELINE | 125 | LF | SR61 | 700+30.25 | 700+34.84 | 148.31 LT | 273.66 LT |
| | GUARDRAIL -ROADWAY, GENERAL/LOW | POLYLINE | 83 | LF | SR61 | 700+33.47 | 700+67.25 | 74.47 LT | 148.31 LT |

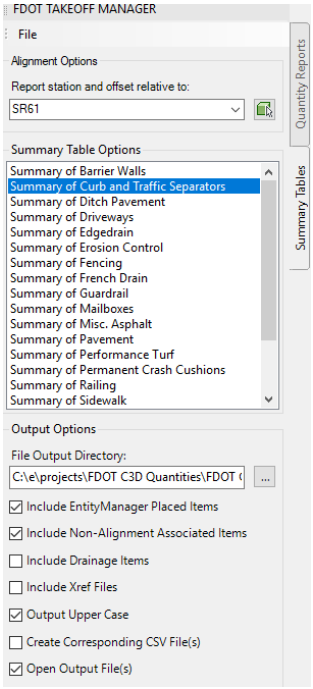
8. Close the report by clicking on the X in the upper right corner.
9. Save the drawing before continuing.

## *Exercise 8.2 Running a Formatted Linear Report*

### ➢ *Running a Linear Report on the Summary Tables tab (Part 2*

In this portion of the exercise, the designer will run a Linear Curb & Gutter report on the summary tables tab which will launch Microsoft excel and open the excel spreadsheet filled in with the data.

1. Continuing in the *dsgnrd01.dwg* file
2. With FTM still open switch to the Summary Tables tab.
3. Select the **SR61** alignment and make the following selections on the dialog, browse to the calculations folder in your project for the report location.




4. Select **Create Summary Tables** to execute the report.
5. Microsoft Excel launches and opens the report. An information dialog box opens and notifies you the report has successfully been created.
6. The report which shows Curb and Gutter & Traffic Separator lengths is displayed below.

SUMMARY OF CURB & GUTTER AND/OR TRAFFIC SEPARATORS

| PAY ITEM NO. | PAY ITEM DESCRIPTION | LOCATION STA. TO STA. | SIDE | AREA ID | UNIT | QUANTITY GROSS LENGTH | QUANTITY DEDUCTIONS TYPE | QUANTITY DEDUCTIONS LENGTH | QUANTITY NET LENGTH P | QUANTITY NET LENGTH F | TOTAL P | TOTAL F | DESIGN NOTES | CONSTRUCTION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0520 1 7 | CONCRETE CURB & GUTTER, TYPE E | 698+81.00 to 698+94.63 | RT | 20423BD | LF | | | | 20.8 | | 5081 | | | |
| | | 698+81.00 to 698+94.63 | RT | 20423B1 | | | | | 20.8 | | | | | |
| | | 698+94.63 to 699+01.25 | RT | 20423B8 | | | | | 6.6 | | | | | |
| | | 699+01.25 to 699+66.22 | RT | 20423B9 | | | | | 89.6 | | | | | |
| | | 699+65.94 to 699+66.33 | RT | 20423D2 | | | | | 6.0 | | | | | |
| | | 700+25.53 to 701+34.03 | LT | 20423IC | | | | | 170.4 | | | | | |
| | | 700+25.70 to 701+34.03 | LT | 2042364 | | | | | 164.5 | | | | | |
| | | 700+41.74 to 700+42.15 | RT | 2042369 | | | | | 6.1 | | | | | |
| | | 700+41.85 to 701+00.03 | RT | 20423BD | | | | | 85.8 | | | | | |
| | | 701+00.03 to 714+21.65 | RT | 2042385 | | | | | 1285.9 | | | | | |
| | | 701+34.03 to 714+24.04 | LT | 20423B0 | | | | | 1325.3 | | | | | |
| | | 703+71.03 to 710+89.08 | RT | 2042331 | | | | | 712.3 | | | | | |
| | | 703+71.03 to 704+21.25 | LT/RT | 20423ZB | | | | | 52.4 | | | | | |
| | | 704+21.25 to 711+38.69 | LT | 2042395 | | | | | 723.4 | | | | | |
| | | 710+89.08 to 711+38.69 | LT/RT | 20423DF | | | | | 51.8 | | | | | |
| | | 714+21.65 to 714+70.14 | RT | 204235F | | | | | 77.5 | | | | | |
| | | 714+24.04 to 714+72.53 | LT | 2042361 | | | | | 75.3 | | | | | |
| | | 714+97.21 to 715+45.70 | RT | 2042360 | | | | | 74.9 | | | | | |
| | | 714+99.57 to 715+48.06 | LT | 2042362 | | | | | 77.1 | | | | | |
| | | 715+45.70 to 715+73.93 | RT | 2042386 | | | | | 28.2 | | | | | |
| | | 715+48.06 to 715+67.93 | LT | 2042381 | | | | | 19.9 | | | | | |
| | | 715+67.93 to 715+73.93 | LT | 2042389 | | | | | 6.1 | | | | | |
| 0520 5 11 | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | 700+69.04 to 703+71.03 | RT | 20426A3 | LF | | | | 303.1 | | 606 | | | |
| | | 711+38.69 to 714+36.38 | LT | 20423ZD | | | | | 149.8 | | | | | |
| | | 711+38.69 to 714+36.38 | LT | 20423ZF | | | | | 149.4 | | | | | |
| | | 714+36.38 to 714+38.37 | LT | 2042391 | | | | | 3.1 | | | | | |

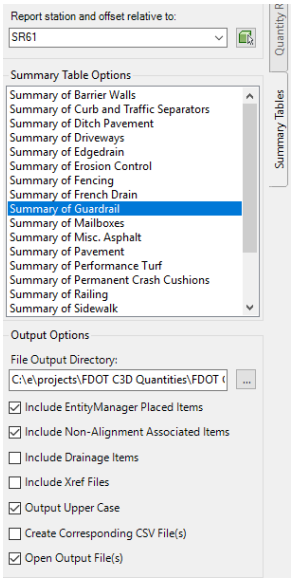
The report which reports the same information as seen in the previous exercise is now formatted in the appropriate spreadsheet and is ready to link to the design file.

7. Save and Close the Excel file, you will link this report later.
8. Save and Close the drawing file.

## *Exercise 8.3 Running a Guardrail Report*

In this exercise, the designer will run a *Summary of Guardrail* report from the Summary Tables tab and save the file to the calculations folder in the project.

1. Continuing in the *dsgnrd01.dwg* file.
2. Using the steps from the previous exercise create and save a summary of guardrail report.




SUMMARY OF GUARDRAIL

| LOCATION | SIDE | GUARDRAIL (W-BEAM, LOW SPEED, TL-2) | | DESIGN NOTES | CONSTRUCTION REMARKS |
|---|---|---|---|---|---|
| | | 0536 1 0 | | | |
| STA. TO STA. | | LF | | | |
| | | P | F | | |
| 700+30.25 to 700+34.84 | LT | 125.4 | | | |
| 700+33.47 to 700+67.25 | LT | 83.5 | | | |
| 700+77.74 to 701+35.50 | LT | 61.4 | | | |
| 701+01.06 to 703+00.04 | RT | 199.0 | | | |
| 701+35.50 to 703+00.04 | LT | 164.5 | | | |
| 703+00.04 to 711+38.64 | LT | 849.6 | | | |
| 705+70.42 to 713+25.27 | RT | 712.7 | | | |

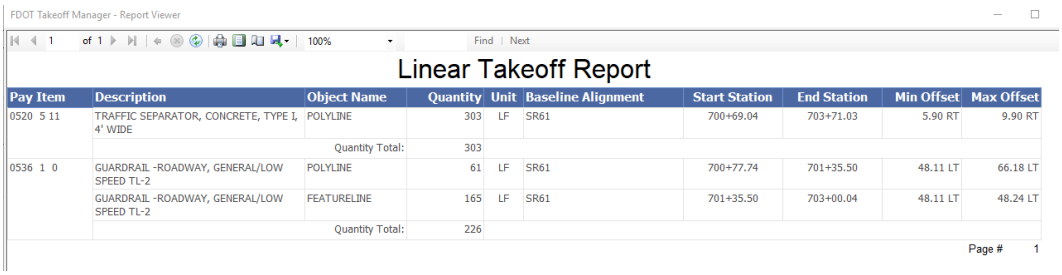
3. Save your drawing before continuing

## *Exercise 8.4 Running a Linear report with Modified Station Values and Offsets*

In this exercise, the designer will run a Linear report along a station range with the offset or swath search distance shortened on one side.

1. On FTM switch back to the *Quantity Reports* tab.
2. Select the **SR61** alignment.
3. For *Start Station* type in **700+50**.
4. For *End Station* type in **704+00.**
5. For *Right Offset Distance* type in **20**, leave Left Offset Distance at its default value.
6. Select **Compute Takeoff** to execute the report.

7. Change the Report type to *Linear Takeoff Report*.




| Pay Item | Description | Object Name | Quantity | Unit | Baseline Alignment | Start Station | End Station | Min Offset | Max Offset |
|---|---|---|---|---|---|---|---|---|---|
| 0520 5 11 | TRAFFIC SEPARATOR, CONCRETE, TYPE I, 4' WIDE | POLYLINE | 303 | LF | SR61 | 700+69.04 | 703+71.03 | 5.90 RT | 9.90 RT |
| | | Quantity Total: | 303 | | | | | | |
| 0536 1 0 | GUARDRAIL -ROADWAY, GENERAL/LOW SPEED TL-2 | POLYLINE | 61 | LF | SR61 | 700+77.74 | 701+35.50 | 48.11 LT | 66.18 LT |
| | GUARDRAIL -ROADWAY, GENERAL/LOW SPEED TL-2 | FEATURELINE | 165 | LF | SR61 | 701+35.50 | 703+00.04 | 48.11 LT | 48.24 LT |
| | | Quantity Total: | 226 | | | | | | |

Page # 1

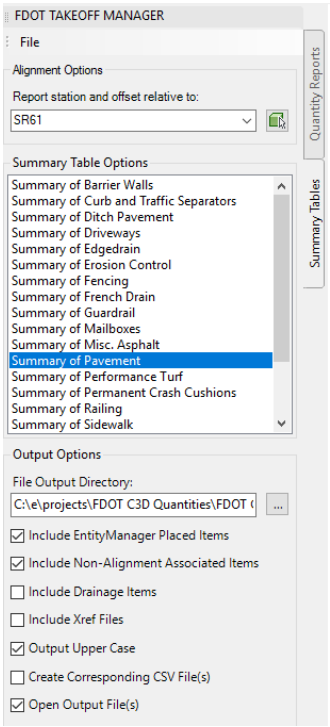
Since the Right-side offset was set to 20' the guardrail was not picked up in the report. Keep in mind that when working with shapes, unless the entire shape is within the search parameters it will not show up in the report.

8. Click on the **X** in the upper right corner to close the report.
9. Save and Close the *dsgnrd01.dwg* drawing file.

## *Exercise 8.5 Running Shape Reports*

In this exercise, the designer will open the shape drawing file that was created earlier and run and save the appropriate reports that will be linked to the design files.

1. Launch the FDOT Civil 3D State Kit if not already open.
2. Open the *qtdsrd01.dwg* located in the roadway folder of your project.
3. Switch to the Model tab, since we are running the reports its ok for all the shapes to be merged together. You can switch to the individual shapes along the bottom if you need to examine a specific shape.
4. On the FDOT Ribbon, select the **Takeoff Manager**.
5. Since we want the formatted reports, select the *Summary Tables* tab.
6. Select the *Summary of Pavement* report with the following options.



7. Select **Create Summary Tables** to execute the report.
8. The report and an information box will open upon completion.
9. Save the drawing file before continuing.

SUMMARY OF PAVEMENT

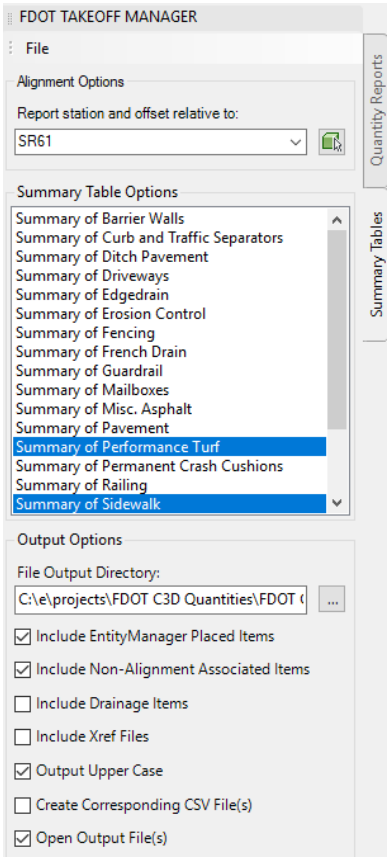
| PAY ITEM NO. | PAY ITEM DESCRIPTION | LOCATION | | SIDE | AREA ID | LENGTH | WIDTH | UNIT | QUANTITY | | TOTAL | | DE NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | STA. TO STA. | DESCRIPTION | | | | | | P | F | P | F | |
| 0285706 | OPTIONAL BASE, BASE GROUP 06 | 699+65.03 to 715+47.97 | | LT/RT | 4049928 | | | SY | 14227.06 | | 14227.1 | | |
| 0334 1 52 | SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC B, PG 76-22 | 699+65.03 to 715+47.97 | | LT/RT | 4049984 | | | TN | 1168.27 | | 1168.3 | | |
| 0337 7 25 | ASPHALT CONCRETE FRICTION COURSE, INC BIT, FC-5, PG 76-22 | 699+65.03 to 715+47.97 | | LT/RT | 4049900 | | | TN | 566.43 | | 566.4 | | |

***Hint*** Did you know that the report would look the same if you initiated it from one of the Shape sheet layouts instead of the model tab? This is because the shapes still reside in the file, they are just visually turned off in the layout.

## *Exercise 8.6 Running Multiple Reports at Once*

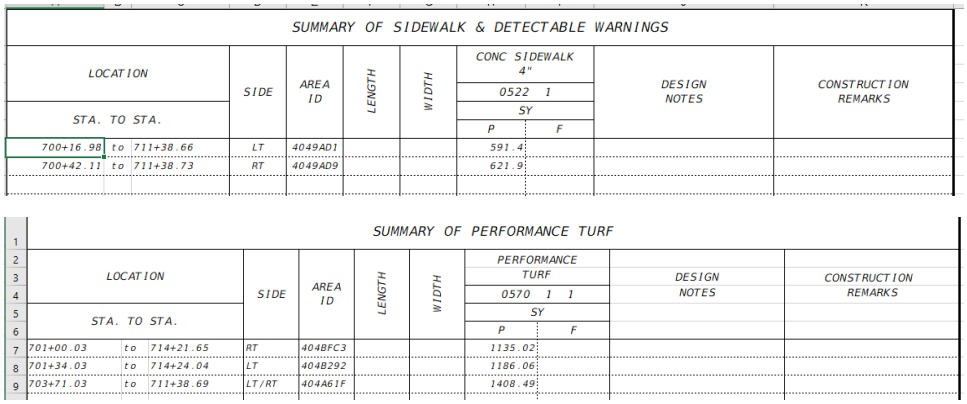
In this exercise, the designer will run the Performance Turf and Sidewalk report simultaneously and save the reports to the calculations folder within the project.

1. Continue working in the *qtdsrd01.dwg*.
2. On FTM Left click on *Summary of Performance Turf.*
3. Hold the **CTRL** button and left click on *Summary of Sidewalk,* make other selections as shown below.
4. Make sure you save the reports in the calculations folder.




5. Select **Create Summary Tables** to execute the reports.

6. Microsoft Excel launches and opens a separate session for each report run. There is no limit to the number of reports you can run at a time.



SUMMARY OF SIDEWALK & DETECTABLE WARNINGS

| LOCATION STA. TO STA. | | | SIDE | AREA ID | LENGTH | WIDTH | CONC SIDEWALK 4" 0522 1 SY P | CONC SIDEWALK 4" 0522 1 SY F | DESIGN NOTES | CONSTRUCTION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 700+16.98 | to | 711+38.66 | LT | 4049AD1 | | | 591.4 | | | |
| 700+42.11 | to | 711+38.73 | RT | 4049AD9 | | | 621.9 | | | |

SUMMARY OF PERFORMANCE TURF

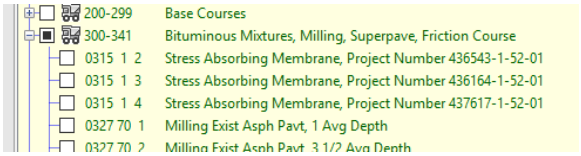
| LOCATION STA. TO STA. | | | SIDE | AREA ID | LENGTH | WIDTH | PERFORMANCE TURF 0570 1 1 SY P | PERFORMANCE TURF 0570 1 1 SY F | DESIGN NOTES | CONSTRUCTION REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 701+00.03 | to | 714+21.65 | RT | 404BFC3 | | | 1135.02 | | | |
| 701+34.03 | to | 714+24.04 | LT | 404B292 | | | 1186.06 | | | |
| 703+71.03 | to | 711+38.69 | LT/RT | 404A61F | | | 1408.49 | | | |

7. Save and Close both Excel files.
8. Save your drawing file before continuing.

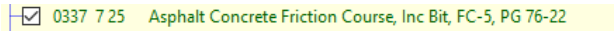
## *Exercise 8.7 Running reports using the Pay Item Filters*

In this exercise, the designer will run a quick report on just the friction course pavement using the pay item filters, which will exclude all other visible objects.

1. Continue working in the *qtdsrd01.dwg* file.
2. Switch to the model tab.
3. On FTM switch to the Quantity Reports tab.
4. Click on the **Pay Item Filters** located on the bottom of FTM.
5. Since the Pay Item number, you want to find is **0337 7 25**, expand the **300-341** category.

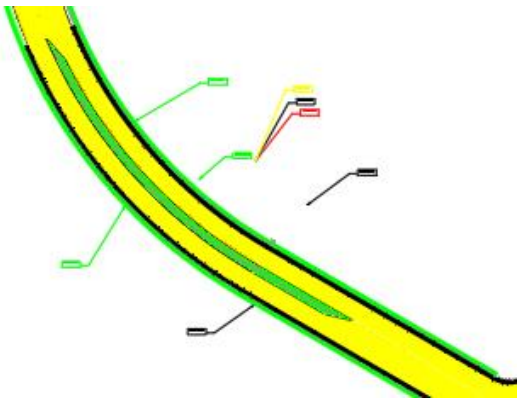



6. Select the **0337 7 25** box.




7. Click the X to close the box, don't worry your selection is still picked.
8. Select the **SR61** alignment.
9. Select **Compute Takeoff** to execute the report.
10. The report viewer opens, change the report type to *Count Takeoff Report* to see the quantity of the Friction Course only.

Notice the busy drawing with all the labels which represent a different shape. The pay item filters are a useful tool to narrow down a report on a specific pay item number as opposed to running a report and having to parse to the desired object.



Count Takeoff Report

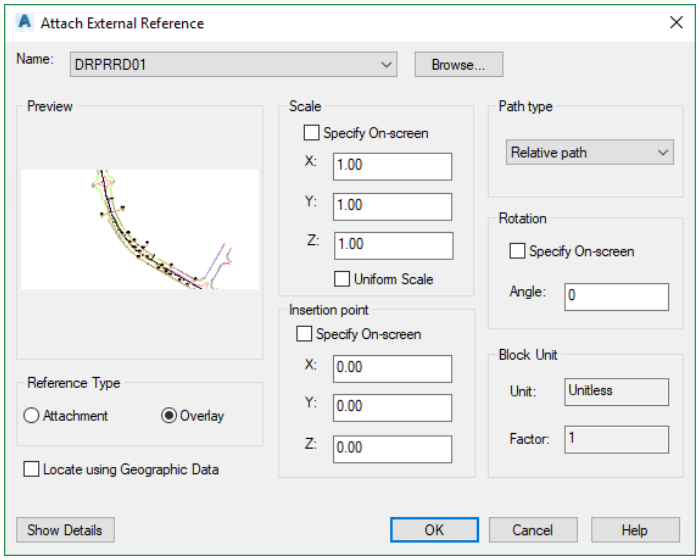
| Pay Item | Description | Object Name | Quantity | Unit | Baseline Alignment | Start Station | End Station | Min Offset | Max Offset |
|---|---|---|---|---|---|---|---|---|---|
| 0337 7 25 | ASPHALT CONCRETE FRICTION COURSE, INC BIT, FC-5, PG 76-22 | HATCH | 566.4 | TN | SR61 | 699+65.03 | 715+47.97 | .22 RT | 149.60 LT |
| | | Quantity Total: | 566.4 | | | | | | |

11. Open the *Pay Item Filters* dialog and select **Clear Selection**. You will need to do this before you run an overall report, since the selections will remain until they are cleared.
12. Save and close the *qtdsrd01.dwg* drawing before continuing.

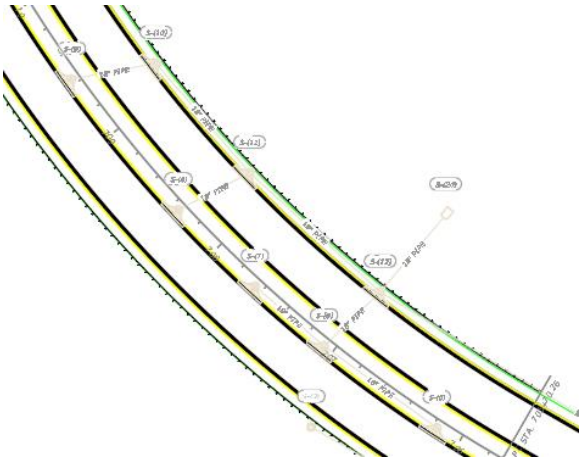
## *Exercise 8.8 Running a Report with a Xref and Drainage Networks*

In this exercise, the designer will run a report on the Drainage Network that had Xdata appended to it using EMX. The designer will use the dsgnrd01 file to Xref in the drainage file for this scenario.

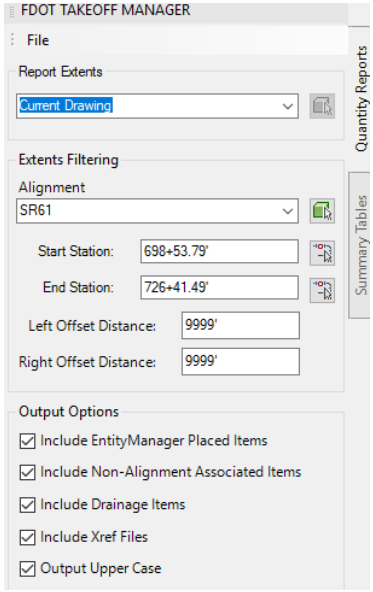
1. Open the *dsgnrd01.dwg* file.
2. Type in **Xref** on the command line to bring up Xref Manager.
3. Click on the dwg attach button on the upper left of the dialog.
4. Browse to the *drprrd01.dwg* file located in the drainage folder in your project.
5. Make sure Overlay is toggled. Match the image below.




6. Select **OK**. The drawing should look like image below.



7. Open FTM if not already open.
8. On the *Quantity Reports* tab select **SR61** for the alignment.
9. Toggle on *Include Drainage Items* and *Include Xref Files*




10. Select **Compute Takeoff** to execute the report.
11. Save and Close your file.

The report not only shows the Drainage Network parts, it also shows the appended sod and steel quantities to the outlet structures that you placed using EMX in an earlier chapter.

# 9 LINKING SUMMARY REPORTS

## OBJECTIVES

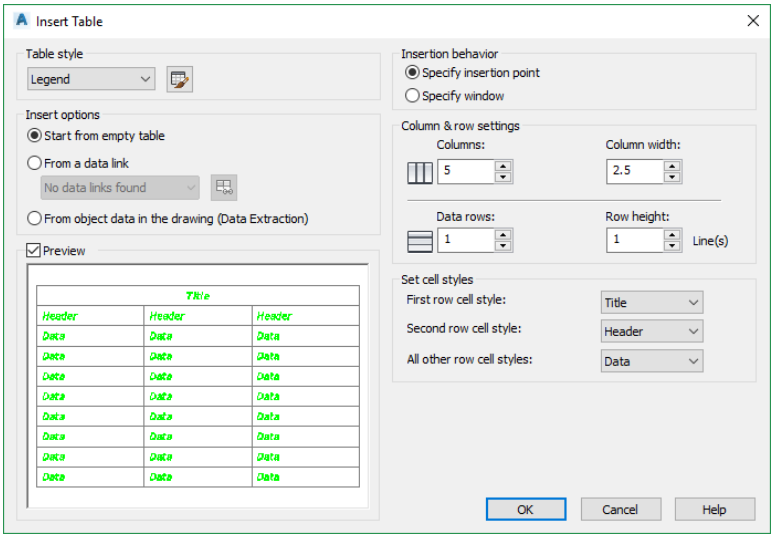
The objective of this chapter is to teach the designer how to link summary reports to the appropriate design files. The designer will also learn editing techniques and proper workflow when working with tables and editing excel files. The designer will learn how to create a Summary of Pay Items plan.

## INTRODUCTION

This section will cover using Autodesk's Data Link Manager to properly link the reports that were run earlier to the appropriate design file. The linked files are treated like reference files, which are accessible in Xref Manager. The designer will also see how edits to the excel file are automatically updated to the design file table, also how to edit the table and the data gets transferred to the original spreadsheet report.

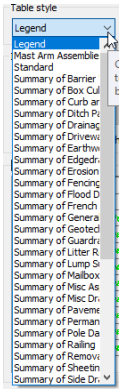
### TABLE COMMAND

You can either type in **Table** on the command line or click on the *Table* button located on the FDOT ribbon on the Quantities panel. When selected the Insert Table dialog box opens.



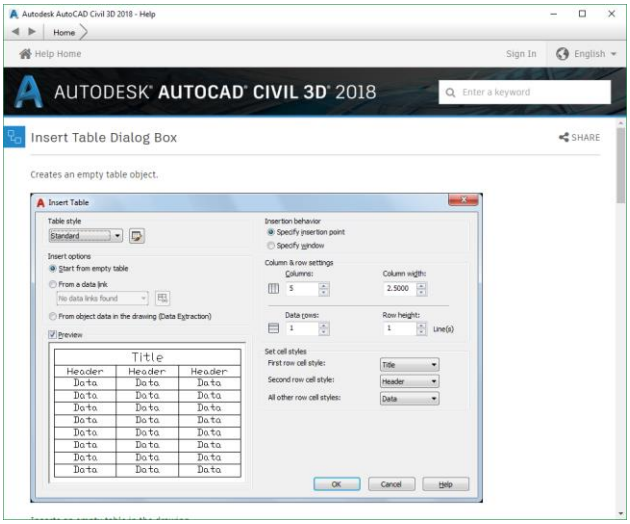

Let's look at the options available;

- **Table Style –** You can either start from a scratch and design a custom table or use the pull down and see a list of FDOT AutoCAD tables that match the Excel spreadsheets that are delivered with the state kit.




- **Insert Options**
  - **Start from empty table –** Starts a new table from the default style.
  - **From a data link –** clicking on this opens the data link manager dialog, which allows the user to link a spreadsheet to a drawing file.
  - **From object data in the drawing (Data Extraction) –** Allows the user to window everything in the active drawing file that has data and puts it in a table and places it in the drawing file.
- **Preview –** Shows a preview of the table that will be placed.
- **Insertion behavior**
  - **Specify insertion point –** allows user to specify an exact point for the table to be inserted.
  - **Specify window –** allows user to draw a window in the drawing file that will be the location of the table placement.
- **Column & row settings –** this controls are used to build a custom table for use in the drawing file.
- **Set cell styles –** these controls used in conjunction with the above controls are used to build a custom table for data entry.

For additional information, select the **Help** button to access the Autodesk Help Knowledge base.



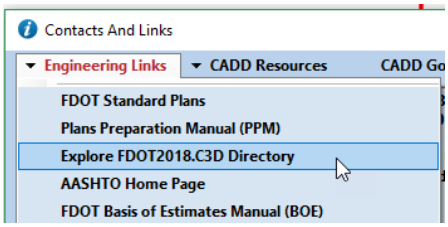
## FDOT Summary Box File Location

The FDOT Civil 3D State Kit is delivered with an abundance of resources that the designer can use (blocks, templates, layer standards, etc.), but also there are already formatted excel spreadsheets that make up the summary boxes.

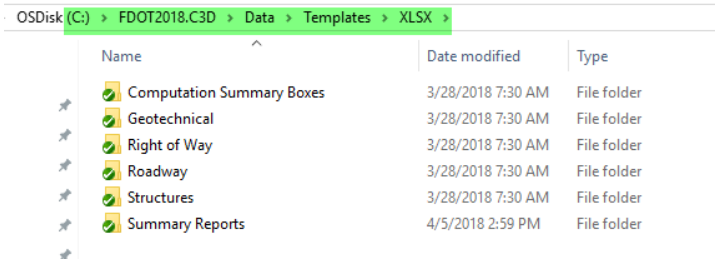
### *Exercise 9.1 Accessing the location of the Summary Boxes and Reports*

1. To access the location in a fast way with the state kit open, switch to the FDOT ribbon.
2. Select the **Links/Contacts.** 

3. Pull down the *Engineering Links* and select **Explore FDOT20xx.C3D Directory**




4. Browse to the following location.




5. Explore each folder and discover what is available, for instance in the *Computation Summary Boxes* folder is the bulk of the Summary boxes that you will use to copy and paste from the Report Viewer reports.

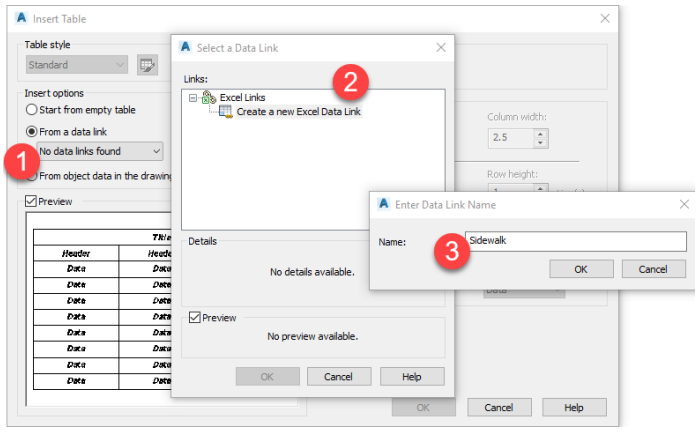
The Summary Reports folder contains the reports used with the automated reports, such as asphalt and sod for example. It is recommended that you do not modify the reports in this folder since it has an accompanying xml file that is reads.

### *Exercise 9.2 Linking Summary of Sidewalk & Detectable Warnings report*

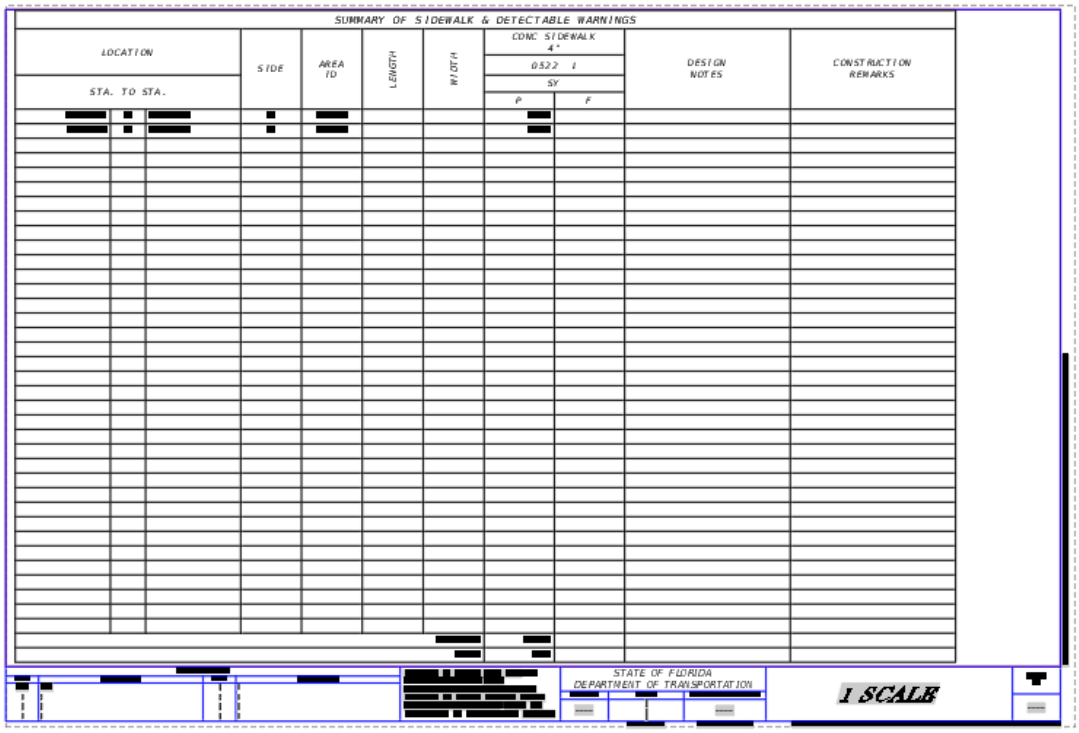
In this exercise, the designer will link the summary of Sidewalk & Detectable Warnings report using the data link manager in the sheet that created in the previous exercise.

1. Open the *sumqrd01.dwg* file and remain in paper space.
2. Make **Tables_dp** the current layer, you can type the name on the command line and press enter for a shortcut.
3. On the FDOT Ribbon select the **Table** command.
4. Using the same steps from Chapter 7 and using the diagram with the sequence of steps shown below, select *From a data link* and open DLM.
5. Click on *Create a new Excel Data Link* to create the linked name.

6. For Data Link Name type in **Sidewalk**.




7. Select **OK.**
8. Select the Ellipse button to browse to the excel file which is located in the *Calculations* folder in your project.
9. Select the Summary_of_Sidewalk (11hr 11min 28sec).xlsx file and press **Open**. Keep in mind the time stamp will be different on each report, so as to not over write an existing report.
10. Select **OK** until you see the word Table on the command line, this means that the table is loading and to be patient.
11. The table is attached to your cursor, select the upper left corner of the border for placement.
12. The table is longer than the 11x17 FDOT border, open the spreadsheet and delete 12 rows.
13. Save and close the spreadsheet.
14. Upon returning to the drawing file you should see a notification message in the bottom right corner of the screen letting you know the link has changed and do you want to update the link, select the blue link to perform the update. The table when the update process is complete should show the 12 rows deleted.

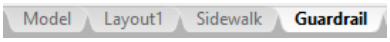



15. Right click on the *1 Scale* layout and rename it to **Sidewalk.**
16. Save the file before continuing.

## *Exercise 9.3 Linking the Summary of Guardrail report*

In this exercise, the designer will copy the Sidewalk layout and link the Summary of Guardrail report to the design file, but this time it will be in model space as opposed to paper space.

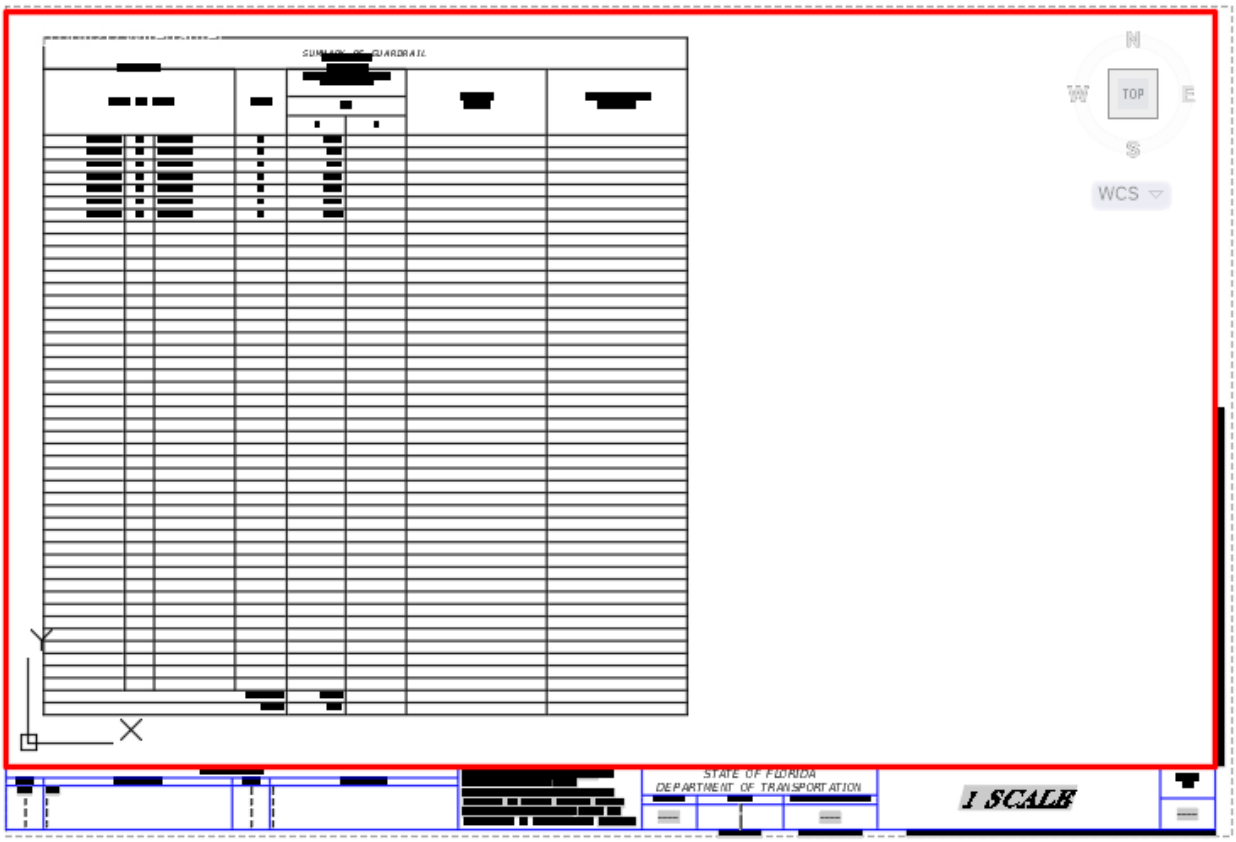
1. Right click on the *Sidewalk* layout and create a copy and move it to the right of the sidewalk layout.
2. Right click and rename it to **Guardrail.**




3. For this exercise, switch to the model tab.
4. Repeating steps 3-10 above link the Summary of Guardrail report located in your calculations folder.
5. For placement, left click anywhere on the screen.
6. Zoom extents to see the entire table.
7. Switch to the *Guardrail* tab and delete the copy of the sidewalk table.
8. Click on Model to change it to paper 

9. Double click in the border to activate the view port.
10. Click on the blue lock to unlock the viewport.
11. Zoom extents to bring the table into the border.
12. Pan to move the table to the left side of the sheet, zoom out and then zoom window with a little padding around the table so it won't be touching the sheet border.

13. When the placement is suitable click on the lock to return the view port to its previous state.

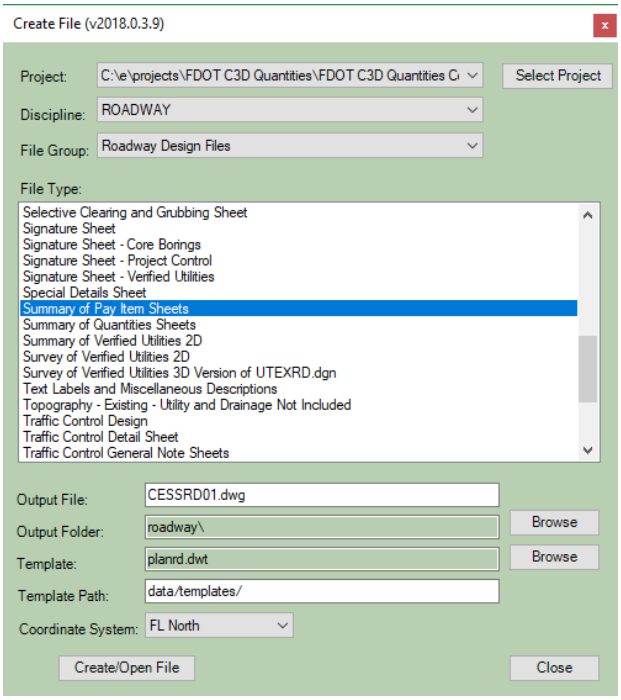



14. Save and close the drawing before continuing.

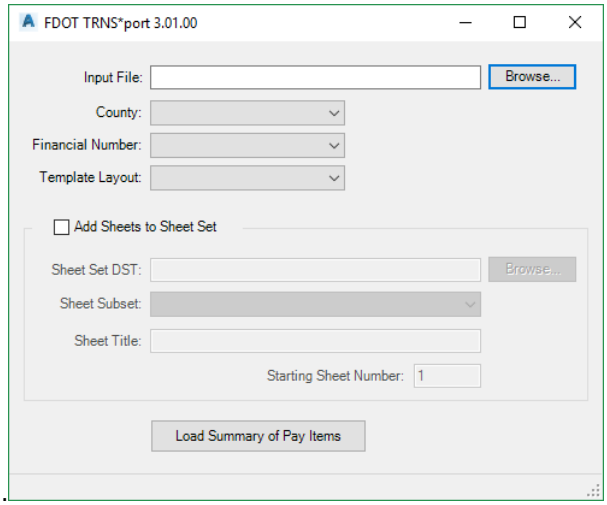
## *Exercise 9.4 Running a Summary of Pay Items Report*

In this exercise, the designer will take a formatted sample report that was taken from designer interface and using the TRNS*port Sheets command will create an automated report that is added to sheets as it runs.

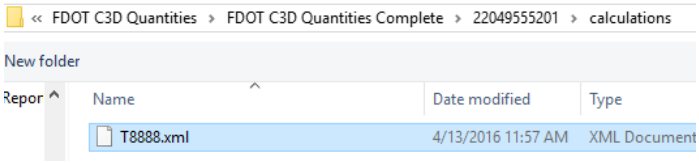
1. With the FDOT Civil 3D State kit open, switch to the FDOT ribbon.
2. Click on the *Create File* application.
3. Make the following selections as shown below.




4. Select **Create/Open File**.
5. Select **Close** to exit dialog box.
6. You will see a 1 Scale sheet layout already in the file and the North Arrow has already been deleted.
7. Right Click on the layout and rename to *Summary of Pay Items.*
8. On the FDOT Ribbon select **TRNS*port Sheets** located in the Quantities panel.
9. The TRNS*port dialog box opens.

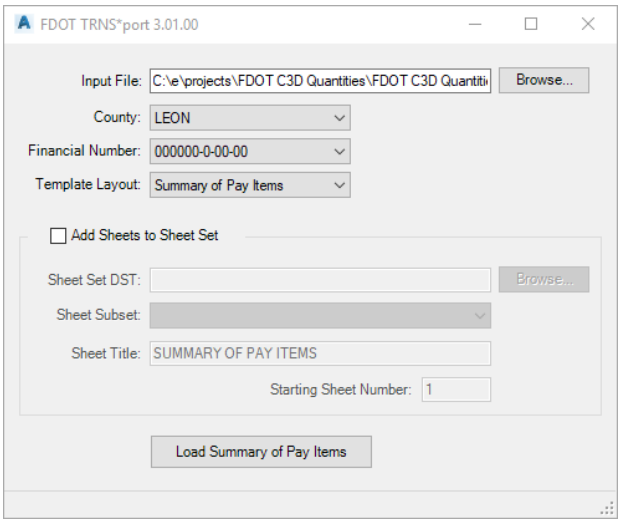



10. For Input file, click the browse button.
11. Navigate to the calculations folder in your project and select the **T8888.xml** file.




12. The dialog auto populates with *Input file, County, & Financial Number.* There is a pulldown that would allow you to pick optional data if available.

13. For *Template Layout* select **Summary of Pay Items** using the pull-down button. This will use the sheet layout and copy it as required by the length of the report.



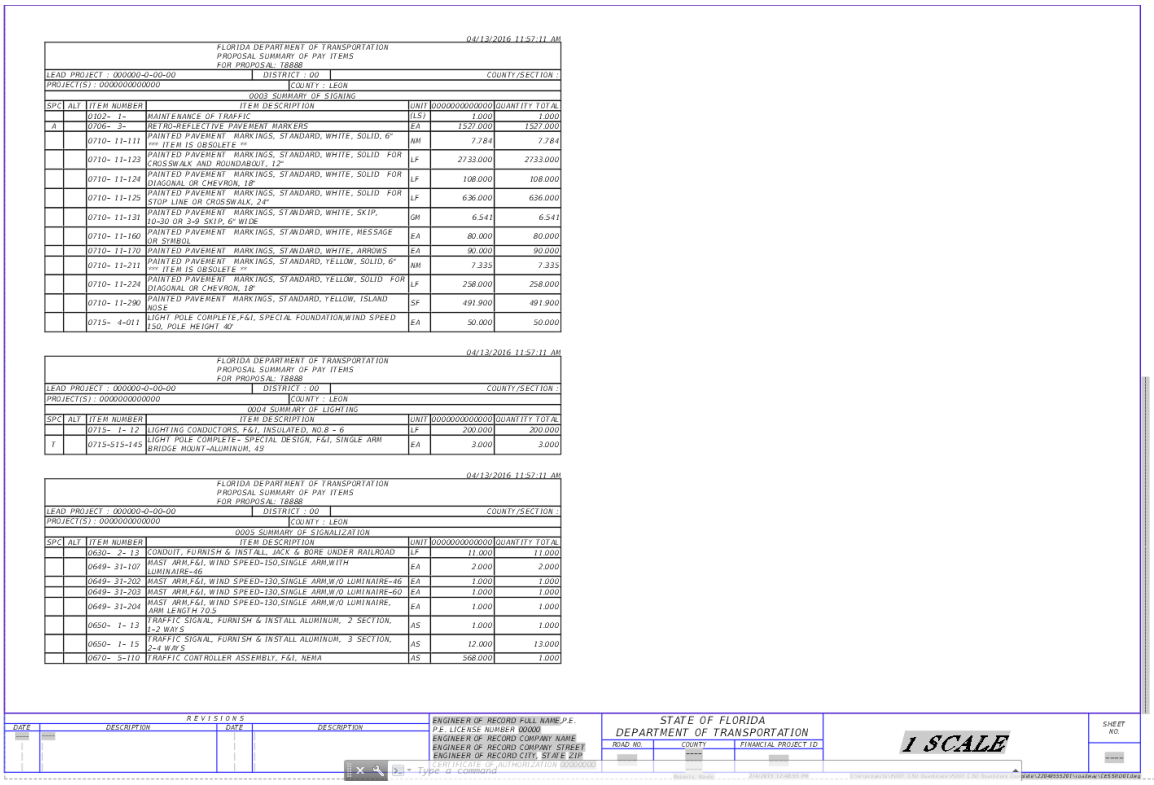

14. Select **Load Summary of Pay Items** to execute the report.

15. Click **OK** on the report information dialog.

16. Close the TRNS*port application.

17. Save the file.

At this time, the application will run and notice the 3 sheet layouts along the bottom, since you renamed the layout to its common name the sheet numbers make more sense now from this point you would add them to existing sheet sets as you have from the traffic plan manual. The reports look as follows;



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FLORIDA DEPARTMENT OF TRANSPORTATION
PROPOSAL SUMMARY OF PAY ITEMS
FOR PROPOSAL: 18888

LEAD PROJECT : 000000-0-00-00 | DISTRICT : 00 | COUNTY/SECTION :
PROJECT(S) : 00000000000000 | COUNTY : LEON

0003 SUMMARY OF SIGNING

| SPC | ALT | ITEM NUMBER | ITEM DESCRIPTION | UNIT | 00000000000000 | QUANTITY TOTAL |
|---|---|---|---|---|---|---|
| | | 0102- 1- | MAINTENANCE OF TRAFFIC | (LS) | 1.000 | 1.000 |
| A | | 0706- 3- | RETRO-REFLECTIVE PAVEMENT MARKERS | EA | 1527.000 | 1527.000 |
| | | 0710- 11-111 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, SOLID, 6" *** ITEM IS OBSOLETE *** | NM | 7.784 | 7.784 |
| | | 0710- 11-123 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, SOLID FOR CROSSWALK AND ROUNDABOUT, 12" | LF | 2733.000 | 2733.000 |
| | | 0710- 11-124 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, SOLID FOR DIAGONAL OR CHEVRON, 18" | LF | 108.000 | 108.000 |
| | | 0710- 11-125 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, SOLID FOR STOP LINE OR CROSSWALK, 24" | LF | 636.000 | 636.000 |
| | | 0710- 11-131 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, SKIP, 10-30 OR 3-9 SKIP, 6" WIDE | GM | 6.541 | 6.541 |
| | | 0710- 11-160 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, MESSAGE OR SYMBOL | EA | 80.000 | 80.000 |
| | | 0710- 11-170 | PAINTED PAVEMENT MARKINGS, STANDARD, WHITE, ARROWS | EA | 90.000 | 90.000 |
| | | 0710- 11-211 | PAINTED PAVEMENT MARKINGS, STANDARD, YELLOW, SOLID, 6" *** ITEM IS OBSOLETE *** | NM | 7.335 | 7.335 |
| | | 0710- 11-224 | PAINTED PAVEMENT MARKINGS, STANDARD, YELLOW, SOLID FOR DIAGONAL OR CHEVRON, 18" | LF | 258.000 | 258.000 |
| | | 0710- 11-290 | PAINTED PAVEMENT MARKINGS, STANDARD, YELLOW, ISLAND NOSE | SF | 491.900 | 491.900 |
| | | 0715- 4-011 | LIGHT POLE COMPLETE,F&I, SPECIAL FOUNDATION,WIND SPEED 130, POLE HEIGHT 40' | EA | 50.000 | 50.000 |

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FLORIDA DEPARTMENT OF TRANSPORTATION
PROPOSAL SUMMARY OF PAY ITEMS
FOR PROPOSAL: 18888

LEAD PROJECT : 000000-0-00-00 | DISTRICT : 00 | COUNTY/SECTION :
PROJECT(S) : 00000000000000 | COUNTY : LEON

0004 SUMMARY OF LIGHTING

| SPC | ALT | ITEM NUMBER | ITEM DESCRIPTION | UNIT | 00000000000000 | QUANTITY TOTAL |
|---|---|---|---|---|---|---|
| | | 0715- 1- 12 | LIGHTING CONDUCTORS, F&I, INSULATED, NO.8 - 6 | LF | 200.000 | 200.000 |
| T | | 0715-515-145 | LIGHT POLE COMPLETE- SPECIAL DESIGN, F&I, SINGLE ARM BRIDGE MOUNT-ALUMINUM, 45' | EA | 3.000 | 3.000 |

04/13/2016 11:57:11 AM

FLORIDA DEPARTMENT OF TRANSPORTATION
PROPOSAL SUMMARY OF PAY ITEMS
FOR PROPOSAL: 18888

LEAD PROJECT : 000000-0-00-00 | DISTRICT : 00 | COUNTY/SECTION :
PROJECT(S) : 00000000000000 | COUNTY : LEON

0005 SUMMARY OF SIGNALIZATION

| SPC | ALT | ITEM NUMBER | ITEM DESCRIPTION | UNIT | 00000000000000 | QUANTITY TOTAL |
|---|---|---|---|---|---|---|
| | | 0630- 2- 13 | CONDUIT, FURNISH & INSTALL, JACK & BORE UNDER RAILROAD | LF | 11.000 | 11.000 |
| | | 0649- 31-107 | MAST ARM,F&I, WIND SPEED-150,SINGLE ARM,WITH LUMINAIRE-46 | EA | 2.000 | 2.000 |
| | | 0649- 31-202 | MAST ARM,F&I, WIND SPEED-130,SINGLE ARM,W/O LUMINAIRE-46 | EA | 1.000 | 1.000 |
| | | 0649- 31-203 | MAST ARM,F&I, WIND SPEED-130,SINGLE ARM,W/O LUMINAIRE-60 | EA | 1.000 | 1.000 |
| | | 0649- 31-204 | MAST ARM,F&I, WIND SPEED-130,SINGLE ARM,W/O LUMINAIRE, ARM LENGTH 70.5 | EA | 1.000 | 1.000 |
| | | 0650- 1- 13 | TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 2 SECTION, 1-2 WAYS | AS | 1.000 | 1.000 |
| | | 0650- 1- 15 | TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 3 SECTION, 2-4 WAYS | AS | 12.000 | 13.000 |
| | | 0670- 5-110 | TRAFFIC CONTROLLER ASSEMBLY, F&I, NEMA | AS | 568.000 | 1.000 |

REVISIONS
DATE | DESCRIPTION | DATE | DESCRIPTION

ENGINEER OF RECORD FULL NAME,P.E.
P.E. LICENSE NUMBER 00000
ENGINEER OF RECORD COMPANY NAME
ENGINEER OF RECORD COMPANY STREET
ENGINEER OF RECORD CITY, STATE ZIP

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO. | COUNTY | FINANCIAL PROJECT ID

1 SCALE

SHEET NO.

Type a command

If you go to the Model tab and zoom extents you will see the reports were created and placed there. If you had to re run the report the application would delete the existing tables before re-creating them in the same spot.

18. Save the file and Close Civil 3D.

This concludes the Automated Quantities Manual