8   SIGNALIZATION TOOLS

OBJECTIVES

The objective of this chapter is to teach the student how to use Design and Computation (D&C) Manager, the FDOT Menu and other GEOPAK tools to create proposed Signal features.

INTRODUCTION

This section discusses several applications and resources that help the designer in the creation of proposed signal features to meet FDOT criteria and CADD standards. These include the FDOT Signals Application, FDOT Signal Pole Application, cell libraries, D&C Manager, and Draw Cell by Feature.

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

FDOT SIGNALS APPLICATION

The FDOT Signals Application was developed to assist in the placement of cells needed during the development of the Signalization Plan Sheets. These cells are placed in the DSGNSG.dgn file. It is recommended to attach the CLIPSGXX.dgn file to insure placement within the area of the plan sheet clip borders.
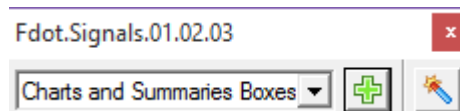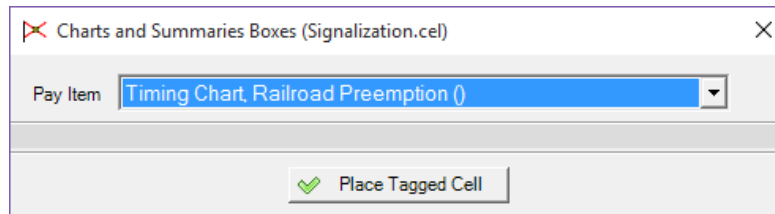

The FDOT Signals Application can be accessed from the FDOT Menu, Traffic Plans > Signals or from the FDOT Plans Development > Traffic Plans task menu.
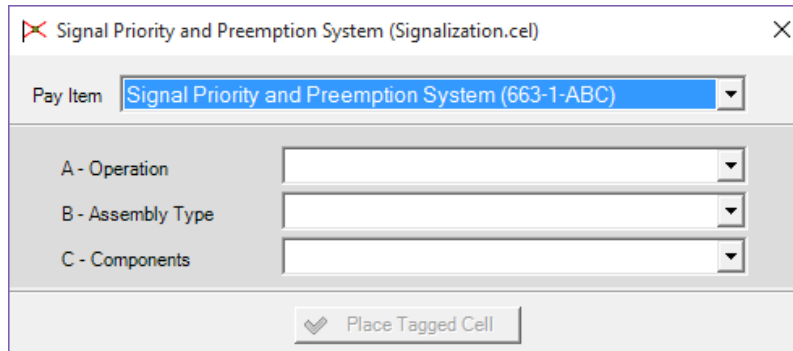
The first dialog to appear contains a drop-down list of categories.
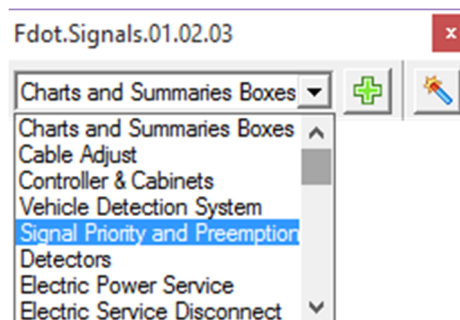
The green "+" button, Add New Items to the Design File, opens up a second dialog box in which to choose the feature to place in the design file. This dialog will vary in the information displayed depending on the category and item chosen.

REVIEW D&C MANAGER SIGNALS ITEMS

Before placing the Signals items it is important to understand how they are set up. The ddb file that FDOT delivers will have cells assigned to the Signal items to assist in the production of plan elements. These items may also have scales and rotations that need to be addressed when placing them. Knowing how the item is set up prior to placing it will alleviate having to experiment, delete and redraw. One advantage to using D&C Manager to draw the mast arms and other Signal elements is that the elements can be automatically quantified. The figure below shows the Mast Arm item in D&C Manager.
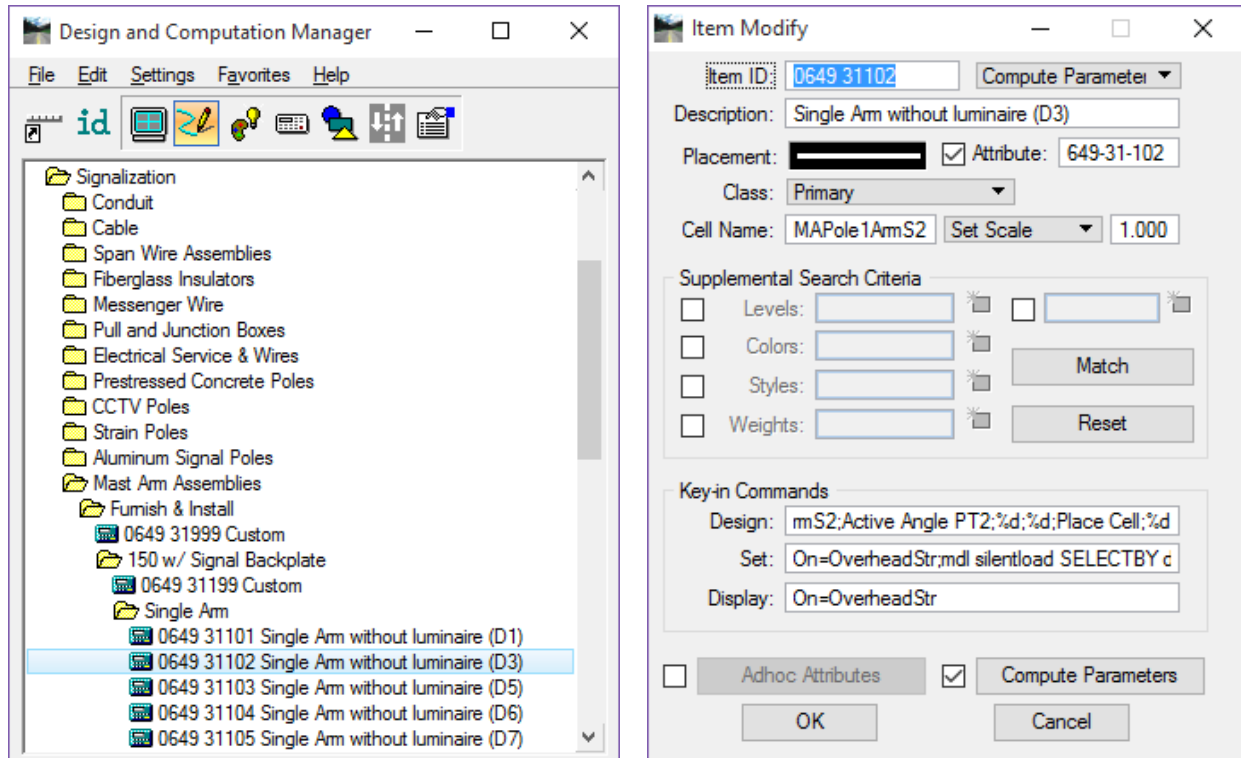
Selecting and then right-clicking on an item offers the options to review or modify the item. The Item Modify or Item Review dialog allows the designer to review how an item will work when placed with D&C Manager.

The top portion of the dialog shows information about the selected item such as pay item number, description, symbology and Cell Name. The bottom portion, Key-in Commands, describes what actions will be taken when the designer double-clicks on this item in D&C Manager.

In the Design field notice the string of commands that takes place when this item is selected for placement. One of the important items the designer needs to be aware of is when this item is placed it requires 2 points to set the rotation.

For more information on the D&C Manager, see Exploring D&C Manager in Chapter 5 or the GEOPAK Help files.

Exercise 8.1 Place Signal Poles using D&C Manager

In this exercise the student will place a Mast Arm Signal Pole at a specified station and offset.

> *Note*   *If using this manual for only Signalization, make sure to unzip the chapter data set before beginning the exercise.*

➢ **Load DDB**

1. Create and open the *DSGNSG01.dgn* and attach the following reference files:

    o **Dsgnrd01.dgn** from the *roadway* folder, *Default* model.

    o **Algnrd01.dgn** from the *roadway* folder, attach the *Default* and *Algnrd_50* model.

    o **Dsgnsp01.dgn** from the signing folder, *Default* model.

    o **Clipsg01.dgn** from the signing folder, *Default* model.
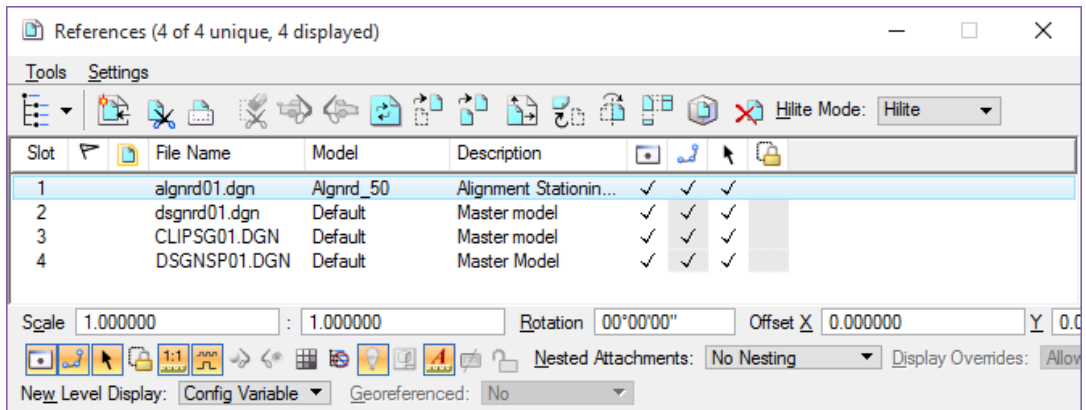
2. Zoom to near station **33+00** on the **CL98** alignment. This is near the center of the intersection. Rotate the view with plan sheet.

3. Use the Level Display to turn **Off** the display of the *Dsgnsp01.dgn* to clean up the area around the intersection.

4. Open D&C Manager.

5. From D&C Manager click **File > Open** and navigate to the project *symb* folder.

6. Select **22049555201.ddb**. This is the project ddb file copied from the FDOTSS4 folder and renamed.

7. Click **OK** to load the ddb file.

➢ **Start Draw Cell by Feature and Place Mast Arm Poles**

1. From the Road tools palette click on the **Draw Cell by Feature** tool. This opens Draw Cell by Feature dialog.
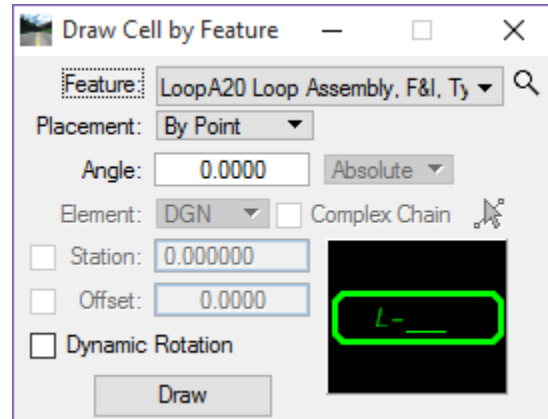
2. The first pole to be setup is **Pole 4**. The quadrants for pole locations are shown in the picture below.
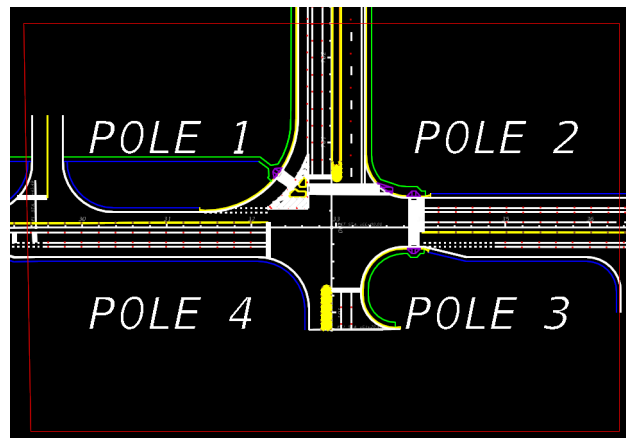
3. To set the *Feature*, click on the magnifying glass icon to open **Select Design & Computation Payitem**.

4. Navigate to **Signalization > Mast Arm Assemblies > Furnish & Install > 130 w/ Signal Backplate > Single Arm**. (This only selects the category to populate the drop down list.)

5. Select an item in the category and click OK.

6. From the drop down list select the *item* 0649 31203 Single Arm without Luminaire (E5).
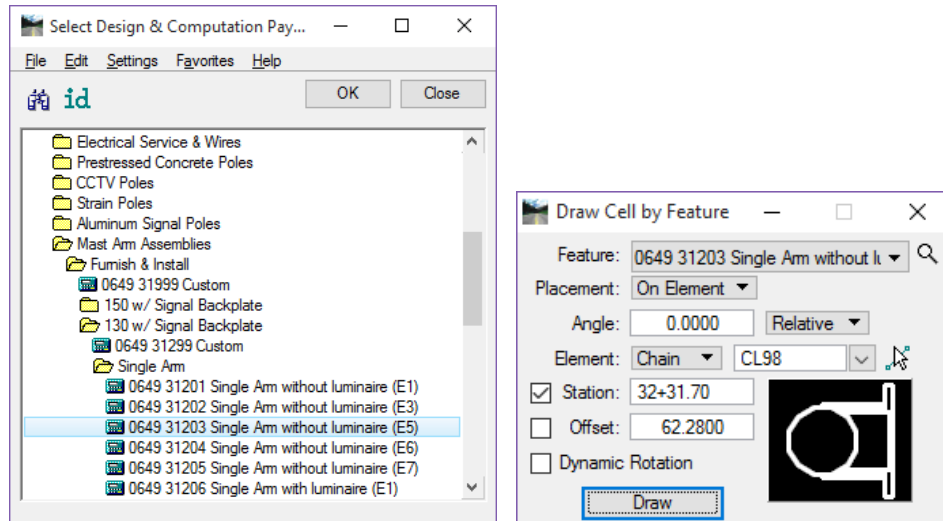
7. Set the *Placement* to **On Element**.

8. Set the *Angle* to **00** and **Relative**. This is based on how the cell was created.

9. Set the *Element* to **Chain**. If necessary, set the GEOPAK Job to the **61 gpk** file.

> *Note* *The GPK file is located in the Roadway directory. You may need to set the COGO preferences to point to the correct location.*

10. From the drop down menu, select **CL98**.

11. Check on *Station* and key in **32+31.70**.

12. Check on *Offset* and key in **62.28**.

13. Click the **Draw** button and move the cursor to the right side of the baseline and issue a **Data Point**.

14. Right-click to **Reset** the command.

15. Repeat steps 2–4 for **Poles 1-3.** Rotate Mast Arm direction as needed. (See BOE for Pay Item Detail):

| Pole	Pay Item	Station	Offset/Direction	Angle
Pole 1	0649 31202 Single Arm without Luminaire (D3)??	32+58.04	41.47 (Left)	270
Pole 2	0649 31203 Single Arm without Luminaire (D5)??	33+59.34	56.27 (Left)	180
Pole 3	0649 31204 Single Arm without Luminaire (D6)??	33+49.31	63.11 (Right)	90

Exercise 8.2 *Place Arm from Signal Cells Web Page*

The Mast Arm on the Signal Pole can be placed by using the Signal Cells web page from FDOT Menu or directly from the Cell Library in MicroStation. The Arm is not drawn with D&C Manager however the item for the Pole will tell the user which cell to use.

Example, one of the Signal Pole placed in the previous exercise used the Item 064931202 Single Arm without Luminaire (E3), the (E3) indicates that the arm should be Mast Arm Type E3. The user can now go to the Signal Cell Webpage and select the cell to be attached to the pole.

In this exercise the designer will place the Mast Arms on the poles placed in the previous exercise.

1. Continuing in the *DSGNSG01.dgn* file, zoom in to **Pole 4** placed around station **32+30**.

2. From FDOT Menu, select **Traffic Plans > Signals > Signalization Cell Webpages > Signal Poles** library. This opens the Signal Poles Cells web page.
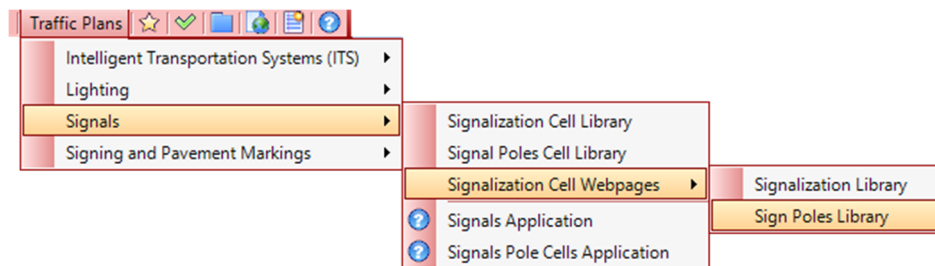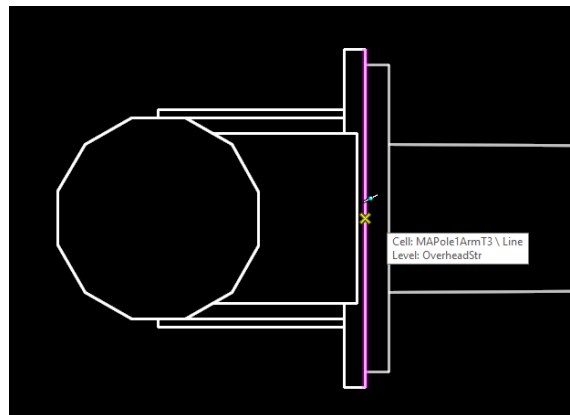

3. Scroll down and select the *Cell* **Mast Arm Type E5**. (This will make the *active cell* **MastArmE5** in MicroStation.)
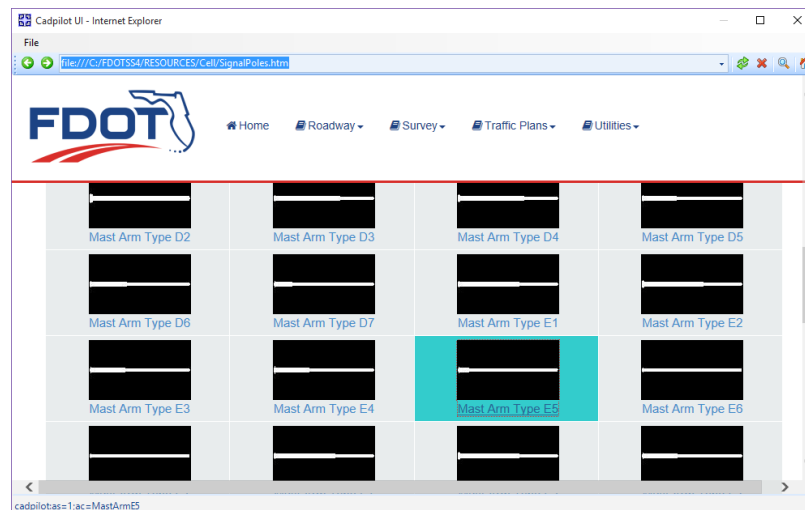
4. In MicroStation, select the **Place Active Cell** tool. (This is just to verify the settings.)
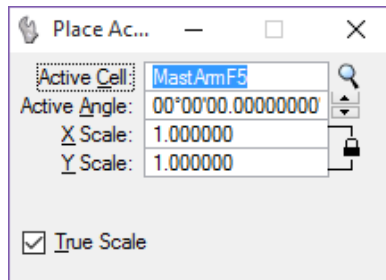
5. Set the *Active Angle* to **00**.

6. Set the *Scale* to **1** for both the **X** and **Y**.

7. Snap to the middle of the face plate of the Signal Pole. See cross hairs in figure below.

8. Issue a **data point** to place the cell.

9. Right-click to **Cancel** the command.

10. Click the **Open Browser** [icon] icon near the end of the FDOT Menu to recall the webpage.

11. Repeat steps 3–10 for **Poles 1-3.** Rotate Mast Arm direction as needed:

Pole	Mast Arm Cell	Rotation
Pole 1	Mast Arm Type E3	270°
Pole 2	Mast Arm Type E5	180°
Pole 3	Mast Arm Type E6	90°

Exercise 8.3 *Place Signal Head*

Much like the Mast Arm, the Signal Head can be placed using Signal cell web page or the FDOT Signalization Cell library. Another option the designer has is **D&C Manager** (DDB). The advantage to using **D&C Manager** is the ability to quantify the items automatically. Depending on the version of the ddb file, it may be necessary to edit the item for the signal head in the ddb to place the correct cell at the correct scale.

The figure below shows the Signal head item in D&C Manager. The designer may need to modify the Cell Name. The Set Scale option may also need to be changed to *Use Active Scale*. Finally, at the bottom of the dialog in the Key in Commands section the designer may need to edit the Cell name again and remove the *AS=1* key in. Once these changes are made and saved to the ddb, the designer can place this item and later quantify them. Notice in the *Design* field the value *Active Angle PT2* this tells the designer that the cell rotation will be set by picking 2 points in the design file.
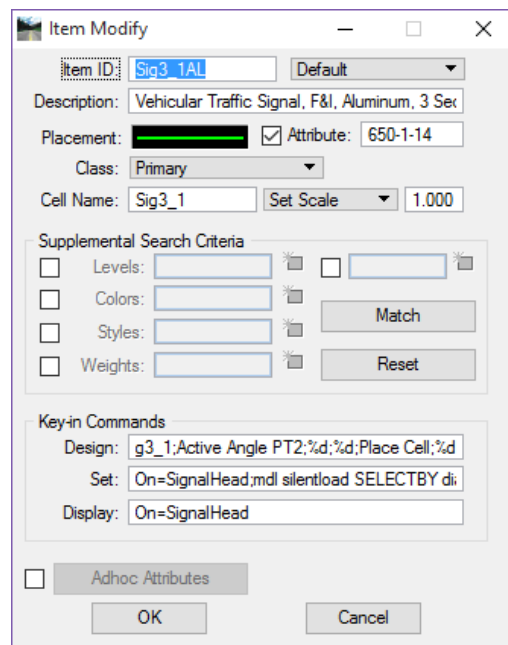
In this exercise the designer will place a **Signal Head** on the **Mast Arm** using **D&C Manager**.

> ➢ *Place Signal Head 5 section 1 Way*

1. Continuing in *DSGNSG01.dgn*, **Pole 4**, zoom out so the entire intersection is in the view.

2. Turn back on the display for the DSGNSP01.dgn file.

3. In D&C Manager, navigate to Signalization > Traffic Signals > Furnish & Install.

4. Scroll to find Traffic Signal > Furnish & Install > Aluminum > 5SHORAL, Vehicular Traffic Signal, F&I, Aluminum, 5 Section, 1 way.

5. Double-click on item 5SHORAL, Vehicular Traffic Signal, F&I, Aluminum, 5 Section, 1 way.

6. Set the rotation angle of the **5SHOR** *cell* by picking **2 points** in the design file to set the angle.

> *Note*   *The first point should be on the signal side of the mast arm where the mast arm is connected to the pole connection plate. The second point should be on the signal side of the mast arm at the very end of the mast arm. Tentative snap to these points and then data point. This will set the signal to the angle of the mast arm.*

7. **Tentative Snap** to the traffic separator end of the stop line of the opposing left turn lane and hit the **'O'** **(Set Origin)** key on the keyboard.

8. Type **-6** in the *X coordinate* field in Accudraw. This will lock the position of the *Traffic Signal Head* centered on the 12ft opposing turn lane.

9. Using the Nearest Snap, snap to the signal side of the mast arm. The cell is now placed on the mast arm centered to the opposing turn lane.

10. Right-click to **Cancel** the command.

> ➢ *Place Signal Head 3 Section 1 Way*

1. In D&C Manager, navigate to Signalization > Traffic Signals > Furnish & Install.

2. Scroll to find 0650 1 13, Traffic Signal, F&I, Aluminum, 3 Section, 1 way > 3SHORAL, Traffic Signal, F&I, Aluminum, 3 Section, 1 way.

3. Double-click on item **3SHORAL**, Traffic Signal, F&I, Aluminum, 3 Section, 1 way.

4. Set the rotation angle of the **3SHORAL** *cell* by picking 2 points in the design file to set the angle.

> *Note*   *The first point should be on the signal side of the mast arm where the mast arm is connected to the pole connection plate. The second point should be on the signal side of the mast arm at the very end of the mast arm. Tentative snap to these points and then data point. This will set the signal to the angle of the mast arm.*

5. **Tentative Snap** to the traffic separator end of the stop line of the opposing left turn lane and hit the 'O' (**Set Origin**) key on the keyboard.

6. Type **-6** in the *X coordinate* field in Accudraw. (This will lock the position of the *Traffic Signal Head* centered on the 12ft opposing turn lane.)

7. Using the **Nearest Snap**, snap to the signal side of the mast arm. The cell is now placed on the mast arm centered on the opposing turn lane.

8. Right-click to **Cancel** the command.

9. Repeat steps 4–33 to complete placing signals heads on **Mast Arm Assembly Poles 1-3***:*
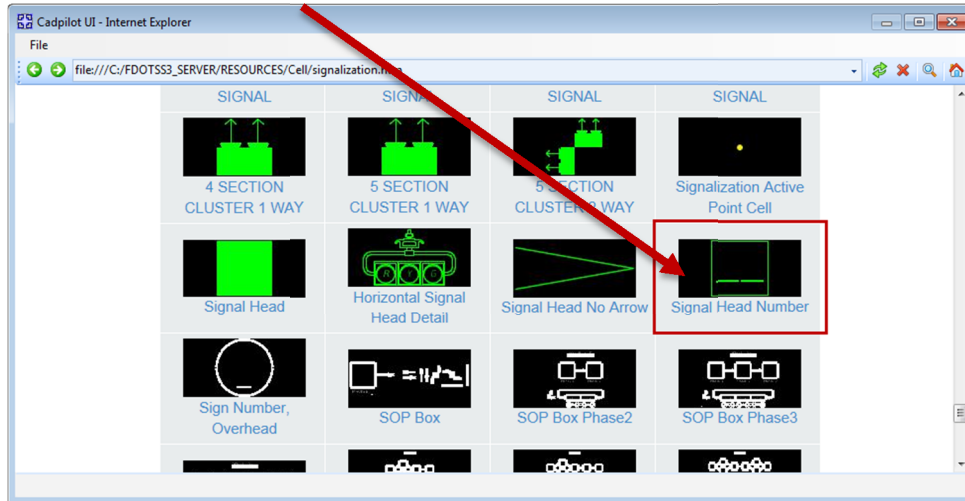
➢ *Place Signal Head Number*

In this part of the exercise the designer will complete the **Signal Heads** by placing a signal number. The next figure shows the finished product.
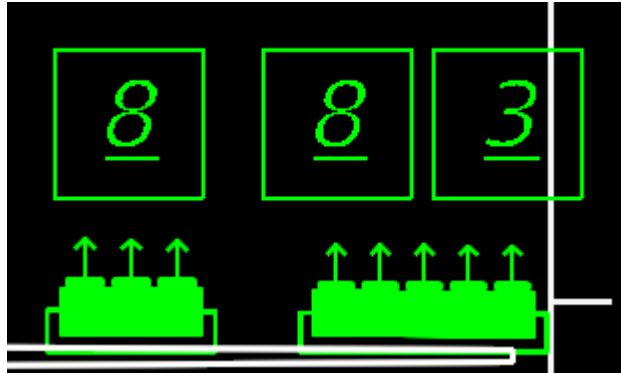

1. In MicroStation, set the *active level* to **SignalHead**.

2. If the *Signal Poles Library Cell Webpage* was dismissed, click the **Open Browser** icon near the end of the FDOT Menu to recall the webpage.

3. Scroll all the way back to the top of the *Signal Poles Library Cell Webpage* and select **Traffic Plans > Signalization > Signalization Library**.
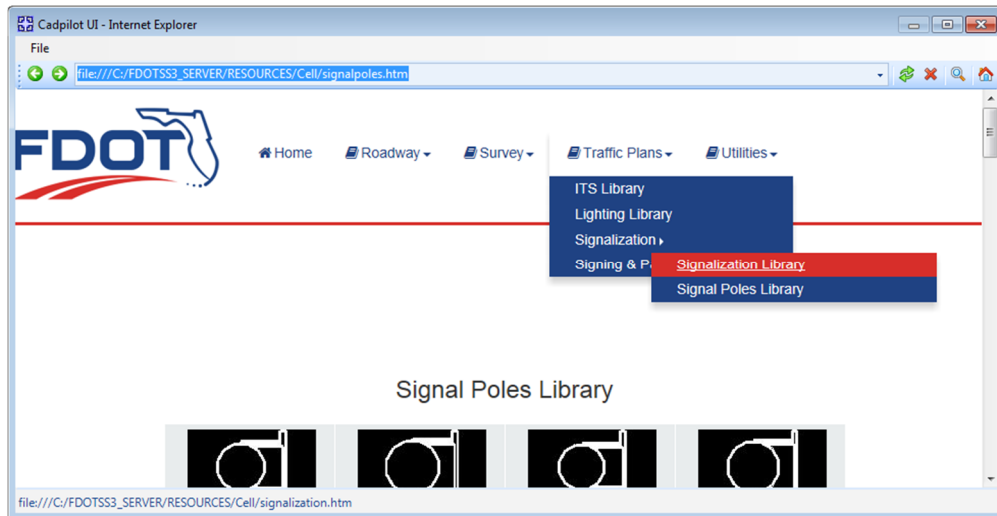
4. Scroll to find the **Signal Head Number** cell selection and click the image or the text link.

5. In MicroStation, select **Place Active Cell** and set the *Active Angle* to **0**.

6. Set the *X and Y Scale* to **1.0**.

7. Position the ***Signal Head Number Box*** center, front of the arrow on the **3 Section, 1 Way Signal Head** and issue a **Data Point**.

8. Place **2 Signal Head Number Boxes** on the **5 Section, 1 Way Signal Head** offset from center, but both boxes centered about the **Signal Head** and issue a **Data Point** for each box.

9. Using the MicroStation *Fill in Single Enter Data Field*, click inside the *Signal Head* number box for the **3 Section, 1 Way Signal Head** and enter the number **8**.

10. **Data point** in the view to accept this value.

11. Right-click to **Cancel** the command.

12. Repeat steps 32-34 to fill in the **2 Signal Head Number Boxes** for the **5 Section, 1 Way Signal Head.** Click inside each **Signal Head Number Box** for the **5 Section, 1 Way Signal Head**. The first box enter the number **8**. The last box enter the number **3**.
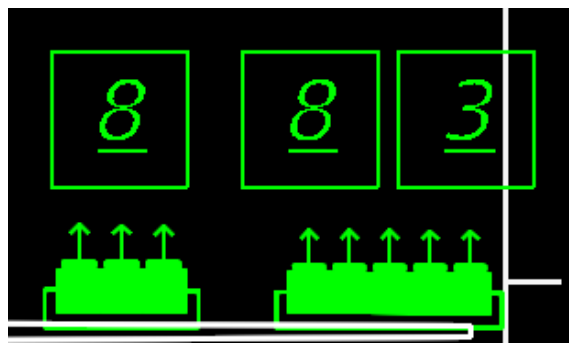

13. Repeat steps 27-35 to place the **Signal Head Number Boxes** and use the MicroStation *Fill in Single Enter Data Field* to fill in the data on all the **Signal Heads Number Boxes** for each pole with data in the table below:

| Pole	Mast Arm Cell	Signal Heads	Box 1	Box 2
Pole 1	Mast Arm Type E3	3 Section, 1 Way	2	
Pole 1	Mast Arm Type E3	5 Section, 1 Way	2	5
Pole 2	Mast Arm Type E5	3 Section, 1 Way	4	
Pole 2	Mast Arm Type E5	5 Section, 1 Way	4	7
Pole 3	Mast Arm Type E6	3 Section, 1 Way	6	
Pole 3	Mast Arm Type E6	5 Section, 1 Way	6	1

Note   *The Enter Data Fields in each Signal Head Number Box has 2 spaces which can be cleaned up by removing one of the spaces using the Text Editor – Word Processor.*

Exercise 8.4 *Place Loop Assemblies*

The loops, like the signal heads, can be placed with MicroStation tools and from the D&C Manager. The advantage to using D&C Manager is the ability to tag the item with intelligence and automate quantities. The Figure below shows the Loop Assembly for a *Type F* loop. Review the Key in Commands before placing the Loop to understand what actions are taken during placement, for example this item requires a 2 point rotation to align the loop with the lane it is being placed in.
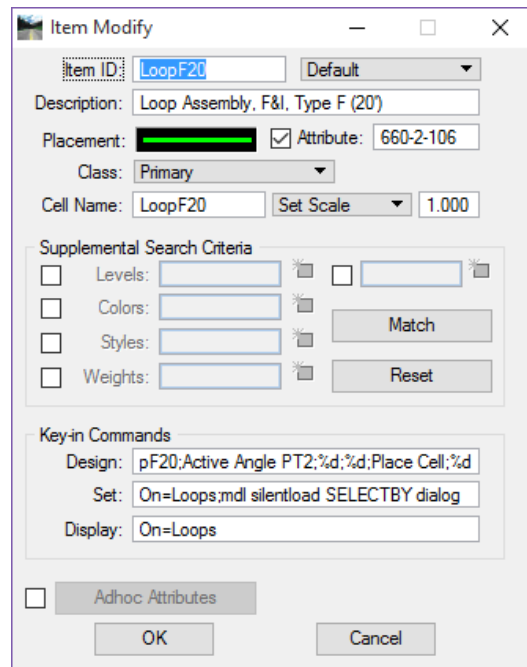

In this exercise the designer will continue working in the same intersection and place the Loop Detectors, using D&C Manager, that correspond to the Signal Heads placed in the previous exercise. Refer to Design Standard index 17781 for additional design criteria for Loop Assemblies. The figure below shows the Loop placed 2' behind the stop bar centered in the turn lane.
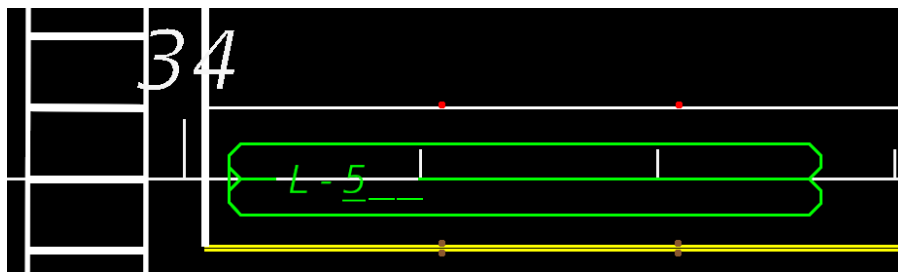
> ## Place Loop Type F

1. Continuing in *Dsgnsg01.dgn* zoom in near station **34+00**.
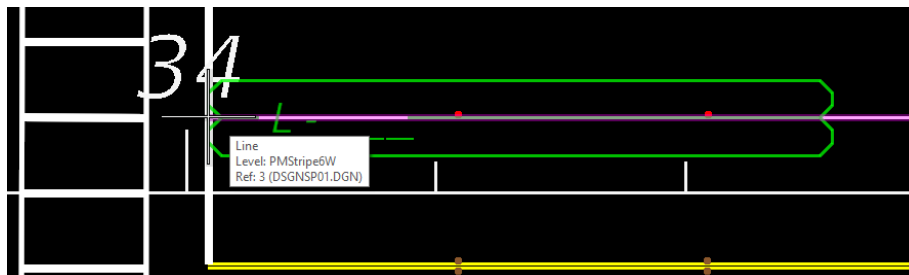
2. Activate AccuDraw if it is turned **Off**.

3. Open **D&C Manager** and navigate to Signalization > Loop Assemblies.
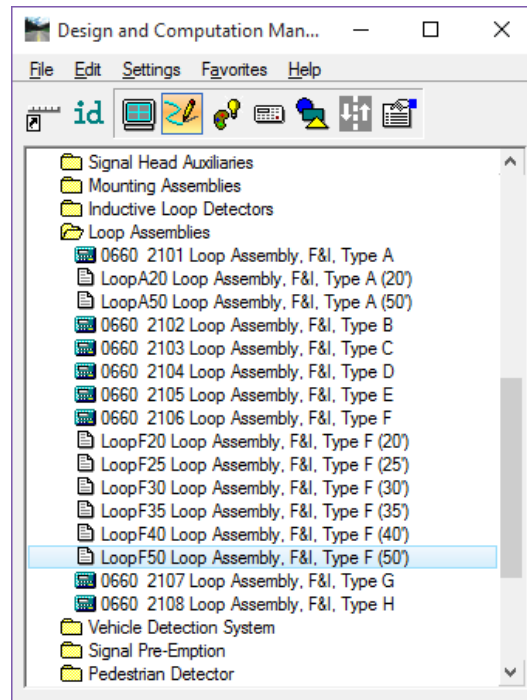
4. Scroll to find *LoopF50 Loop Assembly F&I, Type F (50')* and double-click on the item. This will prompt to set the active rotation angle using 2 points.

    a. For **point 1** snap to the end point of the 6" white lane line nearest the stop bar and issue a data point.

    b. For **point 2** snap to the same 6" white lane line up station and issue a data point. After this point is selected the Loop cell will be attached to the cursor.

Note   *If the wrong rotation was picked, right click to cancel the command then go back to D&C Manager and double-click on the item again to restart the command.*

5. Tentative Snap to the 6" White Lane line at the stop bar.

6. Select the letter **O** on the keyboard. (This sets the **AccuDraw Origin** at the end of the line.) Next establish the center of the turn lane.

7. Type in the number **6** in *Y coordinate* field and click enter. (This is half of a 12' lane. Clicking enter locks the Y axis.)

8. Move the cursor to the right and type in the number **2** in the *X coordinate* field. This moves the Loop exactly **2'** from the stop bar.
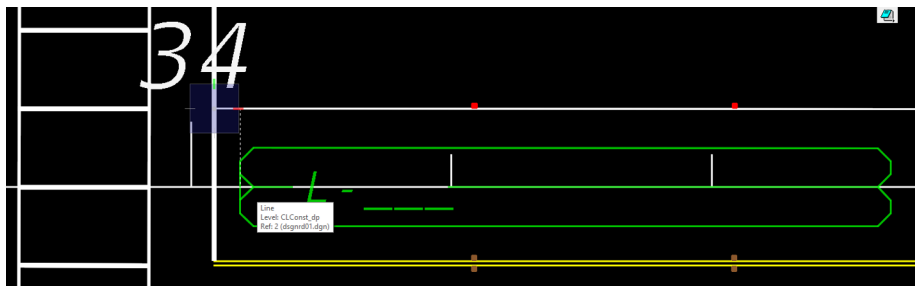
9. Issue a **Data Point** to place the **Loop**.

10. Right click to **Cancel** the command.

11. Using the MicroStation *Fill in Single Enter Data Field* click inside the Loop.

12. Type in the number **5**.

13. Issue a **Data Point** in the view to accept the value.

14. Right click to **Cancel** the command.

➢ *Place Multiple Loop Assemblies*

In this part of the exercise the designer will place multiple loop assemblies to complete a leg of an intersection using the technique learned in the previous exercise.
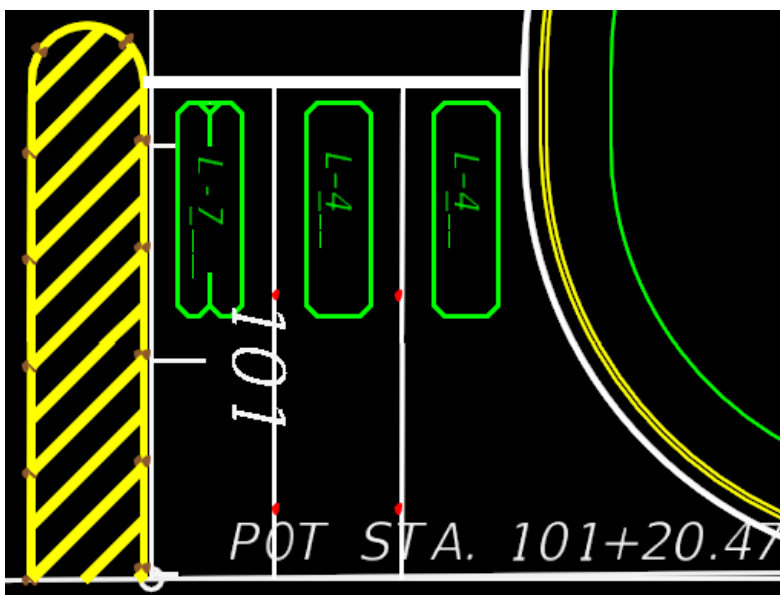
1. Continuing in *Dsgnsg01.dgn* zoom in near station **100+60** on the **WakullaHS** chain.

2. Scroll to find *LoopF20 Loop Assembly F&I, Type F (20')* and double-click on item. This will prompt to set the active rotation angle using 2 points.

    a. For **point 1** snap to the end point of the 6" white lane line nearest the stop bar and issue a data point.

    b. For **point 2** snap to the same 6" white lane line up station and issue a data point. After this point is selected the Loop cell will be attached to the cursor.

    Note   *If the wrong rotation was picked, right click to cancel the command then go back to D&C Manager and double-click on the item again to restart the command.*

3. Tentative snap to the **6" White Lane** line at the stop bar.

4. Select the letter **O** on the keyboard. This sets the AccuDraw Origin at the end of the line. Next establish the center of the turn lane.

5. Move the cursor over towards the center of the turn lane and type in the number **6** in *X coordinate* field. This is half of a 12' lane.

6. Select the letter **O** on the keyboard. This sets the AccuDraw Origin in the center of the turn lane.

7. Move the cursor to the down and type in the number **2** in the *Y coordinate* field. This moves the Loop exactly **2'** from the stop bar.

8. Issue a **Data Point** to place the **Loop**.

9. Right-click to **Cancel** the command.

10. Using the MicroStation *Fill in Single Enter Data Field* click inside the Loop.

11. Type in the number **7**.

12. Issue a **Data Point** in the view to accept the value.

13. Right click to **Cancel** the command.

14. Navigate to Signalization > Loop Assemblies > Furnish & Install.

15. Scroll to find *LoopA20 Loop Assembly, F&I, Type A (20')* and double-click on the item. (This will prompt to set the active rotation angle using **2 points**.)

16. Repeat steps 2 – 11 to place the Type A loops in the 2 adjacent lanes. Use the number 4 for the loop label value.

Exercise 8.5 Place Pull Box

The Pull Box item in **D&C Manager** works much like the Loop Assemblies in that the designer is required to define 2 points to set the rotation angle. As with any item being placed with **D&C Manager** it is good practice to review the item to better understand how the item is placed. If the designer places the Pull Boxes using the Signals Tool Box, those Pull Boxes will need to be **Set** using **D&C Manager** in order to automate quantities.
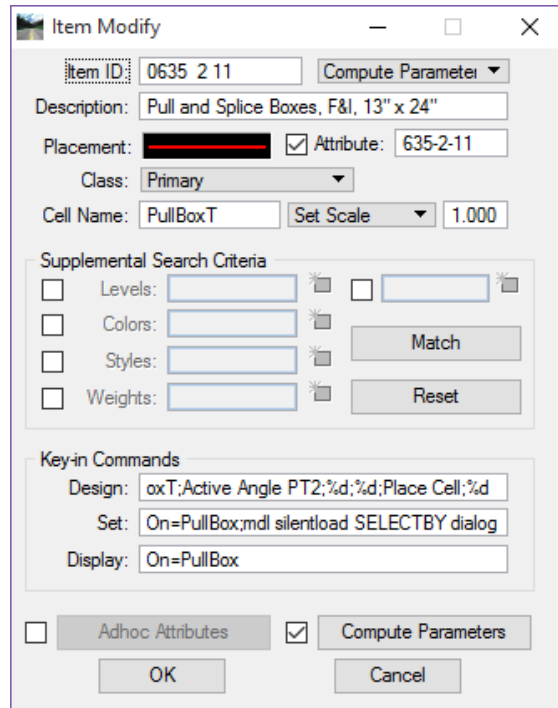
In this exercise the designer will use **D&C Manager** in conjunction with *Draw Cell by Feature* tool to place several pull boxes around the intersection. By using **D&C Manager**, the designer will be able to generate automated quantities. The figure below shows the Pull Boxes drawn in Plan View.

1. Continuing in *Dsgnsg01.dgn***,** zoom in near **Pole 3**.

2. From the Road Tools palette open the Draw Cell by Feature tool.
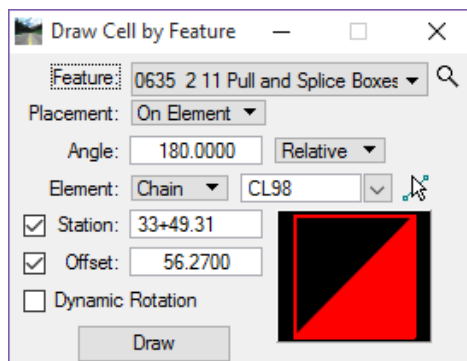
3. To set the *Feature* click on the *magnifying glass* icon to open **Select Design & Computation Payitem**.

4. Navigate to Signalization > Pull and Junction Boxes > Pull and Splice Boxes.

5. Double-click on Item **0635 2 11 Pull and Splice Boxes, F&I, 13" x 24"**. This loads the category into the Draw Cell by Feature tool.

6. In Draw Cell by Feature, click the drop down menu and select the item **0635 2 11 Pull and Splice Boxes, F&I, 13" x 24".** (This should already be set since it is the first item listed in the category.).

7. Set the *Placement* to **On Element**.

8. Set the *Element* to **Chain** and **CL98**.

9. Set the *Station* as **33+42.57** and toggle **On** the lock.

10. Set the *Offset* to **66.02** and toggle on the lock.

11. Click the **Draw** button. The **Pull Box** *cell* will be attached to the cursor. **Data Point** to place the cell between the *Back of Sidewalk* and *Pole* **3**.

12. Repeat steps 4-12 to place **Pull Boxes** at the following *offsets* and *stations*:

| Offset	Station/Side	Offset	Station/Side	Offset	Station/Side	Offset	Station/Side
42.53ft	30+74.08 RT	51.65ft	32+61.17 LT	66.06ft	33+65.61 RT	33.05ft	34+01.29 RT
45.00ft	32+24.67 RT	62.00ft	33+42.57 RT	54.86ft	33+62.59 LT	65.89ft	34+34.12 RT
65.30ft	32+30.58 RT	62.10ft	33+54.83 RT	34.42ft	33+74.98 RT	42.24ft	35+29.48 LT
38.85ft	32+61.18 LT	65.83ft	33+54.83 RT	49.35ft	33+82.27 LT		

Note   These boxes can also be placed by hand by toggling off the Station and Offset options. The figure below shows the configuration of the pull boxes in the intersection.

Exercise 8.6 *Place Controller Assembly*

In this exercise the designer will use the Signals toolbox or the signals Web Page in conjunction with D&C Manager to place a Base Mounted Controller. The figure below shows the general location of the Controller.

1. Continuing in *Dsgnsg01.dgn*, zoom in near **Pole 3**.

2. In the Draw Cell by Feature dialog box, click on the magnifying glass icon to open ***Select Design & Computation Payitem***.

3. Navigate to Signalization > Controllers and Cabinets > Traffic Controller Assembly > Furnish & Install.

4. Select item **0670 5110 Traffic Controller Assembly, F&I, NEMA**.

5. In Draw Cell by Feature, click the drop down menu and select the item **0670 5110 Traffic Controller Assembly, F&I, NEMA.** (This should already be set since it is the first item listed in the category.)

6. Set the *Placement* to **On Element**.

7. Set the *Element* to **Chain** and **CL98**.

8. Set the *Station* as **33+60.25** and toggle on the lock.

9. Set the *Offset* to **64.68** and toggle on the lock.
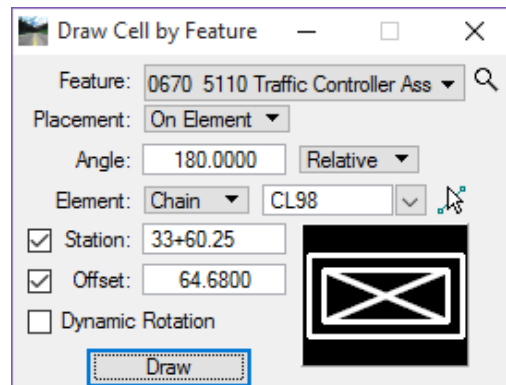
10. Click the **Draw** button. The **Controller Assembly** *cell* will be attached to the cursor. **Data Point** to place the cell.

Exercise 8.7 *Draw Loop Lead in Wire*

In this exercise the designer will draw the Loop Lead-In wire from the end of the Loop Detectors to the Pull Box. The lead-In is paid for under the Loop Detector so the designer will draw this line using the MicroStation Place Line command, no D&C Manager item is used. The figure below shows the Loop Lead-In drawn from Loop Detectors to the Pull Box.
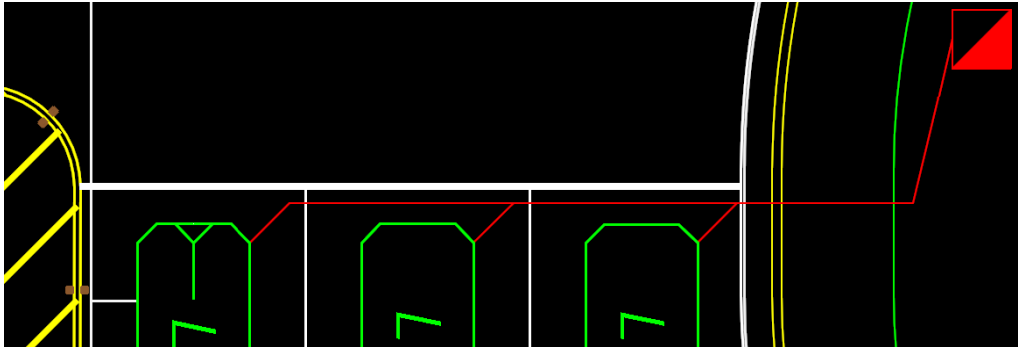

> ➢ *Draw Loop Lead-In*

1. Zoom in near the *Loop Detectors* placed earlier on the **WakullaHS** (**Wakulla High School**) leg of the intersection.

2. In MicroStation, set the *Level* to **LoopLI**.

3. From the FDOT Plans Development Task menu select Drawing > Construct Line at Active Angle from the line tool options.
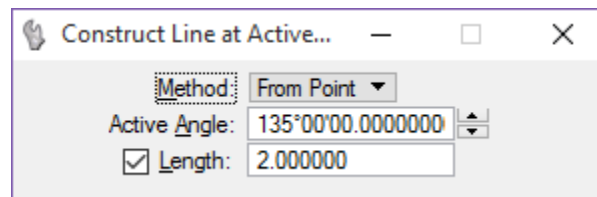
4. Set the *Method* to **From Point**.

5. Set the *Active Angle* to **135**.

6. Check on the *Length* and enter **2.0**.

7. Snap to the end of the **Loop Detector** near the *Stop Bar* as seen in the next figure to the right.
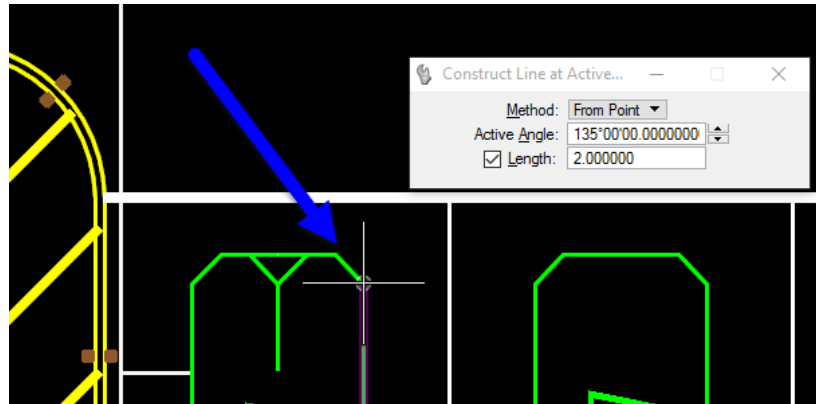
8. Issue a **Data Point** to accept the location.

9. Move the cursor towards the *Stop Bar* and issue a second **Data Point**. The next figure shows the Lead-In connected to the Loop Detector.
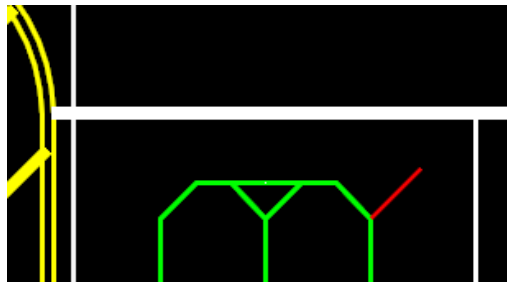
10. Repeat this process on the remaining two **Loop Detectors**.

Note   Next, the user will draw the Loop Lead-In that connects the Loop Detectors to the Pull Box.

11. Using the *Place Line* command, draw a line from **Loop L-7** parallel to the *Stop Bar* to a point past the last **Loop L-4,** then into the first **Pull Box** as shown in the next figure.
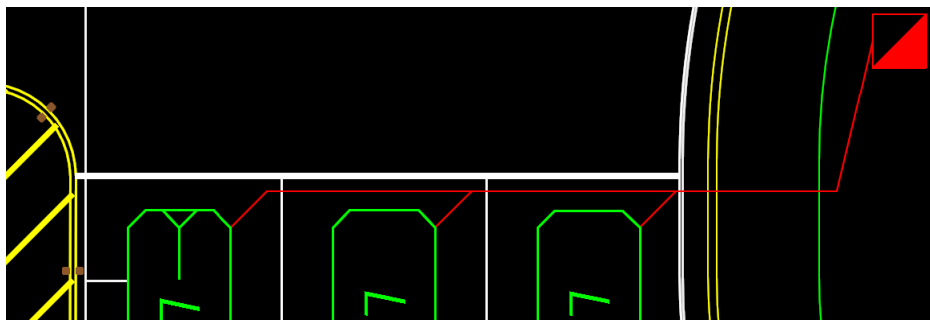
Note   The location of the Pull Boxes will be dependent on each individual project. The placement of Loops, Types of Loops used and Loop Lead-In wire placement may vary from district to district, consult with the district traffic engineers regarding these issues.

Exercise 8.8   Place Conduit

The custom line styles used to draw the *Conduit* lines can be adjusted so that the line style displays graphically pleasing. At times it may be necessary to adjust the line style scale to get the symbols built into the line style to display properly.

To adjust the line style scale in D&C Manager the user would go to **Settings > Design** this opens the Design Settings dialog.
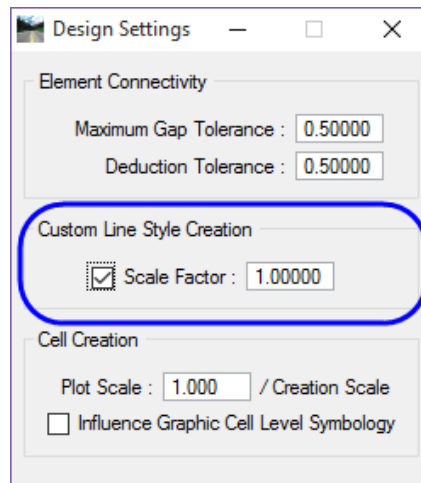

In the center of the Design Settings dialog is the item for *Custom Line Style Creation*. This setting controls how a line style is displayed when drawn with D&C Manager. The user should check on the *Scale Factor* and set the scale. In most cases the Plot Scale will work but in some it may be necessary to adjust this value as with the *Conduit* on a 50 scale plan sheet, a scale of **20.0** gives a better representation of the *Conduit* line style. Changing this value will not affect the quantities; however, it is very important that the designer communicate any changes to all design squad members for consistency.

The figure below shows the same 50' conduit line drawn using two different *Scale Factors*.
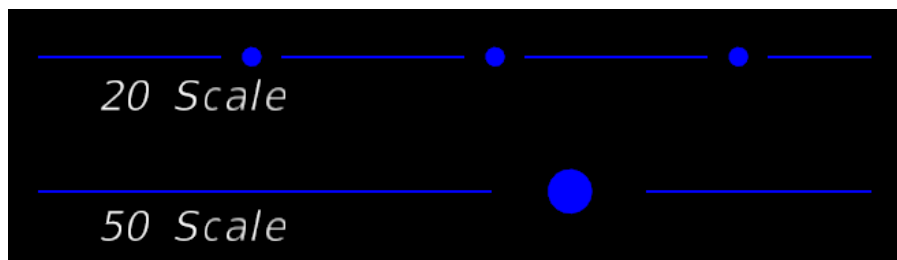
In this exercise the designer will draw conduit from Pull Box to Pull Box and then to the Controller Cabinet. This exercise will use two different types of Conduit, Underground and Under Pavement and Open Trench. The next figure shows the two types of conduit drawn in Plan view.
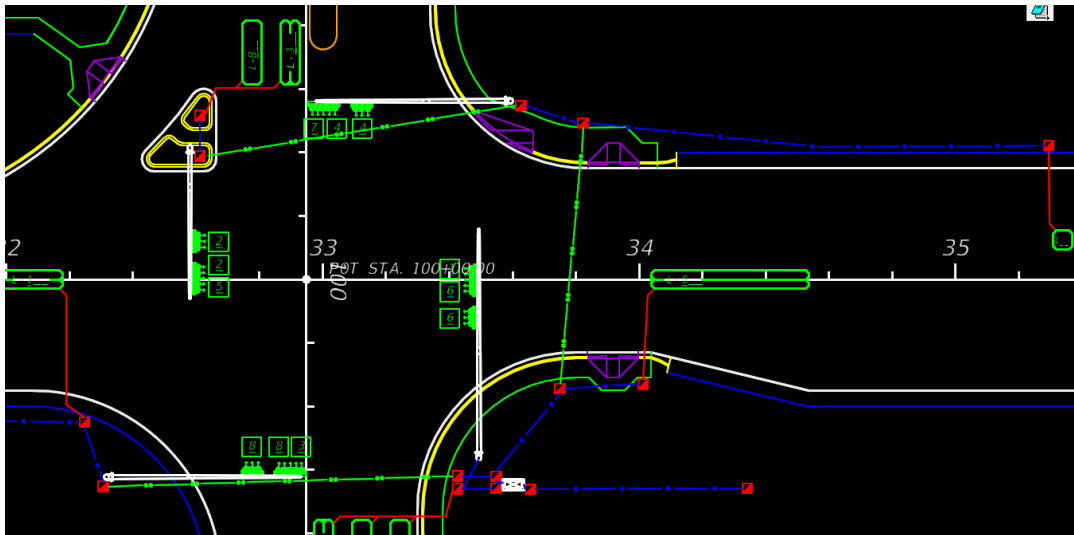

> ### ➢ *Place Conduit Underground*

1. Continuing in *Dsgnsg01.dgn***,** zoom in near the **Pull Box** at Station **30+74.08** placed in a previous exercise.

2. Open D&C Manager.

3. From D&C Manager, select **Settings > Design**. (This opens Design Settings.)

4. Check on *Scale Factor*. Enter the value **20/50 (or 0.4)**.

   Note   Using the value of 0.4 takes into account the Drawing Scale in the file which is set to 1:50.

5. Close the Design Settings dialog.

6. In D&C Manager, navigate to **Signalization > Conduit**.

7. Select item 0630 2 11 Conduit, Furnish & Install, Open Trench or Contractor's Option.

8. In D&C Manager**,** start the **Design** mode.

9. Check on **Place Influence**. (This will set the MicroStation level symbology.)

10. Using the MicroStation *Place Line* tool, draw a line from one Pull Box to the next Pull Box. See figure below.
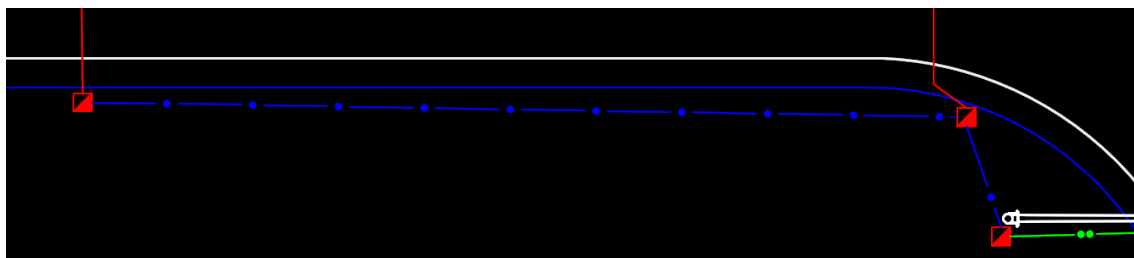
11. Continue to place the rest of the *Conduit item* 0630 2 11 Conduit, Furnish & Install, Open Trench or Contractor's Option and 0630 2 12 Conduit, Furnish & Install, Underground or Underpavement - Directional Bore around the intersection and down the US98 chain. Complete the conduit from the Pull Box to the Controller Cabinet.

12. Zoom to the area near the *Signal Poles* and draw a line from the **Signal Pol**e to the **Pull Box**.
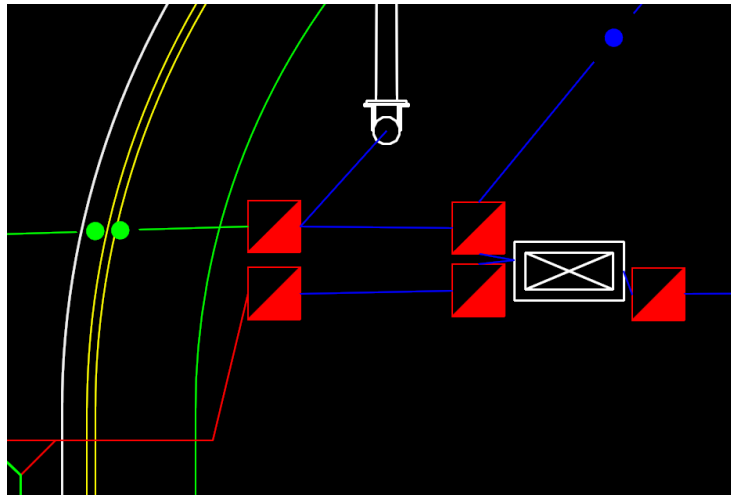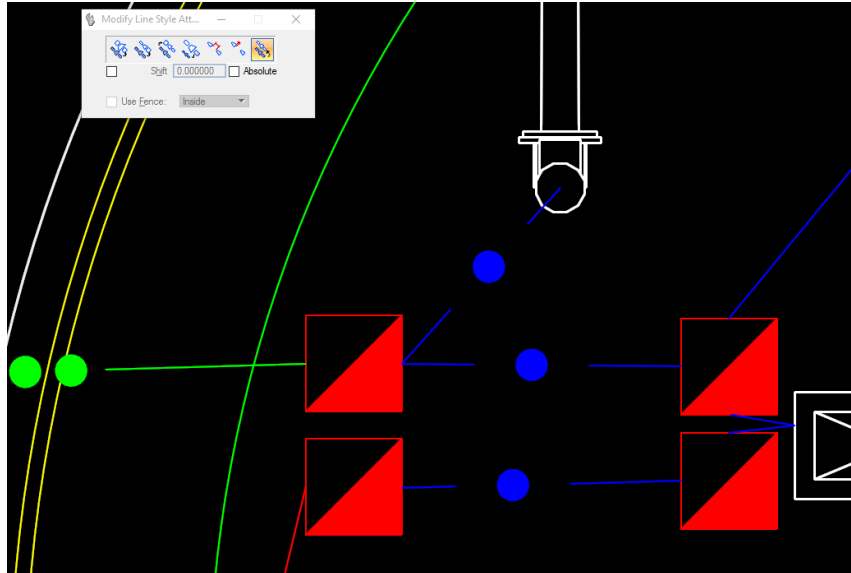

13. Turn **Off** Place Influence.

14. Open the Modify Line Style Attributes tool box from the Change Attributes tool options.
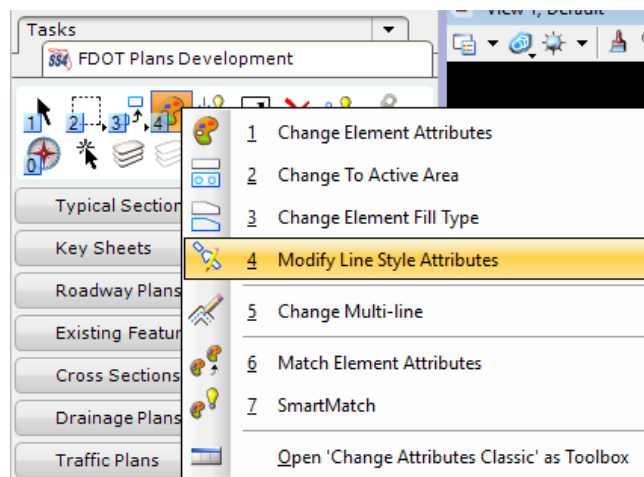
15. On the Modify Line Style Attributes tool box select the Shift option.
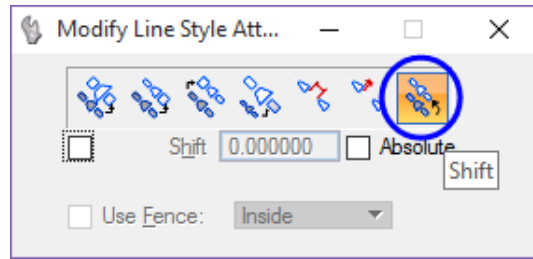
16. Select one of the shorter lines of conduit between the conduits. Move the cursor to shift the lines style so that the dots of the custom line style appear on the elements.
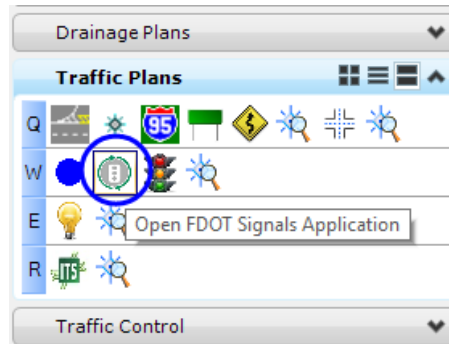
Exercise 8.9 *Signal Head Detail*

➢ ***Place Signal Head Details***

In this exercise the student will use the FDOT Signals Application to place the Signal Head Detail.

1. Zoom to the upper left side of the plan sheet clip border referenced in from the CLIPSG01.dgn file.

2. From Task Navigator, select FDOT Plans Development > Traffic Plans > Open FDOT Signals Application.

3. Click the down arrow next to the *Pay Item* field and select **Traffic Signals Details**.
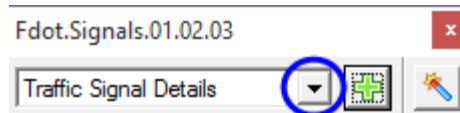
4. Click the **green Plus** button to access the Traffic Signals dialog.

5. Scroll down and select the cell 5 Section 1 Way Left Horizontal (650-51-511) from the drop down list.
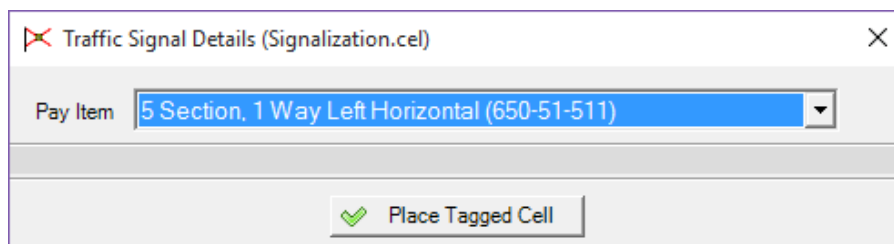
6. Click the **Place Tagged Cell** button on the bottom of the Traffic Signals Details dialog.

7. The MicroStation *status bar* indicates the angle of the cell needs to be entered. **Data Point** in the design plan anywhere.


8. **Data Point** again to set the angle.

9. Place the cell near the top left -corner of the plans sheet. Right click to **Cancel**.

10. Click the **red X** in the upper right corner of the Traffic Signals Details dialog. This is to reset the dialog.

11. Click the **green Plus** button to access the Traffic Signals Details dialog.

12. Click the down arrow next to the *Pay Item* field on the Traffic Signals dialog.

13. Scroll down and select the cell 3 Section 1 Way Horizontal (650-51-311) from the drop down list.
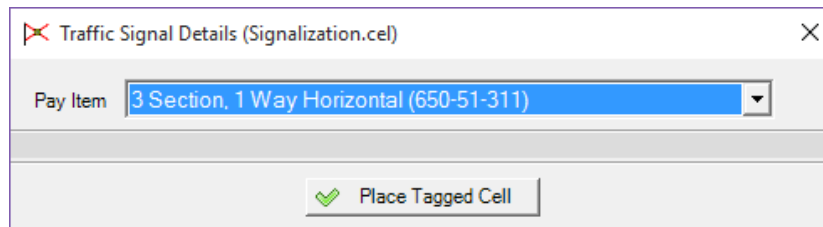
14. Place the cell next to the first cell placed. Right Click to **Cancel**.

15. The *Assembly* text and *Pay item* number box contain *Data* fields which can be edited using the *Edit Data Fields* tool in MicroStation.

16. The *5 Section, 1 Way* will have **4 assemblies** and the *3 Section, 1 Way* will have **4 assemblies**. Use the MicroStation **Fill In Single Enter-Data Field** tool to update the number of assemblies for each Signal Head.


17. Click the **red X** in the upper right corner of the Traffic Signals Details dialog. (This is to reset the dialog.)

➢ *Place Controller Timing Chart and Loop Detector*

In this exercise, place Timing Charts for Controllers and Loop Detector Charts.

1. Continuing in *Plansg01.dgn* and the FDOT Signalization Application, zoom to the bottom left side of the plan sheet.

2. Click the down arrow next to the *Pay Item* field and select **Charts and Summary Boxes**.

3. Click the **green Plus** button to access the Traffic Signals dialog.

4. Scroll down and select the cell Timing Chart Controller 8 Movements.
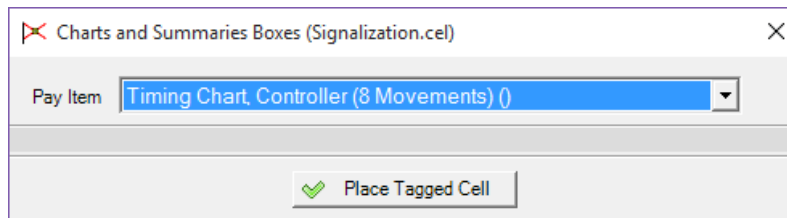
5. Place the cell in the design file. Zoom to the bottom right side of the plan sheet.

6. Repeat the previous steps to place the **Loop Detector Chart Standard**.
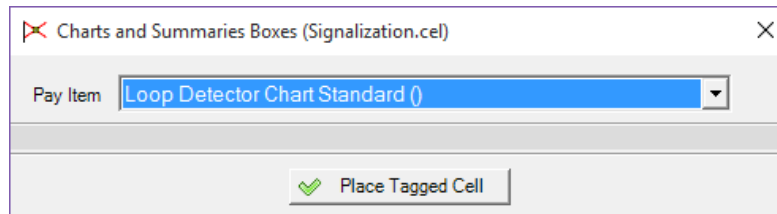
7. Both of these cells have data fields built into them to aid the user in populating the data.