

# 6

## PAVEMENT MARKING PLANS

### OBJECTIVE

The objective of this chapter is to create Proposed Pavement Marking Features using the Design and Computation (D&C) Manager, FDOT Menu and GEOPAK tools.

### INTRODUCTION

This section introduces several applications that help to create a Pavement Marking set of plans:

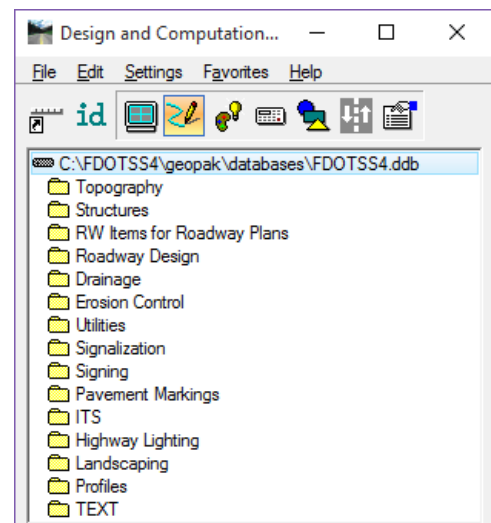
- **D&C Manager** A GEOPAK tool used to help designers draw elements, set symbology, and compute quantities. The FDOT CADD office provides a database set up with the correct symbology, cells, formulas and pay items needed to meet the FDOT standards.
- **Pavement Marking Program** A set of tools within the Design & Computation (D&C) Manager used to draw in pavement markings in accordance with the FDOT Computer Aided Drafting and Design (CADD) standards.
- **Draw Cell Group by Feature** A tool to place multiple cells along elements or alignments. It uses the D&C Manager to insure the placement of cells, arrows and messages is with the correct symbology and pay item information for calculations.

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




### EXPLORING D&C MANAGER

The D&C Manager uses a proprietary DDB provided by FDOT. The installation of the FDOT CADD software places the latest D&C Manager DDB either on the server or on the local hard drive. For new projects, FDOT recommends to copy the latest DDB file from the FDOT installation folder into 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 *FDOTSS4.ddb* is renamed to *22049555201.ddb*. This allows the designer to modify the DDB for specific parameters, and protects it from any future maintenance updates overwriting the file. The latest FDOT DDB file is located in the \FDOTSS4\GEOPAK\databases\ folder. The naming format is *fdot####.ddb* where *####* is the year or version of the FDOT CADD Software.

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

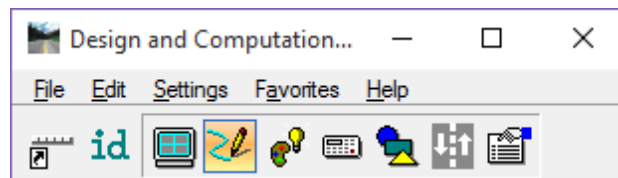



FDOT specifically set the DDB to create elements with the correct level symbology according to the FDOT CADD Standards. The DDB file is set up with discipline folders called categories. Inside of each category are items.


- **Categories** - The basic component of the hierarchical tree is the Category, represented by a folder icon. The categories in the *FDOTSS4.ddb* are divided by discipline. The figure above shows the Categories with a description relative to their discipline
- **Items** - The other DDB component is the item. An item could be a drafting item, a compute item or a default item. *Items* contain specific functions related to defined element symbology or quantity calculations. *Items* are represented by one of three icons:
  -  **Default Icon** -These items are used to set drafting standards for MicroStation commands or to draw COGO elements without annotation.
  -  **Drafting Standards Icon** - These items are used to set drafting standards for MicroStation commands or to draw COGO elements with annotation.
  -  **Calculator Icon** - These items are used to set drafting standards for MicroStation commands, to draw COGO elements and/or compute quantities. FDOT tags graphics with a pay item attribute for additional stratification of features when running computations and defines computation for these items.

## D&C MANAGER MENU BUTTONS

D&C Manager has a toolbar for easy access of different modes. 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.



 - **Switch To Toolbox Mode.** D&C Manager is set up to work in two different modes, as a dialog or a toolbox. This button activates the resizable and dockable toolbox. To change the display back to the whole dialog, click the **Switch to Dialog Mode** button. The Place Influence check box is at the left end of the toolbox.

 - **Identify Item.** The **Identify Item** button sets the D&C Manager item to match a selected MicroStation element previously drawn by the D&C Manager or elements drawn with Graphical COGO and the SMD file. If the item you ID does not match an item in the active DDB, a message appears in the status bar saying: **No matching database item.**

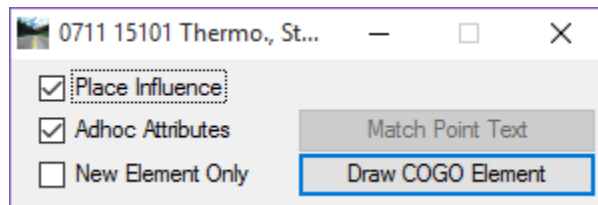


**- Display.** The **Display** button filters the display of MicroStation elements in the design file so only the selected features display, highlighted or hidden. This button expands D&C Manager to show a collection bin. This collection bin is for controlling the display of multiple items at one time. To add items to the collection bin, double-click the item. This tool also opens a second toolbox with four buttons as seen in the figure below.

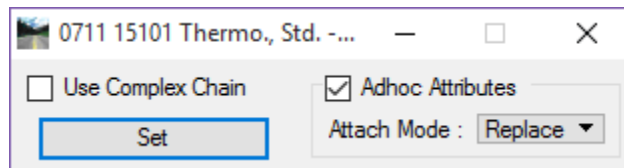
Buttons from left to right: Normal Display, Highlight Selection, Hide Selection and Display Only Selection.



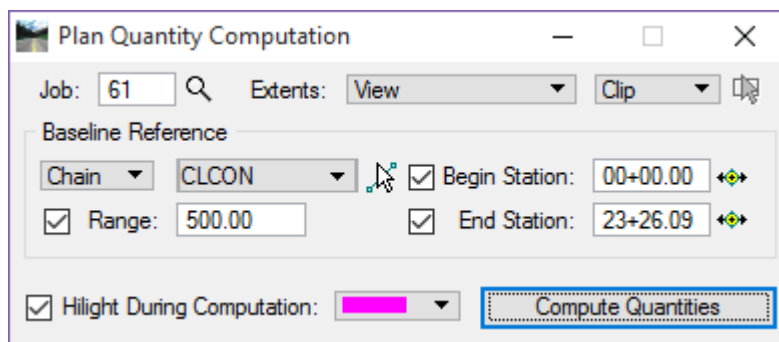
**- Design.** The **Design** button plots COGO and MicroStation elements into MicroStation with the defined symbology when selecting **Place Influence**. Draw Plan and Profile dialog or MicroStation commands place elements.



**- Set.** The Set button sets the symbology of previously drawn MicroStation graphic elements in accordance with the parameters of a selected item in the DDB. This tool fixes elements to meet CADD standards or attach/modify Adhoc Attributes.



**- Compute.** The Compute button tabulates quantities of items placed as a Pay Item by use of the Design or Set mode or have been drawn in MicroStation and they match the search criteria of the ddb file. This tool also expands D&C Manager to show the collection bin; this allows you to process multiple pay items or categories at one time. A second toolbox opens with the computation results.





- **Shapes**. The Shapes button uses plan view MicroStation graphics that defines an enclosed area to create a filled shape for computing area quantities.

*Note* FDOT does not recommend this tool is for use when the Civil Tools have been used for the design. Use the Create Region tool instead with the Associative Region Boundary option toggled OFF.



- **Pavement Marking**. This mode provides additional options for placing pavement striping and markings. This tool adds four additional tools to D&C Manager as shown in the figure below.

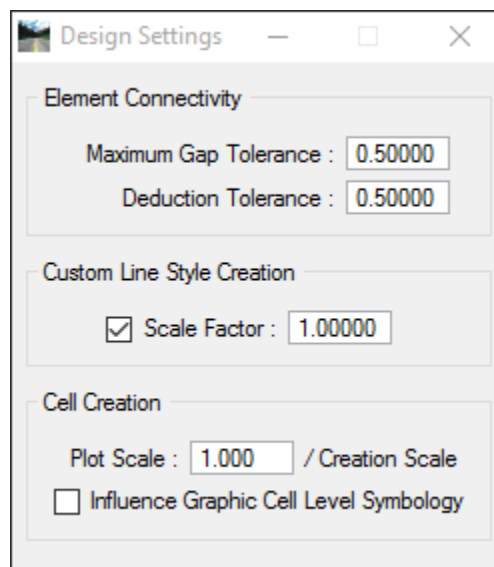
The four tools from left to right: Striping, Separation, Chevron Diverge, and Chevron Merge:



- **Preference**. This expands the toolbar to include four additional buttons to configure D&C Manager. These tools are also accessible from the **Edit** menu.

## DESIGN SETTINGS

Before using D&C Manager to draw or compute items, address settings. These are the Design Settings loaded from the **Settings > Design** menu in D&C Manager.



- **Maximum GAP Tolerance** – If the distance between two specified elements in a MicroStation file is smaller than the **Max Gap Tolerance**, the software assumes the two elements intersect and act accordingly. If the distance is larger than the **Max Gap Tolerance**, GEOPAK assumes the two elements do not connect.
- **Deduction Tolerance** – The Compute mode utilizes the **Deduction Tolerance**. For example, if the pay item is specified for a curb line, and for each manhole (drawn in as a cell), there is a deduction of six feet. The origin of the cell does not have to be on the curb line, but must be within the deduction tolerance in order to recognize cells and make the deduction.

- **Custom Line Style Creation** – The Custom Line Style **Scale Factor** sets a specific scale for custom line styles. Note this scale is only for custom line styles.
- **Cell Creation – Plot Scale** is a ratio with the Creation Scale within the setup of D&C Manager. If the Cell Creation Scale is 10 and the designer wants the cell twice as large as a cell placed with D&C Manager, utilize 20 as the Drawing Scale.

*Note* When entering a drawing scale, all subsequent cells placed from the D&C Manager are scaled accordingly if the item is set to use creation scale. When placing a cell with place influence on, GEOPAK utilizes the drawing scale setting to compute an X & Y scale for use in the MicroStation Place Cell dialog.

- **Influence Graphic Cell Level Symbology** – When active, GEOPAK utilizes the symbology within the D&C Manager, ignoring the element symbology defined in the cell.

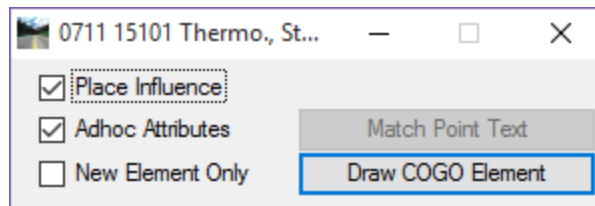
## DESIGN MODE

*Design Mode* is the default mode when the D&C Manager opens. The following functions use the *Design Mode*:

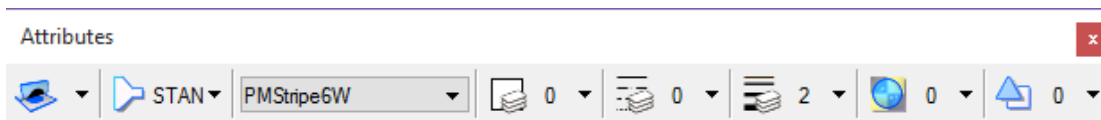
- Set Drafting Standards by use of the *Place Influence* command for the placement of MicroStation elements using MicroStation commands.
- Print COGO elements into the design file according to the drafting standards set by the item's defined parameters.
- Place Adhoc Attributes on an element.

Whether placed in the file by generic MicroStation commands or plotted from COGO, Draw Plan & Profile, the items can be placed as pay items for future tabulation.

By selecting *Place Influence*, the designer can use MicroStation commands to place elements utilizing the element attributes established for the currently selected item in the GEOPAK D&C Manager DDB. With most items, a GEOPAK attribute is placed with the element. This attribute provides another identifier to make the element unique and used to sort features for calculating quantities.



When selecting *Place influence*, the MicroStation level symbology is set. Any MicroStation command to draw a line, copy a line or place a cell is set to this symbology.



*Note* When finished placing the elements for a selected item it is important to remember to turn off *Place Influence*.

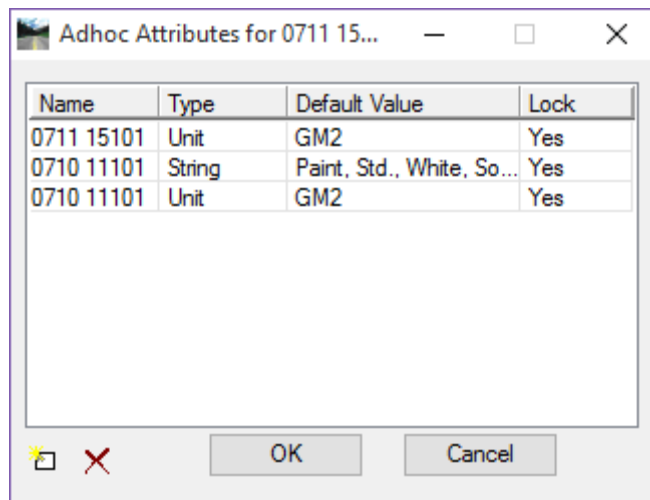
## ADHOC ATTRIBUTES

An Adhoc Attribute is additional information about a particular element. Look at it as another property for the MicroStation element, i.e. *Level*, *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 element with Adhocs. Other down-stream applications use these Adhocs.

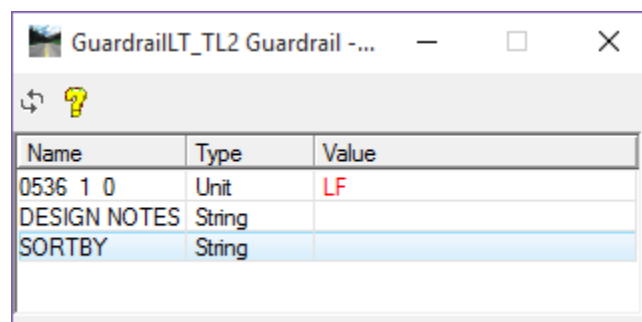
Some Adhocs are placed in the background and the designer does not interact with them. For example, when a proposed & remove sign post is placed with the Draw Sign Program, a 3pc file is utilized to access the D&C Manager DDB to place Adhocs on the post symbol for computing quantities.

The figure below shows the Adhocs that are associated with an item from D&C Manager. These Adhocs are part of the item and are set by default. Nothing indicated this information was set since all of the adhocs are locked for modification when placing elements.



Name	Type	Default Value	Lock
0711 15101	Unit	GM2	Yes
0710 11101	String	Paint, Std., White, So...	Yes
0710 11101	Unit	GM2	Yes

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.



Name	Type	Value
0536 1 0	Unit	LF
DESIGN NOTES	String	
SORTBY	String	

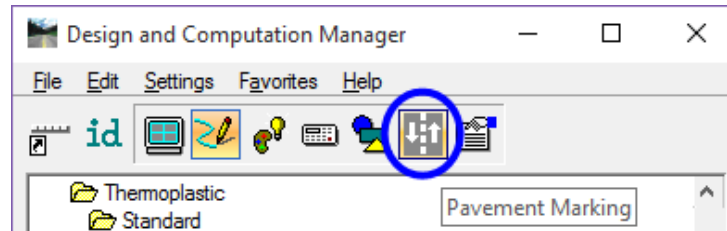
**Note** Adhocs with values displayed in red are locked for modification.

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

- **Name** - The *Name* is an identifying term used when GEOPAK is searching for a specific Adhoc Attribute.
- **Type** - The *Type* identifies the nature of the information, and has various options: Numeric, String, Unit, Quantity, and Remarks.

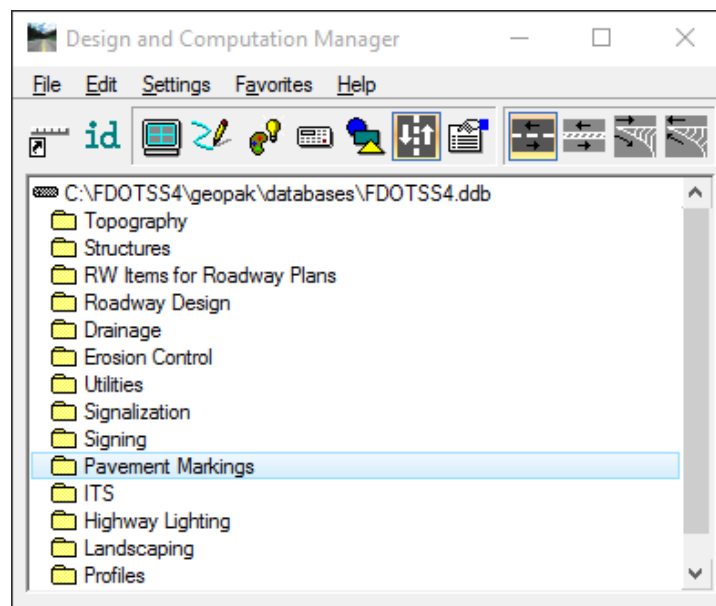
- **Value** - The *Value* is the actual information used by GEOPAK, and is determined by the Type. For example, if the Type setting is Numeric then the Value must be a number and GEOPAK will use it as a number.

## DRAWING PAVEMENT MARKINGS



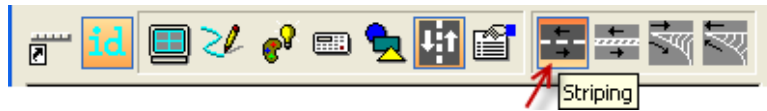
Many of the Traffic Plan items are simple cells or line styles drawn and quantified using the D&C Manager. The Pavement Striping component of the D&C Manager facilitates the production of pavement striping plans. To draw pavement markings with the GEOPAK's Pavement Marking program, select the pay item then click on the *Pavement Marking* button from the D&C Manager dialog. After selecting the *Pavement Marking* button, D&C Manager displays additional *Pavement Marking* options.

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

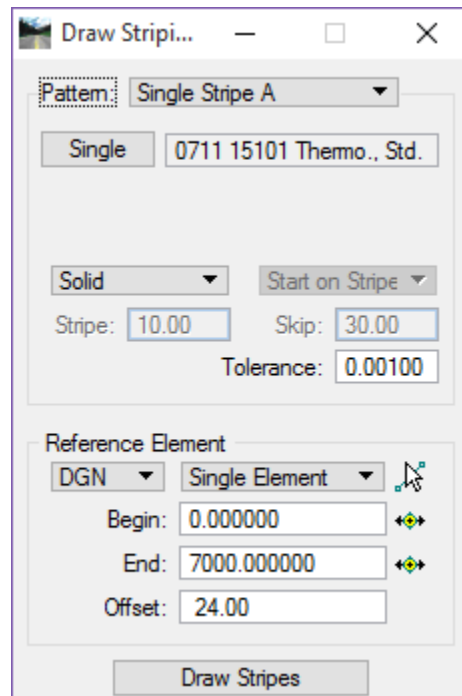


As mentioned earlier in this chapter, there are four additional tools in D&C Manager to aid in the design and layout of pavement marking.

## DRAW STRIPING



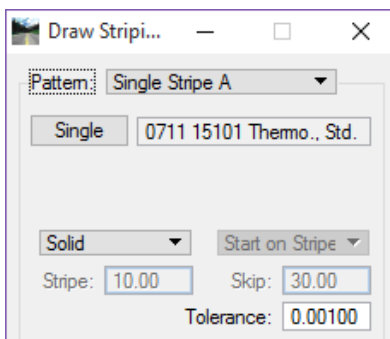
This Draw Striping tool draws all solid or skip pavement markings. The striping tool can reference a GEOPAK chain or an existing MicroStation linear element for length and offsets. The MicroStation elements can be in the active file or in a reference file.



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

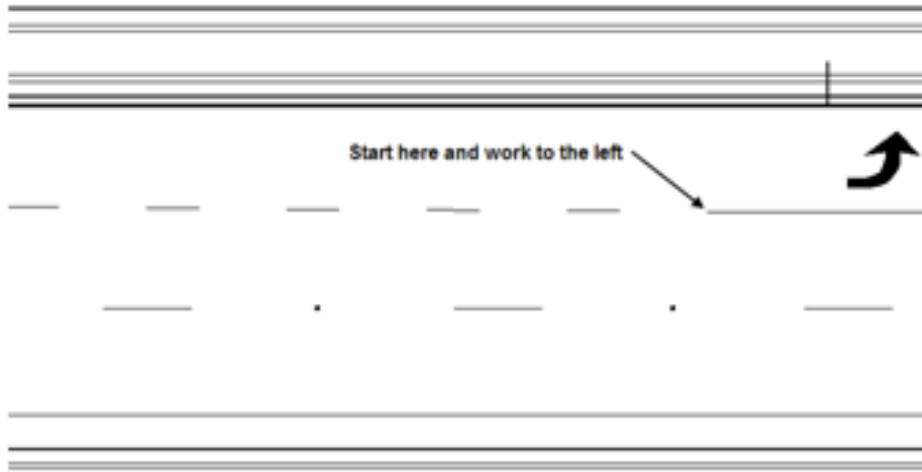
### PATTERN – SINGLE STRIPE OR DOUBLE STRIPE

Single Stripe A or Single Stripe B options allow two different configurations to be stored in a resource file so the type of stripe placed is easily changed. It is a way to set favorites, example; set Single Stripe A to 6” solid white and set Single Stripe B to 6” solid yellow. To draw a 6” solid white line set the pattern to Single Stripe A or to draw a 6” solid yellow line set the pattern to Single Stripe B. The Single Stripe draws solid and skip lines.



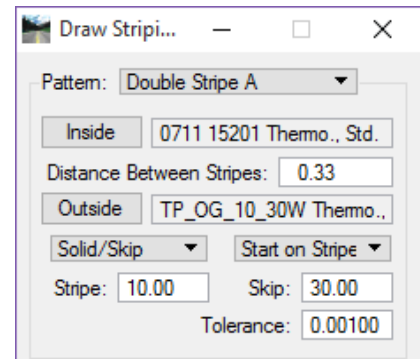
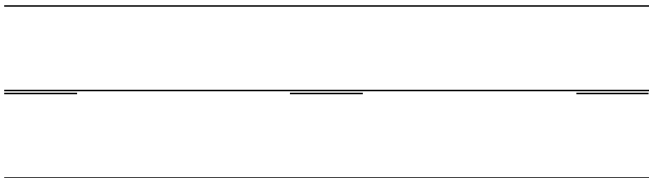


**Note** When drawing skip lines, it is easier to get the spacing correct by using the end point of the solid line that approaches the stop bar, starting on skip and placing the strip in reverse of the driving direction. The figure below shows this scenario.



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

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



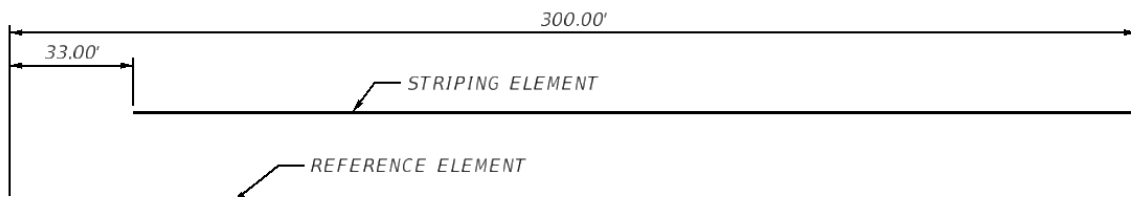
- **Distance Between Stripes** – It is the space between two striping lines. This distance is expressed in terms of master units. There will be times when the designer will need to use a larger distance between lines than what the design standards call for. Example, if the signing and marking plans are at 100 scale a 4" separation between two 6" lines is not enough, the two lines appear like one thick line.
- **Tolerance** – If the length of a segment of pavement marking is less than the Tolerance, there is no placement of the line and only used at the ending point, to determine placement of the final piece of marking.

## REFERENCE ELEMENT – DGN OR CHAIN

The Draw Striping tool uses Reference Elements to create/draw parallel lines and arcs.

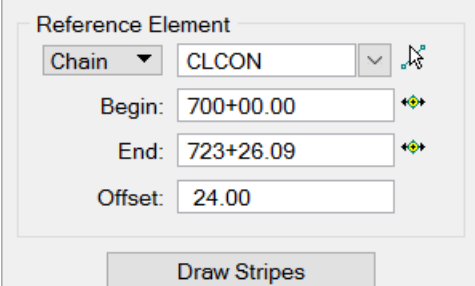
- Reference Type – Drop down options to select the type of reference element to use, **DGN** or **Chain**.
  - ✓ **DGN** – This can be any MicroStation element like the edge of pavement line or another striping line. When you select DGN, there are three options when selecting a MicroStation element:
    - **Single Element** – When selected, use the Identify DGN Element button to select the element. The stationing begins at 0.00 and the length of the element selected determines the end.
    - **Complex Chain** – Select the option, which invokes the MicroStation Create Automatic Complex chain tool to define the elements. Stationing begins at 0.00 and is based on the length of the selected element. This option does not work with elements in a reference file.
    - **Selection Set** – This option works with elements in the active file or in a reference file. Create the selection set, and then set the toggle to **Selection Set**. Click **Accept Selection Set**, which computes the stationing for the selection set. The MicroStation **PowerSelector** works very well for creating the selection set.
  - ✓ **Chain** – This is a GEOPAK chain stored in the GPK. Select the chain from the list or graphically with Identify Chain. Stationing fields are automatically populated. The values may be changed manually or graphically using the Beg and End buttons.
- Begin – Identifies the beginning of the striping. If using DGN element, this field will start at a value of 0.00 or the value of the length of the line selected depending on how the element was created. Enter a value in the field to start the striping at a point other than the beginning of the line. If Station is used the begin station of the chain will be the value.

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



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

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



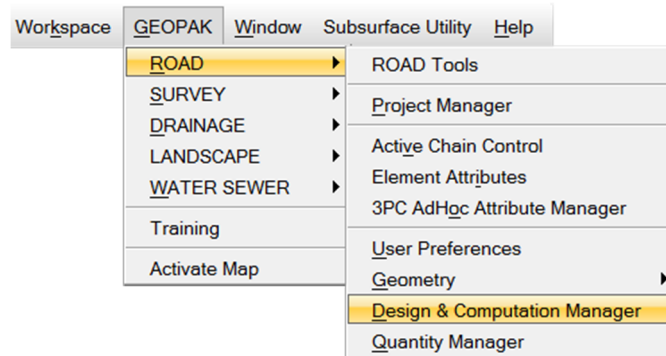
The image shows a software dialog box titled "Reference Element". It contains a dropdown menu labeled "Chain" with "CLCON" selected. Below this are three input fields: "Begin" with the value "700+00.00", "End" with the value "723+26.09", and "Offset" with the value "24.00". Each input field has a double-headed arrow icon to its right. At the bottom of the dialog is a button labeled "Draw Stripes".

- **Offset** – This is the offset from the selected element, either the **Chain** or **DGN** element, to the new striping line. It is not necessary to use plus or minus values, simply graphically indicate the side by moving the cursor to the left or right.
- **Draw Stripes** – This attaches the new striping to the cursor at the defined offset. Just move the striping to the desired side of the **DGN** or **Chain**. Issuing a Data Point places the new striping in the design file. The new striping elements are placed in a graphic group for easy deletion.

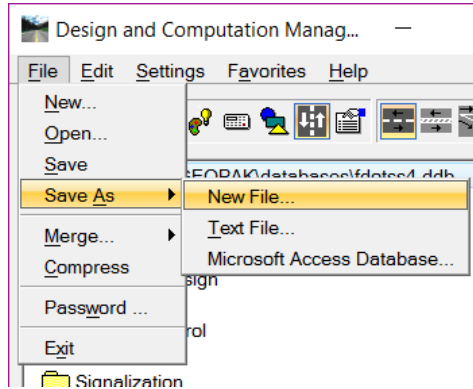
## Exercise 5.1 Create a Project Specific DDB

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

1. Open the file C:\e\projects\22049555201\signing\Dsgnsp01.dgn. (This is the main design file for all signing and pavement marking elements.)
2. From the MicroStation Menu, select **GEOPAK > ROAD > Design & Computation Manager** to open D&C Manager. This should load the *FDOTSS4.ddb* file.

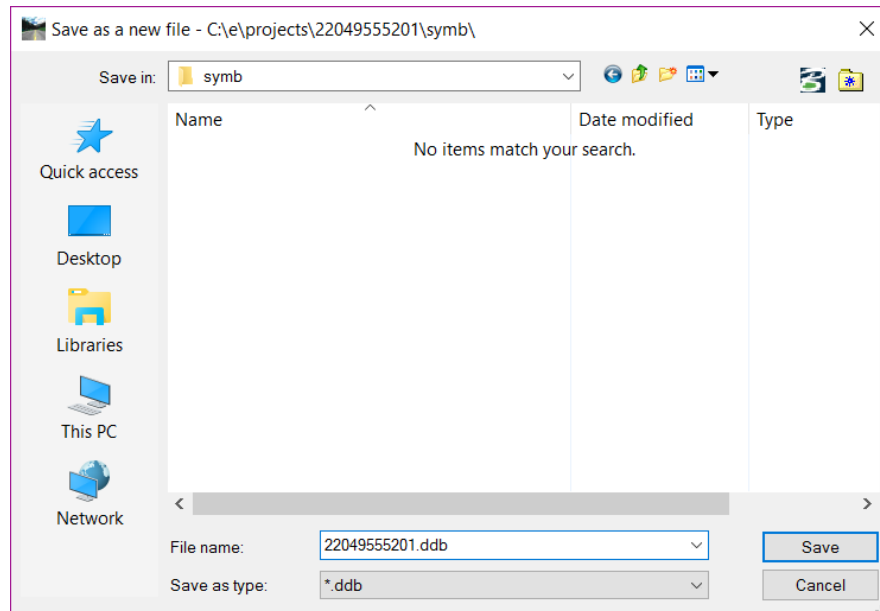


3. From D&C Manager select **File > Save As > New File**.

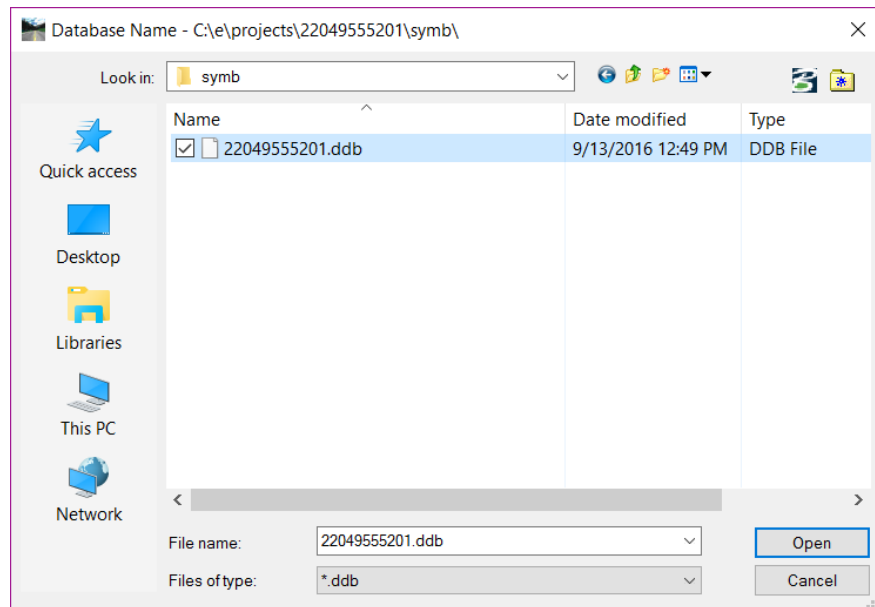


4. Navigate to the project **symp** folder.

5. Rename the file as **22049555201.ddb** and click **OK**.



6. From D&C Manager select **File > Open** and navigate to the saved DDB file in the *symb* directory. Select the file and click **Open**.



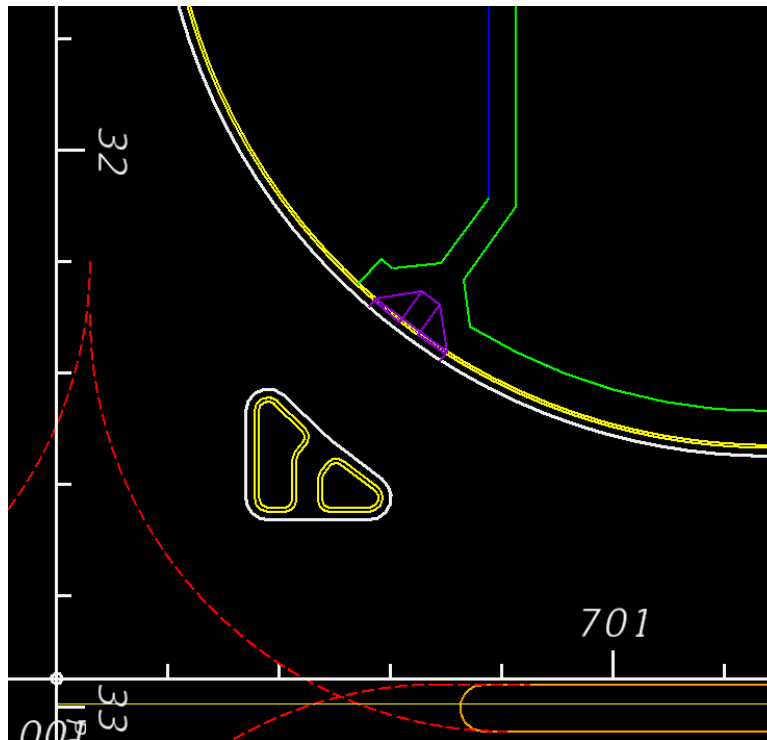
## Exercise 5.2 Draw Crosswalk Markings

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

In this exercise, use the D&C Manager to draw the solid pavement markings for the Special Emphasis Crosswalks. The process will start by placing the outside edge lines using construction lines in the DSGNRD file as the reference elements. Use the D&C Manager and other MicroStation tools to place the longitudinal lines. This exercise utilizes Thermoplastic items as well.

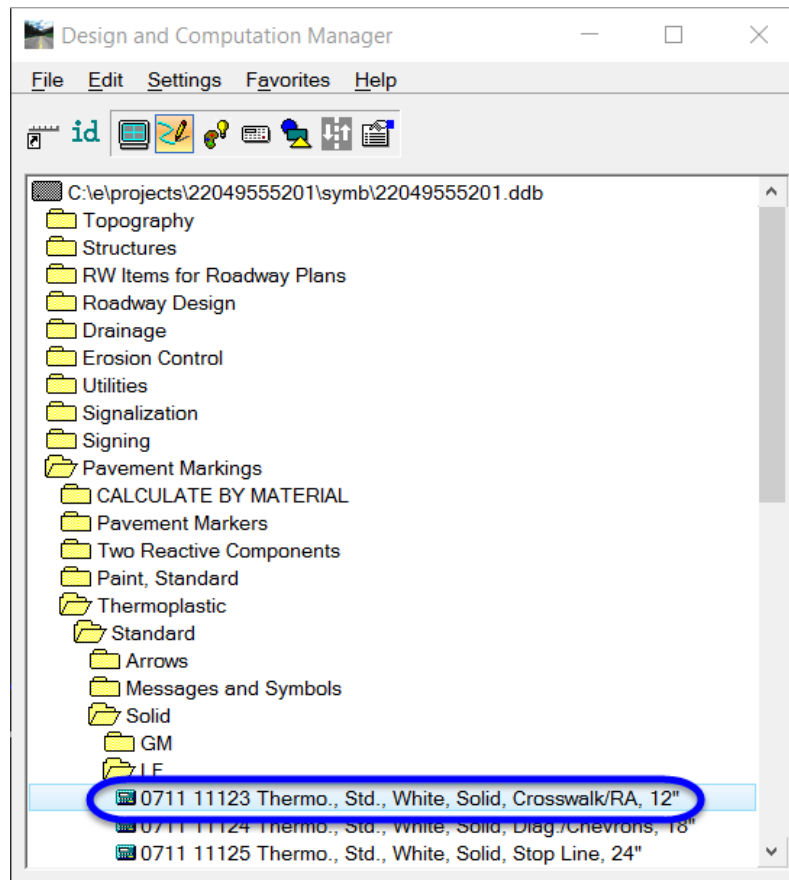
**Note** For the expediency of the class, with the use of MicroStation tools, the construction lines are drawn for all of the Pavement Marking for the new NW corner of the intersection with the curb island. .


1. Continuing in the *Dsgnsp01.dgn*, attach the reference files **Algnrd01.dgn (Algnrd\_50 model)**, and **Dsgnrd01.dgn (Default model)** from the *Roadway* folder.
2. Zoom into the island on the left side of the **SR61** alignment between Stations 700+00.00 and 701+00.00.
3. Use MicroStation tools to *rotate the view* so the **SR61 Alignment** is going **left to right**.




4. Reference the *Dsgnrd01.dgn* file, *ConstructionLines Model*.
5. If D&C Manager is not open, from the MicroStation Menu, select **GEOPAK > ROAD > Design & Computation Manager** to open D&C Manager. Make sure to open the *project ddb*, **22049555201.ddb**, file saved in the *symp* directory.

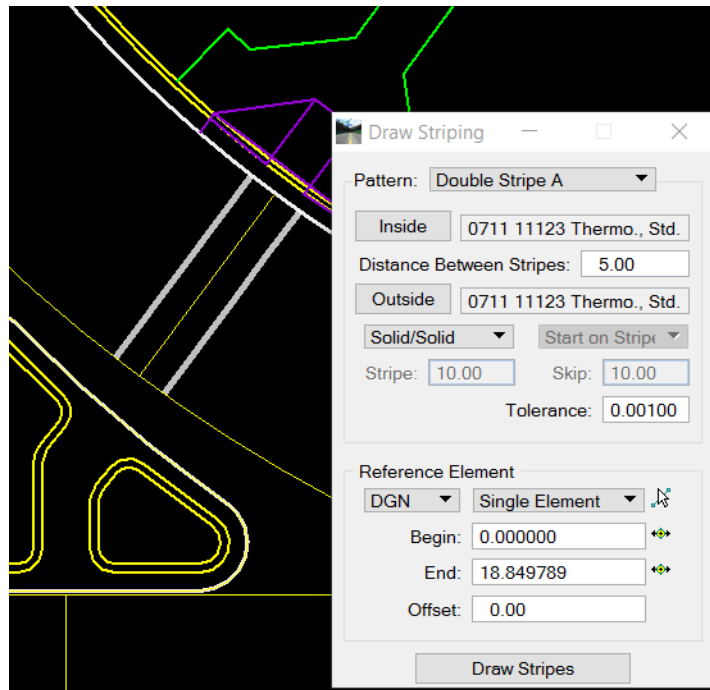
6. From D&C Manager, select **Pavement Markings > Thermoplastic > Standard > Solid > LF > 0711 11123 Thermo., Std., White, Solid, Crosswalk/RA, 12"**.



7. From D&C Manager, click on the **Pavement Markings Program** button . This appends the Pavement Markings Program tools to the D&C Managers button bar.


8. From D&C Manager, click on the **Striping** button  to open the Draw Striping tool.
  - a. Set the *Pattern* to **Double Stripe A**.
  - b. Click the **Inside** and **Outside** buttons to set the *striping* DDB item.
  - c. Set the *Distance Between Stripes* to **7.00**. (Minimum width = 6' + 6" x 2 to centerline of striping each side. See Design Standards, Index 17346.)
  - d. The *type of line* should be set to **Solid/Solid**.
  - e. Set the *Reference Element* to **DGN**.
  - f. Select **Single Element** from the *Reference Type* drop down list.
  - g. Click the **Identify DGN Element** button and select the *yellow construction line* between the island and the right edge of pavement.
  - h. Set the *Offset* to **0.00**. It is not necessary to use a plus or minus with this tool.

- i. Click the **Draw Stripes** button.





9. Place a *Data Point*.
10. **Do Not Close** the Draw Striping dialog.

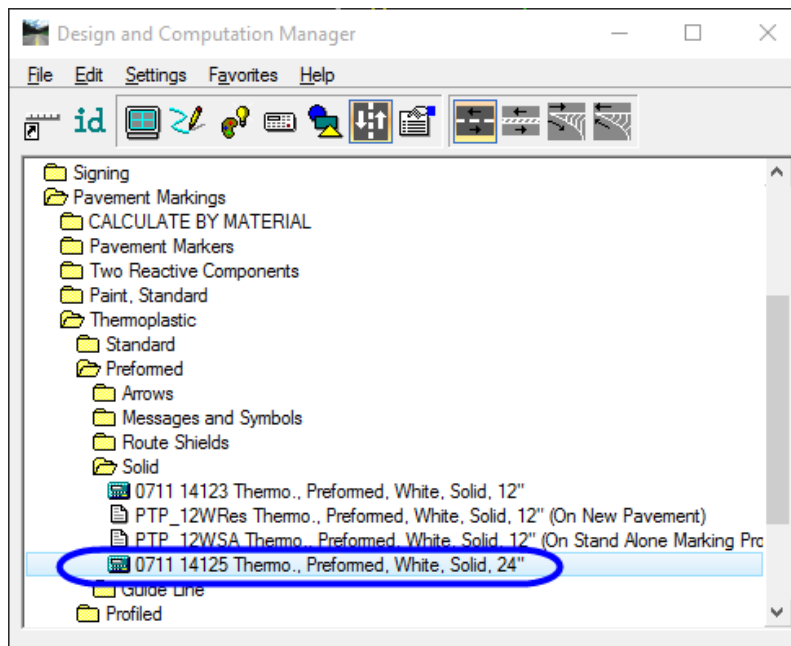
*Note* It is not necessary to close the *Draw Striping* tool to select a different item, go back to *D&C Manager* and select a new item then click the *Single* button to make it active or double click on the new item in *D&C Manager*.

11. Perform a little cleanup work on the 2 lines just placed with the **Trim to Element**  MicroStation Tool. Click on each end of the lines and the adjacent edge of pavement to extend or trim the lines.
12. Repeat steps 8-11 at the other 2 cross walk locations in the intersection.
13. **Do Not Close** the Draw Striping dialog.



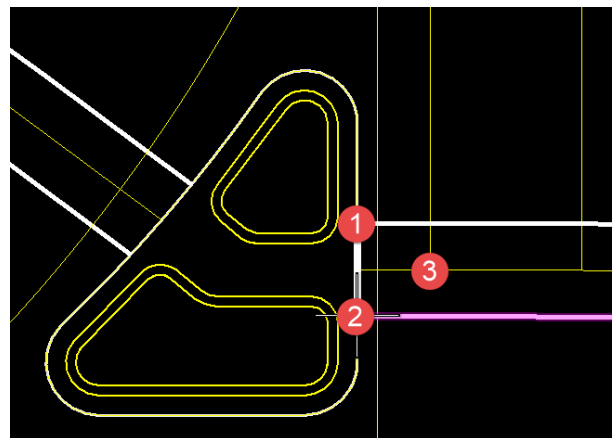
➤ **Placing Special Emphasis Crosswalk Markings (Part 2)**

1. Rotate view so the large crosswalk crossing SR 61 is horizontal across the screen.
2. In MicroStation, select the **Place Smartline**  tool.
3. In the D&C Manager, select the **Design** tool .
4. Double click the **Pavement Markings > Thermoplastic > Preformed > Solid > 0711 14125 Thermo., Preformed, White, Solid, 24"** for the longitudinal crosswalk pavement markings.



**Note** Double clicking on a DDB item sets Place Influence in the D&C Manager and activates the key-in command to “construct perpendicular from”.

5. Snap (1) to the end of crosswalk line at the furthest station at the island.
6. Snap (2) to the end of crosswalk line at the closest station at the island.
7. Using the **Move Parallel** command, Snap (3) to the bike lane line to the right. This places the initial 24” longitudinal crosswalk line at the bike lane.




8. Use the MicroStation **Copy Parallel** tool to copy the initial 24” longitudinal crosswalk line 11.5’ and then again 12’ to the right to line up with the adjacent lane lines. (Or toggle off the Distance and snap to the construction lines at the lane line locations.)

- Continuing with MicroStation **Copy Parallel**, copy the longitudinal crosswalk line across the intersection using the construction elements for locations.

**Note** *To this point, the longitudinal crosswalk lines have been drawn at the lane line locations per the standard index. Next there needs to be longitudinal crosswalk lines drawn 1/2 way between the lane lines with maximum of 60" (5') between the edges of paint. This equates to a maximum of 7' between the centerline of the markings. For 12' lanes copy the lines parallel 6'.*

- Copy the lines found to the left of the travel lanes 6' to the right (or 5.75' for the 11.5' marked lanes).




- Perform a little cleanup work on the longitudinal lines with the **Trim to Element**  MicroStation Tool. Click on each end of the lines and the adjacent edge of pavement to extend or trim the lines, if needed.

## Exercise 5.3 Draw Solid Yellow Striping

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

In this exercise, use D&C Manager to draw the solid pavement markings. The process will start by placing the right inside edge line using the right inside traffic separator line and the right inside curb face line as the reference elements. Thermoplastic items will be used in this exercise.

1. Continuing in the *Dsgnsp01.dgn* file, zoom in near **STA. 704+00**. This is where the inside edge lines are located.
2. **Rotate the view** so the alignment is left to right on the screen.

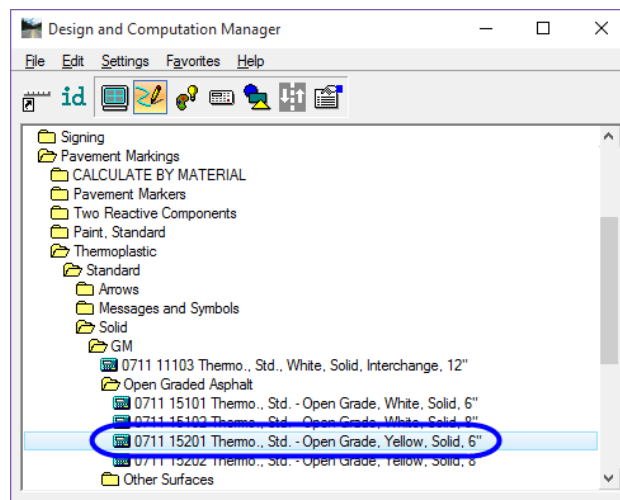
3. From D&C Manager click the **Pavement Marking** button . This activates four additional pavement marking tools.




4. From D&C Manager navigate to the **Pavement Markings > Thermoplastic > Standard > Solid > GM > Open Graded Asphalt** category.

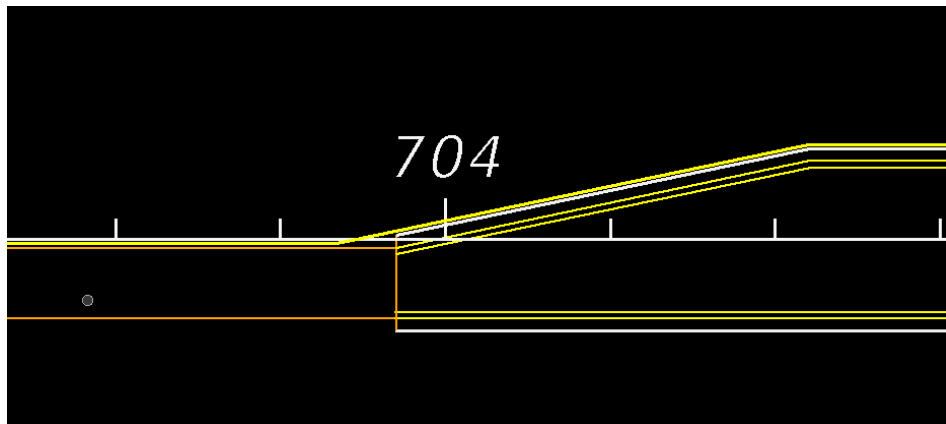
**Hint** From the Edit menu in D&C Manager, there is a search tool to aid in finding a category or item within D&C Manager. To launch the search tool select Edit > Find.

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



6. From D&C Manager, click on the **Striping** button  to open the Draw Striping dialog.
7. Set the *Pattern* to **Single Stripe A**.
8. Click on **Single** to set the active item.
9. The *type of line* should be set to **Solid**. (This is automatically set to solid because the item in D&C Manager was created with the key word **Solid** in the description.)

10. Set the *Reference Element* to **DGN**.
11. Select **Single Element** from the *method* drop down list.
12. Click the **Identify DGN Element** button and select the top **Traffic Separator** line.
13. Set the *Offset* to **0.5**. This offset is for display purposes. 2" is required per Design Standard Index 17346 pg. 2 of 14.
14. Click the **Draw Stripes** button.
15. Move your cursor above the *traffic separator line* and place a **Data Point**.
16. On the Draw Striping dialog, change the *Reference Element DGN method* to **Selection Set**.
17. Click the **Identify DGN Element** button and select the inside edge of pavement lines above the centerline. When all elements are selected click the **Identify DGN Element** button again. This will set the begin and end values which is the total length of all elements combined.
18. Set the *Offset* to **0.5**. Again, this offset is for display purposes.
19. Click the **Draw Stripes** button.
20. Move your cursor above the *edge of pavement line* and place a **Data Point**.
21. Use the **Trim Elements to Intersection** tool to clean up the drawn lines.



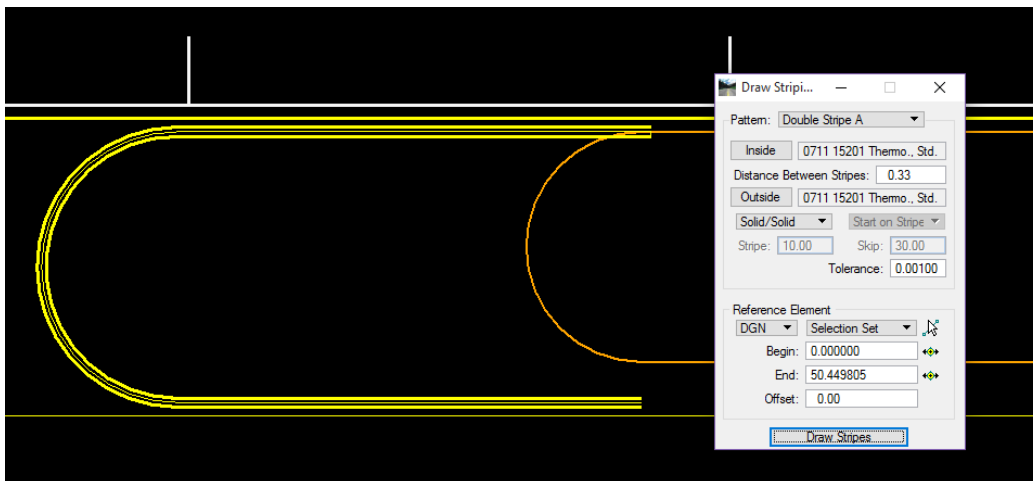
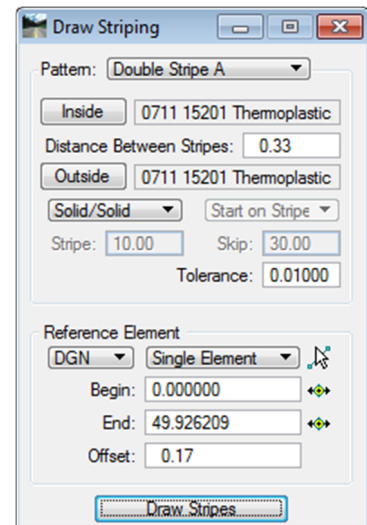
22. **Do Not Close** the Draw Striping dialog.

*Note* It is not necessary to close the *Draw Striping* tool to select a different item, go back to *D&C Manager* and select a new item then click the *Single* button to make it active or double click on the new item in *D&C Manager*.

23. Continue to place the inside edge line pavement markings throughout the rest of the project if class time permits.

➤ **Placing Solid Yellow Striping (Part 2)**

1. Continuing in the *Dsgnsp01.dgn* file, zoom in near **STA. 701+00**.
2. Zoom in to the *Traffic Separator Nose* at **Sta. 701+00**.
3. Select the **construction lines** forming the separation outline in front of the traffic separator nose into a *selection set*.
4. In D&C Manager, select **Item 0711 15201 Thermo., Std. - Open Grade, Yellow, Solid, 6"**.
5. Set the *Pattern* to **Double Stripe A**.
6. Click the **Inside** and **Outside** buttons to set the selected item for both fields.
7. Set the *Distance Between Stripes* to **.33** (4").
8. Leave *type of line* set to **Solid/Solid**.
9. Set the *Reference Element* to **Selection Set**.
10. On the Draw Striping tool, click the **Identify DGN Element** button. This sets the *Begin* and *End* values.
11. Set the *Offset* to **0.0**.
12. Click **Draw Stripes**.
13. **Data Point** in the screen.

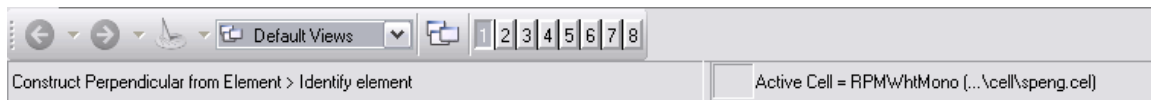


14. Continue to place the inside separation edge line pavement markings throughout the rest of the project if class time permits.

## Exercise 5.4 Draw Stop Line

In this exercise, the student will use D&C Manager to place a stop bar. The **Stop Bar** item in D&C Manager has the Construct Perpendicular command built into it. When using the D&C Manager, always read the MicroStation status bar for hints.

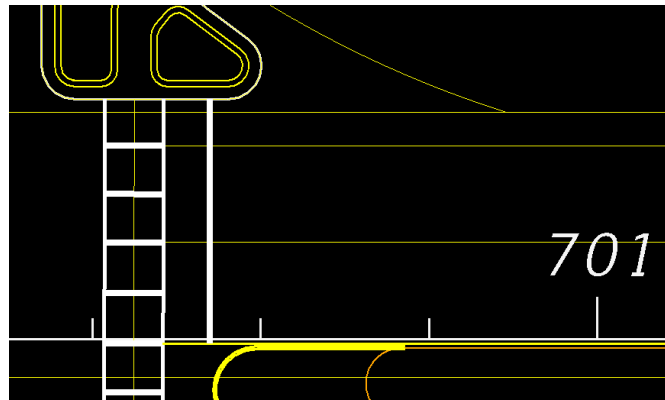
1. Continuing in *Dsgnsp01.dgn*, zoom to near **Sta. 700+60**.
2. **Rotate view** as needed.
3. Open D&C Manager and navigate to the category **Pavement Markings > Thermoplastic Pavement Markings > Standard > LF**.
4. Double click on *Item 0711 11125 Thermo., Std., White, Solid, 24"*. Read the message field in MicroStation.



5. **Snap** to the intersection of the *yellow edge line* and the *yellow construction line* placed where the stop bar needs to be placed for the start point. Moving the cursor will show the direction in which the line will be drawn. Right click if needed to draw the line across the lanes.

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

6. **Snap** to the *white lane line* near the island for the end point.
7. Turn **Off Place Influence**. The figure below shows the stop bar placed.



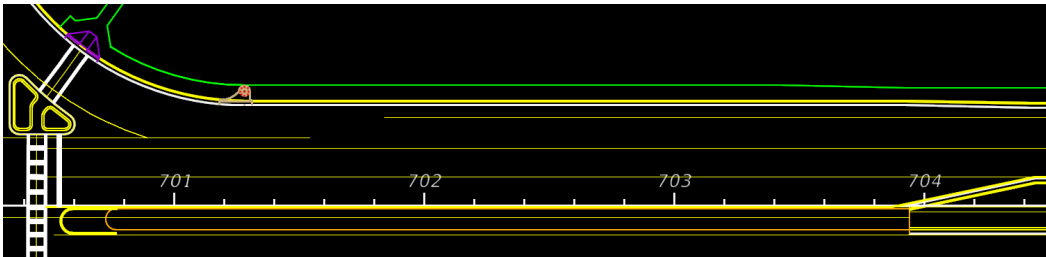
8. Finish placing the *Stop Bar* in other areas throughout the class project.

## Exercise 5.5 Draw Solid White Turn Lane Line Stripe

### ➤ Placing Solid White Turn Lane Line Stripe

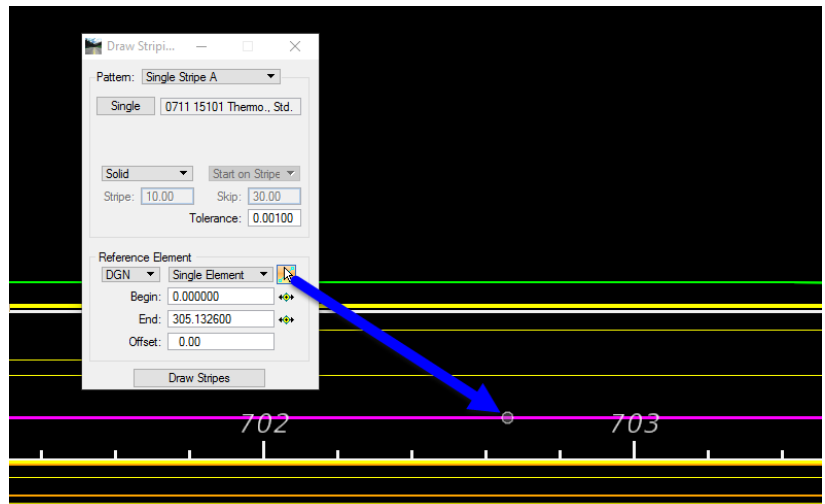
In this exercise, D&C Manager will be used to draw the 6" solid white lane line for the left turn lane. Refer to index 301 for turn lane design criteria and index 17346 for special markings in turn lanes.

1. Continuing in *Dsgnsp01.dgn* zoom into the area of the left turn lane (station 701+00 to 704+00) so you can see the entire turn lane and rotate view accordingly.



**Note** The construction lines have been drawn to include 2 lines. One line for the solid white stripe and the second 85' line for the 6/10 dotted line. The 85' is clearance distance L1 from the table on index 17346 based on a 45 (mph) design speed.

2. In D&C Manager, select the *Draw Striping* tool and select **Item 0711 15101 Thermo., Std. - Open Grade, White, Solid, 6"**.
3. Set the *Pattern* to **Single Stripe A**.
4. Click the **Single** button. This will set the selected item from D&C Manager.
5. Set the *Reference Element* to **DGN** and **Single Element**.
6. Click the **Identify DGN Element** button.
7. Select the *construction line* for the turn lane line. **Data point** again in the screen to accept the selection.
8. Set the *Offset* to **0.0**.
9. Click **Draw Stripes** and place a **Data Point** to accept the drawn lines.
10. Take a moment to review the pavement markings.



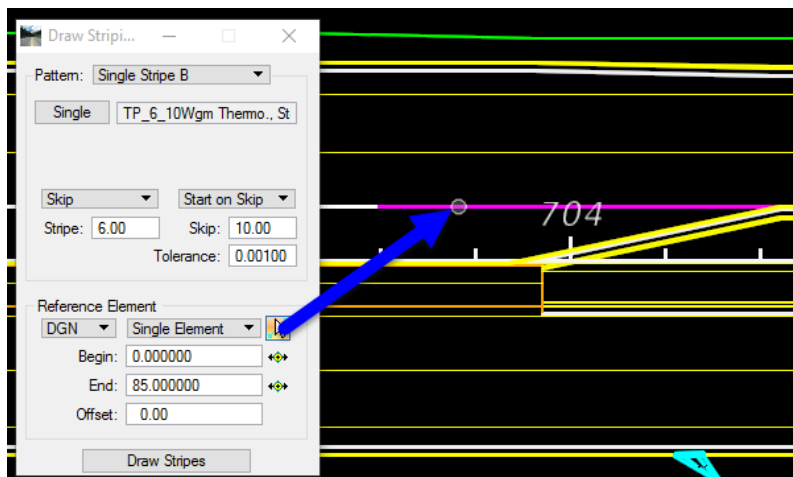
11. Continue to place the **Turn Lane Line Pavement Marking** throughout the rest of the project if class time permits.

## Exercise 5.6 Draw 6/10 White Dotted Stripe

### ➤ Placing 6/10 White Skip Stripe (Part 1)

In this exercise, you will complete the turn lane striping by placing a 6” white 6/10 skip line from the beginning of the turn lane to the 6” solid lane line using the remaining construction line.

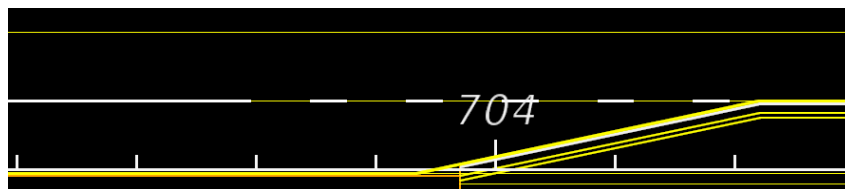
1. In D&C Manager, select *Item TP\_6\_10Wgm Thermo., Std., White, Dotted Ext, 6" (6/10)* located in the category **Pavement Markings > Thermoplastic > Guide Lines**.
2. In the Draw Striping dialog continue with the *Pattern* set to **Single Stripe B**.
3. Click the **Single** button to set the item active.
4. Set the *stripe type* to **Skip**. Set to **Start on Skip**.
5. Set the *Stripe length* to **6.0** and the *Skip length* to **10.0**.
6. Set the *Reference Element* to **DGN** and **Single Element**.
7. Click the Identify DGN Element button.
8. Identify the **construction line** at the end of the turn after the solid white line placed in the previous exercise. **Data point** in the screen to accept the element.



9. Click **Draw Stripes**.

*Note* You can adjust the begin and end points by using the vcr buttons to achieve the desired first stripe line.

10. Place a **Data Point** and reset to **cancel** the command. The figure below shows the finished skip stripes. Later in this chapter you will place left turn arrows in this turn lane.



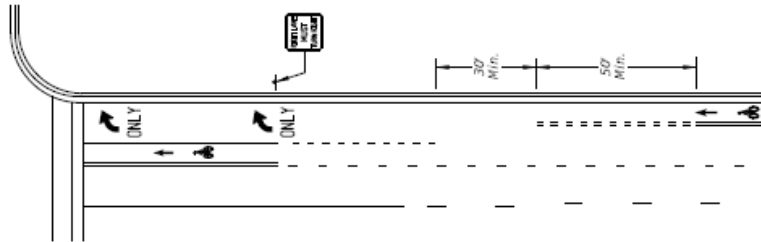
11. Continue to place the **6” white 6/10 skip stripe** throughout the rest of the project if class time permits.



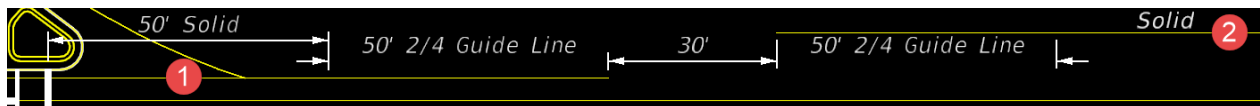
## Exercise 5.7 Draw Bike Lane Striping

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

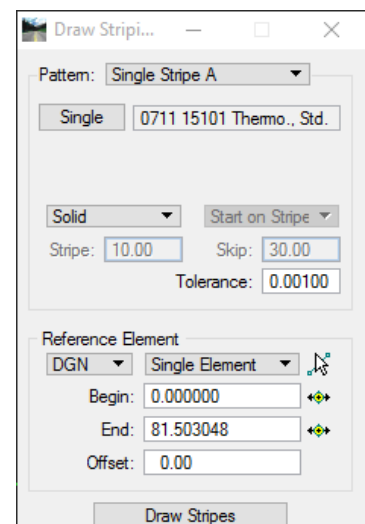
In this part of the exercise, D&C Manager Draw Striping tool will be used to draw the solid white Bicycle Lane line. Use the Design Standards Index 17347 for guidance on bike lane marking criteria. This exercise uses detail KH-2, Intersection with Right Drop Lane, Curb and Gutter Section.



1. Continuing in *Dsgnsp01.dgn*, select the D&C Manager item **0711 15101 Thermo., Std. - Open Grade, White, Solid, 6"**.
2. Set the *Pattern* to **Single Stripe A**.
3. On the Draw Striping dialog, click the **Single** button to make the item active.
4. The *type of line* should be set to **Solid**.
5. For the *Reference Element* change the option to **DGN**.
6. Set the *type of element* to **Single Element**.
7. Click the **Identify DGN Element** button and select the construction line crossing the stop line by the curb island. **Data Point** to accept. (Line marked 1 in figure below.)



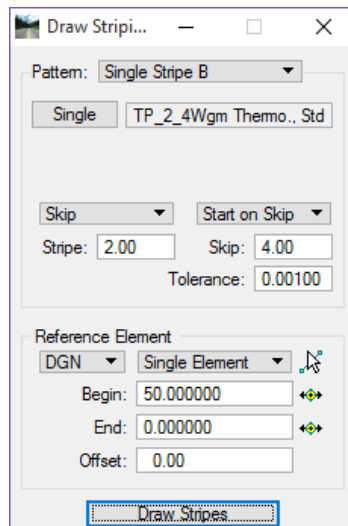
8. Set the *Offset* to **0.0**.
9. Click the **Draw Stripes** button.
10. **Data Point** to accept the placement of the line.
11. Repeat steps 7-10 for the line marked 2 in the figure above.
12. Continue to place the bicycle lane down the right side of the roadway by selecting the *edge of pavement lines* with an *Offset* of **4'**.



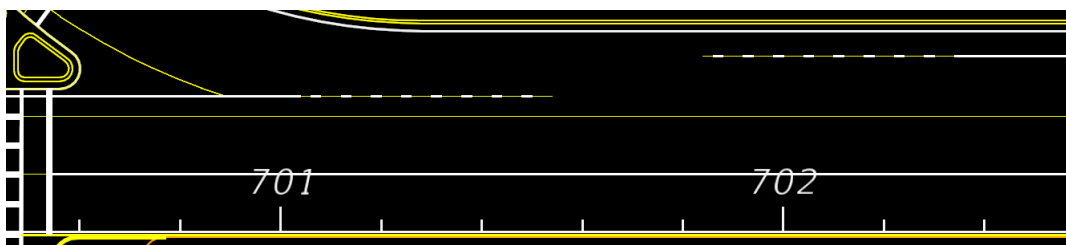
➤ **Placing Guide Line White Striping for the Bike Lane (Part 2)**

In this part of the exercise, D&C Manager Draw Striping tool will be used to draw the 2/4 white guide line required for the Bike Lane.

1. Zoom into the beginning of the *Bicycle Lane* at the beginning intersection.
2. In D&C Manager, select *Item TP\_2\_4Wgm Thermo., Std., White, Guide Line, 6" (2/4)*.
3. In the Draw Striping dialog set the *Pattern* to **Single Stripe B**.
4. Click the **Single** button to set the item active.
5. Set the *stripe type* to **Skip**. Set to **Start on Skip**.
6. Set the *Stripe length* to **2.0** and the *Skip length* to **4.0**.
7. Set the *Reference Element* to **Single Element** and select the *construction line* for the bike lane skip striping closest to the curb island.
8. Click the **Draw Stripes** button. **Data point** to accept the placement of the lines.
9. Click on the **Identify DGN Element** button and select the *construction line* for the bike lane skip striping on the other side of the 30' gap. **Data point** to accept the element.
10. Modify the *Begin* and *End* values to begin at **50.00** and end at **0.0**.



11. Click the **Draw Stripes** button. **Data point** to accept the placement of the lines.
12. Review the markings.



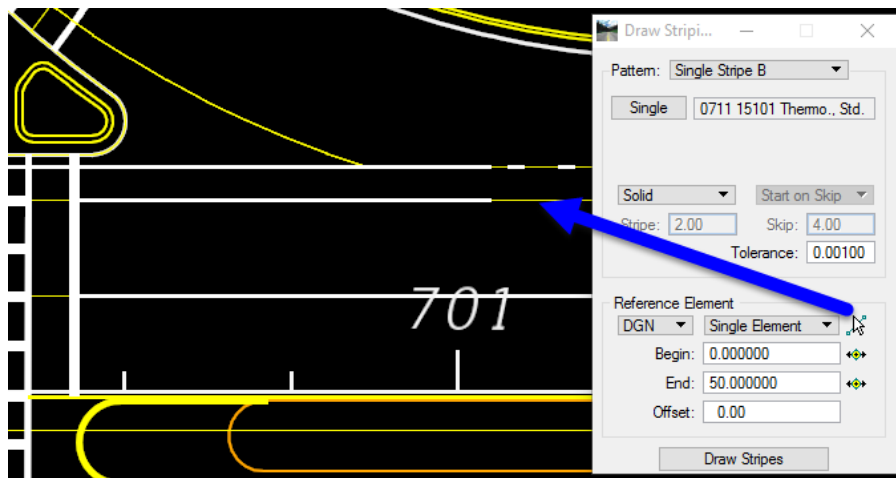
## Exercise 5.8 Draw Lane Line – Solid & 10/30 Skip Stripe

### ➤ Placing 10/30 Skip Stripe (Part 1)

In this exercise, you will use the D&C Manager Draw Striping tool to place the white solid and 10/30 skip line for the through lane at the intersection.

**Note** This tool can be used to place multiple lines simultaneously. This will depend on the distances between where the lines placed are identical offset distances.

1. Continuing in *Dsgnsp01.dgn* zoom to near **Sta 701+00**.
2. Rotate view accordingly.
3. Set the *Pattern* to **Single Stripe B**.
4. Select the D&C Manager item **0711 15101 Thermo., Std. - Open Grade, White, Solid, 6"**.
5. Set the *Reference Element* to **Single Element**.
6. Click the **Identify DGN Element** button and select the outside lane line which turns into the center line of the 2 lanes approaching the intersection. **Data point** to accept the element.
7. Set the *Begin* to **0.0**.
8. Set the *End* to **50.0**. (This is the minimum distance for the solid line when approaching an intersection. See Index 17346.)
9. Set the *Offset* to **0.00**.

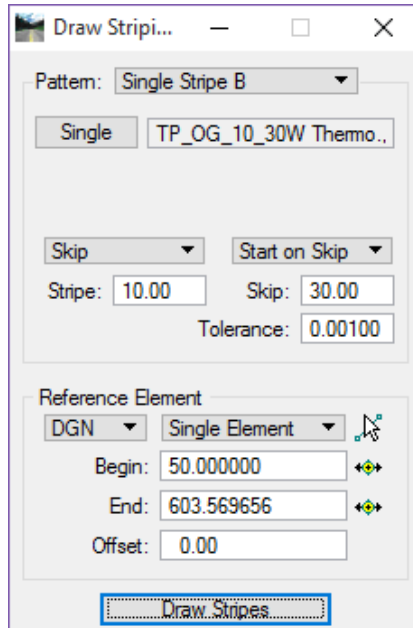


10. Click the **Draw Stripes** button. **Data point** to accept the placement of the line.
11. Move your cursor to the left side of the *element* and place a **Data Point**.

➤ **Placing 10/30 Skip Stripe (Part 2)**

In this exercise, place the single white 6" 10/30 Skip.

1. On the Draw Striping tool set the *Pattern* to **Single Stripe B**.

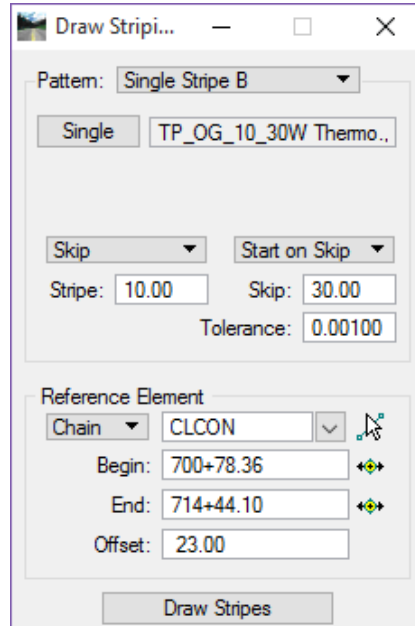


2. In D&C Manager, select *Item TP\_10\_30Wgm Thermo., Std. - OG, White, Skip, 6" (10/30)* from the **Pavement Markings > Thermoplastic > Skip/Dotted > Open Graded** category.
3. Set the *Line Type* to **Skip**.
4. Set to **Start on Skip**.
5. Set the *Stripe length* to **10.0**.
6. Set the *Skip length* to **30.0**.
7. Set the *Reference Element* to **DGN**.
8. Select the same line from previous exercise.
9. Set the *Begin* to **80.0**. (This is the 50' length of solid stripe placed previously.)
10. Set the *Offset* to **0.0**.
11. Click the **Draw Stripes** button. **Data point** to accept the placement of the line.
12. Zoom out to view both sides of the road.

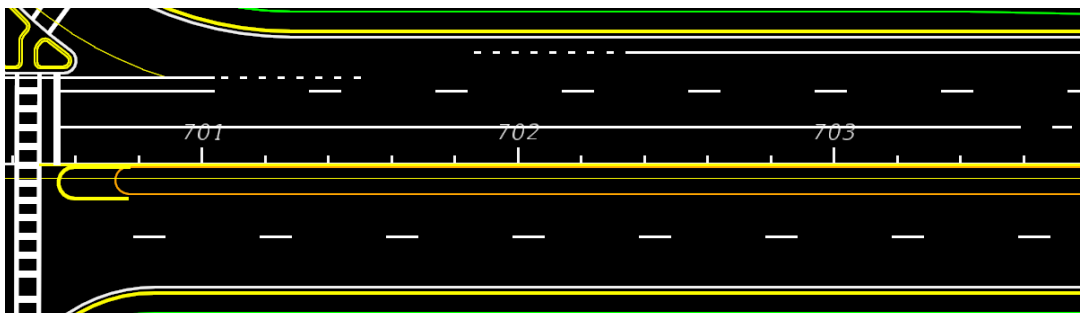
➤ **Placing 10/30 Skip Striping (Part 3)**

In this exercise, the SR61 alignment will be used as the reference chain to add the 10/30 Skip Striping to the other side of the road between the 2 travel lanes.

1. On the Draw Striping tool, ensure that the *Pattern* is set to **Single Stripe B**. The pay item data should still be set to 10/30 skip.



2. Set to **Start on Stripe**.
3. Set the *Reference Element* to **Chain**.
4. Select the **CLCON** from the *drop down list*.
5. Set the *Begin Station* to **700+78.36**. (This is the station 30' beyond the crosswalk.)
6. Set the *End Station* to **714+44.10**. (This is the end of the **10/30 Skip** before the side street intersection.)
7. Set the *Offset* to **23.00**. (This is the offset distance from the **CLCON reference chain** to the lane line the **10/30 Skip** is being placed.)
8. Click the **Draw Stripes** button. Move your cursor in between the edge lines and place a **Data Point** and reset to **cancel** the command. Take a moment to review the striping lines, turn the reference files off to better see the line work.



## DRAW CELL GROUP BY FEATURE

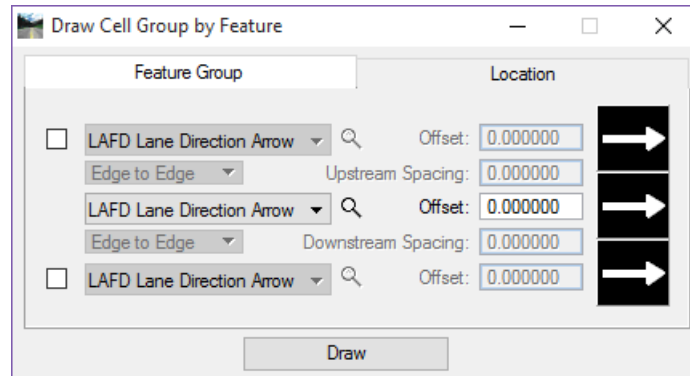
The Draw Cell Group by Feature tool can be used for placing Pavement Messages and Arrows, RPM's or any other cell you want to group together. It is not required to use this tool when placing cells, however, this tool will make the task of drawing Arrows and RPMs much easier. This tool can be opened on the Road tools pallet or on the menu **GEOPAK > ROAD > Plans Preparation > Draw Cell Group by Feature**.

***Note** When using the Draw Cell Group by Feature and/or Draw Cell by Feature tools, always ensure to load the correct GEOPAK DDB as the tool will 'reset' to the DDB specified in the resource file every time the tool is closed and reopened. This GEOPAK DDB may not be the DDB intended for use with your active project.*

The dialog consists of two tabs:

### FEATURE GROUP TAB

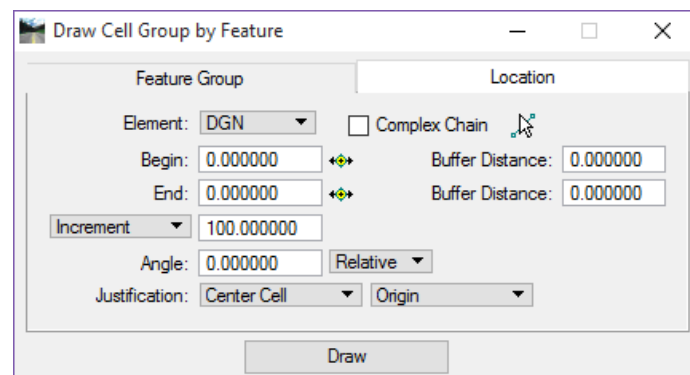
Feature Group defines the D&C Manager item(s) to use, which in turn selects the cell(s) to be placed, and the Offset from the selected element to place the item.



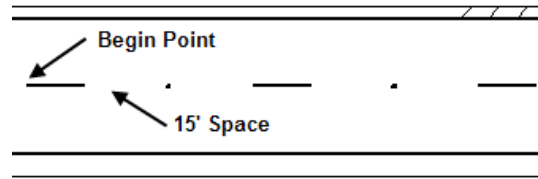
Based on the items that are checked the tool allows the designer to place up to three different cells. The Magnifying glass next to each item allows the designer to browse to D&C Manager and select the appropriate item, which will attach the cell to be drawn. The Offset is the distance from the selected DGN Element or Chain when drawing the cell.

### LOCATION TAB

Location defines whether to use a DGN element or Chain, Begin and End stations, Spacing, Angle, and Justification.



- **Element** – This is either a GEOPAK Chain or DGN element. This function is similar to the Draw Striping tool. The Begin and End fields will be populated with the appropriate data based on the element selected. They can be modified using the buttons or by keying in the value.
- **Buffer Distance** – This is for setting where to start the first cell and end the last cell. Example, when placing RPM's on a 10/30 skip line, if snapping to the beginning of the first painted stripe, set the Begin Buffer Distance to 25.0. This accounts for the 10' (ft) stripe and the 15' (ft) spacing between the first and second stripe.



- **Spacing** – There are several options available to set the spacing between the cells, they are:
  - ✓ **Increment** – This is a set value between cells.
  - ✓ **Even** – Evenly spaces the cells at a user-specified spacing, the buffer distances are ignored.
  - ✓ **Max Spacing** – The location of the beginning and ending cell are determined, then a sufficient number of cells are placed in between, so that the distance between them is no more than the specified Max Spacing and equidistant apart.
  - ✓ **Once** – Only one set or cell is placed. The ending buffer distance is ghosted.
  - ✓ **Each Vertex** – The origin of the cell is placed at each vertex of the selected element. The Begin and End and buffer distances are ghosted.
  - ✓ **End Points** – The origin of the cell is placed at each end point of the selected element. The Begin and End and buffer distances are ghosted.

**Hint** When placing RPMs along a curved roadway this tool does not account for the curve geometry at an offset. You will have to copy parallel one of the edge lines on top of the 10/30 skip line and use that line as the DGN element then delete the copied line. Optionally, the Chain option can be used if the cells can be placed parallel to the selected alignment.

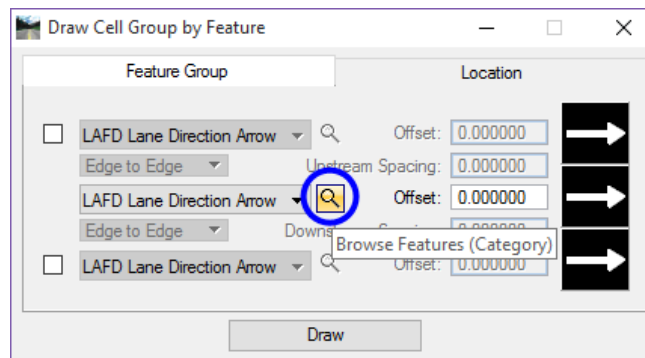
- **Angle** – If set to **Absolute** the angle is based on 0 degrees as horizontal. If set to **Relative** the cell is placed relative to the element selected.
- **Justification** - The justification can be based on the center cell (only option if only one row is placed), the upstream or downstream cell. Only those selected in the **Feature Group** are available for setting Justification.

## Exercise 5.9 Place RPM's - Draw Cell Group by Feature

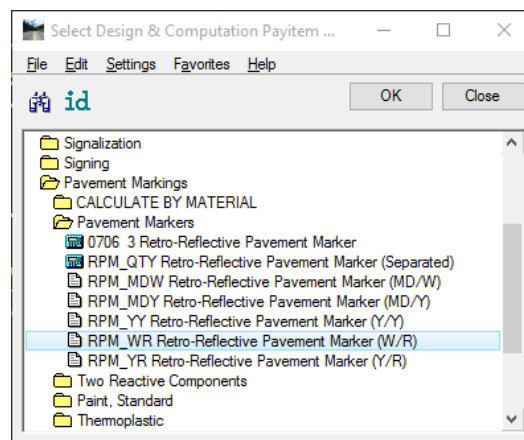
### ➤ Place RPM's using Draw Cell Group by Feature – Feature Group Tab (Part 1)

In this exercise, the student will place RPMs along the 10/30 skip line previously drawn.

1. Continuing in *Dsgnsp01.dgn* open the Draw Cell Group by Feature tool. This tool can be opened on the Road tools palette or on the menu **Applications > GEOPAK ROAD > Plans Preparation > Draw Cell Group by Feature**, or from the Draw Cell option on the **FDOT Plans Development > Traffic Plans** task menu.
2. On the *Feature Group* tab, click on the **Browse Features (Category)** icon in the center of the dialog to open Select Design & Computation Manager Payitem.



3. In Select Design & Computation Manager Payitem dialog navigate to **Pavement Markings > Pavement Markers** and select the *Item RPM\_WR Retro-Reflective Pavement Marker (W/R)*.



**Note** It is not necessary to select the exact item needed. This sets the category to populate the drop down list available on the Feature Group tab of the dialog.

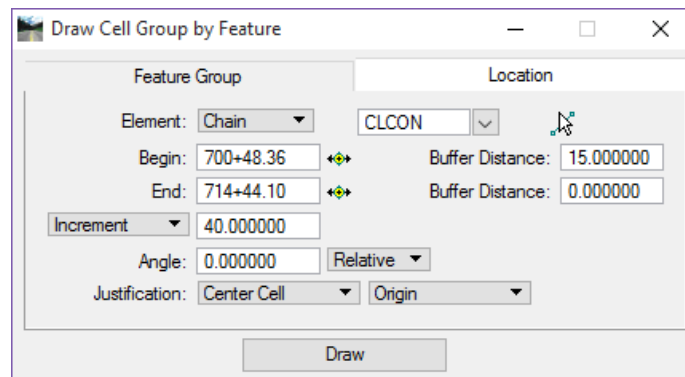
4. Click the **OK** button or **double click** on the item in D&C Manager. This will close D&C Manager and set this category in the *Feature Group* tab.
5. Using the drop down arrow, select the **RPM\_WR Retro-Reflective Pavement Marker (W/R)**.
6. Set the *Offset* to **23.0**.
7. Click on the **Location** tab.



➤ **Place RPM's using Draw Cell Group by Feature – Location Tab (Part 2)**

In this part of the exercise, you will copy the 6" white bicycle lane line over 12' and complete the Location tab of the Draw Cell Group by Feature tool.

1. Continuing in *Dsgnsp01.dgn*, zoom in to the intersection near station 701+00.
2. Continuing on the *Location* tab of the Draw Cell Group by Feature tool, set the *Element* to **Chain**.
3. Select the chain CLCON from the drop down list.
4. Set the *Begin Station* to **700+48.36**. (This is the station at the crosswalk.)
5. Set the *End Station* to **714+44.10**. (This is the end of the **10/30 Skip** before the side street intersection.)
6. Set the *Offset* to **23.00**. (This is the offset distance from the **CLCON reference chain** to the lane line the **10/30 Skip** is being placed.)
7. Set the *Begin Buffer Distance* to **15.0**. This is the distance of half the skip distance (30 ft) to ensure the RPM will be placed centered in the skip between the 10ft skip stripe lines.
8. Set the *End Buffer Distance* to **0.00**.
9. Set to *Increment* and enter **40.0**. This is the spacing between the RPM's.
10. *Angle* should be **0.00** and **Relative**.
11. Set the *Justification* to **Center Cell** and **Origin**.

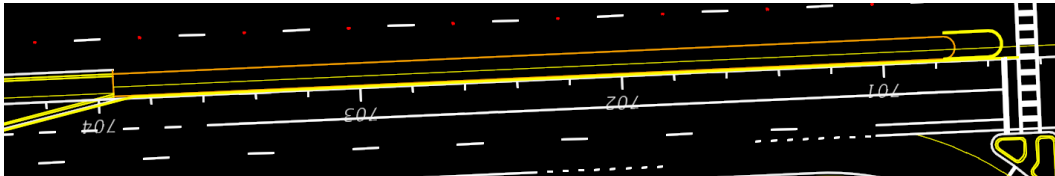


12. Click **Draw** and move the pointer over the skip lines and place a **Data Point**. You should now see RPMs centered between the skips.
13. Take a moment to review the reflective pavement markers. **Do not close** the Draw Cell Group by Feature dialog; need for the next exercise.
14. Continue to place the *rpms* on the remaining 10/30 skip placed in previous exercises. Keep in mind the technique used in this exercise and how the 10/30 skip was placed in the previous exercise.

## Exercise 5.10 Place Turn Arrows - Draw Cell Group by Feature

In this exercise, the Draw Cell Group by Feature tool will be used to draw turn arrows in the left turn lane worked on earlier in this chapter. When placing turn arrows and pavement messages refer to index 17346 for placement and spacing details. This exercise uses the 6" white lane line as the reference element to place the turn arrows.

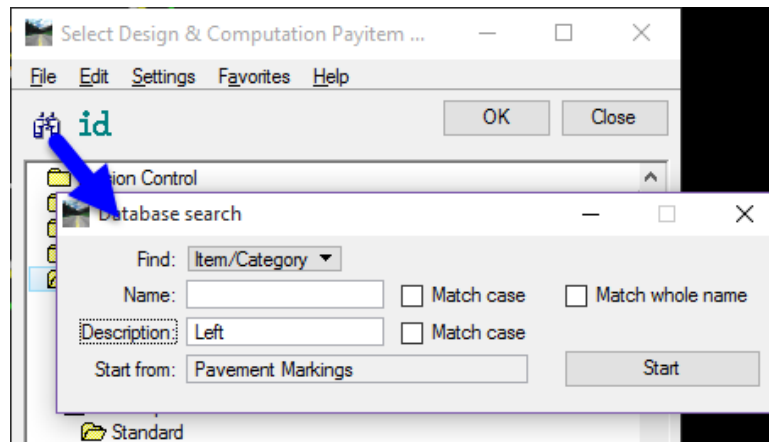
1. Continuing in *Dsgnsp01.dgn*, zoom to the turn lane at the intersection at the beginning of the project.
2. **Rotate view** as needed.



**Note** Due to a quirk in how this tool works, if using the relative option, do not rotate the view to the same angle as the reference element. The cells may come in backwards.

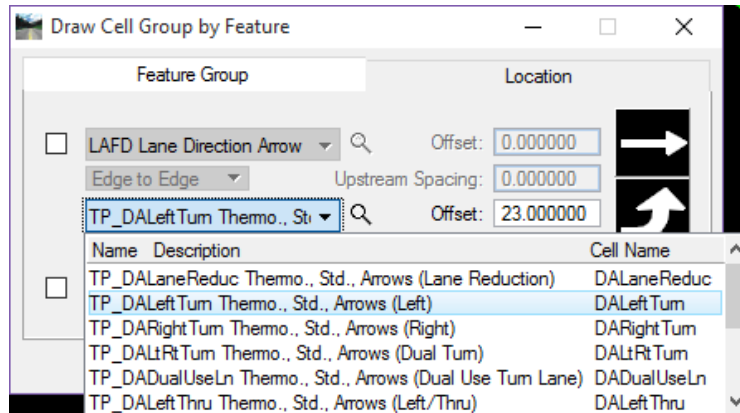
3. On the *Feature Group* tab, click on the **Browse Features (Category)** icon in the center of the dialog to open Select Design & Computation Manager Payitem.
4. On Select Design & Computation Manager Payitem navigate to **Pavement Markings > Thermoplastic > Standard > Arrows > TP\_DALeftTurn Thermo., Std., Arrows (Left)**.

**Note** You can use the search function to locate items if you know the pay item number or description.

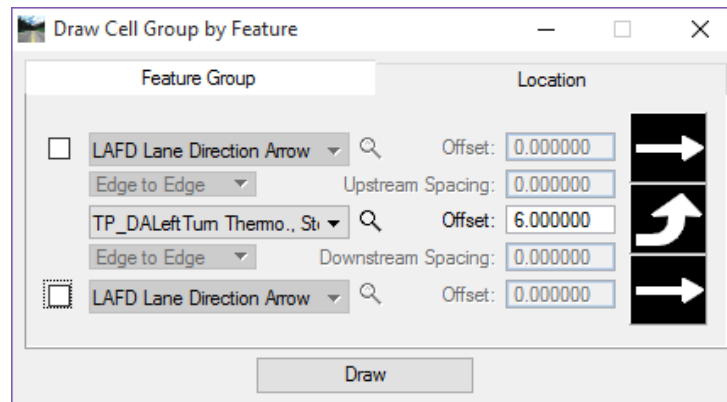


5. Either **Double Click** on the item in D&C Manager or click the **OK** button.

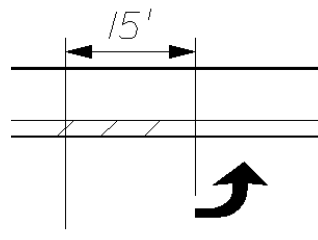
- Next to the *Browse Features (Category)* icon, click the *drop down* menu and select the **Left Directional Arrow**. This will load the appropriate cell.



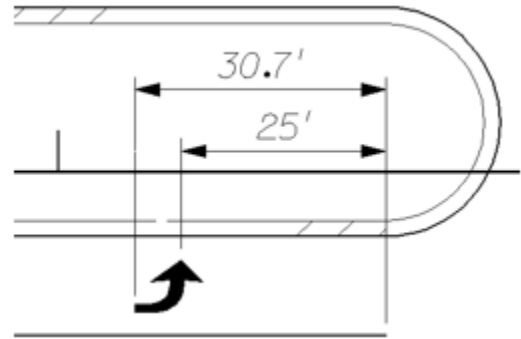
- Set the *Offset* to **6.0**. (This is the distance from the reference element used to place the turn arrows; you must also take into account the cell origin if it is not in the center of the cell.)



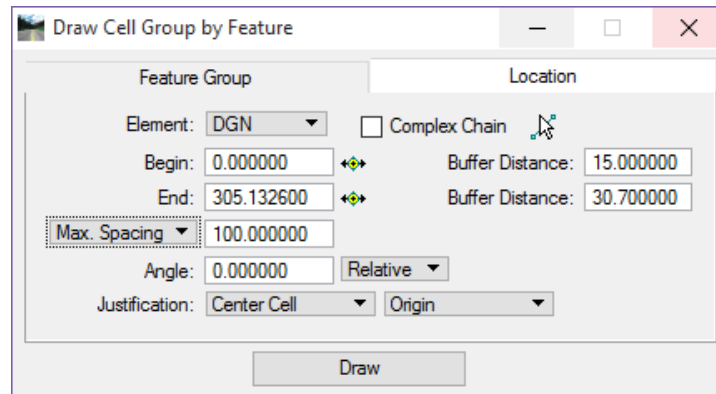
- On the *Location* tab set *Element* to **DGN**. Use the **6" white lane line** as the *reference element*.
- Click the **Identify DGN element** button and select the **6" white lane line**. Make sure and select the line near the entrance of the turn lane.
- Notice the *End distance* value is **305.13'**, based on the details on Index 17346 any turn lane longer than 200' the designer is to add one arrow for each additional 100'. This means the turn lane in this exercise requires four arrows total.
- Set the *Begin Buffer Distance* to **15.00**.



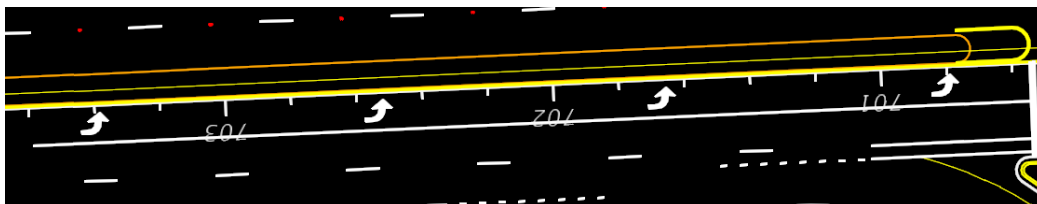
12. Set the *End Buffer Distance* to **30.7**. (This is the distance from the end of the white edge line or stop line to the origin of the turn arrow cell to get the required 25' distance from the end of the lane line or stop line to the point of the arrow.)



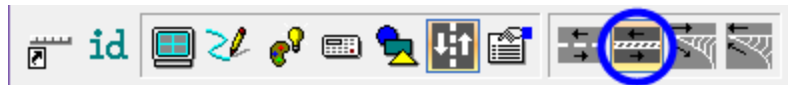
13. Set the *Spacing* to **Max Spacing**. (To maximize the cell placement along the selected reference element.)
14. Set the *Spacing distance* to **100.0**.
15. Set the *Angle* to **0.0**.
16. Set *Rotation* to **Relative**.
17. Set *Justification* to **Center Cell** and **Origin**.



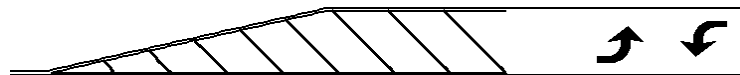
18. Click **Draw** and move the pointer into the turn lane and place a **Data Point**.
19. Close the Draw Cell Group by Feature tool. The figure below shows the completed turn lane.



## CHEVRON SEPARATION

A screenshot of the 'Draw Separation' dialog box. The dialog has a title bar 'Draw Separation...' and a close button. It contains several input fields and dropdown menus. The 'Item' field is set to '0711 11224 Thermo., Std., Yellow'. The 'Distance Between Stripes' is 10.00. The 'Slash Stripe Angle' is 45.00. The 'Tolerance' is 0.00100. There are three sections for points: 'Begin Point', 'Reference / Pivot Point', and 'End Point', each with X and Y coordinates set to 0.0000. There are also dropdown menus for 'Side 1' and 'Side 2', both set to 'Single Element'. A 'Draw Separation' button is at the bottom.

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



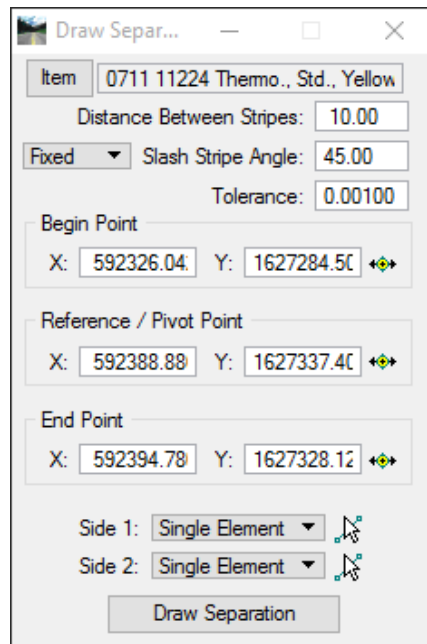
- **Item** – This is the pay item selected in D&C Manager. Clicking the *Item* button loads the selected item from D&C Manager.
- **Distance Between Stripes** - Refer to the indexes for the correct distance between stripes.
- **Slash Stripe Angle** – This is the angle, in degrees, of the stripe.
- **Fixed** - Stripes are placed parallel to the first stripe (relative to the Reference Point), even in non-tangential areas.
- **Variable** - The angle is maintained between the stripe and the location side, even around curves.
- **Begin Point** - Identifies the beginning of the striping. Note: Begin does not have to be on the element (but inside the striping area) as the software constructs perpendicular to the element and utilizes the projection by utilizing Begin (and End), the length of the striping is determined by the designer, not the length of the chain. Note: If the beginning area is in a gore, DO NOT snap to the gore itself, as the point must be inside the striping area.
- **Reference / Pivot Point** - Point projected onto the Side 1 element and the first marking is placed. The placement of all other markings in this processing are placed relative to this first stripe.
- **End Point** - Serves the same function as Begin, but at the opposite end.
- **Side 1** - In order to place the pavement markings correctly, you must understand the difference between Side 1 and Side 2. Side 1 is the termination side of the stripe or where the marking stops.

- **Side 2** - Side 2 is utilized when turning the Slash Stripe Angle. The software begins on Side 2, and draws the marking at the specified angle until it intersects the Side 1 element, where the marking stops. It is also desirable to have the total length of the Side 2 elements longer than the Side 1 elements; however, it is not mandatory. Three methods are supported to define the elements. It is not necessary to use the same method on both sides.
- **Selection Options** – There are three options for selecting the side elements in MicroStation:
  - ✓ Single Element – When selected, you are prompted to select the element.
  - ✓ Selection Set – If the selected elements are in reference files, this method must be utilized, as Complex Chains cannot be selected from reference files. Create the selection set, and then set the toggle to **Selection Set**. Click **Identify DGN Element** to accept the selection set.
    - Complex Chain – Select the option, which invokes the MicroStation Create Automatic Complex chain tool to define the elements.
- **Draw Separation** - By moving the cursor on the screen, the designer can move the striping to the desired angle side (90 degrees), and a **Data Point** places the striping into the MicroStation file. The striping is placed (with each **Data Point**) in a graphic group for easy deletion, if desired.

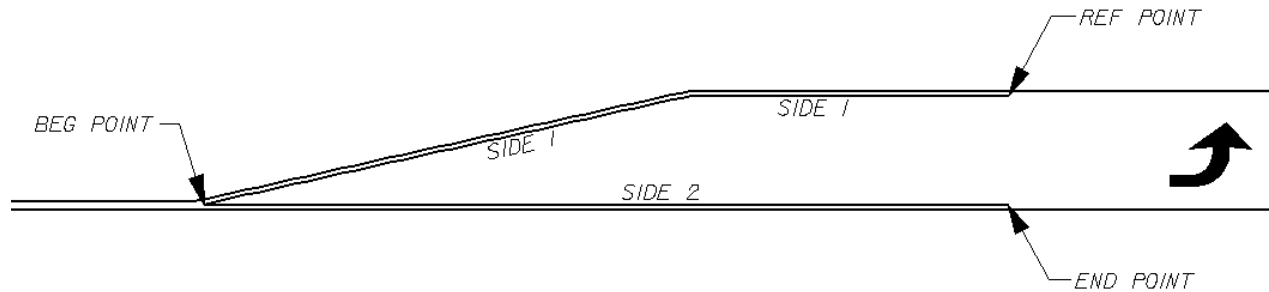
### **Exercise 5.11 Draw Separation**

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

1. Open *Dsgnsp-Stripe.dgn*, **Separation Model**, in the *Signing* folder.
2. Open D&C Manager and select the **Pavement Marking** mode.
3. Navigate to **Pavement Markings > Thermoplastic > Standard > Solid > LF** and select **Item 0711 11224 Thermo., Std., Yellow, Solid, Diag./Chevrons, 18"**.
4. On D&C Manager, select **Separation** from the *Pavement Marking* tools to open Draw Separation.



- a. Set the *Distance Between Stripes* to **10.0**. Refer to *Index 17346* for spacing and angle criteria.
- b. Select **Fixed** for the *stripe angle*.
- c. Set the *Slash Stripe Angle* to **45.0**.
- d. Set the *Begin Point*, *Reference / Pivot Point*, and *End Point* as shown in the figure. Use the VCR buttons next to each option before snapping to the lines.
- e. Use the *tentative snap* to select the **end point** of each line.



- f. For *Side 1* set the option to **Selection Set**.
  - g. Using *Power Selector* to select both lines representing **Side 1**, see figure above.
  - h. Once both lines are selected, click the **Accept Select Set** button next to the *Side 1* option.
  - i. **Clear** the selection set from *Power Selector*.
  - j. For *Side 2* set the option to **Single Element**.
  - k. Click the **Identify DGN Element** button.
  - l. Select **Side 2** as seen in figure above. This is a two-click process; select and accept.
  - m. Click **Draw Separation** and move the cursor onto the screen, adjust the striping by moving the mouse left and right until the desired rotation is present.
5. Place a **Data Point** to draw the stripes. The figure below shows the finished product. The stripes are placed in a graphic group for easy deletion.

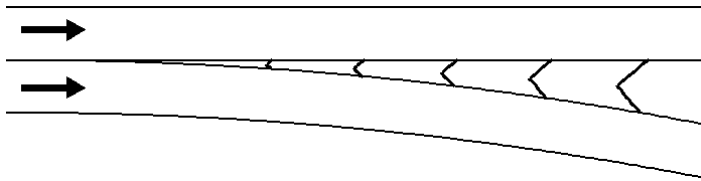


6. Close the **Draw Separation** tool. **Do Not Close D&C Manager**.
7. There are areas in the class project that require separation pavement striping. If time permits, try this technique on the class dataset.

## CHEVRON DIVERGE



The DrawChevron Diverge tool is used for traffic channelization at a gore when traffic flows in the same direction as seen in the figure below. Refer to Index 17346 for specific design criteria.



DrawChevr... — □ ×

Item: 0711 11224 Thermo., Std., Yellow

Distance Between Chevrons: 10.00

Tolerance: 0.00100

Gore Point (Wide End of Gore)

X: 0.0000 Y: 0.0000 ↔

Breaking Line

X: 0.0000 Y: 0.0000 ↔

Diverge Point (Narrow End of Gore)

X: 0.0000 Y: 0.0000 ↔

Side 1: Single Element

Side 2: Single Element

Draw Chevron Diverge

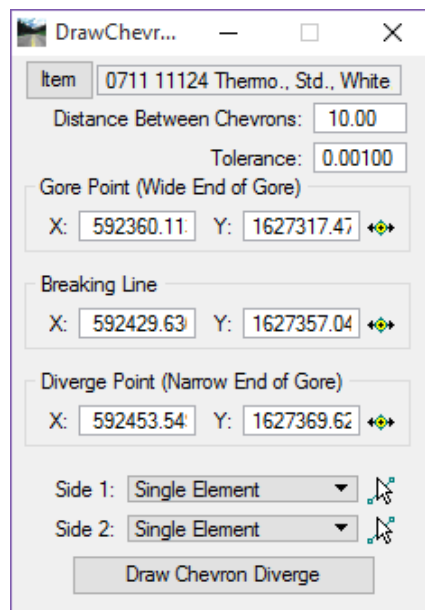
- **Item** – This is the pay item selected in D&C Manager. Clicking the *Item* button loads the selected item from D&C Manager.
- **Distance Between Chevrons** – Refer to the indexes for the correct distance between stripes.
- **Tolerance** - If the length of a segment of pavement marking is less than the **Tolerance**, the line will not be placed. It will only be utilized at the ending point, to determine where the final piece of marking is placed.
- **Gore Point (Wide End of Gore)** – Identifies the wide end of the gore.
- **Breaking Line** – Placed between the two sides and is used to draw the chevron. This can be adjusted during the drawing process to obtain the best scenario.
- **Diverge Point (Narrow End of Gore)** – Identifies where the chevron stops at the narrow end of the gore.
- **Side 1** – Is the intersecting side where the stripe stops.
- **Side 2** – Is utilized when turning the **Slash Stripe Angle**. The software begins on **Side 2**, and draws the marking at the specified angle until it intersects the **Side 1** element, where the marking stops. It is also desirable to have the total length of the **Side 2** elements longer than the **Side 1** elements; however, it is not mandatory.
- **Selection Options** – There are three options for selecting the side elements in MicroStation:
  - ✓ Single Element – When selected, you are prompted to select the element.
  - ✓ Selection Set – If the selected elements are in reference files, this method must be utilized, as Complex Chains cannot be selected from reference files. Create the selection set, and then set the toggle to **Selection Set**. Click **Identify DGN Element** to accept the selection set.
  - ✓ Complex Chain – Select the option, which invokes the MicroStation Create Automatic Complex chain tool to define the elements.
- **Draw Chevron Diverge** – Displays the striping and the diverging line. A **Data Point** draws the chevron and removes the displayed diverging line. The striping is placed (with each **Data Point**) in a graphic group for easy deletion, if desired.



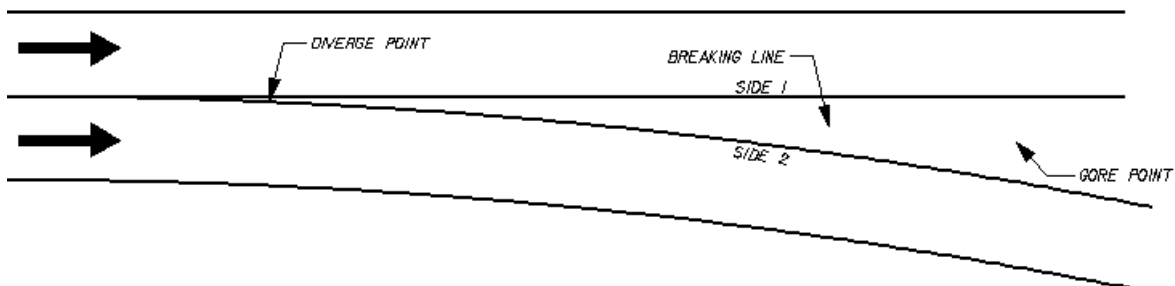
## Exercise 5.12 Draw Chevron Diverge

In this exercise you will draw 18" White chevrons in gore area. Refer to Index 17346 for specific design criteria for your specific project requirements. To aid in the selection of the three pick points you will notice labels with leader lines, the end of the leader lines represent the location to snap to when performing this exercise.

1. Continuing in *Dsgnsp-Stripe.dgn*, open the *model Diverge*.
2. In D&C Manager navigate to **Pavement Markings > Thermoplastic > Standard > Solid > LF** and select *Item 0711 11124 Thermo., Std., White, Solid, Diag./Chevrons, 18"*.
3. In D&C Manager, click **Chevron Diverge**. This opens the DrawChevron Diverge tool as shown below. The *Item* should also be set.

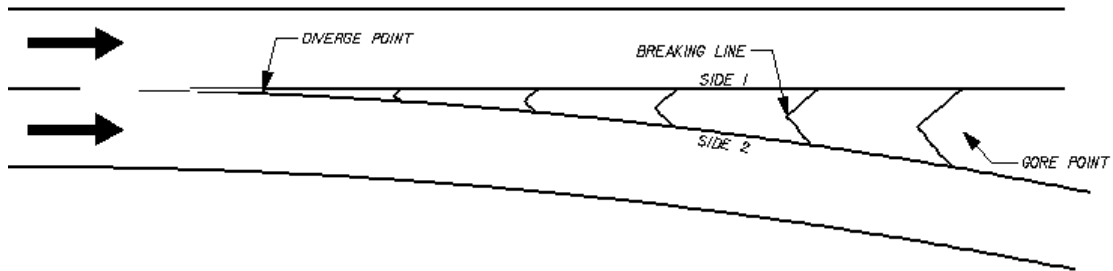


- a. Click the *Item* button if the item is not already set. (If you select the correct *Item* in D&C Manager before starting the **Chevron Diverge** tool the *Item* is automatically filled in.)
- b. Set the *Distance Between Chevrons* to **20.0**. Refer to Index 17345 for spacing.
- c. Set the *Gore Point (Wide End of Gore)*, *Breaking Line*, and *Diverge Point (Narrow End of Gore)* as shown in the figure below. Use the VCR buttons next to each option before snapping to the lines. These locations were preset to aid in the completion of this exercise, feel free to deviate from these points to view the differences in chevron placements.



- d. For *Side 1* set the option to **Single Element**.

- e. Click the **Identify DGN Element** button.
  - f. Select the **Side 1** element as seen in figure above. This is a two-click process; select and accept.
  - g. Repeat the above steps for *Side 2* selecting the **Side 2** element.
  - h. Click **Draw Chevron Diverge** and move the cursor onto the screen, adjust the striping by moving the mouse left and right until the desired rotation is present.
4. Place a **Data Point** to draw the stripes.
5. The figure below shows the finished product. The stripes are placed in a graphic group for easy deletion.

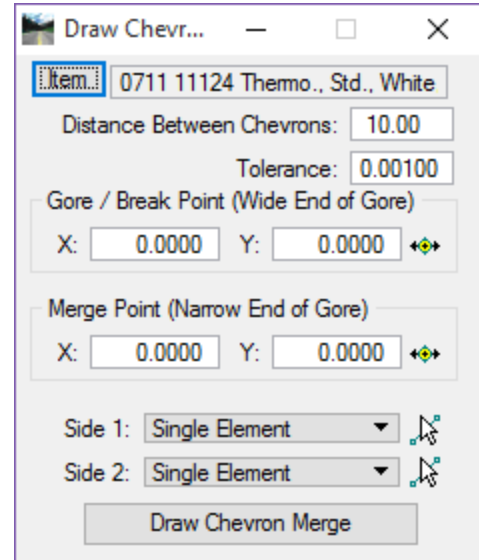
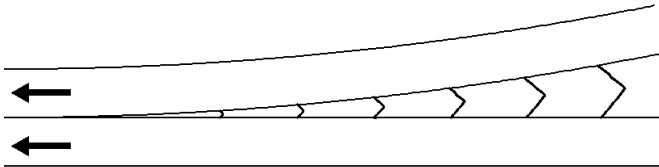


6. Close the Draw Chevron Diverge tool. **Do Not Close D&C Manager.**
7. There are areas in the class project that require diverge pavement striping around the island. If time permits, try this technique on the class dataset.

## CHEVRON MERGE



The Draw Chevron Merge tool is used for traffic channelization at a gore when traffic flows in the same direction in a merging situation as seen in the figure below. Refer to Index 17345 for specific design criteria.

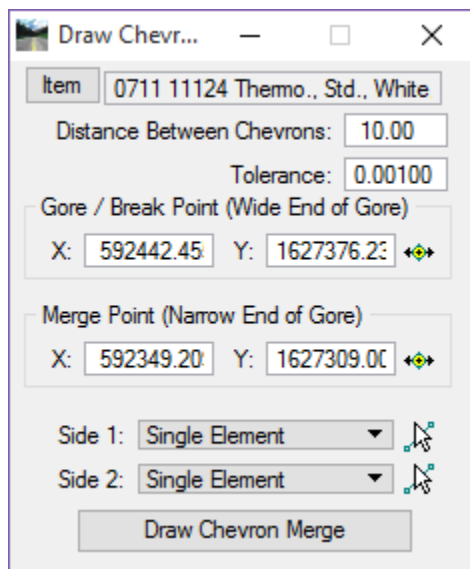


- **Item** – This is the pay item selected in D&C Manager. Clicking the *Item* button loads the selected item from D&C Manager.
- **Distance Between Chevrons** – Refer to the indexes for the correct distance between stripes.
- **Tolerance** - If the length of a segment of pavement marking is less than the **Tolerance**, the line will not be placed. It will only be utilized at the ending point, to determine where the final piece of marking is placed.
- **Gore / Break Point (Wide End of Gore)** – Identifies the breaking line for the chevron and should be located near the wide end of the gore.
- **Merge Point (Narrow End of Gore)** – Identifies the point where the chevron stops at the narrow end of the gore. The software utilizes the **Gore / Break Point**, the **Merge Point** and the intersection of the two sides to construct an arc, which demarcates the breaking in the merging chevron.
- **Side 1** – Is the intersecting side where the stripe stops.
- **Side 2** - Is utilized when turning the **Slash Stripe Angle**. The software begins on **Side 2**, and draws the marking at the specified angle until it intersects the **Side 1** element, where the marking stops. It is also desirable to have the total length of the **Side 2** elements longer than the **Side 1** elements; however, it is not mandatory.
- **Selection Options** – There are three options for selecting the side elements in MicroStation:
  - ✓ Single Element – When selected, you are prompted to select the element.
  - ✓ Selection Set – If the selected elements are in reference files, this method must be utilized, as Complex Chains cannot be selected from reference files. Create the selection set, and then set the toggle to **Selection Set**. Click **Identify DGN Element** to accept the selection set.
  - ✓ Complex Chain – Select the option, which invokes the MicroStation Create Automatic Complex chain tool to define the elements.
- **Draw Chevron Diverge** – Displays the striping and the diverging line. A **Data Point** draws the chevron and removes the displayed diverging line. The striping is placed (with each **Data Point**) in a graphic group for easy deletion, if desired.

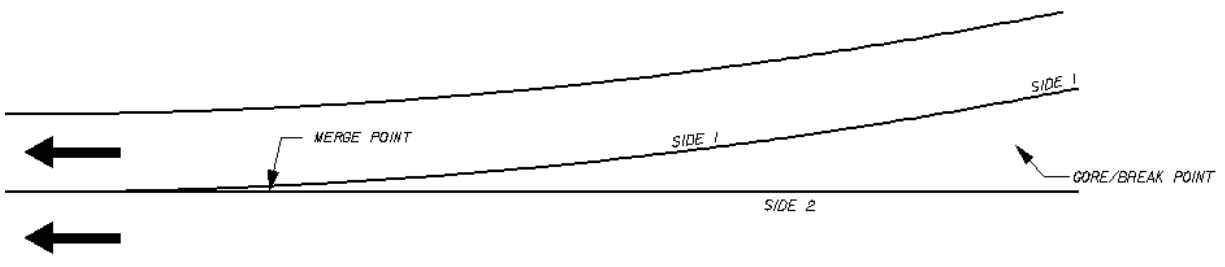
### Exercise 5.13 Draw Chevron Merge

In this exercise the student will draw 18" White chevrons in gore area in a lane merge scenario. Refer to index 17345 for specific design criteria. As mentioned earlier, to aid in the selection of the pick points you will notice labels with leader lines, the end of the leader lines represent the location to snap to when performing this exercise.

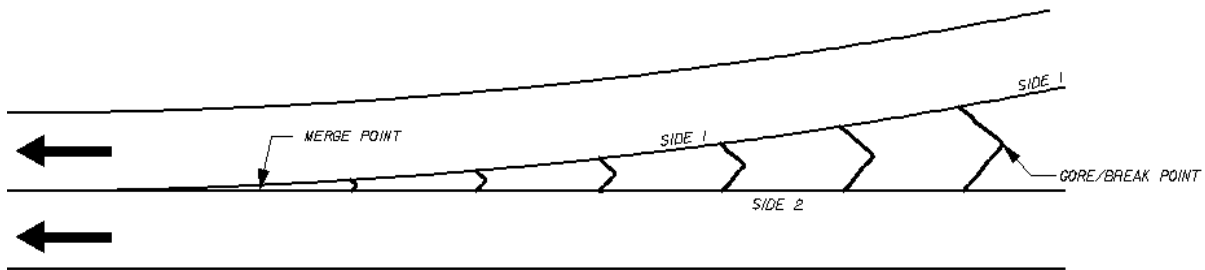
1. Continuing in *Dsgnsp-Stripe.dgn* open the model **Merge**.
2. In D&C Manager navigate to **Pavement Markings > Thermoplastic > Standard > Solid > LF** and select *Item 0711 11124 Thermo., Std., White, Solid, Diag./Chevrons, 18"*.
3. In D&C Manager, click **Chevron Merge**. This opens the *Draw Chevron Merge* tool as shown below. The *Item* should also be set.



- a. Click the **Item** button if the item is not already set. As mentioned previously, if you select the correct *Item* in D&C Manager before starting the Draw Chevron Merge tool the *Item* is automatically filled in.
- b. Set the *Distance Between Chevrons* to **20.0**. Refer to Index 17345 for spacing.
- c. Set the *Tolerance* to **0.10**.
- d. Set the *Gore/Break Point (Wide End of Gore)* and *Merge Point (Narrow End of Gore)* as shown in the figure below. Use the buttons next to each option before snapping to the lines. These locations were preset to aid in the completion of this exercise.



- e. For *Side 1* set the option to **Selection Set**.
  - f. Using *Power Selector* select both lines representing **Side 1**, see figure above.
  - g. Once both lines are selected, click the **Accept Select Set** button next to the *Side 1* option.
  - h. Clear the selection set from *Power Selector*.
  - i. For *Side 2* set the option to **Single Element**.
  - j. Click the **Identify DGN Element** button.
  - k. Select the **Side 2** element as seen in figure above. This is a two-click process; select and accept.
  - l. Click **Draw Chevron Merge** and move the cursor onto the screen, adjust the striping by moving the mouse left and right until the desired rotation is present.
4. Place a **Data Point** to draw the stripes. The figure below shows the finished product. The stripes are placed in a graphic group for easy deletion.

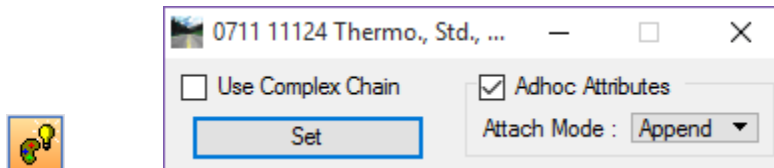


5. Close the Draw Chevron Merge tool.

## FIX ELEMENTS USING D&C MANAGER SET MODE

The D&C Manager has a Set Mode used to fix elements not drawn with the D&C Manager. Example: a project that contains pavement marking items and the designer is trying to run quantities but nothing happens. All of the elements are on the correct level but there is no D&C Manager attribute on them.

Once invoked, the Set command opens the dialog seen below. This dialog allows the designer to set a MicroStation element to a D&C Manager item and add Adhoc attributes to those elements.



The workflow of this tool is:

1. Select the item in D&C Manager.
2. Start the **Set** command.
3. Click the **Set** button.
4. Select the element in MicroStation to fix and accept it.

*Note* Use selection sets to make it easier to fix multiple items at the same time.

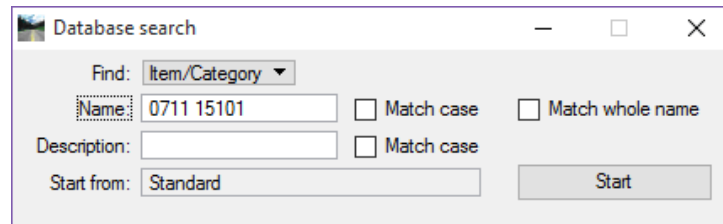
*Note* The Adhoc Attribute feature has the same functionality as in Design mode. It is suggested to always leave this selected. It will not add or change anything if there are no Adhocs attributes on the pay item. The compute method for most pavement marking items are set to Adhoc Attributes. If they are not set to the elements correctly, the elements will not calculate.


### **Exercise 5.14** *Set MicroStation Elements to D&C Manager Item*

In this exercise, the student will set MicroStation lines to have D&C Manager attributes on them. These lines are 100% CADD compliant but they will not quantify. This scenario is common when users in an office do not use D&C Manager to draw elements into MicroStation. No one has to redraw the lines, only to set them to the appropriate D&C Manager item.

1. Open *Dsgnsp-Stripe.dgn* in the *signing* folder.
2. Open the *model* **Fix Lines**. This is set up for this exercise only.
3. Open D&C Manager to use the search function to locate the *item* in D&C Manager.
4. Use the **ID** button and select the elements in the **Fix Lines** model. Notice none of the elements match DDB items.
5. In D&C Manager, select **Edit > Find**.

6. In the Database Search dialog set the *Find* option to **Item/Category**.



7. In the *name* field key-in **0711 15101**. Make sure to add the space in the name.
8. Click **Start**. This will set you on that item and saves having to navigate to it.
9. Close the Database Search dialog.
10. On D&C Manager, click the **Set** icon . This opens the set dialog.
11. Click the **Set** button.
12. Select the **6” White Lane lines** and accept them. It is not necessary to go back to the Set button each time.
13. In D&C Manager set the *Item* to **0711 15201**.
14. Use *PowerSelector* and select the **yellow edge lines**.
15. Click the **Set** button. No need to Data Point on the screen to accept the lines with this option; it is done all in one step.