
Chapter 8

Design and Computation Manager

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8.1 Objectives

- Understand the use of the **D&C Manager** in creating construction plans
- Understand the format of the hierarchical database and how to use it
- Be able to use the **D&C Manager** in conjunction with Microstation to store roadway features and calculate their quantities

8.2 Definitions

The **Design and Computation Manager** (D&C Manager) is a tool that allows MoDOT to standardize graphics elements for drafting and pay item quantities.

8.3 Database

A hierarchical database is used with the **Design and Computation Manager**. For MoDOT the default database is either **MoDOT_English.ddb** or **MoDOT_Metric.ddb**. The database stores information concerning functional classification and display preferences for each feature and item used in a Microstation file.

Categories are used to group and classify the features and items used in creating construction drawings. The content the MoDOT databases are divided into three overall categories – **Pay Items/**, **Drafting Standards/**, and **Design Standards/**. These three categories each contain sub-categories. The sub-categories break down each classification into more specific sections. (See dialog box next page).

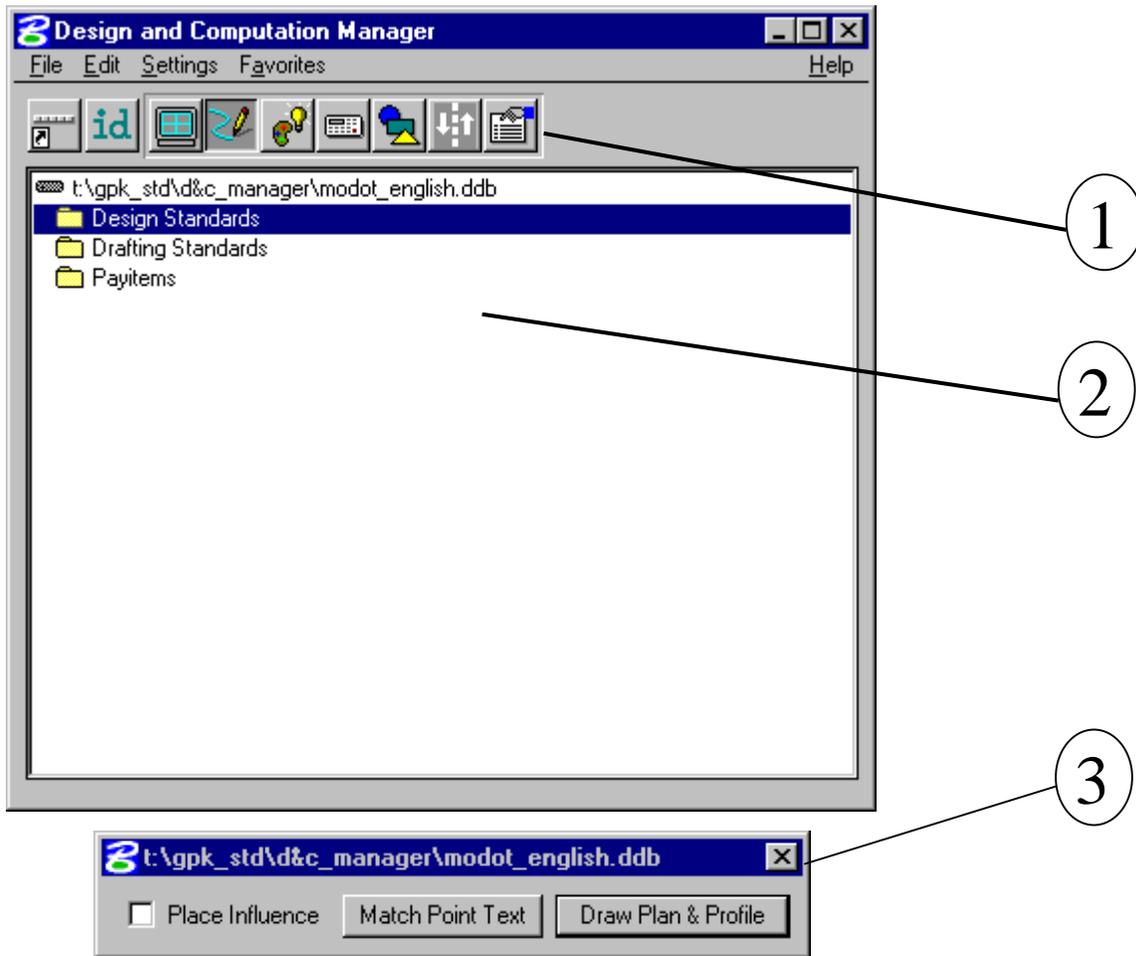
For example, **Pay Items/** is broken into several additional categories like **Pipes/** and **Lighting and Signals/**. **Pipes/** is broken into many different categories representing various types of pipes and pipe features that may be used in the design of your project like **Flared End Sections/**. Within the category **Flared End Sections/** the different pay items for flared end sections are listed.

CADD Support personnel maintain this database. You will find commands within the D&C menu that require a password before execution. This is a security measure to protect the integrity of the database file and ensure its consistent application on a statewide basis.

8.4 Accessing

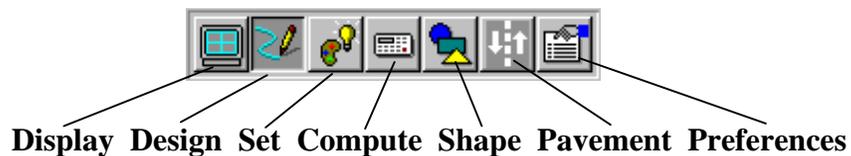
Design and Computation Manager can be accessed from **Project Manager >> Plan View Quantities** or from the **Design and Computation Manager** icon.

The following dialogs will appear.



The D&C Manager dialog box is composed of three distinct areas:

- 1) The D&C Manager may be configured to operate in seven different modes. A single click on an icon will change operational modes. They are: **Display Design Set Compute Shape Pavement Preferences**

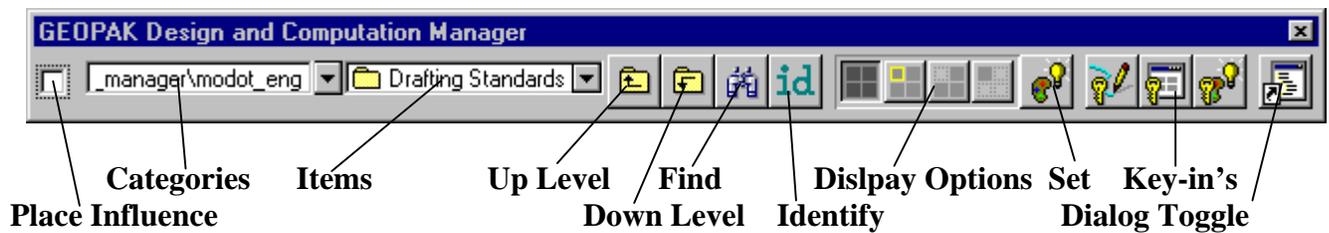


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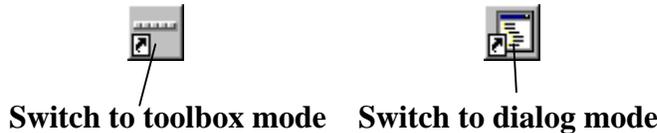
- 2) The **Content box** lists the sub-categories or items available at your current position within the database structure.
- 3) The **Operations box** will appear differently depending on the set mode of operation.

The D&C Manager dialog box can be used in two different modes. The dialog mode as shown on the previous page, allows the user to access items in from a “directory tree” structure. The icons at the top of the dialog allow the user to access the different operational modes of D&C Manager.

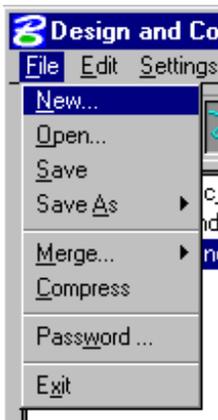
The toolbox mode as shown below, allows the D&C Manager dialog to be docked on the Microstation toolbars. With this format, the user accesses items from the pull-down menus, and can toggle the various tools from the tool bar.



The dialog box can be toggled using the appropriate icons.



8.4.1 File Commands



For a MoDOT Geopak user, the only file command options needed are **Open** and **Exit**.

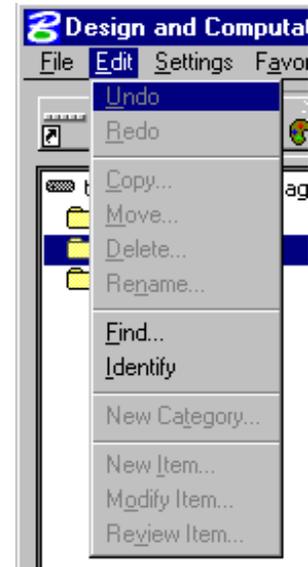
MoDOT_English.ddb or **MoDOT_Metric.ddb** will be used for all MoDOT projects. This file is password protected, so the users will not be able to make changes to it.

8.4.2 Edit Commands

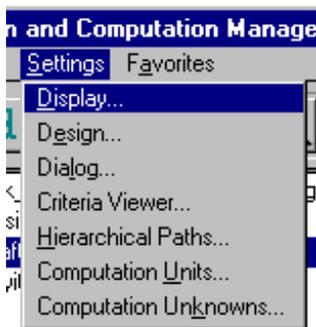
Find - will search the database (from your current location) for an item or category. The display in the D&C Manager dialog box will change to each item/category as it is found.



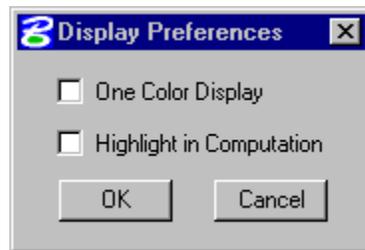
Identify – will show the item name and description attached to an element in the design file.



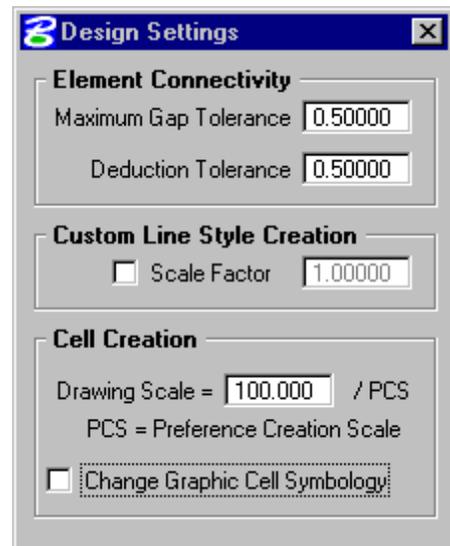
8.4.3 User Commands



Display Settings - temporarily changes the display of elements on the screen to one common color, then the user may specify additional elements to be viewed in their original colors. This tool enhances visualization when working on a complex project.



Design Settings - sets the *maximum gap* tolerance and *deduction tolerance* used in computations and the drawing scale for placing cells. **Do not use the Custom Line Style Creation option.** The **Project** in the Microstation Manager handles the line style scaling in the MoDOT Microstation configuration. This dialog also sets the cell scale to adjust the cell size appropriate to the drawing scale.



8.4.4 Recall Commands



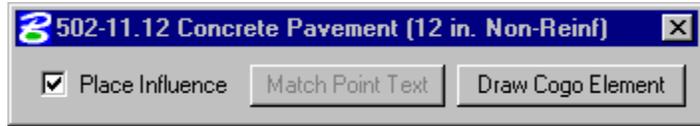
Add to Favorites - saves current D&C Manager path for easy recall in the future.

Organize Favorites – allows the user to edit and save the Favorites list.

8.5 Operational Modes

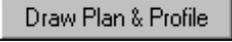
8.5.1 Design

The Design mode allows the user to tag each roadway element as it is placed in the design file based on item parameters and/or write COGO elements to the file.



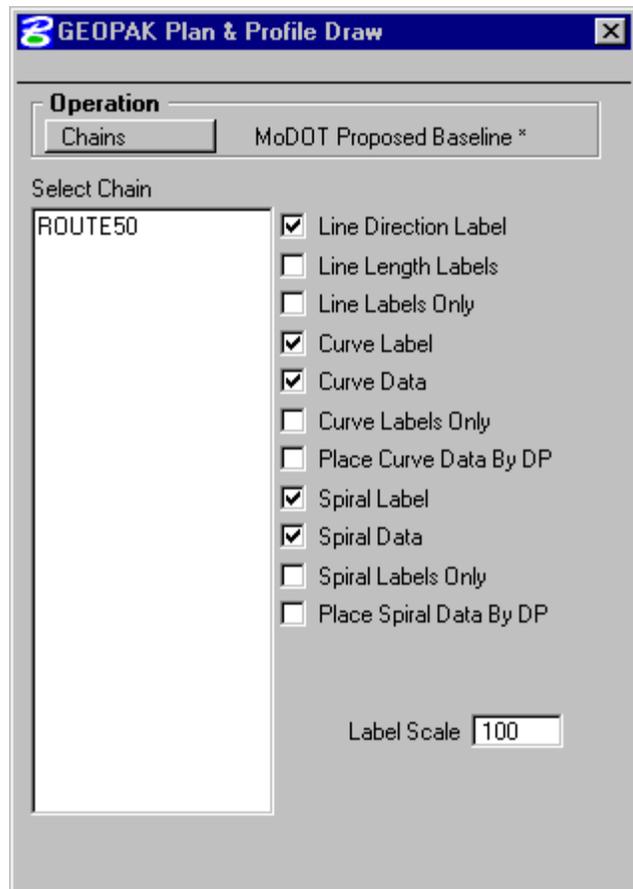
Place Influence will set the level, symbology and attribute tags of elements drawn or copied using Microstation commands. When **Place Influence** is **On**, elements are drawn using the level, symbology and attributes as defined in the Geopak database file. When **Place Influence** is **Off**, elements are drawn using the active level, symbology and attributes of Microstation.

The **Draw Cogo Element** button is for drawing Cogo elements to a design file. A single click to this button prompts the user for a job number then opens a dialog box that allows the user to choose a COGO item to draw.

 If a drafting item is chosen, the **Draw Cogo Element** button changes to **Draw Plan and Profile**. A single click to this button prompts the user for a job number, and then opens the **Geopak Plan and Profile Draw** box shown to the right.

There are nine possible COGO elements that may be recalled from the .gpk file: points, lines, curves, spirals, chains, stationing, parcels, profiles, and parallel chain. Each of these options changes the dialog box to offer relevant draw and label features used when placing an element in a graphics file. When using **Plan and Profile Draw**, be sure to turn off **Place Influence**.

The points and lines dialog boxes have a key-in field that allows the user to specify the names of the COGO elements to be drawn. To use the line operation, the user must use point numbers to specify the ends of the line. The points/lines are drawn immediately after you enter their respective names and press the enter key. To draw more than one point or line, place a dash in-between the point numbers. To draw a line without using consecutive point numbers, use a forward slash.



The dialog boxes for curves, spirals, chains, stationing, parcels, and profiles have a list box that display the names of all stored curves and chains. Highlighting one of the available elements causes it to be drawn into the file. Each type of item has a list of options that can be plotted.

****Note** that Geopak can draw elements to levels not turned on. After elements are drawn, it may be necessary to turn on appropriate levels and fit screen.

****Remember** that **Place Influence** is for drawing Microstation elements. **Draw Plan & Profile** is for drawing **Cogo** elements. **Do Not** have **Place Influence** on when using **Draw Plan & Profile**.

8.5.2 Display

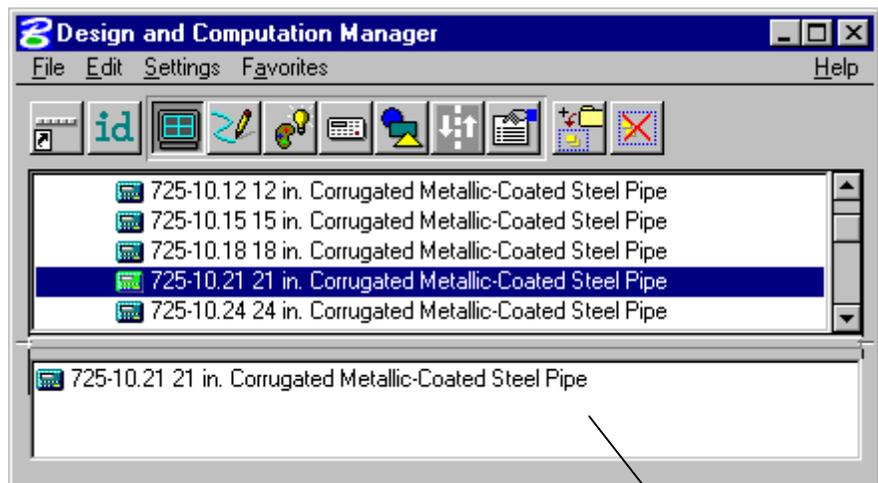
Display mode is used to enhance on screen visualization.

The pay item to be visualized is added to the **Collection** box. Three display options are available for the display of the items in the **Collection** box.

Highlight - will change those items stored in the collection area to the Microstation highlight color.

Not - simply turns off the display of the collection items leaving everything else on.

Only - will turn off everything but the collection items.



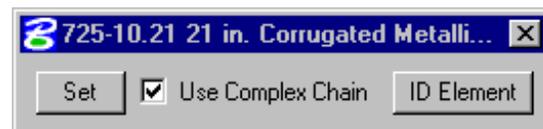
Collection Box

Normal Highlight Not Only

8.5.3 Set

The **Set** mode allows you to assign attributes from the D&C Manager database to existing graphical elements in the file. The **Complex Chain** option automatically creates a chain from graphic elements and applies the attributes of the highlighted item in the content box.

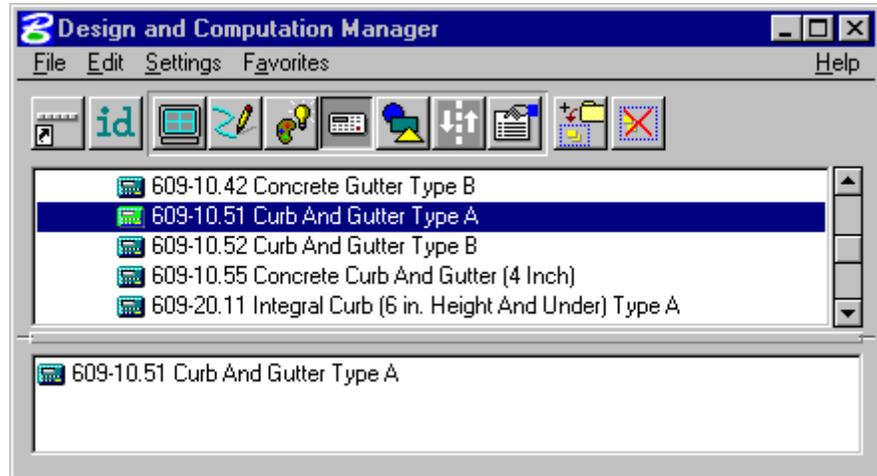
With the Complex Chain option is off, the Set mode is the same as Microstation *Element Select*. The user may tag several elements by depressing the Ctrl key while data pointing each element. This allows you to affect multiple elements with one Set command. **ID Element** is used to specify the complex chain to be changed. **Set** activates the command and changes the element attribute.



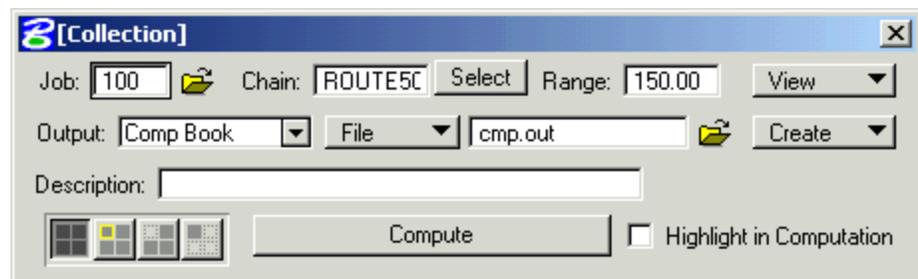
8.5.4 Compute



The **Compute** mode provides quantity calculations from graphic elements placed using the **D&C Manager**. Desired items for inclusion in the computation are added to the collection box at the bottom of the main D&C dialog as shown to the right.



Chosen items within either the **View** or a **Fence** are calculated, which is set in the upper right hand corner of the dialog. The other fields in the top row are discussed later.



There are six **Output** options:

Comp Book - calculates station/offset and coordinates for items defined in the Collection box within a **Range** left and right of a selected **Chain** in the specified **Job** as set by the first three fields in the top row of the dialog. The folder icon can be used to select the job. The output file is ASCII format.

Item Report – a total quantity for each item is calculated. For this option, the job, chain, and range fields are inactive. The output file is ASCII format.

Item Tables – contains the same information as an Item Report. It produces an ASCII formatted quantity table to be included in a drawing file or imported into the estimate program.

SDF Item Report – is similar to Item Report, except that the output file is in SDF (standard database format) or CSV (comma separated value) format.

SDF Comp Book – produces a more detailed report that lists not only quantity summaries, but also geometric properties such as plan view coordinates and station/offsets for located elements. Format is in SDF or CSV format.

DBMS – provides very detailed information including calculated and rounded quantities, geometric properties, pay item numbers, descriptions, station / offset values, etc. The format is the selected database (i.e., Microsoft Access, Oracle, SQL Server, and dbase).

To the right of the Output field is the **Preview/File** option. If preview is chosen, a file is not created and the output is displayed in a GEOPAK window. If set to File, GEOPAK creates the file whose file format is based on the Output type and whose name is defined in the key-in field to the right of the File option. The name can be manually entered or selected via the Files (folder) icon. The user can either **Create** a new file or **Append** the output to an existing file by using the option button at the end of the second row. If desired, a full path may be specified, otherwise, the report will be found in the current directory. The  icon can be used to select an existing file.

Any information keyed into the **Description:** field will be printed at the top of the report. There is a maximum of 48 characters supported for this field.

The four display options described in section 8.5.2 can be utilized using the buttons shown to the right.



The **Highlight in Computation** toggle will highlight all MicroStation elements utilized in the computations if activated.

Compute commences the computation process.

8.5.5 Shape

Shape mode provides tools for creating shapes to be used for area calculations such as pavement.



Three options are available for choosing the elements to create the shape.

Semi-auto – allows the user to trace around the elements to create the shape. The user picks an element, and then GEOPAK finds an intersection on that element. The user clicks the data point button to accept the intersection, or reset to choose another intersection. GEOPAK will then find the next intersection, which the user can accept or choose another. This is repeated until the beginning of the shape is reached.

Automatic – creates the smallest shape possible. The user selects a data point inside the shape they are trying to create. GEOPAK then moves up until it intersects an element, then traces around intersecting elements to create the shape.

Exclusive – works the same as the **Automatic** mode, but allows the user to select elements that will create a whole in the shape.

8.5.6 Pavement

The **Pavement** mode allows the user to place pavement marking including striping, and symbols.



Striping – allows the user to place single or double, solid or skip pavement stripes.



Separation – allows the user to place traffic separation pavement marking.



Chevron Diverge – allows the user to place pavement chevrons in areas of diverging traffic.



Chevron Merge – allows the user to place pavement chevrons in areas of merging traffic.



Symbols – allows the user to place pavement marking symbols with a specified pattern.

These are discussed further in the following pages.

8.5.6.1 SINGLE STRIPING

This box offers predefined configurations for single stripe and double stripe options so the user can easily control the type of striping being placed.

The pay item box will reflect the currently selected pay item in the **D&C Manager** dialog box; the user may change this at any time during the process.

Next, define the start option by selecting **Solid** or **Skip** (or a combination thereof). If **Skip** is active, the user must define the stripe and skip lengths. If an ending stripe is shorter than the Tolerance value, it will not be drawn.

A beginning and ending point for the limits of striping are entered from digitized points on the screen.

The lower portion of the dialog box provides tools for identifying the reference element on which the striping will be based.

After clicking **Apply**, the user must enter a data point on

either side of the reference element to begin striping. Striping is placed at the indicated offset value; the data point controls whether striping is offset left or right. *Striping is placed as a graphic group.*

8.5.6.2 DOUBLE STRIPING

The process for Double Striping is the same as Single, except for having two pay item placement options, Inside and Outside. The user must select either the Inside or Outside button for the highlighted (D&C Manager) pay item to be displayed in the dialog box. Separate quantities are calculated for each stripe.

The remaining process is the same as described above.

8.5.6.3 SEPARATION

This option draws pavement markings between two sets of selected elements.

Elements may be either GEOPAK or Microstation generated.

Once a pay item has been selected, the user may set the **Distance Between Stripes** and the **Slash Stripe Angle**. Tolerance functions the same as for striping.

A **Begin DP** and **End DP** should be issued before the **Reference DP** is identified. The Reference DP must fall between the **Begin DP** and **End DP**. It marks the location of the first pavement marking and determines the direction of the slashed stripe. All other markings will be based on the first stripe.

Tools for defining the limits of the pavement markings are located at the bottom of the Separation dialog box. **ID Intersection** identifies the elements where the striping will terminate. **ID Location** is the set of elements from which the striping begins.

After the **Apply** button is selected, the user must issue a data point in the graphics file for the pavement markings to be displayed.

8.5.6.4 CHEVRON DIVERGE

Once the pay item and its relative parameters have been defined, there are three points needed to define the chevron: **Gore**, **Breaking Line** and **Point**.

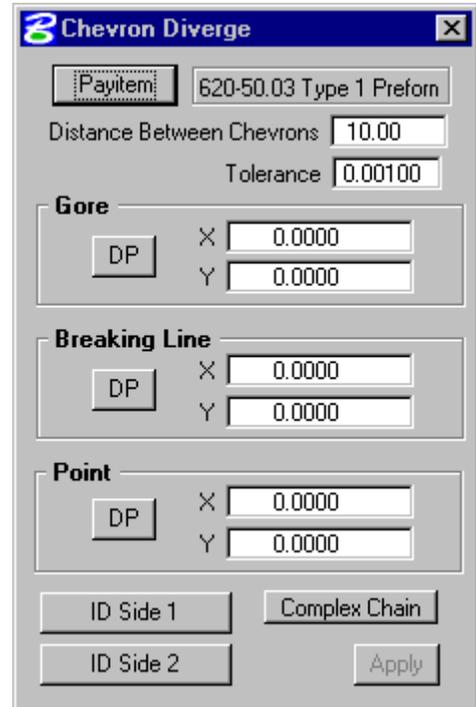
The **Gore** point defines the wide end of the gore.

The **Breaking Line** point must fall between the two sides of the gore and sets the location of the point at which the chevron diverts in a different direction.

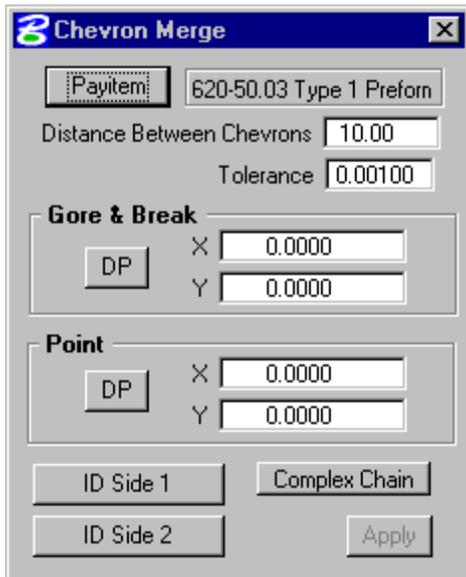
The **Point** represents the narrow end of the gore where chevrons are to stop.

Use the two **ID** buttons to identify the sides of the gore.

Once the **Apply** button is selected, the chevrons are displayed.



8.5.6.5 CHEVRONS MERGE



This process works similar to Chevron Diverge except the two points, Gore and Breaking Line, have been combined into one point that serves both functions.

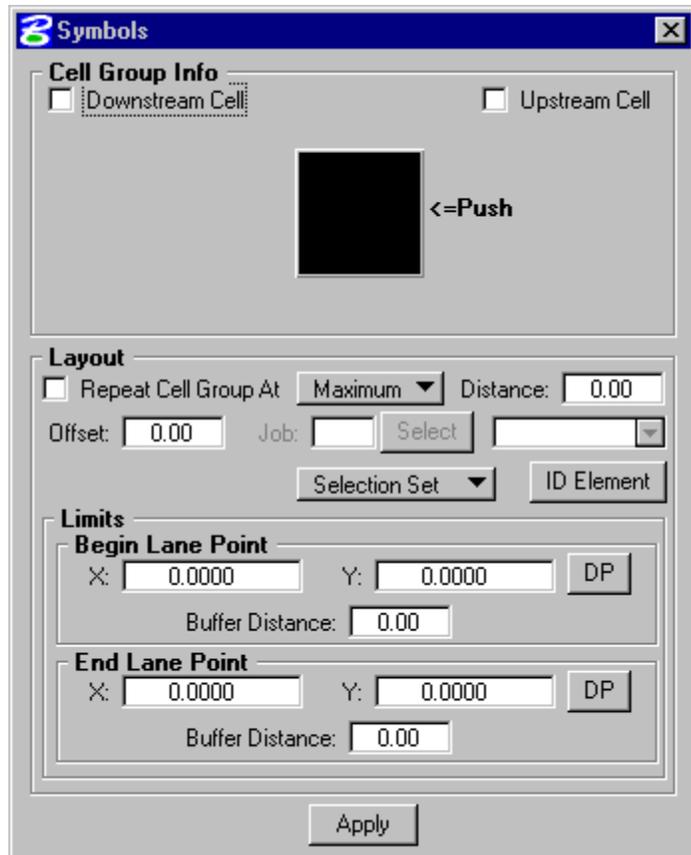
The **Gore and Break DP** should be located near the wide end of the chevron. It simultaneously sets the beginning of the pavement markings and the point at which the chevron will break.

The remainder of the process is as described above.

8.5.6.6 SYMBOLS

Cell Group Info defines the cells to be placed.

Layout allows the user to repeat the cells, and to set the locations of where the cells are placed.



8.6 DP Station/Offset



The **DP Station/Offset** command works in conjunction with Microstation commands and the D&C Manager.

It can be used as the *data point* for any Microstation command. **DP Station/Offset** provides precision placement of elements based on a station and offset of a stored chain.

Uses for this command include precision placement of elements and window functions.



8.7 Draw Transition



Draw Transition will draw a line/curve based on a beginning station/offset and an ending station/offset relative to a selected chain. Use of this command includes turn lanes, mail box widening and lane transitions.

Note: Elements placed with **Draw Transition** will have Microstation element type **curve** when the beginning and ending offsets are different and will have Microstation element type **line** and/or **arc** when the beginning and ending offsets are the same.

