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Chapter 17: Horizontal and Vertical Design

Introduction

Since there are many different, and acceptable, methods of creating horizontal and vertical geometry using GEOPAK, this chapter will not dictate the exact methods to use. Instead we will describe the different methods that can be used and provide a workflow for a macro that will check the horizontal alignment design for kinks, once completed. This chapter will be in two sections: Horizontal Design and Vertical Design.

Horizontal Design

There are four methods of setting a horizontal alignment: Coordinate Geometry (COGO), Graphical COGO, Horizontal Alignment Generator, and Store Graphics. Any of these methods are acceptable to CFLHD. Each one of these methods has their advantages and disadvantages, since graphical COGO and the horizontal alignment generator are similar, we will address these tools together. This chapter will describe each of the above listed methods and indicate their advantages and disadvantages. **Regardless of the method used, the final alignment must be drawn into MicroStation using the GEOPAK D&C Manager, with the CFLHD .ddb file.** This will assure that the elements are drawn with the correct symbology, matching the CFLHD standards.

Coordinate Geometry

Coordinate Geometry can be accessed using Project Manager by selecting the Coordinate Geometry button.

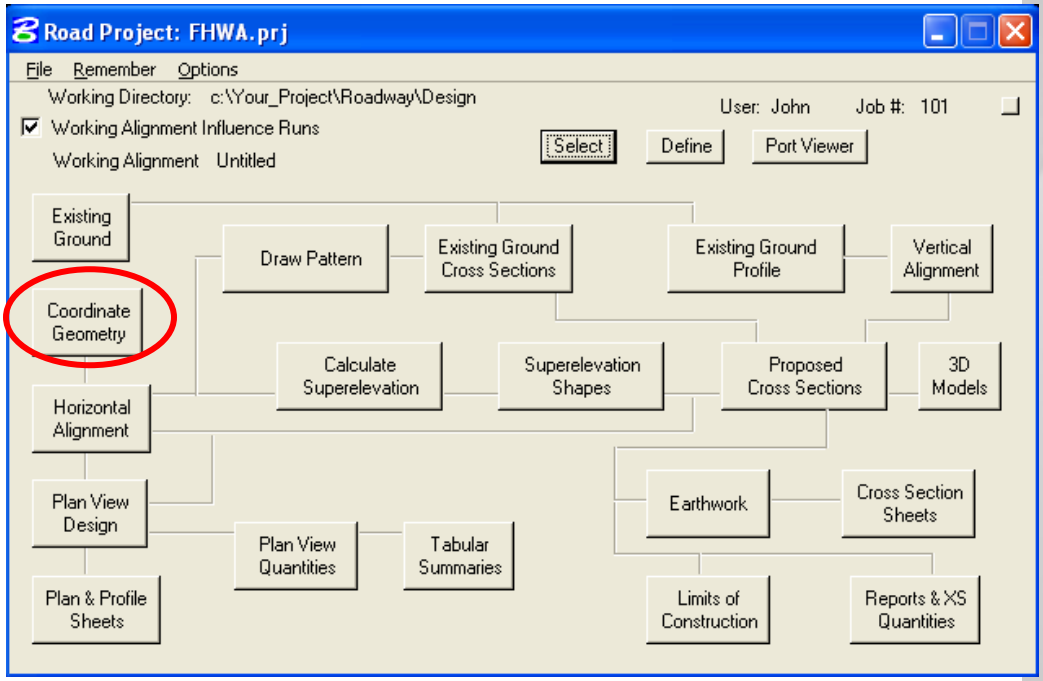


Figure 17-1: Accessing COGO through Project Manager

You can also select the Coordinate Geometry button on the GEOPAK main dialog box.

Figure 17-2: Accessing COGO through Road Tools Icon

If you are using Project Manager, Coordinate Geometry dialog box will be invoked. Otherwise, the Job Number and Operator code will have to be entered in the COGO Startup dialog box. Project Name and Subject are optional fields. Press the OK button to bring up the Coordinate Geometry window.

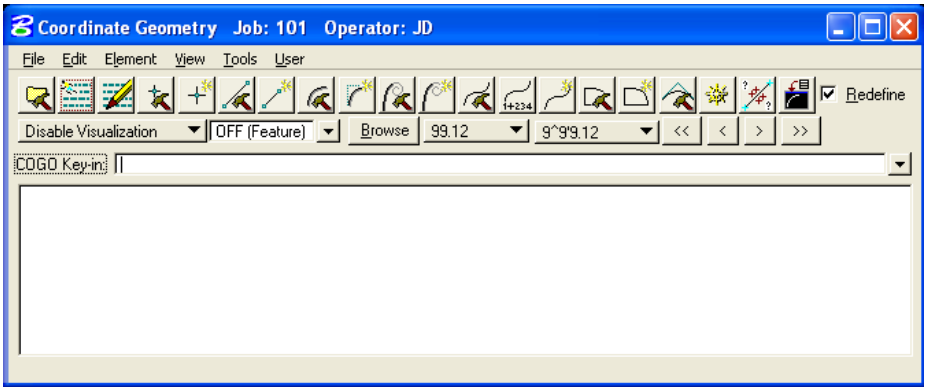


Figure 17-3: Coordinate Geometry

You can create the horizontal geometry by typing commands in at the COGO command line, by creating an input file with a sequence of COGO commands and loading it into COGO, or by using the dialog box driven Store Curve from Tangents, Locate Traverse, etc., tools that are accessed from the COGO pull down menus to generate the commands. If you use the input file method, remember that the COGO input file name can only be 8 characters long, must have the job number as the last three digits in the name, and the extension has to have an “i”+ the operator code. (i.e. XXXXX101.ijd), where the i stands for input file.

Advantages.

- This method allows the user to have more precise control over tangent bearings, control point coordinates, etc., than with Store Graphics, if done properly.

- The user can set visualization on to view progress of design.

Disadvantages.

- Commands for the command line and input file methods are difficult to memorize.
- Small adjustments are hard to make.
- Process is time consuming.

Uses.

- Reviewing both horizontal and vertical alignments.
- Creating output of alignments for printing.
- Tweaking alignments that were created using store graphics, or any of the other methods.
- Storing as-built centerline chain and profiles, especially those for which there are only hard copy paper plans.

Graphical COGO

Graphical COGO allow the user to create coordinate geometry elements using COGO tools with graphic and a user-friendly process. Graphical COGO can be accessed by selecting:

Applications>GEOPAK ROAD>Geometry>Graphical Coordinate Geometry

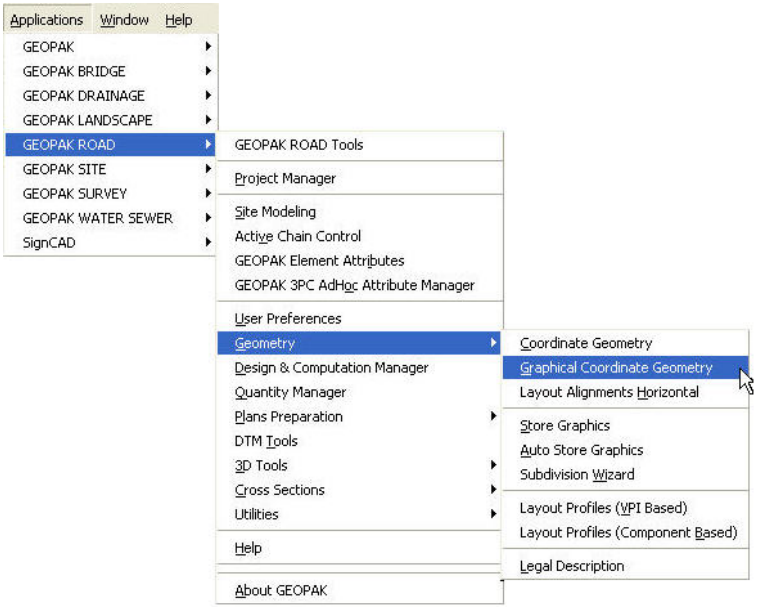


Figure 17-4: Accessing Graphical COGO

Or by selecting the icons from the main GEOPAK Road tool dialog box.

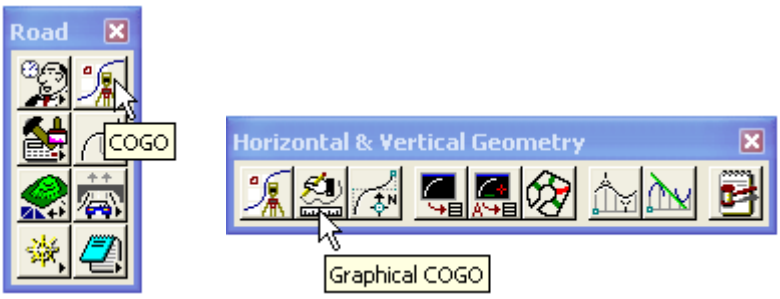


Figure 17-5: Graphical COGO Icons

The Graphical COGO tool frame shown below contains tools for creating COGO elements such as lines, points, curves, modifying COGO elements, manipulating elements, and grouping elements.

Figure 17-6: Graphical COGO Tool Frame

From the main Graphical COGO tool frame, shown above, additional tools may be accessed from each of the four main tool boxes.

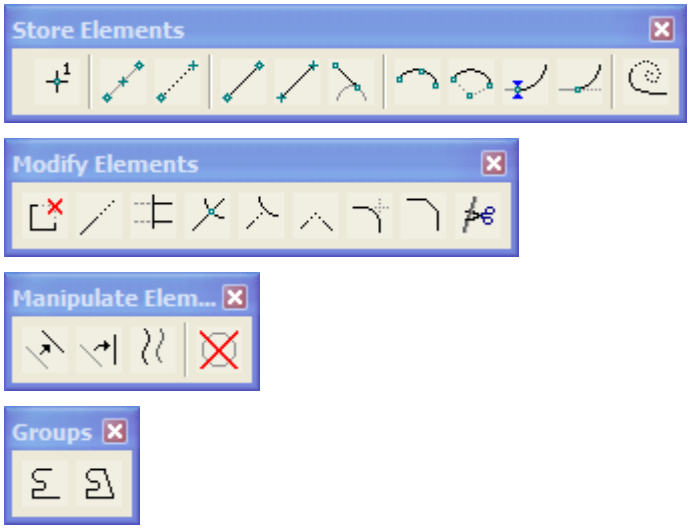


Figure 17-7: Graphical COGO Tools

The Graphical COGO tools shown above, and those in the Horizontal Alignment Generator, look and act the same as many MicroStation tools. However, these tools are not relying on the accuracy of MicroStation graphics, but rather the much more accurate GEOPAK coordinate geometry engine.

Horizontal Alignment Generator (Element Based)

Graphical COGO and the Horizontal Alignment Generator, allow the user to create coordinate geometry elements, much the same as the original COGO tools, but with a much more graphic and user-friendly process.

The Horizontal Alignment Generator can be accessed through the Project Manager by clicking on the Horizontal Alignment button on the flow chart and selecting Graphical Element Based geometry. Horizontal Alignment Generator can also be accessed by selecting:

Applications>GEOPAK ROAD>Geometry>Layout Alignments Horizontal

Or by selecting third icon in the Horizontal & Vertical Geometry tool box. Selecting this icon will invoke the Horizontal Alignment Generator Menu.

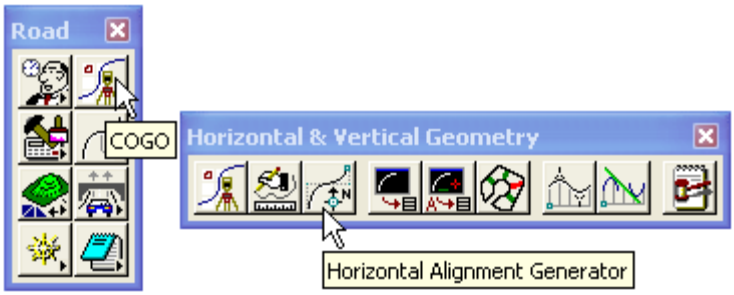


Figure 17-8: Horizontal Alignment Generator

Figure 17-9: Horizontal Alignment Generator Menu

The File pull-down menu allows the user to set preferences for how newly created elements will be displayed, how to name elements, and which geometry tables to use as a default. CFLHD uses the Spiral Design Tables. To access the Spiral Design Tables, path should be set to *V8_RESOURCE\X_30\Standards\Bin\english or metric.*

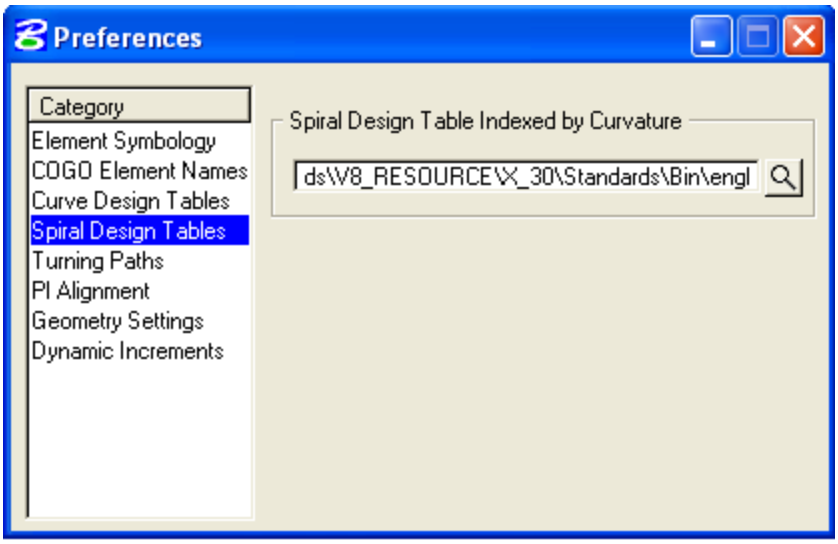


Figure 17-10: Horizontal Alignment Generator Preference

The Design Tables menu allows the user to view the settings for the current default design tables. In the Design Tables pulldown, the user sets the paths and file names for the tables to be accessed. Currently CFLHD uses only the Spiral Curve tables (Metric and English). Once the English or Metric Spiral Curve table is selected, select the design speed and number of lanes. These tables correspond with the AASHTO Green Book.

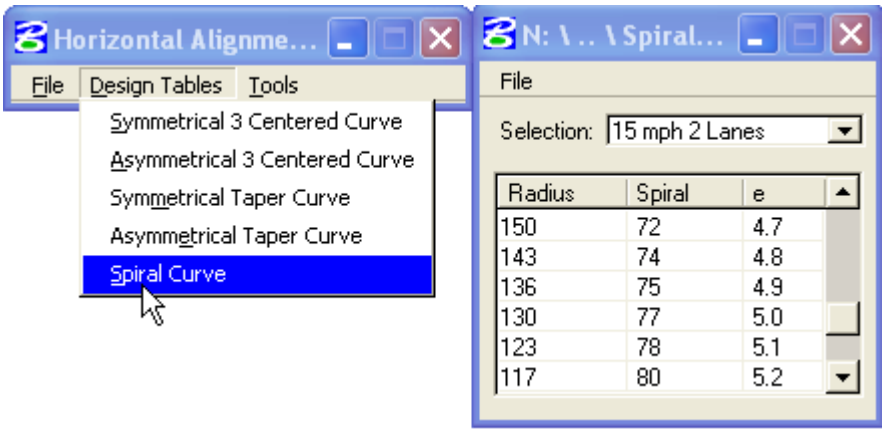


Figure 17-11: Design Tables – Spiral Curve

The tools menu activates the COGO tools that will be used to create geometry elements. Selecting **Tools>Main** accesses the following tool frame.

Figure 17-12: Horizontal Alignment Generator Tool Frame

From the main tool frame, shown above, additional tools may be accessed from each of the six main toolbox icons.

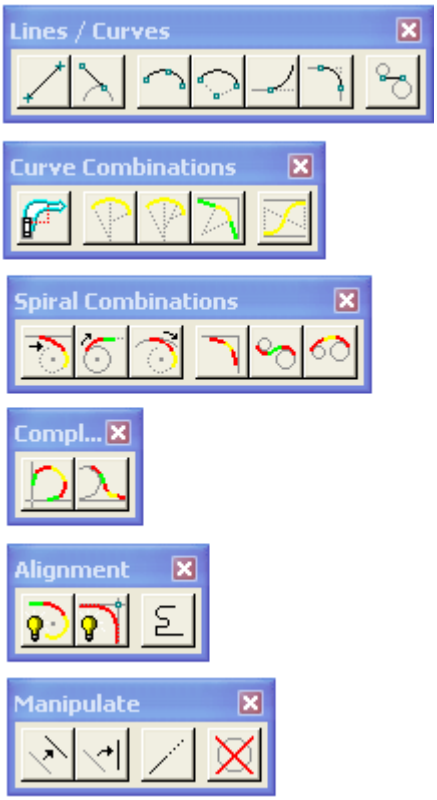


Figure 17-13: Horizontal Alignment Generator Tools

Each of the tool boxes shown above, as well as the tools from Graphical COGO, may be used together to create any combination of geometry, from the simplest to the most complex.

Advantages

- Using these tools to set a horizontal alignment, if done properly, is just as accurate as traditional command line COGO.
- The user does not have to remember syntax of COGO commands.

Disadvantages

- The Graphical COGO and Horizontal Alignment Generator tools can be complicated.
- The process is slower than using store graphics, as detailed below.

Uses

- When the geometry is known, as the input of As-Built alignments.
- When the user wants to give exact bearings and distances.

Store Graphics

The store Graphics procedure is the simplest and quickest method to create a horizontal alignment. The user can use standard MicroStation draw utilities to layout the alignment then use the Store Graphics tool to store the alignment into COGO. Even though MicroStation measurements are to single precision, GEOPAK stored elements are computed to double precision accuracy. Store Graphics will make slight adjustments to the graphical element locations as required forcing each element in the chain to be exactly connected to the immediately preceding element and the immediately following element. These adjustments are always minor (e.g. the coordinates of a curve's PC and/or PT may be adjusted a few millimeters to force the curve to match the tangents exactly) but they do occur and the user has no control over them. However, if the graphical elements were drawn correctly then the chain that gets stored into the gpk file is exactly as "accurate" as a chain stored using any of the other methods.

TIP: Use the filet tool to construct the final curves in the alignment. Placing an arc by tangential snap does not always give accurate results.

This command cannot be accessed using Project Manager, but can be accessed the following two ways. From the GEOPAK pull down menus select, **Applications>GEOPAK ROAD>Geometry>Store Graphics**

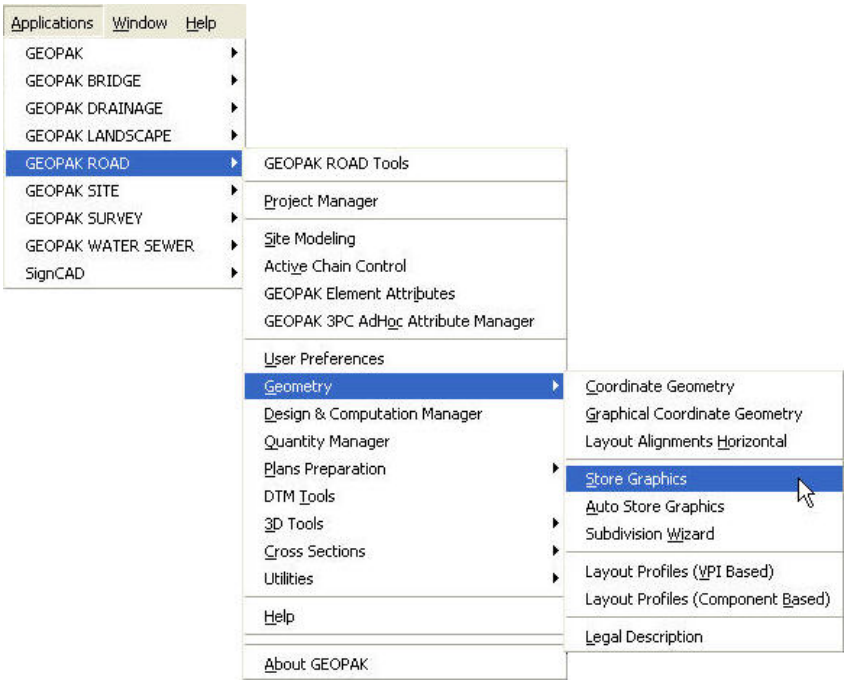


Figure 17-14: Accessing Store Graphics

Or by selecting the icons from the Geopak Road tool box as shown below:

Figure 17-15: Store Graphics Icon

Selecting the Store Graphics Icon will invoke the Store Graphics Dialog box. Points, curves, chains and parcels can be stored with this dialog box. To store a horizontal alignment, toggle to **Chain** as shown below. Set the Mode to **Complex Chain**. Enter the **Job** number (use the magnifying glass to browse to the GPK file), the **Operator Code** (users first and last initial), the name of the chain that will be stored and the **Beginning Station** of the horizontal alignment.

Figure 17-16: Store Graphics

The **Beginning Point** of the chain must be a unique point that has not been used previously. To check what points have already been used in the project, go to Coordinate Geometry (**COGO**) Dialog box as shown below. Select **Element** from the top of the COGO Dialog box. Go to **Point** and then **Utility**. This opens the Point Utility Dialog box which lists all of the points that have been used already. Points can contain numbers and letters. After determining an unused point, close the COGO Dialog box (Choose **No** when the 'COGO session not saved' Alert appears).

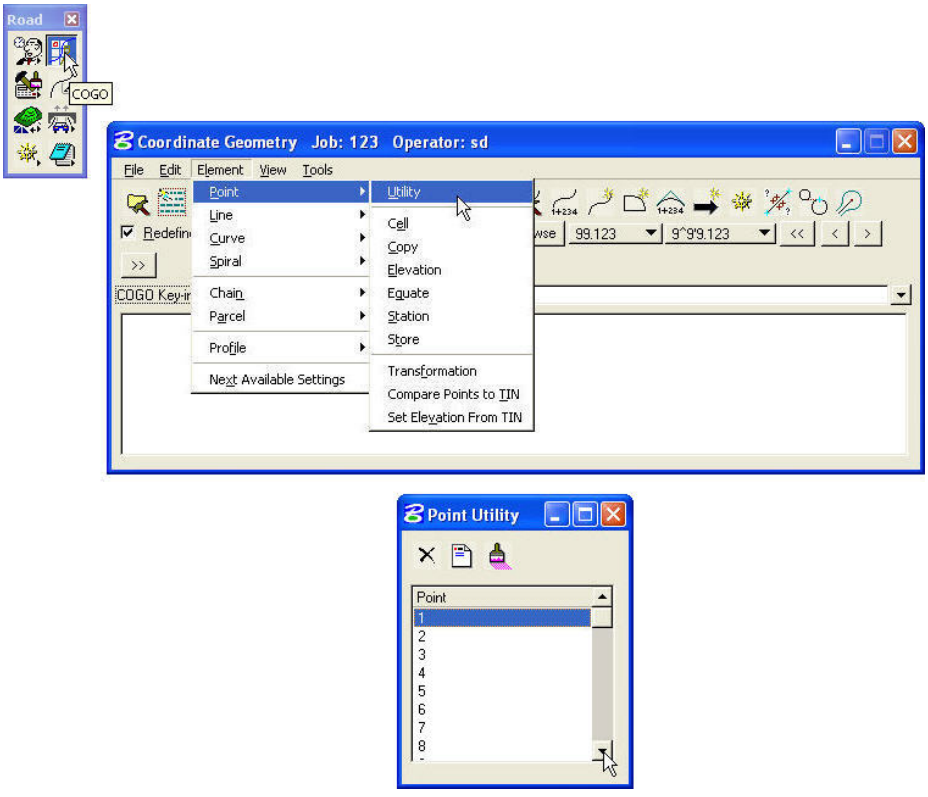


Figure 17-17: Unique Beginning Point

Enter a unique **Beginning Point** in the Store Graphics Dialog box. Fit the entire horizontal alignment in a View (if a portion of the alignment is not in the view, it will not be stored). Click on the **ID Element** button.

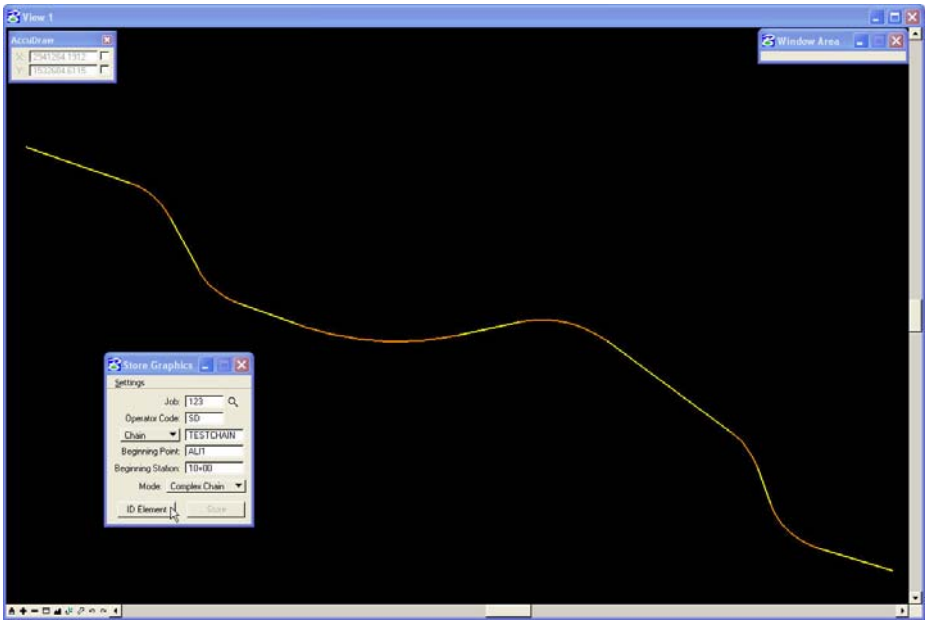


Figure 17-18: ID Element

In the view with the entire alignment, data point the first element in the horizontal alignment, the element will then appear highlighted. Click again, and the rest of the elements will be highlighted. Click again to accept the chain, and the **Store** button will become un-ghosted. Click the **Store** button. Click **OK** on the Store Graphics Notification.

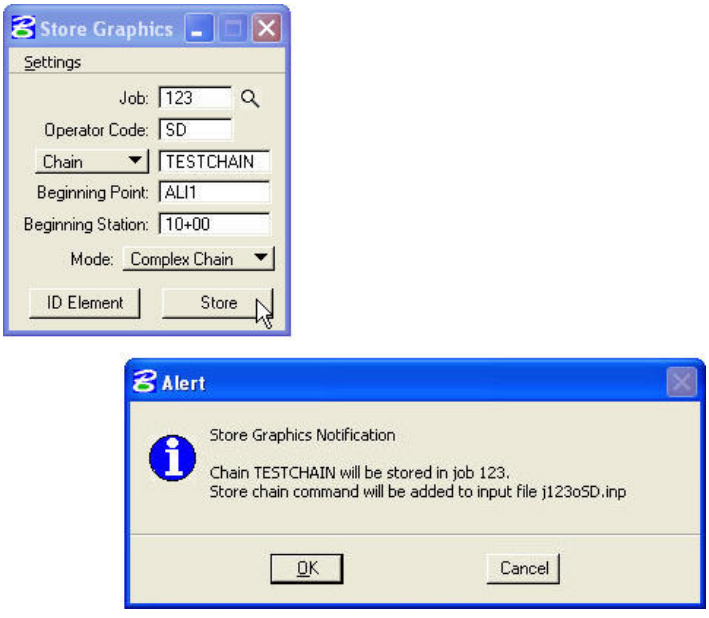


Figure 17-19: Store Chain

Advantages

- Use simple MicroStation commands to layout alignment, adjustments to alignment are quick, and the only point numbers used are on the alignment (usually just the first and last).

Disadvantages

- Not as accurate as COGO. Store Graphics makes minor adjustments to the as-drawn elements in order to get them to tie together mathematically.

- Cannot draw spirals using MicroStation commands. If spirals are needed, you must use Horizontal Alignment Generator to create that element, and then you may continue using MicroStation commands.

Uses

- For long alignments with many elements.

Horizontal Design – Geopak 2004

In GEOPAK 2004 there have not been many enhancements to the workings of the existing coordinate geometry tools. The main COGO dialog box has been enhanced to include utilities for each type of COGO element such as points, lines, curves, chains, etc. The utility dialog box will allow the user to functions such as visualize, print, transpose, etc., for each element type. This allows the user to more efficiently work with each type of element independently. The new COGO dialog box, along with some of the utility dialog boxes is shown below.

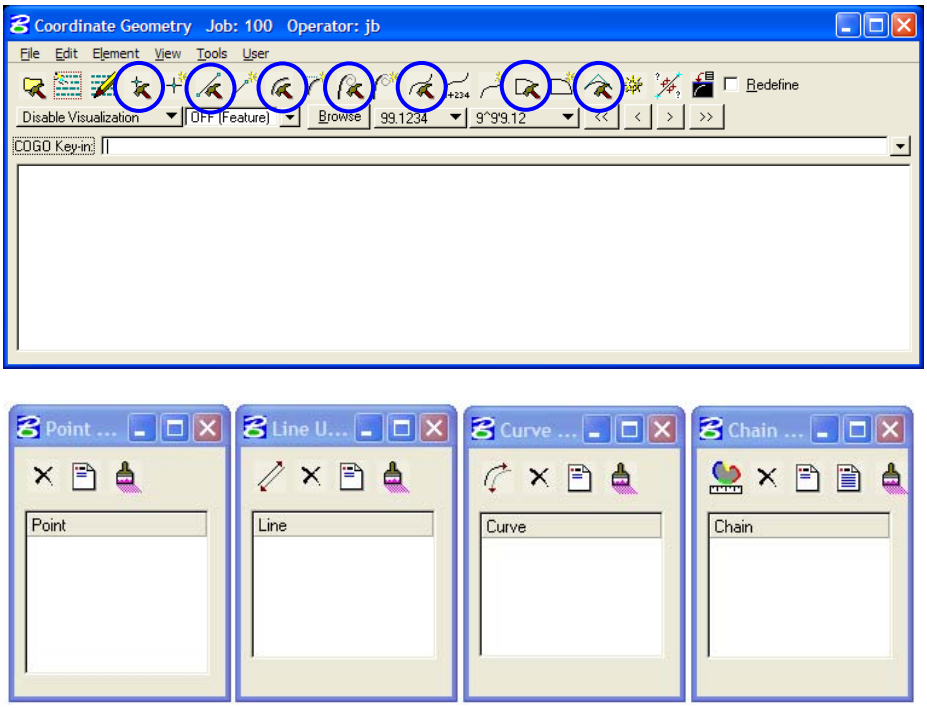


Figure 17-20: New COGO Tools

Vertical Design

There are two tools used to set proposed vertical alignments, and both are acceptable to CFLHD. Engineers and designers have used the VPI based Vertical Alignment Generator since the early days of GEOPAK. This tool, although having been around for years is still a user-friendly, accurate method for creating and storing vertical alignments. The second method is the Component Based Vertical Alignment Generator. This tool has been updated and improved over the VPI based tool, and has yet to be fully utilized by most GEOPAK users. Both these methods are just as accurate and depending on your preference, as easy to use. There are two methods available for creating and storing an Existing Ground profile; Traditional method and the new Draw Profile Tool method.

Existing Ground Profile

Once a run is created for the working alignment, the existing ground profile should be cut and drawn using the D & C Manager. CFLHD's traditional method for cutting existing ground profile is shown below. Existing Ground Profile can be accessed through the Project Manager by selecting the Existing Ground Profile button.

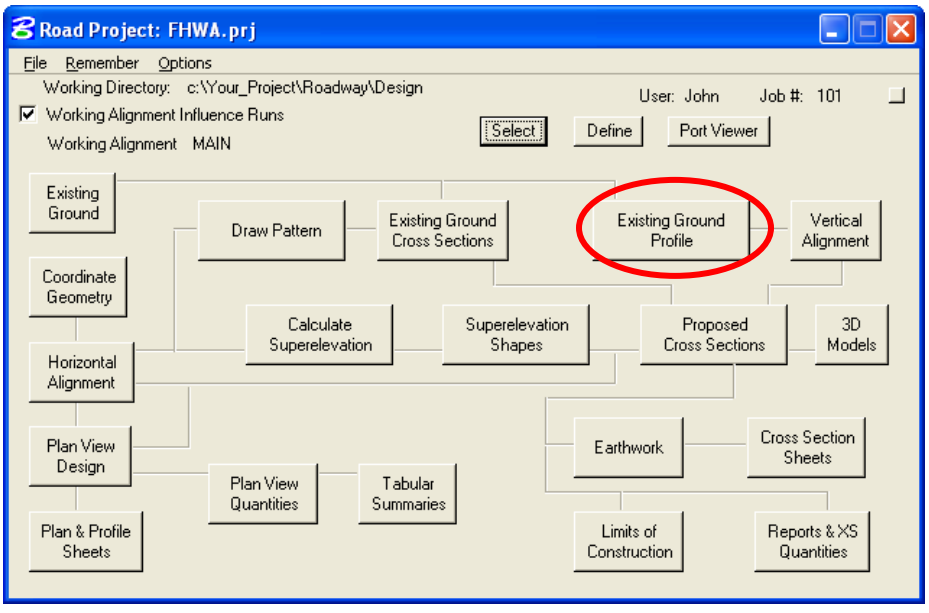


Figure 17-21: Accessing Existing Ground Profile through Project Manager

The Existing Ground Profile dialog can also be accessed by typing in **mdl load ex_prof** command in the MicroStation Key-in box.

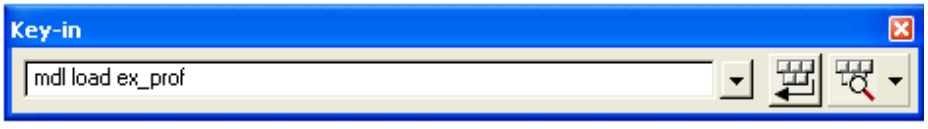


Figure 17-22: MicroStation Key-in

The following Existing Ground Profile dialog box will appear.

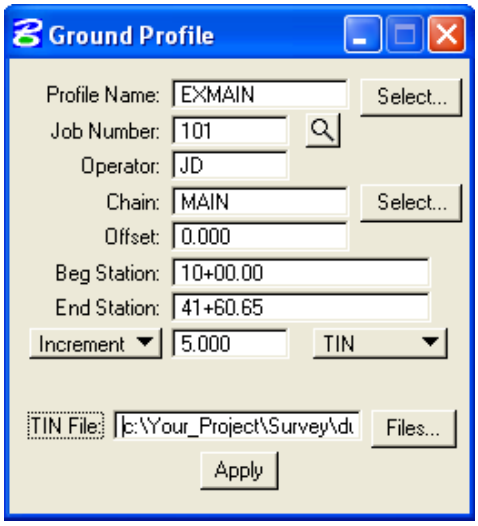


Figure 17-23: Traditional Existing Ground Profile

Enter in the required information and select Apply. Apply will cut your existing ground profile for the chain and store it into the GPK file. Existing ground profile can be accessed and drawn into MicroStation using the Geopak D & C Manager, with the CFLHD **.ddb** file. This will assure that the existing ground profile is placed with the correct symbology.

Draw Profile Tool - GEOPAK 2004

New to GEOPAK 2004 is a streamlined way to create existing ground profiles, and plot both existing and proposed profiles. The Draw Profiles tool is not available through project manager workflow dialog box, but can be accessed by selecting **Applications>GEOPAK ROAD>Plans Preparation>Draw Profiles**

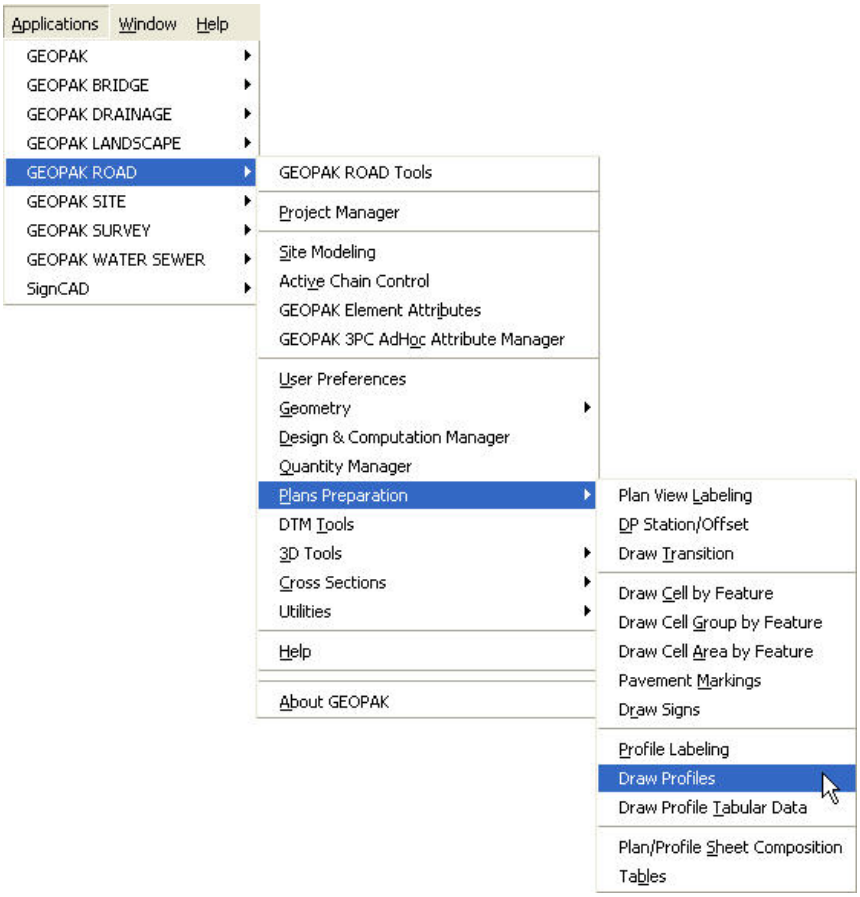


Figure 17-24: Select Draw Profiles

The Draw Profiles tool may also be accessed from the Plans Preparation tool palette as shown below.

Figure 17-25: Draw Profile Icon

All that is needed for this tool is a horizontal alignment and a **.tin** file. This tool allows for the creation of an existing ground profile in much the same way as the Traditional method, but does so behind the scenes, with increased efficiency and a much cleaner workflow. This tool also allows the user to draw profiles into MicroStation using the D&C Manager **.ddb** settings ensuring adherence to the CADD standards. Also, with the Draw Profiles tool, there is no need to delete before re-drawing updated profiles.

Workflow 1: Creating an existing ground profile using Draw Profiles Tool

1. *Select the Draw Profiles tool using one of the methods described above.*
2. *Select the job number where the chain is stored and the associated chain.*
3. *Select the Dialog Profile Cell Control icon located to the right of the job number.*

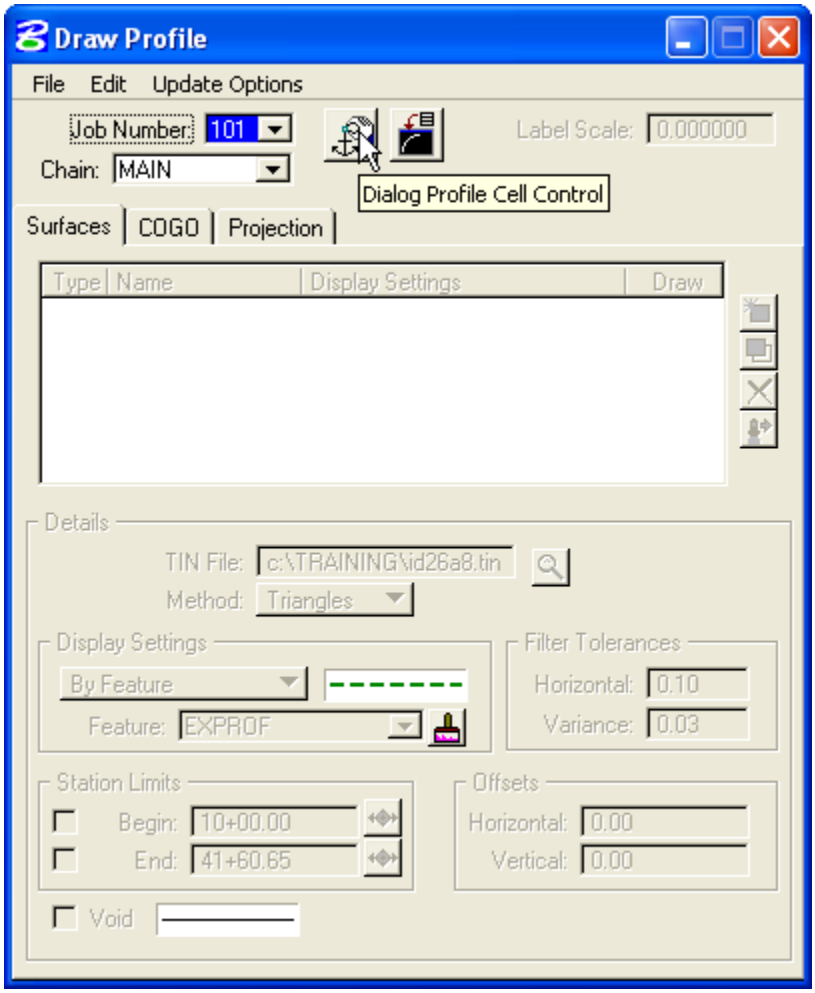


Figure 17-26: Draw Profile Dialog Box

4. *The dialog box below will appear. Select the Place Profile Cell icon on the top right side of this dialog.*

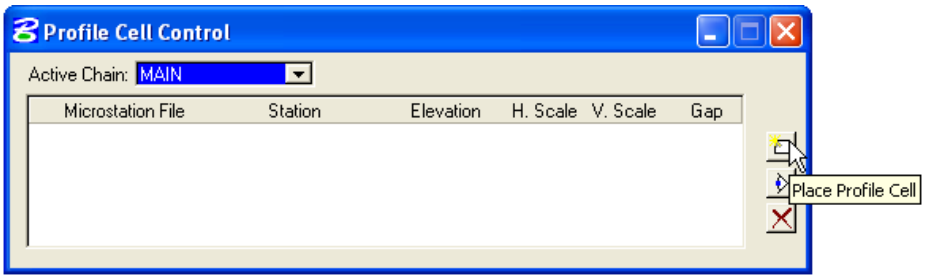


Figure 17-27: Profile Cell Control

5. *Once selected the following dialog box is activated allowing the user to set the station and elevation for the origin of the profile, set the horizontal and vertical scale, and set the top and bottom ranges for the cell. Elevation and Cell Range should match the range of Z value for your project. Notice how similar this dialog looks to the D&C Manager dialog for placing a profile cell.*

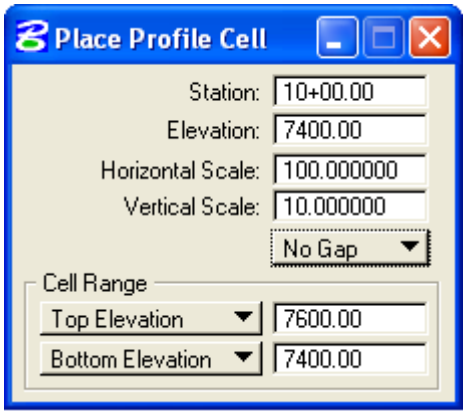


Figure 17-28: Place Profile Cell

6. *Once this dialog box has been populated, the user may place the cell where desired. The Profile Cell Control dialog box will now be populated.*

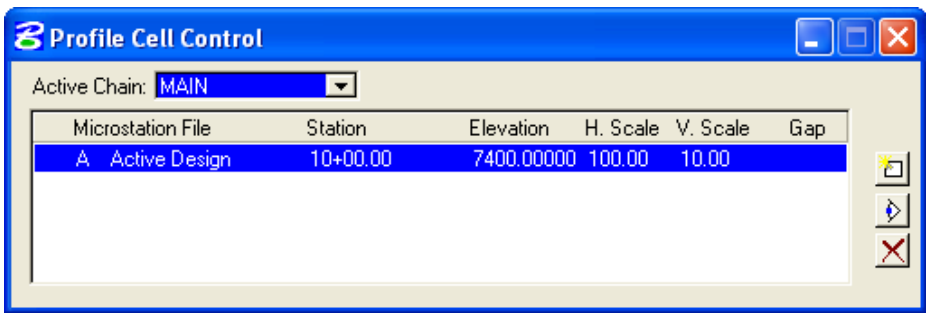


Figure 17-29: Profile Cell Control

7. *Dismiss the Profile Cell Control dialog box and return to the Draw Profile dialog. Notice that before placing the profile cell*

everything below the chain name on this dialog box was grayed out.

8. *This dialog box is now active and the user is now able to populate the Surfaces and COGO tabs.*
9. *Begin by selecting the correct .tin file. Once the .tin file is selected the user must now decide how to cut the existing ground profile. The options shown above; Triangles, Break Lines, POT, Increment, and Even, are the same options allowed in the original Ground Profile tool. Select the Triangles option.*

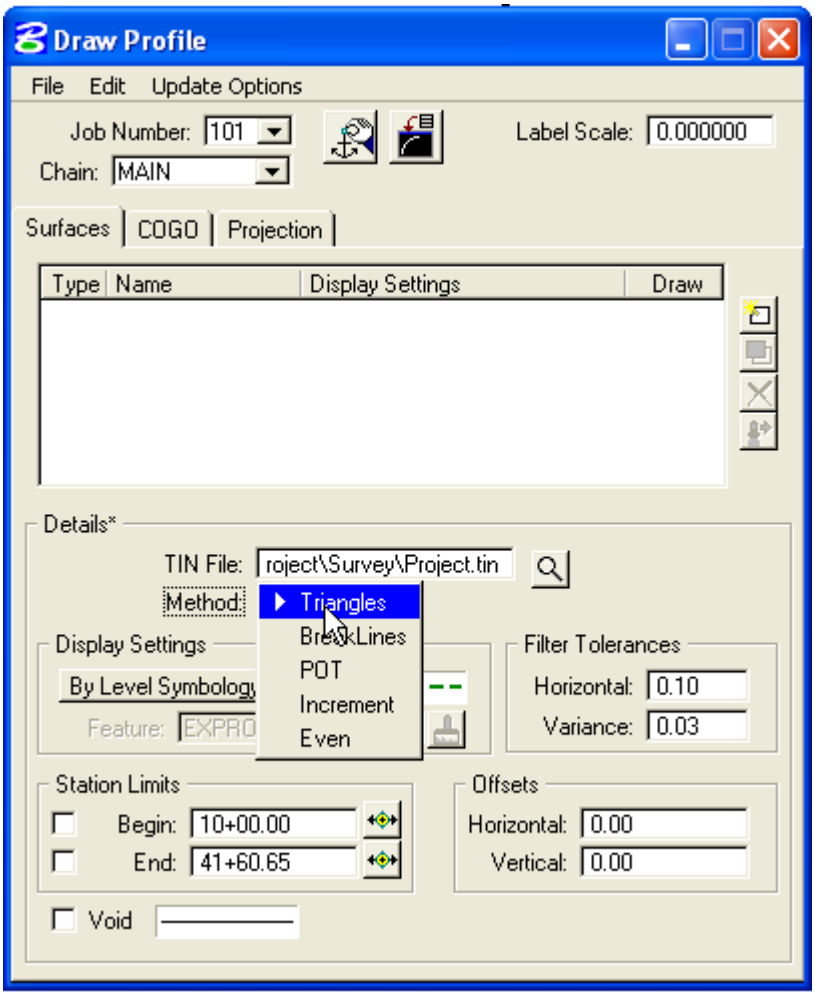


Figure 17-30: Draw Profile Method

10. *Next the user must tell GEOPAK how to draw the profile with the correct symbology. Previously, the user would use the D&C Manager exclusively to accomplish this. The Draw Profile tool will use either the D&C Manager or allow the user to input the level symbology. Select By Feature to access the D&C Manager.*

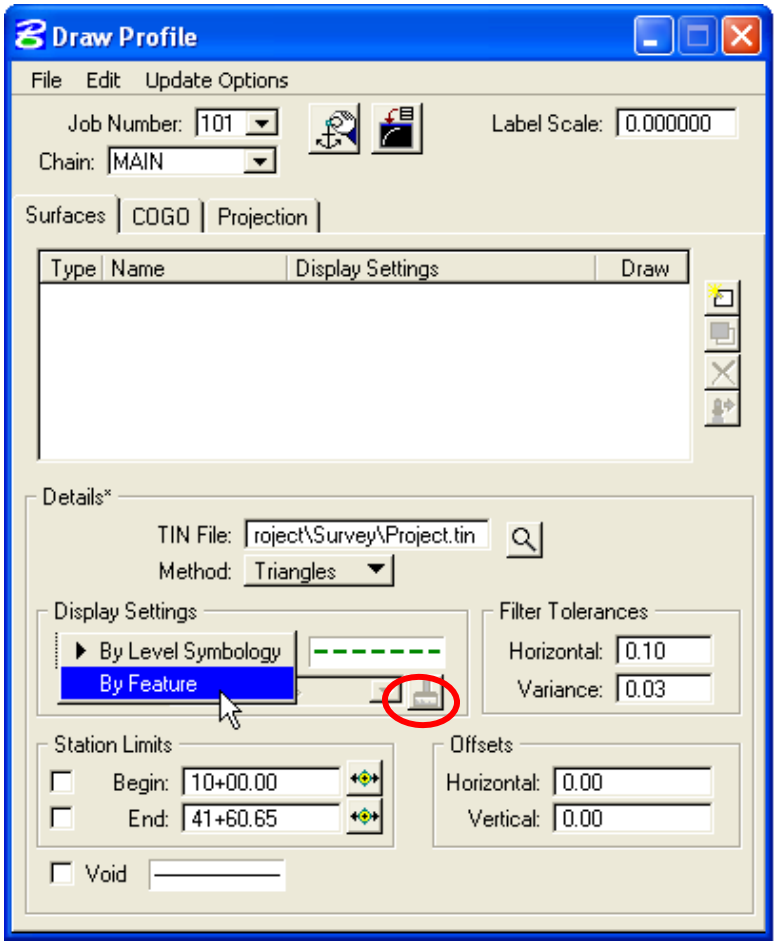


Figure 17-31: Display Settings

11. *Once selected, the paintbrush becomes active. Click on the paintbrush to access the D&C Manager.*

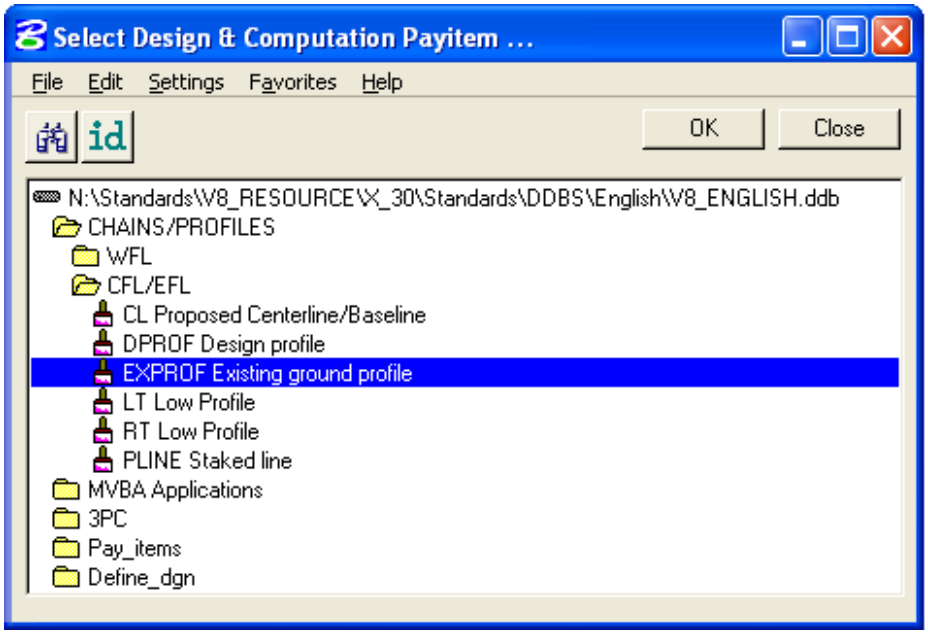


Figure 17-32: D&C Manager

12. *Select the correct element as shown above, CHAINS/PROFILES>CFL/EFL>EXPROF Existing ground profile. Select the OK button in the upper right hand corner of the dialog box.*

13. *Once the dialog box has been populated with the correct .tin file, the method, and the symbology, select the Add Surface Settings icon, circled below.*

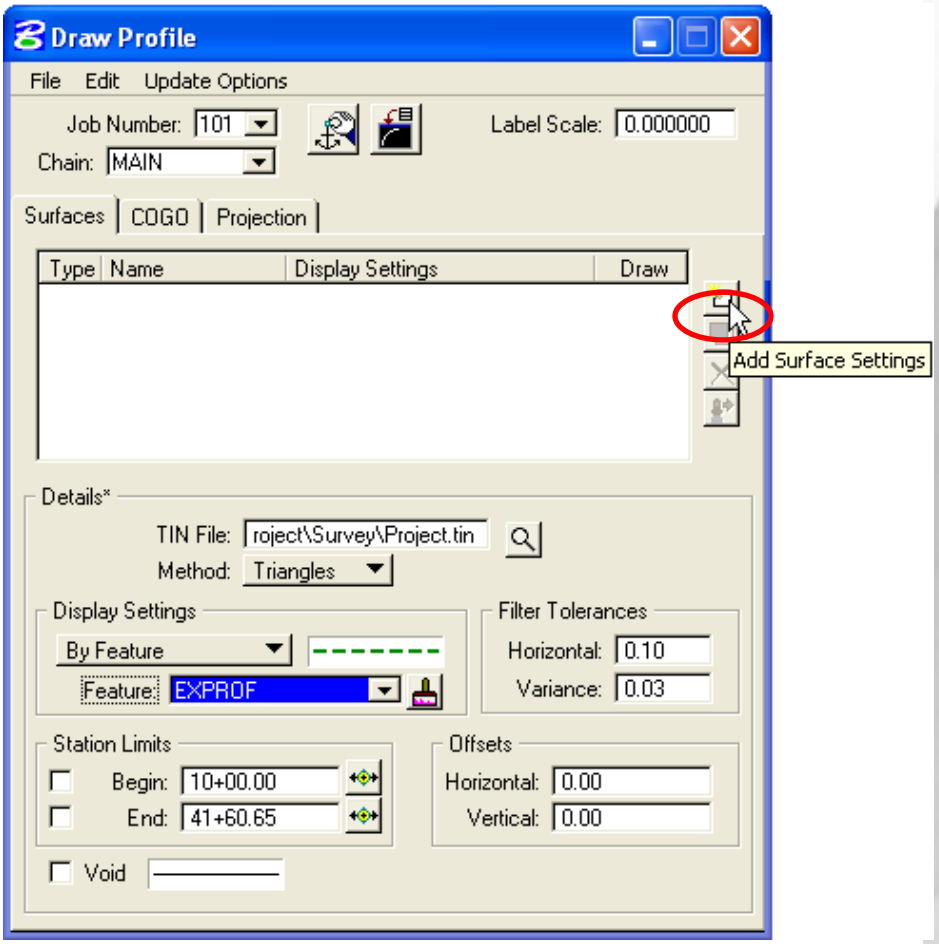


Figure 17-33: Add Surface

14. *Selecting the Add Surface Settings icon will populate the surface into the dialog box and instantly draw the profile onto the previously drawn profile cell.*

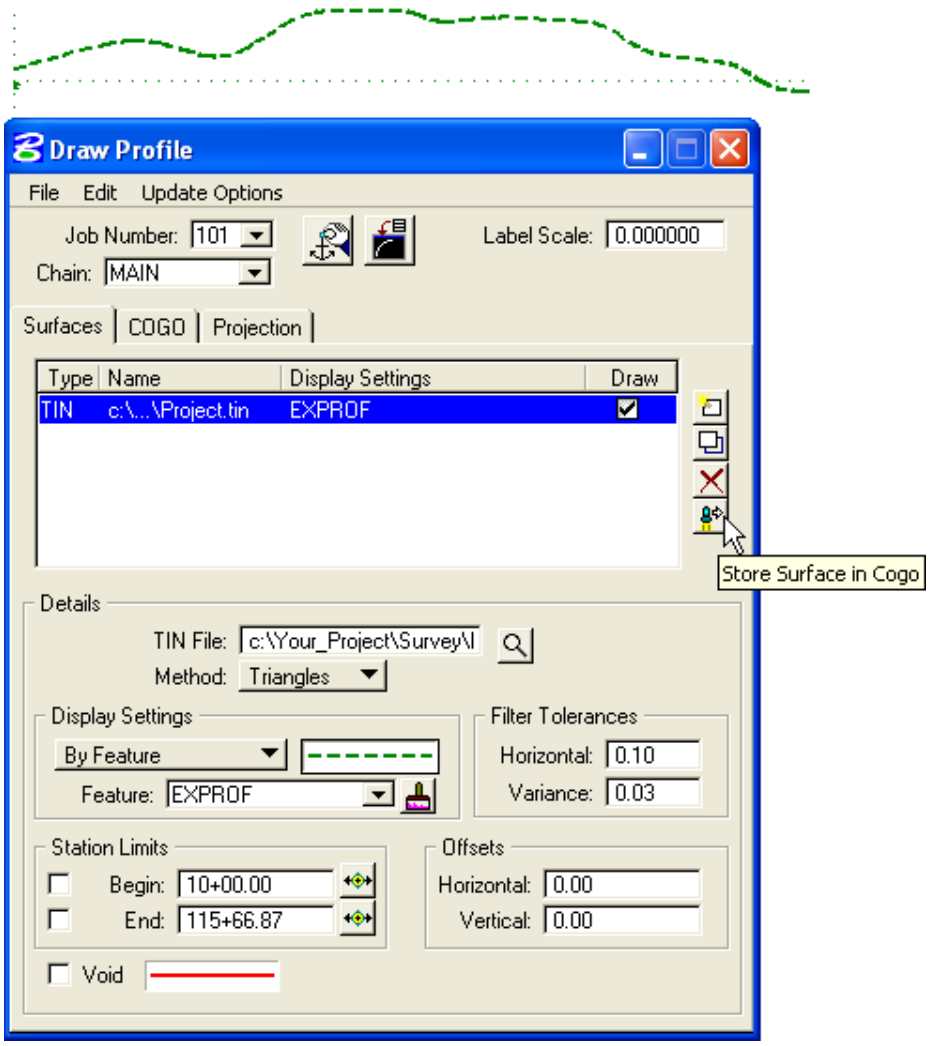


Figure 17-34: Store Surface in COGO

So far this workflow has allowed us to create the existing ground profile and draw it into MicroStation with the correct symbology. In the continuation of this workflow, we will store the profile into COGO and plot more information such as elevation and station labels, along with anything else that was previously available to be plotted from the D&C Manager.

15. *To Store this profile into COGO, select the Store Surface in Cogo icon, as shown above.*
16. *The store profile dialog box will appear. Populate the Profile Name box with the desired name. Check the box labeled Store Profile in GPK. Select Apply.*

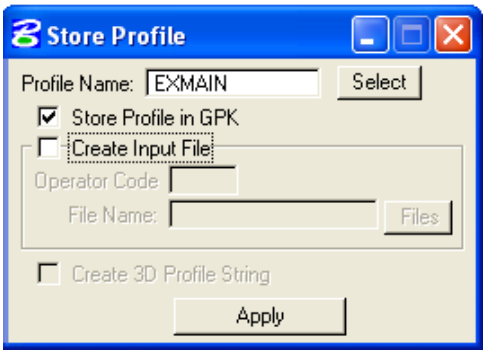


Figure 17-35: Store Profile

17. *The profile is now stored in the GPK. Dismiss the Store Profile dialog box and return to the Draw Profile dialog box.*
18. *Select the COGO tab and from the Profile Name box, select the correct profile.*

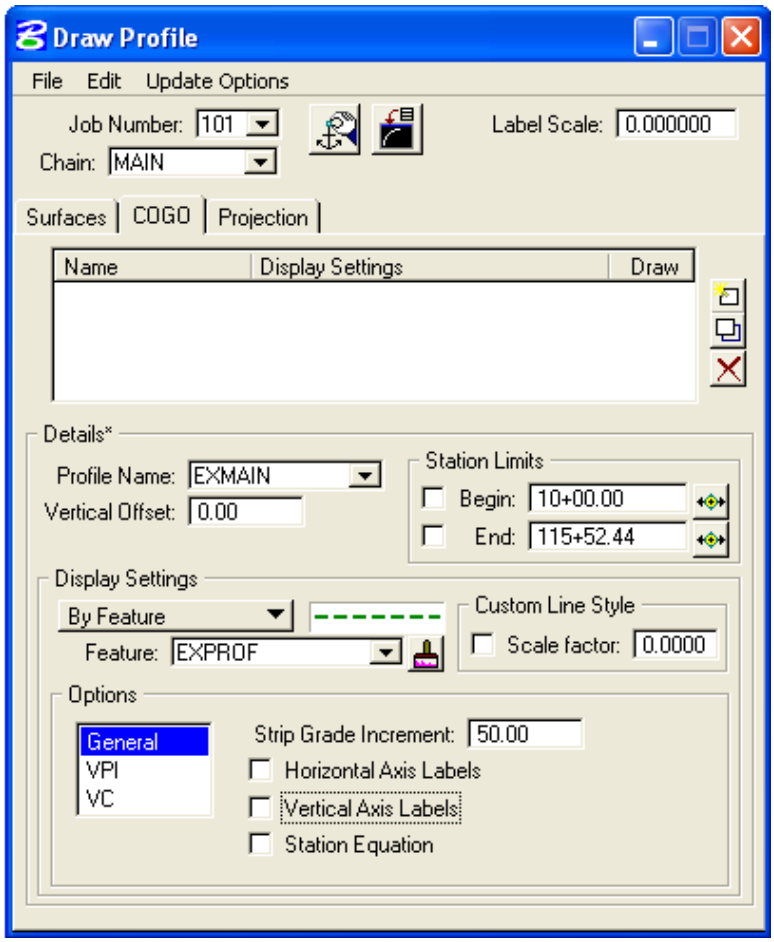


Figure 17-36: Draw Profile Dialog Box

19. *Under the options section, located in the bottom quarter of the dialog box, select General.*

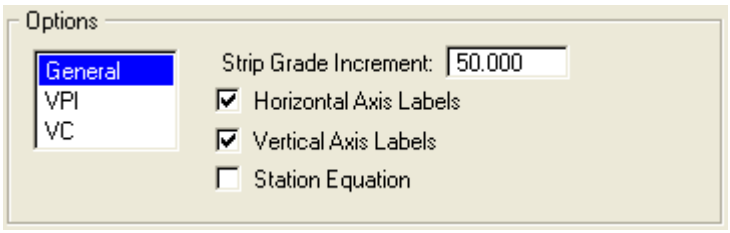
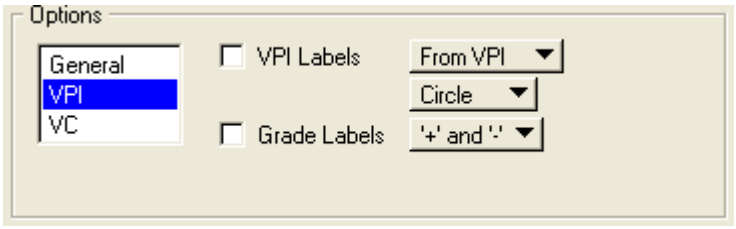


Figure 17-37: Profile Options

20. *This allows the user to select the Axis labels and the Strip Grade Increment, if desired. The additional options are shown below.*



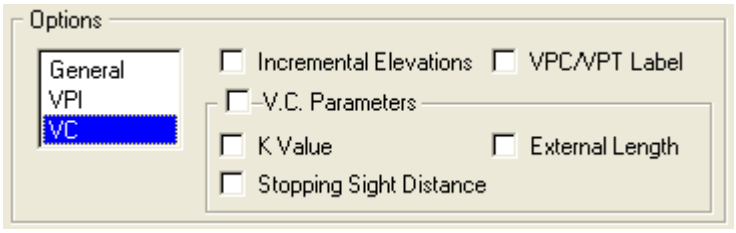


Figure 17-38: Profile Options

21. *From the options shown above the user has the same flexibility in drawing the profile into MicroStation as the D&C Manager. Once the desired options have been selected, click the Add Cogo Profile Settings icon, as shown below, and the profile will be complete. Multiple profiles can be drawn using the COGO tab.*

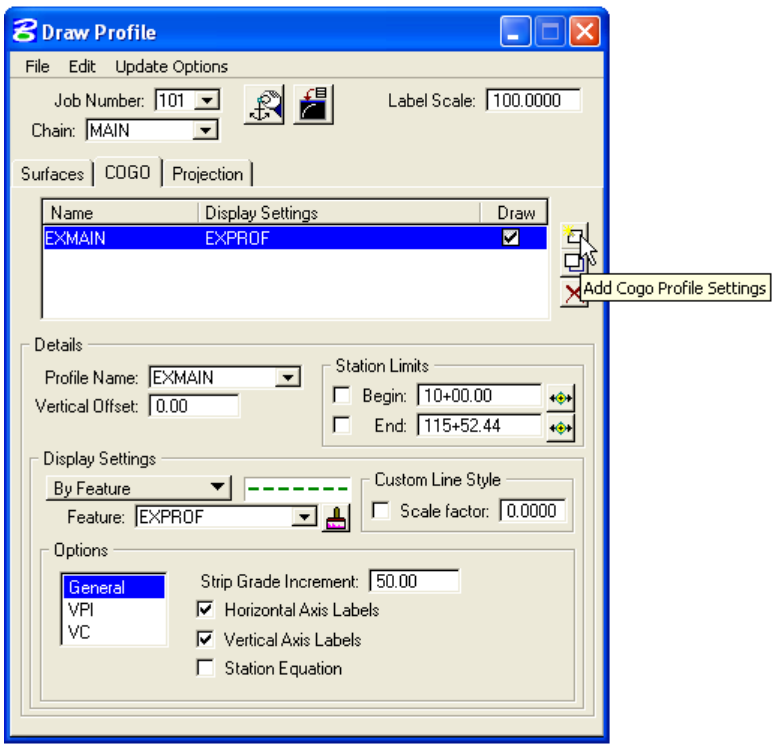


Figure 17-39: Profile Drawn into MicroStation

The projection tab can be used when the chain and profile that needs to be drawn is different than the chain and profile used to create the profile cell.

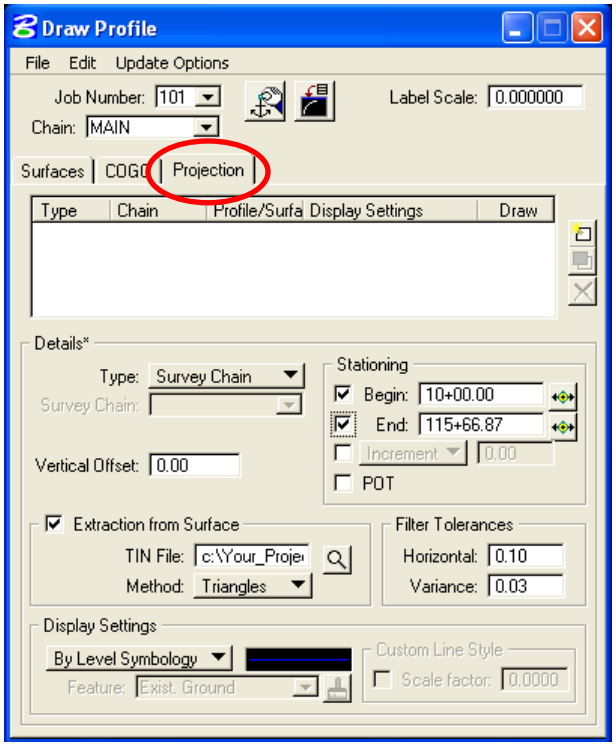


Figure 17-40: Profile Projection Tab

Proposed Vertical Alignment

The VPI based Vertical Alignment Generator is the traditional method used by CFL designers in creating vertical alignments. Vertical alignment generator can be accessed through Project Manager by selecting the Vertical Alignment button.

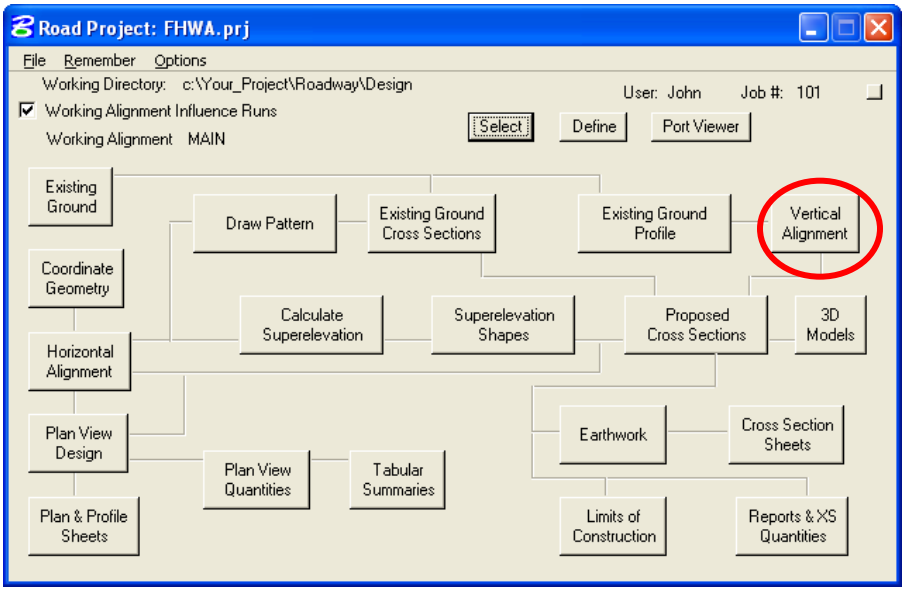


Figure 17-41: Accessing Vertical Alignment through Project Manager

The VPI Based Vertical Alignment Design Tool may also be accessed from the Horizontal & Vertical Geometry tool palette as shown below.

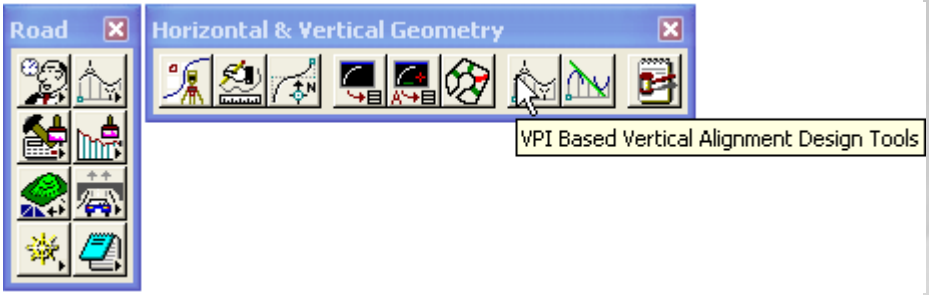


Figure 17-42: VPI Based Vertical Alignment Icon

Selecting the VPI Based Vertical Alignment Design Tool will invoke the dialog box below:

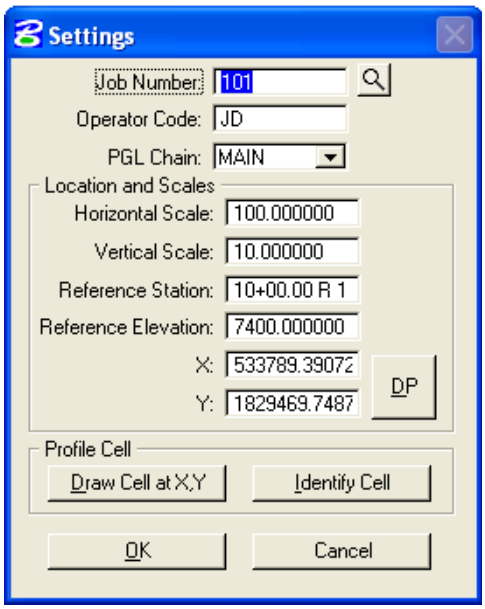


Figure 17-43: VPI Based Vertical Alignment Settings

Once the settings are defined, selecting OK will invoke the GEOPAK Profile Generator.

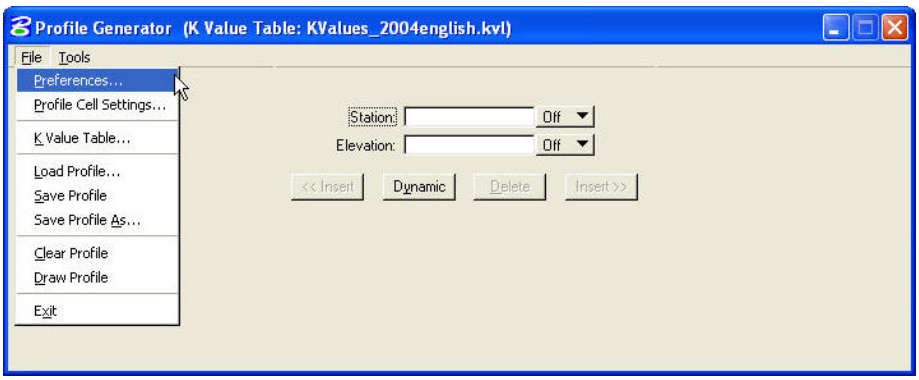


Figure 17-44: Profile Generator

For US Customary projects, the User Preferences are as shown below:

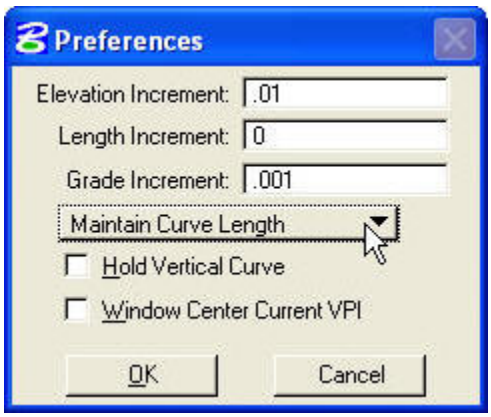


Figure 17-45: User Preferences

If the project requires the use of Maintaining K value instead of Maintain VC Length, commonly used, attach the correct K-Value table. K Value Table can be accessed by selecting **User>K-Values**. The following dialog will appear:

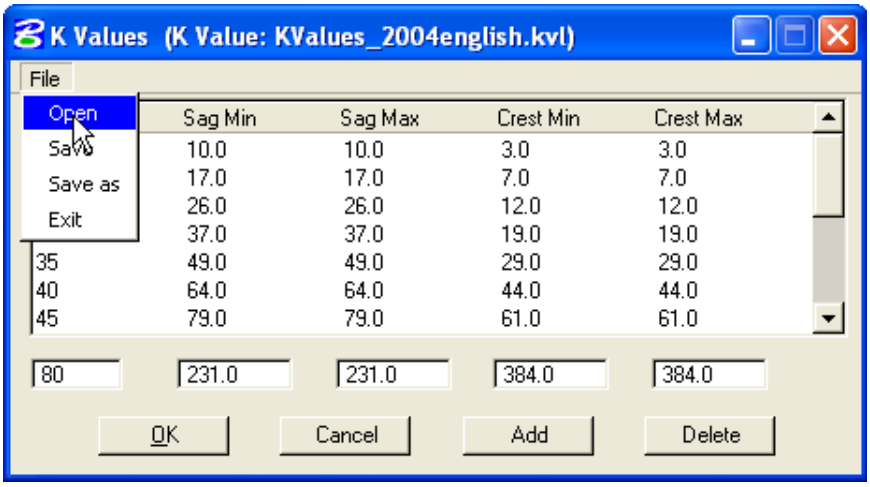


Figure 17-46: K-Value Table

Use **File>Open** to attach the correct unit K-Value table (**.kvl)**. K-Value table can be attached from V*8_RESOURCE\X_30\Standards\Bin\ english or metric.*

After the proposed vertical alignment is created and saved, use the Draw Profile Tool or the D&C Manager to drawn profile in MicroStation, ensuring adherence to the CADD standards. For CFLHD projects, the toggles shown below must be selected prior to drawing the profile.

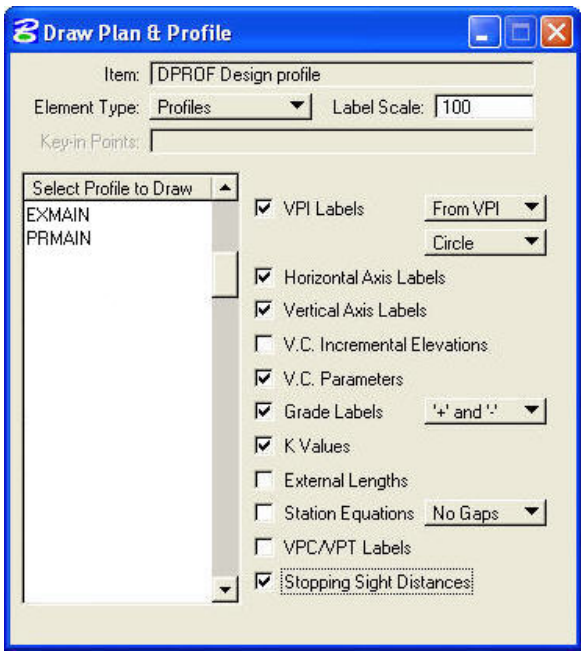


Figure 17-47: D & C Manager to Draw Profile Draw

Workflow 2: Creating Proposed Vertical alignment using Component Based Vertical Alignment Design Tool

The new method to create vertical alignment introduced with Geopak 2000 is the Component Based Vertical Alignment Design Tool. This method allows for vertical alignment to be created graphically and stored using Store Graphics command, similar to the horizontal alignment Store Graphics command. The Component Based Vertical Alignment Design Tool requires COGO to be active as well as an Active Chain and Active Profile Cell. Component Based Vertical Alignment Design Tool requires the use of Active Chain Control, a method introduced with Geopak 2000. Active Chain Control can be used in place of the 3 port viewer.

1. *Select the Active Chain Control tool by Selecting Application>Geopak Road >Active Chain Control*

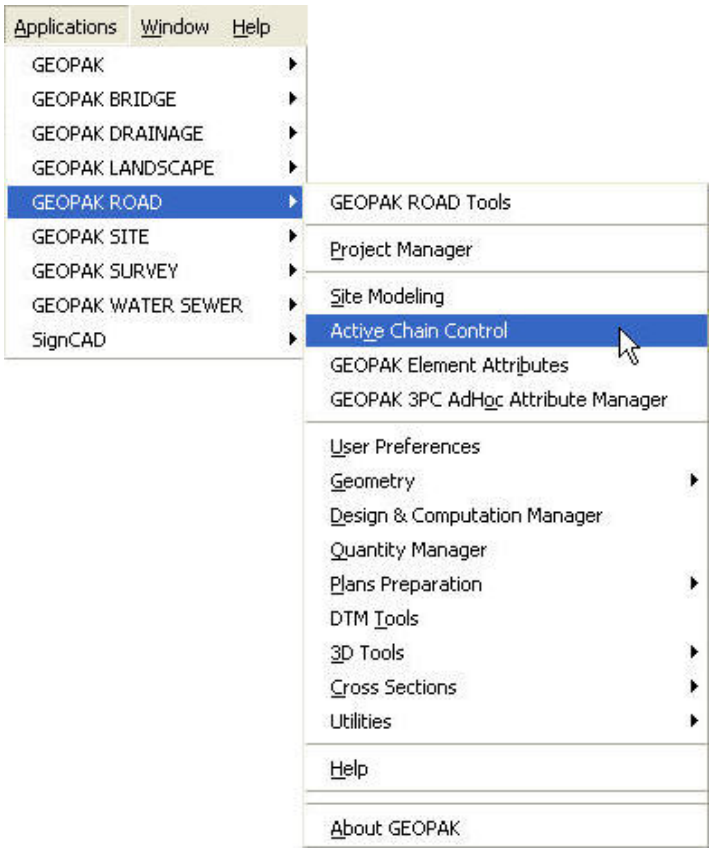


Figure 17-48: Accessing Active Chain Control

Or by selecting Active Chain Control button from the Geopak Main dialog box.

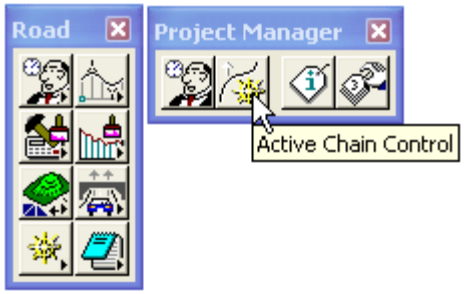


Figure 17-49: Accessing Active Chain Control through Road Tools Icon

Selecting the button will invoke the Active Chain Control dialog.

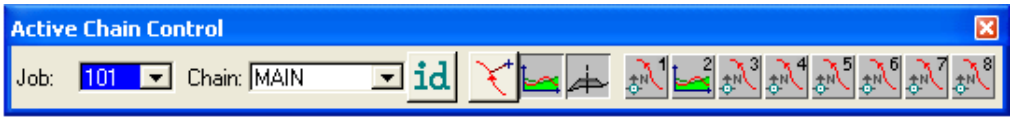


Figure 17-50: Active Chain Control Dialog

2. *Using the Active Chain Control dialog box, eight MicroStation view are available to set the graphical data for Plan, Profile and Cross Section. In the dialog box shown below, View 1 is the plan view, View 2 is the profile view and View 3 is the cross section view. To use the Component Based Vertical Alignment Tool, assign your profile to a view by right clicking on one of the eight MicroStation views and selecting the Profile.*

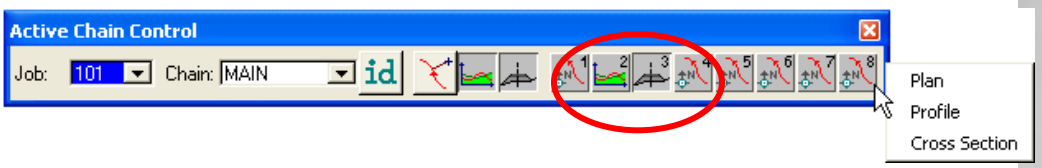


Figure 17-51: Assigning Profile View

3. *Select the Component Based Vertical Alignment Tool by Selecting Application>Geopak Road >Geometry>Layout Profiles (Component Based)*

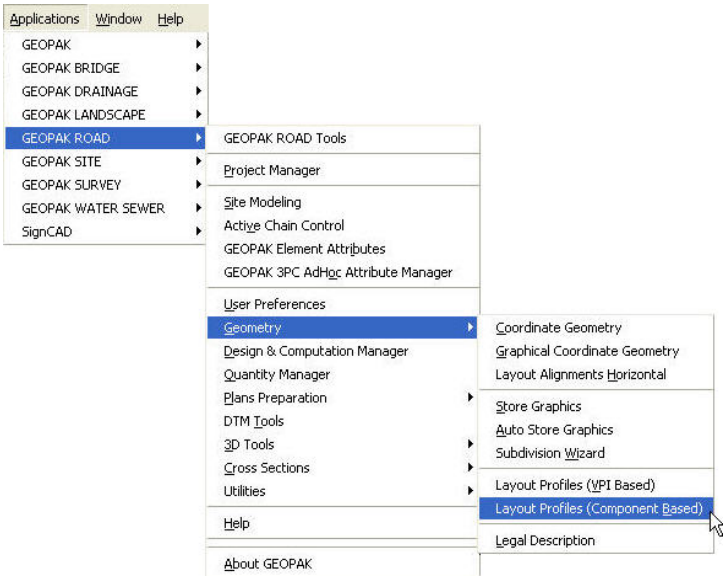


Figure 17-52: Accessing Component Based Vertical Alignment Tool

Or by selecting Component Based Vertical Alignment Tool from the Geopak Main dialog box. Component Based Vertical Alignment Tool is not available through the Project Manager Workflow dialog box.

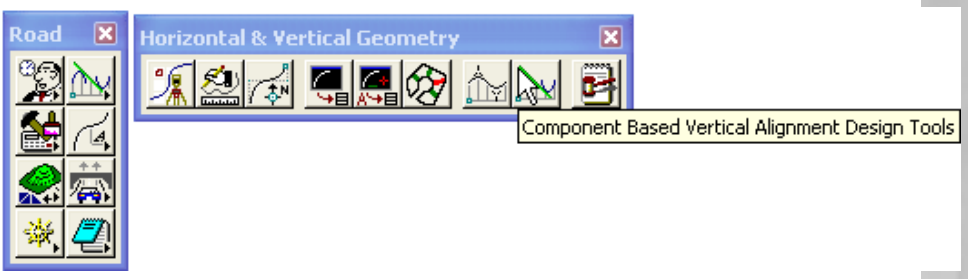


Figure 17-53: Accessing Component Based Vertical Alignment Tool through Road Tools Icon

4. *Once selected the main Component Based Vertical Alignment Tool frame is activated as shown below. The tool frame contains tool boxes to place vertical alignment lines, manipulate vertical alignment elements, place vertical alignment curves and profile tools.*

Figure 17-54: Component Based Vertical Alignment Tool Frame

5. *From the main Component Based Vertical Alignment Tool frame shown above, following additional tools can be accessed from each of the four main tool boxes.*

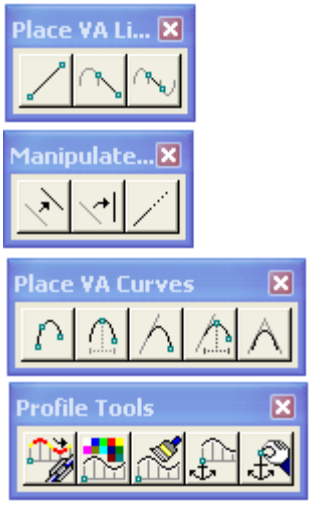


Figure 17-55: Component Based Vertical Alignment Tools

6. *Prior to using the Component Based Vertical Alignment Tools to draw, select the Dialog Graphical Profile Preference icon as shown below.*

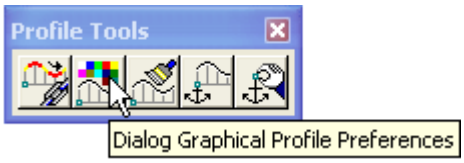


Figure 17-56: Dialog Graphical Profile Preferences

7. *Set the Element Symbology for the Line and Curve. Setting the element symbology will allow for easier viewing when designing the vertical alignment using the Component Based Vertical Alignment Tools.*

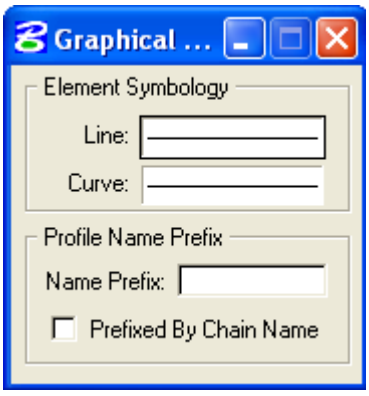


Figure 17-57: Graphical Profile Preferences

8. *Use the Component Based Vertical Alignment Tools to graphically draw the vertical alignment.*

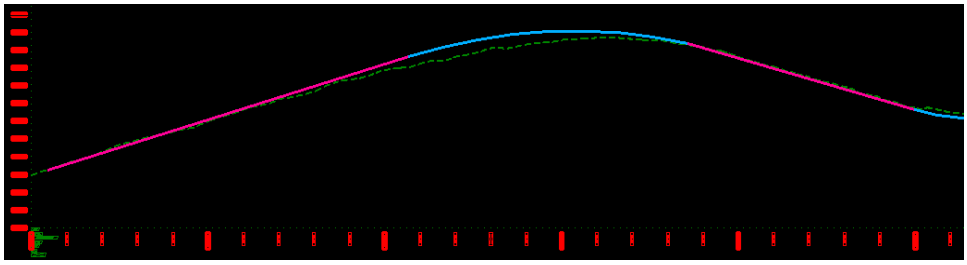


Figure 17-58: Draw Graphical Profile

9. *Once the vertical alignment is drawn using the Component Based Vertical Alignment Tools, vertical alignment can be stored. Select Store Vertical Alignment icon from the Profile Tools dialog to store the vertical alignment.*

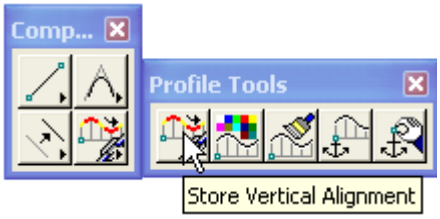


Figure 17-59: Store Vertical Alignment Icon

10. *Once the Store Vertical Alignment icon is selected, the following dialog will activate if the COGO dialog is not already activated. Select OK. The Component Based Vertical Alignment Tools requires COGO to be active.*

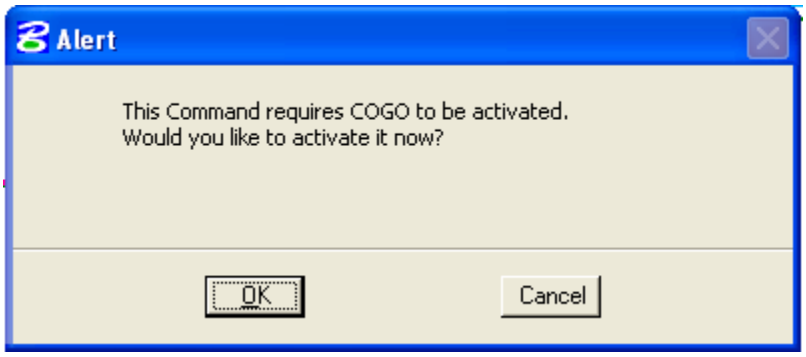


Figure 17-60: COGO Activation

11. *Selecting Store Vertical Alignment icon will activate the following dialog box. Input the profile name and select the elements to store.*

Figure 17-61: Store Vertical Alignment

The various methods for creating horizontal and vertical geometry using GEOPAK are describe in this chapter. Regardless of the

method used, the final alignment and profile must be drawn into MicroStation using the GEOPAK D&C Manager, with the CFLHD .ddb file. Workflow 3 outlines a macro used at CFLHD to check the horizontal alignment design for kinks.

Workflow 3: Macro - Checking for Kinks in Horizontal Alignment

The Check Bearing Macro checks a GEOPAK COGO "describe chain" output file for kinks in the alignment by comparing AH and BK bearings of consecutive chain elements.

1. *Select Coordinate Geometry from the Project Manager Workflow dialog box as shown below.*

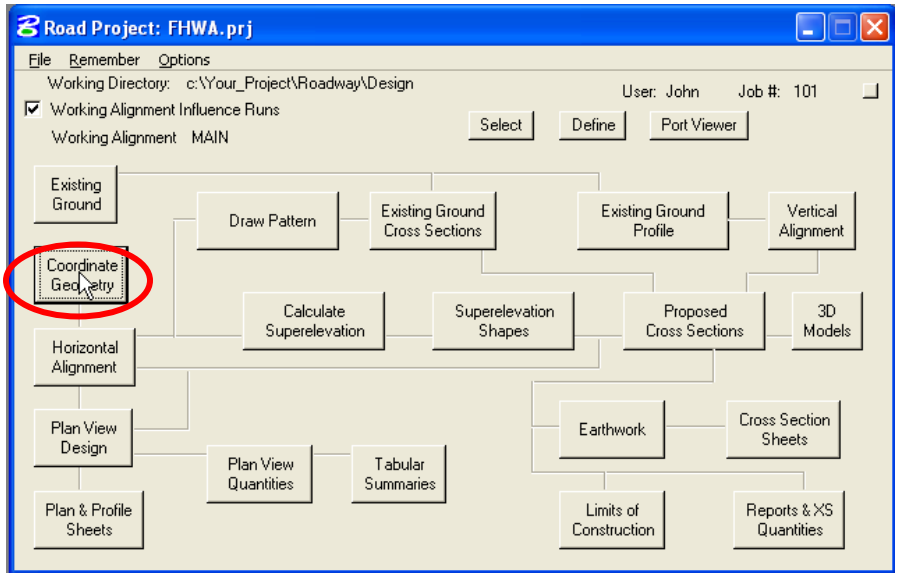


Figure 17-62: Accessing COGO through Project Manager

2. *To describe a chain, Select Element>Chain>Utility from the COGO dialog box.*

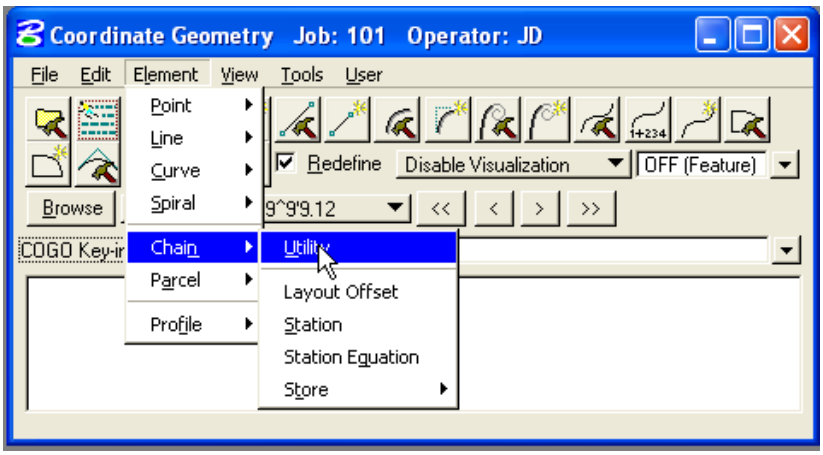


Figure 17-63: Accessing Utility Dialog box

3. *In the Chain Utility dialog box, select the chain you want to describe and Click on the Describe Icon shown.*

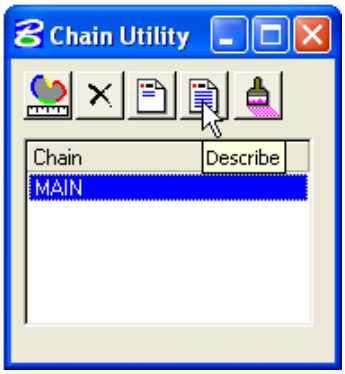


Figure 17-64: Chain Utility Dialog box

4. *COGO dialog box will be populated with the chain described as shown below. Create an Output File by selecting File>Input File Utility from the COGO dialog box.*

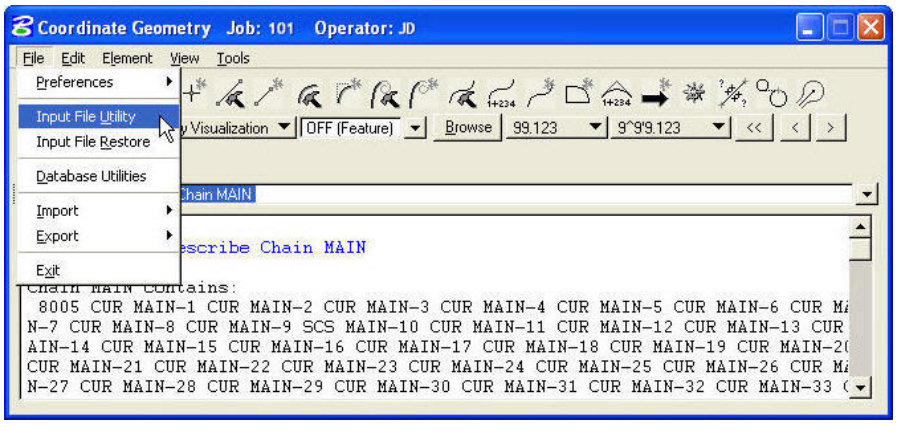


Figure 17-65: Accessing Input File Utility

5. *In the File Utility dialog box, Select output from lower left pull down and type in a name for the Output File. Select apply to create an Output File. Output File for the example is named*

main101.ojd. 101 is the job number, O for output, JD is the user initial.

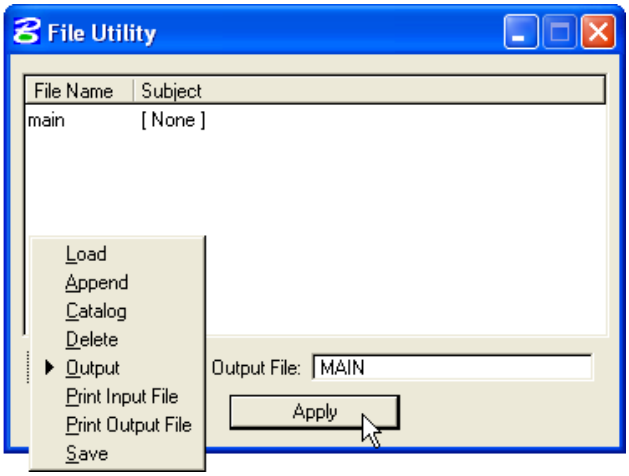


Figure 17-66: File Utility

Once an output file is created describing the chain, the Check Bearing Macro can be used to check for kinks in the alignment.

6. *To run Check Bearing Macro, Select Utilities>Macro >MicroStation Basic from the main MicroStation pulldown menu.*

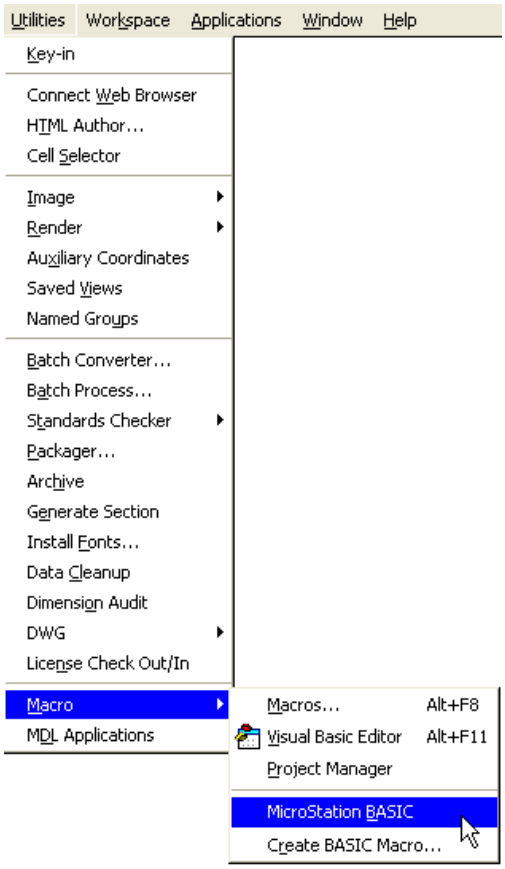


Figure 17-67: Accessing MicroStation Basic

The following dialog will appear:

Figure 17-68: MicroStation Macro

7. *Browse to select chkbear.ba macro from the list of macros. Select the macro and the Start Macro dialog box will appear as shown below. Click on the Run button.*

Macros are located in V*8_RESOURCE\X_30\Standards\Macro*\

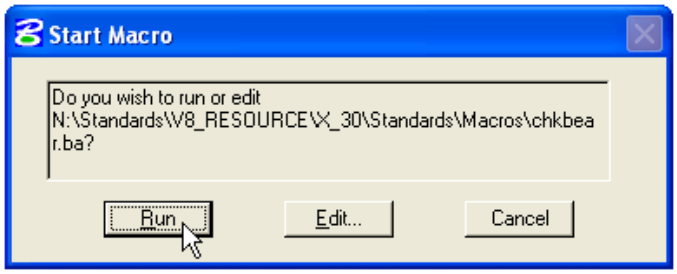


Figure 17-69: Start Macro

8. *Running the macro will invoke the following dialog box. Select the COGO Output File created for your alignment and select OK.*

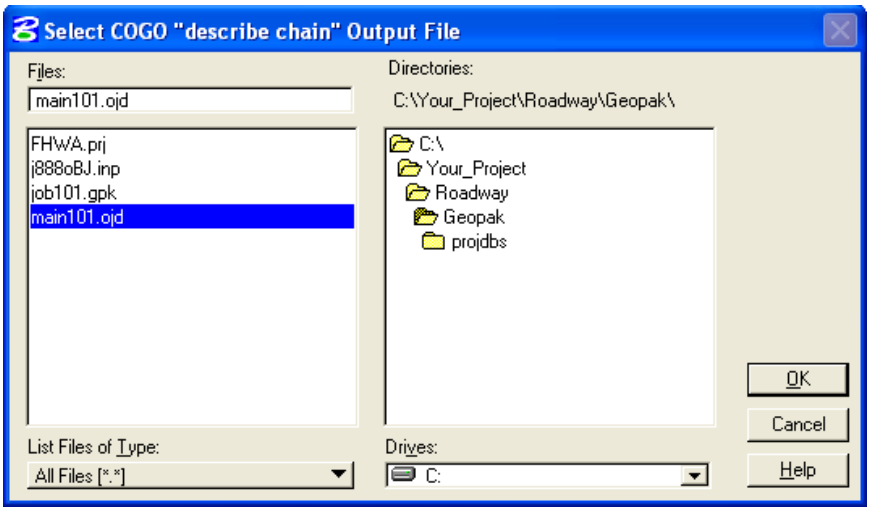


Figure 17-70: Select COGO Output File

9. *Selecting the COGO Output File will invoke the Check Bearings dialog box. In the Check Bearing dialog box toggle 1 second and select OK.*

Figure 17-71: Check Bearings

User sets tolerance for bearing comparison in the check bearing dialog box (i.e., how much do the bearings need to differ before they are flagged as a kink).

10. *Results to the macro run are reported the on screen, as shown below, and in the log files chkbear.log and chkbear.err.*

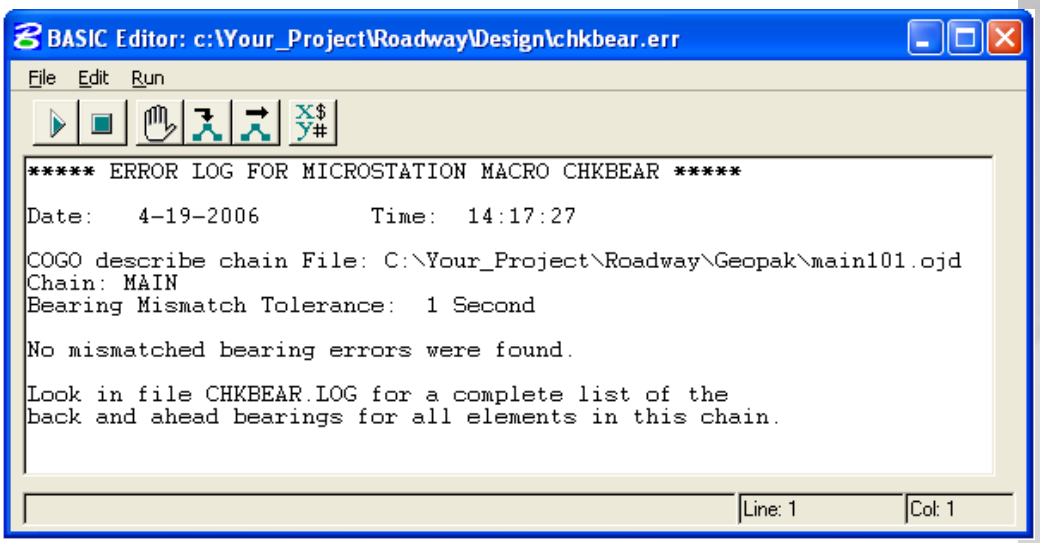


Figure 17-72: Check Bearings Error

If the macro run, reports mismatched bearing errors; user must correct the error and restore the horizontal alignment. Workflow 3 should be repeated till no mismatched bearing errors are found.

Related links: Using Knucklehead's Guide for GEOPAK Road 2004 Edition.

To Create the Horizontal Alignment

Generate the Existing Ground Profile

To Create the Vertical Alignment