U.S. Department
of Transportation

Federal Highway Administration

EFLHD CADD Standards Manual For Microstation & Geopak

March 2007

Standards for use with .x30 criteria

This document has been prepared for:

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Software Versions

Microstation Version 8.5.02.55

GEOPAK Version 8.8.02.40

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Chapter 1 Introduction

Purpose

This document is intended to outline the Federal Highway Administration's Eastern Federal Lands Highway Division's (EFLHD) use of Bentley's MicroStation V8 Version 8.5.02.55 and GEOPAK Version 8.8.02.40, as well as internally developed tools and procedures. The CADD (Computer Aided Design and Drafting) Standards Manual will address issues such as: software, tools, techniques, standards, and procedures, which will aid the user in the efficient production of PS&E plans.

The CADD Standards Manual and the associated electronic files are to be used in the generation of electronic plans by both EFLHD internal designers and the A/E firms doing business with EFLHD.

The proper use of CADD Standards can produce many desirable results, including:

- Increased efficiency and productivity
- Re-usability of data
- Increased ability to share resources

The CADD Standards Manual is intended to be as all encompassing as possible. However, there will be circumstances, such as with various scales of drawings, where there is no one correct answer. In these cases the engineer or designer must use his or her judgment to stay as close to the original intent of this manual as possible.

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Outline of Manual

The CADD Standards Manual covers the use of both MicroStation and GEOPAK. The first section of Chapters covers the use of MicroStation V8, Version 8.5.02.55, including topics such as:

- Directory structures
- File naming conventions and locations
- Seed files
- Annotation
- Line styles
- Color Table
- Cell libraries
- Levels and Symbology
- Batch Printing

The second section of Chapters covers the use of GEOPAK Version 8.8.02.40, including topics such as:

- User Preferences
- Project Manager
- Survey
- DTM creation
- Design and Computation Manager
- Horizontal and Vertical Design
- Cross-Sections
- Plan & Profile Sheet Clipping
- Quantities
- Reports
- File exchange procedures
- Models

Conventions

The CADD Standards Manual contains special features designed to help the users find information quickly and easily. Below is a description of the conventions used throughout this manual.

Use of Bold and (>) Greater-Than Symbol

Bold letters are used to identify program commands, menus, and file names. The greater-than symbol **(>)** is used to divide a series of commands.

For example:

Open the file **TTL.dgn** using the **File>Open** command. If it is not in the expected folder, click the **Cancel** button.

Caution is to be shown when the reader should take particular note of the information being discussed.

Information is used to provide helpful information about a particular item when it is being discussed, or to provide general information about the standards as needed.

Hyper linking

Throughout the manual there will be references to information found on the EFLHD website, along with the accompanying web link to this information. Links will be as shown below:

http://www.efl.fhwa.dot.gov/

Terms and Abbreviations

Abbreviation	Description
CADD	Computer Aided Drafting and Design
EFLHD/EFL	Eastern Federal Lands Highway Division
Excel	Spreadsheet software from Microsoft
FHWA	Federal Highway Administration
GEOPAK	Civil Engineering highway design software from Bentley Systems, Inc.
MicroStation	Drafting Software from Bentley Systems, Inc.
PS&E	Plans, Specifications, & Estimates
Symbology	Color, weight, and style of graphical elements
Working units	MicroStation's system of precision including MU, SU, and UOR
MU	Master Units, part of MicroStation's unit system
SU	Sub-units, part of MicroStation's unit system
UOR	Units of Resolution

Table 1-1: Terms and Abbreviations

Standard File Extensions

Extension	Description
. DGN	MicroStation graphics design file
. DWG	AutoCAD graphics design file
. DDB	GEOPAK D&C Manager database file
. RSC	MicroStation resource file
.X30	GEOPAK Criteria files version
.DTM	Microstation design file containing 3D graphics used to create GEOPAK .TIN file
.TIN	GEOPAK digital terrain model
.DAT	Hydraulic model file (ASCII file containing Northing, Easting, Elevation.
.SMD	Survey manager database
.GPK	GEOPAK coordinate geometry database
.TXT	Final ASCII survey control file
.DGNLIB	MicroStation library containing levels, text styles and dimension styles

Table 1-2: File Extensions

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Support

CADD Support help using this manual, comments, and suggestions for these CADD standards should be submitted using the standard change form, which can be downloaded here, and e-mailed to:

Richard.McDaniel@fhwa.dot.gov

Shoukat.nawaz@fhwa.dot.gov

FLHD's use of MicroStation V8, 2004 Edition

While there are many new tools in MicroStation V8 Version 8.5.02.55 that EFLHD will take advantage of, there are others that will not be endorsed by EFLHD at this time. If the use of a particular tool is not outlined in this section, or in its appropriate place in the CADD Standards Manual, check with the EFLHD project manager as to the acceptance of its use. The most important of these tools and the EFLHD use of these tools is outlined below. As EFLHD is currently testing some of these tools to determine the best use for EFLHD, comments on potential uses are welcome and should be sent to the above e-mail address.

New Generation of Standard Files

EFLHD is implementing a new generation of MicroStation/GEOPAK standard files. This new generation is known as the X30 Generation of standard files. Listed below are links to MicroStation *V8/GEOPAK 2004 – X30 Generation of Standard Files* and *Off-Site Configuration instructions.* Consultants working on EFLHD projects should download the **CADD_Resource_V8.zip** and configure their CADD environment with X30 Generation of Standard Files.

MicroStation V8 / GEOPAK 2004 - X30 Generation of Standard Files

Off-Site Configuration Instructions

Design History

At this time EFLHD will not be using Design History. However, AE firms may use design history if desired. EFLHD is currently evaluating the best uses for Design History, comments and suggestions may be submitted to the e-mail address listed above.

Macros

MicroStation Basic Macros and MicroStation Visual Basic Applications (MVBA) help the user to streamline processes, check geometry, and enhance overall efficiency. Currently EFL does not use macros or MVBA but may in the future. Please check back to see what has been added.

The Macros for MicroStation 2004 are in the process of being updated or being converted to MVBA. Please check back often as they will be added to the website as completed. A list of macros and descriptions will also be available at a later date.

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Chapter 2 Directory Structures

Project Directory Structure

Project related files, including CADD drawing files, survey and mapping data, and engineering data files, will be contained within a specific project directory structure. Files also contained within this directory structure include, correspondence, project documentation, reports, etc. Following the directory structure as indicated in this chapter will allow for consistent handling of all project files, as well as allow for easier archiving at project completion. The first level project directory is shown below, the following pages outline each first level directory in much greater detail, including subdirectories, purpose of each directory, and types of files typically stored within each directory.

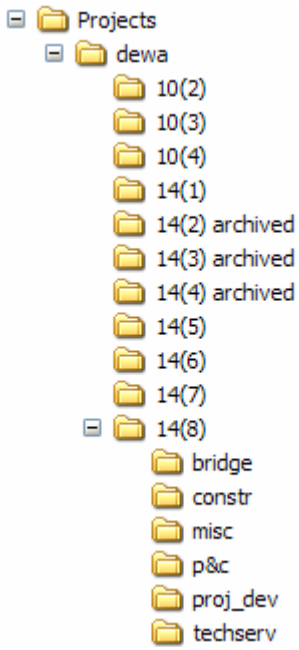

Figure 2-1: Project Directory

While not all directories will be needed for each project, the structure naming convention must be followed where applicable. The sub-directory addressed in this chapter is proj_dev.

The project directory structure has evolved over the last few years so the directory structure for older projects may not match what is shown here. The directory structure and file locations for older projects need not be changed. **The directory structure will be set up for the Project Manager at the beginning of the project.**

Proj_dev

The sub-directories of the proj_dev directory are detailed below.

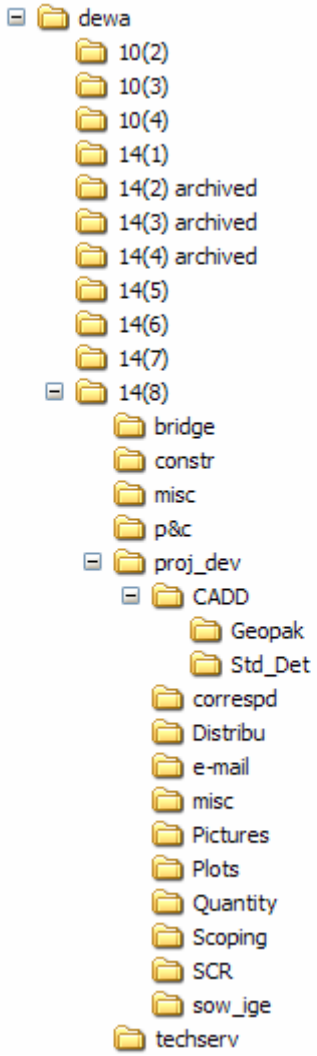

Figure 2-2: Proj_dev Directory

Each sub-directory contains specific files related to each project. The table below outlines the files to be contained within each sub-directory.

CADD	Overall files other than mapping. Including; Alignment file, utility and drainage, traffic control, signing and striping, erosion control, GEOPAK superelevation shapes and patterns, and overall cross-sections including ref-hub cross sections.
Geopak	Project GPK file, GEOPAK input, output files, and log files
Std_Det	Standards and Details
Correspd	Print files, used by contracts group
Distribu	Distribution Files
e-mail	Project e-mails
misc	All other documentation
Pictures	Project photos
Plots	Plot files. (.ini, .000, etc.)
ADOBE	Sub-folder to Plots. Contains all pdf format files
Quantity	Project quantity estimates
Scoping	Scoping report documentation
SCR	Special contract requirements
sow_ige	Statement of work

Table 2-1: proj_dev Sub-directory Files

Bridge

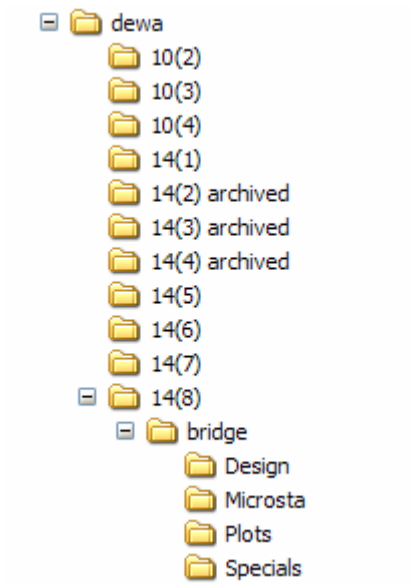

Figure 2-3: Bridge Directory

Design	Design calculations
Microsta	MicroStation drawing
Plots	Plot files
Specials	Special Provisions

Table 2-2: Bridge Sub-directory Files

CADD Support Directory Structure

The CADD support directories contain the standard CADD resource files detailed in the following chapters. These include set up, configuration, and resource files for MicroStation and GEOPAK such as MicroStation seed files and cell libraries, and GEOPAK database files and superelevation tables.

For EFLHD employees the individual CADD machines have been configured with **project configuration files (.pcf)** to automatically find and attach these files. See workflow 1 to make sure these .pcf files are in the correct directory. Use of fonts, line styles, etc., should be seamless.

For our consultants, the ***X30 Generation of standard files download (CADD_Resource_V8.zip)*** can be used to setup the standard CADD support directory structure. Project configuration files ***(EFLHD_Eng_30.pcf and EFLHD_Eng_30.pcf)*** are also provided in the download for the ease of setting up project configuration.

Select to link to the EFLHD Website and to download files: X30 Generation of standard files downloads

CAUTION

This link is not set up at this time.

The standard CADD resource files are set up and maintained by the CADD Coordinator. The resource files are "read-only", as are the directories they reside in, so users cannot make changes to these files or create additional alternate versions of them on the server. These resource files are the "official" versions that should be used throughout EFLHD. Any errors

discovered in these files should be reported to the CADD Coordinator so that they can be fixed.

The standard CADD resource files are located on the designers M: drive in subdirectories under the Standards directory and are accessed by all EFLHD users from here. The directories are shown below:

Figure 2-4: CADD Resource Files

Batch_Plot	Batch plot setup for EFLHD's Acrobat Plan sheets generator.
Borders	EFLHD standard borders – English and Metric in different models
Cross_Section_Shts	Cross section sheet layout libraries(*.xssl) and instruction
Engineers's_Estimate	Instruction to export into dgn tabulation sheet
Master_GPK_Number	Excel file for GPK number – Only for EFLHD's Project Manager
Plan&Profile_Shts	Plan and profile sheet layout libraries(*.psll) and instruction
Project_Configurations	Location of EFLHD pcf files (EFLHD_Eng_30.pcf and EFLHD_Met_30.pcf)
Quantity_Shts	Quantity dgn sheets, quantity Excel worksheet, and instruction – EFLHD's quantity and schedule sheets are attached with Excel file
Sample_Shts	Includes EFLHD's Title sheets, Symbol & abbreviation sheets.
Std_Det_Shts	Instruction to use FLH Standard sheets.
3PC	Miscellaneous criteria files, including MicroStation Basic user interface macros.
Cell_Lib	Standard Cell Libraries (*.cel), FLH_Criteria.cel – Standard criteria cell library.
Config	FLHD pcf file (FHWA_English_30.pcf and FHWA_Metric_30.pcf)-not used by EFLHD
DDBS	US Customary and Metric D&C Manager database files (*.ddb)
Help Diagrams	
Input_Files	EFLHD's earthwork input files for X30 and ancillary data (*.inp)
Library_Files	Standard criteria level library and text style library (*.dgnlib)
MVBA	
Plotting	EFLHD standard plot drivers-Includes shades, color, black and white, and pdf plot drivers.
Resources	EFLHD's font and custom linestyle resource files (.rsc)
Seed	US Customary and Metric 2D and 3D seed files (*.dgn)
Seed_runs	
Tables	Standard color and superelevation tables for X30

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Chapter 3 File Naming Conventions and Plan Sheet Organization

There are many types of files in use at EFLHD. Of utmost importance is the naming convention of the Microstation design files produced throughout a project. The file naming convention is set up to allow anyone to identify the contents of a CAD file without actually opening the file. The following design File Naming Convention is to be implemented on all new projects. This convention is to be used by all EFLHD users and A&E consultant.

Also shown, at the end of this section, is the order of plan sheets for a typical EFLHD project. It is hard to imagine every type of file that may be created in a special case. If a file is not shown, best judgment must be exercised to place the file in an appropriate place within the plan set.

Naming Convention, Microstation Design Files

For Highway Design Section

There are two types of design files that are produced in the process of generating construction plan sheets; Sheet design files and Master design files; Sheet design files represent the finished construction documents for a project, and the Master design files will be used as a reference to the sheet design files.

Assigning file names to CADD design files is to be done with consistency to make future searches for the files a simpler task.
All EFLHD Microstation design files should be named with the following formats:

XXX-YYYYYYYY_ZZZ.dgn

File type descriptor (See table 3.4)

Project number descriptor (See table 3.3)

Section number descriptor (See table 3.1) – Master Design Files
Sheet Number descriptor (See table 3.2) –Sheet Design Files

For All Master Design Files:

Section Number Descriptor	Description
01	Highway Design Section
02	Survey
03	Hydraulics
04	Safety Engineering/Environmental Engineering
05	Geotechnical Engineering
06	Traffic Engineering/Pavement Engineering
07	Bridge Design Section
08	Construction Engineering
09	A&E (All Consultants)

Table 3.1

Plan Sheet Organization:

Sheet Number Descriptor	Description
A	Title Sheet, Conventional Plan Symbols and Abbreviations, Location plan, Survey and horizontal alignment information plan
B	Typical Sections
C	Tabulation of quantities and Summaries & Schedules
D	Mainline Plan and Profile Sheets
E-K	Minor Roadways Plan and Profile Sheets and others.
M	Erosion Control Plan & Narrative, Landscape Plan (last)
N	Temporary Traffic Control Plans
P	Permanent Signing & Striping Plans
R	Bridge Plans
S	Standard Details Sheets and Special Details
T	Mainline Cross Section Sheets
U-Z	Minor Roadways and others Cross Section Sheets

Table 3.2

Note:- *I, L, O, and Q letter designations are not to be used so as not to cause confusion between these letters and the numbers 0 and 1.*

Project Number Organization:

	Forest Highway	Park, Refuge Road	Other
Project Name	AR PFH 65-3(5)	PRA RICH 300(1)	MT OMAD 18(33)
State/Park/Program	Arkansas	Richmond State Park	Missile Road
Highway Route	65	300	18
Segment of Route	3	N/A	N/A
Project Number	5	1	33
Project Number Descriptor	**AR653(5)**	**RICH300(1)**	**OMAD18(33)**

Table 3.3

File Type Descriptor:

	File Type Descriptor
Title Sheet	ttl
Vicinity Maps/Location Sheet	loc
Symbols and Abbreviations	sym
Survey & Horizontal Alignment Inf.	sur
Typical Sections	typ
Summary of quantities/Tabulation	qnt
Plans and profiles	Pln(for plan), prf(for profile), p&p(for plan & profile)
Storm drainage plan	dpl
Storm drainage profile	dpr
Box Culvert Plan & Profile	bpp
Drainage cross section	xsd
Utility Plans and profiles	upp
Erosion Control Plan/narrative	e&s
Landscaping Plan	lnd
Temp Traffic control plan	tcp
Permanent Signing & Striping plan	ssp
Bridge Plan	brp
Roadway Cross sections sheets	xss
Master Design Files	
Project Border File	bdr
Master file for design and Alignment	des
Master file for Profile	pro
Super elevations, pattern for x-sections	wrk
Area Pattern for new pavement etc.	pat
Master Cross section (mainline)	Dxs
Minor Roadways cross section& others	Exs, Fxs, Gxs, Hxs, etc.
Hydraulic, drainage, sediment & erosion	hyd
Master Survey, ROW & Utility Files	
Ground Mapping (3D)	map
Cadastral mapping (Property, boundary & ROW)	cad
Utility Mapping	utl
Aerial Mapping – break-lines & Points (3D)	dtm
Aerial Mapping Intermediate and Index Contours (3D)	tpo
Aerial Mapping Planimetrics (2D)	plm
Aerial Ground Cross Sections	xsc
Right –Of-Way Plans	row
Federal Lands Transfer Plans	flt

Table 3.4

Note: *The 3-digit file descriptor is given for most of the sheets in*
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a typical plan set and master design files. As it is hard to foresee every type of file that may be included in a plan set, a special case may arise where there is no file descriptor for a file that has been created. In such a case, follow the rest of the naming convention as closely as possible, while generating a unique file descriptor for the new file.

Standards and special Details:

All standards and details should be downloaded from WFLHD and not renamed.

All EFLHD Details are copied from EFLHD's Standard directory and also not renamed.

Standards, Details, and Special Details will be kept in Std-Det directory on the project directory.

Note: *1. A special Detail is a modified standard, detail, or project specific detail and should have next alpha.*

2. The Standard Sheet number should have S prefix on it as shown in Table 3.1

2. The sheet numbers of the specials and details are determined after all the standards, details, and special details are assembled.

Naming Convention of EFLHD GEOPAK Job number files:

Job###.gpk

This binary file is created when the user starts a coordinate geometry (COGO) session for the first time or created through Project Manager. All coordinate geometry elements are stored in this file. Multiple users can access this file at the same time, and only one file should be created for each project. The "###" is the only variable in this filename. It represents a job number (up to 3 alphanumeric characters) unique to a project and is defined by the user upon creation.

When working on EFLHD projects, the .gpk number will be assigned by the Project Manager. The convention will be a standard numeric system, starting at 600 for year 2006 and 700 for year 2007 and so on. The first .gpk file assigned in year 2006 would be job600.gpk, then job601.gpk, etc. Internally, EFLHD personnel will request a .gpk number from the Project Manager. The Project Manager will then check out a number, from a file on the wheels server, documenting the project information for the

number is assigned to. This document will be the master list of all .gpk files assigned for all projects. Design Project Manager Can checkout the .gpk number from M:\Cadd_resource_v8\Master_GPK Numbers\MasterGPK-List.xls.

Example: Suggested Naming Convention for NWR Project -RRP LOP 10(2) :

Sheet Series	Sheet No.	Description	Design File names	Remarks
A	A01 A02 A03 A04	Title Sheet Location Map Sheet Symbol & Abbreviation Sheets Survey Information Sheet	A01-LOP10(2)_ttl A02-LOP10(2)_loc A03-LOP10(2)_sym A04-LOP10(2)_sur	
B	B01 B02	Typical Section Sheet 1 Typical Section Sheet 2	B-LOP10(2)_typ Model name B01 Model name B02	Typical Sections
C	C01 C02 C03 C04	Tabulation Of Quantity Sheet Summaries & Schedules 1 Summaries & Schedules 2 Summaries & Schedules 3 etc.	C-LOP10(2)_qnt Models name C01 Models name C02 Models name C03 Models name C04	Quantity Sheets
D	D01 D02 D03 D04	Plan & Profile Sheet 1 of Road 1 Plan & Profile Sheet 2 of Road 1 Plan & Profile Sheet 3 of Road 1 Plan & Profile Sheet 4 of Road 1	D-LOP10(2)_pnp Models name D01 Models name D02 Models name D03 Models name D04	Plan & Profile sheet for Mainline Roadways
	D05 D06 D07 D08 D09	Plan & Profile Sheet 1 of Driveway Plan & Profile Sheet 2 of Parking lot Plan Sheet of Box Culvert Profile Sheet of Box Culvert Plan & Profile Sheet Utilities	D5-LOP10(2)_p&p D6-LOP10(2)_p&p D7-LOP10(2)_pln D8-LOP10(2)_prf D9-LOP10(2)_p&p	Driveway, Parking lot, culvert and utilities related to Mainline roadways
E-K		Road 2, all minors roads, and other roadways		Follow same as D series Sheets

M	M01 M02 to M03 M04- to M05	Erosion Control Narrative Erosion Control Plan sheet Road 1 Erosion Control Plan sheet Road 2	M01-LOP10(2)_e&s MA-LOP10(2)_e&s MB-LOP10(2)_e&s	Use models M02 & M03 Use models M04 & M05
N	N01 to N03 N04 to N05 N06	Temp. Traffic Control Plan Road 1 Temp. Traffic Control Plan Road 2 Temp. Traffic Control Plan others	NA-LOP10(2)_tcp NB-LOP10(2)_tcp N06-LOP10(2)_tcp	Use models N01 N02, & N03 Use models N04 & N05
P		Permanent Signing & Striping Plan		Follow as N Series sheets
T	T01 to T30	Cross Section Mainline Road 1	T-LOP10(2)_xss	All cross section sheets of Road 1 will be in one design file
U	T01 to T10	Cross Section minors Road 2	U-LOP10(2)_xss	Same as in T Series

Table 3.5

Example - Plan Sheet Organization for the project:

Sheet No.	Description
A01 A02 A03 A04	Title Sheet Location Map Sheet Symbol & Abbreviation Sheets Survey Information Sheet
B01 –B02	Typical Sections
C01 C02 –C04	Tabulation Of Quantity Summaries & Schedules
D01-D09	Plan & Profile Sheet of Mainline Road, Driveway, Parking Lots, and Utilities.
E01-E06	Plan & Profile Sheets od minor road 2, Driveway, Parking Lot
M01- M05	Erosion Control Plan and Narrative
N01-N06	Temp. Traffic Control Plan
R01-R09	Bridge Plans
S01-S19	Standard Details Sheets
T01 to T30	Cross Section Mainline Road 1

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Chapter 4 Seed Files

Seed files

Seed files form the base for most newly created MicroStation design files. Seed files act as a template for a new design file containing information such as, working units, global origin, coordinate readout, etc. Creating a new design file with the seed file and opening the new design file using with project configuration file (*.pcf) will give the user access to the EFL level library, outlined in the EFL levels and symbology chapter, as well as EFL text styles and dimension styles, outlined in the annotation chapter.

At EFLHD, there are currently 4 seed files in use, each with attributes pertaining to a different design case. These seed files should be used to create all new files for EFLHD work. See ***Workflow 1*** for help with creating a new MicroStation design file using these seed files.

EFLHD Seed Files	
Name	**Description**
Sur_ft2D.dgn	US Customary 2D based on US Survey foot
Sur_ft3D.dgn	US Customary 3D based on US Survey foot
Int_ft2D.dgn	US Customary 2D based on International foot
Int_ft3D.dgn	US Customary 3D based on International foot

Table 4.1: Seed files for X30 Criteria

These seed files are located at:

M:\cadd_Resource_V8\X_30\Standards\Seed\English

M:\cadd_V8_Resource-V8\X_30\Standards\Seed\Metric

US survey foot seed files are widely used on EFL projects. International foot seed files *(Int_ft2D.dgn and Int_ft3D.dgn*) shall only be used on EFL projects that have state requirement for these working units. Consultants should contact your COTR if unsure of which seed files to use. Note: The above seed files have a resolution of 10.000.

Working units have changed significantly in MicroStation V8. No longer does changing the basic working units affect the size of elements contained in the **.dgn** file. A conversion is now done within the software to display the correct length of elements when the working units are changed from Metric to English, or from drawings with different master and sub units. The design plane has changed as well, to be virtually unlimited. As such, global origin is no longer a factor.

Workflow 1: Creating A New Microstation Design File

1. When starting Microstation, the first dialog shown is the Microstation Manager. From Microstation Manager, select File>New.

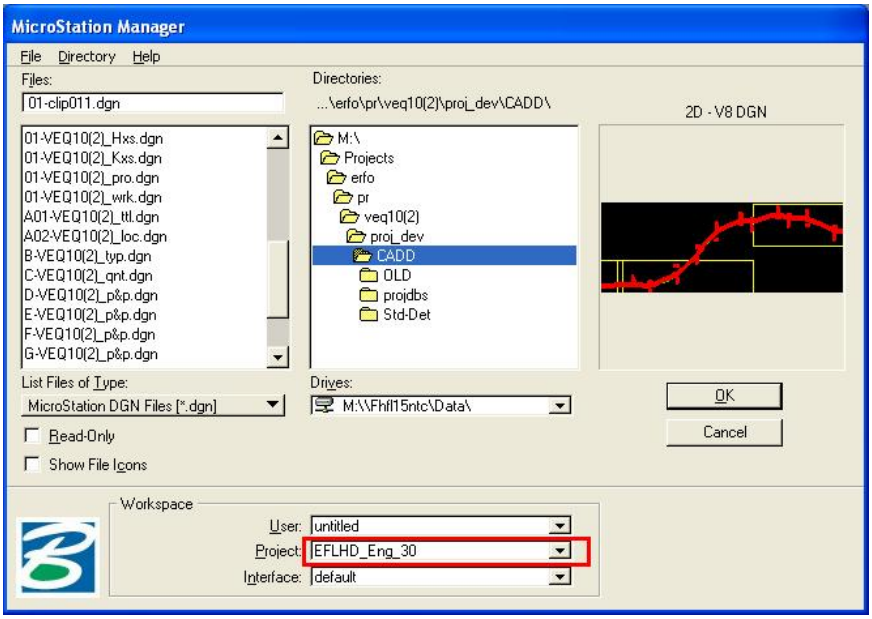

Figure 4-1: New file

2. The Create New Design File dialog will activate. Under the Seed File heading a file is already selected. Click on the Select button to select the correct seed file. The Seed File dialog below shows the path to the EFLHD seed file.

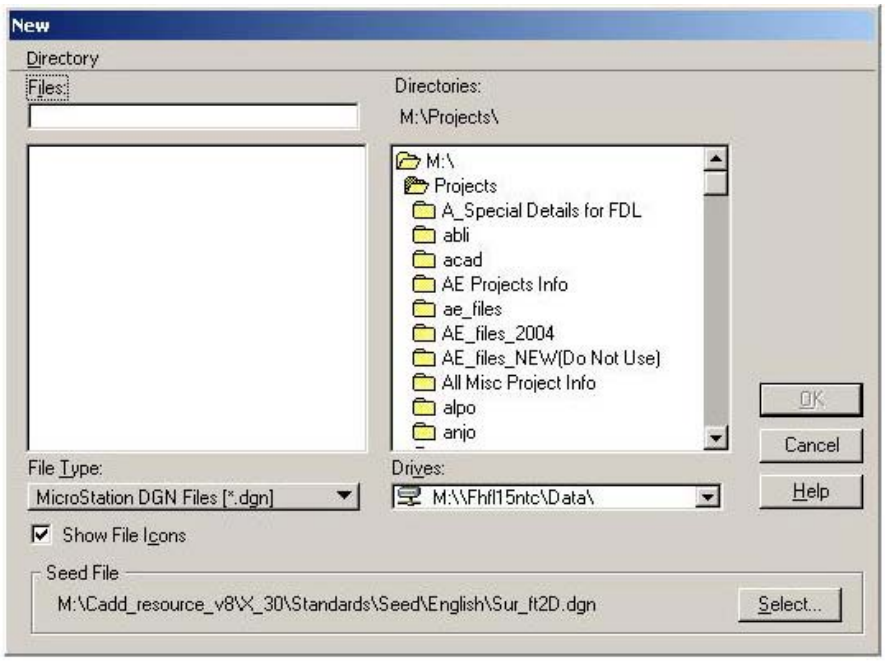

Figure 4-2: New File

From this dialog the user can give the file a new name, select the directory where the file will reside, and select the appropriate seed file to act as a base for the new design file.

3. ***Once the user has reached the correct directory the available seed files will display in the files section of the dialog box. Select the correct seed file and click OK.***

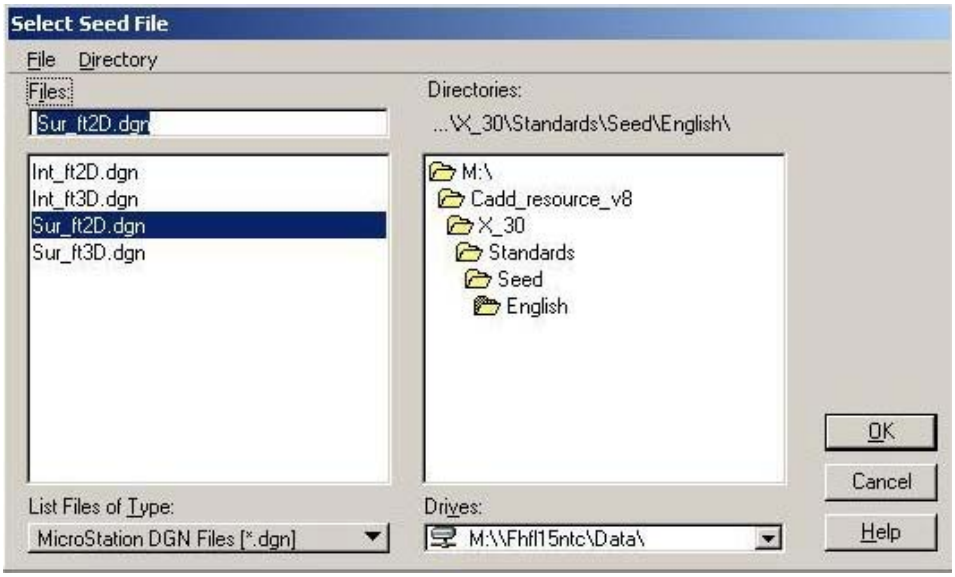

Figure 4-3: Select Seed File

4. ***Give the new design file a name, make sure the path to where the file should be created is correct, and then click OK.***

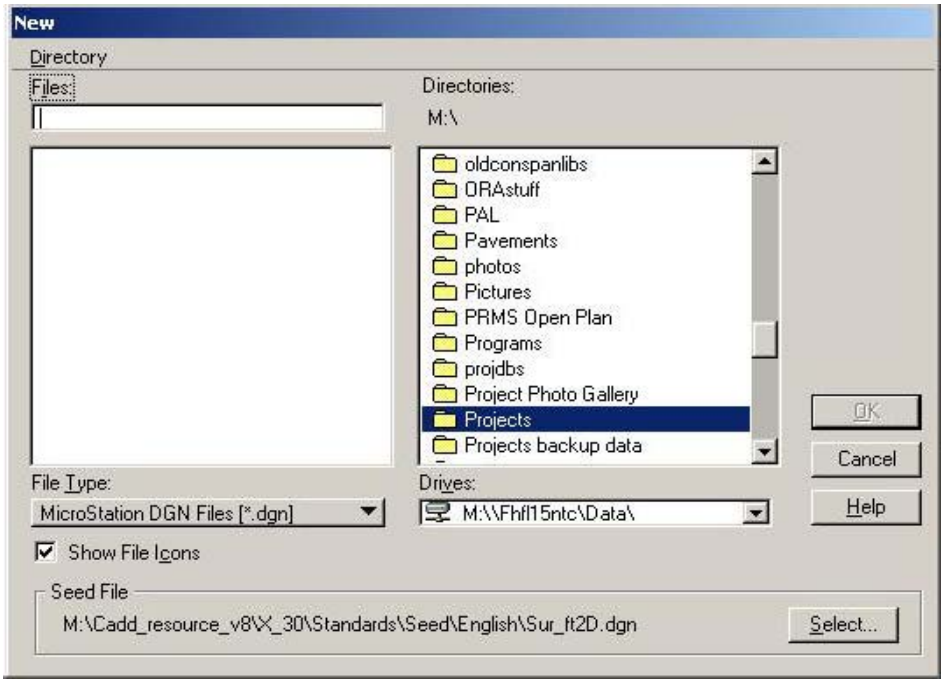

Figure 4-4: Create a new design file

5. ***Under the seed file section, the correct EFLHD seed file is now displayed. In the directories box the example shows the path to where the user would like the file to be created, and in the files box, in the example above a new file a name has been typed in.***

6. ***Prior to opening the new design file, select the project configuration file from the Microstation Manager as shown below.***

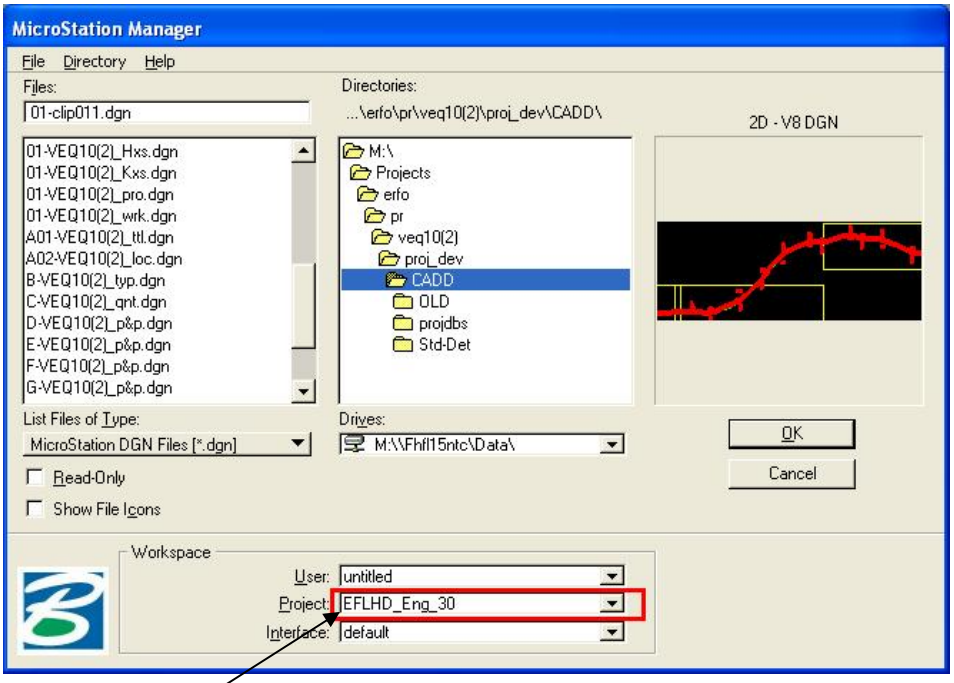

Figure 4-5: Project Configuration Setting

Project Configuration file (*.pcf)

Using the Project Configuration file will give the user access to the X30 Generation of Standard Files (Level library, line styles, cell library, color table, text styles, ddb files, etc.)

Coordinate Readout and Working Units

The Microstation coordinate readout settings and working unit's settings control how measurements are displayed. However, the working unit's settings no longer control the precision of measurements and elements within the design file, as Microstation V8 design files now have 64-bit floating-point accuracy. Care should still be taken when selecting the correct EFLHD seed file located at:

M:\Cadd_resource_v8\X_30\Standards\Seed

If all new design files are created using the EFLHD seed files as outlined in Workflow 1, the coordinate readout and working unit's settings will always be correct, giving the user the correct output. This section shows how to check these settings.

The workflow below explains how to determine what the MicroStation working units settings are for the active design file. The dialog box that displays the working unit's settings also allows the user to change those settings. Changing these settings will no longer affect the size of elements within the design file. However, if the user selects the correct seed file, these settings should not need to be changed. This workflow also shows how to change the MicroStation coordinate readout for the active design file. Changing the coordinate readout settings will simply change the number of decimal points shown when measuring an element.

Workflow 2: Accessing the working units and Coordinate Readout dialog

1. From MicroStation select Settings>Design File.

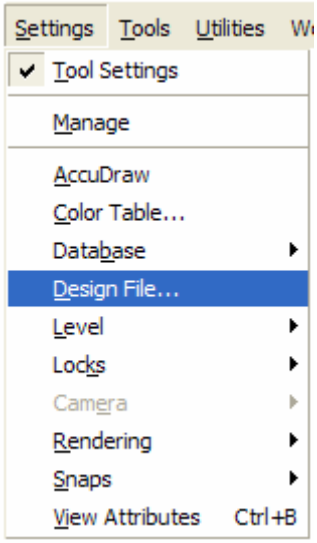

Figure 4-6: Design File Settings

2. From the design file dialog box select Coordinate Readout or Working Units.

Coordinate Readout

The coordinate readout section of the Design File Settings contains several settings including, format and accuracy for both coordinate readout and angles, and mode for coordinate readout. Format, for coordinates, lets the user select to display coordinate readout in terms of master units, sub units or working units. The generally accepted format and the selection for FHWA are master units. For angles, format allows the user to display angles in decimal degrees or degrees-minutes-seconds. Accuracy, as used on the coordinate readout dialog, does not refer to the accuracy of the design file, but rather the number of decimal places to be displayed. The mode selection allows the user to select how angles are displayed: conventional, azimuth, or bearing.

The figures below show the different working units and coordinate readout settings contained within the EFLHD seed files. To access these dialog boxes use the preceding workflow.

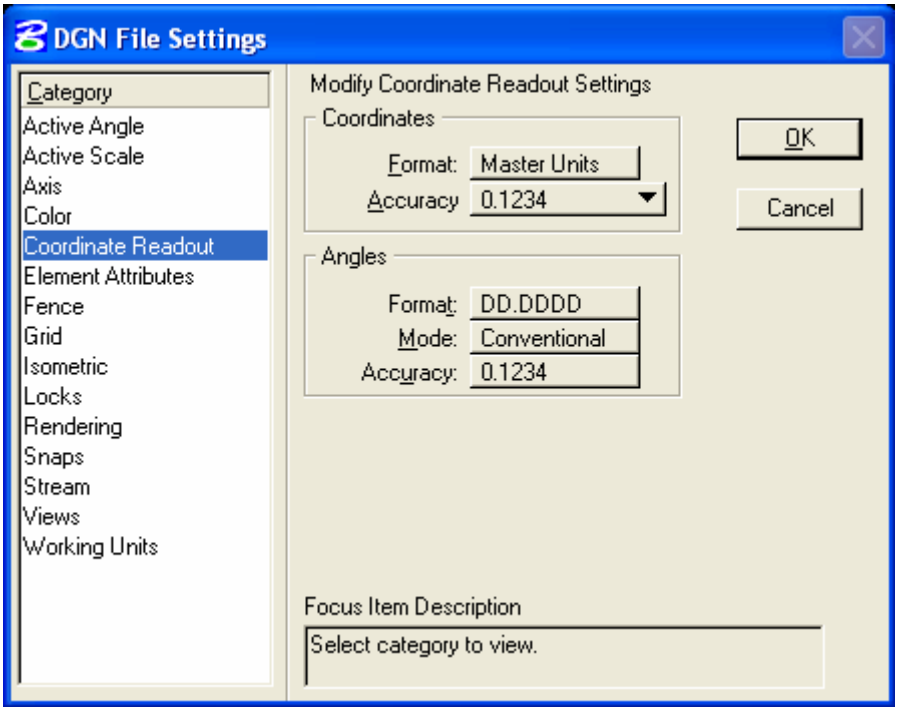

Figure 4-7: Coordinate Readout for English Roadway Seed Files

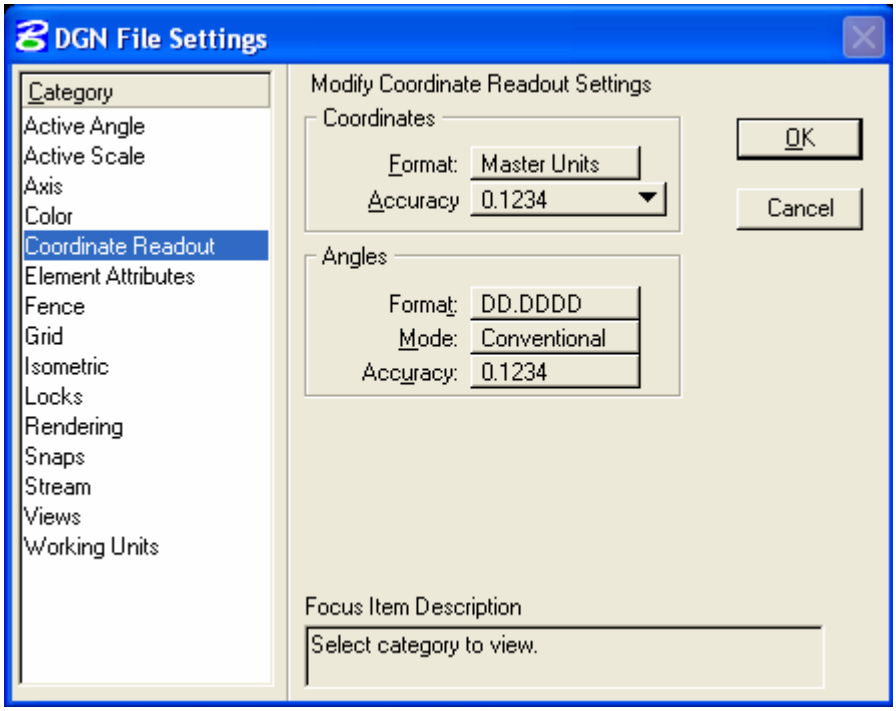

Figure 4-8: Coordinate Readout for Metric Roadway Seed Files

Working Units

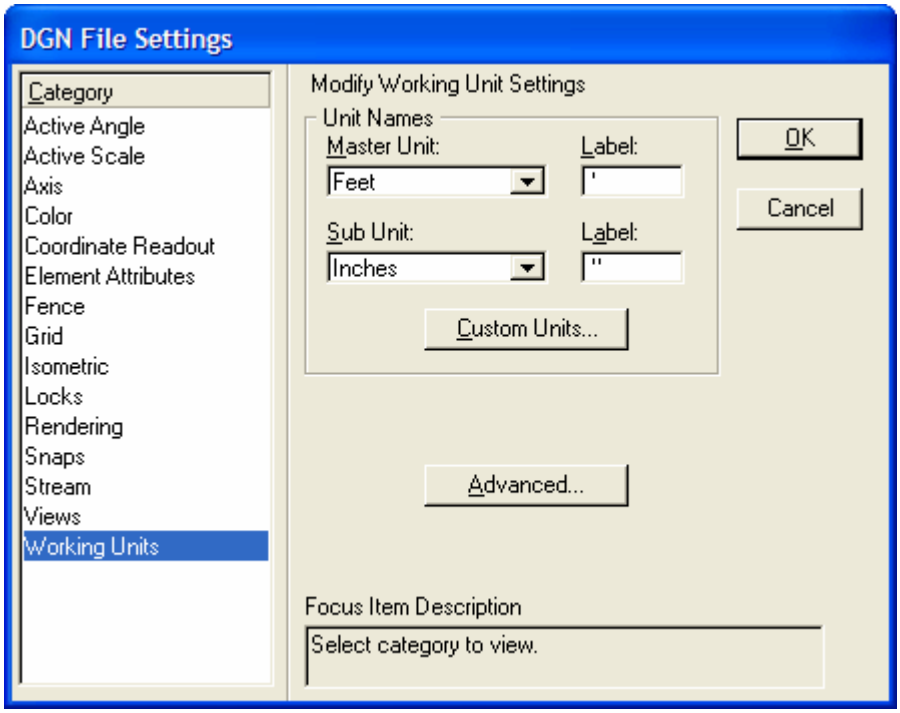

Figure 4-9: Working Units for English International Foot Roadway Seed File

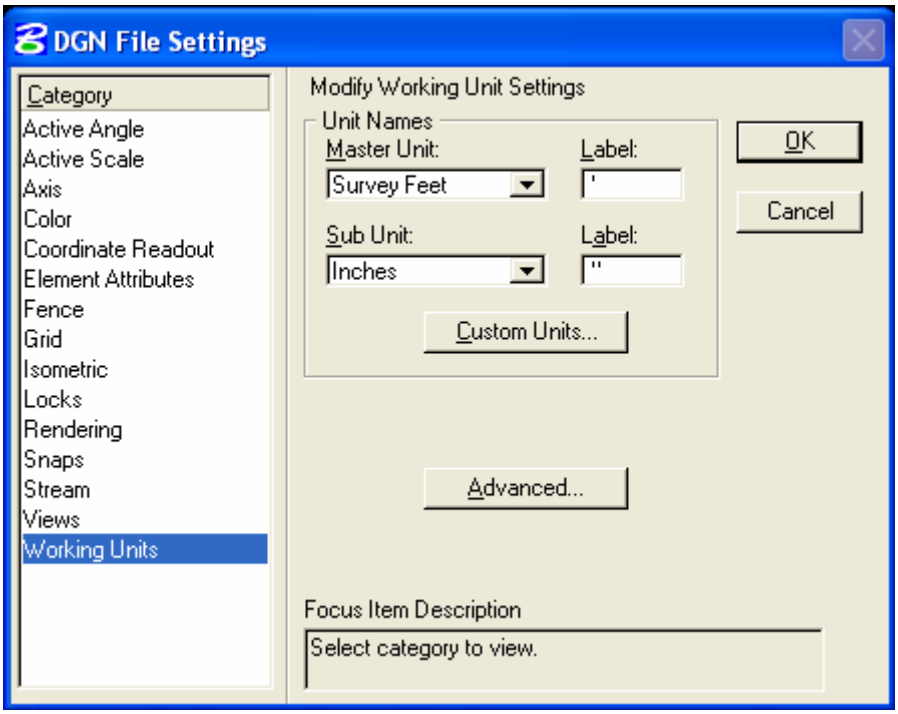

Figure 4-10: Working Units for English US Survey Foot Roadway Seed File

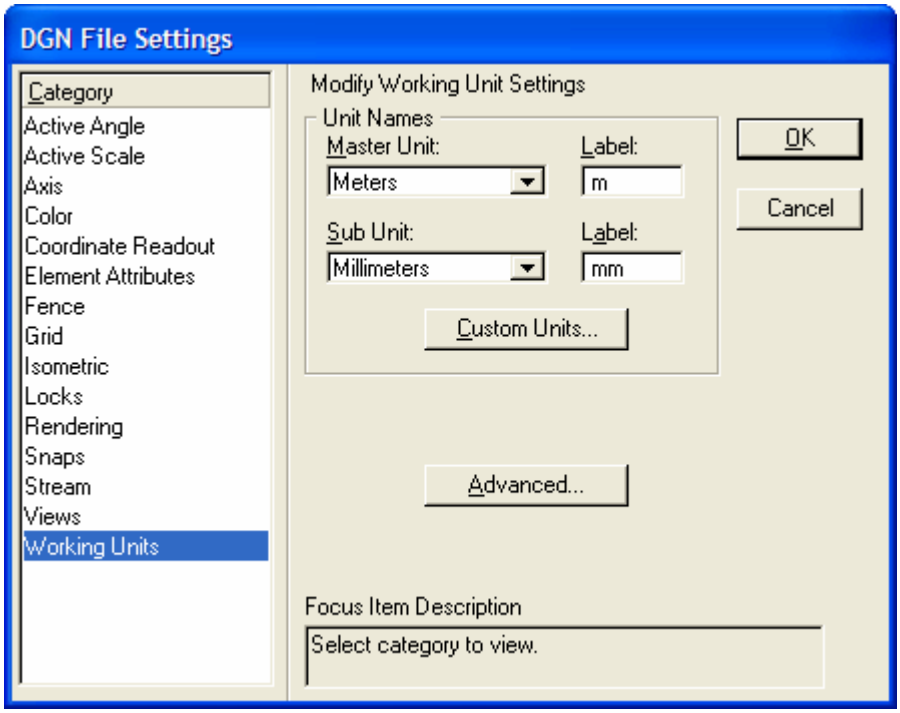

Figure 4-11: Working Units for Metric 2D seed file

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Chapter 5 Annotation

Introduction

Annotation, as it pertains to this chapter, includes both text and dimensions. This chapter will outline the text styles and dimension styles in use at EFLHD, as well as some of the key settings associated with these styles.

Text

MicroStation 2004 gives the user the ability to save the various text settings as a text style. With MicroStation 2004 text styles the user no longer needs to set text parameters such as text font, height, width, etc. each time text is needed. Each of these settings are saved within a text style.

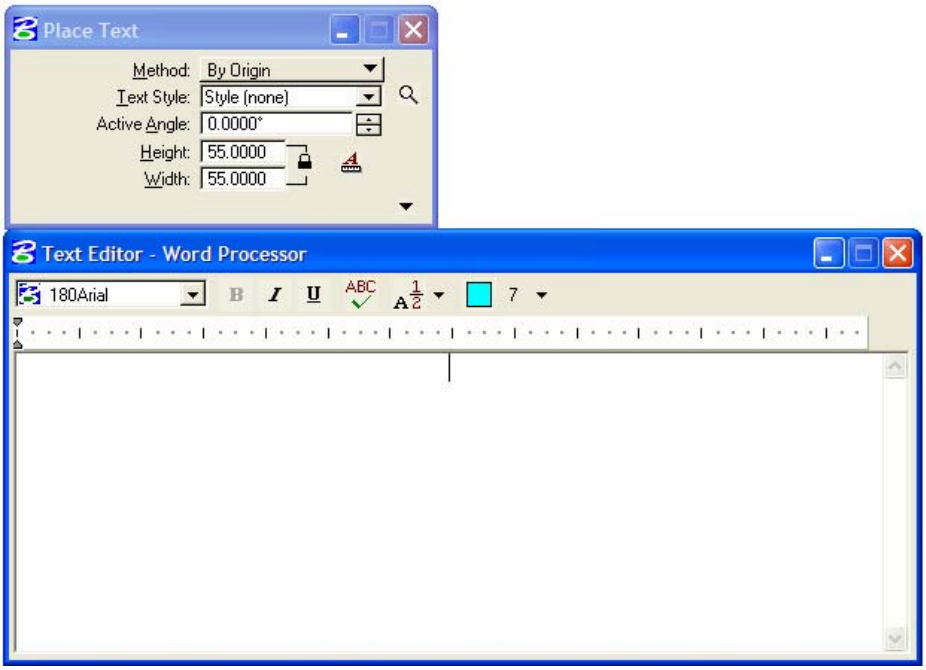

Figure 5-1: Place Text

In the example above, the user has selected the place text tool. The tool settings window, shown above, allows the user to select the correct text style, the Text Editor – Word Processor also becomes active allowing the user to begin annotating the design file.

Also new with Microstation 2004 Edition is **annotation scale**. Annotation scale allows the user to set an annotation scale for the current model allowing text to be scaled to fit the desired output. With this tool, the drawing elements are at a 1:1 scale, but the text will be placed to fit the final scale of the drawing. This also allows EFLHD to have 1 text style for each type of text; title, standard, italic, non-italic, etc., rather than 1 for each type and each scale within each type. For consultants, Annotation

scale definition files are available through the **CADD_Resources_V8.zip** download. Annotation scale definition files for U.S. Customary and Metric units can be found on the EFLHD designers local computer at:

M:\Cadd_resource_v8\X_30\Standards (English or Metric)\

At EFLHD there is 1 text style for each italics and non-italics for both standard text and title/heading text, for both English and Metric EFLHD projects. This is a total of 4 text styles for English and 4 for Metric.

The main attributes of each are the text height, width, and line spacing, at a scale of 1"=100' for U.S. Customary and 1:1000 for Metric, and the font. **Federal Lands Highway will use the Verdana true type font for all projects.**

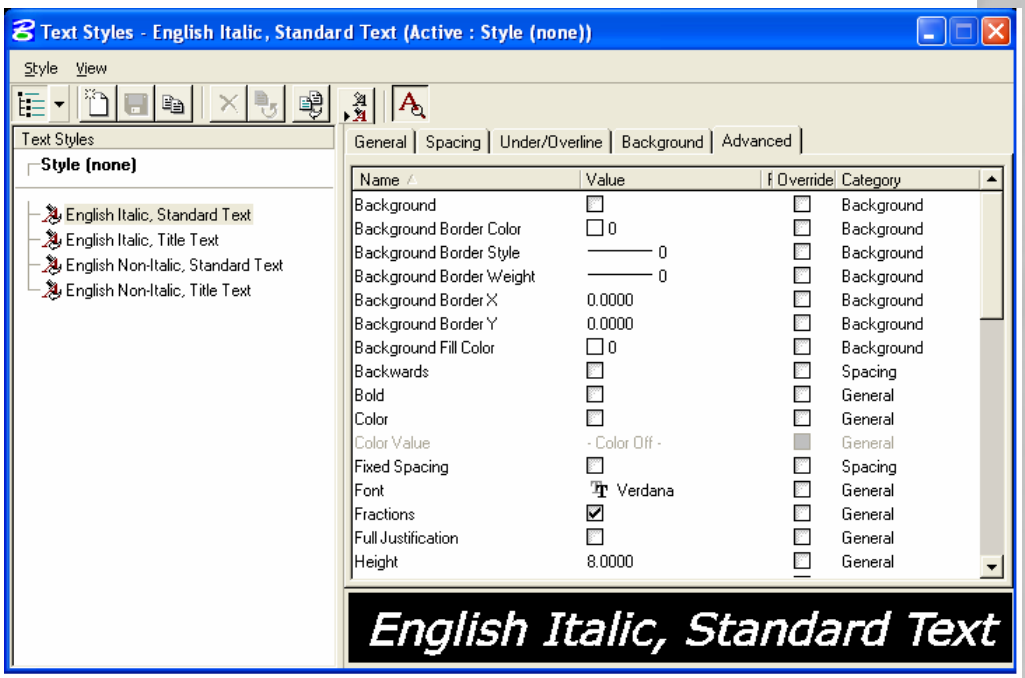

Figure 5-2: EFLHD Text Styles

As mentioned above, available in Microstation 2004 Edition is the use of true type fonts and AutoCAD **.shx** fonts. Microstation will automatically find true type fonts installed on each computer in the operating system \fonts directory, and will find AutoCAD **.shx** file in the AutoCAD system \fonts directory. The original Microstation fonts are still available for use.

EFLHD text styles are contained in 2 Libraries called **eflhd_eng_text_styles.dgnlib** and **eflhd_met_text_styles.dgnlib.**

For consultants, EFLHD text style libraries are available through the **CADD_Resources_V8.zip** download. The EFLHD DGN library can be found on the EFLHD designers local computer at:

M:\Cadd_resource_v8\X_30\Standards\Library_Files\

DGN Libraries are the containers for 3 important features in MicroStation V8. These include: Levels, Text Styles and Dimension Styles. With the DGN library attached each of these will be available to the user. For EFLHD employees, DGN Libraries are automatically attached while opening a design file using the Project Configuration (*.pcf). For EFLHD consultants, using the Project Configuration (*.pcf) files provided with the **CADD_Resources_V8.zip** download will automatically attach the dgn libraries.

Workflow 1: Manually attaching the EFLHD DGN Library

1. ***Select Workspace>Configuration from the main Microstation pull down menus***

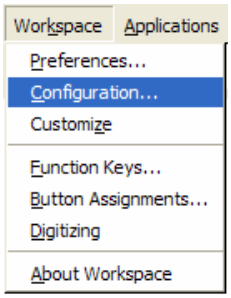

Figure 5-3: Workspace Menu

2. *In the Workspace configuration list, select MS_DGNLIBLIST*

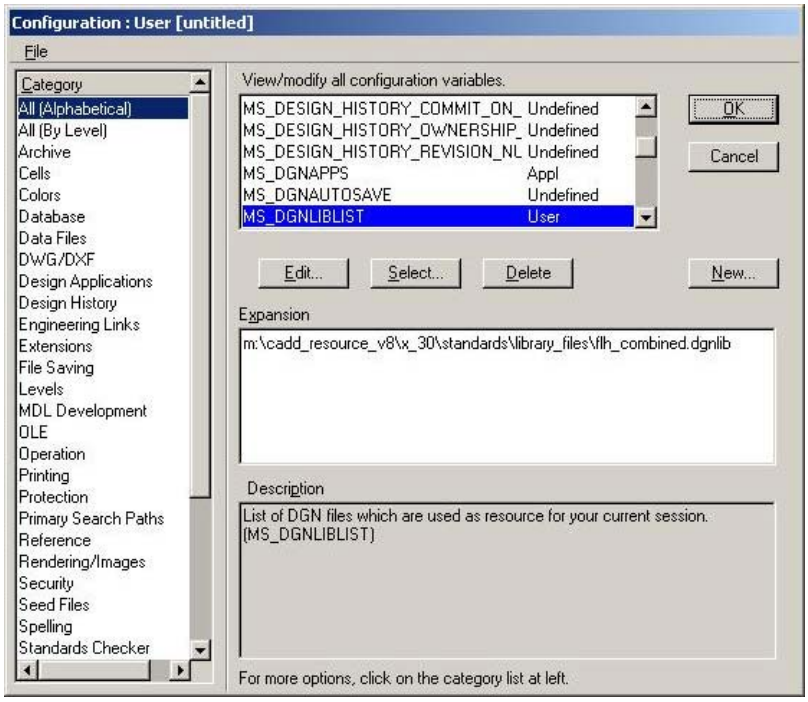

Figure 5-4: DGNLIBLIST Configuration Variable

3. *Choose the select button, and path to the location of the DGN Library.*

4. ***Select the library and click the Add button to add the file to the File List section in the bottom of the dialog box.***

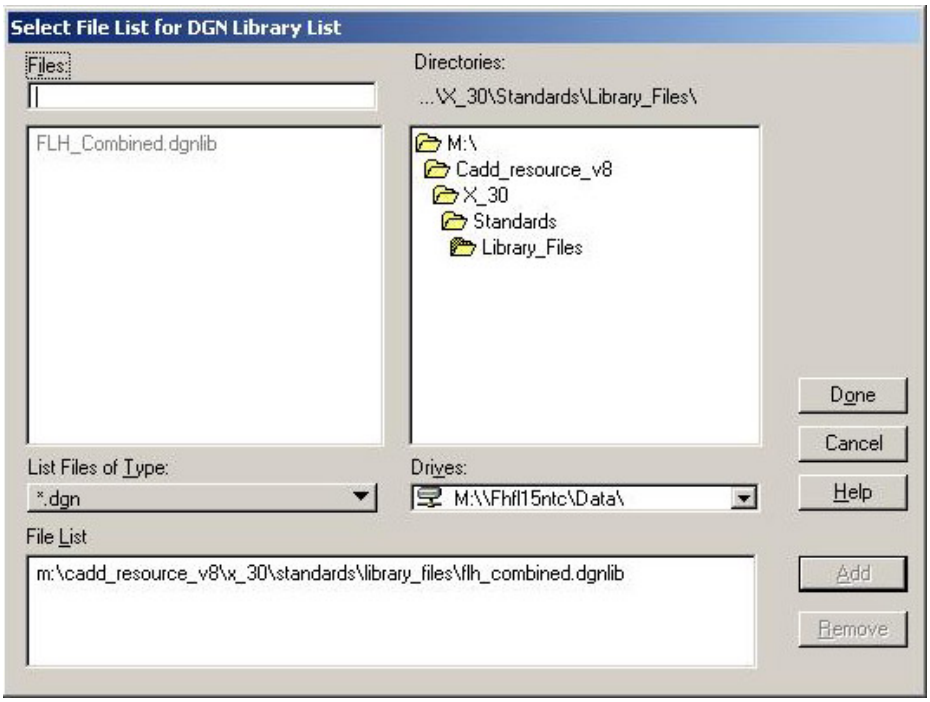

Figure 5-5: Select DGN Library

5. ***Select Done.***

6. ***When prompted to save changes to workspace, select Yes.***

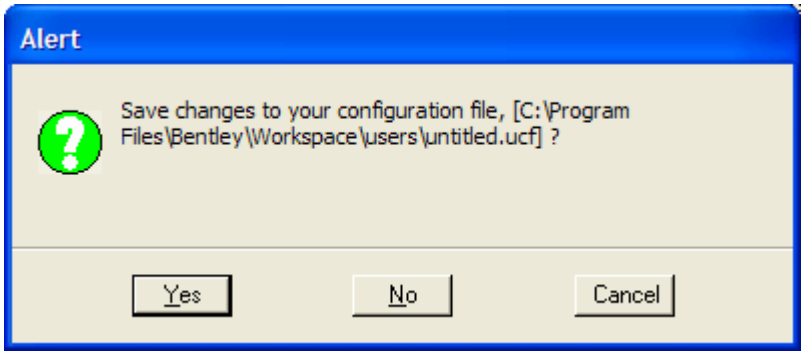

Figure 5-6: Microstation Alert Dialog

7. ***In order for these changes to take affect you must exit Microstation and restart.***

CAUTION

Workflow 1 - Manually attaching the EFLHD dgn library is for information only. EFLHD designers should not manually attach or edit configuration variables. For EFLHD, the CADD Coordinator sets the configuration variables.

Workflow 2: Annotation Scale, Setting the Model Properties (See the section on the use of models on page 1-4.)

1. ***From the MicroStation Primary toolbar, select the Models icon.***

Figure 5-7: Primary Tools

2. ***From the Models dialog box, select Model Properties.***

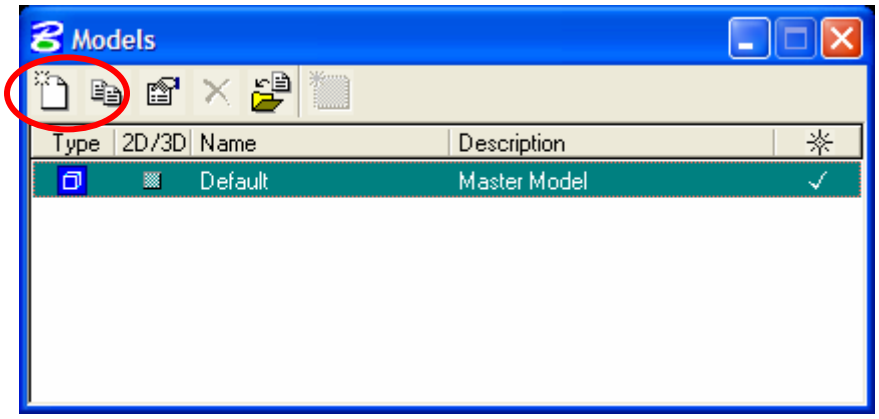

Figure 5-8: Models Dialog

3. ***Select the Edit Model Properties Icon.***

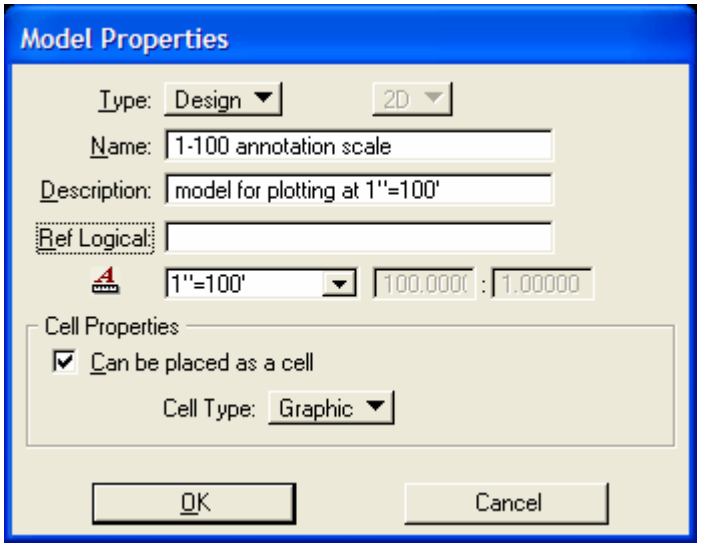

Figure 5-9: Model Properties

4. *You can rename the model, give a new description and select the annotation scale from the dialog above. In the example above, the annotation scale has been set to 1”=100’. Once the model properties have been set, select OK.*

Workflow 3: Annotation Scale, Setting Annotation Lock and Placing Text

1. *Annotation Lock can be selected from the main Microstation pull down menus by selecting Settings>Locks>Annotation Scale, as shown on the left below, or by using the locks menu on the Microstation status bar, as shown on the right below.*

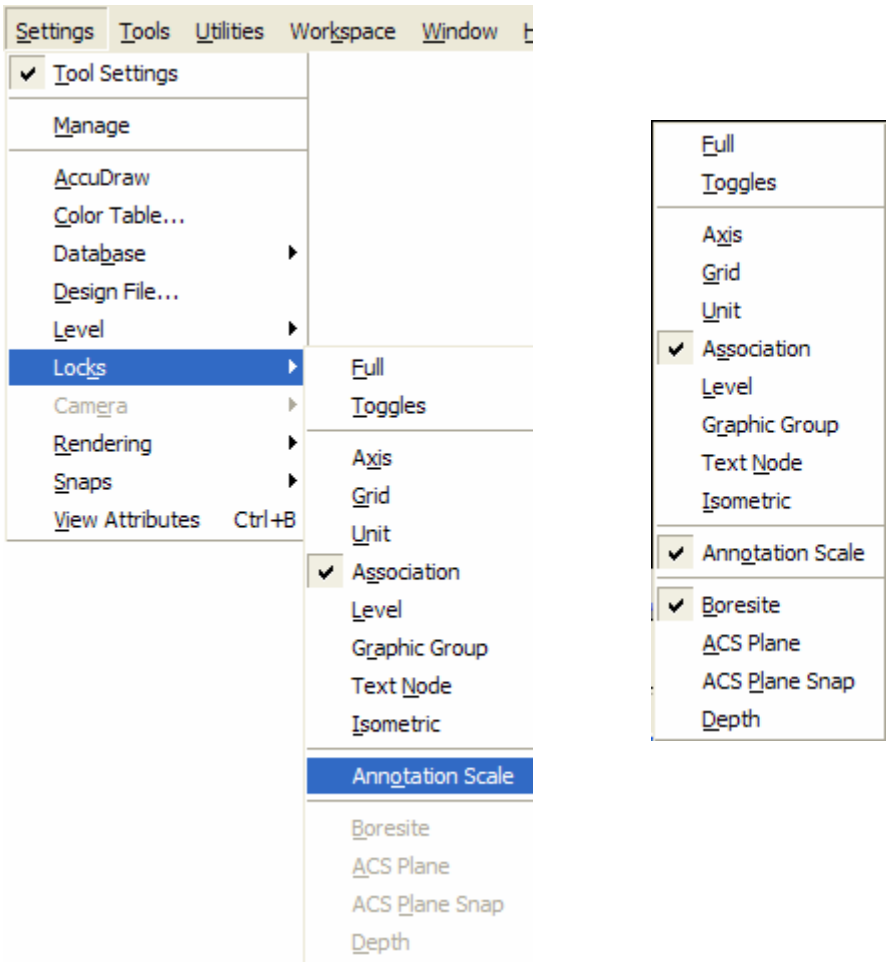

Figure 5-10: Annotation Scale

2. *With Annotation Scale lock on, text will now be placed at the proper size for the output scale.*

3. Select the Place Text tool.

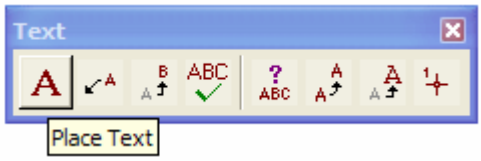

Figure 5-11: Text Menu

4. From the tool settings window, select the desired text style.

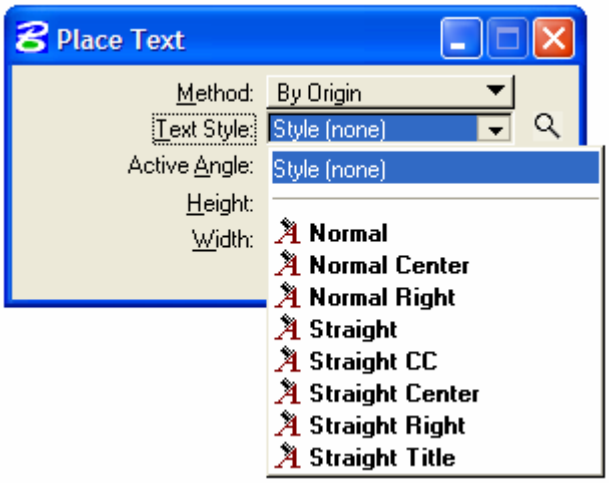

Figure 5-12: Select Text Style

5. By selecting the English Italics Standard Text, the proper text size, font, line spacing, etc. will be set automatically.

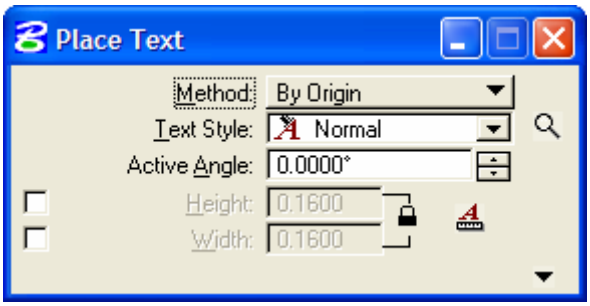

Figure 5-13: Place Text Dialog

6. Begin placing text.

Text Sizes

The following tables outline the text sizes to be used on EFLHD plans. These text sizes have been incorporated into the use of annotation scale.

Metric Text sizes									
11x17 Sheet size	**Scale n:1**								
Description	50	100	200	250	300	400	500	1000	2000
Standard Text	0.1	0.2	0.4	0.5	0.6	0.8	1	2	4
Text Spacing	0.05	0.1	0.2	0.25	0.3	0.4	0.5	1	2
Title/Heading Text	.015	0.3	0.6	0.75	0.9	1.2	1.5	3	6
Title Sub-Heading Text	.125	.25	.5	.625	.75	1	1.25	2.5	5
Sheet Layout Information									
Meters per plan sheet	17.5	35	70	75	100	140	175	350	700
Major tick spacing	2.5	5	10	25	25	25	25	50	100
Minor tick spacing	0.5	1	2	5	5	5	5	10	20

Table 5-1: Metric Text Sizes

English Text sizes							
11x17 Sheet size	**Scale ft/in**						
Description	10	20	40	50	100	200	500
Standard Text	0.8	1.6	3.2	4	8	16	40
Text Spacing	0.4	0.8	1.6	2	4	8	20
Title/Heading Text	1.2	2.4	4.8	6	12	24	60
Title Sub-Heading Text	1	2	4	5	10	20	50
Sheet Layout Information							
Feet per plan sheet	140	280	550	700	1400	2800	7000
Major tick spacing	50	100	100	100	500	1000	1000
Minor tick spacing	10	25	50	50	100	100	500

Table 5-2: English Text Sizes

Standard text height for Metric drawings is calculated as: Scale x 0.002. The standard text height for English drawings is calculated as: Scale x 0.08. Text width will always = text height. Text spacing = text height x .5

Dimensions

Also new in MicroStation V8, 2004 Edition, is the introduction of Dimension Styles. This is a huge benefit for users of the dimensioning tools in MicroStation.

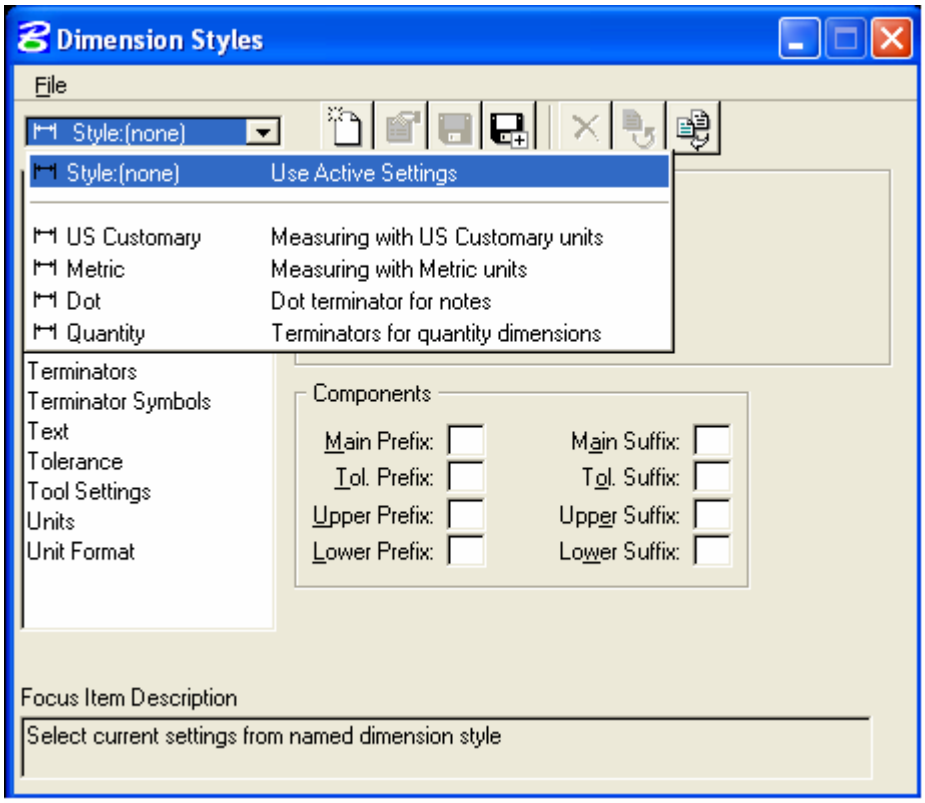

Figure 5-14: Dimension Settings dialog box

In Microstation V8, 2004 Edition the user may setup the parameters for dimensioning and save these parameters as a dimension style, much like text styles, for use at a later time, as shown below. As discussed above, these styles will be contained in a DGN Library that will be attached automatically for EFLHD employees, and will be attached through a project configuration variable for consultants working on EFLHD projects.

As with text, dimension styles also use the Annotation scale to control the size of dimension text. Currently there are 2 dimension styles currently used for Metric and U.S. Customary units. These dimension styles use the correct levels and text styles for EFLHD work. As with text, simply select the dimension tool, then from the Element Dimensioning dialog box, select the correct dimension style, as shown below.

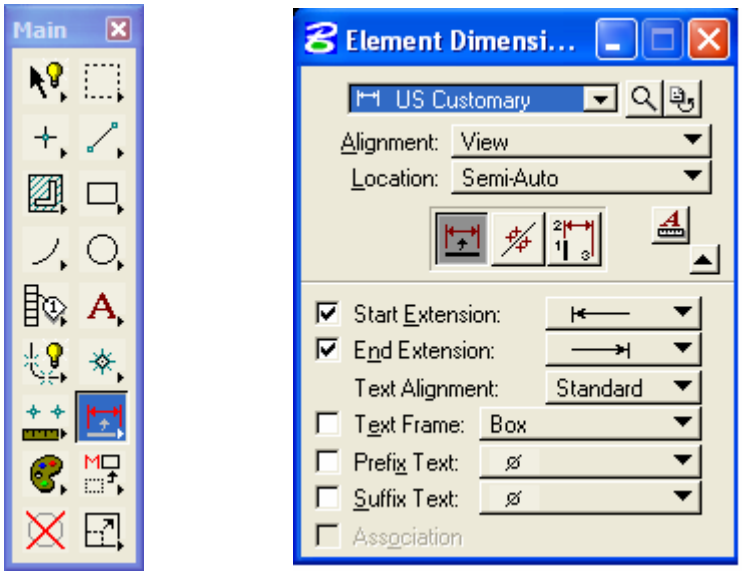

Figure 5-15: Dimensioning dialog boxes

As EFLHD has not used dimensioning in the past, the creation of these styles will be an on-going process. Check the standard downloads at EFLHD website often to see updates as they are posted

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Chapter 6 Line Styles

Overview

Microstation comes with 8 standard Line Styles, which is usually enough for only the most basic Microstation drawing. Custom Line Styles are Microstation's way of creating other Line Style for specific purposes. Line Styles for utilities that have text imbedded in the line, fence Line Style with X's along it are examples of Line Styles that can be created. Custom Line Styles, unlike the fonts discussed in chapter 5, are still contained in resource files with the extension **.rsc**. The only change will be how we access custom line styles for use and viewing prior to placing. This chapter contains information about these resource files including:

- Names
- Locations
- Descriptions
- Workflow for attaching resource file
- Workflow for creating basic custom Line Styles

Line Styles

There are many custom Line Styles in use at EFLHD. There are multiple standard Line Style resource files. They are automatically read by Microstation and will be shown as available Line Styles, provided your machine is properly configured. These files will be attached when entering Microstation through a project configuration variable and the use of these will be seamless.

The EFLHD custom Line Style resource files can be found on the EFLHD designer's local computer at:

M:\Cadd_resource_v8\X_30\Standards\Resources

For consultants, EFLHD line style resources files are available through the **CADD_Resources_V8.zip** download.

Selecting custom Line Styles in Microstation V8 is a simple process as each Line Style found in the attached **.rsc** file will automatically show up in the Line Styles dropdown menu, as shown below.

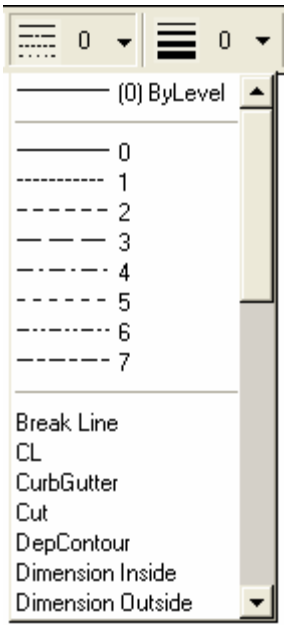

Figure 6-1: Select Custom Line Style

Each of the Line Styles available may be selected by using the scroll bar to find and select the desired Line Style.

As shown above, there is also a selection for ByLevel. This allows a Line Style to be attached to a particular level. Setting the level as the active level will automatically select the Line Style as set in the level library. See chapter 9, Levels and Symbology, for more information on ByLevel attributes.

To view a custom Line Style before placing, select **Element>Line Styles>Custom**, as shown below.

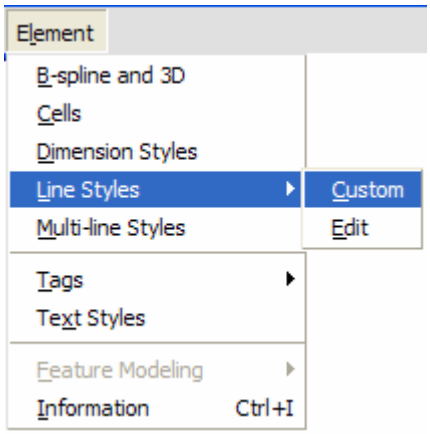

Figure 6-2: Element Menu

With the dialog box for custom Line Styles, shown below, you have the ability to select Line Styles and set Line Style scales.

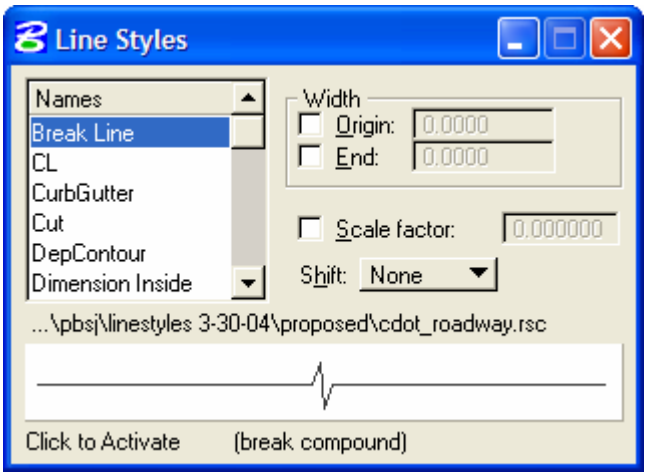

Figure 6-3: Custom Line Styles

For EFLHD employees, custom Line Styles are automatically attached while opening a design file using the Project Configuration (*.pcf). If the correct Line Styles is not displaying, contact CADD support to have this setup.

Line Style Diagrams

See figures below for view of each Line Style in use at EFLHD.

Line Style	
	Tree_Line_2
	Tree_Line
	Township/Range
SF SF	Silt_Fence (FLH)
SF	Silt_Fence(EFLHD)
	Section
	Scarp
	Rock_Lined_Ditch
	Railroad_Tracks_2
	Railroad_Tracks
P/L	Property_Line
P/E	Permanent_Easement_Right
P/E	Permanent_Easement_Left
P/E	Permanent_Easement_Inline
W W	P_Water_Line
	P_Wall
T T	P_Underground_Telephone
P&T P&T	P_Underground_Power_and_Telephone
P P	P_Underground_Power
O O	P_Underground_Oil
G G	P_Underground_Gas
UD UD	P_Underdrain
	P_Two_Posted_Sign
SD SD	P_Storm_Drain
SS SS	P_Sanitary_Sewer
	P_Road
R/W	P_Right_of_Way_Right

Figure 6-4: Line Style Diagram

Line Style	
R/W	P_Right-of-Way_Left
R/W	P_Right_of_Way_Inline
	P_PavedDitch
T T	P_Overhead_Telephone
P&T P&T	P_Overhead_Power_and_Telephone
P P	P_Overhead_Power
	P_Guardwall
	P_Guardrail
	P_Gate
XX XX XX XX XX	P_Fence
	P_Culvert (FLH)
	D_Pipe12, … (EFLHD-Culvert of different sizes)
	P_Concrete_Barrier
Custom Slope	Metric_Custom_Slope
4 :1	Metric 4:1
2 :1	Metric 2:1
1 :9	Metric 1:9
1 :8	Metric 1:8
1 :7	Metric 1:7
1 : 6	Metric 1:6
1 :50	Metric 1:50
1 : 5	Metric 1:5
1 : 4	Metric 1:4
1 : 3	Metric 1:3
1 :20	Metric 1:20
1 : 2.5	Metric 1:2.5

Figure 6-5: Line Style Diagram

Line Style	
1:2	Metric 1:2
1:100	Metric 1:100
1:10	Metric 1:10
1:1.75	Metric 1:1.75
1:1.5	Metric 1:1.5
1:1.25	Metric 1:1.25
1:1	Metric 1:1
1:0.75	Metric 1:0.75
10:1	Metric 10:1
100:1	Metric 100:1
	Mailboxes
Forced Slope Tie	Forced_Slope_Tie
	Edge_of_Water
W W	E_Water_Line
	E_Wall
T T	E_Underground_Telephone
STEAM	E_Underground_Steam
P P	E_Underground_Power
P P	E_Underground_Oil
IRR	E_Underground_Irrigation
G G	E_Underground_Gas
FM FM	E_Underground_Force_Main
FO FO	E_Underground_Fiber_Optic
TV TV	E_Underground_CATV

Figure 6-6: Line Style Diagram

Line Style	
UD UD	E_Underdrain
	E_Two_Posted_Sign
SD SD	E_Storm_Drain
SS SS	E_Sanitary_Sewer
	E_Road
R/W	E_Right-of-Way_Right
R/W	E_Right-of-Way_Left
r/w	E_Right-of-Way_Inline
P/E	E_Permanent_Easement_Right
P/E	E_Permanent_Easement_Left
P/E	E_Permanent_Easement_Inline
T T	E_Overhead_Telephone
P&T P&T	E_Overhead_Power_and_Telephone
P P	E_Overhead_Power
FO FO	E_Overhead_Fiber_Optic
TV TV	E_Overhead_CATV
m m	E_Maintenance_Limits
IRR	E_Irrigation_Ditch
	E_Intermittent_Drainage
	E_Guardwall
	E_Guardrail
	E_Ground
	E_Gate
X X X X X	E_Fence
	E_Dam
	E_Culvert
	E_Concrete Barrier

Figure 6-7: Line Style Diagram

Line Style	
	Dike
	Depression
	Cut_Line
C/E	Construction_Easement_Right
C/E	Construction_Easement_Left
CME	Construction_Easement
TCE TCE	EFL_Temporary_Easement
e e	EFL_Existing_Easement
	Brush_Line
NWR NWR	Boundary_NWR
NP	Boundary_National_Park
	Boundary_Forest
	Boundary_BLM
	Boundary_BIA
	Berm
Bench Cut	Bench_Cut
	¼ Section Line
	1/16 Section Line
	Wattle
	P_Road
	E_Road
	Ditch
	CL1
	Break2
	Break1
DB	Diversion Berm(EFLHD)

Figure 6-8: Line Style Diagram

Workflow 1: Resource file setup

1. ***Download CADD_Resources_V8.zip from the EFLHD web site.***
2. ***As this file is specific to EFLHD projects the user should leave this in the M:\Cadd_resource_v8\X_30\Standards\Resources directory.***
3. ***In Microstation select Workspace>Configuration.***

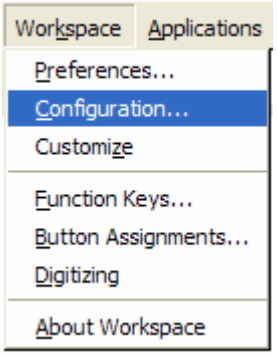

Figure 6-9: Workspace Configuration Menu

4. ***From the workspace configuration dialog box, select Symbology from the list on the left.***

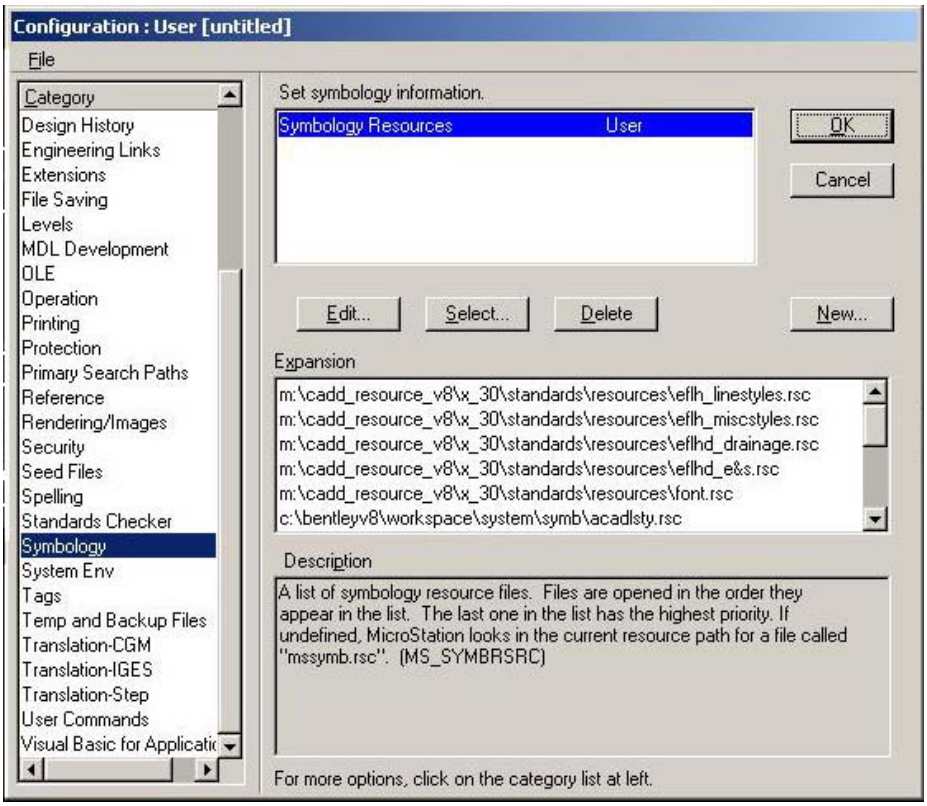

Figure 6-10: Configuration Symbology

5. ***Click on the Select button. This will allow the user to select the EFLHD line style resource files downloaded above (step 4).***

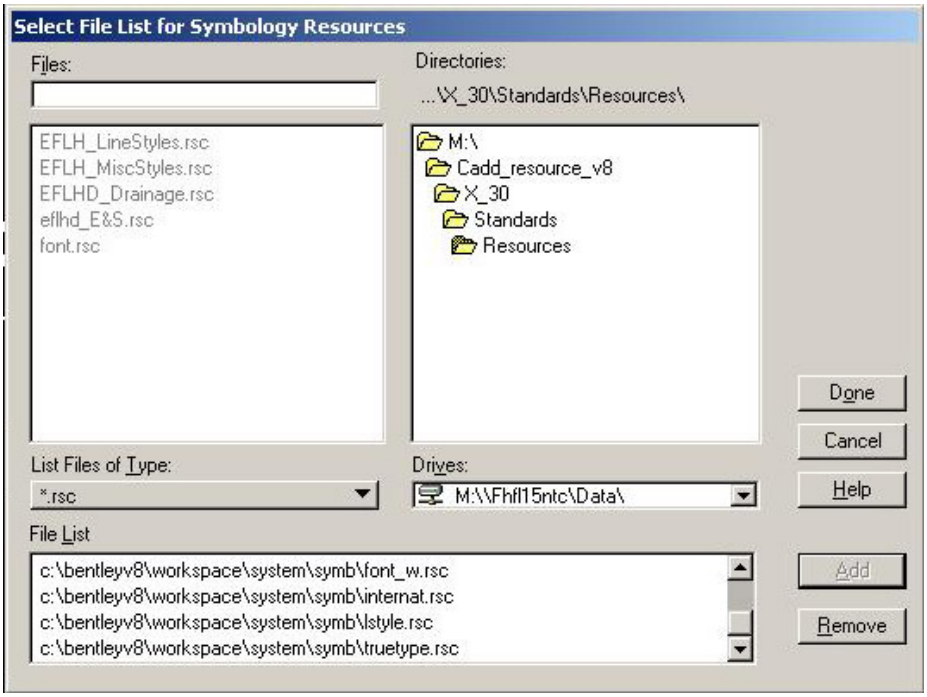

Figure 6-11: Symbology Resources

6. ***Pick the path to the directory where the .rsc files are stored from the upper right directory box. Highlight the appropriate file(s) from the upper left box, and then click the Add button to add the desired file to the file list. Repeat this procedure for each file to be added.***
7. ***Click the Done button.***
8. ***The files will now be shown in the Expansion window of the user configuration box.***

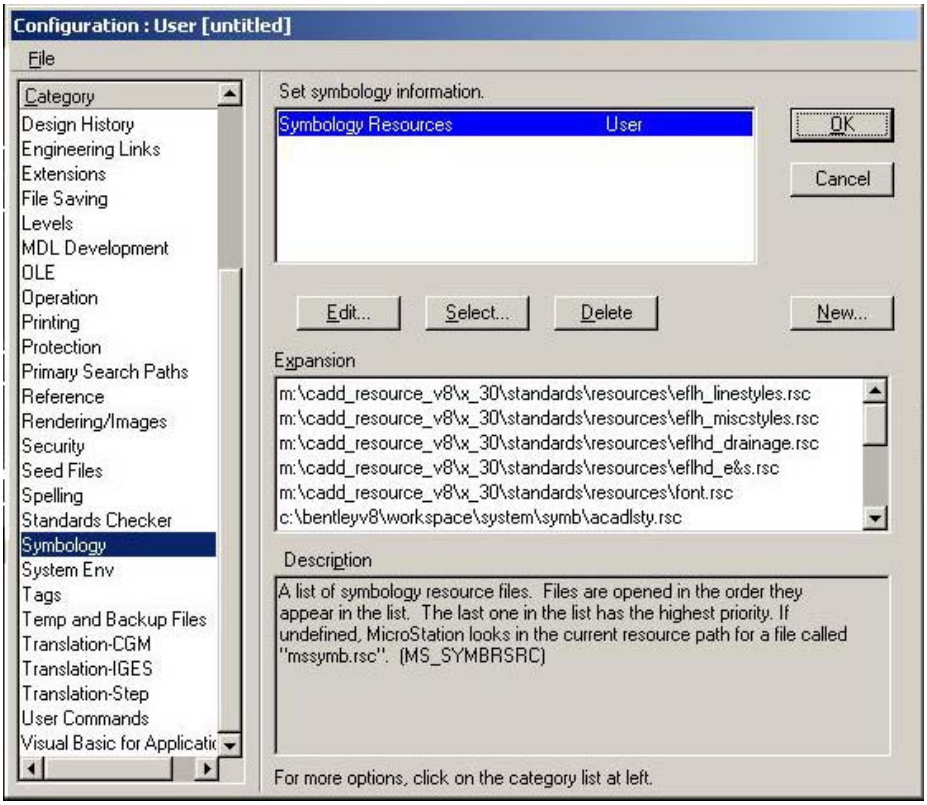

Figure 6-12: User Configuration Symbology

9. ***Click the OK button. The user will see a Microstation alert dialog box asking if changes to the configuration file should be saved, Answer by selecting the Yes button. The correct custom line styles will now be available.***

Workflow 1 will allow user level configuration, which is not the recommended method for the X30 standard files.

Workflow 1 – Resource file setup is for information only. EFLHD designers should not manually attach or edit configuration variables. For EFLHD, the CADD Coordinator sets the configuration variables.

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Chapter 7 Color Table

Color Table

The current color table in use at EFLHD for the X30 Generation of standard files is: **color1.tbl**. This file can be found on the EFLHD designers local computer at:

M:\Cadd_resource_v8\X_30\Standards\Tables

Workflow 1: Attaching EFLHD Color Table

1. From MicroStation select Settings>Color Table…

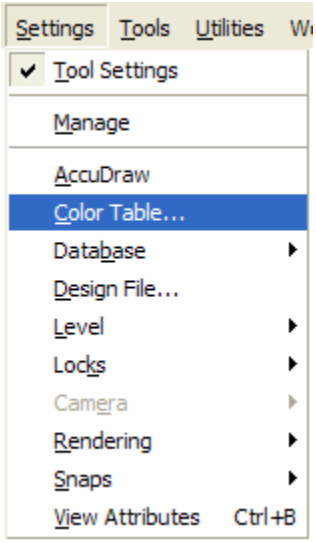

Figure 7-1: Settings Menu

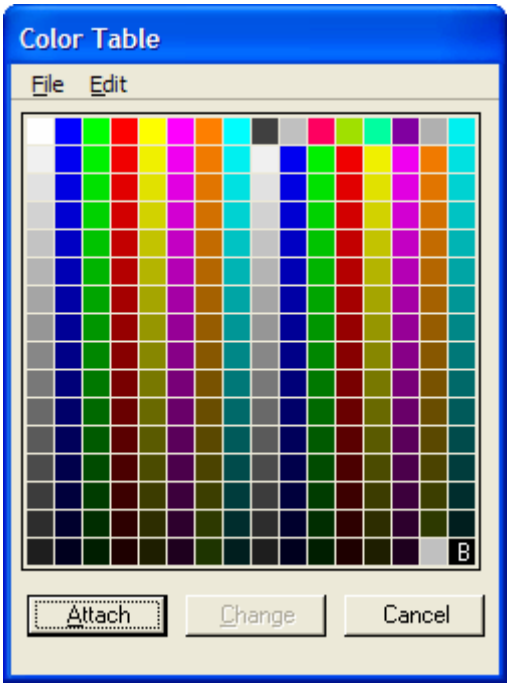

Figure 7-2: Default Color Table

2. *This will open the current color table, usually the MicroStation default color table, shown in Figure 7-2. From the color table palette, select File>Open..., and then select the EFLHD color table to be attached.*

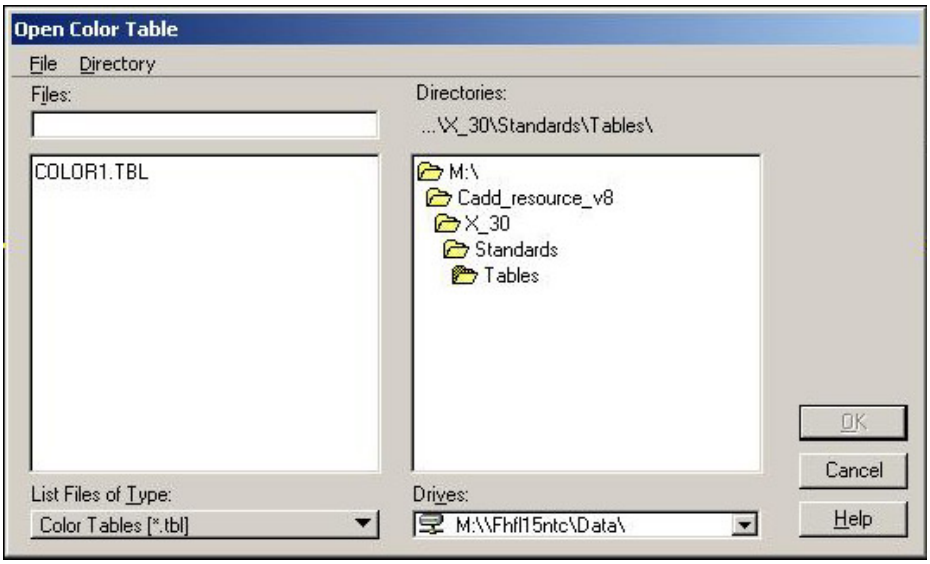

Figure 7-3: Open Color Table

3. *Click OK and the EFLHD color table will now be shown.*

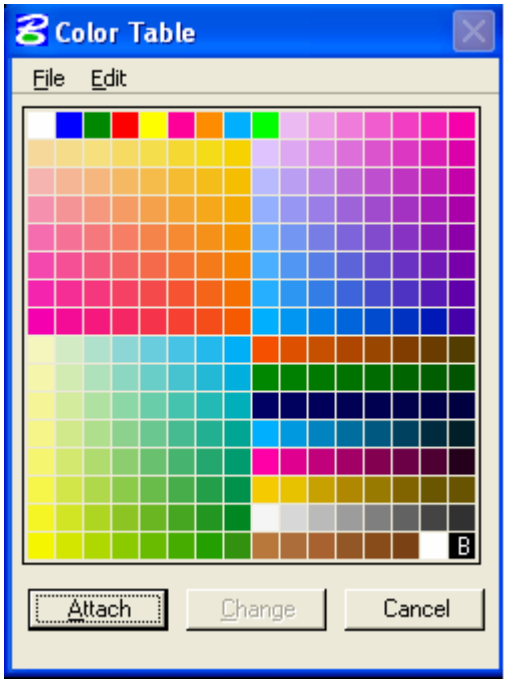

Figure 7-4: EFLHD Color Table

4. ***From the workspace configuration dialog box, select colors.***

5. ***When the correct color table,color1.tbl, is displayed, click on the attach button. The correct color table will now be attached to this drawing.***

For EFLHD employees, color tables are automatically attached while opening a design file using the Project Configuration (*.pcf). If the correct color table is not displaying, contact CADD support to have this setup.

Workflow 2: Attaching the Color Table Permanently

1. *To attach the correct color table more permanently, select Workspace>Configuration... from the main Microstation pulldown.*

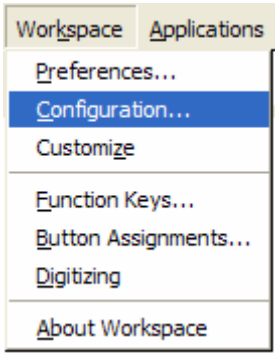

Figure 7-5: Workspace Menu

2. *From the workspace configuration dialog box, select colors.*

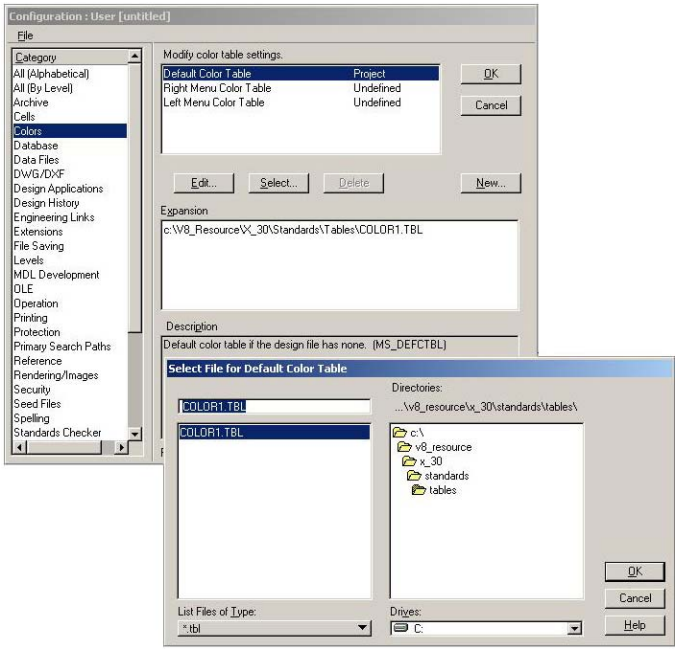

Figure 7-6: User Configuration

3. ***Highlight Default Color Table from the upper right window on the palette. Click on the select button and select the correct color table, color1.tbl. Once selected, click the OK button. This will prompt an alert from Microstation, asking if you really want to save changes to your .ucf file (user configuration file).***

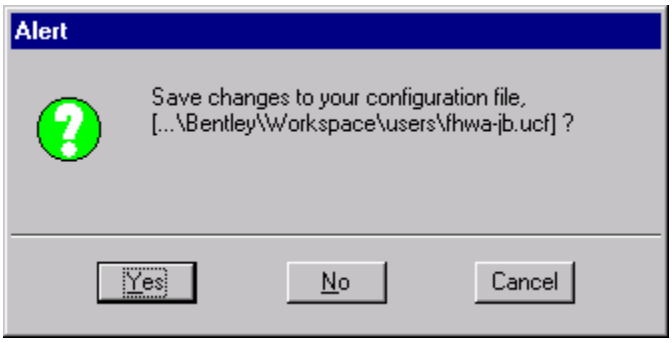

Figure 7-7: Alert Dialog Box

4. ***Choose Yes and the color table will be attached each time Microstation is launched. For all configuration changes, exit Microstation and re-enter for the changes to take affect.***

CAUTION

Workflow 2 - Attaching the Color Table Permanently is for information only. EFLHD designers should not manually attach or edit configuration variables. For EFLHD, the CADD Coordinator sets the configuration variables.

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Chapter 8 Cell Libraries

About EFLHD Cell Libraries

The cell libraries currently in use at EFLHD contain signs, figures, symbols, borders, title maps, etc. The cell libraries have been organized based on cells types within the libraries. This, in most cases, will prevent the user from having to search through many cells to find the desired one.

New to Microstation V8, 2004 Edition

New in Microstation V8 2004 is the file format of cell libraries. Cell libraries now have the same format as .dgn files, making it much easier to edit and create new cells. Also new, is that the restrictions on placing 3D cells in 2D drawings has been removed. 3D and 2D cells may now be placed in any drawing, and you can have both 3D and 2D cells in the same cell library.

This chapter contains information about the EFLHD cell libraries including:

- Names of cell libraries
- Description of each cell library
- Locations of cell libraries, both internally and for consultants

There are also helpful workflows for using these cell libraries placed throughout this chapter, including attaching cell libraries, using cell selector, and defining variables within Microstation to make finding cells and cell libraries easier.

EFLHD Cell Libraries

At EFLHD there are currently 3 cell libraries for general use. The EFLHD cells have been divided into cell libraries based on the type of sheet the cells will most likely be used on. See the table below for a list of cell libraries and a short description of each.

Cell Libraries	
File Name	**Description**
eflhd_engborder.cel	English Borders used by EFLHD
eflhd_EngCell.cel	EFLHD cel
eflhd_MAPS.CEL	All states USA maps
eflhd_SIGN.CEL	All Signs (MUTCD, NPS etc)
FLH_Criteria.cel	FLH criteria cel
Work_dd.cel	WFLHD cel

Table 8-1: Cell Libraries

The cell libraries for the x30 generation of standard files are in the process of being updated. Please check back often as they will be added to the website as completed.

These cell libraries are to be used on all EFLHD projects and are located on the EFLHD network at:

M:\Cadd_resource_v8\X_30\Standards\Cell_Lib

For consultants, EFLHD cell libraries are available through the **CADD_Resources_V8.zip** download.

These cell libraries are not to be edited by anyone other than EFLHD CADD support. If you have suggestions for new cells, edits to existing cells, or general suggestions regarding the EFLHD cell libraries please address these to EFLHD CADD support as detailed in Chapter 1.

Workflow 1: Attaching EFLHD Cell Libraries

1. ***For EFLHD consultants, begin by downloading CADD_Resources_V8.zip from the EFLHD web site. As the cell libraries are specific to EFLHD projects, the user should leave the libraries in the M:\Cadd_resource_V8\X_30\Standards\Cell_Lib directory.***
2. ***From the Microstation drop down menu's, select Element>Cells.***

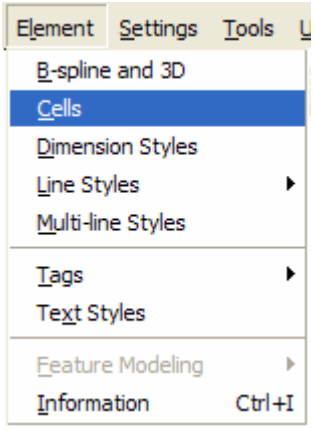

Figure 8-1: Element Menu

3. ***The cell library palette will now be accessible. Select File>Attach, and navigate to the correct cell library.***

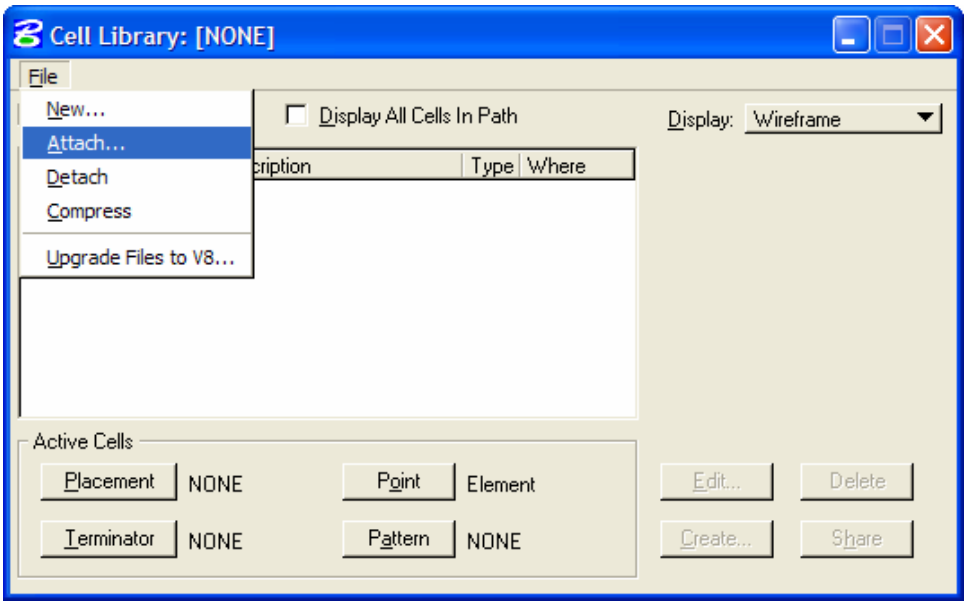

Figure 8-2: Cell Library Dialog Box

4. ***Once selected, the cells will be visible in the windows on the Cell Library palette.***

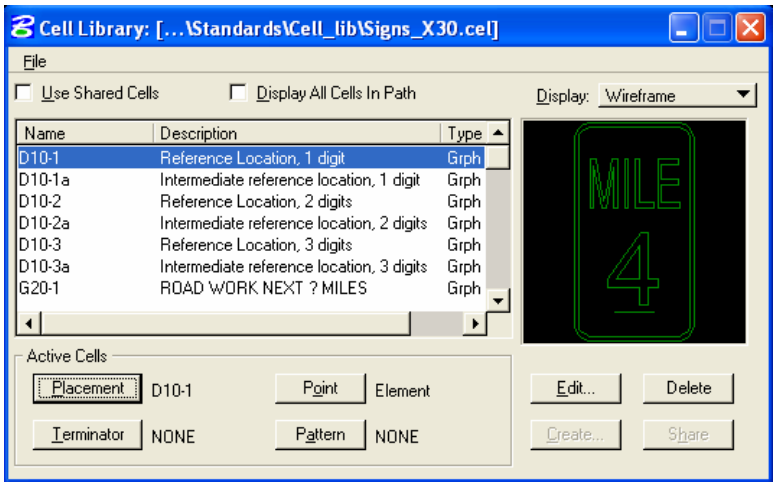

Figure 8-3: Populated Cell Library Dialog Box

Project Specific and Personal Cells

There is often a need for an individual user to create cells during the course of a project for things such as:

- Creating standards notes to be used on multiple sheets.
- Copying information from sheet to sheet.
- Copying information for another user within the project.

While these are valid reasons for creating cells, they must not be placed within the EFLHD standard cell libraries listed above. In these cases, simply create a new cell library and create the new cell there. Once the information has been used the temporary cell library may be deleted, or the temporary cells within the cell library may be deleted. See workflow 2 below, for information on creating new cell libraries.

Workflow 2: Creating a New Cell Library

1. ***Access the cell library palette as shown in Workflow 1. From the cell library palette, select File>New***

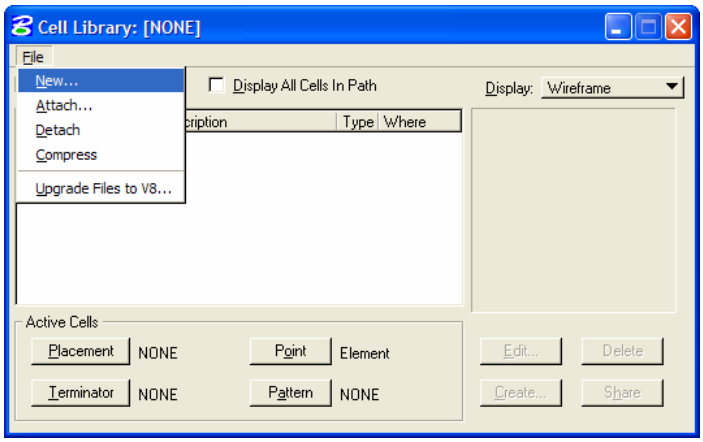

Figure 8-4: Cell Library Dialog Box

2. ***Pick a path to the directory where the cell library is to be created.***

3. ***Type in a name for the new cell library.***

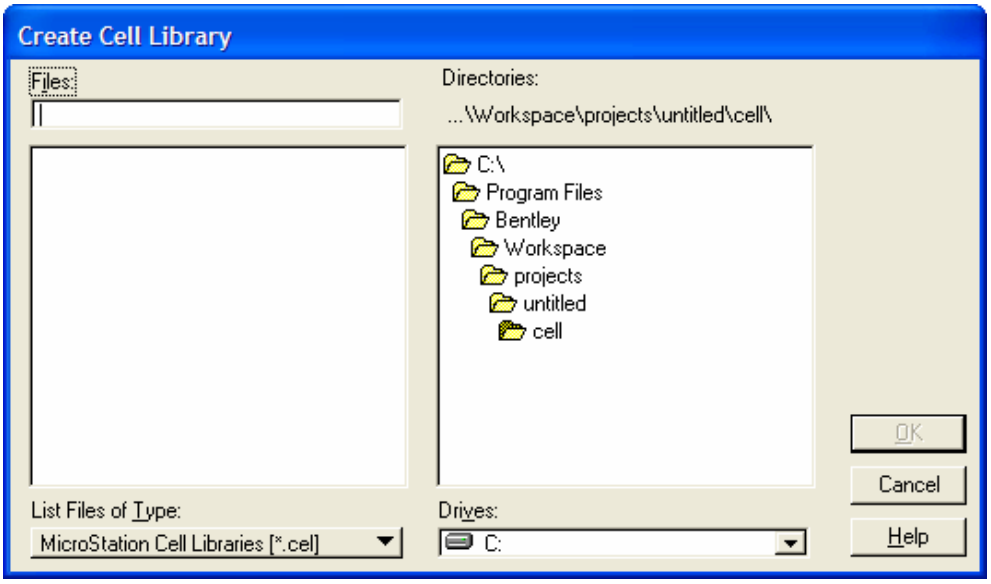

Figure 8-5: Create Cell Library Dialog Box

4. ***Once the new name has been given, the OK button will activate. Select OK and the new cell library will be attached.***

Microstation Cell Configuration Variables

There are several configuration variables that will make the selection of cell libraries easier. The list below shows these variables and a brief description.

- Cell library directories — Where Microstation will look first for cell libraries.
- Cell library list — The list of cell libraries to be shown in the **File** pull down. (Shown below)
- Output cell libraries — Default directory where new cell libraries are placed.

For EFLHD employees, cell libraries are automatically attached while opening a design file using the Project Configuration (*.pcf). If the correct cell libraries are not displaying, contact CADD support to have this setup.

Workflow 3: Modifying Cell Library Configuration Variables

1. ***From the Microstation pull down menu's, select Workspace>Configuration.***

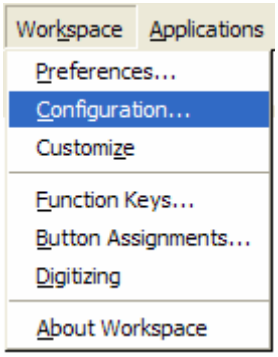

Figure 8-6: Workspace Menu

2. ***From the workspace configuration palette, select cells from the category list on the left side of the dialog box.***

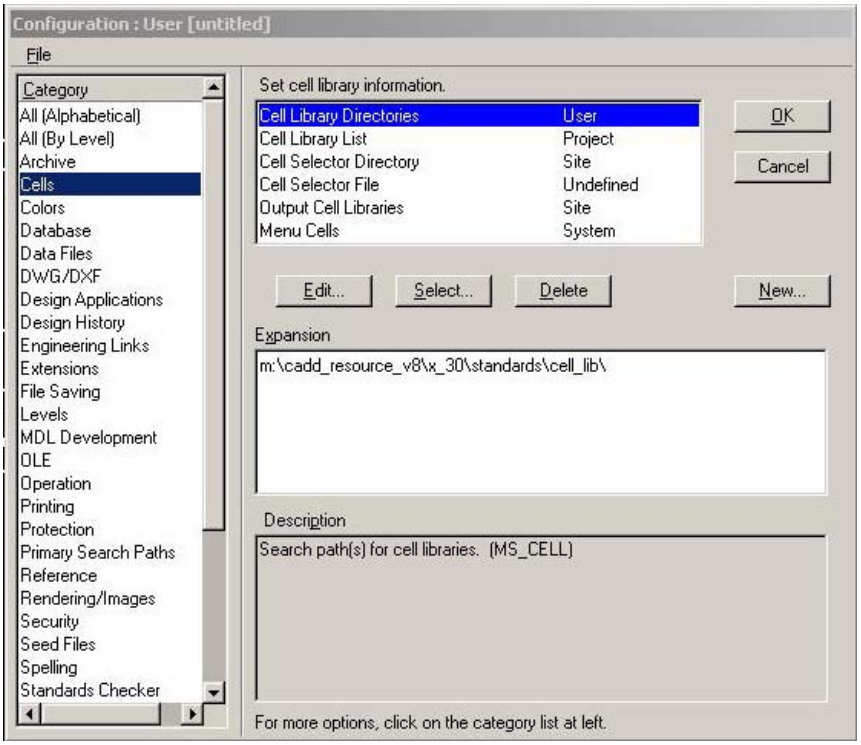

Figure 8-7: Configuration Dialog Box

3. ***Highlight the Cell Library Directories and press the Select button. The default Microstation directories may be listed in the directory list, as shown below. Highlight these directories and click on the Remove button.***
4. ***Path to the directory where the EFLHD cell libraries are stored. Once the directory is displayed, press the Add button. After the correct directory populates the directory list, select the Done button to return to the Configuration dialog.***
5. ***Repeat steps 3 and 4 to set the Output Cell Libraries variable.***

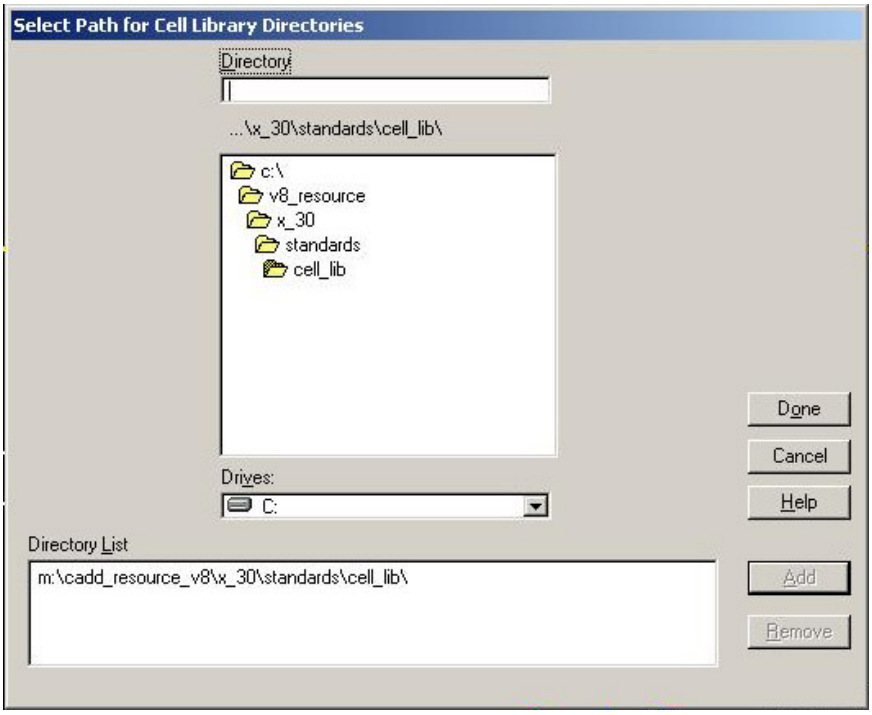

Figure 8-8: Cell Library Path Dialog Box

6. ***Highlight the Cell Library List variable and press the Select button.***
7. ***Select the directory where the EFLHD cell libraries are stored. When the directory has been selected, the available cell libraries will be displayed.***

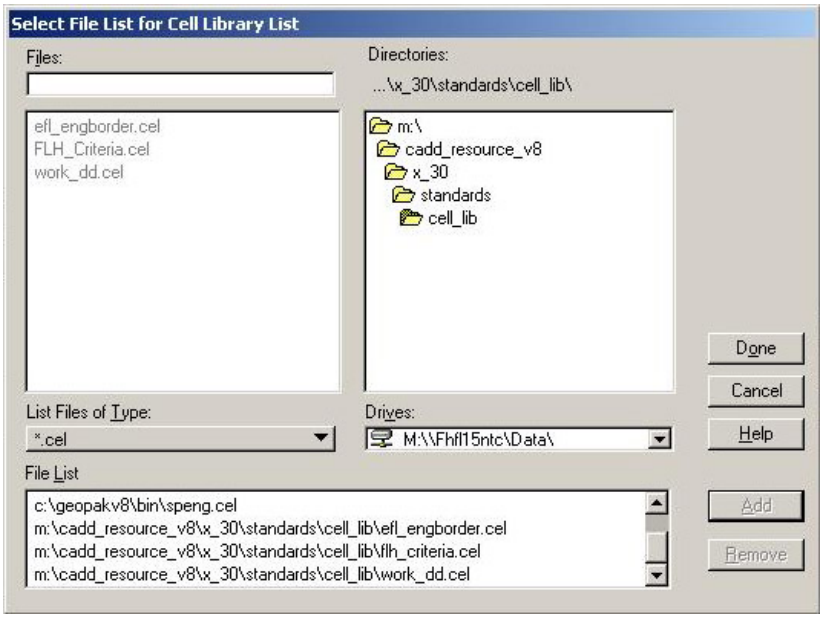

Figure 8-9: File Selection List for Cell Libraries

8. ***Double-clicking the desired cell library, or highlighting the desired cell library and selecting the Add button will place the cell library in the File List box at the bottom of this dialog. Select the cell libraries that the user most commonly uses. When finished select the Done button.***
9. ***At the Configuration dialog box, select OK, to accept the changes that were made.***
10. ***Microstation will ask if changes to the configuration file should be saved, answer by selecting the Yes button.***
11. ***After changing configuration variables, you must exit Microstation and re-enter for these changes to take affect.***

Workflow 3 will allow user level configuration, which is not the recommended method for the X30 standard files.

Workflow 3 – Modifying Cell Library Configuration Variables is for information only. EFLHD designers should not manually attach or edit configuration variables. For EFLHD, the CADD Coordinator sets the configuration variables.

As described at the beginning of this chapter, cell libraries now have the same file format as **.dgn** files, and may be opened and edited the same as a **.dgn** file. As shown in the figure below, there is now a filter for opening **.cel** files through the Microstation Manager dialog box, as well as the standard **file>open** dialog.

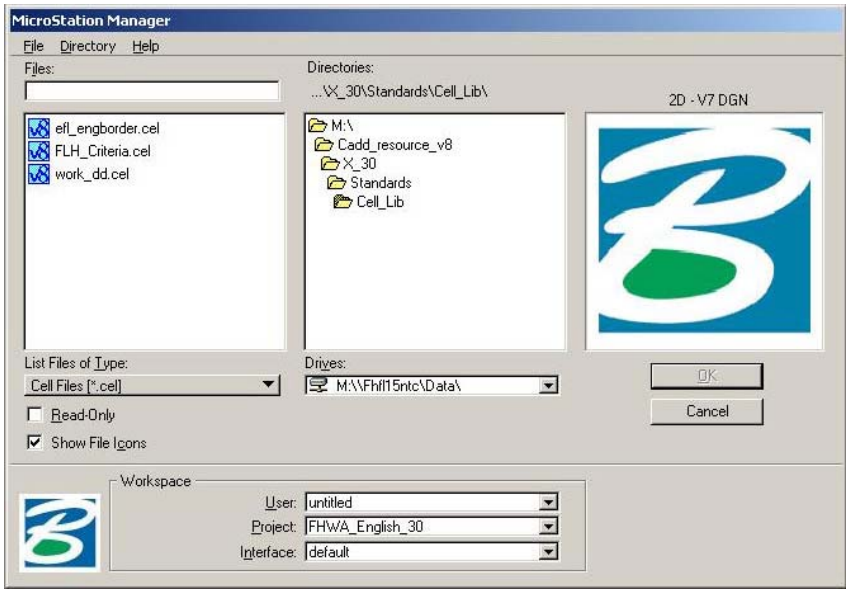

Figure 8-10: MicroStation Manager Dialog Box

Once the cell library is opened, each cell will be contained in its own model. From the models dialog box shown below, arrows, concrt, earth, etc. are cells within the cell library. As such they may be edited in this file, and new cells may be created here as well.

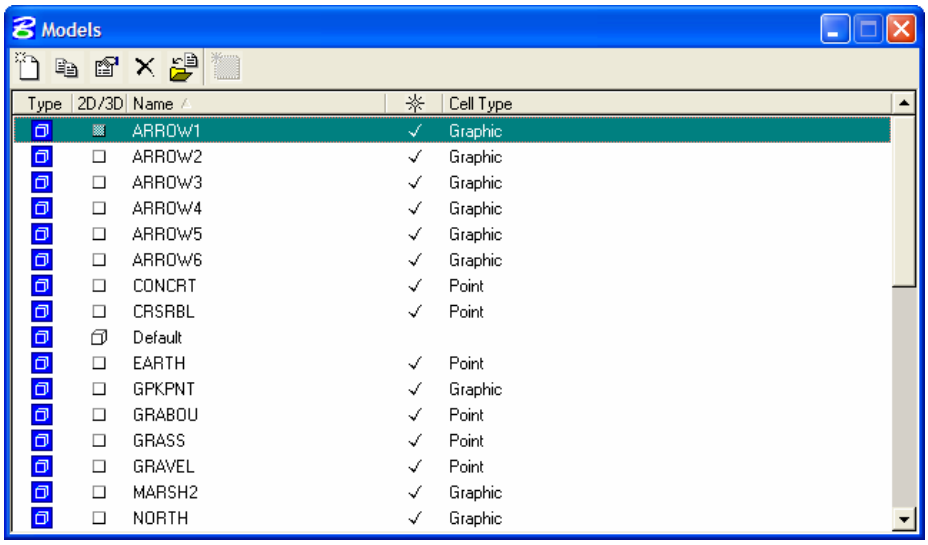

Figure 8-11: Models Dialog Box

When creating cells in the cell library create a new model and begin drawing. When finished, the resulting drawing created in the new model will be a cell.

Workflow 4: Creating a New Model

1. *From the Microstation pull down menu's select File>Models*

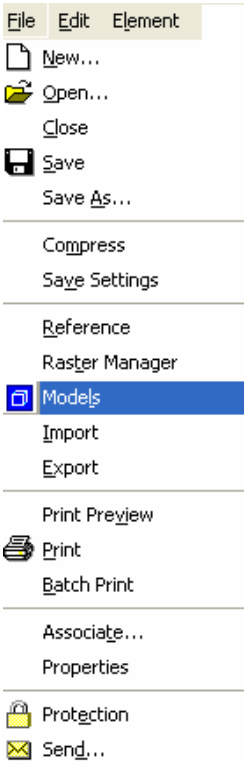

Figure 8-12: Models Menu

2. *From the models dialog box select the Create a new model icon.*

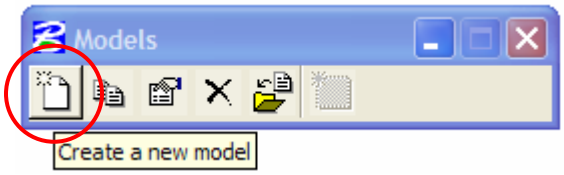

Figure 8-13: Models Dialog Box

3. *Once selected, the following dialog box will activate.*

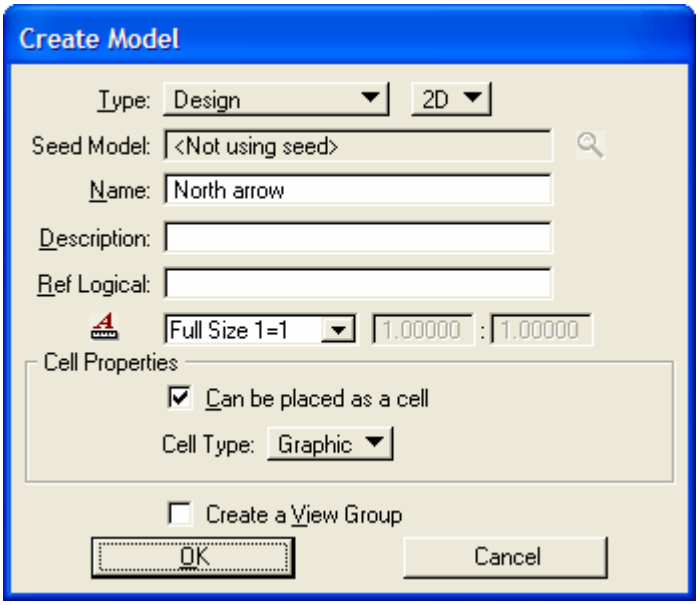

Figure 8-14: Create Models

4. ***Fill in the dialog box as above with the exception of Name. The name field is the desired name of the new cell. Select OK.***
5. ***You will now be in the new cell, named North arrow in the example above.***
6. ***Begin drawing your new north arrow as desired.***

The newly created north arrow is now a cell within the cell library. It will be available when accessing the cell library from any drawing.

Due to the new format of cell libraries, creating new cells in Microstation V8 is as easy as creating a new model in the cell library and drawing the new elements. However, it is important to remember that creating a cell in this manor will not automatically place the origin. In creating cells this way the origin will always be at the coordinates of 0,0. Create the drawing at these coordinates or when finished select the entire cell and move to the correct origin by selecting the move command, issuing a data point at the desired origin then, in

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Chapter 9 Levels and Symbology

Overview

Symbology includes which level, color, line style, and weight are associated with each element to be drawn. Following the symbology outlined in this chapter is essential for several reasons, but perhaps the most important reason is the standardization of the final output. Following the standard symbology will ensure that each element, line work, text, etc., will plot the same from drawing to drawing.

This chapter will detail the levels in use at EFLHD, the associated level symbology, the use of the EFLHD DGN library, and EFLHD level filters, including workflows for many of the new Microstation 2004 Edition tools.

Levels

Within Microstation 2004 Edition, a design file may contain an unlimited number of levels in which data may be displayed. There are two primary ways in which to assign symbology to each element: first, the color, weight, and line style of the graphic elements are set independently. Second, a new addition introduced in Microstation V8, is **ByLevel** symbology. With ByLevel symbology each level may have a pre-assigned color, line style, and weight. By selecting the desired level, these attributes are automatically set.

As discussed above, the level symbology for any level may be set individually. This includes the ability to set some attributes of elements to ByLevel and other attributes independently. More levels are used by EFLHD in Microstation 2004 than the 63 available in previous versions.

While some manual drafting is necessary and expected, most elements should be placed with the GEOPAK D&C manager, the **.ddb** file. This is the best way to insure that elements are placed with the proper symbology, for final output and for use at later stages for GEOPAK criteria files and for computing quantities.

DGN Libraries

In Microstation 2004, levels and the associated ByLevel symbology are stored in a DGN library, and may be attached to any Microstation file. In order to maintain the X30 criteria and future versions of Geopak criteria files, *FLH_Combined.dgnllib* is controlled FLH wide. EFLHD

designers and consultants will not be able to add new levels to the *FLH_Combined.dgnllib* file.

DGN libraries may also contain information for text styles and dimension styles. See the appropriate chapter for these tools. The workflow below outlines how to attach levels contained in the DGN library to the current file.

For EFLHD employees, the standard DGN Library will be automatically attached while opening a design file using the Project Configuration (*.pcf). Workflow 1, shown below, can be used to manually attach the DGN Libraries to a design file.

Workflow 1: Attaching a level library

1. ***Open the Level Manager by selecting the icon in the Primary Tools tool bar, or by selecting Settings>Level>Manager.***

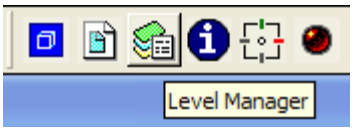

Figure 9-1: Accessing Level Manager

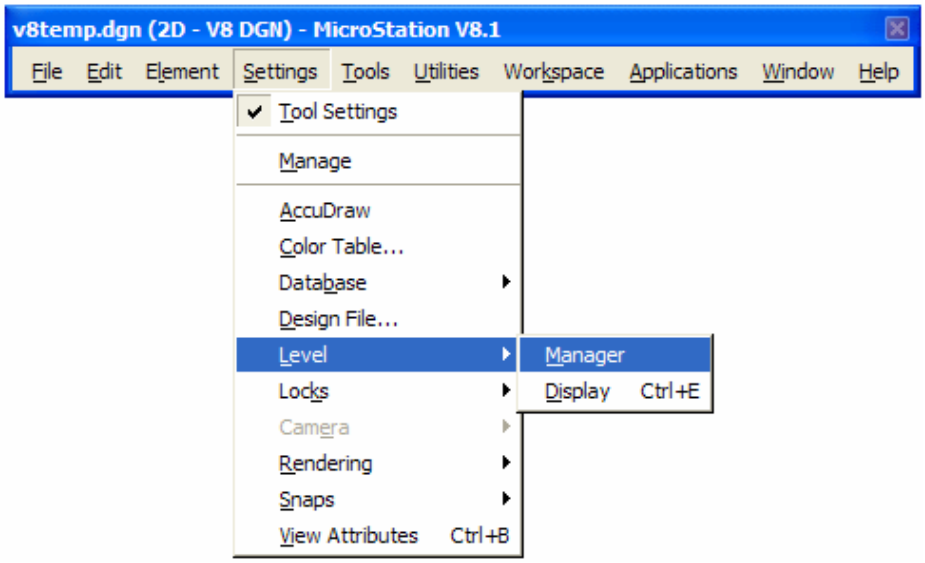

Figure 9-2: Accessing Level Manager

2. ***Notice the dialog that is activated has only one level shown, Default. These are also no level filters available.***

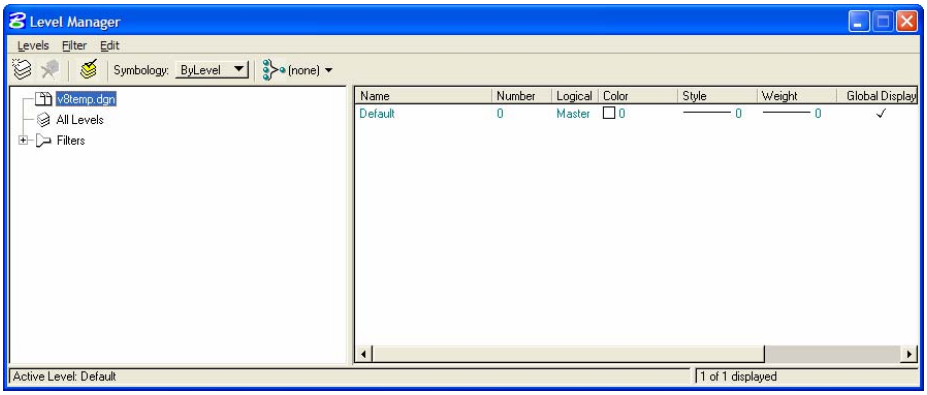

Figure 9-3: Level Manager

3. Select Levels>Library>Attach.

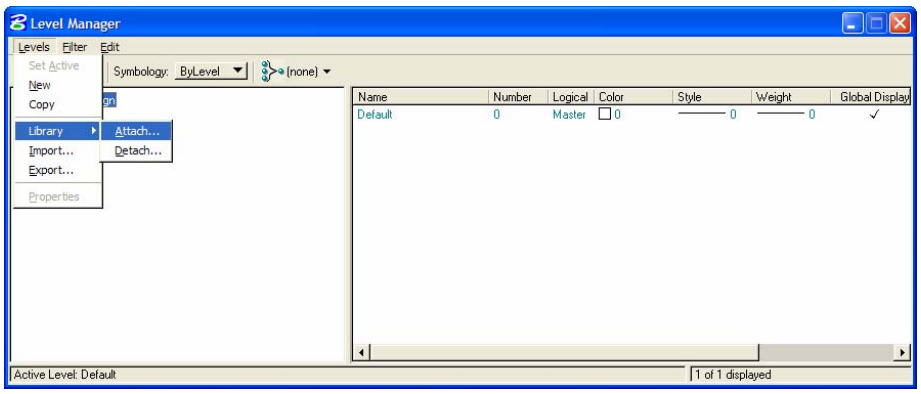

Figure 9-4: Attaching DGN Library

4. Browse to the file FLH_Combined.dgnlib, select OK.

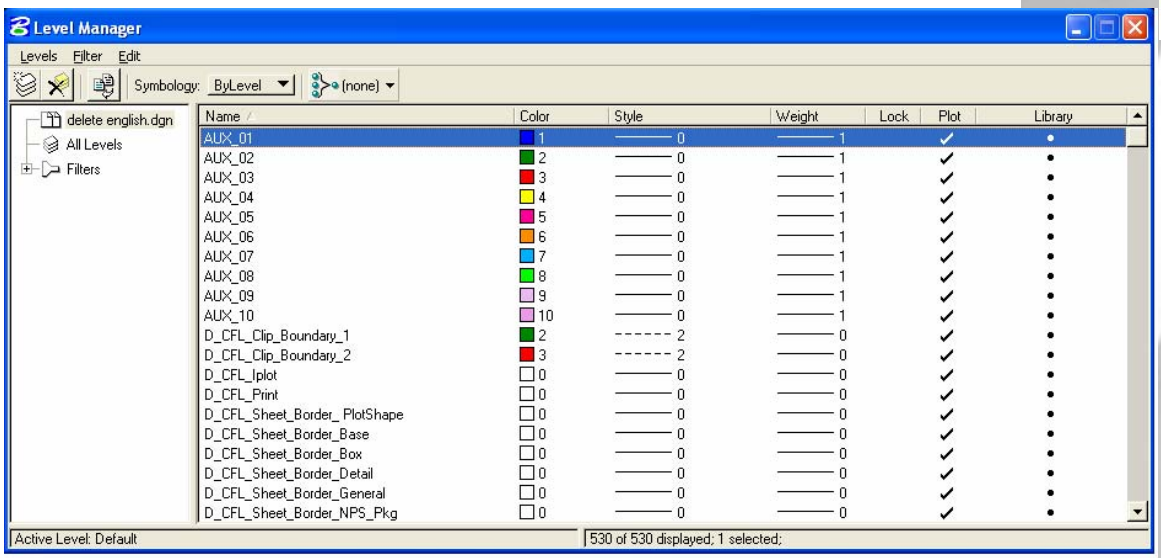

Figure 9-5: Level Manager with DGN Library Attached

Level Filters

Also new in Microstation 2004 are **level filters**. With an unlimited number of levels it could easily become very cumbersome to navigate to the desired level. Level filters are designed to group levels together creating a more manageable set of levels. For example the FLH levels have been broken down to Design, Cross_Sections, and Survey.

Selecting the appropriate filter will display only the desired levels. This does not turn the display of levels on or off, but simply allow the user to work with a smaller sub-set of levels.

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Chapter 10 Batch Printing

About Batch Printing

Batch printing is a MicroStation utility used to print and re-print sets of drawings. Job sets are created containing the desired drawing files and a set of print specifications are created for each job set. The print specifications are defined containing information such as printer, print area, layout, and display. This chapter will detail each of the necessary settings associated with Batch Printing.

Workflow 1: Accessing Batch Printing

1. *From the main MicroStation pull-down menus, select File>Batch Print.*

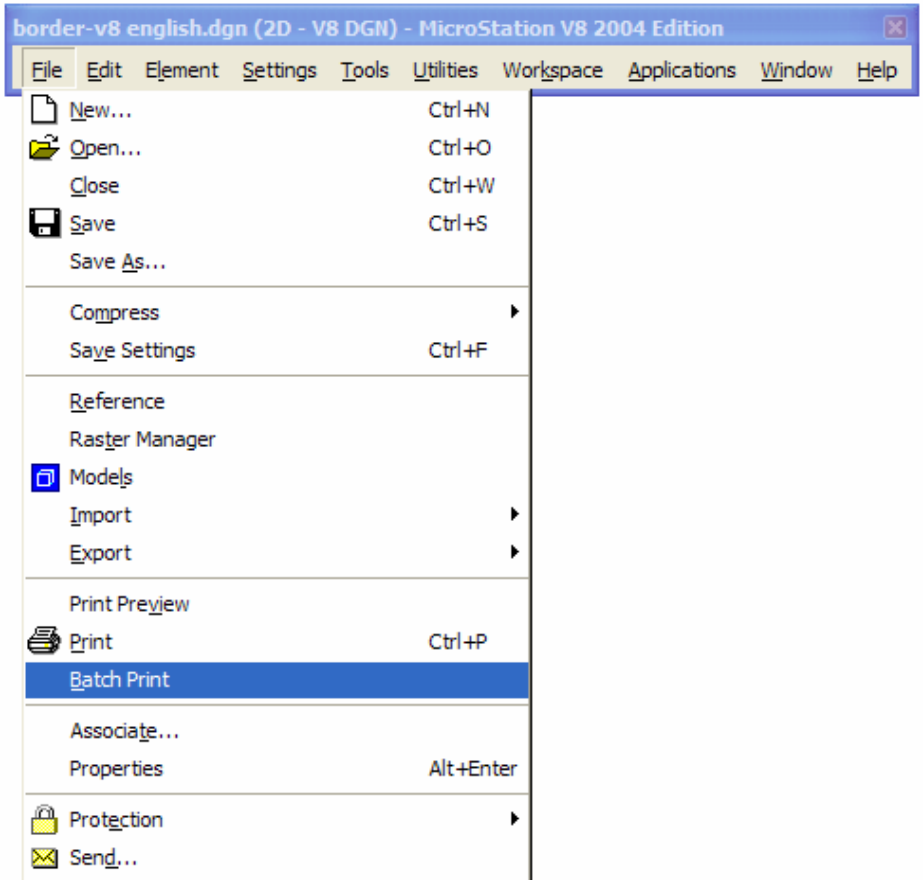


Figure 10-1: File>Batch Print

2. *Once selected the Batch Print dialog box is activated. The top bar on this dialog will show the current Job Set. Shown below as [Untitled]. Once a new Job Set is created or an existing Job Set is opened the name will replace [untitled].*

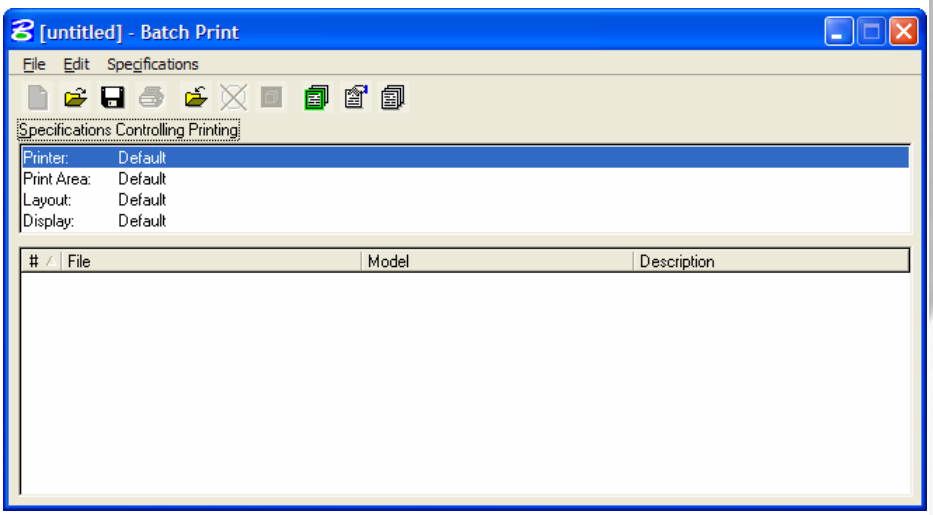


Figure 10-2: Batch Print

3. *To open an existing job set select File>Open and select the desired job.*

Job Sets

Job Sets are lists of files to be printed, along with the associated print specifications used to print the files such as which printer, what area to print, what scale, which pen table, etc. Each job set created will have the extension, **.job**.

Workflow 2: Creating a New Job Set

1. *The user must first select the design files to be added to the Job Set. Select Edit>Add Files…*

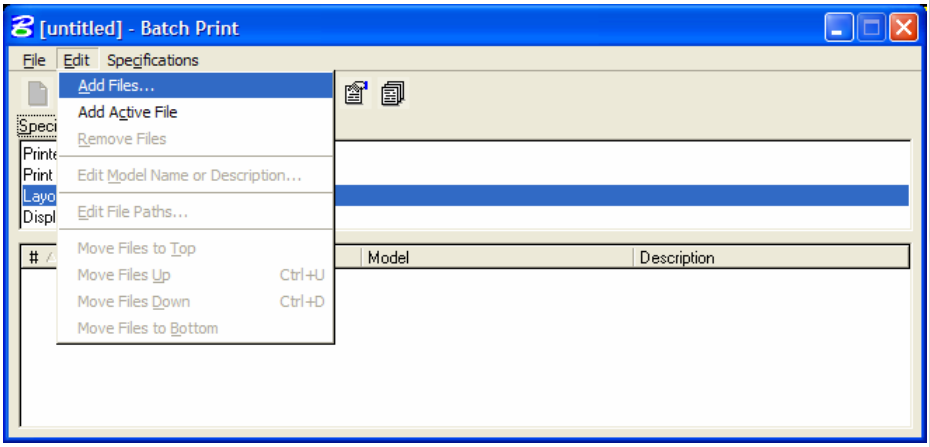


Figure 10-3: Add Files pull down menu

The user may also alternatively select the Add Design Files icon, as shown below.

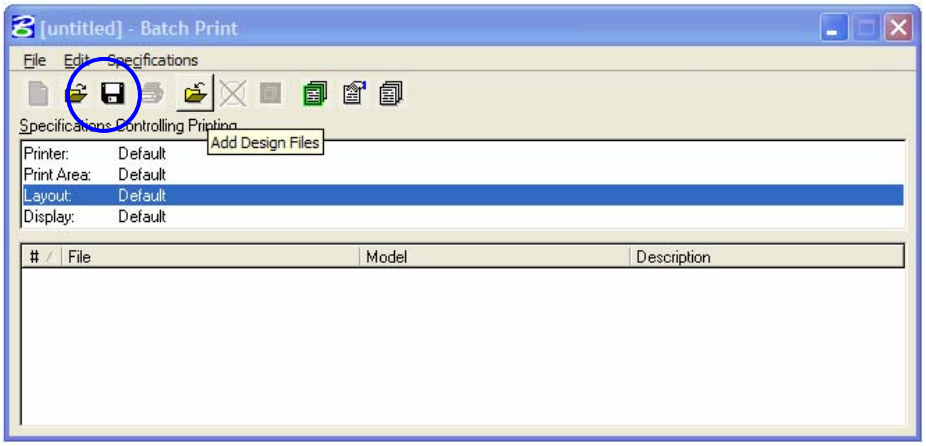


Figure 10-4: Add Files icon

2. *Once selected the following dialog box will activate.*

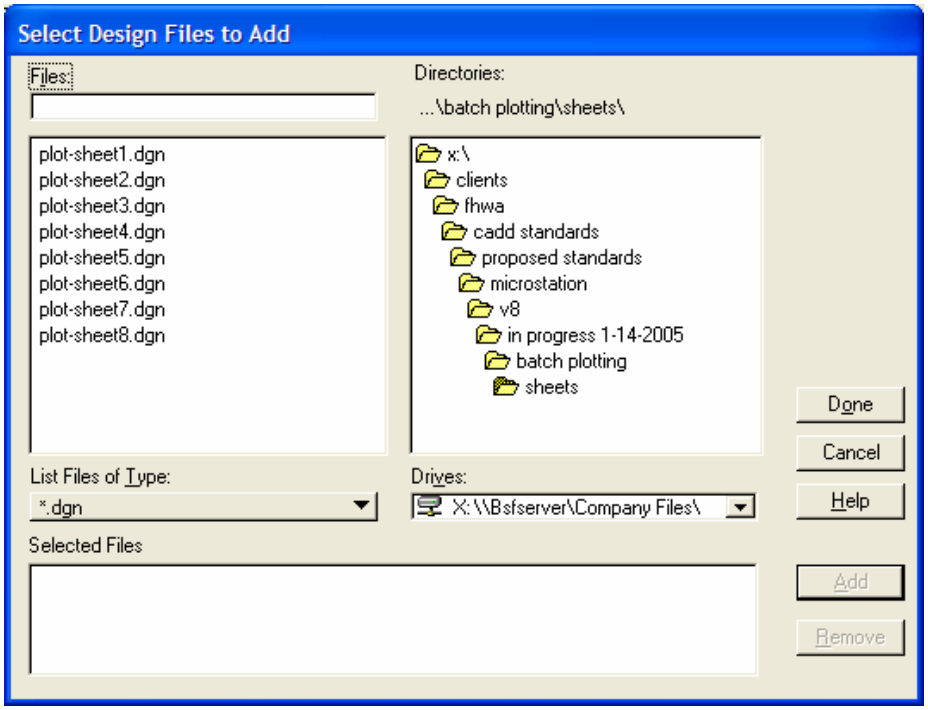


Figure 10-5: Select Files to Add

3. *Select the desired directory from the upper right Directories box. Once you have navigated to the correct directory, select the desired files from the upper left Files box. You may select multiple files by using the control or shift keys while selecting.*
4. *After selecting the desired files, the Add button will be active. Select the Add button and the selected files will be populated in the selected files box at the bottom of the above dialog box.*
5. *Once complete, select the Done button.*

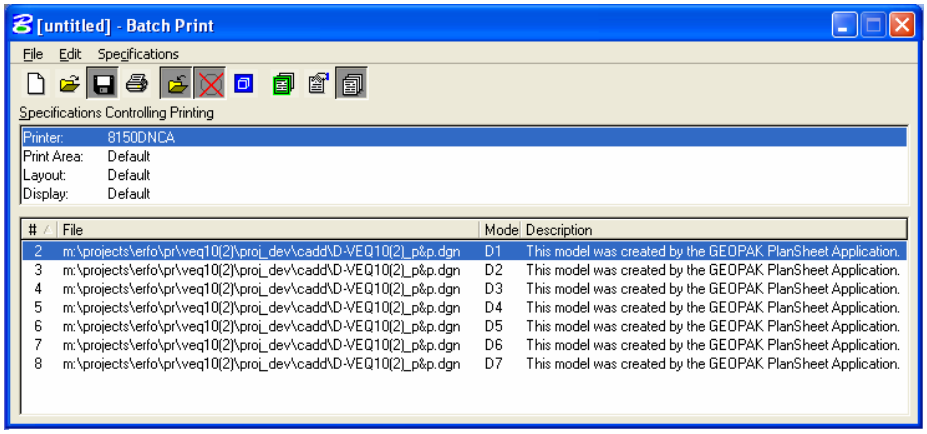
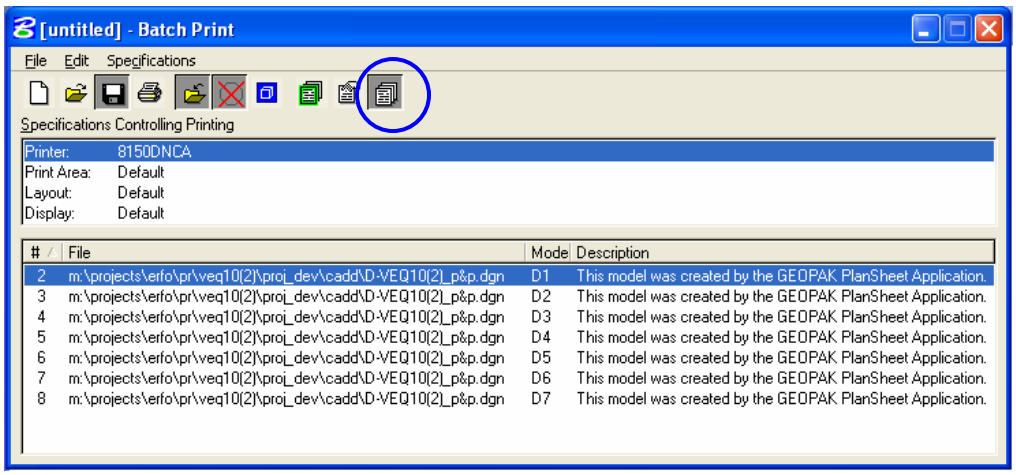


Figure 10-6: Files Added to Job Set

6. *Once the desired files have been selected you may now set the plot specifications. These specifications tell MicroStation how to plot the selected files.*

7. *Select Specifications>Manage, or select the Manage Specification icon, as shown below.*



8. *Once selected the following dialog box will activate.*

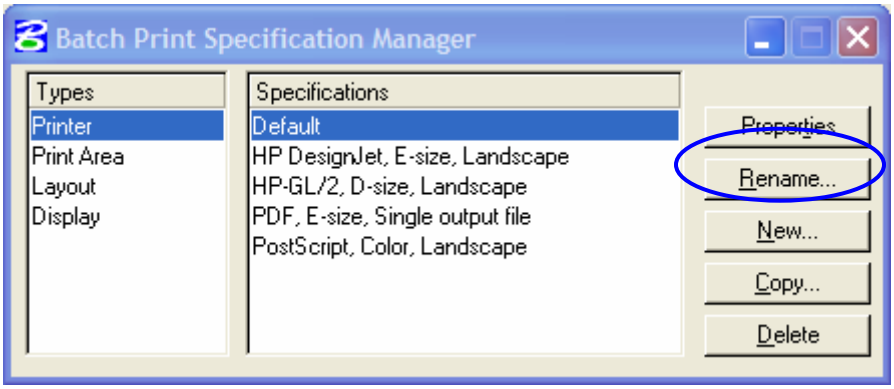
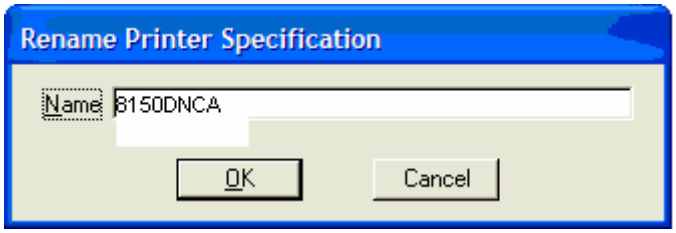


Figure 10-7: Rename Printer

9. *Begin by renaming the default printer to be a more descriptive name. Select Rename, the following dialog box will activate. Give a descriptive name, shown as 8150DNCA below, and select OK.*



10. *Once renamed highlight the printer on the left and the newly renamed 8150DNCA on the right and select Properties.*

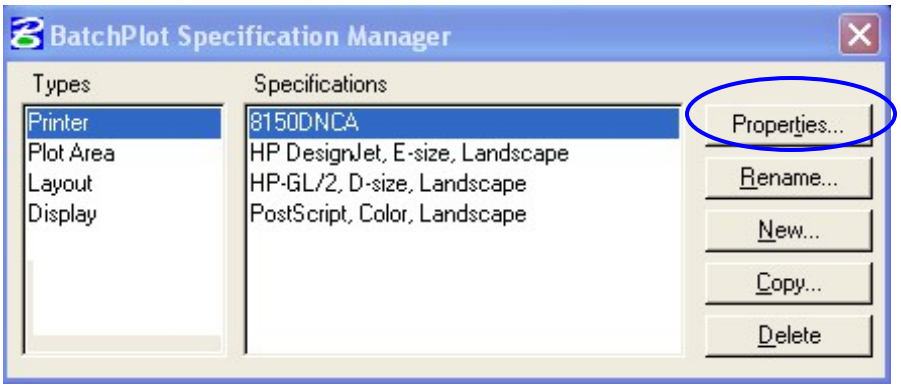
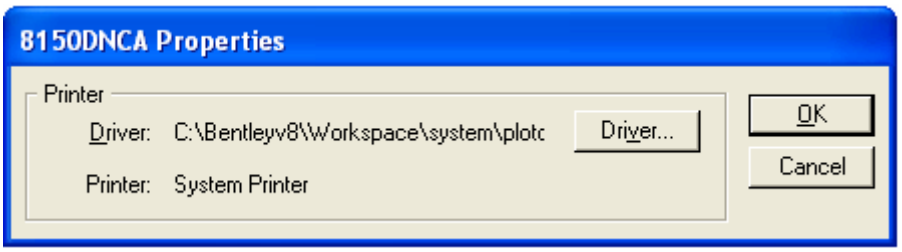


Figure 10-8: Specification Manager

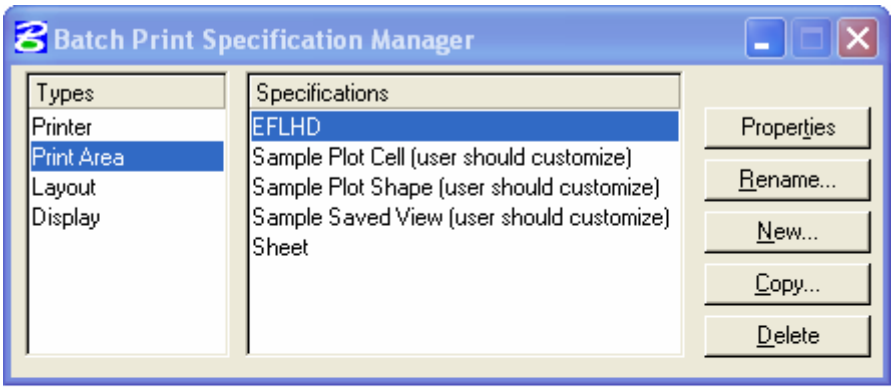
11. *Once selected the following dialog box will activate allowing the user to select the desired printer driver. Select the driver and choose OK.*

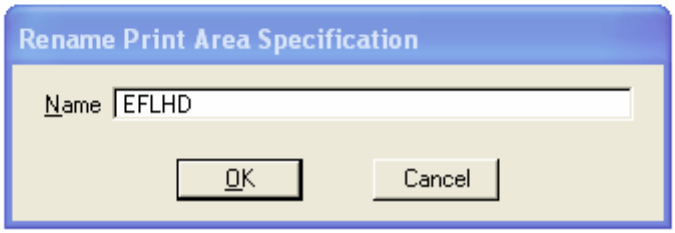
In most cases the EFLHD user will want to select one of the plot driver files found in the m:\cadd_resource_v8\Plotting\plotdrv\ directory in order to achieve special plotting effects such as shading contours or p&p sheet grids.



12. *The next step will be to set the desired print area. Using the EFLHD standard sheet border cells will ensure that a plot shape will be available to define the area to be plotted for each sheet. Included with each border is a plot shape on level D_Plot_shape that has been created as a construction element so it will not plot unless desired.*

13. *As with step 9 above, rename the Print Area specification to be more descriptive, shown below as EFLHD.*





14. *Once renamed select Properties.*

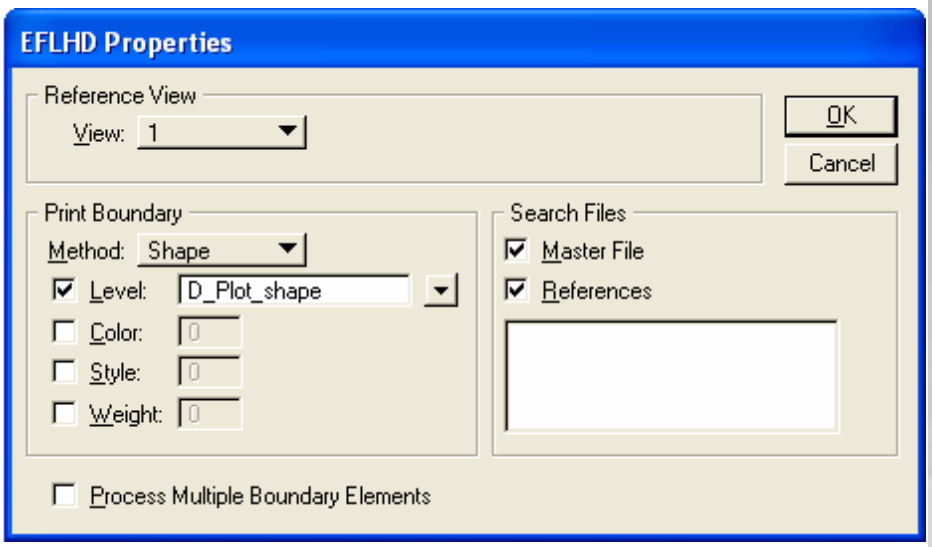
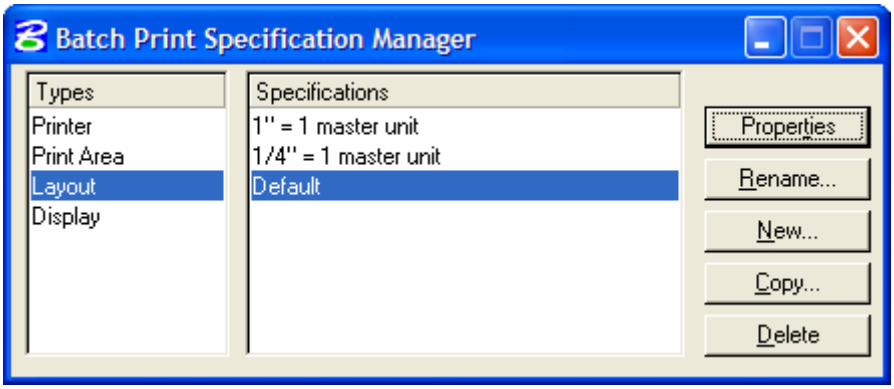


Figure 10-9: EFLHD Plot Properties

15. *The print area properties dialog, shown above, allows the user to select the attributes of the plot shape and to look for the plot shape in either the master file, reference files, or both. If any of the design files to be plotted has more than one sheet then check the Process Multiple Boundary Elements box at the bottom of the properties dialog*

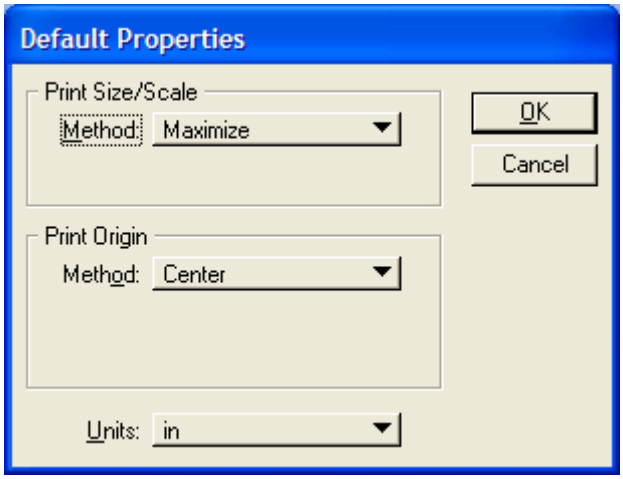
The level of the plot shape must be typed in. The drop-down box will only include the levels in the master file, as the list could get quite long.

16. *Select the attributes of the plot shape and click OK. When selecting the References check box the box below becomes active to allow the user to select certain reference files by logical or file name. If this box is left empty all of the reference files will be searched.*
17. *From the Batch Print Specification Manager dialog box select Layout.*

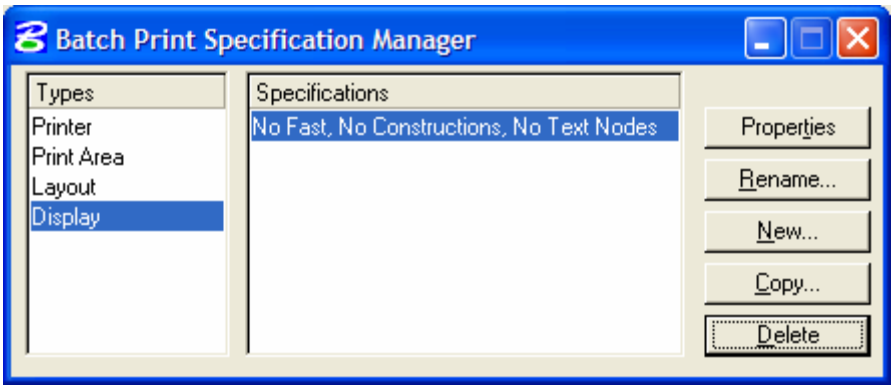


18. *Select Default from the right hand box and then select Properties. For layout, the name (default) may be renamed if desired however there may be little need to change these specifications so default may be fine.*

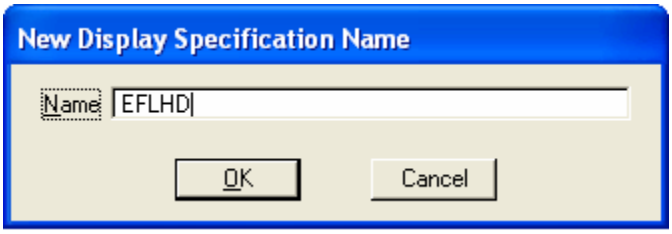
If a EFLHD standard sheet border cell is used and the Print Boundary Method is set to Shape as outlined in steps 12 and 13 above, always setup the Properties as shown below.



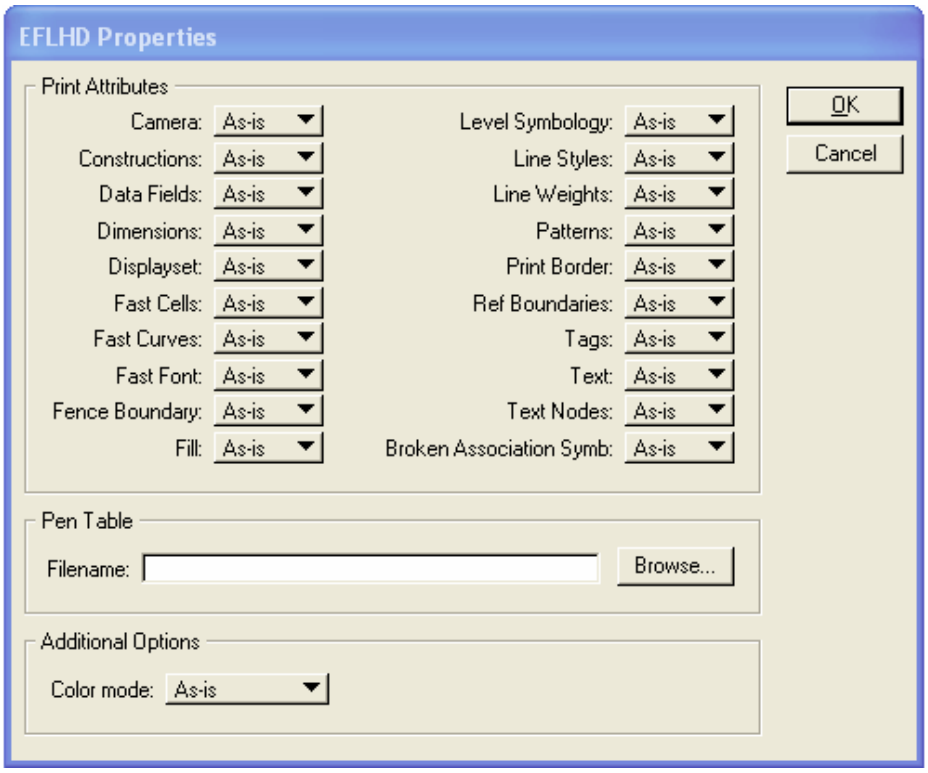
19. *Select Maximize, Center, and the correct units and select OK.*
20. *From the Batch Print Specification Manager dialog box select Display.*



21. *Select New to create a new set of specifications. Input a new name and click OK.*



22. *Select the new name from the right hand box and then select Properties.*



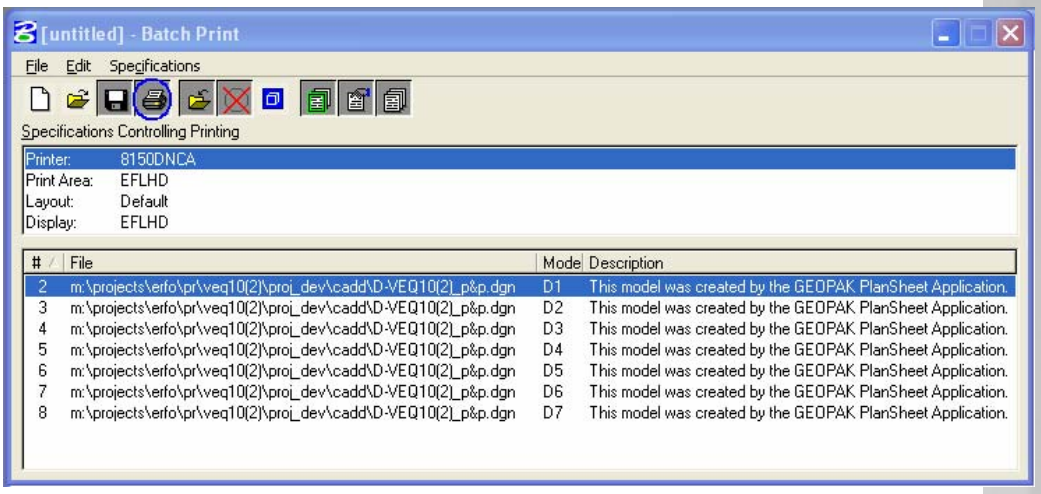
23. *The display dialog is similar to the view attributes dialog box, but is specific to printing. In MicroStation 2004 Edition you have the ability to plot with attributes different than the current view. From this dialog box you also have the ability to specify a pen table.*

EFLHD users will, in most cases, want to specify a pen table here in order to implement special plotting features such as shading certain plotted elements (e.g., P&P sheet grids, contours) or labeling the plot with the plot date and time. The standard EFLHD pen tables can be found in the M:\Cadd_resource_v8\Plotting\pen_tables\directory.

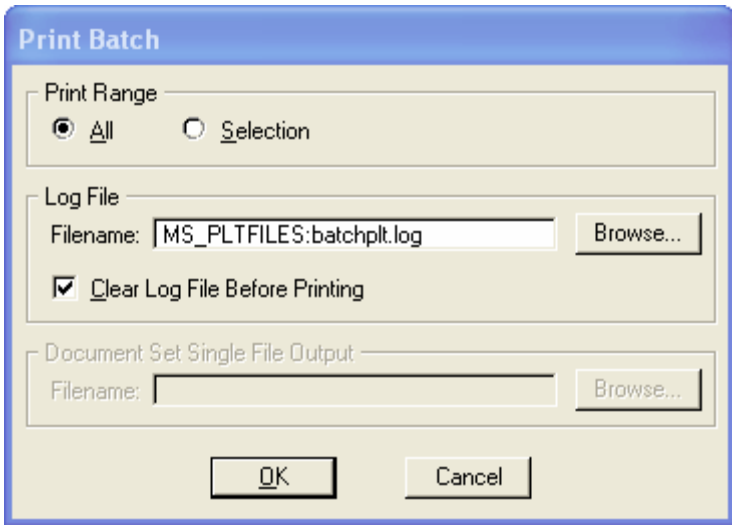
24. *From the example above we have turned Constructions, Print Border, and Ref Boundaries Off. This allows us to use these features during our work but not to plot them.*
25. *Select the desired attributes and select OK.*
26. *Close the Batch Print Specification Manager by selecting the X in the upper right corner.*
27. *Once the files have been added and the specifications set, select File>Save. This will save all of the settings in a Job Set file with a .job extension. Job Set files may be stored in any convenient directory. There is no standard or default directory where batch print looks for these files.*

Workflow 3: Printing

1. *If reprinting a previously saved Batch Print Job Set use File>Open in the main Batch Print dialog pull down menus to select the .job file for that Job Set. This will populate the dialog with the files to be printed and the associated print specifications. If continuing directly from Workflow 2 above (Creating a New Job Set) then skip this step.*
2. *From the Batch Print dialog, shown below, select the printer icon.*

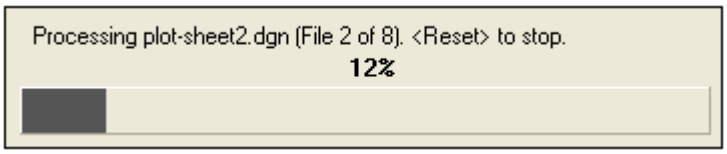


3. *The Print Batch dialog will activate.*



4. *From this dialog box the user can select a print range, and log file.*

5. *Select OK and the files will be sent to the printer. A status bar will be displayed during the process, as shown below.*



EFLHD Internal Ploting

At EFLHD there are several plot drivers and pen tables for both 11x17 and 8 ½ x 11 and for both color and black and white. Listed in the tables below are the plot drivers (**.plt**), the pen tables (**.tbl**) that are automatically attached, and the output produced for each combination.

For Print Sheet:

11"x17" / 8½" x11" Black-and-White Sheets (Metric and English)

Plot driver files location:
M:\Cadd_resource_v8\Plotting\Plot_Driver\plt_lpt1\e_lpt1.plt
M:\Cadd_resource_v8\Plotting\Plot_Driver\plt_lpt2\e_lpt2.plt
Example: Use this driver for all plan sheet except p&p Sheets and Cross Section Sheets.

11"x17" / 8½" x11" Shaded Black-and-White Sheets (Metric and English)

Plot driver files location:
M:\Cadd_resource_v8\Plotting\Plot_Driver\plt_lpt1\e_lpt1s.plt

M:\Cadd_resource_v8\Plotting\Plot_Driver\plt_lpt2\e_lpt2s.plt
Example: Use this driver for p&p Sheets and Cross Section Sheets.

For PDF File:

11"x17" / 8½" x11" Black-and-White Sheets (Metric and English)

Plot driver files location:
M:\Cadd_resource_v8\Plotting\Plot_Driver\PDF\eflhd_bw-pdf.plt
Example: Use this driver for all plan sheet except p&p Sheets and Cross Section Sheets.

11"x17" / 8½" x11" Shaded Black-and-White Sheets (Metric and English)

Plot driver files location:
M:\Cadd_resource_v8\Plotting\Plot_Driver\PDF\eflhd_shade&color-pdf.plt
Example: Use this driver for p&p Sheets, Cross Section Sheets, and all color sheet.

Pen tables: Appropriate pen table is automatically attached when the user selects the plotter driver file.

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These standards are intended for use with EFL .x30 criteria files

Chapter 11: GEOPAK Introduction

Purpose

GEOPAK 2004 Edition (GEOPAK), the civil engineering design software in use at the Federal Highway Administration's Eastern Federal Lands Highway Division (EFLHD), is complex software with many options to select from while working on projects for or at EFLHD. This manual is not intended to teach the novice user how to use GEOPAK, but rather how EFLHD intends GEOPAK to be used on EFLHD projects. As with any powerful software, and many complex processes, there are many different ways to accomplish a given task. This manual will outline the necessary procedures to ensure proper adherence to EFLHD standards for project design.

EFLHD is implementing new criteria files and a new generation of Microstation/Geopak standard files. This new generation is known as the X30 Generation of standard files, these files will need to be run using Microstation 2004 and Geopak 2004 Edition Typical Section Generator.

Overview of GEOPAK 2004

The GEOPAK 2004 Edition has been updated to take advantage of all of the new features of Microstation 2004 including level names, level filters, models, and true type fonts, as well as providing a more consistent look. In each of the following chapters we will outline the EFLHD standard as well as discuss the more pertinent new tools available.

Files Used

There are many types of GEOPAK files in use at EFLHD. In many cases you will use the default files delivered with GEOPAK, as these take their settings from the AASHTO green book. This chapter will outline the files used by EFLHD and GEOPAK, paying particular attention to those that are specific to EFLHD, which must be substituted for the default GEOPAK files.

.GPK	GEOPAK coordinate geometry file	Created the first time COGO is accessed. The EFLHD project manager will assign a file name to use.
.SMD	Survey manager database	Controls how survey information, feature codes, are interpreted by GEOPAK.
.SEP	Superevelation preferences	Controls how superelevation is calculated by GEOPAK
.PRJ	Project manager	Stores information for use by the GEOPAK project manager.
.DAT	Data file used to create .TIN	Contains string and point information used to create DTM's.
.TIN	Triangulated irregular network	Triangulation based on the points stored in the .dat file
.DDB	D&C manager database	Hierarchical database containing information concerning functional clasification and display preferences for each feature and item used in a MicroStation design file.
.X08, .X10	Criteria file	Previous version of EFLHD criteria files.
.X30	Criteria file	New version of EFLHD criteria files.

Table 1.1: GEOPAK Files

The following chapters discuss in detail where to find these files, how to attach them, and information that will be helpful on the use of EFLHD files.

Of the files listed above, the **.SMD, .SEP, .DDB**, and all criteria files, are specific to EFLHD projects and must be used in place of the GEOPAK defaults.

For the locations of the files listed above, see chapter 2, directory structures. For EFLHD consultants, see the EFLHD web site to download these files. EFLHD standard files required to run Geopak 2004 Edition Typical Section Generator is available through the download **CADD_Resource_v8.zip.** Detailed use of each of these files, as well as directions for finding or downloading is contained in the chapter relating to each tool.

The following GEOPAK chapters cover the topics listed below:

- User Preferences
- Project Manager
- Survey Manager
- DTM creation
- Design and Computation Manager
- Horizontal and Vertical Design
- Cross-Sections
- Plan & Profile Sheet Clipping
- Quantities
- Reports

Consultants working on EFLHD projects must download current versions of all EFLHD standard files at the start of each project. EFLHD standard files may be updated from time to time, however, files current at the start of each project will typically be used for the duration of the project. The COTR will notify the consultant if an updated file needs to be used during a project.

GEOPAK 2004 Tools

WFLHD has developed an extensive guide to using the Geopak 2004 software. The guide is called "The Complete Knucklehead's Guided Tour of Geopak 2004 Edition". This site contains tips, examples and procedures. Selecting the following link can access this guide:

The Complete Knucklehead's Guided Tour of GEOPAK 2004 Edition

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Chapter 12: GEOPAK Preferences

Purpose

GEOPAK Preferences control many different aspects of GEOPAK, including how data is displayed, where data is stored, and how to handle complex procedures such as survey data and superelevation. This chapter will outline the preferences that must be set when working on EFLHD projects. This chapter will not detail every preference, as many are not consequential to EFLHD. The preferences not detailed in this chapter may be set to GEOPAK defaults or as the user desires. Information on preferences not detailed here may be found in the GEOPAK help files.

User Preferences

User preferences may be accessed from the main GEOPAK pull-down menu, by selecting **Applications>GEOPAK ROAD>User Preferences**.

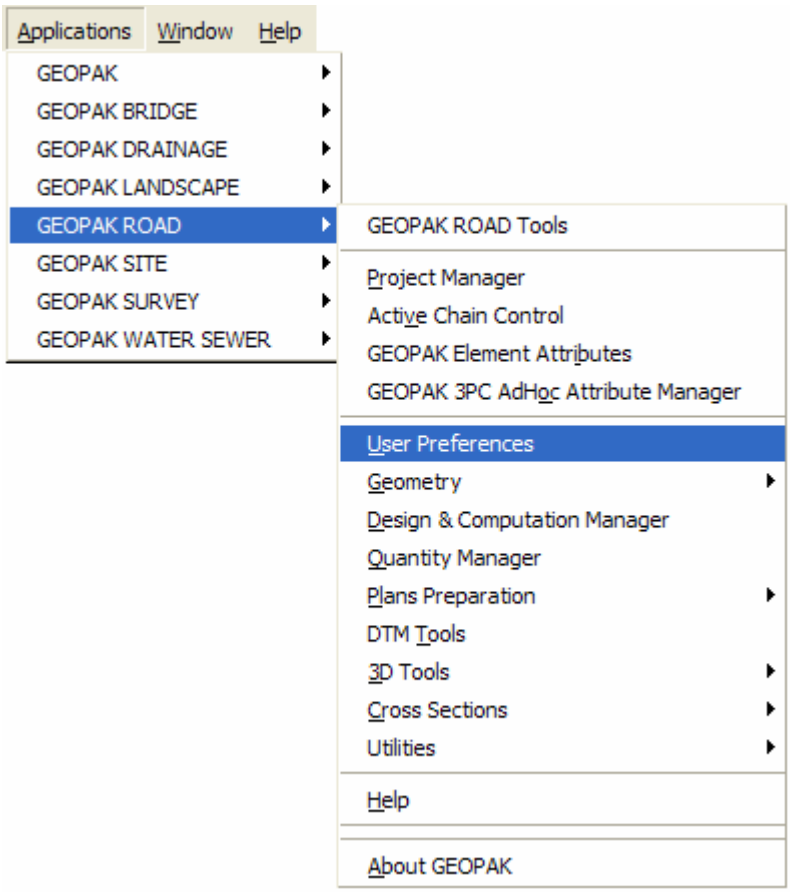

Figure 12-1: Accessing User Preferences

Once selected the User Preferences dialog will activate.

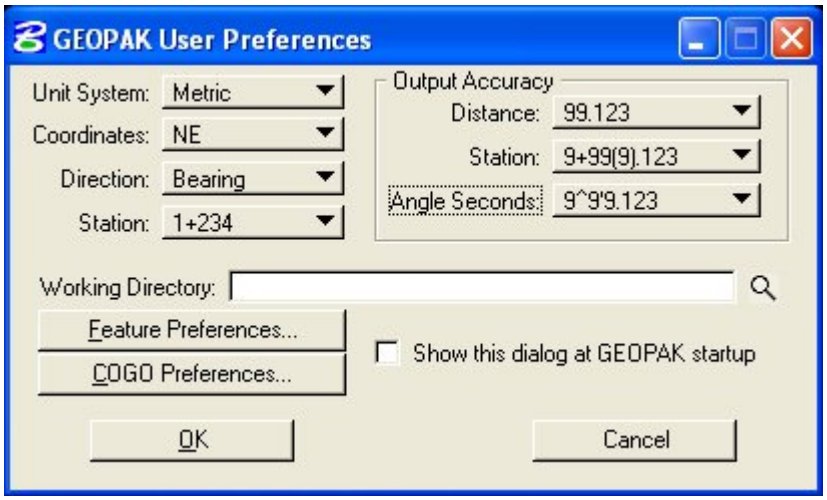

Figure 12-2: User Preferences Dialog

Generic Preferences

The preferences set in the top portion of this dialog box are utilized by many GEOPAK functions including; plan view and cross section labeling, DP Station Offset, and Design and Computation Manager.

The setting of the decimal places only affects rounding of the screen output. Internally, GEOPAK still computes to double precision accuracy.

Generic preferences are set here. Project specific preferences may be set through Project Manager and will take precedence over preferences set here. See the chapter on Project Manager for more information.

CAUTION

The setting of the Unit option button, English or Metric, is critical to getting the correct results for GEOPAK earthwork and cross-section reports.

The following chart describes the settings to use when working on EFLHD projects.

GEOPAK User Preferences		
Preference	**Setting for EFLHD**	**Notes**
Unit System	***Dependent on project***	Determines whether GEOPAK operates according to the English or Metric system of measurement. The Unit parameter affects every GEOPAK component.
Coordinates	***NE***	Sets either NE (Northing/Easting) or XY coordinate values in Labeling components.
Direction	***Bearing***	Sets the direction format for such variables as line direction in Labeling, and components within the Design and Computation Manager.
Station Format	***1+234 (M)*** ***12+34 (E)***	Sets the format for station variables in Labeling, and components within the Design and Computation Manager.
Distance	***999.123 (M)*** ***999.12 (E)***	Sets the number of decimal places for most non-station and non-angle variables in the GEOPAK Labeling, and components within the Design and Computation Manager. Variables affected by the Distance Decimal parameter include point coordinates, curves parameters such as length and radius, inverse distance, elevations, etc.
Station	***9+99.123 (M)*** ***9+99.12 (E)***	Sets the number of decimal places for station variables in Labeling, and components within the Design and Computation Manager.
Angle Seconds	***9°9'9.123" (M)*** ***9°9'9.12" (E)***	Sets the number of decimal places for angle variables in Labeling and components within the Design and Computation Manager. Variables affected by the Angle Sec. Decimal parameter include curve delta and degree, bearings and inverse angles.

Table 12-1: EFLHD User Preference Settings

The Working Directory option directs GEOPAK to where the .gpk file and other data files can be found. If left blank, GEOPAK will look in the directory where the Microstation file was opened. Either the Working Directory or the COGO Job Directory should always be defined so that GEOPAK can find the **.gpk** file.

Feature Preferences

Feature preferences pertain to how survey data is interpreted by GEOPAK. Information for each element is stored in a Survey Manager Database, or **.smd** file. The **.smd** file controls how survey elements and visualized COGO elements are displayed in Microstation. For example, the **.smd** file determines which cell will be used to represent a fire hydrant, or what level, color, weight and line style will be used to depict a fence line that was surveyed in the field. The **.smd** file also controls whether a point recorded in the field will be part of the DTM. The **.smd** file is specific to EFLHD and for consultants, .**smd** file is available at EFLHD website through the **CADD_Resource_v8.zip** download.

The .**smd** file can be found on the EFLHD network at: M:\Cadd_resource_v8\X_30\Standards\SMD.

This **.smd** file only controls survey information and therefore does not need to be set once the survey mapping has been completed.

Workflow 1: Attaching the Correct .smd File

1. ***From the User Preference dialog shown on Figure 12-2, select the Feature Preferences button.***
2. ***The Feature Preferences dialog will activate, showing the currently attached .smd file.***

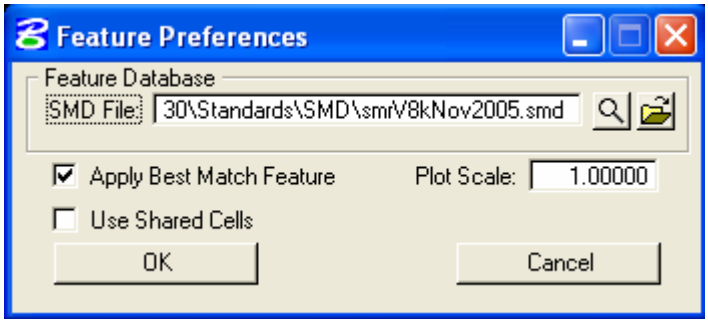

Figure 12-3: Feature Preferences

3. ***The EFLHD standard .smd file to use with the .x30 criteria is Press the Select button and browse to the location of the EFLHD .smd file.***

4. Check the Apply Best Match Feature box and set the Plot Scale field to 1.00

EFLHD .smd file is automatically attached when entering MicroStation using the project configuration file (*.pcf).

COGO Preferences

The COGO preferences dialog box allows the user to specify the Job Open Mode, what GEOPAK will do when a new or incorrect job number is specified, setup COGO directories, and redefinition of COGO elements.

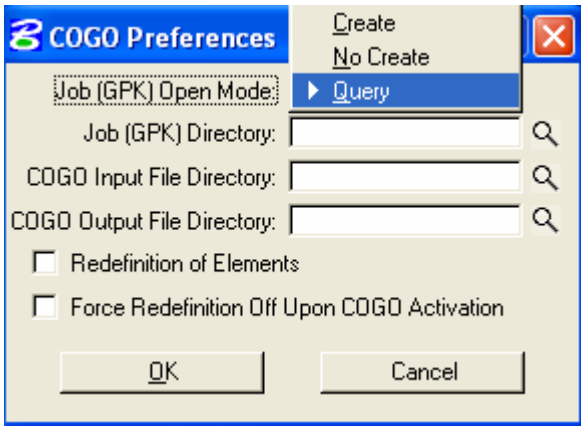

Figure 12-4: COGO Preferences

Job Open Mode

The job open mode specifies what happens when a job number is input.

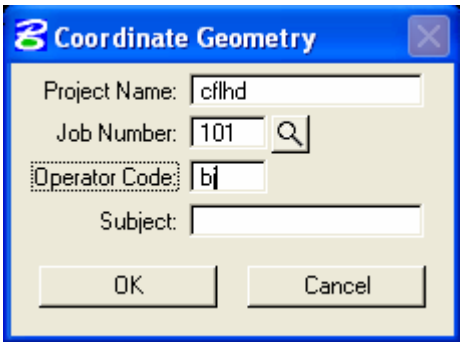

Figure 12-5: Coordinate Geometry

When coordinate geometry is accessed, a job number must be specified. This number corresponds to the file **jobXXX.gpk,** where **XXX** is the job number, shown above as

101. GEOPAK uses the following three rules to search for the specified job number:

- If the Job Directory is defined (in the COGO Preferences dialog box) then GEOPAK looks for the .gpk file exclusively in the Job Directory.
- If the Job Directory is not defined and the Working Directory is defined (in the main GEOPAK Preferences dialog box) then GEOPAK looks for the .gpk file exclusively in the Working Directory.
- If neither the Job Directory nor the Working Directory is defined then GEOPAK looks for the .gpk file exclusively in the directory that the active design file resides in.

Both A/E Contractors and EFLHD roadway designers should get GEOPAK job numbers from their Design Team Leader or Project Manager.

If the .gpk file is found in the directory selected according to these rules then the job will be opened and Job Open Mode doesn't come into play. On the other hand, if the **.gpk** file is not found then the option chosen for Job Open Mode controls how GEOPAK deals with not finding the **.gpk** file as follows:

- **Create:** When set to Create, the job will be opened if it is found, or created if no job matching the number exists in the working directory. This option can be dangerous if an incorrect working directory has been specified. In this case, a new **.gpk** file will be created with no warning to the user.

- **No Create:** When set to No Create, GEOPAK will open the job, if found, or show the following dialog box if the job number is not found.

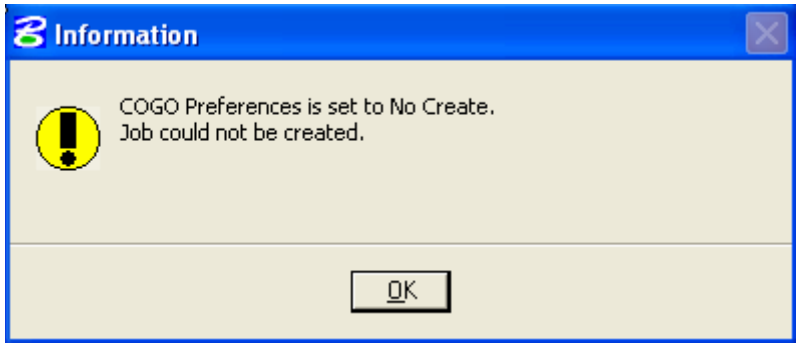

Figure 12-6: No Create Information

- **Query:** The Query option is the option preferred by the majority of users. If the job is found, it will be opened, if not a dialog box will open stating that the job could not be found and asking if the user would like to create the specified job in the working directory.

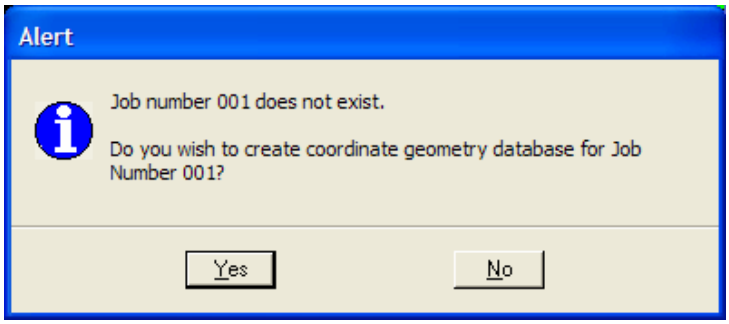

Figure 12-7: Create Job Number

The job open mode **Query** is the EFLHD recommended mode.

Job Directory and Working Directory

The working directory is where GEOPAK puts all of the files created by GEOPAK and is also the first place GEOPAK will look for files when you need to open something from GEOPAK.

The job directory is an ALTERNATE directory to store the .gpk file. If this is set, any **.gpk** you create will be placed in that directory and any time you need to open a **.gpk**, GEOPAK will look in that alternate directory as well.

These two parameters work in unison, the Job Directory is supplemental to the Working directory.

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Chapter 13: Project Manager

Introduction

The GEOPAK Project Manager is a tool which associates the COGO job number, users, project files, working directories, and various user preferences (such as whether to use Metric or English units) with a specific project. Within the project, Project Manager keeps track of all the numerous bits of information for each working alignment (whether one alignment or several) that GEOPAK needs to "fill in" the dialog boxes for all its various procedures. This includes things such as: dgn file name and directory path where the pattern lines and superelevation shapes are drawn; level symbology for the pattern lines and shapes; existing and design profile names, dgn file name, directory path, grid origin, and scale for the profiles; etc. Project Manager "remembers" all this information and automatically shares it among the various GEOPAK procedures as needed, thus eliminating the need for the designer to retype the same information into several GEOPAK dialog boxes. Project Manager also provides the user with an easy to follow on-screen flowchart diagram showing the GEOPAK workflow. All of the various GEOPAK procedures (e.g., cutting existing ground cross-sections, laying out the design profile, drawing pattern lines, etc.) can be accessed by clicking on the buttons in the flowchart, shown later in this chapter. In addition to the storage of information based on the overall project and working alignments, Project Manger also allows for the storage of information related to each process (e.g., creating superelevation autoshapes or processing proposed cross sections) for a working alignment in a GEOPAK "run". For example, the information needed to process proposed cross sections along the mainline could be stored in a run called MAINLINE. Information specific to the run such as cross section file, shapes, typical section, re-definable variables, etc. is stored within the run. Changes made to the chain, proposed profile, pavement width, etc., causing the need to rerun proposed cross sections will now be a painless process. By selecting the run MAINLINE and selecting Files>run, new cross sections will be generated without having to re-enter any of the defined information.

The use of Project Manager is required to create proposed cross sections through the Typical Section Generator. A/E contractors working on EFLHD projects in Microstation V8 and Geopak X30 will be required to use the Project Manager.

Workflow 1: New Project Creation

1. ***Select Applications>GEOPAK ROAD>Project Manager, or select the project manager icon from the GEOPAK Road toolbar. The following dialog box will open.***

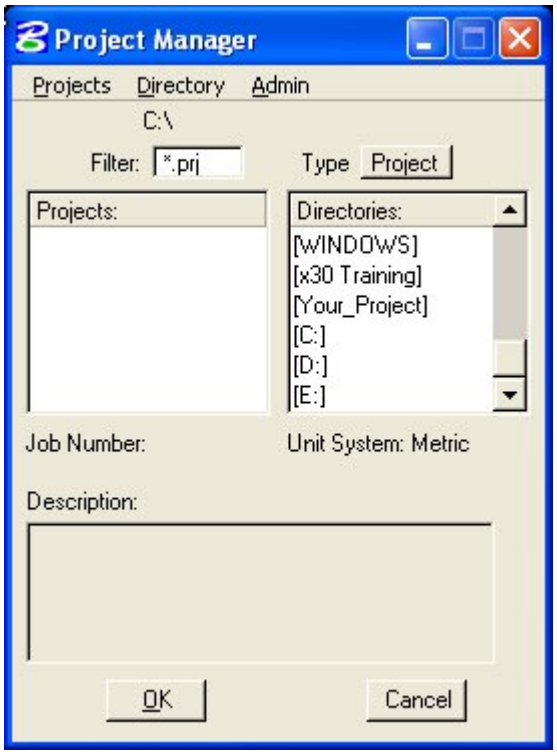

Figure 13-1: Project Manager

2. ***From the Directories section of the Project Manager dialog box, middle right side, path to the desired directory to create the project. This should be the M:\Projects\Project name\Roadway\GEOPAK directory.***
3. ***From the Projects pull down menu, select New.***
4. ***Fill in the desired project name, working directory, job number, and a brief description of the project.***

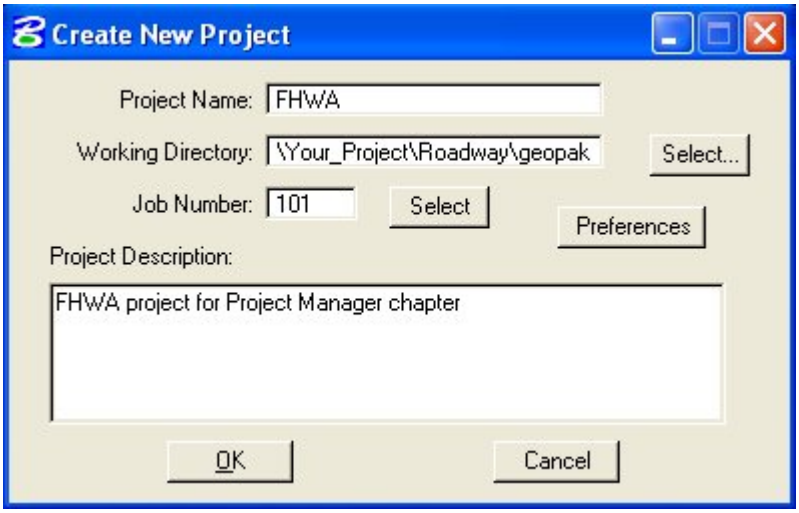

Figure 13-2: Create New Project

The Project Name specified is combined with a ".prj" extension to create the main Project Manager set-up file in the working directory. Therefore, the name specified must be a valid Windows file name (i.e., it cannot contain the special characters \ / : * ? " < > |) Although there is no standard naming convention used for .prj files in EFLHD, it's good practice to use a name that relates to the project's route designation because the Project Name specified here is used to access the Project Manager setup for the project in subsequent sessions.

For EFLHD roadway designers the Working Directory selected should always be the **M:\Projects\project name\proj_dev\CADD** subdirectory under the main project directory on the M: drive.

A/E Contractors should get GEOPAK job numbers from their EFLHD Project Manager. EFLHD roadway designers should also get GEOPAK job numbers from their Project Manager.

If the user is creating a new project definition that does not have an existing .gpk file then the GEOPAK job number should be keyed into the Job Number field. This is how a new .gpk file is created within Project Manager. If the user is creating a new project that has an existing .gpk file, click on the Select button and select the existing .gpk file. If the existing .gpk file isn't visible in the selection window then either the Working Directory is incorrect or the existing .gpk file is not in the Working Directory.

5. ***Select the Preferences button, and set the desired project related preferences. (See the chapter on GEOPAK Preferences, for information related to the preferences dialog box.) Unit specific preferences are shown in the dialog boxes below.***

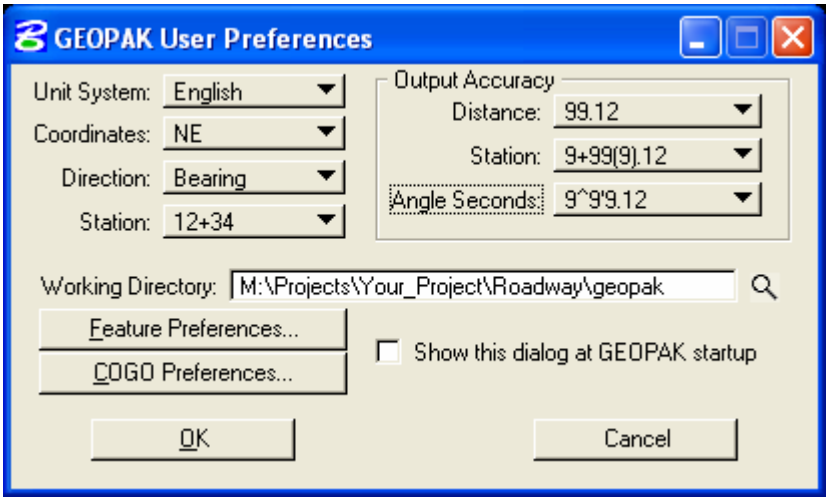

Figure 13-3: English Preferences

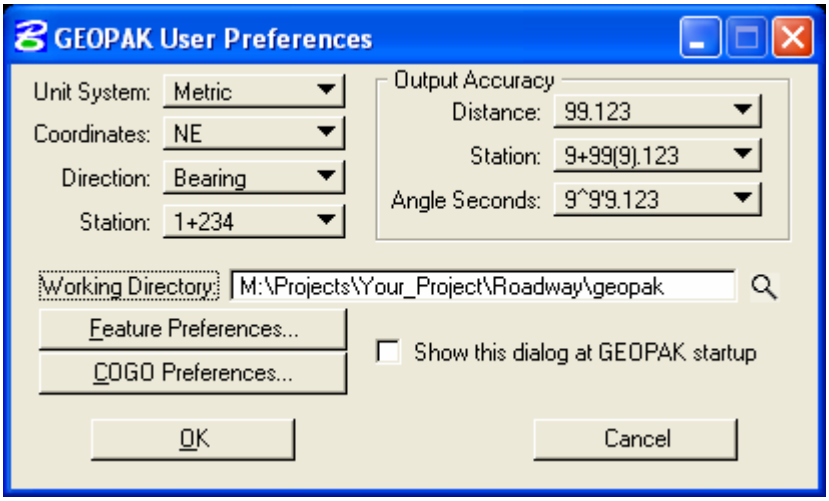

Figure 13-4: Metric Preferences

6. ***Select the COGO Preferences button. Set the Job open mode to Query.***

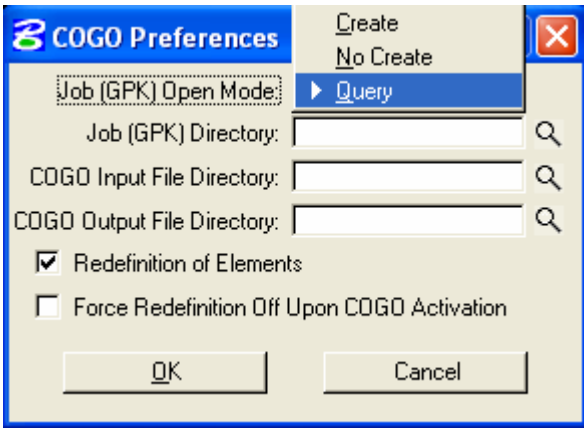

Figure 13-5: Job Open Mode

7. ***Select OK to return to the User Preferences dialog.***
8. ***Select OK button in the User Preferences dialog to exit and accept the preferences.***
9. ***Select OK button on the Create New Project dialog box to finish creation of the new project. (If the .GPK file, corresponding to the job number, does not exist the user will receive an alert stating that the job number does not exist and asking if the job should be created in the working directory.)***

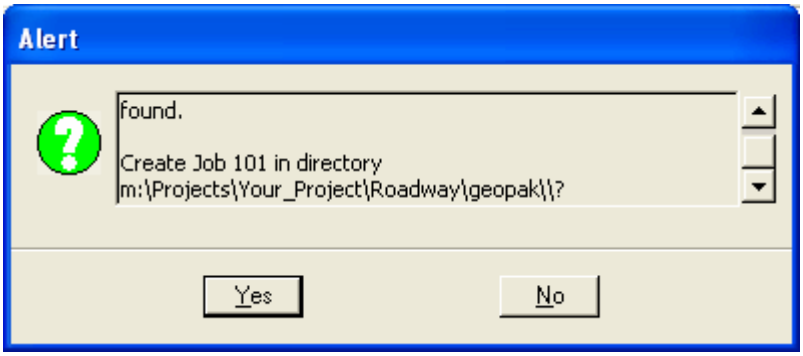

Figure 13-6: .GPK File Alert

CAUTION

At this point, if the job number exists and the user gets the above alert then the existing .gpk file does not reside in the Working Directory that was specified in the GEOPAK User Preferences dialog (See step 6 above). The user should always click the No button. Clicking Yes here will create a new empty job200.gpk, leaving the user with 2 different .gpk files of the same name in different locations. Fix this problem either by moving the .gpk file to the specified Working Directory, or by changing the Working Directory to point to the directory where the .gpk file resides, whichever is appropriate. Then repeat steps 6-10.

10. ***Select Yes on the Create New Project dialog box, the user is taken back to the original Project Manager dialog box to select the desired project. In the case of a newly created project, the name will now be in the projects window ready for selection.***

Once you are finished, users must be created within each project. At least one user must be created for each project. See workflow 3 for user creation.

Users should create only one .prj project file per project and only one .gpk file per .prj file unless special circumstances exist.

Workflow 2: Selecting an Existing Project

1. ***Select the Project Manager icon , or select Applications>GEOPAK ROAD>Project Manager.***
2. ***From the Project Manager dialog box, existing projects are listed in the middle left window labeled, Projects:***

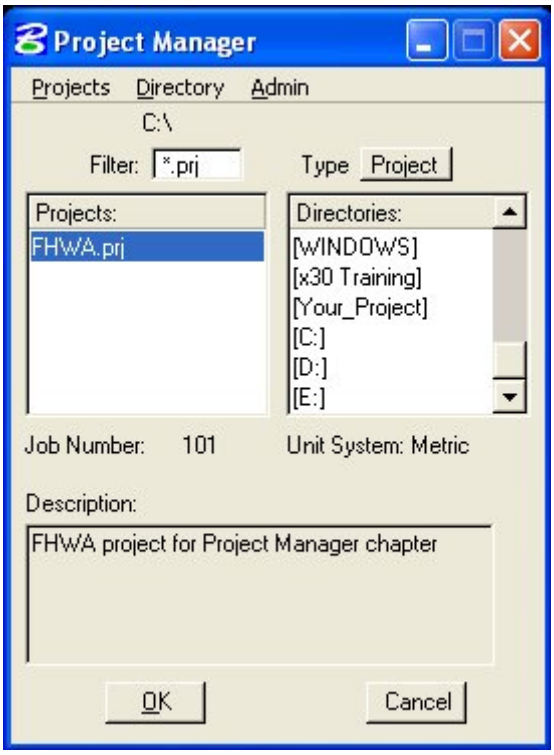

Figure 13-7: Project Manager

3. ***Select the desired existing project and select OK. This will take you to the Project Users dialog box.***

Workflow 3: New User Creation

1. ***Once the project has been selected, the Project Users dialog box will be activated. Select an existing user from the list or create a new user with the following steps.***
2. ***Select Users>New from the Project Users pull down menu.***

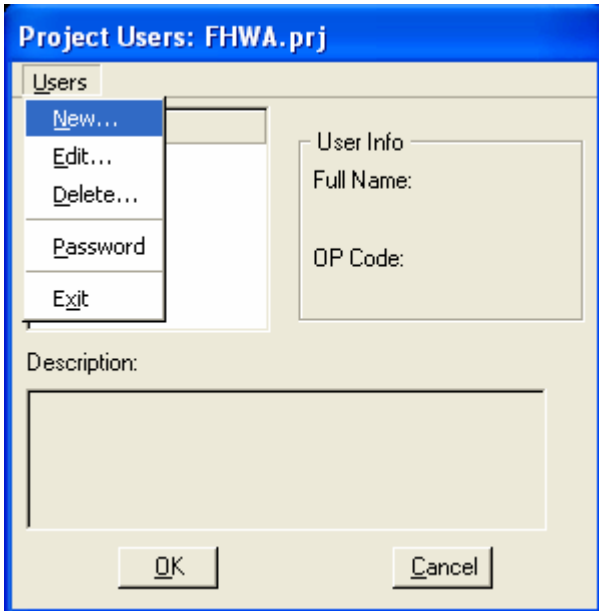

Figure 13-8: Project Manager Users

3. ***From the New Users dialog, shown below, fill in the Name, Full Name, OP Code, and, if desired, the Description fields.***

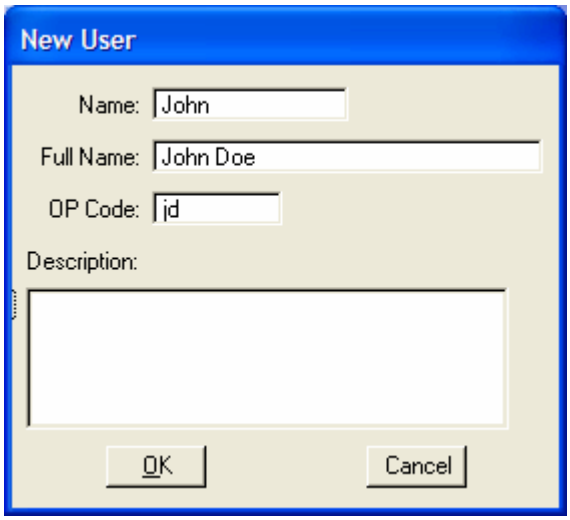

Figure 13-9: Create New User

For EFLHD projects, the following standards apply for filling in the New User dialog box:

Name:	*Users first name*
Full Name:	*Users first and last name*
OP code:	*Users first and last initials*

4. ***Select the OK button once the information is correct.***
5. ***Once the OK button is picked, GEOPAK will activate an alert box asking if you wish to define a password for this user. Click on the No button.***

Figure 13-10: User Password

6. ***When finished you will be returned to the Project Users dialog box and the newly created user will be seen in the pick box on the left side of the dialog box. Select the user by double-clicking on the users name, or by highlighting the user and selecting the OK button.***
7. ***This will activate the roadway design Project Manager dialog, as shown below.***

New to GEOPAK 2004, there is no longer the option to select Project Manager for Survey or Road at this point. Survey has been removed from this workflow and Road is the only option.

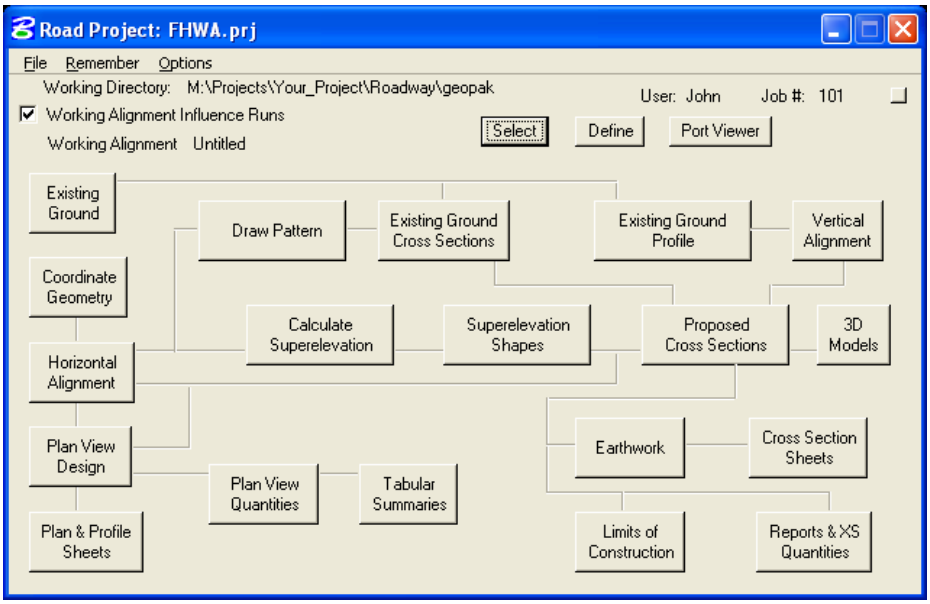

Figure 13-11: Project Manager Roadway Flow Chart

You have now completed the preliminary setup for Project Manager. The dialog above will be the starting point for many of the GEOPAK functions that have previously been accessed through GEOPAK pull-down menus or icons. The bottom sections of the project manager dialog, commonly referred to as the flowchart, will take you to the tools you have already been using. We will get into these tools in more depth in future chapters.

The title bar of the roadway design project manager dialog displays the name of the project. In the example above, the name of the project is **FHWA.prj.** The following section has three pull-down menus; File, Remember, and Options. For details of these menus, see the GEOPAK help documentation. (Remember is shown below, as it can be a time saver that many users do not use.)

Remember: There are two options under the Remember menu: Project and User. Checking any or both of these options will allow Project Manager to skip certain steps. For example, checking Project will take the user directly to the Project Users dialog immediately upon accessing Project Manager the next time, remembering the current project. If a user works on only one project for the majority of the time this will save time. Likewise checking User will remember these settings as well. If there is typically only one user working on the project

it is beneficial to skip the Project Users dialog box, remembering this user each time. (As stated earlier, there should be only one .prj file per project located on the network therefore this setting is machine independent),

It is advisable to check both of these options on. It is very easy to check them off when a switch to another project is necessary. Checking both on will take the user directly to the main Road Project Manager dialog when Project Manager is accessed.

The next row down on the project manager dialog shows the working directory on the left with the user and job number on the right. This is for information only.

Next is the section on working alignment and runs. Below is a definition of each of these new concepts.

Working Alignment: A working alignment is a user-defined group of the basic design components (e.g. horizontal alignment, design profile, roadway template, cross-sections, etc.) that make up a single roadway design. The purpose of a working alignment is to allow Project Manager to "remember" and automatically fill in these components in the dialog boxes for the various GEOPAK procedures. Creating working alignments allows the user to organize data specific to the project or to specific alignments within the project. Many projects will have only one working alignment, while others may have many, depending on the complexity of the job. Project details such as the level and color of the existing ground, the location and attributes of the pattern lines and superevelation shapes, and the location of the plan view file and the chain name, are associated with the working alignment. Defining this information within a working alignment greatly reduces time by not having to re-enter this information each time a different GEOPAK tool is accessed. For example: If all the information about the cross-sections is defined, the user will not have to input the attributes associated with existing and proposed ground when creating proposed cross sections.

Run: Each time a tool is selected the user will create a **run** or select an existing run. The data associated with the use of a tool, for a particular purpose will be saved in the run. This allows the user to redo work without re-inputting information. For example: Creating an existing ground profile requires

inputting profile name, chain, beginning and ending station, how to cut, and the tin file name. With all of this information stored in a run, no inputting of information will be required for each additional time the profile may need to be re-cut.

There are three buttons to the right of the working alignment information; Select, Define, and Port Viewer. These are discussed below.

Select: Allows the user to select or create a working alignment.

Define: The Define button allows the user to define information specific to the working alignment.

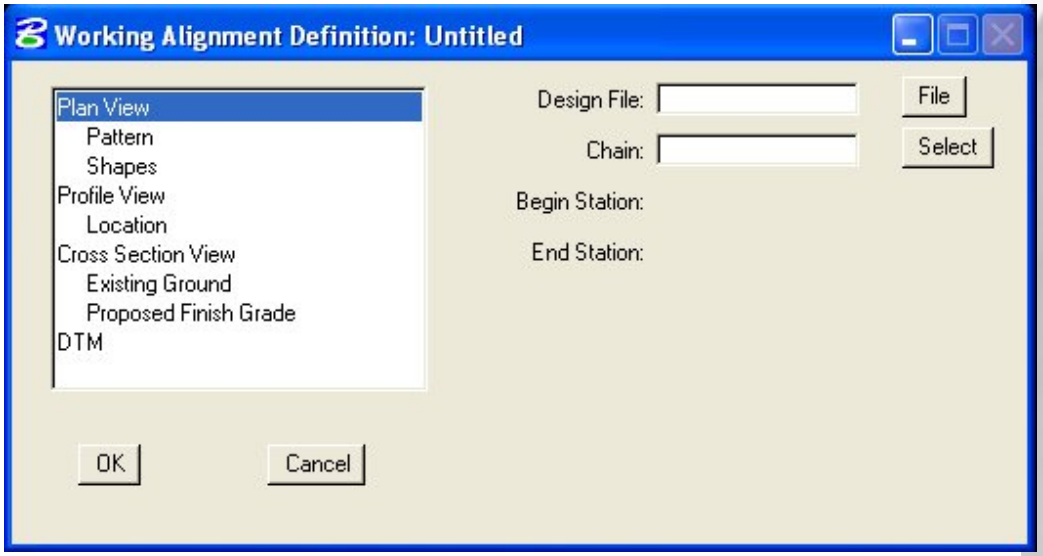

Figure 13-12: Working Alignment Definitions

For each selection on the left, the dialog changes on the right to accommodate the selection. For example: For Plan View, Profile View, and Cross Section View, GEOPAK is looking for a file name, and a chain or profile name. For Pattern and Shapes, GEOPAK needs a file name and attributes of these elements.

Workflow 4: Creating a Working Alignment

Be sure the Working Alignment Influence Runs box is checked before continuing with this workflow. When checked, all information defined will be attributed to the current working alignment. You may create multiple alignments as needed.

1. *From the Road Project Manager dialog box, click on the Select button.*

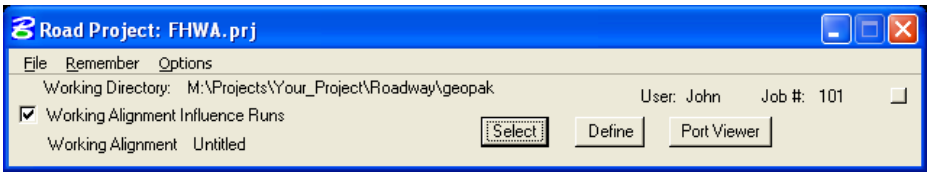

Figure 13-13: Select Working Alignment

2. *The Select Working Alignment dialog will be activated. Select Run>New from the pull down menu.*

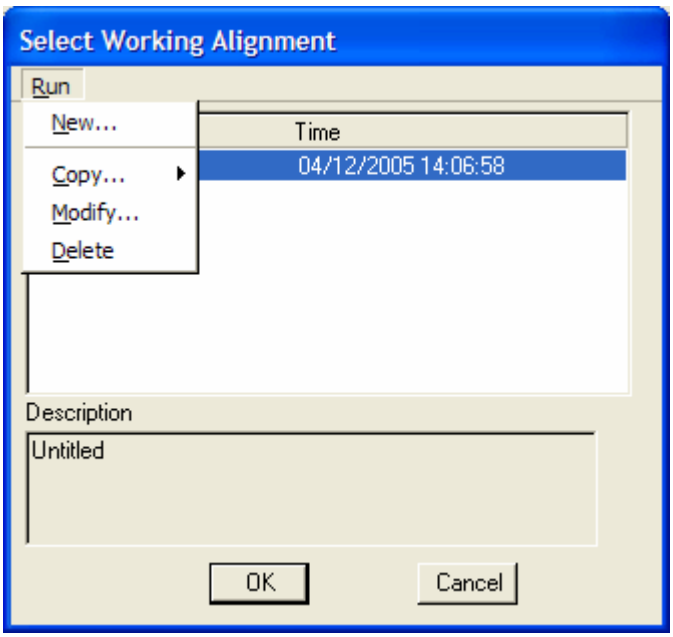

Figure 13-14: Create New Working Alignment

3. *Fill in the Run Name box and, if desired, fill in the description box. Select OK box to finish.*

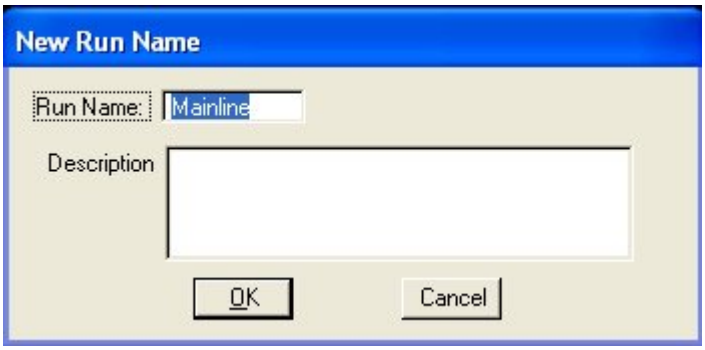

Figure 13-15: Create New Working Alignment Run

4. ***The newly created working alignment run has been created and will now be displayed in the select working alignment dialog box. Highlight the desired working alignment and select the OK button.***

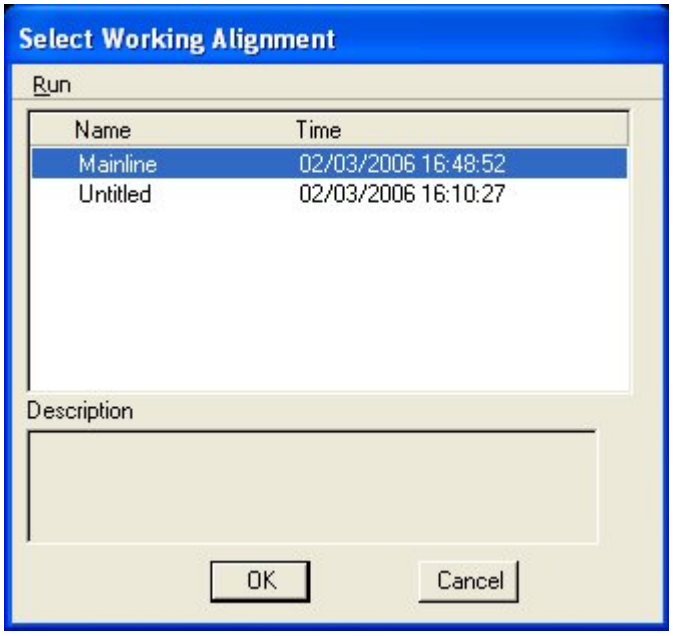

Figure 13-16: Select Working Alignment

5. ***The new working alignment name is now displayed on the Road Project Manager dialog box and the user is now ready to begin project work.***

The workflow outlined above merely creates the empty shell of the working alignment. At this point, or as the project progresses, select the define button and fill in the information, as it becomes available, to complete the working alignment definition. All information defined will be attributed to the selected working alignment.

Port Viewer

The Port Viewer is a handy tool for simultaneously viewing and editing each of the three main elements of a road design: plan, profile, and cross-section. Before invoking the Port Viewer, the user must have the plan view, profile view, and cross-section view, defined in the working alignment definitions, as detailed above.

Once these files have been defined, the Port Viewer will open three additional MicroStation view windows containing the three files listed above.

Workflow 5: Port Viewer

1. ***Begin by accessing the Working Alignment Definitions dialog box from the main Project Manager dialog.***

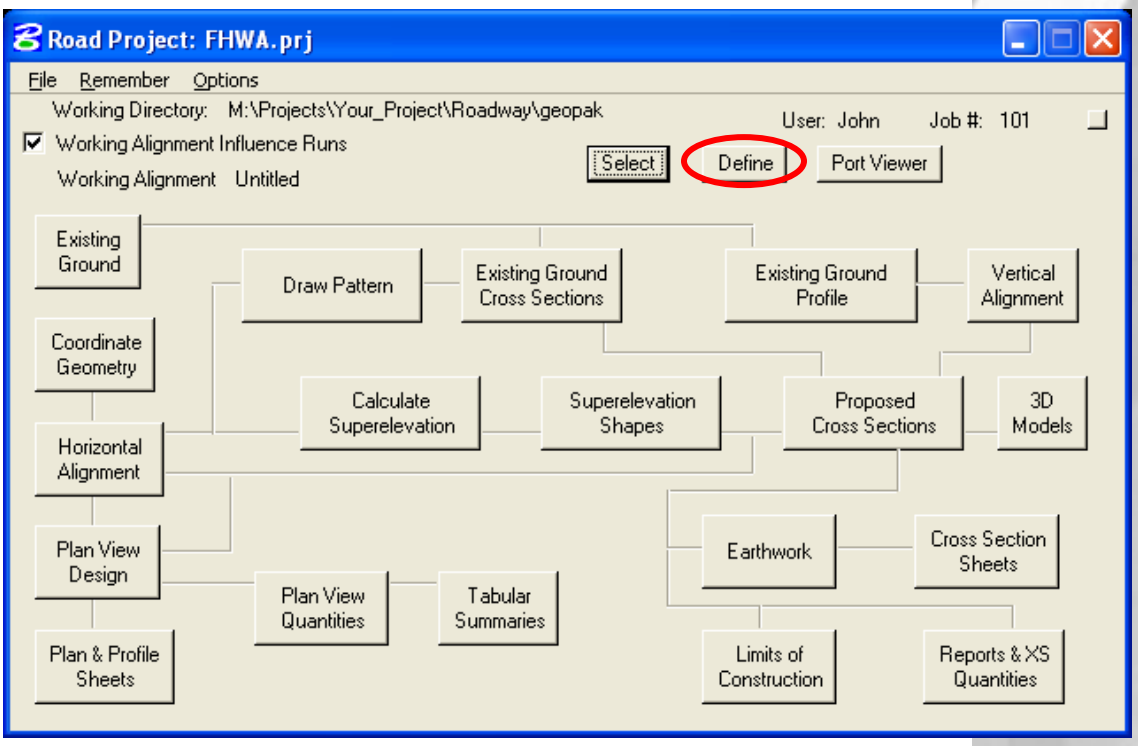

Figure 13-17: Access Working Alignment Definitions

2. ***From the Working Alignment Definition dialog box, shown below, complete the information on the right side of the dialog box. The information, including design file names, chain/profile, cell origin and scale of the profile, etc., must be defined so that the Port Viewer can find the desired files.***

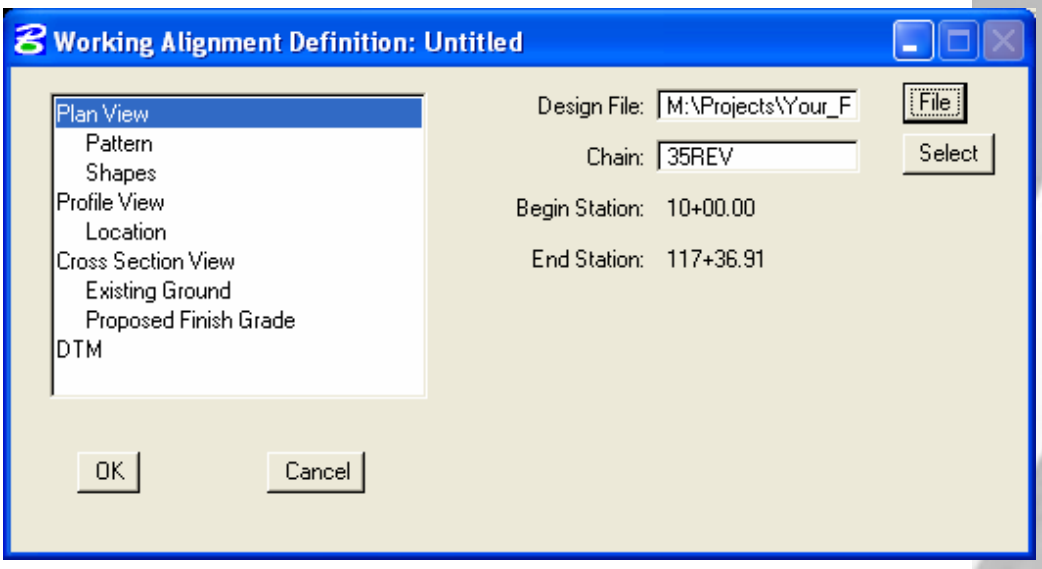

Figure 13-18: Working Alignment Definitions

3. ***Once the Working Alignment information has been defined, the port viewer can be accessed. From the main Project Manager dialog, select the Port Viewer button.***

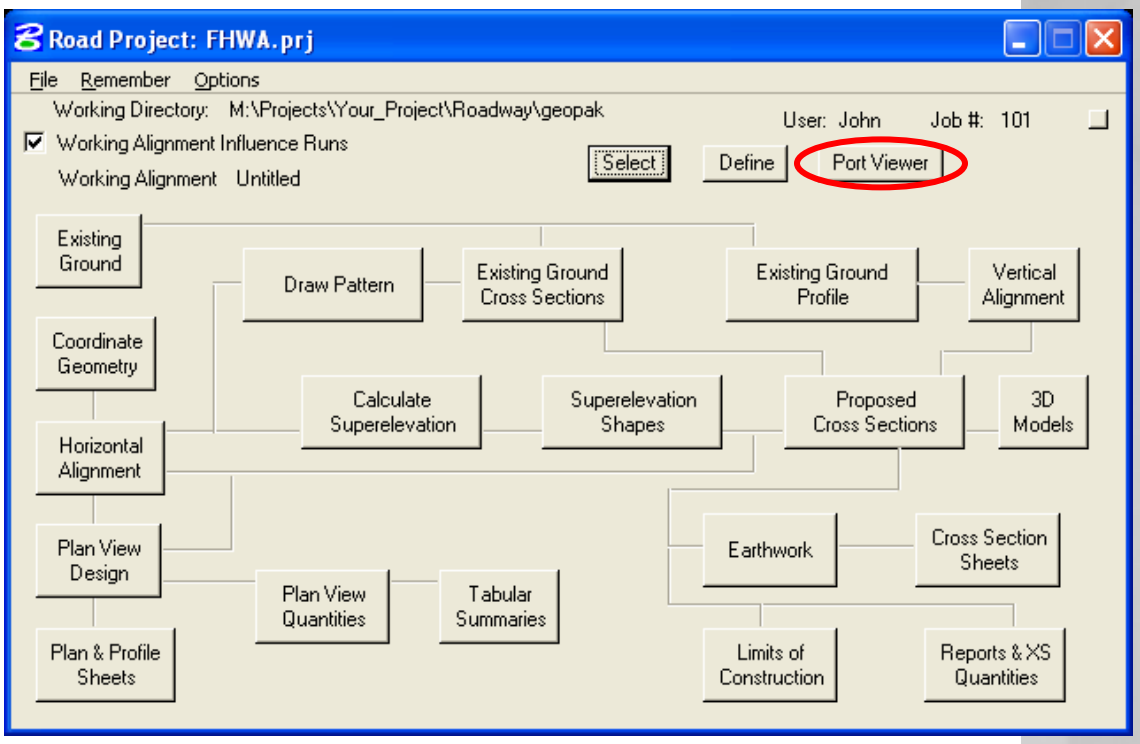

Figure 13-19: Accessing Port Viewer

4. ***The three views should now be visible, along with the Port Viewer tool menu.***

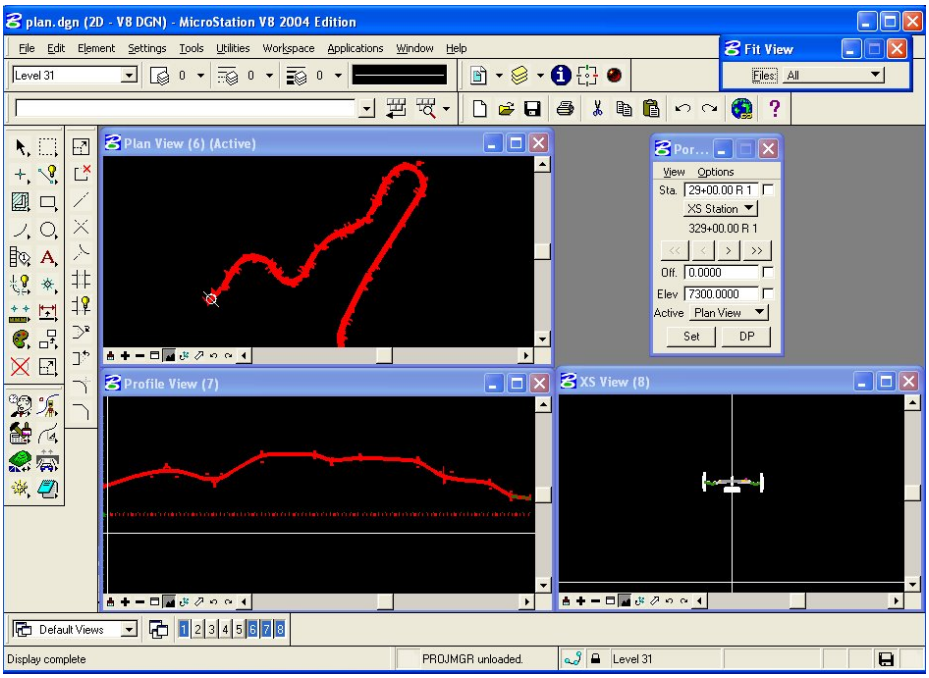

Figure 13-20: Port Viewer

5. ***As shown above, the Port Viewer allows simultaneous viewing of each element. Also, the port viewer provides index lines for easy locating of stations along the alignment. Shown as a line perpendicular to the centerline in the plan view, a vertical line in profile, and cross hairs in cross-section, the index lines allow the user to see where, for example, a problem in profile falls in the plan view. Move through stations by selecting the greater than and less than symbols in the center of the Port Viewer dialog box.***

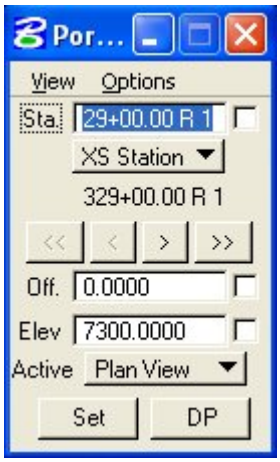

Figure 13-21: Port Viewer Tools

6. ***From the view pull down, the user can fit each of the views or set any of the views as the active view.***

The Port Viewer can be a powerful timesaving tool, as opposed to switching back and forth from the different drawings, during the design process. For more information on the Port Viewer, access the GEOPAK help from the GEOPAK pull down menu.

Related links: Setting up Project Manager for Proposed Cross-Sections using Knucklehead's Guide for GEOPAK Road 2004 Edition.

Setting up the Proposed Cross Section run for the 5 typical sections available through the Typical Section Generator, using Knucklehead's Guide for GEOPAK Road 2004 Edition.

Existing Features

Right of Way

Rehabilitation(3R)

Undivided New Construction

Automated Cross Section Labeling

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STANDARDS FOR USE WITH X30 CRITERIA

Chapter 14: Survey Manager

Overview

Survey Manager is used to input raw or corrected ASCII survey data into MicroStation and GEOPAK. This will allow the user to create a **.tin**, and a topo file, and also input surveyed cross sections used in the final design. Survey Manager will also allow the user to make modifications to the data if there is a bust in the original survey. This section will describe the workflows used to input and modify the survey data provided by surveyors.

SMD File

This file contains the parameters GEOPAK uses to draw the survey data, including information such as:

- The cell to be associated with the survey shot.
- The elements to be included in the DTM. For example, a ground shot would be included in the DTM, and a fire hydrant will not be included.
- The shots that should be part of a string, such as an edge of pavement line.
- The shots that should be part of a break line
- The shots that are spot elevations.

The EFLHD standard **.smd** file is **EFLHDeng.smd**. This file can be attached by clicking on the Feature Preferences button in the GEOPAK User Preferences dialog box, as shown in the GEOPAK preferences chapter.

The Survey cell library, **EFLHDcell.cel**, must also be attached for the **.smd** file above to produce the desired symbology. See chapter 8, Cell Libraries, for more information on attaching the correct cell library.

Importing Survey Data

The survey team should provide an ASCII file with a **.cor, txt, and .cvs** extension. This file will be in a comma-separated format. The columns will be point number, northing, easting, elevation, point code/line code and then a semi colon with any comments. GEOPAK will read this file and, if the correct **.smd** file is referenced, draw the survey data using the standard

level symbology. ***Workflow 1*** will describe the procedure for importing the **.cor** file into GEOPAK.

Workflow 1: Importing Survey Data

1. ***Select Applications>GEOPAK SURVEY>Survey from the pull down menu:***

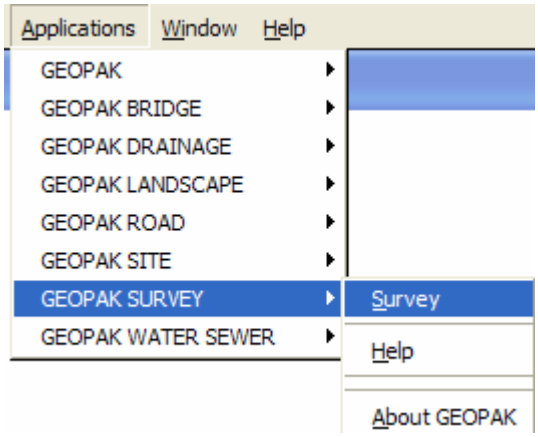

Figure 14-1: Geopak Survey

2. ***This will bring up the following dialog box:***

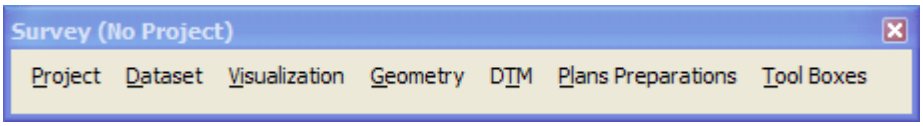

Figure 14-2: Geopak Survey Dialog Box

Select Project>New to get the following dialog box:

Project Name or extension of project

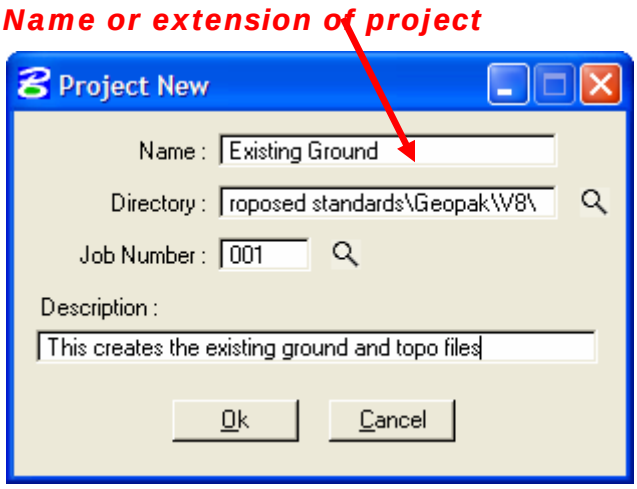

Figure 14-3: New Project

3. *Fill in the dialog box with the required information and select Ok. This will change the title in the Survey dialog box to show the project name.*
4. *Select Dataset>New to get the following dialog box:*

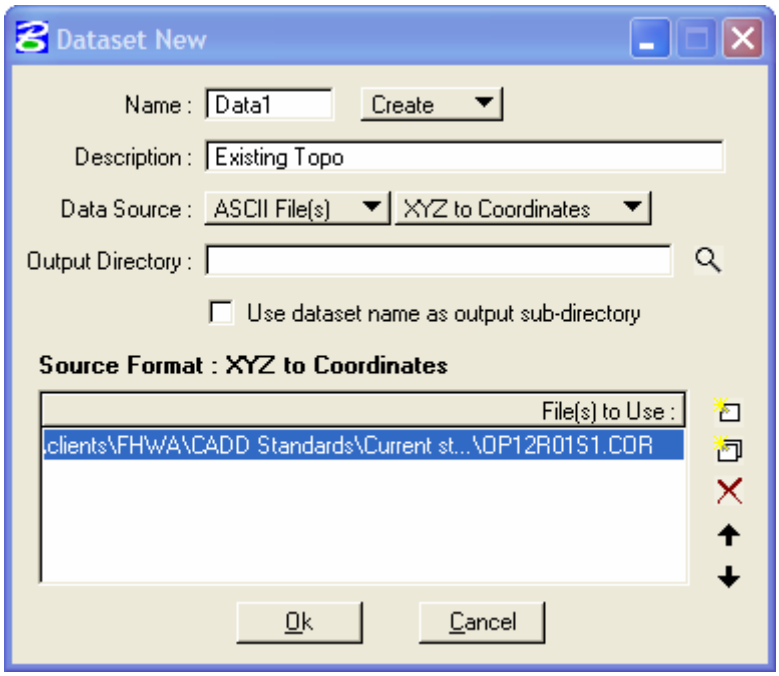

Figure 14-4: Select Dataset

5. *Fill out the dialog box as shown, using the add file to list button to load the desired file. Select Ok to get the following dialog box.*

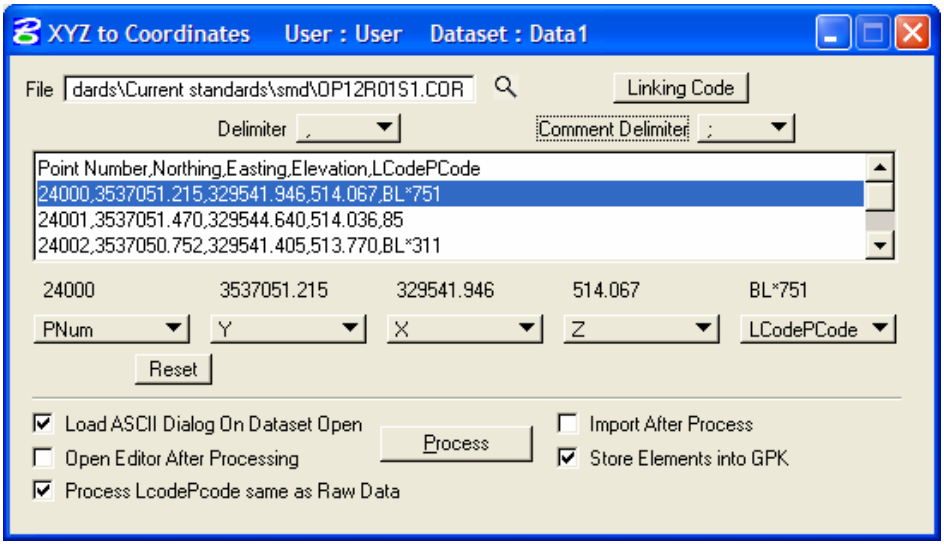

Figure 14-5: Process Dataset

6. The Linking Code button brings up dialog box in which you set the line codes read from the ASCII file. Usually "Code-BL*" is used for begin line and "Code-EL*" is used for end line.

7. Make sure the Delimiter is a comma and the Comment Delimiter is a semi-colon. Highlight any line in the data box and GEOPAK will put that information above the buttons at the bottom of the dialog box. Select the buttons as shown in the above example. The PNum stands for Point Number, Y is the Northing, X is the Easting, Z is the Elevation, and LCodePCode is the Code that the Survey Manager uses to draw the elements properly. If there is a Next button and it is picked it will show one more column, which is the comment column. This button should be set at none. Check the Store Elements into GPK and Import After Process boxes. This will import the points into the GPK.

8. Go to the 3D MicroStation file that the survey data needs to go in and pick Visualization>Visualize the get the following dialog box:

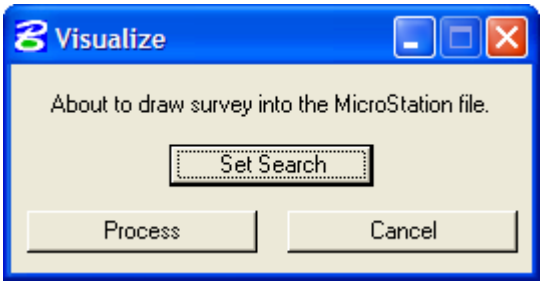

Figure 14-6: Visualization

9. Set Search allows the user to select the Data Set to import into the drawing. After the correct data set is chosen, select Process.

10. Once these values are set, select the Process Survey button on the Survey Operations dialog box.

11. GEOPAK will draw the elements into the drawing. If there are error messages during the process, pick the Dataset>Review Reports>Feature Code Error Report pull downs to find out what the error is. Go to the .cor file and modify to the correct feature code.

12. This next step will build the .tin. Select the DTM>Build DTM>From Survey data pull downs.

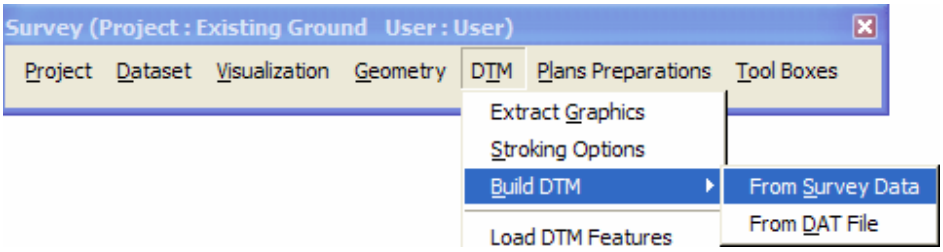

Figure 14-7: Select Build DTM

It will bring up the following dialog box.

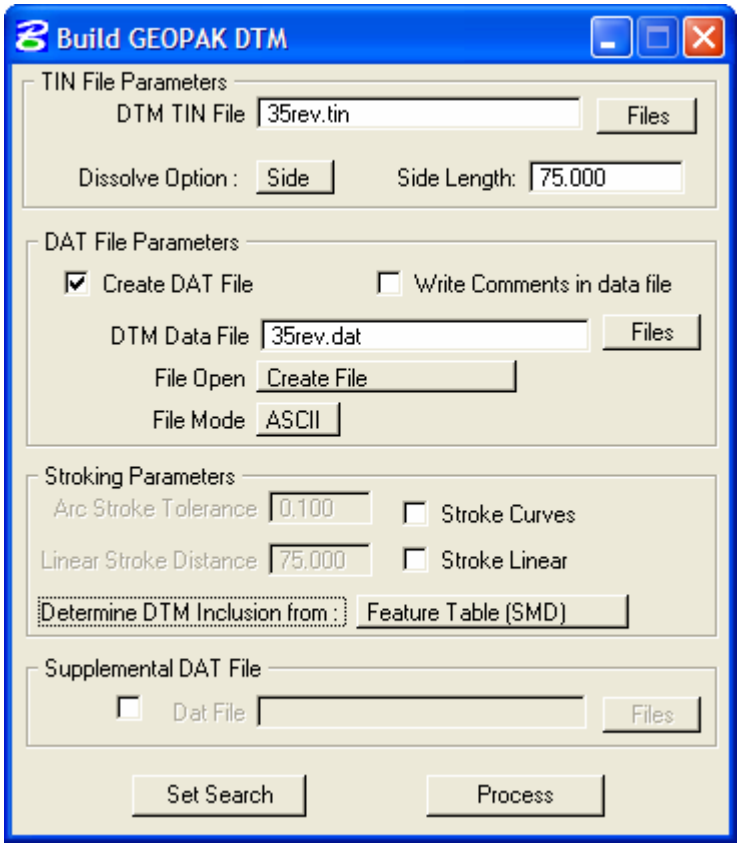

Figure 14-8: Build DTM

13. Type in the new name for the .tin. Select dissolve option side with a side length that is long enough to avoid any voids along the outside edges of the data. The creation of a. DAT file is not necessary but can be done at this point. Select Process and the .tin will be created.

Making Corrections

There will be times when there is a problem in the survey and a correction to a chain or a point will need to be made. If you know where this point is in the **.cor** file, it is easy enough to

fix. But the size of the **.cor** file can be too large to find the error without spending a large amount of time. The most efficient way is to fix it using the Chain and Point Editing features in Survey Manager. Workflow 2 will describe the procedure for editing a chain and Workflow 3 will describe how to edit a point.

Workflow 2: Chain Editing

1. ***While in the drawing containing the graphical elements to be changed select the Geometry>Chains>Edit pull downs. GEOPAK will bring up the following dialog box.***

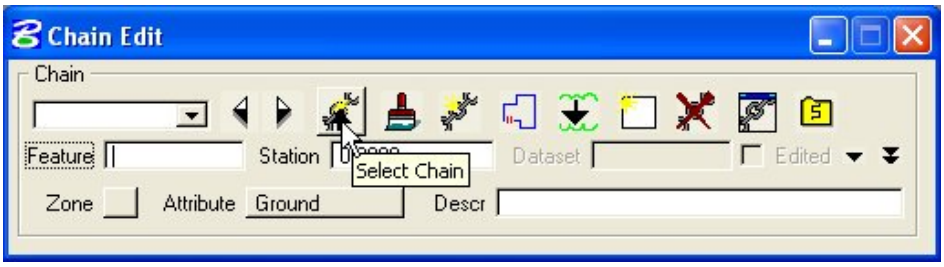

Figure 14-9: Edit Chain, Compact

2. ***Click on the Select Chain icon and choose the chain that needs to be modified. GEOPAK will fill all the chain information into the data fields.***
3. ***Click on the double arrows at the right side of the dialog box to show all the chain information. The GEOPAK Chain Edit dialog box will expand to the following.***

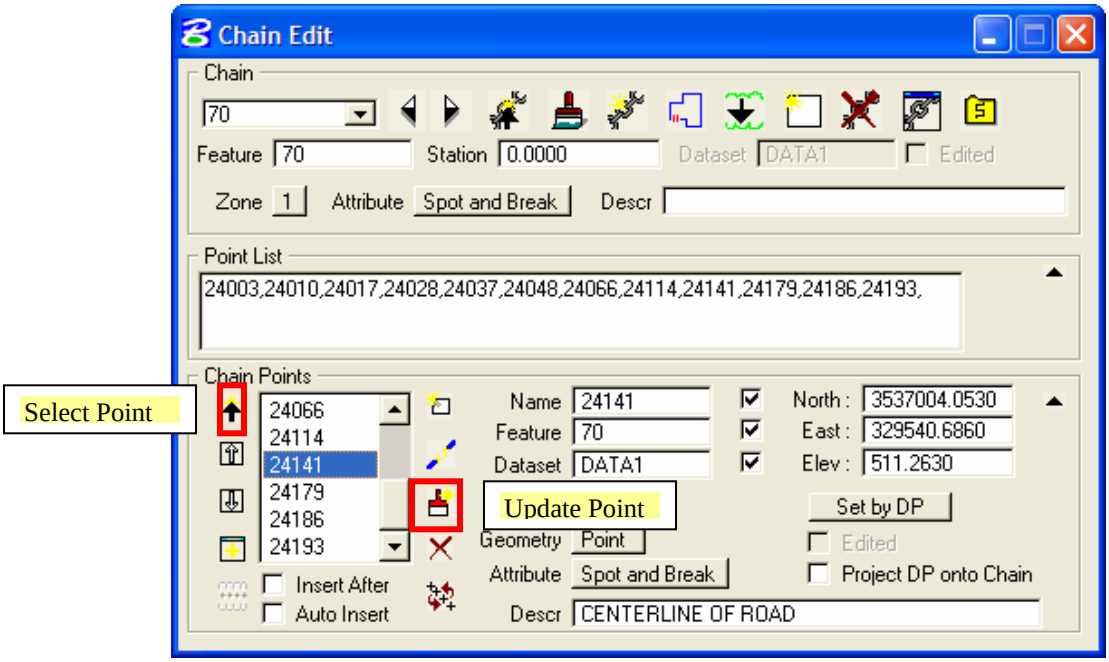

Figure 14-10: Edit Chain, Expanded

4. ***Click on the Select Point icon in the Chain Points section and highlight the point that is to be modified. All of the fields will be filled in with that point's information. Make the necessary change and Select the Update Point button.***

5. ***Once all of the modifications have been made, the .tin file can be updated by repeating steps 12 and 13 of Workflow 1.***

By using the Chain Editing tool, the user can break a chain, add points to the chain, and delete points. GEOPAK will also highlight the point that is selected.

Workflow 3: Point Editing

1. ***While in the drawing containing the graphical elements to be changed select the Geometry>Points>Edit pull downs. GEOPAK will bring up the following dialog box. ALPHIA instead of numeric spot***

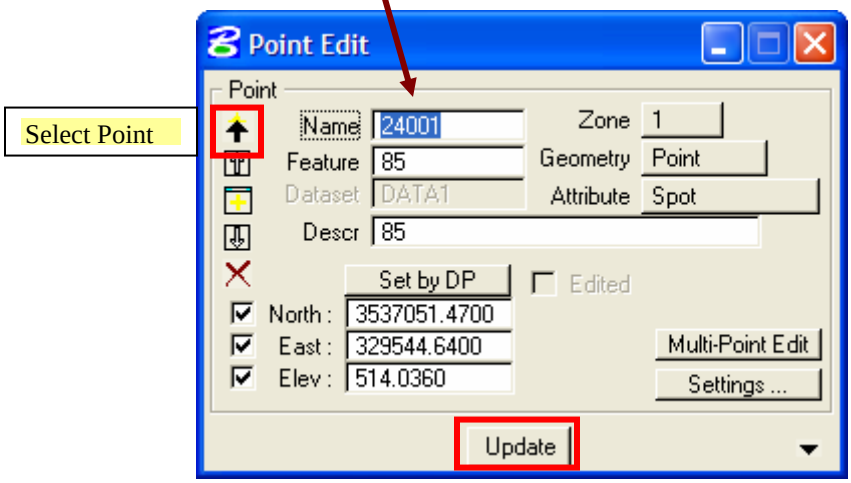

Figure 14-11: Edit Point

2. ***Click on the Select Point icon and highlight the point to be modified. GEOPAK will fill in all the fields with the values for that point.***
3. ***Click the Update button at the bottom of the dialog box.***
4. ***Once all of the modifications have been made, the .tin file can be updated by repeating steps 12 and 13 of Workflow 1.***

Reference Hub Cross Sections

Once the alignment is set. The surveyors will provide a Reference Hub survey. These are provided in a .soe file. These sections will need to be imported into the cross section cells for comparison to the existing sections based on the tin and then the proposed sections will need to be modified to tie into the surveyed sections. Workflow 4 will describe the procedure for importing the .soe file into the existing cells cross-section cells.

Workflow 4: Importing Reference Hub Sections

1. ***While in the cross section drawing, go through the same first four steps as in Workflow 1 above. Instead of changing the Download Raw button to ASCII XYZ, change it to SOE => Cross-Section. This will bring up the following dialog box.***

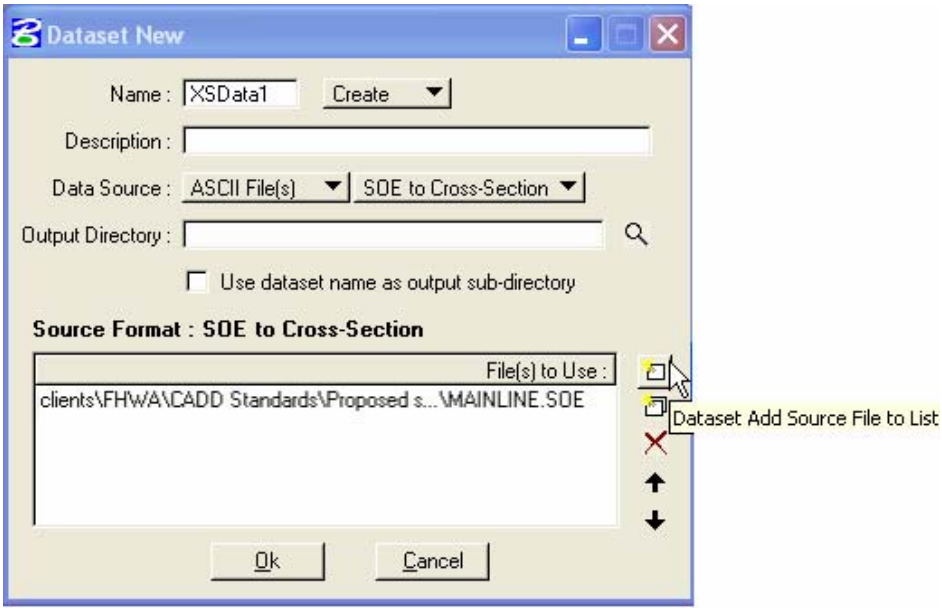

Figure 14-12: SOE =>XS Data Source

2. ***Select the Dataset Add Source File button to load the .soe file to get the following dialog box.***

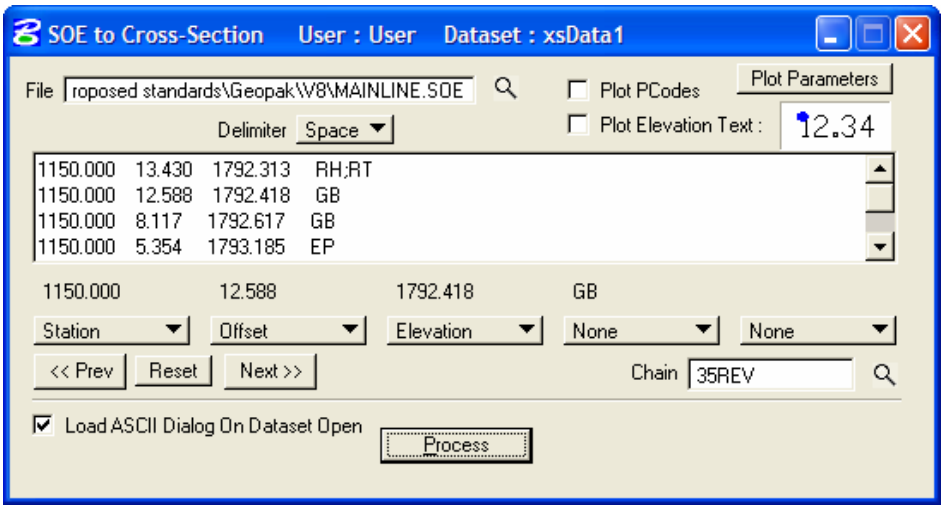

Figure 14-13: Process SOE =>XS Data

3. ***Make sure the Delimiter button is correct (either Space, or Comma).***
4. ***Highlight a row in the Contents of File and GEOPAK will drop those values in the space above the bottom buttons. Set the bottom buttons to match the example.***
5. ***Select the Plot Parameters button to get the following dialog box.***

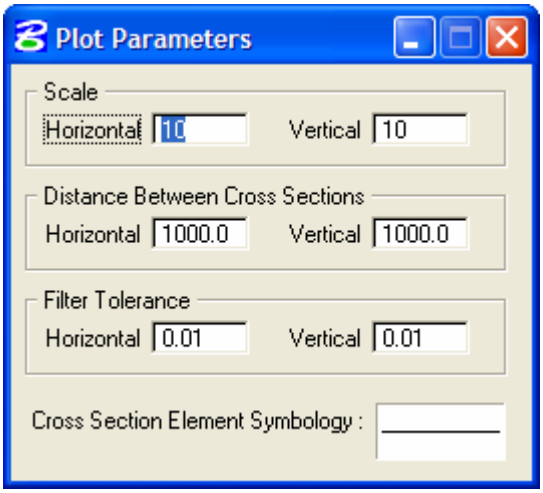

Figure 14-14: Ref Hub Mapping Option

6. ***Since the sections are going into the existing cells, the only changes to be made are in the Cross Section Element Symbology. Change the Level, Color, Weight and Style values to match the example below:***

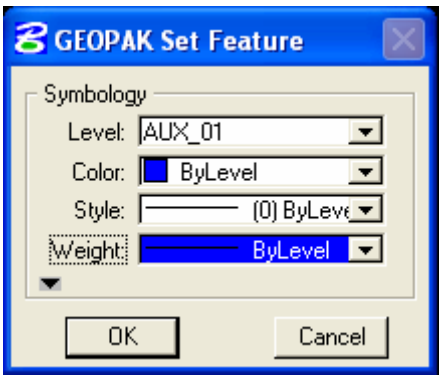

Figure 14-15: Plot Parameters

7. ***Select Process and the sections*** *will be drawn into the drawing.*

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STANDARDS FOR USE WITH X30 CRITERIA

Chapter 15: Digital Terrain Model (DTM)

Overview

An existing ground DTM will be the base with which to create existing profiles, existing cross-sections, generate earthwork, etc. Proper creation is imperative for the success of each of these procedures. This chapter will explain the process for extracting graphics from a DGN file containing 3D elements that represent existing ground.

Extracting Graphics

There will be occasions when a tin will need to be created from a 3D drawing. This can be done using the Extract Graphics command. The following paragraphs and workflows will describe the steps in creating and checking a tin.

This is a two-step process. The first step is to create a **.dat** file; the second step will use the **.dat** file to create the **.tin**. ***Workflow 1*** will describe these two processes.

Workflow 1: Extracting Graphics

1. ***Open the .dtm file that contains the 3 dimensional elements that will be used to create the tin.***

2. ***Access the DTM Menu by clicking on Applications>GEOPAK ROAD>DTM Tools as shown below:***

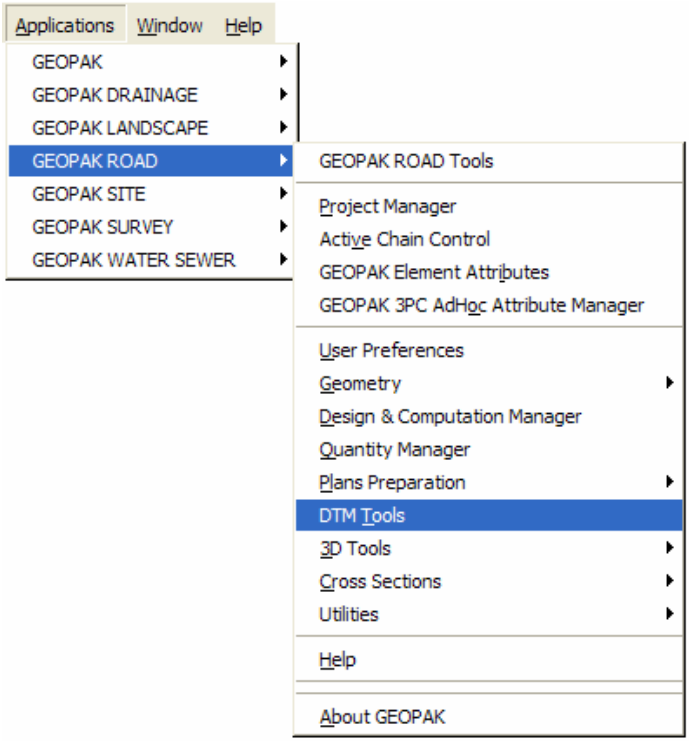

Figure 15-1: Accessing DTM Tools

or by clicking on the DTM icon in the GEOPAK toolbar.

Figure 15-2: DTM Tools Icon

3. This will bring up the following dialog box. Select the Extract Graphics button.

Figure 15-3: DTM Tools Dialog

4. *The following dialog box will come up.*

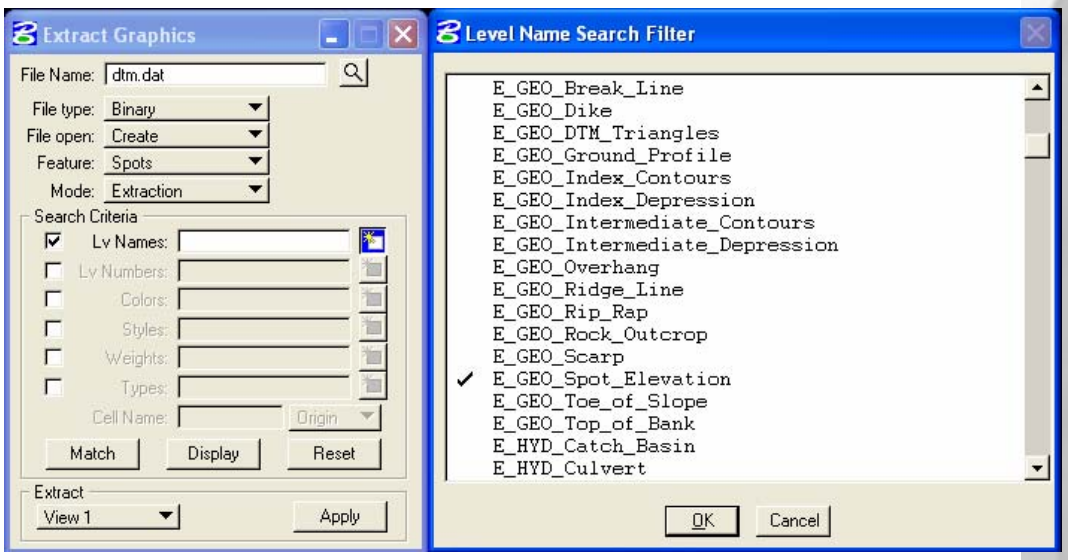

Figure 15-4: Extract Graphics

Fill in the file name for the .dat file, make sure the File open button is on Create unless adding information to an existing .dat file.

5. *EFLHD leveling convention allows for easy separation by level only so the Levels Numbers box should be the only one marked in the Search Criteria area. Pick the Select box by the Levels label to bring up a Microstation Level Name Search Filter dialog box. Since Spots is the Feature identified above in the Search Criteria area, make sure all spots are on level E_GEO_Spot_Elevation and then mark level E_GEO_Spot_Elevation only, then select OK.*

6. *Fit your Microstation view so all elements are included within the current view, make sure*

View is selected in the Extract portion of the Extract Graphics dialog box and pick Apply.

7. *Once that data is extracted change the Extract Graphics dialog box to show File Open = Append and Feature = Breaks as shown below.*

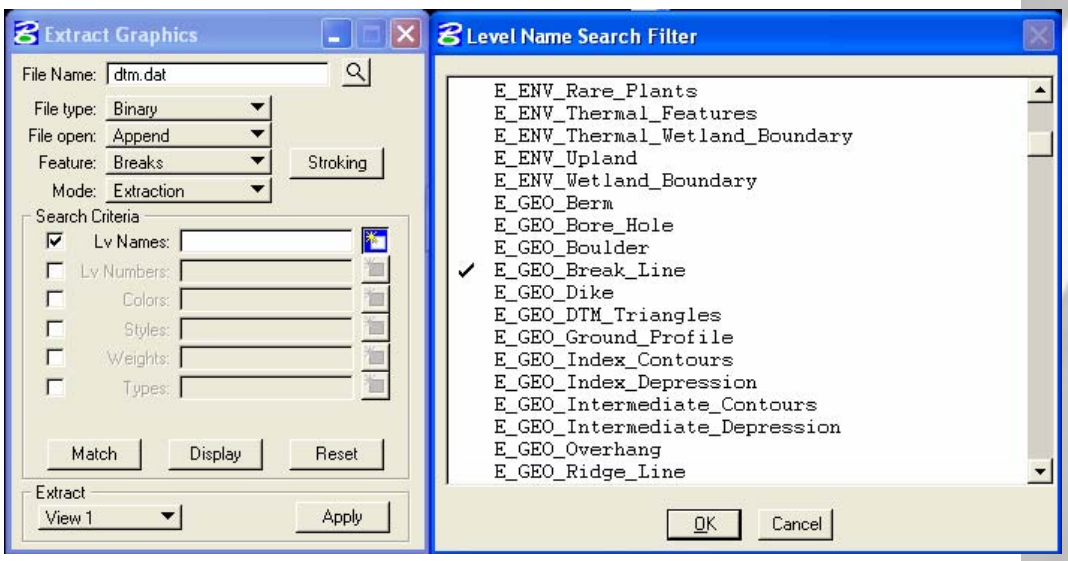

Figure 15-5: Append Settings

8. *Make sure all the break lines are on level E_GEO_Break Line and then change the Selection Level to level E_GEO_Break Line and select Apply.*

9. *Once the .dat file is completed, pick the Build Triangles button.*

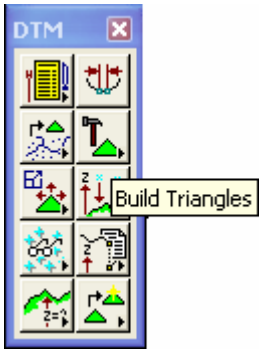

Figure 15-6: Build Triangles

This will bring up the following dialog box.

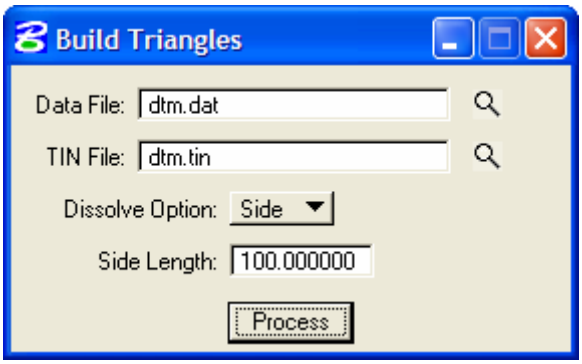

Figure 15-7: Build Triangles

10. GEOPAK will automatically input the .dat file just created. Type in the .tin file name and change the Dissolve Option from None to Side.

11. Select process and GEOPAK will build the tin

The side length refers to the length of a triangle leg placed on the exterior of the tin. We do not want the triangles jumping across areas on the exterior boundary of the survey where there is no survey data. Make sure this length is long enough to avoid any gaps in the middle of the tin, but short enough to keep the triangles from spanning areas where there is no survey.

.

Checking TIN

Once the tin is created, it is important to make sure no elements with zero elevations or no busts in the survey have been included in it. First, check the triangle statistics to verify that the elevation range is realistic. Then draw the contours to make sure they look reasonable. The following workflow will guide the user through these steps.

Workflow 2: Checking the .tin

1. ***Select the DTM Menu button from the DTM toolbar.***

Figure 15-8: DTM Menu

This will bring up the following dialog box.

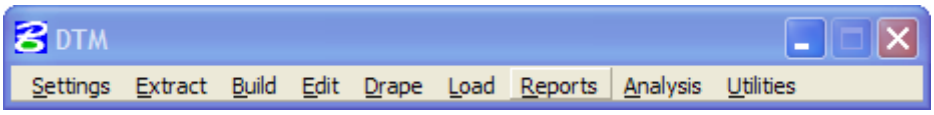

Figure 15-9: DTM Toolbar

2. ***Select Reports>Triangle Statistics to access the TIN statistics dialog box shown below.***

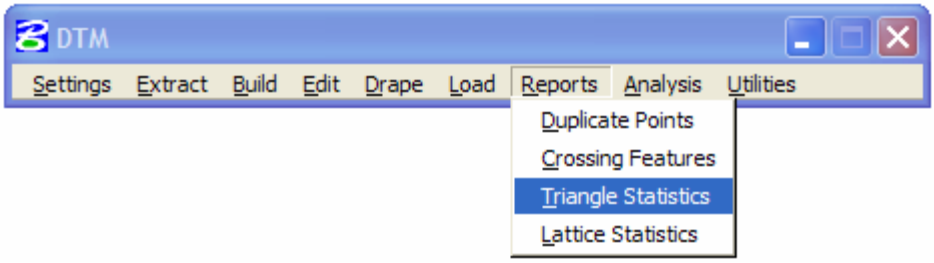

Figure 15-10: Accessing Triangle Statistics

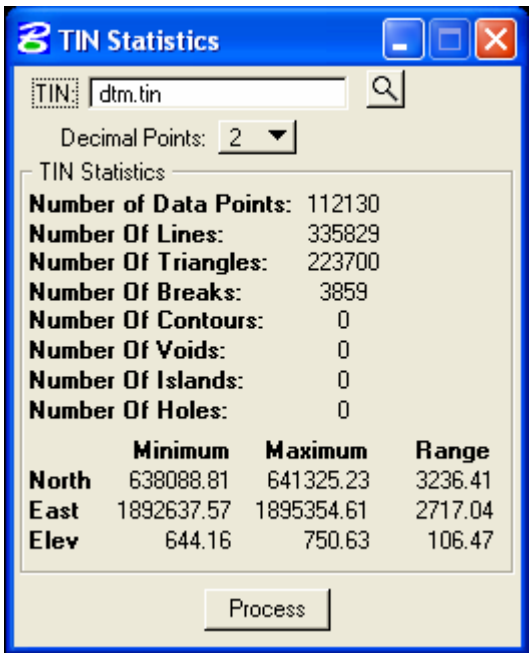

Figure 15-11: TIN Statistics

3. ***GEOPAK will automatically input the current .tin name. Press Process and GEOAPK will fill in the fields. Check the Elevation values to make sure they are consistent with the survey. If there is a zero value or the range does not seem correct, the best way to determine the location of the bust is to draw the contours as described below. Once the bust is located, the correction to the .dtm file can be made and the .dat file can be recreated.***
4. ***To check the .tin by drawing the contours, select the Load DTM Features button.***

Figure 15-12: Load DTM Feature

The following dialog box will come up.

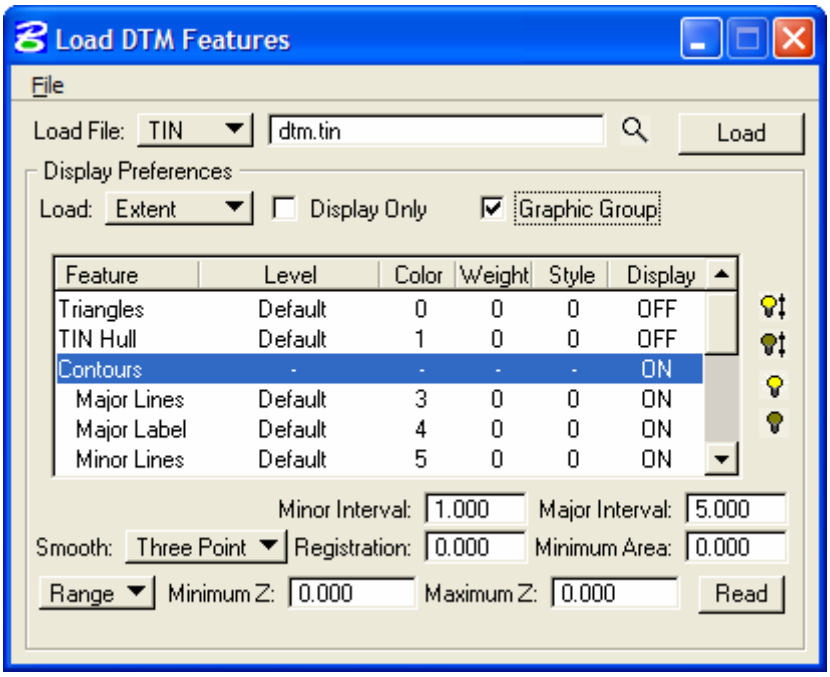

Figure 15-13: Load DTM Features

5. GEOPAK will fill in the current .tin file. Choose Extent and either Display Only or Graphic Group.

If Display Only is selected, the contours will disappear when the view is refreshed. Selecting Graphic Group will allow the user to easily delete the contours.

6. ***Set the Display for Contours, Major Lines, Major Label, and Minor lines ON by highlighting each and picking the yellow light bulb without the arrows next to it. Set the parameters for the lines and labels. Set the Major and Minor Intervals as above and pick the Read button to set the range equal to the range of the tin. Once the parameters are defined select Load button at the top of the dialog box.***
7. ***Review the contours to determine if there are any busts. Make any corrections necessary and start the process over with Workflow 1.***

These contours are not meant for plan production. This process is strictly for checking the tin.

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Chapter 16: D & C Manager

Overview

Elements such as edges of pavement, centerlines, curb and gutter, and guardrail, whether created through GEOPAK coordinate geometry, or simply drawn into MicroStation must be placed with the correct symbology. This is vitally important for such things as plotting, automated quantities, cross-sections, and ease of checking. GEOPAK's design and computation (D & C) manager is the tool that automates this task through the use of a hierarchical database, **.ddb**, containing information about each element to be placed within a set of plans.

EFLHD

At EFLHD, there are English and Metric versions of the database for use on their respective projects. Each **.ddb** file is broken into 3 categories: **Pay_items**, **Criteria**, and **Features**. **Pay_items** is then further broken down into the correct division, as shown below, then to section, then individual item, etc.

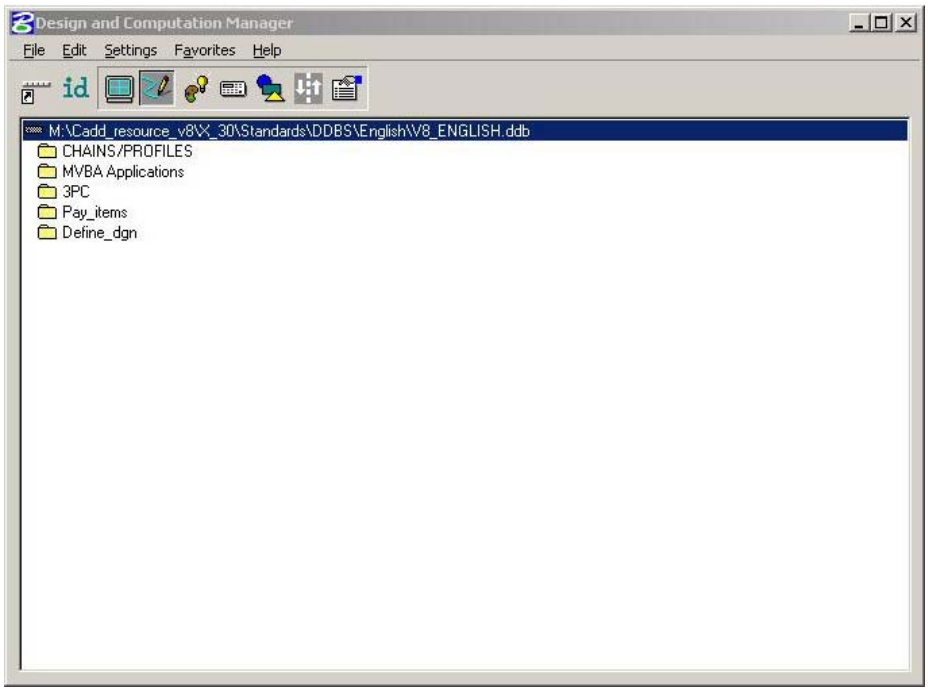

Figure 16-1: Design and Computation Manager

Workflow 1: Downloading and Attaching the Correct .ddb File

1. ***The .ddb file in use at EFLHD can be found at:***

   http://www.eflhd.gov/cadd/standard_files/ddb_files.zip

2. ***From the above link, download file and unzip the .zip file.***
3. ***Place the unit correct .ddb file in a location where it can be easily accessed for each project.***

Placing the .ddb file in a project specific location ensures several things:

- *That the current .ddb file will be used on the project for which it was intended.*
- *That the .ddb file used on the current project will be archived with the project for future use.*
- *That the file is less likely to be copied to a future project, which must, again, download the most current .ddb file.*

4. ***Access the D&C Manager by selecting Applications>GEOPAK Road>Design and Computation Manager, as shown below, or by selecting the D&C Manager icon from the GEOPAK Road tool frame. Once accessed, two dialog boxes appear. The main D&C Manager dialog box, as shown in step 5, and a secondary dialog showing various D&C Manager options.***

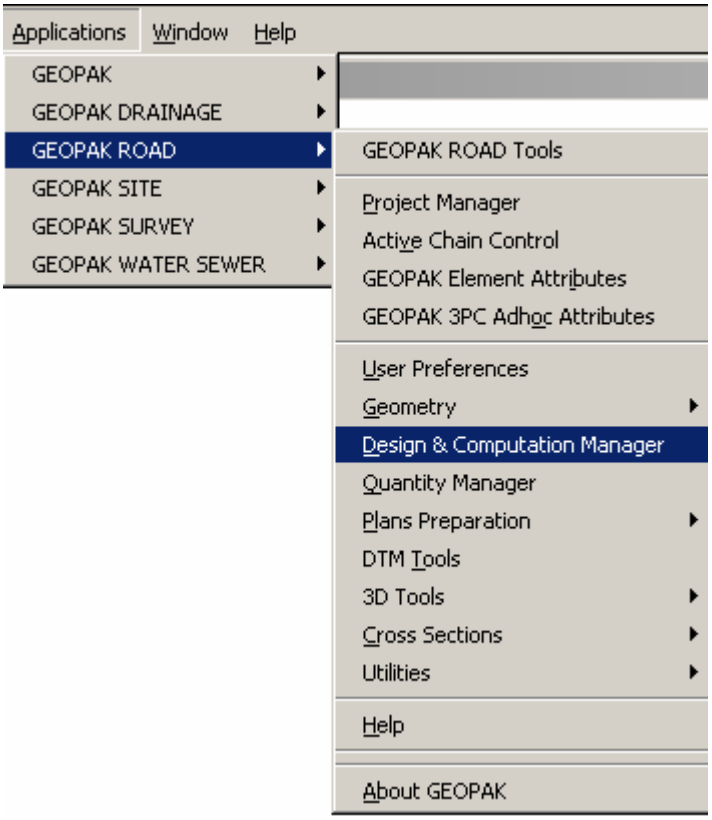

Figure 16-2: Access D&C Manager

***5. From the D&C Manager dialog select** File>Open.*

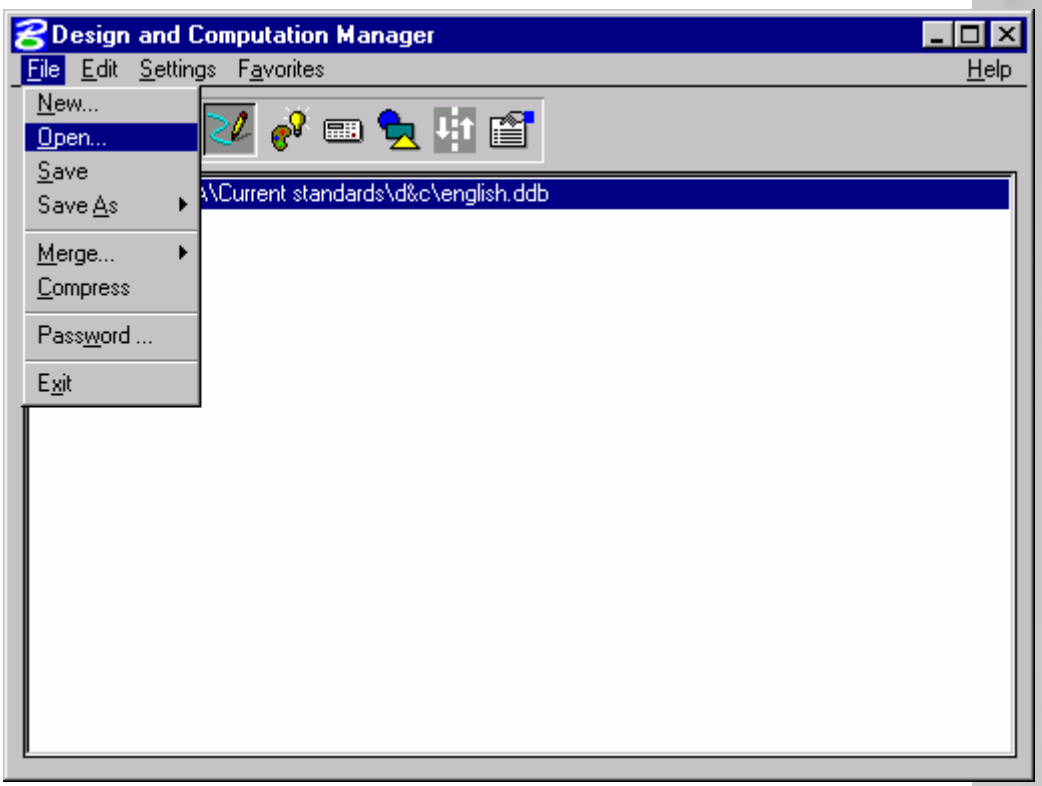

Figure 16.3: Open Database

6. ***Select the .ddb file specific to the units of the current project from the location of the saved files.***

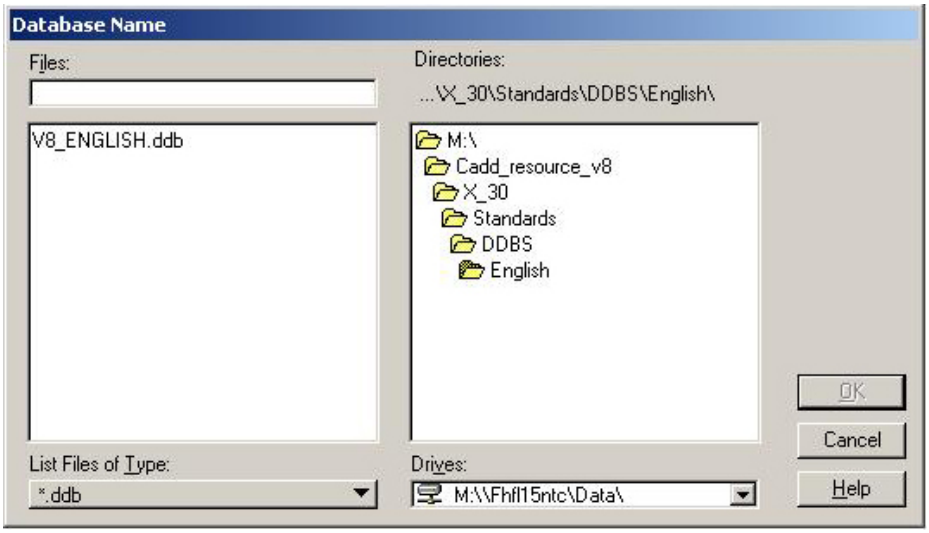

Figure 16-4: Select EFLHD Database

7. ***Select OK, the correct .ddb file will now be attached.***

Using the D & C Manager

As stated in chapter 11, this manual is not intended to teach the use of GEOPAK to the novice user. However, the following workflows will outline the most important uses of the D & C Manager, and their importance to EFLHD. There are two types of information drawn by the D & C Manager: elements such as centerlines, which have been stored in the coordinate geometry database, and elements, such as shoulder lines, which have not been stored. See the chapter on Horizontal and Vertical Geometry for a list of elements for which a coordinate geometry chain must be created.

Workflow 2: Drawing Elements from Coordinate Geometry

8. ***Once a chain, profile, or other coordinate geometry element has been stored in the coordinate geometry database, it will be drawn into Microstation using the D & C Manager's Draw Plan and Profile tool. From the D & C Manager dialog box, select the type of element to be placed. Make sure the Design button, shown as a pencil drawing a line below, is selected.***

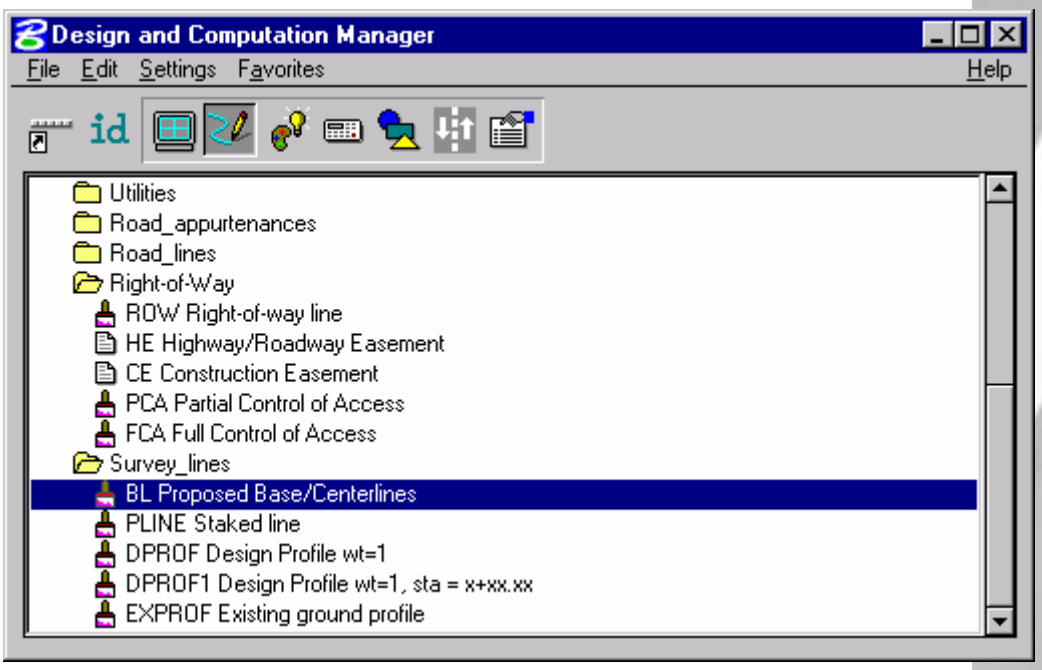

Figure 16-5: Select Database Item

The feature has all of the attributes, as determined by EFLHD, needed to draw the element into Microstation. The following dialog box shows how EFLHD has created each item with the correct level, color, weight, and style, for use with EFLHD criteria, quantities, etc.

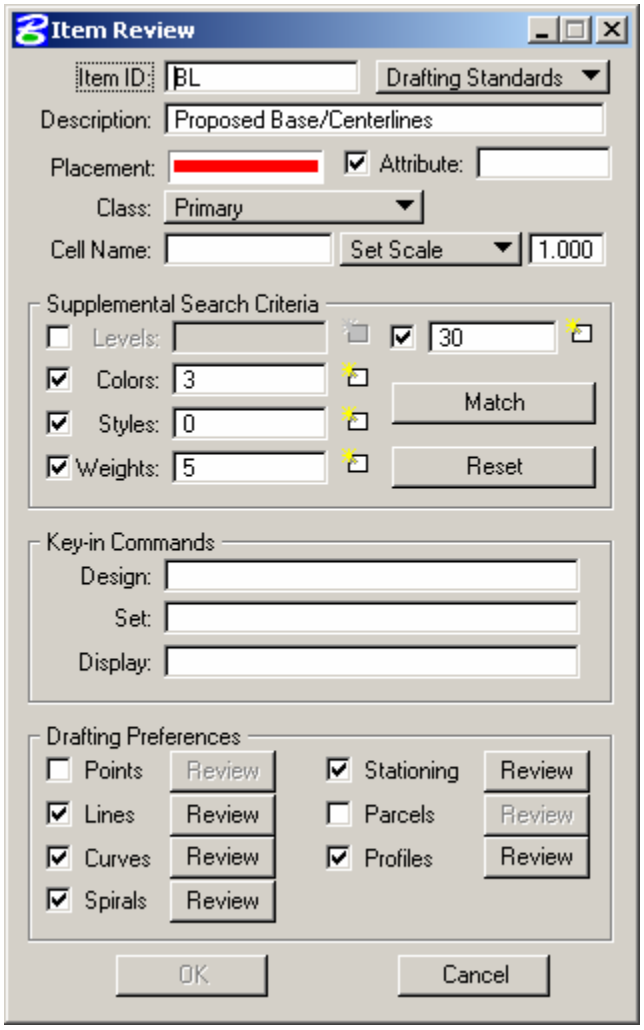

Figure 16-6: Item Review

From the above dialog, selecting any of the buttons from the preferences portion of the dialog box will access information specific to the preference selected. In the case of the dialog below, preferences for drawing lines is shown.

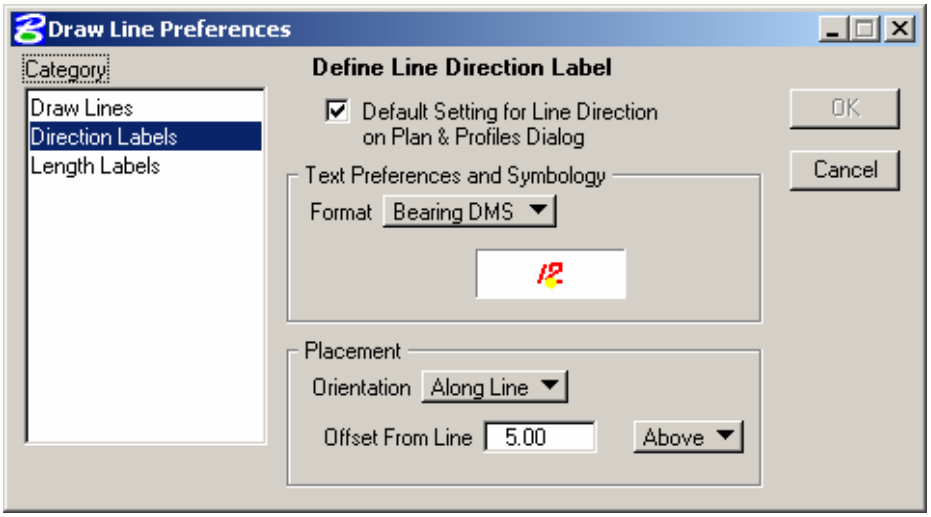

Figure 16-7: Line Preferences

Double click on the window under the format button to get the following dialog box.

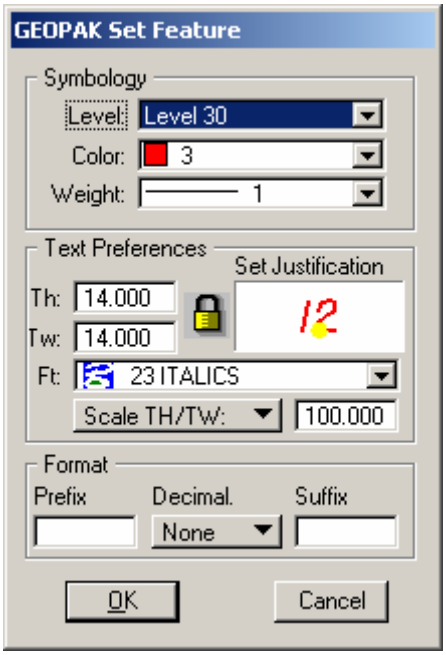

Figure 16-8: Line Feature Preferences

The task of creating all of this information has already been done by EFLHD. It is password protected and cannot be modified by the user.

9. ***Once the correct element has been selected, click the Draw Plan and Profile button in the secondary D&C Manager dialog.***

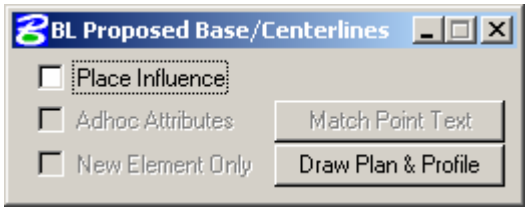

Figure 16-9: Draw Plan and Profile Dialog

10. Clicking the Draw Plan & Profile will activate the dialog box shown below, allowing the user to select the desired COGO element, shown on the left side of the dialog box. The list of elements shown in this box will correspond to the category set by the operation button in the upper left corner of the dialog box. Categories include Chains, Stationing, Profiles, Curves, Spirals, and Parcels.

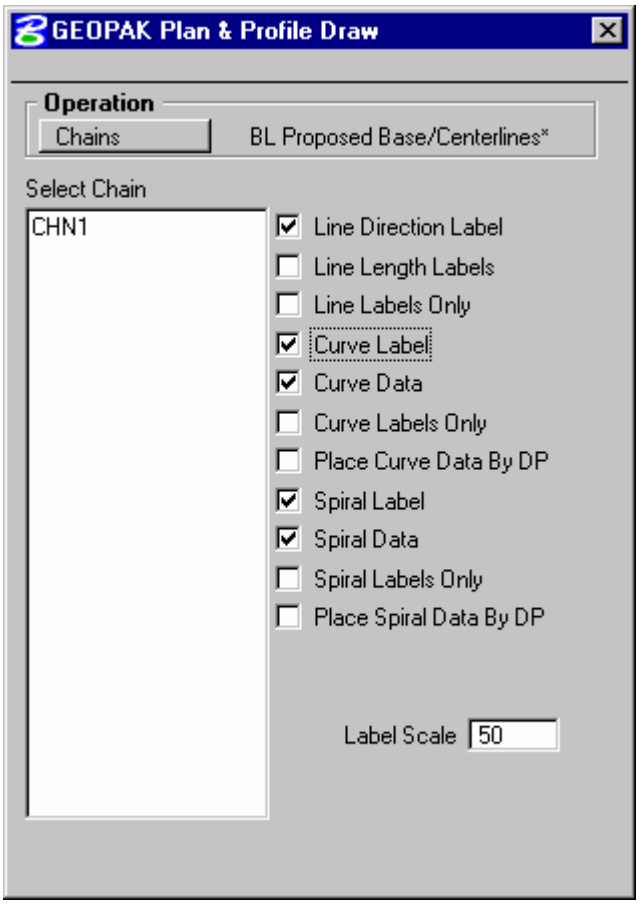

Figure 16-10: Select Chain

11. The various types of annotation that can be placed with the active category of COGO element

are listed along the right side of the dialog box as a series of check boxes. The default setup of these check boxes has been determined by EFLHD. The information to be placed, in this case, Line Direction Label, Curve Label, Curve Data, Spiral Label, Spiral Data, is what EFLHD expects to see on a typical project. As such, for final submission to EFLHD, these toggles must not be changed. For preliminary, in-house work, these may be toggled on/off as needed.

12. The Label Scale field in the lower left corner of the dialog controls the size of text and graphic annotation for the selected coordinate geometry category. The value in this field corresponds to the plot scale on 11x17 size plan sheets where the elements will be used. For example, if D&C Manager is being used to draw a chain for a Metric units project that will be used for 1000:1 scale plan sheets then the value in the Label Scale field should be 1000. Similarly, if D&C Manager is being used to draw a chain for an English units project that is being used for 100' = 1" plan sheets then the value in the Label Scale field should be 100.

For the Stationing category there are a limited number of values that are allowable in the Label Scale field. For Metric units Stationing the allowable values for Label Scale are 50, 100, 200, 250, 300, 400, 500, 1000, and 2000. For English units Stationing the allowable values for Label Scale are 10, 20, 40, 50, 100, and 200. If a value other than those listed is used for the Stationing category no stationing will be drawn.

13. Select the coordinate geometry element to draw by single clicking on it in the list box along the left side of the dialog. The element will be immediately drawn into the active design file.

When drawing a chain into MicroStation, select the desired chain only once. It will plot immediately upon selection. If the plotted chain is not visible, do a MicroStation fit view to fit the chain into the MicroStation window.

Placing Design Elements Using Microstation Commands

Placing elements into Microstation which have not been designed using coordinate geometry, but rather will be drawn using Microstation becomes an easy process with the D & C Manager. EFLHD requires that elements be placed using the correct symbology, for the reasons stated above. Most importantly, EFLHD criteria files search for elements placed with the correct symbology to create proposed cross-sections. The D & C Manager can be used in conjunction with both Microstation commands, such as move parallel and place line, and GEOPAK commands, such as draw transition. This is accomplished with the Place influence command in the D & C Manager.

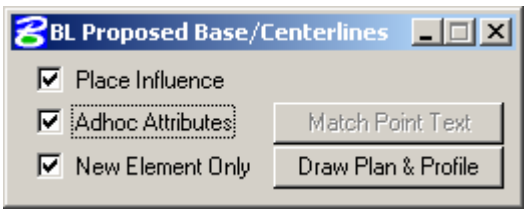

Figure 16-11: Place Influence

Toggling on place influence will allow the user to place any element with the attributes of any element selected in the D & C Manager. With the Adhoc Attributes toggled on, GEOPAK will give the new or modified element the same adhoc values as the active item. With new element only toggled on, any modifications to a selected item will not result in changing the attributes of that element. In the example above, a line drawn using Microstation's place line command will be drawn with the attributes of **BL Proposed Base/Centerlines**.

Workflow 3: Drawing Elements Not Designed in Coordinate Geometry

1. ***From the D & C Manager select the element to be drawn. In the example below, 42" Pipe culvert.***

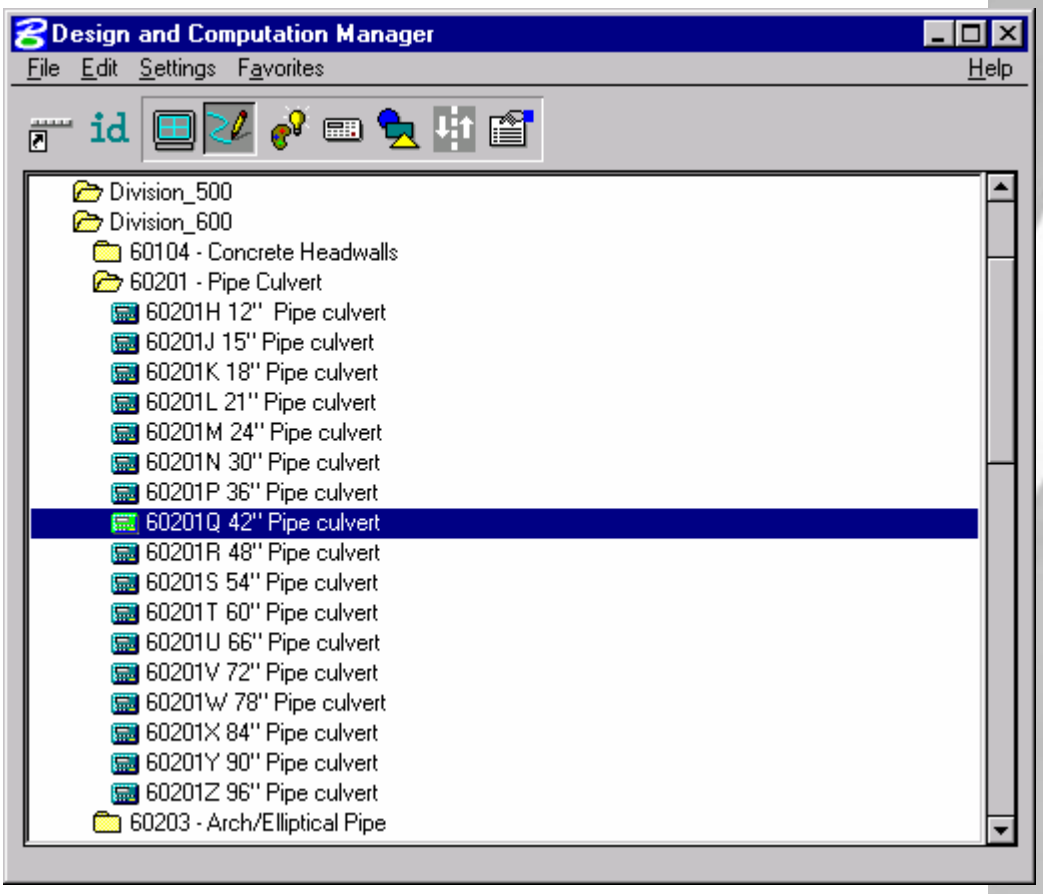

Figure 16-12: Select Database Item

2. Select the desired Microstation or GEOPAK tool, in this example, the move parallel tool.

The move parallel tool, when used without Place Influence, will always place the new element with the symbology of the existing element, regardless of the active attributes. Place Influence over-rides the existing attributes with that of the selected element.

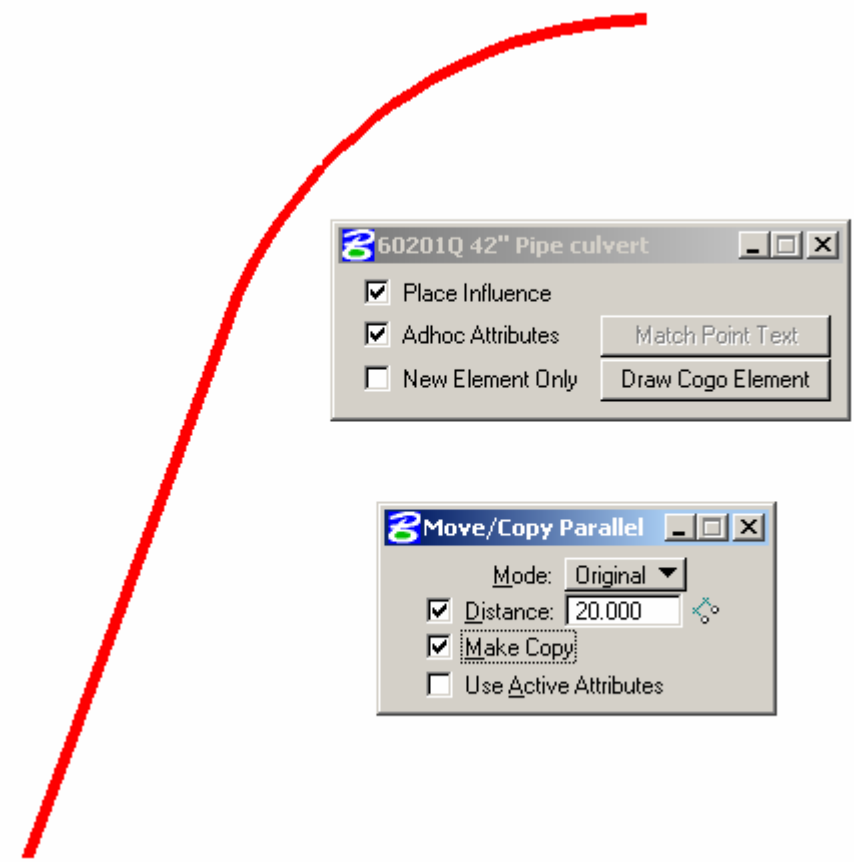

Figure 16-13: Place Influence

3. ***With Place Influence toggled on, select the existing element and accept in the desired direction.***
4. ***The new element will be drawn with the correct attributes of the element selected in the D & C Manager, regardless of the active Microstation attributes.***

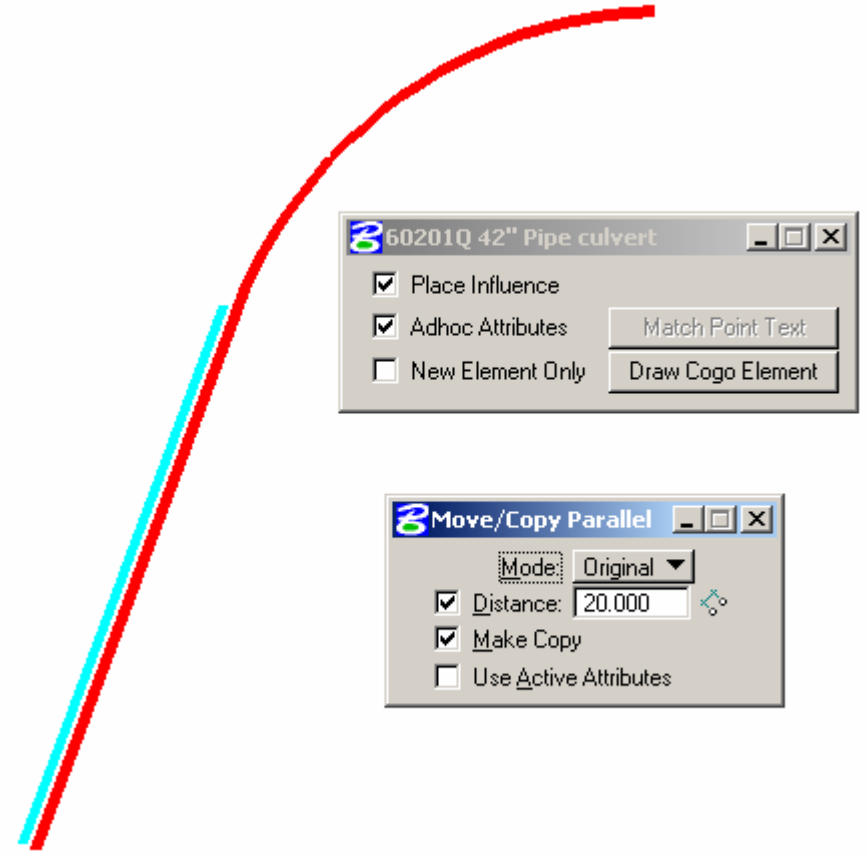

Figure 16-14: Copy Parallel with Place Influence

Information for Advanced Users

Simply setting the active level, color, weight, and style or toggling on the Use Active Attributes button is not the same as using the GEOPAK Place Influence command. The two information dialog boxes shown below are, first, from the element placed with Place Influence toggled on, and, second, without using Place Influence.

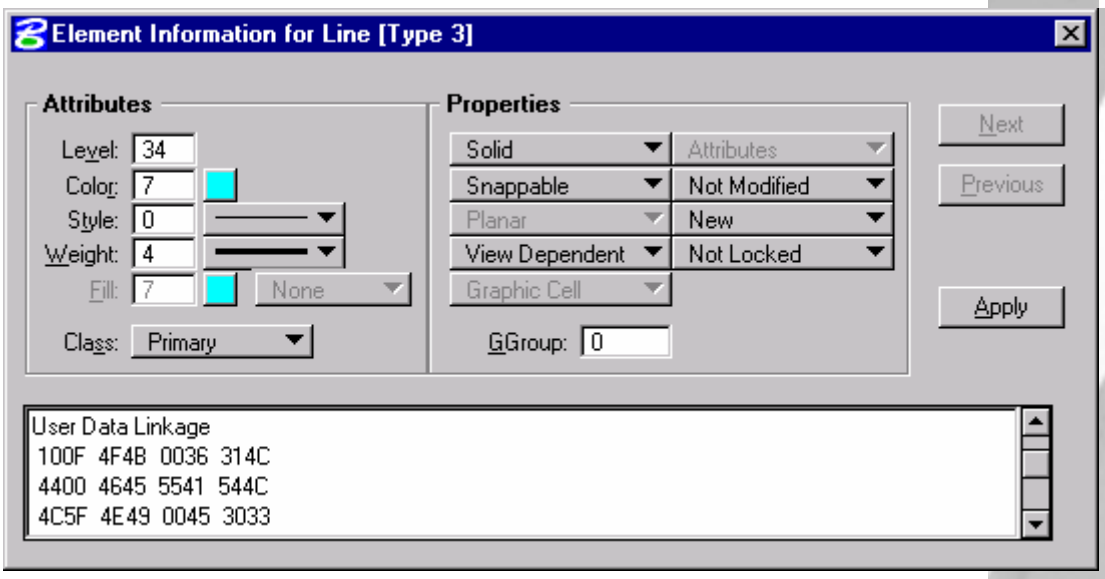

Figure 16-15: Element Information, with Place Influence

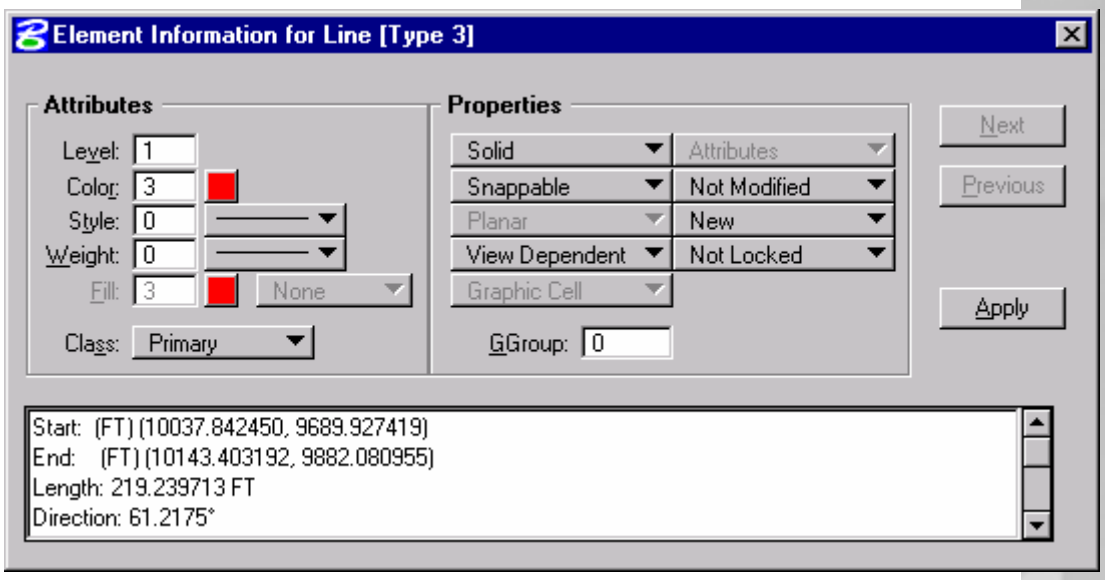

Figure 16-16: Element Information, without Place Influence

As shown above, the element created with place influence has user data linkage attributed to the element. The element created without place influence does not. This extra data is read by GEOPAK for things such as automated quantities, etc.

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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. 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 EFLHD. Each one of these methods have 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 EFLHD .ddb file.** This will assure that the elements are drawn with the correct symbology, matching the EFLHD standards.

Coordinate Geometry

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

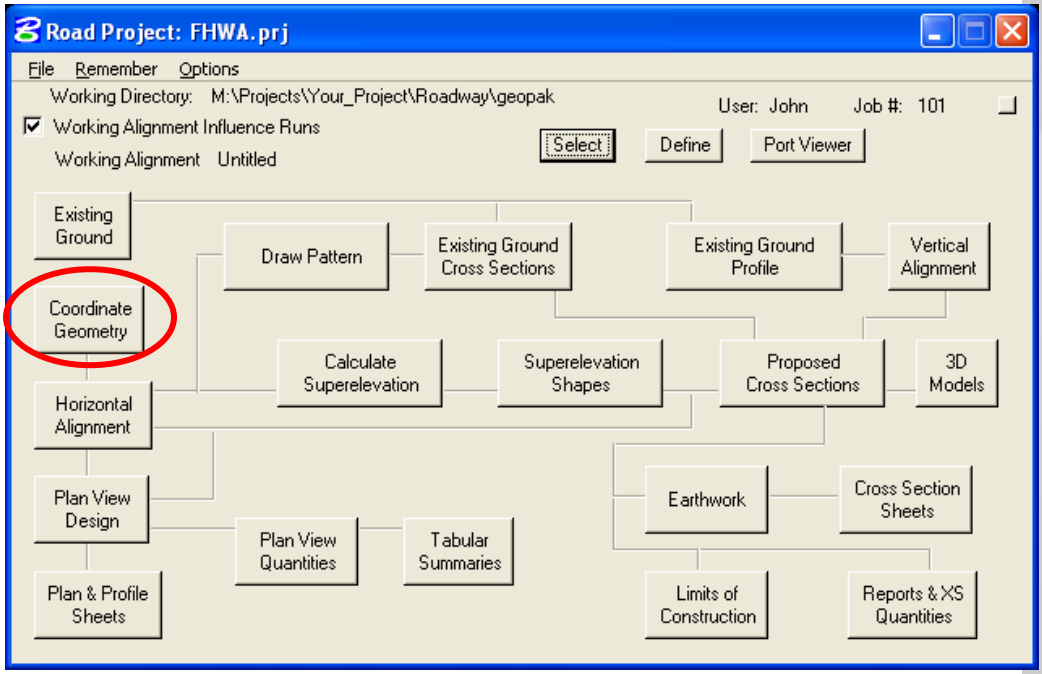

Figure 17-1: Accessing COGO through Project Manager

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.

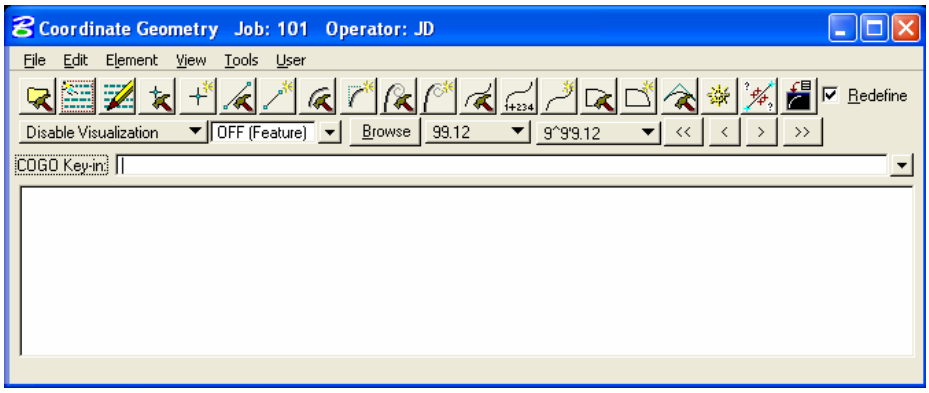

Figure 17-3: Coordinate Geometry

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 / Horizontal Alignment Generator Overview

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. Graphical COGO and the Horizontal Alignment Generator can be accessed by selecting:

Applications>GEOPAK ROAD>Geometry>Graphical Coordinate Geometry, or

Applications>GEOPAK ROAD>Geometry>Layout Horizontal Alignments

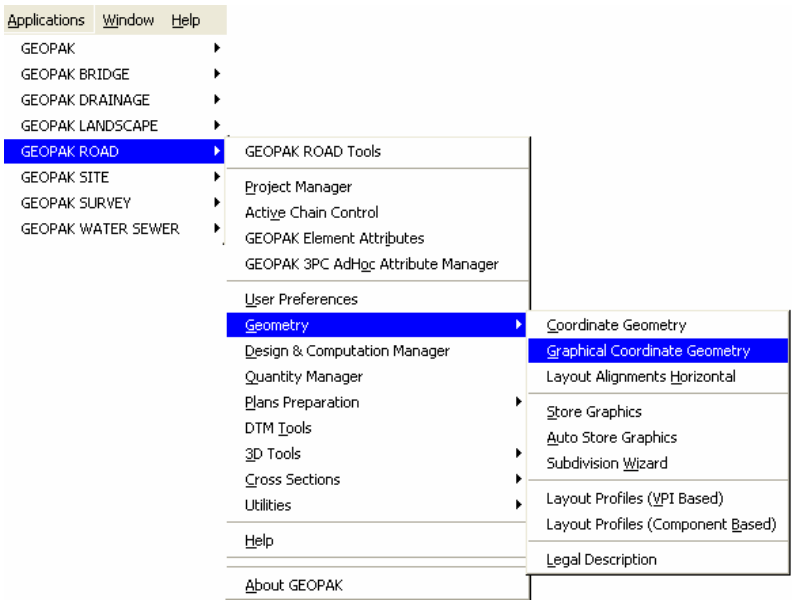

Figure 17-4: Accessing Horizontal Alignment Generator and Graphical COGO

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

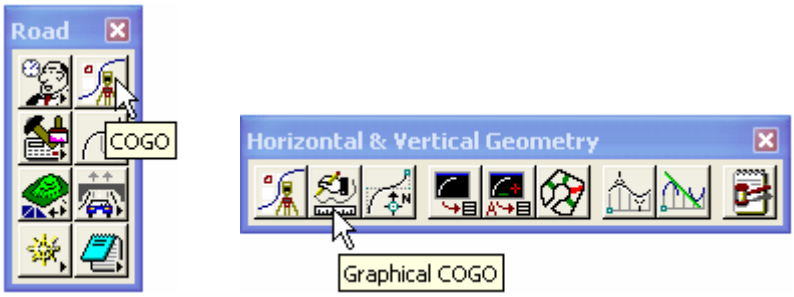

Figure 17-5: Graphical COGO Icons

The Horizontal Alignment Generator can also be accessed using Project Manager by clicking on the Horizontal Alignment button on the flow chart and selecting Graphical Element Based geometry. Graphical COGO cannot be accessed directly from Project Manager.

Graphical COGO

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.

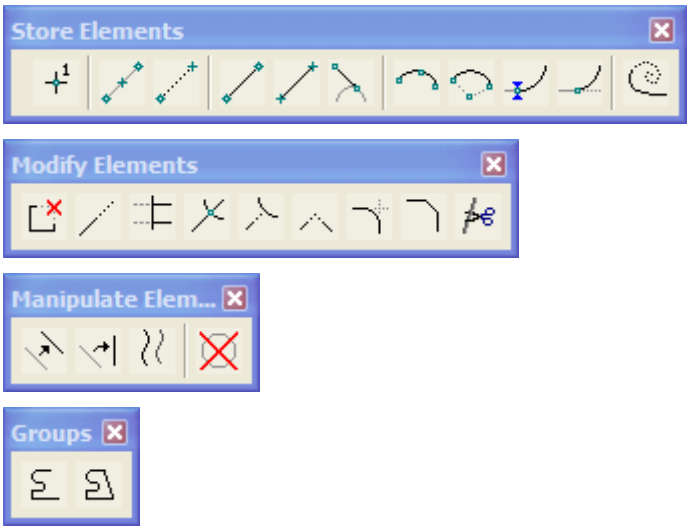

Figure 17-7: Graphical COGO Tools

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)

Horizontal Alignment Generator can be accessed by selecting third icon in the Horizontal & Vertical Geometry toolbox. Selecting this icon will invoke the Horizontal Alignment Generator Menu.

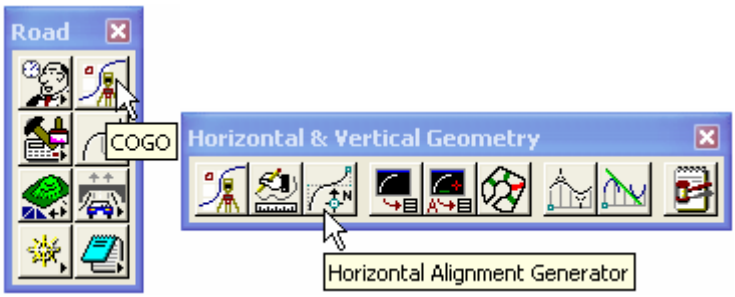

Figure 17-8: Horizontal Alignment Generator

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. EFLHD uses the Spiral Design Tables. To access the Spiral Design Tables, path should be set to *M:\Cadd_resource_v8\X_30\Standards\Bin\english or metric.*

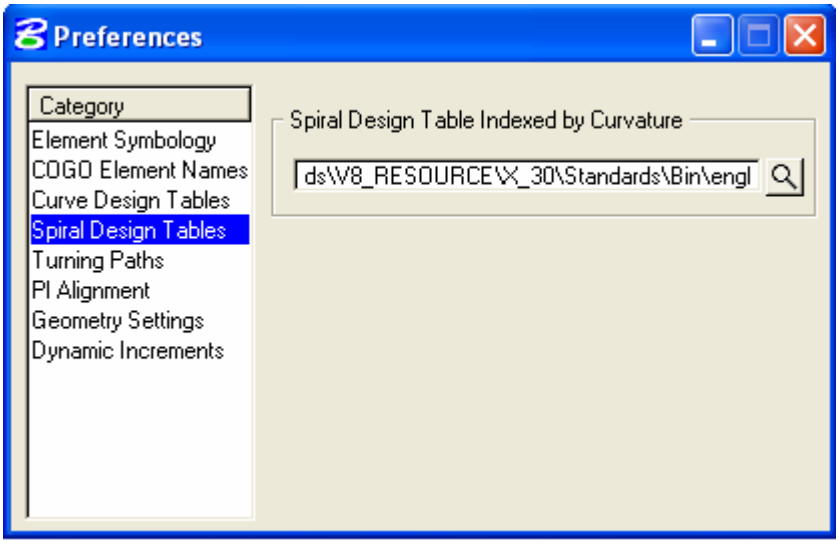

Figure 17-10: Horizontal Alignment Generator Preference

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 EFLHD 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.

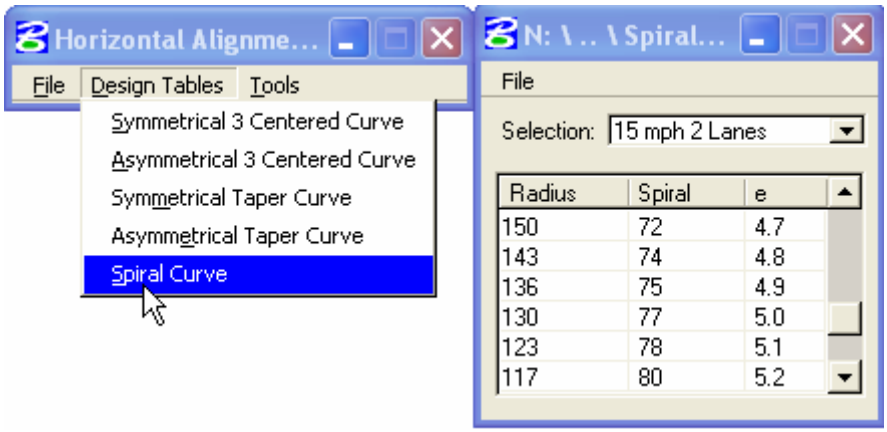

Figure 17-11: Design Tables – Spiral Curve

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.

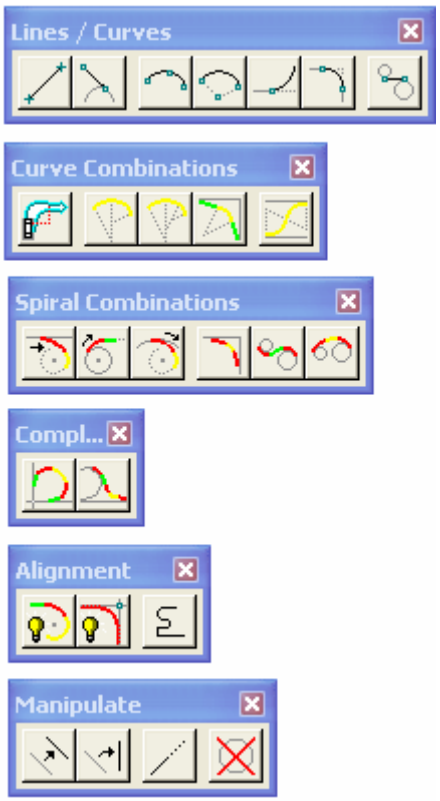

Figure 17-13: Horizontal Alignment Generator Tools

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 tangent 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.

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**

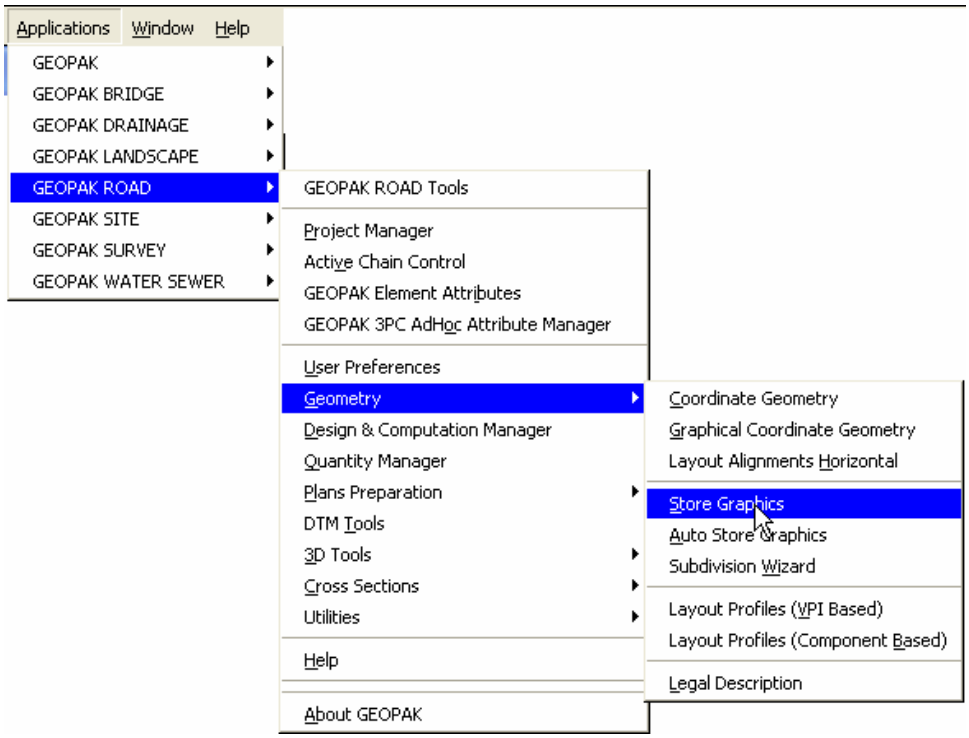

Figure 17-14: Accessing Store Graphics

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. You can store the elements as Complex Chain, Selection Set or Single Element.

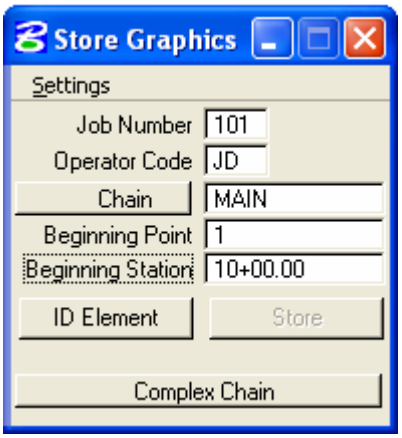

Figure 17-16: Store Graphics

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.

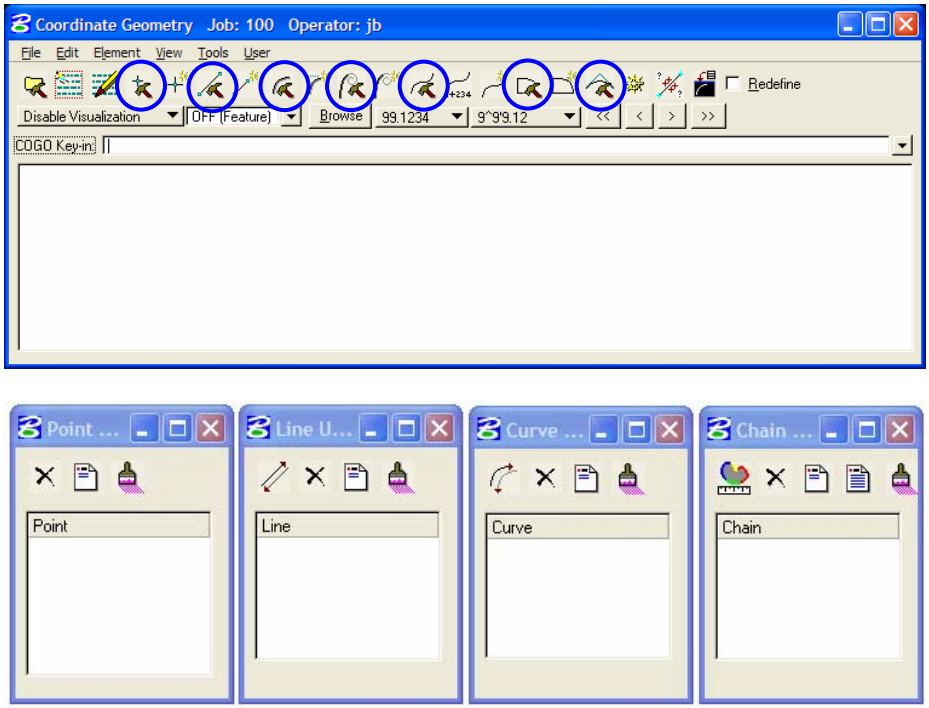

Figure 17-17: New COGO Tools

Vertical Design

There are two tools used to set proposed vertical alignments, and both are acceptable to EFLHD. Engineers and designers have used the 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 a 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. EFLHD's traditional method for cutting existing ground profile is shown below. Existing Ground Profile can be accessed using Project Manager by selecting the Existing Ground Profile button.

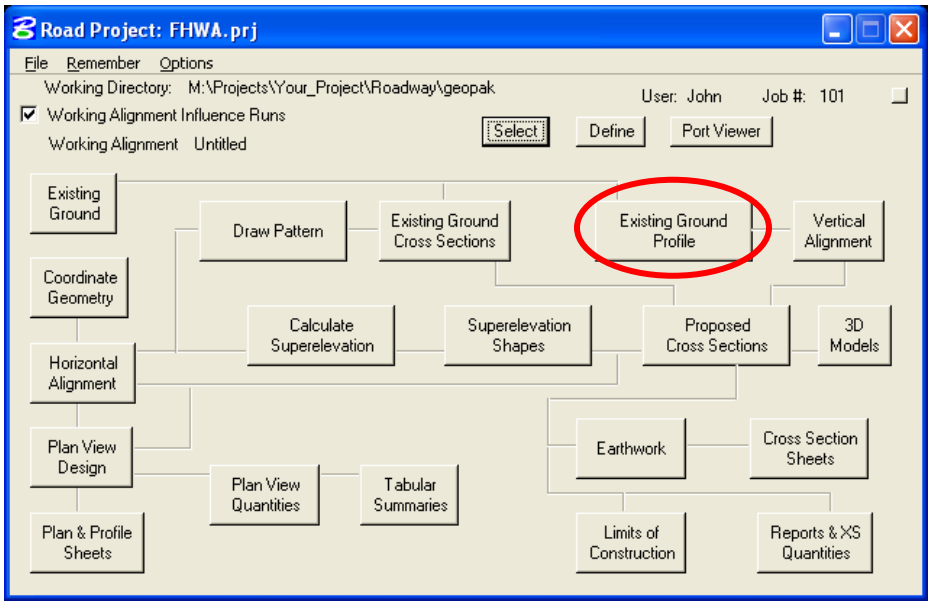

Figure 17-18: Accessing Existing Ground Profile through Project Manager

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

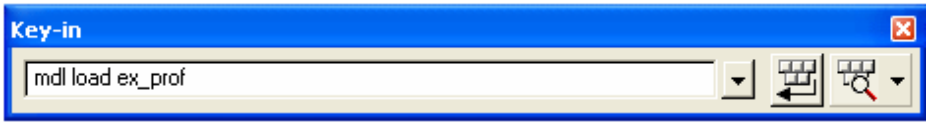

Figure 17-19: Microstation Key-in

The following Existing Ground Profile dialog box will appear.

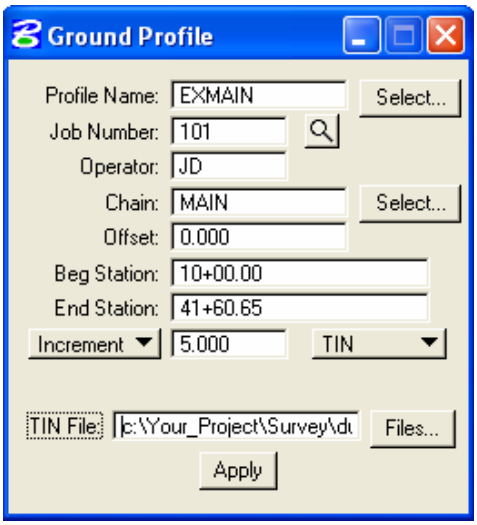

Figure 17-20: Traditional Existing Ground Profile

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 EFLHD **.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, but can be accessed by selecting **Applications>GEOPAK ROAD>Plans Preparation>Draw Profiles**, as shown below.

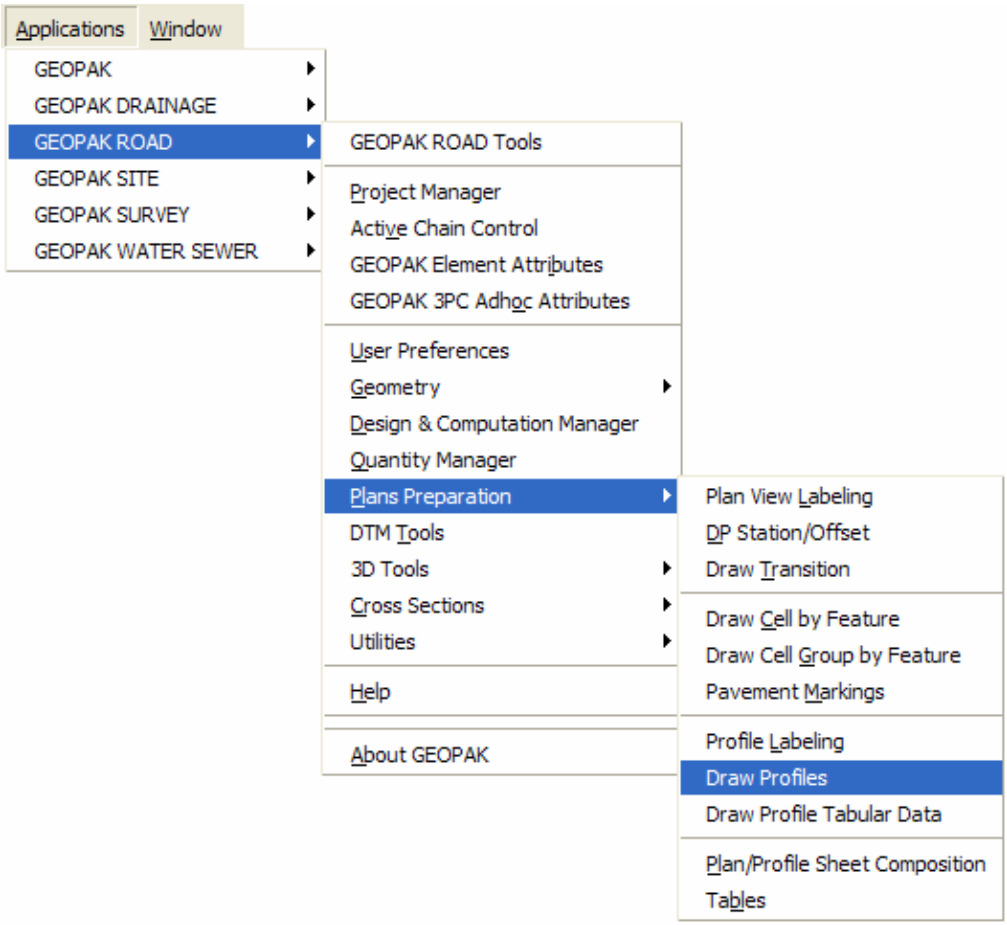

Figure 17-21: Select Draw Profiles

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

Figure 17-22: 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.*

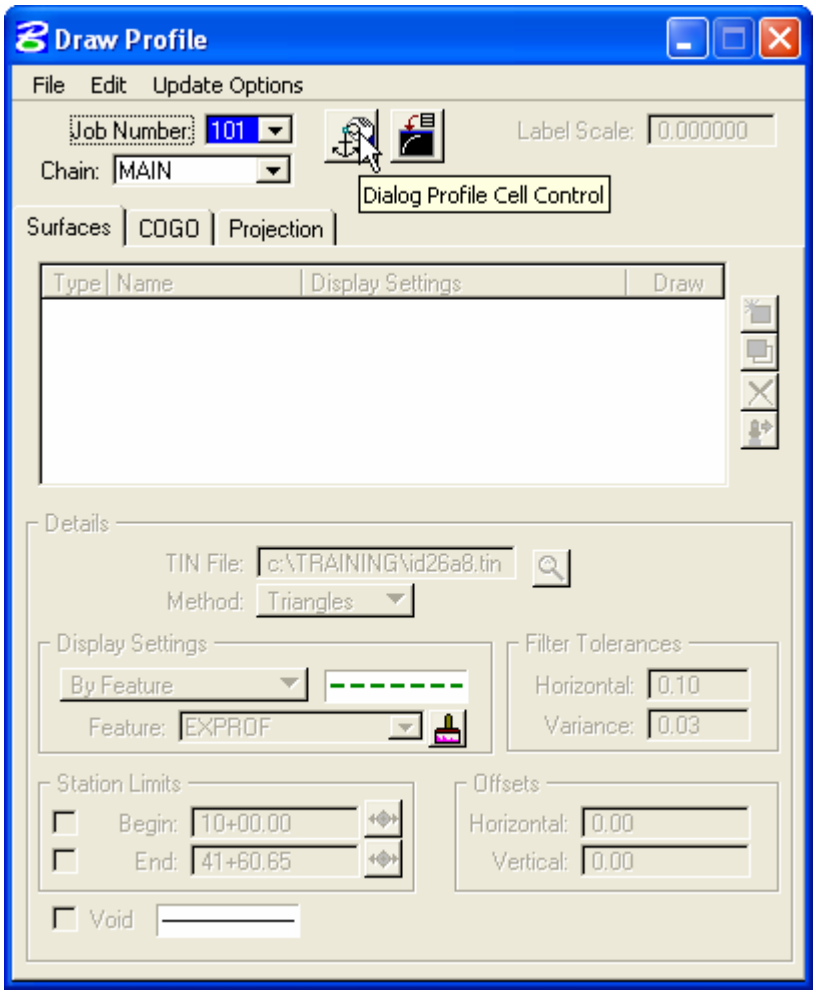

Figure 17-23: Draw Profile Dialog Box

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. The following dialog box will appear.*

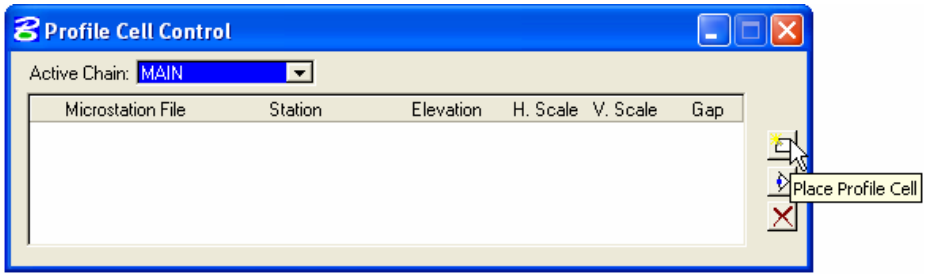

Figure 17-24: Profile Cell Control

4. *Select the Place Profile Cell icon on the top right side of this dialog.*
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.*

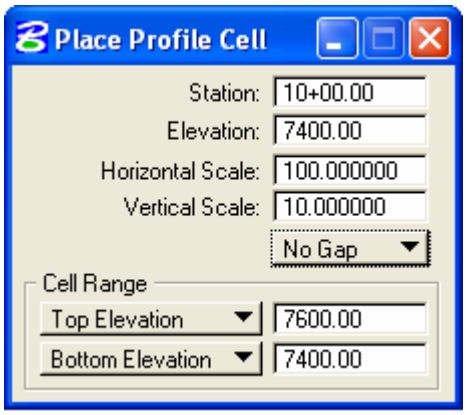

Figure 17-25: Place Profile Cell

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.*

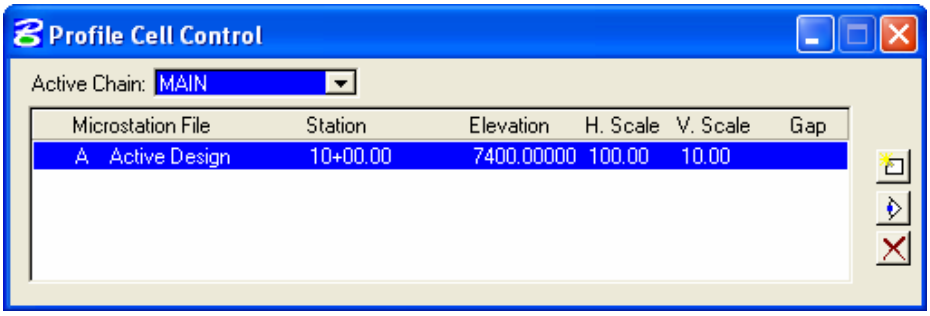

Figure 17-26: Profile Cell Control

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.*

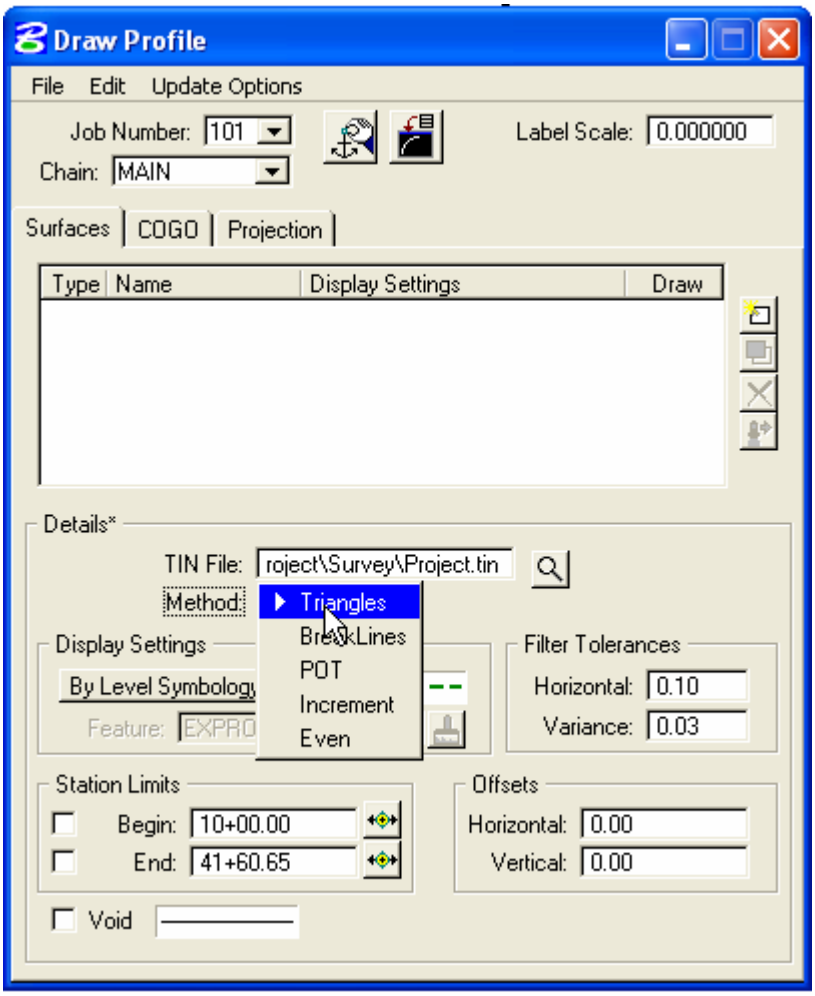

Figure 17-27: Draw Profile Method

9. ***Begin by selecting the correct .tin file.***

10. ***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.***

11. ***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. As shown below, the Draw Profile tool will use either the D&C Manager or allow the user to input symbology.***

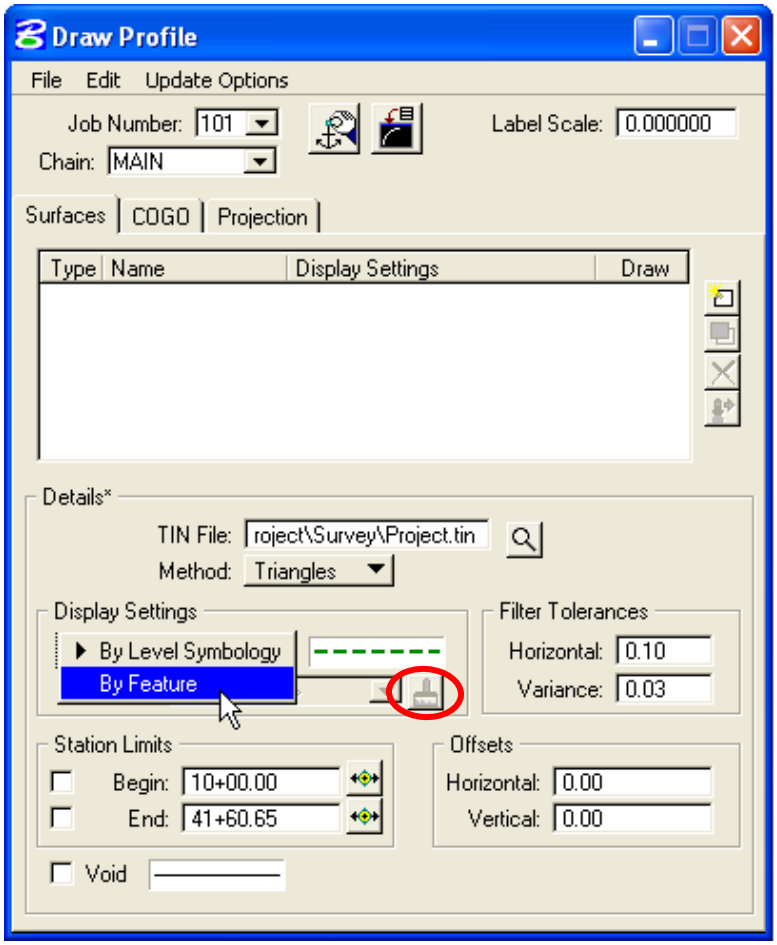

Figure 17-28: Display Settings

12. ***Select By feature to access the D&C Manager.***

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

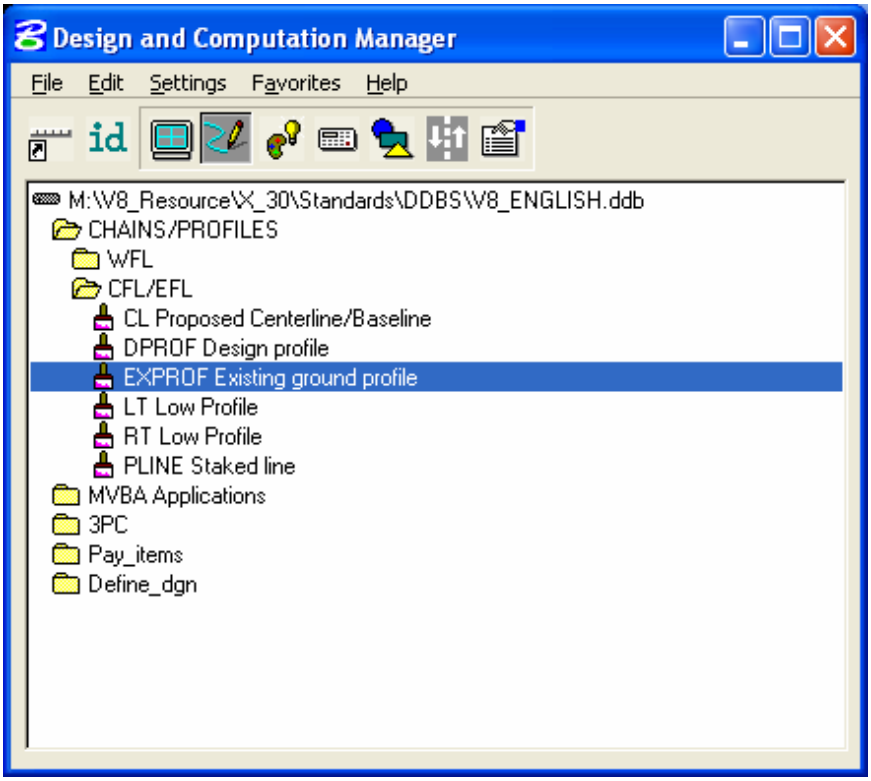

Figure 17-29: D&C Manager

14. ***Select the correct element, shown above as CHAINS/PROFILES>CFL/EFL>EXPROF Existing ground profile Profile.***

15. ***Select the OK button in the upper right hand corner of the dialog box.***

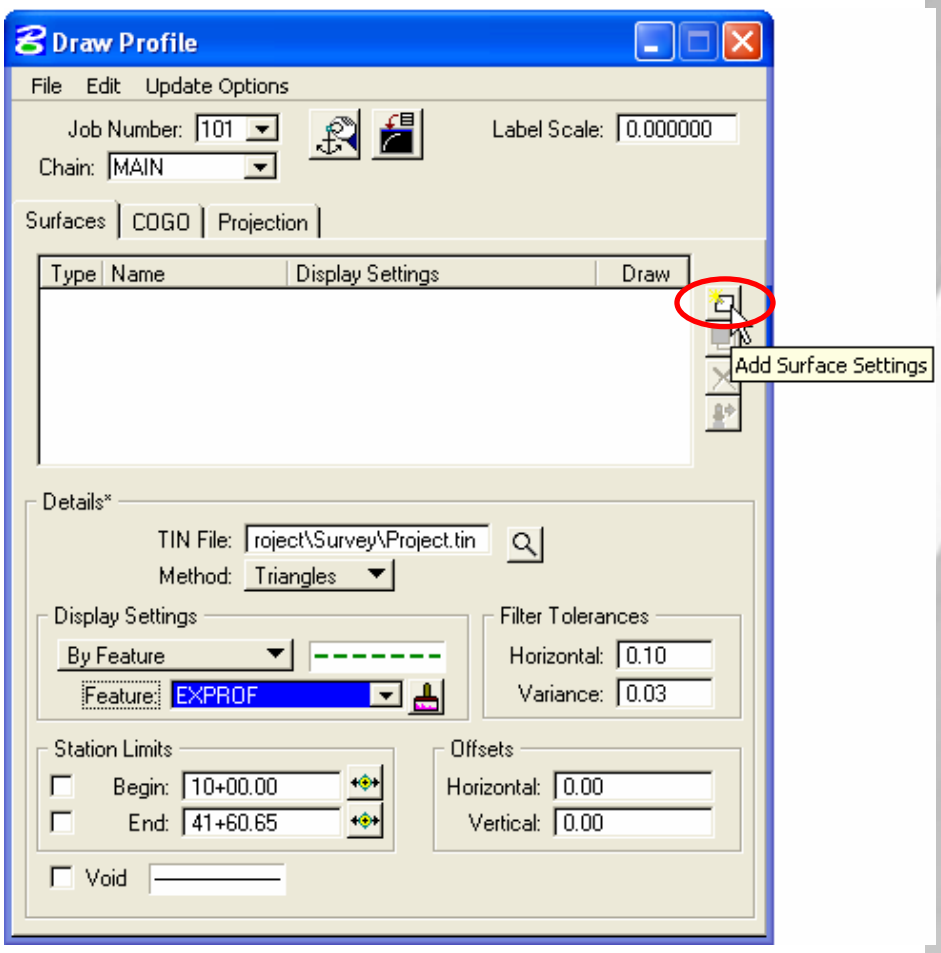

Figure 17-30: Add Surface

16. ***Once the above dialog box has been populated with the correct .tin file, the Method, and the symbology, Select the Add Surface Settings icon, circled above.***

17. ***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.***

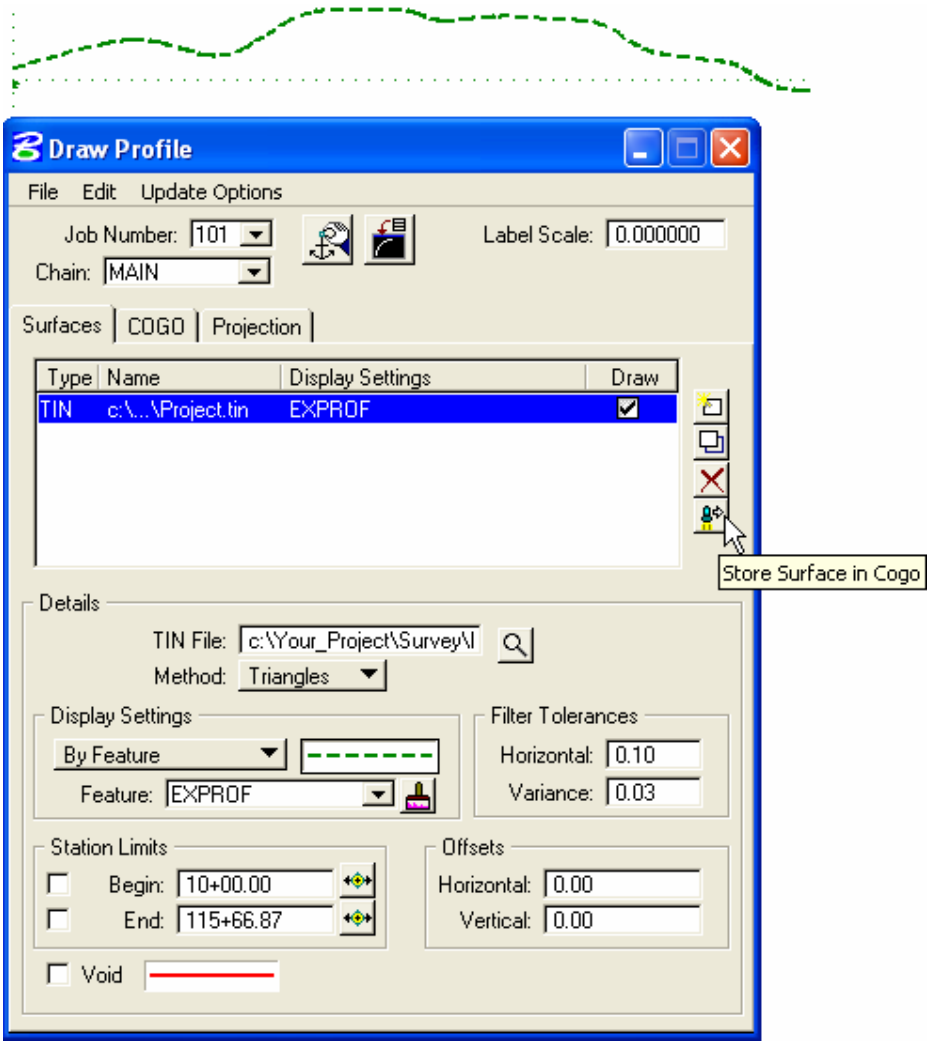

Figure 17-31: Store Surface in COGO

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.

18. To Store this profile into COGO, select the Store Surface in Cogo icon, as shown above.

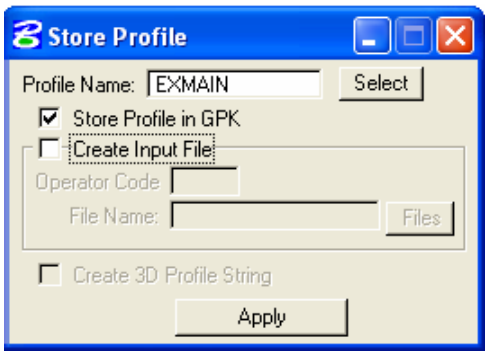

Figure 17-32: Store Profile

19. ***Populate the Profile Name box with the desired name. Check the box labeled Store Profile in GPK.***

20. ***Select Apply.***

21. ***The profile is now stored in the GPK.***

22. ***Dismiss the Store Profile dialog box and return to the Draw Profile dialog box.***

23. ***Select the COGO tab and from the Profile Name box, select the correct profile.***

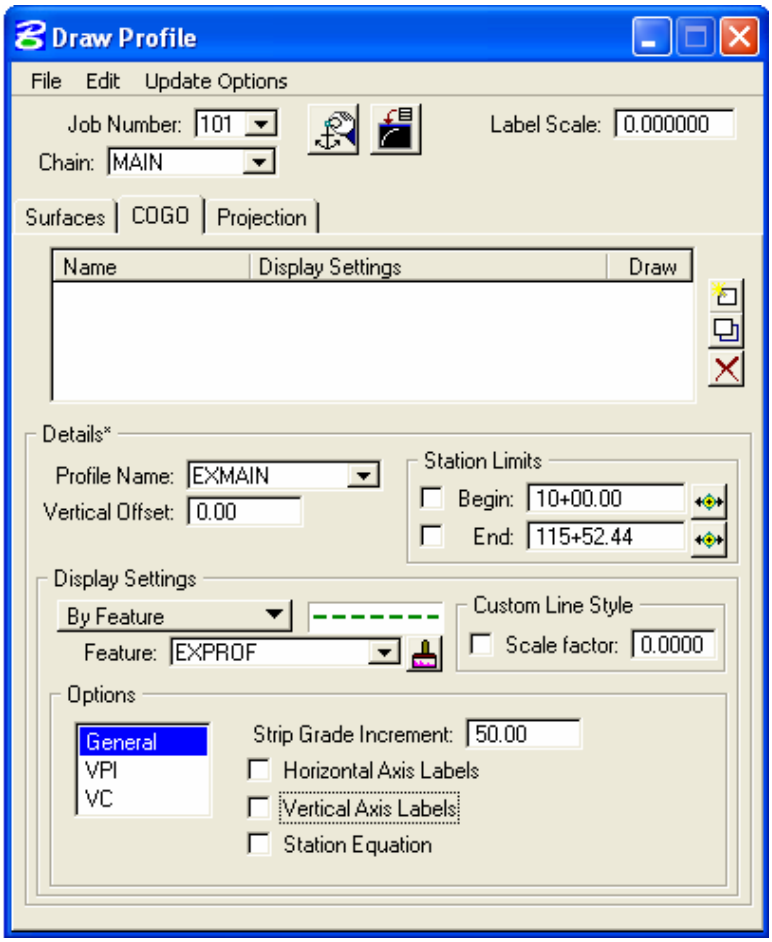

Figure 17-33: Draw Profile Dialog Box

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

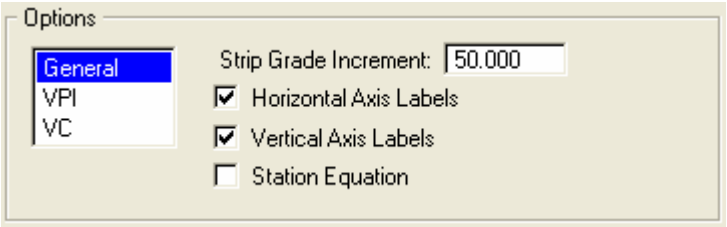

Figure 17-34: Profile Options

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

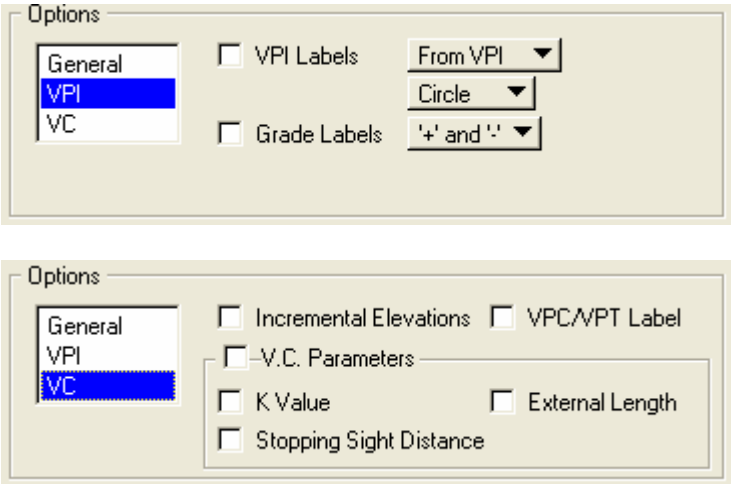

Figure 17-35: Profile Options

26. 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.

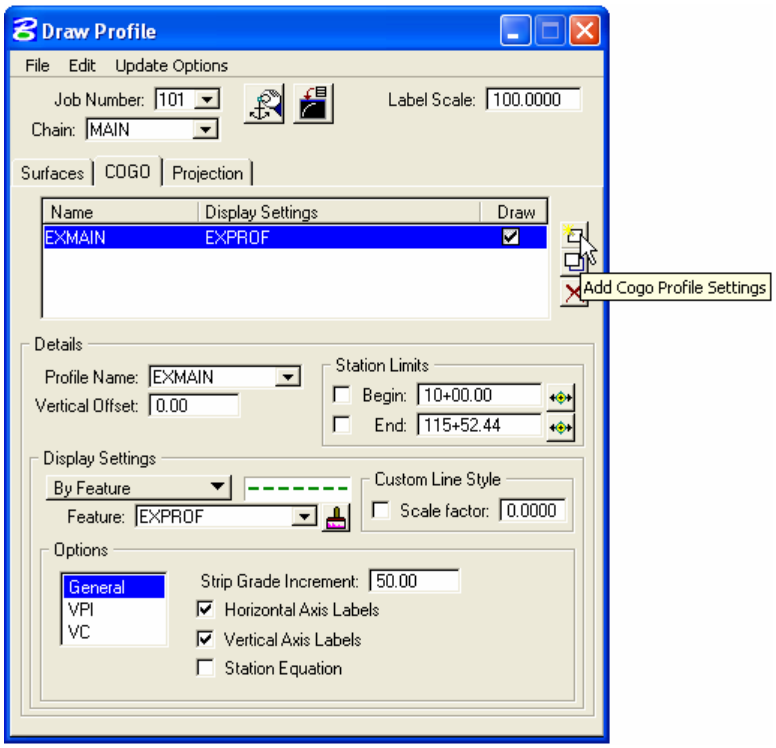

Figure 17-36: Profile Drawn Into MicroStation

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.

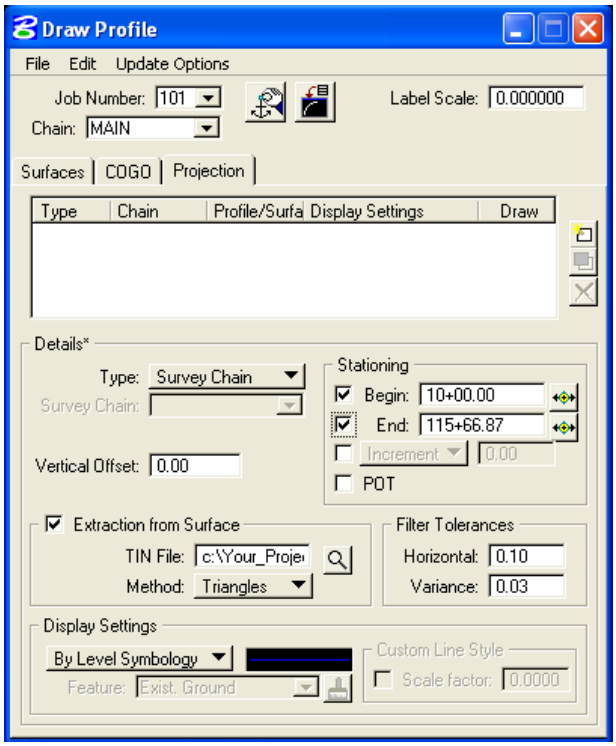

Figure 17-37: Profile Projection Tab

Proposed Vertical Alignment

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

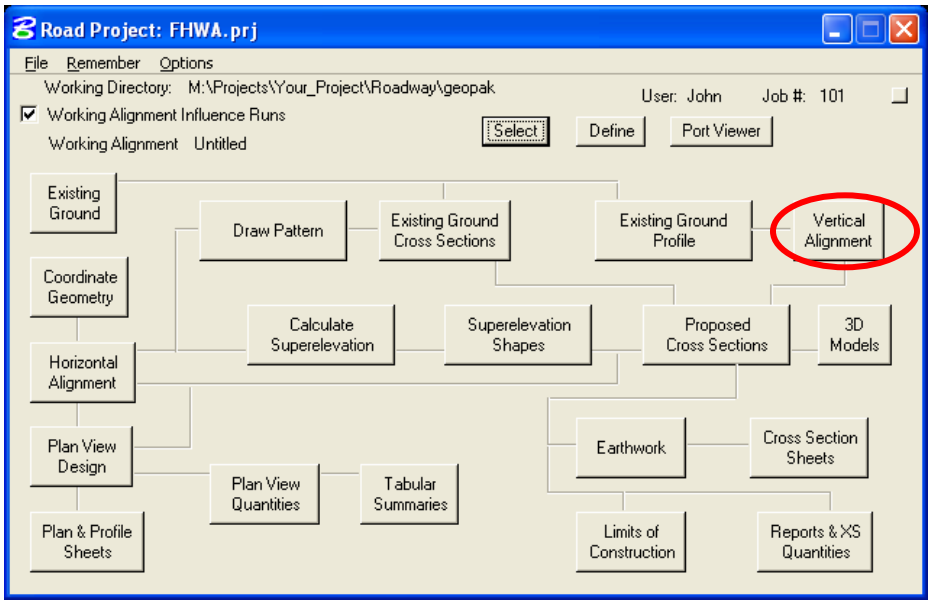

Figure 17-38: Accessing Vertical Alignment through Project Manager

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

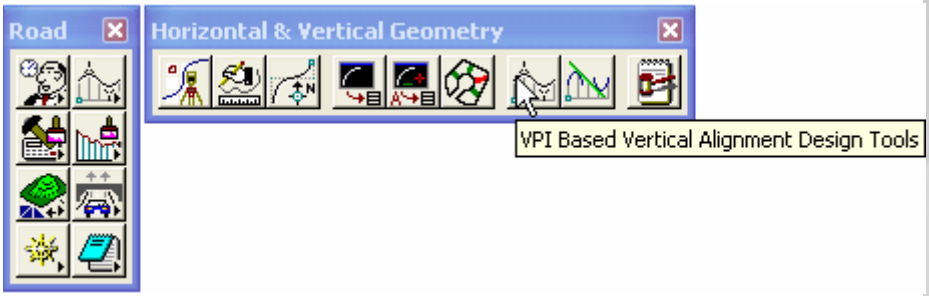

Figure 17-39: VPI Based Vertical Alignment Icon

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

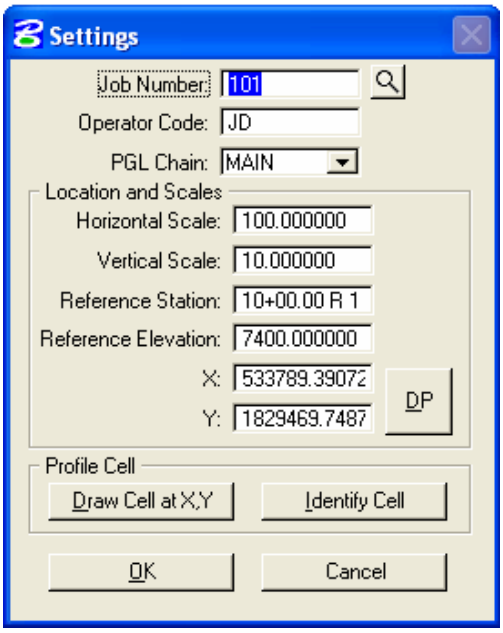

Figure 17-40: VPI Based Vertical Alignment Settings

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

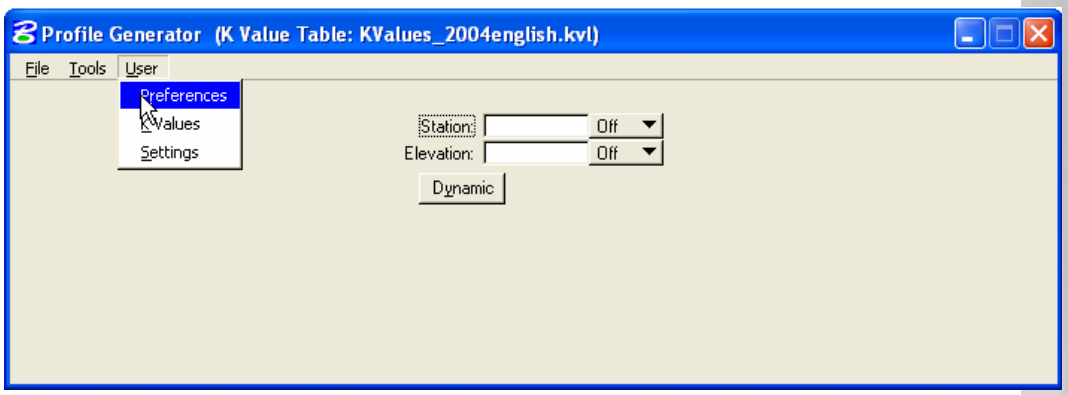

Figure 17-41: Profile Generator

For EFL projects, the User Preferences are as shown below:

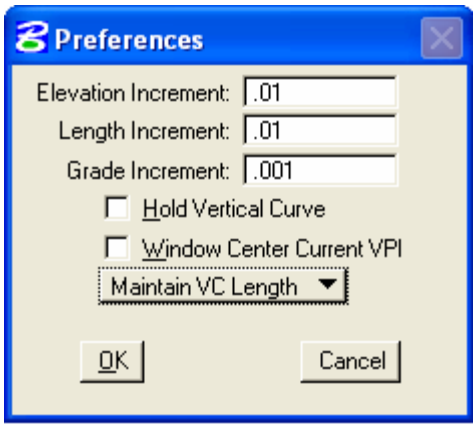

Figure 17-42: User Preferences

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:

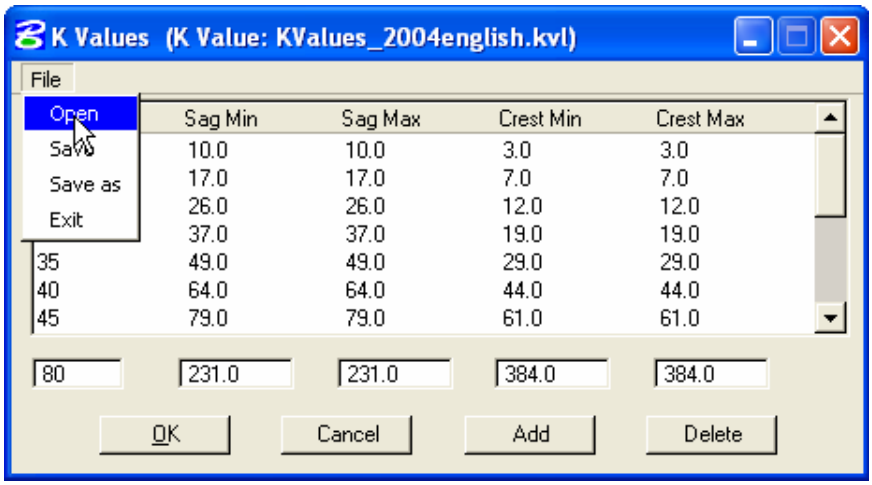

Figure 17-43: K-Value Table

Use **File>Open** to attach the correct unit K-Value table (**.kvl**). K-Value table can be attached from M:*V8_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 EFLHD projects, the toggles shown below must be selected prior to drawing the profile.

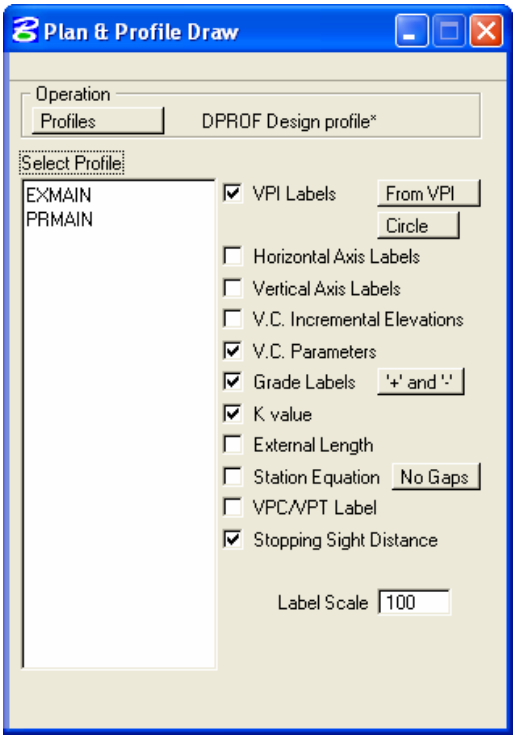

Figure 17-44: D & C Manager to Draw Profile Draw

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***

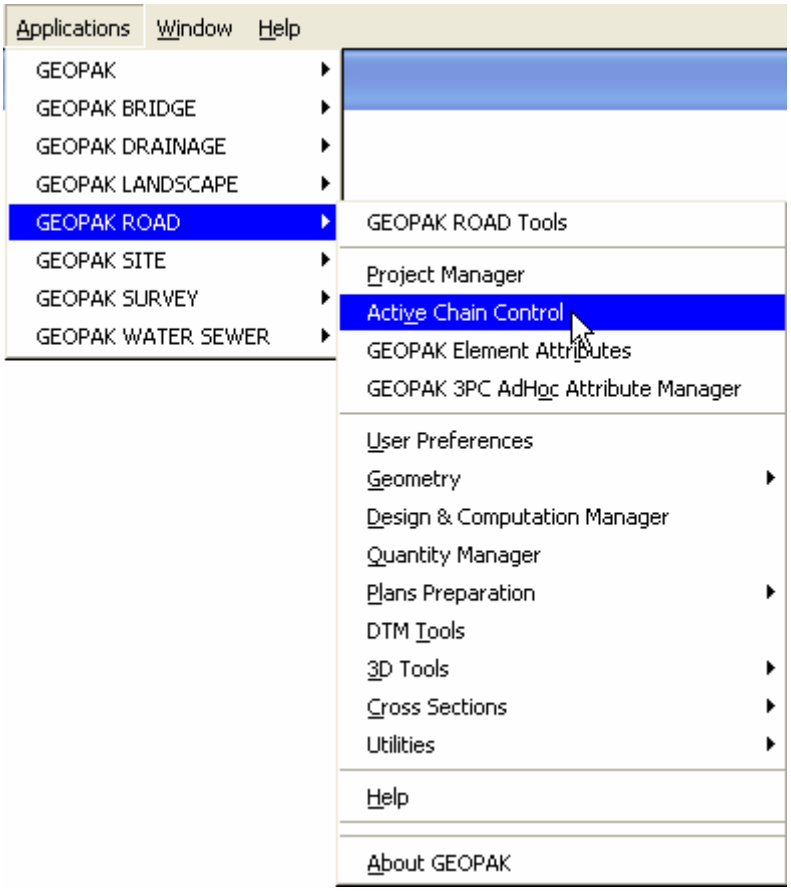

Figure 17-45: Accessing Active Chain Control

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

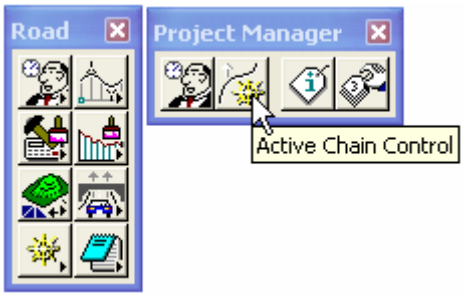

Figure 17-46: Accessing Active Chain Control through Road Tools Icon

Selecting the button will invoke the Active Chain Control dialog.

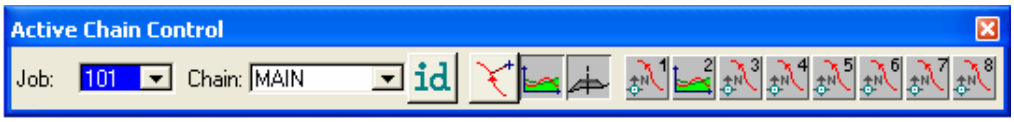

Figure 17-47: Active Chain Control Dialog

2. *Using the Active Chain Control dialog box, 8 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 8 MicroStation views and selecting the Profile.*

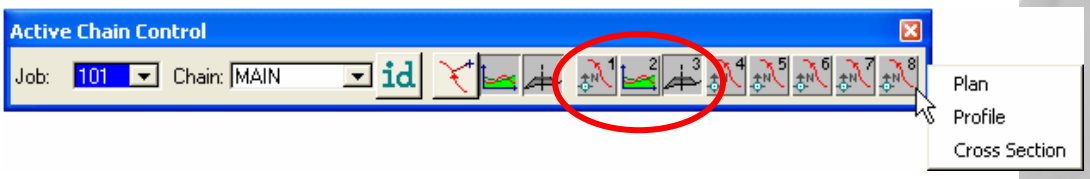

Figure 17-48: Assigning Profile View

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

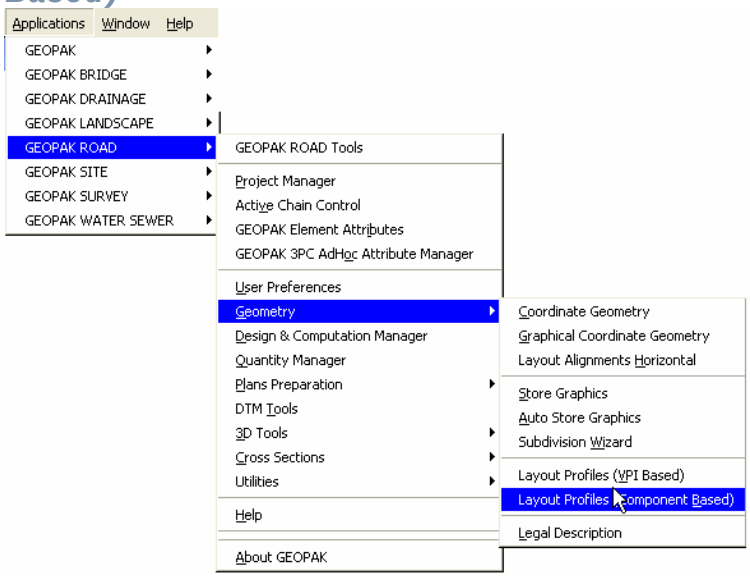

Figure 17-49: Accessing Component Based Vertical Alignment Tool

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.

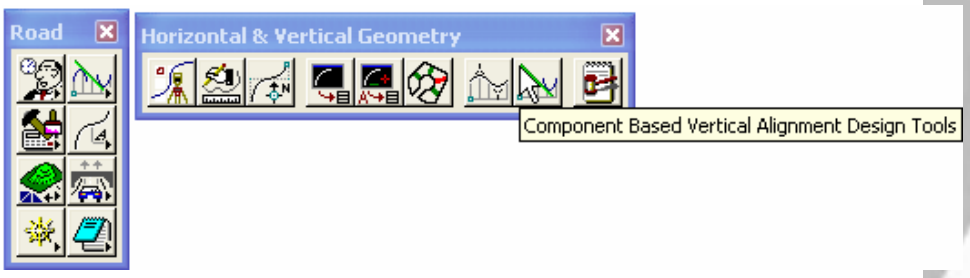

Figure 17-50: Accessing Component Based Vertical Alignment Tool through Road Tools Icon

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 17-51: 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.***

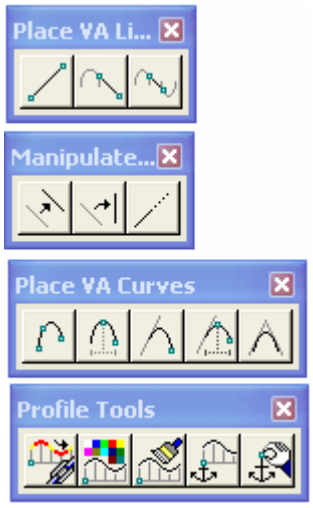

Figure 17-52: Component Based Vertical Alignment Tools

6. ***Prior to using the Component Based Vertical Alignment Tools to draw, select the Dialog***

Graphical Profile Preference icon as shown below.

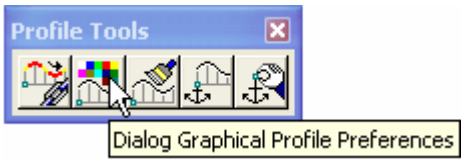

Figure 17-53: Dialog Graphical Profile Preferences

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.*

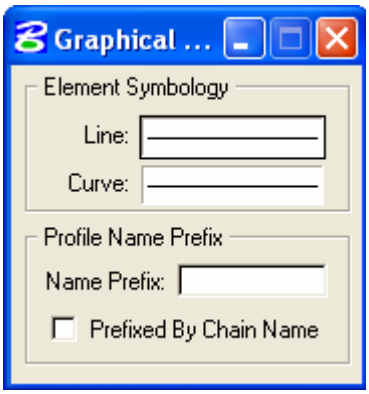

Figure 17-54: Graphical Profile Preferences

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

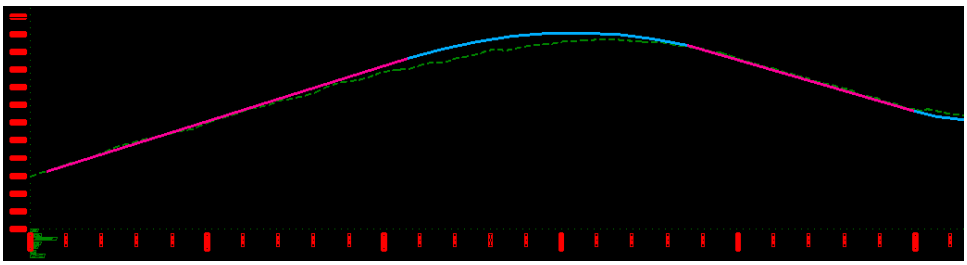

Figure 17-55: Draw Graphical Profile

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.*

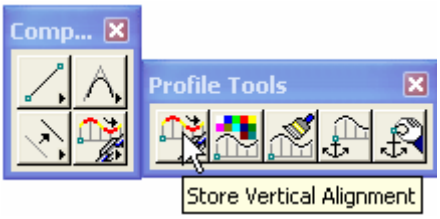

Figure 17-56: Store Vertical Alignment Icon

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.***

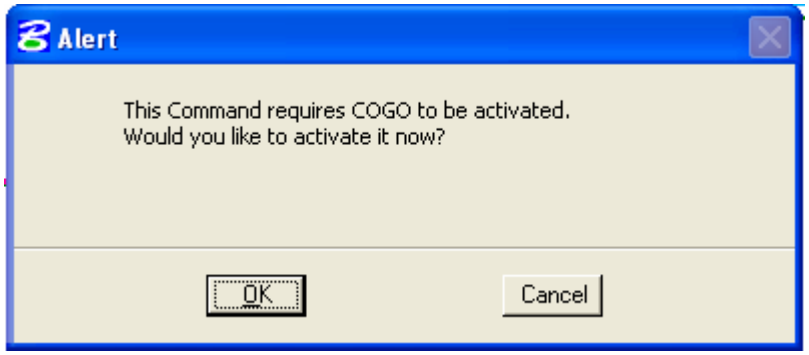

Figure 17-57: COGO Activation

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

Figure 17-58: 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 EFLHD .ddb file.

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

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Chapter 18: Cross Sections

Overview

Proposed Cross sections are used to determine the limits of construction, earthwork, construction staking reports, and 3D modeling. It is very important that they are drawn consistently and to the standards outlined in this chapter. Federal Lands Highway (FLH) has developed a new generation of criteria files know as the X30 Criteria files. With the development of the X30 criteria, creating the proposed cross sections no longer requires the traditional input files and exception data files. With X30 criteria files, Proposed Cross Sections are created through the Project Manager using the Typical Section Generator. Proper setup and use of the Project Manager is crucial in running the Typical Section Generator to create the proposed cross sections. ***All cross section slopes are labeled 1V:1H as per the FP03.***

Prior to running Proposed Cross Section the Project Manager need to be setup as outlined in Chapter 13 of the Geopak 2004 - X30 CADD Standards Manual.

Federal Lands Highway have developed **6 Typical Sections** for the use of developing proposed cross sections. The 6 Typical Sections are ***Divided New Pavement, Existing Features, Existing and Proposed Right of Way, Rehabilitation Typical Section (3R), Undivided New Pavement and Cross Section Labeling.***

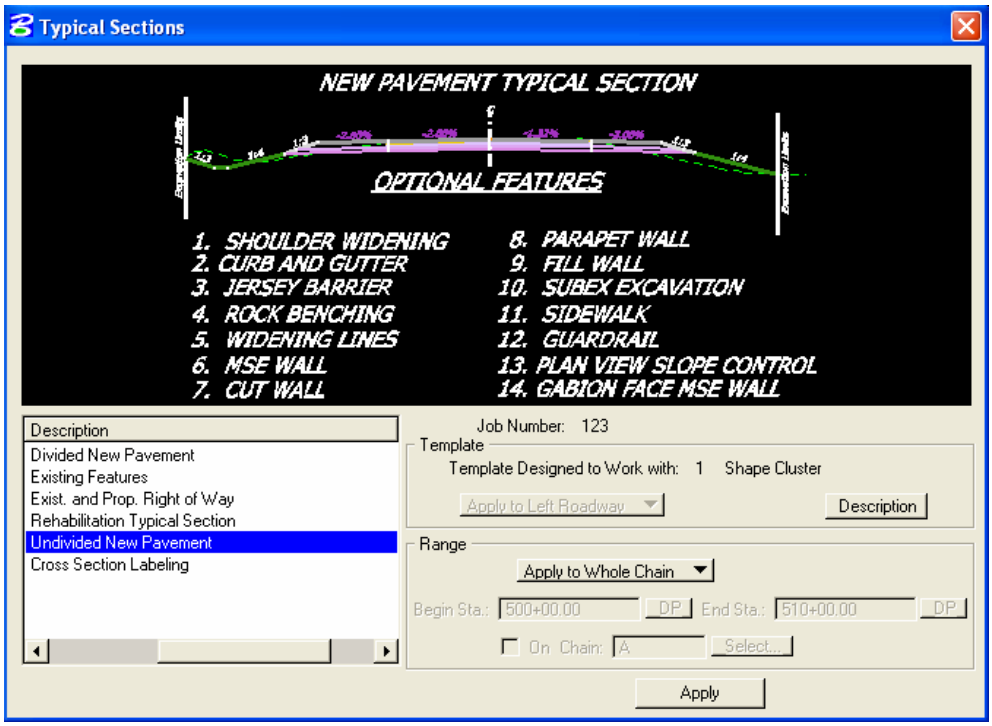

Figure 18-1: FLH Typical Sections

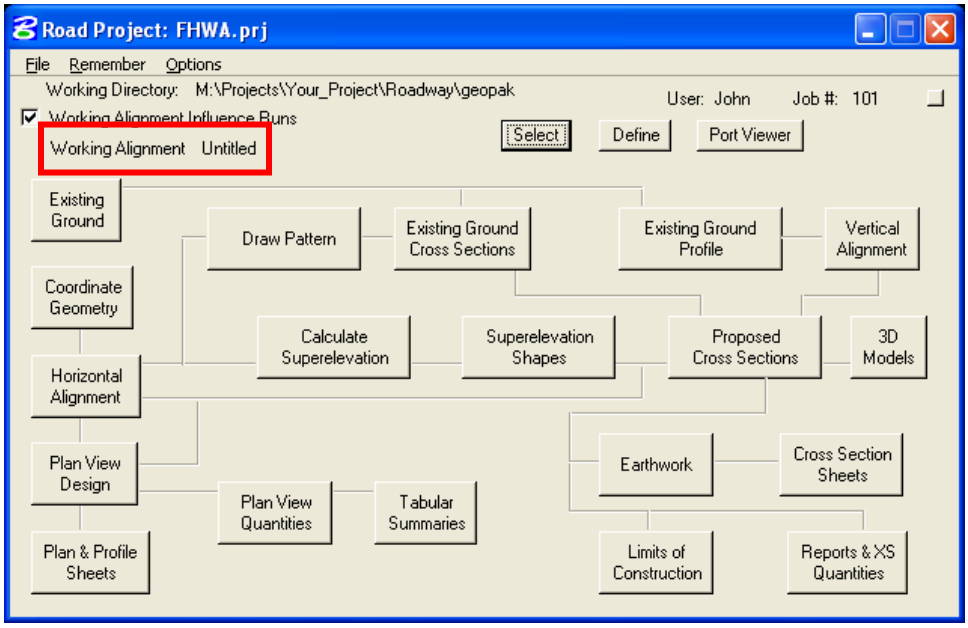

Figure 18-2: Project Manager Dialog

Once the working alignment has been selected and defined, proposed cross sections can be run through the Project Manager Dialog. Follow Workflow 1 below to setup the Working alignment Definition. An example Working Alignment called MAIN will be used to outline the Workflows in this Chapter. The Project Manager was setup in Chapter 13, but the working alignment definition will be explained in detail in Workflow 1.

Workflow 1: Working Alignment Definition

1. ***Select Define button from the Project Manager Dialog as shown below.***

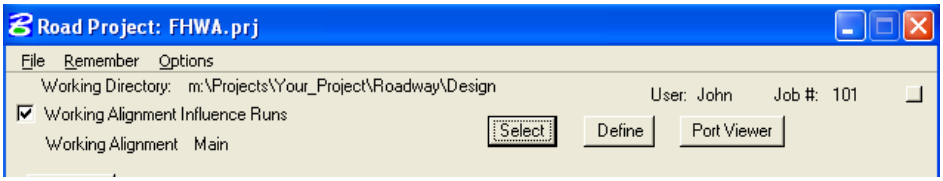

Figure 18-3: Define Working Alignment

2. ***The Working Alignment Definition Dialog Box for the Chain MAIN will appear. In the Plan View category select the proposed design file and select the Geopak alignment chain.***

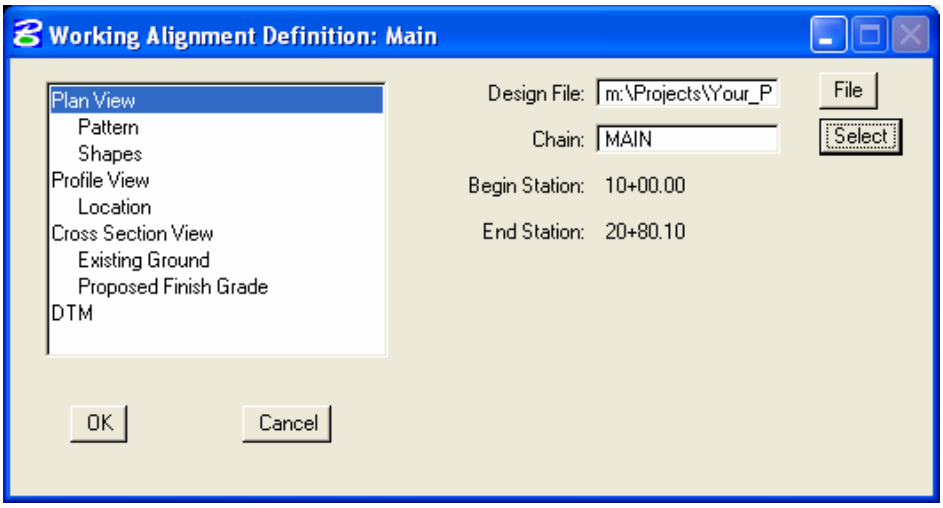

Figure 18-4: Plan View Definition

3. ***In the Pattern category populate the dialog By Station or By Design File. Use named levels P_GPK_Pattern_01 to P_GPK_Pattern_10 to place pattern lines in a design file. Horizontal Scale and Vertical Scale should be set to 1.***

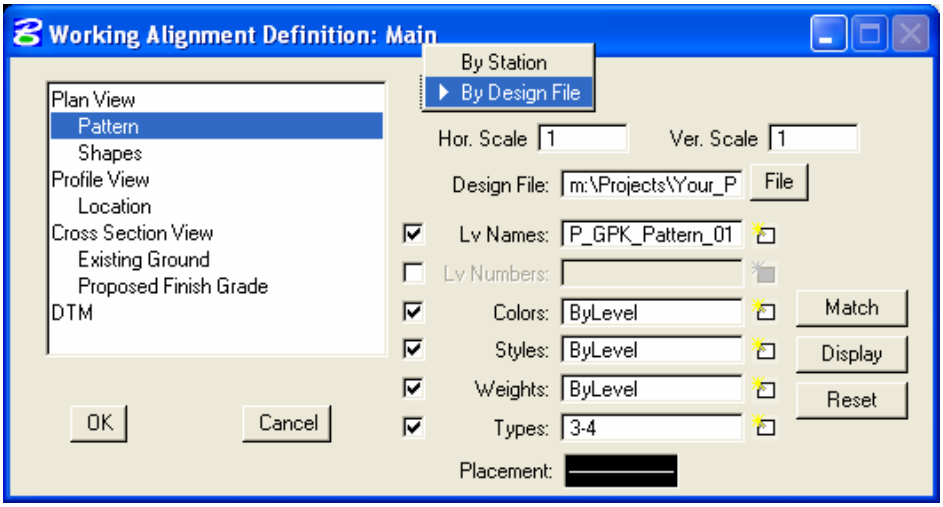

Figure 18-5: Pattern Definition

4. ***In the Shapes category populate the dialog By Search Criteria. Search Criteria will process the cross sections faster than the All in DGN mode. Use named level P_RDW_Super_Shapes to draw superelevation shapes in the Shapes dgn file.***

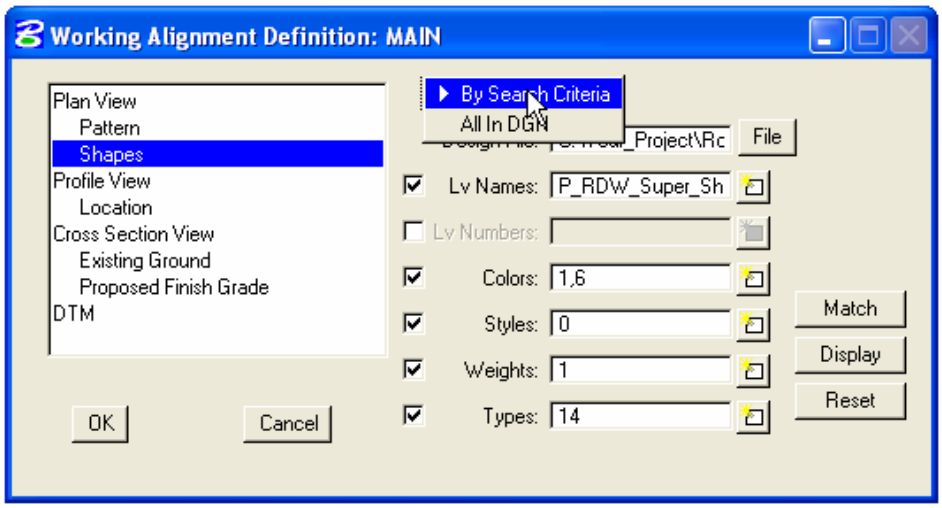

Figure 18-6: Shapes Definition

5. ***In the Profile View and Location category populate the dialogs defining your design profile file, existing profile and proposed profiles. Profile Location can be populated by selecting the Identify Cell button and selecting the profile cell. Profile View and Location are not required to be populated to run Proposed Cross Sections.***
6. ***In the Cross Section View category populate the dialogs defining your XS DGN file.***

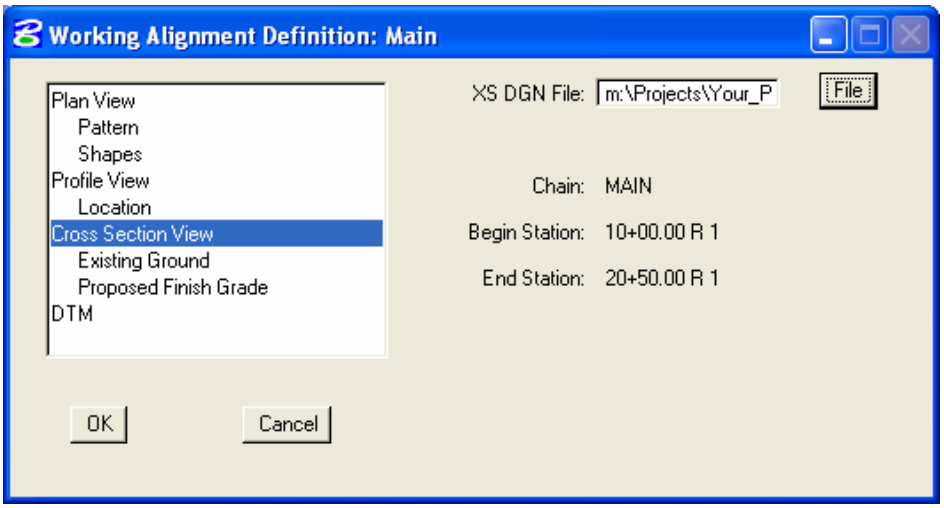

Figure 18-7: Cross Section Definition

7. ***In the Existing Ground category populate the dialogs defining the parameters of your existing ground.***

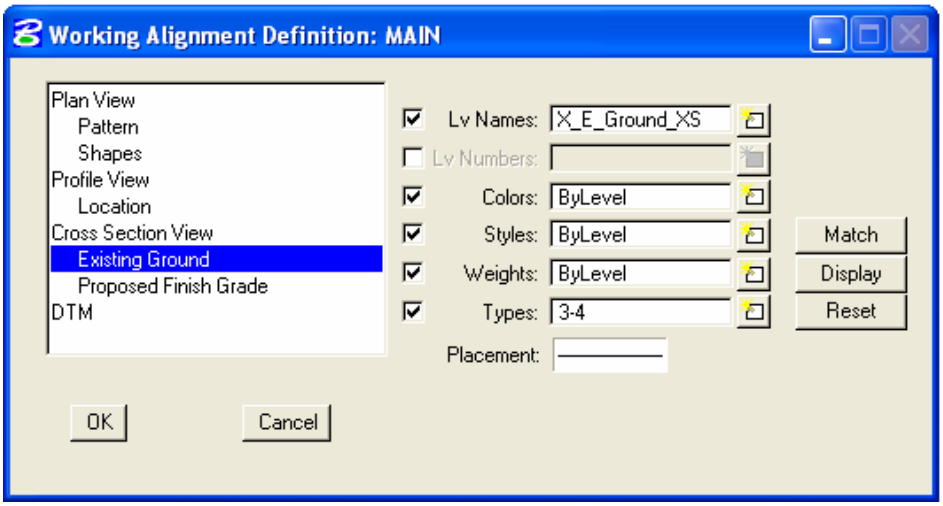

Figure 18-8: Existing Ground Definition

8. ***The Proposed Finished Grade and DTM categories should be completed, but they are not required to be populated to run Proposed Cross Sections. Once all the categories in the dialog box are completed, Select OK to save and close the Working Alignment Definition for the working alignment (example: MAIN).***

Once the working alignment definitions are set for a working alignment, Proposed Cross Sections can invoked from the Project Manager Dialog Box. The Proposed Cross Section can be run for the 6 FLH Typical Sections. Follow Workflow 1 below to process the proposed cross sections:

Workflow 2: Proposed Cross Sections

1. ***Select Proposed Cross Sections button from the Project Manager Dialog.***

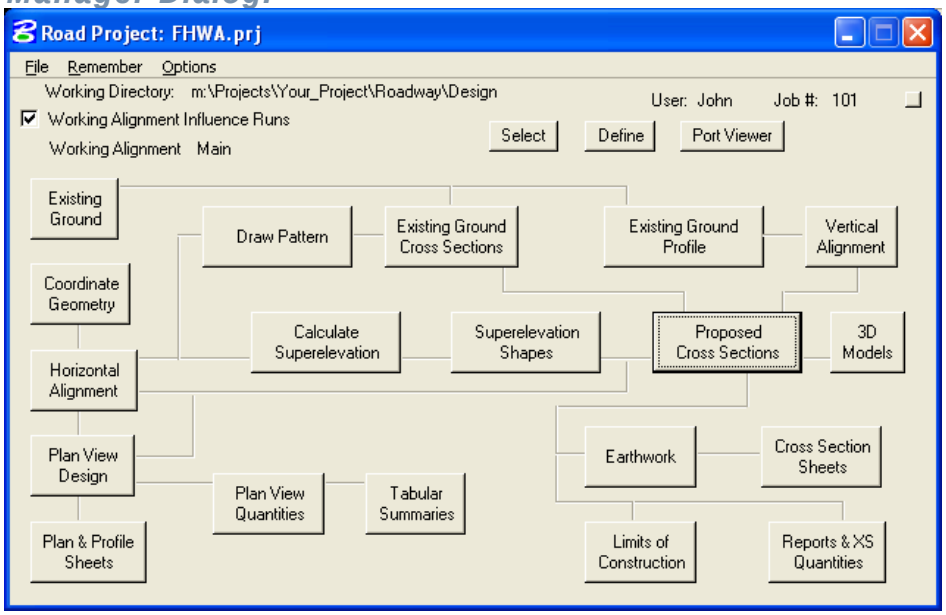

Figure 18-9: Invoking Proposed Cross Sections

2. ***The following dialog will be activated, since no run exist for the example Select New to create a Run.***

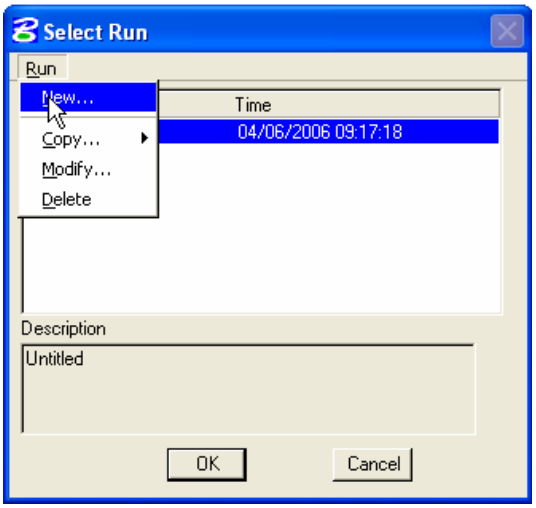

Figure 18-10: Create a New Run

3. ***Create a New Run by entering the run name and description and select OK.***

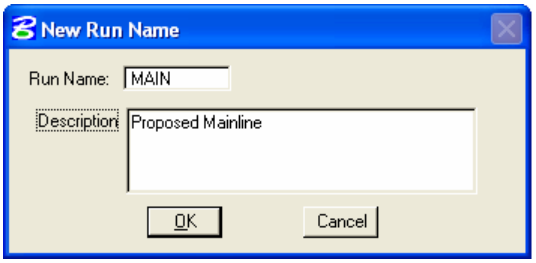

Figure 18-11: New Run

4. ***From the Select Run dialog, select the newly created run MAIN and select OK.***

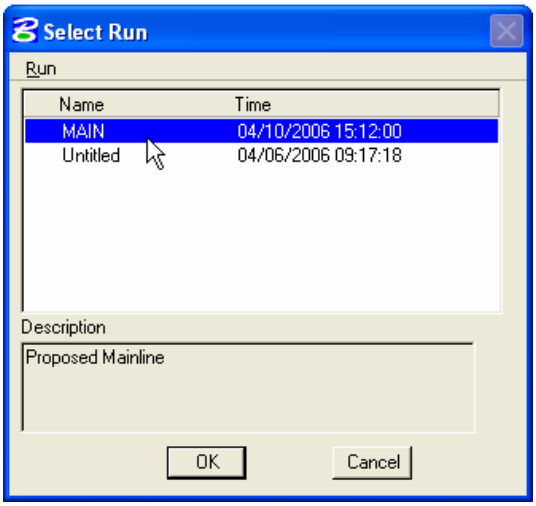

Figure 18-12: Select New Run

5. ***Selecting a Run will access the Proposed Cross Section Dialog.***

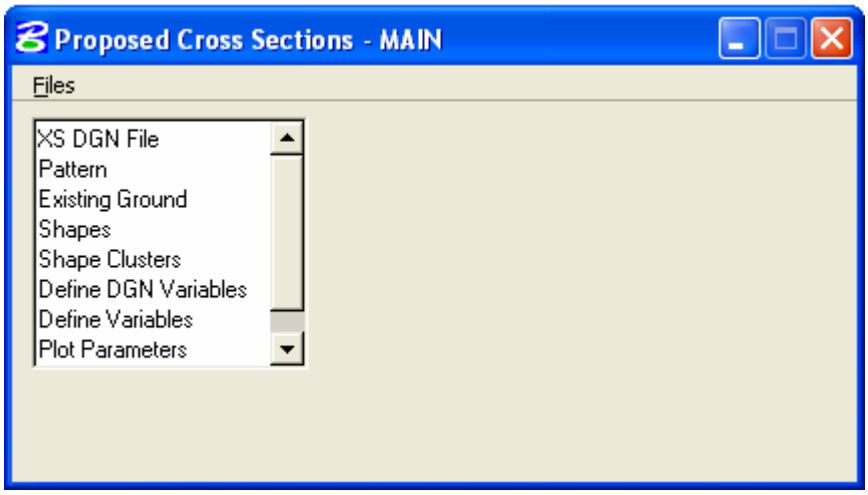

Figure 18-13: Proposed Cross Sections

The Proposed Cross Section run shown in the workflow is for an Undivided New Pavement Typical Section.

The proposed Cross section run holds the same information as the old Proposed Cross Section Input File and Exception Data File combined.

6. ***Select the XS DGN File from the Proposed Cross Section dialog. Note that the dialog box is already filled in by the Working Alignment definition.***

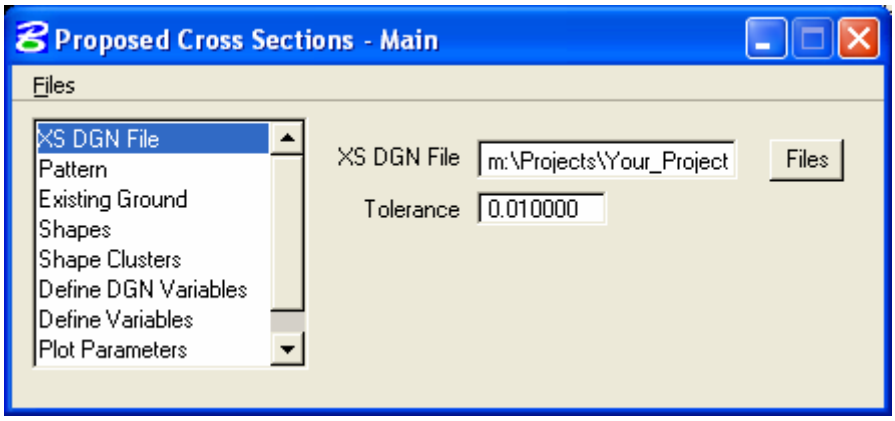

Figure 18-14: Selecting XS DGN File

The tolerance should always be set to 0.010 for English projects and 0.003 for Metric projects. The tolerance setting is very important and the proposed cross section will not process without setting this value.

7. ***Select the Pattern and toggle on Use Working Alignment Definition.***

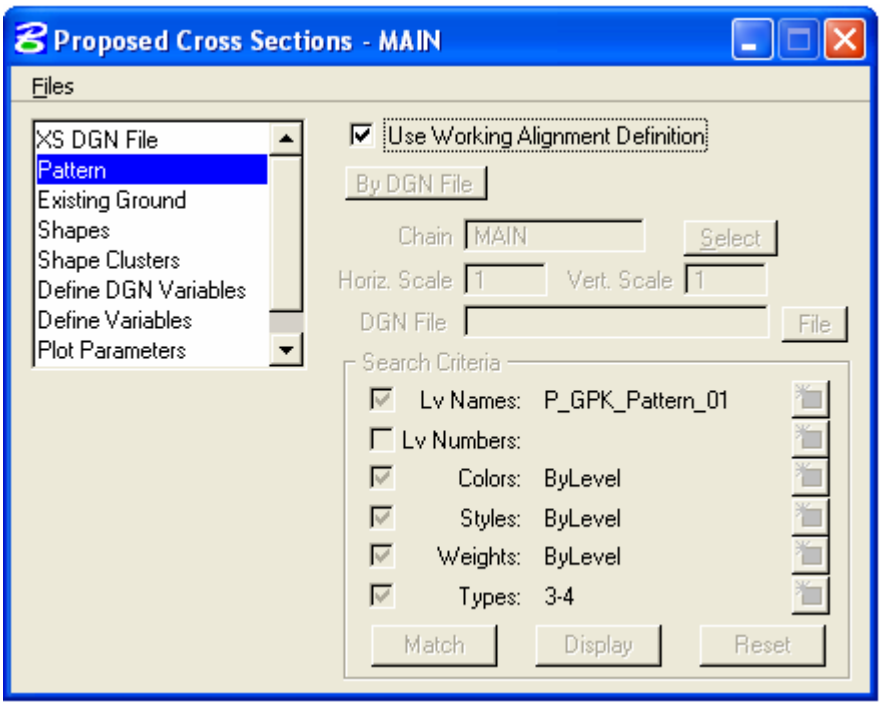

Figure 18-15 Selecting Pattern

8. Select the Existing Ground and toggle on Use Working Alignment Definition.

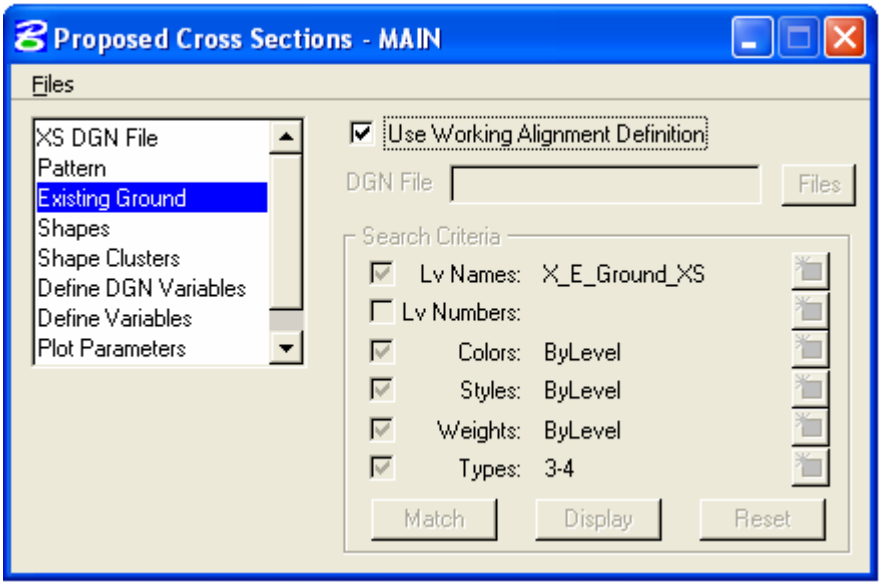

Figure 18-16 Selecting Existing Ground

9. Select the Shapes and toggle on Use Working Alignment Definition.

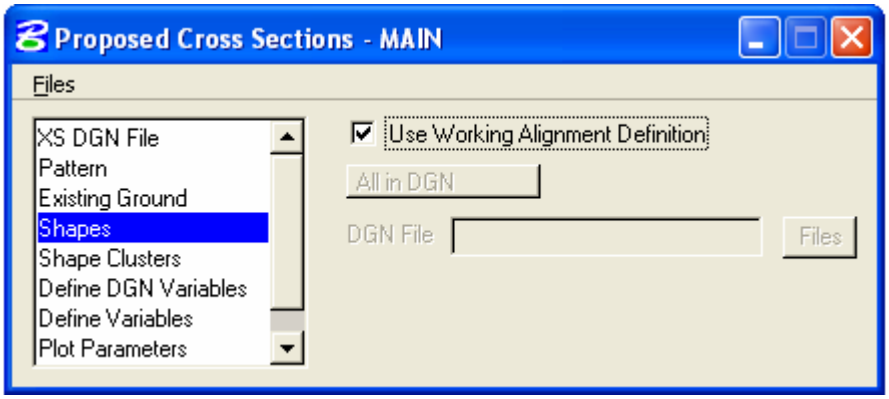

Figure 18-17: Selecting Shapes

The Working Alignment Definition toggle can be used for Pattern, Existing Ground and Shapes; these were previously defined for the working alignment.

10. Select Shape Clusters from the Proposed Cross Section dialog. The following dialog box will appear. Select Scan.

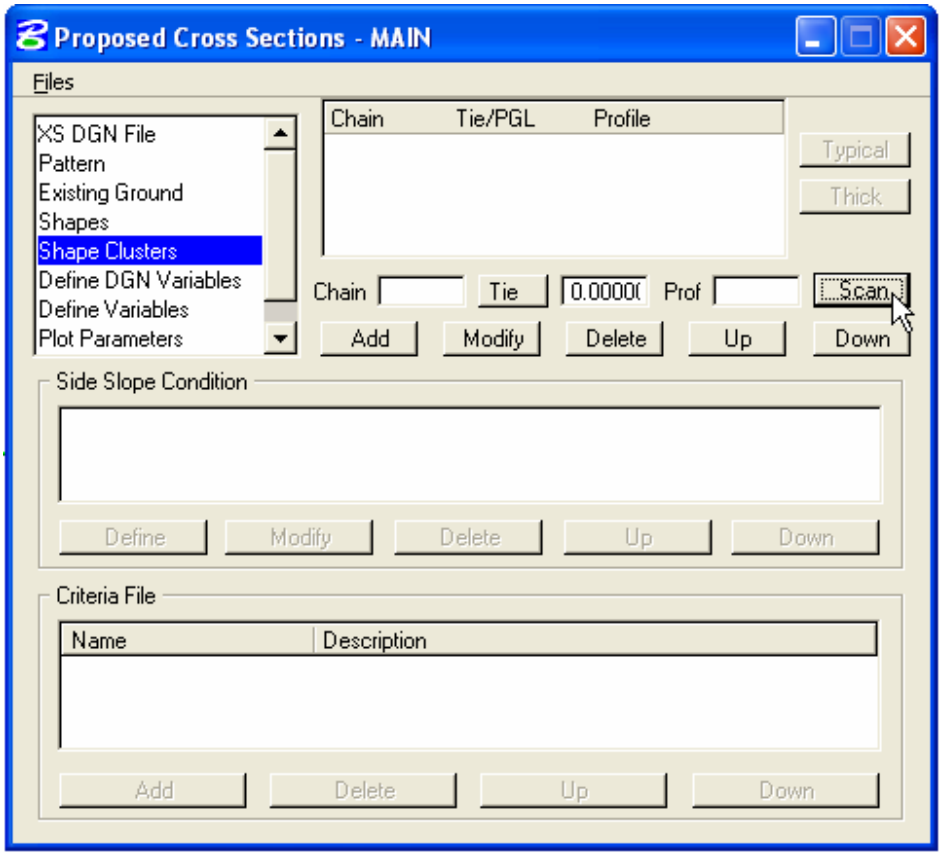

Figure 18-18: Selecting Shape Clusters

11. *Selecting Scan button will access the List of Clusters dialog box. Select the shape cluster and close the dialog box.*

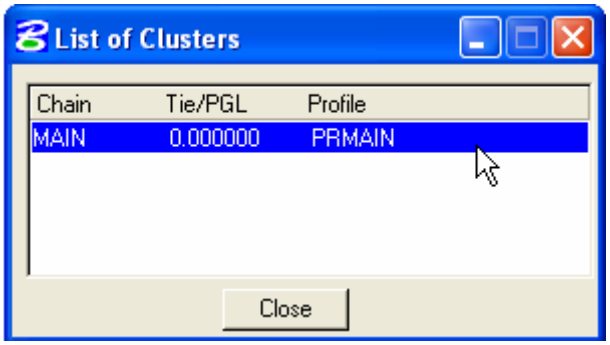

Figure 18-19: List of Clusters

12. *Select the add button from the main shape cluster dialog box to add the shape cluster to the list box as shown.*

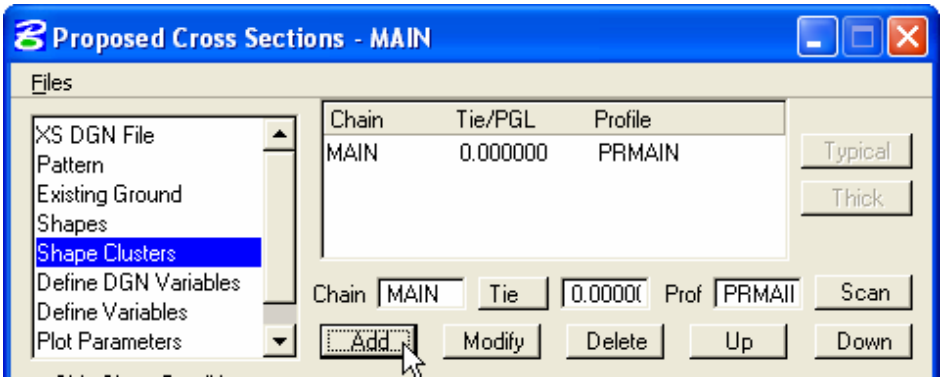

Figure 18-20: Add List of Clusters

13. *Once the shape cluster is added to the list box, highlight the information in list box shown and the Typical button will become active. Select the Typical button to access the Typical Section Generator.*

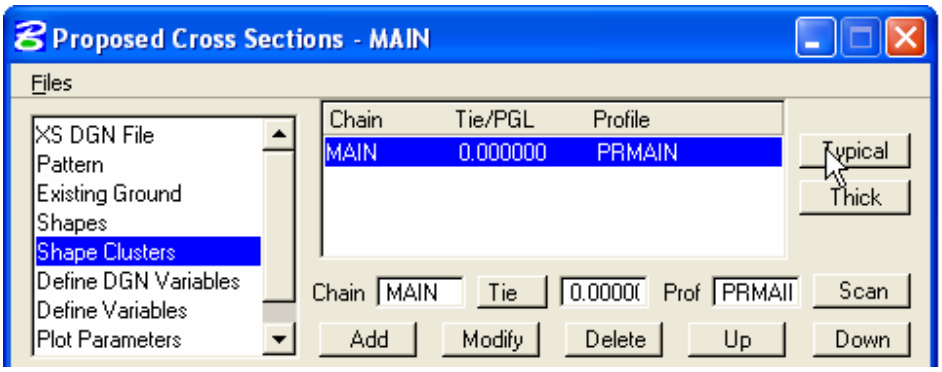

Figure 18-21: Select Typical Section

14. In the Typical Section Generator, 6 typical are available. Select UNPAVT for undivided new pavement. In the Range window, select Apply to Whole Chain. Apply to Station Range to process by station range. Select Apply.

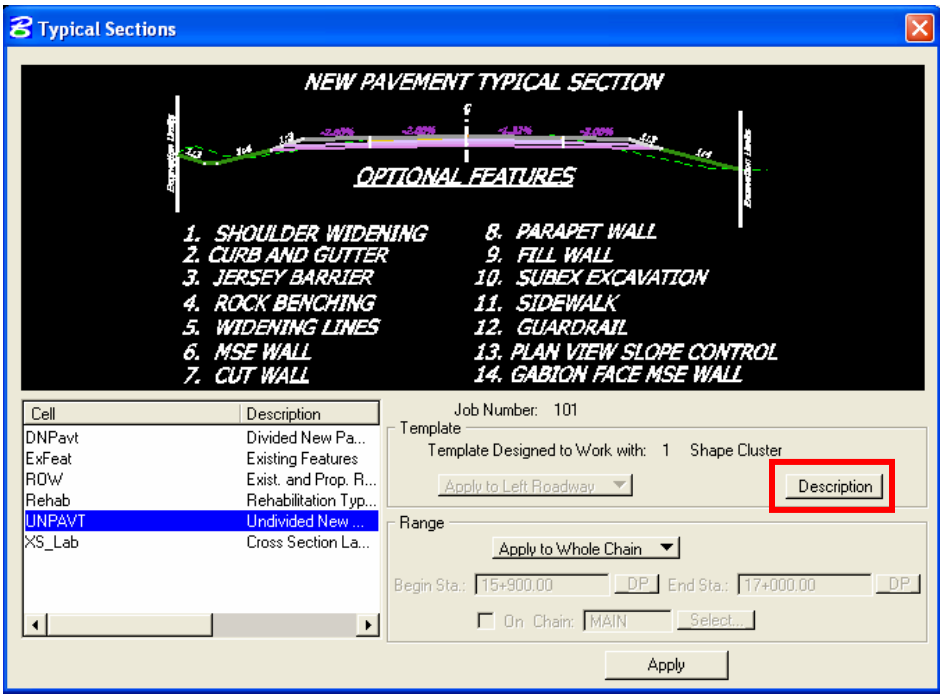

Figure 18-22: Choose Typical Section

Select the Description button in the Typical Section dialog box to access the online help for the selected typical section. Online help document provides detailed drawings and information on how each of the typicals work.

The help files can also be accessed outside the Typical Sections Dialog Box. For Consultants, **Help** documentations are available through the **CADD_Resource_v8.zip** download on EFLHD Website. Help files (*.wri files) are available in the *M:\Cadd_resource_v8\X_30\Standards\Bin\ English or Metric directory.*

The **Help** documentations can be found on the EFLHD network at: *M:\Cadd_resource_v8\X_30\Standards\Bin\English or Metric directory.*

15. The criteria files associated with the Typical Section are populated into the main Proposed Cross Section dialog.

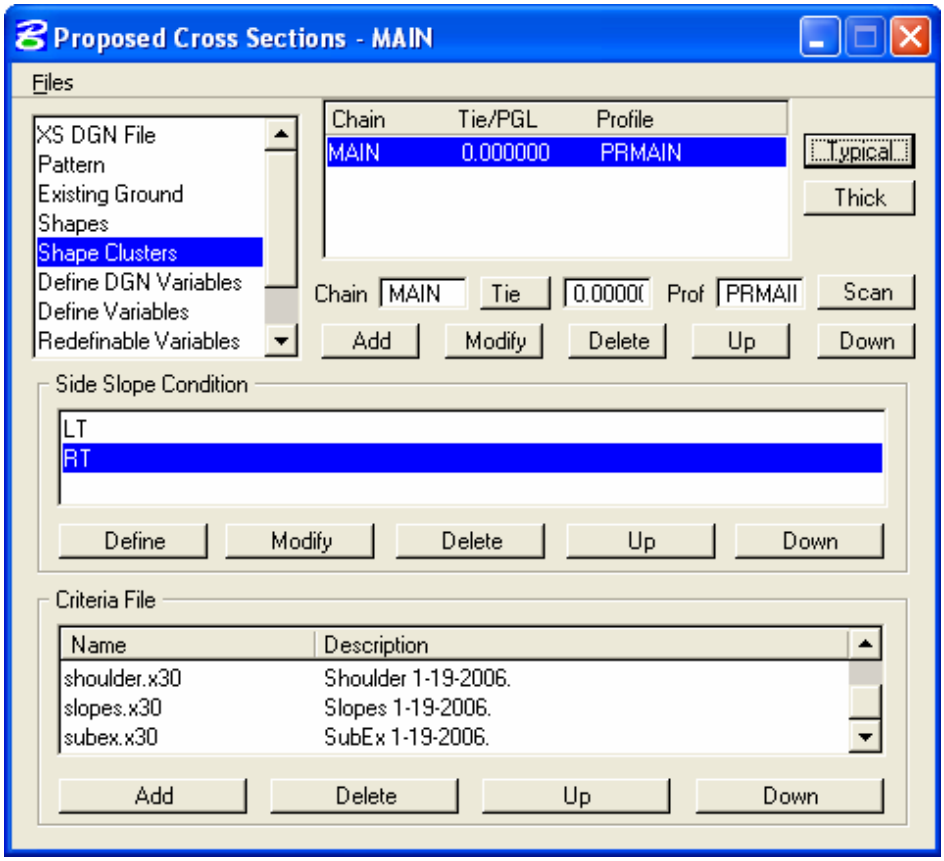

Figure 18-23: Populated Shape Cluster

16. ***The Define DGN Variables should be left blank for Undivided New Pavement Typical. This variable is used only with Automated Cross Section Labeling Typical.***

17. ***Select Define Variables and edit Cross Section dgn, Proposed Plan Dgn and Geopak Lines Dgn values. Edit the default value of the variable and select Modify to accept.***

If any of the dgn files are not in the working directory, the full path must be specified.

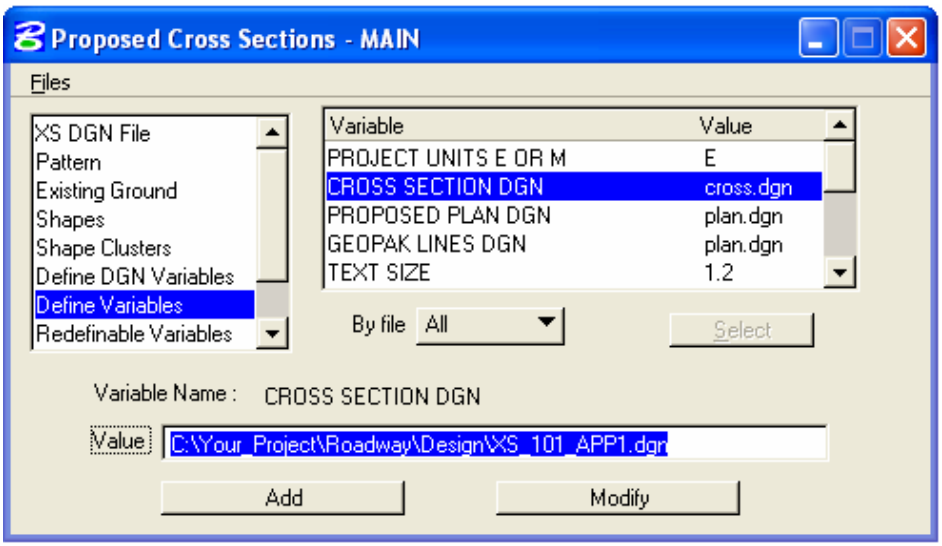

Figure 18-24: Populated Shape Cluster

18. Select Re-Definable Variables as shown below. Select the Edit button to modify the default variables and to set project specific values.

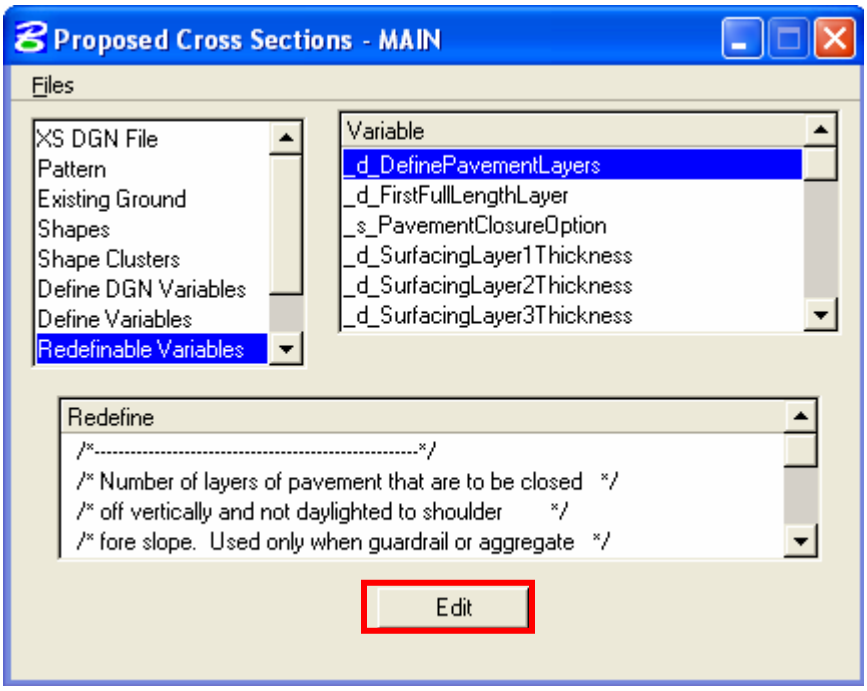

Figure 18-25: Re-Definable Variables

19. Select Plot Parameters and toggle off all the plot options.

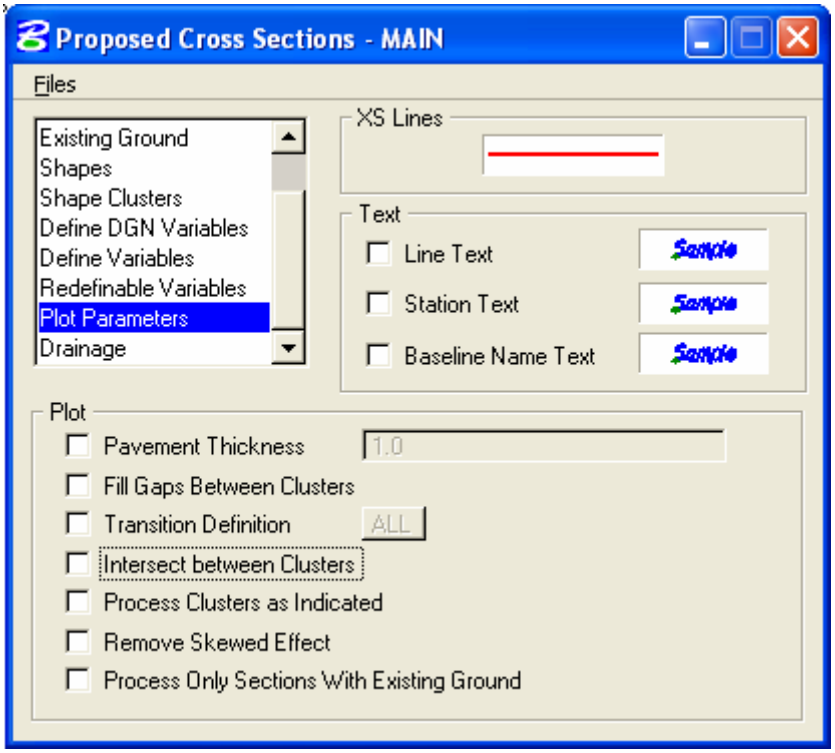

Figure 18-26: Plot options

20. Select the drainage, this should be left blank. This will not apply to the 6 Typical Sections. Once the run has been modified for the working alignment, Select Files >Save Settings to save your run.

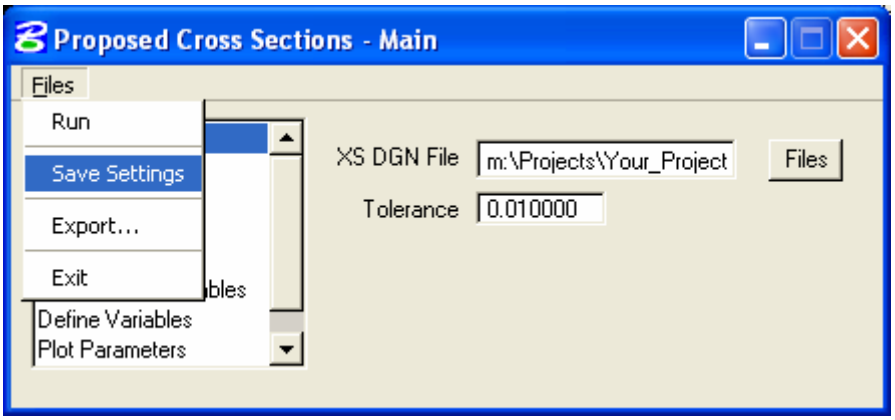

Figure 18-27: Save Settings

21. Select Files >Run to process your proposed cross sections.

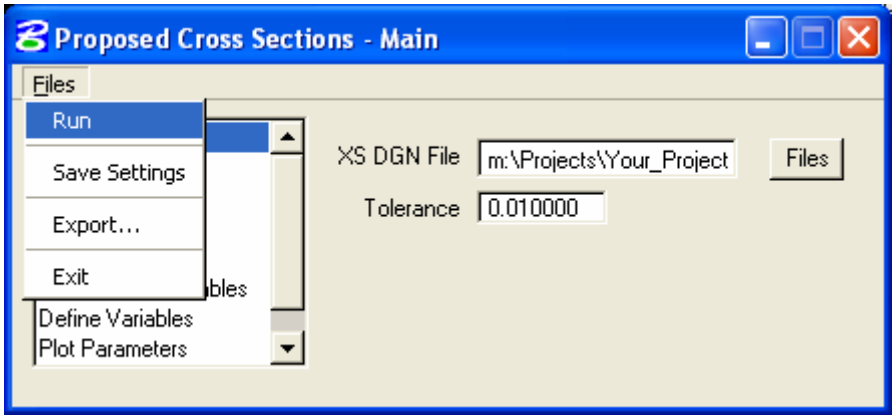

Figure 18-28: Run Proposed Cross Section

22. ***The following Proposed Cross Section Run dialog box will appear. Set the To Log File to To Screen, if no log file is desired. Select Apply process the Cross Sections.***

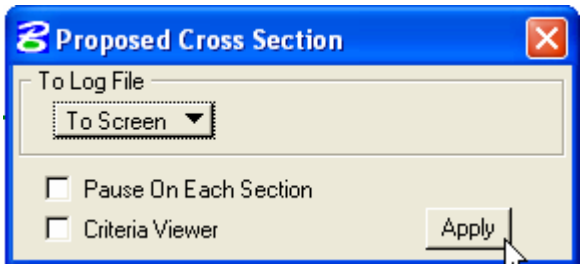

Figure 18-29: Process Proposed Cross Section

Cross Section Navigator

Now that you have completed the cross section run, you will want to view them. The cross section navigator is a tool that makes the viewing of cross sections much easier. Two types of Cross Section Navigators can be used to review the cross sections. A new tool for the Geopak 2004 Edition is the Super Cross section Navigator which allow you to view your cross section based on your profile. The new tool prevents drifting of the cross sections and provides speed controlled cross section movie navigation.

Workflow 3: Cross Section Navigator

1. ***Select Applications>GEOPAK ROAD>Cross Sections>Navigator, or Select the Cross Section Navigator icon from the GEOPAK Road toolbar.***

Figure 18-30: Cross Section Navigator Icon

2. *The Cross Section Navigator dialog will appear.*

Figure 18-31: Cross Section Navigator

3. *Navigator will automatically center the first cross section found, using the station on the cross section cells.*

4. *Use the arrows* *to move up or down station through the cross sections. You can also use the station pull down menu to go to a specific cross section.*

Workflow 4: Super Cross Section Navigator

5. *Select Applications>GEOPAK ROAD>Design & Computation Manager, or Select the Design & Computation Manager icon from the GEOPAK Road toolbar.*

Figure 18-32: Design & Computation Manager Icon

6. *In Design and Computation Manager dialog box, select MVBA Applications>Super Cross Section Navigator. Double Click on Super Cross Section Navigator. The following dialog box will appear.*

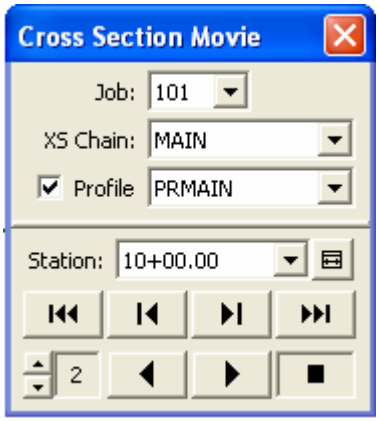

Figure 18-33: Super Cross Section Navigator

Related links: Setting up the Proposed Cross Section run for the 5 typical sections available through the Typical Section Generator, using Knucklehead's Guide for GEOPAK Road 2004 Edition.

Existing Features

Right of Way

Rehabilitation (3R)

Undivided New Construction

Automated Cross Section Labeling

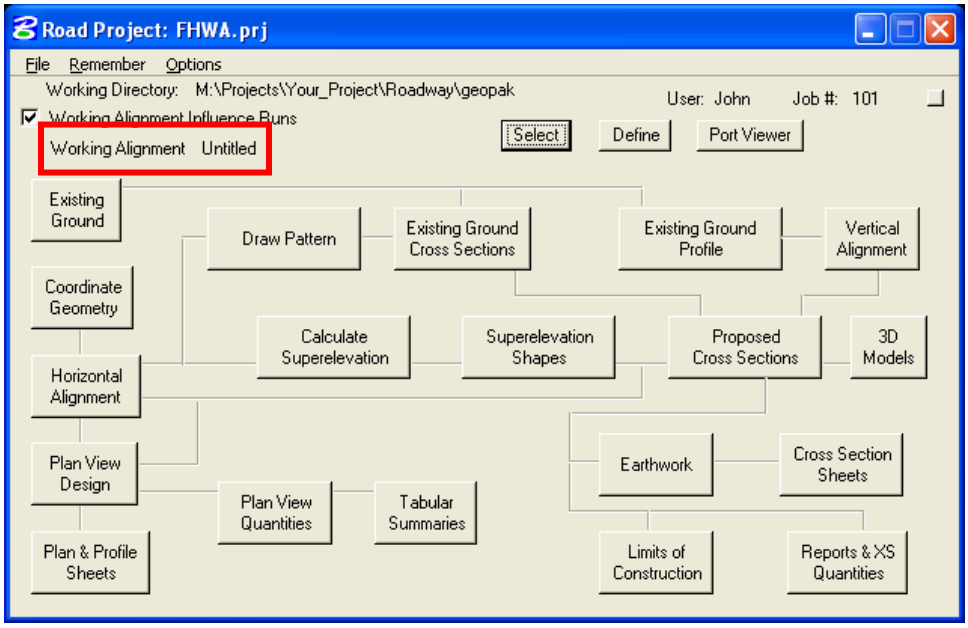

Figure 18-2: Project Manager Dialog

Once the working alignment has been selected and defined, proposed cross sections can be run through the Project Manager Dialog. Follow Workflow 1 below to setup the Working alignment Definition. An example Working Alignment called MAIN will be used to outline the Workflows in this Chapter. The Project Manager was setup in Chapter 13, but the working alignment definition will be explained in detail in Workflow 1.

Workflow 1: Working Alignment Definition

1. ***Select Define button from the Project Manager Dialog as shown below.***

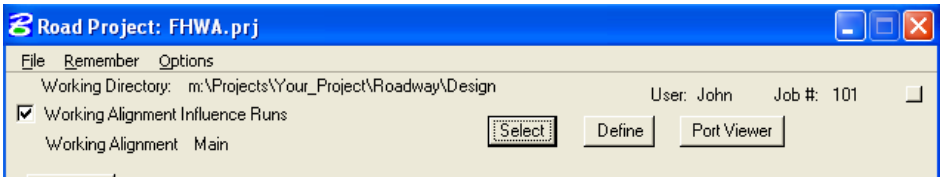

Figure 18-3: Define Working Alignment

2. ***The Working Alignment Definition Dialog Box for the Chain MAIN will appear. In the Plan View category select the proposed design file and select the Geopak alignment chain.***

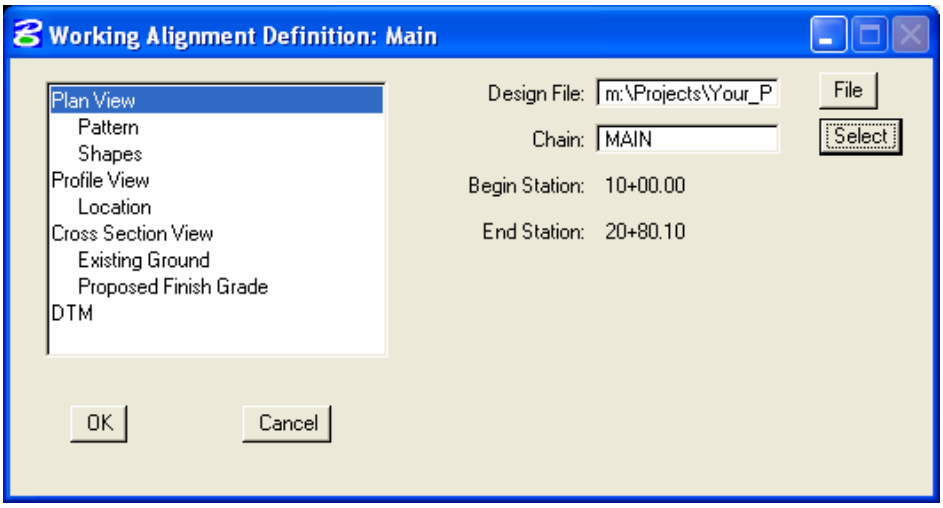

Figure 18-4: Plan View Definition

3. ***In the Pattern category populate the dialog By Station or By Design File. Use named levels P_GPK_Pattern_01 to P_GPK_Pattern_10 to place pattern lines in a design file. Horizontal Scale and Vertical Scale should be set to 1.***

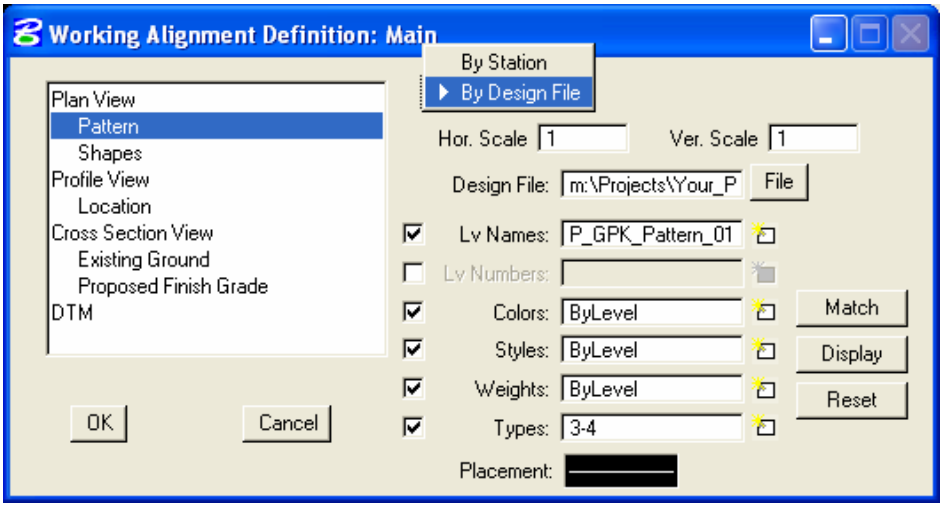

Figure 18-5: Pattern Definition

4. ***In the Shapes category populate the dialog By Search Criteria. Search Criteria will process the cross sections faster than the All in DGN mode. Use named level P_RDW_Super_Shapes to draw superelevation shapes in the Shapes dgn file.***

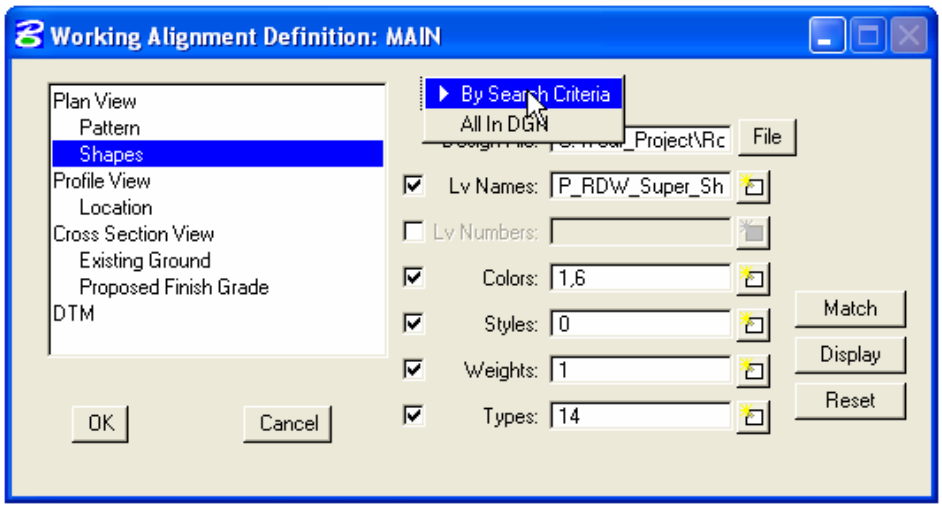

Figure 18-6: Shapes Definition

5. ***In the Profile View and Location category populate the dialogs defining your design profile file, existing profile and proposed profiles. Profile Location can be populated by selecting the Identify Cell button and selecting the profile cell. Profile View and Location are not required to be populated to run Proposed Cross Sections.***
6. ***In the Cross Section View category populate the dialogs defining your XS DGN file.***

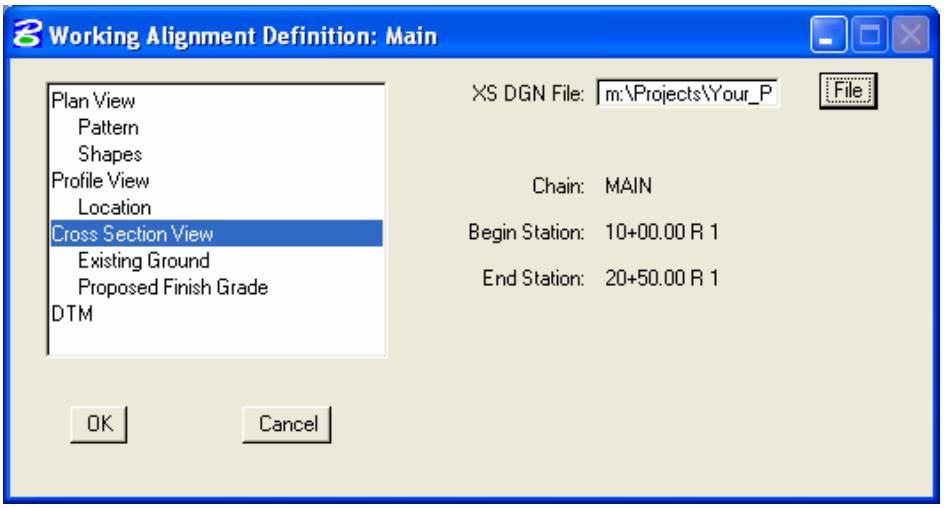

Figure 18-7: Cross Section Definition

7. ***In the Existing Ground category populate the dialogs defining the parameters of your existing ground.***

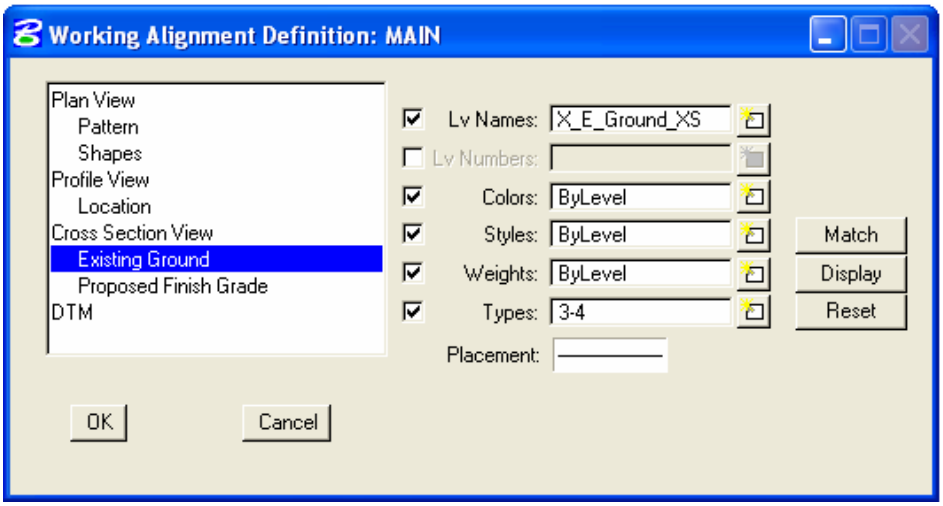

Figure 18-8: Existing Ground Definition

8. ***The Proposed Finished Grade and DTM categories should be completed, but they are not required to be populated to run Proposed Cross Sections. Once all the categories in the dialog box are completed, Select OK to save and close the Working Alignment Definition for the working alignment (example: MAIN).***

Once the working alignment definitions are set for a working alignment, Proposed Cross Sections can invoked from the Project Manager Dialog Box. The Proposed Cross Section can be run for the 6 FLH Typical Sections. Follow Workflow 1 below to process the proposed cross sections:

Workflow 2: Proposed Cross Sections

1. *Select Proposed Cross Sections button from the Project Manager Dialog.*

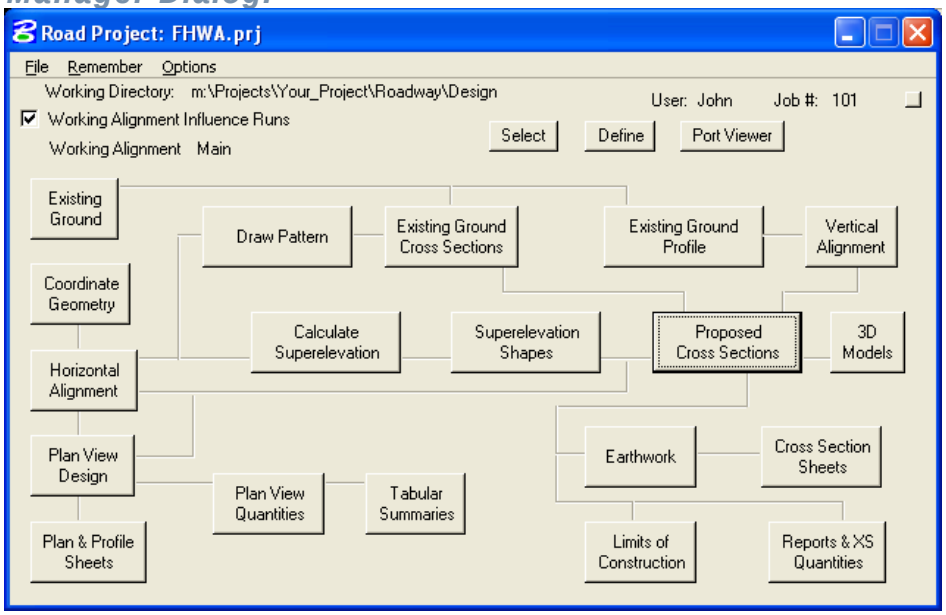

Figure 18-9: Invoking Proposed Cross Sections

2. *The following dialog will be activated, since no run exist for the example Select New to create a Run.*

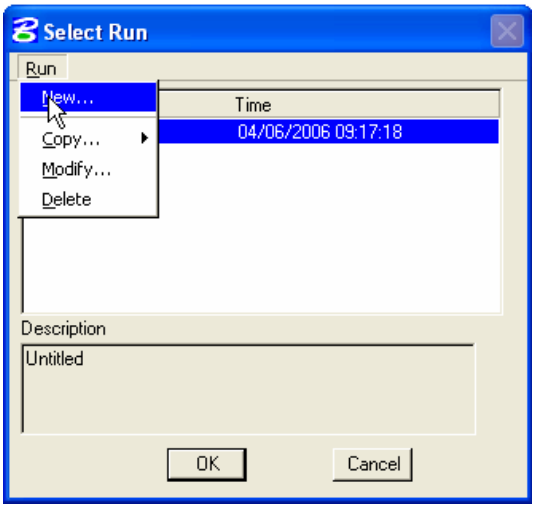

Figure 18-10: Create a New Run

3. *Create a New Run by entering the run name and description and select OK.*

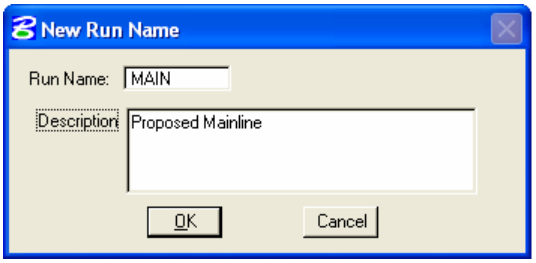

Figure 18-11: New Run

4. ***From the Select Run dialog, select the newly created run MAIN and select OK.***

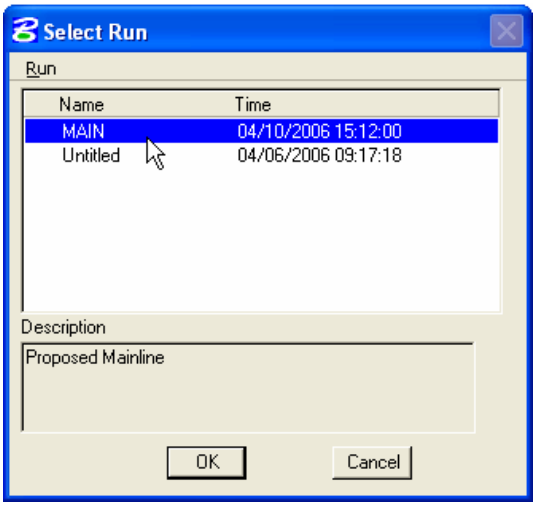

Figure 18-12: Select New Run

5. ***Selecting a Run will access the Proposed Cross Section Dialog.***

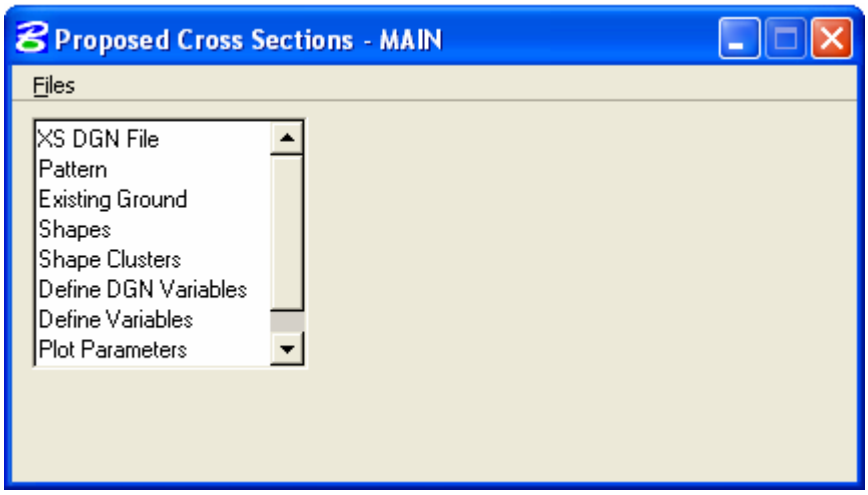

Figure 18-13: Proposed Cross Sections

The Proposed Cross Section run shown in the workflow is for an Undivided New Pavement Typical Section.

The proposed Cross section run holds the same information as the old Proposed Cross Section Input File and Exception Data File combined.

6. Select the XS DGN File from the Proposed Cross Section dialog. Note that the dialog box is already filled in by the Working Alignment definition.

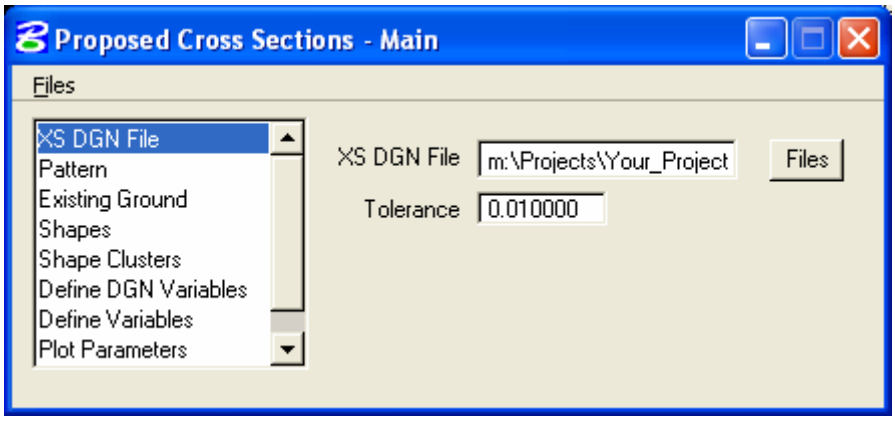

Figure 18-14: Selecting XS DGN File

The tolerance should always be set to 0.010 for English projects and 0.003 for Metric projects. The tolerance setting is very important and the proposed cross section will not process without setting this value.

7. Select the Pattern and toggle on Use Working Alignment Definition.

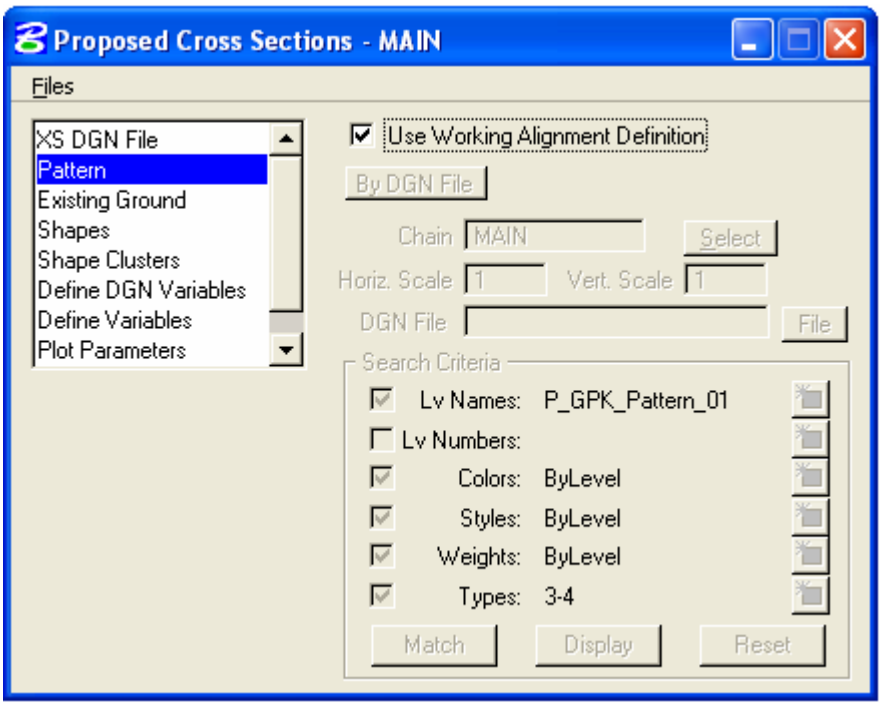

Figure 18-15 Selecting Pattern

8. ***Select the Existing Ground and toggle on Use Working Alignment Definition.***

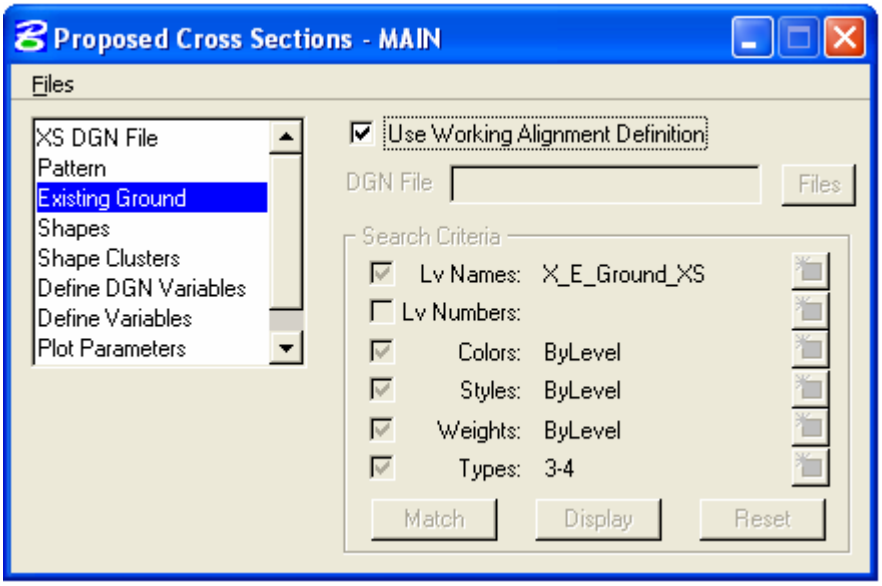

Figure 18-16 Selecting Existing Ground

9. ***Select the Shapes and toggle on Use Working Alignment Definition.***

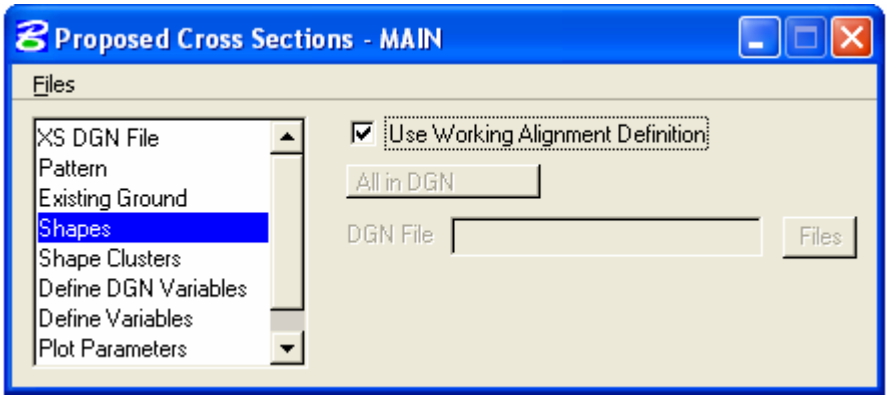

Figure 18-17: Selecting Shapes

The Working Alignment Definition toggle can be used for Pattern, Existing Ground and Shapes; these were previously defined for the working alignment.

10. Select Shape Clusters from the Proposed Cross Section dialog. The following dialog box will appear. Select Scan.

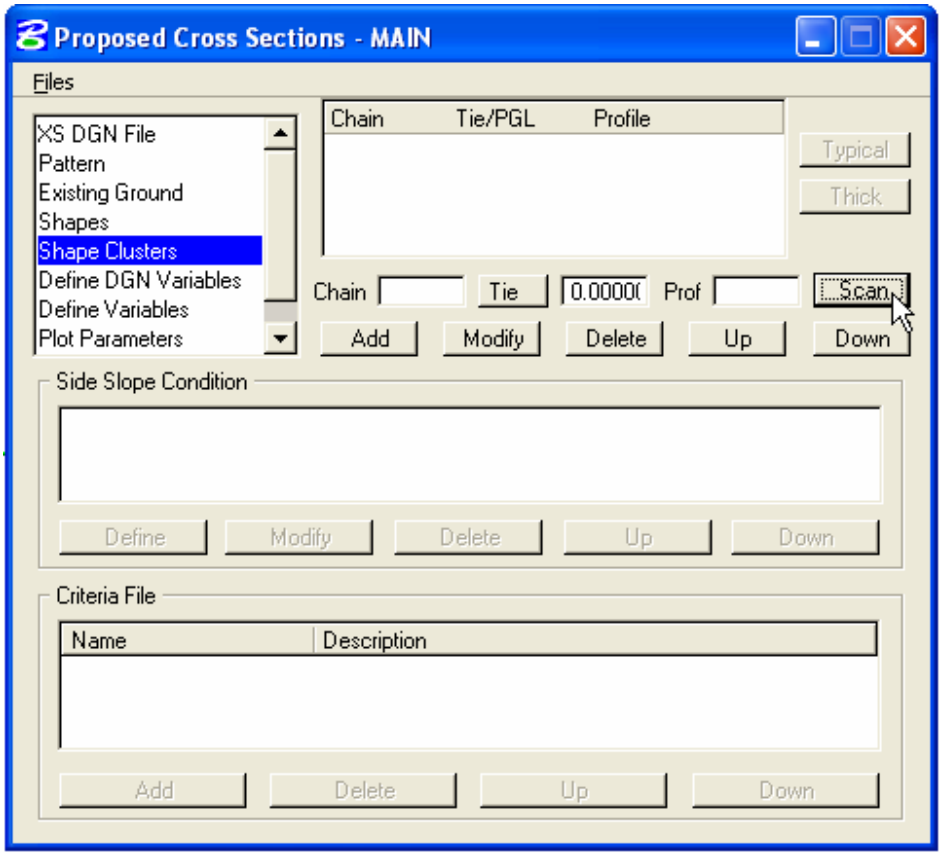

Figure 18-18: Selecting Shape Clusters

11. Selecting Scan button will access the List of Clusters dialog box. Select the shape cluster and close the dialog box.

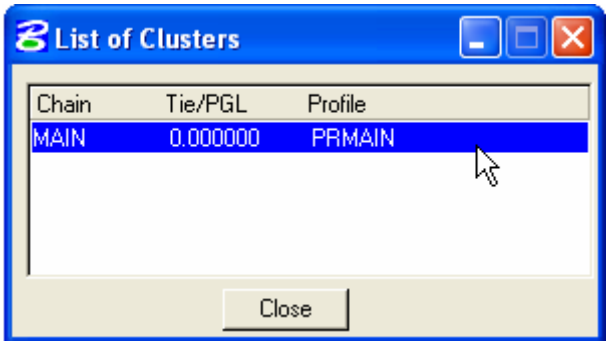

Figure 18-19: List of Clusters

12. Select the add button from the main shape cluster dialog box to add the shape cluster to the list box as shown.

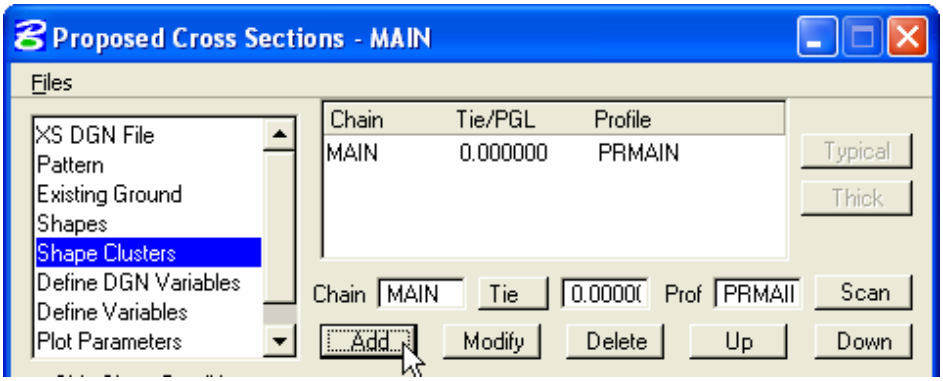

Figure 18-20: Add List of Clusters

13. Once the shape cluster is added to the list box, highlight the information in list box shown and the Typical button will become active. Select the Typical button to access the Typical Section Generator.

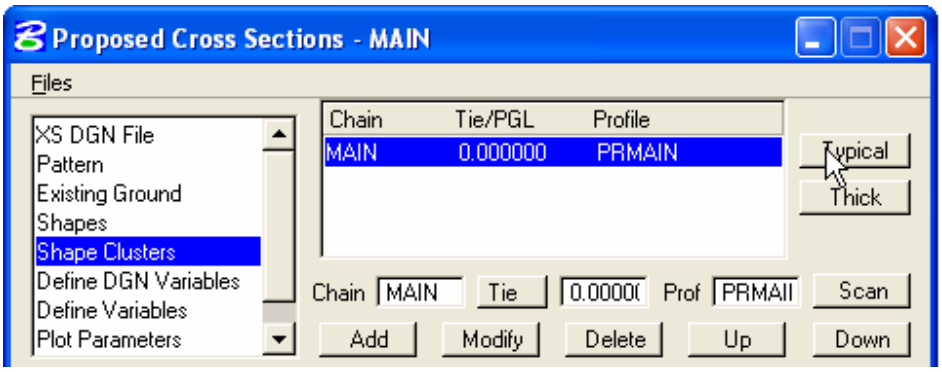

Figure 18-21: Select Typical Section

14. In the Typical Section Generator, 6 typical are available. Select UNPAVT for undivided new pavement. In the Range window, select Apply to Whole Chain. Apply to Station Range to process by station range. Select Apply.

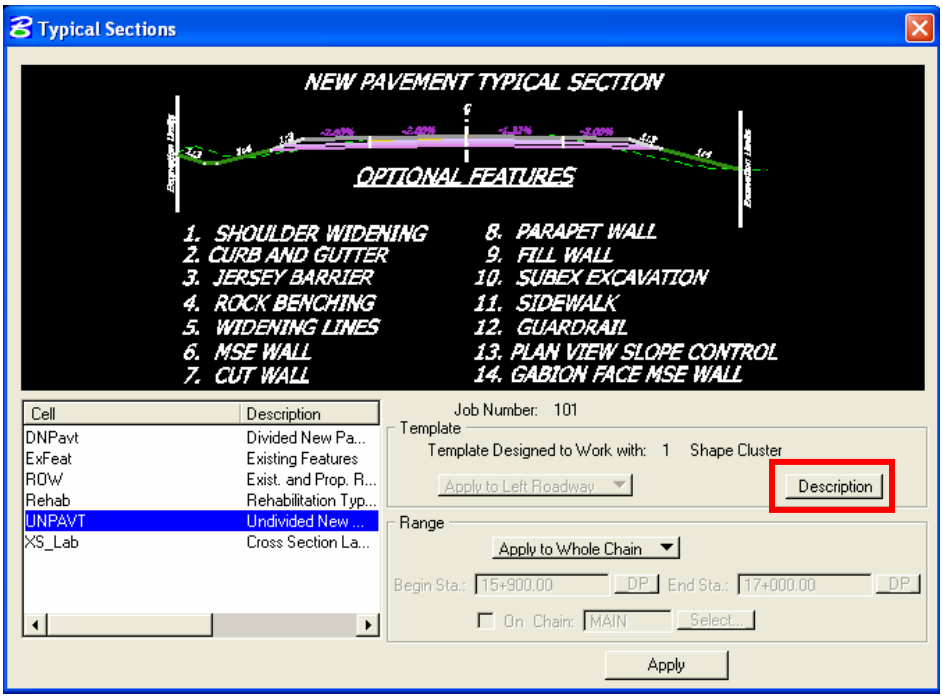

Figure 18-22: Choose Typical Section

Select the Description button in the Typical Section dialog box to access the online help for the selected typical section. Online help document provides detailed drawings and information on how each of the typicals work.

The help files can also be accessed outside the Typical Sections Dialog Box. For Consultants, **Help** documentations are available through the **CADD_Resource_v8.zip** download on EFLHD Website. Help files (*.wri files) are available in the *M:\Cadd_resource_v8\X_30\Standards\Bin\ English or Metric directory.*

The **Help** documentations can be found on the EFLHD network at: *M:\Cadd_resource_v8\X_30\Standards\Bin\English or Metric directory.*

15. The criteria files associated with the Typical Section are populated into the main Proposed Cross Section dialog.

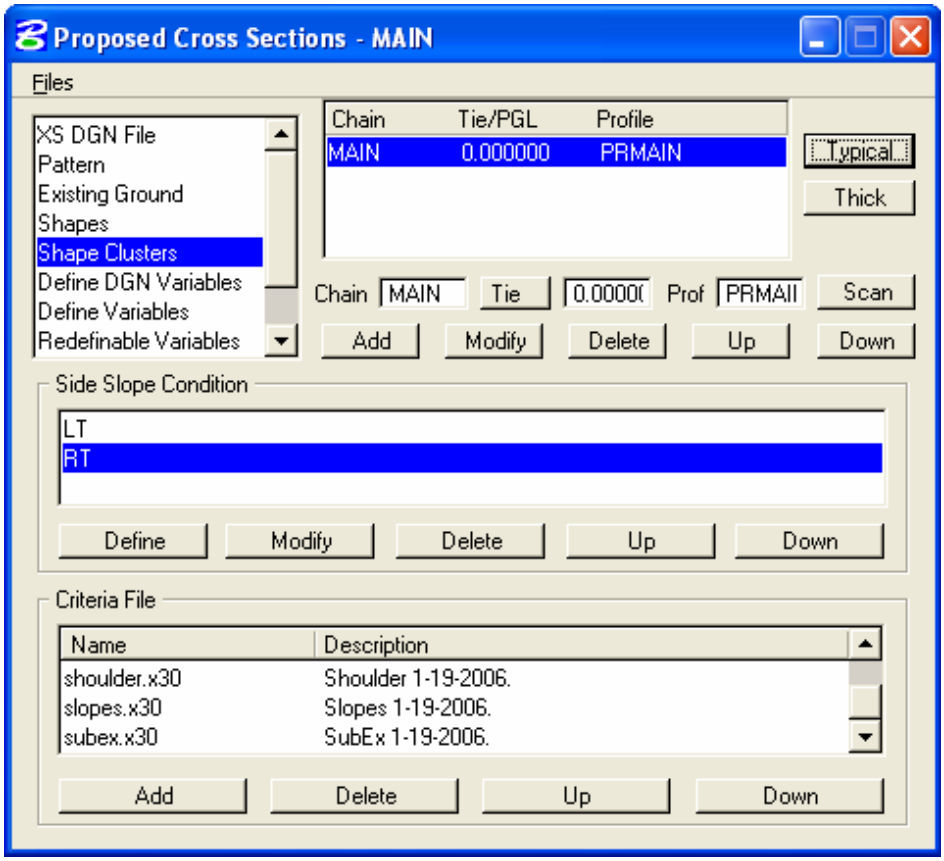

Figure 18-23: Populated Shape Cluster

16. ***The Define DGN Variables should be left blank for Undivided New Pavement Typical. This variable is used only with Automated Cross Section Labeling Typical.***

17. ***Select Define Variables and edit Cross Section dgn, Proposed Plan Dgn and Geopak Lines Dgn values. Edit the default value of the variable and select Modify to accept.***

If any of the dgn files are not in the working directory, the full path must be specified.

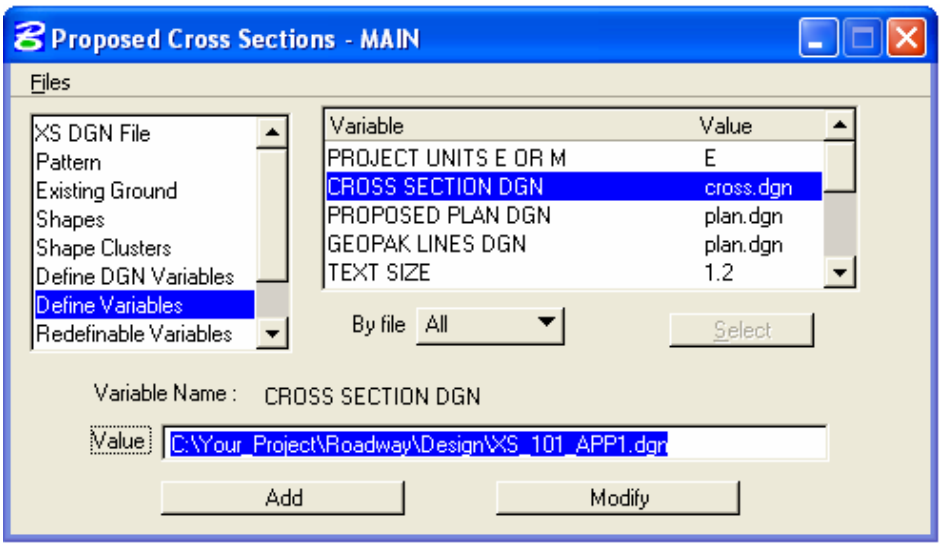

Figure 18-24: Populated Shape Cluster

18. Select Re-Definable Variables as shown below. Select the Edit button to modify the default variables and to set project specific values.

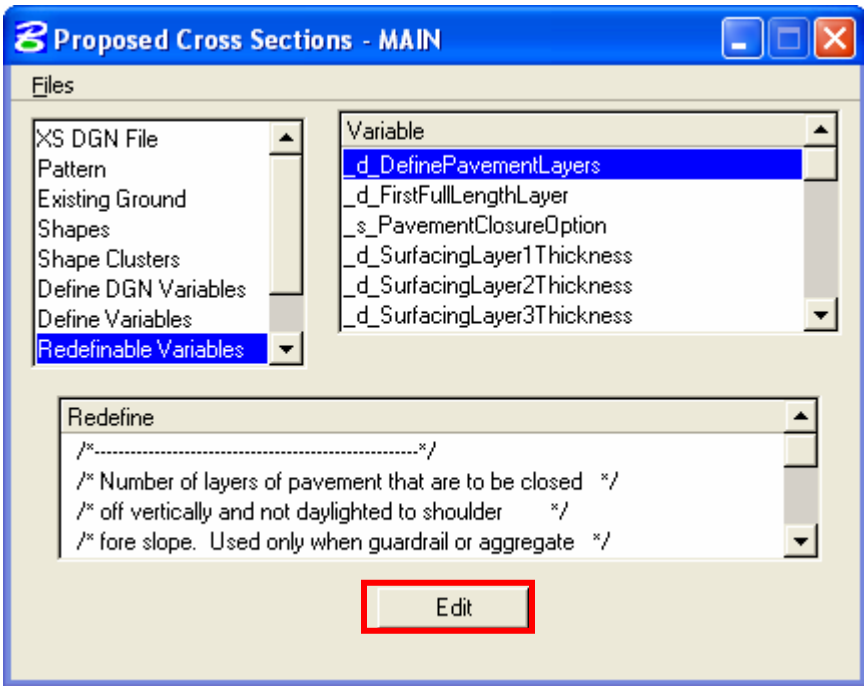

Figure 18-25: Re-Definable Variables

19. Select Plot Parameters and toggle off all the plot options.

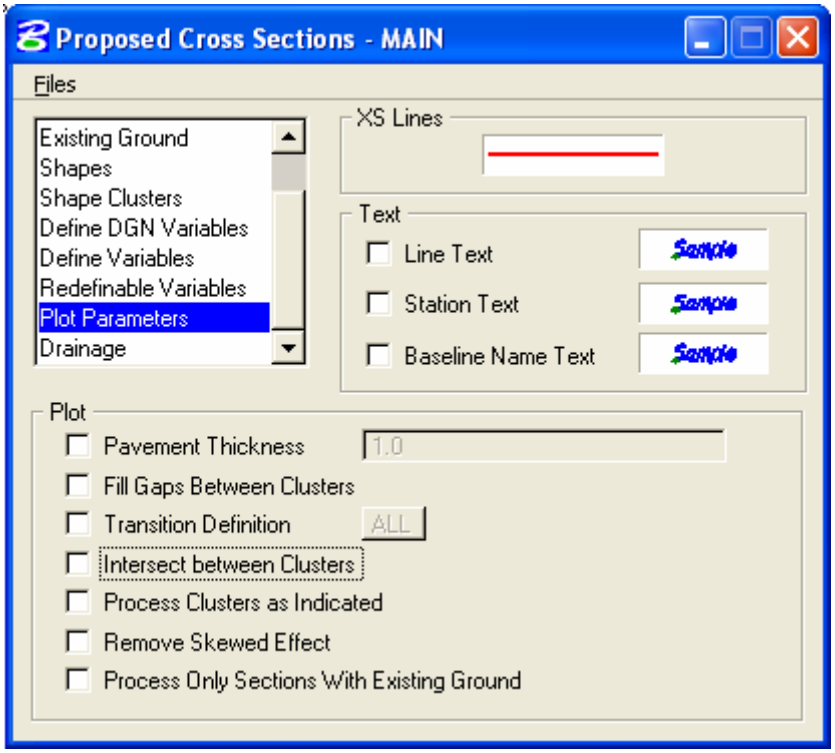

Figure 18-26: Plot options

20. Select the drainage, this should be left blank. This will not apply to the 6 Typical Sections. Once the run has been modified for the working alignment, Select Files >Save Settings to save your run.

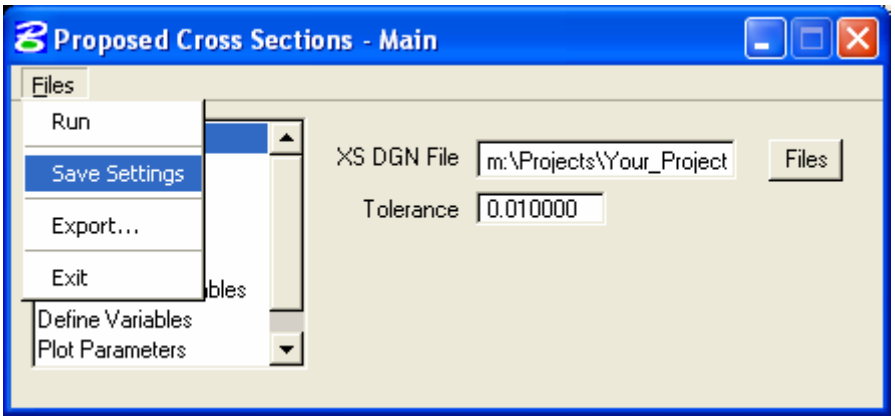

Figure 18-27: Save Settings

21. Select Files >Run to process your proposed cross sections.

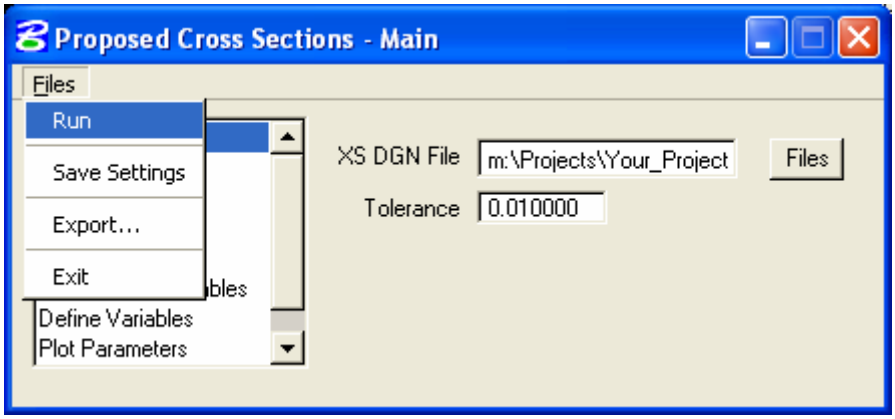

Figure 18-28: Run Proposed Cross Section

22. ***The following Proposed Cross Section Run dialog box will appear. Set the To Log File to To Screen, if no log file is desired. Select Apply process the Cross Sections.***

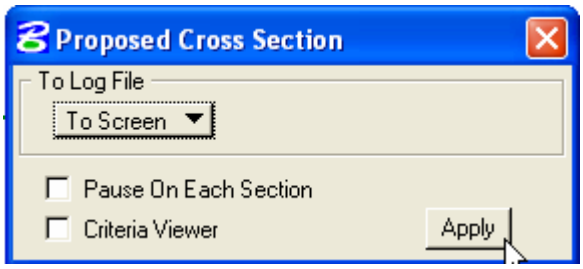

Figure 18-29: Process Proposed Cross Section

Cross Section Navigator

Now that you have completed the cross section run, you will want to view them. The cross section navigator is a tool that makes the viewing of cross sections much easier. Two types of Cross Section Navigators can be used to review the cross sections. A new tool for the Geopak 2004 Edition is the Super Cross section Navigator which allow you to view your cross section based on your profile. The new tool prevents drifting of the cross sections and provides speed controlled cross section movie navigation.

Workflow 3: Cross Section Navigator

1. ***Select Applications>GEOPAK ROAD>Cross Sections>Navigator, or Select the Cross Section Navigator icon from the GEOPAK Road toolbar.***

Figure 18-30: Cross Section Navigator Icon

2. *The Cross Section Navigator dialog will appear.*

Figure 18-31: Cross Section Navigator

3. *Navigator will automatically center the first cross section found, using the station on the cross section cells.*

4. *Use the arrows* *to move up or down station through the cross sections. You can also use the station pull down menu to go to a specific cross section.*

Workflow 4: Super Cross Section Navigator

5. *Select Applications>GEOPAK ROAD>Design & Computation Manager, or Select the Design & Computation Manager icon from the GEOPAK Road toolbar.*

Figure 18-32: Design & Computation Manager Icon

6. *In Design and Computation Manager dialog box, select MVBA Applications>Super Cross Section Navigator. Double Click on Super Cross Section Navigator. The following dialog box will appear.*

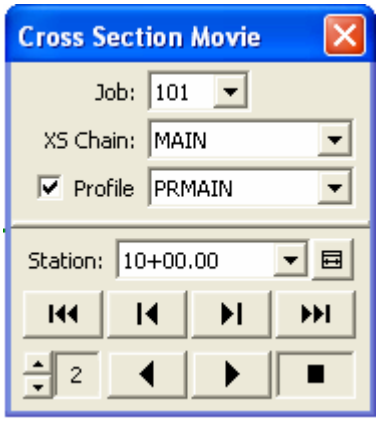

Figure 18-33: Super Cross Section Navigator

Related links: Setting up the Proposed Cross Section run for the 5 typical sections available through the Typical Section Generator, using Knucklehead's Guide for GEOPAK Road 2004 Edition.

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Chapter 19: Plan & Profile Sheet Clipping

Overview

This chapter will describe the methods used to create plan and profile sheets. The following workflows will show the user how to set up sheets using GEOPAK Plan and Profile Sheet Composition tool. This application has evolved over the years, allowing for profile stair stepping, ability to automatically clip the graphics with notches (Title block, project information, etc.,), and customized sheet numbering and station adjustment on sheets.

Note: EFLHD policy is to create all sheet per file with rotate view only. This will use models for all the sheets in one design file and also allow the use of plan and profile labelers when detailing the sheets.

Plan/profile sheet creation

GEOPAK will create separate plan and Profile, double plans and plan/profile sheets. These sheets are generally created at 20, 40, 50, and 100 scale English (ft/in). Workflow 1 will describe the steps necessary to create a plan/profile sheet. Station range, drawing areas, and many other variables are contained in the sheet library files **eflhd_Eng_sheets.psl**. The sheet library file contains many values specific to EFLHD such as cell library names and locations, specific sheet cells to be used, drawing scales, and a variety of text parameters and cannot be modified by the user.

The sheet library files for EFLHD projects are located on the EFLHD network at:
M:\Cadd_resource_v8\Plan&Profile_Shts

For EFLHD employees, the unit correct .psl file will be automatically attached while opening a design file using the Project Configuration (*.pcf).

For consultants, EFLHD sheet library files are available through the **Cadd_resource_v8.zip** download. Download the file and extract the file to the server or local drive, keep the Cadd_resource_v8 directory structure intact. The unit correct .psl file will be attached when opening a design file using the project configuration file.

Clip Sheets and Motif Files

Prior to using the GEOPAK Plan and Profile Sheet Composition tool, three files need to be created. **Clip.dgn**, **Plan_motif.dgn** and **Profile_motif.dgn** should be created to assure proper setup of plan and profile sheets. Outlined below are the uses and instructions for creating each file.

Clip.dgn

Creating a drawing to display the sheet boundaries will allow the user to always have a visual representation of how each sheet will layout in relation to the others. If the design changes, having this file will allow the user to move sheets around to better fit any design changes. To create this sheet, create new design file and select the seed file **"Sur_ft2D.dgn"** and reference the **horizontal alignment design file** and **profile design file** into this new file. By referencing the overall design back into the **Clip.dgn** file, any future design changes will be displayed in this new file, instantly showing the designer which sheets, if any, will need to be adjusted.

Motif files

Motif files act as seed files for clipping plan and profile sheets. Motif file should be a blank file with the proper reference files attached, and the proper levels for each file turned on or off. The **Plan and Profile Sheet Composition tool** will then use these files when clipping each sheet and each clip sheet will have the correct files displayed with the correct levels on. For example, if the plan view in a final plan sheet needs to show overall design, mapping, raster images, ROW, etc., with specific levels on or off for each of these files, you would only need to setup this combination once in the motif file. This information would then be used to create each sheet. These sheets should be named **Plan_motif.dgn** and **Profile_motif.dgn**. To create **Plan_motif.dgn**, create new design file and select the seed file **"Sur_ft2D.dgn"**and attach each reference file that should be shown in the plan view, and turn on or off any levels to make the display look exactly like the final plan sheets in plan view. Repeat these steps for the **Profile_motif.dgn,** referencing the profile sheet into the motif file.

Workflow 1: Plan/Profile sheets using GEOPAK

1. ***Open the Clip.dgn and invoke Plan and Profile Sheet Composition tool from Project Manager by selecting the button for Plan & Profile Sheets. Select a Run or create a new Run.***

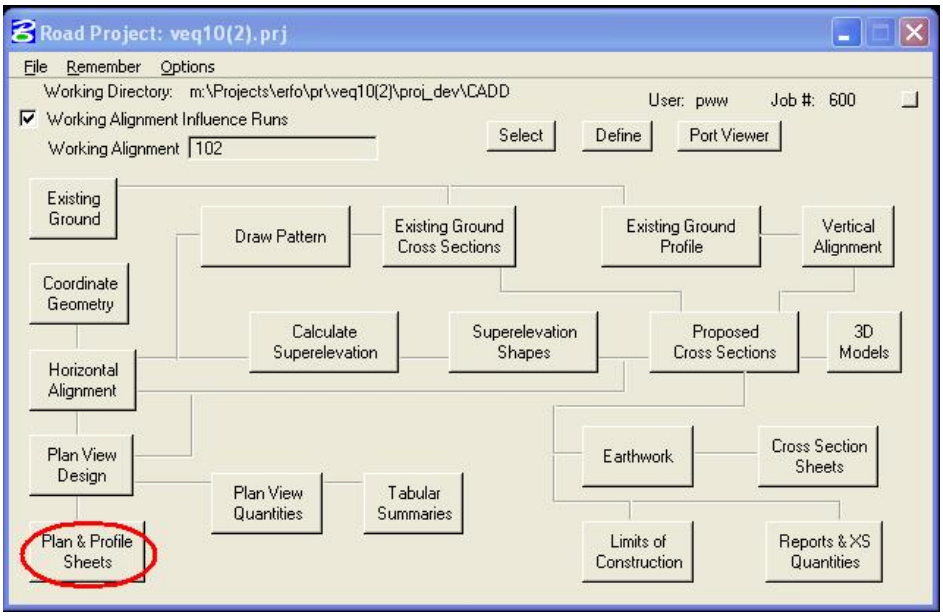

Figure 19-1: Project Manager

The example below is focused on clipping an English project using 100 Scale Plan/Profile sheets.

2. ***The following Plan Sheet Layout dialog box appears. Select 100 Scale Plan/Profile using the drop down arrow, and adjust the Scale field to 100 ft/in as shown below:***

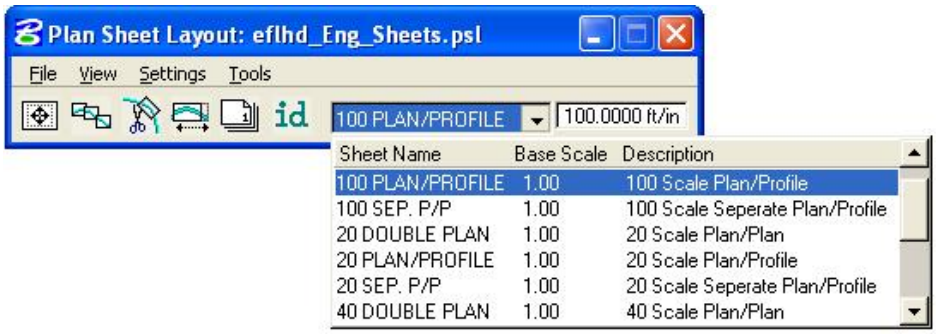

Figure 19-2: Plan Sheet Layout Dialog

3. ***From the pulldowns, select Settings > Sheet Layout and adjust the Sheet Layout Settings as shown below and press OK:***

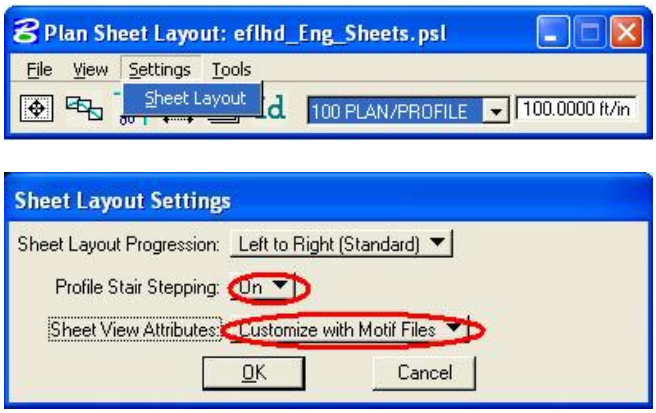

Figure 19-3: Sheet Layout Settings

4. ***Invoke the Sheet Composition dialog by clicking on the Sheet Composition icon from the Plan Sheet Layout dialog as shown below:***

Figure 19-4: Plan Sheet Layout Dialog

5. ***Modify the Sheet Composition dialog box as shown below:***

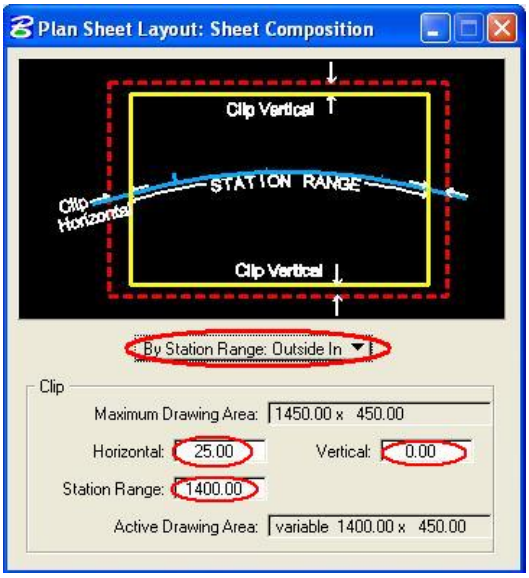

Figure 19-5: Sheet Composition

The dialog shown is settings for a 100 Scale PLAN/PROFILE "sheet style". Other "sheet styles" have been created for English and Metric projects. The settings can be found at the end of this documentation... To go directly there, click HERE.

6. Invoke the Layout Sheets tools by selecting the Layout Sheets icon from the Plan Sheet Layout dialog as shown below:

Figure 19-6: Plan Sheet Layout Dialog

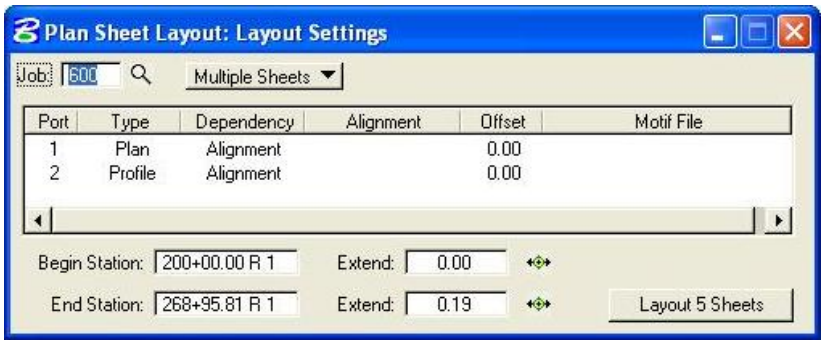

Figure 19-7: Layout Settings

7. ***Select Multiple Sheets from the dialog box and Select the GPK file by keying it into the "Job:" box, or by browsing using the file open icon.***

8. ***To populate the Plan Port Data dialog box, double click anywhere along the row for Port 1 in the Layout Settings dialog box and the following dialog box will be invoked.***

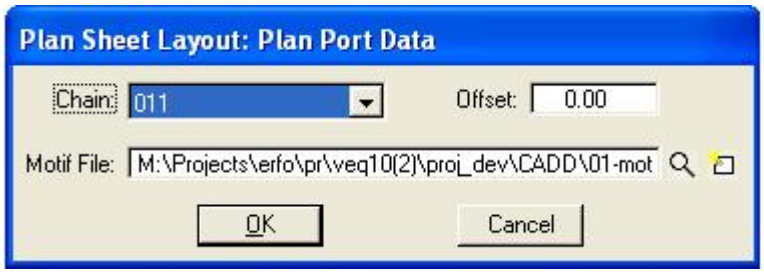

Figure 19-8: Plan Port Data

9. ***Select the correct Chain and the appropriate Plan Motif file. Press OK. If the Motif File has not been created, create Motif files using the second icon as shown below:***

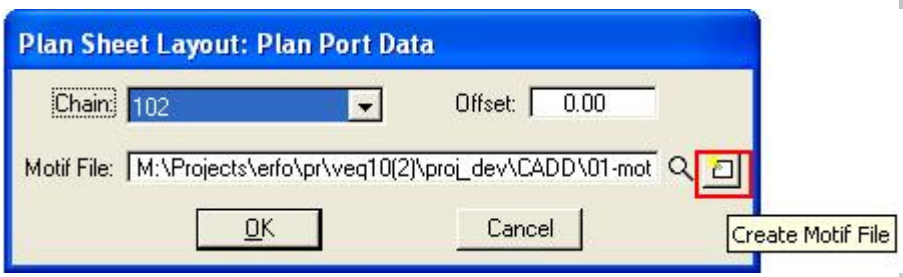

Figure 19-9: Plan Port Data - Create Motif File

Motif file should be created from a "Sur_ft2D.dgn" seed file. After creating the Motif file, make sure to attach the required reference files.

10. ***To populate the Profile Port Data dialog box, double click anywhere along the row for Port 2 in the Layout Settings dialog box and the following dialog box will be invoked.***

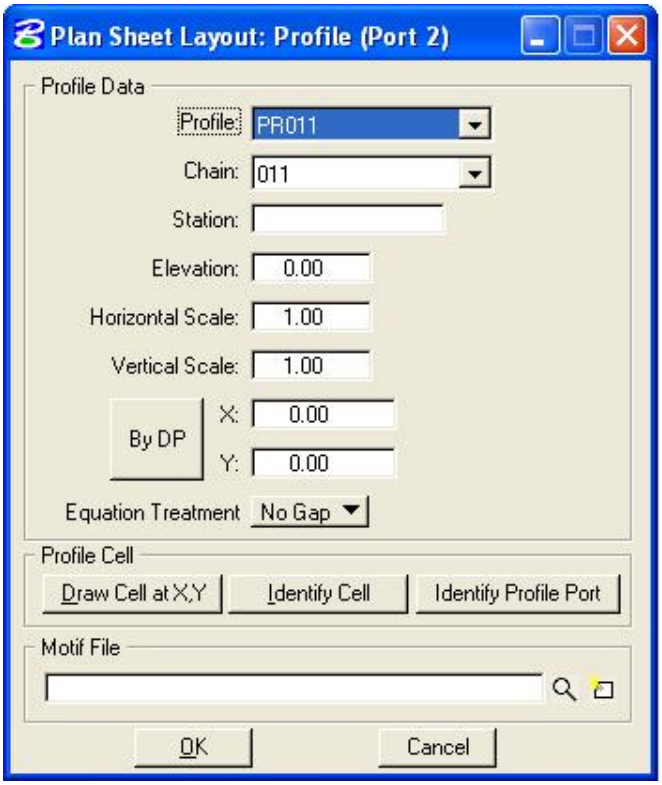

Figure 19-10: Profile Layout

11. If a profile cell exist for the file that is referenced to the Clip.dgn file then click on Identify cell, place data point on the profile cell and accept. Profile Data dialog fields can be populated using this method, or manually enter in the required information.

12. Select the appropriate Profile Motif file. Press OK. If the Motif file has not been created, create Motif files using a "Sur_ft2D.dgn" seed file as outlined in step 9.

13. GEOPAK will calculate the number of sheets to layout, number of sheets calculated will be placed on the button at the bottom right of the Layout Settings dialog box. The extend distance filed will allow the user to enter a value that will shift the clipping shapes backwards or forwards a given distance. If the number of sheets is acceptable, press the Layout 8 Sheets button and GEOPAK will draw clipping shapes into the drawing.

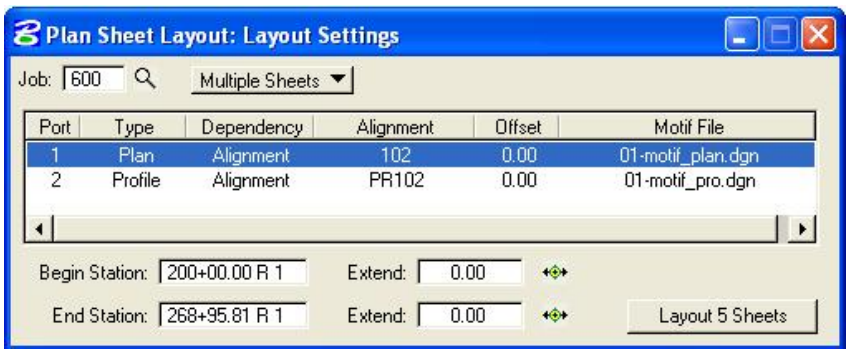

Figure 19-11: Layout Settings

In order for the data to be clipped correctly, use the Sheet Layout Modify Tools. Two most common types of modification supported are sliding the sheets and modifying the drawing area. The drawing area cannot be increased in Length (Horizontal) or Height (Vertical) to exceed the Drawing Area setup in the sheet library.

14. Once the clipping shapes are placed, for extremely curved chains and steep vertical curves it may be necessary to modify the clipping shapes. To invoke the Modify tools, use the Modify Sheets icon, from the Plan Sheet Layout dialog, as shown below:

Figure 19-12: Plan Sheet Layout Dialog

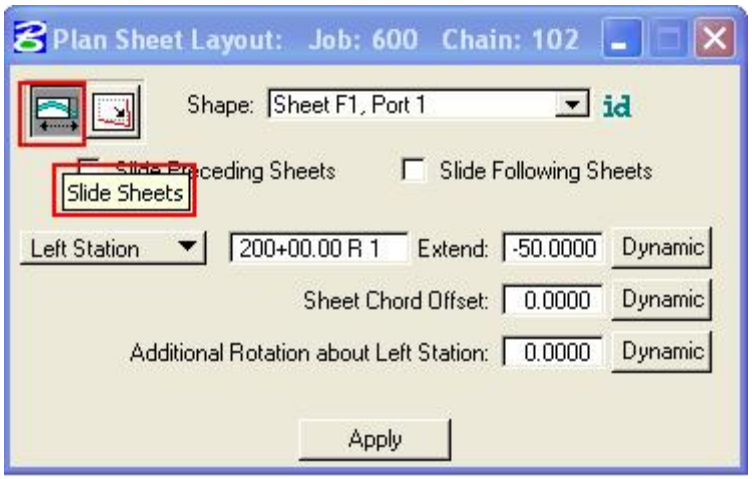

Figure 19-13: Modify Sheet Layout-Plan

15. Identify the Sheet (Clipping Shape) to be modified by clicking on the ID button and then data pointing the clipping shape or simply select it from the pick list, via the down arrow.

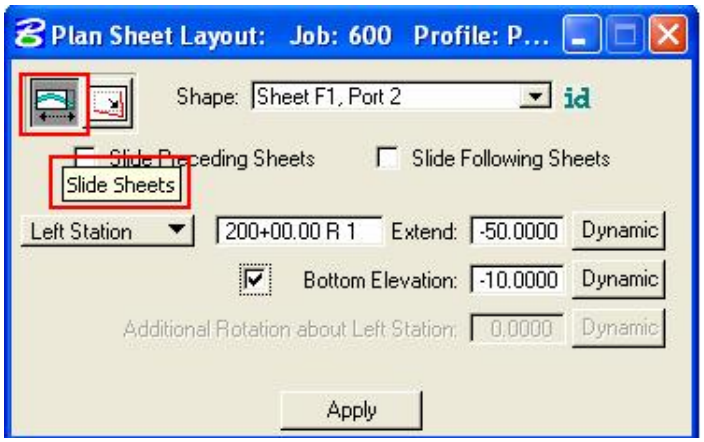

Figure 19-14: Modify Sheet Layout-Profile

NOTE: The application is intelligent enough to know whether a Plan clipping shape or Profile clipping shape has been identified. When a Profile clipping shape is identified, the "**Sheet Chord Offset**" field changes to "**Bottom Elevation**", (as shown above). When modifying the vertical position of a Profile clipping shape, toggle "**Bottom Elevation**" **ON**, type in the desired "bottom of the shape" elevation, or press **Dynamic** and move the shape up or down.

16. Use the Sheet Number Manager tool to number sheet to EFL standards. To invoke the Sheet Number Manager tool, use the Sheet Number Manager icon, from the Plan Sheet Layout dialog, as shown below:

Figure 19-15: Plan Sheet Layout Dialog

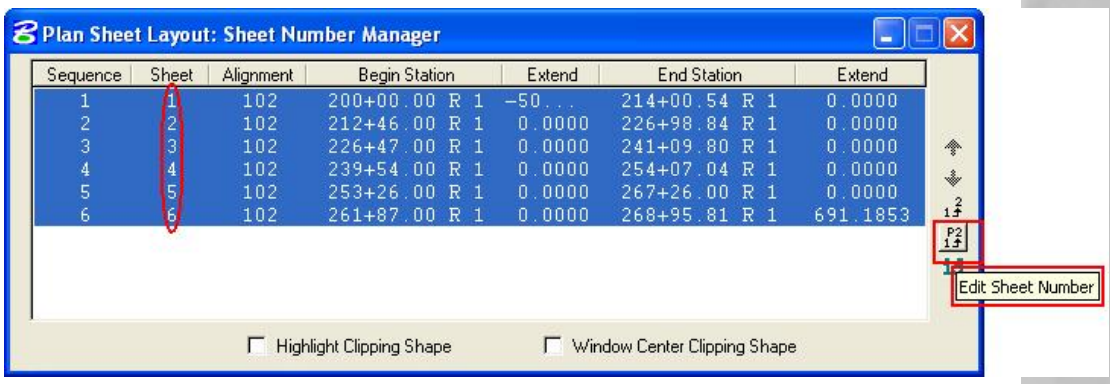

Figure 19-16: Sheet Number Manager

17. Click inside the white area anywhere on row one, hold down the shift key and click a second time anywhere on the last row. Once all rows are selected, click on Edit Sheet Number as shown above.

18. For EFL specific sheet numbering scheme where the sheets are numbered in sequence beginning with D1, complete the Edit Sheet Number dialog as shown below and press OK:

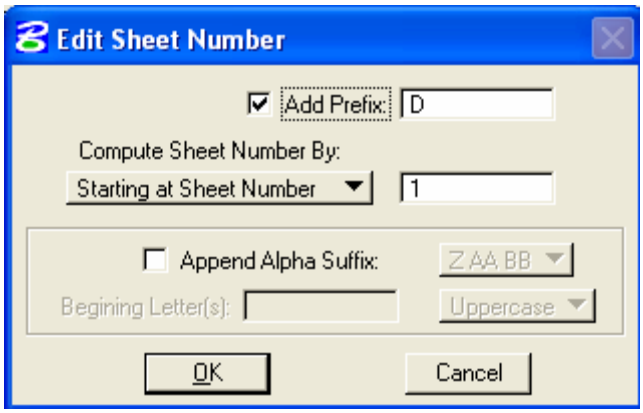

Figure 19-17: Edit Sheet Number

19. When OK is pressed the Sheet Number Manager dialog will appears as shown below:

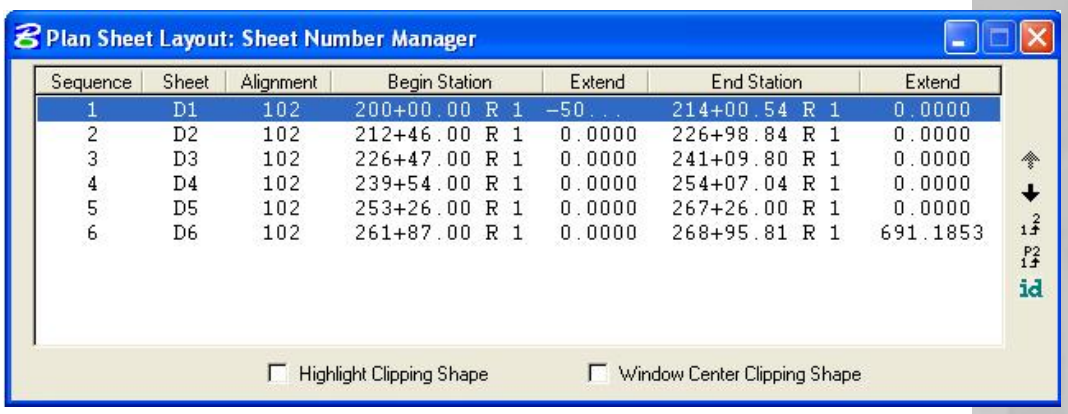

Figure 19-18: Sheet Number Manager

20. Once the clipping shapes are placed and satisfactorily modified, invoke the Clip Sheets tool, Select the Clip Sheets icon from the Plan Sheet Layout dialog as shown below:

Figure 19-19: Plan Sheet Layout Dialog

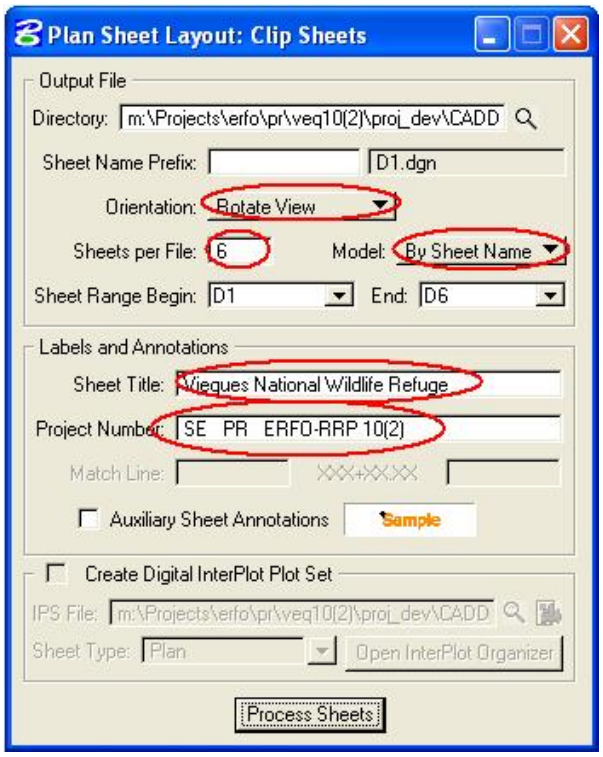

Figure 19-20: Clip Sheets

21. Select the working directory in the Output File box. Keep the sheet name prefix in the second field as blank, change the design file name latter after process.

NOTE: The software **appends** the **beginning sheet number** to the "**Sheet Name** ". You most likely will have to rename this (or these) file(s) later .

22. Select Orientation to Rotate View. The sheet cell and the view are rotated and the clipped graphics maintains it's coordinate grid intelligence, thus allowing for labeling right on the sheet.

NOTE: EFLHD policy to choose Rotate View, thus not to loose coordinate grid intelligence of the clipped graphics.

23. Select Sheet per File to total number of sheets, thus sheet will be drawn in different models of the

design file. EFLHD prefer to use all sheet shown in different models of one design file.

24. Select the Sheet Range required from the pick list, using the drop down arrows. Use the Sheet Number Manager Tool to renumber sheets to EFL specific sheet numbering scheme, (such as D1, D2, D3….) as explained earlier.

25. Enter Labels and Annotation. An example of a completed Clip Sheets dialog is shown below (illustrating the results of the completed Labels and Annotation fields)… when completed press Process Sheets.

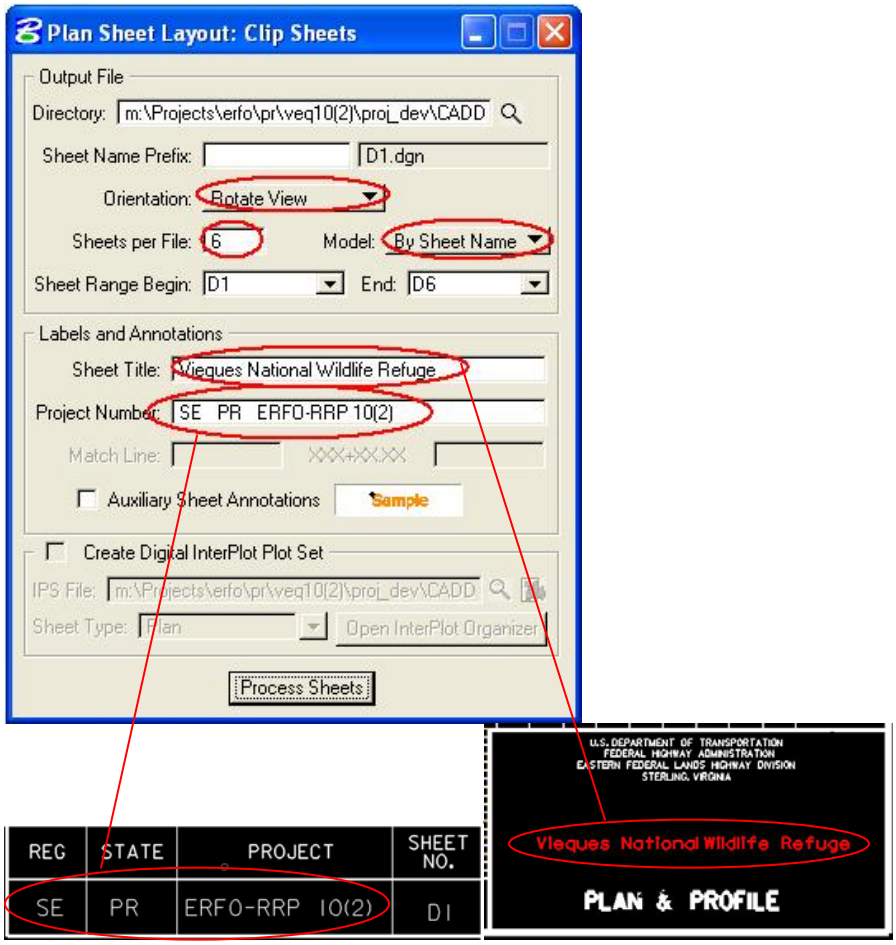

Figure 19-21: Clip Sheets

Note: *Keep 9 space between SE(Region) and PR(state), and 11 space between PR(state) and ERFO-RRP 10(2)[Project Number]*

EFLHD Sheet Composition Dialog Settings:

ENGLISH Sheet Styles:

Table 19-1: English Sheet Styles

Sheet Style	Scale (ft/in)	Station Range	Horizontal	Overlap (if using overlap option)
100 Plan/Profile	100	1400	25	Multiple of 25
50 Plan/Profile	50	700	12.5	Multiple of 12.5
40 Plan/Profile	40	550	15	Multiple of 10
20 Plan/Profile	20	280	15	Multiple of 5
100 Double Plan	100	1400	25	
50 Double Plan	50	700	12.5	
40 Double Plan	40	550	15	
20 Double Plan	20	280	15	
100 Separate Plan/Profile	100	1400	25	Multiple of 25
50 Separate Plan/Profile	50	700	12.5	Multiple of 12.5
40 Separate Plan/Profile	40	550	15	Multiple of 10
20 Separate Plan/Profile	20	280	15	Multiple of 5
10 Separate Plan/Profile	10	140	5	Multiple of 5

METRIC Sheet Styles:

Table 19-2: Metric Sheet Styles

Sheet Style	Scale (n:1)	Station Range	Horizontal Overlap
1000 Plan/Profile	1000	350	10
500 Plan/Profile	50	700	12.5
400 Plan/Profile	40	550	15
300 Plan/Profile	20	280	15
100 Plan/Profile	100	1400	25
500 Double Plan	50	700	12.5
400 Double Plan	40	550	15
300 Double Plan	20	280	15
100 Double Plan	100	1400	25
1000 Separate Plan/Profile	50	700	12.5
500 Separate Plan/Profile	40	550	15
400 Separate Plan/Profile	20	280	15
300 Separate Plan/Profile	10	140	5
100 Separate Plan/Profile	10	140	5

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Chapter 20: Quantities

Overview

Quantities are calculated by many different methods. The type of quantity, its unit of measurement, and how it is shown in the plans will dictate the method used to calculate it. Since this is a CADD manual, this chapter will go through the procedures used to calculate quantities using plan and cross section drawings. A detailed description of each item to be calculated, the means of calculation, and the accuracy needed is reserved for another publication.

These methods will only work if you use D&C Manager to draw or set the symbology of the elements you need to quantify.

This chapter is broken into two sections. Calculations in plan view and calculations in cross sections. D & C Manager will be used to calculate items in the plan drawing and XS Reports will be used to calculate items in the cross section drawing.

Quantities in Plan Drawings

Three different types of quantities can be calculated in the plan drawing: each, linear, and area. All of these will be calculated using the computation tool in Design & Computation manager. Most of the items that need to be calculated are set up in EFLHD's Design & Computation Manager database. So, if you followed these standards while drawing each element, quantity calculations will be easy. See the chapter on D&C Manager for more information on drawing elements.

The D&C manager can be selected by picking Plan View Quantities on Project Manager, or by selecting Design and Computation Manager icon on the GEOPAK Main menu.

Figure 20-1: D&C Manager Icon

If you use Project Manager, GEOPAK will automatically set Design & Computation Manager in Compute mode. If you select Design & Computation Manager from the GEOPAK Main menu, you will need to shift it to Computation mode by picking the Compute button in the menu bar.

Figure 20-2: Compute Icon

This will pop up the following two dialog boxes.

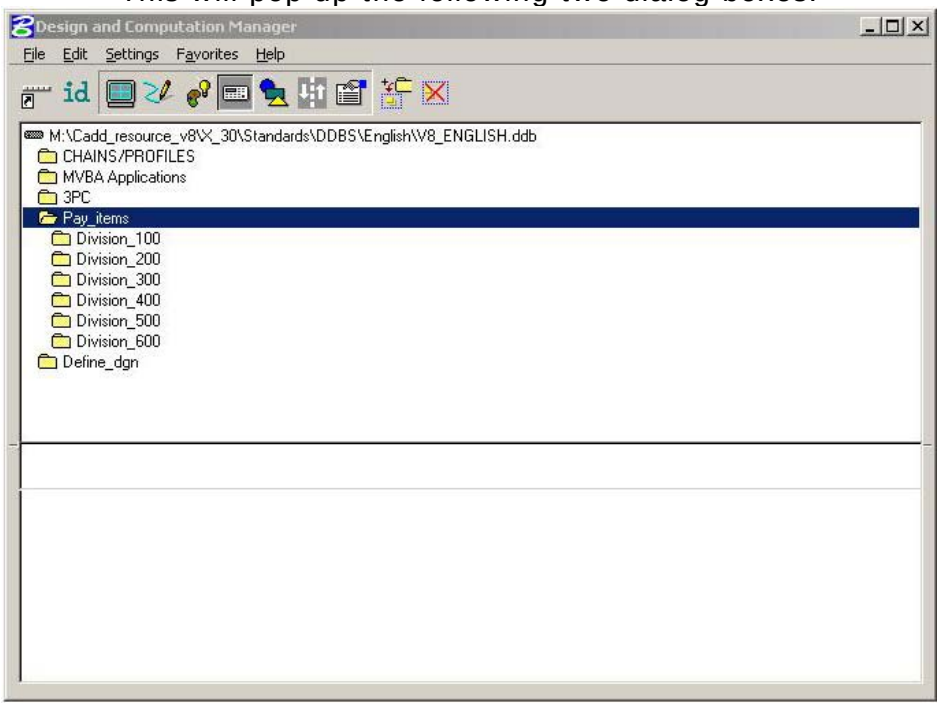

Figure 20-3: Select Item for Computation

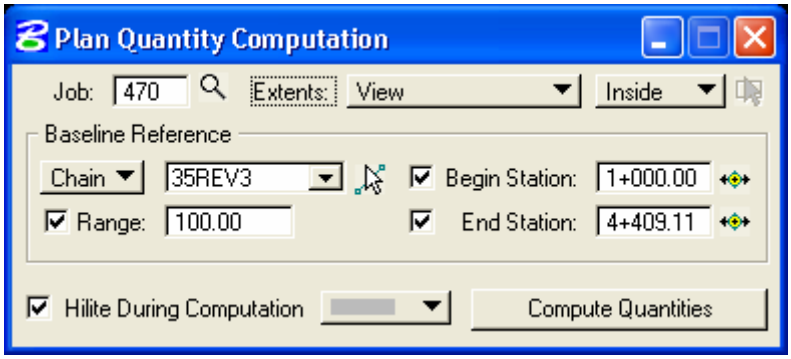

Figure 20-4: Compute Dialog

The first dialog box will allow you to select the items to be calculated. The second dialog box sets up the parameters for calculating and reporting the quantities. The following workflows will explain the processes for calculating quantities in each of the three types: each, linear, and area.

Examples of quantities to be calculated in units of each are, manholes, trees, lights, survey monuments, etc. The following workflow will guide you through the calculation process.

Workflow 1: Calculating "By Each" Quantities

1. ***Select item or items that you want calculated using the D & C Manager item list. Double-clicking on the item to be calculated will populate collection box at the bottom.***

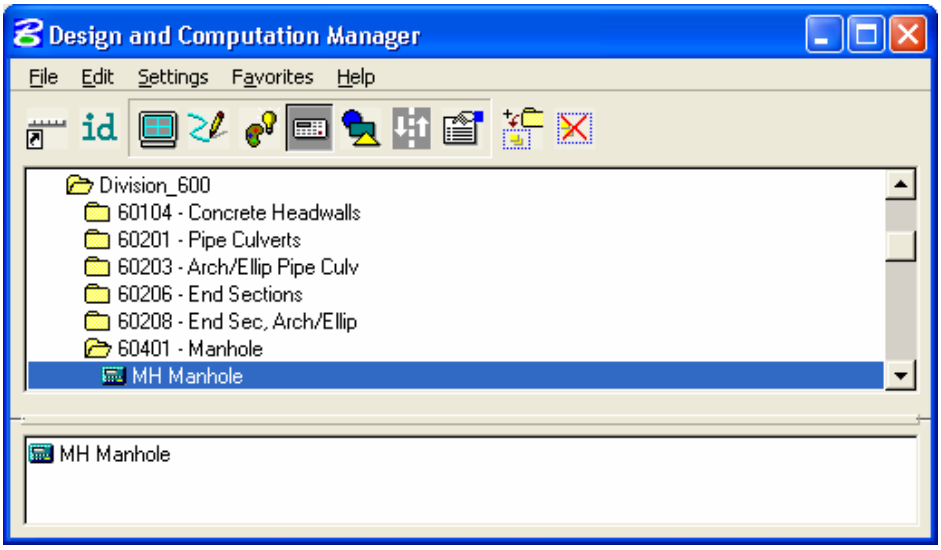

Figure 20-5: Item Selection

2. ***Make sure the Job Number and Chain Name are correct. Set the Extents to View, Fence, or Active Design File. Pick Compute Quantities.***

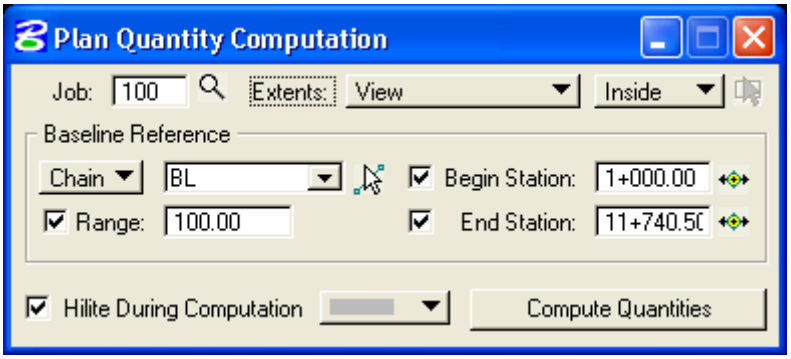

Figure 20-6: Compute Dialog

3. ***This will bring up the following dialog box:***

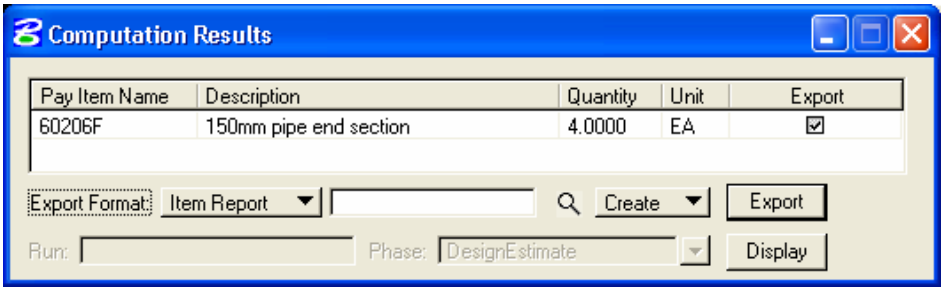

Figure 20-7: Computation Results Dialog

4. ***To get an itemized calculation (Station and Offset to each item), change the Export Format from Item Report to Comp Book, then give it an output file name to look like the following:***

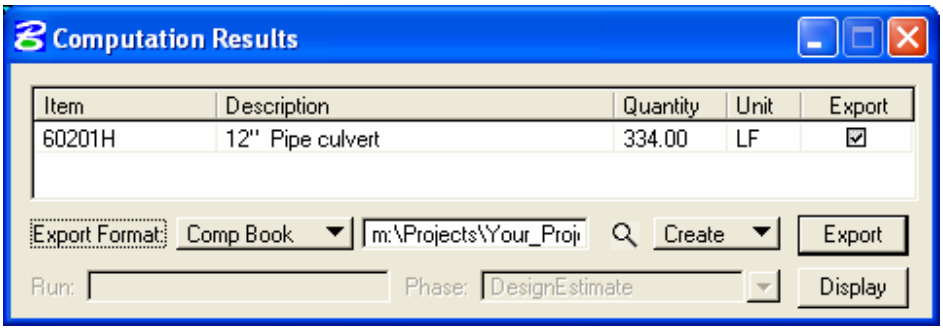

Figure 20-8: Computation Results Dialog for Comp Book

5. ***Pick Export. The following report will be created:***

```
+-------------------------------------------------------------------------------------------+
|  Date: 12/10/2004 2:11:14 PM                                          Page No.    1       |
|  File Name:C:\FHWA\pipe.cmp                                                                |
|  Item: 60206F                                                                              |
|  Desc: 150mm pipe end section                                          Unit: EA            |
|                                                                                            |
+------------------+-------------+-----------+---------------+---------------+------------+
|      Baseline    |   Station   |   Offset  |    Northing   |    Easting    |  Quantity  |
+------------------+-------------+-----------+---------------+---------------+------------+
| BL               |   1+844.08  |    -9.93  |  623688.6999  |  197464.3486  |       1.00 |
| BL               |   1+840.01  |    23.69  |  623660.1813  |  197446.0967  |       1.00 |
| BL               |   2+016.04  |   -11.69  |  623611.1293  |  197617.2084  |       1.00 |
| BL               |   1+992.12  |    22.47  |  623590.5959  |  197580.7046  |       1.00 |
+-------------------------------------------------------------------------------------------+
|   Item Total:     4      Unit: EA                                                      4.00 |
+-------------------------------------------------------------------------------------------+
```

Figure 20-9: Output

Examples of linear quantity calculations are fence, gutter, guardrail, etc. The following Workflow will guide you through the calculation process.

Workflow 2: Calculating "Linear" Quantities

1. ***Select item or items that you want calculated using the D & C Manager item list.***

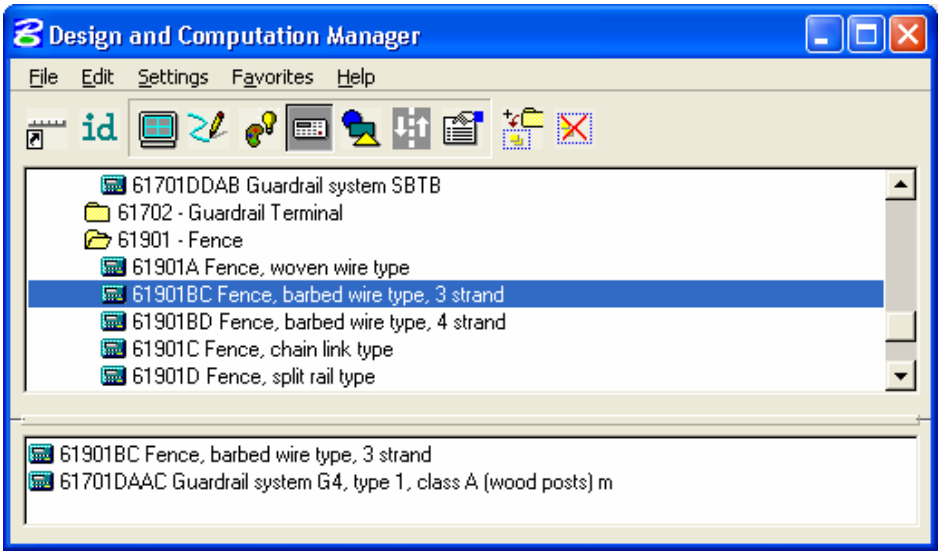

Figure 20-10: Multiple Item Selection

2. ***Make sure the Job Number and Chain Name are correct. Set the Extents to View, Fence, or Active Design File. Pick Compute Quantities.***

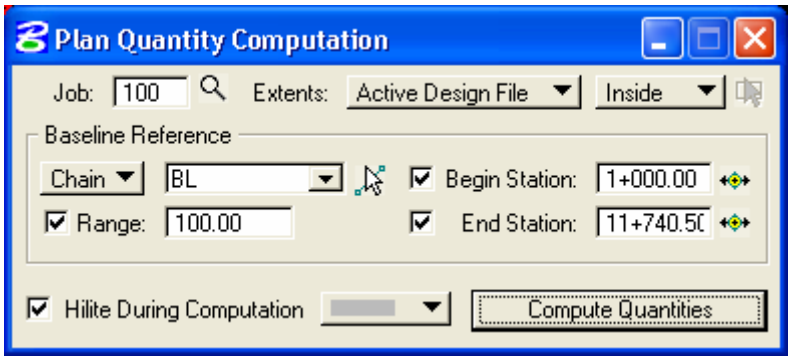

Figure 20-11: Compute Dialog

3. ***This will bring up the following dialog box:***

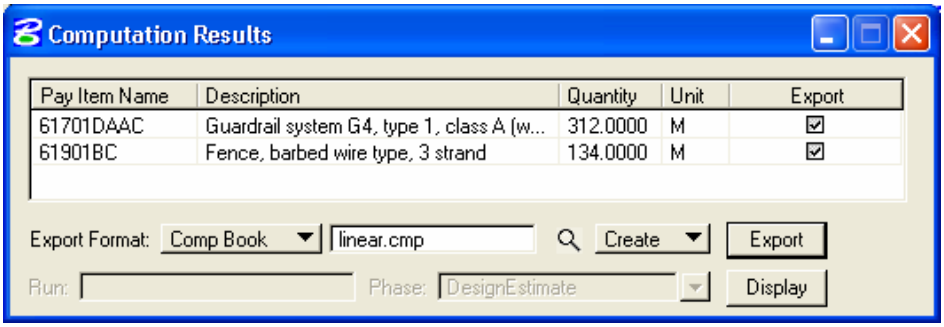

Figure 20-12: Computation Results

4. ***Set Export Format to Comp Book and add a file name. Pick Export, get the following output file:***

Date: 12/10/2004 2:29:58 PM — Page No. 1

LINEAR MEASUREMENT COMPUTATION

Pay Item No. 61701DAAC — Unit:M File Name: linear.cmp

Pay Item Name: Guardrail system G4, type 1, class A (wood posts) m

Baseline	[BEGIN] Station	[BEGIN] Offset	[END] Station	[END] Offset	[ORIGINAL] Gross Length	[ORIGINAL] Deduct	[ORIGINAL] Net Length	[FINAL] Gross Length	[FINAL] Deduct	[FINAL] Net Length	Over/Under Run	Remarks
BL	1+530.30	-22.19	1+846.36	-40.26	312.00	0.00	312.00					
Totals Unit:M					312.00	0.00	312.00					

Date: 12/10/2004 2:29:58 PM — Page No. 2

LINEAR MEASUREMENT COMPUTATION

Pay Item No. 61901BC — Unit:M File Name: linear.cmp

Pay Item Name: Fence, barbed wire type, 3 strand

Baseline	[BEGIN] Station	[BEGIN] Offset	[END] Station	[END] Offset	[ORIGINAL] Gross Length	[ORIGINAL] Deduct	[ORIGINAL] Net Length	[FINAL] Gross Length	[FINAL] Deduct	[FINAL] Net Length	Over/Under Run	Remarks
BL	1+870.30	17.80	2+003.26	20.51	134.00	0.00	134.00					
Page Totals Unit:M					134.00	0.00	134.00					
Totals Unit:M					134.00	0.00	134.00					

Figure 20-13: Output

Notice, in the example above, multiple quantities were calculated at once. You can add the items that you need calculated in the collection box by double clicking on it. If you want to remove an item from the collection box, simply double click on it in the box.

Examples of area quantities that are calculated in the plan view are, sidewalk and concrete pavement. Since GEOPAK uses shapes to calculate areas, area quantities are not quite as simple as the "By Each" and "linear" quantities, but once you get used to it, it is a time saver. The following Workflow will guide you through the process.

Workflow 3: Calculating "Area" Quantities

1. ***Highlight the item you want to calculate, then pick the Shape button on the menu bar.***

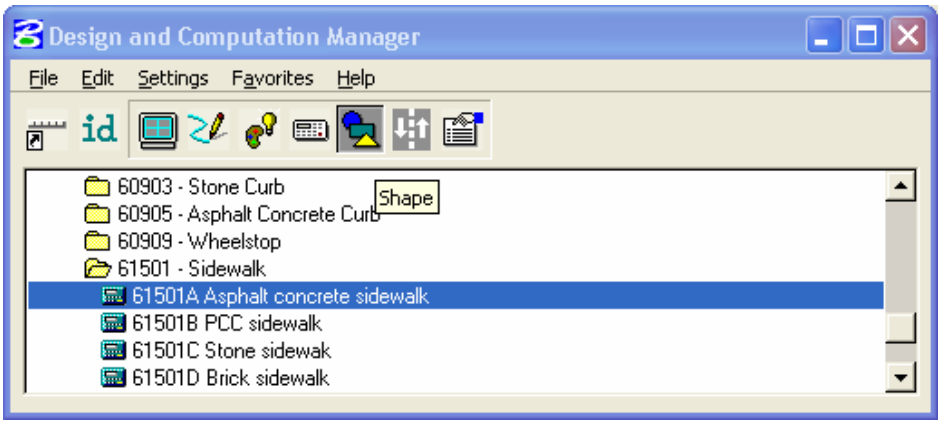

Figure 20-14: Place Shape Icon

2. ***The following dialog box will come up.***

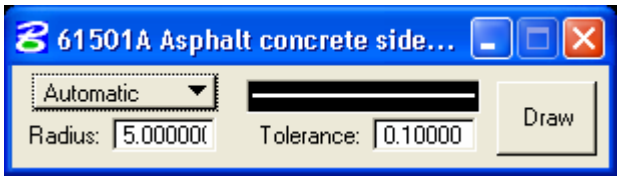

Figure 20-15: Place Shape Dialog

The correct level symbology will be automatically input. The Automatic button has three choices: Semi-auto, Automatic, and exclusive. Semi-auto will allow you to pick the items you want to create the shape with, Automatic will create a shape around a point that you pick inside your area, and exclusive will create a shape where you want to exclude an area such as a planter in the sidewalk.

3. *The two methods that you can use are Automatic and Exclusive. Exclusive is used when there is a deduction from the area, for example a planter in the middle of a sidewalk. Automatic is used when there is no need for deduction. The easiest method is Automatic; the tolerance and radius values can be adjusted if automatic is not working. Pick Draw and pick a data point in the middle of the area that you want the shape in. GEOPAK will draw the shape. When you pick draw with Exclusive, GEOPAK will prompt you to pick a data point inside the outside shape. Once you pick that data point, GEOPAK will highlight the outer shape and then prompt you to pick inside the inner shape to deduct. Once that data point is selected, GEOPAK will draw the shape with the hole in it.*
4. *Go back to Plan Quantity Computation dialog box, Pick Compute Quantities and the following dialog box will appear.*

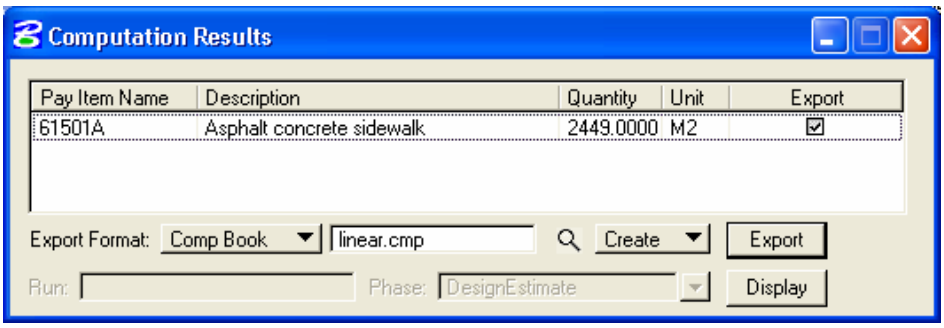

Figure 20-16: Compute Dialog

5. ***Change the Output to Item Report and pick Compute. The following report is what will be produced.***

```
+-----------------------------------------------------------------------------------------+
|                                                                                         |
|        Pay Items List                                                                   |
| Date:12/10/2004 2:53:57 PM       File Name:area.cmp                                     |
|                                                                                         |
+---------------+-----------------------------------------------+-------------+-------------+
|               |                                               |             |             |
| Item No.      | Description                                   |    Unit     |   Quantity  |
|               |                                               |             |             |
+---------------+-----------------------------------------------+-------------+-------------+
|61501A         | Asphalt concrete sidewalk                     |          M2 |    2449.000 |
+---------------+-----------------------------------------------+-------------+-------------+
```

Figure 20-17: Output

GEOPAK can also calculate volumes and weights of items such as pavement and base course. But because the pavement and base course have edge tapers, these quantities are more accurately calculated using a spreadsheet or in the earthwork run.

Quantities in Cross Sections

Besides Earthwork, surfacing, pavement removal, and topsoil, the cross sections are used to calculate seeding and clearing. The earthwork and topsoil calculations will be covered in another chapter. This chapter will provide workflows that show you how to calculate the other two quantities.

Workflow 4: Calculating "Clearing" Quantities

1. ***Open your cross section file and access the XS Reports dialog box. This can be done by pressing the Reports & XS Quantities button in the bottom right hand corner of Project Manager, or by pressing Applications>GEOPAK ROAD>Cross Sections>Reports,***

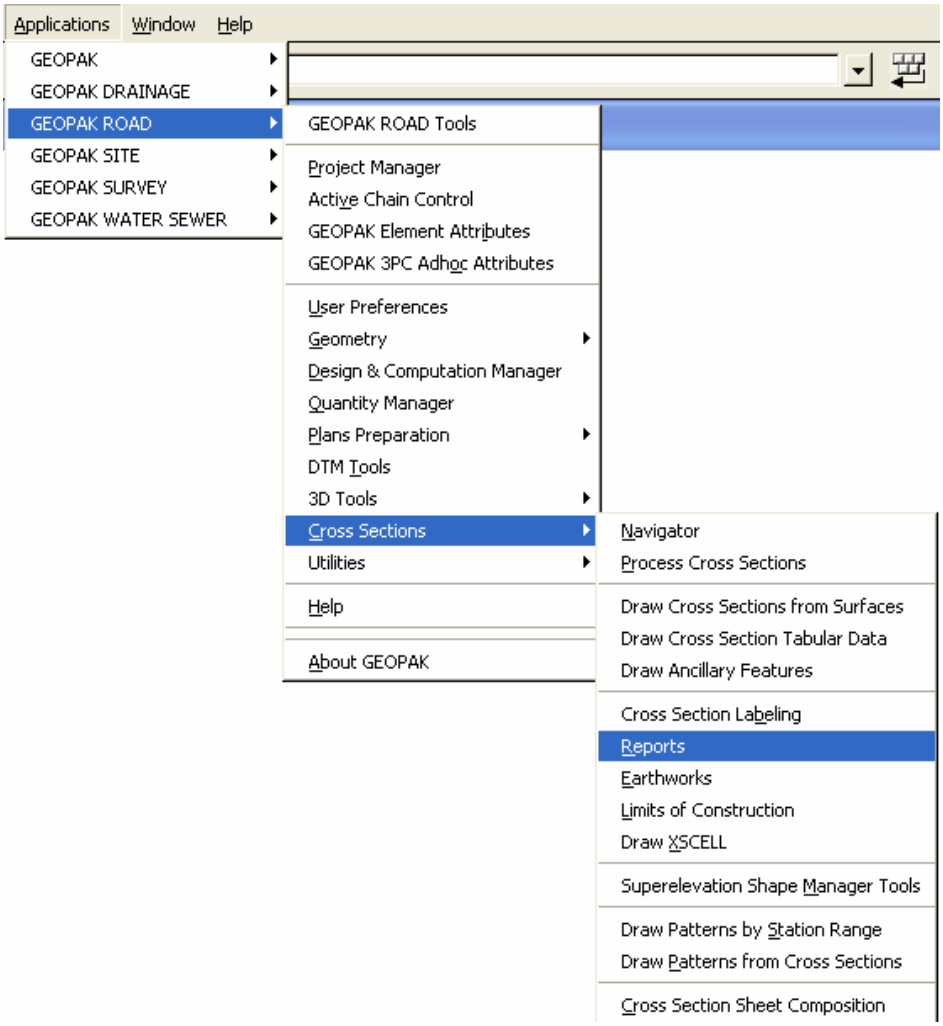

Figure 20-18: Accessing Reports

or by pressing the XS Reports button on the main cross-section palette.

Figure 20-19: Reports Icon

2. This will bring up the following dialog box.

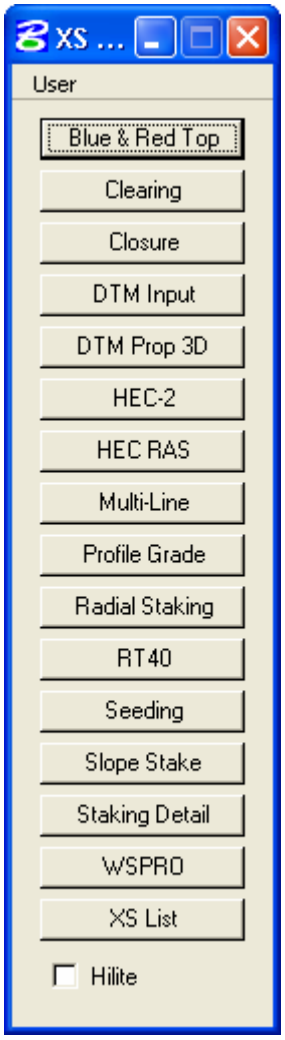

Figure 20-20: Reports Dialog

Press User>Preferences to bring up the following dialog box.

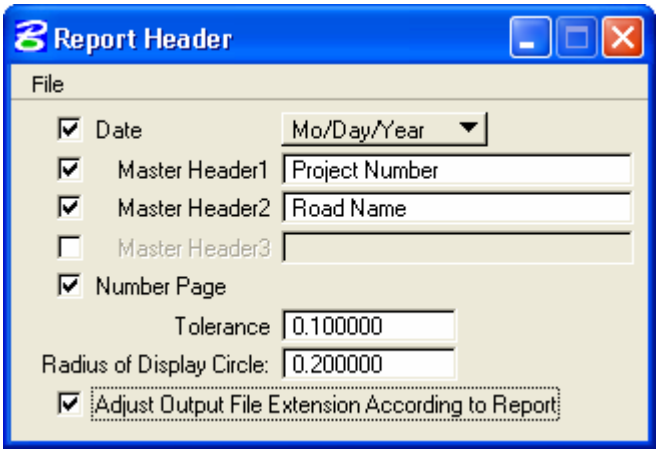

Figure 20-21: Report Settings

3. ***This information will be put at the top of the quantity report. Include the Project Number in the Master Header 1 space, and the Road Name in the Master Header 2 space.***
4. ***Press the Clearing button in the XS Report dialog box.***

Figure 20-22: Clearing Button

5. ***This will bring up the following dialog box. Make sure you check the Beg Station and End Station to ensure that they are the stations you want. For multiple station ranges, the report may need to be run multiple times. The symbology for the Existing Ground will not change (lv = X_E_Ground_XS, co = 4, wt = 0, style = 2), and the symbology for the Proposed Ground should allow GEOPAK to trace completely across from the left catch point, over the top of pavement to the right catch point. To view the selected symbology, pick the symbology button*** ***next to either Existing Ground Line or Proposed Finished Grade. Cut slope rounding, Additional Clearing in Cut, and Additional Clearing in Fill should match what is shown in the typical sections. Each project may have different values. However, typical values are 3.0 m or 10 ft. for Cut Slope Rounding and the Additional Clearing in Cut and Fill should be set at 1.0 m or 3 ft. The increment is set at 500 m or 1000 ft.***

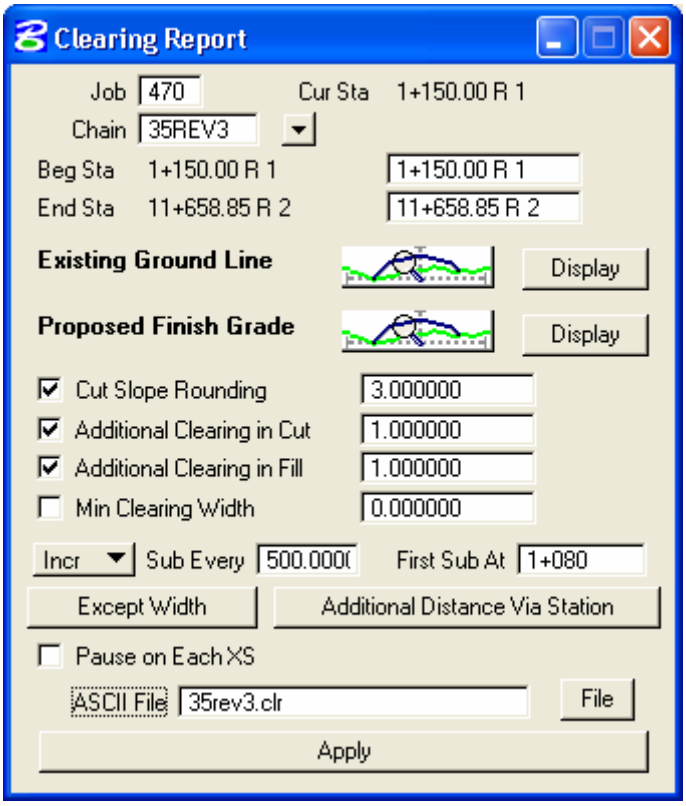

Figure 20-23: Clearing Report Dialog

The Except Width can be used to subtract out the existing pavement width. EFLHD typically does not subtract the existing pavement out, but this can be used if needed. Press the Except Width button to get the following dialog box

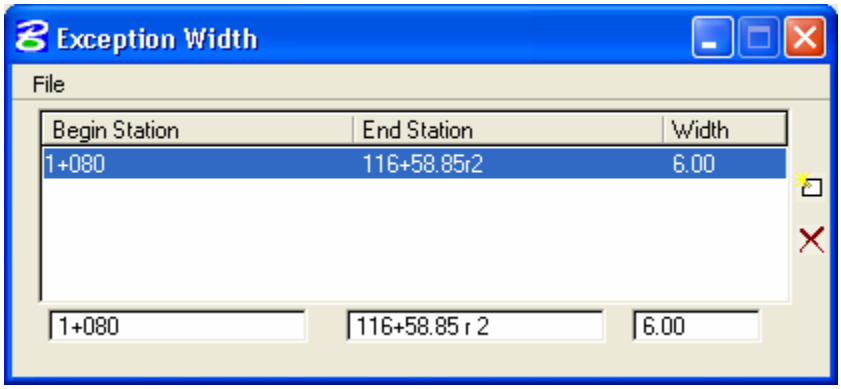

Figure 20-24: Exception Width

6. ***Fill in the beginning station, ending station, and width, then press the add button .***
7. ***Type in the filename for your output, then press Apply. The following output file is produced.***

```
07/30/2004                                          Project Number                          Page# 1
                                                       Road Name
                                                    CLEARING REPORT

CUT SLOPE ROUNDING              =       3.0000 Ft
ADDITIONAL CLEARING IN CUT      =       1.0000 Ft
ADDITIONAL CLEARING IN FILL     =       1.0000 Ft
MINIMUM CLEARING WIDTH          =       0.0000 Ft
SUBTOTALS EVERY     500.0000 Ft. BEGINNING AT STATION 10+80.00 METHOD INCR
ADDITIONAL CLEARING   LEFT   SIDE                      = 0.00          Ft
ADDITIONAL CLEARING   RIGHT  SIDE                      = 0.00          Ft

STATION            CLEARING  DISTANCE     EXCEPTION     AREA      SUBTOTAL  AREAS
                      LT       RT           WIDTH        SF          SF       ACRES


  11+50.00 R 1       5.57      7.28                                    0
                                             0.00        136
  11+60.00 R 1       7.21      7.13
                                             0.00        306

  (file condensed to fit information into example)

                                             0.00        843
  19+40.00 R 1      34.56      7.95
                                             0.00        877
  19+60.00 R 1      36.97      8.19
                                             0.00        931
  19+80.00 R 1      39.24      8.60
                                             0.00        961
  20+00.00 R 1      38.81      9.44                                12495   0.2868   (ACCUM SF 21184.0000  )
DEDUCTED     ACRES  =       0.0000
TOTAL        SF     =   21184.0000
TOTAL        ACRES  =       0.4863
```

Figure 20-25: Output

Workflow 5: Calculating "Seeding" Quantities

1. *Follow steps 1 through 4 in workflow 4.*
2. *Press the Seeding button on the XS Report dialog box.*

Figure 20-26: Seeding Button

3. *This will bring up the following seeding dialog box. The elements are the same as the clearing report with some additional needed information. The Candidate Seeding Element section needs the symbology of the slopes that will be seeded (typically the cut, fill, and ditch foreslopes). These are the slopes that will be seeded. The Max allowable slope can vary on each project. This*

slope will be determined during the project, but for preliminary quantity calculations, you should use 1V:2H as the max allowable slope.

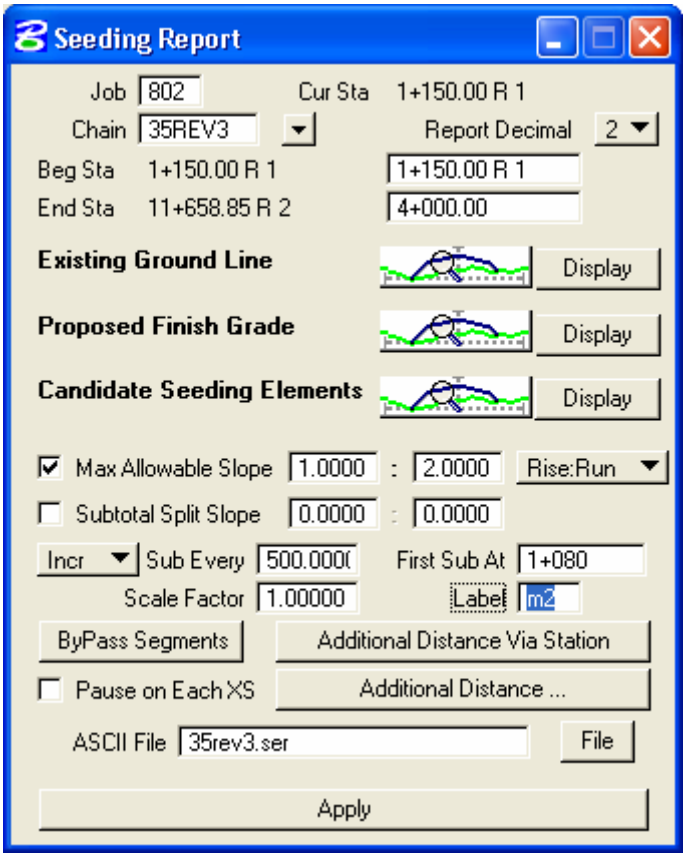

Figure 20-27: Seeding Report Dialog

4. *Pick the Additional Distance button to bring up the following dialog box.*

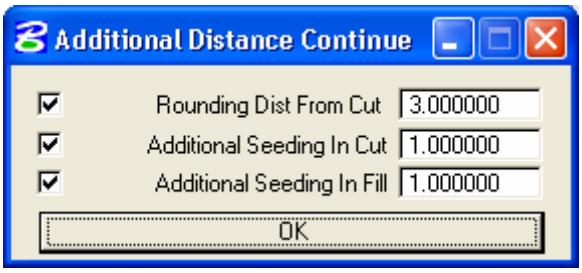

Figure 20-28: Additional Distance

5. *Fill in the appropriate values. They should be the same as the Cut Slope Rounding and Additional clearing in fill values used in the clearing report. Type in the output file you want GEOPAK to write the quantities into and press Apply. GEOPAK will produce the following file.*

```
07/30/2004                                          Project Number                          Page# 1
                                                       Road Name
                                                    SEEDING REPORT

NUMBER OF LEFT  CUT  SLOPES TO BE BYPASSED          = 0
NUMBER OF LEFT  FILL SLOPES TO BE BYPASSED          = 0
NUMBER OF RIGHT CUT  SLOPES TO BE BYPASSED          = 0
NUMBER OF RIGHT FILL SLOPES TO BE BYPASSED          = 0
ROUNDING DISTANCE FROM CUT SLOPE STAKE              = 3.00          Ft
MAXIMUM ALLOWABLE SLOPE FOR SEEDING/SODDING 1.0000  / 2.0000   Rise over Run
ADDITIONAL SEEDING    LEFT   SIDE                  = 0.00          Ft
ADDITIONAL SEEDING    RIGHT  SIDE                  = 0.00          Ft
ADDITIONAL SEEDING IN CUT                           = 1.00          Ft
ADDITIONAL SEEDING IN FILL                          = 1.00          Ft
SUBTOTALS EVERY     500.0000 Ft BEGINNING AT STATION 10+80.00 METHOD INCR
SCALING FACTOR                  =        1.00000                    WITH LABEL            [ SF ]


STATION             SLOPE DISTANCE  AVERAGE SLOPE DIST        A R E A      SF    SUBTOTAL  A R E A    SF
                     LT       RT      LT       RT          LT       RT      BOTH    LT         RT      BOTH
                        (TOTAL)


11+50.00 R 1        0.00     0.00                                                    0        0        0
                    (    0.00)        1.37      0.60       14        6       20
11+60.00 R 1        2.73     1.20
                    (    3.93)        3.95      1.34       79       27      106
11+80.00 R 1        5.17     1.48
                    (    6.65)        9.31      1.33      186       27      213

  (file condensed to fit information into example)

                    (    5.95)        2.25      3.90       45       78      123
19+80.00 R 1        2.25     4.10
                    (    6.35)        2.25      4.53       45       91      136
20+00.00 R 1        2.25     4.95                                                 1675     1617     3293
                    (    7.20)

TOTAL             LEFT              RIGHT             BOTH
   SF=          4203.0000         3235.0000         7441.0000
ACRES=          0.0965            0.0743            0.1708
```

Figure 20-29: Output

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Chapter 21: Reports

Introduction

GEOPAK uses the cross section files to produce staking reports in EFLHD format. The creation of these will be required on all EFLHD projects that have cross sections. These reports include staking details, slope stake reports, and red and blue top reports. The following sections will describe the processes used to create each of the reports.

GEOPAK progresses from left to right across each cross section while preparing each report. To do this, the user will need to provide the level symbology of the existing ground and all the proposed elements required to progress through the points and lines, to be reported on, completely across the cross section.

These reports will be placed in ASCII files for ease of printing and electronic transfer.

Workflow 1: Access Cross Section Reports

1. ***While in the cross section file, open the Project Manager Dialog Box.***
2. ***The Reports & XS Quantities button is located at the bottom right.***

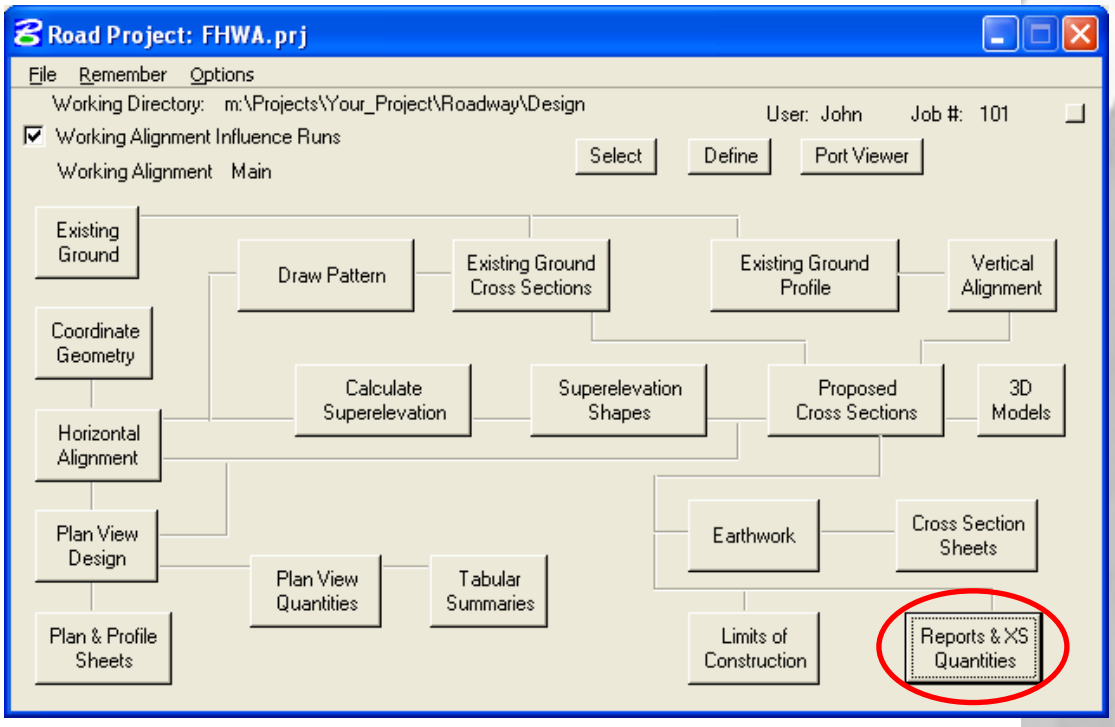

Figure 21-1: Accessing Reports from Project Manager

3. The XS Reports dialog box will appear.

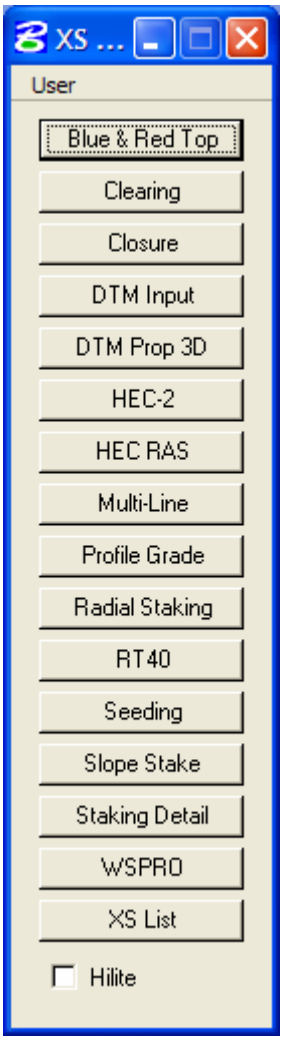

Figure 21-2: Reports Menu

Alternatively, reports may be accessed outside of Project Manager by selecting **Applications>GEOPAK ROAD>Cross Sections>Reports**, as shown below.

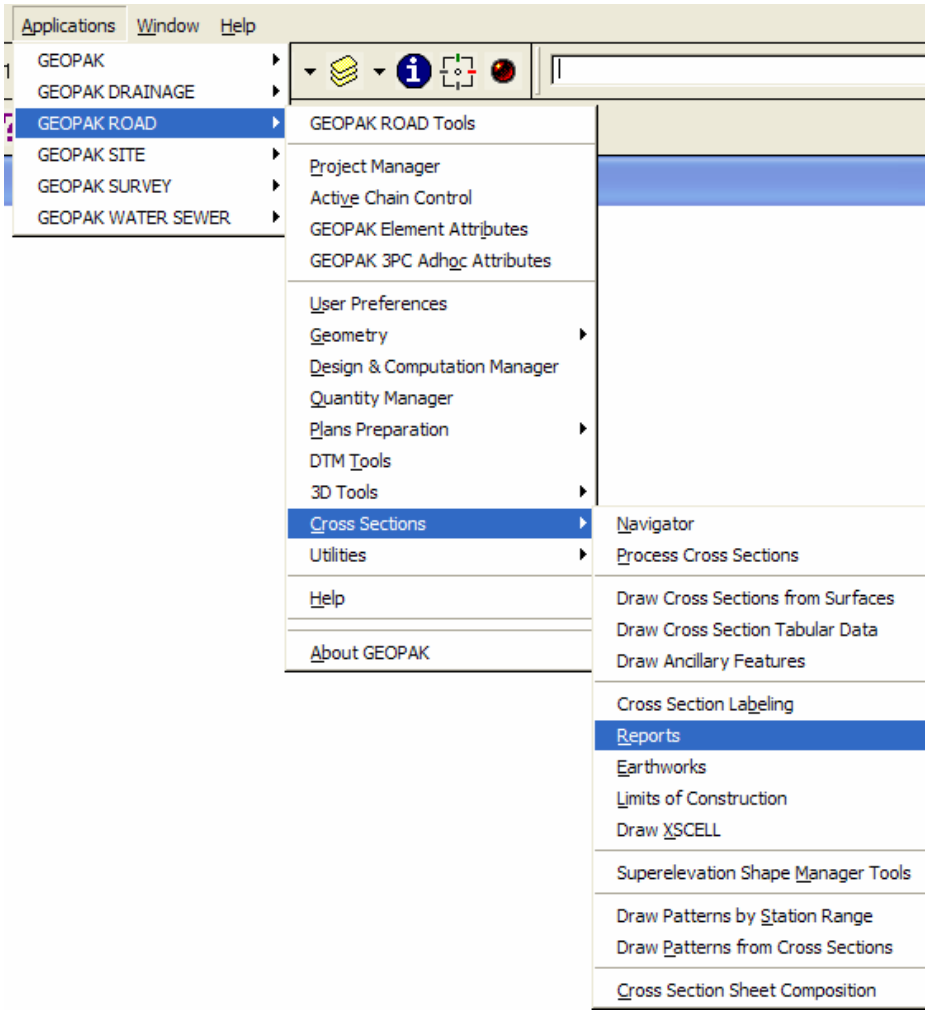

Figure 21-3: Accessing Reports

Report Headers

All reports will require a header to describe the project and report type. The header can be modified by picking the **User>Preferences** button at the top of the XS Report dialog box. This will bring up the Report Header dialog box.

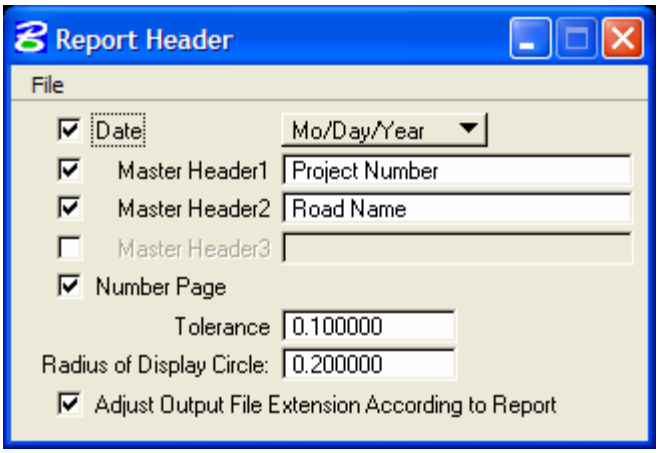

Figure 21-4: Reports Settings

The date, first two master headers and page number should be marked. The first master header should have the complete project name and number, i.e. ***Nevada Forest Highway Project FH 24-1(1)***.

The second master header should have the name of the road. The tolerance should be around the values shown. If GEOPAK stops at many cross sections these values can be adjusted.

The File pull down menu will allow you to save this information to a text file. If you are working on more than one project, you can easily import the correct information on subsequent runs.

Keep in mind that the Radius of Display Circle needs to be less than the smallest line segment on the proposed cross section. If the smallest line segment is the top of curb and it is .15 m (6 in.) then the Radius of Display Circle needs to be .1 (.25 ft.).

Staking Detail Report

The Staking Detail Report is used to locate the catch points at each section. The Staking Detail button is located third from the bottom on the XS Report dialog box. When selected, you will get the following dialog box.

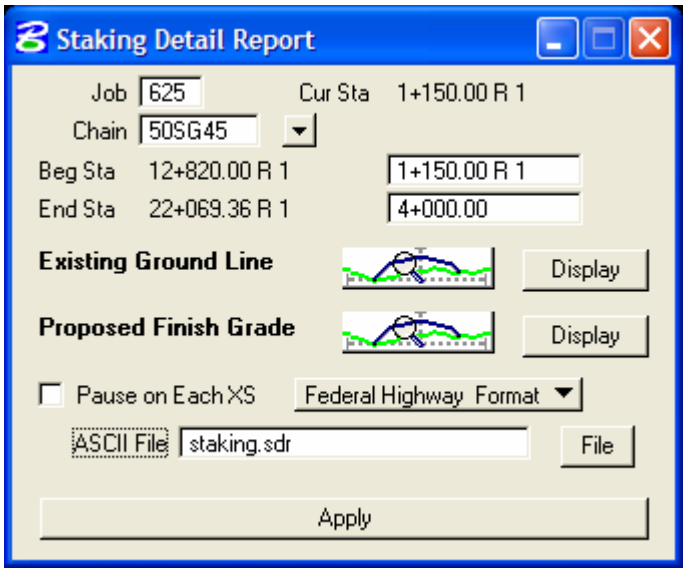

Figure 21-5: Staking Report Dialog

To set the symbology values for the Existing Ground Line and Proposed Finish Grade, pick the symbology button to get the following dialog boxes:

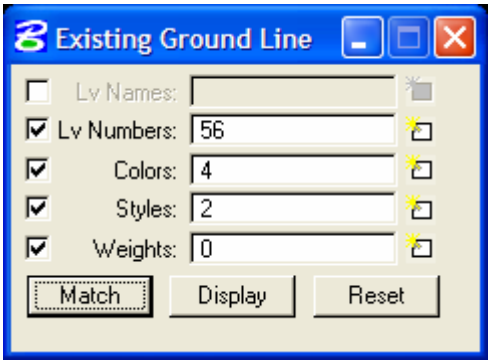

Figure 21-6: Existing Ground Line

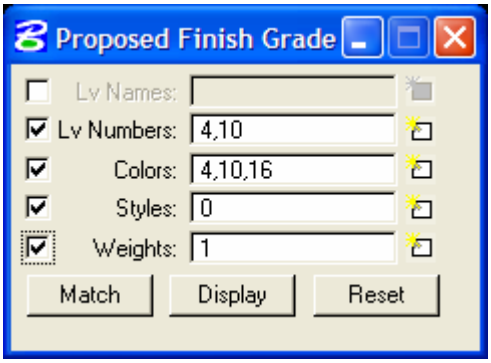

Figure 21-7: Proposed Finish Grade

The buttons to the right of the data field allow the user to select the values to populate the data field. The Reset button clears the values that populate the fields, Display highlights the elements that meet the criteria, and Match allows the user to pick the elements to include in the selection set. The values shown in the Existing Ground Line and Proposed Finish Grade sections will allow GEOPAK to progress through the top of subgrade. This is the path needed to get the correct report.

The values shown in the Proposed Finish Grade are only for a standard ditch or fill section. There will need to be additional symbology added to the Proposed Finish Grade section if retaining walls and other elements are added to the cross sections.

Slope Stake Report

The Slope Stake button is located above the Staking Detail button. When selected, the following dialog box will appear.

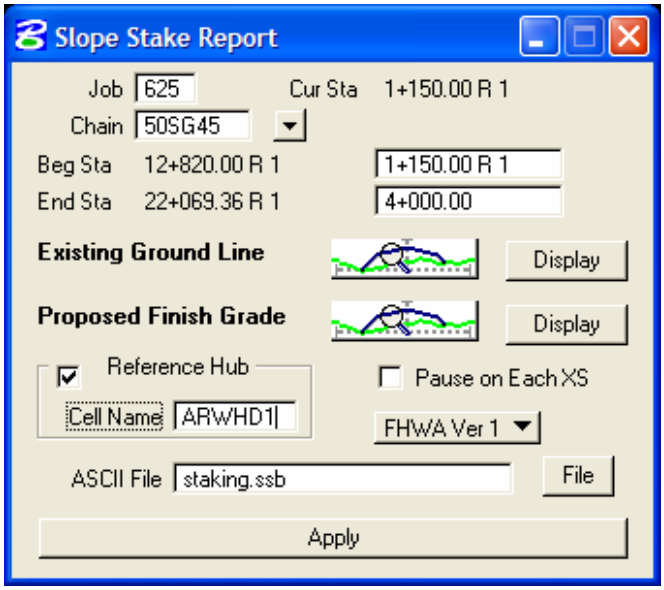

Figure 21-8: Slope Stake Report Dialog

STANDARDS FOR USE WITH X30 CRITERIA

The values in the Existing Ground Line and Proposed Finish Grade sections will be the same as used in the Staking detail Report. The only difference is the addition of the Reference Hub. This is the cell used to indicate the location of the reference hubs on the cross section.

CAUTION

Make sure you use FHWA Ver 1. Not FHWA Ver 2.

Red Tops Reports

Red Tops reports indicate all breakpoints at the top of subgrade between the hinge points. There are two reports that are needed; the standard Red Top Report and the XYZ Red Top Report. The Blue & Red Top button is at the top of the XS Report dialog box.

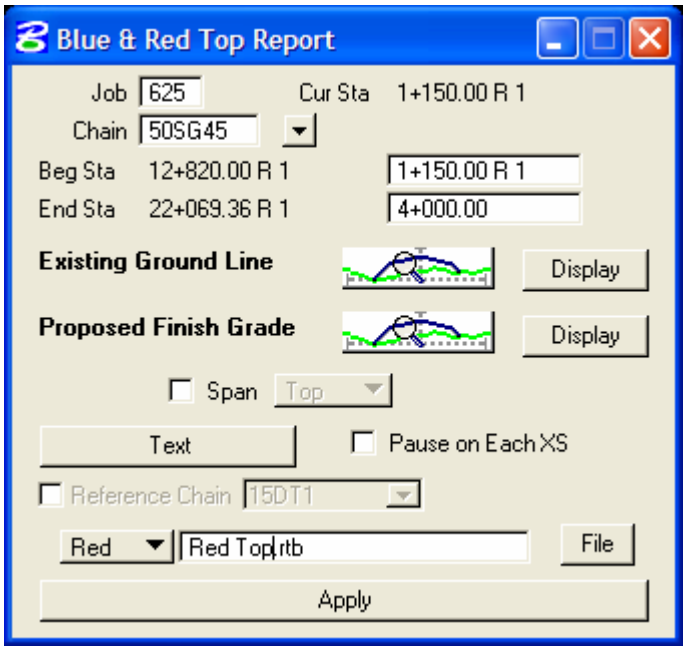

Figure 21-9: Blue and Red Top Report Dialog

Again for the Red Tops, use the same level symbology as for the Staking and Slope Stake reports. The only information that is needed is in the Text button. That will bring up the following dialog box:

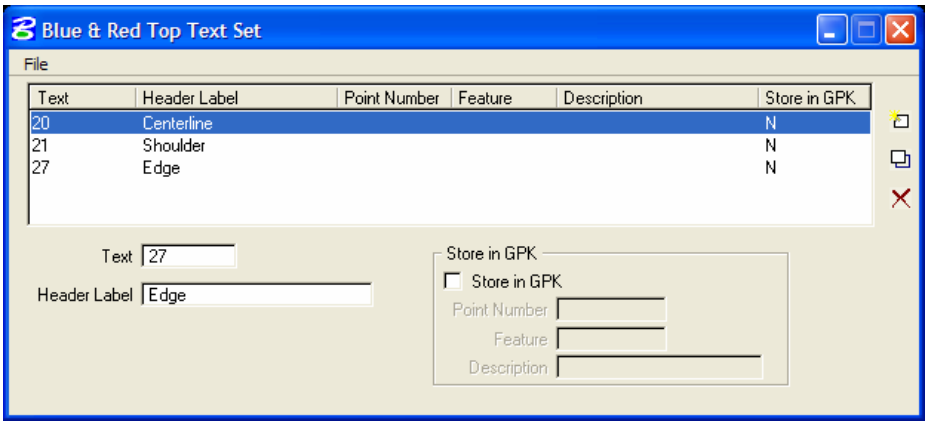

Figure 21-10: Report Text Set

The text is in the cross section at the point that you want reported. The Header label is how the report will label that point. To add a point to the list simply type in the text you want reported on and the label for that text and hit the add button. If you want to change the header or text, highlight the line you want changed and GEOPAK will put the information in the Text and Header Label spaces, make your modifications and hit the modify button. To delete a label, highlight the line to delete and pick the Delete button.

You can save this information for future use by picking the file button at the top of the dialog box.

Make sure the Red button is shown in the Blue & Red Top report dialog box and hit Apply.

The XYZ Red Top Report is the same as the Red Top Report, just change the button that says Red to XYZ.

To differentiate the XYZ Red Top Report from the XYZ Blue Top Report, go back to the user button on the XS Report dialog box and add Red Top XYZ Report to Master Header 3.

Blue Tops Reports

Blue Tops reports indicate all breakpoints at the top of base course. There are two reports that are needed, the standard Blue Top Report and the XYZ Blue Top Report. The Blue & Red Top button is at the top of the XS Report dialog box.

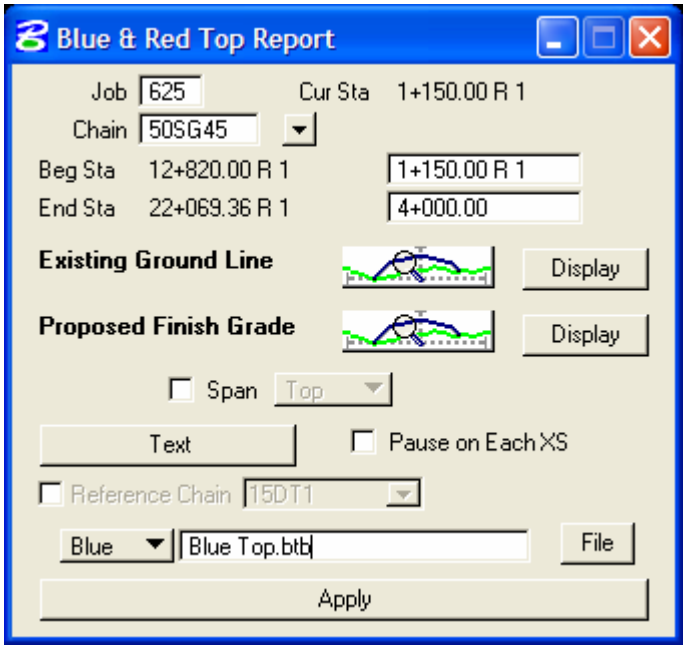

Figure 21-11: Blue and Red Top Report Dialog

For the Blue Tops, use the level symbology for the top of Base course. You may need to include the top of pavement symbology if the foreslope has the same symbology along the base course as the pavement section. The only information that is needed is in the Text button. That will bring up the following dialog box:

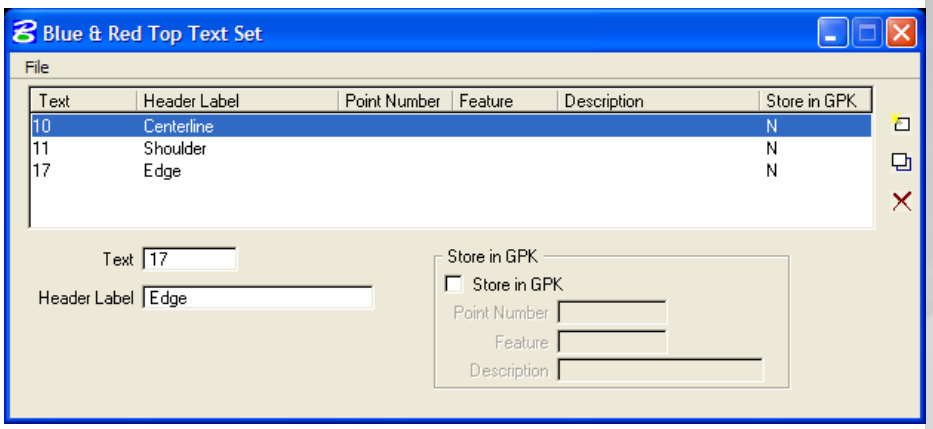

Figure 21-12: Report Text Set

The text is in the cross section at the point that you want reported. The Header label is how the report will label that point. To add a point to the list simply type in the text you want reported on and the label for that text and hit the add button. If you want to change the header or text, highlight the line you want changed and GEOPAK will put the information in the Text and Header Label spaces, make your modifications and hit modify. To delete a label, highlight the line to delete and pick the Delete button.

Make sure the Blue button is shown in the Blue & Red Top report dialog box and hit Apply.

The XYZ Blue Top Report is the same as the Blue Top Report, just change the button that says Red to XYZ.

To differentiate the XYZ Red Top Report from the XYZ Blue Top Report, go back to the user button on the XS Report dialog box and add Blue Top XYZ Report to Master Header 3.

There may need to be an occasion when yellow top reports are needed. There is a button for yellow tops and the process is the same as both the red and blue tops.

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Chapter 22: Print / Plot Procedures

Creating PS Files Using Print/Plot

1. *Get into Microstation and call up the Print/Plot dialog using the Microstation pulldown menus.* (File > Print/Plot)

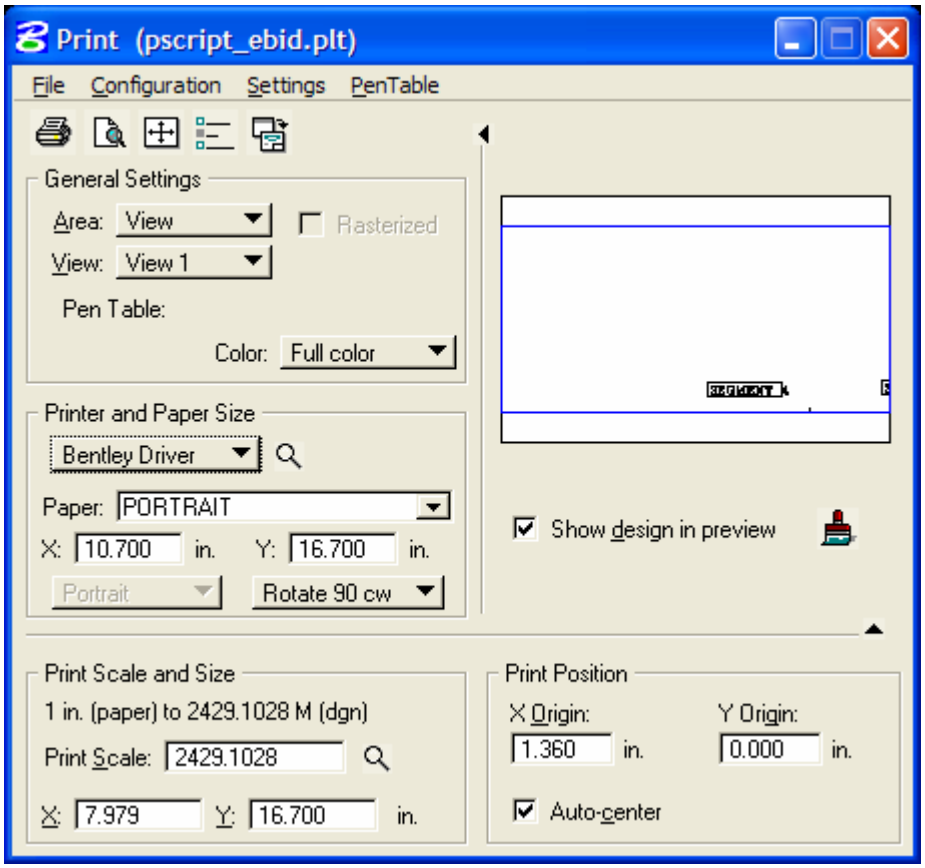
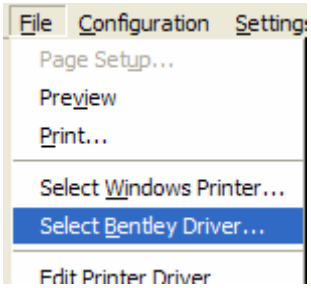


Figure 22-1: Microstation Print/Plot

2. ***Select the PostScript Plot Driver File.***
   The appropriate PostScript plot driver is *pscript_ebid.plt*. ***(Click here to download latest version of pscript_ebid.plt)***
   The currently selected plot driver is displayed in the Plotter: field located at the top of the dialog. If pscript_ebid.plt is not the current plot driver, then click on File > Select Bentley Driver.



3. ***Locate pscript_ebid.plt, and select it. For EFLHD employees It will be in d:\Bentley\Workspace\system\plotdrv\post script***
   A pen table (date.tbl) that places the date, time, and file name along the left edge of any of the standard sheet borders is automatically attached when you select the pscript_ebid.plt plot driver

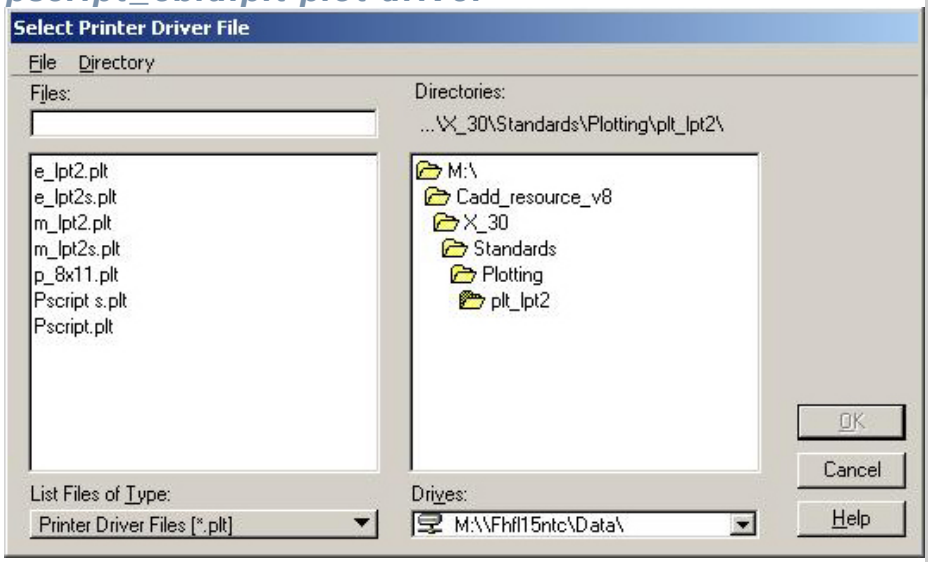


Figure 22-2: Select Plotter Driver

4. ***Set a fence around the plan sheet and select*** *Fence* ***as the Plot Entity.***
   Generally the fence should be snapped to exactly the same points used for plotting hard copies of the plan sheets.
   Make sure that *Fence rather than View* ***appears in the General Setttings portion of the dialog. Pick the View button to change to Fence if necessary.***

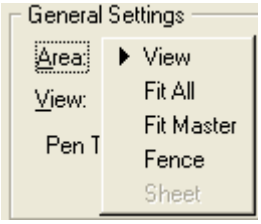


Figure 22-3: Select Plot by Fence

5. ***Select the sheet orientation (landscape or portrait) to match the orientation of the sheets in the design file. The sheet in the Orientation box should reflect the option chosen.***
6. ***Make sure the Rotation button in the middle of the dialog box is set to No rotation.***
7. ***If the settings aren't as shown below, you don't have the correct version of the plot driver file (pscript_ebid.plt). The latest version of the plot driver can be downloaded from the link in step #2.***
   (You should only have to do this step once per Microstation session.)

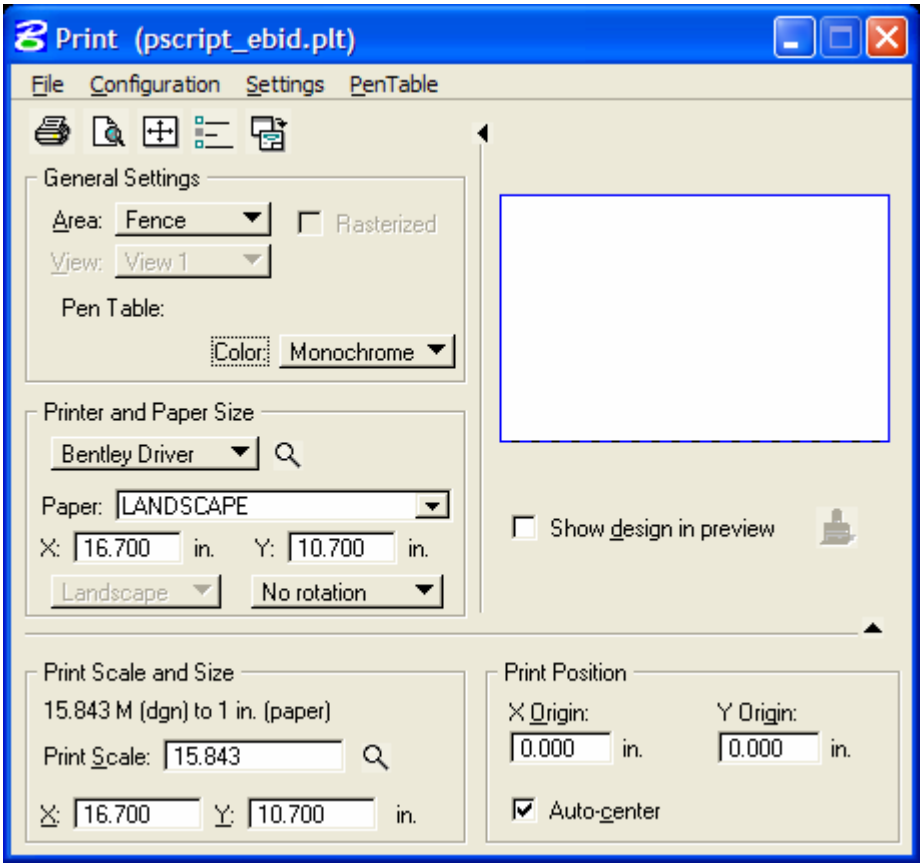


Figure 22-4: Page Setup

8. ***Check Plot Layout***
   Click on the Plot Layout icon (circled in red below) or select Setup > Layout... from the pulldown menus.
   The two things to check here are:
9. ***Scale to value should be set to 100***
10. ***There should be very little, if any, white space around the blue rectangle in the middle of the dialog***
    (the white block represents the 11x17 paper and the blue rectangle represents the size of the plot for the current scale value)

11. If the settings in the Plot Layout dialog aren't as shown below, you don't have the correct version of the plot driver file (pscript_ebid.plt). The latest version of the plot driver can be downloaded from the link in step #2.
(You should only have to do this step once per Microstation session.)

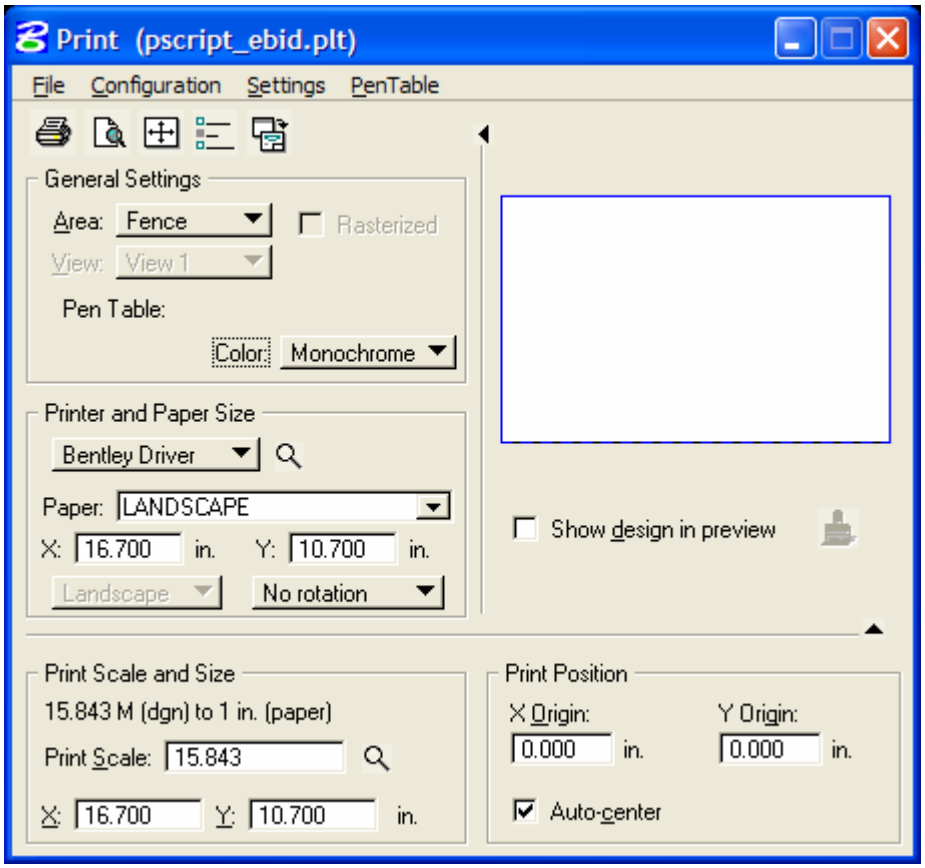


Figure 22-5: Plot Layout

12. Check Plot Options
Click on the Plot Options icon (circled in red below) or select Setup > Options... from the pulldown menus.
Neither Fence Boundary nor Plot Border should be checked. If they are, uncheck them.
(You should only have to do this step once per Microstation session.)

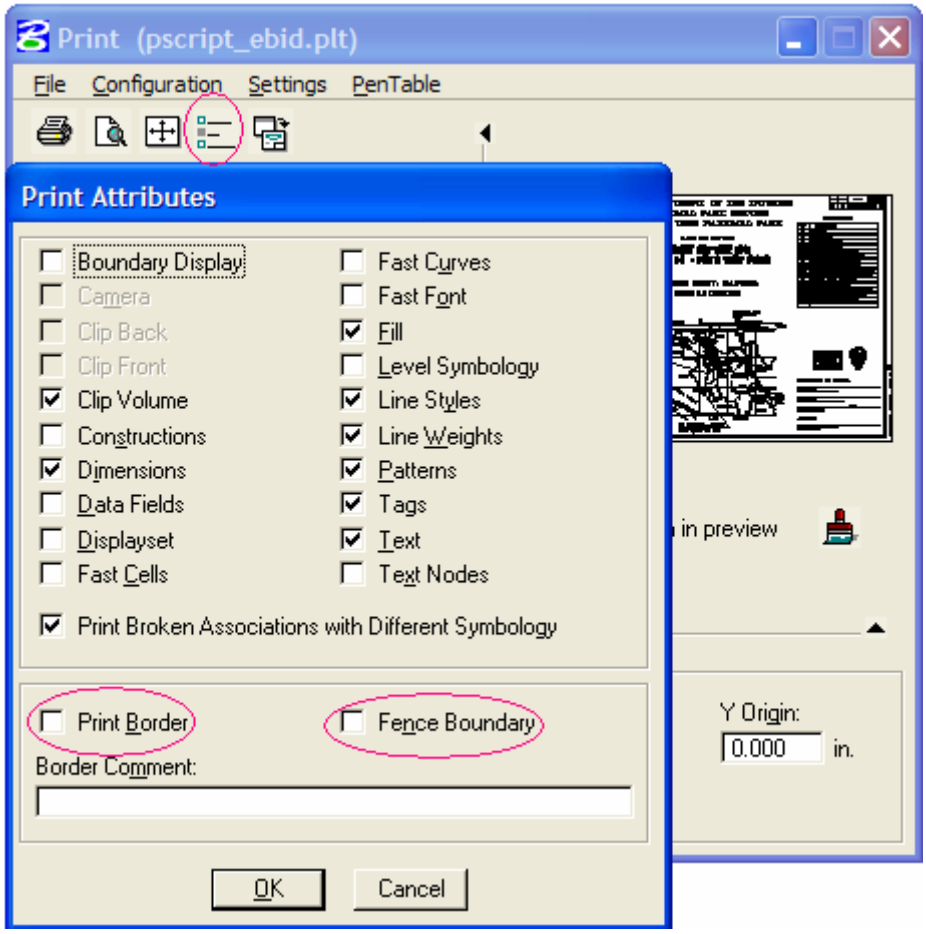


Figure 22-6: Plot Options

13. Preview the plot (optional)

The plot utility shows a preview on the right side of the dialog box or pick the Preview button on the button bar to get a larger preview.

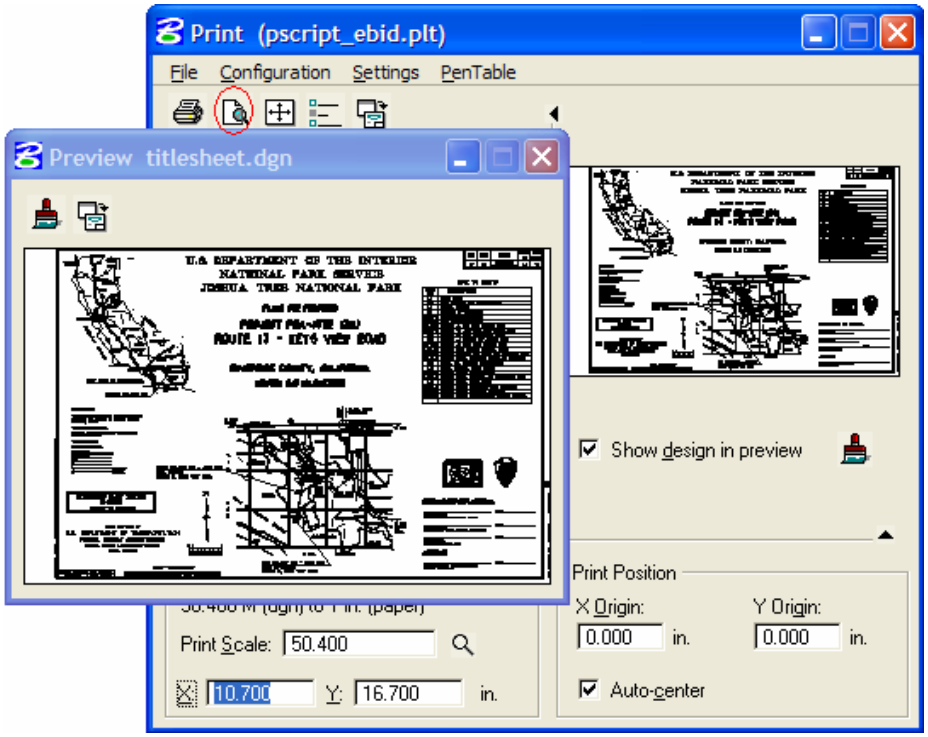


Figure 22-7: Plot Preview

14. ***Create the PostScript plot file***
    Click on the Plot icon (circled in red below) or select* File > Plot *from the pulldown menus. The Save Plot As: dialog will pop up.

15. ***Notice the directory where the PostScript files will be written. Change the directory if you want the PostScript file to go somewhere else.***

16. ***In the Files: field type in a name for the PostScript file. Name the sheets so as to conform to the same naming convention as for .dgn files, but with the .ps extension. See the Microstation chapter on file naming conventions for this information.***

17. ***When you hit the OK button the PostScript file will be created.***

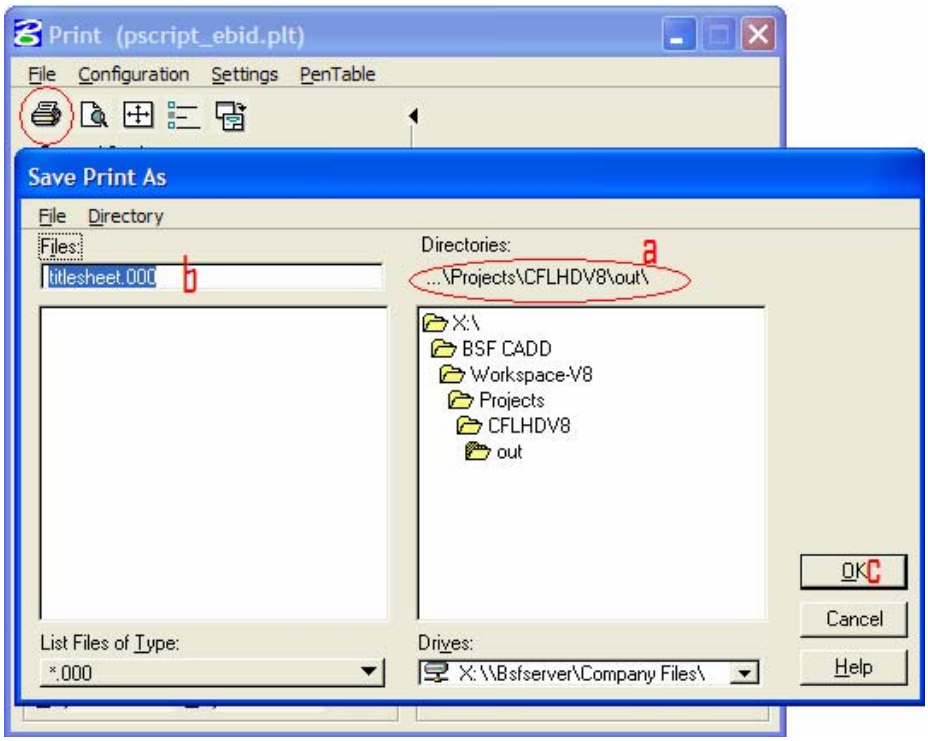


Figure 22-8: Save Plot As

Creating PS files for cross sections using the Print/Plot method would be very time consuming. Since the cross sections are usually plotted in one file, you can use the Batch plot method. To do this, you need to make sure the following four rules are followed.

- Rectangular Microstation shape elements ("plotting shapes") must placed around each sheet outlining the areas within the dgn file to be plotted.
  The standard preference files for BatchPlot are set up to look for the plotting shapes with the following level/symbology: LV=61 CO=0 LC=2 WT=1.
- There should be no cross section sheets in a separate drawing that needs to be inserted within the sheets in your cross section drawing.
- Plotting shapes within a each design file must have been drawn into the file in exactly the order the PostScript files are to be created.
  For example, if the design file contains sheets number 5 through 8, then the first plotting shape drawn into the file must be around sheet 5, the second plotting shape drawn into the file must be around sheet 6, etc.

Duplicate or extra plotting shapes are not allowed

Creating PS Files Using BatchPlot

1. *Make sure the design files to be translated are set up exactly as outlined in the four rules above. (If your design file contains GEOPAK cross-sections created with the standard cross-section layout files then it is already set up correctly.)*
2. *If you're BatchPlotting standard cross-section layout files, make sure to delete all the unused sheets cells from the design file. BatchPlot will plot each and every cross-section sheet cell in the design file regardless of whether or not there are actual cross-sections drawn in the sheet.*
3. *Call up the BatchPlot dialog from the MicroStation pulldown menus (*File > Batch Print/Plot*). The dialog will initially appear as shown below with the Printer, Plot Area, Layout, and Display specifications set to Default.*

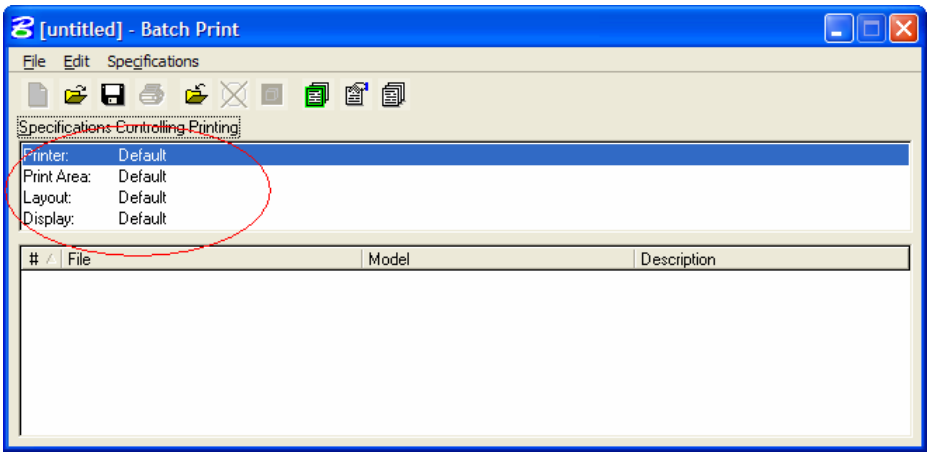


Figure 22-9: Batch Plot

4. *Select the settings for creating PostScript files. There are pre-defined BatchPlot settings files that should be used.*
5. *The appropriate settings are selected by choosing* File > Open... *from the pulldown menu (or the* *button) to bring up the Open Job Set File dialog, as shown below.*

6. *In the list box at the left of the Open Job Set File dialog select either* postscript_files_landscape *or* postscript_files_portrait *to match the orientation of the sheets in the design file, and then click on the OK button to attach the settings.*
   (Note: If you don't see the postscript_files_landscape *and* postscript_files_portrait *selections in the Open Job Set File dialog, it most likely means that you don't have the latest BatchPlot settings files on your computer. Click here to* ***download the latest versions*** *of these files.)*

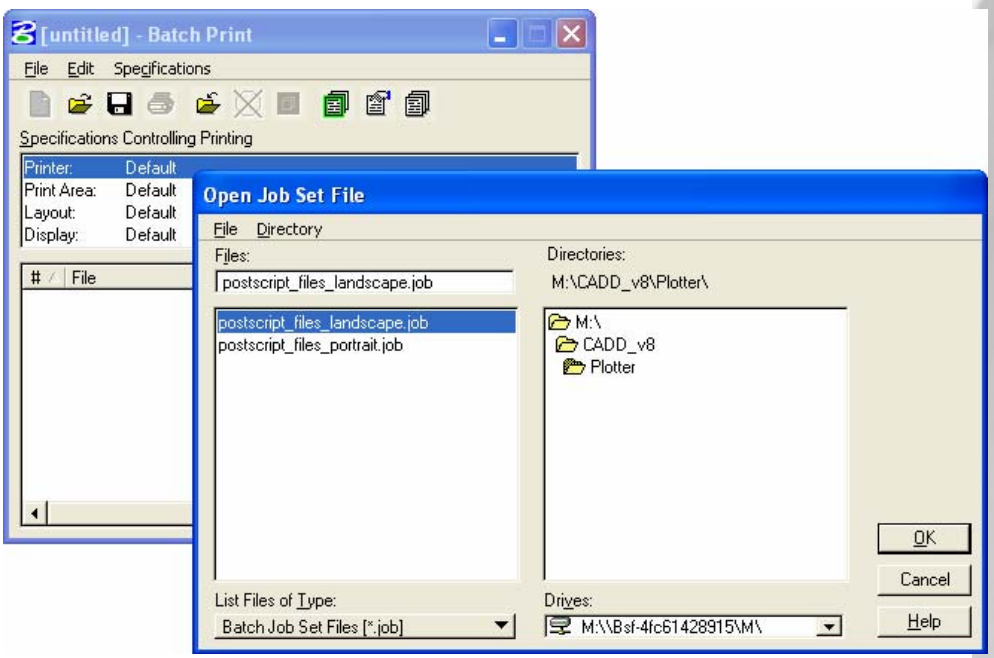


Figure 22-10: Open Job Set

7. *The Open Job Set File dialog will disappear and the BatchPlot dialog should appear as shown below with Printer set to either PostScript Files, Landscape or PostScript Files, Portrait to match the design file sheets, and Plot Area, Layout, and Display set to PostScript Files.*

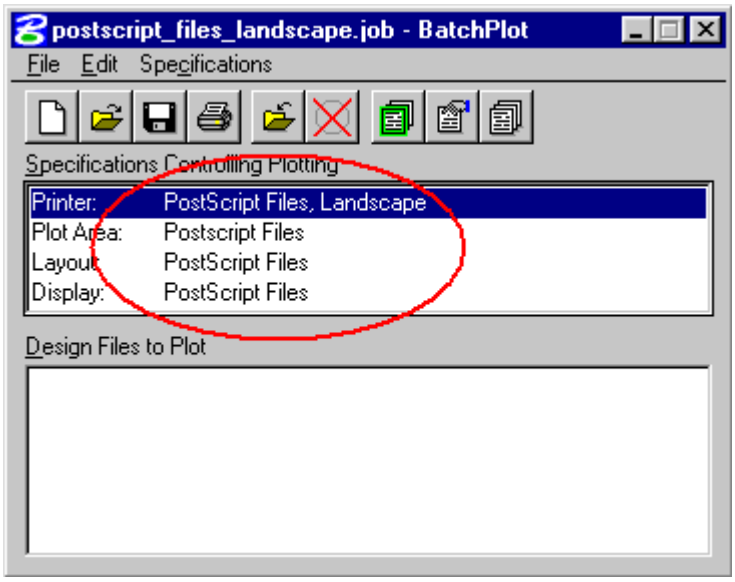


Figure 22-11: Landscape Plots

8. *Select the design file(s) where the plan sheets are drawn.*
9. *Use* **Edit > Add Files...** *from the pulldown menus (or the* *button) to bring up the Select Design Files to Add dialog, as shown below.*
10. *In the Select Design Files to Add dialog, navigate to the directory where the design files reside.*
11. *Select the file(s) with the plan sheets you want to create PostScript versions of.*
12. *Click on the Add button to add the file(s) to the Selected Files list at the bottom of the dialog. (Note: The files will be plotted in the order they appear in the Selected Files list.)*
13. *Click on the Done button to return to the main BatchPlot dialog.*

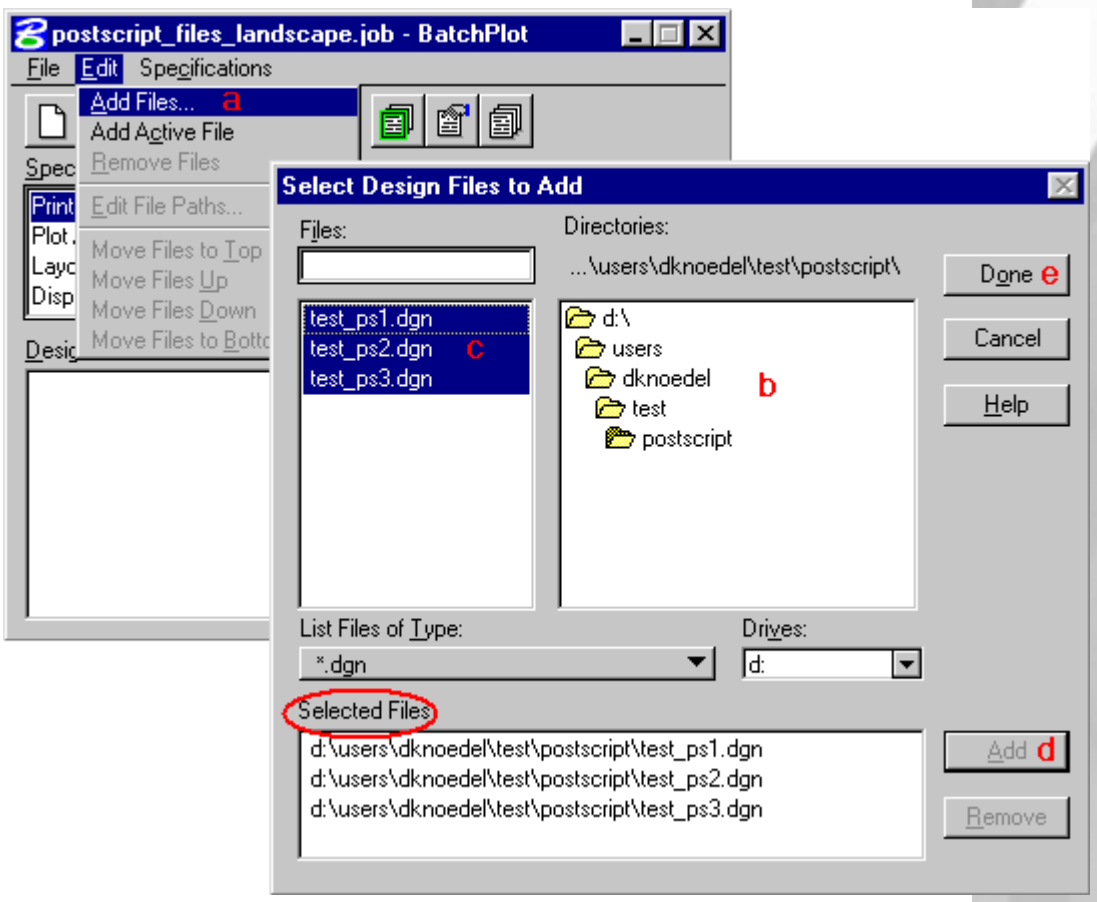


Figure 22-12: Add Files

14. The selected files should now appear in the Design Files to Plot section of the main BatchPlot dialog, as shown below.

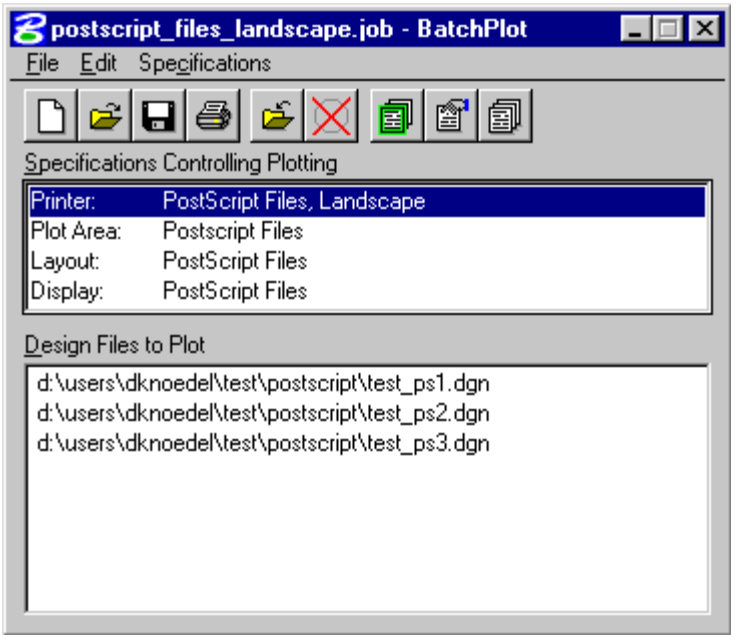


Figure 22-13: Landscape Plots

15. Run BatchPlot to create the PostScript files. Select* File > Print... *from the pulldown menus (or the* *button) to begin creating the PostScript files. The dialog shown below should immediately pop up. Make sure the Print Range is set to All, and then click on the OK button to start the processing.

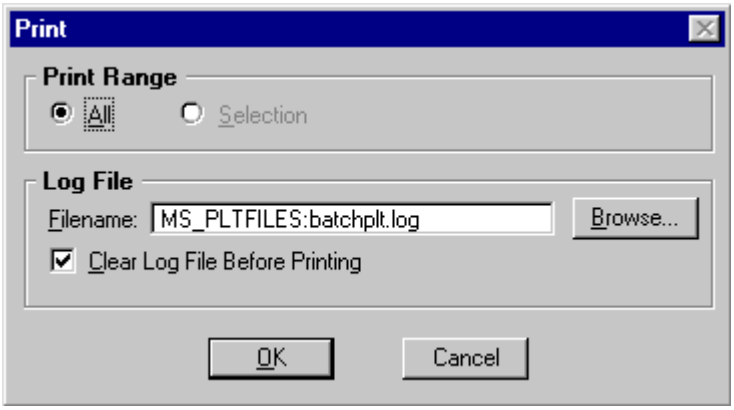


Figure 22-14: Print Dialog

The MicroStation window should begin flashing and the Percent Complete window should pop up.

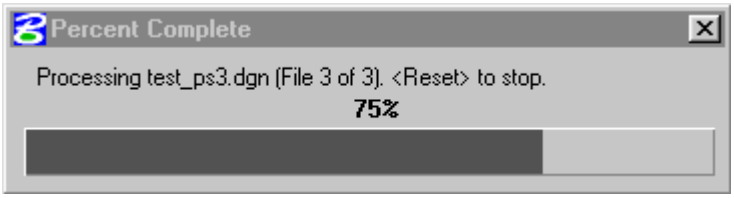


Figure 22-15 Percent Complete

16. When processing is completed, there will be a message in the Microstation status field summarizing the results of the procedure. Ideally the status message will indicate that there were no failures, as in the example shown below. If, on the other hand, the status message indicates that there were failures, check the BatchPlot log file (ustation\out\plot\batchplt.log) for details.

BatchPlot: files:3, plots:6, failures:0

17. If everything worked correctly there should now be one PostScript file per plan sheet in your project directory. The PostScript files should be named XSS000.ps, XSS001.ps, XSS002.ps, etc.

You will need to check that all postscript files were created properly by running them through Acrobat Distiller to create .pdf files.

As part of the final submittal of a project. The designer will need to create a CD that has the following:

- .PDF of every plan sheet
- .PS of every plan sheet
- All quantity spread sheets and reports
- Staking reports.

This CD will be provided to the Construction Engineer as part of the Project Engineer's Notebook.

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Chapter 23: Working Units Policy

Background:

Federal Lands Highway Bridge Office has been in process of converting to the Microstation V8 format and producing standards using uniform cell libraries and seed files. Up until the use of Microstation V8, different Working Units had been used to develop drawings to different scales.

Objective:

The objective of this plan is to develop a standard uniform procedure in developing drawings in the Microstation V8 format. This procedure includes the creation of new Microstation V8 files and the conversion of details and drawings that have been developed prior to Microstation V8 to the Microstation V8 format.

Findings:

A total of Seventeen states where contacted and surveyed on key elements in regards to Microstation V8 working units and resolution. In addition, the three Federal Lands Highway Offices were also contacted and surveyed on the same topics. Both Highway Design and Bridge Design groups were contacted during the survey. The following is a list of common findings:

- Most states have converted or are in process of converting to English Units
- Most states are using survey foot (Needs to be activated in units .def file to have available for use)
- Most states started out using Bentley Working Unit defaults when converted from Microstation V7 to Microstation V8.
- All States are maintaining as-built drawings
- In several states, Bridge Design offices maintained architectural units in their resolution working units for Microstation V8 while Highway Design offices maintained engineering units.

- Some Highway Design offices have either converted to architectural units or considered the conversion.
- Highway Design offices have found that resolution set at 1000 per foot is not enough resolution for cross sections. They have updated the resolution to 10000 per foot.
- It is not uncommon for a bridge design office to scale drawings from highway design offices for their details.

Other Findings:

The definition between a foot and a US survey foot is as follows;

1 foot = .3048000 m

1 survey foot = .3048006 m

The foot used by Microstation V8 as a default from the standard unit list is based on the foot definition, not the survey foot definition. This is the correct definition for most work outside of civil and surveying disciplines. If, however the data is based on geodetic survey measurements, using this default from the standard unit definitions list in Microstation will yield incorrect results on the order of 6 parts in a million. Therefore, survey foot must be used on details linked to mapping or highway details using an engineering scale, but not required for an architectural scaled detail like a bridge detail.

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Federal Lands Highway Bridge - O FILE STRUCTURE FOR PROJECTS

0Border.dgn (Copied from the Seed file directory)

This is a file that contains 1 drawing. This drawing is referenced 40 times into 0Project.dgn so that all global project information is place on this drawing. Whatever is placed on this drawing will be shown automatically on all drawings in 0Project.dgn.

Examples how you would put on 0Border.dgn

Project title in Title Block – Natchez Trace Parkway

Total number of sheets on Bridge Drawing field

Team Leader Name

PRELIMINARY NOT FOR CONSTRUCTION

Etc.

0Project.dgn (Copied from the Seed file directory)

This file is solely a project assembly file. Nothing is to be drawn in this file. 0Border.dgn is referenced into 0Project.dgn for general information in relation to the project as described above. In addition to 0Border.dgn being attached several times to this file, individual drawing files will be attached. These individual drawing files will include information unique to that drawing.

pe.dgn (Created using a seed.dgn file)

This is an example individual drawing file that will be attached into 0Project.dgn. This is your actual working file. All drawings and text will be placed in this file. All unique details and information in relation to this drawing will be located here. Microstation File Naming Convention in the FLHBO Manual is to be used to name files. Drawings are to be completed as models with logical names for easy future reference. Models are to be drawn to full scale then referenced strategically at a reduced scale into one of the borders from the seed file that was attached when the file was created. The Bridge Plans Planning Sheet also located in FLHBO Manual, must be used to identify which border will be used.

Examples you would find in unique drawing file as pe.dgn:

Unique details
Specific sheet number, designer name or checker name for that drawing
Scale
Etc.

Refer to attached FLHBO FILE STRUCTURE FOR PROJECTS for further clarification of project structure.

Bridge Plans Planning Sheet

Project: _____
Description: _____
Filename: _____

Plan Title	File Name
1.	
2	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	
21.	
22.	
23.	
24.	
25.	

PROJECT NO.:
BRIDGE TITLE:

1 of 1

Figure: 24-1

Bridge Plans Planning Sheet

Project: _____
Description: _____
Filename: _____

Plan Title	File Name
26.	
27.	
28.	
29.	
30.	
31.	
32.	
33.	
34.	
35.	
36.	
37.	
38.	
39.	
40.	
41.	
42.	
43.	
44.	
45.	
46.	
47.	
48.	
49.	
50.	

PROJECT NO.:
BRIDGE TITLE:

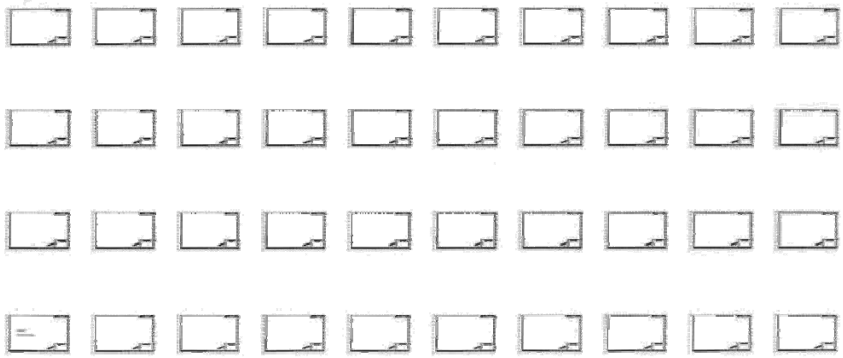

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Figure: 24-2

FEDERAL LANDS BRIDGE CADD STANDARDS					
3/2/2006					
BRIDGE BORDERS					
TOPIC	LC	WT	TX	FT	LV
			(Metric/English)		
Park Name	0	2	4\0.175	2	8
Structure/Crossing Name	0	2	4\0.175	2	8
State Name	0	2	4\0.175	2	8
Sheet Title	0	3	6\0.240	2	8
Information Blocks (top of border)	0	0	3\0.140	2	1
Information Blocks (bot. of border)	0	1	3\0.140	2	8
PRELIMINARY... Label	0	2	12\0.500	7	62
Time & Date of Plot	0	0	3\0.140	23	61
File Location	0	0	3\0.140	23	61
BRIDGE PLANS DETAILING					
TOPIC	LC	WT	TX	FT	
Detail Title	0	2	4\0.175	2	1
Detail Sub Title	0	1	3\0.140	2	1
Detail Scale	0	1	3\0.140	2	1
Concrete Outline	0	3	N/A	N/A	2
Structural Steel Outline	0	1	N/A	N/A	2
Reinforcing Steel	0	1	N/A	N/A	40
Construction Joint Line	0	0	N/A	N/A	2
Existing Structure & Phantom Lines	6	0	N/A	N/A	11
Hidden Lines	3	0	N/A	N/A	2
Centerlines	4	0	N/A	N/A	2
Dimension & Witness Lines	0	0	3\0.140	Verdana	3
Dimension Text	0	1	3\0.140	Verdana	3
Detailing Notes Text	0	1	3\0.140	Verdana	3
Rebar Labels & Text	0	1	3\0.140	Verdana	5
Plan & Elevation General Notes	0	1	3\0.140	Verdana	9
LEGEND					
LC = Line Code (Style)					
WT = Line Weight					
TX = Text Size					
FT = Font					
LV = Level					

Figure: 24-3

MICROSTATION FILE NAMING CONVENTION

Type of file	File name	Various Options
Plot File	0project.dgn	
Border (Common Information for all drawings)	0border.dgn	
Type, Size, and Location	TSL.dgn	
General Notes	GN.dgn	
Plan & Elevation Location Map(s)	PE.dgn	
Site Plan	site.dgn	
Foundation Layout	FL.dgn	
Abutment	abut.dgn	abutX.dgn (e.g. abut1.dgn, etc)
Abutment Details	abutdt.dgn	abutdetX.dgn (e.g. abutdet1.dgn, abutdet4.dgn)
Wingwall Details	wingdt.dgn	wingdetX.dgn (e.g. wingdet1.dgn, wingdet3.dgn)
Abutment Slab	Aslab.dgn	
Pier Foundation	PFoun.dgn	PfounX.dgn (e.g. Pfoun2.dgn, etc.)
Pier	pier.dgn	pierX.dgn (e.g. pier1.dgn, pier5.dgn)
Top of Deck Elevations	TDE1.dgn	
Typical Section	TypXS.dgn	
Deck	deck.dgn	
Superstructure Details	super.dgn	
Girder Details	gird.dgn	girdX.dgn (e.g. gird2.dgn, etc.)
Abutment Diaphragm	ADiaph.dgn	
Pier Diaphragm	PDiaph.dgn	
Longitudinal Prestressing Details	LPSdet.dgn	
Transverse Prestressing Details	TPSdet.dgn	
Bridge Rail Details	rail.dgn	
Expansion Joint Details	ExpJt.dgn	
Miscellaneous Details	misc.dgn	
Reinforcing Bar List	rebar.dgn	rebarX.dgn (e.g. rebar3.dgn).
Approach Slab	appr8.dgn	
Soils and Foundation	soils.dgn	

Figure: 24-4

STANDARD ABBREVIATIONS FOR BRIDGE PLANS

NOTE: Capitalize first letter of abbreviation when first word is in labeling, phrase, or description.

A	
abutment	abut.
ahead	ahd.
alternate	alt.
and	&
at	@
average	avg.
B	
back	bk.
backwall	bkwall.
baseline	B_L
beam	bm.
bearing	brg.
bituminous	bit.
bottom	bot. or B.
bridge	br.
C	
cast-in-place	cip
centerline	C_L
clearance	clr.
concrete	conc.
construction	constr.
continuous	cont.
creek	cr.
cubic	cu.
D	
diameter	dia. or o
diaphragm	diaphr.
drawing	dwg.
each face	e.f.
east	E
elevation	el. or elev.
equal	eq. or =
existing	exist.
expansion	exp.
exterior , external	ext.
F	
far face	f.f.

fixed	fix
foot , feet	ft. or '
footing	ftg.
G	
galvanized	galv.
H	
hexagon , hexagonal	hex.
horizontal	horitz.
hour	hr.
I	
inch , inches	in. or "
inside diameter	ID.
Interior , internal	int.
J	
joint	jt.
L	
left	lt.
length of vertical curve	LVC.
linear	lin.
longitudinal	long.
lump sum	l.s.
M	
materials	mat'l.
maximum	max.
mile , miles	mi.
minimum	min.
minute	min.
N	
near face	n.f.
north	N
O	
optional	opt.
outside diameter	OD
P	
parkway	pkwy.
plate	pl.
point	pt.
post-tension	P/T

pound	lb.
pounds	lbs
prestressed	prestr. or P/S
profile grade	p.g.
R	
reinforcement	reinf.
relocated	reloc.
right	rt.
roadway	rdwy.
route	rte.
S	
shoulder	shldr.
south	S.
spaces	spa.
square	sq.
standard	std.
station	ata.
structure	str.
substructure	substr.
superstructure	superstr.
symmetrical	symm.
T	
temperature	temp.
through	thru.
top	top or T.
transverse	transv.
typical	
V	
vertical	vert.
W	
wearing surface	w.s.
weight	wt.
west	W
with ; without	w/ ; w/o
work point	W.P.
Y	
yard	yd.
year	yr.

Figure 24-5

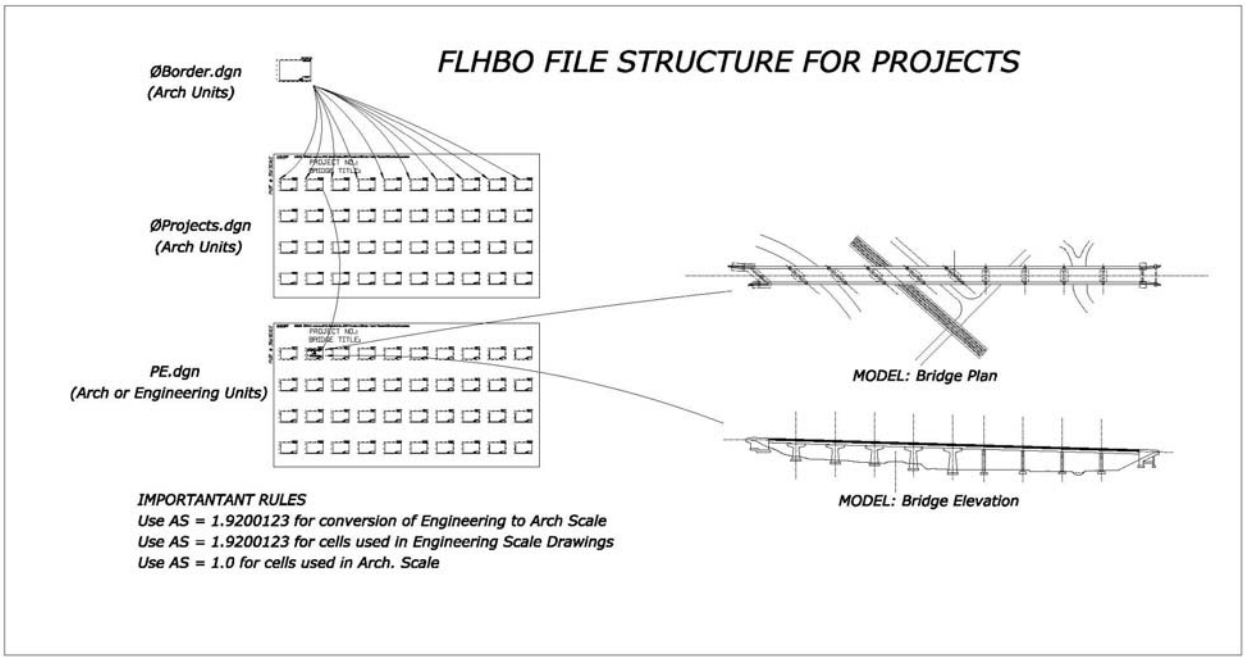
FLHBO FILE STRUCTURE FOR PROJECTS
ØBorder.dgn
(Arch Units)
ØProjects.dgn
(Arch Units)
PE.dgn
(Arch or Engineering Units)
MODEL: Bridge Plan
MODEL: Bridge Elevation
IMPORTANTANT RULES
Use AS = 1.9200123 for conversion of Engineering to Arch Scale
Use AS = 1.9200123 for cells used in Engineering Scale Drawings
Use AS = 1.0 for cells used in Arch. Scale

Figure 24-6

EFLHD DISTRIBUTION PACKAGES

Please note, in coordinating with Highway design, all EFLHD Distribution Packages are to incorporate the following format or changes:

1. Sheet numbers are to start with a capitol R and be numbered R01, R02, R03 etc.

2. PDF files are to have the following format and file name designations:

XXX -YYYYYYYY_ZZZ.dgn
sheet number-Project Name_sheet namethat is referenced into 0Project.pdf

Example:

R01-NATR1J15_pe.pdf

3. Total Sheets Box is to be removed. We will not show total sheets

4. NPS NO. Box is only to be shown on project title sheet.

Final preparation of CADD files at PROJECTADVERTISEMENT

Step 1: Copy "0Projects.dgn" file to "0ContractPlans.dgn" in same directory

Step 2: Open **"**0ContractPlans.dgn"

Step 3: Copy entire contents using fence (Must use Clip Fence!!!!!!)

Step 4: Mark original location of files

Step 5: **Detach ALL Reference files**

Step 6: Delete all other original lines and info

Step 7: Move borders and contents back to original location using fence

OR

Complete Steps 1 & 2

New step 3: Reference filename then drop tools to **" Merge to Master"**.

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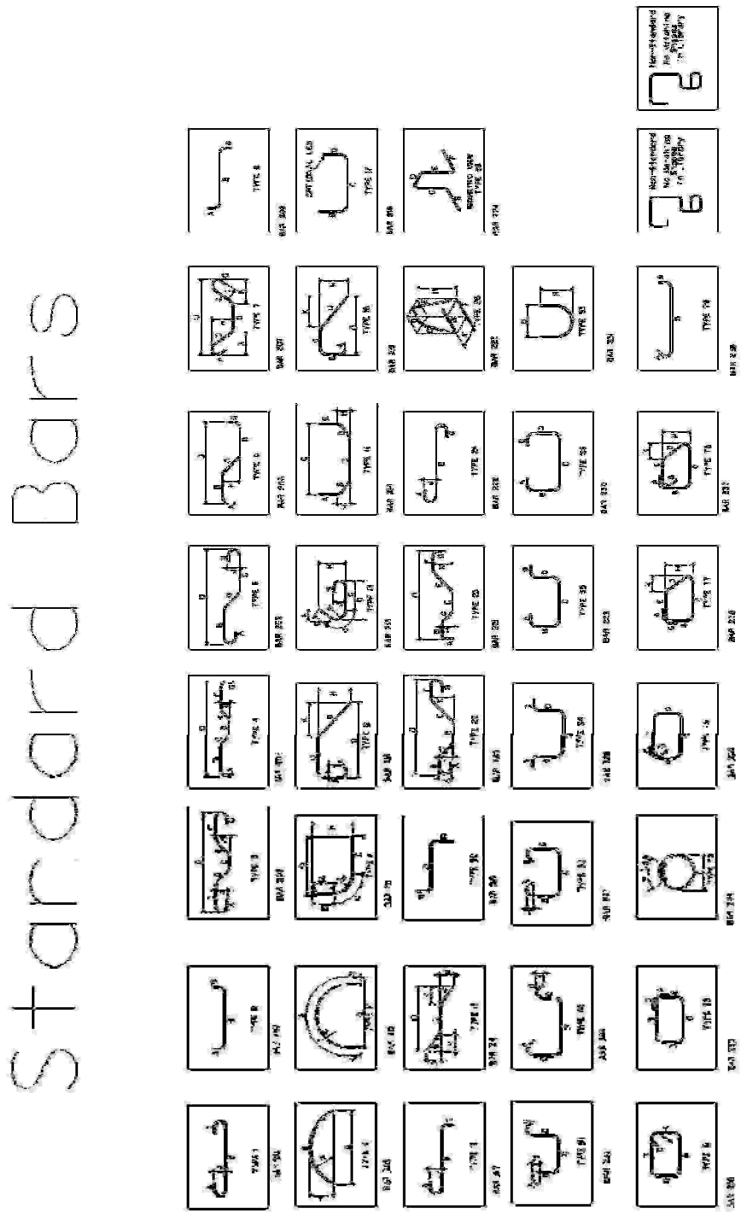

Figure 25-1

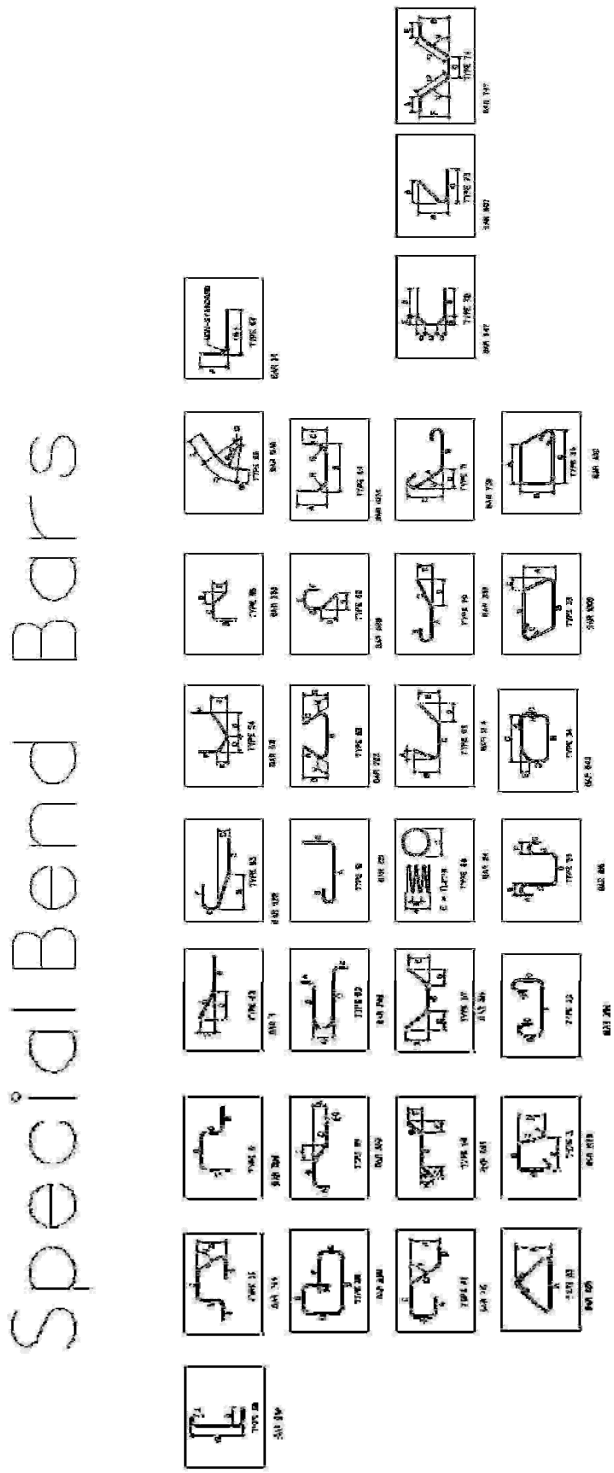

Figure 24-2

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STANDARDS FOR USE WITH X30 CRITERIA

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HOW TO USE GEOPAK REBAR TO CREATE A BAR SCHEDULE

Please note that all projects must follow Federal Lands Highway Bridge Office Standards. This includes file setup. Projects are to be developed by using the "oplot.dgn" method. In summary each drawing is to be in its own file and referenced to the oplot.dgn file for project organization and printing. No file is to contain more than one drawing. Reinforcement schedules are also too located in a single file. The reinforcement schedule is the only file that will be associated with GEOPAK REBAR. This file name is to be called Rebar.dgn and the associated file that GEOPAK REBAR produces is called Rebar.rdb. Rebar.rdb is the file where all the GEOPAK REBAR logic is stored.

1- Open MicroStation and click Applications
2- Go to GEOPAK REBAR and click on Menu

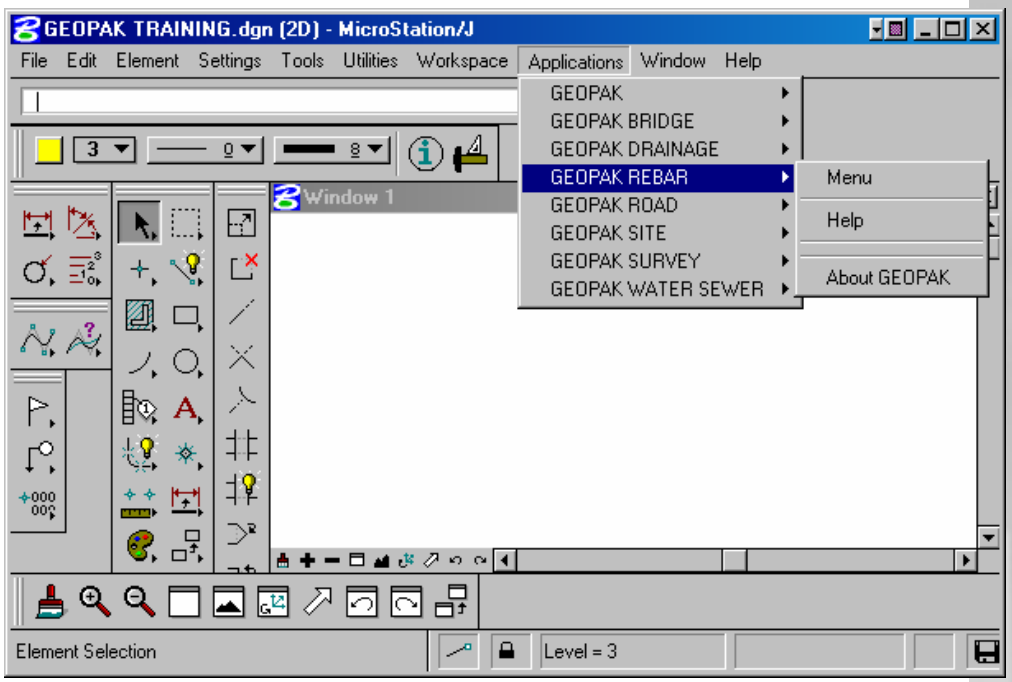

Figure: 26-1

3- Geopak Rebar Login bar menu will appear.
4- Click on Menu and go to select Project.
5- Select Project dialog box will appear, choose FHWA_M0705 for Metric projects and FHWA_E2004 for English projects and proceed.

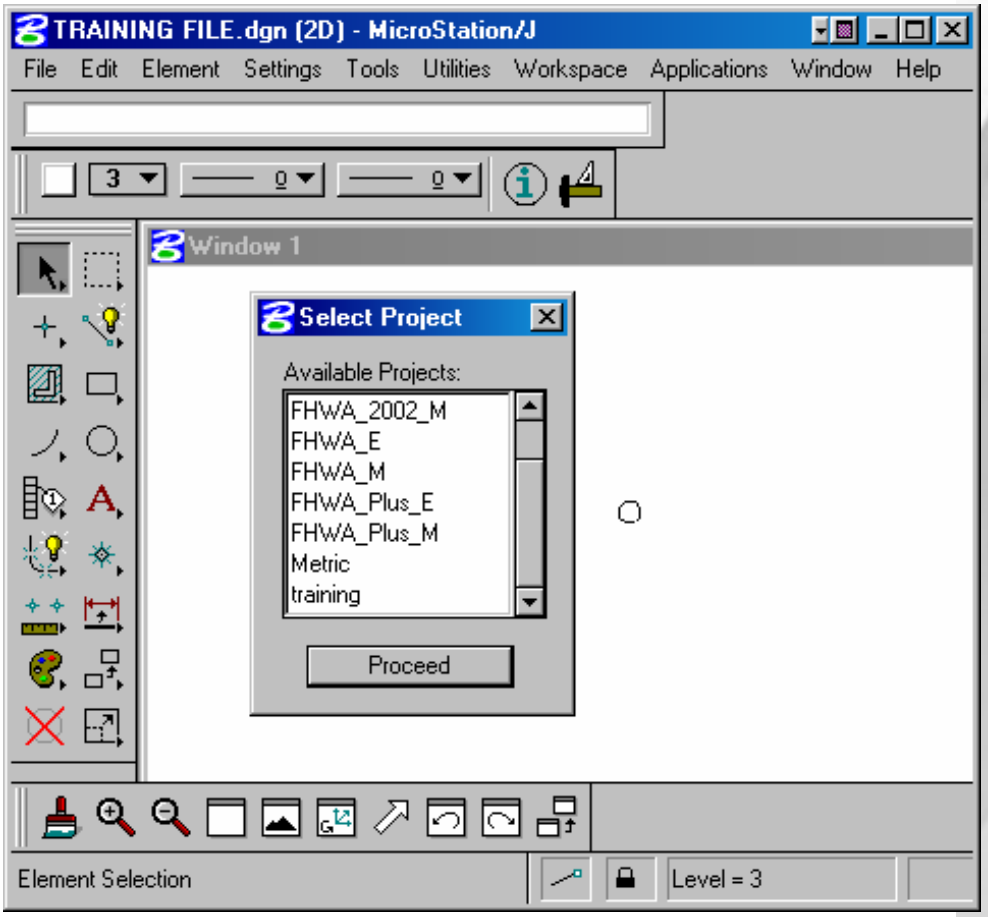

Figure: 26-2

6- The information box will appear, click OK

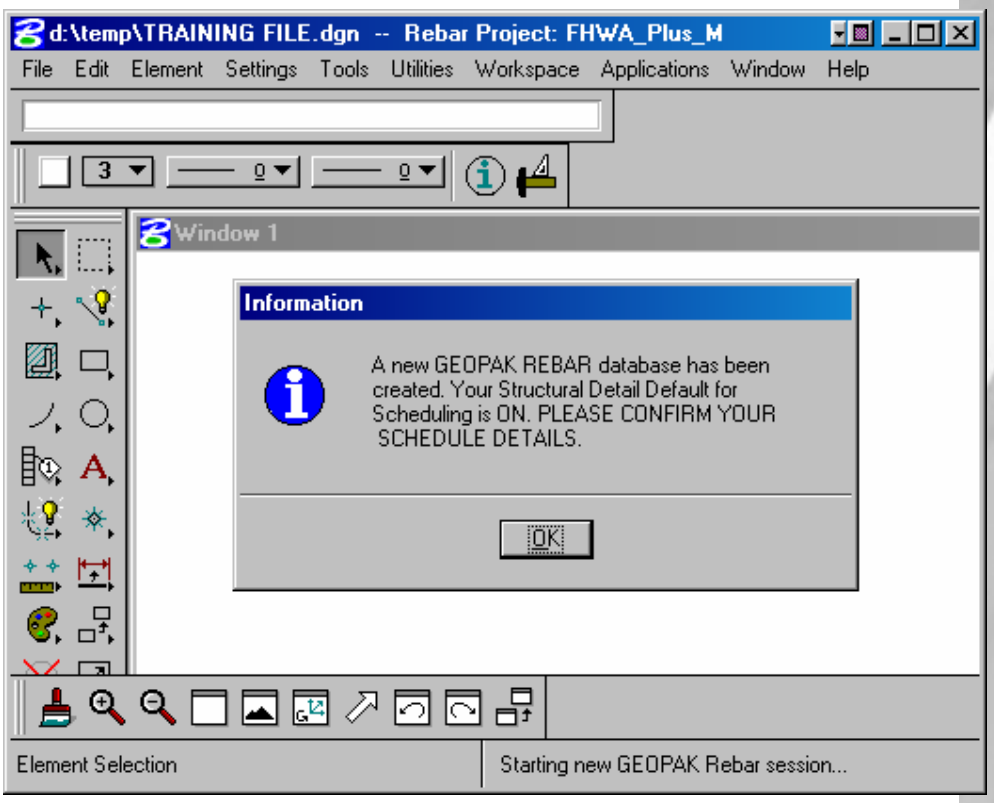

Figure: 26-3

7- The Schedule Details dialog box will appear, fill the necessary information and under Bar Mark Numbering, check per layer box, this will create the schedule with all bars (no matter what the bar size is) in sequence, S1, S2, S3, …etc.

8- Click Open Schedule, Status will change to Schedule OPEN, close the dialog box.

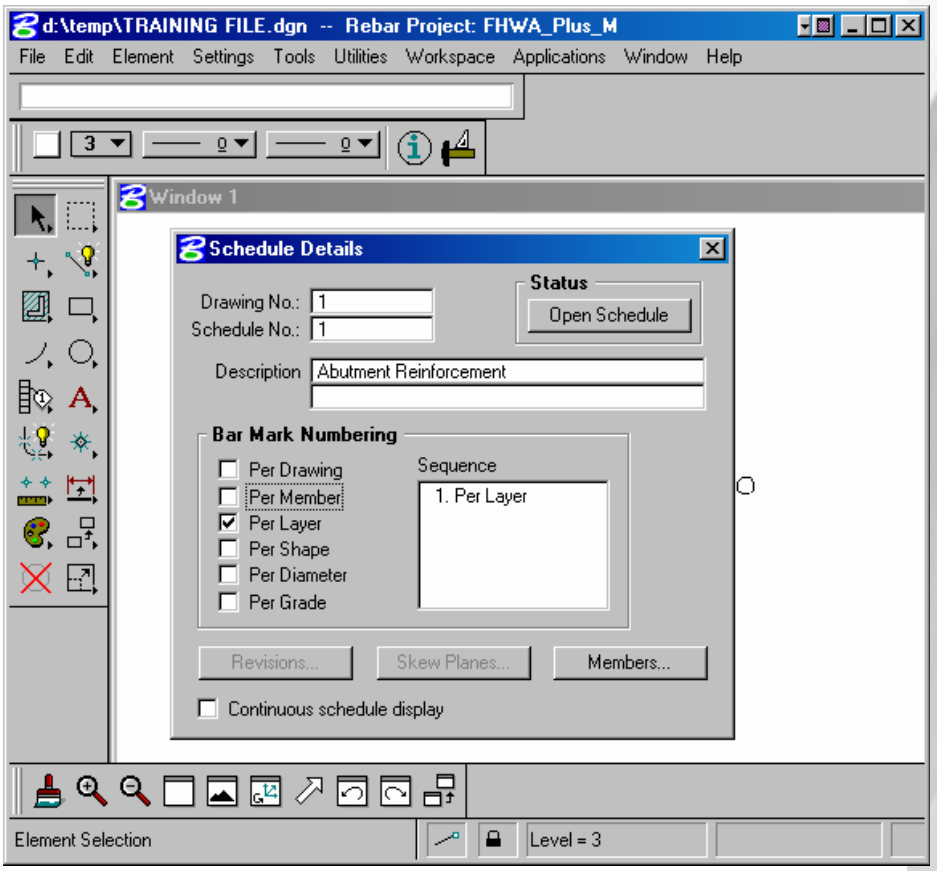

Figure: 26-4

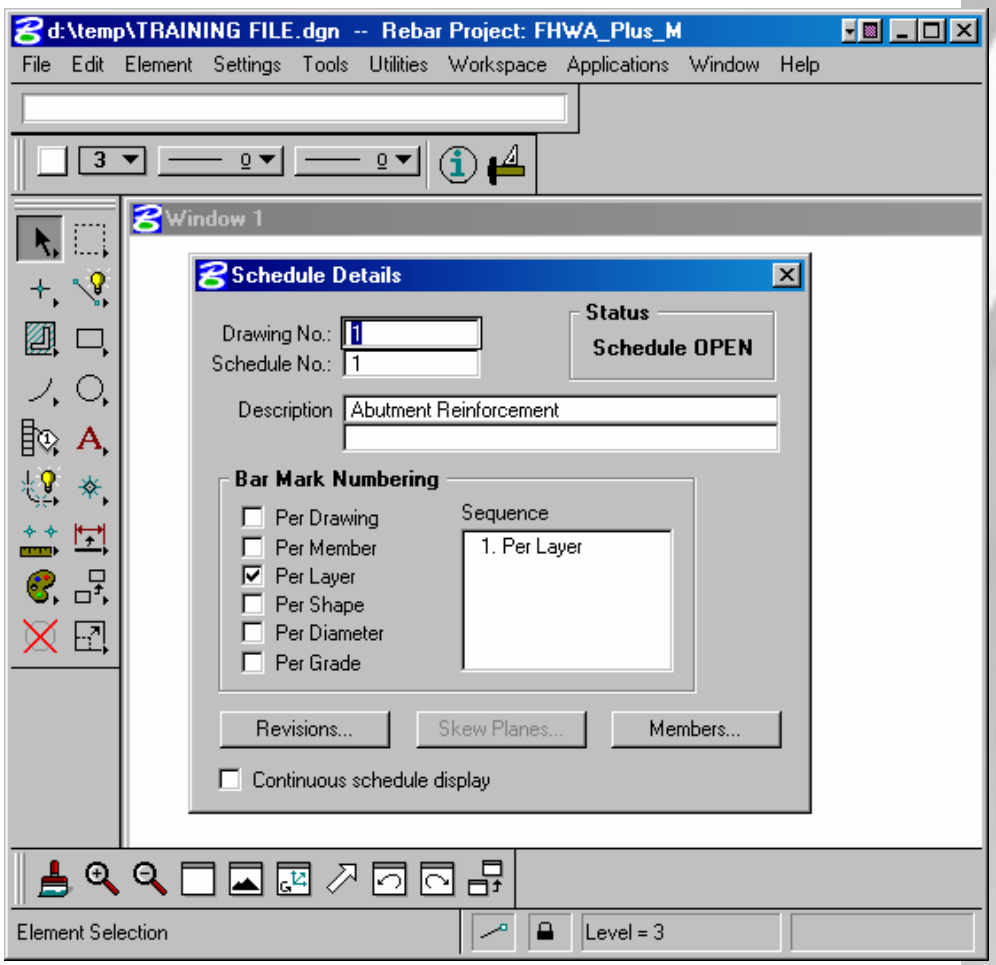
d:\temp\TRAINING FILE.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1
Schedule Details
Drawing No.: 1
Schedule No.: 1
Status
Schedule OPEN
Description Abutment Reinforcement
Bar Mark Numbering
Per Drawing
Per Member
Per Layer
Per Shape
Per Diameter
Per Grade
Sequence
1. Per Layer
Revisions...
Skew Planes...
Members...
Continuous schedule display
Element Selection
Level = 3

Figure: 26-5

9- GEOPAK Rebar menu will appear, click Tools and choose Bar Placement and Bar Editing.

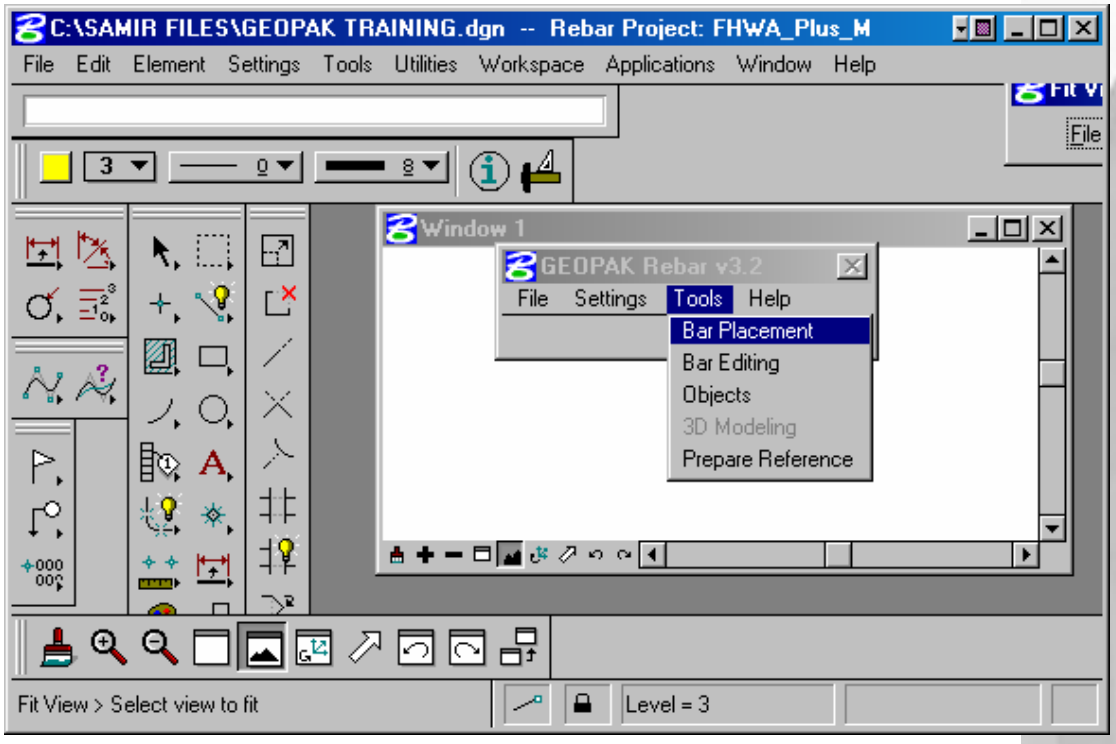

Figure: 26-6

10- Bar Placement Tools and Bar Editing menus will appear, you will need to click the Bar Placement Tools to expand the bar menu.

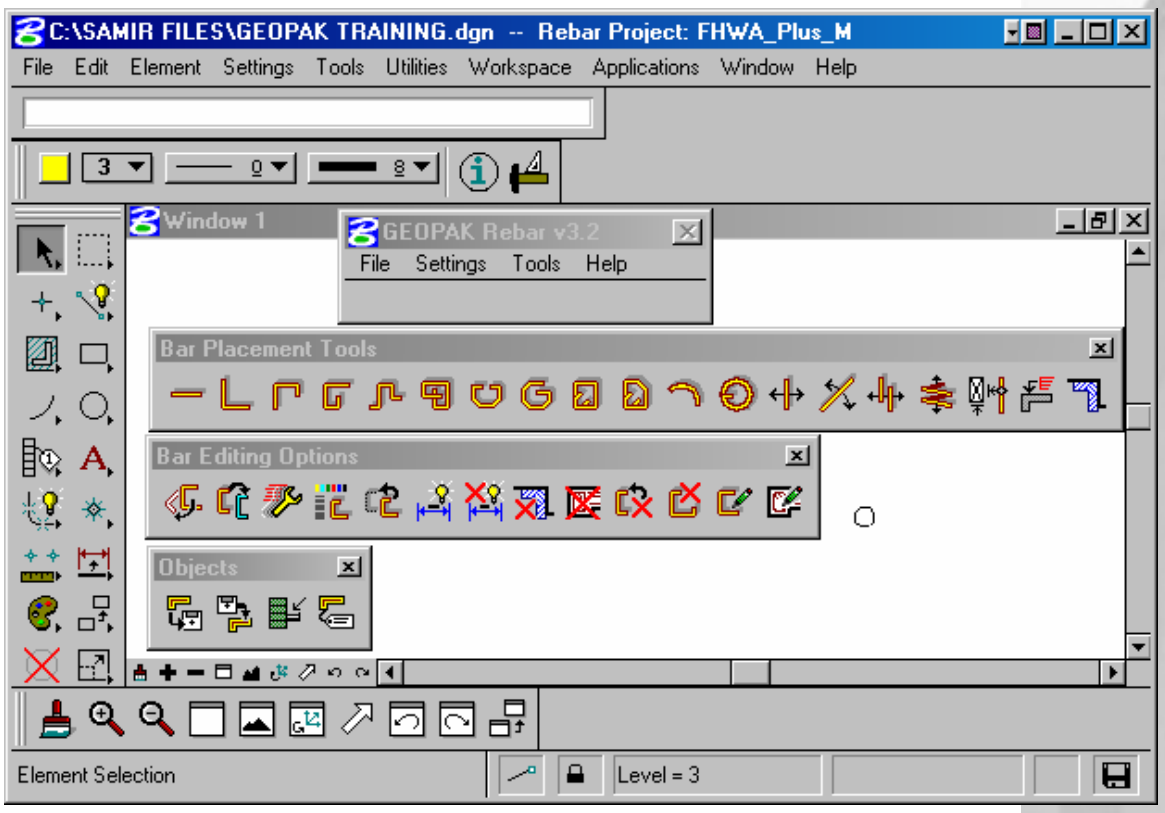

Figure: 26-7

11- Click Settings and choose Schedule.

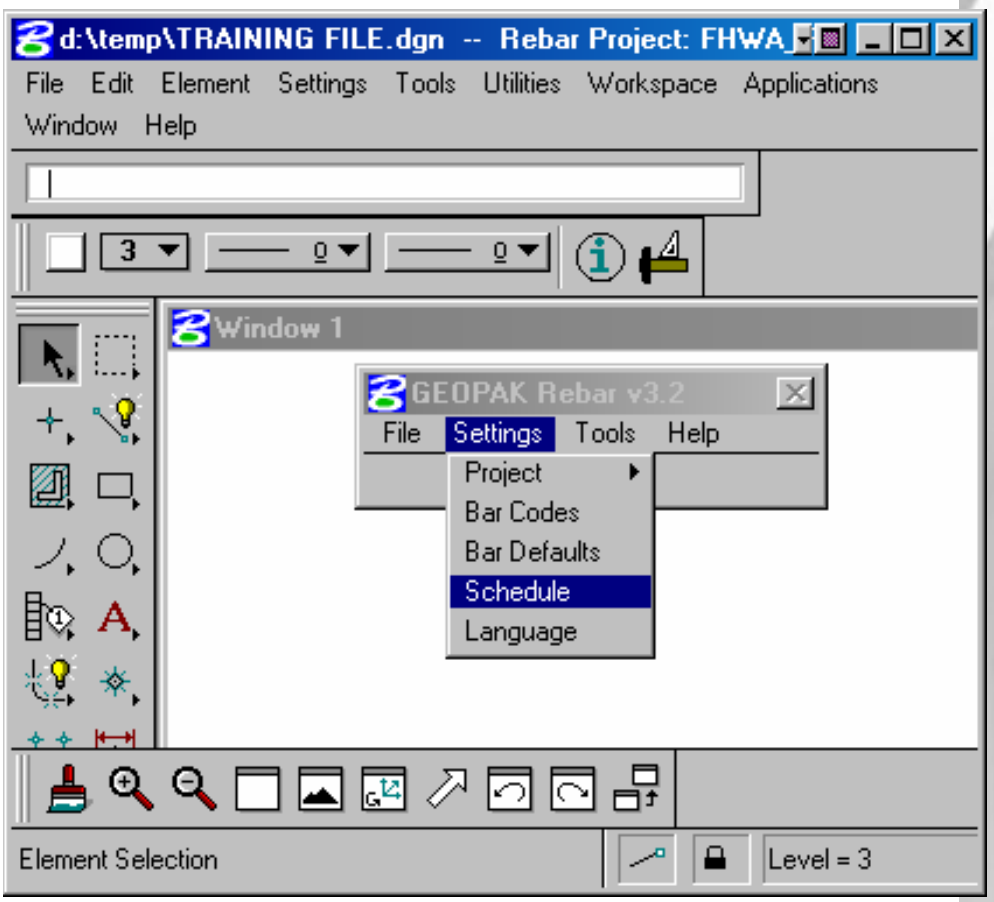

Figure: 26-8

12- Schedule bar menu will appear.

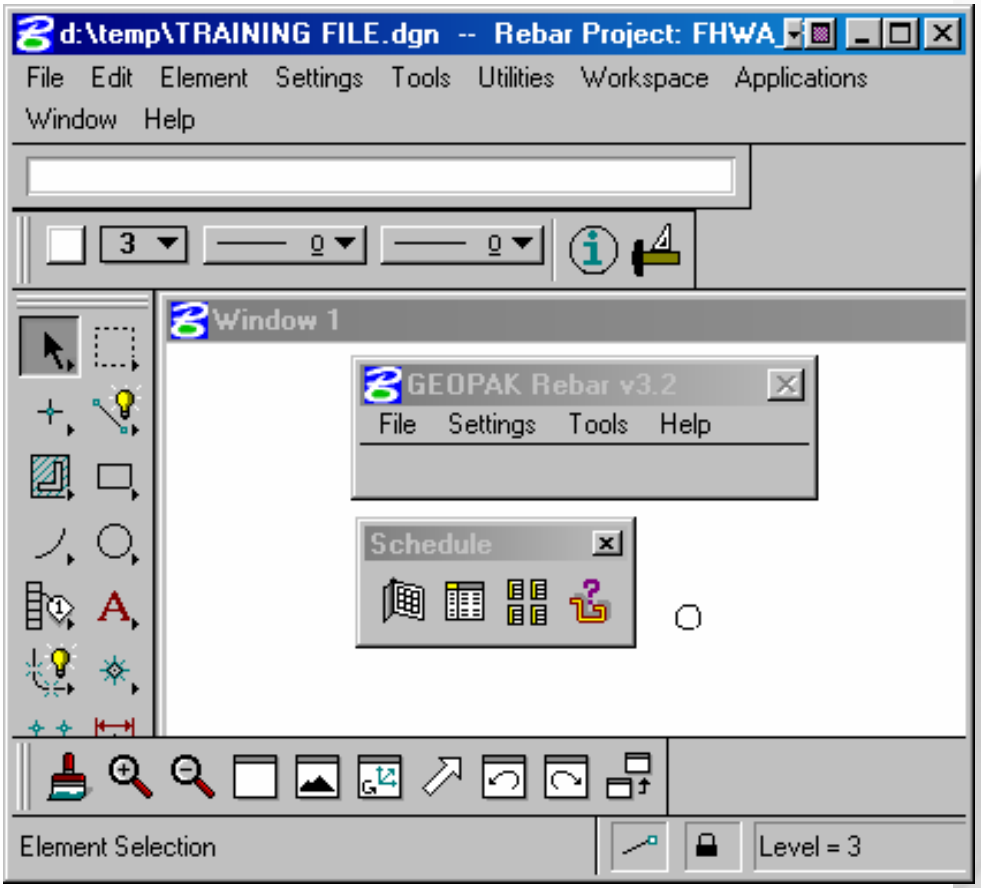

Figure: 26-9

13- To download the STANDARD BAR LAYERS (PF, P, AF, A, AT, W, …etc) for EFL, click on the Settings and choose Bar Defaults.

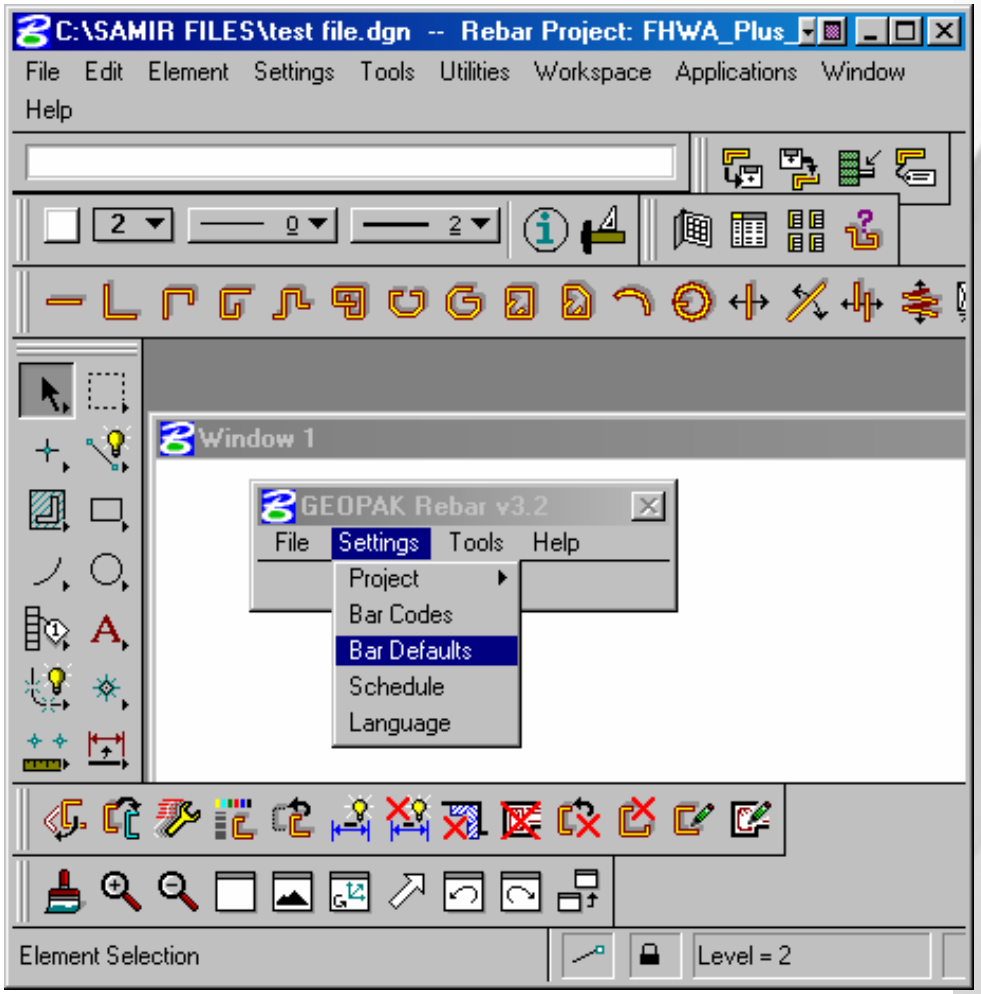

Figure: 26-10

14- The Bar Defaults menu will appear click Read Defaults File button.

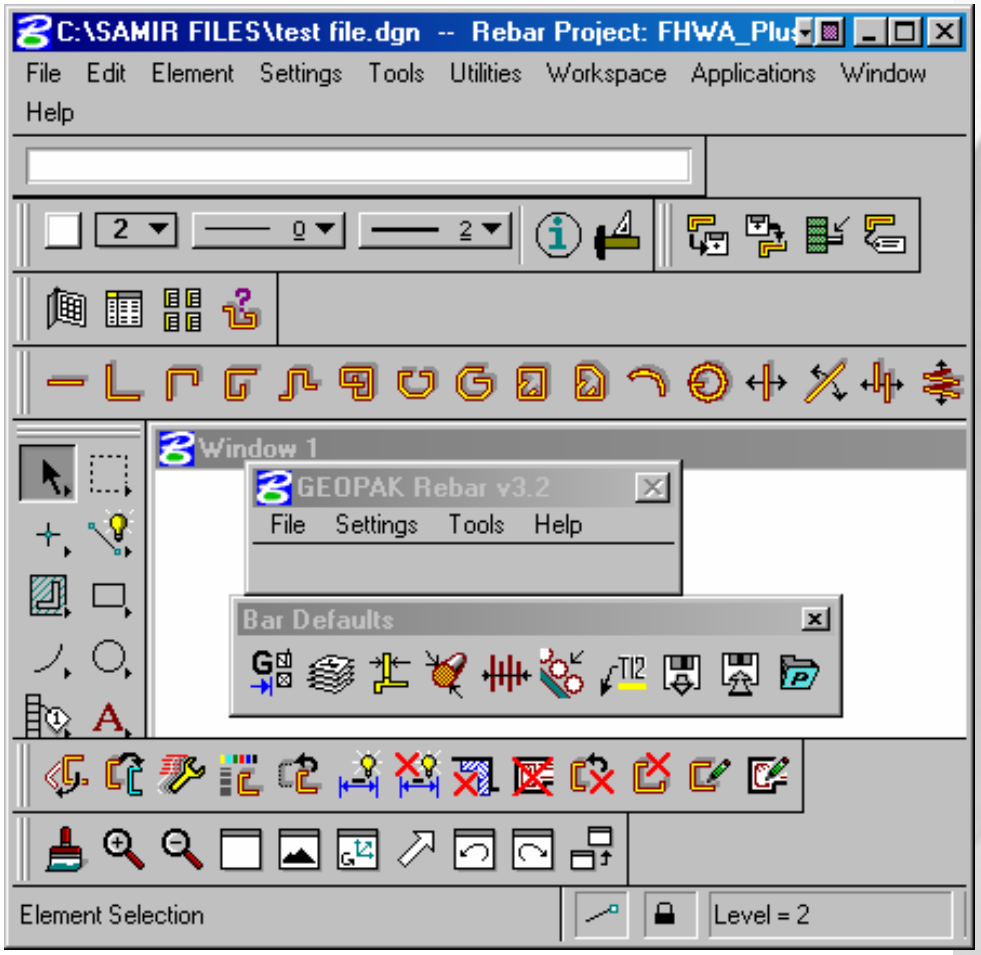

Figure: 26-11

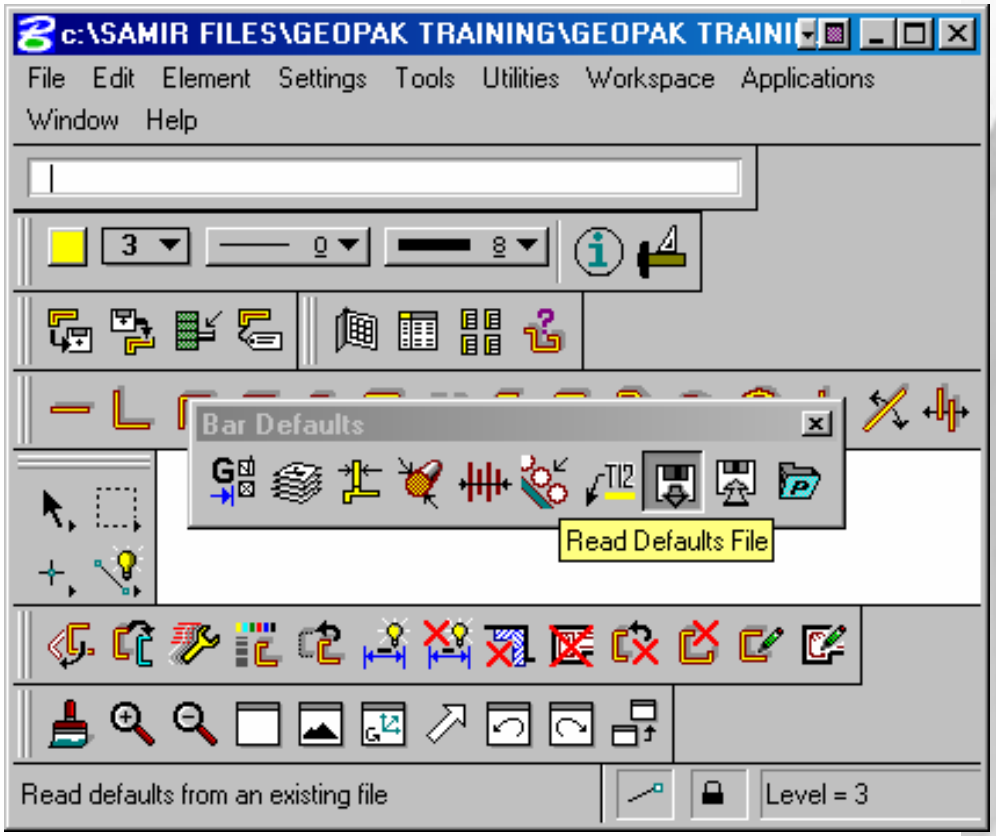
c:\SAMIR FILES\GEOPAK TRAINING\GEOPAK TRAINI
File Edit Element Settings Tools Utilities Workspace Applications
Window Help
Bar Defaults
Read Defaults File
Read defaults from an existing file
Level = 3

Figure: 26-12

15- Load Bar defaults window will open.

16- Go to m:\apps\geopakv8\rebar\projects\FHWA_2004Edition\def71002E (for English and M for Metric). (Sterling path)

17- Change List Files of Type to (All Files [*.*]), choose file def71002E.def (def71002E.def for English and def71002M.def for metric) and click OK. EFL STANDARD BAR LAYERS will be created.

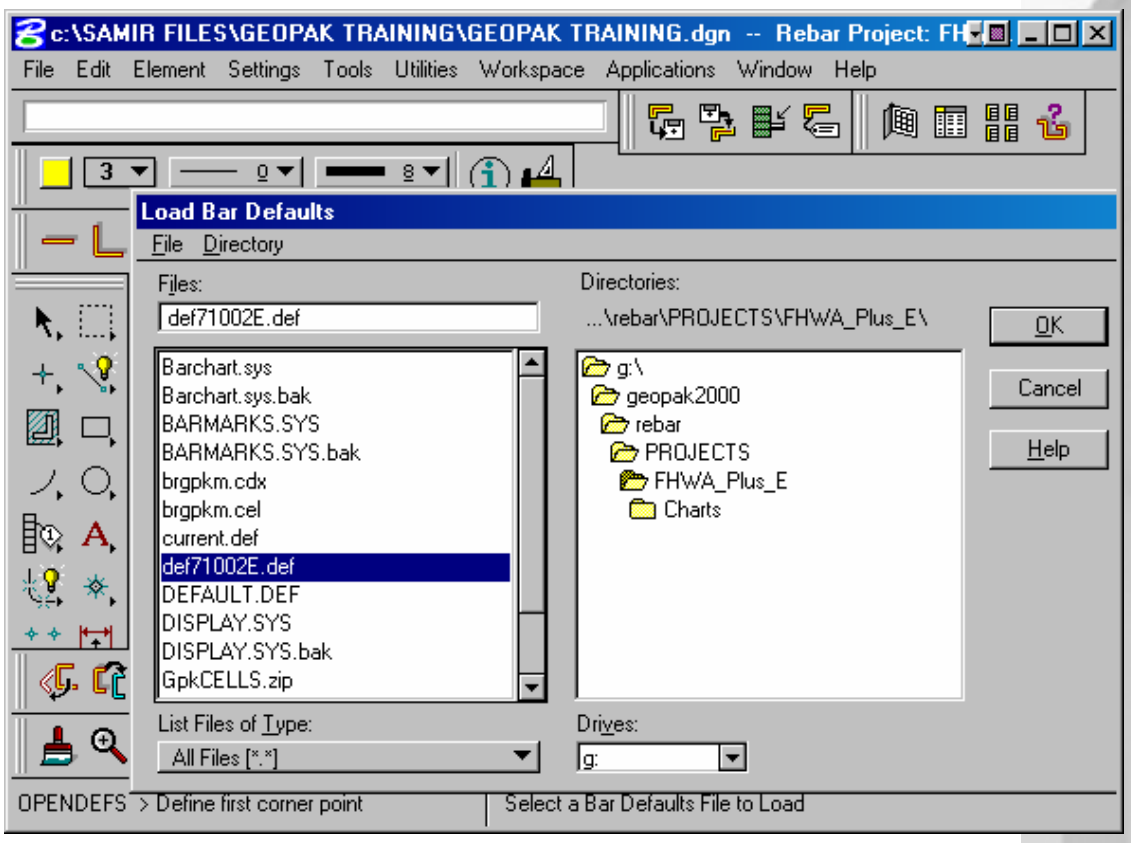

Figure: 26-13

18- Assume you have the following abutment footing details, the design calls for 16 stirrups #16 (12 between piles & 4 outside piles), 7 bars #22 at the top and 8 bars #25 at the bottom of footing.

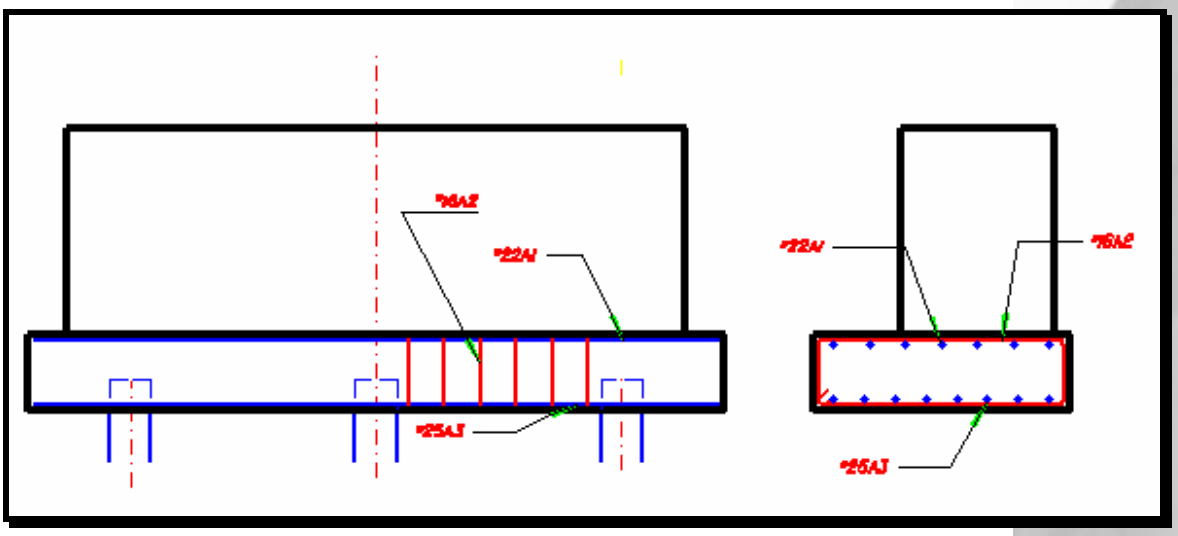

Figure 26-14

19- To create the bar schedule, copy or draw the concrete lines.

20- To draw the #22 top bars, click on the One Legged Bar button on the Bar Placement Tools menu and using the cursor click on the top concrete line of the footing elevation.

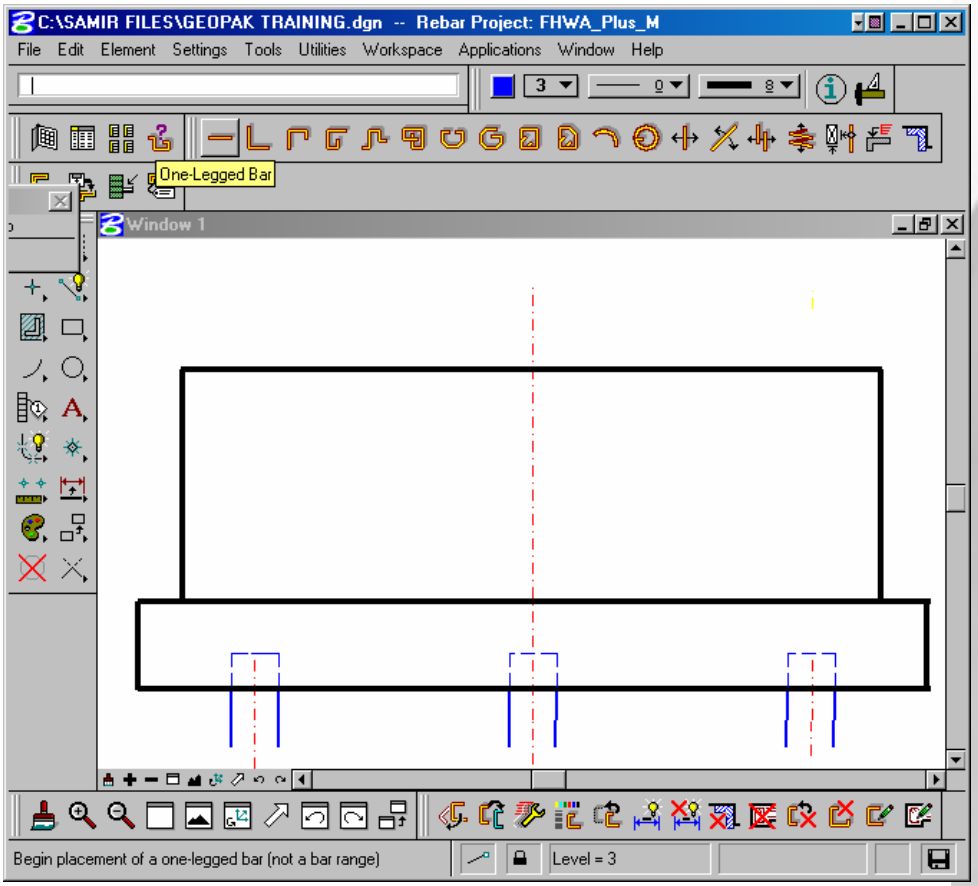

Figure 26-15

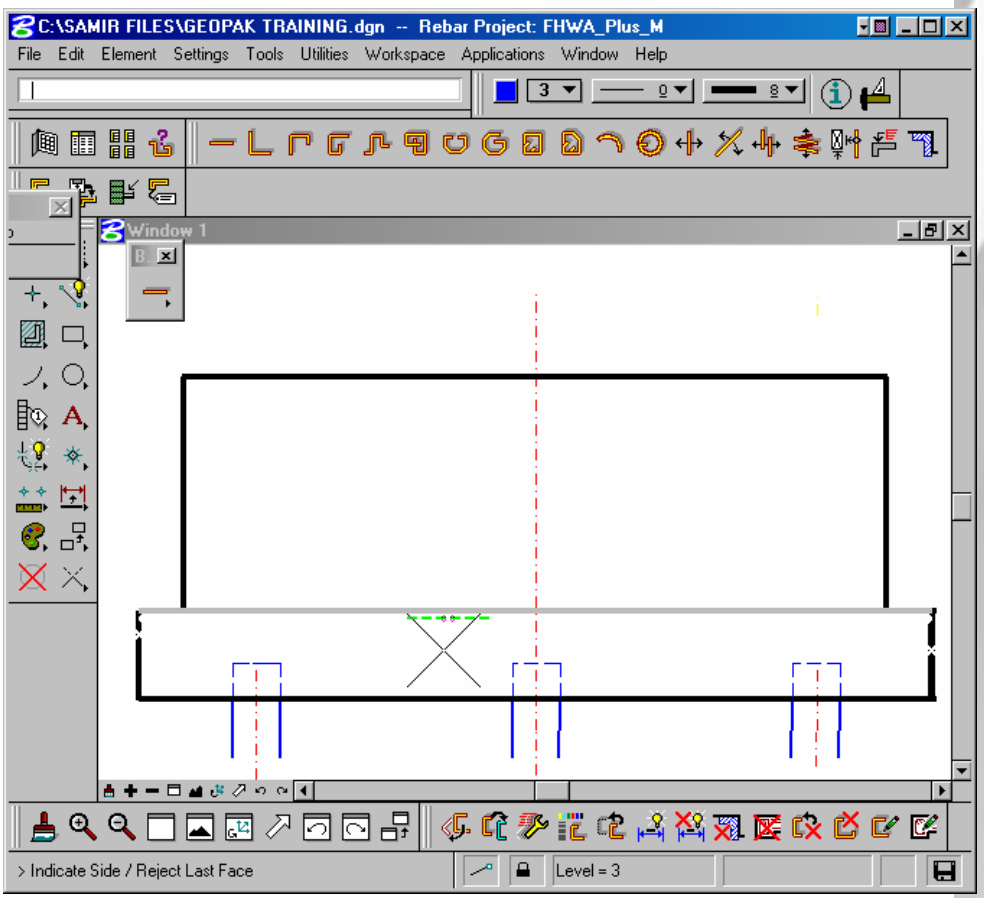
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1
> Indicate Side / Reject Last Face
Level = 3

Figure: 26-16

21- The Bar Placement menu will appear, click the Bar End Details button, the Bar End Details and BARLEGENDS menus will appear.

22- On the Bar End Details menu, check the appropriate cover (50 or 75mm) and click left side, click Next End and repeat the step for right side.

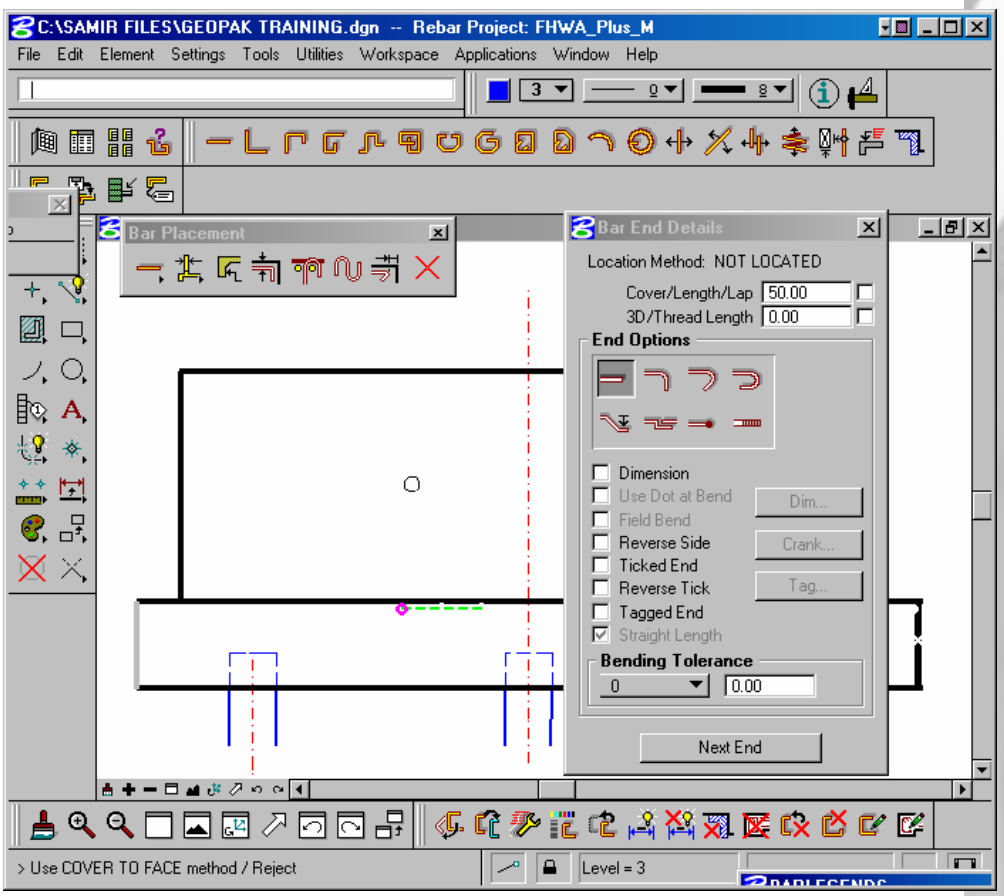

Figure: 26-17

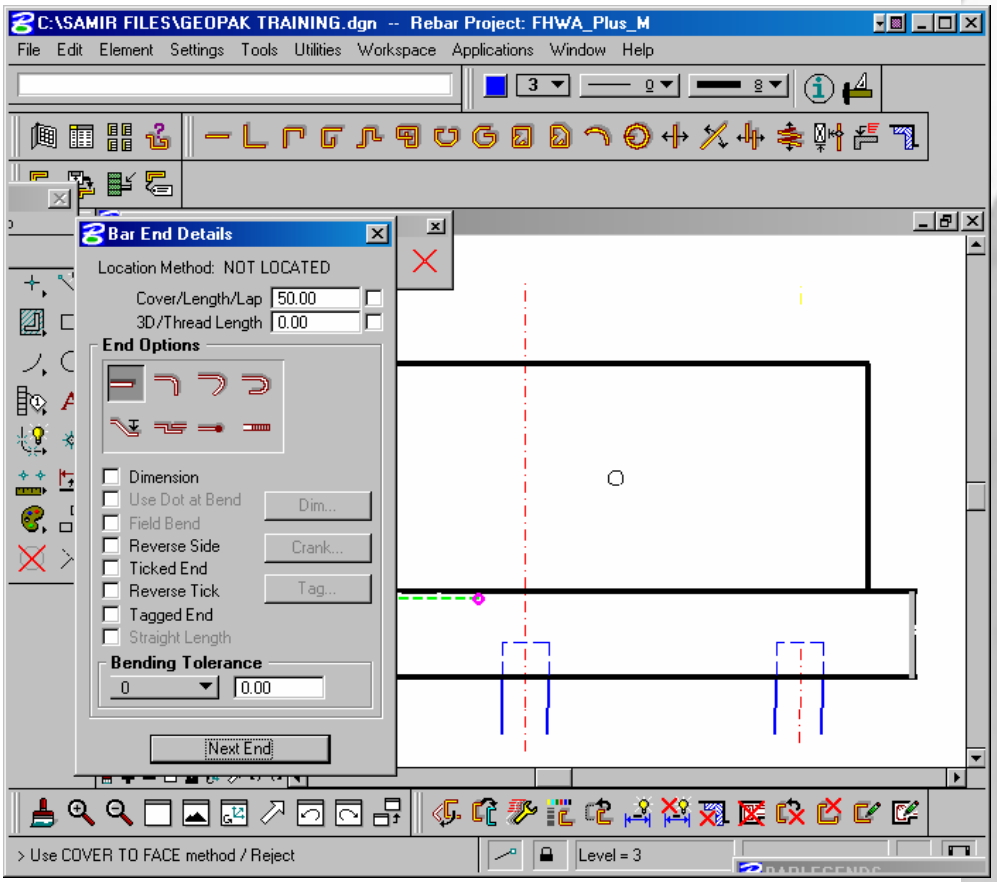
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Bar End Details
Location Method: NOT LOCATED
Cover/Length/Lap 50.00
3D/Thread Length 0.00
End Options
Dimension
Use Dot at Bend
Field Bend
Reverse Side
Ticked End
Reverse Tick
Tagged End
Straight Length
Dim...
Crank...
Tag...
Bending Tolerance
0
0.00
Next End
> Use COVER TO FACE method / Reject
Level = 3

Figure: 26-18

23- Geopak will create the top bar.

24- From the BARLEGENDS choose bar diameter (#22) and bar layer (A), for epoxy coated bars use (#22E).

Note: You can use AF (Abutment Footing) for bar layer if required.

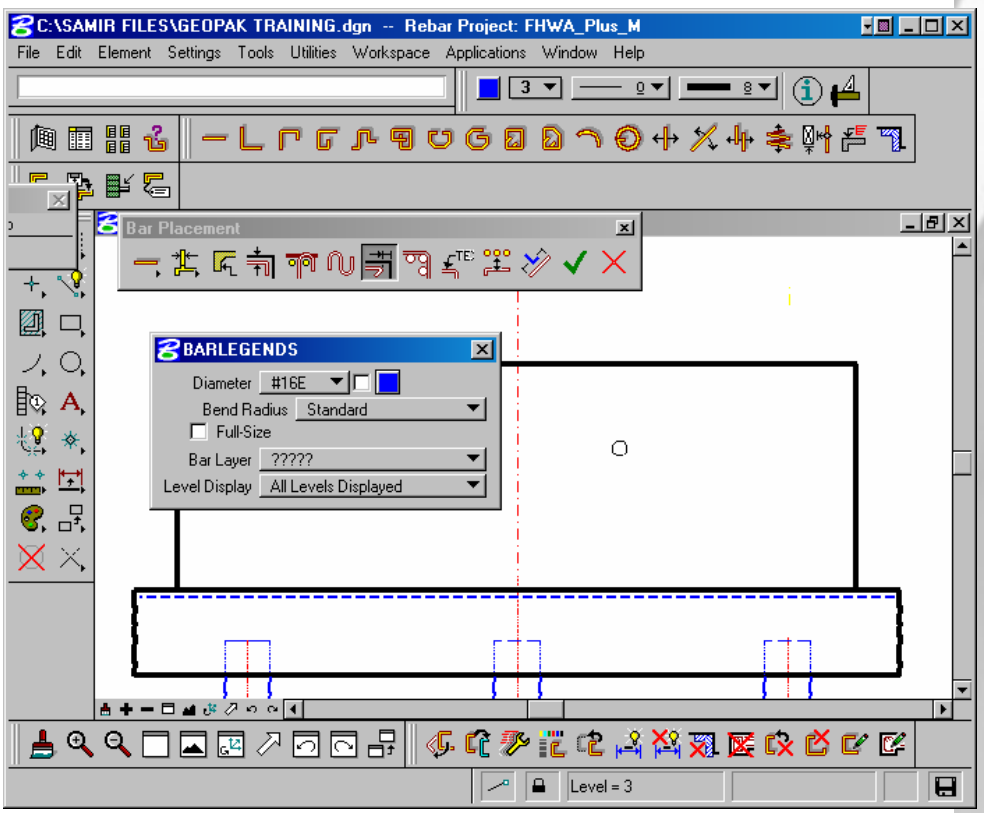

Figure 26-19

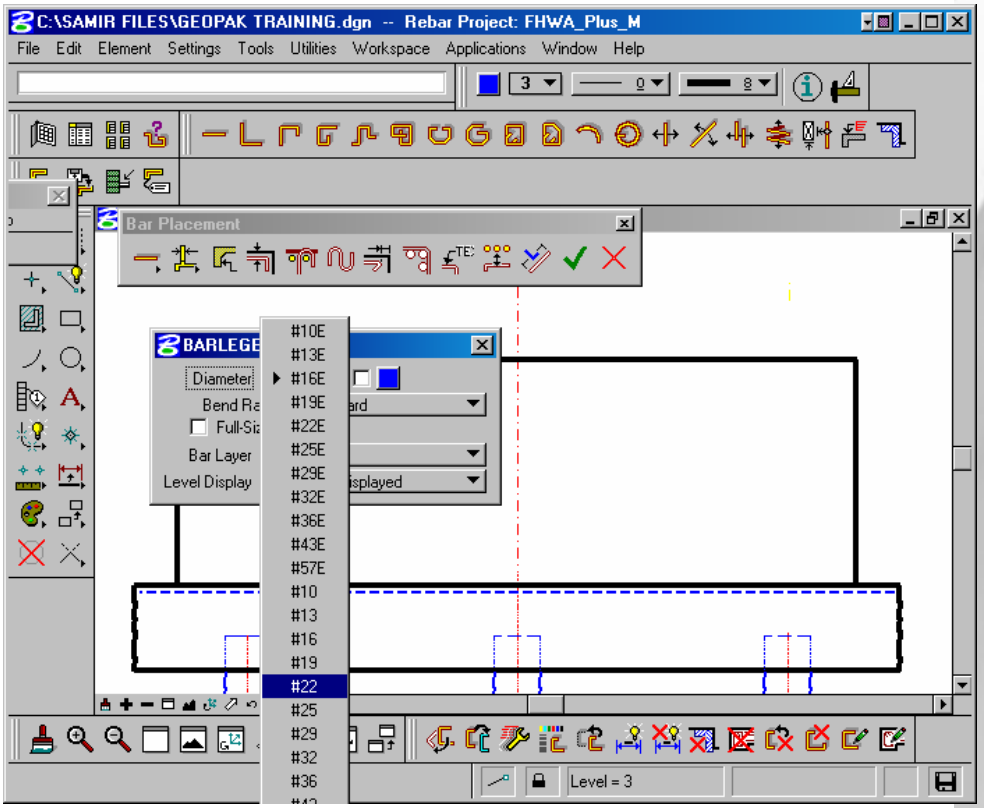
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Bar Placement
BARLEGE
Diameter
Bend Ra
Full-Siz
Bar Layer
Level Display
#10E
#13E
#16E
#19E
#22E
#25E
#29E
#32E
#36E
#43E
#57E
#10
#13
#16
#19
#22
#25
#29
#32
#36
Level = 3

Figure: 26-20

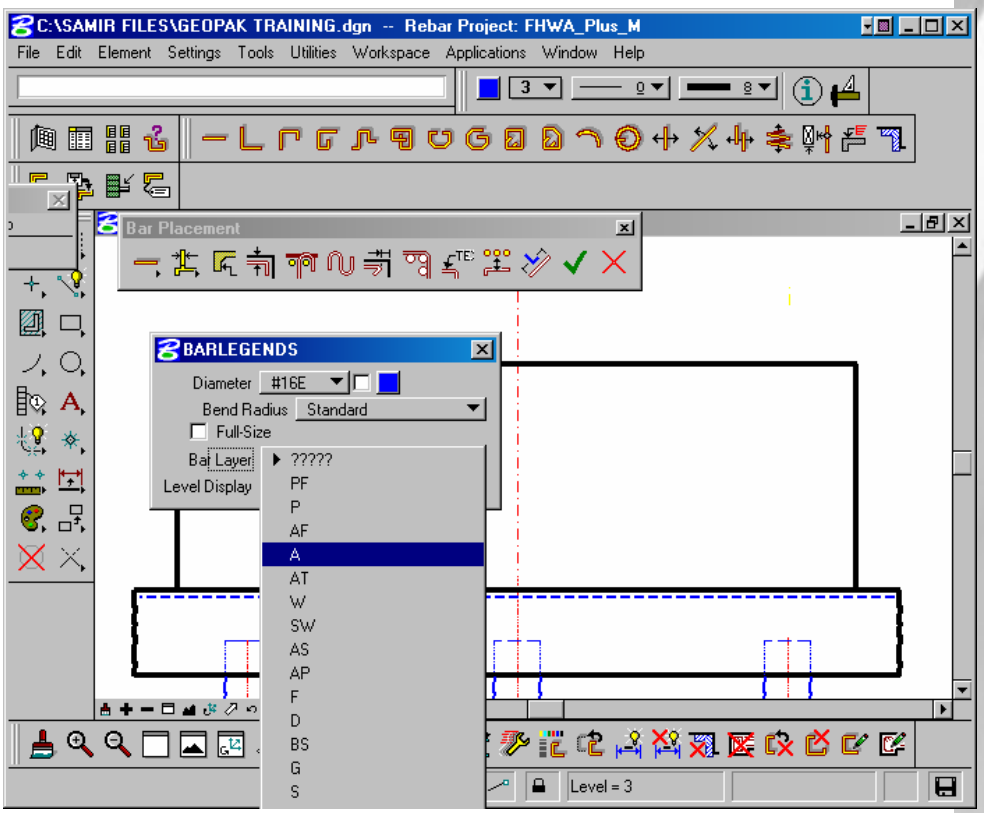
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Bar Placement
BARLEGENDS
Diameter #16E
Bend Radius Standard
Full-Size
Bar Layer
Level Display
?????
PF
P
AF
A
AT
W
SW
AS
AP
F
D
BS
G
S
Level = 3

Figure: 26-21

25- No labeling will be done in this file. All labeling Will be done in the files that contain the actual details.

26- From the Bar Placement menu, click Schedule Data button, Bar Schedule Details will appear.

27- Change Number of Bars to 7 and Number of Sets to 2 (Two abutments), Total Quantity will change to 14, close the window.

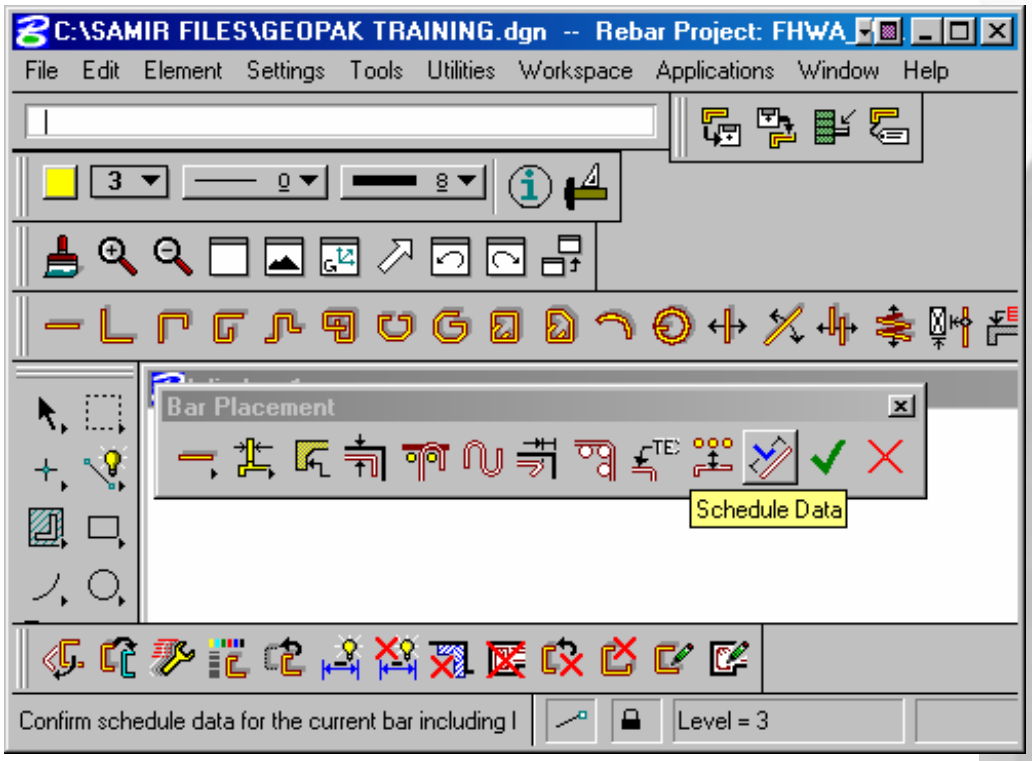

Figure: 26-22

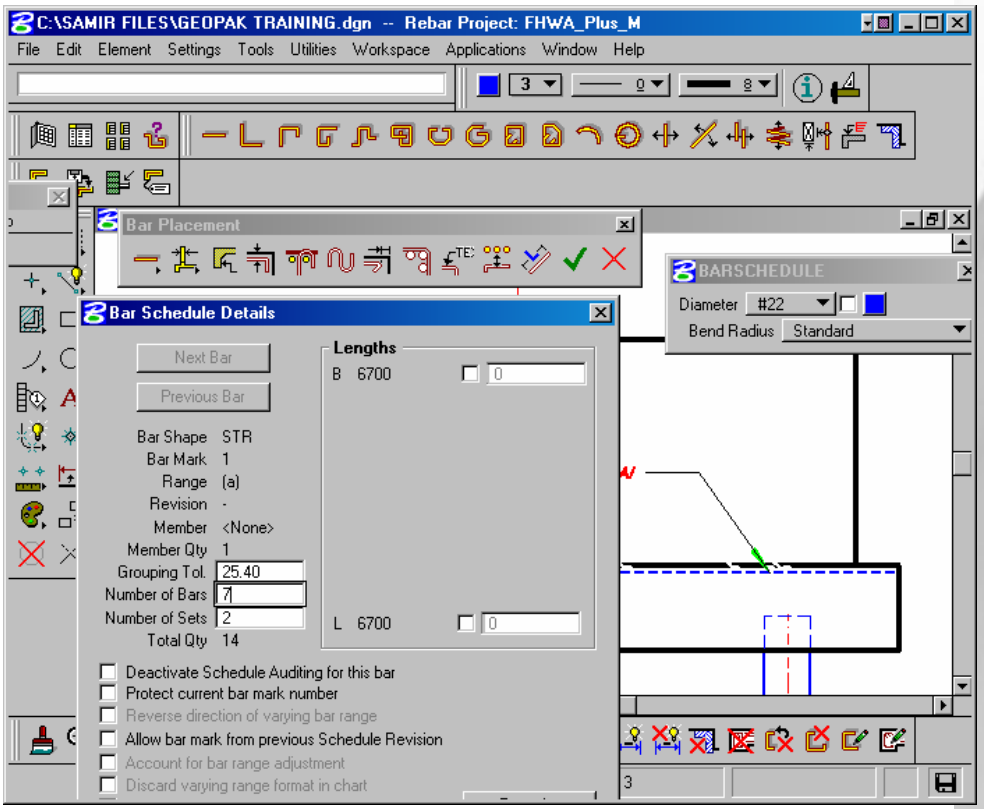
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA_Plus_M
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Bar Placement
BARSCHEDULE
Diameter #22
Bend Radius Standard
Bar Schedule Details
Next Bar
Previous Bar
Lengths
B 6700
L 6700
Bar Shape STR
Bar Mark 1
Range (a)
Revision -
Member <None>
Member Qty 1
Grouping Tol. 25.40
Number of Bars 7
Number of Sets 2
Total Qty 14
Deactivate Schedule Auditing for this bar
Protect current bar mark number
Reverse direction of varying bar range
Allow bar mark from previous Schedule Revision
Account for bar range adjustment
Discard varying range format in chart

Figure: 26-23

28- Save the bar by clicking Save Bar button.

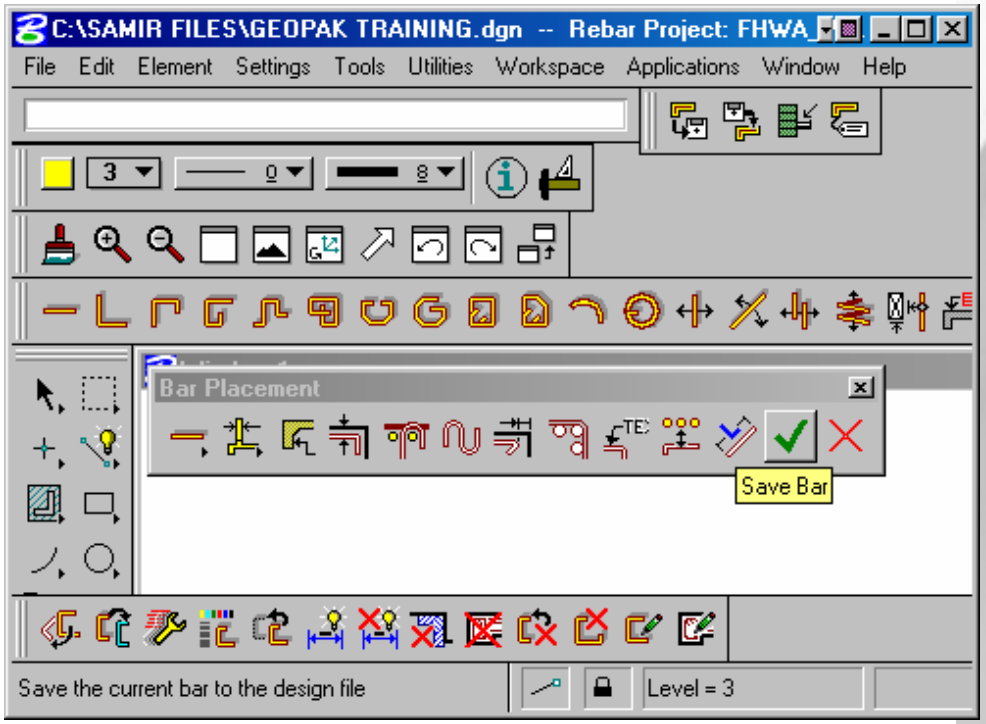

Figure: 26-24

29- Repeat the same steps for the bottom bar (bar size #25, Number of bars 8, Number of Sets 2)

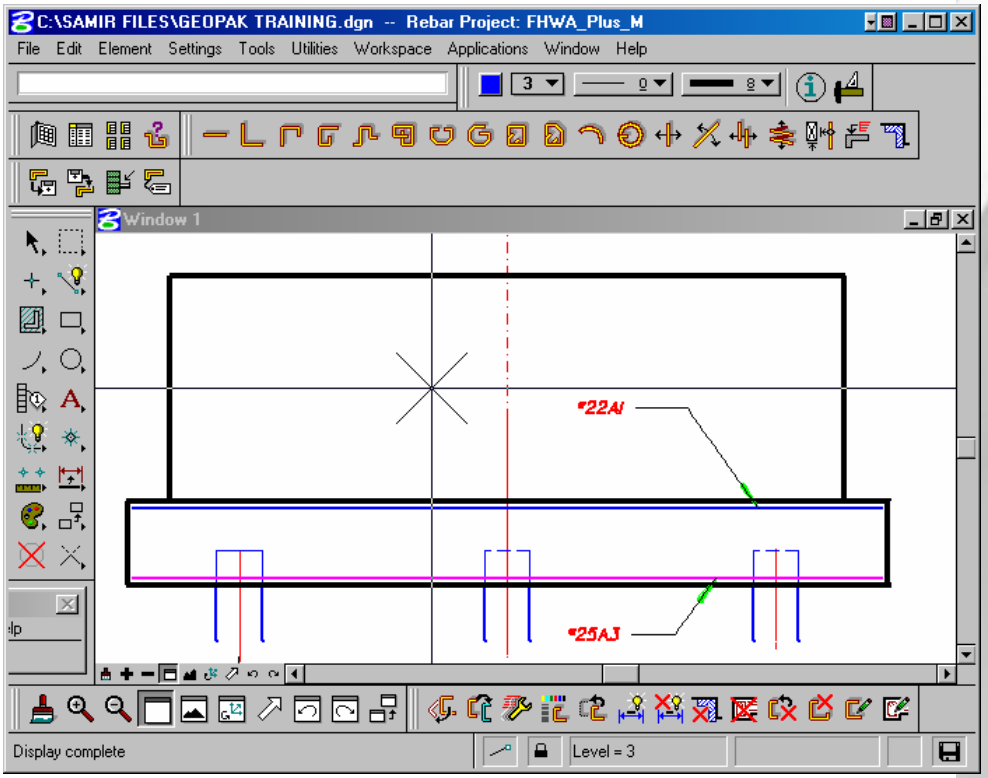

Figure: 26-25

30- To draw the #16 stirrups, click on the FOUR SIDED STIRRUP button on the Bar Placement Tools menu and using the cursor click on the four sides of the footing side view.

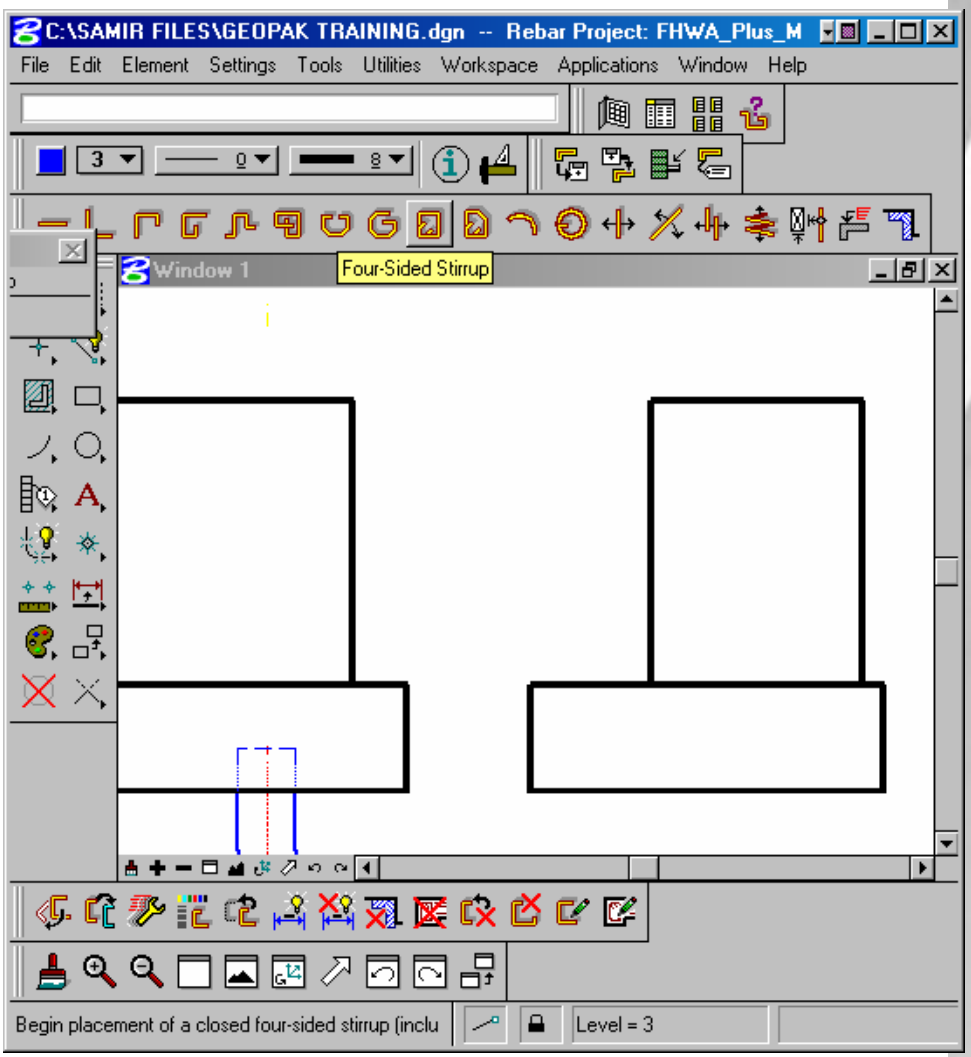

Figure: 26-26

31- Repeat the same steps as for the Top & bottom bars using bar size #16, the program will create the stirrup.

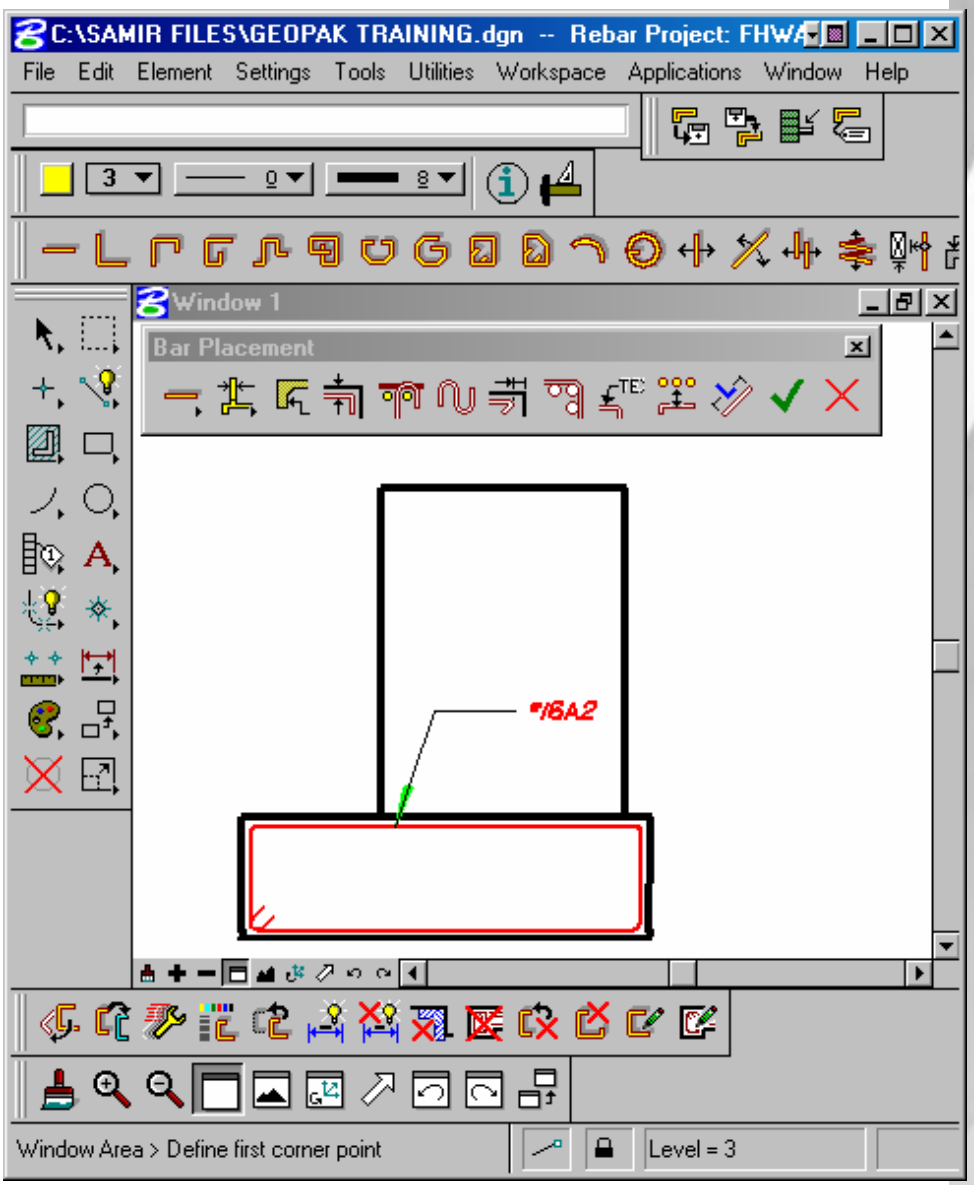

Figure: 26-27

32- From the Bar Schedule Details window, change Number of Bars to 16 and Number of Sets to 2 and close the window.

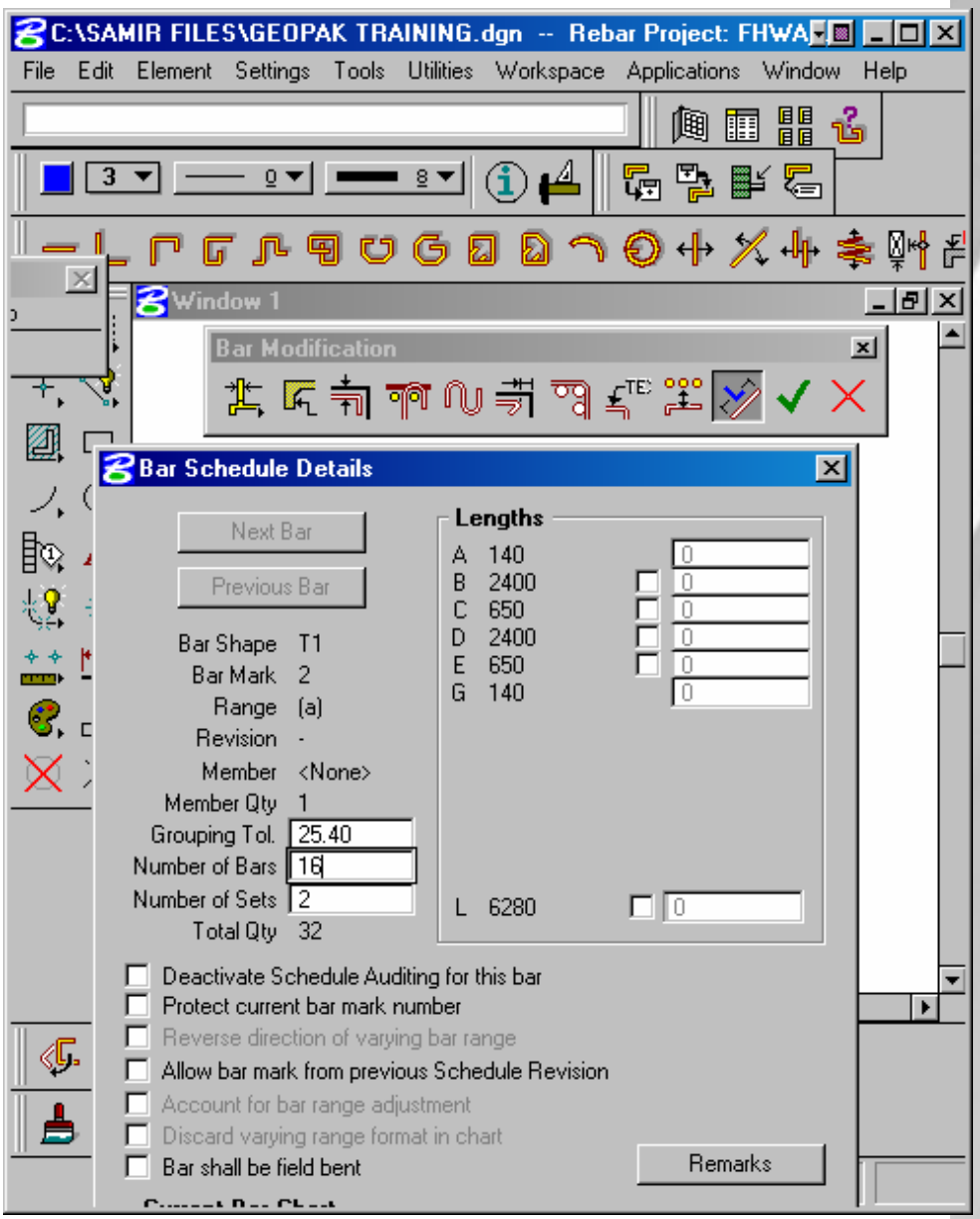
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1
Bar Modification
Bar Schedule Details
Next Bar
Previous Bar
Bar Shape T1
Bar Mark 2
Range (a)
Revision -
Member <None>
Member Qty 1
Grouping Tol. 25.40
Number of Bars 16
Number of Sets 2
Total Qty 32
Lengths
A 140
B 2400
C 650
D 2400
E 650
G 140
L 6280
Deactivate Schedule Auditing for this bar
Protect current bar mark number
Reverse direction of varying bar range
Allow bar mark from previous Schedule Revision
Account for bar range adjustment
Discard varying range format in chart
Bar shall be field bent
Remarks

Figure: 26-28

33- Place fence around the details.

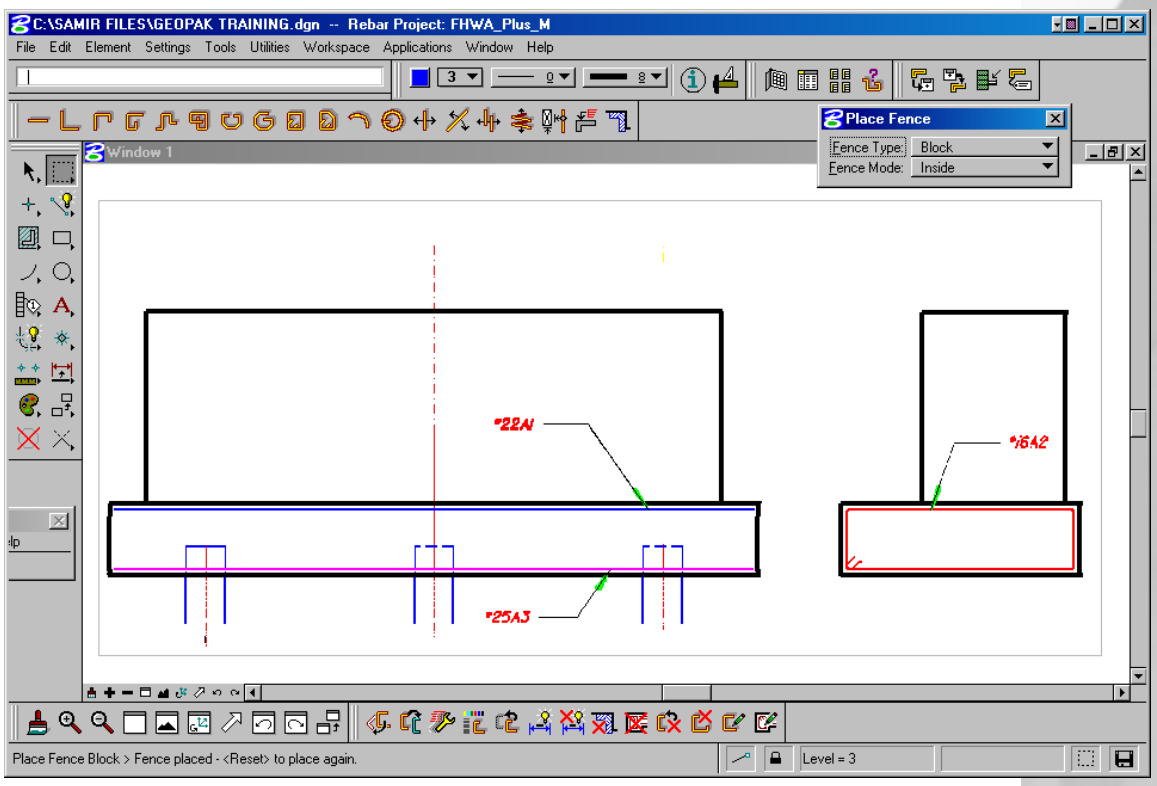

Figure: 26-29

34- Click the Schedule Listing button on the Schedule Bar menu, the Schedule Listing window will open, check the Fence box and all footing bars will appear.

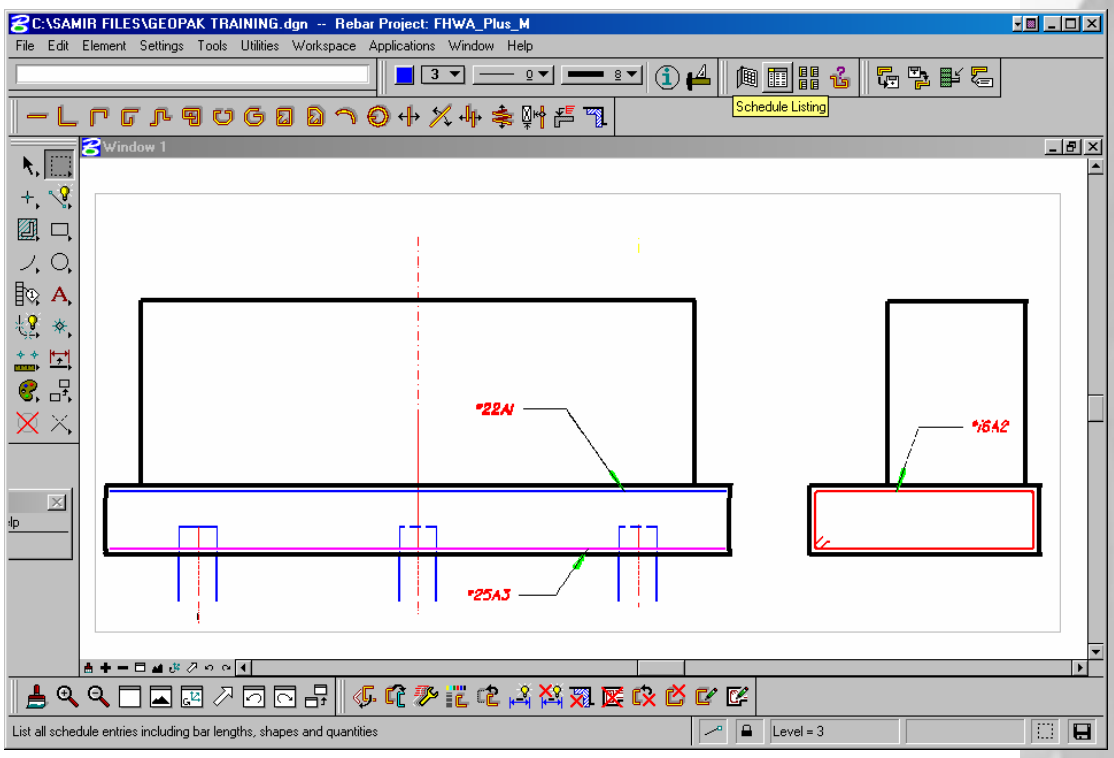

Figure: 26-30

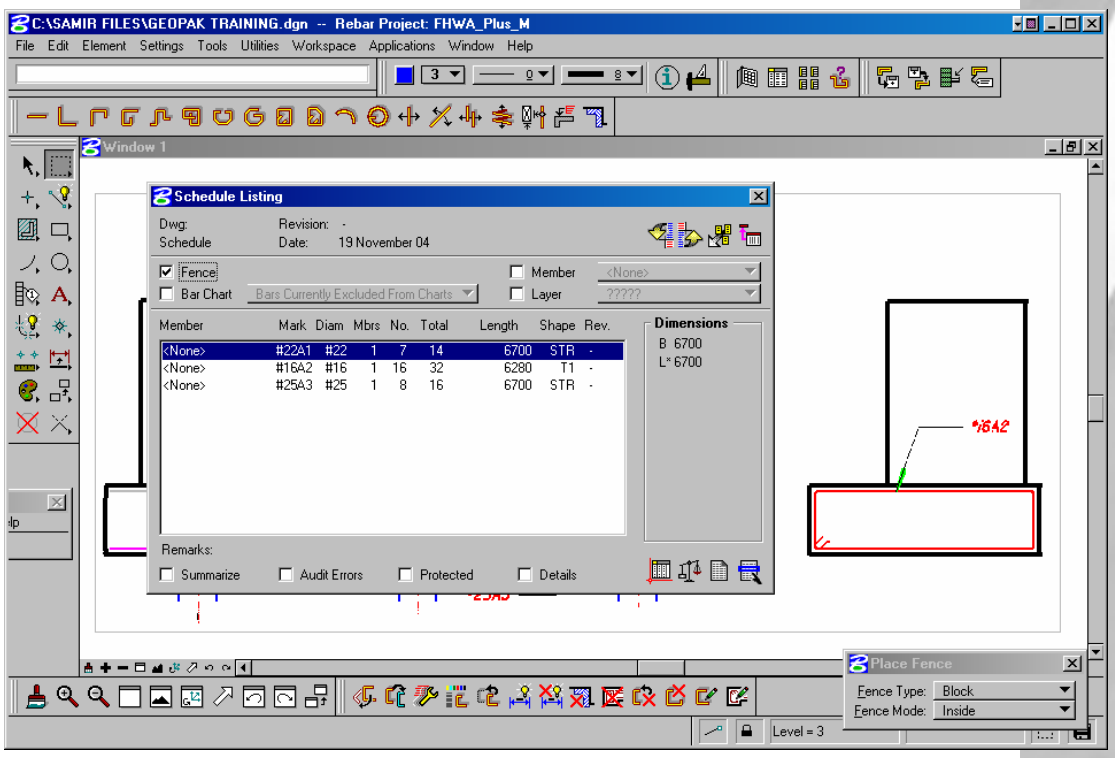

Figure: 26-31

Note: There are different ways to create the bar schedule, by checking the Fence, Bar Chart, Member or Layer box, we used the Fence for this handout.

35- Click Create Bar Chart button, Bar Chart Placement window will open, fill the necessary information and click the Locate button.

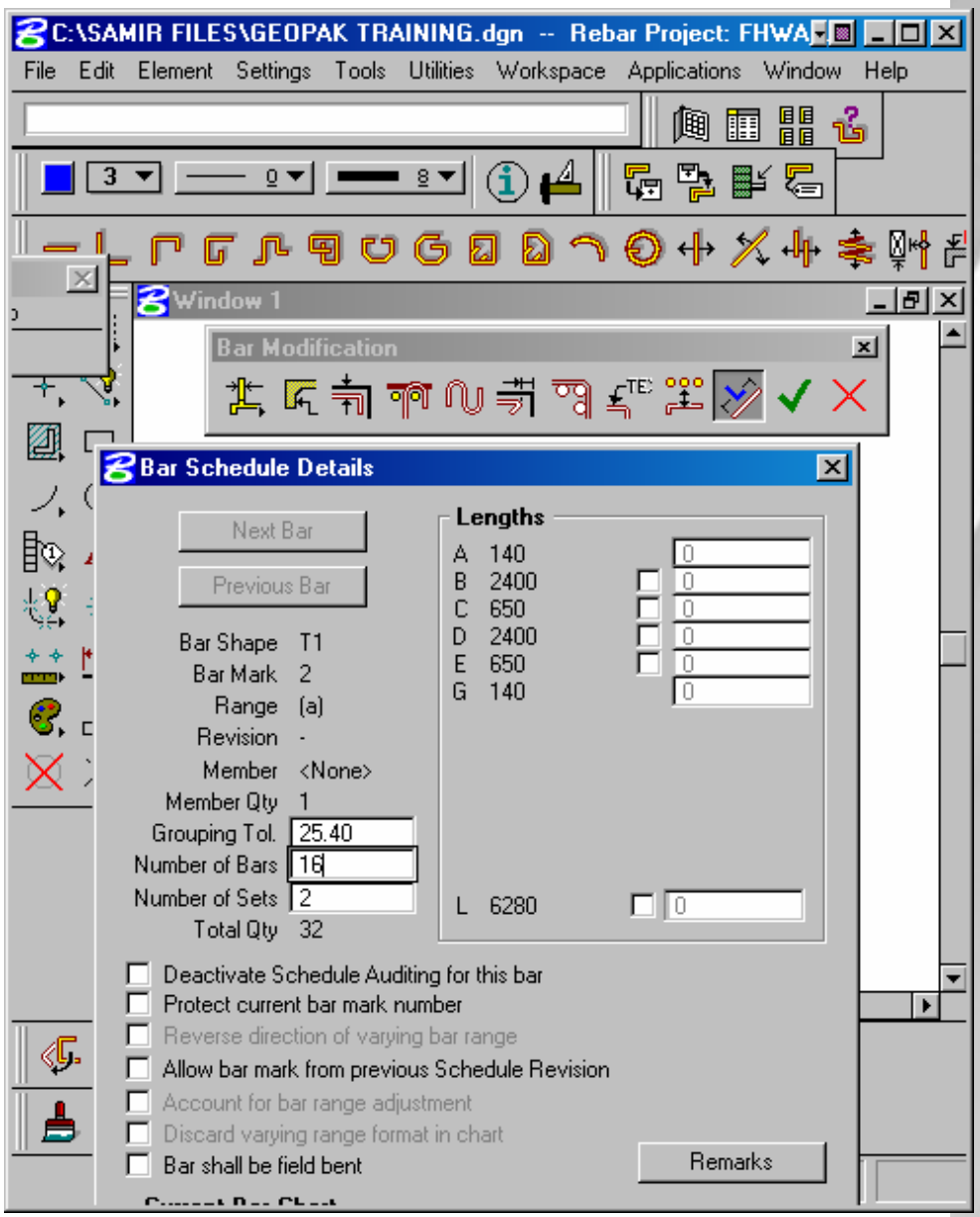
C:\SAMIR FILES\GEOPAK TRAINING.dgn -- Rebar Project: FHWA
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1
Bar Modification
Bar Schedule Details
Next Bar
Previous Bar
Bar Shape T1
Bar Mark 2
Range (a)
Revision -
Member <None>
Member Qty 1
Grouping Tol. 25.40
Number of Bars 16
Number of Sets 2
Total Qty 32
Lengths
A 140
B 2400
C 650
D 2400
E 650
G 140
L 6280
Deactivate Schedule Auditing for this bar
Protect current bar mark number
Reverse direction of varying bar range
Allow bar mark from previous Schedule Revision
Account for bar range adjustment
Discard varying range format in chart
Bar shall be field bent
Remarks

Figure: 26-32

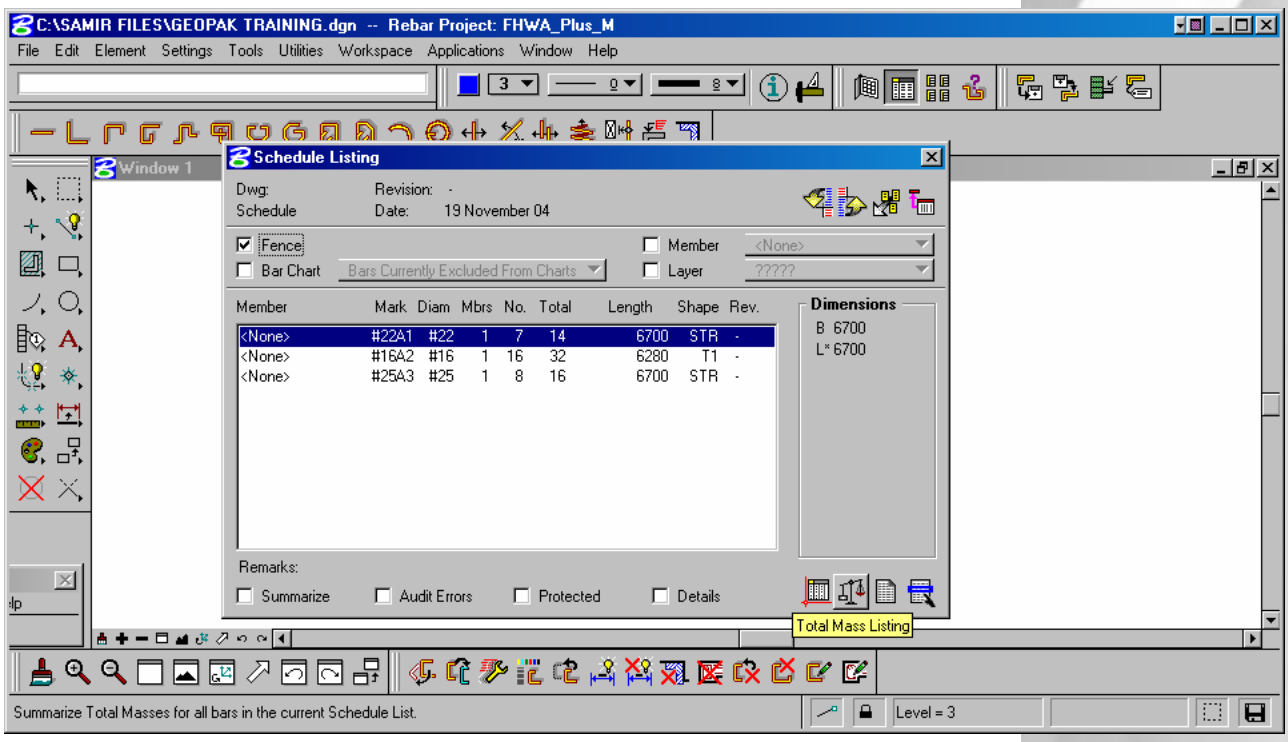

Figure: 26-33

36- Schedule Masses window will open and the total reinforcement quantity will appear.

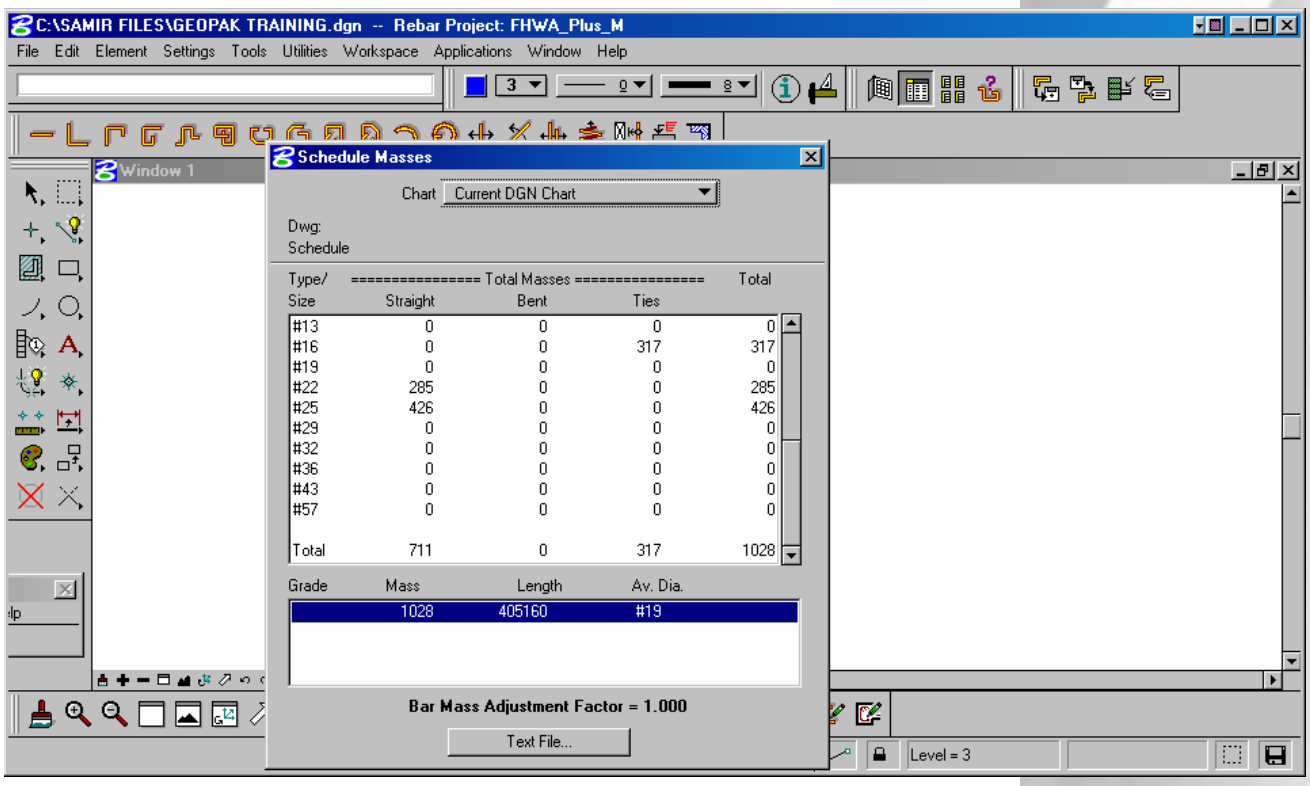

Figure: 26-34

39- Projects designed for EFLHD will require schedules to be turned off. This will be accomplished by masking the reference files. All masking is to be done in the Rebar.dgn file. Future Editions will have a different procedure involving importing and exporting schedules.

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CHAPTER 27 ~ Bridge – Batch Plotting

EFLHD Batch Plotting……27-1,2

BATCH PLOT GUIDELINES
To Plot a series of drawings or <u>total project</u>
Using Cell Name: "Batch plot area"

Step 1: Place Cell "Batch plot area" over borders you want to print. Place them in the order you want.

Step 2: Initiate Batch Print from "File" pull down menu.

Step 3: Select **"Print Area"**

Step 4: Select **"Specifications" button**

Step 5: Select method **"Cell" then hit OK.**

Step 6: Select **"Specifications Properties"**

Select **"Cell"**
Check off**:**

- ✓ **Master File**
- ✓ **References**
- ✓ **Process Multiple Boundary Elements (at bottom of menu)**

Type in **"Batch plot area"** for cell name

Hit **OK**

Step 7: Under **"Edit"** menu, Select **"Add Active File"**

Note: may add more than one file

Step 8: Select **Print, verify pen table and print drive and hit OK**

PLOT DRIVE INSTRUCTIONS:
Highlight "Printer"
Select **"Specifications" button**
Hit "Driver" button
Locate following:
M:\cadd\PLOTDRV\e_lpt1.plt
Hit "OK"

PEN TABLE INSTRUCTIONS:
Highlight "Display" and double click
Select **"Specifications" button**
Hit "Browse" button
Locate following:
M:\cadd\PENTABLE\LABELS.TBL
Hit "OK"

Step 9: Hit **OK thru any other menu that pops up.**

Step 10: Save job in projects folder. File name is in format

name.job

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CHAPTER 28 ~ Bridge – Cell Libraries and Seed Files

Cell Libraries and Seed Files ……28-1

BRIDGE SEED FILES & CELL LIBRARIES

You can find seed files for all three offices, Eastern, Central, and Western in both English and Metric. There are 6 directories total with 3 files in each directory. The 3 file names are similar to the following, but may vary a bit to distinguish English vs.. Metric and other attributes of origin:

0Border.dgn
0Project.dgn (Formally 0Plot.dgn. This was renamed to 0Project)
Seed.dgn

The location of these seed files is at:

M:\cadd\SEED\bridge\BridgeV8\Eastern Seed Files English
M:\cadd\SEED\bridge\BridgeV8\Eastern Seed Files Metric

M:\cadd\SEED\bridge\BridgeV8\Central Seed files English
M:\cadd\SEED\bridge\BridgeV8\Central Seed Files Metric

M:\cadd\SEED\bridge\BridgeV8\Western Seed Files English
M:\cadd\SEED\bridge\BridgeV8\Western Seed Files Metric

The location and names of the Updated Microstation V8 Cell Libraries are:

M:\cadd\CELL\BridgeV8\V8English051706
M:\cadd\CELL\BridgeV8\V8Metric051706

These Cell Libraries are to be used on all projects regardless of geographical location.

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Chapter 29: Consultants Deliverables

Introduction

Throughout the life of the contract, Consultants will be required to submit their files (Deliverables Items) to EFLHD. If these standards are followed, the Consultant will only need to write their directory structure to a CD and submit with only a brief description of Geopak chain names, profile names, and file naming convention.

Deliverable Items - Items that the Contractor provides the Government under the terms of the contract, including reports, documents, plans, maps, and other required items.

Government Provided Data:

The following items are provided to the Contractor:

No.	Item Description	Format(1) (2)
	PDDM	World Wide Web
	FLH A/E Task Order Procedures Manual	World Wide Web
	EFLHD Construction Manual with EFLHD Slope Staking Procedures	.pdf
	Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP03	.pdf
	NPS Park Road Standards	
	NPS Sign Manual located at http://www.nps.gov/npsigns/ or http://www.nps.gov/hfc/acquisition/uniguide.htm	World Wide Web
	Streetscape Manual located at http://www.nps.gov/streetscape/	World Wide Web
	Design Scoping Report and Updates	
	Library of Specifications (LOS)	Word 2000
	EFLHD Special Contract Requirement Development Guidelines	
	GEOPAK standard input files	
	Microstation seed files (level and symbology, etc)	
	Photogrammetric mapping and horizontal and vertical datum	
	EFLHD Supplemental Survey Specifications	
	As-Builts	.pdf
	Bridge Inspection Reports	
	Soils and Foundation (Geotechnical) Report	.pdf
	Engineering Study	.pdf
	Traffic Safety Study	.pdf
	Traffic and Accident Data	.pdf
	FLH / EFLHD Standards and Details	

	Sample Typical Sections, Drainage Summary Sheets, and Sign Schedule Sheets	
	Engineer's Estimate System (EES) Program, EFLHD Pay Item Lists, and Bid History	
	Environmental Documentation	.pdf
	Highway Design Standards form	
	Roadside Design Guidelines form	
	PS&E Forms	
	PS&E Checklist	.pdf
	Sample Invoice Format	
	Sample PS&E Package for each Design Phase described in the Statement of Work, including:	.pdf
	A. Sample Plans	
	B. Sample Special Contract Requirements (SCR)	
	C. Sample Engineer's Estimate (EE)	
	D. Sample Unit Price Analysis (UPA) and sample UPA forms	
	E. Sample Slope Stake Books	
	F. Sample Critical Path Method (CPM) Schedule	
	G. Sample Design Narrative	
	H. Sample Traffic Control Narrative, if separate from the plans	
	I. Sample Sediment & Erosion Control Narrative, if separate from the plans	
	J. Sample Highway Design Standards form	
	K. Sample Utility Status Report	

Table 29-1

(1) Unless otherwise noted, all Government Provided Data will be in electronic format on CD-ROM or DVD.

(2) Electronic versions of select items listed here as well as other design related resources can be downloaded from http://www.efl.fhwa.dot.gov/design/design.htm.

(3) The lastest version of the pay item files for the ESS can be downloaded from http://www.cflhd.gov/design/ee.prog/

Plans Provided by Consultant:
Provide plans that are similar in character and assembly to the sample plans provided by the Government, with all text being fully legible when the plans are printed at half size. Careful attention must be paid to the layout, format, and appearance of the plans. The Government will not accept Plans that are excessively cluttered with information, are poorly organized, or do not meet the general requirements of the Project Development Design Manual (PDDM). Provide Plans that contain the following where applicable:

No.	Description	Notes
	Title Sheet	
	Conventional Symbols and Abbreviations Sheet	Provide symbology and abbreviation legend.
	Location Map and Construction Signing Sheet	Provide sheets containing the location (overall site) of each roadway, indicating beginning and ending of construction, the Partner Agency's right-of-way, preliminary traffic control, etc.
	Survey Information Sheets	For new and existing centerlines, survey control, baselines, or P-lines. Provide sheets containing an overall site (location) map showing locations of primary and secondary control points, sketches of references, NEZ coordinate table of control points, horizontal and vertical datum notes, level of SUE survey conducted (Quality Level " "), etc.
	Typical Section Sheets	
	Tabulation of Quantity Sheets	Using the EES program.
	Schedules and Summaries	Mileage tabulation, removals, erosion control devices, earthwork, paving and pavement patching, drainage, underdrain, guardrail, permanent striping, permanent sign, remove and reset sign, construction sign, etc.
	Plan & Profile Sheets	Provide alternative rehab options.
	Construction Plan Sheets	Provide sheets indicating the work to be performed.

	Special Plan Views	Separate blow-up views of all intersections requiring work, and other necessary locations requiring increased detail.
	Pavement Elevation Sheets	For areas of pavement not shown in the plan and profile sheets or construction plan sheets.
	Erosion Control Narrative and Plans	Provide separate sheets for erosion control narrative and plan views.
	Landscaping Plans	
	Temporary and Permanent Signing and Striping Plans	Provide separate sheets for temporary signs/striping and permanent signs/striping.
	Traffic Control Plans	Including construction phasing, if necessary.
	Signal, Lighting, and Electrical Plans	Traffic signal, showing heads, loops, poles, mast, and other appurtenances, and required phasing. Include locations for street lights, conduits, manholes, pull boxes, etc.
	Drainage and Utility Plans and Profiles	Provide separate plan and profile for storm drainage systems, any box culvert construction or extensions. Show headwater depths and hydraulic grade-lines.
	Drainage Cross Sections	For highway culvert and inlet replacements, and extensions. Show headwater depth, limits of spread, and hydraulic grade-line for all culverts >36”. ----------(Choose one or both as applicable)---------- For all closed system storm sewers (all sizes).
	Detail Sheets	Retaining walls, traffic signals, streetlights, box culvert repairs including headwalls, and special inlets.
	EFLHD Standard Details and Standard Drawings	Provide separate sheets for special details for any details not included in the standard library.
	Roadway Cross Sections	Provide roadway cross-sections at 50’ intervals.
	Bridge Plans and Details	Show areas needing repair and types of repair for: (Insert specifics)

Table 29-2

Deliverables: The contract work and supporting documents will be created and delivered to the Government according to the following formats:

Electronic Transfer of Data: The Government requires the following to ensure compatibility with software used by the Government and to ensure the efficient and timely exchange of computer files between the Government and the Contractor.

All files submitted must be fully compatible with the software versions listed in Chapter 1 of this document without any conversion or editing by the Government. Any files requiring conversion and/or editing by the Government will not be accepted. All files shall be virus free. All files shall use the Government's file naming convention.

1. **Computer Aided Design (CAD) Files:** All CAD files shall be provided in Microstation (*.DGN) compatible format and software versions as listed in Chapter 1 unless specifically exempted by the Government.

2. **GEOPAK Interactive Highway Design Files:** The Government will provide the GEOPAK standard input files (*.GPK, *.INP, *.X, *.DDB) to the Contractor. These files include design standards, design criteria, slope selections, baseline name, profile names, contract plan sheet cells, guardrail information, etc. If the Contractor is required to modify the design criteria or any other files, the Government's Microstation level Library, color tables, line weights, symbology, etc., will be maintained. The Government will provide the Government's seed files, level library, color tables, line weights, symbology, font library, and cell files to the Contractor. When the design is completed, all project input/output files shall be provided to the Government in a format fully compatible with the software versions listed in Chapter 1.

The GEOPAK software has menu options to generate the following Government reports/files. The Contractor shall provide the Government the following reports/files in GEOPAK's current Government format:

Slope stakes
Red tops/Blue tops
Clearing
Seeding
Staking detail
Original cross section list
Design cross section list
Horizontal alignment
Profile grade
Earthwork volumes
HEC2 terrain ASCII file (input file for the HEC2 hydraulic analysis software)
WSPRO terrain ASCII file (input file for the WSPRO hydraulic analysis software)
Radial staking ASCII file (in order by station) which contains the x-y-z coordinates of all of the transit points and, for each terrain station, the x-y-z coordinates for the ROW lines, reference hubs, slope stakes, hinge points, shoulders, and centerline.

Table 29-3

3. **<u>Location Survey Files:</u>** The Contractor shall submit control point data in ASCII format with each record containing the point's identification (see PDDM, Chapter 5), north coordinate, east coordinate, and elevation. Digital terrain model high/low points and breakline points shall each have the same format as above.

4. **Photogrammetric Files:** The Government will provide the Contractor with the Government's Microstation seed files, level library, line weights, color table, symbology, font library, and cell files. Digital terrain model data shall be submitted in the most current 3-D Microstation software design files compatible with the software versions listed in Chapter 1. Contour and planimetric data shall be submitted in 2-D Microstation design files. Note: The Government will provide the Contractor with photogrammetric mapping, performed by the Government, in 3-D Microstation *.DTM files, 3-D mapping, and Microstation/GEOPAK *.TIN files.

5. **Word Processing, Spreadsheet, and Database Files:** For each Phase, all relevant files shall be provided in a format fully compatible, as appropriate, with the following:

Word Processing:	Microsoft Word 2003
Spreadsheets:	Microsoft Excel 2003
Databases:	Oracle, Microsoft Access 2003

6. **Engineer's Estimate Files:** The Contractor shall provide the Engineer's Estimate System (EES) in a format fully compatible for use as input to the Government's EES database. The Government will provide the Contractor with the current version of the EES program, including the pay item database and bid history. The EES is currently running on a Foxpro Database. Current versions of the EES pay items are available at http://www.cflhd.gov/design/ee.prog/.

These specifications will be updated as necessary to reflect changes in the Government software such as adding new software or updating to new versions of existing software. In such instances, the Contractor will be promptly notified.

Computer File Exchange Media: Electronic files shall be exchanged between the Government and the Contractor using the following media as appropriate for Windows Operating Systems:

1. **Compact Disc (CD):** Files on CD(s) should be actual size, not compressed.

2. **DVD:** Files on DVD should be actual size, not compressed.

3. **EMAIL:** Files 5 MB or smaller may be transferred via EMAIL. If compressed, the files should be self-extracting. Contact the COTR for access information.

4. Files may be placed on **EFLHD FTP** web site. Contact the COTR for access information.

5. Files maybe submitted by **Portable Hard Drives, Flash Drives**. Contact the COTR for procedures.

Copies: The Contractor shall provide hard paper copies (plan size 11”X17”) and electronic copies of the deliverables for each Phase of Work. For all deliverables, provide electronic copies in two electronic versions; an electronic version in the original electronic file format (i.e., Microstation (*.DGN), Microsoft Word (*.DOC), Microsoft Excel (*.XLS), etc.) and an electronic version in Adobe Acrobat (*.PDF) file format.