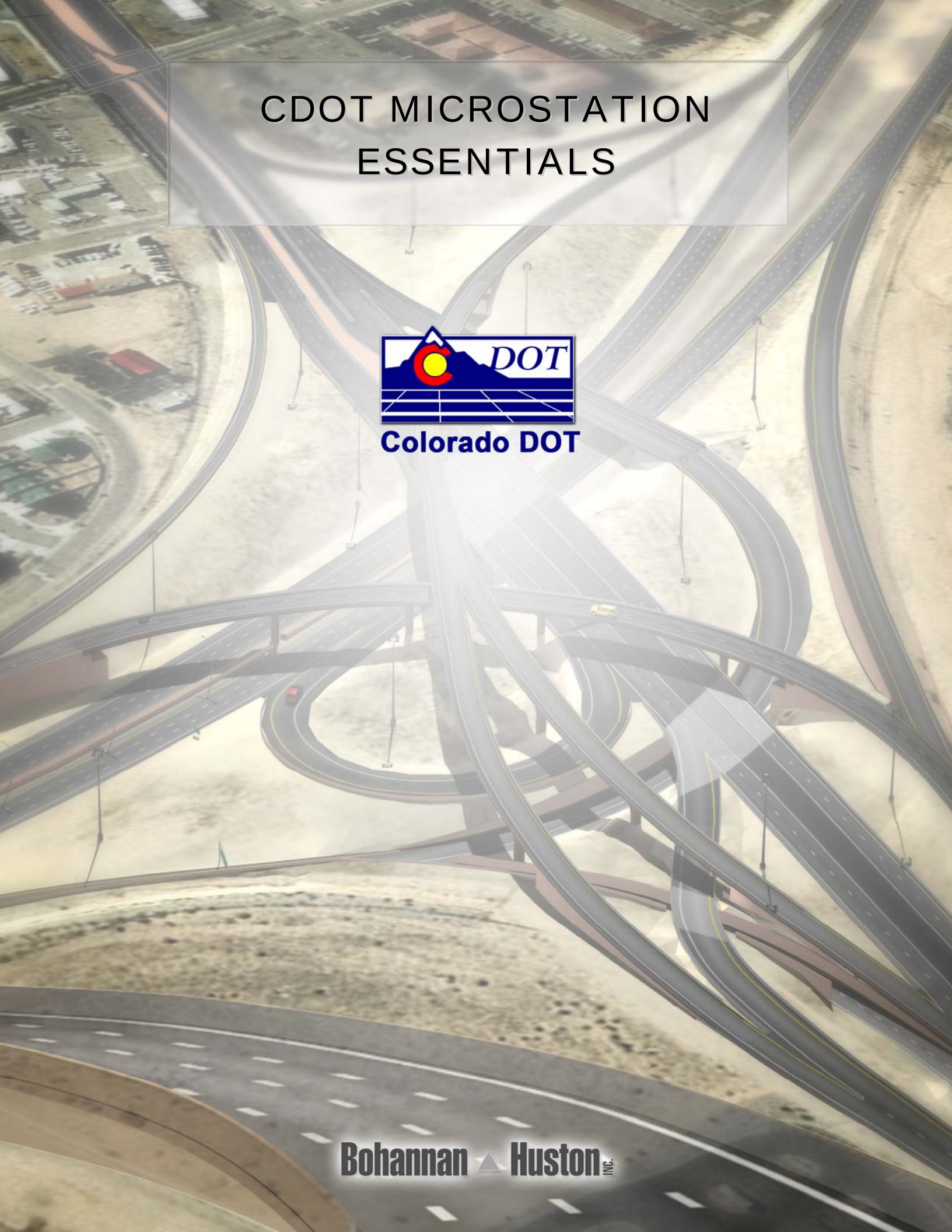
CDOT MICROSTATION ESSENTIALS



Colorado DOT

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Notice

Software Versions

The software products referred to in this publication are furnished under a license and may only be used in accordance with the terms of such license. This document intended for use with the following software versions:

MicroStation® version 08.05.02.55
InRoads® version 08.05.00.00 – Service Pack 5

11_08 – Version 03.02 CDOT Configuration

Document Conventions

There are several conventions that are used throughout this document to indicate actions to be taken or to highlight important information. The conventions are as follows:

Item	Meaning
View Perimeter	a command name or a file that you are to select
Tools > Options	a command path that you are to select – usually from the pull-down menus
Key in	entering data with the keyboard
Document name	style used when referring to another document
Note: text	information about a command or process that you should pay particular attention to
Emphasis	an important word or phrase
1. Numbered Steps	actions that you are to perform as part of the lab activities
<D> or **Data**	press the data button on the mouse
<R> or **Reset**	press the reset button on the mouse
<T> or **Tentative**	press the tentative button on the mouse

Table of Contents

Section 1 — Getting Started with MicroStation 1

1. Design File Basics 1

Mouse mechanics 1

Mouse points 1

Using the mouse 1

Wheel mouse settings 2

Starting MicroStation 3

The MicroStation Manager 4

Opening a MicroStation Design File 5

The CDOT Default MicroStation Interface 6

Pull down menus 7

CDOT Groups Menus 7

Toolbars 9

Tool Settings 11

The Primary toolbar 11

The Key-in Browser box 11

Views 12

Status Bar 14

Show/Hide toolbar options 16

Controlling the mouse 16

View Control toolbar 16

Setting Views for dual monitors 18

Training Directory Structure 19

How To Get Help 19

CDOT CADD & Engineering Innovation Web Site 19

Lab 1 – Getting Started 21

Objectives 21

Starting MicroStation 21

The MicroStation Manager Dialog Box 22

Opening files 22

Working with the Mouse 23

Access Pull-Down Menus 23

Post a pull-down menu from the command window 23

Open a Settings Box 24

Control Views 25

Turn on additional views 25

Fit View 1 26

Rotate all views to top 27

Zoom In within a view 28

Turn off the raster files 30

Zoom out in a view....31
Use the Window Area command....32
Fit views....34
Close some views....35
Make view one fill the screen....36
Mouse Wheel Settings....36
Use the wheel on the mouse to Zoom In/Out....36
Change the wheel settings....37
Pan the project site....38
Try Out Tool Boxes....40
Pull a tool bar from the main palette....40
Float and Dock Toolbars....41
Show/Hide Tools....43
Using the Key-In Box....44
Save settings....46
2. Levels....47
Using the Level Display box....48
Saved views....50
Working with Level Libraries....51
CDOT Level Libraries....51
CDOT Select Group Environment....52
Using the Level Manager....53
ByLevel symbology....54
Setting symbology overrides....57
Working with Level Filters....58
Setting the active level....60
Lab 2 – Levels....61
Objectives....61
Starting MicroStation....61
Working with levels....64
Sorting Levels....64
Turn levels on/off using Level Display....67
Turn levels on/off By Element....73
Save a view....78
Turn all levels on/off....78
Recall the saved view....80
Use key-ins to turn level on/off....81
Set the active level....82
Working with the Level Manager....84
Level Libraries....84
Change the look of the Level Manager box....85
ByLevel Symbology....86
Level Filters....89

3. Working in a CDOT 3D Design Model 97
2D vs. 3D 97
Using Active Depth 99
Using Display Depth 100
CDOT 3D Seed File Defaults 101
Active Depth 101
Display Depth 101
Lab 3 – 3D View Control 103
Objectives 103
Starting MicroStation 103
Checking element elevations 104
Rotating a 3D Standard View 110
Check the Active Display Settings 113
Check the Current Active Depth 113
Check Current Display Depth Settings 114
Turn On Raster Images 117
Section 2 – The CDOT MicroStation Workflow 119
4. Creating a CDOT Project 119
CADD Workflows 119
Model files vs. Sheet files 119
Model File Workflow for Survey/ROW 121
Model File Workflow Roadway Design 122
Model File Workflow for Specialty Groups 123
Sheet File Workflow for Roadway Design 124
Sheet File Workflow for Specialty Groups 125
CDOT CADD Resources 126
CDOT CADD & Engineering Innovation Web Site 126
Single Source Project Data 131
Project set-up 131
Project set-up 132
The Create Project Directory Utility 132
The PCF file 134
Working in a server environment 134
The CDOT Project Directory Structure 135
Training Project Directory 136
Training files 136
CDOT file naming convention 137
Auto-populated files 138
What files go where? 139
The CDOT Workspace 142
The Select Group Environment Utility Revisited 143
Configuration releases 144

The CDOT Level Structure 145
Level naming convention 147
Levels and configuration releases 147
Creating a new CDOT Model file 147
Creating a new CDOT Model file 148
Creating a model file from an auto-populated file 148
Creating Model files from seed files 148
CDOT default settings 148
Working Units 149
Coordinate Readout 150
Referencing others work 150
Attaching References 151
Nested References 151
The Copy Attachment Option 153
Working with Raster Attachments 153
Reference Levels 153
Lab 4 – Creating the Project and Design Model 155
Objectives 155
Create a Sample 99999 project 155
Select Group Environment 157
Start MicroStation 158
Set the Workspace components 158
Create a new Design Model File 159
Creating a new design file using a CDOT seed file 159
Check settings 161
Create a new file by copying an auto-populated model file 163
Check settings 164
Attach the Survey/Topo reference 165
Turn survey levels on/off 168
Live Nesting 175
Update project 99999 181
5. Creating Your Design Graphics 185
The CDOT Menu 185
Opening the menu 185
Parts of the menu 186
Placing Graphics 189
The CDOT Drafting Menu 189
MicroStation Drawing Tools 189
MicroStation Drawing Tools 190
Tool Settings 190
Snap Lock 191

Using AccuSnap 193
- Turning AccuSnap on/off 193
- To snap to an element using AccuSnap: 193
- Multi-Snaps 194
- Precision keyins 195

AccuDraw 196
- Starting AccuDraw 196
- The AccuDraw Compass 197
- The AccuDraw Window 197
- AccuDraw locks 197
- Rotating the AccuDraw compass 198
- Moving the AccuDraw Origin to your cursor location 200
- Shortcut snap modes 200

Deleting elements 200
- To delete an element: 200

Using the Undo and Redo commands 201
- Compressing the design file 201

Element Information 202

Lab 5A– Drawing Basics using the CDOT Menu 203

Objectives 203

Create a Miscellaneous Details file 203

Check Seed File Settings 204

Open the CDOT Menu 206

Place practice graphics with the CDOT Menu 209
- Place Lines 209
- Place Circles 213
- Place Arcs and Shapes 215

Delete and Undo 220
- Delete an element 220
- Undo and Redo the deletion 222

Change the Element Highlight Color 222

Delete all 223

Lab 5B – Draw the Median Island Nose Section 225
- Draw the concrete gutter pan section 226
- Draw the median cover 228
- Draw the pavement section 229
- Draw the subgrade section 229

6. Manipulating and Modifying Design Graphics 231
Using Manipulate tools 231
Using the Modify tools 234
Drawing graphics in 3D 238
Active Depth 238
Depth lock 238
Depth lock and AccuSnaps 238
Using the CDOT Menu ModZ Add On 239
Custom Line styles 239
Setting the Scale 239
Changing the scale 240
Changing Direction 240
Changing Levels and ByLevel Symbology 241
Using Element Information 241
Using the Change Element Attributes tool 241
The CDOT Misc. Toolbar 243
Tags 244
Lab 6A – Place Guardrail lines 245
Objectives 245
Open the Design model file 245
Draw the Guardrail 246
Create the guardrail trace lines 246
Trim the trace line for the extent of the guardrail 248
Check the Depth lock 251
Place the guardrail lines 252
Change the custom line style direction 257
Change the custom line style scale 258
Delete the trace lines 259
Use the Element information to change levels 259
Turn rasters back on 261
Lab 6B – Create 3D Utility Graphics 263
Objectives 263
Create the Utility model file 263
Attach references 264
Raster Images 265
Work with references 266
Use the Copy Attachment option 268
Drawing in 3D (using Depth lock) 271
Place overhead electrical lines 271
Place proposed gas lines 275
Place fiber optic lines using parallel copy 278
Move the utility model to the Reference Files folder 284

7. Cells and Patterns 287
Understanding cells 287
Cell libraries 287
What Are MicroStation Models? 287
CDOT Cell Libraries 290
The Cell Library Dialog 291
Types of cells 293
Placing cells with the Place Active Cell Command 294
Placing cells with the CDOT Menu 297
More information 298
Creating Cells 298
Understanding patterns 299
Patterns toolbar 299
Placing patterns with the CDOT Menu 303
Lab 7A – Create Landscape graphics 305
Objectives 305
Create the L&E model file 305
Place silt fence 307
Place Haybales 309
Create wetlands 311
Lab 7B – Create Hydraulics graphics 315
Objectives 315
Create the Hydraulics model file 315
Place Inlets 316
Connect the inlets with pipes 320
Place a Type C inlet and connect pipes 322
Place the pipe terminator 327
8. Grouping Design Graphics 329
Temporary groups 329
Using Selection Sets 329
Using Fences 331
Semi-permanent groups 333
Groups toolbar 333
Drop Element 333
Creating Complex elements 334
Add to Graphic Group 335
Drop from Graphic Group 336

Lab 8 – Draw a bridge typical section 337
Objectives 337
Create a Bridge Model file for details 338
Draw a bridge typical section 340
Draw the slab construction lines 340
Create the bottom slab construction line 342
Create the slab left side 342
Place the girders 344
Place additional girders 345
Move the girders down to establish the haunch depth 347
Place the Bridge Rail 349
Extend elements 351
Draw the slab 352
Create the top of pavement 357
Clean-up lines at the rails 358
Complex the bridge rail graphics 360
Create a Selection Set of the Bridge Section 362
Create a Graphic Group of the Bridge Section 362
Pattern pavement and slab 364
9. Creating Sheets 367
Roadway Design group 367
Specialty Groups 369
Other sheets 370
More Information 370
Rotating Views 371
Rotate the Plan View with a Keyin 371
Rotate the Plan View by 3 Points 371
Rotate the Plan View by Element 371
Placing Borders 372
Using the CDOT Menu for Border Placement 372
Creating a Project-Specific Border Cell 373
Editing text on the Border 373
Measurement Tools 375
Measuring in 3D 375
Measure Distance 376
Measure Radius 376
Measure Angle 376
Measure Length 376
Measure Area 377
The CDOT Custom Measure XY Distance tool 378

Lab 9A – Create a plan/profile sheet for the intersection 379
Objectives 379
Review Plan/Profile sheets 379
Create a new sheet file 380
Attach the Model file 381
Rotate the View using the 3-point method 383
Place the Border Cell 385
Placing a Clip Boundary 388
Clip the Reference File 389
Turn off the profile grid and text 390
Attach the Design Profile 390
Move the profile reference 391
Place the bar scale, north arrow and RE cells 393
Turn on the reference display 396
Optional exercise 396
Lab 9B – Create a project specific border 397
Objectives 397
Create the border file 397
Use the CDOT Menu to create the border 398
Move the border 400
Edit the border text with project specific information 401
Make the border a cell 402
Lab 9C (Optional) – Create a 40-scale plan sheet 403
Objectives 403
Open the model file 403
Determine the rotation angle for the sheet 404
Place the plan limits cell 405
Create the drawing file 407
Attach the Model file 407
Rotate the View 409
Attach the Border Cell 410
Place the border 411
Place the Clip Boundary 413
Clip the Reference File 413
Place the bar scale and north arrow 415
Set the Text Scale Factor 416
Edit the Bar Scale 417

Lab 9D – Create a Typical Section Sheet 419
Objectives 419
Create a new sheet file 419
Attach the border cell library 420
Replace the border 420
Edit the border text for a Typical Section sheet 421
Check Model Properties 422
Start the Typical Section Program 423
Create a 2-Lane Rural Typical Section 425
Create a 2-Lane Urban Typical Section 427
Save the 2-Lane urban section input file 428
Align the Sections 428
Lab 9E – Create a Bridge General Layout Sheet at Different Scales 431
Objectives 431
Open the bridge model file for plan 431
Reference the Design Model file 431
Move the Bridge Model to the Reference_Files folder 433
Open the bridge model file for section and details 434
Create Saved Views 435
Move the model file to the Reference_Files folder 437
Create the Sheet file 439
Reference the Plan graphics 440
Place the border 442
Reference additional graphics at various scales 444
Lab 9F – Create a General Notes Sheet 447
Objectives 447
Updating Links 447
Editing the Notes 449
Review the changes in the sheet file 452
Re-link the Word document 453
Lab 9G – Create the Standard Plans List Sheet 457
Objectives 457
Open the Sheet File 457
Update the M&S Index 458
Fill in the Border Information 460
Lab 9H – Create a Title Sheet 463
Objectives 463
Open the Title Sheet file 463
Updating Links 464
Edit the spreadsheet file 465
Edit the Border Text 467
Place the RE cell 469

Review the Vicinity Map....470
Attaching a vicinity map as a reference file....472
Move the reference file to align with the title sheet....474
Clip the vicinity map reference....475
10. Annotating and Plotting Sheets....477
Understanding Text and Text Styles....477
Text styles....477
Text toolbar....478
CDOT Menu text....481
Using the Greek characters font....485
Understanding Dimensions and Dimension Styles....486
Dimension Styles....486
Placing Dimensions using the CDOT Menu....486
Dimension toolbar....488
Using the Match Dimension tool....488
Plotting....489
Workflows....489
Printer Drivers....489
Location of PDF files....490
Additional Plotting Workflows....491
Additional Plotting Information....491
Assembling Plan Sets....492
Lab 10A – Annotate the Intersection Plan/Profile Sheet....493
Objectives....493
Start MicroStation....493
Check Text Annotation Scale....494
Work with sheet levels and references....494
Edit the bar scale text....495
Label the Intersection Alignments....495
Set the active angle for placing the county road text....495
Set the text attributes using the CDOT Menu....496
Set the active angle for the main alignment text....497
Place the SH 86 text at the active angle....498
Rotate the InRoads alignment text....498
Place Notes....500
Attach Utility Lines....502
Reference the proposed Utility model....502
Annotate the gas line....504
Annotate the fiber optic line....506
Measure Graphics....507
Measure Distance....507

Lab 10B – Annotate the Bridge General Layout Sheet.....511
Objectives.....511
Start MicroStation.....511
Place Text.....512
Set text attributes.....512
Change the Text Annotation Scale.....513
Dimension the Bridge Typical Section.....514
Dimension the travel lanes and shoulder by element.....514
Dimension the bridge rail curb using linear dimensions.....517
Place additional linear dimensions.....519
Measure the typical section.....519
Edit dimensions.....519
Dimension the Plan.....523
Dimension the bearing of the centerline.....523
Measure the bridge area.....523
Place a note with a curved leader.....524
Dimension the Girder Detail.....526
Lab 10C – Printing to a Printer.....529
Objectives.....529
Start MicroStation.....529
Prepare the sheet for plotting.....529
Print the sheet (classroom printer).....530
Print the sheet (CDOT workflow).....530
Optional Exercise.....531
Lab 10D – Batch Printing to PDF.....533
Objectives.....533
Select Files to Batch Print.....533
Set Batch Process Specifications.....534
Save your Specifications to a Job file (*.job).....538
Create the Batch Prints.....539
Review the PDF files.....539

Index.....511

Section 1 — Getting Started with MicroStation

In this section, you will learn the basics of working in a MicroStation design file. This includes opening and navigating in a design file, working with Levels and understanding 3D design file basics.

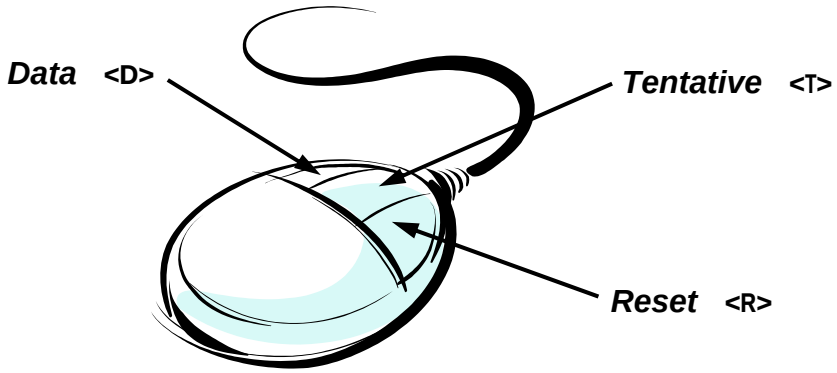
Once you have mastered basic MicroStation principles in Section 1, you will learn how CDOT specifically uses MicroStation in Section 2. Here you will learn the CDOT MicroStation workflow and apply this workflow to create model file graphics, compose sheet files, annotate and dimension sheets, and plot the sheets.

1. Design File Basics

Mouse mechanics

There are three types of mouse "points" you can execute in MicroStation. These points correspond to the different buttons on the mouse. The default settings are:

Mouse points



Data point **<D>** — used to select tools, pull down menus, *etc*., identify coordinate locations, place and manipulate elements, or confirm actions before they take place. The left button is the default data button. Used when prompted to Accept.

Tentative point: **<T>** — used to temporarily locate a point in space or an element. The middle button (or wheel) is the default tentative button.

> **Note:** to execute a tentative point on a two button mouse, simultaneously **click** the right and left buttons.

Reset: **<R>** — releases the current operation or rejects a highlighted element. The right button is the default reset button. Used when prompted to Reject.

Using the mouse

Click — tap the mouse button once.

Double **click** — tap the mouse button twice quickly.

Snap — locate an existing point on an element by using a **<T> ,** then **<D>** to accept.

Wheel mouse settings

MicroStation V8 supports wheel mice. You can set your middle wheel to perform several different view control options including Zoom In/out, pan radial, pan with zoom, *etc*. Select **Workspace > Preferences > Mouse** to configure the wheel on your mouse.

Starting MicroStation

To start MicroStation on the Windows platform:

- From the Windows Start Button, select
  Start > All Programs > MicroStation > MicroStation.

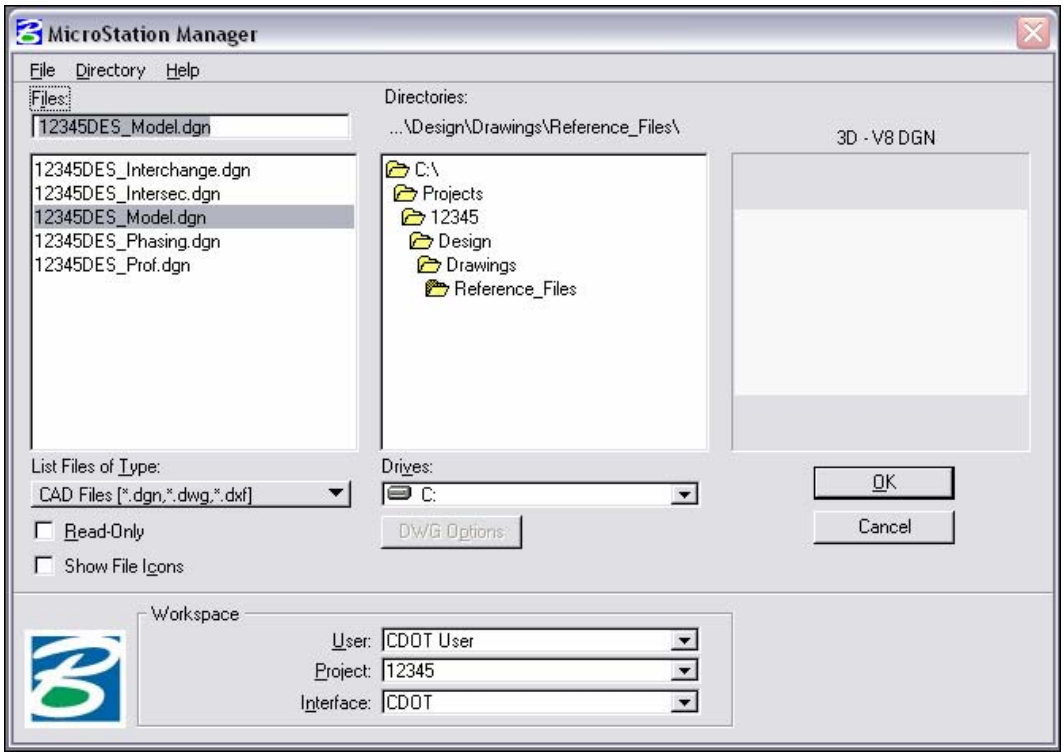
or

- **Double-click** on the **MicroStation V8** icon located in the MicroStation product directory
  (usually **c:\Program Files > Bentley > Program > MicroStation**) or on your desktop.

MicroStation will start and the **MicroStation Manager** dialog box will appear on your screen.

The MicroStation Manager

The **MicroStation Manager** is your file management interface to MicroStation.



By default, a MicroStation design file has an extension of ***.dgn***. "Design file" is a generic term used to describe all MicroStation files, regardless of their use – design, drafting, *etc*. In addition to MicroStation V8 DGN files, you can also open previous version MicroStation files and AutoCAD files (***.dwg*** or ***.dxf***). This is designated under **List Files of Type** drop-down.

Use the **File** pull-down menu to create new MicroStation design files, open existing files or copy, rename or delete existing files. You can also compress a file, which permanently removes the deleted elements and reduces the file size. You can quickly access the last 10 files opened.

Use the **Directory** pull-down menu to create or copy existing directories (folders).

In the Workspace category, select

User: Your login name

Project: Your project name – this is the same as your JPC number

Interface: **CDOT** for the customized CDOT Groups menu and special CDOT interface settings.

For ***Training purposes*** your workspace settings will be:

User: ***CDOT User***

Project: ***12345*** (the JPC for this class)

Interface: ***CDOT***

Note: A more detailed discussion of the CDOT Workspace, which is set with the **Project** and **Interface** options, will take place in Chapter 4.

Opening a MicroStation Design File

To open a MicroStation design file:

- Set **Drives** to the drive containing your file.

- Navigate to the correct directory.

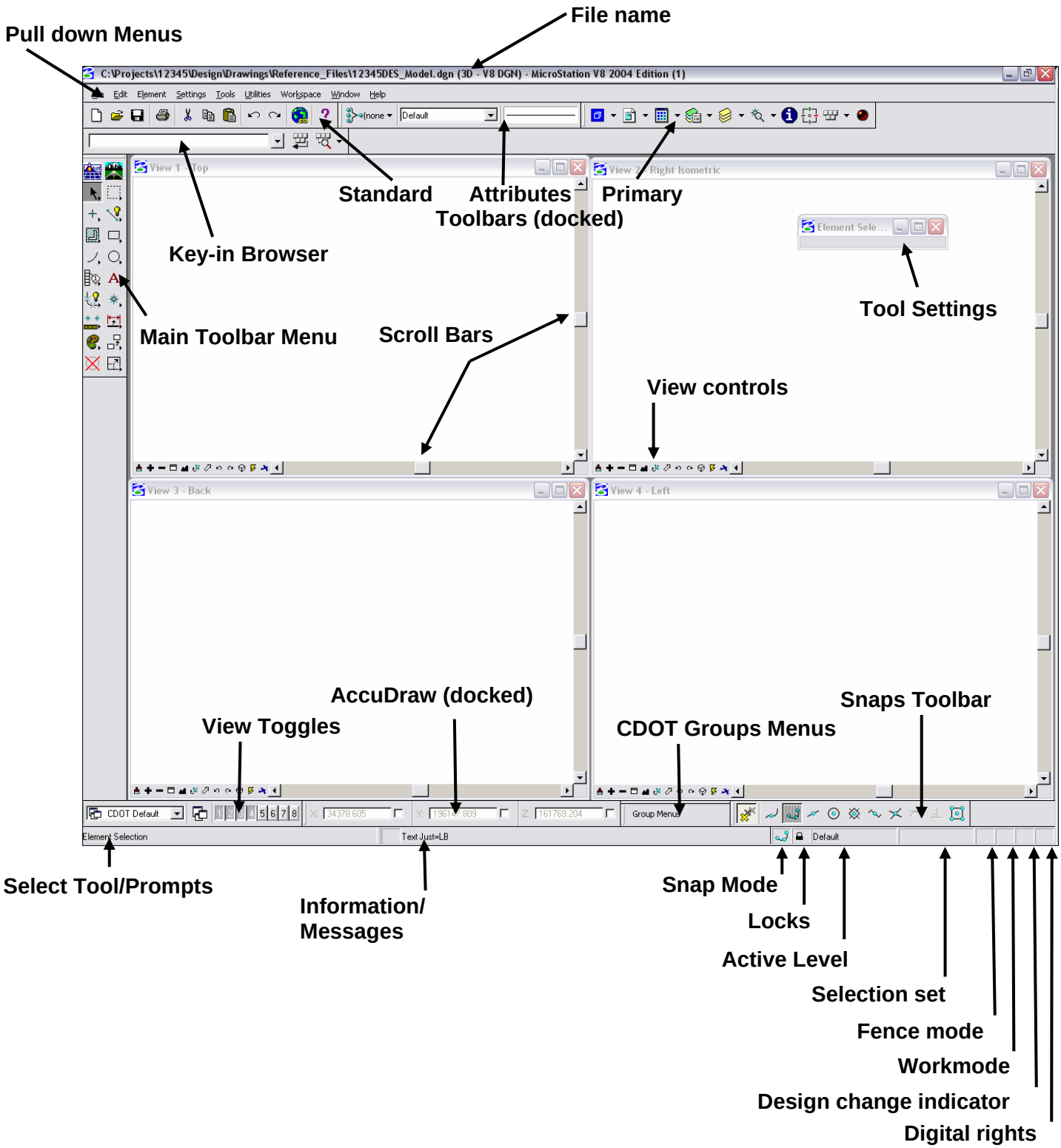
Set **List of File Types** to **MicroStation All files** (***.***) (or to the type of file you wish to open.)

- **Click** to highlight the file.

Click OK.

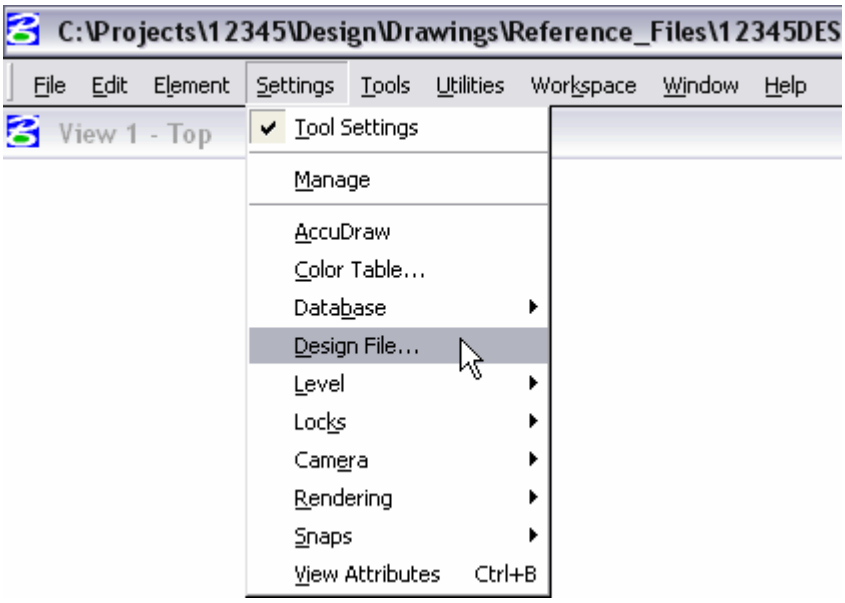
Note: MicroStation design files have a default extension of ***.dgn***, but can have any extension.

The CDOT Default MicroStation Interface



The different parts of the MicroStation screen are:

Pull down menus

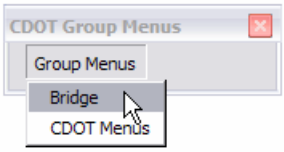


- Pull down menus are used to access MicroStation toolbars, settings and dialog boxes.
- An arrow next to a pull-down command indicates sub-menu options.
- **...** Indicates a dialog box to open.

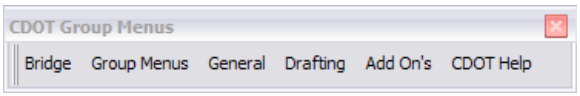
CDOT Groups Menus

The **CDOT Group Menus** contain custom menus specific to CDOT disciplines.

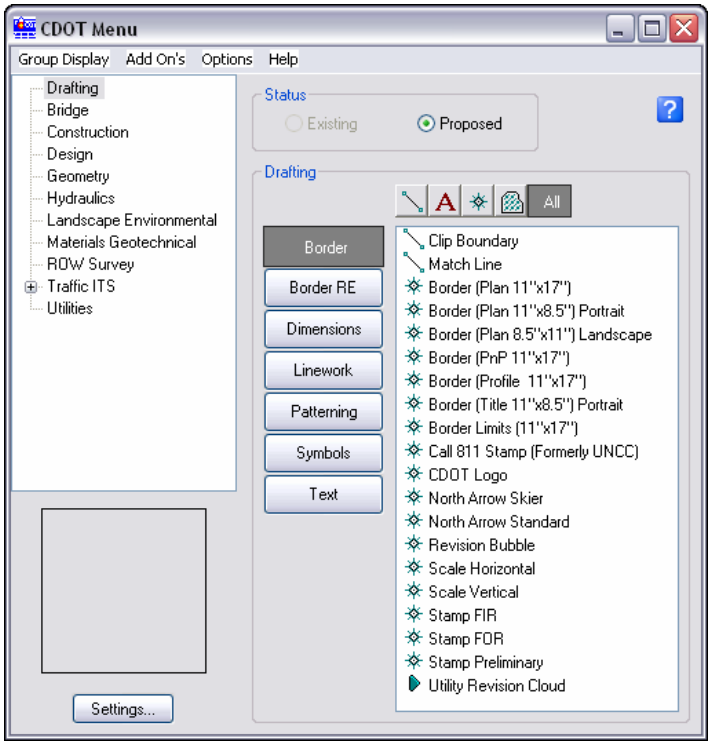
There are two options from the Group Menus pull-down: **Bridge** and **CDOT Menus**.



The Bridge Menu provides custom settings for the Bridge Specialty Group.



The CDOT Menus option provides automation tools and custom programs for general drafting and all other specialty groups.

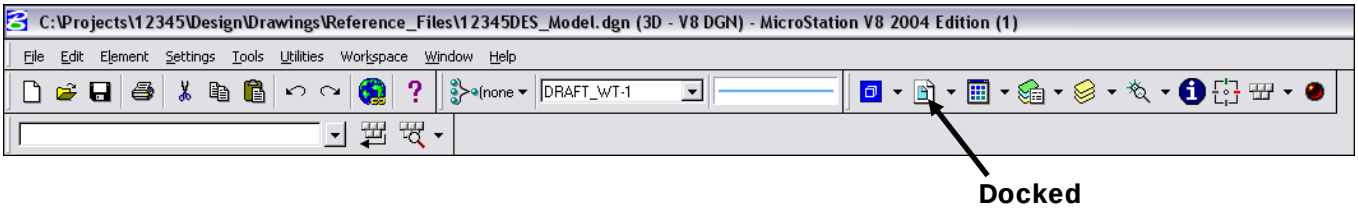


If you close the CDOT Menu and wish to re-open it, select the **CDOT** icon from the **Main** toolbar.

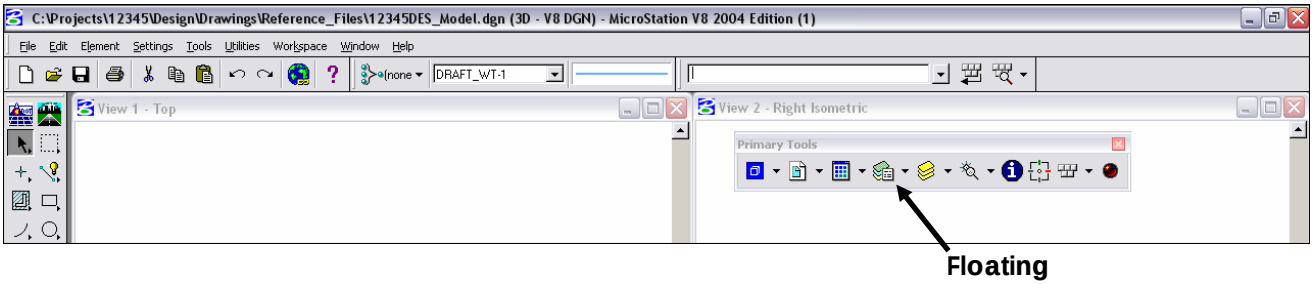
The CDOT Menu is discussed in detail in Chapter 4.

Toolbars

- MicroStation's tools for creating and manipulating your design elements are organized into logical groupings called toolbars.
- Each tool is represented by an icon on its toolbar.
- Toolbars can be opened, closed and moved around the screen like dialog boxes, views and the command window.
- Toolbars can be "docked"

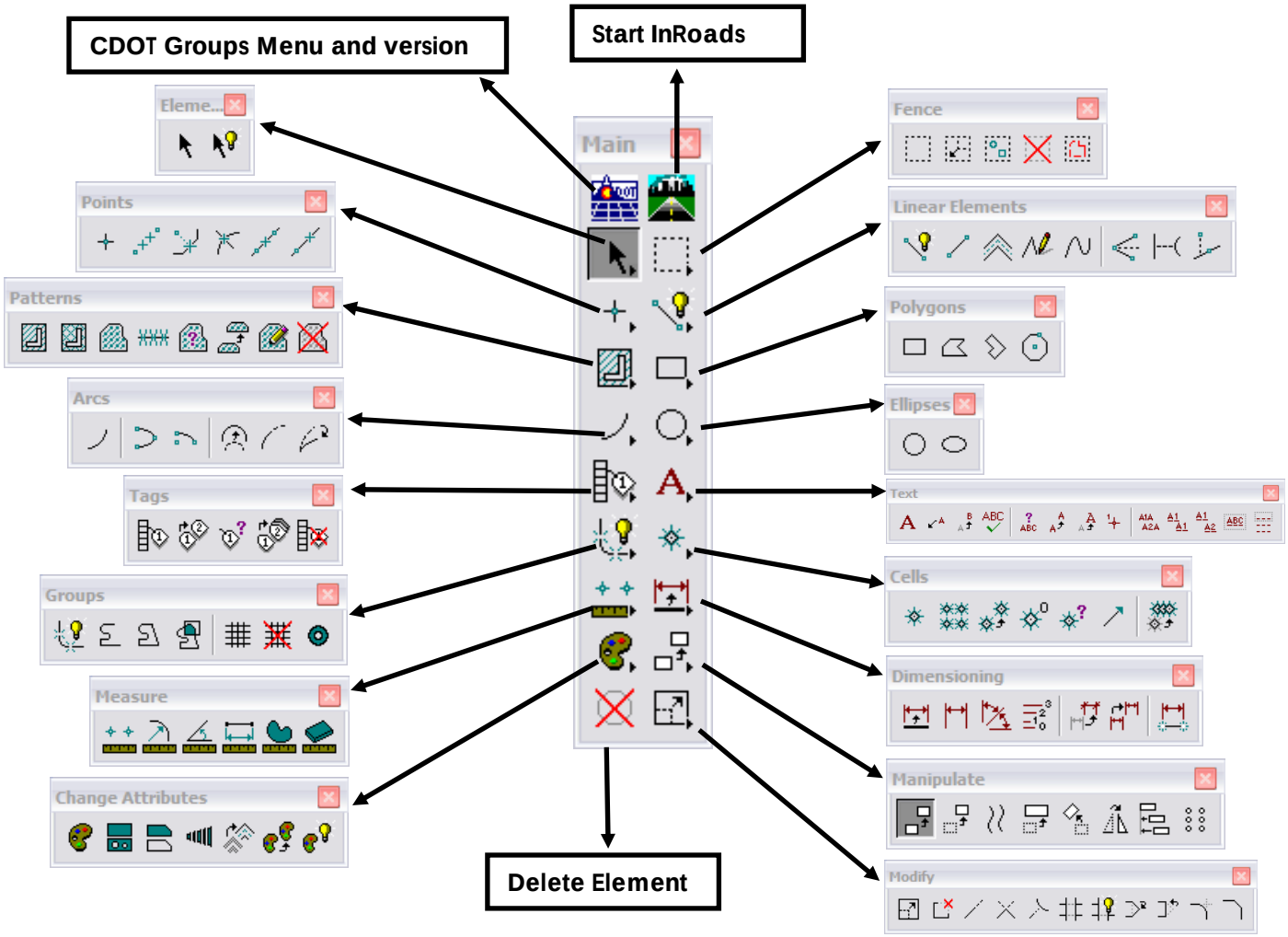


- Or "floated" within the drawing workspace.



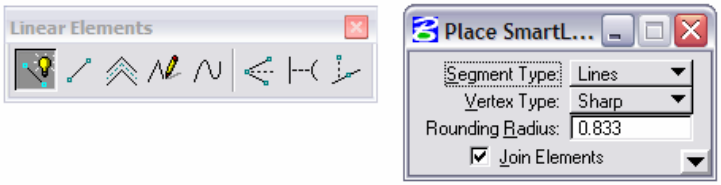
- Most toolbars can be accessed from the menu or from the **Main** toolbar.

The Main toolbar



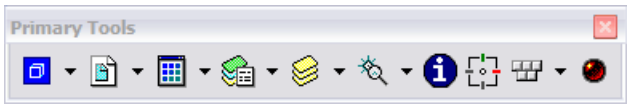
- The **Main** toolbar opens automatically when you start MicroStation. If you close the **Main** toolbar and want to re-open it, select **Tools > Main > Main** from the command window.
- The **Main** toolbar is where you access other toolbars where most of your drawing tools exist.
- To open a toolbar from **Main**, select one of the tool icons and drag the cursor away from **Main** while pressing the data button on the mouse (float the toolbar).

Tool Settings



- Many tools have parameters or settings associated with them, which are shown in the **Tool Settings** dialog box. Each time you select a new drawing tool, the optional settings will appear in the **Tool Settings** box.

The Primary toolbar



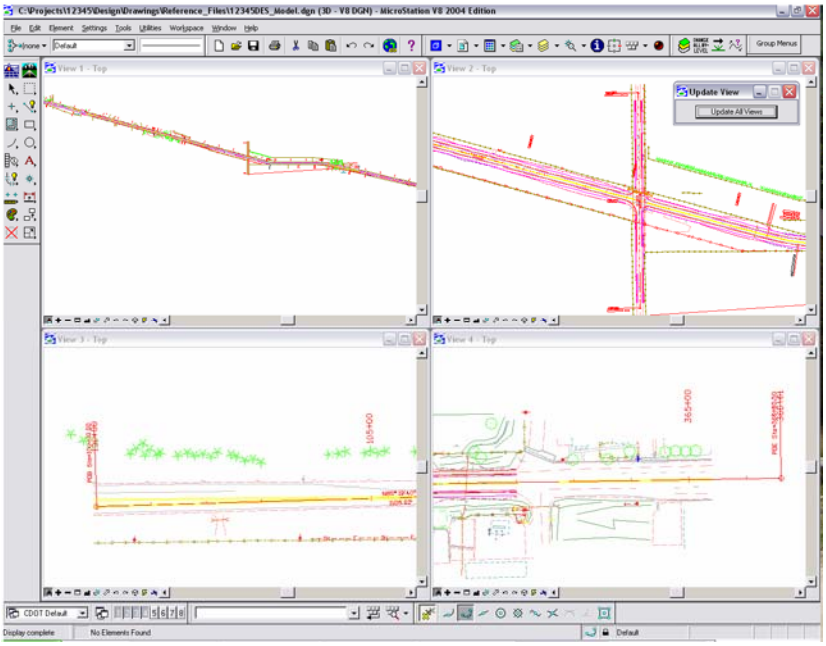
- The **Primary** toolbar contains commonly used MicroStation tools discussed later.
- This is one toolbar you'll frequently use, so you will probably want to open and dock it.
- Select **Tools > Primary** to toggle on the Primary toolbar.

The Key-in Browser box

- Many MicroStation commands can be accomplished by keying in the command text (*e.g.* ***Place Line***).
- Key-ins can also be used to input data (*e.g.* ***xy=<x,y,z>*** to locate a coordinate).

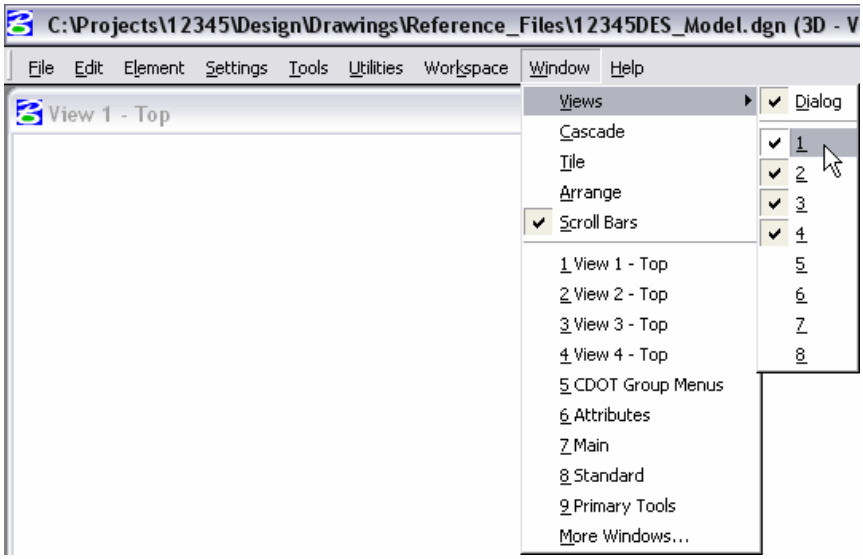
  Note: key-ins are ***not*** case sensitive.
- This is another toolbar you'll frequently use. Select **Utilities > Key-in** to open, then dock the box.
- When you're ready to key in a command, set the focus in the Key-in box by data pointing in it or use the **<Esc>** key.
- After you key in the command, use the **<Enter>** or **<Tab>** key to activate the command.

Views



- The area where graphics are placed is called a view.
- Up to eight view windows can be opened.
- Open and close views from **Window > Views** or the **Views** dialog box.
- You can set different view perspectives (top, front, rotated, *etc*.)

Opening views



A view or view window is the area in which you place graphics and view your design. Up to eight view windows can be opened at one time. You can open and close views from the **Window > Views** pull-down menu.

You can also select **Window > Views > Dialog** to open the **View Groups** toolbar where you can quickly turn views on or off.

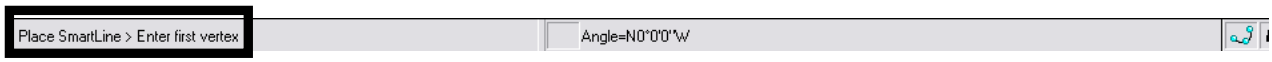
View Groups toolbar

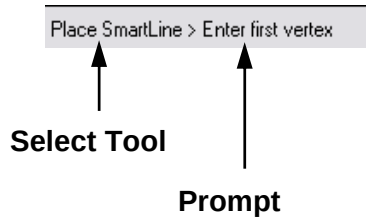
- You can use the control buttons in the upper right-hand corner to maximize, minimize or close a view.

Status Bar

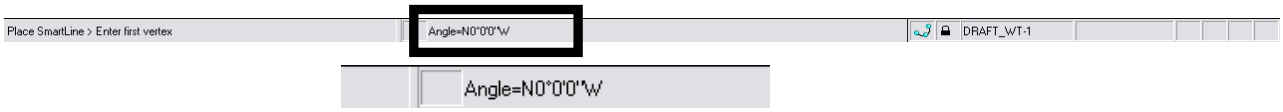
The **Status Bar** is MicroStation's command center composed of the following areas (left to right):

- ***Select Tool*** – displays the name of the active drawing tool.
- ***Prompt*** – displays the next user operation needed by MicroStation.

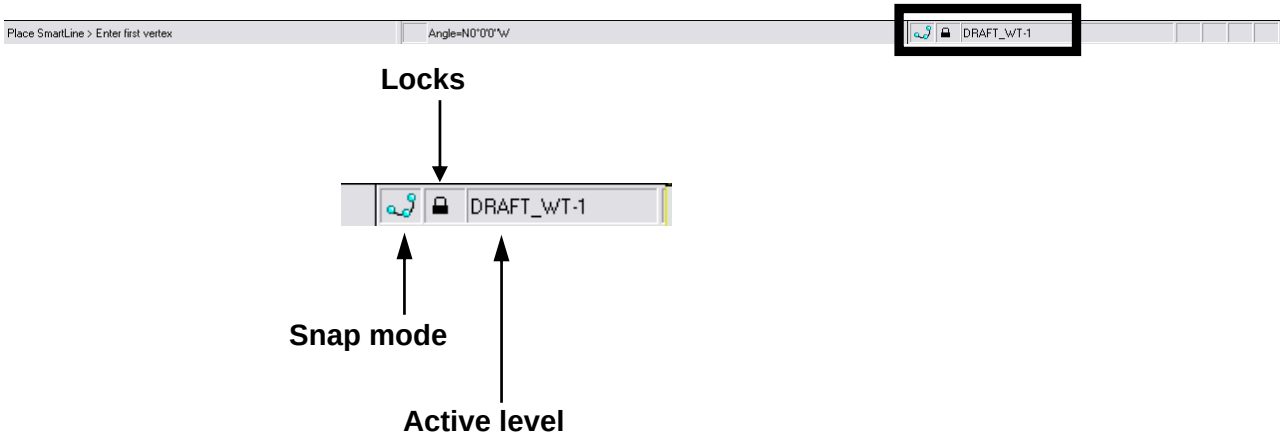




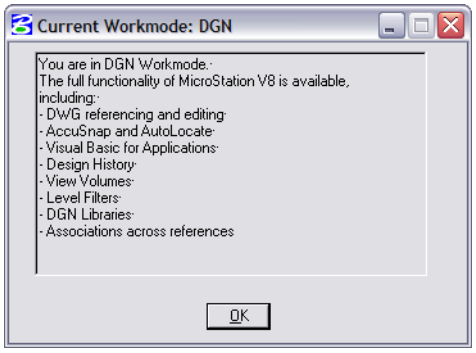
- ***Information and messages*** – displays current element parameter settings, error messages, *etc.* A data point **<D>** in this area activates the **Message Center**.



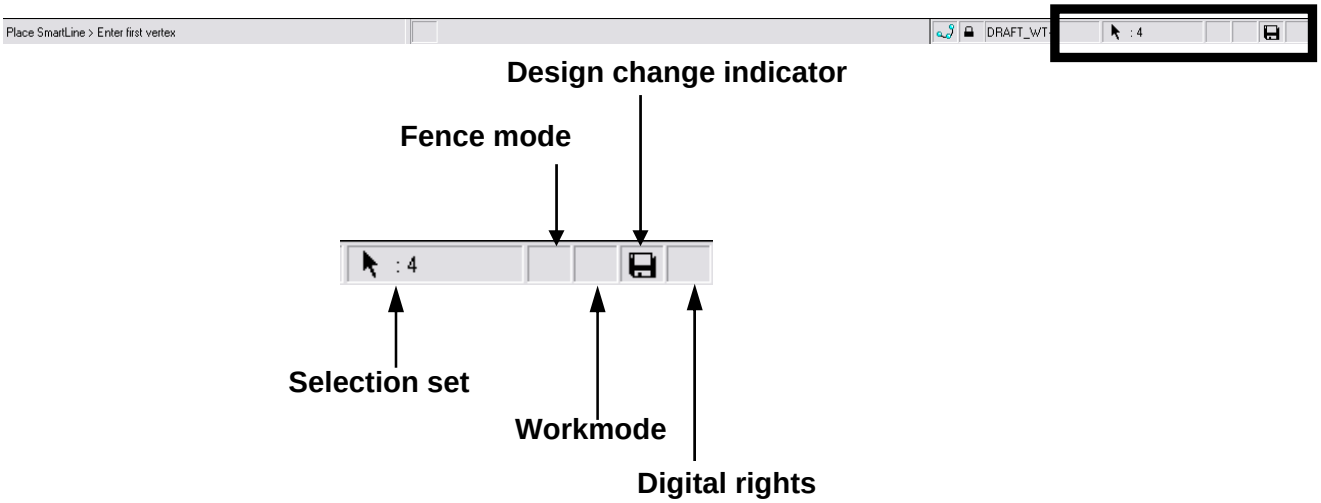
- ***Snap mode*** – displays the active snap mode used in conjunction with a tentative point or AccuSnap.
- ***Locks*** – displays a list of locks that you can quickly toggle on/off.
- ***Active level*** – displays the current level on which graphics are placed. A data point **<D>** in this area activates the **Level Manager**.



- ***Selection set*** – displays number of elements in the current selection set. A data point **<D>** in this area activates selection set commands.
- ***Fence mode*** – displays the active fence mode setting. A data point **<D>** in this area allows you to change the active fence mode.
- ***Workmode*** – a data point **<D>** in this area displays the current Workmode – DGN (or V8), V7, or DWG.



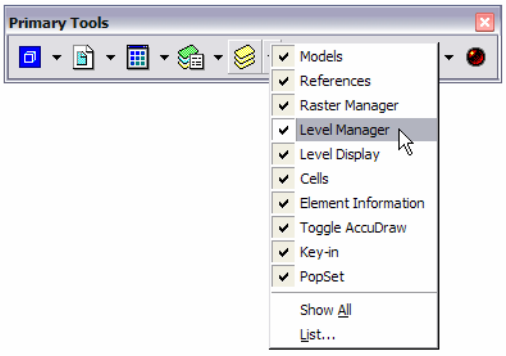
- ***Design change indicator*** – a floppy icon indicates the file has been graphically modified.
- ***Digital rights*** – displays if the file is protected for digital rights (user access control).



Many of these concepts will be covered in later sections.

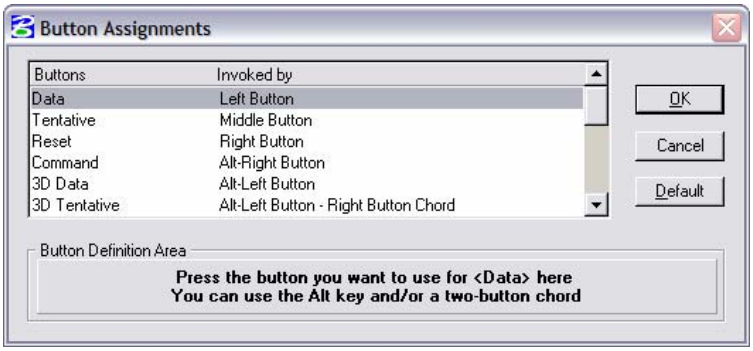
Show/Hide toolbar options

You can select which tools you want to include on any toolbar. This helps streamline your toolbars for the way you work and lets you customize your MicroStation setup.



To show/hide tools, **right click** on any toolbar and toggle the tools on/off as desired. The changes are stored in your MicroStation Workspace.

Controlling the mouse



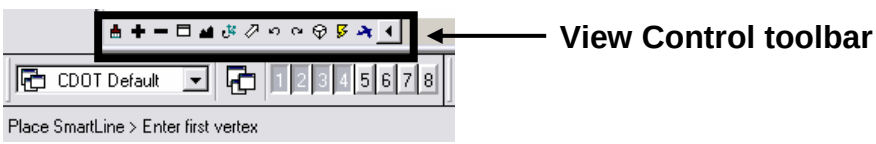
By default, the left mouse button is the **Data** button, the right is the **Reset** and the middle is the **Tentative**.

> **Note**: The middle button may be the scroll wheel on some mice. If so, press the wheel to execute a tentative point.

You can change these button assignments by selecting **Workspace > Button Assignments**.

View Control toolbar

The **View Control** toolbar located in the lower-left corner of each view allows you to adjust what you see in that view and to maneuver around in the view. The horizontal and vertical scroll bars also help you move around in the view. To use the **View Control** toolbar and scroll bars, turn on the option **Scroll bars on View Windows** under **Workspace > Preferences > View Windows**.

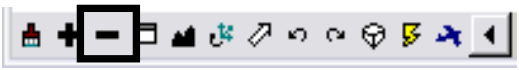


Use the following **View Control** tools as follows:

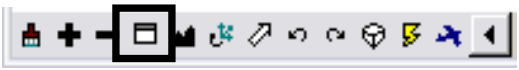
- ***Update View*** — to update a view (refresh or redraw).

- ***Zoom In*** — to increase the magnification of a view by Zoom factor.

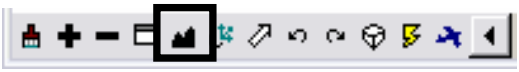
- ***Zoom Out*** — to decrease the magnification of a view by Zoom factor



- ***Window Area*** — to increase the magnification of a view by drawing a "box" around the area you want to see close up.



- ***Fit View*** — to show all displayable elements in a view.



- ***Rotate View*** — to rotate the view (top, front, *etc*.)

- ***Pan View*** — to move around in the view (up, down, right, left, *etc*.)

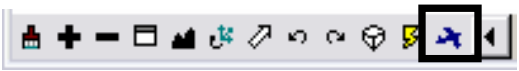
- ***View Previous*** — to step back through view operations.

- ***View Next*** — to step ahead through view operations.

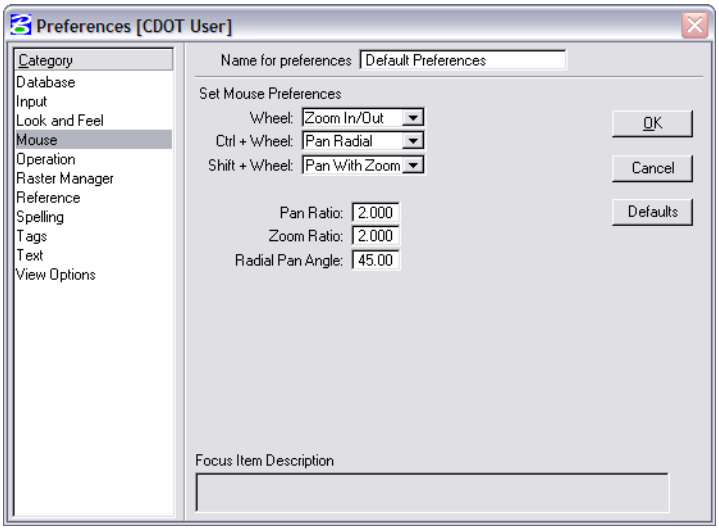
- ***Change View Perspective*** – to change the view's perspective angle

- ***Set View Display Mode*** – to set how 3D graphics will render.

- ***Navigate Camera*** – to interactively "fly" through a design (3D).



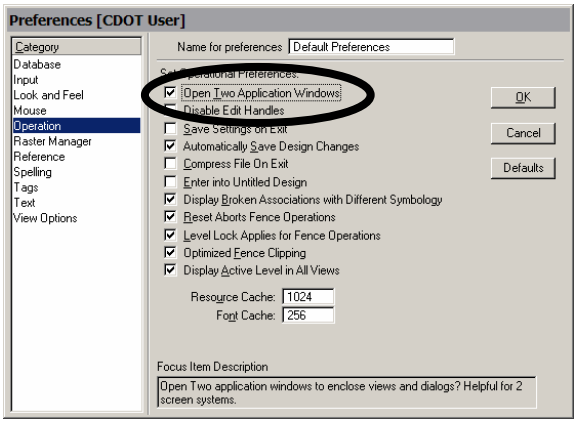
You can set your middle wheel to perform several different view control options including Zoom In/out, pan radial, pan with zoom, *etc.* These options are set under **Workspace > Preferences > Mouse**.



Setting Views for dual monitors

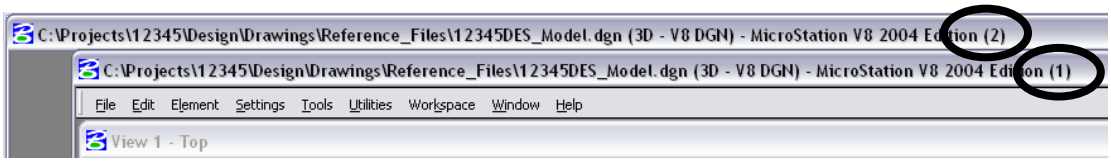
The default CDOT MicroStation workspace is set up to recognize dual monitor machines. However, in case these settings are changed, follow the steps below to reset this feature.

- Start MicroStation.
- Select **Workspace > Preferences > Operation** and toggle on **Open Two Application Windows**.



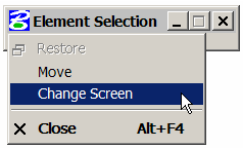
- Select **File > Save Settings**.
- **Exit**, then restart MicroStation.

When MicroStation starts this time, it will open two different windows.



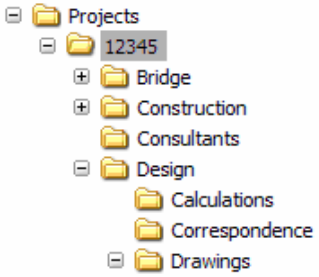
You can drag one window to the other monitor. (***Click on the title bar and drag the window– don't stretch it***). When you maximize the window, it will fill the screen, but stay on the monitor where you placed it rather than trying to span the monitors. In MicroStation, Views 1-4 open in application window 1, while Views 5-8 open in application window 2.

You can drag most MicroStation windows from one monitor to the other, but there are some that will not allow dragging. If you run into one, pick the Bentley logo in the upper left corner and choose Change Screen to move the dialog or menu to the other screen.



Training Directory Structure

All of the files for this class are located in the **C:\Projects\12345** directory. This directory structure, as well as the file names used, conforms to the CDOT standards. More information on the CDOT directory structure and file naming convention is found in **Chapter 4 – Creating a CDOT Project**.



How To Get Help

There are many resources available to assist you when working on your CDOT CADD project. These resources can be found on the CDOT CADD & Engineering Innovation Web site. See ***Chapter 4, CADD Resources*** for detailed information on each of these options.

CDOT CADD & Engineering Innovation Web Site

The CDOT CADD & Engineering Innovation web page is available at:

http://internal/cadd/ It can also be found on the internal CDOT website:

Organizations > Project Development > CADD and Engineering Innovation.

The website (presently only available to CDOT) provides CDOT users with up to date information, tools, and resources related to CADD and the Colorado Engineering Software Transition (CEST) project.

This website is a valuable resource for CADD users and includes:

CADD Library

The **CADD Library** page provides links to manuals, newsletters, standard details, *etc*. One extremely useful link is to the **Tips and Tricks** section for MicroStation and InRoads. This information changes daily, so check back often.

CADD Manual

The CDOT **Computer Aided Design and Drafting (CADD) Manual** outlines CDOT's use of Bentley's MicroStation and InRoads software. It can be accessed several different ways including:

- From the CDOT internal CADD web site home page link;
- From the CDOT Design and Construction Project Support Page (external web site);
- From the CDOT Menu (**Help > CADD Manual**).

CDOT Workflows

There are several standardized MicroStation and InRoads workflows that CDOT has developed to assist you. In addition to accessing the workflows from the CDOT CADD Web site Home page link **CDOT Work Flow**, you can also access workflows:

- From the Windows Start menu (**Start > All Programs > _CDOT_CADD_Information > Workflows**);
- From the CDOT Menu (**Help > Workflows**).

Issues Logs

Check the issues log to determine the status of submitted requests.

Requests & Support

This page provides CADD help solutions where you can help, submit questions and requests, and obtain InRoads, InRoads Survey and MicroStation support.

There is also a link to **IT Services** for hardware support, "how to" instructions, installation, training files, and dual monitor and work space setup.

Training

Use this link to sign up for training classes. You can also review online computer-based training (CBT) for MicroStation, InRoads and InRoads Survey.

Lab 1 – Getting Started

Objectives

After completing this exercise you will know how to:

- Start MicroStation.
- Open a MicroStation design file.
- Use the MicroStation mouse buttons.
- Navigate the MicroStation interface.
- Use the **View Control** commands.
- Assign view controls to the mouse wheel.
- Float and dock toolbars.
- Show and hide tools on toolbars.
- Access the MicroStation Key-in box.

Starting MicroStation

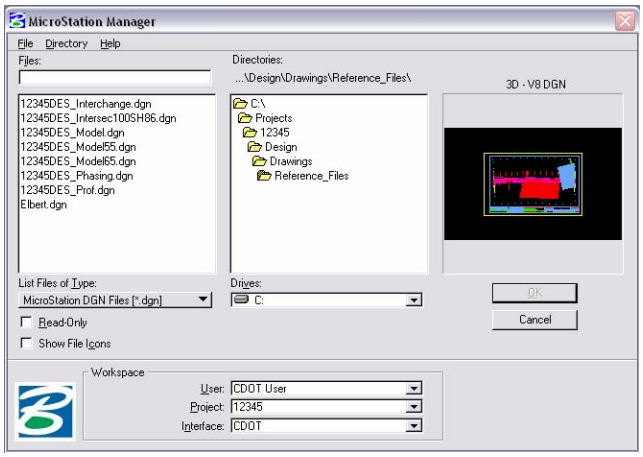
To start MicroStation:

1. Select **Start >All Programs > MicroStation > MicroStation**

   or

   Double-click on the **MicroStation V8** icon located on your desktop or in the MicroStation product directory
   (usually **C:\Program Files > Bentley > Program > MicroStation**).

   MicroStation will start and the **MicroStation Manager** dialog box will appear on your screen.



The MicroStation Manager Dialog Box

The **MicroStation Manager** is your file management interface in MicroStation. It allows you to create, rename, delete and open files as well as set workspace parameters. The MicroStation workspace is made up of three components: Users, Project and Interface. Setting these components allow you to customize the MicroStation interface.

Note: Do not press **<Enter>** after you key data in a dialog box unless you are ready to apply the settings. Use the **<Tab>** key or your mouse cursor to move from one field to the next to choose or enter your setup options before you **Apply** or **OK** the command.

Opening files

1. In the lower portion on the dialog box, set
   - User: **CDOT User**
   - Project: **12345**
   - Interface: **CDOT**

   Note: The Project option automatically sets the directory to **C:\Projects\12345.** You'll lean more about the project configuration file (**PCF**) in chapter 4.

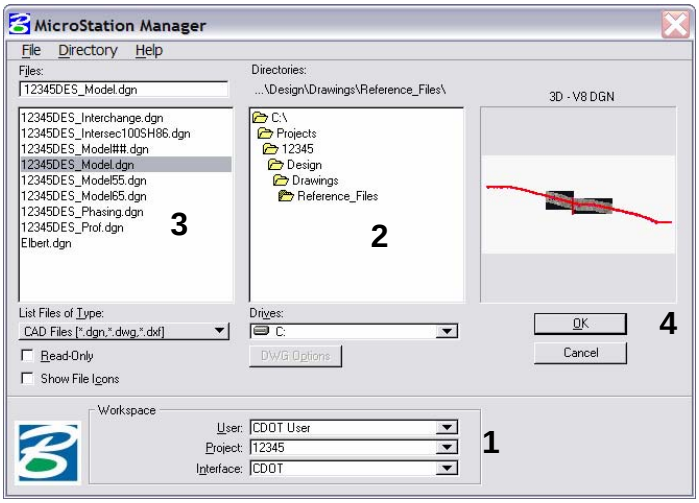
2. In the **MicroStation Manager**, navigate to **\Design\Drawings\Reference_Files** folder.

3. Highlight **12345DES_Model.dgn** as the design file to open.

   A thumbnail preview of the file is shown.

4. Select **OK** to open the design file.

   This is a design model file of CDOT project SH 86, which will serve as the example project for this class as well as other CDOT training classes.



Note: The CDOT Menu opens automatically. You'll use this menu later. For now, minimize or close the CDOT menu.

Working with the Mouse

While in MicroStation, your mouse operations include:

<D> Data (usually the ***left*** button) for selecting tools, highlighting fields, moving dialog boxes, confirming actions, *etc*.

<R> Reset (usually the ***right*** button) for terminating commands, rejecting actions, *etc*.

<T> Tentative (usually the ***middle*** button or scroll wheel) for snapping to existing elements at exact locations.

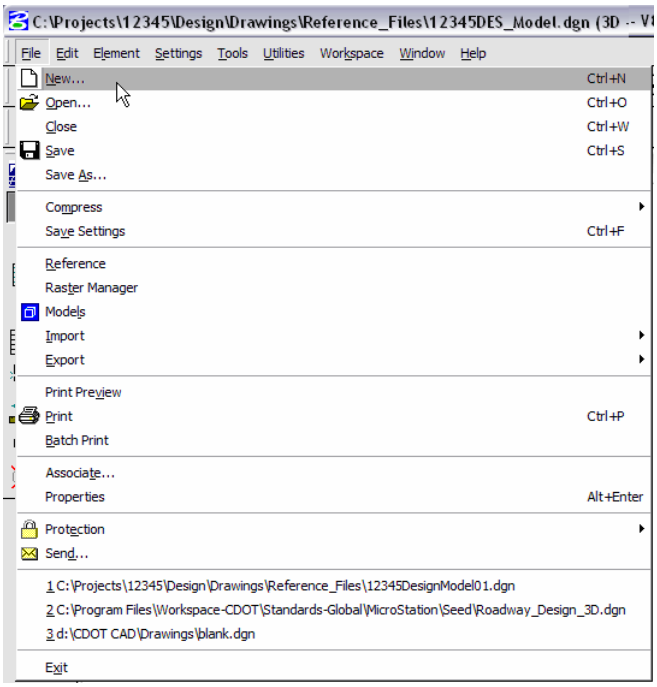
Access Pull-Down Menus

Use pull-down menus to select settings and non-drawing commands from the application window. You can either post a menu (display it until you select a function from the menu) or open the menu and select a command all in one step.

Post a pull-down menu from the command window

1. Point your cursor to **File** in the application window and select it by **clicking** the data point once **<D>.**

    - The pull-down menu appears.

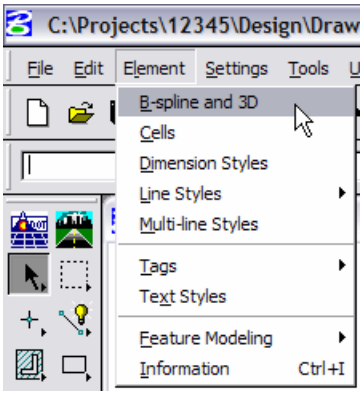


    - Menu names followed by **...** indicate a dialog box will open when you select the item.
    - Names with an arrow to the right indicate there is a sub-menu associated with the item.
    - You can also use the keyboard to select a command from a menu.

2. Use the up and down arrow keys on your keyboard to move up and down an item list or move your cursor.

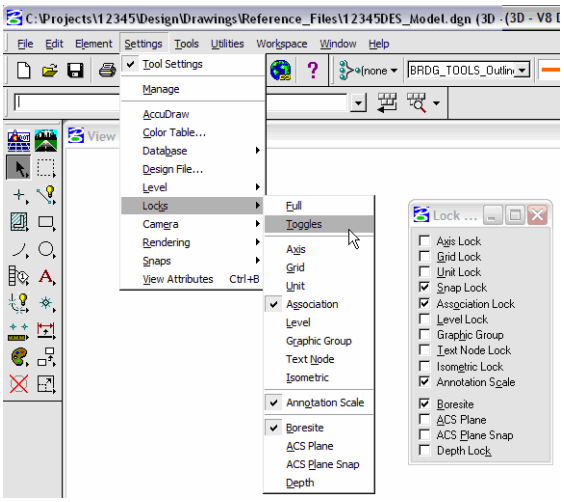
    - Text to the right of an item indicates the hot key or shortcut to use to activate the command (*e.g.*, **Ctrl+N** means to hold down the **Ctrl** key and type **N**).
    - Underlined letters indicate a shortcut key to choose an item from a menu.

3. Move your cursor to **Element** to show the element pull-down menu.



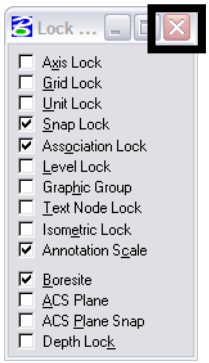
Open a Settings Box

1. Select **Settings > Locks > Toggles** to open the **Locks** settings box.



Note: A settings box, like the Locks box, does not have any command buttons (**OK**, **Close**, *etc*.). Settings boxes can be left open while working in MicroStation.

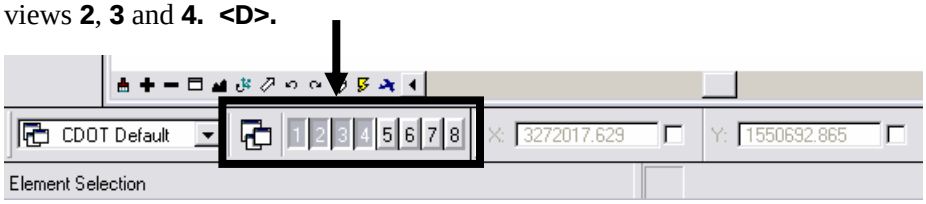
2. **Close** the Locks settings box by selecting the **X** in the upper right hand corner.



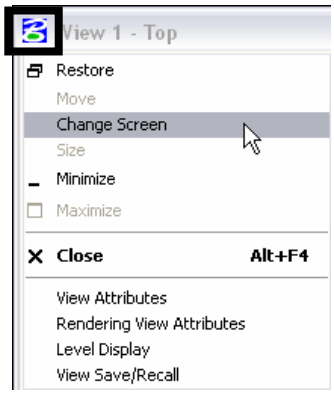
Control Views

Turn on additional views

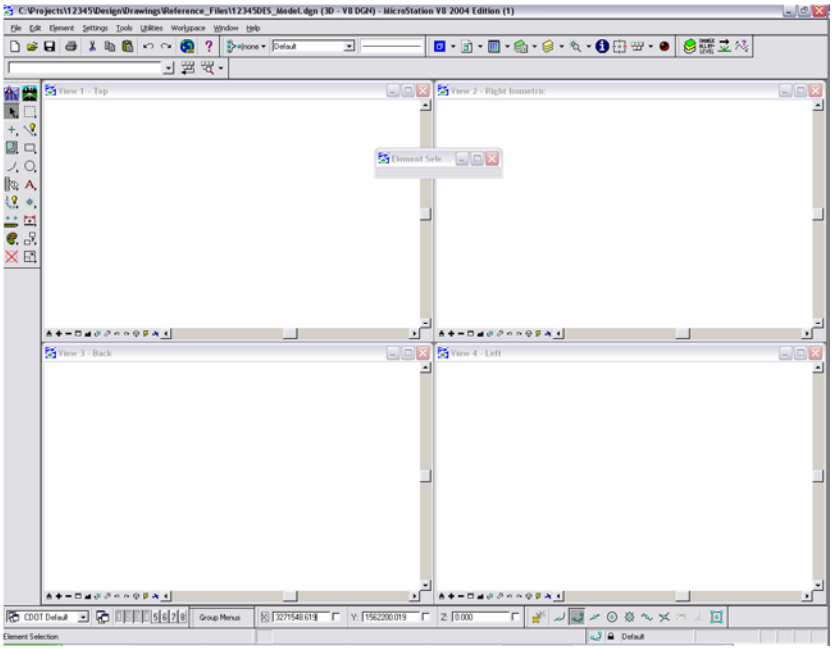
1. From the **View Toggles** box (lower left of the screen), toggle ***on*** views **2**, **3** and **4. <D>.**



Note: By default, views 1-4 open in screen 1, views 5-8 open in screen 2. To move a view to a different screen, select the "B" control menu and choose **Change Screen**.

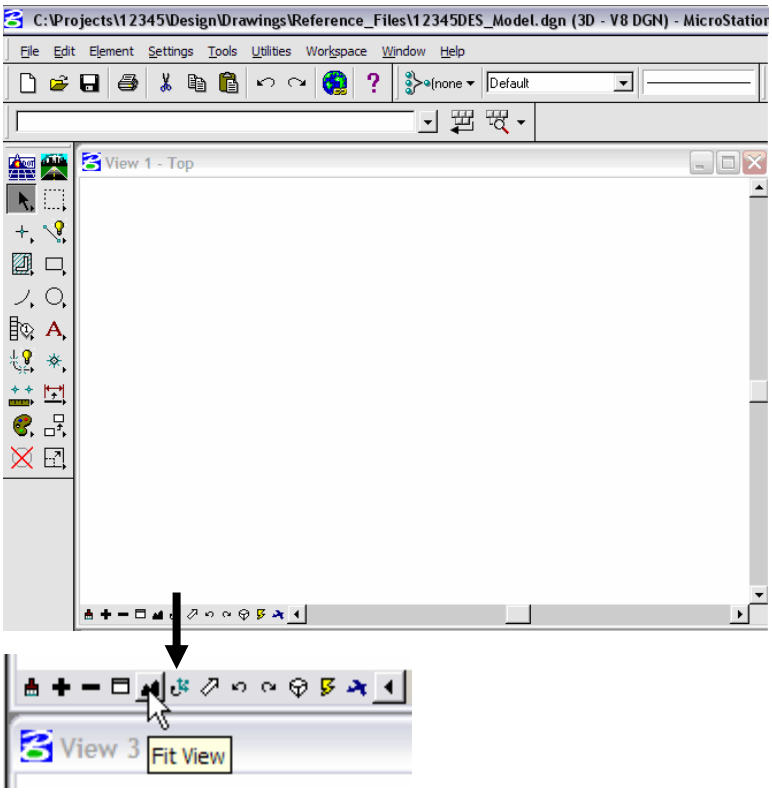


2. Select **Window > Tile** to arrange the views.

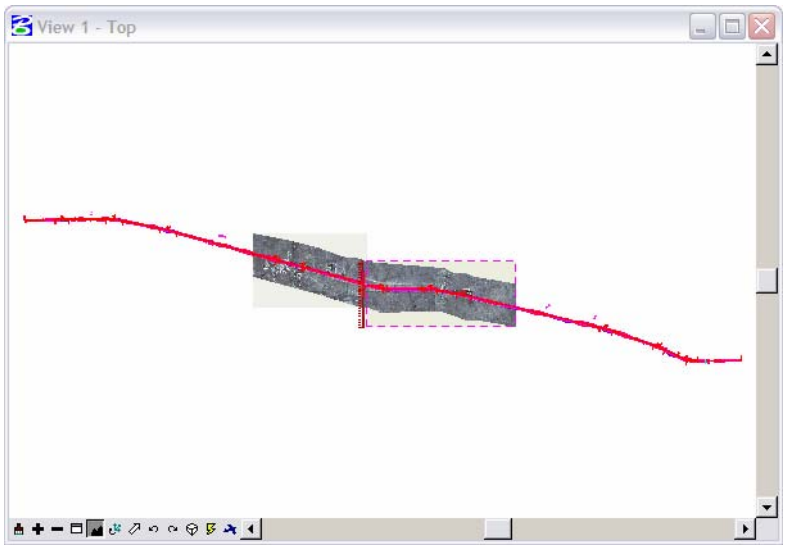


Fit View 1

1. From the View Control toolbar in View 1, select **Fit View**.



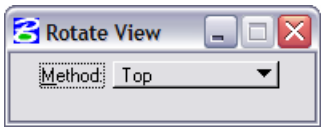
All of the plan view graphics appear in the view.



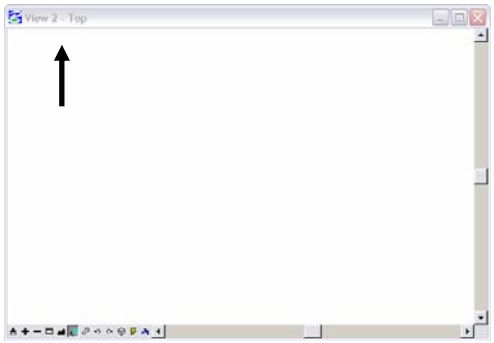
Rotate all views to top

1. From the **View Control** toolbar in View 2 select **Rotate View.**

2. In the **Rotate View** tool settings box, set **Method** to **Top**.

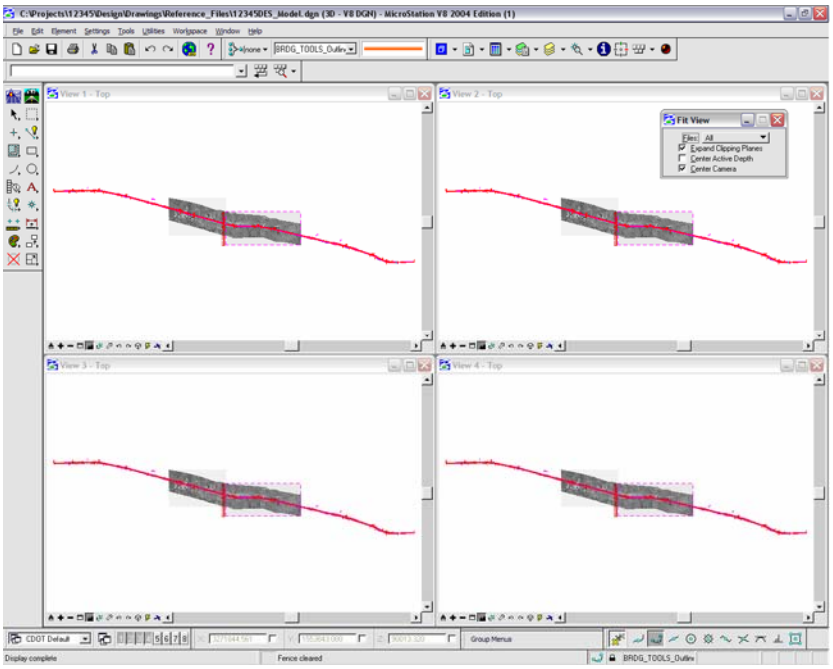


3. **<D>** in View 2 to change it to a top view (verify the view name is Top).



4. **Fit** view 2.

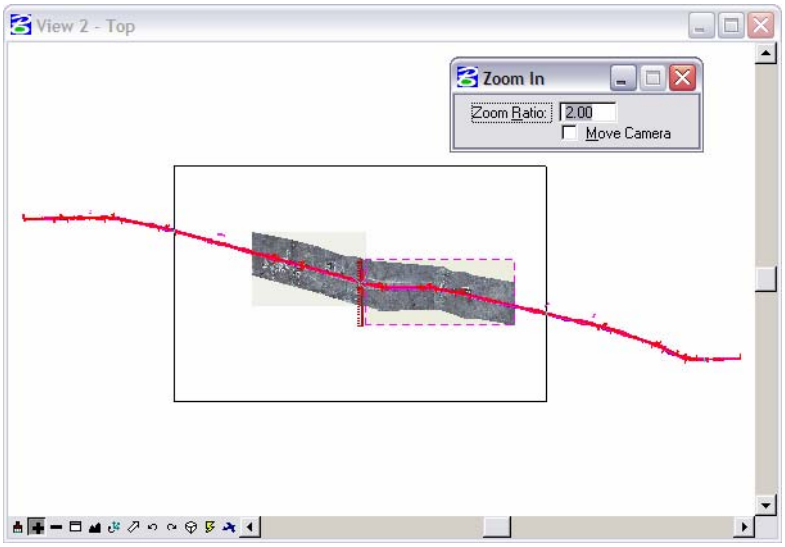
5. Repeat the above steps to rotate views 3 and 4 to a **Top** view and **Fit** the views.



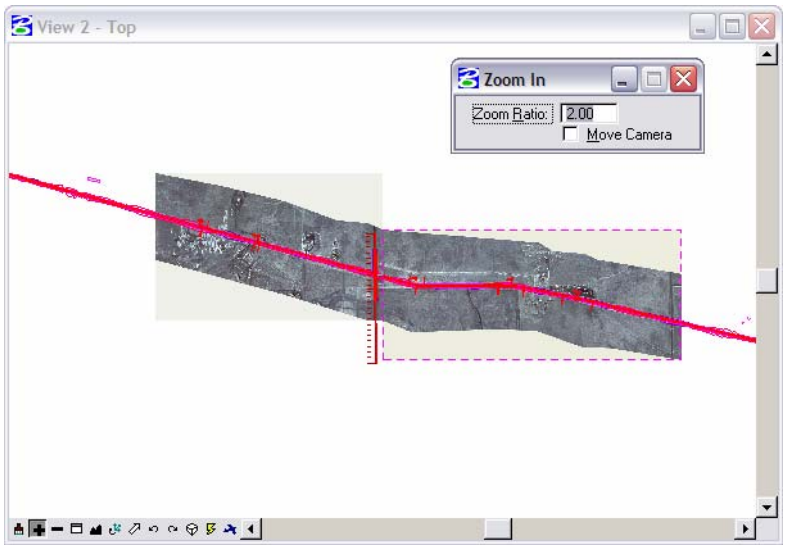
Zoom In within a view

1. From the **View Control** toolbar in View 2, select **Zoom In.**

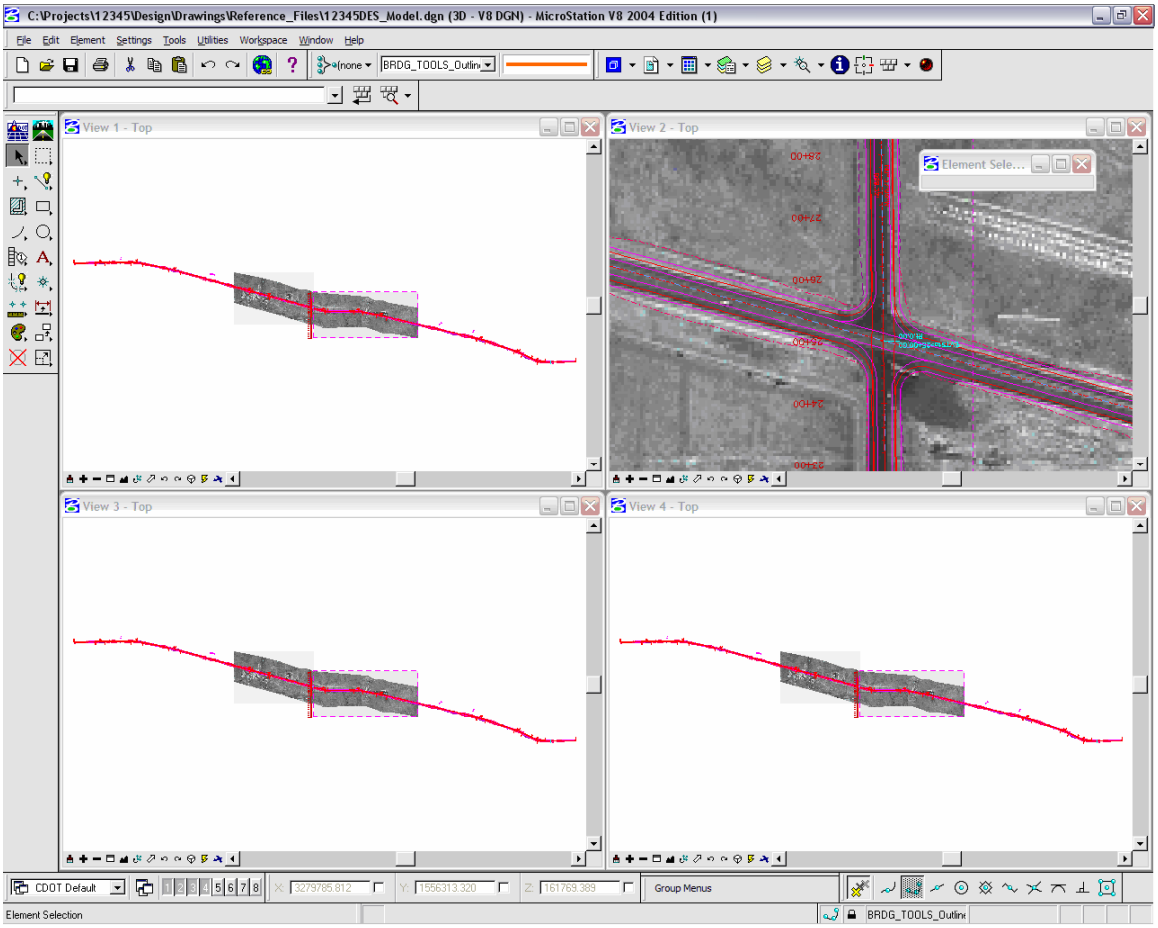
2. Place your cursor (the **X cross-hair**) in the center of the intersection and place a data point **<D>**.



The view is updated to **Zoom In** twice as close. The center of the view is the data point you identified.



3. Continue placing data points until you've zoomed in to the intersection as shown.



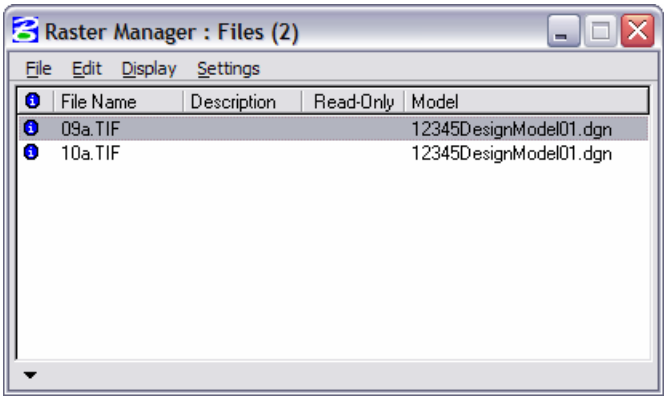
4. Reset **<R>** out of the **Zoom In** command.

Turn off the raster files

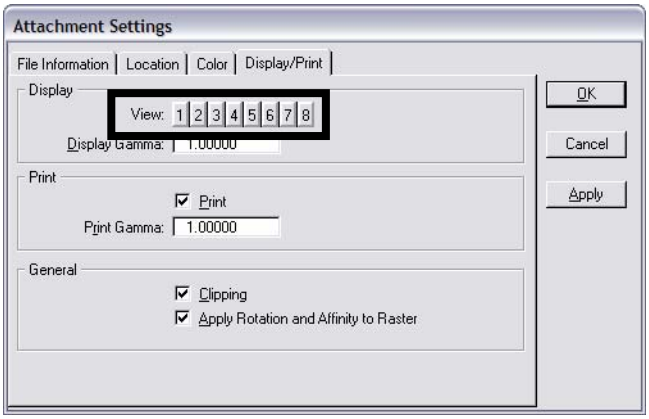
The model file has aerial photos attached. These raster images can be turned off while working in the file.

Note: You will learn more about raster management in Chapter 4.

1. Select **File > Raster Manager**.



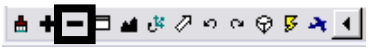
2. Double-click the **09a.tif** file.
3. On the Display/Print tab, toggle off all View (1-8) and select **OK**.



4. Repeat for **10a.tif**.
5. Close the **Raster Manager** box.

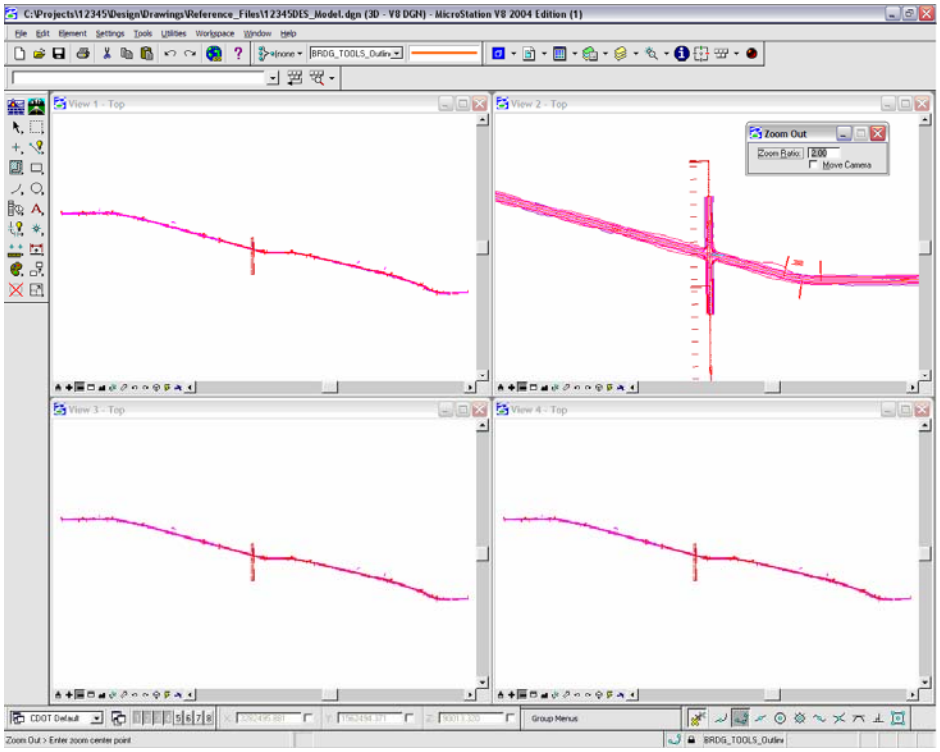
Zoom out in a view

1. From the **View Control** toolbar in View 2, select **Zoom Out.**



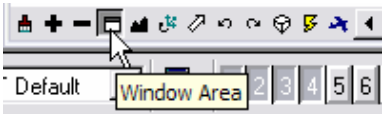
   The view is updated to zoom out twice as far.

2. Again in View 2, **<D>** in the center of the intersection to zoom out again until you can see the entire intersection cross road.



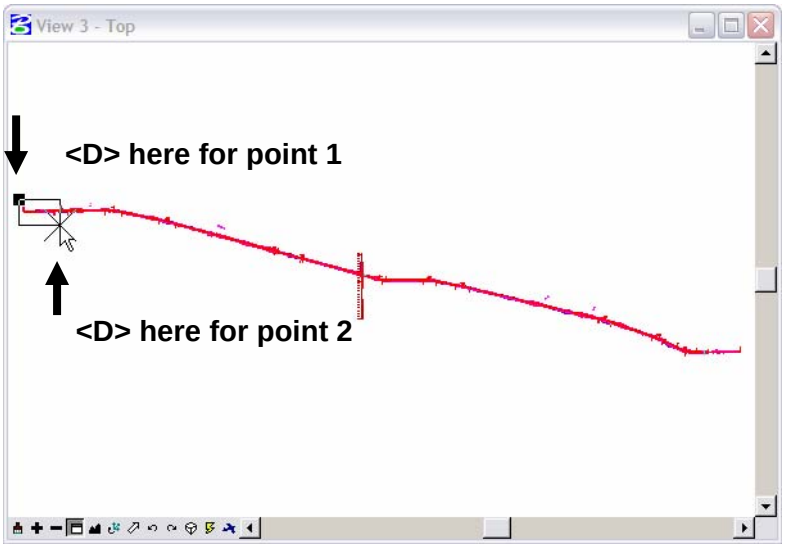
Use the Window Area command

1. From the **View Control** toolbar in View 3, select **Window Area.**

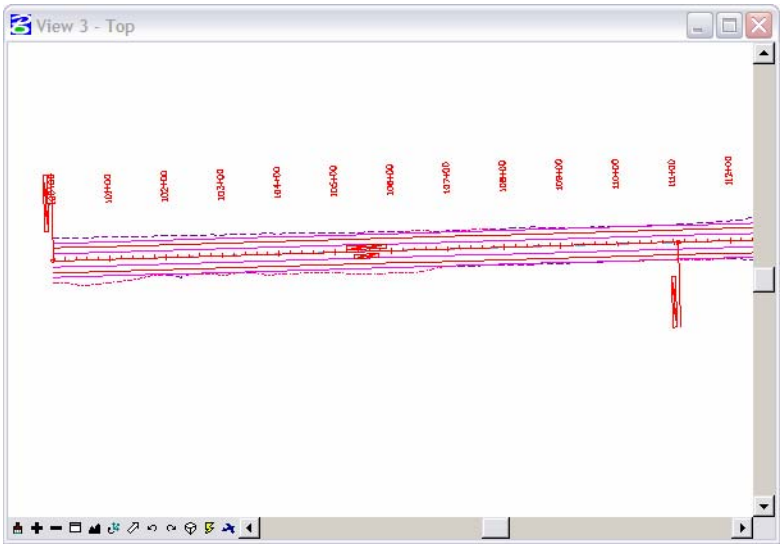


2. **<D>** above and to the left of the beginning of the project.

3. **<D>** again below and to the right of the first point as shown (this will draw a box around what you want to show close-up).

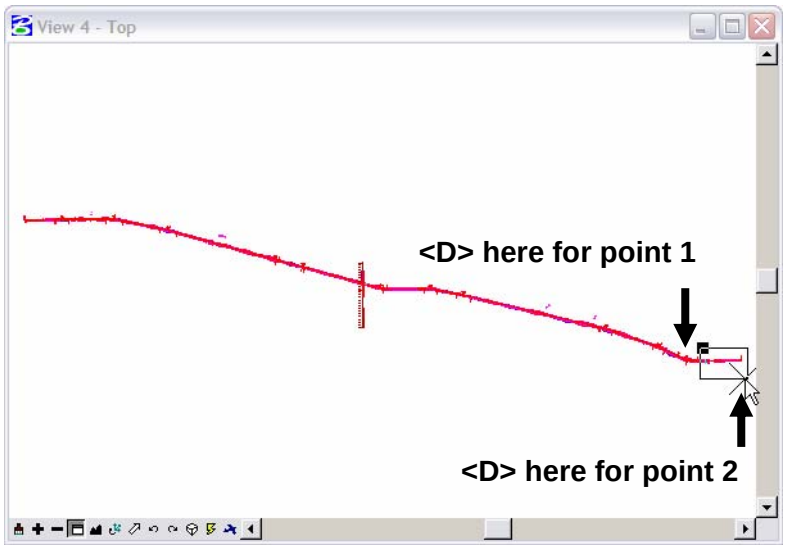


The view is updated to show the alignment at the beginning of the project.

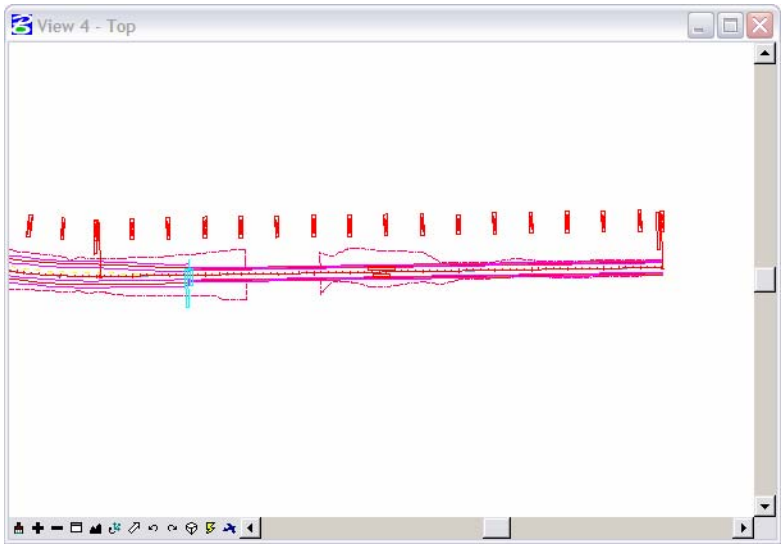


4. While still in the **Window Area command,** move your cursor over to View 4 and **<D>** above and to the left of the alignment end as shown.

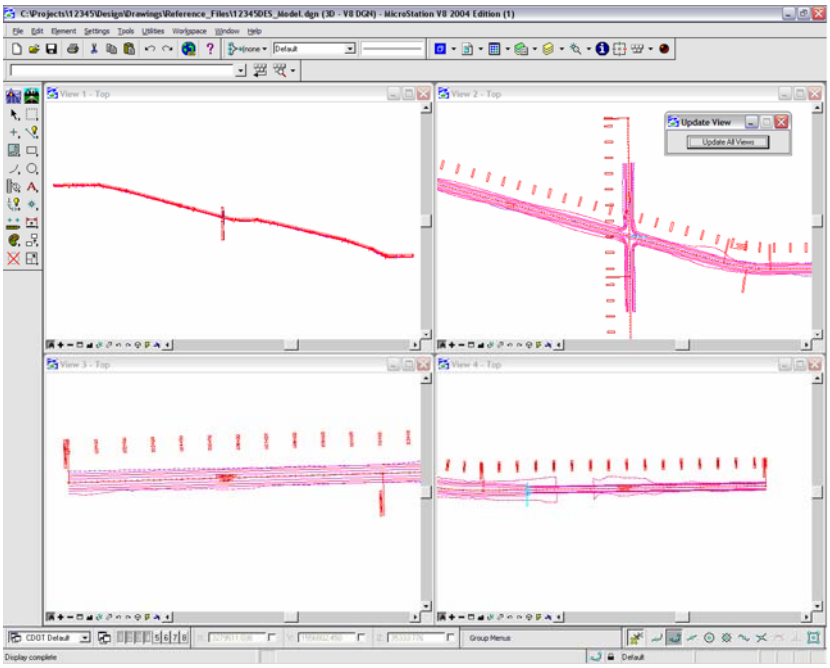
5. **<D>** again below and to the right of the alignment end.



The view is updated to show the end of the project.



Your views should look similar to the illustration below.

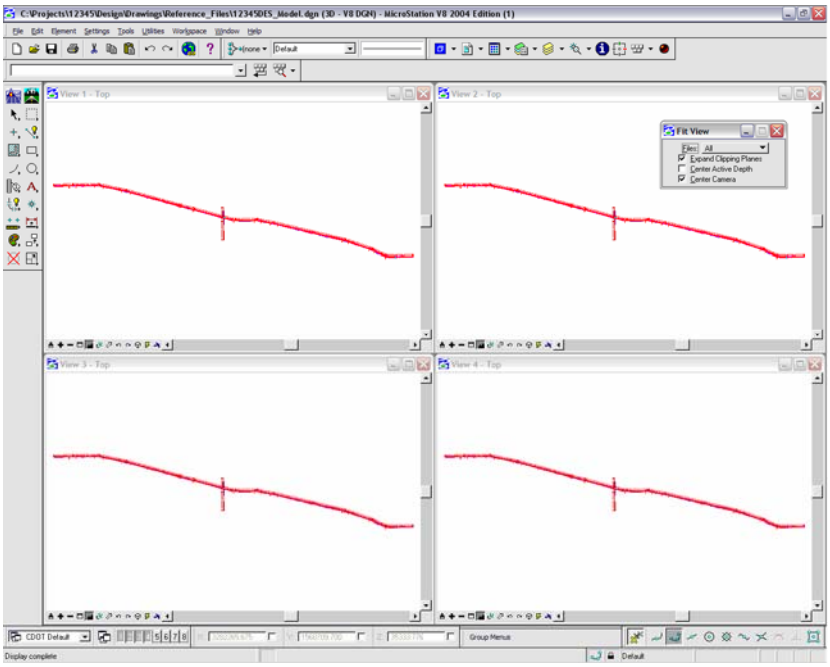


Fit views

1. From View 2, select **Fit View.**

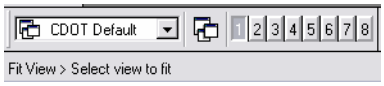
   All of the graphics in View 2 are displayed in the view. The **Fit View** command is a handy way to see all graphics on levels that are on.

2. With the **Fit** command active, **<D>** in views 3 and 4 to select these views to fit.



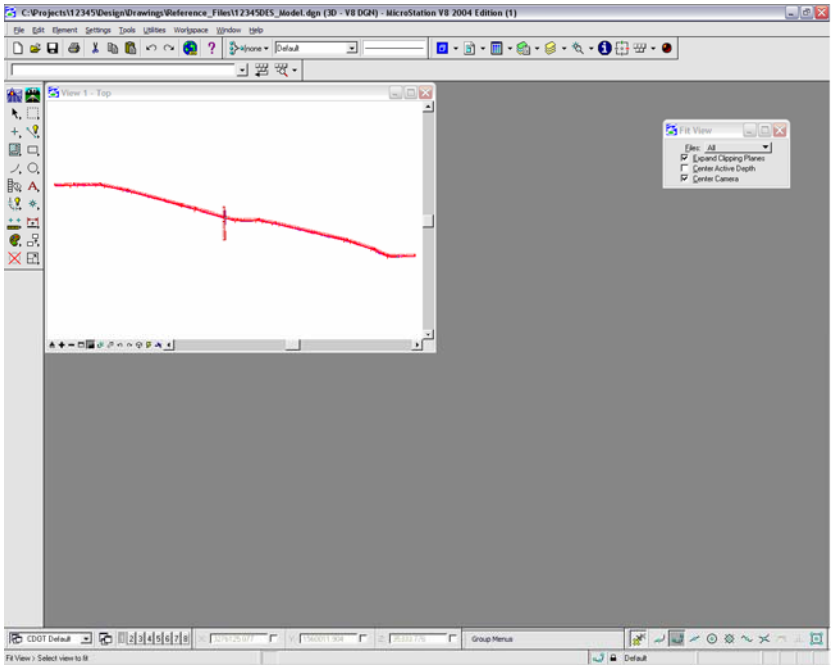
Close some views

1. Toggle ***off*** views 2, 3 and 4 on the **View Toggles** box.



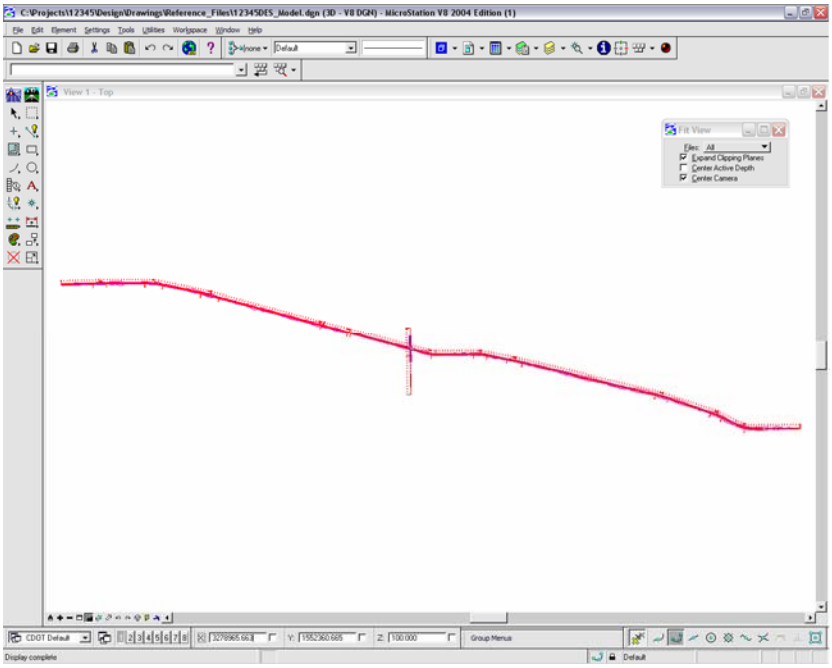
Note: You can also **click** the **X** icon in the view's upper right corner to close it or you can **double-click** on the **B** icon (the control menu icon) in the upper left corner of a view.

Click once on the **B** icon and choose **Change Screen** to move the view to the other monitor.



Make view one fill the screen

1. Select the **Maximize** button in the upper right corner of View 1.
2. **Fit** View 1.



Mouse Wheel Settings

Note: If you do not have a mouse with a wheel, go to the next section titled *Try Out Tool Boxes*.

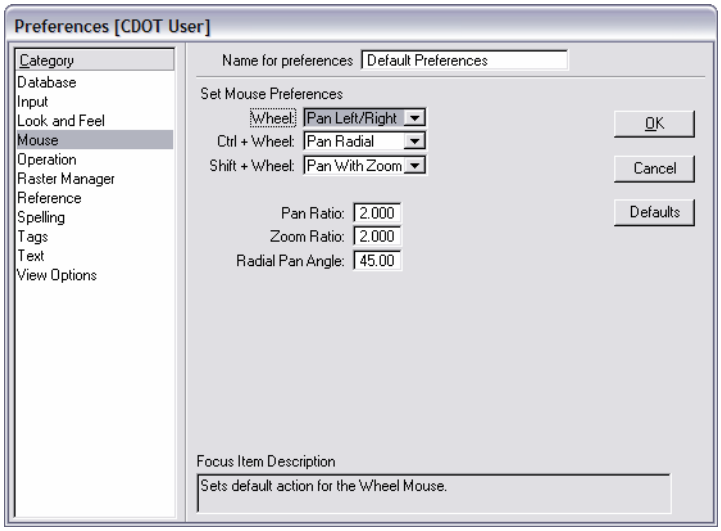
Use the wheel on the mouse to Zoom In/Out

1. Position your cursor over the center of the intersection.
2. Roll the wheel up; this zooms in on your graphics.
3. Roll the wheel back; this zooms out.

Note: If you **<T>** on a location before rolling the wheel, that location will center in the view when the wheel is rolled.

Change the wheel settings

1. Select **Workspace > Preferences > Mouse.**
2. Set the **Wheel** to **Pan Left/Right.**



3. Select **OK** to accept the changes and close the dialog box.
4. Move your mouse wheel back and forth to pan in the view.

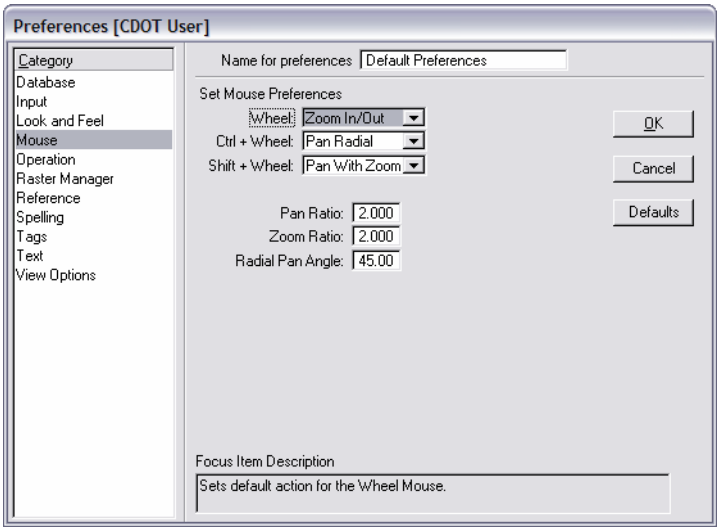
   Notes: You can also **Pan** by selecting this command on the **View Control** toolbar. Specify a "from" and "to" point to move in the view. Toggle on Dynamic Display to see the graphics.

   You can also **Pan** by pressing **<Shift>** on the keyboard while holding down the data button **<D>.** Then, drag your cursor in the direction you wish to move.

5. Practice panning with the **Pan** tool.
6. Practice panning using **<Shift>+<D>.**

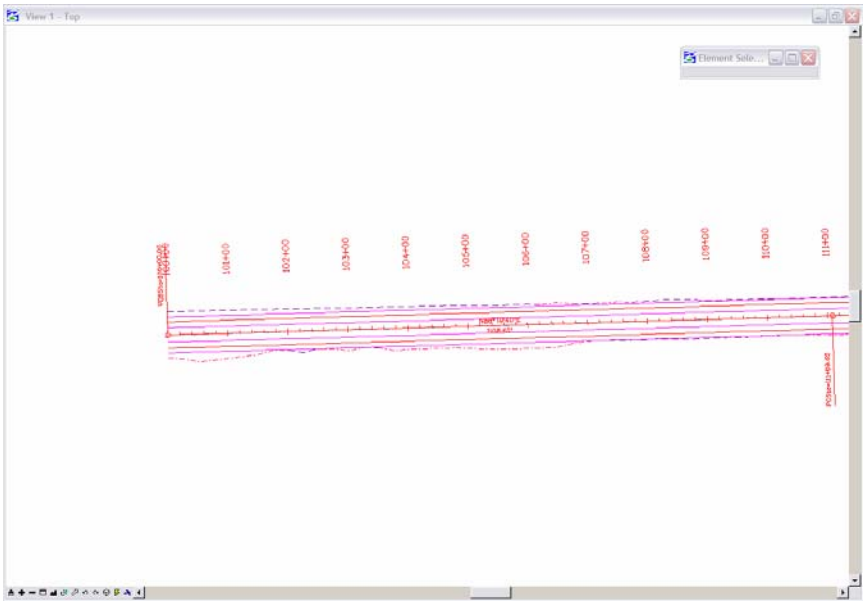
   Note: After you start panning, you can release the **<Shift>** key.

7. Set your wheel for the view control option you prefer (**Workspace > Preferences > Mouse).**



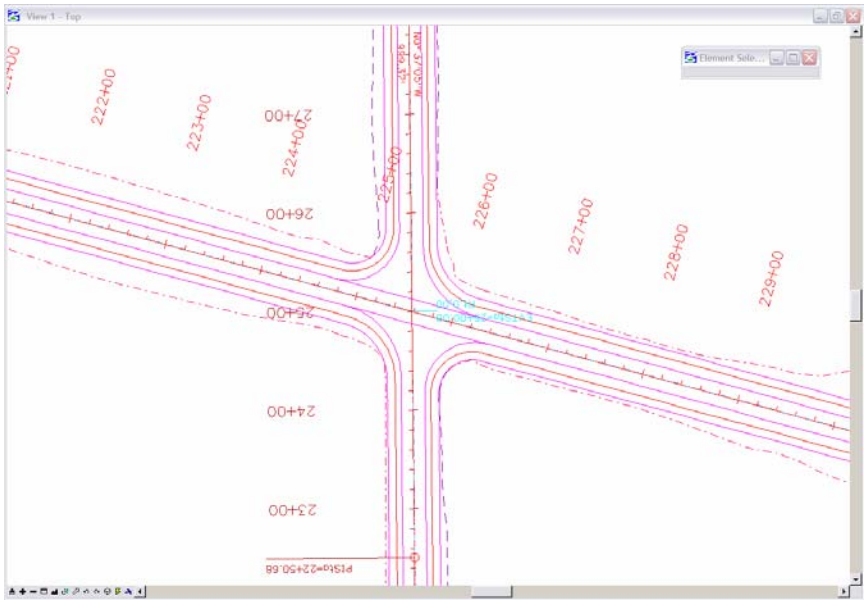
Pan the project site

1. **Window** in to the beginning of the project as shown.

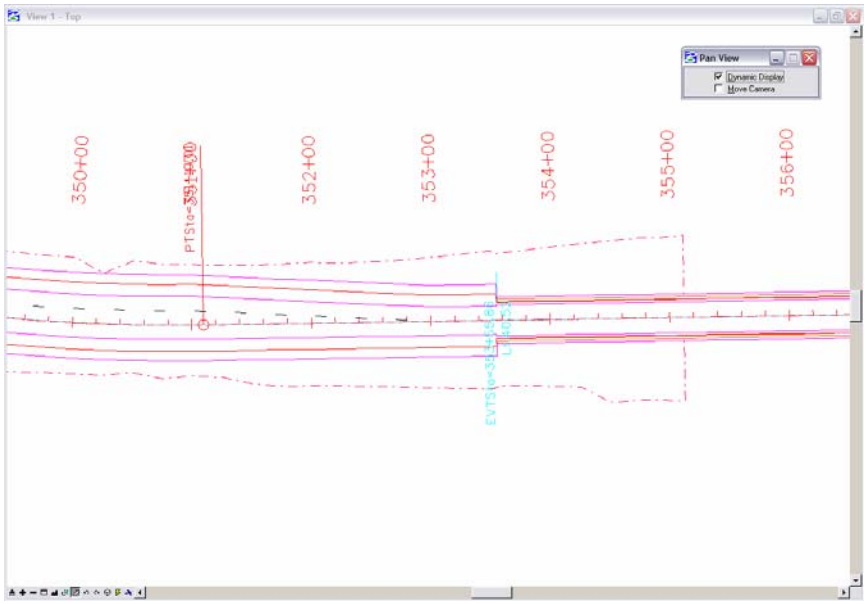


2. Use panning to review the SH 86 project site.

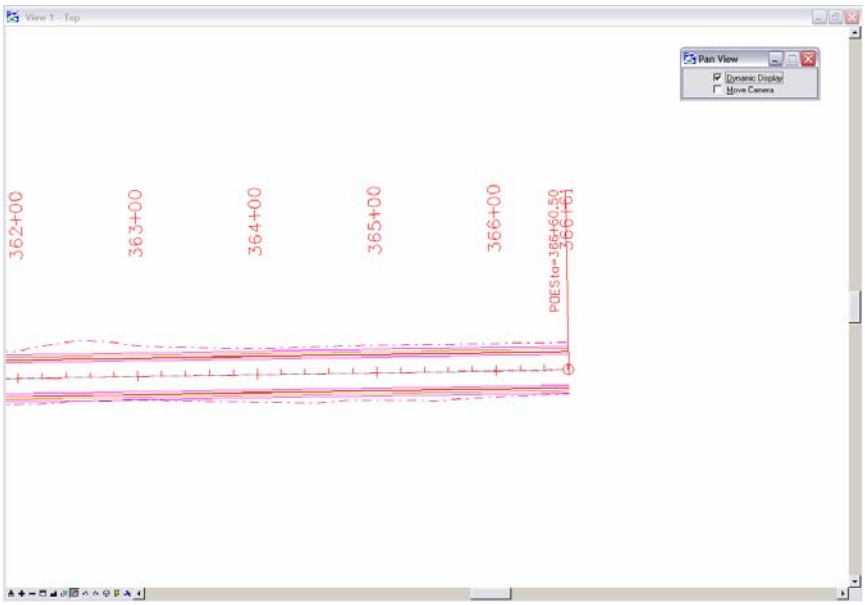
    - Start at the POB (STA 100+00) and pan to the right along SH 86.
    - Pan across the intersection (between STA 220+00 and 230+00).



    - Continuing panning to the right through the transition from rural 2-lane to urban 2-lane with curb and sidewalk (around STA 353+00).



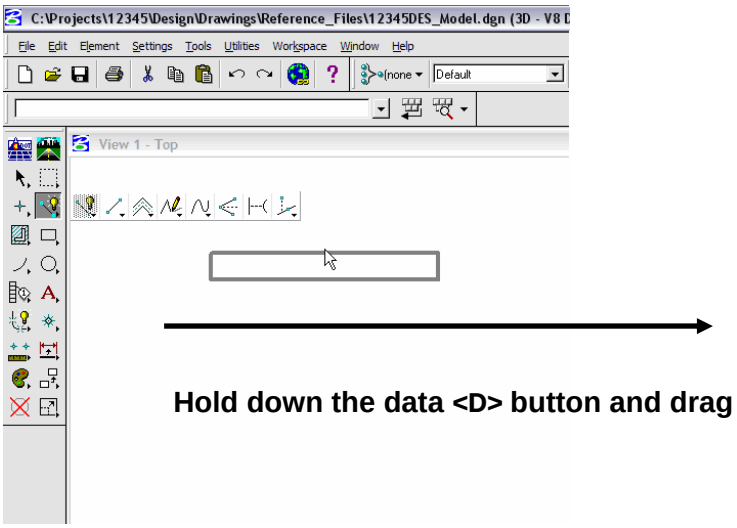
- Stop at the POE.



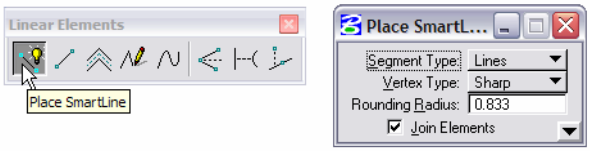
Try Out Tool Boxes

Pull a tool bar from the main palette

1. Select the **Place SmartLine** icon from the **Main** tool palette to display the **Linear Elements** tool bar.
2. Hold down the data button **<D>** and drag your cursor to the right until the tool bar comes loose from the main toolbar.

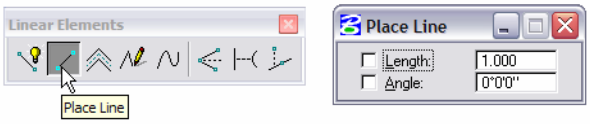


3. Select the **Place SmartLine** command.



The **Tool Settings** box shows this command's settings options.

4. Select the **Place Line** command from the **Linear Elements** toolbar and notice the changes in the Tool Settings box.



Tool Settings updates for each tool selected.

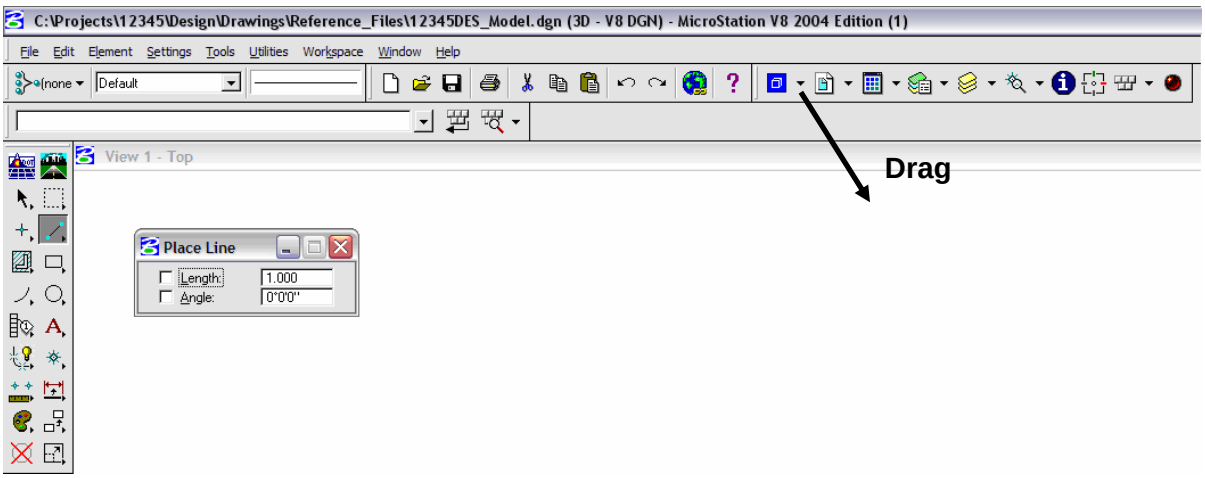
5. **Close** the **Linear Elements** toolbar by **clicking** the **x** in the upper right corner.

Float and Dock Toolbars

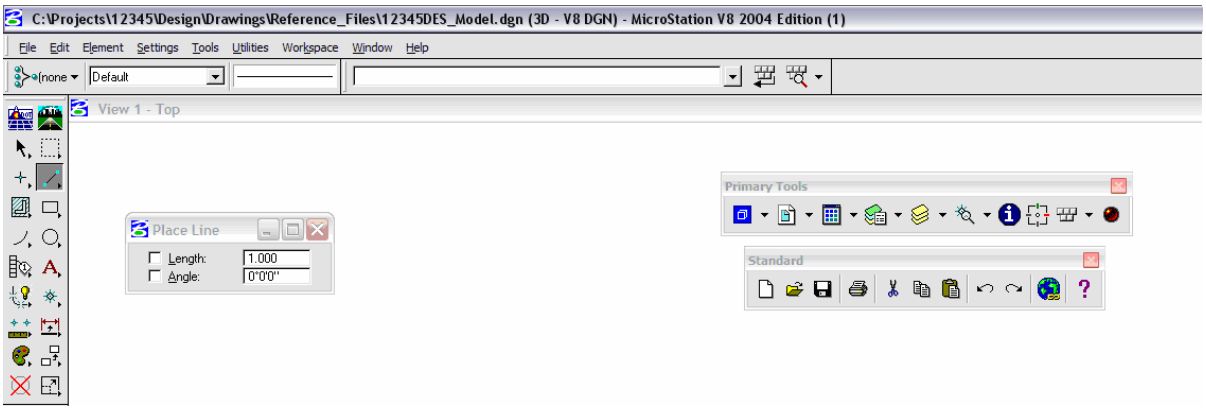
Float the Primary toolbar

1. Position your cursor over the edge of the **Primary Tools** toolbar at the top of the application window.

2. Hold down the data button and drag the toolbar until it "floats" in the view.



3. Repeat for the **Standard** toolbar.



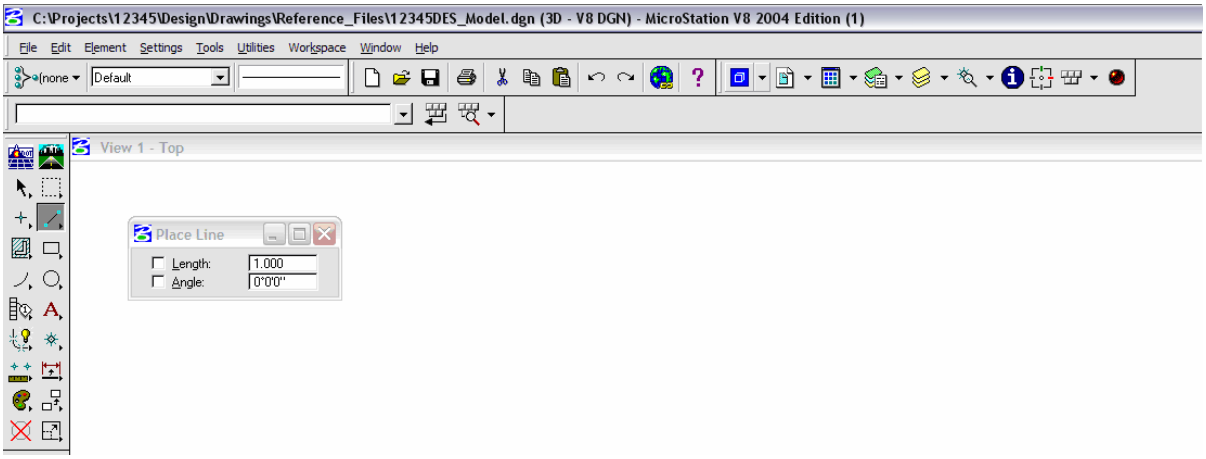
Toggle the Primary Tools toolbox off/on

4. Select **Tools > Primary**.

   The **Primary Tools** toolbox is turned off.

5. Select **Tools > Primary** again to toggle it back on.

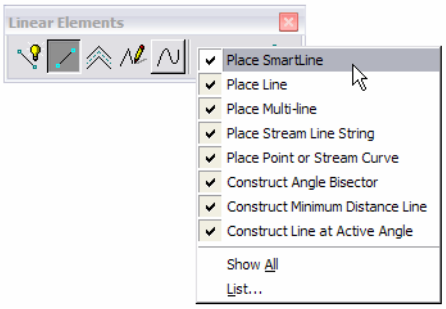
6. Dock the **Primary Tools** and **Standard** toolbars back to the upper right corner of the application window by dragging the title bar with the data button.



Note: Any toolbar can be docked on the perimeter (top, bottom, left or right sides) of MicroStation's application window.

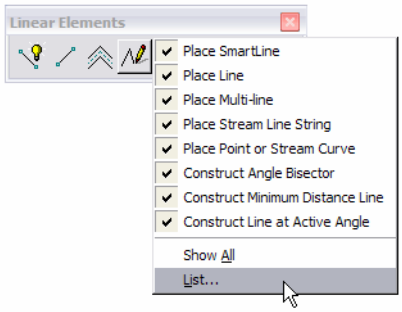
Show/Hide Tools

1. Drag the **Linear Elements** toolbar from the **Main** toolbar.
2. **Right-click** anywhere on the **Linear Elements** toolbar. In the list of tools, toggle ***off*** **Place SmartLine.**

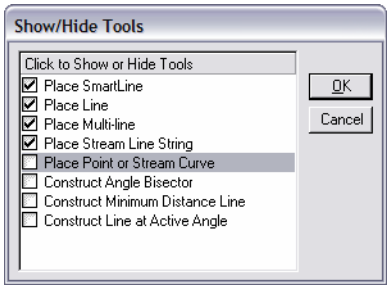


The **SmartLine** tool is removed from the toolbar.

3. **Right-click <R>** again and turn **Place SmartLine** back on.
4. **Right-click <R>** and choose **List.**



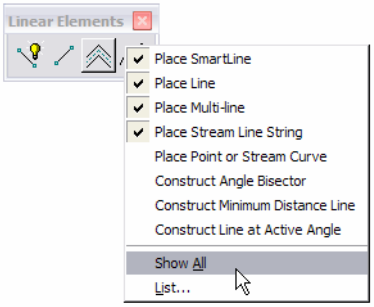
5. Toggle ***off*** the last four tools.



6. Choose **OK.**

The toolbar is updated to show these tools hidden.

7. **Right-click <R>** and select **Show All.**



All tools are now shown on the toolbar.

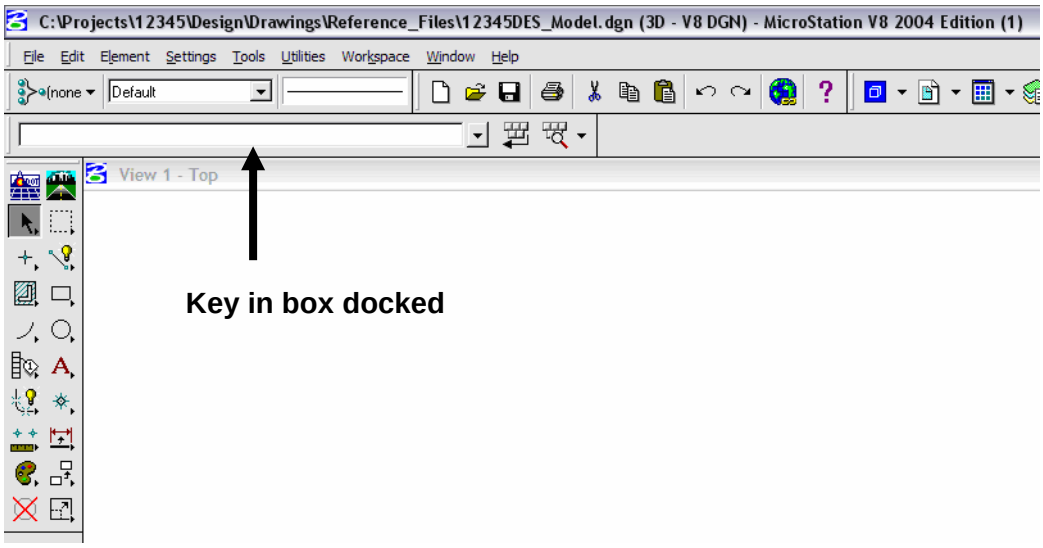
8. **Close** the **Linear Elements** toolbar (**click** the **X** in the upper right corner)

Note: Use this procedure to customize any toolbar to show just the tools you want.

Using the Key-In Box

Open and dock the key-in box

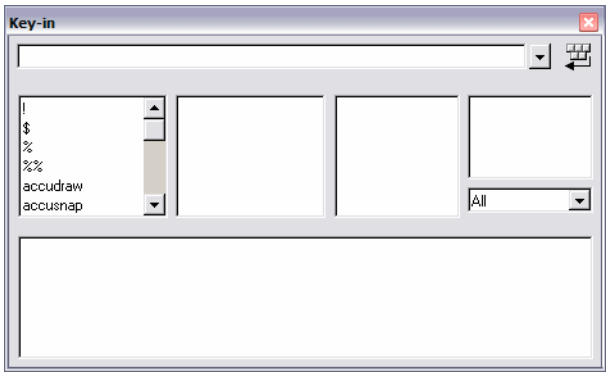
1. Verify the **Key-in** box is opened and dock.



Note: If the **Key-In** box is not open, select **Utilities > Key**-in to open it.

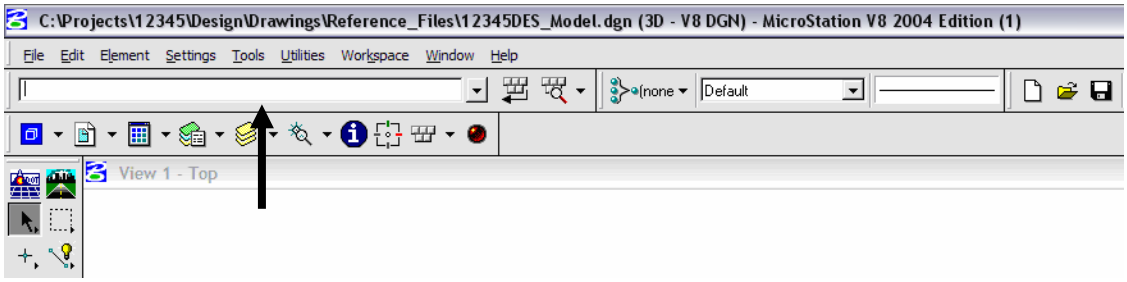
2. Float the **Key-in** box from the top of the screen.

3. Expand it by grabbing the bottom of the box and dragging down.



Key-ins can be selected from the list, but are typically just typed directly into the box.

4. Grab the title bar of the key-in box and drag it to the blank space at the top of the application window.



The **Key-in** box docks beside the other tool bars in the application window.

Note: You can also dock the **Key-in** box at the bottom of the screen if you prefer.

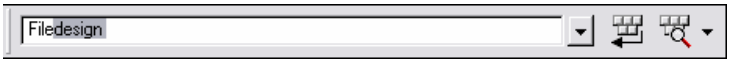
Save settings

Save settings in the file so the views will look the same when you next open the design file.

1. **Fit** View 1.
2. In the **Key-in** box you just docked, place a data point to set the focus in this box (you will get a blinking cursor).

   Note: You can also press **<Esc>** on the keyboard to set the focus in the **Key-in** box.

3. Key in ***File*** (short for **File design**), then press **<Enter>** on the keyboard.



   Note: You ***always*** press **<Enter>** or **<Tab>** after key-ins in the **Key-in** box.

   Keep the **Key-in** box docked. It is where you will key in all MicroStation commands.

   Note: To **Save Settings**, you could also select **File > Save Settings**. Most commands can be accomplished with either key-ins or by selecting from the menu or toolbars.

   By saving settings, the next time you enter this design file, it will be exactly as you left it.

4. Choose **File > Exit** to exit MicroStation and your design file.

   Note: You can change your MicroStation user preferences to always save setting upon exiting the file. Select **Workspace > Preferences > Operation** and toggle on **Save Settings on Exit**. Just remember that if you're working in another user's file, you'll change their settings.

2. Levels

Levels help you separate graphics in the design file and for plotting. By placing your graphics on different levels, you can easily control what graphics to display by turning the appropriate levels on or off. Levels are synonymous with layers in AutoCAD.

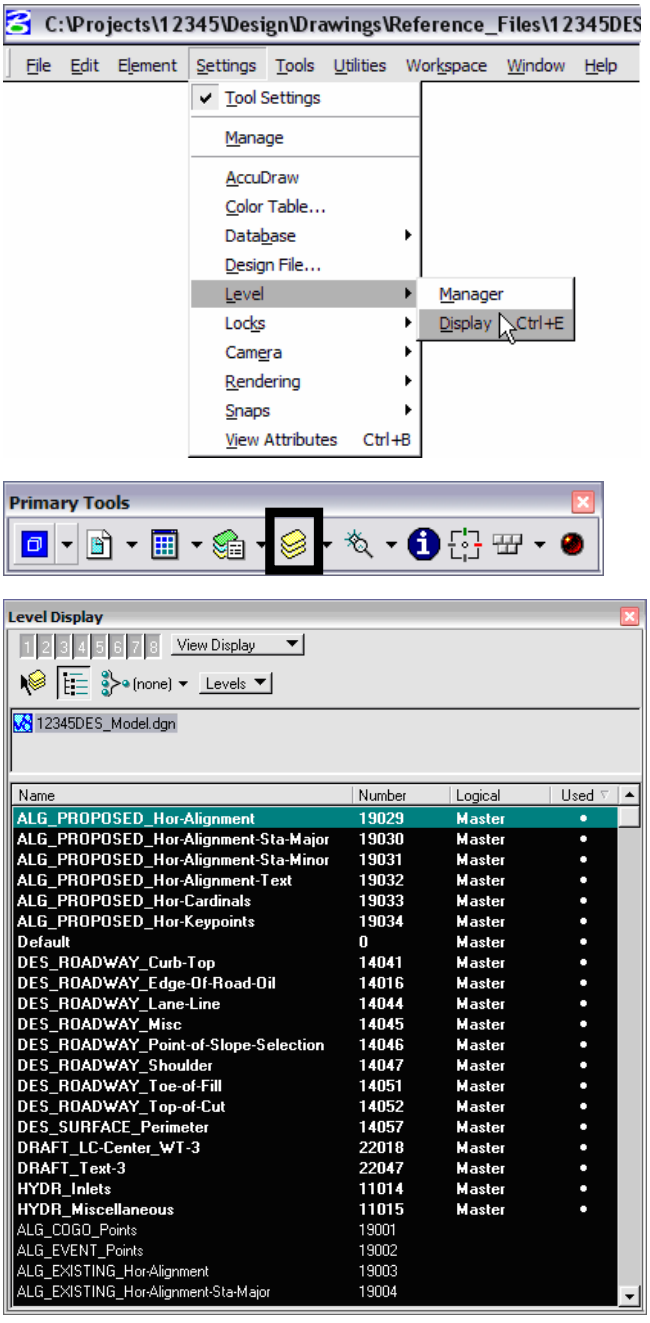
By using a standard level structure defined in your CADD standards, you can create a logical design file. Everyone in the organization knows exactly what graphics are on what level by referring to the CADD standards. This improves the CADD workflow efficiency.

Levels are named and numbered and you can then turn levels on or off by name or number. There is no limit to the number of levels you have in a design file.

The level on which you place graphics is known as the ***active level***. When you set a level active, it is automatically turned on.

Using the Level Display box

Access **Level Display** from **Settings > Level > Display** or from the **Primary** toolbar.



The **Level Display** is used primarily to turn levels on and off in the views selected. You also have the option to turn levels on or off by selecting an element (**right-click <R>** on a level or **click** the **Change Level** button).

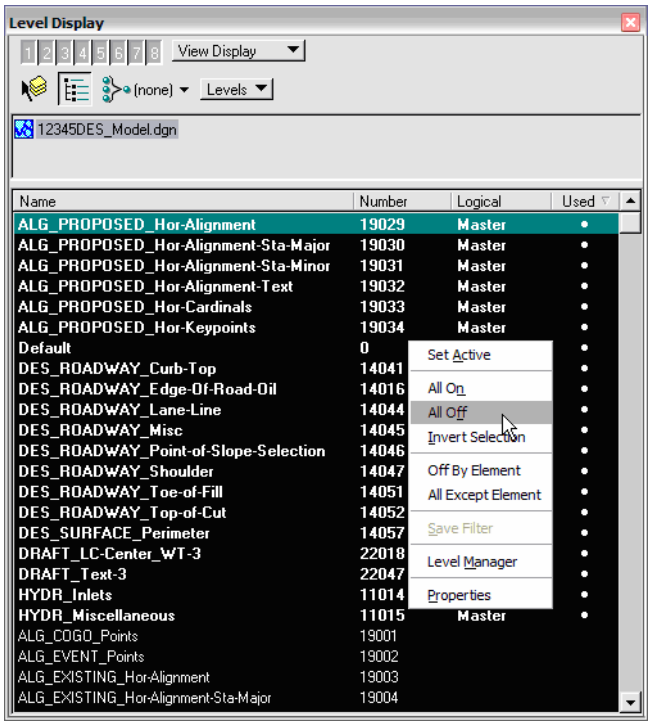
There are three display modes:

- ***View Display*** – turns levels on/off in the chosen view(s).
- ***Global Display*** – turns levels on/off in ***all*** views.
- ***Global Freeze*** – elements in selected view(s) are not displayed, cannot be plotted and graphics cannot be placed on a frozen level.

Note: you can also turn levels on or off with the following key-ins:

- ***on=<level name or number >***
- ***of=<level name or number >*** .

Note: **<D>** and drag across levels in **Level Display** to select multiple consecutive levels or use **<Ctrl>** to select non-consecutive levels. **Right-click <R>** on any level name to quickly turn all levels off/on.

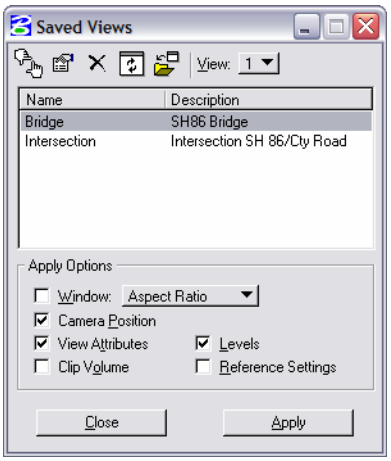


Saved views

Once you have defined a view's parameters (area of display, levels, *etc.*), you can save the view for recall later. For example, you can **Zoom In** on an intersection, turn on all necessary levels and then save the view. Then, no matter where you are in the design file, or what levels you've turned on or off, you can always return to the intersection saved view with the appropriate levels turned on.

To save a view, either:

- Select **View Save/Recall** from the view's control menu



- Or, use the ***sv=<view name,description >*** key-in (e.g. ***sv=intersection***).

  You can later recall the save view from the **View Save/Recall** dialog box or use the key-in ***vi=<view name >*** **.**

Working with Level Libraries

So, where do the levels come from? Levels are obtained from a level library. ***A level library is a master template of levels***, which is attached to your active design file. Libraries can be separated by type (Bridge, Roadway Design, Survey, etc.) and then you can attach multiple level libraries to an active file.

CDOT Level Libraries

CDOT level libraries are attached as a file type ***DGNLIB.*** A DGNLIB file is the same format as a DGN file (they can be opened just like a DGN file in MicroStation) but with a ***.dgnlib*** extension. Typically there are no graphics in a DGNLIB file – just level setups. DGNLIB files can also be used to store text styles and dimension styles (discussed later).

The following CDOT level libraries (DGNLIB files) are currently available:

1. Alignments
2. Bridge
3. Construction
4. Drafting
5. General
6. GIS
7. Hydraulics
8. Landscape and Environmental
9. Materials and Geotechnical
10. Roadway Design
11. ROW
12. Survey
13. Topo
14. Traffic
15. Utilities

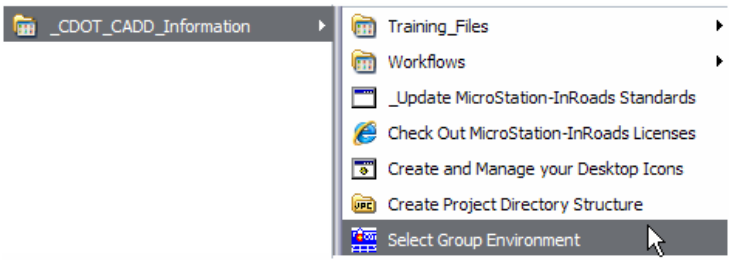
For more information on level libraries, see ***Chapter 4 – CADD Overview, The CDOT Level Structure***.

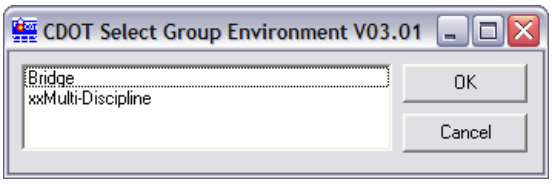
CDOT Select Group Environment

The CDOT discipline-specific DGNLIBs are automatically attached via the **CDOT Select Group Environment** program. When attached, levels from the library are available for use in the active design file. When graphics are placed on a level from the library, the level is copied from the library into the active design file.

Access the Select Group program from the **_CDOT_CADD_Information** program group on your computer's Windows Start menu (**Start > All Programs > _CDOT_CADD_Information > Select Group Environment**). This program provides you two options: Bridge and xxMulti-Discipline. The Bridge option will attach only those libraries necessary for the Bridge specialty group. All other groups will choose the xxMulti-Discipline option, which attaches all level libraries so you can work across disciplines.

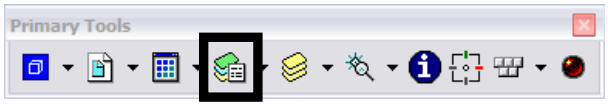
Level libraries selected via the CDOT Select Group Environment will be automatically attached to any design file opened with MicroStation after running the program. You only have to run the utility again if you need to switch groups.



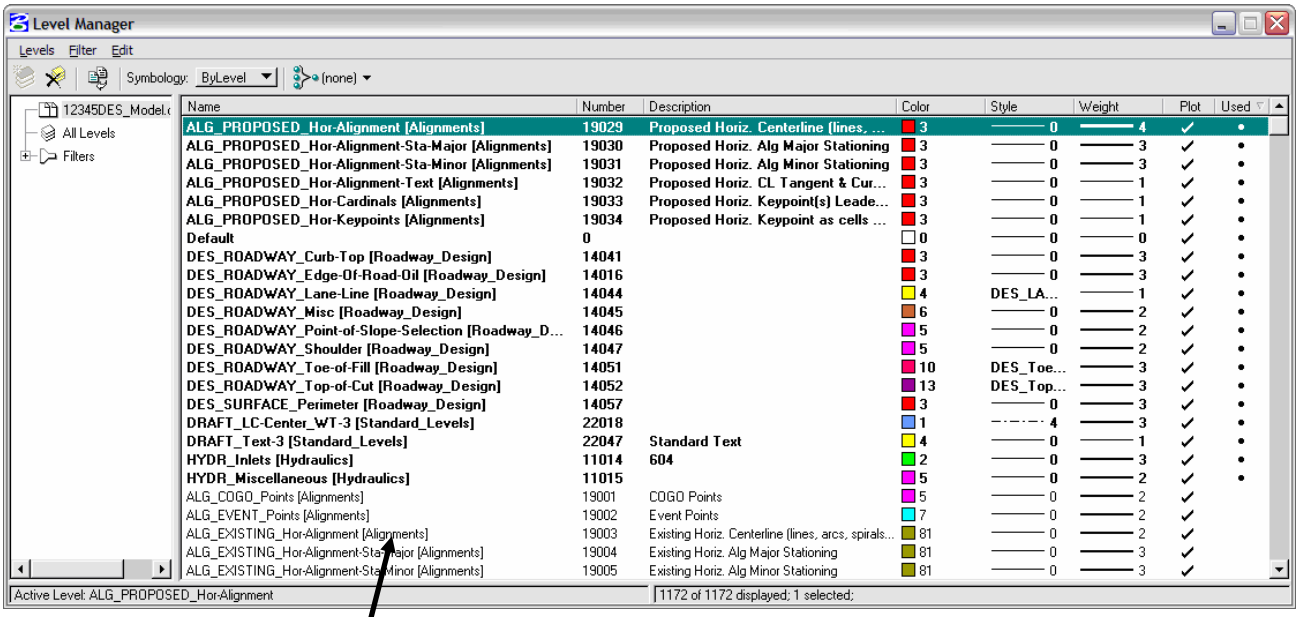


Using the Level Manager

The **Level Manager** is used to set level properties (name, description, number, display, plot, symbologies, *etc*.) and is located next to **Level Display** on the **Primary** toolbar.

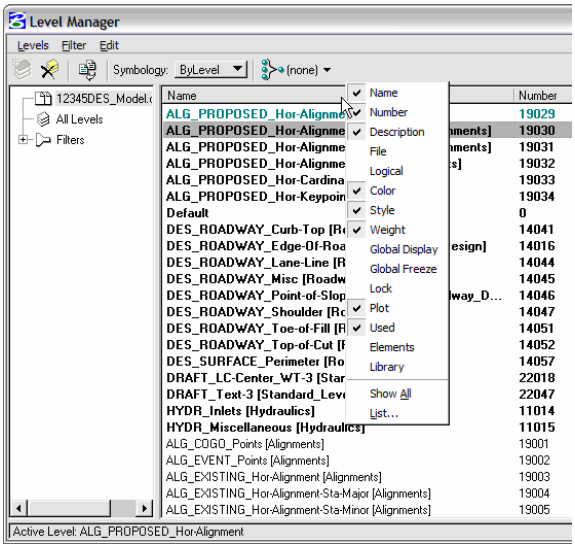


You can also access **Level Manager** from **Settings > Level > Manager** or from the **Primary** toolbar.



Levels with library name shown in brackets

The **Level Manager** shows a list of all levels attached and the library the level is in. Additional information can be displayed by right-clicking in the column headings and turning columns on/off – information like the level number, description, and its **ByLevel** Symbology.

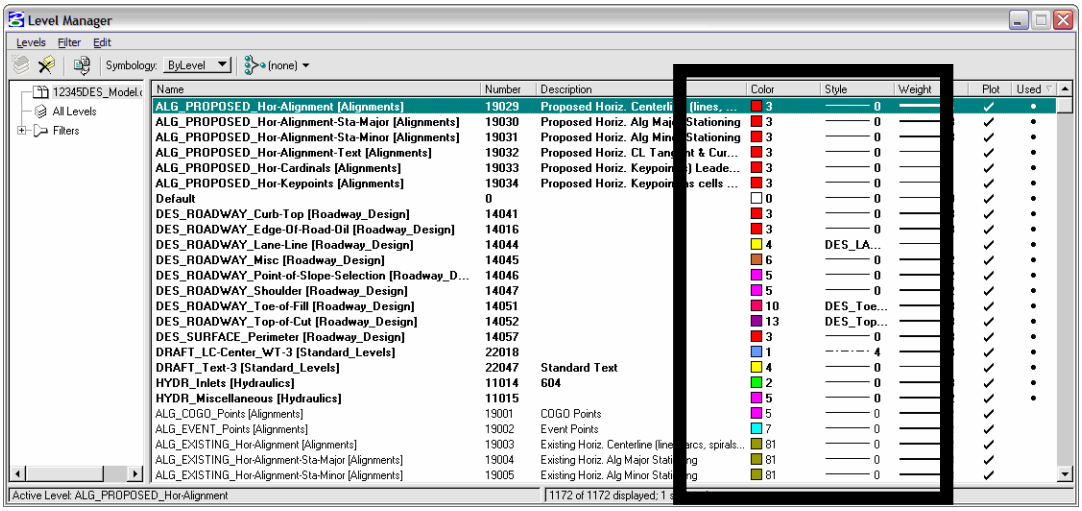


ByLevel symbology

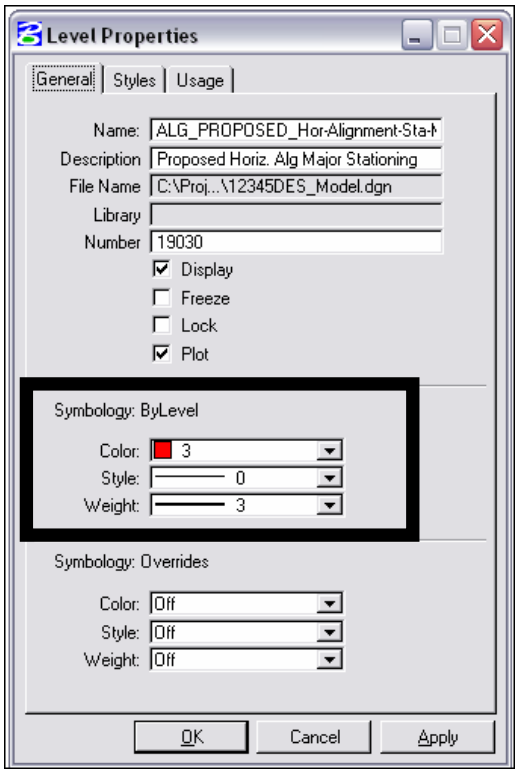
ByLevel symbology is the color, line style and line weight assigned to a level. When you place graphics on that level, the elements take on the level's symbology. The combination of naming levels and using **ByLevel** symbology is a good way to ensure CADD standards are maintained.

> **Note**: CDOT has established **ByLevel** symbology for all its standard levels to conform to CDOT CADD standards. The **ByLevel** symbology is stored with the level in the level library. You should not change the **ByLevel** Symbology.

You can review a level's **ByLevel** symbology by turning on the appropriate columns in the **Level Manager**.

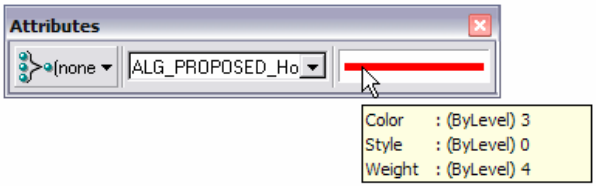


You can also obtain level properties by selecting **Level>Properties** from the **Level Manager**.



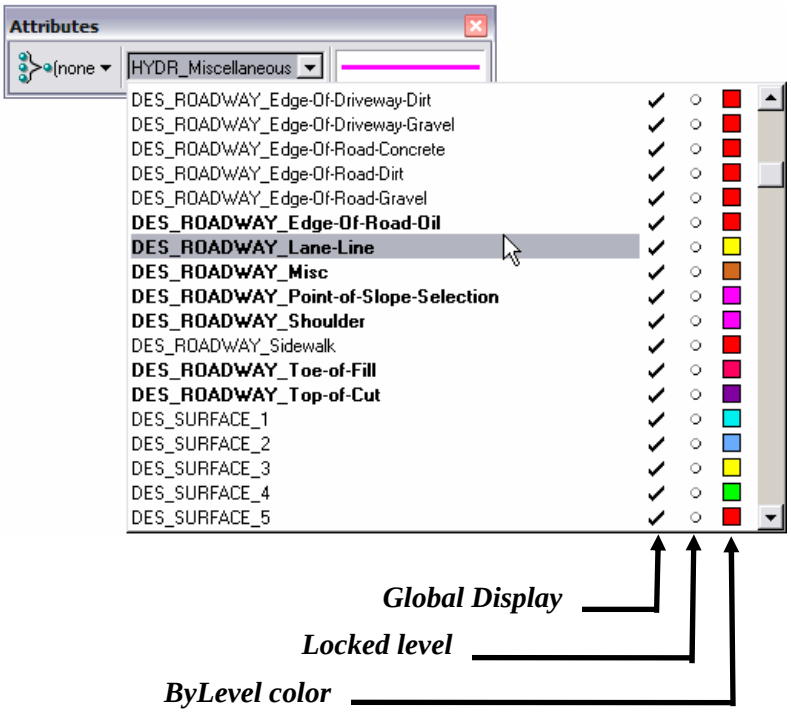
The **Attributes** toolbar is where you can set the **Active Level** (the level on which you will place graphics), which in turn sets the **ByLevel** symbology for the graphics. After making your selection, the **Attributes** toolbar shows you a preview of the **ByLevel** symbology for that level. Hold your cursor over the symbology preview for a description of active color, style and weight.

Note: Unless you have specific reasons or permissions not to, you should ***always*** use **ByLevel** symbologies when creating elements



Note: The CDOT menu, which is discussed in Chapter 5, automates the process of setting the proper level and ByLevel symbology for drawing elements.

The **Attributes** toolbar provides other useful information. In addition to showing the active level, it also shows if the level is turned on/off (global setting – all views), if it is locked (graphics on the level can not be deleted or modified), and the **ByLevel** color.

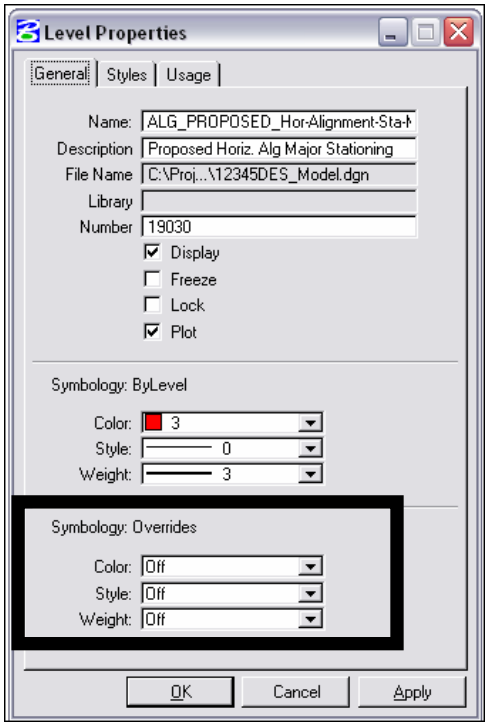


Setting symbology overrides

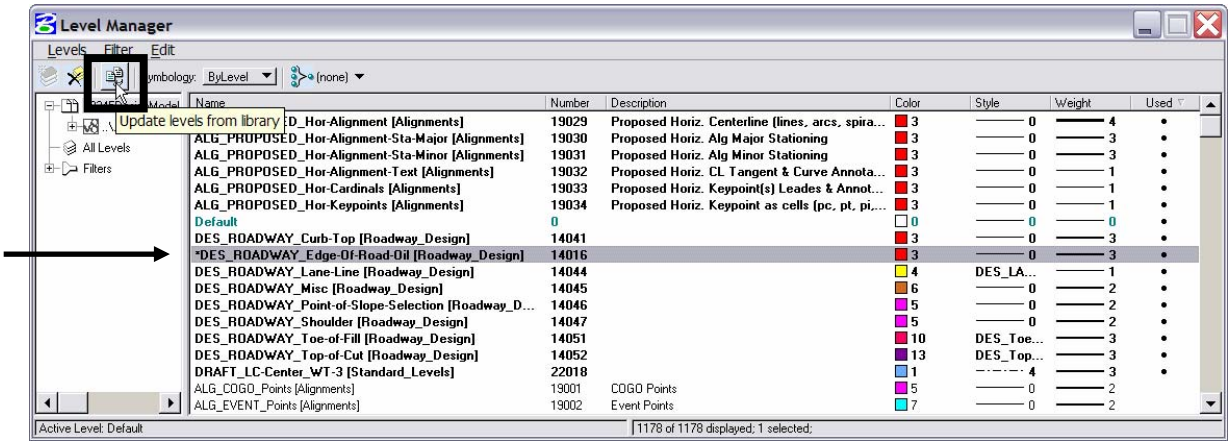
The **Level Manager** is also where you set level **Symbology Overrides**. You can set a different symbology for each level. For example, you may want to "dither out" (to show faintly, typically using a gray color) graphics on a specific level before plotting by setting color, style and weight to 0.

> **Note**: If you need to override the **ByLevel** symbology of an element for a special plot, for example, you should do so by setting the **Symbology Overrides**. ***Do not*** change the **ByLevel** symbology.

Set **Symbology Overrides** under **Level > Properties**



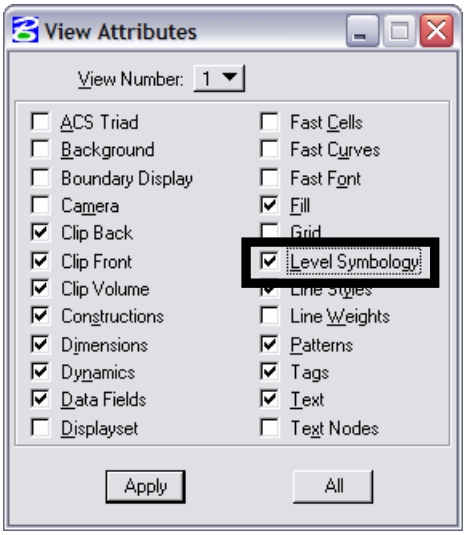
After setting symbology overrides (or if the ByLevel symbology has been changed), an asterisk appears beside the level to let you know that has been changed from the library standards. To synchronize the level back to the library standards, select **Update Levels from Library**.



View Attributes and Symbology Overrides

The **View Attributes** box (**Settings > View Attributes**) is where you tell MicroStation what you want to see (or not see) in a view. For example, you can turn all text in the view on or off. You can also turn off line weights (thicknesses) or line styles (solid, dashed, *etc*.) to show all graphics the same. If you have set **Symbology Overrides** in the **Level Manager**, you have to turn on **Level Symbology** in **View Attributes** before the override takes affect.

Symbology Overrides only affect how graphics are displayed (the element attributes are not changed, just temporarily overridden), whereas **ByLevel** symbology actually sets or changes the element's attributes.



Note: More information on how to set up shaded color and grayscale printing is available in Chapter 10.

Working with Level Filters

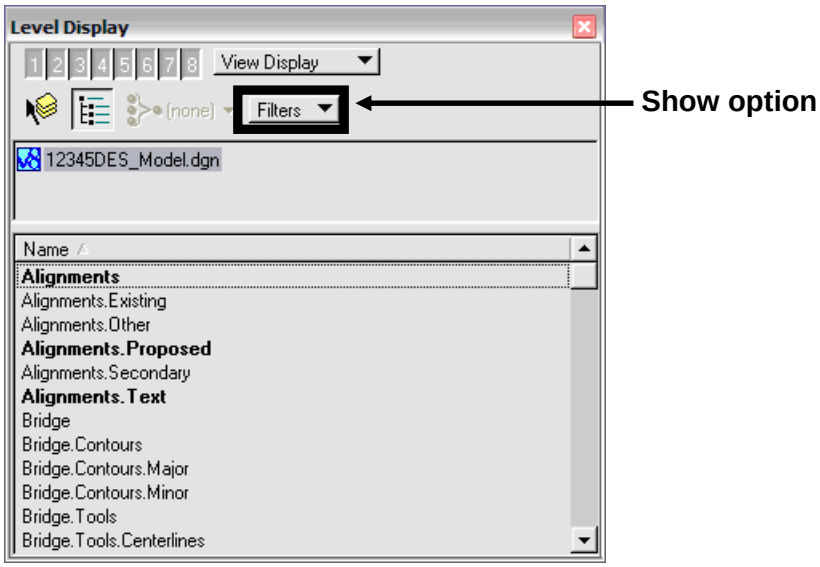
Level filters are named groups of levels that can be turned on or off as a group (*e.g.* all road design levels, all survey levels, all topo levels). You can filter on many criteria (name, number, *etc*.) to create the groups.

CDOT filters

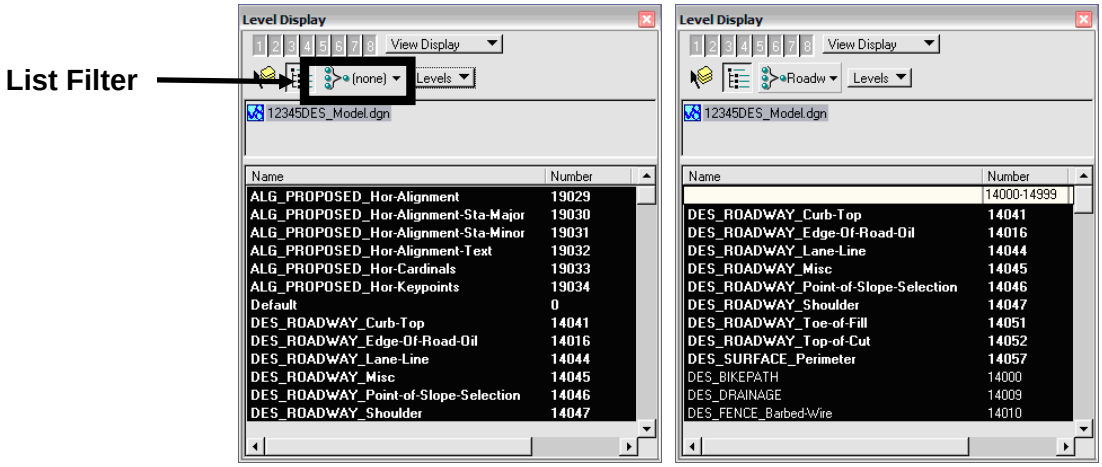
Several pre-defined CDOT filters are available for your use. These filters are obtained from the various discipline-specific CDOT level libraries attached via the **Select Group Environment** program. The filters have been defined based on logical groups of levels that you normally work with (*e.g.* **Cross Section**, **Profiles**, **Surface** for the Design group, **Existing**, **Easements**, **Ownership** for the ROW group.)

Setting filters

Use **Level Display** to turn the filters on or off. Set the **Show** option to **Filters**, and then select the filter from the list. This turns the entire group of levels on/off.



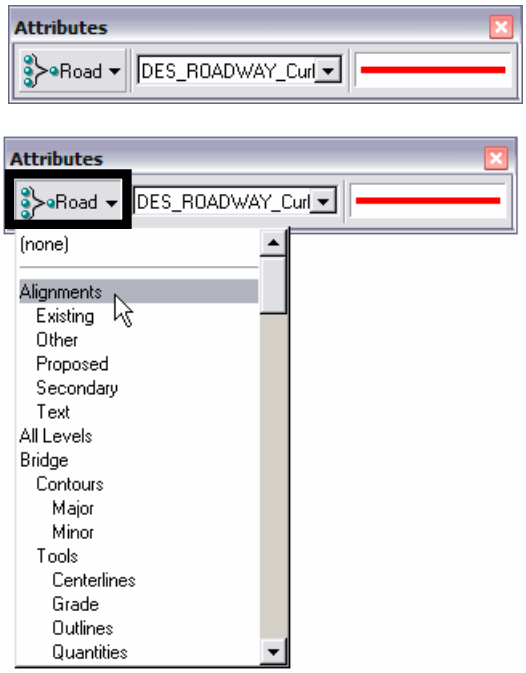
When working with levels, it is often easier to work with just a subset to quickly find a level to set active or turn on/off. In this case, you can "filter down" your levels by setting the **Show Option** to **Levels** and then changing the **List Filter** option from **(none)** to the desired filter.



List Filter set to none (All Levels)

List Filter set to Roadway Design Surface (A subset showing only design surface levels)

Filters can also be set on the **Attributes** toolbar when setting the active level.

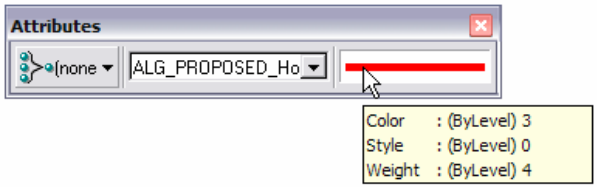


Setting the active level

The active level is the level on which you will place graphics, using the level's ByLevel symbology. There are many ways to set the active level including:

- **Double-clicking <D><D>** the level in **Level Display**
- **Double-clicking <D><D>** the level in **Level Manager**
- **Right-click <R>** in the **Level Manager** and choose **Set Active**
- Using the ***lv=<name or number >*** key-in or
- Selecting the level from the **Attributes** toolbar.

  The active level appears green in the **Level Display** and **Level Manager** boxes.



Lab 2 – Levels

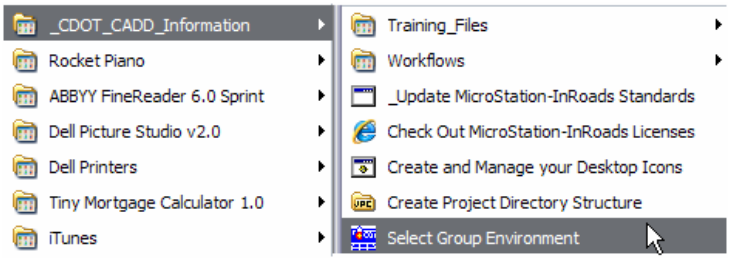
Objectives

After completing this exercise you will know how to:

- Attach the appropriate levels by using the **Select Group** program.
- Use **Level Display** to turn levels on/off.
- Use keyins to turn levels on/off.
- Set the active level for placing graphics.
- Use shortcuts for turning all levels on/off.
- Turn levels off by graphically selecting an element.
- Turn different levels on/off in different views.
- Customize the **Level Display** and **Level Manager** boxes.
- Sort levels.
- Save a view for later recall.
- Access CDOT standard level filters.
- Use level filters to manage levels and turn groups of level on/off.

Starting MicroStation

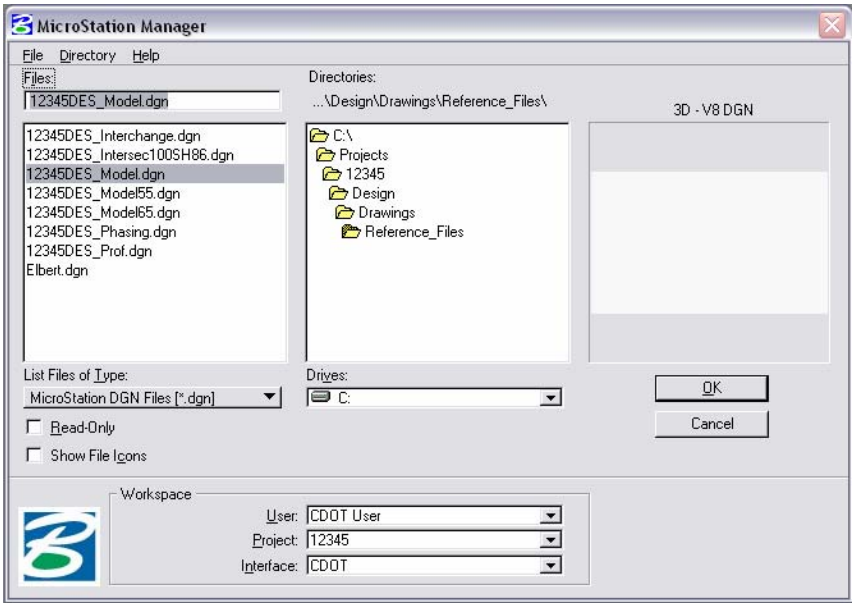
1. From your desktop's **Start** Menu, choose **Start > All Programs > _CDOT_CADD_Information > Select Group Environment.**



2. In the **Select Group Environment** box, select **xxMulti-Discipline**, and then select **OK**.

Note: This will allow you access to all discipline's levels. Refer to Section 2, *The* **CDOT MicroStation Workflow -- Chapter 4** for more information on the Select Group Environment Utility.

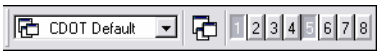
3. Start MicroStation and open the design file **12345DES_Model.dgn** from the **c:\Projects\12345\Design\Drawings\Reference_Files** folder.



View 1 is a plan view of the entire project that you set up in the last lab.

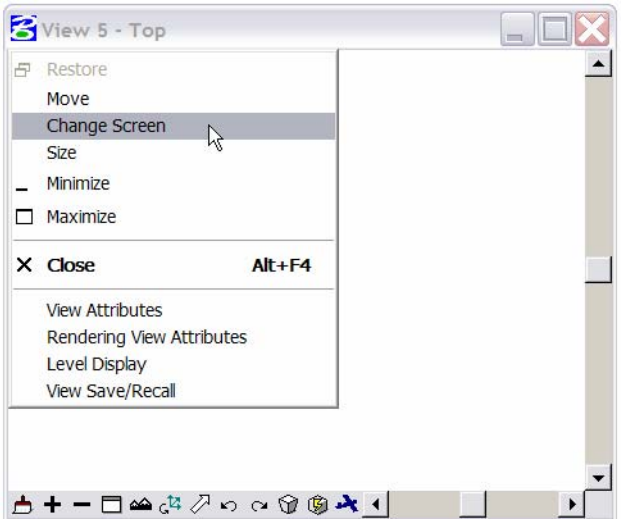
4. Minimize or Close the CDOT Menu.

5. Open View 5 from the **View Toggles** toolbar (lower left).

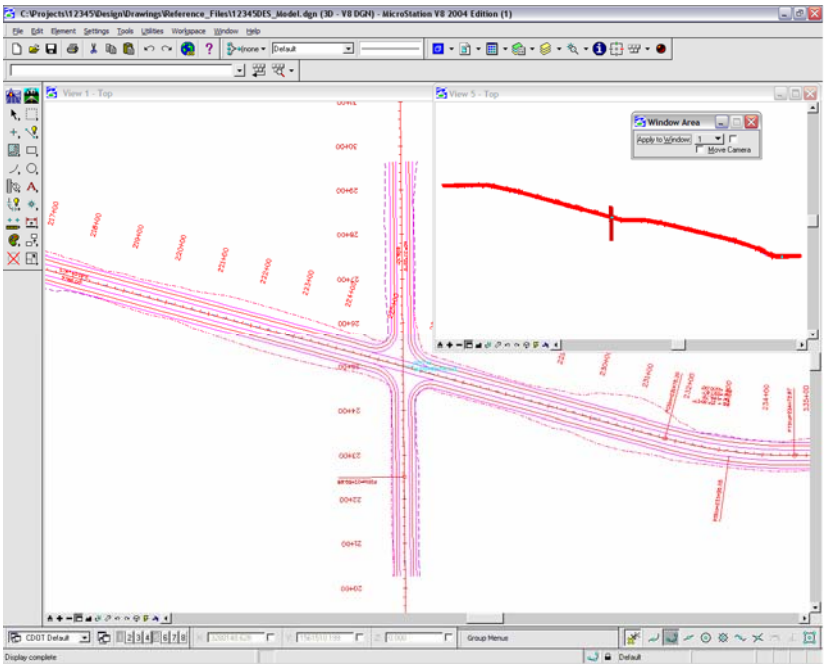


6. **Fit** View 5.

Note: If you want to move View 5 to the left screen, select the **Change Screen** option from the view's control menu (the "B").



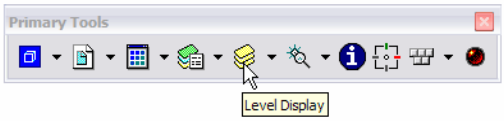
7. In View 1, **Window Area** around the intersection as shown.



Working with levels

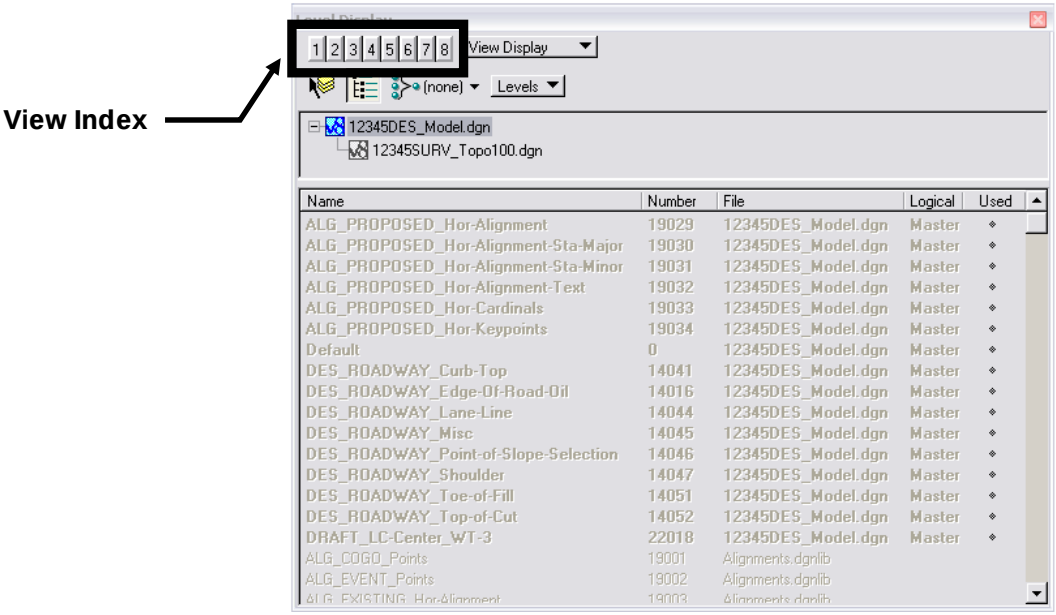
Sorting Levels

1. Select **Settings > Level > Display** (or, from the **Primary** toolbar select **Level Display**).



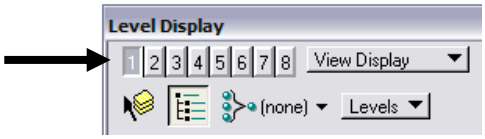
The **Level Display** box opens. It is used to turn levels on and off.

2. In the top left corner on the **Level Display** box, toggle ***off*** all of the **View Indexes**.



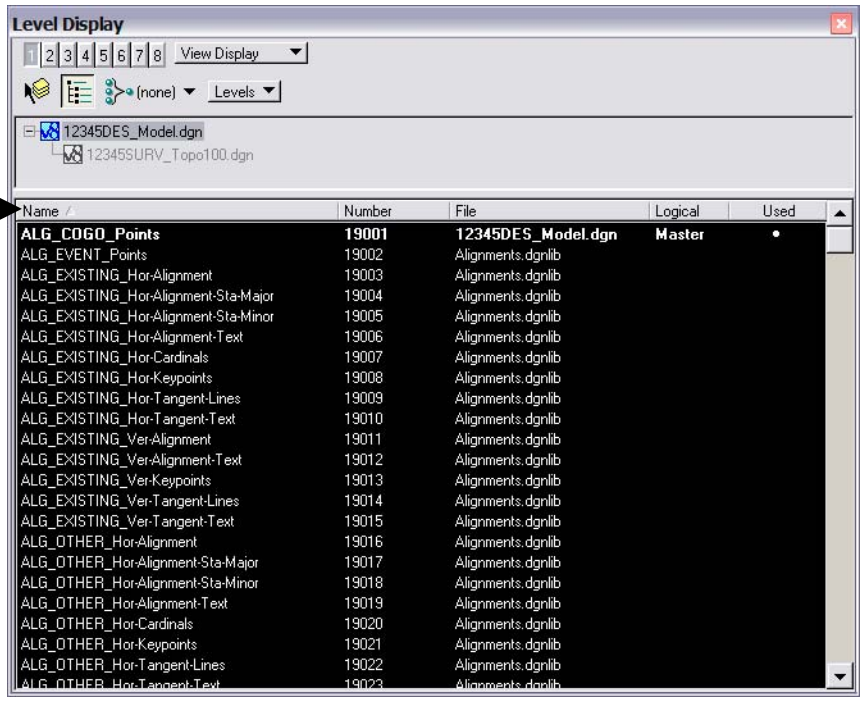
With all view indexes off, there are no levels available to turn on/off (the levels are grayed-out).

3. Turn on **View Index 1** and leave all other view indexes off.



4. **<D>** on the column heading **Name** to sort by name, then **<D>** on **Used** to bring the used levels to the top of the list.

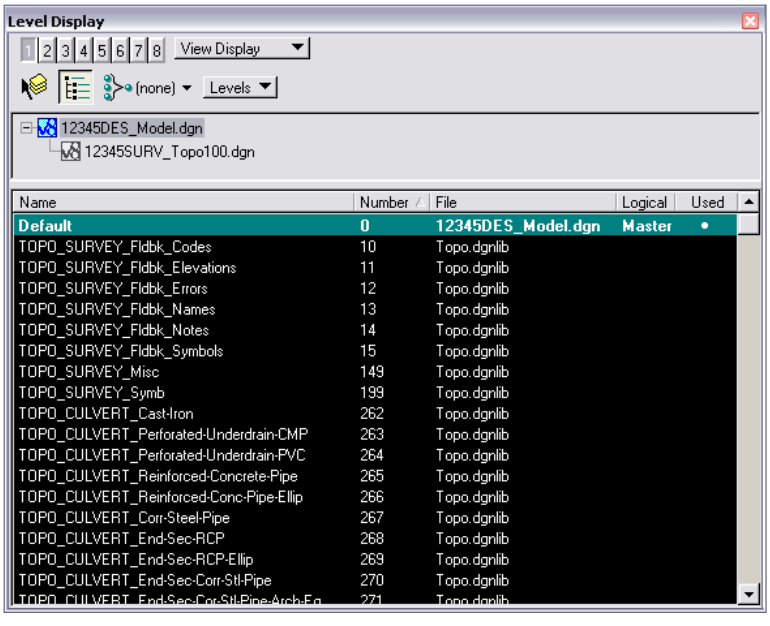
<D> here to sort by Name



5. Scroll through the list of levels.

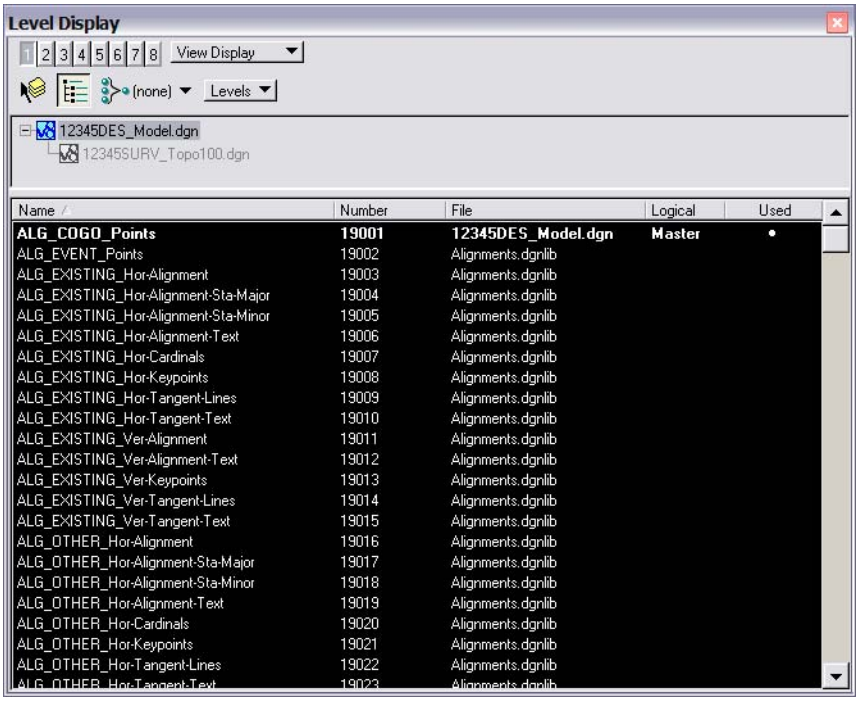
   The levels which are used (those with graphics placed on them) appear in bold text. All other un-used levels are from the attached libraries.

6. **<D>** on the column heading **Number** to sort by level number.



   Note that levels are grouped by number. For example, all Roadway Design levels are 14000 series; all Right-of-Way levels are 15000 series, etc.

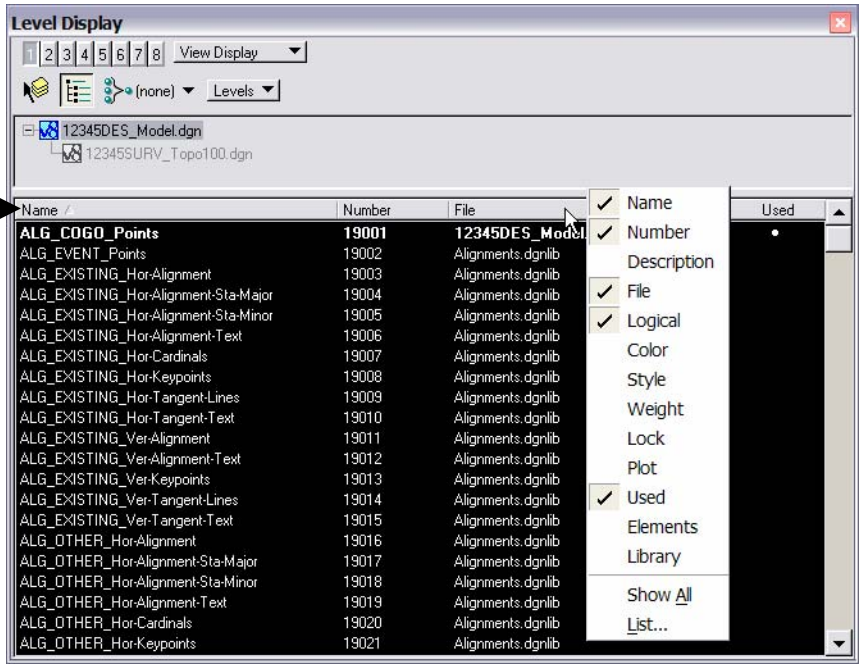
7. **<D>** on the column heading **Name** to sort the levels alphabetically by name and scroll through the level list. (If you toggle the **Name** column, you will sort A – Z, then Z – A). Toggle **Name** until you sort A – Z.



Note: All MicroStation levels are assigned both names and numbers.

8. Right-click in any column heading (**Name**, **Number**, *etc.*) and toggle off the column **Logical**.

Right-click on any column heading to turn columns on or off

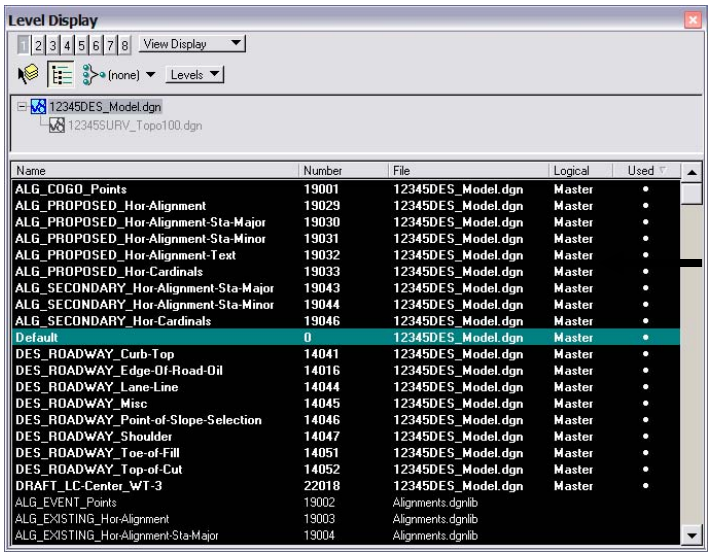


You can customize the look of the **Level Display** box by turning on/off information columns.

Turn levels on/off using Level Display

1. With the levels now sorted by name**, <D>** on the column heading **Used** until all used levels are brought to the top of the list. This now sorts all used levels alphabetically.

   Note: You may have to click **Used** twice to get all used levels to the top.

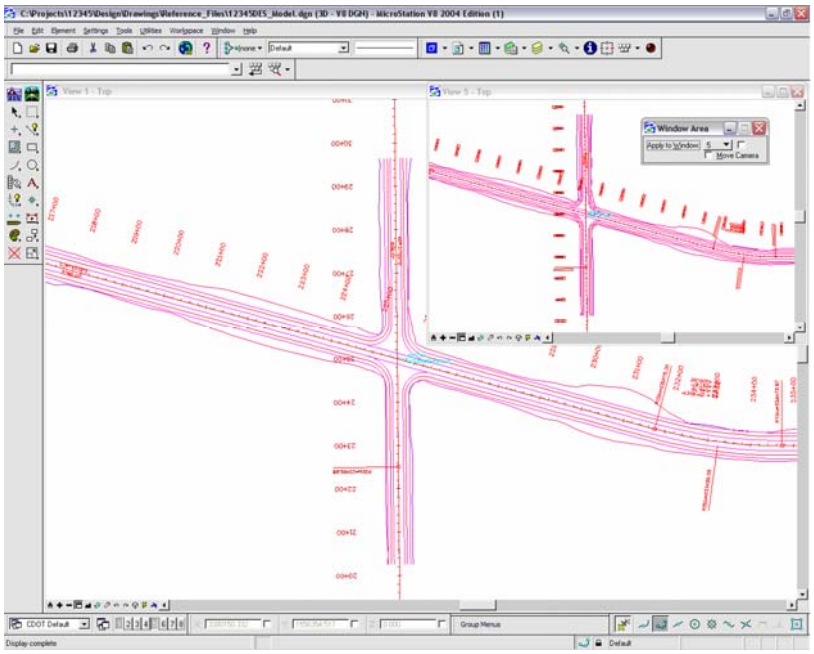


Look for the "dot" in t Used column when sorting Used levels

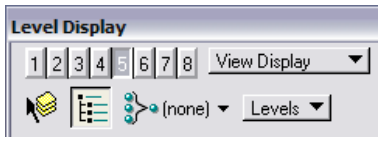
2. Scroll up to the top of the list to see the used levels.

   Note: Sorting by **Used** is a handy way to quickly find a level that you want to turn on/off.

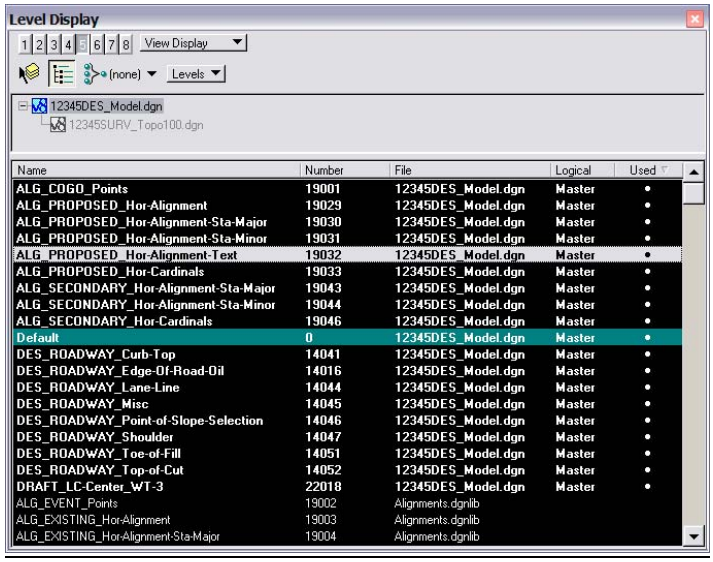
   Window Area around the same intersection location in View 5 as in View 1.



3. In **Level Display**, toggle ***off*** View Index 1 and toggle ***on*** View Index 5 and scroll through the level list.



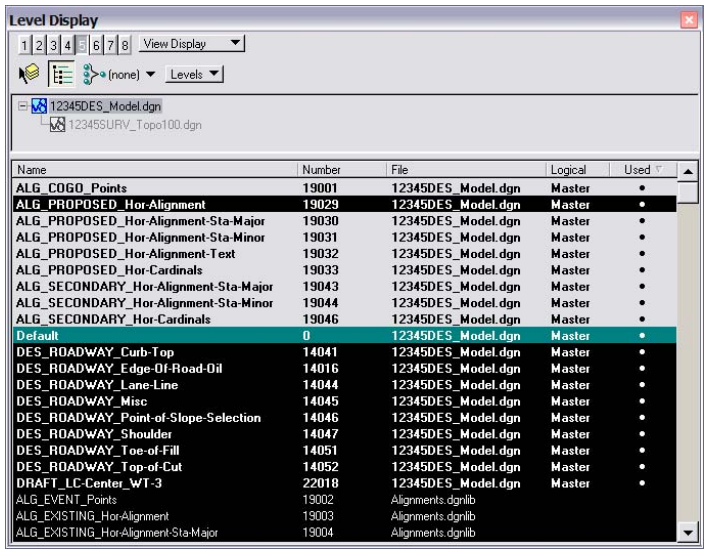
4. **<D>** on the level **ALG_PROPOSED_Hor-Alignment-Text** to turn it off.



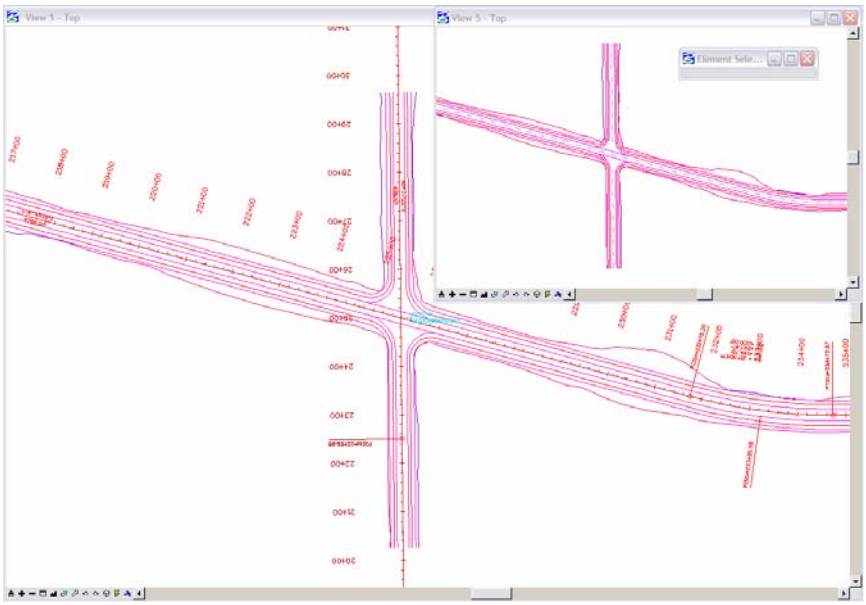
Note: Levels with a black background are on, levels with a white background are off.

Note: Level displays are view dependent – you can have different levels on/off in different views.

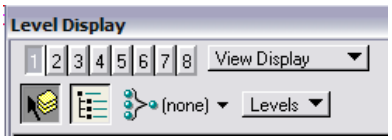
5. In View 5, hold down the data button and drag to turn off all **ALG** levels except the **ALG_PROPOSED_Hor-Alignment** level as shown.



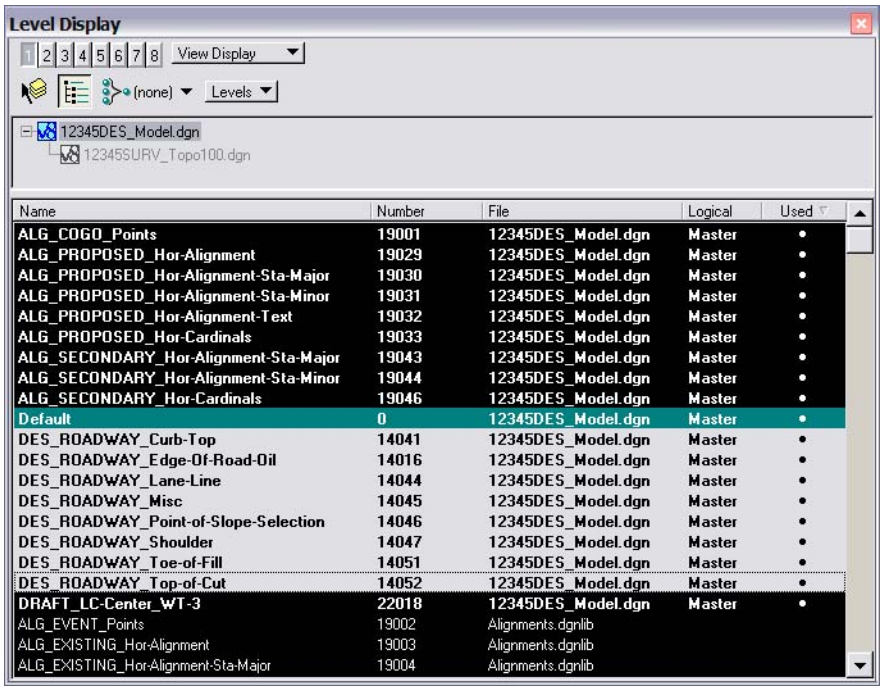
The intersection text is now off in View 5 but on in View 1.



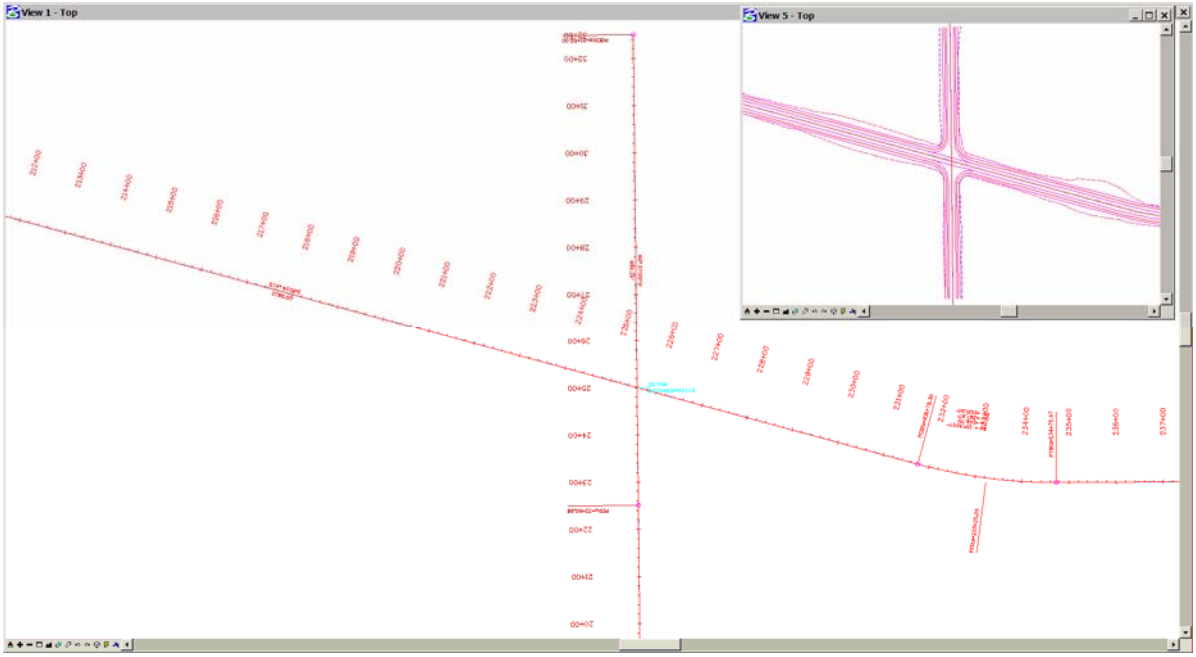
6. Turn ***off*** View Index 5 and turn View Index 1 back ***on***.



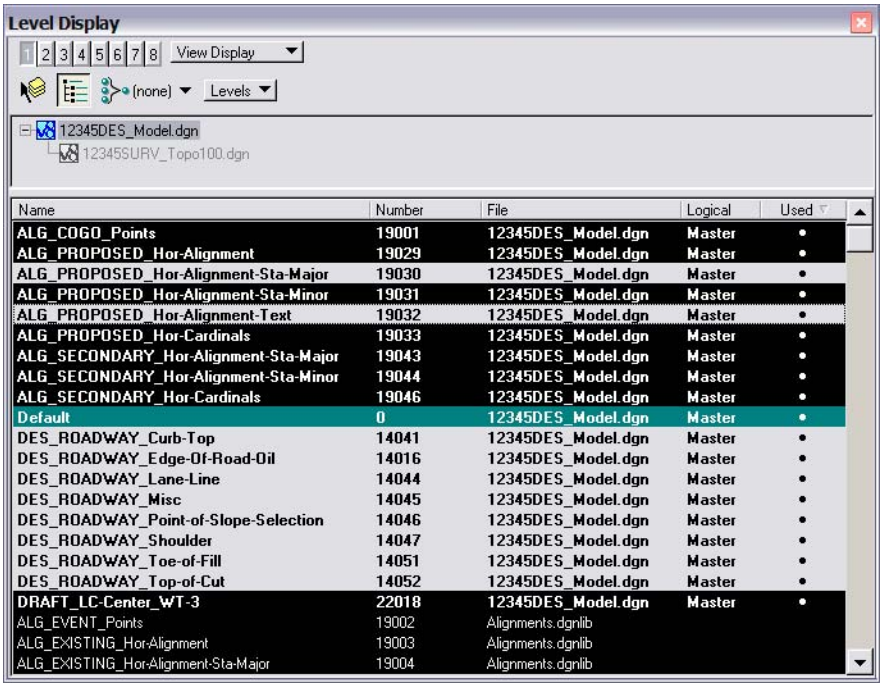
7. Hold down the data button and drag across all **DES**_ levels to turn them ***off*** in View 1.



Only alignment levels are now on in View 1.

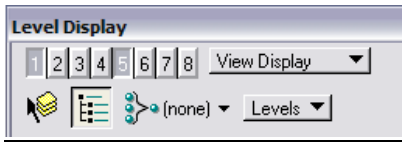


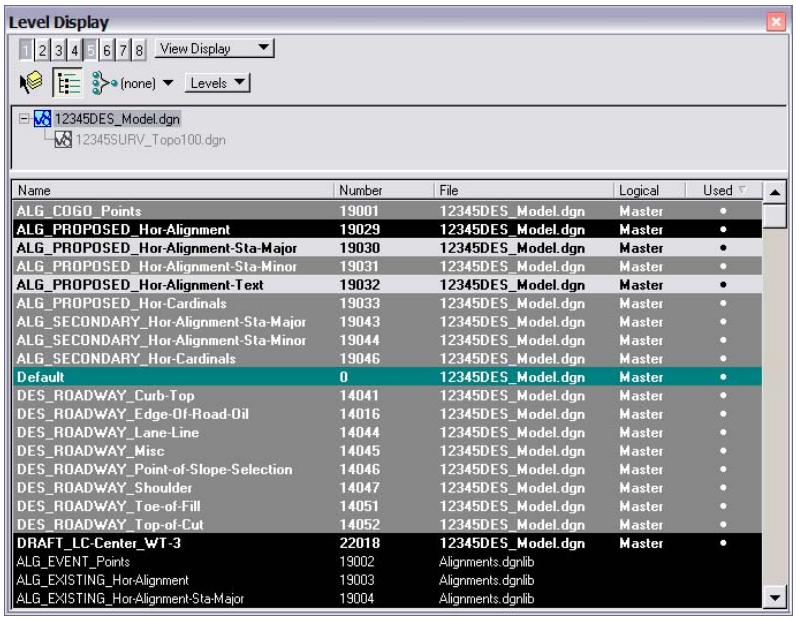
8. Turn ***off*** the levels **ALG_PROPOSED_Hor-Alignment-Text** and **ALG_PROPOSED_Hor-Alignment-Sta-Major** in View 1.



Name	Number	File	Logical	Used
ALG_COGO_Points	19001	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment	19029	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Major	19030	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Minor	19031	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Text	19032	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Cardinals	19033	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Major	19043	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Minor	19044	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Cardinals	19046	12345DES_Model.dgn	Master	•
Default	0	12345DES_Model.dgn	Master	•
DES_ROADWAY_Curb-Top	14041	12345DES_Model.dgn	Master	•
DES_ROADWAY_Edge-Of-Road-Oil	14016	12345DES_Model.dgn	Master	•
DES_ROADWAY_Lane-Line	14044	12345DES_Model.dgn	Master	•
DES_ROADWAY_Misc	14045	12345DES_Model.dgn	Master	•
DES_ROADWAY_Point-of-Slope-Selection	14046	12345DES_Model.dgn	Master	•
DES_ROADWAY_Shoulder	14047	12345DES_Model.dgn	Master	•
DES_ROADWAY_Toe-of-Fill	14051	12345DES_Model.dgn	Master	•
DES_ROADWAY_Top-of-Cut	14052	12345DES_Model.dgn	Master	•
DRAFT_LC-Center_WT-3	22018	12345DES_Model.dgn	Master	•
ALG_EVENT_Points	19002	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment	19003	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment-Sta-Major	19004	Alignments.dgnlib		

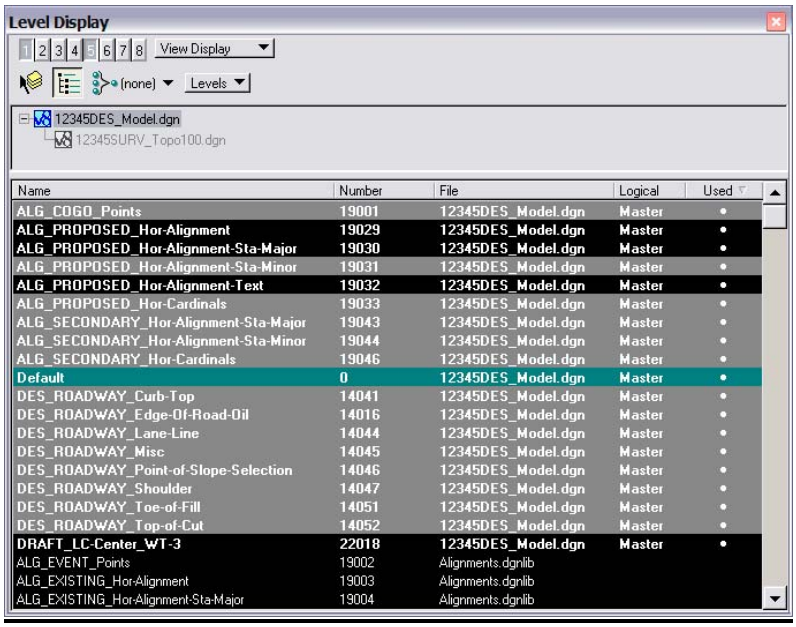
9. Turn ***on*** View Index 5 so that both View Index 1 and 5 are now ***on***.



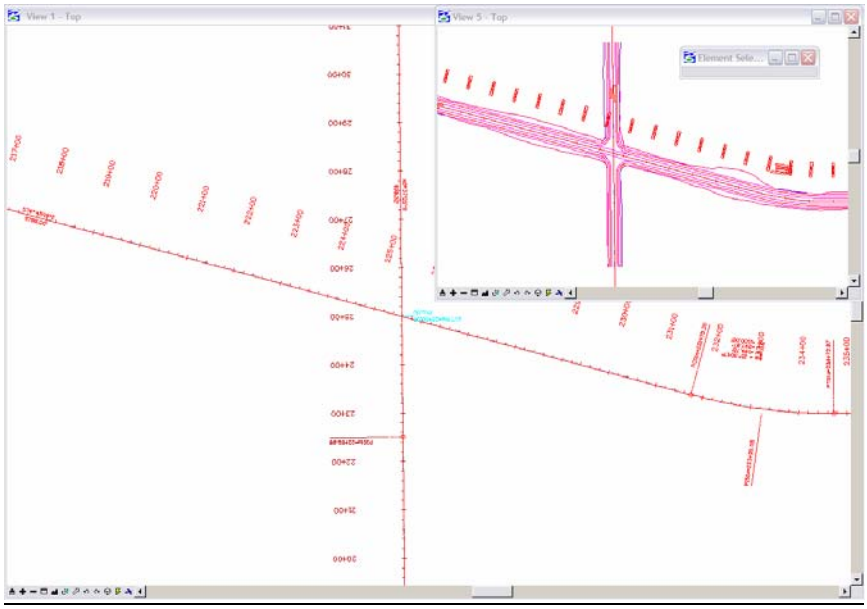


Some levels are now shown with a medium-gray background. When multiple view indexes are on, a medium-gray background means that the level is on in at least one of the views, but not in all selected views. A light-gray background means the levels are off in all selected views.

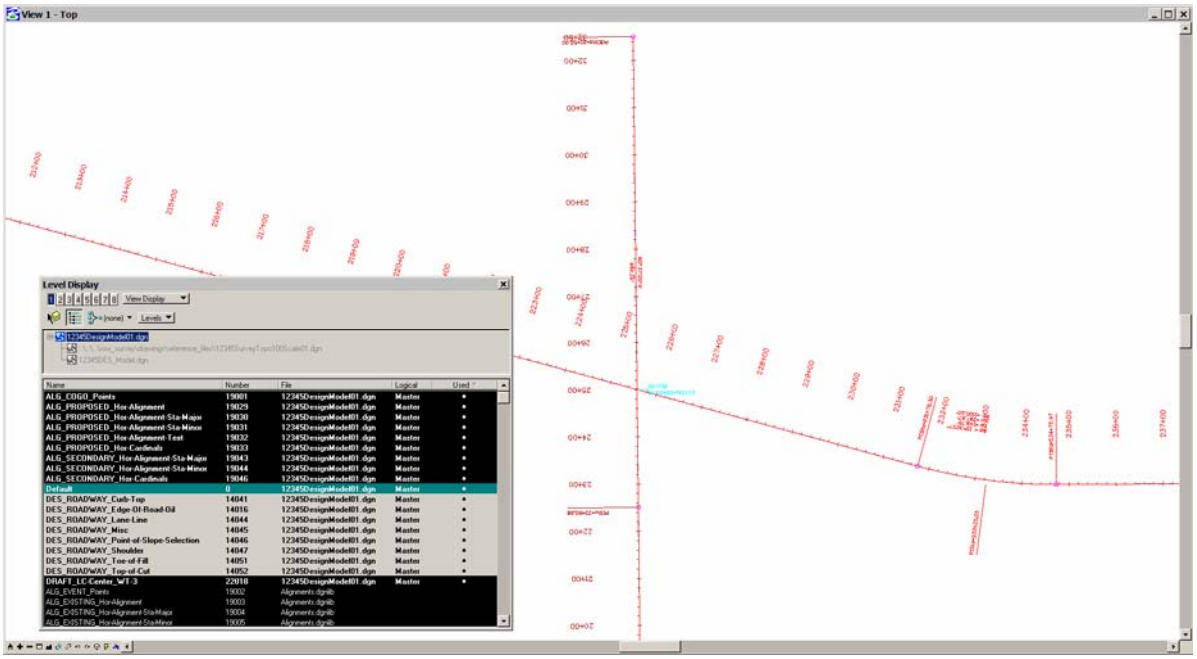
10. Turn on the levels **ALG_PROPOSED_Hor-Alignment-Text** and **ALG_PROPOSED_Hor-Alignment-Sta-Major**.



Note that the levels are turned on in both views 1 and 5.

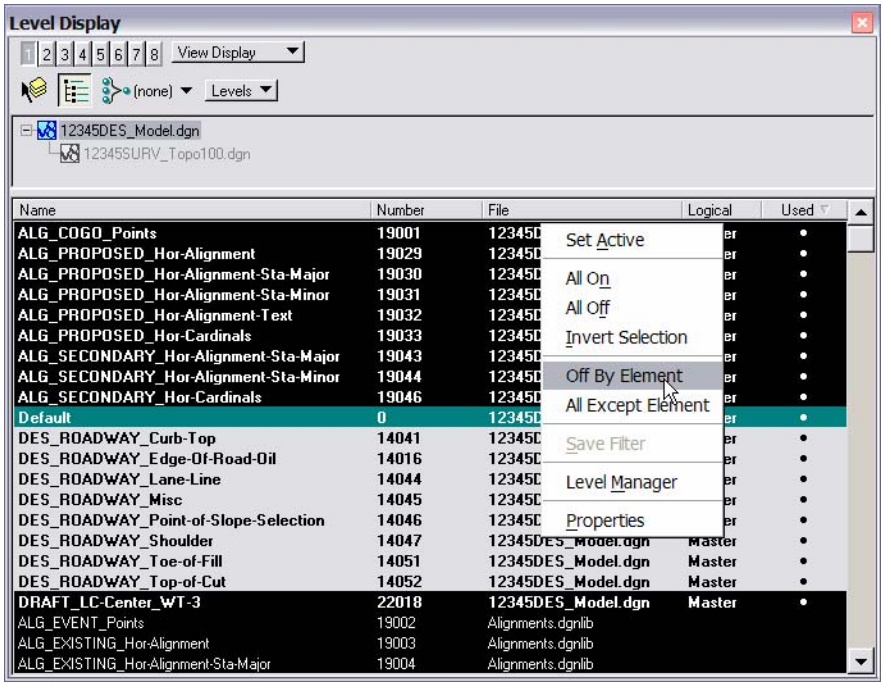


11. Turn ***off*** View Index 5.
12. **Close** View 5.

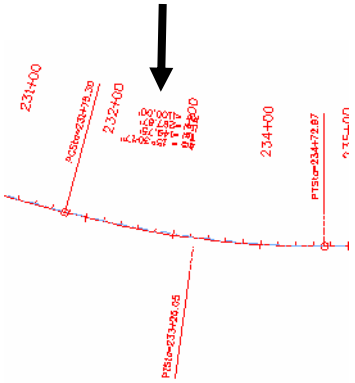


Turn levels on/off By Element

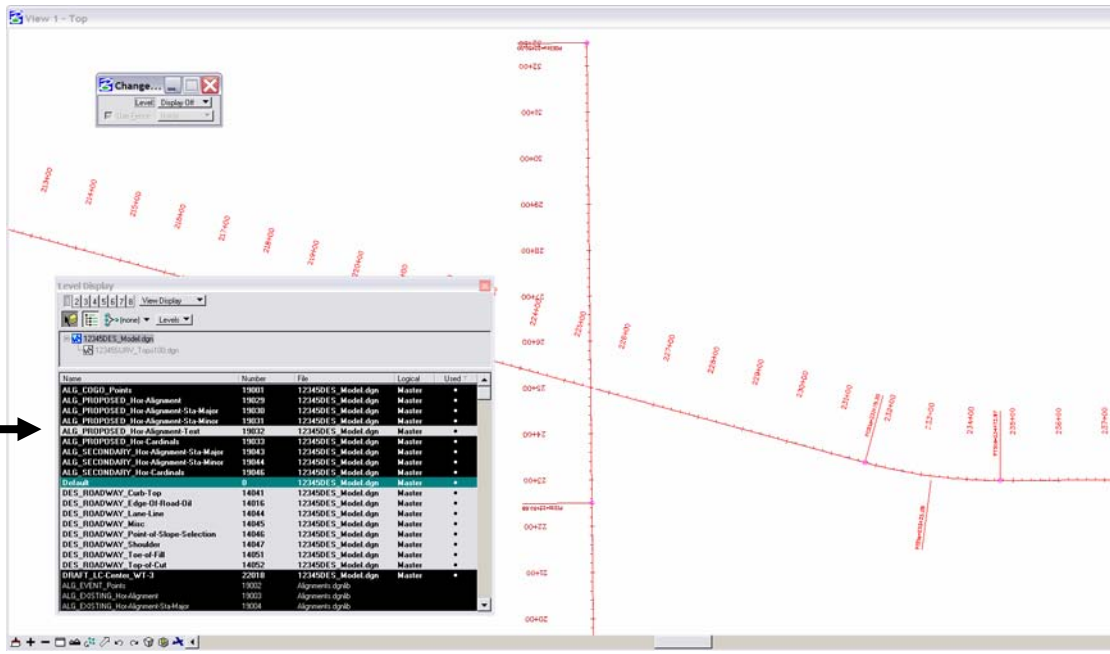
1. The station and alignment text levels are currently ***on***. **Right-click** anywhere inside the **Level Display** box and select **Off By Element.**



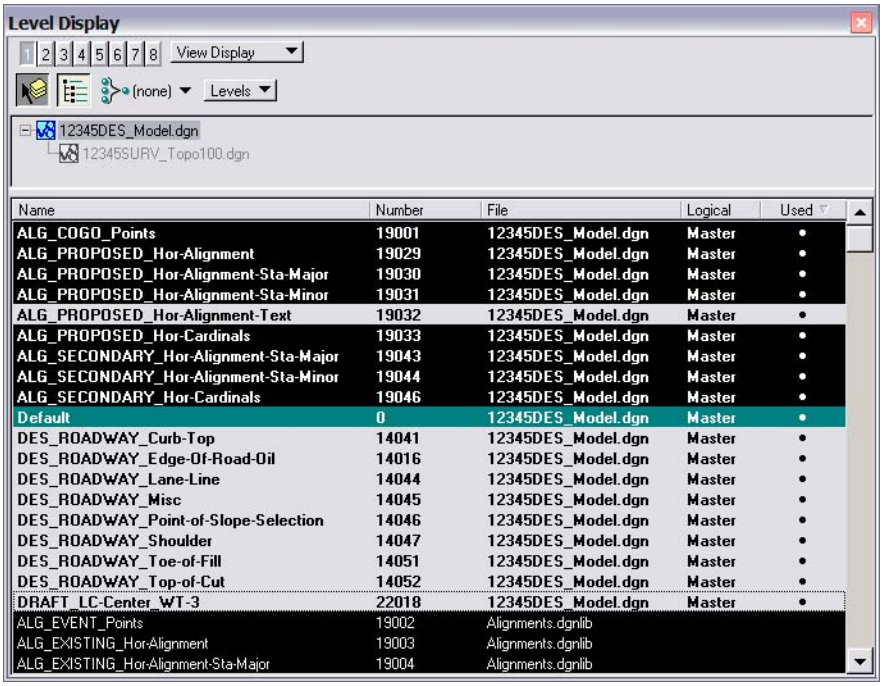
2. **<D>** on the red alignment curve text as shown.



The level **ALG_PROPOSED_Hor-Alignment-Text** is turned ***off*** by graphically picking an element on that level.

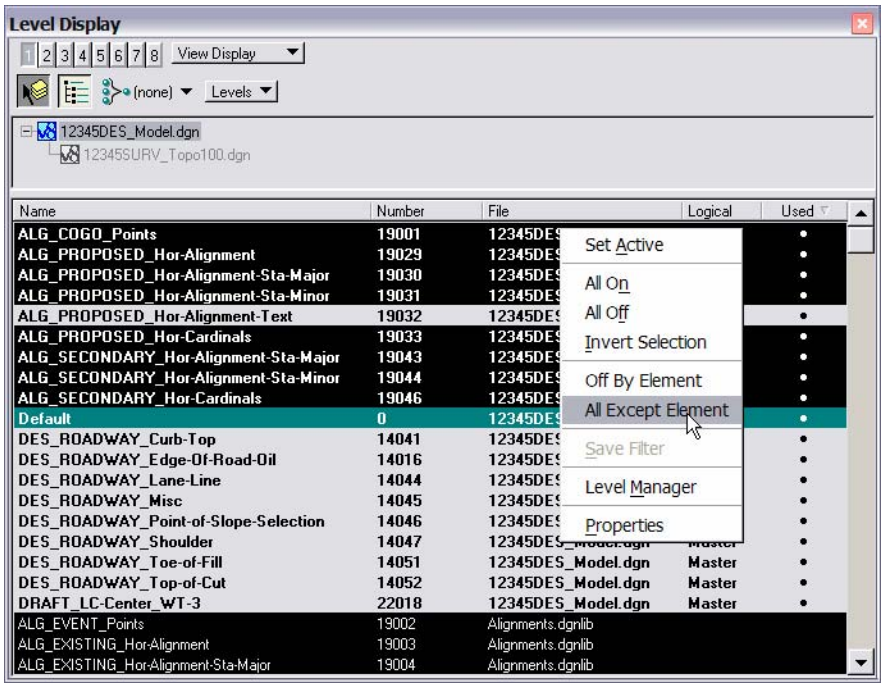


3. Turn off the Level **DRAFT_LC-Center_WT-3**.

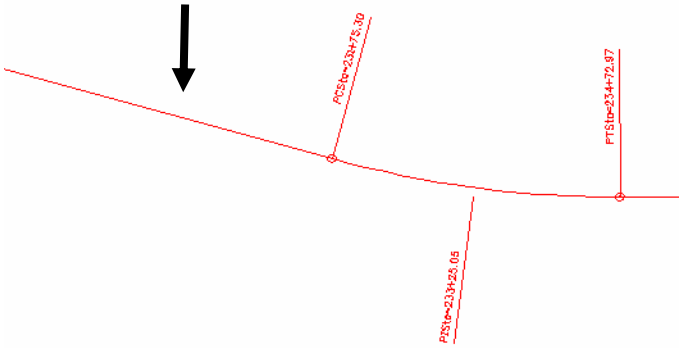


Name	Number	File	Logical	Used
ALG_COGO_Points	19001	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment	19029	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Major	19030	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Minor	19031	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Text	19032	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Cardinals	19033	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Major	19043	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Minor	19044	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Cardinals	19046	12345DES_Model.dgn	Master	•
Default	0	12345DES_Model.dgn	Master	•
DES_ROADWAY_Curb-Top	14041	12345DES_Model.dgn	Master	•
DES_ROADWAY_Edge-Of-Road-Oil	14016	12345DES_Model.dgn	Master	•
DES_ROADWAY_Lane-Line	14044	12345DES_Model.dgn	Master	•
DES_ROADWAY_Misc	14045	12345DES_Model.dgn	Master	•
DES_ROADWAY_Point-of-Slope-Selection	14046	12345DES_Model.dgn	Master	•
DES_ROADWAY_Shoulder	14047	12345DES_Model.dgn	Master	•
DES_ROADWAY_Toe-of-Fill	14051	12345DES_Model.dgn	Master	•
DES_ROADWAY_Top-of-Cut	14052	12345DES_Model.dgn	Master	•
DRAFT_LC-Center_WT-3	22018	12345DES_Model.dgn	Master	•
ALG_EVENT_Points	19002	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment	19003	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment-Sta-Major	19004	Alignments.dgnlib		

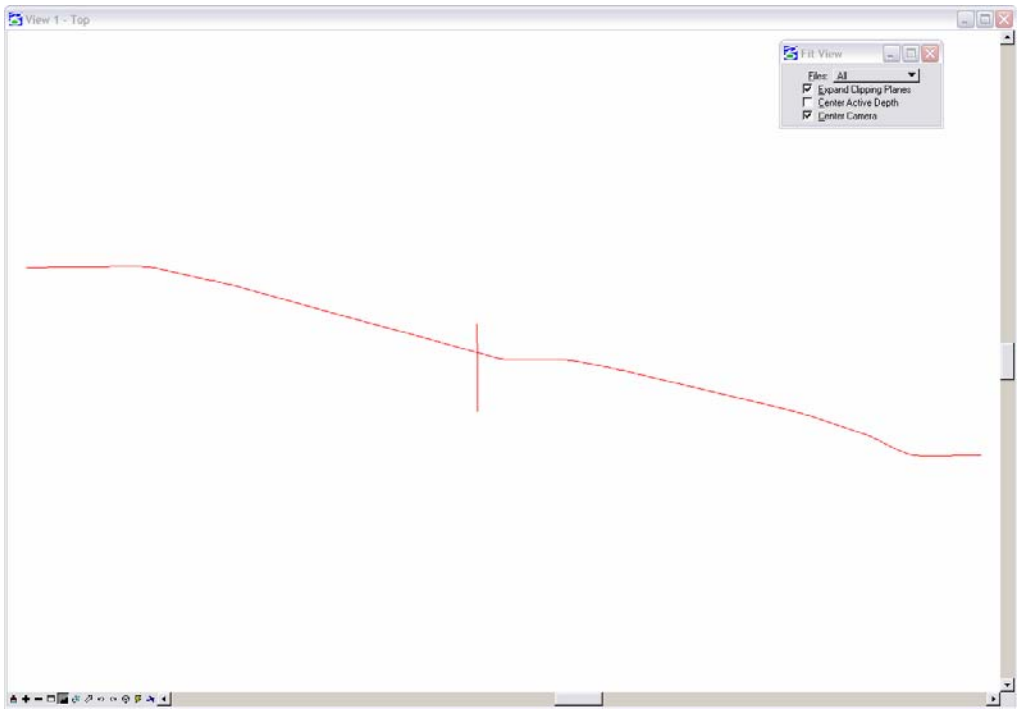
4. **Right-click** again anywhere in the **Level Display** box and select **All Except Element**.



5. **<D>** on the SH 86 (mainline) red-centerline.

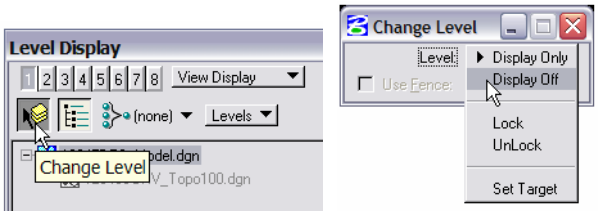


6. **Fit** View 1.

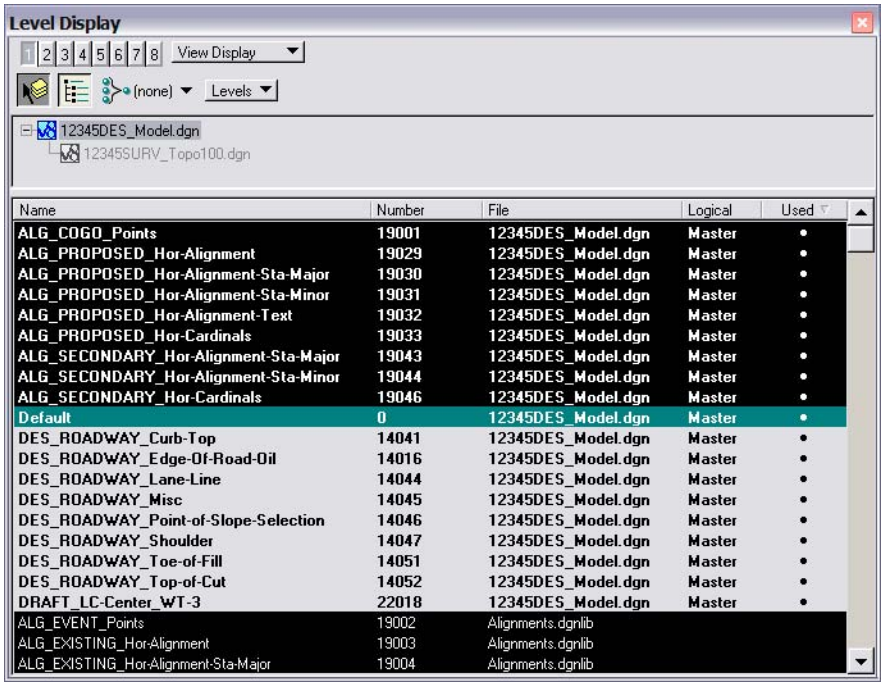


All elements except the centerlines are turned off in the view. The **Off By Element** and **All Except Element** are handy options to turn levels on/off without knowing the level names or number.

Note: You can also use the **Change Level** command, with the **Level** option set to **Display Only** or **Display Off**, to accomplish the same task.

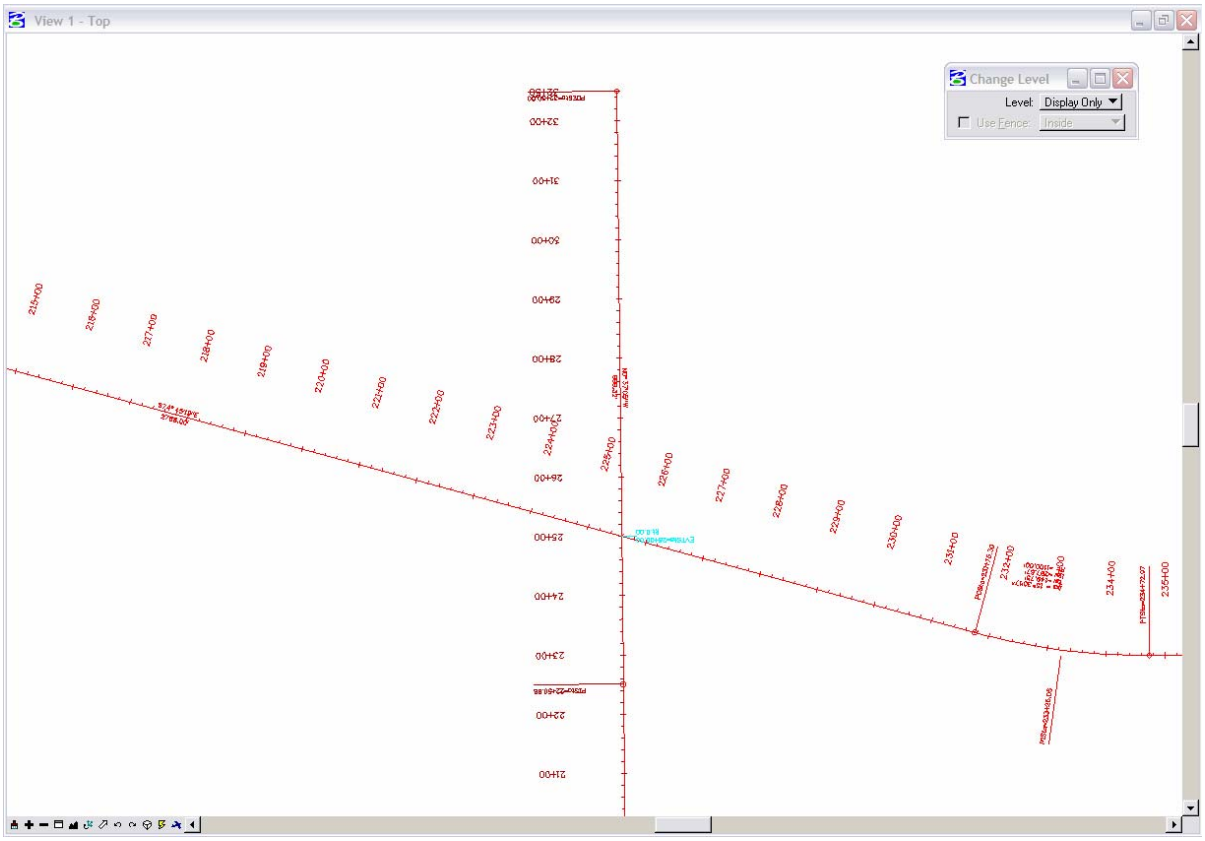


7. Turn ***on*** all of the alignment levels (data point **<D>** and drag across all **ALG** levels**.**



Name	Number	File	Logical	Used
ALG_COGO_Points	19001	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment	19029	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Major	19030	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Sta-Minor	19031	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Alignment-Text	19032	12345DES_Model.dgn	Master	•
ALG_PROPOSED_Hor-Cardinals	19033	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Major	19043	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Alignment-Sta-Minor	19044	12345DES_Model.dgn	Master	•
ALG_SECONDARY_Hor-Cardinals	19046	12345DES_Model.dgn	Master	•
Default	0	12345DES_Model.dgn	Master	•
DES_ROADWAY_Curb-Top	14041	12345DES_Model.dgn	Master	•
DES_ROADWAY_Edge-Of-Road-Oil	14016	12345DES_Model.dgn	Master	•
DES_ROADWAY_Lane-Line	14044	12345DES_Model.dgn	Master	•
DES_ROADWAY_Misc	14045	12345DES_Model.dgn	Master	•
DES_ROADWAY_Point-of-Slope-Selection	14046	12345DES_Model.dgn	Master	•
DES_ROADWAY_Shoulder	14047	12345DES_Model.dgn	Master	•
DES_ROADWAY_Toe-of-Fill	14051	12345DES_Model.dgn	Master	•
DES_ROADWAY_Top-of-Cut	14052	12345DES_Model.dgn	Master	•
DRAFT_LC-Center_WT-3	22018	12345DES_Model.dgn	Master	•
ALG_EVENT_Points	19002	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment	19003	Alignments.dgnlib		
ALG_EXISTING_Hor-Alignment-Sta-Major	19004	Alignments.dgnlib		

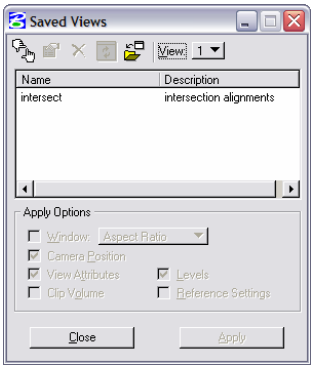
8. **Window** in to the intersection as shown.



Save a view

1. **<D>** in the **Key-in** box to set the focus.
2. Key in ***sv=intersect,intersection alignments*** and press **<Enter>.**

   Note: Always press **<Enter>** or **<Tab>** after key-ins.
3. **<D>** in View 1 to select it as the view to save.
4. Verify you saved the view. Select **Utilities > Saved Views.**

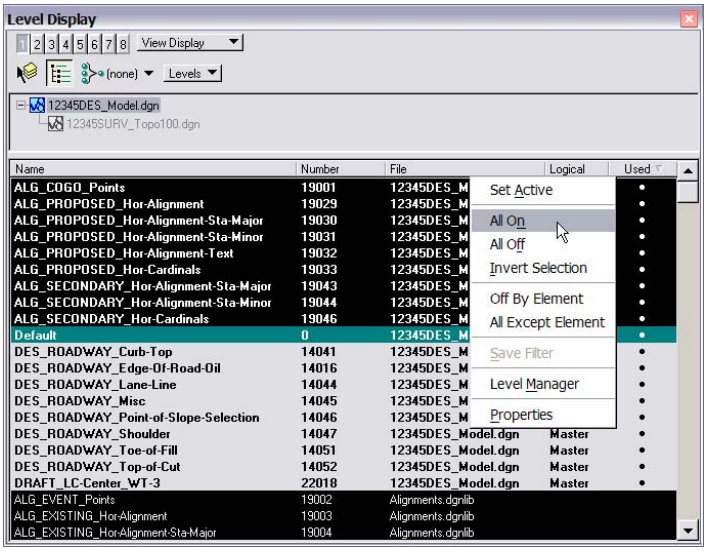


   Note: The **Saved Views** dialog box opens and the saved view shows in the list. The **Saved Views** dialog is used to manage your saved views (create and delete views, edit view names and descriptions, and recall saved views).
5. **Close** the **Saved Views** dialog box.

   You will recall this saved view later.

Turn all levels on/off

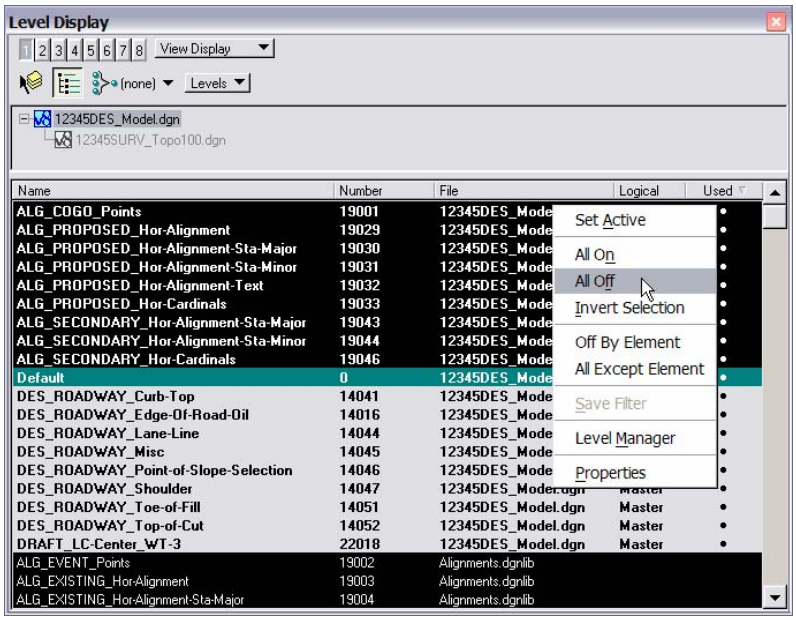
1. **Right-click** again in **Level Display** and select **All On.**



   All levels are turned on in View 1.

2. **Fit** View 1.

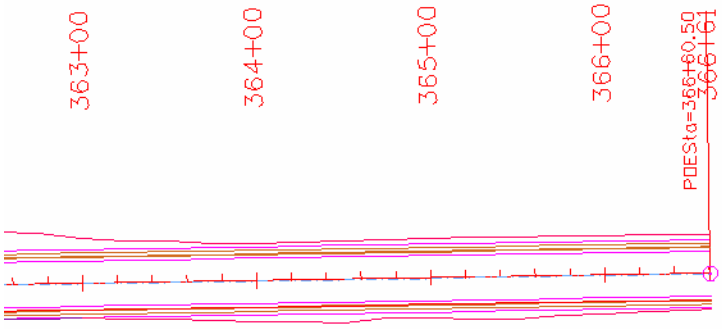
3. **Right-click** in the level display box and select **All Off** to turn all levels ***off*** in View 1.



Note: You can also turn all levels on or off with the key-ins ***on=all*** and ***of=all.***

4. Turn all levels back ***on*** in View 1.

5. Window in to the end of the project as shown.

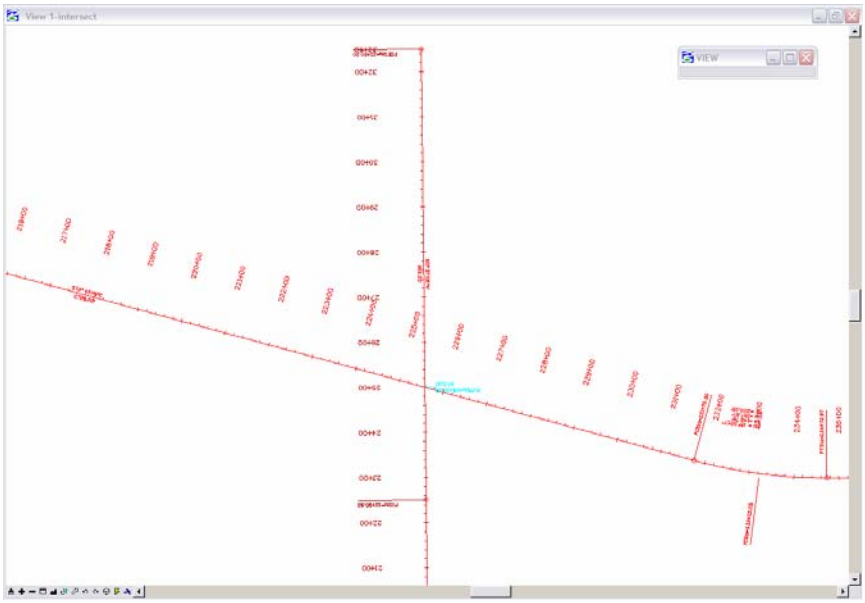


Recall the saved view

1. In the **Key-in** box, key in ***vi=intersect.***

   Don't forget to **<Tab>** or **<Enter>** after key-ins.

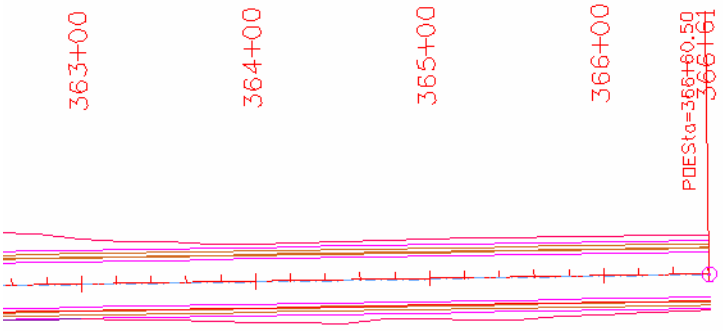
2. **<D>** in View 1.



   The saved view of the alignment and stationing is recalled in View 1. The appropriate levels from the saved view are turned on/off.

3. From the **View Control** toolbar, select **View Previous**.

   The previous view of the beginning of the project is recalled. Notice that all levels are turned back on from this previous view.

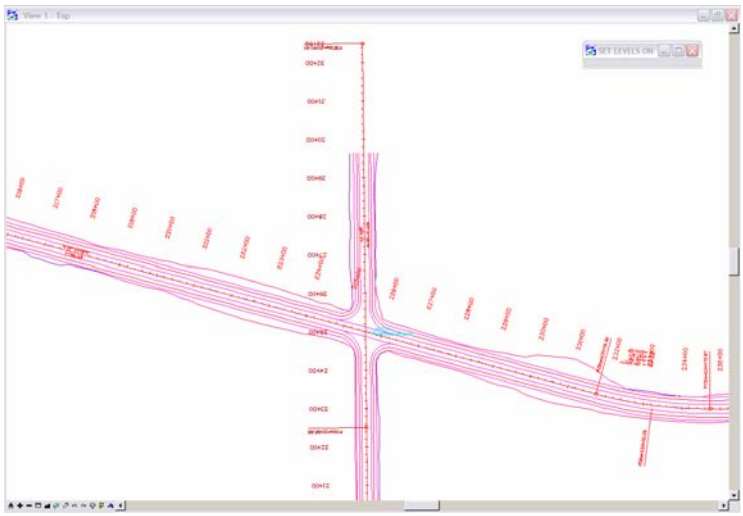


4. Select **View Next**.

   This recalls the intersection view again with the design levels turned off.

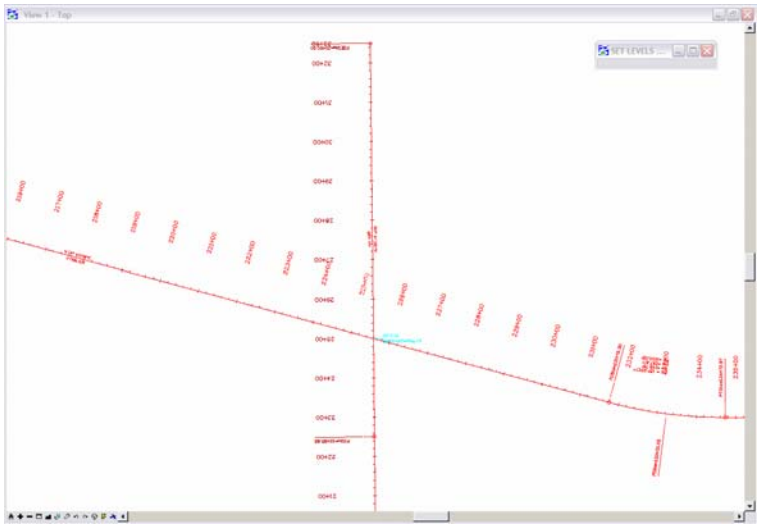
Use key-ins to turn level on/off

1. Key in ***on=all,*** then **<Tab>** or **<Enter>**.
2. **<D>** in View 1 to turn all level back on in this view.



Note: Levels are view-dependent. When using keyins, you must select the view with a data point to tell MicroStation which view to turn levels on or off.

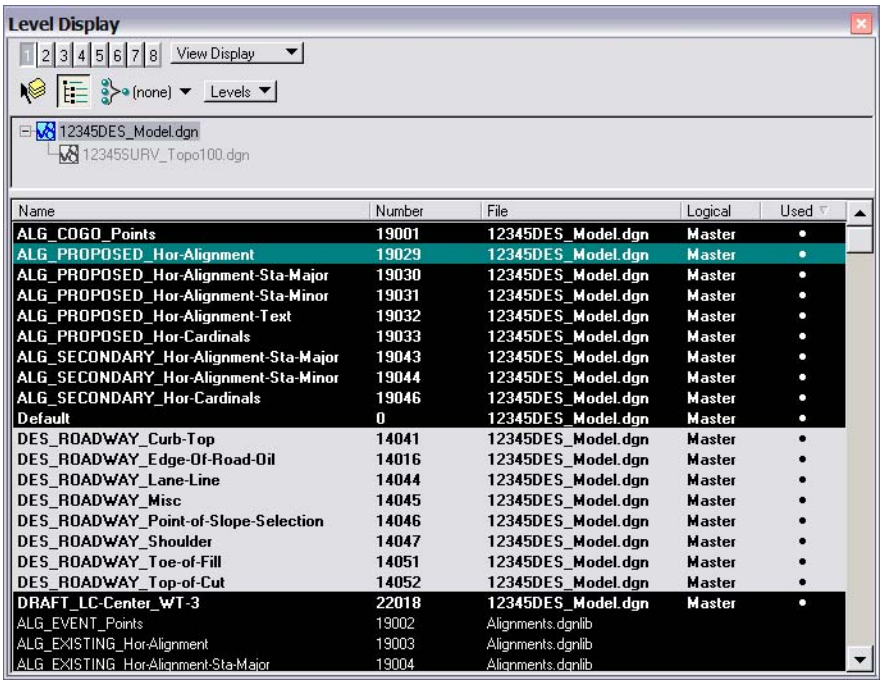
3. Key in ***of=des****
4. **<D>** in View 1 to select View 1



All **DES**_ levels are turned off in view 1. You can use wildcards with keyins to turn a group of levels on or off.

Set the active level

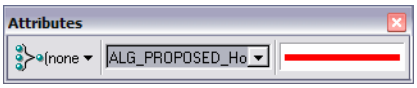
1. In the **Level Display** box, **double-click** on the level **ALG_PROPOSED_Hor_Alignment** to set it active.



The background color changes to green.

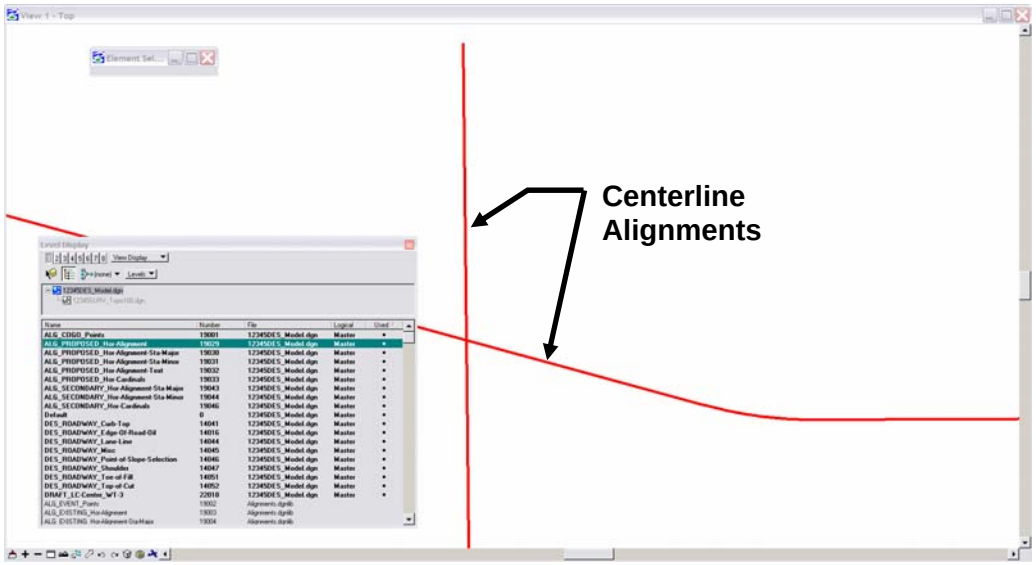
Notes: You can also use the ***lv=*** key-in to set the active level.

The active level is also reflected in the Attributes toolbar at the top of the screen.



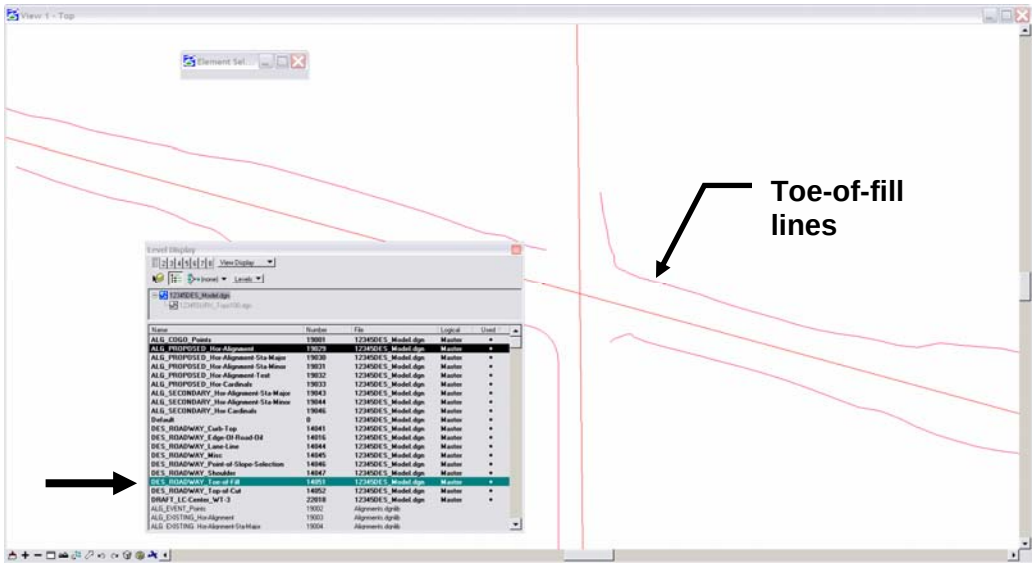
2. Turn all levels ***off*** in View 1.

   All levels are turned off except the alignment centerline because it is the active level.



Note: The active level is always displayed provided the option **Display Active Level in All Views** is toggled on in **Workspace > Preferences > Operation**. If this option is turned off, you can also turn the active level on/off.

3. Key in ***lv=14051***, to change the active level to the **Toe-of-Fill** level.



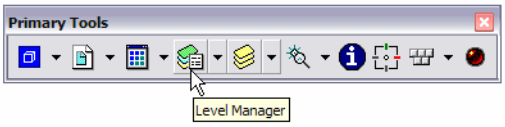
   This level is automatically turned on in the view and now shows with a green background in the **Level Display** box.

4. **Close** the **Level Display** box.

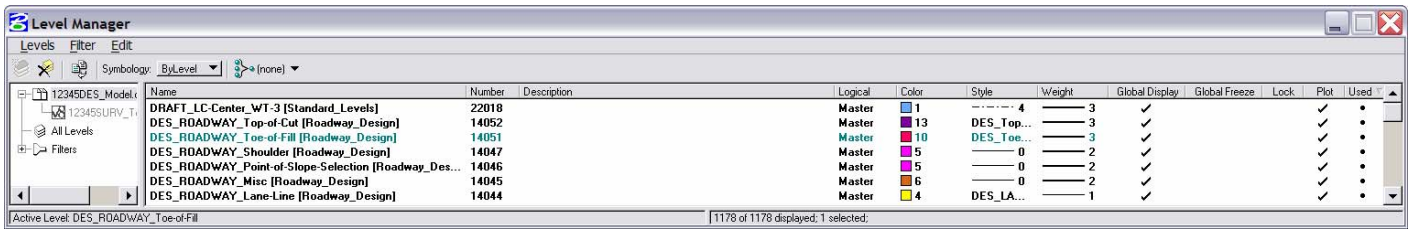
Working with the Level Manager

The **Level Manager** shows all of the level libraries that are attached to your design file, level names, numbers, descriptions, etc. The **Level Manager** also displays each level's **ByLevel** symbology – the color, line style and weight assigned to that level, which conforms to CDOT's CADD standards. Other information like if the level is used, frozen, available for plotting, *etc*. is also shown in the **Level Manager**.

1. Open the **Level Manager**. Select **Settings > Level > Manager** or on the **Primary** toolbar select **Level Manager**.



2. Sort the **Level Manager** on **Used** to bring all the used levels to the top of the list (you may need to scroll over to the right to see the column **Used**).



Level Libraries

Level libraries are master templates of levels. The discipline-specific level libraries (Roadway Design, ROW, Alignments, etc.) are attached to your design file via the **Select Group Environment** utility program that you ran before starting MicroStation. The **Select Group** program has two options: ***Bridge*** and ***xxMulti-Discipline***. All groups except Bridge should choose ***xxMulti-Discipline*** to attach all level libraries. The Bridge option just attaches level libraries needed for the Bridge group.

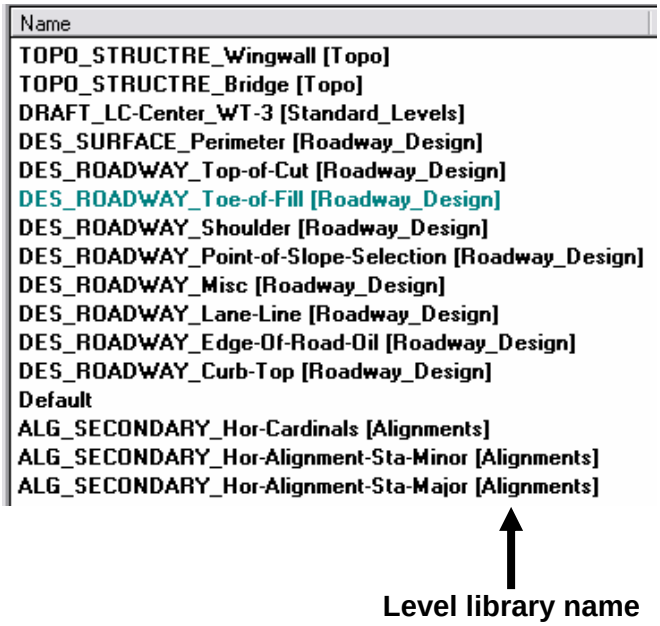
When a level is set active and graphics are placed on this level, the level is copied from the library file to the active design file.

Used levels that are copied to the design file appear bold in the **Level Manager**. All unused levels are in the library.

1. Scroll through the list of levels.

   All levels have a logical level naming convention according to their library (*e.g.* all roadway design levels start with **DES**, all alignment levels with **ALG**, topo levels with **TOPO**).

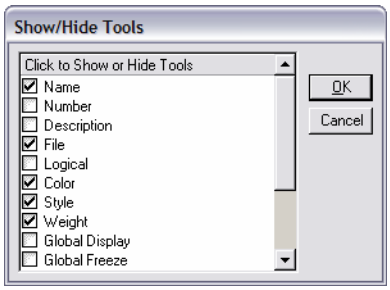
   The library name is shown in brackets after the level name.



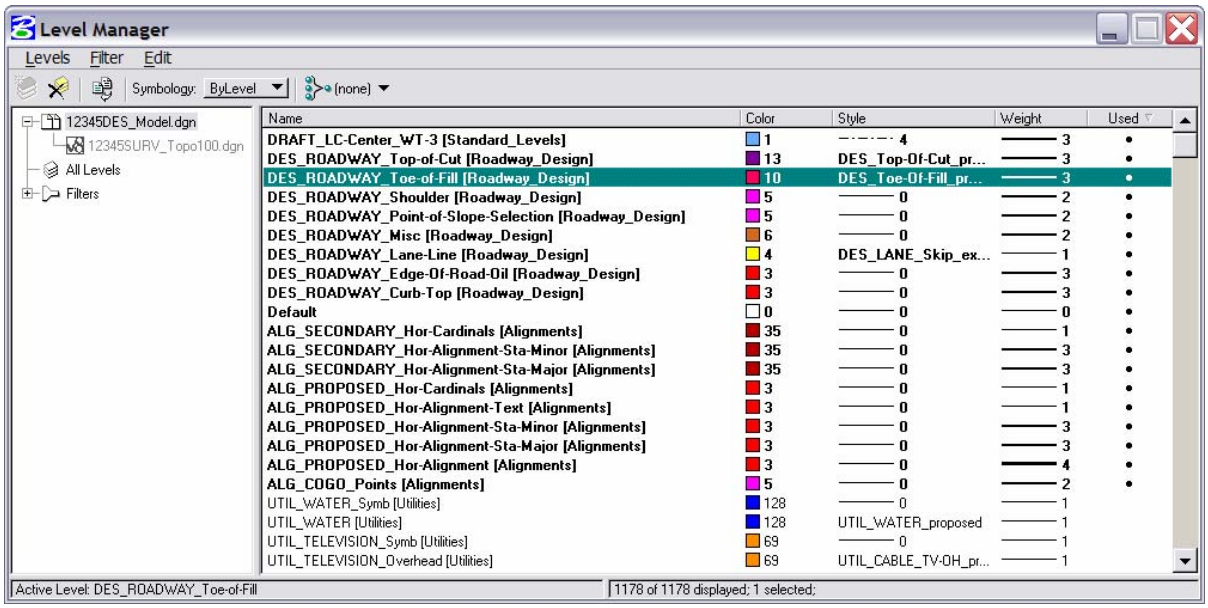
Change the look of the Level Manager box

1. **Right-click** in any column heading (**Name**, **Number**, *etc*.) and select **List.**

2. Toggle ***off*** **Number**, **Description**, **Logical**, **Global Display**, **Global Freeze, Lock, Plot** and **Elements** and select **OK**.



3. Sort on **Used** to bring all the used levels to the top of the list.



The Level Manager box updates to reflect the changes.

4. **Close** the **Level Manager** box.

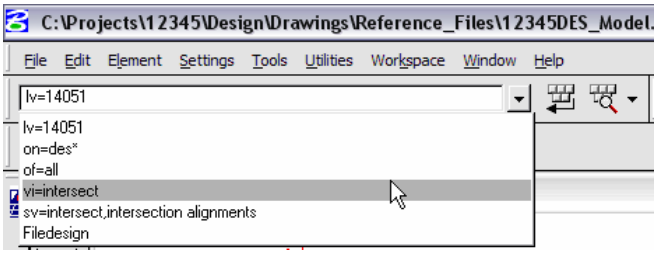
ByLevel Symbology

ByLevel symbology ensures that CDOT CADD standards are met by placing graphics **ByLevel** (the color, line style and weight assigned to that level in the level library).

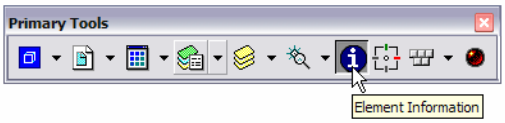
> **Note**: When placing graphics using the **CDOT Group Menus**, the correct level, along with it's **ByLevel** symbology is automatically set for you (see Chapter 5).

Analyze an element

1. Select the drop-down arrow on the **Key in** box to recall the ***vi=intersect*** keyin, Enter the keyin and then **<D>** in view 1 to recall the alignment saved view.

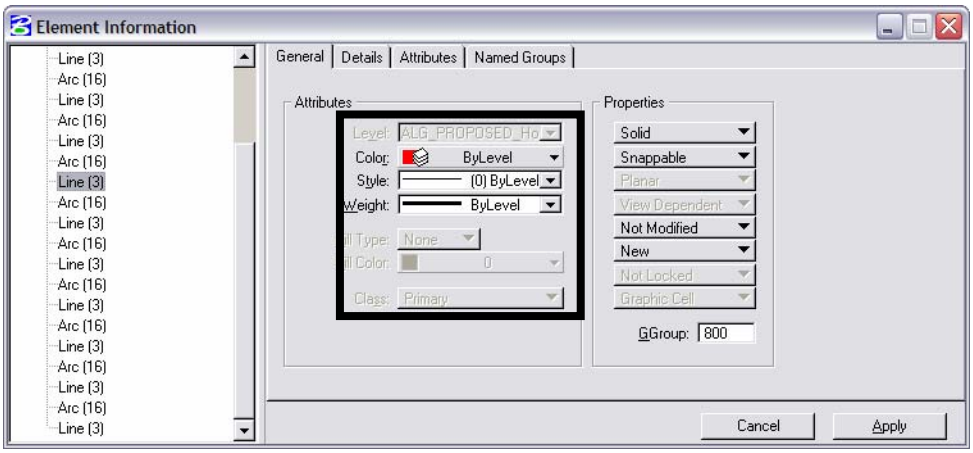


2. From the **Primary** toolbar, select **Element Information.**



3. **<D>** on the horizontal alignment centerline graphic.

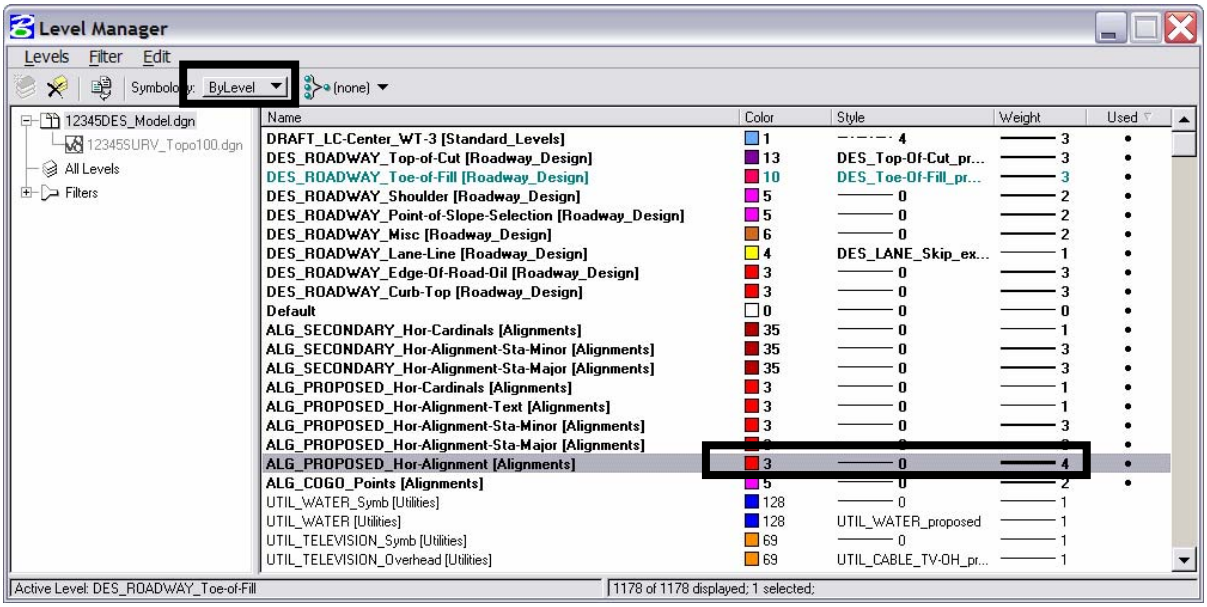
   Element Information shows that the alignment was placed on **ALG_PROPOSED_Hor_Alignment** level and placed with **ByLevel** Symbology.



4. **Cancel** out of the **Element Information** box.

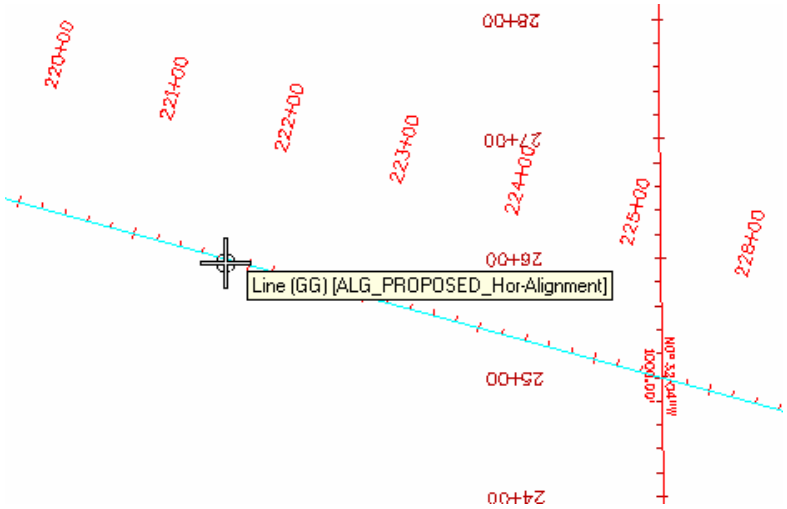
5. Open the Level Manager box.

6. Find the **ALG_PROPOSED_Hor_Alignment** level and note the ByLevel Symbology is set up in the **Level Manager**.



Review Pop-up information

7. Hold your cursor over the centerline of SH 86 (the mainline alignment).



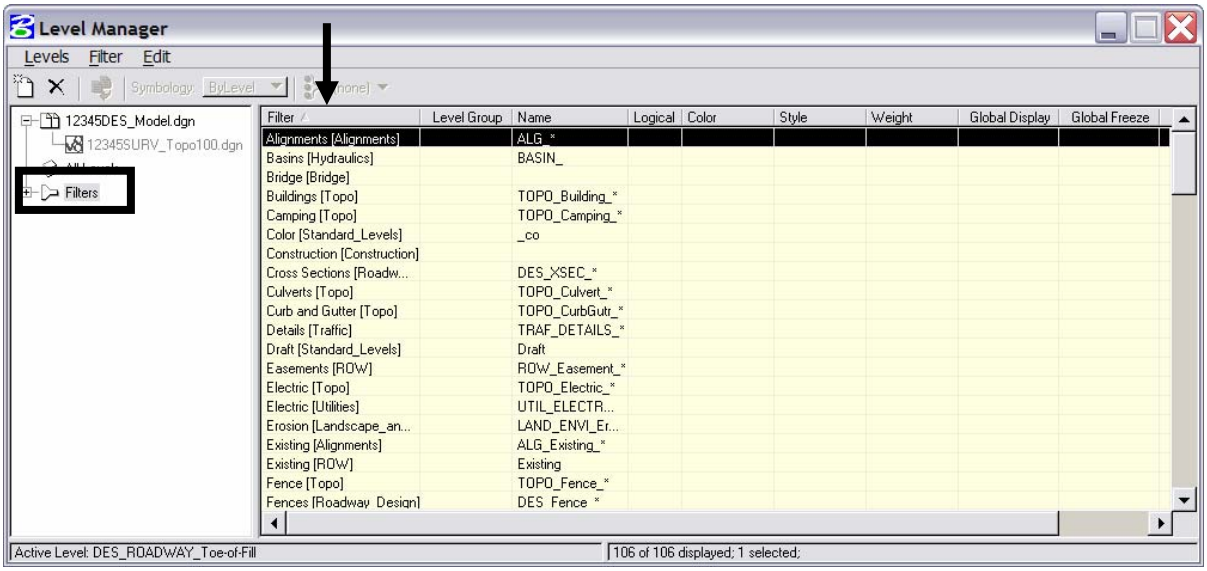
MicroStation's "pop-up" information tells you the type of graphic (line) and the level on which it is placed (**ALG_PROPOSED_Hor_Alignment**.) Pop-up information is a quick way to determine what level graphics are on.

Level Filters

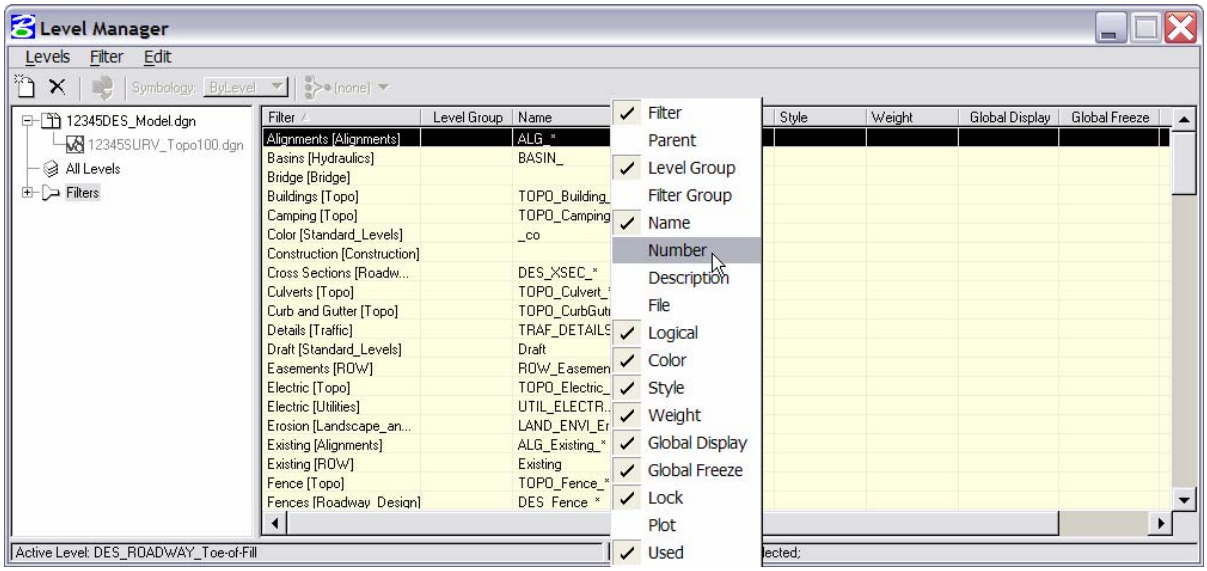
Level Filters are groups of levels created in the **Level Manager** by filtering on virtually any level criteria (name, number, color, *etc*.) and then naming the filter. These level groups can then be turned on/off using the filter.

Review the filters

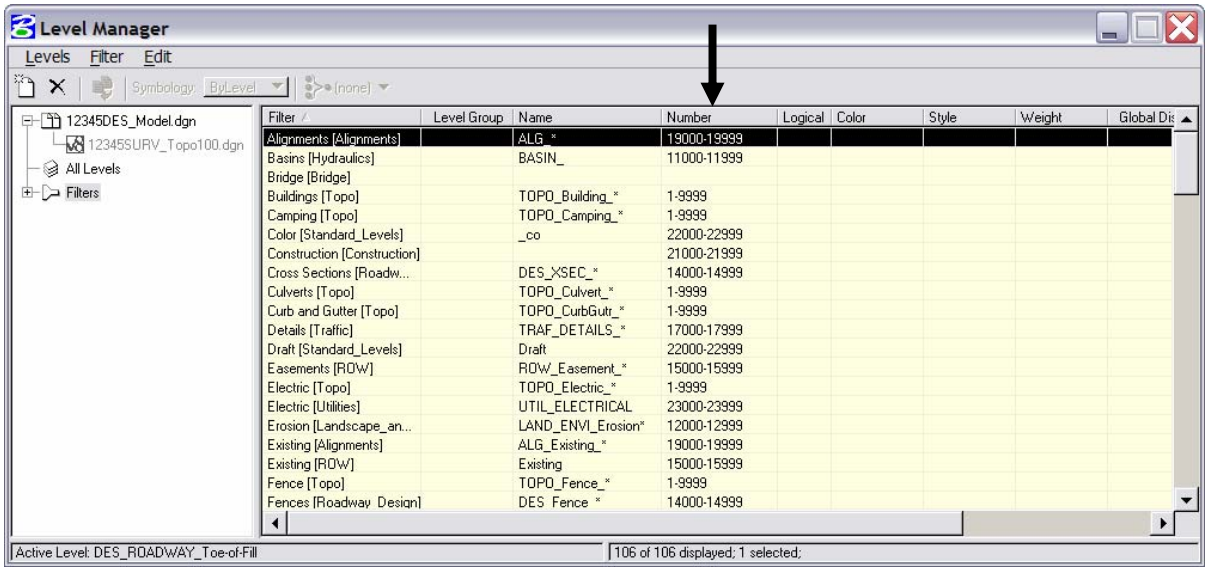
1. In the left pane of the **Level Manager** box, **click** on **Filters**.
2. Click on the column name **Filter** to sort alphabetically by filter name**.**



3. Turn on the **Number** column.



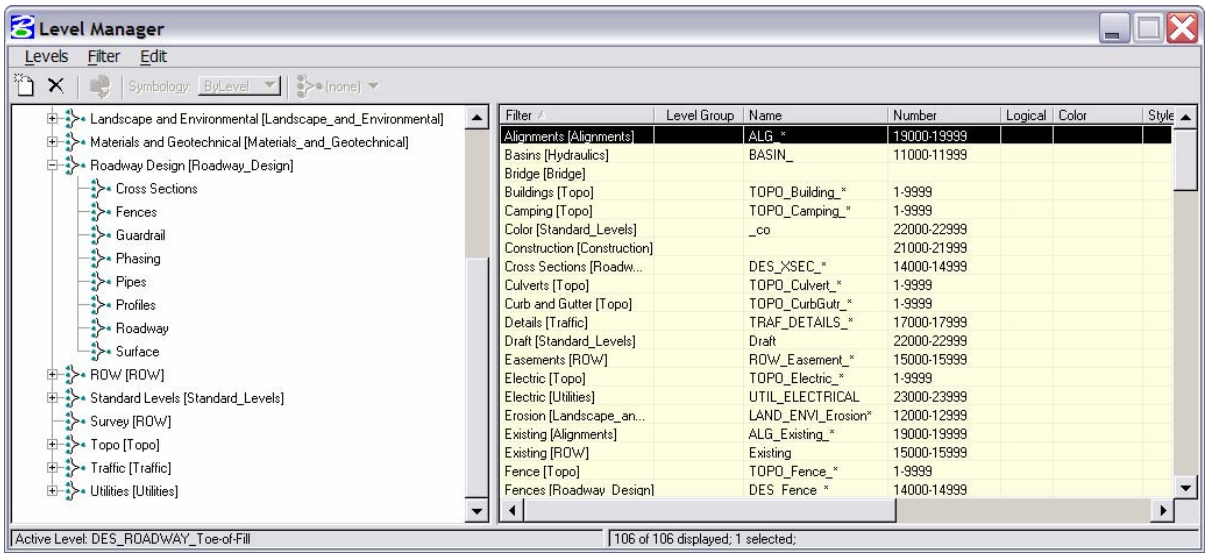
There are several standard CDOT filters, which are based on name and number. The CDOT standard level naming and numbering convention enables the efficient use of level filters.



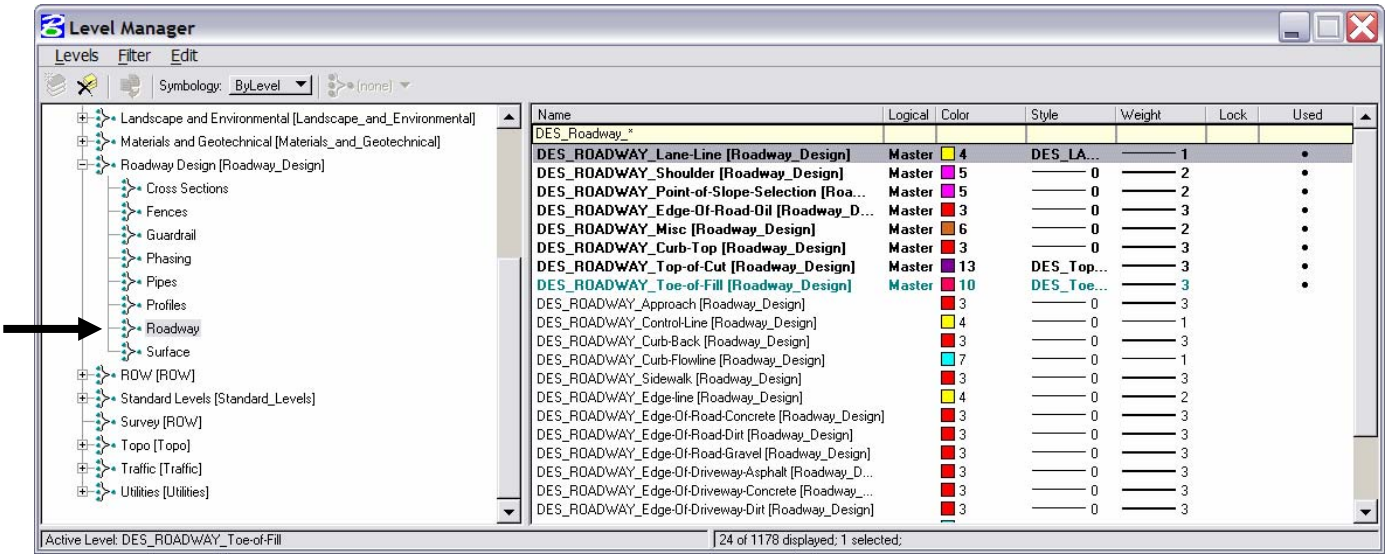
Note: Level filters are stored in level libraries (note the library name in brackets beside the filter).

4. In the left pane of the **Level Manager**, Click the **+** symbol next to the **Filters** to expand the list.

5. Click the **+** symbol next to the **Roadway Design** to expand this list.

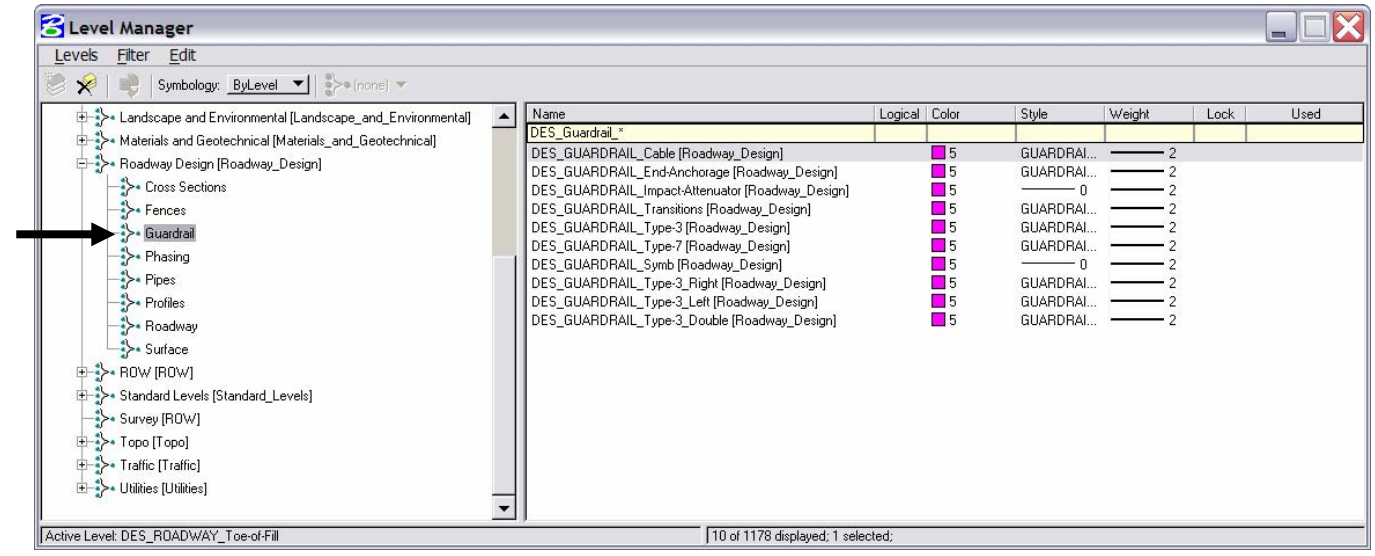


6. **Click** on **Roadway** to review the levels that make up this filter (all design levels with Roadway in the name).



Note that this filter contains both used levels in the active file and unused levels in the library.

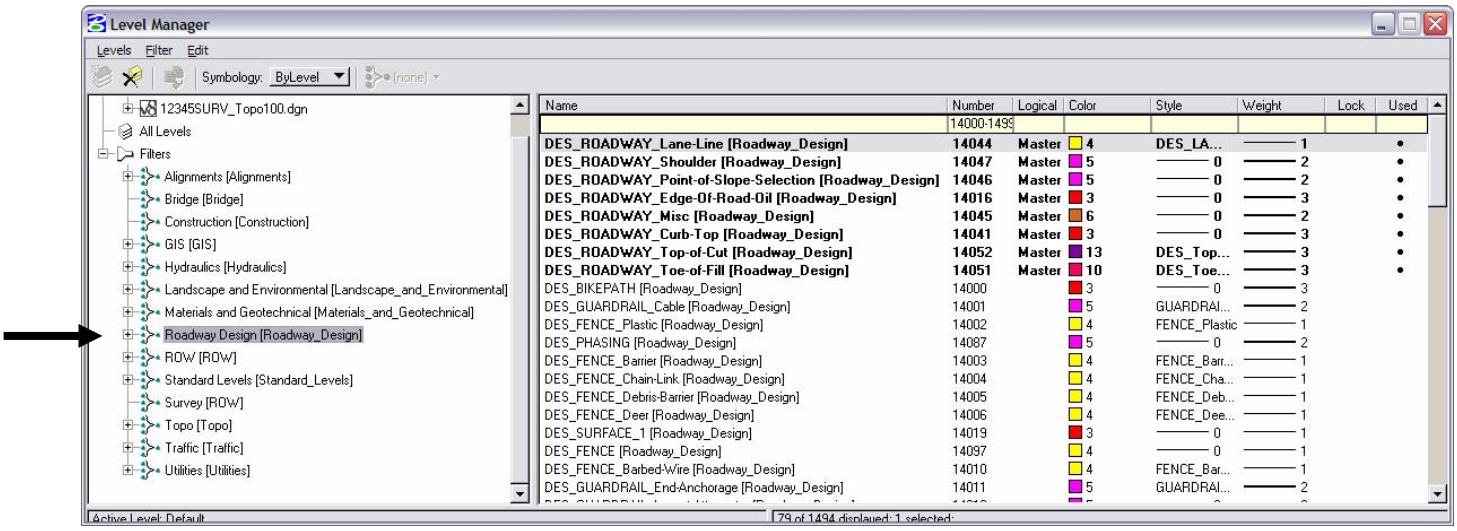
7. Click on **Guardrail** to review all design levels with Guardrail in the name.



Note This filter does not have any used levels in the active design file. All levels are from the library.

8. Right-click in any column heading and turn on the **Number** column.

9. Click on the upper level **Roadway Design** filter to and review levels.



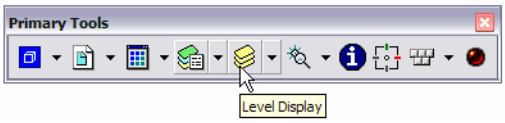
Note that this filter is not filtered on name, but instead contains all levels in the Roadway Design level number range (14000 – 14999). This includes all "children" filter levels like Guardrail and Roadway.

Use level filters to turn levels on/off

The level filters are stored in the level libraries, accessed via the **Level Manager**. However, to actually use the filters, you need to use **Level Display**.

10. **Close** the **Level Manager**.

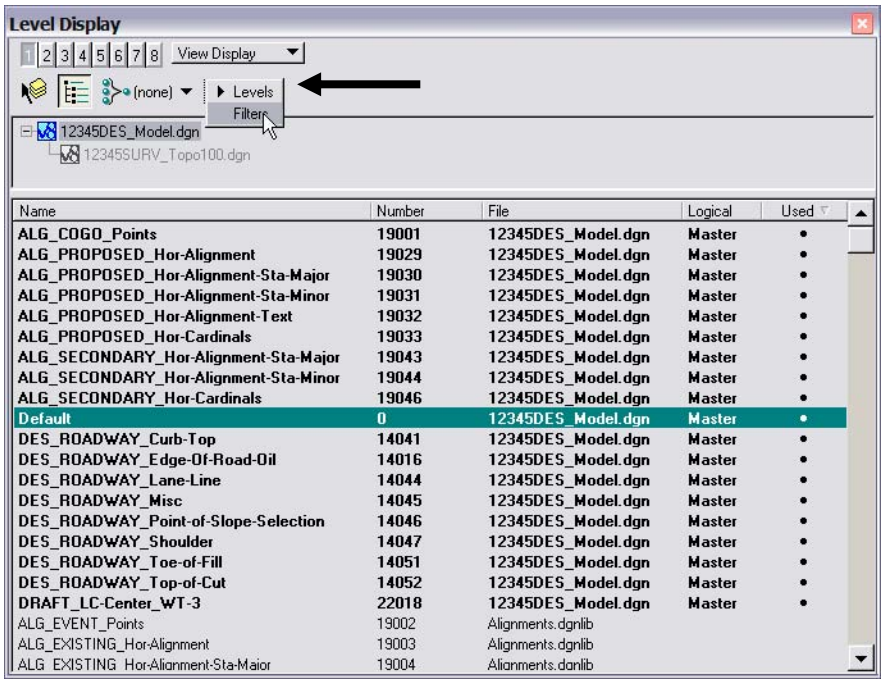
11. **Open** the **Level Display** box from the **Primary** toolbar.



12. Set the active level to **Default** by **double-clicking** it in the **Level Display** box.

13. Turn ***off*** all levels.

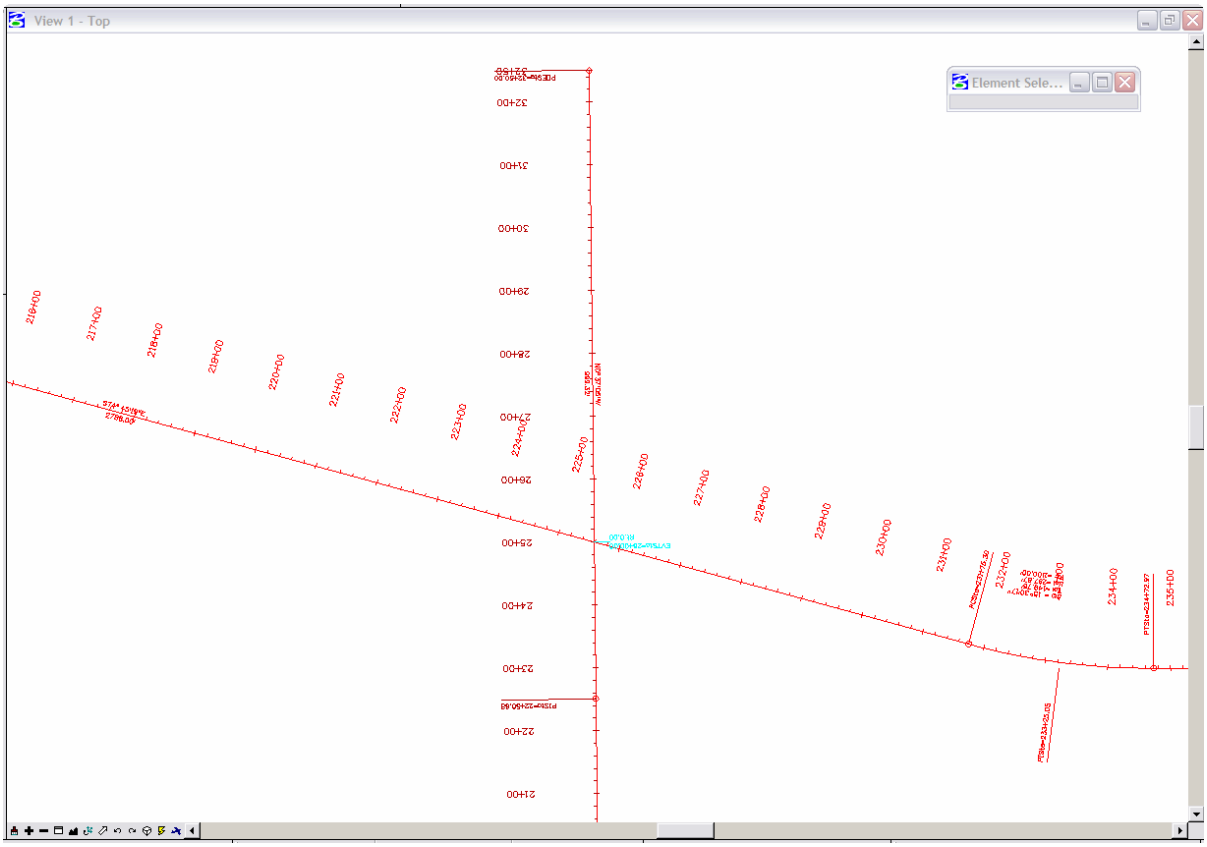
14. Change the **Show** option from **Levels** to **Filters.**



15. Sort the **Level filters** alphabetically in ascending order.

16. Toggle ***on*** the **Alignments** filter.

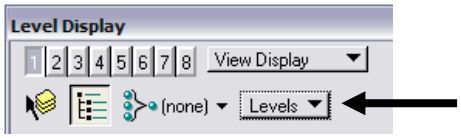
Only the alignment levels (centerline and stationing levels) are turned on. Choosing the filter turns on all levels in the filter.



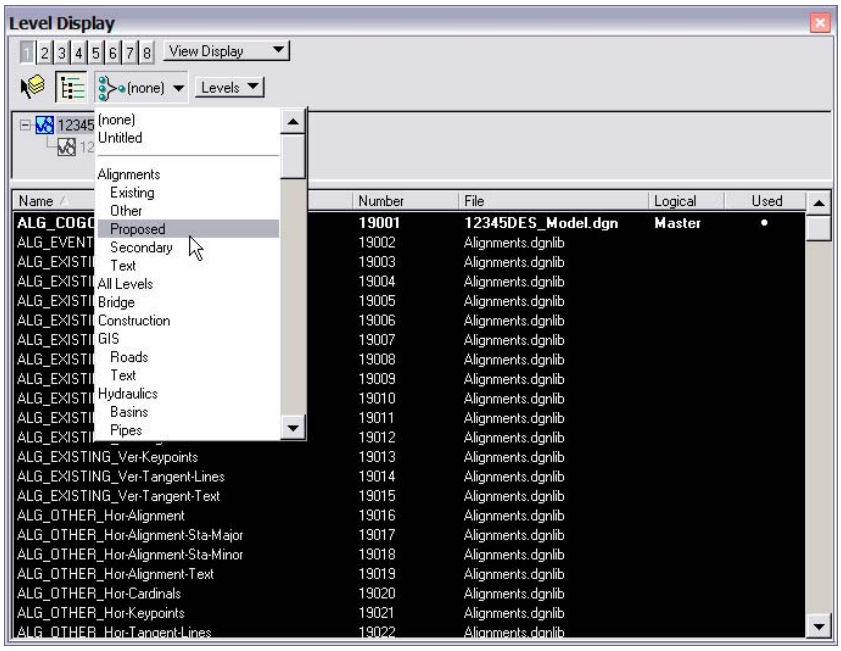
Note: If you toggle the filter off, it turns ***all levels*** on by default. However, selecting the filter again resets the filter and turns on only the filter levels.

Use level filters to select a group of levels to work with

17. With the **Alignments** filter selected, change the **Show** option back to **Levels**.

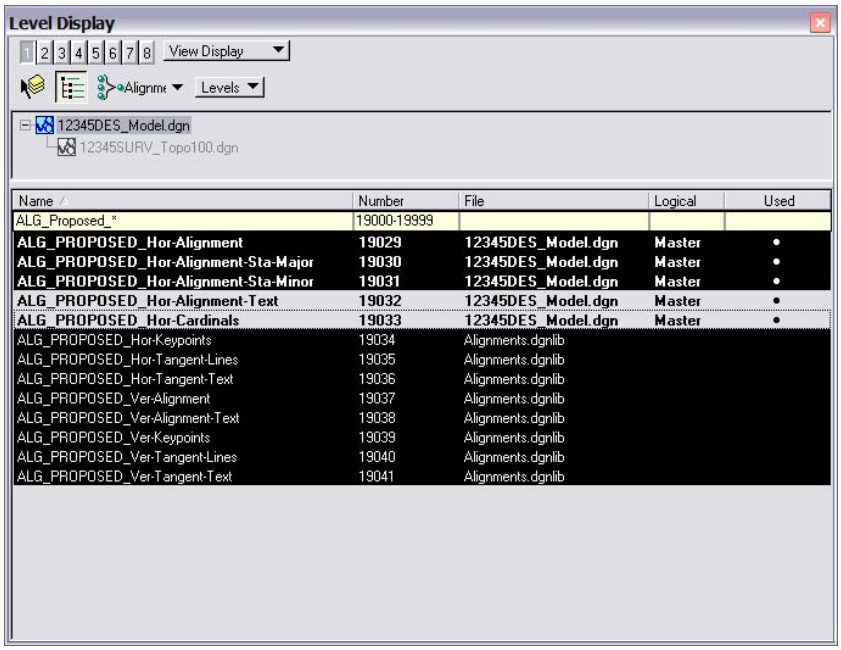


18. Change the **List Filter** from (none) to **Alignments > Proposed**.



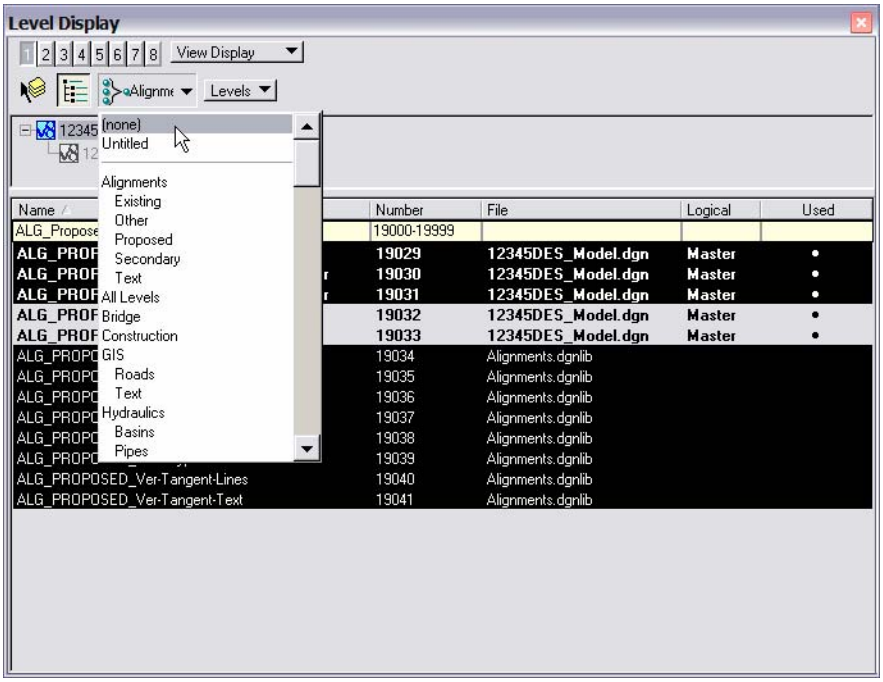
The list of hundreds of levels is filtered down to only a few (the levels contained in the Proposed Alignments filter).

19. Turn off the **ALG_Proposed_Hor-Alignment-Text** and **ALG_Proposed_Hor-Cardinals** levels.



Note: Use **Level Filters** to improve your MicroStation efficiency when searching for levels. Setting the **List Filter** is an efficient way to work with levels. Instead of scrolling through hundreds of levels to find a level to turn on, off or set active, the filter breaks the levels down into a logical and manageable group.

20. Set the **List Filter** back to (none) to show all levels in the **Level Display** list.



21. **Close** the **Level Display** box.

22. **Fit** View 1.

23. Save your settings (**File > Save Settings**).

24. **Exit** MicroStation.

3. Working in a CDOT 3D Design Model

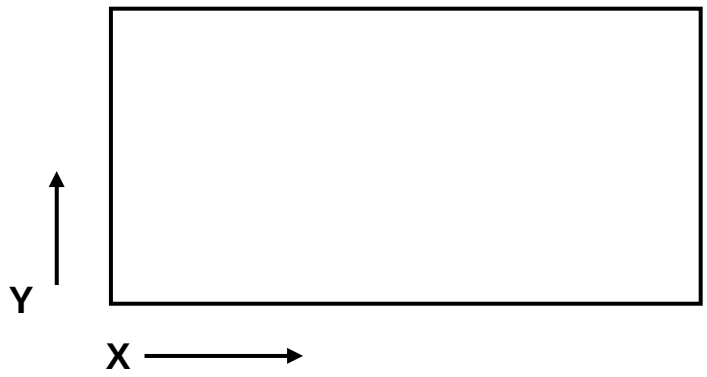
This chapter covers the difference between working in 2D and 3D model and the 3D concepts you need before moving on to InRoads or other 3D applications.

2D vs. 3D

2D design plane

In MicroStation, you can create either 2D or 3D models within a design file. In a 2D model, the working area is known as the ***design plane***. A 2D design plane is similar to drawing on a sheet of paper. You have an X (horizontal) and Y (vertical) axis and all graphics placed in the 2D file are "flat".

2D Design Plane

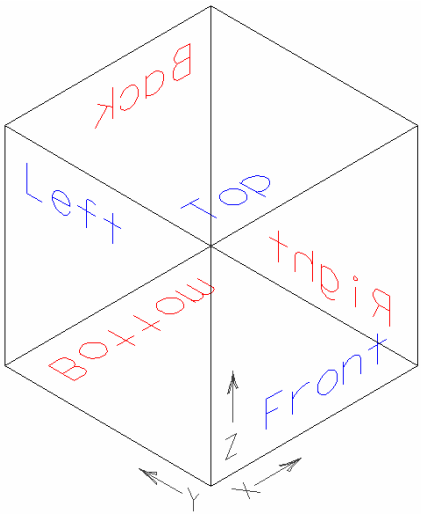


You can rotate the 2D design plane about its perpendicular axis (the Z axis coming out of the screen).

3D design cube

In a 3D model, your work area is called the ***design cube***. You're working in a volume of space with 3 axes — X, Y and Z. When you place elements, you can place them not only in the correct horizontal (X, Y) location, but also in the correct vertical (depth or Z) location to create a true 3D model of your design.

In the design cube, different view orientations can be set. These include: Top, Bottom, Front, Back, Right, Left, Isometric, and Rotated.

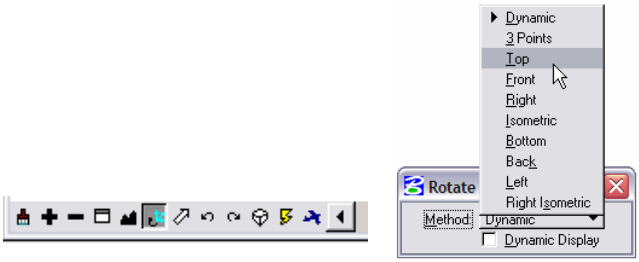


Think of a view as a camera location that's taking a snapshot of your design. When you rotate a view, you're ***not*** rotating ***graphics***. Instead, you're rotating the camera position (or the orientation) of how you're looking at the graphics.

Each "face" of the design cube is a standard view (Top, Front, *etc*.) In addition you can set an isometric view and you can rotate any view about the X, Y or Z-axis. For most civil drafting and design work, the ***top*** view is synonymous with the ***plan*** view and the ***front*** view is synonymous with the ***elevation*** view.

Set view orientations by using either:

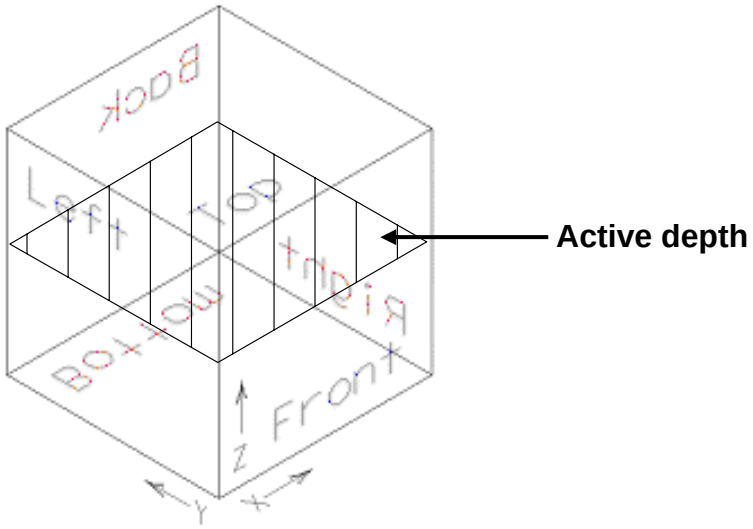
- The **Rotate View** command on the **View Controls** toolbar, or



- The ***vi= <view name >*** key-in (e.g. ***vi=top***).
- The ***rv= <x,y,z>*** keyin to rotate a view about the x, y and /or z axis (*e.g.* ***rv=,,-30*** rotates a view 30 degrees clockwise about the z axis).

Using Active Depth

When working in a 3D design model and placing graphics in a view, at what depth are the graphics being placed? They are placed at the ***active depth***. The active depth is a plane, parallel to your view screen, on which you're placing elements. For example, if you are creating a topo map and manually drawing the 5000-foot contour in the top view, you first set the active depth for the top view to 5000, and then draw the contour.



To set a view's active depth:

- Key in ***az=<depth>***.
- **<D>** to select the view of interest.

The active depth is ***view dependent***. Therefore, you must tell MicroStation which view you're setting the active depth in by data pointing in the view.

> **Note:** For most civil work, you'll set an active depth in the top (plan) view. The active depth is then the elevation at which you're placing graphics. If you switch to a Front view, you'll see the elements at the different elevations.
>
> ***Active depth*** is synonymous with the term ***active z***.

To check a view's current active depth:

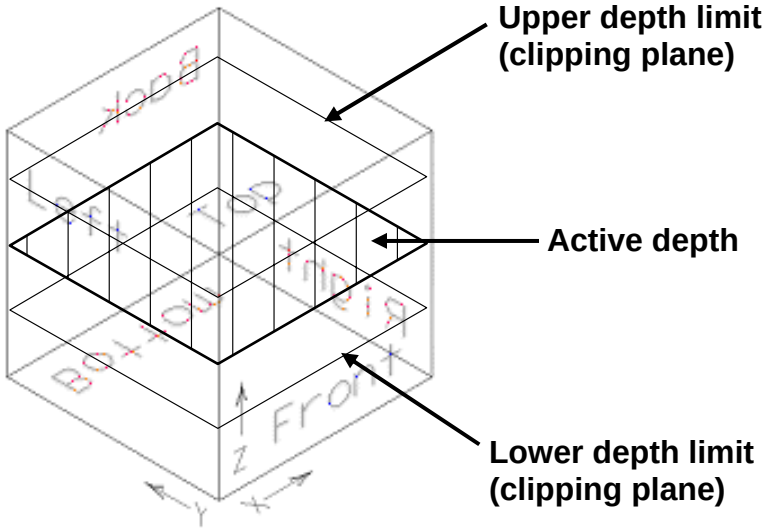
- Key in ***az=$***.
- **<D>** in the view of interest.

The current active depth is displayed in the message field

> **Note:** Use the delta key-in ***dz=<depth>*** to ***move*** the active depth by the delta ***<depth>*** amount, then **<D>** in the view. Multiple data points change the depth each time.

Using Display Depth

Display depth is the depth range or the "slice" of the design cube in which elements are visible. You set the display depth by specifying an upper and lower depth (elevation) range for the view.



To set a view's display depth:

- Key in ***dp=<lower depth, upper depth>***.
- **<D>** in the view of interest.

  Note: Like active depth, display depth is also ***view dependent***. So you have to tell MicroStation which view you're setting the display depth range for by data pointing in the view (the top view in most cases). This allows you to have different display depths in different views.

Display Depth tips:

- Display depth limits are also known as the view's ***clipping planes***.
- A view's active depth is always within its display depth range (*i.e.* you can not set an active depth outside the display depth).
- Use the key-in ***dd=<delta lower depth, delta upper depth>*** to ***expand*** the display depth by the delta amount. This moves the display depth as specified from its current location.
- The **Fit** command automatically changes a view's display depth (expands or shrinks to fit elements currently turned on in the view).

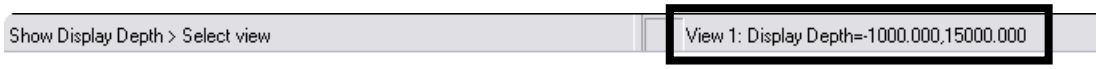
  Note: If you can't see graphics in a 3D model, they may just be outside your display depth. **Fit** your view as a quick check.

- The current active and display depth settings are saved when you save settings (**File > Save Settings**). This determines the default depth when you open a design file.

To check a view's display depth:

- Key in ***dp=$***.
- **<D>** in the view of interest.

  The view's current display depth is displayed in the message field.



CDOT 3D Seed File Defaults

The CDOT default settings for active and display depth are set in the CDOT 3D seed files for each specialty group.

Active Depth

The CDOT default setting for active depth is 0.

Display Depth

The CDOT default setting for display depth is -1000, 15000.

Lab 3 – 3D View Control

Objectives

After completing this exercise you will know how to:

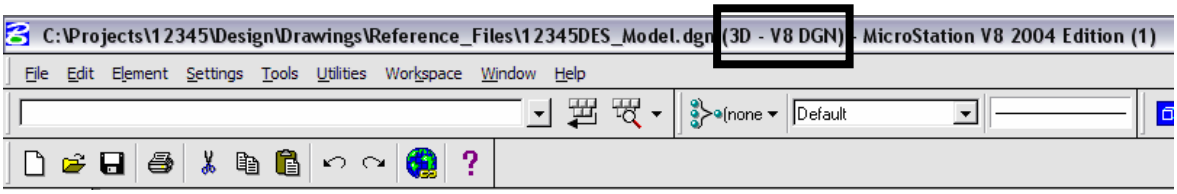
- Check the elevation of an element.
- Rotate a view using the ***rv=*** keyin.
- Rotate a view using the 3-point method.
- Rotate a view by element.
- Rotate to a standard view (Top, Front, etc.) .
- Check and set the **Active Depth**.
- Check and set the **Display Depth**.

Starting MicroStation

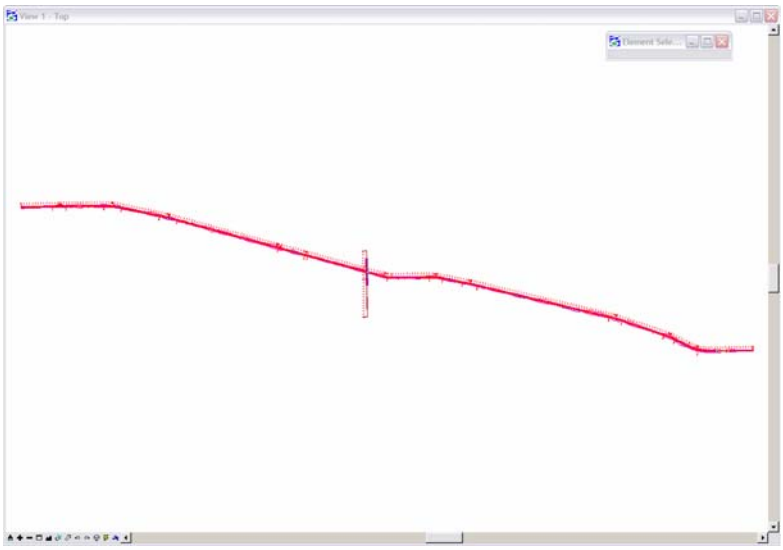
1. Start MicroStation and open the design file **12345DES_Model.dgn**from the **C:\Projects\12345\ Design\Drawings\Reference_Files** folder.

   You will use this CDOT project, which has proposed graphics placed at the correct elevations, to practice with the concept of 3D view controls.

2. Look in the top title bar of the MicroStation window and note that this is a 3D file.



3. **Fit View** 1



The design file shows only the proposed alignments because only the ALG levels were turned on when settings were last saved.

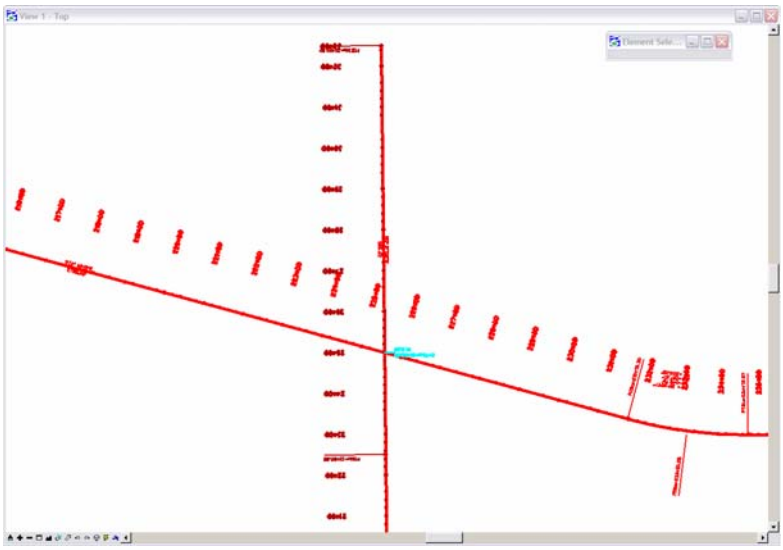
Checking element elevations

You can quickly check the coordinates of any point (including the Z coordinate in a 3D file) by placing a tentative point.

1. Key in ***vi=intersect*** to recall the alignment saved view.

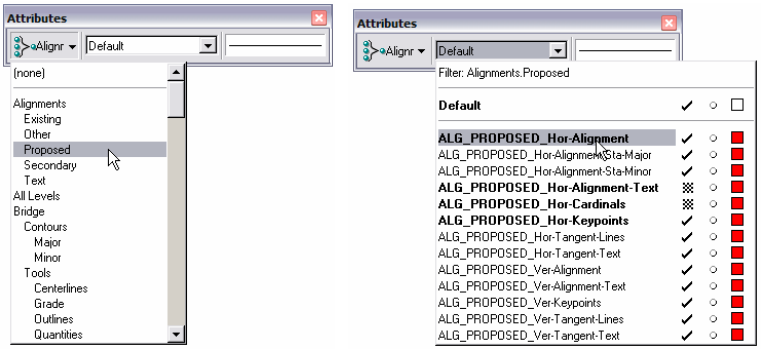
   Note: Always press **<Enter>** or **<Tab>** after keyins.

2. **<D>** anywhere in View 1 to recall the saved view.



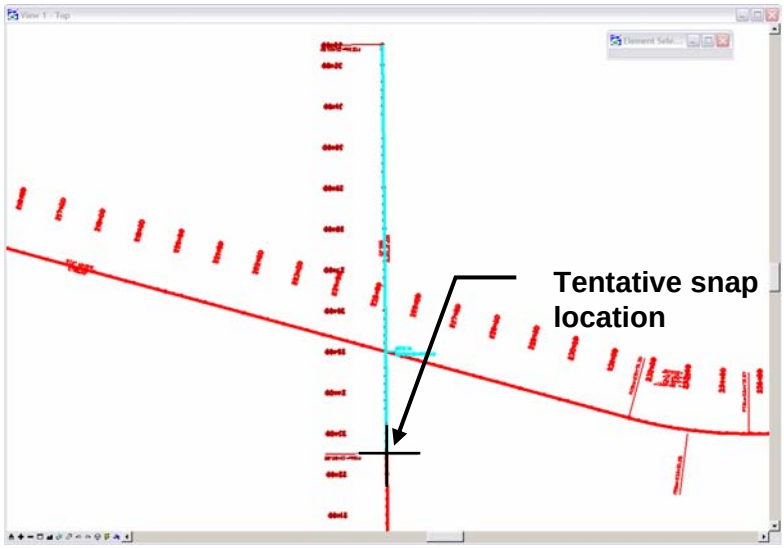
The design file has some graphics, like the horizontal alignment, placed at elevation 0. Other graphics, like contours generated by InRoads, are placed at an elevation range of approximately 6600 ft.

3. On the Attributes toolbar, set the filter to **Alignments-Proposed** and then set the active level to **ALG_PPROPOSED_Hor-Alignment**.



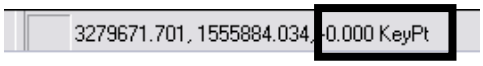
4. Place a **Tentative** point **<T>** on the North-South cross-road alignment just south of the intersection.

Note: The **Tentative** button in the CDOT workspace is set to the ***middle*** button on the mouse. If you want to change it, select **Workspace > Button Assignments**.



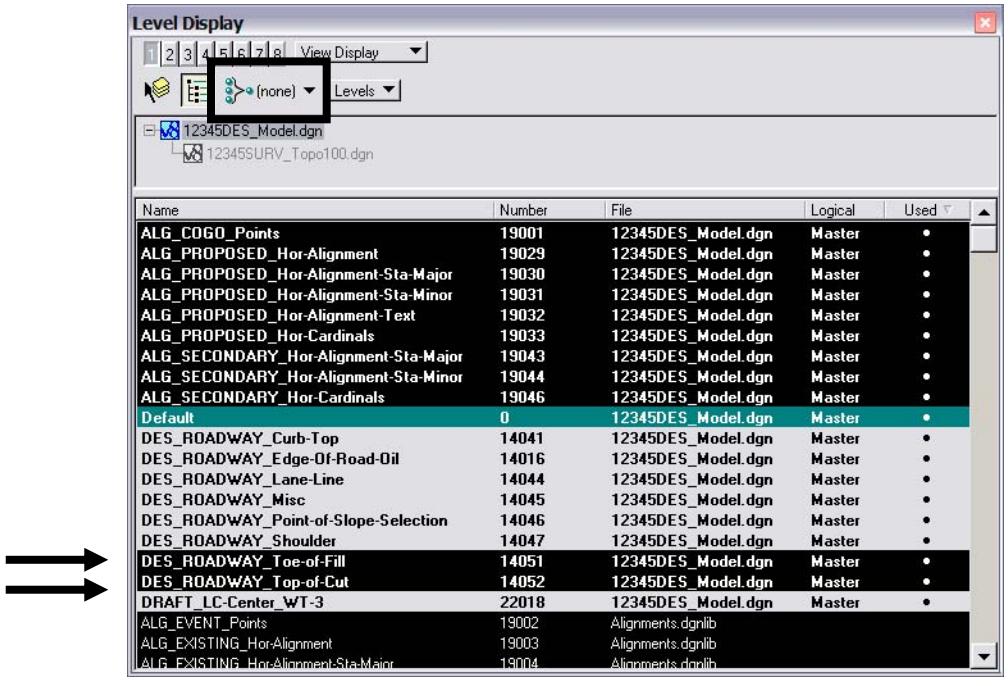
The tentative point jumps to the closest keypoint on the element. You will see a large cross-hair at the keypoint. You'll learn more about keypoint and other snap modes in later chapters.

A tentative point is a temporary location that displays the coordinates for the point in the **Message Field** (bottom of screen).



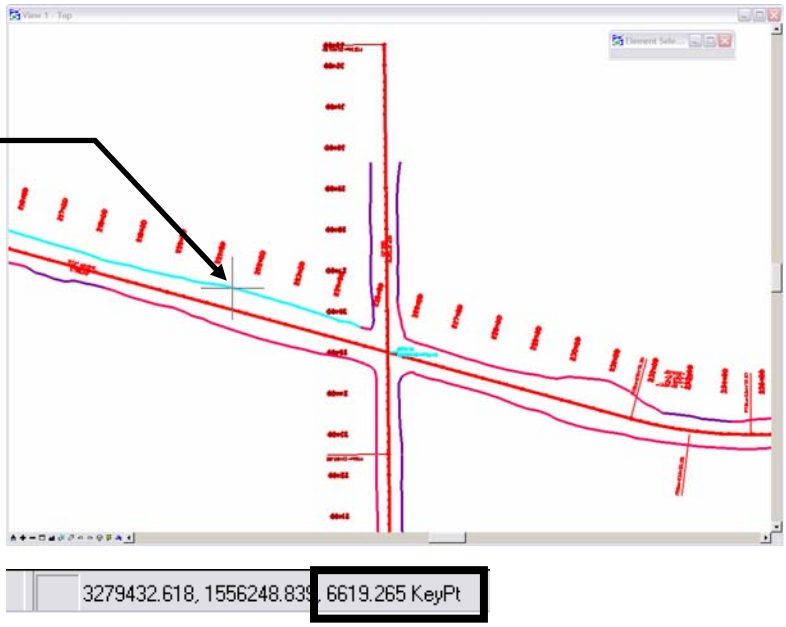
Note that the centerline alignment graphic in the top view (plan view) has a Z value of **0**. Therefore it has an elevation of **0**.

5. Open **Level Display** and set the level **Filter** to **None** to show all levels. Sort by **Name** and then **Used** levels. Turn on the levels **DES_ROADWAY_Toe-of-Fill** and **DES_ROADWY_Top-of-Cut**.



6. **<T>** on one of the cut or fill lines and note its elevation (Z coordinate).

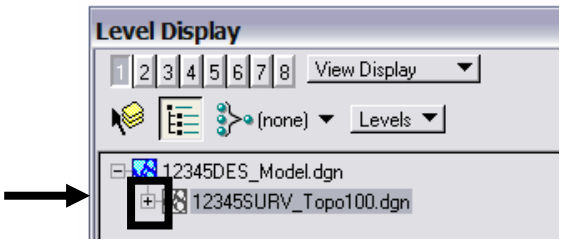
Tentative snap on a cut or fill line



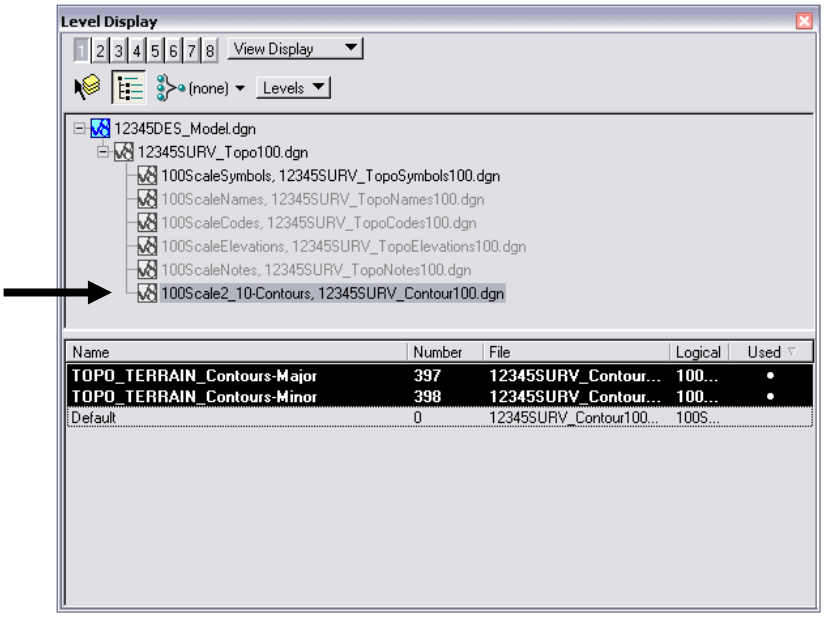
7. **<T>** on a few other top or toe lines and note the elevations.

   The graphics should be placed at a depth of approximately 6620 ft. or within a close range.

8. In **Level Display**, click on the + symbol next to the file **12345SurveyTopo100Scale.dgn** to expand the list of reference files.



9. Highlight the reference **100Scale2_10,12345SURV_Contour100.dgn** and turn on levels **TOPO_TERRAIN_Contours-Major** and **TOPO_TERRAIN_Contours-Minor**.

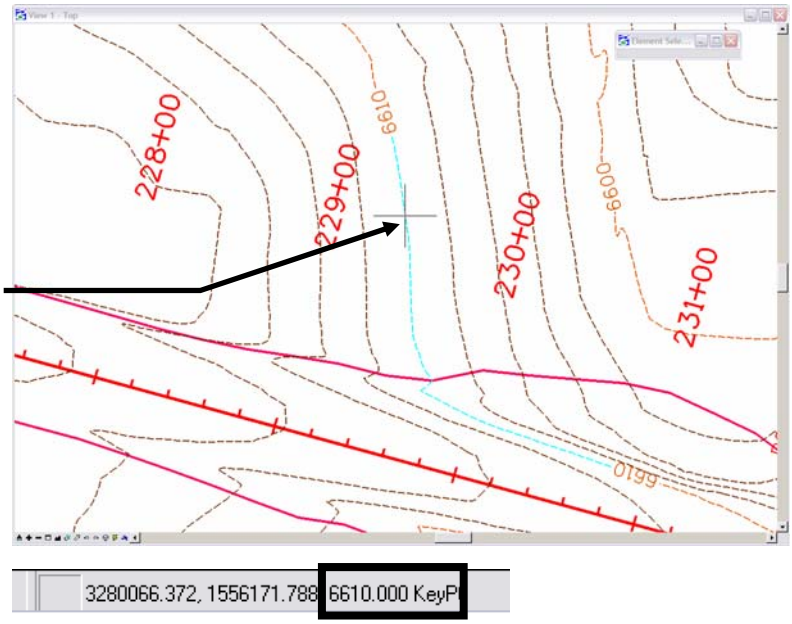


Note: The contour file is a reference to the design model file. You'll learn more about references in Chapter 4.

10. Window in on some of the contours to the right of the intersection so that you can easily read the labels.

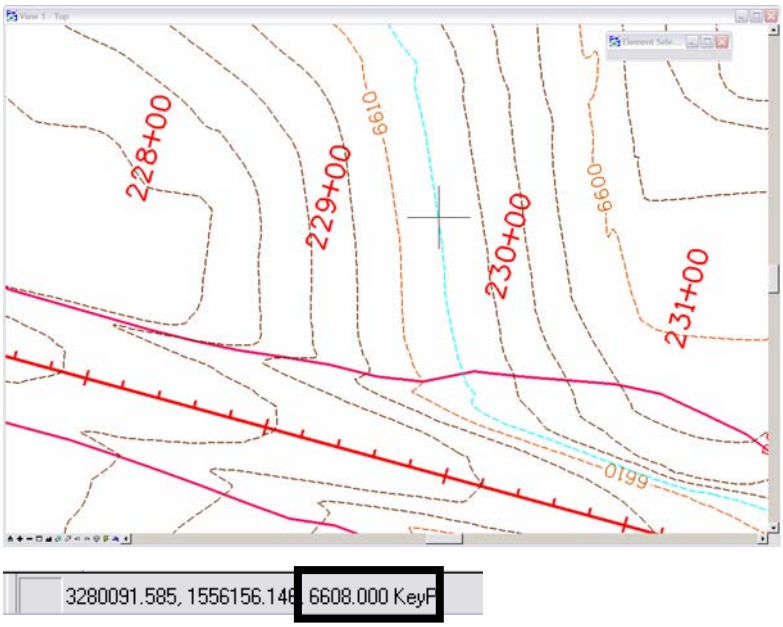
11. **<T>** on some of the major contour graphics and note the elevations.

<T> on a major contour



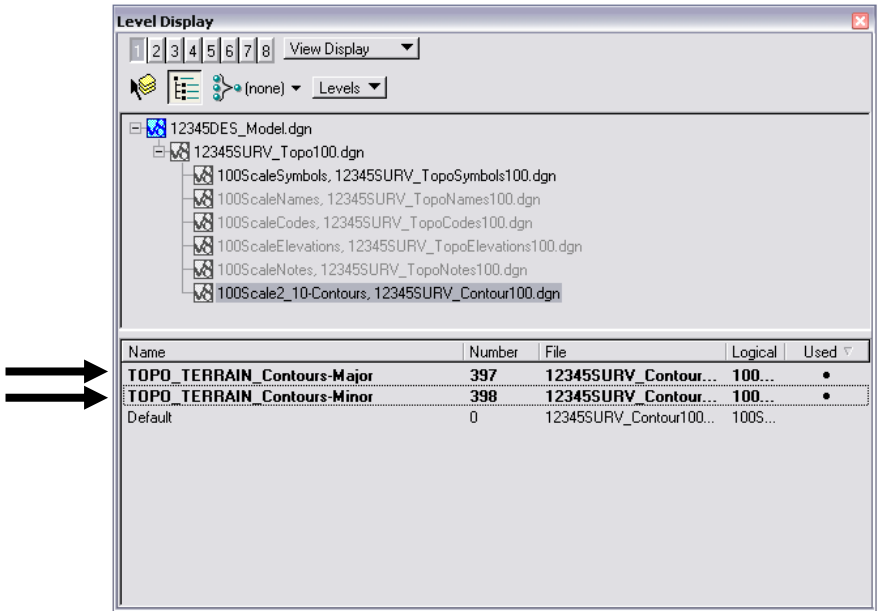
The major contours are placed at 10 ft. intervals.

12. **<T>** on some of the minor contour graphics and note the elevations.

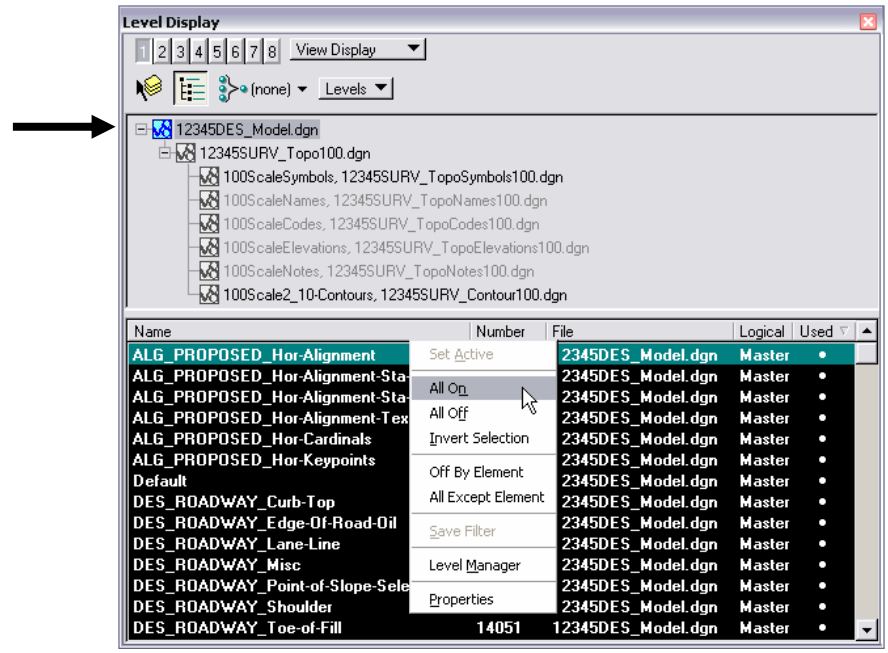


The minor contours are placed at 2 ft. intervals.

13. In **Level Display**, turn off the existing major and minor contour levels as shown.

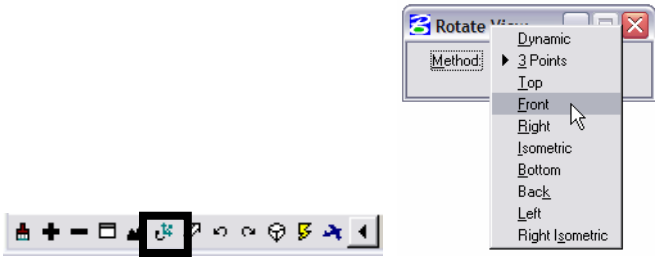


14. In Level Display, highlight the **12345DES_Model.dgn** file to work with the master file levels again and turn all levels on.

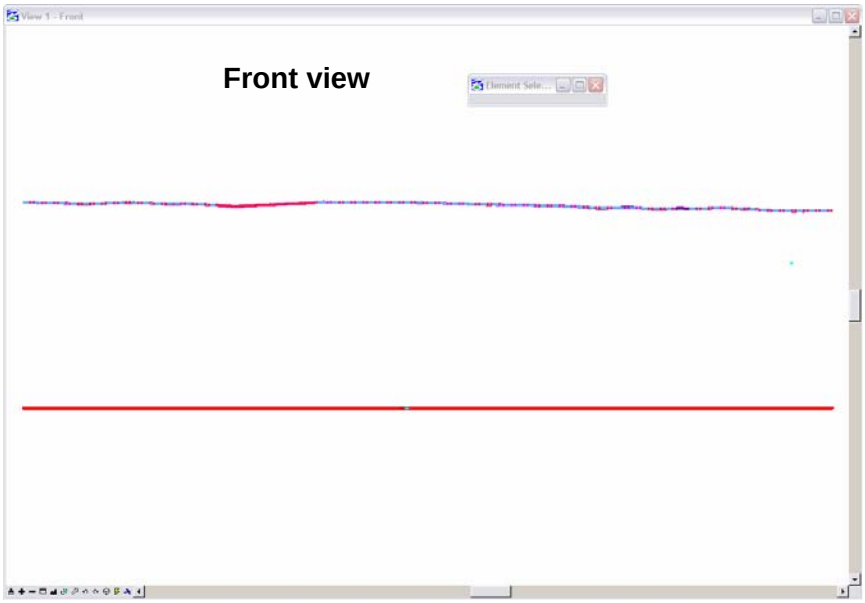


Rotating a 3D Standard View

1. From the **View Control** toolbar, select **Rotate View**.



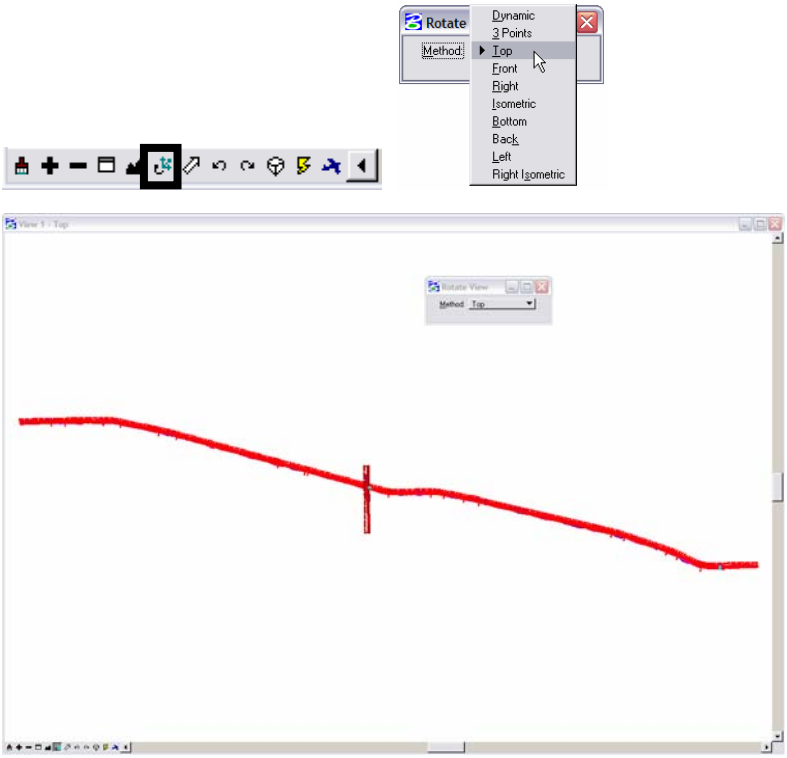
2. In the **Tool Settings** box, set **Method** to **Front**.
3. **Fit** View 1.



The view is rotated from Top (plan view) to Front (elevation view). Note that some graphics, (like the red horizontal alignments you checked earlier), are displayed at elevation 0 below the proposed graphics (edges of oil, cut/fill lines, etc.), which are displayed at the correct elevation (6620 ft. range).

Note: Rotating to the Front view is a handy way to visually check your file for survey busts or bad elevations which may "spike" down to 0.

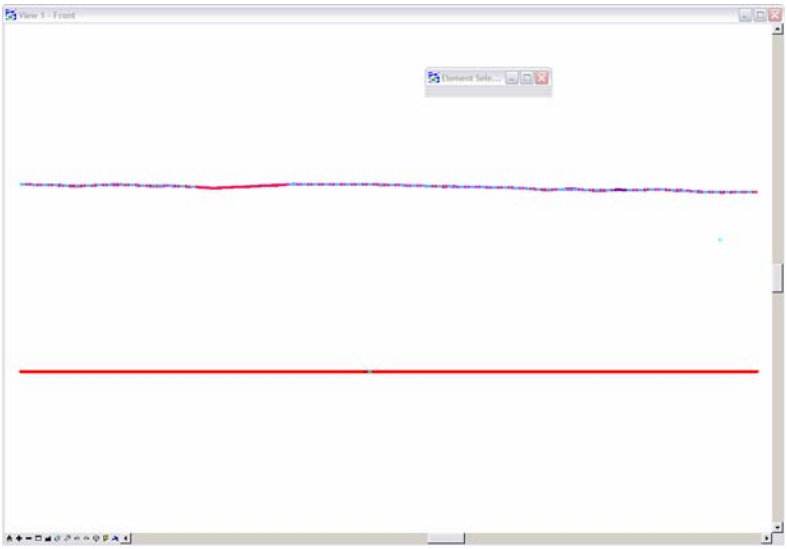
4. Select the **Rotate View** command again and set the **Method** to **Top**.



This returns the view to a plan view and its original un-rotated settings.

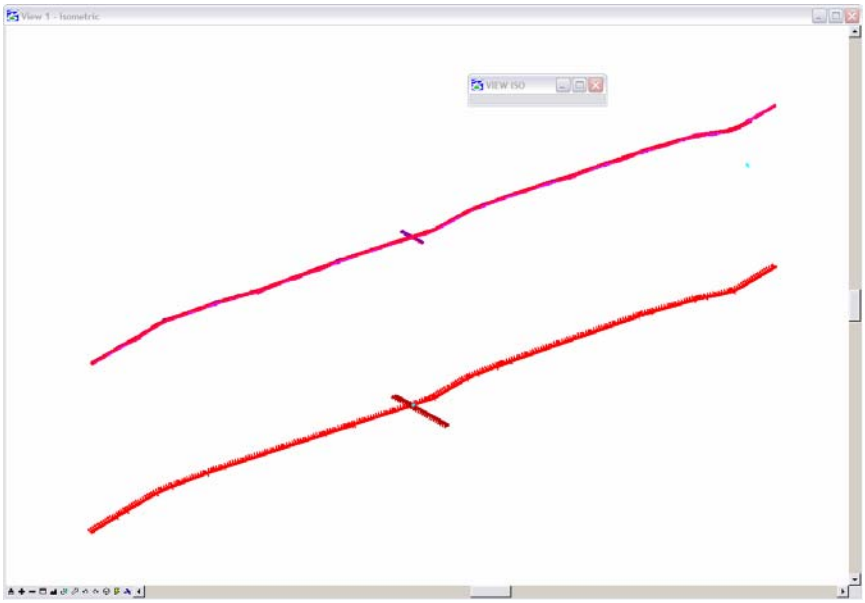
5. Key in ***vi=front***.

6. **<D>** to select the view.



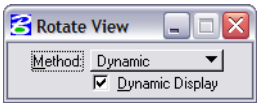
The view is rotated back to an elevation view. You can use the ***vi=*** keyin to rotate to standard views (top, front, isometric, etc.) as well as to recall saved views.

7. Key in ***vi=iso***.
8. **<D>** to select the view.
9. **Fit** the view**.**



This gives another 3D perspective of the design file graphics.

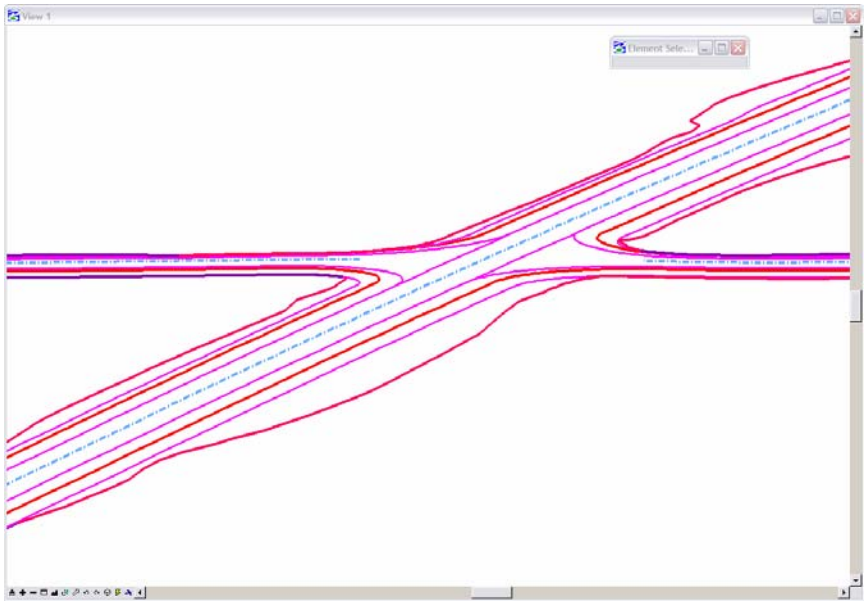
10. Select the **Rotate View** command again, set the **Method** to **Dynamic** and toggle on **Dynamic Display**.



11. **<D>** near the intersection in the view to identify it for rotation, then move your cursor in a counter-clockwise motion.

    As you move your cursor the view dynamically rotates. The **Dynamic Display** option allows you to see the rotation in real time.

12. **Zoom in** on the intersection and continue experimenting with the **Dynamic** rotation option until you're comfortable with the tool.



Hint: If you **<T>** on a location (like the intersection center) after selecting the **Dynamic** method, you will rotate about the tentative point.

Check the Active Display Settings

Check the Current Active Depth

1. **Rotate** the view back to **Top**.
2. **Fit** the view.
3. In the MicroStation **Key-in** box, key in ***az=$*** to check the active depth.

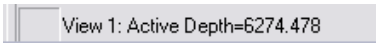
   Note: The dollar symbol ($) is used to request current settings. You can also use a question mark (?).

   MicroStation prompts: **Select View**.

4. **<D>** anywhere in View 1 (top view).

   Note: Active and Display depths are view dependent (*i.e.* you set these in each view). Therefore, you have to tell MicroStation which view you want to check the **Active Depth** in by data pointing in the view.

5. Check the **Message** field.

   MicroStation returns the current active depth setting (yours may be different than shown). This means if any graphics are placed in the design file's top view without giving them an elevation, they will go in at this elevation or depth.

   Since the depth axis of the top view (plan view in a 3D file) is the Z axis, this means graphics will be placed at this elevation.

6. Key in ***az=0***.

7. **<D>** to select the view.

8. Key in ***az=$***.

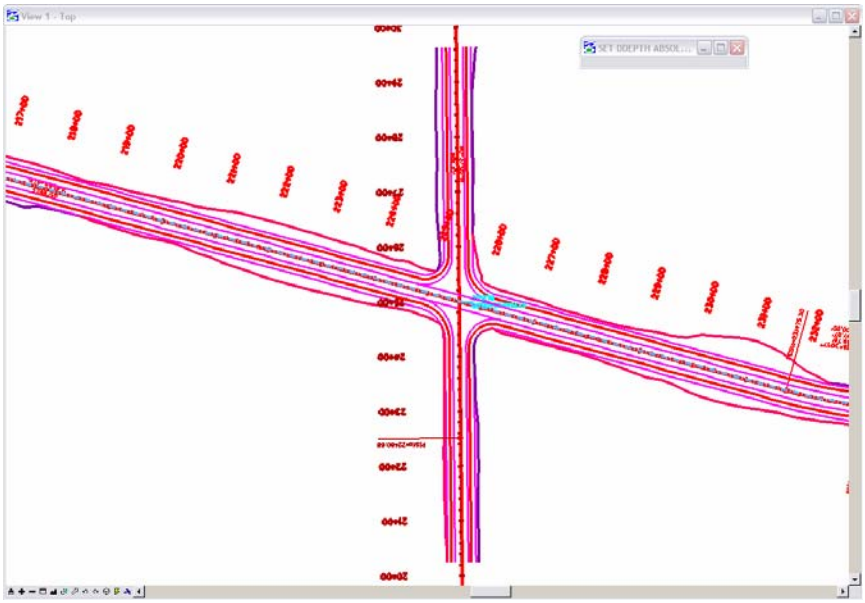
9. **<D>** to select the view.

   You have now set the active depth to 0. Any new graphics placed in the file will be placed at an elevation of 0, unless you snap to an element at another elevation.

Check Current Display Depth Settings

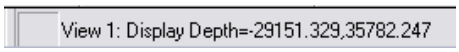
1. **Window** in around the intersection.

2. Key in ***dp=$***, then press **<Enter>**.

3. **<D>** in View 1.

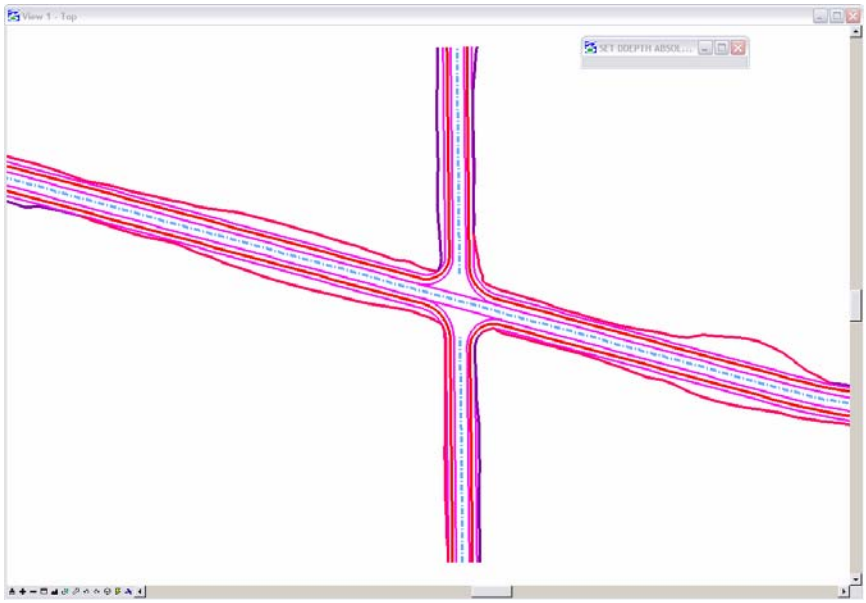
4. Check the **Message** for the current display depth settings.



The current display depth in the top view is set very large (yours may vary from that shown). Therefore, you are able to see all the graphics in the top view since they fall in the depth (elevation) range.

5. Key in ***dp=6000,7000***.

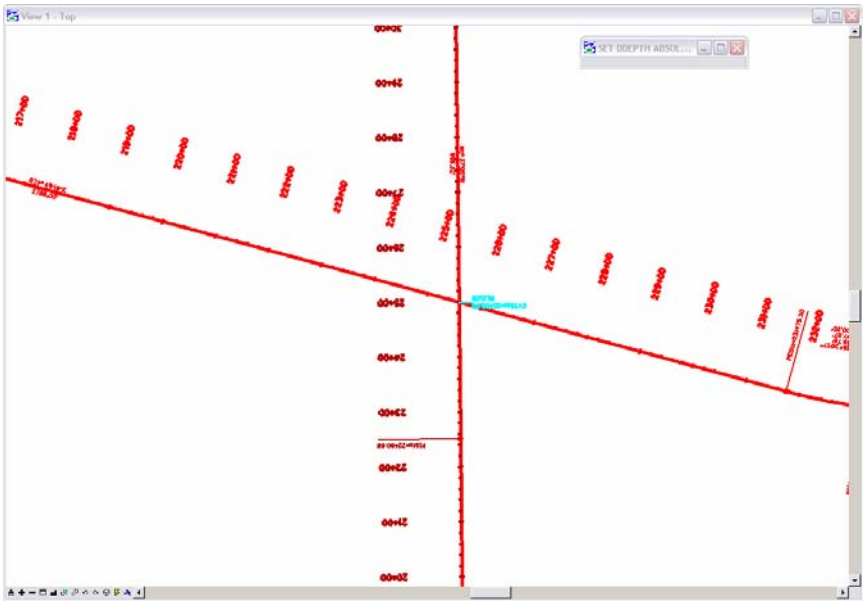
6. **<D>** anywhere in View 1 and look at your graphics.



The graphics placed at this elevation range (shoulder, edge-of-oil, cut/fill lines, *etc*.) now appear in the view. All of the graphics placed at elevation 0, like the red proposed horizontal alignment, stationing and alignment text, are not displayed.

7. Key in ***dp= –10,100***.

8. **<D>** anywhere in View 1 and look at your graphics.



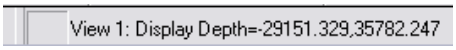
Only the elements placed in this elevation range (*e.g.* the proposed horizontal alignment and text placed at 0) appear in the view. All other graphics are outside of this elevation range and are not displayed.

9. **Fit** View 1.

All of the graphics appear in the view.

10. Key in ***dp=$***.

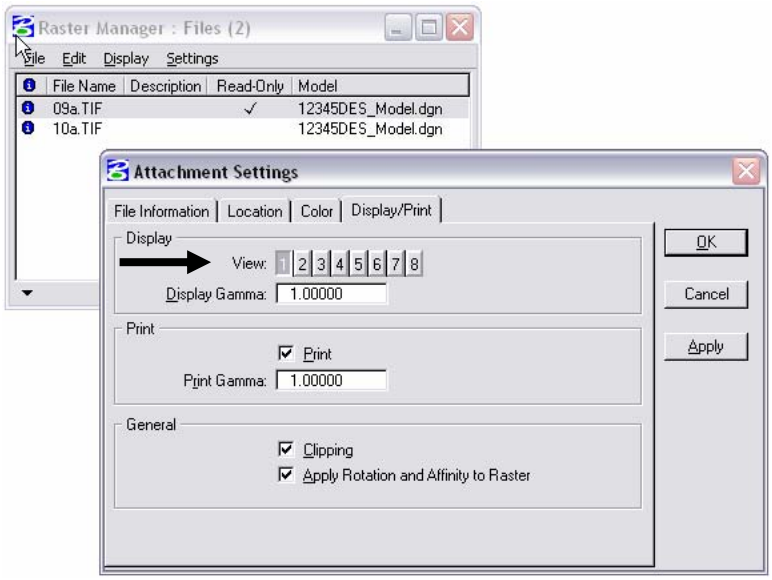
11. **<D>** anywhere in View 1 and check the **Message** field.



The display depth range is automatically expanded after using the **Fit** command to show all of the elements in the view.

Turn On Raster Images

1. Select **File > Raster Manager**.
2. Double-click on the **09a.tif** file.
3. On the Display/Print tab, toggle on View **1** and select **OK**.



4. Repeat for **10a.tif**.
5. Close the **Raster Manager** box.
6. Fit View 1.

   The raster images are now on for a future lab.

7. Select **File > Save Settings**.

   This saves all settings changes, including open views, levels turned on/off, active and display depth settings, *etc*. The next time you enter this design file, it will appear just as you left it.

8. **Exit** MicroStation.

Section 2 – The CDOT MicroStation Workflow

Now that you are comfortable working in a MicroStation design file, you are ready to learn how CDOT specifically uses MicroStation in the project process. This section concentrates on how CDOT creates model file graphics by utilizing the CDOT Menu. It also covers the sheet file creation process. Once your sheets are created, you will learn how to annotate, dimension and plot the sheets.

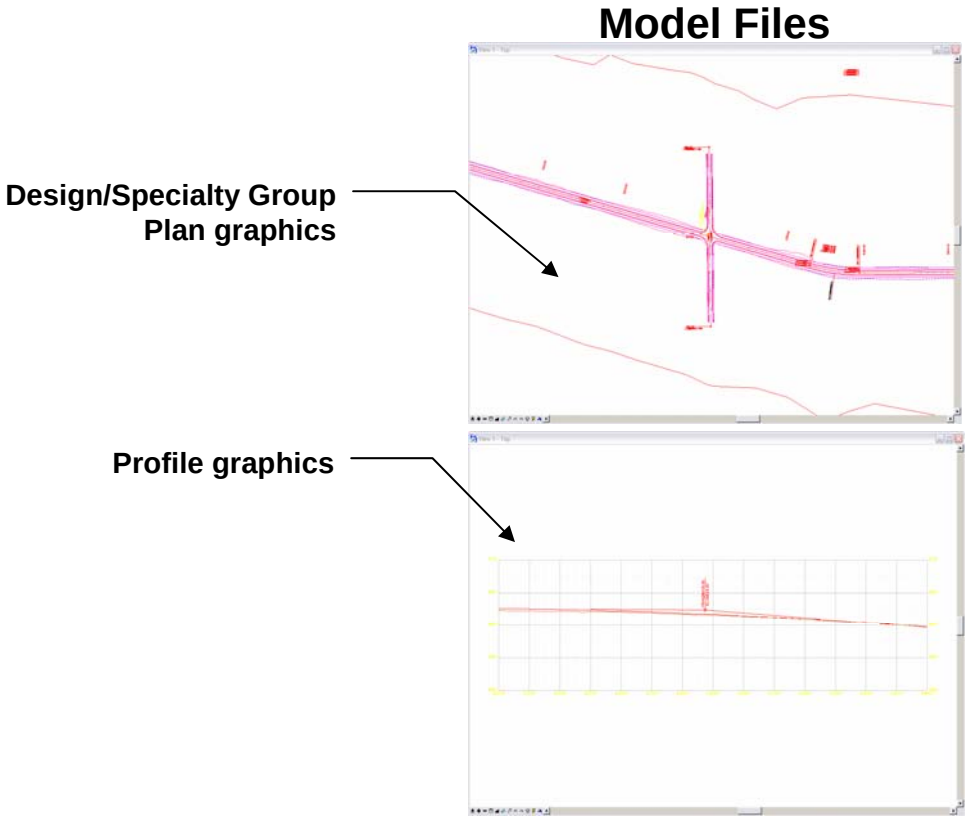
4. Creating a CDOT Project

This chapter is a general overview of the entire CDOT workflow to complete a CADD project using MicroStation. You will learn how to set up a CDOT project and create your design model file and reference other discipline's files.

CADD Workflows

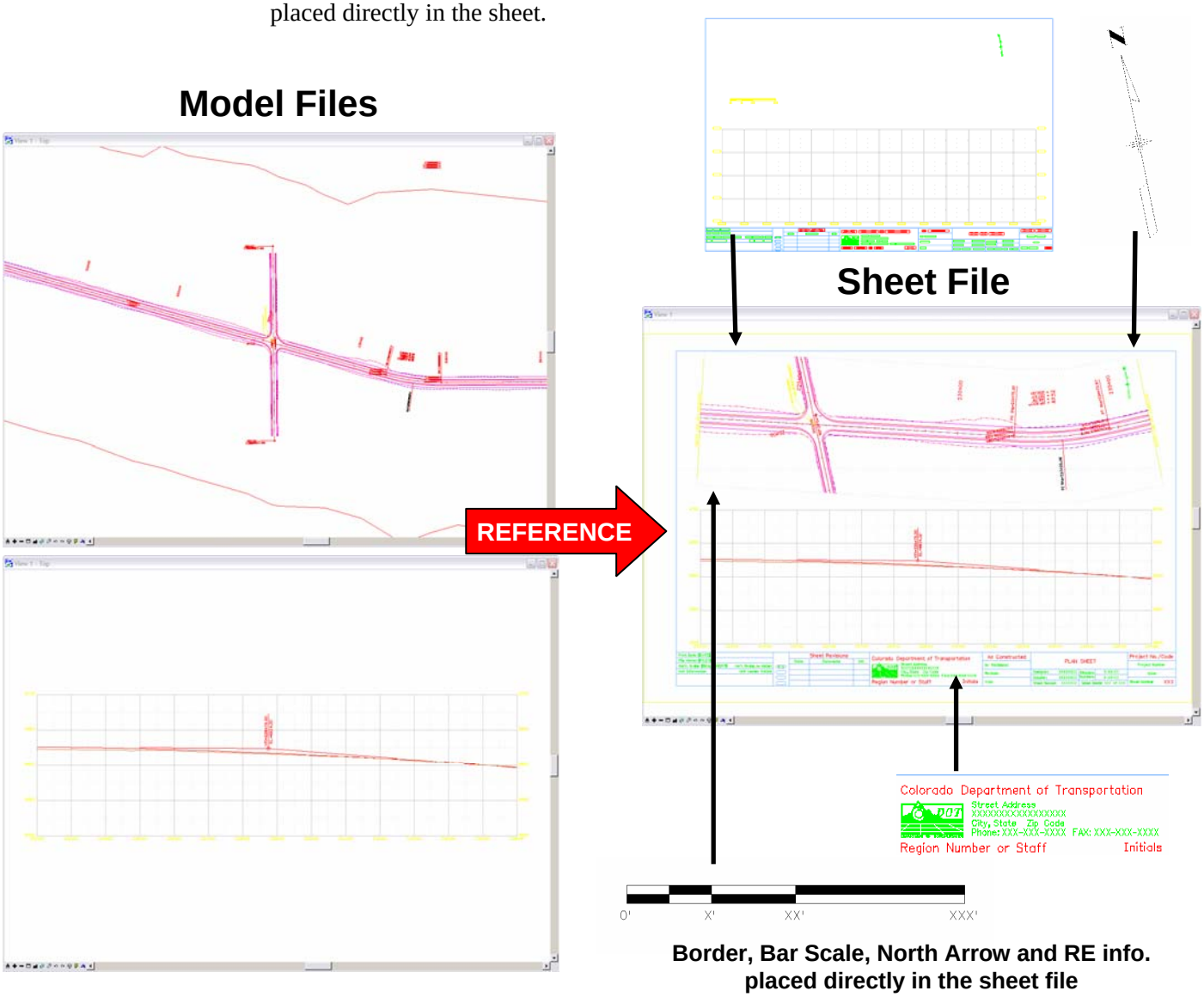
Model files vs. Sheet files

To understand how CDOT uses MicroStation for design and drafting, you first need to understand the difference between Model files and Sheet files. **Model files** contain the design graphics. These are the working files for your design. Each group has at least one Model file, but can have multiple model files for different types of graphics. For example, the Roadway Design group can have a model file for plan graphics and another model file for profile graphics. The Traffic group may have separate model files for signs, signals and lighting.



Sheet files are the files that will be plotted for the creation of a plan set. ***Sheet files reference model file graphics***. A reference is just a MicroStation file attached to your active file (the file you have opened). You can reference multiple model files to create a sheet file. For example, a Bridge general layout sheet may reference the existing survey/topo model, the proposed roadway design model and the proposed bridge model to show all of the needed information on the sheet. A Plan Profile sheet (shown below) references the proposed roadway design model and the profile model.

Sheet files typically do not contain design graphics since they are referenced in from the model files. You can't modify the model file reference graphics in a sheet file; they are there for information only. The sheet files, however, do contain the border and associated information (bar scale, north arrow, etc.) along with text and dimensions, which can be modified since these elements are placed directly in the sheet.

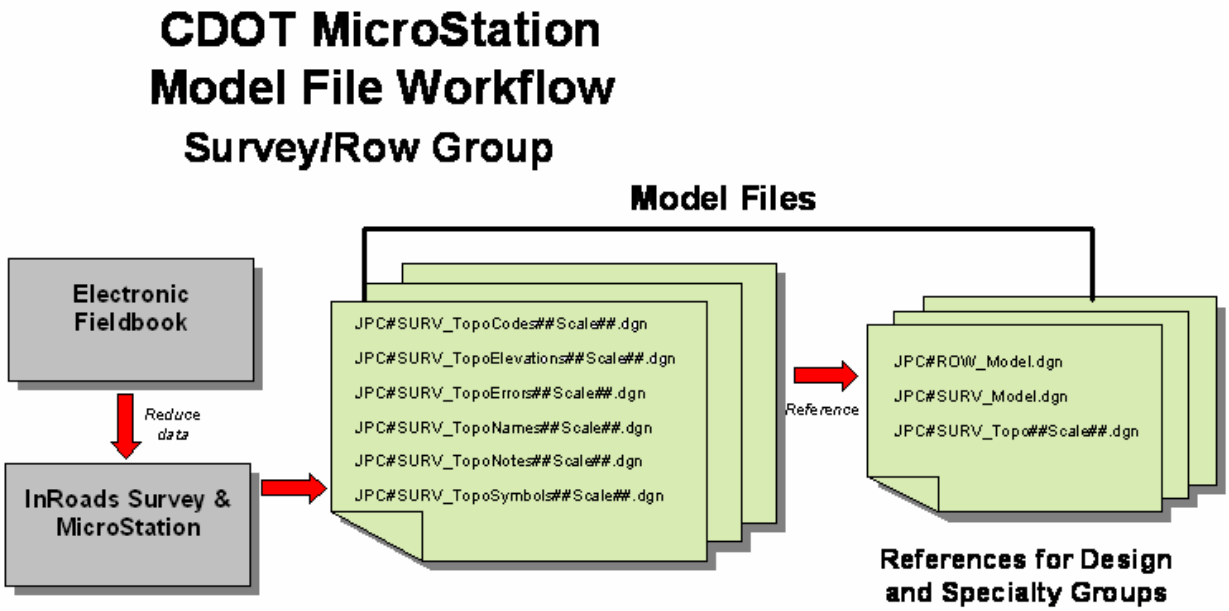


Border, Bar Scale, North Arrow and RE info. placed directly in the sheet file

For more information on References, see the section ***Referencing Others Work*** in this chapter.

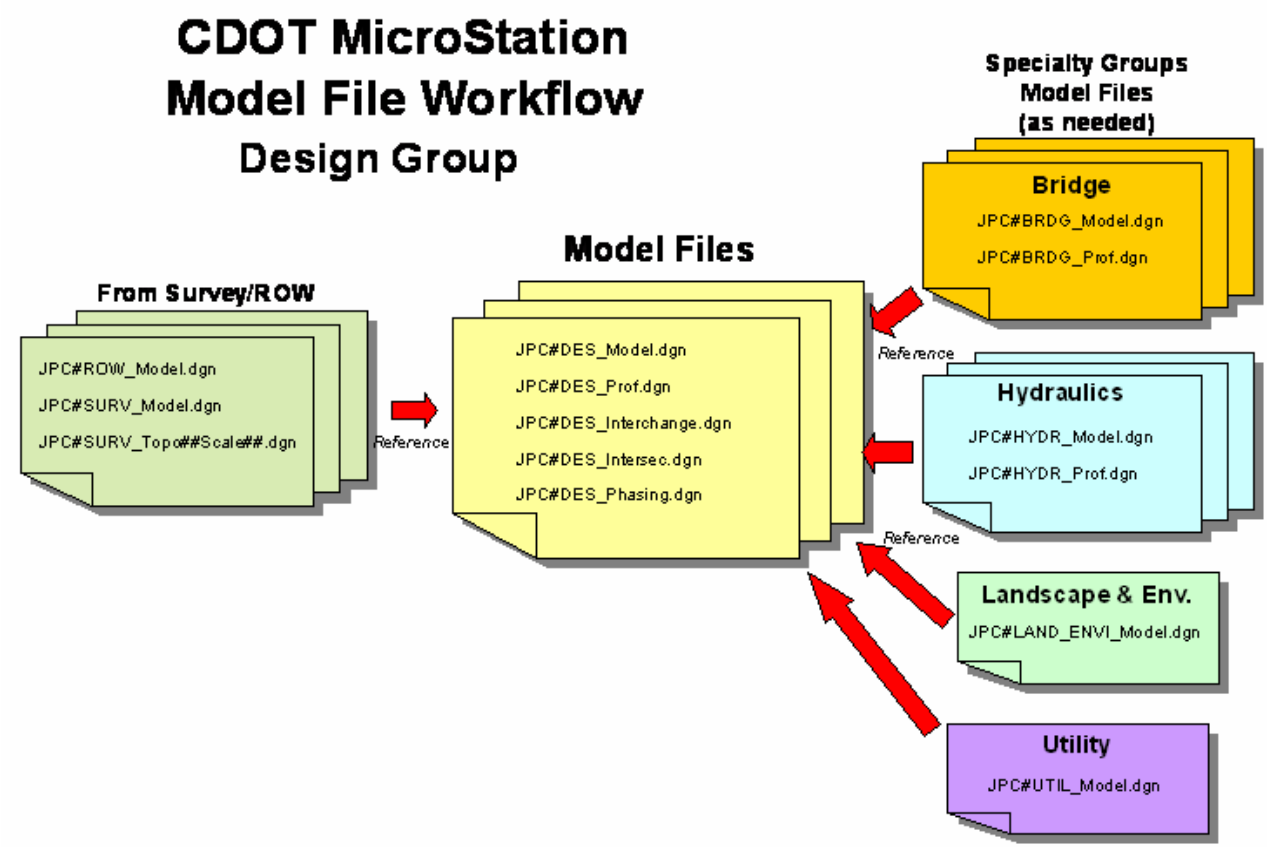
Model File Workflow for Survey/ROW

To create existing model files, the Survey/ROW group uses MicroStation and InRoads Survey to reduce the electronic fieldbook data and create model files for ROW, survey planimetrics and existing topographics. These existing model files can then be referenced by Design and specialty groups as a base for creating the proposed model files.



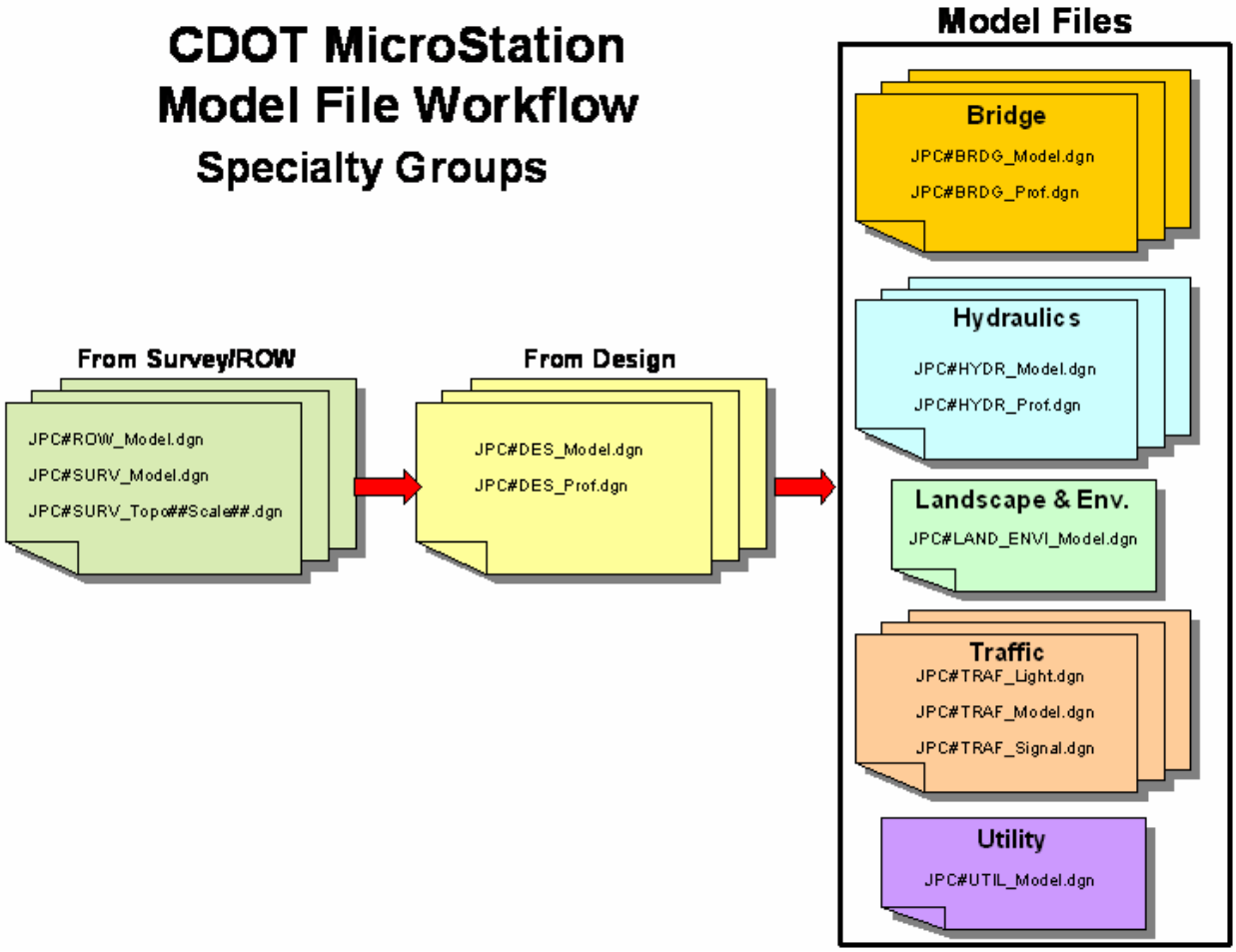
Model File Workflow Roadway Design

To create proposed design model files, the Roadway Design group references the existing survey/topo and ROW models to begin the design. MicroStation and InRoads are then used to create the proposed graphics in various model files – plan, profile, intersection, etc. (See Chapters 5 - 8 for more information on creating your design.) Occasionally, other specialty group model files are needed by Design, so these model files may be referenced as well.



Model File Workflow for Specialty Groups

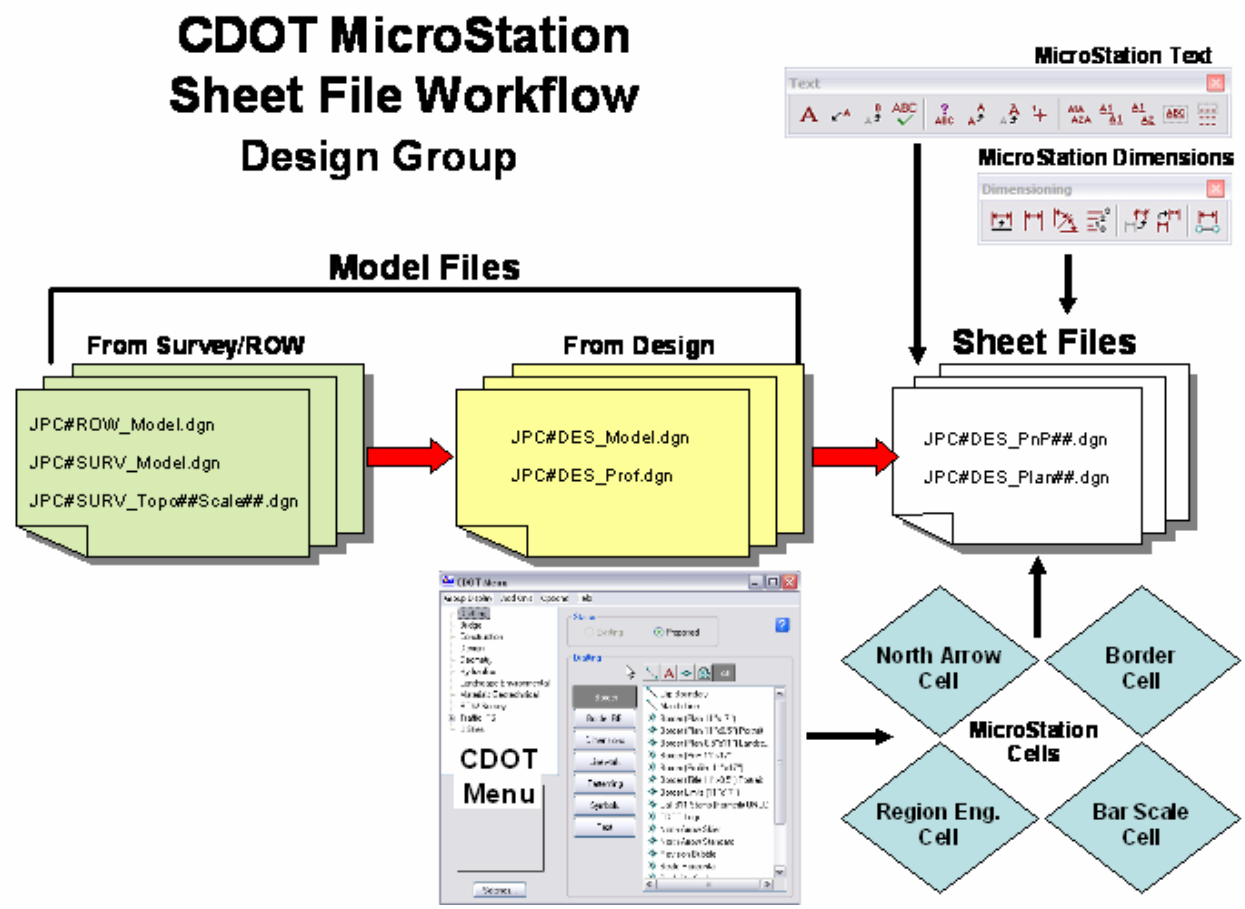
Each specialty group references the Roadway Design group's proposed model file to begin their design. MicroStation and other specialty programs are used to create the graphics in separate model file(s) for each group. (See Chapters 5 – 8 for more information on creating your designs.) When the specialty group references Design's model file, they can choose to reference the existing model file(s) from the Survey/ROW group as well. This way, both existing and proposed graphics can be displayed in the specialty group's model file, if needed.



Sheet File Workflow for Roadway Design

To create sheets (specifically plan or plan/profile sheets in this example), the Design group creates a new MicroStation design file for each sheet. Then, the proposed model file is referenced into the sheet file. Since the proposed model also has the existing model file referenced, the survey graphics can be displayed in the sheet. The sheet file view is rotated, if needed, so graphics appear horizontal. Then, only the portion of graphics needed for the sheet is "clipped" out from the reference. The border, north arrow, bar scale and resident engineer information is then placed directly in the sheet file via the CDOT Menu (see Chapter 5). Many generic sheet files also contain a border, which can be edited. The sheet can be annotated with MicroStation text and the reference graphics dimensioned, if required. Unlike reference graphics, text and dimensions are placed directly in the sheet file and, therefore, can be edited in the sheet.

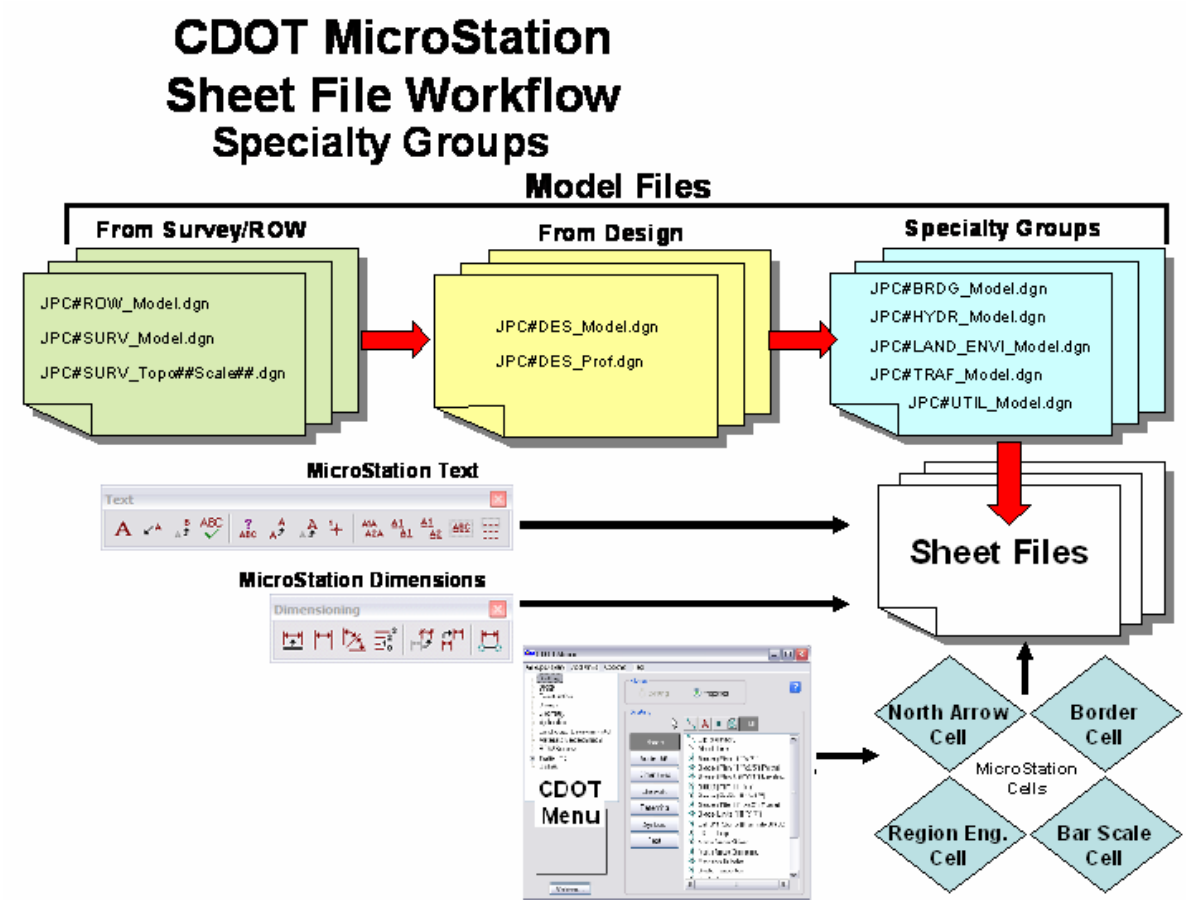
Other sheets like detail, title, general notes, etc. have specific requirements, but use the same general premise of referencing the model file(s) to the sheet file. Typical Section sheets are an exception to the rule, since graphics are created directly in the sheet file using the CDOT Typical Section Program. See Chapter 9 for more information on creating sheets.



Sheet File Workflow for Specialty Groups

Specialty groups create a separate MicroStation design file for each sheet, and then reference their own model file(s) into the sheet file. Since this model file can also have Roadway Design and ROW/Survey's model files referenced, these graphics can be displayed in the sheet. The sheet file view is rotated, if needed, so graphics appear horizontal. Then, only the portion of graphics needed for the sheet is "clipped" out from the reference. The border, north arrow, bar scale and resident engineer information is then placed directly in the sheet file via the CDOT Menu (see Chapter 5). Many generic sheet files also contain a border, which can be edited. The sheet can be annotated with MicroStation text and the reference graphics dimensioned, if required. Unlike reference graphics, text and dimensions are placed directly in the sheet file and, therefore, can be edited in the sheet.

Other sheets like detail, tab, and note sheets have specific requirements. See Chapter 9 for more information on creating sheets.



CDOT CADD Resources

There are many resources available to assist you when working on your CDOT CADD project. These resources can be found on the CDOT CADD & Engineering Innovation Web site.

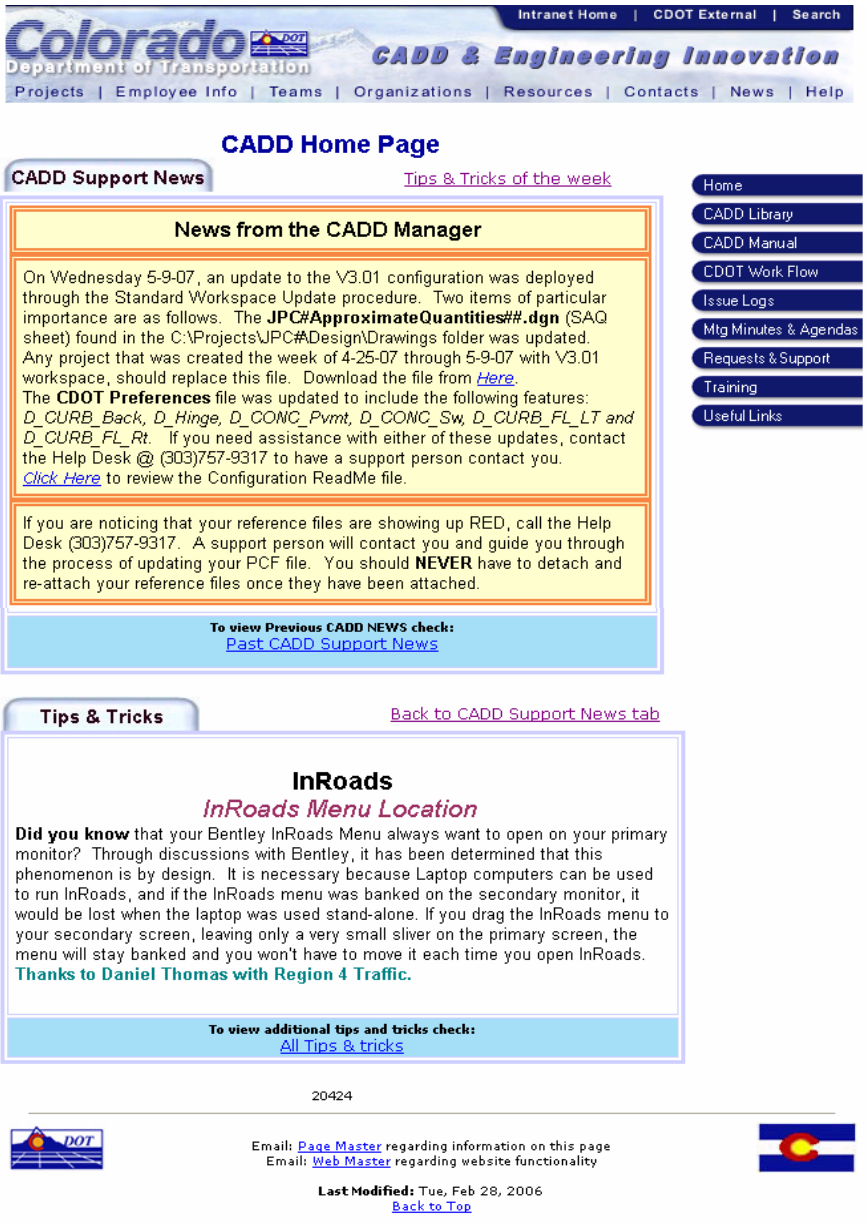
CDOT CADD & Engineering Innovation Web Site

The CDOT CADD & Engineering Innovation web page is available at:

http://internal/cadd/ It can also be found on the internal CDOT website:

Organizations > Project Development > CADD and Engineering Innovation.

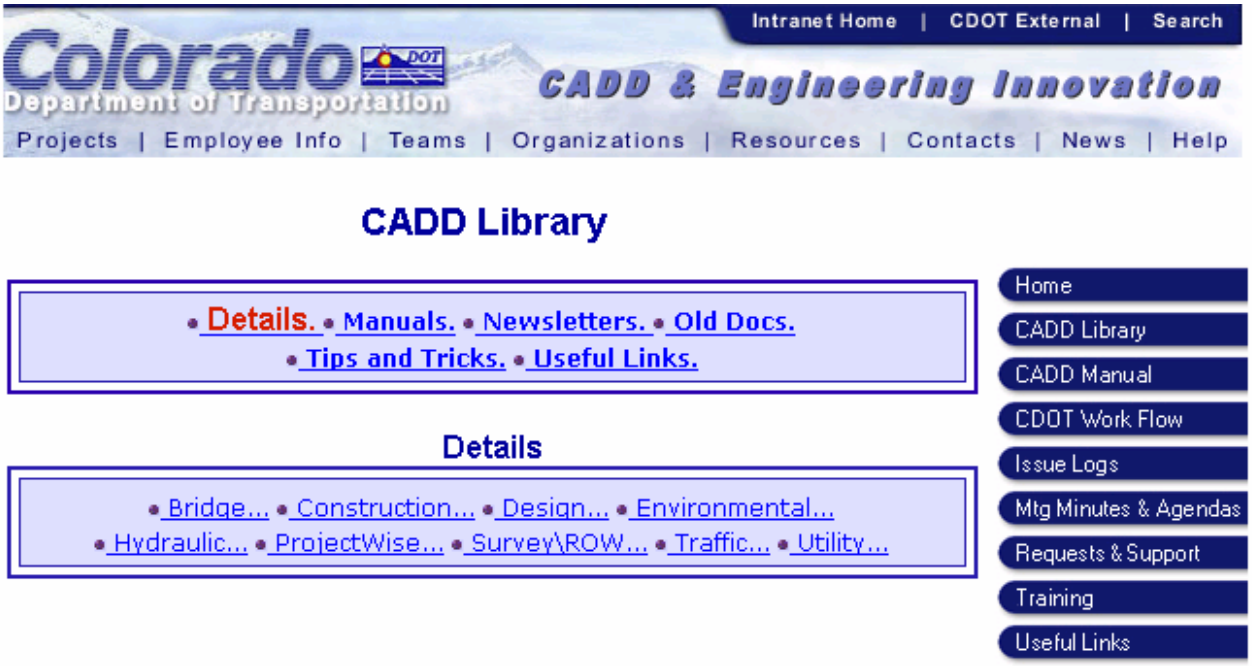
The website (presently only available to CDOT) provides CDOT users with up to date information, tools, and resources related to CADD and the Colorado Engineering Software Transition (CEST) project.



This website is a valuable resource for CADD users and includes:

CADD Library

The **CADD Library** page provides links to manuals, newsletters, standard details, *etc*. One extremely useful link is to the **Tips and Tricks** section for MicroStation and InRoads. This information changes daily, so check back often.



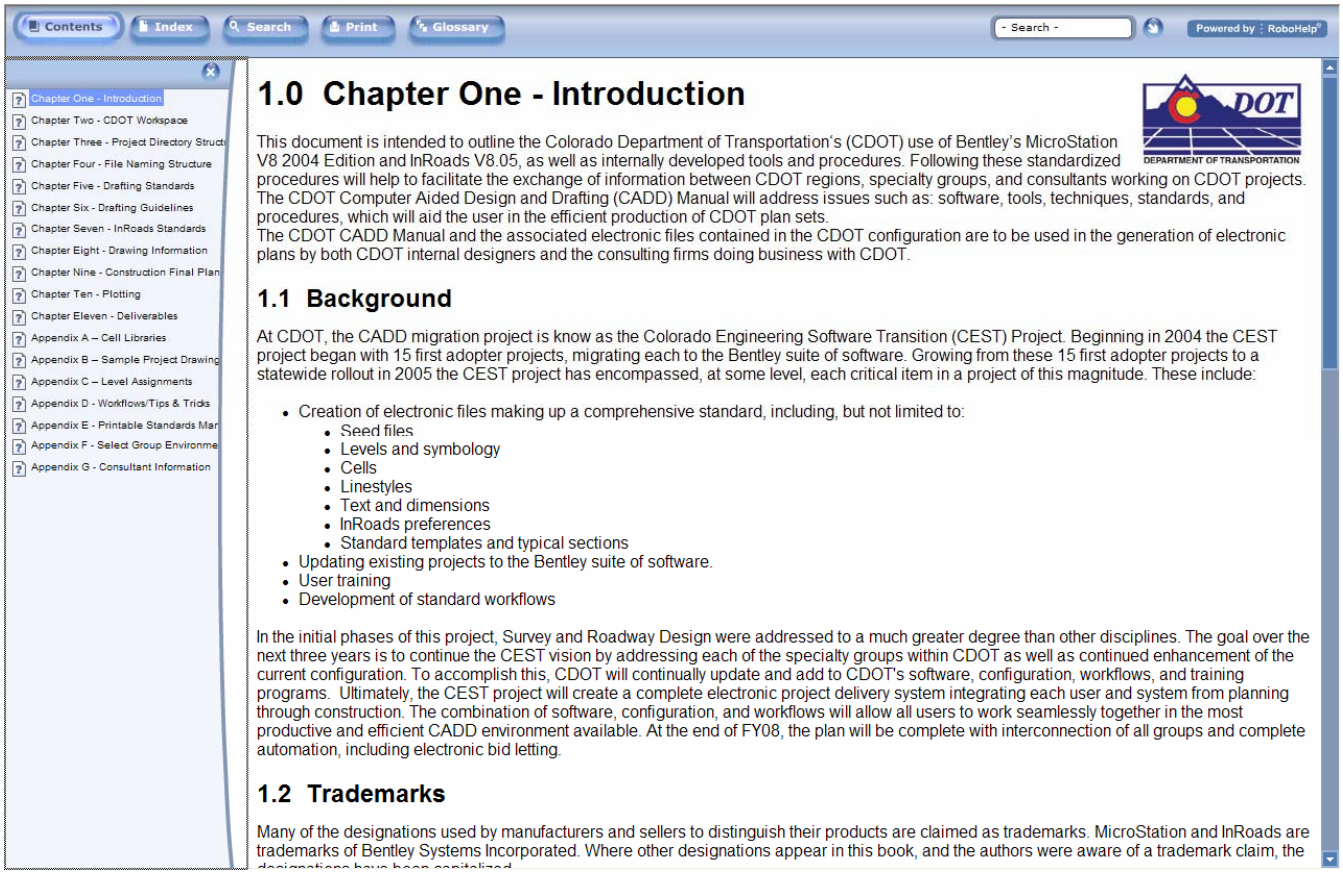
CADD Manual

The CDOT **Computer Aided Design and Drafting (CADD) Manual** outlines CDOT's use of Bentley's MicroStation and InRoads software. It documents standardized procedures for the exchange of information between CDOT regions, specialty groups, and consultants working on CDOT projects. The Manual also addresses software issues, tools, techniques, standards and procedures, etc. which will aid the user in the efficient production of CDOT plan sets.

The CDOT CADD Manual and the associated electronic files contained in the CDOT configuration are used in the generation of electronic plans by both CDOT internal designers and the consulting firms doing business with CDOT. The electronic version of the Manual provides hyperlinks to each chapter as well as context sensitive index and search functions. You can also print chapters or the entire manual.

The CDOT CADD Manual can be accessed several different ways including:

- From the CDOT internal CADD web site home page link;
- From the CDOT Design and Construction Project Support Page (external web site);
- From the CDOT Menu (**Help > CADD Manual**).



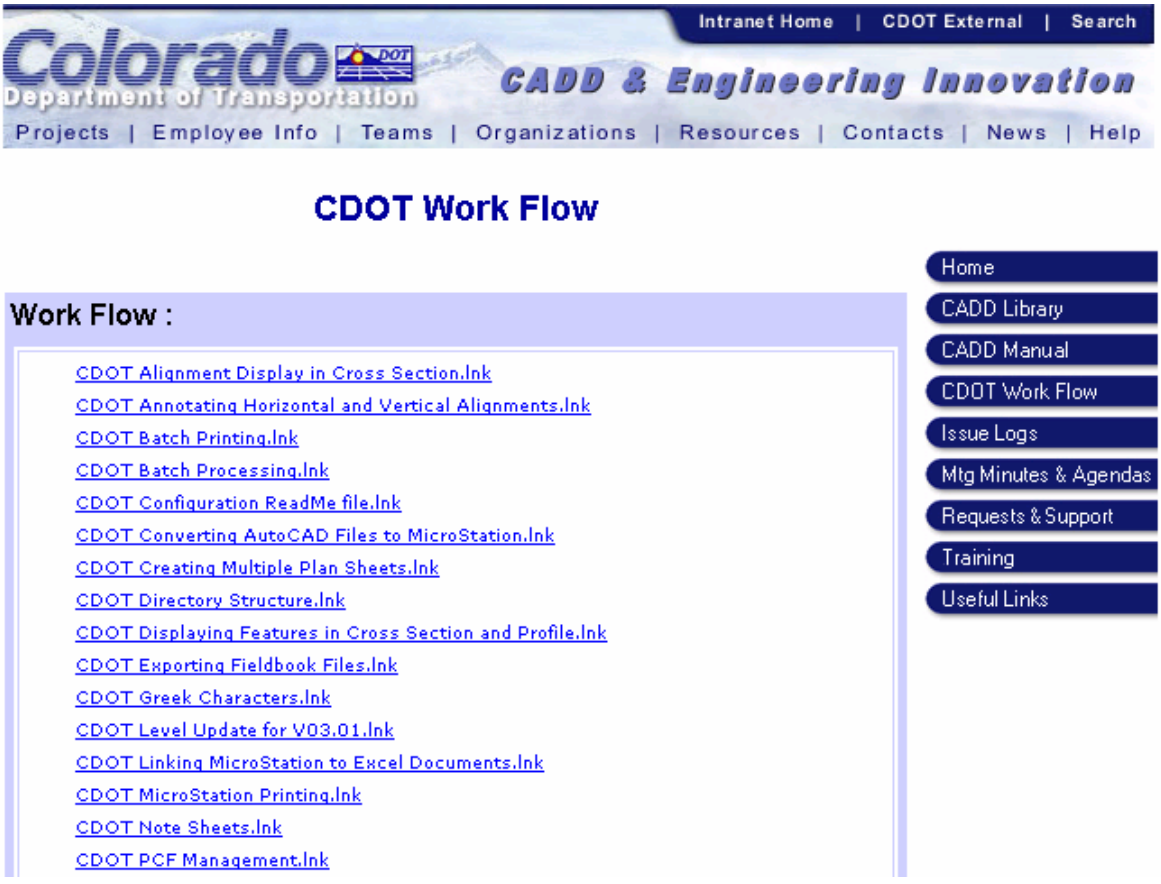
CDOT Workflows

There are several standardized MicroStation and InRoads workflows that CDOT has developed to assist you. These workflows are step-by-step CDOT-specific procedures for certain tasks that you may encounter when working in MicroStation or InRoads on a CDOT project. Many of these workflows are referenced throughout the course.

In addition to accessing the workflows from the CDOT CADD Web site Home page link **CDOT Work Flow**, you can also access workflows:

- From the Windows Start menu (**Start > All Programs > _CDOT_CADD_Information > Workflows**);
- From the CDOT Menu (**Help > Workflows**).

New workflows are typically added with CDOT configuration updates, so check back often.



Issues Logs

Check the issues log to determine the status of submitted requests.

Requests & Support

This page provides CADD help solutions where you can:

- Learn how to get help;
- Submit a questions;
- Submit a request (*e.g.* request a new MicroStation level or InRoads preference), as well as
- Obtain InRoads, InRoads Survey and MicroStation support.

There is also a link to **IT Services** for hardware support, "how to" instructions, installation, training files, and dual monitor and work space setup.

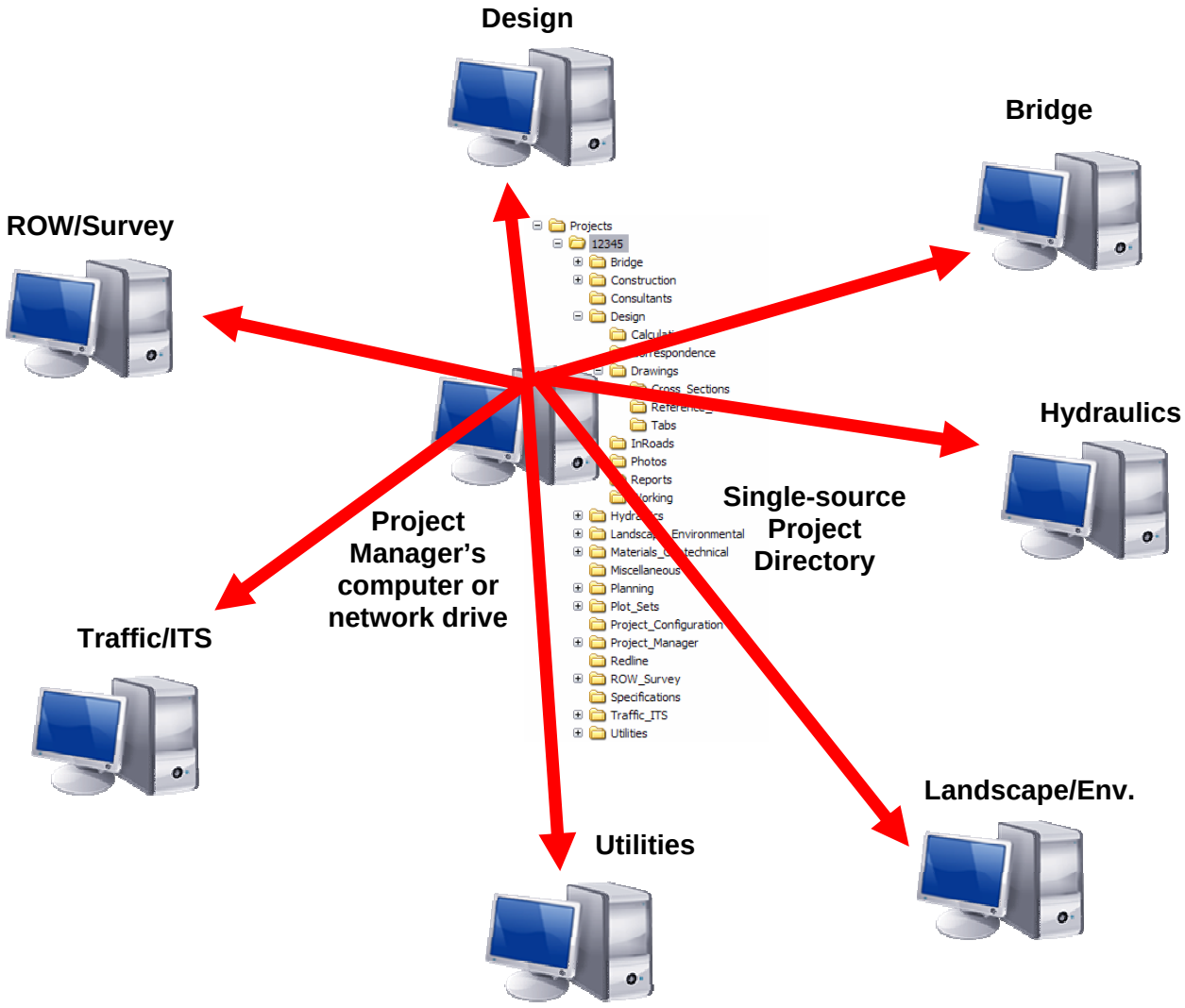
Training

Use this link to sign up for training classes. You can also review online computer-based training (CBT) for MicroStation, InRoads and InRoads Survey.

Single Source Project Data

The use of MicroStation references is a powerful tool that allows all users on a project to share graphical data files from a single source. You should always access graphics files from a central location (either on a project server or from a Project Manager's machine). This eliminates the need to copy graphics files to multiple machines when several users are working on a project. ***Copying graphics files out of their project location is bad practice and should be avoided.***

Instead, you can use MicroStation to reference files you need from other groups, and multiple users can reference the same file. The "owner" of the file can continue working on it while those referencing the file can see the updates. This way, the file remains in a central location and you're assured that you're working with the latest version of that file.

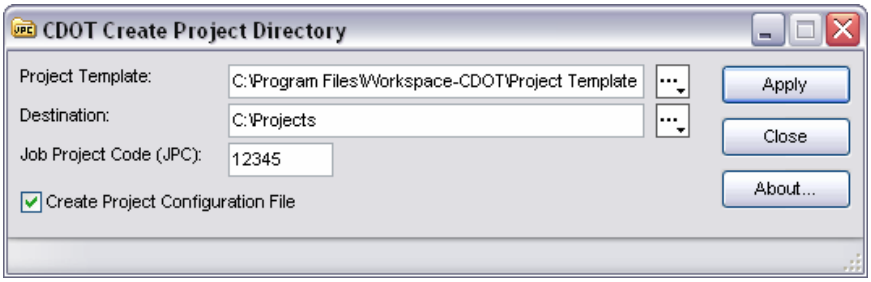


Project set-up

The Project Manager (PM) is responsible for setting up a new project. To take full advantage of single source data, the project directory is created on either a network sever or on the PM's personal computer. All users working on a project would then need to map the PM's machine in order to access the project directory.

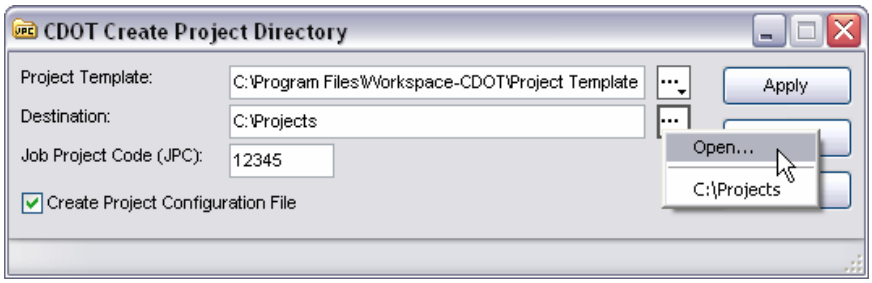
The Create Project Directory Utility

To create the project directory, the Project Manager runs the **Create Project Directory** utility. The utility is found on the Windows Start Menu (**Start > All Programs > _CDOT_CADD_Information > Create Project Directory Structure**).

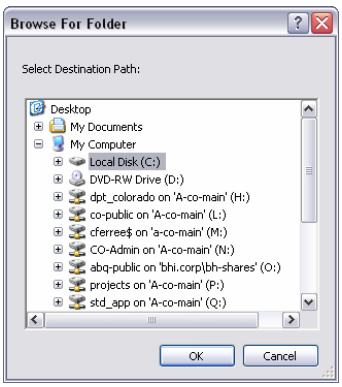


The PM enters the Job Project Code (JPC) and runs the utility. This creates the project directory and associated blank and auto-populated files, along with the **Project Configuration File** (PCF).

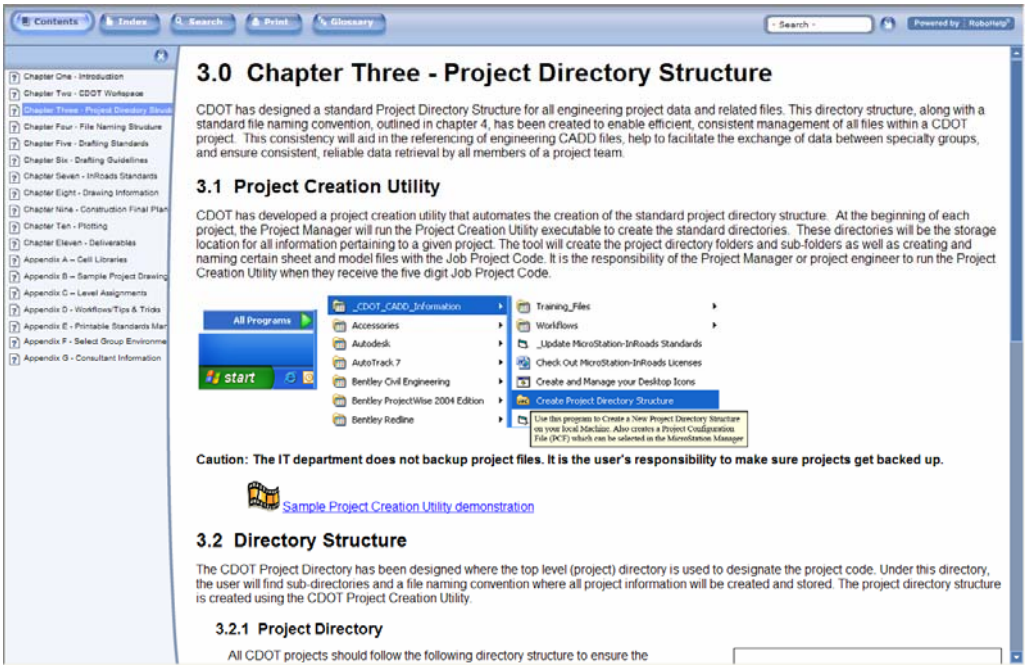
The project can either reside on the Project Manager's computer or on a network drive. If it's on the PM's machine, make sure this drive is shared to others working on the project. To create the project on a network drive, select the Browse button (**...**) next to **Destination** and then select **Open**.



You can now set the path to any mapped network drive.



For more information see the **CDOT CADD Manual**, ***Chapter Three — Project Directory Structure, section 3.1 – Project Creation Utility.***



The PCF file

The Project Configuration File, created by the utility, defines a specific directory that MicroStation defaults to when opening up a DGN file or referencing model files. PCF files are extremely useful when multiple users are accessing the same project directory across the network, or when DGN files are moved from one directory to another.

Working in a server environment

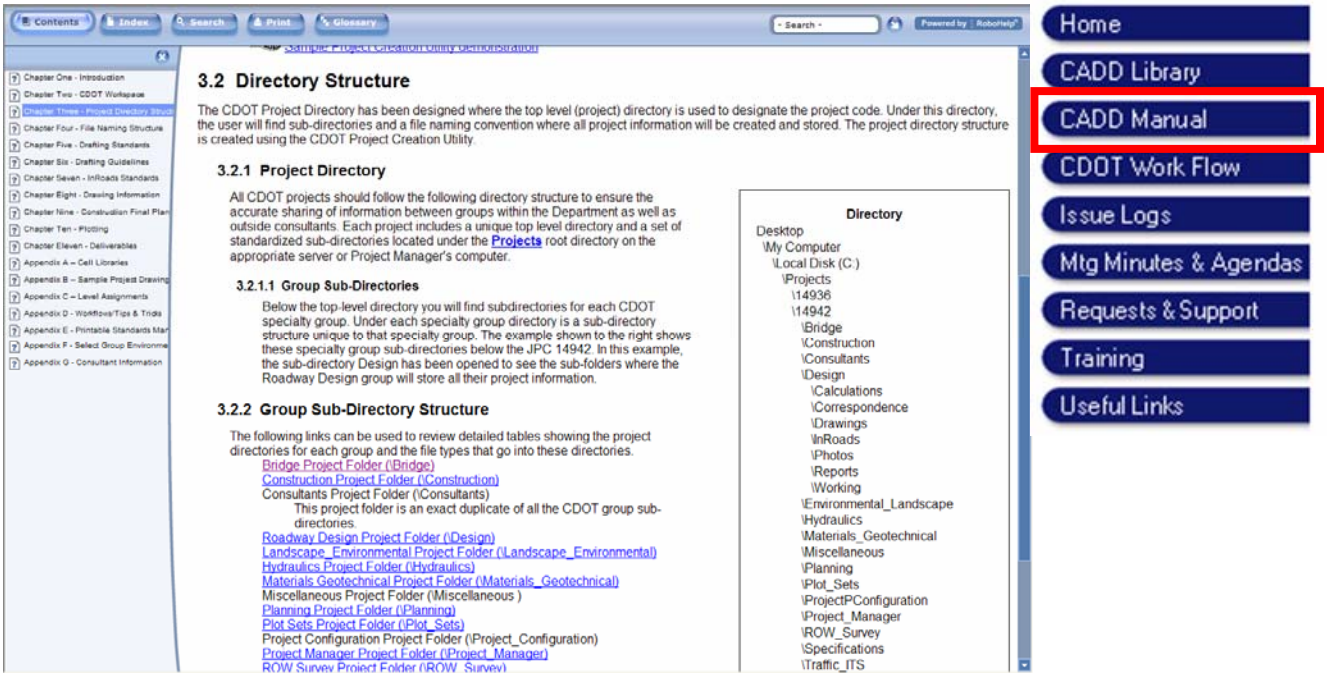
If multiple users are accessing the same project directory, the PCF file will need to be distributed to everyone on the team accessing the project directory. Each member of the team should have their own copy of the PCF file and it should be saved to the same location, **C:\Program Files\Workspace-CDOT\Standards-Local\Projects**. The PCF is also useful for managing references. If a reference file is moved, you should never have to reattach it. You can use the PCF to manage the reference locations.

When team members are sharing the project manager's machine, the PCF file will need to be edited. See the Workflow ***CDOT PCF Management*** for more information.

The CDOT Project Directory Structure

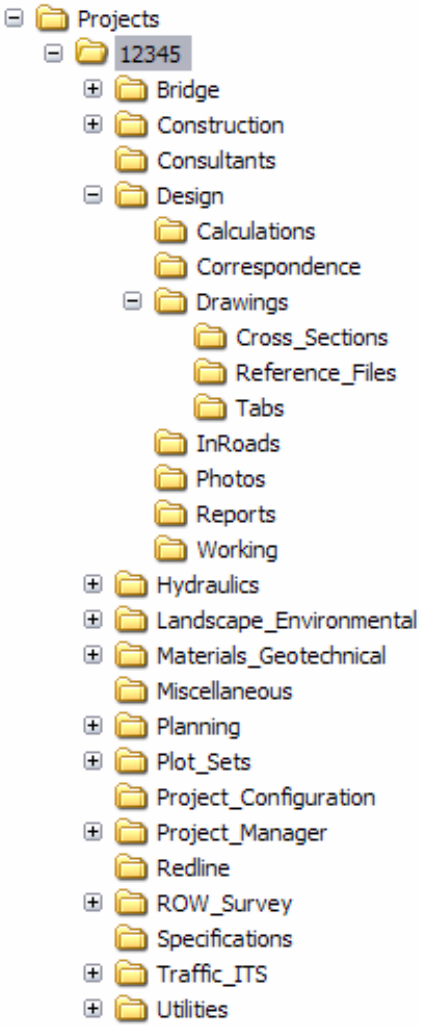
The **Project Creation** utility creates the project directory structure on the server or PM's computer. All CDOT projects should follow this structure to ensure the accurate sharing of information between groups within the Department as well as outside consultants. The CDOT Project Directory's top level designates the project code. Below this folder is a set of standardized sub-directories for each CDOT specialty group. Under each specialty group folder is a sub-directory structure unique to that specialty group.

For more information about the CDOT project directory structure, see the **CDOT CADD Manual**, ***Chapter Three – Project Directory Structure, section 3.2 – Project Directory Structure***.



Training Project Directory

For this training class, you will create a project directory structure with an example Job Project Code (JPC) of 12345 shown below. The Roadway Design group's sub-folder is shown expanded to show an example of a group's sub-folder structure.



Training files

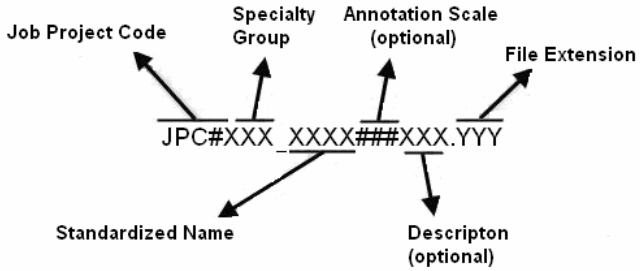
The training lab files for CDOT CADD courses can be accessed from the Windows Start Menu. Select **Start > All Programs > _CDOT_CADD_Information > Training Files > Insert Training Files on my Computer**. A link is also available on the Training page of the CDOT CADD web site.

It is highly recommended that you that you install the training files and continue practicing with MicroStation by completing the lab exercises contained in this course guide, especially if you do not plan to start work on a MicroStation project soon.

CDOT file naming convention

Model files and Sheet files need standard, informative, and unique names to allow easy identification of the specialty group responsible for the file and the type of information contained within the file. All CDOT CADD drawings created should follow this naming convention so the data can be easily identified and shared by all users.

The CDOT file naming convention contains the Job Project Code (JPC), a specialty group identifier, short standardized file name, an optional annotation scale identifier, an optional description, and file extension.



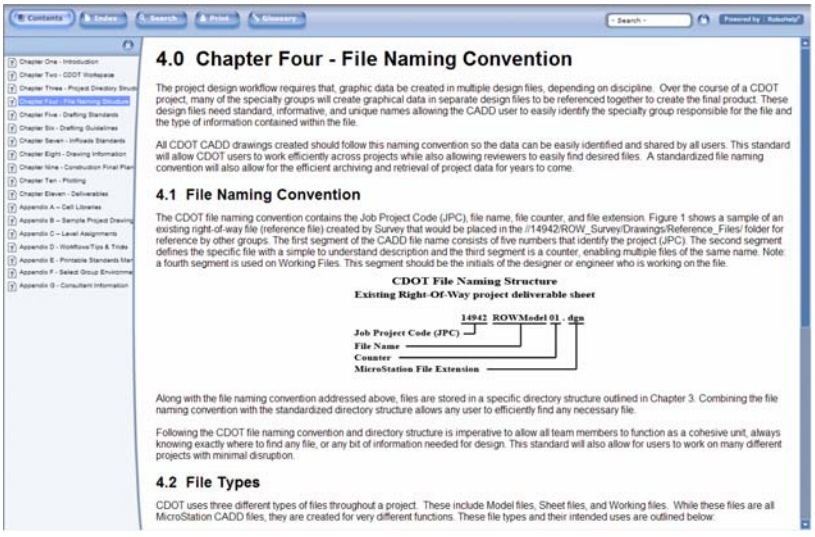
An example of a MicroStation design file would look like the following:

12345DES_Model100US285.dgn

12345 indicating the CDOT Project Number, **DES** indicates it is Roadway Design's model file and **100** indicating it uses a 1"=100' annotation scale, US285 is a description identifying the highway this model depicts. . **DGN** is the default extension for MicroStation design files.

> **Note**: A seventh segment is used on Working Files. This segment should be the initials of the designer or engineer who is working on the file.
> Example: **CU12345DES_Model100.dgn** where CU, are the initials of the designer or engineer (in this example, CU stands for "CDOT User").

For more information about the CDOT project directory structure, see the **CDOT CADD Manual**, ***Chapter Four – File Naming Convention.***



4.0 Chapter Four - File Naming Convention

The project design workflow requires that, graphic data be created in multiple design files, depending on discipline. Over the course of a CDOT project, many of the specialty groups will create graphical data in separate design files to be referenced together to create the final product. These design files need standard, informative, and unique names allowing the CADD user to easily identify the specialty group responsible for the file and the type of information contained within the file.

All CDOT CADD drawings created should follow this naming convention so the data can be easily identified and shared by all users. This standard will allow CDOT users to work efficiently across projects while also allowing reviewers to easily find desired files. A standardized file naming convention will also allow for the efficient archiving and retrieval of project data for years to come.

4.1 File Naming Convention

The CDOT file naming convention contains the Job Project Code (JPC), file name, file counter, and file extension. Figure 1 shows a sample of an existing right-of-way file (reference file) created by Survey that would be placed in the //14942/ROW_Survey/Drawings/Reference_Files/ folder for reference by other groups. The first segment of the CADD file name consists of five numbers that identify the project (JPC). The second segment defines the specific file with a simple to understand description and the third segment is a counter, enabling multiple files of the same name. Note: a fourth segment is used on Working Files. This segment should be the initials of the designer or engineer who is working on the file.

CDOT File Naming Structure
Existing Right-Of-Way project deliverable sheet

14942 ROWModel 01 . dgn
Job Project Code (JPC)
File Name
Counter
MicroStation File Extension

Along with the file naming convention addressed above, files are stored in a specific directory structure outlined in Chapter 3. Combining the file naming convention with the standardized directory structure allows any user to efficiently find any necessary file.

Following the CDOT file naming convention and directory structure is imperative to allow all team members to function as a cohesive unit, always knowing exactly where to find any file, or any bit of information needed for design. This standard will also allow for users to work on many different projects with minimal disruption.

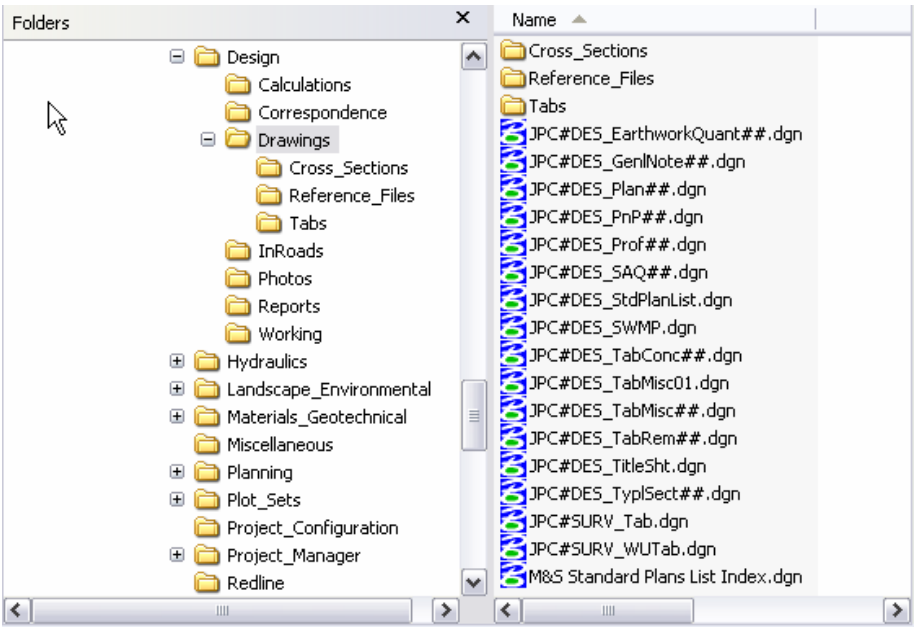
4.2 File Types

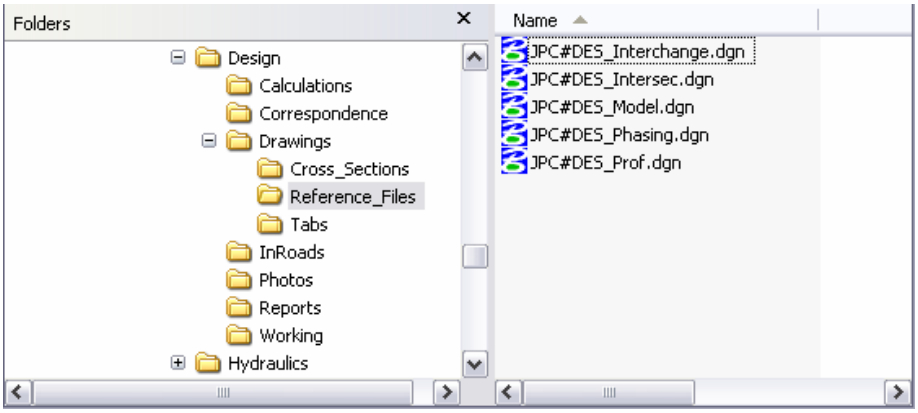
CDOT uses three different types of files throughout a project. These include Model files, Sheet files, and Working files. While these files are all MicroStation CADD files, they are created for very different functions. These file types and their intended uses are outlined below:

Auto-populated files

In addition to creating the project directory structure, the Project Creation Utility also creates several auto-populated drawing files that have the CDOT standard file names already assigned (the # symbol is used for the counter). When creating a new file, one option is to open the appropriated auto-populated file in MicroStation, select **File > Save As** and then rename the file.

The diagrams below shows an example of auto-populated files automatically created for the Roadway Design group.



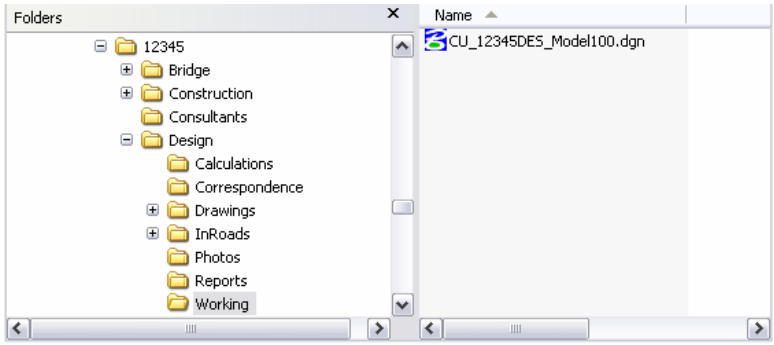


What files go where?

As you've learned there are two main types of CADD files for a CDOT project: ***Model files***, which contain graphics for referencing into sheets and ***Sheet files***, which generally contain either references to model files or non-design related items such as general notes, special symbols, quantities, sheet borders, *etc*.

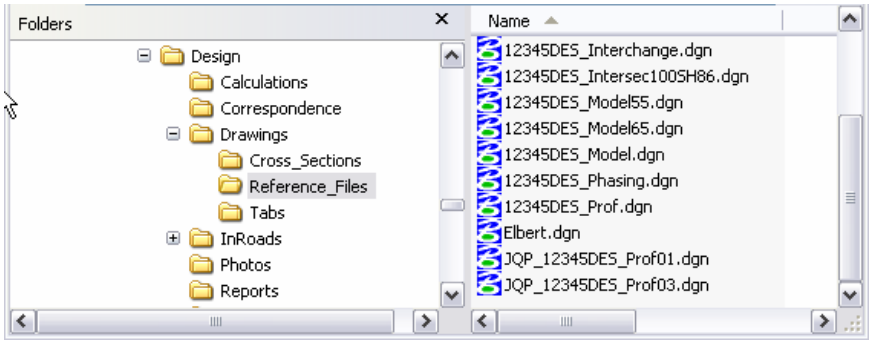
Working Model files

Working files (or sketch files) are model files containing graphical data created during the design workflow. These files should be placed in the "Working" folder in each group's sub-folder. The file name should include the designer's initials. ***These files are not to be considered final design files, and should not be referenced to sheet files or other reference model files***. An example of a working file would be:
//12345/Design/Working/CU_12345Des_Model100.dgn



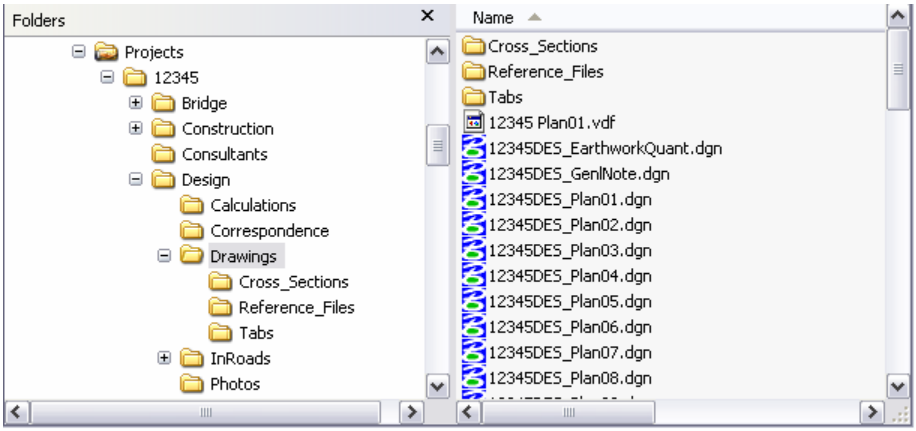
Reference Model files

The most up-to-date model files which are available to other groups for referencing (files that only have the most current non-sketch or working information in them) should be placed in the group's **Drawing > Reference_Files** folder. The designer's or engineer's initials should be removed after moving this file.



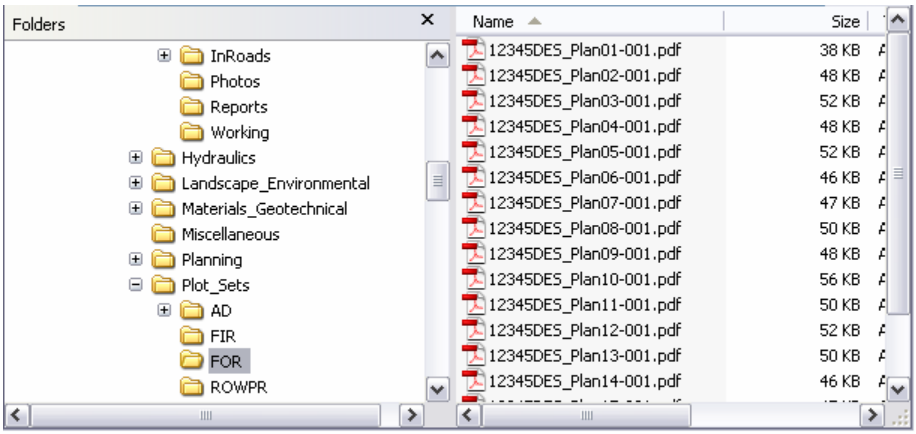
Sheet Files

Sheet files are typically stored in a group's **Drawings** folder as shown.

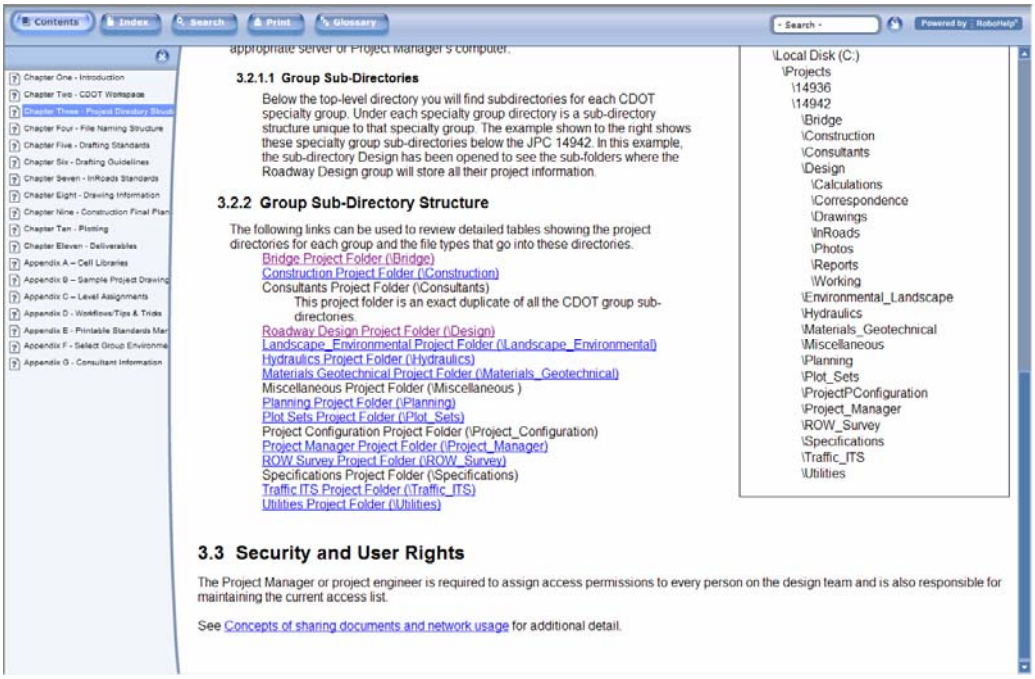


Plot files

When sheet files are plotted to PDF, the plot files are placed in the project's **Plot_Sets** folder. Sub folders for AD, FIR, FOR and ROW are available.



For more information, see the **CDOT CADD Manual**, ***Chapter Three – Project Directory Structure, section 3.2.2 – Group Sub-Directory Structure.***



3.2.1.1 Group Sub-Directories

Below the top-level directory you will find subdirectories for each CDOT specialty group. Under each specialty group directory is a sub-directory structure unique to that specialty group. The example shown to the right shows these specialty group sub-directories below the JPC 14942. In this example, the sub-directory Design has been opened to see the sub-folders where the Roadway Design group will store all their project information.

\Local Disk (C:)
\Projects
\14936
\14942
\Bridge
\Construction
\Consultants
\Design
\Calculations
\Correspondence
\Drawings
\InRoads
\Photos
\Reports
\Working
\Environmental_Landscape
\Hydraulics
\Materials_Geotechnical
\Miscellaneous
\Planning
\Plot_Sets
\ProjectPConfiguration
\Project_Manager
\ROW_Survey
\Specifications
\Traffic_ITS
\Utilities

3.2.2 Group Sub-Directory Structure

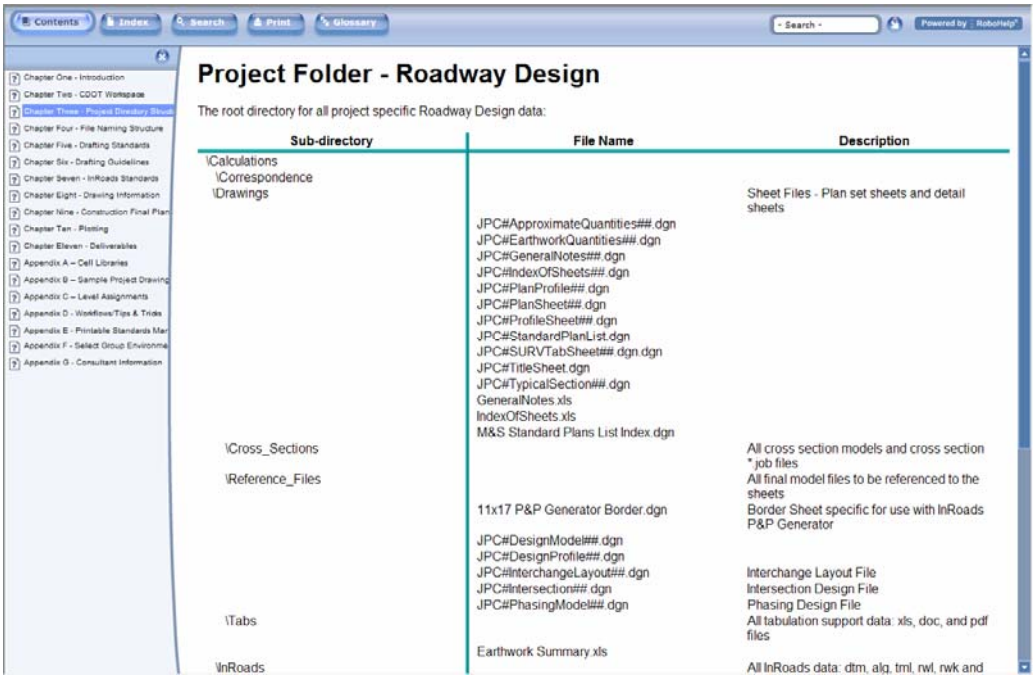
The following links can be used to review detailed tables showing the project directories for each group and the file types that go into these directories.

Bridge Project Folder (\Bridge)
Construction Project Folder (\Construction)
Consultants Project Folder (\Consultants)
This project folder is an exact duplicate of all the CDOT group sub-directories.
Roadway Design Project Folder (\Design)
Landscape_Environmental Project Folder (\Landscape_Environmental)
Hydraulics Project Folder (\Hydraulics)
Materials Geotechnical Project Folder (\Materials_Geotechnical)
Miscellaneous Project Folder (\Miscellaneous)
Planning Project Folder (\Planning)
Plot Sets Project Folder (\Plot_Sets)
Project Configuration Project Folder (\Project_Configuration)
Project Manager Project Folder (\Project_Manager)
ROW Survey Project Folder (\ROW_Survey)
Specifications Project Folder (\Specifications)
Traffic ITS Project Folder (\Traffic_ITS)
Utilities Project Folder (\Utilities)

3.3 Security and User Rights

The Project Manager or project engineer is required to assign access permissions to every person on the design team and is also responsible for maintaining the current access list.

See Concepts of sharing documents and network usage for additional detail.



Project Folder - Roadway Design

The root directory for all project specific Roadway Design data:

Sub-directory	File Name	Description
\Calculations		
\Correspondence		
\Drawings		Sheet Files - Plan set sheets and detail sheets
	JPC#ApproximateQuantities##.dgn	
	JPC#EarthworkQuantities##.dgn	
	JPC#GeneralNotes##.dgn	
	JPC#IndexOfSheets##.dgn	
	JPC#PlanProfile##.dgn	
	JPC#PlanSheet##.dgn	
	JPC#ProfileSheet##.dgn	
	JPC#StandardPlanList.dgn	
	JPC#SURVTabSheet##.dgn.dgn	
	JPC#TitleSheet.dgn	
	JPC#TypicalSection##.dgn	
	GeneralNotes.xls	
	IndexOfSheets.xls	
	M&S Standard Plans List Index.dgn	
\Cross_Sections		All cross section models and cross section *.job files
\Reference_Files		All final model files to be referenced to the sheets
	11x17 P&P Generator Border.dgn	Border Sheet specific for use with InRoads P&P Generator
	JPC#DesignModel##.dgn	
	JPC#DesignProfile##.dgn	
	JPC#InterchangeLayout##.dgn	Interchange Layout File
	JPC#Intersection##.dgn	Intersection Design File
	JPC#PhasingModel##.dgn	Phasing Design File
\Tabs		All tabulation support data: xls, doc, and pdf files
	Earthwork Summary.xls	
\InRoads		All InRoads data: dtm, alg, tml, rwl, rwk and

See also:

- **CDOT CADD Manual**, ***Chapter Four – File Naming Convention, section 4.2 File Types.***
- ***CDOT Directory Structure Workflow***.

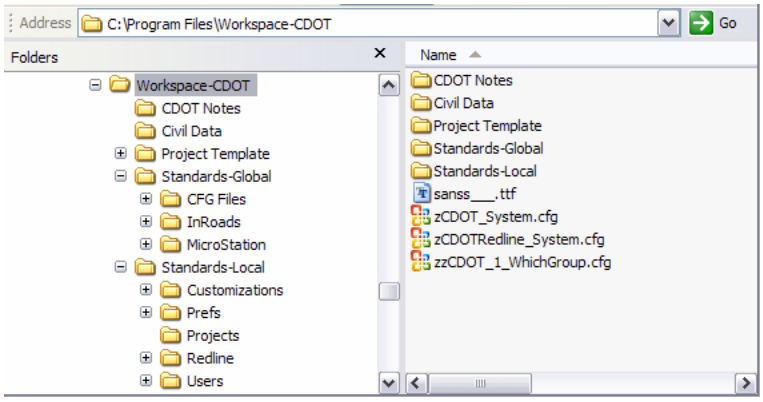
The CDOT Workspace

The CDOT Workspace is a custom environment designed to facilitate CADD productivity and direct the user to CDOT-specific standards, workflows and processes. The CDOT Workspace is a complex set of configuration files, MicroStation and InRoads resource files, workflow documents, and many other customized tools, all designed to work together to increase productivity and efficiency, and allow for a standardized project plan set output. Some of the items in the workspace include:

- Seed files (starter files that contain MicroStation settings for creating new files).
- Cell libraries (standard details, symbols, notes, etc.)
- DGN libraries (standard level structures, text styles and dimension styles).
- Line style resource files (custom line styles).
- Font resource files (special fonts).
- Plot drivers (for plotter configuration and PDFs).
- Pen tables (for special plotting preferences for certain graphics).
- InRoads preference files (for controlling InRoads graphical displays).
- InRoads templates (for standard typical sections).
- CDOT configuration files (to set the correct MicroStation resource files and other standard files located on the user's computer).
- Workflow documents (CDOT standardized procedures for specific MicroStation and InRoads tasks).
- CDOT Group Menus (access to tools and applications which provides a simple, efficient method of applying CDOT's CADD standards to every project).

The installation of the Workspace will be controlled and maintained by the Information Technologies (IT) Department. You can manually update the workspace at any time by selecting the **Start > All Programs > CDOT_CADD_Information > Update MicroStation-InRoads Standards**.

The CDOT workspace and configuration files are located on each user's computer in the **C:\Program Files\Workspace-CDOT** folder.

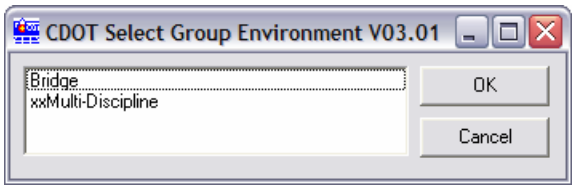


The Select Group Environment Utility Revisited

You have seen how the **Select Group Environment** utility automatically attaches the correct level libraries needed for working on a CDOT project. However, this utility also provides CDOT users ***additional*** MicroStation resources unique to their group (group-specific cells, seed files, linestyles, levels and symbology, *etc*.) The utility must be run prior to starting MicroStation in order to set up tools specific to that user's group.

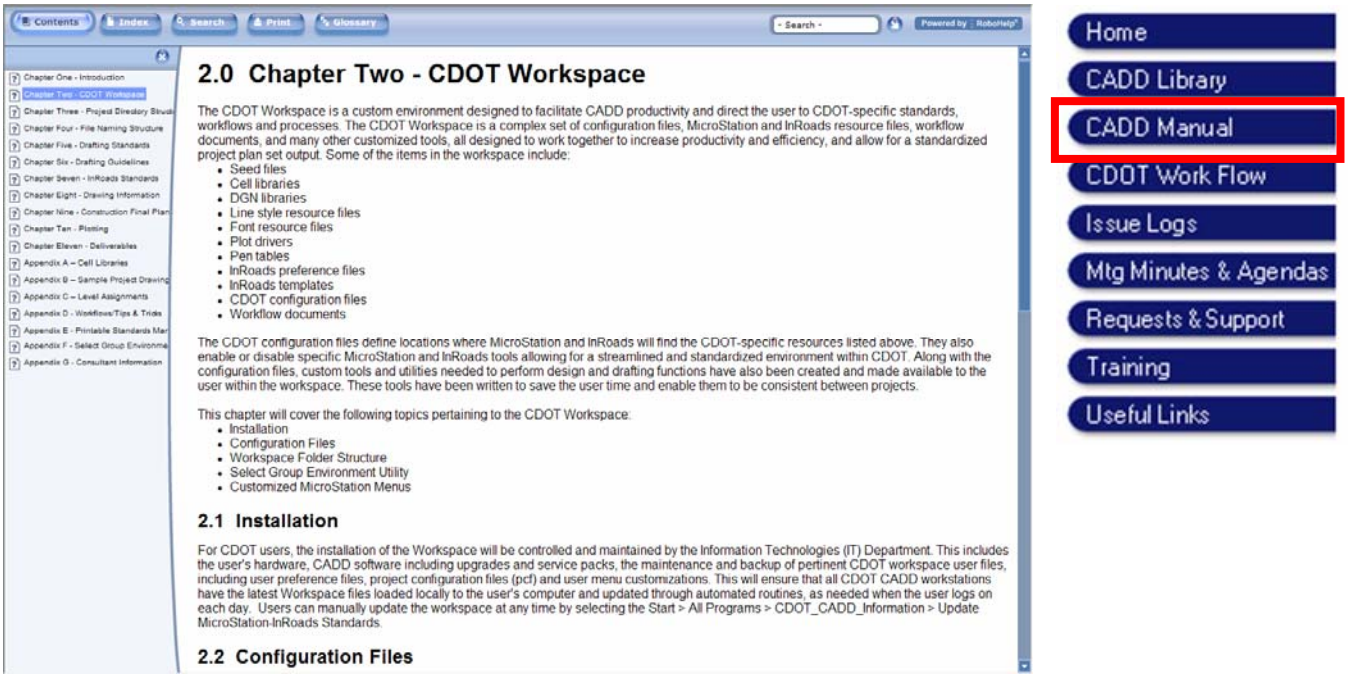
There are two group options: **Bridge** and **xxMulti-Discipline**. The multi-discipline environment enables MicroStation to have all the cell libraries, level libraries and filters, available at anytime without having to load these items individually. The Bridge option loads just the specific files needed for the Bridge group.

The Select Group Environment Utility can be run from the user's computer through the Start button (**Start > All Programs > _CDOT_CADD_Information > Select Group Environment**. You MUST exit MicroStation prior to running this utility.



For more information on the Select Group Environment, see the **CDOT CADD Manual**, ***Appendix F – Select Group Environment Utility.***

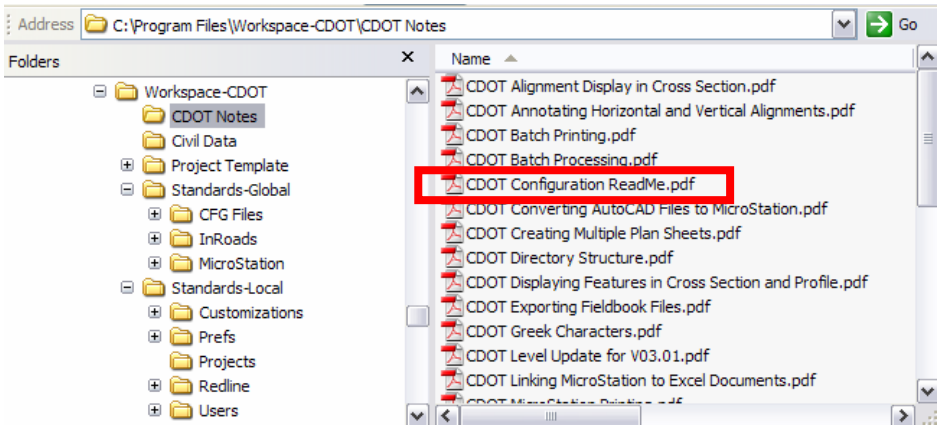
For more information on the CDOT Workspace in general, see the **CDOT CADD Manual**, ***Chapter Two – CDOT Workspace***.



Configuration releases

The IT Department is responsible for updating your computer when the CDOT workspace and configuration is updated. For a detailed description on what's in the new configuration release, see the **CDOT Configuration ReadMe** workflow.

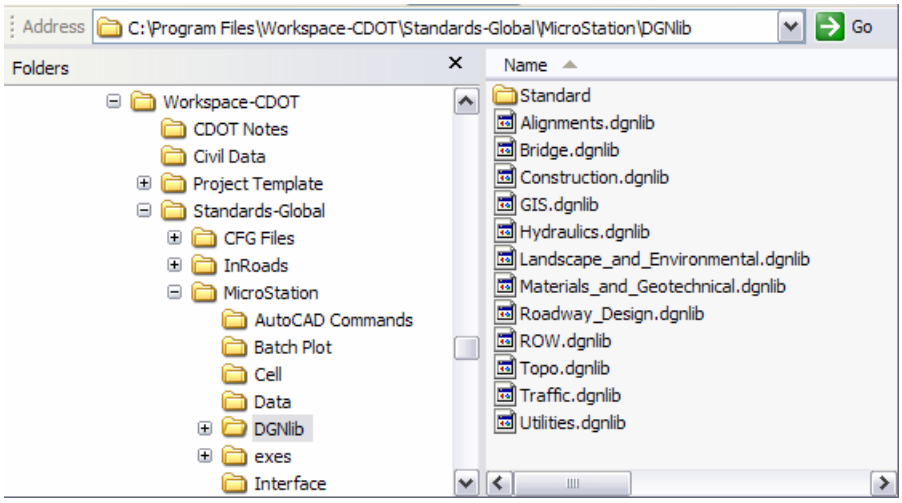
You can also access this workflow and others (in PDF format) from the CDOT workspace in the **CDOT Notes** sub-folder.



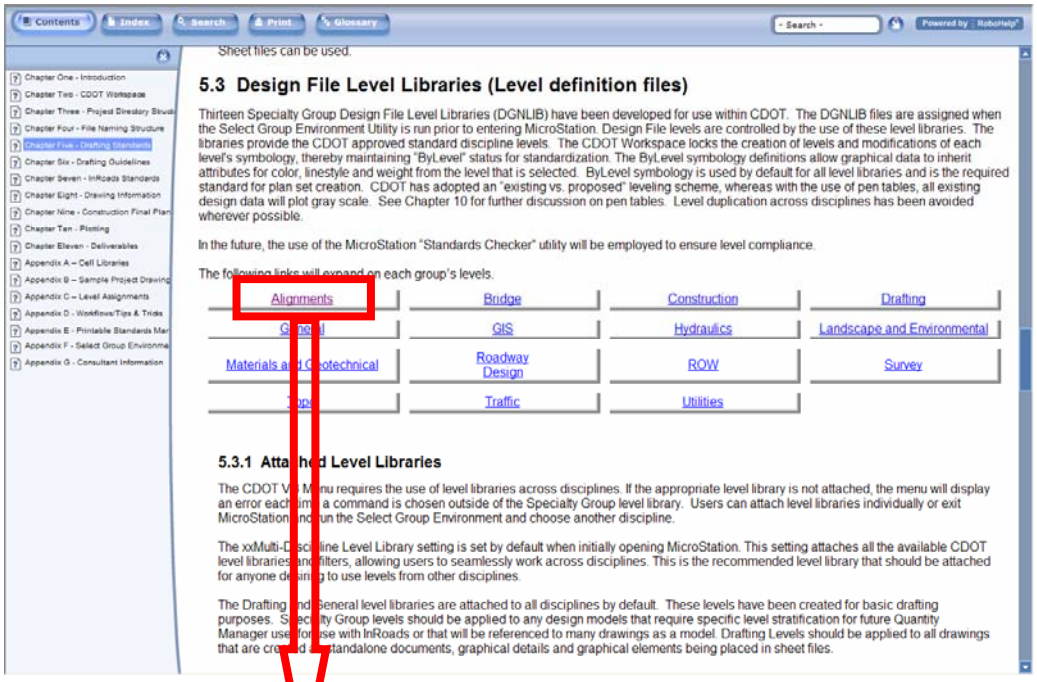
The CDOT Level Structure

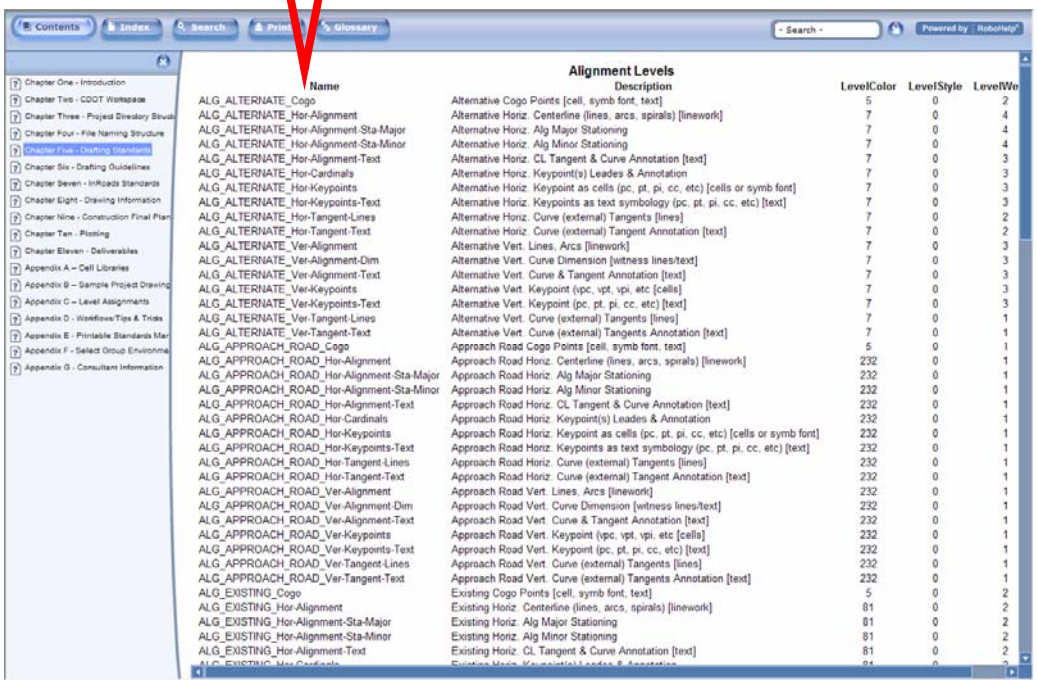
Thirteen Specialty Group Design File Level Libraries (**DGNLIBs**) are available for use within CDOT. The levels libraries are attached to your MicroStation design file via the **Select Group Environment** utility and provide the CDOT approved standard discipline levels you can use when placing graphics. You can not create, edit or delete levels within the CDOT Workspace – you must use the levels provided in the DGNLIBs. Likewise, you can not modify the level's symbology, thereby maintaining "ByLevel" status for standardization purposes. ByLevel symbology is used by default for all level libraries and is the required standard for plan set creation. CDOT has adopted an "existing vs. proposed" leveling scheme, whereas with the use of pen tables, all existing design data will plot gray scale. Level duplication across disciplines has been avoided wherever possible.

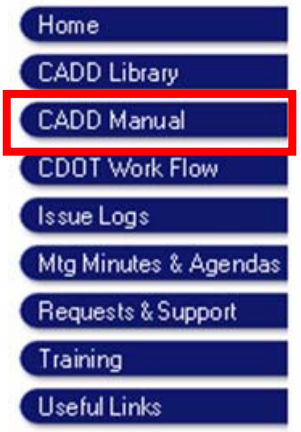
Level libraries (DBNLIBs) are stored in the CDOT workspace (**C:\Program Files\Workspace-CDOT\Standards-Global\MicroStation\DGNlib**).



For more information about the CDOT level structure and a list of all discipline level libraries, see the CADD Manual, Chapter 5 – Drafting Standards, section 5.3 – Design File Level Libraries. You can link to a specific group to review its standard level structure.







Level naming convention

The standard CDOT level naming convention shown below is used to allow for easy filtering of levels in MicroStation's **Level Display or Level Manager**.

Levels and configuration releases

When a new configuration is released, it is not unusual for the CDOT Standards and Configuration committee to add, change or delete levels from the level libraries. If you're working on a project, you will need to update the used levels in a design file to the new configuration standards. Each new configuration release includes a comma separated variable (CSV) file that maps old levels to new levels. You will need to apply this level mapping to all existing files that you wish to update to the new configuration. Refer to the **CDOT Level Update** workflow for more information.

Creating a new CDOT Model file

When you're ready to create a new model file to begin your work, you have two options:

- Create the new file from an auto-populated file or
- Create the new file from a seed file

Creating a model file from an auto-populated file

Auto-populated files are created by the Project Creation utility. The model files are created in the group's **\Drawing\Reference_Files** folder. You can rename these files and save them to the project's **\Design\Working** folder to create your new model file.

Creating Model files from seed files

A seed file is a "starter" file. It has all CDOT standard settings for each specialty group. Seed files are either 2D or 3D, so make sure you choose 3D when creating model files.

See the **CDOT CADD Manual**, ***Chapter Five – Drafting Standards, section 5.2 – Seed files*** for more information.

CDOT default settings

When a new file is created from a seed file or auto-populated file, there are several settings already established that conform to the CDOT standards. Two important settings include **Working Units** and **Coordinate Readout**.

Working Units

The working units in either a 2D or 3D file determine the measurement system for the design file. Working units are defined as:

- Master Units**:**Sub Units or
- MU**:**SU.

You set a design file's working units for any desired measurement system. For typical Imperial units (English), you could set Master Unit to ***feet*** and Sub Units to ***inches***. The working units would then be expressed as ***1:12***. If you set Master Units to ***Feet*** and Sub Units to ***tenths of a foot***, your units would be expressed as ***1:10***.

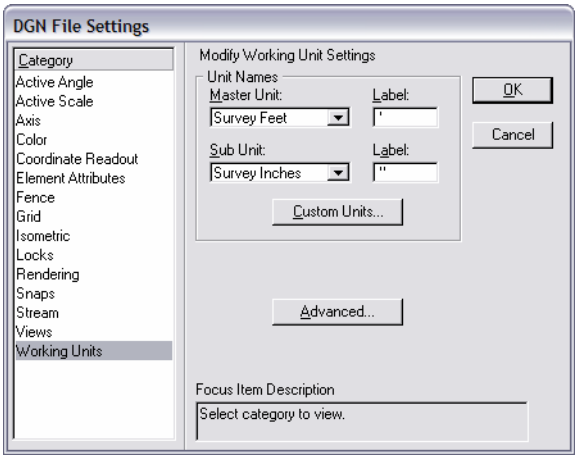
CDOT standard Working Units

CDOT standard working units are 1:12 and express as:

- ***Master Units = Survey Feet (')***
- ***Sub Units = Survey Inches (")***

There are two types of unit definitions for imperial feet – survey and international. These have a slightly different conversion factor from metric. CDOT uses the survey foot definition.

The working units settings are found under **Settings > Design File > Working Units.**



Entering data

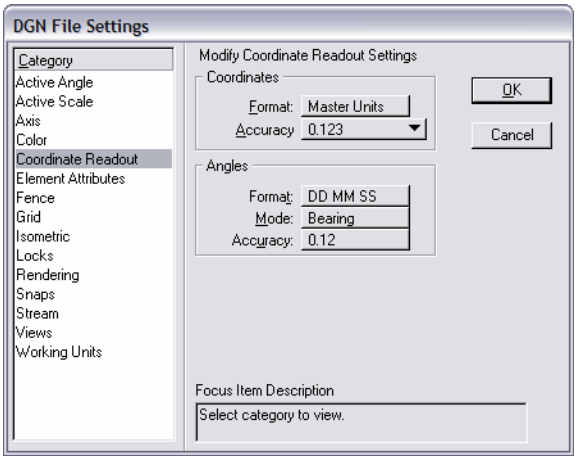
When you enter data for lengths, distances, *etc*. you use the format for working units: **MU:SU**. You can enter data in just master units, just sub units, or both. For example, if your working units are 1:12 (feet and inches), and you want to place a line with a length of 1 foot 1 ½ inches, you could enter the length as:

- 1.125
- 1**:** 1 1/2
- :13 1/2

Note: You can use either fractions or decimals when entering data.

Coordinate Readout

Use **Settings > Design File > Coordinate Readout** to determine how MicroStation values are displayed. This is helpful, for example, when you measure graphics.



You can set your linear values to readout in master units, sub units or both. Angles can readout in either degrees-minutes-seconds (**DD MM SS**) or decimal degrees (**DD.DDDD**) with up to 8 decimal place accuracy.

The CDOT standard coordinate and angle readouts are shown above. These settings are copied over from the seed file.

Referencing others work

A **Reference** is a file that is attached to your active file, so that you can see the file's graphics. Reference graphics are not actually in your active file, but serve as background data. You cannot modify reference graphics from the active file. You can, however, copy graphics from the reference model to the active model and then modify them, if desired. Using references is a good way to copy a large number of graphics from model to model.

The proper use of MicroStation References is critical to achieving two key components of the CDOT MicroStation workflow:

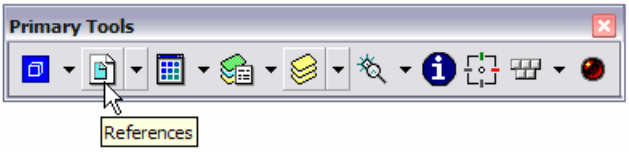
1. Maintaining a single source for project data.
2. Sharing graphical data between specialty groups.

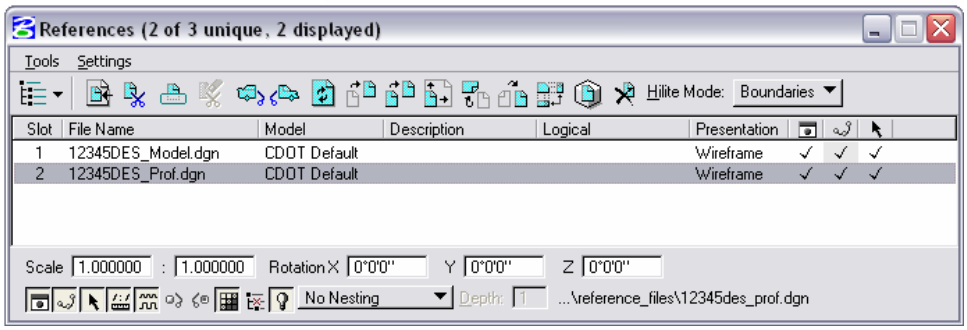
References allow multiple users to work on different parts of a project at the same time. Multiple users can access the same reference from a central location (*e.g.* project directory on the PM's computer). Specialty groups can interact throughout the design process by referencing other discipline-specific model files. The data exchange between disciplines is "real time" when using MicroStation References.

References are useful in the plan set creation phase. You can "build" the sheets by referencing in the individual model files (survey/topo, design, utilities, *etc.*) Each discipline's Master Model file can reference other discipline's model files, as needed. The Master Model file can then be referenced into a newly created sheet file (see **The CDOT MicroStation Workflow** section in this chapter). You can also reference in details and show these at a different scale on the same sheet.

Attaching References

To attach references, select References from the **Primary** toolbar. In the **References** dialog box, select **Tools > Attach**.



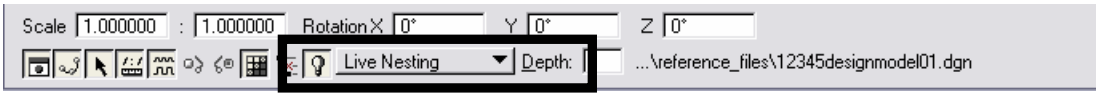


Different reference file attachment methods are available to help control reference manipulations and displays. These include:

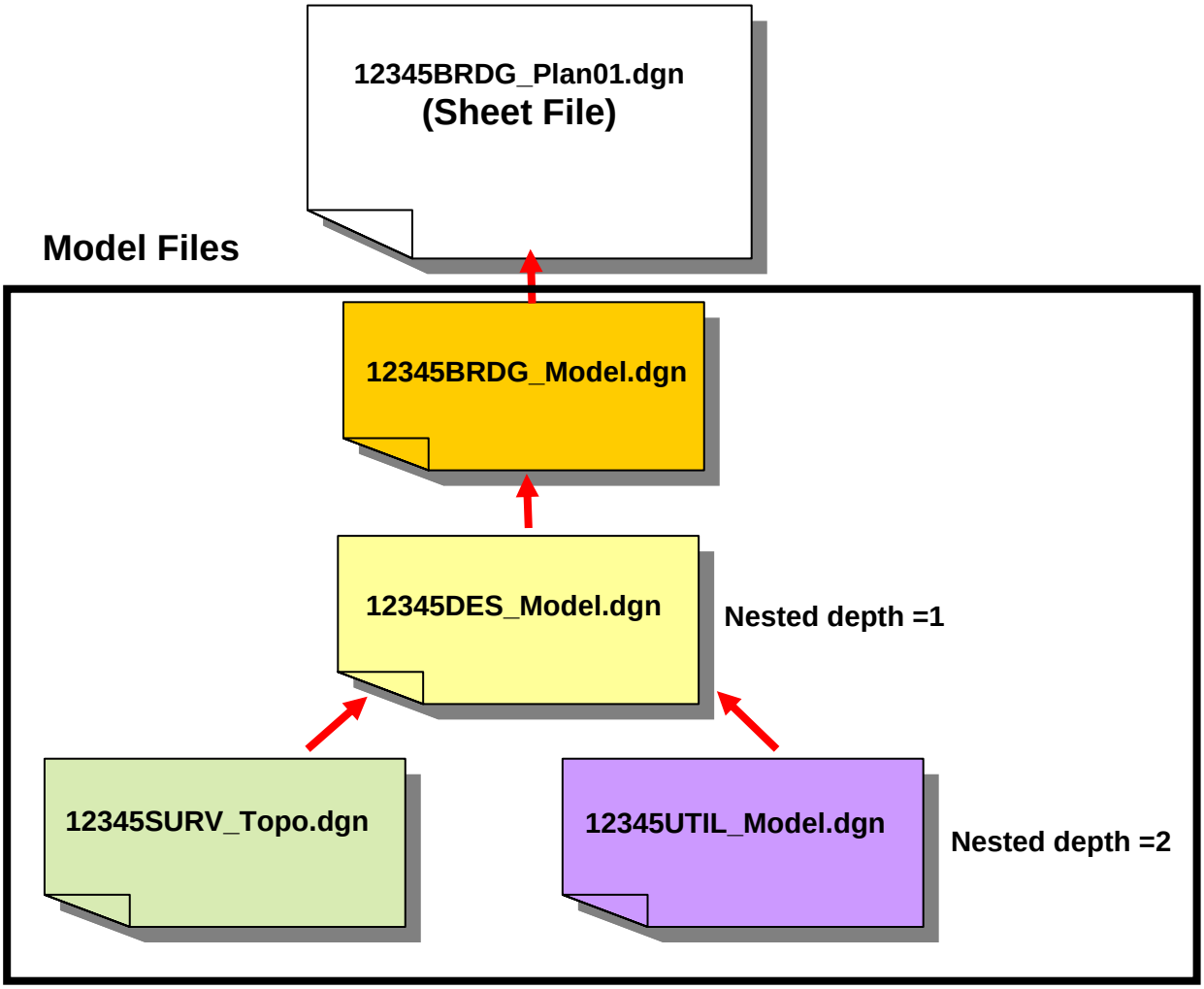
- No nesting
- Live nesting
- Copy attachments

Nested References

References can be attached nested — meaning you can attach a reference's reference.



The **Nested Depth** option determines how many reference levels deep you can attach. In the example below, if the reference **BridgeModel** is attached to **BridgePlanSheet01** with **No Nesting**, only the Bridge Model graphics are attached. If the nested depth is set to **1**, you would attach **BridgeModel01** and **DesignModel01**. If the nested depth is set to **2**, you would attach **BridgeModel01**, **DesignModel01**, **Survey/Topo** *and* **UtilityModel01.**



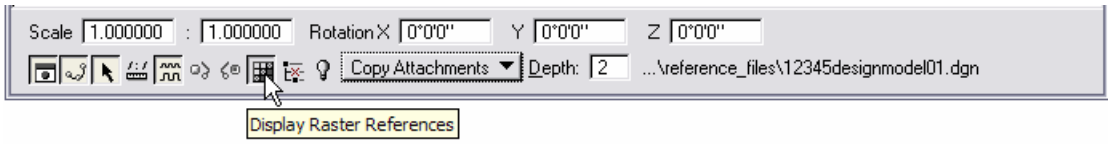
The **Live Nesting** option allows you to dynamically update a reference's sub-references ***after*** the reference is attached. You can change your **Live Nested Depth** and your references will automatically update without having to detach and reattach the reference.

The Copy Attachment Option

The **Copy Attachment** option allows you to dynamically make all nested references upper-level references. This way, you can manipulate and control each reference display individually, if needed. You can switch between nested references and the copy attachment at any time.

Working with Raster Attachments

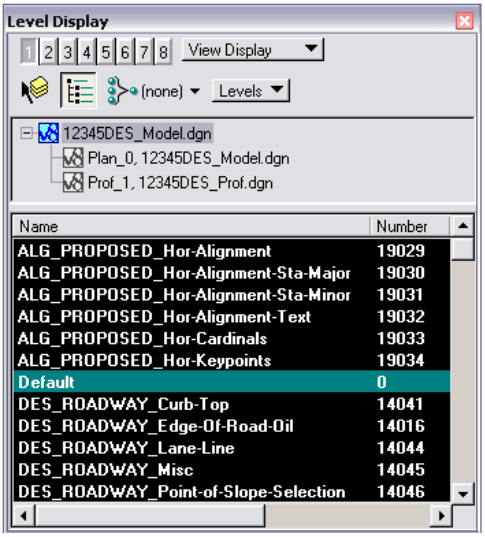
When you attach a reference, you have the option to **Display Raster References**. If the reference has a raster image attached (e.g. aerial photo), you can choose to attach the raster with the reference. You can toggle the raster reference on/off from the **Reference** dialog box.



For more information on working with raster references, see the **CDOT Raster Manager** workflow.

Reference Levels

You can control each reference's levels just like the master file levels. The **Level Display** box shows a list of all attached references to the Master file. Select the reference and then turn the reference level on/off.



Lab 4 – Creating the Project and Design Model

In this lab, you'll create a new **12345** project using the **Create Project Utility**. Then, you'll create a new Roadway Design model from an auto-populated file (generated by the Create Project Utility program) and by creating one from a CDOT 3D seed file. Once created, you'll reference other discipline's work in order to start the design.

In subsequent labs, you'll use a similar process to create other discipline model files (Bridge, Landscape & Environmental, Traffic, etc.).

Objectives

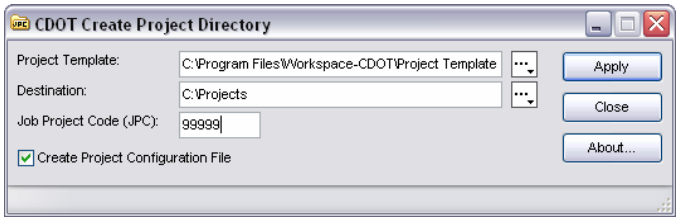
After completing this exercise you will know how to:

- Create a new project and project configuration file (PCF) using the **Create Project Directory Structure** program.
- Re-assign a project number via the PCF.
- Create a new design model using a CDOT seed file.
- Create a new design model using an auto-populated model file.
- Attach a reference.
- Turn reference displays on/off.
- Turn reference levels on/off.

Create a Sample 99999 project

In this example, you are starting your project before a project number has been assigned. You will temporarily assign the project number 99999. Later in this lab, you will learn how to change this project number by updating MicroStation's project configuration file.

1. From the Windows Start Menu, select **Start > All Programs > _CDOT_CADD_Information > Create Project Directory Structure**.
2. Verify that the **Project Template** location is set to **C:\Program Files > Workspace-CDOT > Project Template**.
3. Set **Destination** to **C:\Projects**.
4. Key in ***99999*** for the **Project Code**.



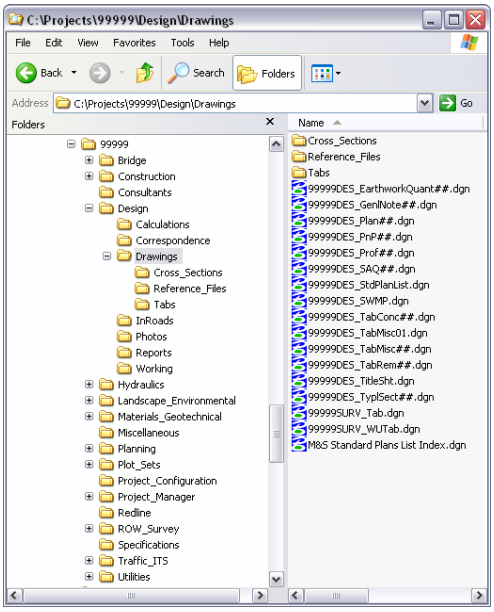
Note: The project number must be a 5-digit numeric code.

5. Toggle ***on*** **Create Project Configuration File**.
6. Select **Apply**.

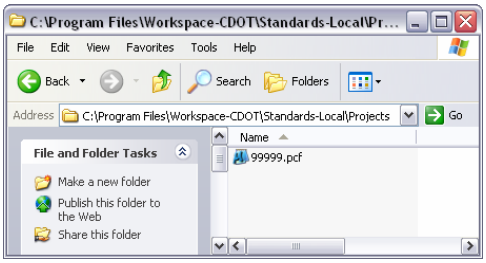
The project directory structure is created in the **C:\Projects** folder and the Project Configuration File (PCF) file is created.

7. **Close** the **Create Project Directory** box.

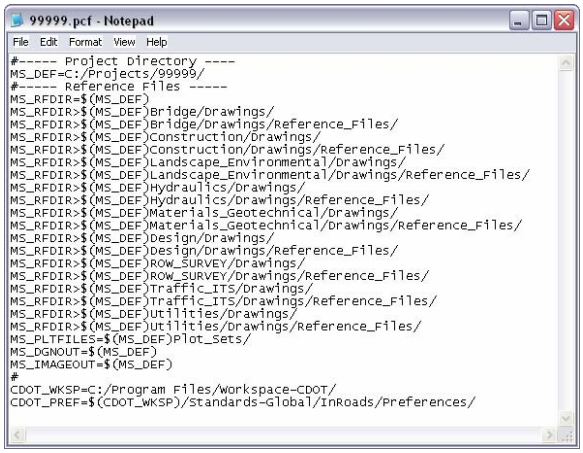
8. Use **My Computer** or **Windows Explorer** to navigate to the **C:\Projects\99999** folder to review your project directory structure. Note that several generic CDOT files (e.g. **99999Des_Model.dgn**) have automatically been created.



9. Use My Computer or Windows Explorer to navigate to **C:\Program Files > Workspace-CDOT > Standards-Local > Projects**.



10. Double-click on the **99999.pcf** file to open it in **Notepad**.



The PCF defines a specific directory that MicroStation defaults to when opening up a DGN file or referencing model files. It makes setting paths much easier in MicroStation.

If your project was installed on a project manager's machine, you could edit this file to specify the location. See the ***CDOT PCF Management*** workflow for more information.

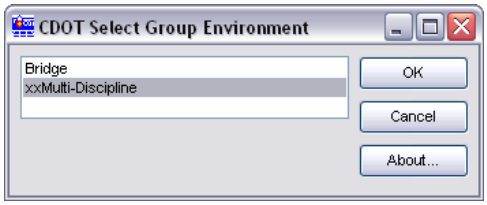
11. Close the **Notepad** file. If prompted to save changes, select **No**.
12. Close **My Computer** or **Windows Explorer**.

    You will later edit the 99999 project and update it with an actual project number. For now, you will continue working in the example 12345 project.

Select Group Environment

Run the **Select Group Environment Utility** to determine which CDOT level libraries will be attached and available for use.

1. From your desktop's **Start** Menu, choose **Start > All Programs > _CDOT_CADD_Information > Select Group Environment.** In the **Select Group Environment** box, select **xxMulti-Discipline**, and then select **OK**.



Any MicroStation design file that is now opened will have all level libraries (general and all disciplines) automatically attached.

Note: You only have to run this program once. The only time you have to re-run it is if you wish to switch groups on the same machine.

Start MicroStation

1. Start MicroStation by double-clicking the desktop shortcut or by selecting **Start > All Programs > MicroStation > MicroStation**.

Set the Workspace components

2. In the lower portion on the dialog box, set:

    - User: **CDOT User**

    This sets user preferences and users customized options like custom toolbars.

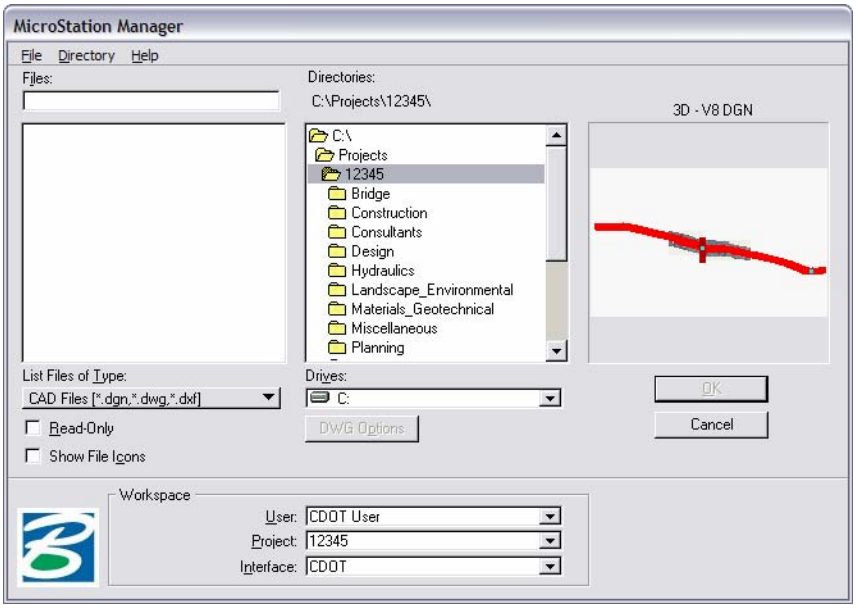
    - Project: **12345**

    Note: ***Be sure to re-set this option*** because it will default to you upper level project directory.

    This Project component of the workspace should already be set by the PCF file created by running the **Create Project Utility**. It sets the proper path for opening, saving and attaching files.

    - Interface: **CDOT**

    This loads custom menus and tools at the organizational level. The CDOT interface will load, among other things, the **CDOT Groups Menu**.

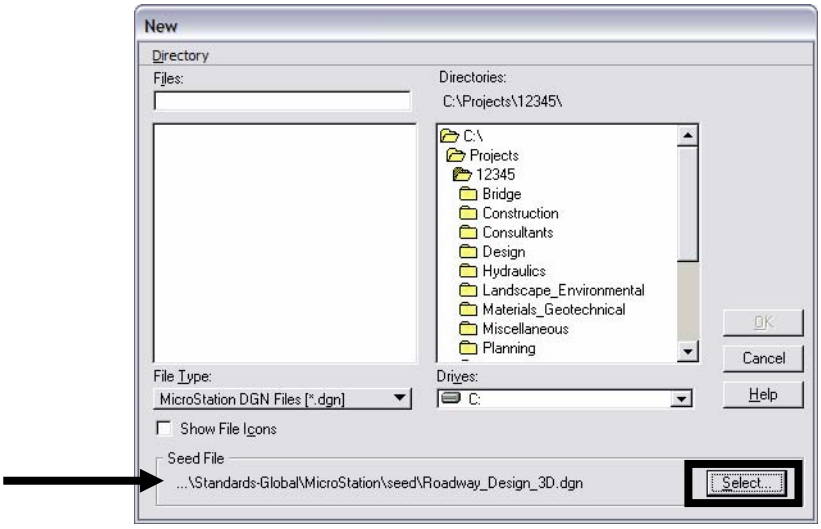


Create a new Design Model File

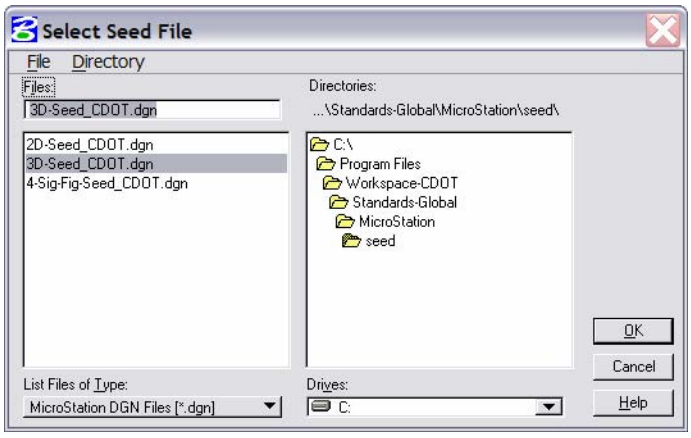
There are two ways you can create a new file: Using a seed file or from a CDOT auto-populated model file. You'll practice both in this session.

Creating a new design file using a CDOT seed file

1. From the MicroStation Manager dialog box, select **File > New**.
2. In the **Seed File** section, choose the **Select** button.



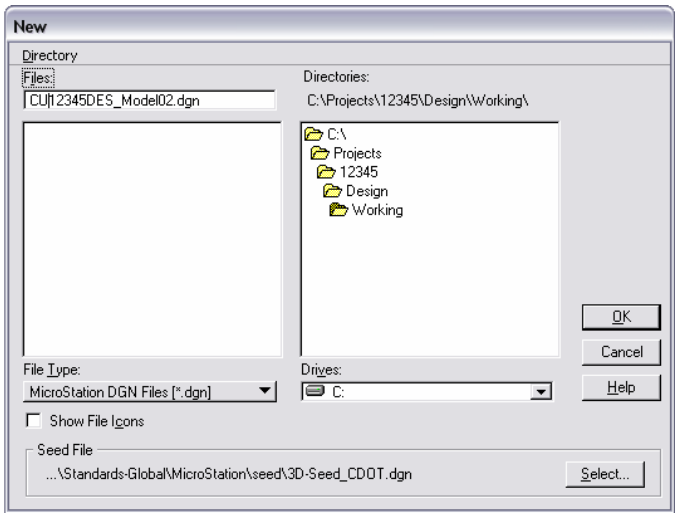
3. Highlight the seed file **3D-Seed_CDOT.dgn** and choose **OK**.



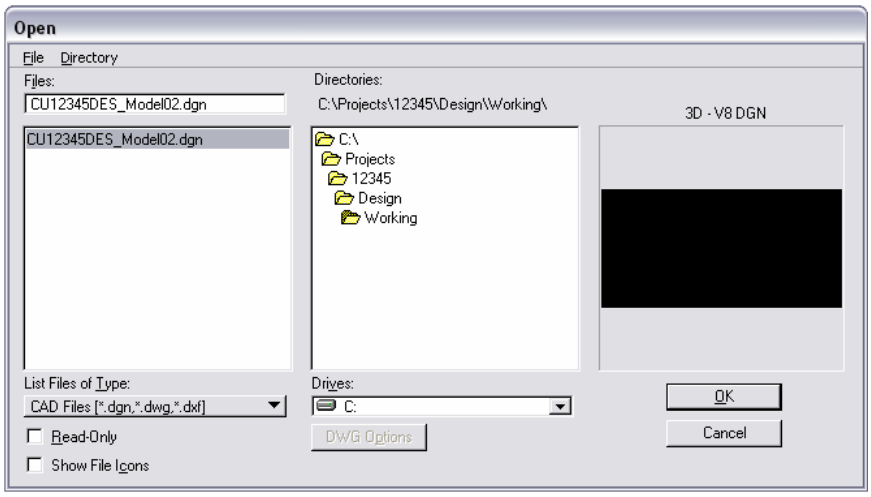
Note: The seed file will copy over all of CDOT's default MicroStation settings when creating the new file.

4. Set the **Directory** to **\Design\Working**.
5. Set **List Files of Type** to MicroStation DGN Files **(*.dgn)**.

6. Key in the name **CU12345DES_Model02.dgn**.



7. In the **New** box, select **OK** to create the new file.

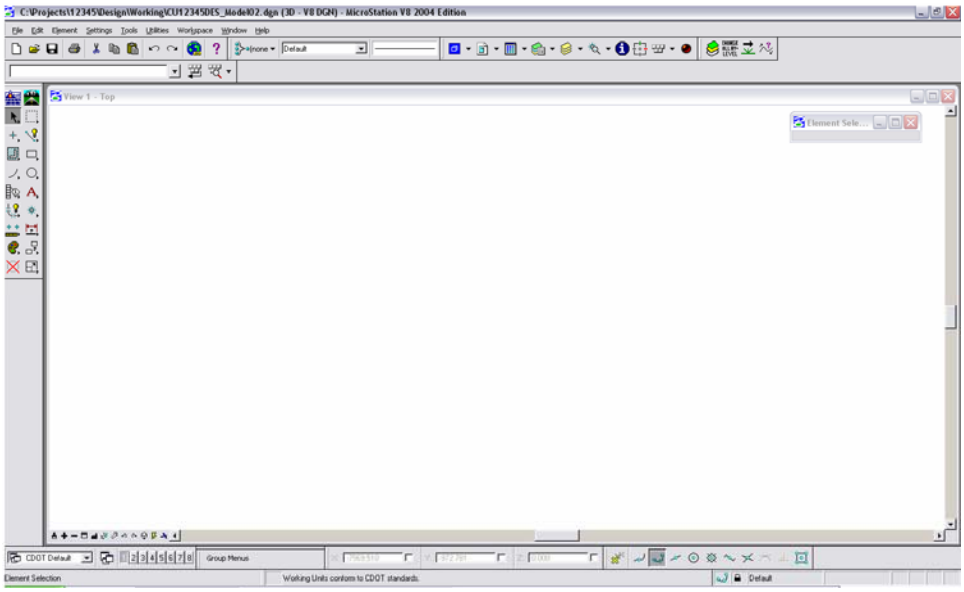


The file is created from the seed file and placed in the **Working** folder. When creating a new working model file, you'll prefix it with your initials (you'll use CU for CDOT USER for this class).

The working folder is for files that you are using for your design process prior to the design being finished. Once complete, you will move the files to the **Reference_Files** folder and take the CU off of the file name.

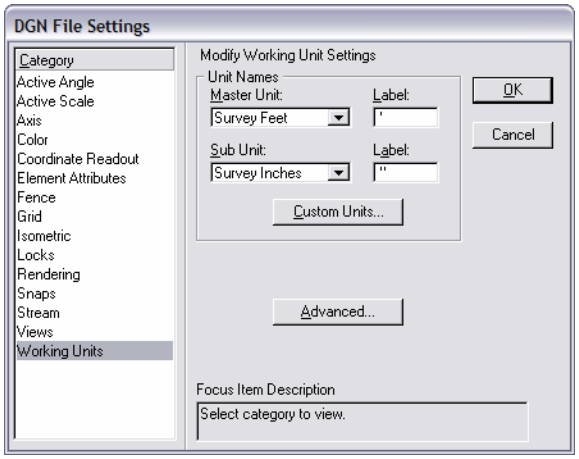
8. In the **MicroStation Manager** box, choose **OK** to open the file.

9. The blank file opens with all of the standard settings from the CDOT seed file.

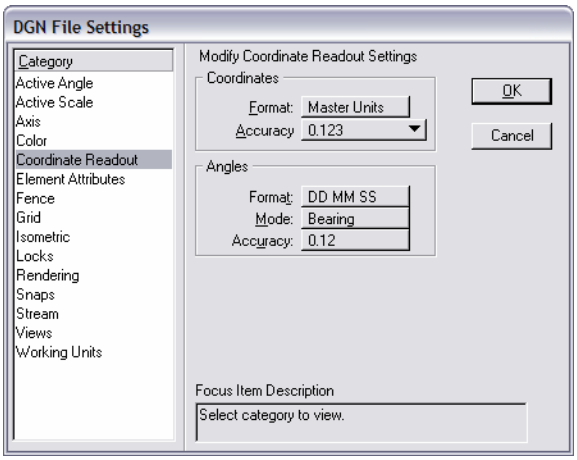


Check settings

1. Select **Settings > Design File > Working Units**. These are the CDOT standard units copied from the seed file.



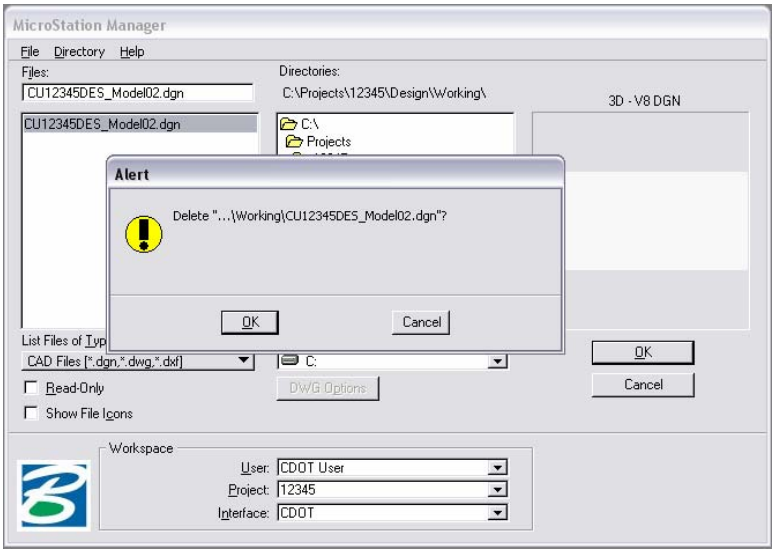
2. In the **DGN File Settings** box, **Coordinate Readout**. These CDOT settings were also copied from the seed file.



3. **Cancel** the dialog box.

4. Choose **File > Close** to return to the **MicroStation Manager**.

5. From the **MicroStation Manager** choose **File > Delete** and choose **OK** from the **Alert** box to delete the file you just created.

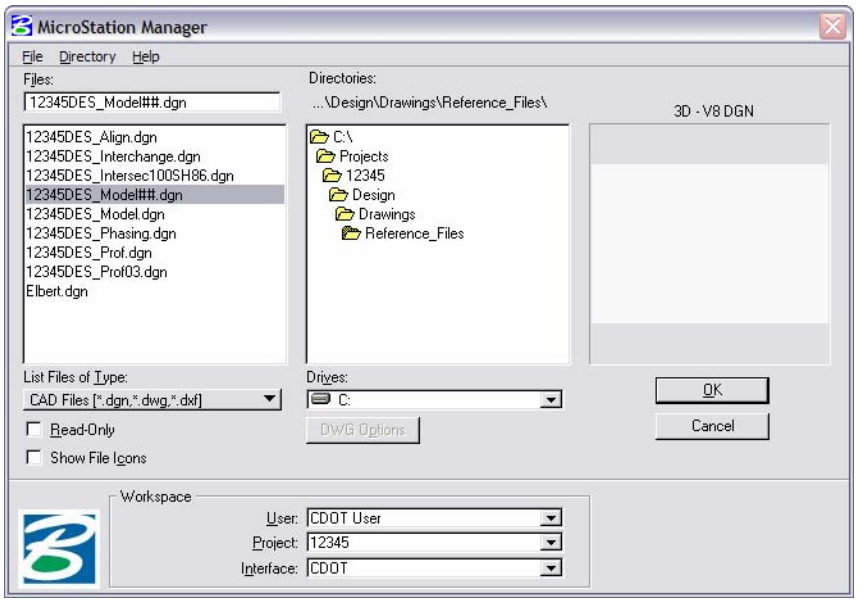


Create a new file by copying an auto-populated model file

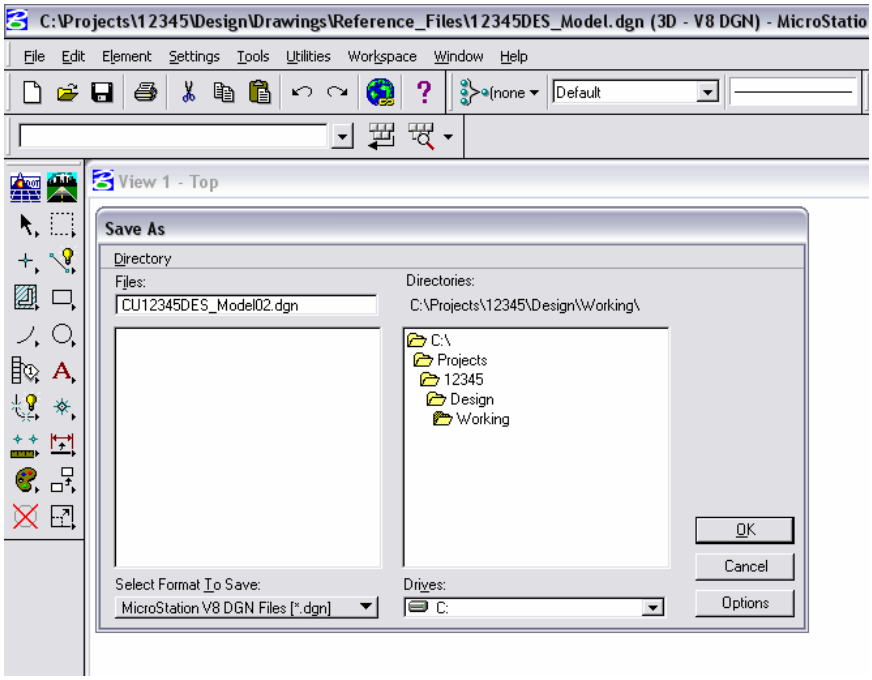
1. In the **MicroStation Manager**, navigate to the **\Design\Drawings\Reference_Files** folder.

2. Select **12345DES_Model##.dgn** and choose **OK** to open the file.

   Note: Make sure you select the file with the ## suffix.



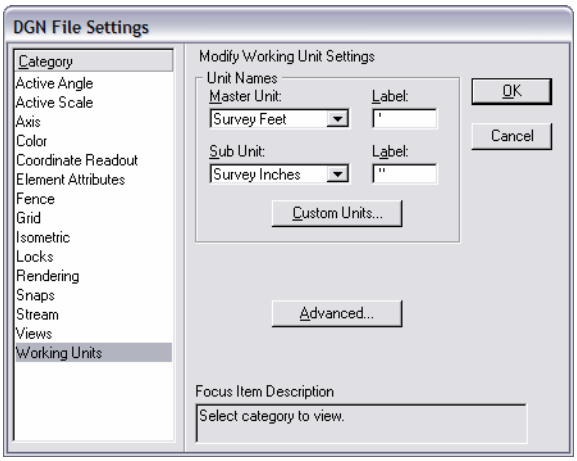
3. After opening the file, select **File > Save As**, navigate to the **\Design\Working** folder key in the name **CU12345DES_Model02.dgn** and select **OK**.



The file is copied to the new name into the working folder.

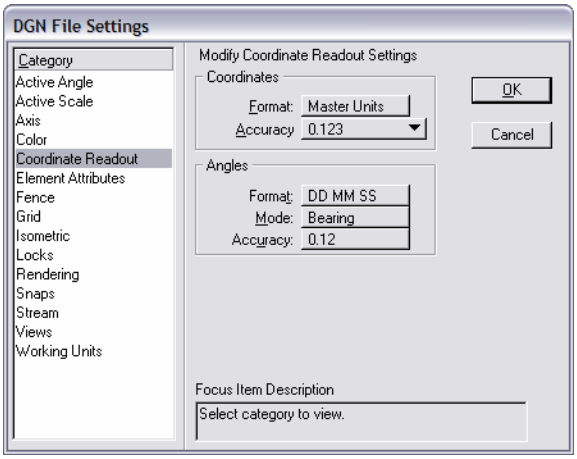
Check settings

1. Select **Settings > Design File > Working Units**.



These are the CDOT standard units, which are the same as the seed file units.

2. In the DGN File Settings box, select **Coordinate Readout**.



These CDOT settings are also consistent with the seed file.

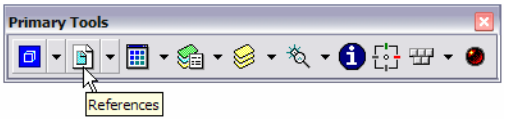
Note: The auto-populated file provides the same settings as a seed file. You can create a new file either way with the same results. However, by copying a CDOT auto-populated file, the name is automatically set to the CDOT standard, you only have to change the counter.

Attach the Survey/Topo reference

After creating your initial design model, you can attach other groups' work that you'll need to start your design. In this case, attach the existing survey and topographic information.

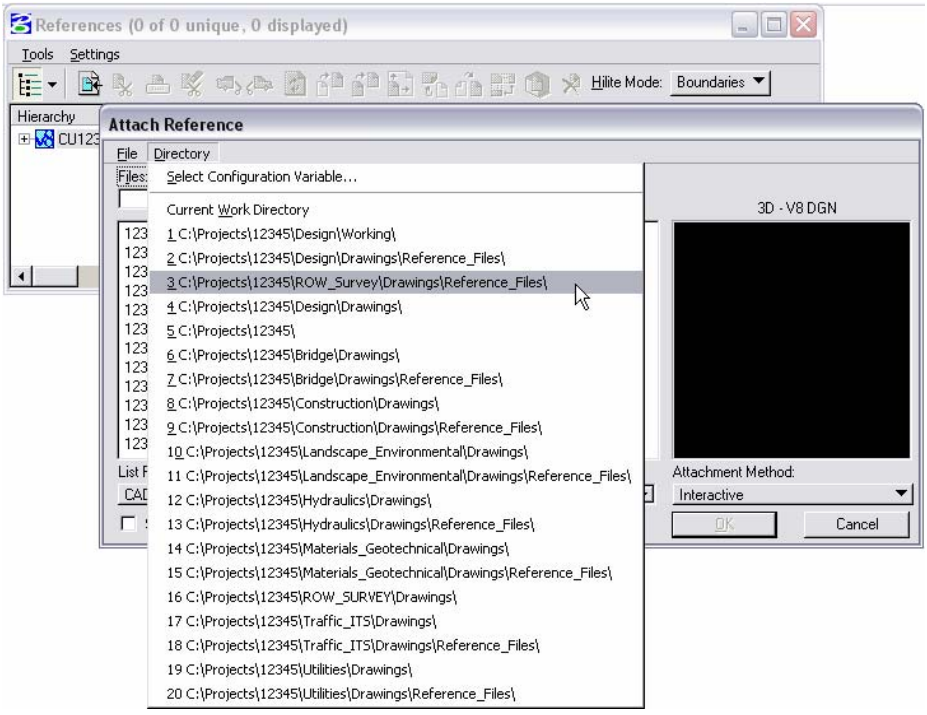
1. Select **File > Reference**.

   Note: You can also choose **References** from the **Primary** toolbar.



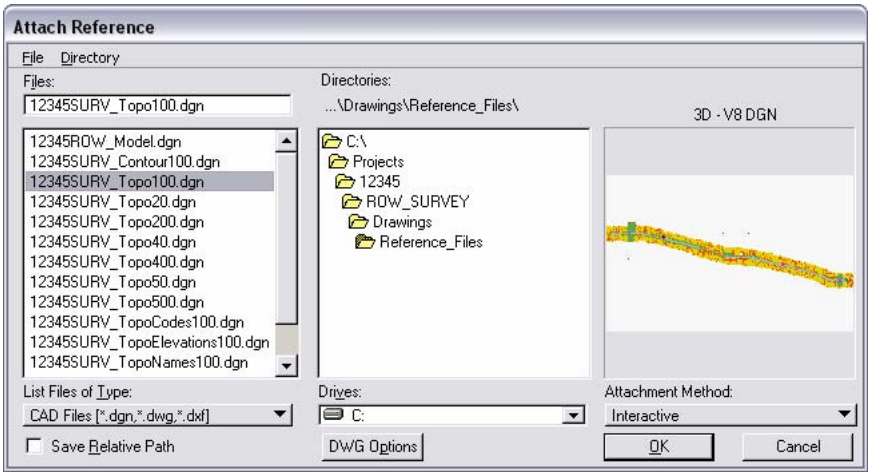
2. On the **References** dialog, select **Tools > Attach**.

3. Your current **Directory** should be **C:\Projects\12345** (obtained from your PCF file). Use the Directory pull down to select the **C:\Projects\12345\ROW_Survey\Drawings\Reference_Files** folder.



   Note: The Reference directory list is read from the PCF.

4. Select **12345SURV_Topo100.dgn** from the list of files.



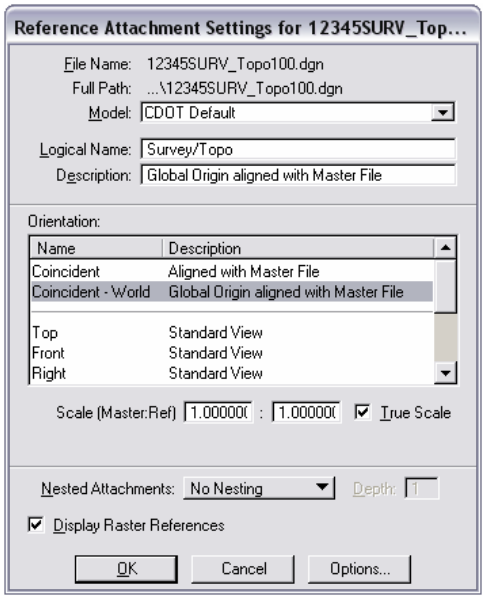
5. Set **Attachment Method** to **Interactive** and select **OK**.

   The Interactive method allows you to supply additional reference settings in the next dialog box.

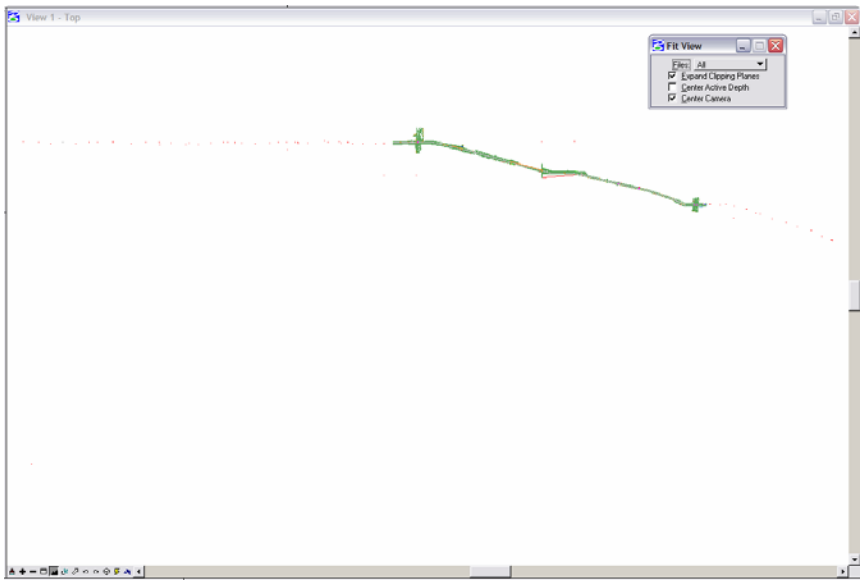
6. In the **Reference Attachment** settings box, key in a **Logical Name** of ***Survey/Topo*** and set:

   - **Orientation** to **Coincident World** (to align Master file and Reference file global origins)
   - **Scale** to ***1:1*** (to bring in graphics full scale)
   - **Nested Attachments** to **No Nesting**
   - **Display Raster Reference** ***on***

7. Select **OK**.

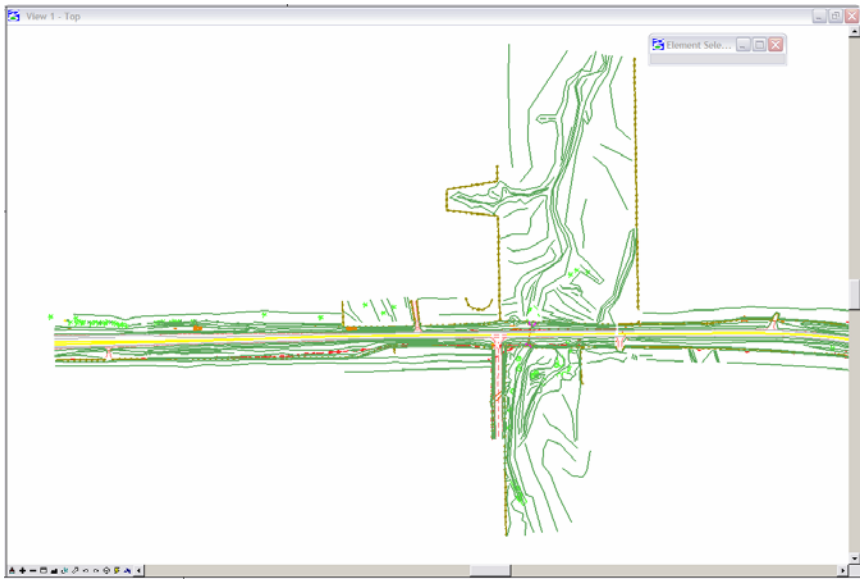


8. **Fit** the view.

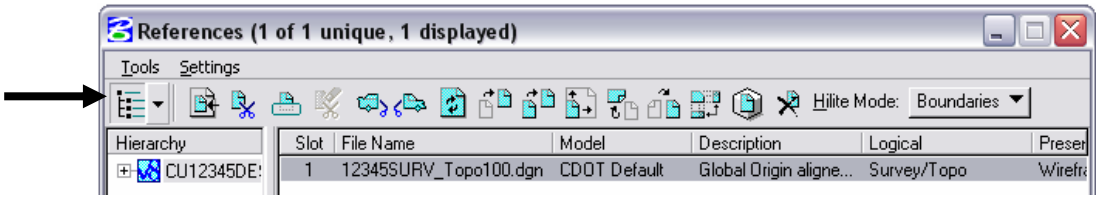


The Survey/Topo reference is attached to the design model master file. The graphics come in at their true coordinates (Coincident-World) and the actual size (1:1 scale).

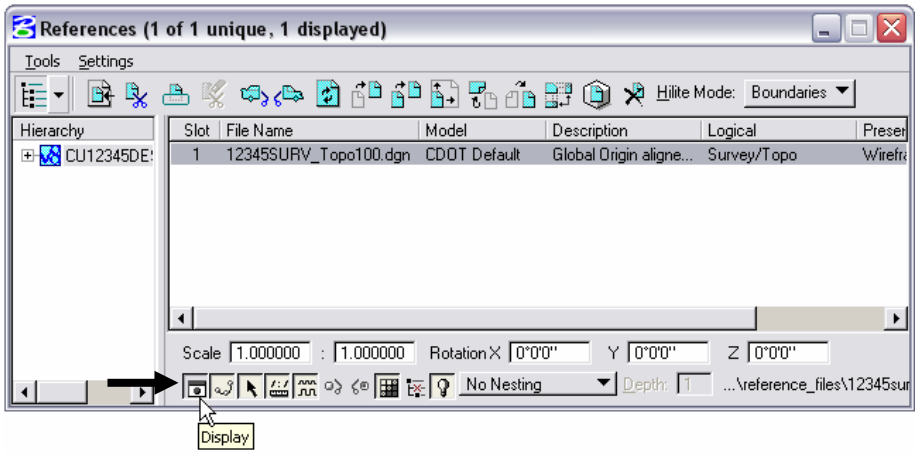
9. Window in on the Survey graphics at the beginning of the project.



10. In the **Reference** dialog, make sure **Show Hierarchy** is turned on and highlight the Survey/Topo reference on the right-side.



11. Toggle the **Display** option ***off***.



12. **Fit** the view.

    With the reference display turned off, there are no graphics to display, since the design model is currently empty.

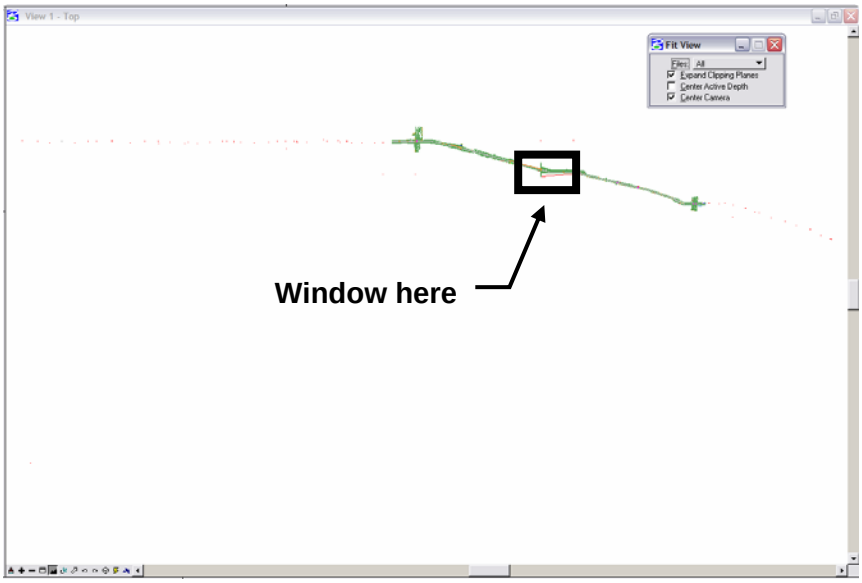
13. Toggle the **Display** option back ***on***.

14. **Fit** the view.

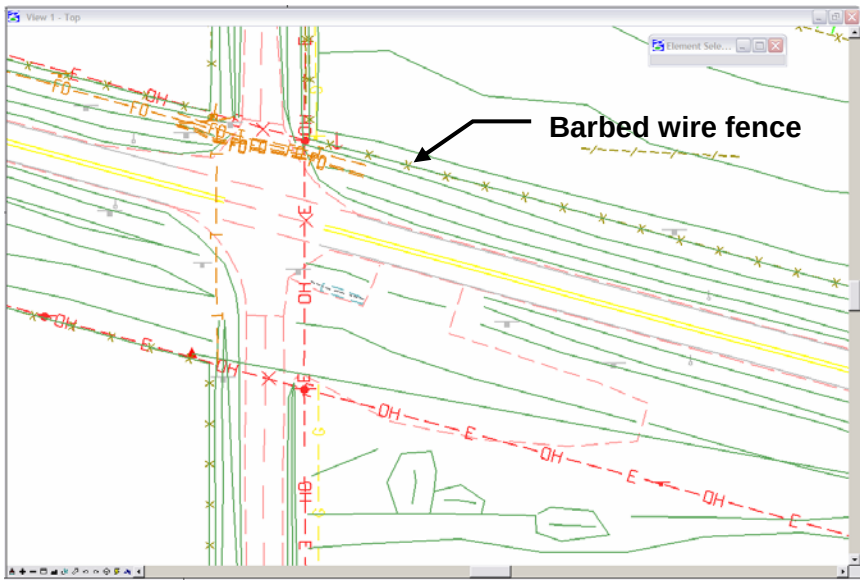
    The design file is now ready to placed proposed graphics with survey and topo graphics referenced for information purposes.

Turn survey levels on/off

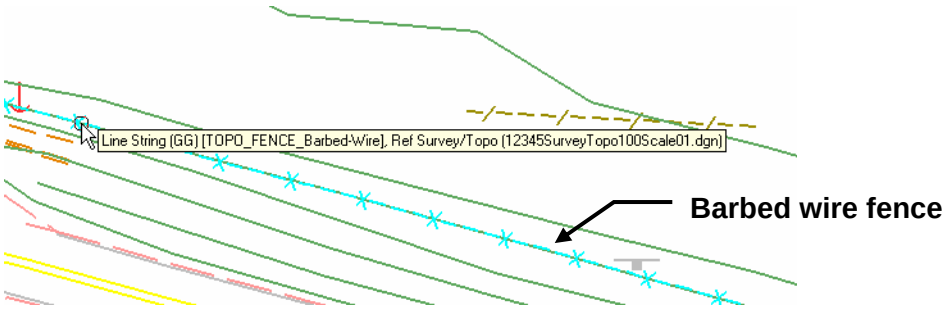
1. Window around the intersection near the center of the project.



2. **Zoom** in as shown.

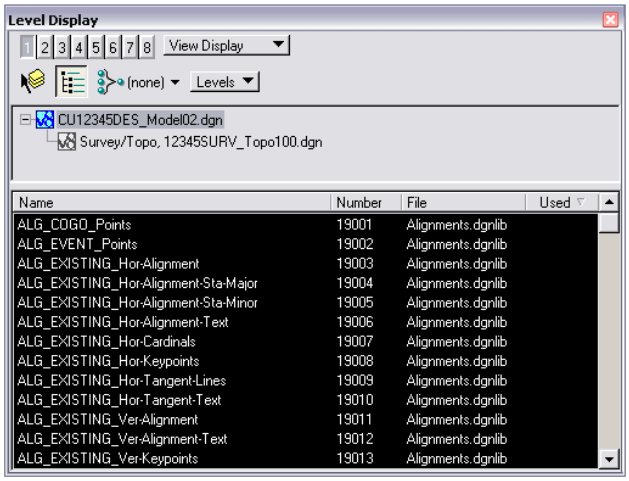


3. Hover over one of the barbed wire fence lines.



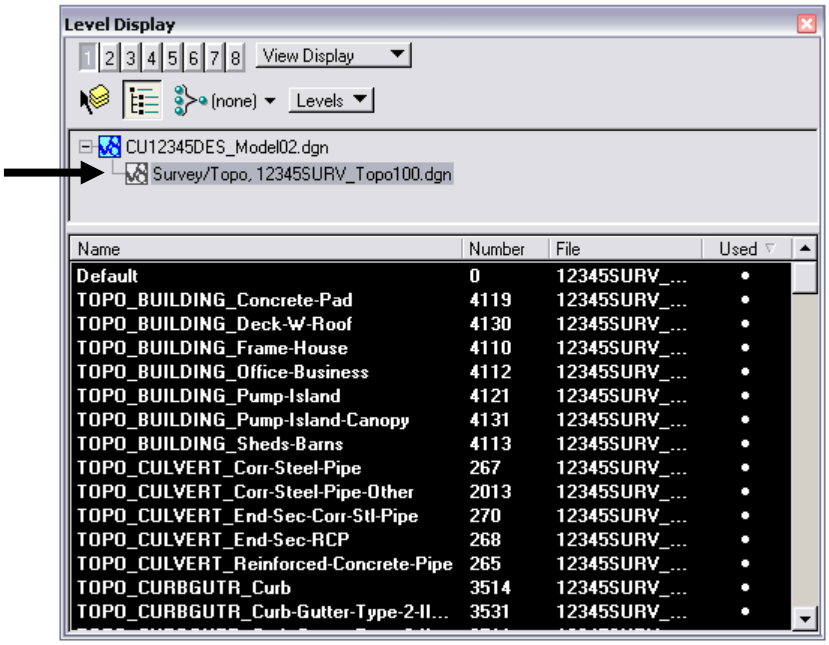
Basic element information "pops up" at your cursor location. MicroStation tells you that the element is on level **TOPO_FENCE_Barbed-Wire** and located in the **Survey/Topo** reference.

4. Open **Level Display** from the **Primary** toolbar.
5. Highlight the master file **CU12345DesignModel02.dgn**.
6. Sort on **Used** levels.



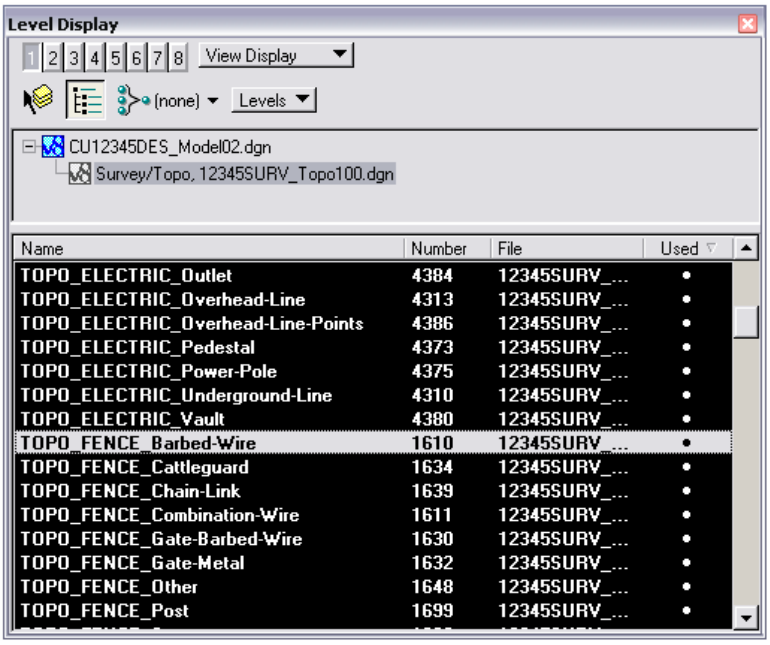
Note that there are no used levels in the master file since there are no graphics in the design model file.

7. Highlight the **Survey/Topo** reference underneath the master file
8. Sort on **Name**, then sort on **Used**.



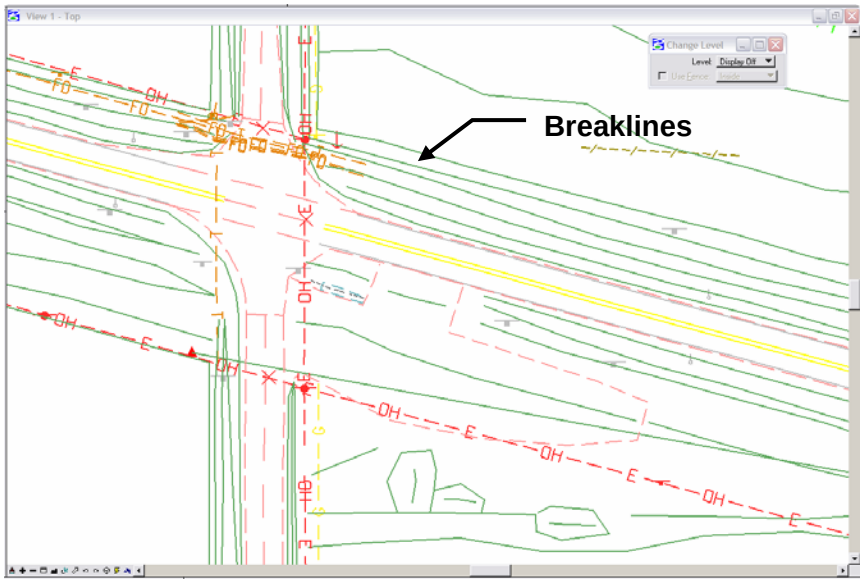
Note that the reference has several used levels.

9. Turn ***off*** the level **TOPO_FENCE_Barbed-Wire**.

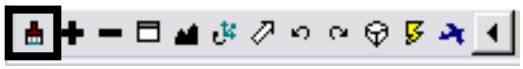


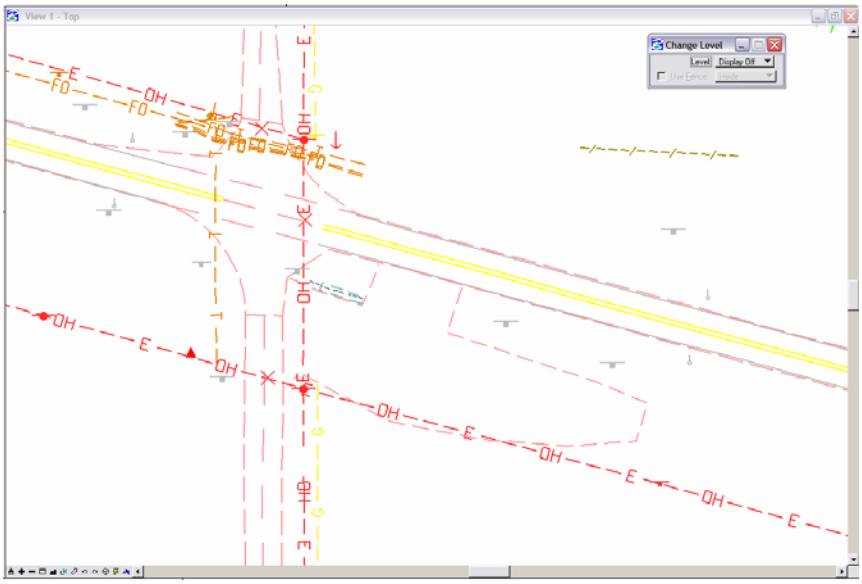
10. Right click in the list of levels and select **Off By Element**.

11. **<D>** on one of the green breaklines to turn off the level **TOPO_TERRAIN_Break-Lines.**



12. **Update** the view.



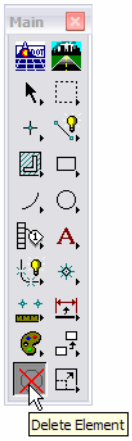


13. Turn other Survey levels on/off as desired.

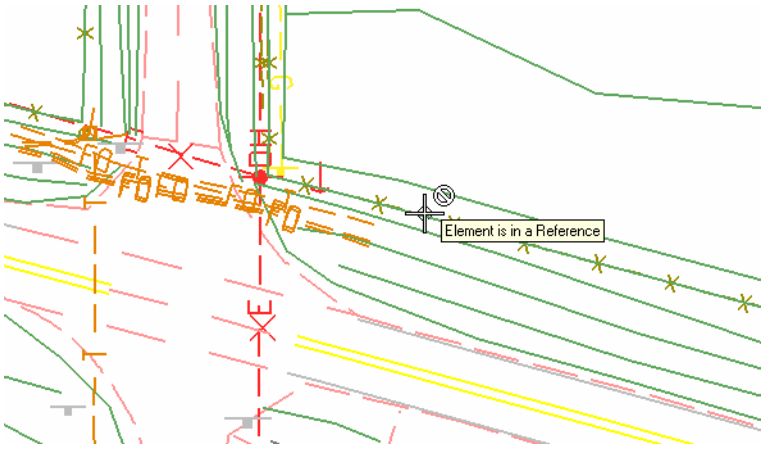
    Note: You have control over all reference levels just like levels in the master file.

14. Turn all Survey levels back ***on***.

15. From the MicroStation **Main** toolbar, select **Delete Element**.

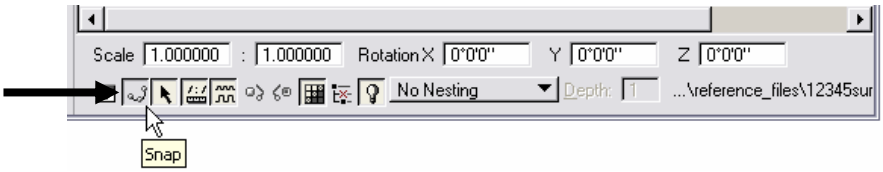


16. **<D>** on the barbed wire fence.



The command is now not available because the barbed wire fence is in the reference file, not the active file. You can not delete or modify reference graphics.

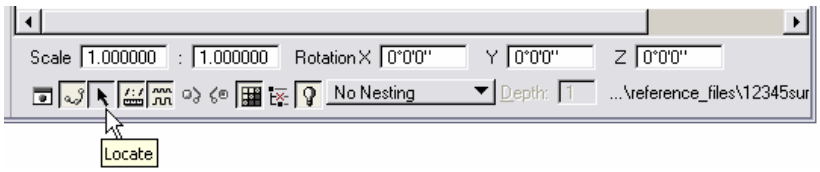
17. In the Reference dialog, turn off **Snap** for the **Survey/Topo** reference.



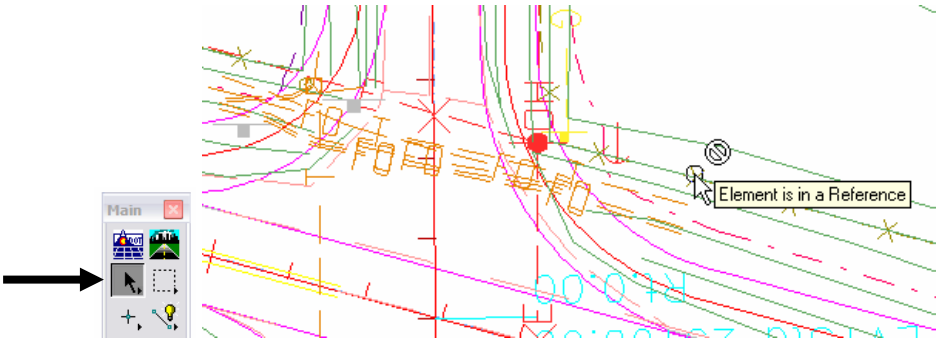
18. Try to tentative snap on some of the Survey graphics.

With **Snap** turned off, you can't tentative to the graphics in the reference file.

19. In the Reference dialog, and turn off **Locate** for the **SurveyTopo** reference.



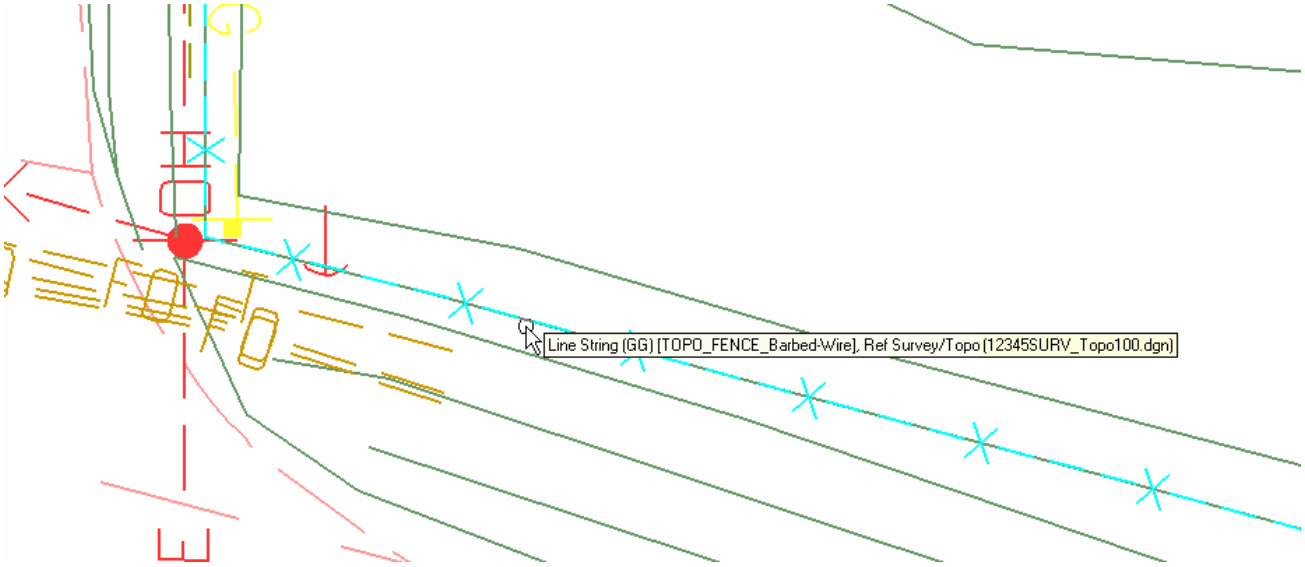
20. On the Main toolbar, choose the **Element Selection** tool and hold your cursor over some of the survey graphics.



With **Locate** off, you can't located reference elements for information, measuring, copying, etc.

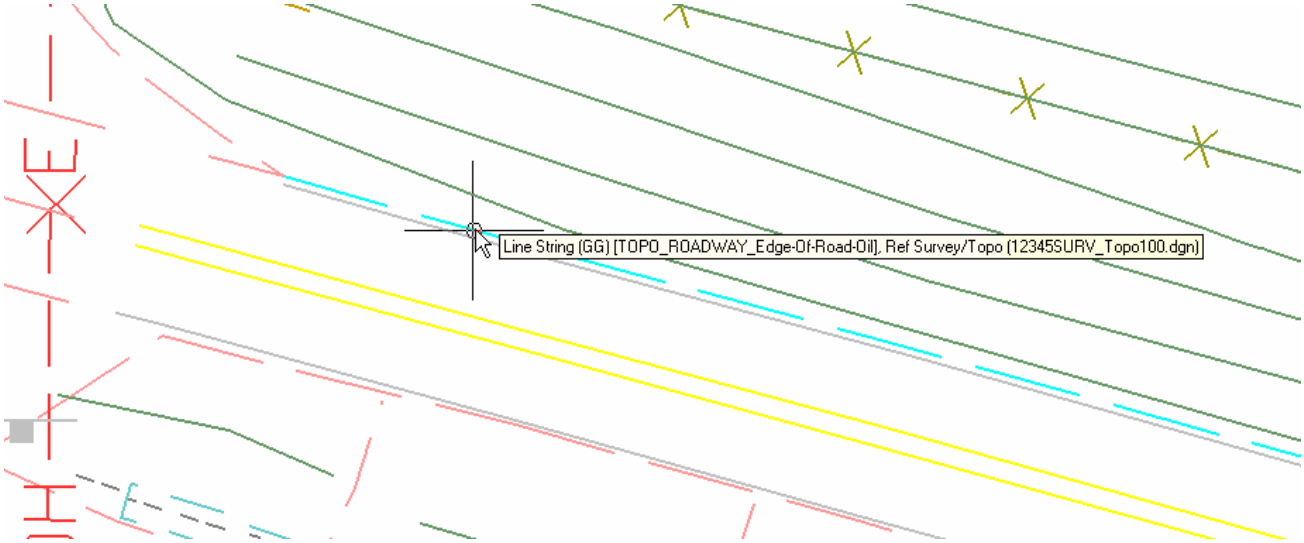
21. In **Level Display**, turn **Snap** and **Locate** back ***on*** for the Survey/Topo reference.

22. Hold your cursor over some of the reference graphics.



You can now locate the graphics.

23. <T> on some reference graphics.

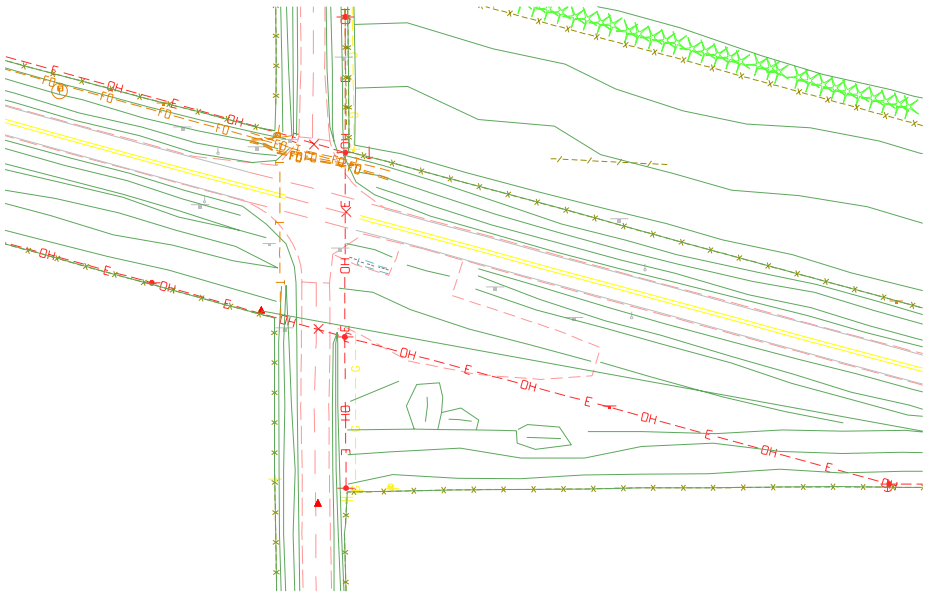


You can now snap to the reference graphics for coordinate information.

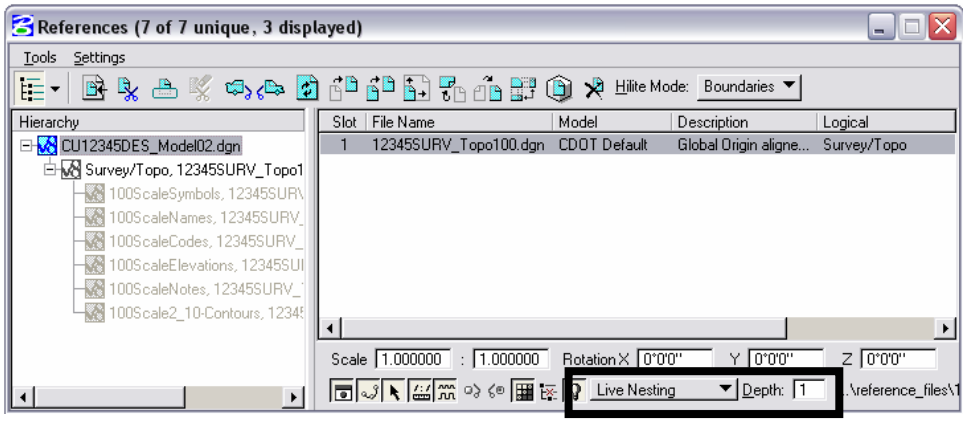
Note: It's often helpful to turn **Snap** off in a reference in dense areas where you don't want to snap to reference graphics. It's useful to turn **Locate** off for a reference if you're copying master file graphics and you don't want to accidentally copy the reference graphics.

Live Nesting

1. Window around the intersection as shown.

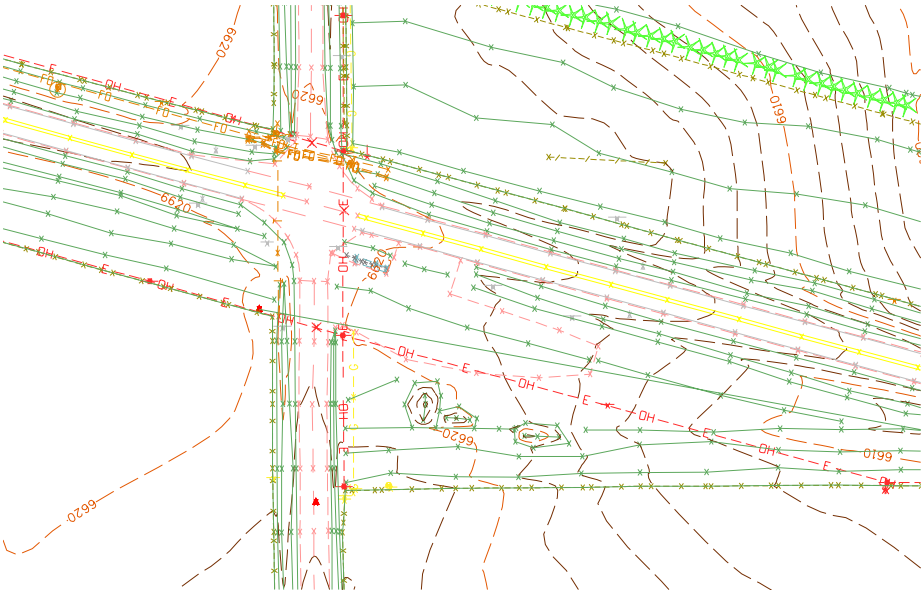


2. In the Reference dialog, change **No Nesting** to **Live Nesting** and set the **Depth** to **1**. Expand the **Hierarchy** list to show all nested references.



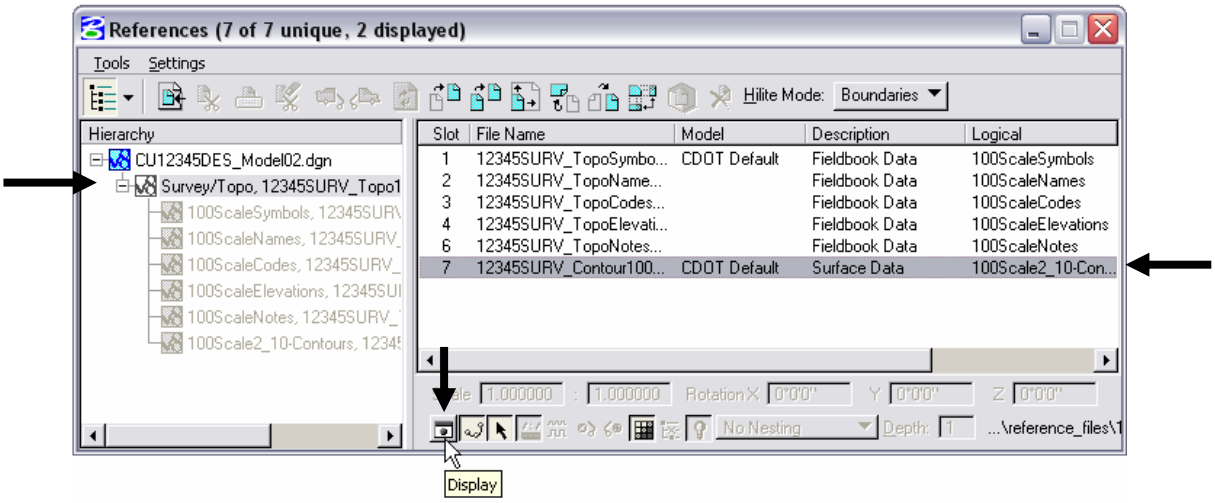
The Survey fieldbook data files, which are referenced to the Survey/Topo model, are now displayed in the file.

3. Review the graphics.

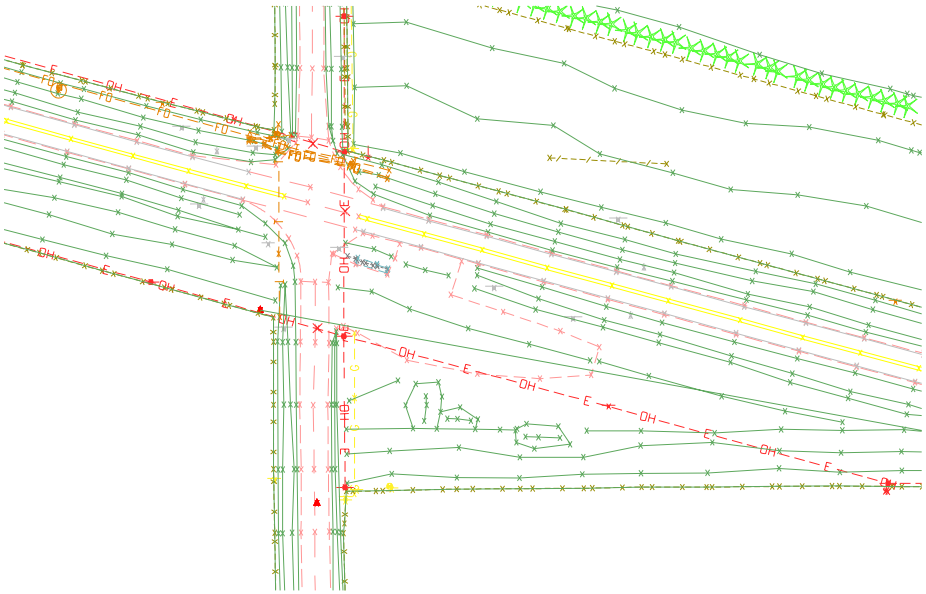


The Nested graphics, including the existing contours are now shown in the file.

4. On the left side of the **Reference** dialog, highlight the **Survey/Topo** reference. On the right-hand side of the **References** box, highlight the **Contour (Surface data)** nested reference and toggle **off** the **Display**.

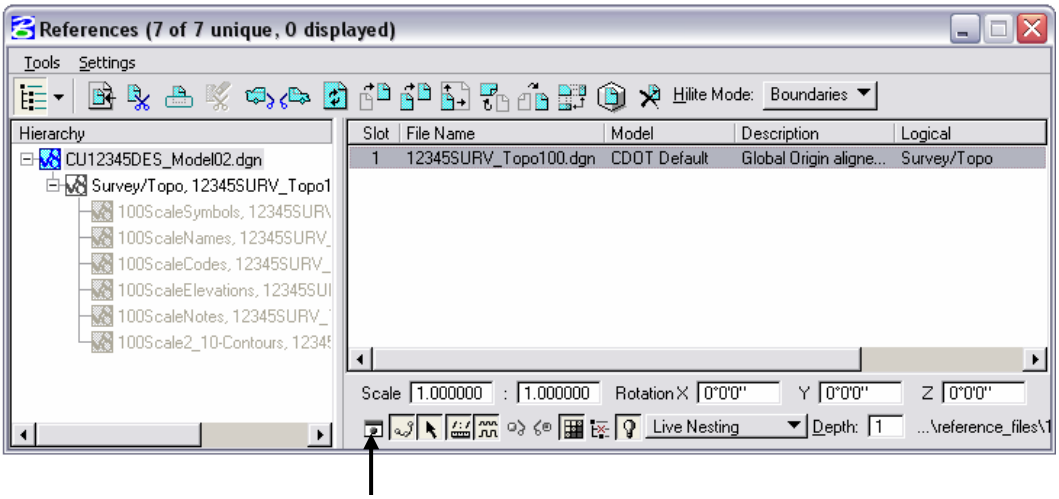


The display of just the nested contour graphics is turned off.



5. Turn the **Contour** reference **Display** back on.

6. On the left side of the **Reference** dialog, highlight the **Design Model** master file. On the right-hand side of the **References** box, highlight the **Survey/Topo** reference and toggle **off** the **Display**.

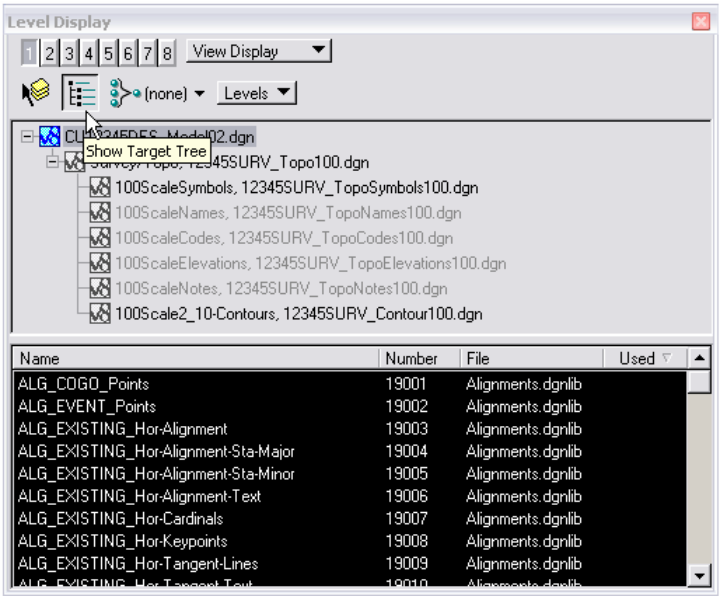


All graphics in the file are turned off.

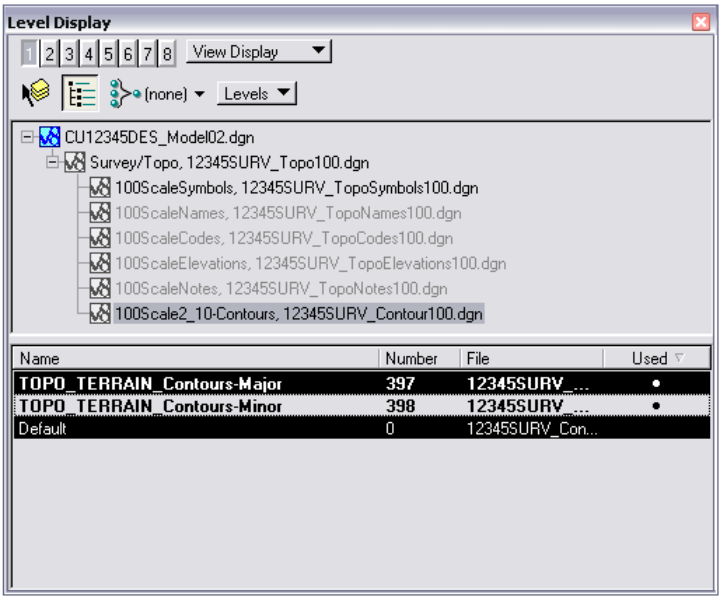
Note: With a nested reference, when you turn off the display of the upper level reference, all nested references are turned off too.

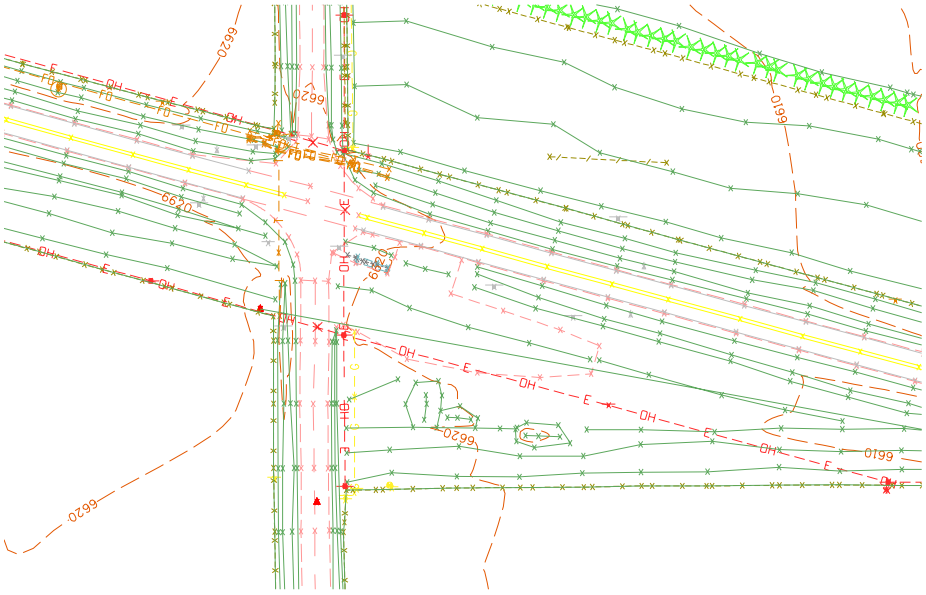
7. Turn the **Survey/Topo** reference display back **on**.

8. Open the Level Display box and expand the **Target Tree** list.



9. Select the Contour nested reference and toggle off the minor contour level.



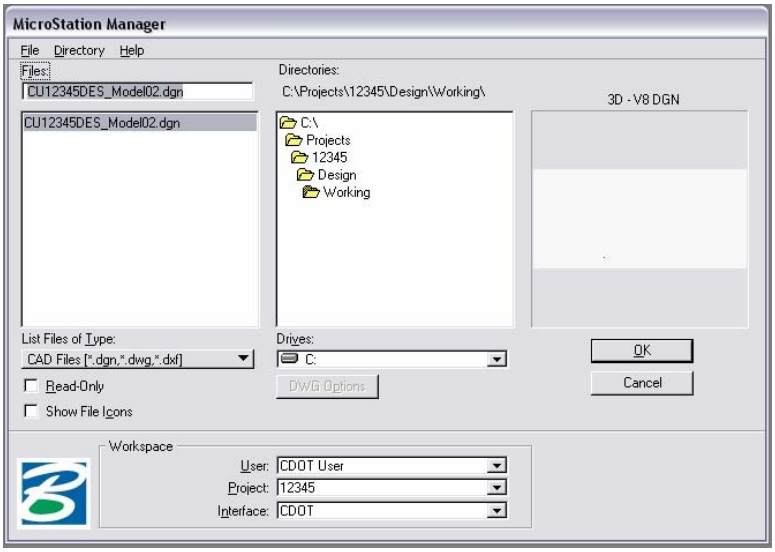


You have control over all nested reference levels via Level Display.

10. Turn the minor contours back ***on*** and **Close** the **Level Display** box.

    You will work more with nested references and the Copy Attachment options in later labs.

11. Choose **File > Close** to return to the **MicroStation Manager**.



12. From the **MicroStation Manager** choose **File > Delete** and choose **OK** from the **Alert** box to delete the **12345DES_Model02** file that you just created in the **Working** folder.

    Note: In this class, you'll work with the previously created Design Model file **12345DES_Model.dgn** in the Refereence_Files folder.

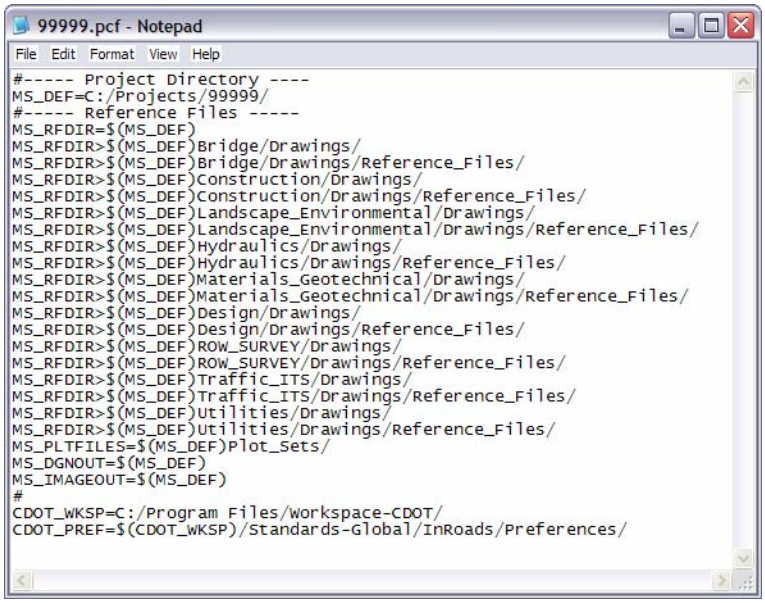
13. Cancel the **MicroStation Manager** box.

Update project 99999

You have now been assigned a project code of ***54321*** for the previously created 99999 project. Update the PCF to reflect this change.

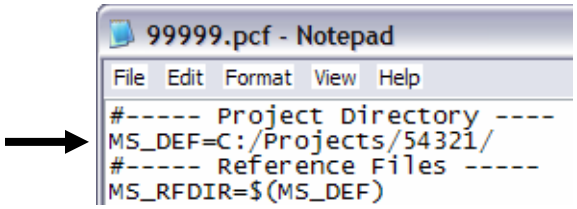
1. Using My Computer or Windows Explorer, navigate to the CDOT workspace (**C:\Program Files\Workspace-CDOT\Standards-Local\Projects**).

2. Double-click on **99999.pcf** to open it with **Notepad**.

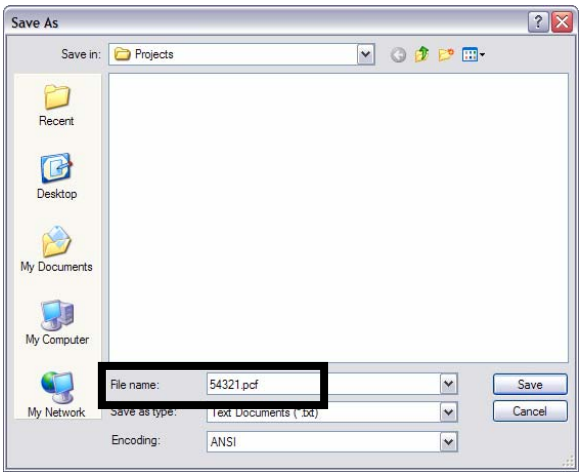


3. On the second line under **Project Directory**, edit it as follows:

   MS_DEF=C:/Projects/54321/



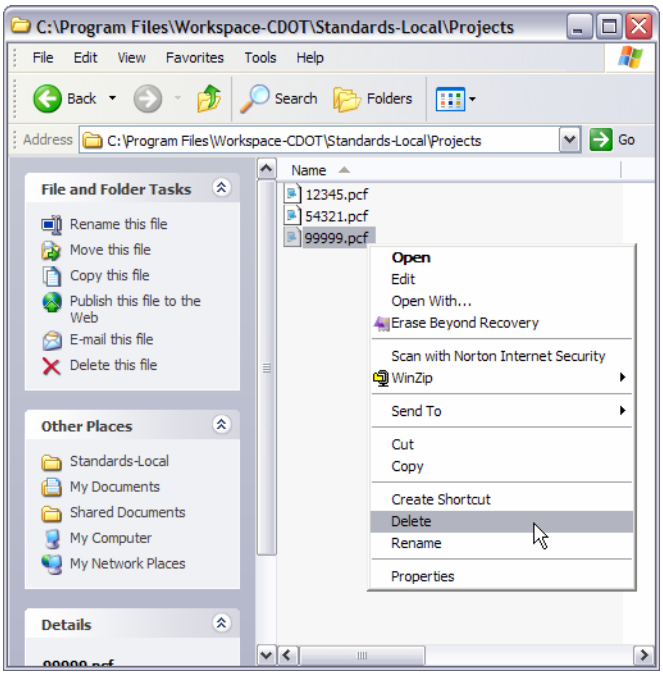
4. Select **File > Save As**, name the file **54321.pcf**. and select **Save**.



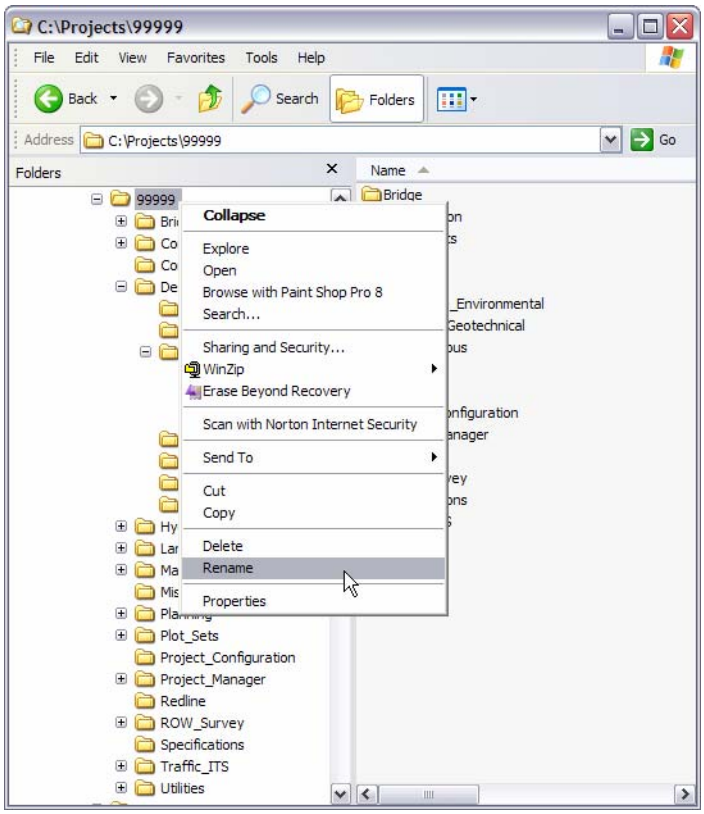
Note: By updating the MS_DEF path, all reference paths are updated as well.

5. Close the **54321.pcf** file in **Notepad**.

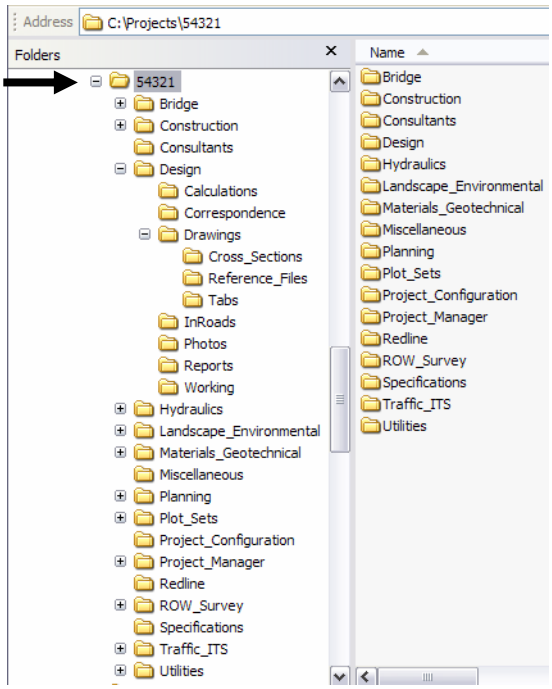
6. Delete the **99999.pcf** file from the **C:\Program Files\Workspace-CDOT\Standards-Local\Projects** folder**.**



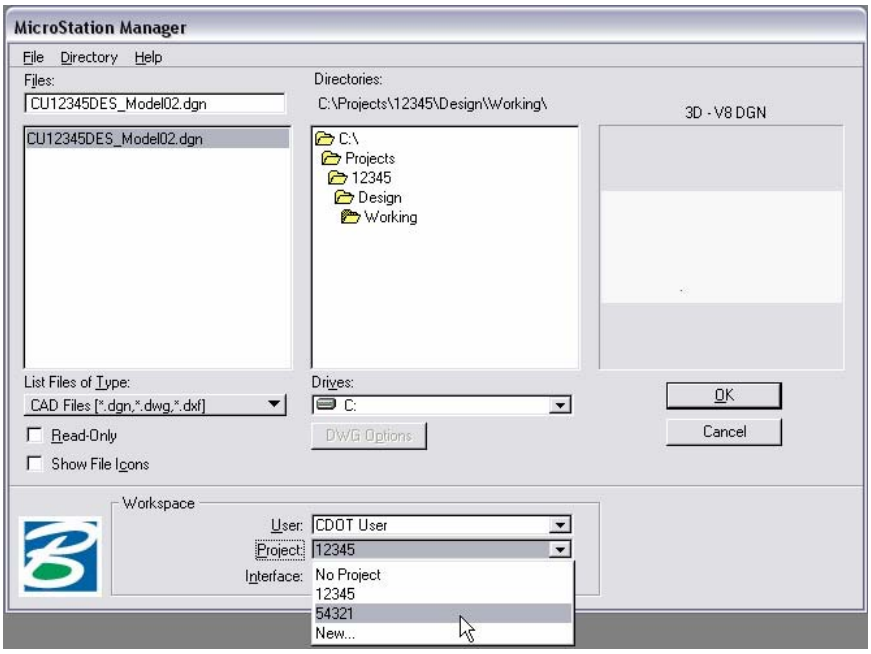
7. Using My Computer or Explorer, navigate to the **C:\Projects\99999** folder.



8. Rename the folder **C:\Projects\54321**.

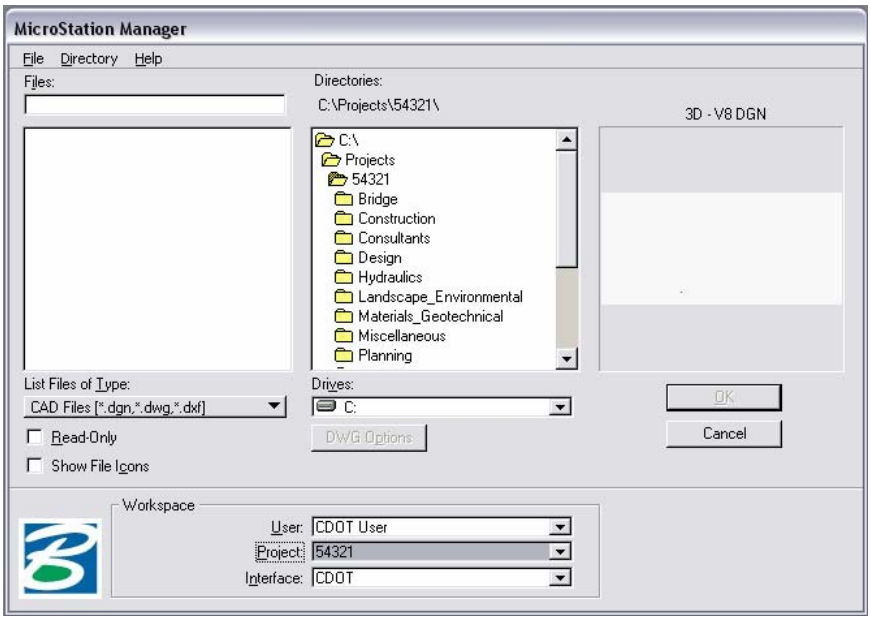


9. Start MicroStation and select the **Project** drop-down



Note that 99999 is no longer available and has been replaced by 54321.

10. Set **Project** to **54321**.



The project directory structure is selected.

Note: All files prefixed with 99999, would need to be renamed with the prefix 54321 on the hard drive.

11. **Cancel** the **MicroStation Manager**.

5. Creating Your Design Graphics

In this Chapter you will learn how to use the CDOT Menu to set standards and place simple graphics. You will also learn how to use precision drawing techniques to locate your graphics.

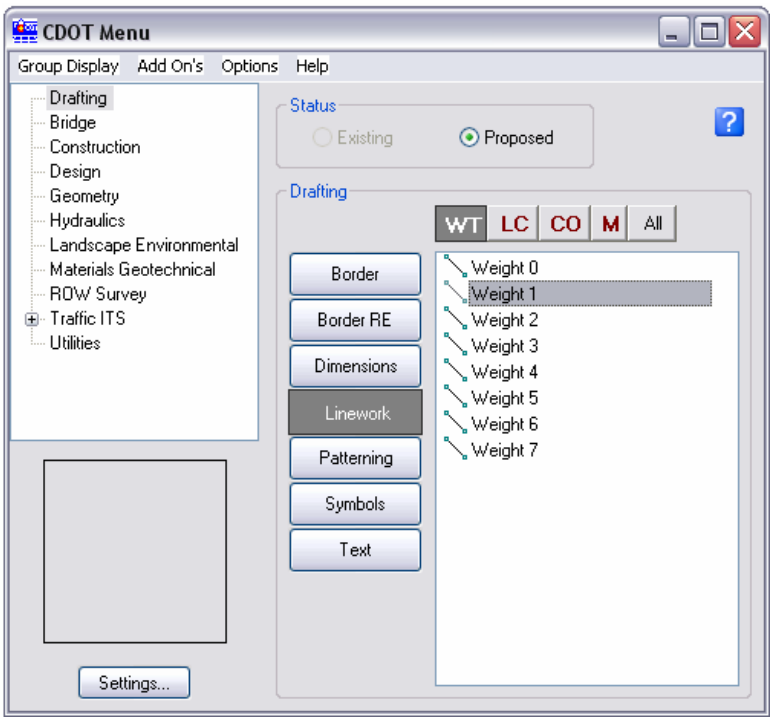
The CDOT Menu

The customized CDOT menu provides access to tools and applications intended to provide the user a simple, efficient method to apply CDOT's CADD standards to every project. These menus direct MicroStation to place elements on discipline-defined levels for drawing consistency.

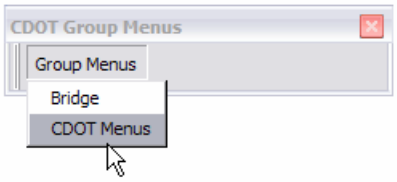
Note: Since the CDOT Menu automatically selects the correct level for element placement across disciplines, you must have selected the **xxxMulti-Discipline** group from the **Select Group Environment** program.

Opening the menu

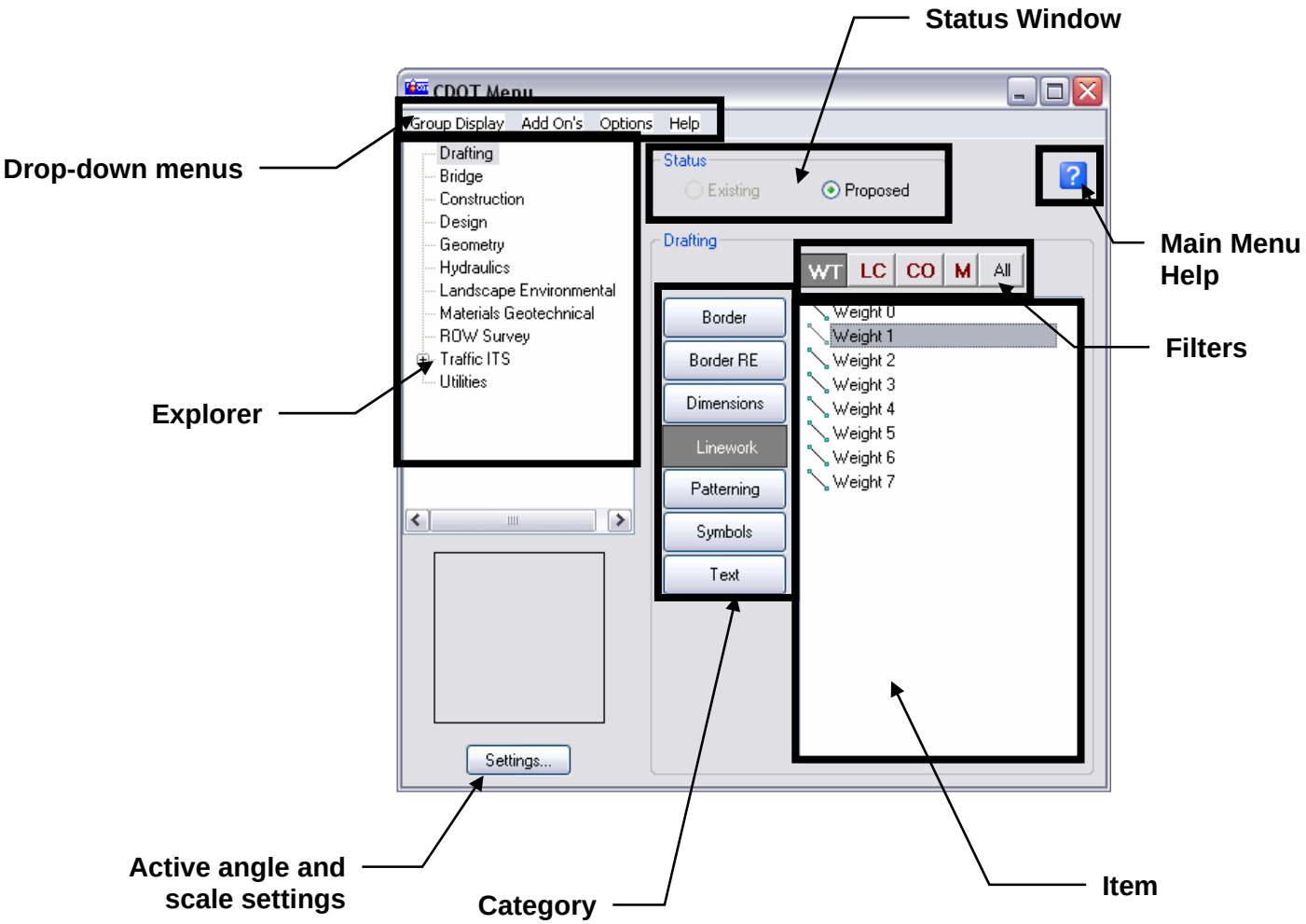
After starting MicroStation, select the CDOT icon from MicroStation's **Main** toolbar to open the CDOT Menu. You can hover over the icon to verify the CDOT configuration release.



Notes: You can also open the CDOT Menu from the Group Menus toolbar. Select **Group Menus > CDOT Menu**. The CDOT Group Menus automatically opens when you start MicroStation. There are two group options: Bridge (and CDOT Menus (for all other groups). The Bridge menu is discussed later in this chapter.



Parts of the menu

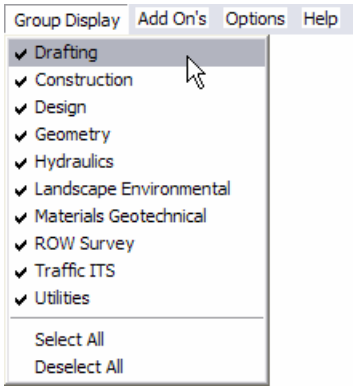


Drop-down menus

Use the drop-down menus to make the following selections:

Group Display

Toggle on your Group to display Explorer menu selections for placing graphics. Some groups, like Drafting and Traffic ITS have "children" options that can be expanded with the "+" symbol in the Explorer menu tree. Drafting is a generic group (*i.e.* it's used by all groups) for placing general text, dimensions, borders, etc. There is an option on this menu to select/deselect all groups.

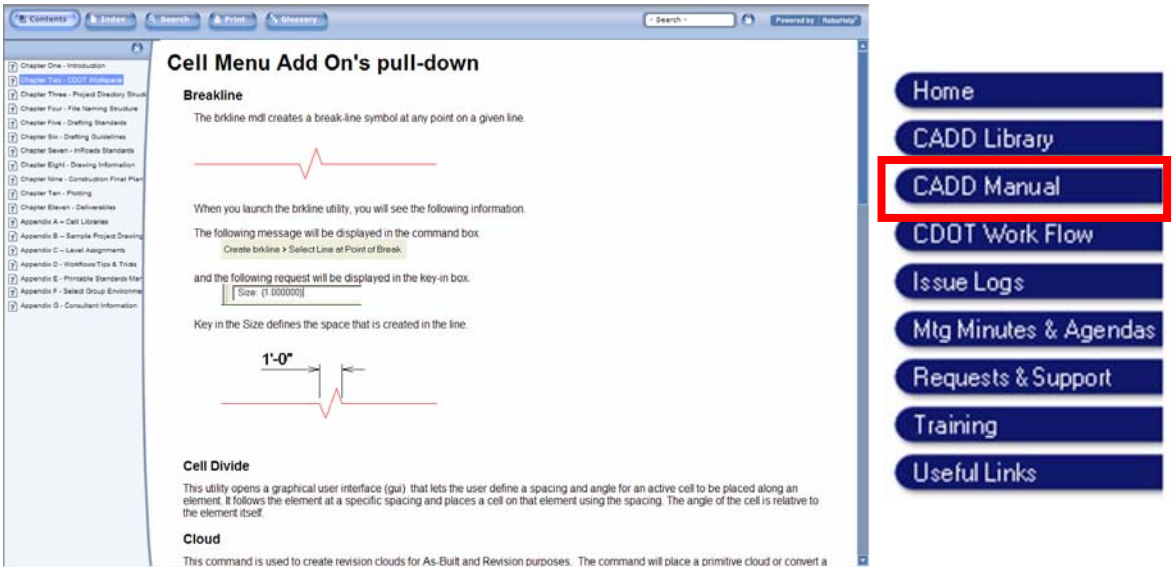


Add On's

Note:
The **Add On's** menu has been replaced with the **CDOT Tools** menu in the 3.02.02 release.

The **Add On's** menu allows you to launch custom add-on programs like AutoTrack, SignCAD, Typical Section Program as wall as other MDL and automation tools for working with graphics like the Breakline tool and the ModZ tool, covered later in this class.

For more information on Add On's, see the **CDOT CADD Manual**, ***Chapter Two – CDOT Workspace, section 2.5 Customized MicroStation Menu*** and follow the links **Review Discipline Specific Group Menus – All about Add On's pull-down**.



Options

This menu allows you to have the CDOT Menu appear on top of any Windows Application, or have it reside behind other programs.

Help

This pull-down provides convenient links to the CDOT CADD web site Home page, the CDOT CADD Manual, Support Requests and Workflows.

Explorer

The Explorer Window is used to navigate through the tree structure of group options.

Status Window

The Status Window is used to select either Existing or Proposed categories/items for a particular group. Category options change based on the Existing or Proposed status.

Category

Group categories for graphic placement.

Item

Items are the specific graphical elements that can be placed in the design file. When an item is selected, the CDOT Menu automatically selects the proper drawing tool and selects the appropriate level for placement (along with that level's **ByLevel** symbology).

Filters

Filters are used to filter types of items. There are five filters: Lines, Text, Cells, Patterns and All. Selecting a filer shows you only those types of elements in the selection window.

Main Menu Help

Discipline specific help topics using the CDOT menu.

Settings

Allows you to set the **Active Angle** and **Active Scale** before placing text, cell and pattern items.

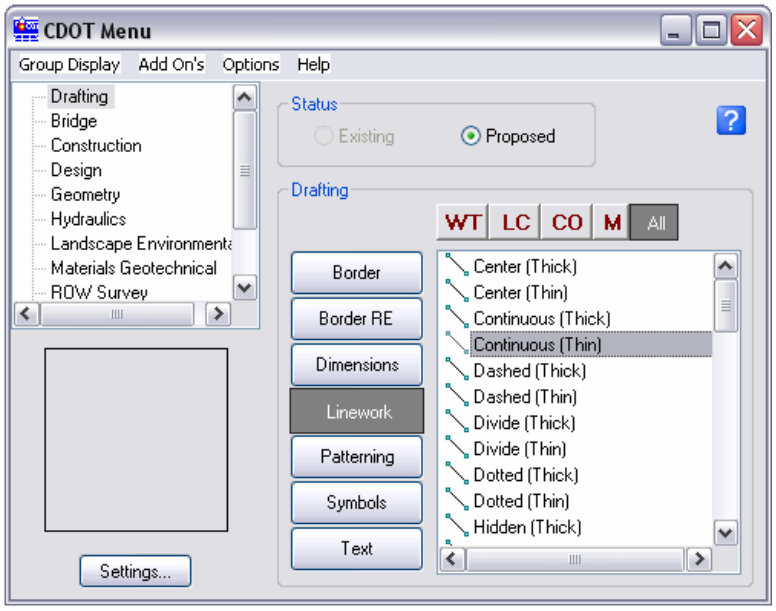
Placing Graphics

The CDOT Drafting Menu

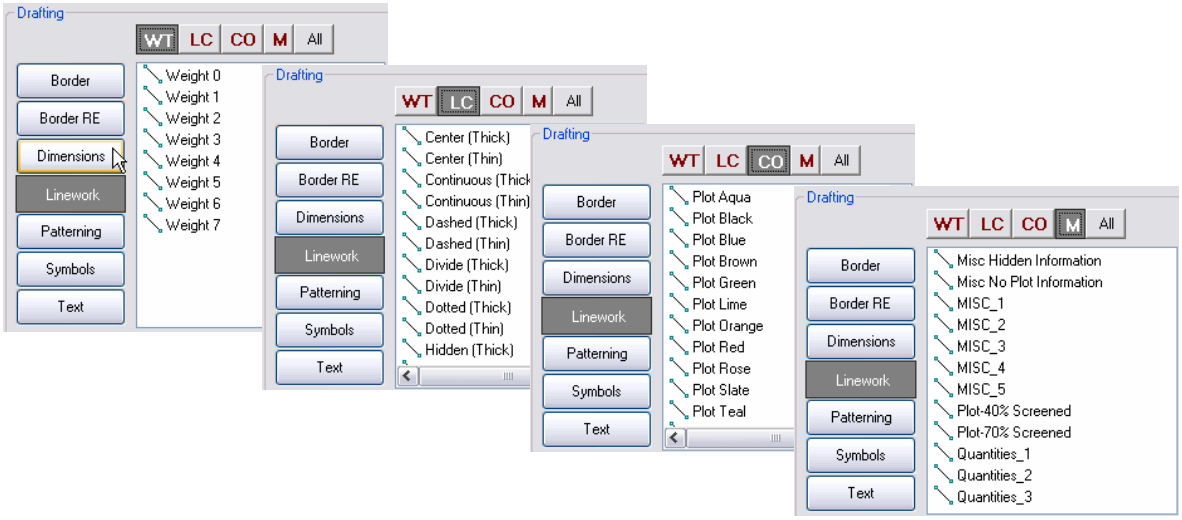
Linework tools

The CDOT **Drafting > Linework** group provides a convenient way to place basic elements from one location. From here you can place **SmartLines**, **Shapes**, **Circles**, **Arcs** and **Hatch** areas.

SmartLines are used to place a chain of connected line segments and arc segments as individual elements or as a single line string or shape.



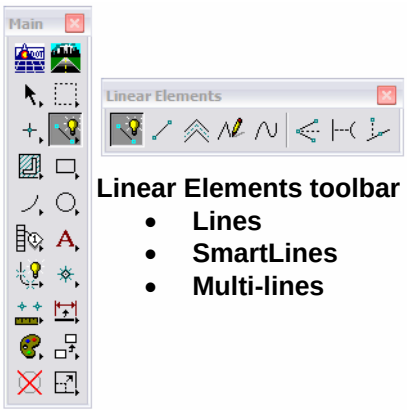
Selecting the **Line Weight**, **Line Style** and **Plot Color** filters sets the appropriate level. Each item in Linework these categories goes on a unique Drafting level.



MicroStation Drawing Tools

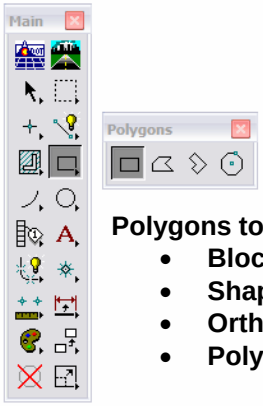
You can also access basic drawing tools from the MicroStation Main toolbar. See the MicroStation online User and Reference Guide for more information.

Important! Read your prompts for proper use of these drawing tools!



Linear Elements toolbar

- Lines
- SmartLines
- Multi-lines

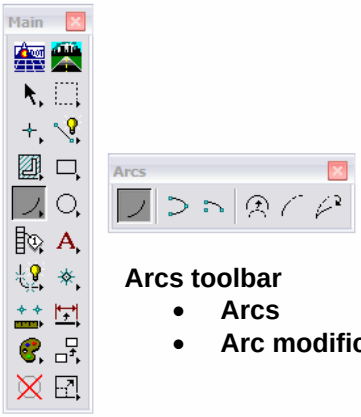


Polygons toolbar

- Blocks (rectangles)
- Shapes
- Orthogonal shapes
- Polygons

Ellipse toolbar

- Circles
- Ellipses

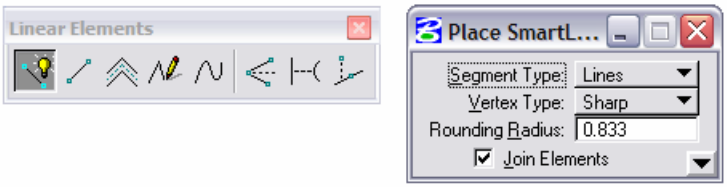


Arcs toolbar

- Arcs
- Arc modifications

Tool Settings

Each time you select a new drawing tool, the optional settings will appear in the **Tool Settings** box.



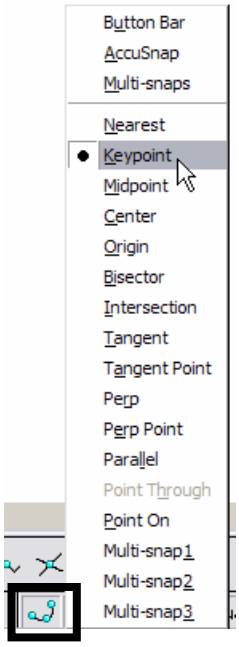
Tool Settings for the Place SmartLine tool

Snap Lock

Snap lock determines if your tentative point snaps are forced onto nearby elements. If **Snap** lock is on and you place a tentative point on or near an element, your cursor locks onto that element at the location specified by the snap mode.

Snap Modes

The active snap mode determines how you will snap onto an element. Several different snap modes are available and can be accessed from the Status bar.



You can also access snap modes from the **Snap Mode** button bar.

Executing snaps

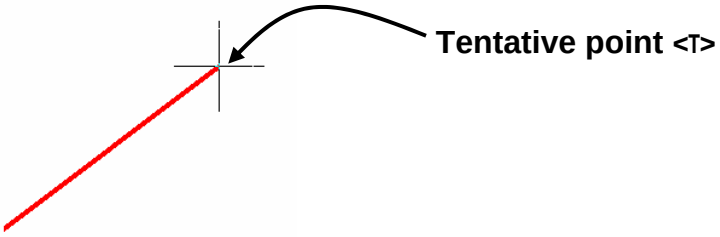
You can execute a snap two ways:

- Using a tentative point, or
- Using **AccuSnap**.

To snap to an element using a tentative point:

- Select the drawing tool (**Place Line**, **Place Block**, *etc*.)
- Set the **Snap** mode (if not currently active).
- **<T>** on the element.

  A large cross hair appears at the snap mode location and the element highlights. MicroStation displays the X,Y,Z coordinates of the **<T>** location in the **Message** field.



- **<D>** to accept the tentative.

Snaps can be a one-time setting. Once you've executed the snap, the snap mode returns to the default setting. ***One-time overrides*** of the default snap mode are accomplished by:

- Choosing a snap mode from the **Status Bar**
- Selecting **Settings > Snaps** or
- By single **clicking** on snap on the **Button Bar.**

You can change the ***default*** snap mode by:

- Selecting a new mode in the **Full** Locks dialog box or
- Double **clicking** the snap mode on the **Button Bar**.

Using AccuSnap

AccuSnap is a feature that streamlines your snaps. Instead of tentative snapping to an element, you can **AccuSnap** to it. In addition, **AccuSnap** can give you basic element information (element type and level).

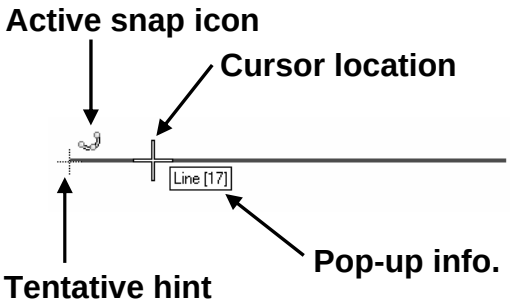
Turning AccuSnap on/off

You can also toggle **AccuSnap** on/off from the **Snaps Button Bar**.

To snap to an element using AccuSnap:

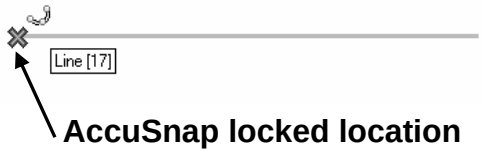
- Select a drawing tool.
- Select a **Snap** mode.
- Move your cursor across the element.

  AccuSnap identifies the element type and its level with ***Pop-up information***. An icon representing the current snap mode is displayed along with a tentative hint – a light dashed cross hair at the closet snap point according to the selected snap mode.



- Move your cursor closer to the tentative hint.

  The cursor changes to a bold X and the element highlights to indicate you're locked on to the snap point.



- **<D>** to select this location.

  A **Tentative** point is ***not*** necessary to define the temporary snap location.

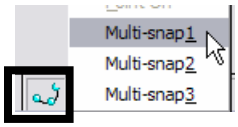
Note: **AccuSnap** sometimes does not work correctly with **Depth** lock on. Therefore, if you're snapping to elements with **Depth** lock on, be sure to turn **AccuSnap** ***off*** and use a Tentative snap <T> instead. This ensures that you'll pick up the active depth instead of the element's depth.

Multi-Snaps

MicroStation includes three **Multi-Snap** modes. **Multi-snaps** are an ordered list of snaps. When you choose a multi-snap with **AccuSnap** on, MicroStation processes the multiple snaps according to your cursor location.

Using Multi-Snaps

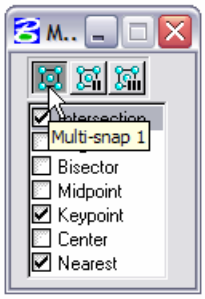
- From the **Snaps** button bar or from the **Status** bar, select a **Multi-Snap** (Multi**-snap1**, **Multi-snap2** or **Multi-snap3**).



- Move your cursor over the element until **AccuSnap** locates the first multi-snap option.
- Continue moving your cursor until the next snap option highlights.
- When you have locked on the correct snap point, **<D>** to accept.

Editing Multi-Snaps

- Select **Settings > Snaps > Multi-snaps** (or select **Multi-snaps** from the **Snaps** button on the Status bar).
- Select a multi-snap (1, 2 or 3).



Note: You can also right-click on the **Multi-snap** icon and select **Properties**.

- Toggle on the snaps you want to include in the multi-snap.
- Toggle off snaps you don't want.
- Close the **Multi-snaps** box.

Precision keyins

Precision key-ins allow you to precisely locate elements in your design file based on its coordinate system. You can locate data points at exact coordinates, at a delta distance from your current location, or at a distance and direction from the current location.

xy=key-in

Use the ***xy=*** key-in to specify a point's exact x, y and z coordinates. The syntax for this key-in is: ***xy=<x,y,z>.***

To place an element at the active depth, leave off the z value.

dx=key-in

Use the ***dx=*** key-in to specify an x distance, y distance and z distance from the current point or from a tentative point. This key-in is sometimes referred to as the "delta" key-in, since it locates a point at a delta distance from the current location. The syntax for this key-in is: ***dx=<dx,dy,dz>.***

You can leave out variables in the key-in. For example, if you only want to locate 100 feet (assuming your master units are feet) in the y direction from the current location, key in ***dx=,100***. To draw planar elements at the active depth in a 3D file, leave off the z value.

The ***dx=*** key-in behaves the same regardless of the view in which you're working. It uses the ***view axis***, meaning it always assigns the x axis to horizontal and the y axis to vertical in any view (top, front, right, *etc*.)

dl=key-in

The ***dl=*** key-in is also a "delta" key-in and works in a similar fashion to the ***dx=*** key-in. It also locates a point at an x distance, y distance and z distance from the current point or from a tentative point. The syntax for this key-in is ***dl=<dx,dy,dz>.***

The difference between the ***dl=*** and the ***dx=*** key-ins is ***dl=*** uses the ***model axis*** in a 3D file. Instead of assigning every view's x-axis to horizontal and y-axis to vertical, it uses the design cube's true coordinate system. For example, a front view's horizontal axis is the x-axis and the vertical axis is the z-axis.

The ***dl=*** key-in behaves differently based on the view in which you're working. In a top view of a 3D file, there is no difference between the ***dx=*** and the ***dl=*** key-ins.

di=key-in

Use the ***di=*** key-in to specify a distance and direction along the view axis from the current point. The syntax for this key-in is: ***di=<distance,direction>*** Like the ***dx=*** key-in, this key-in also uses the view axis.

You can specify the direction in either **DMS** (degrees, minutes, seconds) or **DD** (decimal degrees). This key-in also works in any angle mode (conventional, azimuth or bearing). For **DMS**, use **^** for degrees, **'** for minutes and **"** seconds. For example, ***di=10,n37^19'30.27"e*** would place a point 10 feet at the specified bearing angle.

Note: When using the ***dx=***, ***dl=*** or ***di=*** key-ins, you can place multiple points by using the pipe symbol (above the \ on a standard keyboard). For example if you're in the **Place Line** command and key in ***dx=10|3***, this would place three lines, 10 feet long each, in the x direction.

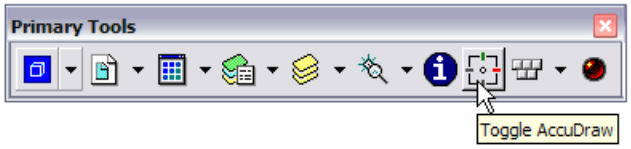
AccuDraw

AccuDraw is a precision drawing tool that streamlines the placement of data points. It basically combines the techniques of precision keyins with axis lock-type features into one command to help you place, modify or manipulate elements.

AccuDraw is context sensitive. Its behavior changes depending on which drawing tool you've selected. **AccuDraw** will evaluate your current position, the previous data point, the drawing tools needs, *etc.* to help you place your next data point.

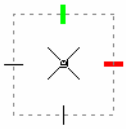
Starting AccuDraw

In the CDOT workspace, **AccuDraw** automatically loads when you open a design file. If you don't want to use **AccuDraw**, you can toggle it off by selecting the **Toggle AccuDraw** button from the **Primary** toolbar.

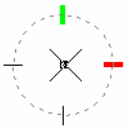


The AccuDraw Compass

When you start **AccuDraw**, one of the first things you notice is the **AccuDraw** compass. The compass shows your origin location (current drawing location) and defines your drawing plane. There are two different drawing plane modes and, therefore, two different compasses: rectangular and polar.



Rectangular mode

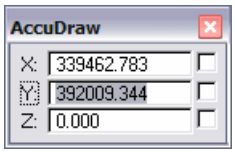


Polar mode

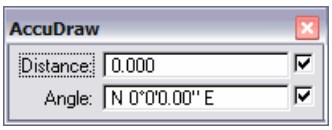
The rectangular mode allows you to enter coordinates or delta distances, relative to the origin point, in an X,Y,Z coordinate system (like an ***XY=***, ***DX=*** or ***DL=*** keyin). The polar mode allows you to enter distances and angles relative to an origin point (like a ***DI=*** keyin).

The AccuDraw Window

The **AccuDraw** window is where you enter your **X**,**Y**,**Z** or **Distance** and **Angle** values. You can also lock the drawing axes. The window changes according to your compass mode.



Rectangular mode



Polar mode

Note: To toggle the compass (rectangular and polar mode), set the focus into the **AccuDraw** window and press **<Spacebar>**.

You can dock the **AccuDraw** window at the top or bottom of the MicroStation window, or you can float the window into the view.

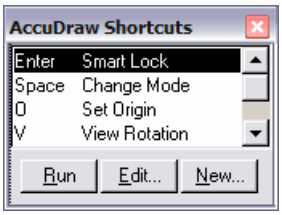
AccuDraw locks

You've seen how to lock your X,Y or Distance, Angle entries you enter in the **AccuDraw** window using the **<Enter>** key. You can also lock "dynamically" in **AccuDraw**. Dynamic entries are X,Y or Distance, Angle values entered automatically as you drag your cursor. Use the following keyboard shortcuts to lock dynamic entries:

- **<X>** – to lock x-axis entries in rectangular mode.
- **<Y>** – to lock y-axis entries in rectangular mode.
- **<D>** – to lock distance entries in polar mode.
- **<A>** – to lock angle entries in polar mode.

Smart Lock

Use AccuDraw's **Smart Lock** feature to lock your cursor in one direction only (your pointer location). For example, if you're working in **Rectangular** compass mode and you only want to move in the Y direction, lock your cursor on the **Y** axis, move your cursor up or down and then press **< Enter>**. You can now only move in the Y direction only. **Smart Lock** in **Polar** mode will lock your cursor to the closest **90** degree axis.



Smart Lock summary:

- In **Rectangular** coordinates, locks X to 0 if the pointer is on the drawing plane y-axis or Y to 0 if the pointer is on the x-axis.
- In **Polar** coordinates, locks Angle to 0°, 90°, -90°, or 180° if the pointer is on a drawing plane axis or otherwise locks Distance to its last entered value.

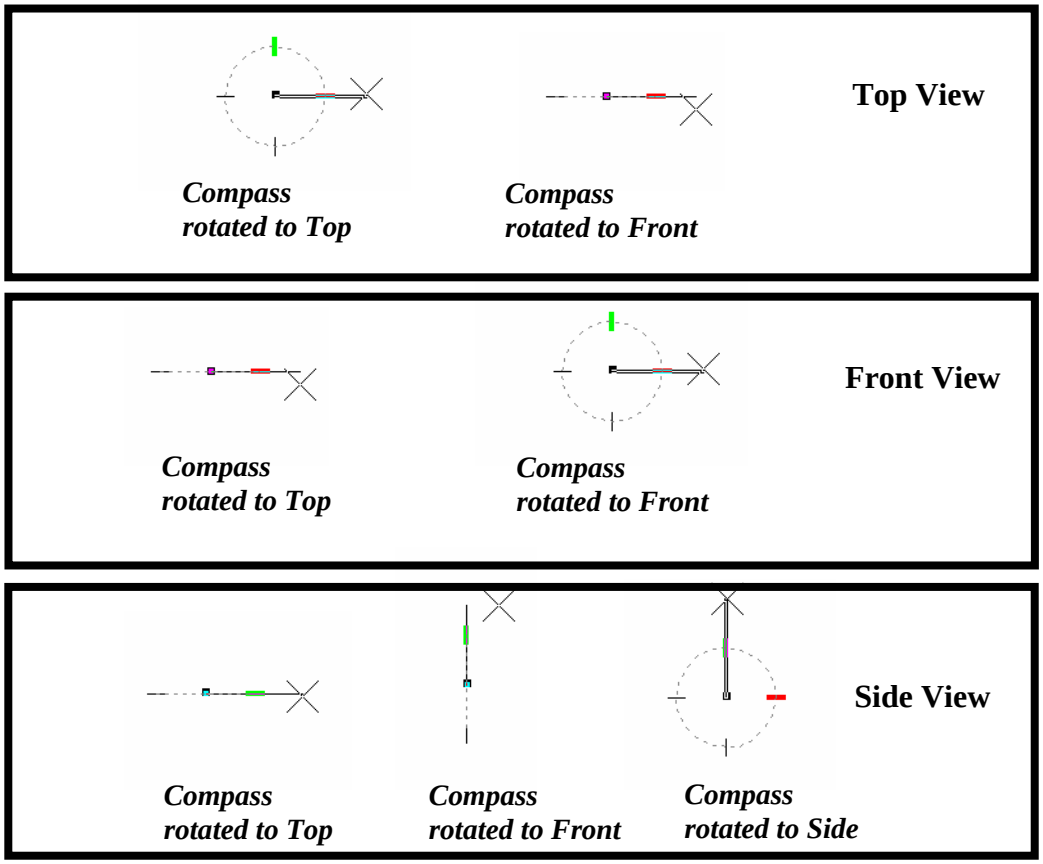
Rotating the AccuDraw compass

There may be times when you do not want the AccuDraw compass to rotate with the element being placed. Instead, you want the compass to maintain its conventional drawing plan mode of X-axis horizontal and Y-axis vertical. In this case, press **V** on the keyboard to rotate the compass back to the "view" plane.

> **Note:** When using AccuDraw with the **SmartLine** tool, there is a **SmartLine** placement Setting (select the drop-down arrow) called **Rotate AccuDraw to Segments**. Toggle this option ***off*** if you always want the AccuDraw compass to maintain its conventional drawing plane mode of X-axis horizontal and Y-axis vertical.

The AccuDraw keyboard shortcut **V** will always rotate the compass to the view in which you're placing elements. Therefore, in a 3D file, pressing **V** in a front view, rotates the AccuDraw compass so that the X-axis is horizontal in the front view; whereas pressing **V** in a top view rotates the compass so that the X-axis is horizontal in the top view, *etc*. Or, you can quickly rotate the compass to a particular view by pressing the appropriate keyboard shortcut below:

- **T** – top view
- **F** – front view
- **S** – side view



Using these keyboard shortcuts simplifies drawing in 3D. For civil design applications, however, most of the time you will be drawing in a top (plan) view.

Another handy rotation option is **Quick Rotate** (keyboard shortcut **<R> <Q>**). This temporarily rotates the compass dynamically as you move your cursor. This is handy to rotate the AccuDraw compass to match the angle of an existing element to place off of that element or when placing cells or text.

Moving the AccuDraw Origin to your cursor location

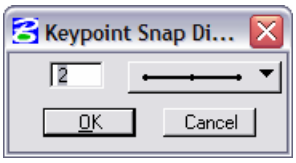
When you tentative snap to an existing element, press **O** on the keyboard to move the AccuDraw origin temporarily to the tentative location. You can then locate the AccuDraw compass off of this tentative point by entering values in the AccuDraw window. If you accept the tentative with a data point, you compass "sticks" in this location.

Shortcut snap modes

AccuDraw provides a shortcut alternative for selecting a few snap modes. Instead of selecting the snap mode from the status bar or the Snaps button bar, you can use on of the following keyboard shortcuts:

- **<N>** — Nearest
- **<C>** — Center
- **<I>** — Intersect

In addition, you can press **<K>** to set the keypoint snap division when using AccuDraw.



Deleting elements

To delete an element:

- Choose the **Delete Element** command from the **Main** toolbar.

- Move your cursor over the element (it will highlight).

  Note: The element highlights if **Identify Elements Automatically** is on in **AccuSnap Settings** (discussed later in this chapter). If this option is not on, **<D>** or snap to identify the element.

- **<D>** to accept the deletion.

  Note: Choose **Element Select** or another tool to get out of the **Delete** command.

Using the Undo and Redo commands

When you delete an element, it is moved to the **Undo** buffer, so MicroStation actually remembers everything that is placed in the design file, even after it's gone. You can retrieve a deleted element using the **Undo** command (**Edit > Undo**). The **Redo** command (**Edit > Redo**) negates the last **Undo** command.

The **Undo** and **Redo** commands not only work on deleted elements, but on most graphics commands. For example, you can place a line, use **Undo** to remove the line, then use **Redo** to re-place the line.

The Undo buffer is virtually unlimited in size (it's only limited by the operating system file size limit).

The **Undo** and **Redo** commands can also be accessed from the **Standard** toolbar (**Tools > Standard**).

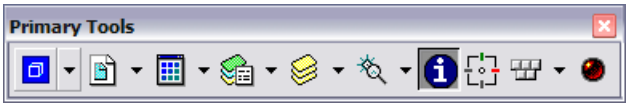
Note: Compressing the design file (**File > Compress Design),** or exiting the design file clears the Undo buffer.

Compressing the design file

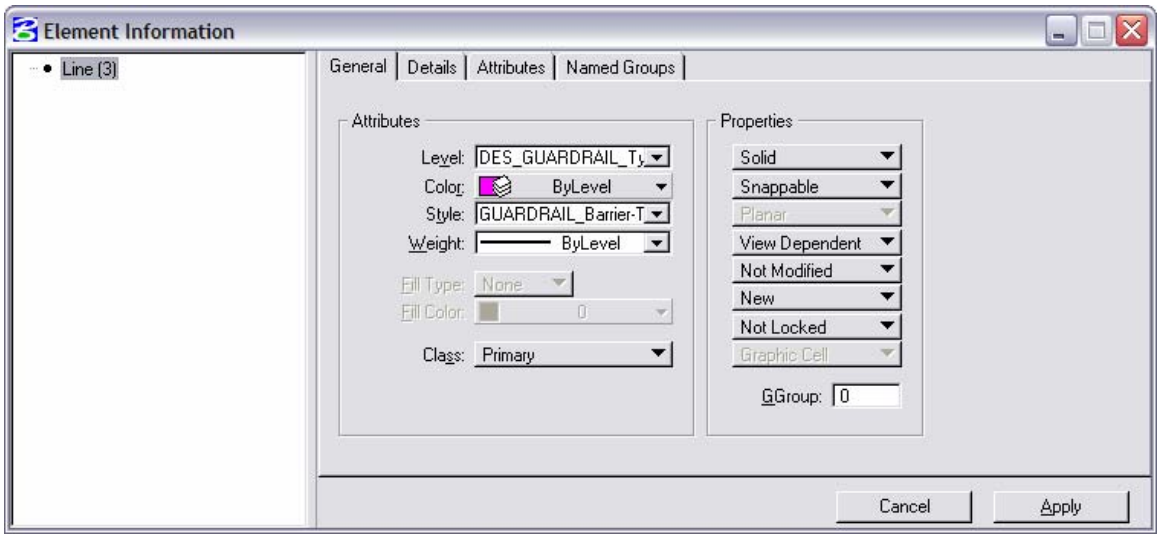
Select **File > Compress > Design** to permanently remove deleted elements from the Undo Buffer. This will make your design file smaller and more efficient. However, you will lose your **Undo** history for the design file session.

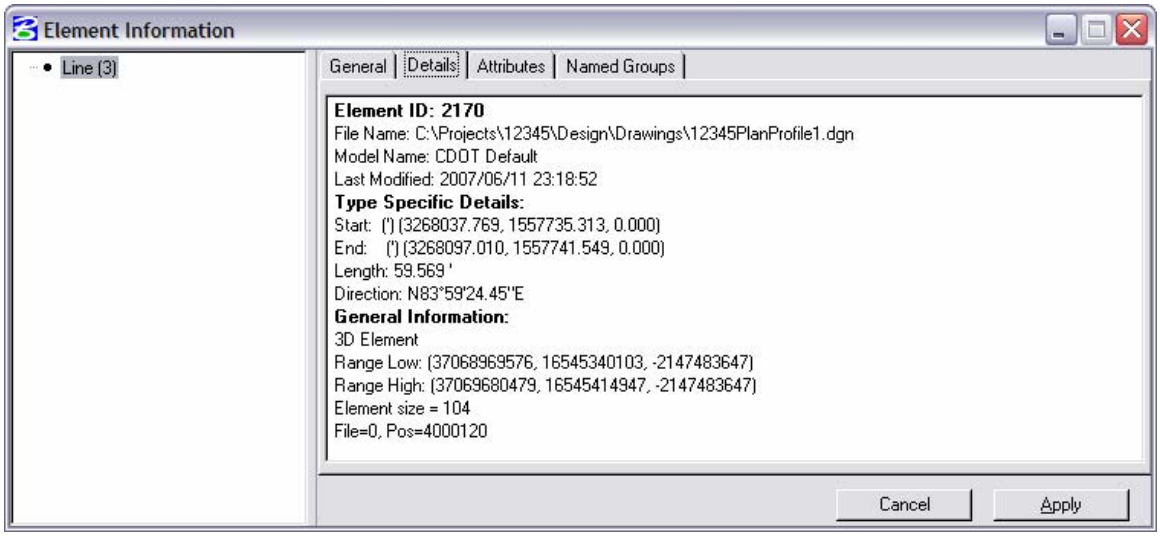
Element Information

Use the **Element Information** command from the **Primary** toolbar to analyze an element for general and detailed information.



Select the command, then **<D>** on an element to get general information on the element's attributes and its properties (solid, snappable, *etc*.) You can change any information on the **General** tab to update the element. The **Details** tab contains information on the element's geometry, including coordinates, size, *etc*.





Lab 5A– Drawing Basics using the CDOT Menu

In this lab you will learn how to access the CDOT Menu and become familiar with its different components and operation. You will use the CDOT Menu to set standards (level, color, line style, line weight), automatically select drawing tools and then place basic elements (lines, circles, arcs, etc.).

Objectives

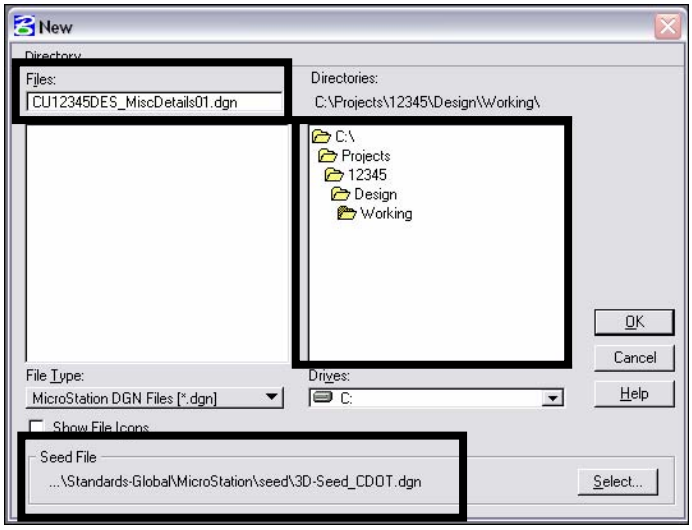
After completing this exercise you will know how to:

- Access the CDOT Menu
- Access the CDOT Bridge Menu
- Use the CDOT Menu to set element attributes.
- Use the CDOT Menu to place basic elements (lines, arcs, circles, shapes, etc.)
- Use the **Delete** command.
- Use the **Undo** and **Redo** functions.
- Change the element highlight color.

Create a Miscellaneous Details file

Create this file to practice placing graphics using the CDOT Menu, as well as to draw a few miscellaneous details that later can be placed on a sheet.

1. Start MicroStation from your desktop shortcut or from the **Start** Menu.
2. In the **MicroStation Manager**, select **File > New**.
3. Verify the **Seed File** is set to **3D-Seed_CDOT.dgn**.

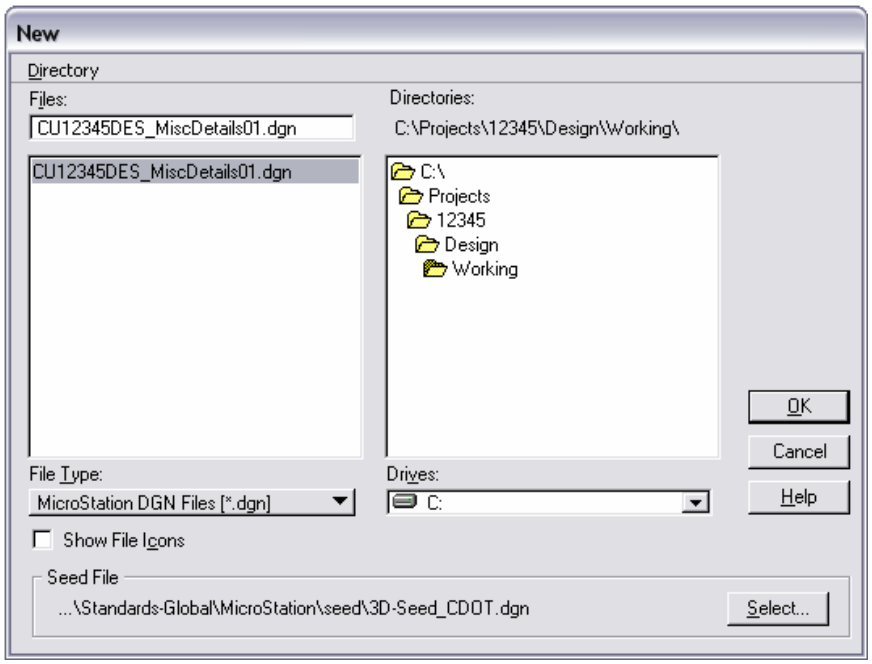


4. Set the **Directory** to **\Design\Working**.

5. Key in a file name **CU12345DES_MiscDetails01.dgn**.

   Note: CU stands for "CDOT User" the initials you'll use for training purposes.

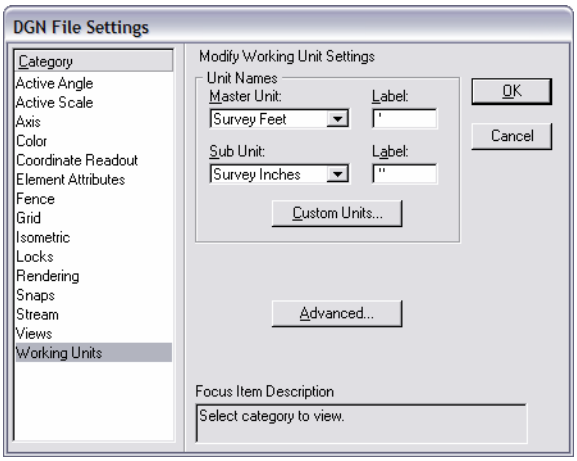
6. Select **OK**.



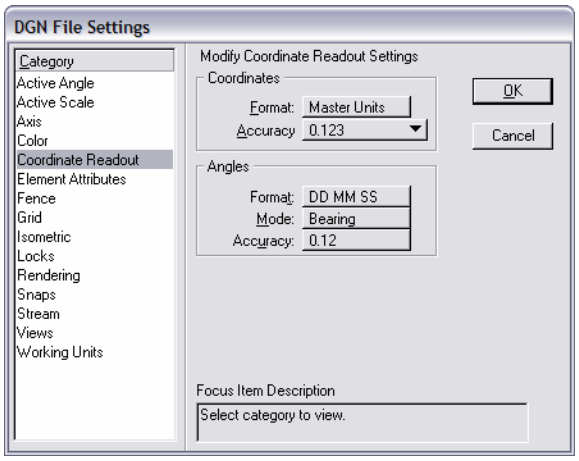
7. With the **CU12345DES_MiscDetails01.dgn** file highlighted in the **MicroStation Manager**, select **OK** to open it.

Check Seed File Settings

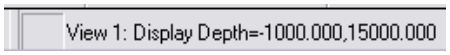
1. Select **Settings > Design File > Working Units** and review the CDOT defaults.



2. In the DGN File Settings box, s0elect **Coordinate Readout** and review the CDOT defaults.



3. **Cancel** the dialog box.
4. Key in ***dp=$*** to check the display depth.
5. **<D>** anywhere in the view to select it.
6. Review the CDOT defaults in the message field.



7. Key in ***az=$*** to check the active depth.
8. **<D>** anywhere in the view to select it.
9. Review the CDOT defaults in the message field.

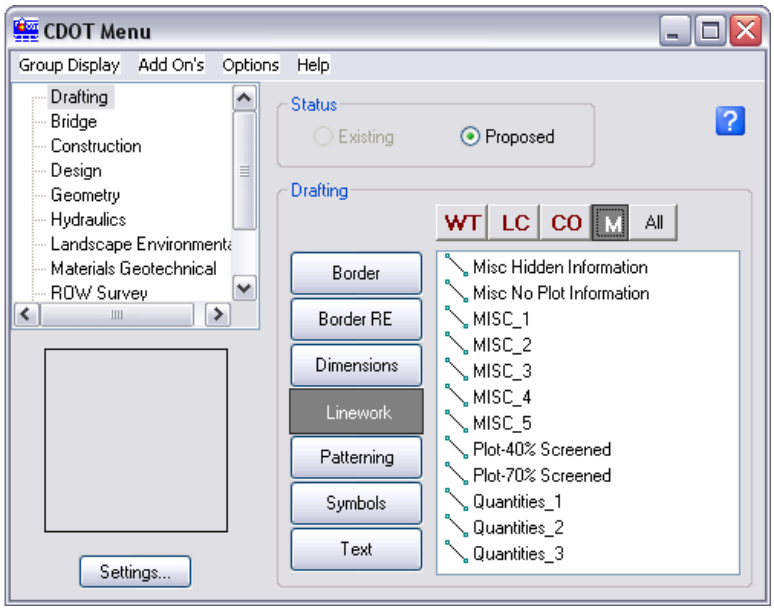
Open the CDOT Menu

1. On the Main toolbar, select the CDOT icon.

Note: On the CDOT Group Menus toolbar, select **Group Menus > CDOT Menus**.

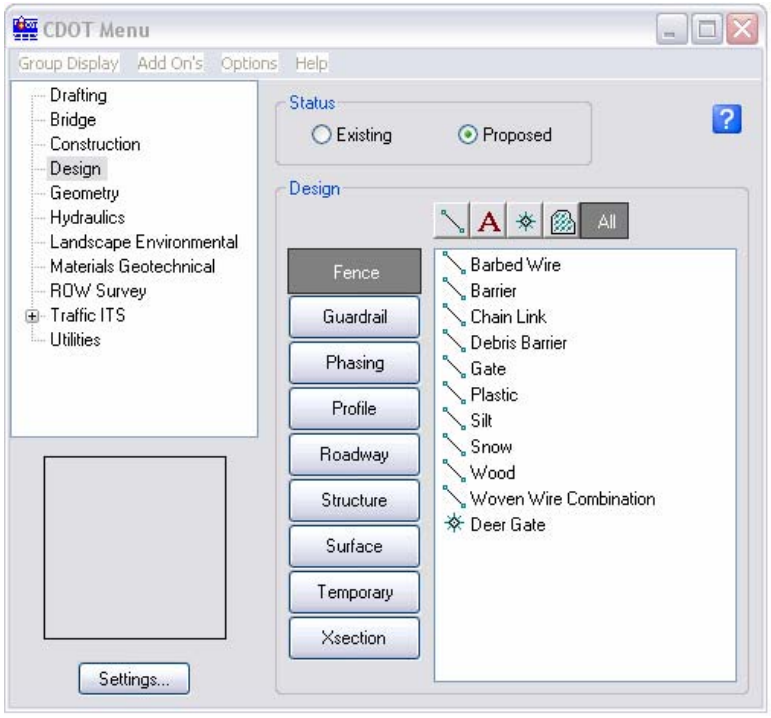
The CDOT Menu V03.02 opens.

2. On the CDOT Menu, select **Group Displays > Drafting** (if not already toggled on).



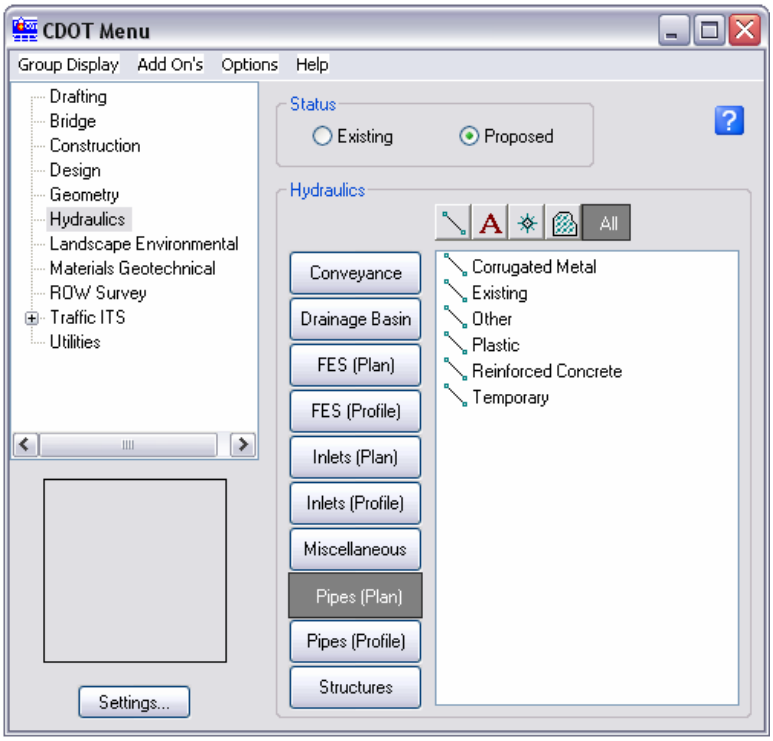
3. Review some of the categories and items available for general drafting.

4. On the CDOT Menu, select **Group Displays > Design**.



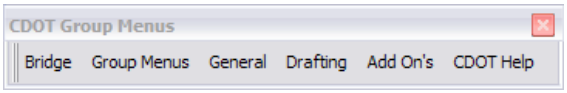
5. Review some of the categories and items available for the **Roadway Design Group**.

6. On the CDOT Menu, open other groups of interest (Hydraulics, Traffic, Utilities, etc.) and review the available categories and items.



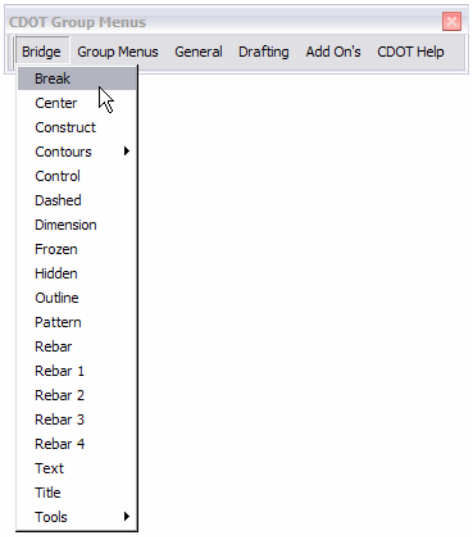
7. On the CDOT Group Menus toolbar, select **Group Menus > Bridge**.

The CDOT Group Menus updates to show the options for **Bridge**.



Note: The Bridge Menu is a different interface from the other Groups, which are located within the CDOT Menus.

8. Select the Bridge pull-down menu and review the categories and items available in the Bridge Menu.

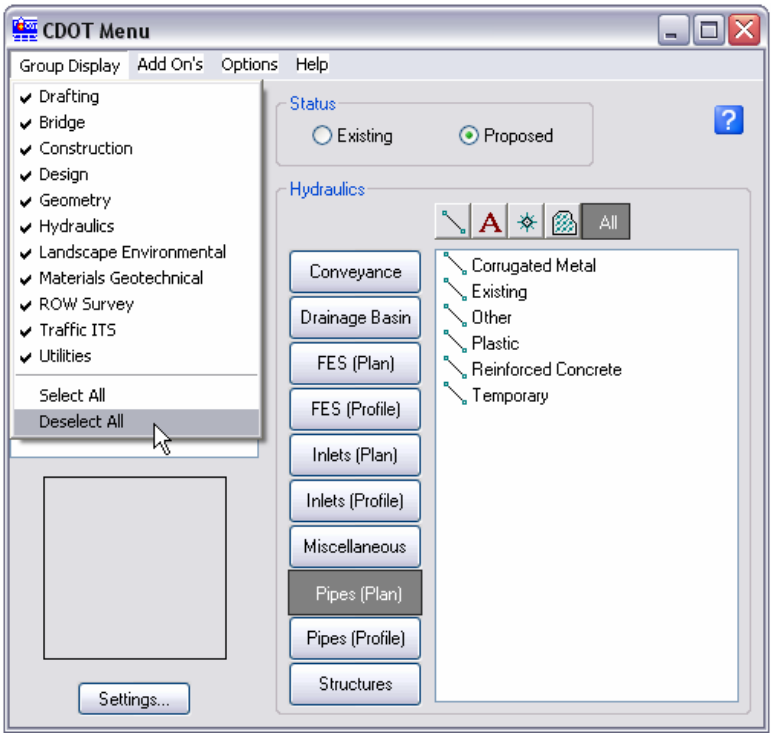


Note: All other pull-downs from the Bridge Menu (Group Menus, General, Drafting, etc.) will open **the CDOT Menu V03.02**.

Place practice graphics with the CDOT Menu

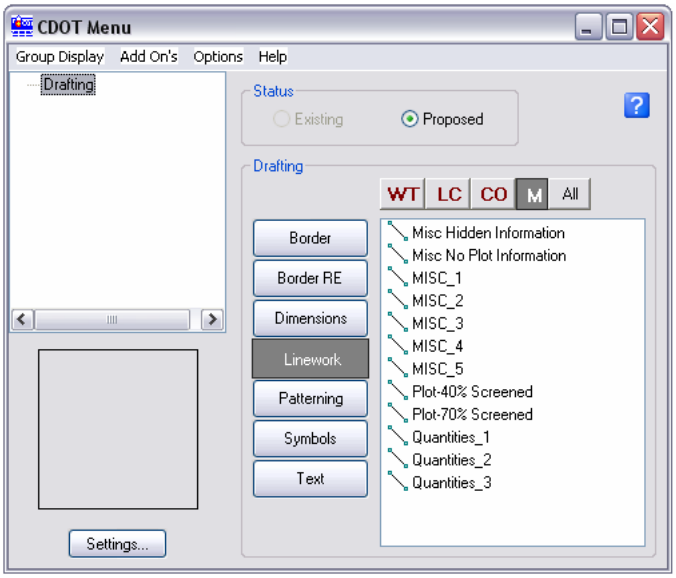
Place Lines

1. On the CDOT Menu, select **Group Display > Deselect All** to turn off all groups.



2. Select **Group Display > Drafting**.

3. In the CDOT Menu Explorer, select **Drafting** to show the **Drafting** Categories.

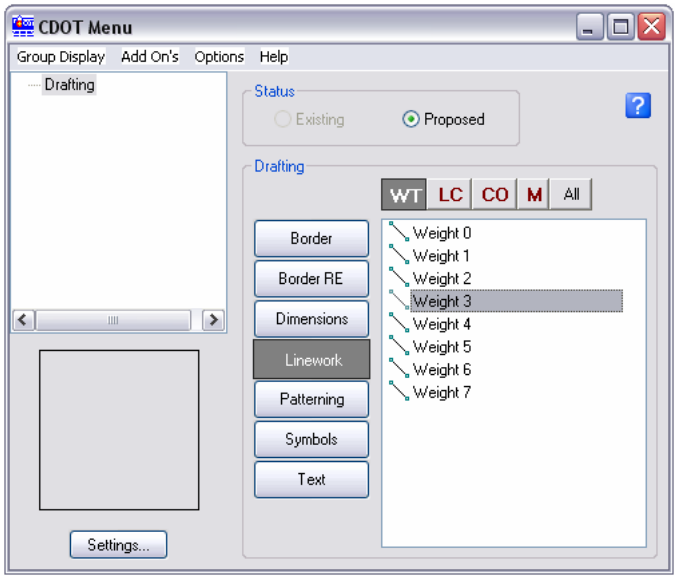


4. Select the **Linework** category.

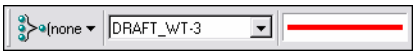
   This category is used for general drafting work that is placed on standard drafting level. The Filters are used to organize the different linework Items.

5. Set the Filter to **WT**, for line weight

6. Select the Item **Weight 3**.



   The filter determines the appropriate drafting level for the **SmartLine**. The Smartline command is the default for this menu. All other drafting commands should be either be picked from the Main tool bar or entered as a key-in.

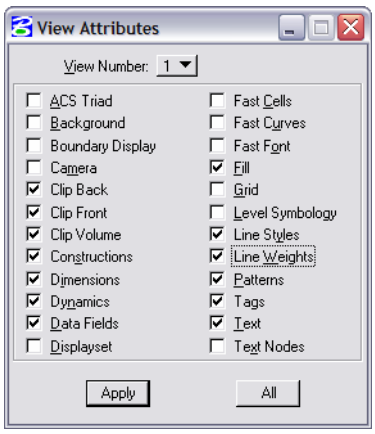


7. Data point in View 1 to enter vertices for the **SmartLine**.

8. **<R>** when finished.

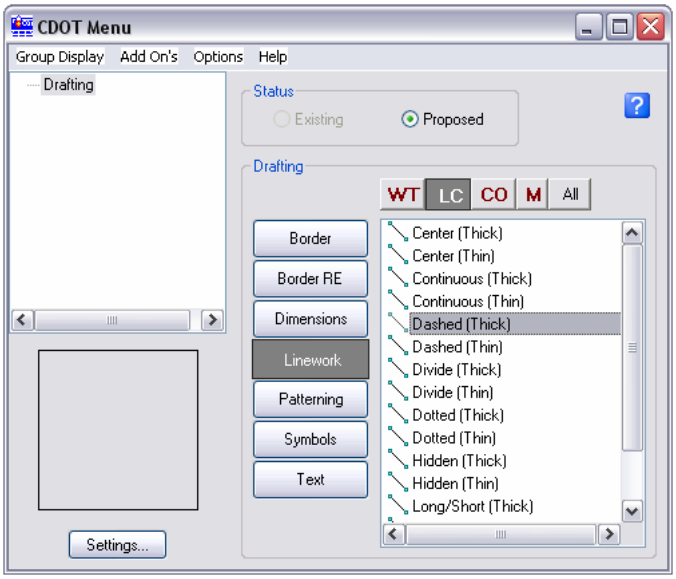
   Note: Always **<R>** when you are finished drawing an element. The active drawing tool (in this case SmartLine) remains active so that you can place another line without having to re-select the item from the menu.

9. The seed file settings have line weights turned off to provide a better on screen display. To see the line weights, select **Settings > View Attributes,** turn **Line Weights** on and select **Apply**.

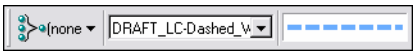


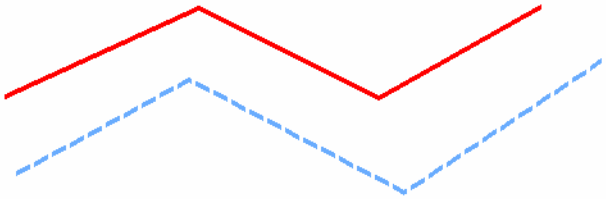
10. Set the **Filter to LC**, for linestyle.

11. Select the Item **Dashed (Thick)**



12. Place another **SmartLine** and note the change in line style and the active level on which it is placed.

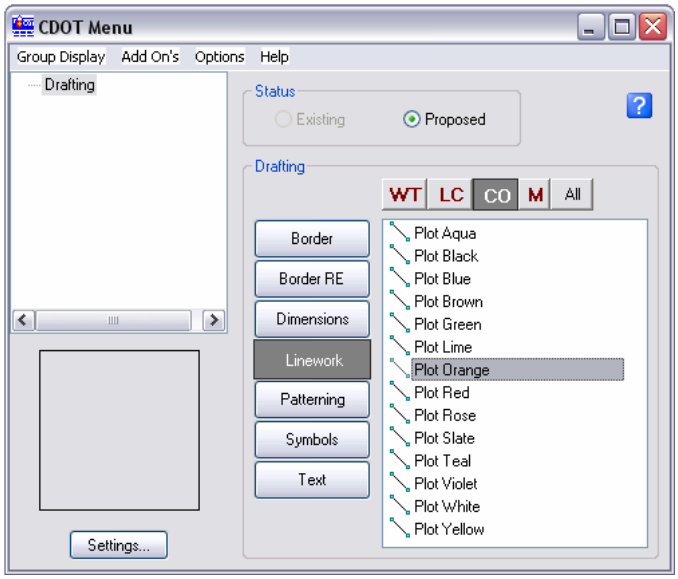




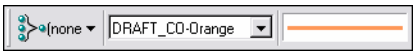
13. **<R>** when done.

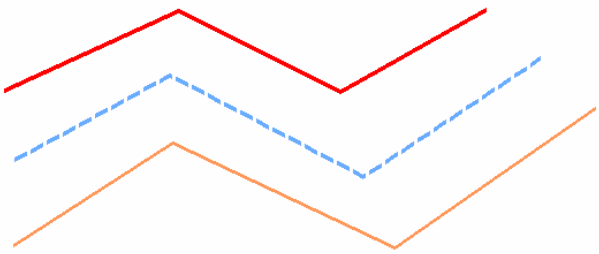
14. Set the **Filter** to **CO, for Color.**

15. Select the Item **Plot Orange**.



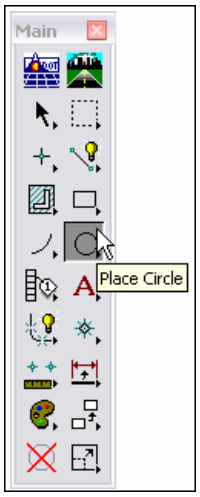
16. Place another **SmartLine** and note the change in both line style and color and the active level on which it is placed.



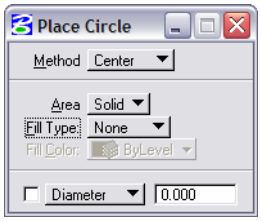


Place Circles

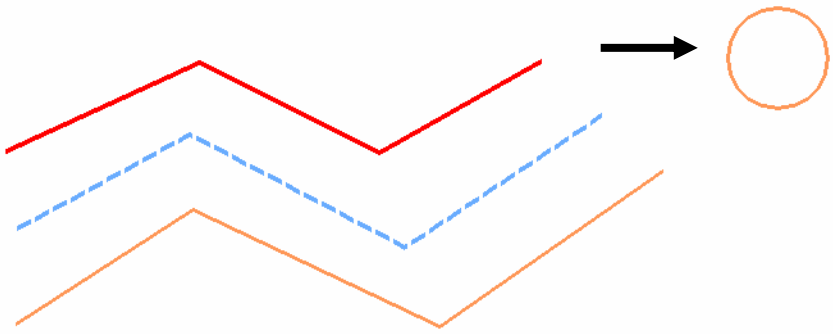
1. In the CDOT Menu, set the **Category**, **Filter** and **Item** to establish whatever level and symbology you like.
2. From the **Main** tool palette, select the **Circle** icon.



3. In the **Tool Settings** box, set **Fill Type** to **None.**

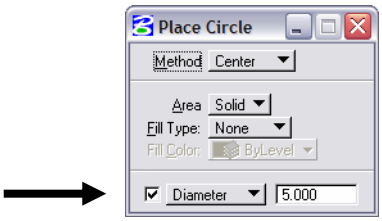


4. Follow your prompts and **<D>** to identify the center of the circle, then **<D>** to place a point on the circle.



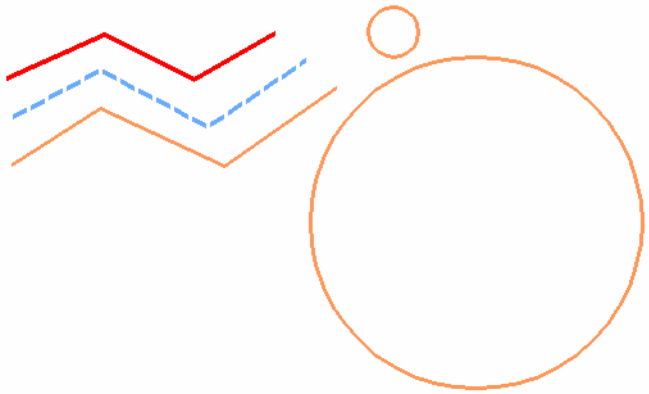
5. **<R>** when done.

6. In the **Tool Settings** box, toggle on **Diameter** and key in a value of ***5***.



Note: ***Important!*** Don't forget to tab after keying in the value. Otherwise, your entry will not be accepted. ***This is true for all fields in MicroStation dialog boxes.***

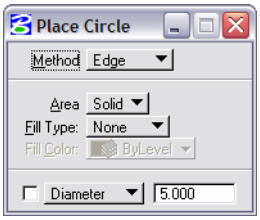
7. **<D>** to identify the center of the 5 ft. diameter circle.



8. **<R>** when done.

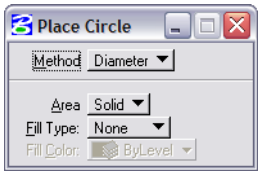
9. Practice placing circles with other diameter or radius values.

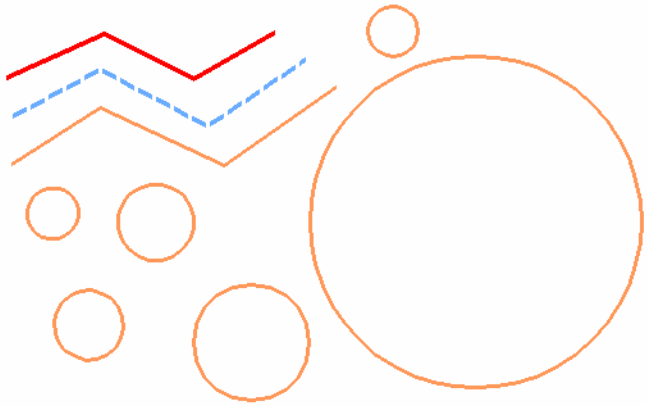
10. In the **Tool Settings** box, set **Method** to **Edge** and toggle off the **Diameter** or **Radius** constraint.



11. Follow your prompts and **<D>** to place a circle by specifying three edge points. **<R>** when done.

12. In the **Tool Settings** box, set the **Method** to **Diameter** and follow your prompts to place a circle with two points for the diameter. **<R>** when done.

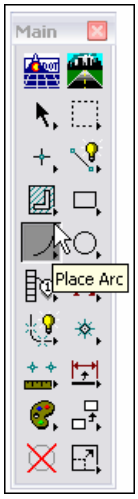




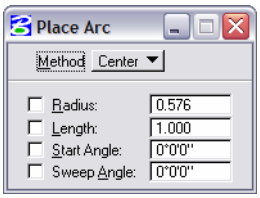
Place Arcs and Shapes

1. In the CDOT Menu, set the **Category**, **Filter** and **Item** to establish the correct level and symbology.

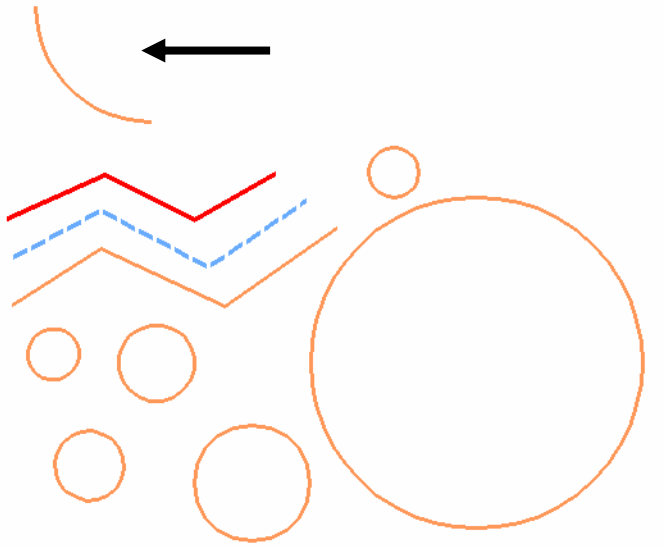
2. From the Main tool palette, select the **Arc** icon.



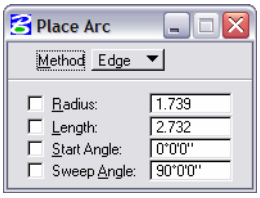
3. In the **Tool Settings** box, set the **Method** to **Center**.



4. Follow the prompts and **<D>** anywhere to place the first arc endpoint.
5. **<D>** to define the arc center.
6. **<D>** to define the second endpoint.

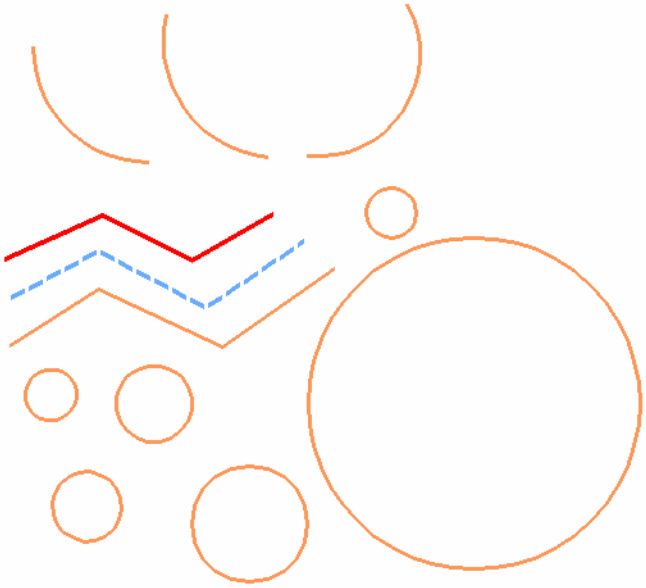


7. **<R>** when done.
8. In the **Tools Settings** box, set the **Method** to **Edge**.

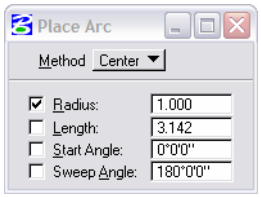


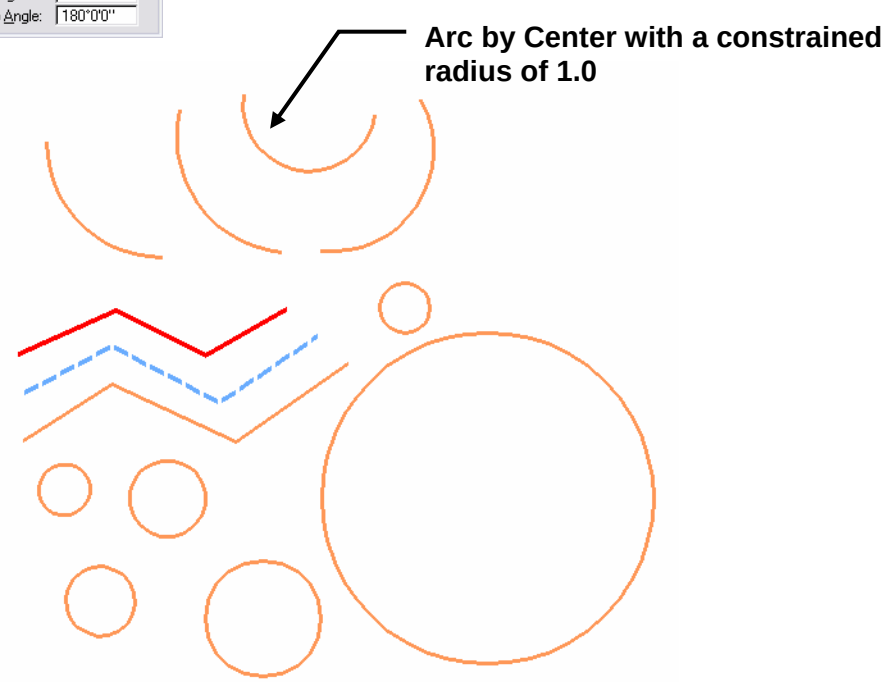
9. Follow the prompts to place an arc by 3 points.

10. Repeat the above step, but place the arc in the opposite direction.

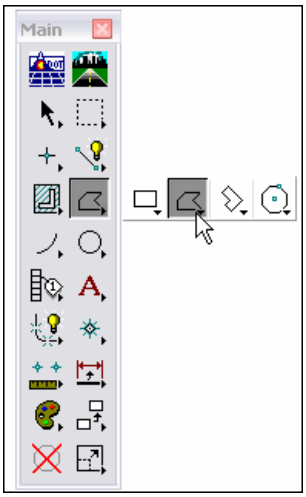


11. Using either the **Center** or **Edge** methods, constrain the radius and place another arc.

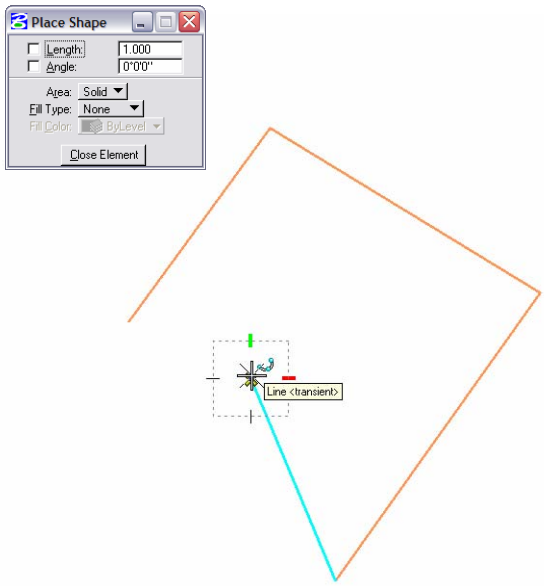




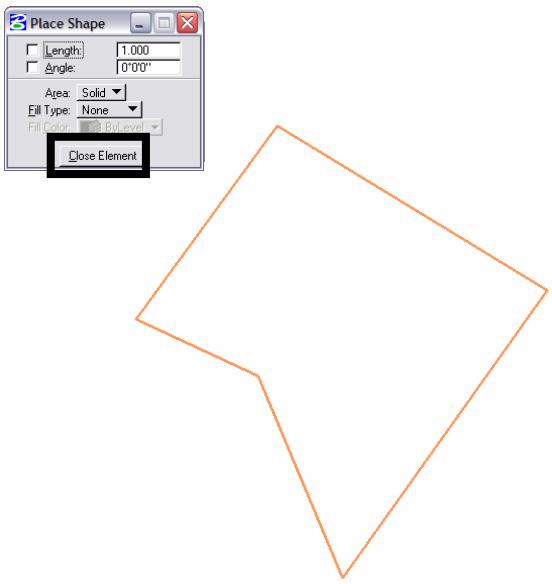
12. Try setting other constrains and place additional arcs.
13. **<R>** when done.
14. In the Main tool bar, set the select the **Place Shape** icon.



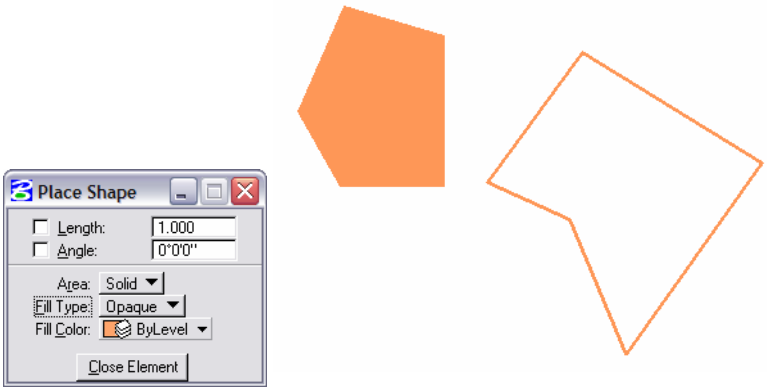
15. <D> to place vertices for an unconstrained shape.



16. For the last data point (to close the shape), select **Close Element**.

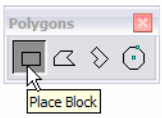


17. In the Tool Settings box, set **Fill Type** to **Opaque** and place another shape.



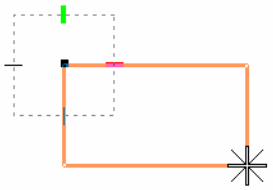
18. Set Fill Type back to **None**.

19. On the Polygons toolbar, select **Place Block**.

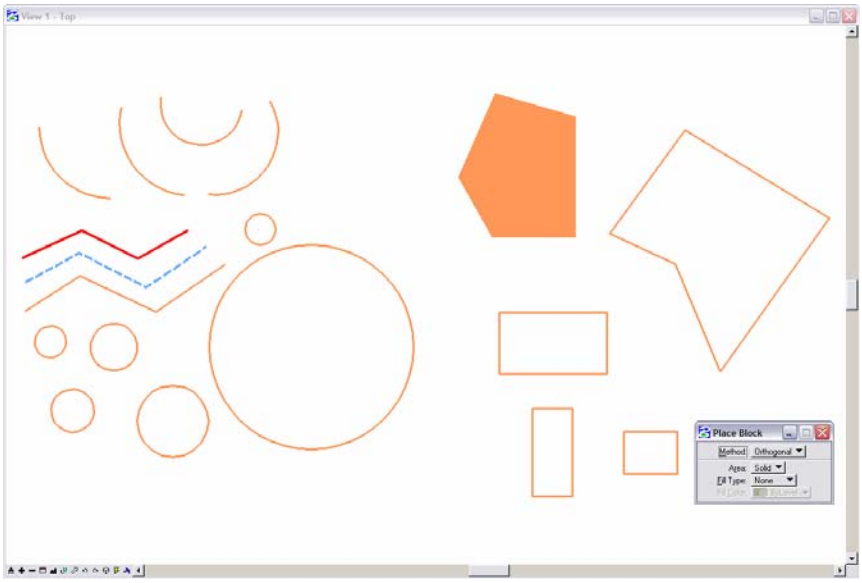


20. **<D>** for the first corner of the block.

21. **<D>** for the opposite corner.



22. Place a few more blocks until you're comfortable with the command.

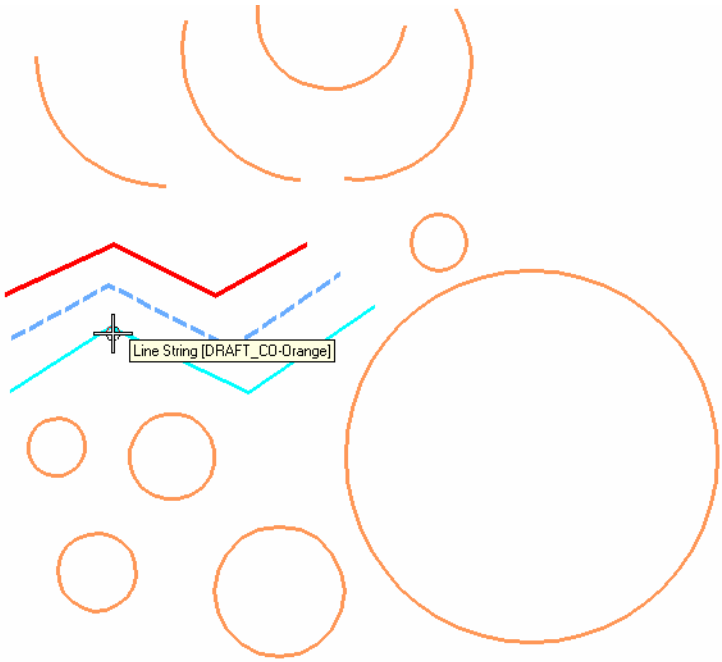


Delete and Undo

Delete an element

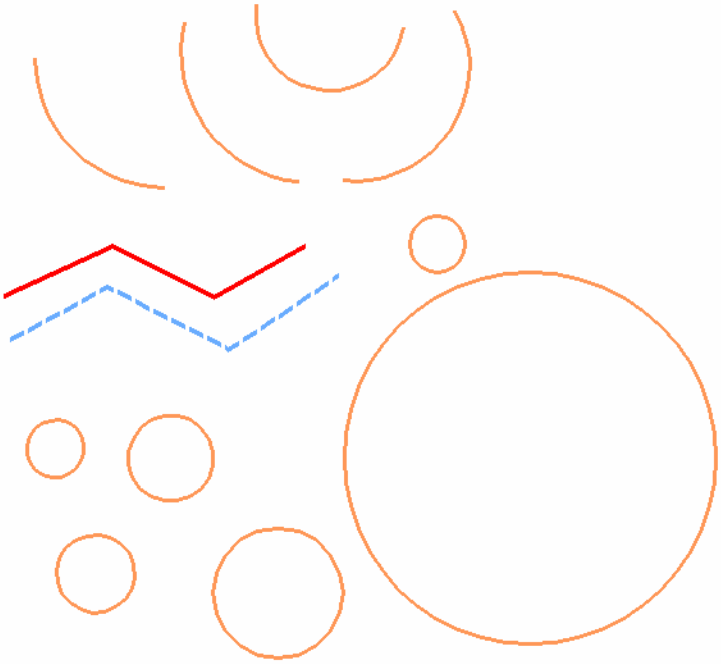
1. **Fit** View 1.
2. From the **Main** toolbar, select **Delete Element.**

3. Move your cursor over the orange line until it highlights.

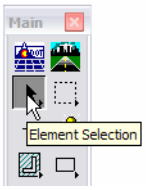


Notice the highlight color is light blue.

4. **<D>** to delete.

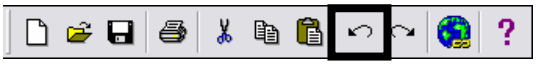


Note: Choose **Element Select** or choose another tool to get out of the **Delete** command.



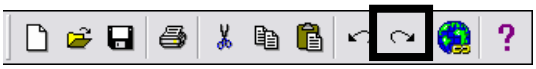
Undo and Redo the deletion

1. From the **Standard** toolbar, select **Undo.**



The line reappears.

2. Select **Redo.**



The line is deleted again.

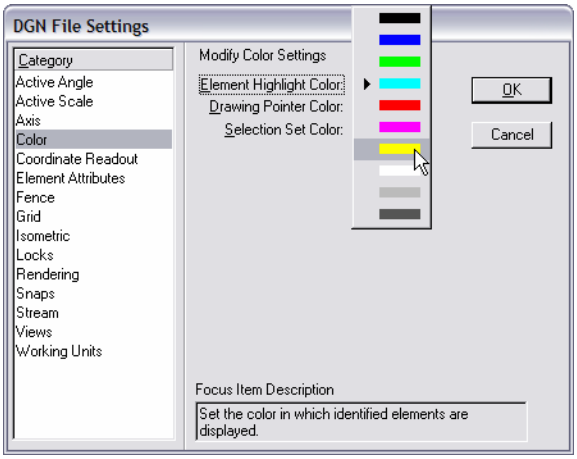
Notes: You can also choose **Edit > Undo** to reverse the previous action and get a description of what you are undoing.

In addition to the **Delete** command, the **Undo**/**Redo** commands work for most MicroStation drawing tools.

If you have coincident elements, **<R>** until the element you want to delete highlights, then **<D>** to delete.

Change the Element Highlight Color

1. Select **Settings > Design File > Color.**
2. Set **Element Highlight Color** to **Yellow.**



3. Select **OK.**

4. Choose **Delete Element** from the **Main** toolbar.
5. Move your cursor over an element until it highlights.
6. Notice the highlight color is now yellow.
7. **<D>** to delete the element.

   The **Delete Element** command remains active and you can continue deleting elements.
8. Set the highlight to a color you prefer.

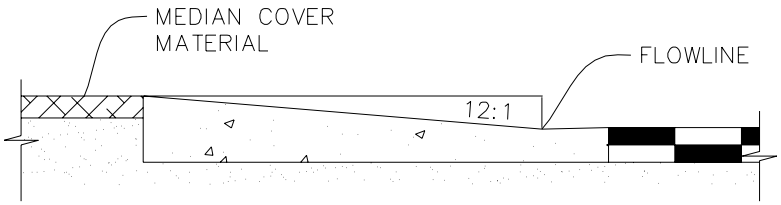
Delete all

1. Select **Edit > Select All** to put all elements you've drawn in a MicroStation selection set (you'll learn more about selection sets later).
2. Choose **Delete** from the **Main** toolbar.

   All elements selected are deleted.
3. Do not exit MicroStation. Continue to the next lab.

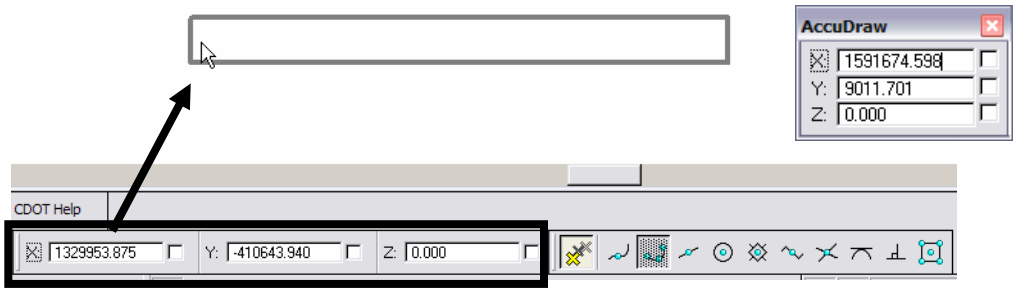
Lab 5B – Draw the Median Island Nose Section

In this lab, you'll draw the nose section shown below using AccuDraw and precision keyins.

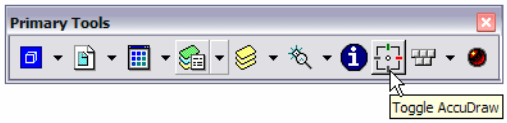


SECTION A–A

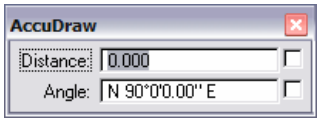
1. From the bottom of the MicroStation screen, drag the AccuDraw Window and float it in the view.



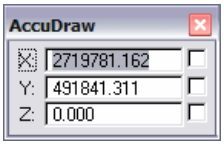
Note: If AccuDraw is not on, toggle it on from the **Primary** toolbar.



If your compass is set to **Polar** mode, switch it to **Rectangular** mode by pressing **<spacebar>** on the keyboard.



Polar Compass



Rectangular Compass

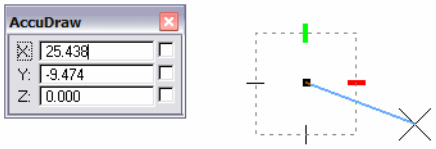
Draw the concrete gutter pan section

1. On the CDOT Menu, set the **Explorer** to **Drafting**, the **Category** to **Linework**, the **Filter** to **WT** and select Item **Weight 1**.

2. Key in ***xy=1000,1000*** to define the starting coordinate for drawing the section (the upper left corner).

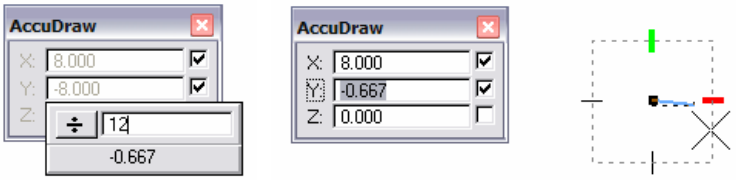
   Note: If you can't see the line's endpoint and it is "rubber banding" into the view, **Zoom Out** and then ***reset once*** **<R>** back into the **Place Line** command. If you zoom with your mouse wheel, you don't have to reset.

3. Set your cursor to slope down and to the right to establish the direction.



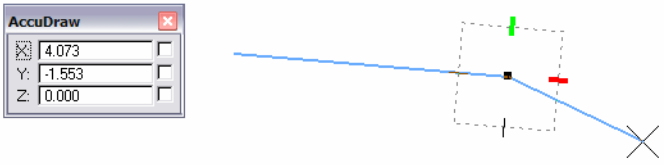
4. Use the **AccuDraw's** rectangular compass to place median's 8 ft. gutter pan at a 1:12 slope. Key in ***8*** for **X** and ***8/12*** for **Y.** (The Y value updates to -0.667). Make sure your cursor is set to slope ***down*** before entering the values.

   Note: Remember, ***do not*** move your cursor into the AccuDraw window to key in your values; you may lose your positive/negative axis orientation. The focus (blinking cursor) is already set for you in the **X** field – just start typing! Then, **<Tab>** or arrow down to the next field.



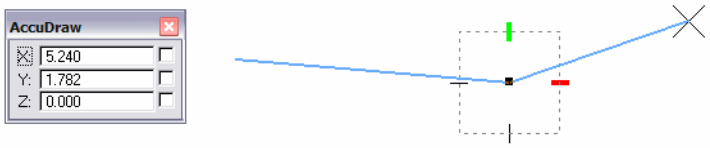
5. **<D>** to place the point.

6. **Zoom in**, if necessary, to see the line



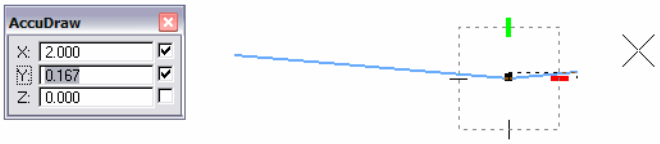
Note that the compass rotates to the segment. You actually want to place the next line from the horizontal axis, so you need to rotate the compass so that X is horizontal.

7. Press **V** on the keyboard to rotate the compass to the view. The X-axis (red tic mark) should now be horizontal.



8. Position your cursor up and to the right to establish the direction of the next segment.

9. Key in ***2*** for **X** and **2/12** for ***Y***. (The Y value updates to 0.167 to establish the slope on the next line).

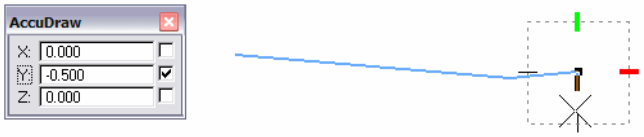


10. **<D>** to place the point.

11. Press **V** on the keyboard to rotate the compass to the view.

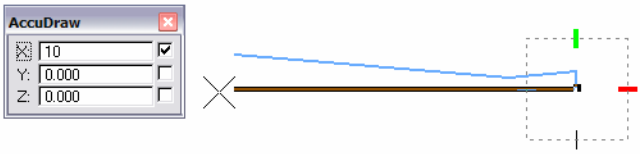
12. Lock your cursor on the –Y axis and key in .5 in the Y field for the next segment. **<D>** to place the point..

    Note: You don't have to key in the negative, AccuDraw knows the direction from your cursor location.

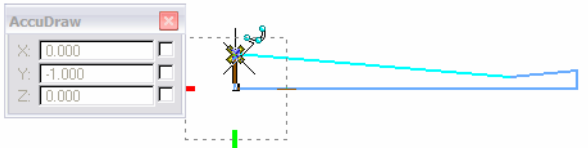


13. Press V on the keyboard to rotate the compass back to the view.

14. Lock your cursor on the –X axis and key in 10 in the X field. **<D>** to place the point.

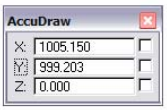


15. Hover over the starting point of the median section. When you see the bold X, **<D>** to AccuSnap to the point to complete.

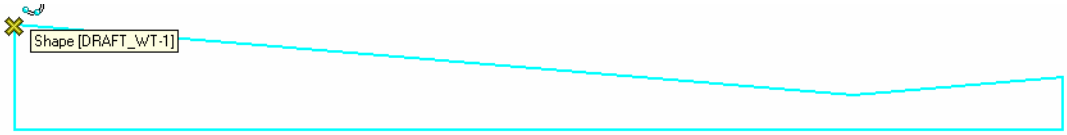


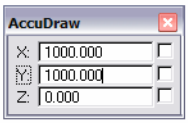
Draw the median cover

1. **Fit** the view.

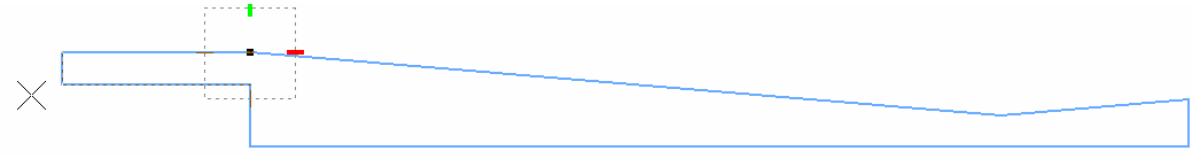


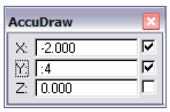
2. Select the **Place Block** command.
3. **AccuSnap** on the upper-left corner of the median.





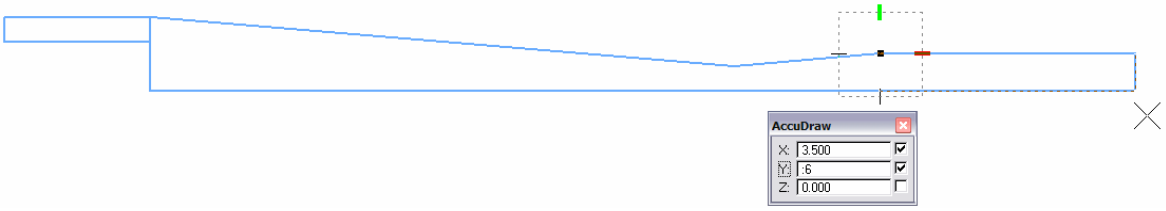
4. Place your cursor down and to the left to establish the direction.
5. Using **AccuDraw's** rectangular window, place a 2 ft. X 4 in. block as shown. Key in 2 for X and :4 for Y (don't forget the colon in front of the 4 to specify inches.) **<D>** to place the point.
6. **<R>** when done.



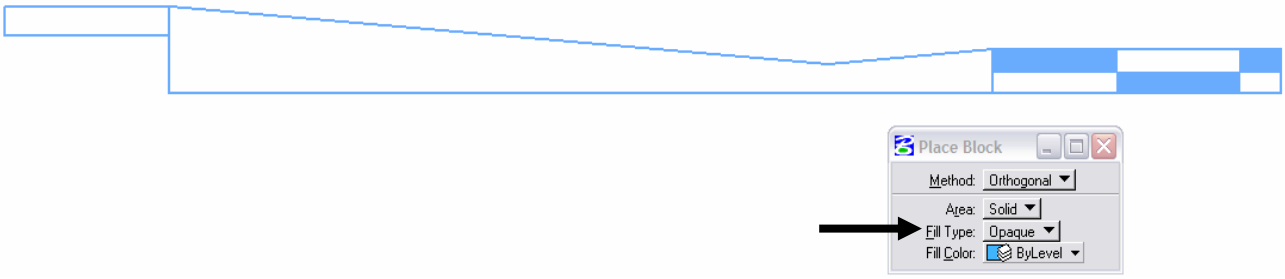


Draw the pavement section

1. While still in the **Place Block** command, **AccuSnap** on the upper-right corner of the concrete section.
2. Using **AccuDraw**, place a 3.5 ft X 6” block as shown.



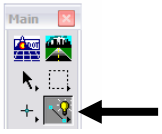
3. In the **Place Block Tool Settings**, toggle **Fill Type** to **Opaque**.
4. Use **AccuDraw** to place two 1.5 ft X 3 in. and one 6 in. X 3 in. filled blocks to create the pattern as shown.



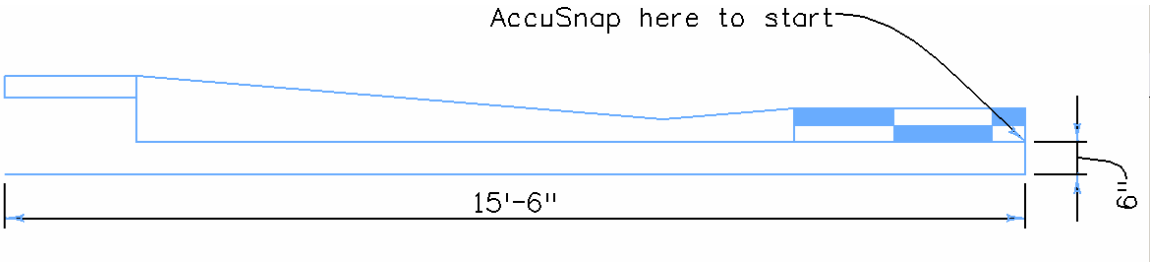
5. Set **Fill Type** back to **None**.

Draw the subgrade section

1. Select the **Place SmartLine** tool.

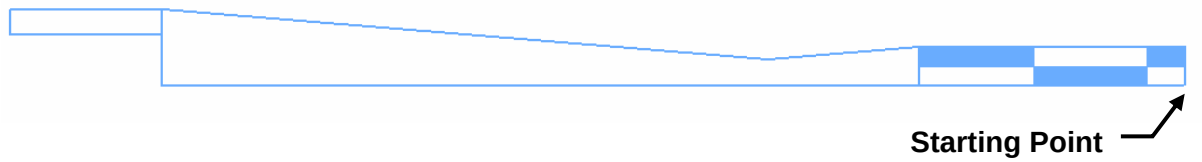


2. **AccuSnap** on the lower-right corner of the asphalt to start the subgrade.



3. Use the information above to place the **SmartLine** using **AccuDraw**.

4. To practice drawing these lines again using precision keyins**, Delete** the two lines you just placed to start over.



5. Re-draw the two lines using the ***dx=*** precision keyin (delta keyin).

   - AccuSnap to the starting point.
   - Key in ***dx=,-:6*** for the first line.
   - Key in ***dx=-15.5*** for the second line.

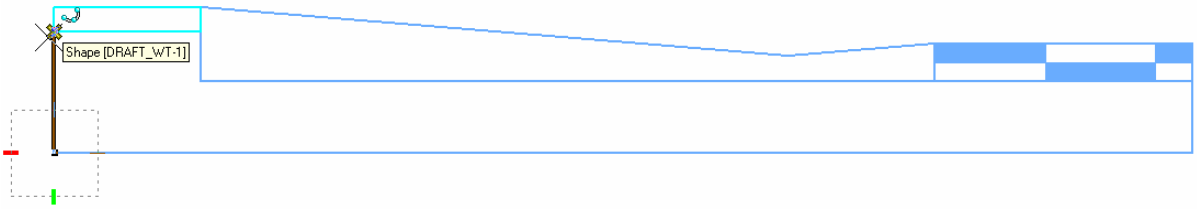
   Note: Don't forget the negative signs. You could also key in ***.5*** instead of ***:6*** and ***15:6*** instead of ***15.5***.

6. Again**, Delete** the two lines you just place to start over.

7. Re-draw the two lines using the ***di=*** precision keyin (distance, direction keyin).

   - AccuSnap to the starting point.
   - Key in ***di=:6,-90*** for the first line.
   - Key in ***di=15.5,180*** for the second line.
   - AccuSnap to the location shown to finish.

   Note: You don't need the negative signs because of the direction.



8. **Fit** the view.

   You've now used MicroStation's two main techniques for precision placement – precision keyins and **AccuDraw**. By using each method, you can compare the two methods and determine which you prefer.

   You'll practice more with precision keyins and AccuDraw in later labs.

9. Save Settings (**File > Save Settings**).

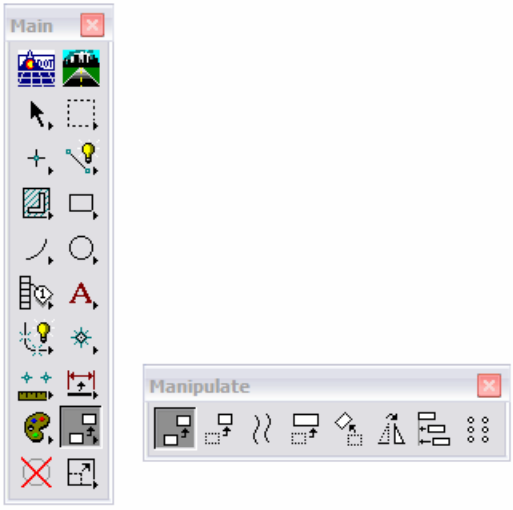
10. **Exit** MicroStation.

6. Manipulating and Modifying Design Graphics

Using Manipulate tools

Now that you know how to place basic elements and control their placement using various locks and snap modes, you're ready to learn how to manipulate and modify the elements you've placed.

The **Manipulate** toolbar commands allow you to manipulate the entire element (copy, move, rotate, scale, *etc*.). Follow your prompts closely to properly execute the commands.



Some of the more commonly used commands include:

Copy

Copies an element from one location to another.

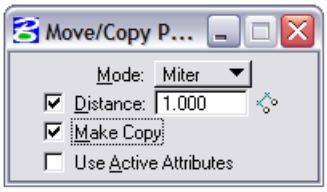
Move

Moves an element from one location to another.

Move Parallel

Moves or copies an element parallel to the original element using one of three modes.

- ***Miter*** — extends or shortens the segments while maintaining the angle of their connections
- ***Round*** — fills the gap with a rounded arc between the two moved elements or
- ***Original*** — the resulting element is the same type as the original element.



The ***Miter*** and ***Round*** modes also help eliminate "loops" that sometimes form in interior corners of the offset element using the **Original** mode.

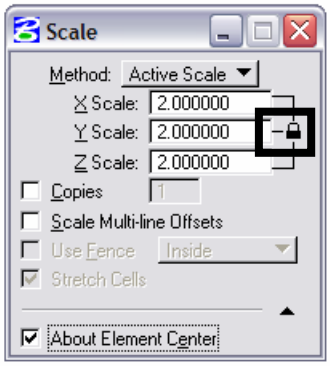
If you specify a distance, you only need to data point the direction.

With **Use Active Attributes** on, the parallel element takes on the active level, color, style and weight.

Scale

Resizes an element based on one of two methods:

- Active scale or
- 3 points.



The lock icon allows you to type in a value once and have it apply to all locked fields. If the lock is 'open', you can enter individual values in the different fields.

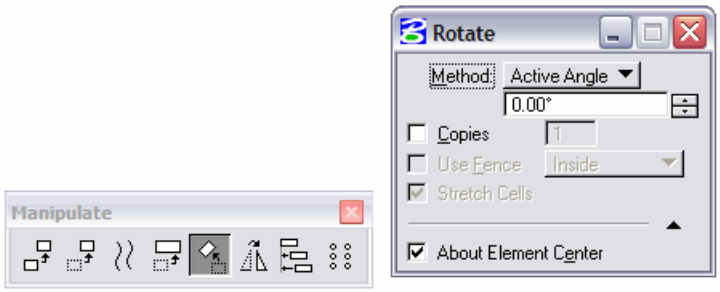
If you like, you can create a copy or copies of the scaled element.

Under **Show Extended**, you can toggle on **About Element Center**, which, when used with the **Active Scale** method, allows you to scale about the element's center with just one data point.

Rotate

Rotates an element using one of three methods:

- **Active Angle**
- **2 Points** or
- **3 Points**.

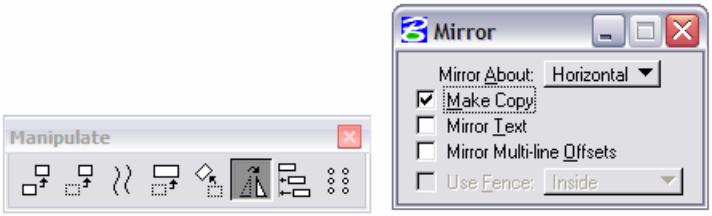


Like the **Scale** command, you can toggle on **About Element Center** under **Show Extended**, which allows you to always rotate about the element's center.

Mirror

Mirrors an element using one of three methods:

- ***Horizontal*** — about horizontal axis
- ***Vertical*** — about vertical axis or
- ***Line*** — about line defined by two data points.



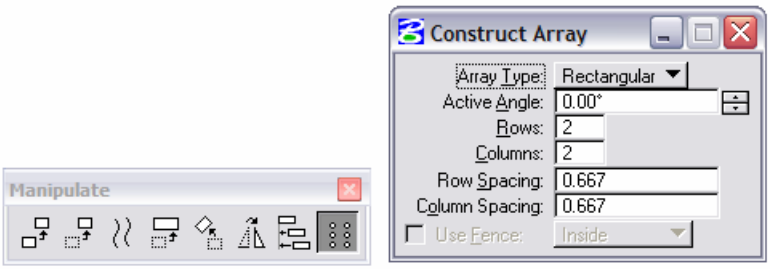
Align Edges

Aligns the edge of one element with the edge of another element using one of the following alignment options: Top, Bottom, Left, Right, Horizontal Center, Vertical Center, Both Centers

Construct Array

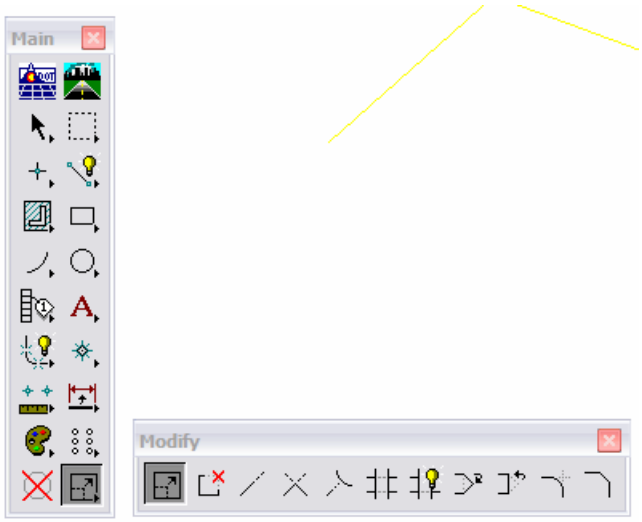
Copies elements multiple times in an array of two types:

- **Rectangular**
- **Polar**



Using the Modify tools

The **Modify** toolbar commands allow you to modify a piece or part of an element (trim, extend, partial delete), instead of manipulating it as a whole.



Modify

Modifies the geometry of an element. This tool works differently on different types of elements. For example, you can:

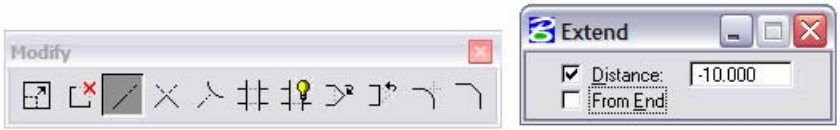
- Move a vertex or segment of a line, linestring or shape
- Scale a block or circular arc or
- Change a circle's radius.

Partial Delete

Deletes part of an element. The element can be closed, or you can delete an interior portion of line, linestring, curve or arc.

Extend

Extend or shorten a line or linestring.



If **Distance** is off, enter a data point to define the new endpoint (i.e. dynamically extend or shorten the line or linestring).

Note: Toggle on **From End** to extend/shorten from the nearest endpoint that you identify. If off, the line is extended/shortened relative to the origin point, no matter where you identify the line.

Extend Two Elements to Intersection

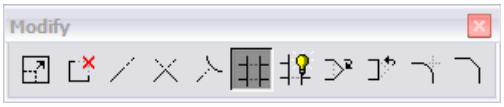
Extends two lines, linestrings, or arcs to their intersection. If the lines or elements currently intersect, it will shorten the elements to their intersection point.

Extend Element to Intersection

Extends one line, linestring or arc to intersect with another element (which does not have to be another line, linestring or arc). If the original element already intersects or overlaps the second element, it is shortened to the intersection point.

Trim

Trims an element at its intersection with a specified cutting element. You can trim multiple elements and you can have more that one cutting element.



When identifying elements to trim, always data point on the portion of the element that you want trimmed.

You can place two cutting elements in a selection set before executing the command and trim elements between them. However, a more effective way of accomplishing this is to use the **IntelliTrim** command.

IntelliTrim

Trims, extends or cuts multiple elements in one operation using two different modes:

- ***Quick Mode*** — allows you to draw a line through multiple elements to trim (or extend) to one cutting (or extension) element.
- ***Advanced Mode*** — allows you to select multiple cutting elements. You can trim or extend elements between or outside of the cutting elements.

To extend elements, set the **Operation** to **Extend** and follow the same steps to define an extension element and then draw a line through the elements to extend.

The Operation **Cut** will break elements in two pieces at the cutting element.

Insert Vertex

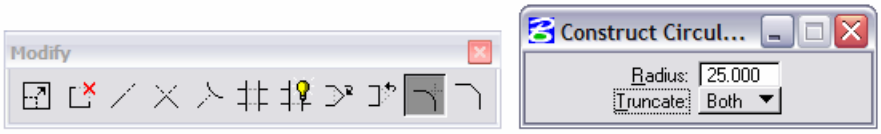
Inserts a vertex on a line, linestring or shape. It is also used to attach a line segment onto the end of a line or linestring.

Delete Vertex

Deletes a vertex on a line, linestring or shape.

Fillet

Constructs a circular fillet (an arc) of a specified radius between to elements or two sides of a linestring or shape. You can truncate one side, both sides or neither side of the original element.



Note: To fillet between 3D elements, they must be co-planar.

Chamfer

Constructs a chamfer between to lines or two sides of a linestring or shape.

Note: To chamfer between 3D elements, they must be co-planar.

Drawing graphics in 3D

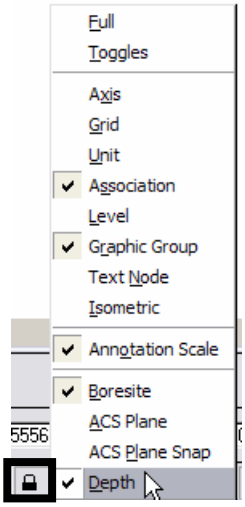
When drawing graphics in a 3D file, you can either draw planar graphics at a particular elevation, or you can draw 3D graphics (endpoints at different elevations).

Active Depth

To draw planar graphics at a particular depth in a 3D file, set the active depth to the desired depth <***az=depth***>, and then place the graphics. The active depth would be the elevation you want to place the graphics if you're drawing in the top view. For example, if you want to draw the 5000 ft. contour, set ***az=5000***, than draw the contour. All data points will be placed at a Z value of 5000. Unless you snap or AccuSnap to existing elements. See below.

Depth lock

When placing new graphics by snapping on to existing elements, you'll pick up the elements' elevation if **Depth** lock if turned off. **Depth** lock locks all of your data points onto the view's active depth plane. Therefore, if you want to place planar elements, but you're snapping on to elements at different elevations, set the active depth to the desired elevation <***az=depth***>, and then turn **Depth** lock on.

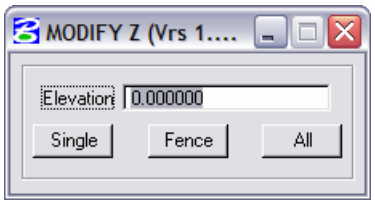


Depth lock and AccuSnaps

Depth lock behaves inconsistently with AccuSnap. Therefore, if you want to place element with **Depth** lock ***on***, turn AccuSnap ***off*** and **Tentative** snap to the elements.

Using the CDOT Menu ModZ Add On

Another way to set the elevation of an element in the top view of a 3D file is to move it (after it is placed) in the Z direction only. This is useful if you want to planarize elements to a specified elevation. The ModZ program is located on the **CDOT Menus**. Select **Add On's > ModZ Load**.



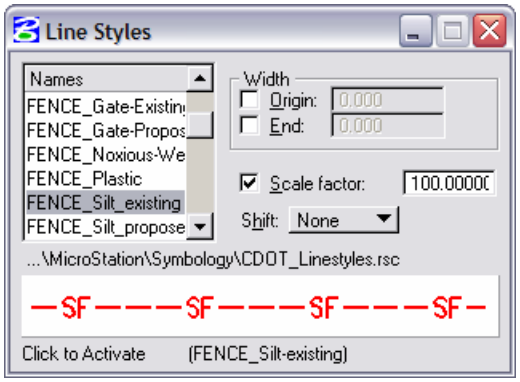
You can specify the elevation to planarize a single element, elements within a fence or all elements in the design file.

Custom Line styles

Custom line styles are used to represent various types of graphics in the CDOT MicroStation configuration. Custom line styles, unlike standard line styles, can be scaled. The line style scale should match the plot scale of the sheet file in which they will be referenced.

Setting the Scale

You should set the line style scale before placing the custom line style. The line style scale is set under **Element > Line Style > Custom**. In the default CDOT workspace, the custom line style scale is set to **100**. You only need to change the custom line style scale if you will eventually reference this file into a sheet with a different scale.



Note: Custom line styles are assigned to levels via **ByLevel** symbology. The line style is automatically selected with the level is set active.

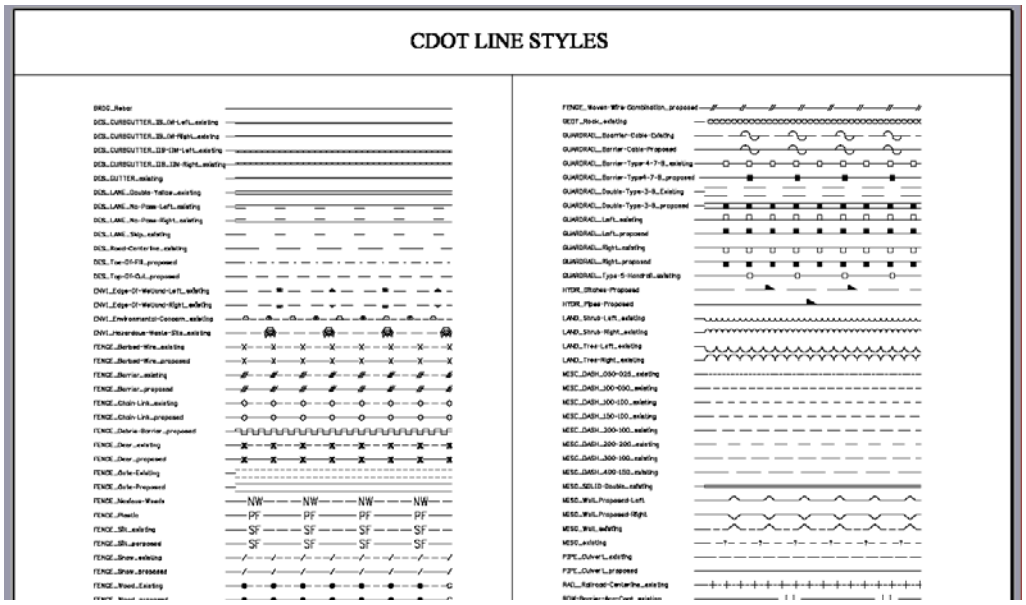
Changing the scale

If you have placed a line style at the wrong scale, you can change the scale with the keyin ***Change Linestyle Scale ##*** (where ## = the scale), and then select the element to change.

Changing Direction

Some custom line styles are directional and depend on the direction they are drawn (e.g. Type 3 guardrail). If you place a custom line style in the wrong direction, key in ***Change Direction***, and then select the element.

For more information on custom line styles, see the **CDOT CADD Manual**, ***Chapter Five – Drafting Standards, Section 5.7 – Line Styles*** and follow the **CDOT Line Styles** links.

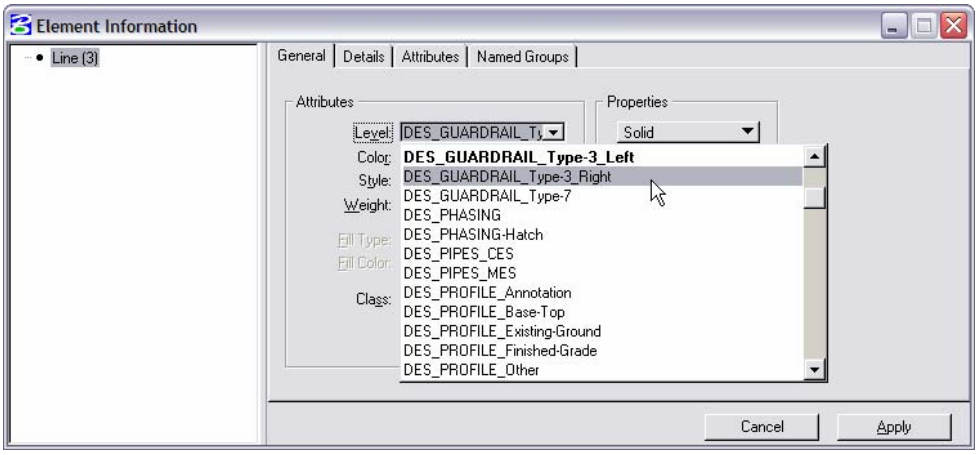


Changing Levels and ByLevel Symbology

If you place an element on the wrong level, and thereby place it with the wrong **ByLevel** symbology, you can change that element to the correct level. Once changed, the graphics will take on the new level's **ByLevel** symbology (as long as the element was originally placed **ByLevel**).

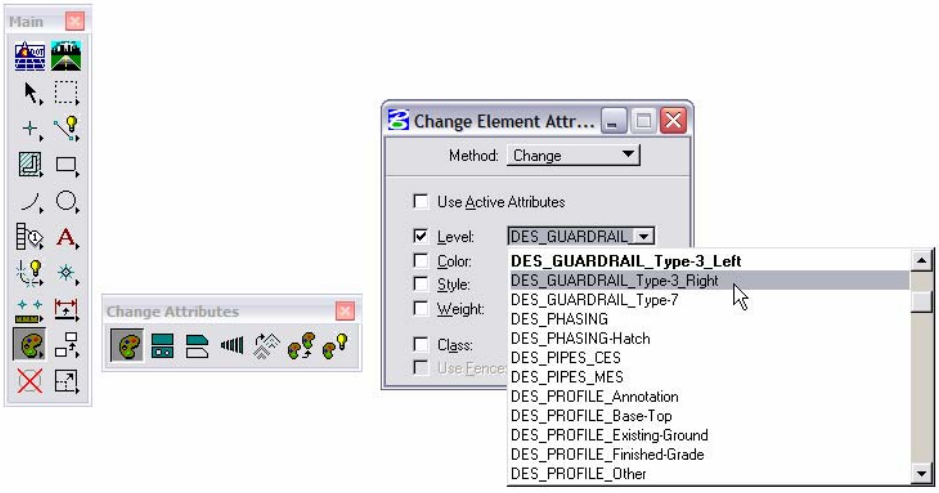
Using Element Information

You can change the level of an element using the **Element Information** command. Be sure to **Apply** the change when done.



Using the Change Element Attributes tool

The **Change Element Attributes** command on the **Change Attributes** toolbar also allows you to change an element's level.



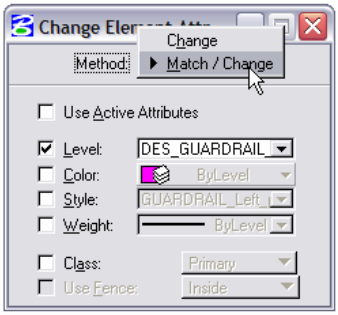
There are two options:

- **Change**

With this option, set the level you want to change to, then select the element.

- **Match/Change**

With this option, you can change an element to a level by matching another element's level. First select the element to match, then select the element to change.



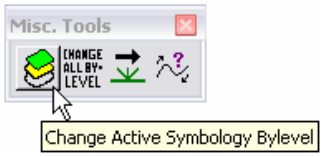
Note: **Be careful!** If **Use Active Attributes** is turned ***on***, the level you set in the **Change** option, or the level you match in the **Match/Change** option, will become the ***active level***. If you do not want to change your active level, turn this option ***off***.

The CDOT Misc. Toolbar

The CDOT Miscellaneous Tools toolbar (**Add On's > Launch Miscellaneous Tools** from the **CDOT Menu**) contains three useful tools:

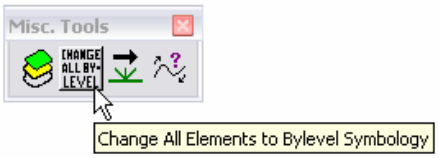
Change Active Symbology ByLevel

If you accidentally change the active color, line style or line weight in the **Change Element Attributes** command, you can re-set the actives back to **ByLevel** symbology with the **Change Active Symbology ByLevel** command.



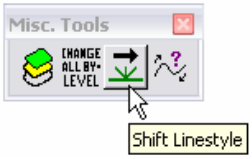
Change All Elements to ByLevel Symbology

If graphics have been placed with symbology other than **ByLevel** symbology, use the **Change All Elements to ByLevel Symbology** command. This is especially useful before plotting to ensure all graphics conform to CDOT standards.



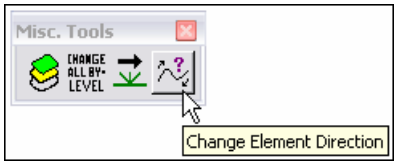
Shift Linestyles

Sometimes custom line styles need to be shifted to meet in corners of to avoid interference with other graphics. Use the **Shift Linestyle** tool to accomplish this.



Change Element Direction

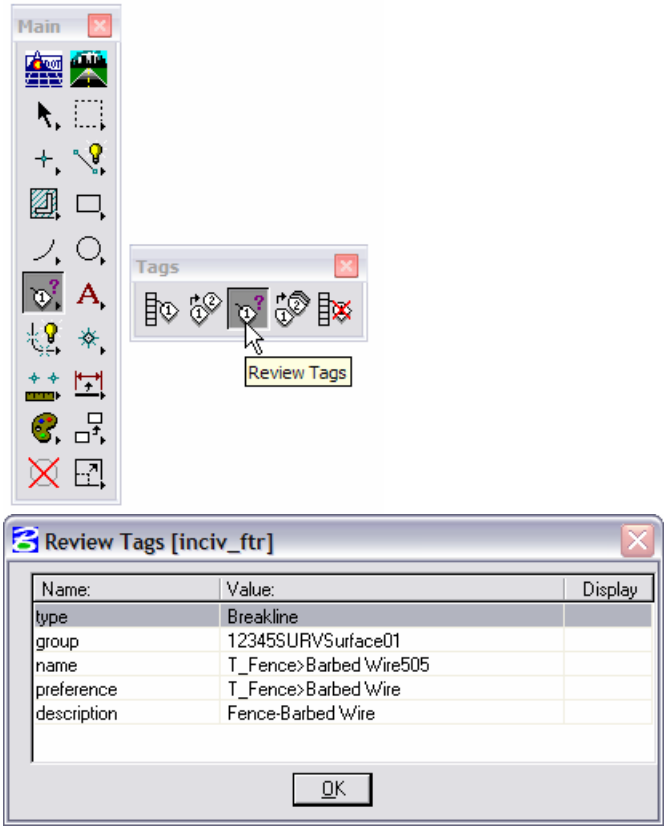
The display of some custom line styles is dependent on the direction the line was drawn. Use the **Change Element Direction** tool to reverse the line so that the style is displayed as desired.



Tags

MicroStation tags are a special way attaching information to elements drawn in the design file. For example, survey graphics contain tag information like feature name, the InRoads preference and description.

Use the **Review Tags** command on the **Tags** toolbar to obtain tag information on an element.



Lab 6A – Place Guardrail lines

In this exercise, you'll place guardrail lines in the design model file and then work with the custom line styles.

Objectives

After completing this exercise you will know how to:

- Use the CDOT Menu to place custom lines styles.
- Change the direction of a directional line style.
- Set the scale for a custom line style.
- Change the scale of a custom line style.
- Change the level on which an element was placed
- Update graphics to **ByLevel Symbology**.

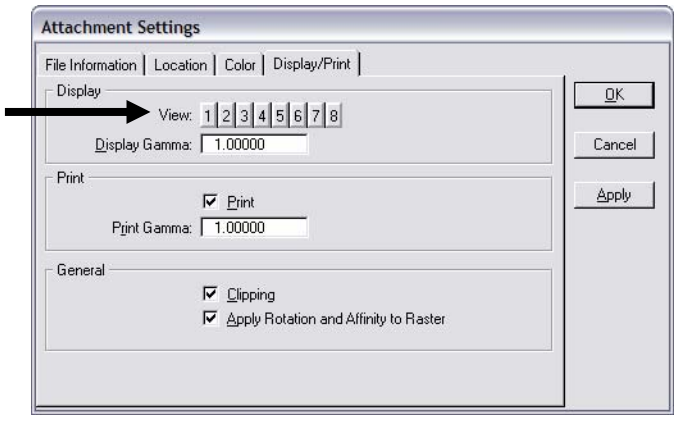
Open the Design model file

1. From the MicroStation Manager, open the **12345DES_Model.dgn** file from the **\Design\Drawings\Reference_Files** folder

   Note that the aerial photo raster images are attached.

2. Select **File** > **Raster Manager**.

3. Double-click on the raster files **09a.tif** and **10a.tif** and turn off their display in View 1.



4. Select **Settings > View Attributes,** toggle *off* **Line Styles** and the select **Apply** to apply this setting to view 1.

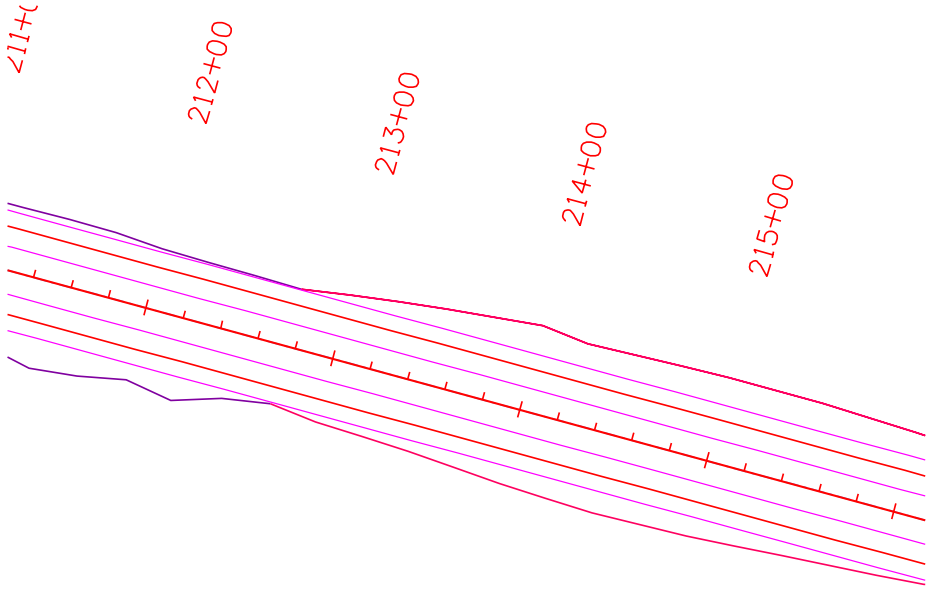
Draw the Guardrail

Next, you'll follow the steps below to place guardrail along the fill area approaching the intersection.

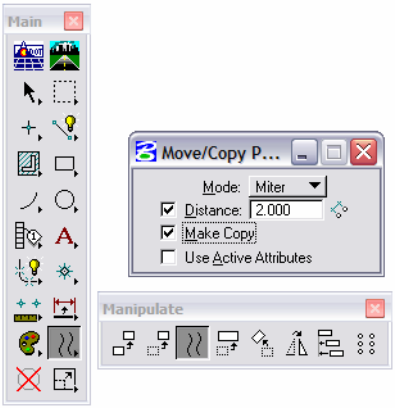
Create the guardrail trace lines

Create temporary lines using the **Parallel Copy** command.

1. **Window** in to the area to the left of the intersection around station range 212+00 – 215+00 as shown.

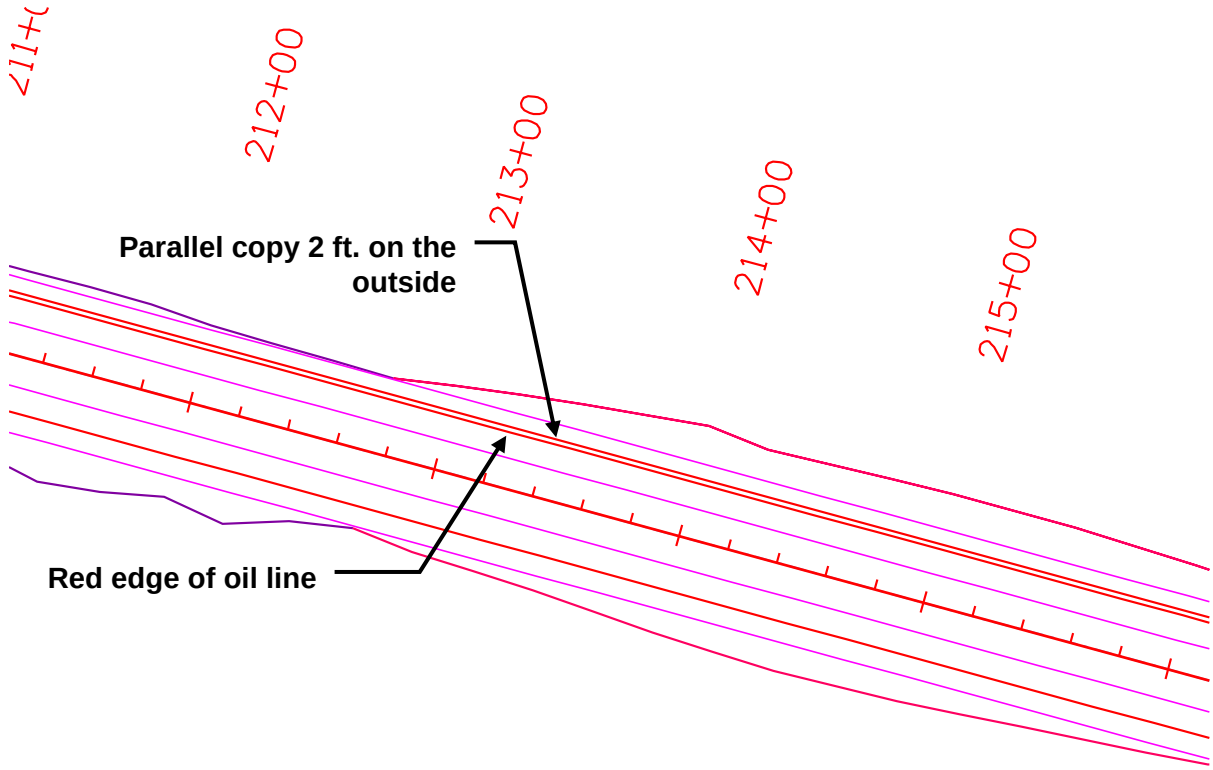


2. Pull the **Manipulate** toolbar off the **Main** toolbar.
3. Select the **Move Parallel** tool off the **Manipulate** toolbar.
4. In the **Tool Settings** box:
   - Toggle on **Distance** and key in ***2***.
   - Toggle on **Make Copy**.

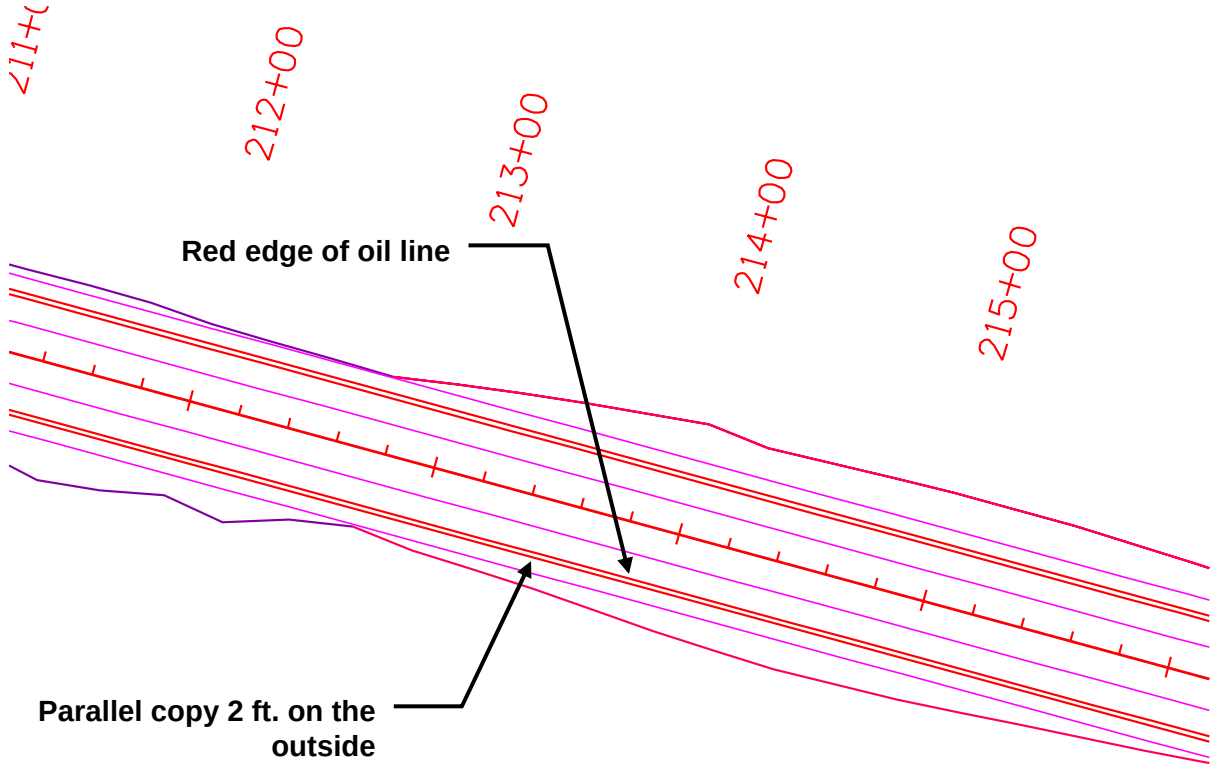


5. **<D>** on the red Edge of Oil line on the upper (North) side of the road.

6. Move your cursor up to establish the direction for the parallel copy.
7. **<D>** to copy the Edge of Oil line.



8. Repeat the above steps to create a guardrail trace line for the lower (South) side of the road. Be sure to parallel copy the Edge of Oil line.

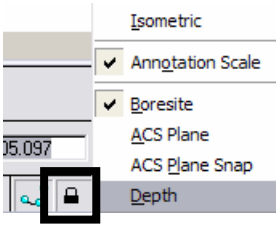


Trim the trace line for the extent of the guardrail

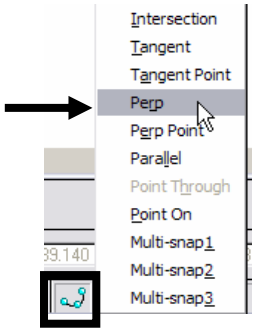
1. On the **CDOT Menu**, select **Drafting > Linework**.
2. Set the **Line Weight** category to **1**.

   Note: This should automatically select the **Place SmartLine** tool.
3. On the Status bar, turn *off* **Depth** lock.

   Note: Make sure that **Depth** lock does *not* have a check mark beside of it to ensure that it is off.

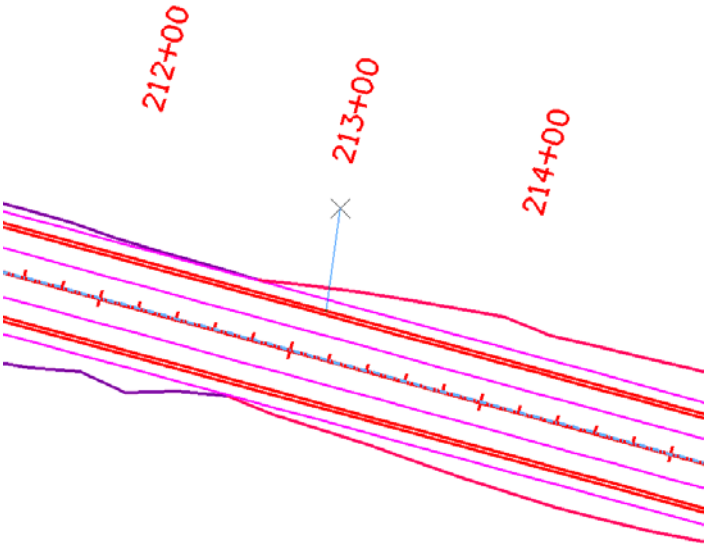


4. On the Status bar, set the active snap mode to **Perp**.

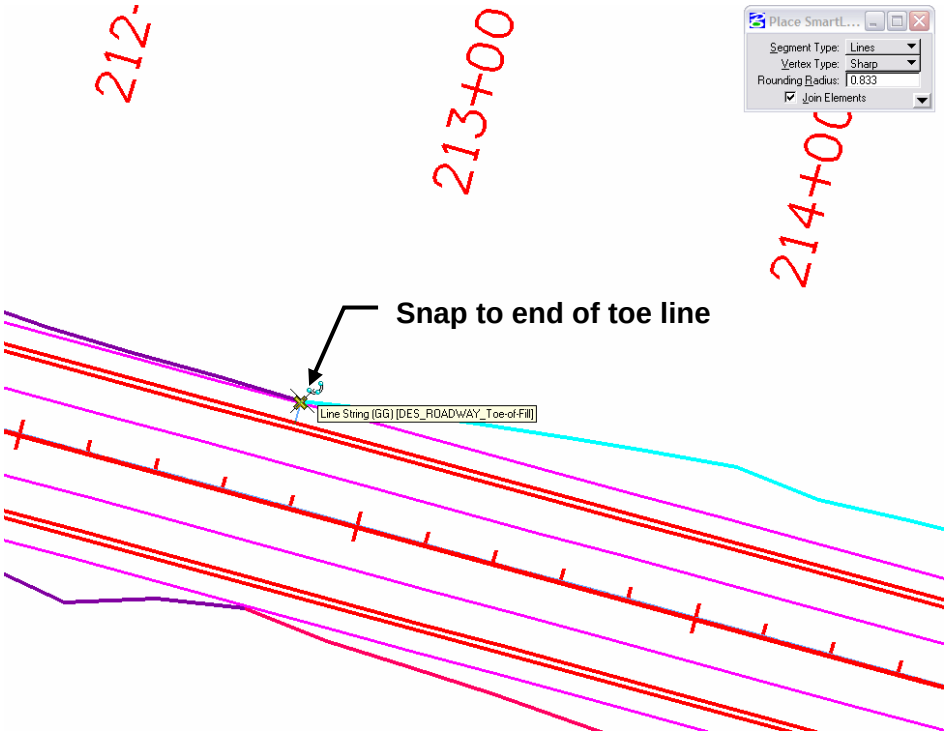


5. **<D>** on the guardrail trace line you just copied.

   As you move your cursor, note how you can only place perpendicular to the trace line.



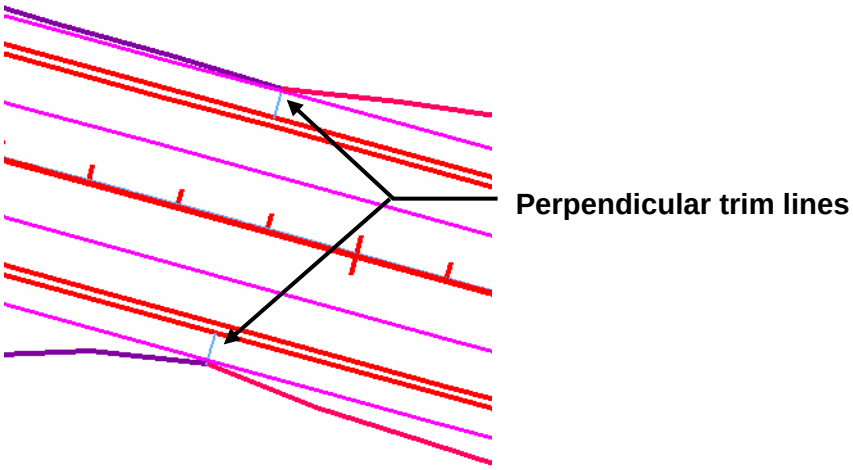
6. **AccuSnap** on the endpoint of the Toe of Fill line as shown to draw the perpendicular line.



This will serve as the cutting element for the trace line. The guardrail starts at the beginning of the toe of fill line.

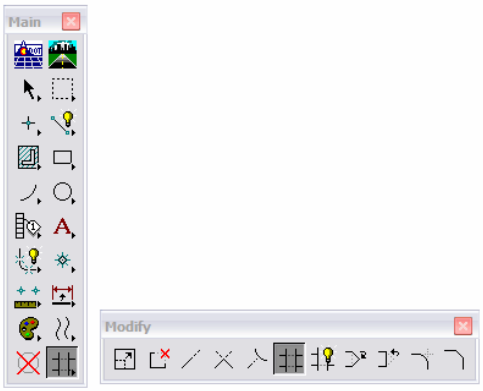
7. **<R>** when done.

8. Repeat the above steps to create a trim line for the other side of the road and be sure to **AccuSnap** to the end of the toe of fill line.



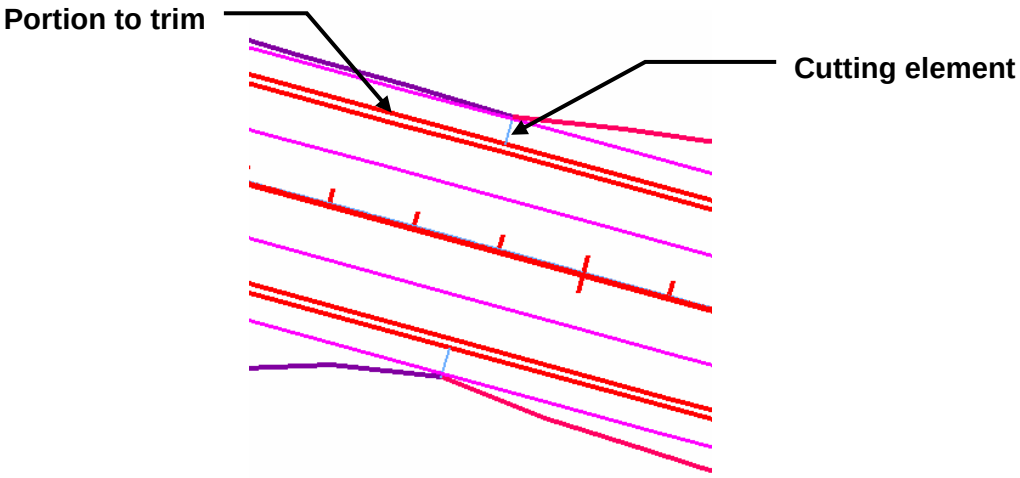
9. Pull the **Modify** toolbar off the **Main** toolbar.

10. Select the **Trim** command.

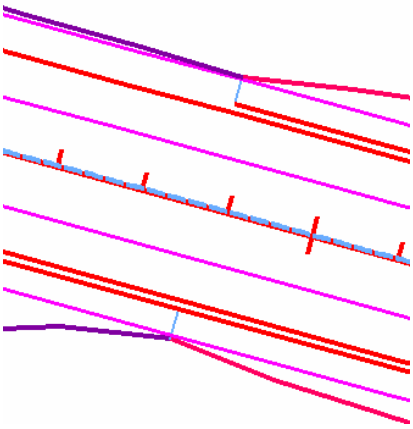


11. Follow your prompts and **<D>** on the perpendicular line as the cutting element.

12. **<D>** on the trace line to the ***left*** of the cutting element as the portion to trim.

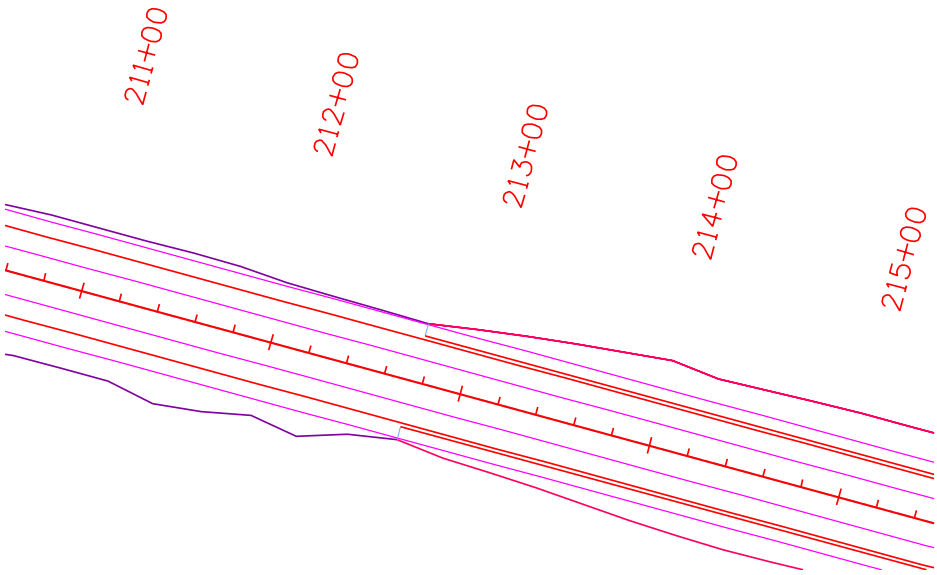


13. **<D>** to accept.



14. **Update** your view, if necessary.

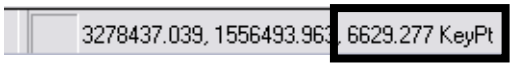
15. Repeat to trim the lower side as shown.



16. Delete the blue perpendicular trim lines.

Check the Depth lock

1. **<T>** on the left end of the upper trace line.



Note that the trace lines were copied at the same elevation as the edge of oil lines. When you place the guardrail lines, you want to place them at an elevation of 0.

Note: If you want the guardrail lines to pick up the correct elevations of the roadway surface, you can drape them with InRoads.

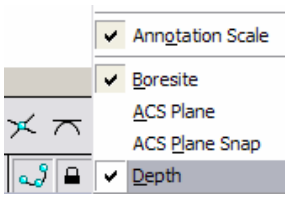
2. Key in ***az=0***

3. **<D>** anywhere in the view to set the active depth.

Note that the active depth is set to the CDOT default of 0.

4. Select the **Locks** button from the **Status** bar.

5. Turn **Depth lock on**.



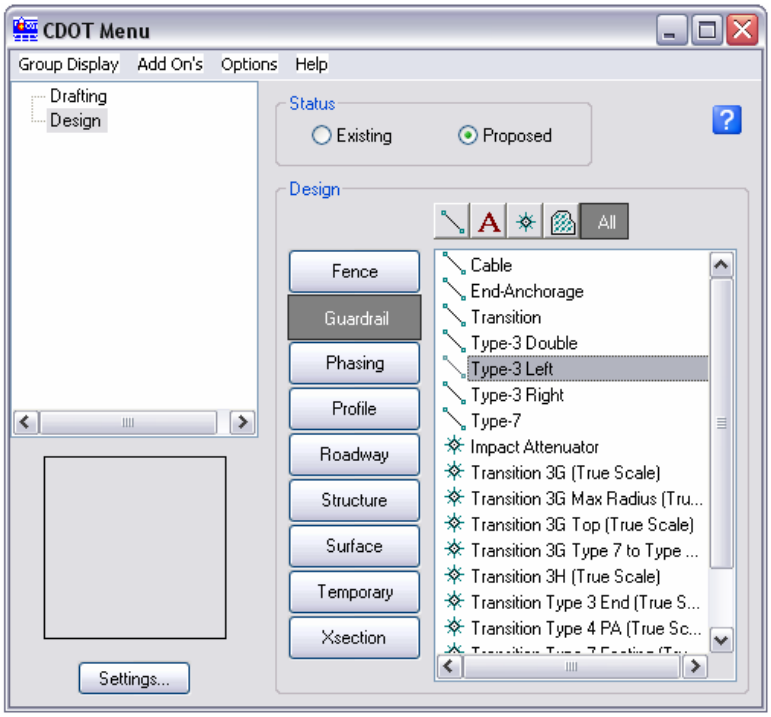
With **Depth** lock turned on, you will place elements at the active depth instead of picking up the elevation of elements you snap on.

6. Toggle **AccuSnap off**.

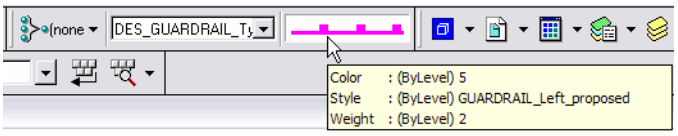
Note: It's always a good habit to turn **AccuSnap** off when using **Depth** lock.

Place the guardrail lines

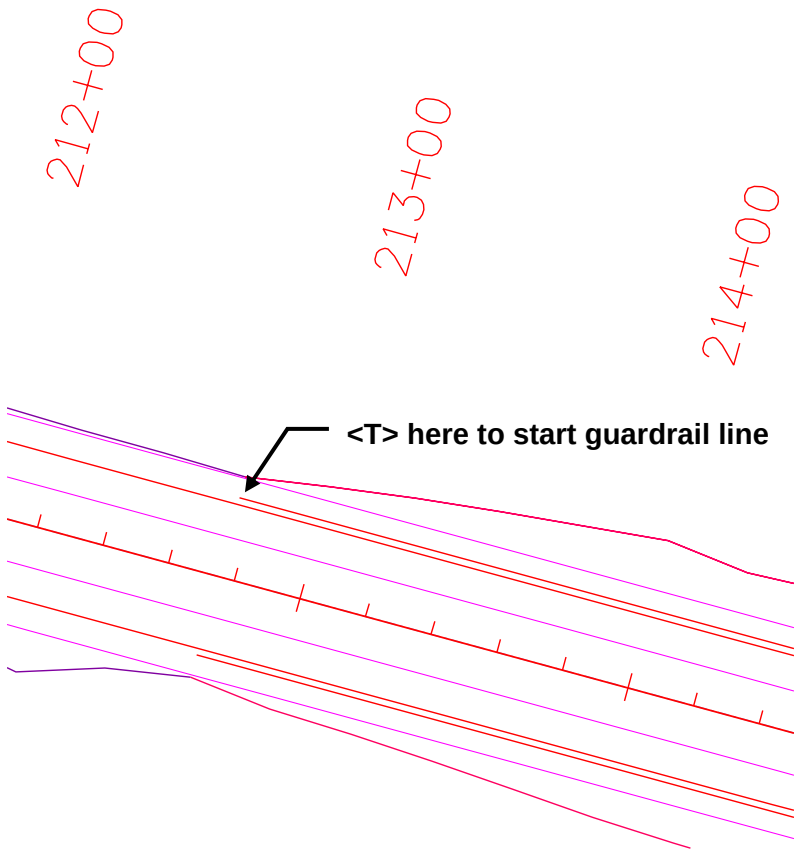
1. On the CDOT Menu, select **Group Display > Design**.
2. Set the **Category** to **Guardrail** and select the item **Type 3 left**.



Note: This ***automatically*** sets the active level to **DES_GUARDRAIL_Type-3_Left** with all **ByLevel** settings (color, style and weight), and ***automatically*** selects the **Place SmartLine** command. Note that the ByLevel style is a directional custom line style called GUARDRAIL_Left_Proposed.



3. **<T>** on the left endpoint of the upper trace line as shown.



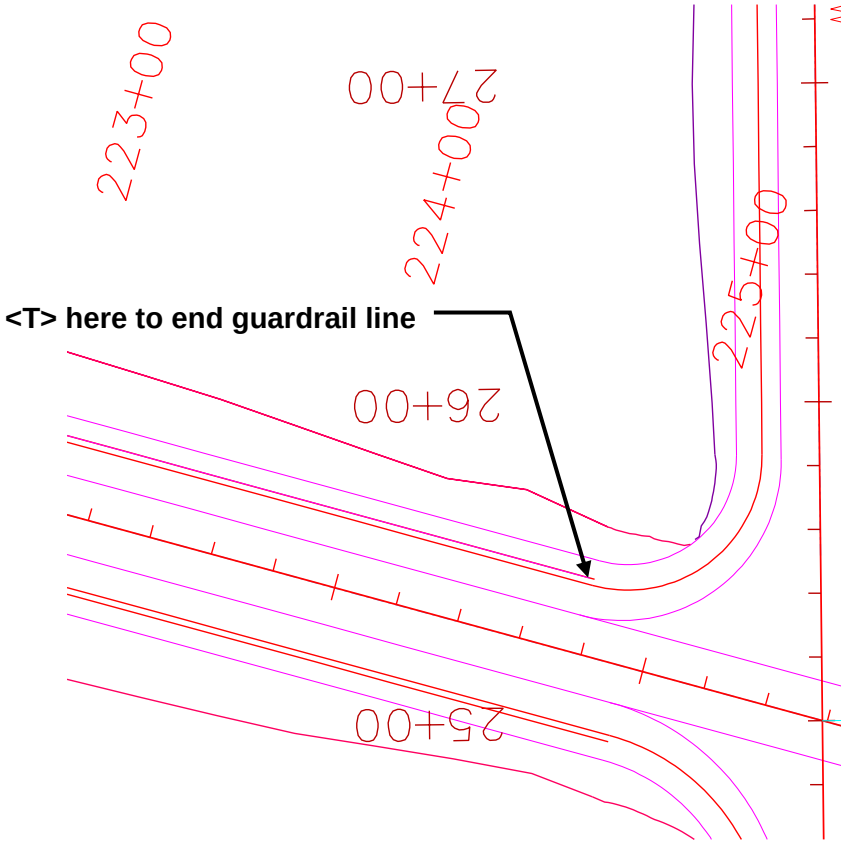
Check the message field. Note that with **Depth lock on**, you're placing the line at a Z value of 0 instead of the elevation of the line's endpoint.

4. **<D>** to accept.

5. **Pan** or **Zoom** to locate the other endpoint of the trace line near the intersection.

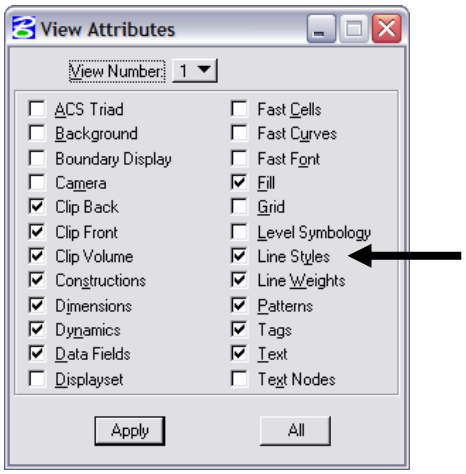
Note: Remember when using View Controls in the middle of a drawing command, reset **<R>** once to get back to the command.

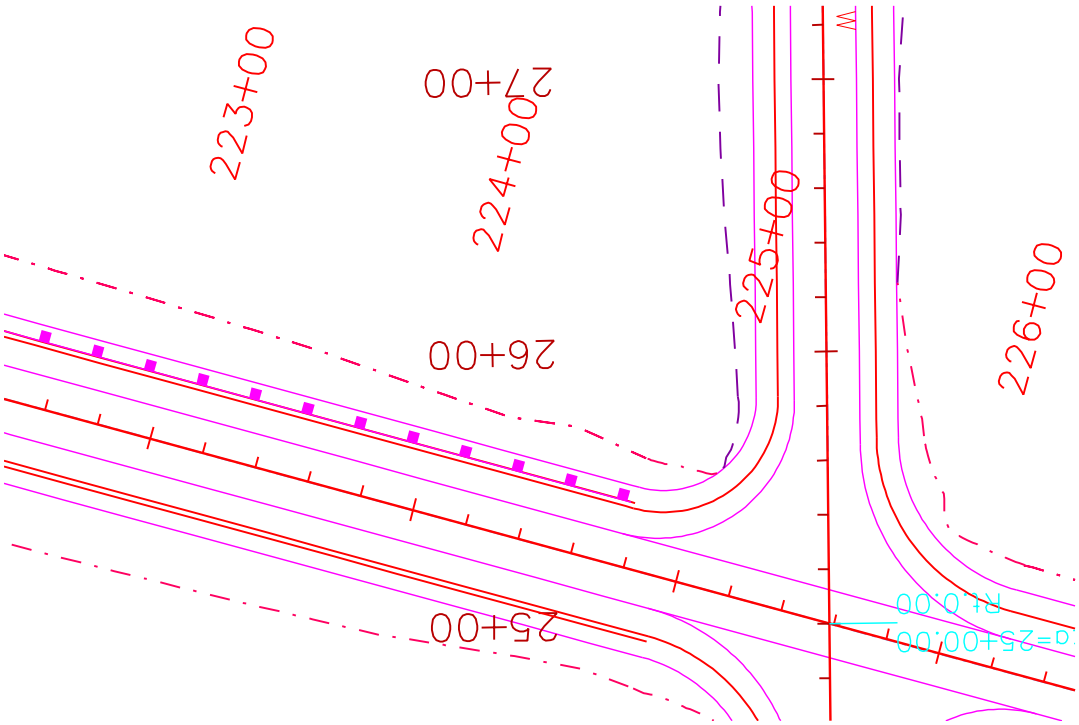
6. Snap **(<T>**, then **<D>**) on the right endpoint as shown.



7. **<R>** when done.

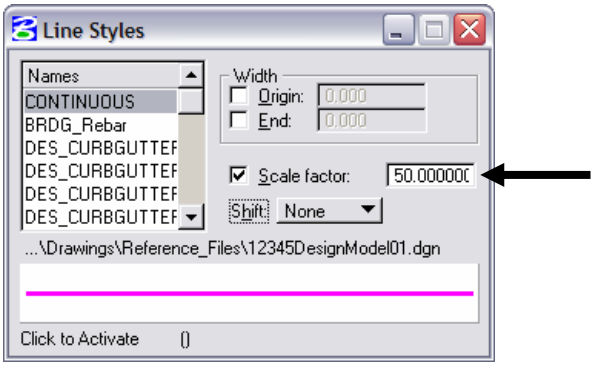
8. Select **Settings > View Attributes** and toggle on **Line Styles** and then select **Apply** to apply this setting to view 1.





Note: Custom line styles are scaled before they are placed. The guardrail line is placed at the default line style scale of 100. The line style scale corresponds to the plot scale (1:100). This setting, which comes from the CDOT seed file, is found under **Element > Element > Line Styles > Custom**.

9. Change the **Line Style** scale factor. Select **Element > Line Style > Custom** and set the **Scale Factor** to **50**.

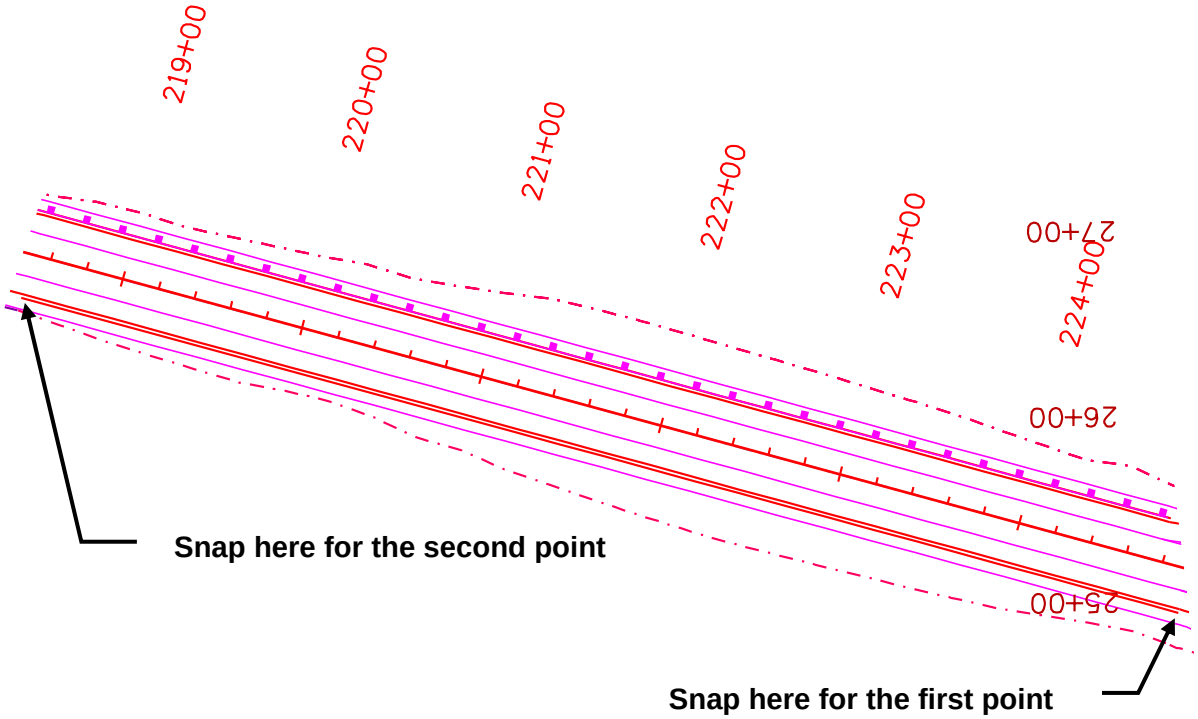


10. On the CDOT Menu, select the **Guardrail Type-3 Right**.

    The active level updates to **DES_GURARDRAIL_Type-3_Right**.

11. **Snap** on the right endpoint of the lower trace line as shown.

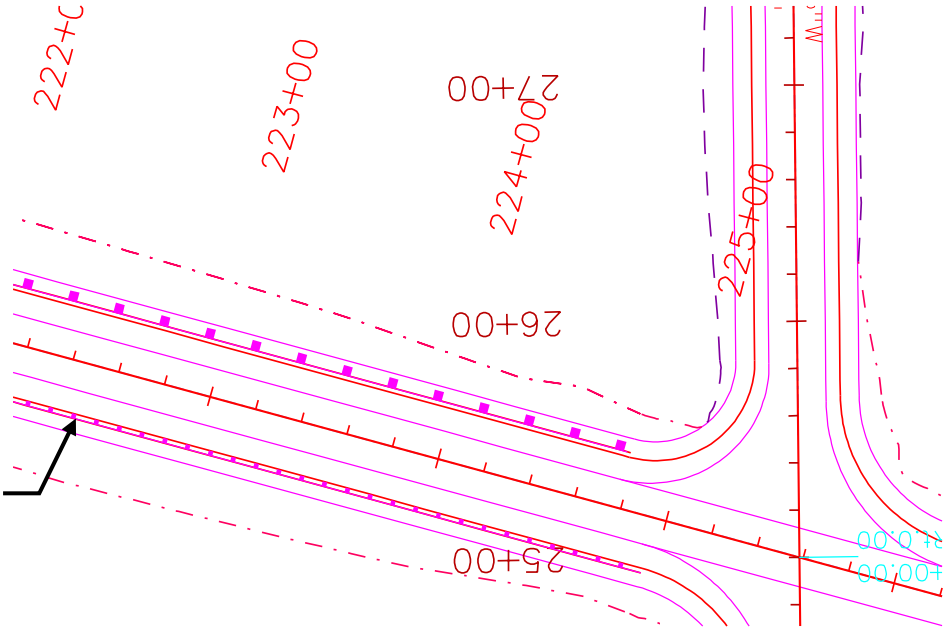
12. **Snap** on the left endpoint as shown.



13. **<R>** when done.

    Note: You are drawing this line right to left to illustrate a point.

50-scale guardrail placed in wrong direction.



Note that this guardrail line is smaller than the first. That's because you set the active scale to 50 before placing the line. It is ½ the size of the first line placed at the default 100 scale.

Note also that the guardrail line is placed in the wrong direction (the posts should be on the outside). Some custom line styles, like these, depend on the direction they are drawn. You drew this line right to left, so it is going in the wrong direction. You can correct this with the **Change Direction** command or through the CDOT Misc. Toolbar using the **Change Element Direction** icon.

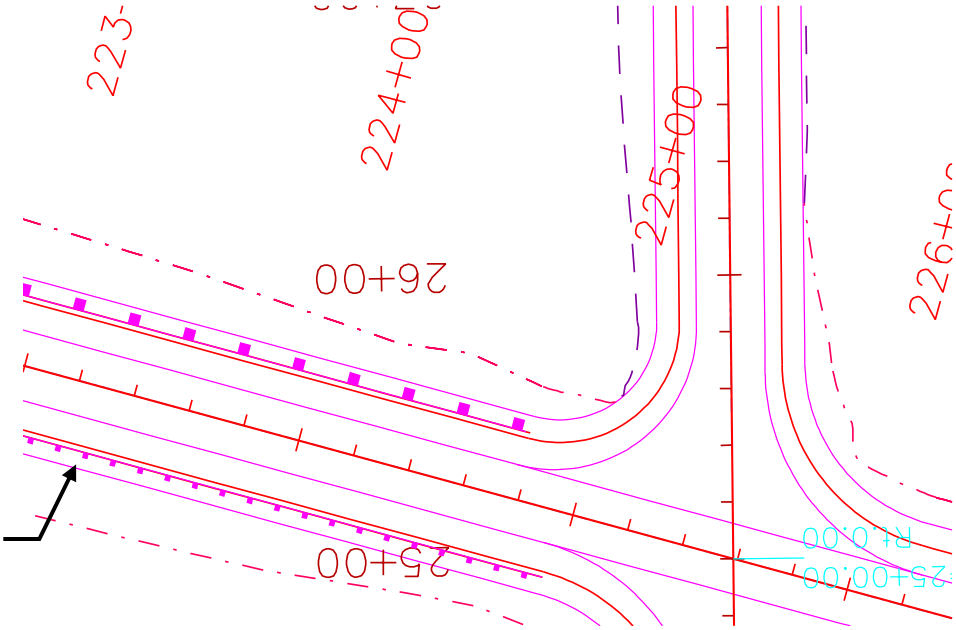
14. Turn **Depth lock off**.
15. Turn **AccuSnap** back **on**.

Change the custom line style direction

1. Key in **Change Direction**.
2. **<D>** on the guardrail line you just placed.

   An arrow is displayed on the line indicating the direction it was placed.

3. **<D>** to change the direction.



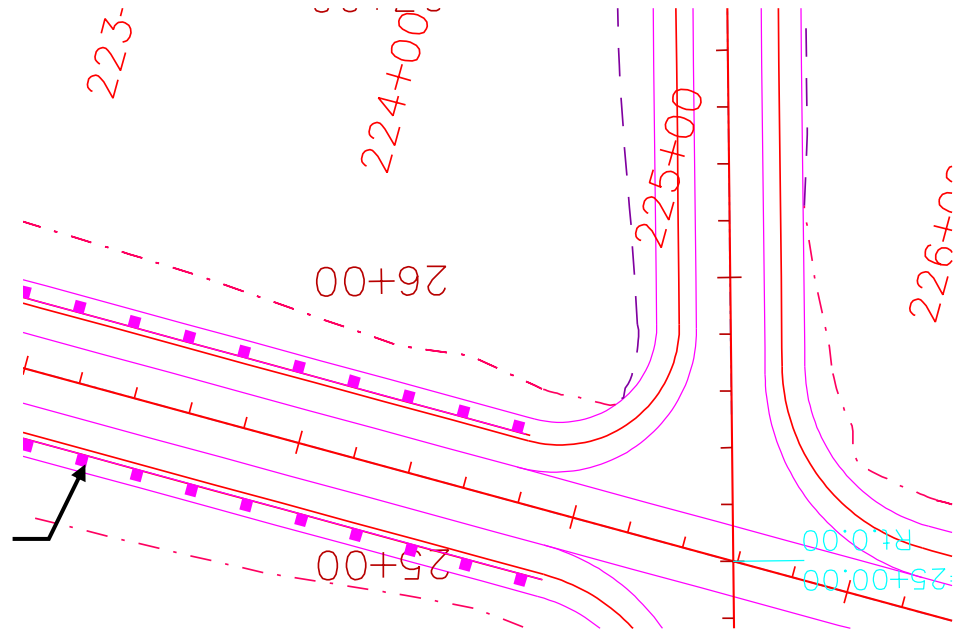
Guardrail after Change Direction command

The posts now appear on the correct side.

Change the custom line style scale

You actually drew the guardrail at the wrong scale. Instead of deleting and re-drawing the guardrail, you can change it to the correct scale of 100.

1. Key in ***change linestyle scale 100*** **<Enter>,** then **<D>** on the guardrail line to change it.



Guardrail after changing linestyle scale factor

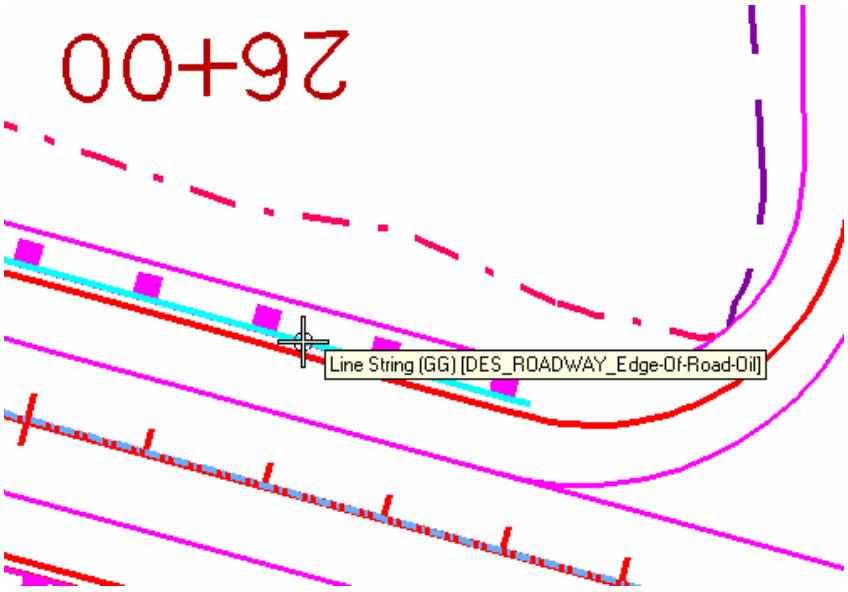
Note: You can select multiple lines and scale them by using the **PowerSelector** (see Chapter 8).

2. Select **Element > Line Styles > Custom** and set the line style **Factor** back to ***100***.

Delete the trace lines

1. Select **Delete** from the **Main** toolbar.
2. Hover over on the trace line with your mouse.

   Note: Watch for the trace line (not the guardrail line) to highlight. If you see the guardrail posts highlighted, **<R>** until the trace line highlights (watch for pop-up information to show the line on level **DES_ROADWAY_Edge-of-Road-Oil**).

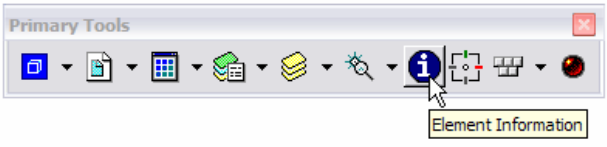


   When using the **Delete** command, use the reset button to select coincident elements.

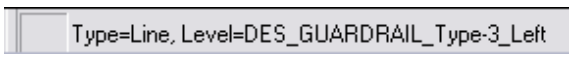
3. With the correct line highlighted, **<D>** to accept.

Use the Element information to change levels

1. Select **Element > Information** or select this command from the **Primary** toolbar.



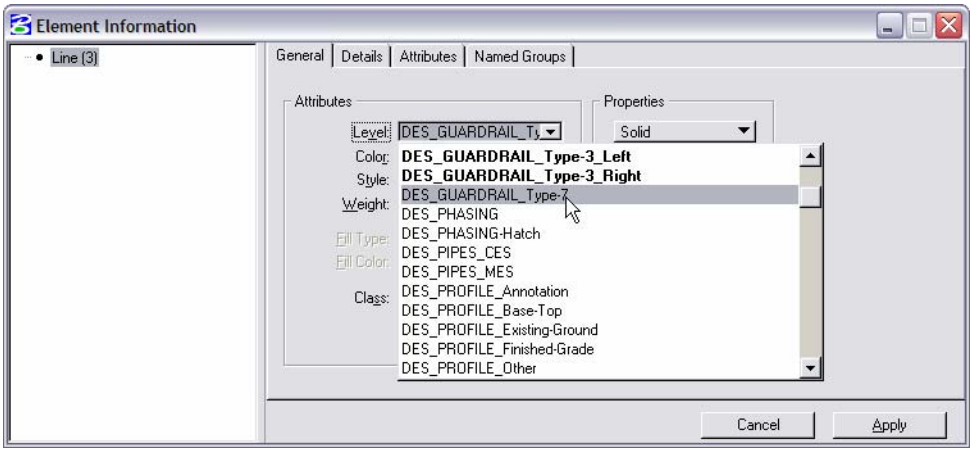
2. **<D>** on the upper **Type 3** guardrail lines you've just placed.
3. Read the basic element information in the **Message** field.



Note: This is the same as the pop-up information provided when you "hover" over an element with your cursor.

4. On the **General** tab of the **Element Information** box, review the element attributes and properties.

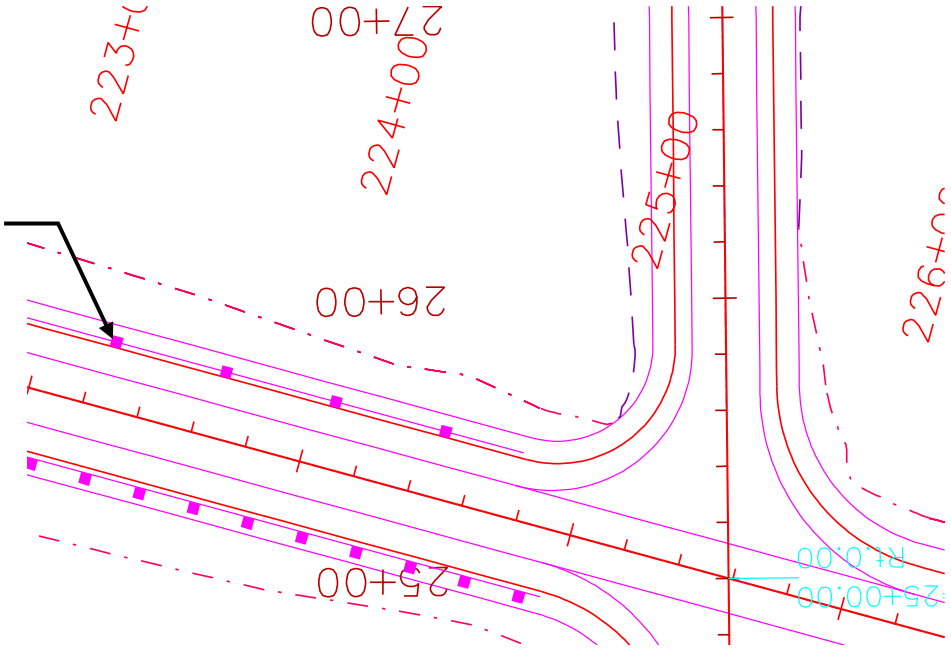
5. Set the **Level** to **DES_GUARDRAIL_Type_7**.



6. In the **Element Information** box, select **Apply**.

   The element is moved to the **DES_GUARDRAIL_Type_7** level and the graphics update.

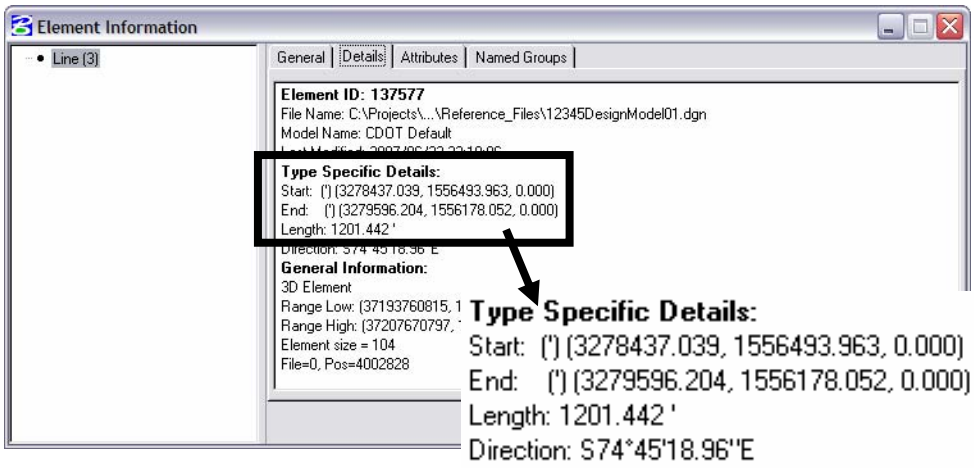
Guardrail changed to Type 7



Note: **Element Information** is one way to change element attributes or properties if the element was originally placed incorrectly.

7. Select the Element Information command again and change the **Level** back to **DES_GUARDRAIL_Type-3_Left** and **Apply**.

8. Select the **Details** tab to review the element geometry.

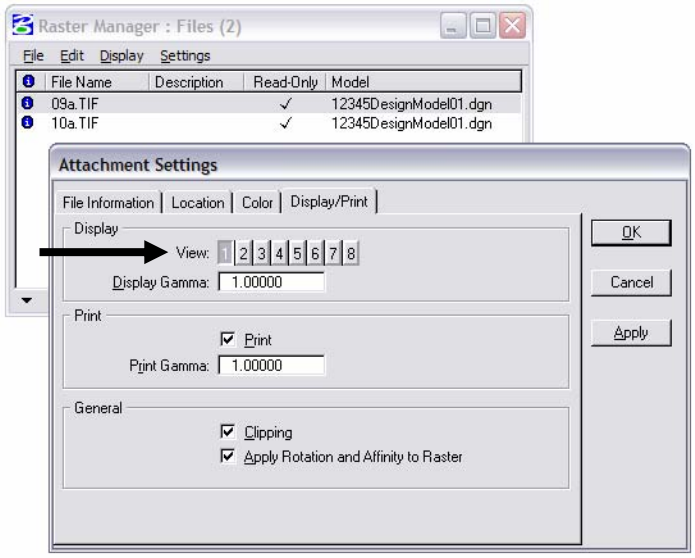


Note that the element was placed at the CDOT default active depth of 0 in the 3D file.

9. **Cancel** the **Element Information** dialog box when done.

Turn rasters back on

1. **Fit** the view.
2. Select **File > Raster Manager** and turn both raster files back on in View 1.



3. **Fit** your view if you don't see the raster images.
4. Select **File > Save Settings**.
5. Continue on to Lab 6B.

Lab 6B – Create 3D Utility Graphics

In this example, you'll create a Utility model file, work with references, and then place proposed 3D utility lines using the CDOT Menu and the parallel copy tool. You'll also modify the graphics as necessary.

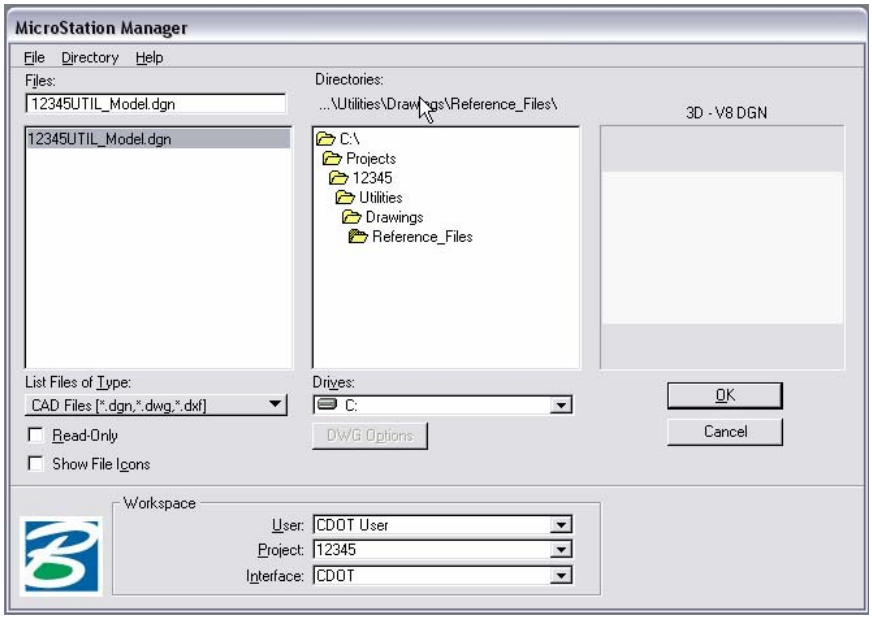
Objectives

After completing this exercise you will know how to:

- Work with nested references
- Use the **Copy Attachment** option for references
- Use the **Locate** setting for references
- Use the CDOT Menu to place custom line styles (Utility lines).
- Place elements in 3D using **Depth Lock**
- Manipulate elements using the **Parallel Copy** tool.
- Modify elements using the **Trim** tool.

Create the Utility model file

1. Select **File > Close** to close **the 12345DES_Model** file.
2. In the **MicroStation Manager** Workspace section, re-set **Project** to **12345**.
3. Set the directory to **\Utilities\Drawings\Reference Files**.

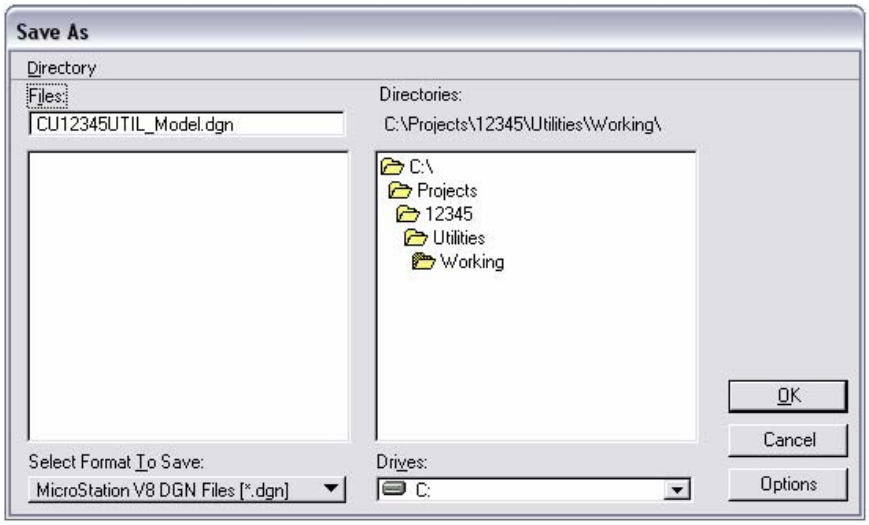


4. Open the file **12345UTIL_Model.dgn**

   The blank Utility model file opens.

5. Select **File > Save As...**
6. Set the Directory to **\Utilities\Working**.

7. Change the file name to **CU12345UTIL_Model.dgn** and select **OK**.

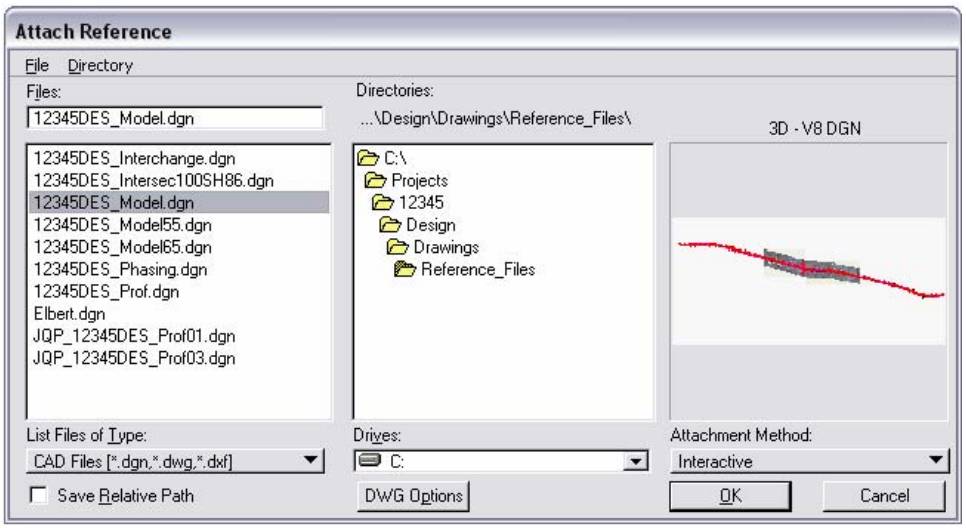


The new file is created in the **Working** folder.

Attach references

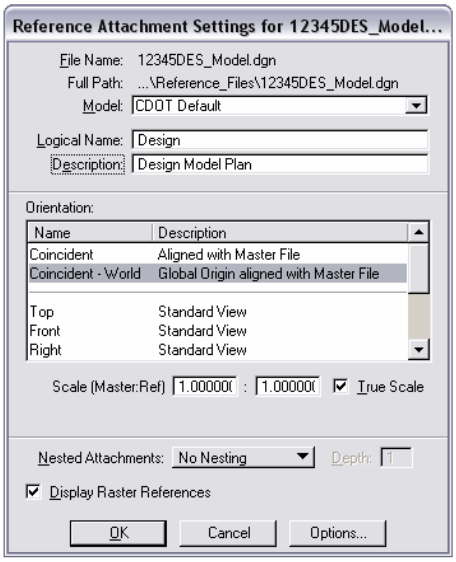
1. Select **References** from the **Primary** toolbar.

2. From the **References** dialog box, select **Tools > Attach** and select the **12345DES_Model.dgn** file from the **\Design\Drawings\Reference Files** folder.



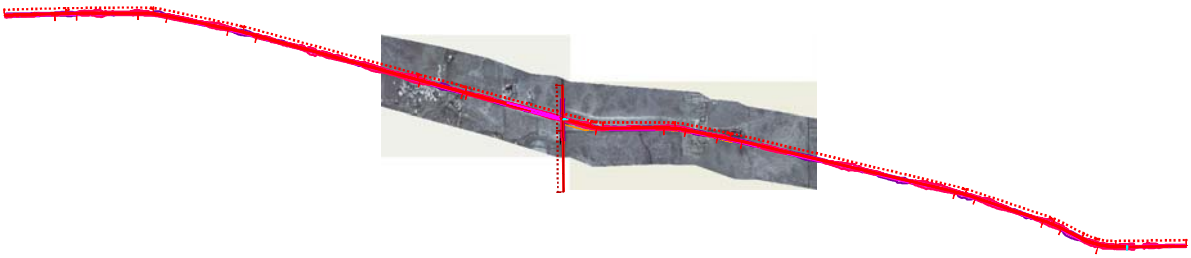
3. Set the **Attachment Method** to **Interactive** and select **OK**.

4. In the **Attachment Settings** box, keyin a logical name of ***Design*** and a **Description** of ***Design Model Plan***. Make sure **Display Raster Reference** is ***on***. Set the other options as shown and select **OK**.



5. **Fit** the view.

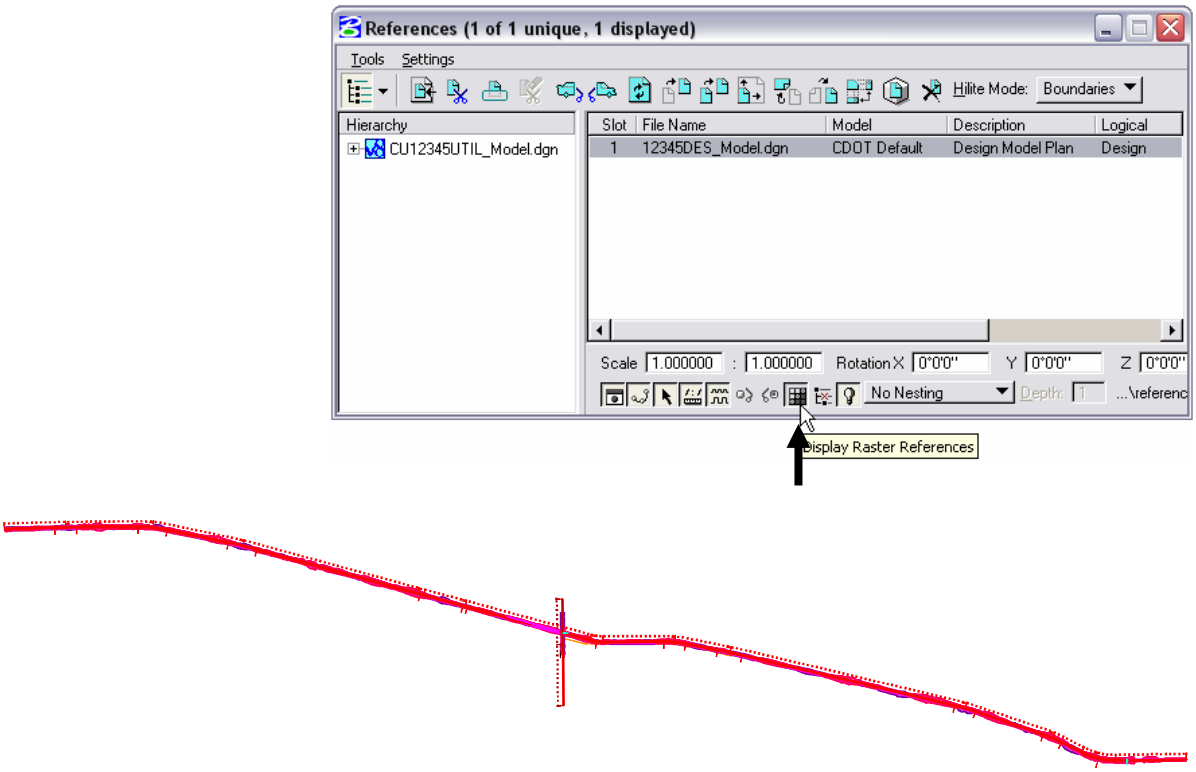
   The Design reference graphics, along with the raster photos, appear in the Utility model file.



Raster Images

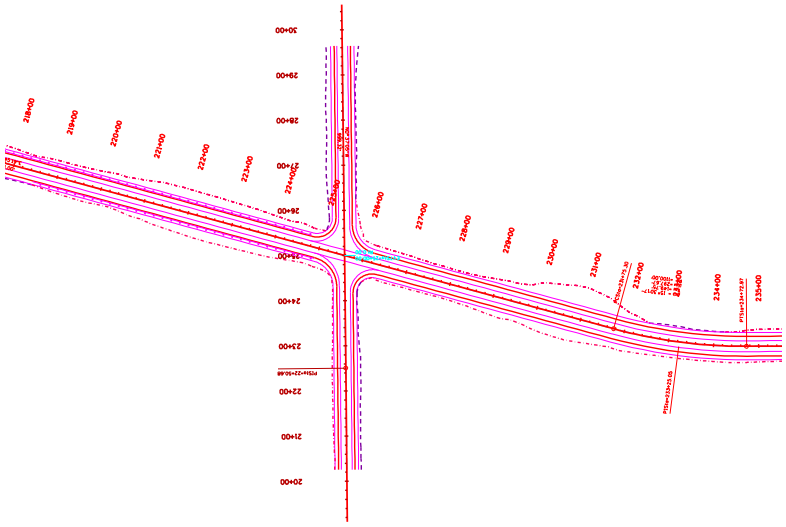
Since **Display Raster References** was turned on when attaching the reference, the aerial photos were attached with the design model file (they were turned on in the Design Model file from the last lab). You can quickly turn them off from the **Reference** dialog instead of opening the **Raster Manager**.

1. In the **References** box, highlight the **Design** reference and toggle **Display Raster** References ***off***.



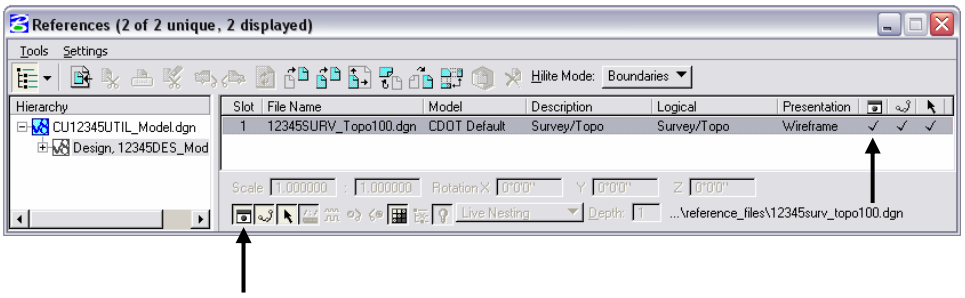
Work with references

1. **Window** in on the Intersection.

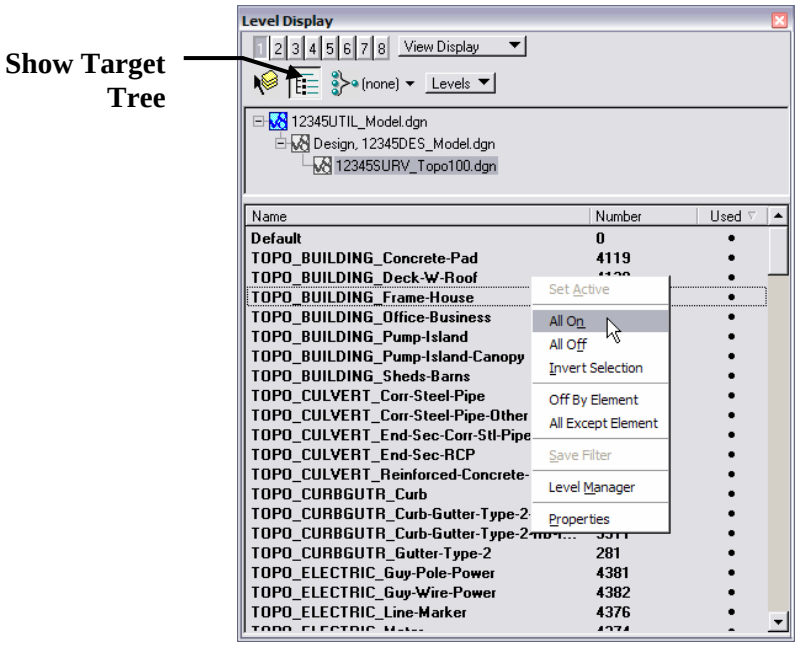


2. On the **Reference** dialog, change **No Nesting** to **Live Nesting** and set **Depth** to **1.**

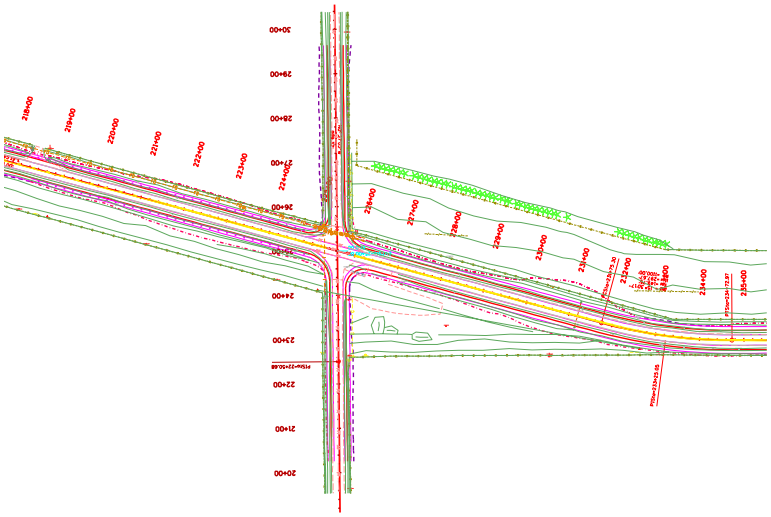
3. On the left, select the upper-level **Design** reference. On the right, select the **Survey/Topo** nested reference and make sure that **Display** is toggled **on**.



4. In the **Level Display** box, make sure the **Show Target Tree** button is **on** and select the **Survey/Topo** Reference. Turn **on** all reference levels.



The nested Survey/Topo graphics are displayed.



5. Back in the Reference dialog box, on the left side, select the upper-level **Utility** master file. On the right side, select the **Design** reference on the right and toggle off **Display**.

   Both Design and Survey/Topo are turned off since Survey/Topo is nested.

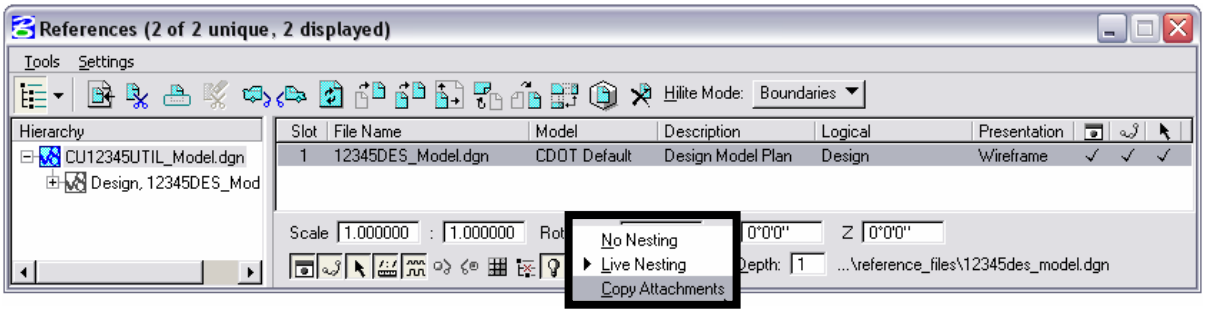
6. Turn the display of the **Design** reference back on.

   What if you wanted to turn off Design graphics and leave the Survey/Topo graphics on? Currently, as nested references, you can't do this. However, in the next section you will accomplish this using **Copy Attachment**.

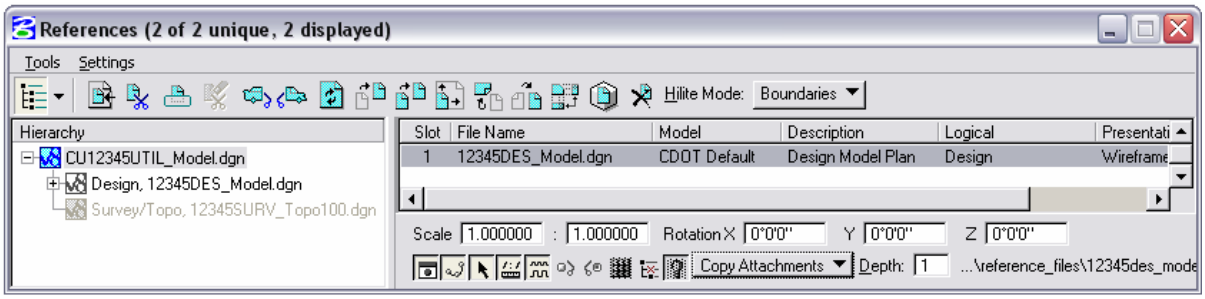
Use the Copy Attachment option

Many times, especially in Model files, you want all your references to be upper level references (as opposed to nested references) so that you can turn on/off the individual reference displays. In order to accomplish this, you would either have to reference all the nested files one by one, or you can use the **Copy Attachment** option.

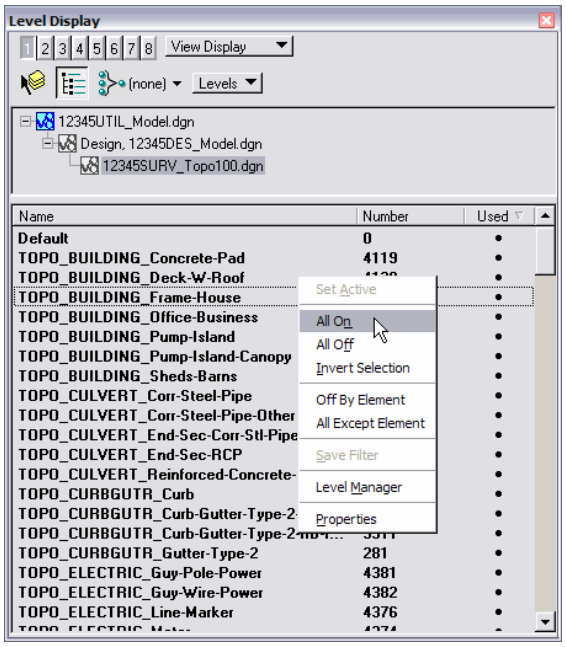
1. With the Design reference selected on the right, change the **Live Nested** option to **Copy Attachment**.



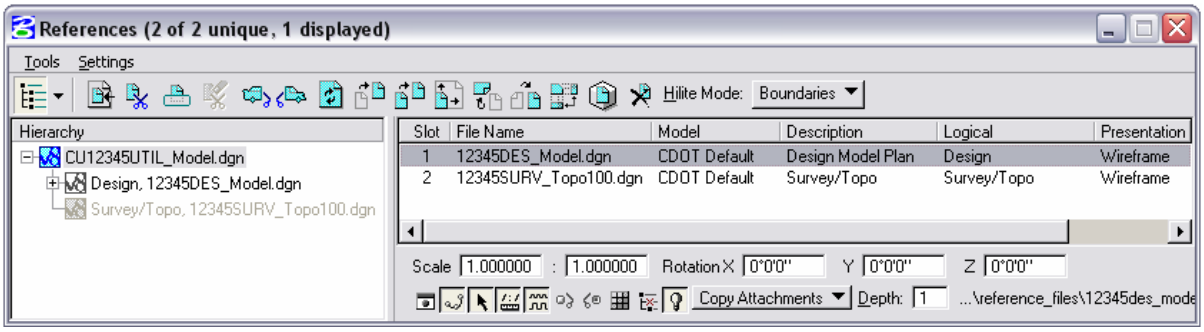
Note that now, on the left-hand side of the **References** box, both the Design and the Survey/Topo references are upper level references. The nested Survey/Topo reference was copied in as a direct attachment.

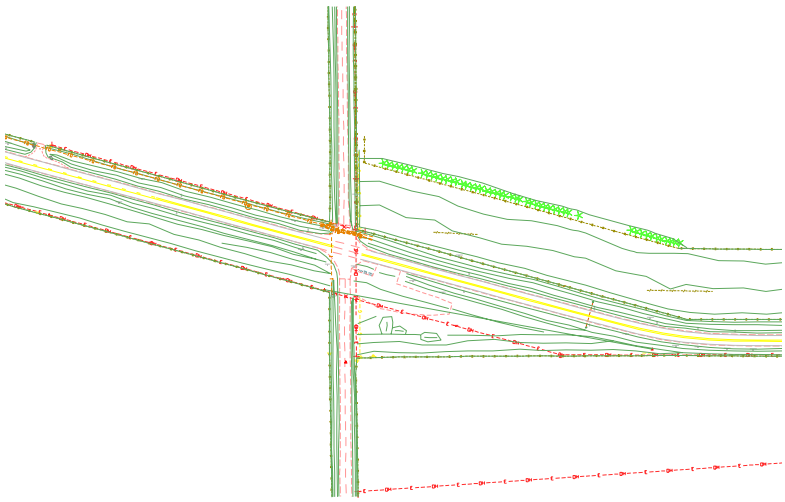


2. Select **Level Display** again and turn **on** all **Survey/Topo** reference levels.



3. On the right-hand side of the **References** box, select the **Design** reference and toggle the **Display off**.

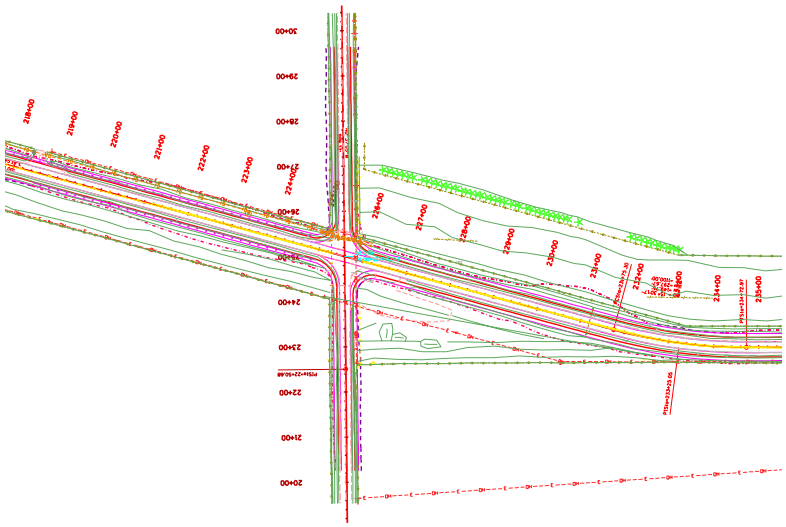




With both references as upper-level, direct attachments, you can now individually turn each reference on/off. The Design reference is turned off while the Survey/Topo graphics remain on.

Note: As a rule of thumb for Model files, you can reference nested to avoid having to attach multiple times. Then, once the nested references are attached, use the **Copy Attachment** option to make all nested references direct attachments. For Sheet files (see Chapter 9), you can typically use nested attachments.

4. Turn the **Design** reference display back **on**.



Drawing in 3D (using Depth lock)

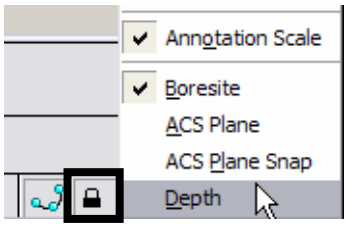
In the next series of steps, you'll practice placing utility graphics from the CDOT Menu with and without **Depth lock**. **Depth lock** determines the elevation that graphics are placed in a 3D file.

Place overhead electrical lines

1. Key in ***az=0***, then **<D>** in the view to check your active depth.

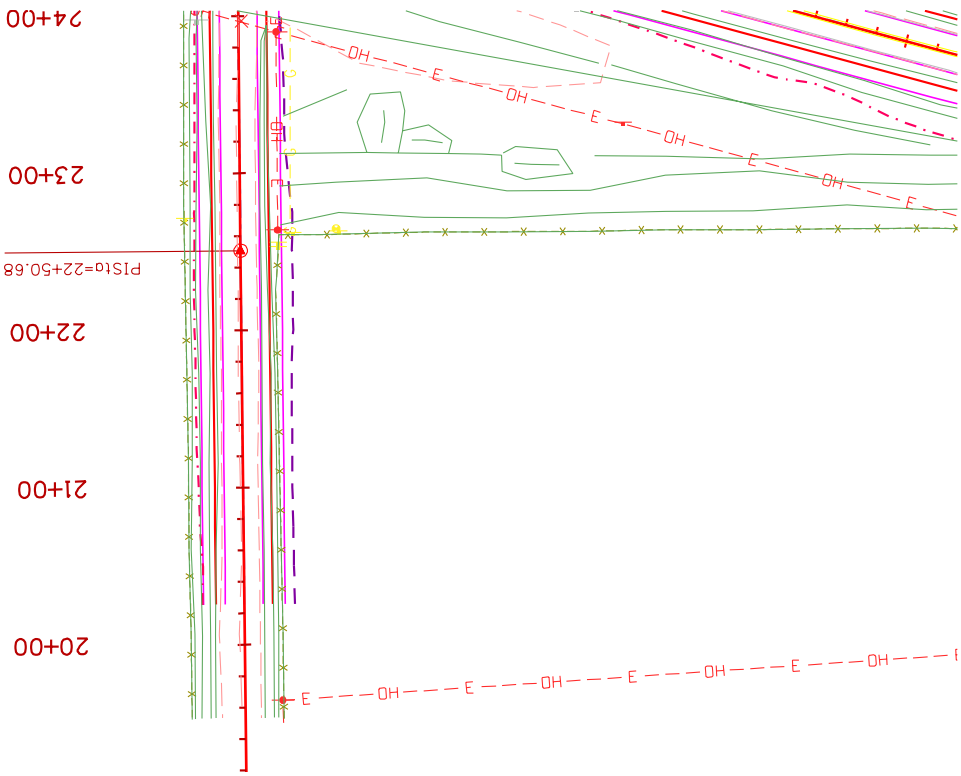
   The active depth is the CDOT default of 0 for the Utility model file.

   Select the **Locks** button on the status bar and verify that **Depth lock** is turned **off**.

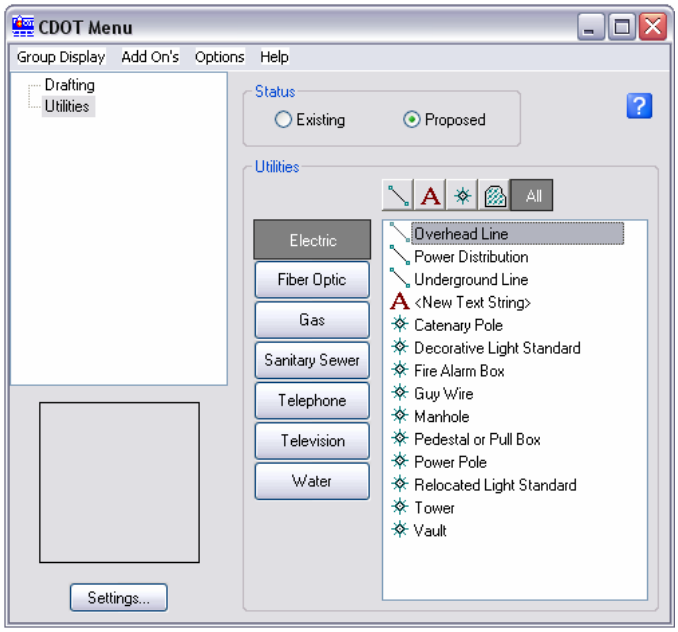
   With **Depth lock** turned off, you will pick up the elevation of elements you snap to in a 3D file.

2. **Zoom in** on the south side of the intersection cross road.



3. Follow the steps below to place a proposed overhead electrical line that connects to the two power poles on the east side of the road.

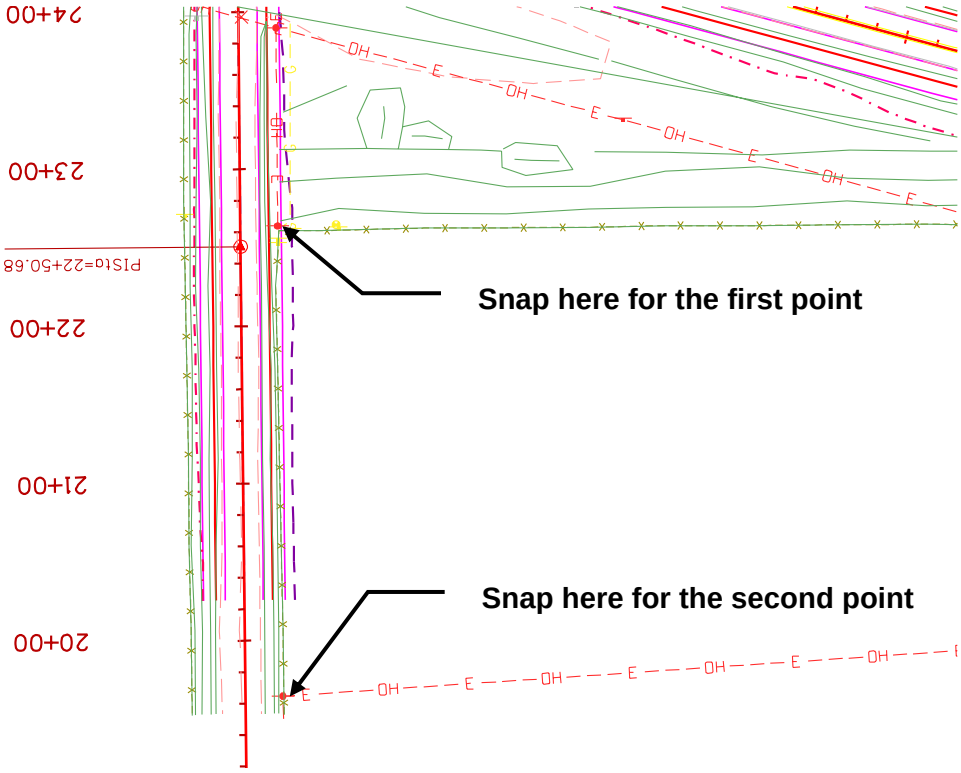
    - On the CDOT Menu, select **Group Displays > Utilities**.
    - Highlight the **Utilities** group and set **Status** to **Proposed**.
    - Select the **Electric** category.
    - Set **Filters** to **All**.
    - Select the **Overhead Line** item.



Note that the active level is automatically set to **UTIL_ELECTRICAL_Overhead** and the **Place SmartLine** command is selected.

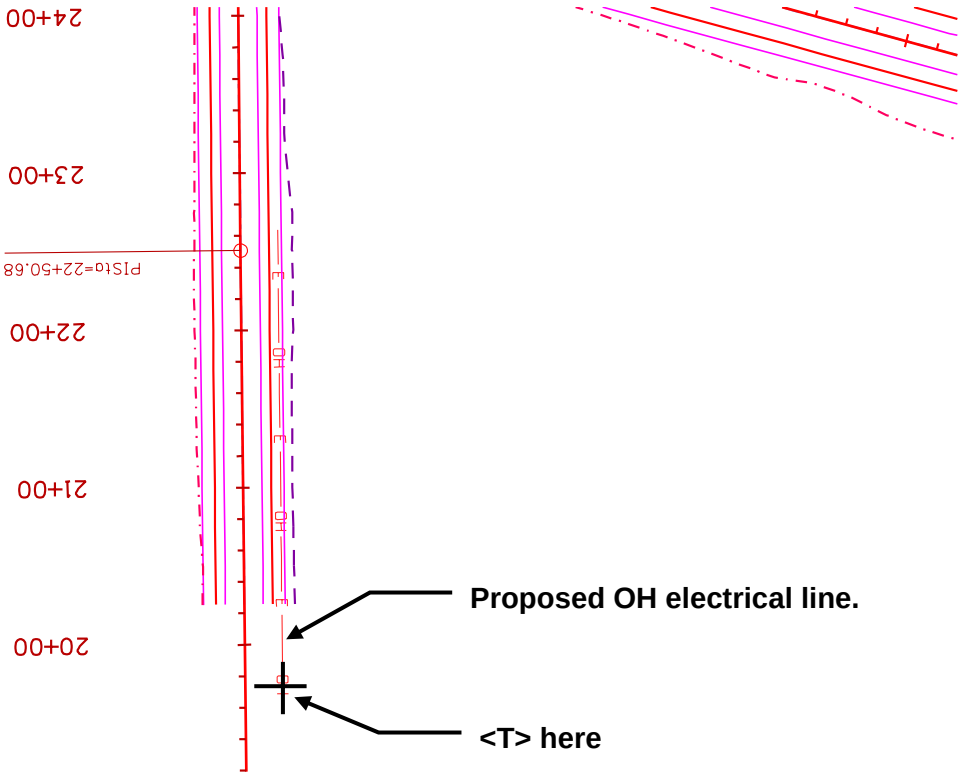
4. **AccuSnap** to the end of the existing North/South overhead line at the power pole as shown.

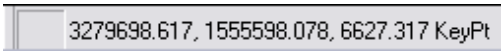
5. **AccuSnap** to the end of the existing east/west overhead line at the power pole as shown.



6. Turn ***off*** the display of the **Topo/Survey** reference to better see the proposed graphics.

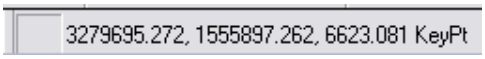
7. **<T>** on the end of the proposed overhead electrical line you just placed.





Note that even though the active depth is 0, since **Depth lock** is turned off the line was placed at the elevation of the existing overhead line (6627.317).

8. **<T>** on the other end of the proposed overhead electrical line to check its elevation.

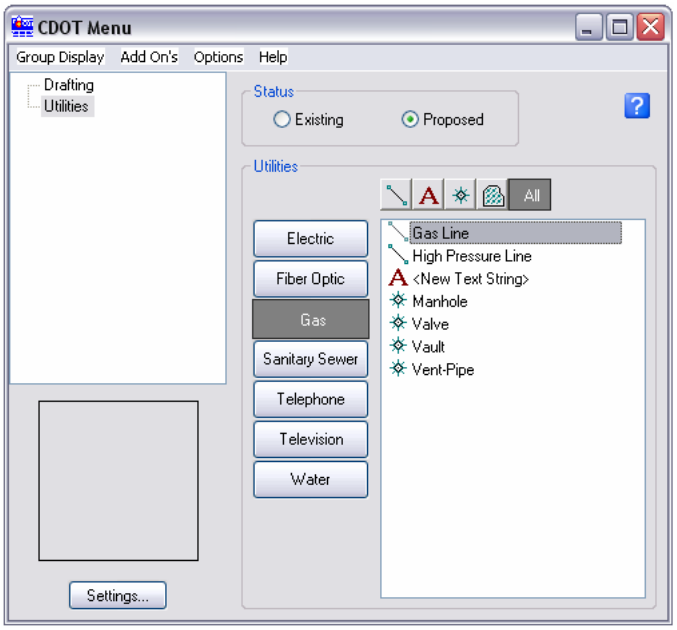


Place proposed gas lines

1. Turn ***off*** the display of the **Design** reference and turn on the display of the Survey/Topo reference.

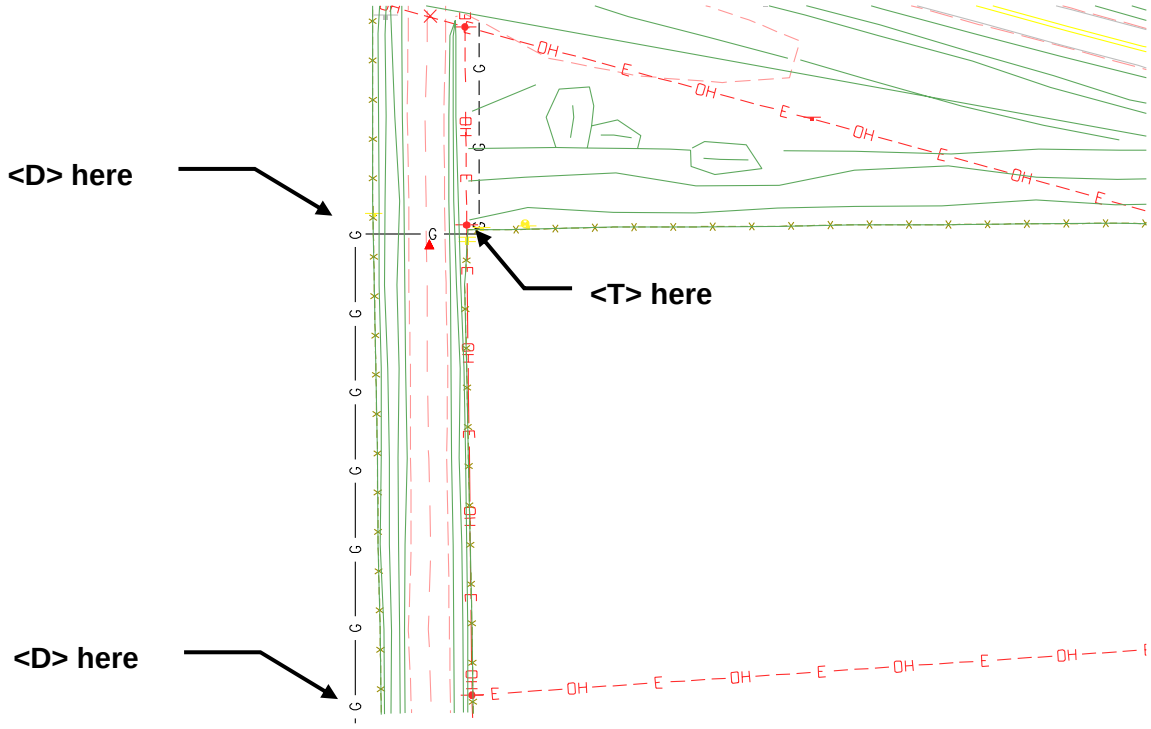
2. Follow the steps below to place a proposed gas line to service the west side of the intersection cross road.

    - On the CDOT Menu, select the **Gas** category.
    - Select the **Gas Line** item.

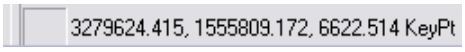


The active level is automatically set to **UTIL_GAS**.

- **<T>** on the end of the existing gas line on the east side of the road.
- Place data points to draw the gas line in the approximate location shown.
- **<R>** when done.

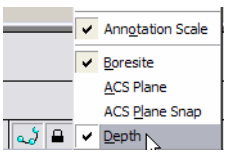


3. **<T>** anywhere on the proposed gas line you just placed and note the elevation.



Since **Depth** lock is **off**, the gas line was placed at an elevation of 6622.514, which is the elevation of the existing gas line at the endpoint where you snapped. You actually want to place the proposed gas line at 0 so that InRoads can later import it as a utility feature at the correct elevation.

4. **Delete** the proposed gas utility line you just placed.
5. Select the **Locks** from the status bar.
6. Toggle **on Depth Lock**.

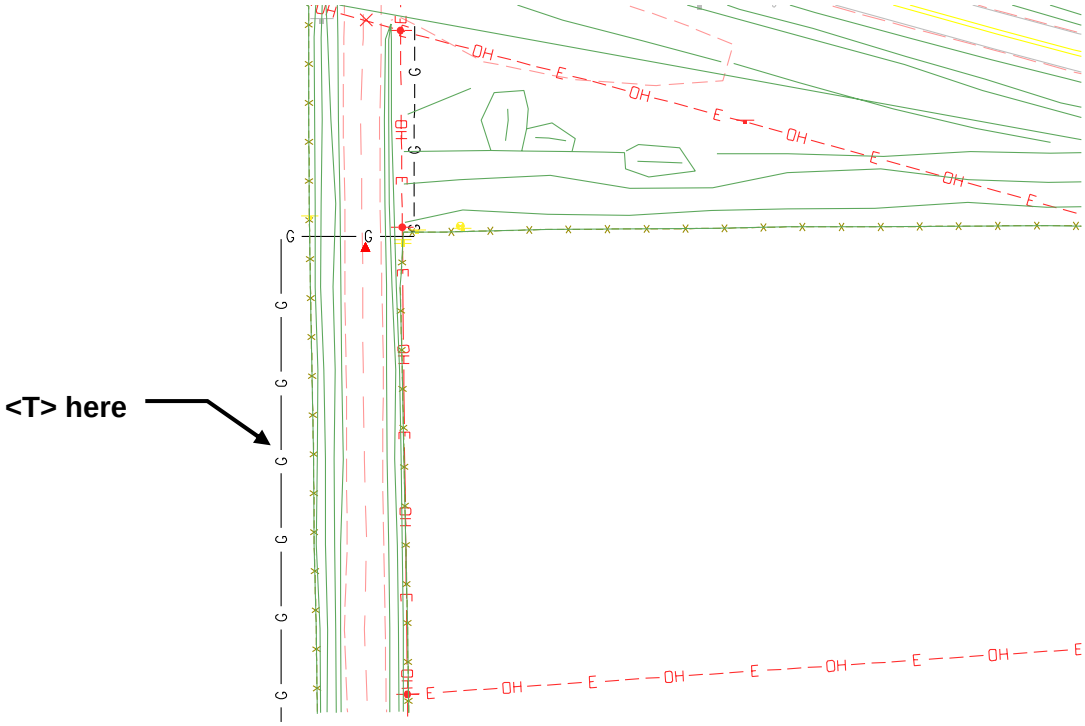


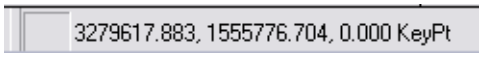
7. On the **Snap Mode** toolbar, toggle **AccuSnap** off.

Note: **AccuSnap** doesn't work consistently when **Depth Lock** is on. Therefore, to ensure **Depth lock** works correctly, toggle **AccuSnap** off.

8. Place the proposed gas line again by a **<T>** on the end of the existing gas line and then placing the other data points in the approximate location shown.

9. **<T>** anywhere on the proposed gas line you just placed and note the elevation.





Since **Depth lock** is on, the proposed gas line was placed at an elevation of 0.

10. Turn **Depth lock off**.

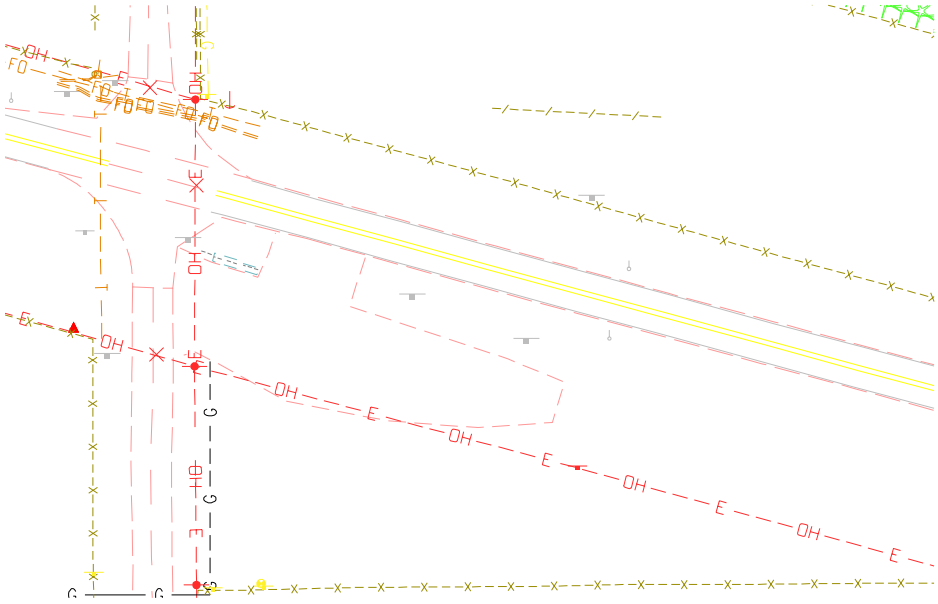
11. Toggle **AccuSnap** back **on**.

Place fiber optic lines using parallel copy

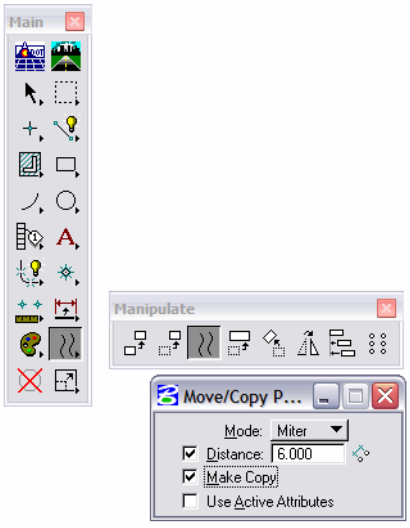
Follow the steps below to place a fiber optic line by parallel copying an existing telephone line.

Locate reference graphics for copying

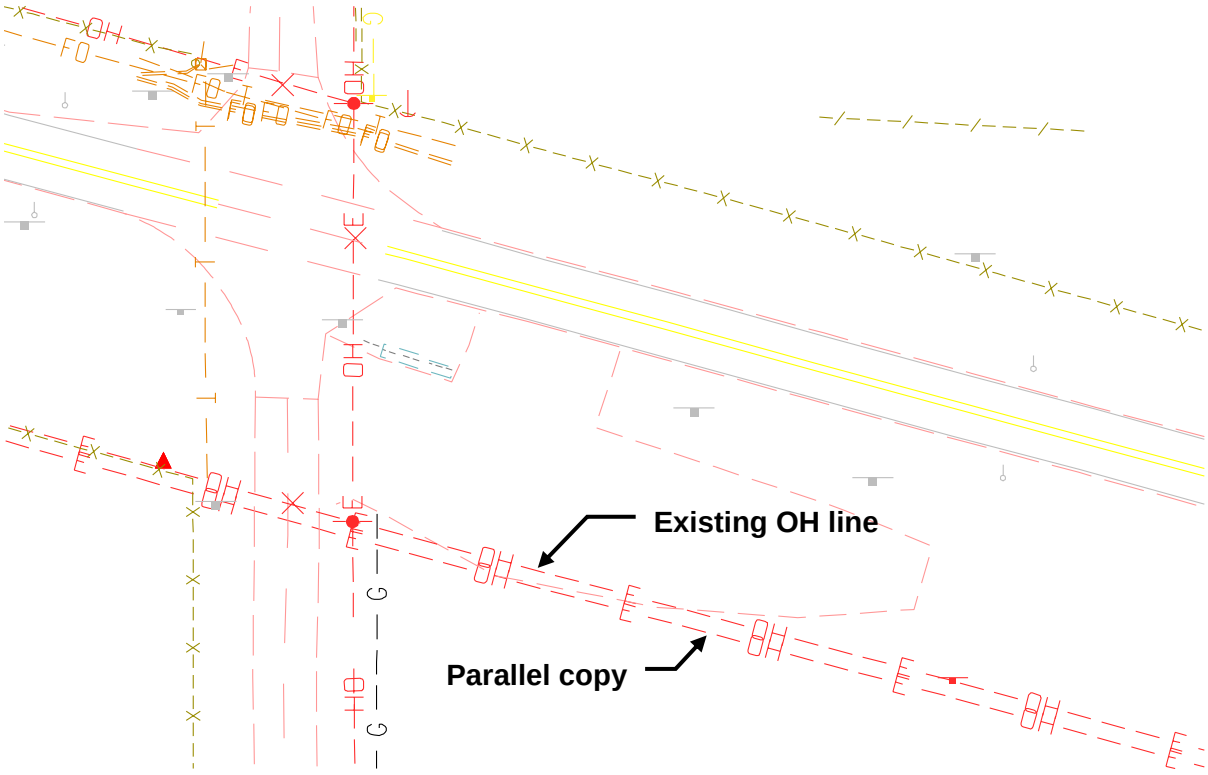
1. Turn off the **TOPO_TERRAIN_Break-Lines** level in the SurveyTopo reference.
2. **Window** in on the existing overhead electrical line in the southeast quadrant of the intersection as shown.



3. Select the **Move Parallel** tool from the **Manipulate** toolbar.
4. In the **Tool Settings** box, set the options as shown.



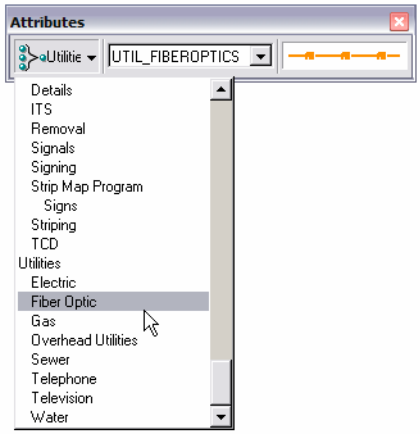
5. **<D>** on the existing overhead line
6. Move the cursor down to specify the direction of the parallel copy.
7. **<D>** to place the copy.



Change element attributes

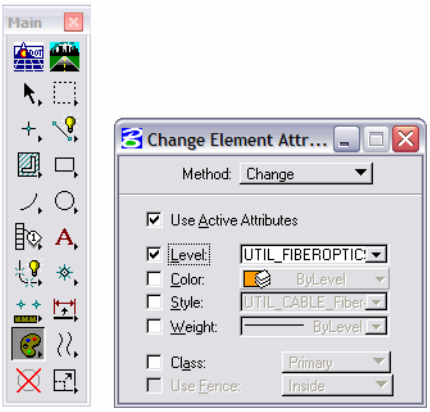
Change the overhead electrical line to an underground fiber optic line using the **Change** command.

8. Set the active level to **UTIL_FIBEROPTICS** (hint: use a filter to help you set the level).

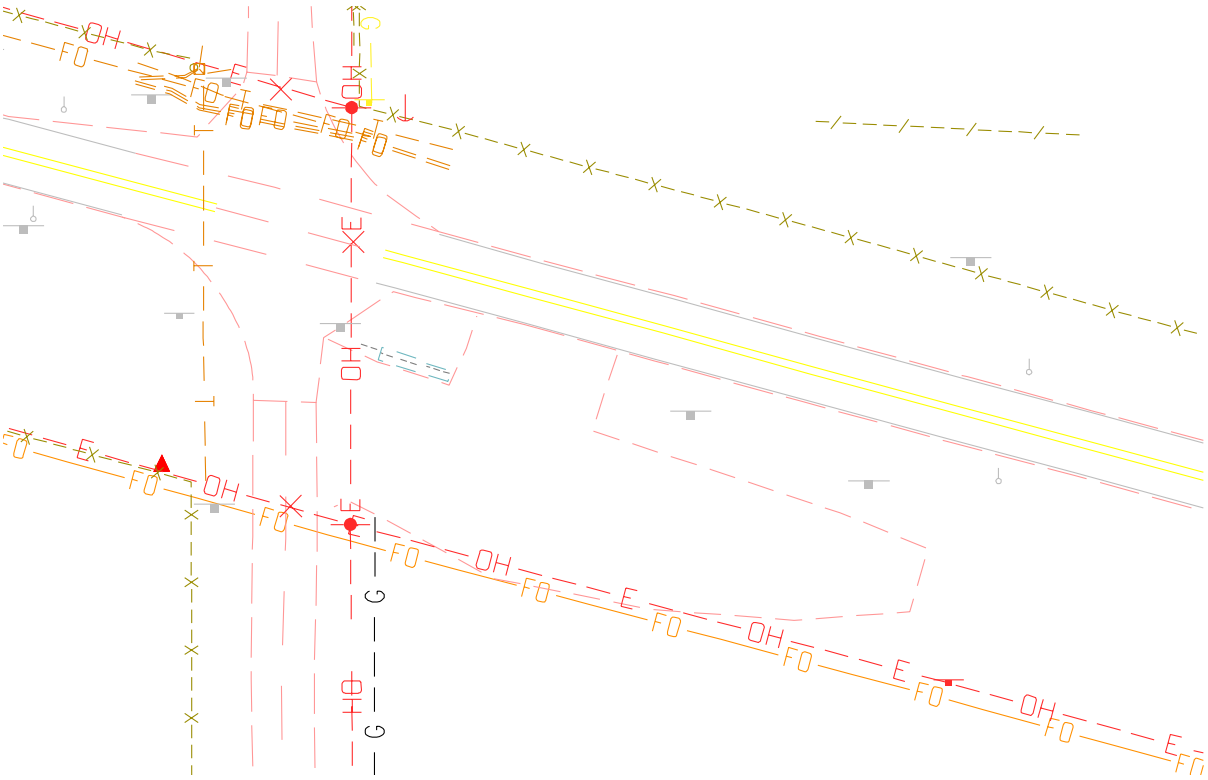


9. Select the **Change Element Attributes** command from the **Change Attributes** toolbar.

10. Set **Method** to **Change.**
11. Toggle **on Use Active Attributes.**
12. Toggle **on Level** (this picks up the active level).



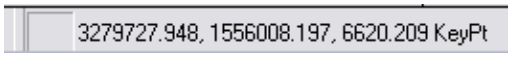
13. **<D>** on the overhead electrical line you just copied as the element to change.
14. **<R>** when done.



Since the Use **Active Attributes** option was turned on, the element was changed to the active level **UTIL_FIBEROPTICS**.

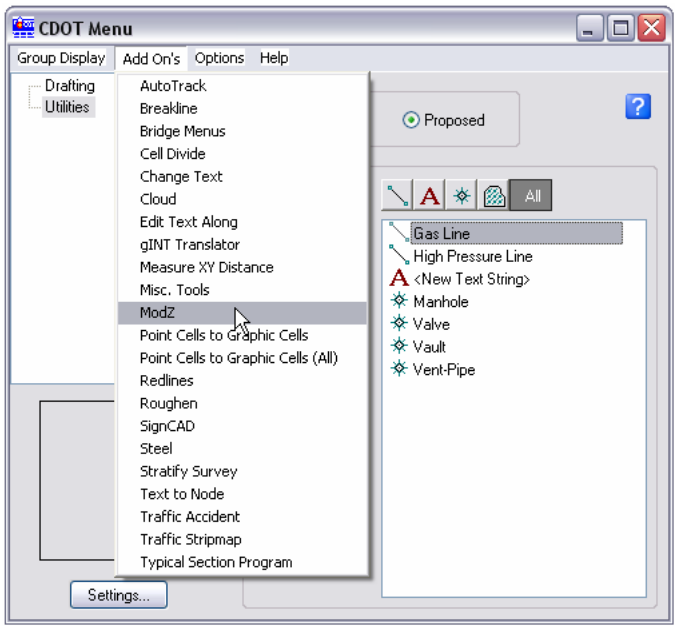
Set the elevation

15. <T> on the fiber-optics line you just placed.

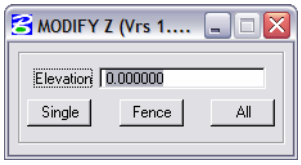


The proposed fiber-optics line is in the 6620 elevation range (your exact elevation may be vary depending on where you placed a tentative point). This elevation is wrong for the fiber optic line since you copied the overhead electrical line. For now, you can set the elevation of this line to 0 and later, it can be placed as a feature in the InRoads surface at the correct elevation. One way to set the elevation of an element is to use the **ModZ** command on the CDOT Menu.

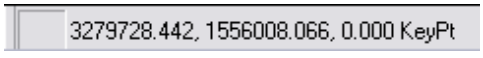
16. On the CDOT Menu, select **Add On's > ModZ**.



17. In the **ModZ** tool settings box, set the elevation to ***0***.



18. Select **Single** (to identify a single element).
19. **<D>** on the new fiber-optics line you created.
20. **<D>** to accept.
21. **<R>** when done.
22. **<T>** on the fiber-optics line to check its elevation.

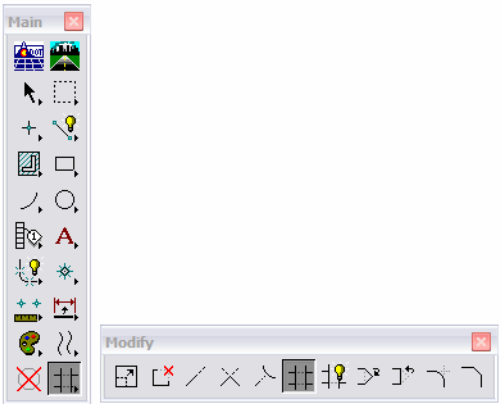


The Z value is now at 0. Use the ModZ command to easily set the elevation of any element or group of elements (selected with a fence).

Trim graphics

The new fiber optic line is only going in on the east side of the intersection cross road. Follow the steps below to use the **Trim** command to edit the fiber optic graphics.

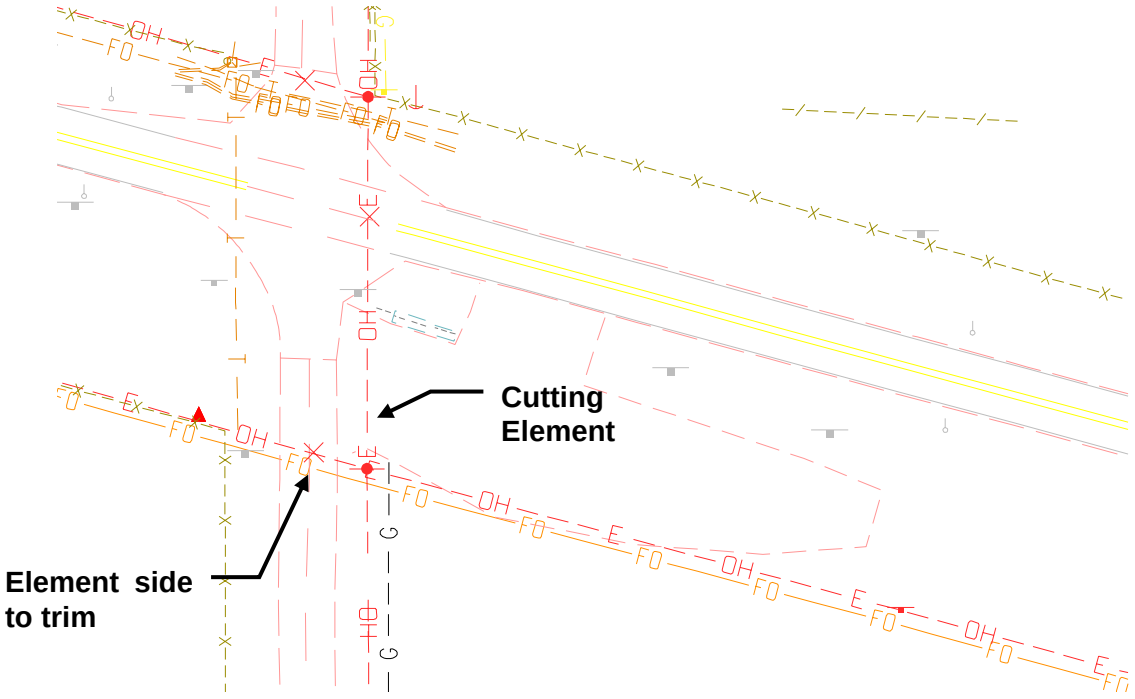
23. Select the **Trim** command from the **Modify** toolbar.



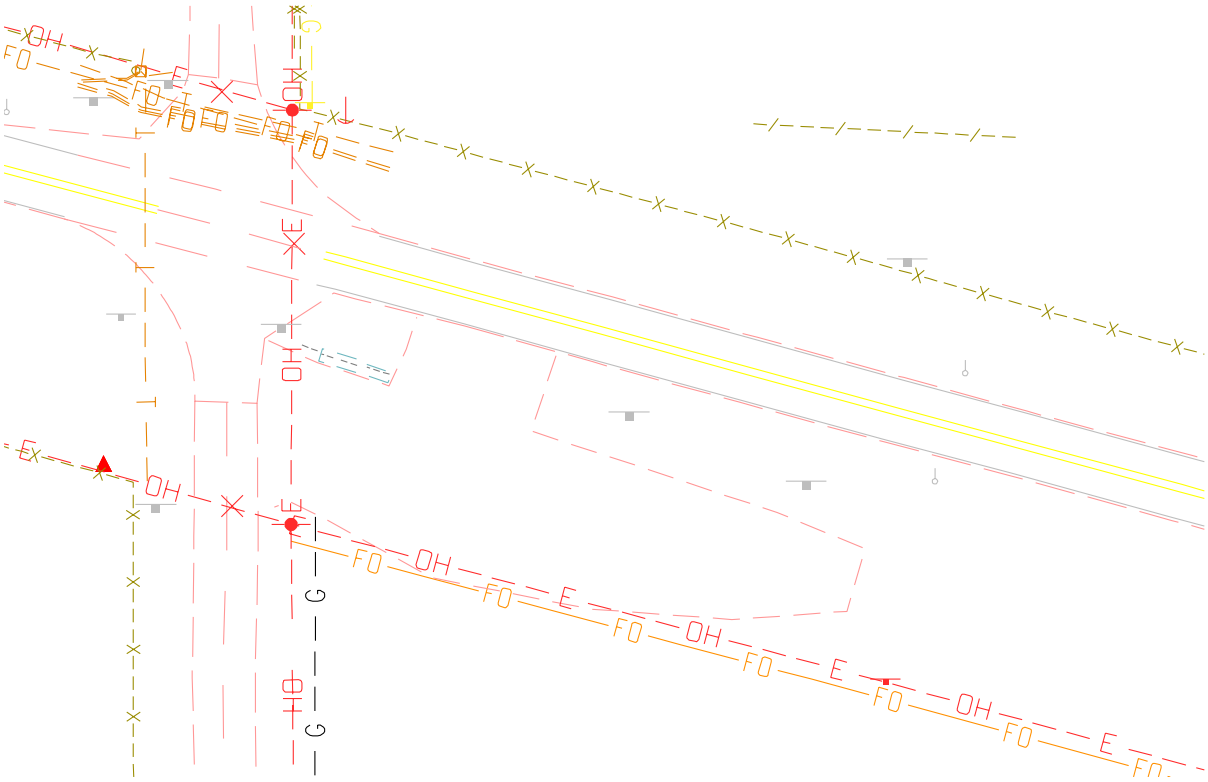
24. **<D>** on the north/south proposed overhead electrical line as the cutting element.

25. **<D>** on the fiber optic line (left side of the cutting element) as the element to trim.

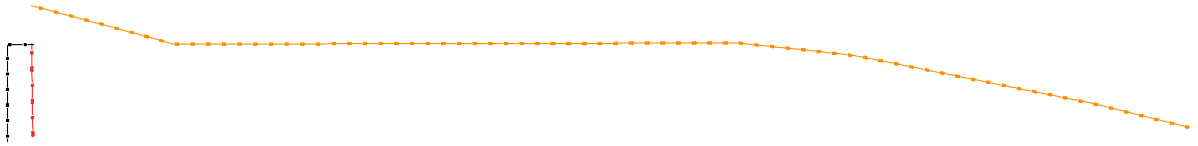
26. **<D>** to accept.



The fiber-optics lines are trimmed as shown.

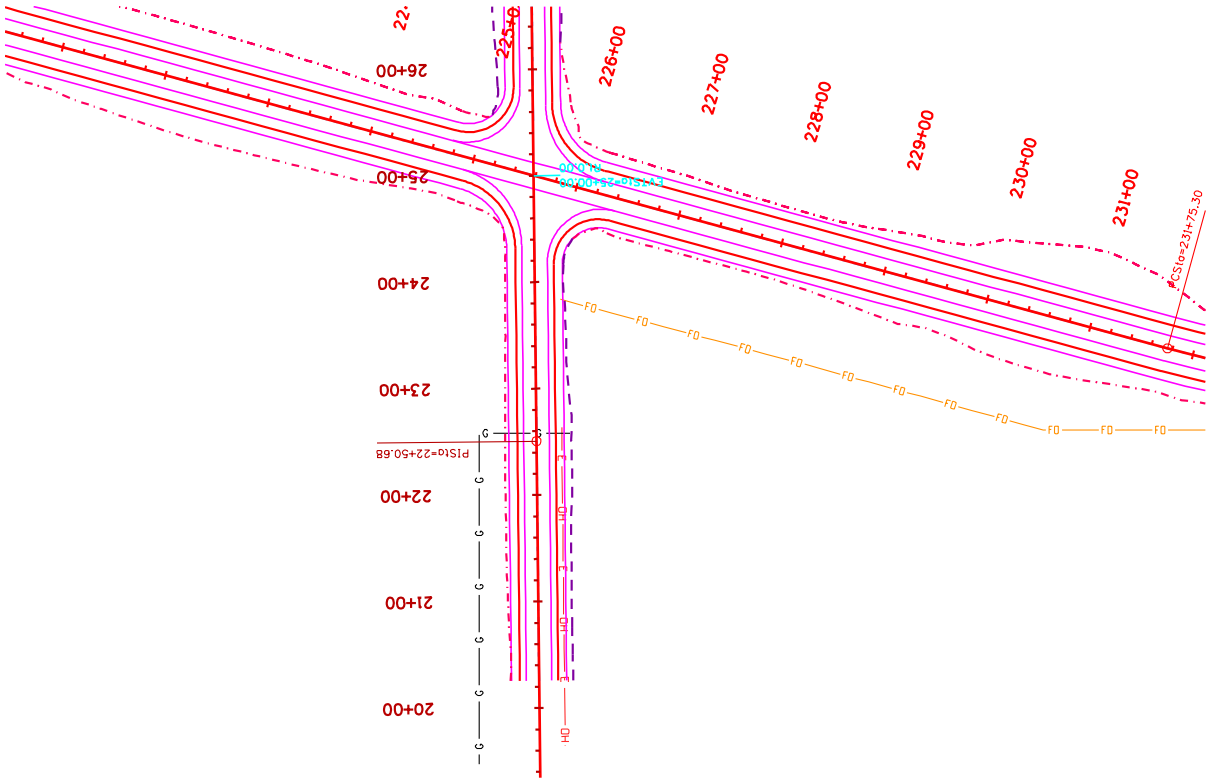


27. Turn off the display of the **Survey/Topo** references.
28. **Fit** the view.



Only the proposed gas, electric and fiber-optic utility graphics appear in the **CU12345UtilityModel01.dgn** file.

29. Turn the display of the **Design** reference ***on*** and window into the intersection as shown.

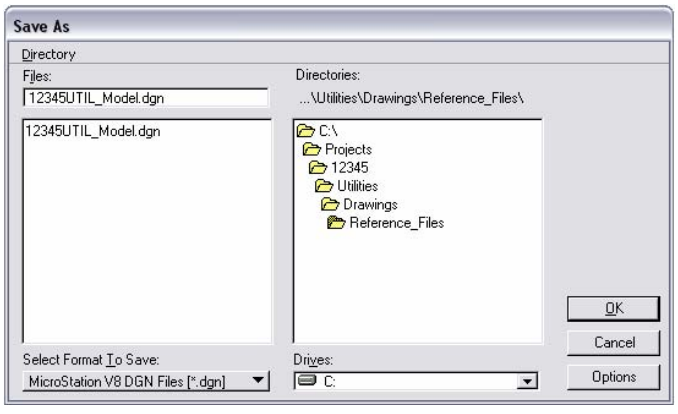


Move the utility model to the Reference Files folder

Move the utility model so that other groups can reference your work.

1. Select **File > Save As** and set the directory to the project's **\Utilities\Drawings\Reference_Files** folder.

2. Remove the CU initials from the file name and select **OK**.

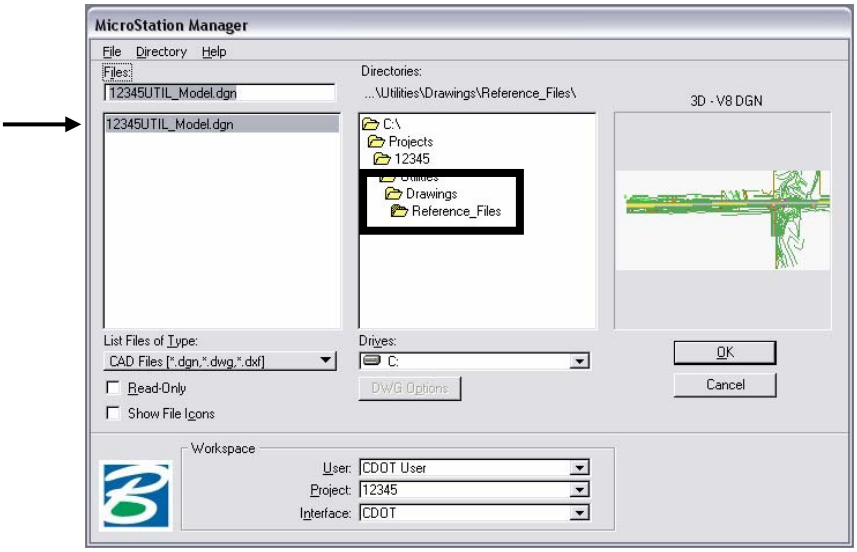


The file is saved to the new location.

Note: The project template delivers standard dgn's for model and sheet files as starter files. You may be prompted to confirm saving over an existing file. Please use caution when performing these tasks as you could lose data. Be sure the files are empty or you are working with the latest files.

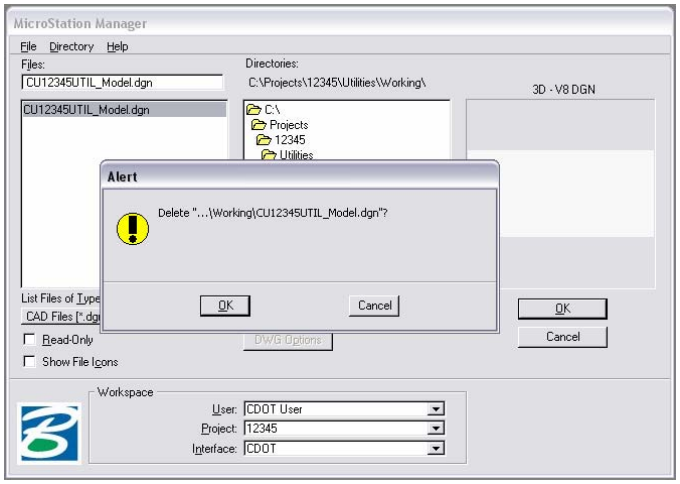
3. Select **File > Close**.

4. In the **MicroStation Manager**, verify that the file was saved to the **Reference_Files** folder.



5. Then, set the directory to **\Utilities\Working.**

6. Select **File > Delete** and delete the file from the **Working** folder.



7. **Cancel** the MicroStation Manager to exit.

7. Cells and Patterns

Understanding cells

Cells are a permanent group of graphics. They are typically used for standard graphics (symbols, details, notes, borders, *etc.)*, which may be used over and over on multiple projects. Cells are stored in a separate cell library file.

When you're ready to place the cell in your design file, attach the cell library to the file. You can then place the cell out of the library multiple times, like a rubber stamp. Once the cell is placed in the design file, it is a single element that exists in the design file. You do not have to have the cell library attached to see the cell.

Cell libraries

Cell libraries are just ordinary MicroStation design files that have a ***.cel*** extension. Cells can be organized into different libraries or you can place all cells in one library. CDOT uses discipline-specific cell libraries, where each group has its own library (Design, Bridge, Traffic, *etc*.)

Cell Library = DGN file

The cell library file contains multiple models and each cell is stored in a separate model.

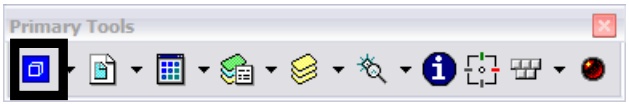
Cell = Model

What Are MicroStation Models?

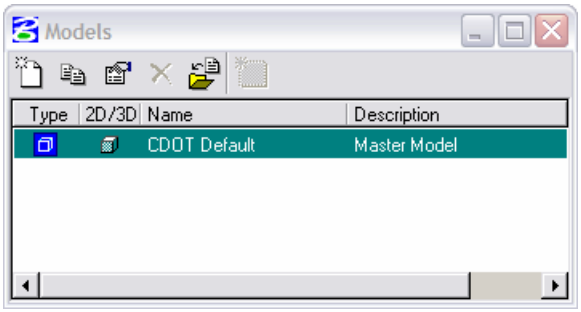
Models are "containers" for graphics within a DGN. Design files must have at least one model (named **CDOT Default** in the CDOT workspace), but can have many. Models in a DGN file are analogous to workbook in an XLS file. Just like each workbook is a separate spreadsheet, each model is a separate set of graphics. And, you can have multiple models in a DGN just like multiple spreadsheets in a XLS file.

> **Note**: Do not confuse ***Model files*** with ***MicroStation Models***. They are two totally separate concepts. A ***Model file*** is a generic term used to describe any working file that contains graphics. A ***MicroStation Model*** is a separate container for graphics inside any MicroStation file – Model or Sheet file.

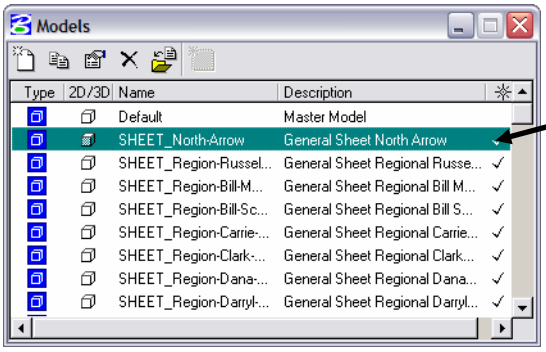
Models are accessed from the **Primary** toolbar. They can be entirely different sets of graphics or different components of the same project (*e.g.* three separate models for plan, profile and cross sections in one project DGN file).



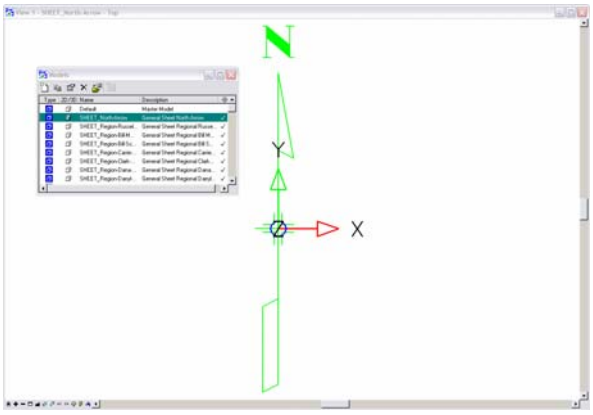
In almost all cases, you will work in one model -- the* CDOT Default *model in all model files and sheet files.



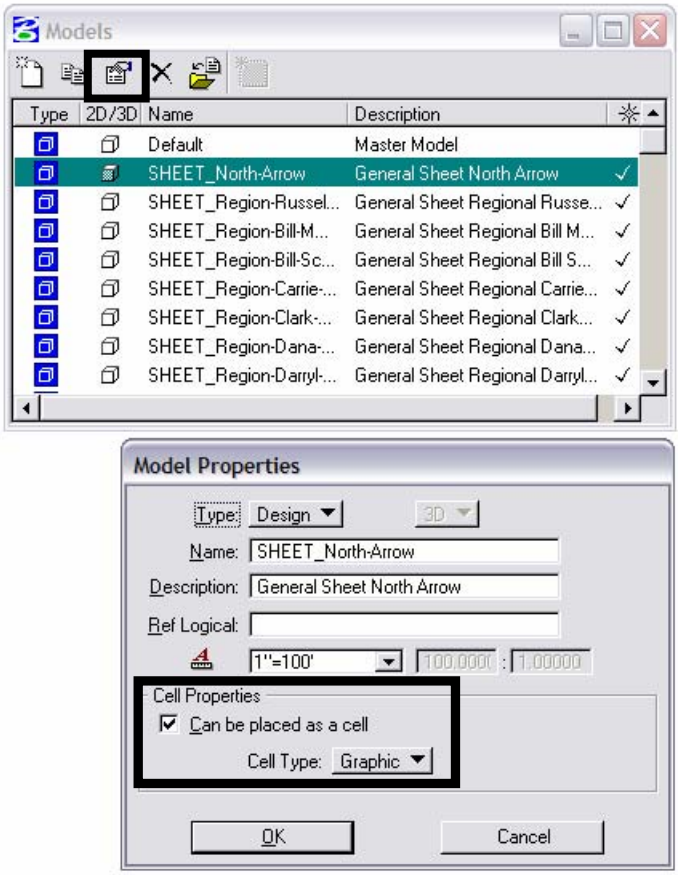
The one exception is when you're working directly in a cell library. Each cell in a cell library is actually just a separate model inside the cell library design file (cell=model). The design file containing the model (cell) can be attached to any other design file as a cell library, and then the model (cell) can be placed out of this file.



Models in a cell library. Each model is a cell.



In order for models to be placed as cells, the option **Can be placed as cell** must be toggled on in the model's properties. In the **Models** dialog box, select the **Edit Models Properties** command to turn this option on/off.



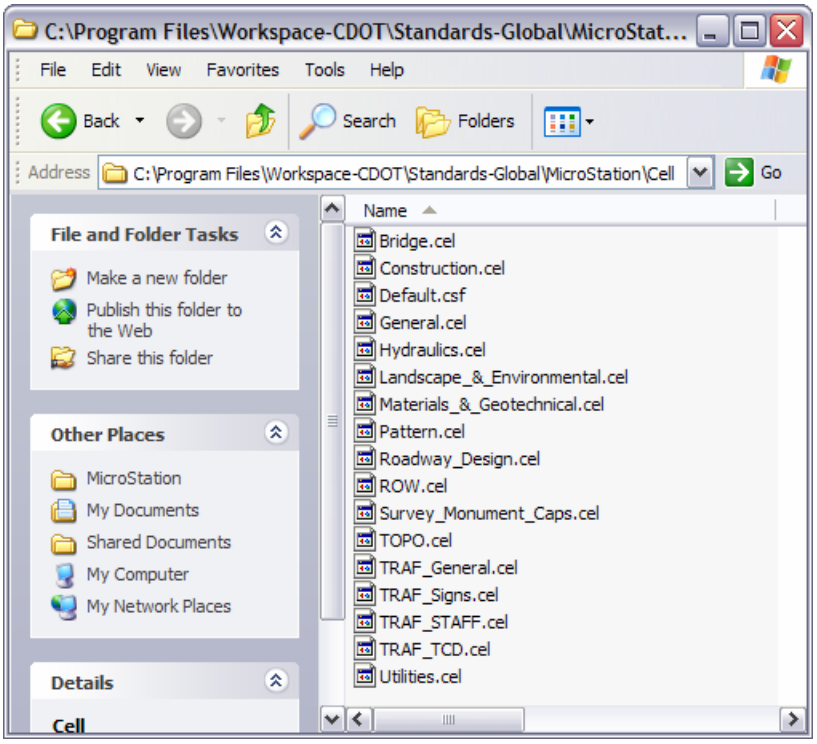
The design file's levels are shared among all models; however each model can have different levels turned on/off for different views. A **Global Display** or **Global Freeze** mode on the **Level Display** box carries through to all models.

Models can also be imported from other DGN files. This is a good way to copy a lot of graphics from one DGN to another, or a good way to build a cell library.

CDOT Cell Libraries

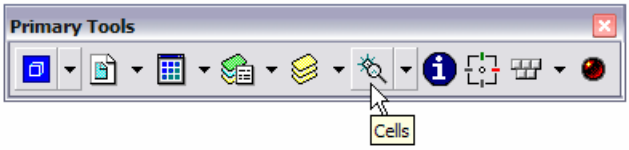
Many of the CDOT standard cells have been created and are stored in discipline-specific cell libraries (*e.g.* Design, Bridge, ROW). The appropriate cell library or libraries are attached to the discipline seed file. When you create a new file from a discipline seed file, the associated cell library is automatically attached to the new file.

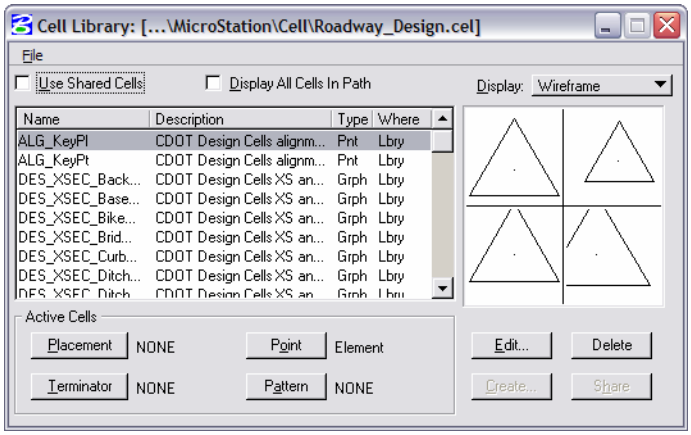
The standard CDOT cell libraries are stored in the CDOT workspace in the folder **C:\Program Files\Workspace-CDOT\Standards-Global\MicroStation\Cells.** The discipline-specific as well as general cell libraries (used by all groups) are shown below.



The Cell Library Dialog

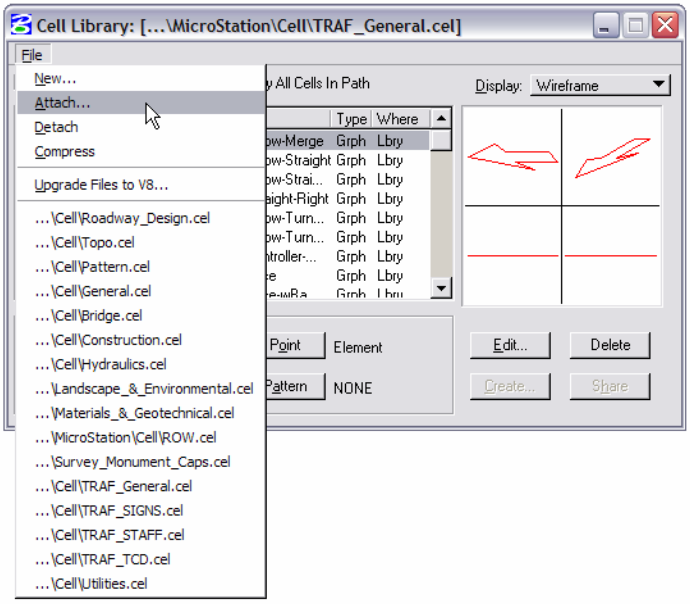
To view all cells contained in a library, you can open the **Cell Library** dialog box. Select **Element > Cells**, or select **Cells** from the **Primary** toolbar.



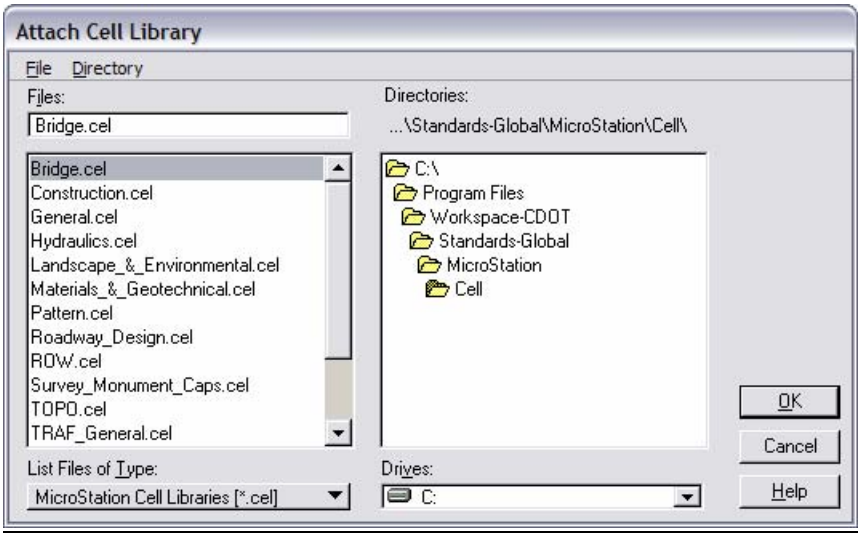


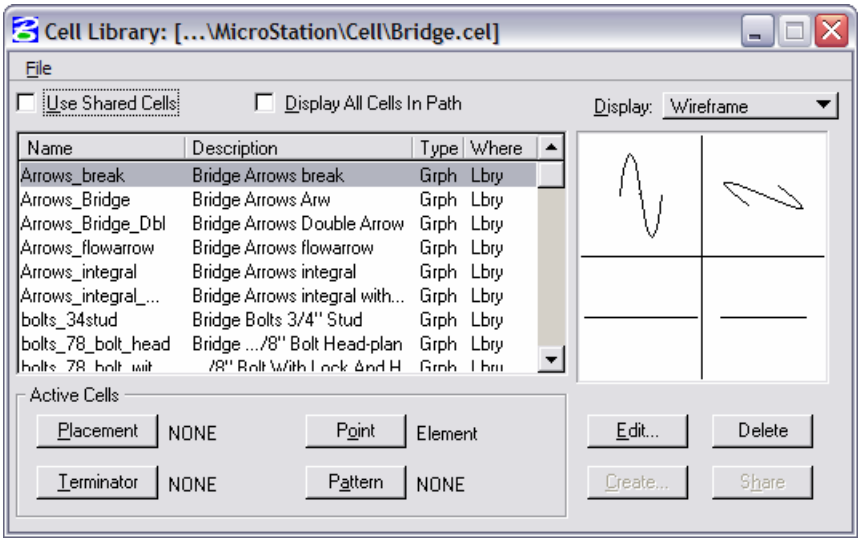
This opens your discipline cell library (attached via your seed file) and a list of cells is shown in the **Cell Library** dialog box.

If you want to access cells form a different library, you can manually attach a library to your active design file. From the **Cell Library** dialog box, **s**elect **File > Attach.**

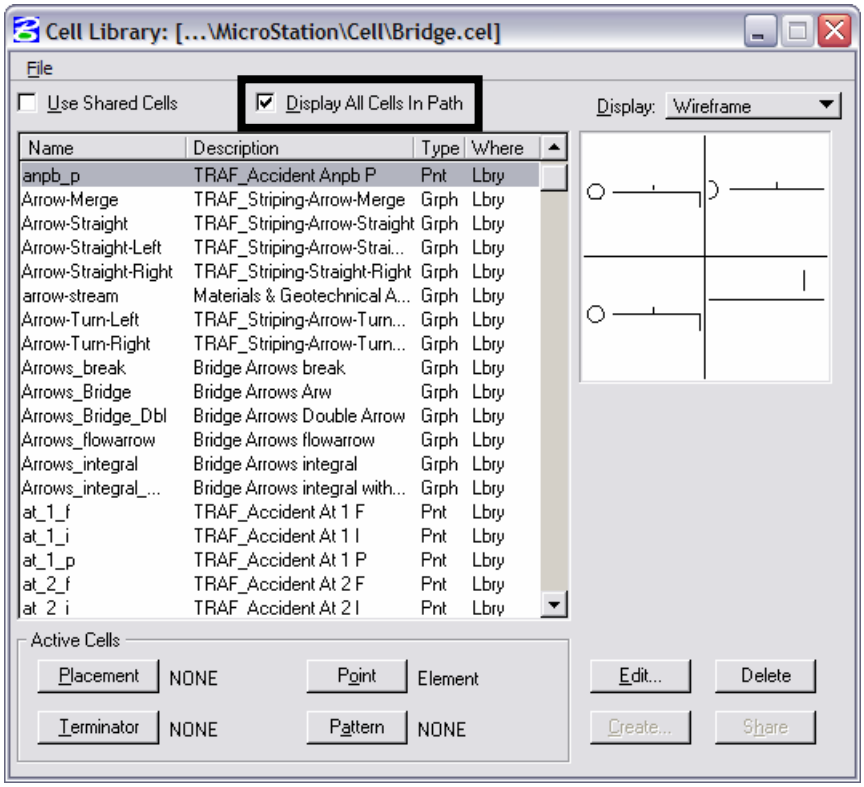


When working in the CDOT workspace, the configuration automatically sets the correct path for ***.cel*** files. Select the library to open and then select **OK** to attach the library.





Note: You can only attach one cell library at a time (when you attach a library, it automatically detaches the current library and attaches the new one). Only the cells from the active library are shown in the list of cells. ***However***, if you toggle on **Display All Cells in Path**, MicroStation displays cells from all of the CDOT libraries that are pathed in the CDOT configuration.



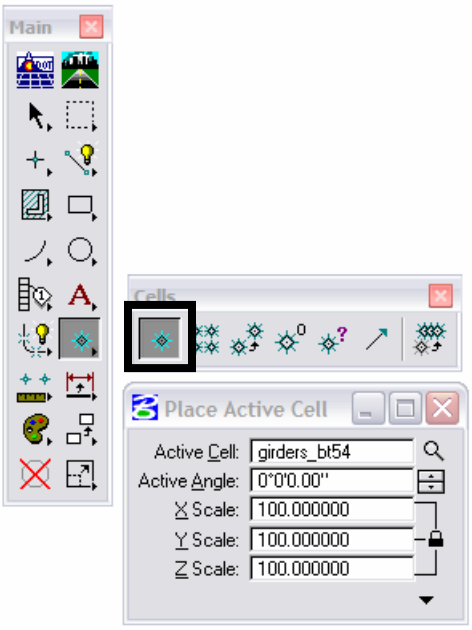
Types of cells

Cells are either **Graphic** cells or **Point** cells. **Graphic** and **Point** cells have different properties after they are placed in the design file. The properties of each type of cell are as follows:

	Graphic Cell	**Point Cell**
Symbology	Maintains active settings used when created	Takes on active settings when placed
Level	Level(s) as created (relative or absolute mode) when placed	Active level when placed
Snappable points	Keypoints	Cell Origin
View	View dependent — appears different according to the view (top, front, *etc*.)	View independent — appears as originally drawn in all views

Placing cells with the Place Active Cell Command

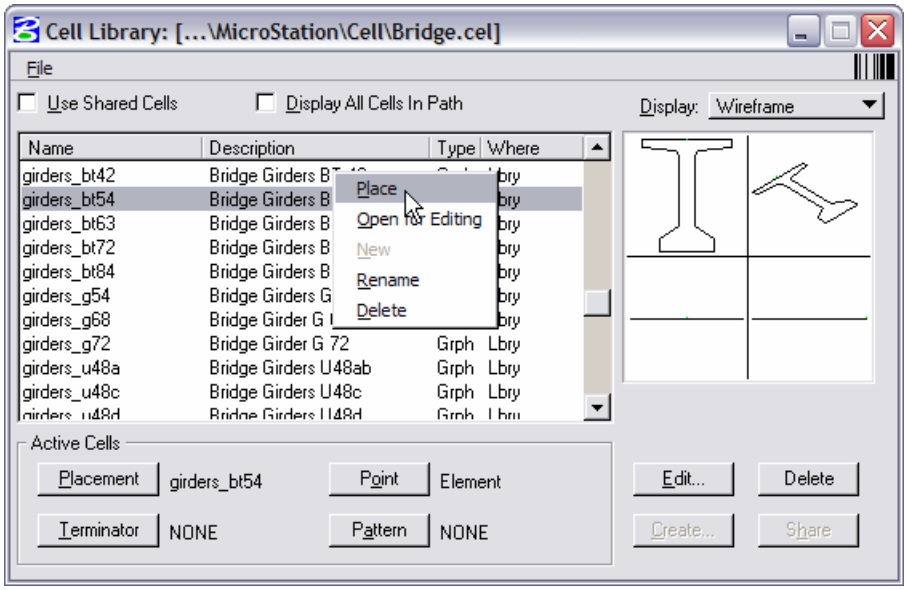
You can place cells out of the cell library into your design file using the **Place Active Cell** command located on the **Cells** toolbar.



The command places either a point or graphic cell in the design file using the active placement parameters including:

- Active cell name (you can browse out to the cell library and select the cell from a list – double-click the cell to make it active)
- Active scale (***as=<scale factor>***)
- Active angle (***aa=<angle>***)
- Active element symbology — for point cells only, and
- Active level — for point cells only.

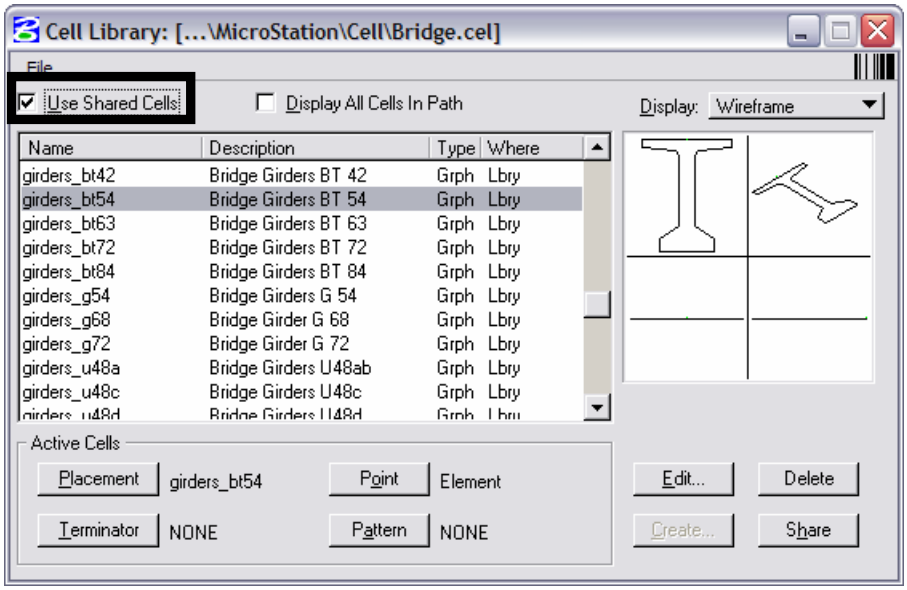
Note: You can also place a cell by right-clicking on it in the cell library dialog box. This sets the cell as the active Placement cell and automatically selects the **Place Active Cell** command.



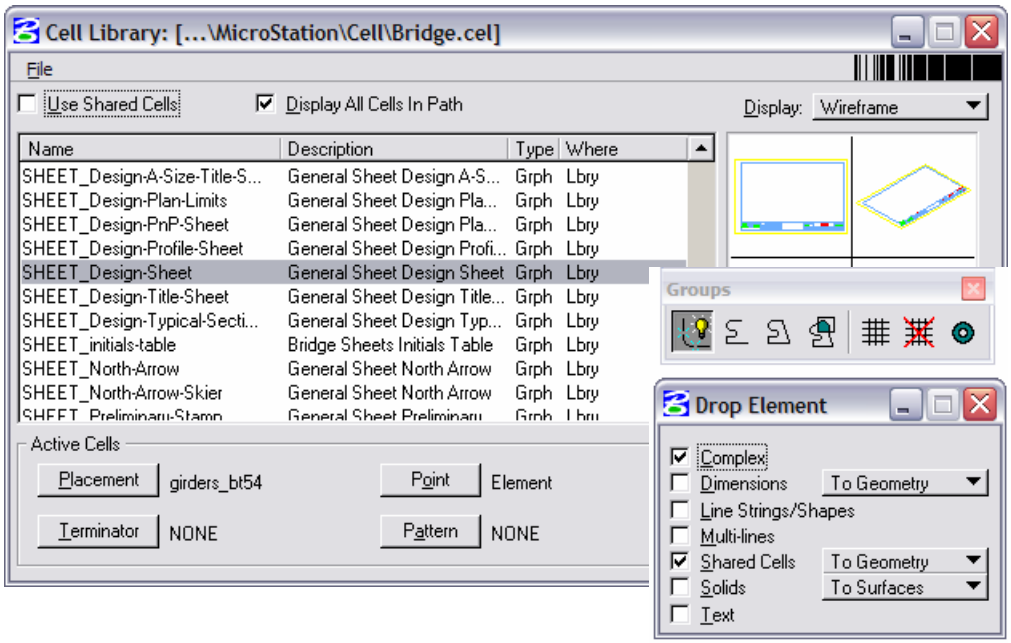
Shared Cells

Cells can be placed as ***Shared***. Then, when you place multiple cells in a design file, MicroStation stores the shared cell definition data once, and all other instances of the cell placement reference this definition. Shared cells keep your design file efficient by writing the cell graphics to the file only once.

Note: To place a shared cell, toggle on **Use Shared Cells** in the cells dialog box.

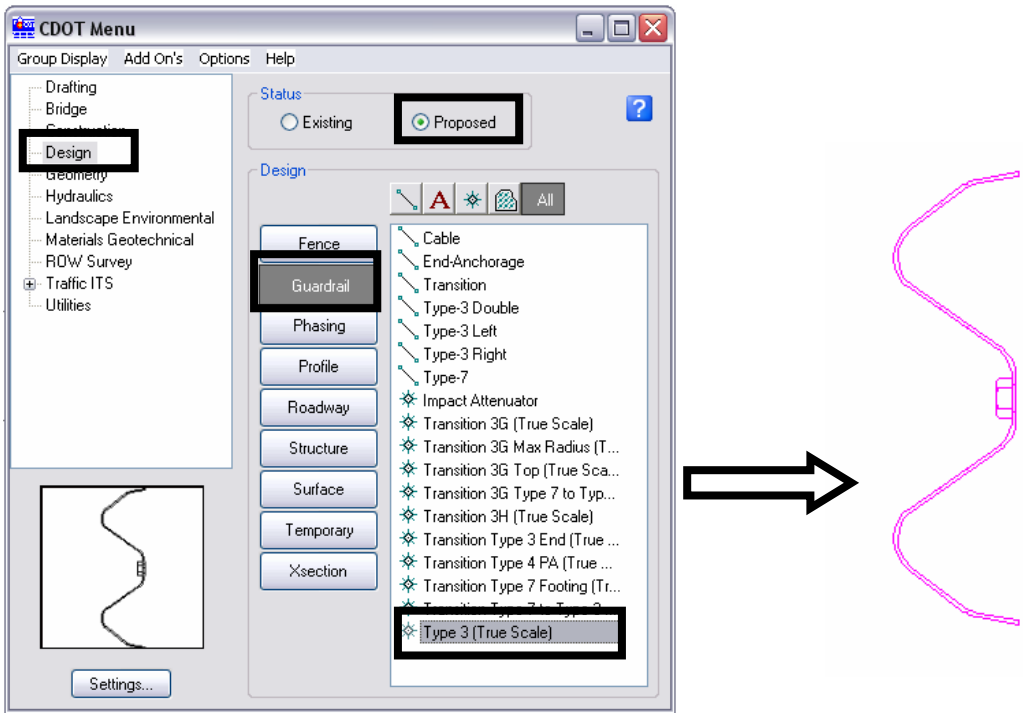


If you're placing a sheet border cell, do not place it as shared. If you do, you will not be able to edit the cell text. If you want to remove the share status of a cell, you can do so with the **Drop Element** command. You can drop a **Shared Cell** to a Normal Cell (for text editing) or to **Geometry** (individual graphics).

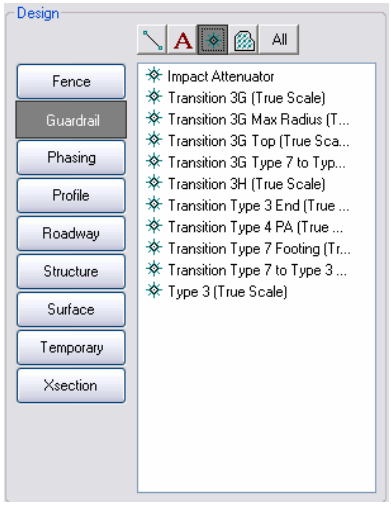


Placing cells with the CDOT Menu

The CDOT Menu streamlines the process of placing cells. After selecting the **Group**, **Status** and **Category**, a list of available cells for that category is shown in the item selection window. Just select the cell item and then place it in your file. The proper level is set active and the **Place Active Cell** command is automatically selected. The specified cell is automatically set active and placed out of the appropriate cell library.



Note: You can set the **Filter** to **Show Cells** to filter only the cell items for a category.

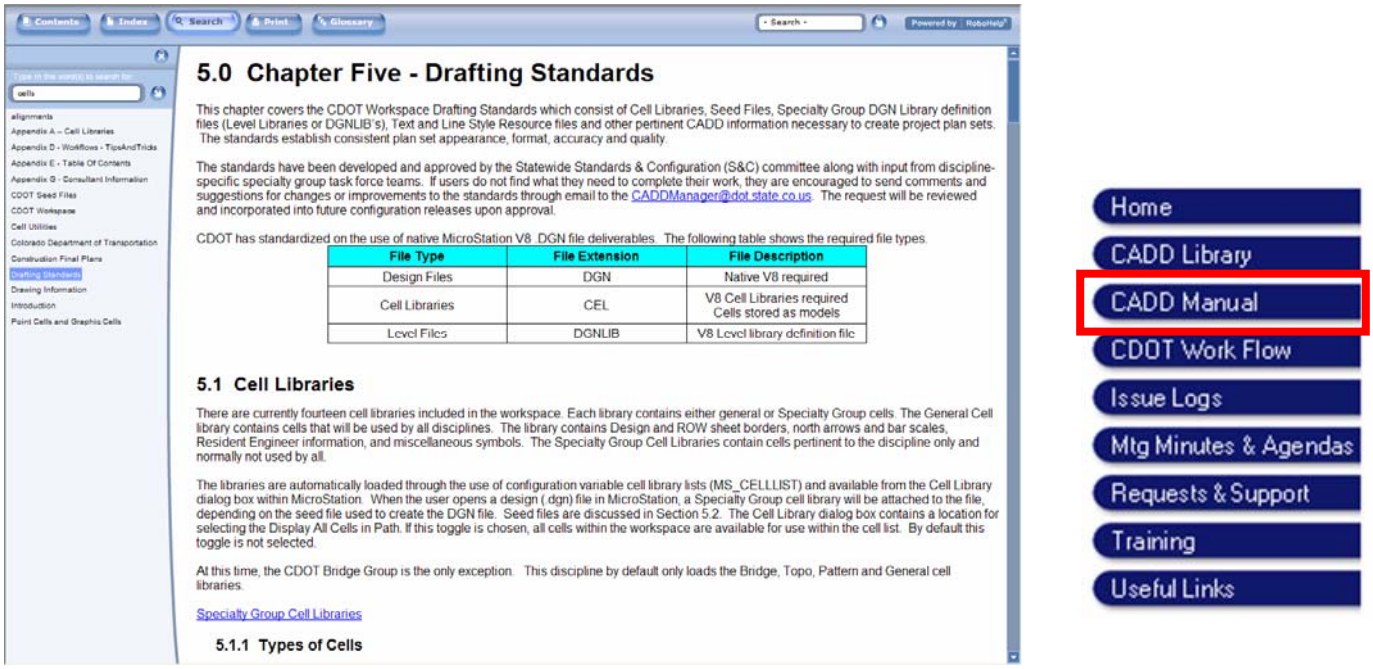


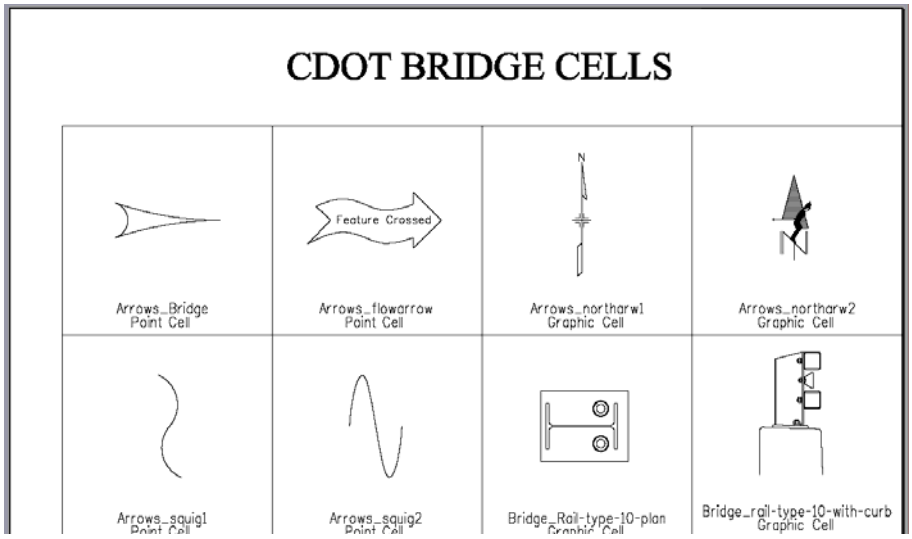
Cell Divide Program

The Cell Divide program located on the CDOT Menu (**Add On's > Cell Divide Load**), will divide any linear or curvilinear elements with the active cell. The program allows you to specify a length and angle to place the cell along the element.

More information

For more information on cells and cell libraries, see the **CDOT CADD Manual**, ***Chapter Five – Drafting Standards, Section 5.1 Cell Libraries***.





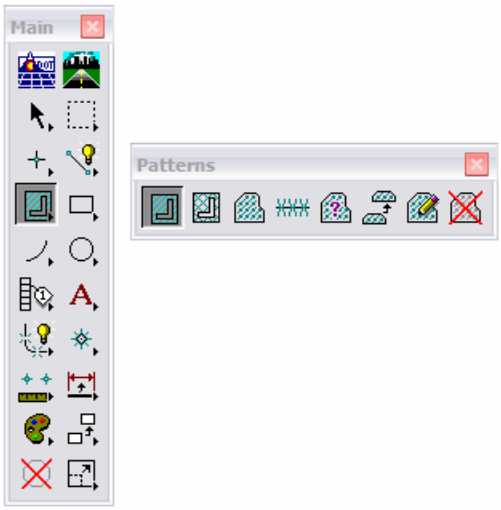
Creating Cells

For information on how to create a cell library and cells, see Chapter 9, lab exercise 9B – Create a project specific border.

Understanding patterns

You may have a need to pattern areas with a hatch, crosshatch or special pattern (concrete, rip-rap, *etc*.). Or, you may need to pattern linear elements like pavement lines with an asphalt pattern. For these situations, you'll use MicroStation's patterning tools.

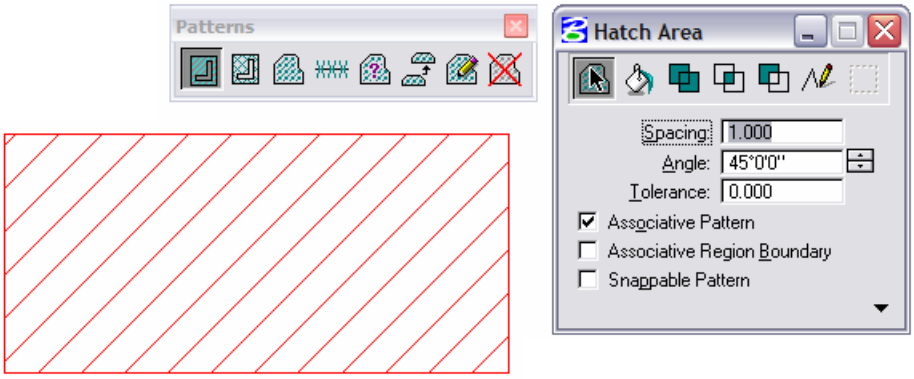
Patterns toolbar



The **Patterns** toolbar contains tools for hatching and cross-hatching shapes or areas. You can also pattern any line, shape or area with a cell. The **Pattern** tools include:

Hatch Area

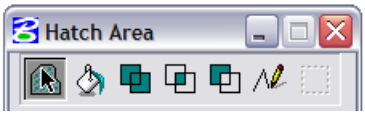
The Hatch Area command hatches a closed shape or area in the active model or a reference. Set the **Spacing** (in master units) and **Angle** of the hatch line and turn on **Snappable Pattern** if you later want to snap to the pattern graphics (the hatch lines in this case). If you're patterning curved element, key in a **Tolerance** or minimum distance for chording off the pattern around the curve.



Toggle on **Associative Patterning** if you want the pattern to update if the element is modified. In addition, broken patterns can be re-associated by re-connecting the pattern shapes.

Toggle on **Associative Region Boundary** to place the pattern on different level from the patterned element (useful for removing the "box" around text

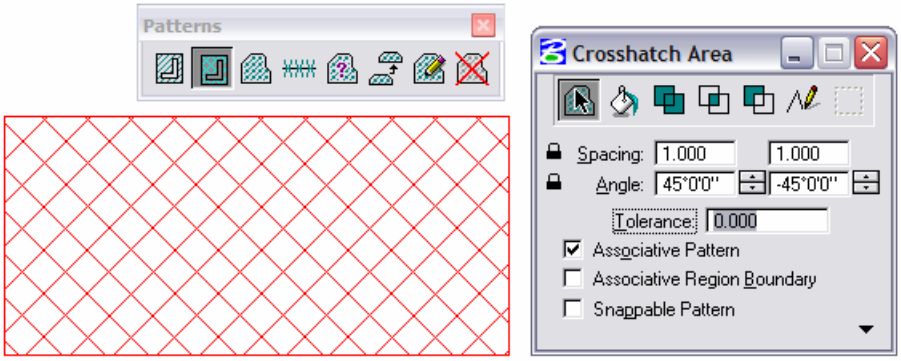
The icon bar at the top of the dialog box allows you to select the pattern method (how the area will be patterned), which includes (items listed in order from left to right on the icon bar):



- ***Element*** —a closed shape.
- ***Flood*** — the area enclosed by a set of elements.
- ***Union*** — area defined by the union of two or more closed shapes.
- ***Intersection*** — area defined by the intersection between two or more closed shapes.
- ***Difference*** — area defined by the difference between two or more closed shapes.
- ***Points*** — an area defined by a series of data points where you dynamically define an area.
- ***Fence*** — the area inside the fence.

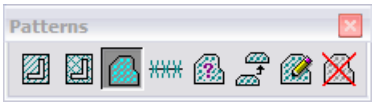
Cross Hatch Area

The **Cross Hatch Area** command uses similar settings to the **Hatch Area** command to cross-hatch an area.

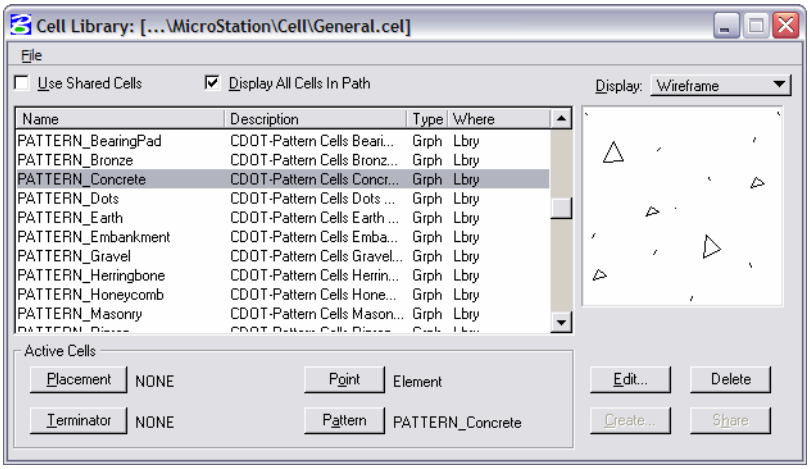


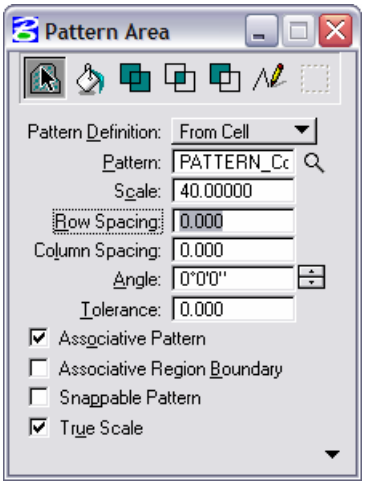
Pattern Area

This command patterns an area or closed shape with a cell. The pattern element(s) can be in the active design file or in references.



Key in the active **Pattern** cell or set it in the **Cells** dialog box (**Element > Cells**). If you toggle on Display All Cells in Path, all pattern cells begin with the cell name PATTERN.





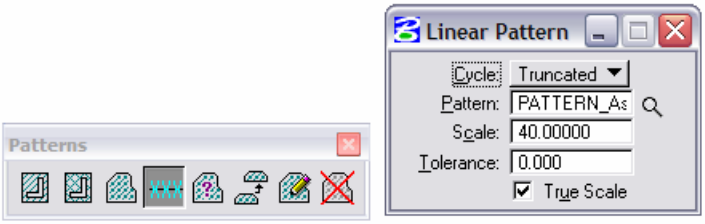
Set the active **Scale** to size the cell, the active **Angle** to determine the placement angle for the pattern graphics, and the pattern **Row** and **Column Spacing** in master units (distance between the tiled cells). The **True Scale** option will reconcile the difference between the cell model's working units and the working units of the design file model in which it is placed (*e.g.* patterning with a metric cell in an imperial design file model). For this option to work, the pattern cell must be a shared cell.

Other options are the same as noted for the **Hatch** and **Crosshatch** commands.

Linear Pattern

Linear Pattern patterns with a cell along an existing linear element. You can pattern both linear and curvilinear elements. Specify the **Cell**, **Scale** and **Tolerance** just like the **Pattern Area** command. In addition, the **Linear Pattern** command has the following **Cycle** options:

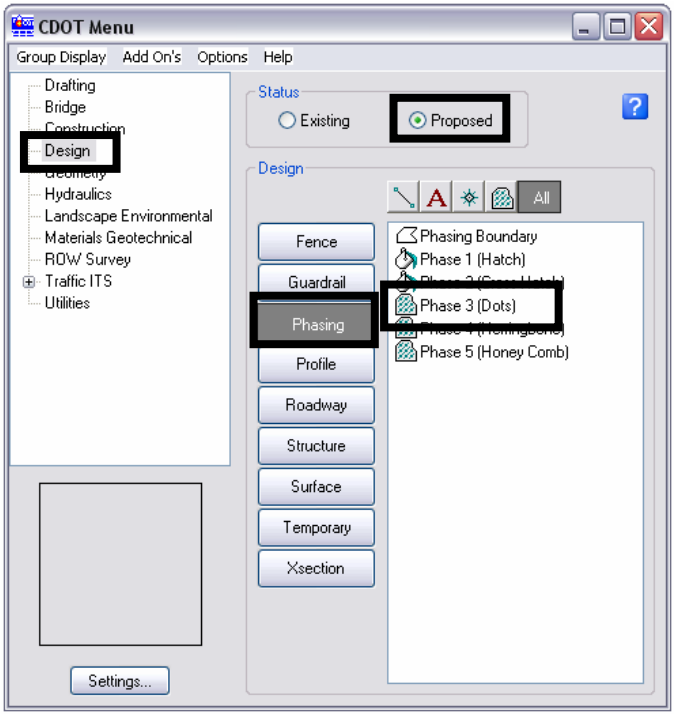
- ***Truncated*** – places the cell for the linear pattern using the specified active scale. Based on this scale, the last instance of the pattern may be truncated.
- ***Complete*** – adjusts the scale for pattern cell so that only complete instances of the cell are placed along the linear element.
- ***Single*** – patterns with one instance of a cell on each linear segment.
- ***Multiple***– adjusts the scale for pattern cell so that only complete instances of the cell are placed along each segment of the linear element.



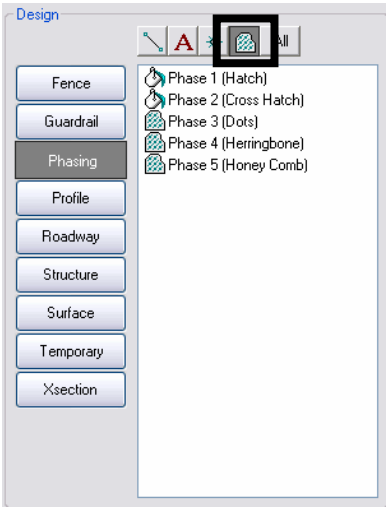
After patterning, you can turn off **Patterns** in the **Settings>View Attributes**. Doing so will display the original linear element.

Placing patterns with the CDOT Menu

The **CDOT Menu** streamlines the process of placing patterns. After selecting the **Group**, **Status** and **Category**, a list of available patterns for that category is shown in the item selection window. Just select the pattern item and then data point inside the region to pattern. (The CDOT Menu uses the Flood method of patterning, so you must data point inside the region to pattern). The proper pattern level is set active and the appropriate pattern command is automatically selected (**Hatch Area**, **Cross Hatch Area**, **Pattern Area** or **Linear Pattern**). If patterning with a cell, the appropriate patter cell is automatically set active.



Note: You can set the **Filter** to **Show Patterns** to filter only the pattern items for a category.



Lab 7A – Create Landscape graphics

In this lab you'll create a Landscape & Environmental (L&E) model file and then use the CDOT Menu to place silt fence lines, hay bale cells and wetlands regions.

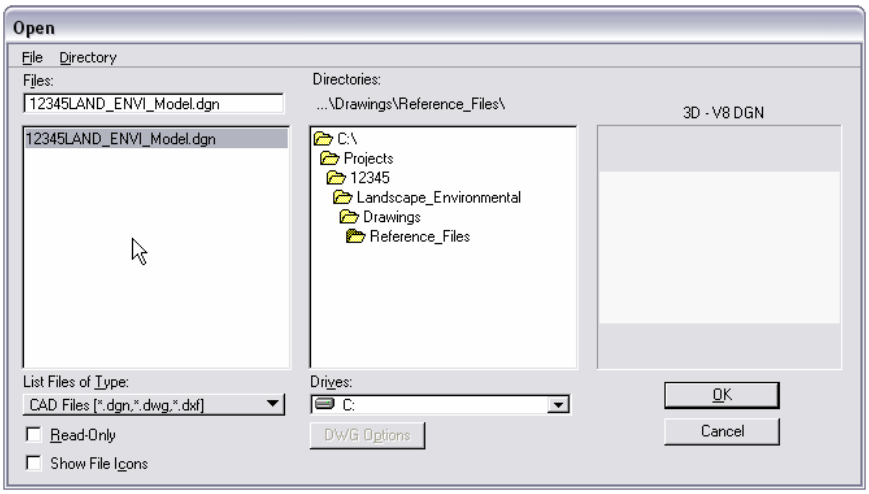
Objectives

After completing this exercise you will know how to:

- Use the CDOT Menu to place L&E custom lines.
- Use the CDOT Menu to place L&E cells.
- Use the CDOT Menu to place L&E shapes (wetlands).
- Use the CDOT Menu to pattern areas.

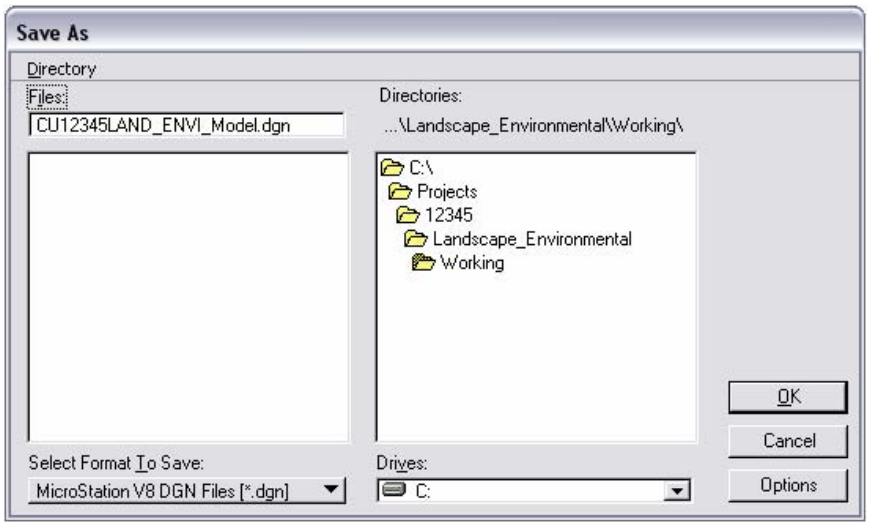
Create the L&E model file

1. Start MicroStation.
2. Re-set **Project** to **12345**.
3. Set the directory to **\Landscape_Environmental\Drawings\Reference Files**.
4. Select the file **12345LAND_ENVI_Model.dgn** and select **OK** to open.



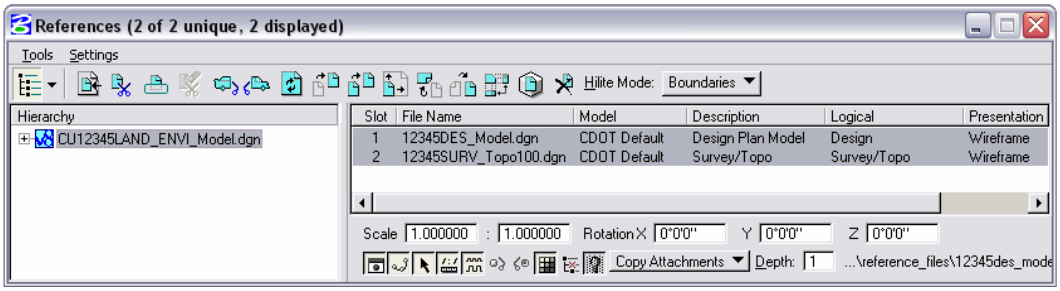
5. After opening the file, select **File > Save As...** and set the directory to **C:\Projects\12345\Landscape_Environmental\Working**.

6. Change the file name to **CU12345LAND_ENVI_Model.dgn** and select **OK** to save a copy to the **Working** folder.

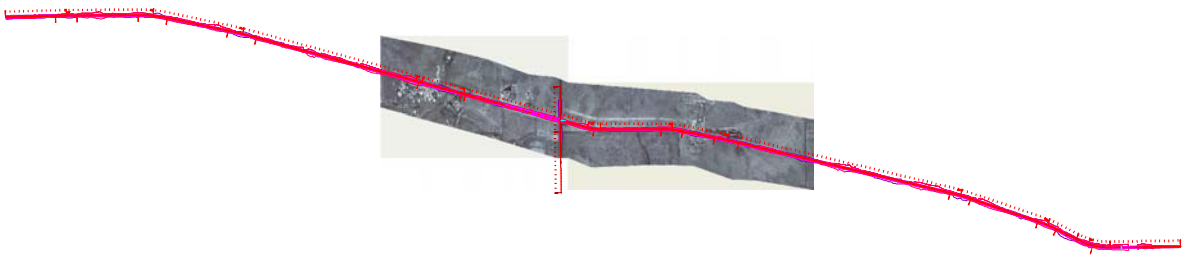


7. Select **References** from the **Primary** toolbar.

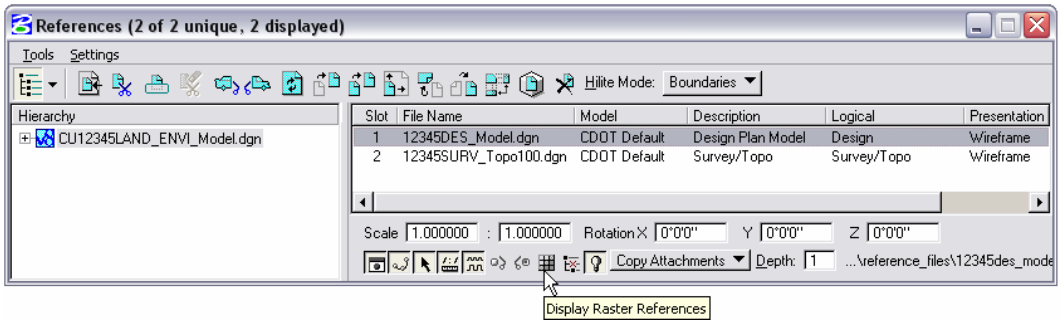
8. Using what you've learned, attach the Design model reference (from Design's **\Drawings\ Reference_Files** folder), **Coincident-World** and at a **1:1** scale. **Copy Attachments** at a depth of **1** to bring in the **Survey/Topo** as direct attachments. See below.



9. Fit the view.

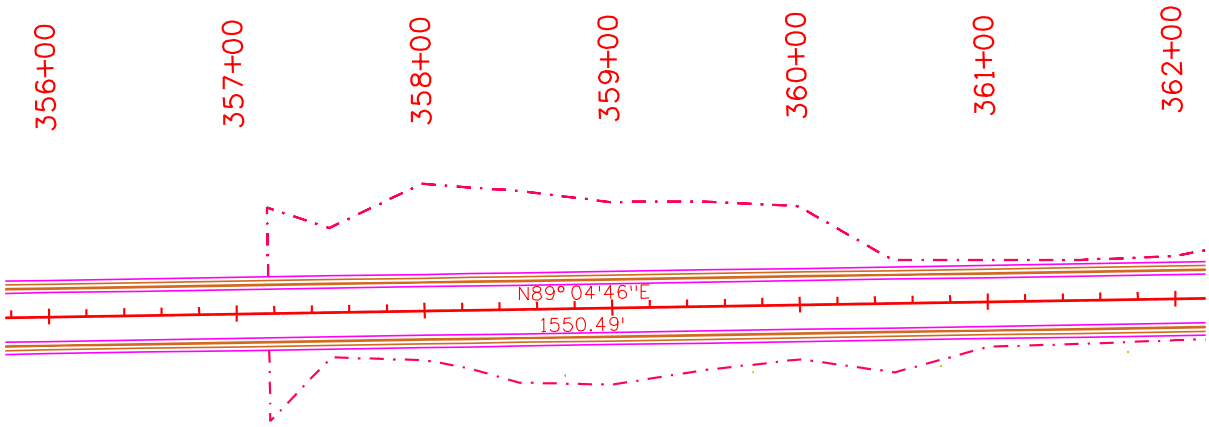


10. From the **Reference** dialog, Turn ***off*** the display of Design's raster references.



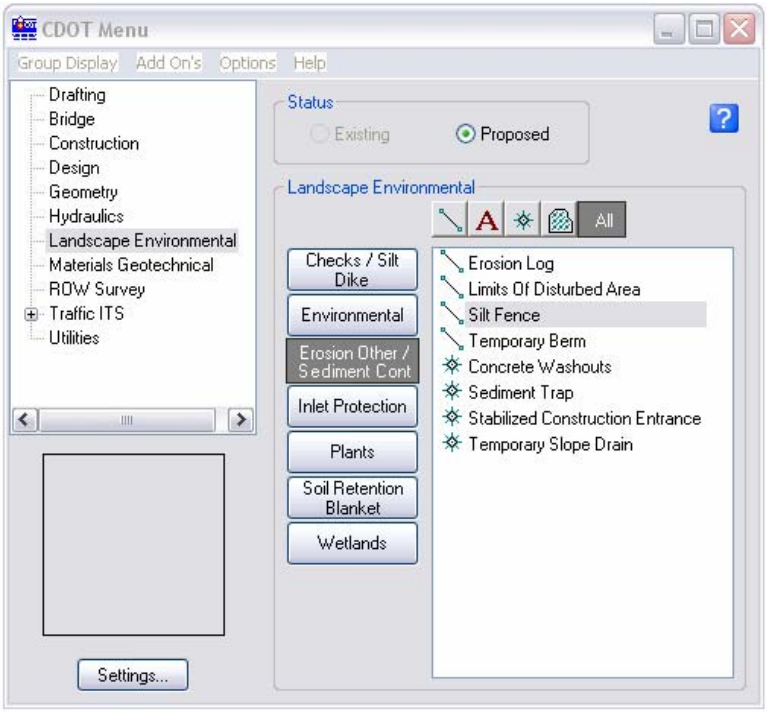
Place silt fence

1. Window around the end of the project just east of the existing bridge.

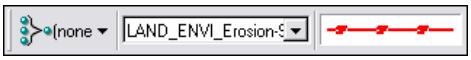


2. From the CDOT Menu, select **Group Displays > Landscape Environmental**.
3. Set **Status** to **Proposed**.
4. Set the category to **Erosion Other / Sediment Control**.

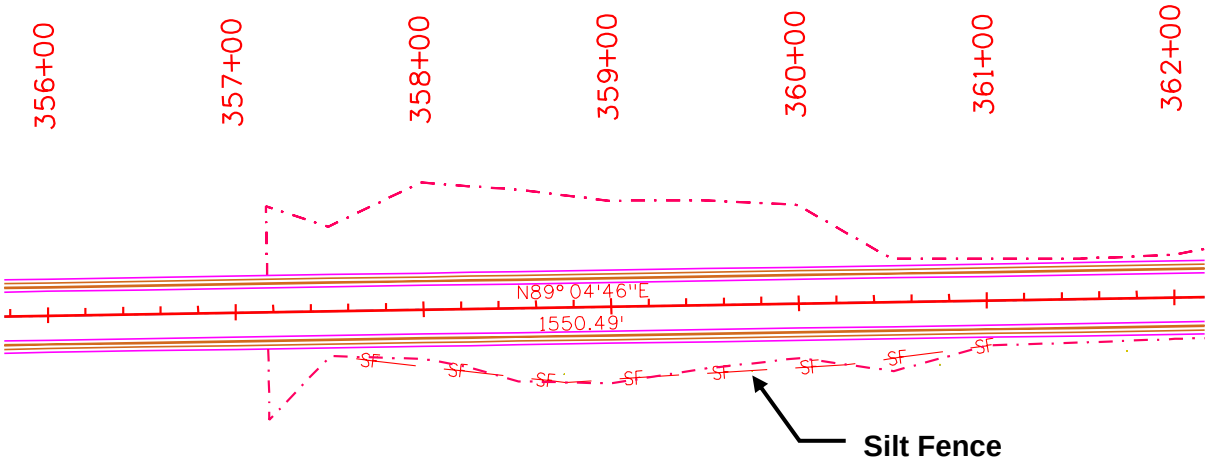
5. Select the **Silt Fence** item.



This automatically sets the active level to **LAND_ENVI_Erosion-Silt-Fence** and selects the **Place SmartLine** tool.



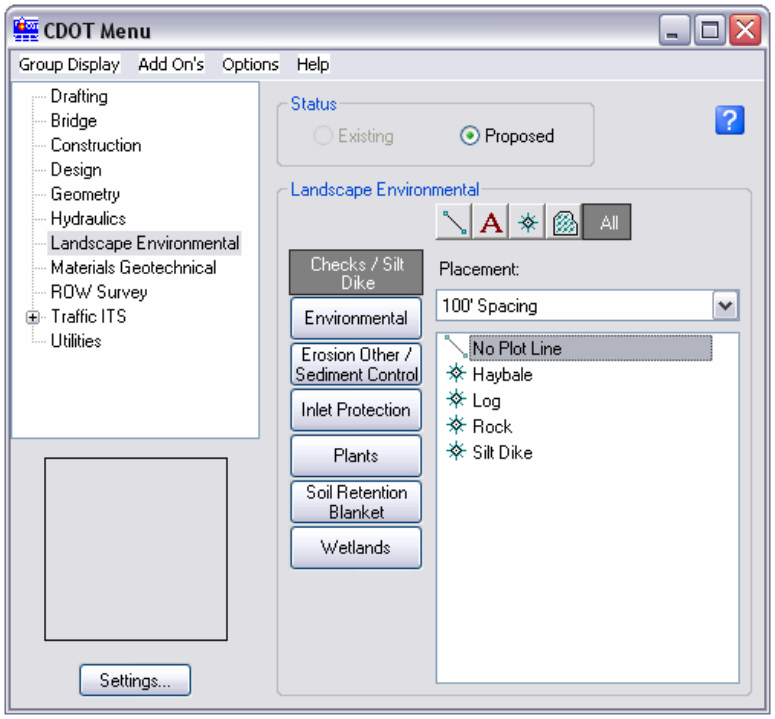
6. Place data points to draw the silt fence along the toe-of-fill line on the south side of the proposed road (similar to the one shown).



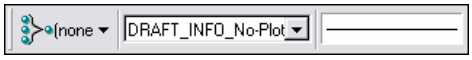
7. **<R>** when done.

Place Haybales

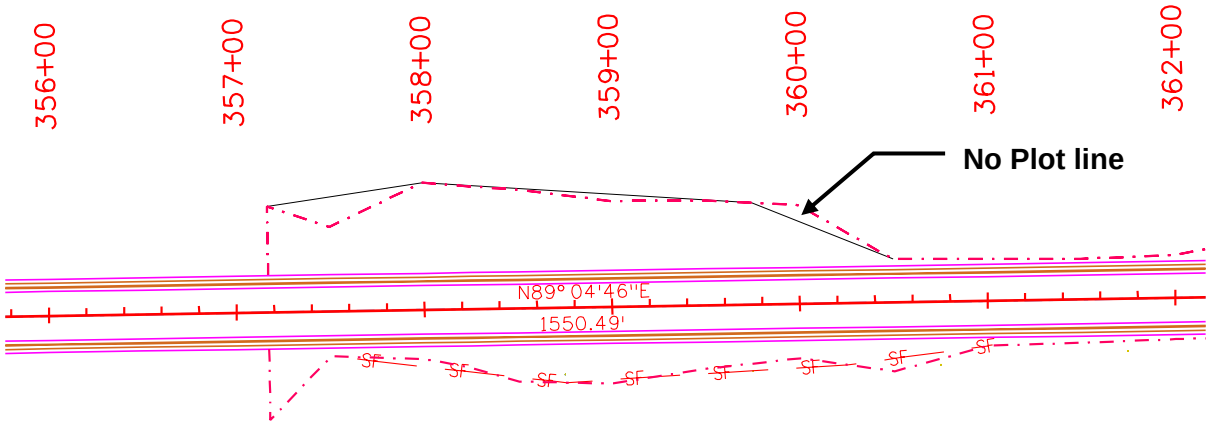
1. Set the category to **Checks / Silt Dike**.
2. Select the item **No Plot Line**.



This automatically sets the active level to **DRAFT_INFO_No-Plot** and selects the **Place SmartLine** tool. The **No Plot** level allows you to place a construction line representing the location of haybales, silt dikes, etc. that you can later divide with a cell.

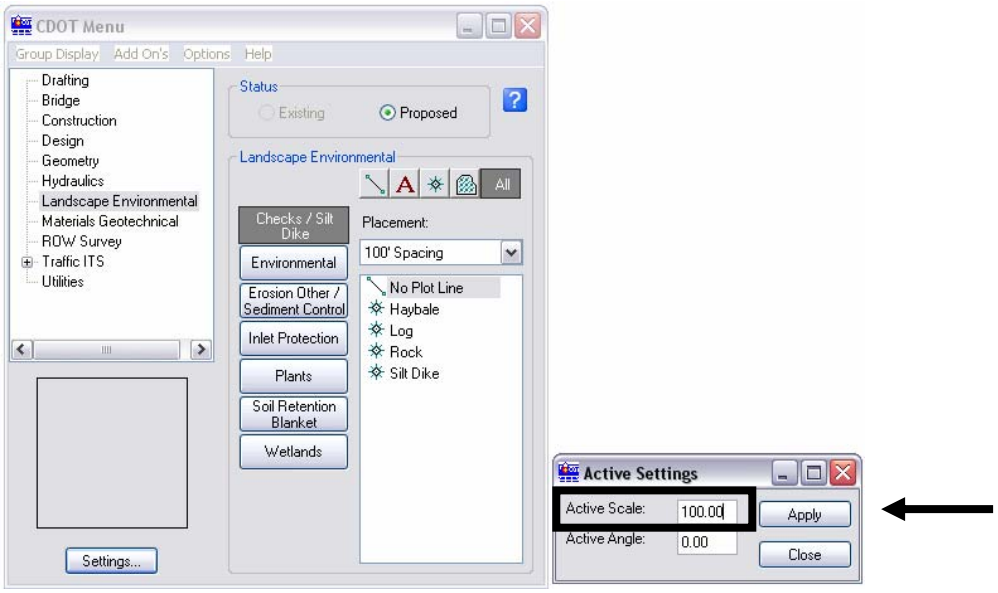


3. Place data points to draw the haybale construction line on the north side of the proposed road as shown.



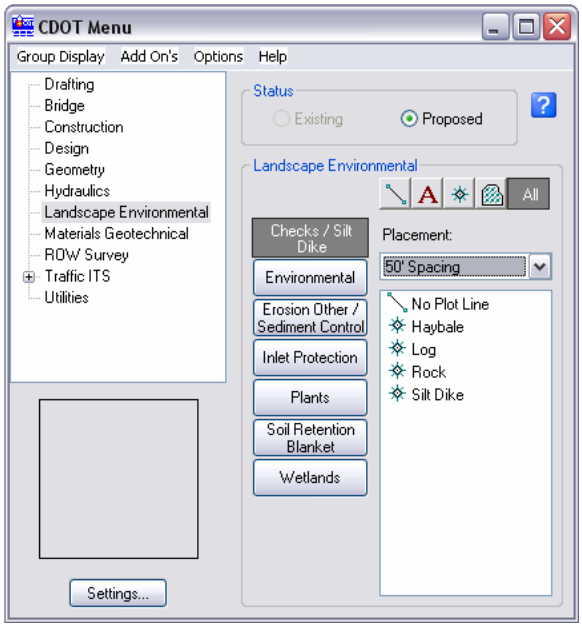
4. **<R>** when done.

5. On the CDOT Menu, select **Settings** and set **Active Scale** to ***100,*** **Apply** and then **Close**.



6. Set **Placement** to ***50'*** **Spacing**.

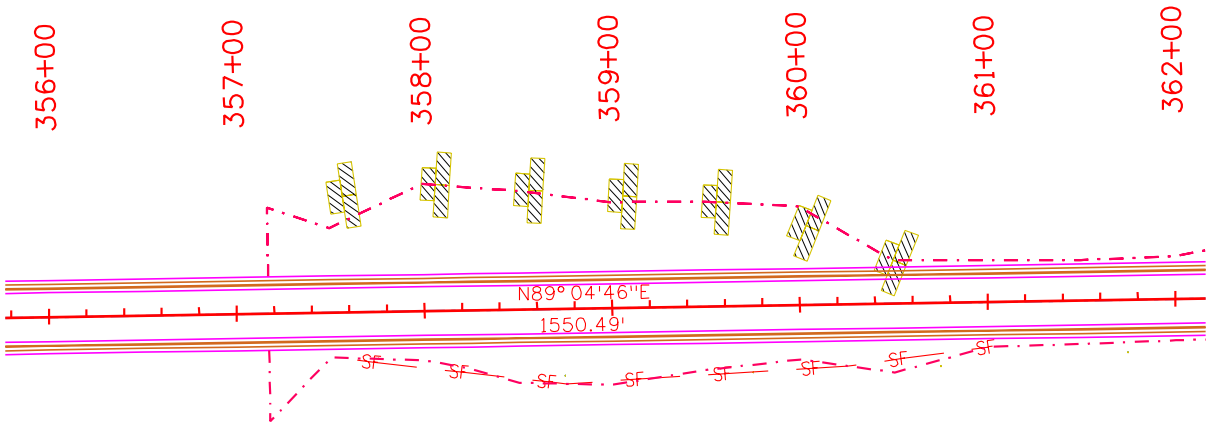
7. Set the item to **Haybale**.



This automatically selects the **Place Cell** command and starts the **Cell Divide** program.

8. When prompted to **Identify Element**, **<D>** on the No Plot line you just placed.

9. **<D>** to accept.

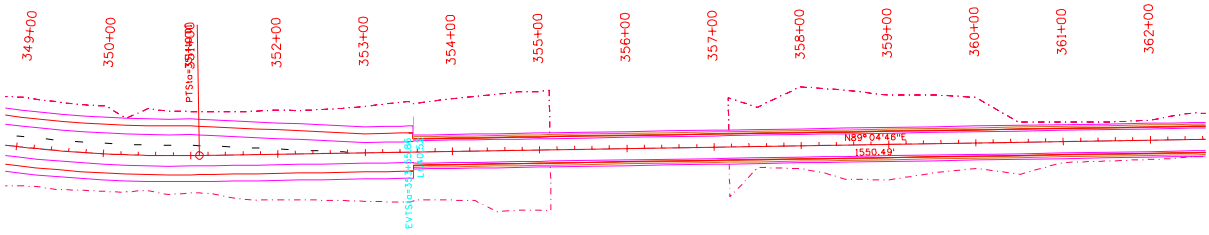


The No Plot line is divided with the haybale cells at 50 ft. intervals.

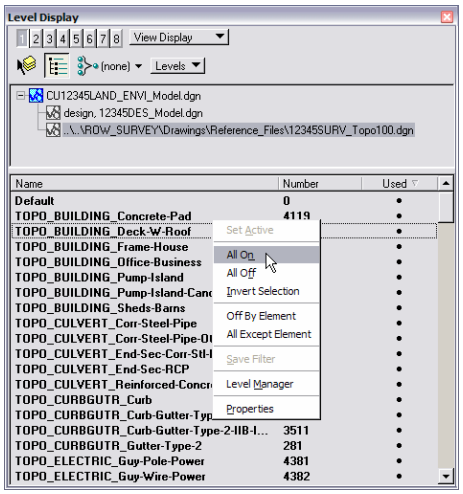
Create wetlands

Draw the wetland shapes

1. Pan over to the left to the area around the bridge as shown.

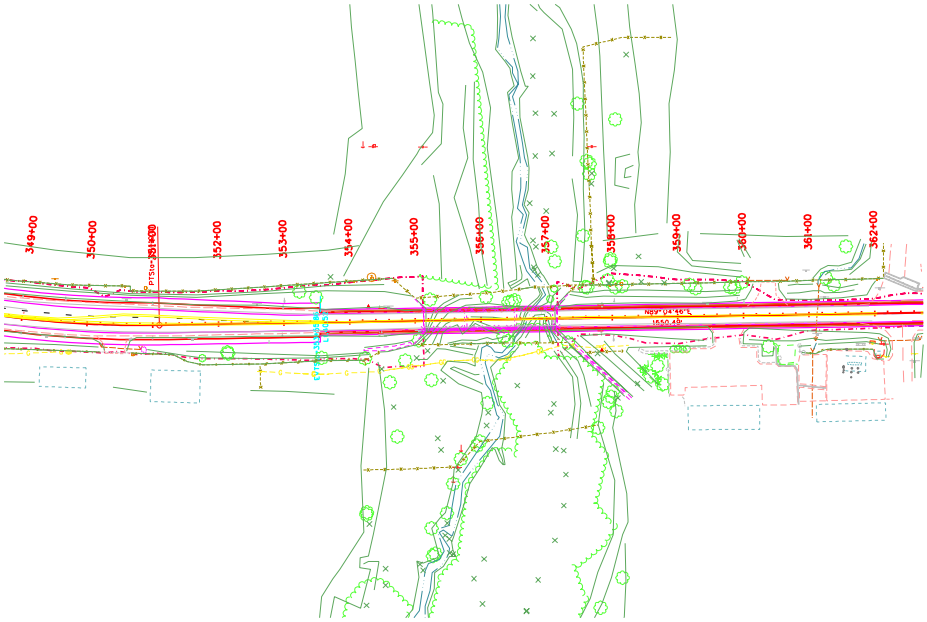


2. Open **Level Display**, highlight the Survey/Topo reference, right-click in the list of levels and turn on all of the **Survey/Topo** reference levels.



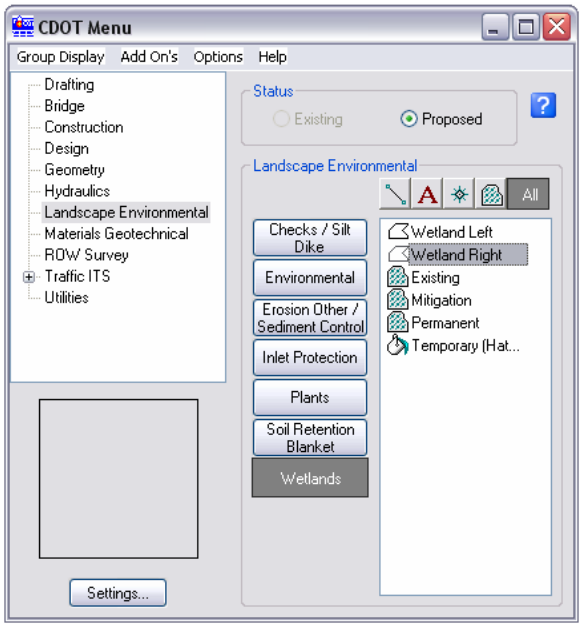
Note: You can also turn reference settings (**Display**, **Snap** and **Locate**) on/off from **Level Display** just like the **Reference** dialog.

3. While in the **Level Display** box, turn on all Survey/Topo levels.



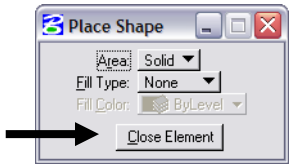
4. On the CDOT Menu, set the category to **Wetlands**.

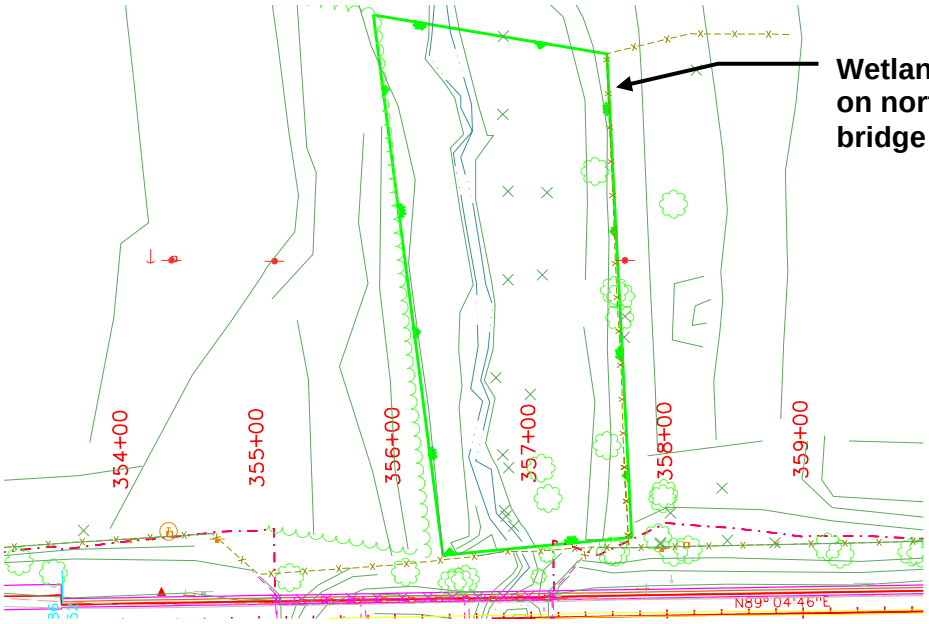
5. Select the item **Wetland Right**.



This automatically sets the active level **LAND_ENVI_Wetland-Right** and selects the **Place Shape** tool.

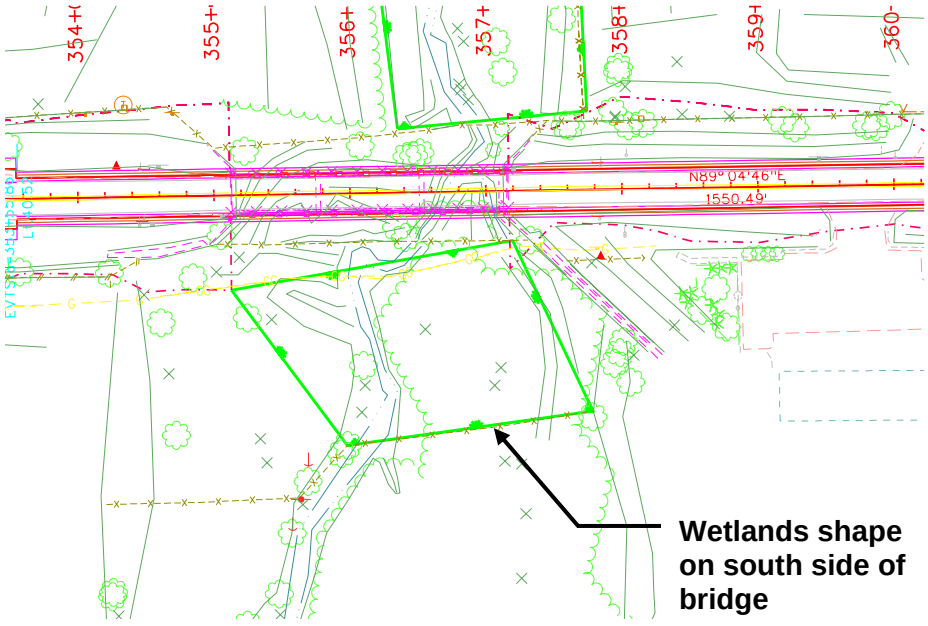
6. Place data points to define the wetlands region as shown. To close the shape, select **Close Element** in the **Place Shape Tool Settings** box.





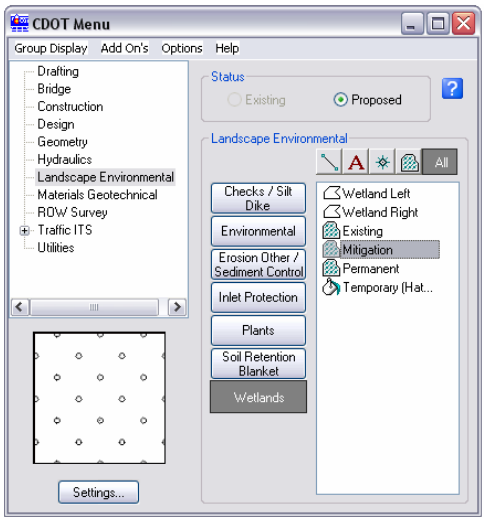
7. **<R>** when done.

8. Repeat for the area on the other side of the bridge as shown.



Pattern the wetlands

9. On the CDOT Menu, select the **Mitigation** item from the **Wetlands** category.

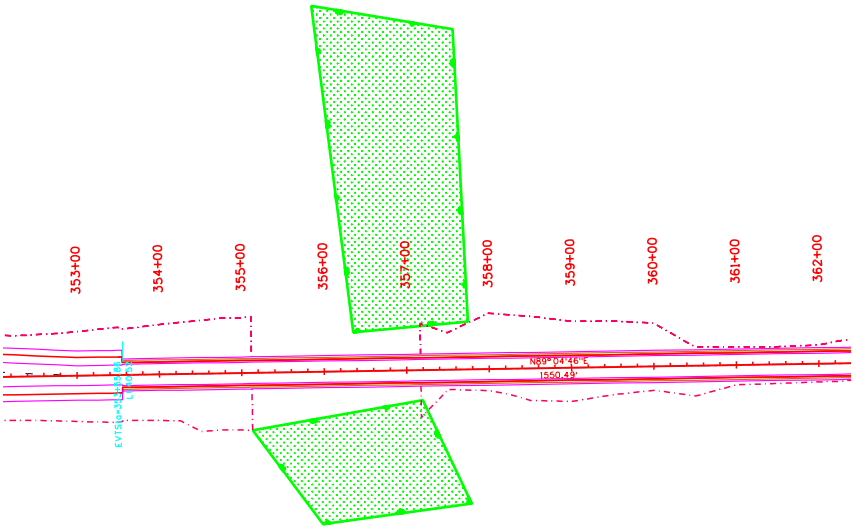


   This automatically selects the **Pattern Area** command and sets the active pattern cell.

10. When prompted, **<D>** on the wetland shape you just drew and then **<D>** to accept.

11. Repeat for the other wetlands shape on the north side of the bridge.

12. Turn ***off*** the display of the **Survey/Topo** reference.



13. **Save Settings**.

14. Proceed to the next lab.

Lab 7B – Create Hydraulics graphics

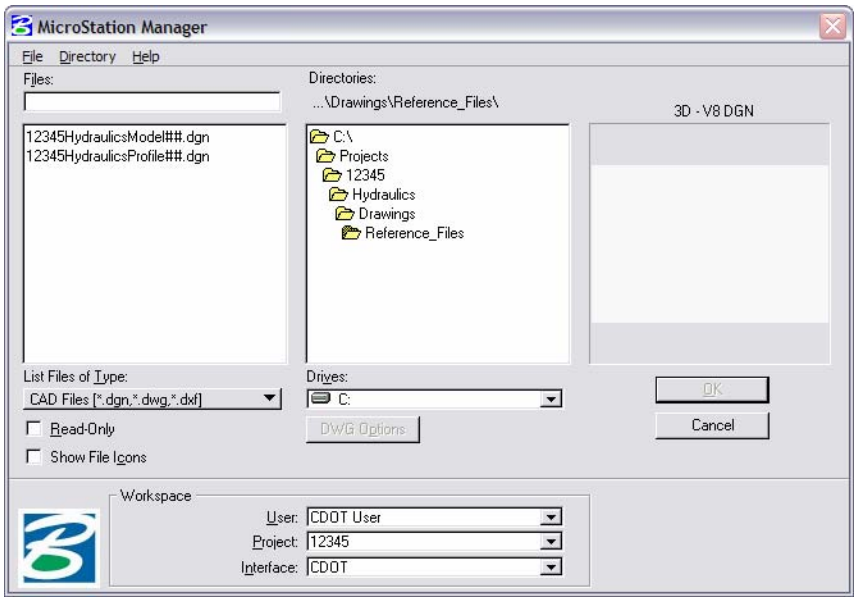
Objectives

After completing this exercise you will know how to:

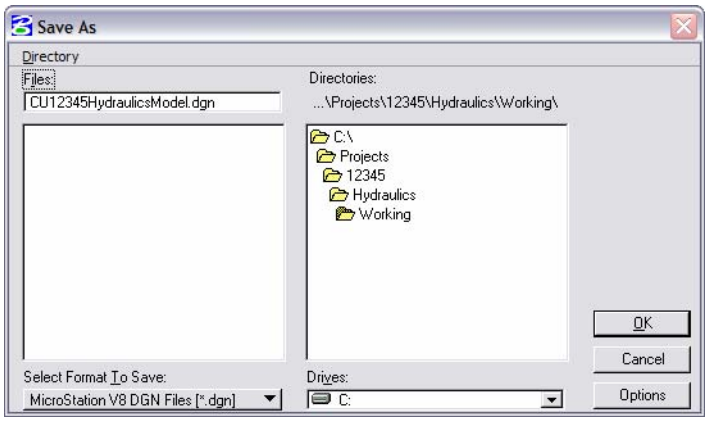
- Use the CDOT Menu to place Hydraulics custom lines (pipes).
- Use the CDOT Menu to place Hydraulics cells (inlets).
- Use the CDOT Menu to place Hydraulics terminators (RCES).

Create the Hydraulics model file

1. In MicroStation, select **File > Open**.
2. Set the directory to **\12345\Hydraulics\Drawings\Reference Files**
3. Select the file **12345HydraulicsModel##.dgn** and select **OK** to open.

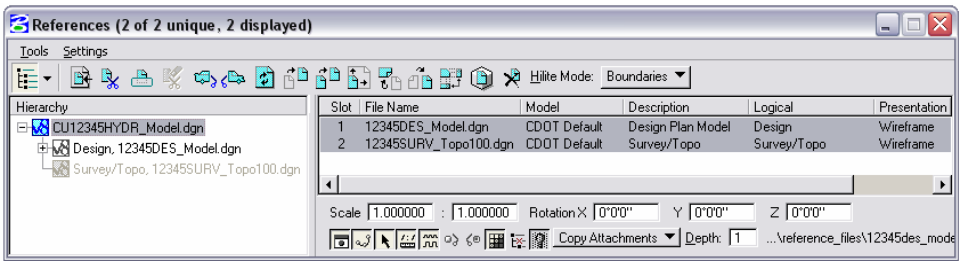


4. Select **File > Save As...** and set the directory to **\Hydraulics\Working**
5. Change the file name to **CU12345ydraulicsModel.dgn** and select **OK** to save a copy to the **Working** folder.



6. Select **References** from the **Primary** toolbar.

7. Using what you've learned, attach the Design model reference (from Design's **\Drawings\ Reference_Files** folder), **Coincident-World** and at a **1:1** scale. **Copy Attachments** at a depth of ***1*** to bring in the Survey/Topo file as direct attachments. See below.

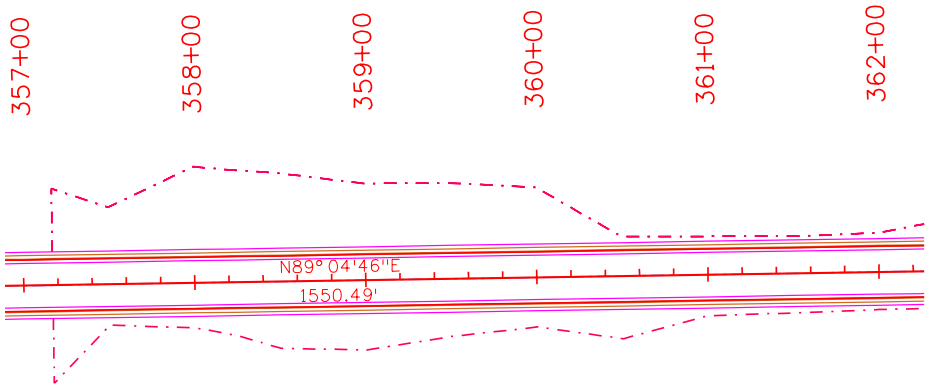


8. From the **References** dialog, turn off the display of the design model's raster references.

Place Inlets

Using known coordinates and the **CDOT Menu**, place proposed Type R inlets along the curb flowline at the end of the project.

1. Window into the area shown near the end of the project.



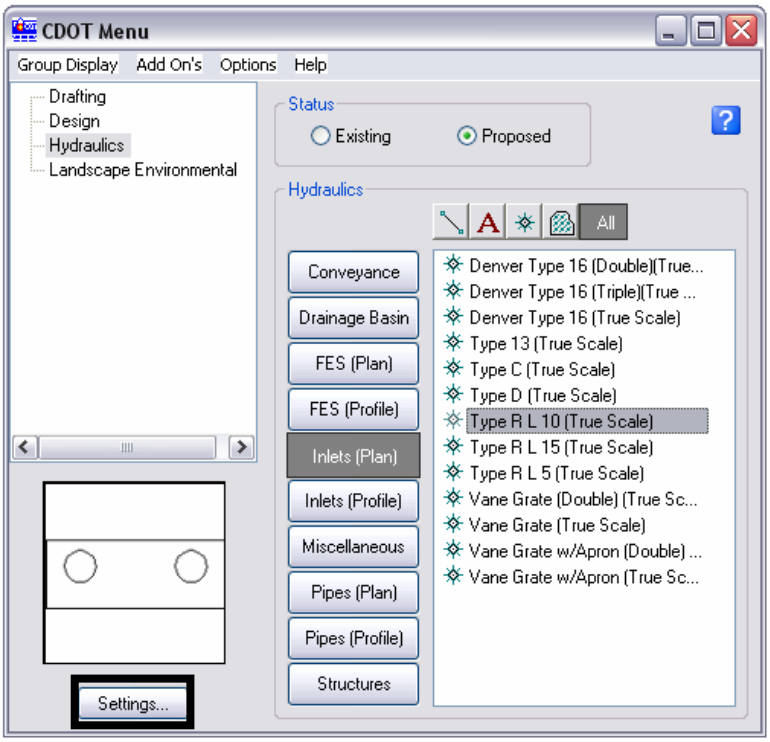
This area of the projects is a proposed 2-Lane urban section with curb, gutter and sidewalk. You'll first place inlets along the curb flowline.

2. Select **Locks** from the status bar and make sure **Depth lock** is turned **off**.

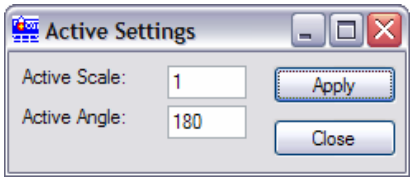
3. On the CDOT Menu, select **Group Displays > Hydraulics**.

4. Select the **Hydraulics** group and then set **Status** to **Proposed**.

5. Select the **Inlets (Plan)** category and then select the **Type *R L 10*** item.



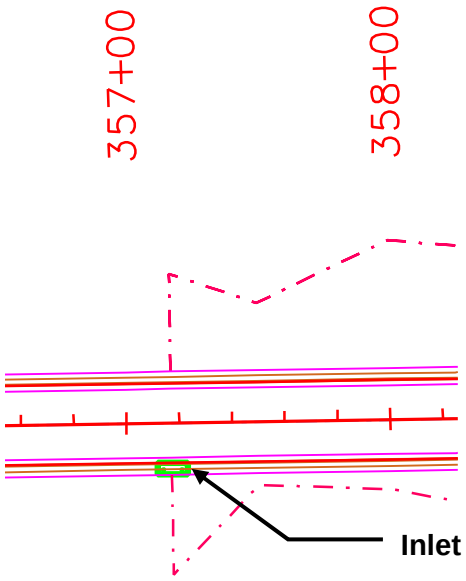
6. Select **Settings** and set **Active Scale** to ***1*** and **Active Angle** to ***180***. **Apply** and then **Close**.



This automatically sets the active level to **HYDR_Inlets** and selects the **Place Cell** command. The inlet cell is attached to your cursor at the origin point. Since you know the coordinate location for the inlets, you can place them with precision keyins.

7. For the 1st inlet, key in
xy=3292424.652, 1553316.387, 6351.8

The inlet appears in the location shown.

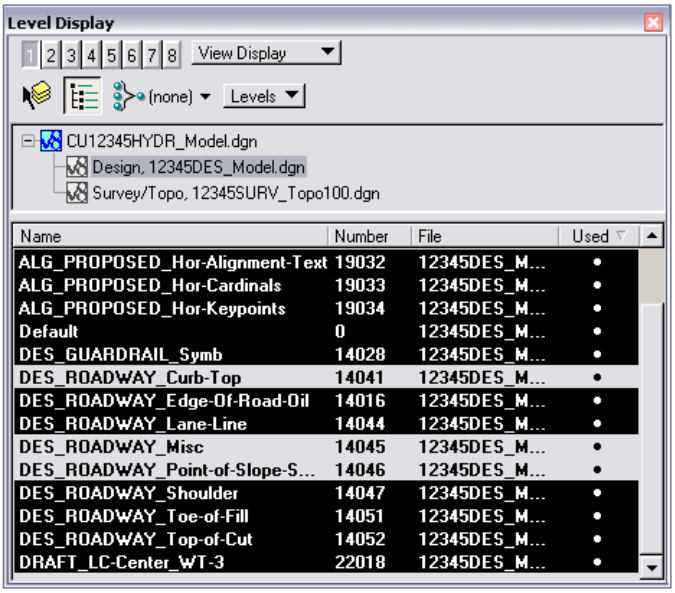


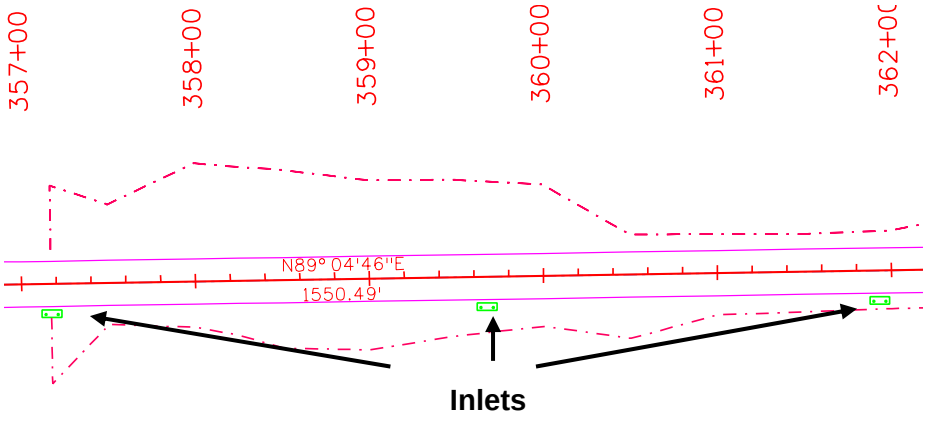
Note: If you don't see the inlet, it could be outside your display depth. Key in ***dp=0,7000*** Enter, and then select the view. You could also fit the view and then window back to this location.

8. For the 2nd inlet, key in
   xy=3292674.652, 1553320.404, 6350.4

9. For the 3rd inlet, key in
   xy= 3292900.384, 1553324.031, 6348.8

10. Turn off the **Design** reference levels shown to better see the inlets.

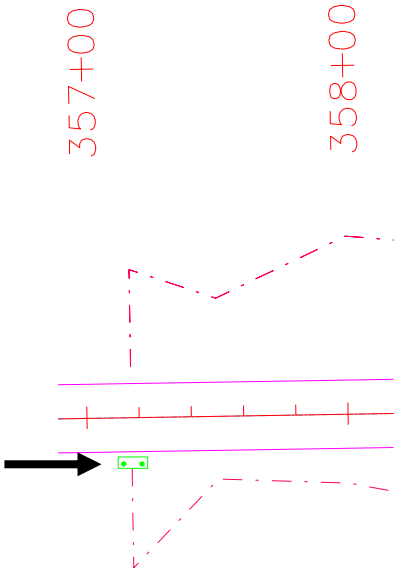




Connect the inlets with pipes

Place the pipes

1. Zoom in on the first inlet.

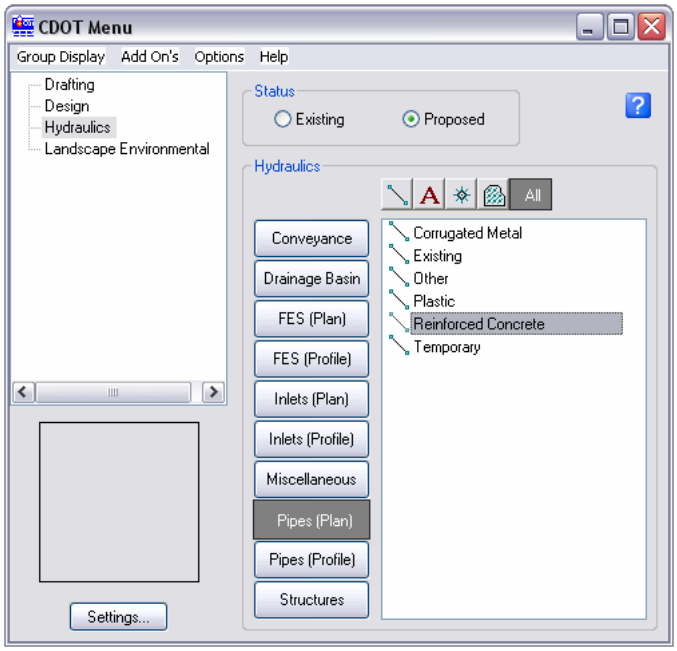


2. Verify that **Depth lock** is still turned **off**.

   Note: When placing pipes, you want to pick up the elevation of the inlets, therefore you need to turn **Depth lock off**.

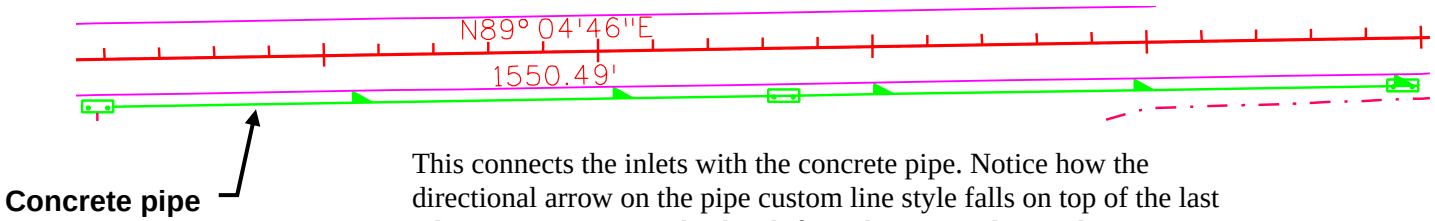
3. On the **CDOT Menu**, set the category to **Pipes (Plan)**.

4. Select the item **Reinforced Concrete**.

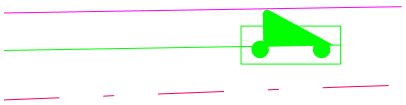


This automatically set the active level to **HYDR_PIPES_Concrete** and selects the **SmartLine** tool.

5. **AccuSnap** on the right-side midpoint of the inlet to begin the pipe.
6. Pan to the right and **AccuSnap** on the left-midpoint of the second inlet.
7. Pan to the right and **AccuSnap** on the right-midpoint of the third inlet.
8. **<R>** when done.

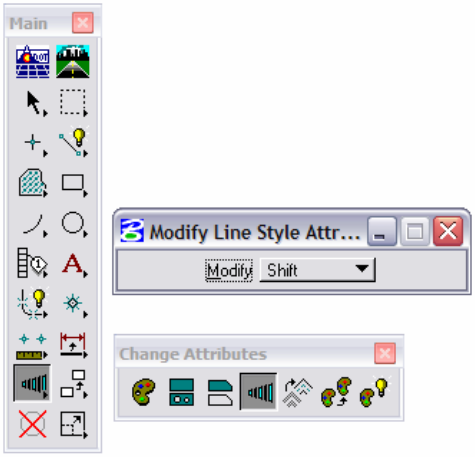


This connects the inlets with the concrete pipe. Notice how the directional arrow on the pipe custom line style falls on top of the last inlet. You can correct this by shifting the custom line style.

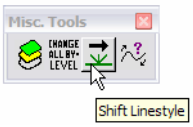


Shift the line

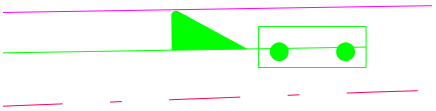
9. Select the **Change Element Attributes** toolbar off the **Main** toolbar.
10. Select the **Modify Line Style Attribute** command.
11. Set the **Modify** option to **Shift**.



Note: The Shift command is also located on the CDOT Misc. Toolbar.



12. **<D>** on the concrete pipe that you just placed and move your cursor to the left. Note how the custom line style shifts as you move your cursor. When the arrow is moved off of the inlet, **<D>** to accept.



Note: Use the **Modify Line Style** command to shift custom lines styles as needed, especially in corners where there may be gaps.

Place a Type C inlet and connect pipes

Turn on the Survey/Topo reference

To help determine the location of the inlet, turn on the Survey/Topo Reference and the Contour reference.

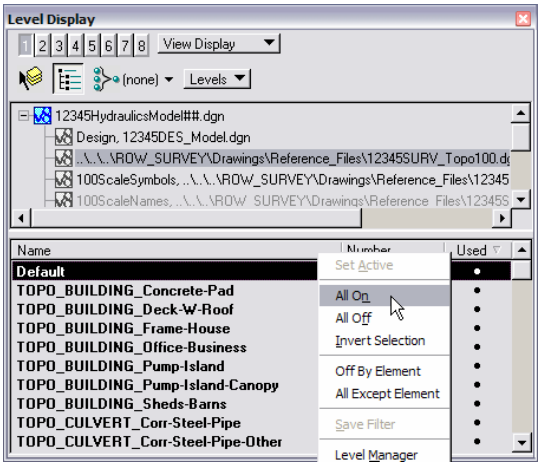
1. On the Reference dialog, select the Design reference set the **Copy Attachment Depth** to ***2***.

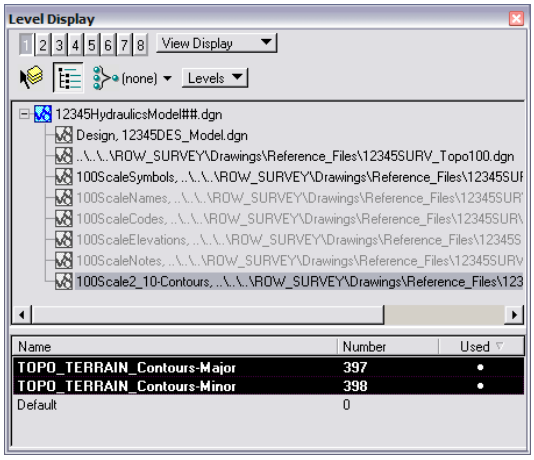
This brings in the Contour reference since the Contour model file is referenced to the Survey/Topo file.

Turn on reference levels

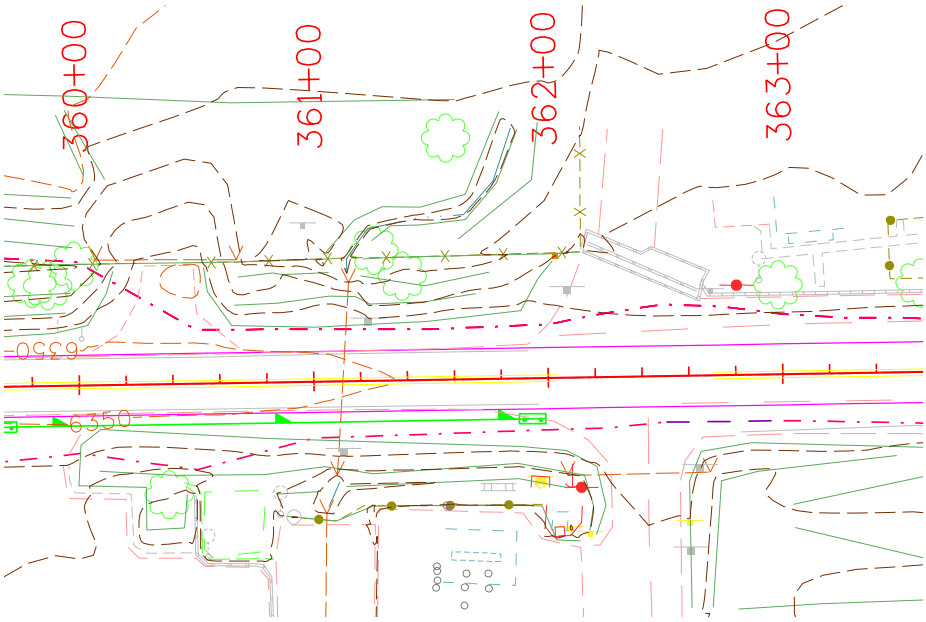
1. In the **Level Display** box, turn **on** all of the **Survey/Topo** reference levels.

2. Turn **on** all **Contour** reference levels.

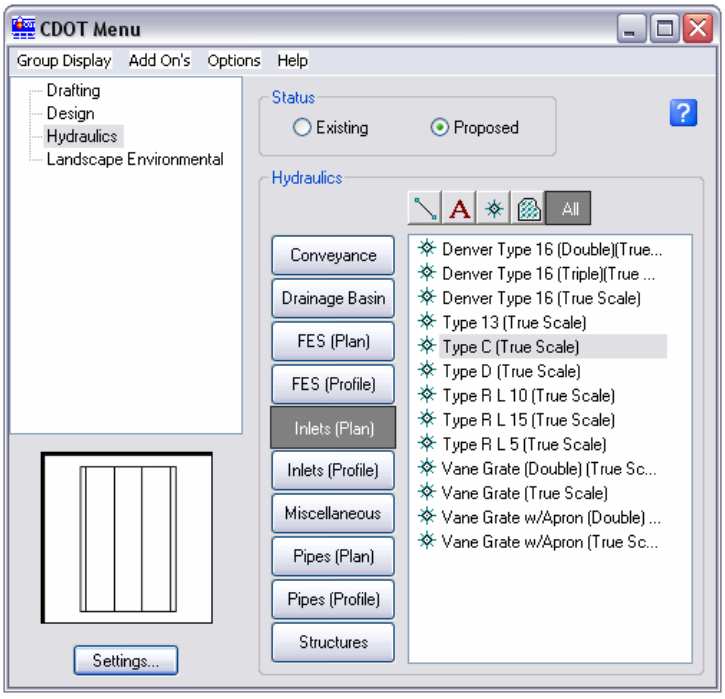




3. Window into the location shown.



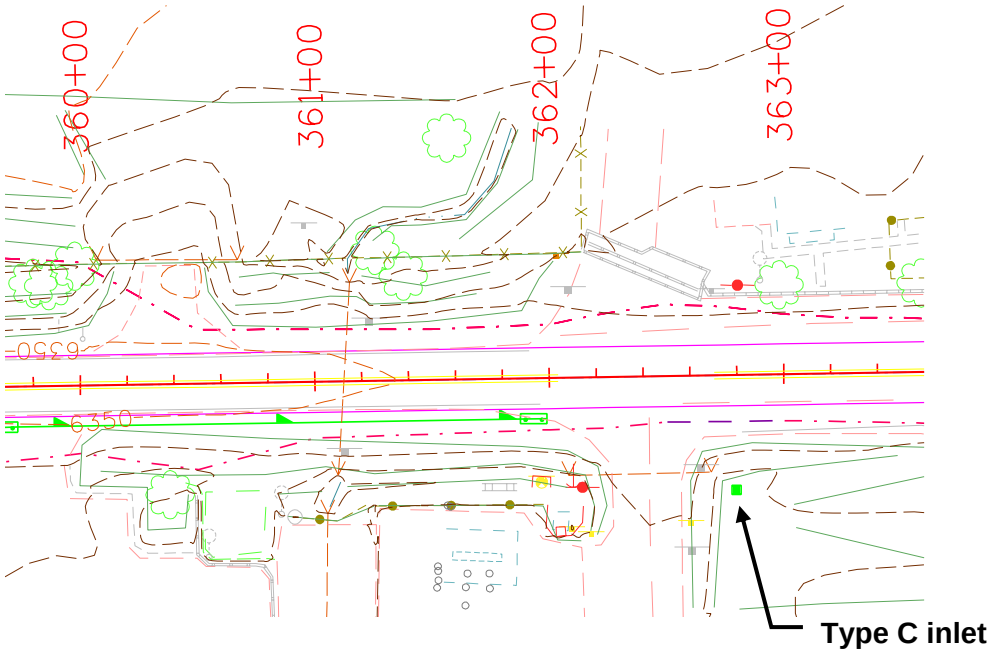
4. On the CDOT Menu, select the **Inlets (Plan)** category and then select the **Type C** item.



This automatically sets the active level to **HYDR_Inlets** and selects the **Place Cell** command. The inlet cell is attached to your cursor at the origin point.

5. Key in ***xy= 3292986.899, 1553291.431, 6345.2***

6. **<R>** When done.

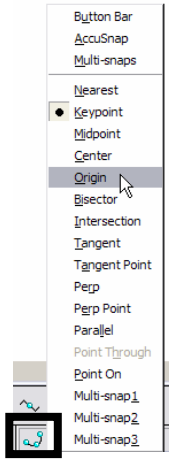


7. On the **CDOT Menu**, set the category to **Pipes (Plan)** and select the **Reinforced Concrete** item again.

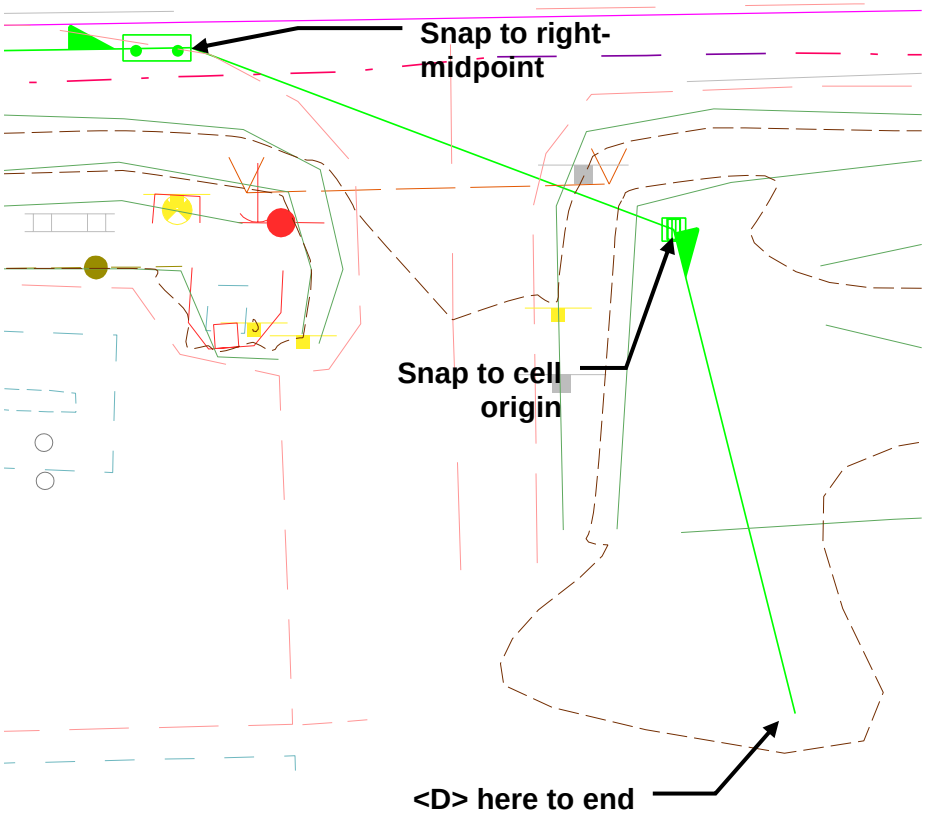
   This automatically set the active level to **HYDR_PIPES_Concrete** and selects the **SmartLine** tool.

8. **AccuSnap** on the right-midpoint of the last Type R L 10 inlet (see below).

9. Select the **Origin** snap mode and **AccuSnap** on the Type C inlet. (see below).

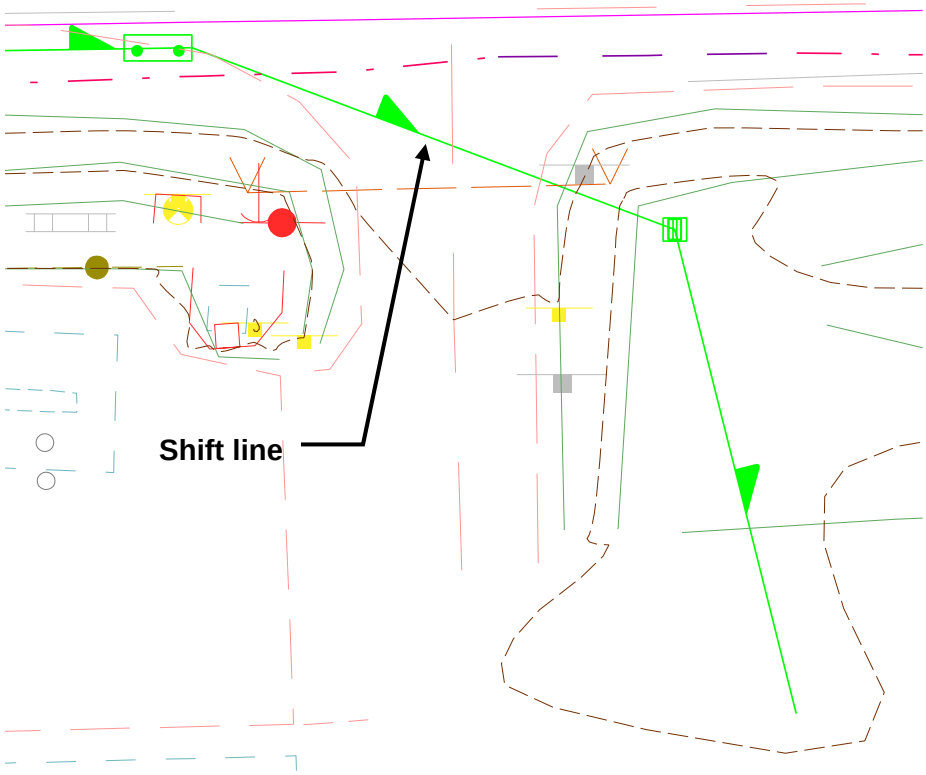


10. Place a final **<D>** in the location shown for the end of the pipe near the contour line (see below).



11. **<R>** when done.

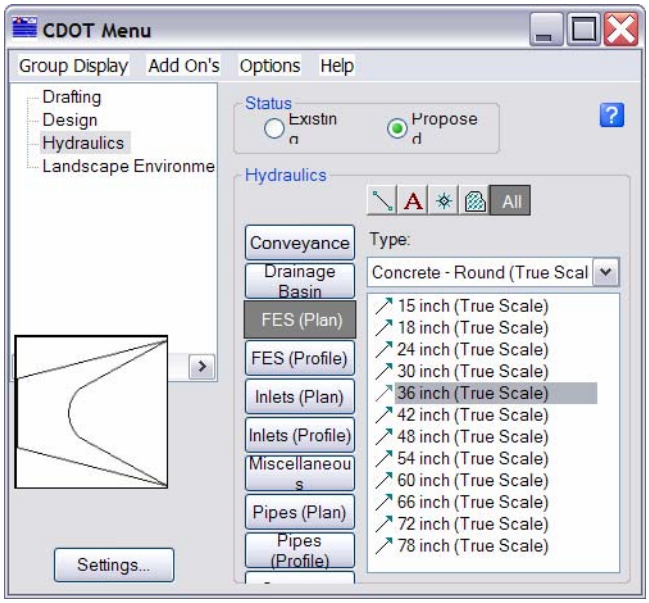
12. Use the **Modify Line Style** again command and **Shift** the pipe line style as necessary to ensure the arrow does not fall on top of an inlet.



Place the pipe terminator

The pipe terminates at a 36” RCES, which you can place as a cell line terminator.

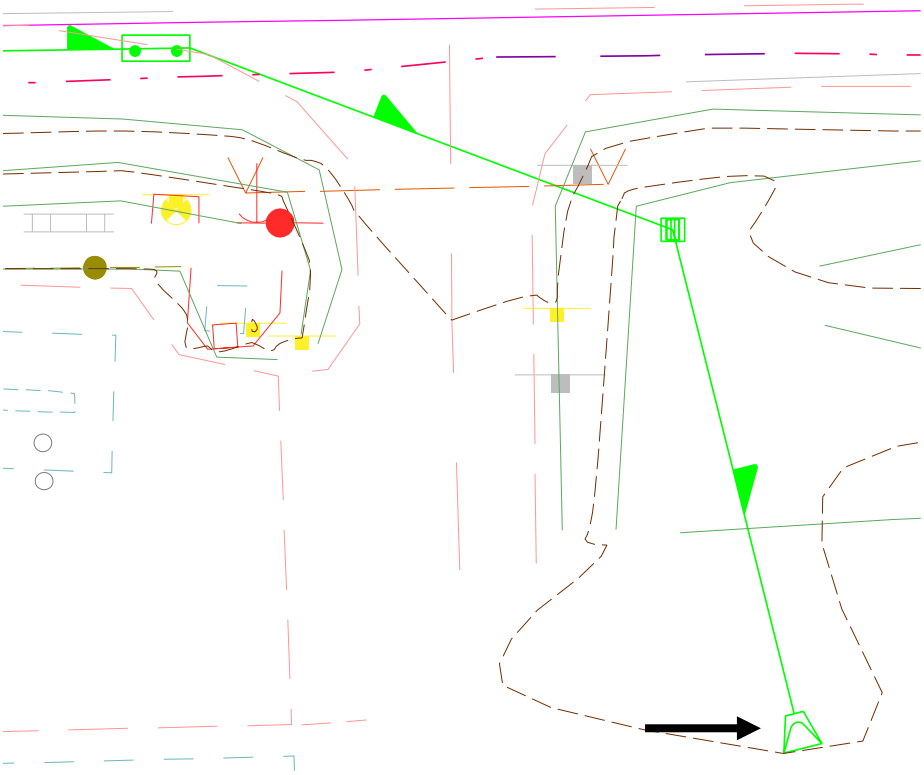
1. On the CDOT Menu, set the category to **FES (Plan)**.
2. Set **Type** to **Concrete – Round**.
3. Select the **36 inch** item.



This automatically set the active level to **HYDR_FES** and selects the **Place Active Line Terminator** tool off the **Cells** toolbar.

4. **<D>** on the end of the concrete pipe as shown.

5. **<D>** to accept.



The RCES terminator is automatically rotated to the appropriate angle and placed on the end of the pipe.

6. **Save Settings**.

7. **Exit** MicroStation.

8. Grouping Design Graphics

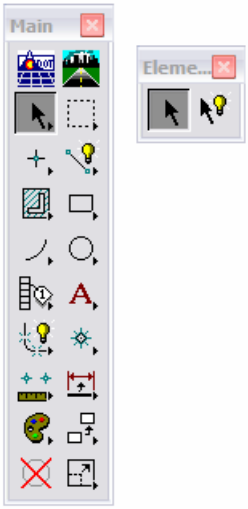
There are times when it is necessary to group elements because it is more efficient to place, modify or manipulate groups of elements rather than perform repetitive commands on individual elements. Element groups can be:

- ***Temporary*** — fences and selection sets or
- ***Semi-permanent*** — graphic groups and complex elements.

Temporary groups

If you want to perform a one-time manipulation on a group of elements (*i.e.* copy them or delete them), create a ***selection set*** or use a ***fence*** to group the elements.

Using Selection Sets



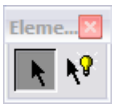
The **Element Selection** toolbar provides various methods for temporarily grouping elements. Once grouped, elements can be modified, manipulated or deleted as a group. When elements are grouped with these tools, they are placed in a selection set and remain in the selection set until you clear the set.

When elements are added to a selection set, they highlight. You can set the selection set color under **Settings > Design File > Color > Selection Set Color**. You can also quickly see the number of elements in the selection set from the indicator on the **Status Bar**.

These tools include:

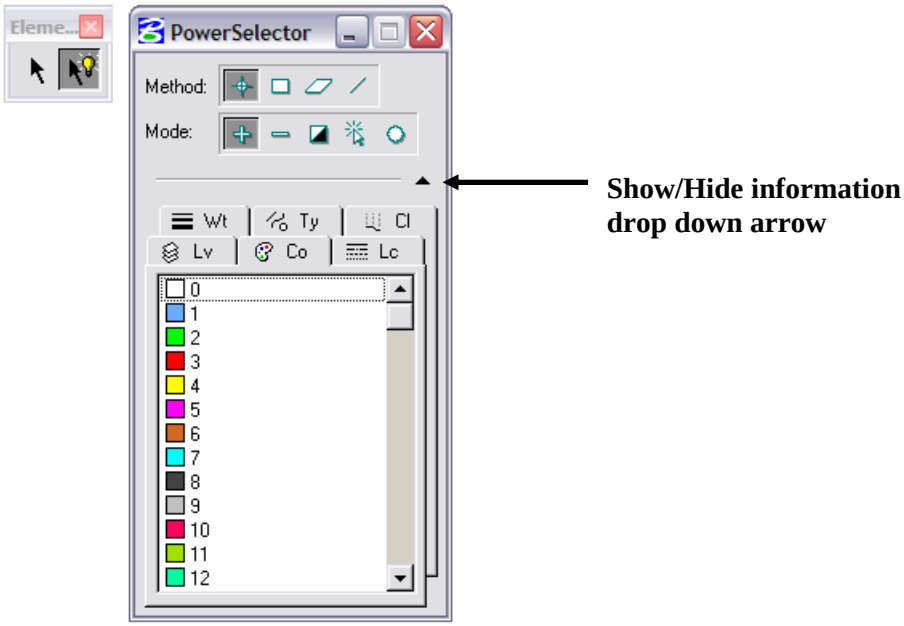
Element Selection

Selects individual elements and adds them to the selection set. You can select multiple elements by either holding down the **Ctrl** key or by holding down the data button and dragging across the elements.



Power Selector

Power Selector provides more options for how elements are added to or deleted from the selection set. This includes filtering elements based on their attributes (color, style, weight, *etc.*) In many cases, you can find and add elements to a set much more quickly by filtering on attributes (*e.g.* all elements on level **Design_Guradrail_Type-3**), than individually picking them with the **Element Selection** tool.



Power Selector also provides several methods for selecting elements including:

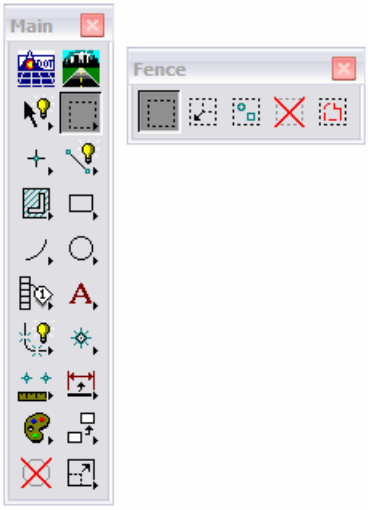
- ***Individual*** — **<D>** on individual elements.
- ***Block*** — selects all elements inside a block you draw. You can toggle the Block option to either inside or overlap.
- ***Shape*** — selects all elements inside an irregular shape your draw. You can toggle the Shape option to either inside or overlap.
- ***Line*** — selects elements by drawing a line through the elements.

The **Mode** option gives you options for adding and removing elements from the set including:

- ***Add*** — places elements in the set.
- ***Subtract*** — removes elements from the set.
- ***Invert*** — toggles an element (adds a removed element or removes an added element).
- ***New*** — clears the current selection set and creates a new set.
- ***Clear/Select All*** — removes all selected elements from the current set, or adds all elements if the set is empty.

To access the attribute filtering option, select the **Show Selection Information** drop down arrow on the PowerSelector **Tool Settings** box.

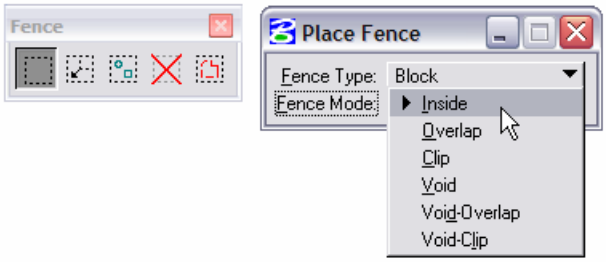
Using Fences



The **Fence** toolbar provides another set of tools to temporarily group elements. Once placed in the fence, the elements can be deleted, manipulated or the attributes changed. When the fence is removed, the elements are no longer grouped.

Place Fence

Temporarily groups elements by drawing a fence boundary around the elements. There are several types of fences you can place including blocks (drawn corner to opposite corner), shapes, and circles, also by element, view or design file.



The fence mode determines which elements will be affected by the fence. These include:

- ***Inside*** — to select elements entirely inside the fence.
- ***Overlap*** — to select elements inside or overlapping the fence.
- ***Clip*** — to select elements inside the fence and cut or break all elements that intersect the fence.
- ***Void*** — to select all elements outside the fence.
- ***Void-Overlap*** — to select all elements outside or overlapping the fence.
- ***Void-Clip*** — to select elements outside the fence and cut or break all elements that intersect the fence.

Once the elements are grouped in the fence, they can be deleted, manipulated, *etc.* You can use MicroStation view controls (**Zoom In**, **Zoom Out**, **Pan** *etc.*) and the fence remains persistent.

To remove the fence, select the **Place Fence** command again.

> **Note**: check the fence indicator on the **Status Bar** to quickly determine is there is a fence placed in the design file.

The **Void** and **Clip** modes are two features not available with selection sets. However, there may be times when attribute filtering (not available with fences) is easier to use — especially when grouping graphics in high-density areas.

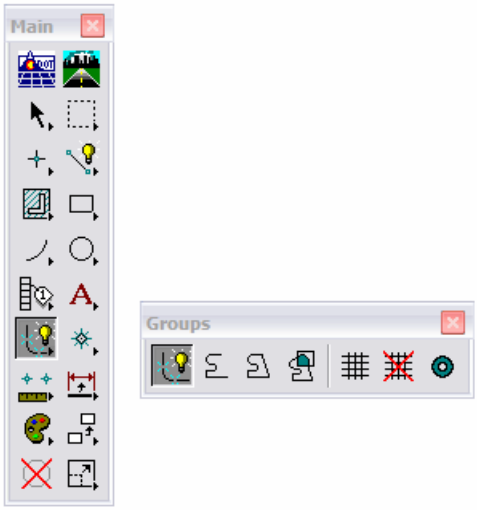
Delete Fence Contents

Deletes the contents of the fence based on the fence mode. Note that the **Delete Element** tool on the **Main** toolbar ***does not*** work for fenced elements.

Semi-permanent groups

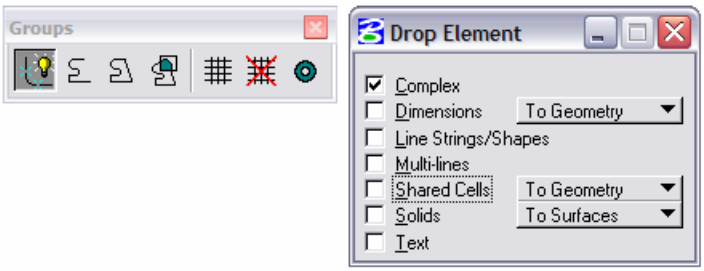
For groups that require more frequent manipulation, it is often more efficient for the elements to remain grouped until you “ungroup” them. These groups — complex chains, complex shapes or graphic groups are created using the **Groups** toolbar.

Groups toolbar



Drop Element

Drop Element returns a complex element to its original graphics. In addition to breaking up complex elements, this command is also used to drop other types of groups including linestrings and cells (discuss later).

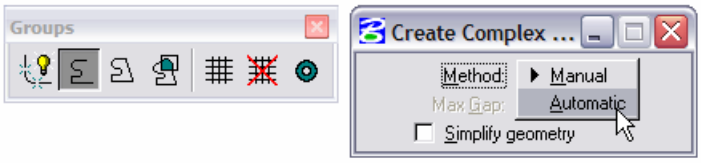


Creating Complex elements

Create Complex Chain

The **Create Complex Chain** command joins a series of lines, linestrings and/or arcs into one element with two end points. This command uses two methods:

- ***Manual*** — you graphically select each element to add to the complex chain.
- ***Automatic*** — adds all elements to the complex chain that are within the specified **Max Gap** distance (handy for numerous elements which would be tedious to pick individually).

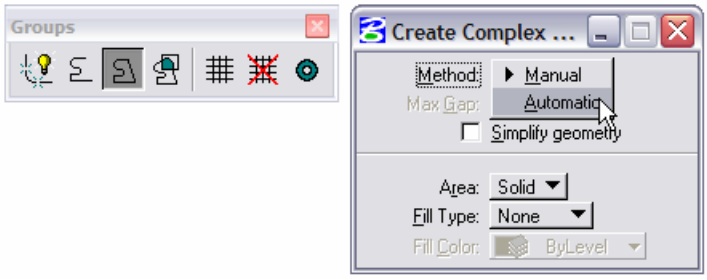


If you toggle on **Simplify geometry**, the new element is created as a linestring instead of a complex element. The advantage is that you can more easily modify a linestring than a complex element.

The new complex chain takes on the active element attributes, regardless of the attributes of the original elements that make up the chain. Be sure to set your active element attributes ***before*** creating the complex chain.

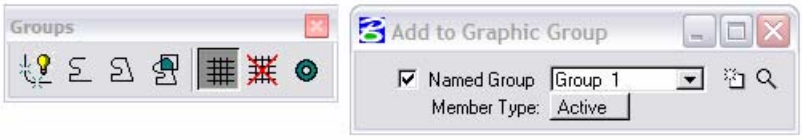
Create Complex Shape

Create Complex Shape joins a series of lines, linestrings and/or arcs into one closed element. A "filler" segment is added, if needed, to close the shape. The same **Manual** and **Automatic** methods found in the **Complex Chain** command are also available on the **Complex Shape** command.

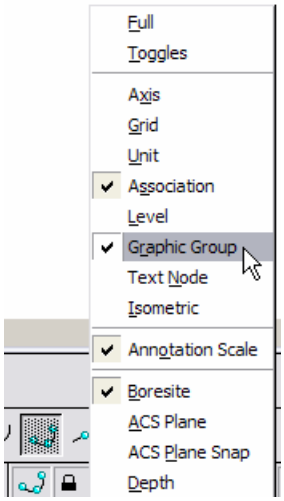


Add to Graphic Group

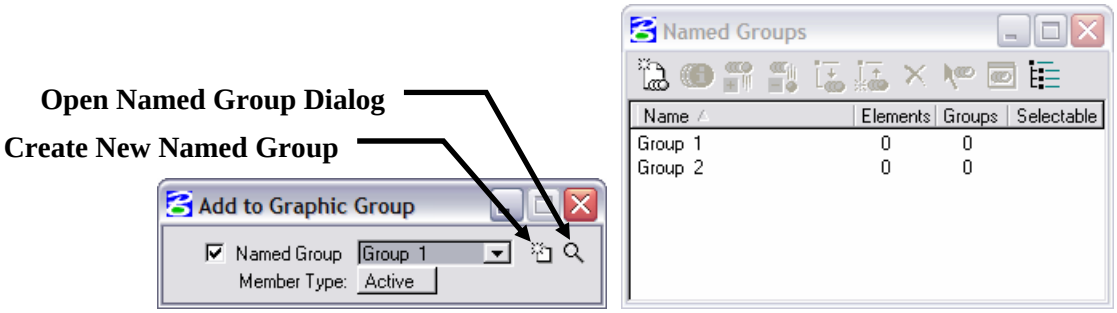
Add to Graphic Group creates a group of individual elements that can be named. Graphic groups are more efficient than a fence or a selection set for items that must be frequently grouped and manipulated. This command can also add elements to an existing named group or can combine groups.



After creating the graphic group, the elements behave as a group as long as the **Graphic Group** lock is on (**Settings > Locks** or **Locks** button on the **Status Bar**). If the **Graphic Group** lock is off, you can manipulate, modify or delete individual elements in the group. However, the elements retain their group status and can be manipulated again as a group if the **Graphic Group** lock is turned back on.

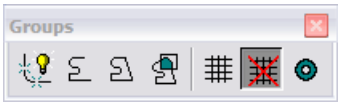


The **Open Named Group** option (magnifying glass icon) is used to manage your named groups (create new groups, add or removed elements from the group, create group hierarchies, *etc*.)



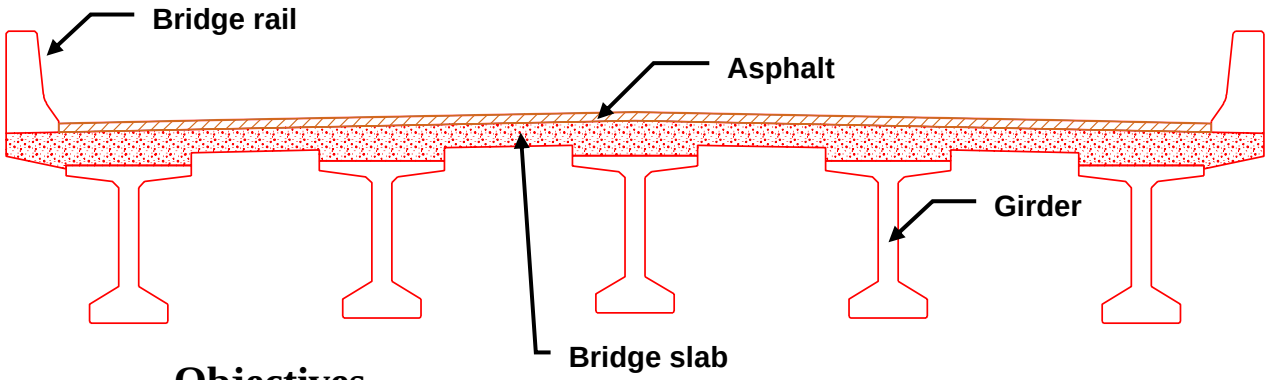
Drop from Graphic Group

Removes individual elements from a graphic group or named group. The command is also used to drop an entire group (break up the entire group into its component elements).



Lab 8 – Draw a bridge typical section

In this lab, you'll practice all of the drawing concepts you've learned so far to create a bridge typical section.



Objectives

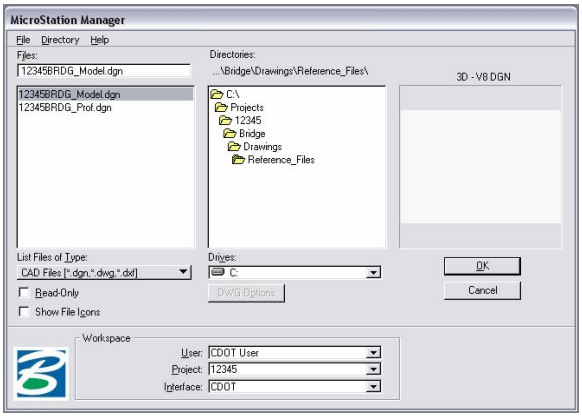
After completing lab 8, you will know how to:

- Use the Bridge Menu to set active attributes (level, color, line style, weight).
- Use basic drawing tools (**AccuDraw**, **AccuSnap**, **Modify** and **Manipulation** tools, cells, patterns, etc.) to draw a bridge typical section and a reinforcement detail.
- Use **Fences** and **Selection Sets** to group graphics.

Create a Bridge Model file for details

Note: Since you have already selected xxMulti-Discipline from the **Select Group** utility, you have access to all Bridge levels. However, you could also select the Bridge Group before starting MicroStation to limit your levels to just those needed for Bridge.

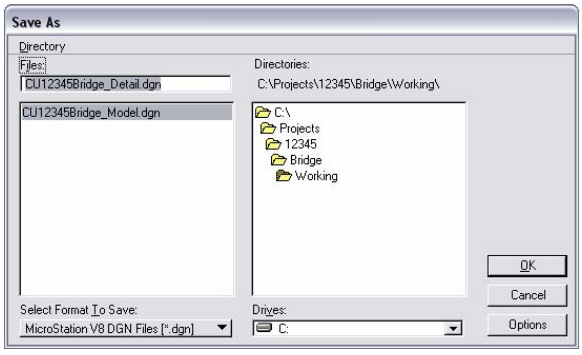
1. Start MicroStation.
2. In the MicroStation Manager dialog box, re-set **Project** to **12345.**
3. set the directory path to **\Bridge\Drawings\Reference_Files.**
4. Select the file **12345BRDG_Model.dgn** and then select **OK**.



The blank model file opens.

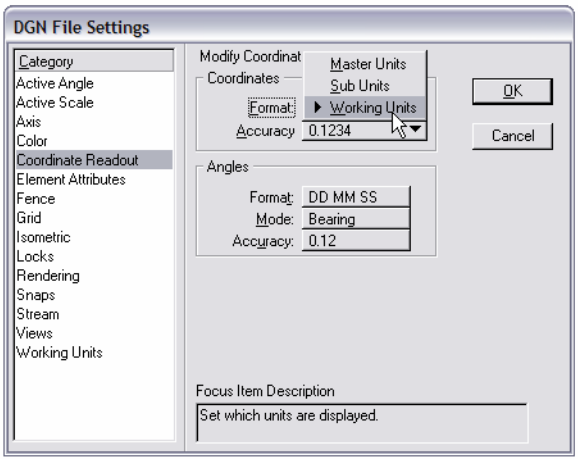
5. Select **File > Save As...** and set the directory to the project's **\Bridge\Working** folder.
6. Rename the file **CU12345BRDG_Detail.dgn** and select **OK**.

Note that you are renaming this file from "Model" to "Detail".



The file is copied to the working folder with the initials CU (CDOT User, for training purposes).

7. Select **Settings > Design File > Coordinate Readout** and set the **Format** to **Working Units**.



8. Select **OK** to change the coordinate readout.

   You will now readout values in feet and inches.

Draw a bridge typical section

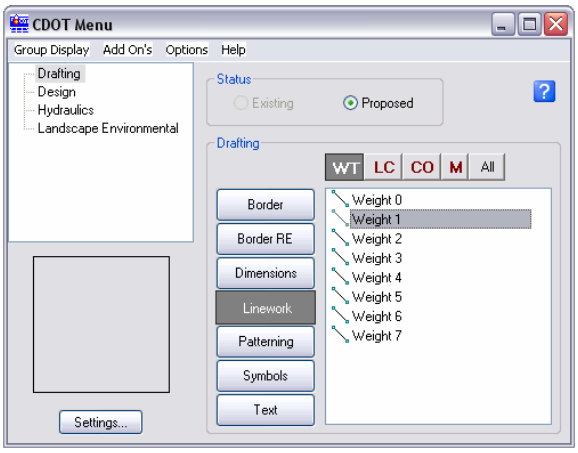
In the next series of steps, you'll use **AccuDraw** and MicroStation tools (drawing tools, manipulation and modify tools, grouping tools, etc.) to create the bridge typical section shown.

You'll begin by drawing construction lines on a drafting level, and then create the final detail on the appropriate bridge level.

Draw the slab construction lines

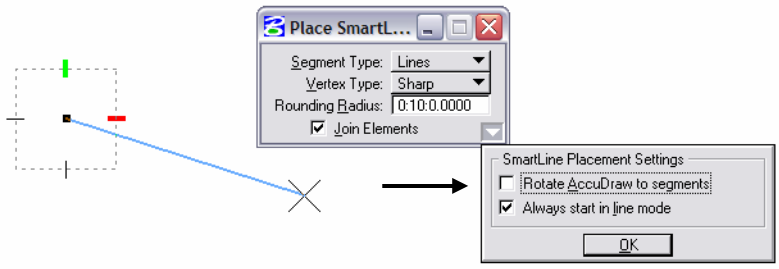
You'll draw the right side of the top of slab starting at the crown point of the road. The right side consists of a 12 ft. travel lane and a 6 ft. shoulder, both at a 2% cross slope.

1. On the CDOT Menu **Drafting** group, select **Linework** category.
2. Set the filter to **WT** and select **Weight *1***.



This sets the active level to **DRAFT_WT-1**.

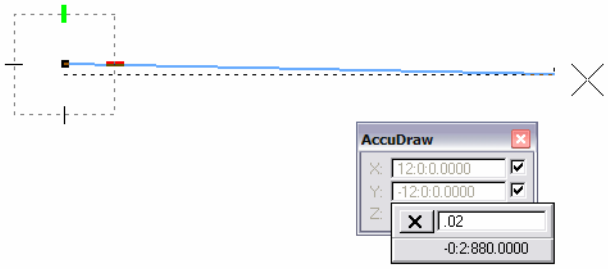
3. **<D>** anywhere to place the first point.
4. Make sure your **AccuDraw** compass is in **Rectangular** mode. If not press **<spacebar>**.
5. In the **SmartLine Tool Settings** box, make sure **Rotate AccuDraw to Segments** is turned **off**.



This will keep the X axis horizontal as you draw **SmartLine** segments.

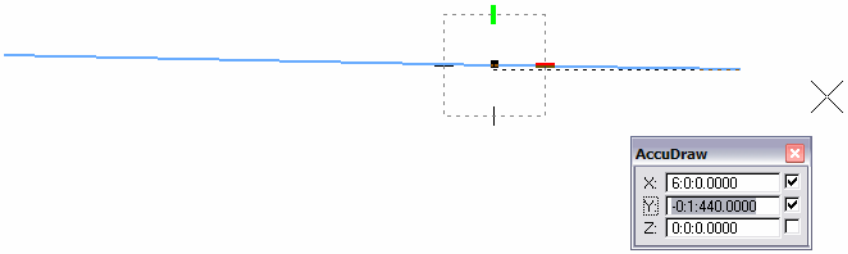
6. Move your cursor down and to the right to establish the direction of the **SmartLine**.
7. In **AccuDraw**, key in ***12*** for **X**, then **<TAB>**.
8. In **AccuDraw**, key in ***12*.02*** for **Y**, then **<TAB>**.
9. **<D>** to place the first **SmartLine** segment.
10. **Zoom In** if needed to see the line.

    Note: Do not reset out of the **SmartLine** command. This will break the SmartLine, which you do not want to do. You want the top slab line to be all one element.



This creates the 12 ft. travel lane at a 2% slope.

11. For the next shoulder segment, move your cursor down and to the right to establish the direction of the SmartLine.
12. In **AccuDraw**, key in ***6*** for **X**, then **<TAB>**.
13. In **AccuDraw**, key in ***6*.02*** for **Y**, then **<TAB>**.



14. **<D>** to place the second **SmartLine** segment.

    This creates the 6 ft. shoulder at a 2% slope.

15. **<R>** out of the **SmartLine** command.

Create the bottom slab construction line

Vertically copy the top slab line down 8 inches for the bottom of slab on the right side.

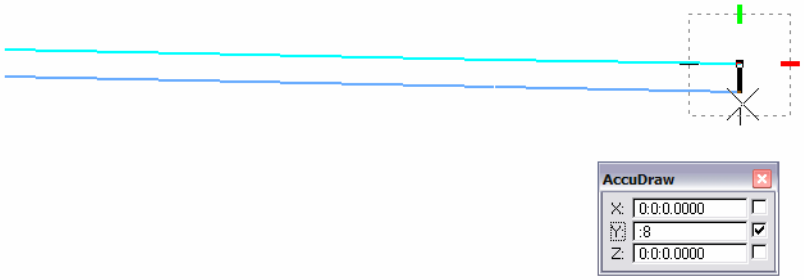
1. Select the **Copy** command from the **Manipulate** toolbar.

2. **AccuSnap** on the right end of the top slab to identify the element to copy.

3. Move your cursor down and lock on to the –Y AccuDraw axis to establish the copy direction. In **AccuDraw**, key in ***:8*** for **Y** and the press **<TAB>** to accept the entry. The value converts to 0.667 feet.

   Notes: Don't forget to key in the colon before the 8 to specify 8 inches.

   You can also use **..** instead of a colon to specify inches (e.g. **..8** for 8 inches)

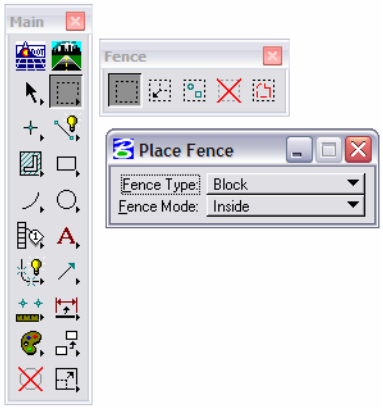


4. **<D>** to place the copy, then **<R>** to complete.

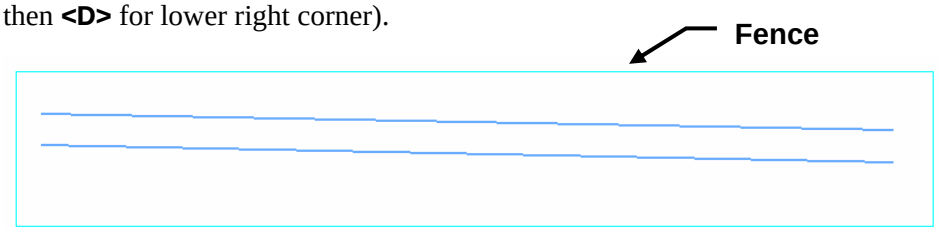
Create the slab left side

Since the right and left sides of the road are symmetrical, you can mirror the right side to create the left side.

1. Select the **Place Fence** command from the **Fence** toolbar and set the **Tool Settings** as shown.

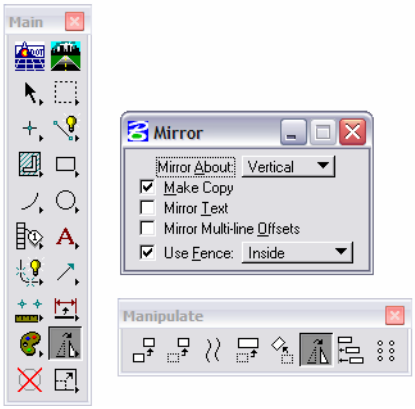


2. Place a fence around the slab graphics **(<D>** for upper left corner and then **<D>** for lower right corner).

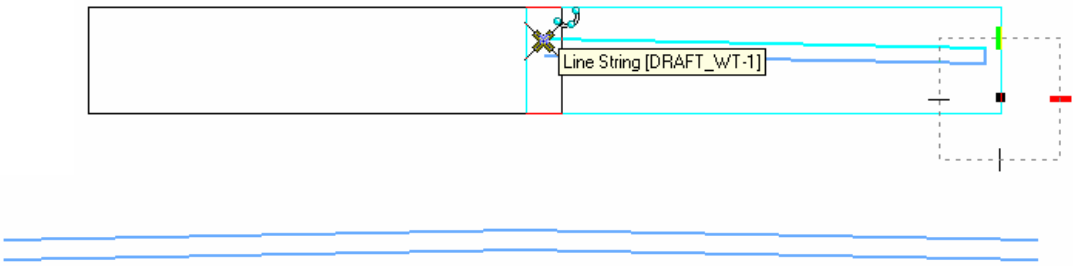


3. Select the **Mirror** command from the **Manipulate** toolbar:

   - Set **Mirror About** to **Vertical.**
   - Toggle on **Make Copy.**
   - Toggle on **Use Fence** and set to **Inside**.



4. **<D>** on the left endpoint of the upper slab line (the crown point) for the mirror copy.



5. **<R>** when done.
6. Select the **Place Fence** command again to remove the fence.
7. **Fit** the view.

Place the girders

1. On the **CDOT** menu, select the **Bridge** Group.
    - Set the **Category** to **Bridge Levels**
    - Set the **Type** to **Basic**
    - Select the **Outline** item

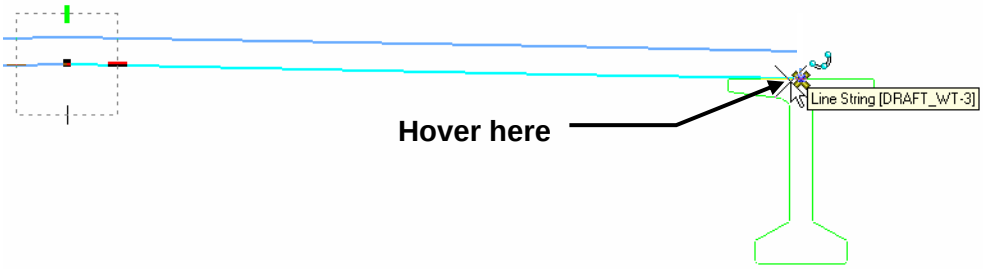
    This changes the active level from a **DRAFT** level to the **BRIDGE_OUTLINE** level for placing the girders.

2. On the CDOT menu, select the Bridge Group.
    - Set the **Category** to **Cells**
    - Set the **Type** to **Girders-BT**
    - Select the **BT54** item

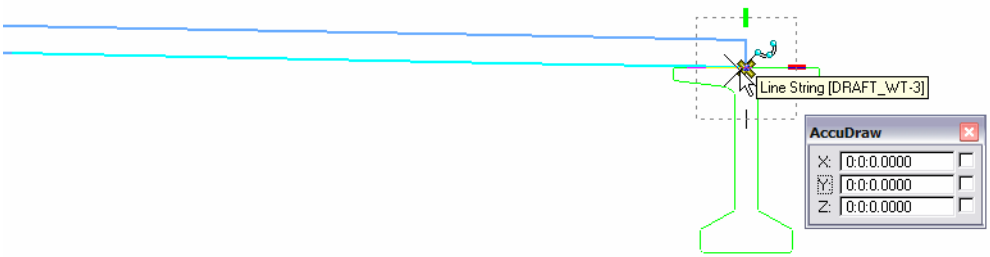
3. On the CDOT menu, select the **Settings** button
    - Set **Active Scale** to ***1***.
    - Set **Active Angle** to ***0***.

    This automatically selects the correct girder cell from the bridge cell library and activates the **Place Cell** command.

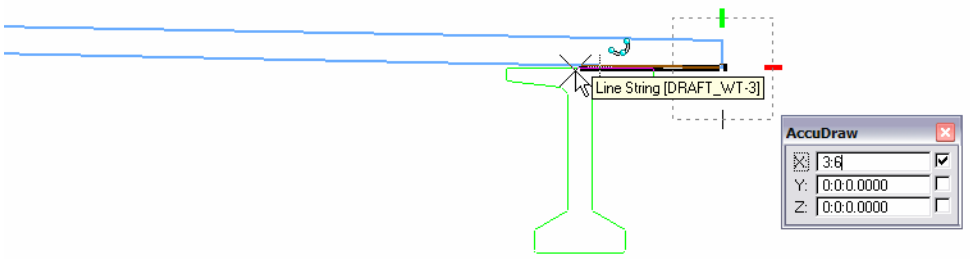
4. With the girder cell attached to your cursor, hover over right endpoint of the bottom slab line (don't **AccuSnap**, just hover and lock on to the point).



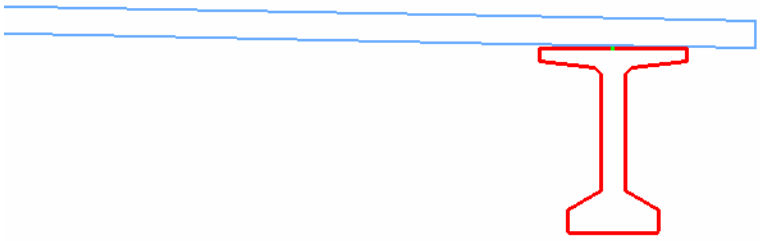
5. Click into the **AccuDraw** box to set it active and press the letter ***O*** on the keyboard to move the **AccuDraw** compass origin to this point.



6. Move you cursor to the left to establish the placement direction, and key in ***3:6*** in the **X** field.



7. With your cursor locked on the **X** axis **<D>** to place the girder cell.

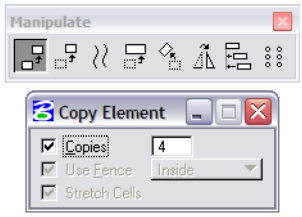


This places the first girder 3 ft. – 6 in. from the right side of the slab. You'll later move the girder down for the proper haunch depth.

Place additional girders

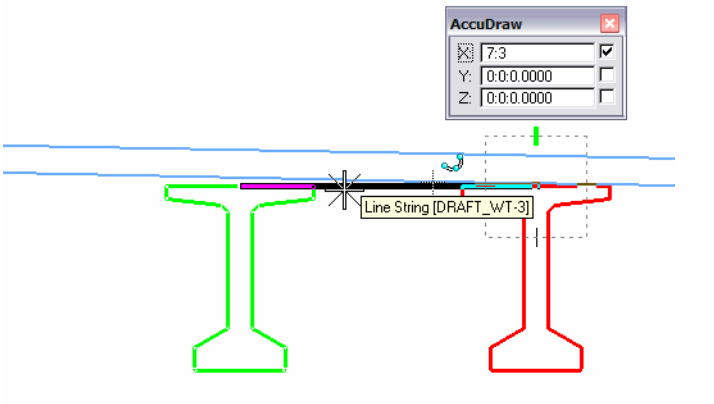
Copy the girder cells to space them 7 ft. 3 in on center.

1. Select the **Copy** command.
2. In the **Tool Settings** box, key in ***4*** for the number of copies.

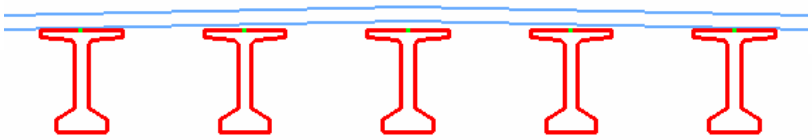


3. Click into the AccuDraw window to set it active.
4. **<D>** on the girder at the top midpoint.

5. Move your cursor to the left to establish the copy direction and key in ***7:3*** in the **X** field in **AccuDraw**.



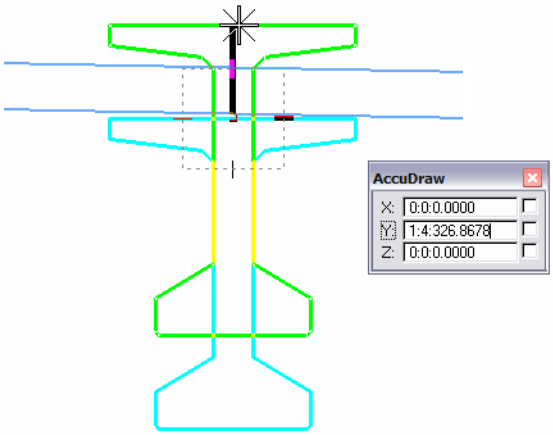
6. With your cursor locked on the **X axis**, **<D>** to place the copies.



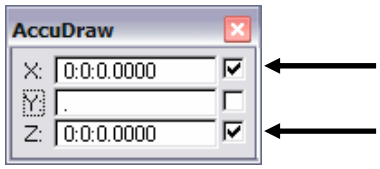
Move the girders down to establish the haunch depth

1. Select the **Move** command from the **Manipulate** toolbar.

2. Click into the AccuDraw window to set active.
3. **<D>** on the right end girder at the top midpoint for the move from location.
4. Move your cursor up and lock on the **Y axis** to establish the direction, then press **<Enter>** on the keyboard.

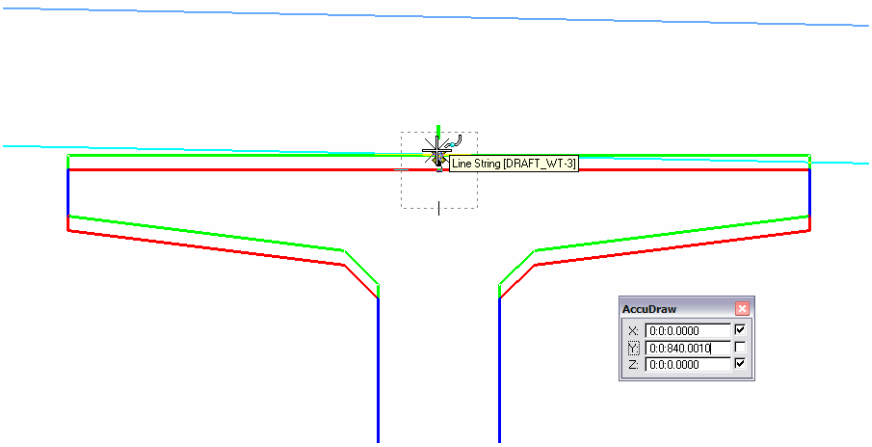


By pressing **<Enter>** you "smartlock" the **AccuDraw X** and **Z** axes, so that you can only move in the **Y** direction.

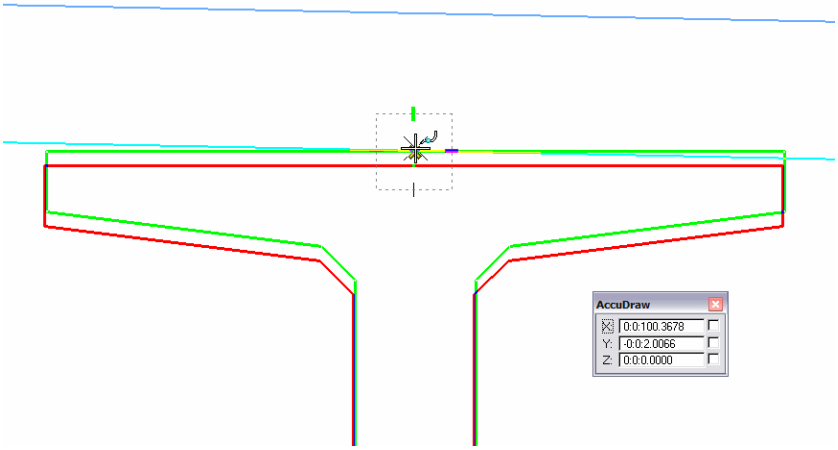


X and Z axis "smartlocked" so that you can only move in Y

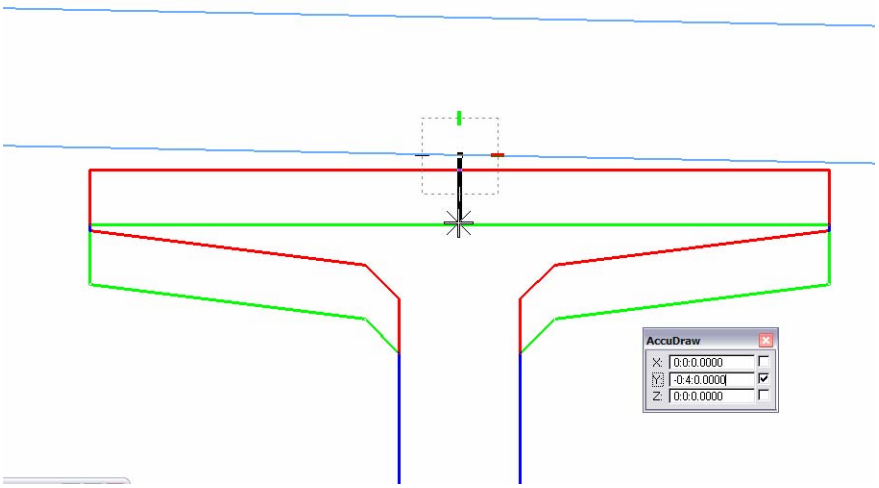
5. Press ***N*** on the keyboard for the **Nearest** snap mode.
6. Hover over (do not data point) at the nearest snap point on the bottom slab line.



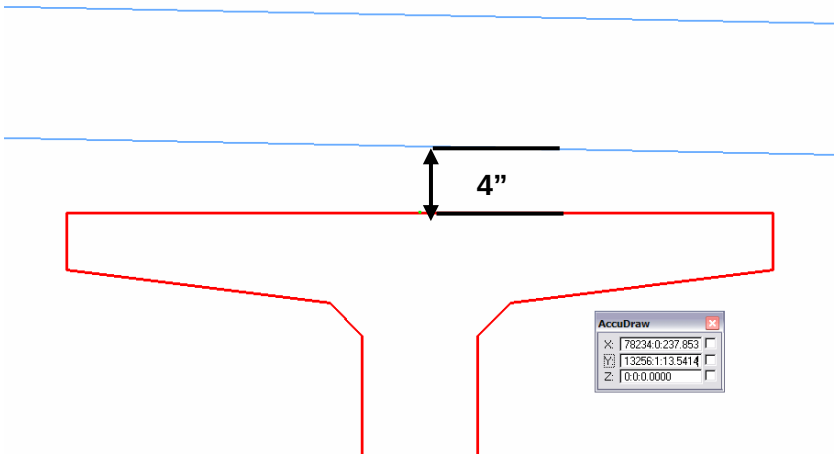
Press the letter ***O*** on the keyboard to move the **AccuDraw** origin to this point.



7. Move your cursor down to establish the move direction, lock on to the **-Y** axis and key in ***:4*** in the **AccuDraw Y** field.

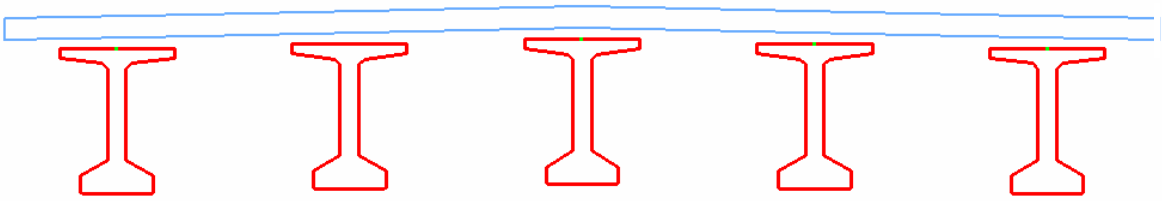


8. **<D>** to move the girder.



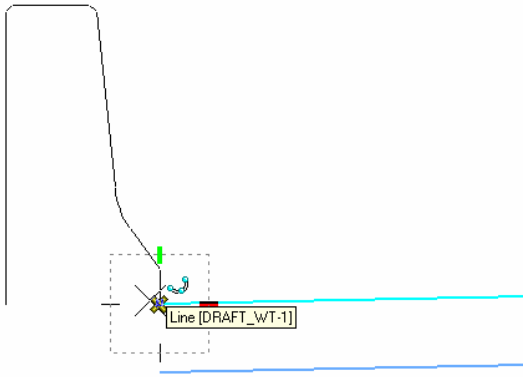
This moves the girder down 4 inches from the bottom of the slab for the correct haunch thickness.

9. Repeat the above steps to vertically move the remaining girders down 4 inches from the bottom of the slab.

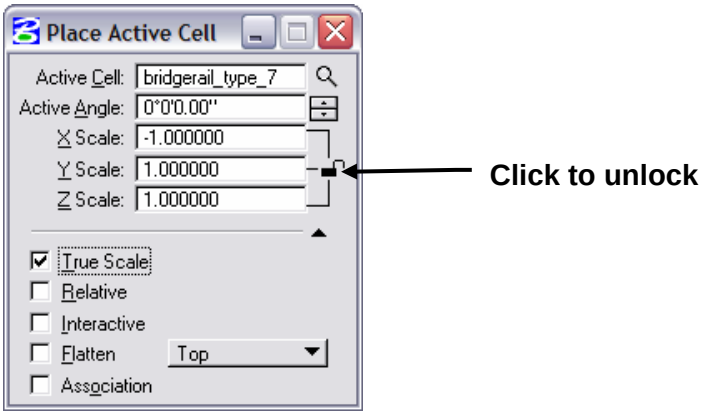


Place the Bridge Rail

1. On the CDOT menu, select the **Bridge** Group.
   - Set the **Category** to **Bridge Rail**
   - Select the **Rail Type 7** item
2. **AccuSnap** on the left end of the top of slab as shown.

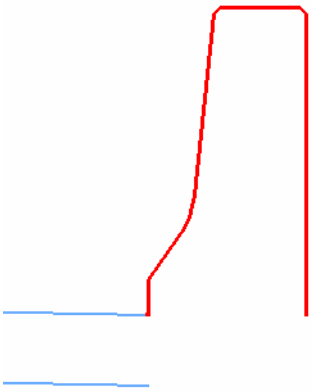


3. For the right-side rail, select the **Place Active** cell again.
4. In the **Tool Settings** box, unlock the axes and set the **X** scale to ***-1***.



Note: **-1** X-axis scale will mirror the cell about the X axis.

5. Place the cell as shown.

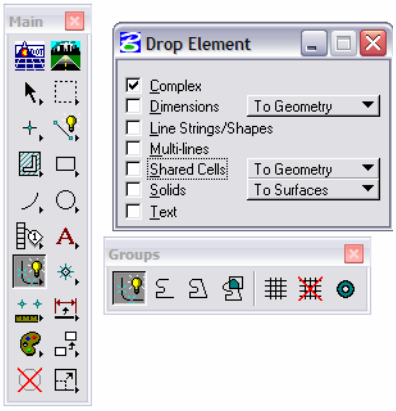


6. **<R>** when done.

Extend elements

Extend the slab lines to join up with the bridge rail. To do this, you'll need to drop the bridge rail cell to its original elements.

1. Select the **Drop** command from the **Groups** toolbar.

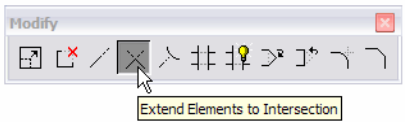


2. Select **Drop Element**, and toggle on **Complex** (the cell is considered a complex element).

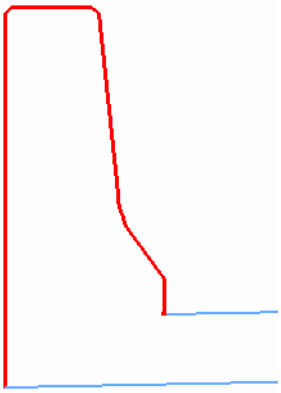
3. **<D>** on the right-side bridge rail cell.

   The cell is dropped to its original elements.

4. Select the **Extend Elements to Intersection** from the **Modify** toolbar.



5. **<D>** on the bottom slab line and then **<D>** on the back of rail line to extend these elements.



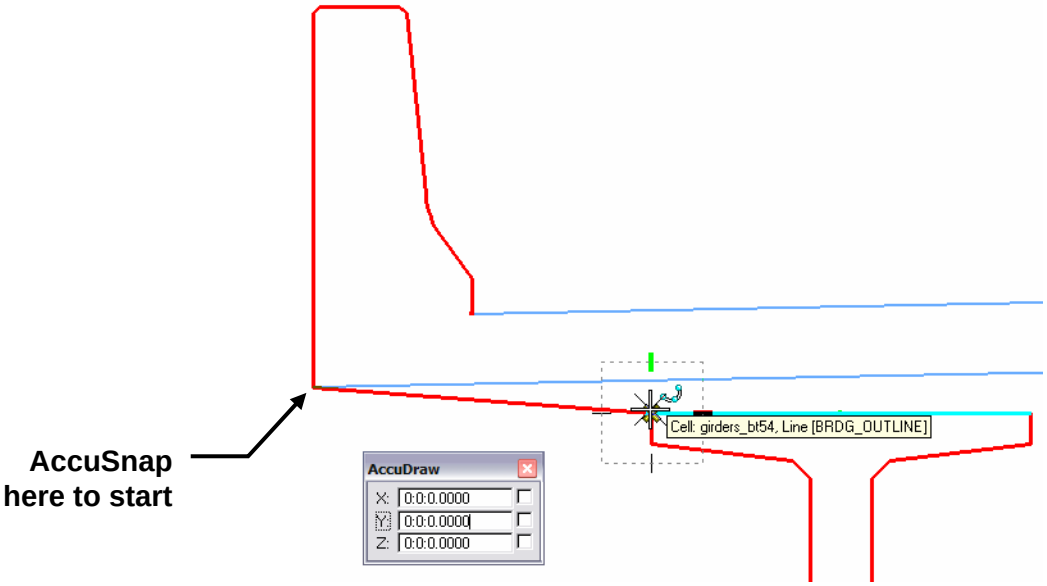
6. Repeat the above steps for the right side.

Draw the slab

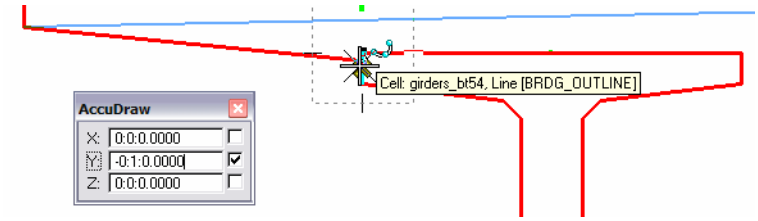
1. With the active level set to **BRIDGE_OUTLINE**, select the **Place SmartLine** tool.
2. Click in the AccuDraw window to set it active.
3. Starting on the left side, **AccuSnap** on the bottom of the bridge rail.

   You want the next point to be 1” below the left-top of the first girder. To do this, you’ll need to move the AccuDraw origin to the top of the girder and then locate 1” down.

4. Hover over the left-top of the girder as shown, click in the **AccuDraw** box and press the letter ***O*** on the keyboard to move the **AccuDraw** origin to this point.

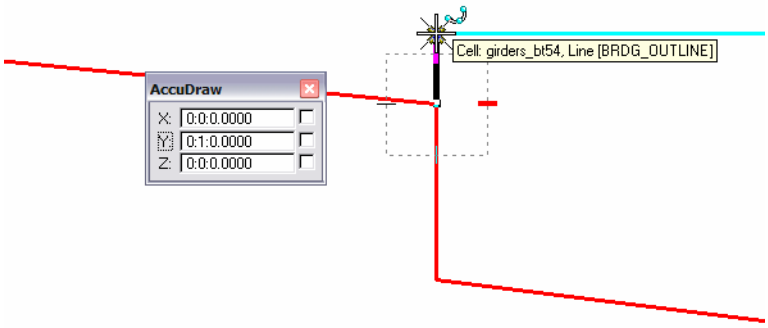


5. Move your cursor down, lock on the **Y** axis and key in a value of ***:1*** (1 inch).



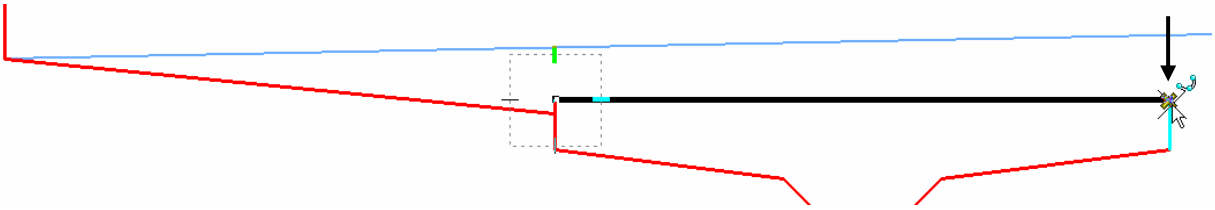
6. **<D>** to place the **SmartLine** segment.

7. **AccuSnap** on the left-top of the girder as shown.



Note: Remember, if you make a mistake, **Undo** the last data point, don't reset out of the SmartLine command.

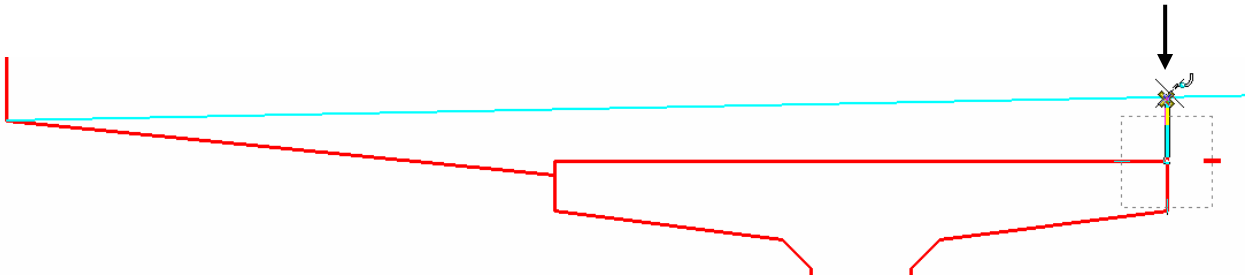
8. **AccuSnap** on the right-top of the girder as shown.



9. Move your cursor up, lock on to the **Y** axis and press **<Enter>** to smartlock the axis.

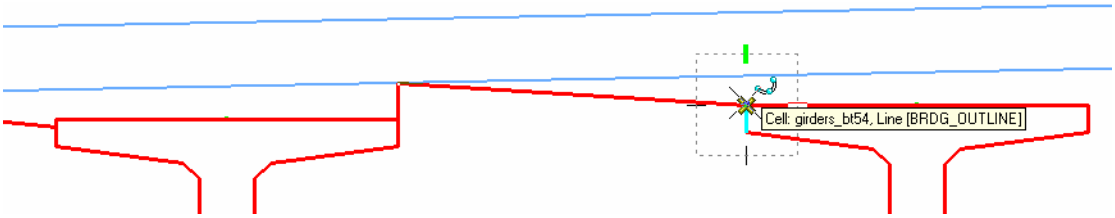
   You can now only move in the Y direction.

10. Press ***N*** on the keyboard for the nearest snap point.

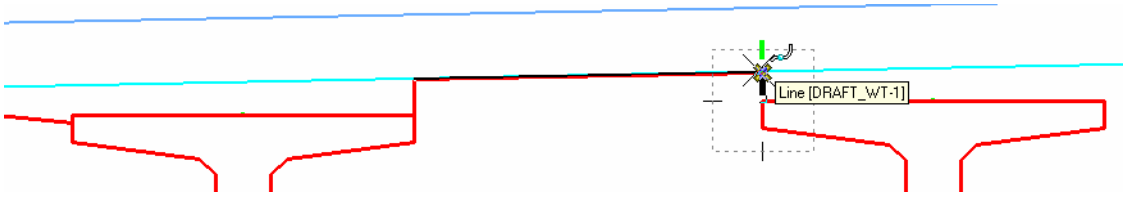


11. **<D>** on the bottom slab line as shown.

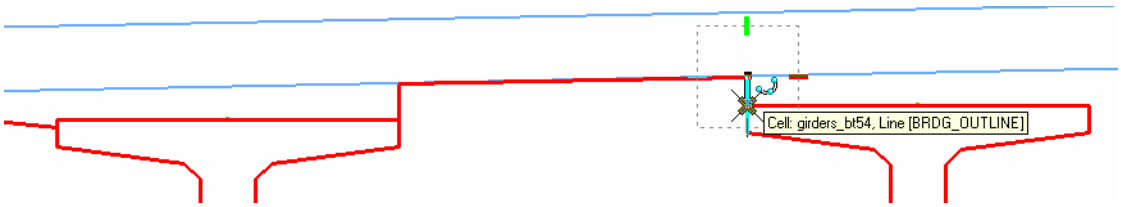
12. Hover over the next girder's top-left endpoint as shown.



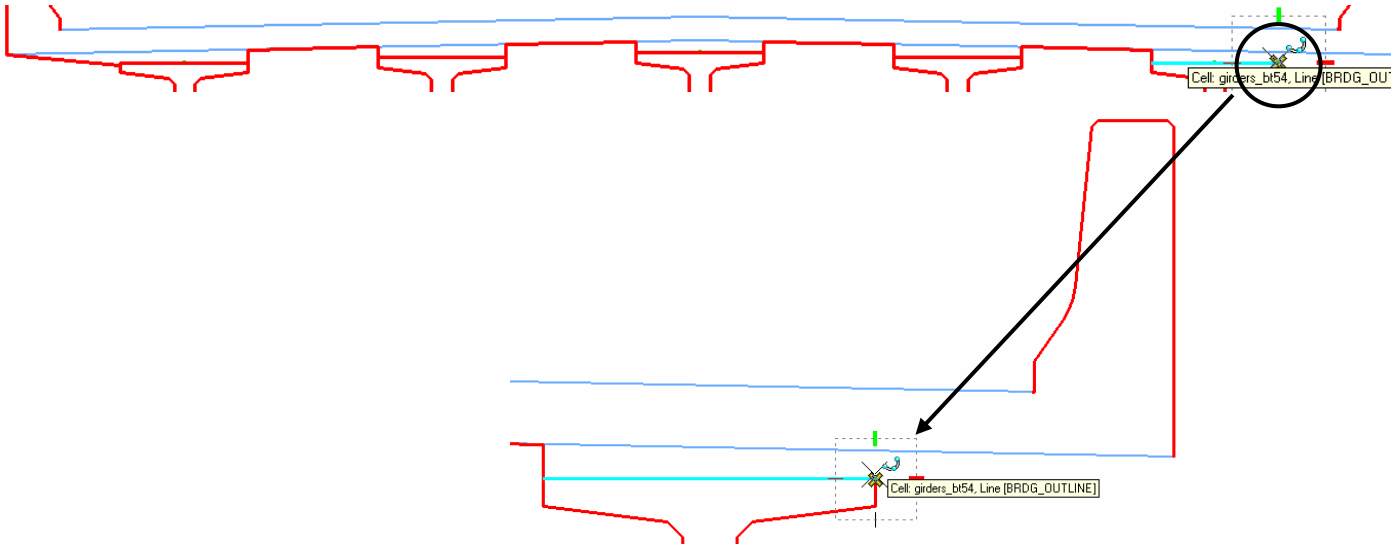
13. Press **O** on the keyboard to move the **AccuDraw** origin to this point (do not data point).
14. Move your cursor up, lock on to the **Y** axis and press **<Enter>** to smartlock the axis.
15. Press ***N*** for the nearest snap point.
16. **<D>** on the bottom slab line as shown.



17. **<D>** on the top left girder edge as shown.



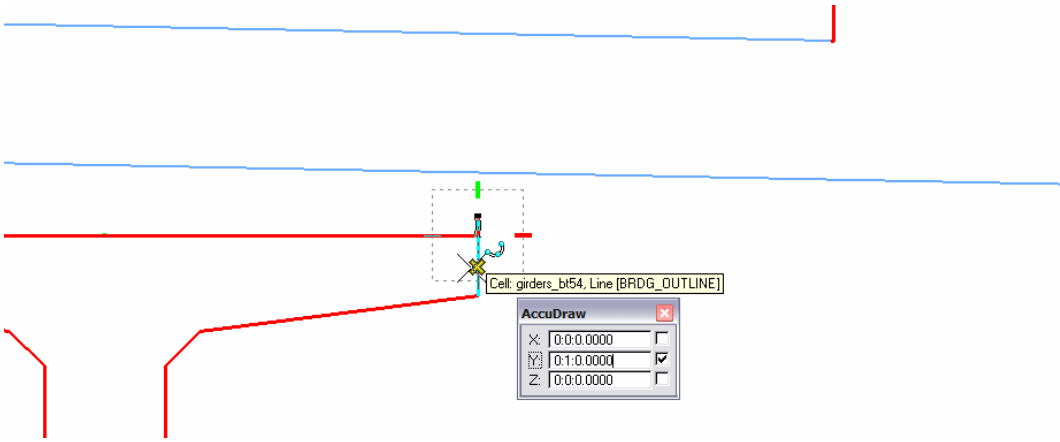
18. Continue these steps on each girder to place **SmartLine** segments as shown until you get to the last girder location shown below.



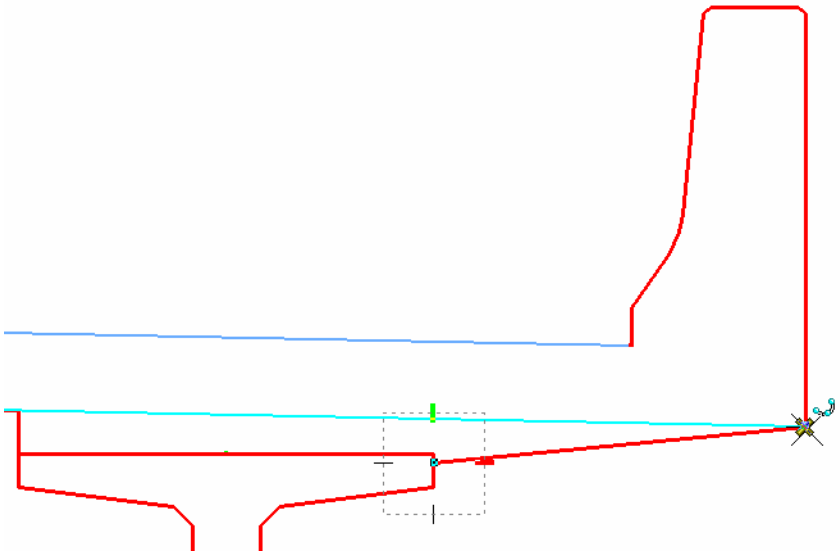
Remember to **Undo**, not reset, if you make a mistake on a segment.

19. On the last girder (far right), move your cursor down, lock on to the **Y** axis and key in a Y value of ***:1*** (1 inch).

20. **<D>** to place the point.

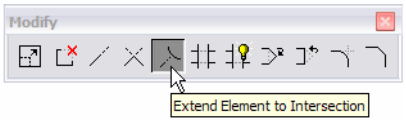


21. **<D>** on the right end of the bottom slab line.

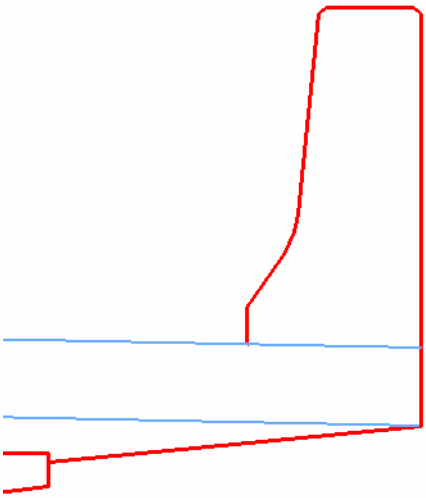


22. **Reset** out of the **Place SmartLine** command.

23. Select the Extend Element to Intersection tool from the Modify toolbar.



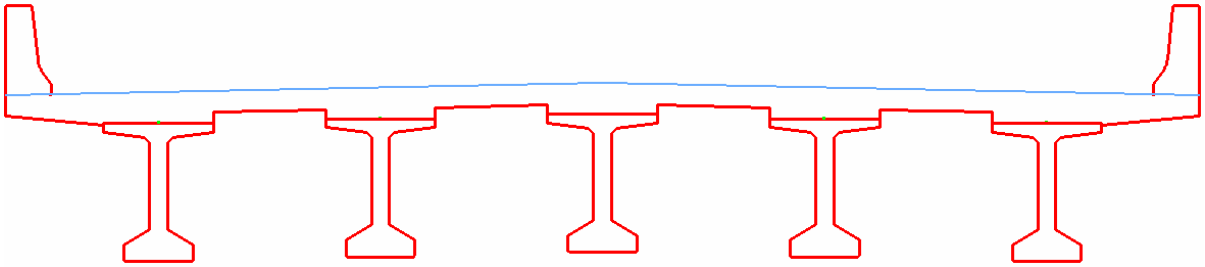
24. <D> on the blue top of slab line and then <D> on the back of bridge rail line to extend these elements.



25. Repeat for the left side.

26. Delete the blue bottom of slab lines.

27. Fit the view.

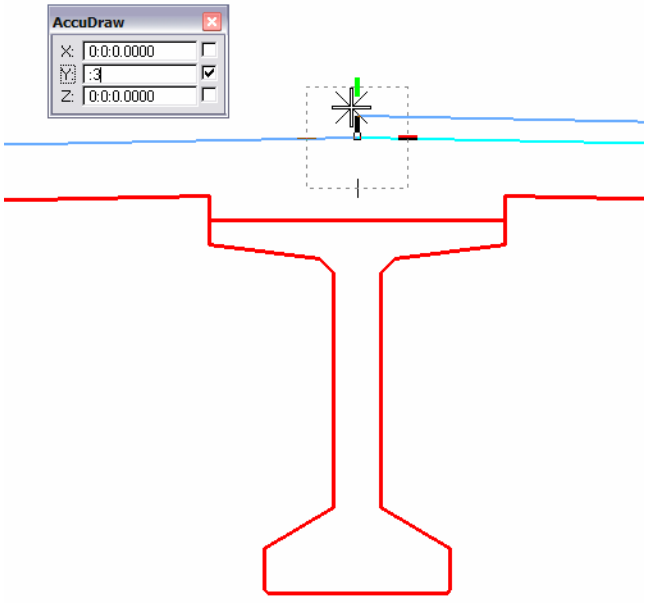


Create the top of pavement

1. **Fit** the view.
2. Select the **Copy** command.
3. **<D>** on the right-side top slab line (blue construction line) at the crown point to select it for copying.

   Note: If you select the bridge slab shape (red element), **<R>** until the top slab line highlights.

4. Move your cursor up and lock-in on AccuDraw's **Y** axis.
5. In **AccuDraw**, key in a Y value of ***:3*** (3 inches).



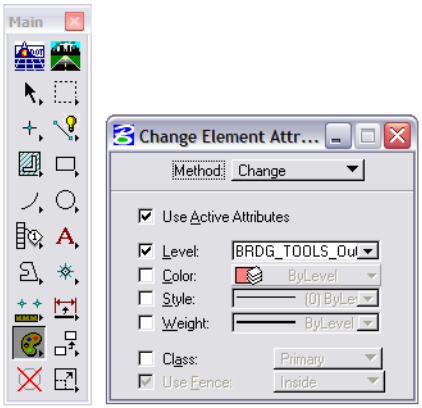
6. **<D>** to copy the top slab line.
7. Repeat for the left side.

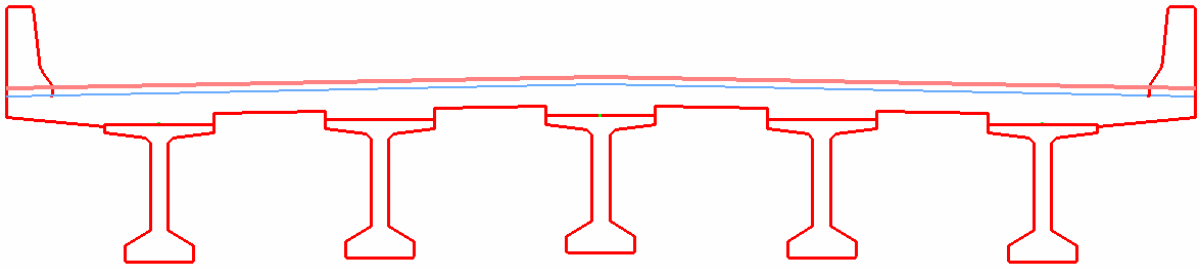
   Note: You can move your cursor up and lock in on the last distance tic mark of 3 inches, eliminating the need to key in the Y value.

8. On the CDOT menu, select the **Bridge** Group.
    - Set the **Category** to **Bridge Levels**
    - Set the **Type** to **Outline**
    - Select the **Outline-Asphalt** item

    This sets the active level to the asphalt level.

9. Change the top of pavement lines to the active asphalt level.





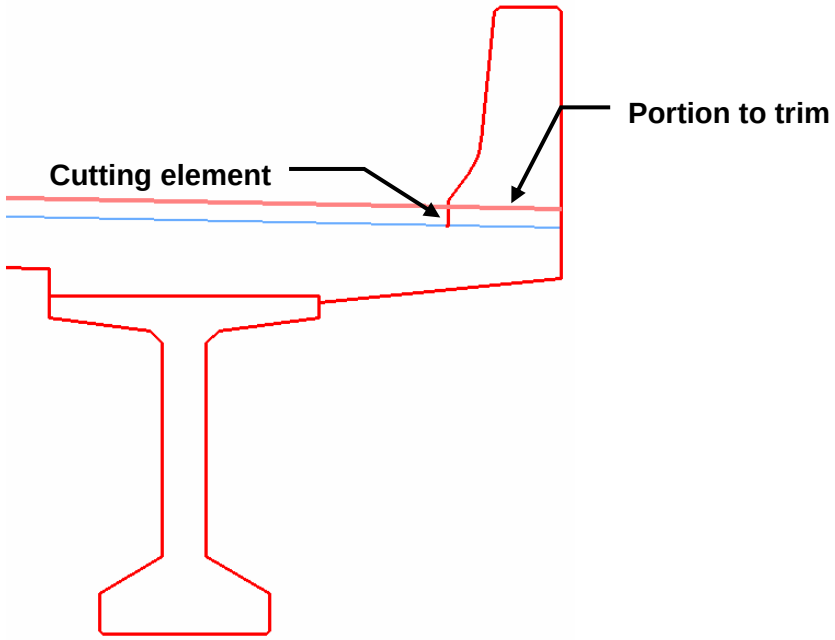
Clean-up lines at the rails

You now need to trim the top of pavement lines that run through the bridge rails, as well as the bottom of the rail that extends below the top of slab.

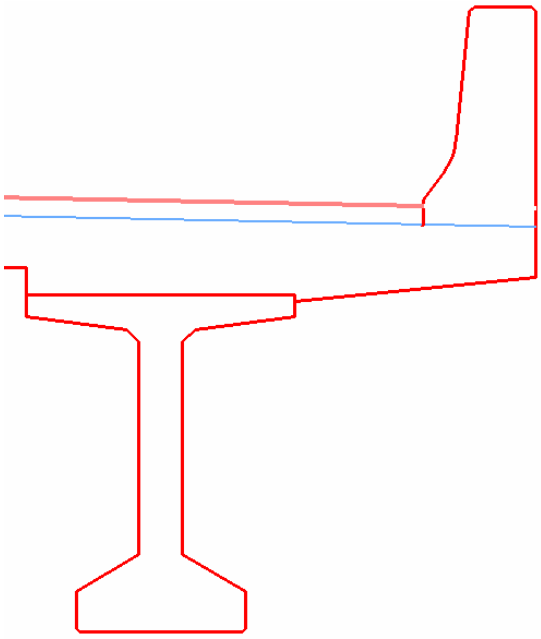
1. Select the **Trim** command from the **Modify** toolbar.

2. Follow the prompts and **<D>** on the vertical edge of the rail to select it as the cutting element.

3. **<D>** on the top of pavement line inside the rail as the portion to trim.



4. **<D>** to accept.

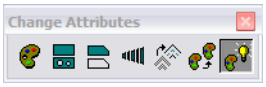


5. Repeat the above steps for the left-side rail.

Complex the bridge rail graphics

Since you dropped the bridge rail cell to trim the graphics, it is no longer one entity. Instead it was dropped to individual lines. You will now group the lines into a complex chain.

1. Select the **SmartMatch** command and **<D>** on any red bridge line to match it.



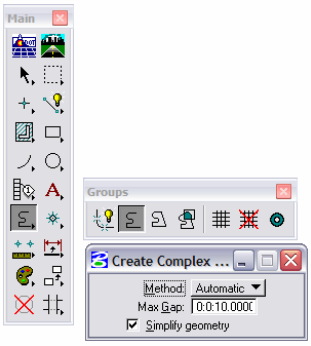
This sets the active level to **Bridge_Outline** to match the slab.

2. Select **Create Complex Chain** from the **Groups** toolbar.

   - Set the **Method** to **Automatic**.

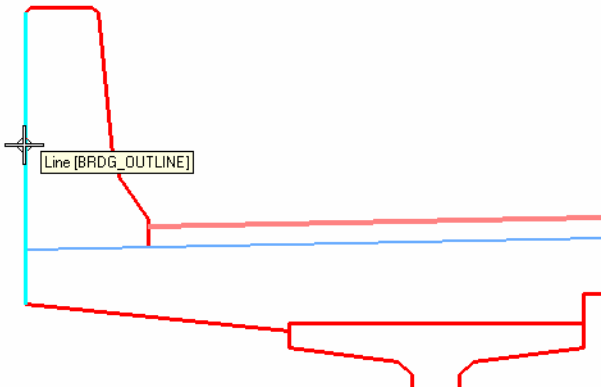
With the **Automatic** method, you do not have to individually identify each element to add to the complex chain. The elements are found automatically within a maximum gap range.

   - Toggle on **Simplify Geometry**.



Note: **Simplify geometry** will make the new element a **SmartLine** instead of a complex element.

3. **<D>** on the first segment of the bridge rail as shown.

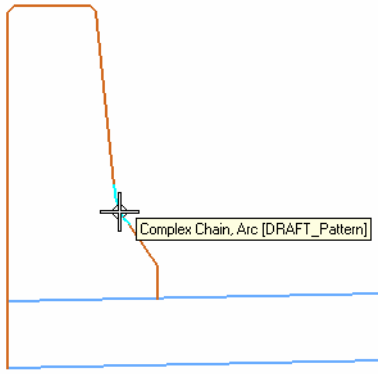


4. **<D>** anywhere above this element to define the direction for adding elements.

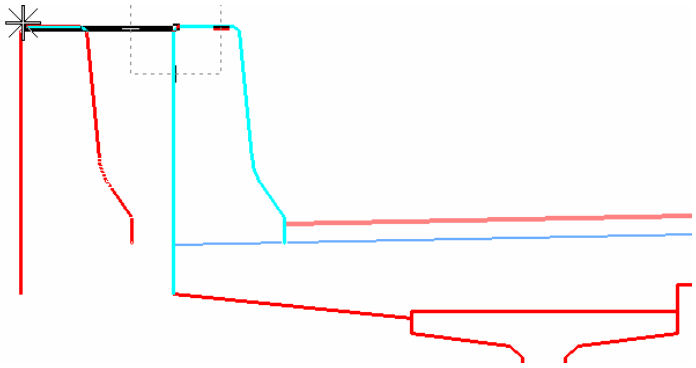
   The remaining bridge rail elements are added to the chain and place on the active **Bridge_Outline** level.

5. **<D>** to accept.

   Note: With some MicroStation commands (like the **Complex Chain** command), if you hover over the complex element it will still show you the individual elements that make up the chain. However, notice that pop-up information tells you it really is a complex chain. When you use the **Copy** command in the next step, you'll see the chained elements behave as one element.



6. Select the **Copy** command from the **Primary** toolbar and copy the bridge rail to a clear area of the design file.



   Note the individual graphics are now chained together into one element.

7. **Undo** the copy.

   Note: You can use the **Create Complex Shape** in a similar fashion to create closed shapes from individual graphics.

Create a Selection Set of the Bridge Section

1. **Fit** the view.
2. Choose the **Element Selection** tool from the **Main** toolbar.
3. Hold down the data button **<D>** and drag across the bridge section (corner to opposite corner). Be sure to include all of the section graphics in this area.

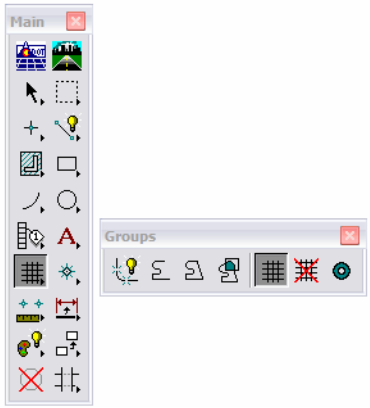
   Notes: The elements are added to the selection set and are highlighted purple (the selection set color). To change the color, choose **Settings > Design File > Color > Select Set Color**.

   The lower right corner of the status bar shows how many elements are now in the selection set.
4. **<D>** in the center of the typical section, hold down the data button and drag the selection set to a new location in the file.
5. Drag the select set back to its original location.
6. **<D>** anywhere in a clear area of your design file to remove the selection set.

   The selection set is a temporary group of graphics until you drop the set.

Create a Graphic Group of the Bridge Section

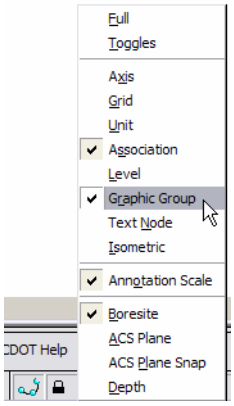
1. Use the **Element Selection** and place the bridge typical section graphics into a selection set again.
2. From the **Groups** toolbar, select **Add to Graphic Group**.



3. **<D>** to accept the selection set element to add to the group.
4. **<R>** out of the command.
5. **<D>** anywhere in a clear area of your design file to remove the selection set.

   The elements “un-highlight” and return to their normal symbology.

6. On the status bar, check your locks and make sure **Graphic Group** lock is on.

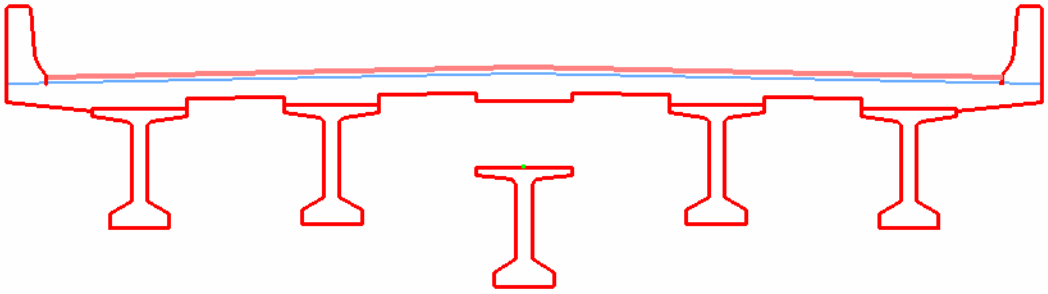


7. Select the **Move** command.
8. **<D>** on the bridge typical section graphics.

   All elements in the graphic group highlight.
9. Move the graphics and a new location and **<D>** to accept.

   With **Graphic Group** lock on, the elements behave as a group.
10. On the status bar, turn the **Graphic Group** lock off.
11. Select the **Move** command again.
12. **<D>** on one of the BT 54 girders.

    Only the girder highlights.
13. Move it to a new location and **<D>** to accept.



With the **Graphic Group** lock off, you can manipulate the individual elements in the group.

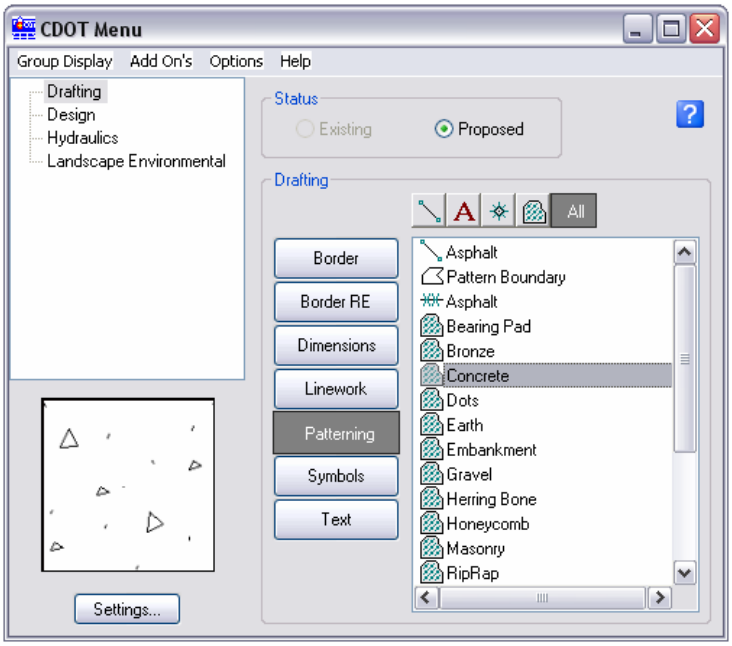
14. **Undo** the **Move** command on the girder.
15. Turn the **Graphic Group** lock back ***on***.
16. Move the bridge typical section graphics back to their original location.

Note: When working in design model files, most InRoads graphics are displayed as graphic groups (*e.g.* contours, profiles, cross sections).

Pattern pavement and slab

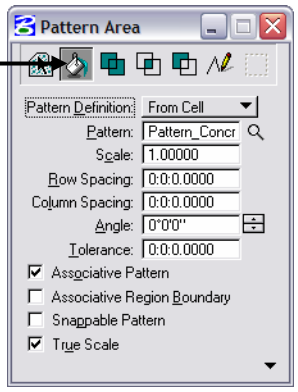
1. **Fit** the view.
2. On the CDOT menu, select the **Bridge** Group.
   - Set the **Category** to **Bridge Levels**
   - Set the **Type** to **Basic**
   - Select the **Pattern** item to set the active level

3. From the **CDOT Menu** Explorer:
   - Select **Drafting**.
   - Set the category to **Patterning**.
   - Select the **Concrete** item.



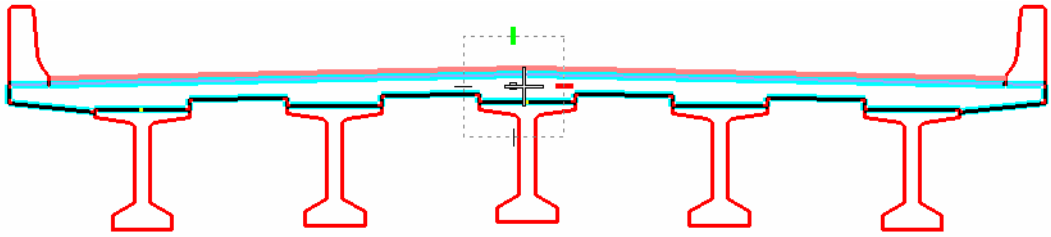
4. In the **Pattern Area Tool Settings** box and set the **Method** to **Flood**, **Active Scale** to ***1*** and the **Active Angle** to ***0***.

Flood Method



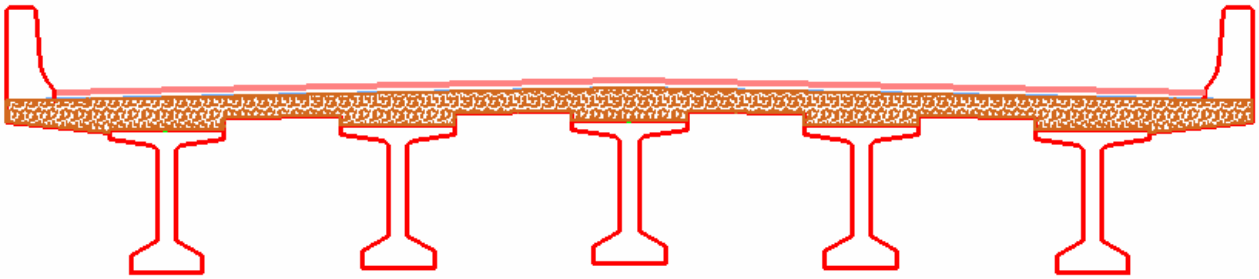
5. Make sure the entire region to flood is shown in your view. Then**, <D>** anywhere inside the bridge slab region.

   The region to flood with the pattern highlights.

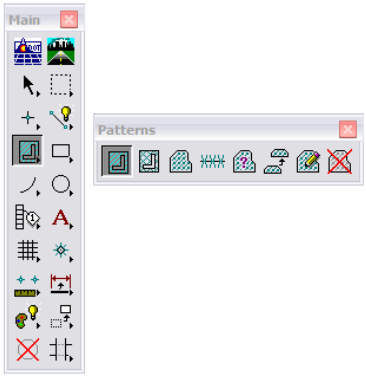


6. **<D>** to accept.

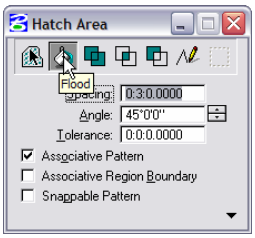
   The shape is patterned with the concrete cell.



7. Select the **Hatch Area** command from the **Patterns** toolbar.

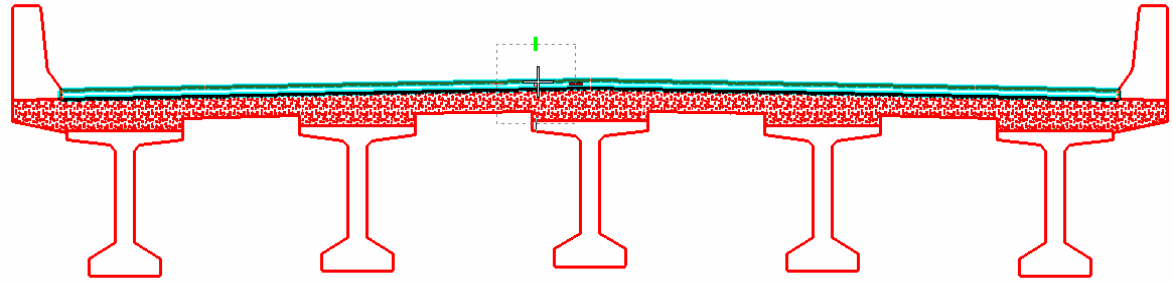


8. In **Tool Settings**, select the **Flood** method, set **Spacing** to ***:3*** and the **Angle** to ***45***.



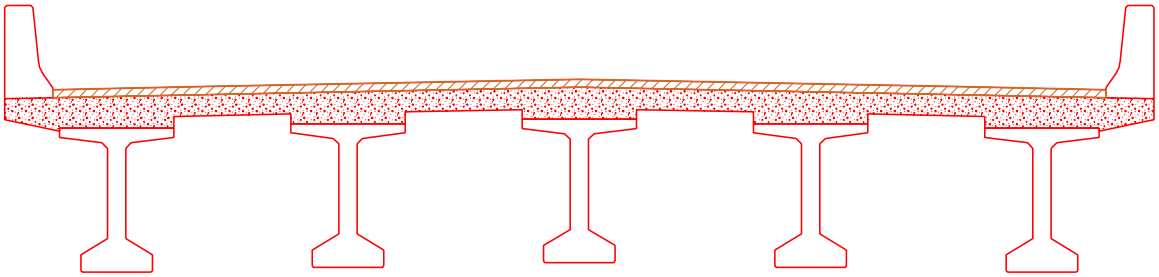
9. **<D>** anywhere inside the pavement area.

   A dynamic display shows the flooded area.



10. **<D>** to accept.

    The region is flooded with the hatch pattern.



11. **Save Settings**.

12. **Exit** MicroStation.

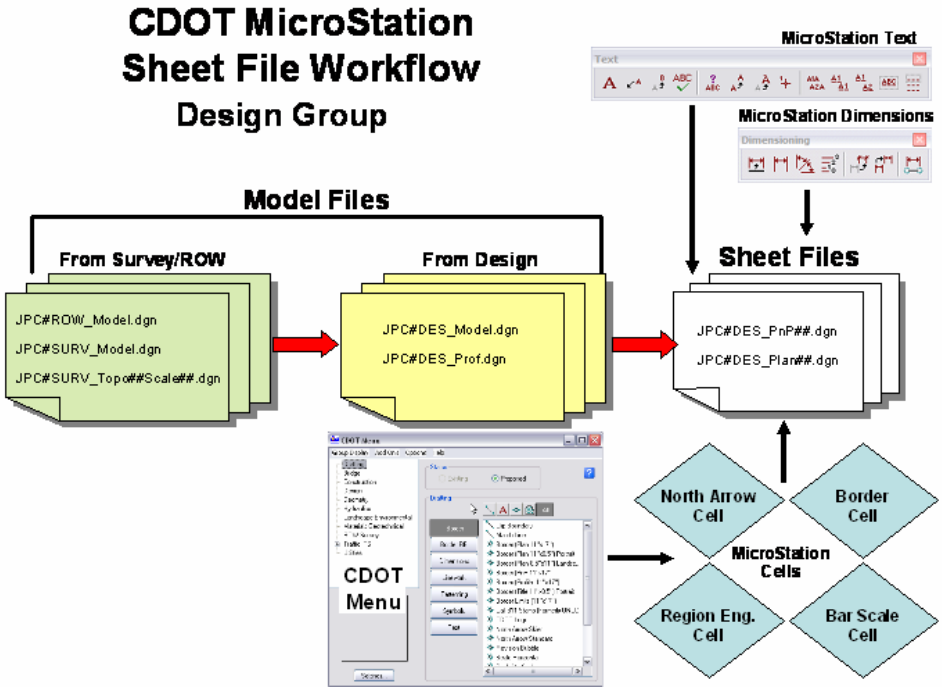
9. Creating Sheets

Roadway Design group

Plan or Plan/Profile sheets

The Design group's sheet file workflow is covered in detail in **Chapter 4**, **The CDOT workflow**. The following is a summary of the Design group's Plan or Plan/Profile sheet workflow:

- Create a new MicroStation design file for each sheet.
- Reference into the sheet file the proposed model file with the Survey/Topo model file nested.
- Rotate the view, if needed, so graphics appear horizontal.
- Clip the references to show only what graphics are needed for the sheet.
- Place the he border, north arrow, bar scale and resident engineer information cell directly in the sheet file.
- Check the sheet file's **Model Properties** and verify set the **Annotation Scale** to the sheet's plot scale. The default for all sheet files except Typical Section sheets is **1:100**.
- Edit the border text as needed.
- Annotate with MicroStation text.
- Dimension reference graphics, if desired.



Note: InRoads **Plan/Profile Generator** automates this process and can quickly generate a set of sheets along an InRoads alignment. Use the above workflow for special situations (approach roads, intersections, *etc.*) or where just a few sheets are needed.

Typical Section sheets

Typical Section sheets are an exception to the rule, since graphics are created directly in the sheet file using the CDOT Typical Section Program. Use the following workflow to create Typical Section sheets (an example is also provided in the lab exercises):

- Create a new sheet file each sheet (you can use the auto-populated file **JPC#DES_TyplSect##.dgn**).
- If you're using the auto-populated file, it contains a generic border. You can either edit the border information, delete the generic border and place a project border, or replace the generic border cell with the project border cell using the **Replace Cell** command.
- Check the sheet file's **Model Properties** and verify set the **Annotation Scale** to **1:10**. This is already set-up if you created your file from the auto-populated file.
- Start the **Typical Section Program** (from the **CDOT Menu** select **Add On's > Launch Typical Section Program**).
- Use the program to create your Typical Section(s). Place the sections directly inside the sheet border.
- Save the typical section input file from the Typical Section Program.

Other sheets

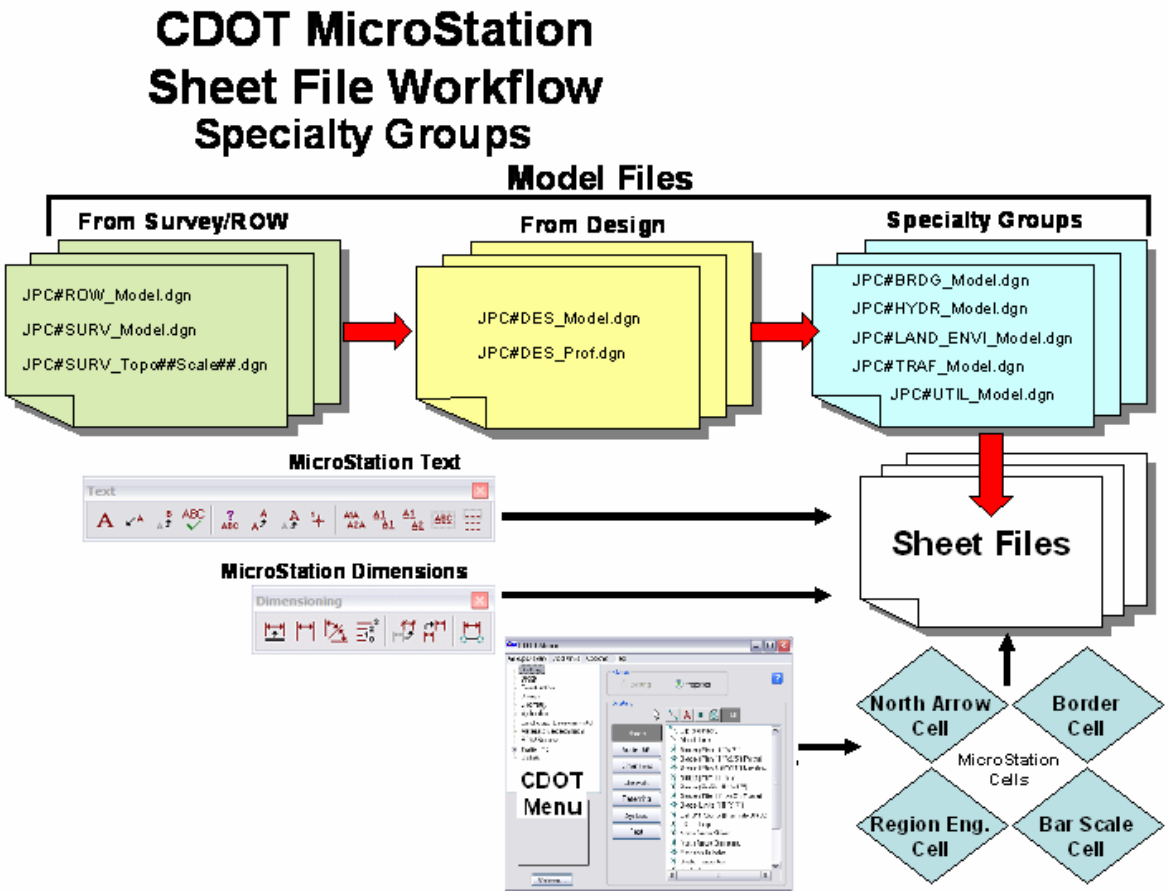
Other sheets like detail, title, general notes, etc. have specific requirements, but use the same general premise of referencing the model file(s) to the sheet file and are illustrated in lab exercises.

Specialty Groups

Plan sheets

The Specialty group's sheet file workflow is covered in detail in **Chapter 4**, **The CDOT workflow**. The following is a summary:

- The Specialty group creates a new MicroStation design file for each sheet.
- Reference into the sheet file the Specialty group model file with the Design model and Survey/Topo model files nested.
- Rotate the view, if needed, so graphics appear horizontal.
- Clip the references to show only what graphics are needed for the sheet.
- Place the he border, north arrow, bar scale and resident engineer information cell directly in the sheet file.
- Check the sheet file's **Model Properties** and verify set the **Annotation Scale** to the sheet's plot scale. The default for all sheet files except Typical Section sheets is **1:100**.
- Edit the border text as needed.
- Annotate with MicroStation text.
- Dimension reference graphics, if desired.



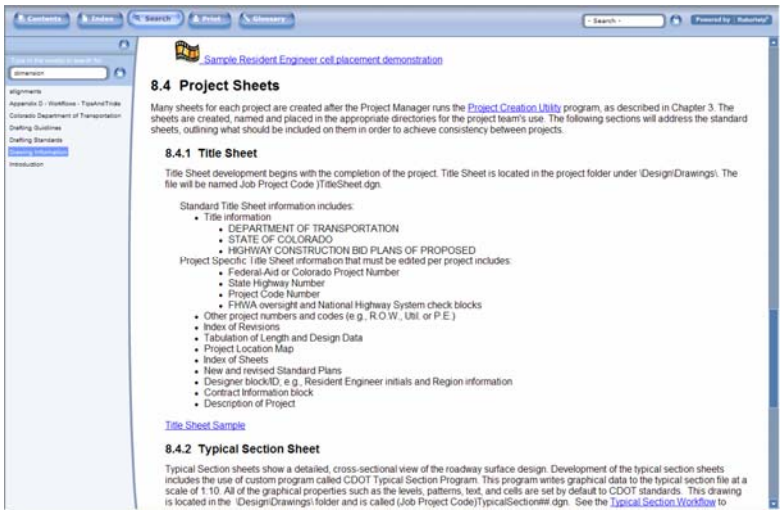
Other sheets

Other sheets like detail, tab, and notes sheets have specific requirements which are illustrated in lab exercises.

More Information

For more information on creating sheet file, see CDOT Workflows **Sheet File Creation**, **Sheet File Creation Multiple Scales**, **Creating Multiple Plan Sheets**, **Note Sheets**, and **Title Vicinity Map.**

See also the **CDOT CADD Manual**, ***Chapter Eight – Drawing Information, Section 8.4 Project Sheets***. This contains several useful links for sheet workflows.



Rotating Views

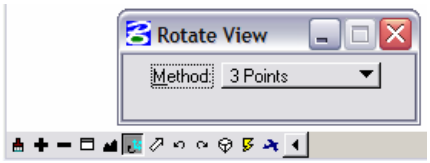
It is often necessary, especially with highway design projects, to rotate a plan view so that the alignment is horizontal to the view. This is especially useful when creating plan sheets. You can accomplish this using the following methods.

Rotate the Plan View with a Keyin

If you know the degree of rotation, you can rotate the view using the ***rv=*** keyin (***rv=X axis rotation, Y axis rotation, Z axis rotation***).

Rotate the Plan View by 3 Points

Use this method to define a view's new positive horizontal (X) axis and new positive vertical (Y) axis. The first two data points define the view's new X axis and the third data point defines the direction for rotation.



Rotate the Plan View by Element

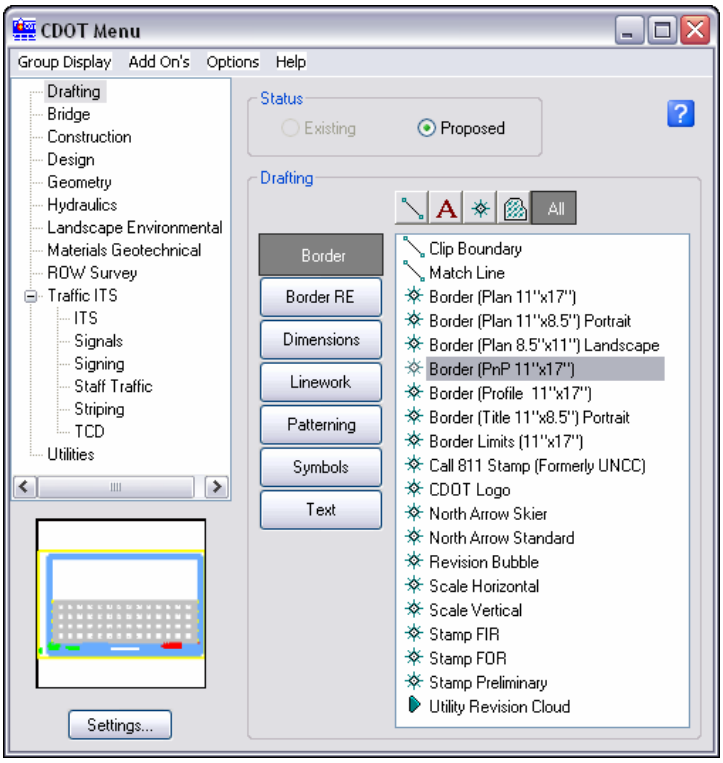
You can use the direction of an element to rotate a view so that the view is horizontal to the element (e.g. a horizontal alignment). Key in **Rotate View Element** and then **<D>** on the element to rotate the view.

> **Note:** The view is rotated based on the direction the element was drawn. The positive X axis is based on the positive direction of the element.

Placing Borders

Using the CDOT Menu for Border Placement

The **Border** and **Border RE** Categories under **Drafting** on the CDOT Menu provide a convenient method of placing the border and related information in a sheet file.

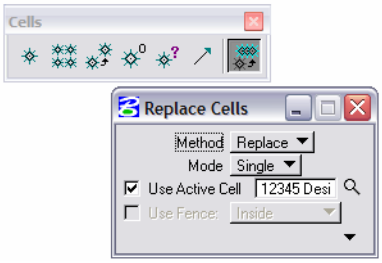


You have the option of placing different types of border cells, as well as other cells for the bar scale, north arrow and resident engineer.

Creating a Project-Specific Border Cell

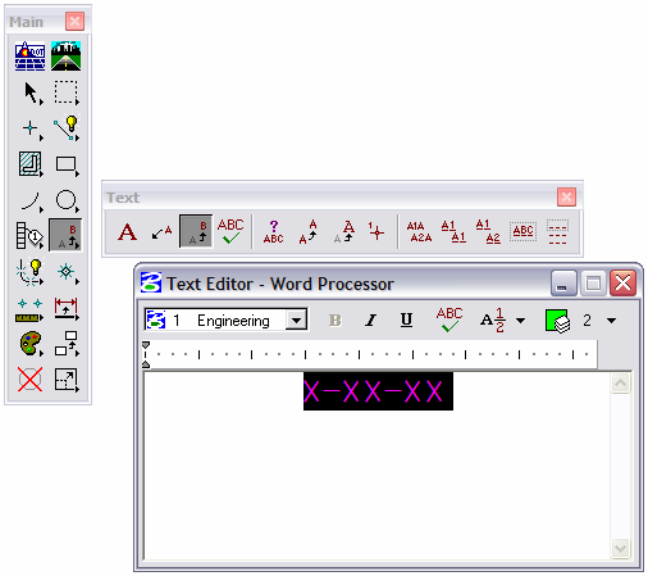
If you use the generic border in the auto-populated sheet files, or if you place a border cell in a sheet file using the CDOT Menu or the **Place Active Cell** command, then you will need to edit the border to specify all of the project-specific information for every sheet. This can be a time-consuming process.

Instead, you can create a project-specific border cell. Place the cell in a blank file, and then edit the cell text to fill in all of the project information (number, code, initials, *etc.*). You can either place this border in a blank sheet file, or replace the generic border cell with the project border cell in the auto-populated file. MicroStation's **Replace Cell** command is handy for this.

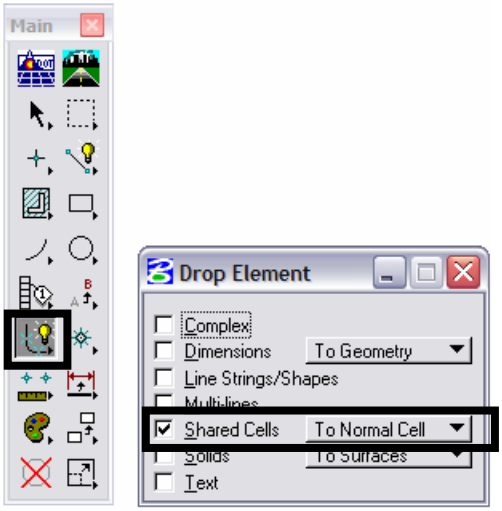


Editing text on the Border

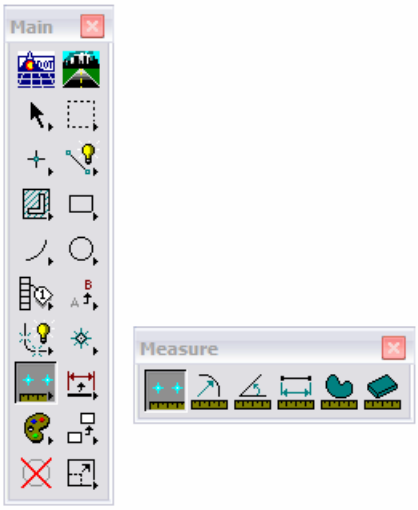
Text in the border cell can be edited using the **Edit Text** command on the **Text** toolbar. Select the text to edit, key in the new text in the **Text Editor** window, and then **<D>** to accept the edit.



Note: If you place the border cell as a **Shared Cell,** you must first drop the cell status to a regular cell if order to edit the cell text.



Measurement Tools

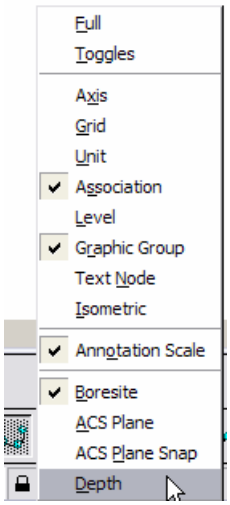


The **Measure** toolbar is used to measure distances, angles, radii and areas. Use **Settings > Design File > Coordinate Readout** to define how measurement values will display (units, precision, *etc*.). If you reference your model file graphics into your sheet file at 1:1, you can measure graphics in the sheet file with accurate results. Otherwise, you'll need to measure graphics in the model file.

Measuring in 3D

Important! In a 3D file, if you want planar measurements, turn on **Depth** lock before using the appropriate measure command. Make sure **AccuSnap** is off if you're snapping to points when measuring in 3D. Use Tentative snaps instead.

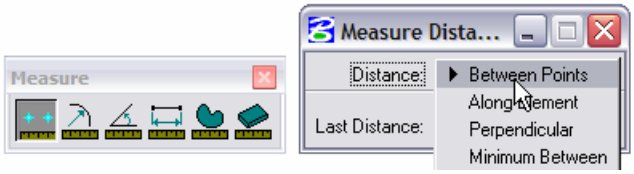
If you want true slope(3D) measurements, turn **Depth** lock off.



Some of the more commonly used measuring tools include:

Measure Distance

Measures distance using one of the following methods:



- ***Between Points***
- ***Along Element***
- ***Perpendicular***

  Note: This command locks on the ***element's*** depth you are measuring perpendicular from to start the measurement. If you want a horizontal measurement (2D measurement in a 3D file), you must first set the **Active Depth** to the depth of the element and make certain **Depth** lock is on.

- ***Minimum Between***.

Measure Radius

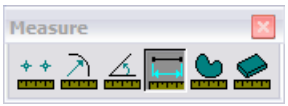
Measures the radius of a circle or an arc, or a circular segment of a complex chain or shape, or the primary and secondary axes of an ellipse.

Measure Angle

Measures the angle between two lines or linestrings, or the angle between two segments of a shape.

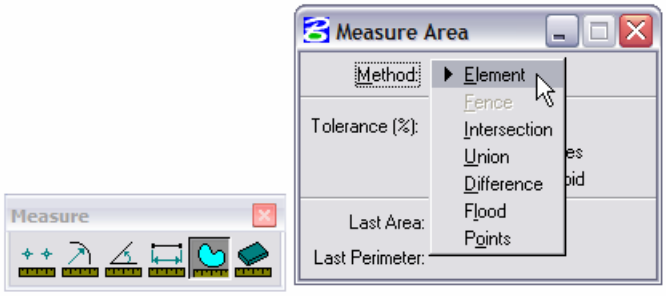
Measure Length

Measures the length of an element or the perimeter of a shape.

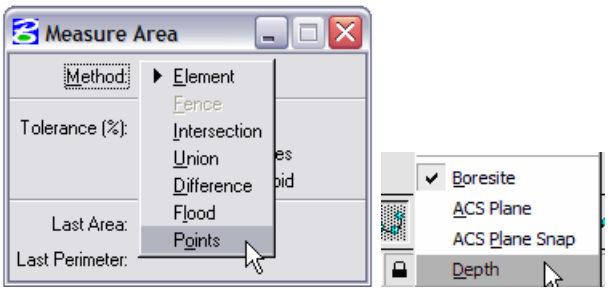


Measure Area

Measures area using the same method options as the **Pattern** tools. This includes the area of a shape (**Element** method) or an area you dynamically define using the **Points** method. In addition, you can **Flood** an area or measure the area of the **Intersection**, **Union** or **Difference** between elements (see **Pattern** commands for an explanation of these methods).

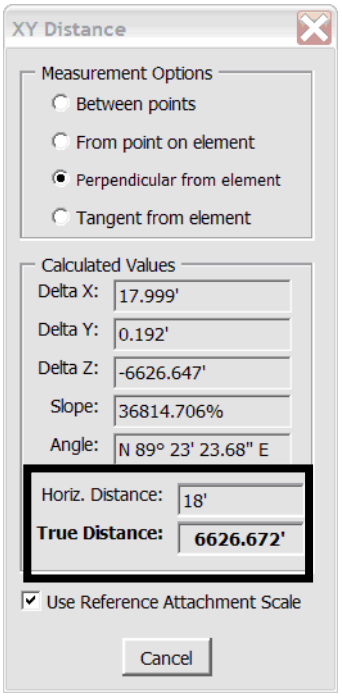


Note: If you're measuring the area of 3D graphics, the **Points** method is the only method that will provide a planar measurement with **Depth** lock turned on.



The CDOT Custom Measure XY Distance tool

From the **CDOT Menu**, select **Add On's > Measure XY Distance** to open this custom tool, which allows you to easily obtain ***both*** planar XY distances along with true 3D slope measurements ***without having to check or set active depth or the depth lock.*** You can use this tool the standard MicroStation Measurement tools for options shown below, including the **Perpendicular from element** option.



Lab 9A – Create a plan/profile sheet for the intersection

Several plan/profile sheets have already been created by Design using the InRoads **Plan/Profile Generator**. However, there are times when you need to create special plan or plan/profile sheets not created by the **Generator**. In this case, you'll create a plan/profile sheet for the side road that runs through the intersection.

Objectives

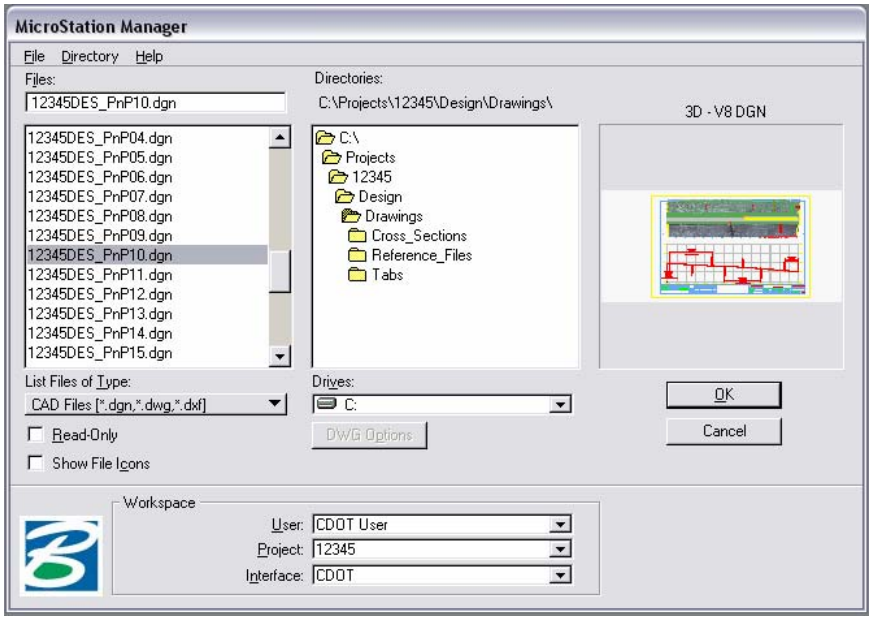
After completing this exercise you will know how to:

- Create a sheet file using a generic project file.
- Attach model files coincident-world
- Attach model files as saved views.
- Rotate the view to horizontal
- Use the CDOT Menu to place a border and associated information (bar scale, north arrow, region cell, etc.)
- Use the CDOT Menu to place a clipping boundary.
- Clip references
- Work with reference levels.
- Move references

Review Plan/Profile sheets

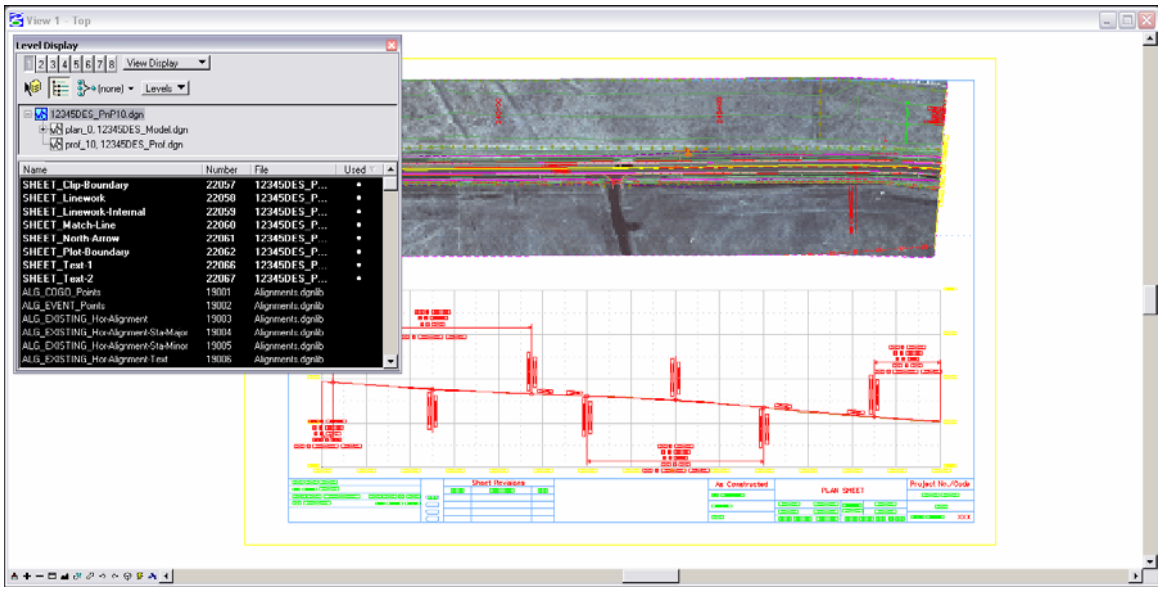
Review the Plan/Profile sheets for this project previously created by the InRoads **Plan/Profile Generator**.

1. Start MicroStation.
2. In the MicroStation Manager, open **12345DES_PnP10.dgn** from the project's …**Design\Drawings** folder.



The InRoads Plan/Profile Generator automates the creation of sheet files along the mainline alignment. This includes rotating the plan-view to horizontal, placing the corresponding profile, placing the border, north arrow and match lines. MicroStation references are used to bring in plan and profile graphics to the active sheet file.

3. Use **Level Display** to review the reference levels on which plan and profile graphics are placed in the sheet file.



Note that the only levels with graphics in the sheet file are sheet levels for the border, match line, north arrow, *etc*.

4. Open other plan/profile sheets, as desired, from the **Drawings** folder and review the sheets.

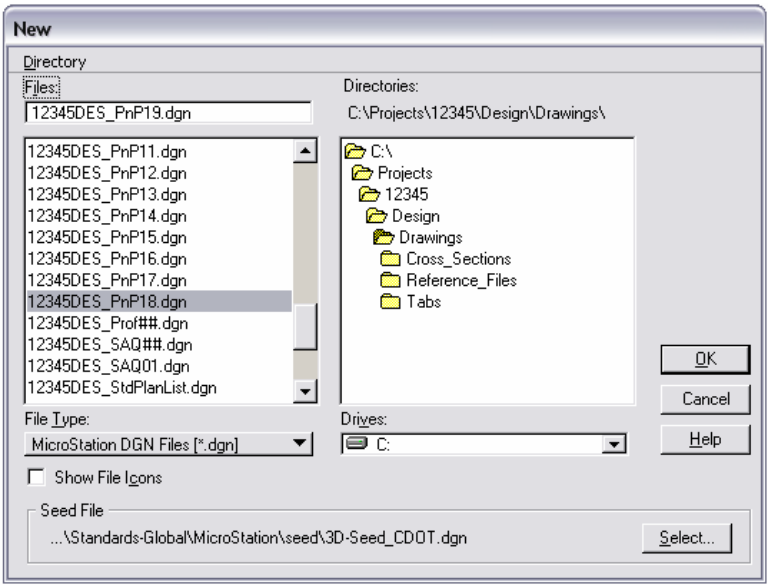
Create a new sheet file

Since the InRoads **Plan/Profile Generator** did not create a sheet for the county cross road at the intersection, you'll create this P&P sheet file manually.

1. Select **File > New**.
2. Set the directory to the project's **\Design\Drawings** folder.
3. In the New box, make sure that the seed file is set to **3D-Seed_CDOT.dgn**. If not, pick the Select button and then select this file.

4. Key in the name ***12345DES_PnP19.dgn***.

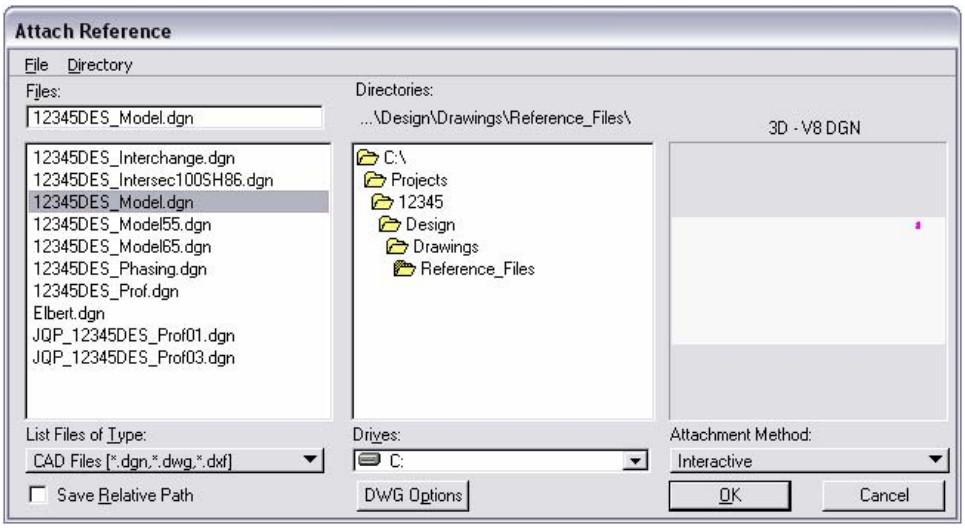
   Nineteen is the next number in the plan/profile set of sheets.



5. Select **OK** to create the file.

Attach the Model file

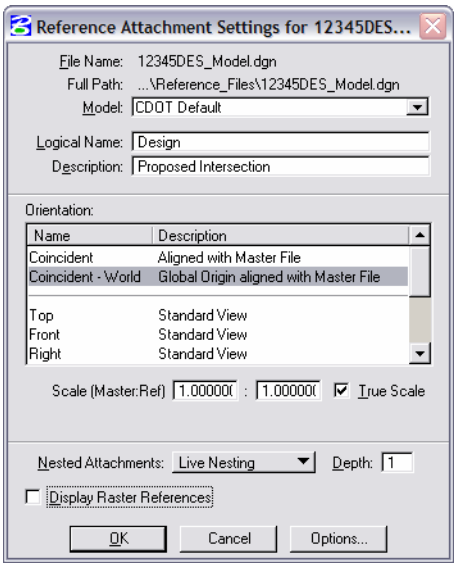
1. Select the **Reference** icon from the **Primary Tools** toolbar.
2. In the **References** dialog box, select **Tools > Attach**.
3. Use the Directory pull-down menu and select the **C:\Projects\12345\Design\Drawings\Reference_Files** folder and select the file **12345DES_Model.dgn**



4. Verify the **Attachment Method** is set to **Interactive**. Select **OK**.

5. In the **Reference Attachment Settings** box:

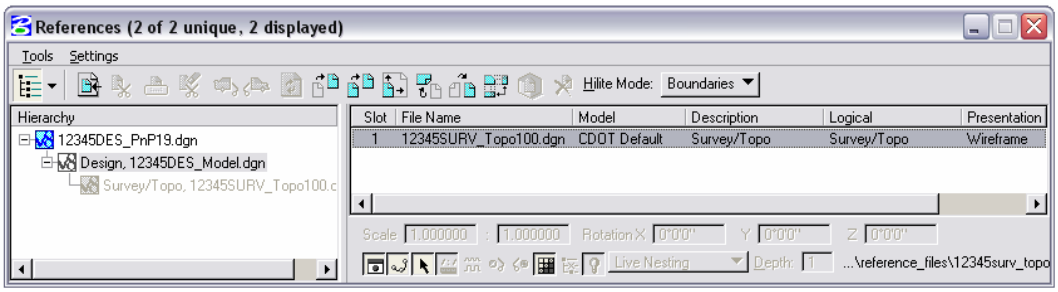
   - Key in a logical name of ***Design*** and ***Proposed Intersection*** for a **Description**.
   - Verify that **Orientation** is set to **Coincident-World** and the **Scale** is set at ***1:1***
   - Set **Nested Attachment** to **Live Nesting** and set **Depth** to ***1***.
   - Turn ***off*** **Display Raster References**.



6. Select **OK**.

   Note: The **Coincident World** option ensures that references are attached with their true coordinate information. A scale factor of **1:1** ensures that plan graphics are referenced in actual size. These two options allow plan sheet graphics to maintain their true model coordinates and size.

7. Turn on the **Show Hierarchy** and expand the hierarchy list.



Note that with nested references, the Survey/Topo reference is nested below the Design model file.

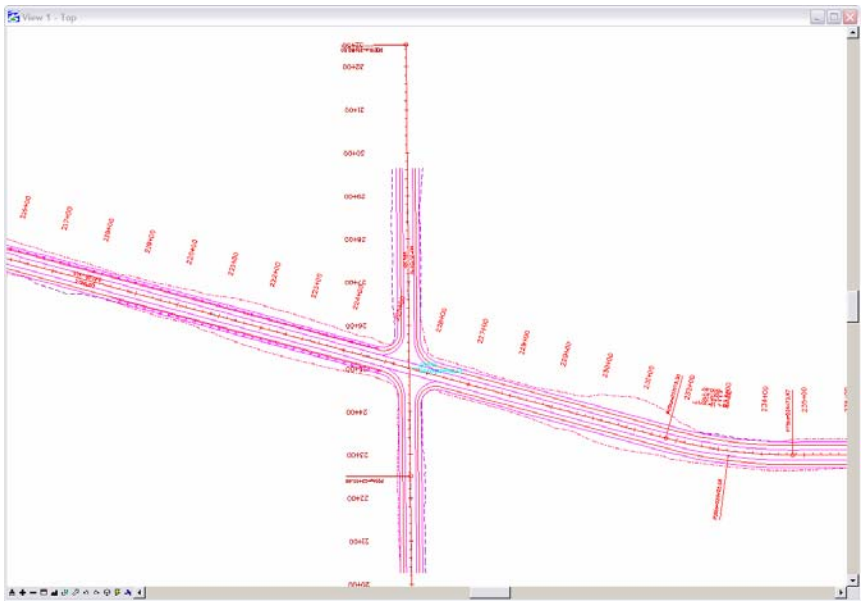
Note: You can typically reference model files as nested to sheet files instead of using the **Copy Attachment** command (as in this case, you want to show both Design and Survey/Topo graphics in the sheet file). However, if you need to control individual references in the sheet file, then use the **Copy Attachment** command.

8. **Close** the **References** dialog.
9. **Fit View** using the icon so all graphics are displayed.
10. Select **File > Save Settings** from the menu.

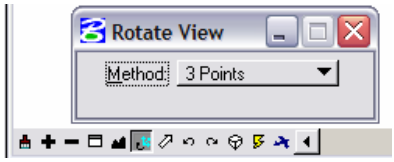
Rotate the View using the 3-point method

Rotate the view so that the side road appears horizontal in the view.

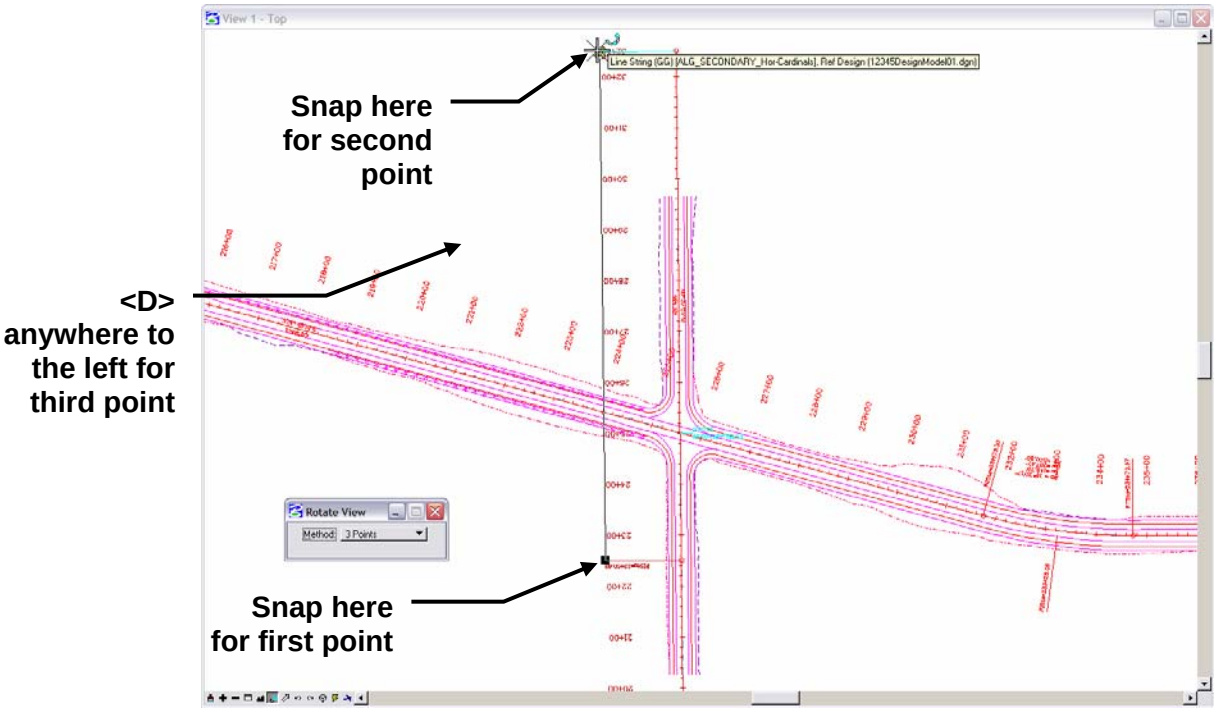
1. Window around the intersection as shown.



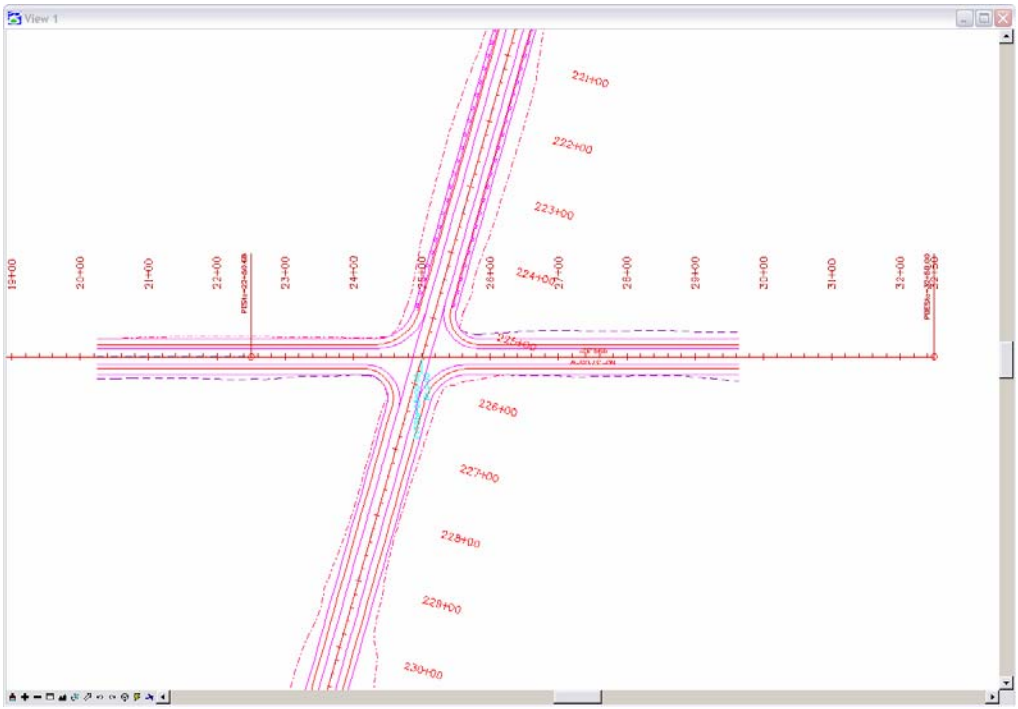
2. Select the **Rotate View** command and set the **Method** to **3 Points**.



3. Follow your prompts and AccuSnap on the end of the PI leader line shown.
4. For the second point (X axis of the view), AccuSnap POE leader line.
5. For the third point (Y direction), **<D>** anywhere to the left of the first two points.



The view is rotated so that the side road appears horizontal.

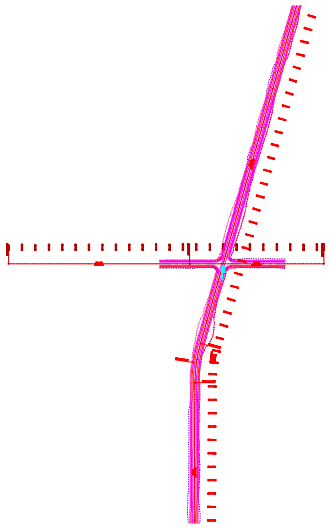


Note: Remember that you are rotating the view, not the graphics. The graphics maintain their original coordinate position in the sheet file.

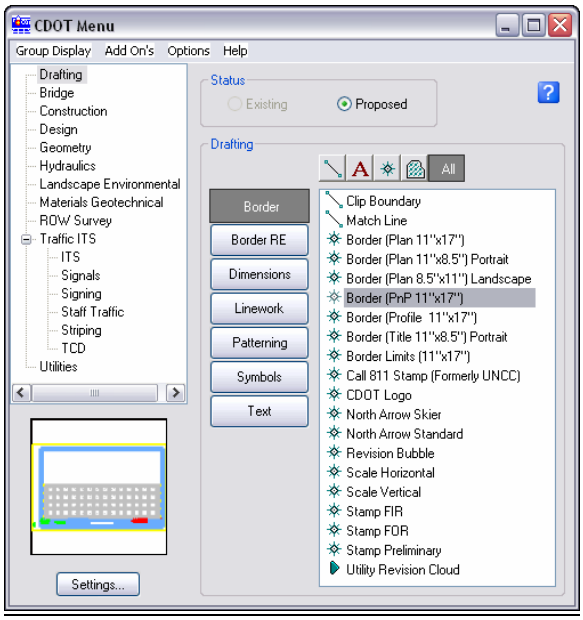
Note: The leader lines are both placed at elevation 0. If you pick points at different elevations, you'll need to first turn on Depth lock before choosing the 3-Point rotation command to avoid a skewed rotation.

Place the Border Cell

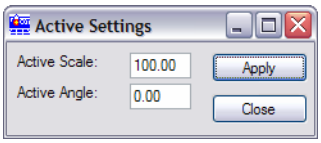
1. **Zoom out** as shown.



2. From the **CDOT Menu** Explorer, select **Drafting** and then select the **Border** category and choose the **Border (PnP 11"x17") Item.**



3. Select **Settings** and set **Active Scale** to ***100*** and **Active Angle** to ***0***.

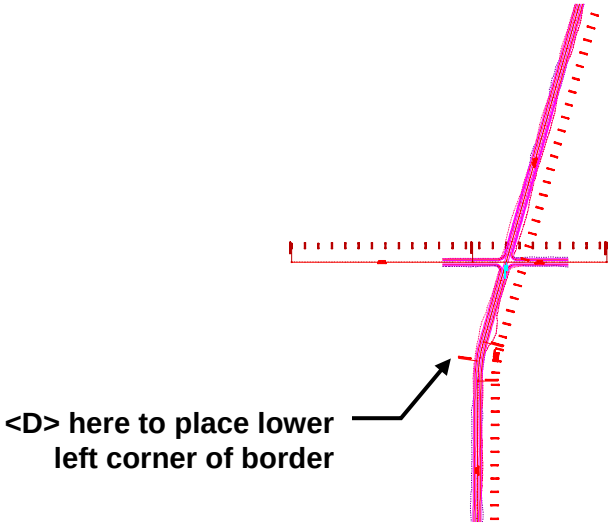


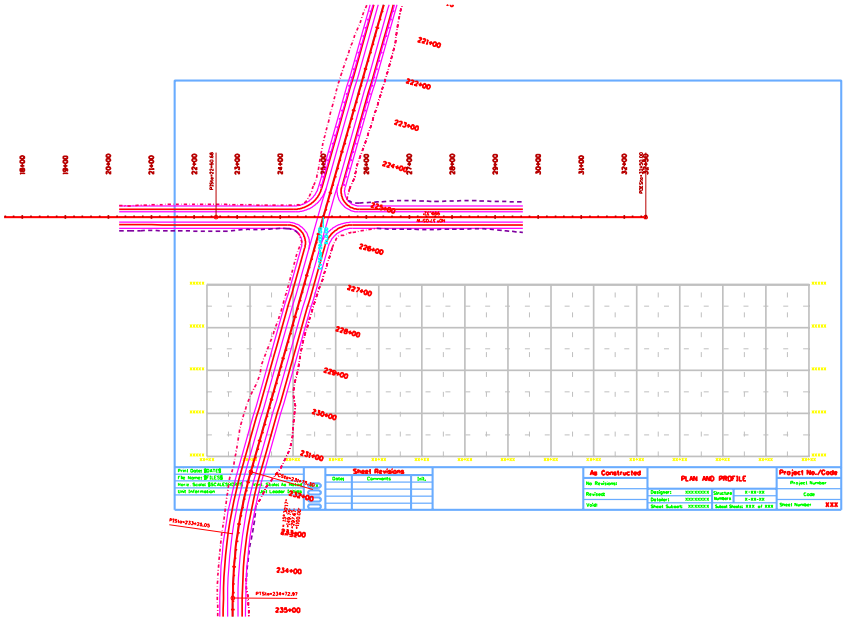
Notes: Coordinate with the Region Surveyor when you are creating sheets that are not at a 1:100 scale. They will provide you with the topography and survey MicroStation files at a different scale. Otherwise, the line work and cells will not be the correct size for the print scale.

The **Active Angle** is view independent and not associated with view rotation. Therefore, the x-axis is always horizontal regardless of the view rotation. You will not need to set this for correct placement of the North Arrow or other cells.

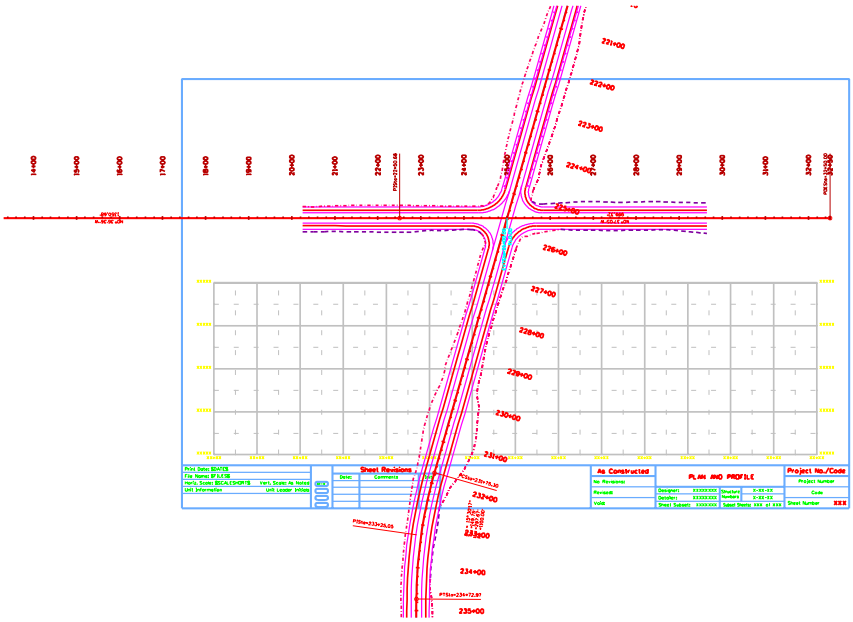
4. Select **Apply** and **Close** in the **Active Settings** box.

5. When prompted to locate the cell origin of the sheet border, **<D>** in the approximate location shown to place it. Don't worry about an exact location – you'll move it in the next step.





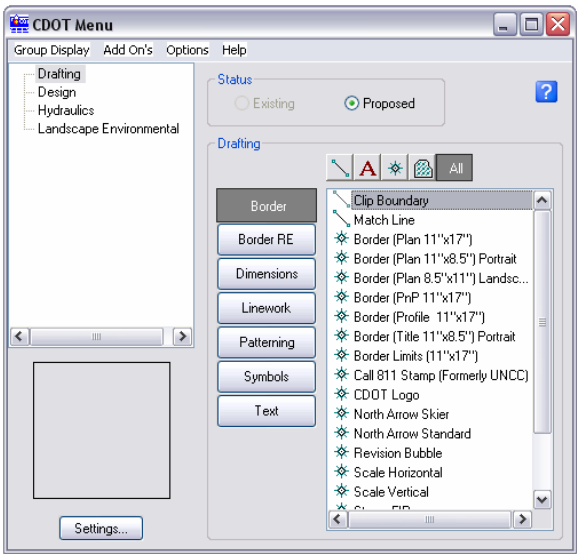
6. If necessary, use the **Move** command and move the border cell so that the intersection is centered in the upper plan portion as shown.



Placing a Clip Boundary

1. From the CDOT Menu Explorer select **Drafting.**

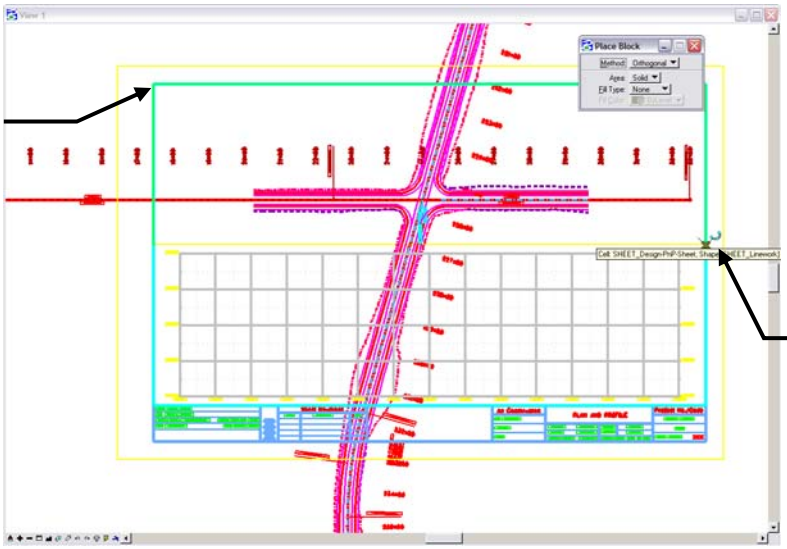
   - Set the **Category** to **Border**
   - Select the **Item Clip Boundary**
   - Verify the **SHEET_Clip-Boundary** level is active.



Note: Since **Plot** is turned off for the level **SHEET_Clip-Boundary** in the **Level Manager**, it will not print.

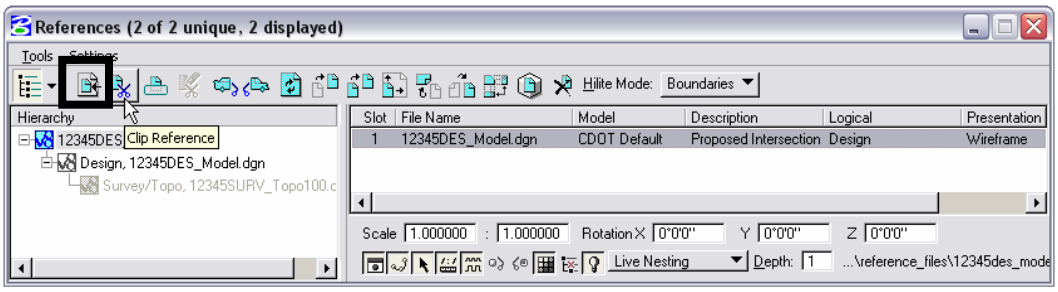
The **Place SmartLine** command is now automatically selected, allowing you to draw an irregular closed shape that represents your clipping boundary of the model file. However, if your clipping boundary is a rectangle, you can use the **Place Block** command.

2. Select the **Place Block** icon from the **Main** toolbar and draw the clipping boundary as shown (corner to opposite corner on the blue inside margin).



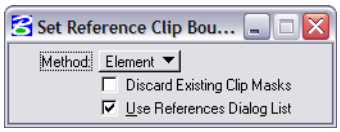
Clip the Reference File

1. In the **References** dialog box, highlight the **Design** reference.
2. Select the **Clip Reference** icon.

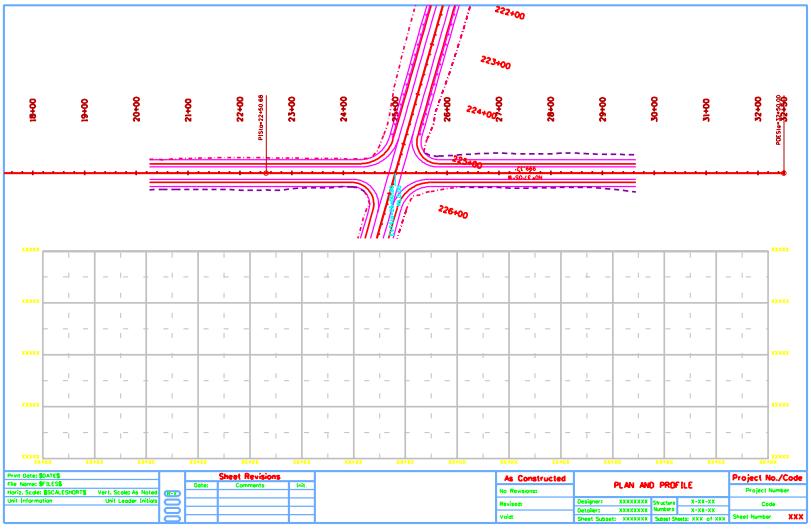


Note: You can select more than one reference file at a time by holding the **<Shift>** or **<Control>** keys down while you are making your selection. You can clip multiple drawings in one step when they are all selected.

3. In the **Tool Settings** box, verify **Method** is set to **Element**.



4. When prompted to **Identify Clipping Element**, **<D>** on the rectangular clipping boundary you just placed.
5. **<D>** to accept.
6. **Fit** the MicroStation view and **Save Settings** after clipping the reference files.



Note: Once the clipping boundary is placed, do not delete it. The clipping region of the reference file will be lost if the boundary is deleted.

In the next Chapter, you'll edit the border text to add project specific information.

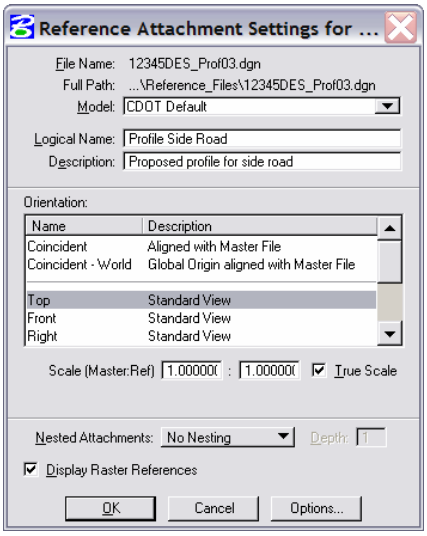
Turn off the profile grid and text

1. Open the **Level Display** box and turn **off** the following levels:
   - **SHEET_Grid**
   - **SHEET_Grid-Minor**
   - **SHEET_Grid-Text**

   This turns off the border's grid for the profile. You'll use the grid provided by the InRoads profile.

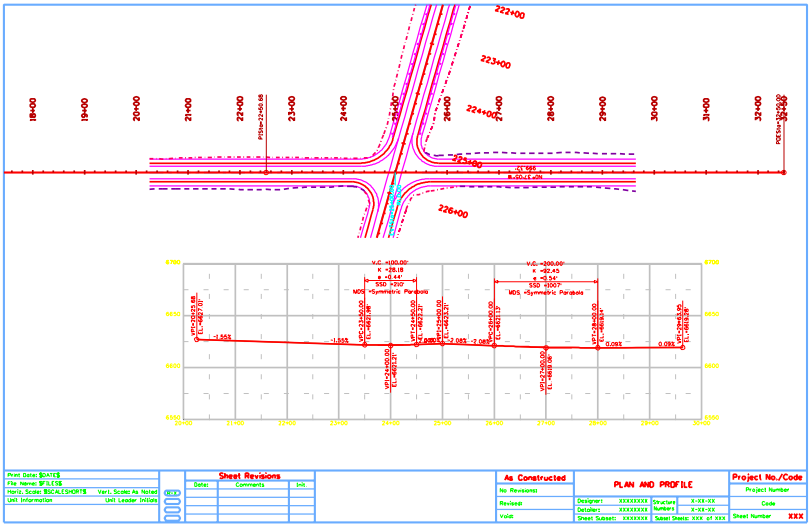
Attach the Design Profile

1. In the **References** dialog box, select **Tools > Attach**.
2. Use the **Directory** pull-down to navigate to the **C:\Projects\12345\Design\Drawings\Reference_Files** folder and select the file **12345DES_Prof03.dgn**
3. Verify the **Attachment Method** is set to ***Interactive***. Select **OK**.
4. In the **Reference Attachment Settings** box:
   - Set **Orientation** to **Top**
   - Key in a **Logical Name** of ***Profile Side Road*** and ***Proposed profile for side road*** as the **Description**.
   - Set **Scale** to ***1:1***
   - Set **Nested Attachment** to **No Nesting**.



5. Select **OK**.

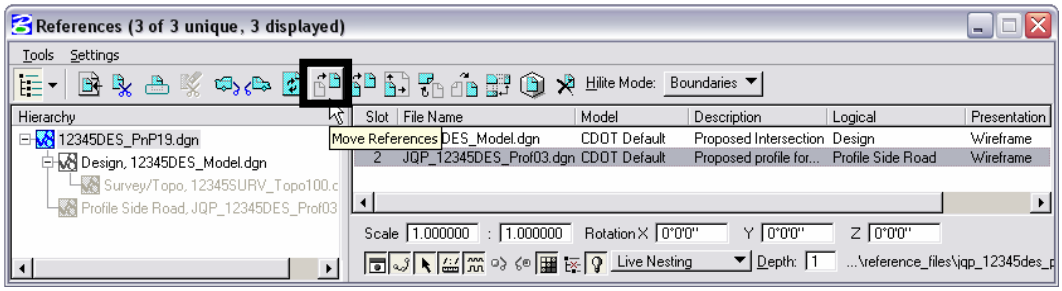
6. The outline of the profile reference is attached to your cursor. **<D>** in the approximate location shown to place the profile.



Move the profile reference

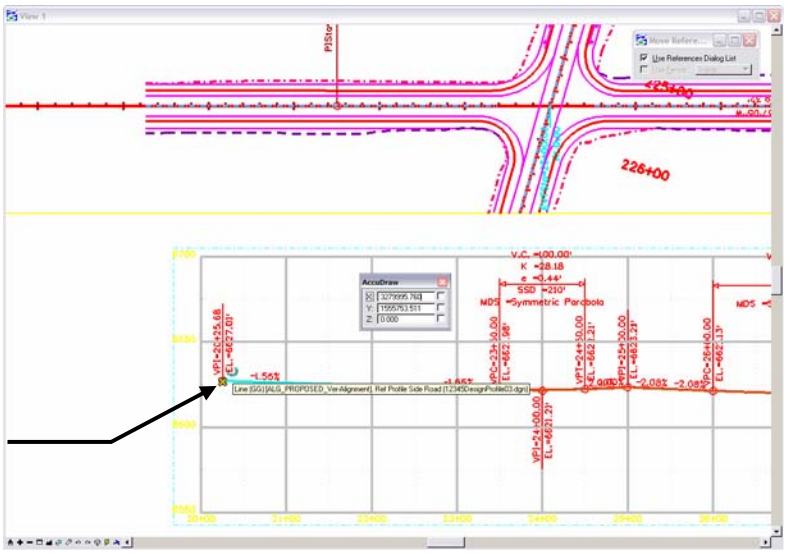
Since you attached the profile reference by a top view, it did not come in at a precise location. Next, you'll move the profile to line it up better with the plan.

1. Turn on **AccuDraw** if it's not already on.
2. Highlight the **Profile** in the **Reference** dialog and select the **Move Reference** icon or select **Tools > Move**.

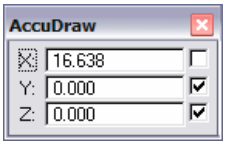


- Click into the AccuDraw window to set it active.

- Snap to the left end of the vertical alignment (the first VPI) as the Move From point.

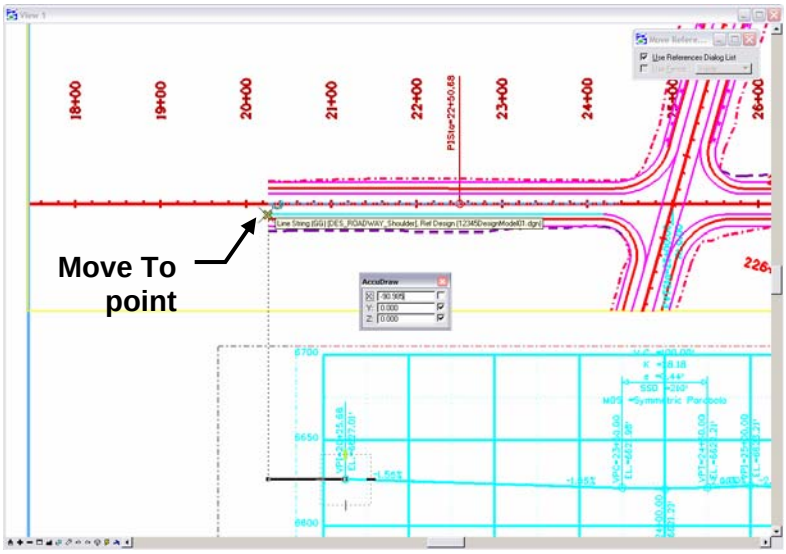


- Move your cursor to the left along AccuDraw's **X** axis to set the focus (blinking cursor) in the AccuDraw **X** field, then Press **Enter**.



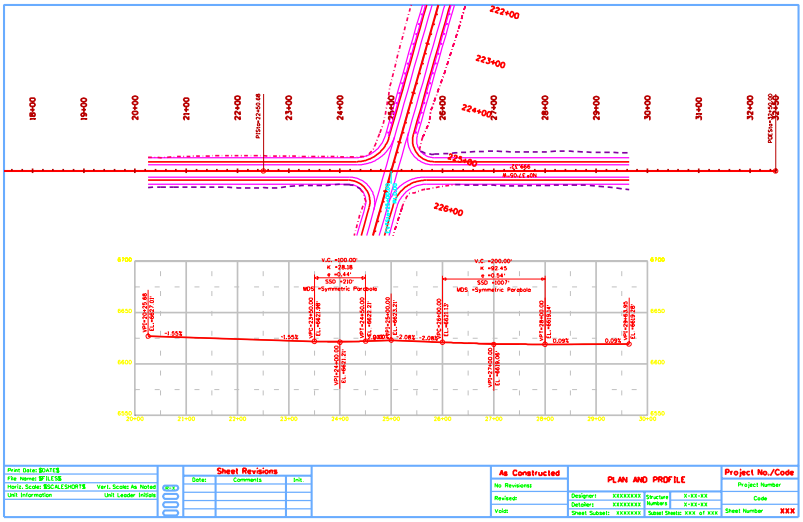
Note: The **Enter** key executes AccuDraw's **SmartLock**. It locks the Y and Z axes to 0 so you can only move in the X direction.

- Move your cursor and **AccuSnap** on the end of the shoulder line as shown. You can zoom in, if needed.



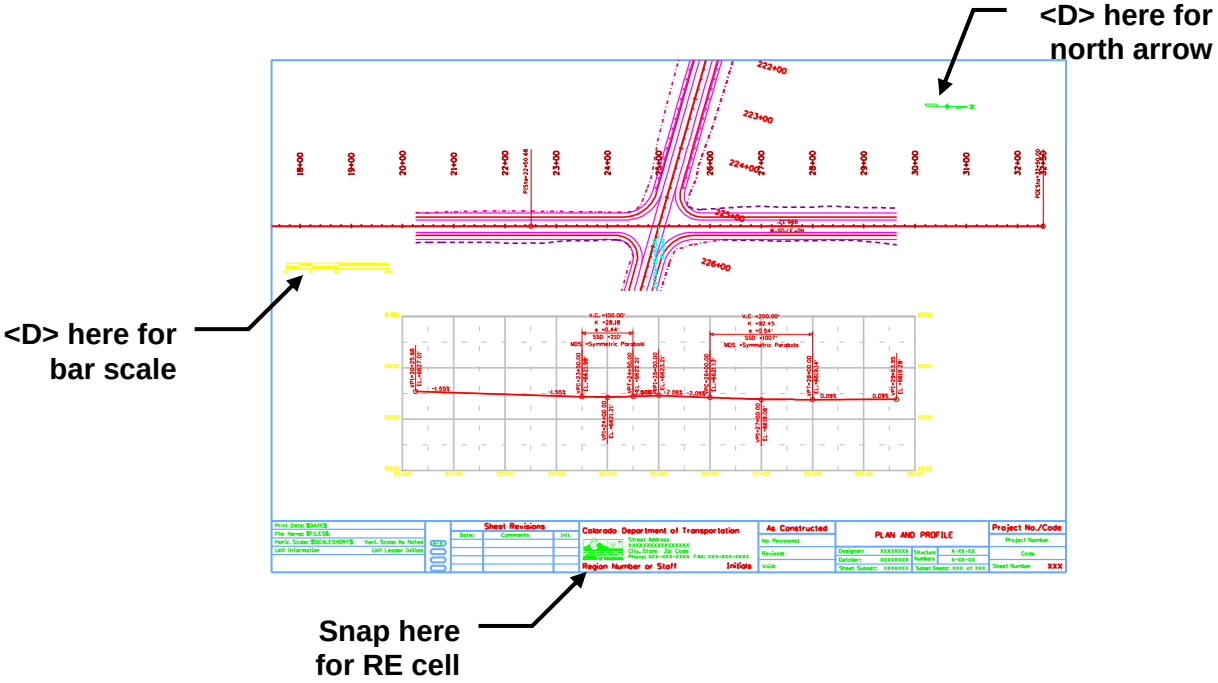
The beginning of the vertical alignment is now aligned with the beginning of the horizontal alignment.

3. **<R>** when done.
4. **Fit** the MicroStation view.



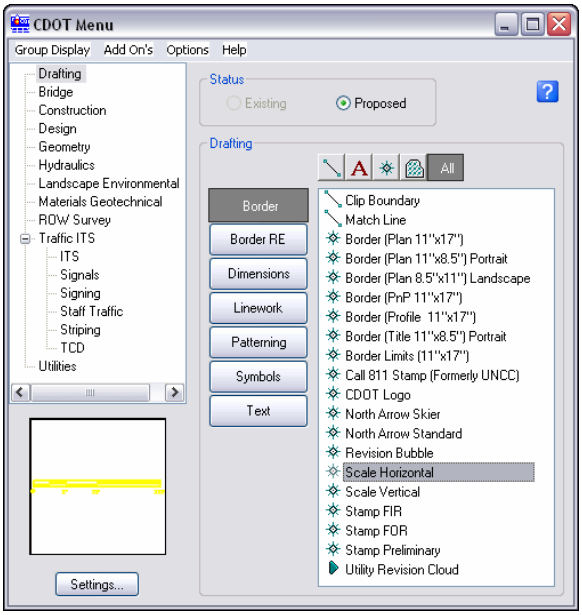
Place the bar scale, north arrow and RE cells

Follow the steps on the next page and use the diagram below to place the various border cells.



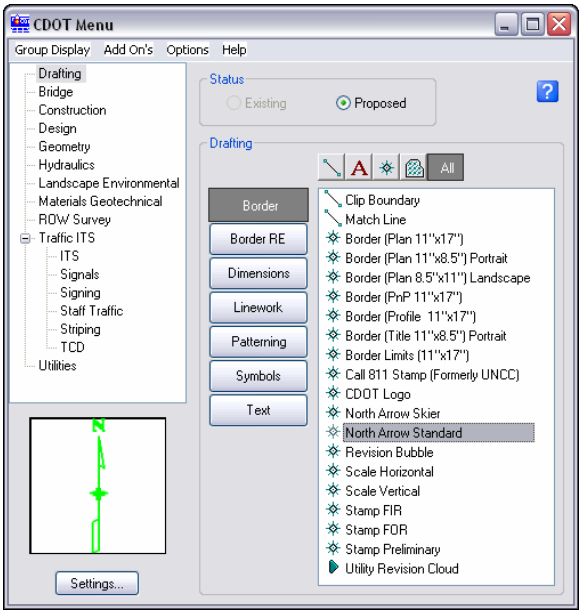
1. From the **CDOT Menu** Explorer, select **Drafting**. Set the **Category** to **Border**.

2. Select the Item **Scale Horizontal**.



3. When prompted to locate the cell origin of the **Bar Scale**. **<D>** inside the sheet border as shown in the diagram on the previous page.

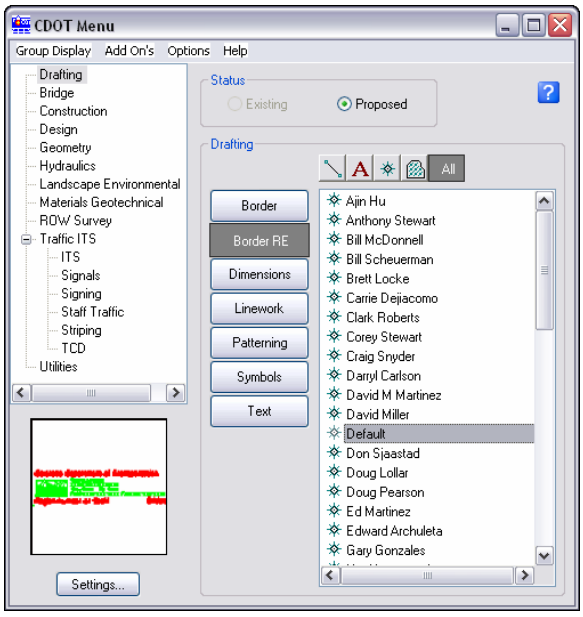
4. Select the Item **North Arrow Standard**



5. When prompted to locate the cell origin of the **North Arrow**, **<D>** inside the sheet border as shown on the previous page.

6. Set the Category to **Border RE**.

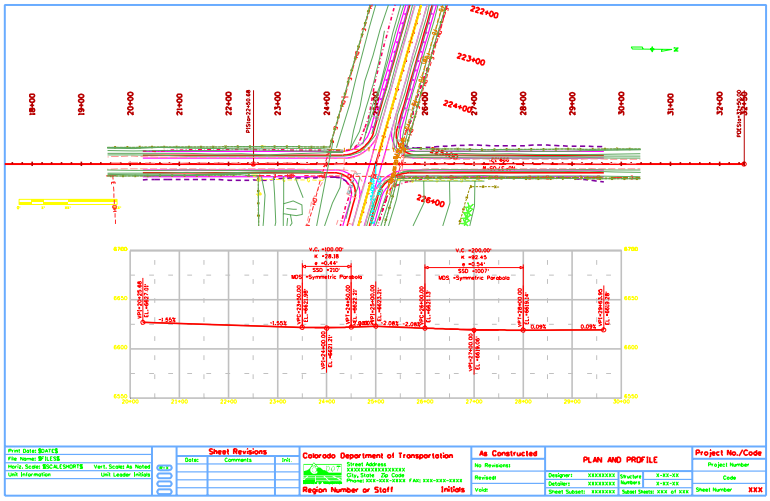
7. Select the Item **Default**.



8. When prompted to locate the cell origin of the **Region Engineer** cell, **Zoom in** as necessary on the bottom portion of the border and **<T>** to the location shown in the previous diagram and then **<D>** to accept.

Turn on the reference display

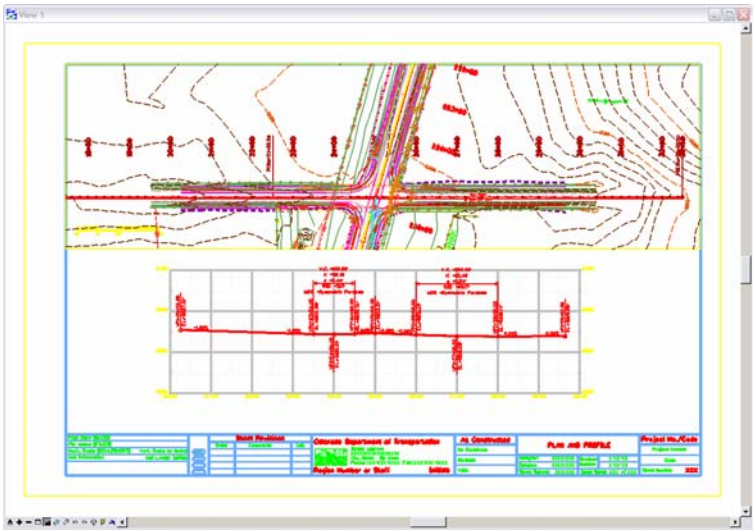
1. On the **References** dialog, select the **Survey/Topo** reference nested under the **Design** Reference.
2. Toggle on **Display** for the **Survey/Topo** reference.
3. Use **Level Display** to turn on all **Survey/Topo** levels.
4. **Fit** the view.



5. **Save Settings**.

Optional exercise

Change the Design reference's nested depth to ***2*** and turn on the display of the contour reference – **12345SURV_Contour100.dgn.** Use **Level Display** to turn on the contour levels to display the existing contours in the plan sheet.



Lab 9B – Create a project specific border

In the last section, you placed a generic border for your plan/profile sheet from the CDOT menu. This is handy when you have only one or two sheets to create since you have to edit the border with project specific information for each sheet. But what if you had several sheets to create? You wouldn't want to edit every sheet to add the project information. Instead, you can create a project-specific border that can be used for all sheets of the same type. This way, you only have to fill in the project information one time.

Objectives

After completing this exercise you will know how to:

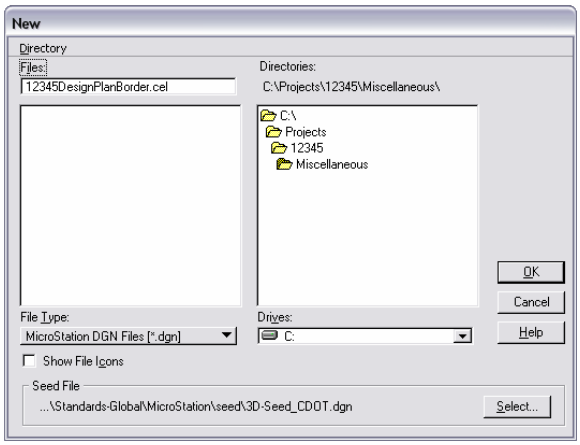
- Create a project-specific border cell library.
- Use the CDOT Menu to place the border and associated information.
- Edit the border text to place project-specific information.
- Make the border graphics a cell.

Create the border file

Since you will use this border for multiple sheets, create one project border to avoid editing multiple borders later.

1. In **MicroStation Manager**, select **File > New**.
2. Set the directory to **C:\Projects\12345\Miscellaneous**.
3. Verify the **Seed File** is set to **3D-Seed_CDOT.dgn**, if not then select it as the seed file.
4. In the **Name** field, key in a drawing file name ***12345DesignPlanBorder.cel***.

   Note: The **.cel** extension denotes this file as a cell library.
5. In the **New** dialog box, select **OK**.

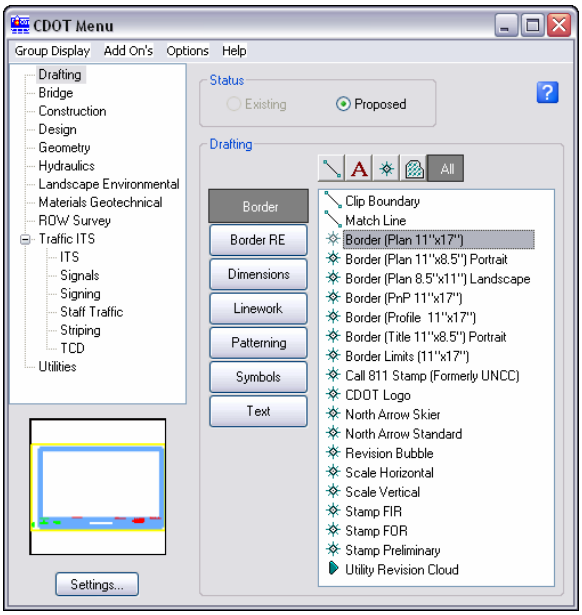


6. The file you created will be highlighted. Select **OK** to open that file.

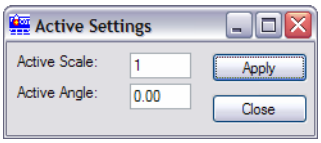
Use the CDOT Menu to create the border

1. From the **CDOT Menu** Explorer, select **Drafting** and set the **Category** to **Border**.

2. Select the Item **Border (Plan 11”x17”)**



3. Select **Settings** and set **Active Scale** to ***1*** and **Active Angle** to ***0***.



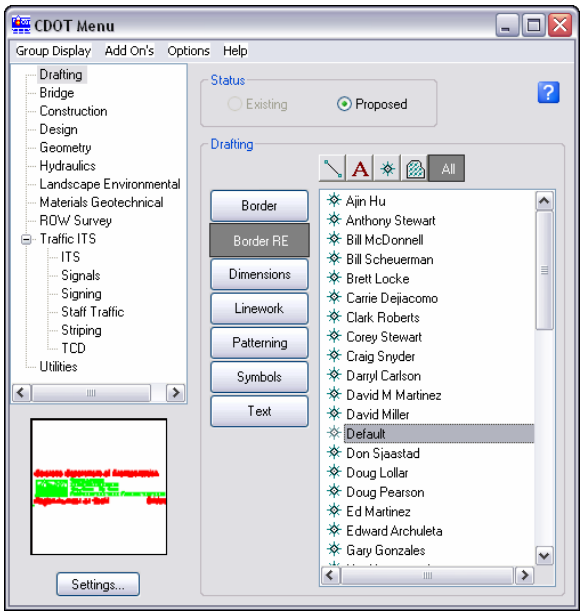
Note: You will create the generic project border cell at a scale of 1 (11 x 17 master units). You’ll actually scale the border, according to your plot scale, later when the cell is placed in the sheet file.

4. Select **Apply** and **Close** in the **Active Settings** box.

5. **<D>** to place the border anywhere in the blank file.

6. Set the Category to **Border RE**.

7. Select the Item **Default**.



8. When prompted to locate the **Region Engineer** cell, **<T>** to the location shown and then **<D>** to accept.

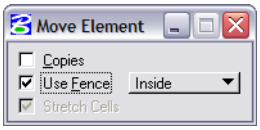
9. **Fit** the view.

Note: You will not place the bar scale and north arrow cell now, but later in each individual sheet.

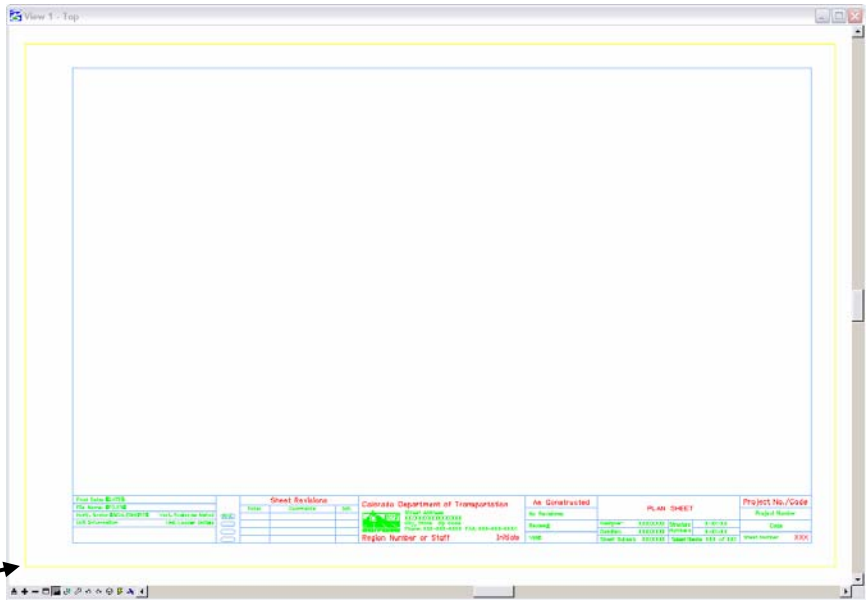
Move the border

The lower left corner of the border ***must*** be located at the 0,0 coordinate in the file since this will be the origin of the cell. So, move it to this location.

1. Place a **Fence** block around the entire border.
2. Select the **Move** command and toggle on **Use Fence**. Set the mode to **Inside**.



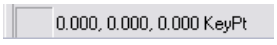
3. Snap to the lower-left corner of the yellow block (outside edge) as the move from point.



4. Key in ***xy=0,0*** as the move to point.

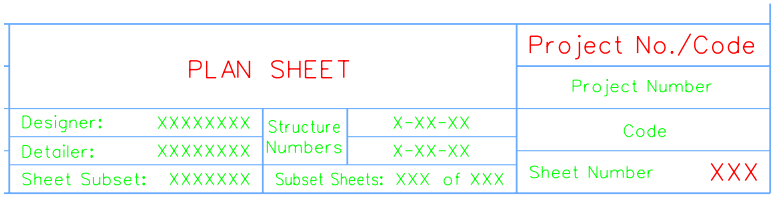
   The border moves to the new location.

5. Reset **<R>**.
6. **Fit** the view.
7. **<T>** on the lower-left edge to verify it's at 0,0.



Edit the border text with project specific information

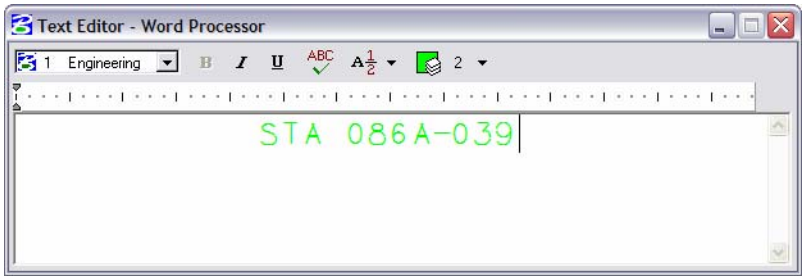
1. **Zoom in** on the lower-right corner of the border as shown.



2. Select the **Edit Text** command from the **Text** toolbar.

3. **<D>** on the **Project Number** text.

4. In the **Text Editor**, replace this with ***STA 086A-039***.



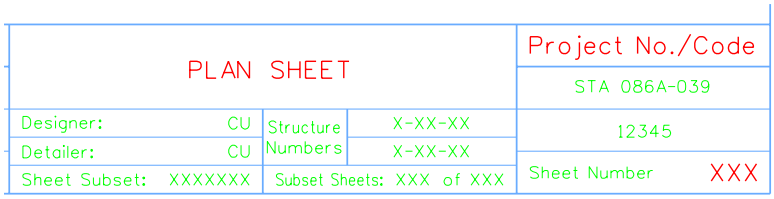
5. **<D>** anywhere to accept.

6. **<D>** on the **Code** text.

7. In the **Text Editor**, replace this with ***12345*** and **<D>** to accept.

8. Edit the **X**'s beside Designer and replace with your initials (CU is used in the illustration, but you can use yours).

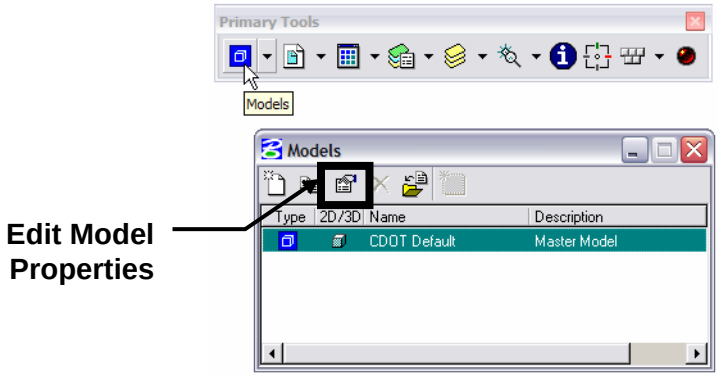
9. Edit the **X**'s beside Detailer and replace with your initials.



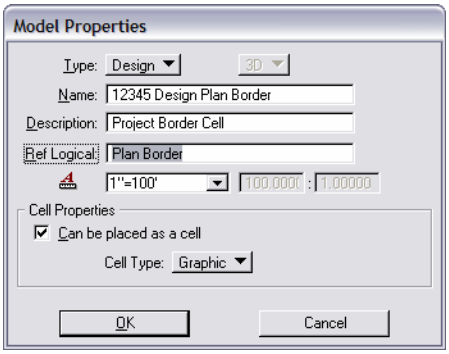
10. **Fit** the view.

Make the border a cell

1. Select **Models** from the **Primary** toolbar.



2. In the **Models** dialog box, select **Edit Model Properties**.
3. In the **Model Properties** box:
    - Toggle on **Can be placed as cell.**
    - Change the **Name** to ***12345 Design Plan Border.***
    - Change the **Description** to ***Project Border Cell.***
    - For **Ref. Logical** key in ***Plan Border.***
    - Leave all other options as shown



4. Select **OK**.
5. **Close** the **Models** box.
6. **Save Settings** (**File > Save Settings**).
7. **Exit** MicroStation.

Lab 9C (Optional) – Create a 40-scale plan sheet

The CDOT default scale for plan sheets is 100. This lab illustrates how to create a special 40-scale plan sheet for the intersection.

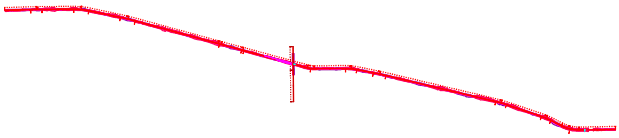
Objectives

After completing this exercise you will know how to:

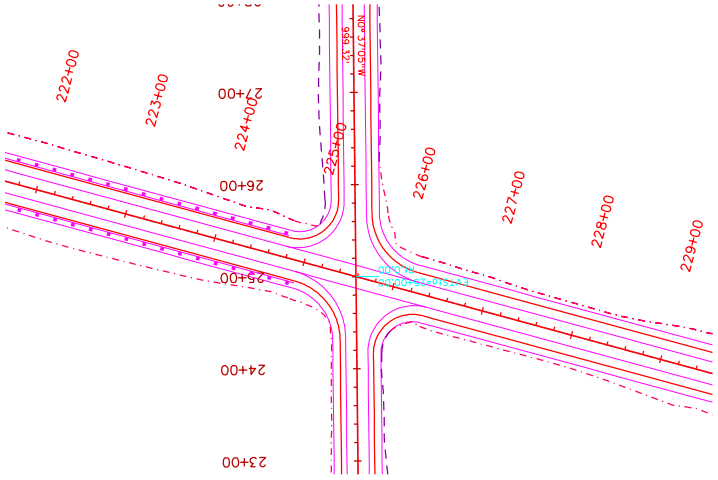
- Create a Plan sheet
- Scale the border for a 40-scale drawing
- Set the **Annotation Scale** to match the border and plot scale.

Open the model file

1. Start MicroStation and open **12345DES_Model.dgn** form the project's **\Design\Drawings\Reference_Files** folder.
2. Select **File > Raster Manager** and turn off the display of the raster files.
3. **Fit** the view.

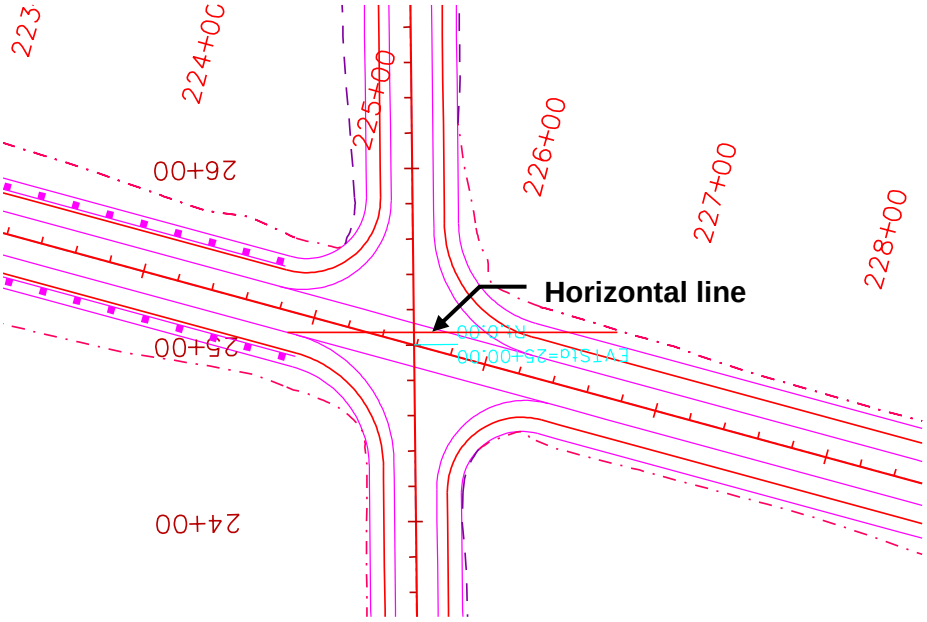


4. Window around the intersection as shown.



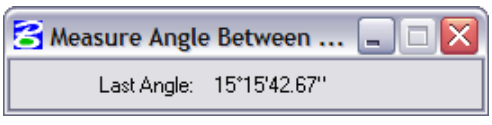
Determine the rotation angle for the sheet

1. On the **CDOT Drafting Menu**, set **Line Weight** to **3**.
2. Using **AccuDraw**, draw temporary horizontal line in the approximate location shown.



3. Select the **Measure Angle** command from the **Measure** toolbar.

4. **<D>** on the horizontal line, then **<D>** on the SH86 proposed centerline.

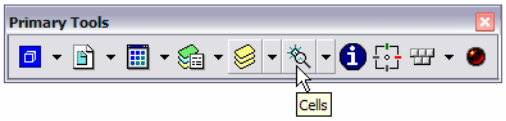


MicroStation displays the result as approximately 15 degrees. This is the rotation angle needed to rotate the view to horizontal at the intersection in a counter-clockwise direction.

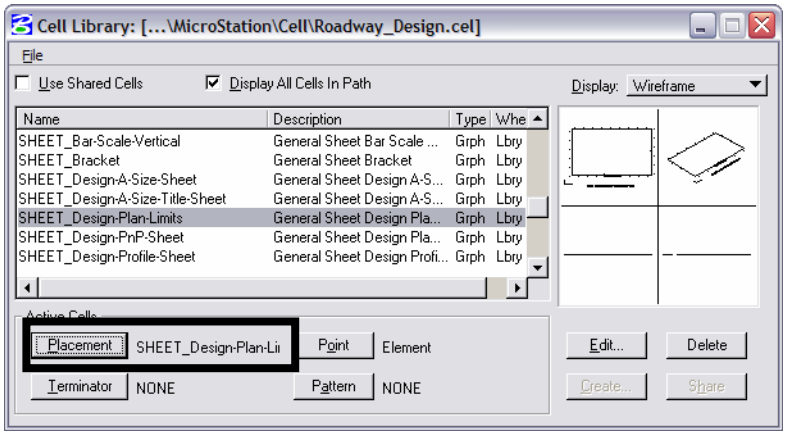
5. **Delete** the temporary measurement line.

Place the plan limits cell

1. Select **Cells** form the **Primary** toolbar to open the cell library.



2. Toggle on **Display All Cells in Path** and select the **SHEET_Design-Plan-Limits** cell and make it the active placement cell.

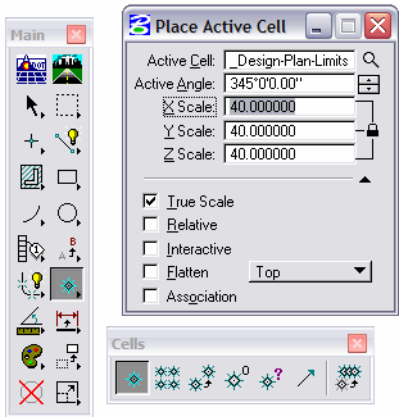


Note: This cell helps to define the plan sheet limits in the model file before placing the border in the sheet file. It contains text characters that can be edited to indicate sheet name, rotation, & scale. The outer line-work depicts the maximum display limits for graphics as it relates to the border sheet. The inside shape reflects ½ inch inside this maximum limit and is the clipping boundary. All graphical information for this cell is on to the MicroStation level, **DRAFT_INFO_No-Plot**.

3. **Close** the **Cell Library** dialog box.

4. Turn on the level **DRAFT_INFO_No-Plot** if it is not currently on.

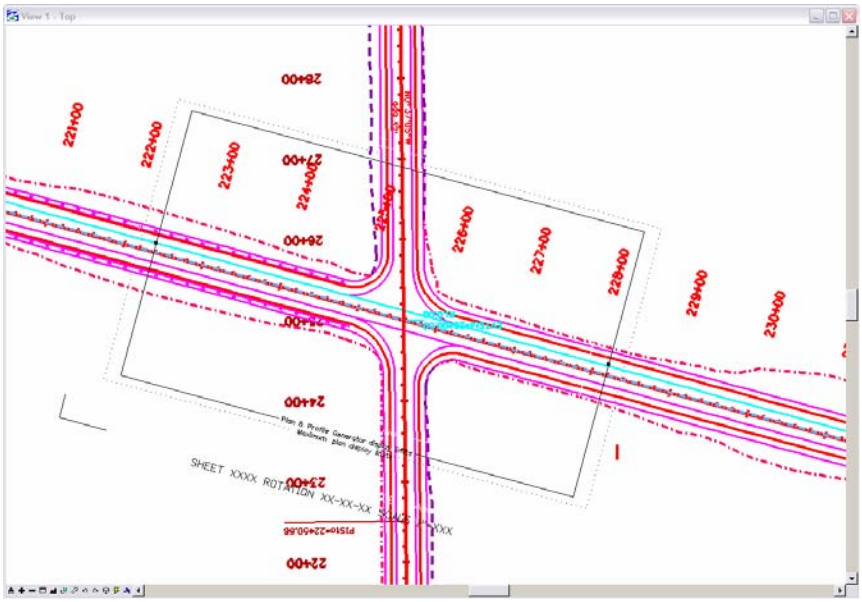
5. Select the **Place Active Cell** command and set the **Active Angle** to ***-15*** and the **Scale** to ***40***.



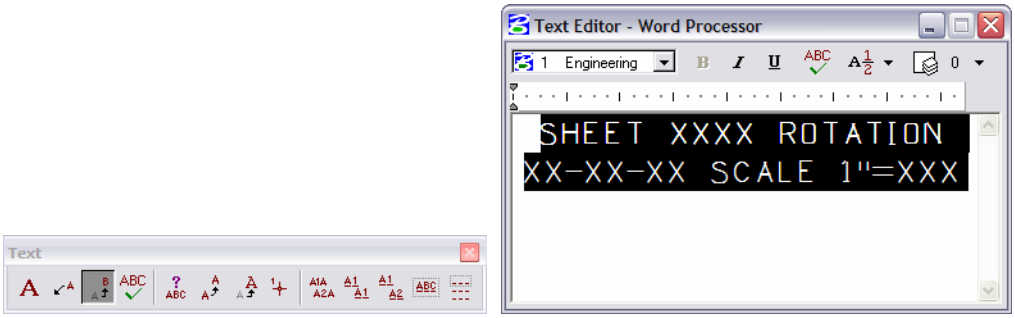
Notes: The scale should be set to the plot scale of the sheet.

Since the positive angles are measured counterclockwise in MicroStation, enter the 15 degree angle as ***negative***. MicroStation converts this to a positive 345 degree angle.

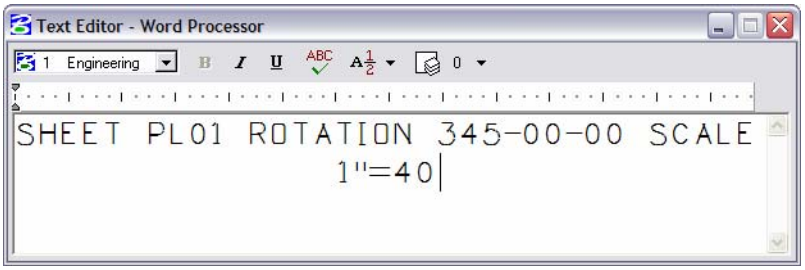
6. Place plan limit cell in the approximate location shown.



7. Select the **Edit Text** command and **<D>** on the text at the bottom of the cell.



8. In the **Text Editor**, make the edits as shown.



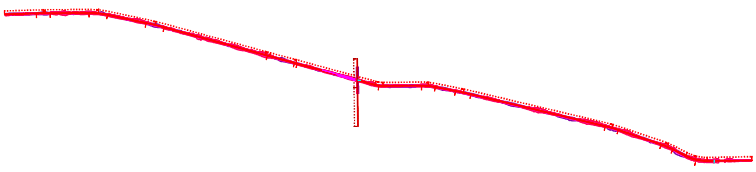
9. **<D>** anywhere in the view to accept.

Create the drawing file

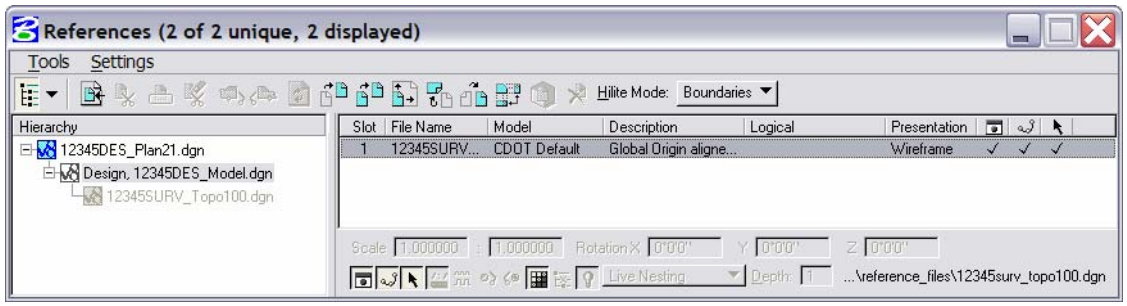
1. From the **MicroStation Manager**, select **File > New.**
2. Set the directory to **C:\Projects\12345\Design\Drawings**.
3. Verify the **Seed File** is set to **3D-Seed_CDOT.dgn**, if not then select it as the seed file.
4. In the **Name** field, key in a drawing file name **12345DES_Plan21.dgn**
5. In the **New** dialog box, select **OK**.
6. The file you created will be highlighted. Select **OK** to open that file.

Attach the Model file

1. Attach the **12345DES_Model.dgn** reference form the **C:\Projects\12345\Design\Drawings\Reference_Files** folder (Use the Directory pull-down to quickly find the folder).
2. Verify the **Attachment Method** is set to **Interactive**. Select **OK**.
3. In the **Reference Attachment Settings** box:
    - Key in a **logical name** of ***Design*** and ***Proposed Intersection*** for a **Description**.
    - Verify that **Orientation** is set to **Coincident-World** and the Scale is set at ***1:1***
    - Set **Nested Attachment** to **Live Nesting** and set **Depth** to ***1***.
    - Turn ***off*** **Display Raster References**.
4. Select **OK**.
5. Fit the view.



6. Turn on the **Show Hierarchy** and expand the hierarchy list.

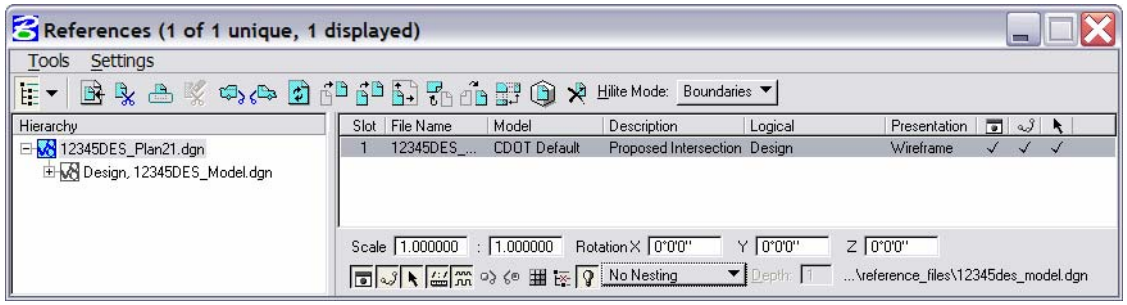


Note that with nested references, the **Survey/Topo** reference is nested below the Design model file.

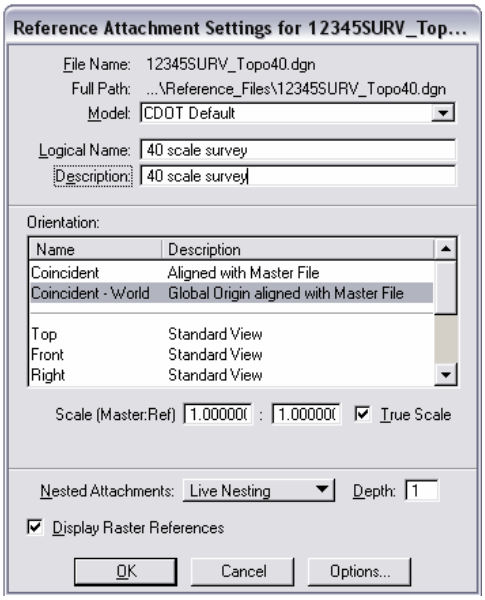
The **Survey/Topo file** that is attached nested to the Model file is for a 100 scale plot. However, you're creating an intersection sheet at a 40 scale. Therefore, you need to attach the correct scale Survey/Topo reference.

Note: Coordinate with the Region Surveyor when you are creating sheets that are not at a 1:100 scale. They will provide you with the topography and survey MicroStation files at a different scale. Otherwise, the line work and cells will not be the correct size for the print scale.

7. Select the Design model reference and change the nesting to **No Nesting** to remove the 100 scale **Survey/Topo** reference.



8. Attach the **12345SURV_Topo40.dgn** file from the project's **\ROW_Survey_Drawings\Reference_Files** folder with the options shown.

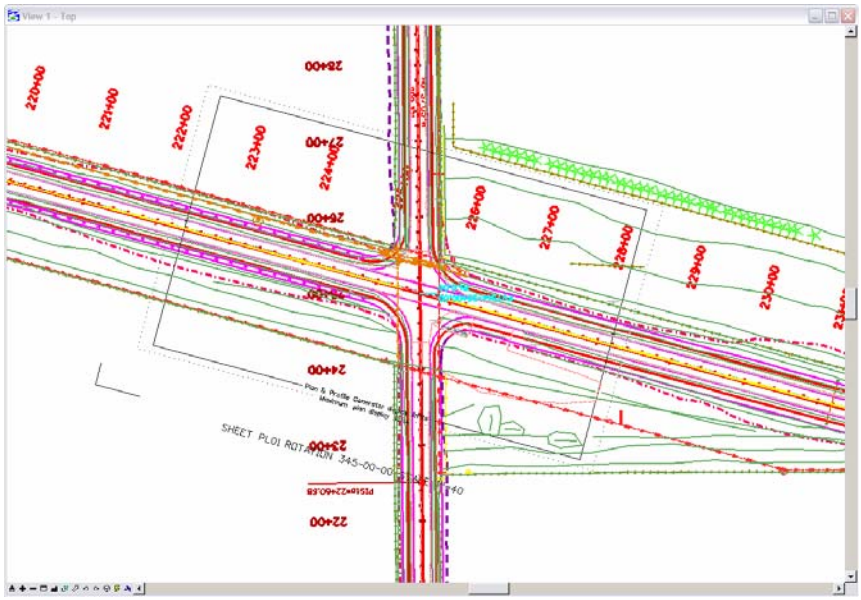


9. **Fit** the view.

Rotate the View

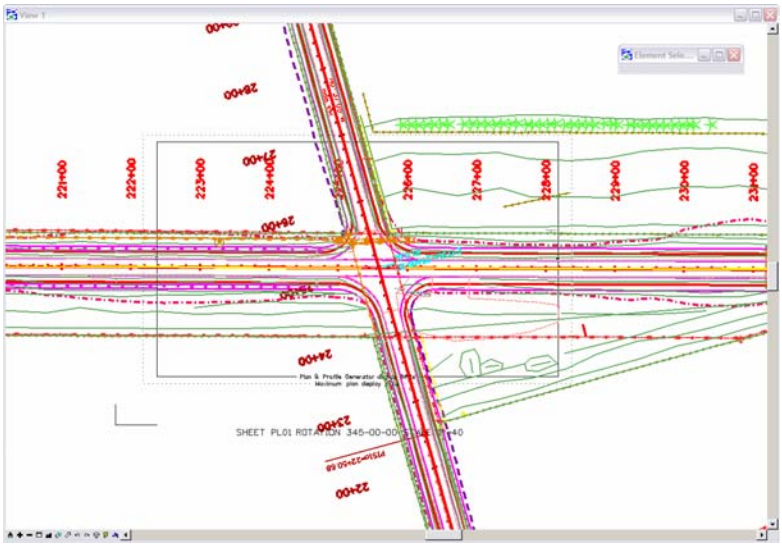
Rotate the view so that the portion of the mainline alignment through the intersection appears horizontal in the view.

1. **Window** around the intersection as shown.



2. Use the **Rotate View**, **3-Point** method to rotate the view so that the plan limits cell is horizontal to the view

Note: You can also use the keyin ***rv=,,15*** since you know the rotation angle from the plan limits cell. The commas are used as placeholders since you are not rotating about X and Y axis. You are only rotating about the Z axis – the perpendicular axis to the Top View.

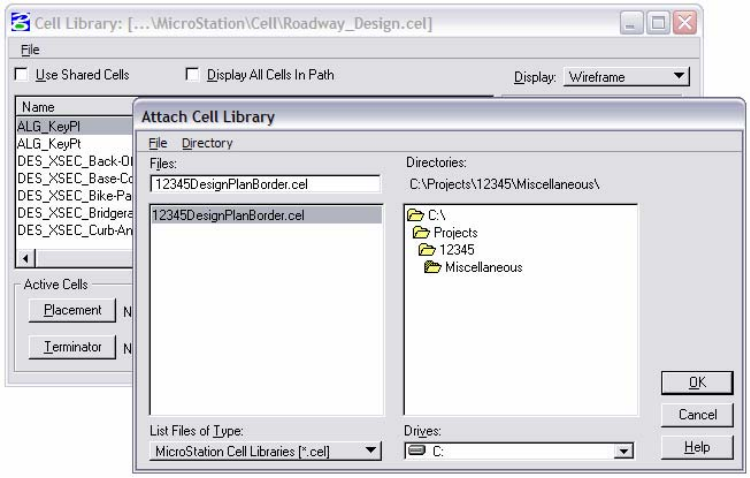


The view is rotated so that the alignment appears horizontal.

Note: Remember that you are rotating the view, not the graphics. The graphics maintain their original coordinate position in the sheet file.

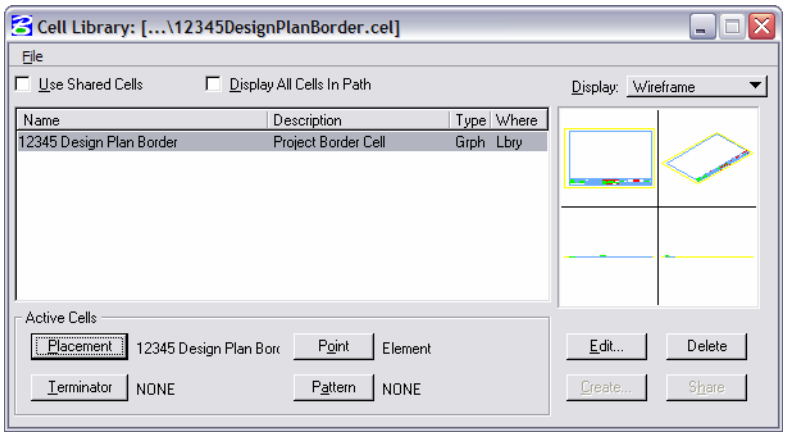
Attach the Border Cell

1. Select **Cells** from the **Primary** toolbar.
2. In the **Cell Library** dialog box, select **File > Attach** and navigate to the **C:\Projects\12345\Miscellaneous** folder.
3. Select the **12345DesignPlanBorder.cel** file.



This is the project-specific border created earlier.

4. Select **OK** to attach the cell library.



The cell library only has one cell (model) – the **12345 Design Plan Border** that you previously created.

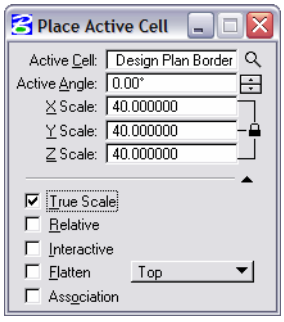
5. Select **Placement** to make the border the active placement cell.

6. Close the **Cell Library** dialog box.

Place the border

1. Select **Place Active Cell** from the **Cells** toolbar.

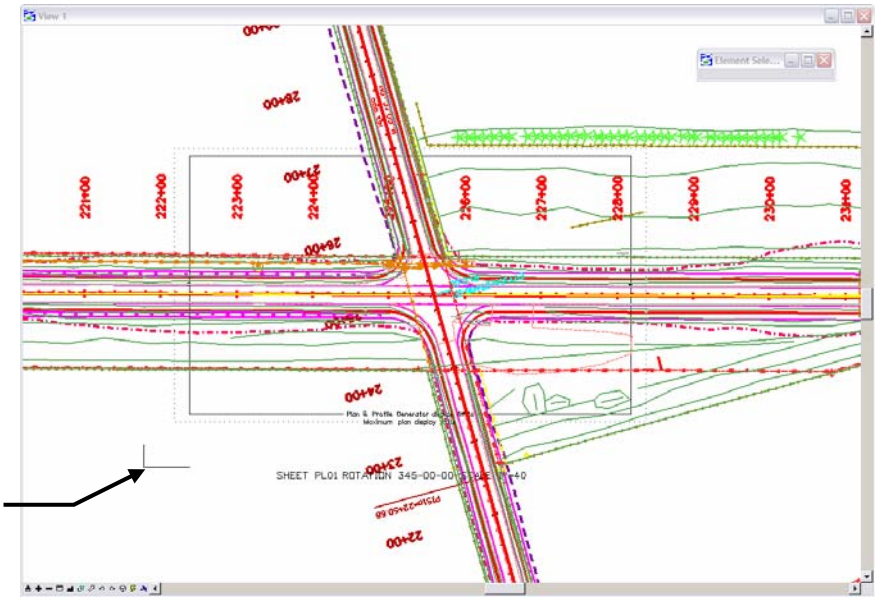
2. In the **Tool Settings** box, set **Active Angle** to ***0*** and the **Active Scale** to ***40*** for X, Y and Z.

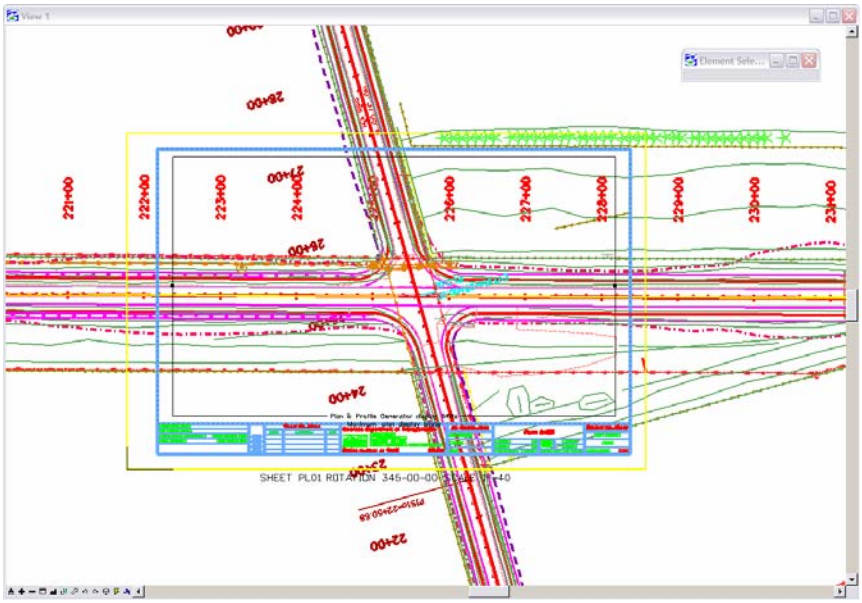


Note: The **Active Angle** is view independent and not associated with view rotation. Therefore, the x-axis is always horizontal regardless of the view rotation. You will not need to set this for correct placement of the North Arrow or other cells.

The **Active Scale** scales the border up 40 times around the full-sized graphics to match the plot scale.

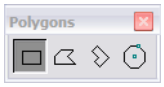
3. AccuSnap on the lower left corner of the plan limits cell as shown to place the border.

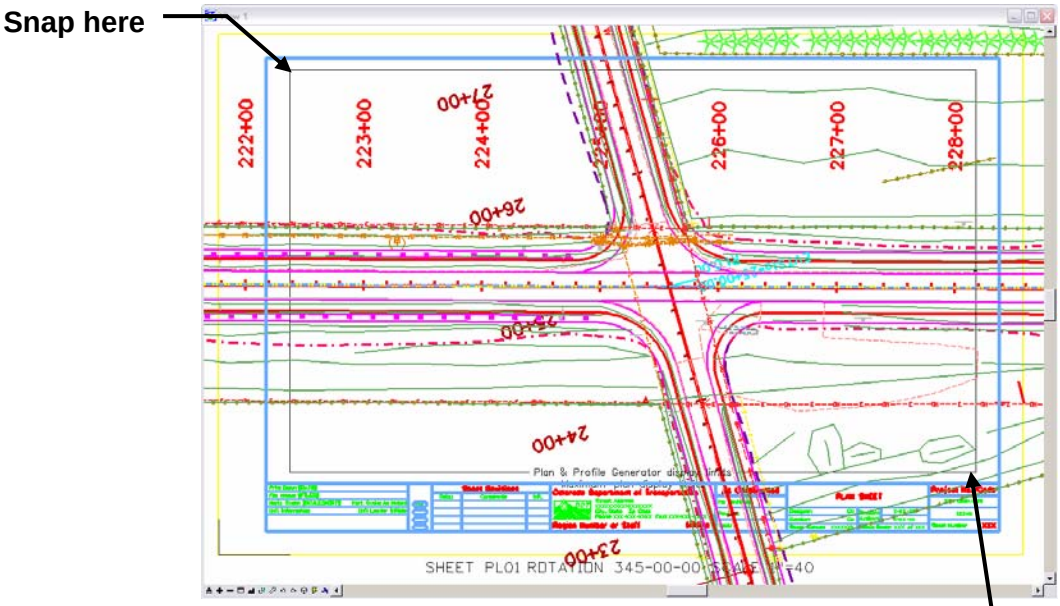




Place the Clip Boundary

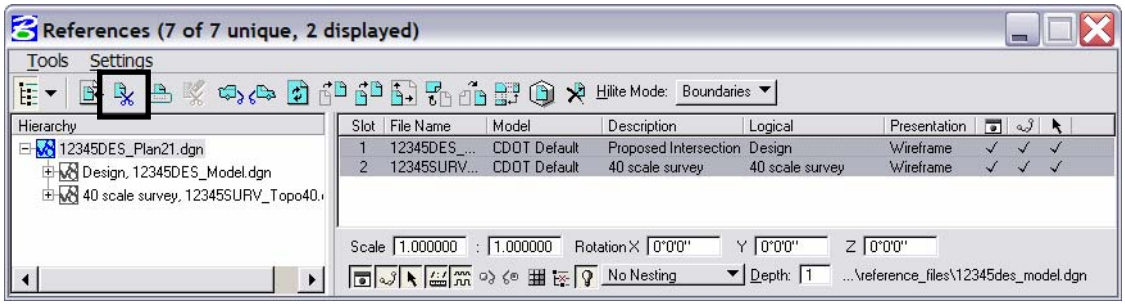
1. From the CDOT Menu Explorer select **Drafting**.
2. Set the Category to **Border**.
3. Select the Item **Clip Boundary** .
4. Select the **Place Block** icon from the **Main** toolbar and draw the clipping boundary by snapping on the opposite corners of the plan limits cell as shown (interior most line).



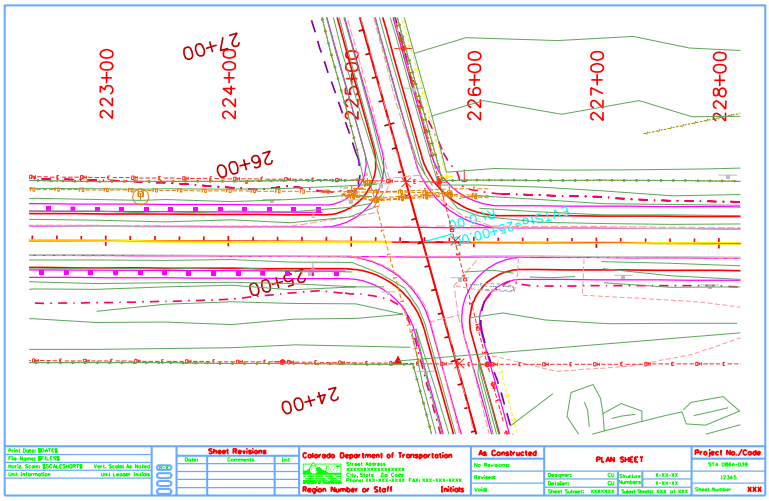


Clip the Reference File

1. In the **References** dialog box, highlight both the **Design** and **Survey/Topo** references for clipping.
2. Select the **Clip Reference** icon.



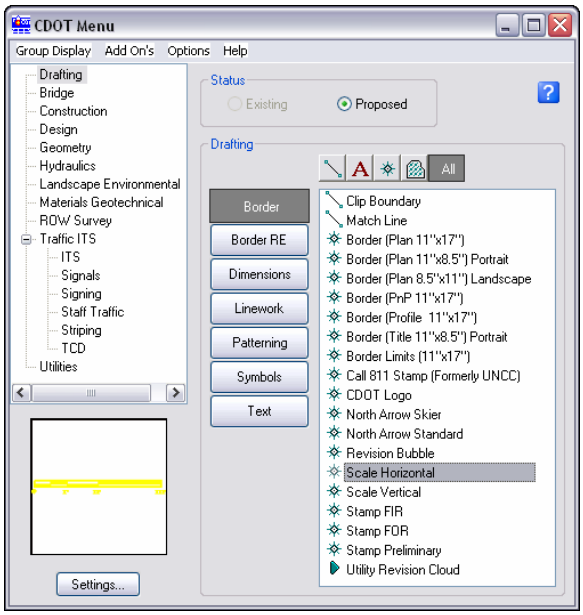
3. In the **Tool Settings** box, verify **Method** is set to **Element**.
4. When prompted to **Identify Clipping Element**, select the rectangular clipping boundary you just placed.
5. **<D>** to accept.
6. **Fit** the MicroStation view and **Save Settings** after clipping the reference files.



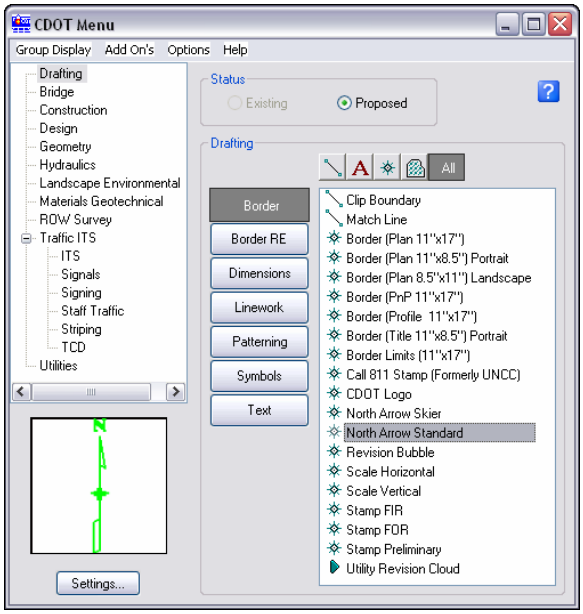
Note: Once the clipping boundary is placed, do not delete it. The clipping region of the reference file will be lost if the boundary is deleted.

Place the bar scale and north arrow

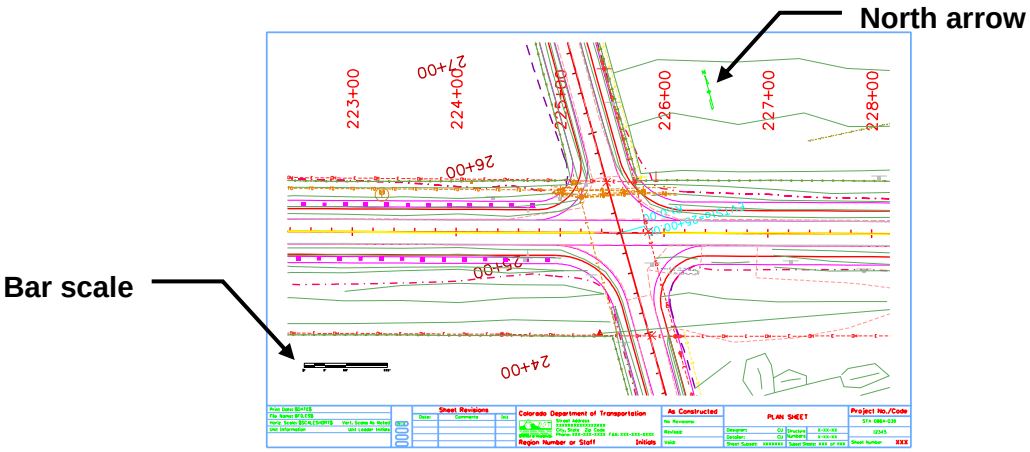
1. From the CDOT Menu Explorer, select **Drafting**.
2. Set the Category to **Border**.
3. Select the Item **Scale Horizontal**.



4. When prompted to locate the origin of the **Bar Scale**, **<D>** inside the sheet border as shown on next page.
5. Select the Item **North Arrow Standard**.



6. When prompted to locate the **North Arrow**, **<D>** inside the sheet border as shown.

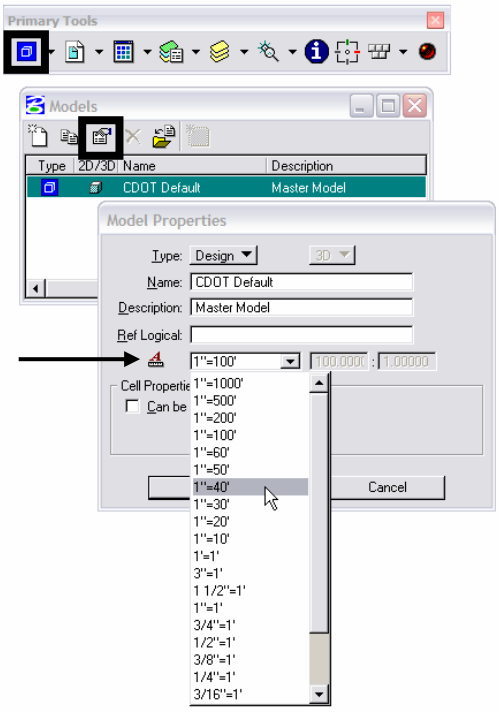


Set the Text Scale Factor

Set the **Text Scale Factor** to match the border and plot scale factors.

1. Select **Models** from the **Primary** toolbar.
2. In the **Models** box, select **Model Properties**.

   Note the **Annotation Scale** is set to **1:100** – the CDOT default.
3. Change the **Annotation Scale** to ***1:40***.



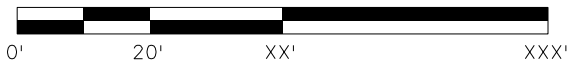
4. Select **OK**.

5. At the **Alert** message, select **Yes** to propagate the changes.
6. **Close** the **Models** box.

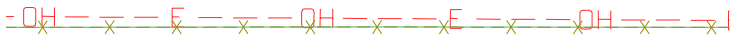
   The **Annotation Scale** for the file now matches the border and plot scales. Later, when text and dimensions are placed in this file, they will be the correct size.

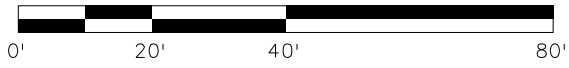
Edit the Bar Scale

1. Window in to the bar scale cell.
2. Select the Edit Text command from the Text toolbar.
3. **<D>** on the X' text on the bar scale.
4. Change the text to 20' and **<D>** to accept.



5. Make the other edits as shown.





6. **Fit** the view.
7. **Save Settings**.
8. **Exit** MicroStation.

Lab 9D – Create a Typical Section Sheet

Normally, all graphics are created in the model file and referenced to the sheet file. The sheet file contains the border, annotations and dimensions. However, typical section sheets are an exception to this rule.

Roadway Design typical sections can be created with the **CDOT Typical Section Generator Program**. The **Generator Program** not only creates the graphics, but it also annotates and dimensions the typical section. It uses a **Text Scale Factor** of 10 for all text. Therefore, the program must be run in a sheet file set up at a 10 scale. The auto-populated file **JPC#DES_TyplSect##.dgn** is automatically created with the text scale factor set to 10 and the border placed at a 10-scale. Therefore, run the **Typical Section Generator** in the sheet file.

Objectives

After completing this exercise you will know how to:

- Create a Typical Section sheet.
- Attach a project-specific border cell library.
- Use the **Replace Cell** command to replace a generic border with a project border.
- Use the **CDOT Typical Section Program** to automatically create a typical section based on input values.
- Use **AccuDraw** and "**SmartLock**" to align graphics.
- **Save** the typical section input file.

Create a new sheet file

1. Start MicroStation and open the file **12345DES_TyplSect##.dgn** from the **\12345\Design\Drawings** folder.

The file opens and contains the generic border.

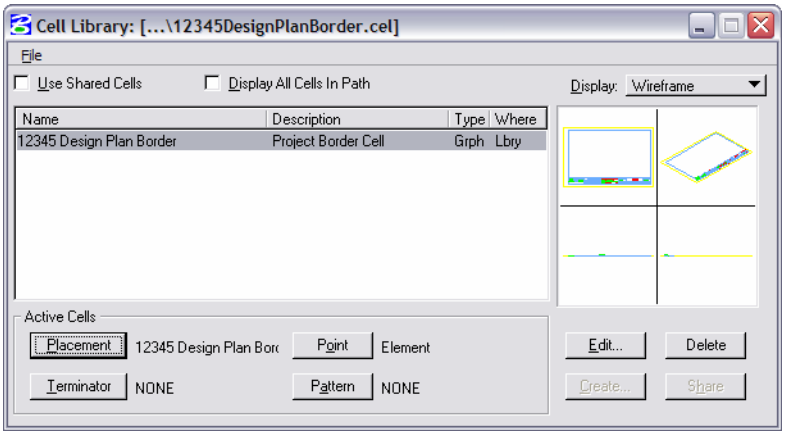
2. Select **File > Save As...** and rename the file to ***12345DES_TyplSect01.dgn*** and select **OK**.

   The file is copied to the **Drawings** folder with the new name.

Attach the border cell library

1. Select **Cells** from the **Primary** toolbar.
2. In the **Cell Library** dialog box, select **File > Attach** and navigate to the **C:\Projects\12345\Miscellaneous** folder.
3. Select the **12345DesignPlanBorder.cel** file.

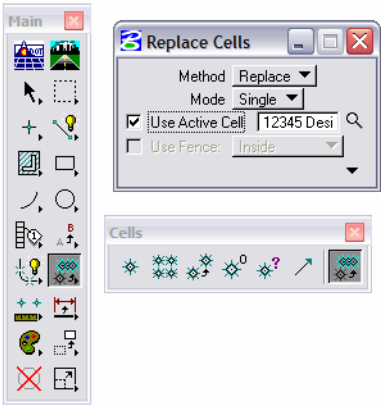
   This is the project-specific border created earlier.
4. Select **OK** to attach the cell library.



   The cell library only has one cell (model) – the **12345 Design Plan Border** that you previously created.
5. Select **Placement** to make the border the active placement cell.
6. **Close** the **Cell Library** dialog box.

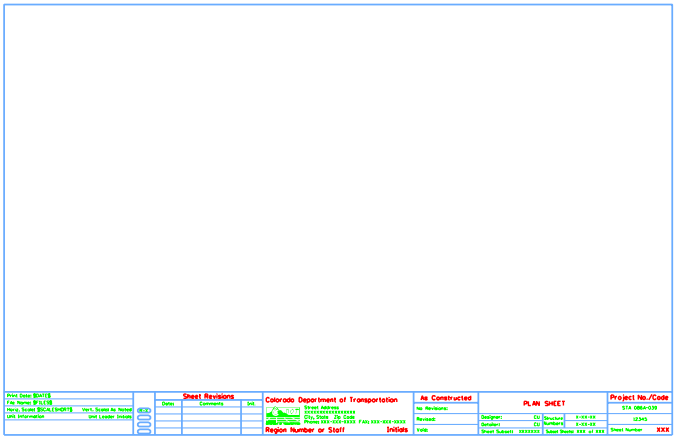
Replace the border

1. Select **Replace Cells** from the **Cells** toolbar.



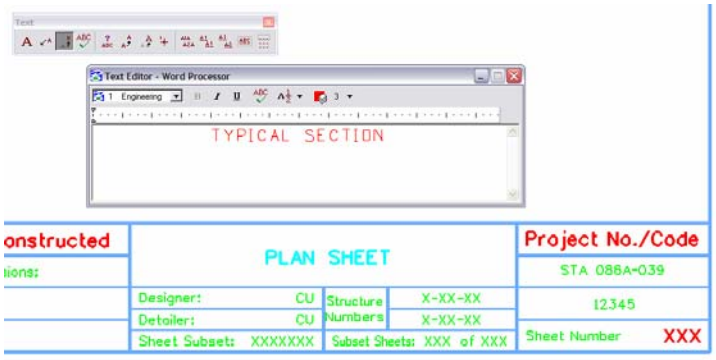
2. In the **Tool Settings** box
    - Set **Method** to **Replace**
    - Set **Mode** to **Single**
    - Toggle on **Use Active Cell**
3. When prompted to **Identify Cell**, **<D>** on the Typical Section Border.
4. **<D>** to accept.

   The generic border is replaced with the project border.

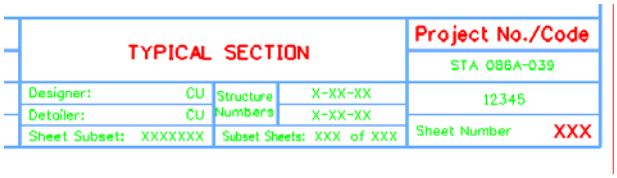


Edit the border text for a Typical Section sheet

1. Select the **Edit Text** Command from the **Text** toolbar.
2. **<D>** on the **Plan Sheet** text.
3. Change the text to ***Typical Section***.



4. **<D>** to accept.

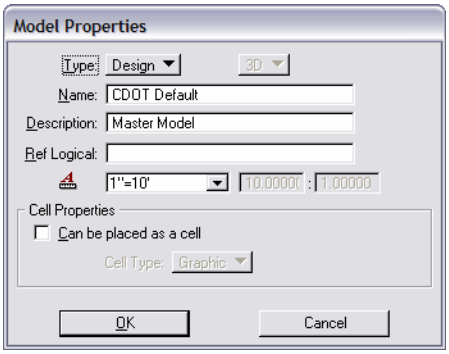


Check Model Properties

1. Select **File > Models** from the menu (or select the **Models** icon from **Primary Tools**).

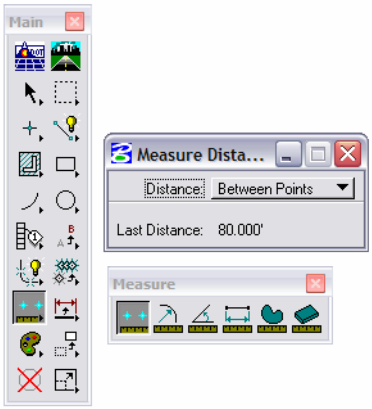
2. Select the **Edit Model Properties** icon

   Note that the **Annotation Scale** factor is set to 1:10 for running the CDOT Typical Section Program. The text placed from the program will appear the correct size.

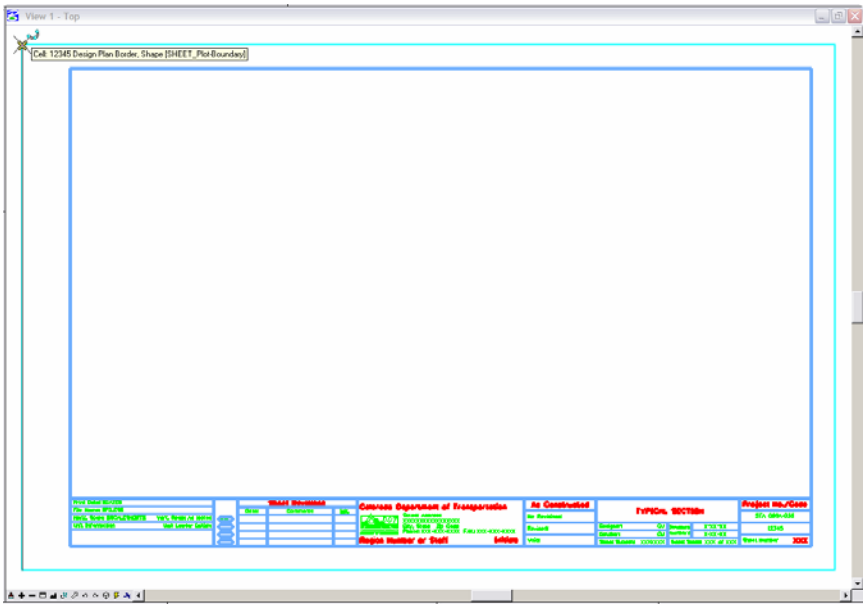


   Note: You must change the **Annotation Scale Factor** if you run the **Typical Section Program** in any file other than the **JPC#DES_TyplSect##.dgn** file.

3. Select the **Measure Distance** command and set the **Distance** to **Between Points**.



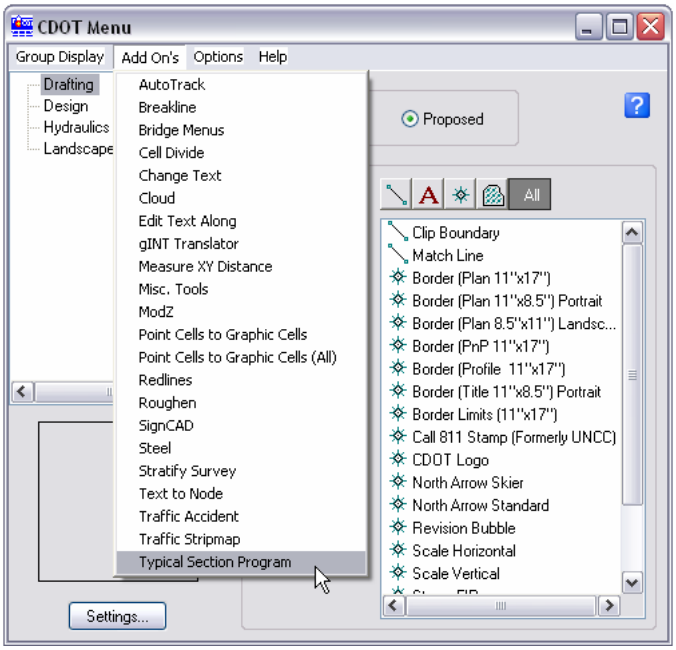
4. Measure the height and length of the border (AccuSnap along the yellow edge).



Note that the border measure 110 x 170, or 10 times the actual size. If the border cell was scaled to a factor other than 1:10 (like 1:100 for a plan sheet), then it must be re-scaled or replaced at the proper scale of 10.

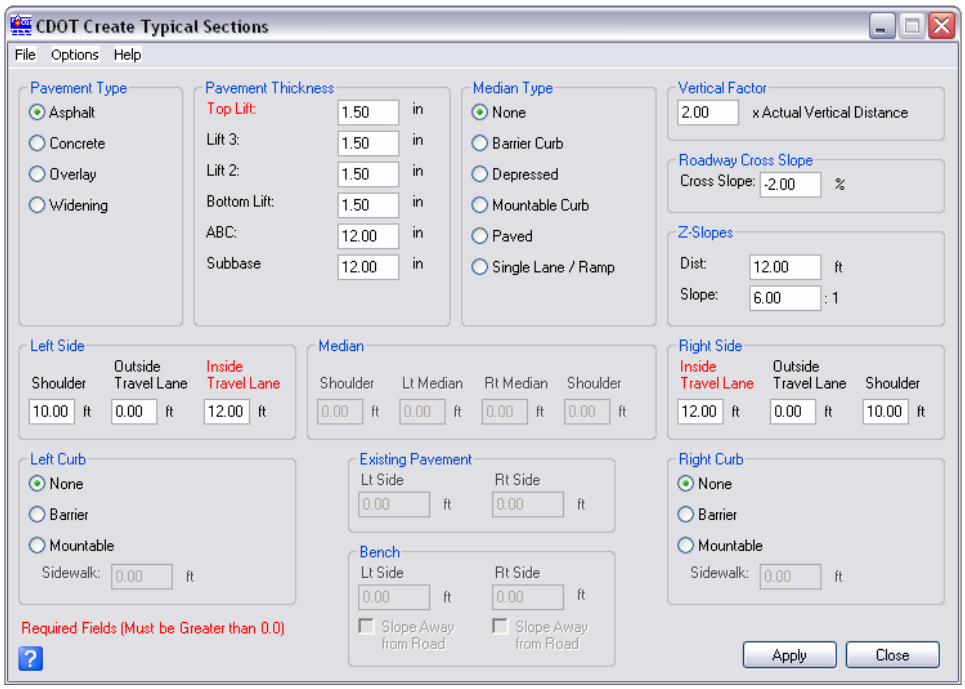
Start the Typical Section Program

1. On the CDOT Menu, select **Add On's > Typical Section Program**.



The **CDOT Typical Section Program** lets the user input different values based on the desired roadway section. The various options are highlighted in blue.

Note: Items that require input are shown in red.

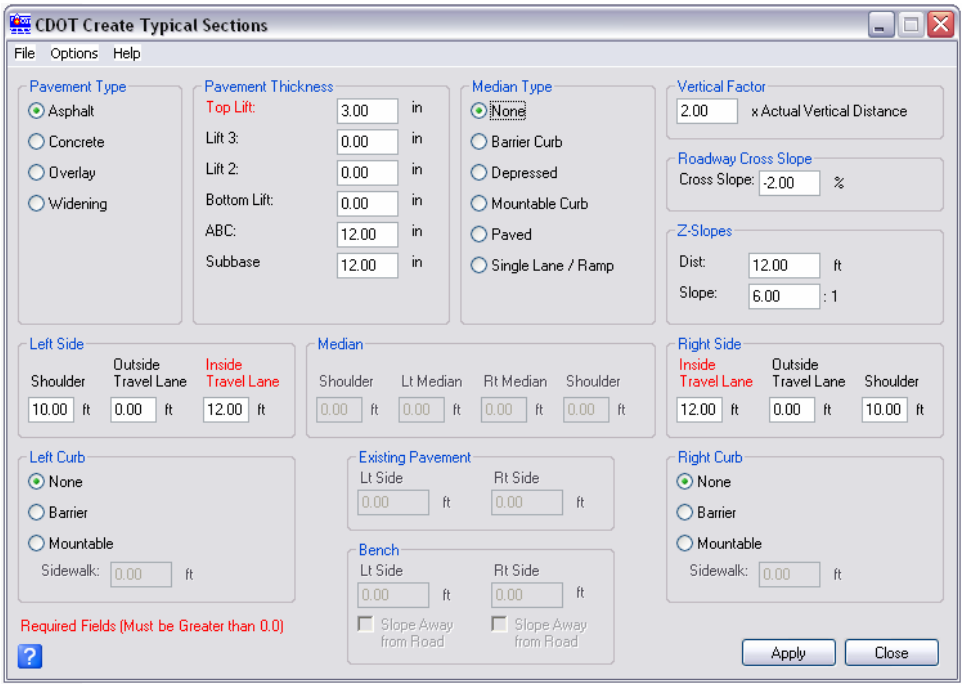


Create a 2-Lane Rural Typical Section

1. On the Create Typical Sections dialog box, select **Options > Writelock** to toggle it **On** (a checkmark).

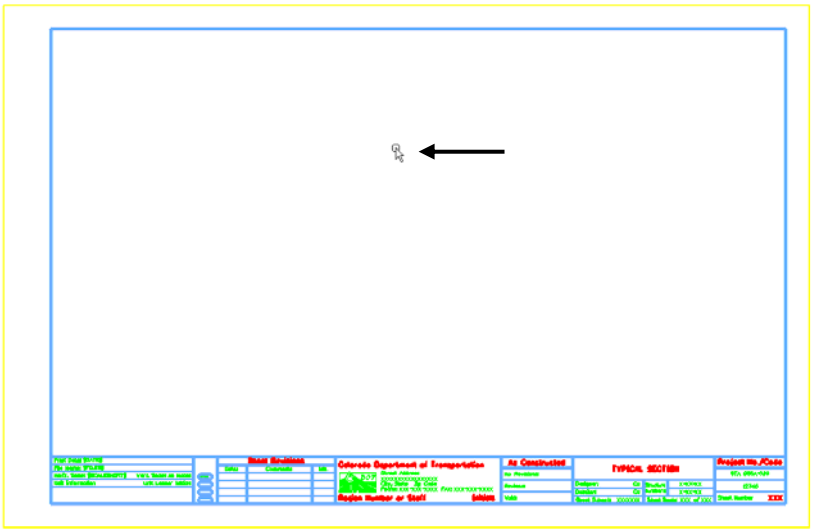
   Note: If **Writelock** is **On**, permanent graphics will be generated in the file. If **Writelock** toggle is **Off,** the graphics are temporary and if you zoom or pan, the graphics will disappear. A checkmark next to **Writelock** indicates that it is on.

2. Set the **Typical Section Program** options as shown.



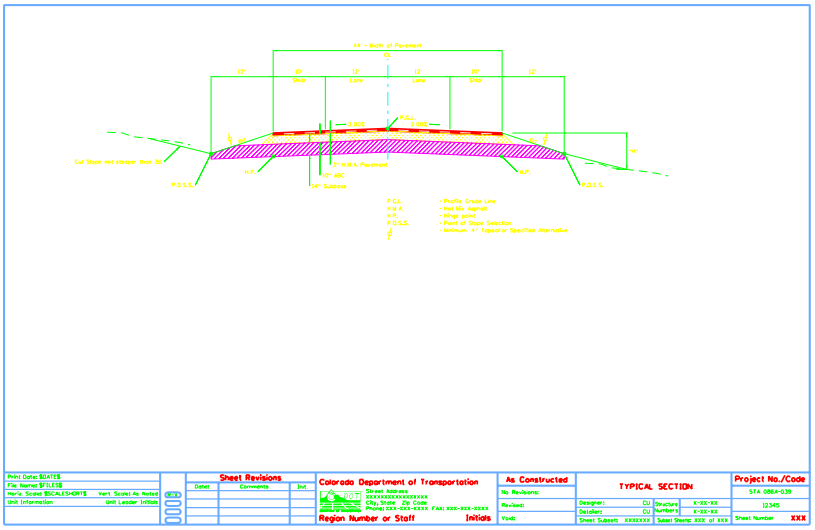
3. Select **Apply**.

4. When prompted to locate the profile grade point, **<D>** near the top-center of the sheet as shown.



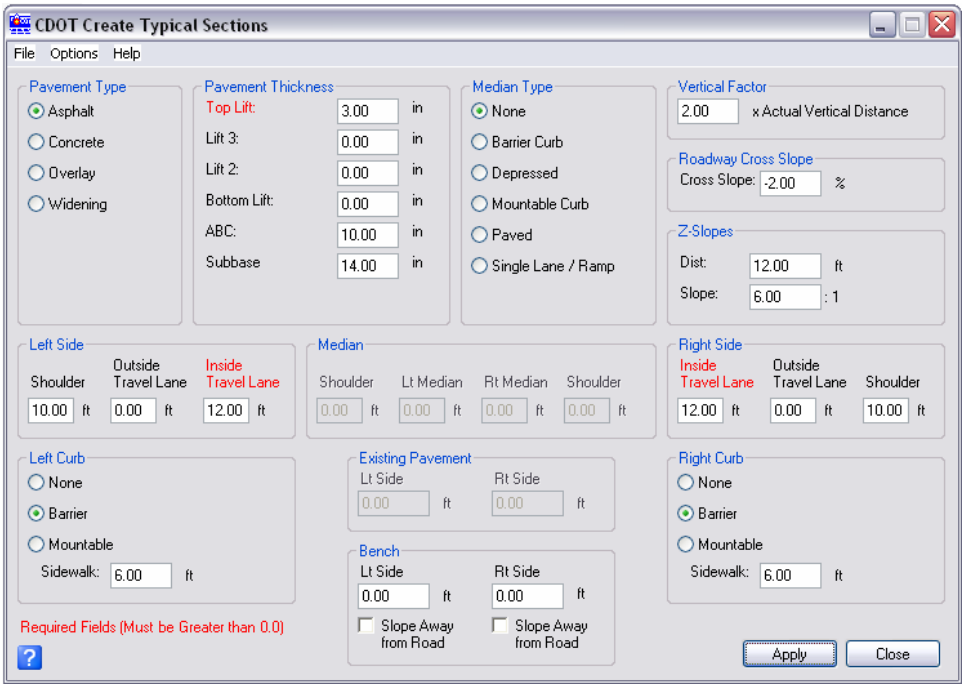
The 2-Lane rural section is automatically drawn, annotated and dimensioned.

5. ***Do not*** close the **Create Typical Section** dialog box.



Create a 2-Lane Urban Typical Section

1. Set the **Typical Section Program** options as shown.

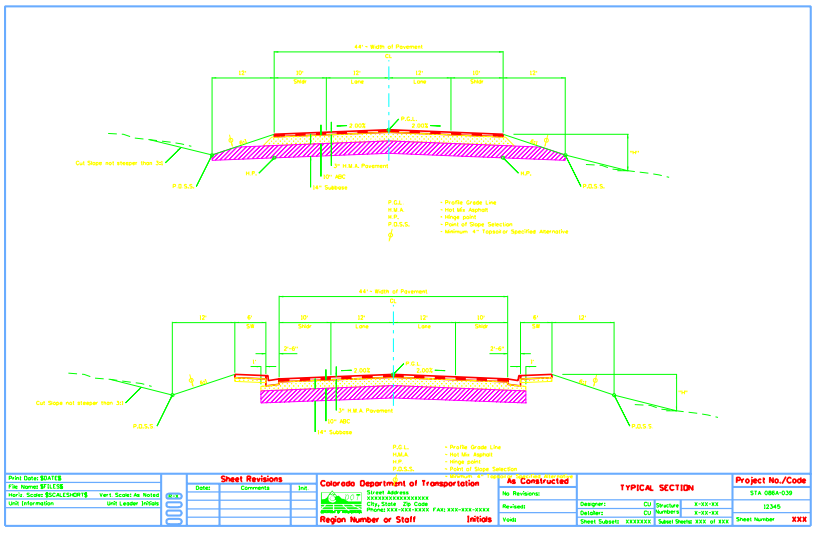


2. Select **Apply**.

3. When prompted to locate the profile grade point, **<D>** near the bottom-center of the sheet below the first section.

   The 2-Lane urban section is automatically drawn, annotated and dimensioned.

4. ***Do not*** close the **Create Typical Sections** dialog box.



Save the 2-Lane urban section input file

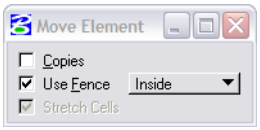
1. From the **Create Typical Section** dialog box, select **File > Save**.
2. Navigate to the **C:\Projects\12345\Miscellaneous** folder.
3. Key in a **File name *SH86_2L_Urban_Typical*** and select **Save**.

   The input file is saved. If you need to generate this typical section again, Select **File > Open** form the **Create Typical Section** dialog box and select this text file.
4. **Close** the **Create Typical Section** dialog box.

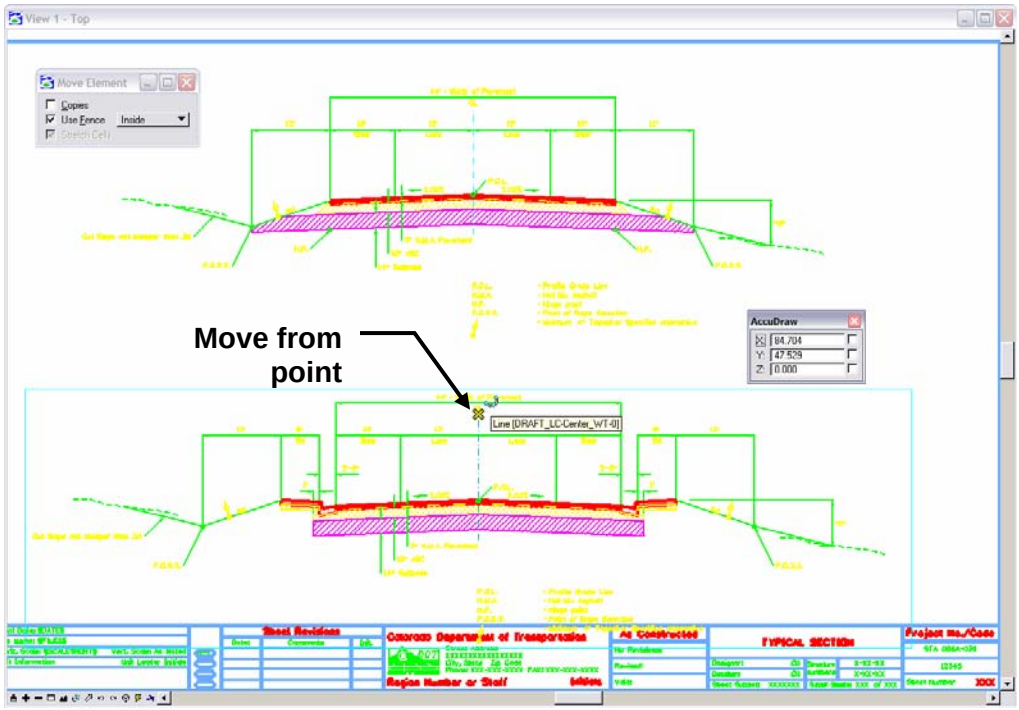
Align the Sections

Since you did not snap to a location for the sections, you may need to align the sections at their centerlines as well as move the section graphics into the border.

1. Place a fence block around the urban section.
2. Select the **Move** command from the **Manipulation** toolbar and toggle on **Use Fence**.



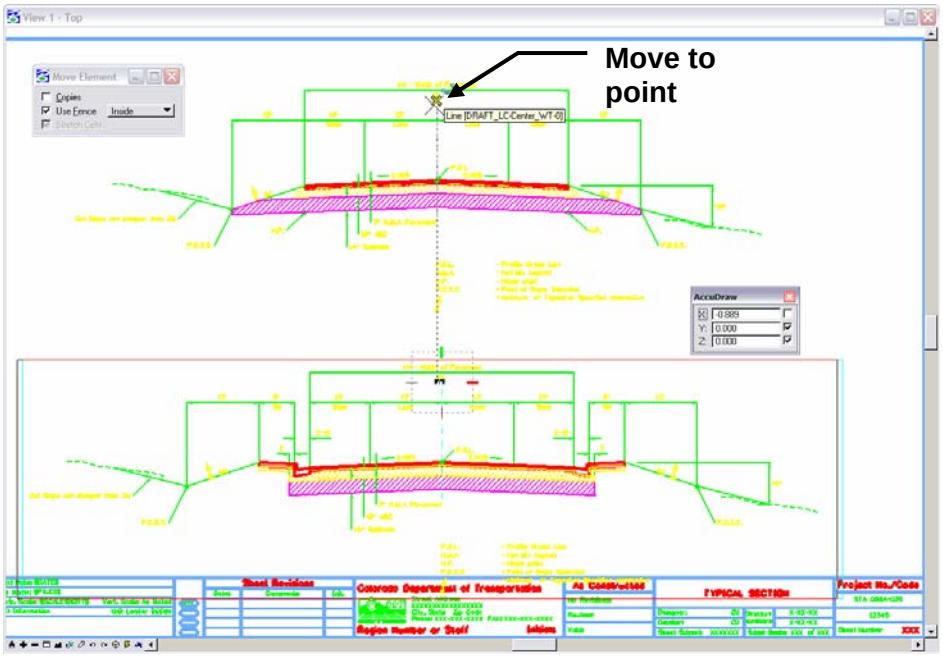
3. **AccuSnap** on the centerline of the urban section as shown for the move from point.



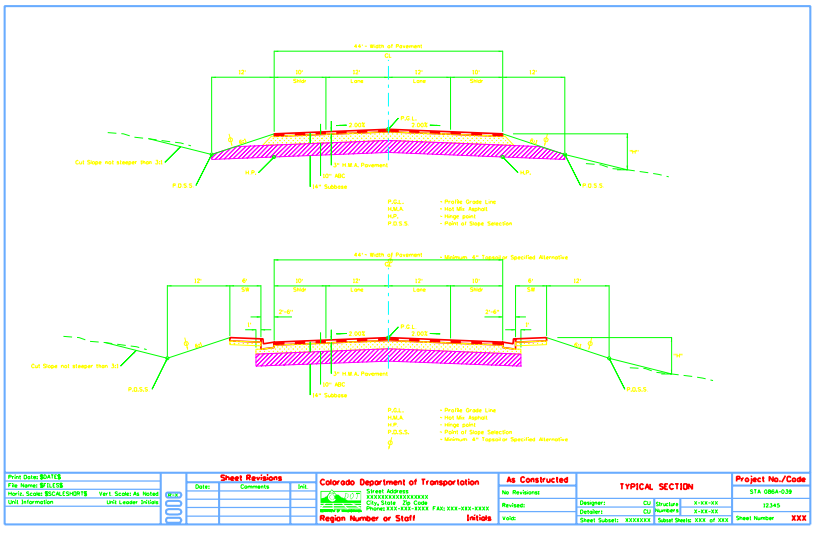
4. **Move** your cursor horizontally (either to the right or left), lock on AccuDraw's X-axis then press **<Enter>** on the keyboard.

   This **smartlocks** the **AccuDraw** axis so that you can only move in the horizontal direction.

5. **<D>** on the rural section centerline as shown for the move to point.



The two sections are now aligned at the centerlines.



6. **Fit** the view.

7. **Save Settings**.

8. **Exit** MicroStation.

Lab 9E – Create a Bridge General Layout Sheet at Different Scales

In this exercise, you'll create a General Layout sheet using the bridge graphics drawn earlier. The exercise will demonstrate how to create a sheet with graphics at different scales.

Objectives

After completing this exercise you will know how to:

- Place a border at a 40-scale.
- Create saved views in the model file for referencing to the sheet.
- Reference plan graphics coincident-world at 1:1
- Reference saved-view section and detail graphics at different scales on the same sheet

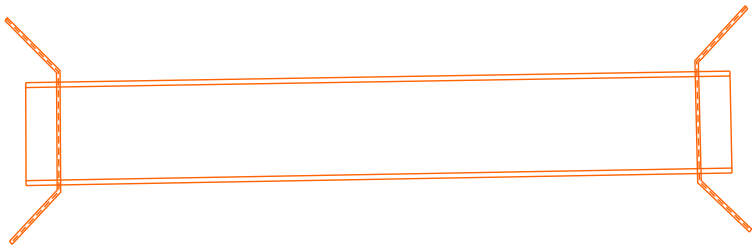
Open the bridge model file for plan

1. Start MicroStation.
2. **Open** the file **CU12345BRDG_Model.dgn** in the project's **\Bridge\Working** folder.

   The blank bridge model file opens.

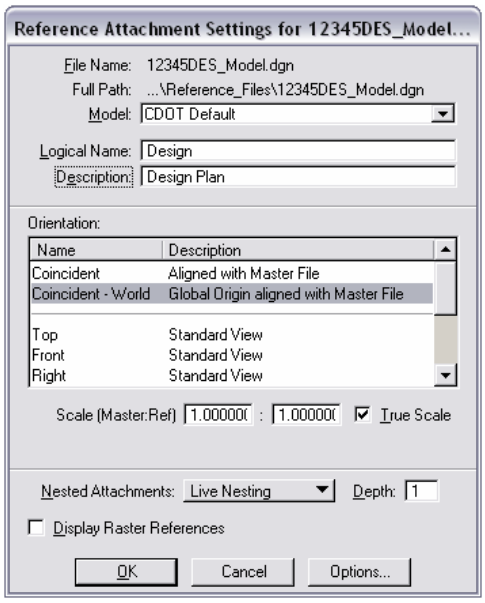
Reference the Design Model file

1. Open **Level Display** and turn on the **BRDG_OUTLINE** level.
2. **Fit** the view.



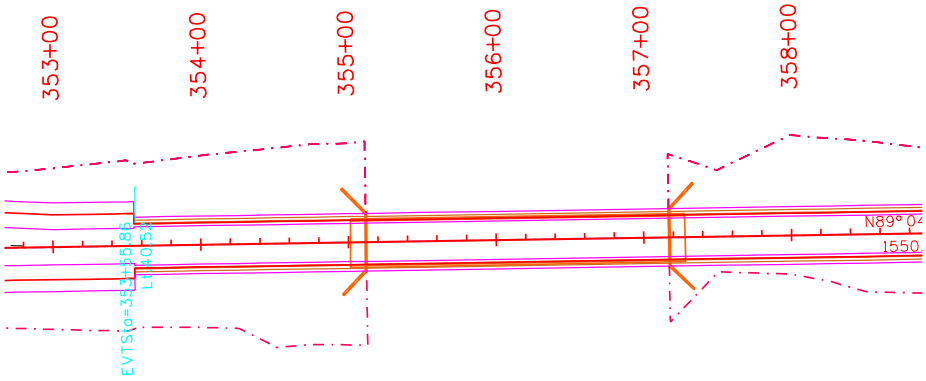
The proposed outline graphics for the bridge have been already created in plan view.

3. Attach the **12345DES_Model.dgn** from the project's **\Design\Drawings\Reference_Files** folder as shown. Attach Coincident-World at a Nesting Depth of 1. Do not attach raster references.



The design model is attached coincident to the proposed bridge graphics. A nested depth of 1 also references the Survey/Topo file (currently the Survey/Topo display is off). You will later reference the bridge plan to a sheet file.

4. **Zoom out** as shown.



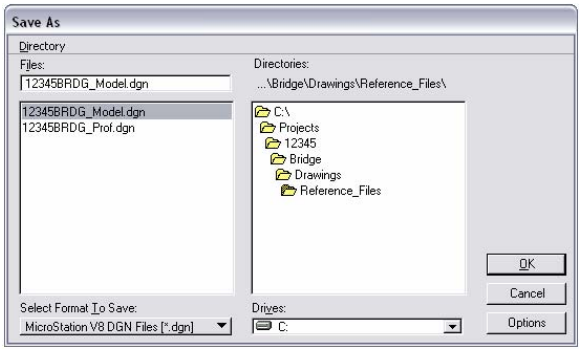
5. **Save Settings**.

Move the Bridge Model to the Reference_Files folder

Since the work in the model file is complete, move from the **Working** folder to the **Reference_Files** folder so that other groups can reference, if needed.

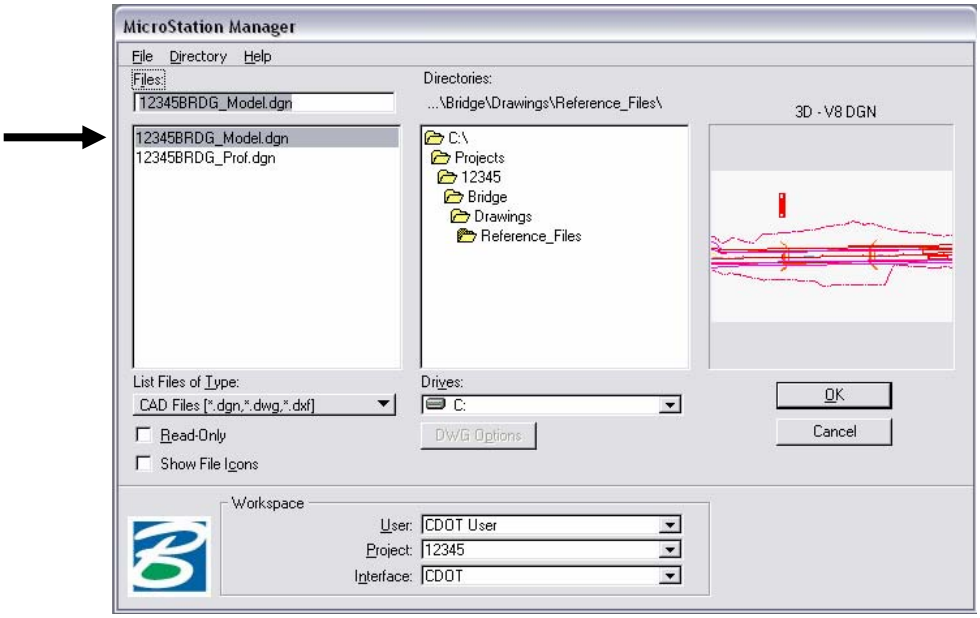
1. Select **File > Save As...**
2. Set the directory to **C:\Projects\12345\Bridge\Drawings\Reference_Files**
3. Remove the CU (CDOT User) initial prefix and rename the file to **12345BRDG_Model.dgn.**

   Note: Your initials are removed from the file when it is ready to transfer to the **Reference_Files** folder.



   Note: The project template delivers standard dgn's for model and sheet files as starter files. You may be prompted to confirm saving over an existing file. Please use caution when performing these tasks as you could lose data. Be sure the files are empty or you are working with the latest files.

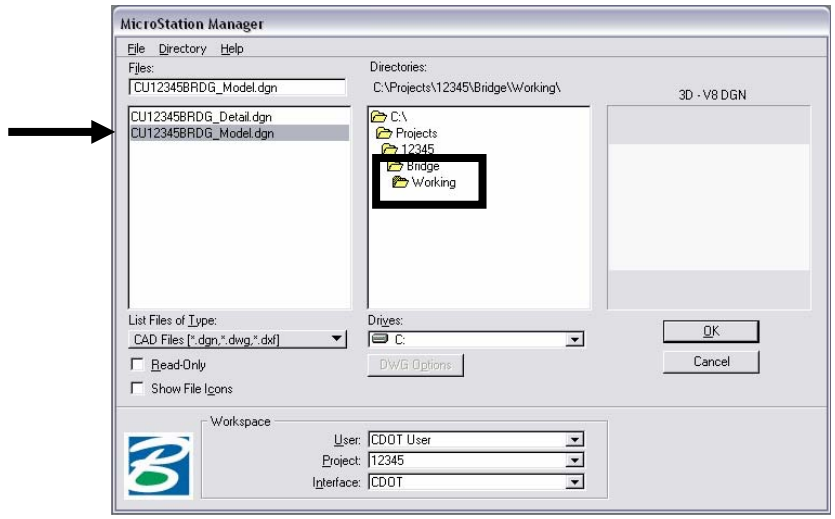
4. Select **OK** to save the file.
5. Select **File > Close** to return to the **MicroStation Manager**.
6. In the **MicroStation Manager**, verify your **12345BRDG_Model.dgn** file was copied to **Reference_Files** folder.



7. Change the directory to **\Bridge\Working.**

8. Select the **CU12345BRDG_Model.dgn** from the **Working** folder and select **File > Delete**.

   Note: Make sure you select the BRDG_Model file and ***not*** the BRDG_Detail file.



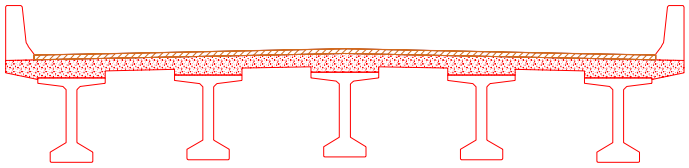
9. Select **OK** to delete the working file.

Open the bridge model file for section and details

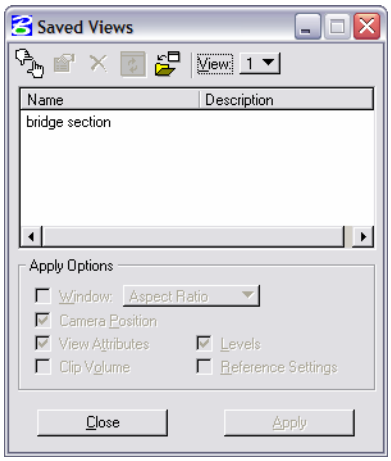
1. Open the **CU12345BRDG_Detail.dgn** file from the **C:\Projects\12345\Bridge\Working** folder.

Create Saved Views

1. **Fit** the view.
2. Make sure that only the section graphics are showing in the view. If not, **Window** around the bridge section. Be sure that the entire section encompasses the view and no other graphics are shown in the view.

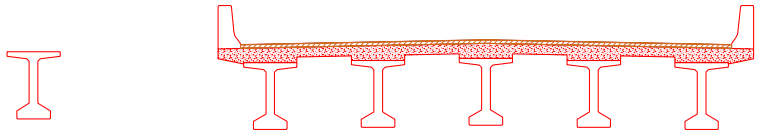


3. Key in ***sv=bridge section***
4. When prompted, **<D>** to in the view to save it.
5. Select **Utilities > Saved Views** to open the **Saved Views** dialog box and verify that the view was saved.



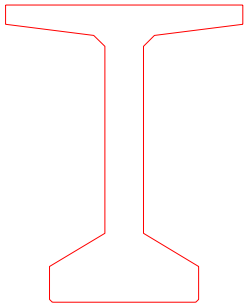
6. Make sure the **Graphic Group** lock is turned ***off***.

7. Select the **Copy** command and copy one of the BT 54 girder cells to the approximate location shown (outside of the section saved view).



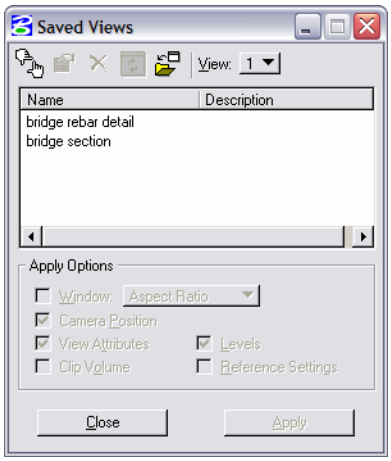
This will be used as a reference on your details sheet.

8. **Window** around the single girder you just copied to create a saved view for the girder detail. Make sure only the girder is shown in the view.



9. Key in ***sv=bridge rebar detail*** and **<D>** in the view to save.

   Note: You can either use the ***sv=*** keyin or the dialog box option to create saved views.



10. **Fit** the view.

11. **Save Settings**.

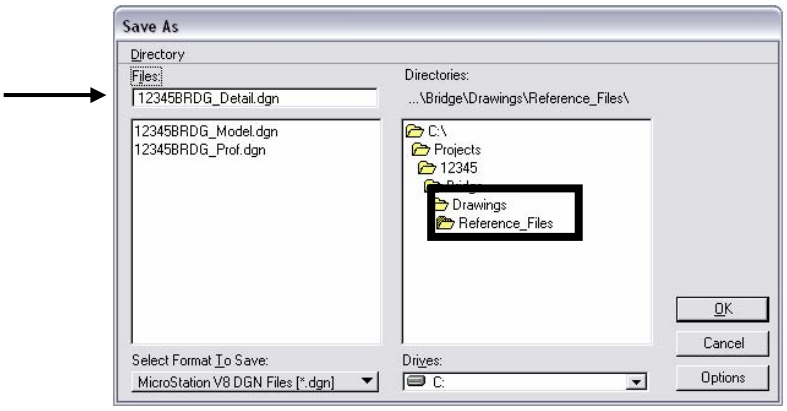
Move the model file to the Reference_Files folder

You're finished working in this bridge model file, so move it to the **Reference_Files** folder.

1. Select **File > Save As...**

2. Set the directory to
   C:\Projects\12345\Bridge\Drawings\Reference_Files

3. Remove the CU (CDOT User) initial prefix and rename the file to **12345BRDG_Detail.dgn.**

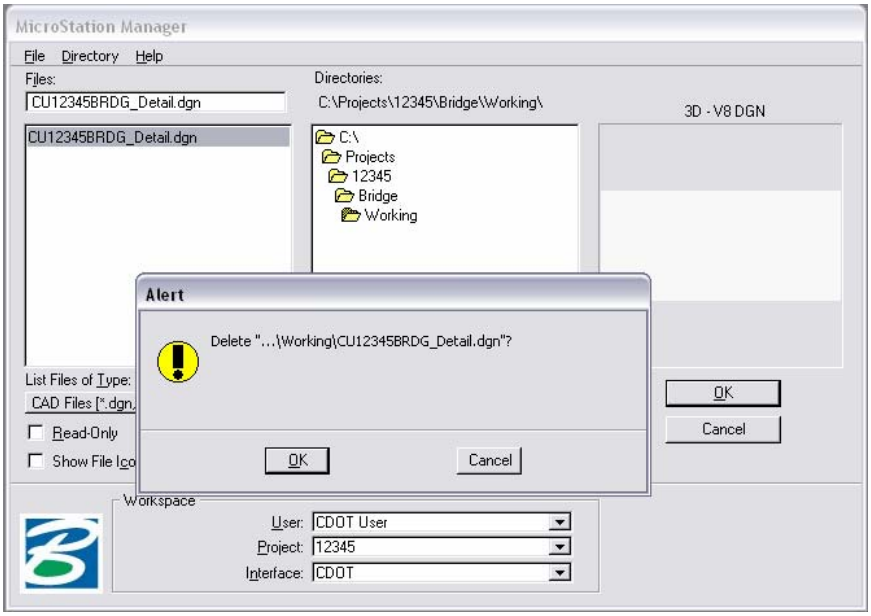


4. Select **OK** to save the file.

5. Select **File > Close** to return to the **MicroStation Manager**.

6. In the **MicroStation Manager**, verify your **12345BRDG_Detail.dgn** file was copied to **Reference_Files** folder.

7. Change the directory to the **\Bridge\Working** folder and select **File > Delete** to delete the **CU12345BRDG_Detail.dgn** file.

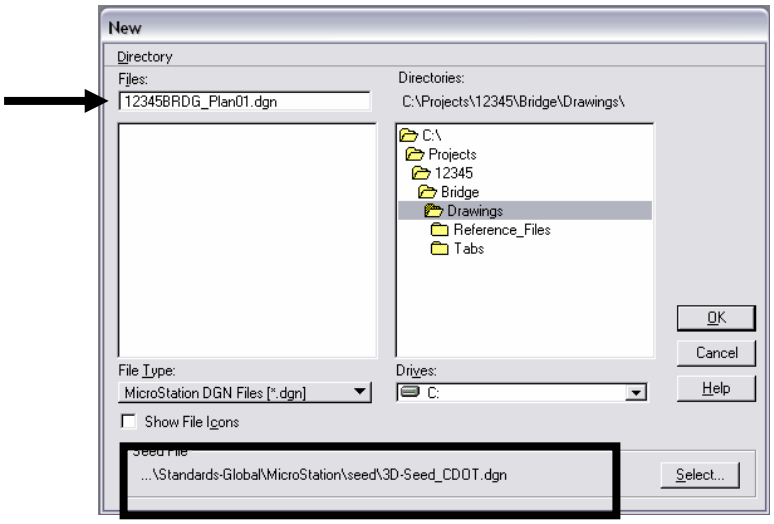


8. Select **OK** to delete the working file.

Create the Sheet file

Create a new sheet file from a seed file.

1. In the **MicroStation Manager**, set the folder location to **C:\Projects\12345\Bridge\Drawings**.
2. Select **File > New** from the **MicroStation Manager**.
3. In the **Seed File** section, choose the **Select** button.
4. Select the seed file **3D-Seed_CDOT.dgn** and select **OK**.
5. In the **Files** field, key in the name ***12345BRDG_Plan01.dgn.***



6. Select **OK**.

   The file appears in the folder list.

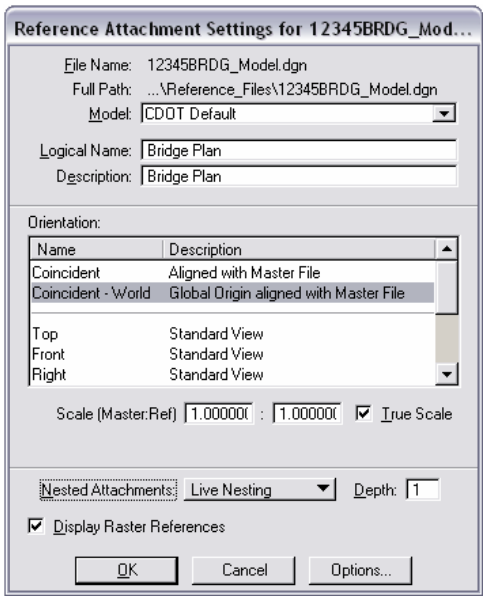
7. Select **OK** to open the file.

   The empty file is created with all of the Bridge default settings from the seed file.

Reference the Plan graphics

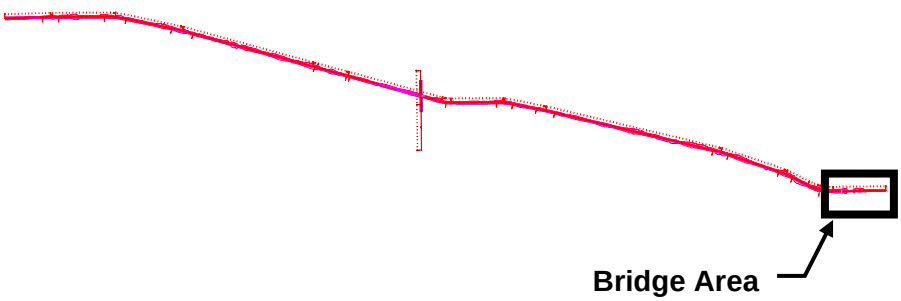
1. Reference the **12345BRDG_Model.dgn** file from the **\Bridge\Drawings\Reference_Files** folder.

2. In the **Attachment Settings** box, set the options as shown and select **OK**.

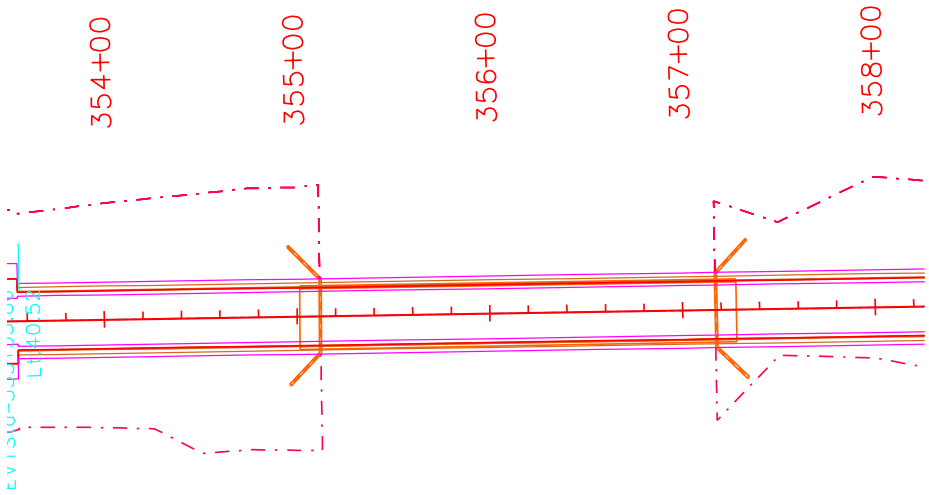


   The bridge plan and the nested design reference are attached to the sheet file. Since you attached at a 1:1 scale and Coincident-World, all of the bridge plan graphics are in their true coordinate locations and actual size.

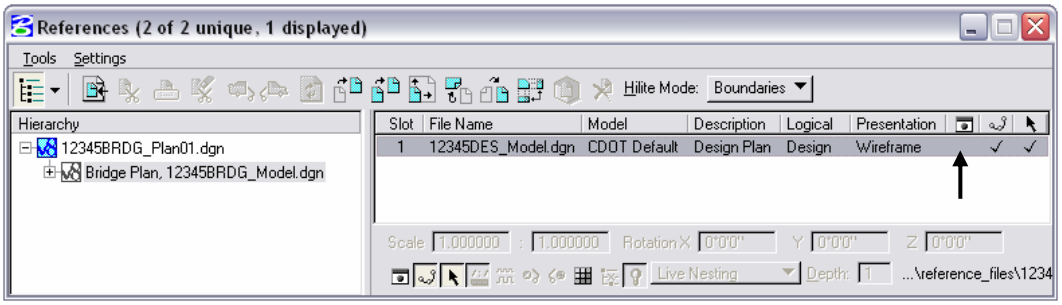
3. **Fit** the view.



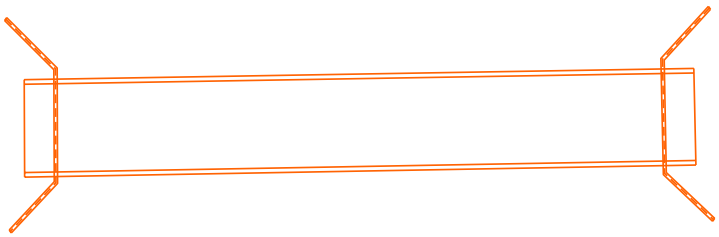
4. Window in on the bridge area as shown.



5. Toggle off the display of the Design reference.



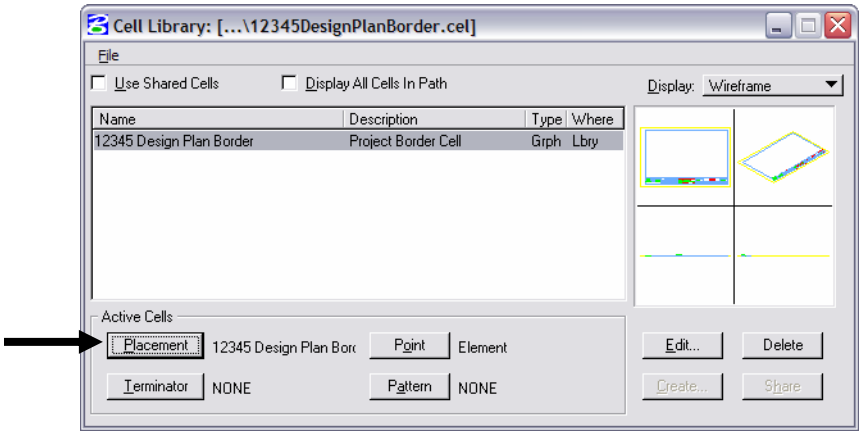
6. Only the graphics from the Bridge model are shown.



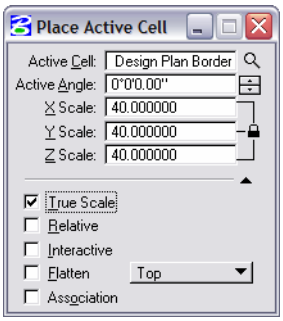
Place the border

With the bridge plan graphics in place, you can now place the border around them.

1. Select **Cells** from the **Primary** toolbar.
2. Select **File > Attach** and attach the **12345DesignPlanBorder** cell library from the **C:\Projects\12345\Miscellaneous** folder.
3. Select the **Placement** option for this cell.

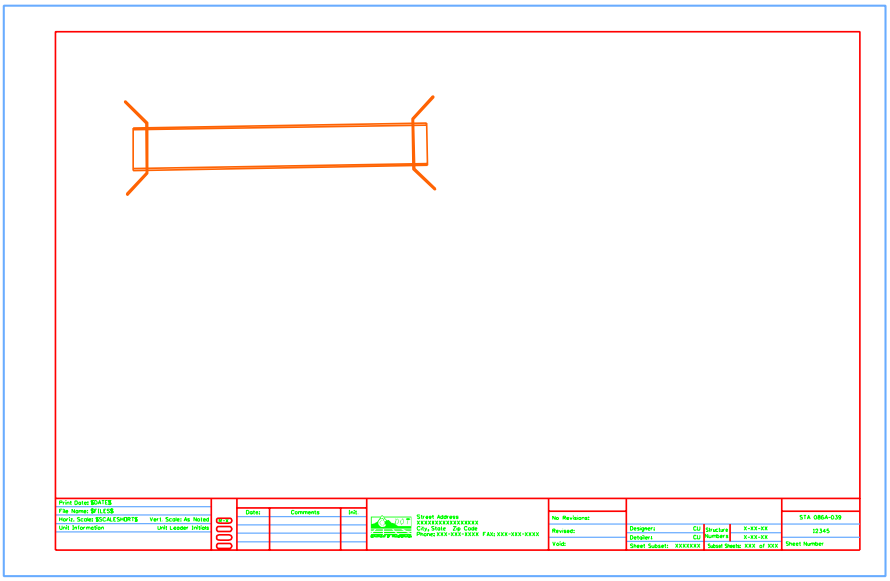


4. Select the **Place Active Cell** command and place the border at a 40 scale.

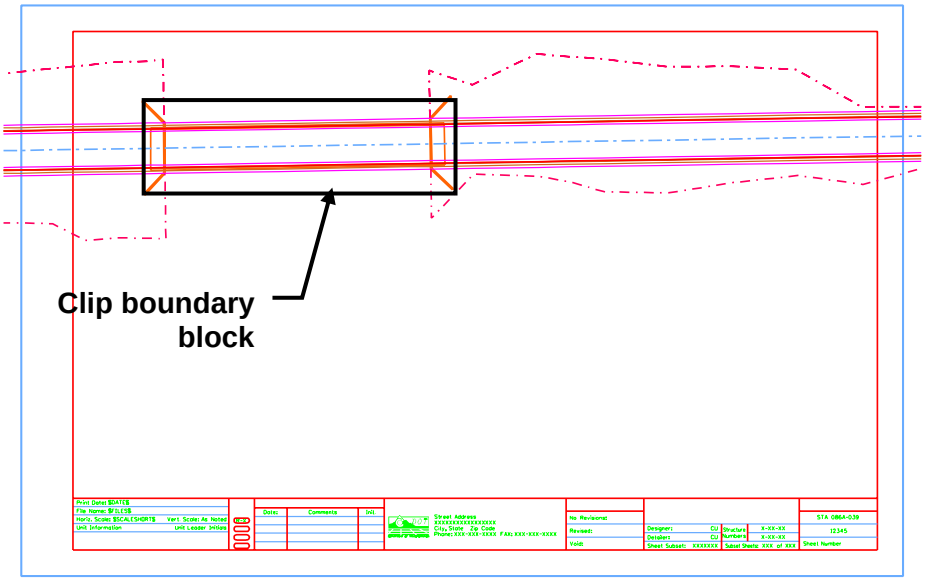


The border scale is the same as the plot scale of 1”=40’.

5. **<D>** to place the border in the location shown. Be sure to position the border so that the bridge plan is in the upper left corner.

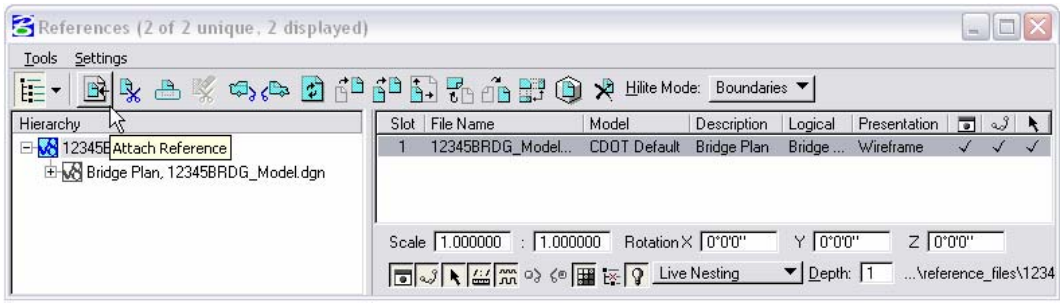


6. Turn on the display of the design reference.

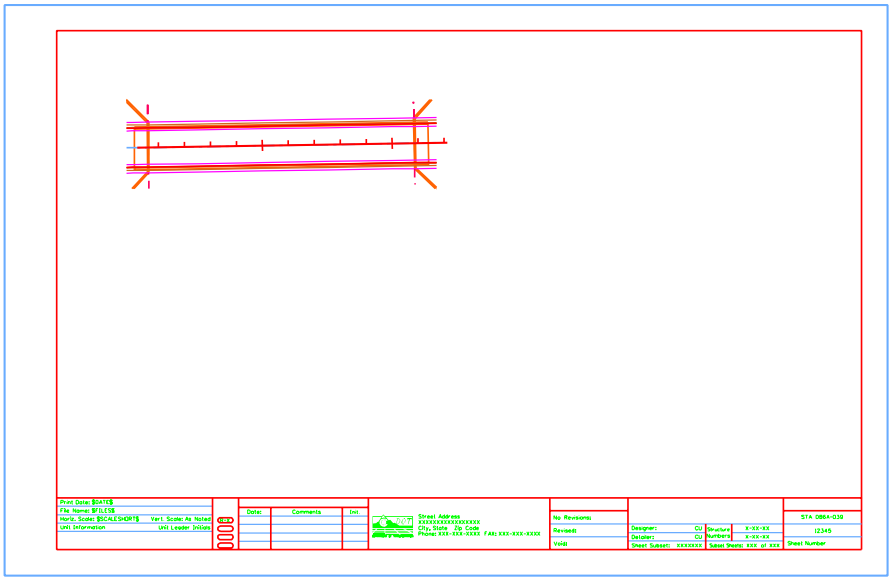


7. On the CDOT Menu Explorer, select **Drafting**.
   - Select the **Border** category.
   - Select the **Clip Boundary** item.
8. Select the **Place Block** command and place the clip boundary block as shown.

9. From the **Reference** dialog box, select the Bridge model reference and then select **Tools > Clip Boundary**.



10. **<D>** on the clip boundary to clip the design model reference.



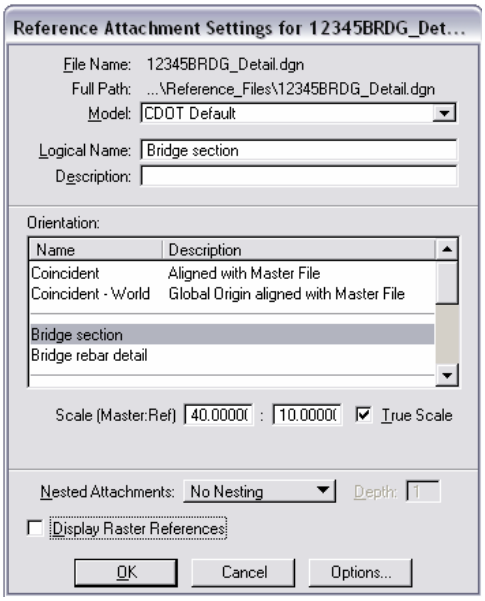
The bridge plan is now place inside the border at the proper coordinates. Design graphics levels can be turned on/off as needed.

Reference additional graphics at various scales

Reference the typical section at a scale of 1” = 10’

1. From the References dialog, attach the file **12345BRDG_Detail.dgn** from the **\Bridge\Drawings\Reference_Files** folder.

2. In the **Attachment Settings** box:

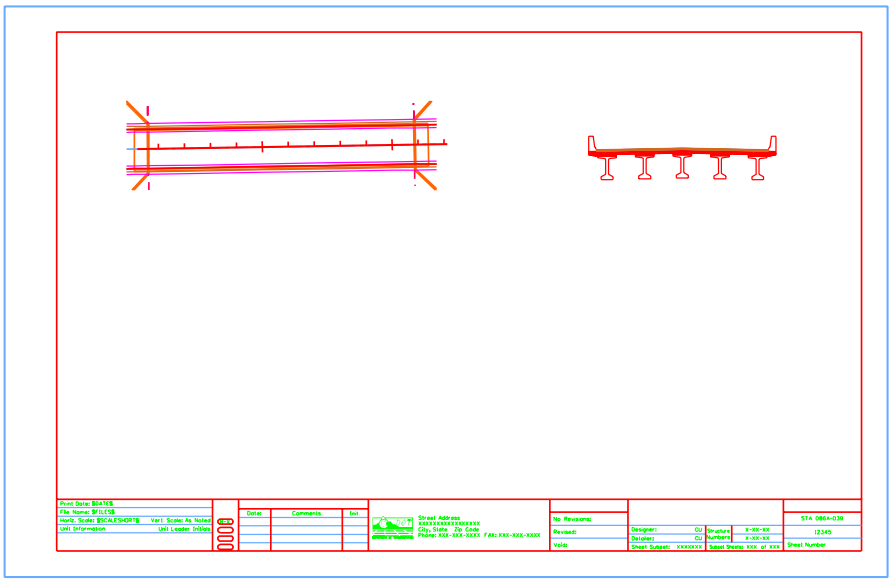


   - Select the saved view **Bridge Section** (the logical name will update to the saved view name).
   - Set the **Scale** to ***40:10***

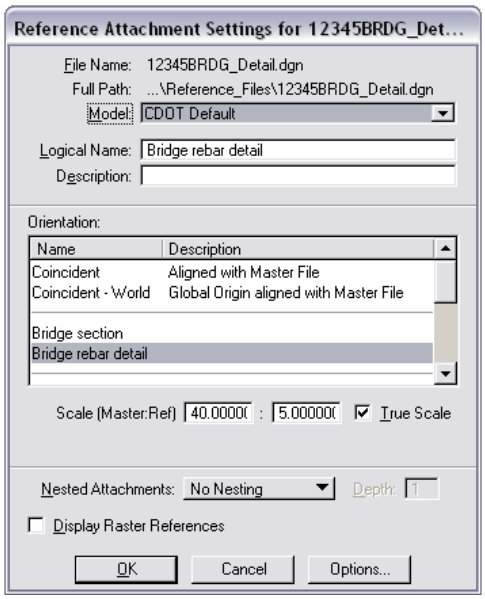
   Note: When working with multiple scales, always key in the border scale in the first field (Master) and the detail scale in the second field (Ref). MicroStation will calculate the scale for your, or you could calculate it yourself and enter ***4:1***.

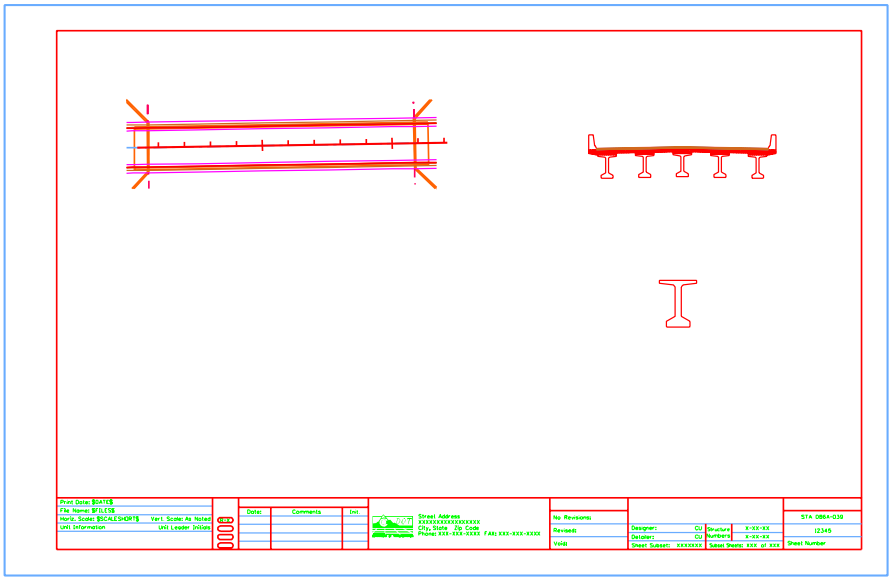
   - Set the other options as shown.

3. Select **OK** and **<D>** to position the saved view reference in the location shown.



4. Reference the **12345RDG_Detail.dgn** again and repeat the above process and reference the girder detail at a scale of 1”=5’.





Note: You’ll annotate and dimension this sheet in the next lab.

5. **Fit** the view.
6. **Save Settings**.
7. **Exit** MicroStation.

Lab 9F – Create a General Notes Sheet

The **12345DES_GenNote.dgn** has been created in the project's **\Design\Drawings** folder through the create project utility. This sheet file currently is linked to a generic notes doc file in the CDOT workspace. However, the sheet files should reference the project-specific notes file, **12345GemeralNote.dgn** located in the **\Design\Drawings\Reference Files** folder. You must first update the references in the sheet file to point to the project notes, and then edit the project notes file to be project-specific.

Note: This process is the same for any specialty group.

Objectives

After completing this exercise you will know how to:

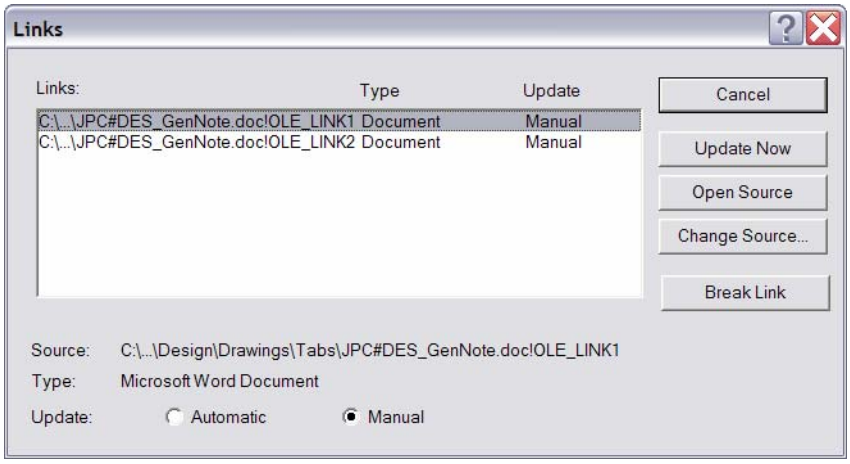
- Open a project notes sheet file.
- Update the Word document link to point to the 12345 project directory.
- Edit the project-specific general notes Word file.
- Re-link the General Notes Word file to the Notes sheet file.

Updating Links

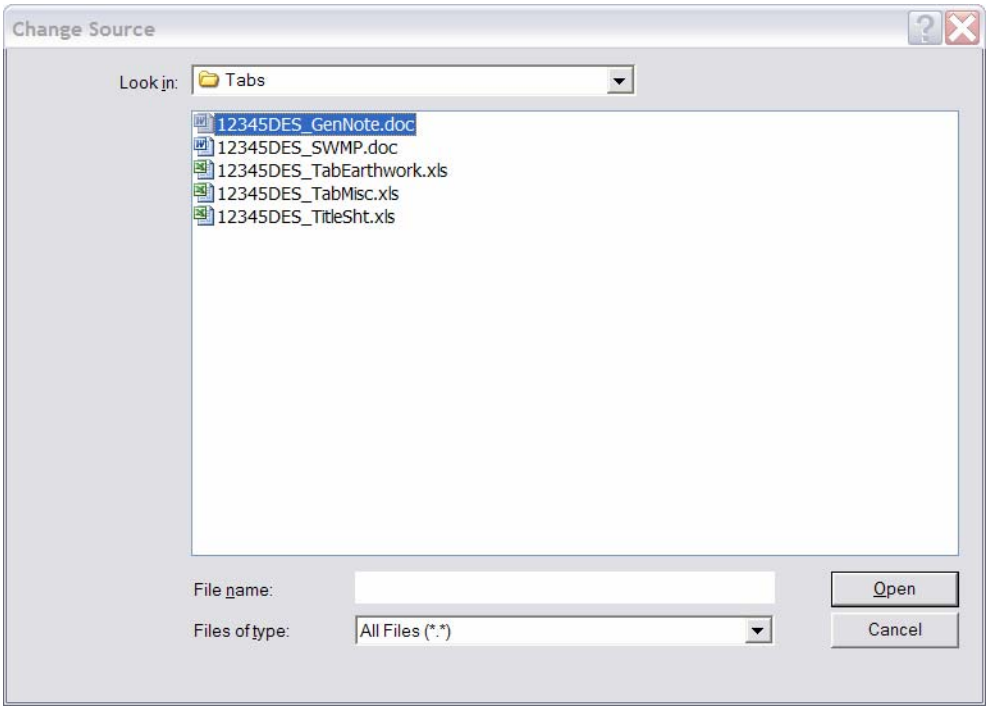
1. Start MicroStation and open the file **12345DES_GenNote##.dgn** from the **C:\Projects\12345\Design\Drawings** folder.

This file was automatically generated by the create project utility program and contains links to a General Notes Word document in the generic project template folder. You will need to update these links to the General Notes Word document in the project folder.

2. Select **Edit > Links**.
3. Highlight the first link in the list and select **Change Source**.

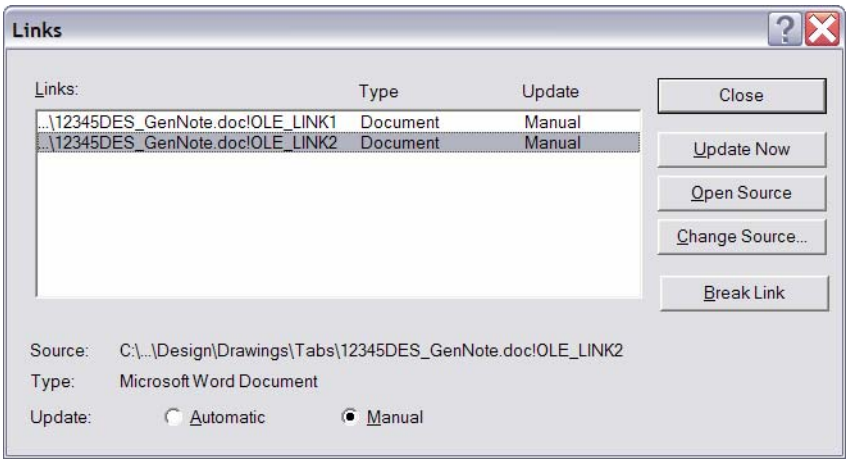


4. In the **Change Source** dialog box, set the Look in folder to **C:\Projects\12345\Design\Drawings\Tabs** and select the file **12345DES_GenNote.doc**.



5. Select **Open** to update the link.

6. Repeat this process for the second link.



7. **Close** the **Links** dialog box.

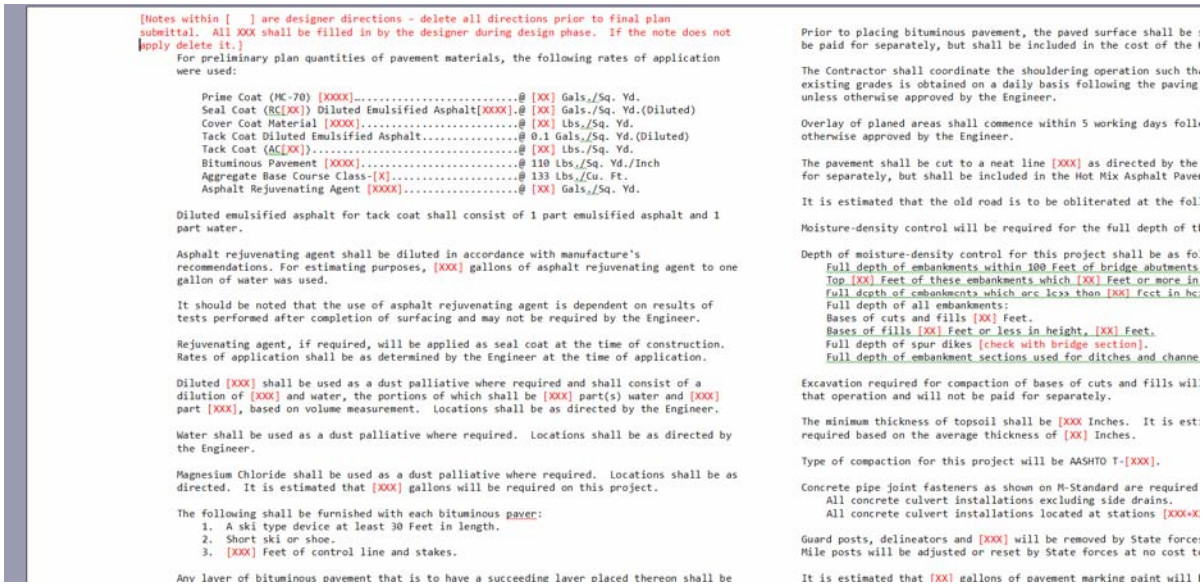
8. **Save Settings** (**File > Save Settings**).

   The General Notes sheet file is now linked to the GenNotes.doc file in the project-specific folder. You can now edit the Word file for your project-specific requirements.

Editing the Notes

1. Double click on the first notes link (left sheet).

   This opens Microsoft Word and the **GenNotes.doc** file.


[Notes within [ ] are designer directions - delete all directions prior to final plan submittal. All XXX shall be filled in by the designer during design phase. If the note does not apply delete it.]

For preliminary plan quantities of pavement materials, the following rates of application were used:

Prime Coat (MC-70) [XXXX].....@ [XX] Gals./Sq. Yd.
Seal Coat (RC[XX]) Diluted Emulsified Asphalt[XXXX].@ [XX] Gals./Sq. Yd.(Diluted)
Cover Coat Material [XXXX].....@ [XX] Lbs./Sq. Yd.
Tack Coat Diluted Emulsified Asphalt.....@ 0.1 Gals./Sq. Yd.(Diluted)
Tack Coat (AC[XX]).....@ [XX] Lbs./Sq. Yd.
Bituminous Pavement [XXXX].....@ 110 Lbs./Sq. Yd./Inch
Aggregate Base Course Class-[X].....@ 133 Lbs./Cu. Ft.
Asphalt Rejuvenating Agent [XXXX].....@ [XX] Gals./Sq. Yd.

Diluted emulsified asphalt for tack coat shall consist of 1 part emulsified asphalt and 1 part water.

Asphalt rejuvenating agent shall be diluted in accordance with manufacture's recommendations. For estimating purposes, [XXX] gallons of asphalt rejuvenating agent to one gallon of water was used.

It should be noted that the use of asphalt rejuvenating agent is dependent on results of tests performed after completion of surfacing and may not be required by the Engineer.

Rejuvenating agent, if required, will be applied as seal coat at the time of construction. Rates of application shall be as determined by the Engineer at the time of application.

Diluted [XXX] shall be used as a dust palliative where required and shall consist of a dilution of [XXX] and water, the portions of which shall be [XXX] part(s) water and [XXX] part [XXX], based on volume measurement. Locations shall be as directed by the Engineer.

Water shall be used as a dust palliative where required. Locations shall be as directed by the Engineer.

Magnesium Chloride shall be used as a dust palliative where required. Locations shall be as directed. It is estimated that [XXX] gallons will be required on this project.

The following shall be furnished with each bituminous paver:
1. A ski type device at least 30 Feet in length.
2. Short ski or shoe.
3. [XXX] Feet of control line and stakes.

Any layer of bituminous pavement that is to have a succeeding layer placed thereon shall be

Prior to placing bituminous pavement, the paved surface shall be
be paid for separately, but shall be included in the cost of the

The Contractor shall coordinate the shouldering operation such th
existing grades is obtained on a daily basis following the paving
unless otherwise approved by the Engineer.

Overlay of planed areas shall commence within 5 working days foll
otherwise approved by the Engineer.

The pavement shall be cut to a neat line [XXX] as directed by the
for separately, but shall be included in the Hot Mix Asphalt Pave

It is estimated that the old road is to be obliterated at the fol

Moisture-density control will be required for the full depth of t

Depth of moisture-density control for this project shall be as fo
Full depth of embankments within 100 Feet of bridge abutments
Top [XX] Feet of these embankments which [XX] Feet or more in
Full depth of embankments which are less than [XX] feet in he
Full depth of all embankments:
Bases of cuts and fills [XX] Feet.
Bases of fills [XX] Feet or less in height, [XX] Feet.
Full depth of spur dikes [check with bridge section].
Full depth of embankment sections used for ditches and channe

Excavation required for compaction of bases of cuts and fills wil
that operation and will not be paid for separately.

The minimum thickness of topsoil shall be [XXX Inches. It is est
required based on the average thickness of [XX] Inches.

Type of compaction for this project will be AASHTO T-[XXX].

Concrete pipe joint fasteners as shown on M-Standard are required
All concrete culvert installations excluding side drains.
All concrete culvert installations located at stations [XXX+X

Guard posts, delineators and [XXX] will be removed by State force
Mile posts will be adjusted or reset by State forces at no cost t

It is estimated that [XX] gallons of pavement marking paint will

2. Read the first instructional paragraph (red text) and then delete it.

3. Delete the following text:

Prime Coat (MC-70) [XXXX] .....@ .XX Gals./Sq. Yd.

Seal Coat (RC[XX]) Diluted Emulsified Asphalt [XXXX] .....@ XX Gals./Sq. Yd. (Diluted)

Cover Coat Material [XXXX].....@ XX Lbs./Sq. Yd.

Tack Coat (AC[XX].....@ XX Lbs./Sq. Yd.

Asphalt Rejuvenating Agent [XXXX].....@ XX Gals./Sq. Yd.

4. Edit the following text to read as follows:

Tack Coat Diluted Emulsified Asphalt.....@ 0.1 Gals./Sq. Yd. (Diluted)

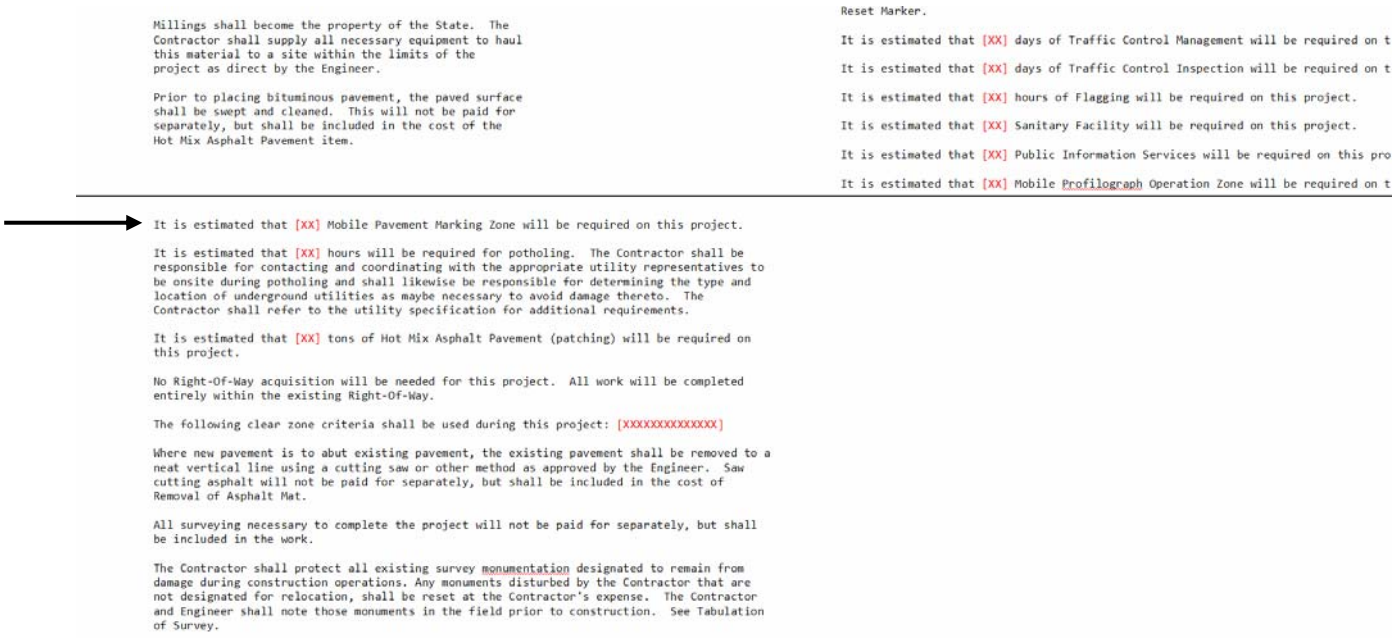
Bituminous Pavement…….....@ 110 Lbs./Sq. Yd./Inch

Aggregate Base Course (Class 6)..... .....@ 133 Lbs/Cu Yd

5. At the bottom of the first column, add a blank line to place the paragraph beginning "*The Contractor shall coordinate the shouldering…*" at the top of the next column.

6. Look at the top of the next page and note that your edits have adjusted the text wrapping. The next page now starts with the note:

   It is estimated that [XX] Mobile Pavement Marking Zone will be required on this project.



Millings shall become the property of the State. The Contractor shall supply all necessary equipment to haul this material to a site within the limits of the project as direct by the Engineer.

Prior to placing bituminous pavement, the paved surface shall be swept and cleaned. This will not be paid for separately, but shall be included in the cost of the Hot Mix Asphalt Pavement item.

Reset Marker.

It is estimated that [XX] days of Traffic Control Management will be required on t

It is estimated that [XX] days of Traffic Control Inspection will be required on t

It is estimated that [XX] hours of Flagging will be required on this project.

It is estimated that [XX] Sanitary Facility will be required on this project.

It is estimated that [XX] Public Information Services will be required on this pro

It is estimated that [XX] Mobile Profilograph Operation Zone will be required on t

It is estimated that [XX] Mobile Pavement Marking Zone will be required on this project.

It is estimated that [XX] hours will be required for potholing. The Contractor shall be responsible for contacting and coordinating with the appropriate utility representatives to be onsite during potholing and shall likewise be responsible for determining the type and location of underground utilities as maybe necessary to avoid damage thereto. The Contractor shall refer to the utility specification for additional requirements.

It is estimated that [XX] tons of Hot Mix Asphalt Pavement (patching) will be required on this project.

No Right-Of-Way acquisition will be needed for this project. All work will be completed entirely within the existing Right-Of-Way.

The following clear zone criteria shall be used during this project: [XXXXXXXXXXXXX]

Where new pavement is to abut existing pavement, the existing pavement shall be removed to a neat vertical line using a cutting saw or other method as approved by the Engineer. Saw cutting asphalt will not be paid for separately, but shall be included in the cost of Removal of Asphalt Mat.

All surveying necessary to complete the project will not be paid for separately, but shall be included in the work.

The Contractor shall protect all existing survey monumentation designated to remain from damage during construction operations. Any monuments disturbed by the Contractor that are not designated for relocation, shall be reset at the Contractor's expense. The Contractor and Engineer shall note those monuments in the field prior to construction. See Tabulation of Survey.

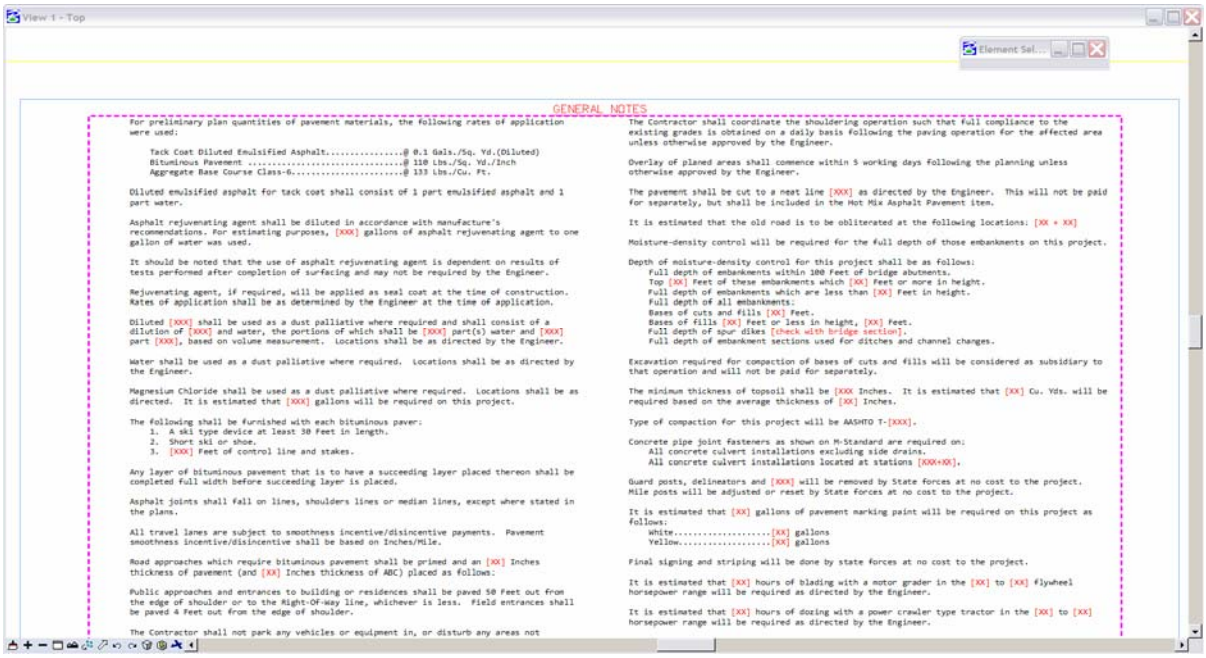
7. Review the text to make sure the edits are correct. If not, edit the text again until you're satisfied.

8. In Word, select **File > Exit** and select **Yes** when prompted to save changes.

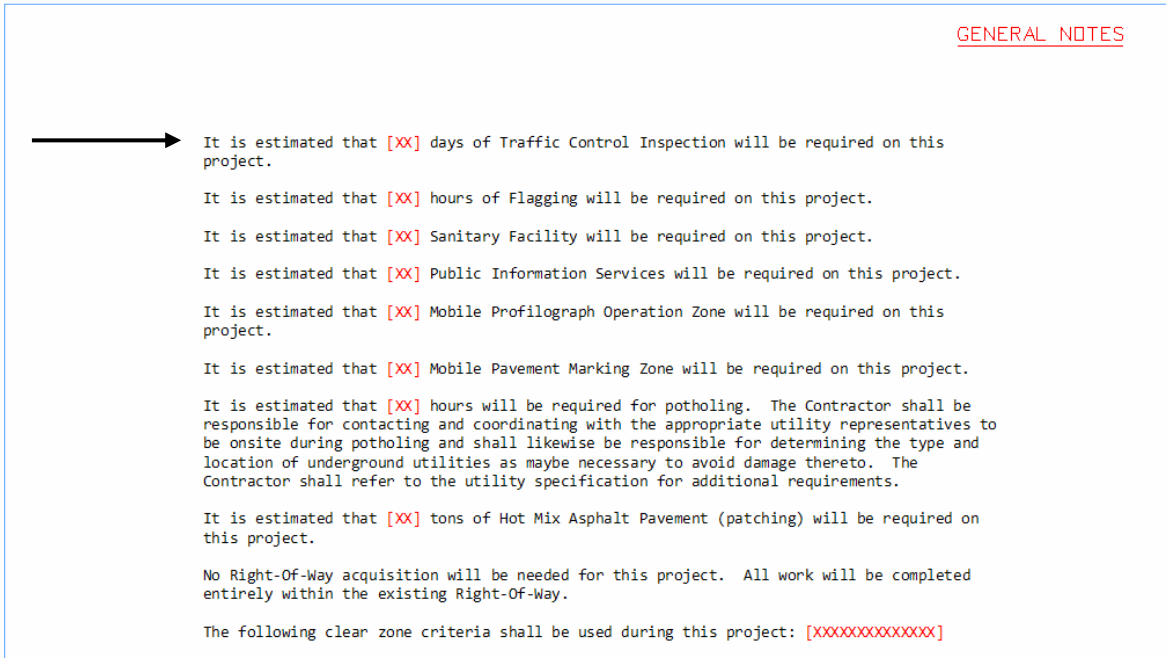
   You are returned to the General Notes sheet in MicroStation.

Review the changes in the sheet file

1. Zoom in on the notes on the first sheet and notes your text edits have been updated in the DGN file.



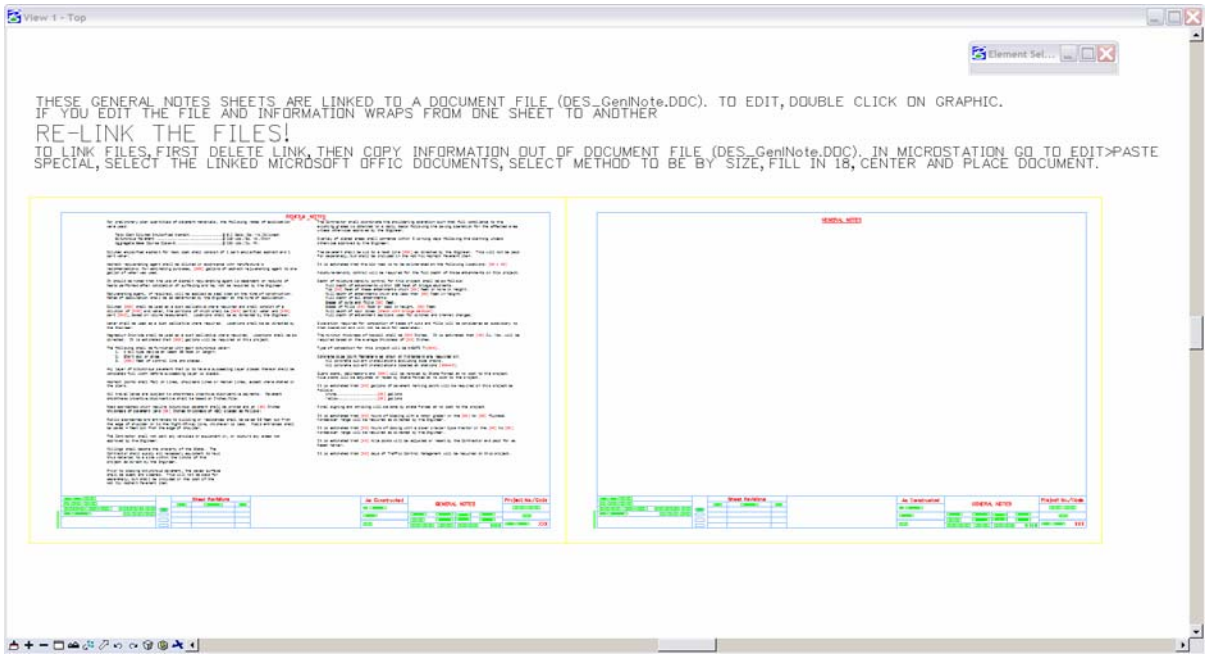
2. Zoom in on the notes on the second sheet (right side) and notice that your edits have ***not*** been updated in the file.



Note: If you make edits that change the wrapping of text between pages in the Word document, you must re-link the file for the edits to update in the MicroStation DGN file.

Re-link the Word document

1. Use the **Element Selection** tool to select the Word document link on the second (right-side) sheet.
2. Select **Delete**.

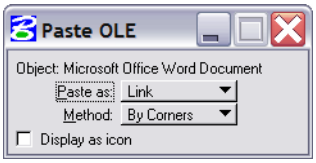


3. Double-click on the Word document link on the first sheet to open the **GenNotes.doc** file.

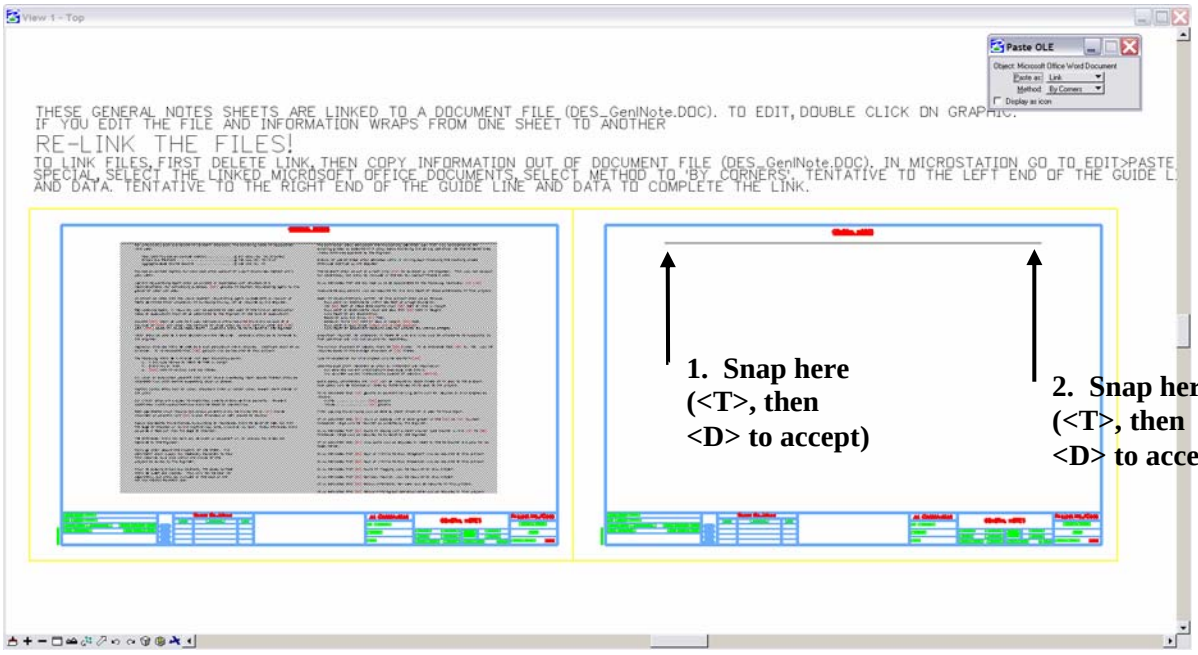
4. Highlight all of the text on the second page and select **Edit > Copy** in Word.

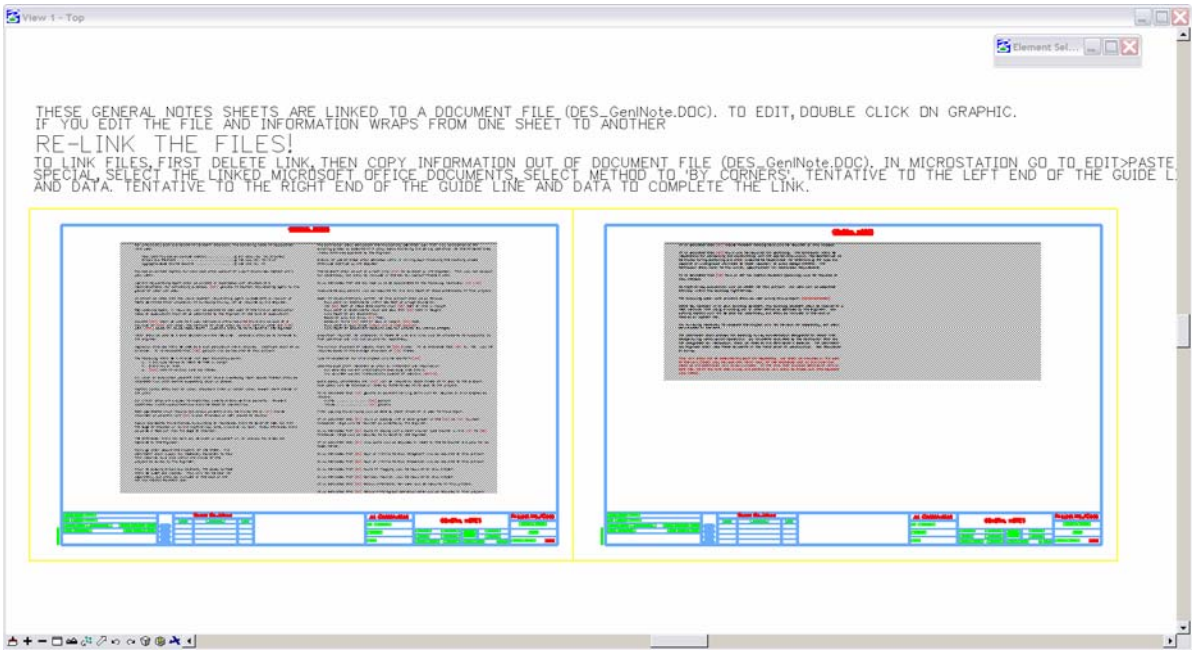
5. ***Do not*** close Word.
6. Switch to the MicroStation application.
7. In MicroStation, select **Edit > Paste Special** and select the **Linked Microsoft Office Word Document** option and then select **Paste**.

8. In the **Paste OLE** box, set **Paste As** to **Link** and **Method** to **By Corners**.

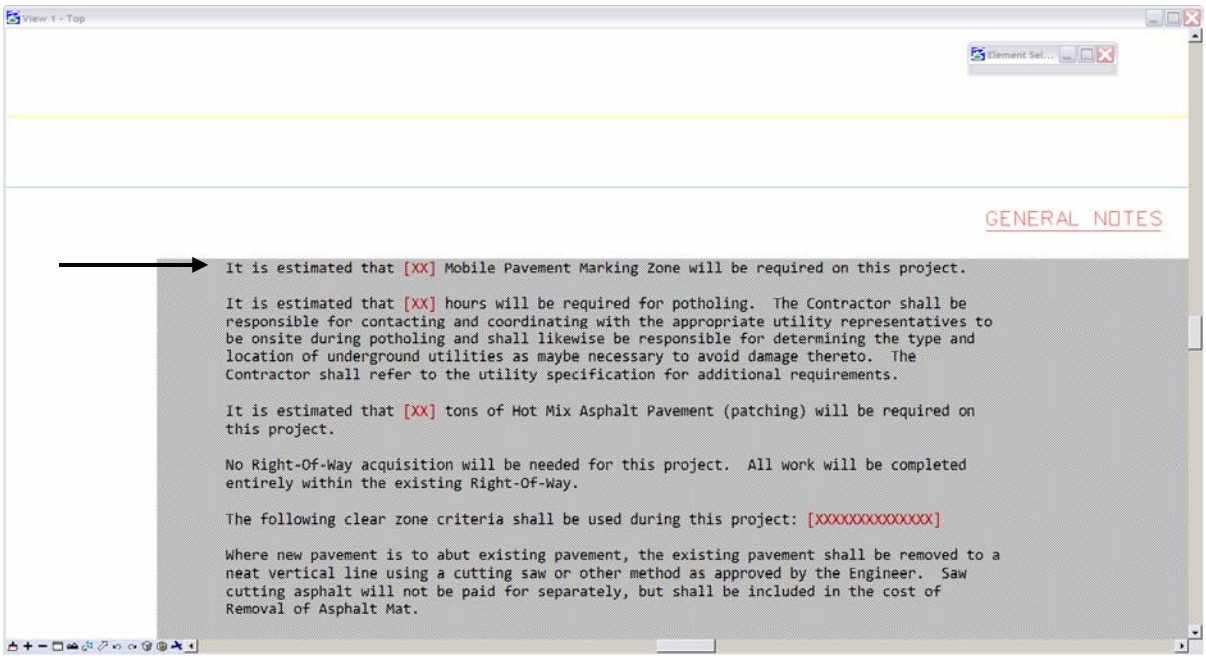


9. Snap to the two ends of the top guideline as shown.





10. Zoom in to review the notes and notice that the link has been updated to reflect your edits.



11. Switch over to the Word document and select **File > Exit**. If prompted to save the file, select **Yes**.
12. In MicroStation, **Fit** the view.
13. **Save Settings**.
14. **Exit** MicroStation.

Lab 9G – Create the Standard Plans List Sheet

The M&S standard sheet is created by downloading the M&S Standards Plan List Index file from the CDOT web site. You can then update the reference in the M&S sheet file to point to this downloaded file.

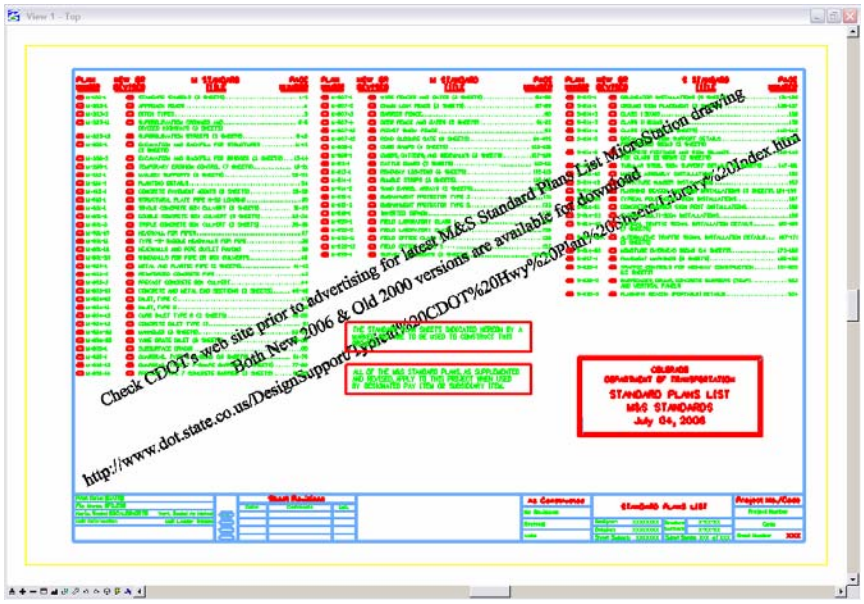
Objectives

After completing this exercise you will know how to:

- Download the M&S Index file from the CDOT web site.
- Update the M&S sheet file reference to the downloaded file.
- Use the **Create Region** command to update the M&S Index Sheet for the project.

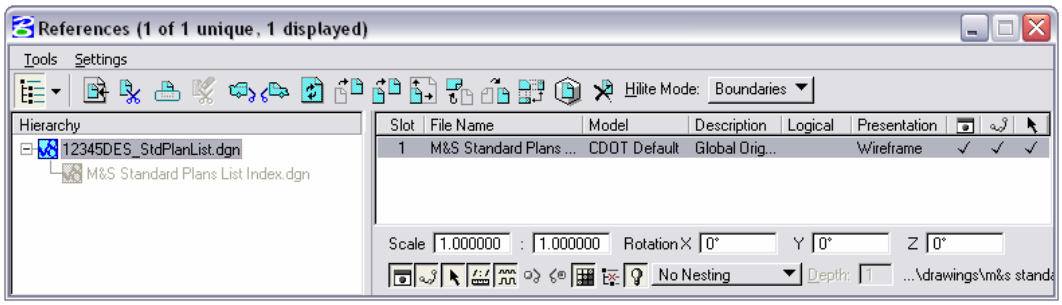
Open the Sheet File

1. Start MicroStation and open the **12345DES_StdPlanList.dgn** file from the **C:\Projects\12345\Design\Drawings** folder.



The file opens and contains the border along with the M&S Standards Plan List reference. It also contains the web address to obtain the latest M&S Index file.

2. Select **References** from the **Primary** toolbar.



Note that the **M&S StandardPlansListIndex.dgn** file is already referenced from the project's **\Design\Drawings** folder. It was automatically placed here from the **Create Project Directory** utility.

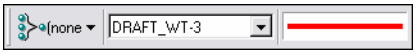
Note: If you need newer or different version of the M&S Standards, you can download it from the following web address: www.dot.state.co.us/DesignSupport/. Save the appropriate file to the project's **\Design\Drawings** folder and then re-attach this reference.

Update the M&S Index

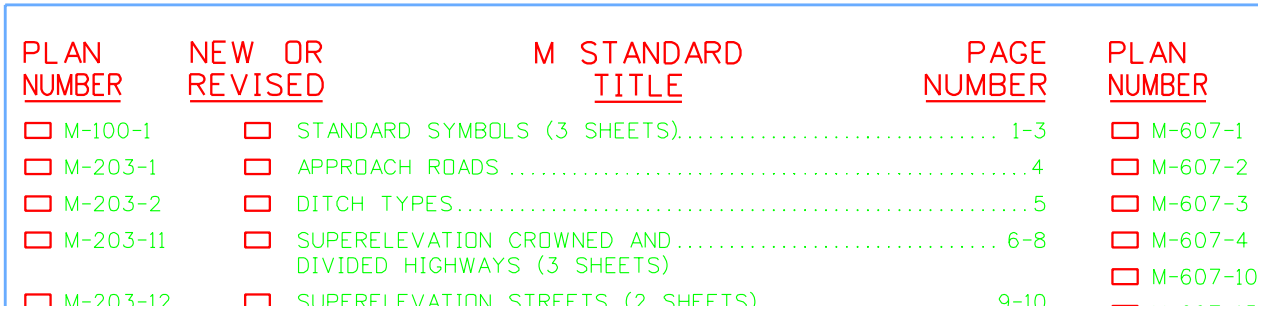
1. Turn off the **DRAFT_INFO_No-Plot** level to turn off the text.

   Note: Since the text is on a "no plot" level, you don't have to turn off the text. However, it just makes working in the file a bit easier.

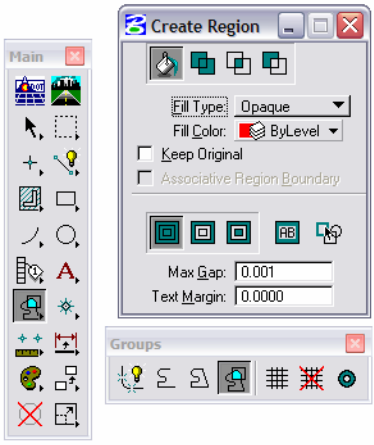
2. Set the active level to **DRAFT_WT-3**.



3. Window in to the top of the sheet as shown.

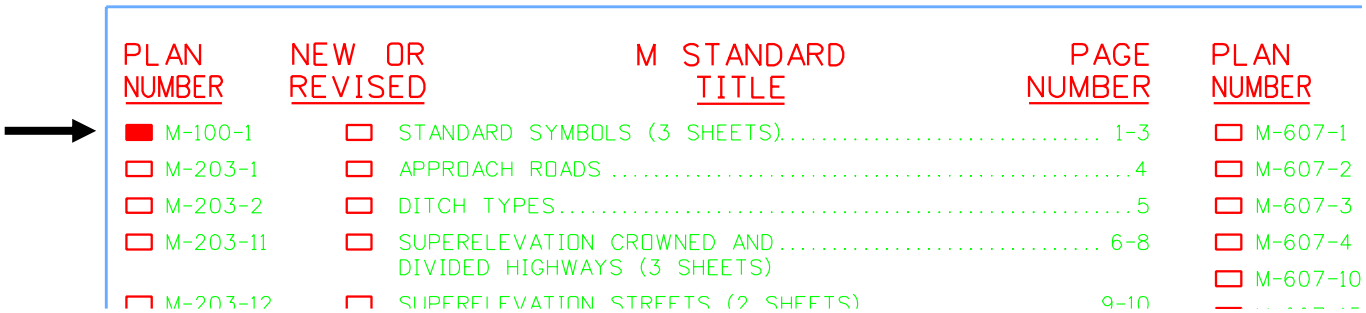


4. Select the **Create Region** command from the **Groups** toolbar and set the options as shown.



5. For the first plan in the list (M-100-1), **<D>** inside the block under the **Plan Number** column.

6. **<D>** to accept.

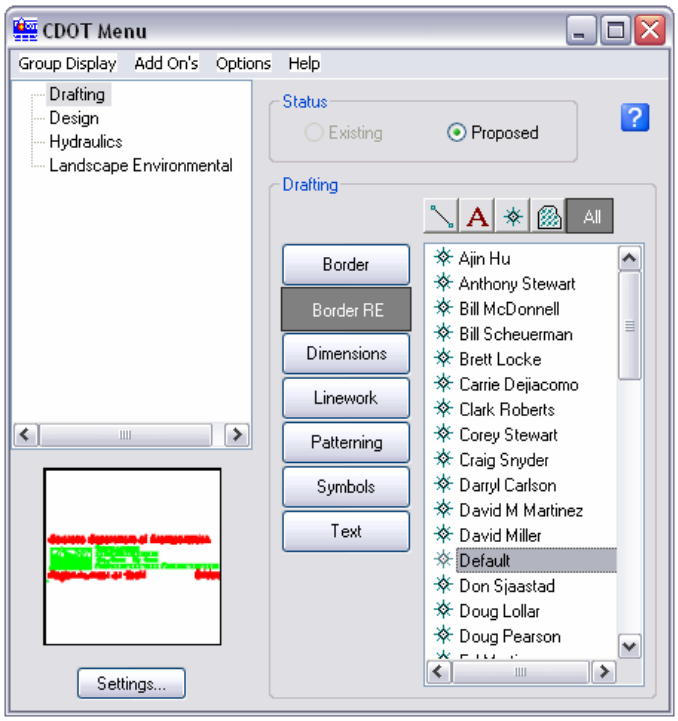


The block is filled-in using this tool.

7. Fill in other blocks as desired.

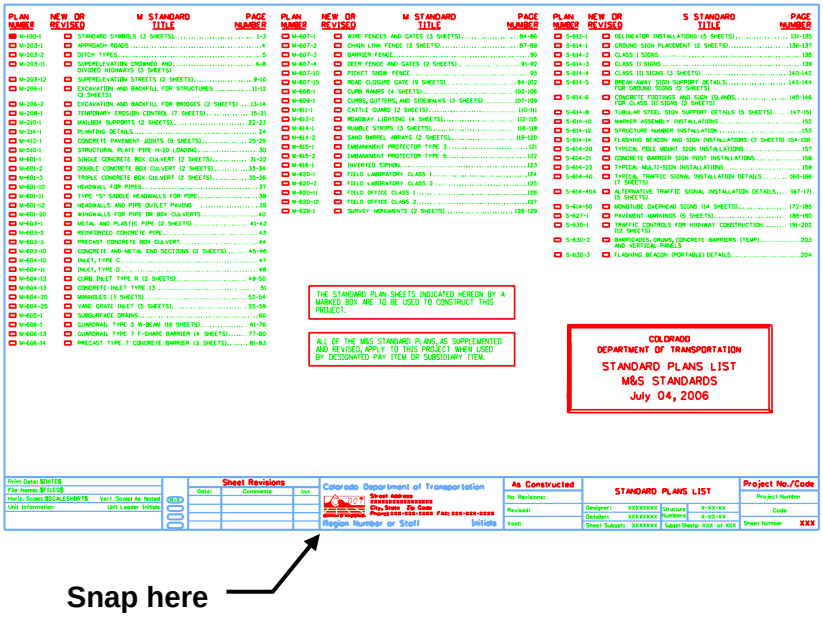
Fill in the Border Information

1. From the CDOT Menu Explorer, select **Drafting**, then the **Border RE** category and select the **Default** Resident Engineer cell.



2. **Apply**.

3. **Snap** to the location shown to place the cell.



4. Use the **Edit Text** command to edit the **Project Number** and **Code** as shown.

5. Use the **Edit Text** command to place your initials in the **Designer** and **Detailer** blocks.

6. **Fit** the view.

7. **Save Settings** (**File > Save Settings**).

8. **Exit** MicroStation.

Lab 9H – Create a Title Sheet

In this lab, you'll learn how to insert a Vicinity Map into the Project Title Sheet.

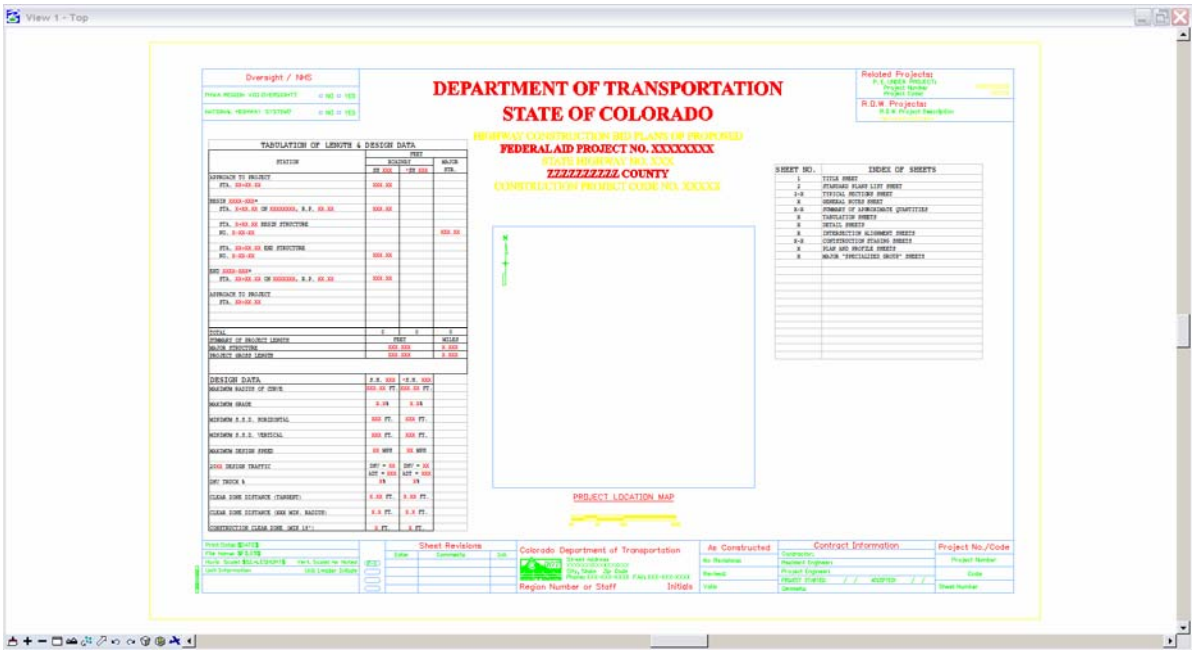
Objectives

After completing this exercise you will know how to:

- Open a project Title Sheet.
- Locate a vicinity map.
- Attach a vicinity map as a reference to the Title Sheet.
- Move and Clip the vicinity reference.

Open the Title Sheet file

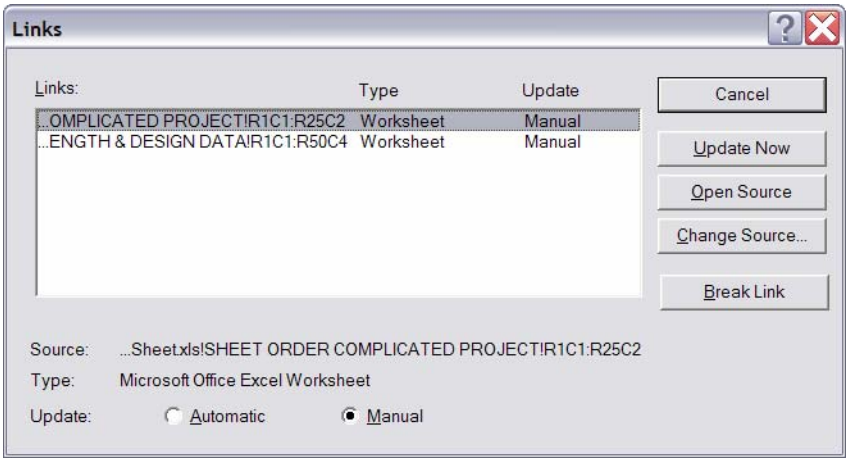
1. Start MicroStation and open the file **12345DES_TitleSht.dgn** for the **C:\Projects\12345\Design\Drawings** folder**.**



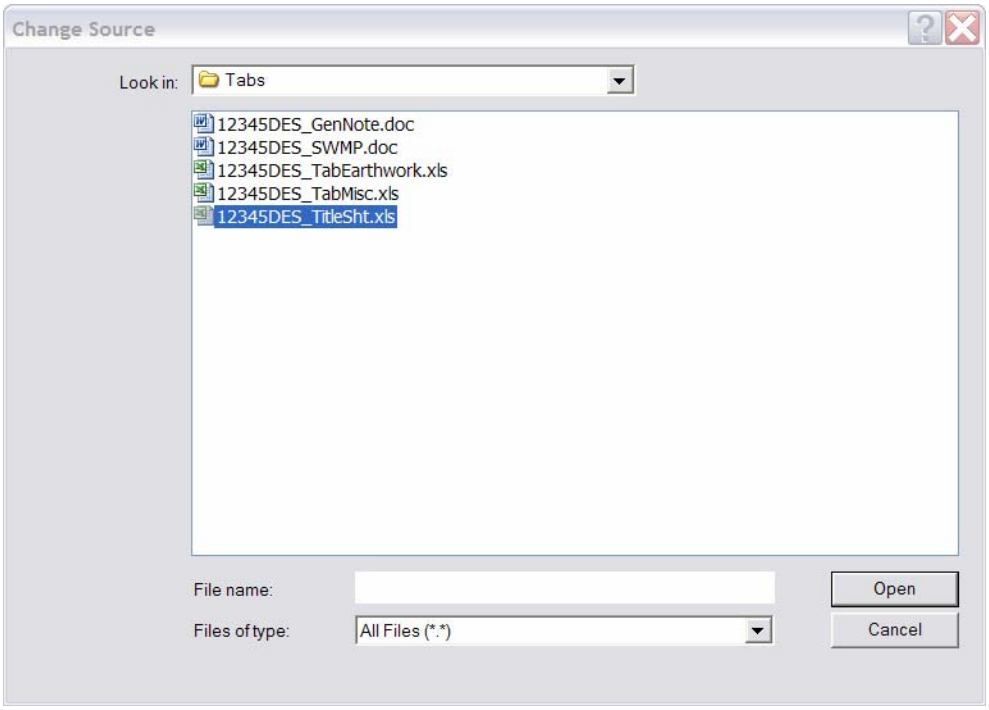
This file was automatically generated by the Create Project Utility program and contains a links to an Excel spreadsheet file in the generic project template folder. You will need to update these links to the **12345DES_TitleSht.xls** file in the project folder.

Updating Links

1. Select **Edit > Links**.
2. Highlight the first link in the list and select **Change Source**.

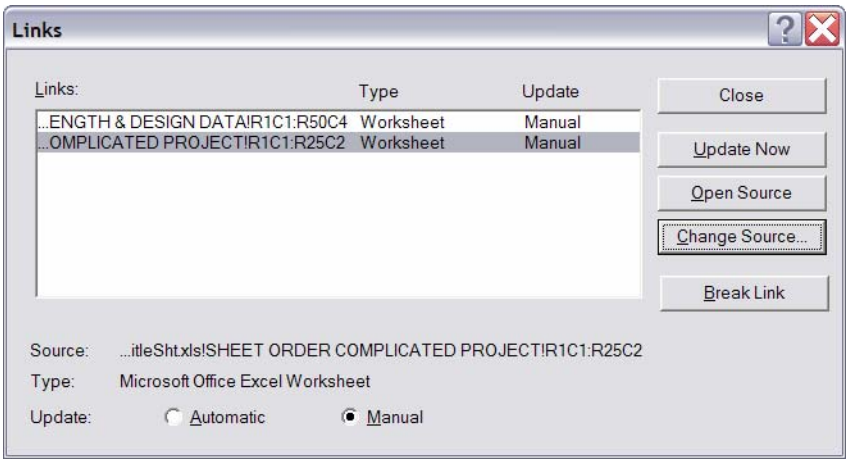


3. In the **Change Source** dialog box, set the Look in folder to **C:\Projects\12345\Design\Drawings\Tabs** and select the file **12345DES_TitleSht.xls**.



4. Select **Open** to update the link.

5. Repeat this process for the second link.



6. **Close** the **Links** dialog box.

7. **Save Settings** (**File > Save Settings**).

   The Title sheet design file is now linked to the Excel spreadsheet file in the project-specific folder. You can now edit the Excel file for your project-specific requirements.

Edit the spreadsheet file

1. Double-click on the **Tabulation of Length & Design Data** link.

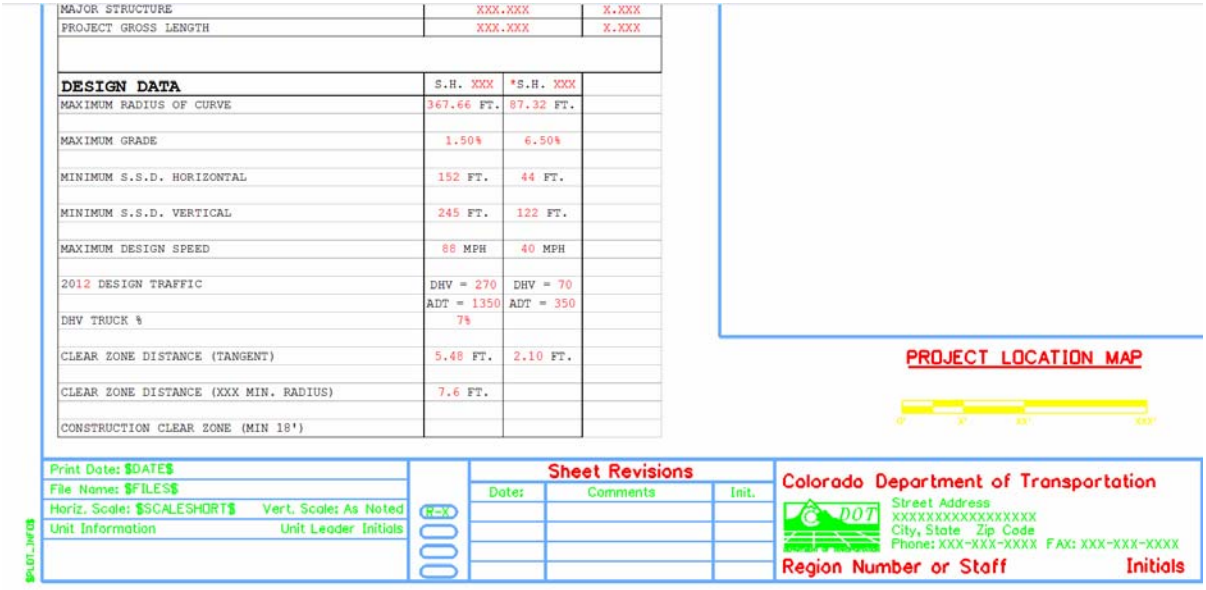
2. Excel starts and opens the **12345DES_TitleSht.xls** file.

3. In the *Design Data* portion of the file, make the following edits:

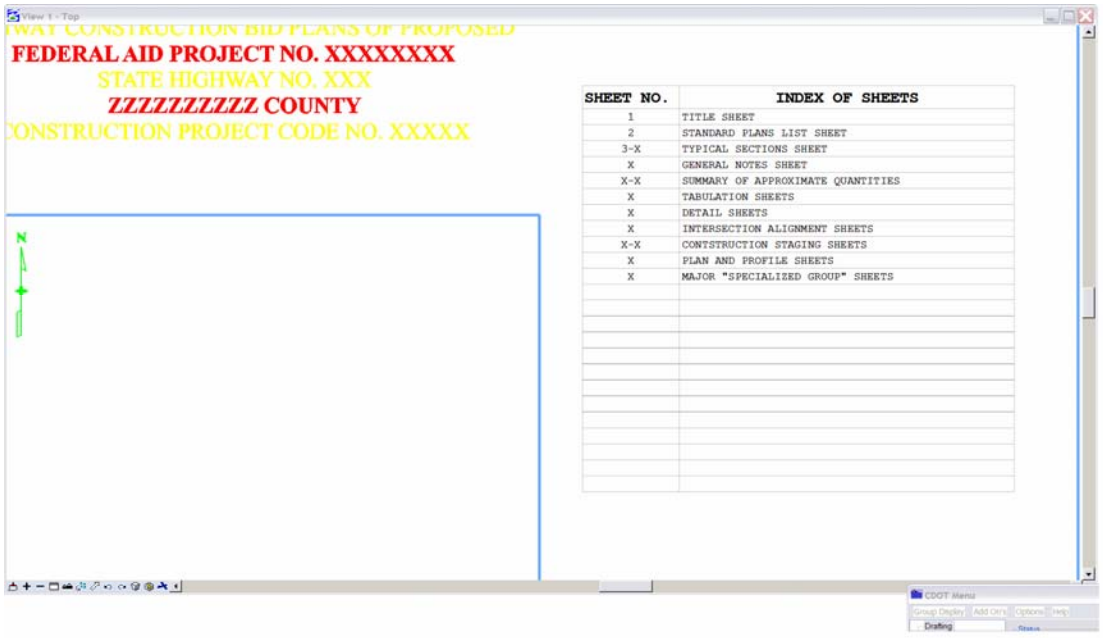
DESIGN DATA	S.H. XXX	*S.H. XXX
MAXIMUM RADIUS OF CURVE	367.66 FT.	87.32 FT.
MAXIMUM GRADE	1.50%	6.50%
MINIMUM S.S.D. HORIZONTAL	152 FT.	44 FT.
MINIMUM S.S.D. VERTICAL	245 FT.	122 FT.
MAXIMUM DESIGN SPEED	88 MPH	40 MPH
2012 DESIGN TRAFFIC	DHV = 270	DHV = 70
	ADT = 1350	ADT = 350
DHV TRUCK %	7%	
CLEAR ZONE DISTANCE (TANGENT)	5.48 FT.	2.10 FT.
CLEAR ZONE DISTANCE (XXX MIN. RADIUS)	7.6 FT.	

4. When finished, select **File > Exit** In Excel. When prompted to save changes to the file, select **Yes**.

5. Switch back to the MicroStation file and note that the edits are now updated in the DGN file.



6. Window in on the *Index of Sheets* link on the right side of the sheet.



7. Using what you've learned, Edit the **12345DES_TitleSht.xls** file and update the DGN file to read as shown below.

   Note: When entering pages ranges (e.g. 3-4) be sure to put a quote mark (') at the beginning of text entry, otherwise Excel will interpret this as a date (i.e. March 4).

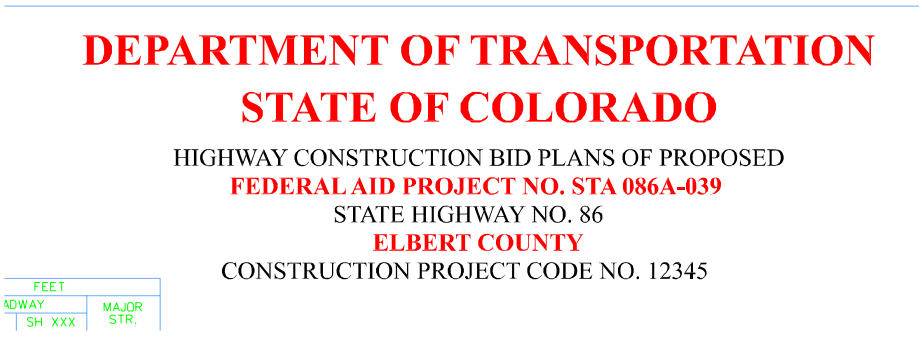
   Hint: You can insert and delete rows as needed in Excel.

SHEET NO.	INDEX OF SHEETS
1	TITLE SHEET
2	STANDARD PLANS LIST SHEET
3-4	TYPICAL SECTIONS SHEET
5	GENERAL NOTES SHEET AND ROADWAY SEEDING PLAN
6-8	SUMMARY OF APPROXIMATE QUANTITIES
9	STRUCTURE QUANTITIES
10	SUMMARY OF EARTHWORK
11	INTERSECTION DETAILS
12-13	WETLAND AND EROSION CONTROL PLAN
14	TEMPORARY WATER DIVERSION PLAN
15	CHANNEL DETAILS
16-17	SH 145 PLAN AND PROFILE SHEETS

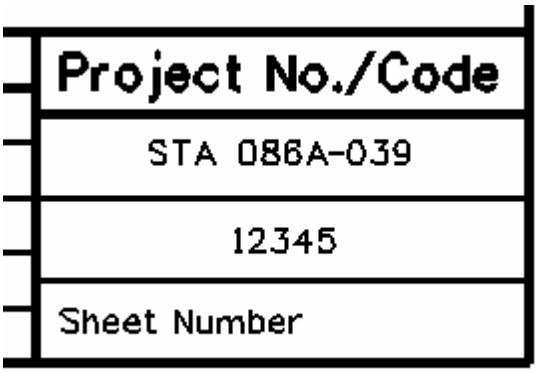
Edit the Border Text

1. Use the **Edit Text** command to make project specific edits to the border as shown.

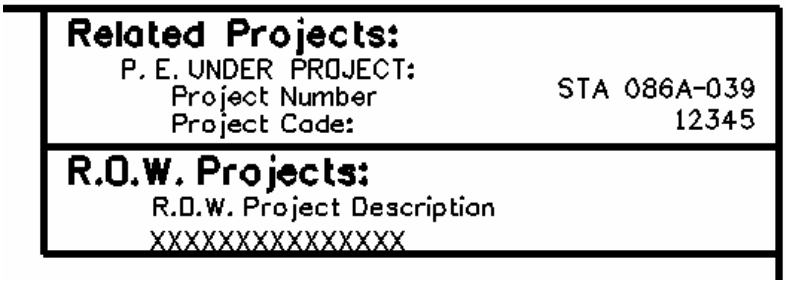
2. **Window** in to the top center of the title sheet and edit the project numbers, highway number and county name as shown.



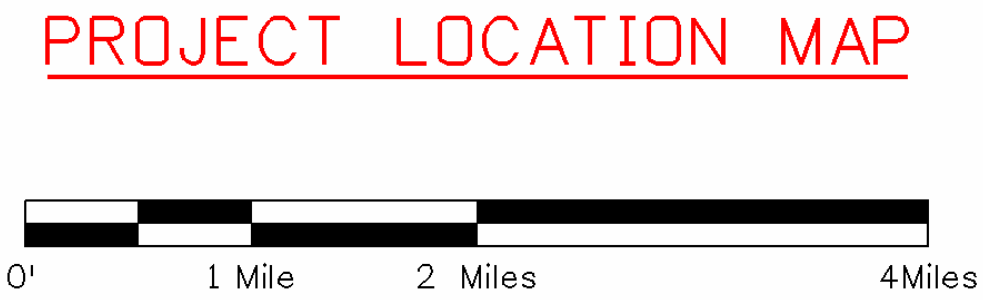
3. **Window** in to the lower-right corner and make the project edits as shown.



4. **Window** in to the upper-right corner and make the project edits as shown.

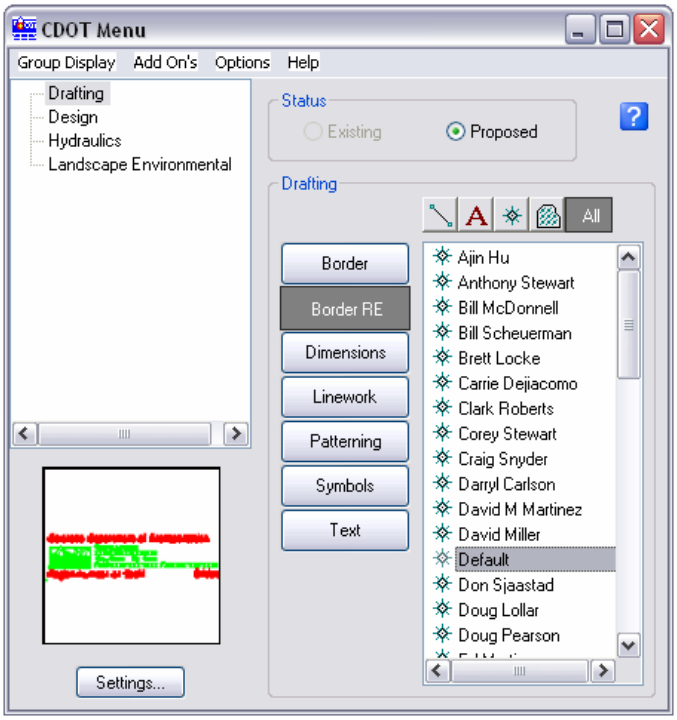


5. **Window** around the bar scale and edit the text as shown.

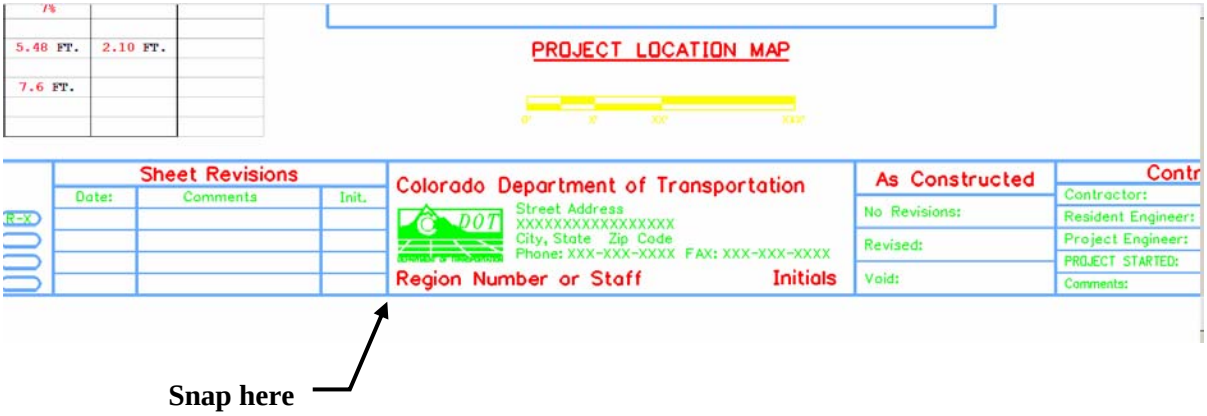


Place the RE cell

1. From the **CDOT Menu**, select **Border RE** from the **Drafting** group.



2. Place the **Default** RE cell in the location shown by snapping to the lower-left corner.



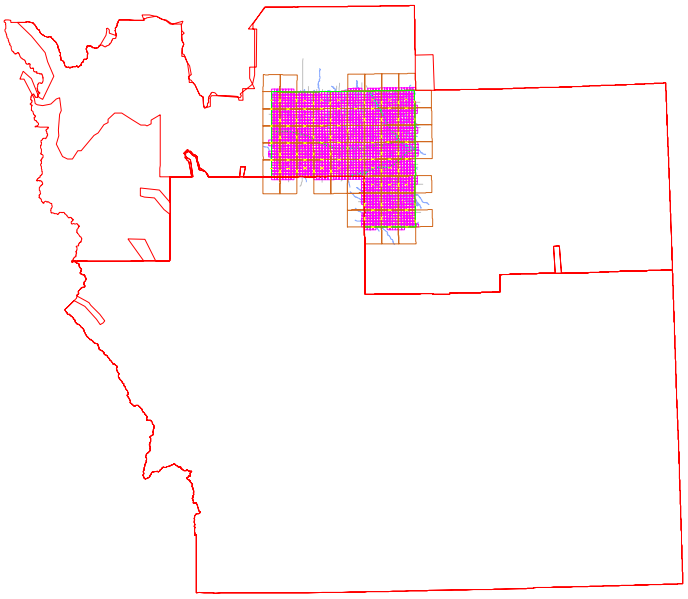
3. **Fit** the View.
4. **Save Settings**.

Review the Vicinity Map

Vicinity maps can be referenced to the title sheet. These maps can be in the form of vector files (CADD elements) or raster files (images).

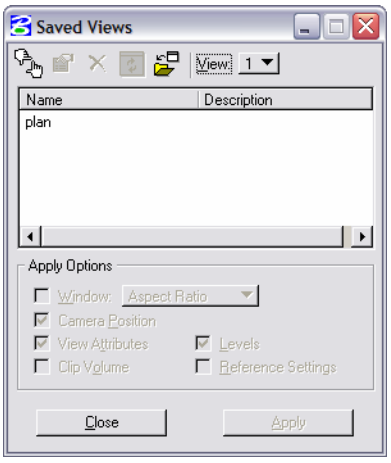
The CDOT standard procedure is to use county maps that have been translated from GIS information, these maps can be found on the shared drive at: \\public\CADD County Maps\. The county of interest should be copied to your project's **...\Design\Drawings\Reference_Files** folder and can be attached as a reference to the project's Title Sheet file.

1. Select **File > Open** and open **Elbert.dgn** from the **C:\Projects\12345\Design\Drawings\Reference_Files** folder.

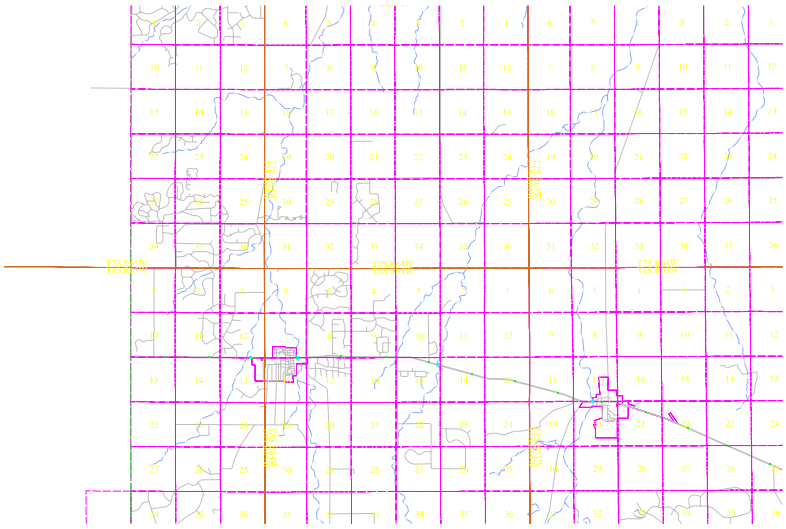


The Elbert county map was translated from GIS and copied from the \\public\CADD County Maps\ shared drive. This file contains a ***Saved View*** to assist in attaching it as a reference file.

2. Select **Utilities > Saved Views** from the MicroStation pull-down menu



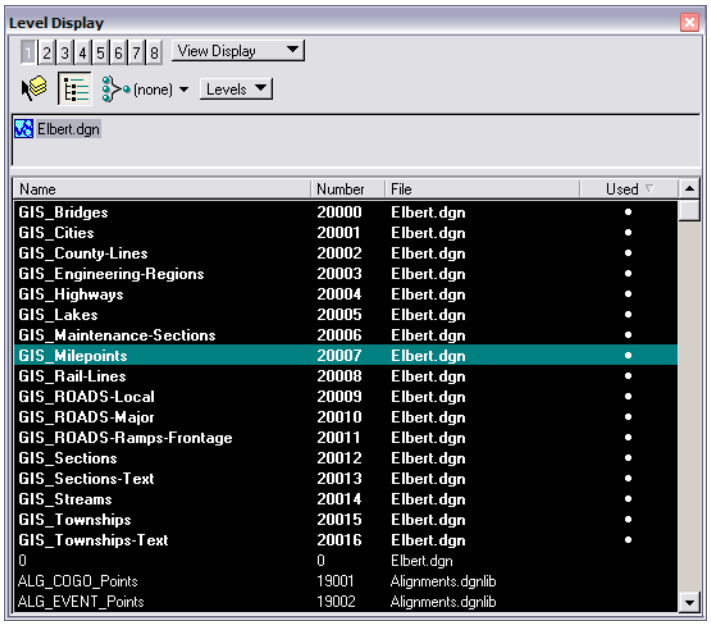
3. **<D>** on the saved view by the name of ***plan*** and select **Apply.**



The MicroStation view updates to the limits of the saved view.

4. **Close** the **Saved Views** dialog box.

5. **Open** the **Level Display** from the **Primary** toolbar. Note that all information resides on **GIS_*** levels.



Name	Number	File	Used
GIS_Bridges	20000	Elbert.dgn	•
GIS_Cities	20001	Elbert.dgn	•
GIS_County-Lines	20002	Elbert.dgn	•
GIS_Engineering-Regions	20003	Elbert.dgn	•
GIS_Highways	20004	Elbert.dgn	•
GIS_Lakes	20005	Elbert.dgn	•
GIS_Maintenance-Sections	20006	Elbert.dgn	•
GIS_Milepoints	20007	Elbert.dgn	•
GIS_Rail-Lines	20008	Elbert.dgn	•
GIS_ROADS-Local	20009	Elbert.dgn	•
GIS_ROADS-Major	20010	Elbert.dgn	•
GIS_ROADS-Ramps-Frontage	20011	Elbert.dgn	•
GIS_Sections	20012	Elbert.dgn	•
GIS_Sections-Text	20013	Elbert.dgn	•
GIS_Streams	20014	Elbert.dgn	•
GIS_Townships	20015	Elbert.dgn	•
GIS_Townships-Text	20016	Elbert.dgn	•
0	0	Elbert.dgn	
ALG_COGO_Points	19001	Alignments.dgnlib	
ALG_EVENT_Points	19002	Alignments.dgnlib	

6. Turn level displays **on** and **off** to verify the data is on the correct levels. Turn all levels **on** when finished.

Attaching a vicinity map as a reference file

In the next series of steps, you will attach the vicinity file as a reference to the title sheet. Once attached, you can move, scale and clip the reference to fit the display limits in the sheet file.

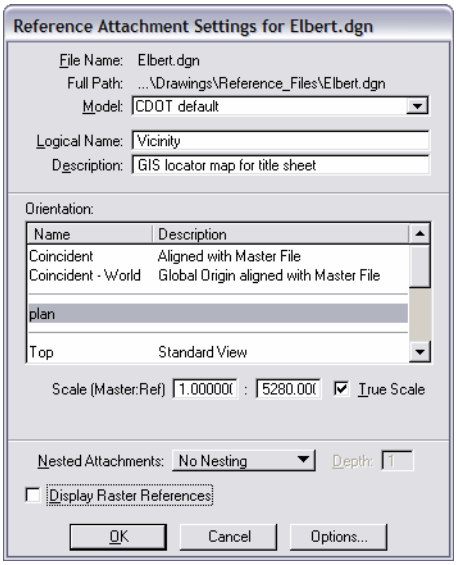
1. Select **File > Open** and reopen the title sheet **12345DES_TitleSht.dgn** from the project's **...\Design\Drawings folder.**

2. Select **References** from the **Primary** toolbar.

3. In the **References** dialog, select **Tools > Attach**.

4. Set the directory to the project's **...\Design\Drawings\Reference_Files** folder and select **Elbert.dgn**.

5. In the **Attachment Settings** box:



   - Under **Orientation**, select **plan** (the saved view).
   - Key in a **Logical Name** of ***Vicinity*** and a **Description** of ***GIS locator map for title sheet***.
   - Key in a **Scale** of ***1:5280***

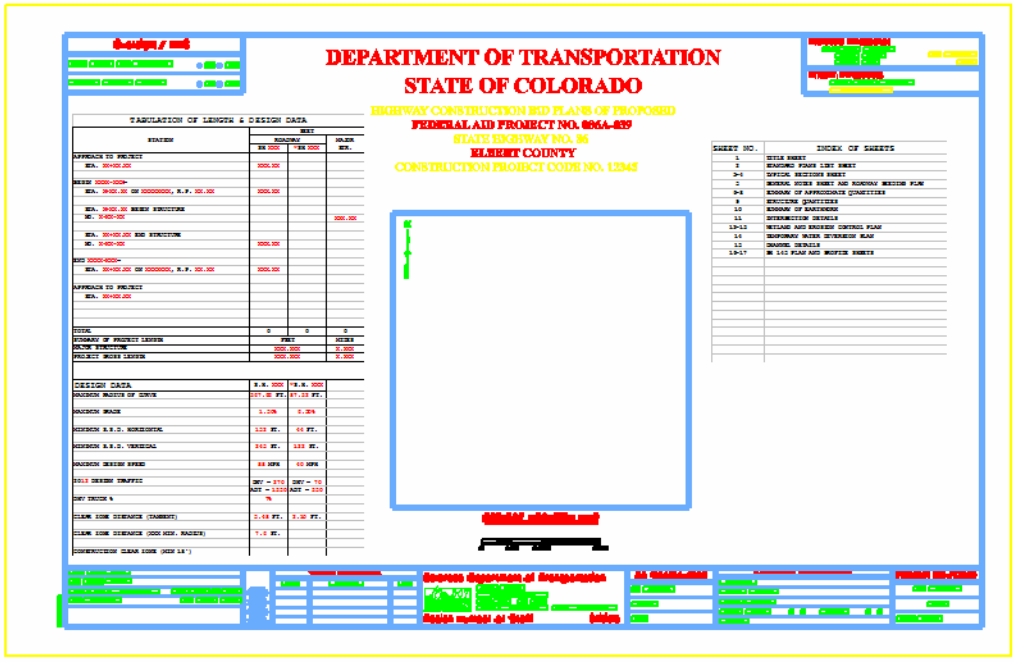
   Note: CDOT GIS maps are designed based on a 1-mile insertions scale (1 inch = 1 mile) for graphics. The linestyle and text scale factors are also based on this scale.

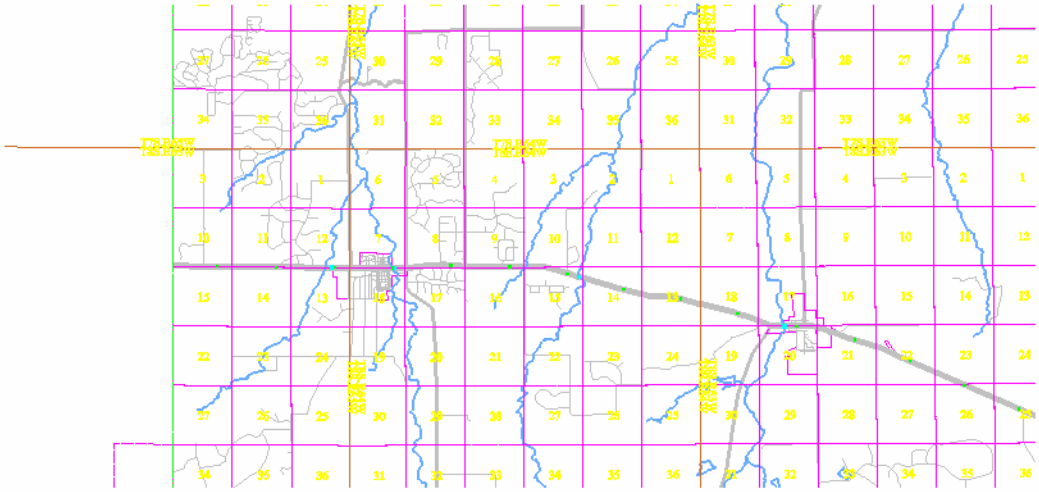
6. Select **OK**.

   The outline of the saved view reference is attached to your cursor.

7. **<D>** anywhere underneath the plan sheet to attach the reference.

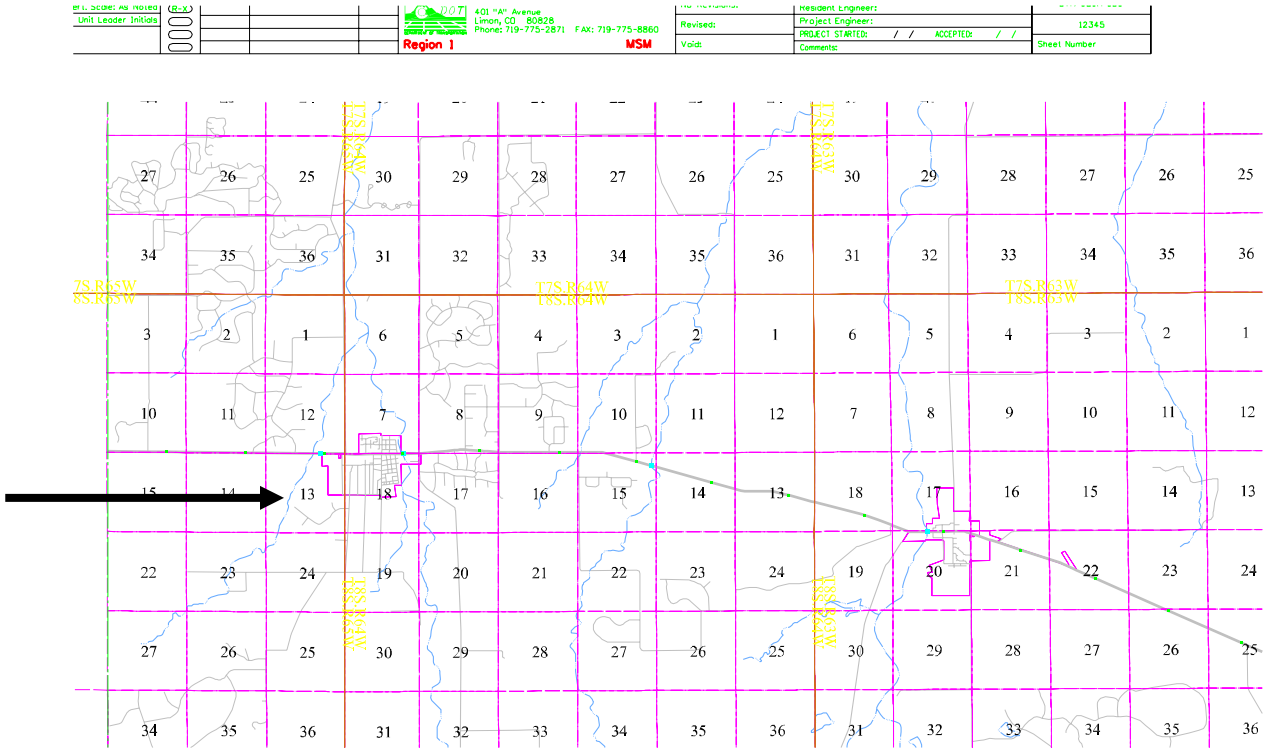
8. Select the MicroStation **Fit** command



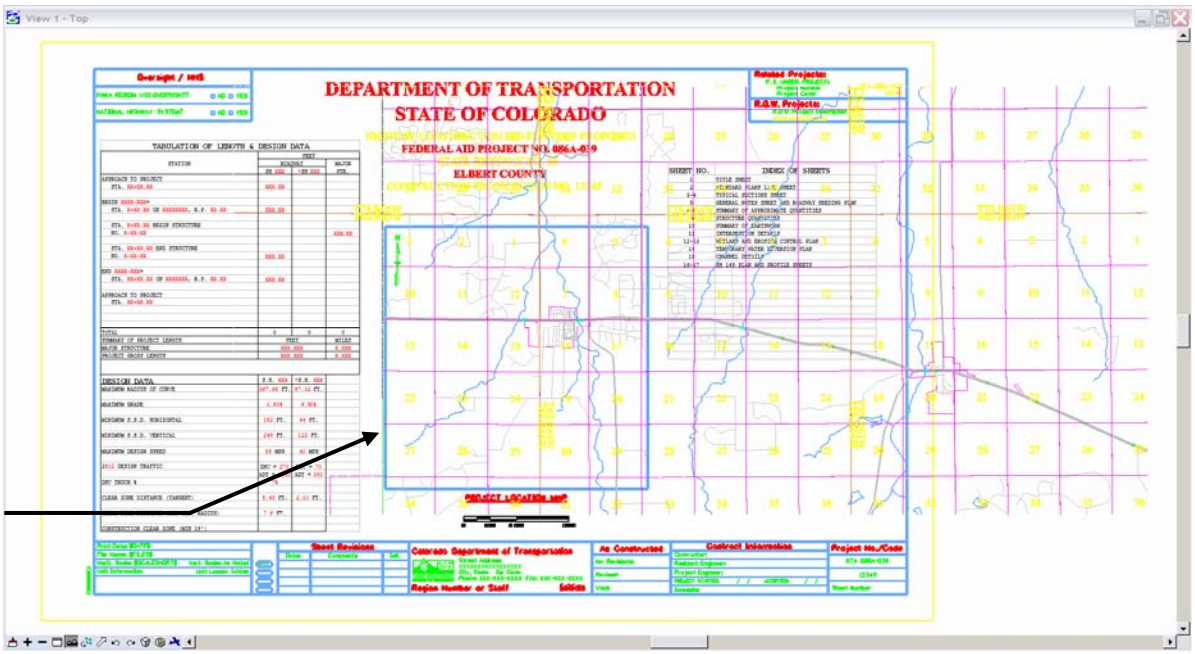


Move the reference file to align with the title sheet

1. In the **References** dialog box, select **Tools > Move.**
2. When prompted to enter a point to move from, **<D>** on section 13 on the vicinity reference.



3. **<D>** approximately in the center of the project location map block for the move to point.



4. Continue to use the **Move Reference** command as needed to position the reference as shown.

5. **<R>** when done.

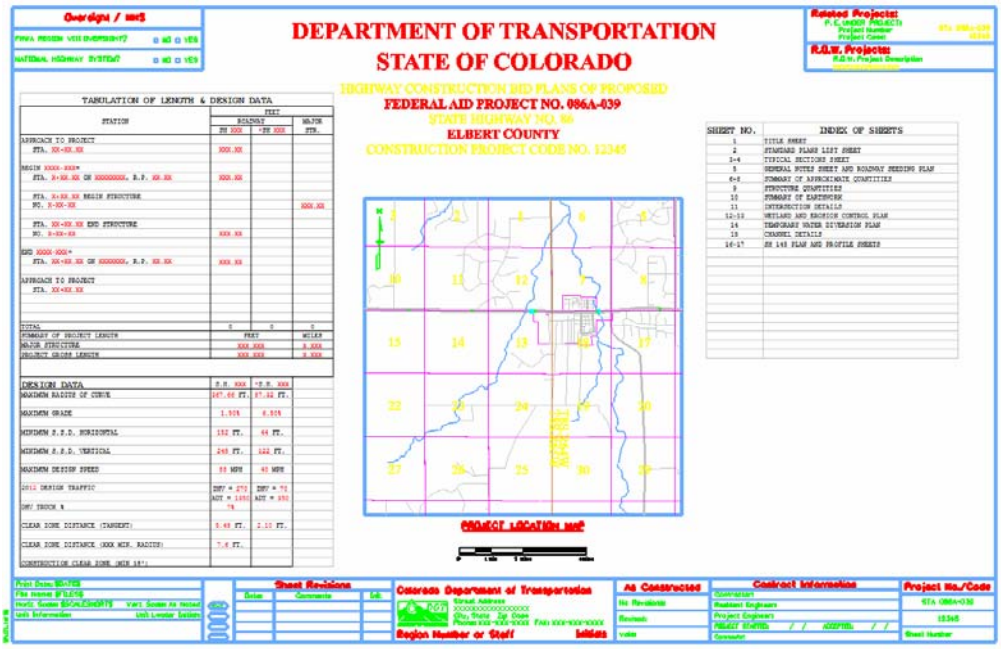
Clip the vicinity map reference

1. In the **Reference** dialog, highlight the **Vicinity** reference
2. Select **Tools > Clip Boundary** from the **Reference File** dialog.
3. In the **Tool Settings** box, set **Method** to **Element**.

   MicroStation prompts 'Select clipping element'

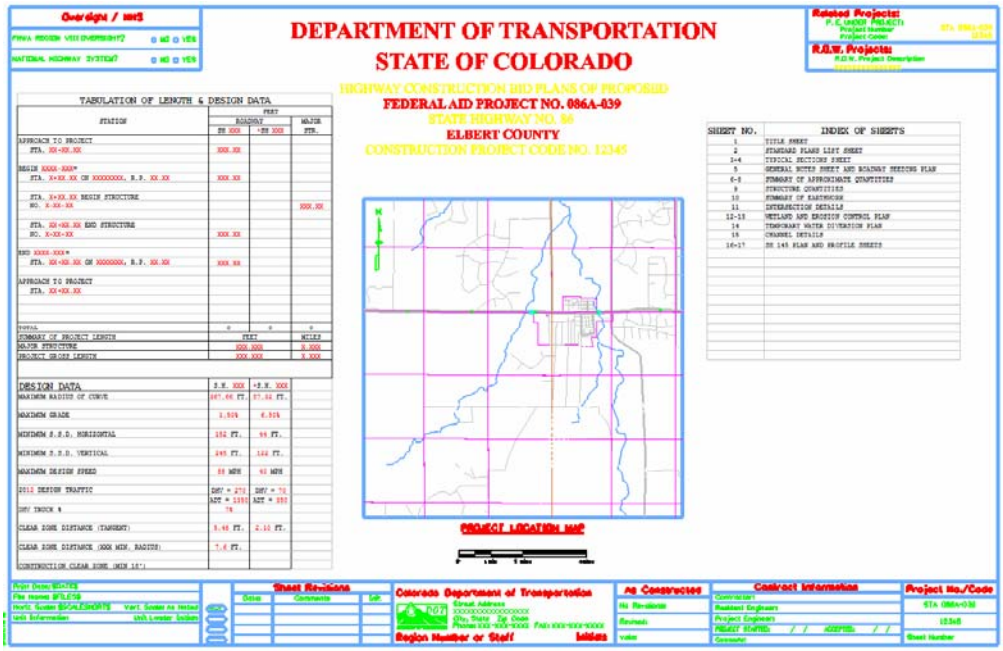
4. **<D>** on the shape representing the limits of the project location map.

5. **<D>** to accept.



6. Open **Level Display** and turn off the **GIS_Sections-Text** and **GIS_Township-Text**.

7. **Fit** the view.



8. **Save Settings**.

9. **Exit** MicroStation.

10. Annotating and Plotting Sheets

Understanding Text and Text Styles

After creating the sheet file, you can now annotate the sheet using MicroStation's text tools and dimension the drawing with the dimensioning tools.

Text styles

Text Styles provide a method of saving and applying text attributes in MicroStation. They function similar to styles used in word processing software, saving text setups that include font, height and width, line spacing, color, *etc.* When you apply a style, it's like applying a whole set of characteristics in one step. Once the style is applied, the text is linked to the style and any future changes to the style will update all text currently using the style. The text style contains attributes like font, height, width, line spacing, line length, text justification, *etc*.

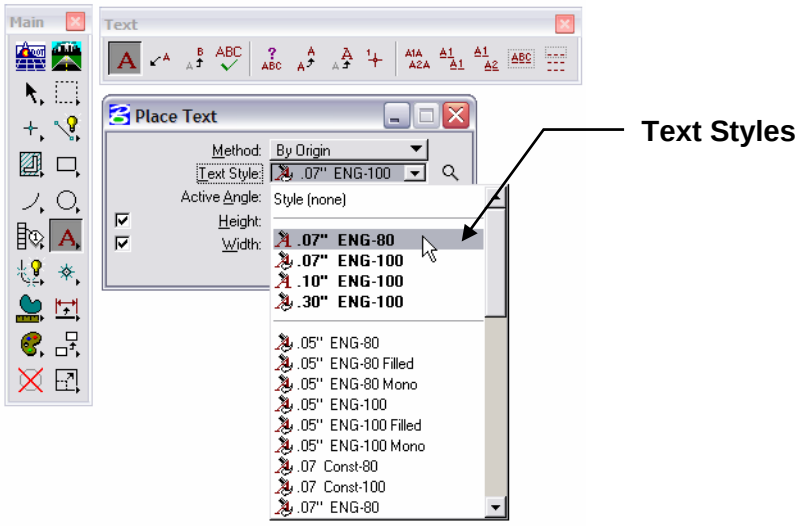
CDOT Text Styles

CDOT text styles are saved in a DGNLIB file called **CDOT-Text & Dim Styles.dgnlib**, located in the **C:\Program Files\Workspace-CDOT\Standards-Global\MicroStation\DGNlib\Standard** folder. This file is automatically attached to any design file opened in the CDOT workspace. This way, you will always have your text styles loaded. Using Text Styles is a very effective in standardizing text throughout a project or agency.

CDOT text styles are categorized by text size (e.g. .07", .10", .14", etc.) Each style is one of two types – 100 or 80 (e.g. **.07" ENG 80**). 100 styles have the same text height and width. 80 styles are proportional sized – the text width is 80% of the text height.

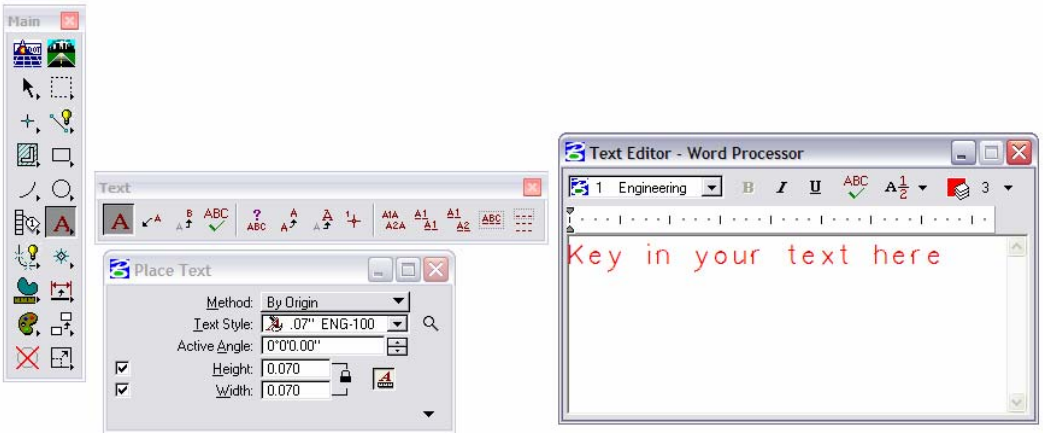
Text toolbar

The **Text** toolbar is used to place and edit text. When you place text, you specify a Text Style to apply to the text.



Place Text

Places text that you enter into the **Text Editor — Word Processor** window. The MicroStation **Text Editor** uses some basic word processing format options (font, bold, underline, italics, *etc*.), which allows for quick text manipulations. You can change these attribute per letter, word or string within a text block.



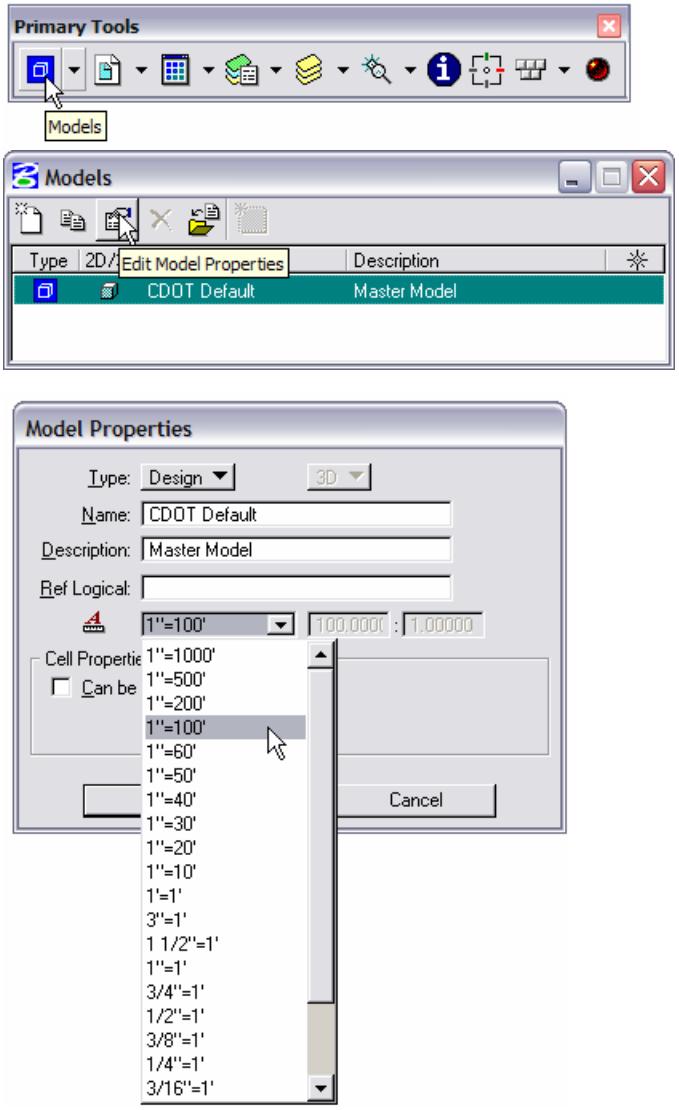
Other word processing functionality includes checking spelling prior to placing text and using **Cut**, **Copy** and **Paste** between MicroStation and other Windows applications.

Text is placed using active text and design file parameters including:

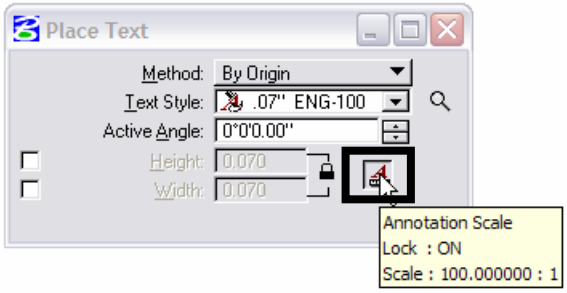
- Active element symbology (color, weight)
- Active level
- Active angle and
- Text style.

Drawing Scale

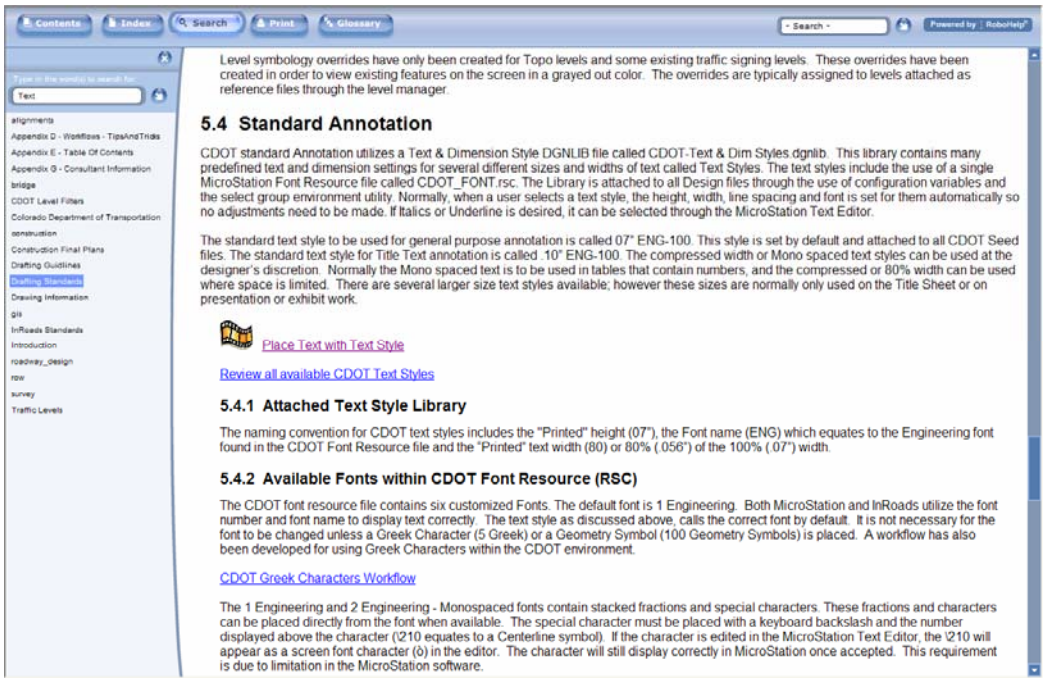
Before placing text, check the **Annotation Scale** for text under **Model Properties**. The **Annotation Scale** is set to ***100***, by default, in the CDOT seed file. This should be the same as your plot scale. If you're plotting at any other scale, change the **Annotation Scale** here. Any text that you've previously placed will be updated (i.e. you don't have to delete and replace the text – it will be re-scaled automatically).



Note: To enable scaling of text, make sure that the **Annotation Scale** lock is turned on in the **Place Text** command before placing your text.



For more information on text, see the **CDOT CADD Manual**, ***Chapter Five – Drawing Standards, Section 5.4 Standard Annotation***.



Level symbology overrides have only been created for Topo levels and some existing traffic signing levels. These overrides have been created in order to view existing features on the screen in a grayed out color. The overrides are typically assigned to levels attached as reference files through the level manager.

5.4 Standard Annotation

CDOT standard Annotation utilizes a Text & Dimension Style DGNLIB file called CDOT-Text & Dim Styles.dgnlib. This library contains many predefined text and dimension settings for several different sizes and widths of text called Text Styles. The text styles include the use of a single MicroStation Font Resource file called CDOT_FONT.rsc. The Library is attached to all Design files through the use of configuration variables and the select group environment utility. Normally, when a user selects a text style, the height, width, line spacing and font is set for them automatically so no adjustments need to be made. If Italics or Underline is desired, it can be selected through the MicroStation Text Editor.

The standard text style to be used for general purpose annotation is called 07" ENG-100. This style is set by default and attached to all CDOT Seed files. The standard text style for Title Text annotation is called .10" ENG-100. The compressed width or Mono spaced text styles can be used at the designer's discretion. Normally the Mono spaced text is to be used in tables that contain numbers, and the compressed or 80% width can be used where space is limited. There are several larger size text styles available; however these sizes are normally only used on the Title Sheet or on presentation or exhibit work.

Place Text with Text Style

Review all available CDOT Text Styles

5.4.1 Attached Text Style Library

The naming convention for CDOT text styles includes the "Printed" height (07"), the Font name (ENG) which equates to the Engineering font found in the CDOT Font Resource file and the "Printed" text width (80) or 80% (.056") of the 100% (.07") width.

5.4.2 Available Fonts within CDOT Font Resource (RSC)

The CDOT font resource file contains six customized Fonts. The default font is 1 Engineering. Both MicroStation and InRoads utilize the font number and font name to display text correctly. The text style as discussed above, calls the correct font by default. It is not necessary for the font to be changed unless a Greek Character (5 Greek) or a Geometry Symbol (100 Geometry Symbols) is placed. A workflow has also been developed for using Greek Characters within the CDOT environment.

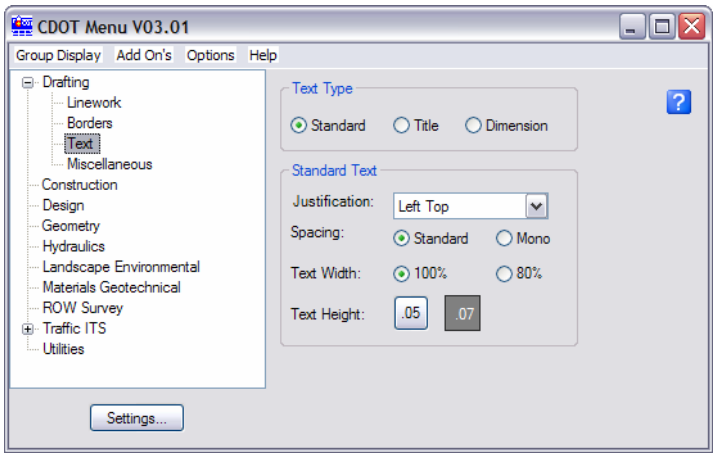
CDOT Greek Characters Workflow

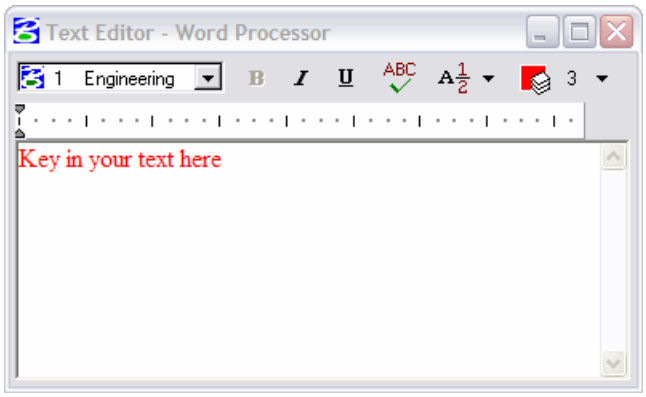
The 1 Engineering and 2 Engineering - Monospaced fonts contain stacked fractions and special characters. These fractions and characters can be placed directly from the font when available. The special character must be placed with a keyboard backslash and the number displayed above the character (\210 equates to a Centerline symbol). If the character is edited in the MicroStation Text Editor, the \210 will appear as a screen font character (ò) in the editor. The character will still display correctly in MicroStation once accepted. This requirement is due to limitation in the MicroStation software.

CDOT Menu text

Placing general text using the CDOT Menu

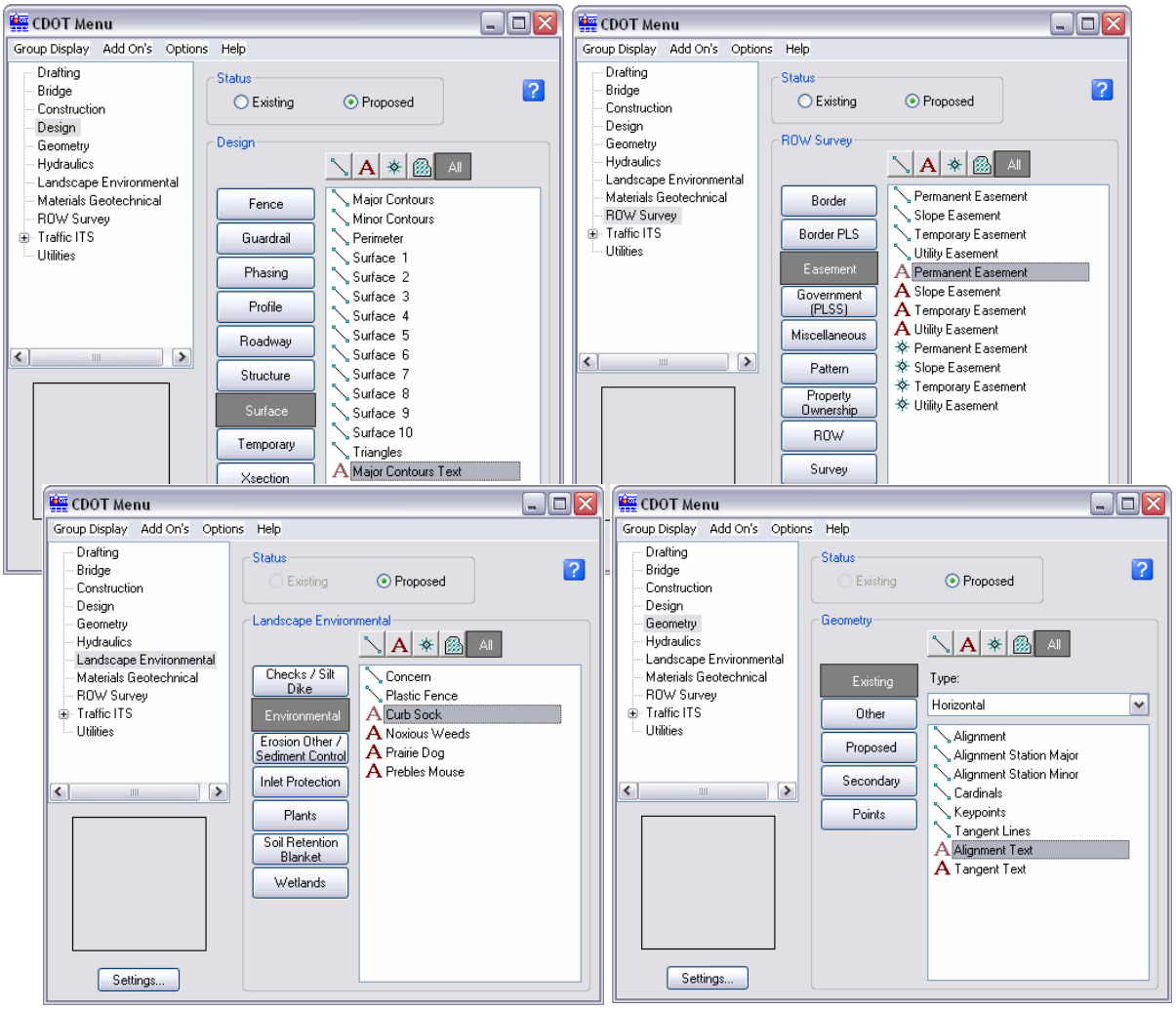
The **CDOT Menu** streamlines the text placement process by minimizing text placement options to those frequently used on CDOT drawings. Select the **Drafting > Text** group to place **Standard** or **Title** text. **Text Justification**, **Spacing** and size can be specified in one location. After setting these main text parameters, key-in your text in the **Text Editor** and then **<D>** to place the text in the file.





Placing Specialty Group text with CDOT Menu

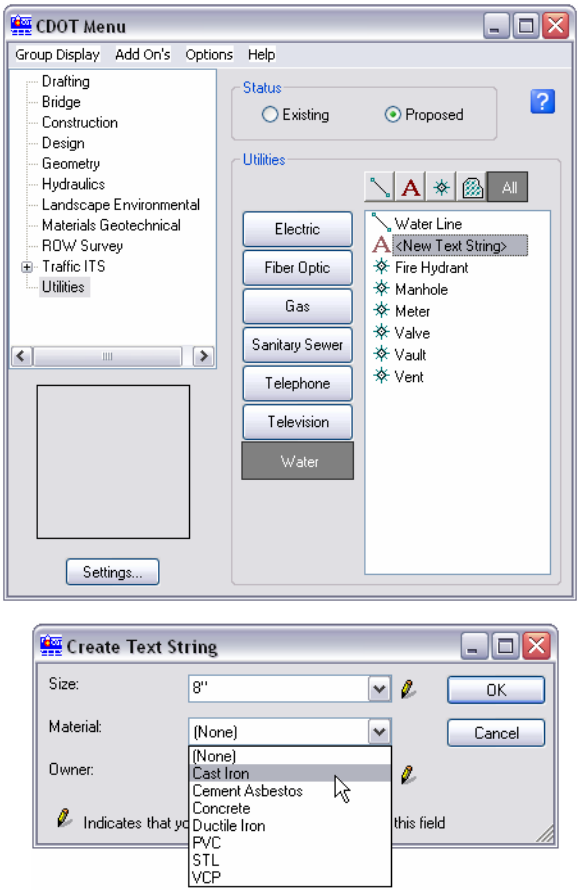
The CDOT Menu also takes the guess work out of placing specialty group text. Select the **Group** and **Category**, and the menu shows the annotation options for the different items in that group. Select the text item and all the text options are automatically set in the **Place Text** command. Just key-in your text in the **Text Editor** and then place in the file.



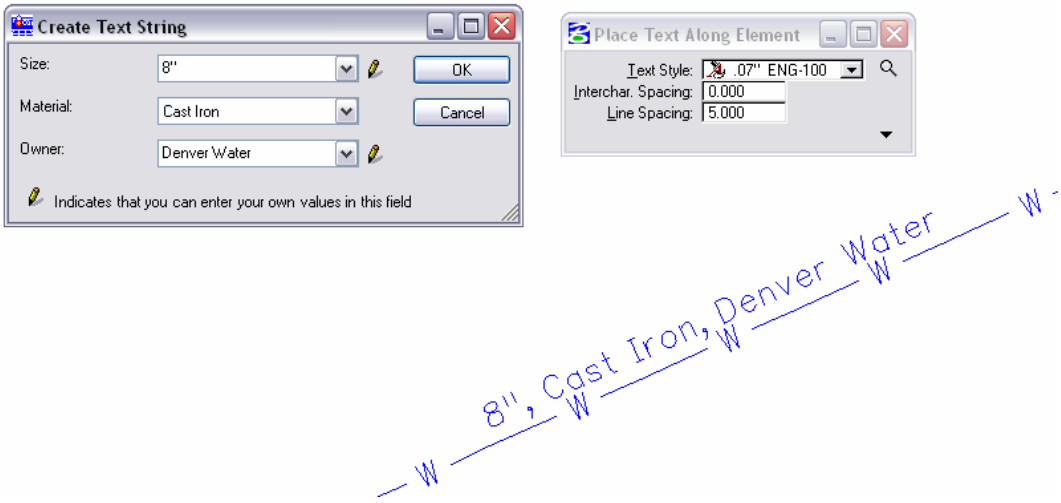
Placing User-defined Utility text

The Utility Group on the CDOT Menu has special options for placing text that allows you to build a database of utility information and then annotate that information directly on the utility line. Each different type of utility has its own set of annotation options specific to that utility line.

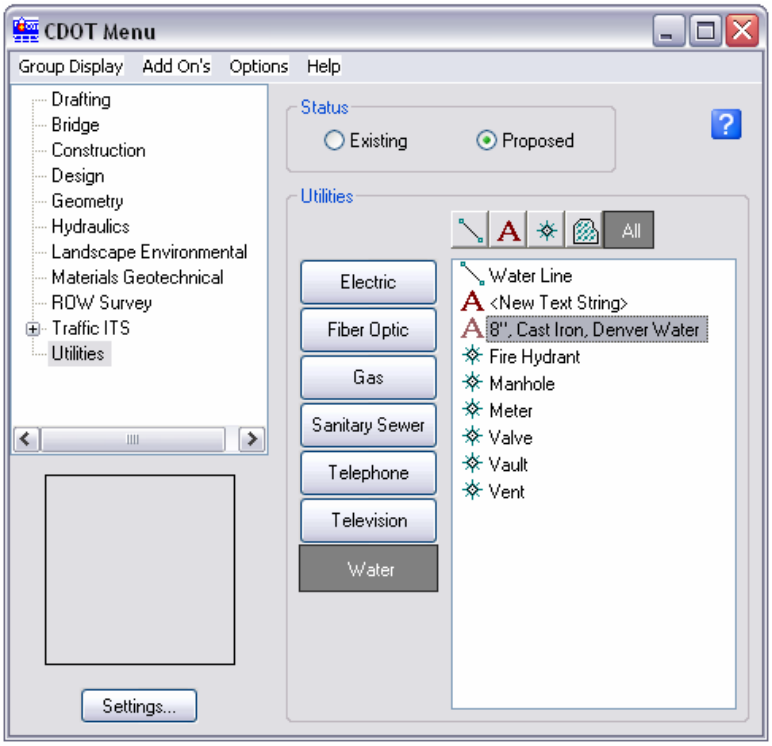
To create a new Utility text annotation, select the **Category** and then select the **<New Text String >** item. You can then select from a list of pre-defined utility features, or create new ones.



After specifying the utility line features, select **OK** and then **<D>** on the line to place the text.

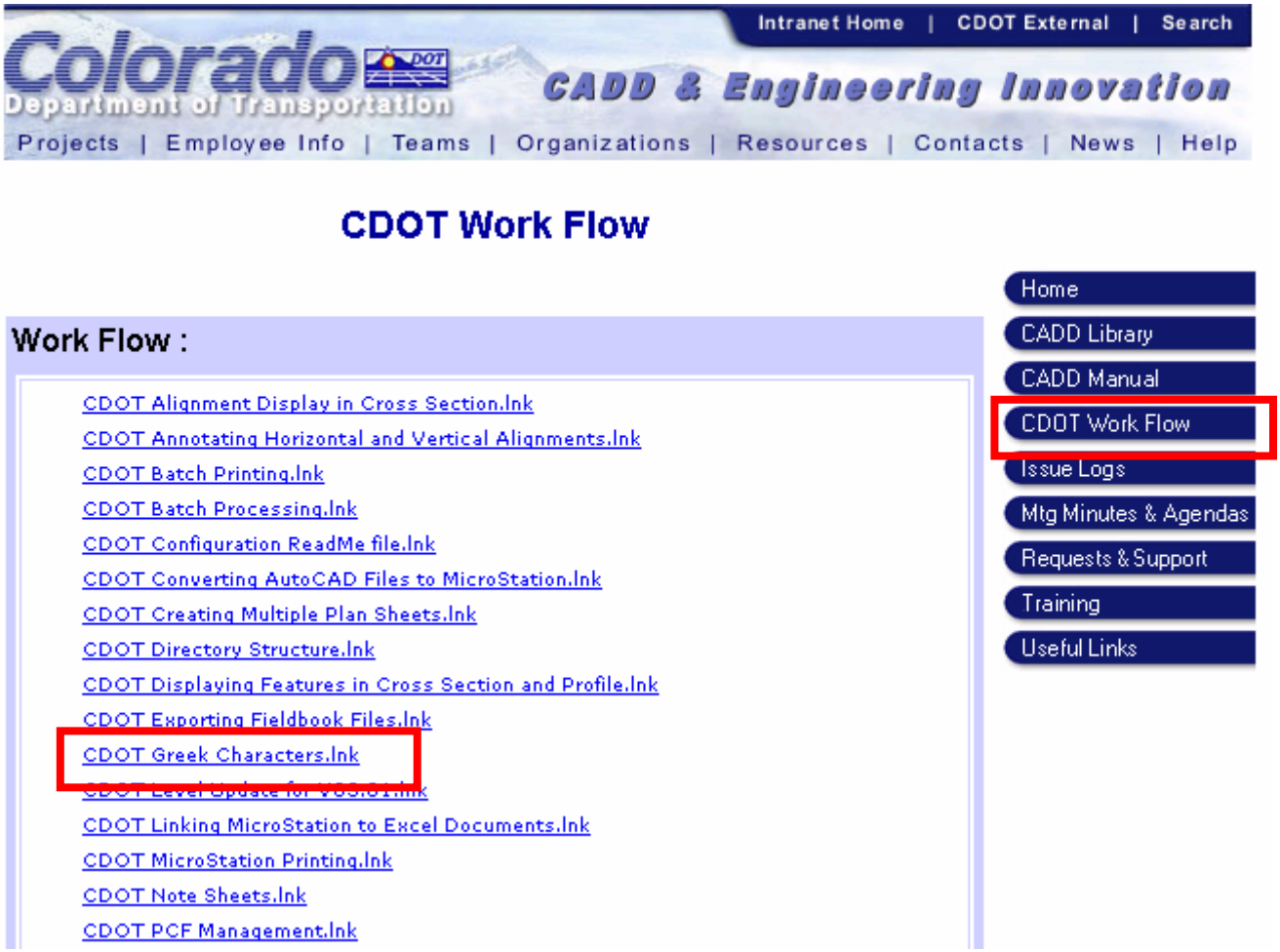


You can save this text information in the CDOT item list for placement again later.



Using the Greek characters font

If you need to place Greek characters on a drawing, then see the **CDOT Workflow, Greek Characters**.



Understanding Dimensions and Dimension Styles

Dimension Styles

Dimension Styles provide a way of saving and applying dimension attributes in MicroStation. They function similar to the text styles, saving setups that include terminators, tolerances, units, *etc.* When you apply a dimension style, it's like applying a whole set of characteristics in one step. Once the style is applied, the dimension is linked to the style and any future changes to the style update all dimensions currently using the style.

CDOT Dimension styles are saved in the DGNLIB file **CDOT-Text & Dim Styles.dgnlib** located in the **C:\Program Files\Workspace-CDOT\Standards-Global\MicroStation\DGNlib\Standard** folder. This file is automatically attached to any MicroStation design file opened in the CDOT workspace. This is a very effective in standardizing your dimensions throughout CDOT.

CDOT Dimension Styles

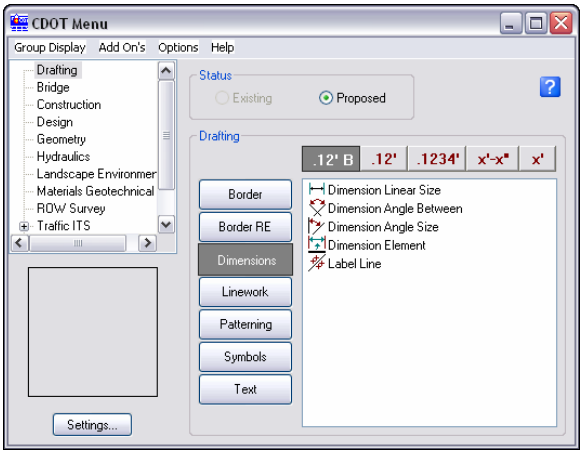
There are currently three CDOT dimension styles available:

- ***CDOT 1*** – Accuracy of 0.1234
- ***CDOT 2*** – Accuracy of 0.12
- ***CDOT 3*** – Feet and inches.
- ***CDOT 4*** – Accuracy of 0.12 B spline Notes
- ***CDOT 5*** – Accuracy of 0

Note: All CDOT Dimension styles have the option **Reference scale** turned **on**. This allows you to dimension reference graphics actual size if the reference attachment was scaled.

Placing Dimensions using the CDOT Menu

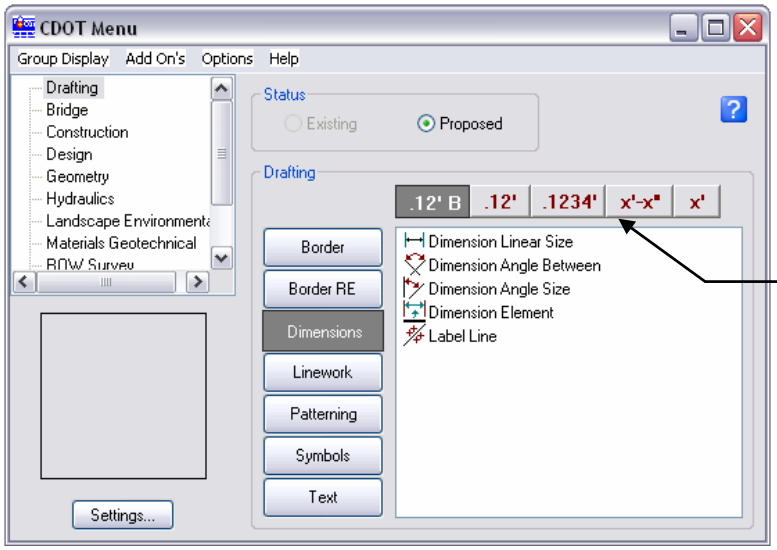
The CDOT Menu streamlines the process of dimensioning elements. From the CDOT Menu Explore select **Drafting** , set the category to **Dimensions**. Five Filters represent the different dimension styles in the configuration.



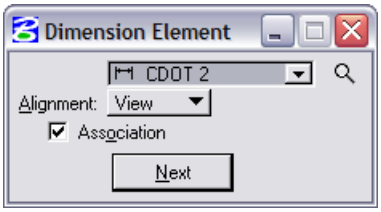
There are five options for each **Filter** or dimension style:

- **Dimension Linear Size** – Dimensions size by specifying a start and end point.
- **Dimension Angle Between** – Dimensions the angle between two points.
- **Dimension Angle Size** – Dimensions the angle between lines.
- **Dimension Element** - Dimensions an element (line, linestring, shape, arc, or circle).
- **Label Line** – Labels a line with a bearing and/or distance and labels the line.

The three accuracy options, .1234, .12 and x'-xx" allow you to specify the CDOT dimension styles CDOT 1, 2 or 3.

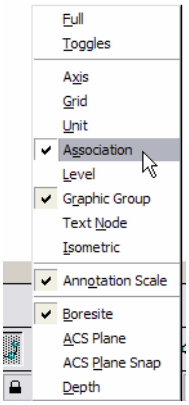


The menu automatically selects the proper dimension command and active level for placing the dimension.



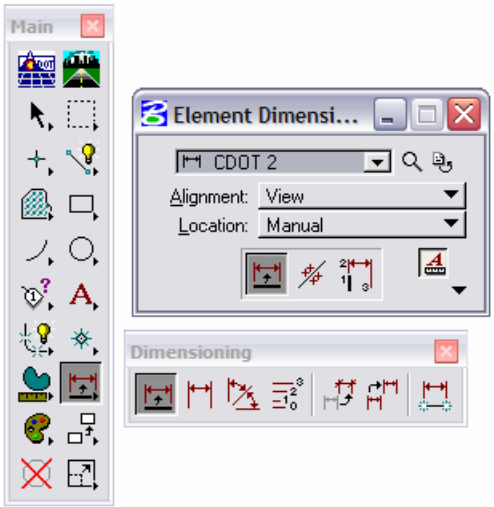
Toggle on **Association** if you want the dimension to update if the element is modified. Associative dimensioning also works for reference elements.

> **Note:** You must turn on the **Association** lock in order to activate the **Association** toggle in the dimension command.



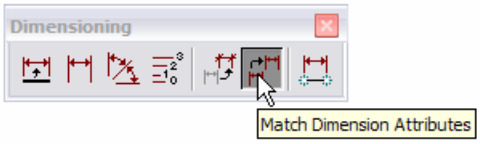
Dimension toolbar

In addition to the CDOT Menu, you can also use the **Dimensioning** toolbar to place dimensions. However, the most common dimensions are on the toolbar.



Using the Match Dimension tool

If there are existing dimensions in the design file, you can match the dimension and then place it again using the dimension command on the toolbar.



Plotting

Workflows

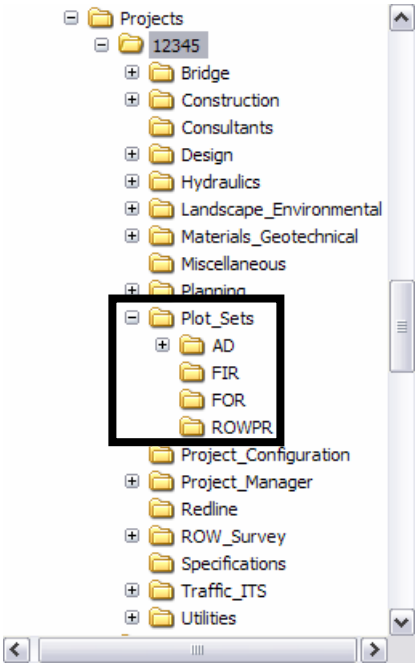
CDOT has established workflows for plotting to either 11” x 17” printers or plotting to Adobe Portable Document Files (PDFs). These workflows include MicroStation Printing for single sheets or Batch Printing for printing multiple sheets or PDF files. See the CDOT Workflows for more information.

Printer Drivers

Two CDOT printer drivers are available to select before plotting – ***CDOT-DefaultPrinter.plt*** and ***CDOT-PDFdriver.plt***. Choose the first if you’re plotting to a printer and the second if you’re plotting to PDF. Printer drivers control plotting devices, plot sizes, CDOT pen tables, etc.

Location of PDF files

When plotting to PDF files, they should be placed in the project's **Plot_Sets** folder under the appropriate subfolder, for use by the reproduction department and other disciplines for reference and review. Only final submittals should be stored in this location.

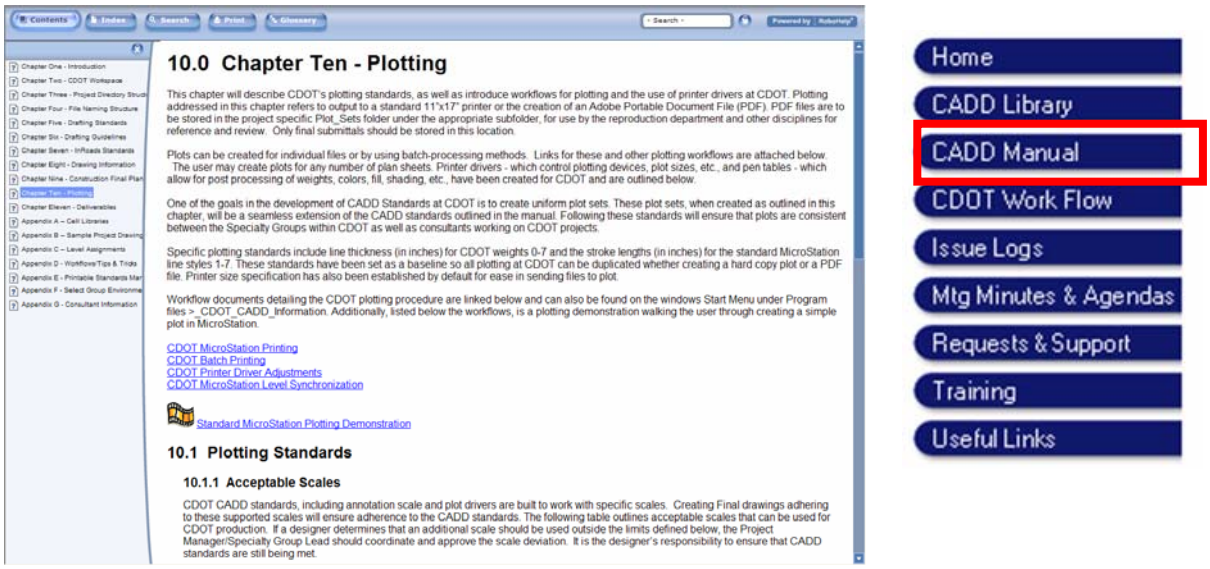


Additional Plotting Workflows

Additional workflows regarding MicroStation printing include ***Printing AutoCAD file in MicroStation***, ***Printing Raster Images***, ***Shaded Color and Grayscale Printing*** and ***Printer Driver Adjustments***.

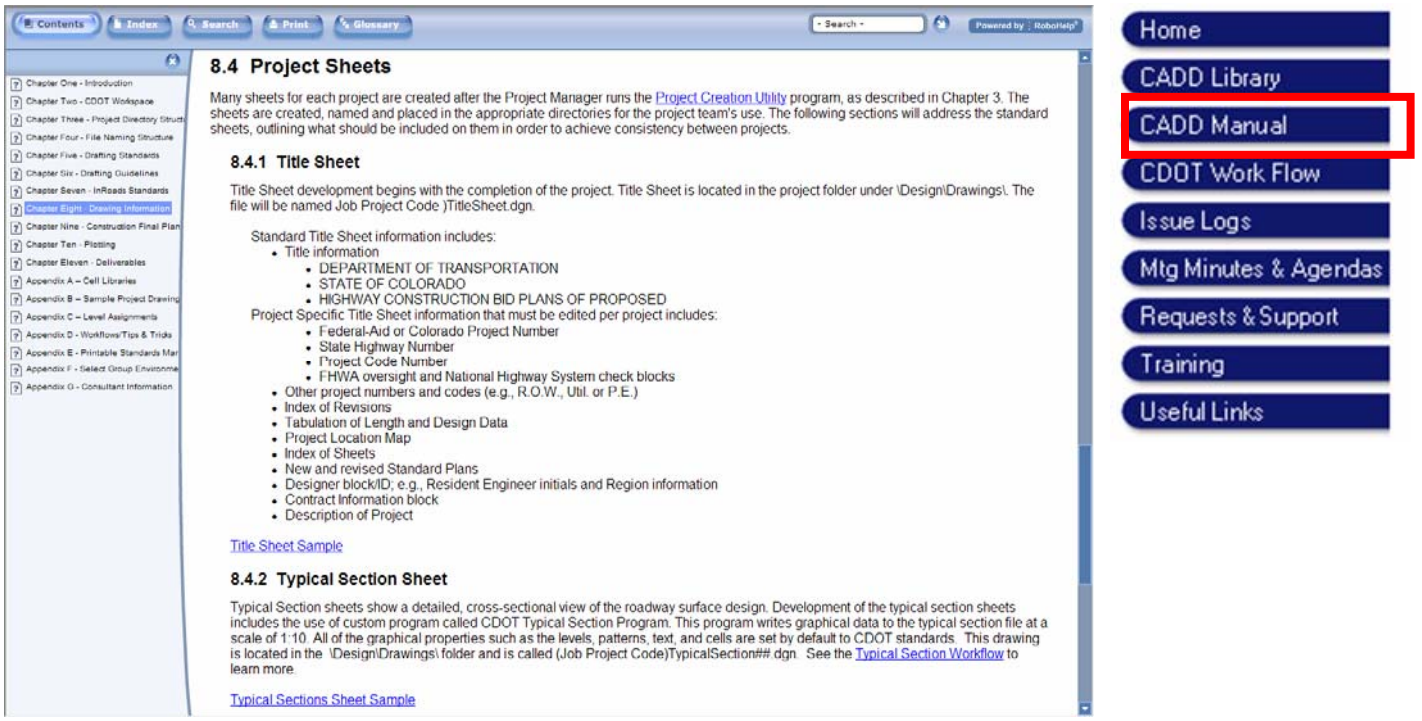
Additional Plotting Information

For additional plotting information, see the **CDOT CADD Manual**, ***Chapter Ten – Plotting***.



Assembling Plan Sets

After you've plotted your files for a plan set, refer to the **CDOT CADD Manual**, ***Chapter Eight – Drawing Information***, for a comprehensive listing of sheets, information to include on each type of sheet, sample project sheets and a final checklist.



Lab 10A – Annotate the Intersection Plan/Profile Sheet

In this lab, you'll annotate the plan/profile sheet with text, notes and custom text strings using the CDOT Menu.

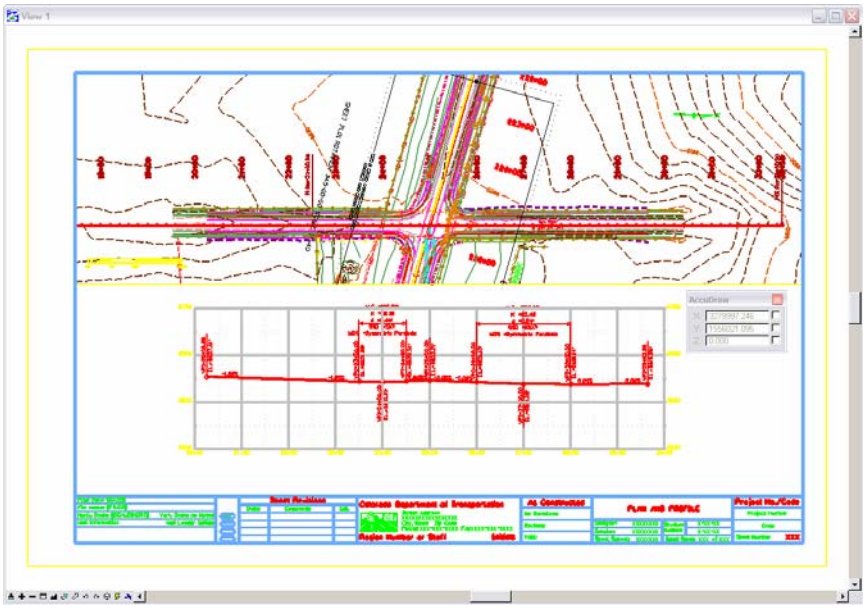
Objectives

After completing this exercise you will know how to:

- Set the active angle for placing text.
- **Place Text** using the CDOT Menu.
- Rotate text.
- Place notes with leader lines and a terminator.
- Create and place custom text strings for utility lines using the CDOT Menu.

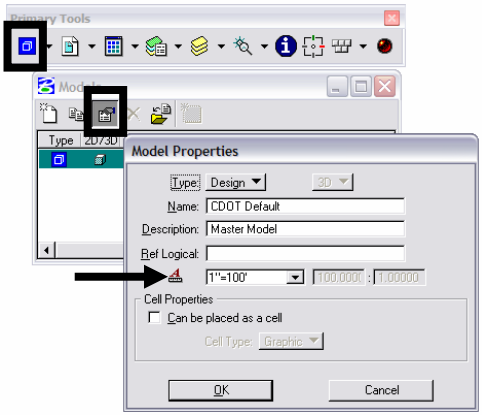
Start MicroStation

1. Start MicroStation and open **12345DES_PnP19.dgn** from the **C:\Projects\12345\Design\Drawings** folder.



Check Text Annotation Scale

1. Select **Models** from the **Primary** toolbar.
2. In the **Model** box, select **Edit Model Properties**.



3. Note that the **Text Annotation Scale** is set to **1:100** (the default setting from the seed file).

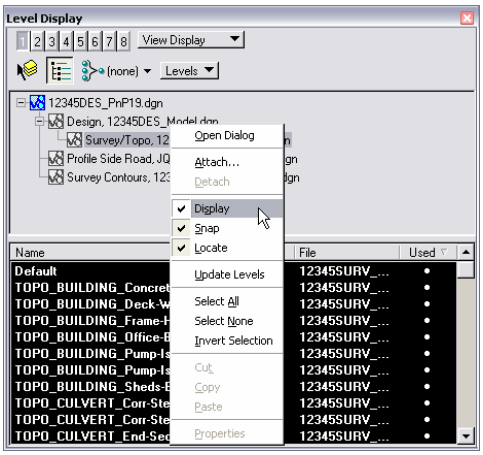
   Note: The **Text Annotation Scale** matches the border scale, which matches the scale for plotting – 100.

4. **Cancel** the **Model Properties** box.
5. **Close** the **Models** box.

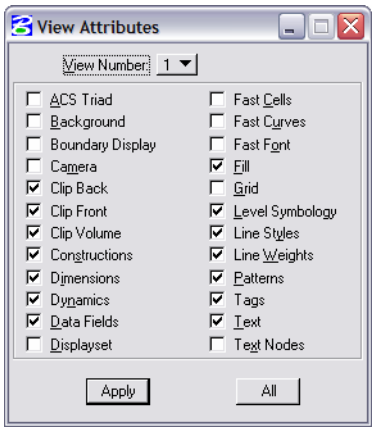
Work with sheet levels and references

The plan limits cell placed along the mainline alignment in the Design model file appears in the sheet. This is on a No Plot level. However, if you don't want to see it, you can turn it off.

1. Open **Level Display** and turn off the **DRAFT_INFO_No_Plot** level in the **Design** reference.
2. In Level Display, turn off the **Survey/Topo** reference.



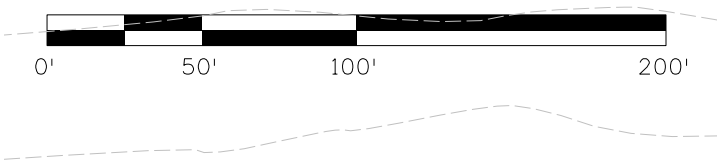
3. Select **Settings > View Attributes**, turn on **Level Symbology** and then **Apply**.



This applies the Symbology Overrides set in the CDOT level libraries for "graying out" the existing contour levels.

Edit the bar scale text

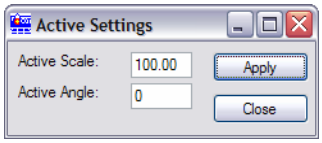
1. **Window** in on the bar scale cell in the lower left portion of the plan view.
2. Use the **Edit Text** command to edit the text as shown for a 100 scale plot.



Label the Intersection Alignments

Set the active angle for placing the county road text

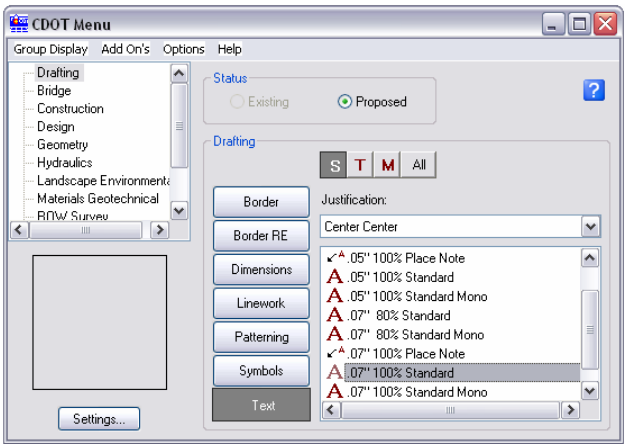
1. On the **CDOT Menu**, select **Settings**.
2. Set the **Active Angle** to ***0***, **Apply** and then **Close** the box.



Set the text attributes using the CDOT Menu

1. On the **CDOT Menu** Explorer, select **Drafting**. Set the category to **Text** and set the following options:

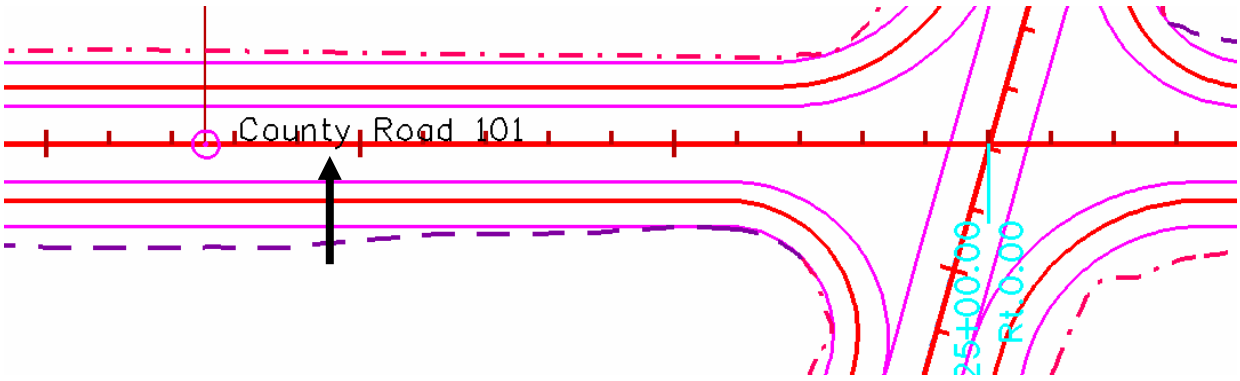
   - **Filter: Standard (S)**
   - **Justification: Center Center**
   - **Item: .07" 100% Standard**



   This sets the active level to **DRAFT_Text-3** and automatically selects the **Place Text** command.

2. In the **Word Processor** box, key in ***County Road 101***.

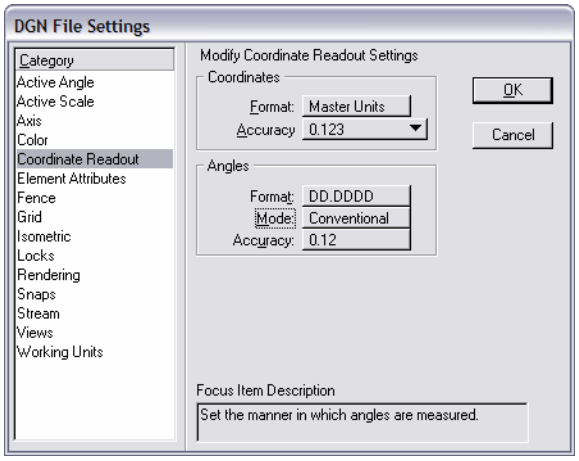
3. **<D>** to the left of the intersection as shown to label the road.



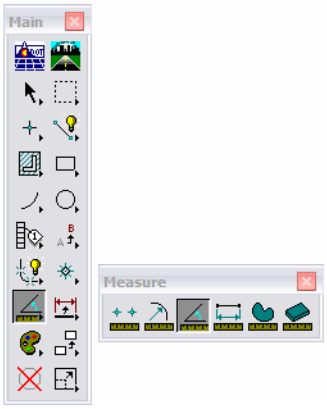
4. **<R>** out of the **Place Text** command when done.

Set the active angle for the main alignment text

1. Select **Settings > Design File > Coordinate Readout**.
2. Set the **Options** as shown for **Conventional Angle Mode**, **Decimal Degrees**.



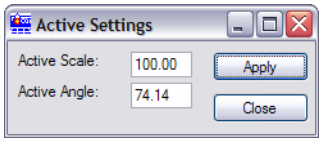
3. Select the **Measure Angle** command from the **Measure** toolbar.



4. **<D>** on the centerline of the side road.
5. **<D>** on the centerline of SH 86.

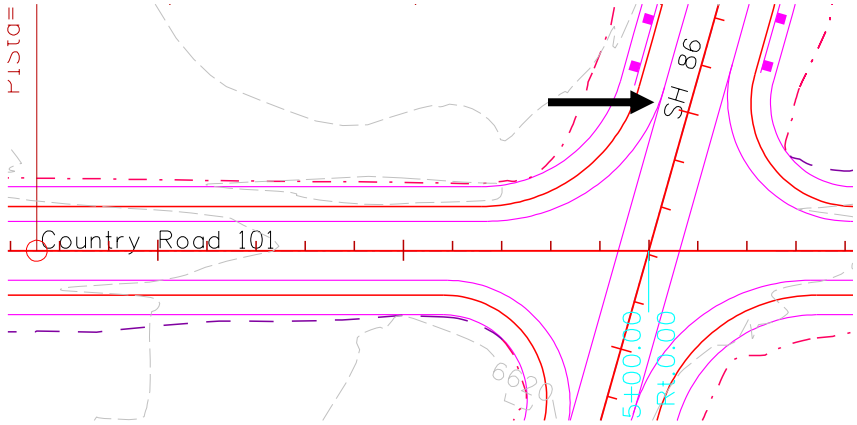
   The angle reads out at 74.14 degrees.

6. From the CDOT Menu, select **Settings** and set the **Active Angle** to ***74.14***, **Apply** and then **Close**.



Place the SH 86 text at the active angle

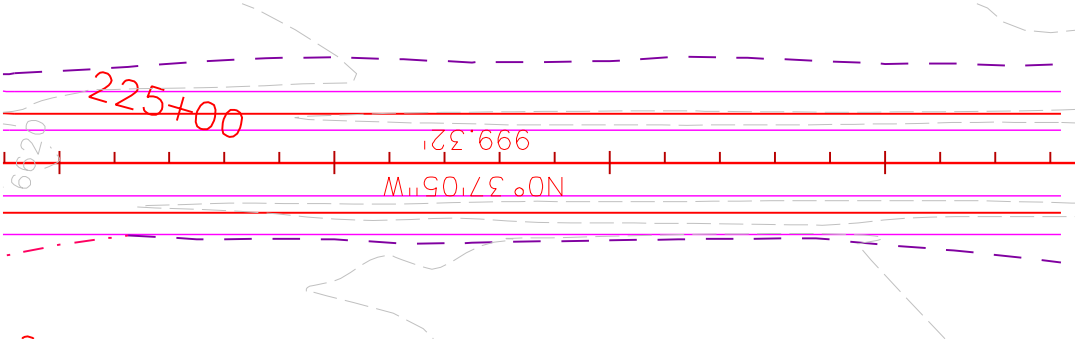
1. On the **CDOT Menu** select **Drafting > Text** and select **.07** again.
2. In the **Word Processor** box, key in ***SH 86***.
3. **<D>** when shown to label the road.



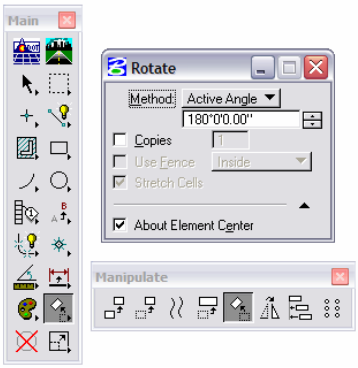
4. **<R>** out of the **Place Text** command when done.

Rotate the InRoads alignment text

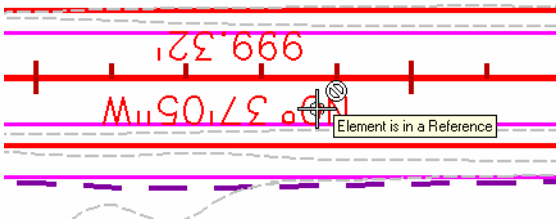
1. Window in to the right of the intersection as shown.



2. Select the **Rotate** command from the **Manipulate** toolbar.
3. Set the **Method** to **Active Angle,** set the **Angle** to ***180*** and toggle on **About Element Center**.



4. **<D>** on the bearing text.

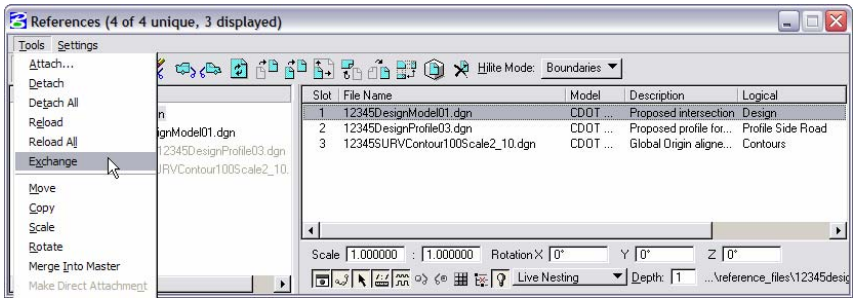


You can't rotate the text because it's in a reference.

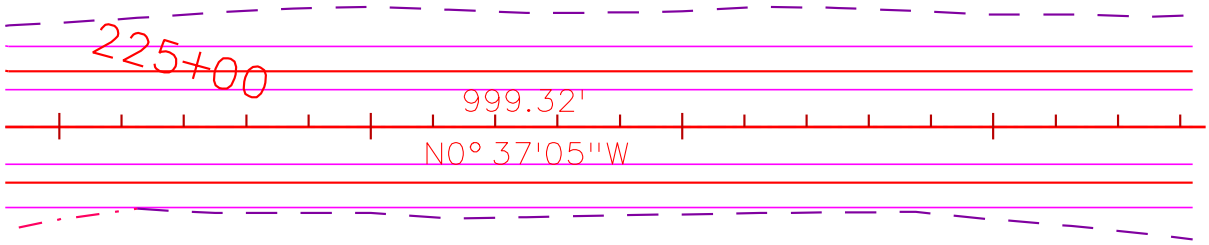
Important! If you're in the Design group and "own" the Design reference, you can "exchange" to that reference to make modifications. Otherwise, contact Design.

5. Select **File > Save Settings**.

6. On the **References** dialog, select the Design reference and then select **Tools > Exchange**.



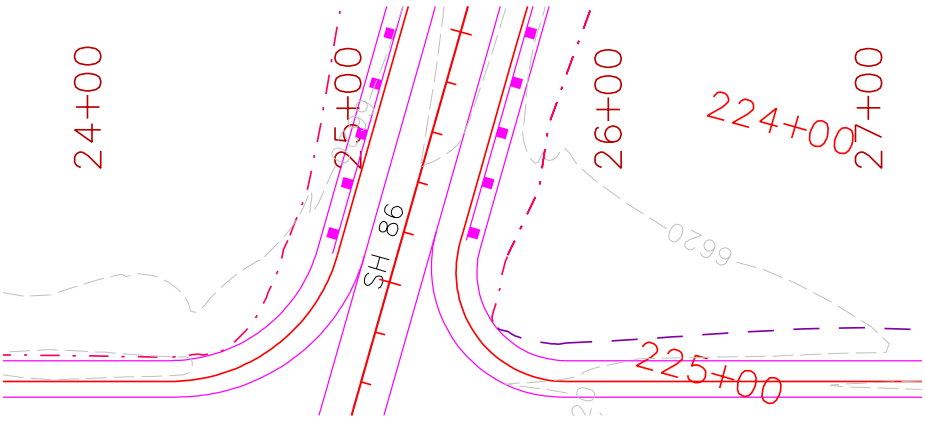
7. Select the **Rotate** command, **<D>** on the bearing text and then **<D>** to accept.



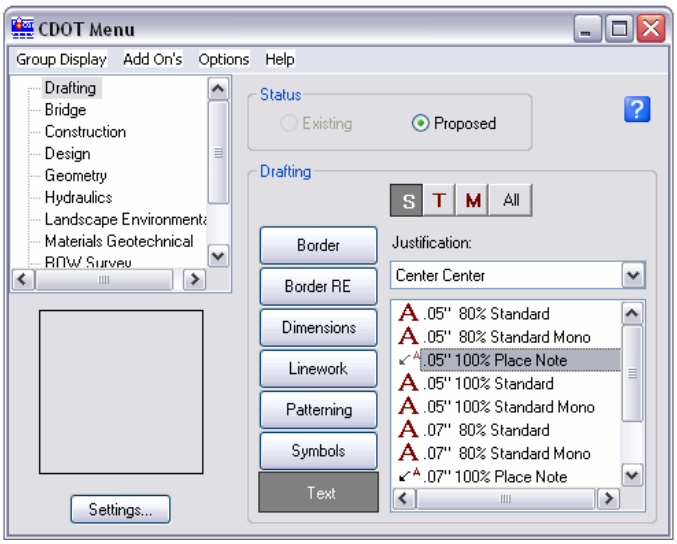
8. Select the **File** pull-down menu and open the sheet file from the list of last open files.

Place Notes

1. Window in above the intersection to view the guardrail as shown.



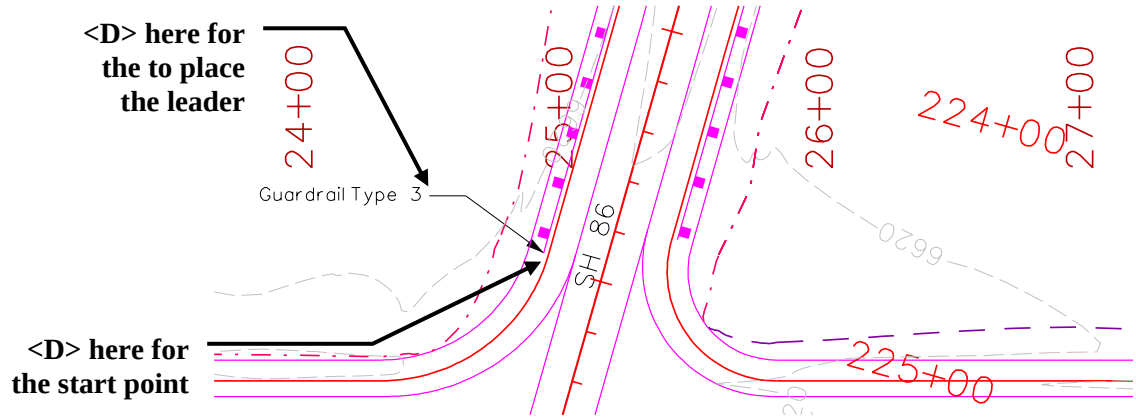
2. On the **CDOT Menu** Explorer, select **Drafting > Text** and select the **.05" 100% Place Note** item.



3. Click inside the **Word Processor** box and key in ***Guardrail Type 3***.

4. **<D>** on the guardrail as shown to define the start point of the note (note terminator).

5. Drag the cursor to the location shown and **<D>** to place the note leader.



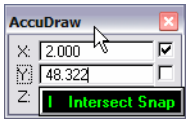
6. ***IMORTANT:*** With your cursor on the ***LEFT SIDE*** of the leader line, **RESET <R>** to place the text.

   Note: If your cursor is on the right side of the leader when you reset, your note will be placed on the right side.

7. With the **Place Note** command still active, click in the **Word Processor** box and key in ***SH 86 STA 225+57.20***.

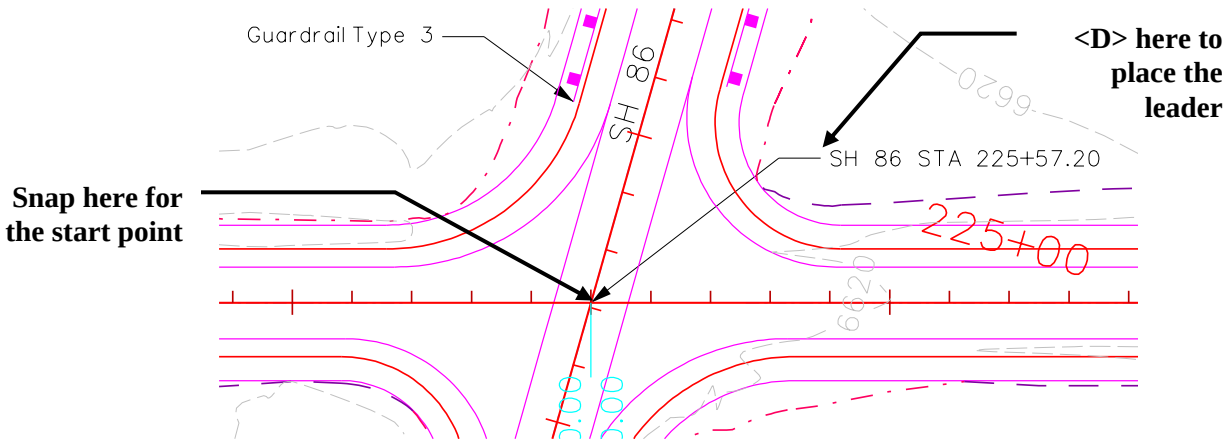
8. On the **Snap Mode** toolbar select the **Intersection Snap**.

   Note: You can also click in **AccuDraw** and press ***I*** on the keyboard.



9. **AccuSnap** to the intersection of the two centerlines as shown for the note terminator.

10. Drag your cursor out and **<D>** to place the leader line.



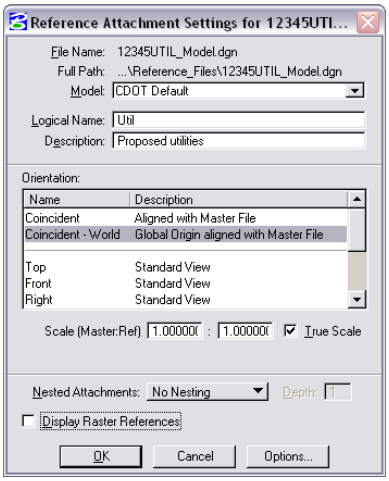
11. With our cursor on the **RIGHT** side of the leader, **<R>** to place the note.

Attach Utility Lines

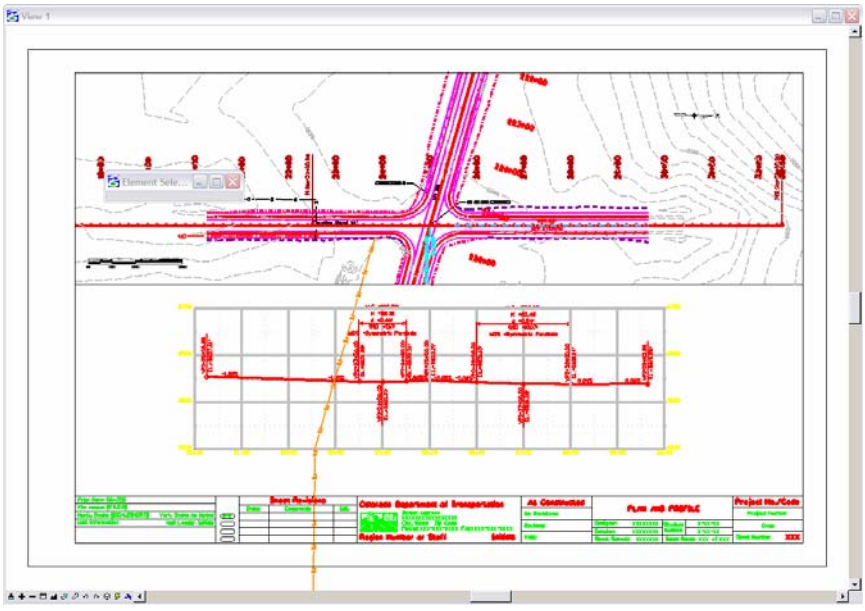
Next, you'll annotate proposed utility lines using the CDOT menu. However, the Utility model was not attached to plan sheet when it was created. Therefore, you must attach the Utility model after-the-fact in order to reference the utility lines for annotation.

Reference the proposed Utility model

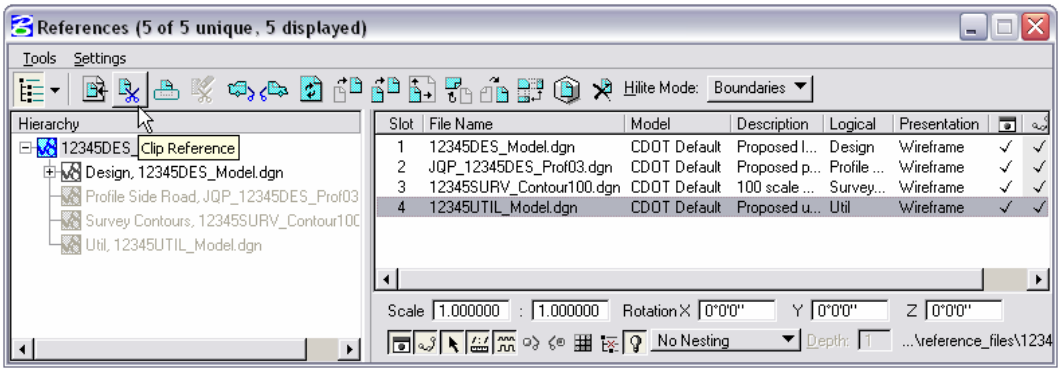
1. **Fit** the view.
2. Open the **References** dialog box.
3. Attach the **12345UTIL_Model.dgn** file from project's **\Utilities\Drawings\Reference_Files** folder. Be sure to attach **Coincident-World** at a ***1:1*** scale with **No Nesting**.



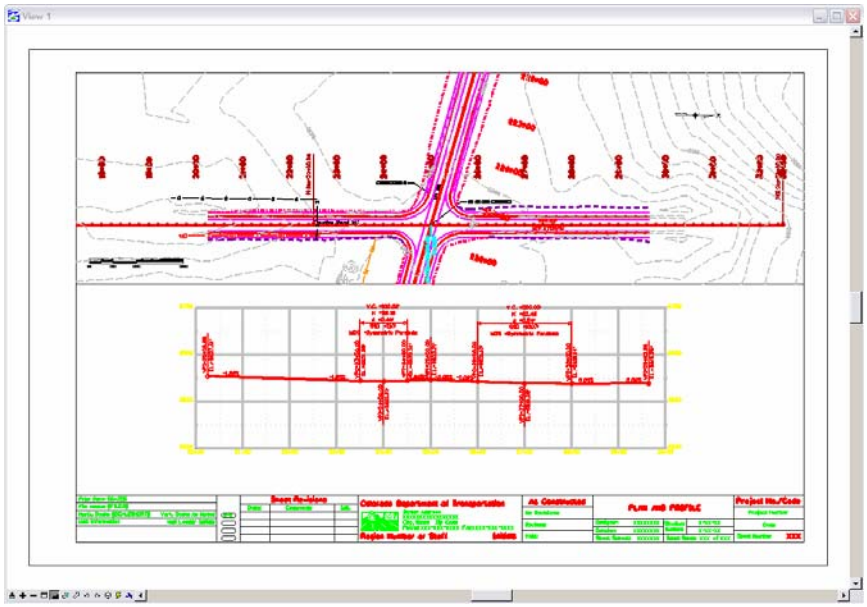
The Utility model is reference, but needs clipping.



4. On the **References** toolbar, select the Utility reference and then select **Tools > Clip Boundary**.

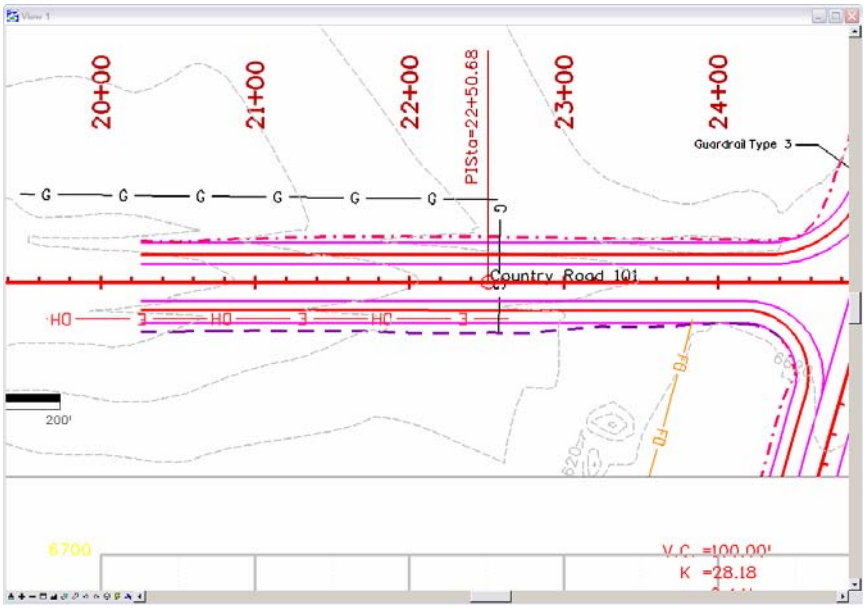


5. **<D>** on the clip boundary block and then **<D>** to accept.



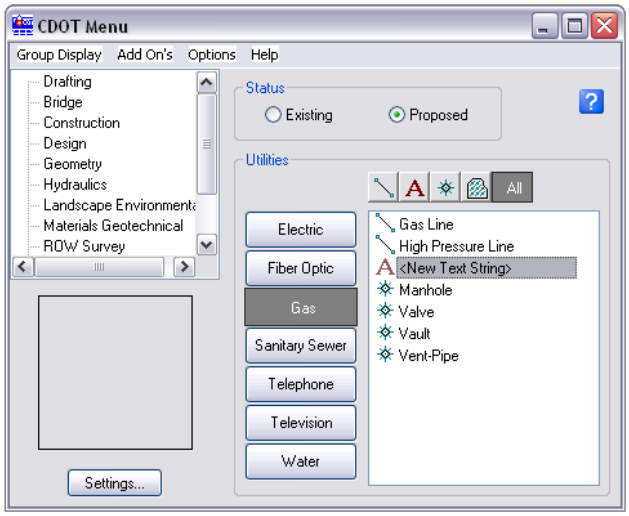
Annotate the gas line

1. Window in on the plan sheet area shown.

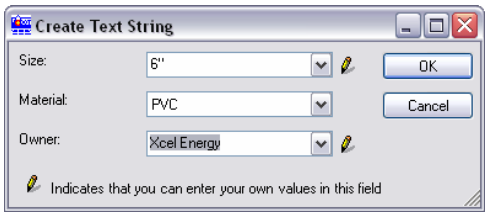


2. From the **CDOT Menu** Explorer, select **Group Display > Utilities** and set the following options:

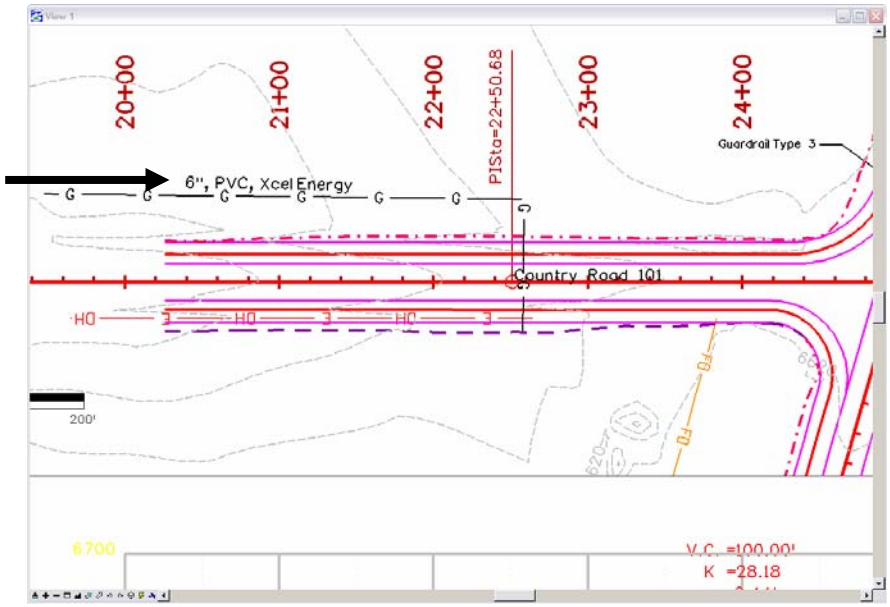
   - Set **Status** to **Proposed**
   - Set the **Category** to **Gas**
   - Set **Filters** to **All** (or Text)
   - Select the item **<New Text String>**



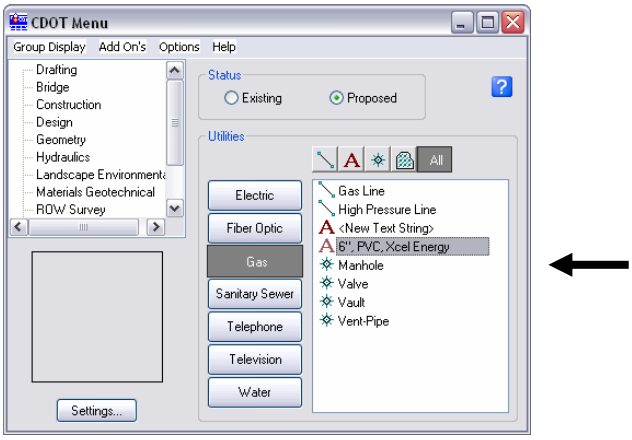
3. In the **Create Text String** dialog box set the following from the drop down options:
    - Set **Size** to **6”**
    - Set **Material** to **PVC**
    - For **Owner**, key in ***Xcel Energy***



4. Select **OK**.
5. When prompted to **Identify Element**, **<D>** on the proposed gas line.
6. **<D>** above the line to accept the text placement.



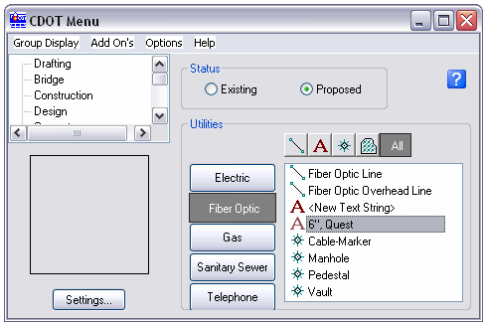
Note: Your custom text 6”, PVC, Xcel Energy is saved as an item in the Gas category for placement again.

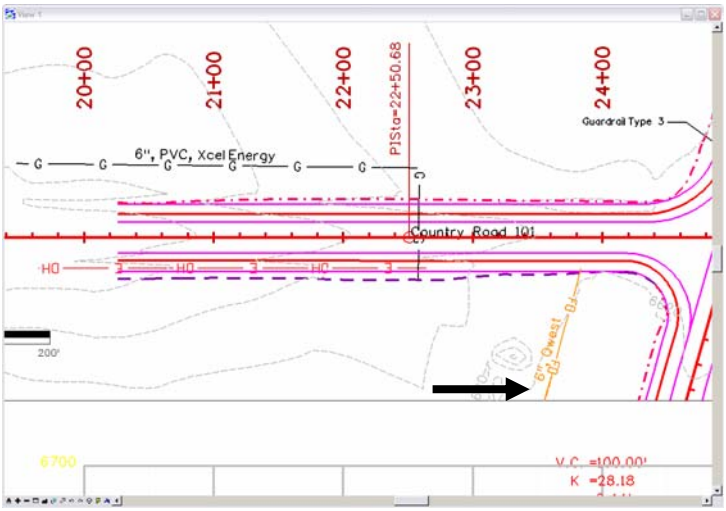


You can right-click on a custom text string and either edit or delete it.

Annotate the fiber optic line

1. Create a custom text string (6”, Qwest) for the fiber optic line and annotate as shown.





Note: Be sure to **<D>** near the bottom of the line to fit the annotation.

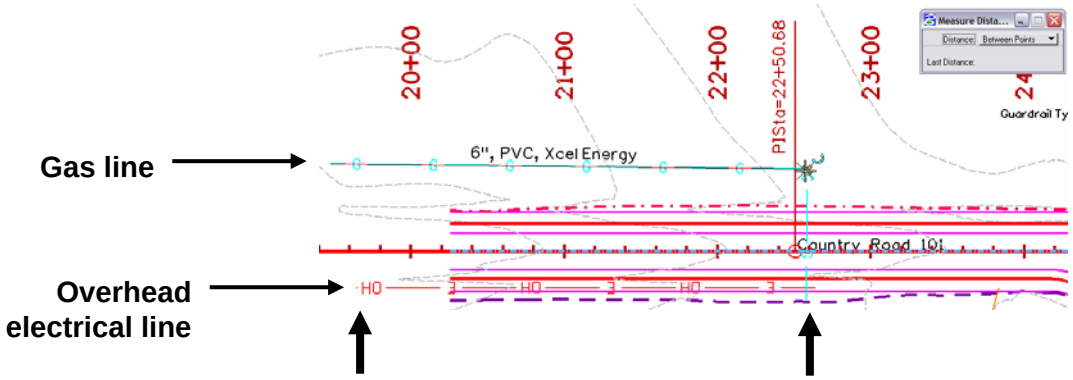
Measure Graphics

Since you referenced your plan view graphics at a 1:1 scale, they are the actual size in the sheet file. Therefore, you can measure plan graphics in the sheet file and get the same results as measuring in the model file. Make sure that Locate is turned on for the reference before using the measuring tools on reference graphics.

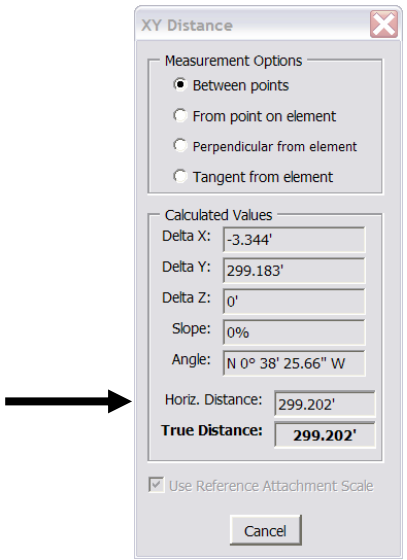
Measure Distance

Between points

1. Measure the OH Electrical Line with the CDOT custom add-on tool.
    - From the **CDOT Menu** select **Add On's > Measure XY Distance.**
    - In the **XY Distance** Dialog box, set **Measurement Option** to **Between points.**
    - **AccuSnap** on the ***two*** endpoints of the proposed Overhead electrical line as shown (snap to tie-in at power pole symbols – see arrows below).



- **<R>** when done.
- Your results should match the dialog box.

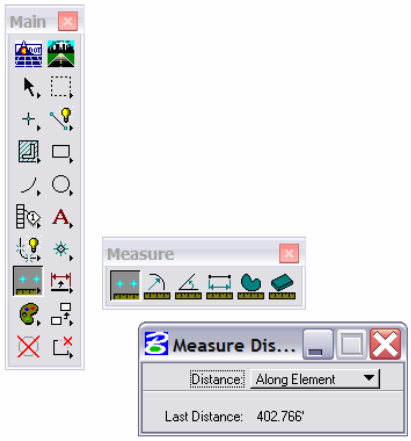


Note: This tool provides horizontal distance measurements even if the 3D graphics you're measuring between are at different elevations.

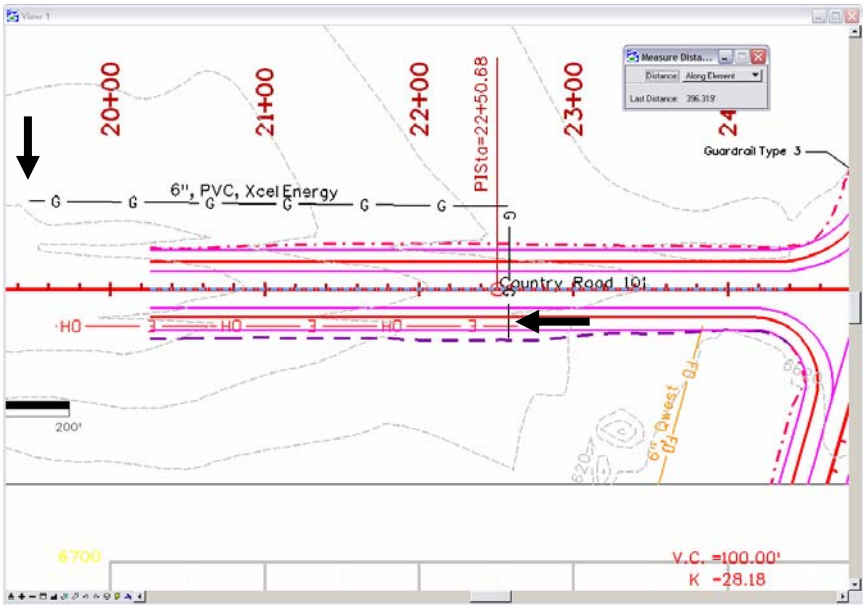
Along element

2. Measure the Gas Line with standard MicroStation tools.

   - Select the **Measure Distance** command from the **Measure** toolbar.



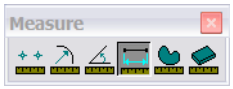
   - Set the **Method** to **Along Element**
   - **AccuSnap** on the ***start*** and ***end*** points of proposed 6” gas line as shown (see arrows).



   - Record your results: _____ft.

Note: Individual results will vary based on how the line was originally drawn.

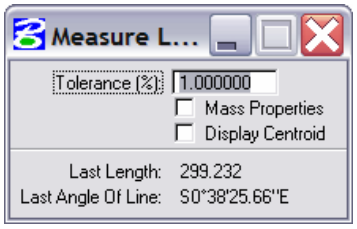
3. Select the **Measure Length** command.



   - **<D>** on the gas line.
   - Record your results: _____ft.

   Your results should be the same as in step 2. With this command, you only have to select the element with a data point to get its entire length.

4. Use **Measure Length** to measure the length of the OH Electrical line.



   Your results should be the same as step 1 where you measure with the CDOT custom **XY Distance** tool.

   Note: When measuring a straight line with this method, you also get the angle of the line.

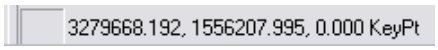
Measure perpendicular

5. In the **Design** Model reference, turn ***off*** the level **DRAFT_LC-Center_WT-3**.

   This element (a blue dashed line) is a coincident to the alignment centerline. Since you will only be working with the alignment, turn this level off and leave the **ALG_PROPOSED_Hor-Alignment** turned on.

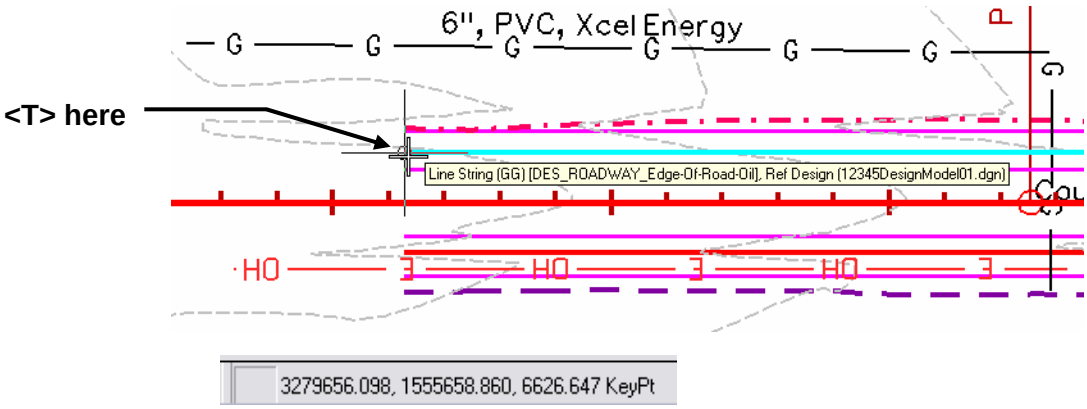
6. Turn **Depth** lock ***off***.

7. **<T>** on the side road horizontal alignment and note the Z value.



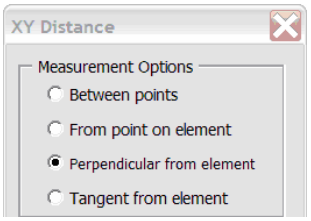
   Horizontal Alignments, like this one, are typically placed at elevation 0.

8. **<T>** on the red upper edge of oil line at the beginning of the alignment and note the Z value.



The edge of oil line is placed at the correct elevation.

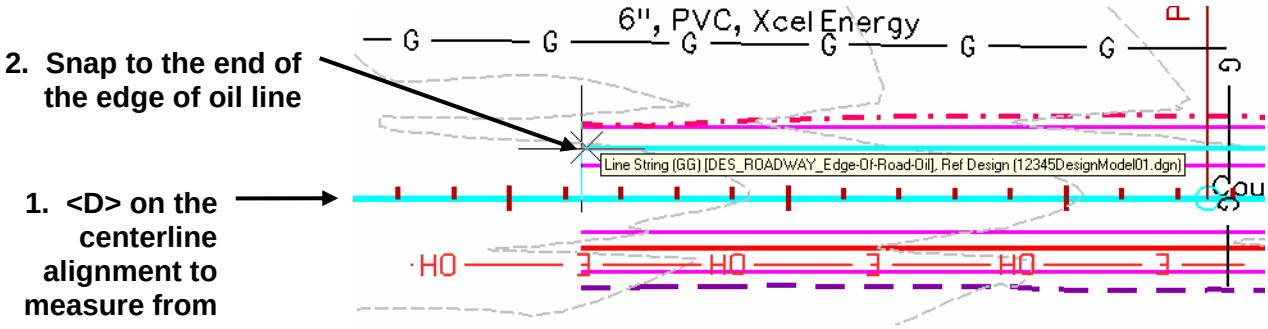
9. In the **XY Distance** dialog box, set the **Option** to **Perpendicular from element**.



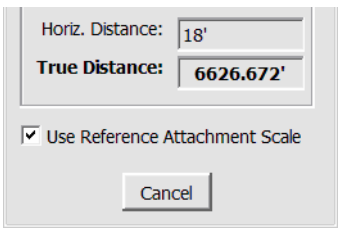
10. **<D>** on the side road horizontal alignment.

    MicroStation displays a horizontal tracking line.

11. **AccuSnap** on the end of the upper edge of oil line.



12. Review your results:



Note that even though the two elements are at different elevations, the CDOT custom **XY Distance** tool provides both the **Horizontal Distance** of 18 feet along with the true 3D slope measurement (or **Total Distance**) of 6626.672 feet.

Lab 10B – Annotate the Bridge General Layout Sheet

In this lab, you'll annotate the bridge general layout sheet with text, notes and dimensions.

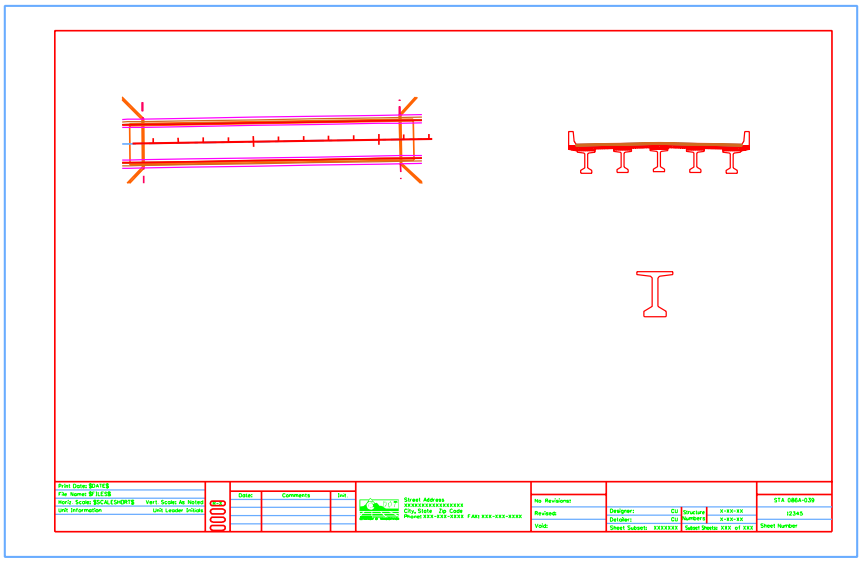
Objectives

After completing this exercise you will know how to:

- Set and change the **Text Annotation Scale** to match the drawing scale.
- Place dimensions using the following methods:
  - Element
  - Linear
  - Angle between lines
  - Bearing and Distance
- Edit dimension text.
- Place notes with curved leaders.

Start MicroStation

13. Start MicroStation and open **12345BRDG_Plan01.dgn** from the **C:\Projects\12345\Bridge\Drawings** folder.



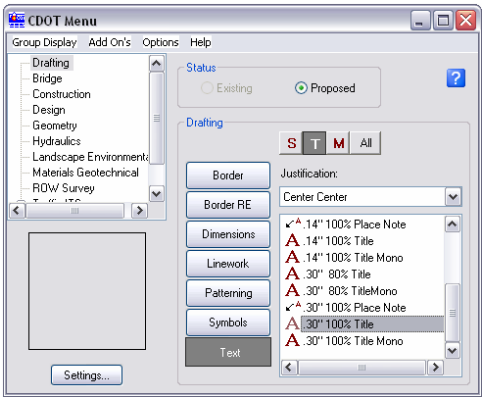
Place Text

Label the different part of the general layout sheet (plan, typical section, etc.)

Set text attributes

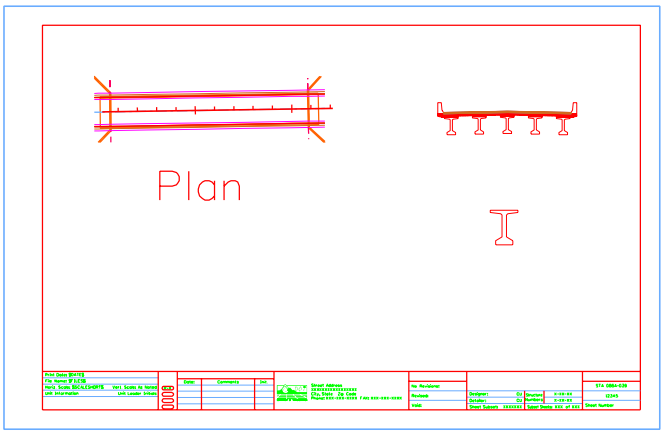
1. On the **CDOT Menu** Explorer, select **Drafting > Text** and set the following options:

   - **Filter: Title (T)**
   - **Justification: Center Center**
   - **Item: .30" 100% Title**



   This sets the active level to **DRAFT_Text-2** and automatically selects the **Place Text** command.

2. In the **Word Processor** box, key in ***Plan***
3. Drag your cursor into the view.
4. **<D>** to place the text as shown.



   Note that the text is extremely large. The text annotation scale is obviously wrong.

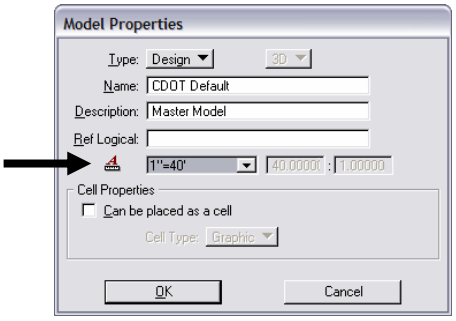
5. **<R>** out of the **Place Text** command.

Change the Text Annotation Scale

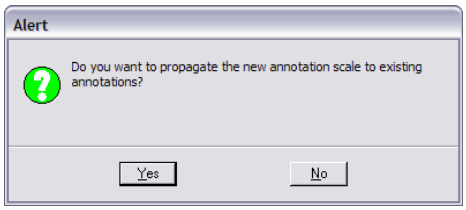
1. Select **Models** from the **Primary** toolbar.
2. In the **Model** box, select **Edit Model Properties**.
3. Note that the **Text Annotation Scale** is set to ***1:100*** (the default setting from the seed file).

   Note: This is a 40-scale drawing (the border was placed at a 40 scale around the graphics). Scaling the text 100 times results is text that is the wrong size.

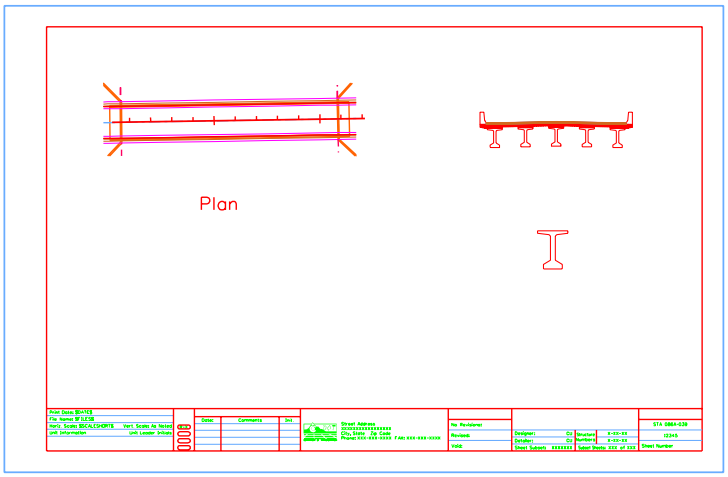
4. Change the **Text Annotation Scale** to ***1:40*** and select **OK**.



5. In the **Alert** box, select **Yes** to propagate the new settings to existing text.

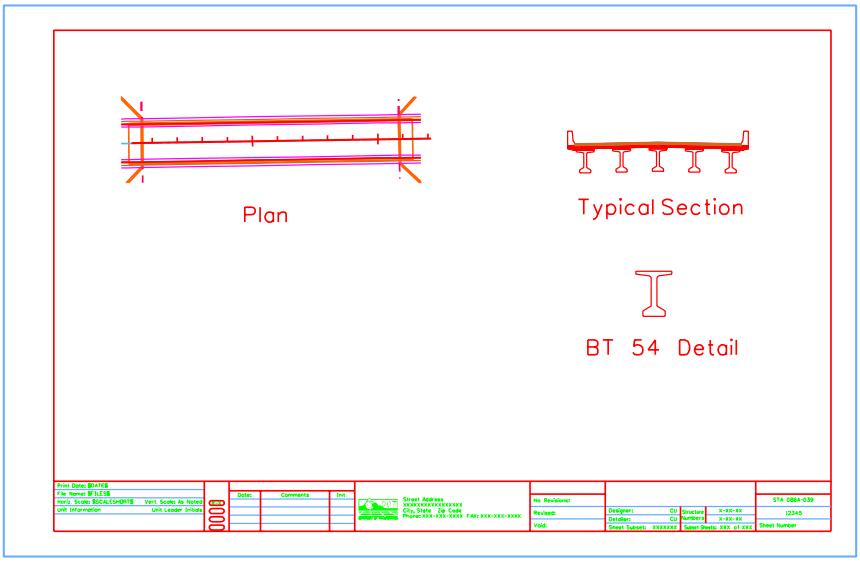


The text "Plan" is automatically resized for a 40-scale drawing and will now measure correctly when plotted.



6. Close the **Models** box.

7. Select **File > Save Settings** to save the new settings.
8. Using the same text attribute settings, place the following text in the locations shown:
    - ***Typical Section***
    - ***BT 54 Detail***
9. Use the **Move** command to move the text to the desired location, if necessary.

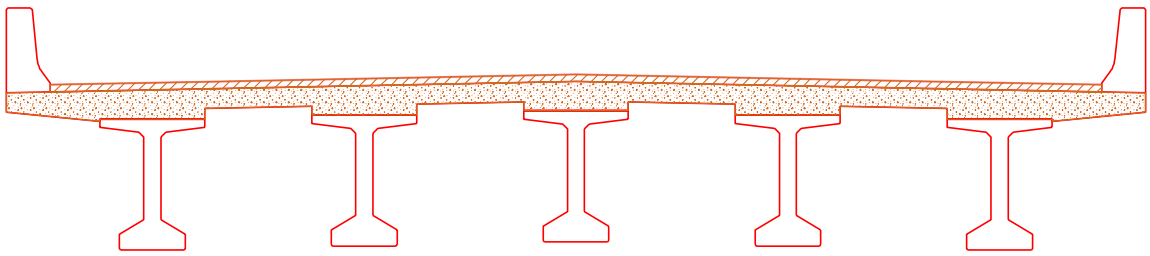


Dimension the Bridge Typical Section

Use the CDOT Menu to dimension the bridge typical section.

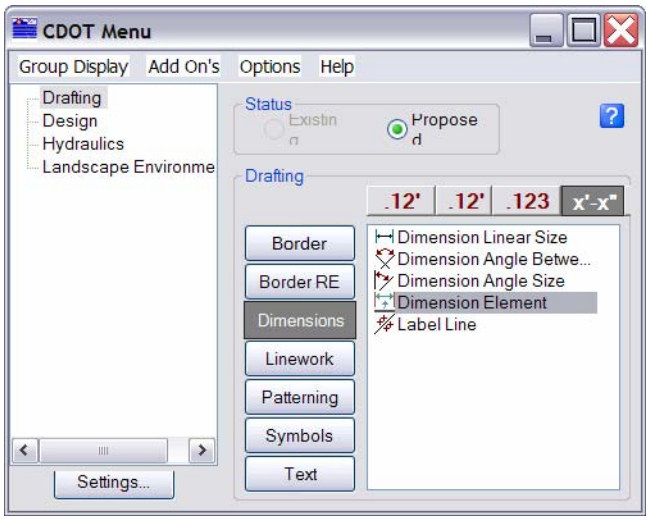
Dimension the travel lanes and shoulder by element

1. **Window** around the typical section.



On the **CDOT Menu** Explorer, select **Drafting** and set the following options:

- **Category: Dimensions**
- **Filter: x'-x"**
- **Item: Dimension Element**

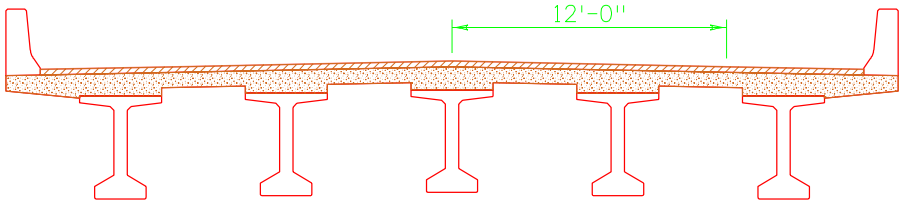


The **Dimension Element** command is automatically selected.

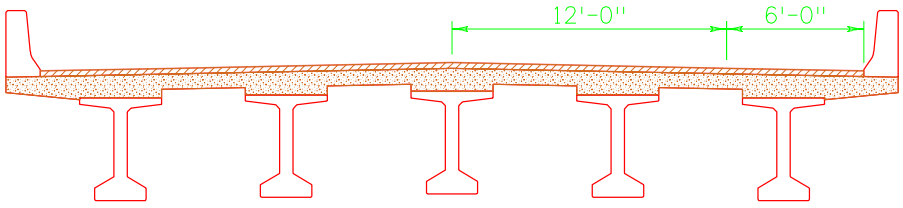
2. When prompted to select the element to dimension, **<D>** on the top pavement to the right of the centerline.

   Note: This should select the 12 ft **SmartLine** segment which represents the travel lane, if not, **<R>** until you select the correct element.

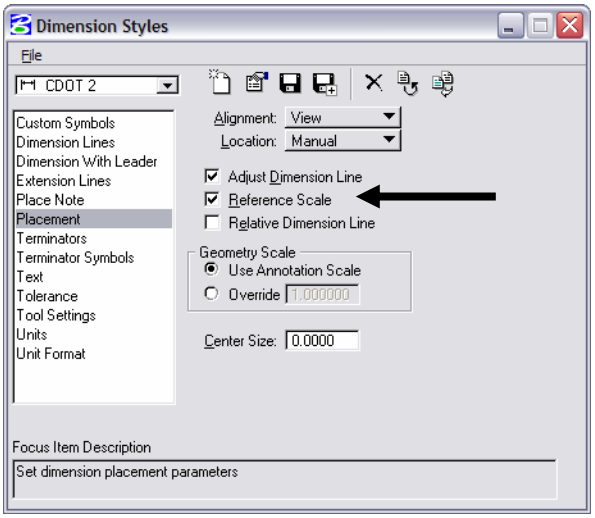
3. Move your cursor up to establish the length of the extension line and **<D>** to place the dimension.



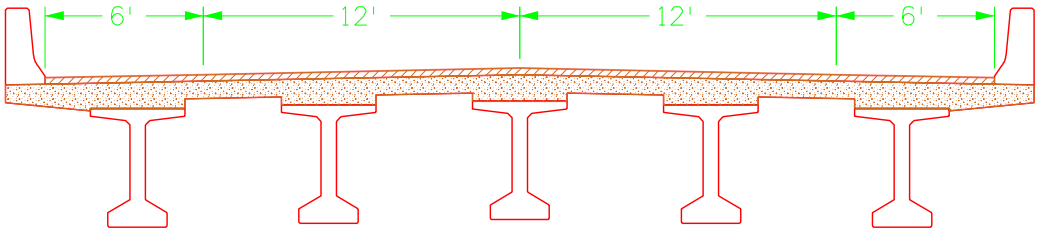
4. Repeat for the 6 ft. right-shoulder segment. **<D>** on the segment near the extension line and then **AccuSnap** on the 12 ft. dimension's terminator to place the dimension.



Note: The elements dimension actual size even though the bridge typical section was scaled up 4 times (40: 10 or 1:10 at a 40-scale). This is because **Reference Scale** is turned on in the **Placement** category of the dimension style. The units for dimensioning are, therefore, read from the model file instead of the sheet file. **Reference Scale** is on by default in all CDOT dimension styles.

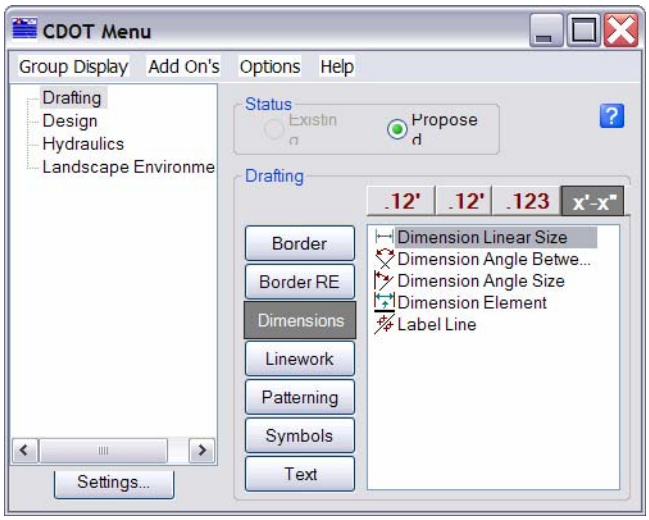


5. Repeat for the left side of the road. Be sure to **AccuSnap** on the adjacent dimension's terminator to line up the dimensions.



Dimension the bridge rail curb using linear dimensions

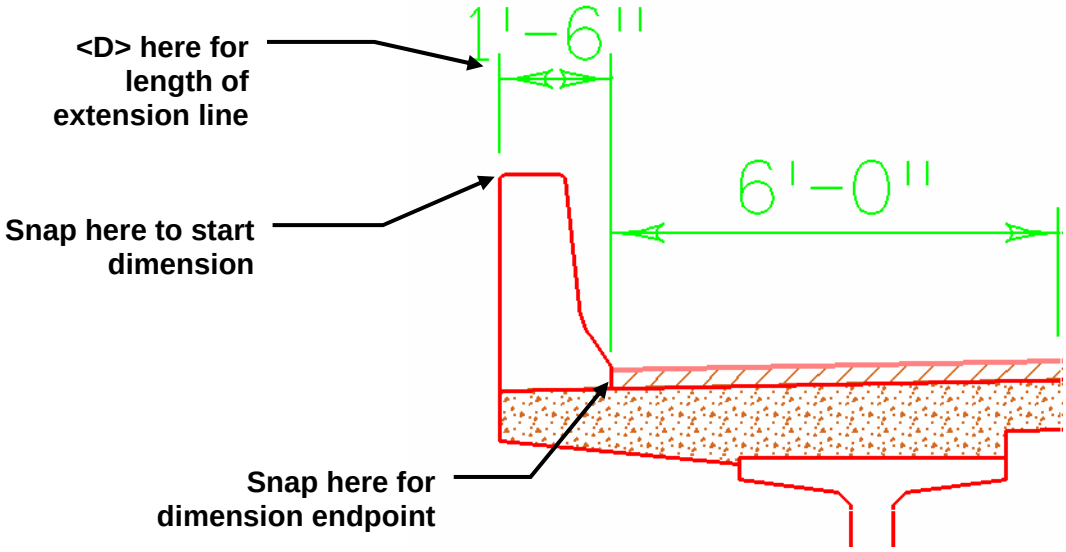
1. On the CDOT Menu Explorer, change the **Item** to **Dimension Linear Size**



2. Following your prompts, **AccuSnap** on the end of the back of the rail for the start of the dimension.

3. Move your cursor up to the approximate location shown and **<D>** to define the length of the extension line.

4. **AccuSnap** on the face of the curb as shown to define the end of the dimension.

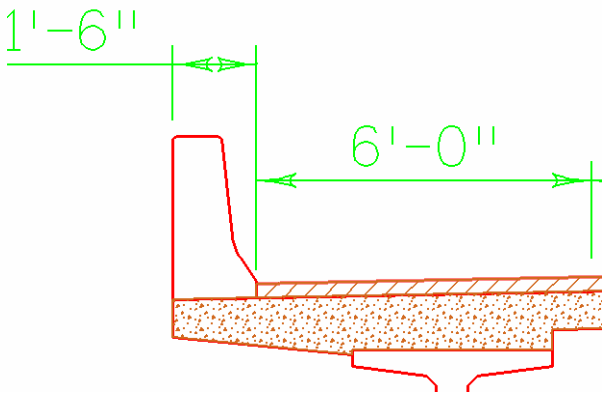


Note that the dimension text is too large for the dimension when placed inside the extension lines. You can **Modify** the text to solve this problem.

5. Select the **Modify** tool from the **Modify** toolbar.

6. **<D>** on the 1’-6” curb dimension text.

7. Lock your cursor on **AccuDraw X** axis and move the text to the left as shown.

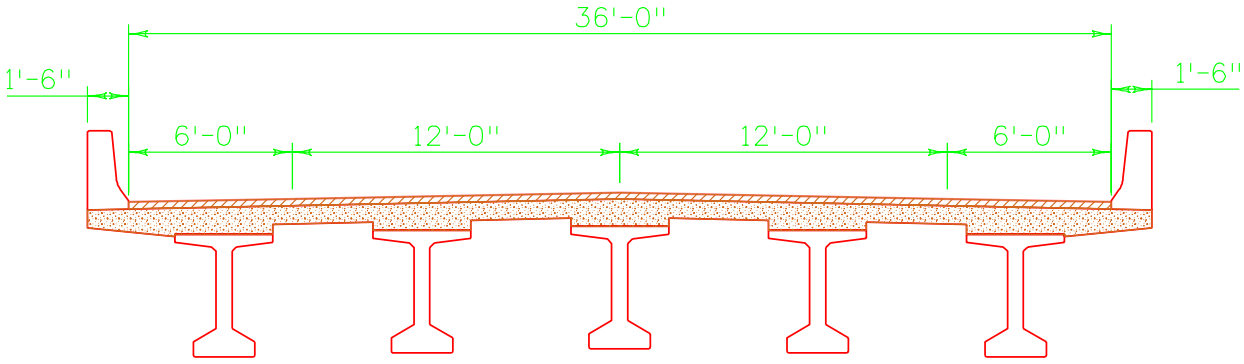


8. **<R>** when done.

9. Repeat the above steps and dimension the curb on the right side.

Place additional linear dimensions

1. Using the **Linear Dimension** command, place additional dimensions for the width of the section as shown.



Measure the typical section

1. Select the **Measure Distance** command and set the method to **Between Points**.
2. **AccuSnap** on the left outside curb line.
3. **AccuSnap** on the right outside curb line.
4. Review your results.

   The typical section measures 144 ft., which is 4 times the actual size since the detail was scaled up on the drawing. While dimension commands can read reference units (via the **Reference Scale** option in the dimension style), measuring command can not. You should only use **Measuring** command in sheet files where the graphics have been referenced 1:1 (like plan view graphics). If graphics have been scaled in the sheet, you must return to the model file for true measurements.

Edit dimensions

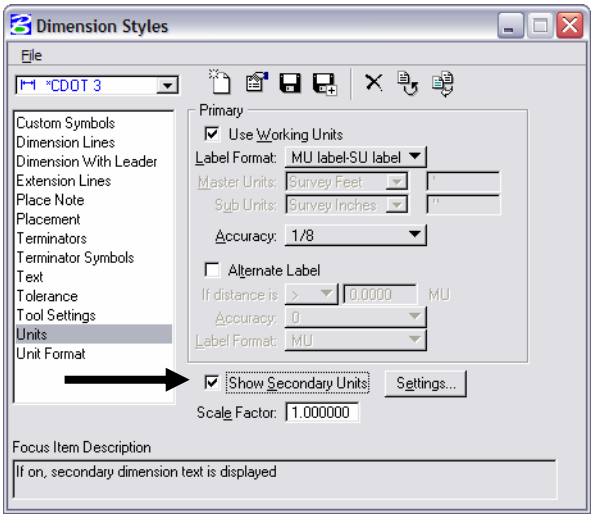
Edit the dimension style

You can change the dimension style to show secondary units below the dimension line. While this is intended for dual dimensioning in metric, you can edit this text to add descriptions to your dimensions.

1. Select **Element > Dimension Styles**.

   The **Dimension Styles** box opens. This is where all the CDOT standard dimension attributes are set. Typically, you will not need to change these settings for most dimensions.

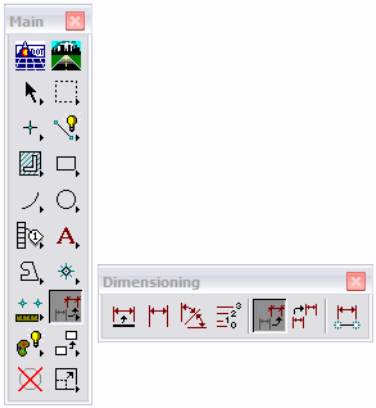
2. Select the **CDOT 3** style and then select the **Unit** category and toggle on **Show Secondary Units**.



3. Close the **Dimension Styles** box.

Change dimensions

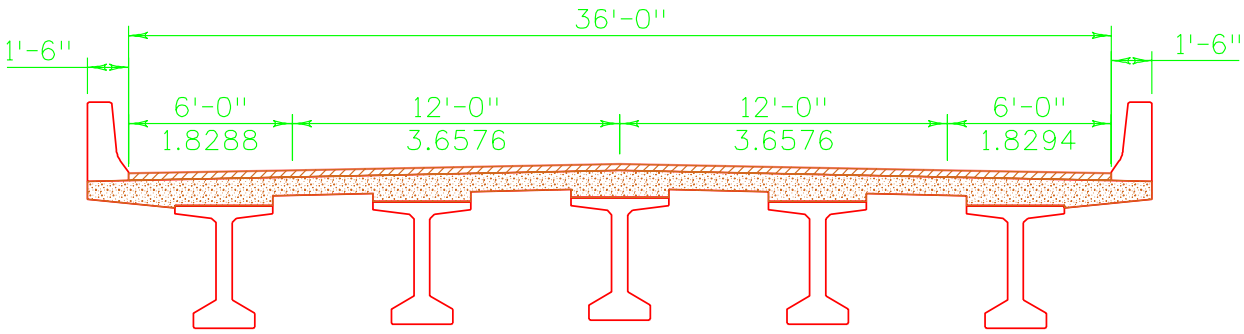
4. From the **Dimension** toolbar, select **Change Dimension**.



5. **<D>** on the 12 ft travel lane dimension and then **<D>** to accept.

   The dimension is updated to show the secondary units.

6. Repeat for the other dimensions as shown.

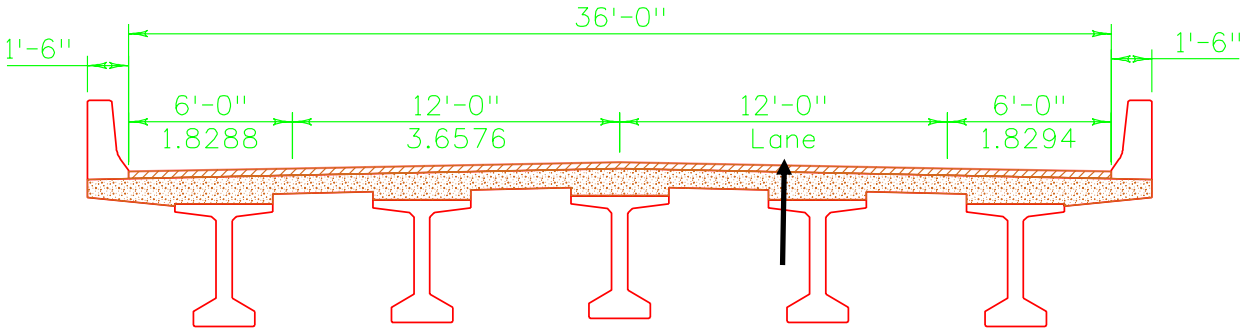


Change dimension text

7. Select the **Edit Text** command from the **Text** toolbar.
8. **<D>** on the 12 ft lane metric text.

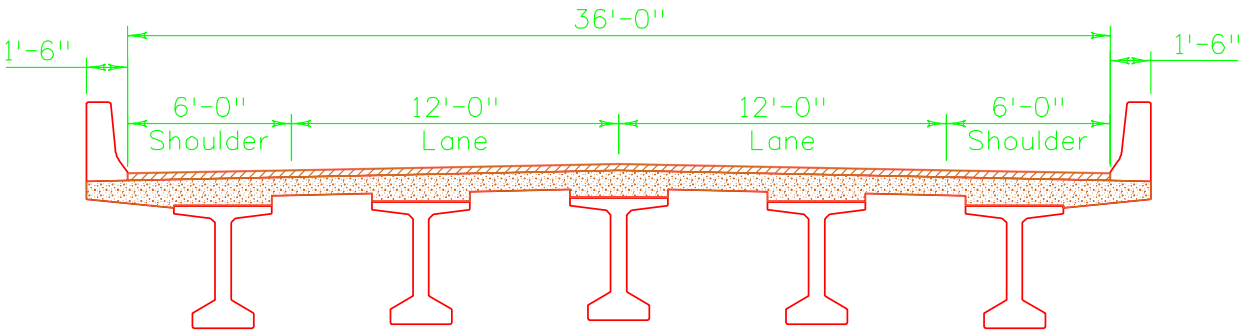
   Note: In the **Text Editor**, the dimension text appears as an asterisk (*) to denote that it is associative text.

9. Change the text to ***Lane***.
10. **<D>** to accept.



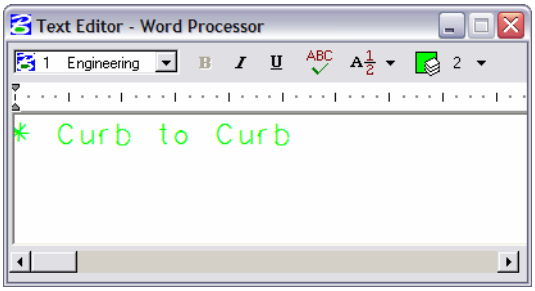
The text is updated on the dimension.

11. Repeat for the other travel lane and the shoulders as shown.

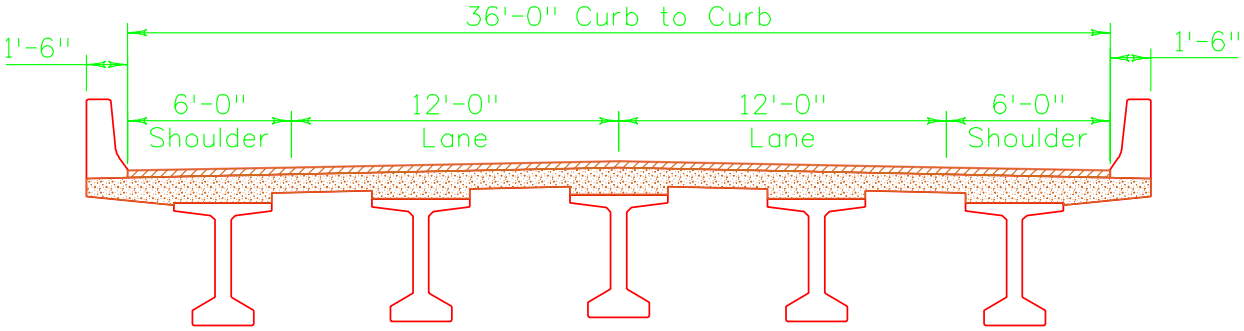


Edit dimension text

12. Using the **Edit Text** command, **<D>** on the 36 ft text.
13. In the **Text Editor**, click to the right of the asterisk to get a blinking cursor.
14. **Space** once and key in ***Curb to Curb***.



15. **<D>** to accept.

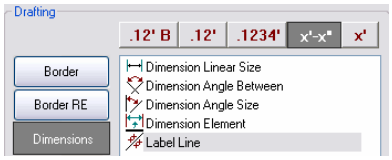


Since you did not delete the asterisk, the text is still associated with the element. You just added text to the associated dimensions.

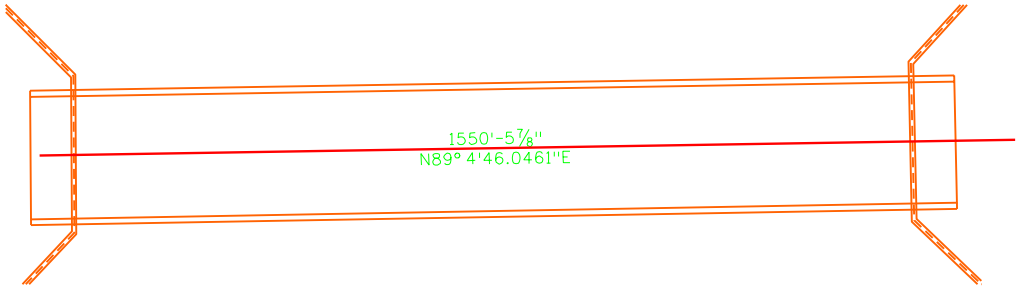
Dimension the Plan

Dimension the bearing of the centerline

1. On the CDOT menu, select **Label Line**.



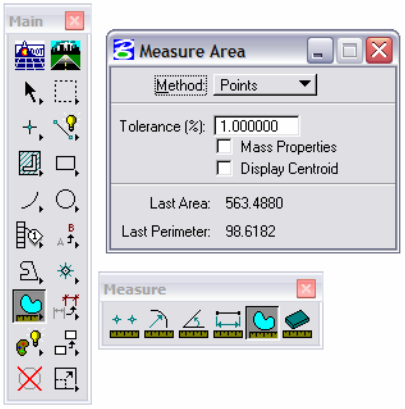
2. **<D>** on the SH 86 centerline.



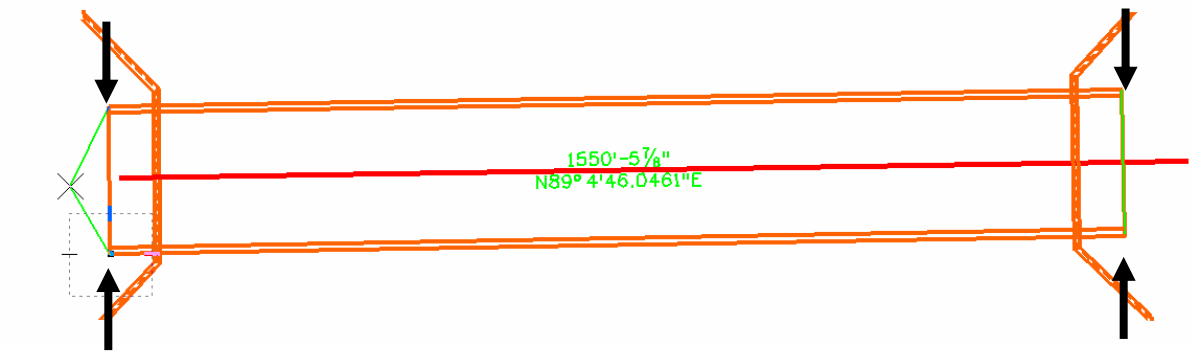
Both Bearing and Distance are placed. If you do not want one of the dimensions, you can drop the dimension, turn off the **Graphic Group** lock and then delete the dimension.

Measure the bridge area

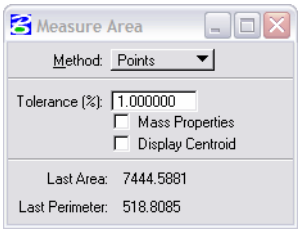
1. Turn **Depth** lock on.
2. Turn **AccuSnap** off.
3. Select the **Measure Area** command from the Measure toolbar.
4. Set the **Method** to **Points.**



5. Snap to the four corners of the bridge as shown (see arrows) to dynamically draw a shape to measure.



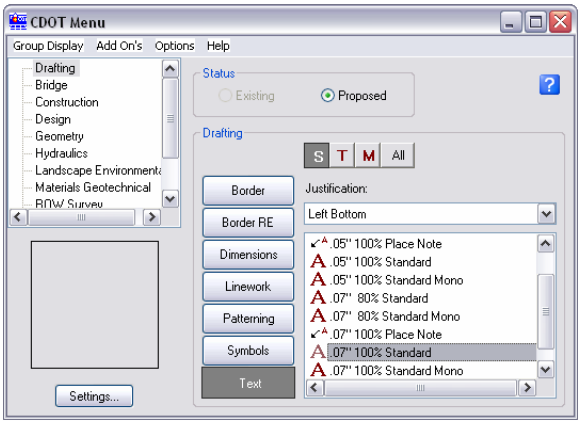
6. Reset **<R>** to close the shape to compute the area (***do not*** loop back and snap on the first point).



Note: The Points method is the only method that gives you a planar area with Depth lock turned on.

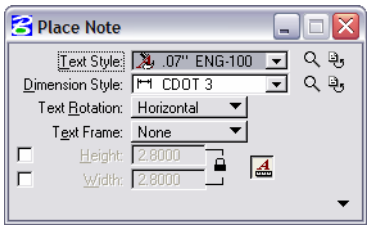
Place a note with a curved leader

1. From the CDOT Menu, set the text options as shown.



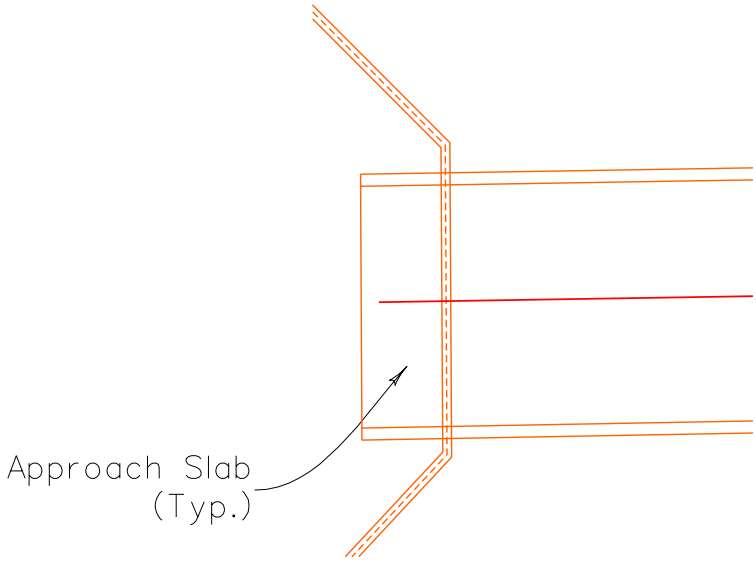
2. Select the **Place Note** command.

3. In the **Tool Settings** box, set the **Dimension Style** to **CDOT 3**.



Note: The **Place Note** command uses a dimension style for the leader and terminator as well as a text style. The CDOT 3 style will place a curved leader without an in-line leader.

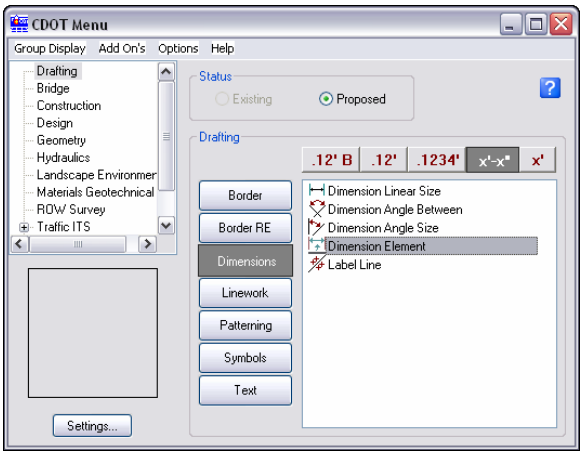
4. Place the note as shown.

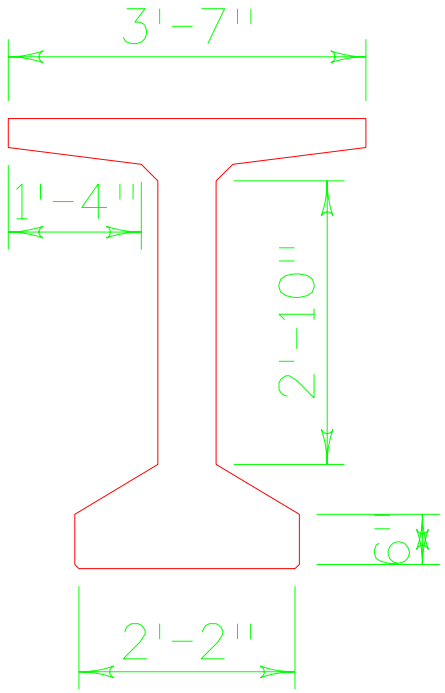


Note: Since this style does not use an in-line leader, you can place the text with a data point instead of a reset point on the side of the leader.

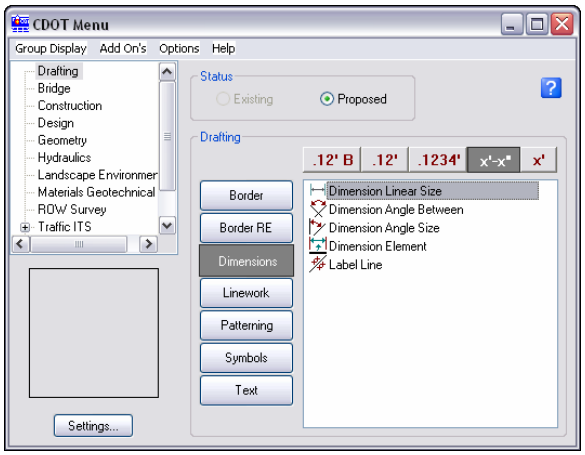
Dimension the Girder Detail

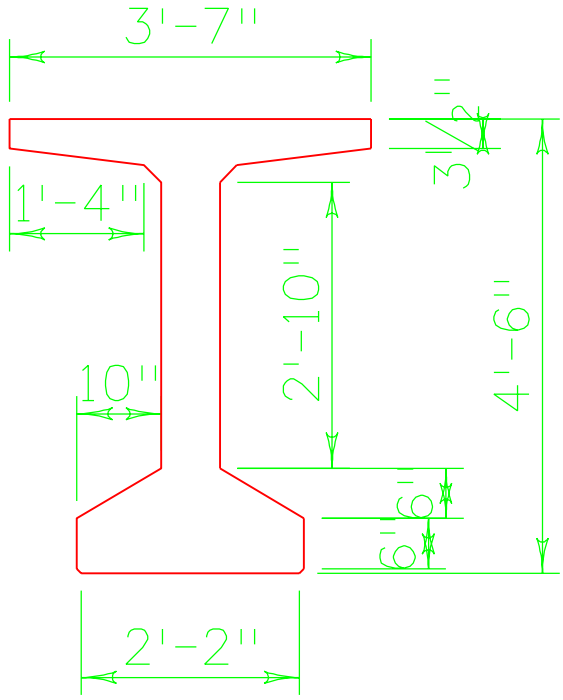
1. Use the **Element** method to dimension the girder as shown.



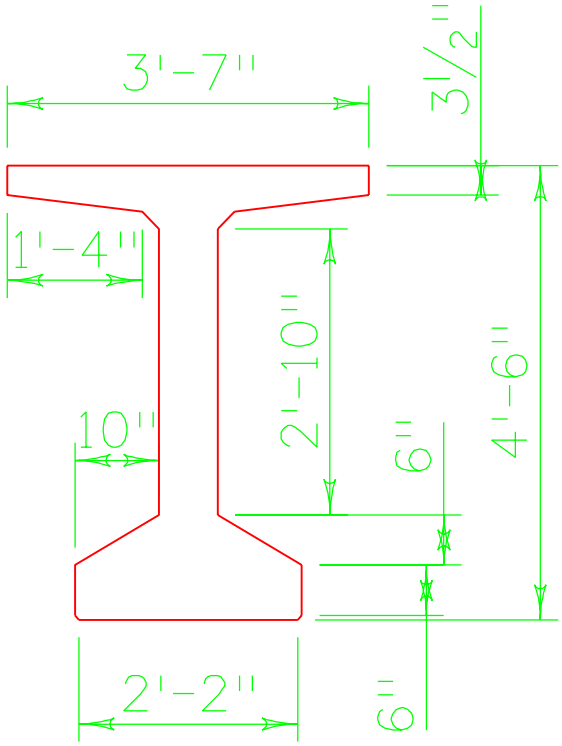


2. Use the **Linear** method to finish placing dimensions.





3. Use the **Modify** command to move the dimension text as shown.



4. **Fit** the view.
5. **Save Settings**.
6. **Exit** MicroStation.

Lab 10C – Printing to a Printer

In this lab, you'll plot a single sheet to the classroom 11 x 17 printer.

Objectives

After completing this exercise you will know how to:

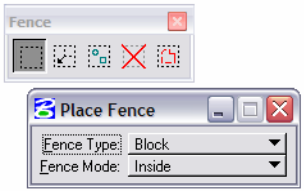
- Prepare a single sheet for printing.
- Print an 11x17 sheet to a printer.

Start MicroStation

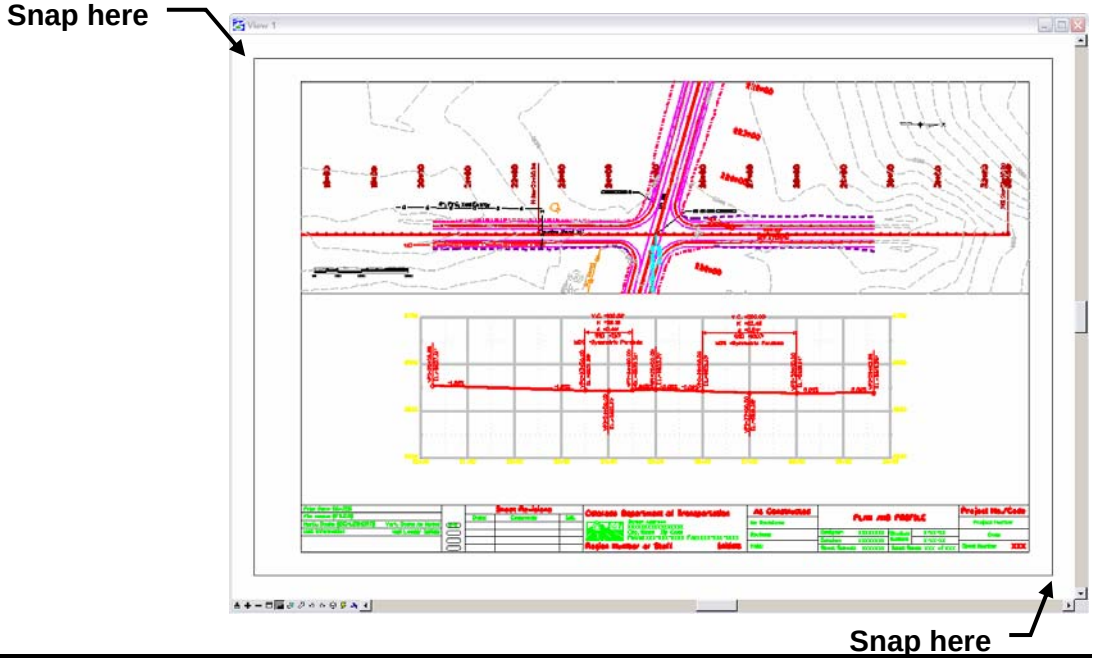
1. Start MicroStation and open **12345PDES_PnP9.dgn** from the project's **…\Design\Drawings** folder.
2. **Fit** the view.
3. Use the **Edit Text** command and edit the border text to add your initials as the Designer.

Prepare the sheet for plotting

1. Select **Place Fence** and set the **Fence Type** to **Block** and **Fence Mode** to **Inside**.



2. **Snap** (**<T>,** then **<D>**) to the corners of the outer-most shape that goes all the way around the plan and profile sheet to place the fence.

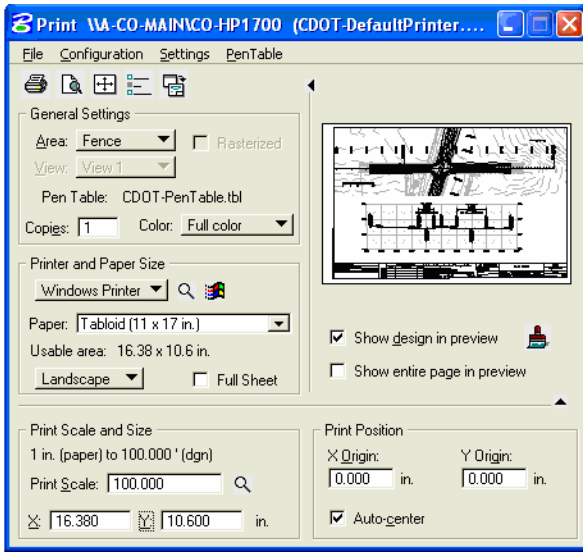


Print the sheet (classroom printer)

1. Select **File > Print** or choose the **Print** icon from the **Standard** toolbar.

2. From the Print dialog box, select **File > Select Windows Printer** and double-click on the **CO-HP 1700** printer. .

3. Set the dialog as shown here. Be sure to set the **Print Scale** to ***100***.



4. Select the **Print** icon or **File > Print**.

   The file is printed to the 11X17classroom plotter.

   Note: For tips on printing raster references (e.g. aerial photos), see the workflow ***Printing Raster Images***.

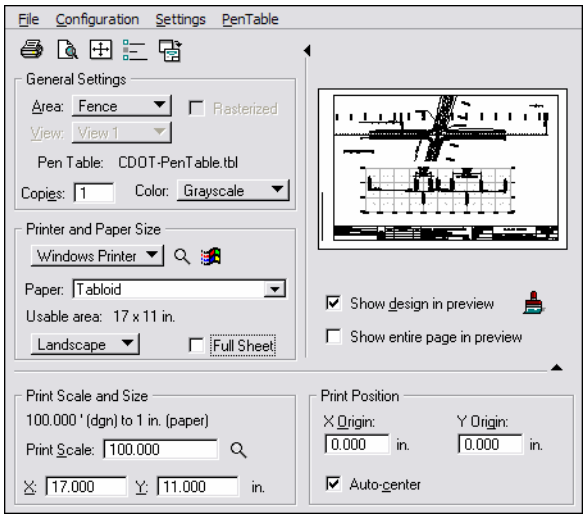
5. Do not exit. You'll keep MicroStation open for the final plotting exercise.

Print the sheet (CDOT workflow)

1. Select **File > Print** or choose the **Print** icon from the **Standard** toolbar.

2. If prompted, select **CDOT-DefaultPrinter.plt** for the print driver, and then select **OK**.

3. Set the dialog as shown here. Be sure to set the **Print Scale** to ***100***.



4. Select the **Print** icon or **File > Print**.

   Note: For tips on printing raster references (e.g. aerial photos), see the workflow ***Printing Raster Images***.

5. Do not exit. You'll keep MicroStation open for the final plotting exercise.

Optional Exercise

1. Open the **12345BRDG_Plan01.dgn** file from the project's **...\Bridge\Drawings** folder.

2. Plot the sheet to the classroom printer. Be sure to set the **Print Scale** to ***40***.

3. Do not exit. You'll keep MicroStation open for the final plotting exercise.

Lab 10D – Batch Printing to PDF

In this lab, you'll use **Batch Printing** to print multiple files at one time. Instead of printing to a printer, you'll print to PDF for the reproduction department (i.e. a plot set for a milestone submittals).

> **Note**: To batch print to a printer, see the workflow *CDOT Batch Printing*.

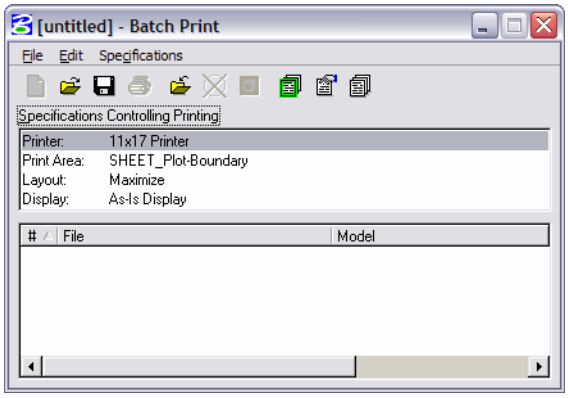
Objectives

After completing this exercise you will know how to:

- Select files to batch print.
- Set and change batch process specifications.
- Create a batch process job file (*.job).
- Batch print to PDF files.

Select Files to Batch Print

1. Select **Batch Print** in MicroStation from the file pull down menu.



> **Note:** You can be in any MicroStation file when you run the **Batch Print** process.

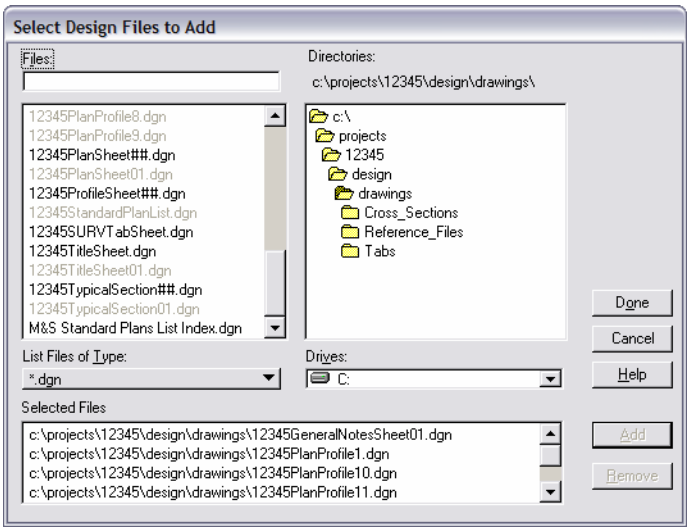
2. In the **Batch Print** dialog box, select **Edit > Add Files**.

> **Note:** **Add Active File** adds the design file that is open in MicroStation.

3. Navigate to the **C:\Projects\12345\Design\Drawings** folder. Select the following files to add to the batch process (you can hold down the **Ctrl** or **Shift** key to select multiple files):

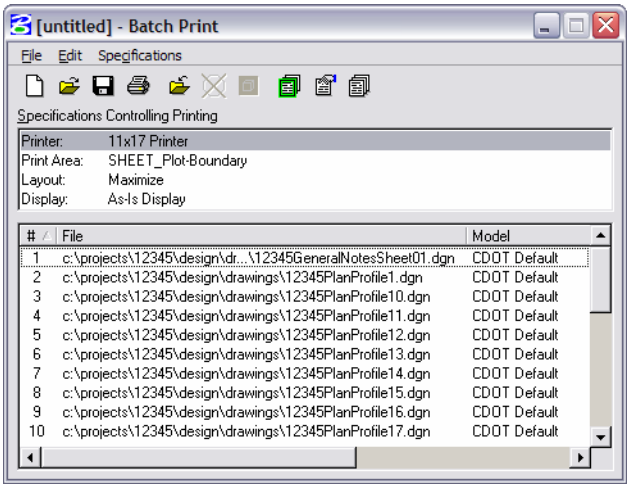
   - **12345DES_GenNote.dgn**
   - **12345DES_PnP01.dgn – 12345DES_PnP19.dgn**
   - **12345DES_StdPlanList.dgn**
   - **12345DES_TitleSheet.dgn**
   - **12345DES_TyplSect01.dgn**

4. Select **Add**.



Note: If you want to add other sheets to the batch process, you can change folders, select the file(s) and select **Add** again.

5. When finished adding files, select **Done**.

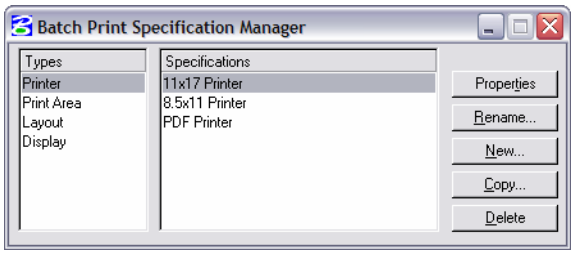


Set Batch Process Specifications

1. The batch process default specifications are:

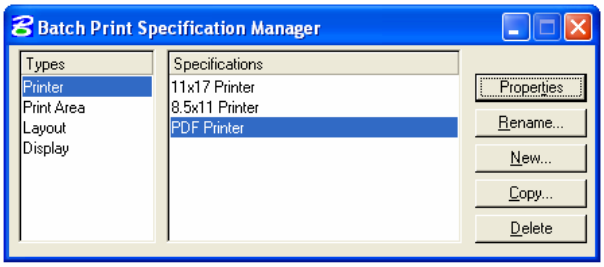
   - **Printer: 11x17 Printer**
   - **Print Area: SHEET_Plot-Boundary**
   - **Layout: Maximize**
   - **Display: As-Is Display**

2. Select **Specifications > Manage** to change the default specifications.

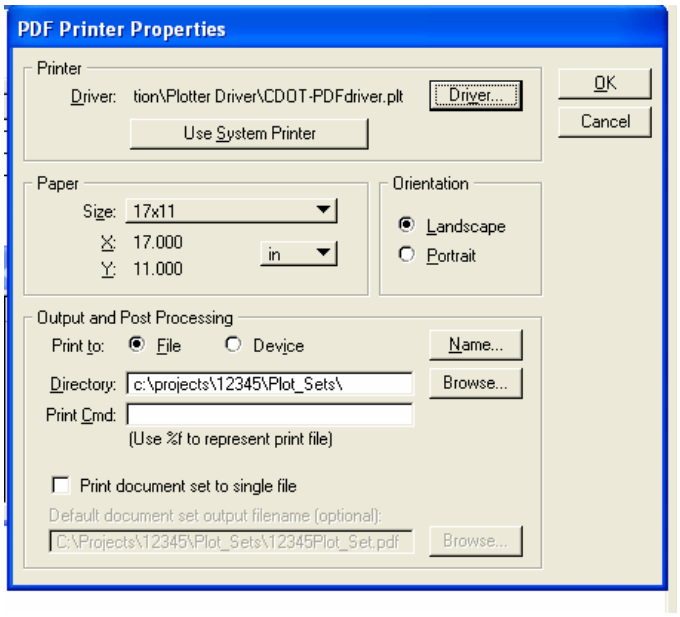


3. Under **Types**, select **PDF Printer**

   - Select Properties

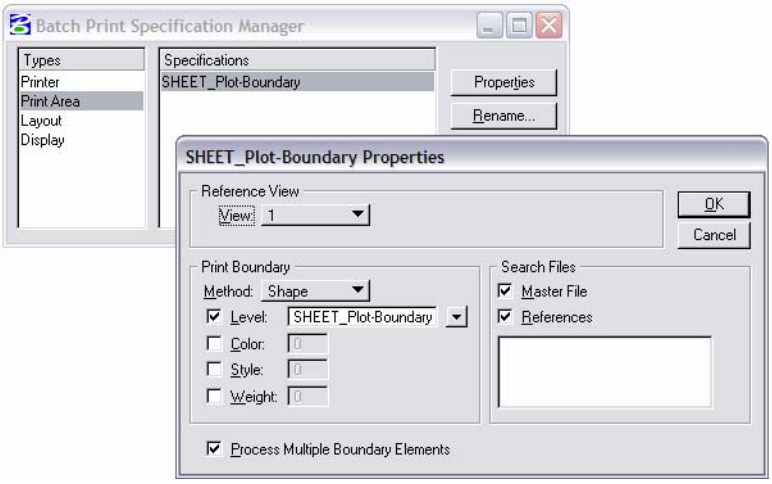


   - Select **Driver** and select **CDOT-PDFdriver.plt** and select **OK**
   - Toggle *off* **Print document set to single file**
   - Set the **Directory** to **c:\projects\12345\Plot_Sets**



   - Select **OK**

- Under **Types**, select **Print Area** and then select **Properties**.

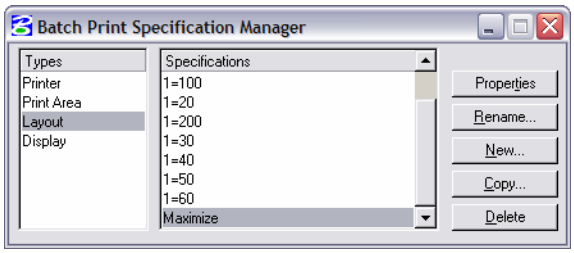


Notes: The printable area defaults to the outer boundary of the standard CDOT sheet border (the yellow shape on level **SHEET_Plot-Boundary**).

Both **Master File** and **References** are checked ***ON*** under **Search Files**. If the level **SHEET_Plot-Boundary** is not found in the **Master File** as a cell, it will search for the level in the Reference files associated with the sheet file.

4. Cancel the **Properties** box.

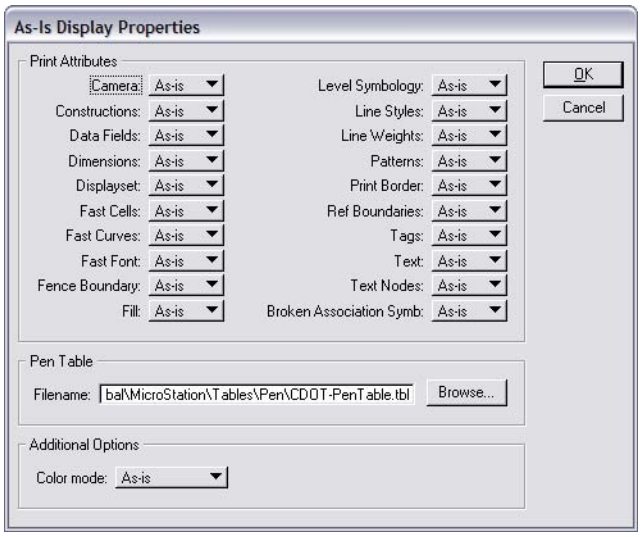
5. Under **Types**, select **Layout** and then select **Maximize**.



Note: The files you have selected for batch plotting are for different plot scales (100-scale, 40-scale, etc.). Therefore, select **Maximize**.

6. Under **Types**, select **Display**

   - Select **As-Is Display**
   - Select **Properties**



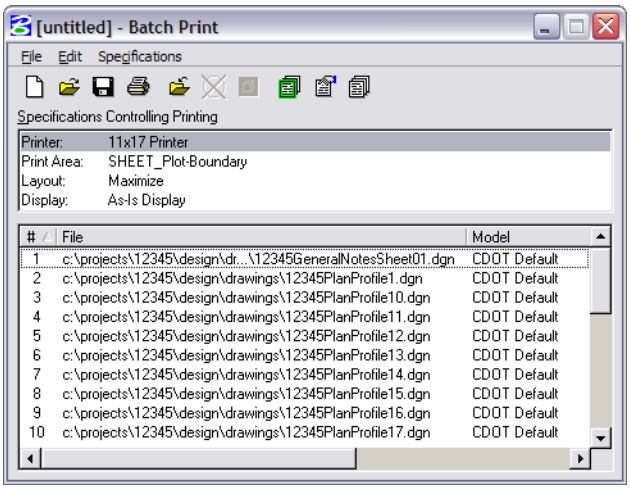
Notes: The **As-Is Display Specification** sets up the print properties for various elements. The **As-Is** setting reads MicroStation's *View Attributes* setting for each design file.

The Pen Table defaults to **CDOT-PenTable.tbl,** which is the table used for black-and-white printing.

7. **Cancel** out of the **Properties** box.

8. **Close** the **Batch Print Specification Manager** box by selecting the **X** in the upper-right corner.

   Your changes are shown in the main **Batch Print** dialog box.

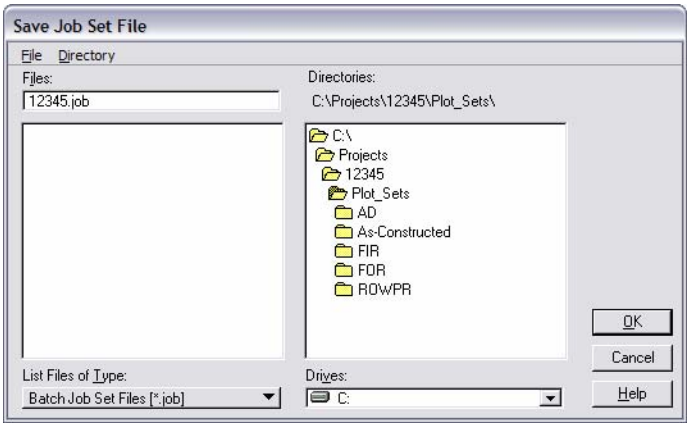


Save your Specifications to a Job file (*.job)

1. From the Batch Print dialog box, select **File>Save As...**
2. Navigate to the project's **...Plot_Sets** folder.

   Note: You should select one of the subfolders (FIR, FOR, etc.) for the appropriate plot set. For training purposes, you'll plot to the upper level Plot Sets folder.

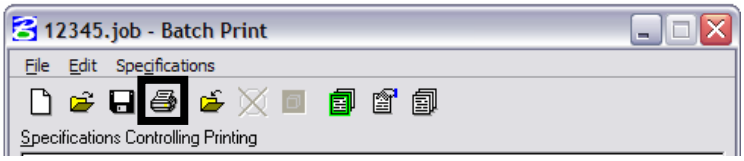
3. In the **Files** field, key in ***12345*** and select **OK**.



The job file should be saved to the project in the appropriate folder under the **Plot_Sets**. The file is automatically assigned a .job extension. If you want to process this job again, select **File > Open** from the **Batch Print** dialog box and choose the **12345.job** file.

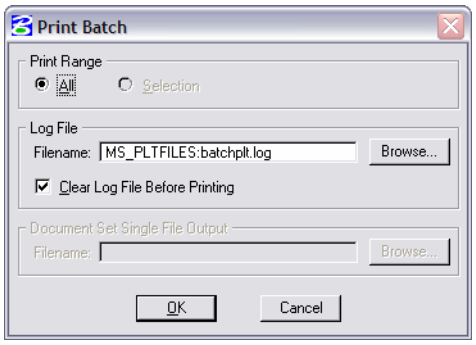
Create the Batch Prints

1. Select the **Print** icon to open the **Print Batch** dialog box.



2. In the **Print Batch** dialog box:

    - Set **Print Range** to **All** to print all the files selected



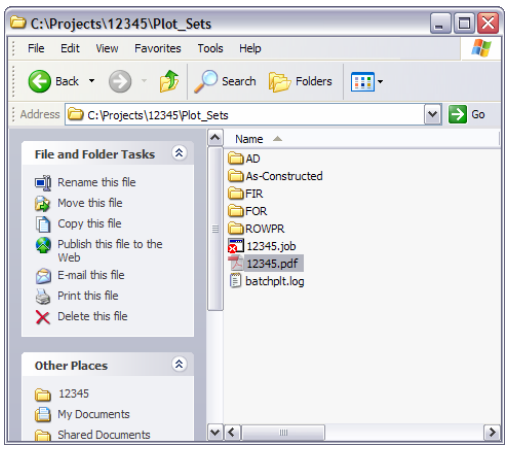
Note: The option **Selection** would print only the files that you highlight in the list.

3. Select **OK** to start the batch process.

    The process will take a few minutes to complete. If errors are encountered, open the error log **batchplt.log** in the **C:\Program Files\Bentley\Program\MicroStation** folder for more information.

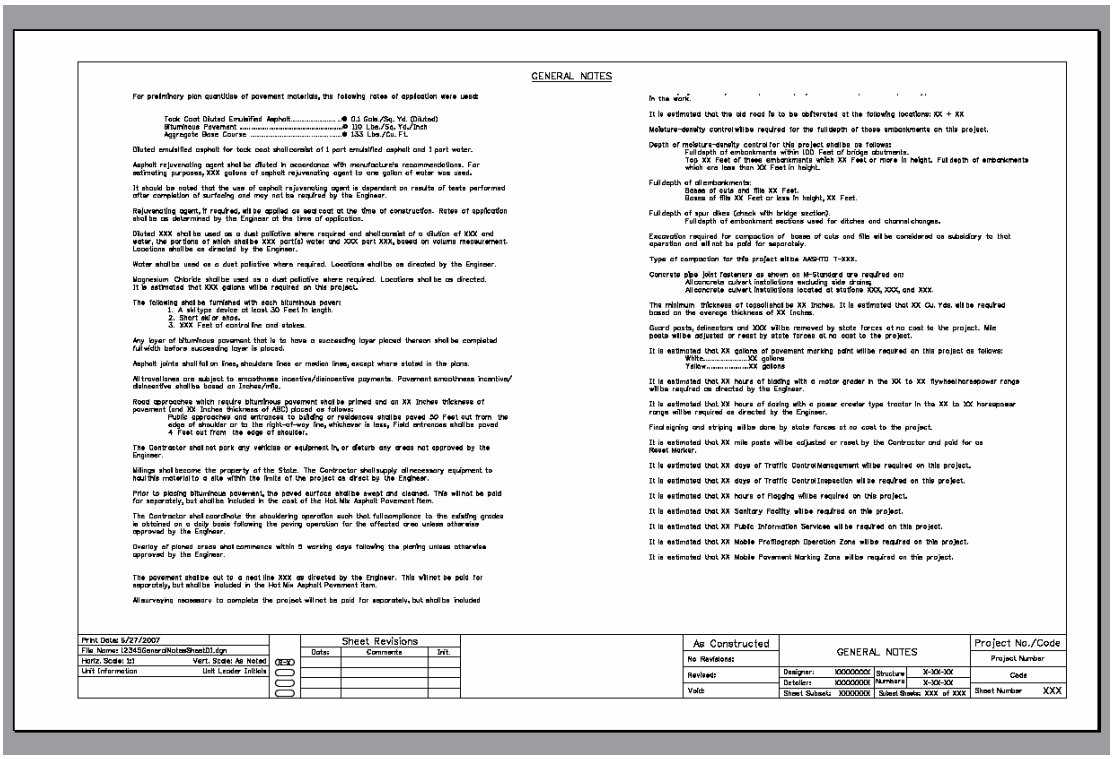
Review the PDF files

1. In Windows, open **My Computer**.
2. Navigate to the **C:\Projects\12345\Plot_Sets** folder.

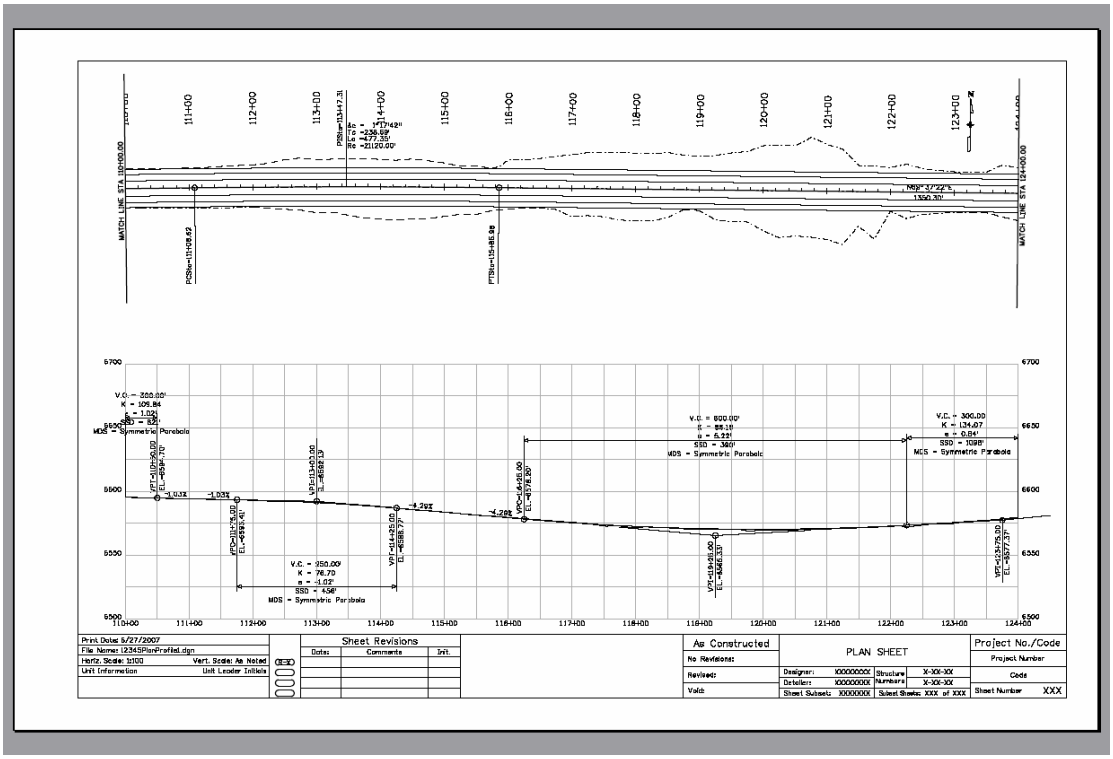


The folder contains the **12345.pdf** file sheets plus the **12345.job** file.

3. Double-click on one of the **pdf** files to open.



4. Continue opening sheets as desired.



5. **Close** My Computer.

6. Return to MicroStation and **Exit**.

2

2D · 97, 148, 149, 380

3

3D · 1, 17, 97, 98, 99, 101, 103, 104, 110, 112, 114, 148, 149, 155, 160, 198, 202, 207, 241, 242, 243, 265, 267, 274, 379, 380, 381, 384, 401, 411, 443, 514

A

About Element Center · 236, 237, 502
AccDraw · 229, 342
AccuDraw · 199, 200, 201, 202, 203, 229, 230, 231, 232, 233, 234, 339, 342, 343, 344, 348, 349, 350, 351, 355, 357, 360, 395, 396, 408, 423, 433, 505, 522
AccuSnap · 14, 194, 196, 197, 203, 232, 233, 234, 242, 253, 256, 261, 276, 280, 323, 326, 339, 344, 348, 353, 355, 356, 379, 387, 396, 416, 427, 432, 505, 511, 512, 514, 519, 520, 521, 523, 527
Active Angle · 497, 499, 501, 502
Active Depth · 99, 101, 103, 113, 155, 242, 380
Align Edges · 237
Association Lock · 491
Associative dimensions · 491
Attributes · 55, 56, 58, 60, 82, 105, 215, 236, 245, 246, 259, 282, 283, 304, 499, 539
AutoCAD · 4, 47, 495

B

ByLevel · 54, 55, 56, 57, 58, 60, 84, 86, 87, 145, 190, 191, 243, 245, 247, 249, 256

C

CADD Overview · 51, 119
CDOT CADD Resources · 19, 20, 126, 127, 128, 129, 130, 133, 135, 137, 141, 143, 146, 148, 189, 190, 244, 300, 374, 484, 493, 495, 496
CDOT file naming convention · 137
CDOT Level Structure · 51, 145, 147
CDOT Menu · 7, 8, 20, 119, 124, 125, 128, 129, 187, 188, 190, 191, 192, 207, 210, 211, 212, 213, 217, 219, 230, 243, 247, 249, 252, 256, 260, 267, 274, 275, 278, 284, 299, 300, 305, 307, 309, 312, 314, 316, 317, 318, 322, 325, 326, 328, 342, 346, 367, 372, 376, 377, 383, 389, 390, 392, 398, 401, 402, 408, 417, 419, 427, 447, 464, 485, 486, 487, 490, 492, 497, 499, 500, 501, 502, 504, 508, 516, 518, 519, 521, 528
CDOT Misc. Toolbar · 247
CDOT Support Process · 19, 20, 126, 128, 190
CDOT Workspace · 142, 143, 144, 145, 189
Cells · 190, 289, 292, 293, 295, 296, 297, 299, 303, 305, 328, 347, 352, 409, 414, 415, 424, 446
Chamfer · 241
Clip Boundary · 392, 417, 447, 448, 479, 507
Complex elements · 336
Compressing the Design File · 204
Construct Array · 238
Coordinate Readout · 148, 150, 163, 165, 209, 341, 379, 501
Copy · 151, 153, 180, 235, 250, 267, 271, 272, 273, 308, 318, 344, 345, 349, 360, 364, 387, 440, 482
Creating Files · 138, 142, 148
Creating Sheets · 123, 124, 125, 371, 372, 373, 374, 375, 376, 377
Custom Line styles · 243

D

Delete Vertex · 241
Deleting Elements · 203
Depth lock · 197, 242, 252, 255, 256, 257, 261, 274, 277, 279, 280, 318, 322, 379, 380, 381, 389, 513, 527, 528
Depth Lock · 197, 242, 252, 255, 256, 257, 261, 274, 277, 279, 280, 318, 322, 379, 380, 381, 389, 513, 527, 528
Design Library · 51, 481, 490
Dimension styles · 490
Dimension Styles · 490, 523, 524
Dimensioning · 490, 491, 492
Dimensions · 371, 373, 490, 492, 518, 519, 521, 523, 524, 527, 529, 530
Directory Structure · 135, 141, 155
Display Depth · 100, 101, 103, 114
Drawing Composition · 119, 120, 137, 139, 140, 273
Drawing Tools · 193
DWG · 15

E

Element Attributes · 245, 247, 282, 323
Element Information · 87, 205, 245, 264, 265
Element Selection · 175, 331, 332, 364, 365
Extend · 239, 240, 354, 359
Extend Element to Intersection · 240, 359
Extend Two Elements to Intersection · 239

F

Fence · 15, 302, 310, 333, 334, 344, 345, 404, 432, 533
File Naming Convention · 137, 141
Fillet · 241
Flood · 302, 305, 368, 381

G

Global Display · 49, 85, 291

Global Freeze · 49, 85, 291
Graphic group · 337
Graphic Group Lock · 337, 365, 366, 439, 527

I

InRoads · ii, 20, 97, 104, 121, 122, 127, 128, 129, 130, 142, 248, 255, 279, 284, 366, 371, 383, 384, 394, 502
Insert Vertex · 241
IntelliTrim · 240

L

Level Display · 48, 49, 53, 59, 60, 61, 64, 66, 67, 68, 73, 75, 78, 82, 83, 92, 96, 105, 106, 107, 109, 147, 153, 171, 175, 179, 180, 291, 313, 314, 384, 394, 435, 475, 480, 498
Level Filters · 58, 89, 95
Level Libraries · 51, 84, 145, 146
Level Manager · 14, 51, 53, 54, 55, 57, 58, 60, 61, 84, 85, 86, 87, 89, 90, 92, 147, 392
Levels · 1, 47, 51, 59, 61, 64, 68, 81, 93, 94, 147, 245
Linear Elements Toolbar · 41, 43, 44
Live Nesting · 153, 176, 177, 386, 411
Locks · 14, 24, 25, 85, 195, 201, 231, 255, 267, 274, 279, 280, 318, 337, 396, 514, 522

M

Manipulating elements · 235
Measuring · 379, 523
Message Center · 14
MicroStation Interface · 4, 6, 22, 159
MicroStation Manager · 3, 4, 21, 22, 160, 161, 163, 164, 181, 185, 207, 208, 249, 267, 288, 340, 383, 401, 411, 437, 442, 443
Mirror · 237, 345
Models · 97, 119, 121, 122, 123, 137, 139, 148, 150, 152, 155, 160, 179, 181, 269, 272, 273, 289, 290, 291, 340, 371, 372, 373, 385, 406, 411, 412, 420, 421, 426, 435, 437, 483, 498, 513, 517
Modifying elements · 235, 238, 239, 253, 267, 285, 323, 324, 327, 339, 354, 359, 361, 521, 522, 532
ModZ · 243
Mouse · 1, 2, 18, 23, 36, 37, 38
Move · 24, 37, 196, 197, 203, 225, 227, 235, 236, 239, 250, 251, 281, 282, 287, 343, 344, 348, 349, 350, 351, 356, 357, 360, 365, 366, 383, 391, 395, 396, 404, 432, 433, 437, 441, 467, 478, 479, 518, 519, 521
Move/Copy Parallel · 236, 250, 281
Multi-Snaps · 197

P

Partial Delete · 239
Patterning · 192, 301, 302, 303, 304, 305, 316, 366, 367, 368, 381
Place Arc · 219
Place Block · 194, 223, 232, 233, 392, 417, 447
Place Circle · 217
Place Line · 11, 41, 194, 199, 213, 230
Place Note · 504, 505, 528, 529
Place Shape · 314, 315
Place SmartLine · 40, 41, 43, 233, 256, 275, 310, 311, 355, 392
Placing Graphics · 192, 299, 305
Plan/Profile · 497
Plotting · 85, 140, 142, 192, 311, 312, 313, 392, 409, 462, 493, 494, 495, 496, 498, 534, 536, 538, 540, 541
Power Selector · 332
PowerSelector · 262, 333
Project Directory Structure · 132, 133, 135, 141
Project set-up · 132, 134

R

Redo · 204, 207, 226
Reference File
  attaching · 476
  moving · 479
  vector graphics · 474
References · 120, 150, 151, 153, 166, 178, 179, 180, 267, 268, 269, 270, 271, 272, 273, 308, 317, 318, 385, 386, 387, 393, 394, 400, 411, 417, 448, 462, 476, 478, 503, 506, 507, 538
Rotate · 17, 27, 98, 103, 110, 111, 112, 113, 201, 202, 237, 342, 371, 373, 375, 383, 387, 413, 497, 502, 503
Rotate View · 220, 236
Rotating a 3D View · 110, 237, 375, 387

S

Saved Views · 78, 439, 474, 475
Scale · 167, 190, 236, 237, 239, 243, 244, 260, 303, 304, 312, 319, 348, 367, 386, 390, 394, 398, 402, 407, 409, 411, 415, 419, 421, 449, 476, 483, 484, 520, 523, 534
Seed File · 142, 148
Select Group Environment · 61, 143, 158
Selection Sets · 331, 339
Shared Cells · 297, 298, 378
Simplify Geometry · 336, 363
Single Source Project Data · 131
SmartMatch · 363
Snap Lock · 194
Snapping to Elements · 194
Starting a new job · 132, 155, 158, 159, 462
Starting MicroStation · 3, 21, 61, 103

T

Tags · 248
Text · 24, 68, 70, 71, 74, 95, 190, 377, 394, 405, 410, 420, 421, 423, 425, 465, 471, 480, 481, 482, 483, 484, 485, 486, 487, 489, 490, 497, 498, 499, 500, 502, 504, 508, 509, 515, 516, 517, 519, 525, 526
Text Annotation Scale · 371, 372, 373, 407, 420, 421, 426, 483, 484, 498, 515, 517

Text styles · 481
Text Styles · 481
Training Files · 136, 158
Trim · 240, 252, 254, 267, 285, 361
True Scale · 303
Typical Section · 124, 189, 371, 372, 373, 423, 425, 426, 427, 428, 429, 430, 431, 432, 518

U

Undo · 204, 207, 224, 226, 356, 358, 364, 366

V

Vertices · 214, 222
View Display · 17, 49

W

Workflows · 61, 119, 121, 122, 123, 124, 125, 150
Working Units · 148, 149, 162, 165, 208, 303, 341
Workspace · 4, 9, 22, 105, 142, 144, 145, 159, 182, 199, 243, 289, 292, 294, 295, 451, 481, 490