

Chapter 5 - 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.

Chapter Objectives:

- Describe the differences between “Sheet” files and “Model” files.
- Discuss the workflow for adding data to model files based on the specialty group
- Discuss the workflow for adding data to sheet files based on the specialty group
- Discuss the benefits of using single source data for project design
- Describe using the Create Project Utility program
- Describe the use of the PCF file
- Discuss the CDOT Project Directory Structure
- Describe how to create new model files
- Discuss working with reference files and raster images

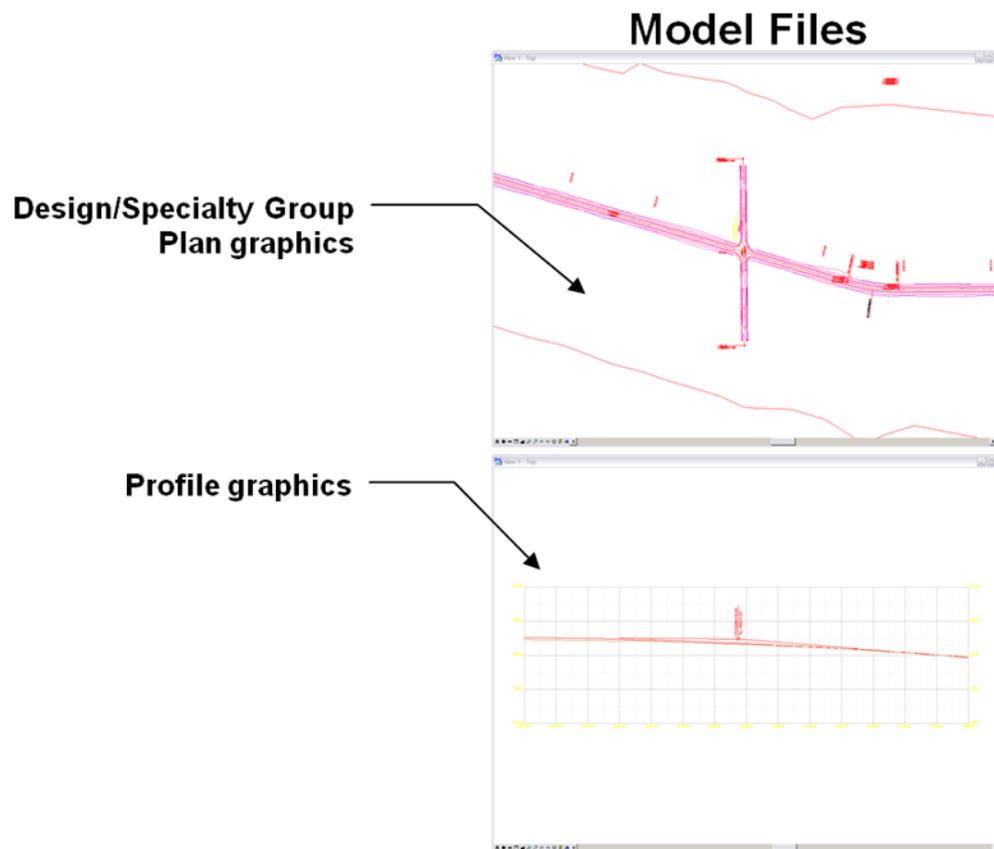
Creating a CDOT Project

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

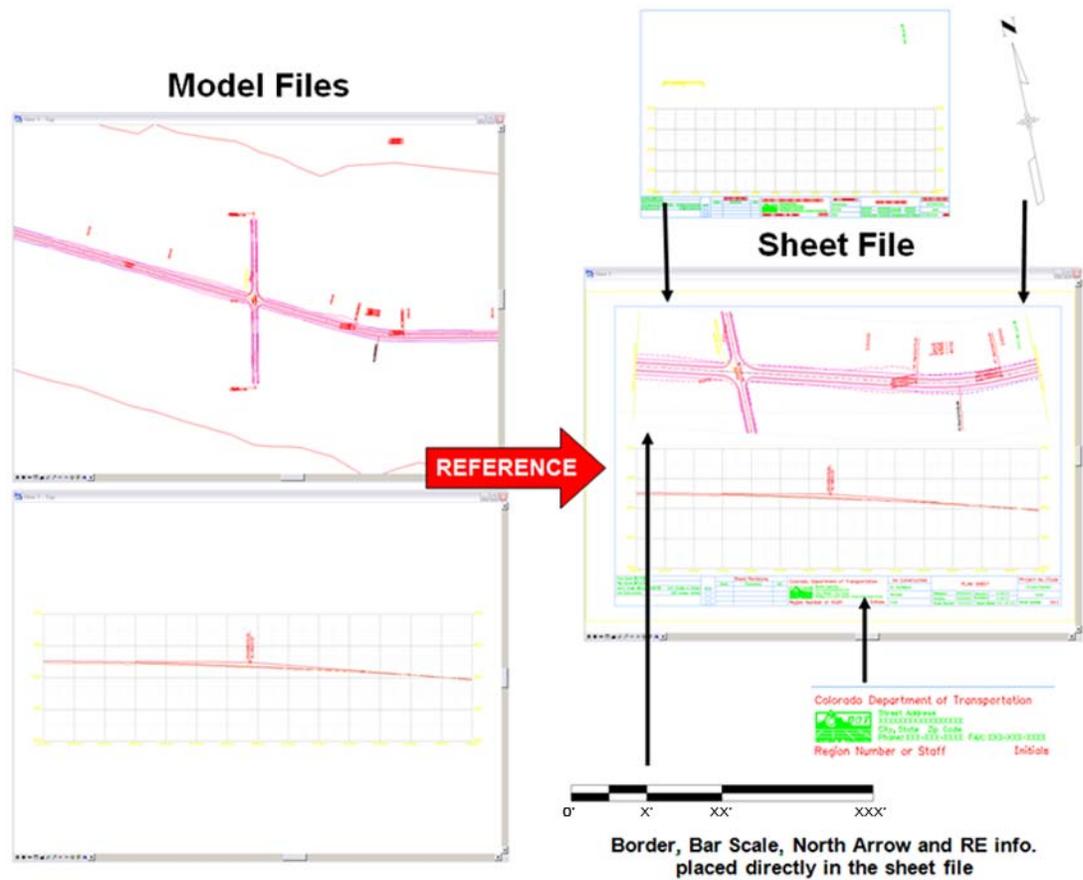
Model files vs. Sheet files

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.

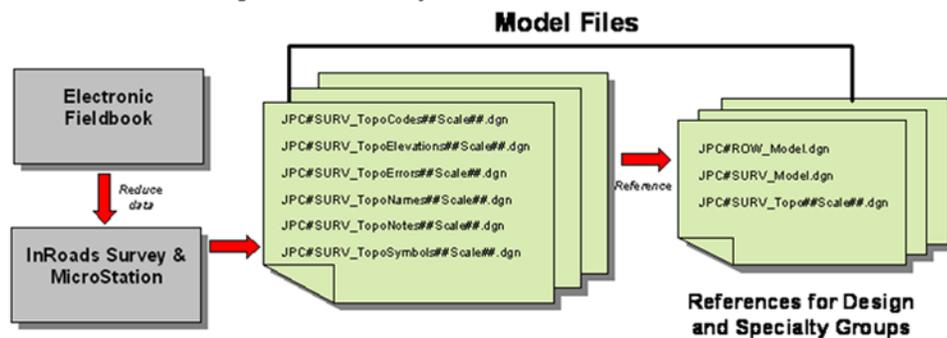


For more information on References, see the section Referencing Other’s Work in this chapter.

Model File Workflow for Survey/ROW

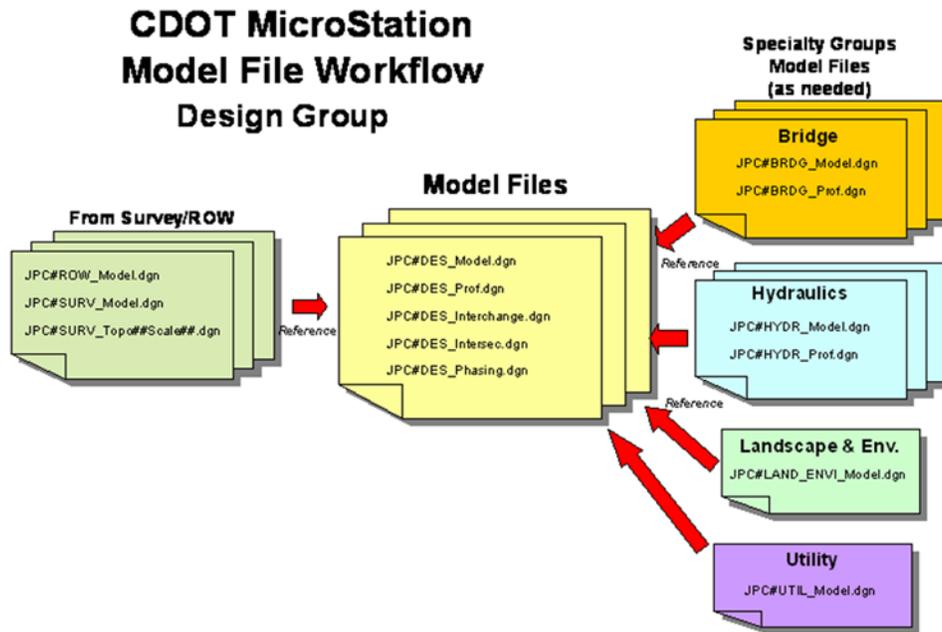
To create existing model files, the Survey/ROW group uses MicroStation and InRoads Survey to reduce the electronic fieldbook data and create model files for ROW, survey planimetrics and existing topographics. These existing model files can then be referenced by Design and specialty groups as a base for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

CDOT MicroStation Model File Workflow Survey/Row Group



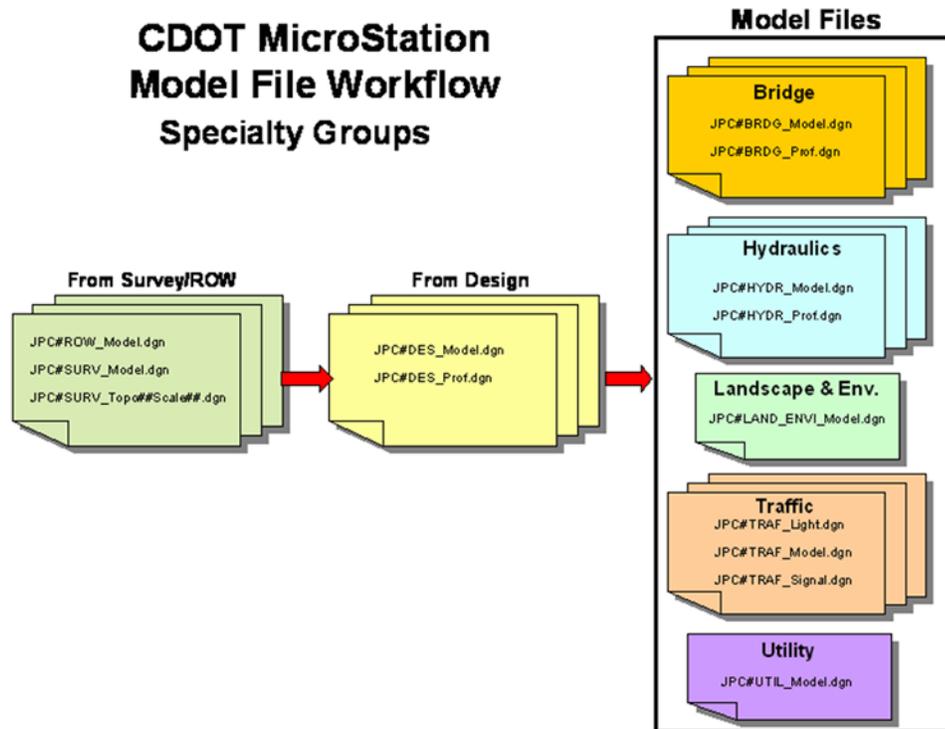
Model File Workflow for Roadway Design

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. Occasionally, other specialty group model files are needed by Design, so these model files may be attached as reference files.



Model File Workflow for Specialty Groups

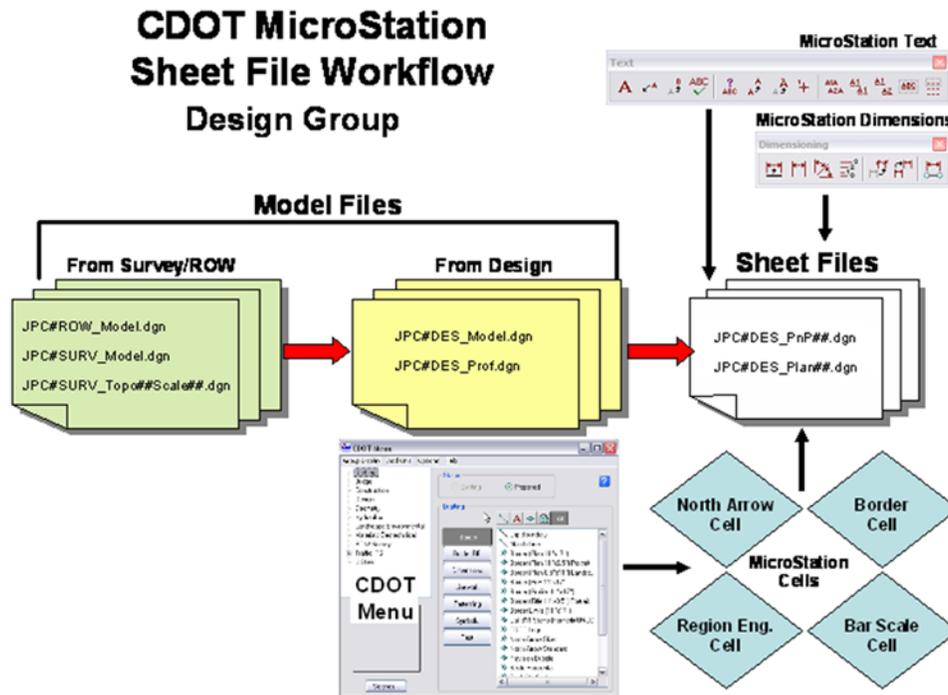
Each specialty group references the Roadway Design group's proposed model file to begin their design. MicroStation and other specialty programs are used to create the graphics in separate model file(s) for each group. When a specialty group references Design's model file, they can choose to reference 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. 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.

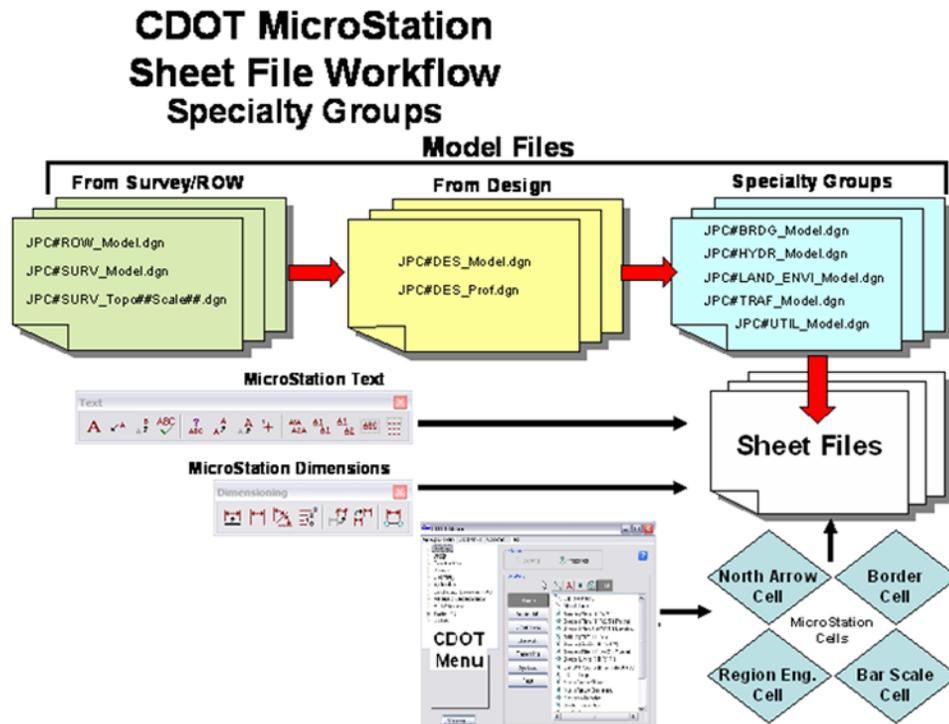
Other sheets such as detail, title, general notes, etc. have specific requirements, but use the same general premise of referencing the model file(s) to the sheet file. Typical Section sheets are an exception to the rule, since graphics are created directly in the sheet file using the CDOT Typical Section Program.



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. 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 such as detail, tab, and note sheets have specific requirements.



Single Source Project Data

There are two methods of setting up a project that can be used to effectively manage a single source of project data:

- ◆ Create the project in ProjectWise (Preferred Method)
- ◆ Create the project on the Project Managers computer

Project set-up on ProjectWise

ProjectWise is a document management system primarily for use with the MicroStation and InRoads software. Other software such as the Microsoft Office Suite can also be integrated into the ProjectWise environment. ProjectWise provides a secure environment where project information can be stored. ProjectWise allows for file check-in/check-out for editing and read only access for checked out files.

For information about using ProjectWise, once the project has been created, refer to:

[ProjectWise User Guide.pdf](#)

Project set-up on the Project Managers Computer

If the project is to be stored on the project manager's computer, use the Create Project Utility to create the proper directory structure. for more information on using the Create Project Utility, refer to:

[CDOT Project Creation and PCF File Management](#)

contact your IT administrator for help in creating a shared drive for a locally stored project. Administrator privileges are required to setup a shared drive.

For references to work properly, everyone will need to map to the shared drive using the same drive letter and path.

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.

CDOT Work Flow

Work Flow :

- [CDOT Alignment Display in Cross Section.Ink](#)
- [CDOT Annotating Horizontal and Vertical Alignments.Ink](#)
- [CDOT Batch Printing.Ink](#)
- [CDOT Batch Processing.Ink](#)
- [CDOT Configuration ReadMe file.Ink](#)
- [CDOT Converting AutoCAD Files to MicroStation.Ink](#)
- [CDOT Creating Multiple Plan Sheets.Ink](#)
- [CDOT Directory Structure.Ink](#)
- [CDOT Displaying Features in Cross Section and Profile.Ink](#)
- [CDOT Exporting Fieldbook Files.Ink](#)
- [CDOT Greek Characters.Ink](#)
- [CDOT Level Update for V03.01.Ink](#)
- [CDOT Linking MicroStation to Excel Documents.Ink](#)
- [CDOT MicroStation Printing.Ink](#)
- [CDOT Note Sheets.Ink](#)
- [CDOT PCF Management.Ink](#)

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CADD Manual
CDOT Work Flow
Issue Logs
Mtg Minutes & Agendas
Requests & Support
Training
Useful Links

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 – Directory Structure.**

3.2 Directory Structure

The CDOT Project Directory has been designed where the top level (project) directory is used to designate the project code. Under this directory, the user will find sub-directories and a file naming convention where all project information will be created and stored. The project directory structure is created using the CDOT Project Creation Utility.

3.2.1 Project Directory

All CDOT projects should follow the following directory structure to ensure the accurate sharing of information between groups within the Department as well as outside consultants. Each project includes a unique top level directory and a set of standardized sub-directories located under the **Projects** root directory on the appropriate server or Project Manager's computer.

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.

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 \(Planning\)](#)
- [Pit Sets Project Folder \(Pit_Sets\)](#)
- [Project Configuration Project Folder \(Project_Configuration\)](#)
- [Project Manager Project Folder \(Project_Manager\)](#)
- [ROW Survey Project Folder \(ROW_Survey\)](#)

Directory

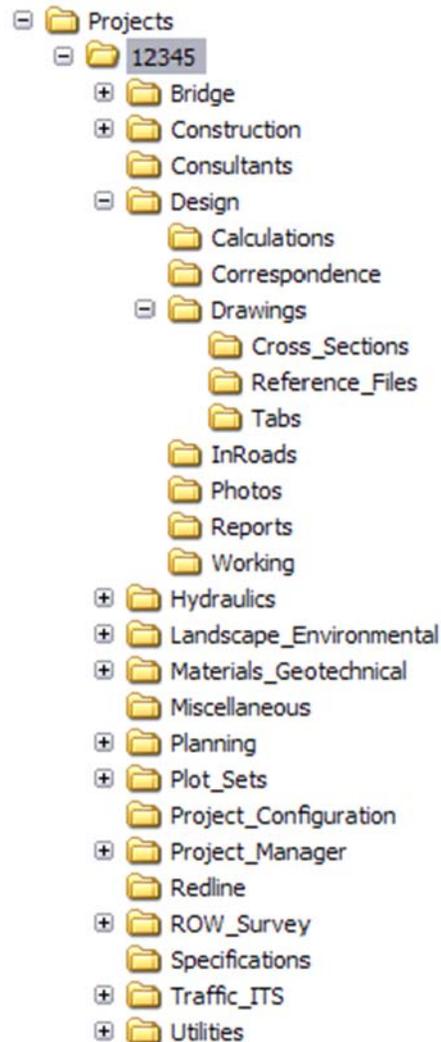
- Desktop
- My Computer
- Local Disk (C:)
- Projects
- 14942
- Design
- Construction
- Consultants
- Design
- Calculations
- Correspondence
- Drawings
- Roads
- Photos
- Reports
- Working
- Environmental_Landscape
- Hydraulics
- Materials_Geotechnical
- Miscellaneous
- Planning
- Pit_Sets
- ProjectConfiguration
- Project_Manager
- ROW_Survey
- Specifications
- Traffic ITS

Navigation Links:

- Home
- CADD Library
- CADD Manual**
- CDOT Work Flow
- Issue Logs
- Mtg Minutes & Agendas
- Requests & Support
- Training
- Useful Links

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.



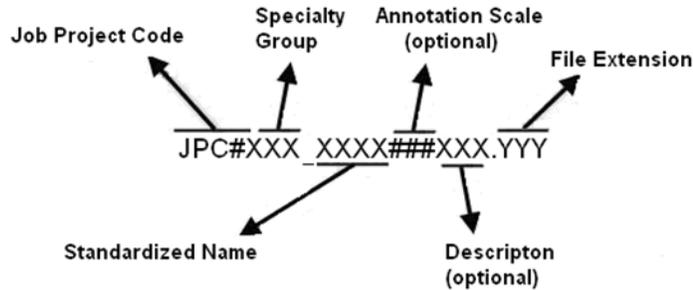
Training files

The training lab files for CDOT CADD courses can be accessed from the Windows Start Menu. Select **Start > All Programs > _CDOT_CADD_Information > V08.11.XX-XM > Training Files > Insert training files on my computer**. A link is also available on the Training page of the CDOT CADD web site.

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, 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: **JS12345DES_Model100.dgn** where **JS**, are the initials of the designer or engineer (in this example, JS stands for “John Smith”).

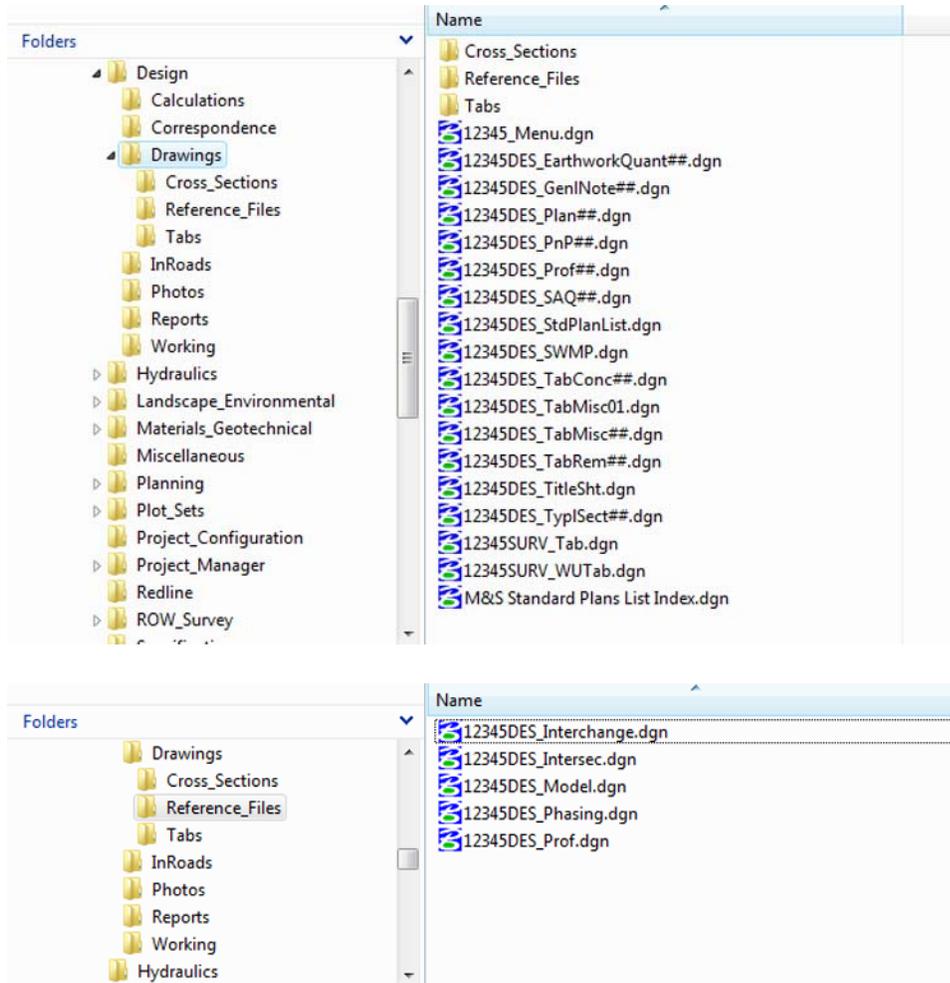
For more information about the CDOT project directory structure, see the **CDOT CADD Manual, Chapter Four – File Naming Convention**.

The screenshot shows a web page titled "4.0 Chapter Four - File Naming Convention". The main content area contains text explaining the CDOT file naming convention and a diagram of the "CDOT File Naming Structure" for an "Existing Right-Of-Way project deliverable sheet". The diagram shows the file name "12345 DES_Model100.dgn" broken down into its components: Job Project Code (JPC) = 12345, File Name = DES, Counter = Model, and MicroStation File Extension = .dgn. To the right of the main content is a vertical navigation menu with buttons for: Home, CADD Library, CADD Manual (highlighted with a red box), CDOT Work Flow, Issue Logs, Mtg Minutes & Agendas, Requests & Support, Training, and Useful Links.

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 appropriate 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.

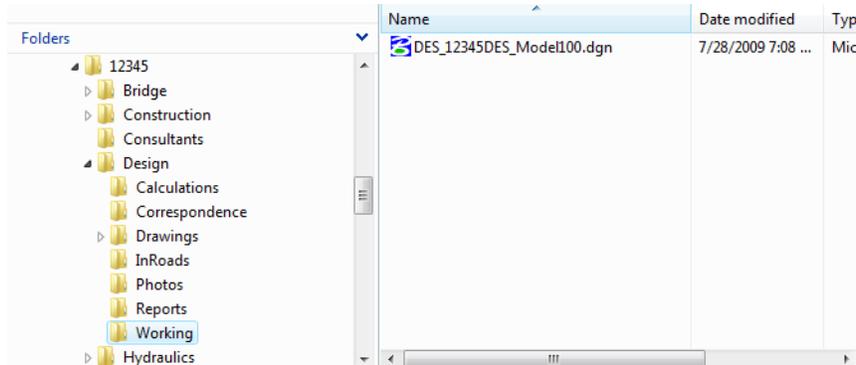


What files go where?

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.

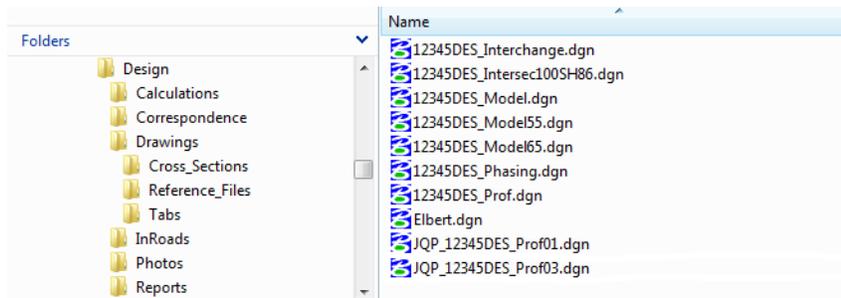
Working Model files

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/JS_12345Des_Model100.dgn*



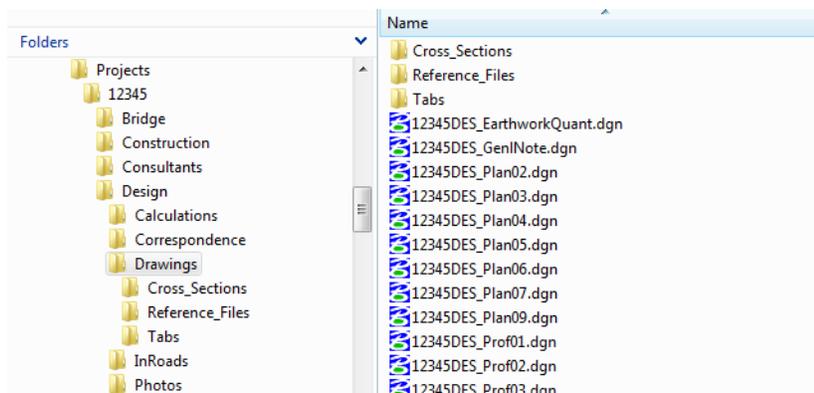
Reference Model files

The most up-to-date model files which are available to other groups for referencing, 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.

Name	Size
12345DES_Plan01-001.pdf	36 KB
12345DES_Plan02-001.pdf	13 KB
12345DES_Plan03-001.pdf	59 KB
12345DES_Plan04-001.pdf	36 KB
12345DES_Plan05-001.pdf	36 KB
12345DES_Plan06-001.pdf	13 KB
12345DES_Plan07-001.pdf	13 KB
12345DES_Plan08-001.pdf	13 KB
12345DES_Plan09-001.pdf	13 KB
12345DES_Plan10-001.pdf	59 KB
12345DES_Plan11-001.pdf	59 KB
12345DES_Plan12-001.pdf	59 KB
12345DES_Plan13-001.pdf	59 KB

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.

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- [Consultants Project Folder \(Consultants\)](#)
- [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.

Sub-directory	File Name	Description
'Calculations 'Correspondence 'Drawings	JPC\ApproximateQuantities.dgn	Sheet Files - Plan set sheets and detail sheets
	JPC\EarthworkQuantities.dgn	
	JPC\GeneralNotes.dgn	
	JPC\IndexOSheets.dgn	
	JPC\PlanProfile.dgn	
	JPC\PlanSheet.dgn	
	JPC\ProfileSheet.dgn	
	JPC\StandardPlanList.dgn	
	JPC\SURV\TasSheets.dgn.dgn	
	JPC\TDSheet.dgn	
	JPC\TypicalSection.dgn	
	GeneralNotes.xls	
	IndexOSheets.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	Interchange Layout File Intersection Design File Phasing Design File All tabulation support data: xls, doc, and pdf files
	JPC\DesignProfile.dgn	
	JPC\InterchangeLayout.dgn	
	JPC\Intersection.dgn	
	JPC\PhasingModel.dgn	
'Tabs		
'InRoads	Earthwork Summary.xls	All InRoads data: dtm, alq, trf, nri, nsk and

See also:

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

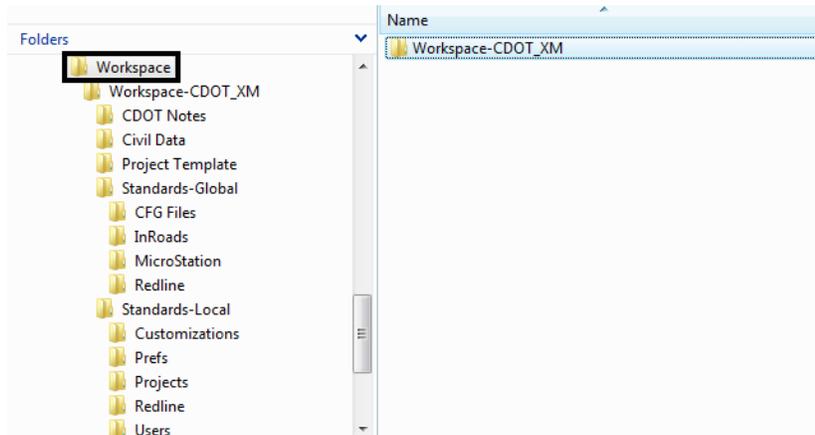
The CDOT Workspace

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:\Workspace** folder.



The Select Group Environment Utility

The **Select Group Environment** utility automatically attaches the correct level libraries needed for working on a CDOT project. 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 with out 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**.

The screenshot shows the CDOT Work Flow page. At the top, there is a navigation bar with "Intranet Home", "CDOT External", and "Search". Below this is the Colorado Department of Transportation logo and the text "CADD & Engineering Innovation". A secondary navigation bar includes "Projects", "Employee Info", "Teams", "Organizations", "Resources", "Contacts", "News", and "Help".

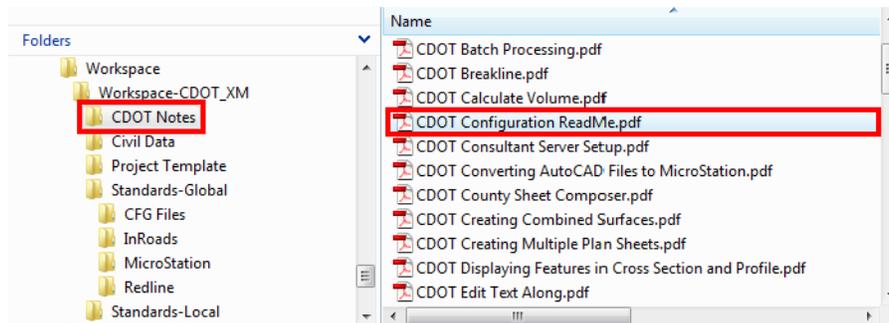
The main heading is "CDOT Work Flow". Below it, a "Work Flow :" section contains a list of links. The link "CDOT Configuration ReadMe file.Ink" is highlighted with a red box. To the right, a sidebar menu contains buttons for "Home", "CADD Library", "CADD Manual", "CDOT Work Flow", "Issue Logs", "Mtg Minutes & Agendas", "Requests & Support", "Training", and "Useful Links". The "Issue Logs" button is also highlighted with a red box.

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.

This screenshot is identical to the one above, showing the CDOT Work Flow page. The "Work Flow :" section lists various links, with "CDOT Configuration ReadMe file.Ink" highlighted in red. The sidebar menu on the right also has "Issue Logs" highlighted in red.

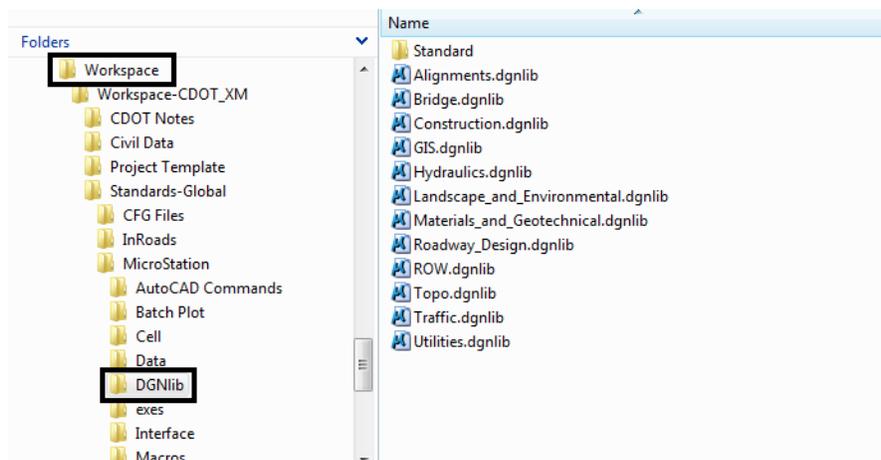
You can also access this workflow and others (in PDF format) from the CDOT workspace in the **CDOT Notes** sub-folder.



The CDOT Level Structure

Thirteen Specialty Group Design File Level Libraries (DGNLIBs) are available for use within CDOT. The level libraries are attached to the MicroStation design file via the **Select Group Environment** utility and provide the CDOT approved standard discipline levels for 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:\Workspace\Workspace-CDOT_XM\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.

5.3 Design File Level Libraries (Level definition files)

Thirteen Specialty Group Design File Level Libraries (DGNLIB) have been developed for use within CDOT. The DGNLIB files are assigned when the Select Group Environment Utility is run prior to entering MicroStation. Design File levels are controlled by the use of these level libraries. The libraries provide the CDOT approved standard discipline levels. The CDOT Workplace locks the creation of levels and modifications of each level's symbology, thereby maintaining "ByLevel" status for standardization. The ByLevel symbology definitions allow graphical data to inherit attributes for color, linestyle and weight from the level that is selected. The ByLevel symbology is used by default for all level libraries and is the required standard for plan set creation. CDOT has adopted an "inherited vs. proposed" leveling scheme, whereas with the use of pen tables, all existing design data will plot gray scale. See Chapter 10 for further discussion on pen tables. Level duplication across disciplines has been avoided wherever possible.

In the future, the use of the MicroStation "Standards Checker" utility will be employed to ensure level compliance.

The following links will expand on each group's levels:

Alignments	Bridge	Construction	Drafting
GIS	Hydraulics	Landscape and Environmental	
Materials & Technical	Roadway Design	ROW	Survey
Traffic	Utilities		

5.3.1 Attached Level Libraries

The CDOT V8iSS2 menu requires the use of level libraries across disciplines. If the appropriate level library is not attached, the menu will display an error each time a command is chosen from the Specialty Group level library. Users can attach level libraries individually or exit MicroStation to run the Select Group Environment and choose another discipline.

The xMulti-Discipline Level Library setting is set by default when initially opening MicroStation. This setting attaches all the available CDOT level libraries and filters, allowing users to seamlessly work across disciplines. This is the recommended level library that should be attached for anyone opening to use levels from other disciplines.

The Drafting Level general level libraries are attached to all disciplines by default. These levels have been created for basic drafting purposes. Specialty Group levels should be applied to any design model that requires specific level stratification for future Quantity Manager use. Use with I/Roads or that will be referenced to many drawings as a model. Drafting Levels should be applied to all drawings that are created in standalone documents, graphical details and graphical elements being placed in sheet files.

Name	Description	LevelColor	LevelStyle	LevelWt
ALG_ALTERNATE_Cogp	Alternative Cogp Points [cell, symb font, text]	5	0	2
ALG_ALTERNATE_Hor-Alignment	Alternative Horiz. Centerline (lines, arcs, spirals) [network]	7	0	4
ALG_ALTERNATE_Hor-Alignment-Sta-Major	Alternative Horiz. Alg Major Stationing	7	0	4
ALG_ALTERNATE_Hor-Alignment-Sta-Minor	Alternative Horiz. Alg Minor Stationing	7	0	4
ALG_ALTERNATE_Hor-Alignment-Text	Alternative Horiz. CL, Tangent & Curve Annotation [text]	7	0	3
ALG_ALTERNATE_Hor-Cardinals	Alternative Horiz. Keypoint(s) Leads & Annotation	7	0	3
ALG_ALTERNATE_Hor-Keypoints	Alternative Horiz. Keypoint as cells [pc, pt, p, cc, etc] [cells or symb font]	7	0	3
ALG_ALTERNATE_Hor-Keypoints-Text	Alternative Horiz. Keypoint as text symbology [pc, pt, p, cc, etc] [text]	7	0	3
ALG_ALTERNATE_Hor-Tangent-Lines	Alternative Horiz. Curve (external) Tangents [lines]	7	0	2
ALG_ALTERNATE_Hor-Tangent-Text	Alternative Horiz. Curve (external) Tangent Annotation [text]	7	0	2
ALG_ALTERNATE_Ver-Alignment	Alternative Vert. Lines, Area [network]	7	0	3
ALG_ALTERNATE_Ver-Alignment-Dim	Alternative Vert. Curve Dimension [unless lineshead]	7	0	3
ALG_ALTERNATE_Ver-Alignment-Text	Alternative Vert. Curve & Tangent Annotation [text]	7	0	3
ALG_ALTERNATE_Ver-Keypoints	Alternative Vert. Keypoint [pc, pt, p, cc, etc] [text]	7	0	3
ALG_ALTERNATE_Ver-Keypoints-Text	Alternative Vert. Keypoint [pc, pt, p, cc, etc] [text]	7	0	3
ALG_ALTERNATE_Ver-Tangent-Lines	Alternative Vert. Curve (external) Tangents [lines]	7	0	1
ALG_ALTERNATE_Ver-Tangent-Text	Alternative Vert. Curve (external) Tangent Annotation [text]	7	0	1
ALG_APPROACH_ROAD_Cogp	Approach Road Cogp Points [cell, symb font, text]	5	0	1
ALG_APPROACH_ROAD_Hor-Alignment	Approach Road Horiz. Centerline (lines, arcs, spirals) [network]	232	0	1
ALG_APPROACH_ROAD_Hor-Alignment-Sta-Major	Approach Road Horiz. Alg Major Stationing	232	0	1
ALG_APPROACH_ROAD_Hor-Alignment-Sta-Minor	Approach Road Horiz. Alg Minor Stationing	232	0	1
ALG_APPROACH_ROAD_Hor-Alignment-Text	Approach Road Horiz. CL, Tangent & Curve Annotation [text]	232	0	1
ALG_APPROACH_ROAD_Hor-Cardinals	Approach Road Horiz. Keypoint(s) Leads & Annotation	232	0	1
ALG_APPROACH_ROAD_Hor-Keypoints	Approach Road Horiz. Keypoint as cells [pc, pt, p, cc, etc] [cells or symb font]	232	0	1
ALG_APPROACH_ROAD_Hor-Keypoints-Text	Approach Road Horiz. Keypoint as text symbology [pc, pt, p, cc, etc] [text]	232	0	1
ALG_APPROACH_ROAD_Hor-Tangent-Lines	Approach Road Horiz. Curve (external) Tangents [lines]	232	0	1
ALG_APPROACH_ROAD_Hor-Tangent-Text	Approach Road Horiz. Curve (external) Tangent Annotation [text]	232	0	1
ALG_APPROACH_ROAD_Ver-Alignment	Approach Road Vert. Lines, Area [network]	232	0	1
ALG_APPROACH_ROAD_Ver-Alignment-Dim	Approach Road Vert. Curve Dimension [unless lineshead]	232	0	1
ALG_APPROACH_ROAD_Ver-Alignment-Text	Approach Road Vert. Curve & Tangent Annotation [text]	232	0	1
ALG_APPROACH_ROAD_Ver-Keypoints	Approach Road Vert. Keypoint [pc, pt, p, cc, etc] [text]	232	0	1
ALG_APPROACH_ROAD_Ver-Keypoints-Text	Approach Road Vert. Keypoint [pc, pt, p, cc, etc] [text]	232	0	1
ALG_APPROACH_ROAD_Ver-Tangent-Lines	Approach Road Vert. Curve (external) Tangents [lines]	232	0	1
ALG_APPROACH_ROAD_Ver-Tangent-Text	Approach Road Vert. Curve (external) Tangent Annotation [text]	232	0	1
ALG_EXISTING_Cogp	Existing Cogp Points [cell, symb font, text]	5	0	2
ALG_EXISTING_Hor-Alignment	Existing Horiz. Centerline (lines, arcs, spirals) [network]	81	0	2
ALG_EXISTING_Hor-Alignment-Sta-Major	Existing Horiz. Alg Major Stationing	81	0	2
ALG_EXISTING_Hor-Alignment-Sta-Minor	Existing Horiz. Alg Minor Stationing	81	0	2
ALG_EXISTING_Hor-Alignment-Text	Existing Horiz. CL, Tangent & Curve Annotation [text]	81	0	2
ALG_EXISTING_Hor-Cardinals	Existing Horiz. Keypoint(s) Leads & Annotation	81	0	2

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**.

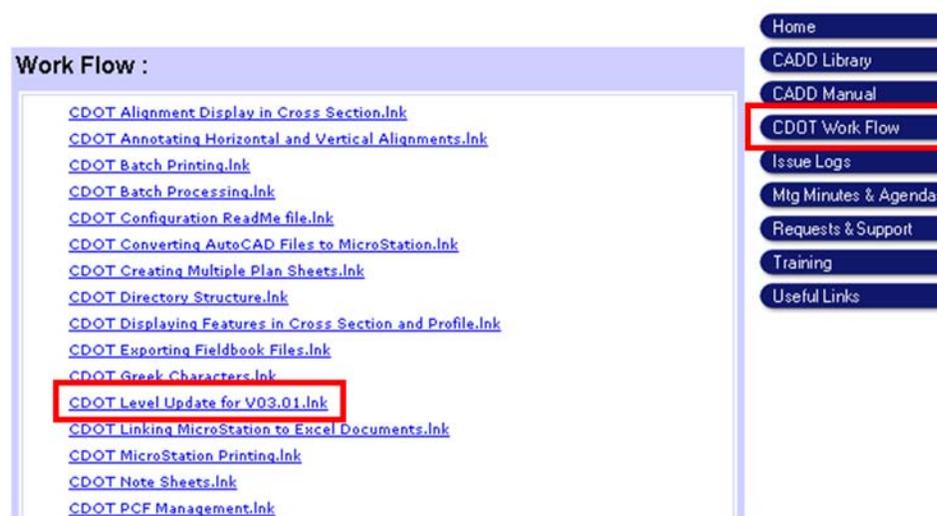


Levels and configuration releases

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.



CDOT Work Flow



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
- Create the new file from a seed file

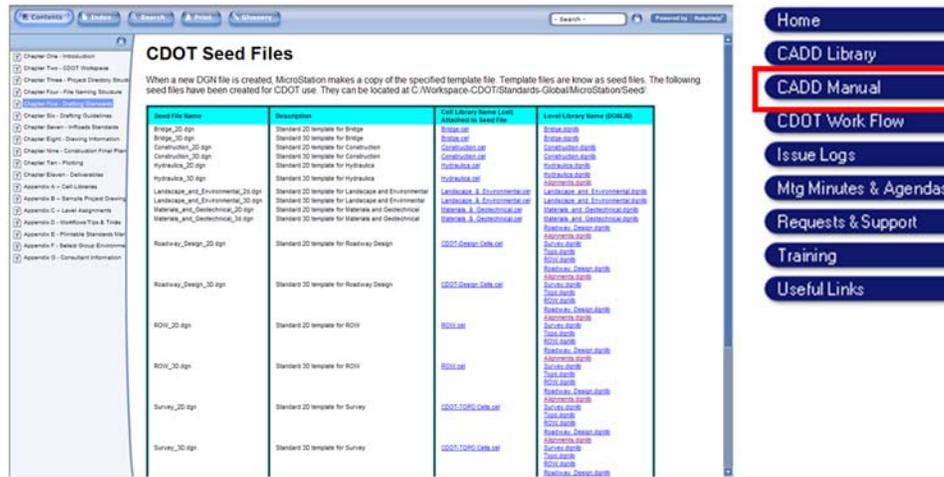
Creating a model file from an auto-populated file

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 **Angle 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
- 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

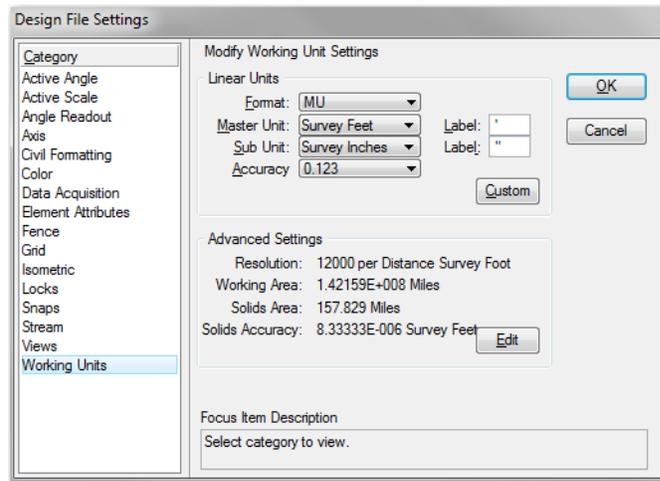
CDOT standard working units are 1:12 and expressed as:

? **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

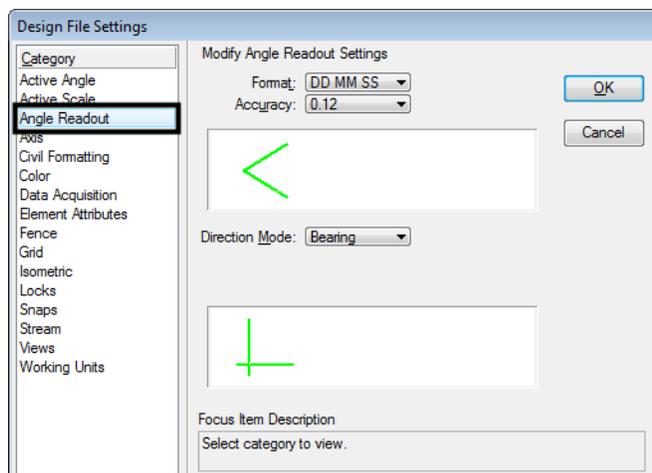
When you enter data for lengths, distances, etc. you use the format for working units: **MU:SU**. You can enter data in just master units, just sub units, or both. For example, if your working units are 1:12 (feet and inches), and you want to place a line with a length of 1 foot 1 ½ inches, you could 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 > Angle Readout** to determine how MicroStation values are displayed. This is helpful, for example, when you measure graphics. The CDOT standard coordinate and angle readouts are shown below. These settings are copied over from the seed file.



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.

Referencing other's 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:

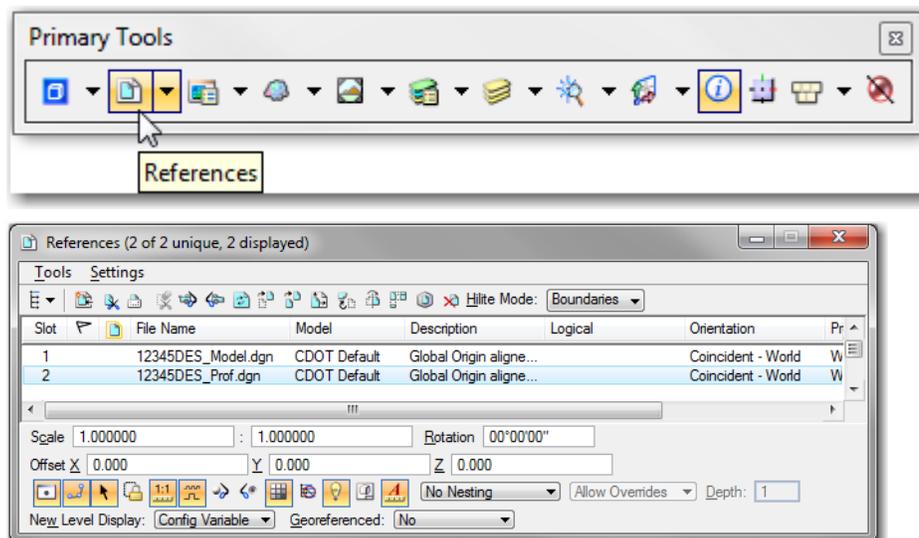
1. Maintaining a single source for project data.
2. Sharing graphical data between specialty groups.

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. 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**.

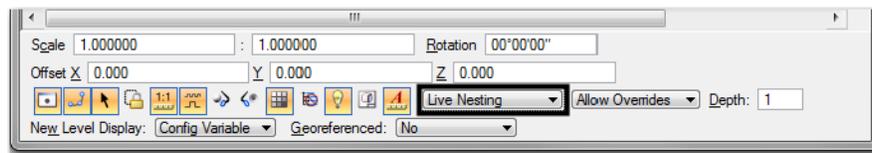


Different reference file attachment methods are available to help control reference manipulations and displays. These include:

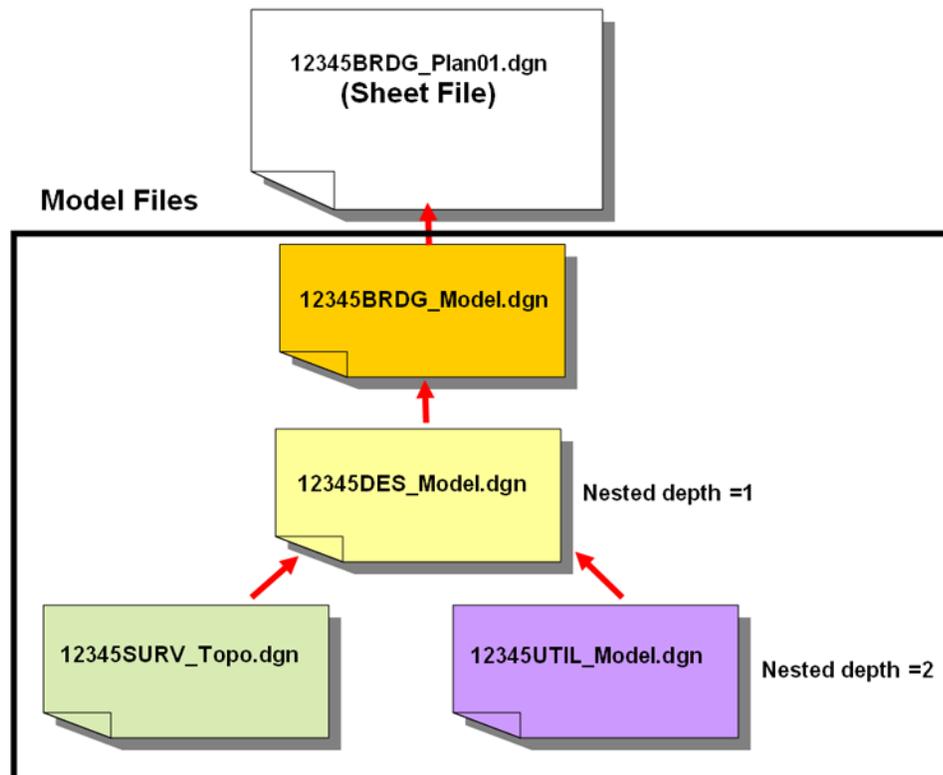
- No nesting
- Live nesting
- Copy attachments

Nested References

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



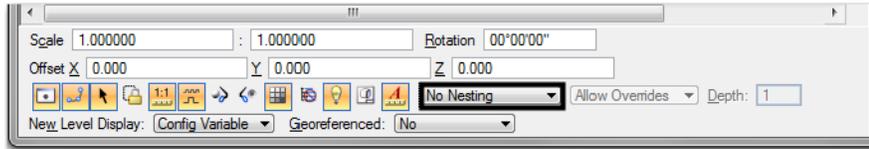
The **Nested Depth** option determines how many reference levels deep you can attach. In the example below, if the reference **BridgeModel** is attached to **BridgePlanSheet01** with **No Nesting**, only the **Bridge Model** graphics are attached. If the nested depth is set to **1**, you would attach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

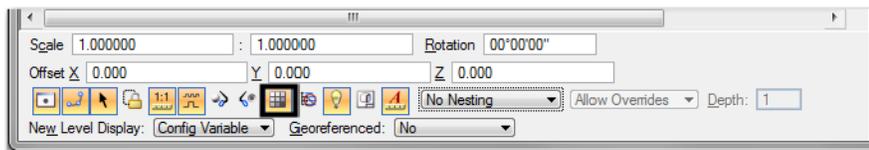
The Copy Attachment Option

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

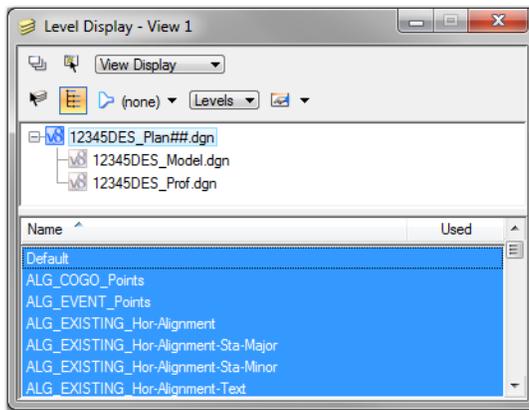
When you attach a reference, you have the option to Display Raster References. If the reference has a raster image attached (e.g. aerial photo), you can choose to attach the raster with the reference. You can toggle the raster reference on/off from the Reference dialog box.



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.



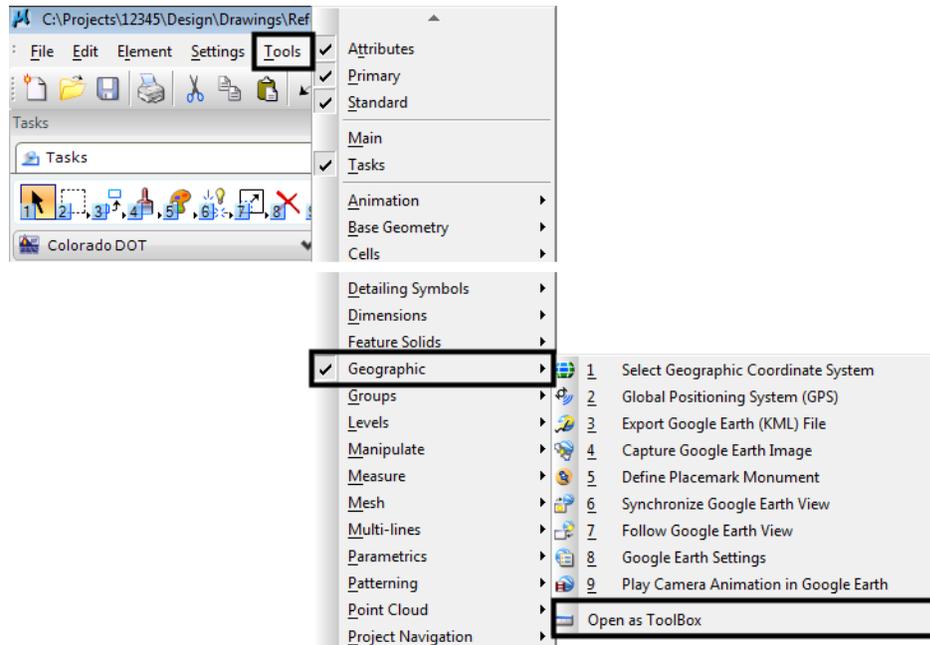
Geographic Tools

A geographical coordinate system uses a series of numbers to locate specific spots on the face of the earth. There are many of these coordinate systems in use today. Many of the data files that can be used by MicroStation have a geographical coordinate system attached. MicroStation has a number of tools to apply and reproject coordinate systems so that data with different systems can be used to create a unified data model.

Geographic Tools

To access the geographic tools,:

1. Select **Tools > Geographic > Open Aas ToolBox**.



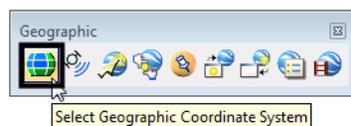
This displays the Geographic toolbox.



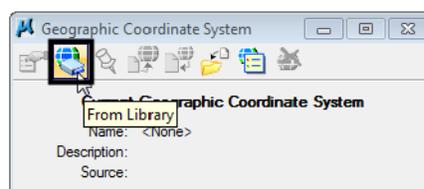
Attaching a Geographic Coordinate System

To attach a geographic coordinate system to a drawing:

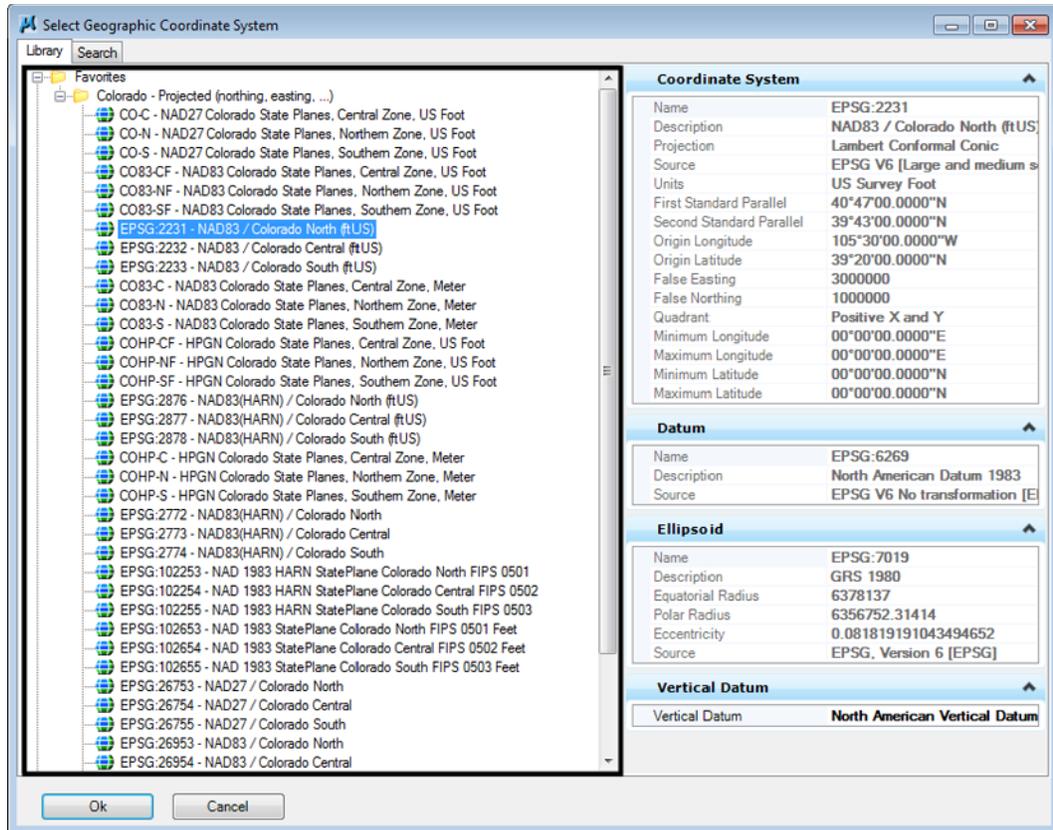
1. Select **Select Geographic Coordinate System** from the Geographic toolbar. This displays the **Geographic Coordinate System** dialog box.



2. From the **Geographic Coordinate System** dialog box, select the **From Library** icon. This displays the **Select Geographic Coordinate System** dialog box.



3. On the **Select Geographic Coordinate System** dialog box, select the **Library** tab.
4. Select the desired coordinate system from the **Library** list.



Note: The commonly use coordinate systems are located in the Colorado - Projected (northing, easting, ...) folder.

5. <D> **Ok** to attach the coordinate system to the file.

Geographic Coordinate Sysrems and Reference Files

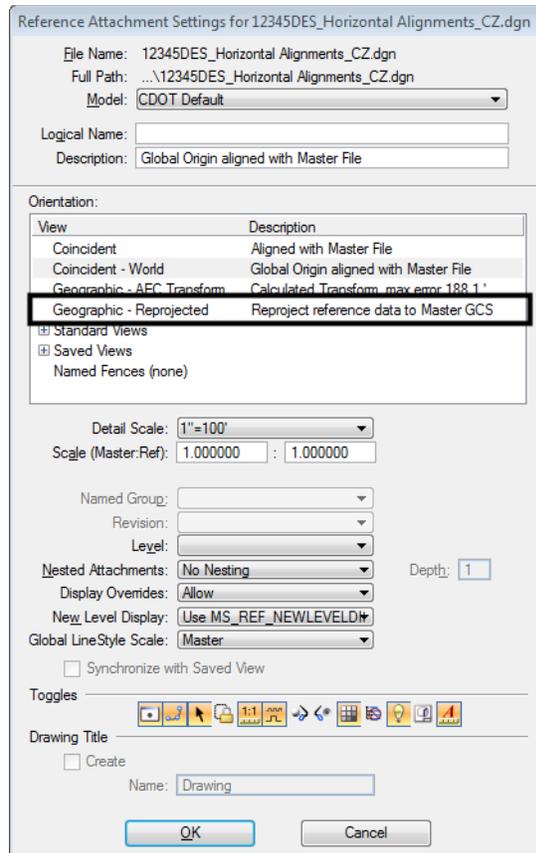
The active file and files referenced to the active file can each have a coordinate system attached. These do not have to be the same coordinate system. MicroStation has the ability to reproject the reference file so the data representing the same point in each file is in the same place in the view.

Note: Both the active file and the reference must have a coordinate sysetem attached in order for the reprojection to take place.

When attaching a reference file witha different coordinate system:

1. Attach the reference file as normal.

- In the **Reference Settings** dialog box, highlight **Geographic - Reprojected** in the Orientation list.



- Complete the attachment process as normal.

Geographic Coordinate Systems and Image Files

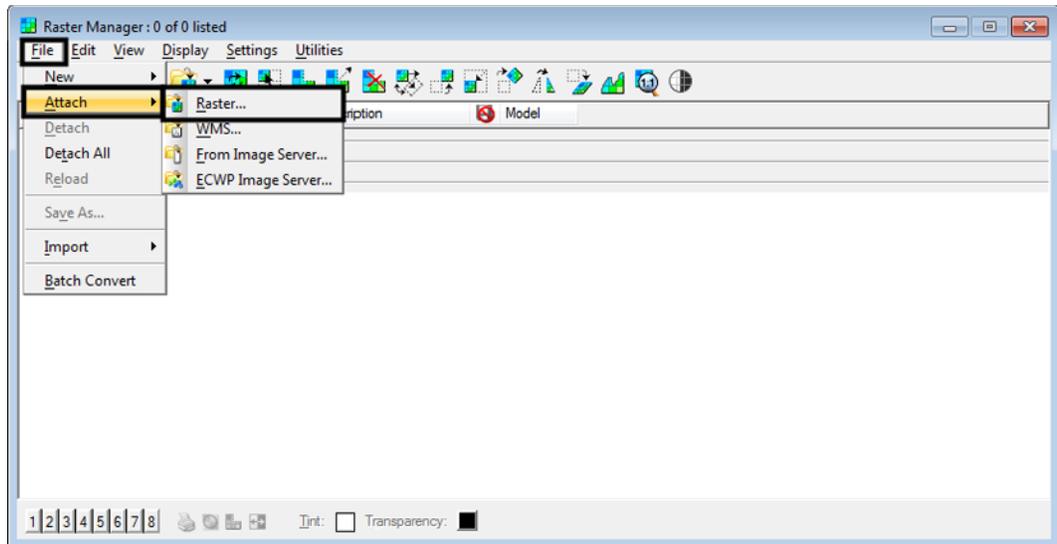
Many image files have geographic coordinate systems attached in the header or as a separate file. These can also be attached and reprojected to the active file's coordinate system. This is accomplished through Raster Manager.

To reproject an image file:

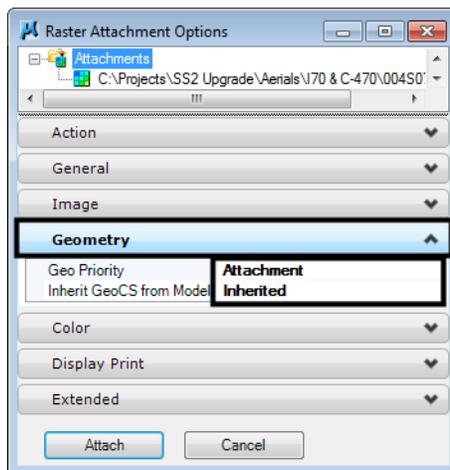
- Select the **Raster Manager** from the **Primary Tools** toolbar. This displays the **Raster Manager** dialog box



- In the **Raster Manager** dialog box, select **File > Attach > Raster**. This displays the **Attach Raster Reference** dialog box.



- Navigate to the desired file, highlight it, and <D> **Open**. this displays the **Raster Attachment Options** dialog box.
- In the the **Raster Attachment Options** dialog box, expand the **Geometry** tab.
- Make the desired settings to **Geo Priority** and **GeoCS from Model**.

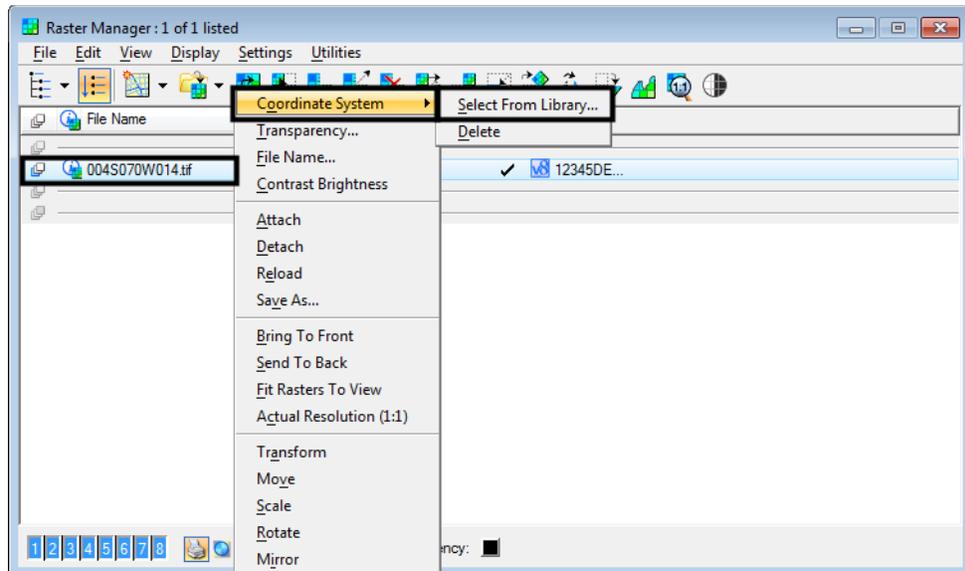


Note: Attachment for **Geo Priority** and **Inherited** for **GeoCS from Model** will work for most files.

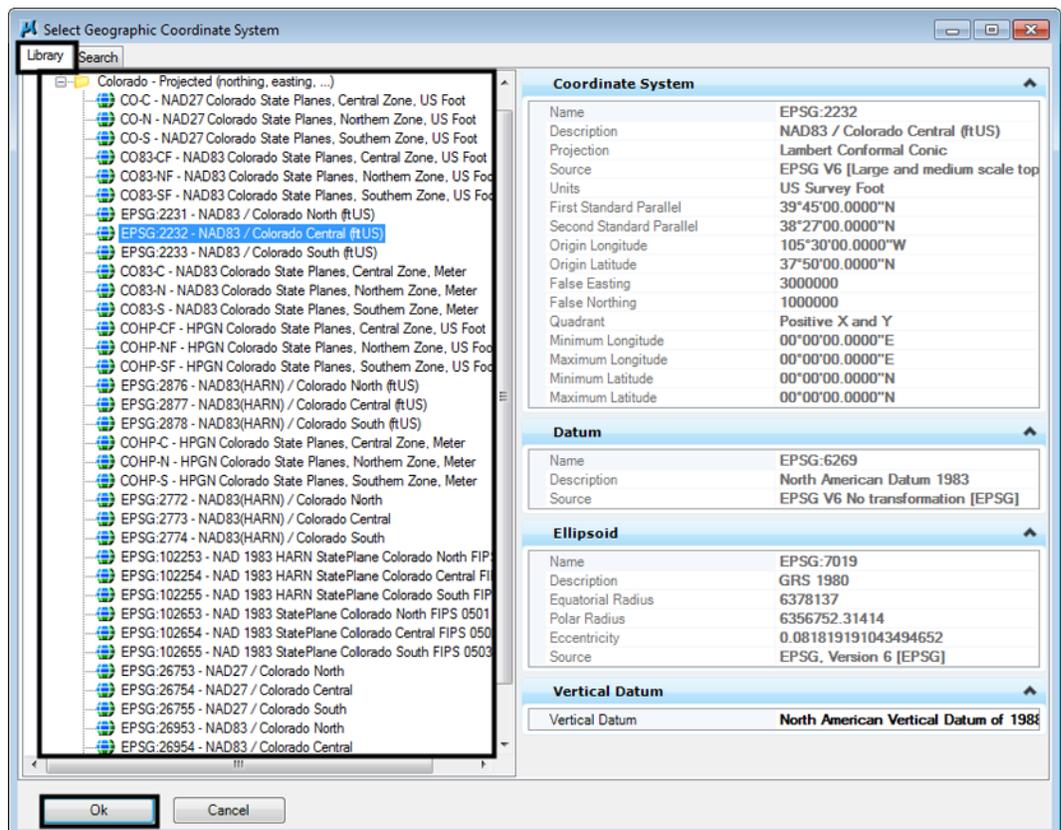
- <D> **Attach** to complete the attachment.

If the coordinate system attached to the raster file is different than that attached to the active file:

7. <R> on the file in **Raster Manager** and select **Coordinate System > Select From Library** from the menu.



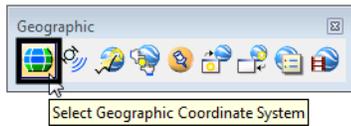
8. In the Select Geographic Coordinate System dialog box, Select the Library tab.
9. Highlight the desired coordinate system.
10. <D> Ok to make the change.



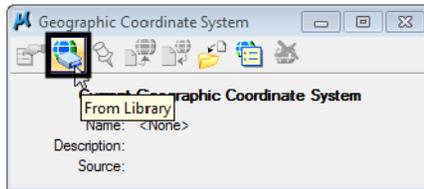
Reprojecting a File With a Different Coordinate System

There may be times when the coordinate system attached to a file needs to be changed and the data in the file reprojected to the new coordinate system. To make this change:

1. Make a copy of the file to be changed.
2. Verify that the copy is open in MicroStation.
3. Select **Select Geographic Coordinate System** from the Geographic toolbar. This displays the **Geographic Coordinate System** dialog box.

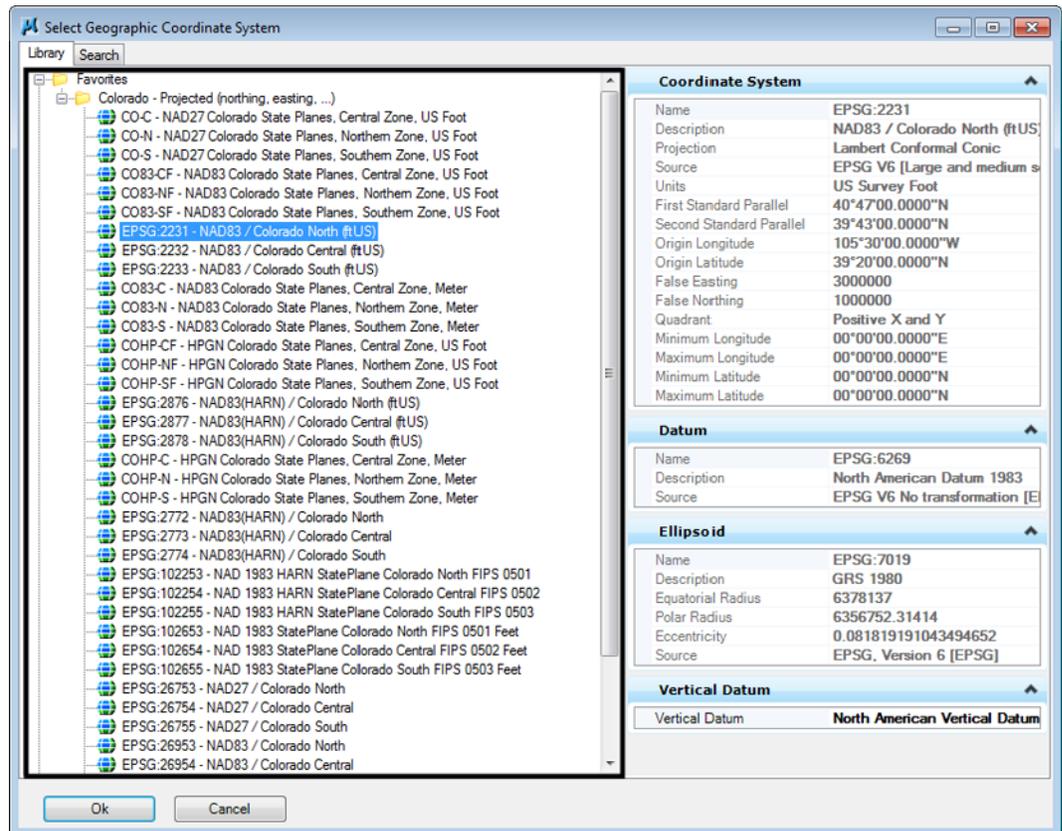


4. From the **Geographic Coordinate System** dialog box, select the **From Library** icon. This displays the **Select Geographic Coordinate System** dialog box.



5. On the **Select Geographic Coordinate System** dialog box, select the **Library** tab.

6. Select the desired coordinate system from the **Library** list.



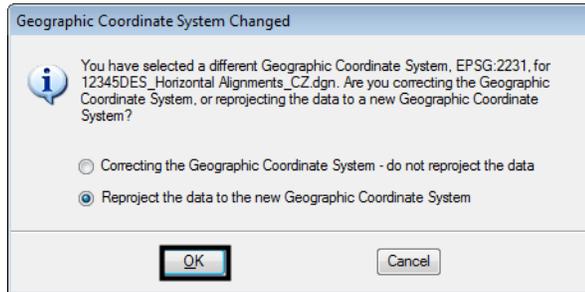
Note: The commonly use coordinate systems are located in the Colorado - Projected (northing, easting, ...) folder.

7. <D> **Ok** to attach the coordinate system to the file. The **Geographic Coordinate System Changed** dialog box is displayed.

There are two options in the The **Geographic Coordinate System Changed** dialog box:

- ◆ **Correcting the Geographic Coordinate System** - do not reproject the data - The data maintains its xyz coordinates from the old coordinate system. In effect, this moves the data's "real world" location in relation to the new coordinate system.
- ◆ **Reproject the data to the new Geographic Coordinate System** - This option changes the xyz coordinates of the data to reflect the same "real world" coordinates in the new coordinate system.

8. Select the desired option and <D> **OK**.



This completes the change to the coordinate system.