

District of Columbia Department of Transportation

MicroStation® V8 CAD Standards Manual

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September 2005

Acknowledgement

This document presents the CAD standards of the District of Columbia Department of Transportation (DDOT). This manual and the DDOT CAD standards and workspace are based on those of the Maryland State Highway Administration's (MDSHA).

The new MDSHA V8 CAD standards and workspace were the result of a great deal of effort and coordination. The final product incorporated resources and comments from MDSHA, the consultant community and from members of the Consulting Engineering Council of Maryland. Thus, given the above and the fact that there are numerous streets which are either bordered by Maryland on one side and DC on the other, or that run through both jurisdictions, DDOT made the decision to adopt the Maryland State Highway Administration (MDSHA) CAD Standards.

Incorporated in the MDSHA workspace are numerous macros and tools that aid in increasing productivity as well as in ensuring compliance with the CAD standards. DDOT has incorporated these macros and tools into its workspace with minimal, and mostly cosmetic, modifications. The MDSHA CAD Standards Manual is also the source and foundation for most of the DDOT CAD Standards Manual. Doing so offers DDOT two benefits: First, the consultants that work on projects in both jurisdictions would not need to learn a new set of standards or tools. Second, the association with MDSHA will facilitate the CAD standards adoption to occur faster than would have been possible had DDOT undertaken to develop all the tools and macros it needs.

The MDSHA workspace and tools are expected to evolve over time to better serve its personnel and the consulting community. As major modifications are made by MDSHA, DDOT will evaluate the updates, and if deemed advisable, update its workspace and replace applicable sections of its CAD Standards Manual.

We want to thank MDSHA personnel and acknowledge the support they provided as DDOT was modifying the SHA workspace and CAD Manual to meet its needs. MDSHA had graciously shared the electronic files needed for the Workspace and CAD manual and extended permission to DDOT to modify and/or adopt any of the files as needed for the new DDOT Workspace and CAD Standards Manual. SHA personnel were very generous with their time, answered numerous questions and provided invaluable help in customizing the Workspace.

The DDOT Workspace, V8 CAD Standards Manual and associated support files will be distributed to consultants on a CD. DDOT employees will also be able to access these on the server and should contact their IT manager for guidance. The guidelines contained in the DDOT CAD Standards Manual are to be followed for all DDOT projects.

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This chapter introduces the contents of the *DDOT MicroStation V8 CAD Standards*. This chapter's major sections describe the intended audience and the purpose of this manual.

About This Manual

This manual is specifically written for MicroStation V8, and it is hoped that this manual will serve as the single information source related to the use of MicroStation V8 at DDOT for all Offices and Divisions.

The manual also marks DDOT's migration to utilizing CAD for drafting and design and specifically its commitment to use MicroStation V8 and related engineering design add-ons and custom applications. As stated previously, since the DDOT Standards and Workspace mirror the MDSHA Standards and Workspace, the CAD Manual will also be updated as major updates or changes occur in the Maryland CAD standards or workspace. The CAD manual and workspace might also be updated as major changes are introduced in MicroStation or Geopak, or as the need arises due to changing or unaddressed needs at DDOT. Updates will be performed by authorized personnel only. No part of the CAD Standards and Workspace, including cells, fonts, text sizes, etc. are to be revised without directions from the Chief Engineer or authorized representative. Suggestions are strongly encouraged and should be directed to Mr. Ardeshir Nafici, Chief, Program Management Support Division, IPMA at (202) 671-4689.

Serving the Needs of CAD Users

This manual serves the needs of several groups of CAD users. DDOT personnel as well as consultants tasked with a project for DDOT will find tables that will help them use the provided tools to set the desired symbology (level, color, weight and style) for design elements. Following the guidelines set in this manual will ensure that the drawings produced are consistent with the most current DDOT CAD Standards. In addition, construction contractors will find that this manual and appendices will help them better understand the drawing symbols and setup, especially when called upon to prepare shop drawings, changed field condition sketches, redline drawings and the like.

Purpose

Users will find that properly using the concepts and tools outlined in this manual will better equip them to produce high-quality CAD drawings more efficiently and consistently. Thus, the purpose of having a CAD standards manual and the tools and associated electronic files can be categorized into three main areas:

1)Quality of Deliverables: The documentation of DDOT's CAD Standards will aid in creating deliverables that have a consistent and superior quality.

2) Efficiency in Design through Tools: The cell libraries, menu files, standard details and other files that accompany this manual are designed to help users quickly place standard graphical elements with just a click or two. Additionally, the custom design tools and macros adopted from the SHA Workspace let users more efficiently create design elements, including drainage structures, traffic signals, right-of-way plats, bridge detail sheets and more in the drawing files.

3) Consistency between Offices and among Consultants: Use of the details, symbols, seed files and other elements that are part of the DDOT CAD standards will ensure that drawings will conform to DDOT's requirements and are consistent—whether projects are done by consultants or DDOT personnel.

Notes

Introduction

This chapter provides an introduction to the DDOT Workspace that has been developed for use with MicroStation V8. This workspace helps users manage the V8 drafting environment by delivering standard elements such as resource files, cells and level libraries, as well as several custom tools and macros developed by DDOT for V8. Details are provided for both users and administrators. This chapter's major sections are listed below:

- 1) [Minimum System Requirements](#)
- 2) [Using the DDOT Workspace](#) shows the MicroStation Manager window and what Workspace Options should be selected to obtain the new V8 CAD Standards.
- 3) [Workspace Setup](#) provides instructions on how to install the Workspace, with notes for both Internal DDOT Users and External Consultant Users.
- 4) [Workspace Options](#) explains how MicroStation's Workspace Options are being implemented at DDOT, including User, Project and Interface.

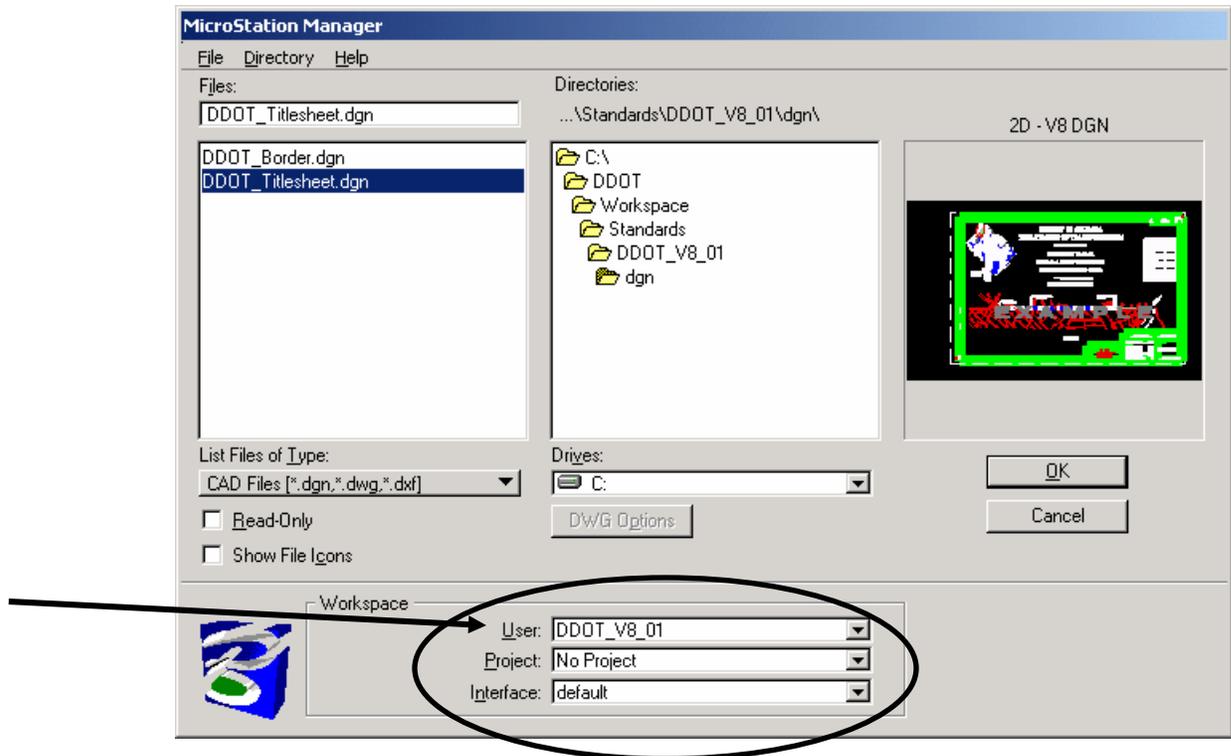
Minimum System Requirements

The January 2005 release of the V8 CAD Standards has been designed to run on **MicroStation V8.01.02.15**. Please refer to Bentley documentation for product system requirements.

Using the DDOT Workspace

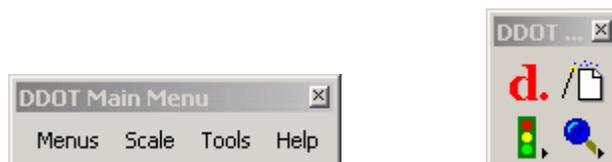
The workspace delivered with this CAD Manual has tools that help increase productivity as well as help users comply with the CAD Standards. As stated before, the Workspace and tools were developed by MDSHA and have been adopted by DDOT with modifications to better fit the needs of DDOT personnel.

When you start MicroStation using the DDOT Workspace, the MicroStation Manager dialog box will appear with various options in the Workspace section:



NOTE: Generally speaking, the only option that needs to be selected is that of **User**, to select the proper CAD Standard version. As of January 2005, the User workspace that should be used for new projects is “**DDOT_V8_01**”. For notes on other User Options, refer to the [Workspace Options](#) section.

Upon loading the MicroStation, the user will immediately know that they are in the DDOT Workspace by the presence of the [DDOT Main Menu](#) and [Toolbox](#).



The **Main Menu** has pulldowns that allow the user to select additional [discipline-specific menus](#), set drawing scale factors and access various custom tools to assist in the drafting process. The DDOT Workspace does not disable any of the MicroStation tools delivered with the software, but offers additional tools that help users adhere to various requirements of the CAD standards such as element symbology, level name, file name, etc.

Workspace Setup

Internal DDOT Users

Within IPMA, the V8 workspace is planned to be implemented across the local area network. This will ensure that all CAD workstations have access to the latest version of tools and settings as they are developed. For instance, if a resource file has been updated, it need not be installed on each computer, but simply added to the network workspace for all users at IPMA to receive the update. The setup of other DDOT agencies has yet to be determined.

To setup the network workspace on a user's machine, perform the following steps:

- 1) **Install** MicroStation V8.
- 2) **Copy** the **mslocal.cfg** file from the LAN Workspace directory, eg: for IPMA one might use S:\CAD\Workspace\mslocal.cfg
- 3) **Paste** to overwrite the mslocal.cfg file on the local machine typically C:\Program Files\Bentley\Program\MicroStation\config\mslocal.cfg

This will redirect the Workspace root to the network location. Not only will resource files and other standard files be maintained on the network, but a directory will automatically be created for each user to store the following custom support files:

- user preference (*.UPF) files
- user interface (*.M01) files
- function key menu (*.MNU) files
- custom configuration (*.CFG) files

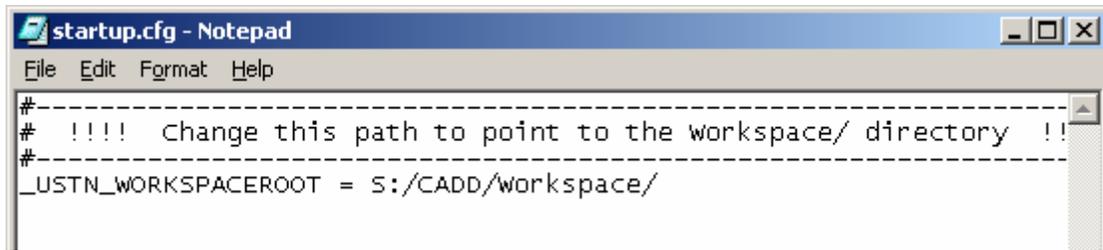
Storing these files on the network promotes portability of each user's custom settings. If a user moves to a new workstation or has their current workstation rebuilt, all settings will be retained. Note also that this is a one-time setup. If new standards are released in the future, they will automatically pass to the user.

External Users (Consultants)

For external consultant users, the DDOT Workspace is provided on the accompanying CD and is also available for web download. The workspace provides the core functionality of DDOT's network workspace, minus certain CAD management aspects.

NOTE: It is recommended that the Workspace be installed on the network, although installation on the local machine will also work.

- 1) Unzip the files to a network or local directory.
- 2) Open the file..\Workspace\startup.cfg in a text editor.



- 3) Redefine the **_USTN_WORKSPACEROOT** variable to point to the location of the Workspace folder as determined in step 1, then save and close the file.
- 4) Create a **desktop shortcut** to V8.
- 5) Right-click the shortcut and select **Properties**.
- 6) When the Properties box opens, append the following text to the Target field (note that it begins with a space):

`-wc"[path]\Workspace\startup.cfg"`

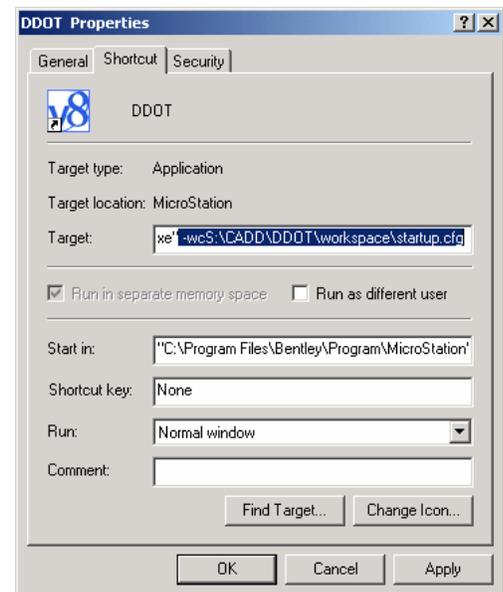
where [path] defines the full directory path of the Workspace.

eg: `-wc" S:\CAD\Workspace\startup.cfg"`

Note: There is no space between `wc` and the quotation mark.

Click **OK**.

You should now have a desktop shortcut that will launch the DDOT Workspace. Users should take care to always load design files for DDOT projects through the shortcut, otherwise the following workspace options will not be available.

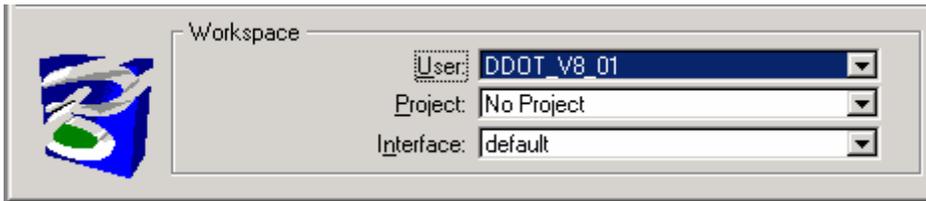


Workspace Options

The combination of **User**, **Project** and **Interface** determines the user's working environment for MicroStation. The significance of these options is explained below.

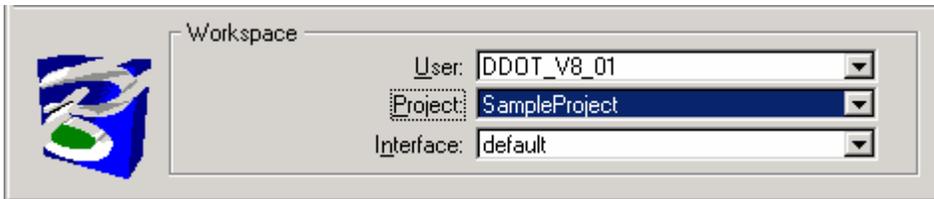
User

The user has the choice of having the DDOT CAD Standards launched when a file is opened or of using the default MicroStation workspace. However, it is greatly encouraged that users select the DDOT V8 01 workspace. This option delivers the new V8 CAD standards and should be selected for any new projects that are to be performed using the V8 design file format (unlimited named levels, etc). V7 files will always be opened as read/only.



Project

The DDOT Workspace does not rely on the Project setting to manage project design files and resources. Rather, this setting is used in-house by some divisions to define certain discipline-specific settings and standards.

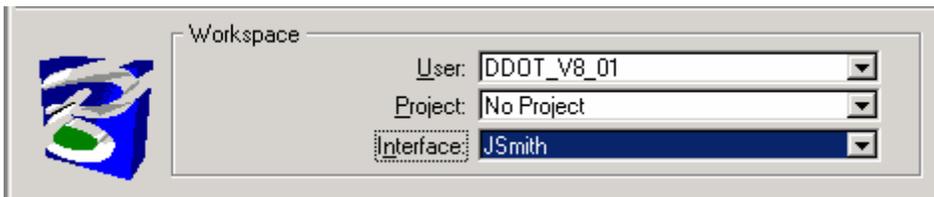


NOTE: For most DDOT users, the Project setting will be preset based on user login and does not need to be changed!

External consultants may continue to use the Project configuration as needed to define specific project working directories, etc.

Interface

The choice of Interface determines what custom pull down menus and toolboxes a user will receive. Depending how it is set up within the organization, this setting could reflect the user's network login name, which would allow individual customization.



For the consultant workspace, the user interface variable is not explicitly defined so users should continue to see the same Interface options that they normally would.

Notes

Introduction

This chapter provides an overview of the modifications to the default MicroStation workspace, and the custom applications and tools developed by MDSHA and made available through the DDOT Workspace. These tools and applications are intended to simplify, standardize and make the creation of CAD drawings more efficient.

Main Menu

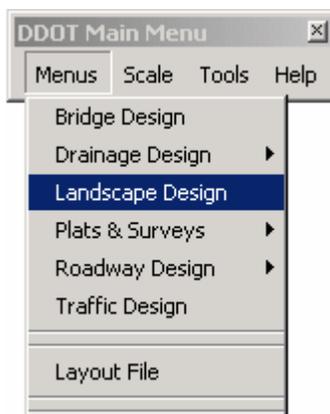
Upon entering the DDOT Workspace, the *Main Menu* will appear, along with the IDS Toolbox. The *Main Menu* contains key pulldown commands that are applicable to any file in the Workspace.



NOTE: The *Main Menu* should always remain loaded. Should it become unloaded or is not visible, there are three ways to reload it. One could either key-in “mdl load DDOTbarmenu”, use the DDOT pull down menu as shown below or access it from the IDS Tools menu by clicking on the “d.” tool.



- The **Menus** pulldown contains links to [discipline-specific menus](#):



Selecting one of the items from the Menus pulldown does the following:

- 1) Unloads the current discipline-specific menu
- 2) Unloads the attached level libraries
- 3) Loads the selected discipline-specific menu
- 4) Loads the appropriate level libraries

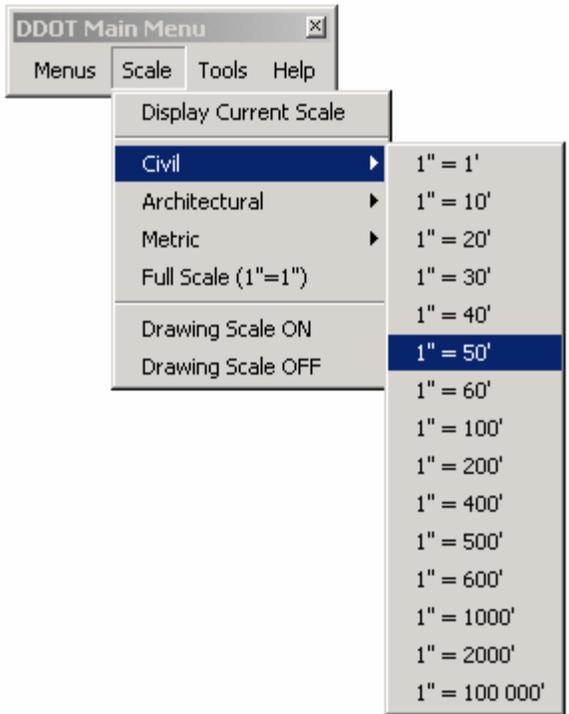
- The **Scale** pulldown contains commands that allow you to set the file's [drawing scale](#). Typically this is done once, at the time the file is first created. The active scale will be displayed along the top of the MicroStation window.

m117.dgn (2D - V8 DGN) - MicroStation V8.1 Scale: 1" = 50'

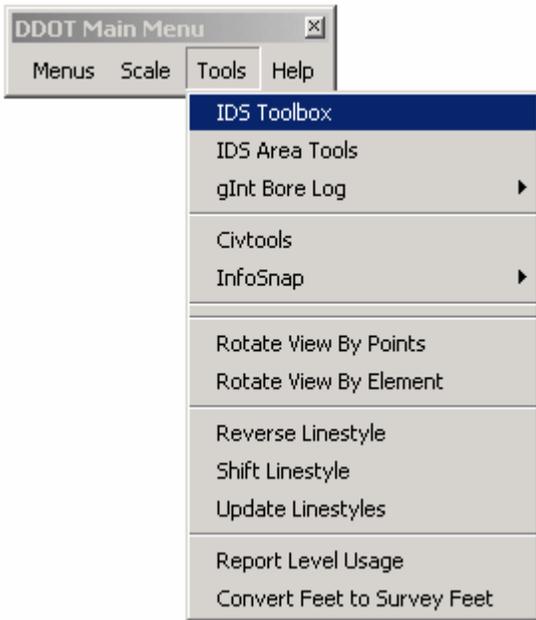
MicroStation V8.1 – This version uses the *Linestyle Scale Factor* as the de facto drawing scale.

MicroStation 2004 – This version uses the *Model Annotation Scale* as the de facto drawing scale.

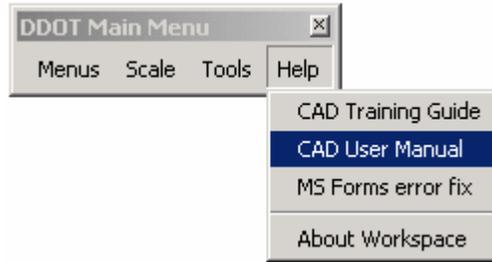
NOTE – when first opening a file in 2004, it may be necessary to reset the drawing scale and the Text Styles (*Tools > Import DDOT Text Styles*) if the file was originally created using V8.1.



- The **Tools** pulldown contains links to various drafting tools, both custom developed and MicroStation delivered.



- The **Help** pulldown contains links to the DDOT CAD Manual, as well as information about the current version of the Workspace.

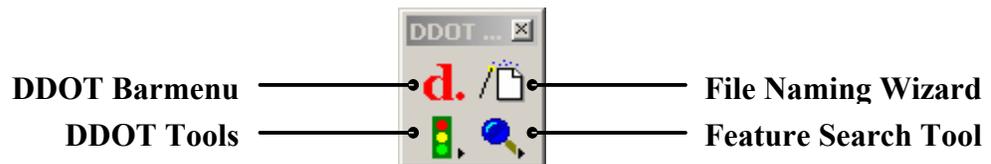


Discipline/File Specific Menus

Many additional barmenus have been created based on file discipline (e.g. Roadway Design, Drainage Design, etc) or general file type (e.g. Plan Sheet, Title Sheet). When a file is first opened, the Workspace checks the file name to see if it follows the standard file naming convention. If there is a match, the appropriate barmenu will be automatically loaded, along with any associated level libraries. As noted above, these barmenus may also be selected from the [Main Menu](#) > Menus.

DDOT (IDS) Toolframe

The DDOT (IDS) Toolframe is a collection of MicroStation V8 tools, and is automatically loaded by the Workspace. If it is unloaded or not visible, select *Tools* > *IDS Toolbox* from the *Main Menu*, or key-in “mdl load idstb”.

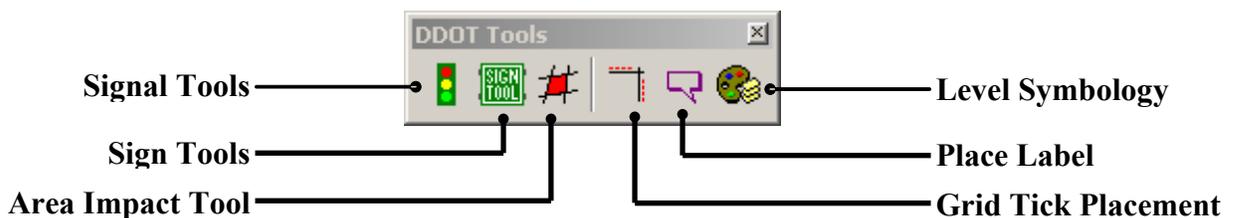


DDOT Barmenu

This button opens the DDOT [Main Menu](#).

DDOT Tools

This toolbox contains a collection of design production tools for signals and signage, area measurement, grid tick placement, placing callout labels and changing symbology.



Signal Tools

The SIGNAL TOOLS assist the user in placing symbols for existing and proposed signal poles and mast arms. The dynamic tool allows the user to interactively specify mast arm lengths and quantity and number of signal heads per mast arm.

Sign Tools

The SIGN TOOLS assist the user in creating guide signs based on MUTCD standards.

Area Impact Tools

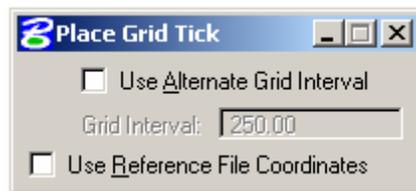
The area impact tools provide a method for measuring, filling and labeling a specified area in one command. The color, fill type, level, measurement units and label units can all be adjusted by the user.

Place Label

The place label tool quickly creates callout labels for such things as limits of work.

Grid Tick Placement Tool

The GRID TICK PLACEMENT TOOL assists the user in placing grid ticks on plan sheets. By default, the grid ticks are locked to a grid interval of 250 ft. One to three grid ticks can be placed. The size of the tick is automatically scaled according to the file's [drawing scale](#).

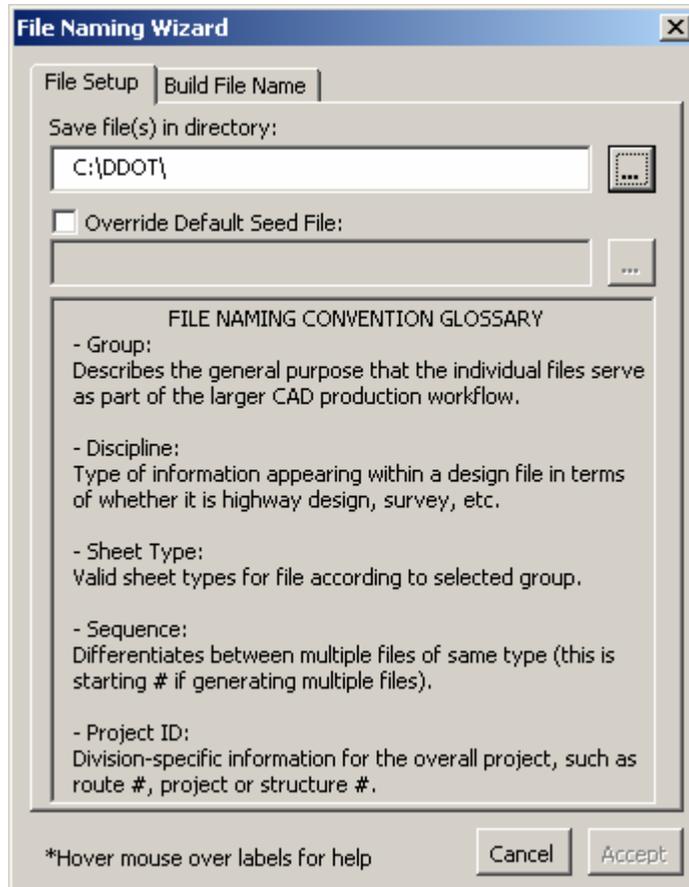


Change Level Symbology

Change Level Symbology allows the user to change level symbology of an element or of an entire file. This will not change the actual symbology attributes of the element but only how they are displayed if Level Symbology is turned on. Level symbology must be checked in the view attributes dialog in order for the user to see the changes.

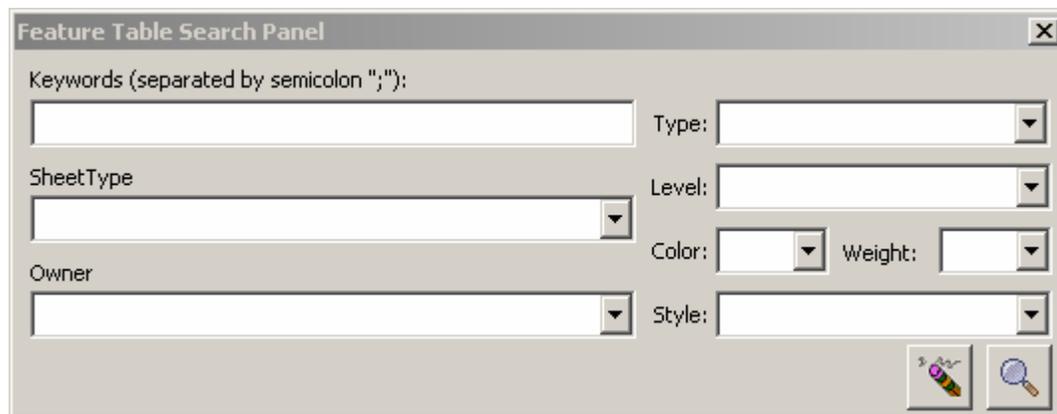
File Naming Wizard

The FILE NAMING WIZARD helps users create files in accordance to the file naming convention. Refer to the "[File Naming Convention](#)" section in [Chapter 3](#) for more information. The File Naming Wizard dialog box is shown below:



Feature Search Tool

The FEATURE SEARCH tool is an interface developed to help browse the CAD Standards for unknown symbology settings.



Notes 

CAD Files Management & File Naming Convention

Introduction

This chapter's major topics are:

- **File Naming Convention**: The new DDOT file naming convention requires that file names follow the format discussed below. This chapter provides details on how to name MicroStation V8 CAD files. Topics include the explanations of two components of a standard CAD file name: File Group and the File Discipline.
- **File Naming Wizard**: The File Naming Wizard has been incorporated within the DDOT Workspace and is explained in this chapter. It is a tool that can be used to ensure that files are named correctly. The File Naming Wizard is adopted from MDSHA's workspace. Use of this tool makes it easier to create files with a naming structure that adheres to the new standard.
- **Renaming Files**: This chapter includes a discussion on renaming a file after it has been created by the File Naming Wizard.
- **File Management and Directory Structure**: The section on directory structure for CAD files discusses how CAD files must be organized and maintained for DDOT projects. This convention has to be followed for all projects, including those designed in-house and/or by consultants.

Purpose of Establishing a Naming Convention

There are several advantages to keeping design elements in separate files instead of keeping everything in one MicroStation file. Multiple design files are required for most types of projects. The DDOT CAD Standards require that each of these design files have a unique name that will adhere to the naming structure discussed herein, and be located in the appropriate directory.

This chapter will describe the CAD files naming convention that needs to be followed for each design file and will also discuss directory structures. Standard and nonstandard file types and file naming conventions are also explained. The new standard requires that a CAD file name consists of three segments, each separated by a dash (-) and an underscore (_). This section will describe in detail these three segments starting with the format for the first segment of CAD file name, followed by the format for the third segment and concludes with a discussion of the middle segment of CAD file name.

Having an established file naming convention and directory structure will be beneficial under multiple scenarios:

Project designed by DDOT personnel: Multiple individuals will work on most projects. If DDOT personnel follow the new DDOT Standards file naming and directory convention, all team members will know exactly where each file is kept and will know the specific file to open if needed either for review purposes or to work on a certain aspect of the design. If an employee working on a project is unavailable, others will be able to step in and continue on the project with minimal disruption. In addition, supervisors will know the directory and file name that has the information they want to check or review.

Projects Designed By Consultants: All work performed by consultants for DDOT projects which start after the release of the CAD Standards manual must follow the file naming and directory structure guideline of the new DDOT CAD Standards. Upon design completion, consultants are expected to submit the electronic version of the design files as specified in [Chapter 6](#), titled [Electronic Data Deliverables](#). If a consultant follows the new file naming and file structure convention, DDOT personnel and other consultants will find it easy to determine which electronic file submitted by a consultant has the information they are seeking.

The New DDOT File Naming Convention

DDOT has adopted Maryland's SHA, MicroStation V8 CAD file naming convention. The file naming convention discussed in this chapter is to be followed for all CAD files and all *Tiff* files, the only difference between the two being the three-character file extension. The extension for all CAD files will be *“.dgn”*, while the extension for *Tiff* files will be *“.tif”*. If one is conducting review of a file, the file name will be the same as the file being reviewed, but the extension will be the default *“.rdl”*.

CAD file names must follow the following format:

gDD-TTNN_ProjectID.dgn

where:

g	=	one-character File Group
DD	=	two-character File Discipline
TT	=	two-character Sheet Type
NN	=	two-character Sequence Number
ProjectID	=	six digit ProjectID

File Naming Convention for the First Segment of a CAD File Name

Under the new file naming convention, the format of the first 3 characters of file names is consistent for all CAD files and is always a one character [File Group](#) followed by two characters which signify the [File Discipline](#). However, the format of the remaining characters will vary based on the contents of the file for the specific discipline.

File Group

The new file naming convention requires that the first character of a CAD file signify the general function of the file. For instance, some files are solely used as reference files, while others are intended for plotting. CAD files are classified into five general function categories, which are referred to as File Groups. Thus, the first character of the file name will designate the File Group to which it belongs.

The five File Groups are identified by a single-letter abbreviation, which is used as the first character in the file name. This first character in the file name essentially specifies whether a file functions as a reference file, as the final plotted output file or as a file that is neither plotted nor referenced into plan sheets.

The five File Groups and their one-character abbreviations are:

p - Print Files/Contract sheets: Files which are used to generate the final construction plot files are composed of various design files that are referenced into the master sheet file. These files are printed to deliver the final products of DDOT CAD, whether they are contract documents, plan sheets, profile sheets, cross-section sheets, schedules, brochures or wall displays. Any file that is plotted to generate a final contract document falls into this group.

Reference Files

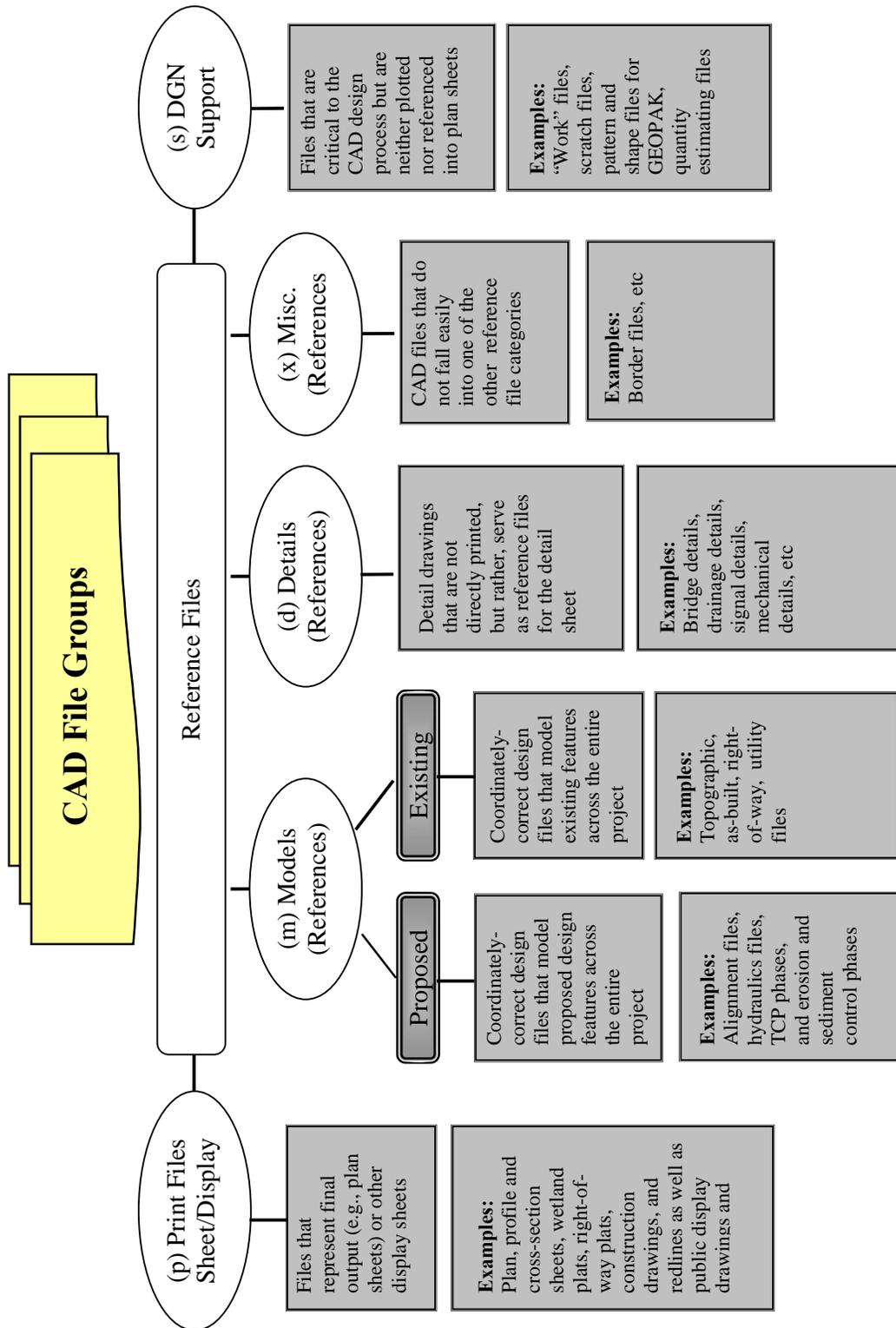
m – Model/Design Files: Reference files which form the basis for the project design. These files will be referenced to final *Print files* (see above). These files contain existing and proposed design elements such as centerlines, profiles, edge of road, MOT plans, signing, pavement marking, cross-sections, etc.

d - Detail Files: Reference files that contain design details such as typical sections, street light details, drainage details, curb details, etc.

x -Miscellaneous Files: Reference files that do not fall easily into one of the other Reference file categories. This could, for example, include the border file.

s - DGN Support/Work Files: Files that are critical to the CAD design process but are neither plotted nor referenced into plan sheets. Such files may be necessary for use of design software (e.g. Geopak pattern files) or may simply be used for engineering, calculations and measurements by the designer.

The majority of files used in creating contract documents will be either an m-model file or a p-print file. An illustration of the CAD File Group hierarchy with some example file types is displayed in the chart on the following page.



File Discipline

The second and third characters in a file name identify the File Discipline. The two-character abbreviation specifies the exact type of information contained in a file. For example the two-character abbreviation for Contours is CT, for Right of Way, RW, for Highway Profile, HP and for Geopak Pattern Lines, PT. The complete list of File Disciplines delivered with the Workspace is shown in [Table 1](#).

However, this list of two-character abbreviations provided with the new DDOT CAD Standards does not cover all possible information that might be shown in a design file. If none of the provided abbreviations describe the specific type of information to be shown in the design file, a File Discipline abbreviation that defines the broad discipline of information appearing within a particular design file shall be used. Examples of broad descriptions of disciplines and their two-letter abbreviation include: Topography (TO), Highway Design (HD), Landscape Design (LD) and Signing (SN). As shown in Table 1, abbreviations for a large number of design disciplines have been provided as part of the CAD file naming convention and workspace.

It should be noted that the File Discipline abbreviations available to choose from will differ depending on the File Group and are very limited for files in the following three File Groups: Support files, Detail Reference Files and Miscellaneous Reference Files. Five File Disciplines are available for Detail Reference Files: Bridge/Structure (BR); Drainage (Plan) Design (DD); Erosion & Sediment Control (ES); Highway Typical (HT); and Stormwater Management (SW). Three File Disciplines are available for Miscellaneous Reference Files: Base Line (BL), Layout (LA) and Legend (LG). Three File Disciplines are available for Support Files: Air Quality (AQ), Highway (plan) Design (HD) and Pattern Lines (PT) (Geopak patterns).

If users cannot find a sufficiently descriptive File Discipline for some of these file groups, it is recommended that they rename the file after creating it using the File Naming Wizard. Please refer to the discussion below on [Renaming Files Created with The File Naming Wizard](#).

It is important to note that File Discipline abbreviations can be used for more than one File Group. For example, the File Discipline abbreviation HD is used for all of the following File Groups: Sheet files, Model Reference Files and Support Files. The first three characters of the file name for these three groups will be pHD, mHD and sHD.

Table 1 offers a large selection of abbreviations for File Discipline. However, if none of the choices from the list fit the content of the CAD file being created, users are encouraged to inform the contact personnel shown in the [Introduction](#) with their recommendation for additions.

Table 1 – File Discipline

Abbreviation	Info Contained in File:
AQ	Air Quality
BL	Base Linen
BR	Bridge / Structure
BG	Brochure Graphics
CT	Contours
XL	Cross Section Layout
XS	Cross sections
DD	Drainage (Plan) Design
DA	Drainage Area
DP	Drainage Profile
ED	Environmental Document
EF	Environmental Features
EI	Environmental Impacts
ES	Erosion & Sediment Control
FD	Future Developments
GN	General
GS	Geometry Sheet
GD	Geometry design-(ER, EP,Sidewalk, curve data, driveway, etc)
GR	Grading (Contours)
GM	Grid Map
HD	Highway (Plan) Design
HC	Highway Cross Section
HP	Highway Profile
HT	Highway Typical
IT	ITS (Intelligent Transportation Systems)
LU	Land Use
LD	Landscape (Plan) Design
LP	Landscape Profile
LA	Layout
LG	Legend
LT	Lighting
MT	Maintenance of Traffic (MOT)
MB	Metes & Bounds
MO	Mosaic
NA	Noise Abatement
NB	Noise Barrier
PT	Pattern Lines (Geopak)
PM	Pavement Marking
PL	Property Lines/Plat Development
CL	Proposed centerline
RR	Railroad (Plan) Design
RF	Reforestation
RW	Right-of-Way
SC	Sequence of Construction
SH	Shading
SG	Signal Design
SN	Signing
SO	Soils & Foundation
SM	Soils Map
SW	Stormwater Management
SD	Stream Diversion
SR	Stream Restoration
ST	Structures
SE	Superelevation Shapes (geopak)
SC	Survey Cookies
TO	Topography (survey)
TX	Topography (survey) Text
TT	Topography to Remain
TM	Town Map
TR	Triangles
AT	Turning Movements (AutoTurn)
UT	Utilities
WD	Wall Display
WT	Wetlands

File Naming Convention for the Third Segment of a CAD File Name (ProjectID)

The third segment of a CAD file name will consist of six numbers that identify the project. Unless directed otherwise by the DDOT project manager, the six-digit code will be the Purchase Order number shown on the Notice to Proceed. For projects performed in-house by DDOT personnel, the Chief Engineer or his designated representative will assign the six-digit project code to each project. It is the responsibility of the project manager or project engineer to ensure that they receive the correct six-digit project number at the start of a project.

The third segment of a CAD file name is added to make each file name unique because the first and middle segments are the same for every project containing that type of information. (For example, the first and middle segment of reference file names that contain survey information will be the same for all projects). DDOT plans to put in place document management software in the near future, and the document check-in and checkout process will be streamlined if each file name is unique.

The six numerical characters that form the third segment of a CAD file name are abbreviated in the discussions that follow by the symbol **ProjectID**. It will have the following format:

ProjectID = CCCCCC

Where CCCCCC = Project Code (6 digits)

File Naming Convention for the Middle Segment of a CAD File Name

The middle segment of a CAD file name will have four alphanumeric characters whose format and content is determined by the first segment of the file name. These four characters will be separated from the File Discipline by a dash (-), and will be separated by an underscore (_) from the ProjectID. The first two characters of the middle segment of a CAD file name are known as [Sheet Type](#) and the last two as [Sequence Number](#).

Sheet Type

The first two characters of the middle segment of a CAD file name represent the Sheet Type and will follow one of the formats discussed below. The sheet type can be a one-character descriptor followed by a zero as a placeholder or both characters can be set to two zeros by the File Naming Wizard. Due to the fact that a File Discipline abbreviation is not provided for some types of file contents, there will be instances where a user might need to rename a file that has been created with the File Naming Wizard. Doing so allows the use of a two-character descriptive abbreviation that will let everyone know at a glance the file content. For example, a File Discipline abbreviation is not provided for Model (Reference) files which contain just the centerline of the project. Thus for projects in which the designer prefers to have the centerline information shown separately from other geometry information, the [File Discipline](#) for the file name can be set to HD for Highway Design, and the file will be renamed using “CL” for Sheet Type. Thus the portion of the file name preceding the sequence number will be mHD-CL

If files created using the File Naming Wizard are renamed on a project, an electronic file must be submitted that explains any abbreviations used that fall outside of those delivered with the Workspace. (See the *Electronic Data Deliverables* chapter in this Manual). Also, refer to the discussion below on [Renaming Files Created with The File Naming Wizard](#) for some abbreviations and formats that can be used when renaming a CAD file.

Sequence Number

The last two characters of the middle segment of a CAD file name are known as the Sequence Number and indicate either the sheet number for Print/Sheet files, or the site or segment number of Model and Support files. If one of these is not specified, the File Naming Wizard will assign two zeros to the Sequence Number.

For multi-site or multi-segment projects, consultants will provide a file with each electronic submittal that describes the site number or segment number convention for the project. (See the *Electronic Data Deliverables* chapter in this Manual)

The paragraphs below will first describe the abbreviations and formats that will be given to the middle segment of a file name by the [File Naming Wizard](#), and will be followed by a discussion on The File Naming Wizard and on renaming a file after it has been created by the File Naming Wizard.

The two characters of the Sequence Number are represented as NN in the discussions below.

1 - Format for the Middle Segment of a Print/Sheet File Name

Depending on the file discipline selected for the first segment of the file name, the Sheet Type for Print/Sheet file names will follow one of the formats below:

T0NN
TTNN
S0NN
00NN

- Where **T0** = Sheet Type is represented by a one character abbreviation (see box on right) followed by a zero
- TT** = Sheet Type is represented by a two letter abbreviation. The abbreviation will depend on the file discipline chosen for the first segment of the file name.
- S0** = Sheet Type is represented by either an E for existing or P for proposed, followed by zero
- 00** = Sheet Type is represented by two zeros.

Sheet Type	T
Title sheet	T
Index sheet	I
Notes	N
Schedules	S
Plan sheet	P
Cross Section sheet	X
Profile sheet	V
Detail sheet	D
Redlines	R
As-Builts	A
Figure / Plate	F
Wall Display	W
Cartography/Mapping	M

All of the above four formats of Sheet Type will be followed by the Sequence Number where:

NN = Two digit sheet number or two zeros if none is specified.

The choices for **T** and **TT** are extensive. There should be no need to rename any Print/Sheet reference file after it has been created by the File Naming Wizard.

2 - Format for the Middle Segment of a Model (Reference) File Name

The **Sheet Type** for Model (Reference) files will have one of the seven formats discussed below, depending on the File Discipline of the first segment of the file name. For each of the seven formats, a table is included that lists the File Discipline choices that will result in that format for Sheet Type.

The **Sequence Number** for Model (Reference) files will always be the site number for multi-site projects, the segment number for multi-segment projects or two zeros for a single site, single segment project.

A - Model (Reference) File Naming Convention– Format No. 1 (Basic File Naming)

00NN

Where **00** = Sheet Type is represented by two zeros, i.e. there will be no selections available for Sheet Type.

NN = Sequence Number or two zeros if none is specified.

Thus if no Sequence Number is specified, the middle segment of the CAD file name will be assigned four zeros by the File Naming Wizard.

The table below shows the File Discipline selections for the first segment of Model (reference) file names that will yield a middle segment with the above format.

File Discipline	File Discipline Description
DD	Drainage (Plan) Design
DP	Drainage Profile
EF	Environmental Features
ES	Erosion & Sediment Control
FD	Future Developments
GM	Grid Map
LD	Landscape (Plan) Design
MT	Maintenance of Traffic (MOT)
MB	Metes & Bounds
MO	Mosaic
RR	Railroad (Plan) Design
RF	Reforestation

SC	Sequence of Construction
SH	Shading
SO	Soils & Foundation
SM	Soils Map
SD	Stream Diversion
SR	Stream Restoration
TT	Topography to Remain
AT	Turning Movements (Auto Turn)
WT	Wetland

B - Model (Reference) File Naming Convention– Format No. 2 (Files designated as proposed or existing)

Some File Discipline selections for Model (Reference) Files will yield a middle segment with the following format:

S0NN

Where **S0** = Sheet Type is represented by either E for existing or P for proposed, followed by a zero.

NN = Sequence Number or two zeros if none is specified.

If any of the File Disciplines shown in the table below are chosen for the first segment of the file name, the second segment of the CAD file name will have the format **S0NN**.

File Discipline	File Discipline Description
GR	Grading
IT	ITS
LU	Land Use
LT	Lighting
PM	Pavement Marking
RW	Existing and Proposed
SG	Signalization
SN	Signing
TR	Triangles

C - Model (Reference) File Naming Convention– Format No. 3 (Files designated by alternatives, phases, etc.)

Some File Discipline selections for Model (Reference) files will yield a middle segment with either of the following two formats:

-AANN_ or -00NN_

Where **AA** = Sheet Type is represented by an alternate or phase number (See box on right for recommendations).

00 = Sheet Type is represented by two zeros if an alternate or Phase number is not provided.

Alternate or Phase	AA
Preliminary Study	01
Preliminary Design, 30% completion	02
Intermediate Design; 60% Completion	03
90% Completion	04
Final Design	00

NN = Sequence Number or two zeros if none is specified.

The File Naming Wizard does not provide an option not to have the two zeros, or to have non-numerical characters. The table below shows the File Discipline selections that will yield a middle segment with the above format if the File Naming Wizard is used.

File Discipline	File Discipline Description
EI	Environmental Impacts
HD	Highway (Plan) Design
HC	Highway Cross Section
HP	Highway Profile
NB	Noise Barrier

D - Model (Reference) File Naming Convention– Format No. 4 (Files designated as existing or proposed with alternates or phases)

Two File Discipline selections will yield a middle segment with one of the two following formats:

S0NN_ or -AANN_

Where **S0** = Sheet Type is represented by either an E for existing or P for proposed followed by a zero.

AA = Sheet Type is represented by an alternate or phase number (See box on right).

NN = Sequence Number or two zeros if none is specified

Alternate or Phase	AA
Preliminary Study	01
Preliminary Design, 30% completion	02
Intermediate Design; 60% Completion	03
90% Completion	04
Final Design	00

The table below shows the File Discipline selections that will yield a middle segment of a CAD file name with one of the above two formats.

File Discipline	File Discipline Description
DA	Drainage Area
PL	Property Lines/Plat Development

E - Model (Reference) File Naming Convention– Format No. 5

One File Discipline selection will yield a middle segment having one of two formats:

AANN

Where **AA** = Sheet Type is represented by an alternate or phase number (See box above).

NN = Sequence Number or two zeros if none is specified

The table below shows the File Discipline selection that will yield a middle segment having the format **AANN** if the File Naming Wizard is used.

File Discipline	File Discipline Description
SC	Sequence of Construction

F - Model (Reference) File Naming Convention– Format No. 6

The TO (Topography) selection for File Discipline will yield a middle segment having the following format:

L0NN

Where **L0** = Sheet Type is represented by a one letter abbreviation signifying one of five file contents shown below, followed by a zero.

NN = Sequence Number or two zeros if none is specified

The table below shows the single letter abbreviations available to choose from and their descriptions:

File Discipline	File Discipline Description	Sheet Type	Description of Sheet Type
TO	Topography	A C F R S	Aerial (Photography) Composite Sources Field Located Recorded Data Survey

G - Model (Reference) File Naming Convention– Format No. 7

The BR (Bridge/Structure) selection for File Discipline will yield a middle segment having the following format:

00NN_ or -TTNN

Where **00NN** = Sheet Type is represented by two zeros, if none is specified, followed by the Sequence Number.

TTNN = Sheet Type is represented by two characters followed by the Sequence Number.

3 - Format for the Middle Segment of a Detail (Reference) File Name

The middle segment of Detail (Reference) file names will follow the format below:

00NN

Where **00** = Sheet Type is represented by two zeros.

NN = Sequence Number or two zeros if none is specified.

The middle segment of a file name will have four zeros if a Sequence Number is not specified due to project not having multi-sites or segments.

As stated previously, when creating files in which to draw details, five File Disciplines are available to choose from when using the File Naming Wizard. These are: Bridge/Structure (BR); Drainage (Plan) Design (DD); Erosion & Sediment Control (ES); Highway Typical (HT); and Stormwater Management (SW). For these five File Disciplines, the Sheet Type will always be 00 if the File Naming Wizard is used when creating the CAD file.

4 - Format for the Middle Segment of a Miscellaneous (Reference) File Name

The middle segment of Miscellaneous (Reference) file names will follow the format below:

00NN

Where **00NN** = Sheet Type is represented by two zeros followed by Sequence Number. If Sequence Number is not specified, the middle segment will be assigned four zeros by the File Naming Wizard.

As stated previously, the File Naming Wizard gives a choice of only three File Disciplines when creating files in Miscellaneous (Reference) Files group. These File Disciplines are: Base Linen (BL), Layout (LA) and Legend (LG).

There may be instances where Miscellaneous (Reference) CAD files have to be renamed. Refer to the discussion on [Renaming Files Created with The File Naming Wizard](#) for some recommended abbreviations and formats that can be used when renaming a CAD file.

5 – Format for the Middle Segment of a Support File Name

The middle segment of Support file names will follow the format below:

00NN or Q0NN

Where **00** = Sheet Type is represented by two zeros.

Q0 = Sheet Type is represented by Q for quantities, followed by a zero.

NN = Sequence Number or two zeros if none is specified.

As stated previously, there are only three File Discipline choices for Support files when creating files using the File Naming Wizard. Of these, Air Quality (AQ) and Pattern Lines (PT) will have the format 00NN. The third, Highway (Plan) Design (HD), will offer a choice of 00NN or Q0NN.

File Naming Convention Summary

Shown below is the full file naming convention that will be followed by the File Naming Wizard for each of the five [File Group](#). For files in the Print/Sheet file group, the Sheet Type will be a one-character abbreviation followed by a zero. For the other File Groups, as discussed above, the [Sheet Type](#) may have different formats depending on the File Group and the File Discipline chosen for the first segment of the CAD name. In the discussions below, all the various formats of Sheet Type are represented by the abbreviation ST. As was used in the discussions above, the abbreviations for [File Discipline](#) and [Sequence Number](#) are DD and NN respectively.

Appendix C shows the characters of the first and middle segment of various file names that will be assigned by the File Naming Wizard.

Print (Sheet) Files Naming Convention

PRINT FILES

pDD-STNN_ProjectID.dgn

Where **p** = the file group character that signifies that it is a sheet file which will be plotted, or used to generate plot files, depending on the software used to plot.

DD = two-character File Discipline (See Table 1)

ST = Single character abbreviation for plot file Sheet Type (see table on Page 3-8) followed by zero

NN = two-digit Sequence Number. It should match the sheet number where possible

ProjectID = CCCCCC

Where *CCCCCC* = Project Code (6 digits)

Reference Files Naming Convention

REFERENCE FILES

tDD-STNN_ProjectID.dgn

Where **t** = the file group character that represents one of these file type designations:

m = signifies that it is a model/design file

d = signifies that the file is a detail reference file

x = signifies that the file is a miscellaneous reference file

DD = two-character File Discipline

ST = two-digit Sheet Type as discussed above

NN = two-digit Sequence Number, which will be either the site or segment number. If none specified, it will be two zeros.

ProjectID = CCCCCC

Where *CCCCCC* = Project Code (6 digits)

Support Files Naming Convention

DGN SUPPORT/WORK FILES

sDD-STSN_ProjectID.dgn

Where **s** = is the file group character that signifies that this is a support file and thus will not be plotted or referenced.

DD = File Discipline

ST = two-digit Sheet Type as discussed above. It is either Q0 or 00 for Support Files.

NN = two-digit Sequence Number, which will be either the site or segment number. If none specified, it will be two zeros.

ProjectID = CCCCCC

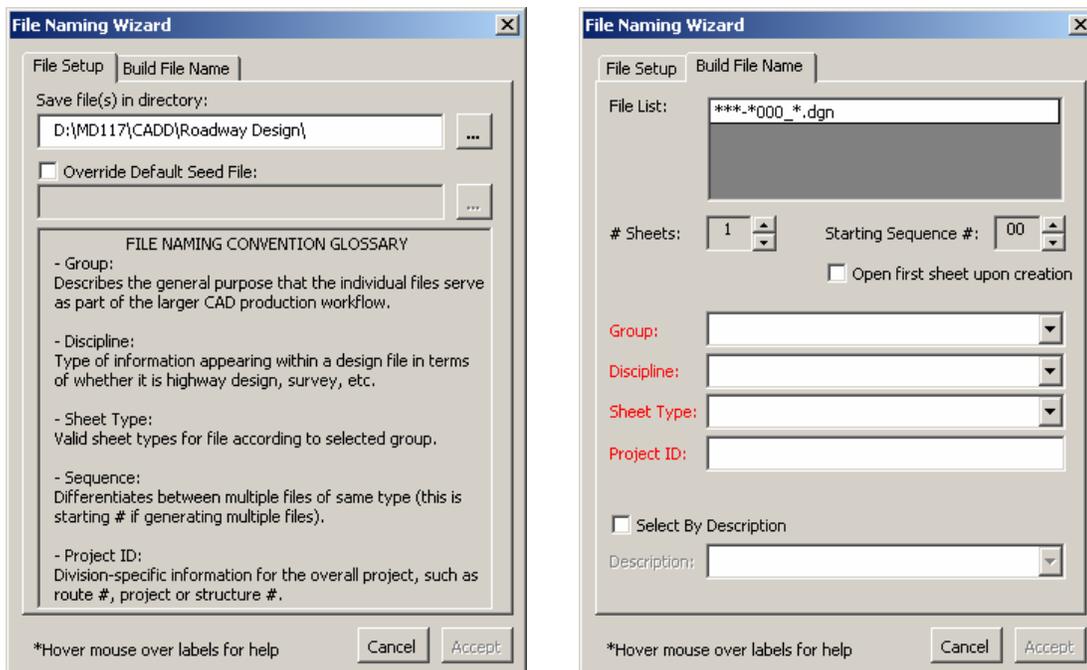
Where *CCCCCC* = Project Code (6 digits)

File Naming Wizard

As stated previously, DDOT has made the decision to follow the CAD standards of MD SHA. A major component of the CAD standards is the CAD files naming format. This DDOT CAD manual has provided a few additional abbreviations for Sheet Type that are not delivered with the Workspace. Except for this, the naming convention has followed the format developed by SHA, which has allowed DDOT to access and utilize a tool developed by SHA to promote understanding of and adherence to the new file naming convention. This tool is called the File Naming Wizard and can be accessed through the [IDS Tool Frame](#) in the DDOT Workspace.



The **File Naming Wizard** not only constructs the file name but also creates one or multiple files in numbered sequence using standard seed files. Required fields are labeled in red text:



There are two methods to build a file name using the wizard:

1. Select by **Group, Discipline & Sheet Type**
2. Select by **Description**

The File Naming Wizard is described in detail in the MD SHA's [V8 CAD Standards Training Guide](#), which has also been included in the files delivered with the DDOT Workspace. Please refer to *V8CADStdTrainingManul.pdf*, which is hyperlinked above and is located in the following sub-directory of the Workspace: `..\Workspace\Documentation`. The

hyperlink shown above will work only when viewing the DDOT CAD Standards Manual that is located in the DDOT Workspace, which can be accessed by selecting CAD USER MANUAL from the [Help](#) pulldown on DDOT [Main Menu](#). Please note that MD SHA's **V8 CAD Standards Training Guide** has been included in the Workspace without any modification since it provides useful information about MicroStation V8 and the SHA developed tools. However, in instances of discrepancy, the DDOT CAD Standards Manual and the DDOT Workspace shall govern.

Renaming Files Created with the File Naming Wizard

The File Naming Wizard offers [File Discipline](#) and [Sheet Type](#) abbreviations that cover a wide range of file contents for Print (sheet) files. In addition to the ability to define the sheet number, these abbreviations allow a file name to be unique within a set of sheet files. Thus a need to rename Print (sheet) files is not anticipated. However, it is likely that users will want to rename CAD files in the other [File Groups](#).

Though an extensive abbreviation for File Discipline and Sheet Type is delivered with the new workspace, it is possible for users to find that none of the abbreviations adequately describe the model reference file they are creating. For example there are no abbreviations for files that contain only the Geopak generated centerline. In such cases, a broad file discipline such as HD for highway design shall be used along with a descriptive Sheet Type such as “CL” for centerline.

For Detail (Reference) Files, Miscellaneous (Reference) Files and Support Files, the File Disciplines available to choose from when using the File Naming Wizard are as few as three or five. These do not cover all possible disciplines that need to be created on a project. Thus a user may either create a CAD file without using the File Naming Wizard or rename it after it has been created with the File Naming Wizard. Doing so enables one to select a File Discipline that is more appropriate for the file content. In addition, utilizing a descriptive two-character abbreviation for [Sheet Type](#) when renaming a file would result in a CAD name that more explicitly describes the file’s contents. For example, a Support file for which a descriptive abbreviation has not been delivered with the Workspace is the Geopak superelevation shape file. In such cases, a broad file discipline such as HD for highway design shall be used in the first segment, along with a descriptive Sheet Type such as “GS” for Geopak shape file within the middle segment of the file name.

Renamed CAD files shall adhere to the format and character limits discussed previously in this chapter.

When an abbreviation for Sheet Type is used outside of those delivered with the Workspace, and for multi-site or multi segment projects, consultants will provide with each electronic submittal a file that describes the site number, segment number and Sheet Type convention for the project. (*See The Electronic Data Deliverables chapter in this Manual*)

The table below shows some recommended two-character [Sheet Type](#) abbreviations for use when renaming a file:

Abbreviation	Info Contained in File:	File Group
CG	Cross Section as generated from Geopak prior to creating layout	X
CL	Proposed centerline	M, D, P
CV	Cover sheet	
EM	Environmental Impact mitigation plan	M, D, P
GD	Geometry design-(ER, EP, Sidewalk, curve data, driveway, etc)	M. P
IX	Index Sheet	X, P
AN	Notes and abbreviations	X. P
GS	Geopak Superelevation Shapes	S

File Management

This section discusses the directory structure for the files created for DDOT projects. This directory format is to be followed whether the project is designed by DDOT personnel or by consultants.

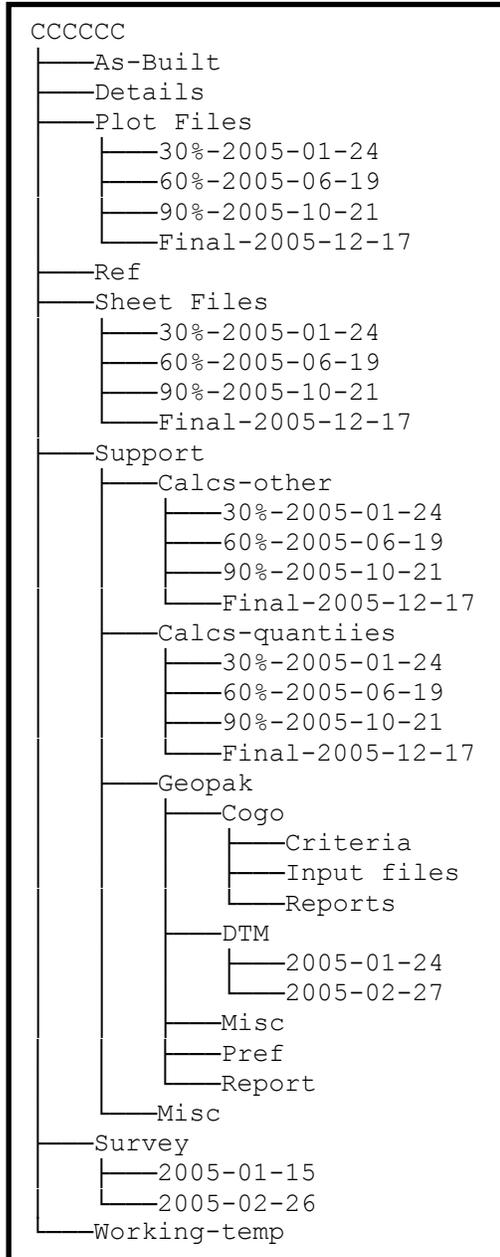
Though consultants are not required to use this structure at their office, they will ultimately be responsible for ensuring that project files are submitted on CD at the completion of a project with the directory structure called for in this CAD Standards Manual, with the correct reference files attached.

In some instances, DDOT may assign a new task number for supplemental work on an existing project. In such situations, unless directed by the DDOT project manager, the original contract number should be utilized for the directory name.

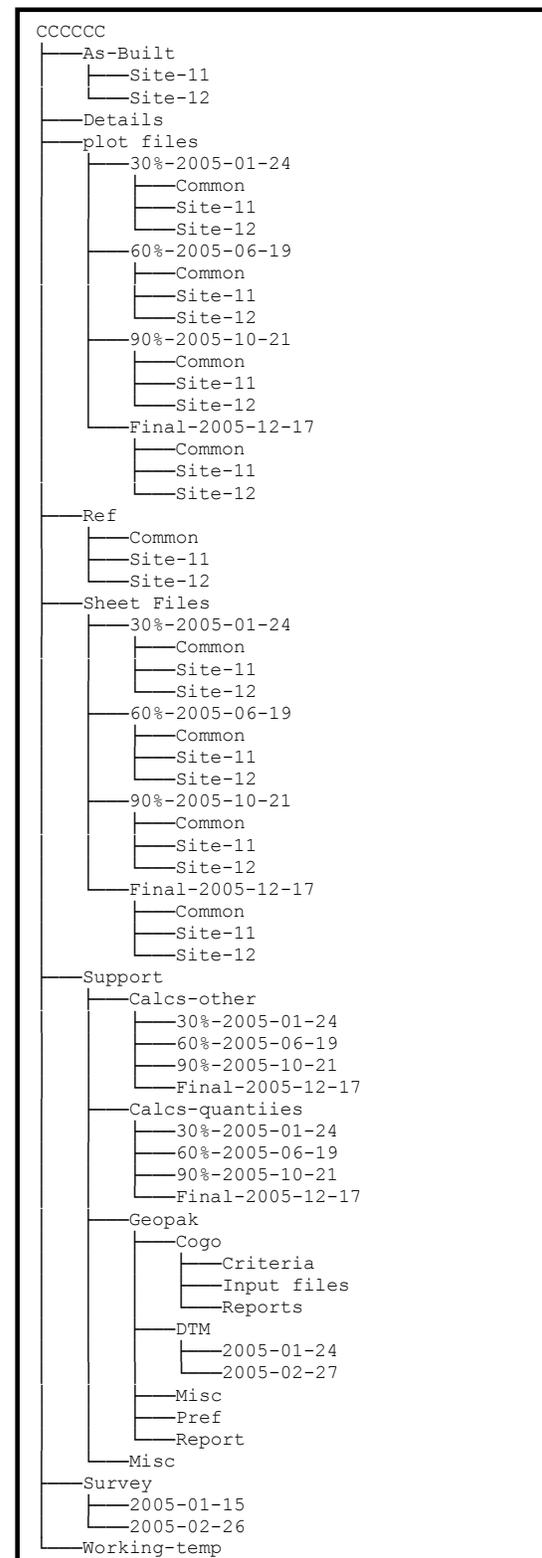
Directory Structure for DDOT Projects

The recommended directory structure is shown below:

Directory Setup for a Single Site Project



Directory Setup for a Multiple Site Project



File organization on DDOT Servers

When organizing project files on file servers, please use the following guidelines:

- Keep all design files belonging to one project together in the proper folder. They can be referenced easily if they are kept together. They may become disconnected if they are not kept in the same folder. Files submitted by consultants or others upon project completion should not be renamed.
- Update reference files regularly to ensure the most current versions of all design files are being used. Check the file folder on the server to see if any newer version exists. Also, keep updated versions of your files on the server so that others can update your files as their reference files.

Notes

Introduction

This chapter provides specific details about DDOT's standard settings and symbology elements, including standard seed files, color table, level names, fonts, etc. This chapter's major sections are listed below:

- [Seed Files](#) lists DDOT's standard seed files for creating new MicroStation V8 files.
- [Standard Settings](#) provides details about the settings contained in the standard seed files. This includes notes about Working Units, Survey Feet, Coordinate Readout, Drawing Scale (**NEW in V8!**), Color Tables and DGN Libraries.
- [Standard Elements](#) provides information about the feature symbology that has been developed for the V8 standards, including level names, line weights, line styles and text styles.

Seed Files

When a new dgn file is created, MicroStation makes a copy of the specified template file. Template files are known as seed files. To ensure design file setup consistency, the following standard seed files have been created for use on DDOT projects. These seed files should always be used as a basis for developing any new design files including cell libraries.

Seed File Name	Description
DDOTModelSeed2D.dgn	Standard 2D model
DDOTModelSeed3D.dgn	Standard 3D model

The following seed file has been developed for use when creating bridge or other detail sheets in MicroStation 2004.

Seed File Name	Description
DDOTDetailSeed2D.dgn	Self-referenced 2D models at different scales

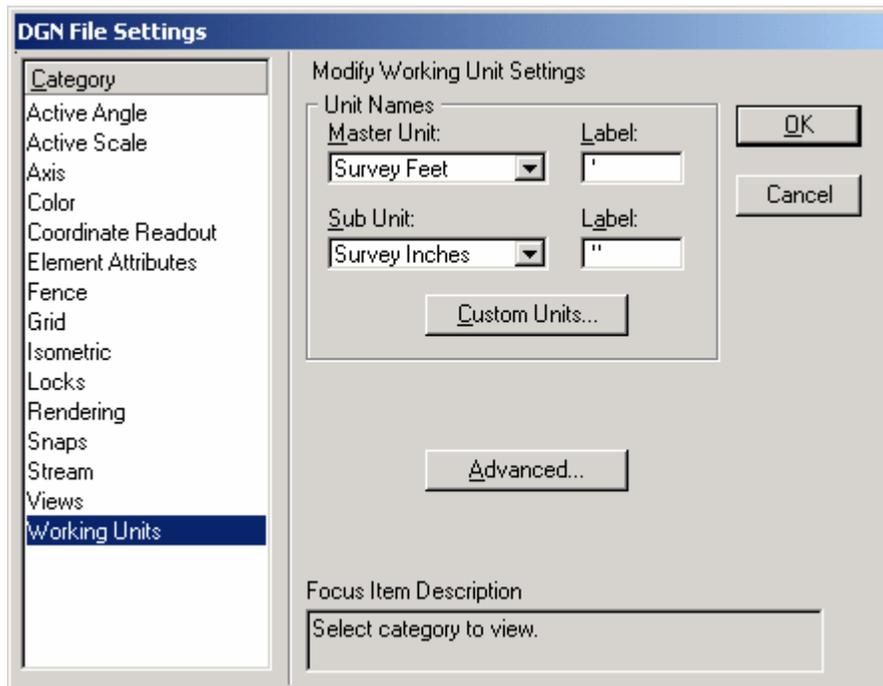
This seed file consists of multiple V8 Models that are self-referenced at different scales to facilitate the creation of multiple details at different scales within the same file. (For more information on working with Multiple Models, refer to the MDSHA [V8 CAD Standards Training Guide](#) in the Documentation directory of the Workspace. As noted previously, in instances of discrepancy, the **DDOT CAD Standards Manual** and the **DDOT Workspace** shall govern).

Standard Settings

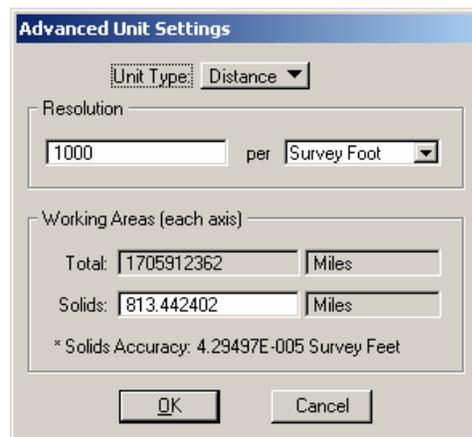
Working Units

All new V8 design files created for use on DDOT projects must conform to the following settings, which are incorporated in the seed files (unless otherwise noted):

Global Origin (2D): 0, 0
Global Origin (3D): 0, 0, 0
Master Unit (Label): Survey Feet (')
Sub Unit (Label): Survey Inch (")



Resolution: 1000 per Survey Foot
Solids Working Area: >375 Miles



Notes on V8 Working Units/Resolution

The MicroStation V8 file format represents a major change in the way that coordinate data is stored. The 32-bit integer-based design plane has been replaced by a double precision floating point coordinate system. This has the following practical effects:

1. The V8 design plane is essentially infinite.
2. Positional accuracy, in terms of master units, is essentially unaffected by unit setup.
3. Unlike Pre-V8 MicroStation, changing the working units does not affect the size of elements.

In V7, if you draw an element measuring 10 ft, then change the working units from feet to meters, the element would measure 10 m long. Now with V8, the same change from feet to meters would result in an element correctly measuring 3.048 m.

While this is an important operational improvement, it also has significant consequences for the way that DDOT must set up their design files.

International Feet vs. US Survey Feet

By default, a “Foot” in MicroStation actually refers to an *International Foot*. However, the state plane coordinate system upon which all DDOT roadway design projects are based is measured in *US Survey Feet*.

International Feet: 1 foot = 0.3048000 m
US Survey Feet: 1 foot = 1200/3937 m \approx 0.3048006 m

The workspace contains a custom units definition file, *units.def*, which was created by MDSHA and which defines survey feet and controls the conversion of V7 files to V8.

Coordinate Readout

The following coordinate readout settings are delivered in the standard seed files:

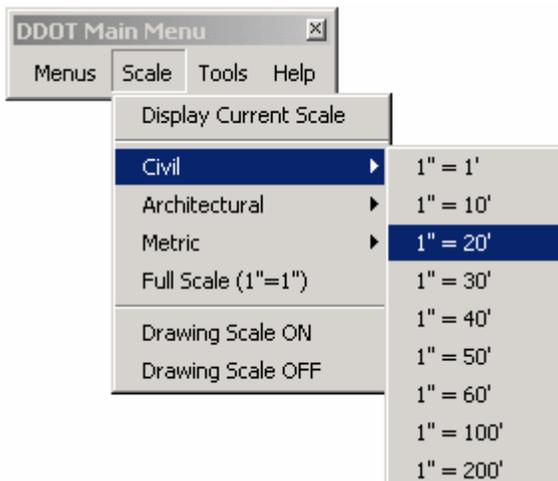
	<u>Models (2D/3D)</u>	<u>Details</u>
Coordinates Format:	Master Units	Working Units
Coordinates Accuracy:	0.1234	1/64
Angles Format:	DD.DDDD	DD.DDDD
Angles Mode:	Conventional	Conventional
Angles Accuracy:	0.1234	0.1234

Drawing Scale

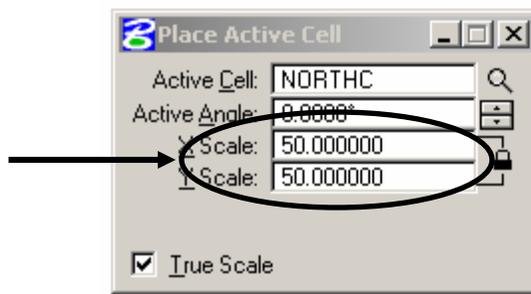
One of the key features of this CAD Standards is the use of a drawing scale which is displayed along the top of the MicroStation window. (If it does not appear in your window, select *Scale > Display Current Scale* from the Main Menu.)



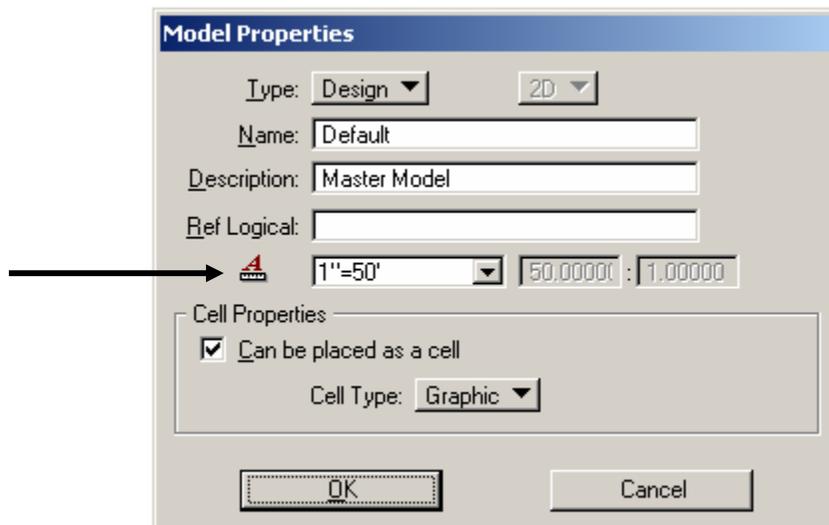
The drawing scale may be changed by selecting the appropriate scale factor from the *Main Menu* pulldown. The scale factor is stored with the file.



All scale-dependent drawing elements, i.e. text, cells and linestyles, have been defined in the CAD Standards at a unit (1:1) scale. The element is then scaled up or down by the drawing scale factor when it is selected from a menu. This helps maintain consistency of scale-dependent drawing features, regardless of the scale being used.



Programming Note: Before processing any scaling commands, the DDOT Workspace checks what version of MicroStation is being used (V8.1 or 2004). If it is **V8.1**, the active *Line Style Scale Factor* is used as the default drawing scale. If it is **2004 or later**, the *Model Annotation Scale* of the active model is used as the default drawing scale. The same *Main Menu > Scale >* pull down sets the scale factor for both.

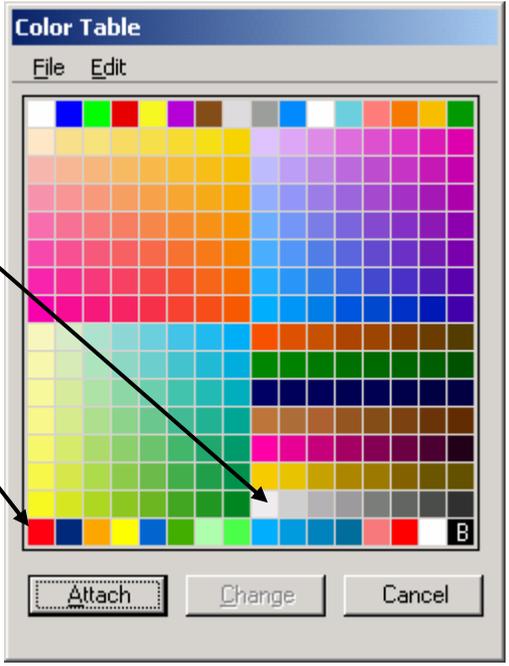


This is a new feature in MicroStation 2004 and has the advantage of being applied at the Model level (as opposed to the linestyle scale factor which is applied across all models in a file.)

Color Table

The standard color table for all DDOT design projects is **ClorDDOT.tbl**. The color table is included on the CD. DDOT personnel can also find it on the sever containing the DDOT Workspace. This color table defines the RGB values for MicroStation colors 0-255. The monochromatic (black & white) pen tables have been set up for use with this table such that all colors plot as black, with the exception of those color values defined below.

Gray Scale	232	Gray 10%
	233	Gray 20%
	234	Gray 30% - shading
	235	Gray 40%
	236	Gray 50% - Linework
	237	Gray 60%
	238	Gray 70%
	239	Gray 80%
True Color	240	DDOT Logo Red
	241	Blue
	242	Orange
	243	Yellow
	244	Blue
	246	Green shading
	247	Green Lines
	252	Red shading
	253	Red Lines
	254	White to block items out



Refer to the chapter on [Plotting](#) for more details.

DGN Library

One of the major new changes to V8 is the use of **DGN Library** files (DGNLIBS) to maintain and deliver CAD Standards. The DGNLIB provides these standard items to the user but locks them from being edited, thus helping to maintain Standards. The standard items can include the following:

- Levels
- Level Filters
- Text Styles
- Dimension Styles
- Cells

Only [level filters](#) and text styles are maintained in the current DDOT's standard DGNLIB. All other standard elements are delivered through other methods. Please refer to the relevant sections below for more information. Once the CAD Standards mature through testing and use, more of the above items will likely be put into DGNLIBS.

Standard Elements

This section describes MicroStation features and the related CAD Standards that must be followed to maintain consistency across all design files.

Features

A *feature* corresponds in a very specific manner to a single type of design information contained within a file type. A feature defines not only a specific piece of information but also how it is to appear within the design file. A single file type may contain hundreds of features, each with its own unique set of attributes.

A comprehensive survey of all features in use by Maryland SHA has been made available to DDOT in-house personnel and the consulting community without modification for use as needed. It is maintained in the IDSIM database received from SHA, along with all primary attributes (level, color, weight, and style, which are also known as symbology) and secondary attributes (including text size, font, etc).

The most important attributes assigned to a feature are level, color, weight and style. Many other parameters, such as text font, text size and so on may be defined for a particular feature, but these extra parameters are not necessarily used for identification purposes. By definition, two elements belong to the same feature whenever they have the same cell name or level, color, weight and style, even if other parameters may be different.

Barmenus

As a general rule, the barmenus are used to find the standard *symbology* (level, color, style and weight) for any item that is contained in the file. If you need an item and can't find it in the barmenus or [Feature Search tool](#), contact the appropriate individuals listed in the Introduction of this manual. A new feature might need to be incorporated into the next release of the DDOT CAD Standards.

Levels

Levels are named slots for graphical elements in a file whose display can be turned on or off. This allows users to have lots of information saved in one file, even if all material does not need to be used or viewed at the same time. MicroStation V8 allows you to define an unlimited number of named levels.

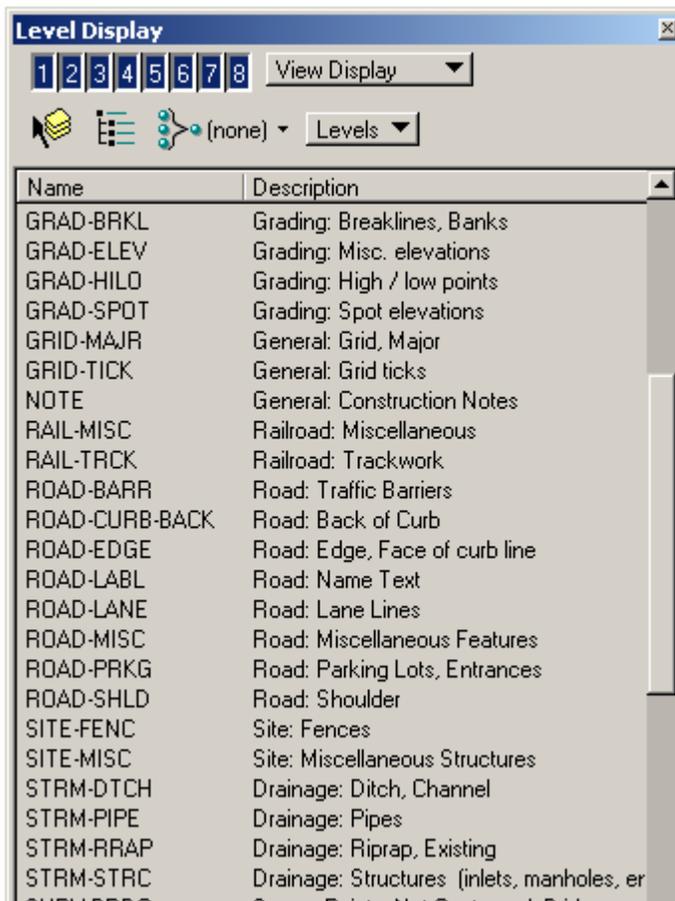
Level Names

The V8 level naming convention developed at MDSHA is based on the guidelines set forth by the National CAD Standards with changes as needed to accommodate a civil transportation workflow. DDOT has adopted the same level naming convention, and this is shown below:

MAJR-MINR-SUBM

Where: **MAJR** = 4-character Major Group
 MINR = 4-character Minor Group
 SUBM = 4-character Sub-Minor Group

As shown in the examples below, most of the levels defined in the seed files have no need to define the sub-minor group. Thus the majority of level names are in the format MAJR-MINR.



Level Library for Topographic File

Level Libraries

Level names are managed by attaching **level libraries**. When a barmenu is selected, the appropriate level library is attached. The library remains attached if you close and reopen the file. Note that when level libraries are detached, or if the file is opened outside of the standard DDOT Workspace, used levels will still appear while unused levels will not.

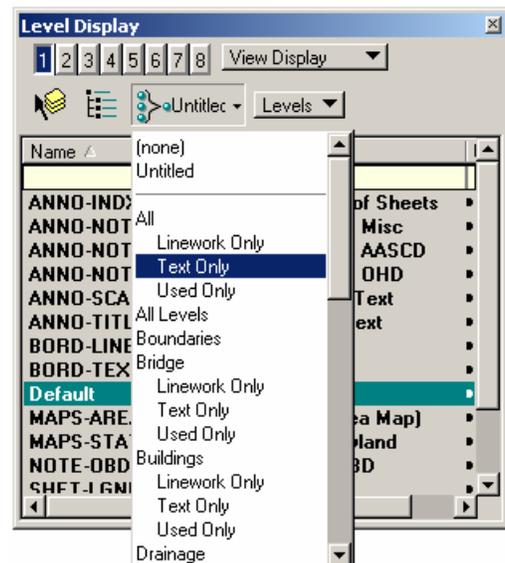
Level libraries have the ability to define level names and descriptions and also by using the *By Level Symbolology* and *Override Symbolology* for each level. (Note that *By Level symbolology* has not been adopted in these Standards). All these attributes are currently maintained for each level library in the IDSIM database. The IDSIM database can then generate the actual level library files in CSV format, which can be opened in excel. Therefore, if a level name needs to be modified, all level libraries using that level can be quickly regenerated. As stated earlier, the MDSHA IDSIM database has been incorporated in the DDOT Workspace

It is important to mention that levels are not enforced via [DGN Libraries](#) for the new DDOT CAD Standards. Individual level libraries have been created for each file and can be attached as needed by selecting the appropriate Barmenu from the DDOT Main Menu. Users also have the option to create new levels as needed and are encouraged to forward needs and suggestions to the contact person provided in the Introduction.

Level Filters

Level filters serve two purposes: (1) to limit the number of levels that appear in a level list and (2) to turn groups of levels on and off when needed. The latter application is especially useful for controlling level display of attached reference files.

Standard level filters based on the level names developed by SHA are delivered as part of the DDOT Workspace. These standard filters are maintained in the *levelfilters.dgnlib* file. Users may also create their own filters that are either temporary or stored in the DGN file (through the level manager). For more information, refer to MDSHA's [V8 CAD Standards Training Guide](#) which is in the *Workspace/Documentation/* directory. (As noted previously, in instances of discrepancy, the **DDOT CAD Standards Manual** and the **DDOT Workspace** shall govern).



Line Weights

If plotted line thicknesses are not formally defined, plots tend to have slightly different appearance depending on the plotter used, the plotting software, driver, pen table, etc. To avoid this, the DDOT V8 CAD Standards has assigned plotted line thicknesses to MicroStation weights 0-15 in accordance with industry standard drafting pens.

MicroStation Weight	Full Size Thickness (mm)	Koh-i-nor Pen Size	Half Size Thickness (mm)
wt = 0	0.18	0000	0.09
wt = 1	0.25	000	0.125
wt = 2	0.30	00	0.15
wt = 3	0.35	0	0.175
wt = 4	0.50	1	0.25
wt = 5	0.60	2	0.30
wt = 6	0.70	2.5	0.35
wt = 7	0.80	3	0.40
wt = 8	1.00	3.5	0.50
wt = 9	1.20	4	0.60
wt = 10	1.40	5	0.70
wt = 11	1.70	6	0.85
wt = 12	2.50	8	1.25
wt = 13	3.80	10	1.90
wt = 14	5.00	12	2.50
wt = 15	6.35	14	3.175

Standard pen tables for Iplot and PLT files for MicroStation plotting with the above line thicknesses defined are delivered in the Workspace. (Refer to the [Plotting](#) chapter for more details). In reality, most standard drafting can and should be accomplished using line weights 0-6, as the weights above 6 are extremely thick.

Thin Lines (wt = 0). Thin lines should be used for existing elements such as baseline/centerline, existing edge of road, existing sidewalks, existing handicap ramps, etc. These lines should also be used for depicting background object lines, hidden lines, and most patterning symbols.

Medium Lines (wt = 1). Medium lines should be used for depicting dimension leaders/witness lines, dimension lines, dimension text, text for notes/callouts, schedule boxes/charts, text inside schedules, minor object lines, line terminators (arrowheads, dots, and slashes) and note leader lines.

Medium Thick Lines (wt = 2, 3). Medium thick lines are the default line weight for drawing most proposed objects including proposed centerline, edge of road, profiles, proposed inlets and pipes, etc. Medium thick lines should also be used for section titles.

Thick Lines (wt = 4). Thick lines should be used for minor title underlining, text for titles and object lines requiring special emphasis.

Extra Thick Lines (wt = 6). Extra thick lines should be used sparingly. Extra thick widths are appropriate for use as elevation grade lines, building footprints or top of grade lines on section/foundation details.

Line Styles

The size of those line styles that should be scale-dependent has been “unitized”. This includes such styles as the Woods Line and any style that contains text. When these styles are used in a drawing, they must be scaled up or down according to the [drawing scale](#) (e.g., times 50 for 50-scale).

This appropriate scale factor is applied automatically when these styles are selected from a barmenu. However, if they are selected through the usual active attribute interface, they may appear incorrect in the drawing because of an improperly set scale or an on/off toggle that was pressed accidentally. When this happens, use the commands under the [Main Menu](#) to apply or remove the scale factor setting. (**DDOT Main Menu**> **Scale** > **Drawing Scale ON**, and so on.)

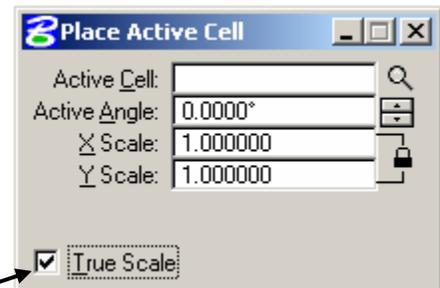
Custom Line Styles

Custom line styles are user created line styles which can be used to draw linear elements such as tree lines and drainage pipes and are truly WYSIWYG (“what-you-see-is-what-you-get”). The custom line styles shown in [Appendix E](#) have been delivered with the DDOT Workspace. These include the symbology for line elements shown in the new DDOT Engineering and Design Manual.

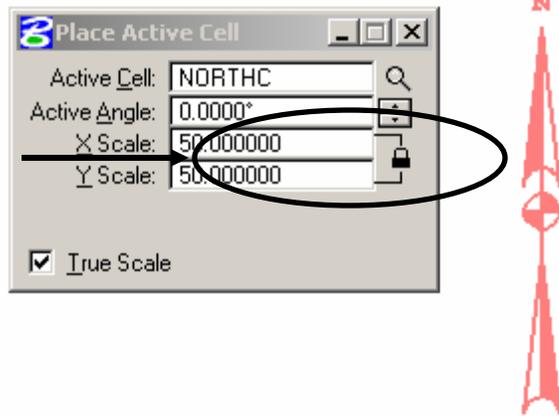
Cells

One of the key changes to the use of cells in MicroStation V8 is the ability to place cells at **True Scale**. E.g., if a cell is drawn 1 foot wide and placed in a metric drawing, it would measure 0.3048 m. Similarly, V8 will rectify the size of cells drawn in files with different [units of resolution](#). This is accomplished through the True Scale setting.

The V8 cells supplied with the DDOT CAD Standards have been created with units of resolution to match the standard seed files (meaning that they will always be true scale). Nevertheless, it is still recommended that users keep the *True Scale* checkbox turned on at all times just in case.



As with the linestyles, most symbol-type cells (i.e. scale-dependent) have been created at a unit size for easy placement. For these cells, the **active scale** should be set to match the [drawing scale](#) (i.e. 1”=50’). When selected from one of the [barmenus](#), the correct active scale will be applied automatically.



The standard cells and symbols to be used for the development of roadway plans for DDOT projects are contained in three cell libraries named DDOT_design.cel, DDOT_survey.cel and DDOT_traffic.cel. The parameters defined by these cells must be followed on all DDOT projects.

Numerous cell libraries are supplied with the MDSHA workspace. These libraries are also included in the DDOT Workspace. [Appendix D](#) lists the MDSHA cell libraries supplied with the Workspace. The cells in these libraries have not been modified in any way. Users should use the MDSHA supplied cell libraries only if a cell for that feature does not exist in the DDOT cell library.

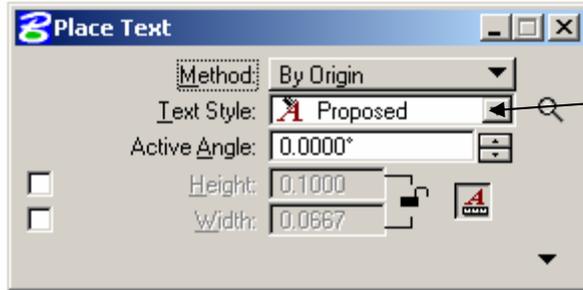
Fonts

The CAD Standards have a single resource file (*DDOTfonts.rsc*) that contains all fonts.

In order to achieve more consistent plan sets, the following standard fonts are recommended for use:

1 – Working:	Proportional font
10/43 – Leroy:	Filled font
3 – Engineering:	Mono-spaced font
42 – font042:	Block font
2 – Fancy:	Serifed font
23 - Slanted	Slanted font for describing all existing features

Use of these fonts is being encouraged through their implementation as Text Styles.



Consultants who require additional fonts for company names or logos may use them as required. However, it should be recognized that in order for electronically submitted plans to display properly, the resource file for any added fonts will need to be submitted as well.

Text Styles

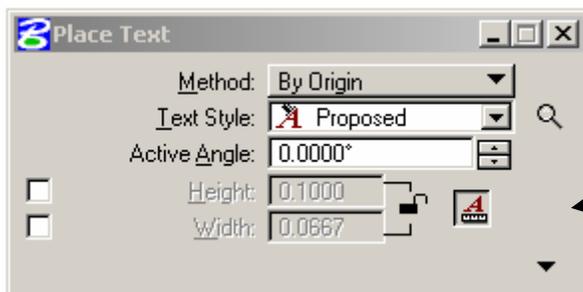
MicroStation V8 has introduced a new feature to facilitate the placement of text – [Text Styles](#). Standard text styles can be created with preset font, text height, text width, etc., for quick and easy placement. The DDOT Workspace takes advantage of Text Styles in the following ways:

One of the primary advantages of Text Styles, aside from maintaining consistent appearance of text, is the ability to propagate the drawing scale to the size of the text. As long as the [Drawing Scale](#) has been properly set from the Main Menu, the size of the text will match. In MicroStation 2004, this is achieved by enabling the *Model Annotation Scale Lock*.

- Sample text styles have been placed in the seed files. Note that these are currently not locked for editing by a DGNLIB file.
- Text Styles are automatically scaled by the active [Drawing Scale](#) as follows:

MS V8.1 – changing the drawing scale via the Main menu triggers a macro that scales the text size of all text styles in the file by an appropriate factor.

MS 2004 – text styles are maintained at unit size (1"=1') but will be scaled at the time of placement if the *Model Annotation Scale Lock* is enabled.



NOTE: In *V8.1*, if a user changes the drawing scale of a file that already contains text, the macro will break the association of the text with the text style used to create it. However, this will not change the appearance of text.

In *2004*, the user will be asked if the drawing scale should be applied to existing text... the recommended response is NO.

Importing Standard Text Styles

If a file was not created based on a standard seed file, it will not contain proper text style definitions. (This is common for files converted to V8 from an earlier version.) Similarly, if a file was created in V8.1 and later worked on in 2004, there will likely be a disconnect with text size (owing to use of the Model Annotation Scale Factor).

To address both of these issues, there is a command on the [Main Menu](#) that will import the standard text styles, scaling them as appropriate. (**Main > DDOT Toolbox > Import DDOT Textstyles**) Be careful, however, because this action will delete any custom text styles you may have created.

Dimension Styles

Dimension Styles are another new MS V8 item. A dimension is a label that shows the linear, radial or angular measurement of an element. A dimension style is a saved set of dimensioning settings. Dimension settings can be stored in either a DGN file or a DGN library. Dimension styles have been created for: *Architectural*, *Structural*, *Civil*, *Detail* and *Survey*. These dimension styles are maintained in the seed files delivered with the CAD standards rather than in the DGNLIB. As with the Text Styles, missing Dimension Styles may be imported to a file from the [Main Menu](#) (**Main > DDOT Toolbox > Import DDOT Dimension Styles**). Once these styles have been refined through use, they may be added to the DGNLIB file.

Notes

Introduction

This chapter provides basic drafting guidelines and procedures when creating contract documents. Some of the information is specific to use of MicroStation V8, while other information is more universal. It is hoped that the information contained in the chapter will prove helpful to drafters both new and experienced.

This chapter's major sections are listed below:

- [DDOT Border File](#) discusses the use of the standard D-size border file developed for creation of contract documents at DDOT.
- [Reference Files](#) contains basic information about attaching reference files in MicroStation V8, and provides recommendations for using the new settings.
- [Text Placement: Model vs. Print Files](#) discusses the proper placement of text in design files.

DDOT Border File

In order to promote a standard title block, a single border file has been developed for all disciplines across DDOT, which should be used for all files except title sheets. This file is located in the *Workspace/Standards/DDOT_V8_01/dgn/* directory and is named **DDOT_Border.dgn**. For title sheets, the file named **DDOT_Titlesheet.dgn** must be used. This file is also located in the same directory.

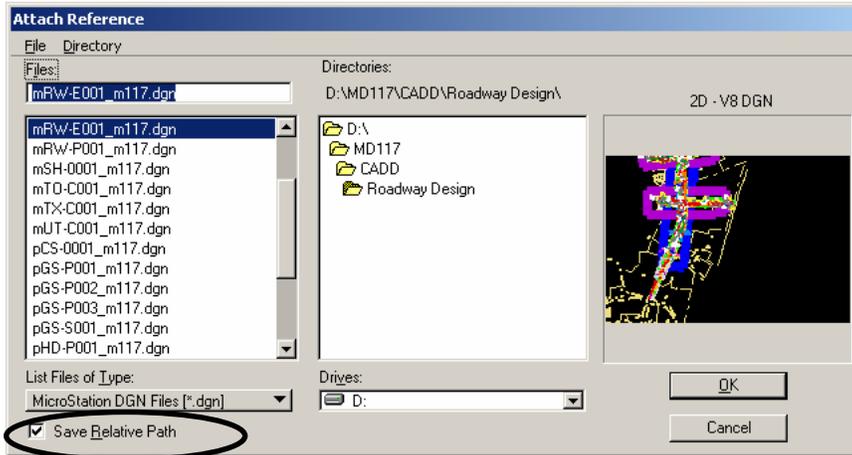
The border file has individual saved views created to deliver discipline-specific settings. When the border file is attached to the plan sheet as a reference file, the appropriate saved view should be selected. The borders and standard sheets provided in the Workspace are drawn to the conventional 1" = 1' scale and should be scaled up or down accordingly when attached. Please refer to MDSHA's [V8 CAD Standards Training Guide](#) for more information. (As noted previously, in instances of discrepancy, the **DDOT CAD Standards Manual** and the **DDOT Workspace** shall govern).

Reference Files

Many interface changes have been made to the way in which reference files are attached. The following recommendations are provided to help you understand the new V8 settings.

Save Relative Path

DDOT recommends all users enable this check box. It remembers the directory location of the reference file relative to the directory of the active file, thereby promoting portability of the project working directory. This setting will not interfere with the MS_RFDIR variable.

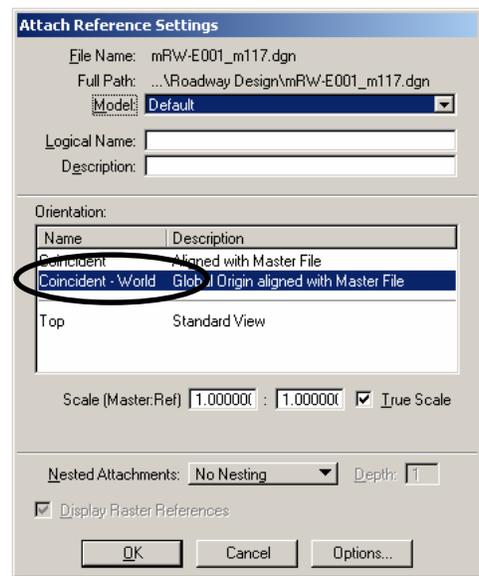


Note that this setting has essentially replaced the *Save Full Path* option of earlier versions, which is no longer an option. Rather, MicroStation V8 searches for reference file attachments in the following manner:

1. active directory
2. relative path directory
3. MS_RFDIR directory
4. full path directory

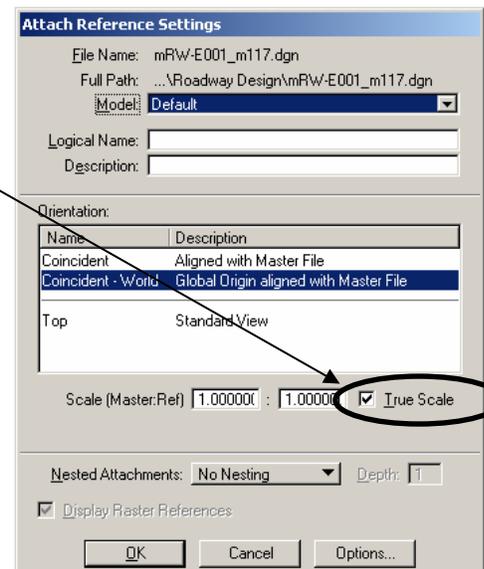
Coincident-World

This setting adjusts reference files with different Global Origins. The Workspace is set up by default to attach coincident-world orientation. *It is recommended that this option always be enabled.*



True Scale

This setting adjusts reference files with different Units of Resolution. As with Coincident-World, *it is recommended that this option always be enabled.*



3D and 2D Design Files

MicroStation V8 now allows 3D files to be referenced into 2D files! This means that under no circumstances should topo files, grading files or other 3D files be “squashed” (exported) to 2D to accommodate referencing into a 2D plan sheet.

Such practice, while common to the V7 workflow, creates the undesirable issue of having multiple versions of the same file in production. If the information in the file needs to change, there is a likelihood that the changes will not be made uniformly to both. Sooner or later, confusion arises as to which copy of the file reflects the most up-to-date information.

Repeat: there is no longer a need to convert 3D files to 2D. Don't do it! If the need arises, set your active depth to zero and activate the Depth Lock.

Text Placement: Model vs. Print Files

Annotation text belongs in the [Print](#) file whenever possible. However there are instances when text must be placed in the [Model](#) file. This usually occurs for items that can be annotated across the entire job, (usually with InRoads or GEOPAK), such as topo text or alignment stationing.

The advantage of placing text items in the Model file is that as the design is refined, the changes can be made globally to the entire project. The disadvantage is that text in a given Model file often overlaps with text in another Model file, both of which are referenced into the same plan sheet. When this occurs, the recommended workflow is to resolve the text conflict in the Print file, **NOT** in the Model file. As follows:

1. Identify the text item that is least likely to change (e.g. topo text labels)
2. Copy all the text from the level on which the conflicting text is located into the Print file (i.e. plan sheet).
3. Turn off the Model file level containing the conflicting text.
4. Resolve the text conflict in the Print file.

Note that all text in a given model file should be at the same scale. 1”=20’ is used for most projects, and topo is generated at that scale unless a specific request is made in advance.

Sometimes, a designer requires the same annotation for different scales (e.g. geometry sheet stationing, wetland plates). Given the ability in MicroStation 2004 to set the Annotation Scale at the model level, designers are encouraged to create a separate model within the same DGN file that is reserved solely for the text at the alternate scale.

Notes

Introduction

This chapter discusses the DDOT Standards for Electronic Submission at the end of design and construction projects.

If the contract for a project requires electronic deliverables in addition to hard-copy deliverables, the guidelines in this chapter shall be followed. It is critical that the hard copy and electronic copy dates match.

MicroStation Files

All drafting for DDOT projects should be done using the version of MicroStation currently in use at DDOT. If directed otherwise by the DDOT project manager, more current versions of the software shall be allowed for use on a project. However, older versions of either MicroStation or Geopak than are in current use at DDOT are not allowed. It is the consultant's responsibility to make sure they are using the proper version.

The file naming convention for the MicroStation files shall be as specified in the [CAD Files Management and File Naming Conventions \(Chapter 3\)](#). All MicroStation files required to recreate the project including plotted sheets and reference files shall be submitted as well as any additional resource files used that are not part of the DDOT Workspace, i.e. fonts used to create a consultant's name or logo.

Roadway Design Files

All roadway design should be done using Geopak. The Geopak files to be submitted include, but are not limited to, the following:

- .gpk file
- .prj files
- cogo input files in ASCII format. These input files could be for creating horizontal alignments, vertical alignments, ROW lines, etc
- COGO output files in ASCII format
- Tin files required to create DTM surface files of existing ground, final design surface, as well as intermediate and as built surfaces if called for by the contract
- criteria files for creating superelevation shapes
- criteria files for generating cross-sections
- criteria files for creating cross-section layout file
- criteria files for cross-section annotation
- criteria files for calculating earthwork
- criteria files for quantity calculations
- Resource files, i.e. .ddb file, used for drawing elements to aid in quantity calculations

Other files should be submitted in ASCII, Microsoft Word or Excel format. These include Spreadsheet Data such as Quantities, Summary Sheets and Index of Files.

Readme.txt

In order to facilitate future data retrieval, all electronic data submittals should be accompanied by an electronic file titled readme.txt. This file will contain a list of all the electronic files that are part of the submittal and will indicate the version of MicroStation and Geopak used for the project.

The DDOT Workspace and accompanying electronic files, such as seed files and cell libraries, will be provided by DDOT on a CD. However, these files are subject to change during a project's life cycle, and consultants may periodically receive new data files. Thus it is important to include a note in the readme.txt file that shows the release date of the DDOT provided data.

For multi-site or multi segment projects, consultants will include in the read me.txt file an explanation of the site number or segment number convention for the project.

A hard copy of the readme.txt file shall be submitted with each CD containing electronic submittals.

Notes

Introduction

One of the primary goals of the CAD Standards effort is to enable the creation of uniform plots sets. Often, plots cannot be reproduced from a set of CAD files because the current owner is unaware of how the original plots were created or does not have access to the pen tables/plot drivers that were used.

This chapter describes the plotting procedures to be used at DDOT. *Plotting* refers to using a printer or large-format plotter to print a hard copy on paper from CAD drawings. Plots can be created with either I-PLOT or Standard MicroStation plotting. Resources provided in the V8 Standards for both methods are described in this chapter. MicroStation plotting is commonly used at DDOT. If DDOT decides to use I-Plot in the future, changing from one method to the other should not result in different outputs. In order to provide a Standard for baseline plotting, plot drivers were created for standard MicroStation plotting, including both mono and full-color plans.

This chapter has five sections:

[Plotting Standards](#) formalizes the plotting weights and line styles that should be used when producing DDOT plans from CAD files.

[Standard MicroStation Plotting](#) covers using pen tables, identifying the plotting area, verifying the plotter, setting the scale and more.

[Generating Images from MicroStation Files](#) describes some methods for generating image files from MicroStation.

Plotting Standards

DDOT is attempting for the first time to standardize plotting characteristics for contract documents. These parameters include the plotted line thickness (in inches) for standard MicroStation weights 0-15 and the stroke lengths (in inches) for standard MicroStation line styles 1-7. The goal is to establish a baseline by which any plots can be duplicated using any plotting method. The standard plot drivers and IPLOT pen tables included in the Workspace should serve as a basis for achieving this result.

Large-format Plotters: A roll-feed machine (typically 36-inch rolls) for the production of larger drawings should be inkjet or thermal. These print a standard-size 34 x 22-inch sheet from MicroStation for all construction documents and plans. Other sizes are used for large wall-display boards.

	I PLOT pen table	MicroStation plot driver
B/W	FullMono.pen	FullMono.plt
Color	FullColor.pen	FullColor.plt

Standard-format LaserJet and Inkjet Printers: Half-size plans are often required (11x 17-inch, tabloid). This is also used in the production of plats, smaller drawings and related documents.

	I PLOT pen table	MicroStation plot driver
B/W	HalfMono.pen	HalfMono.plt
Color	HalfColor.pen	HalfColor.plt

Line Widths

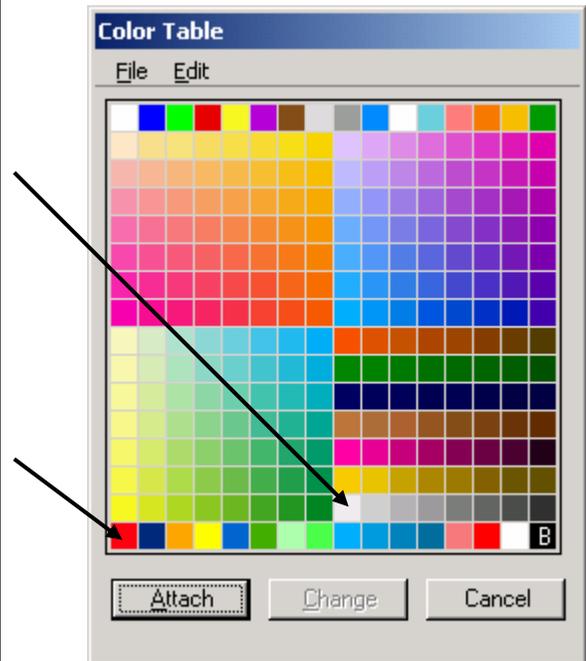
The DDOT V8 CAD Standards establishes plotted line thicknesses. If this is not defined, the line thicknesses that appear on plots will be dictated by the plotter. DDOT has attempted to correct this by hard coding the plotted line thicknesses into the new MicroStation plot drivers. This is also done for I PLOT pen tables for the convenience of consulting firms which use I PLOT. Line weights 0-15 have been re-defined to correspond with the thicknesses of traditional drafting pens, as follows:

MicroStation Weight	Full Size Thickness (mm)	Koh-i-nor Pen Size	Half Size Thickness (mm)
wt = 0	0.18	0000	0.09
wt = 1	0.25	000	0.125
wt = 2	0.30	00	0.15
wt = 3	0.35	0	0.175
wt = 4	0.50	1	0.25
wt = 5	0.60	2	0.30
wt = 6	0.70	2.5	0.35
wt = 7	0.80	3	0.40
wt = 8	1.00	3.5	0.50
wt = 9	1.20	4	0.60
wt = 10	1.40	5	0.70
wt = 11	1.70	6	0.85
wt = 12	2.50	8	1.25
wt = 13	3.80	10	1.90
wt = 14	5.00	12	2.50
wt = 15	6.35	14	3.175

Color Table

The standard color table for all DDOT design projects is **ClorDDOT.tbl**. This color table defines the RGB values for the MicroStation colors 0-255. The monochromatic (black & white) pen tables have been set up for use with this table such that all colors plot as black, with the exception of those color values defined below.

Gray Scale	232	Gray 10%
	233	Gray 20%
	234	Gray 30% - shading
	235	Gray 40%
	236	Gray 50% - Linework
	237	Gray 60%
	238	Gray 70%
	239	Gray 80%
True Color	240	DDOT Logo Red
	241	Blue
	242	Orange
	243	Yellow
	244	Blue
	246	Green Shading
	247	Green Lines
	252	Red Shading
	253	Red Lines
	254	White to block items out



Standard MicroStation Plotting

There are three steps to generating prints or plots of your drawings using MicroStation's standard plotting capabilities:

- Identify the portion of the design file to be plotted.
- Select the appropriate plotting device.
- Transmit the drawing to the plotter.

Identify Plotting Area:

The area you wish to plot can be identified by one of two methods: **Plot by View** or **Plot by Fence**, the most common. Follow these steps to identify your plot area:

1. **Place a fence or arrange within a view**, the portion of the drawing you wish to plot. If you need to plot to a scale, you must place a fence around the sheet border.
2. **Start the plot process** by keying in PLOT or PRINT in the key-in window. Alternatively, you may press the accelerator key CTRL, + the P key. Alternatively, you may select the **Print/Plot** command from the **File** pull-down menu.
3. **Examine the status line on the Plot dialog box** to ensure that "**Fence (View n)**" displays if you intend to plot contents within the fence you have placed. Otherwise, it will display "**View n**".

Plot Drivers:

Plot drivers determine how the MicroStation elements are translated to the printer, including exact colors and the thickness of various line weights. After identifying the plotting area, you need to select a plotter driver. The following drivers are delivered in the V8 Standards for various uses.

FullMono.PLT – For plan sheet production. This will plot all colors, regardless of how they are displayed, as black, except for the following:

Color #	Plotted Color	Color #	Plotted Color
232	LightGray 10%	241	Blue
233	Gray 20%	242	Orange
234	Gray 30% - shading	243	Yellow
235	Gray 40%	244	Blue
236	Medium Gray 50%	246	Light Green
237	Gray 60%	247	Green
238	Gray 70%	252	Light Red
239	Dark Gray 80%	253	Red
240	DDOT Logo Red	254	White

HalfMono.PLT – Identical to FullMono.PLT. However, line weights are scaled for 11 x 17-inch prints.

FullColor.PLT – For full-sized sheets. Colors print as they appear on screen.

HalfColor.PLT – Identical to FullColor.PLT. However, line weights are scaled for 11 x 17-inch prints.

The active driver name displays in the **Plot** dialog box next to the icons. You will normally use “**printer.plt**” for your plots. This driver maps to the Windows system printer driver. If you want to change the plotter driver so that you do not have to use the Windows system printer, follow these steps:

1. Click the **Plotter Driver** button, the icon farthest to the right.
2. From the **Select Plotter Driver File** dialog box, select the appropriate plotter driver. By doing so, you are indirectly selecting the size of the plot you are going to generate.

Specify Plot Size:

With the correct plotter selected, the next step is to verify the size of the plot. This is done via the **Page Setup** icon on the plot dialog box. The Page Size field allows you to select your plot output size.

Set Scale Factor:

You can set the scale factor in two different ways:

1. Key in the master units to plotter units directly.
2. Key in the size as a percentage of normal and let MicroStation calculate the scale.

Keep in mind that **this is the ratio of design file master units to plotting units**. This means that if you are plotting a drawing created using feet, and the scale is 4 feet per inch, the result is a final ratio of 48:1 (48 inches, in the drawing, to 1 inch of paper).

The scale factor and the four fields in the **Margins** section of the **Plot Layout** dialog box are interlinked. When you change one, the other values are automatically updated to reflect the change.

Maximize Plot (Optional):

Sometimes you may want to plot the contents of a fence or a view at the maximum size of the plotter’s chosen paper size. You can achieve this by enabling the **Maximize** check box. This results in the chosen drawing area being plotted to the extents of the plotter’s page size. This is also the default condition when you first enter the Plot dialog box.

Center Plot (Optional):

The **Center to Page** check box shifts the entire plotted area to the center of the chosen page size. In many cases, the plot area you have selected doesn't use the same height-to-width ratio as the page size. Using the **Center to Page** option makes the final plot look more like a finished drawing and may eliminate the need to manually trim the paper plot after printing.

Rotate 90:

The **Rotate 90 Degrees** option on the **Page Setup** dialog box is similar to a portrait/landscape option on printer drivers. Your design may fit more economically on a sheet of paper if you rotate it 90 degrees.

Plot Options:

The **Plot Options** icon brings up a list of additional options for plotting your drawing. Some of the options can be dimmed because they are displayed for information only. If you want to modify any of the plot options, you will need to do so in the **View Attribute** dialog box in the **Settings** menu.

Preview Your Drawing Plot:

Before actually generating your plot, you have the option to preview its appearance right in the Plot window. This is done via the Preview Refresh icon. This is very helpful for seeing the effect of line weight definitions within the plot driver file and other key data.

Transmit Drawing to Plotter:

Follow these two steps to create the plot:

1. Click on the Plot icon, which launches the plot if "printer.plt" is the driver being used.
2. If a driver other than "printer.plt" is selected, you are prompted to give the file name into which the plot data will be placed. The default extension of this file is .000. MicroStation will then create a plot instruction data file for processing by the plotter later.

The most common method for transferring plot data to the plotter is to use MicroStation's PlotFile batch program. From the DOS prompt, key in PLOTFILE *filename* and hit Enter. **While transmitting the plot file to the plotter, the computer will not be available for other work.**

Generating Images from MicroStation Files

Typically, drawings are printed and reviewed. Creating and sending an electronic image of the drawing provides the ability to share the information between users economically by saving money on paper and ink and allows for faster distribution.

Depending on the purpose, you may want to generate the entire project, a drawing sheet or a close-up view to focus on an issue. Some applications include:

- Creating an archive of construction documents that can be printed from any image software
- E-mailing sheets or views for fast review and action
- Inserting pictures of drawings into other documents (Word, PowerPoint, CorelDraw, PhotoShop and so on)
- Renderings/Displays

Three ways to generate images from CAD files will be discussed.

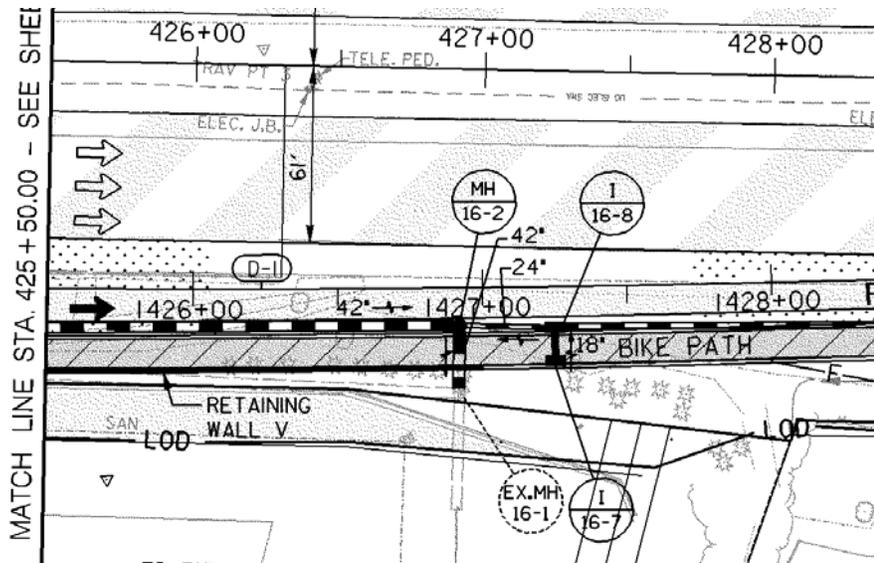
- Using the HD BW Image Printer (I-Plot Monochrome Raster Offline Driver)
- Using a customized Image Plot Driver (PLT)
- Using **Utilities>Image>Save**

Using the HD BW Image Printer (I-Plot Monochrome Raster Offline Driver)

The HD BW Image Printer creates a TIF file and is the preferred solution to generate full-size black-and-white images that look just like plan sheets. The process is identical to plotting, except the printer is selected as the **HD BW IMAGE** on **HDDPLOT**PC. If you were to plot the images that the driver generates by using any standard image editing program on the same size paper, it will closely match the prints that were generated, including pen tables and any effects applied through I-PLOT or a MicroStation .PLT file.

You can actually print from any windows software to **HD BW Image**, such as Excel, Word or PowerPoint.

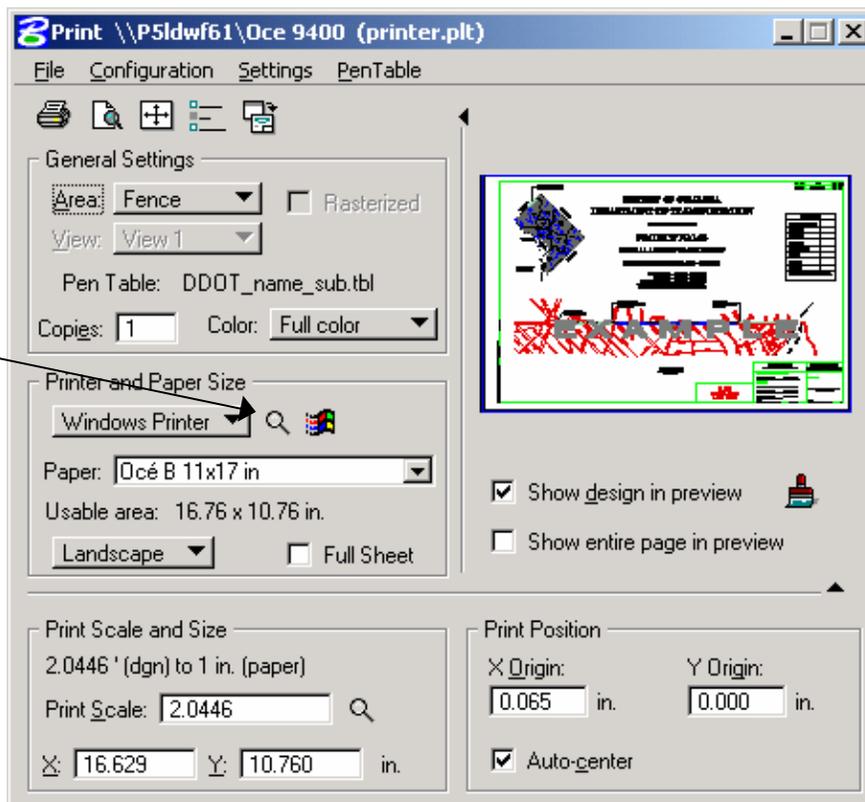
The resolution is high enough for full-size plots with clear text and symbols, and the file size is small enough to run the files through an Internet Web viewer or to put hundreds of plan sheet images on a single compact disc. The small file size for such a high resolution is accomplished because the driver generates a Monochrome (Black and White only) image. However, it goes further than strictly turning all colors into solid black; the driver transforms shades of gray or colors into finely speckled black. From a distance, the speckles appear gray.



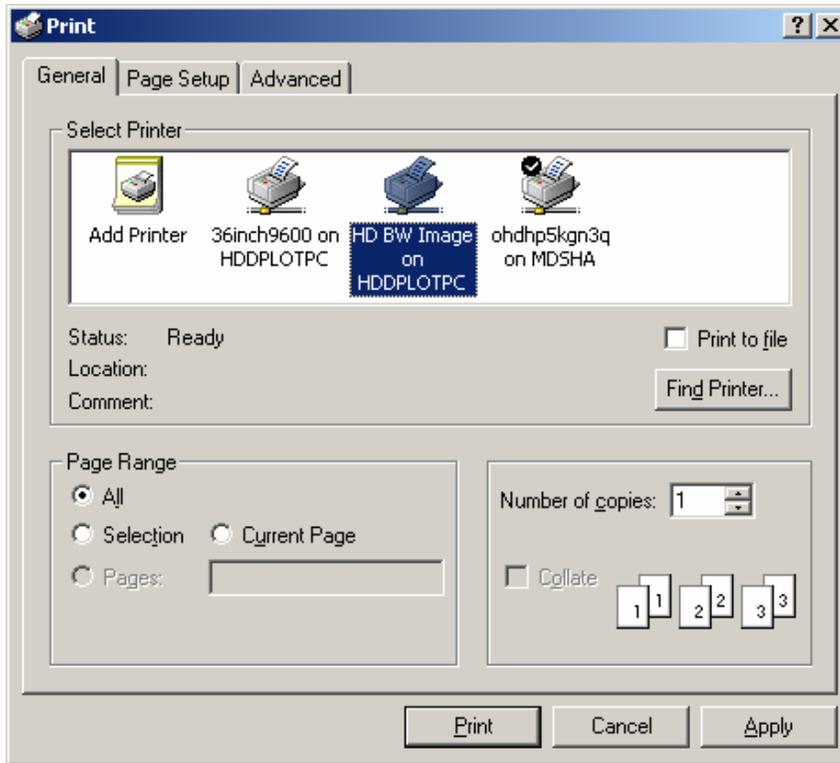
A printed plot document using an HD BW Image Printer

The process is identical to plotting, except the printer is selected as the **HD BW IMAGE on HDDPLOTPC**.

When using MicroStation's standard **File > Print** command, select the following:

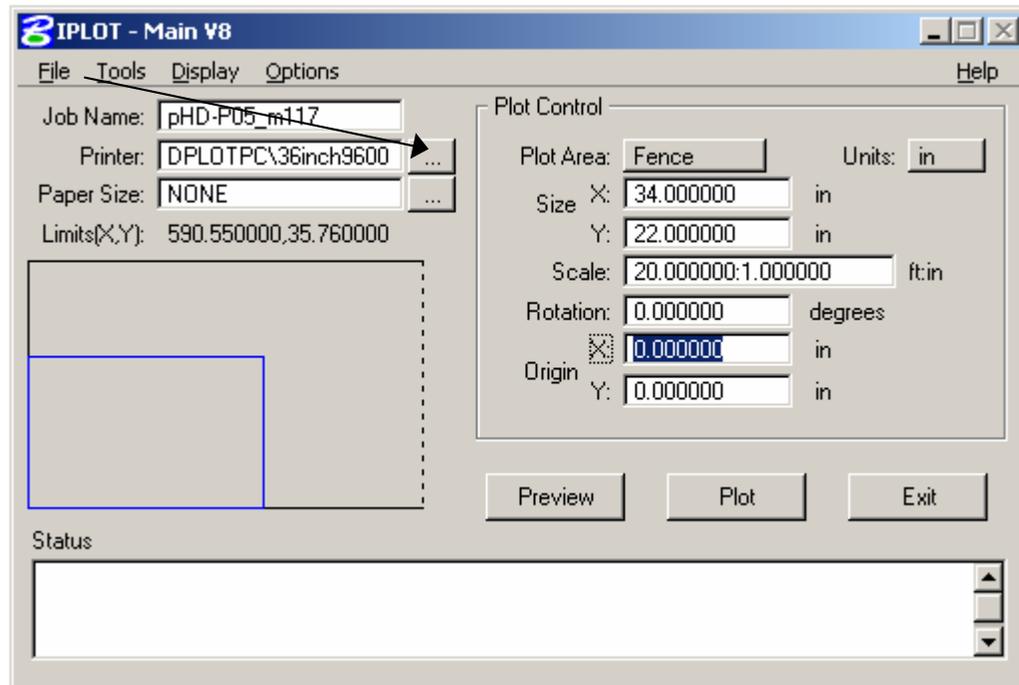


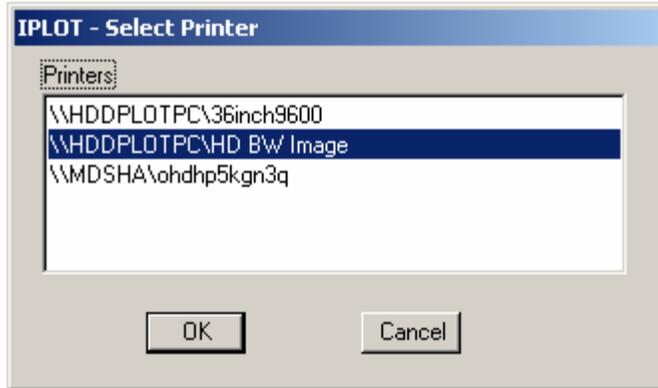
Printing a fence using a Windows printer



Selecting the appropriate printer

When using MicroStation's add-on **I-PLOT** printing software, select the following:





You can also use the **InterPlot Organizer** to print out an entire job. In any case, the images will be created in the folder called **HD BW Image**.

IMPORTANT: Once the files are generated at this location, they should be copied to the appropriate project directory. **ONCE A WEEK, THE FILES IN THIS FOLDER WILL BE AUTOMATICALLY DELETED WITH NO PRIOR NOTICE.**

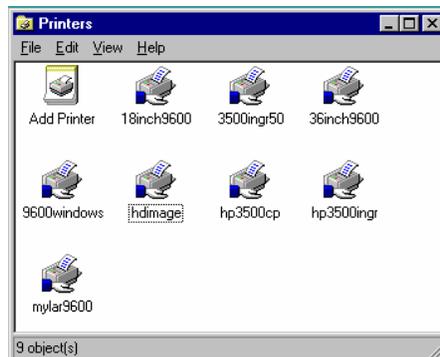
In addition to the folder where images are printed out, the Administrator implements several important settings on the plot server which are outlined on the following pages.

Admin Settings for I-Plot Monochrome Raster Offline Driver

HD BW Image is the I-Plot Monochrome Raster Offline Driver printer. While numerous settings exist, here we explain:

- Setting a File-Naming Pattern
- Creating a custom-size plan sheet

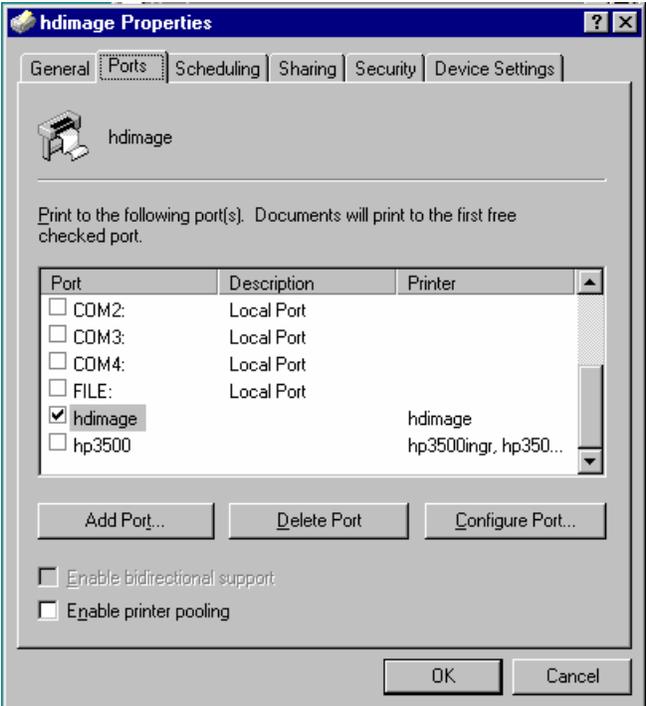
All the settings are accessed through the **Control Panel>Printers**.



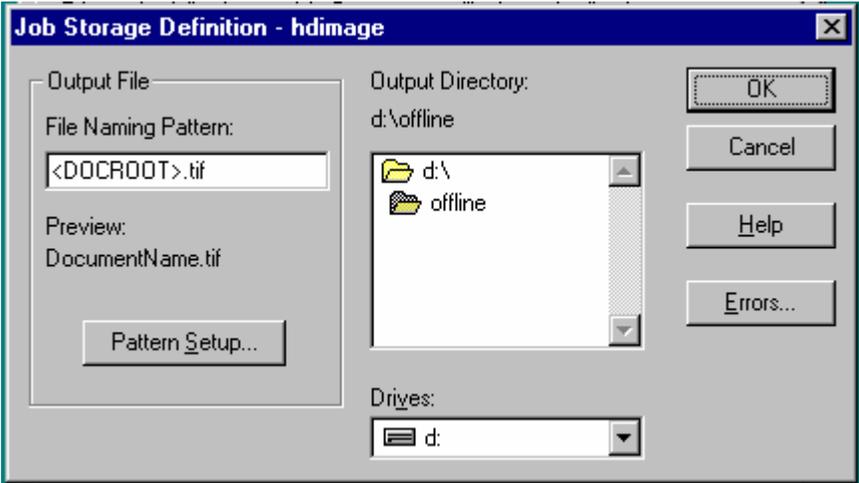
Right-click on the correct Printer, and select **Properties**.

Setting a File-Naming Pattern

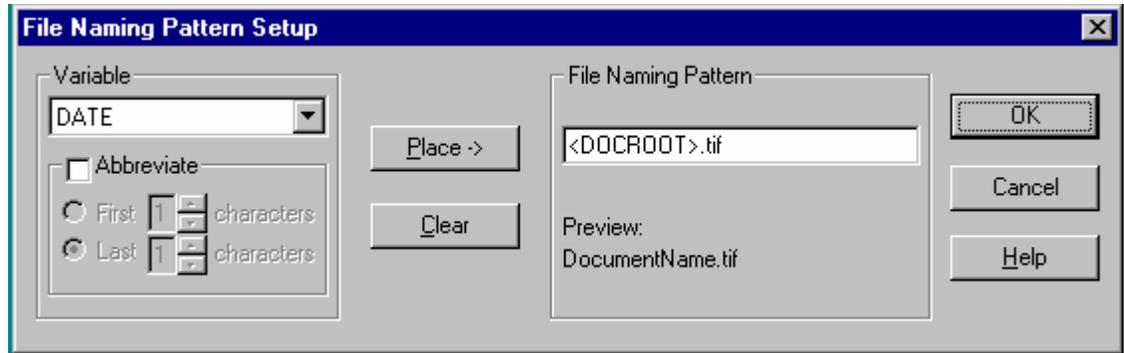
Make sure you are on the **Ports** tab, as shown below.



Highlight **HDImage** and select **Configure Port**.



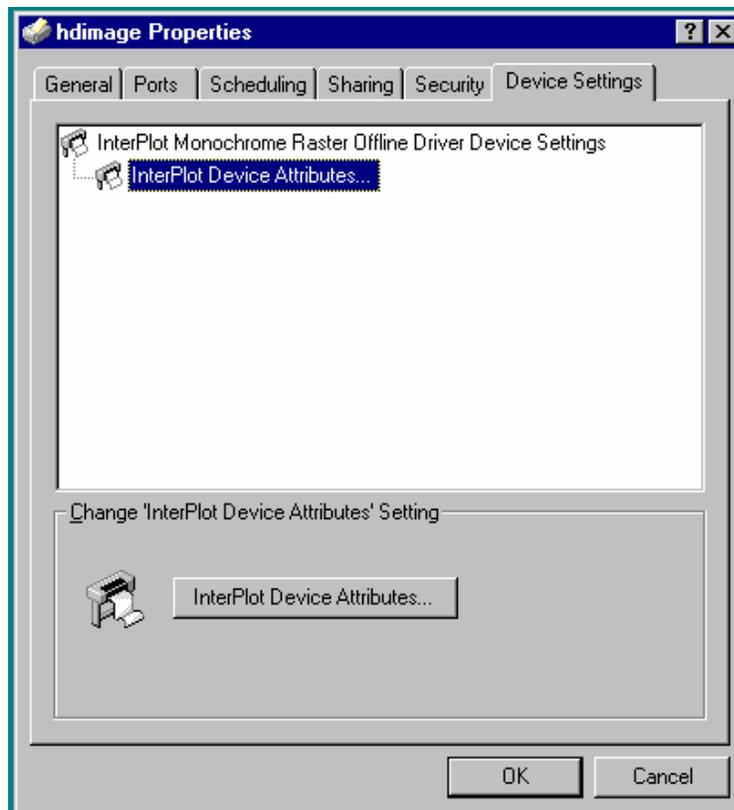
The menu above shows the current directory where TIFs will be stored as well as the Naming Pattern for files that are generated through the printer, which is to use the DOCROOT, or filename without extension and add the .tif extension at the end. Select **Pattern Setup** to change these settings.



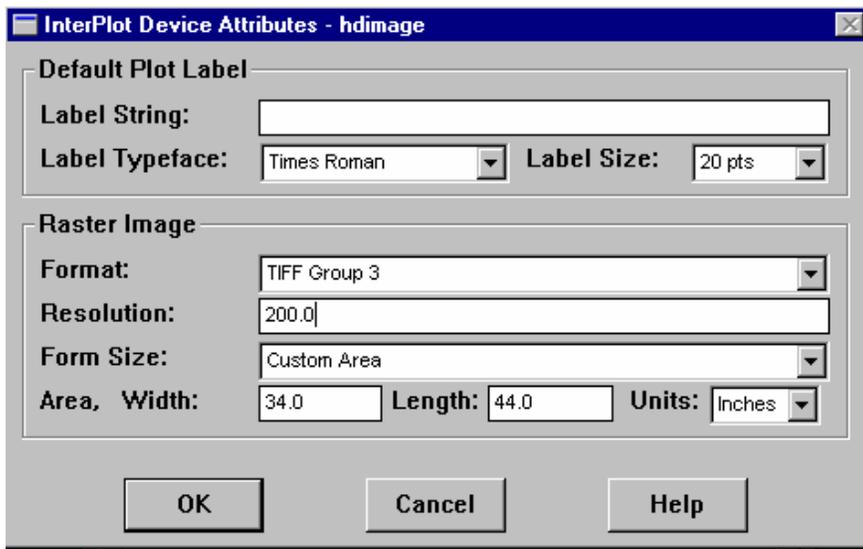
You can use any combination of variable names to create your pattern. Use the **Help** tab for explanations of the variables. You may also type characters; in the case above, the .TIF was added so that the file automatically receives the correct file extension.

Setting a Custom Page Size

Make sure you are on the **Device Settings** tab of the printer **Properties** window as shown below.



Select **InterPlot Device Attributes**, and you can set up a custom size using the menu below.

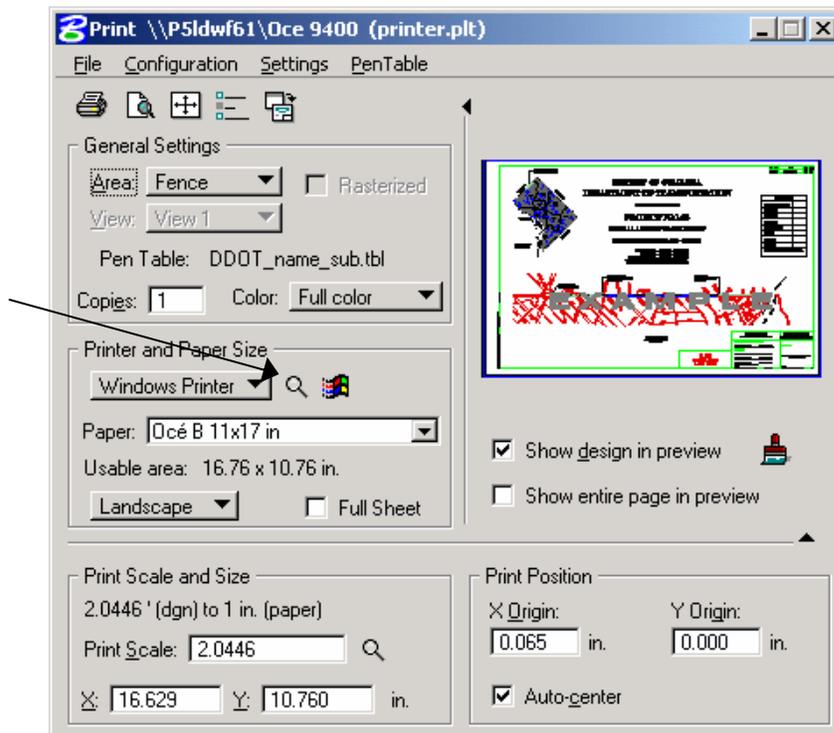


Using a Customized Image Plot Driver (PLT)

Through MicroStation's Standard Print dialog box, the user selects a .PLT file. Most consider .PLT files as a way to select the printer, but you can also select drivers that produce images. The TIFF.PLT that was delivered with MicroStation was customized in three forms, all of which plot in landscape view and in full color.

These generate plots with similar line thickness and appearance as a normal plot, including white background.

When using MicroStation's standard **File>Print**, select the following:



Depending on the application, select one of the following:

TIFF_22by34INCH.PLT – Produces high-resolution images that contain 200 dpi when printed at 22 x 34 inches. File size is **high** – around 2250 KB.

TIFF_11by17INCH.PLT – Produces high-resolution images that contain 200 dpi when printed at 11 x 17 inches. File size is **moderate** – around 800 KB.

TIFF_PPT.PLT – Produces images that are 1024 x 768 pixels in size, which is appropriate for PowerPoint presentations, inserting smaller images in documents or e-mails. File size is **low** – around 140 KB.

Using Utilities>Image>Save

This is useful primarily in 3D renderings as the various rendering shadings (e.g., ray trace) are available. It has been applied to 2D drawings using wireframe shading to generate plotlike images.

The results will be WYSIWYG, except that you can generate an image of as high a resolution as you desire.

Notes 

Appendix A

Glossary

This glossary was developed to ensure that terms were consistent in this manual and with DDOT practices, recognizing that meanings may differ when used outside the context of these Standards.

Term or Abbreviation	Definition
Attribute	Property, such as color or style, of an element or entity.
Addendum	Making a change to a construction project. See Redlining.
AutoCAD	Computer-aided design software that runs on personal computers.
Barmenu	The “Barmenu” is a freely available and customized MicroStation Development Language application. The executable file extension is *.ma. It sets symbology and initiates standard commands for drawing elements, also known as features. The features are arranged in a logical hierarchy on the Barmenu. Different File Disciplines and Purposes will have their own Barmenus, and each Barmenu should contain only those features belonging in a specific file.
Base linens	Borders. This term was used in the hand-drafting days.
CAD	Computer Aided Design and Drafting
CADD	See CAD, the more commonly used abbreviation
Category Code Number	A cell description convention consisting of two numbers enclosed in parentheses which permits programmers to create and write utilities which count cells and tabulate them based on more than one thousand Category Code Numbers.
CEC	Consulting Engineers Council
Cell	A complex element composed of a group of primitive or other complex elements that is stored in a cell library for repeated placement.
Cell Library	A file used to store cells. To access cells in a cell library, the library must be attached to the active DGN file,

Term or Abbreviation	Definition
	except if the Cell Selector dialog box is used.
Check-In	Process of restoring a checked-out file to the server.
Check-Out	Process of copying a file from the server for exclusive editing rights
Clip	To divide an area, elements or portions of elements in a design for manipulation or display.
Clip/Clipping Boundary	A boundary (established with a fence or from a named view) that separates the part of a reference that is displayed from the part that is hidden.
Clip Mask	Used with the Raster Manager or Reference tools, a clip mask allows you to clip out a portion of the image. Masking can be used, for example, to clear an area for text display.
CSV File	Comma-separated values file: The CSV file format is an interchange format for tabular data, such as the contents of a flat file database or a table in a relational database. In this text file format, the first line contains the database field (column) names separated by commas. Each successive line corresponds to a database record (row). On each such line, commas separate the subject record's field values.
Design Rules	Component interactions that provide flags for the designer when a design does not meet DDOT design criteria.
Detail	A file type used to sketch identifying construction or design details.
Dimension Styles (Attributes)	Three new ones have been created: Civil, Structural and COGO, the coordinate geometry programming language. These are the settings for all components of dimension elements, including text (color, weight, font, height and width), lines (color, style, weight and alternates), and level.
Discipline-specific Seed File	A template used to create CAD drawings. It's a blank design file with appropriate DDOT-specific working units and other settings to create custom files for each Division's use.
Display	Final product of CAD files intended for plotting, including any plan, profile and cross section sheets, schedules, wall displays and other files.
Drawing Scale	Drawing scale helps to maintain consistency of scale-dependent drawing features, regardless of the scale used, including text, line styles and cells.
DTM	Digital Terrain Model
DWG	A file extension denoting drawing files.

Term or Abbreviation	Definition
DGN	A design file in MicroStation/J and version 7.
DGNLIB	In MicroStation V8, the Design File Library.
Export	To send data from an application to another source.
Feature	Single type of design information within a file type. Uniquely identifiable by its level, color, weight, and style.
Feature Owner	Office or Division that is designated as an owner of a CAD feature and defines its attributes.
Feature Stakeholder	Office or Division that should be consulted by a Feature Owner when defining its attributes.
Feature User	An engineer or designer who uses a feature when creating a drawing.
File Discipline	Broadly describes the discipline of information appearing within a particular design file in terms of whether it is highway design, survey, drainage design, signage or pavement marking.
File Group	Groups under which file types are categorized
File Group	Describes the general purpose that the individual files serve as part of the larger CAD production workflow: Model, Existing, Proposed, Detail, Print and DGN Support.
File Type	A CAD file containing a specific type of information, namely, Model, Display or Detail.
Fence	A polygonal boundary that designates multiple elements for simultaneous manipulation using fence tools.
HD File	In the V8 Standards, a Horizontal Design file encompassing the horizontal location of the road centerline, edges, sidewalks, cut/fill and other design elements. It replaces an HA file in V7.
IDS	Integrated Design System
IDSIM	Integrated Design System Information Manager. It maintains the list of CAD features with their unique symbology (color, level, weight and so on). IDSIM tracks changes as they are made to the Standards, allowing for version control (version 1.0, version 2.0, etc.). IDSIM facilitates adherence to the standards by allowing CAD Managers to design, modify and generate *.MDF files that drive the Barmenu.
Tool Box	A group of MicroStation add-ons. It is not a single item but a collection of programs.
IGDS	Interactive Graphics Design System: the software that ran on Intergraph VAX-based CAD systems
InRoads and GEOPAK	Civil engineering add-on programs used with MicroStation.

Term or Abbreviation	Definition
I-PLOT	A MicroStation add-on that allows for greater usability in plotting.
InterPlot	Bentley's digital plotting management program.
InterPlot Organizer	MicroStation plot organizer that allows you to print out an entire job.
I-PLOT Plus	An improved version of I-PLOT that automatically calculates the other value to maintain the aspect ratio of the plot.
IPARM	A file containing plot parameters and other data. An IPARM file must be created before executing a plot.
Key-in/key in	An instruction entered into the Key-in window to control MicroStation. Most key-ins have graphical user interface (GUI) control equivalents. To "key in" means to enter this information manually.
Levels	Named slots for information in a file. MicroStation V8 allows the user to create an unlimited number of levels. Their display can toggle on or off, allowing users to have lots of information saved in one file, even if the material does not need to be used or viewed at the same time.
Level Filters	Level filters limit the number of levels that appear in a level list. They also turn groups of levels on and off when needed.
Line Style	A part of the symbology of an element, for example, whether a line is solid, continuous dashes, dots and dashes and so on. Each element can have its own line style or can be defined by separate symbology. You can create custom line styles.
Metafile	A file that creates or defines other files. It's commonly used when creating directories.
MDL	MicroStation Development Language. The extension of the executable file is .MA.
.MDF	File extension for a MicroStation Database File
MDSHA/DDOT	Maryland State Highway Administration/District Department of Transportation
MicroStation V8	Version 8 of the MicroStation CAD software
MicroStation J	Version 7 of the MicroStation CAD software
Model Files	Coordinately accurate drawings, usually in 3D format
Non-DGN Support	Files critical to CAD design but are not themselves CAD files
Plan Sheets	Same as Detail Sheets. They show all the design work for a project.
Plotter	An instrument that graphs the final output of a MicroStation drawing
PLT/.PLT	A customized image plot driver/a plot file extension.

Term or Abbreviation	Definition
Plotting	<i>Plotting</i> refers to using a printer or large-format plotter to print a hard copy on paper from CAD drawings.
PlotFile	A MicroStation batch program that transfers plot data to the plotter.
Print Files	Files where all text, such as tables and construction schedules, should be placed that cannot be directly referenced from a Model file.
ProjectWise	An EIM system that manages file version control and tracking.
Redlining	The process of making changes to a construction site, which involves a great deal of coordination and paperwork.
Reference File	A design file attached to an active design file. Elements in a reference file cannot be manipulated.
Seat	Refers to software license.
Settings Manager	A settings file is an import or export file that stores all settings for a particular conversion as they were when the settings file was created or last saved. Also, a type of module data (".stg" files) that specifies active settings and drawing tool selections; used with the Select Settings window. The Settings Manager oversees all this.
Sheet file	A large design file printed in hard copy, similar to architectural plans.
State	The last known or current status of an application or process.
Storage Area	A designated directory for storing files
Sub-feature	When two different types of design information share the same level, color, weight and style but differ by some other parameters (e.g., text size or cell name).
Symbology	Refers to level, color, style and weight of a drawing object.
Text Styles	New to V8, text styles are used to apply standard text attributes to newly created text. The active Text Style applies to placed text, annotations, tags and other element types that use text.
.TIF or .TIFF	Tagged Image File Format
Tool Frames	A tool box that has smaller tool boxes.
Topo Files	Topography. Files containing maps and surveying information.
Vault	File storage spaces for engineering documents.
Wireframe	A display mode in which surfaces are displayed as their outlines, and elements behind surfaces are displayed as though the surfaces did not exist.
Work Area	Workspace with the same measurements in a file

<i>Term or Abbreviation</i>	<i>Definition</i>
Working files	Nonstandard files used for engineering, calculations and measurements by the designer. They are scrap paper and a backup of the person's work.
Workflow	A defined sequence of procedures.
Workmode	An operating mode of MicroStation, such as DGN, DWG and V7 workmodes.
Workspace	A custom MicroStation environment or configuration
Workspace Preferences Menu	The menu DDOT employees use to set up individual MicroStation workspace.
Working Units	Real-world units to which the design plane is configured to.
Working Unit Settings	The settings that designate the working units and working resolution.

MicroStation & Other Application Software

MicroStation V8

MicroStation V8 is the current version of Bentley's CAD software adopted by DDOT. The upgrade from MicroStation J to MicroStation V8 marks a new milestone in CAD technologies, introducing several new features:

- File format change;
- Changes to clipping plot files for easier manipulation;
- Unlimited levels associated with a file.

DDOT's V8 standards are designed to work with **MicroStation Version 08.01.02.15** or later.

Civil Engineering Applications

DDOT uses a civil design software application called **GEOPAK** on top of its CAD drawings.

GIS Attributes

GIS Attribute flags are necessary to create the needed GIS layers from the CAD File. These features must be accommodated. Such features include traffic signals, storm drains and culverts.

Custom software to support workflows will make it easier to work together. Numerous custom utilities, such as Barmenus, Toolbox and several others are delivered with the Standards. These utilities simplify adherence to Standards while promoting consistency and efficiency.

These tools automate the process of creating and drafting project plans. They ensure that the plotted final result will be consistent and legible. By developing the files consistently, we are imparting "intelligence" into the files. In other words, the various items in the file are coded consistently with a knowledge base that tells us what the items are representing. This intelligence is the foundation for further application development that relies on scanning the file for the features based on the consistent end product. Some examples are below:

- 5) **Estimating:** Adherence to CAD Standards feature tables accommodates developing Engineering Estimates from the files, as each feature can be identified and quantified by its unique symbology.

- 6) **Specifications/IFB Generation:** CAD Standards accommodate developing an Invitation for Bids or Specifications Book from features used in the design files. For example, if CAD features are designed consistently throughout the project plans, each is assigned a number in a central repository, and users select only what they need.
- 7) **Design Rules:** CAD Standards accommodate Design Rules. *Design Rules* are the component interactions that provide flags for the designer when a design does not meet DDOT design criteria. For example, during the placement of a signal pole, a flag appears indicating that it is too close to the curb line and does not meet DDOT criteria. Therefore, it must be placed in a new location.

Notes

File Names as Defined by File Naming Wizard

As discussed in Chapter 3, file names will have the format gDD-TTSS_ProjectID.dgn

Where:

g	=	one-character File Group
DD	=	two-character File Discipline
TT	=	two-character Sheet Type
SS	=	two-character Sequence Number
ProjectID	=	six digit project ID

Shown below are the names that the File Naming Wizard will assign to various file contents. The middle segment of a file name is separated by a “-” (dash) from the first segment and by a “_” (an underscore) from the third segment of a file name. In the tables below, if there are less than four characters in the middle segment of the file name, please note that the name would actually have zeros to bring the total number of characters of the middle segment to four.

Display Files (e.g. Construction Documents, Wall Displays, anything Plotted)

File Name	Abbreviation
Standard Abbreviations/Legend Sheet	pGN-I
Title Sheet File	pGN-T
Drainage Area Map	pDA-P
Drainage Details Sheet	pDD-D
Drainage Schedule Sheet	pDD-S
Erosion & Sediment Control Detail Sheet	pES-D
Erosion & Sediment Control Plan Sheet	pES-P
Grading & Drainage Plan Sheet	pGR-P
Pipe Profiles Sheet	pDP-V
SWM Detail Sheet	pSW-D
SWM Grading Plan Sheet	pSW-P
SWM Pond Landscaping Plan Sheet	pLD-P
Landscaping Plan Sheet	pLD-P
Landscaping Profile Sheet	pLP-X
Reforestation Plans	pRF-P
Brochure Graphics - Alternates Mapping	pBG-AM
Brochure Graphics - Typical Sections	pBG-TS
Environmental Document - Alternate Mapping	pED-AM
Environmental Document - Typical Section	pED-TS
Landscaping Display Sheet	pWD-LD
Landscaping Cross Section Display Sheet	pWD-LP
R/W Cost Estimating Maps	pRW-M
Wall Display - Alternates Mapping	pWD-AM
Wall Display - Study Area	pWD-SA
Wall Display - Typical Section	pWD-TS
Grading Table Earthwork Summary Sheet	pGR-S
Geometry Sheet	pGS-P
Highway Cross Section Plan Sheet	pHC-X
Highway Detail Sheet (i.e. Intersections)	pHD-D
Highway Design Plan Sheet	pHD-P
Highway Profile Sheet Files	pHP-V
Paving Detail Sheet	pHT-D
Typical Section Detail Sheet	pHT-X
Traffic Control Plan Sheet (MOT)	pMT-P
Superelevation Data Sheet	pSE-D
ITS Plan Sheet (Insert)	pIT-P
ITS Plan Sheet (Areawide)	pIT-P
Lighting Details	pLT-D
Lighting Plan Sheet (Insert)	pLT-P

Display Files - Continued

File Name	Abbreviation
Lighting Plan Sheet (Areawide)	pLT-P
Lighting Schedule	pLT-S
General Information Signal Sheet (Insert)	pSG-N
Traffic Signalization Plan Sheet (Insert)	pSG-P
Traffic Signalization Plan Sheet (Areawide)	pSG-P
Signing Detail (Insert)	pSN-D3
Steel Supports (Insert)	pSN-D4
Structures	pSN-DS
Signing Index Sheet (Insert)	pSN-I
Signing & Marking Plans (Insert, SN-2)	pSN-P
Signing Title Sheet (Insert, SN-1)	pSN-T
Abutment Details Sheet	pBP-AD
Pier Details Sheet	pBP-PD
Noise Abatement Displays	pNA-P
ROW Plats	pRW-P
Stream Restoration Plans	pSR-P
Wetlands Impact Plate	pWT-F
Wetlands Mitigation Plans	pWT-P

* use "standard" characters for file type(s) needed

Proposed Design Model Files (e.g. Referenced Design Models)

File Name	Abbreviation
Bridge Model, Plan	mBD
Bridge Model, Profile	mBP
Drainage Area Delineation Model, Proposed	mDA-P
Drainage Design Model	mDD
Erosion & Sediment Control Model	mES
Drainage (Pipe) Profile Model	mDP
Grading (Proposed SWM Contours) Model	mGR-P
Noise Barrier Model	mNB
Landscaping Model, Proposed	mLD
Stream Restoration Model	mSR
Reforestation Model	mRF
Environmental Impacts Model	mEI
Land Use Delineation Model, Proposed	mLU-P
Wetlands Mitigation Model	mWT-A01
Right Of Way Model, Proposed	mRW-PA01
Shading Model	**
Layout Model	mLA
Cross Section Alternates Model	mHC-A01
Future Developments Model	mFD
Highway Horizontal Design Alternate Model	mHD-A01
Highway Vertical Design Alternate Model	mHP-A01
Right Of Way Model, Proposed	mRW-P
Highway Horizontal Design Model	mHD
Contours Model, Proposed	mGR-P
Utilities Model, Proposed	mUT-P
Layout Model	mLA
Rail Relocation Model	mRR
Shading Model	**
Temporary Traffic Phasing Topography Model (Topo to Remain)	mTT
Traffic Control Design Model (MOT)	mMT
Turning Movements	mAT
Highway Vertical Design (Profile) Model	mHP
ITS Model, Proposed	mIT-P
Lighting Model, Proposed	mLT-P
Signalization Model, Proposed	mSG-P
Signing Model, Proposed	mSN-P
Pavement Marking Model, Proposed	mPM-P

** shading may be addressed through alternate workflow, or in separate file named MSH

Existing Design Model Files (e.g. Referenced Models)

File Name	Abbreviation
Base Linen	xBL
Drainage Area Delineation Model, Existing	mDA-E
Environmental Features Model (inc Wetlands)	mEF-E
Land Use Delineation Model, Existing	mLU-E
Soils And Foundation Model	mSO
Soils Map	mSM
Right of Way Model, Existing	mRW-E
Contours Model, Existing	mGR-EA
Topo Model (from Photogrammetry i.e.pln*.3d)	mTO-A
Topo Model, Compiled (from multiple sources)	mTO-C
Topo Model, Updated	mTO-U
Contours Model, Existing	mGR-ES
Surface Triangles Model, Existing	mTR-E
Utilities Model, Existing	mUT-E
Metes & Bounds Model	mMB-E
Mosaic Model	mMO-E
Triangles from Mappers	mTR-E
Topographic Text Labels	mTX-E
Topography File	mTO-S
Work Map Plat Development (Existing R-O-W)	mRW-E
Changeable Message Sign Model	mIT-E
ITS Layout, Existing	mIT-E
Lighting Model, Existing	mLT-E
Pavement Marking Model, Existing	mPM-E
Signalization Model, Existing	mSG-E
Topo to Remain (see Proposed Models)	mTT-E
Signing Model, Existing	mSN-E
Soil Borings (bridge)	mSO

Detail Model Files (e.g. Referenced Detail Models)

File Name	Abbreviation
Drainage Details	dDD
Erosion & Sediment Control Details	dES
Storm Water Mangement Details	dDD-SW
Pavement Details	dHT-D
Typical Section Details	dHT-X

Support Files (e.g. Scratch Files/Specialized Civil Software Files)

File Name	Abbreviation
Geopak Pattern Lines Model	sPT
Geopak Superelevation Shapes Model	sSH
InRoads Working Model	sHD
Roadway Quantity Shapes/Calculations Model	sHD-Q
Air Quality Model	sAQ

Miscellaneous Files

File Name	Abbreviation
Base Linen	xBL
Legend	xLG

MD CAD STD V8 File Naming Convention (Bridge File Types)

File Name	Abbreviation
Electrical Conduit Details	dBD
Detail	dBD
Detail	dBD
Detail	dBD
Bridge Bearing Details	dBD-D
Bridge (Plan) Details - Joint	dBD-DJ
Bridge (Plan) Details - Miscellaneous	dBD-DM
Bridge (Plan) Details - Trough	dBD-DM
Detail	dBD-DM
Bridge (Plan) Details - Wing Walls	dBD-DW
Bridge Dead Load Diagrams	dBD-S
Bridge (Profile) Details - Abutments	dBP-DA
Bridge (Profile) Details - Footers	dBP-DF
Bridge (Profile) Details - Jacking	dBP-DM
Bridge (Profile) Details - Parapet	dBP-DM
Bridge (Profile) Details - Railing	dBP-DM
Bridge (Profile) Details - Pier	dBP-DP
Drainage Details	dDD
Erosion & Sediment Control Details	dES
Pavement Details	dHT-D
Typical Section Details	dHT-X
Bulkhead Elevation Details	dST-DB
Structural Wall Detail - Headwall	dST-DW
Structural Wall Detail - Retaining	dST-DW
Storm Water Mangement Details	dSW-D
Utility Details	dUT-P
Bridge Model, Plan	mBD
Bridge Model, Profile	mBP
Bridge Model, Profile	mBP
Drainage Area Delineation Model, Existing	mDA-E
Drainage Area Delineation Model, Proposed	mDA-P
Drainage Design Model	mDD
Drainage (Pipe) Profile Model	mDP
Enviromental Features Model (inc Wetlands)	mEF-E
Environmental Impacts Model	mEI

File Name	Abbreviation
Erosion & Sediment Control Model	mES
Contours Model, Existing	mGR-EA
Contours Model, Existing	mGR-ES
Contours Model, Proposed	mGR-P
Grading - Proposed	mGR-P
Grading (Proposed SWM Contours) Model	mGR-P
Highway Horizontal Design Model	mHD
Highway Horizontal Design Alternate Model	mHD-A01
Highway Vertical Design (Profile) Model	mHP
Highway Vertical Design Alternate Model	mHP-A01
ITS Model, Existing	mIT-E
ITS Model, Proposed	mIT-P
Lighting Model, Existing	mLT-E
Lighting Model, Proposed	mLT-P
Metes & Bounds Model	mMB-E
Mosaic Model	mMO-E
Traffic Control Design Model (MOT)	mMT
Noise Barrier Model	mNB
Pavement Marking Model, Existing	mPM-E
Pavement Marking Model, Proposed	mPM-P
Pavement Marking Model, Proposed	mPM-P
Rail Relocation Model	mRR
Right of Way Model, Existing	mRW-E
Work Map Plat Development (Existing R-O-W)	mRW-E
Right Of Way Model, Proposed	mRW-P
Right Of Way Model, Proposed	mRW-PA01
Sequence of Construction Model	mSC
Stream Diversion Model	mSD
Signalization Model, Existing	mSG-E
Signalization Model, Proposed	mSG-P
Soils Map	mSM
Signing Model, Existing	mSN-E
Signing Model, Proposed	mSN-P
Soil Borings Model (bridge)	mSO
Soils And Foundation Model	mSO
Stream Restoration Model	mSR
Bulkhead Elevation Model	mST
Structural Wall Model - Headwall	mST
Structural Wall Model - Retaining	mST

File Name	Abbreviation
Topo Model (from Photogrammetry i.e.pln*.3d)	mTO-A
Topo Model, Compiled (from multiple sources)	mTO-C
Topography Model	mTO-S
Topo Model, Updated	mTO-U
Surface Triangles Model, Existing	mTR-E
Triangles from Mappers Model	mTR-E
Temporary Traffic Phasing Topography Model (Topo to Remain)	mTT
Topo to Remain Model (see Proposed Models)	mTT-E
Topographic Text Labels Model	mTX-E
Utilities Model, Existing	mUT-E
Utilities Model, Proposed	mUT-P
Wetlands Mitigation Model	mWT-A01
Red Line Revision Sheet	p**-*R
Bridge (Plan) Detail Sheet - Footings	pBD-DF
Bridge (Plan) Detail Sheet - Girder	pBD-DG
Bridge (Plan) Detail Sheet - Miscellaneous	pBD-DM
Bridge (Plan) Detail Sheet - Reinforcement	pBD-DR
Bridge (Plan) Detail Sheet - Standards	pBD-DS
Bridge (Plan) Detail Sheet - Walls	pBD-DW
Bridge Plan and Elevation Sheet	pBD-P
Electrical Conduit Sheet	pBD-P
Bridge Plan Sheet - Deck	pBD-PD
Bridge Plan Sheet - Girder	pBD-PG
Bridge Plan Sheet - Pier	pBD-PP
Bridge Schedules - Girder	pBD-SG
Bridge Hydraulics Schedules	pBD-SH
Bridge (Abutment) Details Sheet	pBP-DA
Bridge Framing Sheet	pBP-DG
Bridge Profile Sheet - Girder	pBP-PG
Bridge Sections Sheet - Typical	pBP-X
Bridge Sections Sheet - Walls	pBP-XW
Bridge Detail Sheet	pBT-D
Bridge Section Detail Sheet	pBT-X
Bridge Deck Section Detail Sheet	pBT-XD
Drainage Area Map	pDA-P
Drainage Detail Sheet	pDD-D
Drainage Schedule Sheet	pDD-S
Pipe Profiles Sheet	pDP-V
Erosion & Sediment Control Detail Sheet	pES-D
Erosion & Sediment Control Plan Sheet	pES-P

File Name	Abbreviation
Standard Abbreviations/Legend Sheet	pGN-I
Key Map	pGN-K
General Notes Sheet	pGN-N
Title Sheet	pGN-T
Grading & Drainage Plan Sheet	pGR-P
Grading Table Earthwork Summary Sheet	pGR-S
Geometry Sheet	pGS-P
Geometry Sheet	pGS-P
Geometry Stake Out Sheet	pGS-P
Highway Cross Section Plan Sheet	pHC-X
Highway Detail Sheet (i.e. Intersections)	pHD-D
Highway Design Plan Sheet	pHD-P
Highway Profile Sheet	pHP-V
Typical Section Detail Sheet	pHT-X
ITS Plan Sheet (Insert)	pIT-P
SWM Pond Landscaping Plan Sheet	pLD-P
Lighting Detail Sheet	pLT-D
Lighting Plan Sheet (Areawide)	pLT-P
Lighting Plan Sheet (Insert)	pLT-P
Lighting Schedule Sheet	pLT-S
Traffic Control Plan Sheet (MOT)	pMT-P
R/W Cost Estimating Maps	pRW-M
Stream Diversion Plan Sheet	pSD-P
Superelevation Data Sheet	pSE-D
General Information Signal Sheet (Insert)	pSG-N
Traffic Signalization Plan Sheet (Areawide)	pSG-P
Traffic Signalization Plan Sheet (Insert)	pSG-P
Signing Detail Sheet (Insert)	pSN-D3
Steel Supports Sheet (Insert)	pSN-D4
Structures Sheet	pSN-DS
Signing Index Sheet (Insert)	pSN-I
Signing & Marking Plan Sheet (Insert, SN-2)	pSN-P
Signing Title Sheet (Insert, SN-1)	pSN-T
Soil Borings Plan Sheet (bridge)	pSO
Stream Restoration Plans	pSR-P
Structural Culvert Detail Sheet	pST-DC
Structural Culvert Detail - Walls	pST-DW
Bulkhead Elevation Sheet	pST-PB
Structural Culvert Plan	pST-PC
Structural Wall Sheet - Headwall	pST-PW
Structural Wall Sheet - Retaining	pST-PW

File Name	Abbreviation
Structural Culvert Typical Section	pST-XC
SWM Detail Sheet	pSW-D
SWM Grading Plan Sheet	pSW-P
Utility Plan Sheet	pUT-P
Wetland Permit	pWT
Wetlands Impact Plate	pWT-F
Wetlands Mitigation Plan Sheet	pWT-P
Base Linen	xBL
Layout Model	xLA
Legend	xLG

Appendix D

MDSHA Cell Libraries

MDSHA has numerous cell libraries contained in multiple directories. These cell libraries have been made available to DDOT personnel as well as to consultants without any modification. The acronyms used in the cell library names or directory names are based on the major divisions of MDSHA. Shown below is an explanation of the divisions and responsibilities of such divisions at MDSHA, provided to make it easier to understand the cell libraries' directory structure. However, as stated earlier, the three cell libraries that contains most, if not all, of the cells required on DDOT projects are named DDOT_design.cel, DDOT_survey.cel and DDOT_traffic.cel.

- **The Office of Planning and Preliminary Engineering (OPPE)** prepares maps. OPPE coordinates statewide transportation planning with federal, state and local agencies, and conducts preliminary engineering and alternate analyses for budget planning purposes.
- **The Office of Highway Development (OHD)** designs highway and support structures like drainage systems along the selected alternative to meet design guidelines. OHD conducts surveys to provide detailed topographic maps for design. With six Divisions—Highway Design, Highway Hydraulics, Design Technical Services, Communication Design, Plats and Surveys and Engineering Access Permits, OHD oversees projects from the program stage until they are advertised for construction.
- **The Office of Bridge Development (OBD)** designs bridges and other structures such as retaining walls and soundwalls, ensuring quality and safety while employing the latest technologies.
- **The Office of Environmental Design (OED)** deals with highway-related environmental concerns, including sound barriers, retaining walls, landscapes, forests, wetland mitigation, byways, rest areas and more.
- **District Offices** perform design, construction, safety and maintenance for highways falling under their jurisdictions.
- **The Office of Maintenance (OOM)** is charged with the upkeep of state streets and highways.
- **The Office of Materials and Technology (OMT)** tests materials for the planning, design, construction and maintenance offices, focusing on safety

and durability. Contractors might use hot-mix asphalt, concrete, metals, structural coatings and the like to build highways and structures.

- **The Office of Traffic and Safety (OOTTS)** designs lights, traffic signals, street signs and traffic control devices and promotes highway safety.
- **The Office of Construction (OOC)** deploys inspectors to investigate and rate contractor effectiveness, ensuring project quality and safety.
- **The Office of Real Estate (ORE)** deals with legal issues related to right-of-way acquisitions and property plats.
- **The Office of CHART and ITS Development** deploys and monitors intelligent transportation systems (ITS), such as cameras and sensors, to promote intelligent traffic adjustments to maximize infrastructure usage.

Appendix E

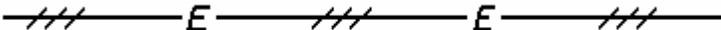
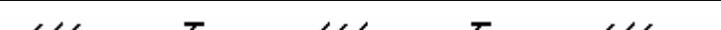
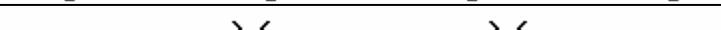
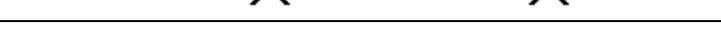
DDOT Custom Line Styles

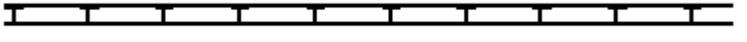
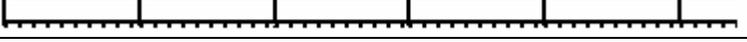
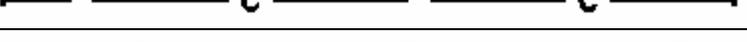
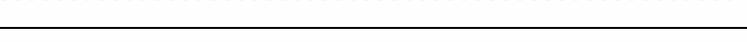
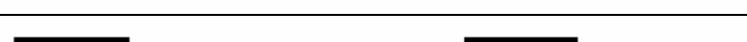
UTILITIES AND PIPES¹²

————— SD ————— SD —————	Exist (UG) Stormdrain Line < 24"
————— SD ————— SD	Exist (UG) Stormdrain Line >= 24"
// ——— SD ——— // ——— SD ——— //	Exist (UG) Stormdrain Line To Be Abandoned
/// ——— SD ——— /// ——— SD ——— ///	Exist (UG) Stormdrain Line To Be Removed
————— SS ————— SS —————	Exist (UG) Sanitary Sewer Line < 24"
————— SS ————— SS	Exist (UG) Sanitary Sewer Line >= 24"
// ——— SS ——— // ——— SS ——— //	Exist (UG) Sanitary Sewer Line To Be Abandoned
/// ——— SS ——— /// ——— SS ——— ///	Exist (UG) Sanitary Sewer Line To Be Removed
————— CS ————— CS —————	Exist (UG) Combined Sewer Line < 24"
————— CS ————— CS	Exist (UG) Combined Sewer Line >=24"
// ——— CS ——— // ——— CS ——— //	Exist (UG) Combined Sewer Line To Be Abandoned
/// ——— CS ——— /// ——— CS ——— ///	Exist (UG) Combined Sewer To Be Removed
————— W ————— W —————	Exist (UG) Water Line < 24"
————— W ————— W	Exist (UG) Water Line >= 24"
// ——— W ——— // ——— W ——— //	Exist (UG) Water Line To Be Abandoned
/// ——— W ——— /// ——— W ——— ///	Exist (UG) Water Line To Be Removed

¹ Note the term UG refers to an underground utility and applies to existing utilities. It is noted as such because that is part of the linestyle name used in the CAD Workspace files.

² Size and Type labels shall be added by the designer to all existing utilities and proposed stormdrain lines.

	Exist (UG) Electric Line
	Exist (UG) Electric Line To Be Abandoned
	Exist (UG) Electric Line To Be Removed
	Exist (UG) Gas Line
	Exist (UG) Gas Line To Be Abandoned
	Exist (UG) Gas Line To Be Removed
	Exist (UG) Telephone Line
	Exist (UG) Telephone Line To Be Abandoned
	Exist (UG) Telephone Line To Be Removed
	Existing Underdrain
	Proposed Underdrain
	Prop Stormdrain Line < 24"
	Prop Stormdrain Line >= 24"
TOPOGRAPHIC AND DESIGN	
	State Line
	ROW
	Building Restriction Line
	Lot Line
	Historic
	Parkland
	PFA
	Bush Line
	Wetland Boundary
	Woods Line
	Floodplain
	Fence Existing, Type
	Fence Proposed, Type

	Fence Gate
	Existing Railroad
	Existing Streetcar
	Existing Guardrail – Double Face
	Proposed Guardrail – Double Face
	Existing Guardrail – Single Face
	Proposed Guardrail – Single Face
	Movable Barrier – 18 in Concrete
	Movable Barrier - 24 in Steel
	Noise Barrier Existing
	Concrete Barrier Double Face
	Concrete Barrier Single Face
	Limit - Cut Line
	Limit - Fill Line
	Limit of Disturbance
TRAFFIC ITEMS	
	Conduit, Existing SL/TS (Streetlight/Traffic Signal)
	Conduit, Proposed PVC 2 - 4 in
	Conduit, Proposed PVC 2 in
	Conduit, Proposed PVC 2&4 in
	Conduit, Proposed PVC 4 - 4 in
	Conduit, Proposed PVC 4 in
	Stripe Double Solid Skip Left
	Stripe Double Solid Skip Right
	Stripe Double Solid
	Stripe Skip 10 30
	Stripe Skip 2 6 (Elephant Track)

	Stripe Skip 3 9 (Puppy Track)
	Stripe Skip HOV (Dinosaur Track)
EROSION AND SEDIMENT CONTROL	
	Ditch Flow
	Flow Path
	Baffle Boards
	Perimeter Dike/Swale-1
	Perimeter Dike/Swale-2
	Temporary Swale B-1
	Temporary Swale B-2
	Temporary Swale B-3
	Temporary Swale A-1
	Temporary Swale A-2
	Temporary Swale A-3
	Straw Bale Dike
	Silt Fence
	Super Silt Fence
	Earthen Dike A-1
	Earthen Dike A-2
	Earthen Dike A-3