



Ohio Department of Transportation

# CADD Engineering Standards Manual (ODOTcadd)

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## Table of Contents

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Table of Contents .....	i
<b>100 GENERAL.....</b>	<b>1</b>
101 Introduction.....	1
101.1 Software .....	1
102 Distribution.....	2
103 Revisions and Updates.....	2
104 Trademarks.....	3
<b>200 CADD STANDARDS.....</b>	<b>4</b>
201 Installation and Configuration.....	4
201.1 General.....	4
201.2 Installation .....	4
201.3 CADD Standards Directory.....	4
201.4 Configuration Variables and Files.....	4
201.5 Desktop Shortcuts .....	6
202 Level Assignments .....	6
202.1 General.....	6
202.2 Level Naming Convention.....	7
202.3 ByLevel Considerations .....	7
202.4 Filters .....	8
202.5 Priority and Transparency.....	11
202.5.1 Priority.....	11
202.5.2 Transparency.....	15
203 Colors.....	17
203.1 General.....	17
204 Line Styles .....	18
204.1 General.....	18
204.2 Types of Line Styles .....	18
204.3 Line Style Scales .....	19
204.3.1 Basemap:.....	20
204.3.2 Survey Processing (Existing Basemap) using the legacy GEOPAK Survey tools.....	23
204.3.3 Survey Processing using OpenRoads Technology .....	24
204.3.4 Sheet Files .....	24
204.4 Plotting.....	27
205 Line Weights .....	27
205.1 General.....	27
205.2 Plotting.....	27
206 Cell Libraries .....	28
206.1 General.....	28
206.2 Cell Types.....	28
206.3 Cell Libraries .....	28
206.4 Cell Placement .....	29

206.4.1 Basemap.....	32
206.4.2 Cell Creation .....	34
206.4.3 Survey Processing using the legacy GEOPAK Survey tools: .....	35
206.4.4 Survey Processing using OpenRoads Technology .....	37
206.4.5 Sheet Files .....	37
<b>207 Fonts.....</b>	<b>39</b>
207.1 General.....	39
207.2 Text Size.....	39
207.3 Text Line Spacing.....	40
207.4 Text Styles.....	40
207.5 Dimension Styles .....	44
<b>208 Seed Files.....</b>	<b>46</b>
208.1 General.....	46
208.2 Models .....	46
<b>209 GEOPAK Design and Computation Manager Database.....</b>	<b>47</b>
209.1 General.....	47
<b>210 GEOPAK Survey Manager Database .....</b>	<b>47</b>
210.1 General.....	47
210.2 Survey Field Codes.....	47
210.3 Survey Manager Database .....	47
<b>211 Working Units .....</b>	<b>48</b>
211.1 General.....	48
<b>212 Global Origin .....</b>	<b>48</b>
212.1 General.....	48
<b>213 Custom Applications .....</b>	<b>49</b>
213.1 General.....	49
<b>214 GEOPAK Criteria Files.....</b>	<b>49</b>
214.1 General.....	49
214.2 Cross Section Criteria Files .....	49
214.3 3 PC Criteria Files.....	50
214.4 Cross Section Input Files .....	50
<b>215 OpenRoads Standards.....</b>	<b>50</b>
215.1 General.....	50
215.2 DGN Libraries.....	50
215.3 Template Libraries.....	51
<b>300 FILE MANAGEMENT.....</b>	<b>52</b>
<b>301 General .....</b>	<b>52</b>
301.1 General.....	52
<b>302 Project Directory Structure and Project Configuration Files.....</b>	<b>52</b>
302.1 Standard Directory Structure .....	52
302.1.1 The Design folder .....	53
302.2 Project Configuration Files .....	57
302.2.1 Project Configuration File Name .....	57
302.2.2 Project Configuration File Content.....	58
302.2.3 Using Project Configuration Files .....	59
302.3 ODOTcadd_CreateNewProject.exe.....	59

<b>303 References</b> .....	<b>60</b>
303.1 General.....	60
303.2 Models.....	60
303.2.1 Types of Models.....	61
303.2.2 Model Names.....	61
303.2.3 Model Properties.....	62
303.2.4 Referencing Models.....	63
303.3 Basemap Design Files.....	63
303.4 Sheet Design Files.....	65
<b>304 File Naming Conventions</b> .....	<b>66</b>
304.1 General.....	66
304.2 File Extensions.....	66
304.3 File Name Format.....	67
304.4 Supplemental Description Guidelines.....	68
304.5 Assigning Supplemental Descriptions.....	69
304.6 Viewing Supplemental Descriptions.....	70
304.7 ODOT_Files.mvba.....	76
<b>305 GEOPAK Digital Terrain Models</b> .....	<b>76</b>
305.1 General.....	76
<b>306 GEOPAK Coordinate Geometry Databases</b> .....	<b>76</b>
306.1 General.....	76
306.1.1 Using OpenRoads Tools.....	77
306.2 GEOPAK COGO Element Names for OpenRoads.....	78
<b>307 GEOPAK Project Manager</b> .....	<b>81</b>
307.1 General.....	81
307.1.1 GEOPAK Road Users.....	81
307.1.2 GEOPAK Survey Users.....	81
307.2 Setting up a Project for GEOPAK Road.....	81
307.3 Setting up a Project for GEOPAK Survey.....	83
<b>400 PLOTTING</b> .....	<b>84</b>
<b>401 General</b> .....	<b>84</b>
401.1 General.....	84
401.2 Plotting.....	85
401.2.1 Line Weights.....	85
401.2.2 Priority and Transparency.....	86
401.2.3 Shading.....	86
401.2.4 Masking.....	86
401.2.5 Text Substitution.....	87
401.2.6 Color Plotting.....	87
<b>APPENDIX A – CADD Information Table</b> .....	<a href="#">Click Here</a>
<b>APPENDIX B – Fonts</b> .....	<a href="#">Click Here</a>
<b>APPENDIX C – Cells and Cell Origins</b> .....	<a href="#">Click Here</a>
<b>APPENDIX D – Custom Line Styles</b> .....	<a href="#">Click Here</a>
<b>APPENDIX F – Level Scale Factors</b> .....	<a href="#">Click Here</a>
<b>Guidelines for Electronic Design Deliverables</b> .....	<a href="#">Click Here</a>

July 20, 2018

## 100 GENERAL

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### 101 Introduction

Computer-Aided Drafting and Design (CADD) is the preferred method of preparing plans for the Ohio Department of Transportation (ODOT). The requirements presented in this manual ensure that CADD files can be used by the entire project team (surveyors, planners, environmentalists, designers, reviewers, contractors, etc.) throughout all phases of project development.

ODOT has adopted MicroStation and GEOPAK as its standard drafting and design software packages, respectively. The standards referenced in this manual have been developed and tested using the MicroStation V8i (SELECTseries 4) and GEOPAK V8i (SELECTseries 4) software versions listed on the following Web page:

[http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD\\_Services/Support/Pages/Software.aspx](http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD_Services/Support/Pages/Software.aspx)

The January 2015 update to ODOT's CADD Standards included new "ODOTcadd" Standards for use with MicroStation and GEOPAK (SELECTseries 4), including support for Bentley's OpenRoads Technology. The OpenRoads Technology tools are included with the installation of GEOPAK (SELECTseries 4).

The new ODOTcadd standards include many of ODOT's previous ODOTstd\V8istd CADD Standards for MicroStation and GEOPAK with additional newly developed standards for Bentley's OpenRoads technology; however, there are some changes that are not backwards compatible with previous releases of ODOT's CADD Standards and existing projects. **ODOT recommends completing existing projects using the previously published ODOTstd CADD Standards.** New projects started after January 2016 with MicroStation and GEOPAK (SELECTseries 4) should be started using the new ODOTcadd Standards.

Existing projects that are to be completed using the legacy ODOTstd CADD Standards can be completed using MicroStation and GEOPAK (SELECTseries 4) software versions. It is not necessary to complete these projects using the MicroStation.GEOPAK (SELECTseries 2) software unless you are specifically using the Roadway Designer or GEOPAK Site tools which have been removed from the GEOPAK (SELECTseries 4) software.

New projects created after January 2016 should be started using the ODOTcadd Standards detailed in this manual. The legacy ODOTstd CADD Standards will no longer be updated.

This manual supersedes all CADD standards previously published in the Bridge Design Manual, the Right-of-Way Manual, and the Location and Design Manual, Volume 3.

This manual is not a textbook and does not exempt the professional from performing responsible engineering and/or surveying. It is intended to provide uniform procedures and standards for organizations that perform CADD related services for ODOT. The professional shall have final responsibility for the accuracy of all input and output of computer-based applications.

#### 101.1 Software

ODOT operates internally using MicroStation and PowerGEOPAK CADD Software only. References made to GEOPAK software throughout this document shall include the GEOPAK Civil Engineering Suite and/or PowerGEOPAK.

ODOT will accept electronic and printed deliverables generated from Autodesk tools.

July 20, 2018

The design software to be used on a project shall be mutually agreed upon by the District and consultant, and shall be explicitly stated in the project's scope. Once the decision has been made to use either MicroStation/GEOPAK or Autodesk, there shall be no deviation from the agreed upon design package, and the same one shall be used until the project's completion.

This document is specific to ODOT's use of MicroStation and GEOPAK software. ODOT will provide no support, standards, documentation, or guidance of any kind with respect to design and delivery using Autodesk tools. All CADD related documentation, training, supporting files, and customization provided by ODOT shall be MicroStation/GEOPAK based only.

Autodesk provides a Civil3D State Kit for use with Autodesk software. A link is provided on the ODOT website to download the State Kit at the following Web page:

[http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD\\_Services/Information/Pages/Autodesk.aspx](http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD_Services/Information/Pages/Autodesk.aspx)

ODOT offers no support for the Autodesk Civil3D State Kit.

The final deliverables of an Autodesk designed project in printed or electronic format shall mimic that of a project designed and delivered using MicroStation/GEOPAK. The electronic deliverables for projects designed using Autodesk tools shall be delivered in the native Autodesk format, and not converted to MicroStation/GEOPAK format.

## **102 Distribution**

This manual, in its entirety, may be freely copied and distributed for the purpose of providing a consistent guide to the CADD requirements of the Ohio Department of Transportation. The manual, Standard CADD files and other support files can be downloaded from the ODOT CADD Standards website at the following address:

[http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD\\_Services/Pages/default.aspx](http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD_Services/Pages/default.aspx)

For ODOT CADD Users, MicroStation and GEOPAK CADD Standards are located on each District and Central Office CADD Server under the ODOTcadd\Standards directory. The legacy ODOTstd CADD Standards are located under the ODOTstd\V8istd folder.

## **103 Revisions and Updates**

The **Office of CADD and Mapping Services**, CADD Section, with input from ODOT's District Offices and the consultant and construction community, will develop, and maintain procedures and standards for the Department's CADD related activities. CADD Manual holders are encouraged to submit comments and suggestions for improvements to the manual or ODOT's CADD Standards. Any errors found should be brought to the attention of the ODOT **Office of CADD and Mapping Services** via the following online support request:

[https://odot.formstack.com/forms/cadd\\_servicerequest](https://odot.formstack.com/forms/cadd_servicerequest)

The Ohio Department of Transportation strives to stay current with state of the art trends in the market. However, impacts on project delivery schedules and the resources necessary to provide future support for new features must be considered prior to any change.

Updating this manual is intended to be a continuous process and revisions will be issued periodically per the release dates stated on the **Design Reference Resource Center (DRRC)** web page at the following address:

<http://www.dot.state.oh.us/drrc/Pages/default.aspx>

The DRRC web page also provides the option to subscribe to an email list for notification of updates to ODOT's Standard CADD Files. Once you have subscribed to the ODOT CADD Standards mailing list, it is your responsibility to notify ODOT of a change of email address by unsubscribing your old email address and re-subscribing using your new email address. See the DRRC web page for instructions on subscribing and unsubscribing.

Revisions to the manual are noted in red text.

## **104 Trademarks**

MicroStation is a registered trademark of Bentley Systems, Incorporated. GEOPAK is a registered trademark of GEOPAK Corporation, now a wholly owned subsidiary of Bentley Systems, Incorporated. © 2015 Bentley Systems, Incorporated.

Autodesk is a registered trademark of Autodesk, Incorporated.

Other trade names, computer protocols, and file formats mentioned in this manual are the trademarks of their respective owners. In no event will the appearance of any graphic, description of any graphic, picture, screen display, or any other method of conveying meaning be considered to impair the rights of the respective owners.

## 200 CADD STANDARDS

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### 201 Installation and Configuration

#### 201.1 General

This section outlines the setup for a typical installation of MicroStation V8i at ODOT. The configuration files discussed in this section are available from the ODOT CADD Standards website.

The ODOTcadd Standards can be downloaded from the ODOT website from the following page:

[http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD\\_Services/Standards/Pages/Files.aspx](http://www.dot.state.oh.us/Divisions/Engineering/CaddMapping/CADD_Services/Standards/Pages/Files.aspx)

#### 201.2 Installation

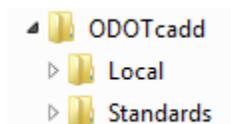
For a typical ODOT installation, Bentley software is installed in the default location.

This manual provides an overview of the configuration files and variables. Detailed configuration information can be found in the document `\ODOTcadd\Standards\ReadMe-ODOTcadd.pdf`.

#### 201.3 CADD Standards Directory

The configuration and associated files for MicroStation and GEOPAK that are used for plan development at ODOT are typically stored in a directory tree with the root of the tree named “`\ODOTcadd`” This directory structure is set to `i:\ODOTcadd` for a typical ODOT installation, where “`i`” is a network drive mapped to the primary CADD file server.

Configuration files and the associated CADD standards are stored in separate folders beneath the ODOTcadd folder as shown below:



- **Local**  
The local directory contains site specific CADD Standards for MicroStation and GEOPAK such as plot configuration files.
- **Standards**  
The Standards directory contains all the CADD Standards for MicroStation (SELECTseries 4) and GEOPAK V8i (SELECTseries 4) and greater.

#### 201.4 Configuration Variables and Files

The ODOTcadd configuration represents a significant change in the way ODOT’s configuration variables are defined.

- ODOT will use a Site Configuration file (`ODOT_Site.cfg`) to define site specific variables that are universally defined for all projects.
- MicroStation Project Configuration Files (`.pcf`) will be used to define project specific variables that are unique to each project.

- ODOT users will access MicroStation or GEOPAK via desktop shortcuts. Separate shortcuts are defined to access MicroStation or GEOPAK using either the new ODOTcadd Standards or the legacy ODOTstd\V8iSTD standards.

The following configuration files are used with the ODOTcadd standards:

- **z\_ODOT\_redirect\_network.cfg** or **z\_ODOT\_redirect\_local.cfg**  
The redirect file is used to set various custom configuration variables to access either the ODOTcadd standards or the legacy ODOTstd\V8iSTD standards. These variables define the paths where ODOT specific data is located.

**z\_ODOT\_Redirect\_local.cfg** is used for installations where the ODOTcadd folder will be housed in the root directory of the local computers C:\ drive.

**z\_ODOT\_Redirect\_network.cfg** is used for installations where the ODOTcadd folder will be housed on a network drive.

The redirect file calls \ODOTcadd\Standards\config\Standards\ODOT\_Site.cfg

The following variables are defined in the redirect file for the ODOTcadd Standards:

**ODOT\_ROOT**

This variable is defined to specify the root folder location for the \ODOTcadd folder.

**ODOT\_STD**

This variable defines the path to the \ODOTcadd\Standards folder

**ODOT\_LOCAL**

This variable can be used to define the location where site specific CADD Standards are located such as plot configuration files.

**ODOT\_USER**

This variable defines the path to the user preference files (.upf)

**ODOT\_PROJECT**

This variable defines the path to the MicroStation project configuration files (.pcf)

**ODOT\_TEMP**

This variable defines the path for temporary resources. The following sub-directories must be created in the location defined by the ODOT\_TEMP variable:

```

\src
\scr
\sketchupimage
\tmp

```

The following variables are defined in the redirect file for the legacy ODOTstd\V8iSTD standards:

**ODOTSTD**

This variable is defined to specify the root folder location for the \ODOTstd folder.

**V8iSTD**

This variable defines the path to the \ODOTstd\V8istd folder.

### **HOMEV8i**

This variable is used to define the location for the MicroStation User Configuration (UCF) and User Preference (UPF) files.

### **V8iSTD\_PROJDIR**

This variable defines the location for MicroStation Project Configuration (PCF) files.

- **ODOT\_Site.cfg**

This site configuration file is used to define the configuration variables for ODOT's MicroStation V8i (SELECTseries 4) CADD standards. This file resides in the following folder:

**\ODOTcadd\Standards\config\Standards**

- **dfltuser.cfg**

This file tells MicroStation what UCF file to use on initial startup. The default is ODOTcadd.ucf.

- **ODOTcadd.ucf**

This UCF file is the default user configuration file for use with ODOTcadd. This file can be used to define any user specific configuration variables for MicroStation or GEOPAK.

## **201.5 Desktop Shortcuts**

ODOT will use separate desktop shortcuts to open MicroStation or GEOPAK with the appropriate ODOT CADD Standards depending on the project being accessed. Each desktop shortcut uses a workspace switch to access either the legacy ODOTstd\V8iSTD CADD Standards (-wsODOTv8istd) or the ODOTcadd Standards (-wsODOTcadd).

See the document \ODOTcadd\Standards\ReadMe-ODOTcadd.pdf for more information.

For additional information on installation and configuration of the ODOTcadd standards, please visit the ODOT CADD Services [YouTube channel](#).

## **202 Level Assignments**

### **202.1 General**

To maintain uniformity among different drawing files, it is essential that an organized leveling system be used. MicroStation permits data to be organized in any fashion on an unlimited number of drawing levels. ODOT has developed a standard set of levels to be used with all design files submitted to or exchanged with the Department.

ODOT's standard levels are defined in a MicroStation DGN Library, **ODOT\_Levels\_General.dgnlib**, which can be obtained from the ODOT CADD Standards website. The DGN library is attached by use of the MicroStation configuration variable *MS\_DGNLIBLIST*.

Users shall not create their own levels for use in any design files submitted or exchanged with ODOT.

See the **CADD Information Table**, [Appendix A](#), for a complete list of the ODOT levels.

## 202.2 Level Naming Convention

ODOT level names use the following naming convention:

### Classification\_Disposition\_Logical Name

The **Classification** consists of two (2) uppercase characters used to group the levels into categories. The Classification names are listed in the table below:

Classification	Description	Classification	Description
AP	Airports	PV	Pavement
BD	Buildings	RC	Recreational
BR	Bridge	RD	Roadway
CM	Corridor Modeler	RS	Raster Files
DR	Drainage	RW	Right-of-Way
DT	Digital Terrain Models	SC	Scratch
DV	Divisions	SG	Signals
EV	Environmental	SH	Sheets
GE	Geometry	SN	Signs
GK	GEOPAK	ST	Standard Construction Drawings & Plan Insert Sheets
GM	Geomedia (County Maps)	SV	Survey
GT	Geotechnical	TR	Truck Turning Paths
HY	Hydraulics	TX	Text
LT	Lighting	UT	Utilities
MD	Modeling	MD	3D Modeling
MT	Maintenance of Traffic	VG	Vegetation
PF	Profiles	XS	Cross Sections
PM	Pavement Marking		

The **Disposition** is used to identify the level for placement of either **X** (existing) or **P** (proposed) information.

The **Logical Name** is used as a description of the element contents. Where appropriate, common industry abbreviations are used.

All ODOT levels names use alphanumeric characters only. No spaces or special characters are used other than the underscore “\_” character.

## 202.3 ByLevel Considerations

In general, to facilitate use of MicroStation’s ByLevel attributes, the ODOT levels have been established such that each curvilinear feature will have its own level. In order to keep the overall number of levels manageable, there are cases where similar features will be placed on the same level making it impossible to use ByLevel attributes for those features. Some exceptions are noted below:

- Standard ODOT cells are placed on the level in which they were created. Each cell is not placed on its own level, rather, like cells are grouped on one level. For example, existing electric utility cells are all placed on the level UT\_X\_Electric\_Cells.
- Storm Sewer Lines - Each proposed storm sewer line 12” and above will be placed using the custom line style stormline, which shall be scaled, based on the pipe size. All proposed storm sewer lines will be placed on the level DR\_P\_Storm\_Sewer.

- Culvert Lines - Each proposed culvert line will be placed using a custom line style based on the culvert size. All proposed culvert lines will be placed on the level DR\_P\_Culvert.
- Maintenance of Traffic Drums - Multiple line styles have been created to represent various typical drum spacing's. These lines are placed on level MT\_P\_Drums.
- Centerline Pavement Marking - Multiple line styles and colors are available representing various centerline pavement markings. These lines are placed on level PM\_P\_CL (proposed) or PM\_X\_CL (existing).

As a general rule, curvilinear design file elements should be placed using ByLevel attributes except in the cases noted in the **CADD Information Table**, [Appendix A](#).

## 202.4 Filters

ODOT's level library, **ODOT\_Levels\_General.dgnlib**, has been configured with a set of default level filters that can be used to control the display of levels based on their attributes. Users may add new filters as deemed necessary to facilitate project development. Users shall not edit or delete the default filters.

The filters included in **ODOT\_Levels\_General.dgnlib** are listed in the table below:

Filter	Value	Result
Aerial Mapping	BD_X_Building "BR_X_SV_Abut" "BR_X_SV_Deck_Top" DR_X_Culvert DR_X_Headwall DT_X_Break_Line DT_X_TIN_Hull DT_X_Void HY_X_Water_Edge HY_X_Wetland_Area PV_X_Bikeway PV_X_Curb PV_X_Driveway PV_X_EOP PV_X_Field_Drive "PV_X_Shoulder" PV_X_Walk RD_X_Concrete_Barrier RD_X_Fence RD_X_Gate RD_X_GR_Lt RD_X_GR_Rt RD_X_Misc_Items RD_X_Noise_Wall RD_X_RR_2 RD_X_Wall VG_X_Tree_line_Lt VG_X_Tree_Line_Rt	Displays all levels that are used by Aerial digital mapping.
Spatial Features	BD_X_Building DT_X_Break_Line DT_X_TIN_Hull DT_X_Void HY_X_Water_Edge PV_X_Curb PV_X_Driveway PV_X_EOP PV_X_Shoulder RD_X_RR_2	Displays levels containing the Spatial features used by Aerial digital mapping.
Topo Features	BR_X_SV_Abut BR_X_SV_Deck_Top DR_X_Culvert DR_X_Headwall HY_X_Wetland_Area PV_X_Bikeway PV_X_Field_Drive PV_X_Walk RD_X_Concrete_Barrier RD_X_Fence RD_X_Gate RD_X_GR_Lt RD_X_GR_Rt RD_X_Misc_Items RD_X_Noise_Wall RD_X_Wall VG_X_Tree_Line_Lt VG_X_Tree_Line_Rt	Displays levels containing the Topo Features used by Aerial digital mapping.
Airport	AP*	Displays levels starting with the characters "AP".
Bridge	BR*	Displays levels starting with the characters "BR".
Bridge Beam	Beam - SV BR*_Gen_Text	Displays bridge levels containing "Beam" except for levels containing "SV" and contains the levels for the Bridge Generic Text.
Bridge Bearing	Brg - SV BR*_Gen_Text	Displays bridge levels containing "Brg" except for levels containing "SV" and

Filter	Value	Result
		contains the levels for the Bridge Generic Text.
Bridge Details	Det - [Beam Brg Dia Rail  Prestress Slab]  BR*_Gen_Text	Displays bridge levels containing “Det” except for levels containing “Beam”, “Brg”, “Dia”, “Rail”, “Prestress” or “Slab” and contains the levels for the Bridge Generic Text.
Bridge Diaphragm	Dia - SV BR*_Gen_Text	Displays bridge levels containing “Dia” except for levels containing “SV” and contains the levels for the Bridge Generic Text.
Bridge Drainage	Drain BR*_Gen_Text	Displays bridge levels containing “Drain” and contains the levels for the Bridge Generic Text.
Bridge General	Gen - SV	Displays bridge levels containing “Gen” except for levels containing “SV”.
Bridge Prestress	Prestress BR*_Gen_Text	Displays bridge levels containing “Prestress” and contains the levels for the Bridge Generic Text.
Bridge Railing	Rail - SV BR*_Gen_Text	Displays bridge levels containing “Rail” except for levels containing “SV” and contains the levels for the Bridge Generic Text.
Bridge Slab	Slab - [Gen SV]  BR*_Gen_Text	Displays bridge levels containing “Slab” except for levels containing “Gen” or “SV” and contains the levels for the Bridge Generic Text.
Bridge Sub_Deep_Foundation	Deep - SV BR*_Gen_Text	Displays bridge levels containing “Deep” except for levels containing “SV”
Bridge Sub_Footing	Foot - SV BR*_Gen_Text	Displays bridge levels containing “Foot” except for levels containing “SV” and contains the levels for the Bridge Generic Text.
Bridge Substructure	Sub - [Foot Deep SV]  BR*_Gen_Text	Displays bridge levels containing “Sub” except for levels containing “Foot” or “Deep” or “SV” and contains the levels for the Bridge Generic Text.
Bridge Survey	_X_SV	Displays bridge levels containing “_X_SV”.
Buildings	BD*	Displays levels starting with the characters “BD”.
Corridor Modeler	CM*	Displays levels starting with the characters “CM”.
Cross Sections	XS*	Displays levels starting with the characters “XS”.
Divisions	DV*	Displays levels starting with the characters “DV”.
Drainage	DR*	Displays levels starting with the characters “DR”.
DTM	DT*	Displays levels starting with the characters “DT”.
Environmental	EV*	Displays levels starting with the characters “EV”.
Existing Levels	_X_ GT_Historic	Displays all existing levels containing “X” and “GT_Historic”.
Geometry	GE*	Displays levels starting with the characters “GE”.
GEOPAK	GK*	Displays levels starting with the characters “GK”.

Filter	Value	Result
Geotechnical	GT*	Displays levels starting with the characters "GT".
Hydraulics	HY*	Displays levels starting with the characters "HY".
Lighting	LT*	Displays levels starting with the characters "LT".
Modeling	MD*	Displays levels starting with the characters "MD".
MOT	MT*	Displays levels starting with the characters "MT".
Pavement	PV*	Displays levels starting with the characters "RV".
Pavement Marking	PM*	Displays levels starting with the characters "PM".
Profile	PF*	Displays levels starting with the characters "PF".
Proposed Levels	_P_ GT_Instrumented GT_Project	Displays all proposed levels containing "P", "GT_Instrumented" and "GT_Project".
Raster	RS*	Displays levels starting with the characters "RS".
Recreational	RC*	Displays levels starting with the characters "RC".
Right-of-Way	RW*	Displays levels starting with the characters "RW".
Roadway	RD*	Displays levels starting with the characters "RD".
Scratch	SC*	Displays levels starting with the characters "SC".
Sheets	SH*	Displays levels starting with the characters "SH".
Signals	SG*	Displays levels starting with the characters "SG".
Signing	SN*	Displays levels starting with the characters "SN".
Std_Constr_Plan_Insert_Shts	ST*	Displays levels starting with the characters "ST".
Survey	SV*	Displays levels starting with the characters "SV".
Text (Generic)	TX* *Text	Displays levels starting with the characters "TX" and the levels containing "Text".
Truck Paths	TR*	Displays levels starting with the characters "TR".
Used	*	Displays levels that are currently in use.
Utilities	UT*	Displays levels starting with the characters "UT".
Vegetation	VG*	Displays levels starting with the characters "VG".

## 202.5 Priority and Transparency

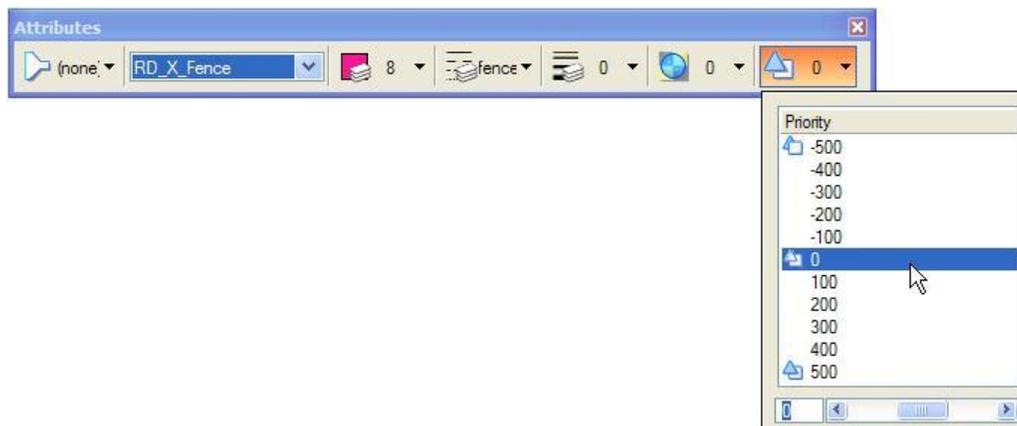
The levels defined in the MicroStation DGN Library, **ODOT\_Levels\_General.dgnlib**, utilize the *Element Priority* and *Transparency* features. The Priority and some Transparency settings have been incorporated in ODOT CADD Standards to facilitate the on-screen viewing of the plan features. See the **CADD Information Table, [Appendix A](#)**, for a complete list of Priority and Transparency values.

- **Priority**  
Elements, levels, and references can be assigned a Priority value. Elements with a higher priority will display on top of elements with a lower value.
- **Transparency**  
Dialog boxes, as well as elements, levels, and references can be set with a transparency value. Transparent elements allow you to see other graphic elements that are “underneath” a transparent element.

### 202.5.1 Priority

Display priority is a technique for specifying the relative front-to-back order in which 2D elements appear in a 2D model (only) when they are displayed in a view. Display priority is only useful or necessary for 2D models, since all elements in 3D models have their own explicit 3D coordinate space. In 3D models, elements closer to the eye are always drawn in front of elements further from the eye so display priority is not necessary.

The elements with the highest priority values are displayed in front, while the elements with the lowest priority values are displayed in the back. Values for Element and Level priority may range from -500 to 500.



By default, MicroStation displays the elements on your screen in the order in which they were drawn. If you're using reference files, the active file will display first followed by the reference files in the order of attachment. And finally, if you're using raster reference files, the order is: the raster images first, then the active file elements, followed by the vector reference files.

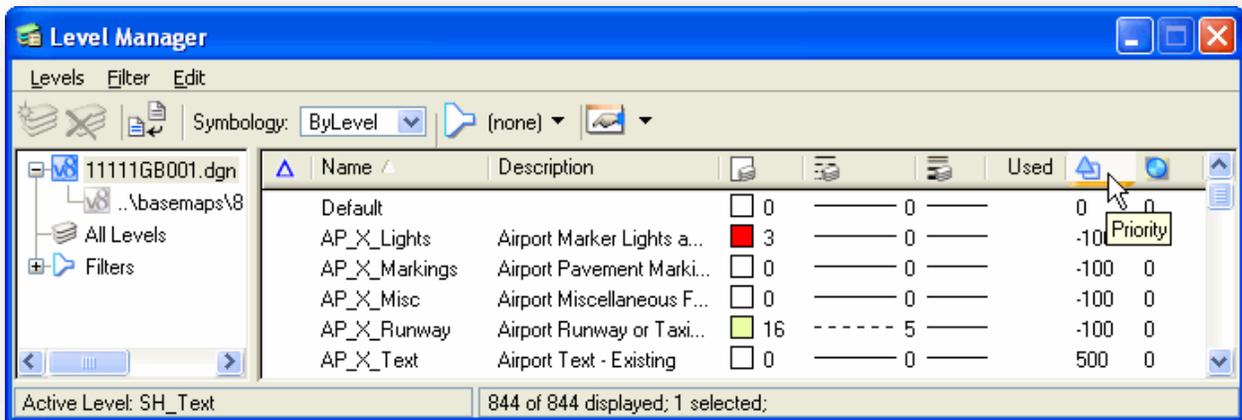
**Note:** Levels for Raster Reference files have been created. The Raster Reference files have been assigned a low priority value so they will always be displayed behind any existing and proposed features and references.

Display priority is not supported in editions prior to MicroStation XM. Files created using display priority will appear “unsorted” when displayed in previous editions of MicroStation V8, or when saved to DGN V7.

In 2D models, you can assign display priority values to references, levels, and to individual elements. The hierarchy for display priority is reference: level: element. That is:

- All elements in a reference with a higher reference display priority will appear in front of all elements from references with a lower value.
- Within a single model, or from references with the same reference display priority, elements on levels with higher level display priority will appear in front of those with a lower value.
- Where elements have the same reference and level display priority, the element display priority determines those that will appear in front of others.
- Where two elements have the same reference, level, and element display priorities, the one that appears later in the display order (that is, file position and update sequence) appears on top.

Levels are the main priority differentiator on top of which the individual elements of a particular level can be tweaked relative to each other. Priority values have been assigned for each level in the ODOT level library as shown below.



- Levels for Existing plan features have been assigned a priority value of -100.
- Levels for Proposed plan features have been assigned a priority value of 100.
- Levels for Existing and Proposed Text have been assigned a priority value of 500.
- The level SH\_Major\_Grid\_Line has been assigned a priority value of -480.
- The level SH\_Minor\_Grid\_Line has been assigned a priority value of -490.
- Levels used for GEOPAK specific features have been assigned various priority values to facilitate better on-screen viewing of the graphics.
- Levels configured for Raster Reference files have been assigned a priority value of -500.

With these priority assignments, proposed plan view features will always display on top of existing plan view features regardless of the order in which the elements are drawn.

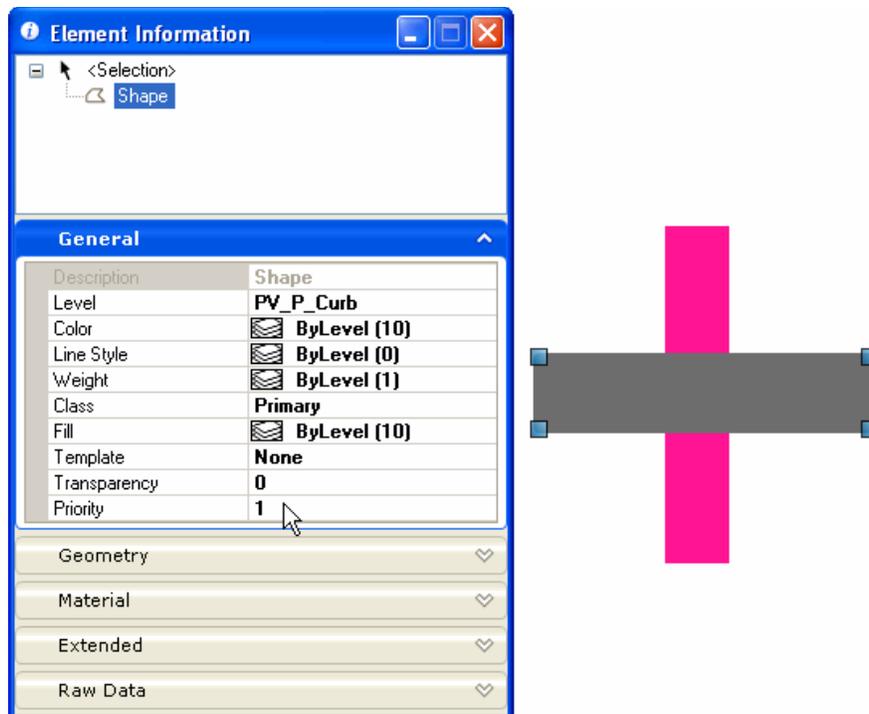
You do not need to assign a priority value to the elements as they are placed in the design file. The elements will be displayed according to the priority value that is assigned to the level.

**Note:** The Active Element Priority value is not a *ByLevel* setting. When the Active Level is changed on the **Attributes** tool bar, the value of the **Active Element Priority** is not set to match the value assigned to the level.

In the case where two elements are placed on different levels that have the same priority setting, the last element drawn is displayed on top. This can be changed by assigning a priority value to the element. Priority values can be assigned when the element is initially placed, or assigned later with the Change Element Attributes tool.

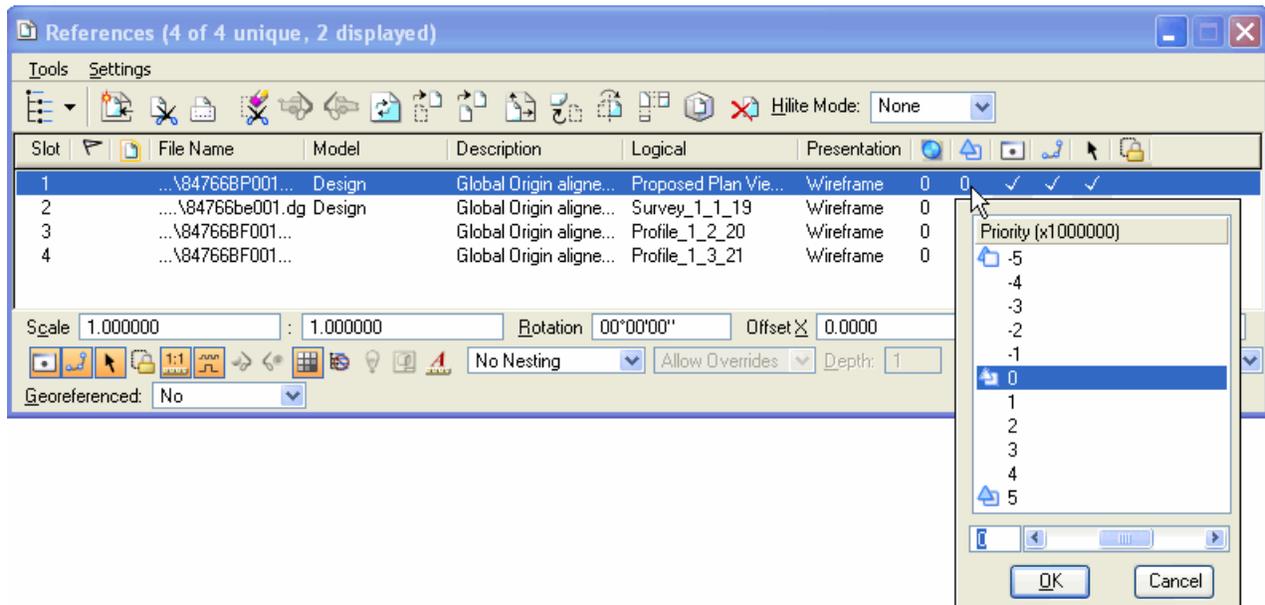
The priority value assigned to an element is not an “override” of the level setting. The priority value assigned to an individual element is “relative” to the level setting. Behind the scenes, MicroStation uses an equation (See *BE Communities for further details*) to determine the “final” priority value of the element. However, most users will be content to know that modifying the priority assigned to an individual element up or down by increments of one (1) will allow them to modify the display priority as needed.

It should be noted that the priority value of an element that is reported in the **Element Info** dialog is the actual value assigned to the element, not the calculated value.



The priority of an element can be modified using the **Change Element Attributes** tool.

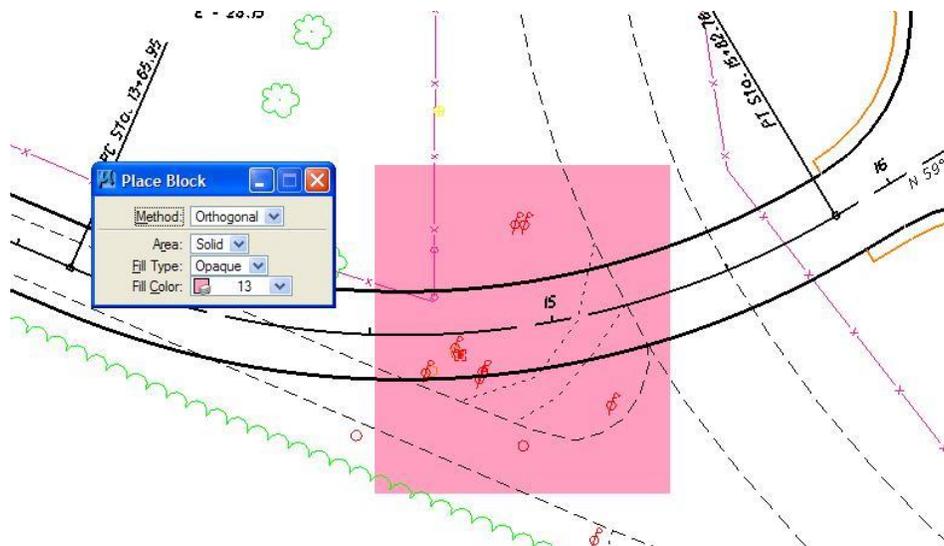
Priority can also be assigned to Reference files. By default, where a reference is attached it is assigned a value of 0 as shown below.



Values for priority assigned to a reference file can range from -5 to 5.

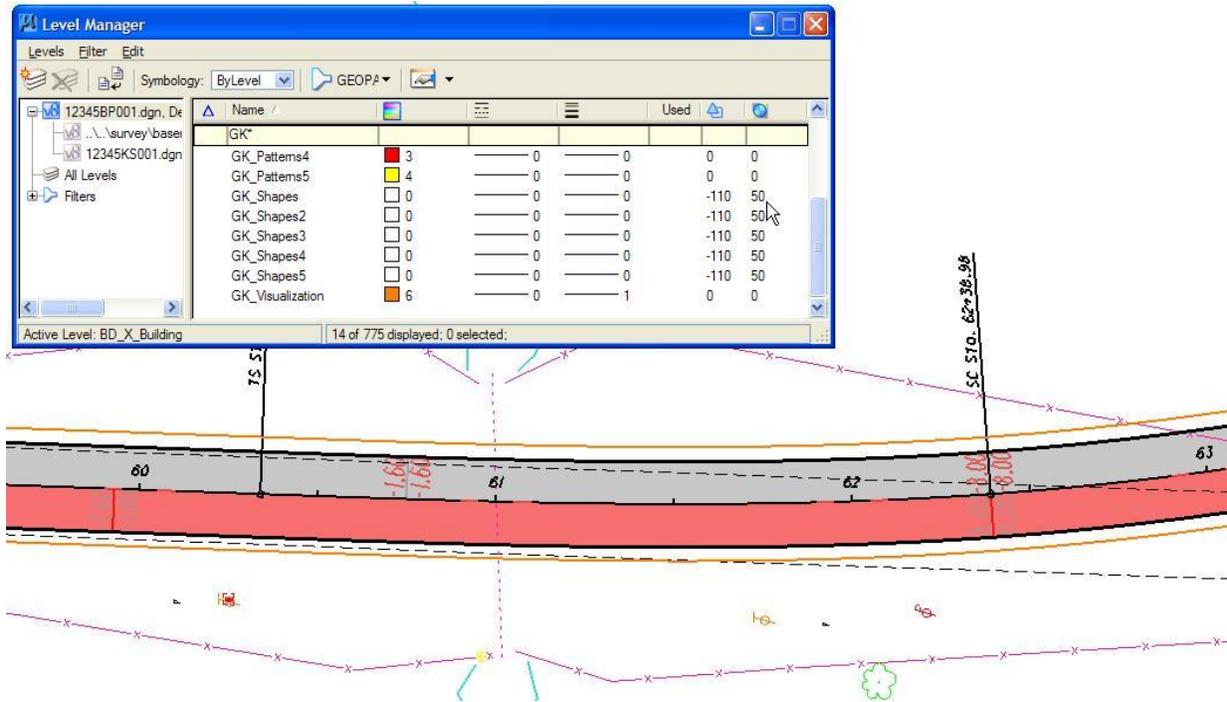
The hierarchy for display priority is reference: level: element. Therefore, when an element is drawn over referenced graphics, the reference file will take priority over elements placed in the master design file on a level that has the same priority value.

All of the graphics representing existing features, which are in a reference file, are displayed on top of the shape drawn on the existing building level, as shown below:

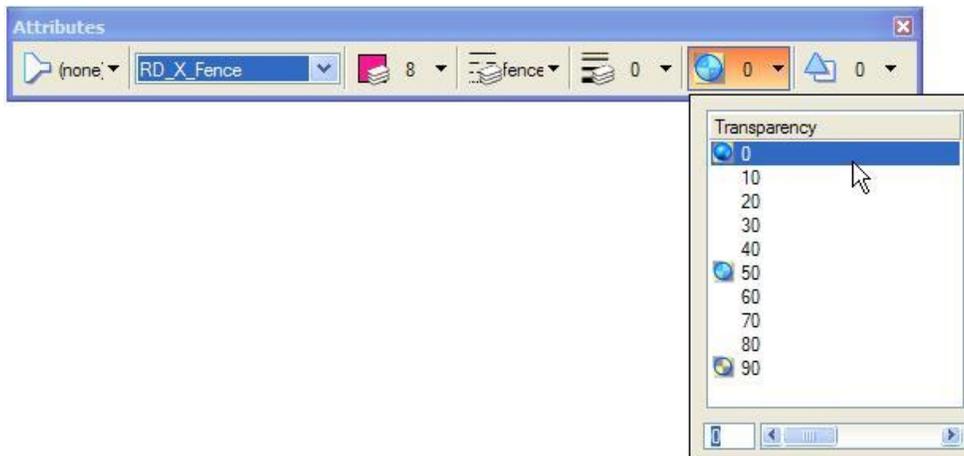


### 202.5.2 Transparency

Transparency can be set for elements, levels, and references. Transparency may vary from 0% to 100%. A value of 0 indicates no transparency at all, while a value of 100% indicates almost complete transparency.

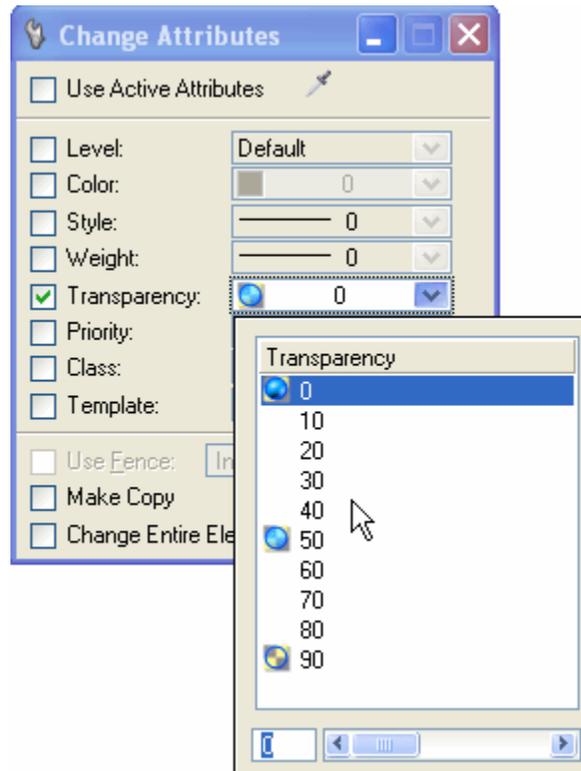


Transparency can be assigned to elements when they are placed by selecting a value from the Attributes tool bar.



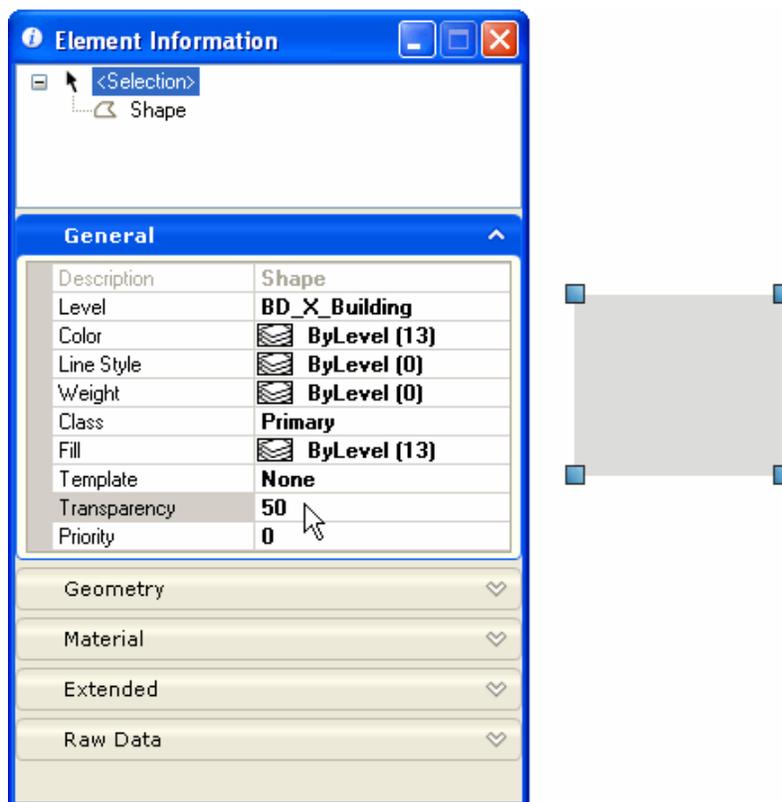
**Note:** The Active Element Transparency value is not a *ByLevel* setting. When the Active Level is changed on the Attributes tool bar, the value of the Active Element Transparency is not set to match the value assigned to the level.

The **Change Element Attributes** dialog can be used to set the Transparency values for previously placed elements.



Just like Priority, when new elements are drawn they take on the Transparency value assigned to the level. Setting the Active Element Transparency in the Attributes tool box is not an “override”. Behind the scenes, MicroStation uses an equation (See *BE Communities for further details*) to determine the “final” transparency value of the element.

The Transparency value reported in the Element Information dialog box represents the value assigned to the element and not the “final” transparency value as calculated by MicroStation.



**Note:** When opening an existing MicroStation V8 design file in XM or V8i, the priority and transparency values will not be in effect unless an “Update Levels from Library” command is issued.

## 203 Colors

### 203.1 General

Standard colors are specified to ensure consistency and to enable users to easily identify plan elements in shared files.

Each element in a MicroStation design file is assigned a color number. MicroStation reads a color table to determine the correct color to display for the specified number. Standard color numbers for plan graphics are specified in the CADD Information Table, [Appendix A](#).

The ODOT standard color table, **ODOT\_color.ctb**, can be obtained from the ODOT CADD Standards website. The MicroStation configuration variable *MS\_DEFCTBL* is used to specify the ODOT color table.

The color values may vary or appear different on screen due to the graphics cards, monitors display capability, etc.

## 204 Line Styles

### 204.1 General

Line styles are used to differentiate curvilinear elements in the design file and on the plotted sheet. There are eight default line styles available in MicroStation using the values zero (0) through seven (7). Additionally, ODOT has developed a set of Custom Line Styles to be used for drawing various plan view graphic items requiring custom symbology. Custom Line Styles are created as Cosmetic or Physical line types. For detailed information see [Section 204.2 - Types of Line Styles](#).

The ODOT standard line-style resource file, [ODOT\\_Linestyles.rsc](#), can be obtained from the [ODOT CADD Standards website](#). The MicroStation configuration variable `MS_SYMBRSRC` is used to specify the custom line style resource file.

Users shall not create their own custom line styles for use on ODOT plan sheets.

Standard line codes and custom line styles for plan graphics are specified in the [CADD Information Table, Appendix A](#) and displayed in [Appendix D](#).

### 204.2 Types of Line Styles

ODOT CADD Standards contain two (2) types of custom line style definitions:

#### 1. “Cosmetic” line styles

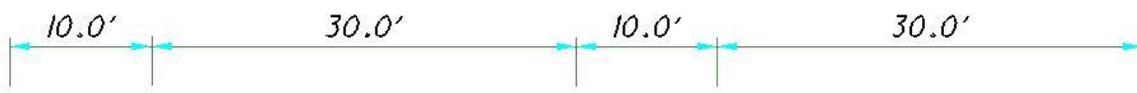
Cosmetic line styles are used to represent the location of an item, but not the actual size or spacing of the item. A fence line, shown below, is an example of a cosmetic custom line style.



- The location of the symbols along the custom line style does not represent the actual location of fence posts, and are intended only to designate the line as a fence line.
- Cosmetic line styles are typically placed in the design file at a scale of one (1) and then displayed using the Global Line Style Scale or Annotation Scale factors in the design file at a scale corresponding to the intended plotting scale of the final plans.

#### 2. “Physical” line styles

Physical line styles are used to represent the location of an item, and the linear spacing of the components of the item. A pavement marking lane line, shown below, which consists of alternating 10' dashes and 30' gaps, is an example of a physical custom line style.



- Physical line styles are always placed in the design file at a scale of 1, regardless of the plotting scale.
- Physical line styles are designated as such that the Global Line Style Scale and Annotation Scale factors when applied are ignored.

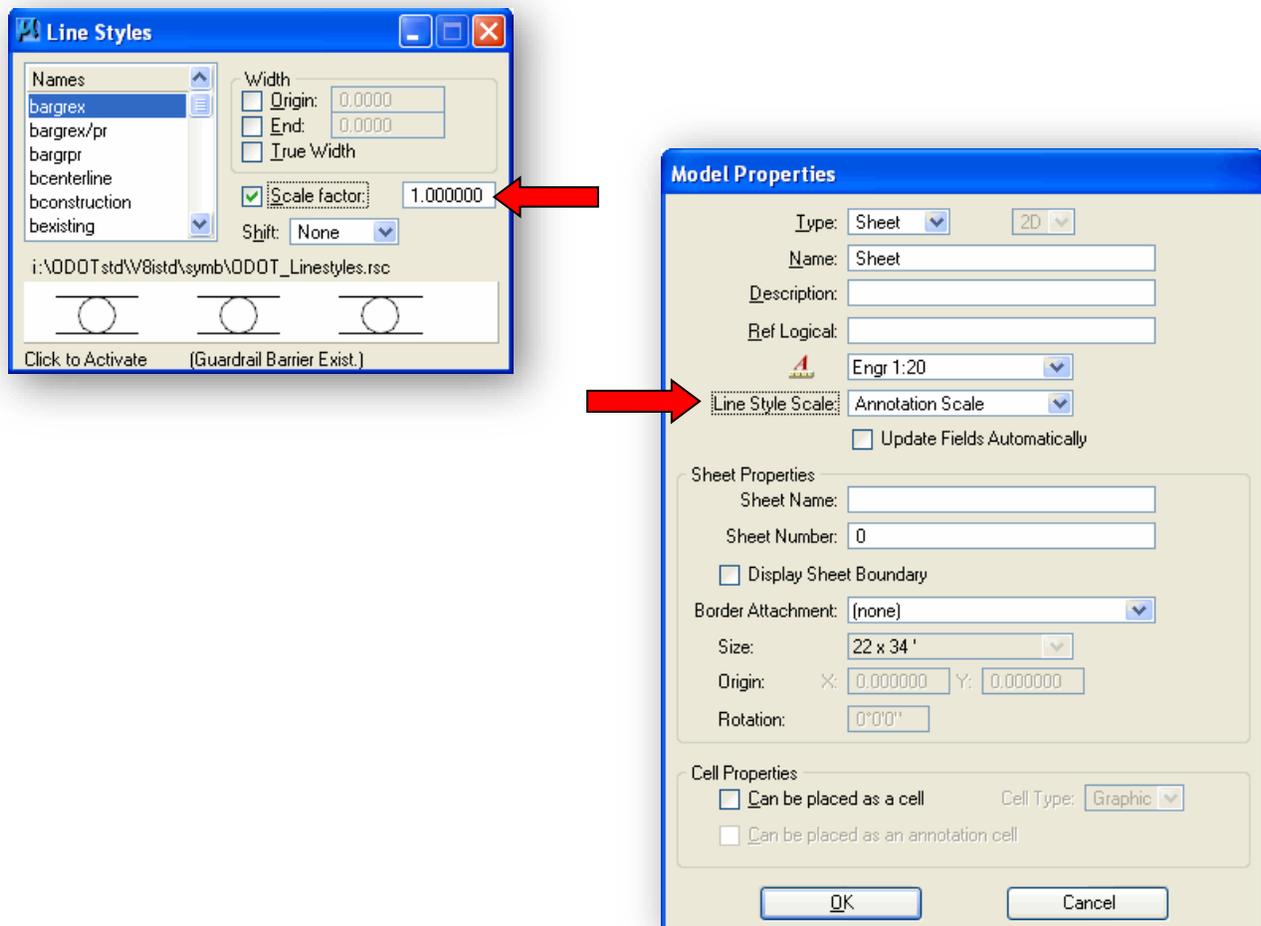
Cosmetic and Physical line styles for plan graphics are specified in the [CADD Information Table, Appendix A](#) and displayed in [Appendix D](#).

## 204.3 Line Style Scales

During the development of a set of plans, it is common to reference the same basemap design file into different detail sheet files that may be plotted at different scales. The location and dimensions of all plan view basemap design file information shall be drawn in the default “Design” model using real world dimensions at a 1:1 scale. Custom Line Styles are to be placed in the basemap at a scale of one (1) so the Model Properties “Line Style Scale” feature can be used.

The **Model Properties Line Style Scale** feature can be used to control the display size of line styles in the active design file, and in any Reference attachments. This will allow the designer to control the display size of the line styles for any intended plotting scale.

All custom **Line Styles** should be placed at a scale of **one (1)** and then scaled using the **Model Properties Line Style Scale** feature.



The following details the recommendations for Scaling Custom Line Styles when drafting and designing ODOT plans using the features available in MicroStation V8i. The final decision regarding plan drafting and design is at the discretion of the designer.

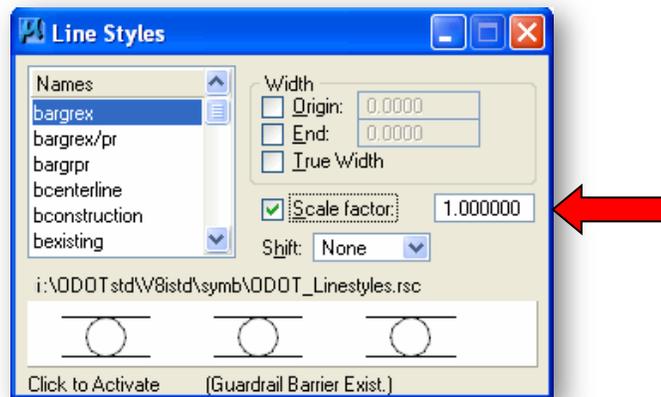
### Recommendations for Scaling Custom Line Styles on ODOT plans:

When attaching the basemaps as References into the “*Sheet*” model, set the **Model Properties Line Style Scale** for the appropriate sheet scale. Changing the **Model Properties Line Style Scale** value will cause the display of the line styles to change according to the value selected. This will affect line styles drawn in the active file, as well as referenced graphics, depending on the settings when the references were attached.

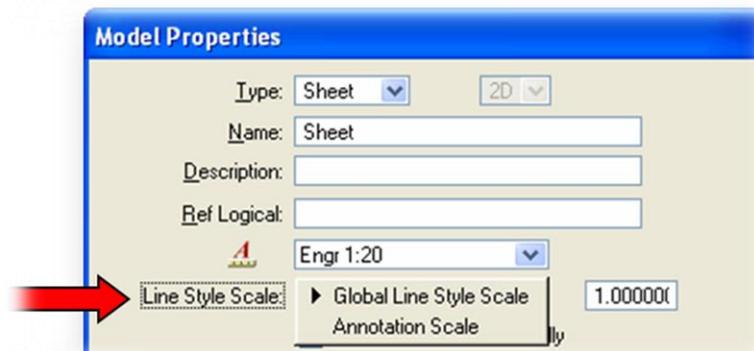
#### 204.3.1 Basemap:

##### Manual Placement (Existing and Proposed):

Place all Line Styles in the basemap design file at a scale of *one (1.0)*.



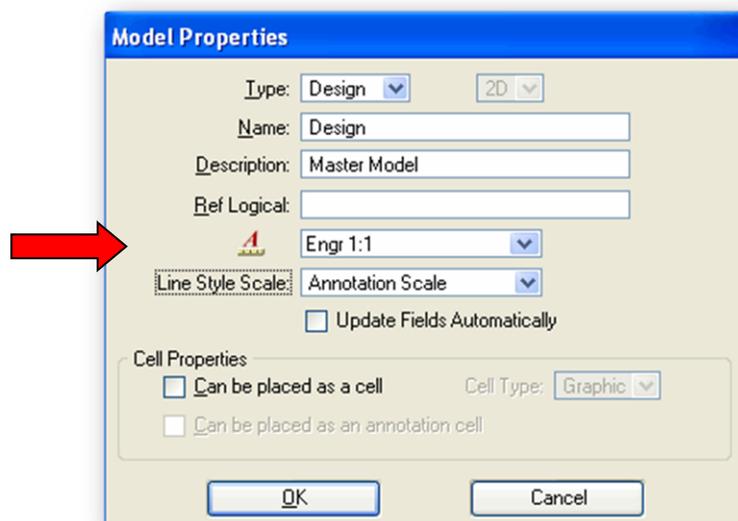
When working in the basemap, use the following steps to set the Line Style Scale:



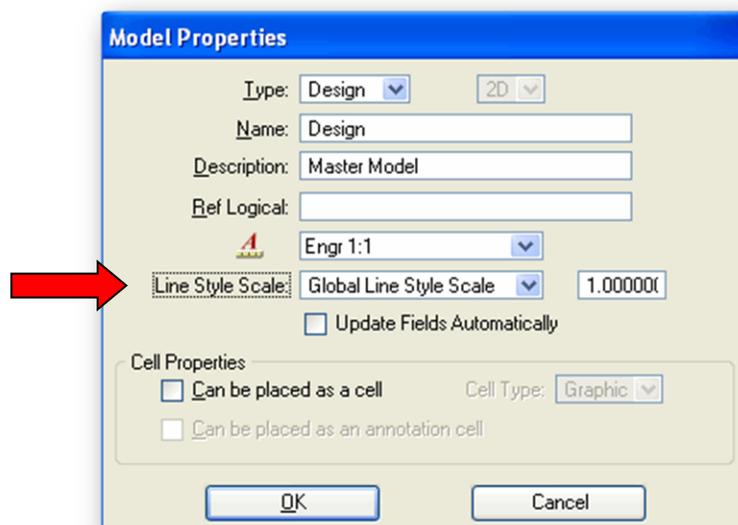
In the **Model Properties** dialog box, set the **Line Style Scale** using one of the following two (2) methods:

1. From the **Line Style Scale** drop-down menu, select **Annotation Scale** to set the line style scale factor to match the **Model Annotation Scale**.

**Note:** This is the recommended procedure for all Roadway Design files.



2. From the **Line Style Scale** drop-down menu, select **Global Line Style Scale** to set the line style scale factor to a value different than the **Model Annotation Scale**.

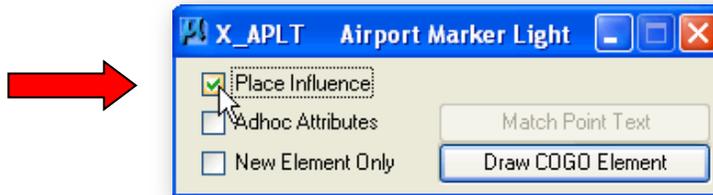


### GEOPAK Placement (Existing and Proposed):

The **GEOPAK Design and Computation Manager** dialog box can be used to place line styles in the basemap using the default Design mode.



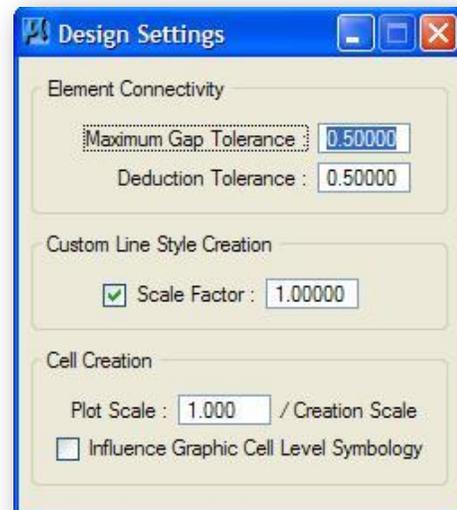
The **Design** mode is used to plot COGO elements into MicroStation, with the desired symbology, by use of the Draw Plan and Profile dialog box. It can also be used to set drafting standards used in conjunction with MicroStation's element placement commands, with the **Place Influence** option *toggled on*, as shown below:



When using the **Design** mode the following procedure is used to place **Line Styles** in the basemap:

Before you begin placing MicroStation elements in Design Mode, it is good practice to check the **Design Settings** to ensure that the **Custom Line Style Creation's Scale Factor** value is set properly.

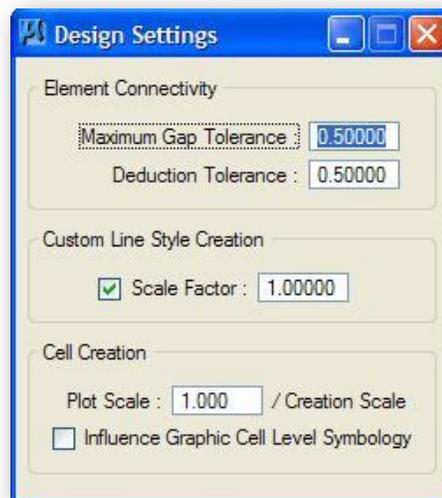
From the **Design and Computation Manager** dialog box, select **Settings > Design** to access the **Design Settings** dialog box shown at right.



The following options related to **Line Style** placement are available from or when using the **Design Settings** dialog box:

### Custom Line Style Creation

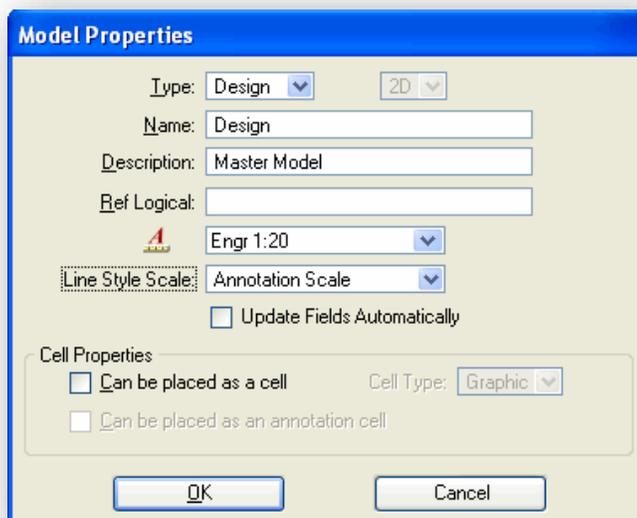
The default custom line style **Scale Factor** to be used when drawing MicroStation elements is specified here. For ODOT plans, this value should be set to **one (1.0)** as shown right, to allow the Model Annotation Scale to control the custom line style scale.



The **Annotation Scale** is set as follows for Custom Line Styles:

- Select the **Models** dialog box.
- From the **Models** dialog box, select **Edit Model Properties** to access the **Model Properties** dialog box as shown below.
- From the **Line Style Scale** drop-down menu, set the **Line Style Scale** as desired.

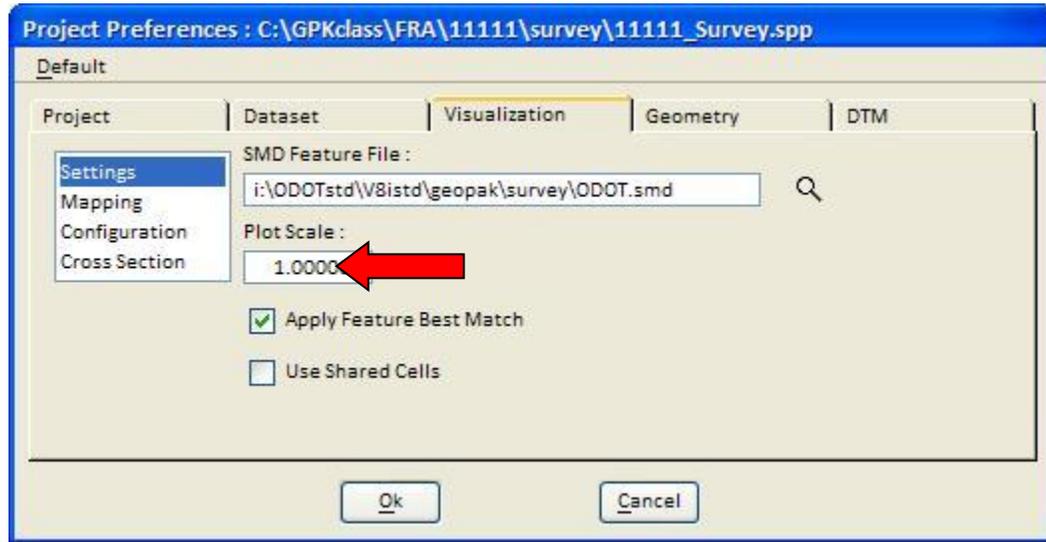
In the example shown right, the **Annotation Scale** is set to a value of **Engr 1:20**. The **Line Style Scale** value is set to match the **Annotation Scale**.



### 204.3.2 Survey Processing (Existing Basemap) using the legacy GEOPAK Survey tools

The **GEOPAK Project Preferences** dialog box is used to control how the line styles in the basemap will be drawn when the survey data is processed using the legacy GEOPAK Survey tools. To use the

**Model Properties “Line Style Scale”** feature, the field data must be visualized at a scale of **one (1.0)** as shown below:



The **Plot Scale** feature is used to control the size of the custom line styles used in the mapping of the survey data. The base scale is defined for each feature code in the SMD file. The Plot Scale should normally be set to a value of one (1.0) for all ODOT projects.

**Note:** For more detailed information on processing the survey data into MicroStation see the [ODOT GEOPAK V8i Survey Training Guide](#) and the [ODOT GEOPAK V8i Road 1](#) training guide.

### 204.3.3 Survey Processing using OpenRoads Technology

Survey data processed using the OpenRoads Survey technology is drawn according to the current MicroStation Annotation Scale setting and will respond to changes in the Annotation Scale value.

For more detailed information processing survey data using OpenRoads technology see the [ODOT GEOPAK Survey with OpenRoads Technology](#) training guide.

### 204.3.4 Sheet Files

In the “**Sheet**” model, set the **Model Properties Line Style Scale** for the appropriate sheet scale.

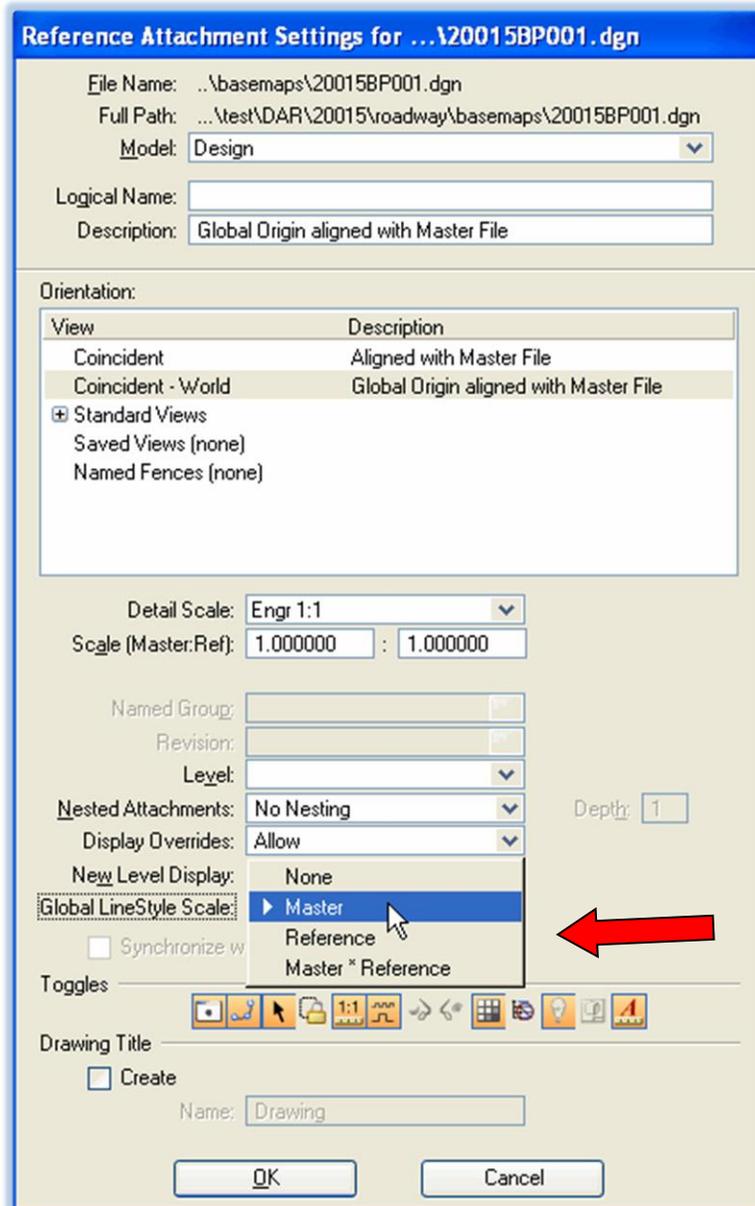
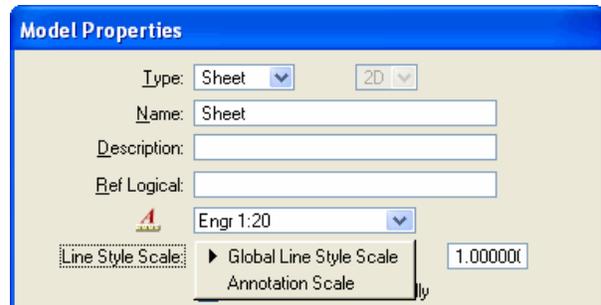
In the **Model Properties** dialog box, set the **Line Style Scale** using one of the following two (2) methods:

1. From the **Line Style Scale** drop-down menu, select **Annotation Scale** to set the line style scale factor of the lines styles to match the **Model Annotation Scale**.

**Note:** This is the recommended procedure for all Roadway Design files.

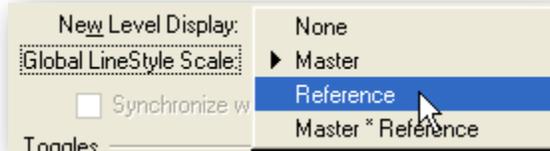
2. From the **Line Style Scale** drop-down menu, select **Global Line Style Scale** to set the line style scale factor to a value different than the **Model Annotation Scale**.

When attaching References in the “Sheet” model, set the **Global Line Style Scale** to **Master** in the **Reference Attachment Settings** dialog box. This will allow the master file to control the scaling of line styles in the active file and all reference attachments.

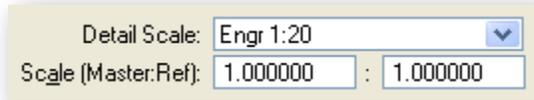


**Important Notes when Referencing:**

- Be aware that if the Line Styles were placed in the basemap using a Scale factor other than a Scale of 1. The referenced line styles are scaled by the **Model Properties Line Style Scale** set in the new design file and will appear out of scale.
- For legacy projects, if the survey data was mapped (visualized) in the basemap for a specific scale, such as 20, set the option “**Global Line Style Scale**” to **Reference** in the **Reference Attachment Settings** dialog box to match the Annotation Scale value set in the original reference file.

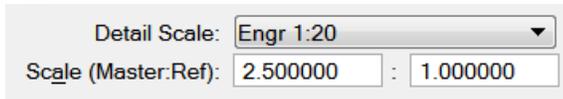


- If the Model Annotation Scale is already set in the design file and the Model Annotation Scale is set in the Reference at 1:1, the **Detail Scale** in the **Reference Attachment Settings** dialog box displays the Model Annotation Scale and the Scale (Master:Ref) displays a 1:1 scale like shown below:

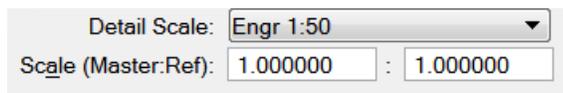


- Be aware if the Model Annotation Scale is already set in the design file and the Model Annotation Scale is set in the Reference other than 1:1, the **Detail Scale** in the **Reference Attachment Settings** dialog box displays the Reference’s Model Annotation Scale and the Scale (Master:Ref) is then calculated from the referenced model’s annotation scale and the active model’s annotation scale.

For example if the Reference file has a Model Annotation Scale set at 1:20 and the design file has a Model Annotation Scale set at 1:50 the **Detail Scale** displays the Reference’s Model Annotation Scale (1:20) and the Scale (Master:Ref) is calculated 2.5:1 as shown below:



To avoid the Reference from scaling in the design file like shown in the example above make sure the Scale (Master:Ref) is set to 1:1. If the Scale (Master:Ref) is not set at 1:1 you will need to change it. Once you have set the Scale to 1:1 the Detail Scale will then read the design file’s Model Annotation Scale that was set like shown below:



**Bridge Design Files:**

Multiple custom line styles for centerlines have been designated for specific plotting scales (10 scale, 20 scale, 50 scale, etc). Separate levels have been established for the representation of these centerlines. These line styles and levels are specified in the **CADD Information Table, [Appendix A](#)**.

Several line styles have been developed specifically for use on Bridge plans that are not always placed at a specific scale relative to the plotting scale. See [Appendix F](#) for suggested Scale factors. The line styles listed in the table below shall be scaled as necessary to produce a legible detail. These line styles are assigned to the appropriate level by use of ByLevel attributes.

Line Style Name	Description
brcllong	Centerline Long
brclshort	Centerline Short
brconstjoint	Construction Joint
bexisting	Existing Objects
brhiddenex	Hidden Line Existing
brhiddenpr	Hidden Line Proposed
brphasepr	Phase Construction Line
brbarex	Existing Reinforcement Bars
brbarpr	Proposed Reinforcement Bars

**204.4 Plotting**

The dash and gap lengths of the MicroStation default line codes 0-7 are defined by the plotting software. See [Section 400 - Plotting](#) for the ODOT plotting values for line codes 0-7.

**205 Line Weights****205.1 General**

Line weights are used to differentiate graphical elements in the design file and on the plotted sheet. Line Weight width ranges from weight 0 (narrowest) to weight 31 (widest) and designate the thickness of the line used to draw or plot a graphic element.

Standard line weights for plan graphics are specified in the [CADD Information Table, Appendix A](#).

**205.2 Plotting**

See [Section 400 - Plotting](#) for information on line weight plotting thickness values.

## 206 Cell Libraries

### 206.1 General

A cell is a complex element composed of a group of primary elements or other complex elements. Cells are stored in a cell library. For plan consistency, it is advantageous to create cells for items that will be repeatedly placed in a design file. Several ODOT standard cell libraries are available as detailed in [Section 206.3 - Cell Libraries](#).

### 206.2 Cell Types

Most of the cells created in ODOT’s cell libraries have been created as *graphic* cells. The symbology (color, line style, line weight, and level) of a graphic cell is determined when it is created. When graphic cells are placed, they are level-independent, i.e., they do not rotate with the view and they keep the settings that were active when they were created. A few cells have been created as *point* cells where appropriate. A point cell takes on the active symbology set in the file at the time it is placed and are view independent, i.e., they rotate with the view.

Several “Pattern and Terminator Type” symbols that were created as graphic type cells in the following cell libraries are now taking advantage of a new feature in MicroStation when placing them in the design file:

ODOT\_Geotech.cel  
 ODOT\_Geotech\_1996.cel  
 ODOT\_Symbols.cel

Graphic Cells can be produced on the “**Default**” Level using specific symbology, such as, color, line style, and line weight. A benefit to graphic cells being created on the “Default” level is the new symbols act similar to point cells when placed in the design file they inherit the Active Level, but not the symbology (color, line style, line weight). It is important to note, that the graphic cell does not inherit the Active Symbology (i.e. color, weight, line style) like a “Point Cell”, unless the graphic cell was drawn on the “Default” level with the attributes set to “ByLevel”.

### 206.3 Cell Libraries

The following Cell Libraries are available to facilitate the drawing of commonly used symbols and sheet borders as described below:

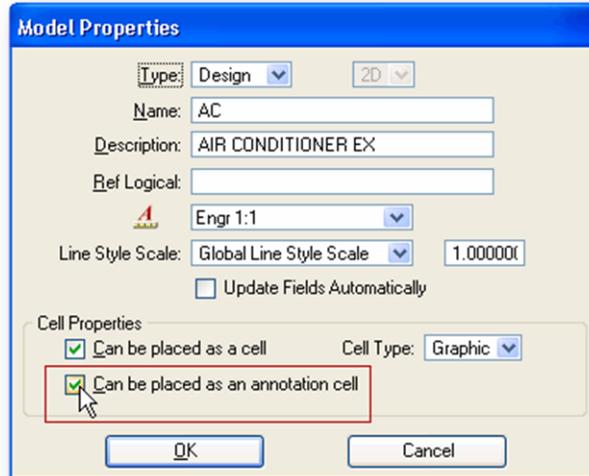
Cell Library	Description
ODOT_Bridge.cel	Commonly used cells for Bridge plans.
ODOT_Drainage.cel	Cells for standard drainage structures.
ODOT_Geotech.cel	Cells used for Geotechnical Information.
ODOT_Geotech_1996.cel	Cells used for the Specifications for Subsurface Investigation.
ODOT_RW.cel	Commonly used cells for Right-of-Way plans.
ODOT_Sheets.cel	Cells for standard plan sheet borders.
ODOT_Symbols.cel	Cells representing standard plan symbols.

A set of cell libraries has been developed to include standard signs from the Office of Roadway Engineering, Sign Designs and Markings Manual. These sign cells are easily placed using a custom application, ODOT\_Signs.mvba. A complete list of the sign cell libraries and instructions for running the signs application can be found on the ODOT CADD Services website.

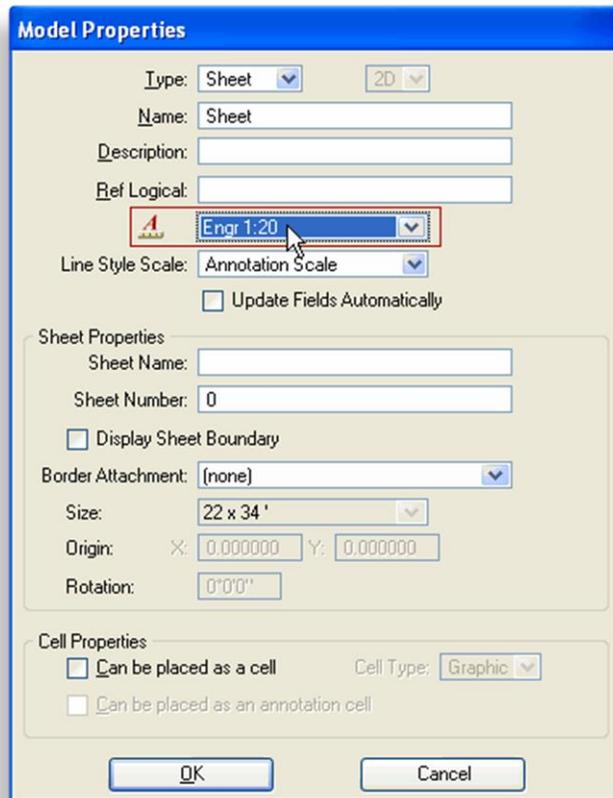
The Cell libraries can be accessed from the ODOT CADD Standards website via the MicroStation Downloads web page.

### 206.4 Cell Placement

The ODOT cell libraries have been updated to utilize the new enhancement for Annotation Cells. Every cell can be placed as an Annotation Cell when the new feature “Can be placed as an annotation cell” is toggled on in the **Model Properties** dialog box.



When you change the active model's **Annotation Scale** value, annotation cells in the model are automatically scaled by the new value.



**Annotation Scale** - sets the scale for Text, Dimensions and Cells in the model. You can select from the list of common scales used for ODOT plan sheets. When placing Text, Dimensions or Cells, the Annotation Lock must be on to ensure that the text, dimensions and cells are placed at the defined scale.

ODOT CADD Standards contain two (2) types of cell definitions:

1. **“Cosmetic” cells**

Cosmetic cells are used to represent the location of an object and are intended only to designate the location not the actual size or dimensions of the object. A Mail Box, shown below, is an example of a cosmetic cell.



- Cosmetic cells are typically placed in the design file at a scale of one (1) and then displayed using the Annotation Scale factors in the design file at a scale corresponding to the intended plotting scale of the final plans.
- The ability to place Cosmetic cells using the **Annotation Scale Lock** has been enabled in the cell definition by toggling on the **Can be placed as annotation cell** option.

2. **“Physical” cells**

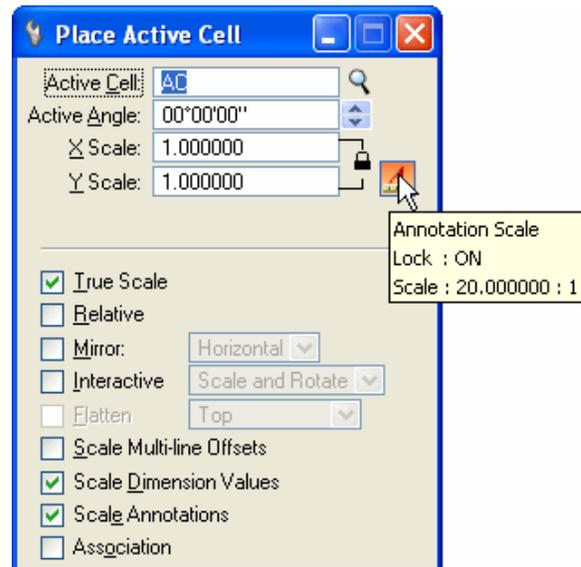
Physical cells are used to represent the actual size or dimensions of an object. A Catch Basin, shown below, is an example of a physical cell.



- Physical cells are always placed in the design file at a scale of 1, regardless of the plotting scale and are designated as such that the Annotation Scale factors when applied are ignored.
- The ability to place Physical cells using the **Annotation Scale Lock** has been disabled in the cell definition.

The **Place Active Cell** tool is used to place annotation cells. The tool's settings window has an **Annotation Scale Lock** icon similar to the one for the Place Text tool and dimensioning tools. When you set the **Active Cell** to a cell that can be placed as an annotation cell, the Annotation Scale icon should be enabled as shown right.

The icon's tool tip tells you the active model's annotation scale factor and the off/on state of the **Annotation Scale Lock**. If this lock is on, the model's **Annotation Scale** factor will be applied to the cell you are placing. To turn on the **Annotation Scale Lock**, click the icon.



**Note:** If the Annotation Scale lock is off when placing cells in the design file the Annotation Scale feature is ignored.

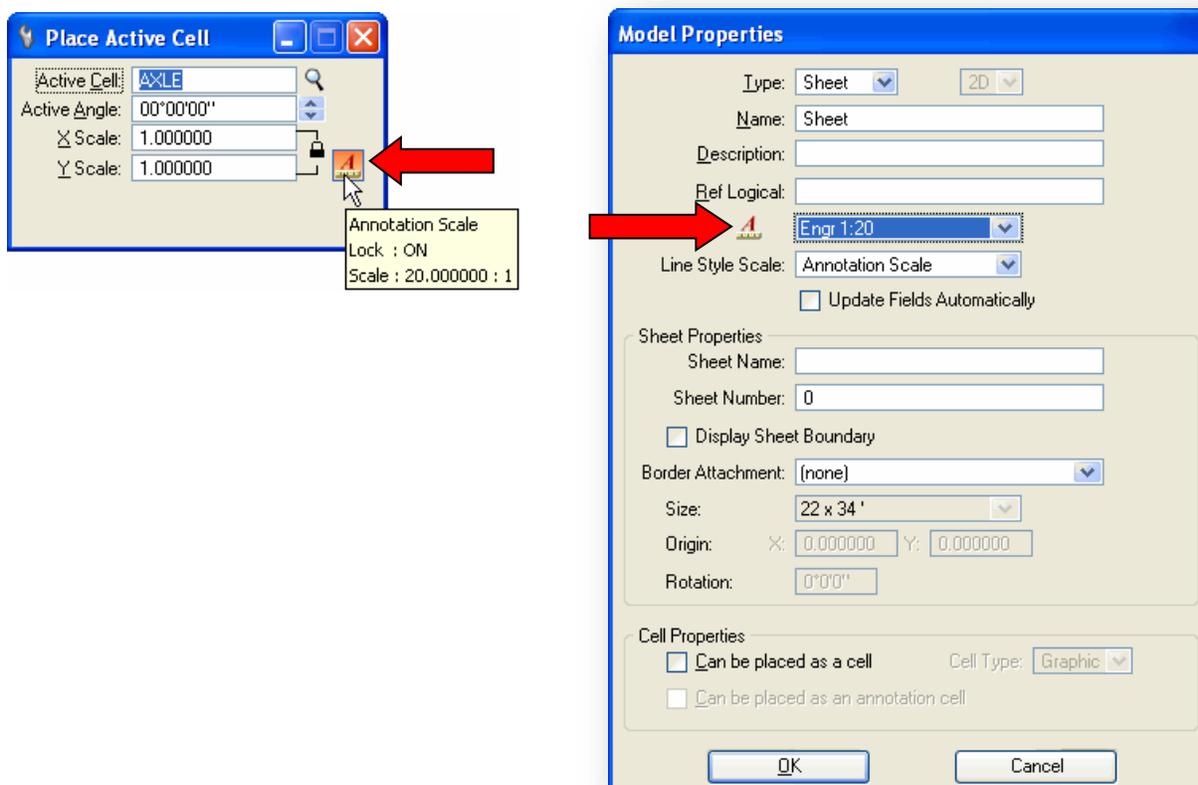
Cosmetic and Physical cells for plan graphics are specified in the **CADD Information Table**, [Appendix A](#) and displayed in [Appendix C](#) along with the Cell Origins.

### Recommendations for Scaling Cells on ODOT plans:

Basemap design files are used to draw existing and proposed plan view information for the entire length of the project for both Roadway and Bridge projects. All basemap information shall be drawn in the default Design model. The location and dimensions of all plan view basemap design file information shall be drawn using real world dimensions at a 1:1 scale. Cells are to be placed in the basemap at a scale of one (1), with the **Place Active Cell's Annotation Scale Lock toggled on** so the **Model Properties Annotation Scale** feature can be used.

When attaching the basemaps as References to the "Sheet" model, set the **Model Properties Annotation Scale** for the appropriate sheet scale. Changing the Model Properties Annotation Scale value will cause the display of the Cells to change according to the value selected. This will affect cells, text and dimensions drawn in the active file, as well as referenced graphics depending on the settings when the references were attached.

All cells should be placed at a scale of **one (1)**, with the **Place Active Cell's Annotation Scale Lock toggled on**, and then scaled using the **Model Properties Annotation Scale** as shown below.

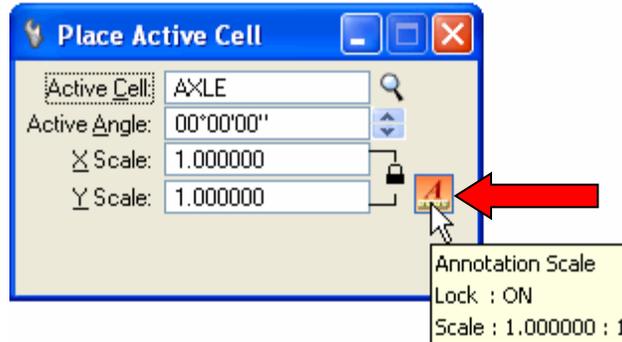


The following procedures listed are based on the expanded features available in MicroStation. The final decision regarding plan drafting and design is at the discretion of the designer.

### 206.4.1 Basemap

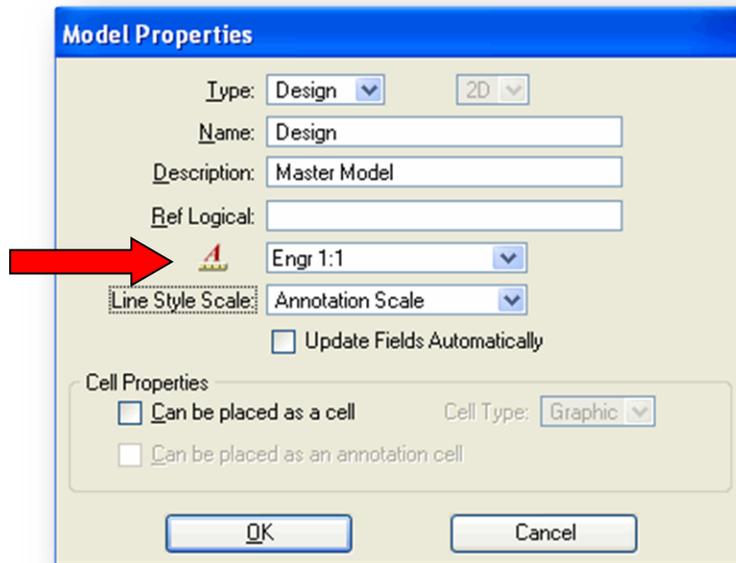
#### Manual Placement (Existing and Proposed):

Place all Cells in the basemap design file at a Scale of *one (1.0)*, with the **Place Active Cell Annotation Scale Lock** toggled on.



When working in the basemap, use the following procedure to set the Annotation Scale:

In the **Model Properties** dialog box, set the *Annotation Scale* to the appropriate Engineering Scale desired.

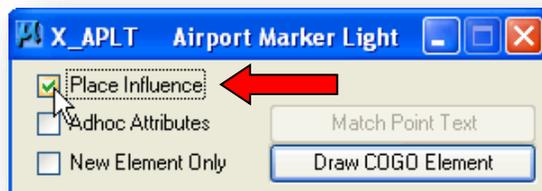


## GEOPAK Placement (Existing and Proposed):

The GEOPAK **Design and Computation Manager** dialog box can be used to place cells in the basemap using the default **Design** mode.



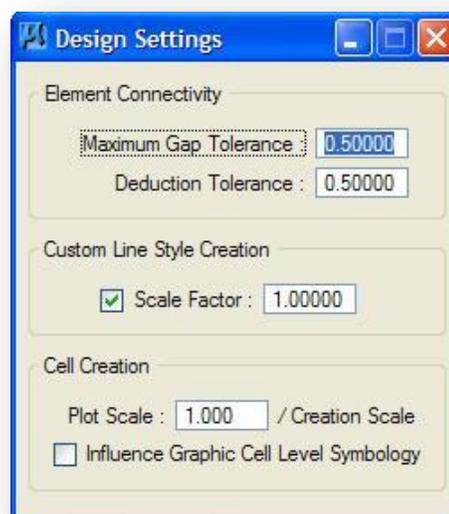
The **Design mode** is used to plot COGO elements into MicroStation with the desired symbology by use of the Draw Plan and Profile dialog box. It can also be used to set drafting standards to be used in conjunction with MicroStation's element placement commands, with the **Place Influence** option **toggle**d on, as shown below:



When using the **Design** mode, the following procedure should be used to place **Cells** in the base map:

Before you begin placing MicroStation elements in Design Mode, it is good practice to check the **Design Settings** to ensure that the **Cell Creation's Plot Scale** value is set properly.

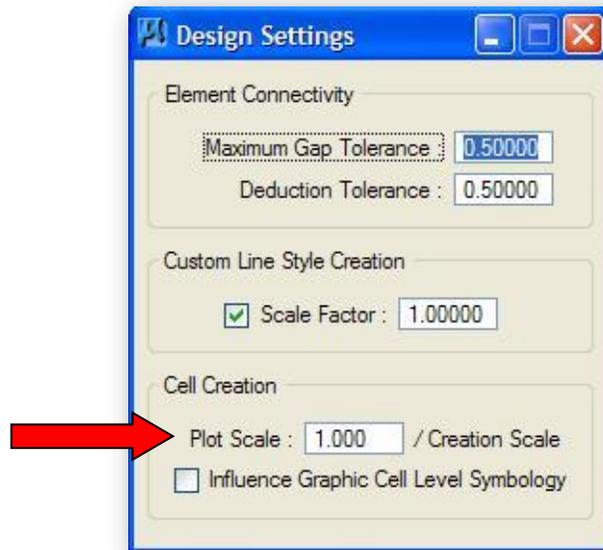
From the **Design and Computation Manager** dialog box, select **Settings > Design** to access the **Design Settings** dialog box shown at right.



The following options related to **Cell** placement are available from or when using the **Design Settings** dialog box:

#### 206.4.2 Cell Creation

The default **Plot Scale** factor for placing cells is specified here. For ODOT plans, this value should be set to **one (1.0)** to allow the Model Annotation Scale to control the cell scale.



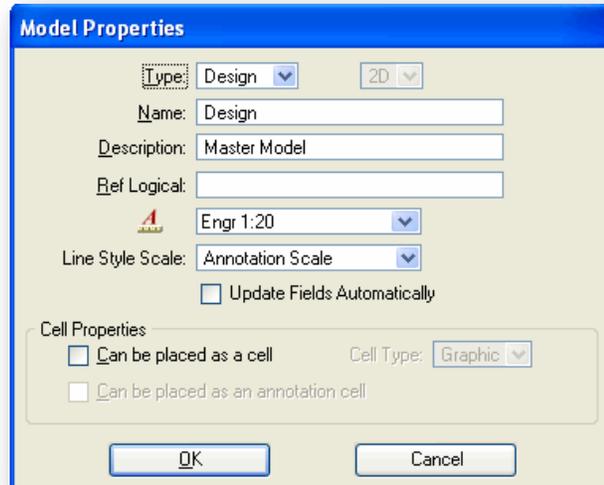
#### Influence Graphic Cell Level Symbology

When active, the *Influence Graphic Cell Symbology* uses the symbology within the Design and Computation Manager, ignoring the element symbology used when the cell was created. This option should always be **toggle off** for ODOT plans.

The **Annotation Scale** is set as follows for Cells:

- Select the **Models** dialog box.
- From the **Models** dialog box, select **Edit Model Properties** to access the **Model Properties** dialog box as shown below.
- Set the **Annotation Scale** as desired.

In the example shown, the **Annotation Scale** is set to a value of Engr 1:20, with the **Line Style Scale** value set to match the **Annotation Scale**.

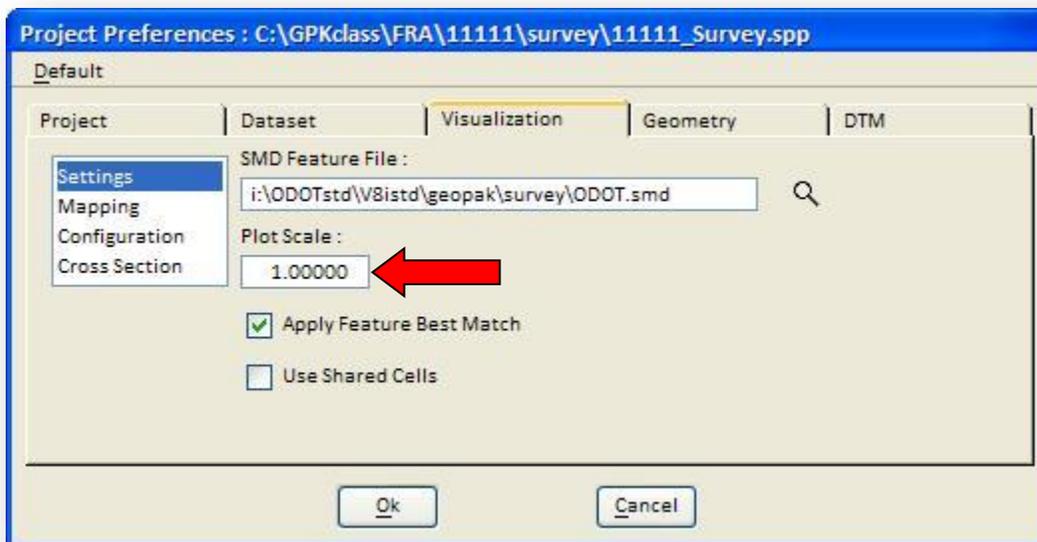


#### Notes:

- The method described above is a change in procedure from previous MicroStation releases.
- The ODOT Design & Computation Manager Database for GEOPAK V8i has been specifically modified to accommodate placing cells using the Model Annotation Scale. Previous versions of ODOT.ddb will not allow the cells to be scaled using the Annotation Scale.

#### 206.4.3 Survey Processing using the legacy GEOPAK Survey tools:

The **GEOPAK Project Preferences** dialog box is used to control how the Cells in the basemap will be drawn. To use the **Model Properties** “**Annotation Scale**” feature, the Cells must be visualized at a scale of **one (1.0)** as shown below:



The **Plot Scale** item is used to control the size of the Cells, and Text used in the mapping of the survey data. The base scale is defined for each feature code in the SMD file. The Plot Scale should normally be set to a value of one 1.0 for all ODOT projects.

Text and cells placed by GEOPAK Survey are not automatically scaled until the annotation scale is manually applied to the survey mapping.

To apply the model annotation scale to the Cells and Text, type the command **Annotationscale Add** into the Key-in window inside MicroStation as shown.



This command will apply the annotation scale to all the cells and text in the model. The cells and text will now take on the active model annotation scale value.

After the annotation scale has been applied to the cells and text in the file by use of the Annotationscale Add command, you do not need to run the key-in command again for the cells and text to honor changes to the model annotation scale.

#### Important Survey Processing Notes:

- If *additional* survey data is mapped to the same design file, it will be necessary to run the key-in **Annotationscale Add** command again in order for the new data to honor the current annotation scale value.
- The display of the text, cell, and line styles can be controlled uniquely for reference attachments. For example, the Survey Basemap file can be set with the model annotation scale value necessary for the Surveyor. Designers may reference the file and set the model annotation scale for a different value as needed for the plans without altering the survey basemap.
- The **Annotationscale Add** command will optionally work with a MicroStation selection set. If no elements are selected when the command is processed, all cells and text in the active model will be processed.
- Care must be taken to ensure that elements other than the survey information are not selected when the **Annotationscale Add** command is applied. For example, the text for centerline stationing and curve data that is placed by the GEOPAK Design and Computation Manager is placed for a specific plotting scale (this procedure will not change). If you apply the **Annotationscale Add** command to these elements, they will appear out of scale when the command is applied since they were not originally placed at a scale of one (1).

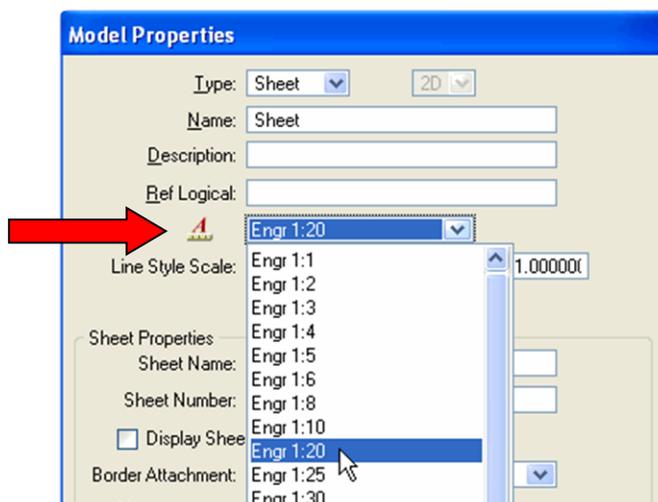
### 206.4.4 Survey Processing using OpenRoads Technology

Survey data processed using the OpenRoads Survey technology is drawn according to the current MicroStation Annotation Scale setting and will respond to changes in the Annotation Scale value.

For more detailed information processing survey data using OpenRoads technology see the [ODOT GEOPAK Survey with OpenRoads Technology](#) training guide.

### 206.4.5 Sheet Files

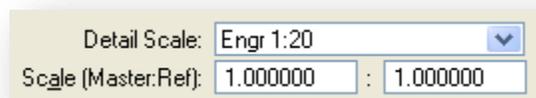
In the “Sheet” model, set the Model Properties *Annotation Scale* for the appropriate sheet scale.



Changing the Annotation Scale value will cause the display of the Text, Cells and Dimensions to change according to the value selected. This will affect elements drawn in the active file, as well as Referenced graphics, depending on the settings when the references were attached.

#### Important Notes when Referencing:

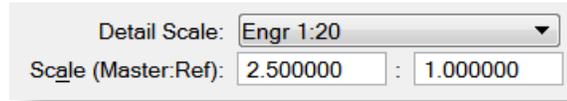
- Be aware that if the Cells were placed in the basemap using a Scale factor other than a Scale of 1, with the Cell Annotation Scale Lock on, the referenced cells will be scaled by the Model Annotation Scale set in the new dgn file and will appear out of scale.
- If the Model Annotation Scale is already set in the design file and the Model Annotation Scale is set in the Reference at 1:1, the *Detail Scale* in the **Reference Attachment Settings** dialog box displays the Model Annotation Scale and the Scale (Master:Ref) displays a 1:1 scale like shown below:



- Be aware if the Model Annotation Scale is already set in the design file and the Model Annotation Scale is set in the Reference to anything other than 1:1. The *Detail Scale* in the **Reference Attachment Settings** dialog box displays the Reference’s Model

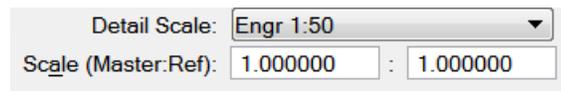
Annotation Scale. The Scale (Master:Ref) is then calculated from the referenced model's annotation scale and the active model's annotation scale.

For example, if the Reference file has a Model Annotation Scale set to 1:20 and the design file has a Model Annotation Scale set to 1:50, the **Detail Scale** displays the Reference's Model Annotation Scale (1:20) and the Scale (Master:Ref) is calculated 2.5:1 as shown below:



Detail Scale: Engr 1:20  
Scale (Master:Ref): 2.500000 : 1.000000

To avoid the Reference from scaling in the design file, like shown in the example above, make sure the Scale (Master:Ref) is set to 1:1. If the Scale (Master:Ref) is not set to 1:1, you will need to change it. Once you have set the Scale to 1:1, the Detail Scale will then read the design file's Model Annotation Scale that was set, as shown below:



Detail Scale: Engr 1:50  
Scale (Master:Ref): 1.000000 : 1.000000

## 207 Fonts

### 207.1 General

ODOT has defined several standard fonts for use on all plans. It is important to use these fonts so that the final plotted version matches the electronic version of the file. Only the fonts provided by ODOT (30, 31, 57, and 70) are acceptable for use on ODOT plans. True Type fonts shall not be used on ODOT Construction plans.

The ODOT standard font resource file, **ODOT\_Fonts.rsc**, can be obtained from the ODOT CADD Standards website. The MicroStation configuration variable *MS\_FONTPATH* is used to specify the font library.

The following fonts are available in the ODOT standard font resource file, **ODOT\_Fonts.rsc**:

**Font 30** - Straight, proportional characters with uppercase, lowercase, and fractions. This font is for general plan use and has the modified keystrokes set.

**Font 31** - Slanted, proportional characters with uppercase, lowercase, and fractions. This font is for general plan use and has the modified keystrokes set.

**Font 57** - Straight, proportional characters with the Greek alphabet in upper and lowercase.

**Font 70** - Block filled. This font is used on plan sheets when a bold title is necessary.

Modified keystrokes are used to generate certain symbols and special characters for Font 30 and Font 31 as shown in [Appendix B](#). Font 57 and Font 70 are also shown for reference.

All text placed on Bridge sheets, excluding text contained in standard border cells, shall use Font 31.

All text placed on Geotechnical Exploration sheets, excluding text contained in standard border cells, shall use Font 30 or Font 31. For purposes of this manual, the term “Geotechnical Exploration sheets” shall apply to all sheets generated per the **Specifications for Subsurface Investigations (SSI)** or the [Specifications for Geotechnical Explorations \(SGE\)](#).

### 207.2 Text Size

Standard text sizes have been defined to ensure uniform legibility of all plan sheets. Standard text size refers to the size of the text on the finished plot, not the text size in the design file. The correct design file text size is dependent upon the intended plot scale. ODOT standard text sizes for the finished plot scale are shown in the following table:

Text Type	Plotted Text Size
Normal	0.14”
Subtitle	0.17”
Title	0.20”
Main Title	0.25”

To calculate text size used in a MicroStation design file for various scaled plan sheets use this method:

$$(\text{Text Size}) \times (\text{Plotting Scale}) = \text{Design File Text Size}$$

**Example:** 0.14 inch x 20 feet/inch = 2.8 feet

Text sizes smaller than the Normal text size are not acceptable.

For all Roadway plan sheets and Geotechnical Exploration sheets, the preferred method to set the text size is by use of the Model Annotation Scale parameter. See **Section 207.4 - Text Styles** for more information.

Text placed in the sheet model for bridge detail sheets should normally be placed at a scale of 1. For more information on the use of design models and sheet models, see [Section 303 - References](#).

### 207.3 Text Line Spacing

In general, Text Line Spacing should be one-half (0.50") the text height. The spacing between lines on summary, sub-summary, general note sheets and charts is generally equal to the minimum text size.

**Note:** If needed it is permissible to use Text Line Spacing equal to the minimum text size.

Text Line Spacing distances is now relative to the Text Height. In the previous versions of MicroStation these distances were an absolute value in master units. If the text height changed dramatically, the spacing could become inappropriate. Now, if the text height changes the spacing adjusts relative to the change in the text height. The Text Line Spacing is now a factor of the Text Height.

For example, with the scale factor set at 0.50" (one-half) the Line Spacing for ODOT's Text Styles would be as follows:

Normal Text Size 0.14" x Line Spacing 0.50"	=	a Line Spacing of 0.07"
Sub-Title Text Size 0.17" x Line Spacing 0.50"	=	a Line Spacing of 0.085"
Title Text Size 0.20" x Line Spacing 0.50"	=	a Line Spacing of 0.10"
Main Title Text Size 0.25" x Line Spacing 0.50"	=	a Line Spacing of 0.125"

### 207.4 Text Styles

A MicroStation Text Style is a saved set of text parameters such as font type, text width, text height, color, etc. Text styles enable you to place text in a consistent and automated manner. ODOT's standard text styles are defined in a MicroStation DGN Library, **ODOT\_Styles\_TextDim.dgnlib**, which can be obtained from the ODOT CADD Standards website. This file is attached for use by the MicroStation configuration variable *MS\_DGNLIB*.

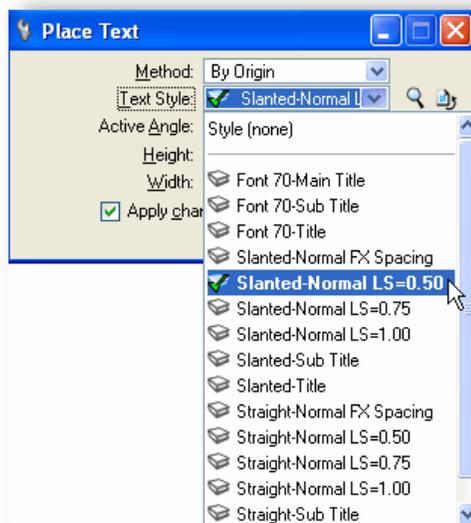
The following Text Styles have been configured for use on ODOT plans:

Style Name	*Text Size	*Line Spacing	Font
Font 70-Main Title	0.25	0.50	70
Font 70-Title	0.20	0.50	70
Font 70-Sub Title	0.17	0.50	70
Masked Slanted-Normal LS=0.50	0.14	0.50	31
Masked Straight-Normal LS=0.50	0.14	0.50	30
Slanted-Normal FX Spacing	0.14	0.50	31
Slanted-Normal LS=0.50	0.14	0.50	31
Slanted-Normal LS=0.75	0.14	0.75	31
Slanted-Normal LS=1.00	0.14	1.00	31
Slanted-Sub Title	0.17	0.50	31
Slanted-Title	0.20	0.50	31
Straight-Normal FX Spacing	0.14	0.50	30
Straight-Normal LS=0.50	0.14	0.50	30
Straight-Normal LS=0.75	0.14	0.75	30
Straight-Normal LS=1.00	0.14	1.00	30
Straight-Sub Title	0.17	0.50	30
Straight-Title	0.20	0.50	30

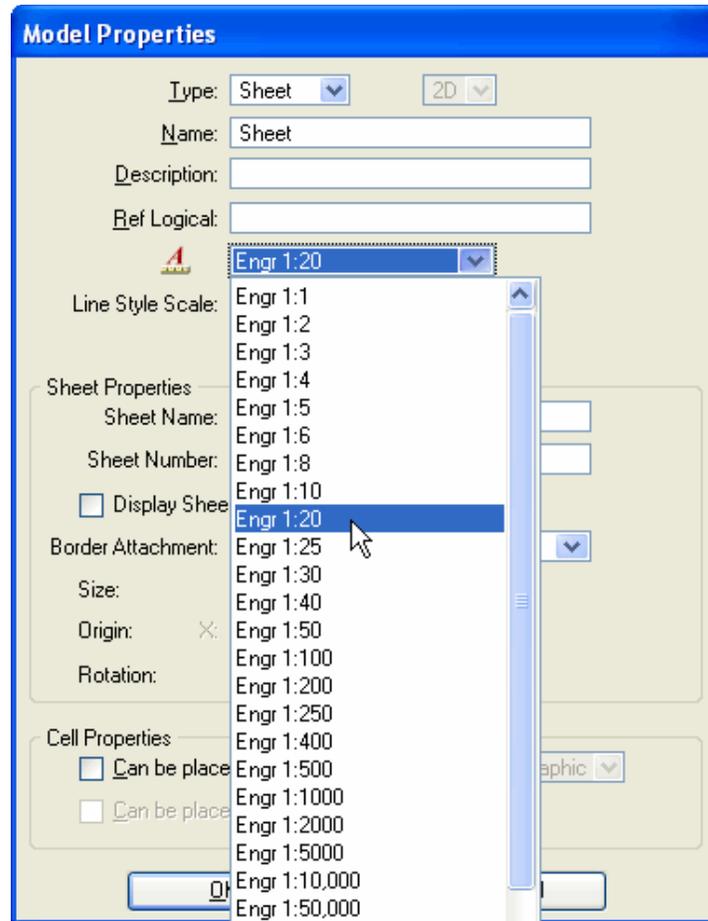
\*Text size and Line Spacing units are “inches”.

All text placed on Bridge sheets, excluding text contained in standard border cells, shall use the “**Slanted**” text styles.

The active text style can be selected in MicroStation prior to placing text. Select the **Place Text** command to access the following dialog box shown at right.



Selecting a Text Style will set the text size appropriate for a 1:1 plot. To place text for other plotting scales, users can automatically set the text size by setting the MicroStation Model Annotation Scale before placing the text. From the MicroStation pull-down menu, select **File > Models** or select the **Models** icon on the Primary Tools box, then select **Edit Model Properties** from the Models dialog box to access the dialog shown:



The list of available annotation scales is defined in the ODOT Standard file **ODOT\_scales.def** which can be obtained from the ODOT [CADD Services](#) website. The MicroStation configuration variable **MS\_CUSTOMSCALEDEF** is used to assign the scale definition file.

The following annotation scales have been defined in ODOT\_scales.def:

Engineering Scales		Architectural Scales	
Name	Scale	Name	Scale
Engr 1:1	1:1	Arch 12"=1'-0"	1:12
Engr 1:2	2:1	Arch 6"=1'-0"	1:6
Engr 1:3	3:1	Arch 3"=1'-0"	1:3
Engr 1:4	4:1	Arch 1 1/2"=1'-0"	2:3
Engr 1:5	5:1	Arch 1"=1'-0"	1:1
Engr 1:6	6:1	Arch 3/4"=1'-0"	4:3
Engr 1:8	8:1	Arch 1/2"=1'-0"	2:1
Engr 1:10	10:1	Arch 3/8"=1'-0"	8:3
Engr 1:20	20:1	Arch 1/4"=1'-0"	4:1
Engr 1:25	25:1	Arch 3/16"=1'-0"	16:3
Engr 1:30	30:1	Arch 1/8"=1'-0"	8:1
Engr 1:40	40:1	Arch 1/16"=1'-0"	16:1
Engr 1:50	50:1	Arch 1/32"=1'-0"	32:1
Engr 1:100	100:1		
Engr 1:200	200:1		
Engr 1:250	250:1		
Engr 1:400	400:1		
Engr 1:500	500:1		
Engr 1:1000	1000:1		
Engr 1:2000	2000:1		
Engr 1:5000	5000:1		
Engr 1:10,000	10,000:1		
Engr 1:25,000	25,000:1		
Engr 1:50,000	50,000:1		
Engr 1:100,000	100,000:1		
Engr 1:250,000	250,000:1		

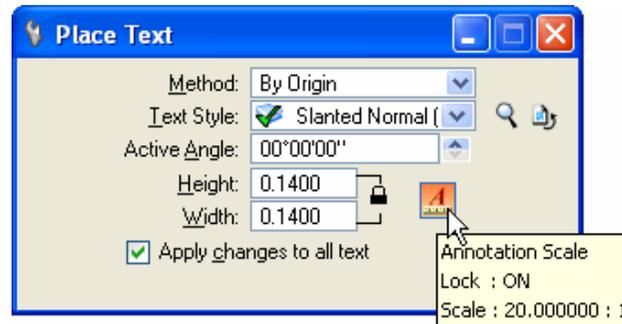
**Architectural** scales are used for annotating bridge details when the text is placed in the design model instead of the sheet model.

**Engineering** scales should be used for all Roadway sheets including the Bridge Site Plan sheet and Geotechnical Exploration sheets.

See the [Location and Design Manual, Volume 3 - Roadway Design](#), the [Bridge Design Manual](#), and the [Specifications for Geotechnical Explorations \(SGE\)](#) for recommended sheet scales.

July 20, 2018

In order to apply the annotation scale to a Text Style, you must toggle on the **Annotation Scale Lock** in the **Place Text** dialog box before placing the text. Select the **Place Text** command to access the dialog box shown below:



In the example above, the ODOT, standard text style **Slanted-Normal LS=0.50** has been selected with the Model annotation scale set to **Engr 1:20**. The text size and line spacing will be set as follows:

Text Size: 0.14 inch x 20 feet/inch = 2.8 feet  
Line Spacing: 0.50 inch x 2.8 feet = 1.4 feet  
(Line Spacing is set to half the Text size)

Text Styles do not set the Level or Weight for the text placement. The text will be placed on the active level with the active weight. All text placed using Text Styles established for Title and Sub-Title text should be placed at a weight of 2.

## 207.5 Dimension Styles

Similar to Text Styles, a MicroStation Dimension Style is a saved set of dimensioning parameters. ODOT has configured a set of dimension styles to be used on ODOT plans. These styles are defined in the ODOT Standard DGN Library, **ODOT\_Styles\_TextDim.dgnlib**, which can be obtained from the ODOT CADD Standards website. This file is attached or used by the MicroStation configuration variable **MS\_DGNLIB**.

The following dimension styles have been defined in **ODOT\_Styles\_TextDim.dgnlib**:

Dimension Style	Font	*Text Size	Description
Dec-0, Slanted	31	0.14	Decimal Feet, No decimal places
Dec-0, Straight	30	0.14	Decimal Feet, No decimal places
Dec-1, Slanted	31	0.14	Decimal Feet, 1 decimal place
Dec-1, Straight	30	0.14	Decimal Feet, 1 decimal place
Dec-2, Slanted	31	0.14	Decimal Feet, 2 decimal places
Dec-2, Straight	30	0.14	Decimal Feet, 2 decimal places
Dec-Multiline, Slanted	31	0.14	Decimal Feet, 0.01 accuracy
Dec-Multiline, Straight	30	0.14	Decimal Feet, 0.01 accuracy
Fract-Multiline, Slanted	31	0.14	Fractions, 1/16" accuracy
Fract, Slanted	31	0.14	Fractions, 1/16" accuracy
Masked Fract, Slanted	31	0.14	Fractions, 1/16" accuracy
Masked Fract-Multiline, Slanted	31	0.14	Fractions, 1/16" accuracy
XS-Intersection0Marker	30	0.0001	Used with OpenRoads Features

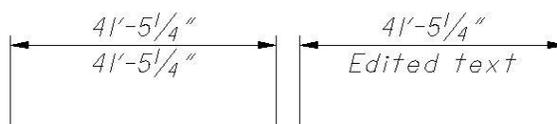
\*Text size units are "inches".

Line Terminators shall be a filled arrow created with a width to height ratio of 2.5:1. The terminator width shall equal the text height.

Leader Lines may be broken when crossing dimension lines. In order to keep broken lines to a minimum, it is recommended that the user relocate the dimension callout or reposition the dimension. Leader lines and terminators shall be a weight of zero (0) and shall be placed on the same level as required for text notes and callouts.

Similar to Text Styles, the text size for Dimension Styles can be set by use of the Model Annotation Scale parameter. See section 207.4 Text Styles for more information.

The Multiline dimension styles have been configured to place dimension text above and below the dimension line as shown at left in the example below. These Dimension styles have been provided to allow the user to edit the dimension text to contain a label as part of the dimension element. This is advantageous in the case where the dimension is moved or modified since the text is part of the dimension and not a separate text string that must be moved manually. The MicroStation Edit Text command is used to edit the dimension text. An example of the edited text is shown at right below:



Bridge plans shall use the “**Fract, Slanted**”, “**Fract-Multiline, Slanted**” or “**Masked Fract, Slanted**”, “**Masked Fract-Multiline, Slanted**” dimension styles. All Bridge dimensions shall be placed associated.

Dimensions shall not have their status dropped.

## 208 Seed Files

### 208.1 General

MicroStation uses a “seed file” to create all design files. A seed file is a template in which standard parameters are set. Seed files do not typically contain elements, but like other design files they do contain settings like working units and view configurations. Using a standard, customized seed file helps maintain uniformity and keeps the user from having to adjust design file settings each time a file is created.

The following two-dimensional (2D) and three dimensional (3D) seed files are available on the [ODOT CADD Services](#) website. The Geographic Coordinate System (GCS) for each seed file is defined as shown in the table below:

Dimension	Seed File Name	Geographic Coordinate System
2D	ODOTSeed2d.dgn	None
2D	ODOTSeed2d_OH83-2011-NF.dgn	OH83-2011-NF
2D	ODOTSeed2d_OH83-2011-SF.dgn	OH83-2011-SF
2D	ODOTSeed2d_OH83-NF.dgn	OH83-NF
2D	ODOTSeed2d_OH83-SF.dgn	OH83-SF
3D	ODOTSeed3d.dgn	None
3D	ODOTSeed3d_OH83-2011-NF.dgn	OH83-2011-NF
3D	ODOTSeed3d_OH83-2011-SF.dgn	OH83-2011-SF
3D	ODOTSeed3d_OH83-NF.dgn	OH83-NF
3D	ODOTSeed3d_OH83-SF.dgn	OH83-SF

The MicroStation configuration variable *MS\_DESIGNSEED* is used to define the default seed file.

### 208.2 Models

ODOT’s seed files each contain two models as listed in the table below.

Model Name	Type
Design	Design Model
Sheet	Sheet Model

For more information on the use of models, see [Section 303 - References](#).

## **209 GEOPAK Design and Computation Manager Database**

### **209.1 General**

The primary purpose of the GEOPAK Design and Computation Manager (D&C Manager) is to assist the user with the placement of MicroStation elements according to a set of predefined CADD standards.

ODOT provides a standard D&C Manager database, **ODOT.ddb** that has been configured according to the CADD standards outlined in this manual. The ODOT.ddb can be obtained from the ODOT [CADD Services](#) website.

The D&C Manager can be used to facilitate the placement of curvilinear features or point features represented by cells according to ODOT standards. For more information on the use of the GEOPAK Design and Computation Manager, see the [ODOT GEOPAK Road 1 Training Guide](#) on the ODOT [CADD Services](#) website.

Users are not permitted to edit the ODOT.ddb.

## **210 GEOPAK Survey Manager Database**

### **210.1 General**

The GEOPAK Survey Manager Database is primarily used to assist the user with mapping field survey codes to the appropriate MicroStation symbology according to a predefined set of CADD Standards and Survey field codes.

### **210.2 Survey Field Codes**

ODOT has developed a set of standardized field codes for all survey data submitted to the Department. The list of standard field codes for ODOT projects can be obtained from the ODOT [CADD Services](#) website.

The field code list is available in PDF format in the \ODOTcadd\Standards\Geopak\Survey\Field\_Codes folder.

Users are not permitted to use other field codes to supplement the ODOT code list for any project related survey data submitted to or exchanged with ODOT.

### **210.3 Survey Manager Database**

ODOT has developed a standard Survey Manager Database, **ODOT.smd**, for use with GEOPAK Survey Software to map the field codes contained within a set of survey data to the appropriate symbology in a MicroStation design file according to the CADD Standards set forth within this manual. The ODOT.smd can be obtained from the ODOT [CADD Services](#) website.

Users are not permitted to edit ODOT.smd.

The OpenRoads Survey tools use an XML file that has been exported from the ODOT.smd file to facilitate mapping the survey data according to ODOT's CADD Standards. The ODOT\_SMD.xml file can be obtained from the ODOT [CADD Services](#) website.

## **211 Working Units**

### **211.1 General**

MicroStation lets you draw in "real world" units; feet, inches, meters, etc. These real world units are called working units. Working units are expressed as Master Units (the largest units in common use in a design file, such as feet) and fractional Sub Units (such as inches).

The default definition for a foot in MicroStation is the International Foot. The U.S. Survey Foot definition can be defined by use of a unit definition file. ODOT has developed a standard unit definition file, **ODOT\_Units.def**, to define the U.S. Survey Foot as the standard Master Unit. This file can be obtained from the ODOT [CADD Services](#) website. The active unit definition file is specified by the configuration variable *MS\_CUSTOMUNITDEF*.

MicroStation design files used in plan preparation shall use the following standard working units as defined in the ODOT seed files and in **ODOT\_Units.def**:

Unit Names	Label
Master Unit: Survey Feet	'
Sub Unit: Inches	"

The ODOT seed files have been defined with a standard resolution setting of 12000 per Survey Foot. This setting shall not be changed by the user.

ODOT's seed files are set up with the standard working units described above. Deviation from these working units is not permitted.

## **212 Global Origin**

### **212.1 General**

Elements in the design file are drawn by placing data points. Each data point placed in the design plane has associated X (easting), Y (northing) and Z (elevation, 3D files only) positions or coordinates. The design plane is simply a Cartesian coordinate system upon which your design model lies.

In the ODOT Seed files, the point called the **Global Origin** is set to the design plane's exact center (178,956.9707, 178,956.9707) and assigned the coordinates 0,0 (2D files) and 0,0,0 (3D files).

The **Global Origin** is defined in ODOT's Seed Files and should never be changed for ODOT projects.

## **213 Custom Applications**

### **213.1 General**

ODOT has written several programs to assist the user with specific CADD related functions. Each application can be accessed from the main menu bar under the **ODOT** pull-down menu. The ODOT pull-down menu has been configured to group the applications logically.

A detailed list of applications including documentation is available on the ODOT [CADD Services](#) website for download.

ODOT's pull-down menu for applications is defined in a MicroStation DGN Library, **ODOT\_Menu.dgnlib**, which can be obtained from the ODOT **CADD Services** website. The DGN library is attached by use of the MicroStation configuration variable *MS\_DGNLIBLIST*.

## **214 GEOPAK Criteria Files**

### **214.1 General**

Criteria files are ASCII text files written in the GEOPAK Criteria language. Criteria files are primarily used to draw proposed cross section graphics in a MicroStation design file.

Three Port Criteria (3PC) commands can be used to extend the processing capabilities of GEOPAK Criteria to draw MicroStation elements in a plan, or profile, design file in addition to the cross section design file. For ODOT purposes, criteria files that are processed from the GEOPAK Design and Computation Manager to draw plan or profile information are referred to as "3PC files". Criteria files that are processed from cross section mode are referred to as "criteria files" even though the cross section criteria file may contain 3PC commands to draw elements in the Plan or Profile design files.

**NOTE:** ODOT's Criteria Files are provided as-is. Changes and revisions to ODOT's criteria files are no longer supported.

### **214.2 Cross Section Criteria Files**

ODOT has developed a set of criteria files to assist the user with the drawing and detailing of the proposed cross sections. These criteria files are available on the ODOT [CADD Services](#) website.

The ODOT cross sections criteria files have been developed according to the standards defined in the [Location and Design Manual, Volume 1 - Roadway Design](#). These criteria files are provided as a convenience to the user and are not intended to draw all aspects of every cross section correctly. The designer must take care to review the results and make any modifications necessary to the cross section graphics to ensure compliance with ODOT design standards.

Cross Section Criteria files shall have an .x file extension.

Users are permitted to copy and modify the criteria files as necessary to achieve the desired results. Modified criteria files should be renamed to avoid confusion with the ODOT standard criteria files. All new or modified criteria files shall be submitted to ODOT with the completed project data. Refer to ODOT's [Guidelines for Electronic Design Deliverables](#) for more information.

As a standard practice, users should copy all cross section criteria files used on the project to the project's \Design\geopak\criteria sub-directory. See [Section 302 - Project Directory Structure](#) for information on project directories.

## 214.3 3 PC Criteria Files

ODOT has developed various 3PC applications, which are used in conjunction with the GEOPAK Design and Computation Manager. These applications can be obtained from the ODOT [CADD Services](#) website.

Three Port Criteria files run from the GEOPAK Design and Computation Manager shall have a .3pc file extension.

The configuration variable GPK\_DC\_3PCDIR is used to specify the directory location containing the 3PC applications.

Users are permitted to copy and modify the 3PC criteria files as necessary to achieve the desired results. Modified 3PC criteria files should be renamed to avoid confusion with the ODOT standard criteria files. All new or modified criteria files shall be submitted to ODOT with the completed project data.

As a standard practice, users should store new or modified 3PC criteria files in the project's \Design\geopak\criteria\3pc sub-directory. See [Section 302 - Project Directory Structure](#) for information on project directories.

## 214.4 Cross Section Input Files

Cross sections can be processed in GEOPAK through a dialog box interface by use of the GEOPAK Project Manager, or by an ASCII input file.

All cross section input files used on the project shall be submitted to ODOT. Refer to ODOT's [Guidelines for Electronic Design Deliverables](#) for more information. Input files shall be stored in the project's \Design\geopak\input sub-directory.

Cross Section input files shall use relative paths where applicable.

## 215 OpenRoads Standards

### 215.1 General

The ODOTcadd Standards include several new standard files defined for use with Bentley's OpenRoads technology.

### 215.2 DGN Libraries

Several MicroStation DGN Libraries have been configured within the ODOTcadd workspace, for use with Bentley's OpenRoads Technology, as detailed below.

#### **ODOT\_DesignProjectSettings.dgnlib**

This DGN Library contains default settings for the OpenRoads Civil Standards. The settings can be reviewed from the MicroStation **Project Explorer** by selecting **Civil Standards > Project Settings**. Two groups of settings are defined by this DGN Library: **Corridor Design Stages** and **Linear Template Design Stages**. This file is included by use of the MicroStation Configuration Variable *CIVIL\_PROJECTSETTINGSDGNLIBLIST*.

**ODOT\_DesignStandards.dgnlib**

This DGN Library defines the Design Standards for Horizontal and Vertical alignments according to various standards defined in the [Location and Design Manual, Volume 1 - Roadway Design](#). The settings can be reviewed from the MicroStation **Project Manager** by selecting **Civil Standards > Design Standards > Vertical** or **Civil Standards > Design Standards > Horizontal**. This file is included by use of the MicroStation Configuration Variable *CIVIL\_DESIGNSTANDARDSDGNLIBLIST*.

**ODOT\_Features\_Design.dgnlib**

This DGN Library defines OpenRoads Features for design as well as the MicroStation Element Templates. The Element Templates are included in the ODOTcadd configuration by use of the variable *MS\_DGNLIBLIST*. The OpenRoads Features are included in the ODOTcadd configuration by use of the variable *CIVIL\_CONTENTMANAGEMENTDGNLIBLIST*.

**ODOT\_Features\_Survey.dgnlib**

This DGN Library is used for multiple purposes. The file defines the OpenRoads Survey field codes which in turn use the file ODOT\_SMD.xml to define the various parameters for each feature code. The DGN Library also defines Features for Terrain Model visualization. The OpenRoads Features are included in the ODOTcadd configuration by use of the variable *CIVIL\_CONTENTMANAGEMENTDGNLIBLIST*.

The DGN Library also defines the default Survey Settings for OpenRoads. These settings can be reviewed from the MicroStation **Project Explorer** by selecting **Civil Standards > Project Settings > Survey > Settings**. The configuration variable *CIVIL\_PROJECTSETTINGSDGNLIBLIST* is used to include these settings in the ODOTcadd workspace.

## 215.3 Template Libraries

Bentley's OpenRoads technology uses Templates to define the cross sections of the proposed roadway. These templates are applied to a design corridor to create a 3-dimensional model of the proposed design. ODOT provides a template library, **ODOTcadd\_Templates.itl**, with several cross section components that can be used as a starting point to design the typical sections for the proposed roadway corridor.

ODOTcadd\_Templates.itl is located in the following folder:

`\\ODOTcadd\Standards\Geopak\Road\templates`

The normal practice is to copy the template library from the standards to the `\\Design\Geopak` folder for each project. The copied template library should be renamed as follows:

`nnnnnn_Templates.itl`

Where:

`nnnnnn` = The five (5) or six (6) digit PID number for the project.

The template library can be included in the configuration by use if the MicroStation Configuration Variable *CIVIL\_ROADWAY\_TEMPLATE\_LIBRARY*; however this variable is undefined in the ODOTcadd workspace since the Template library will be unique for each project. The MicroStation Project Configuration File (PCF) is used to define project specific variables. See [Section 302.2 - Project Configuration Files](#).

## **300 FILE MANAGEMENT**

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### **301 General**

#### **301.1 General**

File management refers to how documents are organized and stored. Its primary purpose is to provide a safe repository for information and to minimize the possibility of that information being lost.

This section documents changes to ODOT's File Management standards to be used with projects started after January 16, 2015, using MicroStation and GEOPAK (SELECTseries 4) or greater, and using the "ODOTcadd" standards.

Projects started prior to January 16, 2015 should be completed using the file management standards defined for ODOTstd\V8istd.

The January 16, 2015 update represents the last update to ODOT's legacy ODOTstd CADD Standards.

### **302 Project Directory Structure and Project Configuration Files**

#### **302.1 Standard Directory Structure**

A standard project directory shall be used to house all project related data for the various workflows involved in the project development process throughout the lifecycle of the project.

Alphanumeric characters, a dash "-", an underscore "\_", or a period "." are the only characters permitted in folder names. No other special characters, or spaces, are permitted in any folder name.

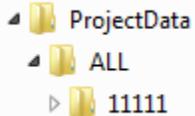
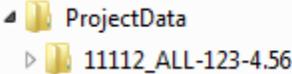
A standard project directory structure for projects started after January 16, 2015, using the ODOTcadd Standards, shall consist of a main directory on the server named "ProjectData".

Under the ProjectData directory, an optional sub-directory may be created with the three (3)-letter character of the County (County codes are defined in the [Location and Design Manual, Volume 3, Section 1302.2.2.1](#)) in order to separate the projects by County if desired.

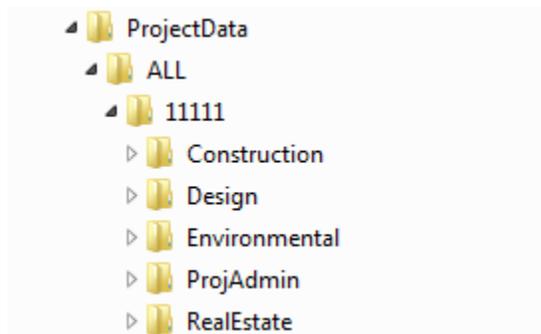
Under the optional County sub-directory, or directly under the ProjectData folder, a sub-directory will be created using the five (5) digit ODOT Project Identification Number (PID) and will contain all project related information. The PID number folder is considered the primary folder for the project.

An optional 15-character supplemental description may be added to the PID number if desired, separated from the PID number by an underscore "\_" character. The supplemental description is intended to assist users in finding the project data when the PID number is not known. Typically, the description is used to identify the primary county route and section of the plan as identified on the Title sheet. Alphanumeric characters, a dash "-", an underscore "\_", or a period "." are the only characters permitted in the supplemental description. No other special characters or spaces are permitted in any folder name.

Each ODOT District office or consulting firm should be consistent with use of the optional County sub-directory. For example, do not mix and match folder structures with some projects placing the PID folder under the County folder and some projects placing the PID folder directly under the ProjectData folder.

Example using a County sub-directory	Example with an optional description and without a County sub-directory
	

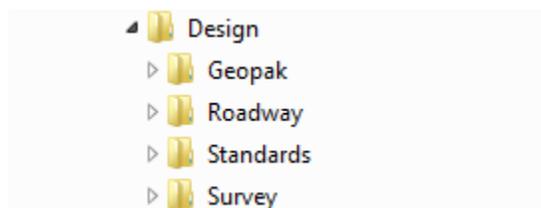
Beneath the PID number folder, five sub-folders are defined representing various workflow processes for the project. The following folders are defined:



### 302.1.1 The Design folder

The Design folder is used to house all project related data used for the generation of the construction plans for the project, from planning to final design.

Multiple discipline-specific sub-directories may be used to separate the roadway design information into separate folders. For small projects, a minimum of two folders are required under the Design folder; Roadway, and Standards. If the project includes field survey work, a Survey sub-directory shall be used for that information. GEOPAK related files shall be stored in the Geopak sub-directory.



For larger projects involving multiple design teams, it is sometimes desirable to use an expanded directory structure to split the roadway design information into separate discipline specific sub-directories. This expanded folder structure will allow each design team to set file permissions to restrict access to their data, as needed.

The discipline sub-directories will be defined for the division of work by ownership, not necessarily the type of work. As files are developed by the various disciplines, they should generally be placed into the project sub-directories corresponding to the creator of the work. For example, Roadway design would typically place their files under the Roadway sub-directory, Surveyors would place their files under the Survey sub-directory, and so forth.

In design, there may be instances where one discipline's work overlaps with another. If a particular discipline requires information from another discipline, or shares files with multiple disciplines, the

needed files should be referenced from the original directory and not copied (see [Section 303 - References](#)).

The Roadway folder is considered the default folder for the project if a discipline specific folder is not defined. For example, if a designer develops the drainage sheets for a project where discipline specific folders have not been defined, by default, the files produced would go in the Roadway sub-directory. However, if so desired, the designer has the ability to create a Drainage sub-directory and move the files there at a later time. In making the determination of which discipline's sub-directory the file should be placed, the designer must use common sense.

In some cases, it will be advantageous to create non-standard directories for additional separation of work. This is common when multiple parties work on a single discipline design and the data must be managed and merged. These additional directories can be created under the discipline specific subdirectories to accommodate such circumstances. Do not create these subdirectories at the same level as the standard discipline subdirectories.

<b>Figure 302-1.1 Design Directory Structure</b>		
	<b>Notes:</b>	
	Drainage	Optional folder for drainage design. See Figure 302-1.2 for sub-directories.
	Geopak**	Parent folder for all GEOPAK specific files. See Figure 302-1.3 for sub-directories.
	Geotechnical	Optional folder for geotechnical information. See Figure 302-1.2 for sub-directories.
	Landscape	Optional folder for landscape. See Figure 302-1.2 for sub-directories.
	Lighting	Optional folder for lighting. See Figure 302-1.2 for sub-directories.
	MOT	Optional folder for maintenance of traffic. See Figure 302-1.2 for sub-directories.
	Roadway*	Required Folder for Roadway Design information. See Figure 302-1.2 fir sub-directories.
	RW	Optional Folder for projects with Right-of-Way Acquisition See Figure 302-1.4 for sub-directories.
	Signals	Optional folder for signals. See Figure 302-1.2 for sub-directories.
	Standards*	Parent folder for project specific standards used during project development. See Figure 302-1.7 for sub-directories.
	Structures	Optional folder for bridge and wall design. Required for projects with work on more than one bridge or wall. See Figure 302-1.5 for sub-directories.
	Survey***	Parent folder for survey information. See Figure 302-1.6 for sub-directories.
	Traffic	Optional folder for traffic control. See Figure 302-1.2 for sub-directories.
	Utilities	Optional folder for utility information. See Figure 302-1.2 for sub-directories.
	* Required Folder for all projects ** Required folder if GEOPAK is utilized for design or survey *** Required folder is survey related field work is preformed	

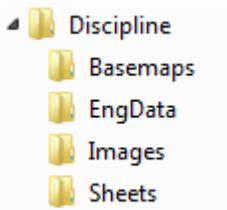
Figure 302-1.2 Design\Discipline Specific Sub-Directories		
	<b>Notes:</b>	
	Discipline	Where Discipline = the following sub-directories: Drainage, Geotechnical, Landscape, Lighting, MOT, Roadway, Signals, Traffic, Utilities.
	Basemaps	Basemap design files for the discipline.
	EngData	Design documents, spreadsheets, or application data.
	Images	Any digital or scanned images.
	Sheets	Plan sheet MicroStation design files for the discipline.

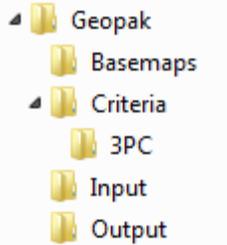
Figure 302-1.3 Design\GEOPAK Sub-Directories		
	<b>Notes:</b> The GEOPAK Project Manager creates additional sub-directories as required by the software.	
	Geopak	GEOPAK related files including the .gpk and .prj files
	Basemaps	OpenRoads Civil Geometry basemap design files
	Criteria	Custom criteria files used for the project.
	3pc	Customized three port criteria files used for the project.
	Input	COGO input files.
	Output	COGO output files.

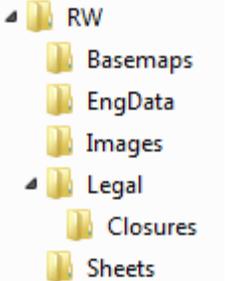
Figure 302-1.4 Design\RW Sub-Directories		
	<b>Notes:</b>	
	Basemaps	Right-of-Way basemap design files.
	EngData	Design documents, spreadsheets, or application data.
	Images	Any digital or scanned images.
	Legal	Legal descriptions for all property takes.
	Closures	Survey closures for all the property takes.
	Sheets	Plan sheet MicroStation design files.

Figure 302-1.5 Design\Structures Sub-Directories															
	<p><b>Notes:</b></p> <p>The use of the Structures folder is optional. For smaller projects with minimal bridge or wall work on only one bridge or wall, and where the designer will be preparing the plan details, bridge and wall design data may be stored in the Roadway folders.</p> <p>For larger projects involving more than one bridge or wall, a separate Structures folder is required with sub-directories for each bridge and wall.</p>														
	<table border="1"> <tr> <td>AAA000_1111S</td> <td>Parent folder for bridge data, where: AAA = 3 character county code 000 = 3 digit Route number 1111 = 4 digit SLM of the structure without the decimal point. S = 1 digit code (For twin structures: L for Left, R for Right. C for collector/distributor roads or twin structures combined in the same directory, P for Ramps.)</td> </tr> <tr> <td>Wall_111</td> <td>Parent folder for wall data, where: 111 = 3 alphanumeric character wall number</td> </tr> <tr> <td>Basemaps</td> <td>All bridge related basemap design files.</td> </tr> <tr> <td>EngData</td> <td>Design documents, spreadsheets, or application data.</td> </tr> <tr> <td>Images</td> <td>Any digital or scanned images.</td> </tr> <tr> <td>Sheets</td> <td>All structure related plan sheet design files.</td> </tr> <tr> <td></td> <td></td> </tr> </table>	AAA000_1111S	Parent folder for bridge data, where: AAA = 3 character county code 000 = 3 digit Route number 1111 = 4 digit SLM of the structure without the decimal point. S = 1 digit code (For twin structures: L for Left, R for Right. C for collector/distributor roads or twin structures combined in the same directory, P for Ramps.)	Wall_111	Parent folder for wall data, where: 111 = 3 alphanumeric character wall number	Basemaps	All bridge related basemap design files.	EngData	Design documents, spreadsheets, or application data.	Images	Any digital or scanned images.	Sheets	All structure related plan sheet design files.		
	AAA000_1111S	Parent folder for bridge data, where: AAA = 3 character county code 000 = 3 digit Route number 1111 = 4 digit SLM of the structure without the decimal point. S = 1 digit code (For twin structures: L for Left, R for Right. C for collector/distributor roads or twin structures combined in the same directory, P for Ramps.)													
	Wall_111	Parent folder for wall data, where: 111 = 3 alphanumeric character wall number													
	Basemaps	All bridge related basemap design files.													
	EngData	Design documents, spreadsheets, or application data.													
	Images	Any digital or scanned images.													
	Sheets	All structure related plan sheet design files.													

Figure 302-1.6 Design\Survey Sub-Directories																					
	<p><b>Notes:</b></p>																				
	<table border="1"> <tr> <td>Aerial</td> <td>Aerial mapping design files and images</td> </tr> <tr> <td>Basemaps</td> <td>Basemap design files.</td> </tr> <tr> <td>Docs</td> <td>Documents, letters, memos, etc...</td> </tr> <tr> <td>EngData</td> <td>Design documents, spreadsheets, or application data.</td> </tr> <tr> <td>GCS</td> <td>Custom MicroStation Geographic Coordinate System Definitions</td> </tr> <tr> <td>GPS</td> <td>GPS data</td> </tr> <tr> <td>Images</td> <td>Scanned images.</td> </tr> <tr> <td>RawData</td> <td>Raw survey data.</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	Aerial	Aerial mapping design files and images	Basemaps	Basemap design files.	Docs	Documents, letters, memos, etc...	EngData	Design documents, spreadsheets, or application data.	GCS	Custom MicroStation Geographic Coordinate System Definitions	GPS	GPS data	Images	Scanned images.	RawData	Raw survey data.				
	Aerial	Aerial mapping design files and images																			
	Basemaps	Basemap design files.																			
	Docs	Documents, letters, memos, etc...																			
	EngData	Design documents, spreadsheets, or application data.																			
	GCS	Custom MicroStation Geographic Coordinate System Definitions																			
	GPS	GPS data																			
	Images	Scanned images.																			
	RawData	Raw survey data.																			

Figure 302-1.7 Design\Standards Sub-Directories		
	<p><b>Notes:</b> This sub-directory is primarily used for project archiving and electronic submission. During project development, ODOT users should always reference all CADD Standards from the main CADD Standards directory. Project specific standards, such as seed files, plot drivers, etc. shall be stored in the Standards folder.</p>	
	cell	Cell Libraries
	config	Configuration files
	ctb	Color Tables
	dgnlib	DGN Libraries
	macros	MicroStation Basic Macros
	mdlapps	MDL Applications
	office	Standard template for the project index file
	plotdrv	Plot drivers
	seed	Seed files
	symb	Symbology .rsc files
	tables	Pen tables
	vba	Visual Basic Applications

## 302.2 Project Configuration Files

### 302.2.1 Project Configuration File Name

MicroStation Project Configuration Files (PCF) are used to define configuration variables that require a unique value for a specific ODOT project. With the release of the January 2015 CADD Standards, ODOT began using a PCF file for each project started with the ODOTcadd standards.

PCF files shall be housed in a folder named “ProjectPCF”. This folder is typically located on the same shared network drive as the “ProjectData” folder described in [Section 302.1 - Standard Directory Structure](#).

PCF files shall be named using the following convention:

*XXX\_nnnnnn\_description.pcf*

Where:

- XXX = An optional the three letter county code as defined in the [Location and Design Manual, Volume 3, Section 1302.2.2.1](#))
- nnnnnn = The five (5) of six (6) digit PID number for the project.
- description = An optional description, 15 characters maximum.

An optional description may be added to the PCF file name similar to the optional description that is permitted for the project’s PID folder name. If a description is included, it shall be separated from the PID number by an underscore “\_” character and may consist of alphanumeric characters, a dash “-”, an underscore “\_”, or a period “.” character. The description is intended to be used to identify the primary County, Route, and Section of the plan as identified on the title sheet and should match the description used for the project folder name.

Example PCF file name with optional description: 111111\_AAA-111-12.34

### 302.2.2 Project Configuration File Content

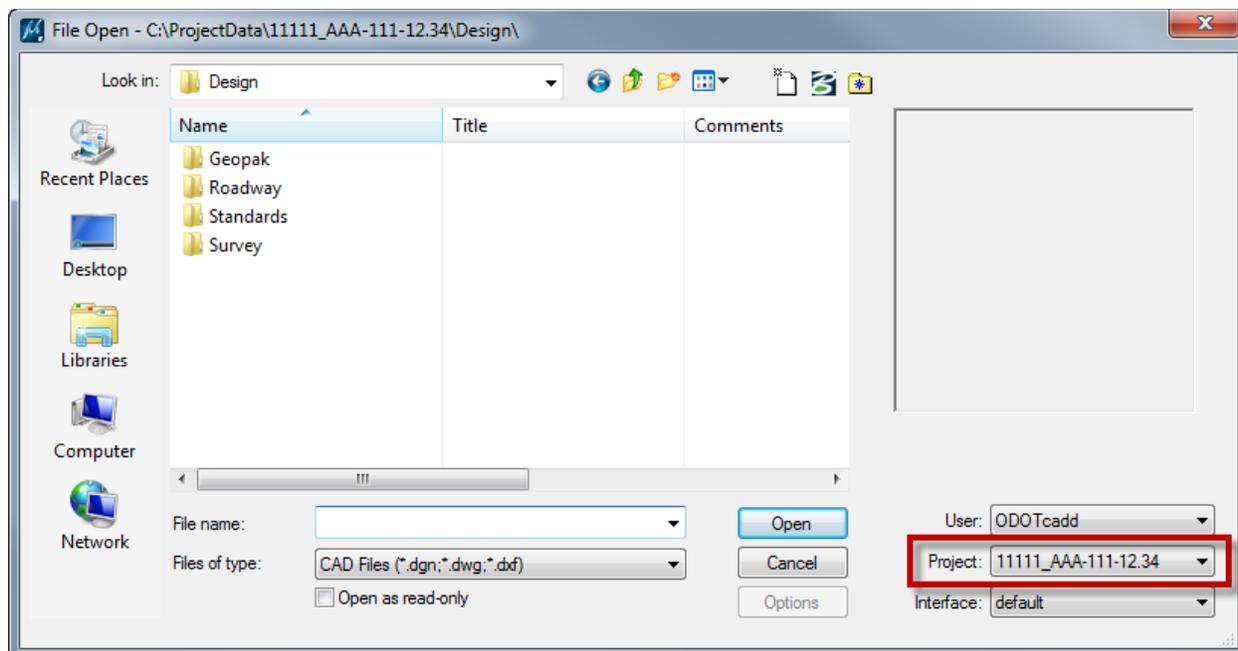
The content of the PCF file will vary for each individual project. An example of a typical PCF file is shown below:

```
_USTN_PROJECTDESCR = ODOT Project 111111_AAA-111-12.34 #Project Description
_USTN_PROJECTDATA = C:/ProjectData/111111_AAA-111-12.34/Design/
ODOT_PROJECTROOT = $(ODOT_PROJECT)
ODOT_PID = 11111
#-----
MS_DEF = $_USTN_PROJECTDATA) #Project Location Start
MS_BACKUP = $_DGNDIR) #Backup to same location as dgn
MS_SEEDFILES = $_USTN_PROJECTDATA)Standards/seed/ # Search Directory for Project Specific Seed files.
MS_GEOCOORDINATE_USERLIBRARIES = $_USTN_PROJECTDATA)Survey/GCS/111111_Custom.dty
CIVIL_ROADWAY_TEMPLATE_LIBRARY = $_USTN_PROJECTDATA)Geopak/111111_Templates.itl
MS_PRINTDEF_PATH = $_USTN_PROJECTDATA)Standards/plotdrv/
MS_PLTFILES = $(ODOT_PROJECTROOT)ProjectAdmin/PlanPackage/ # Output Directory for Print Files.
MS_REF_DEFAULTATTACHDIRECTORY = $_USTN_PROJECTDATA) # Set the default directory when attaching references
instead of the last directory

%lock MS_PLTFILES
%lock MS_SEEDFILES
%lock MS_DESIGNSEED
%lock MS_GEOCOORDINATE_USERLIBRARIES
%lock CIVIL_ROADWAY_TEMPLATE_LIBRARY
#-----
```

### 302.2.3 Using Project Configuration Files

With the use of PCF files, users should always access MicroStation via the Windows Start Menu in order to select the appropriate Project, as shown in the example below. **Note:** Double-clicking the file name in Windows Explorer will access the last project that was selected.



### 302.3 ODOTcadd\_CreateNewProject.exe

ODOT provides a custom program, **ODOTcadd\_CreateNewProject.exe** that can be used to create the project directories and the PCF file for the project. This program is available on the ODOT CADD Standards website.

## 303 References

### 303.1 General

References are used to display the contents of one or more MicroStation design files within the active design file.

The most common use of references is to display **Basemap** design file information (See [Section 303.3 - Basemap Design Files](#)) in a **Sheet** design file (See [Section 303.4 - Sheet Design Files](#)) to generate the various plan sheets used by a typical ODOT roadway project.

References are also used to display the contents of one basemap design file in another basemap design file to facilitate the design process (i.e. display the existing survey data in the proposed right-of-way basemap).

### 303.2 Models

A **Model** is a 2 or 3 dimensional drawing area that is stored in a design file. A single design file can contain multiple models, which means you can have multiple, independent, drawing areas in a single design file. Each model has its own set of view parameters, working units, reference attachments, etc.; however all models within the same design file share the same Color Table and Background Colors. Users can only edit one model at a time in a design file.

To manage the model's properties in a DGN file open the **Models** dialog box. This dialog box contains tools that not only allows the user to edit the model's properties but also allows the user to create, copy, import, delete and open specific models in the DGN file.

The Models dialog box can be accessed several ways:

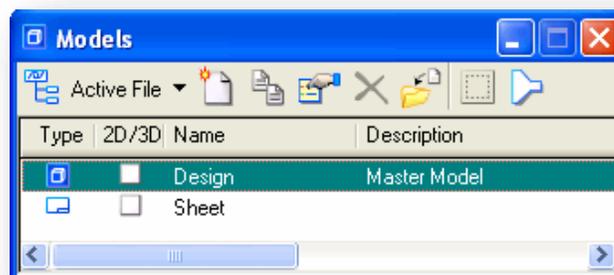
Key in: **model manager**

or

Select **File > Models** from the Main Menu bar.

or

Select the **Models** icon in the Primary Tools box.



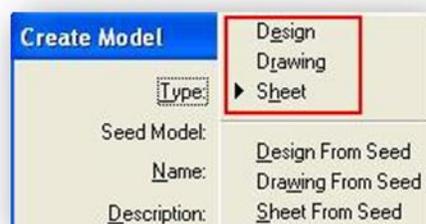
The **Models** dialog box contains various tools that allow the user to work with models. See the MicroStation documentation for complete information. Only items specific to the ODOTcadd Standards are discussed here.

Double-clicking a **Model** within the dialog box makes the model active. Alternatively, you can use the **View Groups** window to rapidly switch between models visited in the current design session as shown below:



### 303.2.1 Types of Models

Different types of models are available in MicroStation. The model types are **Design**, **Drawing** and **Sheet**. The **Design** and **Sheet** models are used by ODOT for creating all new models. ODOT does not currently use the Drawing model.



- **Design** - model is used for creating design geometry that can be either 2D or 3D. All basemap information shall be drawn in the default design model. See [Section 303.3 - Basemap Design Files](#) for more detailed information.
- **Drawing** - model serves as a Drawing Area for centralizing annotations that need to be shared across multiple sheets. A drawing model is always a 2D model. *ODOT does not use the Drawing model at this time.*
- **Sheet** - model is used to assemble the plan sheets that are used for plotting a set of plans that can be either 2D or 3D. Sheet border cells and annotations are placed in the Sheet model. See [Section 303.4 - Sheet Design Files](#) for more detailed information.

### 303.2.2 Model Names

When creating a new design file using one of ODOT's seed files, a Design and Sheet models are already created for your use, as follows:

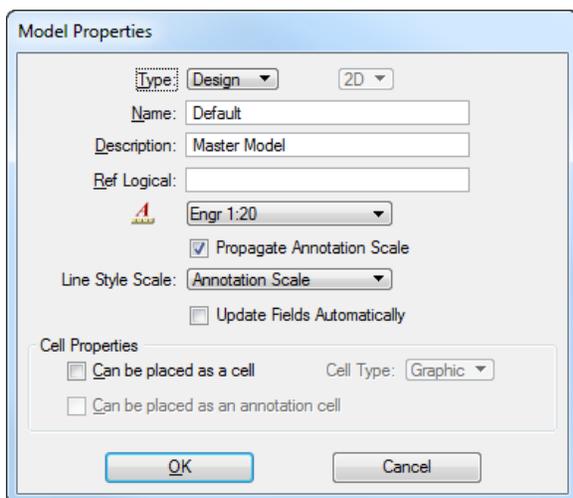
ODOT has a recommended standard for naming models when developing a set of plans. ODOT Applications utilize the Model name "Sheet" except for cross sections. The GEOPAK Cross Section attachment options do not provide the capability to generate each cross section sheet in a separate design file, see the ODOT [GEOPAK V8i SELECTseries 1, Road 2, Training Guide - Chapter 10](#) for details. The model name "**\*Sheet\***" as provided by ODOT's seed files is utilized by ODOT's plotting software.

Therefore, it is strongly recommended not to change the model names in the design files since the programs and or software are dependent on the model names. Any name changes to the models could prevent the application(s) from working properly.

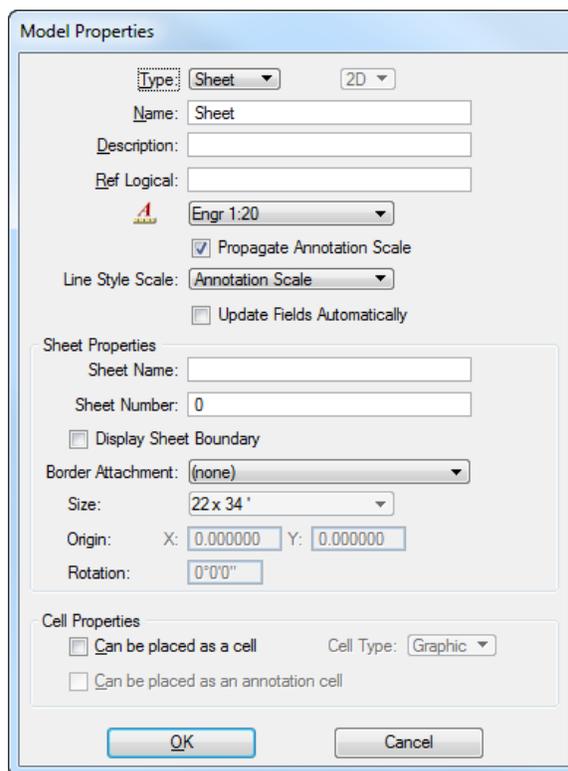
For detailed information on how models are set up for Plan and Profile sheets and Cross Section Sheets see the ODOT GEOPAK V8i Road 1 and 2 Training Guides.

### 303.2.3 Model Properties

You can review or edit properties of a model in the open design file by choosing the **Edit Model Properties** icon on the **Models** dialog box. The model properties are different depending on what type of model is selected, Design, or Sheet, as shown below:



“Design” Model Properties



“Sheet” Model Properties

See the MicroStation documentation for complete information. The items specifically related to the ODOTcadd Standards are discussed here.

- **Type** - sets the model's type (Design or Sheet) and dimensionality (2D or 3D). See [Section 303.3 - Basemap Design Files](#), and [Section 303.4 - Sheet Design Files](#), for information on the use of Sheet and Design models.
- **Name** - is a text field to enter a name for the model. See [Section 303.2.2 - Model Names](#).
-  **Annotation Scale** - sets the scale for text, dimensions and cells in the model. You can select from the list of common scales used for ODOT plan sheets. When placing text, dimensions and cells the Annotation Lock in the tool settings window must be on to ensure that they are placed at the defined scale. The list of common scales is located from the ODOT\_Scales.def file located in the */ODOTcadd/Standards/data* directory.

- **Line Style Scale** - Lets you set the scale for custom line styles. For most ODOT sheet types the Line Style Scale is set to Annotation Scale.

#### Sheet Properties:

- **Sheet Name** - Lets you assign a name to the sheet model. ODOT's plot configuration files for a multi-page PDF plan submission use the Sheet Name that is assigned here as the bookmark name in the PDF file.
- **Sheet Number** - Lets you assign a sheet number to sheet models. This makes it easy to control the order of sheet models for presentation, printing, cataloging in a project, or generating PDFs. The Sheet Number field is strictly limited to integer values only.
- **Display Sheet Boundary** - If toggled on, a sheet element will display in the new sheet model. The Sheet Boundary option must be toggled on in order to use the Sheet Name and Sheet Number when generating a multi-page PDF document for the plan set using ODOT's plot configuration files.
- **Border Attachment** - When you associate a border attachment to a sheet model, any changes to the annotation scale for the sheet, automatically are propagated to the border attachment. The Border Attachment parameter is normally set to "None" for ODOT projects.
  - **Size** - sets the sheet size.
  - **Origin** - sets the origin of the sheet.
  - **Rotation** - sets the rotation angle of the sheet, measured in degrees counter-clockwise from the x-axis (horizontal).

#### 303.2.4 Referencing Models

When selecting a reference to attach, users must select the appropriate model, **Design** or **Sheet**, in a design file. A Design or Sheet model can be attached as a reference to the currently active model in the open design file or in other design files. See [Section 303.3 - Basemap Design Files](#) and [Section 303.4 - Sheet Design Files](#).

### 303.3 Basemap Design Files

Basemap design files are used to draw existing and proposed plan view information for the entire length of the project for both Roadway and Bridge projects. All basemap information shall be drawn in the default **Design** model. The location and dimensions of all plan view basemap design file information shall be drawn using real world dimensions at a 1:1 scale.

For Roadway projects, the most common basemap design files are as follows:

- One containing the existing information (typically from ground survey or Aerial mapping).
- A second containing the proposed roadway information.
- A third containing the proposed Right-of-Way information. Existing Right-of-Way information may be in the same file with the proposed Right-of-Way information.
- If OpenRoads Horizontal Geometry tools are used, these alignments are typically stored in their own basemap design file.

Plan view information may be separated into multiple discipline-specific basemap design files as listed below:

Allowable Plan View Basemap Files
Aerial mapping
Bridge
Drainage
Environmental
Existing Ground Survey
Geometry
Geotechnical
Landscaping
Lighting
Maintenance of Traffic
Proposed Roadway
Right-of-Way
Signals
Traffic Control
Utilities
Walls

If a bridge basemap is used, a separate basemap design file is required for each bridge on the project.

A basemap is also used for profiles and cross section graphics. Unlike plan view basemap files, profile and cross section basemap design files shall contain both the existing and proposed information in one file.

The profile basemap may be used to plot all the profiles for the entire project in one file. It is not necessary to create separate profile basemaps for each alignment in the project. Profiles should always be plotted in their own design file and never combined with any other basemap. After generating the profile basemap, do not delete the profile cell. The profile cell is placed on the level “GK\_Cells” as defined by the Configuration Variable *GPK\_LEVEL\_PROFILE\_CELL* and can be toggled on or off using the MicroStation Level Manager, if required. If the configuration variable is not defined, the profile cell is placed on the level “Default”.

A separate cross section basemap should be used for each alignment in the project. Cross sections for multiple alignments should never be plotted in the same cross section basemap. Cross sections should always be plotted in their own design file and never combined with any other basemap. After generating the cross sections, do not delete the cross section cells. Cross section cells are placed on the “GK\_Cells” level as defined by the Configuration Variable *GPK\_LEVEL\_XS\_CELL* and can be toggled on or off using the MicroStation Level Manager, if required. If the configuration variable is not defined, cross section cells are placed on the level Default.

When discipline specific sub-directories are used, as defined in [Section 302.1.1 - The Design Folder](#), all basemap design files shall be stored in the appropriate discipline specific basemaps sub-directory and shall not be copied into another sub-directory for editing or referencing. If discipline specific sub-directories are not used, the basemap design files shall be stored in the Roadway\basemaps folder.

See [Section 302.1 - Standard Directory Structure](#), for guidance on maintaining Survey Basemaps for Roadway and Bridge Projects.

Standard design file names for Basemaps are detailed in [Section 304.3 - File Name Format](#).

### 303.4 Sheet Design Files

Sheet design files are used to assemble the plan sheets that are used for plotting a set of plans. The Sheet design files are assembled by referencing Design models from the necessary basemap design files to the sheet model of the sheet file. Sheet border cells and annotation are typically placed in the sheet model.

For Roadway projects, including the Bridge site plan and Geotechnical Exploration sheets, when attaching basemap Design models to the Sheet models the user shall not scale, move, or rotate the basemap reference attachment. Basemap Design models shall be attached using the MicroStation **Coincident-World** setting. If a rotated plot view is required, the user shall rotate the sheet design file view for proper plot orientation. The sheet border cells shall be placed in the rotated view. All reference file clipping shall be done in the rotated view.

For Bridge sheets, a single design file may include both existing and proposed plan view information.

When developing Bridge profiles (including profiles for culverts greater than 10 feet in diameter or span), place the profile in a design model. Reference the profile from the Design model into the Sheet model (Site Plan or Culvert Detail sheet). All profile labeling shall be completed in the Sheet model.

Final plan sheets shall be in the Sheet Model. No items other than what is shown on the final plotted sheet are allowed to be shown in the Sheet Model. Any detail shown in the final plotted sheet shall be represented at a 1:1 scale in either the Design model or Sheet model of the corresponding file.

The purpose of having the existing details drafted, or referenced, at a 1:1 scale is to facilitate the electronic transmission of design data (via email or equivalent) without providing the entire project directory. If necessary, the designer can merge the referenced details within the design file.

Each plan sheet shall be contained within the Sheet Model. Only one plan sheet per model is permissible for all file types, including cross sections. Users may elect to create multiple sheet models in a sheet design file. Only sheets of a like type are permitted in a multi-model sheet design file. For example, it is not permissible to create a design file containing the title sheet in one model and the schematic plan in a second model. For multi-sheet design files, the first sheet model is named "Sheet" as defined in the ODOT seed files. Subsequent sheet models should be named consecutively; Sheet2, Sheet3, Sheet4, etc. The models in a multi-model cross section sheet design file generated by use of GEOPAK are named automatically by the software and start with a prefix of "XS\_SHEET\_".

When sheet design files are submitted to the Department, no other graphics are permitted in the Sheet model other than the graphics representing the final plotted sheet. All extra graphics used to generate the sheet, or old versions of the sheet, should be deleted or moved to a design model. No extra reference attachments that are not a part of the final sheet are permitted to be attached to the sheet model.

In order to ensure that reference file attachments are maintained when moving project files from the original project directory to another location, such as a CD for submission or to an archive directory, references shall be attached using relative paths. The user shall not use MicroStation or GEOPAK options to "Save Full Path" for reference attachments.

All completed sheet design files submitted to or exchanged with ODOT shall use references where applicable. It is not recommended that users copy referenced graphics into the sheet files for the completed sheet design files submitted to ODOT.

## **304 File Naming Conventions**

### **304.1 General**

The efficient sharing and transfer of information from consultants/contractors to ODOT and vice versa relies on the use of a systematic file naming convention. This section outlines a consistent, comprehensive file naming convention for graphic and associated files used in the CADD environment, which shall be used for all projects.

With such large quantities of data being created, it is essential that operators create their new files with names that signify the content of each. Therefore, each sheet of the plan shall be contained in its own separate design file.

Standard naming conventions shall be used for all design files, standard input files and GEOPAK criteria files. Document all file names, both standard and project specific, in the Project Index file (**For information on the Project Index File, see ODOT's [Guidelines for Electronic Deliverables](#)**). In the event a particular file type for the project is not addressed by this manual, use the file naming convention as a template for selecting an appropriate name or contact the **Office of CADD and Mapping Services' [CADD Services](#)** section for assistance.

In order to avoid conflicting attachments of reference files, there shall be no duplicate file names within the project directory structure or copies of the same file within the project directory. It is not permissible to copy the same basemap design files into multiple discipline specific sub-directories.

### **304.2 File Extensions**

Standard file name extensions for information submitted to, or exchanged with, ODOT shall be as follows:

<b>File Type</b>	<b>Extension</b>
MicroStation design files	.dgn
MicroStation cell libraries	.cel
MicroStation/GEOPAK Resource file	.rsc
GEOPAK Criteria files	.x
GEOPAK Cross Section Input files	.inp
GEOPAK GPK Files	.gpk
GEOPAK Triangle Models	.tin
Postscript Sheet Image Files	.ps
Adobe Acrobat Files	.pdf
Microsoft Word Documents	.doc or .docx
Microsoft Excel Spreadsheets	.xls or .xlsx
Microsoft Project files	.mpp
XML files	.xml

For file types not listed above, the default file extension defined by the software shall be used.

### 304.3 File Name Format

ODOT has defined the following naming convention to be used on all design files submitted to, or exchanged with the Department.

It is not permissible to use special characters (i.e. @, #, -, >, +, %, etc.), spaces, or decimal points in file names.

Standard Plan Insert sheets shall retain the name designated by the issuing office.

#### Standard Design File Naming Format

nnnnnn\_aa###.dgn

- nnnnnn = Five (5) or Six (6) digit PID Number
- aa = Two (2) letter code identifying the plan sheet type (see Figure 304-1 File Name Type Codes)
- ### = Three (3) digit number identifying the number of drawings of the same type. The three digit number is required even if there is only one drawing of a particular type in the plan set.

#### Examples:

123456\_BE001.dgn  
123456\_GP005.dgn

Bridge and wall design files have unique file naming requirements, as detailed below:

For smaller projects with work on only one bridge or wall, the designer may elect to house the bridge and wall files in the Roadway\basemaps and Roadway\sheets folders. In this case, the file names for the bridge and wall files will use the Standards Design File Naming Format detailed above.

For projects involving bridge or wall work on more than one bridge or wall, the bridge and wall files for each bridge or wall are stored in their own folder, as detailed in [Section 302.1.1 - The Design Folder](#). In this case, the bridge and wall files are named as detailed below:

#### Bridge Design File Naming Format

rrr\_nnnns\_aa###.dgn

- rrr = Three (3) digit route number
- nnnn = Four (4) digit SLM of the structure, without the decimal point.
- s = One (1) digit code followed by an underscore (For twin structures: L for Left, R for Right. C for collector/distributor roads or twin structures combined in the same directory, P for Ramps.)
- aa = Two (2) digit Bridge plan sheet type (see Figure 304-1 - File Name Type Codes)
- ### = Three (3) digit number identifying the number of drawings of the same type. The three digit number is required even if there is only one drawing of a particular type in the plan set.

#### Examples:

071\_0546L\_PI002.dgn  
071\_0546R\_SP001.dgn

**Wall Design File Naming Format**

nnnnnn\_yyy\_aa###.dgn

- nnnnnn = Five (5) or Six (6) digit PID Number
- yyy = Three (3) digit wall number followed by an underscore (three digits required and maximum).
- aa = Two (2) digit wall plan sheet type (see Figure 304-1 File Name Type Codes)
- ### = Three (3) digit number identifying the number of drawings of the same type. The three digit number is required even if there is only one drawing of a particular type in the plan set.

**Examples:**

123456\_001\_WP005.dgn

123456\_001\_WS001.dgn

**304.4 Supplemental Description Guidelines**

ODOT allows users to provide supplemental description information by use of MicroStation’s File Properties. The intent of the supplemental description is to provide additional descriptive information to aid the designer in identifying a particular file.

The following properties are available in a MicroStation Design File: Title, Subject, Client, Keywords, and Comments.

For ODOT projects, the following properties shall be used for design files submitted to or exchanged with the Department:

**Title**

The Title property can be used to specify the file type description. If used, the description shall correspond to the file descriptions for each file type shown in **Figure 304-1 - File Name Type Codes**, prefixed with the Discipline name (see the examples on the following page).

**Comments**

The Comments property can be used to provide additional descriptive information to aid the designer in identifying a particular file. Comments are user definable with the following guidelines:

For Roadway design files the comment should start with the route name/number, where applicable, using the route name as follows:

<b>IR###</b>	Interstate route with three digit number, e.g. IR071 for Interstate route 71.
<b>US###</b>	United State route with three digit number, e.g. US033 for US route 33.
<b>SR###</b>	State route with three digit number, e.g. SR315 for State route 315.
<b>CR###</b>	County Road with three digit number, e.g. CR056 for County road 56.
<b>RAMP###</b>	Ramp with up to three character name/number, e.g. RAMP2S for ramp 2-S.
<b>ROADNAME</b>	Road name, e.g. Paris for Paris road. Note, directions (N, S, E, W) can be used on projects where plans exist for two different directions of the same roadway, e.g. Paris N for Paris road north.

Following the route name/number, the Comment property can contain additional information to help identify the specific sheet of the plan.

For Bridge design files, a brief description of the plan sheet contents should be included.

Supplemental Description Examples:

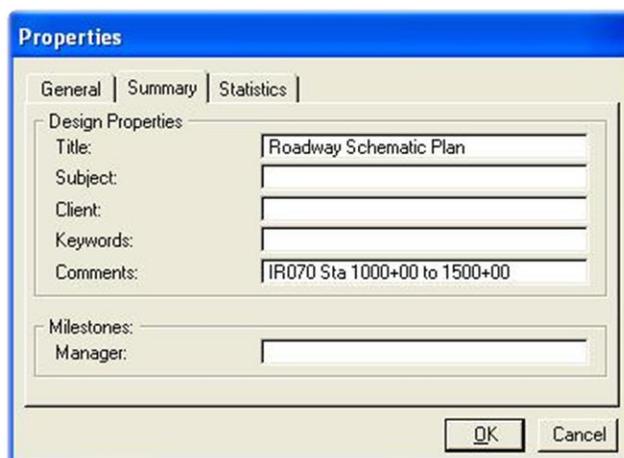
File Name	Title Property	Comments
123456_GP001.dgn	Roadway Plan & Profile or Plan	IR071 Sta 50+00 to 60+00
123456_MH002.dgn	MOT Phase Details	TR123 Phase 2
123456_BP005.dgn	Basemap Proposed Roadway	SR185
070_1234L_BS003.dgn	Basemap Bridge	Alternate C
070_1234L_SD001.dgn	Superstructure Details	Framing Plan
070_1234L_SD002.dgn	Superstructure Details	Camber/Deflection

Supplemental descriptions are optional and may be used at the designer's discretion.

### 304.5 Assigning Supplemental Descriptions

Supplemental descriptions can be assigned in one of two ways:

1. Assigning properties in MicroStation. Select **File > Properties** to access the Properties dialog shown below. Select the Summary tab to assign the Title and Comments properties.
2. ODOT provides a Visual Basic application, **ODOT\_Files.mvba**, to create files using the ODOT file naming conventions detailed in this manual. The program will automatically assign the Title property. A key-in field is provided to enter the comments for each file created by the program. See the [ODOT CADD Services](#) website for more information.



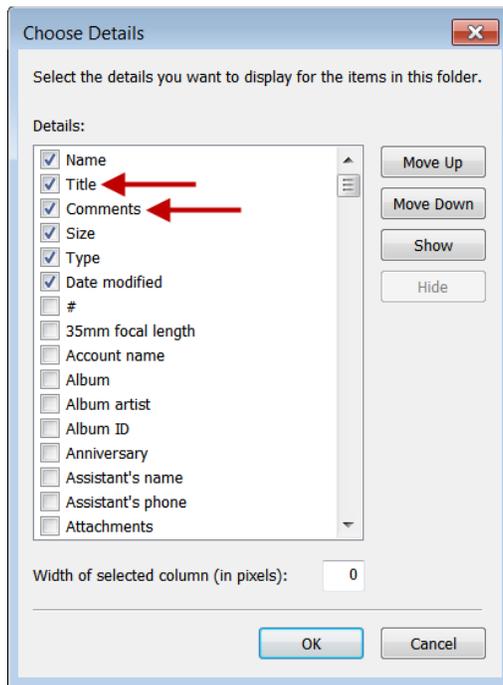
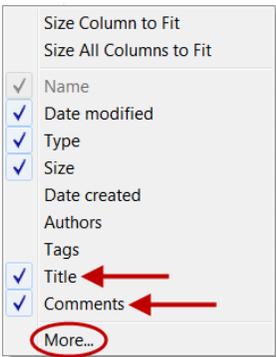
### 304.6 Viewing Supplemental Descriptions

Supplemental description information assigned to the file properties can be viewed in Windows Explorer, and in MicroStation file open dialog boxes.

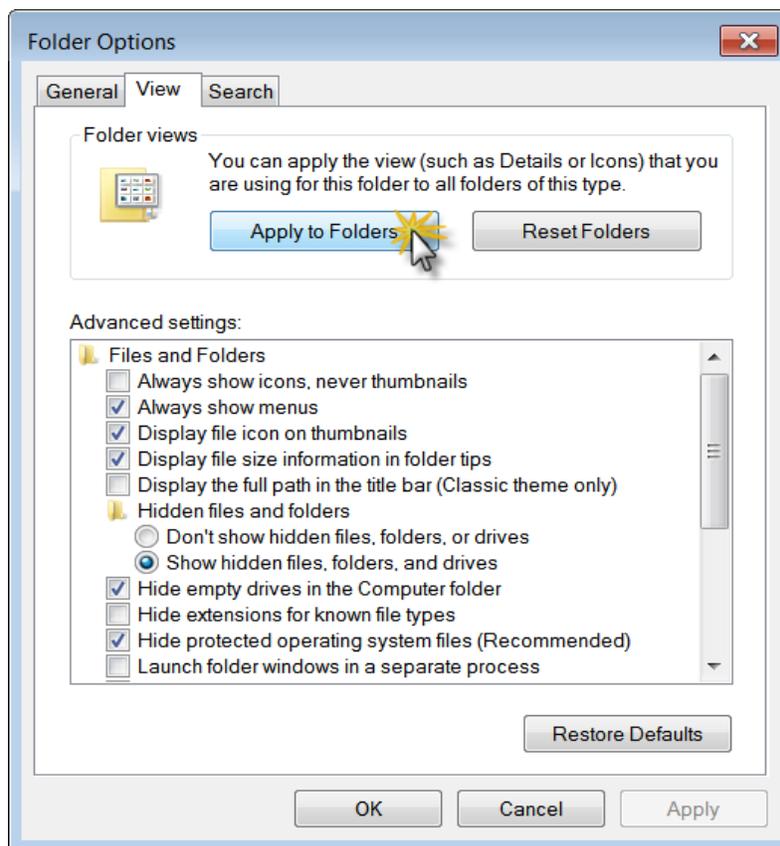
To view the information in Windows Explorer on Windows 7 systems take the following steps:

1. From the **View** pull-down menu, select **Details**
2. Right-click on the column header to access the pop-up menu shown below. Toggle on the **Title** and **Comments** options in the pop-up menu or if they are not available select **More** and toggle on the options in the Choose Details dialog box shown below.
3. The columns can be arranged in the desired order by dragging the column headers.

Name	Title	Comments	Size	Date modified
11111GB001.dgn	Roadway Schematic Plan	IR070 Sta 1000+00 to 1500+00		11/1/2012 12:34 PM
11111GB002.dgn	Roadway Schematic Plan	SR185 Sta 50+00 to 80+00		11/1/2012 12:36 PM
11111GE001.dgn	Roadway Superelevation Table	SR185		11/1/2012 12:35 PM
11111GP001.dgn	Roadway Plan and Profile or Plan	SR185 Sta 50+00 to 54+00		11/1/2012 12:35 PM
11111GP002.dgn	Roadway Plan and Profile or Plan	SR185 Sta 54+00 to 58+00		11/1/2012 12:38 PM
11111GP003.dgn	Roadway Plan and Profile or Plan	SR185 Sta 58+00 to 62+00		11/1/2012 12:38 PM
11111GP004.dgn	Roadway Plan and Profile or Plan	SR185 Sta 62+00 to 66+00		11/1/2012 12:39 PM
11111GP005.dgn	Roadway Plan and Profile or Plan	SR185 Sta 66+00 to 70+00		11/1/2012 12:39 PM
11111GP006.dgn	Roadway Plan and Profile or Plan	SR185 Sta 70+00 to 74+00		11/1/2012 12:40 PM
11111GP007.dgn	Roadway Plan and Profile or Plan	SR185 Sta 74+00 to 78+00		11/1/2012 12:40 PM
11111GP008.dgn	Roadway Plan and Profile or Plan	SR185 Sta 78+00 to 82+00	77 KB Bentley MicroStation Design	11/1/2012 12:40 PM
11111GP009.dgn	Roadway Plan and Profile or Plan	Jameson Sta 12+00 to 16+00	77 KB Bentley MicroStation Design	11/1/2012 12:41 PM
11111GT001.dgn	Roadway Title Sheet		112 KB Bentley MicroStation Design	11/1/2012 12:34 PM
11111XS001.dgn	Roadway Cross Sections	SR185 Sta 50+00 to 55+00	77 KB Bentley MicroStation Design	11/1/2012 12:35 PM

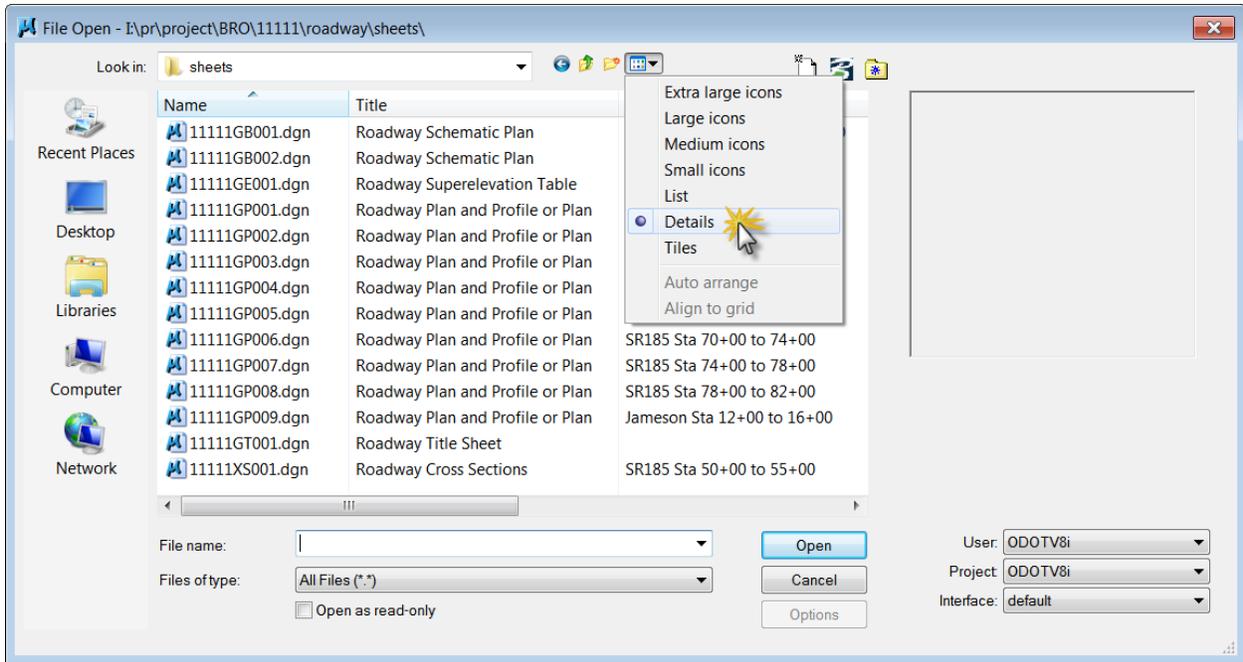


- To save these changes, from the Windows Explorer pull-down menu select **Tools > Folder Options... Organize > Folders** to open the *Folder Options* dialog shown below. From the **View** tab, select **Apply to Folders**.



If the title and comments fields are not displaying in the MicroStation File Open dialog box, take the following steps:

- Open a MicroStation design file.
- From the MicroStation pull-down menus, select **Workspace > Preferences** to access the *Preferences* dialog.
- From the *Preferences* dialog, select the **Look and Feel** category. Toggle on the **Use Windows File Open Dialogs** option.
- Close MicroStation.
- From the *MicroStation Manager* dialog, change the **View Menu** option to **Details** as shown.



**Notes:**

- The **Title** and **Comments** columns are not displayed by default. To display the columns, right click on the column headings and toggle the options for **Title** and **Comments** on.

Figure 304-1 File Name Type Codes

BASEMAP DESIGN FILES	
Aerial Mapping	- BA
Bridge	- BS
Combined Aerial and Ground	- BC
Drainage	- BD
Environmental	- BV
Existing Ground Survey	- BE
Field Book	- FB
Geometry	- BK
Geotechnical	- BI
Landscaping	- BL
Lighting	- BH
Maintenance of Traffic	- BM
Profiles	- BF
Proposed Roadway	- BP
Right of Way	- BR
Signals	- BG
Traffic Control	- BT
Utilities	- BU
Walls	- BW

BRIDGE SHEETS	
Site Plan	- SP
General Plan	- SG
General Notes	- SN
Estimated Quantities	- SQ
Staged Construction Details	- SC
Removal	- SV
Foundation Plan	- SO
Rear Abutment	- SR
Forward Abutment	- SF
Piers	- SI
Superstructure Details	- SS
Transverse Section	- ST
Deck Plan	- SD
Railing	- SA
Bearing	- SB
Expansion Device Details	- SX
Miscellaneous Details	- SM
Reinforcing Steel List	- SL
Sheeting	- SH

GEOPAK RELATED BASEMAP FILES	
GEOPAK Components in single file (Clipping Borders, Pattern Lines, Superelevation Shapes)	- KA
Clipping Borders	- KC
Corridor Modeling	- KM
Digital Terrain Model Features	- KD
GEOPAK Bridge	- KB
GEOPAK Site Elements	- KI
Profile Motif File	- KF
Pattern Lines	- KL
Plan Motif File	- KP
Superelevation Shapes	- KS
GEOPAK Cross Section Cells (Channel)	- XA
GEOPAK Cross Section Cells (MOT)	- XT
GEOPAK Cross Section Cells (Roadway)	- XC

DRAINAGE SHEETS	
Drainage Schematic / Site Plan	- DB
Project Site Plan / Erosion Control / Storm Water Pollution Prevention Plan	- DE
Notes	- DN
Sub-Summary	- DS
Plan & Profile or Plan	- DP
Profile	- DF
Quantity Table	- DQ
Culvert Details	- DC
Details	- DD
Miscellaneous	- DM
Channel Section Sheets	- XD

**LIGHTING SHEETS**

Schematic	- LB
Notes	- LN
General Summary	- LG
Sub-Summary	- LS
Plan	- LP
Quantity Table	- LQ
Circuit Diagrams	- LC
Elevation Views	- LE
Details	- LD
Miscellaneous	- LM

**LANDSCAPING SHEETS**

Schematic	- PB
Notes	- PN
Sub-Summary	- PS
Plan	- PP
Details	- PD
Miscellaneous	- PM

**MAINTENANCE OF TRAFFIC SHEETS**

Schematic	- MB
Notes	- MN
Detour Plan	- MD
Sub-Summary	- MS
Typical Sections	- MY
Miscellaneous	- MM
Phase Details	- MH
Phase Plan & Profile or Plan	- MP
Profile	- MF
Quantity Table	- MQ
MOT Cross Section Sheets	- XM

**RIGHT-OF-WAY SHEETS**

Legend	- RL
Centerline Survey Plat	- RC
Property Map	- RM
Summary of Additional R/W	- RS
R/W Detail	- RD
R/W Topo	- RT
R/W Boundary	- RB
Railroad Plat	- RR

**ROADWAY SHEETS**

Title Sheet	- GT
Schematic Plan	- GB
Typical Sections	- GY
General Notes	- GN
General Summary	- GG
Maintenance Data	- GJ
Sub-Summary	- GS
Calculations / Computations	- GC
Plan & Profile or Plan	- GP
Profile	- GF
Quantity Table	- GQ
Superelevation Table	- GE
Pavement Details	- GA
Intersection / Interchange Details	- GI
Guardrail / Barrier Details	- GR
Drive Details	- GD
Miscellaneous	- GM
Fencing Plan	- GX
Layout Plan	- XL
Grading Plan	- XG
Cross Section Sheets	- XS

**SIGNAL SHEETS**

Notes	- CN
General Summary	- CG
Sub-Summary	- CS
Plan	- CP
Quantity Table	- CQ
Details	- CD
Miscellaneous	- CM

**GEOTECHNICAL EXPLORATION SHEETS**

Boring Logs (8.5x11)	- IL
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**SOIL PROFILE SHEETS**

Cover	- IC
Lab Data	- ID
Plan & Profile or Plan	- IP
Profile	- IF
Cross Sections	- IX

**STRUCTURE FOUNDATION EXPLORATION SHEETS**

Cover	- ZC
Plan & Profile or Plan	- ZP
Profile	- ZF
Boring Logs	- ZL
Lab Data	- ZD

**GEOHAZARD EXPLORATION SHEETS**

Cover	- YC
Plan & Profile or Plan	- YP
Profile	- YF
Cross Sections	- YX
Boring Logs	- YL
Lab Data	- YD

**TRAFFIC CONTROL SHEETS  
(Pavement Marking and Signing)**

Schematic	- TB
General Notes	- TN
General Summary	- TG
Sub-Summary	- TS
Calculations / Computations	- TC
Plan	- TP
Quantity Table	- TQ
Elevation Views	- TE
Details	- TD
Miscellaneous	- TM

**UTILITY SHEETS (Water, Sanitary, etc)**

Schematic	- UB
Notes	- UN
General Summary	- UG
Sub-Summary	- US
Calculation / Computations	- UC
Plan & Profile or Plan	- UP
Profile	- UF
Quantity Table	- UQ
Elevation Views	- UE
Details	- UD
Miscellaneous	- UM

**WALL SHEETS**

Schematic	- WB
Calculation / Computations	- WC
Details	- WD
Elevation	- WE
Estimated Quantities	- WQ
Foundation	- WT
Plan & Profile or Plan	- WP
Profile	- WF
Miscellaneous	- WM
Notes	- WN
Sheeting	- WH
Typical Section	- WY
Sub-Summary	- WS
Steel List	- WL
Cross Section Sheets	- WX

### 304.7 ODOT\_Files.mvba

ODOT provides a custom program, **ODOT\_Files.mvba** that can be used to create MicroStation Design Files for the project. This program is available on the ODOT [CADD Services](#) Website.

## 305 GEOPAK Digital Terrain Models

### 305.1 General

The naming of GEOPAK Digital Terrain Models (DTM) is defined as shown in the table below:

Digital Terrain Models (DTM) - .tin	
Aerial Mapping Existing	- nnnnnn_XAE##
Bridge Deck/Surface Existing	- nnnnnn_XBR##
Bridge Deck/Surface Proposed	- nnnnnn_PBR##
Combined Aerial and Ground Survey Existing	- nnnnnn_XCB##
Ground Survey Existing	- nnnnnn_XGR##
Proposed	- nnnnnn_P##

where:

nnnnnn = Five (5) or Six (6) digit PID number

## = 2 digit number 01, 02, 03, . . .

## 306 GEOPAK Coordinate Geometry Databases

### 306.1 General

When coordinate geometry calculations are processed in GEOPAK by use of the legacy GEOPAK Coordinate Geometry tools, the resulting geometric elements are stored in a separate binary file. This Coordinate Geometry (COGO) database, the GPK file, is then used by other GEOPAK processes for a variety of tasks.

In addition to storing the GEOPAK Coordinate Geometry information, the GPK file is used to store field survey information when the survey data is processed using the legacy GEOPAK Survey tools.

Each project, regardless of its size, shall have one COGO database (.gpk file) containing all project data processed through GEOPAK Survey or GEOPAK COGO commands. For projects involving multiple locations, it is permissible to use separate GPK files for each.

The naming of the GEOPAK Coordinate Geometry Database files submitted to ODOT shall be as follows:

**GPk Files - .gpk**

GEOPAK Coordinate Geometry Database - Job###.gpk

where:

job = GEOPAK Naming Convention

### = 3 digit route number or first three characters of street name

### 306.1.1 Using OpenRoads Tools

The **SELECTseries 3** release of GEOPAK includes new **OpenRoads Civil Geometry** tools that can be used to define horizontal and vertical alignments graphically. The geometric information generated by the use of these tools is stored in a MicroStation basemap design file for ODOT projects. **Section 304-1, File Naming Convention**, details the use of various basemap files for discipline specific tasks. **Figure 304-1 - File Type Codes** details the file naming convention for the basemap files. The OpenRoads Civil Geometry information is stored in the following file for a typical ODOT project:

File Type (Per Fig. 304-1)	Directory
Geometry Basemap - BK	Per Figure 302-1.3; (\Design\Geopak\Basemaps sub-directory)

The GPk file is not automatically created when using the new **OpenRoads** technology; however users will have the ability to create one if necessary. Civil geometry elements must be exported to a GEOPAK COGO database (GPk file) in order to be used by the legacy GEOPAK plan production tools, such as Plan and Profile Clipping, Plan View Labeling, etc. The same GPk file shall be used for exporting OpenRoads Civil Geometry information that is used for all other GPk file related tasks.

Field survey data processed using the new OpenRoads Survey tools is stored in a MicroStation design file and is not stored in a GEOPAK GPk file, as with the legacy GEOPAK Survey tools. OpenRoads Survey information is stored in the following design file for a typical ODOT project:

File Type (Per Fig. 304-1)	Directory
Survey Fieldbook - FB	Per Figure 302-1.6; (\Design\Survey\RawData sub-directory)

The Fieldbook design file is not used by design personnel and is intended to be a record of the data collection, processing, and editing as completed by the Surveyor. Once the data processing is complete, a Survey Basemap is exported from the Fieldbook design file for use by the design personnel. The Survey Basemap design file is exported to the following folder:

File Type (Per Fig. 304-1)	Directory
Survey Basemap - BE	Per Figure 302-1.6; (\Design\Survey\Basemaps sub-directory)

The OpenRoads survey data can be exported to the GPk file if needed; however, it is not mandatory. If the survey data is required in a GPk file, it shall be exported to the same GPk file used for the project. The use of multiple GPk files for ODOT projects is not permitted.

The GEOPAK GPk file is stored in the **\Design\Geopak** sub-directory for a typical ODOT project.

## 306.2 GEOPAK COGO Element Names for OpenRoads

To facilitate the efficient sharing and transfer of COGO information between consultants, ODOT, and contractors, the GEOPAK COGO Element Names detailed below have been established.

Each OpenRoads Civil Geometry horizontal and vertical alignment is uniquely named within the MicroStation design file. These alignment names do not have the same limitations as GEOPAK COGO; however, since the alignment information must be exported to the GPK file for use with many of the workflow processes within GEOPAK, it is important to ensure that OpenRoads horizontal and vertical alignment names are compatible with the GPK element name formats.

This section details COGO element names for projects using the OpenRoads Civil Geometry tools to generate horizontal and vertical alignments that will be subsequently exported to the GEOPAK GPK File. For COGO Element names that are not user definable when using the OpenRoads Civil Geometry horizontal and vertical alignments, such as spirals, and curves, or not currently supported items such as parcels, see the [ODOT CADD Engineering Standards Manual](#), section **300 FILE MANAGEMENT**.

COGO element names in the GEOPAK GPK file are limited to a maximum of 15 alphanumeric characters. No special characters, periods, or spaces are permitted other than the underscore character.

For ODOT projects, horizontal alignment chain names shall be limited to 12 characters as detailed below. Vertical alignment names are limited to a maximum of 15 characters and use a two or three character prefix followed the Horizontal Alignment name.

When OpenRoads Civil alignment information is exported to the GPK file, sub-element names for horizontal alignments (points, curves, and spirals) are automatically defined by the software. Therefore, sub-element names are not specifically defined for ODOT projects when the horizontal alignment data is defined using the OpenRoads Civil Geometry tools. Note that Point names can be defined using the *Next Available Settings* function within GEOPAK COGO.

The following element names for horizontal and vertical alignments have been established for OpenRoads Civil Geometry elements.

**Civil Geometry Alignment Elements**

**Horizontal Alignments (Chains)**

Alternates Existing	AX#_rddd%
Alternates Proposed	AP#_rddd%
Baseline Existing	BLX_rddd%
Baseline Proposed	BLP_rddd%
Centerline Existing	CLX_rddd
Centerline Proposed	CLP_rddd
Centerline MOT Existing	CLX_MOT_rddd
Centerline MOT Proposed	CLP_MOT_rddd
Centerline Right of Way Existing	CLX_RW_rddd
Centerline Right of Way Proposed	CLP_RW_rddd
Centerline of Survey	CLX_SV_rddd

Where:

r=Route Type

C=County Road

I=Interstate Route

R=Ramp

S=State Route

T=Township Road

U=U.S. Route

ddd=3 digit route number 020, 270, 142, etc.

%=1-2 digit Ramp number A, 2S, 3A, etc.

#=1 digit number 1, 2, . . .

Notes: If the route type is unknown or the road is a local street, the rddd code should be replaced with the street name ensuring that the resulting horizontal alignment name is no longer than 12 characters.

For projects where multiple alternates are considered, once the alignment and profile have been selected they should be copied and given the name of the proposed elements. This will ensure that the proposed alignments are named uniquely rather than just being one of the many alternatives.

**Vertical Alignments**

Existing Profile	X_name
Proposed Profile	P_name
Proposed Profile Alternates	A#_name

Where:

name=The name of the horizontal alignment the profile is associated with

#=1 digit number 1, 2, 3, etc.

**Roadway / Misc. Alignments**

**Horizontal / Vertical Alignments**

Cable Line Existing	CABt_###o
Construction Limit	CON_rddd##o
Construction Limit Alternates	CONA_rddd##o
Culvert	CULt_rddd_sssss
Ditch	DITt_###o
Driveway	DRt_rddd_sssso
Electric Line	ELEt_###o
Gas Line	GASt_###o
Right of Way	RW_rddd##o
River / Stream	RIVt_###
Sanitary	SANT_###o
Storm Sewer	STMt_###o
Telecommunication	TELT_###o
Water Line	WATt_###o

Where:

t=Type, X (Existing) or P (Proposed)

o=Side, if applicable, L (Left) or R (Right)

sssss=Station or Drive Name

10+23.45 would be 01023

100+25.67 would be 10026

##=2 digit number maximum 01, 02, . . .

###=3 digit number maximum 01, 100, etc.

r=Route Type

C=County Road

I=Interstate Route

R=Ramp

S=State Route

T=Township Road

U=U.S. Route

ddd=3 digit route number 020, 270, 142, etc.

Notes: If the route type is unknown or the road is a local street, the rddd code should be replaced with the street name, or a portion of the street name. This will ensure that the resulting horizontal or vertical alignment name is no longer than 15 characters.

If a profile is needed for the above elements, name the profile the same as the corresponding chain-

**COGO Right of Way Elements**

Chains RWrddd###  
 Curves RWC###

where:

###=3 digit number maximum 01, 100, etc.

r=Route Type

C=County Road

I=Interstate Route

S=State Route

T=Township Road

U=U.S. Route

ddd=3 digit route number 020, 270, 142, etc.

Notes: If the route type is unknown or the road is a local street, the rddd code should be replaced with the first four characters of the street name.

**COGO Right of Way Parcels**

Parent Tract ##  
 Types of Title ##\_ppppnz

where:

##=2 or more digit number 01, 02, 03, . . .

Note: The number for the Types of Title shall match the number of the Parent Tract.

pppp=1 to 4 character parcel identification code as shown below.

**Fee Simple Title (store a Taking in GEOPAK)**

Acquired Fee Simple Excess Land	EL
Excess Land Sold or Swapped	ES
Fee Simple Excess Land	E
Fee Simple Uneconomic Remnant	ER
Limitation of Access	WL
Reservation of Access	WD

**Easements (store as Easement in GEOPAK)**

Aerial	A
Channel	CH
Flowage	FL
Limited Access	LA
Railroad or Public Utility	U
Scenic Easement	SC
Standard Highway	SH
Sewer	SW
Slope	SL
Temporary Easement	T

**Agreements (store as Easement in GEOPAK)**

Work	WA
------	----

**Others (store as Occupied in GEOPAK)**

Present Road Occupied (PRO)	PRO
PRO Inside	PROI
PRO Total	PROT

n=When the parent tract has multiple Types of Title of the same type, a 1 digit number is used to identify each Type of Title.

z=Additional Modifiers:

In the name of another State agency, LPA, etc.	V
Special Reservation	R

Examples:

03 (parent tract)  
 03\_LA (easement for parent tract 03)  
 03\_WD1 (taking for parent tract 03)  
 03\_PRO (occupied area for parent tract 03)

## 307 GEOPAK Project Manager

### 307.1 General

The GEOPAK Project Manager is used to facilitate the organization of GEOPAK related data during project development. The GEOPAK Project Manager file has a .prj file extension. For ODOT projects, use of the Project Manager with GEOPAK Road is optional, but is recommended with GEOPAK Survey.

The GEOPAK Road and GEOPAK Survey software applications both make use of the .prj file. For ODOT projects, it is recommended that you do not use the same .prj file for both the GEOPAK Road and GEOPAK survey software applications.

If the Survey data is to be processed with the OpenRoads Survey tools, use of the GEOPAK Project Manager is not required.

#### 307.1.1 GEOPAK Road Users

For GEOPAK Road users, the GEOPAK Project Manager files (.prj) should be stored in the \Design\Geopak sub-directory. GEOPAK will create additional files and sub-directories in the \Design\Geopak sub-directory as required by the software. The .prj file shall be named as follows for use with GEOPAK Road:

*nnnnnn\_Design.proj*

where *nnnnnn* = Five (5) or Six (6) digit PID Number

#### 307.1.2 GEOPAK Survey Users

For GEOPAK Survey users, the GEOPAK Project Manager file (.prj) should be stored in the \Design\Survey sub-directory. GEOPAK Survey will create additional files and subdirectories as required by the software. The .prj file shall be named as follows for use with GEOPAK Survey:

*nnnnnn\_Survey.proj*

where *nnnnnn* = Five (5) or Six (6) digit PID Number

### 307.2 Setting up a Project for GEOPAK Road

When creating a new project for GEOPAK Road, use the following guidelines to supplement the project information.

Items under the *Create New Project* dialog.

- (1) **Project Name:** For this example, this field would be nnnnnn\_Design.
- (2) **Working Directory:** Used to specify the default directory that GEOPAK will use to open and save files. For this example this field would be set to \project\FRA\123456\Design\Geopak\
- (3) **Job Number:** This is used to identify the Coordinate Geometry (COGO) Database (gpk) for the project.

Use the three digit number for the mainline route number. For example, for State Route 4 the Job Number would be 004, for Township Road 50 it would be 050, etc.

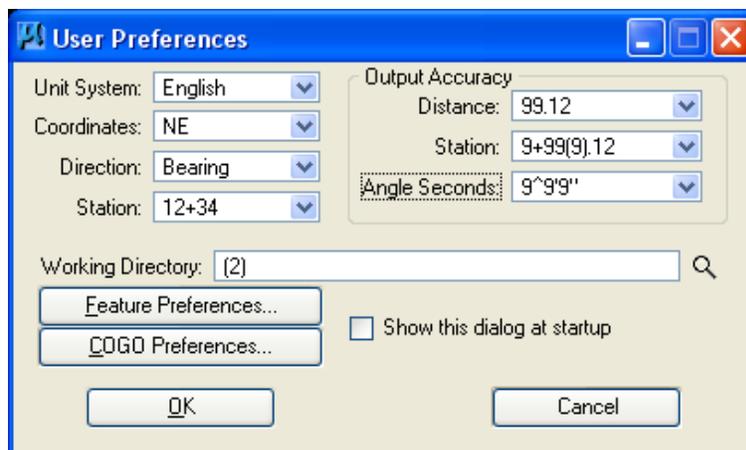
In cases where there is not an established route number, the first three characters of the road name should be used.

- (4) The **Project Description** field shall contain the following information.

<b>County-Route-Section:</b>	FRA-070-0.00
<b>PID Number:</b>	123456
<b>State Job Number:</b>	555555*
<b>Project Manager:</b>	Ms. Jane Doe
<b>Project Designer:</b>	Mr. John Dow
<b>Project Description:</b>	The scope of work for project 12345 goes here. Include as much detail as necessary to define the work done for the project.

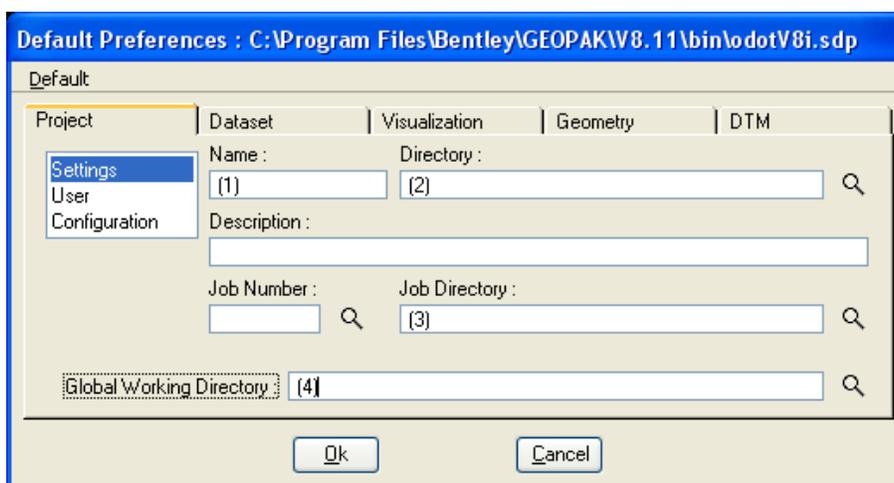
\* If the State Job Number (SJN) is not assigned at the time of creation, leave the area blank where the number is required. Update this field when SJN number is assigned.

In the middle of the *Create New Project* dialog, select the **Preferences** button to access the *GEOPAK User Preferences* dialog. The values shown below are the recommended settings for an ODOT project.



### 307.3 Setting up a Project for GEOPAK Survey

Before you create a new Survey project, you must first set the default Survey Preferences using the *Default Preferences* dialog. The values assigned for the Default Preferences are used when the Survey project is created.



Items under the Default Preferences dialog related to creating the .prj file for use with GEOPAK Survey:

- 1) **Name:** This field is used as the name for the .prj file. For this example, the name would be nnnnnn\_Survey, where nnnnnn = the PID number for the project.
- 2) **Directory:** This field is used to define the directory where the .prj file is created. The directory would be set to the \survey folder for the project.
- 3) **Job Directory:** This field is used to define the directory where the .gpk file for the project will be stored. The .gpk file shall be shared between the GEOPAK Road users and the GEOPAK Survey users. The Job Directory should be set to the \Design\Geopak folder for the project.
- 4) **Global Working Directory:** This field is used to define the folder used as the parent folder for all other GEOPAK Survey software functions. The Global Working Directory should be set to the \Design\survey folder for the project.

## 400 PLOTTING

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### 401 General

#### 401.1 General

ODOT is now using multi-page PDF files for plan submissions instead of TIFF images. PDF printing is facilitated using the MicroStation Print Organizer.

The **Print Organizer** is a MicroStation utility for printing and reprinting a set of design files, models, or Project Explorer links. The files that are to be printed are saved as a print set, (PSET), file.

ODOT includes a template PSET file, ODOTcaddseed.pset, prepopulated with folders to organize the design files that will make up the print. The PSET folder structure mimics the plan set structure from [Section 1300 of the Location and Design Manual, Volume 3](#). Additional directories can be added if needed. When the PDF is generated, the empty directories will not be included. The PSET folder names become the multi-page PDF bookmarks.

In the ODOT\_Styles\_Printing.dgnlib, Print Styles are defined that control the output from Print Organizer. Print Styles include ODOT standard Plot Configuration Files and Pen Tables, and enable generation of PDF files as well as printed output. The ODOT\_Styles\_Printing.dgnlib also defines a named expression, ODOT\_SheetName, which can be applied to the plot set. This reads the Sheet Name from the model property of a sheet model type and applies it to the name of the page in the PSET. The template PSET file uses this named expression as the default. If the Sheet Name in Model Properties is blank, then the Model Name from the Model Properties dialog is used as the default page name.

ODOT uses pen tables that are applied to the graphical elements when the design file is plotted. The pen tables translate various elements in the design file to the final output version.

Elements should be plotted black, with the exceptions listed in [Section 401.2.6](#) - Color Plotting. The major and minor grid levels are set to a lower priority, so they plot under most plan sheet details. Cross section and profile grids should be plotted as shown in the [Location and Design Manual, Volume 3](#), Figure 1202-1.

Standard MicroStation plotting files are included in ODOT's CADD Standards download, available on the **Office of CADD and Mapping Services**, [CADD Services](#) web page. The files available for download include user documentation. Also, see **PDF Printing with Print Organizer** in the **Project Management with the ODOTcadd Standards** Training Guide for additional details.

## 401.2 Plotting

MicroStation pen tables and Printer Driver Configuration files for use with MicroStation V8i are located in the following directory for ODOT users:

- ..\ODOTcadd\Standards\pltcfg\

Plotting documentation is located here:

- ..\ODOTcadd\Standards\ODOT\Documentation\Plotting\

The plotting documentation has detailed settings and usage information. The following briefly describes the settings in the Printer Driver Configuration Files, (ODOTcadd.pltcfg, ODOTcaddL.pltcfg and ODOTcadd\_PDF.pltcfg), and pen tables, (ODOTcadd\_Pen.tbl and ODOTcadd\_PenC.tbl). An additional Printer Driver Configuration File, (ODOTcadd\_PDF\_Levels.pltcfg), is distributed with the standards but is not currently in use for plan submissions.

**Note:** Elements not handled by the Shading or Masking sections of the ODOTcadd\_Pen.tbl are plotted Black.

### 401.2.1 Line Weights

The Printer Driver Configuration Files specify the MicroStation element weight to output line thickness. Line weights in the configuration files are defined as below for 22"x34" Prints. The configuration files set the Weight Scale to 0.5 for 11"x17" and 8 ½"x11" prints, so the thickness is one-half the values shown in the table. The Style Scale is also set to 0.5 for 11"x17" and 8 ½"x11" prints, reducing the dash and gap lengths of standard MicroStation line styles by one half. Though line thicknesses are defined to weight 10, only weights 0-5 are used in ODOT's level standards:

Element Weight	Thickness (approximate inches)
WT= 0	0.006"
WT=1	0.014"
WT=2	0.026"
WT=3	0.036"
WT=4	0.046"
WT=5	0.056"
WT=6	0.066"
WT=7	0.076"
WT=8	0.086"
WT=9	0.096"
WT>=10	0.106"

Due to the variation in plotting accuracy of various printers, the thicknesses shown in the table above can be modified as deemed necessary to achieve the desired results.

### 401.2.2 Priority and Transparency

Plotting priorities are determined by the MicroStation level and the assigned element Priority values in the ODOT\_Levels\_General.dgnlib. Priority and Transparency are not handled in the ODOT standard pen tables.

### 401.2.3 Shading

The following functionality to shade various plan sheet elements is included in the ODOTcadd\_Pen.tbl:

- **Cross Section Grids**

The pen table shades Major and Minor Cross Section Grids using the following settings:

**Major Grid** - uses Color = 42 (RGB Value = 176, 176, 176)

**Minor Grid** - uses Color = 43 (RGB Value = 192, 192, 192)

- **Shading Filled Shapes** - is an option to highlight specific areas on the plan sheet.

Shading levels were created to fill shapes with varying shades of Gray. The pen table fills shapes based on the following shading levels:

**SC\_Shading1** - uses Color = 41 (RGB Value = 160, 160, 160)

**SC\_Shading2** - uses Color = 43 (RGB Value = 192, 192, 192)

**SC\_Shading3** - uses Color = 45 (RGB Value = 224, 224, 224)

- **Shading Reference(s)** - is a method to fade the entire Reference into the background.

To gray shade a reference, the **Logical Name** must begin with **gray**, for example gray1, gray2, etc. Color 41 (RGB Value = 160, 160, 160) is used to gray shade references. When plotting a reference using a logical name beginning with gray, the pen table will gray shade the entire reference.

- **Title Sheet Shading**

Corporation boundaries and route shield fills on the Title Sheet Area Map are handled in the pen table.

### 401.2.4 Masking

Masking is an option to hide specific areas on a plan sheet. No elements will show underneath.

The Masking level plots all elements, or filled shapes, as White to mask any elements underneath. The pen table processes elements on the following masking level:

**SH\_Masking** - uses Color = 255 (Background Color)

**Note:** To create a border around the masking shape change the color and place the shape using the Fill Type set to Outlined.

#### **401.2.5 Text Substitution**

Text replacement of the text string, (````), on sheet borders is handled by the pen table. The default setting inserts the file name, model name, date, time and username using Printing Accounting Variables.

#### **401.2.6 Color Plotting**

The ODOTcadd\_PenC.tbl is used for producing color output of an ODOT plan sheet. This pen table does the Major and Minor Cross Section shading and Reference shading the same as above. Some text on the SH\_Data level is changed from White to Black by the pen table, so that it will display. Text substitution is handled as above. All other elements are plotted in their display colors.