

# 7 Plans Preparation

Section 7 defines the file organization structure, data formats, and delivery procedures for the electronic CADD data. These standards are mandatory components of preparing plans for WSDOT. The designer is responsible for resolving all omissions, deficiencies, and errors in a timely manner to prevent any negative impacts on the project schedule.

## 7.1 PS&E Plan Set

In conjunction with the migration from CAiCE to InRoads as the principle design application, WSDOT is also transitioning from a set of MicroStation standards and resources based on 63 levels to an environment that uses many more levels. These two MicroStation environments are referred to as the “63 level environment” and the “expanded level environment.” The 63 level environment is used with CAiCE and the expanded level environment is used with InRoads.

For plan sets prepared in the expanded level environment, the information in the *CADD Standards for MicroStation using Expanded Levels* supersedes the information printed in Sections 3 and 5 of the WSDOT *Plans Preparation Manual*. For expanded level plan sets the *Plans Preparation Manual* and the *CADD Standards for MicroStation using Expanded Levels* contain the standards for the appearance of the final hard copy plan set. **This document (EEDS) contains the requirements and standards relating to the electronic version of expanded level plan sets.**

For plan sets prepared in the 63 level environment, all necessary information for both plan appearance and electronic standards is contained in the printed *WSDOT Plans Preparation Manual*. The *CADD Standards for MicroStation using Expanded Levels* and the EEDS do not apply to 63 level plan sets.

*Note: Any further references to the *Plans Preparation Manual* in this document are referring to both the PPM and the *CADD Standards for MicroStation using Expanded Levels*. The *CADD Standards for MicroStation using Expanded Levels* is published only in electronic form and is available on-line from the WSDOT web.*

### 7.1.1 Data Organization

All electronic project files and data will be organized as defined in Sections 3 and 4 of this manual.

### 7.1.2 General Requirements

#### 7.1.2.1 Project Datum

The datum used in the base plan files shall match the datum and units used throughout the project. Typically this is a project datum in US Survey feet.

#### 7.1.2.2 Sheet Sizes

The finished product sheet size for PS&E plan sheets is 11" x 17." Final plots will be produced at this size. Note: For clarity, the *Plans Preparation Manual* shows WSDOT symbols and text at the size they would appear on a 22" x 34" plan sheet. Symbols and text on the final printed 11" x 17" plans will be one-half the size shown in the *Plans Preparation Manual*.

#### 7.1.2.3 Project-Level Resources

Potential project-level resources include a line style resource file, cell library and/or dgnlib. All project resources must be documented in the PS&E Plan Set Project Documentation spreadsheet. (See Section 8.9). Project-level resources by definition are nonstandard which presents problems with exporting this data to other applications (such as InRoads) and their use should be minimized as much as possible.

#### 7.1.2.4 Referencing 63 Level Data

If older MicroStation design files adhering to WSDOT's previous 63 level standards are to be used in conjunction with files in the current expanded level environment, the following guidelines should be observed:

- If the 63 level data is to be modified, it should be converted to the newer expanded level standards.
- If the 63 level data is to be referenced read-only, it may be left in the 63 level configuration. At the time of attachment, a 63 level design file referenced to an expanded level file must have reference settings of Coincident World, True Scale off and attachment scale of 2:2 *not* 1:1. (These unusual settings are due to the fact that most 63 level files are labeled as International feet, but are actually set to US Survey feet.)

### 7.1.2.5 ByLevel Symbology

In the WSDOT environment only one feature is drawn on any given level so ByLevel is the standard for color, weight and linestyle for all standard WSDOT features. ByLevel is activated automatically by the WSDOT menu for all standard levels, but is not activated for levels designated as user levels.

### 7.1.2.6 User Levels

The WSDOT work environment contains many levels designated as user levels that have no standard feature assigned to them. Since users aren't allowed to create new levels, these user levels have been provided for project-specific requirements that necessitate the drawing of elements of non-standard, project specific features. Because any items drawn on user levels is by definition non-standard, they will not translate and export to other WSDOT applications (such as InRoads) as easily as information drawn to WSDOT standards. For this reason, the use of nonstandard information on user levels should be kept to a minimum.

### 7.1.2.7 Project Filters

Users may create their own filters in specific design files or in the project-level dgnlib. It is recommended that a filter be created at the project level that matches the level configuration for each type of plan in the plan set. For example, there should be project-level filters whose levels correspond to the base plan levels referenced in the drainage plans, channelization plans and so on.

## 7.1.3 WSDOT Resources and Related Conventions

CAD Drafters will use the most current set of WSDOT resources for MicroStation Expanded Levels including seed files, cell libraries, linestyle resource files, plot configuration files and pen tables.

The WSDOT environment provides files and electronic resources organized under a master resource folder called CAE\_RSC (Computer Aided Engineering Resources). Under this master resource folder is a subfolder named MS\_ExpandedLevels that contains all the electronic resources necessary for WSDOT PS&E plan set development. (See Figure 7-1

The current set of WSDOT resources are automatically downloaded to all WSDOT computers connected to the WSDOT wide area network and are updated automatically as needed.

WSDOT provides consultants with a complete set of WSDOT standard resource files in the form of cell libraries, dgn libraries, color and pen tables, macros, plot files and config files. The WSDOT resource files are available for download from WSDOT's CAE Consultant Resources web site at:

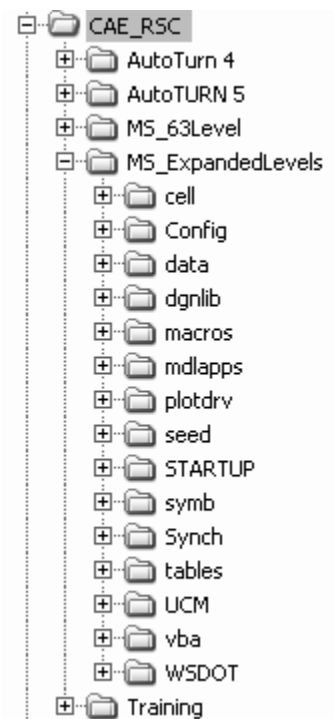
<http://www.wsdot.wa.gov/eesc/CAE/resources>

### 7.1.3.1 Design File Libraries (DGNLib) Files

The WSDOT environment uses two dgn libraries: WSDOT.dgnlib and *projname.dgnlib*. WSDOT.dgnlib contains all the standard levels for WSDOT PS&E plan set development.

CAE\_RSC\DGNLIB\WSDOT.DNGLIB contains all the standard levels for the WSDOT environment.

The project level dgnlib is stored in the project directory structure in the **CADD\dgnlib** subfolder. The project level dgnlib contains the user levels and



WSDOT Resource Folders  
Figure 7-1

any user-defined filters for the project. NOTE: In order for this file to be available in MicroStation, the **CADD\dgnlib** folder must be added to the MicroStation environment variable MS\_DGNLIST. MS-DGNLIST is modified automatically when the WSDOT Create Project macro is used and the MicroStation project is selected through the MicroStation Manager dialog box.

### 7.1.3.2 Seed Files

WSDOT seed files shall be used when creating files for PS&E plan sets.

The file CAE\_RSC\SEED\PSE\_BASE.DGN is the seed file to be used when creating PS&E base plan design files.

The file CAE\_RSC\SEED\PSE\_SHEET.DGN is the file to be used when creating PS&E Sheet design files.

Details on the WSDOT seed files are as follows:

- Base seeds:
  - Master Units: US Survey Feet – FT
  - Sub Units Custom – th (1000 th per FT)
  - Resolution: 1,000,000,000 per US Survey Foot
- Sheet seeds:
  - Master Units: Inches – in
  - Sub Units Custom – th (1000 th per in)
  - Resolution: 1,000,000,000 per Inch

### 7.1.3.3 Text

All standard WSDOT fonts are in the file CAE\_RSC\RSC\FONT.RSC in the WSDOT resources. In most cases font 165 (Arial Italic) shall be used in conjunction with existing features and font 214 (Arial Bold) shall be used in conjunction with new features. Exceptions to this rule are when the *Plans Preparation Manual* specifies the use of the block outline font 42.

Minimum text size for existing text is 0.05" and 0.06" for new text on the final 11" x 17" printed sheets. Text at minimum sizes shall be all upper case. Text at larger sizes may be in upper and lower case.

The correct font and text size for each data item is specified in the *Plans Preparation Manual*. The text size provided in the *Plans Preparation Manual* is the size of the text as it appears on the 11" x 17" printed sheet.

When working in a base plan, the relationship between printed text size in the *Plans Preparation Manual* and the text size setting in MicroStation is

MicroStation setting = final print size x plotting scale.

To place text that is to be .06 inches on the final 50' per inch plot, multiply .06 inches times 50 feet per inch to get 3 feet. Similarly, the text size setting in MicroStation to produce text at .075 inches on a 1"=100' scale drawing is .075 inches times 100 feet per inch or 7.5 feet.

When working in a sheet file, the text size should always be set to the true size desired on the final drawing which is the size that is specified in the *Plans Preparation Manual*.

Text size is calculated automatically when using the WSDOT menu based on the scale selected and the type of design file you are working in (sheet or base plan).

### 7.1.3.4 Cells

CAE\_RSC\CELL\WAEDETAILS.CEL is a supplemental cell library containing template cells for details which can be used as starting point for roadway sections and other details.

CAE\_RSC\CELL\WAESTATE.CEL contains all the cells and symbols need to produce WSDOT PS&E plan sets. WAESTATE.CEL contains cells that will be placed in base plans and cells that will be placed in sheet files.

Cells designed for placement in the sheet file are named with the **SH** parent code and have master units in inches. These cells are placed directly on the sheet at a scale of 1:1.

Cells that are to be placed in the base plan have master units of feet and are placed according to their type. Cells used in the base plan come in two types: **symbol cells** and **true-size cells**.

- **Symbol cells** are cells that appear on plan sheets that are always the same size regardless of the plan sheet scale. On the printed plan, symbol cells do not reflect the actual size of the object they represent, just the locations. Examples of symbol cells are catch basin and utility pole symbols. WSDOT symbol cells are stored in the cell library at the size they should appear on the printed sheet. When placing these cells in the base plan, they must be scaled up by the same scale factor as the sheet. Thus when placing cells for a base plan that will be plotted at 1"=100', the cell should be placed at an active scale of 100. This scale is set automatically when the WSDOT menu and scale tools are used.
- **True-size cells** are cells that are always the actual ground size of the objects they represent. Examples of non-scaling cell are many of the painted pavement markings such as the HOV symbol and RR crossing symbol. True-size cells are sized in the library so that they should always be placed at an active scale of 100 in the base plan to reflect the true ground size regardless of plotting scale. True-size cells are flagged as such in the *Plans Preparation Manual* and on the WSDOT menu.

Sheet cells can be placed in the base plan by selecting the desired plotting scale and making sure that the True Scale option is turned off. Base plan cells can be placed in a sheet file by selecting a scale of 1 and making sure that the True Scale option is turned off.

The correct cell size is calculated automatically when using the WSDOT menu based on the scale selected, the type of design file you are working in (sheet or base plan) and the type of cell being placed.

#### 7.1.3.5 Linestyles

All custom linestyles needed to produce WSDOT PS&E plan sets are in CAE\_RSC\SYMB\ELSTYLE.RSC. WSDOT custom linestyles are stored in the linestyle resource file at the true size they will appear on the printed sheet. When placing custom linestyles in the base plan, they must be scaled up by the same scale factor as the sheet. Thus when placing a linestyle that will be plotted out at 1"=100', the linestyle should be placed at an active linestyle scale of 100.

If a custom linestyle needs to be placed in the sheet file (e.g., in a legend), it should be placed at an active linestyle scale of 1.

Custom linestyle scales are calculated automatically when using the WSDOT menu based on the scale selected and the type of design file you are working in (sheet or base plan).

#### 7.1.3.6 Color Table

In general the color table C:\CAE\_RSC\SYMB\COLOR.TBL should be attached to WSDOT design files. COLOR.TBL is set up to color all elements per their parent codes so that each parent code has its own color.

Optionally COLOR2.TBL may be useful when working on a specific major category of features as it breaks up the set of elements having the same parent code into subgroups that show up with different colors.

For example with COLOR.TBL attached all proposed utilities display in the same color. With COLOR2.TBL attached, proposed utilities display with the different utility types (water, gas, telephone, etc.) in different colors.

### 7.1.3.7 Plot Configuration Files

When plotting WSDOT PS&E plan sets, the plot configuration files under CAE\_RSC\PLOTDRV must be used to ensure the linestyles and weights plot out properly. The major plot configuration files and their uses are shown in Figure 7-2 below.

EngBWFull.plt	Black and white, 34 x 22 plots
EngBWHalf.plt	Black and white, 11 x 17 plots
EngCFull.plt	Color, 34 x 22 plots
EngCHalf.plt	Color, 11 x 17 plots
PDF_EngBWFull.plt	PDF format, black and white, 34 x 22 plots
PDF_EngBWHalf.plt	PDF format, black and white, 11 x 17 plots
PDF_EngCFull.plt	PDF format, color, 34 x 22 plots
PDF_EngCHalf.plt	PDF format, color, 11 x 17 plots

**Plot Configuration Files**  
*Figure 7-2*

### 7.1.3.8 Pen Table

When plotting WSDOT PS&E plan sets, the pen table CAE\_RSC\PLOTDRV\WSDOT.TBL must be used. WSDOT.TBL enables the plotting fields on WSDOT sheet borders and ensures that filled elements are plotted first.

## 7.1.4 File Types and Requirements

Data for a MicroStation PS&E electronic plan set is stored in either a base plan file or a sheet file. This section will define these two file types and their requirements.

### 7.1.4.1 Base plans

Base plans contain all coordinate based information for the plan set. This includes all survey data, photogrammetry data, locations for all new data and all text related to those elements and features.

Depending on the size and other factors of any specific project, there may be one or more base plans. For small projects where there is one primary designer it may make the most sense to keep all coordinate based data in one base plan. With more complicated projects it will probably be more efficient to split the coordinate based information into multiple base plans. Typically these multiple base plans would contain data for different areas of the design (e.g., drainage, channelization, and site preparation). A multiple base plan organization allows more than one designer to access and work on base plan data simultaneously. Either configuration is acceptable.

#### File Naming for Basemaps

Base plans will all have a file type code of BP. (See Section 4.3 of this document for complete details).

Examples:

- P1234\_BP\_EXIST.DGN** Base plan containing all existing data for project P1234
- P1234\_BP\_DR.DGN** plan containing all new drainage data for project P1234
- P1234\_BP\_ALRW.DGN** plan containing all new alignment and r/w data for project P1234

#### Saved Views and Project Filters in Base Plan Files

WSDOT base plans must contain saved views (or saved views in combination with filters) that display the area and levels in the basemap that correspond to any particular sheet to which the base plan is referenced.

This allows users to see the correct area and levels in the base plan as it will be displayed on the final plotted sheets. When a user recalls a saved view in the basemap, the user should see the same “picture” that is plotted on the sheet in terms of both the levels and area displayed. The levels displayed by the saved view (and/or filter) used in the base plan and the levels displayed by the reference attachments derived from that saved view in the project’s sheet files must be kept the same.

It is recommended that project filters be set up to store the various level schemes for each type of plan sheet. These filters can then be used to adjust levels in the sheet files and in the base plans.

If such project filters are used, base plans must also have saved views to recall the location for the area of the base plan used in each sheet. These generic saved views would not save level configurations and would have generic names such as Sheet1, Sheet2, Sheet3, etc. Such saved views allow users to recall any particular sheet’s location and then use the project filters to adjust the level display to match the desired sheet.

If project filters are not used, base plans must have saved views that will recall both the location and the levels used for each plan sheet. These sheet specific saved views will have names that correspond to the sheet reference number found in the lower right corner of the plan sheet above the sheet number—DR1, DR2, CH1, CH2, and so on.

All saved views in the base plan must be rotated so that the controlling alignment is horizontal across the saved view. This rotation of the saved view is what controls the orientation of the reference file in the attachment to the sheet file.

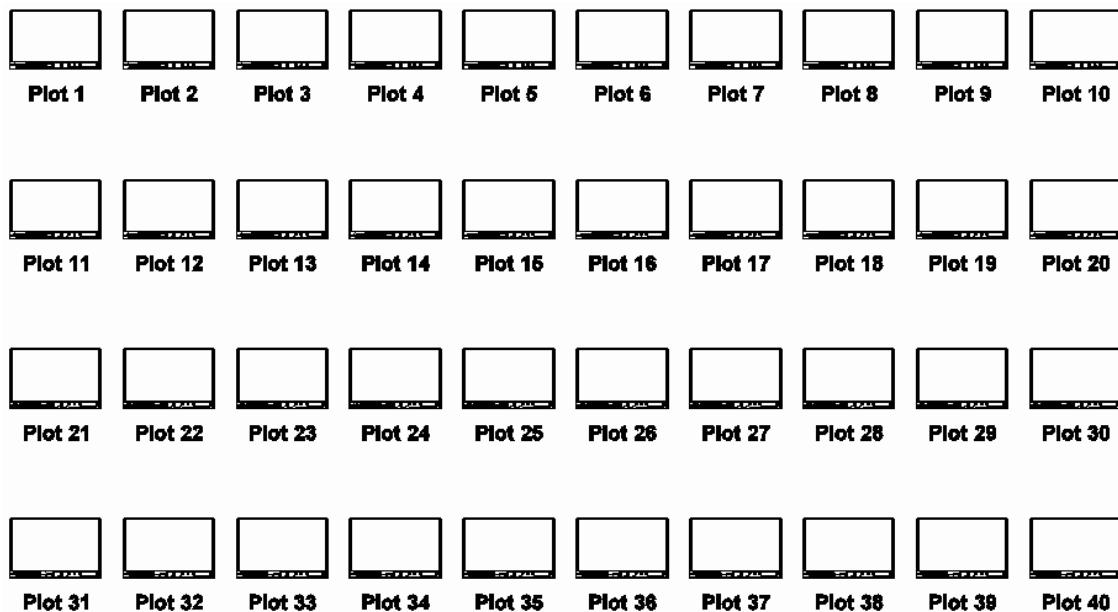
#### 7.1.4.2 Sheet Files

Sheet files contain all the sheet borders with associated title bar information and all elements that are placed in relation to the sheet border such as legends, scale bars, match lines and north arrows.

Sheet files are created from WSDOT seed files to ensure that their master units are inches.

##### Placing Sheet borders

Sheet borders are placed in the sheet file at an active scale of 1 in a matrix shown in Figure 7-3 below: Each border measures 11” x 17”.



WSDOT Sheet Matrix  
Figure 7-3

The origin of the matrix is

the lower left corner of Plot 1 and is at

coordinates of 100000, 100000. The rows are 20 inches apart and the columns are 30 inches apart. The matrix can contain up to 40 sheets, but borders should only be placed as needed. Final sheet files should not contain any empty borders.

Use of the WSDOT Place Sheet macro assures compliance in regard to sheet sizes and locations

#### Saved Views in Sheet Files

A saved view should be created for each sheet location. The saved view name will be PLOT 1, PLOT 2, and so on. When the saved view is recalled, the entire sheet border should be displayed. The levels displayed by the saved view must match the levels that are to be plotted.

The WSDOT Place Sheet macro automatically creates the correct saved views when the sheet borders are placed.

#### Reference Attachments to Sheets

The WSDOT resources have been set up so that when the base plan is referenced to a sheet border, it is referenced at the same scale as the desired final plot. Thus for a 50' to 1" plot the reference attachment scale is 50:1. Likewise for a 10' to 1" plot, the reference attachment scale is 10:1.

The levels displayed by the reference attachment and the levels stored in the base plan's saved view (and/or filter) used in the creation of that attachment must be kept in synch with one another.

### **7.1.5 PS&E Plan Set Documentation**

#### **7.1.5.1 PS&E Plan Set Documentation Sheet**

(For form template and sample see 8.9)

The following items should be documented for each plan set:

- State Route(s) and mileposts
- File Units
- Scale used

#### **7.1.5.2 PS&E Base Plan Documentation Sheet**

(For form template and sample see 8.10)

The following items should be documented for each base plan file:

- Other DGN files referenced
- Occupied user levels and design elements drawn on them
- Filters/saved views to be used to call up sheet views
- Raster images attached

#### **7.1.5.3 PS&E Sheet File Documentation Sheet**

(For form template and sample see 8.11)

The following items should be documented for each sheet contained in a sheet file:

- Plot location
- Sheet ID
- Files and/or raster images referenced
- List of levels or filter to display sheet's reference files properly
- Scale and rotation angle of reference files

## 7.1.6 Project Closure and Transition

After the supplier has prepared a complete MicroStation PS&E design package as described in Section 7.1 by preparing all the appropriate electronic information the following requirements will apply.

### 7.1.6.1 Project Cleanup

The final version of the PS&E plan set should contain the base plans (folder CADD\Baseplans), sheet files (folder CADD\PS&ESheets), backups of resources used (folder CADD\PS&ESheets\ResourceBackups) and any other supporting information necessary for the customer and/or future designers to understand and use the plan set in MicroStation. All data not necessary for production of the final plan set or of use to future designers or drafters should be deleted from the project.

### 7.1.6.2 Preparation of PS&E Data Within CADD-Folder

The following must be provided in the **CADD\PS&ESheets** folder:

- Completed PS&E Plan set Checklist
- **ResourceBackup** subfolder– This subfolder is to be created at project finalization. The resource files needed to recreate the PS&E plan set must be copied to this location. Resource files that should be copied are all cell libraries, linestyle resource files, dgn libraries (both WSDOT standard and project specific, font resource files and color tables.

The following must be provided in the **CADD\Basemaps** folder:

- All basemaps used in PS&E plan set

The following must be provided in the **CADD\CADDDocumentation** folder:

- Documentation as described in previous section

### 7.1.6.3 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 2.

A complete PS&E plan set package will be prepared as described in Section 7 by compiling all the appropriate electronic information and notifying the customer that the project has been finalized.

Delivery will be accomplished by providing the customer access to the project folder if both the designer and customer share a network resource that allows them both to reference the same folder structure. Access to the entire project folder is necessary when transferring interrelated survey, design and CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design subfolder is sufficient.

If a shared network location is not an option, the designer will provide the customer with a copy of the final data. This can be accomplished using any medium that can reliably contain the entire folder structure to be transferred (e.g., an e-mail, an FTP site, a compact disk, or a DVD).

### 7.1.6.4 Data Archival

On projects where the supplier is internal to WSDOT, it is the supplier who is responsible for archival of the final electronic design data per the region's policy for archival of electronic project data. When an external supplier is providing data to WSDOT, it is the WSDOT customer who is responsible for archival of the final electronic data per the region's policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.