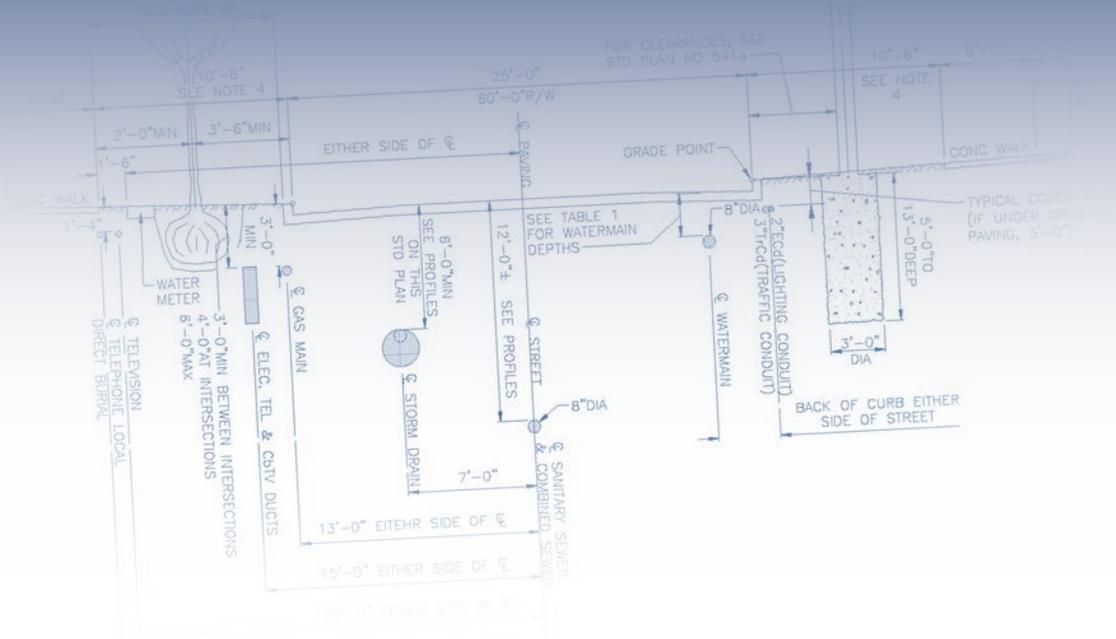




CAD Manual

Inter-Departmental CAD Standard



CAD Manual

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Preface

A message from
Ray Hoffman and Peter Hahn

We believe that corporate data is as important and critical of an asset to the City as our physical infrastructure. Managing enterprise-wide corporate data is essential to our mutual success and enhances the data-driven decision-making mode that helps us to manage the City's assets. Creating CADD documents to a common standard puts Seattle Department of Transportation and Seattle Public Utilities in better control of our engineering data.

Over the past year the Inter-Departmental CADD Committee was tasked with updating the existing CADD standards for SPU and SDOT to help both groups remain consistent with industry standards. Thanks to the hard work of a very dedicated joint committee, we now have an improved Inter-Departmental CADD Standard that is endorsed by both SPU and SDOT.

The Inter-Departmental CADD Committee is sanctioned to maintain and update this standard. Each major work unit using AutoCAD and AutoCAD Civil 3D has a representative on the committee. This representative is responsible for disseminating information from the CADD committee to the work unit and is responsible for bringing the concerns and suggestions of the work unit back to the committee for discussion.

Using this Inter-Departmental CADD Standard will make our engineering data compatible with GIS data. It will also make it easier for people in our departments to work effectively together using concurrent engineering principles and allow and allow us to more easily re-use and build on data for future projects, studies, or initiatives. Over time, this effort should help both our departments realize more efficiency for data reuse and as a result help us better control costs in this area.

We both endorse the Inter-Departmental CADD Standard and expect every SDOT and SPU employee or consultant doing CADD work for the City to use this standard and to deliver AutoCAD or AutoCAD Civil 3D compatible files as a final product. If you have any questions regarding this standard, please contact your CADD Committee representative.



Peter Hahn, SDOT Director



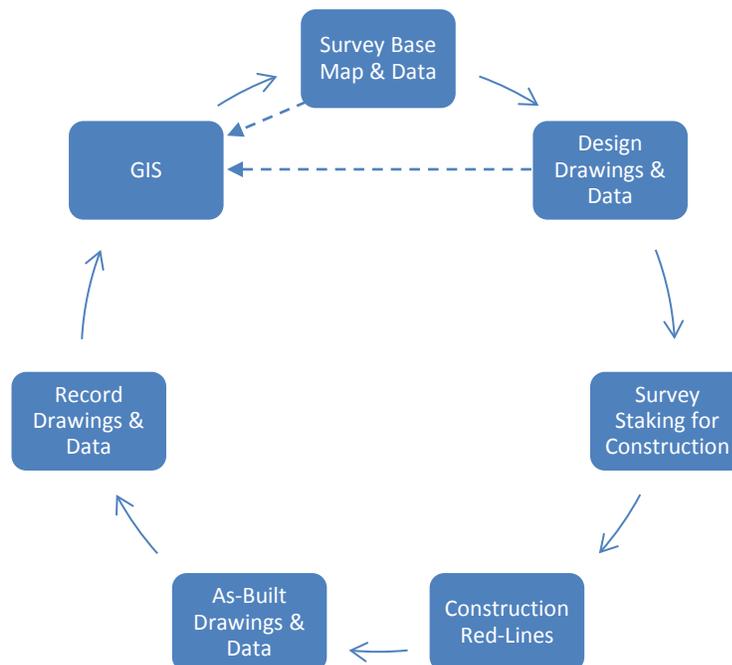
Ray Hoffman, SPU Director

Introduction

The City of Seattle Inter-Departmental Computer-Aided-Drafting (CAD) Standard was set in place to ensure that all CAD drafting work performed in house or by a city-hired consultant could be readily used by various city departments and easily translated into the city's GIS network.

Contract plans result from the work of many specialists and engineers. A base map may be used simultaneously by disciplines such as water design, drainage design, sewer design, roadway design, landscaping design, etc. All the disciplines of a project fit against the base map, making it possible to compare and complete various design elements in tandem. This ability to work concurrently depends on developing, maintaining and employing CAD standards. The goals of maintaining coherence, minimizing wasted effort in recreating design, and maximizing the effectiveness of a project team are all best served by adhering to the CAD standard.

The chart below shows a typical project drawing/data lifecycle:



CAD Requirements for Consultants

If you are performing computer-aided-drafting (CAD) services for the City of Seattle you must adhere to the requirements in the Design Drafting Guidelines document found here:

http://www.seattle.gov/util/Engineering/Consulting_Resources/For_Drafting_Consultants/

Supported Software Version

The civil mapping/design/plan production software supported by the City of Seattle is **Autodesk® AutoCAD® Civil 3D® 2017**.

Legal Disclaimer

This CAD Manual (“Document”) should not be used as a substitute for codes and regulations. The applicant is responsible for compliance with all code and rule requirements, whether or not described in this Document.

This Document contains Autodesk® AutoCAD® and Autodesk® AutoCAD® Civil 3D® usage tips and instructions which are for reference only and are not a replacement for formal training. Contact an Autodesk® Certified Instructor for training opportunities.

Tracking Numbers

A project tracking number is a unique tracking number used for file-naming (see SECTION 3: Project Data Sharing) during and after the pre-construction phase of a project. Once a drawing set has entered the 60% design phase, Vault Plan and Serial numbers are also obtained and added to the title blocks via Sheet Set Manager.

Obtaining a Project Tracking Number (PTN) for SPU Projects

Prior to setting up drawing files, contact SPU_CADsupport@Seattle.gov with the following information to obtain a PTN:

1. SPU Project Manager (PM) Name
2. Project Name
3. Project Location
4. SPU Work Authorization Number (charge code/number; obtain from PM)

Obtaining a Project Tracking Number (PTN) for SDOT Projects

Prior to setting up drawing files, contact the SDOT Project Manager for the Work Authorization Number (charge code/number). This number will serve as the PTN for file-naming purposes.

Obtaining Vault Plan and Serial Numbers

During the 60% design phase of the project, contact the [Engineering Records Center \(Records Vault\)](#) to obtain an application form. A cover sheet is required to be submitted along with the completed application.

Common Abbreviations

BIM.....	Building Information Modeling
CAD.....	Computer-Aided-Drafting
COS.....	City of Seattle
DREF.....	Data Reference
DWF.....	Design Web Format
ERC.....	Engineering Records Center (Vault)
GIS.....	Geographic Information System
PM.....	Project Manager
PTN.....	Project Tracking Number (unique number for each project)
SDOT.....	Seattle Department of Transportation
SPU.....	Seattle Public Utilities
SSM.....	Sheet Set Manager
VPI.....	Vault Plan Index
XREF.....	External Reference

More abbreviations can be found in [STANDARD PLAN NO 002](#).

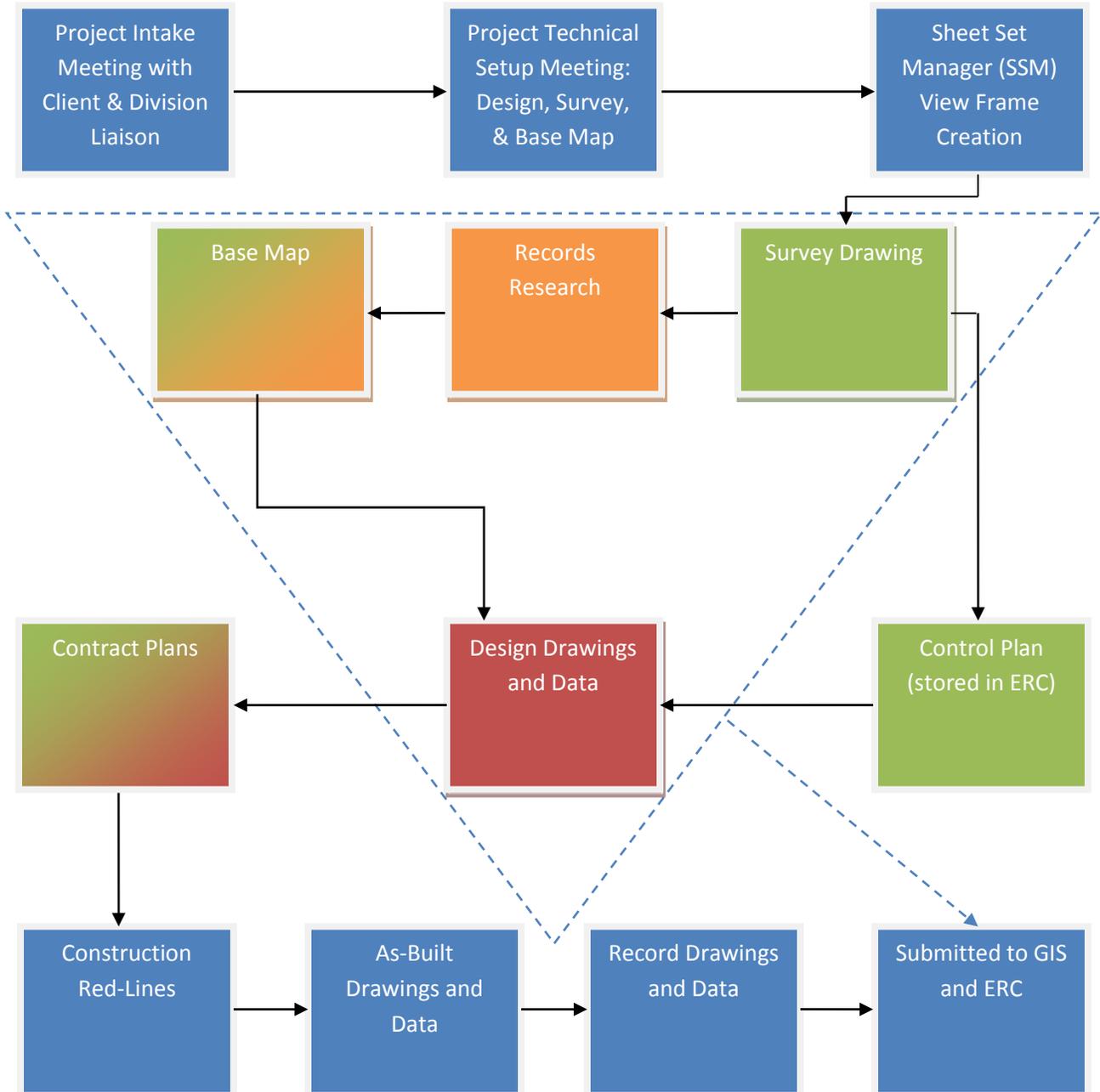
The Highlights

To help you navigate this document easier, here are the highlights:

- ✓ **THE SETUP:** For information on downloading templates and supporting files, see page 9.
- ✓ **THE BASICS:** For basic drawing and planning guidelines, see pages 32 and 33.
- ✓ **FILE NAMING:** Our file-naming conventions are described on pages 19, 21, 26 and 31.
- ✓ **TITLE BLOCKS:** Instructions on setting up title blocks and views start on pages 11 and 19.
- ✓ **LAYERS:** A list of common layer names is found on page 52.
- ✓ **LINework:** Guidelines for drafting features can be found on page 72.
- ✓ **ANNOTATION:** Text, dimensions, leaders and table settings are found on pages 86-93.
- ✓ **PLOTTING/PRINTING:** Requirements for printing drawings are found on page 94.
- ✓ **CHECKING:** Use the checklist on page 99 to check your work.
- ✓ **FINAL PRODUCT:** A description of the final product is found on page 100.

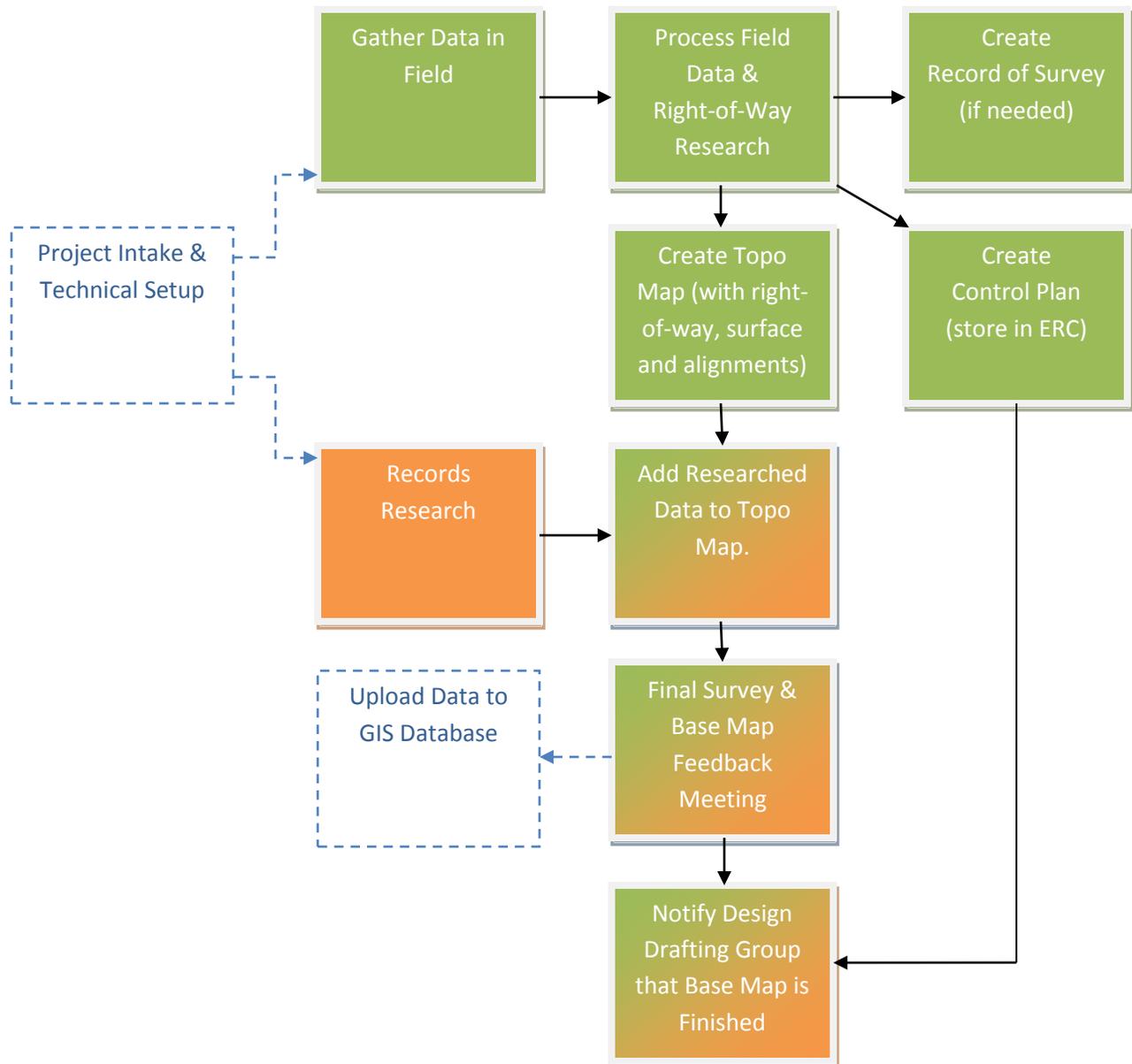
SECTION 1: Workflow for Civil Projects

The diagram below shows the workflow for typical civil projects.



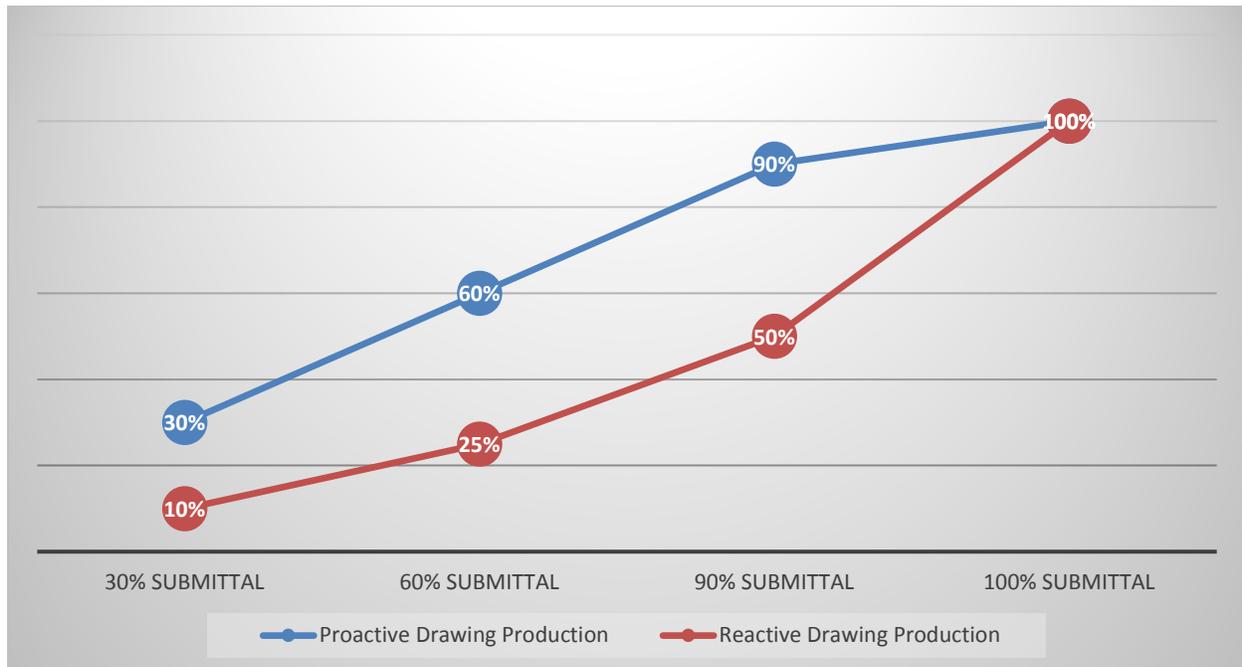
Base Map Creation Workflow

The diagram below shows the typical workflow for the Survey unit.



Design Drafting Approach

Creating data and drawings as efficiently as possible while reducing mistakes is the goal of implementing and utilizing CAD standards. A reactive approach costs more money and may cause more errors because we end up making last-minute edits and changes. We want to be proactive with how we spend our time creating deliverables.



The **red line** in the chart above shows a reactive approach, which does the bare minimum amount of work early in the project, causing many important design drafting tasks to be ignored or delayed until the end of the project. There are many problems with this approach, including:

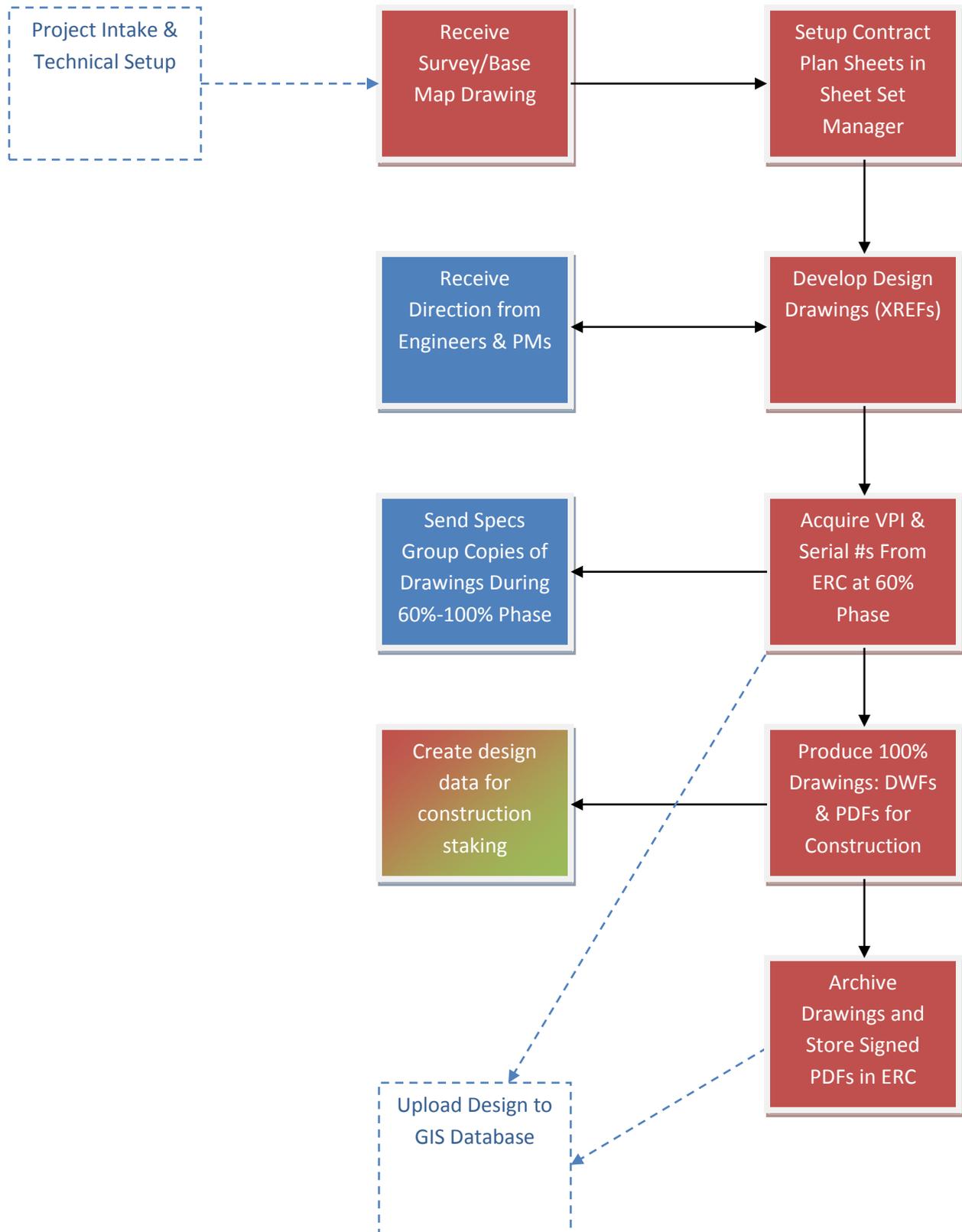
- A large amount of work is left to be done at the last-minute, making the project prone to mistakes and schedule delays.
- Shortcuts are taken to save time, which reduces the quality of the CAD data.
- The project is prone to more change orders and design changes during construction.

The **blue line** in the chart above shows a proactive approach, which does most of the work early in the project, causing design drafting costs to be higher during early submittals. Here are some common tasks that should be done early on:

- Pre-30%: Develop a 3D base map with researched or verified depths of underground utilities that may cause conflicts during design.
- 30%: Develop sheet index table, create named plan views and set match line locations for all disciplines (X-VIEW drawing) and setup sheets. See pages 23-25 for more information.
- 30%: Create 3D models of all proposed features for clash detection and analysis.
- 30%: Create classified objects with some object data filled in, per SECTION 6: Linework and Data.
- 60%: Determine proposed elevations and create profiles and/or sections.

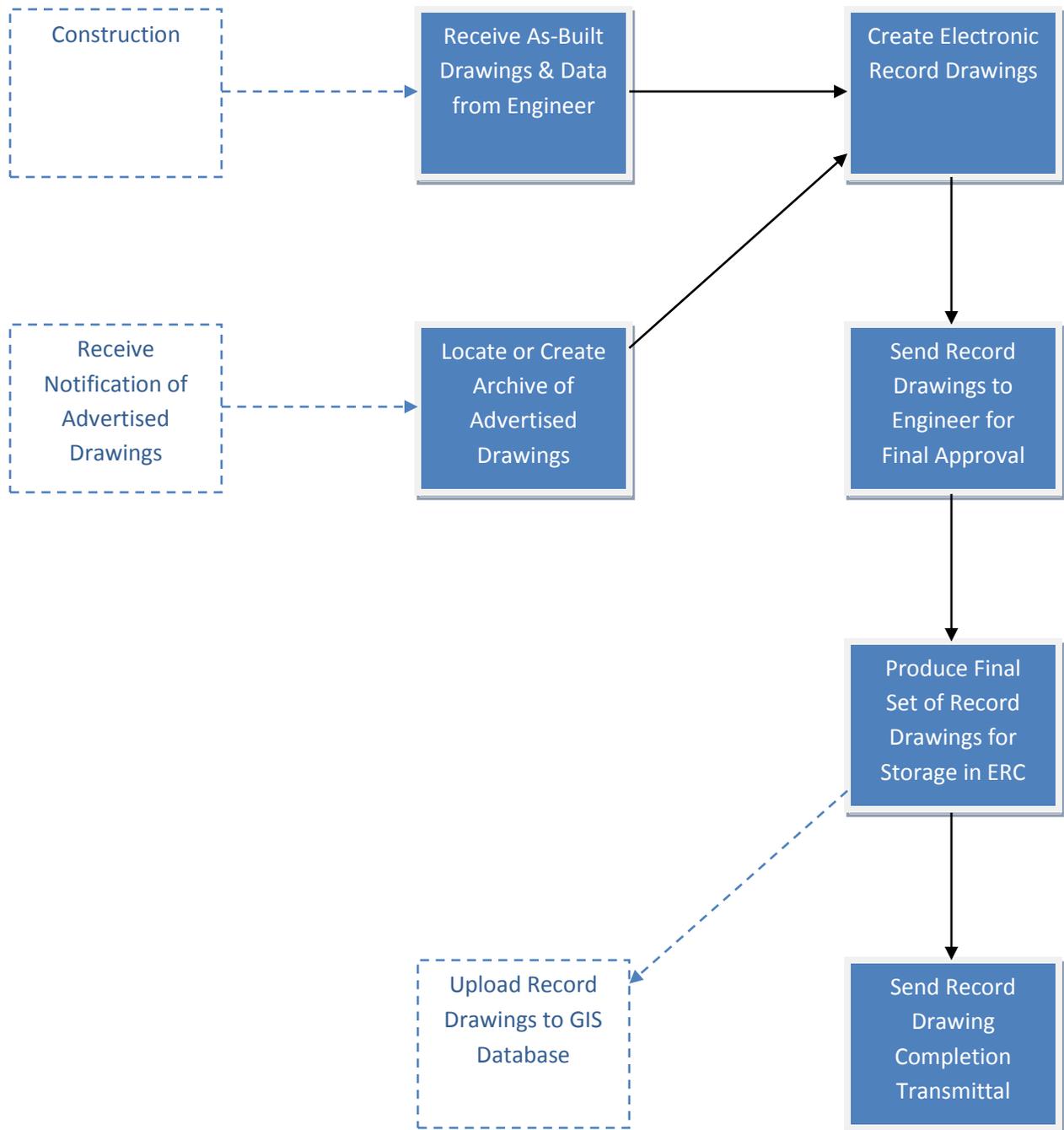
Typical Design Drafting Workflow

The diagram below shows the typical workflow for Design Drafting unit.



Record Drawing Workflow

The diagram below shows the typical workflow for Record Drawing unit.



SECTION 2: Support Files

To download support files, visit: Seattle.gov/util/CAD

We periodically update this web page with the latest documentation (CAD Manual, CAD Manual Appendices and Sample Drawings), templates and support files (blocks, fonts, linetypes, and more).

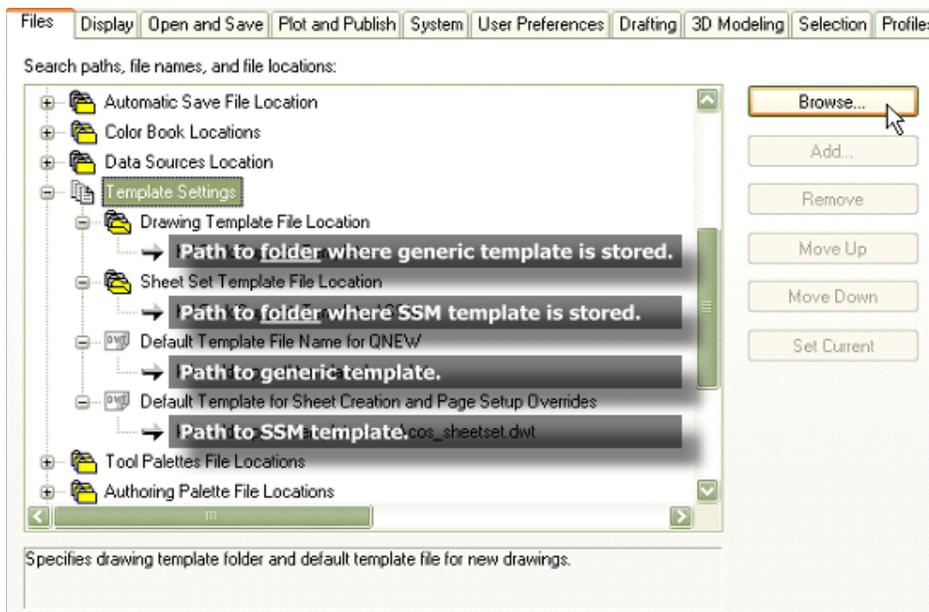
Support Files Disclaimer of Warranties

Seattle Public Utilities and Seattle Department of Transportation provide downloadable Autodesk® AutoCAD® Civil 3D® support files (“Support Files”) available online; see link above. Seattle Public Utilities and Seattle Department of Transportation disclaim to the fullest extent authorized by law any and all warranties, whether express or implied, including, without limitation, any implied warranties of merchantability or fitness for a particular purpose. Without limitation of the foregoing, Seattle Public Utilities and Seattle Department of Transportation expressly do not warrant that:

- a) the Support Files will meet your requirements;
- b) the Support Files will be free of bugs, errors, viruses or other defects;
- c) any results, output, or data provided through or generated by the Support Files will be accurate, up-to-date, complete or reliable;
- d) the Support Files will be compatible with third party software;
- e) any errors in the Support Files will be corrected.

Templates

Standard Civil 3D® templates are available online (see link above). Once you have downloaded the templates, make sure AutoCAD® Civil 3D® template settings point to where the templates are stored. Type **OPTIONS** on the command line, click on the “Files” tab, and then expand the “Template Settings” section:



AutoCAD® Civil 3D® Templates

There are two AutoCAD® Civil 3D® templates available for download; one for surveying/base mapping (SV-COS-C3D17.dwt) and one for design drafting (DD-COS-C3D17.dwt). Each template is customized for its unique purpose.

The drawing units are set to “feet”, specifically “US Survey Foot” and the coordinate system is “HPGN (HARN) Washington State Planes, North Zone, US Foot” (code: HARN/WO.WA-NF).

To verify these settings, first run the UNITS command to verify the insertion scale. Then run the EDITDRAWINGSETTINGS command to verify the drawing units and coordinate system.

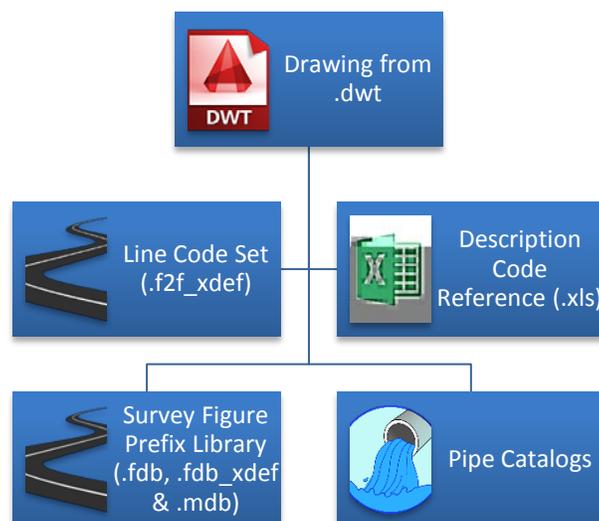
Survey Drawing Template

Highlighted below are some features in our Civil 3D design drawing template:

- Description Key Sets (command: SHOWTS)
- Layer filters and descriptions (command: LAYERPALETTE)
- Object styles (settings tab of SHOWTS)
- Text styles (command: STYLE)
- Label Styles (command: ADDLABELS)
- Multileader styles (command: MLEADERSTYLE)
- Dimension styles (command: DIMSTYLE)
- Table styles (command: TABLESTYLE)
- Linetype variables: LTSCALE, PSLTSCALE, MSLTSCALE & CELTSCALE are set to 1.

Related Survey Drawing Template Files

Download and connect the line code set or survey figure prefix library and pipe network (commands: SetNetworkCatalog | SetPressureNetworkCatalog) support files to your drawings. A description code reference file is also available. See page 17 for more information about support files.



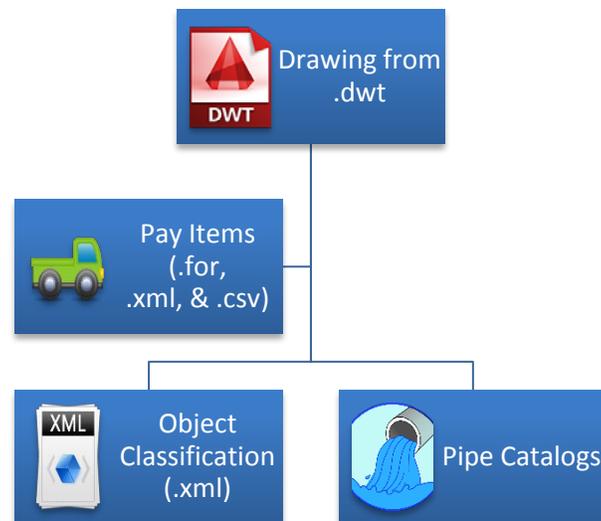
Design Drawing Template

Highlighted below are some features in our Civil 3D design drawing template:

- Layer filters and descriptions (command: LAYERPALETTE)
- Object styles (settings tab of SHOWTS)
- Text styles (command: STYLE)
- Label Styles (command: ADDLABELS)
- Multileader styles (command: MLEADERSTYLE)
- Dimension styles (command: DIMSTYLE)
- Table styles (command: TABLESTYLE)
- Multiline styles (command: MLSTYLE)
- Linetype variables: LTSCALE, PSLTSCALE, MSLTSCALE & CELTSCALE are set to 1.

Related Design Drawing Template Files

Download and connect pay item (command: QTOManager), object classification (command: ATTACHDEF) and pipe network (commands: SetNetworkCatalog | SetPressureNetworkCatalog) support files to your drawings. See page 17 for more information about support files.



Title Block Template

There is one AutoCAD® Civil 3D® Sheet Set Manager template (.DWT containing the SPU/SDOT title block) and an accompanying .DST file available for download to be used on SPU/SDOT projects. If the project you are working on requires the use of either [Seattle Parks & Recreation](#) or [Seattle City Light](#) title blocks, download their title block templates, which are compatible with our CTB (see page 94) but are not setup to be used with Sheet Set Manager.

There are many benefits to using a Sheet Set Manager template, including:

- Easy sheet data management
- Detail and section referencing blocks containing dynamic fields that automatically get updated
- Dynamic barcodes that automatically get updated (required for archival)
- Updatable sheet index table
- Batch plotting

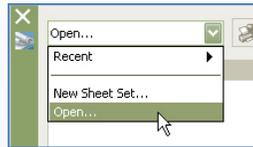
Use the SSM command in AutoCAD® Civil 3D® to open the Sheet Set Manager palette. From there you can use the drop-down to open or start a new Sheet Set:



Before you use the Sheet Set Manager template, you will need to make a few changes to the .DWT and .DST files. Open the .DWT file and modify the page setups to work with your plotters and printers. You will also need to modify the .DST file (see tips on the next couple of pages).

Tip: Setup Sheet Set Manager .DST File Outside the City Network

Before you start using Sheet Set Manager, you need to make a few changes to the .DST file. To do this start up Sheet Set Manager (command: SSM) and open the COS_SheetSet.DST file through SSM.



Right-click on “COS_SheetSet” in SSM and select “Properties...”

Page Setup Overrides File

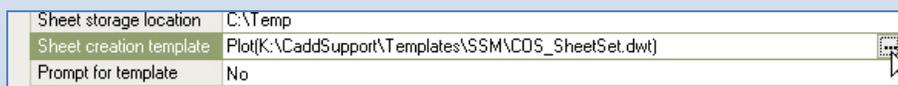
Click the ellipsis (...) button next to the “Page setup overrides file” field .



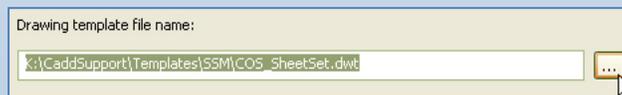
Browse to the location where COS_SheetSet.DWT is stored and click Open.

Sheet Creation Template

Click on the ellipsis (...) button next to the “Sheet creation template” field.



Then click on the ellipsis button in the next dialog box to browse to the location where you stored COS_SheetSet.dwt.



Click Open.

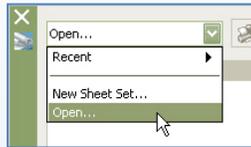
Click OK.

Finally click OK to save and close the Sheet Set Properties.

Tip: Setup Sheet Set Manager Callout Blocks Outside the City Network

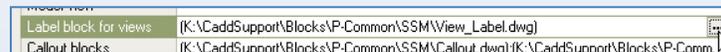
There are callout blocks associated with the City of Seattle SSM template and in order to use them you need to download the blocks and save them in a folder on your network or computer. Once you have done this you will need to tell SSM where to find them.

To do this start up Sheet Set Manager (command: SSM) and open the COS_SheetSet.DST file through SSM.

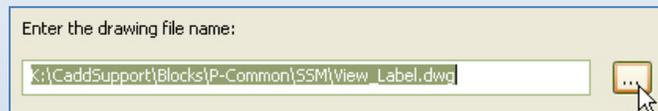


Right-click on “COS_SheetSet” in SSM and select “Properties...”

First click on the ellipsis (...) button next to the “Label block for views” field.

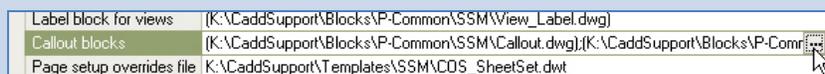


In the resulting dialog box click on the next ellipsis (...) button.



Browse to the folder where you saved the SSM callout blocks and select C-view_name.dwg. Click Open. Click OK in the “Select Block” dialog box.

Then select the ellipsis (...) button next to the “Callout blocks” field (see following picture).



You will find a list of paths pointing to blocks. Delete all of them. You will then need to add the folder paths for all the blocks (except the C-view_name.dwg block) so SSM knows where to find them on your network or computer.

Click the “Add...” button. Then click the ellipsis (...) button in the “Select Block” dialog box. Select a block (not the C-view_name.dwg block) and click “Open”. Repeat this for all blocks except the C-view_name.dwg block.

Click OK.

Starting a New Sheet Set

Start a new sheet set (command: NewSheetSet) using “an example sheet set” and select “COS_SheetSet” to use as the example. The sheet set should be named in this format: project tracking number (PTN) followed by an underscore and the project name (words separated by underscores). For example: **[PTN]_Project_Name** (this will become the project DST file).

The screenshot shows the 'Create Sheet Set - Sheet Set Details' dialog box. The sidebar on the left has four steps: 'Begin', 'Sheet Set Example', 'Sheet Set Details' (which is selected and highlighted with a blue arrow), and 'Confirm'. The main content area is divided into several sections. At the top, 'Name of new sheet set:' is followed by a text input field containing '[PTN]_Project_Name'. Below that, 'Description (optional):' is followed by a text area containing 'Use this DST file to setup standard COS sheet drawings.'. The next section is 'Store sheet set data file (.dst) here:' followed by a text input field containing 'P:\Projects...' and a browse button (three dots). Below this is a note: 'Note: The sheet set data file should be stored in a location that can be accessed by all contributors to the sheet set.'. There is an unchecked checkbox labeled 'Create a folder hierarchy based on subsets'. At the bottom of the main area is a button labeled 'Sheet Set Properties' with a mouse cursor over it. At the very bottom of the dialog are three buttons: '< Back', 'Next >', and 'Cancel'.

Click the “Sheet Set Properties” button to edit the values of fields for the entire sheet set (“Sheet Set Custom Properties”) and the default values of fields for individual sheets (“Sheet Custom Properties”). See page 19 for a visual of where these fields are located in the title block.

Sheet Set Properties

Sheet Set

This section should be filled in for you already. You can skip this section.

Project Control

Fill in the project number, name, phase and milestone (if applicable). The milestone field will be displayed on the lower left corner of every title block in the sheet set. For example, when your project is approaching the 60% design milestone, in the milestone field type 60% SUBMITTAL (NOT FOR CONSTRUCTION) and every sheet will display this label.

Sheet Custom Properties

This contains the default settings for creating new sheets, but will not change settings for existing sheets. For example, if there will be only one drafter for every sheet in the project, fill in the drafter's initials in the appropriate field and every sheet that is created from that point on will contain those initials by default. If you are not sure what changes will be made in the future, leave this section as-is. You can change these properties on a sheet-by-sheet basis in the future.

Sheet Creation

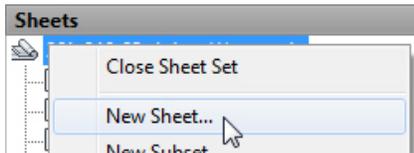
This section should be filled in for you already. You can skip this section.

Sheet Set Custom Properties

This section contains the global settings for your entire sheet set. You should fill in most of the fields in this section. The data in these fields will show up on all the title blocks in this sheet set.

Creating Sheets

To create a new sheet, right-click on the sheet set and select "New Sheet..."



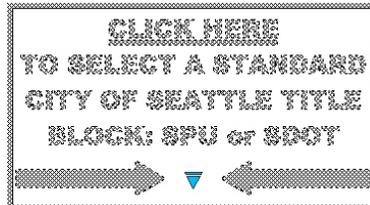
Fill in the "Number" and "Sheet Title" fields. Together the "Number" and "Sheet Title" fields are the same as the file name of the sheet drawing (see page 22 for sheet file-naming convention).

When you create a new sheet with the SPU/SDOT Sheet Set Manager template, you are given the opportunity to select either the SPU or SDOT title block:

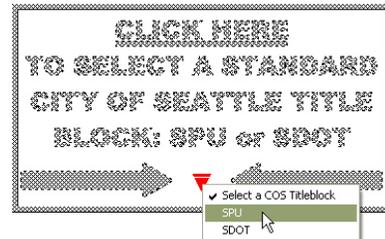
1. You will see this:



2. Click on it to reveal hidden grip:



3. Click the grip to select title block:



See pages 27, 42 and 93 for information about using Sheet Set Manager for detail/section referencing.

To edit the properties of an individual sheet, right-click on it in the "Sheet List" tab of Sheet Set Manager and select "Properties..." After you make changes to sheet properties you will need to run the "REGEN" command in the drawing to see the fields update with the changes. If this does not work, set the FIELDEVAL system variable to 31 to make fields update when you open, save, plot, eTransmit and regen.

Additional Support Files

Here are a few support files available online at: <http://Seattle.gov/util/CAD>

Survey Line Code Set and Figure Prefix Library

Standard line code set and figure prefix library support files are available to download.

Hatch Patterns

Standard hatch patterns that match [STANDARD PLAN NO 003](#) are available as a downloadable .PAT file.

Civil 3D® Pipe Network Catalog

We provide a Civil 3D® Pipe Network catalog that includes common pipe materials and sizes and standard structure sizes as defined in [STANDARD PLAN NO 200](#).

Plot Style Table (.CTB) Files

Standard printing (see page 94 for more information):

- COS_CADD_Standard.ctb (for printing standard drawings)
- Record_Drawings.ctb (for printing As-Built and Record Drawings)

Non-standard printing:

- COS_CADD_Fine-Color.ctb (for printing non-standard figures with fine color lines)
- COS_CADD_Fine-Mono.ctb (for printing non-standard figures with fine black lines)

Fonts

Standard “SHX” and “FMP” files are available online. AAA.SHX is used to generate customized standard linetypes. To make sure the barcodes on the plan sheets appear correctly, install the **fre3of9x.ttf** font natively to your PC.

Linetypes

Standard linetypes that match [STANDARD PLAN NO 003](#) are available online as a downloadable .LIN file.

Blocks

Standard blocks that match [STANDARD PLAN NO 003](#) are available online.

Reference Drawings

You can download a reference drawing containing a legend of common layers, linetypes, hatch patterns, text and blocks that you can use in your drawings to match properties to.

Object Classification

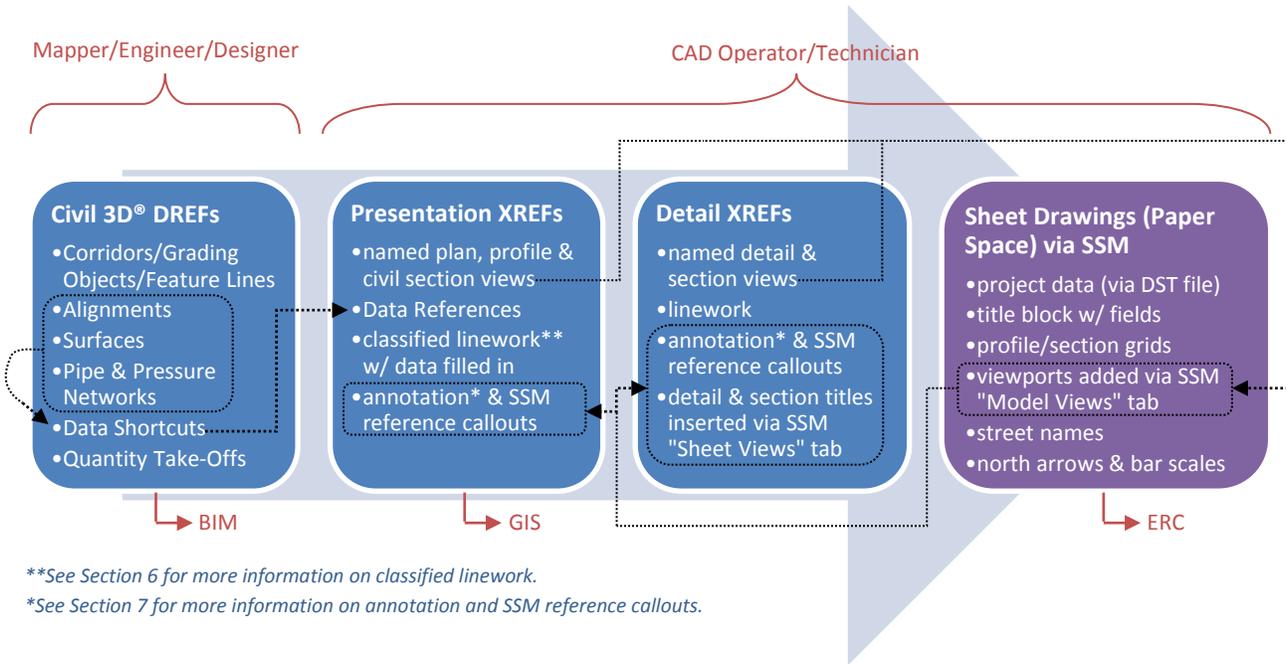
SPU-Object-Classification.xml is available online; used for attaching “Object Data Tables” to 2D utility pipes, fittings, instrumentation/appurtenances and structures. See page 83 for more information.

Pay Items

APWA bid items are provided in a format that can be used by the Civil 3D® QTO Manager. See Appendix 6 for more information.

SECTION 3: Project Data Sharing

Sharing project data amongst team members is an essential part of concurrent engineering. There are three core elements of AutoCAD® Civil 3D® that enable drawing/data sharing: Civil 3D® data references (DREFs), external references (XREFs) and Sheet Set Manager (SSM).



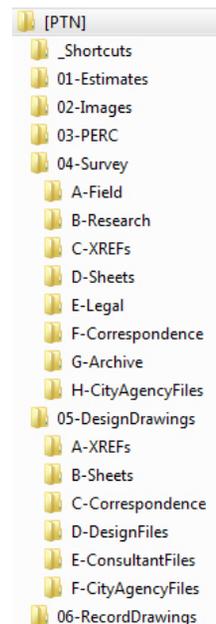
**See Section 6 for more information on classified linework.
 *See Section 7 for more information on annotation and SSM reference callouts.

There are three types of drawings: 1) “Civil 3D DREFs”, 2) “presentation XREFs” and 3) “detail XREFs”. In some cases, Civil 3D® data and 2D presentation linework can be in the same drawing(s).

Civil 3D® data is added to *Civil 3D DREF* drawings and data shortcuts are created. *Presentation XREF* drawings containing views connect to the data shortcuts by creating a reference. *Detail XREF* drawings contain views and display even more information about the design. Plan, profile, civil section and detail XREF views are added to *sheet drawings* via Sheet Set Manager (other XREF drawings may be overlaid in sheet drawings but care must be taken to ensure that the primary XREF is on top of the others). Sheet Set Manager fields can then be used in any drawing to reference sheet numbers, details and sections.

Folder Structure

Having an agreed-upon folder-structure allows all CAD Technicians to work in one place; all XREFs, DREFs, and Sheets for the project reside in the same place and are available for all to reference. Project folders are named in this format: project tracking number (see page 2 for information on project tracking numbers). Each project folder contains sub-folders (example shown in the image on the right) including the “_Shortcuts” folder which contains data shortcuts for the project.



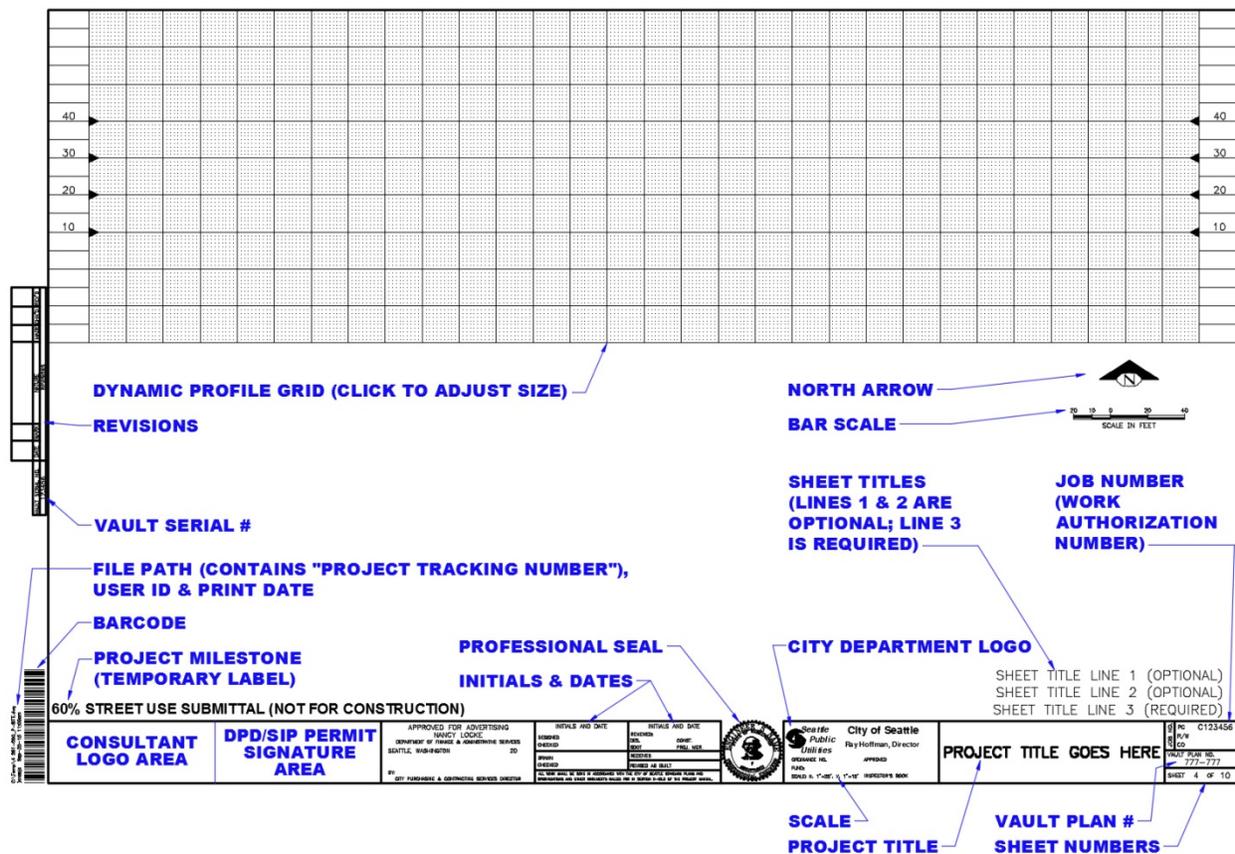
Sheet Set Manager

AutoCAD® and Civil 3D® have a powerful sheet creation/management tool called Sheet Set Manager (SSM). It leverages the power of fields to make cross-referencing easy and it allows you to print (based on a predefined page setup) selected or all sheets with a simple right-click.

The .DST file name shall be the project tracking number followed by an underscore and the project name (words separated by underscores). For example: **[PTN]_Project_Name.dst**

SPU/SDOT Title Block Overview

The SPU/SDOT title block is contained within a template that was specifically designed to be used within Sheet Set Manager (SSM). Various SSM fields are editable within the “Sheet Set Custom Properties” (all sheets) and “Sheet Custom Properties” (individual sheet). Right-click on the sheet set or individual sheets and select “Properties...” to edit these fields.



Vault Plan Number & Vault Serial Number

Vault plan & serial numbers may be acquired in the [Engineering Records Center \(Vault\)](#). A cover sheet for the project plan set must be submitted in order to receive the numbers. These numbers are required by the 60% drawing submittal and are linked to the barcode.

“Sheet Set Custom Properties” fields: **Vault Plan Number** **Vault Serial Number**

Sheet Numbers

Sheet # of # should be shown here. The sheet number is linked to the barcode. Right-click on a sheet in SSM and select “Rename & Renumber...” to renumber it.

“Sheet Set Custom Properties” field: **Total Number of Sheets**

Job Numbers

Enter the work authorization number(s) provided by the project manager.

“Sheet Set Custom Properties” fields: **Job Number – CO** **Job Number – PC** **Job Number – R/W**

Project Title

This space is reserved for the project title only.

“Sheet Set Custom Properties” field: **Project Title**

Sheet Titles

Lines 1 and 2 are optional; line 3 is required (bottom to top). These fields are embedded within MTEXT so that the text can wrap if needed. It is common to use line 2 for the [drawing numbers](#) (e.g. G-001, CU101, S-501, etc.; see discipline designators on page 44) and line 3 for the sheet titles (see page 33).

“Sheet Custom Properties” fields: **Line 1: Sheet Custom Title** **Line 2: Sheet Custom Title** **Line 3: Sheet Custom Title**

Scale

The title block scale should be in one of these formats:

- **plan only format:** 1”=20’
- **plan + profile format:** H. 1”=20’, V. 1”=10’
- **details and cover sheet format:** AS NOTED
- **notes, schedules, tables, etc. format:** NONE

“Sheet Custom Properties” field: **Scale**

Professional Seal

Insert or XREF professional seal in this location. If multiple seals are needed, they may be stacked above.

“Sheet Custom Properties” field: **PE Seal Registration Number**

Initials & Dates

Initials and dates may be entered here digitally or left blank for hand-written initials and dates upon completion.

“Sheet Custom Properties” fields: **Design Checker Initials** **Designer Initials** **Drafter Initials** **Drawing Checker Initials**
Revised As-Built

Milestone

The project milestone label is meant to be temporary; remove before completion (ALT+032).

Sheet Set “Project Control” field: **Project milestone**

Barcode

Every sheet includes a barcode on the lower left corner of the sheet that is automatically generated based on the Vault Plan Number and sheet number fields. As a part of an established business process, after the engineering plan sets are signed, they go to the Engineering Records Center (ERC) where they are processed (scanned) into the Virtual Vault, and physically archived.

In order for this barcode to display correctly, you need to download and install the proper font (fre3of9x.ttf - see SECTION 2: Support Files). The barcode utilizes the “3 of 9” barcode format. For more information on the “3 of 9” barcode format, see: http://en.wikipedia.org/wiki/Code_39

“Sheet Set Custom Properties” field: **Barcode Modifier** (contains a hyphen during design phase)

Revisions and Addendums

The revision block is located on the left-hand side, just outside of the title block. There is room for about three lines of text (layer G-ANNO-REVS, 0.08 text height, color red) in the revision block. Revision clouds (command: REVCLOUD) shall be placed in paper space on layer G-ANNO-REVC, set to the “normal” style with 0.125 arc length. Revision triangles shall use the “_TagTriangle” block on layer G-ANNO-REVS.

North Arrow

North arrows should be oriented up, to the left or aligned within the area shown on page 32.

Bar Scale

The appropriate bar scale block should be inserted into the sheet under the North arrow.

Profile Grid

The profile grid block is on layer G-ANNO-GRID, can be turned on and off as needed and can be dynamically sized. The grid block contains elevation attributes (double-click to edit). Align the elevations shown in the viewport with the elevations shown on the grid. XREF'd grid line and elevation layers in model space should be set to not print when overlaid through a viewport on this grid block.

Consultant Logo Area

Insert or XREF logos on the G-ANNO-LOGO layer in this location. CAD logos shall be blocks and use colors shown on page 94 within them. Image logos shall be grayscale with borders turned off.

The permit signature box (layer G-ANNO-SIGS) and SDCI (formerly DPD) stamp may also appear in this area; plan accordingly.

“Sheet Set Custom Properties” field: **Permit Numbers**

Tip: Remove Dashes from Sheet Set Manager Fields with ALT+032

When you erase data in a Sheet Set Manager field, it will appear as four dashes in the drawing. To avoid this, click in the field, delete the contents (if not already deleted), hold down the **ALT** key, type **032** and then let go of the ALT key. This will force a space in that field and the dashes will disappear in the drawing.

Sheet File-Naming Convention

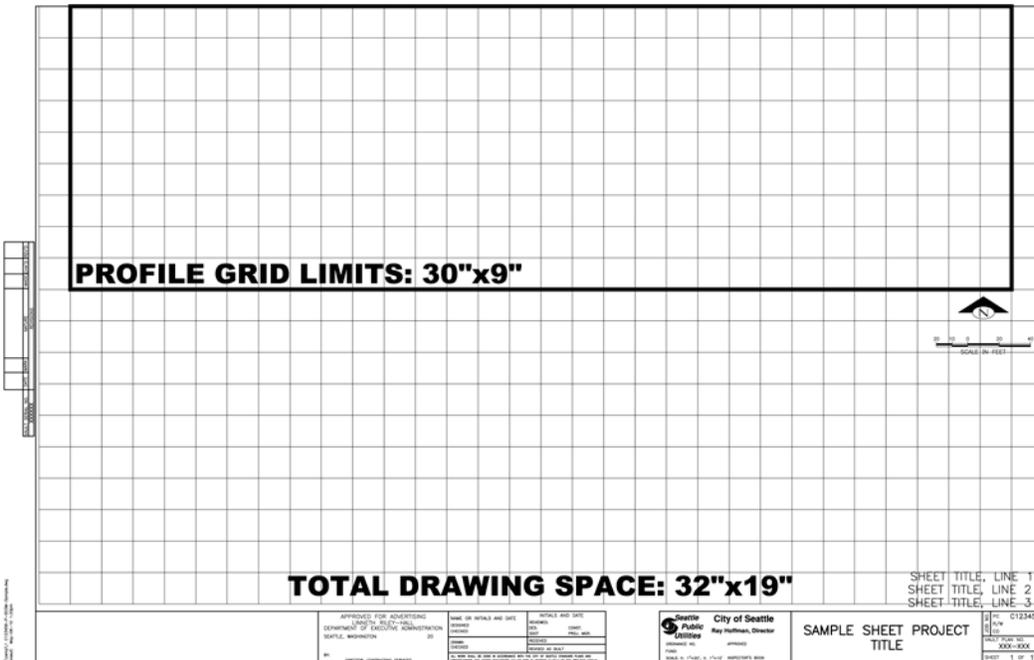
Here is the standard file-naming convention for sheets* (layouts with title blocks): sheet number followed by a space, project tracking number followed by an underscore, a “P” followed by a hyphen, a major layer field (see page 45) followed by a hyphen and a description. The standard method for creating sheets is one layout per .DWG file. Here are some common sheet file names (order varies):

• Cover:	# [PTN]_P- COVR -[description].dwg
• Site:	# [PTN]_P- SITE -[description].dwg
• Notes:	# [PTN]_P- NOTE -[description].dwg
• Water:	# [PTN]_P- WATR -[description].dwg
• Drainage:	# [PTN]_P- STRM -[description].dwg
• Sewer:	# [PTN]_P- SSWR -[description].dwg
• Combined Sewer:	# [PTN]_P- CSWR -[description].dwg
• Water Bodies:	# [PTN]_P- CHAN -[description].dwg
• Rivers and Creeks:	# [PTN]_P- RIVR -[description].dwg
• Ponds:	# [PTN]_P- POND -[description].dwg
• Landscape:	# [PTN]_P- VEGE -[description].dwg
• Paving:	# [PTN]_P- ROAD -[description].dwg
• Channelization:	# [PTN]_P- MRKG -[description].dwg
• Traffic Signals:	# [PTN]_P- SIGL -[description].dwg
• Structural:	# [PTN]_P- STRU -[description].dwg
• Details:	# [PTN]_P- DETL -[description].dwg
• Right-of-Way:	# [PTN]_P- RWAY -[description].dwg
• Temporary Erosion & Sediment Control:	# [PTN]_P- EROS -[description].dwg
• Removal:	# [PTN]_P- DEMO -[description].dwg
• Protection:	# [PTN]_P- PROT -[description].dwg
• Irrigation:	# [PTN]_P- IRRG -[description].dwg
• SCL Power/Electrical Conduits:	# [PTN]_P- POWR -[description].dwg
• Mechanical:	# [PTN]_P- MECH -[description].dwg
• Architectural:	# [PTN]_P- ARCH -[description].dwg

*for As-Built Drawings add **AB-** to the front of the PTN; for Record Drawings add **RD-** to the front of the PTN.

View Planning

It is important to plan your design views to fit inside the SPU/SDOT title block. The total drawing space within the title block is 32"x19". The profile grid takes up 30"x9".

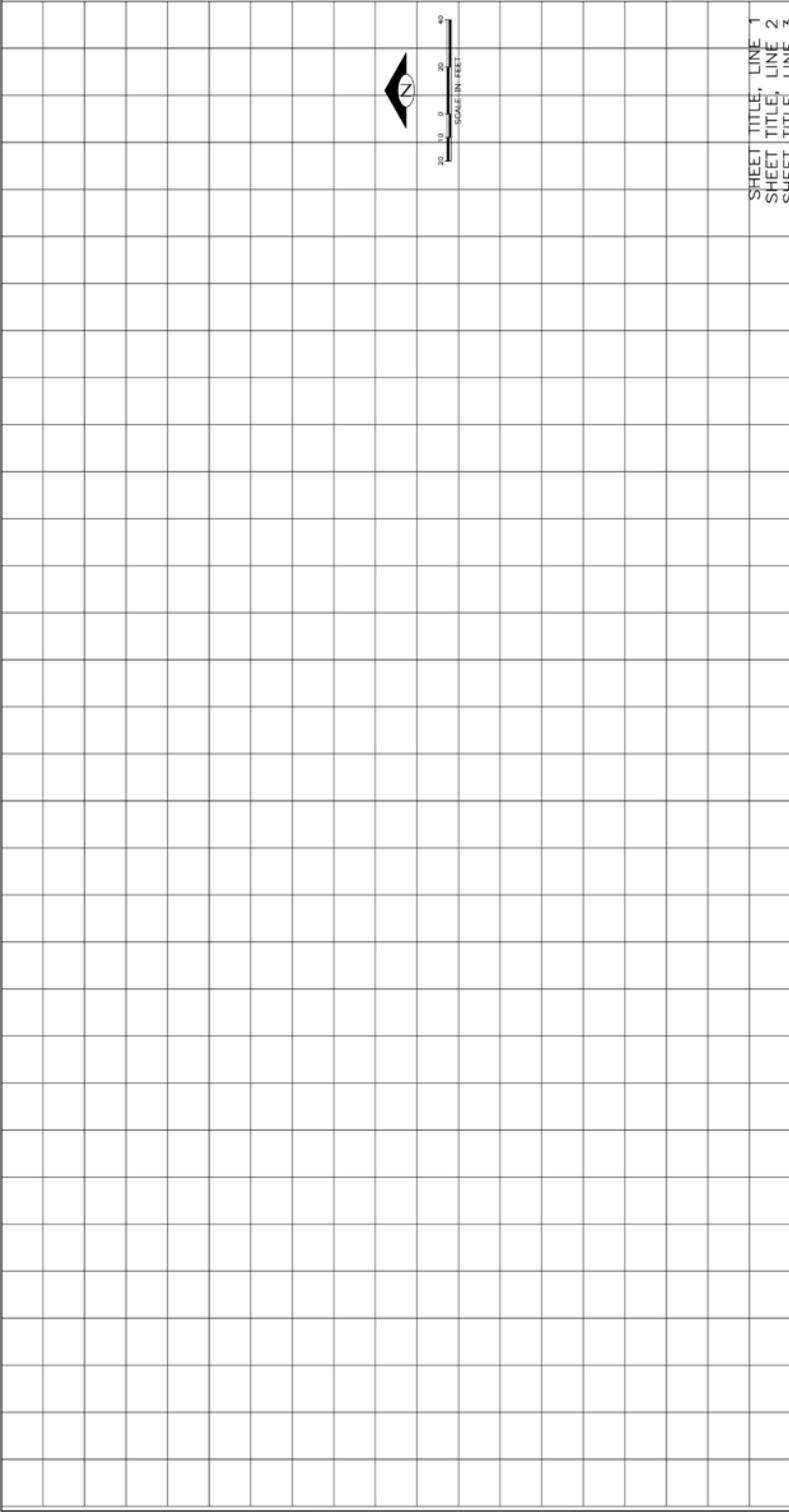


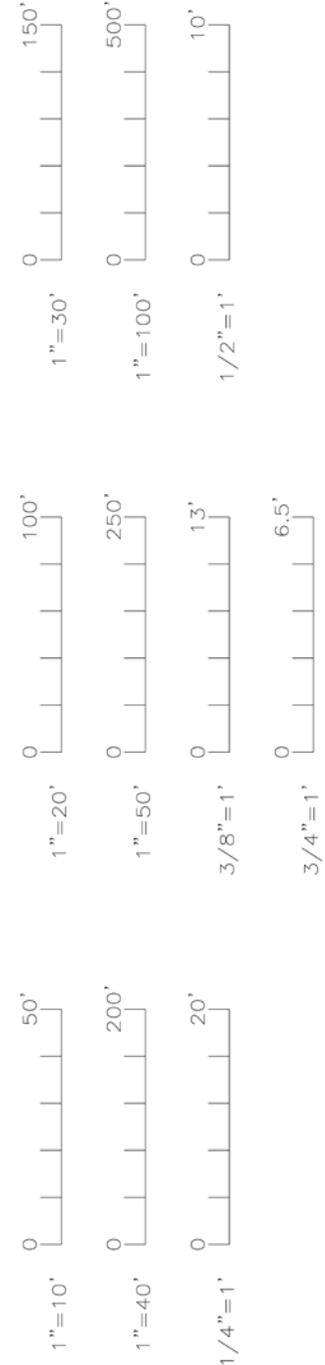
When planning for drawing views make sure to leave about ½ inch space on every side that has a match line and about 1 inch of space under profile views for station labels. Also if a legend or notes will appear on the sheet, leave about 5 or 6 inches on the right hand side.

Use the image on page 24 as a planning tool to estimate the approximate number of sheets required for a project. This tool allows you to plan drawing views using common engineering and architectural scales. The drawing area in the image reflects useable drawing area of the title block. Inside the drawing area is a grid which contains representations of 1"=20' scale. A graphic component 100 ft. x 40 ft. drawn at a 1"=20' scale would be approximated by counting five squares over and two squares down.

Before you create XREF drawings, it is recommended that you create a "Plan Views" XREF (see file naming convention on page 26) and in model space add overlapping rectangles (for civil drawings put the rectangles on layer C-VIEW-FRME) representing the limits of sheet viewports with match lines inside the overlap areas. These rectangles are scaled by the planned viewport scale factor (for example, a 5"x2" rectangle in paper space equals 100'x40' in model space at 1"=20'). Then create a named view for each rectangle. To do this, align your UCS (command: UCS) with the rectangle so the Y direction is aligned along the narrow edge of the rectangle, orient the drawing space to align with your UCS (command: PLAN; use "current" option) and create a named view (command: VIEW) that matches the limits of the box. Repeat this for every rectangle. When you are finished setting up the plan view drawing set the UCS back to World and copy and rename the drawing file to create every other plan XREF.

View Planning Worksheet

	SHEET TITLE: LINE 1 SHEET TITLE: LINE 2 SHEET TITLE: LINE 3									
	SAMPLE SHEET PROJECT TITLE									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;"> APPLICANT'S FEE \$ _____ </td> <td style="width: 33%;"> NAME OF RETAIL AND DATE (REQUIRED) _____ </td> <td style="width: 33%;"> RETAILER AND DATE (REQUIRED) _____ </td> </tr> <tr> <td> MAP NUMBER _____ </td> <td> MAP NUMBER _____ </td> <td> MAP NUMBER _____ </td> </tr> </table>	APPLICANT'S FEE \$ _____	NAME OF RETAIL AND DATE (REQUIRED) _____	RETAILER AND DATE (REQUIRED) _____	MAP NUMBER _____	MAP NUMBER _____	MAP NUMBER _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;"> City of Seattle Ray Hoffman, Director APPROVED </td> <td style="width: 33%;"> PROJECT NO. _____ </td> <td style="width: 33%;"> SHEET 1 OF 1 </td> </tr> </table>	City of Seattle Ray Hoffman, Director APPROVED	PROJECT NO. _____	SHEET 1 OF 1
APPLICANT'S FEE \$ _____	NAME OF RETAIL AND DATE (REQUIRED) _____	RETAILER AND DATE (REQUIRED) _____								
MAP NUMBER _____	MAP NUMBER _____	MAP NUMBER _____								
City of Seattle Ray Hoffman, Director APPROVED	PROJECT NO. _____	SHEET 1 OF 1								



Sheet Index Planning

Use the order of the list below to create your sheet index based on the views you planned:

- Cover Sheet.....# of sheets: 1 (discipline: G)
- Sheet Index (may go on cover sheet)# of sheets: (discipline: G)
- Notes.....# of sheets: (discipline: G)
- Survey Control Plan (including datum info).....# of sheets: (discipline: V)
- Right-of-Way Plan (if needed).....# of sheets: (discipline: V)
- Site Plans.....# of sheets: (discipline: C)
- CSEC Plans.....# of sheets: (discipline: C)
- Demolition/Removal/Protection Plans
(may be combined with CSEC and/or discipline plans)# of sheets: (discipline: C)
- Water Plans and Profiles.....# of sheets: (discipline: C)
- Water Details# of sheets: (discipline: C)
- Drainage/Wastewater Plans and Profiles# of sheets: (discipline: C)
- Drainage/Wastewater Details.....# of sheets: (discipline: C)
- Street Lighting and Signal Plans# of sheets: (discipline: C)
- Street Lighting and Signal Details and Diagrams# of sheets: (discipline: C)
- Power Plans.....# of sheets: (discipline: C)
- Power Details and Diagrams.....# of sheets: (discipline: C)
- Communications Plans.....# of sheets: (discipline: C)
- Communications Details and Diagrams# of sheets: (discipline: C)
- Paving/Roadway Grading Plans and Profiles# of sheets: (discipline: C)
- Paving/Roadway Grading Sections and Details# of sheets: (discipline: C)
- Intersection Plans# of sheets: (discipline: C)
- Channelization/Signage Plans.....# of sheets: (discipline: C)
- Landscaping/Irrigation Plans.....# of sheets: (discipline: L)
- Landscaping Details and Schedules# of sheets: (discipline: L)
- Structural Plans, Details and Sections.....# of sheets: (discipline: S)
- Architectural Plans, Elevations, Details and Sections# of sheets: (discipline: A)
- P&ID# of sheets: (discipline: D)
- Mechanical.....# of sheets: (discipline: M)
- Electrical Details and Diagrams.....# of sheets: (discipline: E)
- Other: _____ # of sheets: (discipline:)
_____ # of sheets: (discipline:)

XREFs

External Referencing, or XREF'ing, has been a standard procedure for concurrent engineering for a long time. The base map drawing should be XREF'd into design drawings as a basis for the design. Every design discipline (plan view) should be a separate XREF drawing.

Sheet drawings (paper-space layouts) should XREF the base map and design drawings into model-space and display all or a portion of the composite plan view with viewports. Overlay the primary XREF last so it is on top of all other XREFs. To put the primary XREF back on top, use the COPYBASE command with a base point of 0,0,0 and erase the XREF. Then use the PASTECLIP command with the insertion point 0,0,0.

The XREF type should always be “overlay”. The path type should always be “relative path”.

XREF File Naming Convention

Here is the standard file-naming convention for XREF drawings: the project tracking number followed by an underscore, an “X” followed by a hyphen and a major layer field (see page 45) followed by a hyphen if an optional description is included afterward. Here are some common XREF file name examples:

- Survey: [PTN]_X-**TOPO**-[optional_description].dwg
- Right-of-Way: [PTN]_X-**RWAY**-[optional_description].dwg
- Base Map: [PTN]_X-**BASE**-[optional_description].dwg
- Named Plan Views: [PTN]_X-**VIEW**-[optional_description].dwg
- Site: [PTN]_X-**SITE**-[optional_description].dwg
- Water Design: [PTN]_X-**WATR**-[optional_description].dwg
- Drainage Design: [PTN]_X-**STRM**-[optional_description].dwg
- Sewer Design: [PTN]_X-**SSWR**-[optional_description].dwg
- Combined Sewer Design: [PTN]_X-**CSWR**-[optional_description].dwg
- Mechanical Design: [PTN]_X-**MECH**-[optional_description].dwg
- River and Creek Design: [PTN]_X-**RIVR**-[optional_description].dwg
- Pond Design: [PTN]_X-**POND**-[optional_description].dwg
- Landscape Design: [PTN]_X-**VEGE**-[optional_description].dwg
- Paving Design: [PTN]_X-**ROAD**-[optional_description].dwg
- Channelization Design: [PTN]_X-**MRKG**-[optional_description].dwg
- Traffic Signals Design: [PTN]_X-**SIGL**-[optional_description].dwg
- Structural Design: [PTN]_X-**STRU**-[optional_description].dwg
- Details: [PTN]_X-**DETL**-[optional_description].dwg
- Temporary Erosion & Sediment Control: [PTN]_X-**EROS**-[optional_description].dwg
- Removal: [PTN]_X-**DEMO**-[optional_description].dwg
- Protection: [PTN]_X-**PROT**-[optional_description].dwg
- Irrigation: [PTN]_X-**IRRG**-[optional_description].dwg
- Miscellaneous: [PTN]_X-**MISC**-[optional_description].dwg
- Architectural Design: [PTN]_X-**ARCH**-[optional_description].dwg
- SCL Power/Electrical Conduit Design: [PTN]_X-**POWR**-[optional_description].dwg

Detail View Naming

Because we are using Sheet Set Manager, it is crucial to create named views (command: VIEW) in XREF drawings (model space). View names should reflect the exact title of the drawing view, detail or section. For example, an “air valve vault detail” view should be named, AIR VALVE VAULT DETAIL. The AutoCAD® view manager, however, will not allow certain “special characters” in named views (such as <>^”:;?*|,=`) but there is a workaround. Here are %% codes to use in place of these special characters:

%%60 = <	%%39 = ’	%%44 = ,
%%62 = >	%%34 = ”	%%63 = ?
%%47 = /	%%58 = :	%%42 = *
%%92 = \	%%59 = ;	%%61 = =

Tip: Create a Named View

To create a model space view, type VIEW on the command line and click the “New...” button in the View Manager dialog box.

Type the view name using the %% codes if necessary. For example, if the title of the view is **24” BFV DETAIL** you should type **24%%34 BFV DETAIL** in the View Name field.

The screenshot shows the 'View Manager' dialog box with the 'View Properties' tab selected. The 'View name' field contains the text '24%%34 BFV DETAIL'. The 'View category' dropdown is set to '<None>' and the 'View type' dropdown is set to 'Still'. Below these fields are two tabs: 'View Properties' (active) and 'Shot Properties'. Under 'View Properties', there are two sections: 'Boundary' and 'Settings'. In the 'Boundary' section, there are two radio buttons: 'Current display' (unselected) and 'Define window' (selected). To the right of these radio buttons is a small icon of a window with a red 'X' and a mouse cursor. In the 'Settings' section, there is a checkbox labeled 'Save layer snapshot with view' which is currently unchecked.

Placing XREF Views on Sheets

Use the “Model Views” tab in Sheet Set Manager to place views on sheets. After the view has been placed it may be adjusted or clipped as needed and other XREFs may be overlaid in model space to display additional information.

If information is not visible through a viewport, make model space of the viewport active, open Layer Manager, check the “VP Freeze” column for frozen layers and thaw them if necessary. After doing this, if linework appears but annotation is still invisible, set ANNOALLVISIBLE to 1 to see annotation not associated with the viewport scale (see page 89 for more information on adding scales to objects).

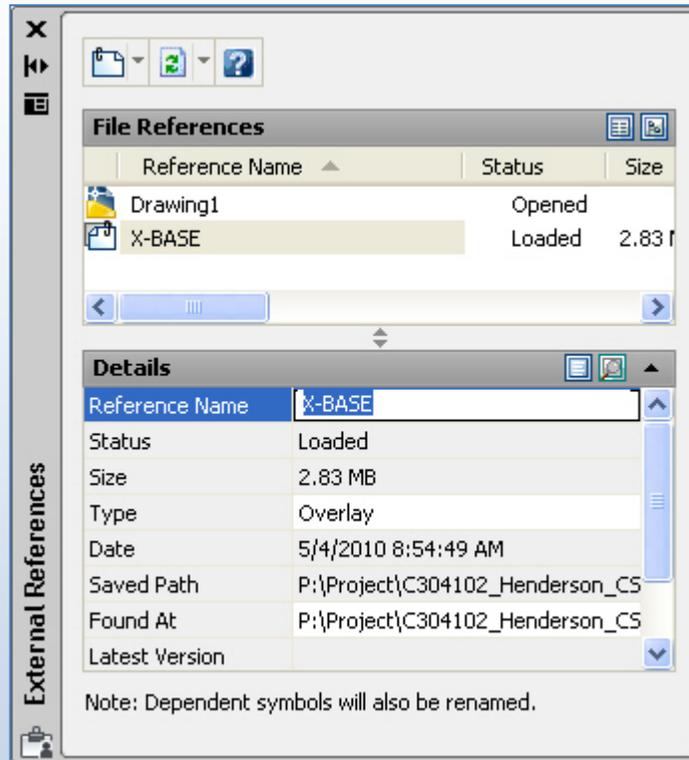
XREF Aliases

An XREF “Alias” is also known as an XREF “Reference Name”; the layer prefix (followed by the | symbol) for the XREF layers. This allows users to easily filter layers based on individual XREF names (or aliases) using Layer Filters and Layer States. Additional XREF aliases may be created by typing an “X-” followed by a major layer field (see page 45). Here are some common XREF alias names:

- Survey: X-TOPO
- Right-of-Way: X-RWAY
- Base Map: X-BASE
- Named Plan Views: X-VIEW
- Site: X-SITE
- Water Design: X-WATR
- Drainage Design: X-STRM
- Sewer Design: X-SSWR
- Combined Sewer Design: X-CSWR
- Mechanical Design: X-MECH
- River and Creek Design: X-RIVR
- Pond Design: X-POND
- Landscape Design: X-VEGE
- Paving Design: X-ROAD
- Channelization Design: X-MRKG
- Traffic Signals Design: X-SIGL
- Structural Design: X-STRU
- Details: X-DETL
- Temporary Erosion & Sediment Control: X-EROS
- Removal: X-DEMO
- Protection: X-PROT
- Irrigation: X-IRRG
- Miscellaneous: X-MISC
- Architectural Design: X-ARCH
- SCL Power/Electrical Conduit Design: X-POWR

Tip: How to Modify an XREF “Alias”

In the External References (XREF) palette you can edit the “Reference Name” (in the “Details” section of the palette) for each XREF.



The XREF layers will then look like this:

```
X-BASE|RU-SSWR-ANNO
X-BASE|RU-SSWR-LATL
X-BASE|RU-SSWR-MHOL
X-BASE|RU-SSWR-PIPE-LRGE
X-BASE|RU-SSWR-PIPE-SMAL
X-BASE|RU-SSWR-STRC
```

Detail Numbering and Section Lettering

If the viewport contains a detail or section give it a number or letter designation via the “Sheet Views” tab of Sheet Set Manager (right-click on a view and select “Rename & Renumber...”). Then place the correct type of title under it (see page 93 for information on how to do this).

Creating Civil 3D® Data in XREFs

It is important to add understandable names and descriptions to Civil 3D® objects. Some object types may be “data referenced” into other drawings (see page 31) so it is important to use layer-control to ensure duplicate objects are not visible when XREFs are overlaid in sheet drawings.

All Civil 3D® label styles must meet our annotation standards (see SECTION 7: Annotation).

Points

Points may be used to display features, modify/define a surface or be used as key notes.

Surfaces

The finish grade surface is created in the X-GRAD drawing and should be displayed as labeled contours via external reference on the sheet drawing(s). Civil 3D® “grading” objects such as Corridors, Feature Lines and Grading Objects are intended to be flexible tools for building surfaces but these objects should not be printed on the sheets.

Alignments

Existing alignments should be labeled according to our presentation standards (see page 35) with 100-foot tics.

Proposed alignments should reside in the XREF drawing they are associated with. For example, a water main alignment should be created in the X-WATR drawing.

Profiles and Profile Views

Some Profiles may be created for presentation purposes while some may be created for reference or design purposes but not shown on the sheets.

The Profile Views in model space is for design purposes only and used to align with the grid provided in paper space in the sheet drawing(s) through a viewport (by default the Profile View layers are set to not print).

Pipe Networks

Pipe Networks should reside in the XREF they are associated with (see page 31 for more information) and are used for design. Polylines, Multilines and Blocks are used for accurate presentation (see SECTION 6: Linework and Data).

Other Objects

Other Civil 3D® objects may be utilized as needed to support the creation of drawings, but care must be taken to ensure presentation standards are met.

Because of some limitations View Frame Groups are rarely used for typical City of Seattle projects.

Data Shortcuts and Data Referencing

Civil 3D® has a tool called *Data Shortcuts* which allows you to share project data. Here is a list of the types of data that can be shared using Data Shortcuts: Surfaces, Alignments, Profiles, View Frame Groups (rarely used) and Pipe Networks.

Terminology: “Create Data Shortcut” means to share the Civil 3D® data with others (publish XML to *_Shortcuts* folder). “Create Reference” means to bring shared Civil 3D® data into your drawing.

One person can create a data shortcut of data they have created and another person can create a reference to that shared data. For example, the survey technician will *create data shortcuts* of alignments, existing ground surfaces and pipe networks. The design technician will XREF the base map, freeze the alignment, surface, and pipe layers, and *create data references* of the alignments, existing ground surfaces, and pipe networks to use as the basis for the design.

Remember, when referencing data shortcuts into your drawing, also XREF the source drawing. There are two benefits to this: 1) you will get notifications every time the source drawing gets a change and 2) when you eTransmit a drawing, the data shortcut source file will automatically come along with it.

Civil 3D DREF Drawing File Naming Convention

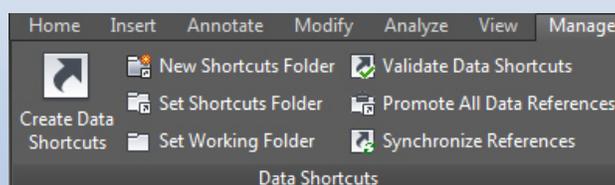
Here are standard file naming conventions for some DREF drawings:

- | | |
|--|--|
| • Existing Surface(s), Alignment(s) and Pipe Network(s): | [PTN]_X- BASE -[description].dwg |
| • General grading Surface(s) and Alignment(s): | [PTN]_X- GRAD -[description].dwg |
| • Roadway grading Surface(s) and Alignment(s): | [PTN]_X- ROAD-GRAD -[description].dwg |
| • Drainage grading Surface(s) and Alignment(s): | [PTN]_X- STRM-GRAD -[description].dwg |
| • Sewer Pipe Network(s) and Alignment(s): | [PTN]_X- SSWR-PIPE -[description].dwg |
| • Storm Pipe Network(s) and Alignment(s): | [PTN]_X- STRM-PIPE -[description].dwg |
| • Combined sewer Pipe Network(s) and Alignment(s): | [PTN]_X- CSWR-PIPE -[description].dwg |
| • Water Pipe Network(s) and Alignment(s): | [PTN]_X- WATR-PIPE -[description].dwg |

Tip: Create Data Shortcuts in Civil 3D

1. Type the **SetWorkingFolder** command, select **P:\Project** and click OK.
2. Type the **SetShortcutsFolder** command, select your project name and click OK.
3. To create data shortcuts type the **CreateDataShortcuts** command, select the items for which you want to create shortcuts and click OK.

Tools to manage your data shortcuts can be found in the “Manage” tab of the ribbon:



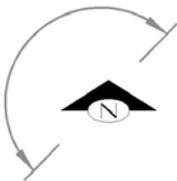
SECTION 4: Drawing Guidelines

Overview

Every drawing should be in the world UCS with the 0,0 point defined by Survey in the Survey drawing. It is important to maintain an accurate coordinate system in order to allow the exchange of design information amongst the project team and allow information from different design groups to be displayed together easily. Each design drawing should be in model space (with nothing in paper space) and should have no other drawing files externally referenced (XREF'd) into it. As you are working on your drawing, you will have the base and other design drawings externally referenced during your drawing session, but when you are complete, it is important to unload all XREFs.

General Drafting Guidelines

- North arrows should be oriented up, to the left or aligned within this area:



- Do not draw on layers 0 (zero) or Defpoints because they cannot be manipulated in an XREF.
- Create the design in model space at 1 drawing unit = 1 ft.
- Create each design element/discipline as a separate file (XREF).
- Create files in the appropriate folders, giving each file an appropriate name (see SECTION 3: Project Data Sharing).
- The XREF type should always be “overlay”.
- The XREF path type should always be “relative path”.
- XREF in the survey/base map drawing and other needed design files as required on appropriate “X” layers (see page 71).
- Work in the correct vertical and horizontal datums:
<http://www.seattle.gov/util/Engineering/LandSurveyServices/PlanReviewChecklist/>
- Draft at Z = 0, design at Z = true elevation.
- Use standard COS layers, colors and linetypes (see SECTION 5: Layers).
- Features should be drawn in accordance with [STANDARD PLAN NO 003](#) (see SECTION 6: Linework and Data).
- Use standard COS blocks (see SECTION 2: Support Files).
- Use standard COS text styles and text heights and follow standard annotation practices (see SECTION 7: Annotation).
- Abbreviations should be shown in accordance with [STANDARD PLAN NO 002](#).
- Lettering should not be shown to identify features for which standard symbols are used, unless lettering is shown in the standard symbols.
- Plot with COS color table (see SECTION 8: Plotting/Printing).
- Lock all viewports.
- Linetype variables LTSCALE, PSLTSCALE, MSLTSCALE & CELTSCALE should always be set to 1.

Planning and Setup

- ❑ Setup the cover sheet (see page 34 for requirements) and plan a place for the sheet index. The sheet index may need to go on another sheet if the plan set contains more than 55 sheets.
- ❑ Decide if you are going to implement [discipline-based drawing numbers](#) (see page 20) above the sheet titles. Format: two-character discipline designator (see page 44; use a dash for second character if discipline designator is a single character), sheet type code (0: general; 1: plans/profiles; 2: elevations; 3: sections; 5: details; 6: schedules/diagrams) and a two-digit sequence number.
- ❑ Setup the X-VIEW drawing and use it to create all other XREFs (see page 23). This view drawing may be used to create viewports in sheet (title block) drawings via Sheet Set Manager before overlaying other XREFs; viewport thaw (VP Freeze column of the Layer Manager) “X” layers as needed.
- ❑ In model space of sheet drawings showing plan views overlay the base map and freeze objects that don't need to be shown (such as street names, camera symbols, reference text, etc.). Add street names to title block drawings in paper space.
- ❑ In model space of sheet drawings, overlay secondary XREFs (change colors to 145 and freeze annotation in secondary XREFs – see page 36 for more detailed information) before overlaying the primary XREF (use “relative path” and “overlay” for all XREFs). The primary XREF may contain referenced surfaces and alignments; freeze the same referenced surfaces and alignments in all other XREFs so there are no duplicates shown in sheets.
- ❑ If SIP is required, thaw the SIP signature box (layer G-ANNO-SIGS) in the sheet drawing.
- ❑ If a profile is needed, thaw the profile grid (layer G-ANNO-GRID) in the sheet drawing and add a viewport showing the XREF'd profile view.
 - ❑ Match lines must fit within profile grid (0.5 inches of space for match line text).
 - ❑ Major stations in plan view should align with major profile grid lines.
 - ❑ Do not freeze profile view layers as they will inadvertently make profile grade lines disappear. Simply set the profile view layers to not plot; visible but not printable.
 - ❑ Edit the attributes of the grid block and align the elevations shown in the viewport with the grid lines.
- ❑ North arrows, bar scales, notes and legends appear in the right-hand portion of every sheet (should appear in the same location on every type of sheet).
- ❑ Rotate North arrows to match plan orientations.
- ❑ Edit the example professional seals or remove them and insert the correct seals (you have the option to create and overlay an XREF in paper space of sheet drawings that contains miscellaneous information to be shown on all title blocks such as logos, a professional seal, Hansen numbers, etc.)
- ❑ Familiarize yourself with and adhere to the checklists on pages 32 and 34-42.

Annotation (Viewport Zoom) Scale Guidelines for Plan Views

Project area less than or equal to 250 feet long:	1" = 10'
Project area over 250 feet long:	1" = 20' (1" = 10' as needed)

Special Cases

Channelization & signage plans:	1" = 20' or 1" = 40'
Intersection plans:	1" = 10' or 1" = 5'

Presentation Standards Checklists

Sample drawings are available for download on the web (see SECTION 2: Support Files).

Title Blocks

The SPU/SDOT Sheet Set Manager template shall be used to create title block drawings (see page 9 for more information on downloading and setting up the SPU/SDOT Sheet Set Manager template). Title blocks shall contain the following:

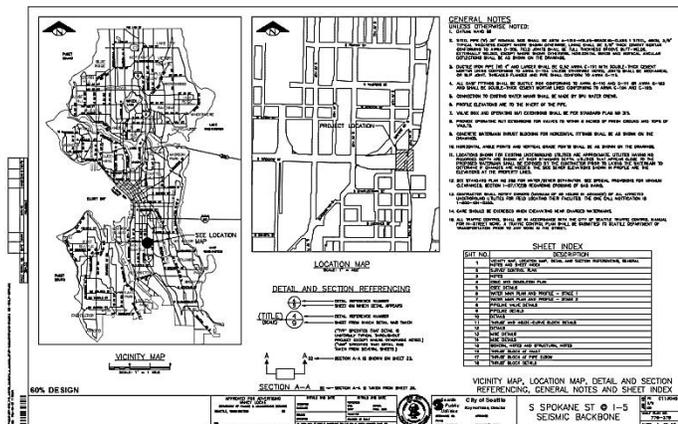
- Project title
- Sheet numbers (sheet # of #)
- Job numbers (work authorization numbers)
- Vault plan number
- Vault serial number
- Sheet titles (may also include discipline-based drawing numbers)
- Professional stamp (stamp must be signed if plans are complete)
- Designer, drafter and checker initials
- Scale (horizontal and vertical if applicable; for example: H. 1" = 20', V. 1" = 10'). If drawing has no scale, write NONE. If drawing has various scales, write AS NOTED in title block and write the scales under the view titles.
- Department of Finance & Administrative Services (FAS) signature box.
- Street Improvement Permit (SIP) signature box (only applies to sheets submitted for the SIP).
- Barcode (lower-left, just outside of title block)
- Hansen numbers for SIP and SDCI permits (0.125 text height shown vertically within the title block on the inside right edge above the sheet title).

NOTE: Do not explode title blocks or overwrite fields with text. To add something to the title block (such as a company logo or professional engineer's seal) XREF or insert a drawing into the layouts.

Cover Sheet Presentation

The cover sheet should be sheet #1 and contain the following:

- Vicinity map at scale: 1" = 1 MILE
- Location map (may go on another sheet if more room is required) at scale: 1" = 400'
- Datum block
 - Vertical datum note, including:
 - Benchmark reference number, description (including location), and elevation
 - Datum name



- Horizontal datum note, including:
 - Basis of bearing description
 - Description of monuments used for basis of bearing
 - Coordinates on each monument used for basis of bearing
 - Bearing and distance between the two monuments
 - Source of coordinates (Published, GPS, or what?)
- Detail & section referencing block
- Sheet index (may go on another sheet if more room is required)
- Notes (may go on another sheet if more room is required)

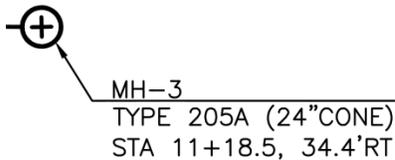
Survey Control Presentation

Survey control information should be included in every plan set. The survey control information may be included on the location map or may be shown on it's own sheet. The survey control information sheet must meet SIP requirements (http://www.seattle.gov/transportation/stuse_sip.htm#check) and include:

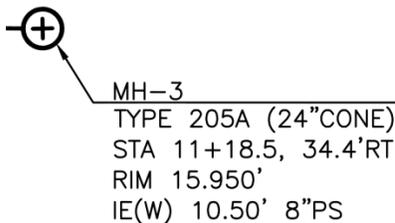
- Street names.
- Description of every monument (cased, buried, surface brass cap, etc.).
- Coordinates for each monument, which must include Northing and Easting.
- Bearing and distance on each street between each two monuments, and distance from offset monument (if any) to intersection.
- Radius, delta angle, and arc length on any curving monument lines or baselines.
- Bearing and distance and/or dimension from monumented line to construction baselines (if any).
- Stations at intersections and all monuments.
- Station numbering must be unique for each street. Come up with different starting stations for each street alignment so that the numbers do not overlap (start with 10+00 and go up from there).
- Stationing on North/South alignments must increase to the South to abide by city presentation standard of north up or left. Stationing on East/West alignments must increase to the East to abide by city presentation standard of north up or left.
- Station at the beginning, end, at each intersection and at PCs and PTs of curving monument lines (no stationing that starts at property line, end of existing paving, or other indeterminate point).
- Description and elevation of any site BMs or control points with elevation (it is ok to use monuments with elevations as site BMs).
- Dimension from monument line to right-of-way line on each street; if variable, show dimension at each end of block.
- Washington State Licensed surveyor's stamp (stamp must be signed if plans are complete).
- Current contact information for the surveyor whose stamp appears on the drawing (name, address, phone, and/or email).

General Plan & Profile Sheet Presentation

- ❑ Profile views are typically shown above plan views on utility sheets and shown under plan views for roadway sheets. The plan and profile views should be aligned so that the improvement is in direct relationship between the two views as much as possible.
- ❑ Street names must be shown (see SECTION 7: Annotation).
- ❑ All disciplines (paving plans, watermain plans, sewer plans, etc.) should use the same match line locations.
- ❑ Plan views should show callouts containing horizontal information (such as stations and offsets), including vertical information only if it is not represented in a profile view.



Profiles should show callouts containing vertical information (such as invert and rim elevations), including horizontal information only if it cannot be represented in a plan view.



- ❑ Plan views should have a North arrow with a bar scale under it.
- ❑ For multi-discipline projects, show nearby improvements for context (such as showing water improvements on a drainage plan) but freeze the annotation and change the linework to color 145. To do this, overlay an XREF of the secondary improvement, viewport freeze (VP Freeze) secondary improvement layers that don't need to be shown (such as annotation) and change the viewport color (VP Color) of the remaining secondary improvement layers to color 145.
- ❑ Use standard COS detail and section referencing callouts (see page 42).
- ❑ Proposed geo-referenced features and vertices of area limits must be labeled in such a way as to easily locate in the field (such as station/offset labels, Northing/Easting labels or point labels referring to a table containing station/offset data).

Match Lines

- ❑ Adjoining sheets must use match lines at an even station with the sheet number referenced.
- ❑ Dimensioning between features shown on separate sheets should be shown with double arrowheads at the match line.
- ❑ The scale must not change across match lines.
- ❑ Match lines may not be placed in intersections.

Removal/Demolition Plan Presentation

- ❑ Removal/demolition sheets show clearing and grubbing, building removal and other items being removed that are not covered elsewhere in the plan set. Items to be removed on a removal/demolition sheet should be shown in bold, crossed out or covered with a hatch pattern.
- ❑ All other removal items should be shown on the sheets they are associated with in an existing lineweight (color 125) with a proposed callout.

Construction Stormwater Erosion Control (CSEC) Plan Presentation

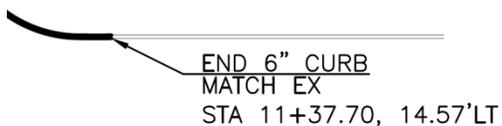
- ❑ Soil, vegetation and tree protection shown; use an existing lineweight (color 125) and a proposed callout stating that the item is to be protected.
- ❑ A legend must be included on CSEC sheets for linetypes, symbols and hatch patterns used.

Paving Plan Presentation

- ❑ Show outlines of castings/openings in paved area.
- ❑ Spot elevations are shown at least every 25 feet at the crown, flow line, top of curb and property line with the following descriptions (may be shown in a point table):

CROWN
 EDGE OF PAVEMENT
 FLOW LINE
 BACK OF WALK
 FRONT OF WALK
 GROUND LINE
 GRADE BREAK LINE

- ❑ Station and offset (or station and pavement width) from monument line or construction baseline to all beginnings and ends of curb and/or “match existing” points, angle points, and changes of curb height.



- ❑ Intersection(s) shown on separate sheet(s) at 1"=10' scale (show street names; no match lines required) depicting curb returns and ADA ramps with the following information (may be shown in tables):

- ❑ Delta angle, radius, tangent and length on all curb returns and reverse curves, elevations at PC's, PT's, PRC's, quarter points and high and low points of curb returns (along flowline).

CURB RETURN TABLE

CURB RETURN NO.	POINT	STATION	OFFSET	ELEVATION AT FLOW-LINE	CURVE GEOMETRY
C2	RADIUS POINT	STA 50+00.00	32.30' LT	N/A	$\Delta = 89.11$ $R = 20.00$ $T = 19.69$ $L = 31.10$
	PC	STA 50+00.65	12.35' LT	377.36'	
	1/4	STA 50+08.19	14.06' LT	377.85'	
	1/2	STA 52+14.51	18.51' LT	378.35'	
	3/4	STA 50+18.68	25.02' LT	378.84'	
	PT	STA 50+20.06	32.62' LT	379.34'	

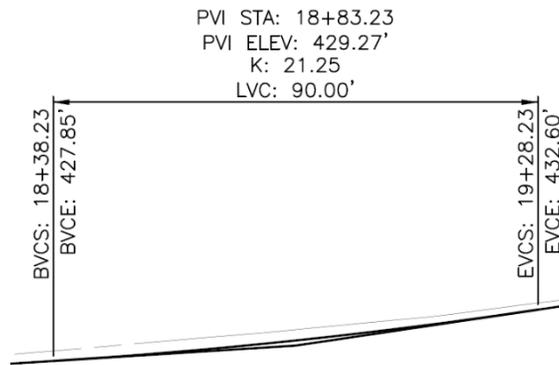
- ❑ Elevations at all corners of each proposed ADA ramp (including top of curb at the start of the wings).

RAMP-2 (SE) POINT TABLE			
POINT	ELEV	STATION/OFFSET	DESCRIPTION
R2-A	56.41'	STA 14+44.00, 14.42'RT	TOP OF CURB
R2-B	56.26'	STA 14+39.58, 16.99'RT	FLOW LINE
R2-C	56.45'	STA 14+36.80, 19.87'RT	FLOW LINE
R2-D	56.93'	STA 14+34.08, 25.03'RT	TOP OF CURB
R2-E	56.67'	STA 14+43.71, 20.98'RT	TOP OF RAMP
R2-F	56.75'	STA 14+40.93, 23.86'RT	TOP OF RAMP
R2-G	56.71'	STA 14+47.33, 24.48'RT	BACK OF LANDING
R2-H	56.79'	STA 14+44.20, 27.02'RT	BACK OF LANDING

Paving Profile Presentation

- ❑ Call out whether the profile refers to the centerline of road, top of curb, gutter/flow line, or other feature.
- ❑ Show elevations and stations at all grade breaks.
- ❑ Show elevations at all "match existing" points.
- ❑ Provide a description of any vertical curves (required for grade changes greater than 1%). The description must include:
 - ❑ VPI station and elevation.
 - ❑ Length of vertical curve (min along streets is 75').

- High or low point station and elevation, if applicable.



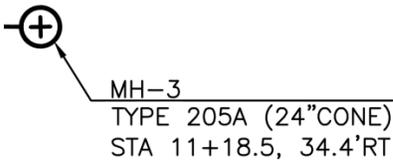
Paving Cross Section Presentation

- Dimension from centerline to saw cut, flow line (if other than base of curb), face of curb, sidewalk and sidewalk width, and right-of-way line.
- Show height of curb or dimensions of thickened edge of asphalt
- Show cross slope on all paved surfaces

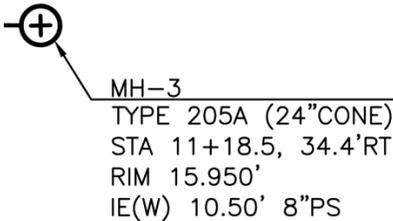
Sewer, Storm Drain, and Water Main Plan Presentation

(for information on linework see page 73; for information on callout formatting see pages 90 and 91)

- ❑ Leader callout showing the identification of each structure (name/number in this format: MH-#, VAULT-#, CB-#, INL-#, etc.) above the “type” as defined in the [City of Seattle Standard Plans](#) and the station and offset from a monument line or construction baseline to:
 - ❑ center of structures (maintenance holes, cleanouts, hydrants, valves, etc.), except most catch basins and inlets are stationed at the face of curb.
 - ❑ all horizontal break points and all connection points.



NOTE: if a structure is not shown in a profile, also include the rim elevation and invert elevation(s) with compass direction(s) in parenthesis.



- ❑ Each pipe run (between structures or maintenance holes) must have a loop-leader callout showing the size, type of pipe and material in parenthesis.

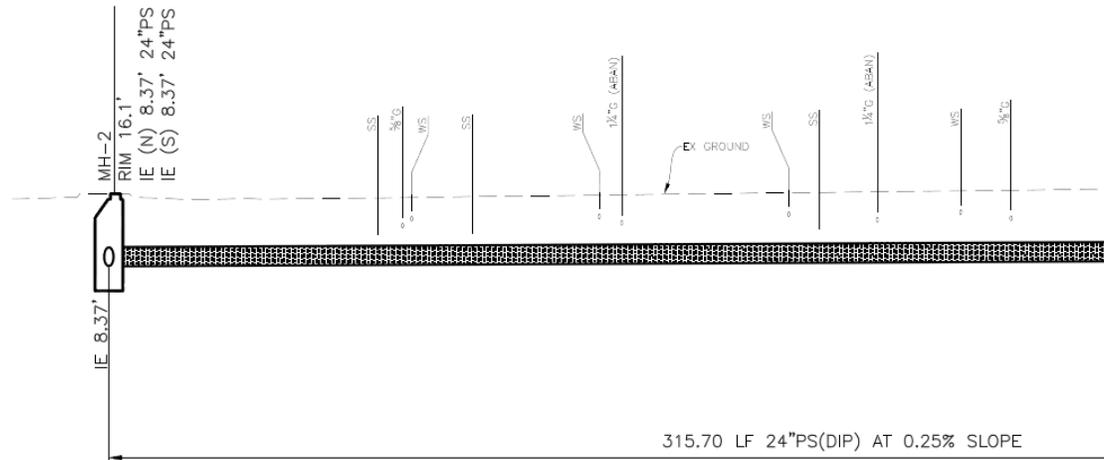


Sewer, Storm Drain, and Water Main Profile Presentation

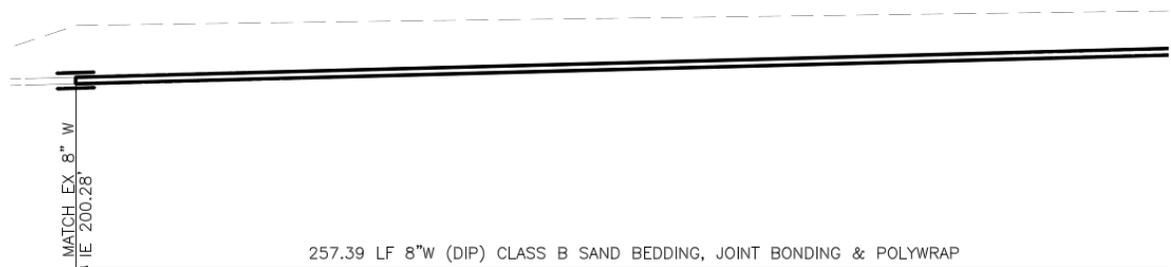
(for information on setting up profile linework see page 79)

- ❑ Horizontal scale should match associated plan view scale. Vertical scales may vary.
- ❑ Pipes are projected onto the profile view(s) aligned with existing street control stationing as a general rule (exceptions: pipes in non-roadway sites such as parking lots, parks or hillsides may need to be shown as true-length for clarity).
- ❑ Profiles are required for all sewer, storm drain, combined sewer and water mains and must include:
 - ❑ Vertical callout above each structure showing the structure’s identification (name/number) on the left side and rim elevation on the right side (in this format: RIM ##.##’). Station and offset callouts are not required in utility profiles unless not shown anywhere else.
 - ❑ Vertical callout below structures and pipes showing elevations at each invert, connection, and/or grade break on each pipe (in this format: IE ##.##’).

- Each gravity pipe run must have a horizontal dimension line below that goes from center of MH to center of MH showing the length (linear feet), size (inches), type, material in parenthesis, and slope (percentage). For example: 60 LF 12"PS (DIP) AT 2.00% SLOPE. Other pipes connected to drainage structures are dimensioned from the inside face of structure walls.



- Each water pipe run must have a horizontal dimension line below showing the length (linear feet), size (inches), type (W), material in parenthesis, class of bedding and type of protection. For example: 60 LF 12"W (DIP), CLASS B SAND BEDDING, JOINT BONDING & POLYWRAP.



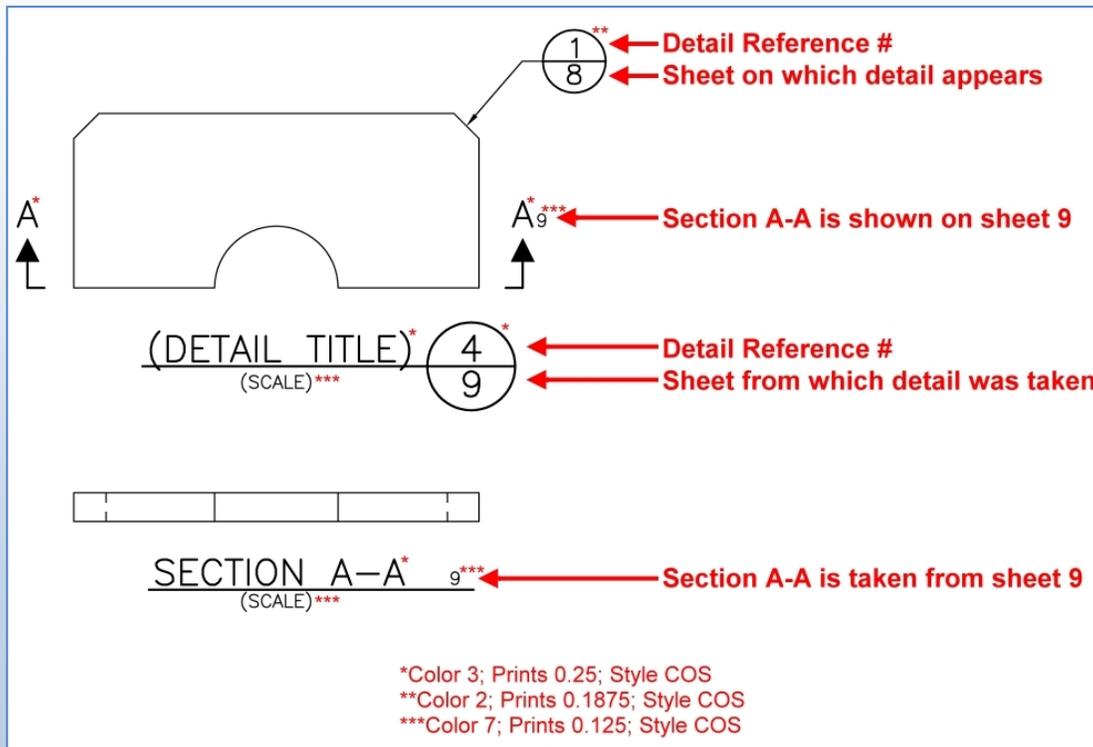
- Radius and delta angle of curved pipes, if applicable.

Detail & Section Presentation

- ❑ Add detail and section viewports to sheets via the Sheet Set Manager “Model Views” tab.
- ❑ Details should be drawn to scale and typically dimensioned in an architectural format.
- ❑ Details should be separated into individual drawings (XREFs) by discipline. A detail drawing (XREF) should only contain a set of detail views that share the same scale (unless a detail contains a blow-up).
- ❑ There are two types of sections: “civil sections” and “detail sections”. Civil sections relate to a plan view and are typically dimensioned in an engineering format while detail sections relate to a detail view and are dimensioned in an architectural format.
- ❑ Details should be labeled with a title, scale centered under the title, reference numbers in a bubble callout to the right of the title (see page 93 for standard detail title block) and a North arrow.
- ❑ Sections should be labeled with a letter designation in this format: SECTION X-X # (sheet reference is shown to the right of the title) and scale centered underneath (see page 93 for standard section title block).
- ❑ Detail and section viewports should be numbered/lettered via the Sheet Set Manager “Sheet Views” tab and arranged in order to be read from left-to-right/top-to-bottom.
- ❑ If a detail is provided in the [City of Seattle Standard Plans](#), simply refer to it by number (i.e. STANDARD PLAN NO ###X); it is not required to be in the plan set unless it is modified.

Tip: Detail & Section Referencing Standards

For more information see page 93.



QC Markup Guidelines

Drawings can be plotted digitally or physically and marked up (see SECTION 8: Plotting/Printing). For clear written communication, use one of the three options shown below to callout and illustrate with the following colors:

- **RED:** new/revised linework or text to be added/modified in the drawings
- **GREEN:** deletions
- **BLUE:** clarifying comments to CAD technician

OPTION 1: DWF

- Markups must be done with [Autodesk Design Review](#) on full-size drawings (at least 22"x34").
- Markups must be done in color with the markup tools located in the "Markup & Measure" tab.

OPTION 2: PDF

- Markups must be done with [Adobe Acrobat](#) (not reader) on full-size drawings (at least 22"x34").
- Markups must be done in color with the following "Comment & Markup" tools: Callout Tool, Text Box Tool, Cloud Tool, Arrow Tool, Line Tool, Rectangle Tool, Oval Tool, Polygon Line Tool and/or Polygon Tool (sticky notes are not valid).

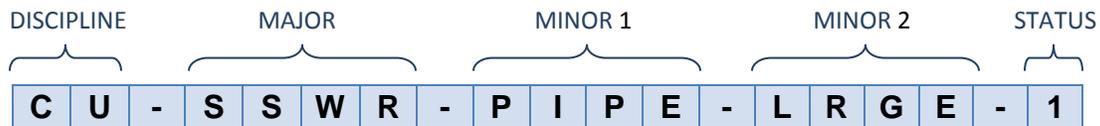
OPTION 3: Hard-Copy Prints

- Markups must be done on full-size (at least 22x34) or half-size (11x17) drawing prints.
- Handwriting must be clearly written.

SECTION 5: Layers

The layer name format is organized as a hierarchy. This arrangement allows users to select from a number of options for naming layers according to the level of detailed information desired. Layer names consist of distinct data fields separated from one another by dashes. A detailed list of abbreviations, or field codes, is prescribed to define the content of layers. Most field codes are mnemonic English abbreviations of construction terminology that are easy to remember.

The layer name format, showing the Discipline Designator, the Major Group, two Minor Groups (optional), and the Status (optional) fields looks like this:



Below, and on the next few pages are lists of common layer fields. Not all field codes are represented – refer to the [National CAD Standards](#) for layer field codes of disciplines not defined in this CAD Manual.

Layer Fields: Discipline Designators



Designator:	Description of Discipline Designator:
G	General
GR	General Record Drawing
V	Survey (verified as-builts)
VA	Aerial Survey
VF	Construction Field Survey
VJ	Calculated Survey
R	Base Map (based on existing records)
RK	Project Information for GIS
RP	Base Map Paving
RU	Base Map Utilities
C	Civil (proposed)
CD	Civil Demolition
CU	Civil Utilities
CP	Civil Paving
CG	Civil Grading
CT	Civil Transportation
CR	Civil Record Drawing (also used for as-built drawings – see page 70 for more info)
L	Landscaping (proposed)
LR	Landscaping Record Drawing (also used for as-built drawings – see page 70 for more info)

Designator:	Description of Discipline Designator:
E	Electrical (proposed – for schematics and details, use DETL layers found on page 70)
EI	Electrical Instrumentation (proposed – for schematics and diagrams)
ER	Electrical Record Drawing (also used for as-built drawings – see page 70 for more info)
M	Mechanical (proposed – for schematics and details, use DETL layers found on page 70)
MR	Mechanical Record Drawing (also used for as-built drawings – see page 70 for more info)
S	Structural (proposed – for schematics and details, use DETL layers found on page 70)
SR	Structural Record Drawing (also used for as-built drawings – see page 70 for more info)
A	Architectural (proposed – for schematics and details, use DETL layers found on page 70)
AR	Architectural Record Drawing (also used for as-built drawings – see page 70 for more info)
D	P&ID (proposed – for schematics and details, use DETL layers found on page 70)

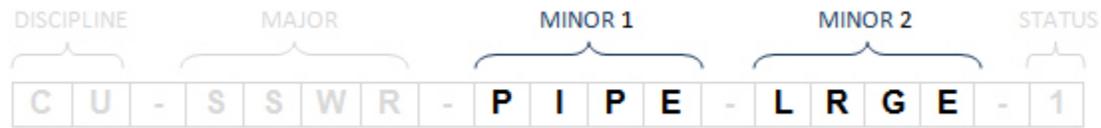
Layer Fields: Major Group



Major Fld:	Description of Major Layer Field:
ALIN	Alignments
ANNO	Sheet annotation
BLDG	Buildings and primary structures
BLIN	Baseline
BNDY	Political Boundaries
BORE	Test borings
BRDG	Bridges
BRKL	Break / fault lines
CABL	Cable
CHAN	Water bodies (channels, lakes & the Puget Sound)
COMM	Communications
CSWR	Combined sewers
CTRL	Control points
DATA	Data outlets
DETL	Details
DIAG	Diagrams
DRIV	Driveways
DTCH	Ditches or washes
EROS	TESC (temporary erosion and sediment control)
ESMT	Easements
FNDN	Foundations
FENC	Fencing
FIRE	Fire protection system
FLHA	Flood hazard area
FUEL	Fuel gas

Major Fld:	Description of Major Layer Field:
GRND	Ground systems
HVAC	Heating, ventilation and air conditioning
INTR	Interference
IRRG	Irrigation
LITE	Light poles
LOCN	Limits of construction
MATL	Material section
NBLT	As-Built and Record drawing: Crossed out features that were not built
NODE	Point
NGAS	Natural gas
PIPE	Pipes
PLNT	Plant and landscape material
POND	Ponds
POWR	Power (Seattle City Light)
PRKG	Parking
PROF	Profiles
PROP	Property
PVMT	Pavement (non-roadway paving, i.e. conc pads)
RAIL	Railway
RBAR	Rebar
RIVR	Rivers and Creeks
ROAD	Roadways
ROCK	Rocks and Rockery
RRAP	Riprap
RWAY	Right-of-Way
SECT	Sections
SGHT	Sight distance
SIGL	Traffic signals
SITE	Site features
SOIL	Soils
SURV	Survey
SSWR	Sanitary sewer
STEM	Steam
STRM	Storm sewer
SWLK	Sidewalks
TINN	Triangulated irregular network
TOPO	Topography
TRAL	Trails or paths
VIEW	Viewports
WALL	Walls
WATR	Water supply systems
WETL	Wetlands
WTZN	Water pressure zone

Layer Fields: Minor Group



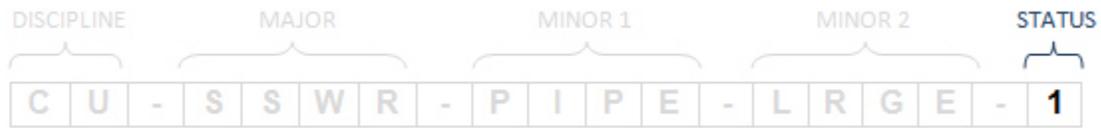
Minor Fld:	Description of Minor Layer Field:
025Y	Flood: 25 year mark
050Y	Flood: 50 year mark
100Y	Flood: 100 year mark
200Y	Flood: 200 year mark
ACCS	Easements: Access (pedestrian only)
ANNO	Annotation
ASPH	Pavement: Asphalt
ASSM	Corridors: Assemblies
BACK	Pavement: Back
BARR	Barriers (jersey barriers, noise barriers, etc.)
BARS	Sheets: Bar scales
BERM	Berms
BIKE	Bike racks
BNCH	Benches
BNDY	Topography: Boundaries (surface boundaries)
BOLD	Details: Thick lines
BOTD	Ditches: Bottom of ditch
BRCK	Brick
BRNG	Annotation, Alignments: Bearing and distance (survey coordinates)
BUFF	Wetlands: Buffers
CATV	Utilities: Cable television
CIPR	TESC: Culvert inlet protection
CITY	City Boundaries
CNTY	County Boundaries
CNTE	TESC: Drainage divides
CNTR	All: Center lines
COLS	Columns
CONC	Pavement: Concrete
CONS	Easements: Conservation
CORR	Corridors
CSTG	Easements: Construction / grading
CTLJ	Walls: Control joints
CURB	Pavement: Curbs
DATM	Datum notes
DAYL	Grading: Daylight lines
DECK	Buildings: Outdoor decks (no roof)
DEPR	Topography: Depression (depression contours)

Minor Fld:	Description of Minor Layer Field:
DIMS	Dimensions
DRAN	Grading: Drainage slope
DVDK	TESC: Diversion dike
EDGE	Channels, major water bodies, ponds, creeks and rivers: edge of water
ELEC	Utilities: Electrical
EQPM	Utilities: Equipment (pumps, motors, etc.)
EWAT	Ditches: Edge of water
FACE	Pavement: Face (front)
FALT	Topography: Fault / break lines
FDPL	Flood plain
FEAT	Grading: Feature lines
FIBR	Fiber Optic
FINE	Details: Thin lines
FIXT	All: Fixtures (wheel stops, parking meters, hardware, etc.)
FLNE	Channelization: Fire lane
FRME	Sheets: Frame
GRAL	Fencing: Guard rails
GRID	Profiles: Profile grid
GRVL	Pavement: Gravel
HID1	Details: Thick hidden lines
HID2	Details: Thin hidden lines
HRAL	Handrail
PATT	All: Hatch Patterns
HVIS	High-visibility construction fencing
HYDR	Water: Fire hydrants
IMGS	Images and photos
INEG	Easements: Ingress / egress (vehicles only)
INPR	TESC: Inlet protection
INST	Utilities/Electrical: Instrumentation (meters, valves, traffic signal hardware, electrical, etc.)
INTR	Misc: Interference
KEYN	Sheets: Keynotes
LABL	Annotation: Labels
LATL	Utilities: Laterals (sewer & drainage connections)
LEGN	Sheets: Legends, symbol keys
LANE	Channelization: lane
LIDR	LIDAR Data
LINE	All: Lines (property lines, etc.)
LOGO	Logos
LOGS	Logs
LOOP	Traffic: Loops
LRGE	Utilities: Large piping (>= 12")
LSCP	Misc: Landscape
MAIL	Mail boxes

Minor Fld:	Description of Minor Layer Field:
MAJR	All: Major lines
MARK	Channelization: directional arrow
MATC	Sheets: Match lines
MEDM	Details: Medium-weight lines
MHOL	Utilities: Maintenance hole castings/openings
MINR	All: Minor lines
MRKG	All: Markings
NOTE	Sheets: Notes
NBLT	As-Built and Record drawing: Feature not built
NPLT	Misc: Non-plotting graphic information
NRTH	Sheets: North arrows
NSBR	Walls: Noise Barriers
NATL	National Boundaries
OTLN	Buildings: Outline
OVHD	Buildings: Overhead (overhang)
PAVR	Pavement: pavers
PERM	All: Permanent
PHON	Utilities: Telephone lines
PIPE	Utilities: Pipes
PLSS	Public Land Survey System
POLE	Utilities: Boxes / poles
POST	Fencing: Posts
PRCH	Buildings: Porch (attached, roof overhead)
PROF	Profiles
PROJ	Grading: Projection lines
PUMP	TESC: Bypass pumping
RAMP	Channelization: curb ramp
RDME	Misc: Read-me layer (not plotted)
REDL	Misc: Redlines
REFR	Annotation: reference boxes (PHANTOM2 linetype)
REPL	Wetlands: Replacement
REVC	Misc: Revision clouds
REVS	Sheets: Revisions
ROAD	Pavement: Roadways
ROCK	Rockery/rocks
RTWL	Walls: Retaining walls
RWAY	Easements: Right-of-way (public access)
SAMP	Sections: Sample lines
SAND	TESC: sand bags
SBCK	Property: Setback lines
SCHD	Sheets: Schedules
SCUT	Sawcut
SECT	Sections

Minor Fld:	Description of Minor Layer Field:
SEGM	Channelization: segment
SERV	Utilities: water services
SHEA	Walls: Structural bearing or shear walls
SIGL	Traffic Signals
SIGN	All: Signs
SILT	TESC: Silt fence
SLID	Channelization: solid
SLNE	Channelization: stopline
SLOP	Grading: Slope patterns
SMAL	Utilities: Small piping (< 12")
SPOT	Topography: Spot elevations
SSLT	TESC: Super silt fence
STAN	Alignments: Stationing
STEL	Fencing: Steel
STRC	Utilities: Structures
STRP	Channelization: Striping
STEP	Stairs/steps
SUBA	Corridors: Sub-assemblies
SUBT	Annotation: Sub-titles
SURF	Surface
SWAY	Utilities: Spillway
SWMT	Utilities: Storm water management
SYMB	Sheets: Reference symbols
TABL	Sheets: Tables
TANK	Utilities: Storage tanks
TITL	Annotation: Titles
TOEB	Topography: Toe of bank
TOPB	Topography: Top of bank
TOPD	Ditches: Top of ditch
TPIT	Topography: Test pits
TRAK	Channelization: track
TRAL	Pavement: Trail or path (public access)
TTLB	Sheets: Border and title blocks
UGND	Utilities: Underground
UPVD	Pavement: Unpaved surface
UTIL	Utilities
VIEW	View frames/boxes
WELL	Utilities: Wells
WHIT	Channelization: White paint lines
WOOD	Fencing: Wood
XWLK	Channelization: crosswalk
YELO	Channelization: Yellow paint lines
ZONE	Channelization: zone

Layer Fields: Status



Status:	Description of Status Field:
1	Phase/iteration 1
2	Phase/iteration 2
3	Phase/iteration 3
4	Phase/iteration 4
5	Phase/iteration 5 or objects only displayed at 1" = 5' scale
6	Phase/iteration 6
7	Phase/iteration 7
8	Phase/iteration 8
9	Phase/iteration 9
10	Phase/iteration 10 or objects only displayed at 1" = 10' scale
20	Objects only displayed at 1" = 20' scale (rarely used because this is the default scale)
30	Objects only displayed at 1" = 30' scale
40	Objects only displayed at 1" = 40' scale
50	Objects only displayed at 1" = 50' scale
80	Objects only displayed at 1" = 80' scale
100	Objects only displayed at 1" = 100' scale
D	Existing to demolish (for modifications to base map; matches existing color and linetype)
H	Horizontal (for profile grids)
V	Vertical (for profile grids)
F	Future work (linetypes may be changed for visual clarity if it is included in a legend)
T	Temporary work (linetypes may be changed for visual clarity if it is included in a legend)
X	Not in contract (linetypes may be changed for visual clarity if it is included in a legend)

Layer Color Guidelines

As a general rule, different object types are assigned to separate layers. Follow these guidelines when assigning colors to layers, unless otherwise noted in the list of Common Layer Names below:

Object Type	Existing Layer Color(s)	Proposed Layer Color(s)
Layer colors for Linework/Blocks	125	<i>(choose color from SECTION 8: Plotting/Printing, p. 94)</i>
Layer colors for Annotation	<i>(choose color from the Text Color and Size Chart, p. 86)</i>	
Layer colors for Hatch	125	22
Layer colors for Civil 3D® Objects	125	7

Common Layer Names

The templates come pre-loaded with a few standard layers by default. Below is a list of some common layer names (not all layer names are represented here).

[] is to be replaced with one of the Discipline Designators shown on page 44.

Sheet Annotation

Annotation in Paper Space/Title Block Drawings

Layer Name	Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies to
[]-ANNO	Sheet Annotation (typically used on sheet/title block drawings)	125/7	Continuous	Annotation
[]-ANNO-BARS	Bar Scales	125/7	Continuous	Linework
[]-ANNO-BRNG	Bearings and distance labels (survey coordinates)	125/7	Continuous	Annotation
[]-ANNO-GRID	Profile Grid	1	DOT	Linework
[]-ANNO-GRID-MAJR	Profile Grid - Major	22	GRID2	Linework
[]-ANNO-GRID-MINR	Profile Grid - Minor	22	GRID1	Linework
[]-ANNO-IDEN	Identification tags	125/7	Continuous	Annotation
[]-ANNO-KEYN	Keynotes	125/7	Continuous	Annotation
[]-ANNO-LABL	Labels	125/7	Continuous	Annotation
[]-ANNO-LEGN	Legends, symbol keys	125/7	Continuous	Annotation
[]-ANNO-LOGO	Logos	1	Continuous	Linework/ Annotation/ Images
[]-ANNO-MARK	Markers, break marks	125/7	Continuous	Annotation
[]-ANNO-MATC	Match lines	2	Continuous	Annotation
[]-ANNO-NOTE	Notes	125/7	Continuous	Annotation
[]-ANNO-NPLT	Non-plotting graphic information	6	Continuous	Annotation

Layer Name	Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies to
[]-ANNO-NRTH	North Arrows	125/7	Continuous	Linework
[]-ANNO-RDME	Read-me layer (not plotted)	1	Continuous	Annotation
[]-ANNO-REFR	Reference boxes	2	PHANTOM2	Linework
[]-ANNO-REVC	Revision clouds	6	Continuous	Annotation
[]-ANNO-REVS	Revisions	1	Continuous	Annotation
[]-ANNO-RWAY	Street Names (labels for maps)	205	Continuous	Annotation
[]-ANNO-RWAY-SUBT	Side Street Names (streets adjacent to street with proposed improvement)	145	Continuous	Annotation
[]-ANNO-RWAY-TITL	Main Street Name (street with proposed improvement)	205	Continuous	Annotation
[]-ANNO-SCHD	Schedules	125/7	Continuous	Annotation
[]-ANNO-SUBT	Sub-title	145/2	Continuous	Annotation
[]-ANNO-SYMB	Reference symbols	125/2	Continuous	Annotation
[]-ANNO-TABL	Data tables	125/7	Continuous	Annotation
[]-VIEW-FRME	view frame	120	Continuous	Linework

Legal

Right-of-Way

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-RWAY	Right-of-way	185	Continuous	Linework
[]-RWAY-ANNO	Text, dimensions, leaders, etc.	205	Continuous	Annotation
[]-RWAY-CNTR	centerline	125/1	CENTER3	Linework
[]-RWAY-CTLA	controlled access	205/2	Continuous	Linework
[]-RWAY-LINE	lines	185	Continuous	Linework
[]-RWAY-LMTA	limited access	185	BUILDING	Linework
[]-RWAY-MRKR	marker	125/7	Continuous	Linework
[]-RWAY-STAN	stationing	125/7	Continuous	Annotation

Property & Boundaries

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-BNDY	Political Boundaries	165	BORDER	Linework & Civil 3D® Object
[]-BNDY-ANNO	text, dimensions, leaders, etc.	125/7	BORDER	Annotation
[]-BNDY-CITY	City boundaries	165	BORDER	Linework
[]-BNDY-CNTY	County boundaries	165	BORDER	Linework
[]-BNDY-NATL	National boundaries	165	BORDER	Linework
[]-BNDY-ZONE	Political zoning	165	BORDER	Linework
[]-PROP	Parcel lines	185	Continuous	Linework & Civil 3D® Object
[]-PROP-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-PROP-DONA	Legal-donation land claim	125	HIDDEN	Linework
[]-PROP-LINE	interior lot lines, survey benchmarks, property corners	125	Continuous	Linework
[]-PROP-ORDI	Property boundary-legal ordinance	125	DASHED2	Linework
[]-PROP-QTRS	Property boundary-quarter section	125	BORDER2	Linework
[]-PROP-RSRV	Property boundary-reserve	125	HIDDEN	Linework
[]-PROP-SBCK	setback lines	125	HIDDEN	Linework
[]-PROP-SECT	Property boundary-section boundary	125	BORDER2	Linework
[]-PROP-SUBD	Property boundary- subdivision (interior) lines	125	BORDER2	Linework
[]-PROP-SXTS	Property boundary-sixteenth section	125	BORDER2	Linework
[]-PROP-TABL	tables	125/7	Continuous	Linework
[]-PROP-VACA	Property boundary-Legal vacation	185	PSS	Linework

Easements

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-ESMT	Easements	125/7	Continuous	Linework & Civil 3D® Object
[-ESMT-ACCS	access (pedestrian only; private access)	205/2	EASEMENT	Linework
[-ESMT-ANNO	Text, dimensions, leaders, etc.	205/2	EASEMENT	Annotation
[-ESMT-CATV	utility - cable television	205/2	EASEMENT	Linework
[-ESMT-CONS	conservation	205/2	EASEMENT	Linework
[-ESMT-CSTG	construction / grading	53	DOT2	Linework
[-ESMT-ELEC	utility - electrical	205/2	EASEMENT	Linework
[-ESMT-FDPL	flood plain	205/2	EASEMENT	Linework
[-ESMT-INEG	ingress / egress (vehicles; private access)	205/2	EASEMENT	Linework
[-ESMT-LSCP	landscape	205/2	EASEMENT	Linework
[-ESMT-NGAS	natural gas line	205/2	EASEMENT	Linework
[-ESMT-PHON	telephone line	205/2	EASEMENT	Linework
[-ESMT-ROAD	roadway	205/2	EASEMENT	Linework
[-ESMT-ROAD- PERM	roadway: permanent	205/2	EASEMENT	Linework
[-ESMT-ROAD- TEMP	roadway: temporary	53	DOT2	Linework
[-ESMT-RWAY	right-of-way (public access)	185	Continuous	Linework
[-ESMT-SGHT	sight distance	205/2	EASEMENT	Linework
[-ESMT-SSWR	sanitary sewer	205/2	EASEMENT	Linework
[-ESMT-STRM	storm sewer	205/2	EASEMENT	Linework
[-ESMT-SWMT	storm water management	205/2	EASEMENT	Linework
[-ESMT-TRAL	trail or path (public access)	205/2	EASEMENT	Linework
[-ESMT-UTIL- PERM	permanent utility easement	205/2	EASEMENT	Linework
[-ESMT-UTIL- TEMP	temporary utility easement	53	DOT2	Linework
[-ESMT-WATR	water supply	205/2	EASEMENT	Linework

Site/Topo Features

Buildings

Layer Name	Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies to
[]-BLDG	Buildings and primary structures	125/7	BUILDING	Linework & Civil 3D® Object
[]-BLDG-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-BLDG-DECK	Outdoor decks (no roof)	125/7	BUILDING	Linework
[]-BLDG-OTLN	Outline	125/7	BUILDING	Linework
[]-BLDG-OVHD	Overhead (overhang)	125/7	BUILDING	Linework
[]-BLDG-PRCH	Porch (attached, roof overhead)	125/7	BUILDING	Linework

Borings

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-BORE	Test borings	125/7	Continuous	Linework & Civil 3D® Object
[]-BORE-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation

Erosion Control

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-EROS	Erosion and sediment control	125/7	Continuous	Linework & Civil 3D® Object
[]-EROS-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-EROS-CIPR	culvert inlet protection	145 (50% transparent)	Continuous	Hatch
[]-EROS-CNTE-OTLN	construction entrance outline	2	Continuous	Linework
[]-EROS-CNTE-PATT	construction entrance hatch	7	Continuous	Hatch
[]-EROS-DDIV	drainage divides	125/3	Continuous	Linework
[]-EROS-DVDK	diversion dike	125/3	Continuous	Linework
[]-EROS-INPR	inlet protection	145 (50% transparent)	Continuous	Hatch
[]-EROS-SILT	silt fence	125/7	CHAINLINK_1	Linework
[]-EROS-SSLT	super silt fence	125/7	CHAINLINK_2	Linework

Fencing

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-FENC	Fences	125/7	Continuous	Linework & Civil 3D® Object
[-FENC-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-FENC-GRAL	guard rail	125/4	GUARD_RAIL	Linework
[-FENC-HRAL	hand rail	125/4	HAND_RAIL	Linework
[-FENC-POST	posts	125/4	Continuous	Linework
[-FENC-STEL	steel (barbed wire and/or chain link)	125/4	CHAIN_LINK_FENCE	Linework
[-FENC-WOOD	wood	125/4	WOOD_FENCE	Linework

Landscaping

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-PLNT	Plant and landscape material	125/7	Continuous	Linework & Civil 3D® Object
[-PLNT-ANNO	text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-PLNT-BEDS	perennial and annual beds	125/2	Continuous	Linework
[-PLNT-BUSH	bushes and shrubs	125/2	Continuous	Linework
[-PLNT-CTNR	container or planter	125/6	Continuous	Linework
[-PLNT-EDGR	planting bed edger	125/6	Continuous	Linework
[-PLNT-GRND	ground covers	125/2	Continuous	Linework
[-PLNT-PALM	palm trees	125/2	Continuous	Linework
[-PLNT-PLTS	planting plants	125/2	Continuous	Linework
[-PLNT-REMN	material to remain	125/2	Continuous	Linework
[-PLNT-REMV	material to be removed	125/7	Continuous	Linework
[-PLNT-SEED-PATT	seeding areas	125/22	Continuous	Hatch
[-PLNT-SHAD-PATT	shadow area	125/22	Continuous	Hatch
[-PLNT-TREE	trees	125/2	Continuous	Linework
[-PLNT-TURF-PATT	lawn areas	125/22	Continuous	Hatch
[-PLNT-VINE	vines	125/2	Continuous	Linework

Major Water Bodies (navigable channels such as major rivers, lakes and the Puget Sound)

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-CHAN	Major water bodies (navigable channels)	125/7	Continuous	Linework & Civil 3D® Object
[]-CHAN-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-CHAN-EDGE	edge	125/2	Continuous	Linework
[]-CHAN-CNTR	center of channel	125/1	CENTER3	Linework
[]-CHAN-TOEB	toe of bank	125/2	PHANTOM2	Linework
[]-CHAN-TOPB	top of bank	125/2	PHANTOM2	Linework

Ponds

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-POND	Ponds	125/2	Continuous	Linework & Civil 3D® Object
[]-POND-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-POND-EDGE	edge	125/2	Continuous	Linework
[]-POND-SWAY	spillway	125/2	Continuous	Linework
[]-POND-TOEB	toe of bank	125/2	PHANTOM2	Linework
[]-POND-TOPB	top of bank	125/2	PHANTOM2	Linework

Rivers and Creeks

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-RIVR	Rivers and creeks	125/2	Continuous	Linework & Civil 3D® Object
[]-RIVR-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-RIVR -EDGE	edge	125/2	Continuous	Linework
[]-RIVR -CNTR	center of channel	125/1	CENTER3	Linework
[]-RIVR -TOEB	toe of bank	125/2	PHANTOM2	Linework
[]-RIVR -TOPB	top of bank	125/2	PHANTOM2	Linework
[]-RIVR-LOGS	logs	125/2	Continuous	Linework
[]-RIVR-ROCK	rocks	125/2	Continuous	Linework

Surface Materials (non roadway)

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-PVMT	Pavement (non-roadway paving, i.e. conc pads)	125/2	Continuous	Linework & Civil 3D® Object
[-PVMT-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-PVMT-ASPH-OTLN	pavment outline	125/2	Continuous	Linework
[-PVMT-ASPH-PATT	asphalt surface	125/22	Continuous	Hatch
[-PVMT-CONC-OTLN	pavment outline	125/2	Continuous	Linework
[-PVMT-CONC-PATT	concrete surface	125/22	Continuous	Hatch
[-PVMT-GRVL-OTLN	pavment outline	125/2	Continuous	Linework
[-PVMT-GRVL-PATT	gravel surface	125/22	Continuous	Hatch
[-PVMT-PAVR-OTLN	pavment outline	125/2	Continuous	Linework
[-PVMT-PAVR-PATT	unit paver surface	125/22	Continuous	Hatch
[-RRAP	Riprap	125/7	Continuous	Linework & Civil 3D® Object

Surface/Topology

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-TOPO	Surfaces	125/7	Continuous	Civil 3D® Object
[-TOPO-ANNO	Surface annotation	125/7	Continuous	Annotation
[-TOPO-MAJR	Major contour lines	22/2	DASHED2 (0.75 LT scale)/ Continuous	Linework
[-TOPO-MINR	Minor contour lines	125/7	DASHED2 (0.75 LT scale)/ Continuous	Linework
[-TOPO-TOPB	Top of bank	125/2	PHANTOM2	Linework
[-TOPO-TOEB	Toe of bank	125/2	PHANTOM2	Linework
[-TINN-BNDY	Terrain Irregular Network surface boundary	125/2	PHANTOM2	Linework
[-TINN-VIEW	Terrain Irregular Network surface triangles	250	Continuous	Linework

Site

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-]LOCN	Limits of construction	3	PHANTOM2	Linework
[-]LOCN-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-]SITE	Site features	125/7	Continuous	Linework & Civil 3D® Object
[-]SITE-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-]SITE-BARR	barriers	125/7	Continuous	Linework
[-]SITE-BIKE	bike racks	125/7	Continuous	Linework
[-]SITE-BNCH	benches	125/7	Continuous	Linework
[-]SITE-COLS	columns	125/2	Continuous	Linework
[-]SITE-EWAT	edge of water	125/2	Continuous	Linework
[-]SITE-MAIL	mail boxes	125/7	Continuous	Linework
[-]SITE-POST	posts	125/7	Continuous	Linework
[-]SITE-POLE	light poles	125/2	Continuous	Linework
[-]SITE-WEIR	weirs	125/2	Continuous	Linework

Walls

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-]WALL	Walls	125/7	Continuous	Linework & Civil 3D® Object
[-]WALL-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-]WALL-CTLJ	control joints	125/3	Continuous	Linework
[-]WALL-NSBR	noise barrier	125/3	Continuous	Linework
[-]WALL-RTWL	retaining	125/3	Continuous	Linework
[-]WALL-SHEA	structural bearing or shear walls	125/3	Continuous	Linework

Wetlands

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-WETL	Wetlands	125/1	Continuous	Linework
[]-WETL-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-WETL-BUFF-PATT	buffer	22	Continuous	Hatch
[]-WETL-REPL-PATT	replacement	22	Continuous	Hatch

*Utilities**Sewer/Drainage*

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-CSWR	Combined sewer	125/7	Continuous	Linework & Civil 3D® Object
[]-CSWR-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-CSWR-CNTR	centerline	125/1	CENTER3	Linework
[]-CSWR-LATL	storm drain connection	125/4	SD/ Continuous	Linework
[]-CSWR-MHOL	maintenance hole casting	125/6	MH/ Continuous	Linework
[]-CSWR-PIPE	pressure pipe fittings	125/6	Continuous	Linework
[]-CSWR-PIPE- LRGE	pipng: >= 12"	125/3	PSS/ Continuous	Linework
[]-CSWR-PIPE- PATT	hatch patterns	3	Continuous	Hatch
[]-CSWR-PIPE- SMAL	pipng: < 12"	125/6	PSS/ Continuous	Linework
[]-CSWR-STRC	structures	125/6	MH/ Continuous	Linework
[]-DTCH	Ditches or washes	125/2	Continuous	Linework & Civil 3D® Object
[]-DTCH-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-DTCH-BOTD	bottom	125/2	ENDITCH/ PNDITCH	Linework
[]-DTCH-EWAT	edge of water	125/7	Continuous	Linework
[]-DTCH-TOPD	top	125/2	WDITCH	Linework
[]-SSWR	Sanitary sewer	125/7	Continuous	Linework & Civil 3D® Object

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-SSWR-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-SSWR-CNTR	centerline	125/1	CENTER3	Linework
[]-SSWR-LATL	lateral line	125/4	SD/ Continuous	Linework
[]-SSWR-MHOL	maintenance hole casting	125/6	MH/ Continuous	Linework
[]-SSWR-PIPE	pressure pipe fittings	125/6	Continuous	Linework
[]-SSWR-PIPE-LRGE	piping: >= 12"	125/3	PSS/ Continuous	Linework
[]-SSWR-PIPE-PATT	hatch patterns	3	Continuous	Hatch
[]-SSWR-PIPE-SMAL	piping: < 12"	125/6	PSS/ Continuous	Linework
[]-SSWR-STRC	structures	125/6	MH/ Continuous	Linework
[]-STRM	Storm sewer	125/7	Continuous	Linework & Civil 3D® Object
[]-STRM-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-STRM-CNTR	centerline	125/1	CENTER3	Linework
[]-STRM-LATL	storm drain connection	125/4	SD/ Continuous	Linework
[]-STRM-MHOL	maintenance hole casting	125/6	MH/ Continuous	Linework
[]-STRM-PIPE	pressure pipe fittings	125/6	Continuous	Linework
[]-STRM-PIPE-LRGE	piping: >= 12"	125/3	PSS/ Continuous	Linework
[]-STRM-PIPE-PATT	hatch patterns	3	Continuous	Hatch
[]-STRM-PIPE-SMAL	piping: < 12"	125/6	PSS/ Continuous	Linework
[]-STRM-STRC	structures	125/6	MH/ Continuous	Linework

Water/Fire/Irrigation

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-FIRE-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-FIRE-HYDR	hydrants and connections	125/6	Continuous	Linework
[]-FIRE-INST	valves	125/6	Continuous	Linework
[]-FIRE-PIPE	pipng & fittings	125/6	WATER/ Continuous	Linework
[]-IRRG	Irrigation	125/7	Continuous	Linework & Civil 3D® Object
[]-IRRG-ANNO	text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-IRRG-COVR-PATT	coverage	125/22	Continuous	Hatch
[]-IRRG-DRIP	drip irrigation tubing	125/7	Continuous	Linework
[]-IRRG-EQPM	equipment (pumps, valves, and controllers)	125/6	Continuous	Linework
[]-IRRG-LTRL	lateral pipe	125/6	WATER/ Continuous	Linework
[]-IRRG-MAIN	mainline	125/6	WATER/ Continuous	Linework
[]-IRRG-PIPE	pipng & fittings	125/6	WATER/ Continuous	Linework
[]-IRRG-SLVE	pipe sleeve	125/6	Continuous	Linework
[]-IRRG-SPKL	sprinklers (rotors, heads)	125/6	Continuous	Linework
[]-IRRG-VALV	valves	125/6	Continuous	Linework
[]-WATR	Water supply systems	125/7	Continuous	Linework & Civil 3D® Object
[]-WATR-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-WATR-CNTR	centerline	125/1	CENTER3	Linework
[]-WATR-INST	instrumentation (meters, valves, etc.)	125/6	Continuous	Linework
[]-WATR-MHOL	castings/openings	125/6	Continuous	Linework
[]-WATR-PIPE	pipe fittings	125/6	Continuous	Linework
[]-WATR-PIPE-LRGE	pipes and fittings: >= 12"	125/6	WATER/ Continuous	Linework
[]-WATR-PIPE-PATT	hatch patterns	7	Continuous	Hatch
[]-WATR-PIPE-SMAL	pipes and fittings: < 12"	125/5	WATER/ Continuous	Linework
[]-WATR-SERV	water services	125/6	WATER/ Continuous	Linework

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-WATR-STRC	water structures (casings, tie-backs, vaults, etc.)	125/6	Continuous	Linework
[]-WPZN	Water pressure zone	53	DOT	Linework

Power

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-POWR	Power	125/7	Continuous	Linework & Civil 3D® Object
[]-POWR-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-POWR-FENC	enclosure fence	125/7	CHAIN_LINK_FENCE	Linework
[]-POWR-INST	instrumentation (meters, hand holes, transformers, etc.)	125/2	Continuous	Linework
[]-POWR-MHOL	castings/openings	125/6	Continuous	Linework
[]-POWR-OVHD	overhead lines	125/3	Continuous	Linework
[]-POWR-POLE	box / pole	125/3	Continuous	Linework
[]-POWR-STRC	structures	125/6	MH/Continuous	Linework
[]-POWR-UGND	underground lines	125/3	ECD	Linework
[]-POWR-UGND-CONC	concrete encasement	125/2	subbase	Linework

Fuel/Gas

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-FUEL	Fuel gas	125/7	Continuous	Linework & Civil 3D® Object
[]-FUEL-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-FUEL-EQPM	equipment (pumps, motors)	125/7	Continuous	Linework
[]-FUEL-INST	instrumentation (meters, valves, etc.)	125/7	Continuous	Linework
[]-FUEL-MHOL	castings/openings	125/6	Continuous	Linework
[]-FUEL-PIPE	piping	125/6	Continuous	Linework
[]-FUEL-TANK	storage tanks	125/2	Continuous	Linework
[]-FUEL-UGND	underground piping	125/6	Continuous	Linework

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-NGAS	Natural Gas	125/2	Continuous	Linework & Civil 3D® Object
[]-NGAS-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-NGAS-INST	natural gas: meters, valves, etc.	125/2	Continuous	Linework
[]-NGAS-PIPE	natural gas: pipes	125/2	GAS	Linework
[]-NGAS-TANK	natural gas: tanks	125/2	Continuous	Linework

Communications

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-COMM	Communications	125/7	Continuous	Linework & Civil 3D® Object
[]-COMM-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-COMM-OVHD	Overhead lines	125/2	oh_comm	Linework
[]-COMM-POLE	Box / pole	125/2	Continuous	Linework
[]-COMM-UGND	Underground lines	125/2	Tel	Linework
[]-COMM-INST	Instrumentation (hand holes, etc.)	125/2	Continuous	Linework
[]-COMM-FIBR	Fiber optic lines	125/2	Tel	Linework

Roadways

Roadway Paving/Channelization/Signals

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-ROAD	Roadways	125/2	Continuous	Linework & Civil 3D® Object
[]-ROAD-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-ROAD-ASPH-OTLN	asphalt hatch outline	125/2	Continuous	Linework
[]-ROAD-ASPH-PATT	asphalt hatch	125/22	Continuous	Hatch
[]-ROAD-CNTR	centerline	125/1	CENTER3	Linework
[]-ROAD-CONC-OTLN	concrete hatch outline	125/2	Continuous	Linework
[]-ROAD-CONC-PATT	concrete hatch	125/7	Continuous	Hatch
[]-ROAD-CURB	curb	125/4	Continuous	Linework
[]-ROAD-CURB-BACK	curb: back	125/4	Continuous	Linework
[]-ROAD-CURB-FACE	curb: face	125/4	Continuous	Linework

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-ROAD-FLNE	fire lane	125/1	Continuous	Linework
[]-ROAD-FLNE-MRKG	fire lane: pavement markings	125/7	Continuous	Linework
[]-ROAD-FLNE-SIGN	fire lane: signs	125/7	Continuous	Linework
[]-ROAD-GRVL-OTLN	gravel hatch outline	125/2	Continuous	Linework
[]-ROAD-GRVL-PATT	gravel hatch	125/22	Continuous	Hatch
[]-ROAD-MRKG	channelization: pavement markings	125/7	Continuous	Linework
[]-ROAD-MRKG-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Linework
[]-ROAD-MRKG-CNTR	channelization: center	127/2	CHANDASH10-20	Linework
[]-ROAD-MRKG-BIKE-CNTR	channelization: bike centerline	125/7	CHANSEG3-9	Linework
[]-ROAD-MRKG-BIKE-EDGE	channelization: bike edge	125/7	Continuous	Linework
[]-ROAD-MRKG-BIKE-ZONE	channelization: green bike zones	125/3	Continuous	Linework
[]-ROAD-MRKG-LEGN	channelization: legend	125/1	Continuous	Linework
[]-ROAD-MRKG-SLNE	channelization: stopline	125/3	Continuous	Linework
[]-ROAD-MRKG-WHIT-EDGE	channelization: white paint: edge	125/7	CHANSEG2-4	Linework
[]-ROAD-MRKG-WHIT-LANE	channelization: white paint: lane	125/7	CHANDASH10-20	Linework
[]-ROAD-MRKG-WHIT-SEGM	channelization: white paint: segment	125/7	CHANSEG2-4	Linework
[]-ROAD-MRKG-WHIT-SLID	channelization: white paint: solid	125/7	Continuous	Linework
[]-ROAD-MRKG-XWLK	channelization: crosswalk	125/3	Continuous	Linework
[]-ROAD-MRKG-YELO-SEGM	channelization: yellow paint: segment	125/2	CHANSEG2-4	Linework
[]-ROAD-MRKG-YELO-SLID	channelization: yellow paint: solid	125/2	Continuous	Linework
[]-ROAD-PAVR-PATT	unit paver surface	125/22	Continuous	Hatch
[]-ROAD-PLNT-OTLN	median/planting strip hatch outline	125/2	Continuous	Linework
[]-ROAD-PLNT-PATT	median/planting strip	125/22	Continuous	Hatch
[]-ROAD-PROF	roadway profile	125/2	DASHED2 (0.75 LT scale)/ Continuous	Linework
[]-ROAD-SIGL	traffic signals	125/7	Continuous	Linework

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-ROAD-SIGL-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Linework
[]-ROAD-SIGL-FIXT	traffic signals: pedestrian push buttons, etc.	125/1	Continuous	Linework
[]-ROAD-SIGL-INST	traffic signals: hand holes, cabinets, etc.	125/1	Continuous	Linework
[]-ROAD-SIGL-LOOP	traffic signals: loops	125/1	Continuous	Linework
[]-ROAD-SIGN	signs	125/1	Continuous	Linework
[]-ROAD-STAN	stationing	125/7	Continuous	Linework
[]-ROAD-UPVD-PATT	unpaved surface	125/22	Continuous	Hatch

Driveways

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[]-DRIV	Driveways	125/2	Continuous	Linework & Civil 3D® Object
[]-DRIV-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[]-DRIV-ASPH-OTLN	asphalt hatch outline	125/2	Continuous	Linework
[]-DRIV-ASPH-PATT	asphalt surface	125/22	Continuous	Hatch
[]-DRIV-CNTR	centerline	125/1	CENTER3	Linework
[]-ROAD-CONC-OTLN	concrete hatch outline	125/2	Continuous	Linework
[]-DRIV-CONC-PATT	concrete surface	125/7	Continuous	Hatch
[]-DRIV-CURB	curb	125/4	Continuous	Linework
[]-DRIV-CURB-BACK	curb: back	125/4	Continuous	Linework
[]-DRIV-CURB-FACE	curb: face	125/4	Continuous	Linework
[]-DRIV-FLNE	fire lane	125/1	Continuous	Linework
[]-DRIV-FLNE-MRKG	fire lane: pavement markings	125/7	Continuous	Linework
[]-DRIV-FLNE-SIGN	fire lane: signs	125/7	Continuous	Linework
[]-DRIV-GRVL-PATT	gravel surface	125/22	Continuous	Hatch
[]-DRIV-MRKG	pavement markings	125/7	Continuous	Linework
[]-DRIV-MRKG-WHIT	white paint	125/7	Continuous	Linework
[]-DRIV-MRKG-YELO	yellow paint	125/2	Continuous	Linework
[]-DRIV-SIGN	signs	125/7	Continuous	Linework
[]-DRIV-UPVD-PATT	unpaved surface	125/22	Continuous	Hatch

Sidewalks

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-SWLK	Sidewalks	125/2	Continuous	Linework & Civil 3D® Object
[-SWLK-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-SWLK-ASPH-OTLN	asphalt hatch outline	125/2	Continuous	Linework
[-SWLK-ASPH-PATT	asphalt	125/22	Continuous	Hatch
[-SWLK-CONC-OTLN	concrete hatch outline	125/2	Continuous	Linework
[-SWLK-CONC-PATT	concrete	125/22	Continuous	Hatch
[-SWLK-RAMP	curb ramps	125/2	Continuous	Linework
[-SWLK-STEP	stairs/steps	125/2	Continuous	Linework

Trails/Paths

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-TRAL	Trails or paths	125/2	Continuous	Linework & Civil 3D® Object
[-TRAL-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-TRAL-ASPH-OTLN	asphalt hatch outline	125/2	Continuous	Linework
[-TRAL-ASPH-PATT	asphalt hatch	125/22	Continuous	Hatch
[-TRAL-CONC-OTLN	concrete hatch outline	125/2	Continuous	Linework
[-TRAL-CONC-PATT	concrete hatch	125/22	Continuous	Hatch
[-TRAL-GRVL-OTLN	gravel hatch outline	125/2	Continuous	Linework
[-TRAL-GRVL-PATT	gravel hatch	125/22	Continuous	Hatch
[-TRAL-MRKG	pavement markings	125/7	Continuous	Linework
[-TRAL-SIGN	signs	125/7	Continuous	Linework
[-TRAL-UPVD-PATT	unpaved surface	125/22	Continuous	Hatch

Parking Lots

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-PRKG	Parking	125/2	Continuous	Linework & Civil 3D® Object
[-PRKG-ANNO	Text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-PRKG-ASPH-OTLN	asphalt hatch outline	125/2	Continuous	Linework

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-PRKG-ASPH-PATT	asphalt surface	125/22	Continuous	Hatch
[-PRKG-CONC-OTLN	concrete hatch outline	125/2	Continuous	Linework
[-PRKG-CONC-PATT	concrete surface	125/7	Continuous	Hatch
[-PRKG-CURB	curb	125/4	Continuous	Linework
[-PRKG-CURB-BACK	curb: back	125/4	Continuous	Linework
[-PRKG-CURB-FACE	curb: face	125/4	Continuous	Linework
[-PRKG-FIXT	fixtures (wheel stops, parking meters, etc.)	125/1	Continuous	Linework
[-PRKG-FLNE	fire lane	125/7	Continuous	Linework
[-PRKG-FLNE-MRKG	fire lane: pavement markings	125/7	Continuous	Linework
[-PRKG-FLNE-SIGN	fire lane: signage	125/1	Continuous	Linework
[-PRKG-GRVL-PATT	gravel surface	125/22	Continuous	Hatch
[-PRKG-MRKG	pavement markings	125/7	Continuous	Linework
[-PRKG-MRKG-WHIT	white paint	125/7	Continuous	Linework
[-PRKG-MRKG-YELO	yellow paint	125/2	Continuous	Linework
[-PRKG-SIGN	signs	125/1	Continuous	Linework
[-PRKG-STRP	striping	125/7	Continuous	Linework

Details

Detail Drawings

Layer Name	Layer Description	Existing/ Proposed Colors	Existing/ Proposed Linetypes	Applies To
[-DETL	Details	125/7	Continuous	Linework & Civil 3D® Object
[-DETL-ANNO	text, dimensions, leaders, etc.	125/7	Continuous	Annotation
[-DETL-ANNO- SUBT	sub-title	145/2	Continuous	Annotation
[-DETL-ANNO- TITL	title	205/3	Continuous	Annotation
[-DETL-CNTR	center lines	125/1	CENTER2	Linework
[-DETL-BOLD	continuous lines - bold	205/6	Continuous	Linework
[-DETL-MEDM	continuous lines - medium	145/2	Continuous	Linework
[-DETL-FINE	continuous lines - thin	125/1	Continuous	Linework
[-DETL-BOLD- HIDD	hidden lines - bold	205/6	HIDDEN	Linework
[-DETL-MEDM- HIDD	hidden lines - medium	145/2	HIDDEN	Linework
[-DETL-FINE-HIDD	hidden lines - thin	125/1	HIDDEN	Linework
[-DETL-PATT	hatch patterns	125/22	Continuous	Hatch
[-DETL-RBAR	rebar	145/4	Continuous	Linework

As-Built and Record Drawings

For As-Built and Record Drawing layers simply replace the discipline designator of civil layers with “CR”, landscaping layers with “LR”, electrical layers with “ER”, structural layers with “SR”, mechanical layers with “MR” and architectural layers with “AR” and use colors found in the Record_Drawings.ctb plot style table on page 94.

Special Circumstances

Layer Name	Layer Description	Color	Linetype	Applies To
[-NBLT	Features/linework designed, but not constructed in the as-designed location	145	(matches original object linetype)	Linework & Civil 3D® Object
[-ANNO	text, dimensions, leaders, etc. (also used to cross out features and related annotation that were not constructed)	37	Continuous	Annotation

External References

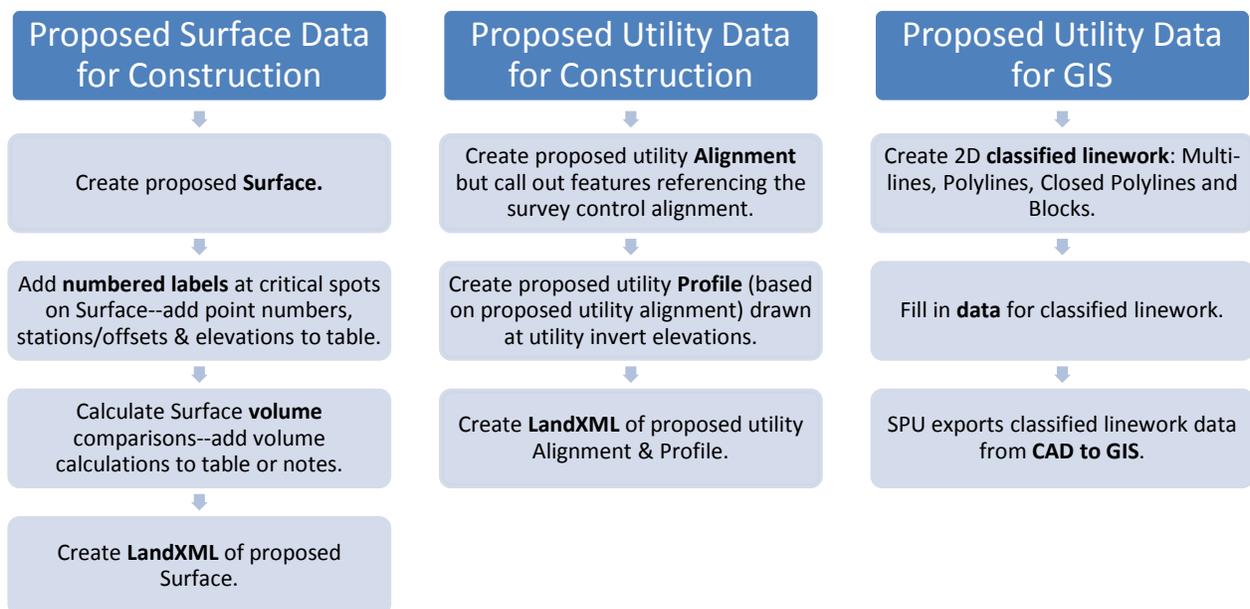
XREF Layers

Layer Name	Layer Description	Color	Linetype	Applies To
X-ARCH	XREF: architectural	7	Continuous	XREF
X-BASE	XREF: base map	7	Continuous	XREF
X-CHAN	XREF: major water bodies (channels, lakes & Puget Sound)	7	Continuous	XREF
X-CLIP	XREF clipping boundary	7	Continuous	Linework
X-DEMO	XREF: demolition/clearing/removal	7	Continuous	XREF
X-DETL	XREF: details	7	Continuous	XREF
X-EROS	XREF: temporary erosion & sediment control	7	Continuous	XREF
X-GRAD	XREF: grading	7	Continuous	XREF
X-IMGS	XREF: images/photos	7	Continuous	Images
X-IRRG	XREF: irrigation	7	Continuous	XREF
X-MECH	XREF: mechanical	7	Continuous	XREF
X-MISC	XREF: misc.	7	Continuous	XREF
X-MRKG	XREF: channelization		Continuous	XREF
X-PERC	XREF: Prelim. Engineering Resource Composite	7	Continuous	XREF
X-POND	XREF: ponds	7	Continuous	XREF
X-POWR	XREF: SCL power design	7	Continuous	XREF
X-PROT	XREF: protection	7	Continuous	XREF
X-RIVR	XREF: rivers and creeks	7	Continuous	XREF
X-ROAD	XREF: paving	7	Continuous	XREF
X-RWAY	XREF: right-of-way	7	Continuous	XREF
X-CSWR	XREF: combined sewer	7	Continuous	XREF
X-SIGL	XREF: signals	7	Continuous	XREF
X-SITE	XREF: site	7	Continuous	XREF
X-SSWR	XREF: sewer	7	Continuous	XREF
X-STRM	XREF: drainage	7	Continuous	XREF
X-STRU	XREF: structural	7	Continuous	XREF
X-TOPO	XREF: survey	7	Continuous	XREF
X-VEGE	XREF: landscaping	7	Continuous	XREF
X-VIEW	XREF: view frames	7	Continuous	XREF
X-WATR	XREF: water	7	Continuous	XREF

SECTION 6: Linework and Data

Linework should be drawn in accordance with [STANDARD PLAN NO 003](#). As a general rule features should be drawn in model space, located per an established survey control line, overlaid into a sheet drawing along with the survey/base map and visible through a viewport in paper space. Details should also be drawn in model space, overlaid into a sheet drawing, and visible through a viewport in paper space. Schedules, notes, legends, tables, schematics and diagrams may be placed directly in paper space if so desired.

Not only is linework created for presentation purposes, but data is also created for construction and exportation into SPU's Geographic Information System (GIS). The chart below displays an overview of typical data required:



Drafting Existing Features on Base Maps

Linework for surveyed features are generated through an automated process. Additional linework may be added from researched resources. For example, an existing maintenance hole consists of two parts: the casting (survey point) and the barrel (a Civil 3D® Pipe Network Structure/maintenance hole block).

Blocks

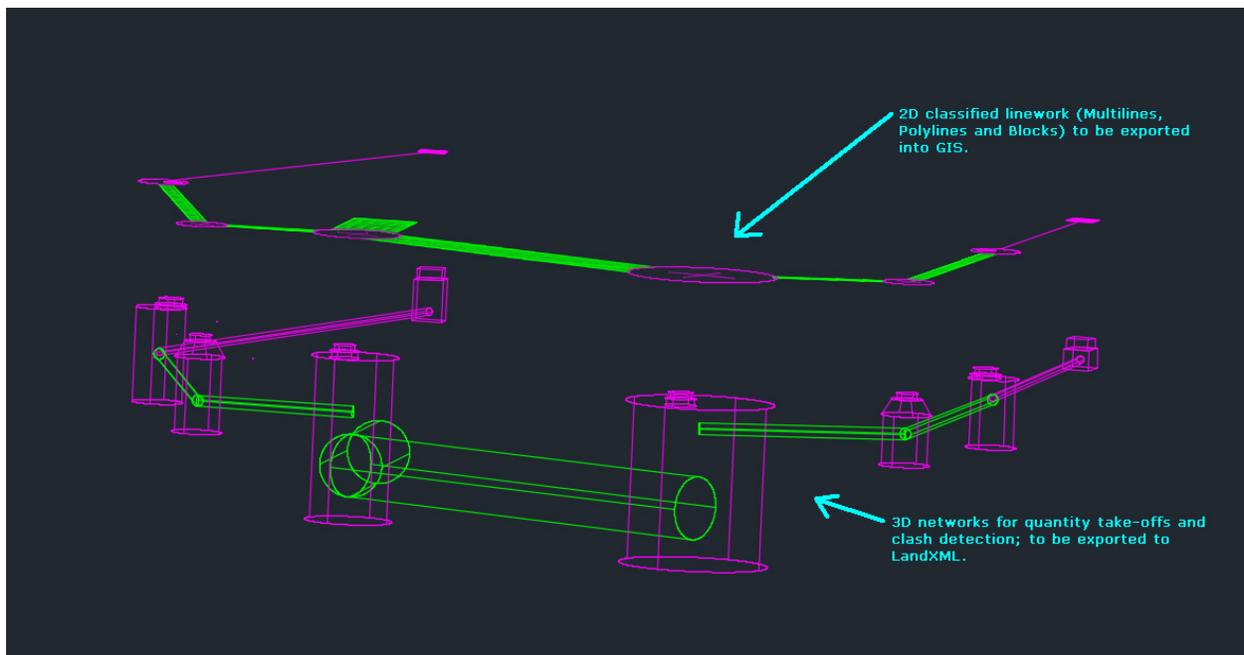
All blocks provided by the city (see SECTION 2: Support Files) are designed to be inserted at a scale of 1. Some blocks are not to scale and “annotative” (meaning they will scale up and down with the drawing scale) and some are actual size and static. Many of the blocks have dynamic properties (look for “DB” at the end of the block name which stands for “dynamic block”).

Blocks are more than just symbols – many are also exported into SPU's GIS system (location, block name and layer) so do not explode them. If it becomes absolutely necessary to explode a callout block that contains attributes (such as a loop leader block or section referencing block), use the BURST command.

Drafting Proposed Utilities in Plan

Design of utility systems are done in 2D using “Polylines”, “Multilines” and “Blocks” because geo-referenced pipes and structures must be accurately portrayed in a specific way with data attached in order to be exported into SPU’s GIS system. **2D utility linework (w/data) is always required by SPU.**

AutoCAD® Civil 3D® Pipe/Pressure Networks may be used for data referencing, clash detection, labeling, analysis, optimization and quantity take-offs. A typical method is to set Pipe/Pressure Network objects to a non-plotting style and trace over them with 2D linework (usually in a separate XREF, see SECTION 3: Project Data Sharing).



3D Utility Design (data referencing, clash detection, labeling, analysis, optimization & quantity take-offs)

- Pipes
- Structures, Fittings & Appurtenances

2D Presentation of Utility Design (always required)

- Polylines/Multilines (pipes and ditches)
- Closed Polylines (vaults, tanks, ponds, custom structures, etc.)
- Blocks (MHs, CBs, inlets, fittings, appurtenances, etc.)

GIS (Spatial Data)

- Lines
- Polygons
- Points

Best Practices for 2D Utility Drafting

When drafting utilities in 2D at 1"=20' scale, "Polylines" must be used to depict pipes less than 12" in diameter and "Multilines" must be used to depict pipes greater-than or equal to 12" in diameter. This rule applies to other scales and must be adjusted relative to 1"=20'.

- Line Endpoints:** Do not trim linework within "Blocks". Our standard proposed blocks have a wipeout object inside to make the linework passing through look as though it was trimmed to the outside of the blocks (make sure the draw order is correct so the block is on top of the pipe linework). These blocks are located on the web (see SECTION 2: Support Files) and on the internal SPU network (P:\CaddSupport\Blocks\). Utilizing standard blocks is important because the block names are exported into our GIS system.

Gravity Pipe Block Names

<input type="checkbox"/> C-CB240a	(catch basin type 240a)
<input type="checkbox"/> C-CB240b	(catch basin type 240b)
<input type="checkbox"/> C-CB240c	(catch basin type 240c)
<input type="checkbox"/> C-CB240d	(catch basin type 240d)
<input type="checkbox"/> C-CB241	(catch basin type 241)
<input type="checkbox"/> C-CB242a	(catch basin type 242a)
<input type="checkbox"/> C-CB242b	(catch basin type 242b)
<input type="checkbox"/> C-CB277a	(catch basin type 277a)
<input type="checkbox"/> C-CB277b	(catch basin type 277b)
<input type="checkbox"/> C-MH	(maintenance hole – generic)
<input type="checkbox"/> C-MH-DB	(maintenance hole – generic)
<input type="checkbox"/> C-MH204-5a	(maintenance hole type 204.5a)
<input type="checkbox"/> C-MH204-5b	(maintenance hole type 204.5b)
<input type="checkbox"/> C-MH204a	(maintenance hole type 204a)
<input type="checkbox"/> C-MH204b	(maintenance hole type 204b)
<input type="checkbox"/> C-MH205a	(maintenance hole type 205a)
<input type="checkbox"/> C-MH205b	(maintenance hole type 205b)
<input type="checkbox"/> C-MH206a	(maintenance hole type 206a)
<input type="checkbox"/> C-MH206b	(maintenance hole type 206b)
<input type="checkbox"/> C-MH207a	(maintenance hole type 207a)
<input type="checkbox"/> C-MH207b	(maintenance hole type 207b)
<input type="checkbox"/> C-MH208a	(maintenance hole type 208a)
<input type="checkbox"/> C-MH208b	(maintenance hole type 208b)
<input type="checkbox"/> C-MH209a	(maintenance hole type 209a)
<input type="checkbox"/> C-MH209b	(maintenance hole type 209b)
<input type="checkbox"/> C-MH210a	(maintenance hole type 210a)
<input type="checkbox"/> C-MH210b	(maintenance hole type 210b)
<input type="checkbox"/> C-MH211a	(maintenance hole type 211a)

<input type="checkbox"/>	C-MH211b	(maintenance hole type 211b)
<input type="checkbox"/>	C-MH212a	(maintenance hole type 212a)
<input type="checkbox"/>	C-MH212b	(maintenance hole type 212b)
<input type="checkbox"/>	C-cb-DB	(catch basin – generic)
<input type="checkbox"/>	C-co	(clean out)
<input type="checkbox"/>	C-inl-DB	(inlet – generic)
<input type="checkbox"/>	C-inl250a	(inlet type 250a)
<input type="checkbox"/>	C-inl250b	(inlet type 250b)
<input type="checkbox"/>	C-inl252	(inlet type 252)
<input type="checkbox"/>	C-hb11-DB	(11¼ degree bend)
<input type="checkbox"/>	C-hb22-DB	(22½ degree bend)
<input type="checkbox"/>	C-hb45-DB	(45 degree bend)
<input type="checkbox"/>	C-hb90-DB	(90 degree bend)
<input type="checkbox"/>	C-vertbend-DB	(vertical bend)
<input type="checkbox"/>	C-open_end-DB	(outfall)

Pressure Pipe Block Names

<input type="checkbox"/>	C-av	(air valve)
<input type="checkbox"/>	C-bo	(blow off)
<input type="checkbox"/>	C-concblk-DB	(concrete blocking)
<input type="checkbox"/>	C-cross-DB	(cross)
<input type="checkbox"/>	C-gv-DB	(gate valve)
<input type="checkbox"/>	C-hb11-DB	(11¼ degree bend)
<input type="checkbox"/>	C-hb22-DB	(22½ degree bend)
<input type="checkbox"/>	C-hb45-DB	(45 degree bend)
<input type="checkbox"/>	C-hb90-DB	(90 degree bend)
<input type="checkbox"/>	C-hyd	(fire hydrant)
<input type="checkbox"/>	C-plug-DB	(plug)
<input type="checkbox"/>	C-red-DB	(reducer)
<input type="checkbox"/>	C-sleeve-DB	(sleeve)
<input type="checkbox"/>	C-tee-DB	(tee)
<input type="checkbox"/>	C-wgv-DB	(gate valve with chamber)
<input type="checkbox"/>	C-wgvvch-DB	(gate valve with vault chamber)
<input type="checkbox"/>	C-av-DB	(angle valve with chamber)
<input type="checkbox"/>	C-bfv-DB	(butterfly valve)
<input type="checkbox"/>	C-blv-DB	(ball valve)
<input type="checkbox"/>	C-ckv-DB	(check valve)
<input type="checkbox"/>	C-cnv-DB	(cone valve)
<input type="checkbox"/>	C-gbv-DB	(globe valve)
<input type="checkbox"/>	C-ndl-DB	(needle valve)
<input type="checkbox"/>	C-pgv-DB	(plug valve)

- | | | |
|--------------------------|---------------|-----------------------------|
| <input type="checkbox"/> | C-rsgv-DB | (resilient seal gate valve) |
| <input type="checkbox"/> | C-wm | (water meter) |
| <input type="checkbox"/> | C-vertbend-DB | (vertical bend) |
- **Small Pipes:** For pipes that are shown as single lines (less than 12" in diameter at 1"=20' scale), use the PLINE command to draw a "Polyline". Because it is required to enter the start and end invert elevations for each pipe run, draw each run of pipe (invert to invert) as a separate polyline.
 - **Large Pipes:** For pipes that are shown as double lines (equal-to, or greater-than 12" in diameter at 1"=20' scale), a "Multiline" will be used with an associated hatch pattern filling the pipe. Run the MLSTYLE command to manage pipe sizes and set the proper pipe size current. There are a few pre-defined "Multiline Styles" in the design template. Click OK to close the "Multiline Style" dialog box, then type the MLINE command to draw a multiline. Once the MLINE command has been started type J, hit enter, type Z and hit enter again to set the justification to "Zero" (center of the pipe). Draw multilines in the same way you draw polylines. To clean up one multiline connected to another (at a horizontal bend), run the MLEDIT command, choose the "Corner Joint" option and select both multilines. This way you have separate multilines that look joined together.
 - **Elevations:** For consistency, draw all 2D linework at elevation 0. To make sure this happens, set the ONAPZ system variable to 1 to avoid snapping to another object's elevation.
 - **Layer Names:** Make sure every object is on the correct layer and each layer is named correctly:

Water Lines

- | | | |
|--------------------------|-------------------|--|
| <input type="checkbox"/> | CU-WATR-PIPE-LRGE | (design drawing: water mainlines ≥ 12" diameter) |
| <input type="checkbox"/> | CU-WATR-PIPE-SMAL | (design drawing: water mainlines < 12" diameter) |
| <input type="checkbox"/> | CU-WATR-SERV | (design drawing: water services) |
| <input type="checkbox"/> | CU-FIRE-PIPE | (design drawing: fire protection piping) |
| <input type="checkbox"/> | CR-WATR-PIPE-LRGE | (record drawing: water mainlines ≥ 12" diameter) |
| <input type="checkbox"/> | CR-WATR-PIPE-SMAL | (record drawing: water mainlines < 12" diameter) |
| <input type="checkbox"/> | CR-WATR-SERV | (record drawing: water services) |
| <input type="checkbox"/> | CR-FIRE-PIPE | (record drawing: fire protection piping) |

Water Blocks

- | | | |
|--------------------------|--------------|--|
| <input type="checkbox"/> | CU-WATR-PIPE | (design drawing: water fittings and concrete blocking) |
| <input type="checkbox"/> | CU-WATR-INST | (design drawing: water valves and meters) |
| <input type="checkbox"/> | CU-FIRE-HYDR | (design drawing: fire hydrants) |
| <input type="checkbox"/> | CU-FIRE-INST | (design drawing: fire valves) |
| <input type="checkbox"/> | CR-WATR-PIPE | (record drawing: water fittings and concrete blocking) |
| <input type="checkbox"/> | CR-WATR-INST | (record drawing: water valves and meters) |
| <input type="checkbox"/> | CR-FIRE-HYDR | (record drawing: fire hydrants) |
| <input type="checkbox"/> | CR-FIRE-INST | (record drawing: fire valves) |

Water Polygons

- CU-WATR-STRC (design drawing: water structures)
- CR-WATR-STRC (record drawing: water structures)

Sewer/Drainage Lines

- CU-STRM-LATL (design drawing: storm laterals)
- CU-STRM-PIPE-LRGE (design drawing: storm mainlines $\geq 12''$ diameter)
- CU-STRM-PIPE-SMAL (design drawing: storm mainlines $< 12''$ diameter)
- CU-SSWR-LATL (design drawing: side sewers)
- CU-SSWR-PIPE-LRGE (design drawing: sanitary sewer mainlines $\geq 12''$ diameter)
- CU-SSWR-PIPE-SMAL (design drawing: sanitary sewer mainlines $< 12''$ diameter)
- CU-CSWR-PIPE-LRGE (design drawing: combined sewer mainlines $\geq 12''$ diameter)
- CU-CSWR-PIPE-SMAL (design drawing: combined sewer mainlines $< 12''$ diameter)
- C-DTCH-TOPD (design drawing: ditch outlines)
- C-DTCH-CNTR (design drawing: ditch centerlines)
- CR-STRM-LATL (record drawing: storm laterals)
- CR-STRM-PIPE-LRGE (record drawing: storm mainlines $\geq 12''$ diameter)
- CR-STRM-PIPE-SMAL (record drawing: storm mainlines $< 12''$ diameter)
- CR-SSWR-LATL (record drawing: side sewers)
- CR-SSWR-PIPE-LRGE (record drawing: sanitary sewer mainlines $\geq 12''$ diameter)
- CR-SSWR-PIPE-SMAL (record drawing: sanitary sewer mainlines $< 12''$ diameter)
- CR-CSWR-PIPE-LRGE (record drawing: combined sewer mainlines $\geq 12''$ diameter)
- CR-CSWR-PIPE-SMAL (record drawing: combined sewer mainlines $< 12''$ diameter)
- CR-DTCH-TOPD (record drawing: ditch outlines)
- CR-DTCH-CNTR (record drawing: ditch centerlines)

Sewer/Drainage Blocks

- CU-STRM-STRC (design drawing: storm structures)
- CU-SSWR-PIPE (design drawing: sanitary sewer fittings for force mains)
- CU-SSWR-STRC (design drawing: sanitary sewer structures)
- CU-CSWR-PIPE (design drawing: combined sewer fittings for force mains)
- CU-CSWR-STRC (design drawing: combined sewer structures)
- CR-STRM-STRC (record drawing: storm structures)
- CR-SSWR-PIPE (record drawing: sanitary sewer fittings for force mains)
- CR-SSWR-STRC (record drawing: sanitary sewer structures)
- CR-CSWR-PIPE (record drawing: combined sewer fittings for force mains)
- CR-CSWR-STRC (record drawing: combined sewer structures)

Sewer/Drainage Polygons

- CU-STRM-STRC (design drawing: storm structures)
- CU-SSWR-STRC (design drawing: sanitary sewer structures)
- CU-CSWR-STRC (design drawing: combined sewer structures)
- C-POND-TOPB (design drawing: pond outlines)
- C-POND-TOEB (design drawing: pond bottom area outlines)
- CR-STRM-STRC (record drawing: storm structures)
- CR-SSWR-STRC (record drawing: sanitary sewer structures)
- CR-CSWR-STRC (record drawing: combined sewer structures)
- CR-POND-TOPB (record drawing: pond outlines)
- CR-POND-TOEB (record drawing: pond bottom area outlines)

Designing Utilities with AutoCAD® Civil 3D® Pipe/Pressure Networks

The purpose of using AutoCAD® Civil 3D® Pipe/Pressure Networks is to define accurate 3D utility data for clash detection and quantity take-offs and to have the data displayed as stylized geometry – but due to limitations, presentation standards may not be met. Many of the object styles provided in the templates are designed to match [STANDARD PLAN 003](#) for the design phase but final presentation should be done with 2D linework (see best practices on page 74). Standard City of Seattle parts have been deployed in-house and are available on the web (see SECTION 2: Support Files). You may create custom parts if so desired for design use.

Pipe Network structure names for gravity systems should follow this format: MH-#, CB-#, VAULT-#, etc. (the pound sign is a unique number starting at 1 for each type of structure and increasing with each subsequent structure).

There are some limitations to using Pipe/Pressure Networks, such as custom part configurations that are difficult to define. Also Pipe Network structures must be shown as solids in profiles to account for rotation but then pipes inside structures will no longer be masked. Limitations like this prevent us from using Pipe/Pressure Networks for final presentation.

Best Practices for Designing in 3D and Drafting in 2D

Lay out the design with Civil 3D® Pipe/Pressure Network(s) in the data shortcut source file (see page 31), create reference of the Pipe/Pressure Network(s) in the presentation XREF and set pipe and structure styles to “_No Plot”. For the final presentation of the design, trace over the Pipe/Pressure Network(s) using practices shown on page 74. For your convenience, Civil 3D® Pipe Network labels may still be used and printed.

Drafting Proposed Utilities in Profile

Typically linework for pipes drawn in profile views should align with the right-of-way control stationing. Here are steps to accomplish this:

1. **Create Control Profile Grid:** Create a profile view grid with a non-plotting profile grade line using the right-of-way control alignment. The purpose of this profile view grid is to project the pipeline features onto the grid so they align with the right-of-way stationing.
2. **Create Pipeline Profile Grade Line(s):** Draw a non-plotting alignment that matches the pipeline geometry and create another profile view grid using the pipeline alignment. Existing and finish profile grade lines may be shown on this profile view grid. This profile is simply source data for the grade line(s) over the pipe geometry and may or may not be used for anything else.
3. **Superimpose Pipeline Grade Line(s) onto Control Profile Grid:** Superimpose the pipeline profile grade line(s) onto the right-of-way control profile view grid (command: SuperimposeProfile) to show the grade line(s) directly over the pipe. The end result is a hybrid profile showing grade elevations over the pipeline and stationing along the street control line. Civil 3D® Pipe Network parts and other 3D geometry (command: ProjectObjectsToProf) may be projected onto this hybrid profile.

There are some cases where pipes are best shown as true length along the pipe alignment in profile views. If the pipeline does not align horizontally with the plan view on a sheet, align one of the stations (preferably a major station, if possible) from the plan vertically with the same station in the profile (typically on the left-hand side of the sheet).

In profile views, draw the outside shape of maintenance holes and structures and draw pipes connected to the outside walls. Double-line pipes are filled with hatch (see page 81) while maintenance holes and structures are not.

Vertical pipeline data shall be accurately represented as a Civil 3D® Pipe Network or as a non-plotting Civil 3D® Profile with PVIs matching pipeline elevation points (the Civil 3D® Profile name should indicate the pipe location, size and if it represents the pipe's invert or center line) for construction staking purposes.

Tip: Pipe Network Structure Properties

Structure properties (command: EditStructureProperties) "Structure Rotation Angle" and "Sump Depth" (lowest invert to inside bottom of structure) are common properties to adjust.

Drafting Proposed Paving and Grading Plans

Each proposed paving area shall be depicted with a closed polyline filled with the appropriate hatch pattern (see page 81). Castings, inlets and other openings shall be drawn with closed polylines and shall not have paving hatch patterns crossing through them.

Proposed grading shall be accurately modeled as one or more 3D surface(s). Proposed contours shall be generated from the 3D surface as a style, labeled and shown to match existing surface contours where the proposed and existing surfaces meet.

Drafting Proposed Paving and Grading Profiles

Roadway profiles shall be created from proposed or existing roadway centerline alignments. If the proposed centerline diverges from the existing roadway centerline, at a good starting point, match the proposed stationing with the existing stationing. Proposed station numbers shall not conflict with existing station numbers.

If the roadway is curved and does not align horizontally with the plan view on a sheet, align one of the stations (preferably a major station, if possible) from the plan vertically with the same station in the profile (typically on the left-hand side of the sheet).

Proposed grade shall be depicted with a profile grade line with station & elevation labels shown at grade breaks, slope labels shown on profile line segments and vertical curve callouts shown on curves where applicable. The existing grade profile line shall also be shown and labels (shown at 20 foot intervals, at least) at the bottom of the profile showing existing and proposed elevations (stacked text at each interval rotated 90 degrees with 0.125 plotted text height for proposed and 0.08 plotted text height for existing).

Drafting Proposed Landscaping Plans

There may be many kinds of trees and other plants that need to be represented on the landscaping plans. Custom blocks and hatch patterns may be created and used along with a legend to clearly depict the plantings.

Hatch Patterns for Proposed Utilities, Paving & Vegetation

Hatch colors are controlled by layer. Here are common hatch patterns* used to depict proposed improvements:

Description	Pattern	Angle	Annotative Scale
Combined sewer mainlines (double line pipe fill)	DOTS	90	0.5 (1"=20' scale: 10)
Sanitary sewer mainlines (double line pipe fill)	ANSI31	90	1 (1"=20' scale: 20)
Storm drain mainlines (double line pipe fill)	ANSI31	90	0.5 (1"=20' scale: 10)
Water mainlines (double line pipe fill)	DOTS	0	0.5 (1"=20' scale: 10)

Description	Pattern	Angle	Annotative Scale
Asphalt paving for all surfaces	DOTS	45	0.5 (1"=20' scale: 10)
Concrete paving for roadways & driveways	DOTS	45	1 (1"=20' scale: 20)
Concrete paving for sidewalks & bike ways (non-roadway)	AR-CONC	45	0.05 (1"=20' scale: 1)
Gravel roadways (legend needed)	GRAVEL	0	0.25 (1"=20' scale: 5)
Unpaved roadways (legend needed)	DASH	0	0.5 (1"=20' scale: 10)
Pond bottom areas (legend needed)	AR-SAND	0	0.05 (1"=20' scale: 1)
Turf planting areas (legend needed)	GRASS	0	0.167 (1"=20' scale: 3.3)
Clearing and grubbing (legend needed)	ANSI31	0	1 (1"=20' scale: 20)
Stabilized construction entrances	GRAVEL	0	0.5 (1"=20' scale: 10)

*Additional hatch patterns (or variations thereof) may be used as long as a legend is included to describe it.

Exporting LandXML for Field Verification

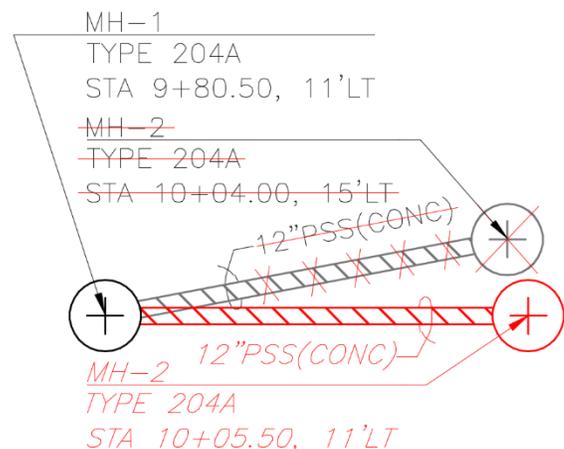
After the design is complete, export proposed surfaces and horizontal/vertical utility data from Civil 3D® to the LandXML format (command: LandXMLOut). This data will be used for field verification if needed. If the utilities are depicted using Pipe Networks, then export the Pipe Networks to LandXML. If proposed utilities are depicted with any other linework, then create Alignments (commands: CreateAlignmentLayout or CreateAlignmentEntities) showing the horizontal centerline and Profiles (command: CreateProfileLayout) showing critical elevations of each proposed utility system (you may need to create profiles not shown on the plans) and export to LandXML. Before exporting make sure the imperial units are set to "survey foot" (command: EDITLANDXMLSETTINGS).

Drafting As-Built and Record Drawing Utility Linework

Items not built shall be put on the CR-NBLT layer (color 145) and crossed out with the CR-ANNO layer (not deleted). New/revised linework showing the as-built work shall be drawn on top of the original design. As-Built and Record drawing layers have the "CR-" discipline designator and use colors 32-38 (see SECTION 8: Plotting/Printing).

Complete As-Built and Record Drawing requirements are found here:

http://www.seattle.gov/util/Engineering/Consulting_Resources/For_Drafting_Consultants/



CAD to GIS

Seattle Public Utilities exports CAD data to GIS during the 60%, 90%, 100% and Record Drawing phases.

Object Classification for Proposed and Record Drawing Utilities

In order for 2D utility linework to be exported into our GIS system, “Object Data Tables” need to be added to each 2D utility pipe (“Polylines” and “Multilines”) and structure (“Blocks” or closed “Polylines”). This process is called “Object Classification”. At the end of a project, City staff export the geo-referenced utility data into the GIS system. Object classification is done in three steps within Civil 3D:

1. Use the ATTACHDEF command to attach the object classification XML file (see SECTION 2: Support Files).
2. Use the CLASSIFY command to classify water, sewer, drainage and combined sewer “Polylines”, “Multilines” and blocks. Care must be taken to ensure each object has the correct classification.
3. Select classified objects and use the PROPERTIES command to fill in the correct data (the Date_Created, User_ID, ACAD_Version, Milestone, CAD_KEY, FEA_KEY and EQNUM_ID fields are filled out by an SPU staff member at time of export).

Object Classification Checklist for Proposed and Record Drawing Utilities

Below are critical fields to be filled in during the 60%-100% and record drawing phases. The remaining fields (not listed here) will be filled in by SPU staff at the time data is exported from CAD to GIS.

- ❑ **LINES:** Water, sewer, drainage and combined sewer pipes (including mainlines, laterals, side sewers, services, irrigation and ditches) must have the following object data attached and filled out:
 - InsideDiameter (inches – a real number without any other characters)
 - Material (common materials: CONC, RCP, DIP, CIP, STLP, HDPE, PVC, VCP)
 - StartInvert (start pipe invert in decimal feet)
 - EndInvert (end pipe invert in decimal feet)
 - VPI (found in the VAULT PLAN NO section of the title block)
 - PE_License (number found in the PE seal of the associated plan sheet)
 - Quality_Level (use codes: QLD, QLC, QLB or QLA – see page 84)
- ❑ **POLYGONS:** Water, sewer, drainage and combined sewer custom structures (closed “Polylines”, not blocks, depicting outlines of encasements, tie-backs, tanks, vaults, custom structures, ponds, swales, etc.) must have the following object data attached and filled out:
 - Description (a short descriptive line of text)
 - VPI (found in the VAULT PLAN NO section of the title block)
 - PE_License (number found in the PE seal of the associated plan sheet)
 - Quality_Level (use codes: QLD, QLC, QLB or QLA – see page 84)
- ❑ **BLOCKS:** Water, sewer, drainage and combined sewer blocks must have the following object data attached and filled out:
 - VPI (found in the VAULT PLAN NO section of the title block)
 - PE_License (number found in the PE seal of the associated plan sheet)
 - Quality_Level (use codes: QLD, QLC, QLB or QLA – see page 84)

Inverts

Follow these guidelines when filling in the StartInvert and EndInvert fields:

Pressure Pipes

Start at the source of pressure, if known. If the source is unknown, then go from North to South/East to West; services start at main and end at meter/property line.

Gravity Pipes

Go from high to low inverts. Laterals start at a high invert and end at a mainline or a structure.

Asset ID Numbers

SPU assigns “asset ID” numbers to utility features for the 60%, 90%, 100% and Record Drawing submittals. An automated program reads the PTN (see page 2) in the XREF file name (see page 26), creates ID numbers and assigns them to objects.

Asset numbers follow this format: **[PTN]-[Asset Category Number]-[Object eHandle]**

Asset Category Numerical Codes:

STRM BLOCKS	10
STRM LINES	11
STRM POLYGONS	12
SSWR BLOCKS	20
SSWR LINES	21
SSWR POLYGONS	22
CSWR BLOCKS	30
CSWR LINES	31
CSWR POLYGONS	32
WATR BLOCKS	40
WATR LINES	41
WATR POLYGONS	42

Quality Levels

Designed utility features always have the lowest “quality level” assigned: QLD. Once features have been built, the quality level may go up during the Record Drawing phase. Here are the “quality level” codes:

- QLD** Features drawn from records or other uncertified source.
- QLC** Above ground features have been surveyed and the underground features have been adjusted to them.
- QLB** Sub-surface survey/geophysical imaging, referenced to survey-accurate control.
- QLA** Exposed features were accurately surveyed.

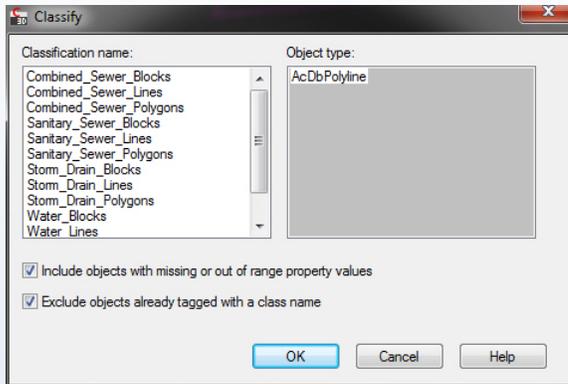
For more information see [ASCE 38-02](#).

Tip: How to “Classify” Utility Linework

Attach the Object Class Definition File to your drawing by using the **ATTACHDEF** command.

The **SPU-Object-Classification.xml** definition file is available online or on the City’s internal network at: **P:\CaddSupport\Custom\Design-Drafting\XML\SPU-Object-Classification.xml**

To classify objects start the **CLASSIFY** command in Civil 3D.



Select the type of objects you are classifying (for example if you want to classify all the water lines, select the “Water_Lines” classification name) and click OK and then select all the water lines in your drawing. An even easier way is to select the same type of objects first and then run the **CLASSIFY** command to classify them all at once.

Once “Object Data Tables” have been added to the utility linework, fill in the tables with real data. To add data to an object, simply select one or more objects and start the **PROPERTIES** command. At the bottom of the “Properties” palette, you will see the object data fields:

VPI	
PE_License	
Date_Created	
User_ID	
ACAD_Version	
Milestone	
CAD_KEY	
Quality_Level	

Simply type the data into the fields and hit ESC to deselect the linework. Repeat this until all the linework have object data filled in.

Remember, you can select multiple objects at the same time. For example you could select several or even all pipes that are the same size and material. Then you only have to enter the object data for those pipes once, rather than individually for each object.

To see what objects have not yet been classified run the **MAPSELECTUNCLASSIFIED** command.

SECTION 7: Annotation

Annotation must go in model space (of XREF drawing files) with the linework it is associated with; however there are cases in which annotation (such as notes, legends, etc.) may appear in paper space. All annotation must be UPPERCASE.

Text Styles

For existing and proposed drawings the standard text style (command: STYLE) name is "COS" with the "font name" set to RomanS.shx, the "paper text height" set to 0.00, and the "width factor" set to 1.00.

For As-Built and Record Drawings the standard text style name is set to "COS-Record" with the same settings above plus the "oblique angle" set to 20.

Text Color and Size Chart

Use the chart below as a guide to help you determine text colors* and heights in drawings with typical engineering and architectural scales. Colors should be controlled by layers (see SECTION 5: Layers).

Drawing Scale Factor:		1**	5	10	20	50	100
Layout (viewport) Zoom Scale:		1 XP	1/5 XP	1/10 XP	1/20 XP	1/50 XP	1/100 XP
Scale Name:		1"=1'	1"=5'	1"=10'	1"=20'	1"=50'	1"=100'
COLOR & SIZE	RED/125 (title block text/existing features)	0.08	0.4	0.8	1.6	4	8
	WHITE/105 (proposed features/house #s)	0.125	0.625	1.25	2.5	6.25	12.5
	YELLOW/145 (sub-titles/side streets)	0.1875	0.9375	1.875	3.75	9.375	18.75
	GREEN (titles)	0.25	1.25	2.5	5	12.5	25
	MAGENTA/205 (non-plotting notes/main streets)	0.3125	1.5625	3.125	6.25	15.625	31.25

Drawing Scale Factor:		16	24	32	48	64	96
Layout (viewport) Zoom Scale:		1/16 XP	1/24 XP	1/32 XP	1/48 XP	1/64 XP	1/96 XP
Scale Name:		3/4"=1'	1/2"=1'	3/8"=1'	1/4"=1'	3/16"=1'	1/8"=1'
COLOR & SIZE	RED/125 (station & offset/existing features)	1.28	1.92	2.56	3.84	5.12	7.68
	WHITE/105 (proposed features/house #s)	2	3	4	6	8	12
	YELLOW/145 (sub-titles/side streets)	3	4.5	6	9	12	18
	GREEN (titles)	4	6	8	12	16	24
	MAGENTA/205 (non-plotting notes/main streets)	5	7.5	10	15	20	30

*As-Built and Record Drawing annotation shall use colors shown on page 94 **plotted text height

Notes

Use MTEXT to create numbered notes. On the general notes sheet(s) every set of notes should have a sub-title that says “UNLESS OTHERWISE NOTED:”. The title shall be green, underlined and 0.25; sub-titles shall be yellow, not underlined and 0.1875; and text shall be white and 0.125.

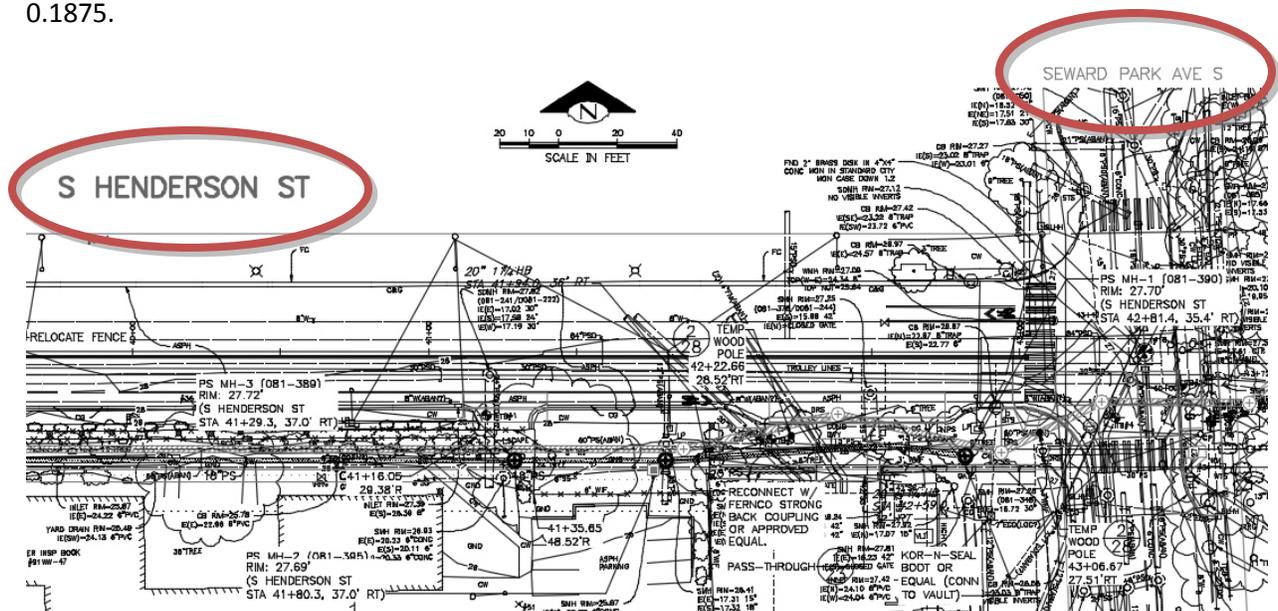


Notes and legends on all other sheets don't need a sub-title and the title shall be yellow, underlined and 0.1875.



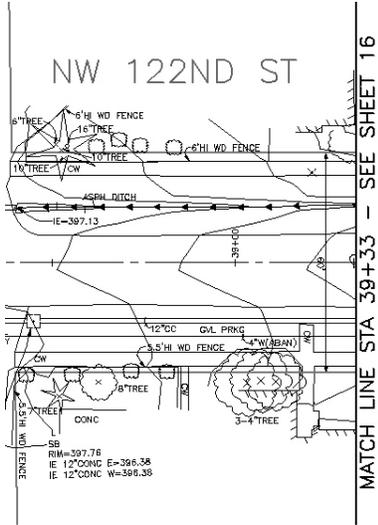
Street Names

When an XREF is overlaid into a sheet drawing, the street names in the XREF should be frozen through the viewport or set to not plot. Add street name text labels in Paper Space. Main street text labels are color 205 and have a text height of 0.3125. Side street text labels are color 145 and have a text height of 0.1875.



Sheet Match Lines

Match line text shall be yellow, 0.1875, center-justified and aligned with and centered on the mid-point of the match line in this format (use a field for the sheet #): MATCH LINE STA ###+## – SEE SHEET # (use the **C-match_line-L.dwg** and **C-match_line-R.dwg** blocks for left and right match lines respectively)



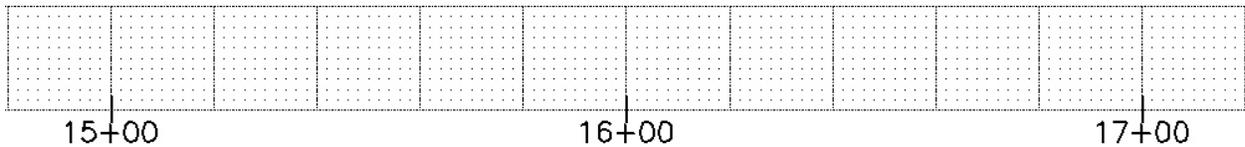
Tip: AutoCAD® Fields

You can insert an AutoCAD® Field for Sheet Set Manager view numbers and sheet numbers into Text, MTEXT, Dimensions, Multileaders and block attributes. To do this, use the CTRL+F keyboard shortcut or right-click and select “Insert Field...” when in any AutoCAD® text editor and select the “SheetSet” or “SheetView” field name.

Project Name	10 - 201-846 P-WATR-10	SHEET VIEW
Project Number	11 - 261-846 P-WATR-11	SheetNumber
SaveDate	12 - 261-846 P-WATR-12	SheetDescription
SheetSet	13 - 261-846 P-WATR-13	RevisionNumber
SheetSetPlaceholder		RevisionDate

Sheet Profile Grid Stationing

Profile grid stationing text shall be yellow, 0.1875, center-justified and aligned under major grid lines with a 0.25” tic mark. See page 21 for more info on the profile grid.



Annotative Text, Dimensions, & Multileaders

The COS & COS-Record text styles, dimension styles, and multileader styles should be set to “annotative” in AutoCAD® Civil 3D. This means that you set the text size to the drawing scale factor of 1 (plotted text height) in model-space and allow AutoCAD® Civil 3D® to size and display the annotation based on the annotative scale set in the drawing or viewport.

For example, if you add text with a height of 0.08 in model-space and the annotative scale is set to 1”=20’, AutoCAD® Civil 3D® will automatically size the text to 1.6 (viewports with a scale of 1”=20’ will also display the text height as 1.6 which will then plot at 0.08 on a full-size plot).

Annotative Scale List

For scaling to work properly with XREFs, standard scale name formats must be followed. Here are two standard formats (please note that there is a space on both sides of the equal sign):

Engineering scale format: 1” = x’

Architectural scale format: x/x” = 1’-0”

Dimension Styles

Here are a few important dimension style (command: DIMSTYLE) settings:

Dimensions for Proposed Features *

- Arrowheads: Closed filled
- Arrow size: 0.14
- Text style: COS
- Text height: 0.125
- Scale for dimension features: Annotative

*use the same settings for As-Built and Record Drawings except that the text style is COS-Record (see page 86)

Dimensions for Existing Features

- Arrowheads: Closed filled
- Arrow size: 0.1
- Text style: COS
- Text height: 0.08
- Scale for dimension features: Annotative

Tip: AutoCAD® Annotation Commands

- Use the command OBJECTSCALE to add/remove scales applied to individual text, dimensions, multileaders, or blocks (use the ANNOAUTOSCALE command to toggle the ability to add scales to all annotative objects at once).
- Use the command ANNOALLVISIBLE to show/hide annotative text, dimensions, multileaders, or blocks that do not have the current annotative scale. This allows you to easily show/hide text, dimensions, multileaders, or blocks through viewports based on scale.
- Use the command SCALELISTEDIT to add/edit annotative scales.

Multileader Styles

We recommend using the MLEADER command instead of the QLEADER command for drawing leaders. Multileaders work much better than quick-leaders in most cases.

Here are a few important multileader style (command: MLEADERSTYLE) settings:

Multileaders for Proposed Features*

- Arrowhead size: 0.14
- Arrowhead symbol: Closed filled
- Leader type: Straight
- Text style: COS
- Text height: 0.125
- Scale: Annotative

*use the same settings for As-Built and Record Drawings except that the text style is COS-Record (see page 86); a Civil 3D® label (command: AeccLbDIgGeneralNote) with the same settings may be used instead of a multileader

Multileaders for Existing Features

- Arrowhead size: 0.1
- Arrowhead symbol: Closed filled
- Leader type: Spline
- Text style: COS
- Text height: 0.08
- Scale: Annotative

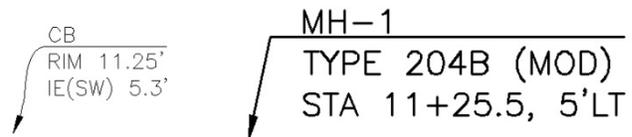
General Multileader Guidelines

The left edge of multileader text should line up vertically (left justification) and the leader(s) should always extend to text. Leaders on the left side of the text should be aligned with the middle of the top line of the text.

Leaders on the right side should be aligned with the middle of the bottom line of text.

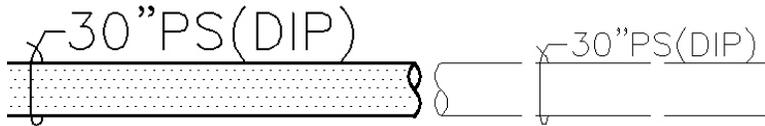


If the information below the first line is secondary information (such as rim, inverts, etc.) the leader should underline the first line of text.



Loop Leaders

Utility pipes in plan views must be called out with a loop leader callout. There are loop leader Pipe Network label styles available in the design template and dynamic loop leader callout blocks available on the web (see SECTION 2: Support Files): **Loop-Leader-Proposed-L.dwg**, **Loop-Leader-Proposed-R.dwg**, **Loop-Leader-Existing-L.dwg** and **Loop-Leader-Existing-R.dwg**.



These blocks are not annotative because the loop needs to maintain a constant size but the text within the blocks is. To add new scales to loop leader text, first set ANNOAUTOSCALE to 4 and then change the drawing scale. This procedure applies the new scale to all annotative objects.

Key Note Label Format

Key notes are called out on the plan view with a circle Multileader in this format: # (i.e. a number inside a circle).



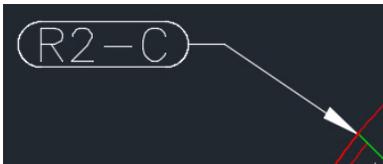
Grading Label Formats

Grading point labels are called out on the plan view with rounded rectangle labels.

General Grading: G# (i.e. G1001 in a rounded rectangle)



Ramp Grading: R#-X (i.e. R2-C in a rounded rectangle; for RAMP-2, point C)



Pond Grading: P#-X (i.e. P2-A in a rounded rectangle; for POND-2, point A)



Curb Return Label Format

Curb Returns are called out on the plan view with a hexagon Multileader in this format: C# (i.e. C1 in a hexagon; refers to curve geometry table).

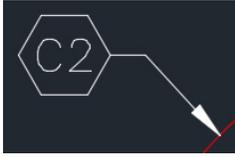


Table Styles

Tables (command: TABLE) may be used for the sheet index, schedules, and other tabular information. Here are a few important table style (command: TABLESTYLE) settings:

Title Cell Style

- Alignment: Middle Center
- Text style: COS
- Text height: 0.25
- Text color: Green
- No border above, to the left, and to the right.

Header Cell Style

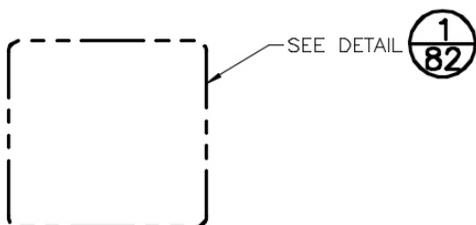
- Alignment: Middle Left
- Text style: COS
- Text height: 0.1875
- Text color: Yellow
- Border color: Yellow (all borders)

Data Cell Style

- Alignment: [varies]
- Text style: COS
- Text height: 0.125
- Text color: Black/White (color 7)
- Border color: Yellow (all borders)

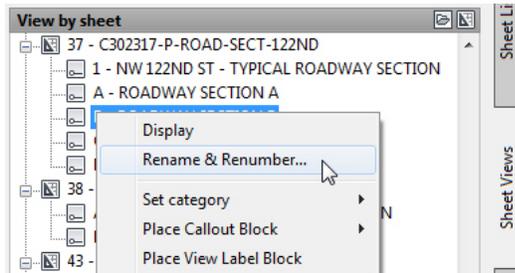
Reference Boxes

Use layer []-DETL-ANNO-REFR (color yellow, linetype PHANTOM2) to create a box that references to another detail or sheet.

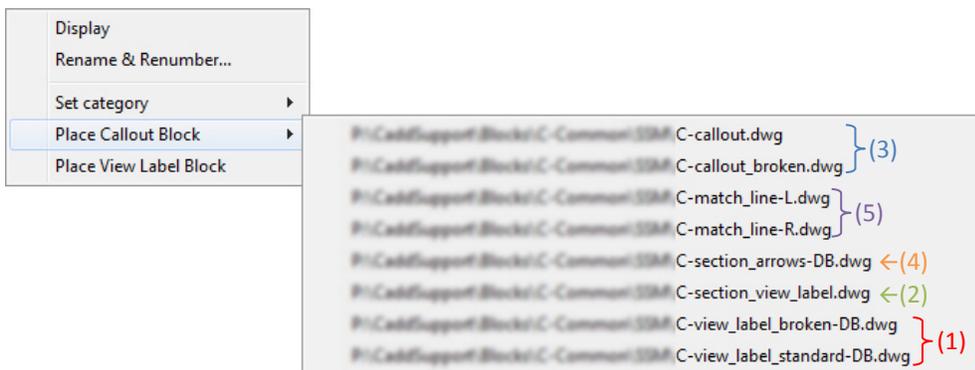


Detail and Section Referencing

Create detail and section views via the “Model Views” tab of Sheet Set Manager (right-click on a view and select “Place on Sheet”). After creating views, set the []-DETL-ANNO-SYMB layer current, go to the “Sheet Views” tab and select “Rename & Renumber...” to give the view a number or letter designation (see page 42 for more information).



Then use Sheet Set Manager (via the “Sheet Views” tab, right-click on a view and select the “Place Callout Block” flyout) to place detail and section referencing blocks (see SECTION 2: Support Files):



- **(1) DETAIL TITLES:** Use either **C-view_label_standard-DB.dwg** or **C-view_label_broken-DB.dwg*** for detail titles. These blocks may be placed under the detail views in paper space. These blocks need to refer back to the sheet the detail was taken from. To do this, double-click on the sheet number to edit the attribute and then double-click on the sheet number value to assign the correct sheet.
- **(2) SECTION TITLES:** Use **C-section_view_label.dwg** for section titles. This block may be placed under the section views in paper space. This block also needs to refer back to the sheet the section was taken from.
- **(3) DETAIL REFERENCE CALLOUTS:** Use either **C-callout.dwg** or **C-callout_broken.dwg*** next to annotation to refer to a detail’s number and the sheet number where it is displayed.
- **(4) SECTION REFERENCE CALLOUTS:** Use **C-section_arrows-DB.dwg** to indicate where a section is cut and to refer to the section’s letters and the sheet number where it is displayed.
- **(5) MATCH LINES:** Use the following match line blocks in paper space: **C-match_line-L.dwg** (*left* match lines; may also be used for *top* match lines) or **C-match_line-R.dwg** (*right* match lines; may also be used for *bottom* match lines). See page 88 for more information about match lines.

*Sheet number fields separated with commas; no spaces.

SECTION 8: Plotting/Printing

Page Setups

Common plot settings (set the resolution to 1200 dpi in your laser printer preferences for best results):

- Paper size: 34"x22" (full-size) or 17"x11" (half-size)
- Plot area: extents (do not put linework or annotation outside of title block limits)
- Drawing orientation: Landscape
- Full-size plot scale: 1" = 1'; half-size plot scale: 1" = 2' (always check "scale lineweights")

Plot Style Tables (pen assignments)

Standard .CTB files are provided online (see SECTION 2: Support Files). **COS_CADD_Standard.ctb** contains the standard pen and color assignments for contract drawings and base maps:

Lineweight	Plotted Color	Color No. w/ Screening: 100	Color No. w/ Screening: 80	Color No. w/ Screening: 65	Color No. w/ Screening: 60	Color No. w/ Screening: 55	Color No. w/ Screening: 50
0.003	BLACK	105, 125					
0.007	BLACK	22, 65, 186	252	253			254
0.01	BLACK	14, 85, 206					
0.012	BLACK	1, 226					
0.014	BLACK	7, 246					
0.014	BLACK	130					
0.02	BLACK	2, 21				145	
0.024	BLACK	3, 165, 41					
0.028	BLACK	4, 61				185	
0.031	BLACK	6, 81			205		
0.039	BLACK	5					
0.047	BLACK	12, 245, 121					
0.07	BLACK	53					

Record_Drawings.ctb contains the same standard pen and color assignments as **COS_CADD_Standard.ctb** plus a few more for As-Built and Record Drawings:

Lineweight	Plotted Color	Color No. w/ Screening: 100
0.01	RED	38 (used for hatch patterns)
0.012	RED	31 (compare to proposed color 1 lineweight)
0.014	RED	37 (compare to proposed color 7 lineweight)
0.02	RED	32 (compare to proposed color 2 lineweight)
0.024	RED	33 (compare to proposed color 3 lineweight)
0.028	RED	34 (compare to proposed color 4 lineweight)
0.031	RED	36 (compare to proposed color 6 lineweight)
0.039	RED	35 (compare to proposed color 5 lineweight)

Modifications to the .CTB files and using colors not defined in our plot style tables (see page 94) are strictly prohibited. The quality of prints may be impacted by type of paper used and the resolution in the printer settings. Contact the printer/plotter vendor to find out the optimum paper that should be used. It is recommended to set the resolution to 1200 dpi in the printer/plotter settings if possible.

Tip: Print Quality

The quality of prints may be impacted by type of paper used and the resolution in the printer settings. Contact the printer/plotter vendor to find out the optimum paper that should be used. It is recommended to set the resolution to 1200 dpi in the printer/plotter settings if possible.

Paperless Plotting

Creating DWFs and PDFs is an important part of our work process. Not only does it save paper, but it also allows us to electronically share drawings with people who do not have Civil 3D.

DWF Format (optional, for reviews)

The DWF format can be marked-up electronically and DWF sheets can be overlaid for comparison using Autodesk® Design Review. Download for free at: <http://usa.autodesk.com/design-review/>

Recommended DWF Printer/Plotter

DWFx ePlot (XPS Compatible).pc3

Recommended DWF “Paper Size” for Full-Size Sheets:

ANSI expand D (34.00 x 22.00 Inches)

Recommended DWF Plot Offsets (center title block on page):

X: -1.25

Y: -1.00

PDF Format (required)

The PDF format can be opened with Adobe Reader. Download for free at: <http://get.adobe.com/reader/>

Required PDF Printer/Plotter

DWG to PDF.pc3

Required PDF “Paper Size” for Full-Size Sheets:

ANSI full bleed D (34.00 x 22.00 Inches)

Required PDF Plot Offsets (center title block on page):

X: -1.00

Y: -0.63

DWF/PDF File-Naming Convention

During the design phase, set PUBLISHCOLLATE to 1 to make sure all sheets are included in one file.

- DWF naming convention: [PTN]_[milestone]-[project_name/description].dwf
- PDF naming convention: [PTN]_[milestone]-[project_name/description].pdf

Example of a plan set: 261-123_90%-1st_Ave_Watermain_SIP_Submittal.pdf

Final Design Drawing PDFs

For final Design Drawings (100%/advertised/conformed plan set), standalone PDFs must be created for each plan sheet (set PUBLISHCOLLATE to 0) using this naming convention: **[VPI #]-[Sheet #]**

Example of a single plan sheet: 777-123-1.pdf

Final PDFs must be signed with “digital” signatures, not “electronic” signatures, per the State of Washington Board of Registration for Professional Engineers and Land Surveyors (see page 100). This means that simply putting a likeness (image or vector) of your signature on PDFs does not meet the standard.

Record Drawing PDFs

For Record Drawings, standalone PDFs must be created for each plan sheet (set PUBLISHCOLLATE to 0) using this naming convention: **[VPI #]-A[Sheet #]** (prior to plotting, the “Barcode Modifier” field in the Sheet Set Custom Properties of Sheet Set Manager must be updated to: **-A**).

Example of a single plan sheet: 777-123-A1.pdf

SECTION 9: Electronic Transmittals

Here is an electronic transmittal checklist:

- We prefer to receive the file package in .ZIP format (see following page for more information).
- Make sure files follow our file naming convention (see SECTION 3: Project Data Sharing).
- Use organized folder structure (proper file naming and relative XREF paths ensure smooth translation).
- Include files from data links (i.e. Excel files).
- Include sheet set data and files (including .DST file, plot files, and XREFs).
- Include data shortcut source files & LandXML files (you may need to manually include these).
- Include PDF file(s) of the plan set.

Tip: Recommended eTransmit Settings

AutoCAD® Civil 3D® enables you to package up a set of files for Internet transmission with the eTransmit tool. Start eTransmit by opening a drawing that you would like to transmit and typing ETRANSMIT on the command line or by right clicking on a sheet set (command: SSM) and selecting eTransmit.

Click the “Transmittal Setups...” button in the “Create Transmittal” dialog box and click the “Modify...” button in the “Transmittal Setups” dialog box:

The screenshot shows the 'Transmittal Setups' dialog box with the following settings:

- Transmittal type and location:**
 - Transmittal package type: Zip (*.zip)
 - File format: Keep existing drawing file formats
 - Maintain visual fidelity for annotative objects
 - Transmittal file folder: [Empty field]
 - Transmittal file name: Prompt for a filename
- Path options:**
 - Use organized folder structure
 - Source root folder: [Empty field]
 - Place all files in one folder
 - Keep files and folders as is
- Actions:**
 - Send e-mail with transmittal
 - Set default plotter to 'none'
 - Bind external references
 - Bind
 - Insert
 - Prompt for password
 - Purge drawings
- Include options:**
 - Include fonts
 - Include textures from materials
 - Include files from data links
 - Include photometric web files
 - Include unloaded file references
 - Include sheet set data and files

Submitting CAD Files and Data to SPU and SDOT

The City of Seattle email system blocks incoming emails from outside sources containing .ZIP files thus you will not be able to send them via email. Instead you will need to upload the file package to a secure cloud-sharing service or a secure FTP server.

Since Seattle Public Utilities operates the Engineering Records Center (Vault) which is an archive of City infrastructure information, all 100% or conformed drawing set CAD files and data, addendum and design change CAD files and data, as well as as-built drawings and data are required to be submitted to **SPU_CADsupport@Seattle.gov** for archival.

Submitting to Seattle Public Utilities

Contact the **SPU_CADsupport@Seattle.gov** email address to submit digital files and arrange coordination of hard-copy submittals. Ensure that the files meet the submittal requirements on page 99 before submitting to SPU.

Submitting to Seattle Department of Transportation

Contact the SDOT Project Manager for drawing submittal protocol. Ensure that the files meet the submittal requirements on page 99 before submitting to SDOT.

Send the 100% or conformed drawing set CAD files and data, addendum and design change CAD files and data, as well as as-built drawings and data to the **SPU_CADsupport@Seattle.gov** email address for archival.

SECTION 10: Submittals

Before submitting drawings to the City of Seattle, ensure the following items are addressed:

Pre-Submittal Checklist

30% CAD Submittals

Use the Planning and Setup checklist on page 33 to get started. Check for the following items:

- X-VIEW drawing with match line locations established per SECTION 3: Project Data Sharing.
- Sheet Set Manager was used to create sheets and viewports; barcodes are visible on all sheets.
- Complete cover sheet (vicinity and location maps, sheet index, and detail & section referencing).
- Professional stamps, North arrows and bar scales where needed/required.
- Survey control drawing with datum info and PLS stamp, if required.
- XREFs are set to overlay and relative path and on the correct "X" layer.
- All entities are on standard layers (names, colors and linetypes per SECTION 5: Layers).
- Annotation formatting is standard (see SECTION 7: Annotation):
 - spelling
 - text style settings; all text is uppercase and set to the standard text height
 - dimension style, multileader style and Civil 3D® label style settings
 - MTEXT notes and legends formatting are consistent (text heights and colors)
 - loop leaders around utilities
 - table formatting: table style (title, heading and data styles), fonts and text justification
 - match line formatting
 - profile grid stationing and elevations
 - use of detail/section title and referencing blocks (see SECTION 4: Drawing Guidelines)
- Blocks (standard blocks must be used for water, storm, sewer and combined sewer).
- Title block scales are accurate:
 - plan only format: 1"=20'
 - plan + profile format: H. 1"=20', V. 1"=10'
 - details and cover sheet format: AS NOTED
 - notes, schedules, tables, etc. format: NONE

60% CAD Submittals

Check the above checklist and the following items:

- Station & offset labels are shown on all proposed features (may be included in tables).
- VPI and Vault Serial numbers acquired and added to title blocks via Sheet Set Manager.
- Utility linework drawn and classified with data added per SECTION 6: Linework and Data.

90%, 100% (Advertised/Conformed Set) & Record Drawing CAD Submittals

Check the above checklists and the following items; send to SPU_CADsupport@Seattle.gov for archival:

- Elevation labels are shown on all proposed features where required (may be included in tables).
- Drawings conform to checklists in SECTION 4: Drawing Guidelines.
- All data synced (plotted annotation, classified linework data, Pipe/Pressure Network data, etc.).
- PDF sheets plotted per SECTION 8: Plotting/Printing and digitally-signed per submittal requirements shown on page 100 (physically-signed Mylars are also acceptable).

Submittal Requirements

The following items are required for approval:

30% Submittals

- AutoCAD® .DWG files, the Sheet Set Manager .DST file and related files (see SECTION 9: Electronic Transmittals).
- 22"x34" PDF of plan set created with "DWG To PDF.pc3" and "COS_CADD_Standard.ctb" (see SECTION 8: Plotting/Printing).

60% and 90% Submittals

- AutoCAD® .DWG files, the Sheet Set Manager .DST file and related files (see SECTION 9: Electronic Transmittals). Geo-referenced water, sewer, drainage, and combined sewer features (blocks and 2D linework for proposed utilities) must be "classified" (see page 83) for import into Seattle Public Utilities' GIS system.
- 22"x34" PDF of plan set created with "DWG To PDF.pc3" and "COS_CADD_Standard.ctb" (see SECTION 8: Plotting/Printing).

100% Advertised/Conformed Drawing Set Submittals

- AutoCAD® .DWG files, the Sheet Set Manager .DST file and LandXML files of the final product (see SECTION 9: Electronic Transmittals) created according to the City of Seattle Inter-departmental CAD drafting standards. Geo-referenced water, sewer, drainage, and combined sewer features (blocks and 2D linework for proposed utilities) must be "classified" (see page 83) for import into Seattle Public Utilities' GIS system.*
- Signed drawing submittal options (choose only one option for the entire plan set):
 1. 22"x34" PDFs of plan set sheets created with "DWG To PDF.pc3" and "COS_CADD_Standard.ctb" (see SECTION 8: Plotting/Printing) and digitally-signed per [the Board of Registration for Professional Engineers and Land Surveyors interpretative guidelines](#). We require a single digitally-signed PDF file for each sheet (see page 96).
 2. Plotted full-size (at least 22"x34") hard copy drawing using COS_CADD_Standard.ctb (see SECTION 8: Plotting/Printing) composed of black pigment-based ink on 3-mil (or thicker), double-matte mylar (100%, reverse read) with seal and signature affixed.

*Addendums and design changes must be incorporated into the CAD files and submitted to the SPU_CADsupport@Seattle.gov email address for archival.

As-Built and Record Drawing Submittals

Complete As-Built and Record Drawing requirements can be found here:

http://www.seattle.gov/util/Engineering/Consulting_Resources/For_Drafting_Consultants/

Acknowledgements

This document was written by [Joshua Jones](#) from Seattle Public Utilities with input and support from the City of Seattle Inter-Departmental CAD Committee. Special thanks go to the following people who have supported the CAD process:

Gigi Canter, for development of customization and support files

Amos Reinemer, for software and desktop support

Dean Huber, for City of Seattle standard blocks and Civil 3D® Pipe Network part development

Janet Hart and **William Choate**, for survey requirements

Thomas Shea and **Gavin Schrock**, for sheet barcode development

Melissa Hill and **Elizabeth Anderson**, for presentation standards

Dave Hildahl and **Tim Reese**, for as-built and record drawing standards

Change Log

- | | |
|------------|---|
| 12/27/2016 | Included “addendums” with revision standards on page 21. |
| 01/25/2017 | Added “GR” discipline designator on page 44. |
| 02/09/2017 | Removed DWF requirements on page 100. Only PDFs are required. |
| 02/09/2017 | Updated plotting/printing info in SECTION 8: Plotting/Printing. |

