# CAD Manual Appendices

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Introduction

The CAD Manual Appendices have been written to provide helpful information in support of the CAD Manual. The content in the appendices are not standards, but tips and information to help achieve the standards defined in the CAD Manual.

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.

Appendix 1: Working With Point Groups

As a standard practice, a “_No Display” point group is created along with various other groups under the “Point Groups” section in the Prospector tab of the Toolspace (command: SHOWTS).

To change the display of points in a drawing, right-click on “Point Groups” and select “Properties...”
Point groups are displayed based on hierarchy. Whatever point group is on the top takes priority over all other point groups under it. If “_No Display” is on top, no points will be displayed in the drawing.

Move a point group to the top to see the points contained within that group.
Appendix 2: Working With Sheet Set Manager

Introduction
Sheet Set Manager (SSM) is a powerful tool in AutoCAD. SPU & SDOT use SSM to ensure consistency in every sheet as required by our CAD standards. Here are some helpful tips for using SSM.

Creating a New Sheet Set
Start up Sheet Set Manager one of the following ways:

- Click on this button: 
- Type SSM in the command line.
- Ctrl+4
- Select the pull-down menu: Tools → Palettes → Sheet Set Manager

Create a new sheet set by selecting the down-arrow in Sheet Set Manager and selecting “New Sheet Set...” (see following picture).
Create a new sheet set using an example sheet set (see following picture).

Click “Next >”. Select a sheet set to use as an example (see following picture). The COS_SheetSet should be the only option if you set your template paths correctly using the instructions on the first page.

Click “Next >”.
Fill out the form with your project name, description and the sheet set storage location (see following picture).

Click the “Sheet Set Properties” button to add more information about your project to the sheet set (see following picture).
## Appendix 2: Working With Sheet Set Manager

![Sheet Set Properties - C302404_Sample](image)

### Sheet Set Properties - C302404_Sample

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>C302404_Sample</td>
</tr>
<tr>
<td>Sheet set data file</td>
<td>K:\CaddSupport\Sample Drawings\Plot_Files\C302404_Sample.dwg (v1.1)</td>
</tr>
<tr>
<td>Description</td>
<td>Sample drawing set showing standard COS sheet drawings.</td>
</tr>
<tr>
<td>Model view</td>
<td></td>
</tr>
<tr>
<td>Label block for views</td>
<td>[K:\CaddSupport\Blocks\F-Common\SSM\View_Label.dwg]</td>
</tr>
<tr>
<td>Callout blocks</td>
<td>[K:\CaddSupport\blocks\F-Common\SSM\Callout.dwg][K:\CaddSupport\Blocks\P...</td>
</tr>
<tr>
<td>Page setup overrides file</td>
<td>K:\CaddSupport\Templates\SSM\COS_SheetSet.dwt</td>
</tr>
</tbody>
</table>

### Project Control

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project number</td>
<td>C302404</td>
</tr>
<tr>
<td>Project name</td>
<td>27TH AVE S/S FOREST ST SEWER &amp; WATER REHABILITATION</td>
</tr>
<tr>
<td>Project phase</td>
<td></td>
</tr>
<tr>
<td>Project milestone</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Sheet Custom Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Checker Initials</td>
<td></td>
</tr>
<tr>
<td>Designer Initials</td>
<td></td>
</tr>
<tr>
<td>Drafter Initials</td>
<td></td>
</tr>
<tr>
<td>Drawing Checker Initials</td>
<td></td>
</tr>
<tr>
<td>PE Seal Expiration Date</td>
<td>mm/dd/yyyy</td>
</tr>
<tr>
<td>PE Seal Registration Number</td>
<td>#</td>
</tr>
<tr>
<td>Received</td>
<td></td>
</tr>
<tr>
<td>Reviewed by Const</td>
<td></td>
</tr>
<tr>
<td>Reviewed by Des</td>
<td></td>
</tr>
<tr>
<td>Reviewed by Proj Mgr</td>
<td></td>
</tr>
<tr>
<td>Reviewed by SDOT</td>
<td></td>
</tr>
<tr>
<td>Revised As-Built</td>
<td></td>
</tr>
<tr>
<td>Scale</td>
<td>H. 1&quot;=20', V. 1&quot;=10</td>
</tr>
<tr>
<td>Sheet Custom Title</td>
<td></td>
</tr>
</tbody>
</table>

### Sheet Creation

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet storage location</td>
<td>K:\CaddSupport\Sample Drawings\Plot_Files</td>
</tr>
<tr>
<td>Sheet creation template</td>
<td>Plot[K:\CaddSupport\Templates\SSM\COS_SheetSet.dwt]</td>
</tr>
<tr>
<td>Prompt for template</td>
<td>No</td>
</tr>
</tbody>
</table>

### Sheet Set Custom Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Number - CD</td>
<td></td>
</tr>
<tr>
<td>Job Number - PC</td>
<td>C302404</td>
</tr>
<tr>
<td>Job Number - R/W</td>
<td></td>
</tr>
<tr>
<td>Project Title</td>
<td>27TH AVE S/S FOREST ST SEWER &amp; WATER REHABILITATION</td>
</tr>
<tr>
<td>Total Number of Sheets</td>
<td>4</td>
</tr>
<tr>
<td>Vault Plan Number</td>
<td>123-456</td>
</tr>
<tr>
<td>Vault Serial Number</td>
<td>123456</td>
</tr>
</tbody>
</table>

### Sheet Set Custom Properties

- Edit Custom Properties...
**Explanation of Sheet Set Properties:**

**Sheet Set (skip)**
This section will be filled in for you already. You can skip this section.

**Project Control (if applicable)**
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% DRAWINGS. Every sheet will display this label.

**Sheet Custom Properties (skip for now; add to individual sheets)**
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 (skip)**
This section will be filled in for you already. You can skip this section.

**Sheet Set Custom Properties (project information)**
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.

Click OK when you are done.

Click “Next >” and you will see a summary of the sheet set you just created. Click Finish.
**Creating Sheets**

Right-click on the sheet set and select “New Sheet...” (see following picture).

![Image showing the Sheet Set Manager with a New Sheet option highlighted]

Fill in the “Number” and “Sheet title” boxes. The “File Name” box will automatically be filled in for you. The “Sheet title” should follow the standard file naming convention (see following pictures).

![Image showing the New Sheet dialog box with filled fields]

**NOTE:** See CAD Manual for standard file naming convention.
Your new sheet will now appear under the sheet set. Right-click on the new sheet and select "Properties..." (see following picture).
Appendix 2: Working With Sheet Set Manager

Scroll down in the resulting dialog box and edit the section called “Sheet Custom Properties” (see following picture).

Notice that in the above picture the field called “Line 3: Sheet Custom Title” is filled in as “SEWER PLAN & PROFILE”. This field will show up as green text in the lower-right corner of the sheet. Our standard is to fill out the “Line 3…” field as the “Sheet Description” because this field will also be referenced on the cover sheet in the sheet index. The “Line 1…” and “Line 2…” fields are optional and can be used if needed.

When finished hit OK.

Double-click on the sheet to open it and then select the correct titleblock:

1. You will see this:
2. Click on it to reveal hidden grip:
3. Click the grip to select titleblock:

As in the pictures above, click on the box to select either the SPU or SDOT titleblock.
You will see a title block with fields already filled in for you based on the properties of the sheet set and the sheet (see following picture).

NOTE: If you right-click on the sheet set or the sheet and edit the properties, you will need to “REGEN” the drawing to see the changes in the drawing.

If you need to display a profile grid on a sheet, simply thaw the layer called C-ANNO-GRID (you may need to REGEN). A profile grid block with attributes will appear. Simply double-click on it to edit the left and right elevation attributes. When you overlay an XREF of a profile drawing in model space and create a viewport on the grid, you can align the profile elevations with the profile grid block elevations by selecting the viewport box and snapping one of the XREF’s elevations perpendicular to the appropriate profile grid block elevation. Then set the XREF’s profile grid & elevation layers to not plot.
You can switch between the SPU titleblock and the SDOT titleblock simply by selecting the titleblock and clicking on the triangle grip next to the City of Seattle logo (see following pictures).

Click on the triangle grip to select either the SPU or SDOT titleblock.
Creating XREF Views

Open one of your sheet drawings through SSM that you want to add a view to. Set the G-VIEW-FRME layer current and draw a rectangle (command: RECTANG) where you want the view to go. It doesn’t have to be perfect as the viewport can be adjusted later. WBLOCK the rectangle out and name it something like “ViewFrame-Full.dwg” (delete it from the drawing). Open an XREF containing your linework and insert your newly created view frame block into it.

When inserting this view frame you can specify the scale you will want to see in your viewports (see following picture). If you will be printing your drawing at 20-scale, set the scale to 20. If you will be printing at 100-scale, set it to 100. And so on…
Insert the view frame using the Nearest OSNAP on an alignment.
Then, using another Nearest OSNAP, drag and click on the alignment to align the view frame with the alignment (see following picture).
If you want to move the view frame edge to align with a specific station, you can move the view frame at the intersection (OSNAP) of the frame edge and the alignment, and snap it to a station using the Insert OSNAP (see following picture).

If you only need one view, then you’re done. If you need more than one view, from this point on, you can either repeat the steps above to insert another view frame, or you can copy the current view frame as many times as you need.
Next you need to align your UCS with the first view frame. To do this type UCS on the command line. Then type OB (for OBJECT) and select the bottom of a view frame (see following picture).

Then type PLAN on the command line and hit Enter twice.
To create a view, simply type V (command: VIEW) and click the “New...” button to create a new view (see following picture).
Give the view a name and type a category name (optional). Make sure you uncheck the “Save layer snapshot with view” checkbox (see following picture).

Click the “Define window” radio button to set your view. Snap, using the END or INT OSNAP, to the corners of the view frame.

Then hit Enter to accept the window definition.

Repeat the steps above to create more views.

**NOTE:** Be aware that if your view frames rotate, you may need to re-align the UCS with every view.
Creating Viewports
In Sheet Set Manager select the “Model Views” tab and double-click on “Add New Location...” (see following picture).
Browse to the location where your XREF files are located and click the “Open” button. The “Browse for Folder” dialog box will appear blank even though drawings exist in the folder (see following picture).
If xrefs are stored in more than one location, add another location by following the same procedure shown above (see following picture).

Click the + icon next to the XREF name to reveal the views contained in the drawing (see following picture).

Right-click on a view name and select “Place on Sheet” (see following picture).
Right-click to set the scale of the viewport (see following picture).

You will notice that it automatically puts the XREF in model space, creates a viewport box and inserts a view title.

**WARNING**: Be aware that Sheet Set Manager automatically “freezes” all other layers in that viewport. If you want anything else to show in that viewport you will need to “thaw” layers in that viewport.

**CONCEPT**: When placing a plan view on a sheet such as a base map, generally you will want to show another XREF (such as a water or drainage design) on top of it. To do this, you do not need to follow the process above and place another view in the sheet. All you need to do is go into Model Space and overlay an XREF. However, you must be aware of the warning above about layers frozen in that viewport. If you overlay an XREF and it doesn’t appear in the viewport, check your layers and thaw them in that viewport.

**At this point you need to change two objects to the correct layer**: Change the viewport box to the G-VIEW-FRME layer; and switch to model space and change the XREF to the correct layer (X-****).
Creating a Sheet Index
To create a sheet index on the cover sheet, first open the cover sheet drawing. Then in Sheet Set Manager on the “Sheet List” tab, right click on the Sheet Set (top item) and click on “Insert Sheet List Table...” (see following picture).

You will get a dialog box that looks like this:
Click OK to insert the sheet index on the cover sheet. When you add, delete, renumber, or rename sheets (by editing the Line 3: Sheet Custom Title field), you need to update the table. To do this, right-click on the table and select “Update Table Data Links” (see following picture).
Publishing

Open COS_SheetSet.dwg and right-click on the “Plot” tab and select “Page Setup Manager...” Create page setups for your plotters, and then save and close the template file.

To publish (plot) a set of plans in your sheet set, in the Sheet List tab of Sheet Set Manager right click on the sheet set and select Publish → Publish using Page Setup Override → [select a page setup override].

This will plot all the sheets in your sheet set according to the settings in the page setup that you selected. Please note that the page setup overrides will only work if you have the plotters installed correctly on your computer.

**NOTE:** When creating/editing page setups in the template (DWT file), you must set the “Plot area” to either Layout or Extents. SSM will ignore page setup overrides with plot areas set to Display or Window.

**TIP:** To setup/modify a Page Setup Override for your plotters/printers, simply right-click on your sheet set and select:

Publish → Manage Page Setups...

This will open up the Page Setup Manager for the DWT template file. Generally we setup our plot areas to Extents and select the “Center the plot” checkbox. But we realize that sometimes it is easier to use a different plot area such as Display or Window. When first creating your page setup, it is ok to use Display or Window plot areas, but because SSM doesn’t support those plot areas you will eventually need to change it back to Layout to be usable in SSM.
For example, if you find it easiest to setup the plot area with “Window”, go ahead and do so. Hit ok in the Page Setup dialog box to save it. Then modify your Page Setup again and change it from Window to Layout. The Layout plot area will maintain the same plot area previously set by the Window plot area and it will now be usable as a Page Setup Override in SSM.

Placing Callout Blocks for Detail/Sheet Cross-Referencing
Here is an example of our standard method of cross-referencing between sheets and views:

DETAIL AND SECTION REFERENCING

![Diagram of callout blocks for detail/section referencing]

- **DETAIL REFERENCE NUMBER:** Sheet on which detail appears
- **DETAIL REFERENCE NUMBER:** Sheet from which detail was taken

("TYP" specifies that detail is uniformly typical throughout project except where otherwise noted.)
("VAR" specifies that detail was taken from several sheets.)

SECTION A-A is shown on sheet 32.

SECTION A-A is taken from sheet 30.

It is important that you number your views in Sheet Set Manager. This enables you to cross-reference between views and sheets using callout blocks that contain Sheet Set Manager fields. To number your views, click on the Sheet Views tab, expand the sheet to see the views, and right-click to select “Rename & Renumber…” (see following picture).
Here is an example of renaming and renumbering a detail view:

Notice in this example of a detail view, it has been numbered as 1 and the title contains %%%44 to represent a comma.

TIP: “Number” section views with letters, and all other views with numbers. For example a Section A-A will be numbered with the letter A. When placing a section callout block, it will refer to the letter A and display the section view title properly.

Once your views have been named and numbered properly, you can place all kinds of callout blocks in any drawing. To place a callout block in a drawing, right-click on a view and select:

“Place View Label Block”, or...

“Place Callout Block” → [select a block]
Update Barcodes on Record Drawing Sheets

All sheets contain a barcode for indexing in the Engineering Records Center (ERC). When a sheet set is converted into a “Record Drawing” sheet set, the barcodes need to be updated to reflect this.

To do this, open the Sheet Set, right-click on the sheet set name at the top...

...and select “Properties…” Look for the “Barcode Modifier” field:
Simply add an A after the hyphen in the “Barcode Modifier” field:

<table>
<thead>
<tr>
<th>Sheet Set Custom Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barcode Modifier</td>
</tr>
<tr>
<td>Federal Aid Project No</td>
</tr>
<tr>
<td>Job Number - CO</td>
</tr>
</tbody>
</table>

Do this and all the barcodes in the entire sheet set will be updated next time you print.
Appendix 3: Markup, Measure and Compare with Autodesk Design Review

Autodesk Design Review is free software that you can use to view, print, markup, and measure drawings in DWF format. Click on the “Markup & Measure” tool:

Markup Protocol
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

Drawing Comparisons
To compare design changes between submittals, open a DWF in Design Review and select a sheet that you want to compare.

Go up to the “Tools” tab and click “Compare Sheets”.
Browse to find a DWF of the same drawing set, created at a different time. Then select the same sheet that you currently have open in Design Review.

If you want, you can change the default colors for things that were deleted or added between the sheets.

Final result is essentially an automatic markup of the DWF sheet showing what is new and what has been deleted.

(the sheet shown above was compared to a completely different sheet to show exaggerated differences)
Appendix 4: Grading Tables

It is often important to create a finish grade (proposed) surface when doing any kind of grading. If you create a surface, data for it can be automatically added to tables. Automated tables containing a station/offset and an elevation for each grading point are preferred in order to avoid mistakes. It might seem strange, but an easy way to accomplish this is to use Pipe Network structures and labels.

Point Label Styles

It is important to follow agreed-upon label formats for grading points. Here are a few:

- **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)

This label style (CG-SPOT) is available in the design drafting Civil 3D template.
Point and Point Label Layers

Before you get started run the **EDITDRAWINGSETTINGS** command, go to the Object Layers tab and change the Structure and Structure-Labeling layers to C-TOPO-ANNO.

![Object Layers settings](image)

Essentially you are adding topo points instead of Structures and topo labels rather than Structure labels.
**Point Numbering Setup**

Before you start creating points, think about how they will be numbered. If you want to start your point numbers at 1000, then it will be easier to set this up instead of going back and renumbering later on. To set this up before creating a new Pipe Network, go to the Settings tab of Prospector (if not visible, use command: **SETTINGS**), expand Pipe Network and Commands, right-click on CreateNetwork and select “Edit Command Settings…”

Expand Default Name Format and edit the Structure Name Template.

Here is an example of grading points that start at 1000:
Create Points
In the Home tab of the Ribbon, select: Pipe Network → Pipe Network Creation Tools

Create a Pipe Network for each grading feature surface and name it so it is easily associated with the feature (the Network name will be displayed in the table title later). Select the parts list called CG-SPOT, choose the proposed grading surface, select an alignment nearby and use the CG-SPOT structure label style.

In the Network Layout Tools, expand “Spot Elevation” and select the “EDIT STRUCTURE DESCRIPTION” structure part.
Then add “Structures Only”.

![Diagram showing R2-B, R2-A, R2-E, R2-C, R2-D, R2-H with points and labels]

Add the points and drag the labels so they are easy to read.

![Prospector tab showing structure descriptions]

You can rename the structures in the Prospector tab of Toolspace (command: SHOWTS); this will automatically update the labels.

![Table showing structure descriptions]

Also, you will need to edit the structure descriptions which can be displayed in the table. To edit a bunch of descriptions at once, select a few (using SHIFT or CTRL), right-click on the “Description” column header and select “Edit...”

![Table editing options]

Type a description, hit ENTER and all that were selected will change.
If you decide to change the numbering (going forward) for your points, right-click on your Pipe Network and select “Network Properties...”

Go to the Layout Settings tab and edit the name template for Structures.

You can click on the button to edit the name template...

...which allows you to change the starting number.

Going forward, new points you create for this Network will use this template and starting point.
You can also switch the referenced surface and alignment names in the Network Properties:

This will not change any points you have already created – only points you create going forward.

**Create Tables**

In the Annotate tab of the Ribbon, select: Add Tables → Pipe Network → Add Structure

Select the CG-SPOT table style and network (you may change other settings if you’d like) and click OK.
Click to add the table someplace in your model space. This table will automatically update if you modify the surface elevations or move the structures to a new location.

<table>
<thead>
<tr>
<th>POINT</th>
<th>ELEV</th>
<th>STATION/OFFSET</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2–A</td>
<td>56.41’</td>
<td>STA 14+44.00, 14.42’RT</td>
<td>TOP OF CURB</td>
</tr>
<tr>
<td>R2–B</td>
<td>56.26’</td>
<td>STA 14+39.58, 16.99’RT</td>
<td>FLOW LINE</td>
</tr>
<tr>
<td>R2–C</td>
<td>56.45’</td>
<td>STA 14+36.80, 19.87’RT</td>
<td>FLOW LINE</td>
</tr>
<tr>
<td>R2–D</td>
<td>56.93’</td>
<td>STA 14+34.08, 25.03’RT</td>
<td>TOP OF CURB</td>
</tr>
<tr>
<td>R2–E</td>
<td>56.67’</td>
<td>STA 14+43.71, 20.98’RT</td>
<td>TOP OF RAMP</td>
</tr>
<tr>
<td>R2–F</td>
<td>56.75’</td>
<td>STA 14+40.93, 23.86’RT</td>
<td>TOP OF RAMP</td>
</tr>
<tr>
<td>R2–G</td>
<td>56.71’</td>
<td>STA 14+47.33, 24.48’RT</td>
<td>BACK OF LANDING</td>
</tr>
<tr>
<td>R2–H</td>
<td>56.79’</td>
<td>STA 14+44.20, 27.02’RT</td>
<td>BACK OF LANDING</td>
</tr>
</tbody>
</table>

Utilize a viewport to display the ramp tables on a sheet.
Appendix 5: Working With Multilines

Multilines are used to depict large pipes on civil plan drawings (for more detailed information about why we do this, see Section 6 in the CAD Manual).

Multiline Styles

Multilines may be used to draw pipes in 2D plans and profiles. The “design” Civil 3D template contains a lot of Multiline styles that represent standard pipe sizes. Type MLSTYLE to see the Multiline styles:

In this dialog box you can set a Multiline style current.

Multiline styles are “closed” so you can easily add hatch patterns to them.
Creating Multilines
To create a Multiline, type MLINE in the command line. You will get this prompt:

Specify start point or [Justification/Scale/STyle]:

**J for Justification**
A picture says it all (clicking from left to right):

**S for Scale**
Don’t use this unless you need an exaggeration.

**ST for Style**
Type the style name exactly as you created it. We have styles created for common pipe sizes. For example a 12" concrete pipe’s style would be named 12-CONC. An 18" ductile iron pipe’s style would be named 18-DIP.