The Secrets of Cutting Plan and Profile Sheets in AutoCAD® Civil 3D®
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CV304-1P In this class, you'll learn how to set up the Sheet Set Manager for your AutoCAD Civil 3D projects and how to streamline the process of cutting Plan and Profile sheets using the 2008 Plan Production wizard. We will also explore how to split the profile views and have them remain dynamic to the model.

About the Speaker:
Michelle started using AutoCAD® Release 9 when she was in the U.S. Air Force working as a surveyor, designer, and construction manager. She has worked for both municipalities and consulting engineering firms as an engineering/GIS technician. Michelle served two years as an advisor to Autodesk on the Autodesk Authorized Training Center Advisory Board where she served as chair and vice chair. In that role, she advised Autodesk and other training centers how to make the product and the product training more effective for end users. She currently acts as the mentoring coordinator for IMAGINiT Technologies while continuing to help clients implement their Civil 3D® and related products.
Civil 3D helps you efficiently create great road designs. First you start with the surfaces, parcels, and alignments. Next you quickly create profiles, and a typical cross section that will easily put in every line including curb and gutter, sidewalk, and daylight lines. But let’s face it, road projects can be very daunting and time consuming when it comes to cutting sheets. At least it used to be...

**Introduction**

Introduced in Civil 3D in the 2008 release, View frames and the production of associated sheet sets automate the process of producing plan and profile sheets for defined alignments.

View frames are rectangular borders which represent an area along the alignment. The view frames overlap and are registered with each other using match lines. View frames (Figure 1) are created based on a layout chosen as part of the creation process. The application uses a wizard (Figure 2) to guide you through the process of determining the layout selection, frame and match line styles and the associated profile style if profiles are to be plotted as part of the set. Once the view frames have been created, the associated sheets may be generated and plotted.

![Figure 1. View Frames and match lines.](image)

![Figure 2. View Frames Wizard](image)

You may create as many sets of view frames as you need for any model. Each frame set may have a different template associated with it, as well as different styles for the frames, match lines and profile. You can control frame and match line visibility using layers.

Once created, frames and match lines may be repositioned within limits, allowing you to fine tune the set.

**The Components**

The components you need to create view frames and their associated sheets are:

- The source drawing (Figure 3). This is the drawing (DWG) that contains the model you are working with. The source drawing contains the profiles and profile views that you will use to plot in your layouts. The profile view that you are using in model
space need not be the same profile view that you use in plotting the profile with your view frame set. More on this in a later section!

Figure 3. Source drawing containing the designed alignment and profile

- The layout template (Figure 4). This is a template (DWT) containing the layouts with the viewports set up at the required scales. It may also have title blocks, borders, additional text, scales, north arrows and other components needed for the sheet, but which are not part of the model.

Figure 4. Layout Template
We will look at setting up the template first, then add any additional styles to the model to bring this all together.

**The Layout Template**

The first step in developing the view frame set and associated sheets is to ensure you have a template with the layouts set up at the required scales and with all the details.

Let’s say that you want to create sheets at 1” = 30’ and 1” = 60’. You want the 1” = 30’ sheets to be on 24”×36” (D) sized paper and the 1” = 60’ sheets to be on 11”×17” (B) sized paper. Profiles on the 1” = 30’ sheets will be at a vertical scale of 1” = 5’ and profiles on the 1” = 60’ sheets will be at a vertical scale of 1” = 10’. You want title blocks, scale bars and north arrows on both sheet sizes. We will set everything in the layouts except the vertical profile scales.

*Start with a blank template.* Make sure you use the correct template for the units you are using. For this example, I started with the NCS Imperial template furnished with Civil 3D 2009.

*Next, I have created two layouts and named them to correspond with the sheet scales and paper sizes I want to plot* (see Figure 5).

![Figure 5. Layout Tabs.](image)

Remember, do not use any special characters such as the apostrophe in the layout names. The application will get upset and warn you about this.

*Next, select a layout, right-click, and select Page Setup.* Page Setup Manager allows you to set the correct plotter, page size, etc. The figure 6 shows the information for one of the layouts.
Once you have set up the layouts, you can place the elements such as borders and viewports in paper space on each of the layouts. Figure 7 shows a layout with two viewports, the top one for a plan view and the bottom one for a profile.
The viewports should have the correct scales set (in this case 1" = 30’). The other property of the viewports that will need to be set is the Viewport Type. You can select this from the Properties Sheet for the viewport by selecting a viewport to make the grips visible, right clicking, and selecting properties. You can choose Plan, Profile or Undefined from the dropdown. Figure 5 shows the property Sheet for the top viewport in Figure 7. The Viewport Type is how the application knows what to put where on the sheet and what scale is going to be used to create the view frames and the plots. Once the viewports are set up correctly, you should lock them. You can do this by selecting a viewport to make the grips visible, right clicking and selecting Yes as the Viewports Locked property from the context menu. The viewports need not be rectangular, but they should be the same width because the profile will correlate with the plan in regards to the position of the stationing.

You should insert elements such as borders, north arrows, scale bars, etc. first so that you can position the viewports accurately. Borders can be inserted as blocks or XREFs. Be careful if you use XREFs. If you have more than one layout in the template, and the border is an XREF, not all the layouts may function as you would like. Only one layout becomes active, even though several may be defined in the template. This is not an issue if the borders are inserted as blocks. Images may be attached, but remember to attach them to the layout, not to model space.

The north arrow should be inserted as a block. When the sheets are produced, the application will use the local block reference to orient the north arrow correctly. This is an option you can set in the Create Sheets wizard. We will look at this in detail later.
OK, now we have our template with the two layouts at the correct scales and sheet sizes with all the drafting elements in place. Be sure to save it as a template (DWT) file. We are ready to move to the view frame and sheet set creation part of this procedure.

Creating View Frames

Now we switch to the source drawing with our model.

First, we will make sure we have the correct profile view for the vertical scale we want to display in our plotted sheets. We will go to the Settings Tab of the Toolspace and create a profile view with a 6:1 vertical exaggeration. This gives us a 1” = 5’ vertical scale at 1” = 10’ and 1” = 10’ vertical scale at 1” = 60’.

Figure 9. The 6:1 Profile Style.

Figure 10. The Graph Tab showing the Vertical Exaggeration.
Figure 11. Horizontal Axes Labels (shows the horizontal tick and label values.)

Note that there is a **Y value offset of 1.0000”** for the major tick and label for the bottom of the profile view and that the Tick and label start station checkbox has been unchecked. The labeling for the major tick and label for the top axis is shown in Figure 11.

Note that the **Y offset is set to -2.0000”**. Setting these values has the effect of drawing the labels into the grid area, rather than placing them along the axes. When we do the final settings for the display components we will turn the ticks off. I will explain why in a minute.

Figure 12. Top Axis Major Tick and Label
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Figure 13. Vertical Axes Labels (shows the vertical axis tick and label values.) We have moved the vertical axis labels, and we have put an *X offset of 5.0000”* on the left axis and *unchecked the Tick and label start elevation checkbox*. As you can see from Figure 14, we have also *offset the right axis ticks and labels - 1.0000”* from the axis.

Figure 14. Right Axis Major Tick and Label.

*The last step is to set the visibility of the components.* Figure 15 shows what we have left visible.
Figure 15. The Display Settings.

What we are left with after all this is a basic graph with the major and minor grids and the major labels for each axis, with these labels offset from the axes using our specified values.

So, why have we done this? When Civil 3D plots the profiles it will look at the profile view style you specify in the view frame creation and use that view style to generate the profile for each frame in the group. The profile view appropriate for the frame is placed in the viewport at the scale you specified. However, unless you split the profile, the grid may be clipped in the viewport and the axes may not form part of that profile view in the viewport.
You may end up with just a grid with the profile traces and no labels. What we have done by creating this profile view is to pull the elevation and station labels into the body of the grid so that it’s likely they will be seen. This is only one option available. You can split the profile or use the automatic setting for the elevation range.

You may find that, depending on the topography and the alignment, a profile view like this one may not be needed. Plotting just a plan will not require any profile manipulation, and just a profile may not either. I have included this to illustrate a way of getting a labeled profile in a plan and profile plot where labels may not be visible otherwise.

Creating the View Frames

View frame groups are quite easy to create using the wizard provided in Civil 3D 2009. Let’s get started.

From the top menu choose General > Plan Production Tools > Create View Frames. This starts the wizard

We are going to create a frame group for the long alignment shown in Figure 16.

Figure 16. The Edgemont Highlands Alignment.

The first page in the wizard, the Alignment Page, allows us to choose the alignment and the stationing. You can use the automatic stationing or select a range either by typing it in or selecting from the drawing. You can select the start and end stations independently. You can select the alignment from a drop down list or from the drawing. Figure 17 shows the wizard’s Alignment page. When you have entered your choices, click on the NEXT button to advance to the Sheets Page.
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Figure 17. The Alignment Page.

Figure 18. The Sheets Page.
Figure 18, above shows the Sheets page which allows us to choose the sheet setup and view frame alignment. You can choose the components to plot (plan, profile or both) and the template to use to create the sheets. You can browse for the template by clicking on the button. Figure 19 shows the layout selection dialog that appears once we have selected our template. Note that both the layouts we constructed are available for use.

The View Frame Placement section of this page allows us to arrange the view frames either along the alignment or with the frames rotated according to the north orientation in the drawing. The checkbox option in this section allows us the choice of starting the first frame at a specified distance value before the start of the alignment. Entering a value here adds a margin so that the start location of your view frame does not hide important drawing data that you may want to display. If you leave this field blank, some drawing data near the start of the first view frame may be too close to the start of the view frame and may not plot. When you have entered your choices, click on the NEXT button to advance to the View Frame Group Page.

Figure 19. Select Layout as Sheet Template Dialog.

Figure 20. The View Frame Group Page.
Figure 20 shows the **View Frame Group Page**. This page deals with the naming and display of the individual frames and the naming of the frame group.

The first section applies to the view frame group. Here we can provide a name and optional description for the frame group.

The second section allows us to set up the individual frame name conventions, the layer the frames reside on, the frame and frame label styles, and the placement of the frame label in relation to the frame border. As in all Civil 3D dialogs, you can edit any of the styles or create a new one as needed. The same holds true for the layer selection; you can use an existing one or make a new layer at this time. I would recommend that you create a new layer for the view frames, since you may want more than one set in the drawing.

By default, the view frames and view frame labels are placed on layer 0. Using the **Drawing Settings Dialog** (Figure 21.) you can change the default layer and add prefix or suffix values to capture each set individually. You can set these values in a template you use as your drawing base. Doing it this way assures that your frames and labels will always be on layers with the same properties and layer name format.

![Drawing Settings Dialog](image)

Figure 21. The Drawing Settings Dialog.

When you have entered your choices, **click on the NEXT button to advance to the Match Lines Page** (Figure 22.).
Match lines are displayed only in model space and in plan views. They are not displayed in profile views. If you have selected to create plan and profile or profile only sheets, the \textbf{Insert Match Lines} option is selected automatically. You cannot edit its value. If you are creating only plan views, selecting this option will cause match lines to be inserted on the view frames in the plan views. If you do not want to show match lines on the view frames, clear this check box.

The \textbf{Positioning} section of this page allows you to set the Snap Station and Frame Overlap values.

\textbf{Clear the Snap Station option} to use a rounding value (calculation) for the match line positioning based on derived stations. Select this option to use the rounding calculation value that is entered. The rounding calculation \textit{always rounds down}. For example, if the calculated station for a match line is 48+37.69, then a rounding of 100 would place the match line on 48+00. Note that this option will not accept values that cause the match lines to be placed in undesirable locations (e.g. before the previous match line or before the beginning of the alignment). If a rounding calculation would result in the match line being placed in an undesirable location, the rounding calculation is ignored and the match lines are placed at the calculated station.

The Frame Overlap option gives you the ability to increase the distance that you can move match lines in the plan view after they have been created. When you increase this margin, or additional distance, the overlap area of the match lines increases. This option can also be used to force an overlap of frames in plan sheets only when, on a straight line alignment for example, adjacent edges of two view frames might be coincident, and therefore do not provide enough room on either side of the match line for labeling and notes.
The Match Line and Labels sections of this page provide options for the display and labeling of the match lines. The settings are similar in function to those for view frame visibility and labeling.

When you have entered your choices, click on the NEXT button to advance to the Profile Views Page (Figure 23.).

![Profile Views Page](image)

Figure 23. The Profile Views Page.

The Profile Views page contains two controls, the Profile View Style and the Band Set.

The Profile View Style control allows you to select the profile style that will be used to plot the profiles on the sheets. This does not have to be the same style as you have used to show the profiles in your model. In our example, we have selected our newly created Plotted Style Profile at 6:1.

The Band Set Style control allows you to choose a band set to display with the plotted profile. To simplify plotting in this example, we are going to choose No Bands to display with the profile.

Remember, all the values in these controls refer to styles and objects contained in this, the model source drawing, not the template that you are using for the sheet creation.

That completes the View Frames Wizard. Clicking on the CREATE VIEW FRAMES button generates the frames shown below in Figure 24.
Figure 24. The View Frame Group.

Figure 25 shows the View Frames and Match Lines listed in the Prospector. Right clicking on any of the entries opens a **Properties Dialog** for that object. You can edit the name and style on the Information tab of the dialog, but the application does not let you alter other properties of the objects. Right clicking on a view frame object also allows you to create a sheet for that object from the context menu.

Now, we will use these frames to create a set of sheets.
Creating the Sheets

Creating the sheets is also a straightforward process, managed by a wizard. From the top menu choose General > Plan Production Tools > Create Sheets. This starts the wizard.

Figure 26. View Frame Group and Layouts Page.

The page in figure 26 lets you choose which view frame group to use and the range of frames within the selected group. Within the View Frame Group section you can choose All or Selection. Choosing Selection opens a dialog which displays all the frames (figure 27). You then choose the ones you want (CTRL and SHIFT work as in any Windows list).

Figure 27. View Frame Selection Dialog Box
The Layout Creation section allows you to determine where the layouts will be placed and how many layouts to place in each drawing. You have the option of placing all the layouts in one new drawing or all layouts in the current drawing. You can choose a layout name and if you have a north arrow block in your layout, you can have it aligned with the plan view in each sheet.

When you have entered your choices, **click on the NEXT button to advance to the Sheet Set Page** (Figure 28).

![Figure 28. The Sheet Set Page.](image)

The Sheet Set page is divided into two sections. The **Sheet Set** section allows you to choose whether you want to create a new sheet set or add the sheets to an existing set. If you choose to add the sheets to a new set, a browse button will appear and file dialog will open.

You can also specify the sheet set file (DST) storage location.

The **Sheets** section allows you to set the sheet files storage location and the sheet file name.

If you have implemented Vault, you must be logged into the Vault in order to add your files to the Vault. Luckily, we have the option to Log into the Vault from here. Then you will simply put a check mark in the **Add files to Vault** option.

When you have entered your choices, click on the NEXT button to advance to the **Profile Views Page** (Figure 29).
Figure 29. The Profile Views Page.

There are three sections to this page. The **Profile View Settings** shows the profile view style you have chosen to use and the band set that you have chosen. These can not be changed in this dialog.

The second section deals with **Other Profile View Options**. You use these options to change some settings on the profile views that will be used to create these sheets.

The third section helps you **Align Views**. You will have three options on aligning your plan and profile view with each other.

**Under the Other Profile view options choose the Get Other Settings From An Existing Profile View option if you want to use the settings from another profile view in the current drawing. Select a profile view in the list or click \[\] to select a profile view in the drawing.**

**Under the Other Profile view options select the Choose Settings option if you want to use the Create Multiple Profile Views Wizard to select options from multiple profile views.** When you select this option, the **Profile View Wizard** button is available. You can use the **Create Multiple Profile Views Wizard** to create multiple profile views if you wish. When you use this option, multiple profile views will be created and placed in the model space of the file containing the sheets. At the end of the **Create Multiple Profile Views Wizard** session, you are returned to the **Profile Views** dialog of the **Create Sheets Wizard**.

The **General** (Figure 30) and **Station Range** (Figure 31) pages of the **Create Multiple Profile Views Wizard** describe the Alignment, Profile View Style and Station Range you have chosen.
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Figure 30. The General Page.

Figure 31. The Station Range Page.
This brings us to the third page of the wizard. Now, here’s where it gets interesting. Figure 32 shows the **Profile View Height** page. We have the option of leaving the automatic view height or choosing to split the profile. The *First, Intermediate and Last* split profile styles can be defined independently. Once the sheets are created, each sheet also may be fine tuned if you need adjustments to the content of any of the viewports.

The Profile view datum (the lowest elevation of the profile grid) can be set by the Minimum elevation or the Mean elevation.

The **Split Station** and **Datum Option** controls define where the vertical and horizontal profile splits occur. They can be set to exact stations and elevations or the previous major or minor grid values. That way, if the profile begins to creep out of the top of your profile view due to drastic elevation changes, rather than splitting the view at 23+54.56 it can be split at the previous major grid (23+00) or the previous minor grid (23+50). The Datum at the split can also be set to the exact elevation (4567) at the split or at the previous major grid elevation (4560) or the previous minor grid elevation (4565).

![Create Multiple Profile Views - Profile View Height](image)

**Figure 32.** The Profile View Height Page.

*When you have entered your choices, click on the NEXT button to advance to the Profile Display Options Page* (Figure 33).

The **Profile Display Options** page allows us to determine what the displayed profiles should look like. The default settings are those current in the drawing. You can change them here, which will affect all instances of the profile in the sheets, or you can adjust them on a per sheet basis after the sheets have been created. Sometimes, you may need to change the labeling for a certain profile or represent the profile trace differently.
When you have entered your choices, **click on the NEXT button to advance to the Profile Data Bands Page** (Figure 34). Note that if you have a pipe network or networks in the profile, you will be taken to the **Pipe Network Display** page instead of the **Data Bands** page.

If you specified data bands in the Profile Views page of the View Frames Creation wizard, they will be listed on this page. You can edit the style for the band here if needed. If you did not choose any bands to display, then the **Set Properties** control will be empty.
When you have entered your choices, *click on the NEXT button to advance to the Multiple Plot Options Page* (Figure 35).

This page determines how multiple profile views will be arranged in the model space of the drawing containing the sheets. This page is active only if there is more than one sheet in the drawing, and therefore more than one profile view. You can arrange the profile views draw order by row or column, and specify the row and column spacing.

![Figure 35. The Multiple Plot Options Page.](image)

When you have entered your choices, *click on the FINISH button to return to the Profile Views Page of the Create Sheets wizard* (Figure 29.).

*Clicking on the NEXT button brings us to the Data References page* (Figure 36) of the Create Sheets wizard. This page of the wizard lets you select the data that you want referenced in your sheets.

In the collections that are displayed, items that are required for creating the sheets, such as the selected alignments and profiles, are already selected. You cannot edit these items because you cannot clear the check mark. All other items that are available are expanded in the tree. Select the items in the tree that you want to include in your sheets. The reason you would use a reference is that the new drawing file that will be created for your sheets will contain an x-ref of the source file. Efficiency is gained by also including object references so that you can utilize Civil 3D object labels.

If you have chosen to have the sheets saved in the current file, (in other words, if you have chosen *All Layouts In The Current Drawing* on the *View Frame Group And Layouts* page of the *Create Sheets* wizard), then the *Data References* page of the *Create Sheets* wizard is skipped (not displayed).
The two controls below the data references window are:

- **Pick From Drawing.** Click this button to select the objects in the drawing. The other option is to check mark the data you want referenced (with a data shortcut or vault shortcut) in your sheets if you know the names of the items you want.

- **Copy Pipe Network Labels To Destination Drawings.** Select this option to copy any pipe network labels to the destination drawing or drawings. If no pipe networks exist, this option is not available.

![Create Sheets Data References](image)

Figure 36. The Data References Page of the Create Sheets Wizard.

When you have completed the wizard, **click on the CREATE SHEETS button to create the sheets.** You will be prompted that your current drawing will be saved (Figure 37.).

![Save Current Drawing Confirmation](image)

Figure 37. Save Current Drawing Confirmation.

**Click OK to continue.**

You will be prompted to select a profile view origin. Select a point in a blank area of the drawing that won’t interfere with any existing objects or line work. This origin is used as the insertion point for any profiles required on the sheets. These profiles (or profile) are
created in the model space of the drawing containing the sheets (or sheet). All the existing contents of the model space of the current drawing are referenced into the drawing or drawings containing the sheets.

Once the process completes, the **Event Viewer** gives you a notification (Figure 38.), and **Sheet Set Manager** opens, displaying the sheet list (Figure 39.).

![Figure 38. The Event Viewer.](image)

![Figure 39. Sheet Set Manager.](image)
The Plotted Sheets

Figure 40. A Plotted Sheet with a 50’ Profile View Height.

Figure 41. Profile View Detail.
We have plotted the sheets based on our 6:1 profile, the 1” = 30’ scale and the 24” x 36” sheet size using the layout we created with the border and other details. The sheet is shown in Figure 40, and a detail in Figure 41.

Looking at the detail, we see that the grid displays the stationing inside the grid as we expected, but the labeling for the geometry is cut off. This occurs because the application will clip the grid to fit when the profile view is split based on a user specified height. In this case, the specified height is 50’. If an automatic height is used, the application will try to fit the grid in with some buffered space around it. However, since we want to have the vertical scale specified at 1” = 5’, we can not use an automatic height; since this does not guarantee us that we will see the entire grid at the scale we want. Parts of the profiles may be missing. One solution to this problem is to access the Profile View Properties for this Profile View and specify a user specified height of 25’ in this case. Do this by selecting the Profile view, right clicking, and selecting the Profile View Properties. On the Elevations Tab a User specified height can be set.

This causes a few more splits in the profile due to the reduced height, but as you can see from Figure 43, everything plots properly.

Depending on the topography, you may have to modify some of the other sheets as well to get them to look as you would like. It’s a bit of work, but overall, this process is a lot faster than manually trying to draw and position things. With a bit of practice, you can produce these sheet sets in a few minutes. The layout templates, once created, can be used many times.
Figure 43. The Same Sheet with a 25’ Profile View Height.