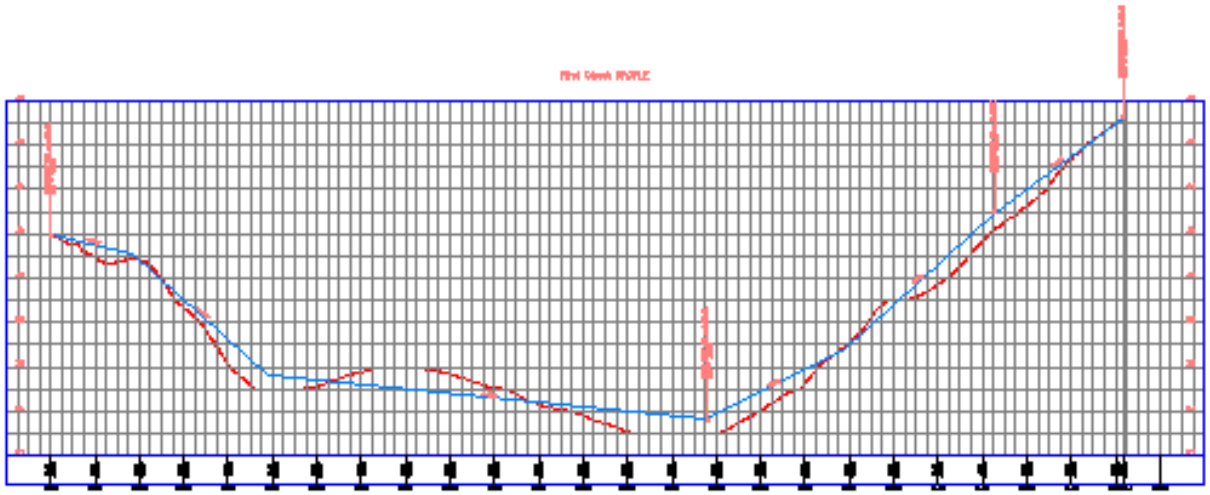
Contents

Tutorial: Designing Simple Profiles

Exercise 1: Creating and Displaying Surface Profiles with Offsets

In this exercise, you will create and display a surface profile from an existing surface.

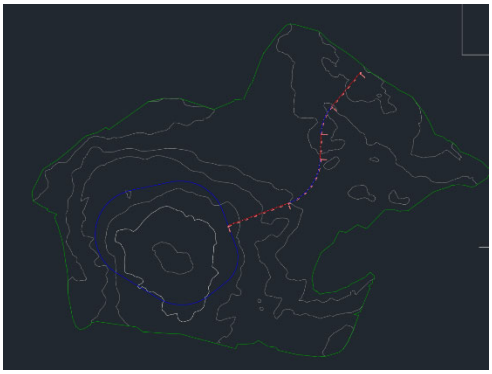
An *existing ground* profile is extracted from a surface and shows the changes in elevation along a horizontal alignment. A *layout* profile is a designed object that shows the proposed grade and elevations to be constructed. Profiles are displayed on an annotated grid called a *profile view*.



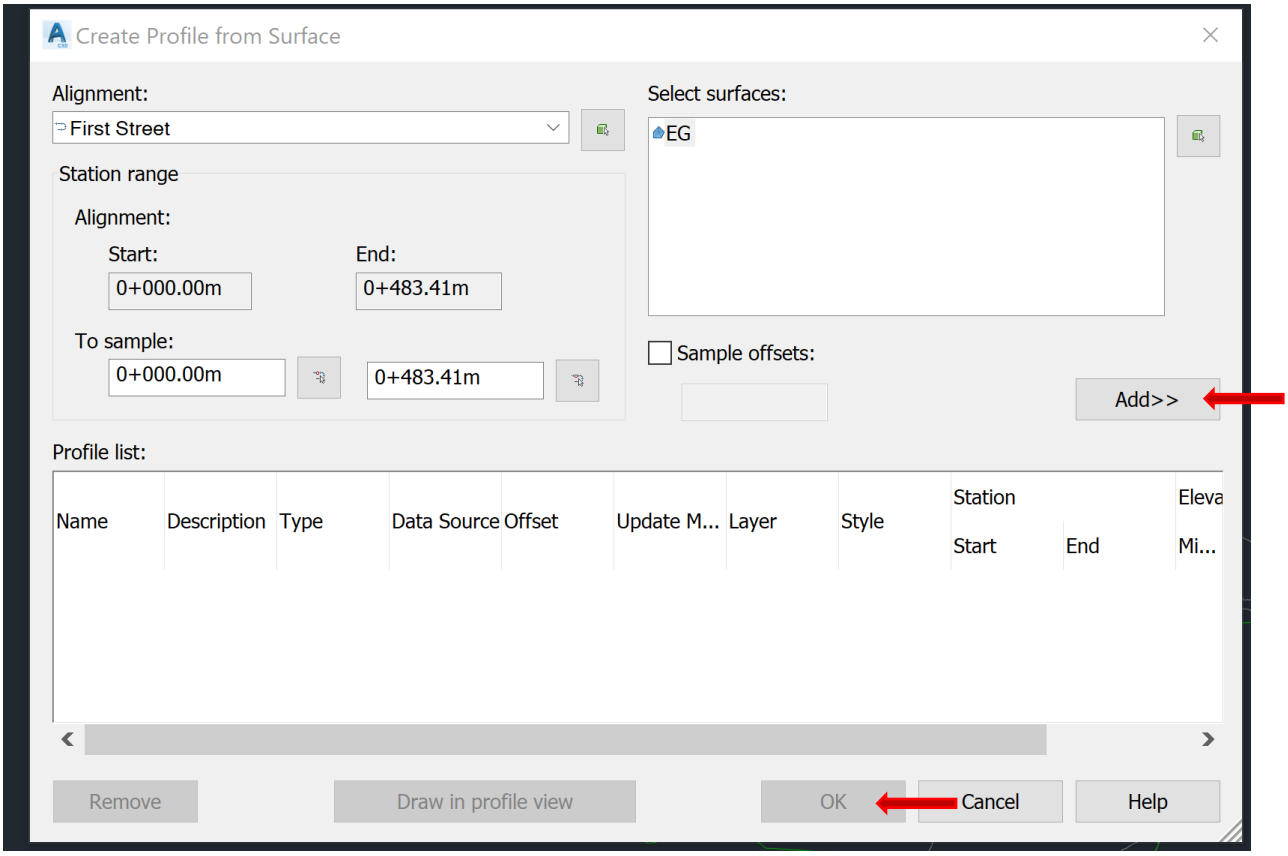
Display an existing ground profile in a profile view

1. Open drawing Profile-1.dwg, which is located in the drawings folder. Save this files as Profile-1_Exercise 1_lastname firstname.dwg

   This drawing contains an existing ground surface, an alignment that represents a road centerline, and a polyline that represents the centerline of an intersecting road. You will use the rectangle in the northeast corner of the site as a guide to create a profile view.



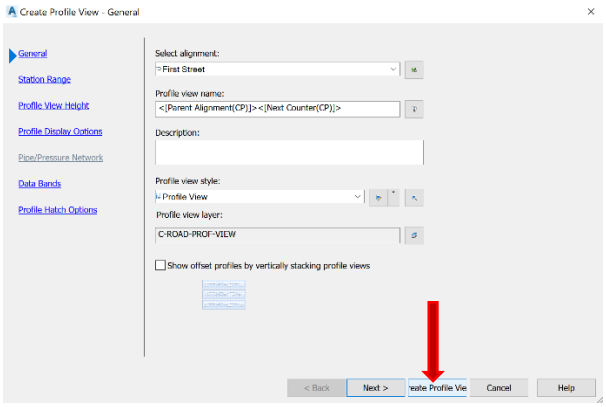
2. Click Home tab ➤ on the Create Design panel ➤ Profile drop-down ➤ Create Surface Profile .
3. In the dialog box, click Add and then click OK.



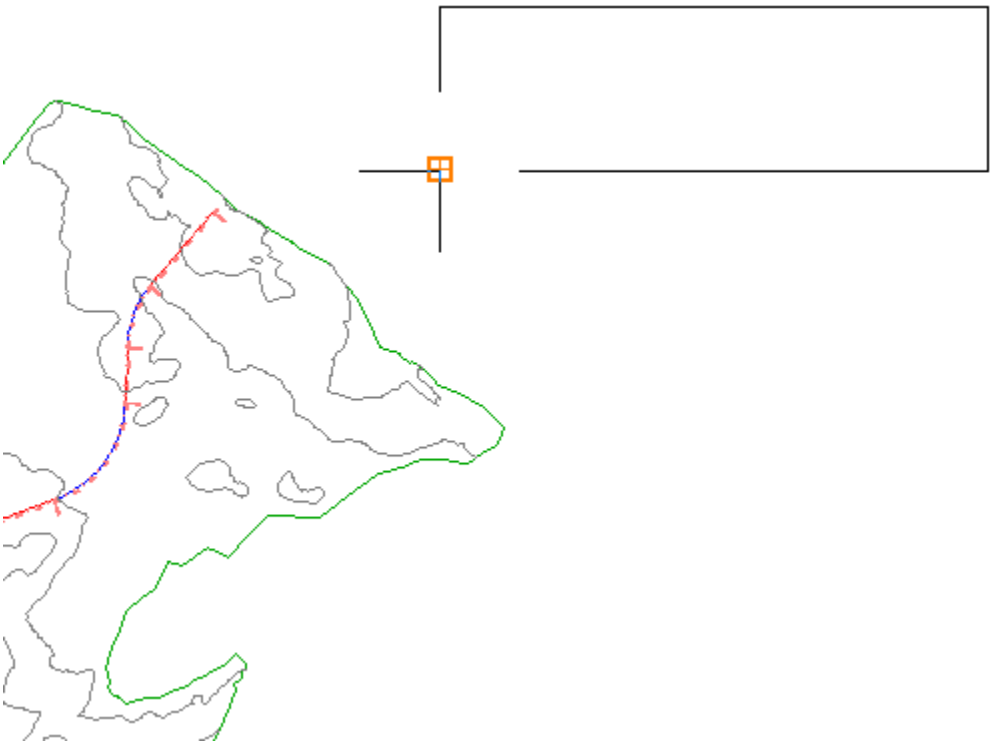
Note:

For this exercise, the First Street alignment and the EG surface are the only available selections, and are selected by default.

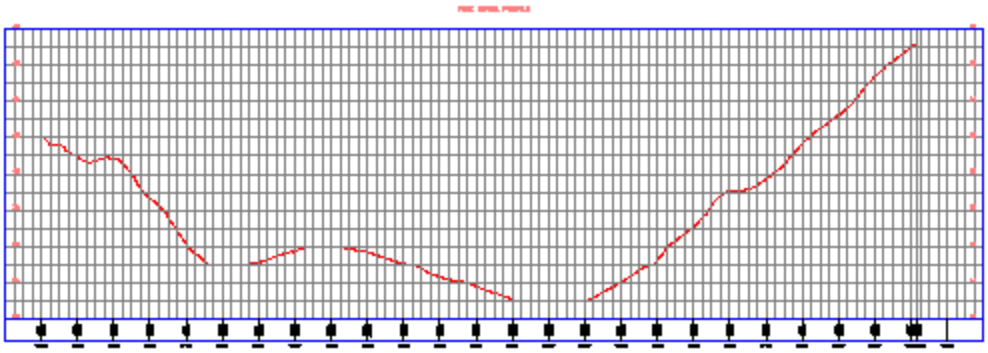
4. Click Profile View.
5. Click Create Profile View.
6. Click Create Profile View button in the dialog box



7. In the drawing, click the lower left corner of the rectangular placeholder.



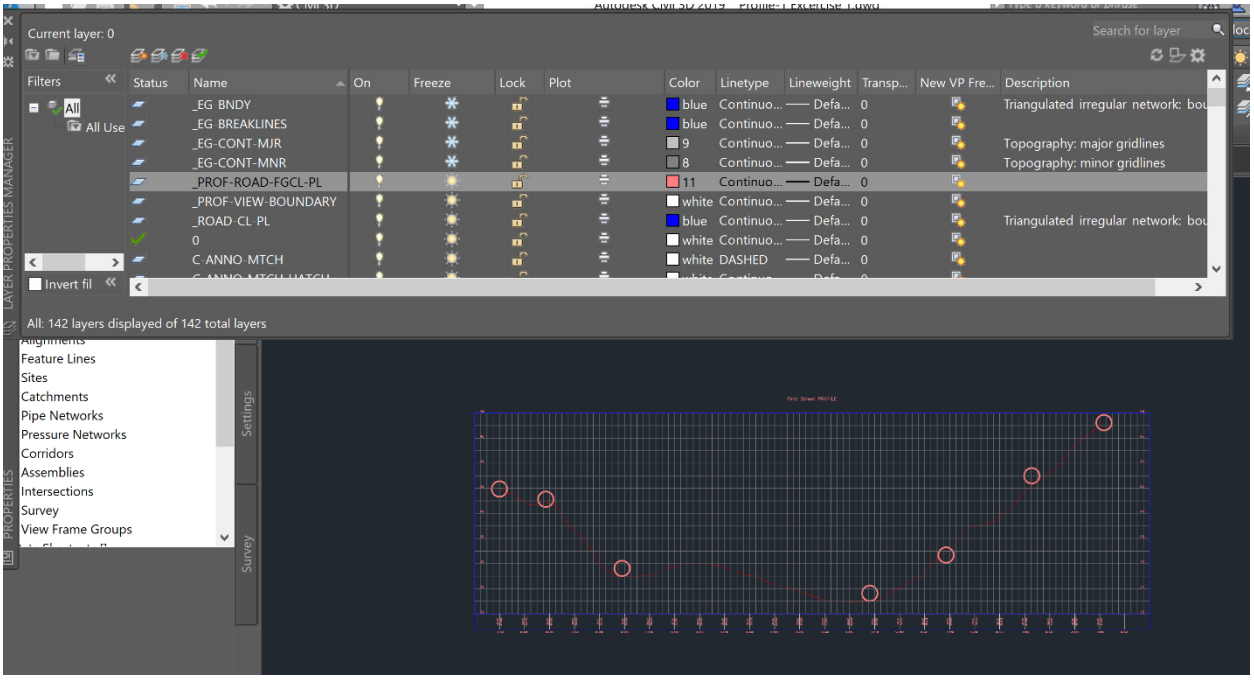
The First Street Profile view is displayed in this box, containing the dashed profile that represents the existing ground (EG) surface. The left and right sides annotate elevations. The bottom annotates the stations.



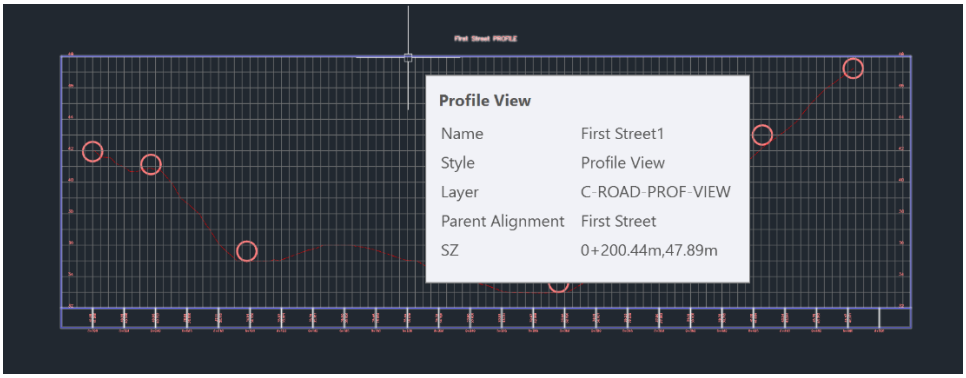
Create a layout profile

1. Click Home tab ➤ Layers Properties panel ➤ Layer drop-down. Next to the **_PROF-ROAD-FGCL-PL** layer, click ☼.

   You will use the circles in the profile view as a guide to draw a layout profile.

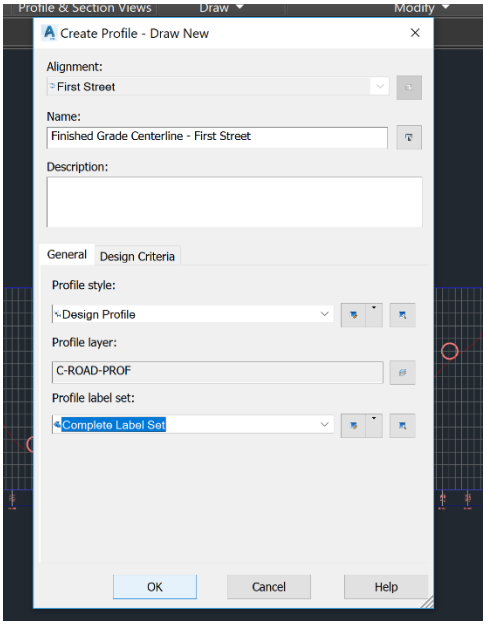


2. Click X to close the Layer Property menu
3. Click Home tab ➤ On the Create Design panel ➤ Profile drop-down ➤ Profile Creation Tools.
4. In the drawing space, Select the profile view that you created.



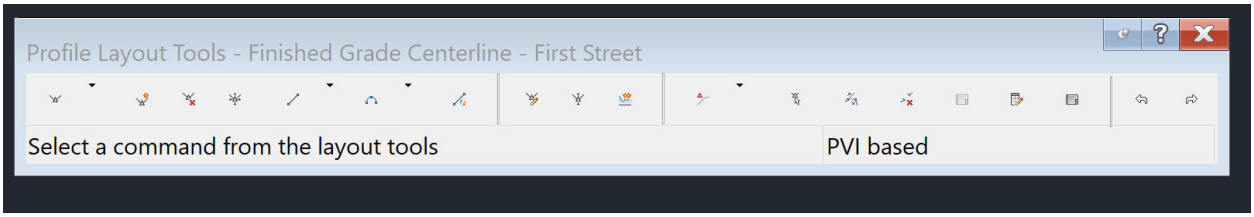
5. In the Create Profile - Draw New dialog box, specify the following parameters:

- Name: **Finished Grade Centerline - First Street**
- Profile Style: **Design Profile**
- Profile Label Set: **Complete Label Set**



Click OK.

The Profile Layout Tools toolbar is displayed. This toolbar enables you to lay out a finished grade profile, using either *points of vertical intersection* (PVIs) or constraint-based tangent and curve entities. For this exercise, you will create PVIs at specified points. Tangents will be created between the PVIs, and curves will be created at each PVI.



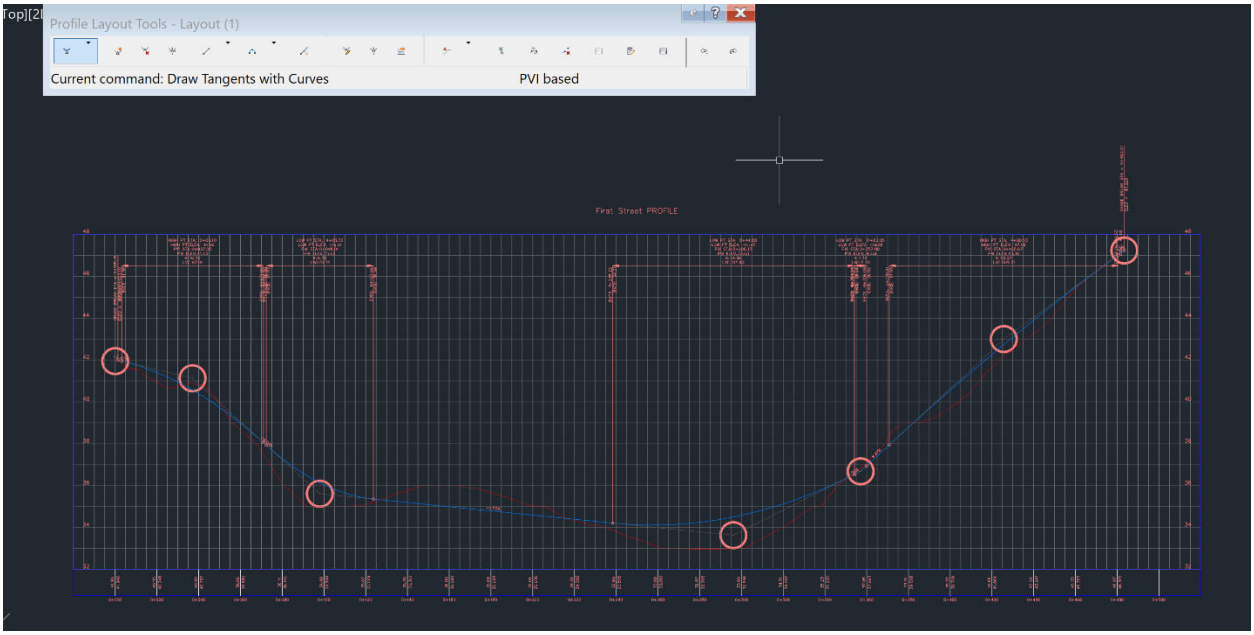
6. In the Profile Layout Tools toolbar, in the Draw Tangents list , select Draw Tangents With Curves.

   The command line prompts you to specify a start point.

7. Before selecting a start point, verify that Object Snap (OSNAP) is on and Endpoint and Center modes are selected. On the status bar, right-click Object Snap . Click Settings. In the Drafting Settings dialog box, on the Object Snap tab, click Clear All, then select **Endpoint** and **Center**. Click OK.
8. Go back to the drawing space, moving from left to right, click the circle center points to place PVIs.
9. Press Enter to complete the layout profile.

   The blue Finished Grade Centerline profile and its labels are displayed in the profile view.

10. Click X to close the Profile Layout Tools toolbar.
11. Click Home tab ➤ Layers Properties panel ➤ Layer drop-down. Next to the **PROF-ROAD-FGCL-PL** layer, click . Click in the drawing to exit the Layer Control list.



To continue to the next tutorial, go to Using Surface Profiles.

Parent topic: Profiles Tutorials

Save this file as: Profile-1_Exercise 1_lastname firstname.dwg

Close this file.

Tutorial: Using Surface Profiles

This tutorial demonstrates how to create surface profiles and display them in a profile view.

A surface profile is extracted from a surface, and is often called an *existing ground* profile. It is displayed on a graph called a *profile view*. Each profile view is associated with a single horizontal alignment, but it can display multiple surfaces and offset profiles from that alignment. An *offset profile* displays surface elevations at a specified distance horizontally offset from the alignment. When you create a profile along the centerline of a horizontal alignment, AutoCAD Civil 3D can create one or more offset profiles automatically.

Surface profiles can be either static or dynamic. A ***static*** profile shows the elevations at the time it was created, but does not react to later changes in the alignment or surface.
A *dynamic* profile automatically changes if the elevation changes along the horizontal alignment, so it remains current.

Topics in this section

- **Creating and Displaying Surface Profiles with Offsets**
  In this exercise, you will create a surface profile from an existing surface.
- **Changing the Profile Style**
  In this exercise, you will change a profile style in two different ways.
- **Reviewing Surface Profile Characteristics**
  In this exercise, you will examine some of the information displayed in the profile and the profile view.

Exercise 2: Creating and Displaying Surface Profiles with Offsets

In this exercise, you will create a surface profile from an existing surface.

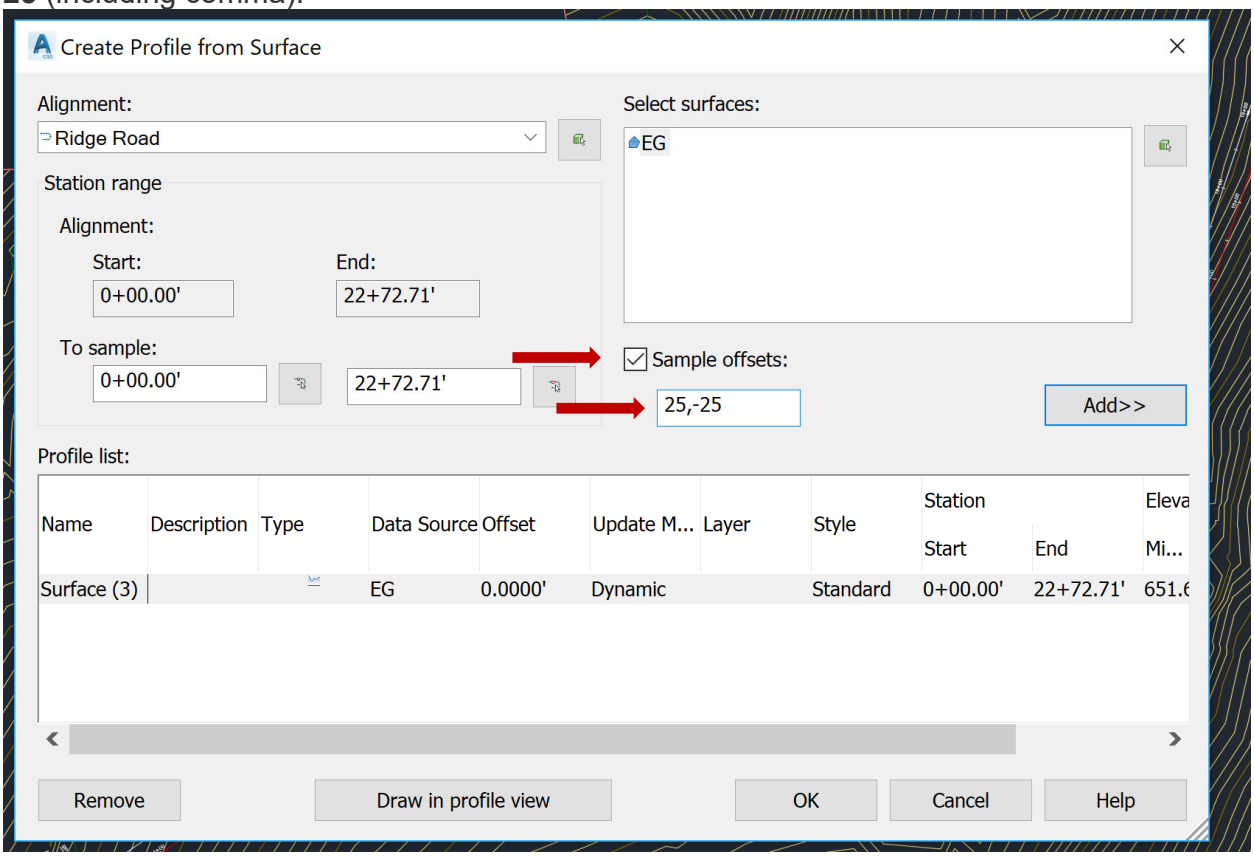
After creating the profile and several offsets, you will create a profile view to display the profiles.

Create centerline and offset surface profiles

1. Open Profile-2A.dwg, which is located in the tutorials drawings folder. Save it as Profile-2A.dwg Exercise 2_lastname firstname.dwg

   The drawing contains an existing ground surface and two horizontal alignments. Examine the alignments. The red one with curves is named Ridge Road, and represents a proposed road centerline. The other is named Power Line, and represents a proposed power line offset about -25 feet from the road.

2. Click Home tab ➤ Create Design panel ➤ Profile drop-down ➤ Create Surface Profile .
3. In the Create Profile From Surface dialog box, under Select Alignment, select **Ridge Road**.
4. Click Add.
5. Select Surface () in the Profile list
6. Select the Sample Offsets check box. In the field next to the check box, enter **25,-25** (including comma).



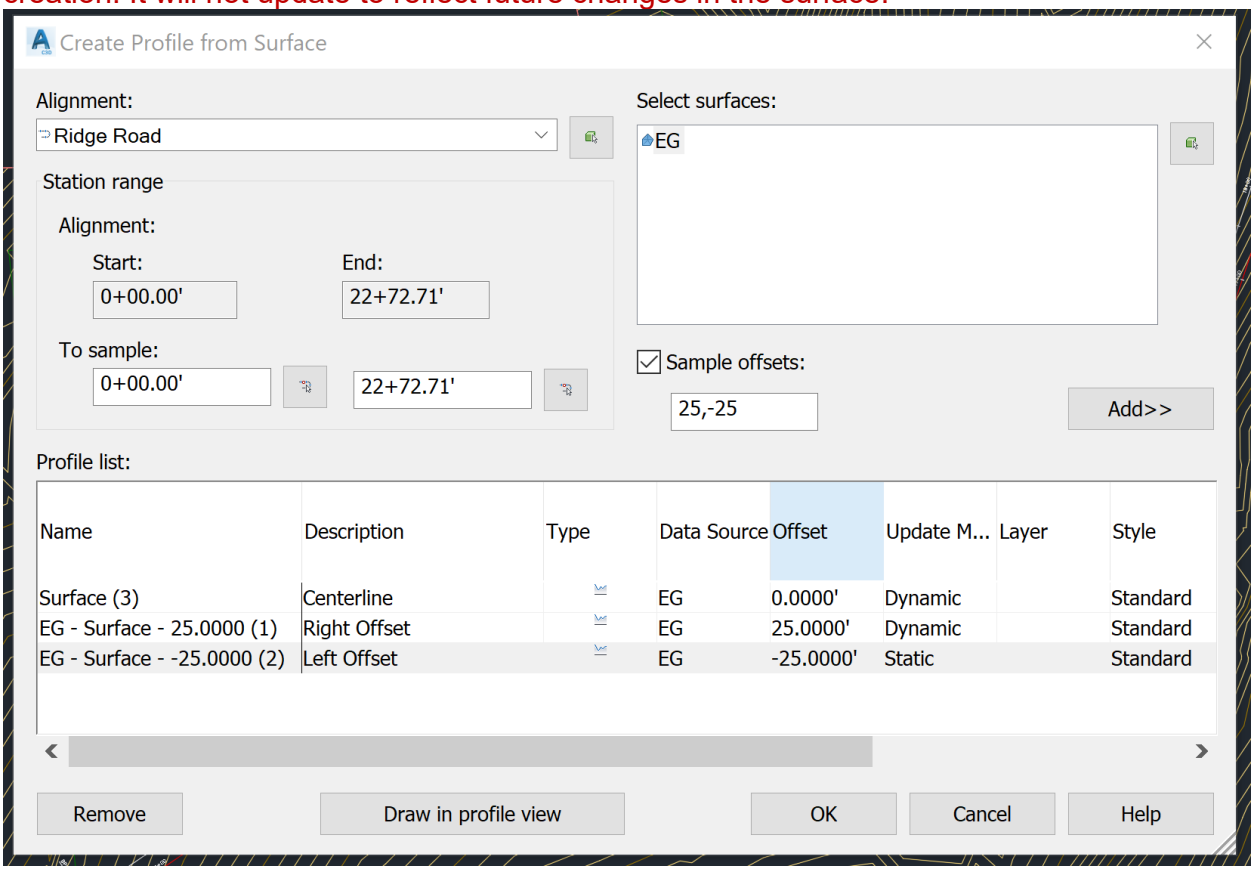
This field enables you to specify that profiles be created on either side of the centerline. The left offset (–25) will mark the approximate location of the power line. If you wanted more offsets, you could enter a series of them here. Use positive numbers for right offsets and negative numbers for left offsets, with values separated by commas.

7. Click Add.
8. In the Profile List, in the Description column, enter the following descriptions:

- EG - Surface: **Centerline**
- EG - Surface - 25.000: **Right Offset**
- EG - Surface - -25.000: **Left Offset**

9. In the Profile List, in the Update Mode column, for the left offset, change the value to Static.

This option specifies that the left offset reflects the surface elevations at the time of its creation. It will not update to reflect future changes in the surface.



10. Click OK.

A message that indicates profiles have been created is displayed in the Event Viewer.

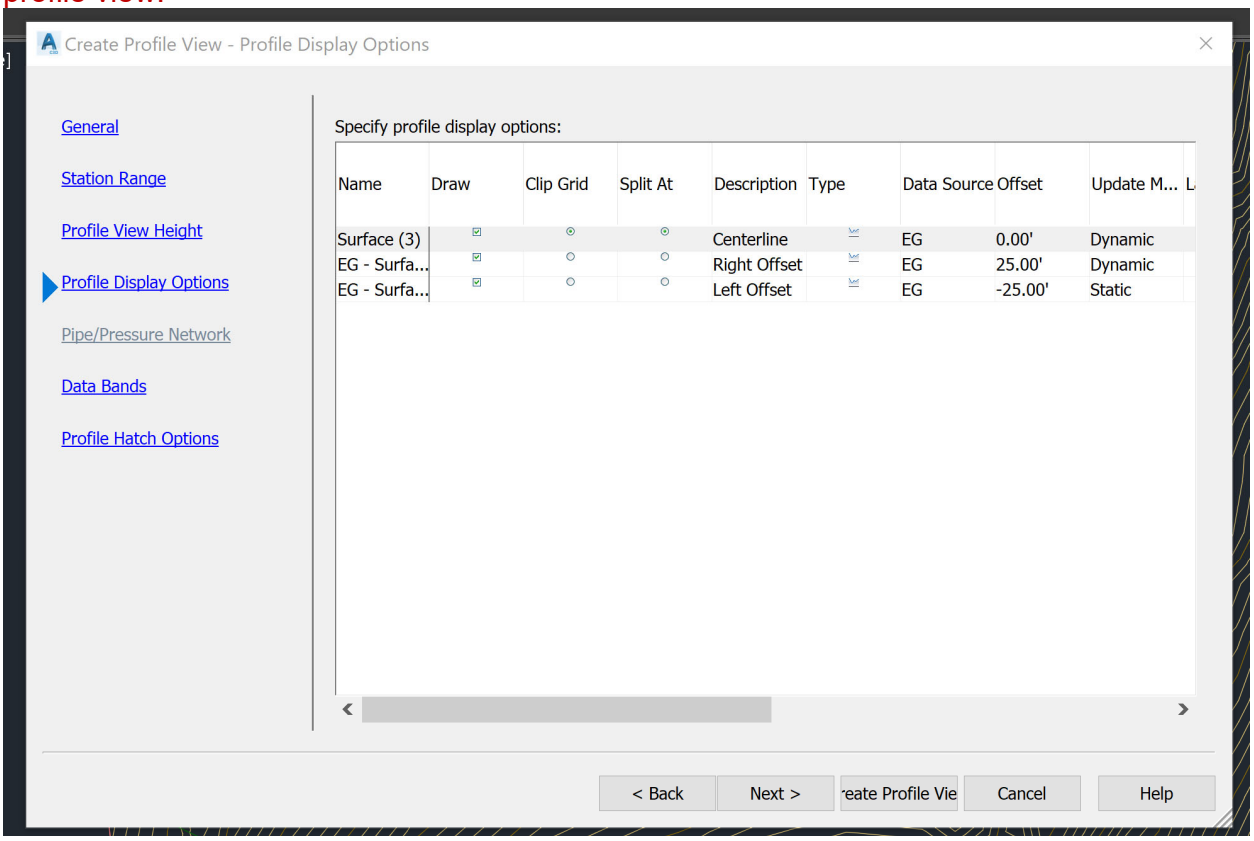
Display the surface profiles in a profile view

1. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Create Profile View .

   The Create Profile View wizard is displayed, where you can configure the display of the profile. The wizard contains the many controls for displaying profiles in a profile view. You can use either the Back and Next buttons at the bottom or the links along the left side to navigate through the pages. You can click Create Profile View at any time to accept the settings and create the profile view in the drawing.

2. In the Create Profile View wizard, on the General page, under Select Alignment, select **Ridge Road**.
3. Click Profile Display Options.

   The table on the Profile Display Options page shows the existing profiles for Ridge Road. By default, they are all checked in the Draw column, indicating that they will appear in the profile view.

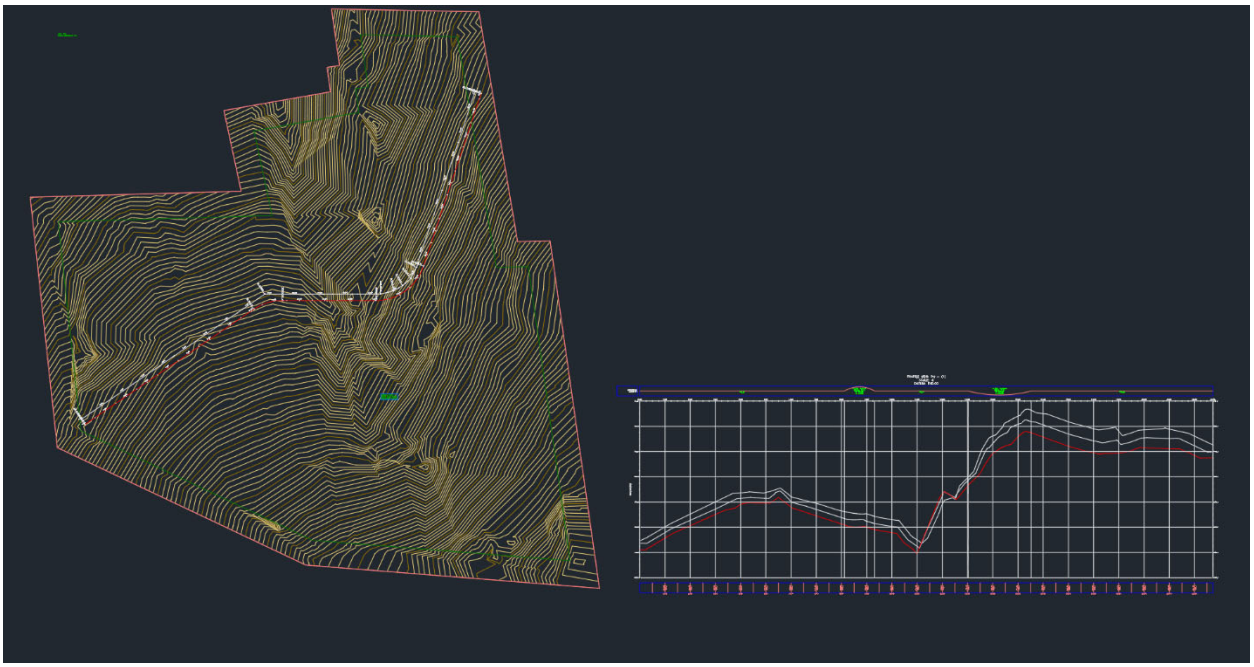


4. In the Style column, double-click the cell for the Left Offset.
5. In the Pick Profile Style dialog box, change the style to **Existing Ground**. Click OK.
6. In the Labels column, double-click the cell for the Left Offset.
7. In the Pick Profile Label Set dialog box, change the style to **<None>**. Click OK.

You will not create labels for the existing ground profiles. You will specify a label set when you create a layout profile in the Using Layout Profiles tutorial.

8. Repeat Steps 6 and 7 for the other two profiles.
9. Click Next.
10. Click X to cose this menu
11. From the Profile & Sections View menu Click Profile View, then Click Create Profile View.
12. Make sure Ridge Road is selected from the Select alignment.
13. Select Create Profile View
14. In the drawing, pan and zoom to a blank area at the lower right of the surface. Select and click at a suitable location for the lower left corner of the profile view grid. Select and click a suitable locate for the end of the profile. Use the move command to move the profile, if you need to move its position.

    The profile view is drawn, with a grid, axes, title, and two data bands along the X axis, one above the grid and another below it.
    Because of its style, the left offset line is red.



Note:
If you want to move a profile view within a drawing, click anywhere on the grid to select it. A blue grip appears near the lower left corner. Click the grip and drag the profile view to a new location.

Save this file as Profile-2A.dwg Exercise 2_lastname firstname.dwg

To continue this tutorial, go to Changing the Profile Style.

Exercise 3: Changing the Profile Style

In this exercise, you will change a profile style in two different ways.

First, you will change a profile style globally, which changes the profile's appearance in all profile views. Then, you will learn how to override a profile style in a single profile view. Finally, you will hide the offset profiles.

This exercise continues from Creating Surface Profiles.

Create a profile view

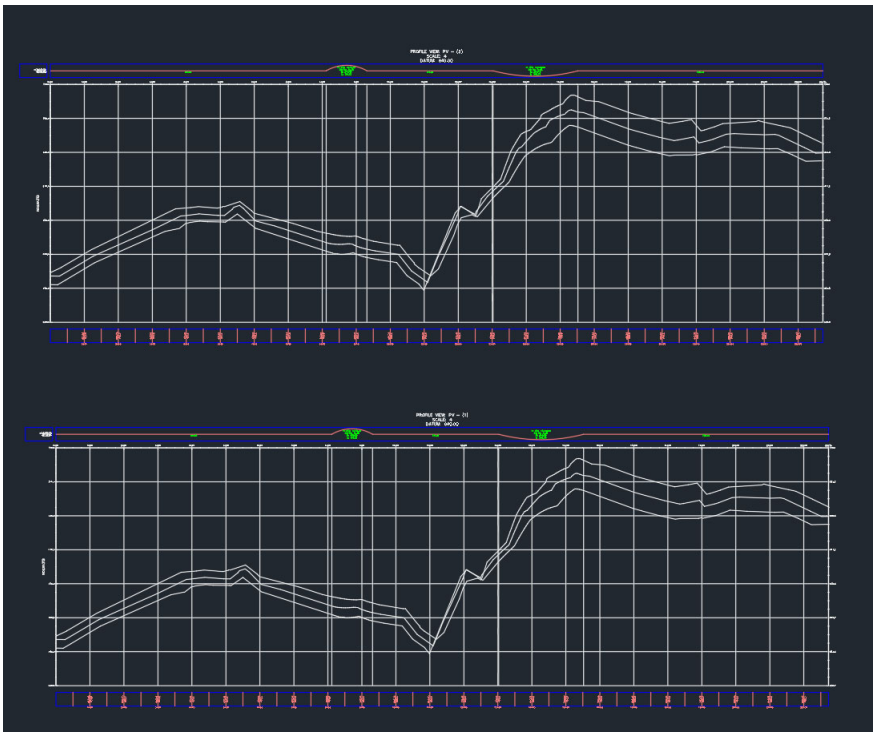
This Exercise continues using Profile-2A Exercise 2.dwg, with modifications you made in the previous exercise. Open this file and resave it as Profile-2A Exercise 3.dwg

1. Click Home tab ➤ Profile & Section Views panel ➤ Profile View Drop-down ➤ Create Profile View  .
2. In the Create Profile View wizard, on the General page, under Select Alignment, click **Ridge Road**.
3. Click Profile Display Options.
4. Under Specify Profile Display Options, in the Style column, double-click the cell for the Left Offset profile.
5. In the Pick Profile Style dialog box, select **Standard**. Click OK.
6. In the Name column, select the first row. Hold down the Shift key, and then select the last row.
7. In the Labels column, double-click one of the cells.
8. In the Pick Profile Label Set dialog box, select **<None>**. Click OK.
9. In the Create Profile View button at the bottom of page, click Create Profile View.
10. Pan to a location above the top of the first profile view, then click in the drawing.

    The new profile view, PV - (2), is drawn. The left offset profile is the same color (white) as the other two profiles.

11. Pan to the lower profile view, PV - (1).

    Notice that its left offset line has also changed. The left offset profile changed because you changed the style of the profile, which affects every instance of the profile in every profile view in the drawing.

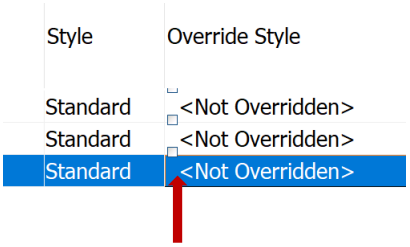


Change a profile style

1. Select the PV - (1) profile view grid (i.e., lower profile). Right-click. Click Profile View Properties.
2. Click the Profiles tab.

   On this tab, you can change properties of a profile line after it has been drawn in a profile view.
   Scroll until you can see the Style and Override Style columns.

3. Select the third row (EG-Surface—25.0000 (2)

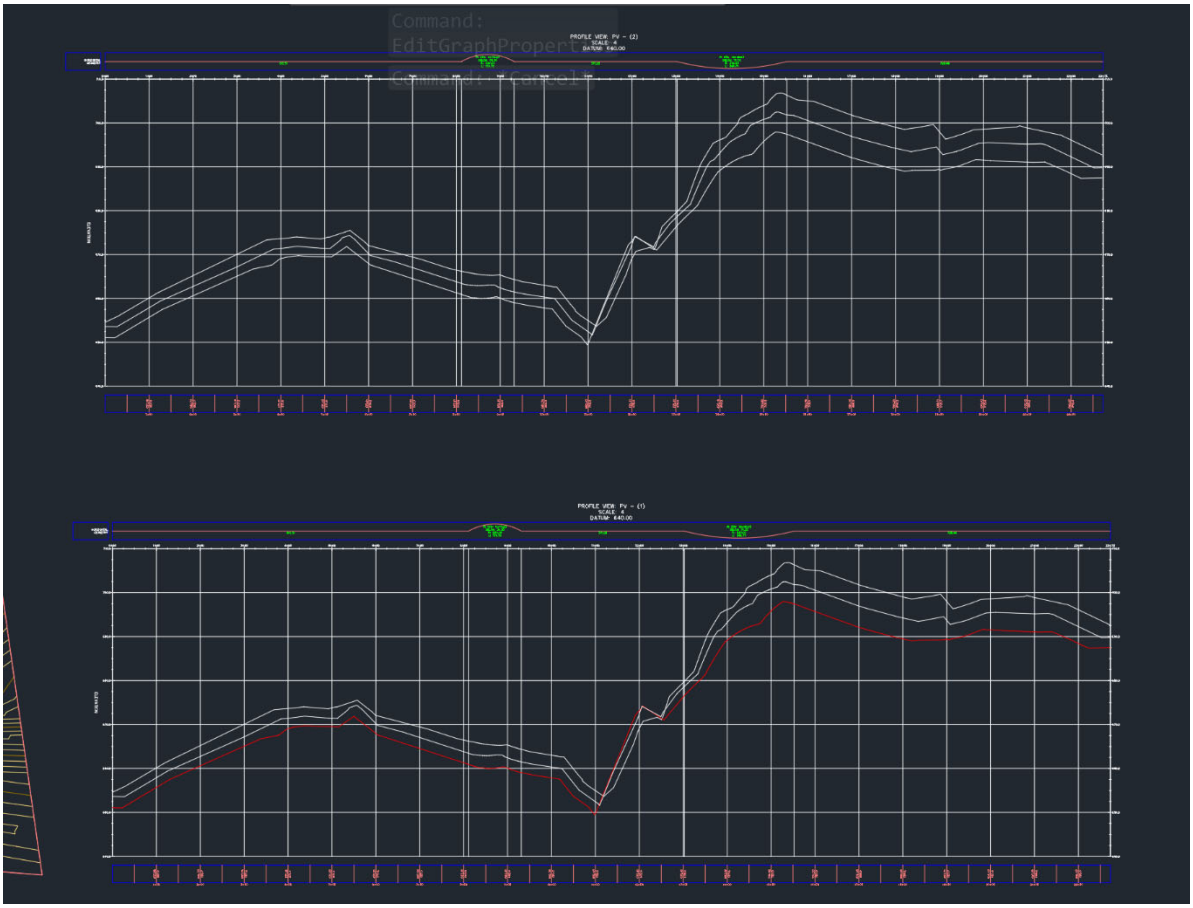


4. Click this box just left of <Not Overridden> (see red arrow above).
5. When the pick profile style pop-up menu appears, change the style to Existing Ground.

	Style	Override Style
	Standard	<Not Overridden>
	Standard	<Not Overridden>
	Standard	Existing Ground

6. Click Ok.
7. In the Profile View Properties Menu, click Apply
8. Click OK to exit this menu.

Note: The Left Offset profile changes to red (reflecting the Existing Ground style) in profile view PV - (1), but not in PV - (2). The left offset profiles are different because you overrode the profile style for the particular profile view, but did not change the profile style. You can use a style override to preserve the profile style within a profile view, protecting it from later style changes.



Further exploration: In the Profile View Properties dialog box, clear the Override Style check box for the left offset. Click the Style column for this offset, change it to **Standard**, then click Apply. This changes the style for the profile and affects both profile views in the drawing.

Note:
The left offset line is an approximate and static profile of the terrain along the power line. Optionally, if you wanted to see the actual profile, you could create a profile and profile view based on the Power Line alignment.

Save this drawing as Profile-2A Exercise 3.dwg

To continue this tutorial, go to Reviewing Surface Profile Characteristics.

Exercise 4: Reviewing Surface Profile Characteristics

In this exercise, you will examine some of the information displayed in the profile and the profile view.

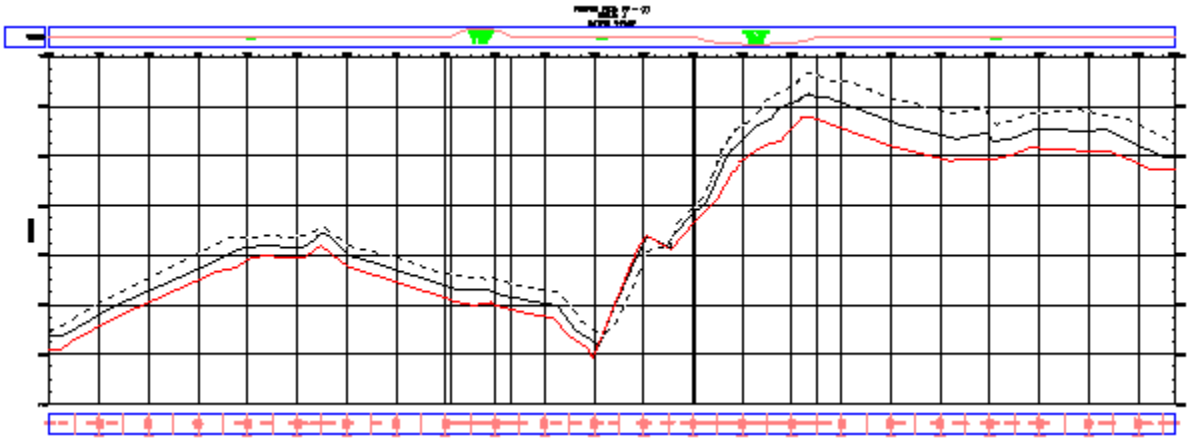
This exercise continues from Changing the Profile Style.

Examine the profile view characteristics

This Exercise continues using Profile-2A Exercise 3.dwg, with modifications you made in the previous exercise. Open this file and save as Profile-2A Exercise 5.dwg Note we will not make changes in Exercise 4 to this file, so name it Exercise 5.

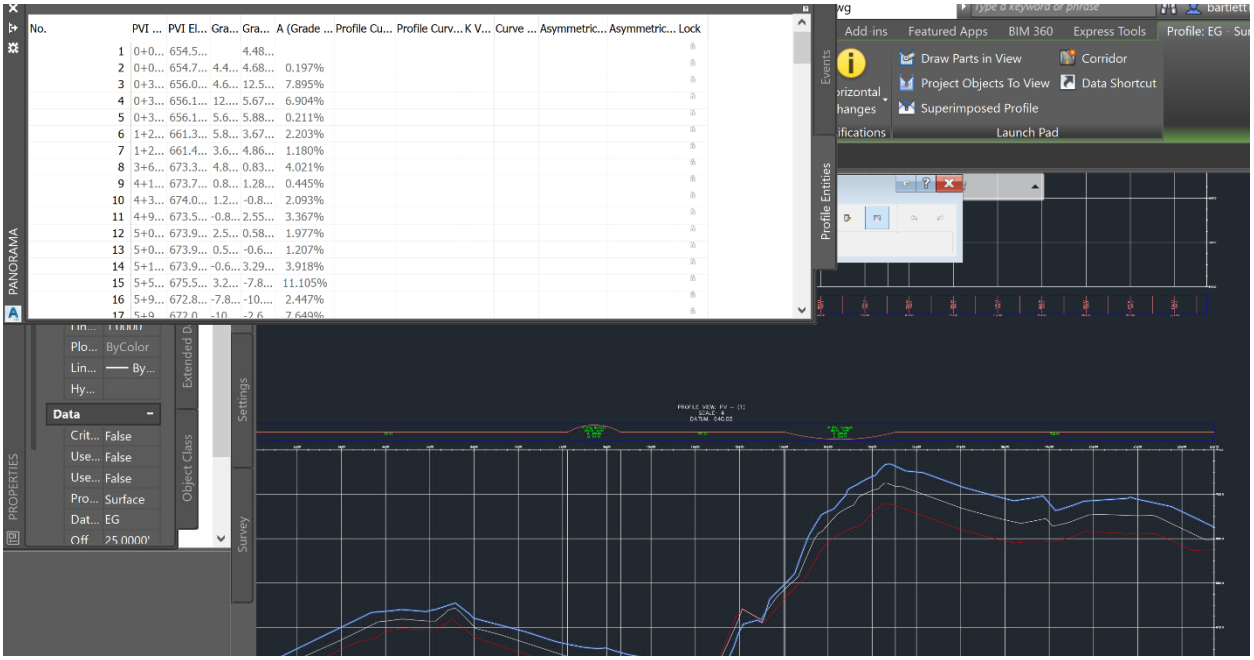
1. Zoom in to the lower profile view PV - (1) so that you can clearly see the three profile lines.
2. Select the highest profile line (the right offset profile), being careful not to select the profile view grid. Right-click. Click Edit Profile Geometry.

   The Profile Layout Tools toolbar is displayed. Notice that no editing grips are displayed along the profile, and most controls in the Profile Layout Tools toolbar are shaded and unavailable. This profile is dynamic. It is linked to the surface elevations, and no part of the line can be edited.



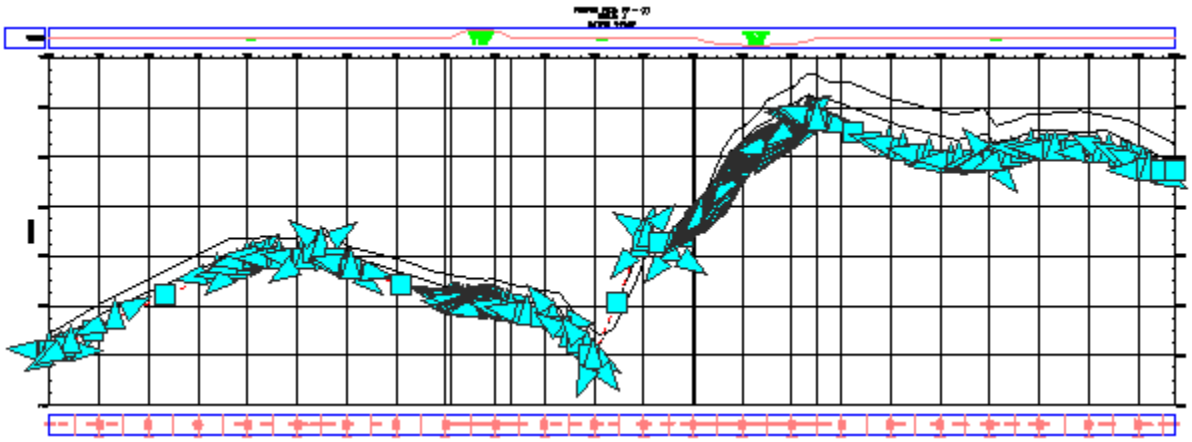
3. In the Profile Layout Tools toolbar, click  .

   The Profile Entities vista is displayed in the Panorama window. This table displays useful grade data for the entire profile. Again, values are shaded and unavailable so you cannot edit them. Editing these values would break the integrity of the link between the profile and the surface.



4. Press Esc to deselect the right offset profile.
5. Select the red (left offset) profile line.

   Notice that editing grips appear along this profile. If you zoom out, you can see that the same profile is also selected in the other profile view. If you grip edit the profile in one profile view, the same changes apply to the other copy of the profile.



   Because this line is a static profile, and detached from the surface, you can edit it in various ways, including copying and moving it. You would not edit this line if you wanted to preserve it as a snapshot of the surface at a particular time.
   Notice that the Profile Entities table now displays the design data for the left offset profile, with values you can edit. When you selected the left offset profile, it became the active profile for the editing tools.

6. Close the Profile Layout Tools toolbar.

The Profile Layout Tools toolbar and Profile Entities vista both close, and the left offset profile line is deselected in the drawing.

To continue to the next tutorial, go to Using Layout Profiles.

Tutorial: Using Layout Profiles

This tutorial demonstrates how to create and edit layout profiles, which are often called design profiles or finished grade profiles.

A layout profile represents a proposal for a road or other designed surface. This type of profile is always drawn on the grid of a profile view, which usually displays the surface profile along the same horizontal alignment.

A layout profile includes the following elements:

- Straight line tangents with specified grade or slope.
- Points of vertical intersection (PVI) where tangents meet.
- Vertical curves that are usually parabolic in shape. Vertical curves can also be circular or asymmetrical parabolic.

  Vertical curves can be one of two basic types: crest curves or sag curves.

- A *crest* curve exists at a hilltop, or wherever the incoming tangent has a higher grade than the outgoing tangent. There are three types of crest curves: a positive to negative grade transition, positive to positive, and negative to negative. The point of vertical intersection (PVI) of a crest curve is above the curve.
- A *sag* curve exists at the bottom of a valley, or wherever the incoming tangent has a lower grade than the outgoing tangent. There are three types of sag curves: a negative to positive grade transition, negative to negative, and positive to positive. The PVI of a sag curve is below the curve.

  The vertical curves on a layout profile can be designed in relation to engineering speed tables for safe vehicular travel at a particular maximum speed. Other tables can be used to design vertical curves so that the distance illuminated by the headlights of a vehicle at night is always greater than the stopping distance at the maximum design speed.

Topics in this section

- **Creating a Layout Profile**
  In this exercise, you will create the layout profile. Typically, this profile is used to show the elevations along a proposed road surface or a finished grade.
- **Editing a Layout Profile**
  In this exercise, you will modify the layout profile by using grips and entering specific attribute values.
- **Copying a Profile and Offsetting it Vertically**
  In this exercise, you will copy part of a centerline layout profile. You will use the copy to create a starting line for a ditch profile that is a specified distance below the centerline.

Exercise 5: Creating a Layout Profile

In this exercise, you will create the layout profile. Typically, this profile is used to show the elevations along a proposed road surface or a finished grade.

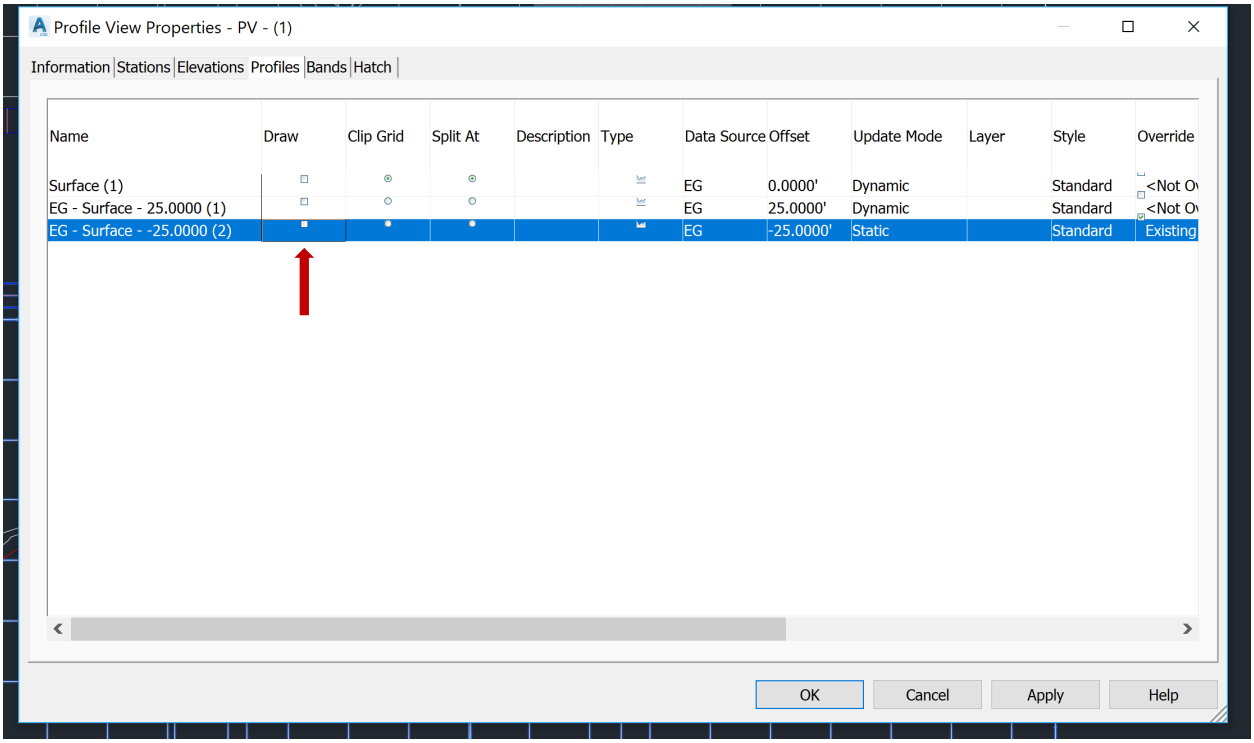
The layout profile is similar to a horizontal alignment, in that it is constructed of straight tangents with optional curves placed where the tangents intersect. These tangents and curves on a layout profile are located in the vertical plane and the intersection points are called points of vertical intersection (PVI).

This exercise continues from the Using Surface Profiles tutorial.

Hide the offset profiles

This Exercise continues using Profile-2A Exercise 5.dwg that you created previously. Open Profile-2A Exercise 5.dwg.

1. Click the bottom grid to select profile view PV-1. Right-click. Click Profile View Properties.
2. In the Profile View Properties dialog box, on the Profiles tab, clear the Draw check boxes for the right offset and left offset profiles.
3. Click Apply, then OK. Note that all profile lines disappear.

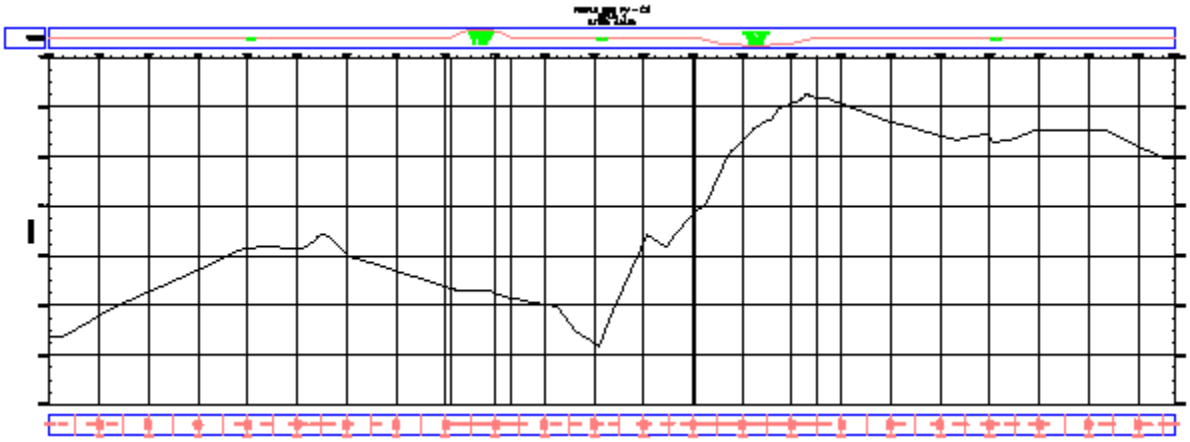


The Profiles tab displays all existing profiles for a given horizontal alignment, both surface profiles and layout profiles. You can use the Draw check boxes to specify which profiles to display in the profile view.

Further exploration: You can permanently delete a profile by selecting it in the drawing (or in Toolspace) and pressing the Delete key. If you delete a profile, it is removed from all profile views, the list of profiles in the Profile View Properties dialog box, and Toolspace.

To restore a deleted surface profile, create a new one. The new profile is displayed in any applicable profile views, and can be edited in the Profile View Properties dialog box.

To continue with this exercise, ensure that the centerline profile is visible in profile view PV-(1) in the Profile View Properties (See Steps 1 -3 above).



Specify the profile creation settings

1. **Note:**
   Turn off Object Snap (OSNAP).

2. Click Home tab ➤ Create Design panel ➤ Profile drop-down ➤ Profile Creation Tools .
3. In the workspace Click the bottom grid to select profile view PV-1.
4. In the Create Profile – Draw New dialog box, change the Profile Style to **Finished Ground**.
5. In the Profile Label Set list, select **Standard**. Click .
6. In the Profile Label Set dialog box, on the Labels tab, specify the following parameters:

- Type: **Horizontal Geometry Points**
- Profile Horizontal Geometry Point: **Station & Type**

7. Click **Add**.
8. In the Geometry Points dialog box, examine the geometry points that can be labeled. You can specify any combination of points that you want to label. Click OK.

Note:

For more details about geometry point labels, see the Adding Labels in Groups tutorial exercise.

9. In the Profile Label Set dialog box, click OK.
10. Click the Design Criteria tab in the Create Profile – Draw New Menu.

    The options on this tab are used only if you want to ensure that the profile design meets specified design criteria. You will not apply design criteria to the profile in this exercise. You will learn how to use the design criteria feature in the Designing a Profile that Refers to Local Standards tutorial.

11. Click OK to accept the settings.

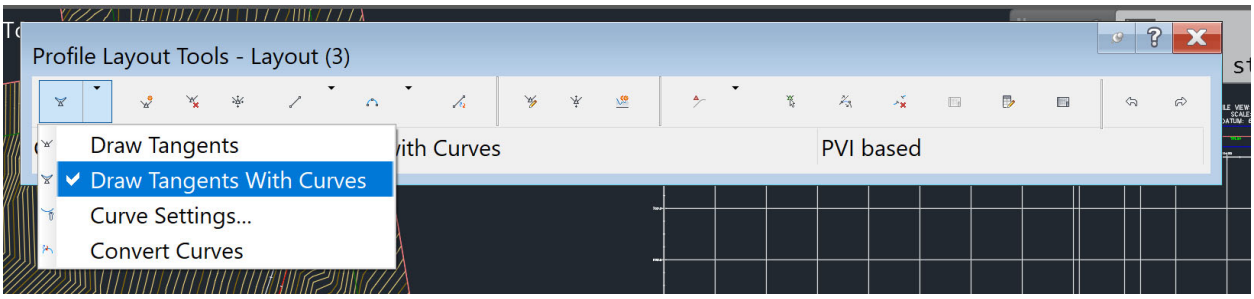
Draw the layout profile

1. In the Profile Layout Tools toolbar, click the arrow on the right side of and click Curve Settings.
2. On the Vertical Curve Settings dialog box, specify the following parameters:

- Curve Type: **Parabolic**
- Crest Curve Length: **100**
- Sag Curve Length: **100**

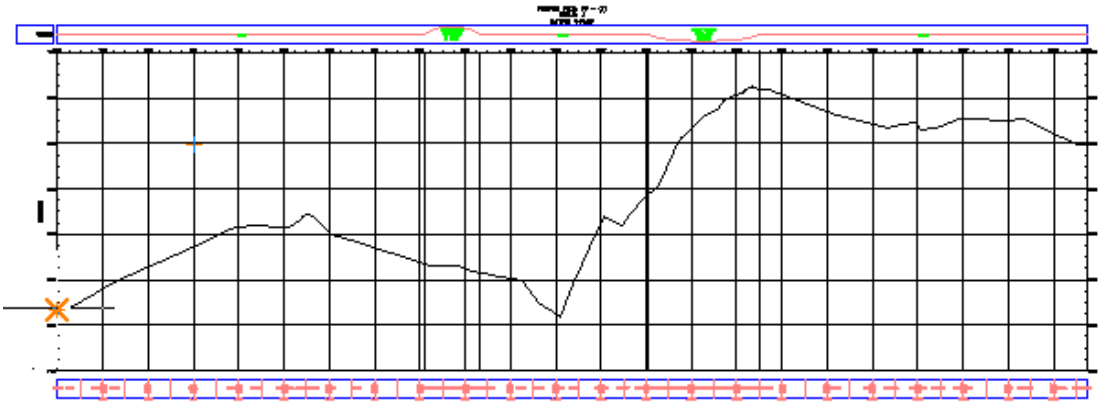
Notice that you can select one of three curve types and specify parameters for each type.

3. Click OK.
4. In the Profile Layout Tools toolbar, select Draw Tangents With Curves.

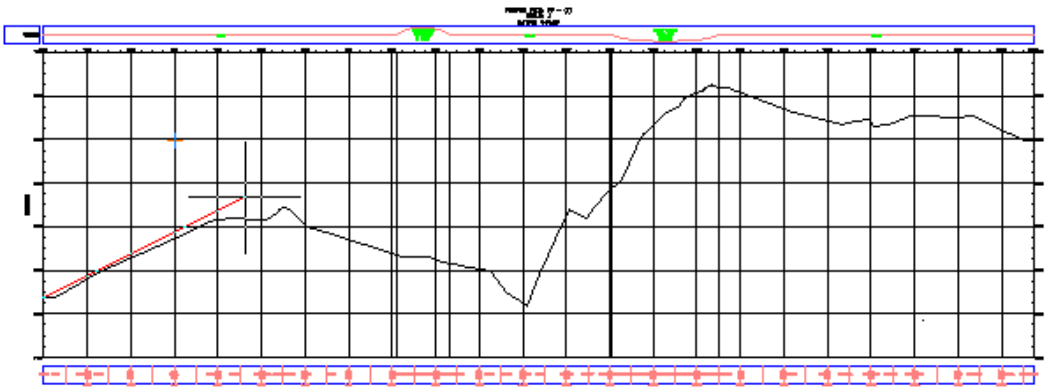


You are now ready to draw the layout profile by clicking in the drawing at the proposed locations of PVIs. At each PVI, the application inserts a curve. To be realistic, your line should follow the general profile of the surface centerline. However, it can cut across steep hills and valleys to outline a smoother road surface.

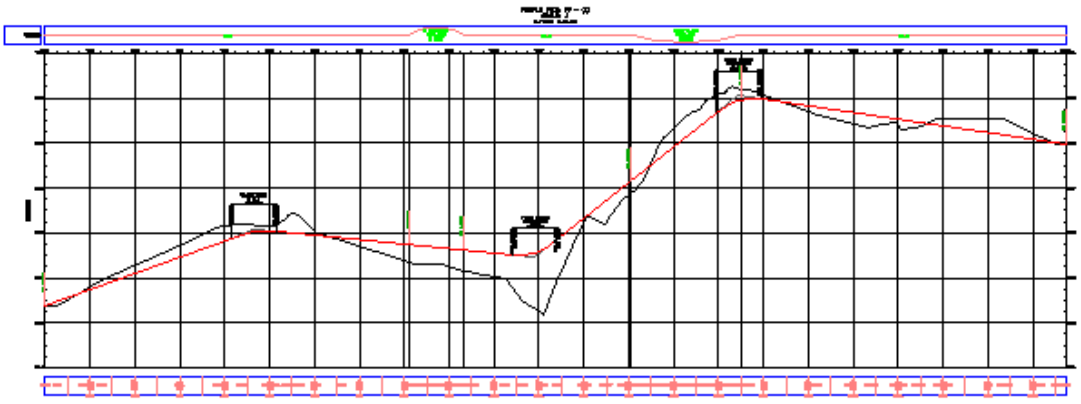
5. In the profile view, click the left side, near the centerline surface profile, to start the layout profile.



6. Extend the line to the right and click at another location near the centerline surface profile. Continue in this manner.



7. At the last point, right-click to end the profile. The layout profile is now drawn and labeled.



8. Zoom and pan along the layout profile to examine the labels.
   Save this file as: Profile-2A Exercise 5 lastname firstname.dwg.

Exercise 6: Editing a Layout Profile

In this exercise, you will modify the layout profile by using grips and entering specific attribute values.

This exercise continues from Creating a Layout Profile.

Edit the profile parameters

This Exercise continues using Profile-2A.dwg, with modifications you made in the previous exercise.

1. In the bottom profile view, select the red layout profile. Right-click. Click Edit Profile Geometry.

   The Profile Layout Tools toolbar is displayed.

2. On the Profile Layout Tools toolbar, click .

   This option specifies that you will edit the data for each profile PVI. If you had clicked , you would edit the data for each profile line and curve sub-entity.

3. On the Profile Layout Tools toolbar, click Profile Grid View .

   The Profile Entities vista is displayed in the Panorama window. The first row in the table provides data about the starting point of the layout profile. Subsequent rows provide data about the PVIs. The last row provides data about the end point.

4. Examine the Grade In and Grade Out columns with the aim of reducing one or more of the steeper grades in the profile.

   Notice that the Grade Out value for one PVI is the same as the Grade In value for the next PVI. The values are the same because they refer to the same tangent.

5. In row No. 3, in the Grade Out column, double-click the 8.000% value and then enter **5.000**. Press Enter.

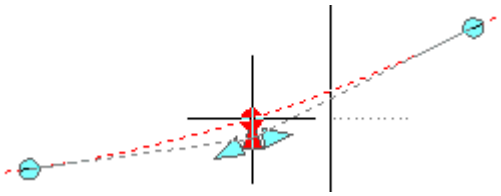
   The value changes in the Grade In column of row No. 4. The line in the drawing adjusts to the new value.
   Further exploration: Experiment with changing K values and Profile Curve Lengths. In each case, the Profile Curve Radius also changes.
   This exercise demonstrates that if your design process provides you with guidelines for K values or vertical curve length, you can easily edit profile specifications in the Profile Entities table.

6. On the Profile Layout Tools toolbar, click Profile Layout Parameters.
7. In the Profile Entities vista, select row 2.

   The Profile Layout Parameters dialog box displays the parameters for the first PVI on the profile.

Grip edit the profile

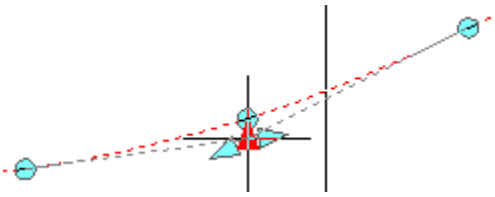
1. With a profile curve clearly visible, click the circular grip at the curve midpoint. The grip turns red, which indicates that it can be moved.



2. Move the cursor to a new location closer to or farther from the PVI, then click.

   The curve moves to pass through the point you clicked. The length of the curve changes. Notice that the affected attributes update in the Profile Entities vista and Profile Layout Parameters window.
   Further exploration: Click another grip and move it to a new location. Note how other grips react.

3. Click the triangular grip at the curve midpoint.



4. Move the cursor to a new location closer to or farther from the PVI, then click.

   In the Profile Entities vista, notice which entity's PVI Elevation updates.

5. Select the row of the entity that you changed.

   The entity's attribute values are displayed in the Profile Layout Parameters window.

6. Close the Profile Layout Tools toolbar.

   The Panorama window (Profile Entities vista) and Profile Layout Parameters dialog box close.

   To continue this tutorial, go to Copying a Profile and Offsetting it Vertically.

   Parent topic: Tutorial: Using Layout Profiles

Exercise 7: Copying a Profile and Offsetting it Vertically

In this exercise, you will copy part of a centerline layout profile. You will use the copy to create a starting line for a ditch profile that is a specified distance below the centerline.

This exercise continues from Editing a Layout Profile.

Copy the layout profile

1. This Exercise continues using Profile-2A.dwg, with modifications you made in the previous exercise.
2. In profile view PV-1, select the red layout profile. Right-click. Click Edit Profile Geometry.
3. In the Profile Layout Tools toolbar, click  .Copy Profile
4. In the Copy Profile Data dialog box, specify the following parameters:

   To use more advanced features of the product, you will make the profile copy shorter than the original.

   Note:
   The station values recommended in this step have been chosen because in the drawing *Profile-3B.dwg*, they include the two center tangents of the Layout (1) profile. If you are using another drawing with a much different profile, you may have to enter different station values. To be included in the profile copy, a complete tangent must be within the copied range. If part of a tangent extends beyond the range, the whole tangent is excluded from the selection set.

- PVI Range: **Station Range**
- Start: **300**
- End: **1700**
- Destination Profile Options: **Create New Profile**

5. Click OK.

   The new profile is drawn on top of the old one.

6. In Toolspace, on the Prospector tab, expand the Alignments ➤ Centerline Alignments ➤ **Ridge Road** ➤ Profiles collection under the alignment.

   Your profile copy is displayed with the layout profile icon  and name.

7. Press Esc.

Offset the profile

1. In the drawing, click the profile view. Right-click. Click Profile View Properties.
2. On the Profiles tab, clear the Draw check box for the original layout profile, **Layout (1)**.

Clearing the check box removes the original profile from the profile view. Later, you can restore this profile to the profile view if you wish.

Tip:
Instead of removing a profile from the profile view, you can try selecting a profile to move it. However, the process described here is more reliable with overlapping profiles.

3. Click OK.

   The Profile View Properties dialog box closes and the profile view is redrawn, showing the copy of part of the layout profile.

4. Click the layout profile.

   The name of the selected profile is displayed in the Profile Layout Tools toolbar. In the next few steps, you will lower the profile copy by 5 feet to represent the elevation of the ditch.

5. On the Profile Layout Tools toolbar, click Raise/Lower PVIs.
6. In the Raise/Lower PVI Elevation dialog box, specify the following parameters:

- Elevation Change: **-5**
- PVI Range: **All**

7. Click OK.

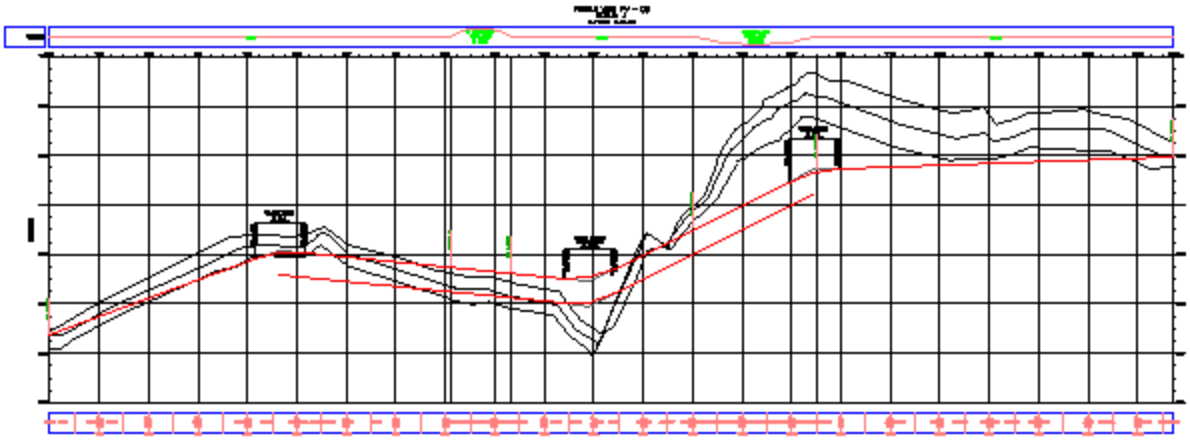
   In both profile views, the line moves to its new position.
   This profile copy is a full-featured object that can be edited in the same way as the original layout profile.

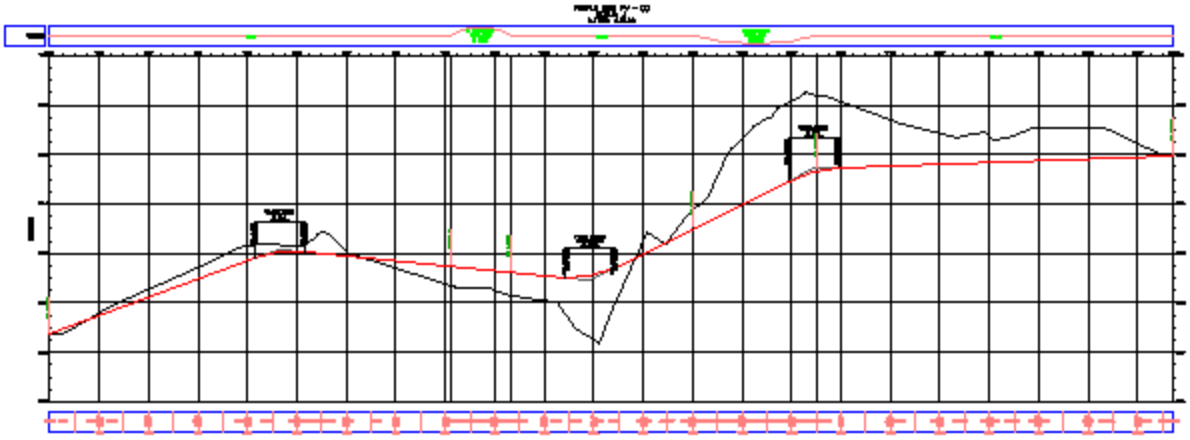
8. Press Esc to deselect the profile.
9. In the drawing, click the profile view. Right-click. Click Profile View Properties.
10. On the Profiles tab, set the Draw check boxes to the following states:

- **Layout (1)**: **Selected**
- **Layout (1) [Copy]**: **Cleared**

11. Click OK.

    Clearing the check box removes the copy of the profile from the profile view. Notice that the copy is still displayed in the profile view PV-(2).





To continue to the next tutorial, go to Designing a Profile that Refers to Local Standards.

Parent topic: Tutorial: Using Layout Profiles

Optional Tutorial: Designing a Profile that Refers to Local Standards

This tutorial demonstrates how to validate that your profile design meets criteria specified by a local agency.

To create a profile using design criteria, you use the same basic workflow that you use to create a profile without design criteria. During profile creation, you can select a design criteria file, from which you can specify the minimum K tables to which the profile must comply. If the parent alignment also uses design criteria, the design criteria file that is specified for the alignment is applied to the profile by default. You can specify a different design criteria file for the profile, if desired.

The design criteria file specifies minimum K values at given speeds for stopping, passing, and headlight sight distances. You can create custom design checks to validate profile design criteria other than minimum K values. To apply a design check to a profile, you must add it to a design check set.

Note:

For detailed exercises on creating design checks and modifying the design criteria file, see the Designing an Alignment that Refers to Local Standards tutorial.

Topics in this section

- **Specifying Profile Design Criteria**
  In this exercise, you will specify minimum standards for a layout profile.
- **Drawing a Profile that Refers to Design Criteria**
  In this exercise, you will draw a profile that refers to specified minimum standards.
- **Viewing and Correcting Profile Design Criteria Violations**
  In this exercise, you will check the profile design for criteria violations, and then learn how to correct violations.

Optional Exercise 8: Specifying Profile Design Criteria

In this exercise, you will specify minimum standards for a layout profile.

Specify minimum profile design standards

1. Open Profile-4A.dwg, which is located in the tutorials drawings folder.
2. Click Home tab ➤ Create Design panel ➤ Profile drop-down ➤ Profile Creation Tools .
3. Click one of the grid lines to select the profile view.
4. In the Create Profile – Draw New dialog box, on the General tab, specify the following parameters:

- Name: **Main Road**
- Profile Style: **Design Profile**
- Profile Label Set: **<none>**

5. On the Design Criteria tab, select the Use Criteria-Based Design check box.

   The Use Design Criteria File, Default Criteria, and Use Design Check Set options are now available. The design criteria file that was selected by default is the same file that was applied to the parent alignment. You may choose to use a different design criteria file for the profile. For this exercise, you will accept the default.

6. Under Use Design Check Set, click the arrow next to . Click Create New.

   In the next few steps, you will create a new design check set to validate that the sag and crest curves meet a minimum length value.

7. In the Profile Design Check Set dialog box, on the Information tab, for Name, enter **Profile Curve Length**.
8. On the Design Checks tab, in the Type list, select Curve. In the Curve Checks list, select **L>=30**. Click Add.
9. In the Design Check table, in the Apply To column, select Crest Curves Only.
10. Repeat Steps 8 and 9 to add the **L>=60** curve design check to the design check set. In the Apply To column, select Sag Curves Only.
11. Click OK.
12. In the Create Profile - Draw New dialog box, click OK.

    The Profile Layout Tools toolbar is displayed in the drawing window. You can start drawing the layout profile that refers to the criteria you specified.

    To continue this tutorial, go to Drawing a Profile that Refers to Design Criteria.

    Parent topic: Tutorial: Designing a Profile that Refers to Local Standards

Optional Exercise 9: Drawing a Profile that Refers to Design Criteria

In this exercise, you will draw a profile that refers to specified minimum standards.

You will use the standard profile layout tools to create a profile using the criteria-based design feature.

This exercise continues from Specifying Profile Design Criteria.

Draw profile tangents

Note:

This exercise uses Profile-4A.dwg with the modifications you made in the previous exercise.

1. On the Profile Layout Tools toolbar, ensure that Draw Tangents is selected.
2. In the profile view, snap to the center of each of the circles that are labeled A through E.

   Important: To replicate the results described in this exercise, ensure that you use the Center object snap to snap to the center of the circles when you are drawing the tangents. For information about using object snaps, see the Using Basic Functionality tutorial.

3. After you click in Circle E, right-click to end the profile.

   The layout profile consists of tangents connected at points of vertical intersection (PVIs). Next, you will add curves at each PVI.

Add a free curve that exceeds the design standards

1. On the Profile Layout Tools toolbar, click the arrow next to . Select Free Vertical Curve (Parabola).
2. On the profile view, click the tangent that enters Circle B on the left (the “first entity”).
3. Click the tangent that exits Circle B on the right (the “next entity”).

   On the command line, notice that you can select the parameter that you want to use to define the curve. The displayed value for the selected parameter is the minimum value that is required by the design criteria file. For this exercise, you will enter values that do not meet the design criteria, and then examine the results.

4. On the command line, enter **R** to specify a radius value. Enter a radius value of 500.

   The curve is drawn between the tangents, and a warning symbol is displayed. You will learn how to diagnose and correct the violations in Viewing and Correcting Profile Design Criteria Violations.

5. Repeat steps 3 and 4 to add an identical curve to the PVI in Circle C.

Add a free curve that meets the design standards

1. On the profile view, click the tangent that enters Circle D on the left (the “first entity”).
2. Click the tangent that exits Circle D on the right (the “next entity”).
3. Press Enter to accept the minimum radius value that is displayed on the command line.

   The curve is drawn at Circle D, but this time no warning symbol is displayed. You can use the command line to quickly apply minimum values to profile entities as you draw them.

4. Right-click to end the command.

   To continue this tutorial, go to Viewing and Correcting Profile Design Criteria Violations.

Optional Exercise 10: Viewing and Correcting Profile Design Criteria Violations

In this exercise, you will check the profile design for criteria violations, and then learn how to correct violations.

When a profile sub-entity violates a criteria or design check, a warning symbol is displayed on the sub-entity in the drawing window, Profile Entities vista, and Profile Layout Parameters dialog box. When the cursor is hovered over a warning symbol, a tooltip displays information about the violation. If a design criteria has been violated, the tooltip displays the criteria that has been violated, as well as the minimum value that is required to meet the criteria. If a design check has been violated, the tooltip displays the name of the design check that has been violated.

This exercise continues from Drawing a Profile that Refers to Design Criteria.

Check the profile design for criteria violations

This Exercise continues using Profile-4A.dwg, with modifications you made in the previous exercise.

1. Pan and zoom so that you can see Circles B and C on the profile view.

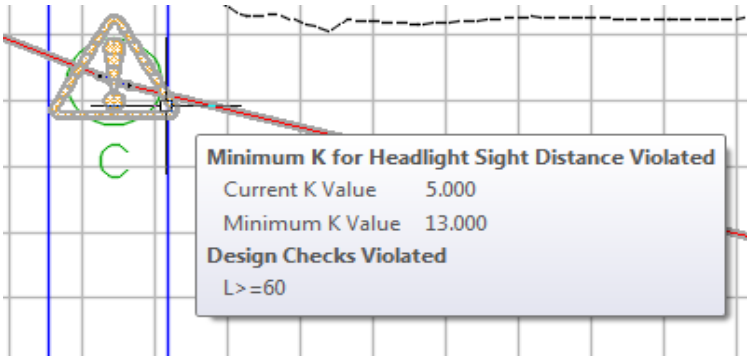
   Note:

   The warning symbols do not automatically scale when you zoom in. Enter **REGEN** on the command line to resize the warning symbols.

2. Hover the cursor over the  symbol in Circle C.

   The tooltips are a convenient way to review design criteria violations in the drawing window. Two violations are displayed in the tooltip:

- First, the curve does not meet the recommended minimum K value for headlight sight distance. The curve K value and minimum acceptable K value are both displayed.
- Second, the curve does not meet the formula specified in one of the design checks. Notice that the name of the design check is displayed, but not the current or recommended values. Values are not displayed because design checks are custom formulas that are created by the user.



Note:
If a sub-entity violates multiple criteria or design checks, only a single symbol is displayed on the sub-entity. To clear a symbol from a sub-entity, all the violations must be cleared.

3. If the Profile Layout Tools toolbar is not open, select the red layout profile. Right-click. Click Edit Profile Geometry.
4. On the Profile Layout Tools toolbar, click Entity Based.
5. Click Profile Grid View.

   In the Profile Entities vista, in rows 2 and 4, notice that a warning symbol appears in the No. column, as well as several other columns. Warning symbols appear next to each value that violates the design criteria that are specified in the design criteria file.

6. In row 2, hover the cursor over the warning symbol in the No. column.

   Notice that the tooltip displays the design criteria and design checks that have been violated. Notice that while the two curves violate the minimum length specified by the design checks, a warning symbol does not appear in either Length cell. Design checks are custom, mathematical formulas that return either a true or false value. They do not provide feedback other than whether the applicable entities meet or violate the conditions in the design check.

7. On the Profile Layout Tools toolbar, click Profile Layout Parameters.

   The Profile Layout Parameters window is displayed, containing no data.

8. In the Profile Entities vista, click row No. 4, which is the curve entity in Circle C.

   The design data for the curve entity is displayed in a three-column table in the Profile Layout Parameters window, where data is easy to review and edit.
   Notice that in the Profile Layout Parameters window, in the Design Criteria panel, a symbol is displayed next to the design criteria property that has been violated. In the Layout Parameters panel, the Value column displays the actual parameters of each sub-entity. The Constraints column displays the design criteria values that the sub-entities must meet. A symbol is displayed next to the K Value row because the value violates the design criteria. As is true in the drawing window and Profile Entities Vista, the design check that has been violated is displayed, but individual parameters that violate the check are not marked.

Correct the design criteria violations

1. In the Profile Layout Parameters window, on the Layout Parameters panel, change the Length Value to **65.000m**. Press Enter.

   Notice that the warning symbol is cleared from the Design Checks panel, as well as from row 4 in the Profile Entities vista. The new curve length value meets the value specified by the design check. Increasing the curve length also affected the K value, which increased to meet the minimum value for Headlight Sight Distance.

2. In the Profile Entities vista, click row No. 2, which is the curve entity in Circle B.
3. In the Profile Layout Parameters window, on the Layout Parameters panel, change the Length Value to **35.000m**. Press Enter.

   The ⚠ warning symbol is cleared from the Design Checks panel, but not from the K Value row on the Profile Entities vista.
   The curve still does not meet the minimum K value for passing sight distance, so the warning symbols are displayed. To clear a warning symbol, the entity must meet all values specified in both the design criteria file and the applicable design checks.

   Tip:

   There are two recommended methods for working around a Minimum K For Passing Sight Distance violation:

- Add a new design speed at the station at which the curve begins. You can do this in the Alignment Properties dialog box, on the Design Criteria tab.
- Designate the station range along curve as a No Passing Zone. This solution does not clear the warning symbol from the drawing, so you should annotate the symbol and No Passing Zone in the final plot.

To continue to the next tutorial, go to Displaying and Modifying Profile Views.

Parent topic: Tutorial: Designing a Profile that Refers to Local Standards

Tutorial: Displaying and Modifying Profile Views

This tutorial demonstrates how to change the appearance of profile views.

You may change profile view style, add labels and data bands, split a profile view, and create multiple profile views to suit your production requirements.

The *profile view style* controls the format for titles, axis annotation, and other elements of a profile view.

Multiple profile views are useful for plotting short segments of a profile in separate profile view grids of a consistent length and vertical scale.

A profile can be *split* within either a single or multiple profile view. Splitting a profile allows a profile view to display a profile elevation range that is greater than the profile view's specified height.

Multiple profile views are most useful when you are creating final construction documents from your design. For best results, design your profile in a single profile view, then use the plan production tools to create multiple profile views.

When you must annotate centerline and offset profiles extensively, you can create *stacked* profile views, in which each profile line is displayed in a separate profile view grid.

Topics in this section

- **Editing the Profile View Style**
  In this exercise, you will learn how to change the data displayed in a profile view.
- **Adding Hatch Patterns Between Profiles**
  In this exercise, you will illustrate the cut and fill regions along an alignment by applying hatch patterns between the surface and layout profiles.
- **Projecting Objects onto a Profile View**
  In this exercise, you will project multi-view blocks, COGO points, and 3D polylines from plan view onto a profile view.
- **Splitting a Profile View**
  In this exercise, you will split a profile view so that the full elevation range of a layout profile fits in a shorter profile view.
- **Creating Multiple Profile Views**
  In this exercise, you will produce a set of profile views to display short, successive segments of a profile.
- **Creating Stacked Profile Views**
  In this exercise, you will create a series of three profile views that contain a centerline and left and right offset profiles.

Optional Exercise 11: Editing the Profile View Style

In this exercise, you will learn how to change the data displayed in a profile view.

You use the Profile View Style dialog box to define profile view styles that control the format for titles, axis annotation, and other elements of a profile view.

The Profile View Properties dialog box is the central location in which you can modify all components of the profile view, including profiles, labels, styles, and data bands.

You can also do some common editing tasks, such as deleting profiles or modifying profile labels, within the drawing window by right-clicking the appropriate object.

Change the profile view style

1. Open Profile-5A.dwg, which is located in the tutorials drawings folder.
2. Click the grid to select profile view profile view PV- (1). Right-click. Click Profile View Properties.
3. Click the Information tab.
4. In the Object Style field, change the profile view style to **Major Grids**. Click Apply.

   Notice that this style change affects the X-axis annotation as well as the grid.

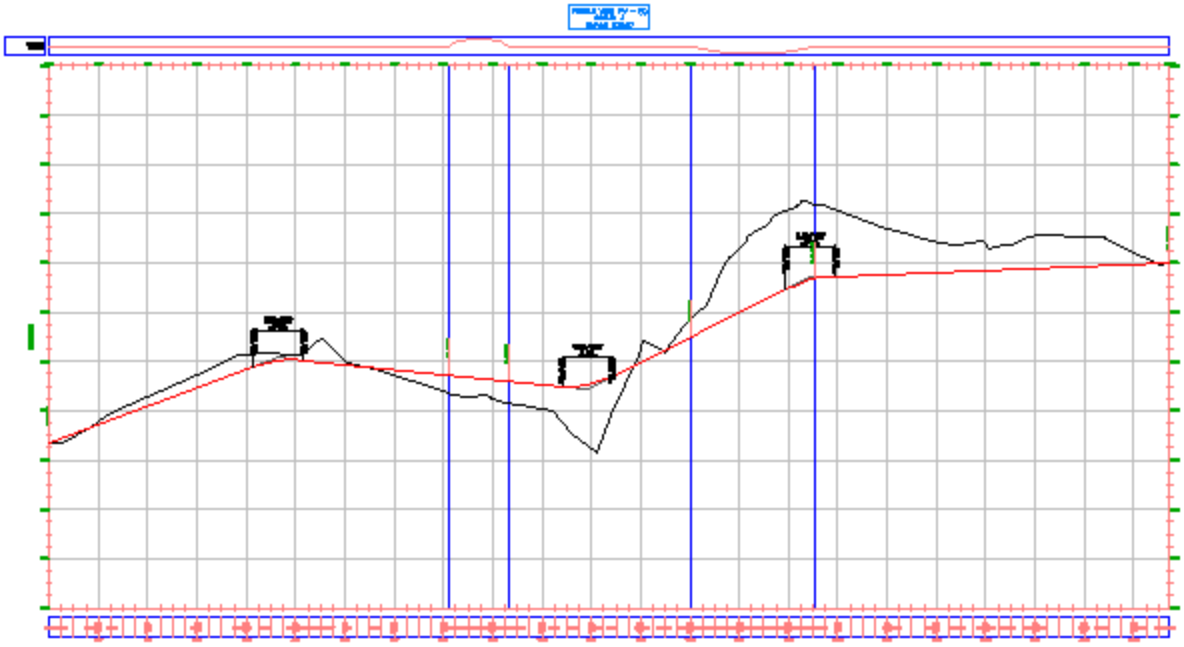
5. Click Edit Current Selection.
6. In the Profile View Style dialog box, examine the contents of the various tabs to see the many settings that can be included in a style definition.

   For example, on the Title Annotation tab, you can change the format and location of the profile view title. On the Display tab, you can turn various parts of the profile view on and off.

7. Click Cancel, and then click OK to close the Profile View Properties dialog box.
8. Zoom out so you can see both profile views.

   When you applied the Major Grids style, which includes grid padding above and below the profile, PV- (1) enlarged to overlap PV- (2).

9. Click PV- (2) and move it up above the title block for PV- (1).

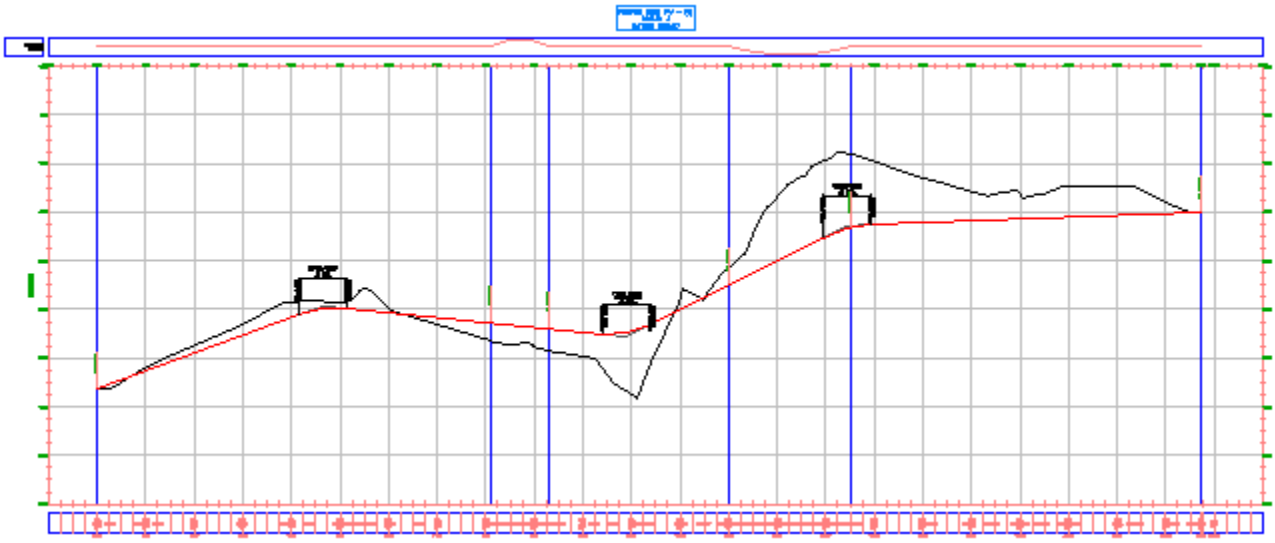


Now you will edit the Major Grids profile view style to add consistent grid padding, clip the profile view grid, and modify the appearance of the ticks along the axis.

Modify the grid in the profile view style

1. Click the PV - (1) grid to select the profile view. Right-click. Click Edit Profile View Style.
2. In the Profile View Style dialog box, on the Grid tab, under Grid Padding, change the padding of all four axes to **1.0000**.
3. Click Apply.

   Notice that in the drawing, there is now one full major grid between the profiles and the profile view extents.

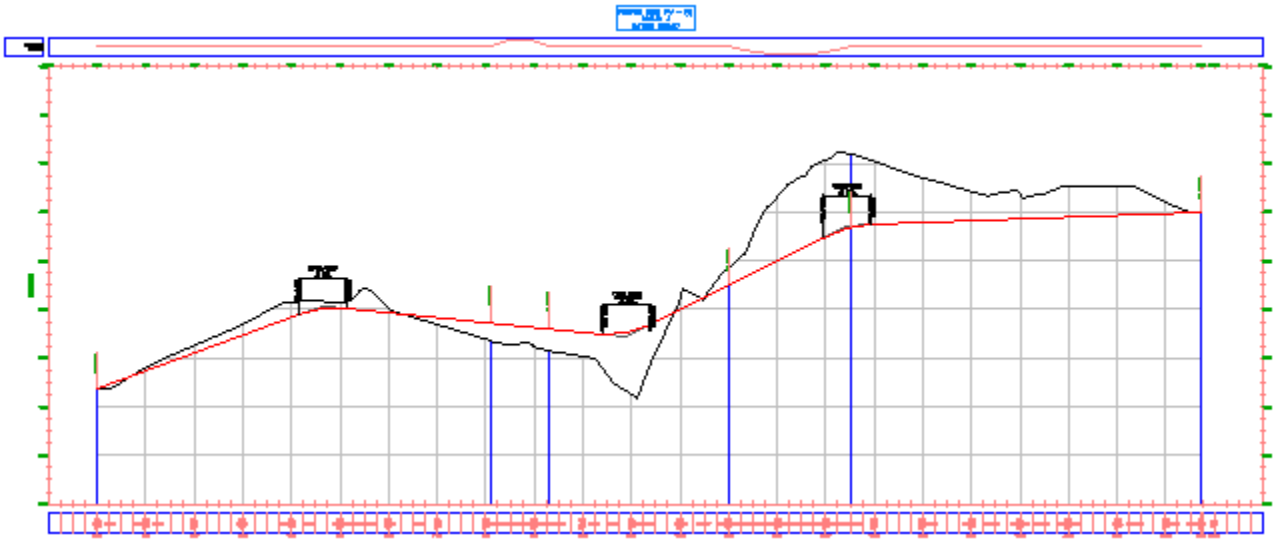


4. Under Grid Options, select Clip Vertical Grid and Clip Horizontal Grid. Under both selections, select Omit Grid In Padding Areas.

   Notice that the graphics in the dialog box change to demonstrate the effect the setting has on the profile view.

5. Click Apply.

   Notice that in the drawing, the profile view grid has been removed from above the surface profile and the padding area you specified.



   The grid is clipped to the surface profile because the Clip Grid setting in the profile view properties for PV - (1) is set to the centerline surface profile. Setting the profile view style to Clip To Highest Profile(s) would override the property setting and clip the grid to the layout profile.

6. Click OK.

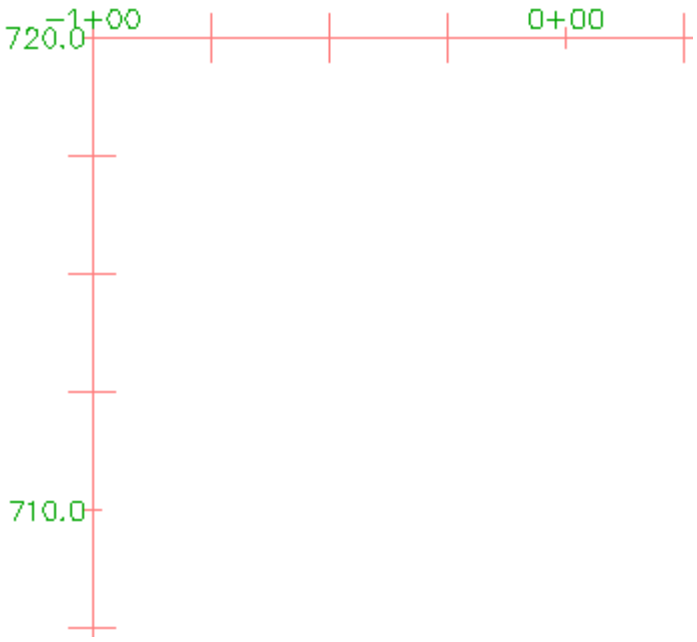
   Note:

   If the style changes have not been applied to the profile view, enter REGEN at the command line.

   Modify the axis annotation in the profile view style

1. Pan and zoom to see the upper left corner of the profile view grid. Zoom in so you can clearly see the tick marks on the horizontal and vertical axes.

   Notice that the starting station labels overlap. In the next few steps, you will correct the overlap and modify the justification of the ticks at the major stations.



2. Click the grid to select the profile view. Right-click. Click Edit Profile View Style.
3. In the Profile View Style dialog box, on the Horizontal Axes tab, click Top.

   This control sets the focus of the controls on this tab to the top axis. If, after you have changed the top axis, you would like the changes to carry over to the bottom axis, select Bottom and repeat the changes.

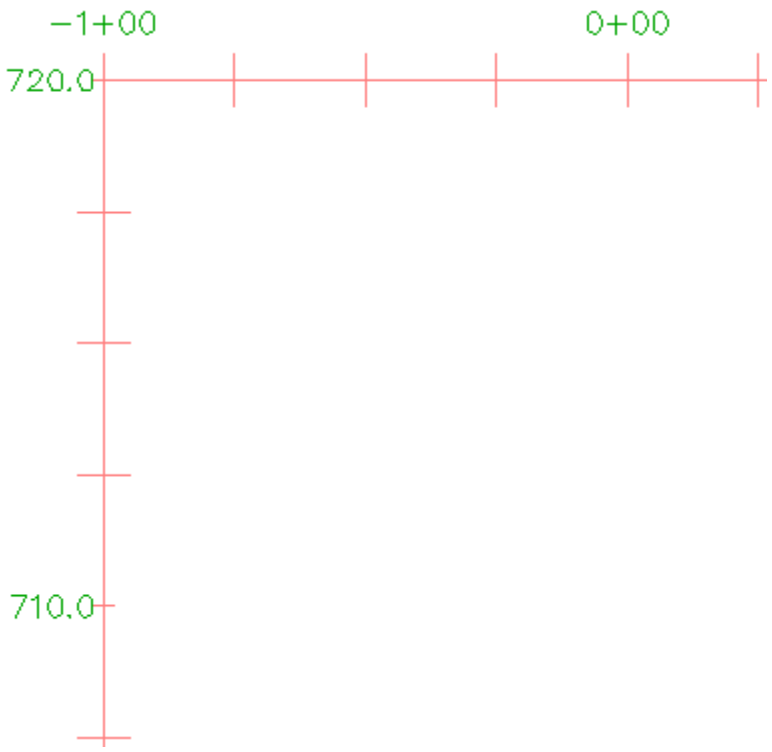
   Note:
   The bottom axis controls the major and minor grid spacing.

4. Under Major Tick Details, specify the following parameters:

- Tick Size: **0.2500**
- Y Offset: **0.1000**

5. Click Apply.

   The major ticks are longer, and the station labels move up.



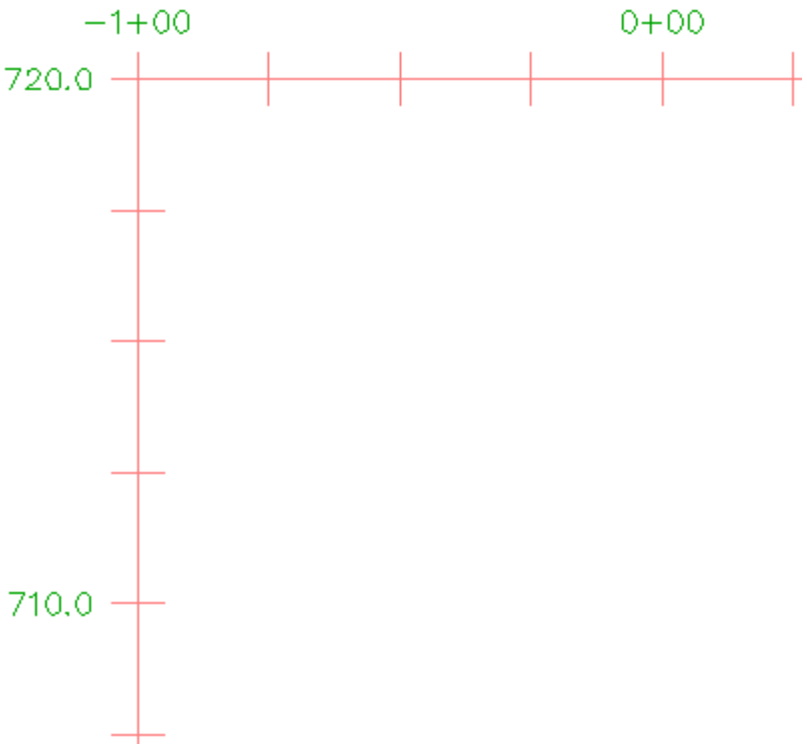
6. On the Vertical Axes tab, make sure Left is selected as the axis to control.

   Note:
   The left axis controls the major and minor grid spacing.

7. Under Major Tick Details, specify the following parameters:

- Tick Size: **0.2500**
- X Offset: **-0.1000**

8. Click OK.
   The ticks are longer, and the elevation labels move to the left.



Further exploration: Experiment with the other settings in the Major Tick Details area. Make the same changes you made in the previous steps to the right axis.

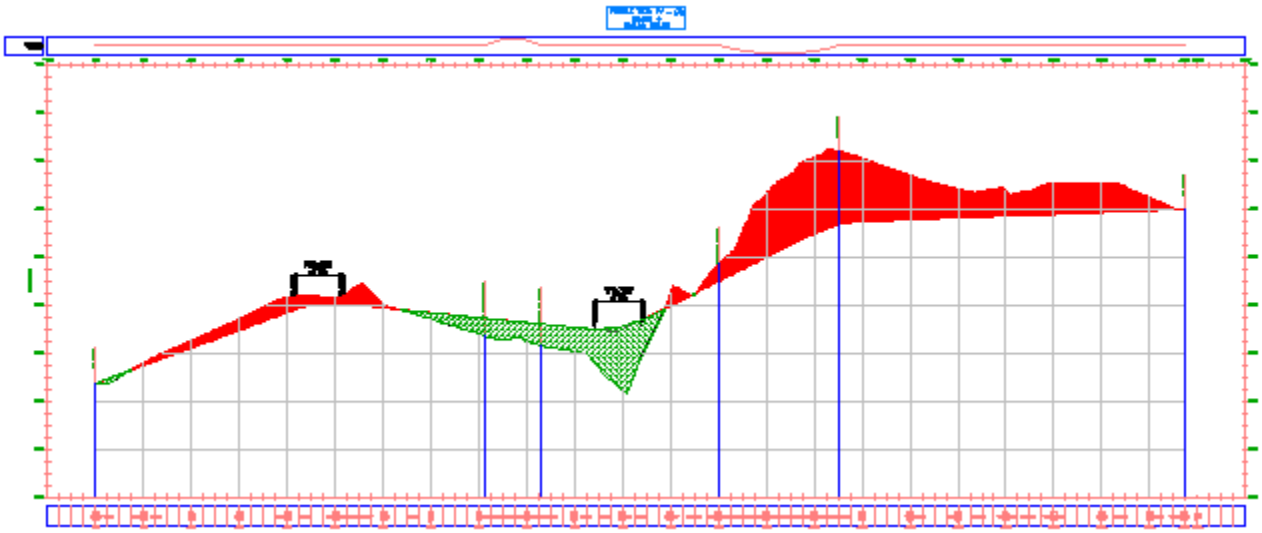
To continue this tutorial, go to Adding Hatch Patterns Between Profiles.

Parent topic: Tutorial: Displaying and Modifying Profile Views

Exercise 12: Adding Hatch Patterns Between Profiles

In this exercise, you will illustrate the cut and fill regions along an alignment by applying hatch patterns between the surface and layout profiles.

Hatch patterns can be applied to areas that are formed by two profile lines. Hatch patterns are applied in the Profile View Properties dialog box. You can either specify the area type, or use an existing quantity takeoff criteria. You use shape styles to apply the desired hatch patterns and colors to the areas you have defined.

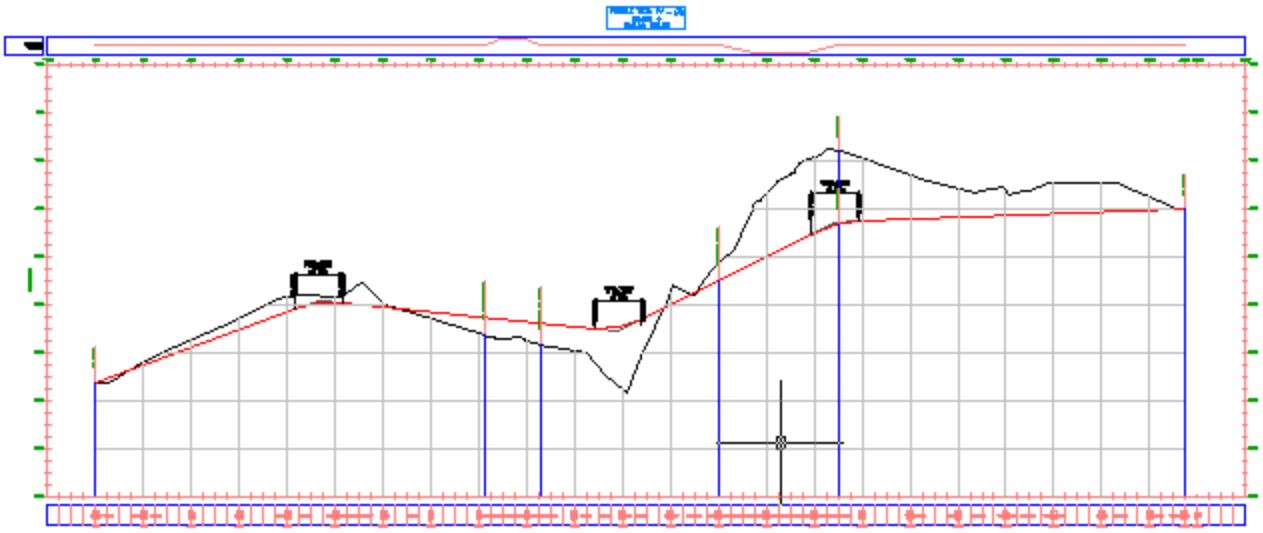


This exercise continues from Editing the Profile View Style.

Access the profile view properties

1. Open Profile-5B.dwg, which is located in the tutorials drawings folder.

   This drawing is similar to the drawings you used in previous profiles tutorial exercises. This drawing contains an additional profile view, Profile View PV - (3), which contains an existing ground and layout profile. You will add hatch patterns that highlight the cut and fill areas between the two profiles.



2. Click the Profile View PV - (3) grid to select the profile view. Right-click. Click Profile View Properties.

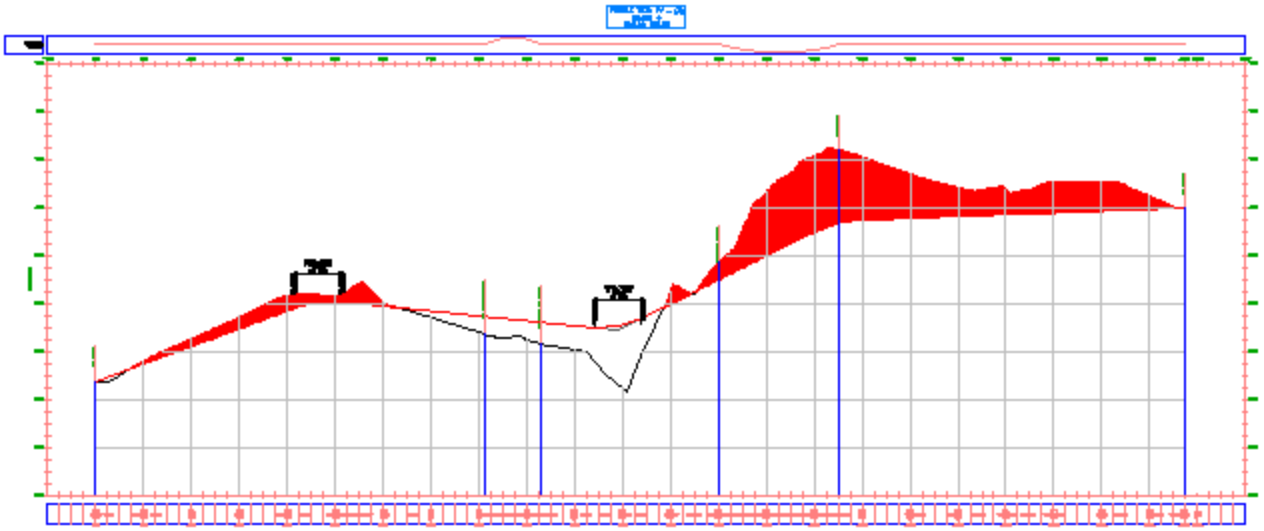
Define a cut area hatch

1. In the Profile View Properties dialog box, on the Hatch tab, click  Cut Area.

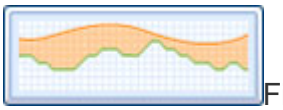
   A Cut - (1) area is displayed in the Hatch Area table. For Upper Boundary, the first surface profile in the list is automatically assigned. For Lower Boundary, the first layout profile in the list is assigned automatically.

2. In the Shape Style column, click **Standard**.
3. In the Pick Shape Style dialog box, select **Cut**. Click OK.
4. In the Profile View Properties dialog box, click Apply.

   The specified shape style is displayed in the cut areas between the profiles.



Define a fill area hatch

1. In the Profile View Properties dialog box, on the Hatch tab, click  Fill Area.

   A Fill - (1) area is displayed in the Hatch Area table. For Upper Boundary, the first layout profile in the list is automatically assigned. For Lower Boundary, the first surface profile in the list is assigned automatically.

2. In the Fill - (1) entry, for Shape Style, click the **Standard** entry.
3. In the Pick Shape Style dialog box, expand the list of shape styles.

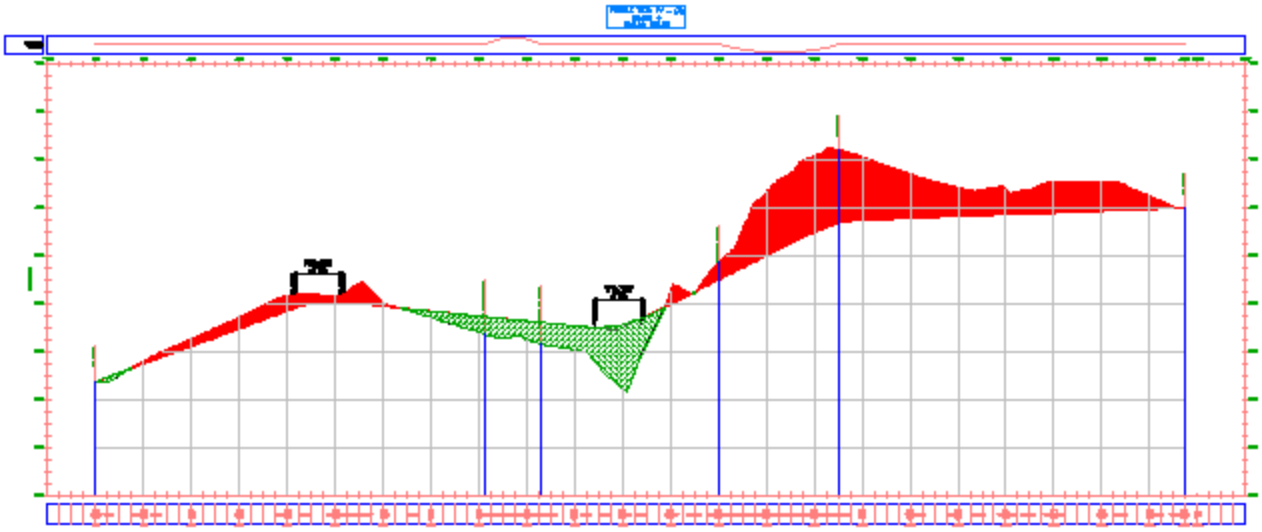
   An appropriate Fill style does not exist in this drawing. You will create one in the following steps.

Create a fill shape style

1. In the Pick Shape Style dialog box, select **Cut**.
2. In the Pick Shape Style dialog box, click the down arrow next to . Click Copy Current Selection.
3. In the Shape Style dialog box, on the Information tab, for Name, enter **Fill**.
4. On the Display tab, under View Direction, select Profile.
5. Select both entries in the Component Display table.
6. Click one of the Color cells.
7. In the Select Color dialog box, for Color, enter **92**. Click OK.
8. In the Component Hatch Display table, for Pattern, click the **Dash** entry.

9. In the Hatch Pattern dialog box, for Pattern Name, select **Cross**.
10. Click OK four times.

    The Profile View Properties dialog box closes, and the new hatch pattern is displayed in the fill areas between the profiles.



To continue this tutorial, go to Projecting Objects onto a Profile View.

Parent topic: Tutorial: Displaying and Modifying Profile Views

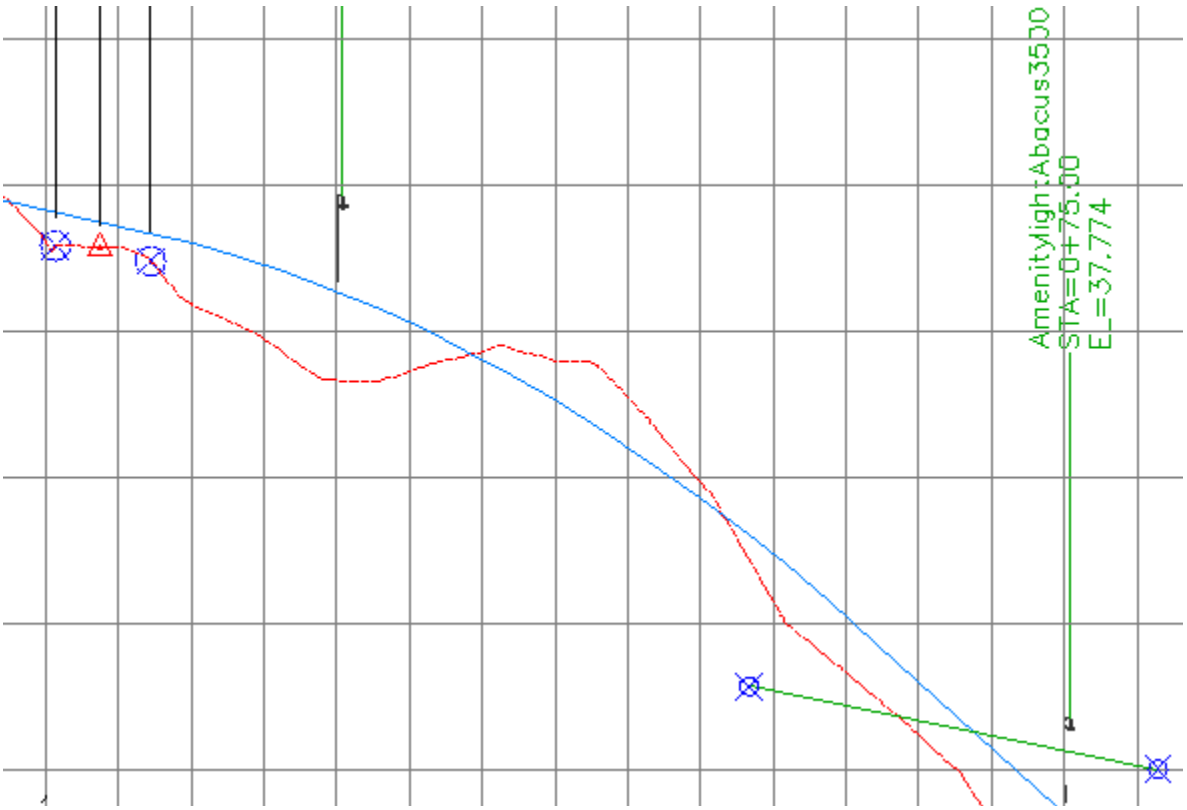
Optional Exercise 13: Projecting Objects onto a Profile View

In this exercise, you will project multi-view blocks, COGO points, and 3D polylines from plan view onto a profile view.

You can project a variety of objects, such as AutoCAD points, solids, blocks, multi-view blocks, 3D polylines, COGO points, feature lines, and survey figures onto a profile view. The process you will use in this exercise can be applied to any of these objects.

Note:

Before you project an object into a profile view, make sure that the object has a defined elevation. Otherwise, the elevation may be zero, and the profile view will be expanded vertically to accommodate the zero elevation value.

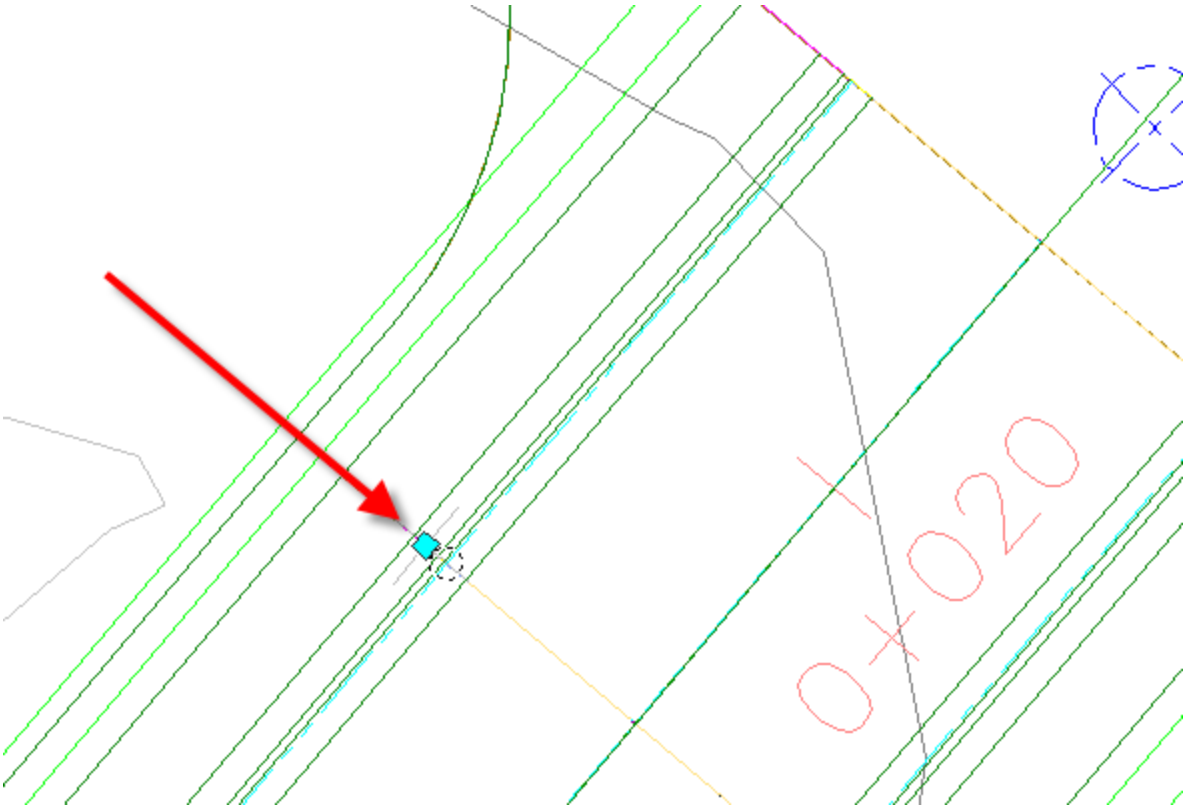


Project multi-view blocks onto a profile view

1. Open Profile-5C.dwg, which is located in the tutorials drawings folder.

   Two viewports are displayed in this drawing. A plan view of COGO points that represent an existing road, and a proposed corridor is displayed in the left viewport. A profile view that contains existing ground and proposed ground profiles of the proposed road is displayed in the right viewport.

2. In the left viewport, at station 0+025, select the multi-view block that represents a light post. Right-click. Click Select Similar.



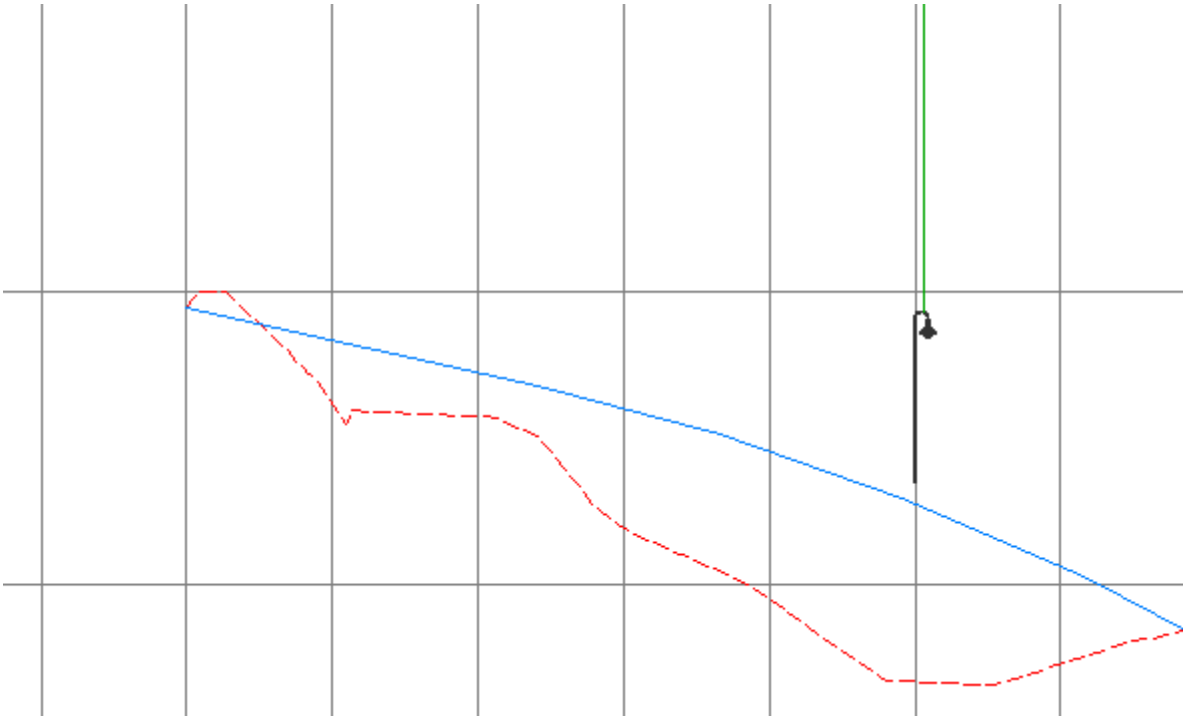
All the light posts along the proposed road corridor are selected.
When you insert a multi-view block into a drawing, it is created as a standard AutoCAD block. Before it can be projected onto a profile view, a multi-view block must be exploded from its original AutoCAD block form.

3. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Project Objects To Profile View .
4. In the right viewport, click the profile view grid.
5. In the Project Objects to Profile View dialog box, click <Set All> in each column to specify the following parameters:

- Style: **Projection Without Exaggeration**
- Elevation Options: Surface ➤ **First Street Surface**
- Label Style: **Object Name Station And Elevation**

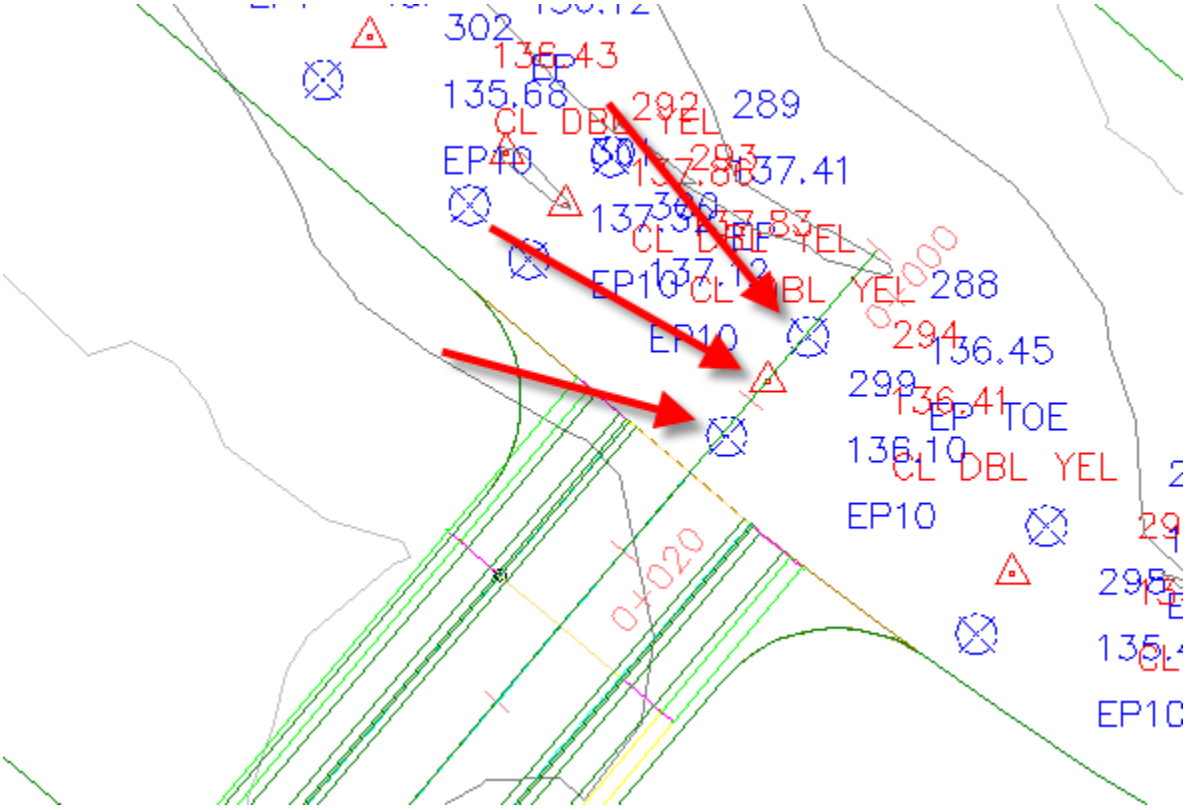
6. Click OK.

The light poles are displayed on the profile view.

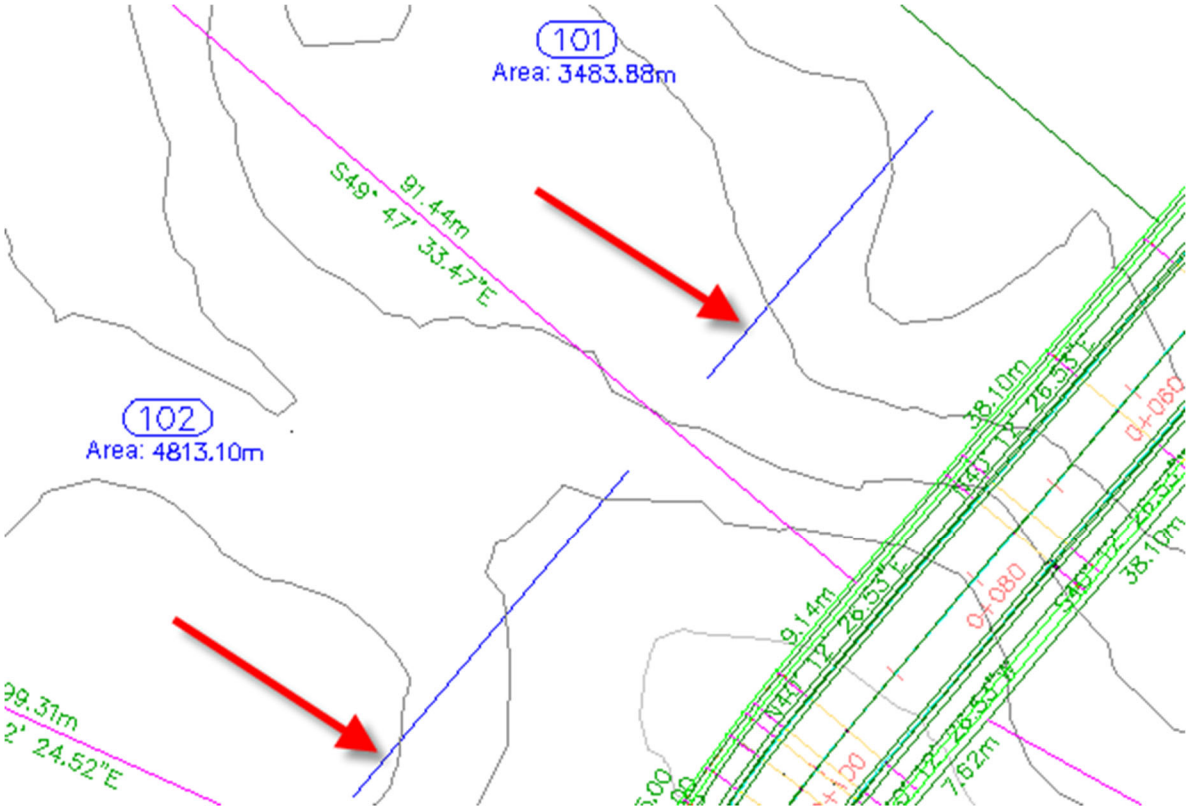


Project COGO points and 3D polylines onto a profile view

1. In the left viewport, select the three COGO points that are along the proposed road centerline.



2. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Project Objects To Profile View .
3. In the right viewport, click the profile view grid.
4. In the Project Objects To Profile View dialog box, click Pick Objects.
5. In the left viewport, zoom out and select each of the blue 3D polylines that represent the front of building footprints.

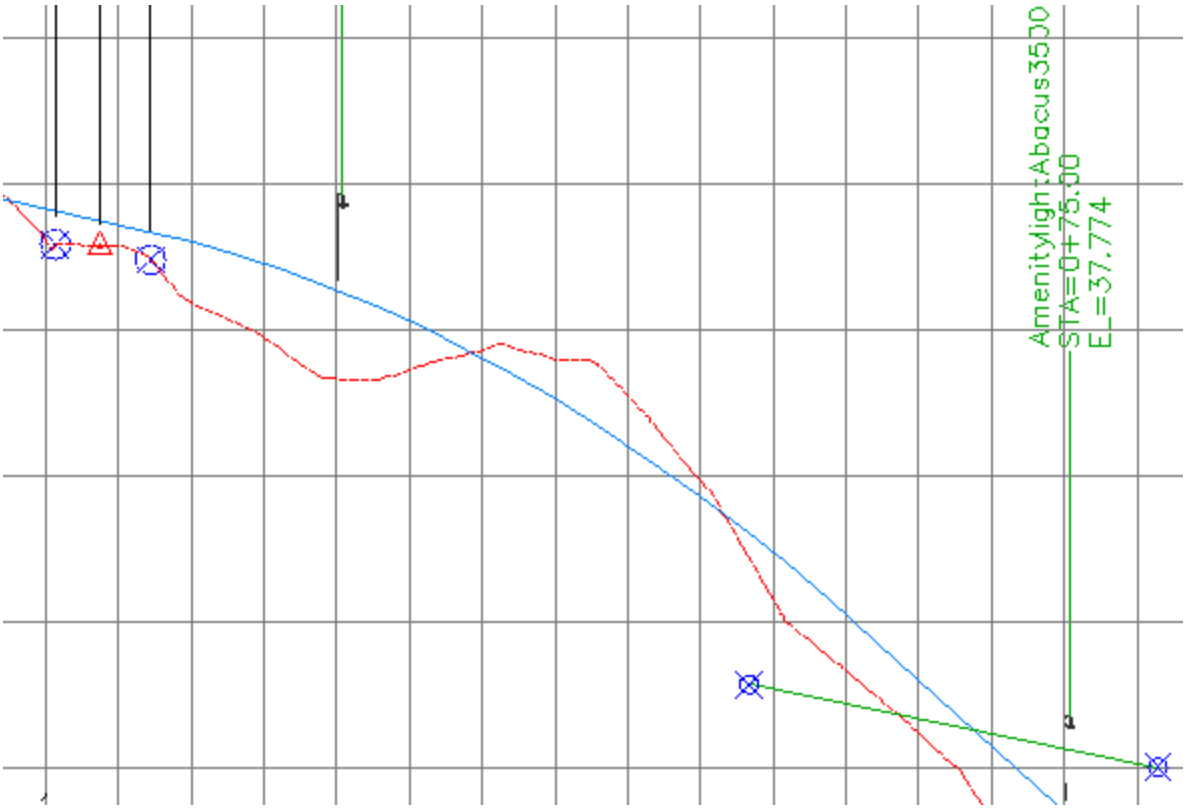


6. Press Enter.
7. In the Project Objects To Profile View dialog box, in the 3D Polylines row, under Style, click <Set All>.
8. In the Select Projection Style dialog box, select **Projection Without Exaggeration**.

   Leave the Elevation Options setting at Use Object. In this case, the appropriate elevation value is a property of the selected objects.

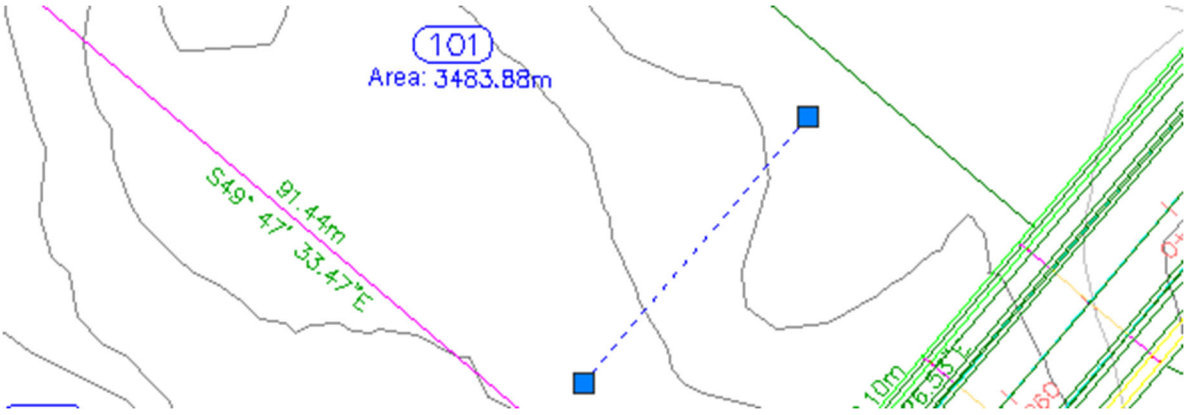
9. Click OK twice.

   The COGO points and building 3D polylines are displayed in the profile view.



Edit the projected object elevation

1. In the left viewport, select the 3D polyline in parcel 101.



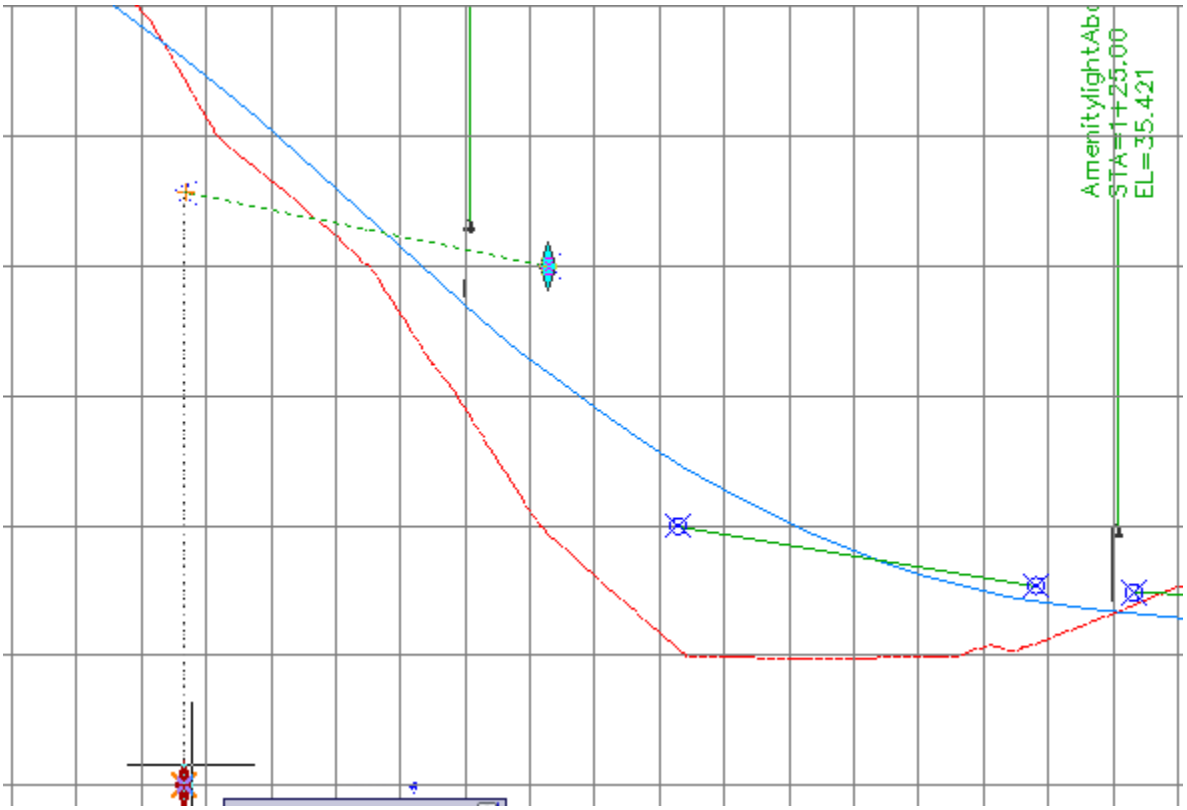
2. On the command line, enter **LIST**.

   In the AutoCAD Text Window, notice that the elevation values for the polyline vertices are approximately 38.

3. Press Enter. Close the AutoCAD Text Window.
4. In the right viewport, select the 3D polyline that crosses between stations 0+060 and 0+080.

When you select the 3D polyline in the profile view, notice that the 3D polyline in plan view is highlighted.

5. Drag the left grip down toward the bottom of the profile view.



6. Repeat Steps 1 and 2 to examine the new elevation value.

   When you grip edit a projected feature line or 3D polyline, the corresponding elevation of the source object is adjusted.

7. Press Enter. Close the AutoCAD Text Window.

Modify the display of projected objects in profile view

1. In the right viewport, select the profile view grid. Right-click. Click Profile View Properties.

   The Projections tab is displayed on the Profile View Properties dialog box. You use the controls on this tab to change the parameters that you used when you projected objects onto the profile view.

Note:
Like other AutoCAD Civil 3D labels, label parameters are changed by selecting the desired label, and then using the Labels contextual tab on the ribbon.

2. In the Profile View Properties dialog box, on the Projections tab, clear the 3D Polylines check box.
3. Click Apply.

   The 3D polylines are removed from the profile view, and are cleared from the Profile View Properties dialog box.

4. Click OK.

   Further exploration: Examine the style settings that are available for projected objects. Projected object styles are located in Toolspace, on the Settings tab, in the General ➤ Multipurpose Styles ➤ Projection Styles collection. Label styles for projected objects are located in Toolspace, on the Settings tab, in the Profile View ➤ Label Styles ➤ Projection collection.

   To continue this tutorial, go to Splitting a Profile View.

Optional Exercise 14: Splitting a Profile View

In this exercise, you will split a profile view so that the full elevation range of a layout profile fits in a shorter profile view.

This exercise continues from Projecting Objects onto a Profile View.

Split a profile view

1. Open Profile-5D.dwg, which is located in the tutorials drawings folder.
2. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Create Profile View .
3. In the Create Profile View wizard, on the General page, specify the following parameters:

- Select Alignment: **Ridge Road**
- Profile View Style: **Standard**

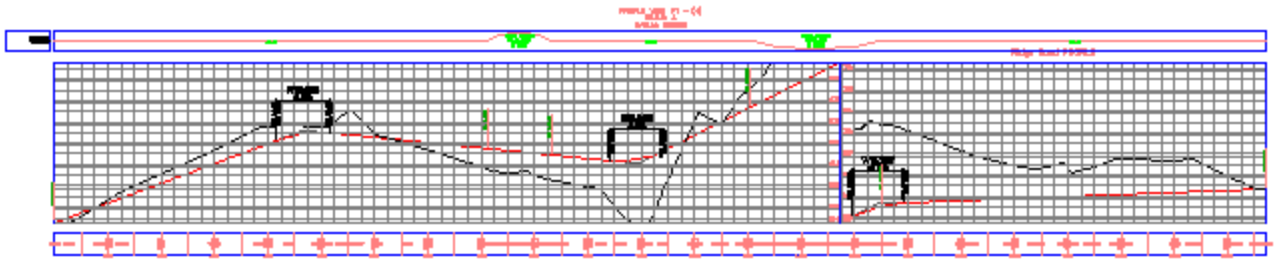
4. On the left side of the wizard, click Profile View Height.
5. On the Profile View Height page, specify the following parameters:

- Profile View Height: **User Specified**
- Maximum: **670.00'**
- Split Profile View: **Selected**

   The split profile view controls are now available. These controls allow you to select separate profile view styles for the first, intermediate, and last segments of the split profile view. For this exercise, accept the default split profile view settings.

6. Click Next.
7. On the Profile Display Options page, clear the Draw check boxes for all profiles except EG - Surface (1) and Layout (1). In the Layout (1) row, select the Split At option. This option specifies that the split occurs at the appropriate elevation of the layout profile and ensures that the entire layout profile will appear in the profile view.
8. Scroll to the right until the Labels column is visible. In the EG - Surface (1) row, click the Labels cell.
9. In the Pick Profile Label Set dialog box, select **<None>**. Click OK.
10. Click Create Profile View.
11. When prompted, pan and zoom to a clear area in the drawing window, then click to create the profile view.

    A new profile view is created. Notice that because you specified a shorter maximum height in step 7, the profile view grid is shorter than the other profile views in the drawing. In order to fit the profile in the shorter grid, the profile has been split in two segments. The full length and elevations of the red, layout profile are visible because you set the Split At setting to Layout (1) in step 6. Notice that there is a vertical axis in the middle of the profile view that displays the elevations for both split segments.



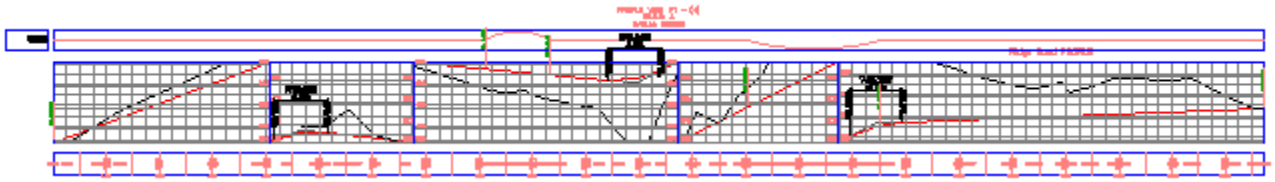
Modify the properties of the split profile view

1. In Toolspace, on the Prospector tab, expand the Alignments ➤ Centerline Alignments ➤ Ridge Road ➤ Profile Views collections.

   Notice that a single new profile view (PV - (4)) was created.

2. On the Prospector tab, right-click PV - (4). Click Properties.
3. In the Profile View Properties dialog box, on the Elevations tab, under Elevation Range, change the Height to **15.000'**.
4. Click Apply.

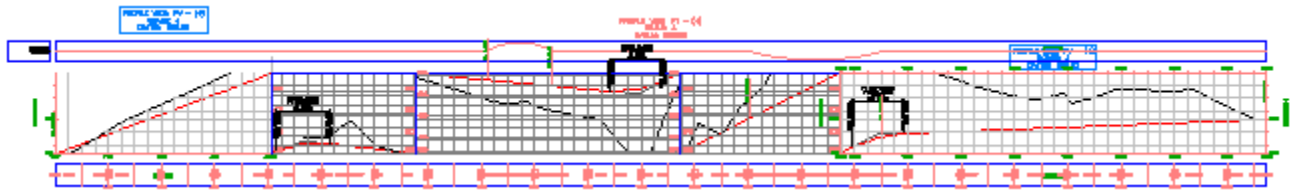
   Notice that in the drawing window, the profile view has been split into five segments to accommodate the new height.



Now you will change the style of the first and last profile view segments.

5. In the Profile View Properties dialog box, in the Split Profile View Data table, in the No. 1 row, in the Profile View Style column, click .
6. In the Pick Profile View Style dialog box, select **Left & Bottom Axis**. Click OK.
7. Repeat steps 5 and 6 to change the Profile View Style in row No. 4 to **Full Grid**.
8. Click OK.

   Three different profile view styles are displayed in the single profile view grid. While a split profile is displayed in a single profile view grid, it may have separate styles applied to each of its split segments.



To continue this tutorial, go to Creating Multiple Profile Views.

Optional Exercise 15: Creating Multiple Profile Views

In this exercise, you will produce a set of profile views to display short, successive segments of a profile.

Multiple profile views are most useful when you are creating final construction documents from your design. For best results, design your profile in a single profile view, then use the plan production tools to create multiple profile views for plotting or publishing. During the plan production process, you create sheets that display sections of alignments and profiles.

In this exercise, you will bypass the plan production tools to create multiple profile views in a currently open drawing. You will use the Create Multiple Profile Views wizard, which allows you to quickly specify the profile view properties before you create them. If you access this wizard during the plan production process, many of the properties are not available because they are already set in the *view frame group*.

For a tutorial that demonstrates the plan production tools, go to Plan Production Tutorials.

This exercise continues from Splitting a Profile View.

Create multiple profile views

1. Open Profile-5E.dwg, which is located in the tutorials drawings folder.

   This drawing contains two roads, Maple Road and Oak Road, and a single profile view of Oak Road.

2. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Create Multiple Profile Views .
3. In the Create Multiple Profile Views wizard, on the General page, specify the following parameters:

- Select Alignment: **Oak Road**
- Profile View Style: **Major Grids**

4. Click Next.
5. On the Station Range page, in the Length of Each View box, enter **500.00'**.
6. Click Next.
7. On the Profile View Height page, specify the following parameters:

- Profile View Height: **User Specified**
- User Specified: **50.00'**
- Profile View Datum By: **Mean Elevation**

  This option specifies that the profile lines will be positioned in the profile based on the mean of the highest and lowest elevation value of the profiles that are drawn in the grid. This option provides an equal amount of space above and below the profile lines. This option is useful when you have to annotate a profile that has fairly consistent elevation values.

- Split Profile View: **Selected**

  This option makes the split profile view controls available, which allow you to select separate profile view styles for the first, intermediate, and last segments of any split profile views. For this exercise, accept the default split profile view settings.

8. Click Next.
9. On the Profile Display Options page, ensure that the Draw check box is selected for both profiles.
10. In the Oak Road - Proposed row, select the Split At option.

    This option specifies that if the profiles contained in the profile view must be split to fit in the specified profile view height, the split will occur at the appropriate elevation of the layout profile. This option ensures that the entire layout profile appears in the profile view.

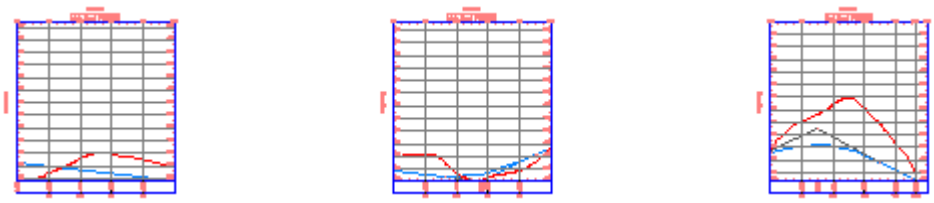
11. Click Next to open the Pipe Network Display page.

    You can use this page to select the pipe network or parts that you want to display in the profile view. For this exercise, you will not display any pipe network parts.

12. Click Next.
13. On the Data Bands page, under Select Band Set, select **EG-FG Elevations and Stations**.
14. Click Next to open the Profile Hatch Options page.

    You can use this page to specify hatch patterns between the profiles in the profile view. For this exercise, you will not specify any hatch patterns.

15. Click Next.
16. On the Multiple Plot Options page, set Maximum in a Row to **4**.
17. Click Create Profile Views.
18. When prompted, pan and zoom to a clear area in the drawing window, then click to create the profile views.



19. In Toolspace, on the Prospector tab, expand the Alignments, Oak Road, and Profile Views collections.

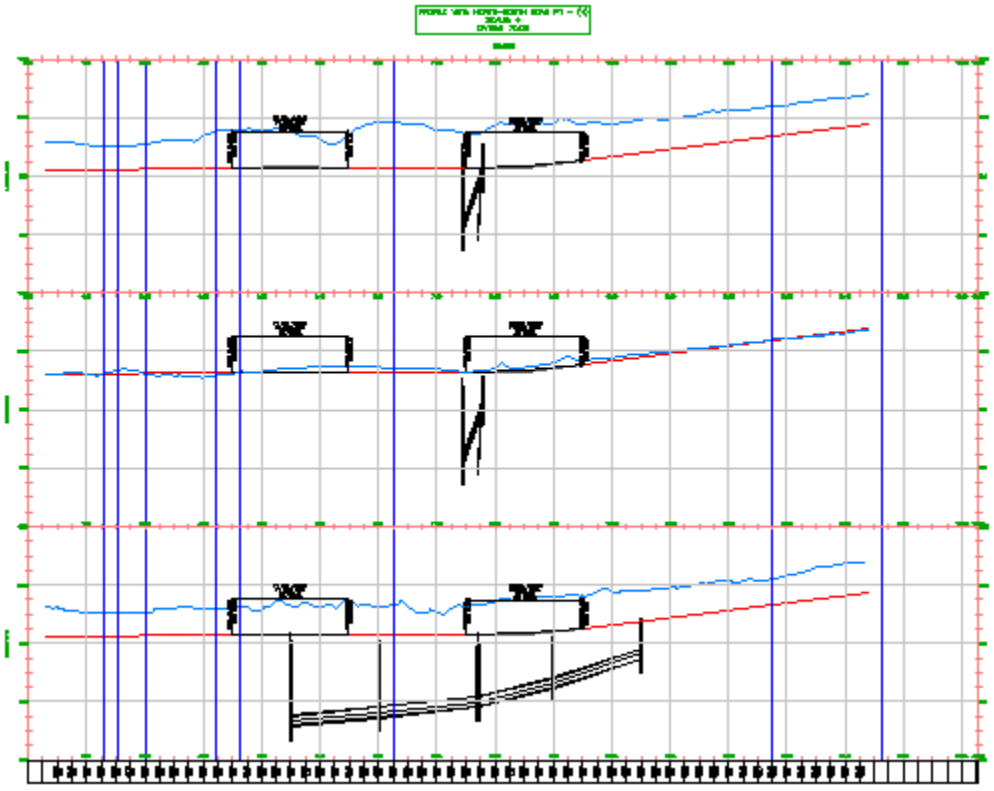
    Notice that a separate profile view was created for each 500.00’ segment.

    To continue this tutorial, go to Creating Stacked Profile Views.

Optional Exercise 16: Creating Stacked Profile Views

In this exercise, you will create a series of three profile views that contain a centerline and left and right offset profiles.

Stacked profile views are a collection of related profiles that are drawn in separate, vertically arranged profile views. When each profile is displayed on its own profile view grid, more space is available to annotate each profile.



This exercise continues from Creating Multiple Profile Views.

Create stacked profile views

1. Open Profile-5F.dwg, which is located in the tutorials drawings folder.

   The drawing contains an existing ground surface, several alignments, and a profile view. The profile view contains centerline and left and right edge of pavement (EOP) profiles of the alignment that travels from North to South along the West side of the site. Because the profiles are crowded in the profile view, you will create a series of stacked profile views so that you can see the profiles clearly and have ample room for annotation.

2. Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down ➤ Create Profile View .
3. In the Create Profile View wizard, on the General page, specify the following parameters:

- Select Alignment: **North-South Road**
- Show Offset Profiles By Vertically Stacking Profile Views: **Selected**

  The graphic at the bottom of the page changes color to indicate that the option is active.

4. **Note:**
5. The Profile View Style setting on this page is not used. You will assign separate styles for each profile view in the stack.
6. On the left side of the Create Profile View wizard, click Stacked Profile.
7. On the Stacked Profile page, specify the following parameters:

- Number Of Stacked Views: **3**
- Gap Between Views: **0**

  Note:

  The Gap Between Views value is measured in drawing units. A positive value adds space between the profile view grids. A negative value causes the profile view grids to overlap.

- Top View Style: **Stacked - Top**
- Middle View Style: **Stacked - Middle**
- Bottom View Style: **Stacked - Bottom**

8. Click Next.
9. On the Profile Display Options page, in the Select Stacked View To Specify Options For list, select Middle View.

   Note:

   The number of views that is visible in this list depends on the value you specified for **Number Of Stacked Views** in Step 5.

10. In the Specify Profile Display Options table, select the Draw check box for the following profiles:

- **EG Centerline**
- **Centerline**

11. In the Select Stacked View To Specify Options For list, select Top View.
12. In the Specify Profile Display Options table, select the Draw check box for the following profiles:

- **EG Left Offset**
- **EOP Left**

13. In the Select Stacked View To Specify Options For list, select Bottom View.
14. In the Specify Profile Display Options table, select the Draw check box for the following profiles:

- **EG Right Offset**

- **EOP Right**

15. Click Next.
16. On the Pipe Network Display page, in the Select Stacked View To Specify Options For list, select Bottom View.

    Most of the pipe network is on the right-hand side of the alignment. You will specify that the pipe network components will be displayed in the profile view that displays the right EOP profiles.

17. In the Select Pipe Networks To Draw In Profile View area, select the Select check box.
18. In the Name column, expand the **Network - (1)** pipe network.
19. Clear the check boxes for the following parts:

- **W-E Pipe - (1)**
- **W-E Pipe - (2)**
- **W-E Structure - (1)**
- **W-E Structure - (2)**

    These parts are a branch of the pipe network that follow the West-East alignment.

20. In the Select Stacked View To Specify Options For list, select Middle View.
21. In the Select Pipe Networks To Draw In Profile View list, select the Select check box.
22. Clear all check boxes except for the following parts:

- **W-E Pipe - (1)**
- **W-E Pipe - (2)**
- **W-E Structure - (1)**
- **W-E Structure - (2)**

23. In the Select Stacked View To Specify Options For list, select Top View.
24. In the Select Pipe Networks To Draw In Profile View list, select the Select check box.
25. Clear all check boxes except for the following parts:

- **W-E Pipe - (1)**
- **W-E Pipe - (2)**
- **W-E Structure - (1)**
- **W-E Structure - (2)**

26. Click Create Profile View.
27. In the drawing, pan to the clear area at the right of the surface. Click to place the profile views.
28. In Toolspace, on the Prospector tab, expand the Alignments ➤ Road: North-South ➤ Profile Views collection.

    Notice that three separate profile views were created.

    To continue to the next tutorial, go to Tutorial: Working with Data Bands.

Optional Tutorial: Working with Data Bands

This tutorial demonstrates how to add and change the appearance of data bands in a profile view.

Data bands can be placed at either the top or bottom of the profile view to annotate profile station and elevation data, vertical or horizontal geometry points, and so on. Data bands can be added to a profile view either as a set or individually.

Note:

Data bands are also used with section views. The tasks you will learn in the following exercises can be applied to profile views and section views.

Topics in this section

- **Adding Data Bands to a Profile View**
  In this exercise, you will add data bands along the bottom of a profile view.
- **Moving Labels in a Data Band**
  In this exercise, you will learn how to rearrange labels in data bands.
- **Modifying a Data Band Style**
  In this exercise, you will learn how to change the data that is displayed in a data band.

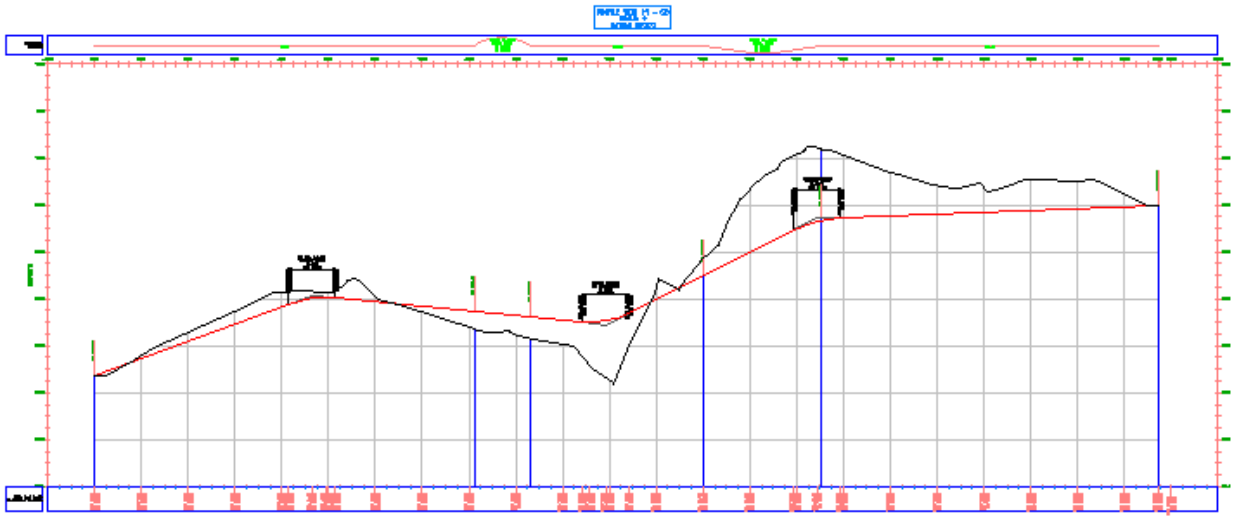
Optional Exercise 17: Adding Data Bands to a Profile View

In this exercise, you will add data bands along the bottom of a profile view.

Add profile view data bands

1. Open Profile-6A.dwg, which is located in the tutorials drawings folder.

   The data band at the top of profile view PV - (3) shows the locations of horizontal curves in the parent alignment. Blue vertical lines cross the profile view grid to mark the start and end of each horizontal curve. The data band at the bottom annotates the elevation of both profiles at the major stations.



2. Select the profile grid. Right-click. Click Profile View Properties.
3. In the Profile View Properties dialog box, on the Bands tab, specify the following parameters:

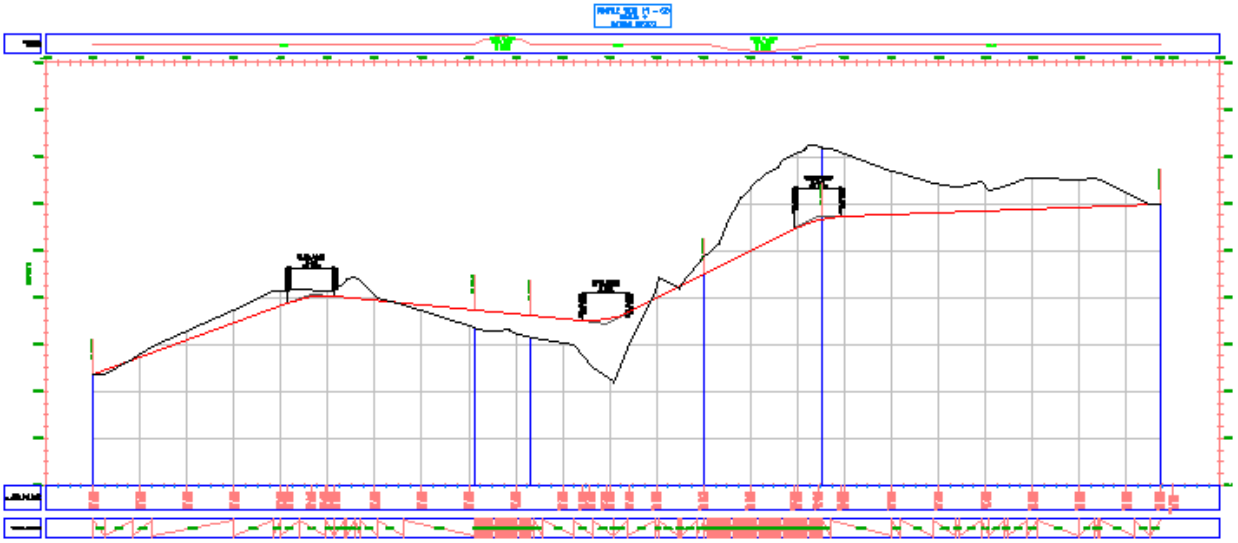
- Band Type: **Vertical Geometry**
- Select Band Style: **Geometry**
- Location: Bottom Of Profile View

4. Click Add.

   The band is added to the bottom of the list.

5. Click Apply.

   The new data band is displayed at the bottom of the stack of data bands. This data band labels the vertical geometry points of the first profile in the list. In this case, the existing ground profile was selected by default. You will change the referenced profile later in this exercise.

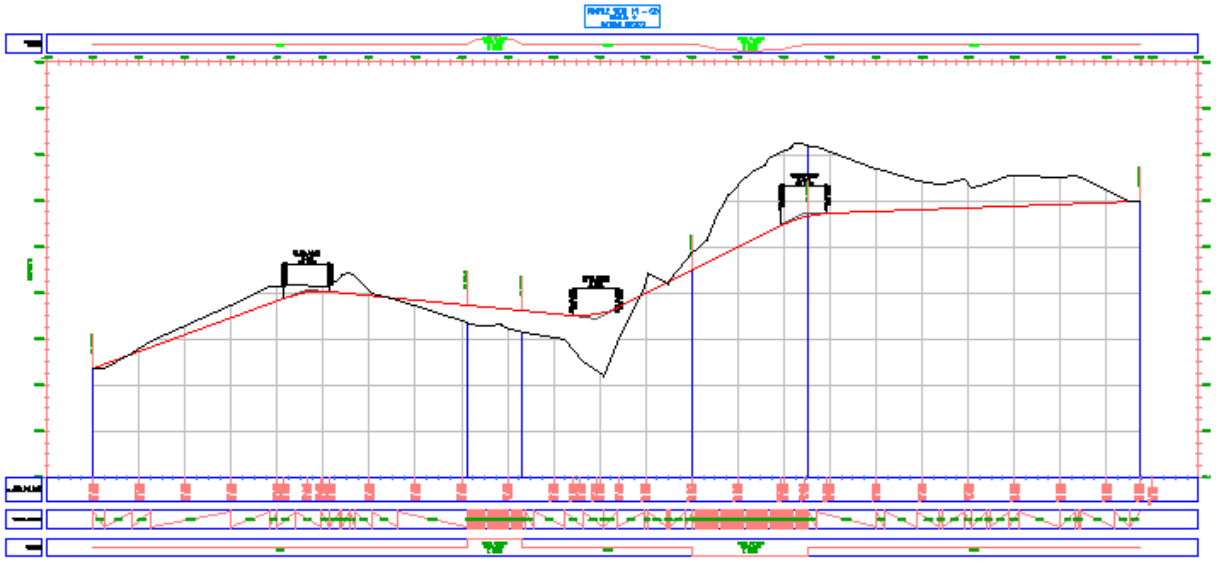


6. In the Profile View Properties dialog box, on the Bands tab, specify the following parameters:

- Band Type: **Horizontal Geometry**
- Select Band Style: **Curvature**
- Location: **Bottom Of Profile View**

7. Click Add.
8. Click Apply.

   The horizontal geometry band is added to the bottom of the profile view in the drawing. This data band is drawn in a different style from the one along the top of the grid. However, both styles show the location of horizontal curves and are labeled with basic engineering data about the curves. These bands are useful for evaluating the design profile from a drainage and safety point-of-view.



9. In the Profile View Properties dialog box, on the Bands tab, specify the following parameters:

- Band Type: **Profile Data**
- Select Band Style: **Horizontal and Vertical Geometry Point Distance**
- Location: Bottom Of Profile View

10. Click Add.

    In the Geometry Points To Label In Band dialog box, you can specify the individual horizontal and vertical geometry points to label using the current style. For this exercise, you will accept the default selections.

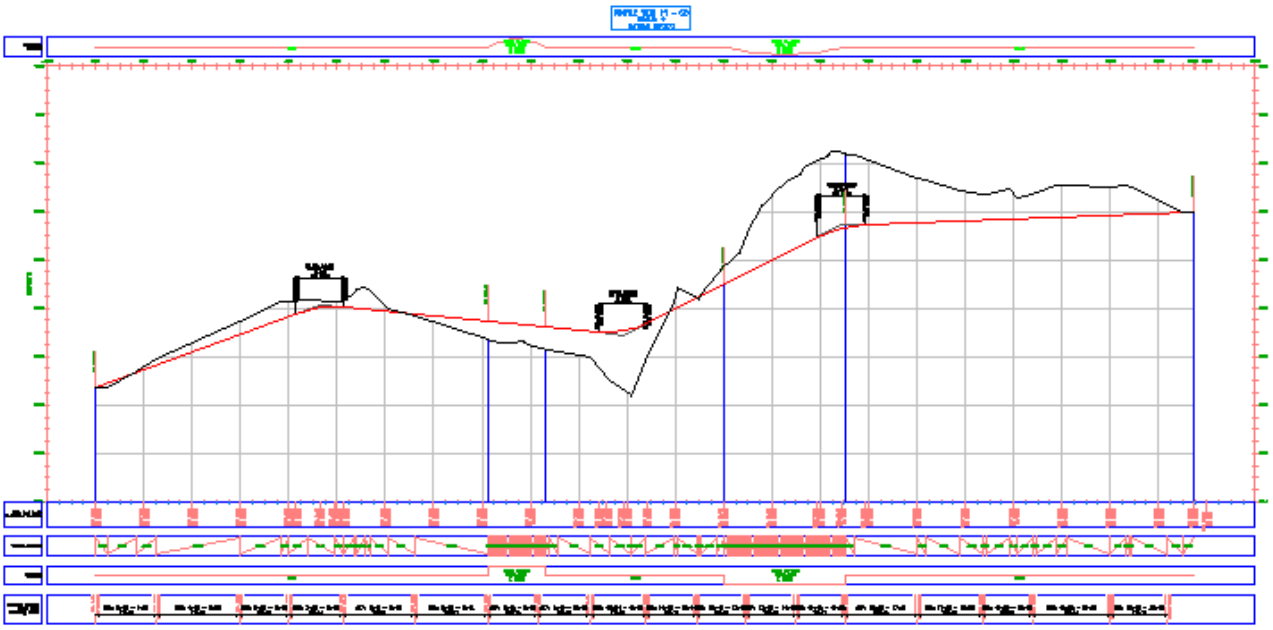
11. In the Geometry Points To Label In Band dialog box, click OK.

    Note:

    For more information on geometry point labeling, see the Adding Labels in Groups tutorial exercise.

12. Click Apply.

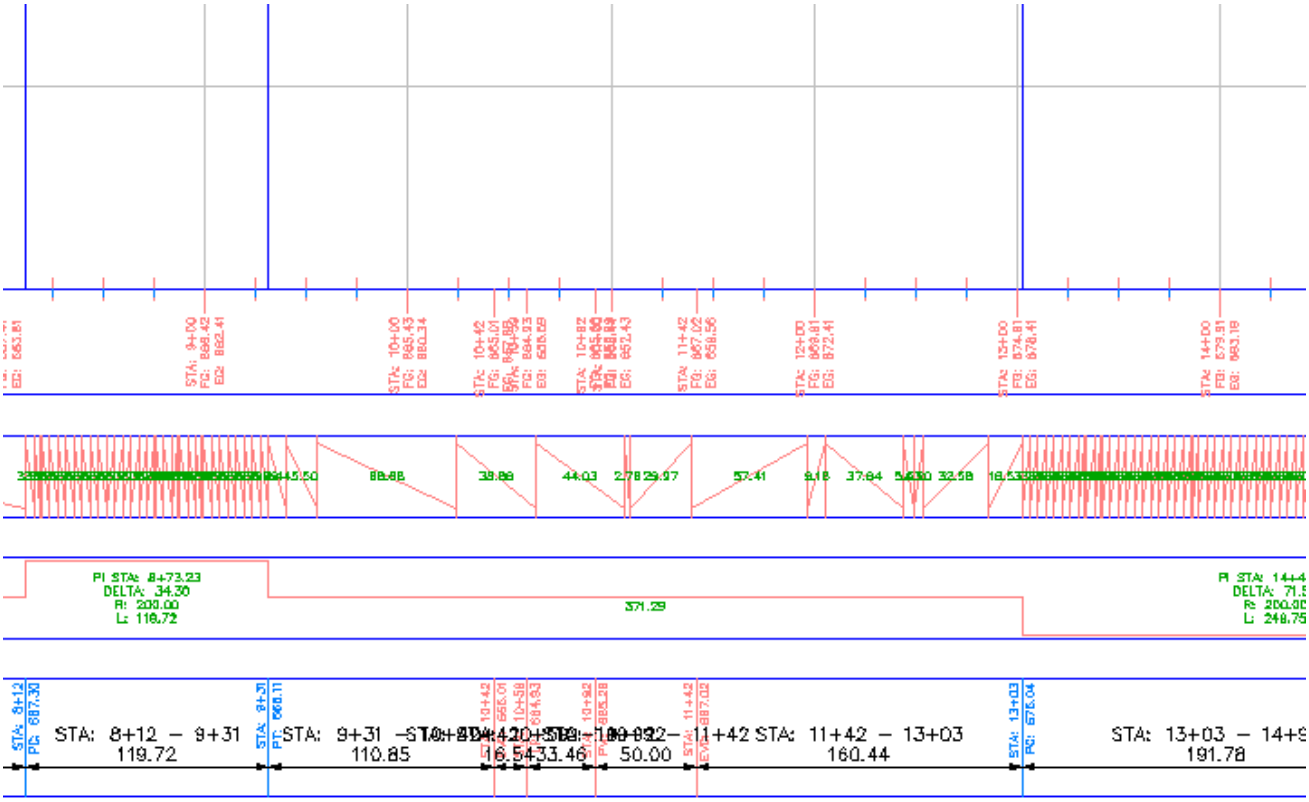
    The new data band is displayed at the bottom of the stack of data bands. This data band labels the incremental distance between the horizontal geometry points of the parent alignment.



Change the profiles referenced in data bands

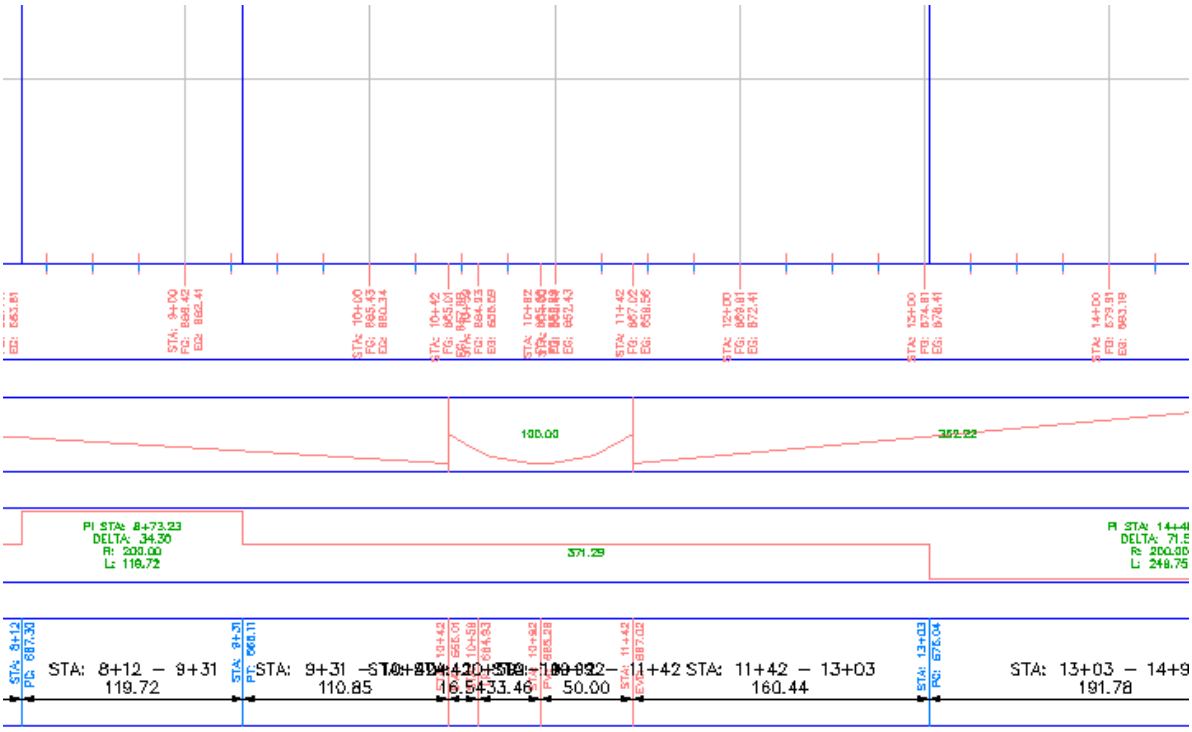
1. In the List Of Bands table, in the Profile1 column, change the value to **Layout (1)** for the Profile Data band at the bottom of the list.
2. Click Apply.

Now, the Profile Data band shows elevations of both the existing ground and finished grade profile at each major station. The Horizontal Geometry Point Distance band displays the finished ground elevation at each horizontal geometry point.



3. For the Vertical Geometry band, change the Profile1 setting to **Layout - (1)**.
4. Click Apply.

   Now, this band shows the length of each grade segment along the layout profile.



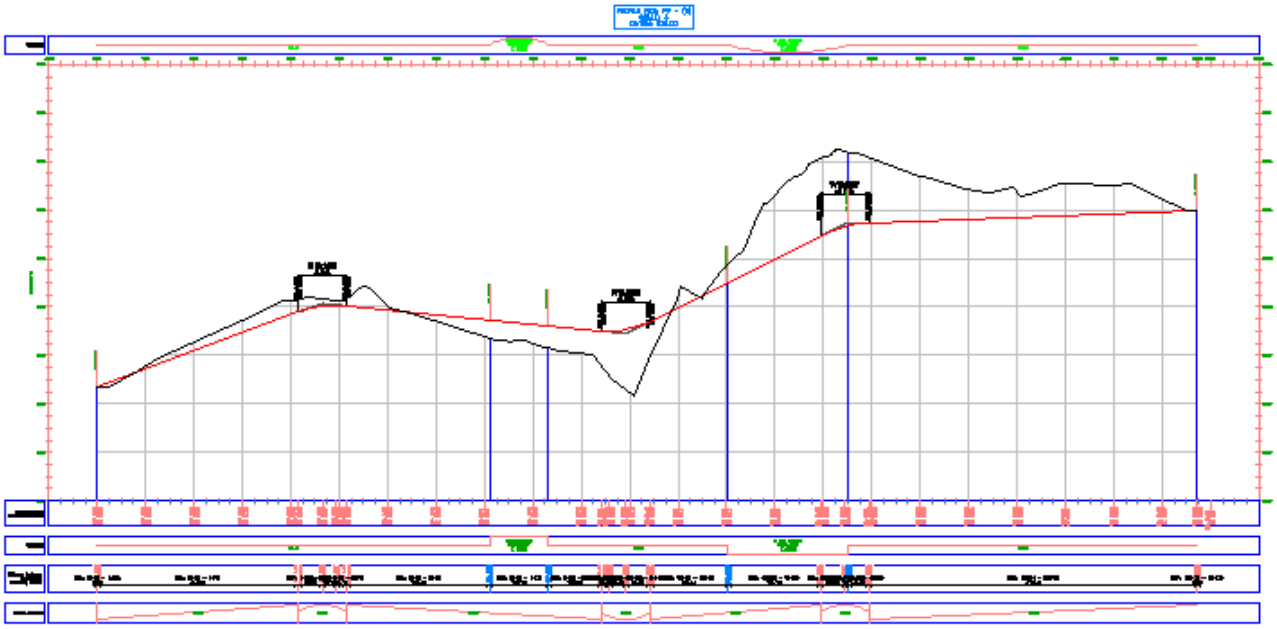
Rearrange the data bands

1. In the table of bands list, select the Vertical Geometry band. Click ⇩ twice, then click Apply.

   The Vertical Geometry band moves to the bottom of the stack of data bands.

2. Click OK.

   This arrangement of bands is convenient for analysis. It displays horizontal and vertical geometry, as well as comparative elevation data for the surface profile and the layout profile.
   Notice that in the bottom, Vertical Geometry band, the labels in the uphill tangents are obscured by the tangents. You will correct this in Modifying a Data Band Style.



To continue this tutorial, go to Moving Labels in a Data Band.

Optional Exercise 18: Moving Labels in a Data Band

In this exercise, you will learn how to rearrange labels in data bands.

Data band labels may overlap one another if the points they label are close together. In this exercise, you will learn how to stagger a series of labels in a data band, and then move individual data band labels to specific locations.

This exercise continues from Adding Data Bands to a Profile View.

Stagger data band labels

This Exercise continues using Profile-6A.dwg, with modifications you made in the previous exercise.

The data bands at the bottom of profile view PV - (3) annotate the horizontal and vertical geometry of the proposed road alignment, and the elevation of each profile at the major stations.

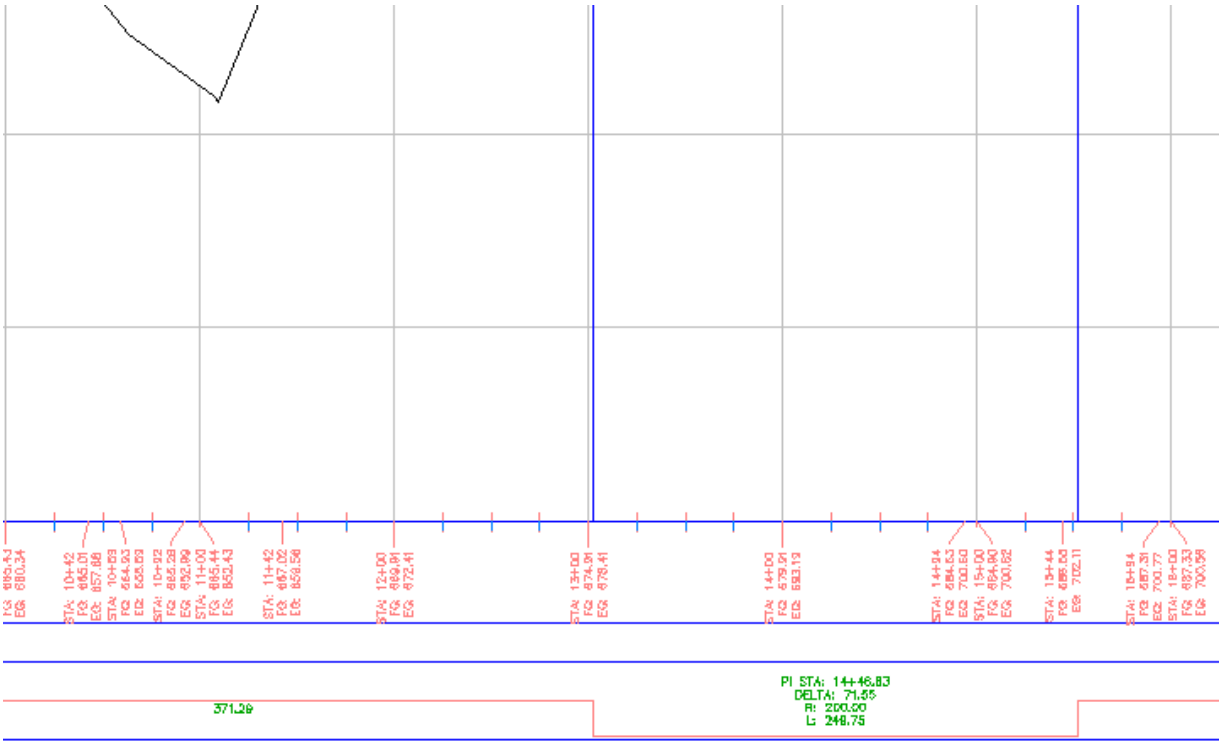
1. Zoom in to the following area.

The horizontal and vertical geometry labels overlap in this area.

2. Select one of the geometry labels in this band. Right-click. Click Properties.
3. In the Properties palette, under Staggering, specify the following parameters:

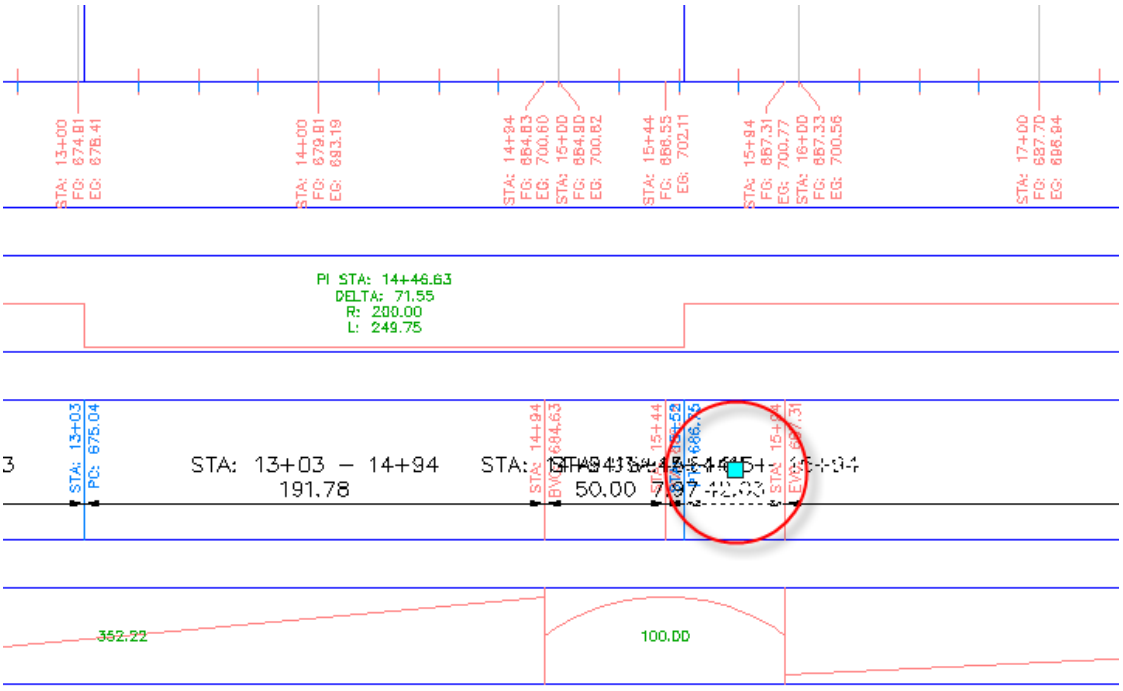
- Auto Stagger: **Stagger Both Sides**
- Stagger Line Height: **0.0250**

The band labels are evenly spaced along the data band, and leader lines are created to the label anchor points.

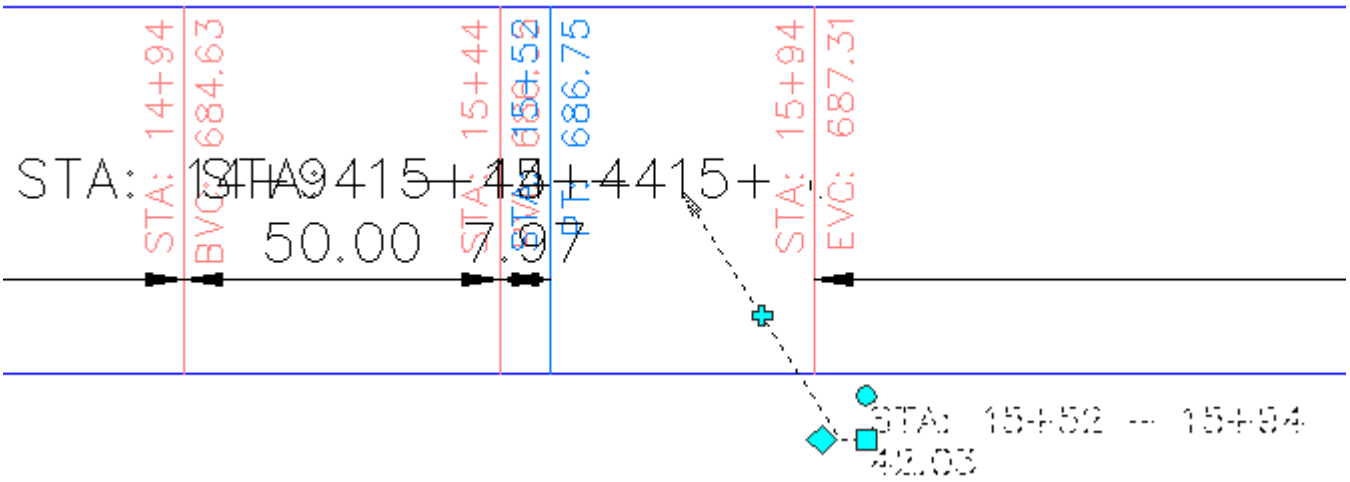


Move data band labels

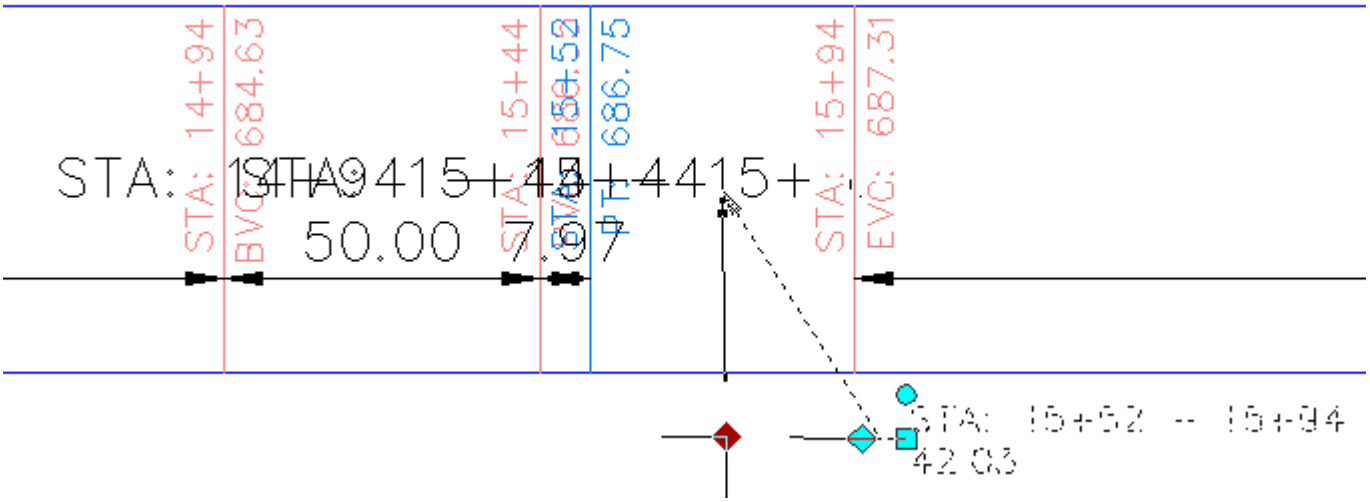
1. In the bottom data band, Ctrl+click the following label.



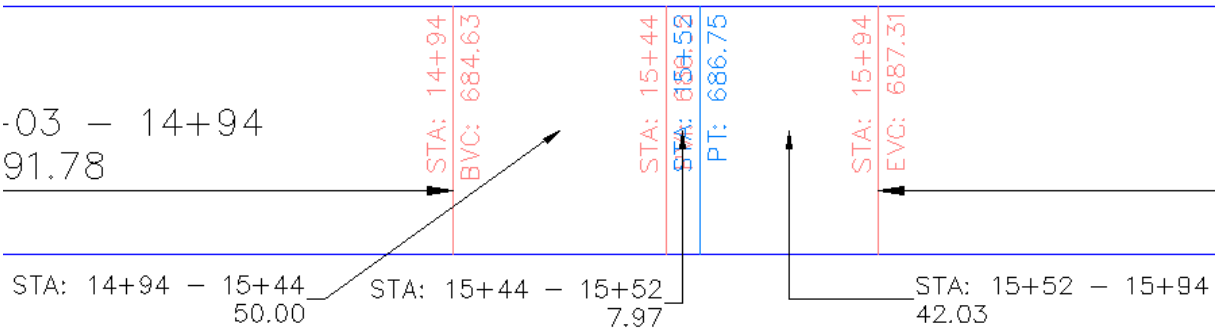
2. Drag the grip down and to the right. Click to place the label.



3. Click the ✚ grip. Drag the grip to the left. Click to place the grip.
   A new vertex is added to the label leader line.



4. Repeat Steps 1 through 3 to move the labels that are to the left of the one you just moved.



To continue this tutorial, go to Modifying a Data Band Style.

Optional Exercise 19: Modifying a Data Band Style

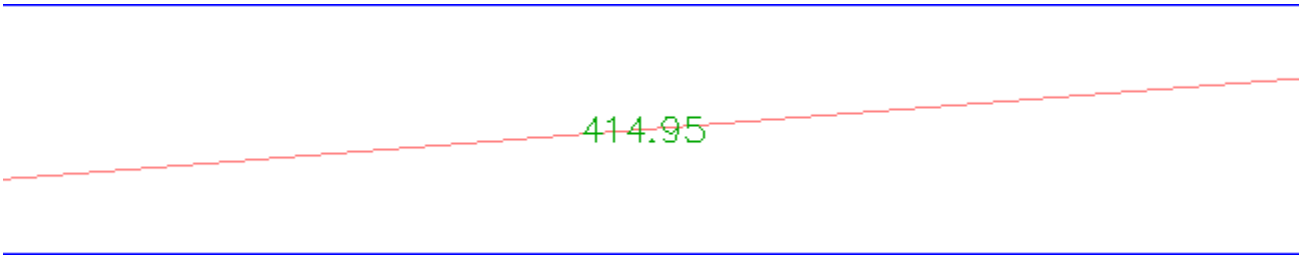
In this exercise, you will learn how to change the data that is displayed in a data band.

This exercise continues from Moving Labels in a Data Band.

Modify the data band style

1. Open Profile-6C.dwg, which is located in the tutorials drawings folder.

   Notice that in the bottom, Vertical Geometry band, the labels in the uphill tangents are obscured by the tangents.



2. Select the profile grid. Right-click. Click Profile View Properties.
3. In the Profile View Properties dialog box, on the Bands tab, in the Location field, select Bottom Of Profile View.
4. In the Vertical Geometry row, click next to **Geometry**.
5. In the Pick Band Style dialog box, click Edit Current Selection.
6. In the Vertical Geometry Band Style dialog box, on the Band Details tab, in the Labels and Ticks area, the At field indicates which type of band labeling has the focus of the editing tools. Make sure that Uphill Tangent is selected.
7. In the Labels and Ticks area, click Compose Label.

   The Label Style Composer dialog box contains the controls for creating and editing label components. Notice the many controls that are available for band label format.

8. In the Text collection, change the Attachment value to Bottom Center.
9. Click OK three times.
10. In the Profile View Properties dialog box, click Apply.

    Notice that in the drawing, the position of the data band's uphill tangent label has changed.

Further exploration: Change the label position for the downhill tangents and sag and crest curves.

Parent topic: Tutorial: Working with Data Bands