CHAPTER

6

Profile Views and Profiles

INTRODUCTION

Road design’s second step views an alignment from its side, showing the elevations along its path. In Civil 3D, a profile view is a grid that displays and annotates a profile’s stations and elevations. A profile is the elevations from a surface or line work representing a roadway’s vertical design within a profile view. Civil 3D dynamically links the profile view (grid) and the surface profiles to the alignment. If you are editing the alignment (move, shorten, or lengthen), the profile view and the surface profiles change to show the modified alignment’s length and elevations. Changing a surface causes its profile to change within a profile view. The vertical design unaffected by a changing alignment will need adjustment after changing an alignment’s geometry.

Styles affect the grid format, the grid annotation and types, profiles, and their display properties. A complicated web of dependencies and styles makes up the final profile view and its profiles.

OBJECTIVES

This chapter focuses on the following topics:

- Introducing and Creating a Profile Grid
- Creating a Simple Profile Grid Style and Modifying Existing Grid Styles
- Introducing and Creating a Profile
- Creating a Simple Profile Style and Modifying Existing Grid Styles

OVERVIEW

This chapter covers roadway design’s second phase, profile view and profiles. A profile view is a graph that represents an alignment’s stationing and elevations along that alignment’s path. A profile is line work within a profile view that represents surface elevations along an alignment’s path or a proposed roadway’s vertical design. A profile view and its surface profiles are the backdrop for the proposed roadway vertical design.
It is in the profile view that you start developing a feel for a road design’s impact on earthworks volumes. The proposed roadway’s height above or below existing ground’s elevations begins by giving visual feedback as to amounts of earthwork or what problems need to be resolved to build the road (see Figure 6.1).

**FIGURE 6.1**

There are three steps to creating a profile and profile view. First, there must be data; an alignment and its profile data which can be a surface or a file containing alignment stations and their elevations. The second step is creating the profile (sampling surface elevations, assigning styles, and adjusting other values), and the last step, if you chose to do so, is immediately creating a profile view containing the profile(s).

Profile and Profile View steps:

1. Have an alignment and a surface or read profile data from a file
2. Create a Profile
3. Create a Profile View

A profile view can contain multiple profiles (surfaces and proposed vertical designs). Each profile can have a different style, thus allowing it to display its information uniquely in the profile view.

**Unit 1**
A Profile View is a graph in which profiles are drawn. A profile represents the existing ground, subsurfaces, or one or more proposed vertical designs. The styles that affect a profile view and its profiles are the focus of this first unit.

**Unit 2**
The second unit of this chapter reviews the steps needed to create a profile and its Profile View.

**Unit 3**
Within a profile view and an existing ground profile, a designer creates a vertical (alignment) roadway design. A vertical alignment contains tangents and vertical
Curves. Civil 3D has three vertical curves types: circular, symmetrical, and asymmetrical parabolic curves. Creating a vertical alignment is the topic of the third unit of this chapter.

**Unit 4**
The analysis and editing of a vertical alignment (profile) is the focus of this chapter's fourth unit. This unit reviews a vertical alignment using Toolbox reports, the Inquiry Tools, profile properties, and vistas within the vertical editor.

**Unit 5**
The fifth unit of this chapter reviews profile and vertical alignment annotation and projecting 3D objects to a profile view. The annotation is the result of label sets applied when a profile is created or is the result of labels that are added after the profile is created.

**UNIT 1: PROFILE VIEW AND PROFILE STYLES**

A Profile View is a graph in which profiles exist. Profiles within a view represent existing ground and other surfaces along an alignment and one or more proposed vertical designs.

**PROFILE VIEW**
Profile View is a grid that represents alignment stations and elevations along its path. Stations are along the graph's top or bottom and create vertical lines to mark the stations in the profile view's elevation area (see Figure 6.2). The station interval has a major and minor increment with station annotation at the major stations (minimally). All values are user specified and set in the styles applied to the profile view.

Elevations are measured from a graph's datum (lowest elevation) upward to the highest elevation. The line interval is an even elevation (every 2 or 5 feet, for example) and has secondary tick marks at minor increments with annotation at major elevations (minimally). All values are user-specified values set in the styles applied to the profile view.

![Figure 6.2](https://example.com/figure62.png)

**FIGURE 6.2**
Traditionally a profile view is 1/10th of the horizontal scale. If you are working with a drawing that has a 1" = 40' scale, the vertical scale is 1" = 4' (1 inch of paper represents 4 feet of relief).

**PROFILE VIEW STYLE — FULL GRID**

A Profile View Style defines values that affect titles and defines station and elevation annotation. A Profile View Style is a multi-tabbed dialog box with each tab affecting different aspects of the view.

**Information**

As with all styles, there is an Information tab. This tab contains the name, description, and details on who created or modified the style as well as when that style was created or modified.

**Graph**

The Graph tab affects the vertical scale and profile view direction (see Figure 6.3). The panel’s top half lists the current vertical and horizontal scales, and the amount of vertical exaggeration. By default, a vertical scale is 1/10th of the horizontal scale. If the horizontal scale is 1" = 40', then the vertical scale is 1" = 4'. The vertical scale at the top left sets traditional scales and just below it, a user can set a custom scale value.

The panel’s lower half sets the profile view’s direction (left to right or right to left).

![Figure 6.3](image)

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Grid

Grid’s top sets a view’s clipping parameters. There are four possible toggle combinations: all on; all off; clip horizontally; and clip vertically. The effect of toggling on all clip toggles is seen in the right side of Figure 6.4. The left side of Figure 6.4 shows what occurs when all the toggles are off.

FIGURE 6.4

If you are toggling on only horizontal clipping, the right side of Figure 6.5 shows the result. If you are toggling on only vertical clipping, the left side of Figure 6.5 shows the result.

FIGURE 6.5
The panel’s lower left sets the major grid padding around a grid. The panel’s lower right sets an axis offset. When the axis offset has a positive value, a gap appears between the axis and the grid lines (see Figure 6.6).

**FIGURE 6.6**

**Title Annotation**

The panel’s left side sets the title’s content, text style, text size, and location (see Figure 6.7). The title has a justification setting and a border toggle. The panel’s right side sets the title text, justification, text style, size, and content, for each of the four axes.

**FIGURE 6.7**
**Horizontal Axes**

Horizontal Axes defines major and minor station text and tick intervals, text styles and size, and titles (see Figure 6.8). Station labeling can be at the top, bottom, or both. The panel’s top toggles the settings for the grid’s top or bottom and if the first grid line is annotated. The rightmost column defines ticks that represent the horizontal geometry that is displayed in the view.

![Profile View Style - Full Display](image)

**FIGURE 6.8**

**Vertical Axes**

Vertical Axes defines the elevation annotation’s major and minor text and tick intervals and text styles, justification, rotation, and size (see Figure 6.9). Elevation labeling can be at the right, left, or both. The panel’s top center toggles the side to which the settings apply and whether the first elevation grid line has annotation.
Display

Even though a style defines the profile view axes’ annotation, the Display tab settings determine what annotation the view style actually displays. The Display tab lists all of the view’s components, their layer, layer properties, and their visibility (see Figure 6.10). Even though every possible tick, grid, or label is defined, they will show only if they are turned on in this panel.
BAND SETS
A Band Set name is an alias for a Band Styles collection and depends on specific (band) styles to create their definition. Band Sets place vertical and horizontal information as a band at the profile view's bottom (or top) (see Figure 6.11). Traditionally, a band is at the profile view's bottom. A band's information may include the following: elevation or station values; graphics representing vertical, horizontal, section, or superelevation geometry; or a pipe network. When there is more than one band, the bands stack below the view with a gap between them. The Create Profile View dialog box assigns band sets when you create a view. Profile view’s Properties dialog box, Bands panel manages bands already assigned to a view (add, delete, or modify).

If the band set contains station and elevation data, it displays the same data as a profile view style. You need to turn off the profile view annotation to remove it from the view, otherwise it will show in the band.

A Band Set can have one or any combination of six band styles types: Profile Data; Horizontal and Vertical Geometry; Sectional Data; Pipe Network Bands; and Superelevation data. These six style types are themselves a collection of values from their respective object type values. For example, the Profile Data styles emphasize labels for major and minor stations, horizontal and vertical geometry points, and station equations. The Vertical Geometry styles emphasize Up and Down hill tangent and sag and crest curve labeling, etc.

Profile View Properties’ Bands panel manages its assigned band sets: add, delete, or modify (see Figure 6.12). When you are creating a Profile View from a surface, Civil 3D automatically assigns the surface to Profile 1 and Profile 2. The assignment remains until a specific profile is reassigned to Profile 2. Generally, this assignment is after the proposed vertical design has been drafted.
Band Styles

All band style dialog boxes have four tabs: Information, Band Details, Display, and Summary (see Figure 6.13). The Band Details panel defines all potential style labels and the Display panel defines what label components are displayed.

The Information and the Summary panels are the same for all styles. Information names and records the style’s creation and modification dates. The Summary panel reviews only the basic settings for each label type and tick and does not review specific label values. Viewing specific label values is the function of the Band Details tab.

Profile Data Band Style

Profile Data Band style annotates major and minor stations, stations and elevations, cut and fill, profile elevations, etc. Each band type style will have a different list of values.

Band Details

Band Details defines the band’s title text style (top left), title content, its size, and location (middle left), and the band’s general layout (see Figure 6.13). The layout area (bottom left) includes the gap between the band and the profile bottom (or top) and the title’s text box width and height.
Band Details panel’s critical part is what is not visible. What is hidden are listed label Types label definitions: At Major Station; At Minor Station; etc. When you highlight a label type and click Compose Label…, the Label Style Composer dialog box opens and names the label type you are reviewing or creating (see Figure 6.14).

When the Component Name drop-list arrow is clicked, it lists all of the label’s components. Figure 6.14 lists all of Profile Data style’s At Major Station label components. By selecting each label type (At Major Station, At Minor Station, etc.), clicking Compose Label…, and listing its Component Name, the style reveals what it labels.
Display
Display’s settings assign each component its layer, properties, and visibility for a band’s title, ticks, and lines (see Figure 6.15).
**Vertical Geometry Band Style**

Vertical Geometry draws and annotates critical proposed vertical design values (see Figure 6.16). This style uses an assigned profile as data for its labels and this style also sketches its geometry in the band.

![Vertical Geometry Band Style - Geometry](image)

**FIGURE 6.16**

**Horizontal Geometry Band Style**

Horizontal Geometry draws and annotates critical horizontal alignment values (see Figure 6.17). This style uses an assigned alignment as data for its labels and then it sketches its geometry in the band.
Superelevation Band Style

Superelevation Band style annotates proposed superelevation critical points (see Figure 6.18). This style uses an assigned alignment as data for its labels and sketches the superelevation in the band.
Sectional Data Band Style
Sectional Data Band style creates annotation that represents data from a sample line group: sample line stations (At Sample Line Station) and the distance from the previous sample line (see Figure 6.19). These styles use an assigned sample line group as data for its labels.

Pipe Network Band Style
Pipe Network Band style creates annotation from an assigned pipe network (see Figure 6.20). The band labels structure and pipe values: station, inverts, slope, length, etc.
PROFILE STYLES

Profile styles affect the way a profile is displayed in a profile view. In any implementation, there will be at least four profile styles: existing ground: right and left; and design. These styles visually differentiate the profile types in a profile view (see Figure 6.21).
PROFILE LABEL SETS AND STYLES
Profiles have Label Sets. A Label Set name is an alias for a collection of profile label styles. Profile label styles focus on Major and Minor Stations, Horizontal Geometry Points, Lines, Grade Breaks, and Sag and Crest curves. The label set most often used is the one assigned to a vertical design. You can later change a profile's labels in its Properties dialog box (see Figure 6.22).

![Profile Label Set](image)

**FIGURE 6.22**

Station
Station styles label vertical designs with major, minor, and horizontal geometry points.

Major, Minor, and Horizontal Geometry Styles
The Major and Minor Station styles are interval label styles. The Major and Minor label styles frequency is set by the profile view stationing parameters. The Horizontal Geometry Points labels attach to the vertical design. The data types for the label styles include alignment, profile, and superimposed profile data (see Figures 6.23 and 6.24).
Grade Breaks

Grade Breaks labels a profile tangent’s beginning and ending station. Using this label on surface profiles creates a multitude of labels. Like all Profile labels, the focus of Grade Breaks labels should be the vertical design, not surface profiles (see Figure 6.25).
Line label styles annotate a profile tangent’s grades and/or slopes. In addition to tangent information, additional alignment and profile data is available to this style (see Figure 6.26).

Curve label styles annotate a profile’s vertical curve’s critical values. In addition to curve information, additional alignment and profile is available to this style (see Figure 6.27).
The Add Labels command adds labels to a profile after creating it. These labels include two point profile view label styles: Station and Elevations; and Depths. Figure 6.28 shows a Station and Elevation label style example. These labels appear in the profile view’s grid.

**ADD LABELS LABEL STYLES**

The Add Labels command adds labels to a profile after creating it. These labels include two point profile view label styles: Station and Elevations; and Depths. Figure 6.28 shows a Station and Elevation label style example. These labels appear in the profile view’s grid.

**PROFILE VIEW AND PROFILE SETTINGS**

The Edit Drawing Settings dialog box contains several values that affect profiles, profile views, and their labels. Any style in the Profile settings branch can override these
initial settings. However, if the Edit Drawing Setting values are locked, the lower styles that reference the locked values cannot change the values.

**Edit Drawing Settings — Object Layers**

Edit Drawing Settings sets profile object base layer names. Each layer can have a modifier (prefix or suffix) and its value is the profile’s name (see Figure 6.29).

![Figure 6.29](image)

**Edit Drawing Settings — Abbreviations**

This section defines critical points profile abbreviations (see Figure 6.30). You can change these values to reflect area conventions. These abbreviations are for reporting or listing critical profile points.
Edit Feature Settings — Profile View

Edit Feature Settings has four sections that assign initial profile view values. Default Styles assigns view, marker, label set, and Add Label styles (see Figure 6.31). Default Name Format defines how to create a profile file view name.
Profile View Creation sets whether a file is to be split when created, whether to set elevation values manually, and what parts of a pipe network to include (only selected segments or the whole network). Split Profile View Option assigns whether a profile should be split when it is made and how to determine the split view section’s datum elevation (see Figure 6.32). Stacked Profile View Options determine if profile view are stacked or set side by side. Default Projection Label Placement settings specify the default placement of labels for objects projected to profile views.
Profile’s Edit Feature Settings dialog box assigns initial styles and a label set for all Profiles (see Figure 6.33). Default Styles assigns what style appears when a new profile is created. Default Name Format defines the Profiles, Offset Profiles, Superimposed, and the 3dEntity Profile Name Template naming convention.

**FIGURE 6.32**

**Edit Feature Settings — Profile**

Profile’s Edit Feature Settings dialog box assigns initial styles and a label set for all Profiles (see Figure 6.33). Default Styles assigns what style appears when a new profile is created. Default Name Format defines the Profiles, Offset Profiles, Superimposed, and the 3dEntity Profile Name Template naming convention.
The Profile Creation section sets the default vertical curve type (parabolic) and the initial values for each vertical curve type (circular, parabolic, and asymmetrical parabolic), and vertical curve design parameters (eye height, stopping height). Criteria-Based Design Options toggle on their use and also set the name of the Default Design Check Set (see Figure 6.34).
VERTICAL SEGMENT CHECKS

A user evaluates a design by comparing AASHTO charts to a design. If a user does not want to use criteria design values, then the user can define design checks for vertical tangents and curves. Defining these checks is similar to defining an expression (see Figure 6.35). Figure 6.35 defines a tangent and curve check.
Summary

- Edit Drawing Settings sets initial values used by all Profile View or Profile styles and commands.
- Even though they define all possible profile view annotation, the display settings control what is visible for the profile view style.
- Profile Styles assigns component layers and their properties.
- Profile label styles are primarily for vertical alignment labeling.
- A Profile Label Set places labels in a profile view, and a Profile View Band Set places data at a Profile View’s top or bottom.
- Add Labels creates Station and Elevation and Depth labels after creating profiles and their view.
- Instead of using criteria-based design, a user can define a series of design checks.

Unit 2: Creating a Surface Profile and Its View

Creating a surface profile and its profile view is a two-step process: sample surface elevations and create a profile view. These two steps can be executed as a single command sequence or as two separate steps. You can create a profile view without a surface; however, you will have to add elevations to the profile view to view its grid.

Surface Data

First, you determine the elevations along the alignment’s path. To do this, Civil 3D samples a surface or reads a station and elevation data file. This step associates surface or file elevations to the alignment stationing. The easiest method is to sample surface elevations. If you have multiple surfaces, you can sample one or all of them.

Create Surface Profile

The Create Profile from Surface dialog box displays values necessary to sample a surface (see Figure 6.36). The dialog box’s top left sets the alignment, and its top right sets the surface(s) to sample. The dialog box’s middle left sets the beginning and ending sampling stations. By default, they are the alignment’s beginning and ending stations. At the middle right, the Sample offset is toggled on for use. The box to the toggle’s right lists offset sampling distances (to the alignment’s right and/or left side). Each offset appears as a separate entry in the Profile list with its assigned offset value. On the dialog box’s right side, the Add button places the selected and set items in the Profile list (dialog box’s bottom).

The Profile List displays each profile’s sample information as a row of information. If you have multiple entries, multiple profiles are created. Each profile entry displays the surface name, type, update mode, profile style, stations, and minimum and maximums elevation. Each profile can have a different Profile style and values.

At the dialog box’s bottom are two important buttons: Remove and Draw in profile. Remove deletes unwanted Profile list entries. Draw in profile view calls the Create View Wizard, and creates a profile view (grid) for the listed profile(s). If you click OK, then creating the profile view is a separate step.
CREATE PROFILE VIEW

Create Profile View displays a wizard. The wizard defines the name, style, band set, stations, elevations, station splits, and view contents.

General

General sets the alignment's name and sets the profile view's name, profile view style, and its base layer, and if there are multiple profiles, they are stacked (see Figure 6.37). If multiple profiles are not stacked, then all profiles appear in a single profile view.
Station Range
Station Range sets the profile view’s station range; it may be different from the sampled range (see Figure 6.38). If set to Automatic, the values are the sampled station range. When set to manual, the values are a user-specified range.

![Create Profile View - Station Range](image)

**FIGURE 6.38**

Profile View Height
Profile View Height sets the profile view’s elevation range (see Figure 6.39). If set to Automatic, the values are the sample elevation range. If set to manual, they are a user-specified range. When User specified is toggled on, the lower half of the dialog box becomes active. It is here that a user can split a profile into three segments using station and elevation settings with each having their own profile view style. Splitting a profile view creates a profile view with limited vertical height. This is not usually necessary when a user creates an initial design profile; however, when a user creates plan and profile sheets, splitting the profile may be necessary.

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Profile Display Options
Profile Display Options determine which profiles to display and their mode, it sets their object and label styles, and it reviews their station and elevation values (see Figure 6.40).

FIGURE 6.39

FIGURE 6.40
**Pipe Network Display**

Pipe Network Display selects entire pipe networks or their pipes and structures to draw in a profile view (see Figure 6.41). By selecting a network, all of its pipes and structures are selected. The Show only parts selected to draw in profile view draws only selected parts in the profile view.

**Data Bands**

Data Bands sets the Band Set (top), its location (middle), and its properties (bottom) (see Figure 6.42). When you are creating the initial profile view, there is usually only one profile. In this case, the wizard assigns the surface profile to Profile1 and Profile2. When you are defining the second profile, you must change Profile2’s assignment to the new profile.
SUMMARY

- The Create Profile from Surface command samples one, all, or any combination of surfaces.
- The Create Profile or Create Profile View dialog box select which profiles appear in a profile view.
- A Profile View can pad the grid area around a profile.
- A Profile View can clip the horizontal or vertical view grid.
- A Profile View’s annotation is around its grid perimeter.
- A Profile style assigns a component’s layer name and properties.
- A Profile’s annotation is within a profile view’s grid.
- Profile View label styles are placed after the profile(s) and the views are created.

UNIT 3: DESIGNING A PROPOSED PROFILE

Within the profile view and its existing ground profile, a designer creates a vertical road design. This design goes by many names: vertical alignment, finished ground, etc. A vertical alignment contains proposed tangents (lines) and vertical curve segments.

Vertical curves transition a vehicle from one grade to the next. There are two types of vertical curves: crest (transitioning from an up to a down grade) or sag (transitioning from a down to an up grade). There are three vertical curve types: circular, asymmetrical (parabolic), and parabolic. The parameters to create these curves are curve length or a K Value. A K Value represents the horizontal distance along which a 1 percent change in grade occurs on the vertical curve and is a measure of abruptness.

PROFILE CREATION TOOLS

The Home tab’s Create Design panel’s Profile – Profile Creation Tools toolbar has several commands creating a design profile. See Figure 6.43.

Create Best Fit Profile

The Create Best Fit Profile uses cogo points projected into a profile and sorted by station to create tangent segments. If the points also define a curve, the routine will create an arc or parabola up to a user-specified value. If the points create a curve exceeding this value, the routine creates a PVI. This routine also uses 3D polylines and feature lines.

Create Profile from File

This routine reads a file containing station and elevation values to create a profile. The file must have a starting and ending station value with elevations. The file can also include vertical curve lengths. There cannot be a vertical curve at the beginning or end of a profile. Following is an example of a profile file that starts at station 1000 and ends at station 6300.

```
1000 1100.25
1050 1004.25
2000 1009.00 140.0
```
Create Superimposed Profile
The routine creates a copy of a profile from another profile view and places the copy in a second profile view. For example, a cul-de-sac has profiles for the bulb’s gutter line alignment and you want to place a copy of it into the cul-de-sac’s centerline profile. This allows you to evaluate the differences between the two profiles within the same profile view.

Create Profile from Corridor
This routine creates a profile from a corridor feature line. This routine is essential when wanting to develop vertical control for a corridor. The routine uses the corridor’s feature line’s current vertical values and places them in a profile view where you can refine their values with the profile editing tools.

Profile Creation Tools
The tools of the Profile Creation Tools toolbar are for designing a vertical alignment’s tangent and curve segments (see Figure 6.44). After starting the command and identifying the profile view, the Create Profile dialog box opens with two tabs assigning site, styles, and design criteria.
After setting the values in the Create Profile dialog box, click OK to display the Profile Layout Tools toolbar. Minimally, you can draft tangent (line) segments and later add the vertical curves to the alignment.

Clicking the toolbar’s leftmost icon’s drop-list arrow lists its available drafting modes: draw tangents only and tangents with vertical curves. The last item listed sets the vertical curve default values: curve length or K Value. The default type, length, and design values are from Profile’s Edit Feature Settings (see Figure 6.45).
The toolbar’s next three icons insert, delete, or move tangent Points of Vertical Intersection (PVIs).

**Tangents**
Tangents’ icon stack creates three tangent types; fixed, floating, and free (see Figure 6.46). You draft a fixed tangent by selecting two points, a floating tangent attaches to the end of an existing vertical curve, and a free tangent is drawn between two existing vertical curves. Fixed and Floating also use a best fit drawing method. The Solve Tangent Intersection routine creates intersection tangents even though they may not intersect.

![Figure 6.46](image)

**Curves**
The Curves’ icon stack drafts fixed, floating, and free vertical curves. See Figure 6.47.

**Fixed**
A fixed curve segment does not connect to or depend on preexisting segments. Fixed vertical curves have several variations: three points; best fit; selecting an endpoint and identifying a pass-through point; selecting two points and entering in the tangent grade at the start of the vertical curve; selecting two points and entering in the tangent grade at the end of the vertical curve; and selecting two points and entering a parameter (K or minimum radius).

**NOTE**
When describing fixed segments, think of zero dependencies.

**Floating.** Floating vertical curves have three variations: selecting an existing segment to attach to and identifying a pass-through point and a K value; selecting an existing segment to attach to and identifying a pass-through point and a grade; or using a best-fit method.

**NOTE**
When describing floating segments, think of one dependency.

**Free.** Free vertical curves have three variations: selecting two existing segments and specifying a K value or a radius; using a best-fit method; or selecting two existing segments and specifying a parabolic, asymmetrical parabolic, or circular vertical curve and setting additional parameters.

**NOTE**
When describing of free segments, think of two dependencies.
The next icon converts AutoCAD line work into profile segments.

The central three icons (left to right) create PVIs by entering their values in a table, raise or lower a PVI, and copy a profile.

The sixth icon in from the right toggles vertical design between PVI and entity-based commands.

The four icons on the right side are used to select sub-entities (tangents or vertical curves) for the Sub-Entity Editor, Delete Sub-Entities, and display a Grid View editor (overall alignment editor).

Vertical Design Check Sets marks tangents and curves that do not pass the Sets’ scrutiny.

**TRANSPARENT COMMANDS**

Seven transparent commands affect drafting a vertical alignment. The first three use a selection in plan view to set a value in profile view: Profile Station from plan; Profile Station and Elevation from Plan; and Profile Station and Elevation from COGO Point. Each of these methods prompts for a plan view selection and transfers the selection’s values to a profile view. The remaining four methods work inside a profile view: Station and Elevation; Profile Grade Station; Profile Grade Station; and Profile Grade Length. Station and Elevation prompts for a station and then prompts for its elevation. Profile Grade Station prompts for a grade, freezes the cursor at the specified grade, and uses the cursor to draft the tangent line with the grade. Profile Grade Station creates a PVI at a specific elevation using a fixed grade. The last method prompts for a grade, a starting point, and the length of the grade.

**PROFILE2 ASSIGNMENT**

Creating the initial profile view assigns the surface to both Profile1 and Profile2. Profile2 is traditionally the proposed vertical design and its elevations appear in the profile view's data band (see Figure 6.12). Profile2’s assignment is a manual step and is done in the Profile View's Properties dialog box.

**ASSIGNING DESIGN CHECKS**

When creating a profile, it can be assigned a design checks set. When a segment violates a design rule, it receives a tag indicating it did not clear the check.
EDIT LABELS...
If you are not adding labels while designing a profile, Edit Labels... adds or changes labels assigned to a profile. In the drawing, select a profile, press the right mouse button, and from the shortcut menu, select Edit Labels.... The Profile Labels dialog box lists currently assigned label types and styles (see Figure 6.48). The Add control allows for label additions to the current list and the Delete button deletes any assigned label type and style. The dialog box’s top right sets the label type and style to add, and at the bottom are controls to import a profile label set or to create one from the current label list.

![Profile Labels dialog box](image)

FIGURE 6.48

SUMMARY
- Profile's Edit Feature Settings dialog box values set the vertical curve's type, criteria, and calculation values.
- There are three vertical curve types: circular, symmetrical, and asymmetrical parabolic curves.
- There are three plan view vertical design transparent commands: Profile Station from Plan; Profile Station and Elevation from Plan; and Profile Station and Elevation from COGO Point.
- There are three profile view vertical design transparent commands: Profile Station Elevation; Profile Grade Station; and Profile Grade Length.
- You can create an initial vertical design with or without vertical curves.
- If you are creating an initial design with only tangent segments, you can add vertical curves at anytime.
- If you are creating overlapping vertical curves, the routine issues cannot resolve error and start prompting you for new values.
- If you are drafting an initial vertical design with tangents and vertical curves and there is no solution for a vertical curve, the routine will not draw a vertical curve.
Vertical alignment analysis and editing is this unit’s focus. The vertical design analysis uses Toolbox reports or information displayed in the Profile Layout Tools toolbar’s Grid View or Sub-entity editors. Also, grips graphically edit a design profile. The Inquiry Tool palette has profile and profile inquiry commands.

**PROFILE REPORTS**
Toolbox has several profile reports (see Figure 6.49). In Toolbox, select the report type, right mouse click, and from the shortcut menu, select Execute…. Depending on the report type, a user selects the profile or enters a Create Reports dialog box. Here, a user selects the profile and continues to generate the report.

**FIGURE 6.49**

**INQUIRY TOOL**
Inquiry Tool has two profile view and profile inquiries (see Figure 6.50). The profile view inquiries are Profile View Station and Elevation at Point and Profile View Elevation and Grade between Points. The Profile inquiries are Profile Station and Elevation at Point and Profile Elevation Difference at Station. Both query sets prompt for the surface and profiles. After selecting a point or point(s), the Inquiry Tool palette populates and displays the query results.
GRAPHICAL EDITING

Profile grips graphically manipulate its PVIs and segments. When selecting a profile, Profile displays grips to edit a vertical curve’s length, change its PVI location and elevation, or move a PVI by holding one tangent’s grade and changing the second tangent’s grade. When manipulating a PVI’s grip, all connected tangents change to accommodate its new location (see Figure 6.51).

Each grip type has a specific editing function. For example, round grips at a vertical curve’s end and midpoints lengthen the curve. PVI right and left arrow grips hold one
tangent’s grade while moving the PVI and changing the second tangent’s grade. A PVI red triangle grip adjusts both tangent grades, which changes the PVI’s location.

**PROFILE LAYOUT TOOLS EDITORS**

The Profile Layout Tools toolbar provides two editors for reviewing and editing profile tangent and vertical curve values: Grid View displays all vertical alignment values; and Profile Layout Parameters displays selected vertical segment values. Figure 6.52 shows the Profile Layout Parameter dialog box.

Making any adjustments in either editor causes the profile to recalculate and it is then redisplayed with its new values. Each editor indicates editable values with black print.

**FIGURE 6.52**

**SUMMARY**

- Toolbox reports a profile’s station, elevation, grades, and length of vertical curves.
- When you are graphically editing a vertical curve, manipulate its grips linked to specific geometric PVI and vertical curve points.
- When you are graphically editing a profile, round grips affect vertical curves.
- When you are graphically editing a profile, arrow grips affect the PVI’s location by holding the first or second grade.
- When you are graphically editing a profile, by selecting the triangular PVI grip, you change its location, the in and out grades, the PVI elevation, and/or the PVI station.

**UNIT 5: PROFILE ANNOTATION**

This unit reviews profile view annotation. A design profile can be annotated as it is created or after it has been created. This concept was reviewed earlier in this chapter.
SPOT PROFILE LABELS

A second profile annotation type is Profile View labels to annotate stations and elevations. The Add Labels, Profile Views menu, Add Profile View Labels command creates these label types: Station and Elevation and Depth. The Station and Elevation label annotates its namesake at user-selected locations (see Figure 6.53). After identifying the profile view, a jig appears connecting the stationing along the profile’s bottom to the cursor. After selecting the station, the jig freezes at the station and it switches to identify the elevation.

Depth annotates the distance between two selected points. If you are selecting a lower then a higher point, the label is a positive grade. If you are selecting a higher and then a lower point, the label is a negative grade.

FIGURE 6.53

PROJECTING OBJECTS TO PROFILE AND SECTION VIEWS

Civil 3D projects AutoCAD points, blocks, 3D solids and 3D polylines, Civil 3D COGO points, feature lines, and survey figures to a profile and/or section view. The objects must exist in the drawing before projecting them to a view and CANNOT start and end after the profile stationing. If the object’s type is not correct, the routine removes it from the projection selection set. A projected object may represent a waterline, cable line, electric lines, ROW lines for a profile and/or section, etc.

After drafting the object, in the Profile or Profile View ribbon tab, the Launch Pad panel’s right side, you select Project Objects to Profile View. After selecting the objects to project and the profile/section view, the Project Objects to Profile/Section View dialog box displays (see Figure 6.54). In the Project Objects to Profile View dialog box, for each selected object, you select a style, an elevation option, and if desired, a label style.
Projection Styles

A projected object style defines both profile and section behavior and is found in Setting’s Multipurpose section. The Information tab supplies the style’s name. The Profile and Section panels define the behavior for all possible object types (see Figure 6.55). You select the object type from a list by clicking the drop-list arrow at
the panel’s top left. Each object type has a unique properties list. Both Profile and Section have the same object type and properties list. The Display panel sets the profile and section layers and their properties. The Display tab sets the projection object’s layers (see Figure 6.56).

**SUMMARY**

- Station and Elevation are profile view labels.
- Depth labels the distance between select points within a profile view.

This ends the Profiles and Profile Views Chapter. The next chapter focuses on the Assembly, its subassemblies, and the roadway model, the corridor.