Autodesk Civil 3D Styles: A Guide to the Fundamentals

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Introduction

Autodesk® Civil 3D® software is a state-of-the-art design and drafting application from Autodesk. Built on the familiar AutoCAD® drawing environment, Civil 3D extends the tools and features available to surveyors, engineers, and drafters, enabling them to create dynamically linked models of proposed and existing project elements.

In the simplest terms, *dynamically linked models* are related entities within a drawing that automatically update when changes are made to one of the entities. These entities include drawing *objects* that comprise the model itself (such as digital terrain models, alignments, and corridors) and the annotation or *labels* associated with the objects. The appearance and behavior of these objects and labels are controlled by *styles.* Through styles, Civil 3D gives users great flexibility in the presentation of design elements. To get the most from Civil 3D, users can create customized styles, which, along with various other drawing settings, can be saved in a drawing template file (DWT) for easy reuse. For users who do not need customized styles, Civil 3D comes with a variety of ready-to-use styles and settings. This paper gives an overview of the various settings used to control drawing content, explains how styles fit into the hierarchy of settings, and describes how to get up and running quickly with customized styles.

Hierarchy of Settings

Autodesk Civil 3D uses several different settings arranged in a hierarchal structure to control the display and behavior of drawing objects and their labels. Settings are established globally at the top of the hierarchy through *drawing-level settings; style-level settings* provide further refinement and control. Finally, *object-level settings* enable users to apply individual settings to single entities.

At the highest level, drawing-level settings control the different settings for many of the features of newly created objects. The Drawing Settings dialog box shown in Figure 1 is accessed via the Settings tab in the Toolspace by right-clicking an open drawing and then choosing Edit Drawing Settings from the context-sensitive menu. As shown, various tabs control a range of drawingwide settings. The Units and Zone tab sets the drawing units and provides the option of establishing a coordinate system, projection, and data for the drawing. With a zone established, settings on the Transformation tab allow for the application of transformation settings such as sea-level scale factor and rotation.

In regard to working with styles and establishing the behavior and appearance of objects, the Object Layers tab is the most relevant. On this tab users define the default destination layers

for newly created objects and optional layer name modifiers. As objects are created, they default to the layer settings established here.

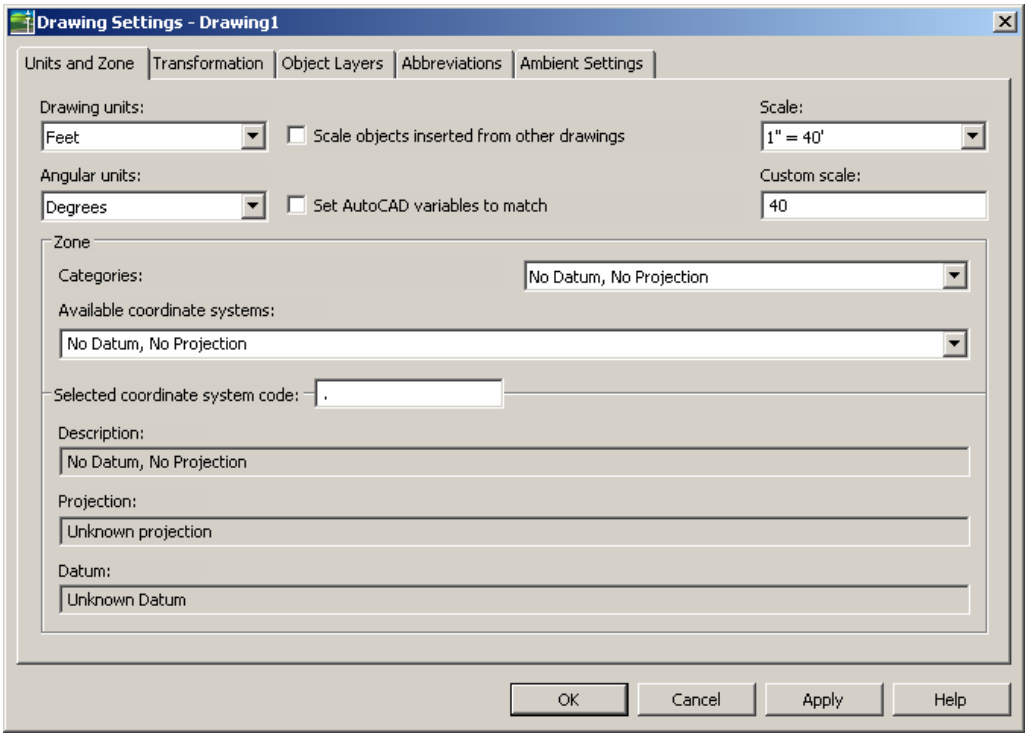

Figure 1. Drawing Settings dialog box.

The Abbreviations tab controls the default abbreviations used in annotating and labeling. The options on the Ambient Settings tab affect the default values when objects are created.

As objects are created in Autodesk Civil 3D, they are automatically assigned different style types: object styles, label styles, or both. These style-level settings represent the second tier of settings in the Civil 3D hierarchy. Users can take advantage of the predefined styles installed with Civil 3D, or they can create custom styles to suit particular needs. Many firms prefer their plans to have a unique look. With other software, this means a lot of manual annotation, labeling, or the use of custom or third-party applications. With style-level settings, users can achieve the same customized look with much less effort. Creation of styles and use of style-level settings are discussed in more detail later in this paper.

Although style-level settings often provide adequate control of object appearance and behavior, it sometimes may be necessary to apply specific settings to individual objects. Object-level settings make this possible by enabling the user to override drawing- and style-level settings on a per object basis.

Although the entire hierarchy of setting levels can be used to create a final drawing conforming to a specific set of criteria, the most commonly employed settings are the styles.

Styles

Style-level settings (hereafter referred to simply as *styles*) are implemented using three different style types: object styles, label styles, and table styles. These style types share common features and also have components unique to the entities to which they apply. The rest of this paper discusses the details of each style type and the recommended workflow for using styles.

Object Styles

Object styles control the display and design characteristics of an object. When the user creates an object, the software applies a style. Autodesk Civil 3D ships with a predefined style, named “Standard,” for each type of Civil 3D object. Many other predefined styles can be found in the sample templates included with the software. Although these styles may be suitable for certain applications, most users require styles customized to meet their specific needs.

The Settings tab of the Toolspace contains collections of styles for various entity types, such as surfaces, points, and alignments. Let’s use the alignment style as an example for creating a new object style. To easily create a unique object style, simply start with a copy of an existing style and then edit its properties as needed. Right-clicking the Standard object style and choosing Copy from the context-sensitive menu displays the dialog box shown in Figure 2, which is used to modify (or create) an object style.

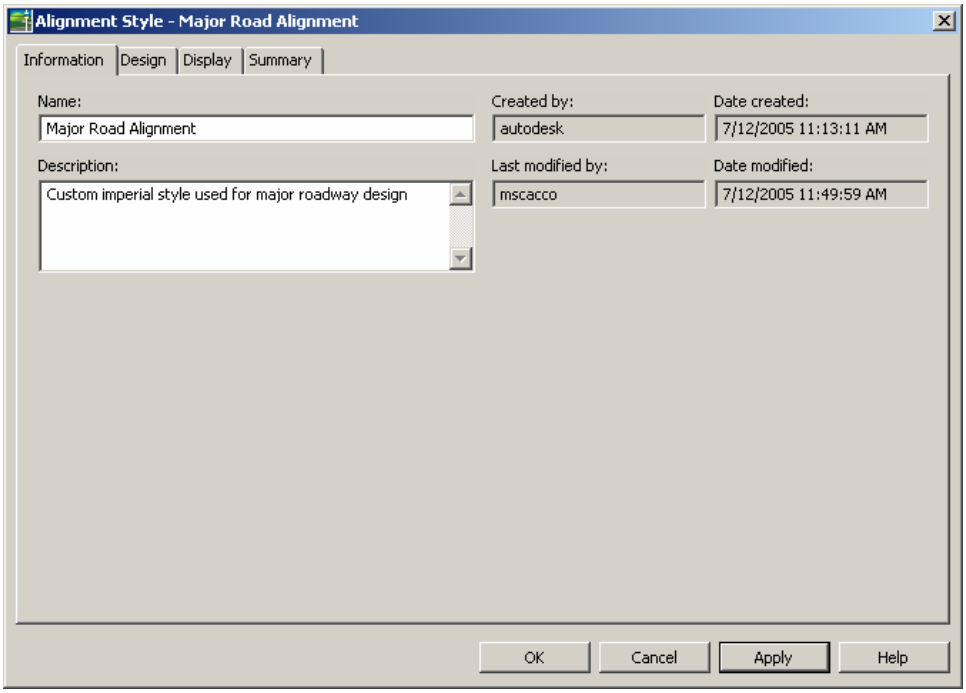

Figure 2. Alignment Style dialog box.

Many of the object-style settings are the same regardless of the object type, but each object type also has unique settings. For example, all objects have settings for Information, Display, and Summary, but alignment objects have an additional setting for Design. Let’s examine each tab to understand how to create a custom object style.

The Information tab is where you enter a name and an optional description for the style. In this example, the style name has been changed to Major Road Alignment.

For alignments, the Design tab is quite simple, with one setting for modifying grip-edit behavior.

Figure 3 shows the Display tab, which you use to establish settings controlling the appearance of objects. Each object type has several components, the display of which can be independently controlled to create a customized style. The tab bears some similarities to the familiar Layer Manager dialog box, providing options for component visibility, color, linetype, linetype scale, lineweight, and plot style. In addition, the layer on which the component is created is also controlled here. In this example, the various components for alignment linework (line, curve, and spiral) are each on separate layers. These could all just as easily be on the same layer, C-ROAD-ALIGN, for example. Note also that the visibility of

several components is turned off. Another feature of the display settings is the ability to represent the object differently in 2D and 3D views. In Figure 3, the view direction is set to 2D, indicating that the settings established are used when the object is viewed in 2D plan view. For 3D isometric views, simply change the view direction to 3D and then modify the settings as desired.

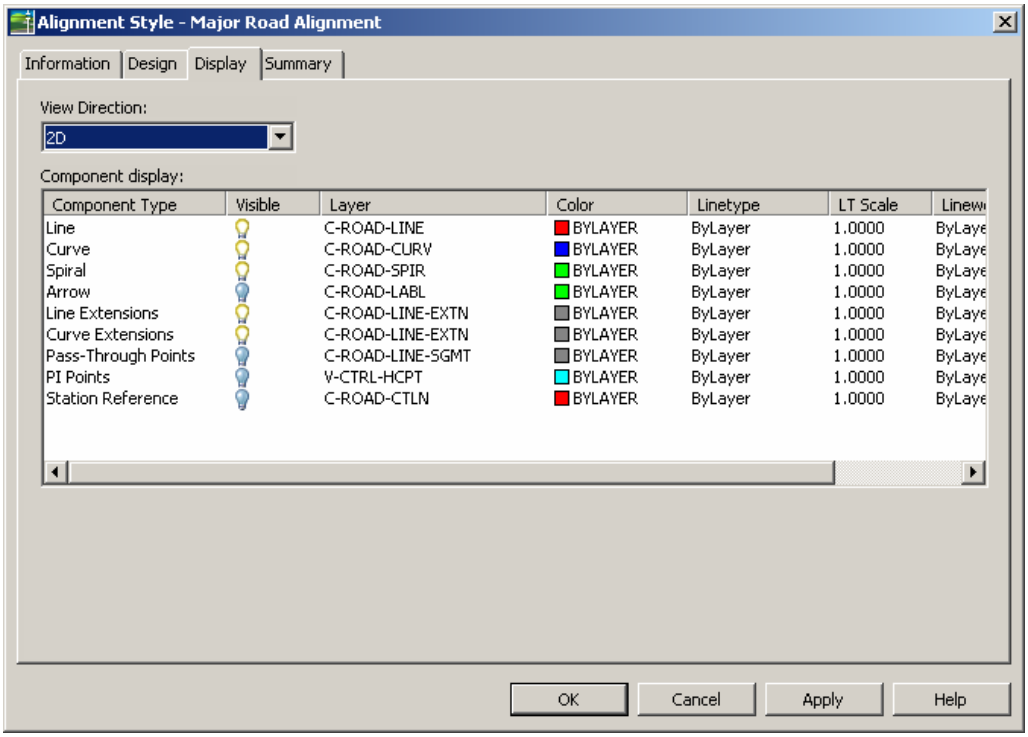

Figure 3. Alignment Style dialog box, Display tab.

The Summary tab provides a summary of the settings established on the other tabs in the Object Style dialog box. On this tab you can make changes to some of the settings on the other tabs, such as the Name and Description.

Once an object style has been created, it is ready to use. An object style can be applied in a few different ways. At the time the object is created, you must select the object style to be used or accept the default object style. Figure 4 shows the Create Alignment – Layout dialog box.

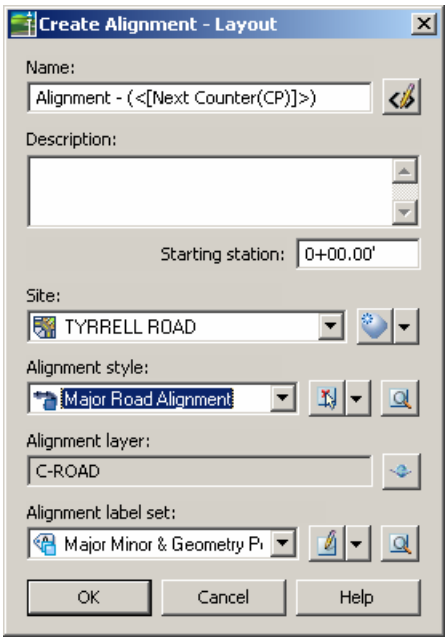

Figure 4. Create Alignment – Layout dialog box.

Use the Alignment Style drop-down near the middle of the dialog box to set the object style to be applied to the new alignment. When the alignment is created, it takes on the appearance and design characteristics as defined by the Major Road Alignment. Users have the option of creating a variety of different object styles and then selecting the appropriate style at the time the object is created. Alternatively, users can modify the object's style at any time after it is created. This is done via the object Properties dialog box accessed from the Toolspace Prospector or by right-clicking the object in the drawing space and choosing Properties from the context-sensitive menu. Figure 5 shows the Alignment Properties dialog box for a sample alignment, Route 45.

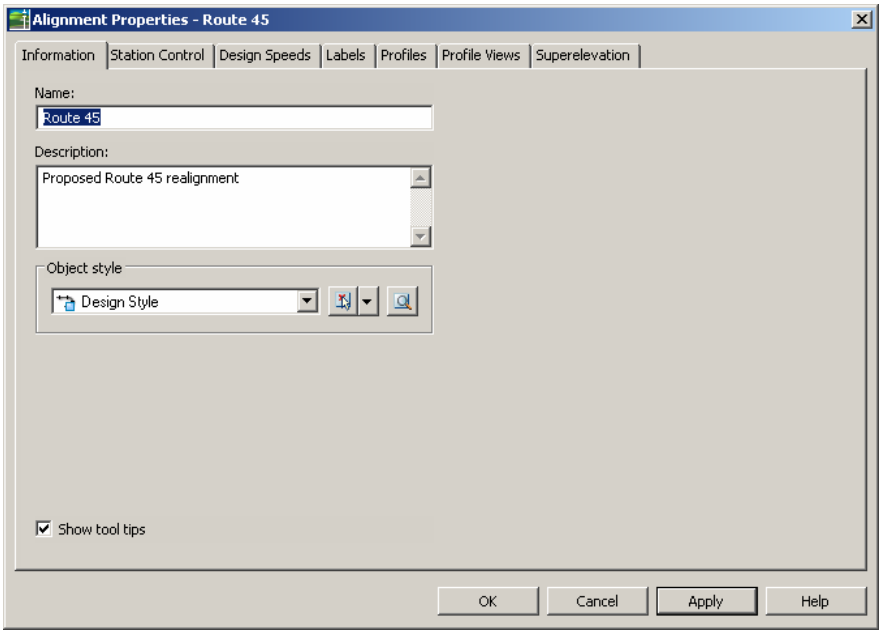

Figure 5. Alignment Properties dialog box.

The current object style for the alignment object is listed on the Information tab. Figure 5 shows the object style for this alignment as “Design Style.” From this tab, users can modify the object style by selecting a previously defined object style from the drop-down menu. Click Apply or OK to apply the new style to the object. The appearance and design characteristics of the object are updated to reflect the newly applied object style settings.

Use object styles to easily and effectively enforce company design and drafting standards. First, create a set of customized object styles, and then edit the feature settings for each object type to set the desired object style as the default. Figure 6 shows the Edit Feature Settings dialog box for alignments. Note the Alignment Style value is set to Major Road Alignment, the custom style created in the earlier example. The drawing is then saved as a template file (DWT) and used when creating new drawing files.

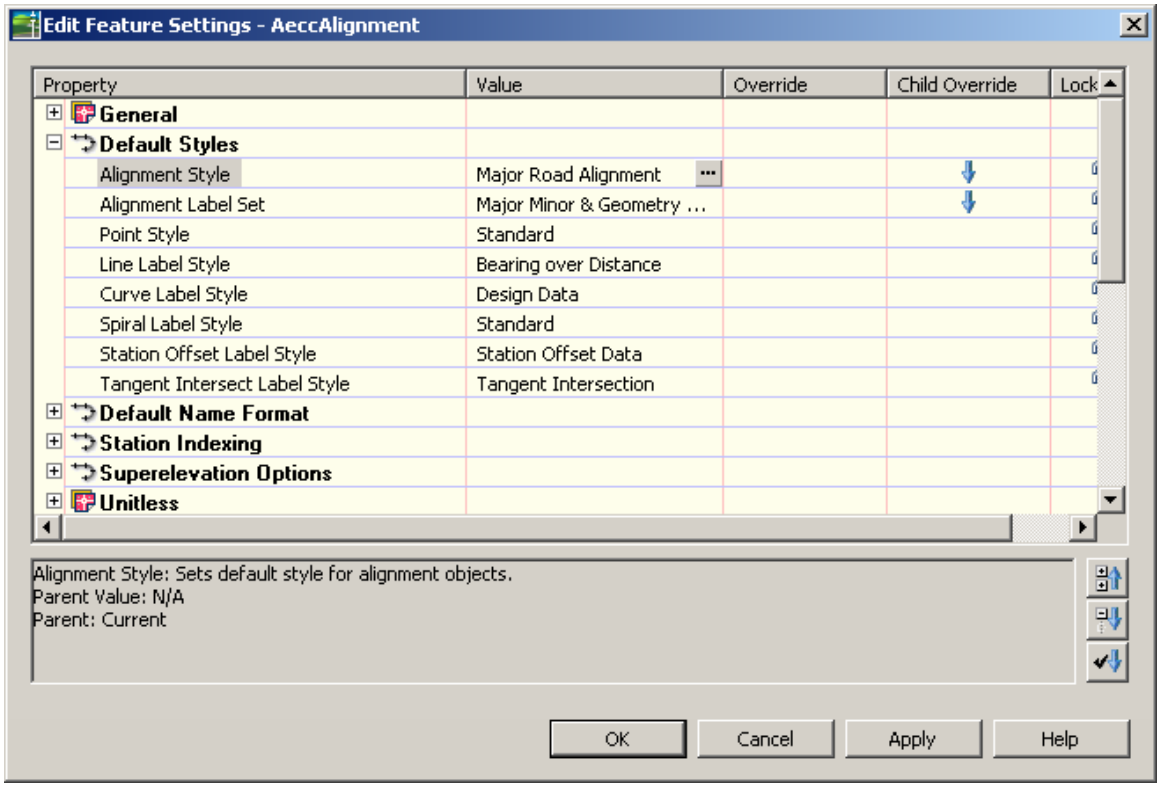

Figure 6. Edit Feature Settings dialog box for alignments.

Hint: Use either of the following methods to establish the feature settings for each object type:

- Edit the settings for all alignments that will be created by right-clicking at the top-level setting for an object type. In this case, right-click the Alignment setting to access the feature-level settings for all alignments that are to be created, as shown in Figure 6A.
- Change the command settings for an object so that you can provide greater control over how the object will be created or edited, as shown in Figure 6B. For example, you could define that all alignments created “by Polyline” would default to a different style and layer than alignments created using the Layout command.

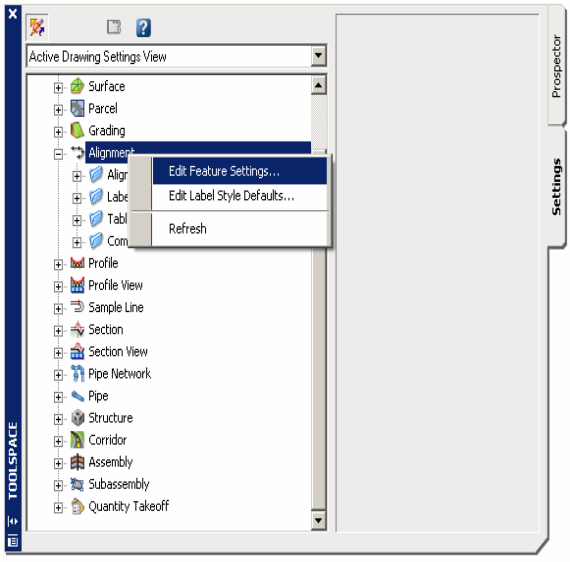

Figure 6A. Edit feature setting for alignments.

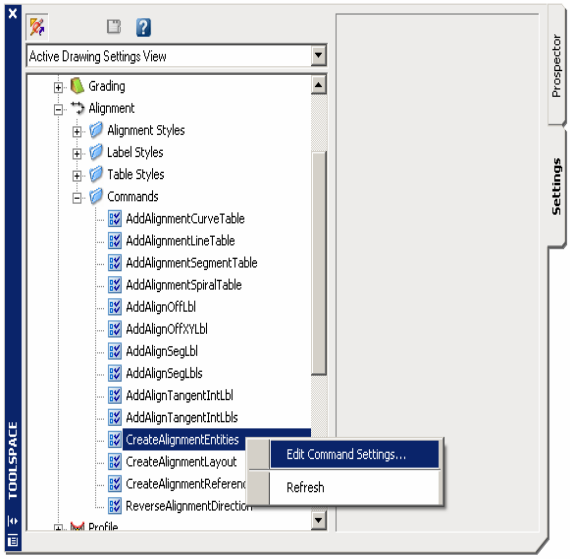

Figure 6B. Edit command settings.

In summary, object styles control the appearance and design characteristics of the objects themselves. You can create custom object styles to meet specific needs and use them as the default style for newly created objects. Save these settings in a drawing template for easy reuse.

Label Styles

Object styles control settings for objects, and label styles control the settings for the annotation and labeling of these objects. The general procedures for creating and applying label styles are similar to those for object styles. However, the specifics can get more involved. Label styles consist of three key components: *general* label properties, the *layout* parameters of the label components, and the *dragged state* characteristics of the label.

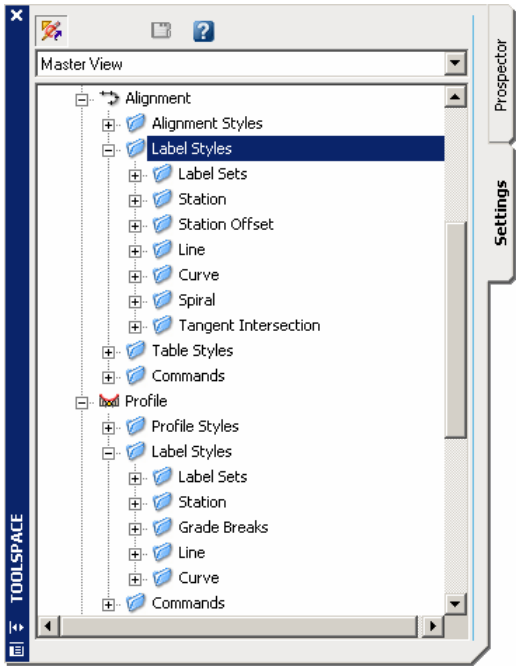

Figure 7. *Label Styles* subfolders for alignments and profiles.

Like object styles, label styles are grouped in collections by object type on the Settings tab of the Toolspace, with different object types having varying *Label Style*s subfolders. In Figure 7, for example, the alignment label style subfolders are similar to, but not exactly like those for profile label styles. Each object type has label types for the different elements of the object. For alignments, these are Station, Station Offset, Line, Curve, Spiral, and Tangent Intersection. After the various label-style elements have been defined, you can group them together in Label Sets for easy assignment to objects.

Let's look at an example of creating a label style and label set for an alignment. First, we'll create a label style for the Major Station, and then a label style for the Minor Station. Last, we'll create a label set consisting of these two styles, plus a Geometry Point label style. As with object styles, it's easiest to create a new label style by copying and then modifying an existing style. Right-clicking the predefined label style named Standard and choosing Copy from the context-sensitive menu opens the Label Style Composer, which you use to create label styles for every type of label for all object types. Figure 8 shows a portion of the dialog box.

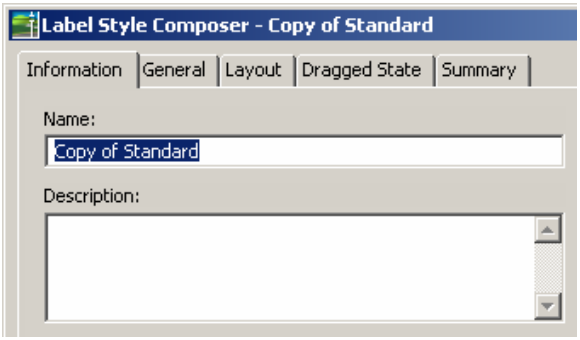

Figure 8. Label Style Composer dialog box.

The Label Style Composer consists of five tabs. The Information tab is where you enter a name and optional description for the label style. It also contains information about when the style was created and modified, and by whom. Label style names should describe what the label will look like. Here, we are creating a customized label for the major stations, named "Custom Major Station."

The General tab consists of a preview pane and a property editor that adjusts the properties of the label style itself. The first property, Label, controls the text style, visibility (true or false), and the layer of the label's text elements (Figure 9).

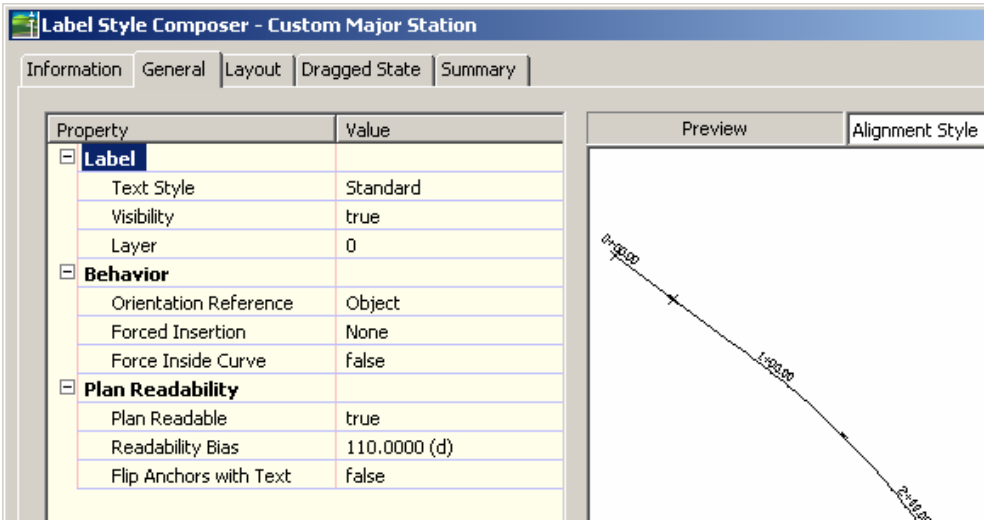

Figure 9. Label Style Composer dialog box, General tab.

The Behavior property contributes to the location and orientation of the label. Typically, the default values shown meet the needs of new users. As the name implies, the Plan Readability property provides settings used to keep text labels oriented as desired in relation to the printed page.

The Layout tab is arguably the most important part of the Label Style Composer. This is where you define the components of the object to be labeled as well as the text labels themselves. This tab consists of a preview pane, a component selector, and a component property editor. Figure 10 shows a portion of the Layout tab.

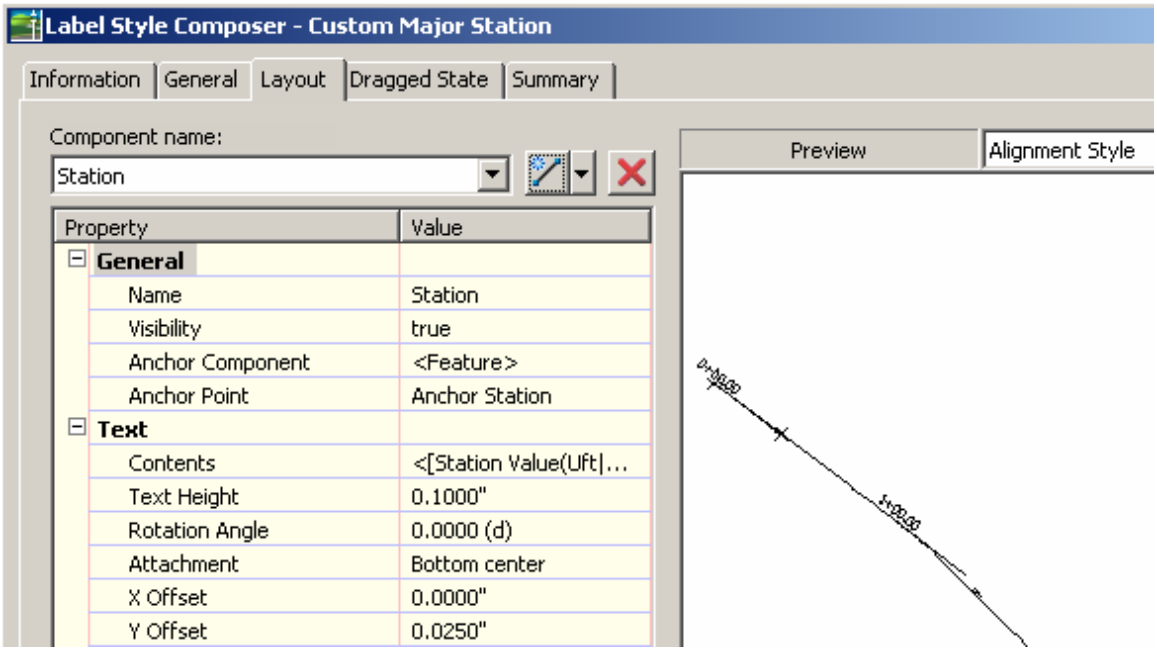

Figure 10. Label Style Composer dialog box, Layout tab.

The steps required to create a label style consist of first creating a component and then modifying the properties of that component. Components can be one of a variety of types depending on the object to be labeled. For alignments, the label component types are Text, Line, Block, and Tick, and the editable properties vary depending on the component type. Define a component by selecting the appropriate type from the fly-out button, as shown in Figure 11, and then modifying its properties.

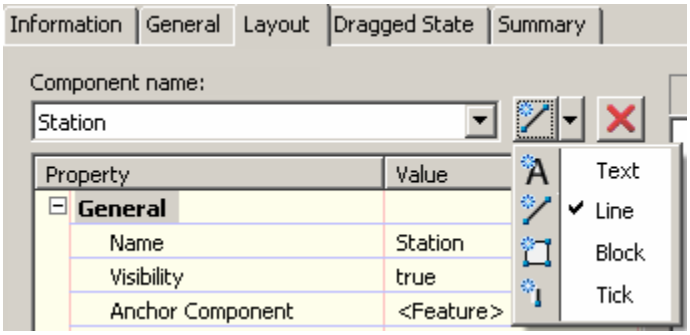

Figure 11. Define a label component type.

In this example, there is a single component named Station. This is a text component with three groups of editable properties, General, Text, and Border. The General properties define the name of the component, its visibility, and its anchor component and anchor point. The

anchor component defines what the station component of the label is attached to and is either the object itself (the feature) or another component of the label style, such as a line or tick. The anchor point defines the point on the anchor component where the station component is attached. In the example shown in Figure 12, the component named Station is attached to the feature (the alignment) and connects to the alignment at the point on the alignment referred to as the anchor station.

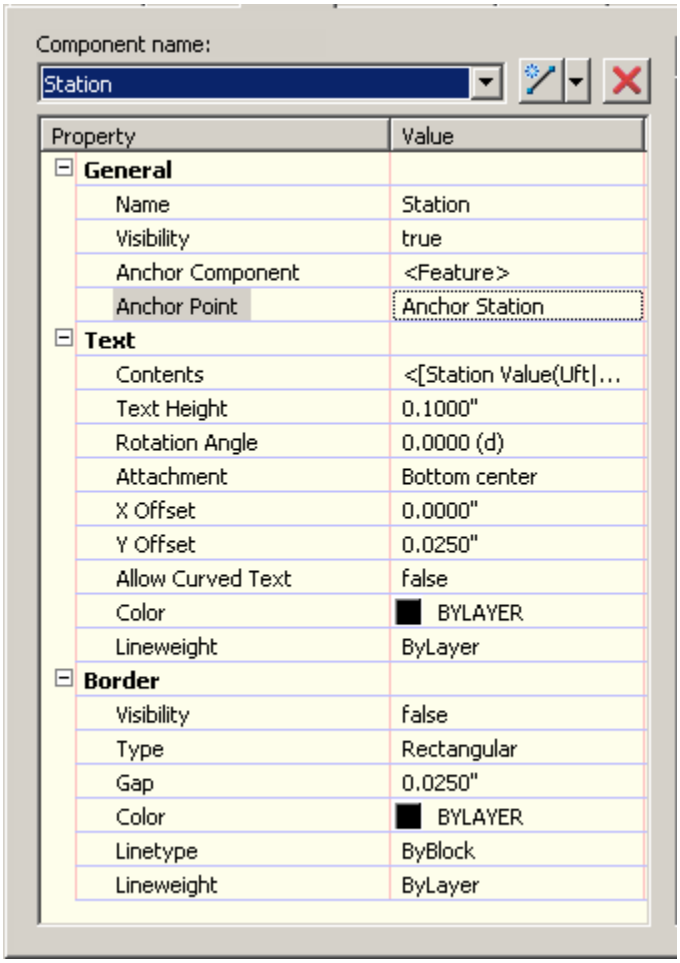

Figure 12. Properties of the Station component.

The text properties of a label style are perhaps the most confusing element of a label component. Most of the text properties are straightforward, such as text height, rotation angle, color, lineweight, and so on. These are all familiar properties of regular dtext. The attachment value defines the location on the text itself that connects to the anchor point discussed in the previous paragraph.

The value for contents of the label is a bit more complicated and needs further explanation. To change the contents of the text label, single-click in the value cell and then click the ellipsis  to open the Text Component Editor – Label Text dialog box shown in Figure 13.

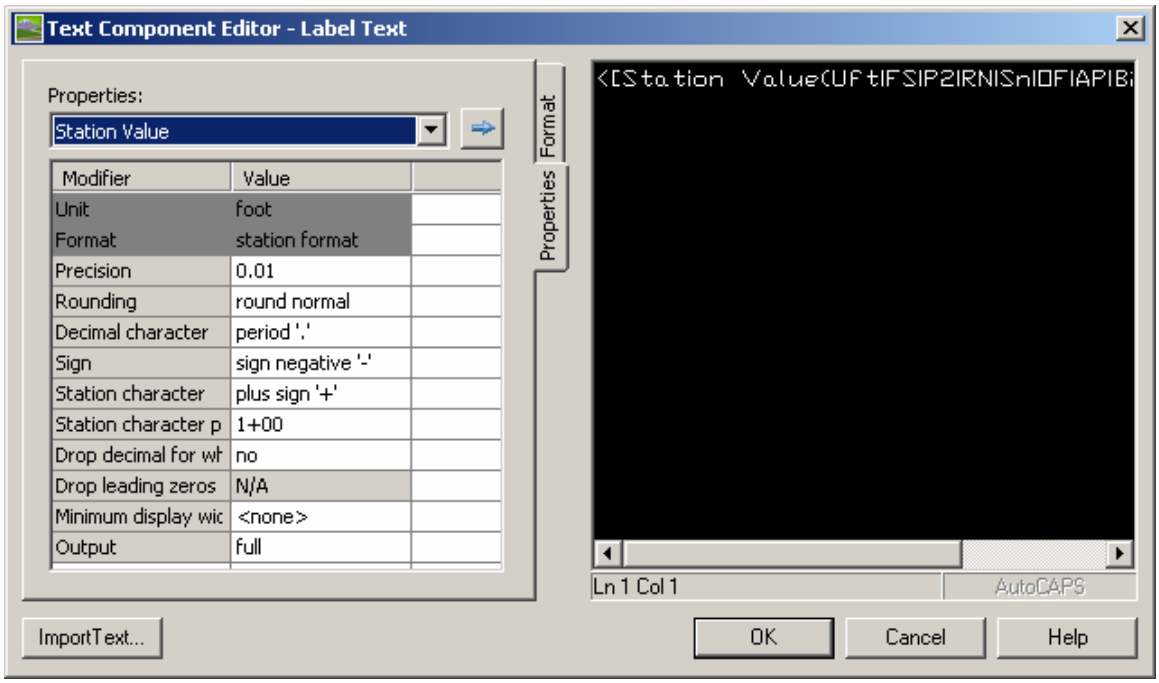

Figure 13. Text Component Editor – Label Text dialog box.

The Text Component Editor is the same dialog box used to create label-style text components for all object types (profiles, parcels, alignments, and so forth). The editor consists of three main areas: the text editing area on the right and two tabs, Format and Properties.

The Properties tab contains a drop-down list of all properties of the feature to be labeled. Each property has a list of modifiers whose values you can adjust to create a customized text label. In Figure 13, the Station Value property is shown, along with modifiers for unit, format, precision, and so on. To change a modifier value, click in the value cell and then choose the desired settings from the drop-down list. Figure 14 shows the drop-down list used to set the Precision modifier.

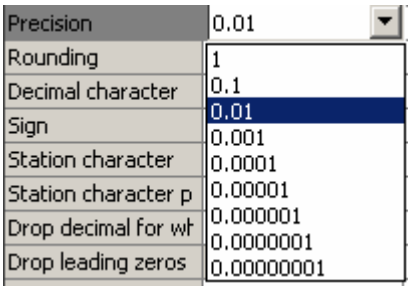

Figure 14. Drop-down list used to set the Precision modifier.

Next to the Properties drop-down is a button with a blue arrow that you use to apply the modifier values. First, adjust the modifier values as desired, changing precision, rounding, and so on to meet your custom requirements. Next, position the cursor at the desired location in the text editor on the right. Finally, apply the adjusted settings by clicking the  button. The coding required to display the information about the feature property is inserted into the text editor. You can add information manually to the text label component simply by setting the cursor at the desired location in the text editor and typing text. In Figure 15, the text "STA:" was entered manually and the remainder of the text was created automatically when the  button was pressed.

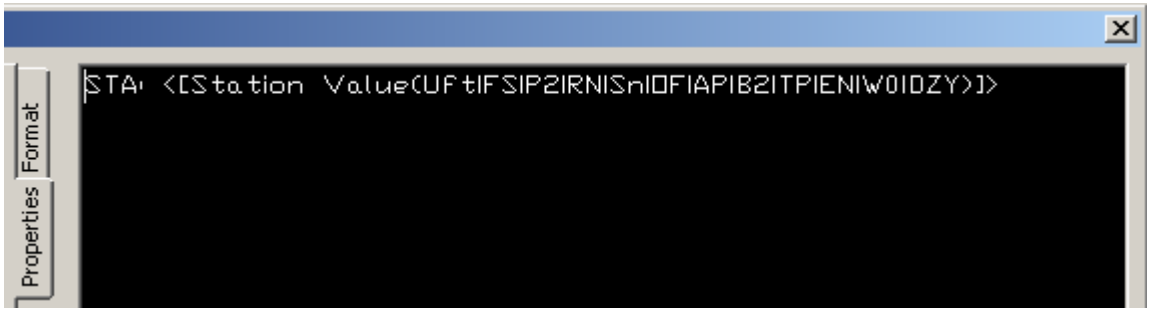

Figure 15. Enter text in the text editor.

This example demonstrates that you can enter text anywhere in the text editor window simply by typing. Note that the manually added text must not be entered in angled brackets < >, which identify the limits of the automatically generated portion of the text label.

The Format tab controls settings for text formatting. Here, you can modify typical text settings such as Justification, Font, and Color. Text style, however, is set on the General tab and cannot be changed here. See Figure 16.

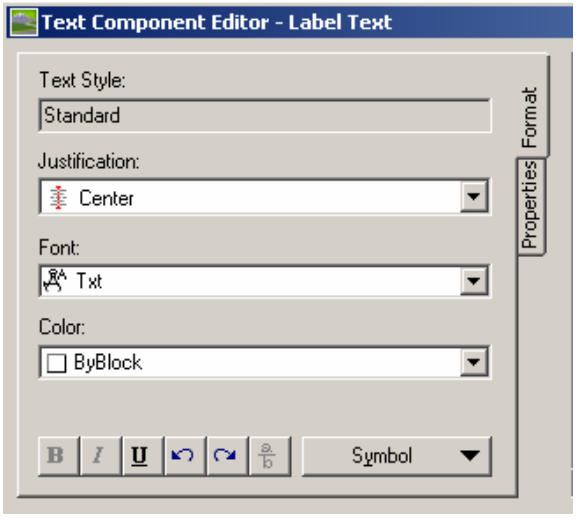

Figure 16. Text Component Editor dialog box.

In addition to text components of a label style, you can use various other components to define the complete style (see Figure 11). For alignments you can add a tick component. From the component creation drop-down, select Tick as shown in Figure 17.

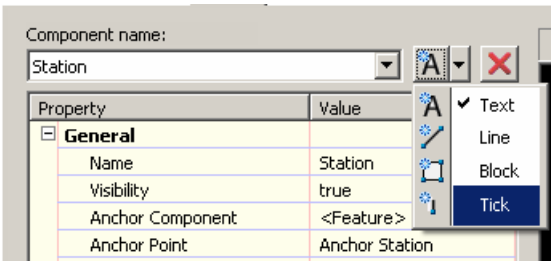

Figure 17. Add a tick component for alignments.

This creates a new tick label component whose properties you can now modify to meet your needs. The properties for a tick include General and Tick. Typically, you should provide a descriptive name for the tick by changing the value in the name cell. In Figure 18, the name has been changed to Major Tick.

For alignments, the tick component references a block whose parameters can be modified under the tick property values. In Figure 18, this tick component references the block named AeccTickLine using a block height value of 0.1 inch, rotation angle zero, and the other settings as shown.

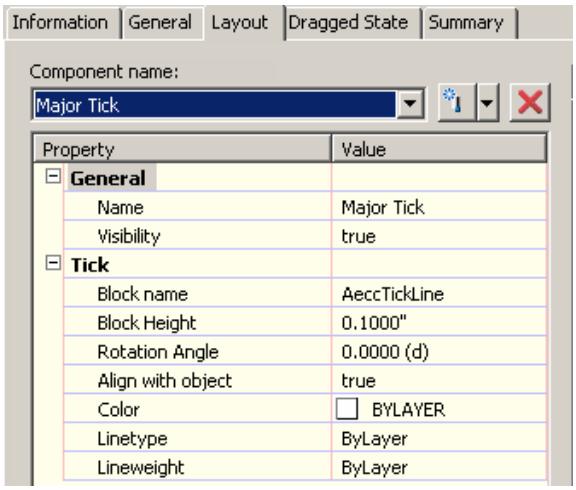

Figure 18. Tick properties.

Note: The block reference must already exist in the current drawing. Repeat this procedure of creating layout components and modifying their properties until you have defined all elements of the label style. To delete a component, select it from the component drop-down and click the  button.

The next tab of significance is Dragged State. As the name implies, this tab controls the appearance and behavior of the label when it is moved or “dragged” from its default location. Two main property groups are used to control the state of the dragged components and the leader. Figure 19 shows this tab.

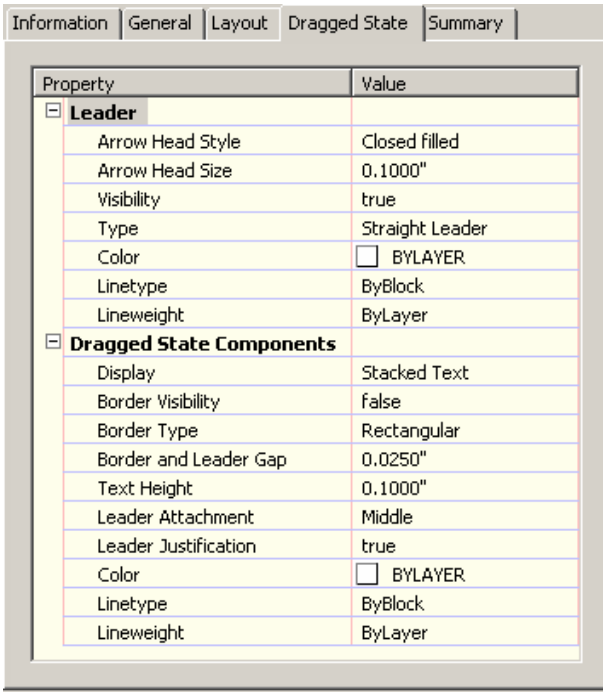

Figure 19. Dragged State tab.

Label styles are often grouped together into *label sets*. It is common to apply more than one label style to an object, such as an alignment label style for major stations and another for minor stations. Grouping label styles into label sets makes it easy to apply multiple styles to an object in one operation instead of having to apply each style individually.

As with creating a new label style, it's easiest to create a new label set by copying an existing set and then modifying it. Figure 20 shows the Alignment Label Set dialog box. It too has an Information tab where you specify the name and an optional description. The Labels tab is where you add individual label styles to the set and save them for later reuse.

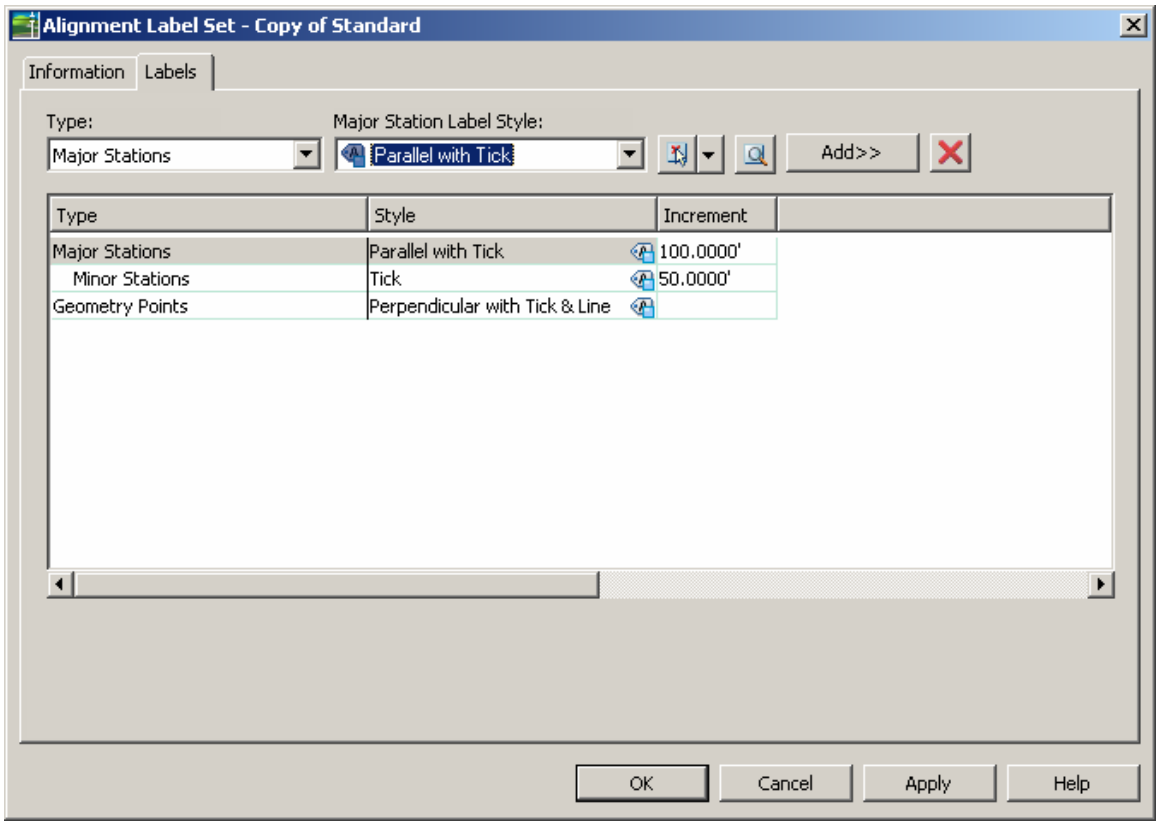

Figure 20. Alignment Label Set dialog box.

Let's examine the various parts of this dialog box.

Type: The Type drop-down lists each of the Station Label groups: Major Station, Minor Station, Geometry Point, Station Equation, and Design speed.

Label Style: After you select a Type, the label styles available for that Type are listed in the Label Style drop-down list. In Figure 20, the Label Style drop-down list is called Major Station Label Style. The name of this drop-down changes depending on the Type selected.

Add/Delete: After you select the desired Type and Label Style, use the Add>> button to add the label style to the set. To delete a style from the set, highlight the style in the lower list and press the button. In Figure 20, the label set consists of a Major Station label style named Parallel with Tick, a Minor Station label style named Tick, and a Geometry Point label style named Perpendicular with Tick & Line.

Increment: The Increment setting enables you to define the increment at which the various label styles are applied. For this example, the major is set to 100 feet and the minor to 50 feet. (Geometry Point styles are not applied at increments, but rather at all geometry points such as Point of Curvature and Point of Tangent.)

The process for applying label styles is nearly identical to that for applying object styles. You can apply them at the time the object is created or after the fact by modifying the object's properties. Referring back to Figure 4, note that there is an option to define the label style set at the time the object is created. After objects are created, you can add label styles individually or in sets from the Labels tab in the object's Properties dialog box, as shown in Figure 21. Notice this tab is similar to the Label Set Creation dialog box, with the added options of importing a predefined set of label styles Import label set... and saving the current set of styles for future reuse Save label set....

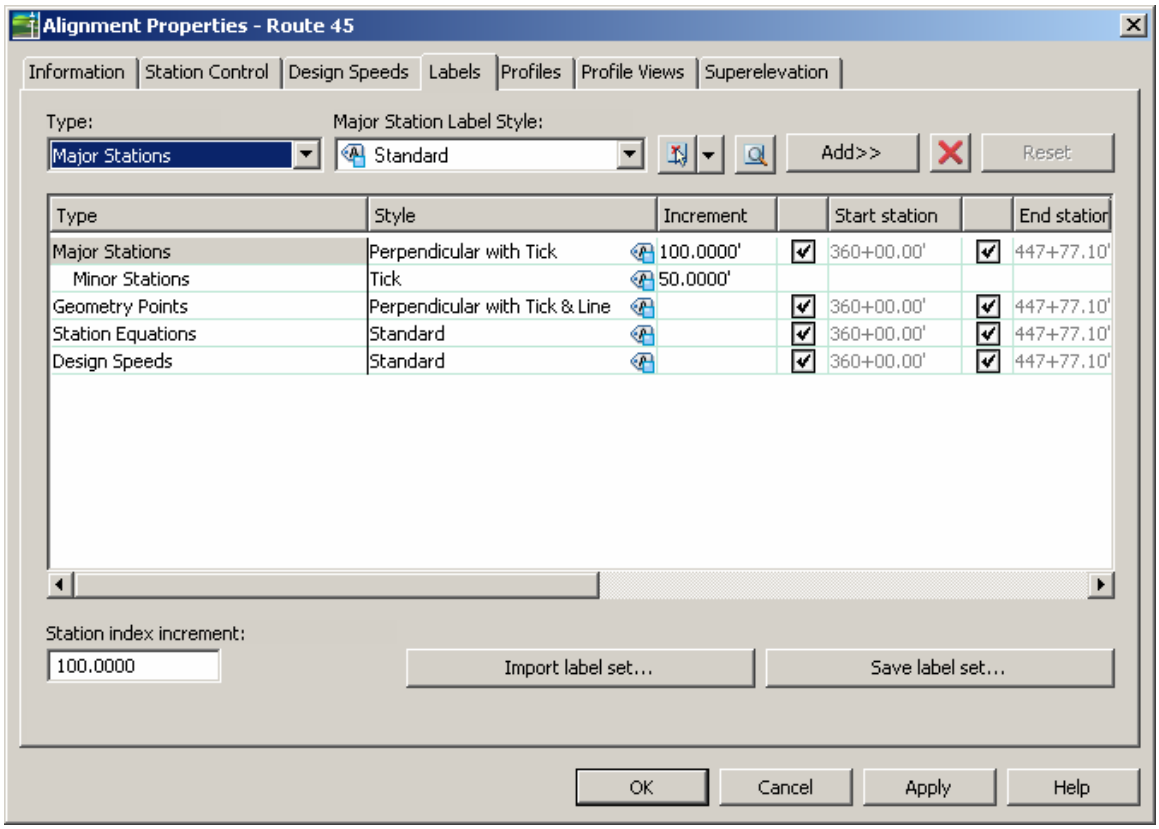

Figure 21. Alignment Properties dialog box.

A great timesaving feature of label styles is their ability to maintain their scale and orientation regardless of the twist angle or zoom level set in a paper space viewport. This means that you can show the same area of the drawing in separate viewports, each with its own rotation and scale. The labels themselves appear identical in each viewport, properly oriented to be plan readable and at the same height. As with object styles, you can use label styles to effectively implement and enforce CAD standards by saving them in a reusable drawing template file.

Table Styles

You can present information about many Autodesk Civil 3D features in table format. The tables used to present this data have table styles associated with them. The concepts for creating table styles are similar to those for creating object and label styles. Use the Table

Style dialog box to modify properties of table styles, as shown in Figure 22. Unique to table styles is the Data Properties tab. Here table settings, text settings, and the table structure are all set. Table and text settings are relatively self-explanatory.

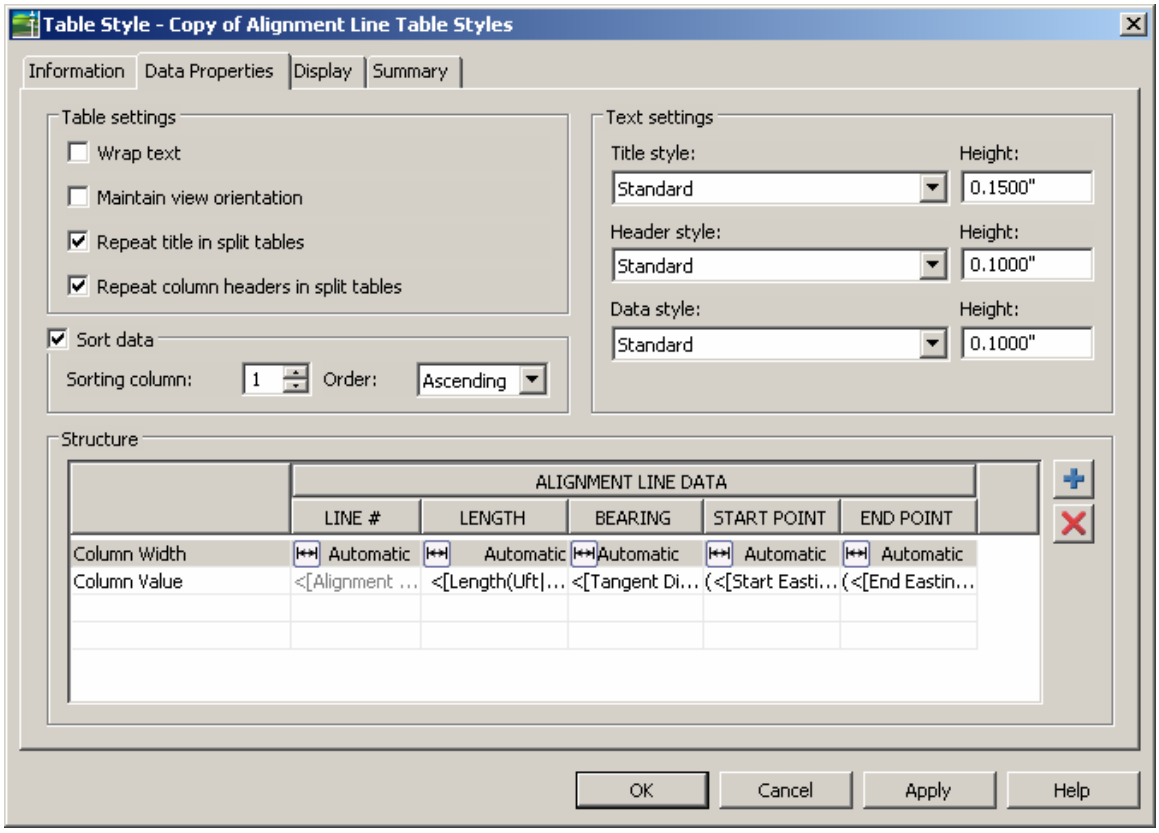

Figure 22. Table Style dialog box.

You establish the structure of the table by adjusting the settings in the lower half of the Table Style dialog box. Edit the table and column titles by double-clicking the title and making desired edits in the Text Component Editor.

Add  and delete  table columns using the buttons shown. Edit the contents of table cells by double-clicking the value to open the Text Component Editor. The editor is identical in look and function to that discussed earlier and shown in Figure 13.

The function of the Display tab is similar to that of the Display tab for object styles, with the visibility and appearance of various table components set via a layer manager-like interface.

Recommended Workflow

It is worth noting that although styles are *used* on a regular basis, they are not *created* regularly. After initial style and template creation by a CAD manager or CAD committee, it is unlikely that the average user in your organization will need to make styles or edit styles on their own. In fact, to effectively enforce CAD standards, this should be discouraged. Instead, users should apply the styles saved in the template and use overrides as needed to adjust the typical styles used by the organization.

One recommended workflow for getting up and running with styles is as follows:

1. Create a drawing template file containing the text styles, blocks, layers, and linetypes commonly used by your organization.

2. Working in the drawing template, create customized object, label, and table styles. Start with copies of the styles that ship with Autodesk Civil 3D that most closely resemble your desired style, and modify them as needed. Don't worry about creating every single style type that your organization may ever need. Start with the basics, and add new styles as needed.
3. Adjust the drawing and feature settings of the template to default to your customized styles, and adjust other drawing and feature settings as needed.
4. Save the drawing template (DWT) file on a network server or other location accessible to all users who need it.

   Note: You may find it useful to have more than one template, each applicable to a different drawing type, such as Grading Plans, Plan & Profile Plans, and so forth.
5. When creating new Autodesk Civil 3D objects, apply the desired styles.
6. Override the styles for specific objects and labels as dictated by drafting and design needs unique to each project.

Conclusion

Autodesk Civil 3D is a powerful application that can be used right out of the box with the styles and templates provided. However, to get the most from the software, users may want to customize these features to meet their specific needs. Understanding the basic concepts outlined in this paper helps demystify styles and helps users get up and running quickly with Autodesk Civil 3D.