



Settings & Styles

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Why Objects & Styles?

The plain and simple truth is that using CAD primitives (lines, arcs, circles, etc) to create complex 3D models and drawings has limitations. This is not a physical limitation because you can create a map with millions of primitives.

Primitives are easy to create, but everything you create also needs to be edited and managed later. A typical commercial site has thousands of components (objects) in it. Using pictures to representing all of this stuff is time consuming and therefore expensive.

The more significant issue is that things change. If you draw a grading plan and then draw a separate section based on that plan, you now have multiple sets of lines to edit and change every time something changes. Even automatically printing the section creates editing and line management issues that inhale man-hours. The sheer number of things to manage and get "right" every time becomes a bigger and bigger quality control issue.

This type of methodology is really Computer Aided Drafting no matter what people may call it. You are using a better and faster pencil to make pictures, but that is all you are doing.

Evolution or Revolution

Civil 3D (C3D) represents an evolution in traditional CAD applications. It is not revolutionary nor is it by any means the only CAD application changing its stripes in this regard. We all want better representations and we want more control over those representations with less effort and less actual hard work. We want to reduce the management and QA time if you are a civil engineer, surveyor or their client.

We want the CAD primitives to behave like survey points, parcels, ditches, roads, and pipes. We want the CAD stuff to be more like the "real" world. "Objects" provide an answer.

Object enabled CAD has arrived in many flavors and fashions. C3D is a good example of this next level of CAD technology in the marketplace. It does most of the traditional CAD stuff and a lot more. C3D doesn't work the same as a traditional CAD application. It does a lot more than make pictures from CAD primitives.

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Portions of this document were produced and edited by multiple members of our Technical Services staff without whose knowledge and expertise this document would be impossible to produce. Special recognition to our Clients and their staffs who aided in the validation and review of the contents.

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Features and Objects

C3D employs "Features" that are ALL collections of interactive objects. At the most basic level every C3D feature has a line work picture and some automatic labeling tied to the spatial geometry of the line work primitives. The line work is one object and the label is automatically produced from and managed with the line work. The two parts are inseparable and are referred as a "feature". A feature is a collection of interactive objects.

The visible objects in C3D are 90%+ data and have only a small geometric "Model" component. You have a multiple tabbed set of default properties for a Feature Style. In addition, you can attach and pull even more information from the object by attaching "User Classifications" to some Features.

The C3D geometry engine must "know" how to draw the Feature in a lot of detail in multiple views. The engine actually asks to the object what to display! The object must know how to construct and display itself. That is what "object oriented" means. It is a self-contained definition of a Surface, a Parcel, or a Corridor. Hence, we also have "object enablers" so people without C3D can see the objects.

Object Representations

All C3D Features are more complex than the simple feature described above. All C3D Features are also viewpoint aware. Potentially you can get one picture if you look straight down on the object in "Plan" view and a completely different picture if you look at in a southwest isometric view. In other words, the objects inside the Features can present or display themselves differently depending upon how the camera in C3D is looking at them. Currently, C3D publicly supports multiple "Display Representations". The named Display Representations are called "Plan, Profile, Section, and Model.

For example this display capability built into every C3D object is how the labels in C3D are able to adjust themselves to be "plan readable". If the current AutoCAD viewport in a Layout is rotated 35 degrees (use DVIEW and the TWIST option) and scaled twice as large (change the Scale property of the viewport object), the labels in the viewport are automatically different from how they are displayed in the Model Layout. You can see this by creating two model space viewports and setting up two different camera views of any C3D Feature that is labeled.

All visible C3D objects in early releases actually had three potential views called Object Representations. Obviously objects use Plan Object Representations the most.

Representations in Early Civil 3D releases	
Plan	A 2D view looking down or up along the Z axis of the object
Elevation	A 2D view rotated 90 degrees around the X axis of the object
3D View	Every other view of the object

Therefore most C3D objects really only have and need only the Plan Object Representation. The Elevation (or Section) Object Representation is used occassionally. The 3D-View Object representation is used in all 3D views.

The Object Representations employed in Civil 3D were renamed and somewhat simplified in 2006-07. How they worked was the same. The Elevation representation was hidden but was still there in the Display System.

Representations in Civil 3D 2006-2007 releases	
2D	A 2D view looking down or up along the Z axis of the object Used for ALL Plan, Profile, Sections
3D	Every other view of the object Used for model or 3D views



The Object Representations employed in Civil 3D 2009 were again renamed and again simplified.

The Elevation representation was renamed and reconfigured into two new standard representations to aid in reducing the number of styles needed for complex Profile and Section views of Features.

Representations in Civil 3D 2009 release	
Plan	A 2D view looking down or up along the Z axis of the object Used for ALL Plan, Profile, Sections
Model	Every other view of the object Used for model or 3D views
Profile	Used for Profile specific views
Section	Used for Section specific views

Remember the Object Representation or picture you see and "print" of the C3D object is dependent on how you are viewing the object. In C3D you can control "how" objects are displayed and printed. This is actually a separate function from the Feature Properties themselves. This is controlled by the Feature Style on the Display tab.

Features Styles and Display Representations

C3D employs Feature Styles to control how the line work type objects display themselves in the 2D and 3D Display Representations. Label Styles control how the label objects appear and what is labeled also in both the 2D and 3D Display Representations. These are managed and edited only in the Toolspace>>Settings tab.

In regular AutoCAD, we expect a CAD primitive to appear a certain way because it was on a certain layer with certain set of current layer properties. This Layer Management approach works great for simple 2D drafting work. However, the Layer Management approach collapses rapidly under the weight of Line (primitive) management, duplicated annotation at different scales, and duplicated editing and quality control checking time as the "model" gets more complex and more "views" of the model are produced.

Layer Management is NOT nearly as important in C3D as it is in Land Desktop or AutoCAD. If you think and work in using a Layer Management perspective to get what you want to display and plot, C3D is actually more difficult to master.

Between the sophisticated control of views available via viewports in Layout tabs attached to the 2D and 3D Display Representations, you have probably more control over what you see and print than you really thought you ever wanted.

Styles – What is a style?

You can control almost all of the properties of almost all C3D feature individually. A feature's "style" acts like a default stamp or data dump of "default" properties stored in the style when you create the feature in the drawing.

A "style" is, in effect, an object without an actual object. It is a set of data information you can apply to an object of particular type. By the way, this same conceptual model applies to AutoCAD primitives that have style like "textstyles" and "dimstyles". In this respect Autodesk has been consistent in their programming approach.

Edit the Style Properties of Individual Features

Editing the individual properties of individual features, while possible and sometimes necessary (in special circumstances), creates a management nightmare. This is like putting all of your line work on one layer in AutoCAD and then changing the colors and linetypes of the lines around to create a picture. It works, but using the method actually makes more work later if something changes.

Copy & Edit Styles to Manage the Features More Efficiently

C3D favors this approach: Create a generalized style of feature that meets most of your design criteria. Plunk the features in as needed. Now you need a different tweaked display of a Surface. Copy your generalized Surface style and give it a similar name. Change the property values in the new Surface Style to tweak the Surface Feature in the drawing. Select the Feature and change the Surface Style from the old Style name to the new Style name.

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The Difference in Creation and Editing Methods

AutoCAD work with primitives generally favors fixing, tweaking and cleaning up things as you go. C3D generally tends to favor punching things in and fixing, tweaking and cleaning up things later because of the power of Feature styles.

With Feature Styles in C3D (and other Autodesk vertical software) Management by Style pays because you are managing the data that drives the picture, not messing with the picture. The more you can do this the less time you spend fixing, tweaking and cleaning up things and the more interactive and flexible your design becomes.

Advantages of Style Management

- Well-constructed simple styles can be replaced downstream in your design process with more complex and developed styles without editing all the objects individually.
- Design problems become apparent when the new style properties conflict with the current object settings.
- You can make massive changes to your design by changing styles.
- But you have to plan somewhat to do this effectively

Your working method and practice will take time to develop and it will be significantly different than an AutoCAD or LDT based method and practice of drawing and model construction.

Feature Creation Management

Each C3D Feature employs three forms of "input" as a feature is created. You must recognize and identify these forms for each C3D Feature. You need to ask the question, "Where does the C3D Feature information come from?"

Object values can be categorized in this fashion:

System Values

- These values come from the Toolspace>>Settings>>Drawing Settings and systems settings in the Options dialog box.
- You can also see these inside C3D by selecting any Feature branch in the Toolspace>>Settings tab, right click and pick, Edit Feature Settings in the menu.
- You can see many of your current drawing's systems settings by selecting NOTHING and looking in the Properties box.
- All of the systems values can be managed from the Options dialog box, various screen controls, and/or drawing setup routines.

Style Values

- These values come from the Feature's named style and are changed in the Toolspace>>Settings>>Feature branch>>Feature Style name, right click and pick Properties
- Many Features are actually constructed from multiple Features and therefore there is more than one Feature Style that affects how a "feature" behaves in to model.
- Some Style values are affected by Rules set in the Drawing Settings or Feature Settings or in a Feature's named style. C3D has more than a few Feature sub Styles (e.g. Grading Criteria Styles) that you can think of as tools that supply a specific set of Rules at Feature creation.
- You can see the current Style Name of the current Feature in the Style section in the Properties dialog box, but you cannot change it there in C3D.
- Attached named styles usually appear in the Information, Labels, and other tabs of the Feature Properties dialog box.

User Values

- Many C3D Features are created via the Layout Toolbar interface. The Layout Toolbar interface is NOT employed for Features that exist to collect and interconnect other Features – Profiles, Corridors, Sections, and Assemblies.
- The values are the final piece of the Feature creation puzzle and currently in C3D are often defaulted by a criteria Style type tool and may be supplied by the tool or by responding to command line prompts.
- Almost ALL User values can and are constrained by both System and Style rules and values.
- You can see and edit User input values typically in Layout toolbar Edit tools, Panorama Editors, and Feature Property dialog boxes of Features that are collectors.
- A very important User value is the Feature Style and the current Label Set of Label Styles.
- If you build certain Feature Styles with Style supplied values, you will NOT be able to change User values. If you manually change some Style based values after you create a Feature the Feature may not produce a visible result or you may crash C3D. This is particularly true with all Feature Sub Styles that define Criteria. To avoid this problem: Delete the Feature and rebuilt it with a different Style tool.

Learning to identify these three types of values for each C3D Feature helps a user grasp more rapidly how the Features work and how they are created. In some respects, C3D Features act like parameter driven “blocks”. It definitely helps to know where the controls are for the parameters.

Feature Style and Setting Management

The following guidelines will help you tackle Style and Setting issues in a production environment. This is an important issue because if you do it well you’ll get:

- Consistent drawings
- Produced in less time for fewer man-hours
- Reduce quality assurance/control man-hours
- Keep your hair and your job
- Maybe get a raise

Autodesk supplies a number of sample styles with C3D. All of the supplied styles are a valuable learning resource and save you a lot of work because you don’t have to start from scratch. However, these styles should ONLY be seen as instructive examples.

Do Not Use Autodesk C3D Supplied Styles

The Autodesk supplied top end Feature styles should NOT be used as production tools! Because they are provided does not mean that you should employ them during your use of C3D in actual working projects. Employing them “as is” is NEVER a good idea.

- Minimally, you should copy and rename the C3D styles with your own names. The same style name assumes that the style values or setting are the same. It is possible that one staff member can modify a named style and a second staff member can insert the effected objects into another drawing and have the style values changed. This can create significant confusion among your production staff or with your partner firms as well.
- Employing your own standardized names will preserve the style values in your own drawings and in drawings you supply to your partners.
- You can simply add your company initials or a project designator to the Autodesk supplied C3D style names by renaming the style.
- You should use the description properties of styles to clarify the usage, purpose, and differences of your named styles. A little style documentation will save you problems, wasted work, and confusion later.

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- Your project specific styles should evolve into company standardized styles. Depending on the varied nature of your firm's work, you will probably develop more than one set of standard styles for various types of projects. Feature Style is a very powerful tool that can be of great benefit to your firm.
- You should employ your project and/or company styles as a quality control device in your project model drawings. Always apply the project/company standard styles to Feature prior to producing your deliverables. This provides a great quality control mechanism.

Invest in C3D Template Drawings

Currently, C3D relies on templates to manage what styles are readily available and to control what Drawing, Feature, Style, and Command settings are defaults and how they are controlled.

Constructing one or more firm specific drawing template files for your organization is NOT OPTIONAL if you want to employ C3D effectively in production.

- If you are a small firm with very few users, employ Autodesk example templates but make at least minimal renaming changes of top level Feature Style names.
- Constructing a firm's initial template(s) is unfortunately NOT a simple task nor should it be done by a single individual no matter how skilled or brilliant.

You need to decide:

- Whether or not to make the move from CTB (color based plotting) to STB (Named based plotting). CTB is familiar and comfortable, but STB is much simpler and more capable once you make the change.
- Whether you also want to change from LDT traditional vendor based Layer naming system to the National CAD Standards. LDT 2006 ships with mostly NCS compliant examples and C3D uses NCS Layer names by default. Currently LDT supports Layer Standards via Layer Key Styles, but C3D does not. This is frustrating, but getting around the issue is not too difficult.
- Whether or not to employ NCS drawing naming conventions in both LDT and C3D
- How you are going to implement and then train your staff to employ the new standards

You need to produce

- At least one Plan Resource drawing template and one Plan and Profile Resource drawing template –maybe you can get by with one
- At least one Sheet template for the Sheet Manager
- A reasonable complete set of major or top end C3D Feature display Styles and Label Styles that meet your CURRENT presentation standards.
- It is IMPORTANT that you first create C3D Styles that produce to your CURRENT deliverable standards and complement what work you will still do in LDT
- Styles that produce drawing work that agree with your LDT prototype results

You will need to plan to SYSTEMATICALLY evaluate your progress and regularly make adjustments and modifications to the templates and Styles while your staff learns to employ the new software and new standards. If you don't set aside time to do this, you will have delivery deadline problems.

Use Styles Your Staff Understands

You should ONLY employ simple styles when you build your models that your model building staff thoroughly understand.

- The danger of employing a Feature style your staff does not understand in detail is that they will attempt to make inappropriate edits to the style to fix "problems". This often creates a circle chasing cycle that wastes production staff man-hours.

Delete Unused Styles

Aggressively Delete unused styles from your production drawings. DO NOT Purge core company Feature Styles and Criteria type Styles. DO NOT purge "Standard" styles that serve as placeholders for all object styles so that C3D has a place to start. Purging the unused display styles helps you in these ways:

- Purging reduces the size of your drawings and improves your drawing load and save times and reduces total hardware requirement.
- Systematically purging unused styles reduces the perceived complexity of your drawings for your staff. They are not overwhelmed with unnecessary details.
- Purging unused style creates a habit that your staff will always access standard project style files for Feature styles not yet in the drawing. This means that you will achieve faster standardization of style backed by good work habits. You will also be far less likely to have different copies of the same named style in different drawings.
- Purging unused styles helps your staff learn to effectively employ the Toolspace>> Settings tool and C3D's Multiple Document Environment faster.

How to Delete Styles

- 1) Go to Toolspace>>Settings>>Feature branch>Feature Styles
- 2) Select the Styles you want to Delete in the right pane
- 3) Right click and pick Delete from the menu
- 4) You CANNOT delete any style that is currently referenced (or in use)
- 5) There is an icon in the Toolspace to turn on the In Use icons

How to Copy Styles to Another Drawing

- 1) Make sure you KNOW which drawing contains the GOOD styles – THIS SHOULD NEVER BE a production drawing.
- 2) Open the drawing with the good styles
- 3) Open to drawing you want to update the styles in
- 4) Delete any styles with the same names in the drawing you want to update
- 5) If the Style is in use, change the Features in the drawing you want to update to employ any style you do not want to update – Standard always works
- 6) Tile the drawings in the C3D Window to show both drawings at the same time
- 7) In the drawing with the good styles
- 8) Go to Toolspace>>Settings>>Feature branch>Feature Styles
- 9) Select the Styles you want to Copy in the right pane
- 10) Drag and drop the selected styles into the drawing you want to update
 - If you get the "cannot overwrite and do you want to make a copy of the style" message, STOP and go back and fix the problem before going on.
 - Numbered copies of styles are a time consuming and confusing mess to clean up.
- 11) When you copy the styles into the drawing to update, C3D will make that drawing the CURRENT drawing.
 - The Toolspace will AUTOMATICALLY switch to show the Styles in the CURRENT drawing
 - Save the drawing
 - Click back over to the GOOD Styles drawing and wait for the Toolspace to show the change
- 12) If you need to copy more styles from another feature, be very careful and aware of which drawing is CURRENT.

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Use Styles to Solve Common Design Problems

Do not make changes to specific and individual Features unless absolutely necessary and delay these actions for as long as possible in all cases. This is contrary to typical production AutoCAD behavior.

- o You REALLY need to be careful of this in Profile Views and Section Views. It is really way to easy to individually update ONE Profile View and believe you are editing the Style for all Profile Views
- o Are you editing a STYLE or an instance of a Feature with that Style?
- o C3D makes this possible, because sometimes you MUST update just ONE Profile View or Section View.

In the Right Click menu for every C3D Feature you have a generally centered section that allows you to:

- o <Feature Type> Properties takes you to the Properties of the individual Feature (see above)
- o Edit <Feature Type> Style (takes you to the Style Properties box like the Toolspace>>Settings>>Feature branch>>Feature name right click Properties) – You should probably NEVER use the right click menu method for this. "It's the dark side of the Force, Luke." It is just too easy to change Style properties when you should copy and edit a NEW style instead. Style properties shouldn't change in production drawings without WILLFUL and THOUGHTFUL INTENT.
- o Edit <Feature Type> loads a Layout Toolbar or a collector's Properties dialog box
- o Many Features have Editors that display Panorama vista editing tools
- o If the Feature is a member of the Site Parcel, you can also change its current Site
- o Feature that support data shortcuts will allow you to create one in the menu
- o If the Feature is a data shortcut reference, you can Synchronize or Promote it
- o You can always access the "AutoCAD" version of the object's properties in the Properties dialogbox. This is not useful currently in C3D.

AutoCAD favors fixing primitive specific problems in the drawing as soon as possible. A style and Feature based application like C3D favors developing styles that solve common problems. Working in this manner actually reduces the time invested in editing drawings. Not working this way usually creates additional work.

You should employ more sophisticated styles in test and style drawings prior to introducing them into production drawings and models.

Categories of Feature Styles

C3D has three Categories of Feature Styles which is not currently really clear in the Toolspace.

The Toolspace does support filtering of Drawing Features and Labels by both ALL open drawings (Master View) or one drawing (Active Drawing View).

Civil Features	Annotative or Label Features	Multi-Purpose Features
Style based Features that actually display in drawings	Features used to annotate the appropriate Feature. Each Feature supports one or more Label Sets & Label Styles or a Table Style. Note that the Marker, Link, and Shape Multipurpose features support labels used in Sections.	Objects that are used by other Feature styles and referred to by name. Used by object styles to typically define appearance of objects and the information management or relationships the objects.

About the Authors

Portions of this document were produced and edited by multiple members of our Technical Services staff without whose knowledge and expertise this document would be impossible to produce.

Special recognition to our Clients and their staffs who aided in the validation and review of the contents.

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