

Digging Into

AutoCAD Civil 3D 2009

Level 1 Training

Rick Ellis

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Cadapult Software Solutions, Inc.

Digging Into AutoCAD Civil 3D 2009

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He has assisted with the development of many computer systems involving spatial data, for industries as diverse as transportation, property management, engineering, and facilities management. He also enjoys being a cartographic designer and collects atlases, maps and globes.

Russell is a member of the Association of American Geographers, the Autodesk Developer Network, and co-author of “Digging Into Autodesk Map 3D 2009”.

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About Cadapult Software Solutions, Inc.

www.cadapult-software.com

Founded in 2002, Cadapult Software Solutions, Inc. is an independently owned small business located near Portland, Oregon specializing in training, consulting services, and technical support for CAD systems with a focus on the Civil/Survey/GIS industry. Cadapult Software Solutions helps clients maximize the return on their software investment through training classes, consulting services, and support. We offer a wide range of Training options, from standard open enrollment classes to customized on-site training. Our mobile training lab gives us the flexibility to bring classes to our clients regardless of the location. Support options ranging from telephone support to on-site visits help to ensure the continued success of your CAD solution. Although we hold several certifications with Autodesk, Cadapult Software Solutions is an independent company and therefore can provide recommendations and solutions that best fit a clients needs rather than being limited to a specific company's product line. Further affiliations with other consultants and software companies give Cadapult Software Solutions a broad range of experience and industry knowledge to draw from that is not common for a company of its size.

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Sample Exercise

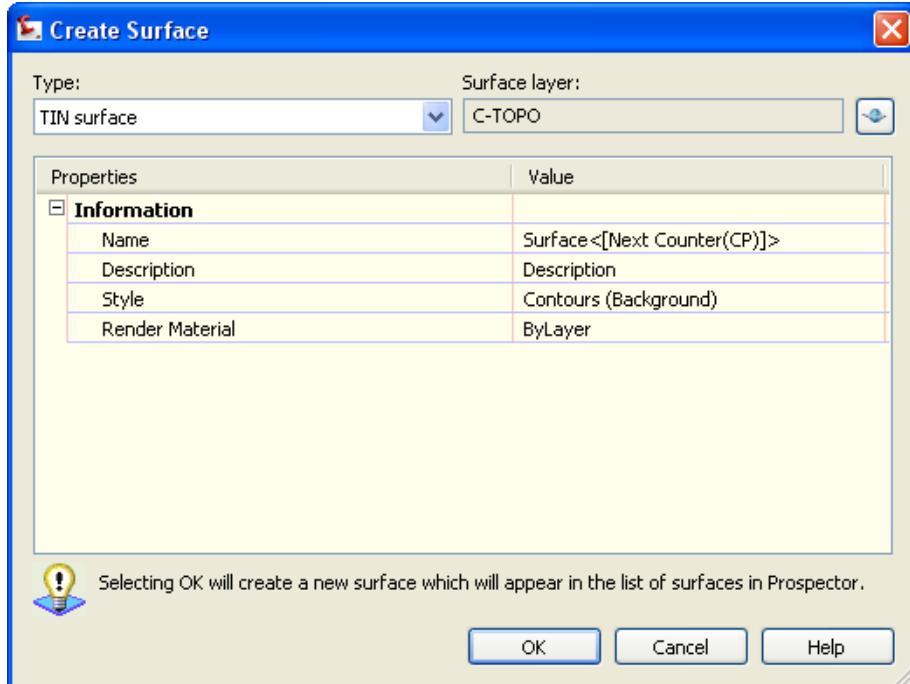
3.2 Creating a Preliminary Existing Ground Surface

In this set of exercises, you will create a preliminary surface of the existing ground from the *AutoCAD* objects that you queried into the drawing in the previous chapter. In later chapters, you will build a surface from survey data and merge it with the preliminary surface, using the preliminary surface to add buffer data around your survey.

3.2.1 Creating a Surface

A *Surface* in *Civil 3D* is an *Object*. This surface object contains the surface definition and is saved in the drawing on a layer just like any other *AutoCAD* object. The surface object can be displayed many different ways by changing the surface style. As an example the surface can be displayed as triangles, contours, or elevation bands.

1. Continue working in the drawing **Design.dwg**.
2. If it is open, **Close the Map Task Pane**.
3. If the *Toolspace* is not visible, turn it on by selecting **General ⇒ Toolspace**.
4. On the *Prospector* tab of the *Toolspace*, right-click on **Surfaces** and select ⇒ **Create Surface**.



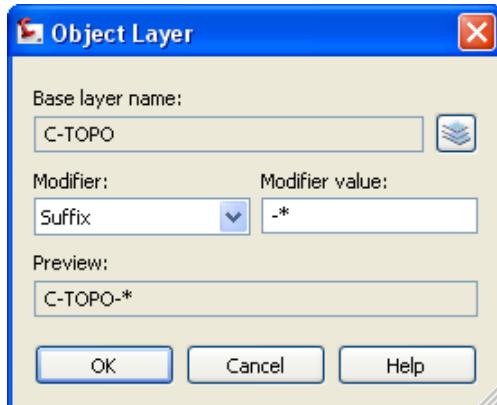
5. Confirm that **TIN surface** is selected as **Type**.

The *TIN Surface* type is the most common type of surface. It can be created from many different types of data that form a triangulated irregular network.

You can also create *Grid Surfaces* that are optimized for data on a regularly spaced grid. A common use of the Grid Surface is for building a surface from DEM data.

TIN Volume and *Grid Volume* surfaces can also be created for volume calculations between two surfaces. These are similar to the Composite Volume and Grid Volume calculations in *Land Desktop*.

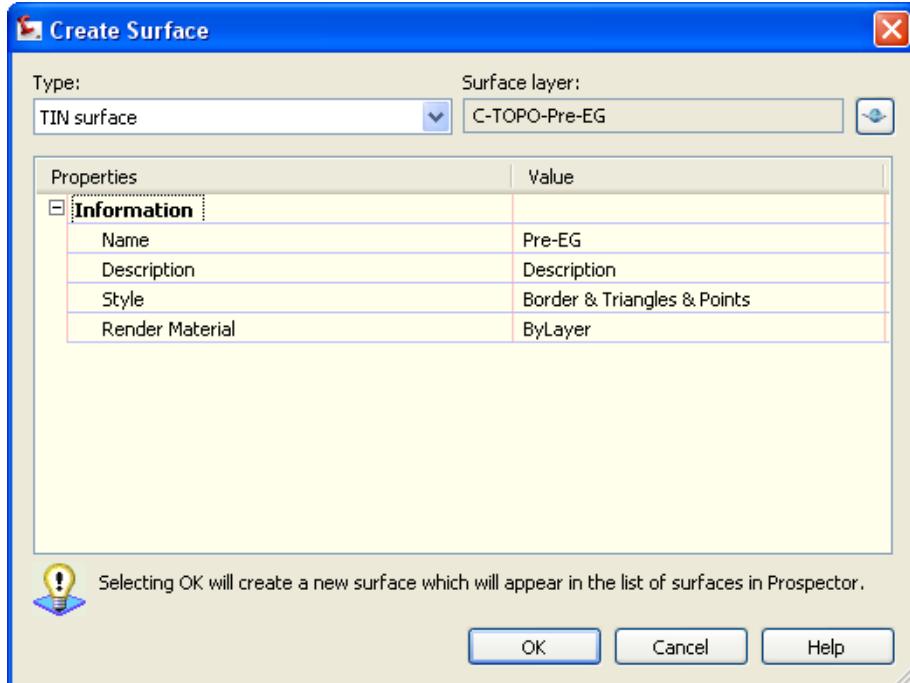
6. Click the **Surface Layer** button to open the *Object Layer* dialog box.



7. Set the **Modifier** to **Suffix**.
8. Enter "**-***" as the **Modifier value**.

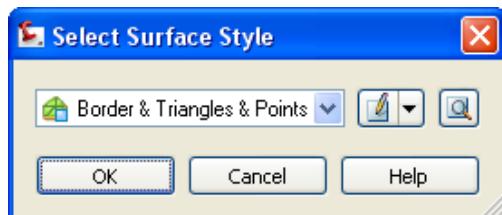
This will add the surface name as a suffix to the surface layer.

9. Click <<OK>> to close the **Object Layer** dialog box.



10. Enter "Pre-EG" for the Surface Name.

11. Click in the *Style Value* field to activate the Ellipses <<...>> button, and then click it to select a *Style*.



12. Select the **Style Border & Triangles & Points** from the drop-down list.

This will set your surface to display a standard looking TIN as soon as surface data is added.

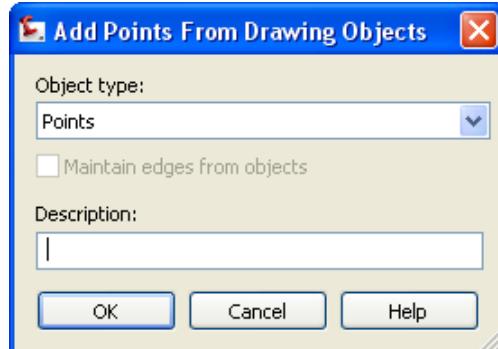
13. Click <<OK>> to close the *Select Surface Style* dialog box.
14. Click <<OK>> to close the *Create Surface* dialog box.

The surface is now created and can be found in the *Prospector*. At this point the surface does not have any data so it is not displayed in the drawing editor.

3.2.2 Adding Surface Data

Once a surface is created you can add many different types of data to construct the model. The first step in this process is to find out what type of data you have available. You may want to List the properties of objects that you intend to use in the surface to find out what type of an object they are and if they have an elevation assigned to them. For example it is important to know if your spot elevations are *AutoCAD* points, blocks, or text. If they have elevations you can use any of these but you need to know what they are so that you can use the appropriate command.

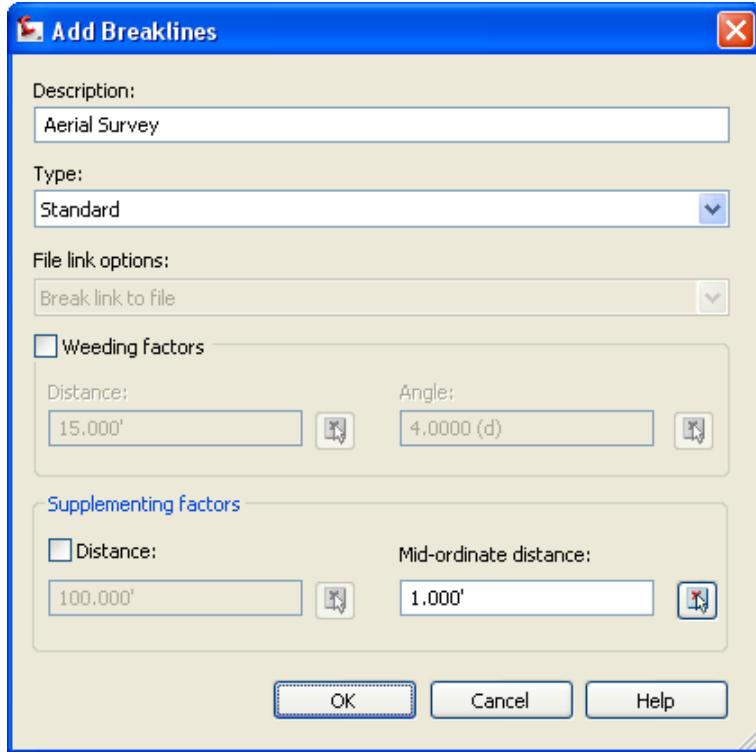
1. Turn off the layers **EX-BREAKLINE** and **Project Boundary** to isolate the spot elevations layer.
2. On the *Prospector* tab of the *Toolspace*, expand the **Surfaces** node.
3. Expand the **Surface Pre-EG**.
4. Expand the **Definition** node under *Pre-EG*.
5. Right-click on **Drawing Objects** under the *Definition* node and select \Rightarrow **Add**.



6. Confirm the **Object** type is set to **Points**.
7. Click <<OK>>.
8. Select all the points with a crossing window, then [Enter] to end the command.

The spot elevations are added to the surface and the surface is updated. The surface will display on your screen as triangles according to the surface style. If the surface is not visible on your screen, then check to see if the layer **C-TOPO-Pre-EG** is off or frozen. If it is, turn it on to display the surface. You may need to **Regen** the drawing after changing the layer state to see the surface.

9. Turn off the layer **EX-SPOTELEV**.
10. Turn on the layer **EX-BREAKLINE**.
11. Confirm that the **Definition** node under the **Surface Pre-EG** is expanded on the *Prospector* tab of the *Toolspace*.
12. Right-click on **Breaklines** under the **Definition node** and select => **Add**.



13. Enter "Aerial Survey" for the Description.

14. Confirm that the Type is set to Standard.

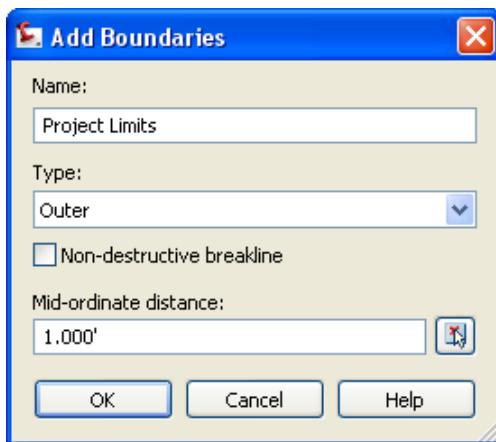
You will not use any *Weeding* or *Supplementing factors* in this exercise. These options allow you to remove or add vertices to breaklines respectively. These are useful options if you have breaklines that have been over digitized and may have thousands of extra vertices very close together or if you need to add vertices to a breakline that has long distances between vertices.

15. Click <<OK>>.

16. Pick the **breaklines** with a crossing window.

The breaklines are added to the surface and the surface is updated.

17. Turn on the layer **Project Boundary**.
18. Confirm that the **Definition** node under the Surface Pre-EG is expanded on the *Prospector* tab of the *Toolspace*.
19. Right-click on **Boundaries** under the **Definition node** and select \Rightarrow **Add**.



20. Enter "Project Limits" for the Name.
21. Confirm that the Type is set to Outer.
22. Confirm that the option for Non-destructive breaklines is Disabled.

Enabling the *Non-destructive breaklines* option trims the surface at the boundary while disabling it erases any surface lines that cross the boundary. This option is useful when you have good surface data on both sides of the boundary and are using the boundary to limit the extents of the surface. It is typically not used for outer boundaries.

23. Click <<OK>>.
24. Pick the Boundary.

The boundary is added to the surface and the surface is updated. The surface is dynamically linked to all of its surface data. So if you edit a point, breakline, or boundary the surface and the corresponding node under the surface definition will display as "Out of date" in the *Prospector*. If you right-click on the surface name in the *Prospector* and select *Rebuild* the surface will be updated to reflect the changes in the surface data. The undo command can be used to undo any changes to the surface or the surface data.

25. Save the drawing.

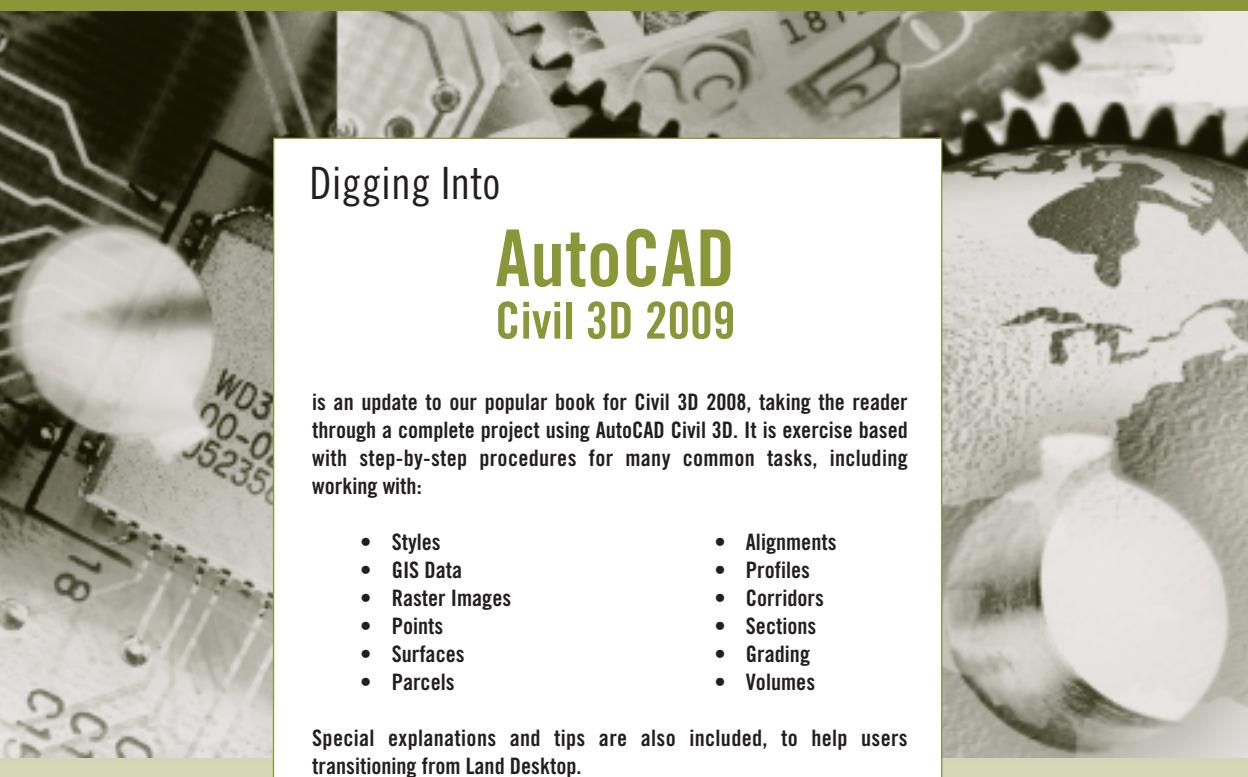
3.2.3 Changing the Surface Style to Control Display

The surface style controls the display of the surface. By changing the surface style you can display the surface in many different ways. Creating and editing surface styles will be covered in detail in *Chapter 5*. For now you should just get comfortable with the concept that surfaces can be displayed many different ways and that the display is controlled by the surface style.

1. Turn off the layers **EX-BREAKLINE** and **Project Boundary**.

You should now see the surface, displayed as triangles, by itself without the breaklines or boundary.

2. On the *Prospector* tab of the *Toolspace*, right-click on **Surface Pre-EG** and select \Rightarrow **Surface Properties**.



Digging Into

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is an update to our popular book for Civil 3D 2008, taking the reader through a complete project using AutoCAD Civil 3D. It is exercise based with step-by-step procedures for many common tasks, including working with:

- Styles
- GIS Data
- Raster Images
- Points
- Surfaces
- Parcels
- Alignments
- Profiles
- Corridors
- Sections
- Grading
- Volumes

Special explanations and tips are also included, to help users transitioning from Land Desktop.

"Rick's background in the civil engineering field, combined with his knowledge of the technology, uniquely qualifies him as a teacher and author of this new Civil 3D Training Guide. His thorough step-by-step manual and consistent ability with technical software led us to choose him to train Pierce County's employees. This training guide is thoughtfully laid out with precise directions and graphics. Thank you!"

**—Gael Serviss, Engineer Technician/CAD Manager
Pierce County, WA**



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