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White Paper

Comparing Autodesk Civil 3D 2005 and AutoCAD 2005

Autodesk commissioned this review by Michael Carris. Carris is Business Development Manager for K-TEK Solutions, a K-TEK certified professional, an Autodesk authorized consultant, and an Autodesk certified instructor. With more than 15 years' experience in civil engineering and surveying, engineering design, and land surveying, he provides consulting, training, and technical support for Timmons Group in Richmond, Virginia, and to many public and private engineering and surveying firms across the country. He is known for his expertise in design visualization, GIS, mapping, civil engineering, and land surveying software applications.

The following report has been minimally edited by Autodesk for editorial and formatting consistency.

Introduction

Most engineering firms say that they are in the business of creating review plans—a process that typically involves a project manager, project engineer, designer or design engineer, and drafters. The drafters spend hours creating drawings that represent the engineer's design intent. Often, these plans must be heavily edited, requiring many hours of additional drafting time.

The application these firms typically use is AutoCAD® software. Autodesk, however, provides industry-specific versions of AutoCAD for each discipline in the architecture, engineering, and construction (AEC) industry. Although a large majority of civil engineering firms use Autodesk® Land Desktop, many are still using AutoCAD software alone.

AutoCAD is a powerful application that enables a user to accurately represent the design intentions of an engineer or a land surveyor. By itself, it is a great product for drawing the engineer's plans. Some say, however, that AutoCAD is simply a computerized pencil and paper, essentially just a drafting tool.

Autodesk® Civil 3D™ software is a new design and drafting application that provides tools to accurately create a model that can be used to automatically generate engineering plans. Not only does it provide civil design tools, but because it is built on Autodesk Map® 3D, it provides all the features and benefits of AutoCAD and Autodesk Map® software.

Comparing these products is not fair, because they are different in too many ways. AutoCAD focuses on automating the drafting process, while Autodesk Civil 3D is designed to create a model of a civil engineering project using intelligent objects that adapt to modifications and automatically perform many drafting chores. This paper focuses on the advantages of using Civil 3D over AutoCAD when preparing a set of review plans.

Advantages of Autodesk Civil 3D over AutoCAD

Plans are often cluttered with information in an attempt to ensure that the contractor meets the design engineer's exact specifications. A subdivision plat, for example, typically depicts the existing site conditions and property boundary information, along with the proposed

design of the new lot layout. This information is displayed by using lines, arcs, text, and other AutoCAD entities.

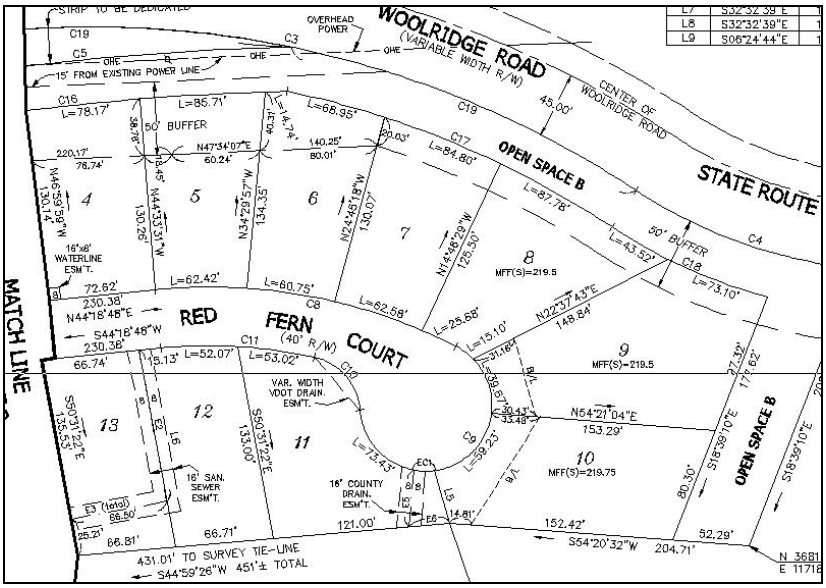

Figure 1

Figure one depicts a drawing with a large amount of text and information. The lot lines have bearings and distances, as well as parcel numbers. Creating this information involves three steps. First the geometry is drawn using the appropriate AutoCAD tool. Next, the geometry property is listed to determine information like direction and length. This information is then used to label the geometry using the text feature. If the geometry is modified or moved, the process must be repeated. Not only is this process time consuming, but the designer or drafter is relying on the graphics for the design information and must pay close attention to any geometry modifications to update labels or annotation.

You can create the same map using Autodesk Civil 3D's parcel object tools, which enforce certain design criteria. For example, the Create Lot Line tool enables you to draw lot lines that are perpendicular or radial to the right of way. Grips allow for easy editing and help maintain design intent. And as the lot lines create a closed parcel, the parcel object stores the data about the parcel within the drawing. This data is then used to either manually or automatically label the lot lines, parcel name, parcel area, or any other parcel information.

Engineering designs are rarely static. The client may decide midway through the process that lots should be smaller or reconfigured to gain a few more parcels. AutoCAD users must then modify the parcel geometry manually and reannotate the parcel components. Getting the parcel to be a required minimum size can be an arduous trial-and-error process.

Using the Autodesk Civil 3D Parcel Sizing tool, you simply adjust the parcel objects, taking the guesswork out of calculating a lot with a minimum area. You can merge, divide, and reshape parcels, and the parcel labels adjust automatically.

Scale and plan orientation is another area where Autodesk Civil 3D outshines AutoCAD. Before starting a drawing in AutoCAD, the drafter must determine the drawing scale and orientation. If the original scale is at 1" = 50', the size of the labels and text annotation is set to five AutoCAD units for the text to be plotted at .1 of an inch. If the drawing scale later changes to 1" = 30', the drafter has a monumental task to readjust all the labels. Changing the drawing scale may also require multiple sheets, which in turn may require that the labels in sheet one be oriented differently from those in sheet two. Accomplishing

this task in AutoCAD is time consuming. If a label appears on both sheets, you must use multiple labels on separate layers to show the label on both sheets at different angles.

With Autodesk Civil 3D, the process is simple. Because labels in Civil 3D are view dependent, the viewport controls the size and orientation of the labels. Simply create your design at 1"= 50' but set the viewport scale to 1"= 30'. The labels adjust automatically.

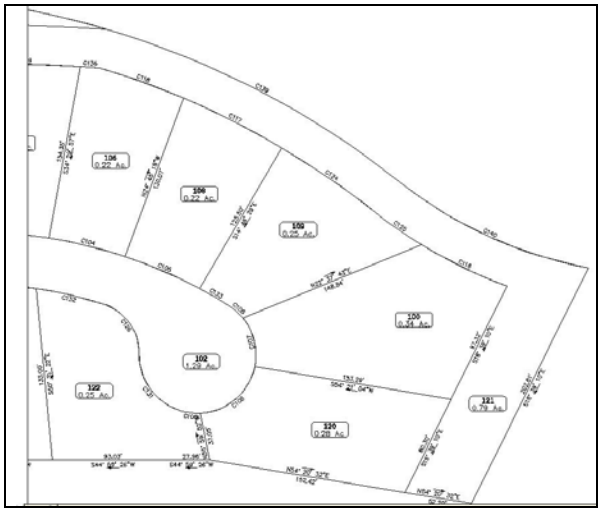

Figure 2

Figure 2 shows the design at 1"=30' with a view orientation angle of 215 degrees. The labels are plan readable and sized appropriately. The view in Figure 3 is set to a scale of 1"=20' with view orientation angle of 0. Labels in both views are the same size and are all plan readable. Both figures use the same set of labels.

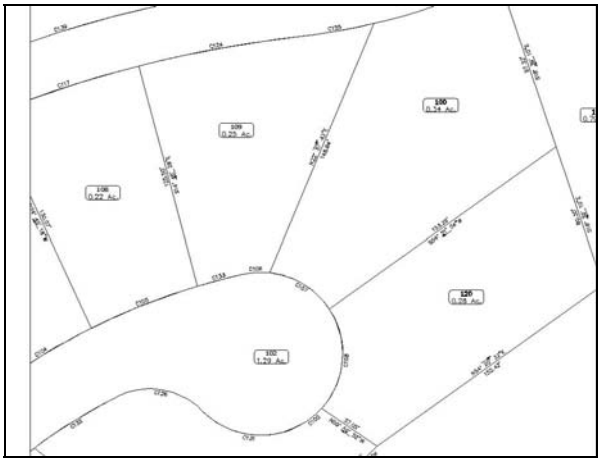

Figure 3

The following sections describe tasks that would be impossible in AutoCAD software without a third-party add-on or major customization.

Horizontal Alignment

Horizontal alignments typically represent the centerline of a road. In AutoCAD the alignment can be drawn but not truly engineered. Labels can be placed but not automatically. If the road alignment needs to be modified, then the labels must also to be modified.

In Autodesk Civil 3D, you create the alignment using alignment design tools. Labels are placed automatically. If the scale or orientation changes, labels update accordingly.

Surfaces

Surfaces in AutoCAD software are represented by contour lines. However, this is not a true surface. Users must interpolate between contour lines to determine a spot elevation. Surfaces are used to determine volumes and perform a slope analysis. None of this is possible using AutoCAD.

In Autodesk Civil 3D the surface is also an object and can determine volumes, display contours, and slopes, interpolate spot elevations, and much more.

Profiles and Sections

Creating a profile or section in AutoCAD requires a designer to scale and plot stations and elevations along a centerline, and then transfer this data to a graph. The graph itself must be created manually, and if a vertical scale factor is used, the designer must calculate that variable into the elevations when plotting the data. Then the drafter labels the profile with the required information. If the horizontal alignment or the surface changes, this process starts all over.

Autodesk Civil 3D uses the horizontal alignment and the surface to create the vertical profile and generate the grid and all the labels. If the alignment or surface is modified, these changes are reflected in the profile. The profiles, labels, and grid all update dynamically.

Point Objects

In AutoCAD, signs, manholes, trees, and other features displayed on a set of plans are typically represented by blocks or symbols. Some of these blocks have attributes that are used as labels for the feature. Those symbols that do not have attributes require text or mtext to label the feature. The same issue with scale and orientation or edits that exists in the other areas exists here as well.

In Autodesk Civil 3D point objects are used to represent these same features. Point objects are dynamic and have labels associated with them. Points objects can be adjusted for scale and orientation.

Conclusion

Both Autodesk Civil 3D and AutoCAD provide powerful design and drafting tools. However, using AutoCAD to create accurate and timely review plans is like using a hammer and handsaw to build a house. It can be done, but power tools get the job done faster and more accurately. If you are using AutoCAD to design and create your plans, take Autodesk Civil 3D for a test drive to see the difference for yourself.

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