



Quicker by design

Bury Council is transforming its highways thanks to AutoCAD Civil 3D, which has reduced the design lifecycle by a ratio of up to 6:1 on some activities.

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Dave Giblin, Group Engineer (design & construction),
Department of Environment and Development Services.

Since adopting market-leading civil engineering solution, AutoCAD Civil 3D, 18 months ago, Bury Metropolitan Borough Council has seen a vast improvement in the productivity of its road design activities. To give an idea of the difference the software has made to his team's performance, Dave Giblin, Group Engineer (design & construction) at the Council's Department of Environment and Development Services, notes that design stages which might have taken six weeks previously, can now be collapsed to just one week, thanks to the realistic 3D simulations that can be achieved on screen.

Although a long-standing user of Autodesk AutoCAD design software, the council had been using an old legacy system for civil engineering modelling, which it had acquired in the early 90s. Their original software had been a significant investment for Bury Council so they were initially reluctant to change to another new system.

Says Giblin: “The system was big and user-unfriendly for infrequent users, so, although we were paying the yearly maintenance fees, we were not using it as often as we could have.”

No design too complex

Civil 3D is a user-friendly AutoCAD-based tool designed for use on a range of civil engineering projects, including road design, site layout, and pipeline routing - any project requiring earth to be moved in large quantities. The latest release of the software, is an object-based dynamic 3D model system. This maintains relationships between all of its design entities, so that objects such as road alignments, surface models and building pads interact

with each other intelligently within the designs. So the effect of one change on another aspect of the plans can be seen immediately.

Giblin's team specialises in highway planning and design, and its 'bread and butter' business is junction design. “We redesign existing junctions, add right turns, and widen roads, for example to incorporate bus corridors,” he explains.

When the section read about the availability of a dedicated highways alignment package from Autodesk, this sparked great interest among the team. Project work was becoming more complex and the Council team needed a solution that would enable it to visualise alternative scenarios, so that it could consider more options, without delaying engineering work, or incurring extensive additional costs if plans changed.

One of the many attractions of Civil 3D was the object-based design approach, as this would enable Giblin's team to rapidly and accurately test out a series of alternative scenarios, and play through the ramifications, before committing resources.

A recent project involved connecting a piece of land newly designated by the planning department for construction to the main highway infrastructure.

Virtual excavation

The project was complex for several reasons. The highway was around 7 metres above the level of the adjoining land. The initial solution was for a ramp and bridge to be built between the two. This constituted a major earth-shifting job, so Giblin's team wanted to consider all the alternatives before moving forward.



“We first considered a bridge, but this meant a minimum headroom requirement for the road below,” he explains.

“When we discounted this due to stats issues and decided to close the road below, our only restrictions were vertical alignments. We chose instead to build just the ramp. Thanks to Civil 3D, we didn’t have to change the whole design; just part of it. We were able to reprofile 1500 cubic metres of excavation and associated cross-sections over a 400m long road in just five minutes. Previously, each iteration of changing a vertical alignment and working up cross-sections and volumes might have taken up to two weeks at a time, making it impractical to try out different scenarios.”

Rapid draining modelling

Meanwhile, new demands for sustainable urban drainage, in the wake of the floods of summer 2007, meant that the engineering team had to perform sophisticated simulations of the site’s surrounding environment to cope with changes to water flow caused by the new construction. Specifically, Giblin’s team needed to be able to model and verify the storage capacity of a nearby pond to cope with rising water levels.

Giblin explains: “The grading tools within Civil 3D allowed us to model the features of the pond below the surface of the water that were not able to be picked up by the land surveyors. We extrapolated existing bank slopes and determined a probable bed level. We could then vary the virtual water level and calculate the volume available for storage. The contouring abilities of Civil 3D then allow us to visualise the outline of the pond surface at that level.”

A further challenge was to determine the feasibility of building a deep manhole, or ‘chimney’, into the embankment to provide continued access to a large underground chamber, and how the different elements would work when integrated together. Civil 3D made this very easy.

Summarising the benefits of the software, Giblin says: “It takes the pressure off a major part of a project, accelerating the design part and enabling new alternatives to be simulated which would not have been practical before, especially if they were slightly unusual. This allows us to be more creative.

Working with the facts

“I like the fact that there is a ground model of my site in the system,” he continues, explaining that now, all of the measurements taken by land surveyors are processed by the software to produce a very accurate, triangulated (3D) ground model. “This means I can now design within these constraints, rather than with an incomplete data set, where I may be stopped in my tracks because some of the information I need is either missing or in the wrong format. Now I can just get on with it, and know that I am producing more accurate feasibilities. It gives me a margin of comfort I didn’t have before, to know I’m dealing with what’s really there and not someone’s interpretation of it.”

The more the Council team use Civil 3D, the more they are realising what is possible, Giblin concludes. “Before, we had to have specialists using our old software for 20 hours a week and even those who’d been trained to use it became rusty if they hadn’t used it for six or nine months. As a council, we can’t afford expensive specialists; we have to be jacks of all trades.

“Civil 3D is easy-to-use and intuitive and, even if there are parts of the package we haven’t fully explored yet, there is always the flexibility that we can do 85% of the design work we need in Civil 3D, and easily add the rest in AutoCAD which we’re all very familiar with, for any final tweaking we might want to do, and then see this propagate across the design.

“But, we’re becoming more and more sensitive all the time to new scenarios we could use Civil 3D for, so we expect to derive even greater benefits from the software in future.”

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