

GHD Pty Ltd

Sean Lawrence

12d DIMENSIONS:

BIM



Sean Lawrence addressing the delegates of the 12d Technical Forum 2018 about 12d Model and Revit

Project Summary

Using 12d Model with Industry Foundation Classes (IFCs) and Revit is quite advantageous for all Revit users; using this information allows them to have greater collaboration between the two products.

For more information

To find out more about how you can create better designs faster with the 12d Model solution for civil engineering design, visit www.12d.com.



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The Challenge

Previously, in other projects, the challenges GHD faced involved linking 12d Model drainage network models into Revit (various methods used include 3D CAD, ExDS .xml Generator, an Excel-based generator), 12d TINs into Revit (limited information) and Civil data into Revit (various plugins including Dynamo to try and replicate civil design data such as track slabs for light rail). However, across a major project, replicating 12d data in Dynamo without a dedicated resource can be a lengthy process. These methods often involved long and complicated import processes, and they only had limited information.

The Solution

Using 12d Model with IFC helped to alleviate some of this. IFCs are the global standard used to describe, share, and exchange construction and facilities management information. As a data format, IFC is neutral and non-proprietary (*i.e.* not the product of, or favouring, any particular vendor).

GHD's workflow for using 12d Model with Revit entails exporting an IFC file from 12d Model, editing the IFC file in a text editor, then linking it into Revit. They use the IFC Express Writer within 12d Model to facilitate this process. Once they've shifted the 12d Model closer to zero for Revit, they open it with a text editor so as to change the `IFCCartesianPoint` to 0,0 (the `IFCCartesianPoint` is the coordinate used by Revit as its placement point).

This process will stop the data from being distorted and therefore useable by Revit. This model shift and step of editing the file is not done for other software like Navisworks.

When exporting from 12d Model to Revit, Sean said it's important to remember to change the `IFCCARTESIANPOINT` to `((0.0,0.0,0.0))`, making sure the origin in the IFC Express Writer Dialogue Box matches the Revit Project base point coordinates, and to ensure the Export Attributes box has been ticked.

Before they bring it into Revit, they set up a few options that allow them to map certain 12d Model elements and IFC classes to an appropriate object inside Revit. They achieve this by setting up a template with a pre-defined project base point which allows them to generate a model in real-world coordinates. They also set an IFC mapping class, which allows them to map 12d elements to the correct Revit categories *e.g.* pipes that come out on an IFC element assembly to the Pipes category inside Revit, 12d TINs to a Site category inside Revit, and for anything that's on a building element proxy, they can choose to map this to a generic model or something else.

Linking an IFC file into Revit creates a few extra automatic files (IFC files, Revit files, HTML Log files, and Shared Parameters files, which are used for mapping attribute data from 12d Model a parameter inside Revit).

Sean demonstrated aspects of these processes, including handy tips for how to get around some issues that can arise, and how interrogating a model in Revit allows them to see all the different kinds of data that are coming through from attributes in 12d Model. Mapping attributes and checking calculations are correct is essential to this process.

So what is actually generated when we put an IFC into Revit from 12d Model? All the element information comes from the 12d Attributes, but it's a static model when linking into Revit. By using these programs together, Sean's team was able to produce an accurate replication of geometry without having to re-model through Dynamo. The colours were driven from 12d Model polygon colour mapping, which was ideal for standardisation. They used a Shaded/Realistic model with Graphics Display Options – Show Edges = "Off" to make polygon triangulation disappear (something Sean was able to demonstrate to the audience in his presentation), and created Linked Views for project consistency.

The string information from 12d Model, according to Sean, was extremely beneficial as an export – they were able to use IFC generated strings for 3D pick line modelling, and to colour strings by filter or category using the parameter information from 12d Model. Strings were used to show edges in 3D views while "Show Edges" was unticked.

In Plan View, some important steps in GHD's processes included filtering 12d strings to show Control Lines and Road Linemarking, using filters to hide the lower Trimesh models for a cleaner view, and adjusting transparency to view below the surface. They also used shading techniques to get their Linked View plans looking consistent across all projects. In Section View, they filtered for annotation of different elements.

When linking 12d IFCs into Revit, there are automatically generated schedules for each IFC Class mapped, and schedules are generated as a result of the IFC Class to Revit Category Mapping Template. This allows them to check data and use it for their own techniques when writing documentation.

As with the trimeshes from 12d Model, the GHD team is able to use the IFC Site Export function from 12d to generate a Site category family of any TIN. The ability to export an existing SurveyTIN and SuperTin with Linework for use in drawings have also proved invaluable, as having cross-sectional display control, Plan Shaded, Colour Change, contour and linework control, and the ability to change Mapping of Survey export from 'Generic Models' to 'Lines' Revit category.

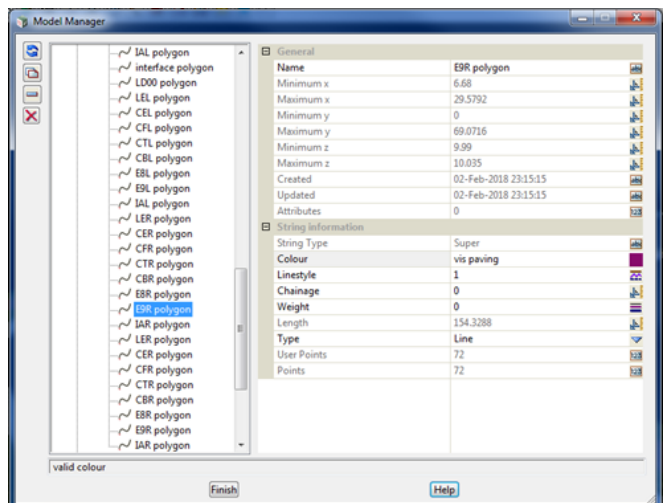
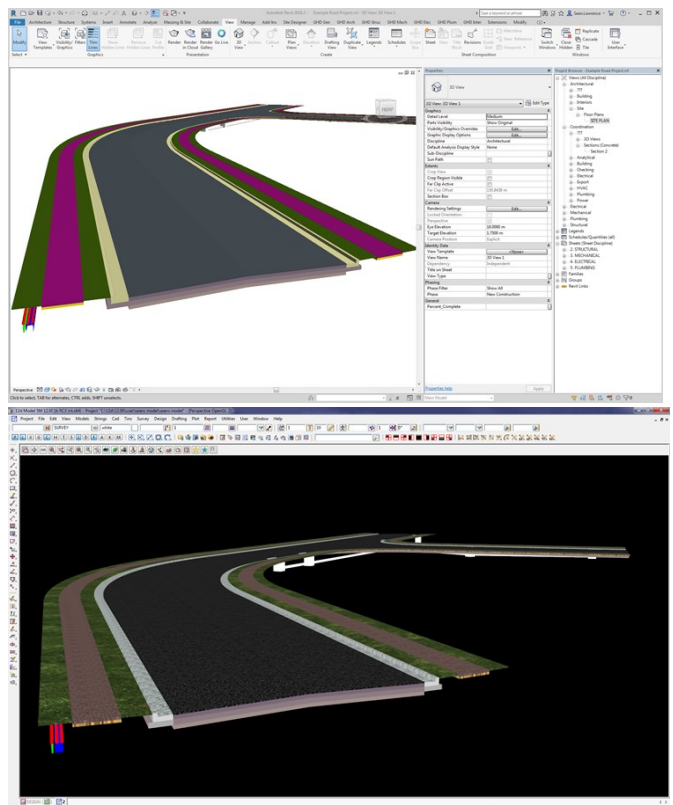
Sean also ran through some of the challenges his team faced in using Revit, such as not being able to edit elements when linking IFC files, and not being able to use colour overrides in Plan or 3D, and how upgrading to 12d Model 14 is helping them to overcome some of these issues. In particular, using IFC 4 in 12d Model 14, the team was able to bring data back into 12d. This method keeps file sizes smaller, allowing for more complex design. 'Splitting

data into Entity models' allowed them to separate all the IFC elements into their individual IFC Class models.

The GHD team was also impressed by their ability to use these processes in their civil documentation without the need to remodel services – it all came directly out in their annotated cross sections, with the help of macros in 12d Model.

Result

Overall, the positive impact of being able to use 12d Model in this way, Sean said, has given GHD the ability to gain accurate and up-to-date information in a variety of areas, to help them produce even better-detailed design jobs for their clients.



Accurate replication of geometry without having to re-model



Roads and Highways

12d Model's design option is the smarter solution for the design, modification and maintenance of Road and Highway projects.

Enjoy advanced 3D tools to design local and major roads, intersections, roundabouts, highways, interchanges and much more.



Ports and Dredging

12d Model is the solution for port infrastructure and dredging, easily managing the very large datasets and complex volume calculations often required by these projects.

A complete range of flexible and customisable volume calculation tools allow teams to extract and present the information quickly and easily.



Land Development

12d Model is the most versatile solution for the creation of sustainable land development projects, including residential, commercial and industrial developments, recreational areas, landfills, and agriculture projects.

Easily manage all aspects of your land development project from earthwork quantities, road design utilities and drainage design.



Airport Infrastructure

12d Model provides a solution for the design, construction and analysis of new airports, as well as the upgrade and maintenance of existing runways and airport infrastructure.

Easily manage large airport infrastructure projects and share data across multi-disciplinary teams.



Rail

12d Track has been specifically designed for the survey, design and construction of light, heavy and high speed rail projects.

Extensive railway tools in 12d Track allow the rail designer to quickly and easily design their projects. These options are built on the existing 3D modelling and design tools available in 12d Model.



Mining Infrastructure

12d Model's powerful set of exploration, site investigation, survey and analysis tools are crucial for the initial design, construction and ongoing operation of mining projects.

Comprehensive tools for the survey, design and construction of access roads, railways, earthworks and services allow for the coordinated design and management of mining infrastructure from within 12d Model.



Drainage, Sewer and Utilities

12d Model provides comprehensive tools for the design, analysis and optimisation of stormwater and sewer projects using rational, dynamic (hydrograph) and 2d drainage methods.

Powerful clash detection management allows for efficient 3D modelling of service networks such as gas, electricity, telecommunications and water prior to construction.



Surveying

12d Model is a complete surveying package providing the tools to manage all facets of surveyed data including LIDAR, topographical, as-built, conformance, traversing, geodetics, data mapping, labelling and much more.

The 12d Field option runs on a ruggedized tablet and gives the user access to full 12d Model functionality, allowing you to take the entire project into the field with the most comprehensive pick-up and set-out tools.



Oil and Gas

12d Model assists with the design, construction and mapping of oil and gas pipelines, original site exploration and the wide range of infrastructure required for oil and gas projects.

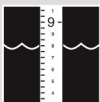
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



Construction

12d Model is the ultimate software for construction with powerful set-out options, direct interfaces to machine control and detailed conformance reporting and auditing.

Manage 3D data and control volumes, quantities and progress claims with 12d Model. Set-out your project and undertake conformance and as-built surveys live on-site using 12d Field.



Rivers, Dams and Hydrology

12d Model handles very large datasets and interfaces with a wide range of analysis packages, making it perfect for flood studies and the management of rivers and dams.

12d has partnered with industry leading analysis software, allowing users to apply 2D drainage analysis from within 12d Model.



Environmental

12d Model's ability to handle very large datasets combined with flexible and comprehensive 3D analysis and modeling tools make it perfect for a wide variety of environmental projects.

Existing workflows can adopt 12d Model easily as it allows users to directly interface with GIS systems and most software packages and file formats.

Why Choose 12d?

- Powerful data processing & intelligent functionality.
- Modular, easy to update & completely customisable.
- Seamless integration with major industry software and hardware.
- Used in over 55 countries worldwide.
- Friendly support & training from industry experts.

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