

Arup

CLIENT: Transport for NSW

Challenges solved by 12d Model:

- Improved collaboration across teams and disciplines
- Cutting down on work after initial setup
- Design verification checks within 12d Model

12d DIMENSIONS:

Civil Engineering

BIM

"The review process becomes so much easier because people can be reviewing it anytime they want. They don't have to wait for an output of plans because they just open up 12d Model and see it all there in a 3D space. It's simple."

--Danny Wilcox, Arup

Pushing the boundaries of design innovation

Arup moves from 2D to 3D with 12d Model



Westmead Terminus

Introduction

Arup, founded in 1946, is an independent firm of designers, engineers, architects, planners, consultants and technical specialists working across every aspect of built environments. The company employs over 14,000 specialists working across 90+ disciplines in 34 countries.

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.



Australasia: Sydney
P: sales@12d.com
M: +61 2 9970 7117

The Challenge

Arup won the contract for Parramatta Light Rail, a major road and rail project in western Sydney. This involved re-routing traffic onto different streets to allow for the construction of the light rail. The project covered many different areas, which required multiple solutions and different disciplines. The client was also keen for the design to be delivered in a digital space rather than just on paper, and deadlines were very tight.

Traditionally, Arup had designed roads in one package and structural designs in another package. But constantly switching back and forth between CAD and 12d Model, from paper to digital and back, took up a lot of time. Instead, Arup decided to use a BIM approach and find a more efficient and collaborate way to design, making it a truly "digital engineering" project.

The Solution

12d Model was chosen as the software solution because it enabled everything to be done digitally, in 3D. To start with, Arup invested time in setting up and customising the project. This effort quickly paid off as things progressed, because it saved a lot of time and rework down the track.

By using 12d Model as the single source, Arup was able to have all the different disciplines in one place, working collaboratively.

"We could design out any issues that we saw right at the start, rather than leaving it to the end of the project and then picking up errors and having to go back and do rework," explains Jarrod Dixon, Senior Designer, Arup.

Another improvement was being able to do all the design verification checks within 12d Model. Previously these had been done outside of 12d Model in 2D, but now all the turning paths, sight line checks and so on could be done in a 3D 12d Model, enabling designers to review as they worked.

The client could visually see the benefits of the system and was "on board the whole way through the design phase".

"Usually, you'd have a roll plot on the table, and when they asked for it a couple of times during meetings, we said, well hang on a second, have you got a HDMI cord? And we just plugged in the model and after doing that once or twice, they were on board," says Danny Wilcox, Designer, Arup.

CAD plans, when required, could be generated straight from the 3D models. This meant very little drafting - with only one drafter being employed on the entire project.

One section of road works had a complex structure for a widening. Arup created a model showing the 4D changes in time of how the structure would be built and how the road would stay live at the same time, and then how the rail could be added to that at the end. "It was quite interesting to see, and the people's faces in the room when they saw it all come together. It was pretty cool," Danny says.



Robin Thomas Reserve

By doing this, they were also able to give the construction team a better idea of the different phases and staging of the project. This gave them a better idea of how much the project would cost, and where they could improve construction methods to deliver the project more efficiently - a method referred to as "5D BIM".

The team also used lots of snippets and macros. Smart snippets were used to automate and streamline the design process, allowing users to have different inputs into the snippet. This changed the code in the background to enforce the way that they modelled and keep everything consistent, producing consistent outputs and saving time.

Macros also helped save a lot of time. One macro was created to dynamically carry out aquaplaning checks, so designers could move around and pick the worst areas easily. Vehicle paths were also an area that the team invested time in, because they were usually done in CAD, which was very iterative, hard and time-consuming work. Now these are all computed within 12d Model, they move with the design as the design changes and can then be exported straight to PDF or straight to a 3D model.

"The way 12d is set up to allow you to customise inbuilt panels with macros is pretty cool. So, anytime you hit a bit of a stumbling block where you want to do something completely different, you can dive into a macro and really nut it out and get something cool," Danny says.

Another macro was created to automatically recalculate and output lines of sight. The client wanted to get as

many trees into the precinct as possible, which meant Arup needed to check sight lines at every single driveway and intersection, to ensure that trees weren't obstructing the view. In a 2D plan this would have been largely guesswork, but the 3D model allowed them to see exact views. This included being able to see the true scale of signage, such as speed signs versus four pole directional signage.

"The Parramatta Light Rail project has set the standard and set the bar for how we're going to work in the future. We've done a scope with surveyors and got them on board in terms of giving us improved information. We've worked with Transport NSW to standardise the schema of the attributes that we want applied to the data so that we can manipulate it in different ways within 12d Model. And there's a bit of a push to get that outside of Arup as well and make that a real standard and bring everyone's level up," Jarrod says.

Outcomes

Improved collaboration

Using a BIM approach with 12d Model offered unprecedented coordination. Different teams and disciplines were all able to collaborate on the design.

Time-saving automation

By customising and standardising the project at the outset, and using 12d Smart Snippets and Macros, hundreds of hours of work and rework were saved.

3-dimensional insight

By moving from 2D to 3D, designers were able to clearly see exact lines of sight from any angle. Taking this to 4D, with the time stages of the project added, helped the construction team find cost efficiencies.

"The industry is definitely moving to a way now where you have the one model the whole way through. So, the model rolls through the different design phases, then rolls through the construction phase and like you said, it rolls into the asset management phase down the track. I think that the client can definitely see the benefit in it, and I think they'll start to request it on future projects now as well."

--Jarrod Dixon, Arup



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.

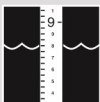
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



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.

AUSTRALASIA: Sydney
 E sales@12d.com
 P +61 2 9970 7117

12d Solutions Pty Ltd PO Box 351
 Narrabeen NSW 2101 Australia
 © 2019 12d Solutions Pty Ltd