

Revit® Structure Software:

Speed, ease and fewer project staff in Arup Cork

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James Duggan

Associate Director and Project Manager,
Arup Consulting Engineers

Arup Consulting Engineers has developed a leadership position in engineering services in Ireland and employs over 500 personnel in offices in Dublin, Cork, Limerick and Galway. The firm is part of the Arup Partnership, one of the world's largest and most successful consulting practices with over 10,000 staff working in more than 37 countries through 86 permanent offices. At any one time Arup will have 10,000 or more projects running concurrently. The original Arup firm was founded in 1946 when Sir Ove Arup established offices in London and Dublin. The Arup Group today consists of a number of independent yet inter-related practices that operate in partnership. It is a unique firm, its independence guaranteed because it is owned in trust on behalf of its employees. In addition to structural, civil and building services design, Arup offers a wide range of other services. This multi-disciplinary approach means that any given project may involve people from a number of disciplines, sectors or offices.

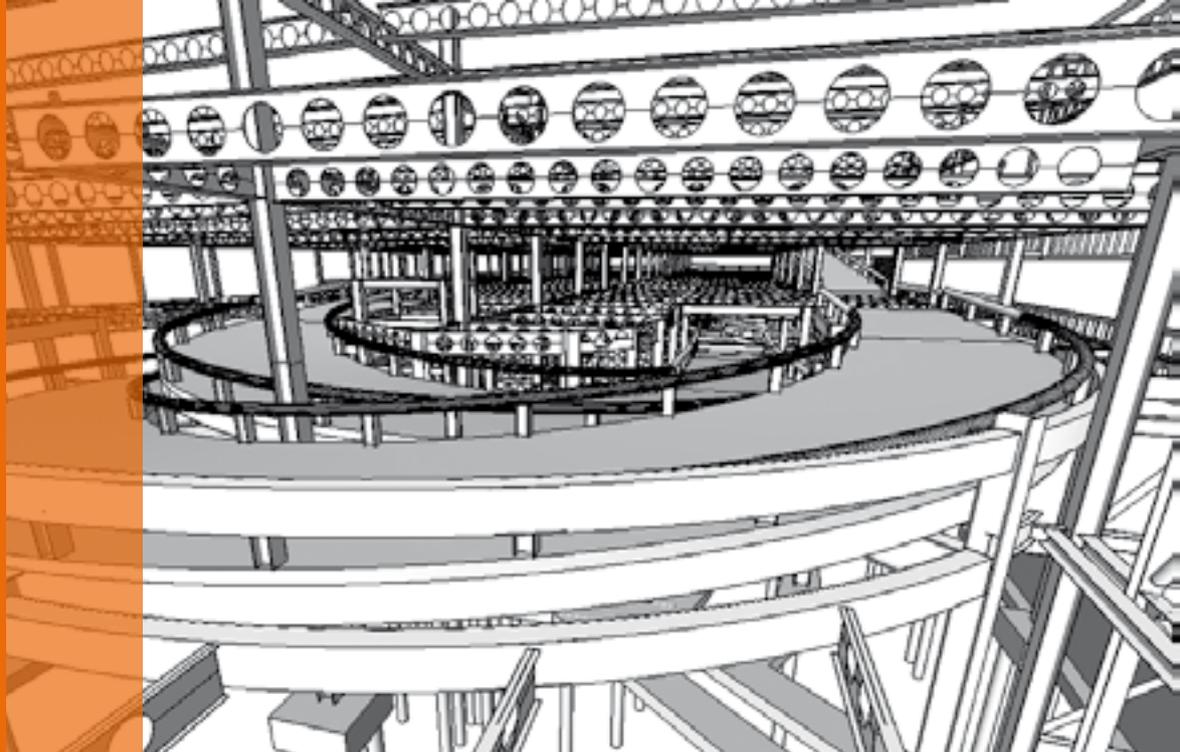
The Cork office has a team of 110 organised in four business units with teams of approximately 20 technical staff led by a director. Two of these teams are involved with structural design work and have been working with Revit Structure software since early 2006. “So far we have used Revit Structure on a number of projects including mixed retail and commercial developments in Blackpool and Dennehy's Cross as well as Ballincollig town centre and a new campus building for electronics multinational EMC,” explains James Duggan, associate director and project manager. “But the principal project based on Revit Structure is the €80 million re-development of the Douglas Village shopping centre.”

“We are now on site and construction has begun. It has been a complex project during the design phases, in a large part because this is in fact one of the oldest and most successful shopping centres in Ireland. So the re-development and extension has gone through many design revisions driven by site constraints, the planning process and modifications of the development itself.” James Duggan points out that at 65,000 metres sq. the Douglas centre extension is bigger than the original. The most significant design revisions have included, for example, the addition of offices and major changes to the anchor unit.

“When we moved on to Revit Structure as our CAD platform we had some experience in 3D design,” explains lead project technician Stephen Whelan. “We all recognised the value of working in 3D but encountered some problems because the 2D drawings generated from those other packages were generally poor in quality. With Revit the opposite is true and on this project we have been able to produce high quality 2D drawings quickly and easily once the primary model was in place.”

Confirming that the anticipated increase in productivity in drawing production was one of the major factors in the Arup decision to move to Revit Structure, James Duggan adds that engineering visualisation was also important for the complex design challenge of the Douglas project. “For example, one part of the design involves a scissors spiral access ramp. That could really only be designed in 3D and the visuals were just fantastic. This is true 21st century structural design.”

He explains that the complicated nature of the Douglas project, with a large new development



being added to the existing shopping centre on a constrained urban site, poses a wide range of design challenges. "It certainly has meant that we needed a lot of visualisation and then cross sections to confirm the details for other professionals and contractors. For example, we have generated over 300 sections right through the building. On one occasion at the client's request we had to produce a section on every grid line, immediately, so over 60 detailed sections were produced overnight. Now that we are in the construction phase, 2D working drawings are being readily generated as required."

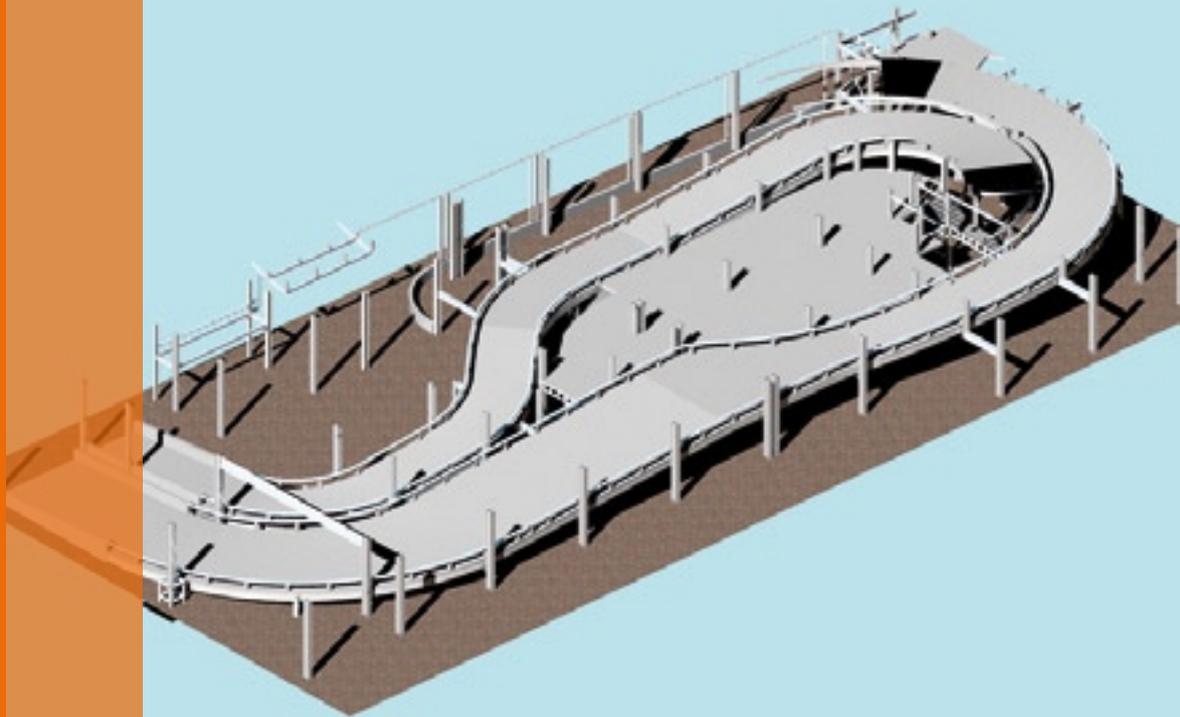
An area in which Revit Structure contributed greatly to the speed and control of the design project was in scheduling for beams and columns, according to James Duggan. "There is a full library of British Standard specifications in Revit so once the specific sizes are associated initially the system ensures the same beam cannot have two different specifications. It is a simple and highly useful example of the many ways in which a building information model can hold information in a definitive form and ensure consistency where drawings generated in 2D applications does not have this intelligence" In a similar vein, he recalls, Arup ran a clash detection trial for the Blackpool project in respect of HVAC and piping which worked very well. "Our M&E department modelled in their services over our structural model using Revit MEP. They were very pleased with the linking and modelling ability."

Collaboration within the Arup office on the Douglas Village project was greatly facilitated by the relevant features in Revit Structure, according to Stephen Whelan. "We had three people working simultaneously using the work sharing facility and there were simply no issues at all. Each would work on a section of the model, borrow any elements required, and save back to the main network model every 15 minutes. So everyone had an up to date view and knew exactly what was going on. It completely avoided the kinds of mistake that can easily occur in other forms of collaboration and ensured that the overall design work progressed at a good pace all the time."

But for Arup in Cork the undoubted highlight of its experience so far with Revit Structure has been the visualisation capabilities, James Duggan emphasises. "Not to play down the ease and speed of the design and drawing features, but being able to visualise highly complex structural designs has been enormously valuable to us. That has been true both in house—working with our mechanical and electrical colleagues, for example—and in presenting the project designs to clients and third parties. One superb example is our draft design for a spiral access ramp in the new Douglas Village Shopping Centre. We were able to show all of the project partners an animated drive through as if there was a camera on the bonnet of a car driving up and down the spiral of the ramp."

So far, the Arup team has used the visualisation capability just to show the structural elements of designs. "There has been a certain amount of rendering to make the visuals more realistic, such as changing sky and clouds going round that spiral vehicle ramp. The quality has been very good, higher than for example in AutoCAD®. But we have not yet attempted higher quality, detailed rendering. In large measure this is because so far we have just not needed that level of realism for the presentations the projects have required. This is a superb tool for presenting design approaches to a client, with complete clarity and little room for ambiguity or misunderstanding. But by and large structural engineering does not need the detailed realism that some kinds of architectural visualisation might demand."

From a project management point of view, the engineer and CAD technician relationship which exists today is further developed using Revit Structure. This includes communication through visualisation but very importantly through Revit's ability to produce a 3D analysis model in a wide variety of formats which can then be used in third party structural analysis software. Arup Cork used this Revit facility to produce the initial analysis model in Douglas Village Shopping Centre. A great amount of time was saved because the technician had produced



the 3D model. Instead of the engineer producing a similar analysis model at the same time, the 3D model from Revit was exported to Oasy's GSA. The bi-directional link that Revit offers with other analysis software packages is the future of engineering today. Arup Ireland are currently looking at other packages that link with Revit Structure and hoping to develop this further.

From an overall business point of view, the value of the move to Revit Structure for Arup Consulting Engineers in the Cork office has been absolutely clear: "Not only has it speeded up the design work on our projects," James Duggan confirms, "but we have significantly reduced the number of technicians that need to be involved in any project. It has also extended the span of control of a project manager like me—in fact I'm now spread over a number of significant projects simultaneously!"

Training has not been a problem, he adds: "Graduates these days are used to working in 3D and in any event if the person has any flair at all for CAD, Revit is not a difficult package to master. We have already had experience of how easy it is for a newcomer to slot into a design team quite quickly. But we also invest in professional Revit training for the staff to ensure that they are up to speed."

"One other point should be made about tendering for projects: with every potential new client we can now present multiple design options and sketches in an attractive visual format and both efficiently and quickly. All markets are highly competitive today, including engineering consultancy. We believe that Revit and 3D modelling in general is now a necessity for a firm like ours."

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