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Uniting the BIM World with Navisworks

Also Inside

- *If You Can't Beat It, Customize It*
- *AutoCAD in Live Theatre*



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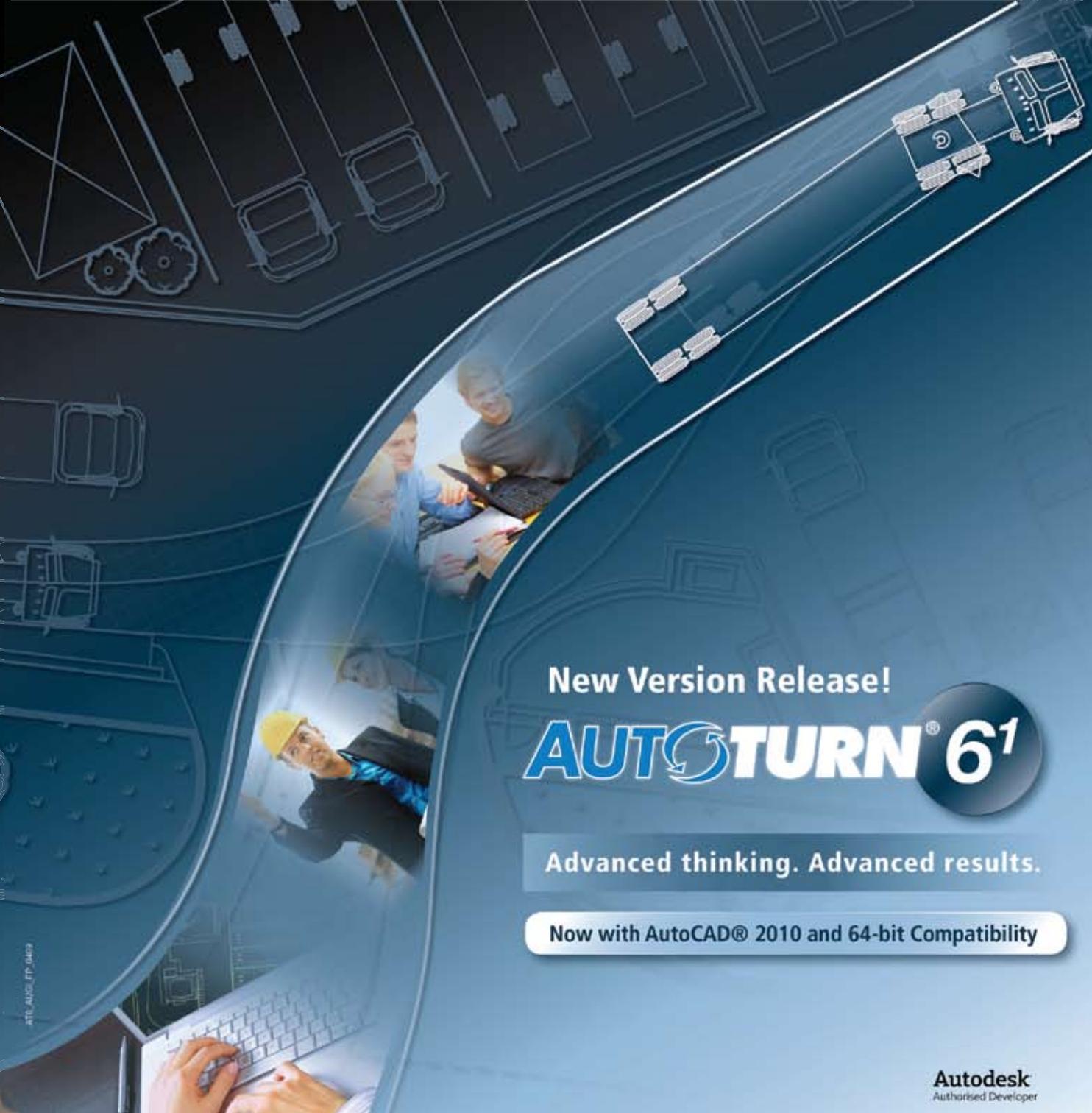
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Uniting the BIM World with Navisworks



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The CAD Manager



A Good Fit: Is CAD Management right for you?

Not everyone is cut out for CAD management. Many can be given the title, but I think that some will excel in the role more than others. Some just fit the profile. This is not to say that others cannot be successful. There are many CAD managers who are successful. Success can be defined in several ways. It can mean that they developed a good standard, or that they created good menus, or that they have completed successful projects. These are all tasks that a wide array of managers can complete.

But while being successful can be defined in many ways, success does not define a good fit.

So what makes a good fit?

What makes a good fit between the work, functions, duties, responsibilities, and roles of a CAD manager and you? What makes a successful CAD manager? Who is cut out for this kind of work? What makes one CAD manager seem to work so well at it and another struggle? Is there some pattern that might help you figure it all out before you get stuck in a job or a career that you don't really like?

I think a good fit means that your firm is happy with your work, you are happy doing that work, and the work makes your firm more successful.

Here are some areas that I think will help you determine if you might be a good fit for a career in CAD management.

Prerequisites

Most of the CAD managers I have talked to have performed that role as an

outgrowth or progression of their technical ability. They are very advanced in the skills that are needed for working the technology of design. This has nothing to do with their capability at the design functions apart from the computer. They are just very good with the computer side of things. It comes easy to them.

I think a good fit means that your firm is happy with your work, you are happy doing that work, and the work makes your firm more successful.

So if I were to tell others about your CAD ability, I would say:

- You have a great understanding of the CAD software.
- You are able to figure out just about anything.

- You have a way of getting things done in CAD that others admire.
- You seldom have trouble figuring out a problem and finding an answer.
- When there is a problem, you have an answer.
- You are able to work around problems and get the work done.
- You catch on quick.
- You “get it” sooner than others.
- Things just work for you.
- You are the person others can go to when they have a problem.
- You can get it to work when others cannot.

These are all statements about CAD ability that are usually said about the CAD managers I know. These are a must. You cannot be a good CAD manager without knowing the tools of the trade inside and out. It is expected. Without these skills, you will not succeed in the long run.

But it doesn't stop there. It takes more than just good CAD skills to make a good CAD manager. If you stop at good CAD skills, then there will come a point when others will know more than you. CAD managers are not guaranteed to know everything. There may be others. But before that happens (and it will) good CAD managers have transitioned into having more skills than just CAD skills.

Management skills

Management skills can also be technical in nature. These are the hard skills. The soft skills are people skills.

Let's start with the hard skills. These are typically thought of as planning, organizing, monitoring, and controlling. These are learned skills that come from information and understanding developed through practice.

So if I were to tell others about your management hard skills, I would say:

- You are very organized and it seems to come naturally.
- You offer others suggested ways of organizing.
- You think along the lines of process improvement.
- You are much better than others at planning.
- Your plans are well thought out.
- Your planning breaks down complicated tasks into manageable portions.
- You are adept at making course corrections if things don't work out as planned.

Now let's discuss the soft skills. These would include people skills such as communication, delegation, negotiation, coaching, and mediating. These skills allow you to get along with others and to move things forward when people do not cooperate.

So if I were to tell others about your management soft skills, I would say:

- You get along well with others.
- You are able to communicate at all levels of the firm.

- Your written and verbal skills are superior.
- You are able to assign tasks to others and oversee their efforts.
- When others have a misunderstanding, you are able to clarify it.
- There are very few who think that you are heavy-handed.
- You are able to make wise trade-offs to get things done.
- You offer advice to many and they welcome it.
- You are able to get two parties to find common ground even though they may disagree.

It is who you are

Soft and hard skills can help you make a positive career move, but I think that a good fit also depends on who you are as a person. Character counts for more than you think. This includes the more deeply rooted personal characteristics such as trustworthiness, honesty, integrity and confidence.

So if I were to tell others about you, the person, I would say:

- You have confidence in your abilities without being conceited.
- You are happy with who you are, but you are still learning and getting better.
- You enjoy being around others—not extroverted per se, but you operate well in crowds or small groups.

- You are honest and straightforward.
- You include others in what you do.
- You welcome other people's ideas and give them credit.
- You do what you say you will do when meeting deadlines.
- If (when) you fail, you admit your mistakes.
- You share with others: ideas, information, and successes.

If the things stated above can be said about you, or more correctly, are already said about you, then you have a greater chance of succeeding in a CAD management position. The reason is simple. A good fit is a combination of what you can do, who you are, and what your company wants from your position. When all these are in union, things can start clicking.



Mark W. Kiker is president of the AUGI Board of Directors. He is a National CAD Standards Project Team Member and team member of the National BIM Standard. Mark is general editor of BLAUGI and also publishes caddmanager.com, the CADD Manager's journal, as well as the caddmanager.com blog. He is a returning faculty member at Autodesk University. He is currently chief information officer for HMC Architects in Ontario, California.

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Uniting the BIM World with Navisworks



I am always taken aback a bit when I hear statements made about Building Information Modeling (BIM) being the future of design. Invariably I hear one person or the next talking about how BIM will change the industry and this or that will happen in the future—this brave new future provided by this interesting “new” technology.

I am taken aback because, while these statements would have been shrewd assessments of the future of the industry if they had been made back in 1999 or even as recent as 2003, those statements are hardly appropriate now. BIM is reality in the AEC industry.

And let’s be honest about why we have arrived at this moment in history where everything has changed. We are the beneficiaries of the ingenuity of a small software firm called Revit Technology Corporation and the infinite wisdom of design juggernaut Autodesk, which put forth its personal stamp (and a year’s worth of R&D cash) on the strategy “if you can’t beat `em, buy `em!” Revit is the reason we are here, period.

Sure, Graphisoft was in the building modeling business for quite a while before

Revit came along, but a good idea poorly executed is not innovation. No program has been devised that combines intuitive functionality with simplicity and ease of

use the way that this particular piece of software does. Make no mistake--Revit was the epiphany, the better mousetrap. Since its release it has relegated its com-

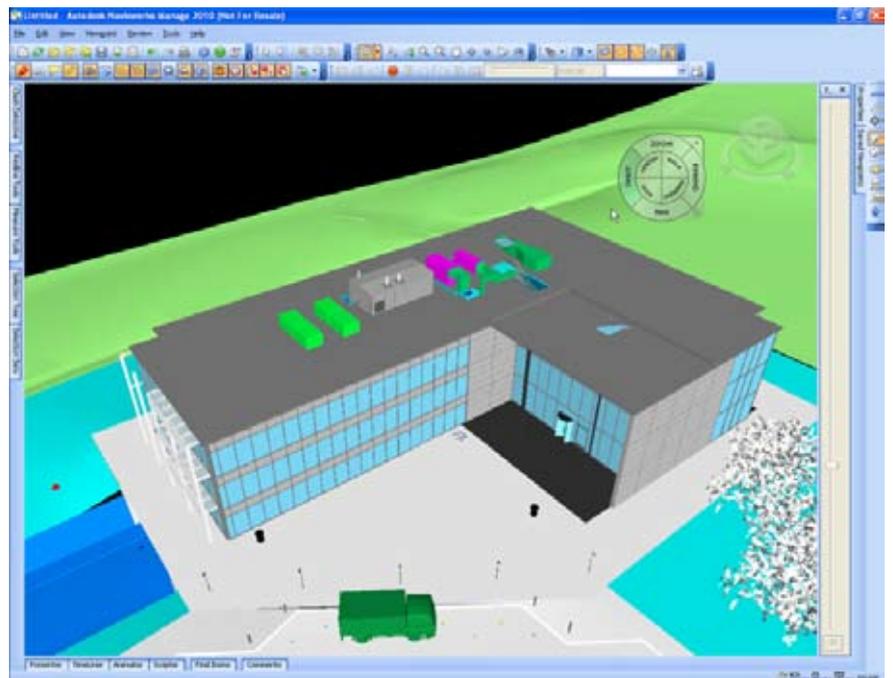


Figure 1: Navisworks easily compiles model data from various sources.

petition to the ranks of the “me toos” that innovate only when faced with a situation that requires it for their very survival.

The reality of BIM today

Wow! That was biased. But sometimes even biased statements are true. So as you wipe your weary eyes late in the year 2009, you have landed in a world where BIM has become a dominant, demanded, and, yes, mainstream piece of technology. How mainstream? Four years ago while working for an Autodesk reseller in Smyrna, Georgia, I got a rather unusual phone call from an Autodesk rep in Southeast Asia.

Autodesk had been approached by a general contractor to request that someone in the Atlanta area talk with a local architectural firm they were working with to introduce them to Revit because of all the project coordination issues being caused by the firm’s insistence on using Microstation!

Today, you can simply ask the tradesmen bidding for work on the mammoth new international terminal project at Atlanta, Georgia’s Hartsfield-Jackson International Airport. If their bids are successful they will be provided with BIM technology at the projects’ expense. Anytime someone wants you to use a piece of software so badly that they are willing to buy it for you, that person is serious about BIM.

Holder Construction is heading up the BIM modeling efforts there and Paul Hedgepath’s team is doing an outstanding job. What is also interesting is that the project is providing not only Revit to the successful bidder, but also a piece of software called Autodesk® Navisworks®.

Come together right now

Yes, that’s right, Navisworks. And as BIM moves further and further mainstream you will find that this piece of software is going to be vital for firms committed to working in BIM. Why? Well, despite the best efforts of myself and my esteemed colleagues, people have and do invest in BIM solutions other than Revit.

In addition, those who collaborate on projects large and small will find themselves and their partners using a mosaic of design software to get the job done. Architects working in Revit may have associate firms working in ArchiCAD or Bentley BIM. The project may involve solutions from third-party developers such as CAD-DUCT or Sprink-CAD. And let’s not forget the civil and site work that may only be available in a program like AutoCAD® Civil 3D.

The paradigm shift that is BIM requires a higher level of communication between the parties participating on a project and at a much earlier stage than was required previously. So the question becomes: How can all of these professionals communicate their ideas in a format that can be easily understood?

To some extent, the developers have attempted to solve that problem for you. That’s right, all you have to do is buy (and learn) more software! I mean, if your team will just use Revit-based solutions then co-

No program has been devised that combines intuitive functionality with simplicity and ease of use the way that this particular piece of software does.

ordination is no problem. Wait... well, if we all use Bentley solutions then coordination is no problem. Wait... if all use Archi-CAD-based solutions.... well you get my point.

In the 21st century we have to be able to bring our ideas together using the solutions into which we have invested our time and money and that is precisely what Navisworks does!

Actually, any single software-based coordination effort is going to have its problems. For example, clash and interference detection is available in AutoCAD® MEP, but it can only detect conflicts with MEP data created in the system. It will pick up a duct versus pipe clash just fine, but if you are clashing duct versus (Bentley) Structural frame, you are out of luck.

With Navisworks, you can analyze de-

sign data authored in just about any CAD or BIM software solution. The most important thing to remember is that Navisworks is not an authoring tool. Navisworks does not create models—it analyzes them.

It is also important to remember that Navisworks was created to work with 3D model data. I’m not saying 2D data can’t be brought into Navisworks. I am saying that it’s probably a waste of time. So if you don’t have a 3D model to use, you will have to create one or have someone create it for you.

Also, just to get this out of the way (for the price conscious), Navisworks is a rather expensive piece of software. But it is an analytical tool, so you don’t need to provide a seat of Navisworks for everyone. A few seats on a network license usually cares for the needs of the small to mid-size firm, allowing everyone to benefit from the power of cross-platform communication.

Navisworks begins

Where did this thing come from? Well, you have our friends from across the pond to thank for this particular piece of software.

NavisWorks was a small software firm in Sheffield, England. The company developed a product called Jet-Stream that consisted primarily of a product called Roamer, which offered the base function of combining models from any 3D design solution and performing a virtual walkthrough.

Various plug-ins were developed to enhance Roamer’s core functionality. “Publisher” turned the assembled model data into an .nwd file that could be viewed by anyone using a free viewer called (appropriately enough) “Freedom.”

The plug in “Clash Detective” was easily the most popular tool in that it was able to analyze the model data and find clashes and interferences in the combined models. This is the “money” feature and even today Clash Detective is what people think of when they think of Navisworks.

The “Presenter” plug-in provided the ability to apply photorealistic lighting systems and materials to the model data.

“Timeliner” enabled 4D construction simulation. It linked geometry in the model to events in the project timeline. Project management programs such as Microsoft Project could now be linked to a graphic model and animation that could change automatically when the Project timeline was altered.

Sounds good, yes? Autodesk thought so too, and back in 2007 they paid \$25 million cash to bring Navisworks into the fold of Autodesk AEC design solutions.

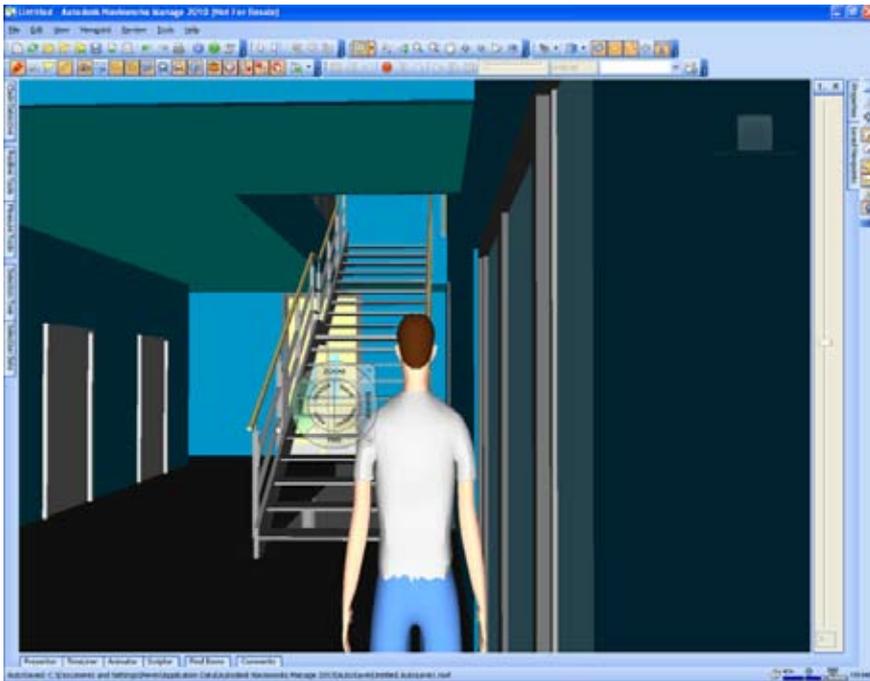


Figure 2: The virtual avatar gives you a guided tour of the design.

Since then there have been a few changes. One of the first things that changed was the product delivery method. Roamer was added to the rest of the individual modules and Navisworks Manage was created. This single product provides all the functionality of the Navisworks family of products. Generally when someone says I need to buy Navisworks, Manage is what they are asking for.

Navisworks Simulate provides the functionality of Presenter and Timeliner. While the Publisher plug-in now exists as Navisworks Review. The free viewer, Freedom,

was retained as is. Clash Detective is available only in Navisworks Manage.

Security? No problem

Now when we talk about sharing data across design teams, invariably people get a little concerned. If their intellectual property was reverse engineered, then it could be a threat to their livelihood. Navisworks addresses that issue by providing .nwd. This format can be generated with enhanced security features to prevent exporting or translating into another file type.

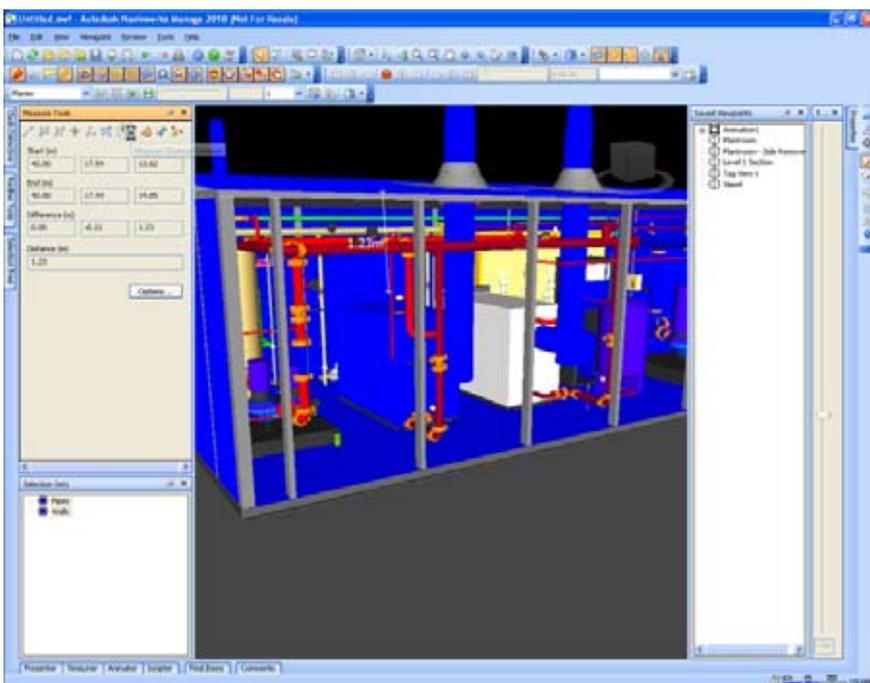


Figure 3: Will it fit? Ask Navisworks!

In addition, published files can be enabled with an expiration date. This means at a certain date determined by the person who created the file, the file shuts itself down and is no longer accessible. So even the most security-conscious collaborators can share files with confidence.

No better time?

Okay, I have always been one to think out of the box, but how in the world could I assert to the AUGI community that in a time of work scarcity and staff downsizing it might be a good idea to buy an additional piece of software? The answer is in the question. It is precisely BECAUSE work is harder to find and staff has been reduced that acquiring Navisworks makes sense.

I am not alone in the belief that the hardships experienced recently have changed the face of our business, perhaps permanently. The firms emerging from that chaos are leaner and need the ability to meet their clients' needs without regard to the software being used to perform the work.

Staff reductions make better communication an absolute necessity because the workload will definitely increase before additional staffing is considered. Autodesk has been responsive to this issue. In many cases, those wishing to acquire seats of Navisworks can approach Autodesk about migrating software no longer in use to Navisworks for a reduced price.

It also is worth pointing out that as your clients become more BIM aware, the creation of model data for collaboration purposes could be considered an additional service—justifying, of course, an additional fee.

Now is an excellent time for you to diversify your service offerings and expand your client base. There are a number of shovel-ready construction projects breaking ground that were not designed using Revit or any other BIM application.

Inherently these projects contain errors that will be difficult to detect by traditional means. What if your firm, having achieved mastery in Revit modeling, offered construction modeling and conflict detection as a service?

In the government arena, more attention is being directed toward sustainability. Well, using Navisworks in conjunction with your BIM application gives you the ability to offer as-built modeling services to the government sector. These as-built models can be used to establish a baseline documenting current energy usage. It will then be an easier task to show the impact of green building upgrades by modifying the as-built model with a variety of sustainable features. The resulting Navisworks file



Figure 4: Photorealistic 4D renderings

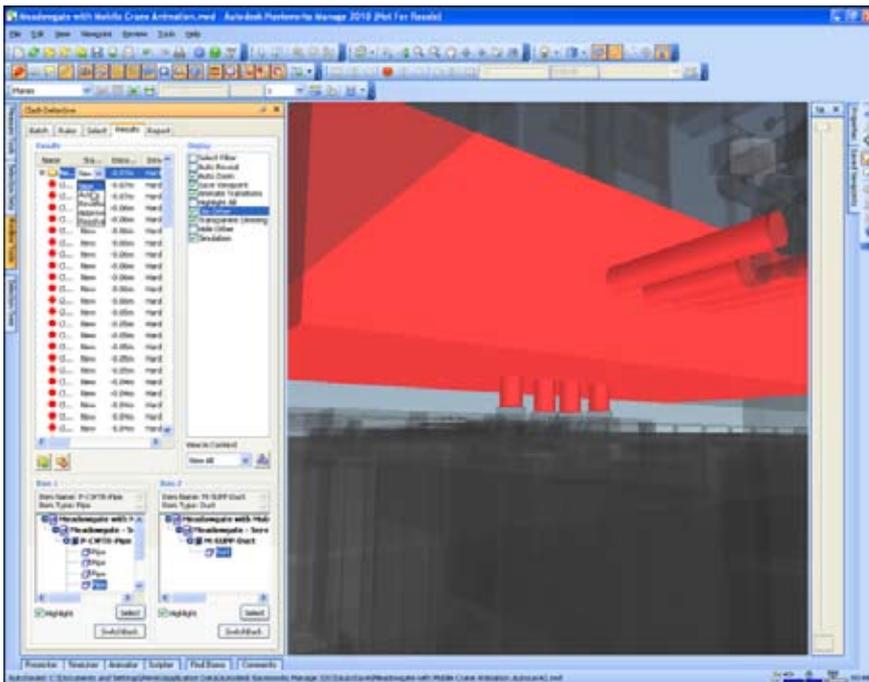


Figure 5: Errors can't hide from Clash Detective!

could be a valuable tool for planning and deploying green building technologies.

Back at the jobsite

The new Cobb County Courthouse currently under construction in Marietta, Georgia, is an excellent example of the benefits of BIM and Navisworks at the jobsite.

Winston Williams, Jr., a project manager with Turner Construction, came up with

an excellent approach to apply BIM to a job done primarily in 2D CAD-based software. Williams had BIM models created of the architectural and structural plans. Then, using Navisworks, he allocated space to the MEP consultants within the model. This effectively eliminated conflicts by empowering all parties involved with the knowledge of where their work was in the 3D model space.

I have to tell you it was one of the best ideas I have seen in quite a while. The result? Navisworks delivered! Project consultants, hesitant and skeptical at first, were readily won over when they saw the value of using Navisworks to communicate. The project broke ground in late summer and the top-off party is in three weeks—before the end of 2009. Not bad, not bad at all.

Get it together!

In the end, our goals are the same. Deliver the best product possible for our clients no matter what software we use. Navisworks helps us to deliver that result. Even from the earliest stages of design, Navisworks unites a world that can no longer afford to be isolated with one product or another. Our tools today provide us with a better understanding of our work than we ever had before. Shouldn't we understand our collaborators' work as well?



Judah Jackson has 21 years of experience using Autodesk design solutions. Judah is a Revit Implementation Certified Expert and the Business Development Manager at Advanced AEC Solutions in Atlanta, Georgia. You can contact him via email at jjackson@aaecs.com.

If You Can't Beat It, Customize It

Many questions have come to me about customizing AutoCAD® Architecture. Customization can be basic or complex, depending on your needs. Being able to customize AutoCAD Architecture to suit your needs is one of the reasons that it has become such prominent software. Let's look at the Customize User Interface (CUI) and some specific customizations that can be completed within the CUI.

Customize User Interface

AutoCAD Architecture has featured the CUI since the 2006 release. The CUI is the main method of altering the interface and is a management tool designed to help you make AutoCAD Architecture fit your needs. Customization of the user interface is done by modifying the XML-based CUIx file within the CUI Editor.

When you open the CUI Editor, you will see three main windows in the Customize tab: Customizations, Commands, and Properties (Figure 1). Within these windows, you can edit toolbars, tool palettes, commands, and the menu bar. You can also edit the Ribbon's panels, tabs, and buttons. You should begin by scrolling through all the possibilities and familiarize yourself with the CUI environment before proceeding into customization.

We will now proceed to look at a few elements of customization possible with the CUI Editor.

Customize a workspace

Customization options for workspaces include creating a workspace using the CUI Editor, displaying a toolbar in all workspaces, and changing the properties of a workspace. In the CUI Editor, you can modify or create workspaces with precise properties associated with the application and drawing windows, as well as user interface elements (toolbars, menus, palettes, and so on).

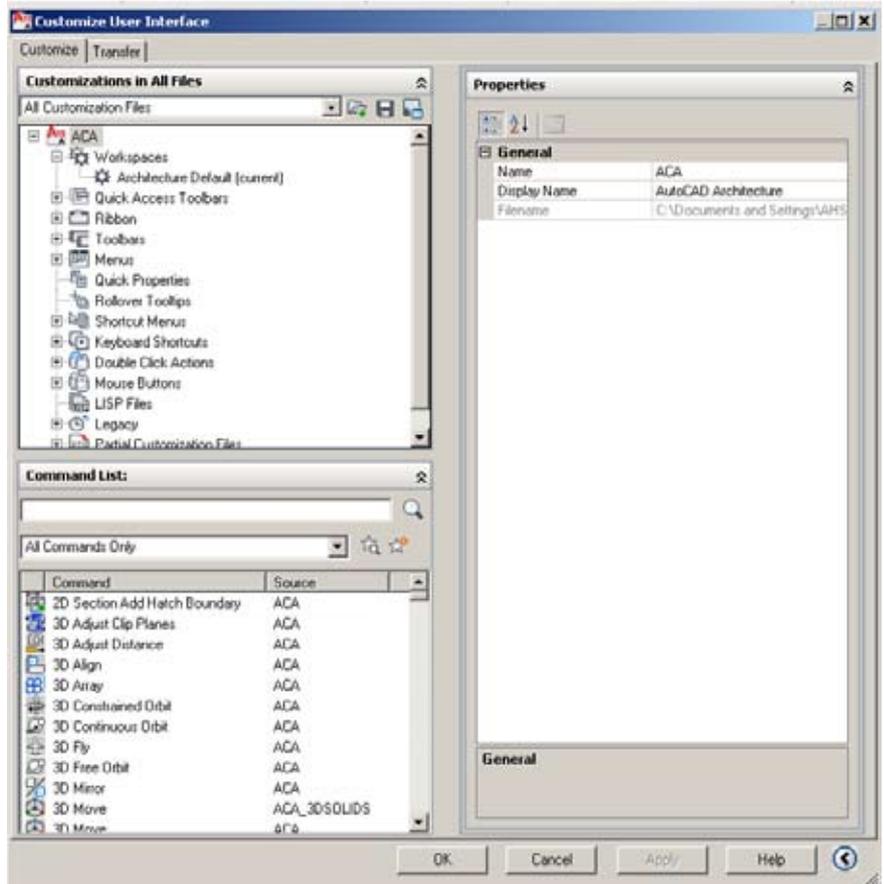


Figure 1: CUI Editor

To customize a new workspace, you can start from scratch or begin with an existing workspace. I recommend starting with an existing workspace, as it is easy to remove items from a workspace, but difficult to add them.

Begin by opening the CUI dialog box, located under the Manage Tab of the Ribbon. In the Customizations in All Files box, select the workspace to edit. Right click the workspace and select Duplicate (see Figure 2). You can then right-click and select Rename to give it a new name.

If you wish to create a new blank work-

space, right click on the Workspaces label and select New Workspace. You can then give it a name by typing over the default name.

Now, in the Workspace Contents pane, select Customize Workspace. Now you can add items or remove items by expanding the topic area and select the box to the left of each item that you want to add (see Figure 3). Scroll up and down the dialog area until you have selected and removed everything you want for the new workspace. When you are finished, select Done and then Apply and your changes will be saved.

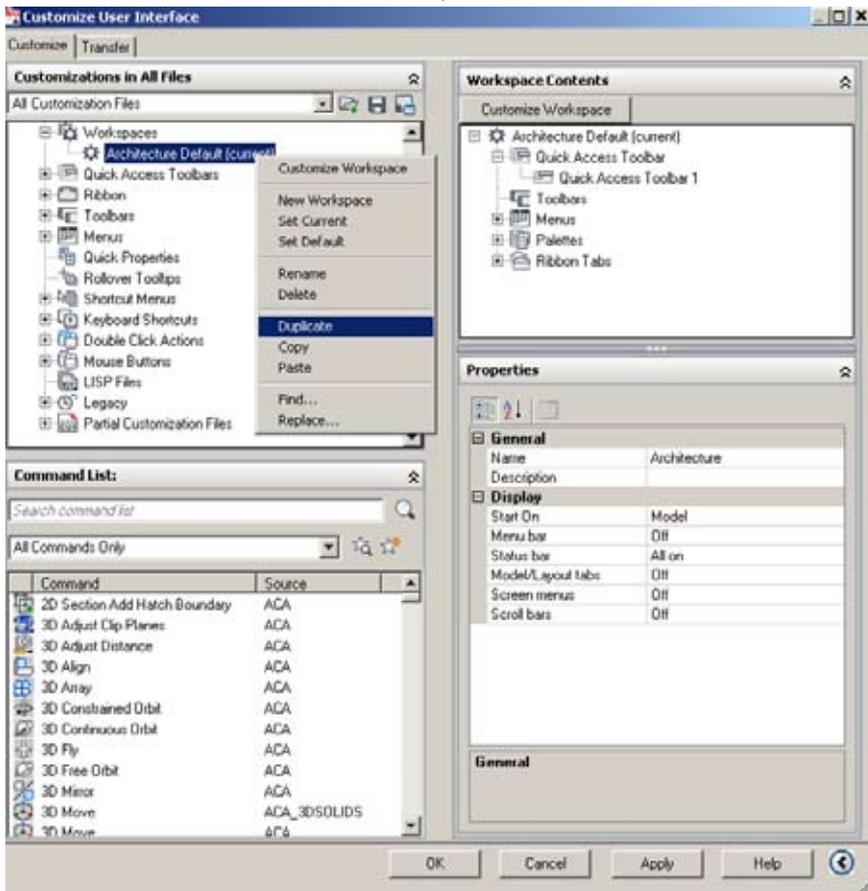


Figure 2: Duplicate Workspace

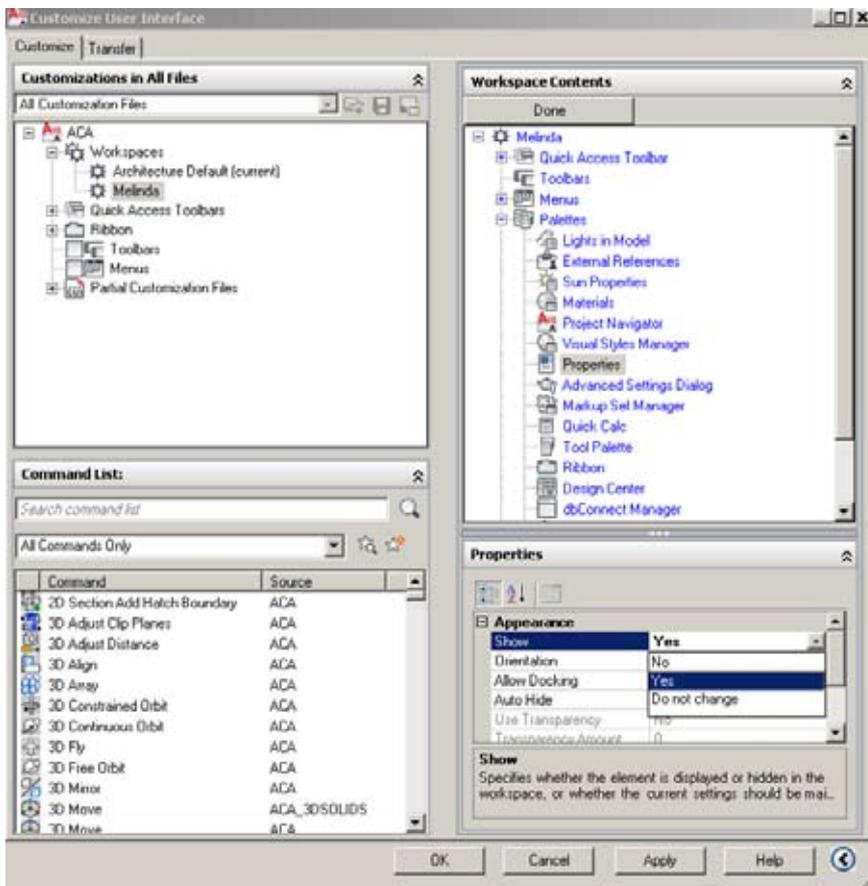


Figure 3: Workspace Editor

You can also change the properties of an existing workspace. In the CUI Editor under the Customize tab, select the workspace whose properties you wish to change. Then, in the Properties pane, you can edit the Name, Description, Start On, Menu Bar, Status Bar, Model/Layout Tab, Screen Menus, and Scroll bars. Select Apply.

Customize a command

Commands can easily be created, re-used, and edited. The Customize tab of the CUI Editor allows you to add any command listed in the Command List pane to a menu or toolbar. Before we customize a command, it is important to note that when you change the properties of a command in the Command List pane, the properties of the command are changed everywhere the command is referenced. Each property of a command in the Command List pane controls which actions are taken when the command is used.

A new command can be created from scratch, copied from an existing command to create a new command, or created from editing the properties of an existing command. When a command is created or edited, the following are properties you can define: command name, description, command display name, tags, macro, extended help file, element ID, and small or large image.

To create a new command, begin by opening the CUI dialog box, located under the Manage tab of the Ribbon. In the CUI Editor Customize tab, Command List pane, select Create a New Command. This will display a new command in both the Command List pane and the Properties pane. In the Properties pane, fill out the information as follows (see Figure 4).

Name – Enter a name for the command. This will be displayed as a tooltip or menu name when the command is added to a user interface element, such as the Ribbon.

Description – Enter a description for the command. This will be displayed on the status bar or a tooltip.

Extended Help File – Enter the name of the file and ID to use for the extended help for the command.

Command Display Name – Enter the name of the command that you want to display for the command.

Macro – Enter a macro for the command: `^C^C_ <NAME>`.

Tags – Enter the tags that you want to use when searching for commands in the Search field of the application menu.

Element ID – Enter an element ID for the command.

You can also select an image to be associated with the new command. Please note

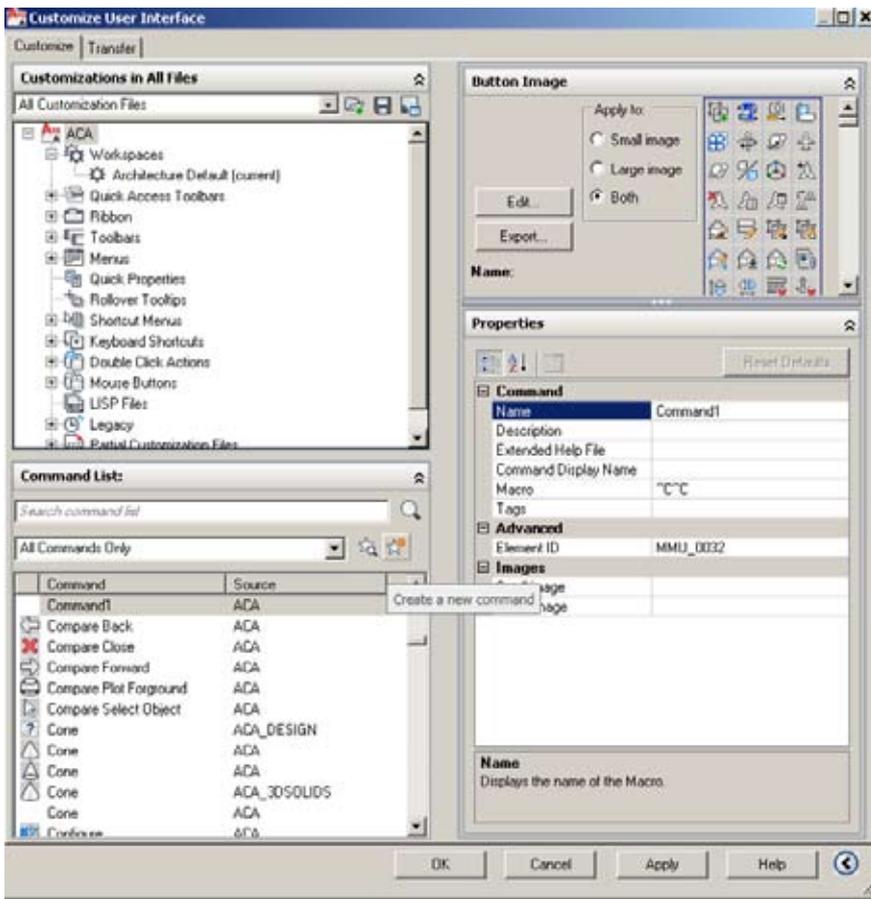


Figure 4 : Command Editor

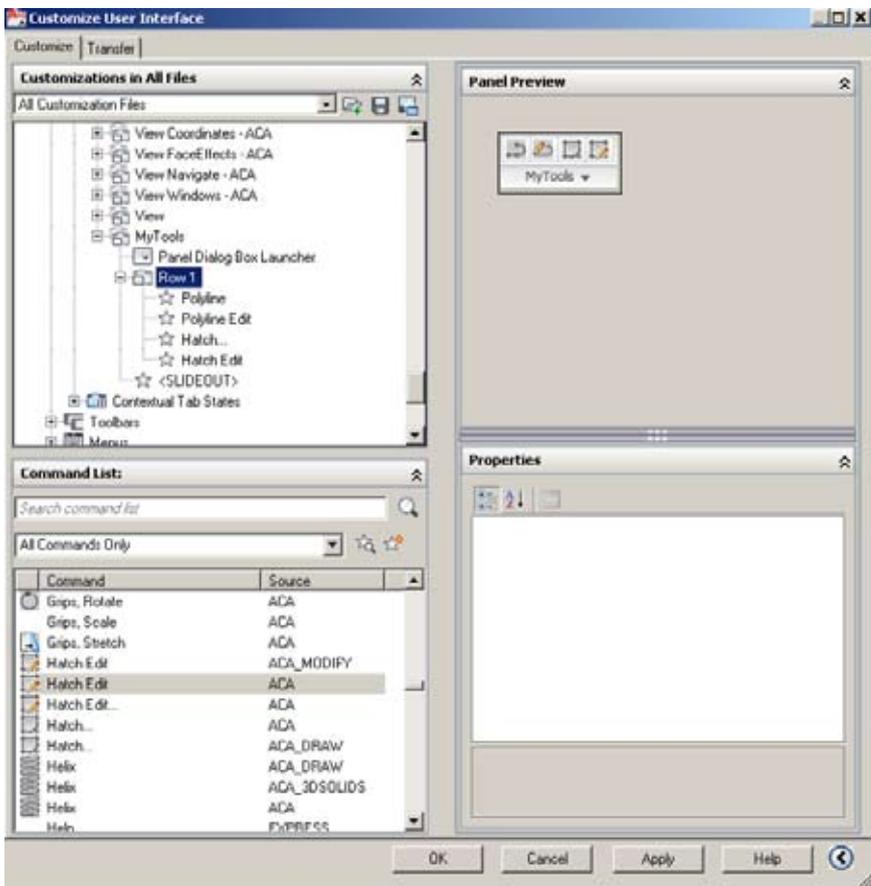


Figure 5: New Panel

that the same information will need to be changed for editing a command, as well.

Create a Ribbon panel

The Ribbon can be customized by creating and modifying Ribbon panels and organizing Ribbon panels into groups of tools that are task-based with Ribbon tabs.

By customizing Ribbon panels, you can organize frequently used commands and cut down on time spent searching for needed tools. Ribbon panels are organized by rows, slideout elements, and sub-panels. Rows and sub-panels are used to organize how controls and commands are displayed on the ribbon panel. A slideout is automatically added to each ribbon panel and, by default, controls which rows are shown. It is important to note that rows that are located below a slideout are displayed only when a Ribbon panel is expanded.

Ribbon panels can be created from scratch or from an existing dashboard panel or toolbar. Let's create one from scratch.

To create a new ribbon panel, begin by opening the CUI Editor under the Manage tab of the ribbon. In the Customizations In All Files pane of the Customize tab, expand the Ribbon node. On the Panels node, right-click and select New Panel. Enter a Name and Display Text under Properties. Now drag and drop the commands you want on your new Ribbon panel from the Command List to Row 1.

If you want several commands to appear on your new panel, right-click on Row 1 and select New Row. This is also where you would create a new sub-panel, if needed. Continue until you are finished and select Apply and OK.

Conclusion

AutoCAD Architecture has become prominent mainly due to its ability to be customized to meet the varying needs of CAD users everywhere. As you can see from viewing the CUI Editor, there are many ways to customize and only a few of them are discussed here. In a future article, we will delve more deeply into specific customizations and discuss ways this can work for you. Remember, if you can't beat it, customize it!



Melinda Heavrin is a CAD Coordinator for Norton Healthcare in Louisville, Kentucky. She can be reached for comments and questions at melindaheavrin@alltel.net.

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Use the Right Tool the Right Way



What it Really Takes to Implement Revit, Part 1

Editor's note:

Past columns in this space have concentrated on tips and tricks for new or experienced Revit users. This is the first part of a two-part series on implementing Revit—how to consider making the considerable transition from 2D or 3D CAD to Building Information Modeling, and what that means to a company's workflow and entire approach to design and documentation.

The following material is excerpted from *Introducing and Implementing Revit Architecture 2010* by Lay Christopher Fox and James J. Balding, AIA, and is copyright by Autodesk Press and the authors.

—Chris Fox, AUGI Revit Editor

Seven factors

While there are many different factors that will affect the success of Autodesk® Revit® implementation efforts, most can be grouped into one of seven categories, listed below in order of importance.

- Firm size
- Project size
- Architectural style
- Project type
- Scope of services

- Firm locations
- Firm culture and age

Firm size: the big issue

The size of the firm is the number one issue when it comes to implementing BIM. While there are many factors that firm size will affect during implementation, the key factors are project size, technology, training/support/R&D, personnel, decision making, and standardization.

The following sections include general observations regarding key factors related to company size. Each category has been rated as holding an advantage toward either larger or smaller firms. This is by no means an absolute system, and the advantage could be great or slight—use your own experience when considering these issues and evaluating your own situation.

Project size: advantage—smaller firms

Large firms generally have larger projects, and when it comes to Revit Architecture, project size can be viewed as an obstacle with regard to implementation.

If you consider adding all of the building data to one file, that file can certainly grow and will become exponentially larger than the single referenced files you may be presently using. BIM products such as

Autodesk Revit Architecture have strategies to alleviate the issue of large projects. However, many firms feel that they need more time to get to a comfort level using full Revit Architecture implementation on such large-scale projects. It is important to note that this does not count out larger projects; they will simply require a little more planning and more experience.

This is where the smaller firms tend to shine. They typically have smaller projects that are ideal for Revit Architecture. There is not as much information to be communicated in a smaller project, which translates to smaller files and project teams.

One thing to keep in mind when selecting projects based on project size is that it is advisable not to base the decision entirely on the floor plan area, but on the “spatial size,” including both the amount of mass and detail to be built. For example, designing and documenting a 750,000-square-foot (s.f.) warehouse using Revit Architecture can be far easier than creating a 20,000 s.f. Gothic cathedral.

Technology: advantage—larger firms

The fact that Revit Architecture models are larger and more complex than ordinary 2D drafting files means that the software and models require fast machines

with plenty of RAM and good video cards. When it comes to technology, larger firms usually have the upper hand. They typically have the latest hardware, fast local area and wide area networks, and perhaps even a dedicated Information Systems team to support the systems.

The small firms generally find themselves behind the eight ball in this arena. They may have made a recent, significant investment in connectivity, hardware, or software, and can't afford to budget large-ticket items such as these every year. A small firm that has made a substantial investment in technology could find itself in an advantageous position when implementing Revit Architecture.

Firms of any size should pay close attention to the hardware requirements of BIM software as well as performance on typical firm project types. Maintaining up-to-date hardware and software often pays dividends not only in the speed of deliverables but also in perceivable pride of ownership, which can provide incentives to learn and maintain knowledge, thus reinforcing a company's commitment to technology.

Training/support/R&D: advantage—larger firms

The larger the firm, the larger the operating expenses. With this in mind, the ability to create and maintain in-house expertise to provide training and support, as well as perform research and development roles for firm-specific tasks, becomes significant. This phenomenon often runs parallel with a firm's CAD manager role. If the firm has a full-time CAD manager, typically it will have a full-time Revit Architecture manager who is often one and the same person.

The smaller firm will tend to have a part-time CAD manager, often an architect who knows the ins and outs of computers better than the rest of the firm. Firms can expect additional overhead and responsibilities when it comes to implementing and steadily using BIM. The return on investment over time is proving to be much larger proportionately when comparing results from Revit Architecture to 2D CAD.

Training and support are two of the keys to success, discussed in greater detail later, and they should be given serious thought when implementing Revit Architecture.

Personnel: advantage— larger firms

When planning the implementation of BIM, one of the first things you need is a "champion," the person responsible for heading up the change. However, one per-

son cannot do everything required to make the move to Revit Architecture. You will need talented people to carry out the plan and use the software effectively enough to deliver on the promise.

Because larger firms have larger talent pools from which to select, they generally have the luxury of hand-selecting the users who best suit the chosen tool. One thing to note, however: the proportion of talent and roles within a firm will tend to be about the same for both larger and smaller firms.

Decision making: advantage—smaller firms

When it comes to making the decision to change, it seems better to have a single entity make that decision rather than a committee. Nowhere does the saying "too many chefs spoil the broth" apply more appropriately than in implementing change. Larger firms with multiple locations will have more challenges in the way of purchasing, planning, and organizing an implementation plan.

Smaller firms, generally based in one location, have just one "chef" who makes the decision to implement BIM, and then it is time to move on. When changes in the plan occur, there isn't another round of negotiations, planning, etc., to slow progress.

Standardization: advantage—smaller firms

Here again, the larger firm will tend to have many "chefs," from the top to the bottom. Somewhere in between might be a local CAD manager or two with individual CAD standards and techniques. If your firm is international, you have, potentially, different languages, building techniques, documentation techniques, and cultures and infinitely more issues of diversity to face.

Smaller firms get the nod in this arena. With one location, standards can be established, and even voted on, in one location, perhaps at one time. When changes to a standard occur, communicating that change is simple, and most users will understand the reasoning behind it because it undoubtedly arose from issues within the local firm.

Firm size: conclusion

While each subject has been labeled with a score giving an advantage to one size firm or the other, the intention of this section is to make firms aware of the issues regarding firm size and to assist them in their implementation process.

Firm Size Final Score:

Larger firms – 3

Smaller firms – 3

Project size

While project size is a major factor in Revit Architecture implementation, it also is influenced more generally by firm size. Refer to the Project Size section under the preceding firm size discussion.

Architectural size

When referring to architectural style and the implementation of Revit Architecture, the foundation of the distinction is the size, shape, and amount of detail involved. Revit Architecture does not recognize the literal difference, for instance, between Romanesque, Renaissance, and Post-Modern architecture.

Common sense, while not always common, does in fact make sense here. When it comes to modeling a building, straight, square forms are easier to model/build than those of the organic styles of Mr. Frank Gehry. This is not to say that it is impossible to build a sweeping tilted wave of a facade, just that more time and techniques are required. If you can imagine the effort required to physically build the building, there is not a great difference to building it virtually using Revit Architecture. Simply put, more detail, shapes, and mass equal more time to develop and build.

While modeling all of the components in a project has desirable effects, keep in mind that it is not always necessary. During the planning stages of a project, it should be determined what will be modeled and what can be "represented" with lines, arcs, and circles. A simple example: If you have raised wood paneling on a door, there is no harm in drawing lines on the surface of the door to represent the paneling and moving on with the project. Some might argue that it would not render properly or that there is a different material in the panel. The point is that there needs to be an understanding, on a per-project basis, of what is important enough to model and what isn't. Three-dimensional modeling in Revit Architecture is not an all-or-nothing proposition.

Project type

Project types often affect different firms in different ways. Generally speaking, however, some project types are better suited for Revit Architecture than others. Again, this is not to say that a certain project or project type cannot be done effectively.

Some of the aspects of project types that dictate the ease of implementation include elements that are repetitive, component-driven, and/or area-driven or those that make use of—and find great value in—the different visualization and/or scheduling advantages of Revit Architecture.

Entertainment/retail

Some of the advantages of Revit Architecture in the entertainment and retail industries might be the presentation value gained in color fills for area or room types, or the coordination of area calculations. Perhaps there is a need to schedule and color the tenant spaces by lease expiration, retail type, or rent per foot. Bi-directional, live scheduling may also have advantages, whether that includes display racks, flooring, or parking stalls.

Some of the challenges facing the entertainment/retail architect might include custom furniture and fixtures or project size and scale. It has also been noted that due to the nature of a retail mall, individual retailers often have architects of their own; therefore, there can be many different designs and ideas flying about at any given time.

Health care/hospitality

Health care and hospitality designs, of course, are going to have significant gains using the repetitive, modular, or component-driven aspects of Revit Architecture. It could be argued that this is also the case with CAD drawings, where xrefs, blocks, or cells are used, but Revit Architecture goes beyond that.

When duplicating the data along with graphic representation of that data, you have the benefit of scheduling, coordination, and visualization. When a single change to one guest-room sink and vanity can affect the plans, interior elevations, sections, scheduling, and specification information for 500 rooms, there is great efficiency in place.

Generally, health care and hospitality projects are large, very complex designs with large project teams. Incorporating and coordinating the necessary data set can become a significant burden. Planning a project of this nature is possible, but requires advanced planning and experienced Revit Architecture-capable staff.

Residential

Residential projects gain tremendously from using Revit Architecture since they are generally smaller in size, as discussed earlier. Beyond that, there is also the fact that residential clientele may not read or understand floor plans, sections, and elevations, but certainly would be able to understand a perspective or a rendering.

Challenges facing a residential architect might include the smaller scale of the project as well, surprisingly enough. Residen-

tial work tends to be shown at a larger scale and, therefore, includes more detailing in each drawing. This tendency can give rise to the notion that all of the information must therefore be modeled. The residential architect would be wise to evaluate and plan the model simply.

Public/religious

This is a very broad spectrum and it includes projects large and small, simple and complex. What they have in common is that there is a large body of critics to please. Whether it is the congregation of a church or the citizens of a city, communication is the key ingredient here.

This brings the visualization aspect of

Revit Architecture to the forefront. City councils can be shown the proposed building model within the proposed setting. The public can readily understand the aesthetics of a rendering and the color-fill diagrams showing the location of the services to be provided.

Challenges facing an architect specializing in these areas might include the fact that many of these building types can be rather large and ornate in nature, requiring additional modeling time. The need to provide many different presentation-level images requires additional time working out materials and possibly significant computer rendering time.

Scope of services

Due to the nature of Revit Architecture—building a virtual model of the project rather than representing one with lines—it has been noted that more of the effort is front-loaded in the schematic design and design development phases. In other words, you are working out constructability issues earlier in the design process. This generally provides great gains in efficiency in the construction-documentation phase. Architects need to be cognizant of this issue, and perhaps make adjustments in the area. When the scope of services ends at what could be described as the traditional design-development phase, there is a greater level of information within the model than before.

Architects are beginning to understand this and respond in many ways, such as marketing additional services, adjusting fees (front-loading) to maintain projects through their entirety, and using a project information base as a sales tool for current and future work.



Firm locations

It may go without saying, but the more office locations there are in a firm, the more complex the implementation process gets. There are many things to consider, as noted earlier. Training, support, and standardization also become more important (and slightly more difficult) when there are multiple office locations. It is not impossible to accomplish widespread implementation efficiently; it will, however, require a little more planning. The planning will need to take into account the different office cultures, personnel, and so on.

Firm culture and age

Firm culture and age may not seem important in the planning stages of implementation. However, their effect will become readily apparent during the implementation itself. How well does the firm accept and anticipate change? Is it a corporate culture? How do the lines of communication operate and what is the management organization? Who will back and support the initiative?

When age is considered, generally speaking, younger firms are more open to change, while older firms tend to be more set in their ways and resistant to a change of this nature.

Next time: four keys to implementation success

In the second part of this article we will introduce the four keys to success in implementation. We have found that when firms focus on these keys, the potential for success increases greatly.



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CAD in Live Theatre

The theatre and entertainment industries have always been early adopters of technology, so it is perhaps surprising that software to aid those who mount productions have only come into widespread use in the last 10 years or so. In the UK, this is due, in part, to cost. Many of the largely publicly funded theatre companies would rather spend what money they have on the visible parts of a production such as scenery, costumes, and, above all, the actors. However AutoCAD® (along with other programmes) is now widely used at all levels of the industry.

In addition, although the technical side of this industry is perhaps looking for new things, scenic designers are by nature a bit more conservative. Faced with the change from the drawing board to AutoCAD, many cannot make the move. There are obvious reasons for this; for instance, loss of time whilst learning a new skill whilst still under the limited time constraints in theatre. After all, in this industry we can't deliver late. If the publicity says the show opens at 7:30 on a certain night, that is when it must happen.

One major obstacle is that there is no real theatre-oriented CAD software for us to use as we are too small a sector for most programme makers to consider outside certain strict parameters that will be discussed later.

Allied to this is the nature of CAD programmes for designers of theatrical productions. All CAD systems demand concrete information and numerical data. The designers' work in theatre is highly collaborative, engaging with the director of the piece and their interpretation of a script. Designs may be created and then

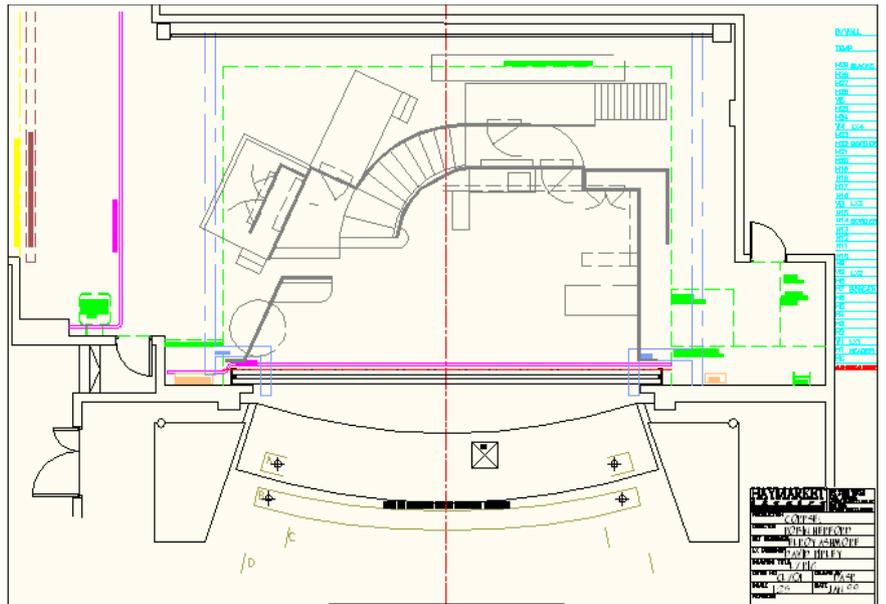


Figure 1: Typical theatre ground plan showing basic structural and technical details plus scenery in place.

discarded at an early stage, long before the designer is prepared to give the information demanded by a CAD programme. As a result there is much debate about what CAD, in this context, means. Is it Computer Aided Design or Computer Aided Draughting? My own view is that for the reasons outlined above we currently use CAD systems for draughting up designs created in card, as sketches, and by discussion for others to then build and finish.

I recently undertook a survey on behalf of the Association of Lighting Designers, the UK body for professional lighting designers in the entertainment industry. This survey polled lighting designers on their use of software. I found that more than 90 percent of respondents were using some

sort of software for their work. Most of the use was as a straight replacement for the drawing board, although much of the specialist lighting software does much more than this.

There are several types of drawing a production will need in order to get the show on. In comparison to many other industries, the majority of these are actually quite straightforward. In the first instance a ground plan is required for the venue in which the show will take place. For the majority of productions this is not a complex structural drawing, but more often a fairly detailed drawing of where the stage walls are, access onto the stage for scenery, etc., where the flying equipment (used to raise and lower scenery, lighting etc. over the stage area) is, removable

stage sections, or those parts that are on lifts (see Figure 1).

Although the majority of such a drawing will be taken up with the stage area, there is usually an indication of part of the auditorium as well. This is so that the audience sightlines can be checked against the design. This is not to ensure that everyone in the audience has a good view of the stage—hopefully the people who designed the venue sorted this out—but to ensure that the production can hide what it doesn't want the audience to see until they are supposed to. To ensure this “masking”,

CAD Standard for application within the industry as does the US Institute of Theatre Technology.

All these drawings are usually done by the designer. Very successful designers may have an associate who does the drawings and distributes them. Other may employ freelance draughters to translate their sketches and notes into workable drawings.

It is interesting to note that part of a designer's job will be to produce a scale model, fully painted, of the set. In the UK and Europe this will generally be to

the shapes of the scenery with no colour or material detail, allowing approximate costs to be made. It also means that when cuts are made, as they inevitably are, time isn't wasted on rebuilding the model from scratch. The completed model at 1:25 will include all the paint finishes and set dressing details that are to be used for the production. This also allows the various carpenters and scenic artists who will make the scenery to take the model apart and have it in their workshops as a reference.

The next drawing to be created will be the detail working drawings of the scenic elements, which will be broken into the constituent parts and dimensioned. Notes are also added for mouldings, finishes, etc.—exactly as they would be done in an architectural drawing. However, these drawings are indicative of what the final product should be. Those who need to fabricate these units will take both the model and the drawings and undertake a thorough analysis of the requirements.

This includes structural considerations—do actors stand on this piece of scenery; does it move (remember onstage things can move in almost any direction); how is it going to be stored offstage; do parts of it need to fold away or can it be broken into smaller units. Lastly there are considerations of weight and cost.

As a result of this analysis, the designer's working drawings are radically revised so that the actual structure can be constructed that will fulfil all of the criteria outlined above.

Another use for the designers' ground plan is for the rehearsal room. Apart from those companies with the time, space, and budget to be able to rehearse on the set, theatre companies create a copy of the scenic ground plan in electrical tape. This is to help the actors get used to where the entrances and exits are and to visualise how much space they will actually have on stage. Of course, rooms on a stage bear little resemblance to true rooms. A small, claustrophobic space onstage is often 3 or 4 metres wide, which is quite large. How-

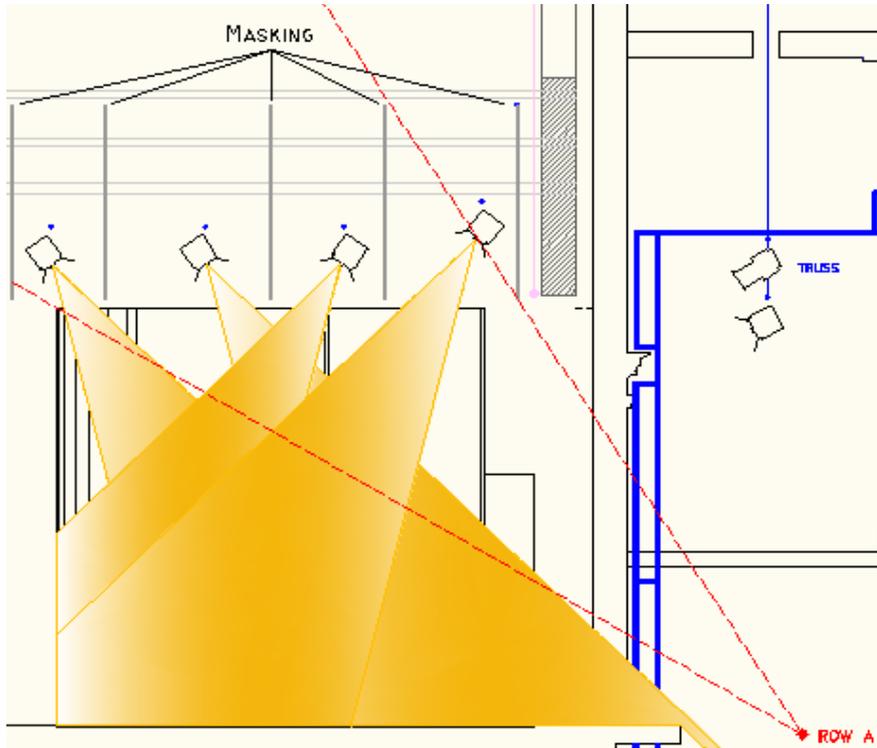


Figure 2: Detail of a section of the above show, showing the audience sightline (red dashed line), beams from the lights, and masking in position.

usually frames or drapes of black serge are used beyond the end scenery. Masking is also used to create a picture frame around the scenery. A common saying in theatre is “What is the best way to mask the show? Lower the curtain!” The sightline issue is always a compromise and is both a vertical and horizontal problem as all the equipment and scenery above the stage also may need to be hidden. The section comes into play here so that the audience can't see the lighting, for instance, but the lights can “see” the area of the stage upon which they are focussed (see Figure 2).

With this basic drawing and the design approved, the final version of the set is then laid onto the venue ground plan. This is where CAD standards need to be applied before the drawing becomes too cluttered. The Association of British Theatre Technicians has its own

a scale of 1:25. This is unfortunately not a “standard” scale, so it has to be added by AutoCAD software's theatrical users! Visualisation within a CAD programme is still quite unusual in theatre so the show is visualised in card. Initially this is what is called a “white card” model as it shows just

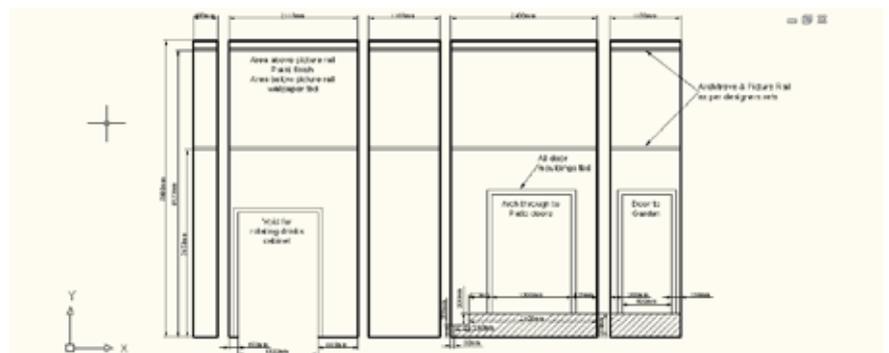


Figure 3: Technical drawing as supplied by a scenic designer. The scenery is drawn in elevation as if leaning against the wall in a continuous run.



Figure 4: In *The Diary of Anne Frank*, Anne's tiny attic space is almost 10 metres wide and 5 high—more than four times actual size. Haymarket Theatre, Basingstoke, UK. Scenic Design by Elroy Ashmore. Lighting by David Ripley.

ever, with use of colour and lighting a garret can convincingly be achieved.

In the rehearsal rooms, the cast needs to know these parameters so that they can tune their performances accordingly and so they know their way around the set. Of course they still react with surprise at the size of the actual set. Stairs, for example, are always a problem when it comes to using them in three dimensions onstage, having just run over a few lines of tape for the past three weeks.

So far we have looked at the scenic element of any production, but of course if the set is built and painted it is invisible until lit. The lighting designer will use the scenic ground plan to add the lighting equipment required for a production. The lanterns and associated equipment are represented by graphical symbols (unfortunately not standardised internationally) containing text information. For this purpose, blocks with attributes are ideal.

Nowadays, there is a vast array of lighting equipment from which to choose (budgets notwithstanding)—from conventional lights to moving lights which can pan, tilt, change colour, and project images. Also in these energy-conscious days, we are increasingly looking to LED light sources to replace the current high wattage lamps required.

All the lighting equipment is connected, either through dimmers or directly to a lighting control console, which can record every aspect of a lighting designer's intentions as "cues" or "scenes," and then faithfully play them back as required.

All of this technology requires a lot of numerical information; for instance, one

lantern will need to show the dimmer or socket it plugs into, the control channel used to fade it up and down, the colour filter, if required, perhaps its use, and any other accessories required. Multiply this by possibly several hundred units and you can see that a lot of data will be produced alongside the actual plan.

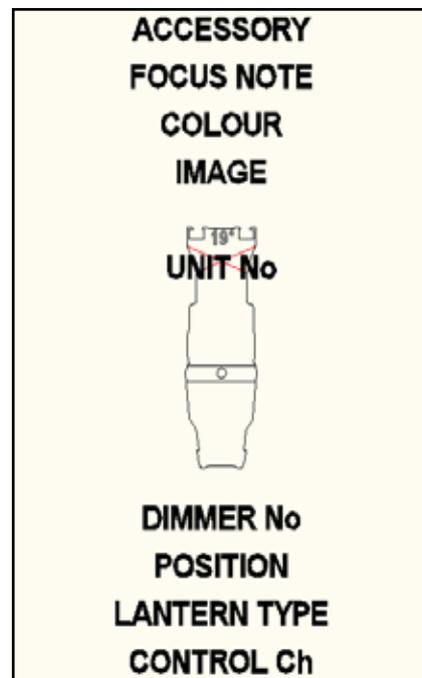


Figure 5: A theatrical lantern symbol in LD Assistant, showing some of the attribute information that is required to create the lighting in a modern production.

This is simplified by attribute extraction to produce many of the lists that would have been previously counted by hand

from a printed copy of the lighting plan. The lighting crew members who actually rig these lights require printed copies of the plan, often in several different versions due to the density of information. Again, strict layering standards are required to simplify this process. Otherwise, things get missed out. This can obviously cause problems later and with the limited amount of time available prior to the opening of a show this can cause problems for the entire production.

Plots can be divided into the physical location of lanterns and where they plug in, another might just detail accessories and cabling required, whilst another version could show just the specialised equipment that has been built into the set, for instance. Finally, the lighting designer will require a plot showing the control channel number for communicating to the lighting console operator, the lantern colours and images, and focus notes.

Although all this is achievable in AutoCAD, many lighting designers want the ability to see their designs before arriving at the venue by being able to focus the lanterns and control their intensities as part of a design package. This is known in the industry as pre-visualisation and for many large scale productions, particularly in the event and rock-n-roll sectors, it is an essential part of the process, saving many hours and costs in the venue. It is also a useful tool when pitching to clients as the fine control of light scenes allows very realistic renders to be created.

In an upcoming issue, we will look at LD Assistant, an Autodesk-based programme created by Design and Drafting of Oak Lawn, Illinois, that aids lighting designers in the entertainment industry to plan and visualise their productions as well as produce all the paperwork required to mount an event and connect to the control console bidirectionally.



David Ripley has more than 25 years experience in the entertainment industry as a production manager, lighting designer, and educator. He now runs *cad4theatre*, providing draughting services, training, and consultancy to the industry in all things AutoCAD. He is the author of *AutoCAD – A Handbook for Theatre Users* and runs the Association of British Theatre Technician's AutoCAD distance learning course as well as teaching at several UK drama schools. He is the UK Dealer and Support Centre for LD Assistant, an Autodesk-based lighting design and visualization programme.

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Creating Parametric Families

There are many different definitions on the Web about what “parametric design” is or is not, and we could go forever trying to find the most appropriate one. But to keep things simple I will use the following definition.

Parametric Design is “a method of linking dimensions and variables to geometry in such a way that when the values change, the part changes as well.” (N. Easton, 2003)

That means that model geometry can be changed by simply altering numerical values without the need to edit or redraw the components of the model. In this article we will see the value of parametric design in the context of using parameters to control component families.

Parameters

A parameter is a property whose value controls the graphical representation of the component or its behavior, making it

different from others. Some parameters are constant to all types of the same family. These are called Type Parameters. On the other hand, parameters that change value from type to type are called Instant Parameters. Instant parameters affect only the specific instance or object being edited.

Component Families are those stored outside of the Autodesk® Revit® project to be loaded as needed. They are created using the Family Editor. These families allow you to create objects with nearly unlimited parameters and behaviors. Examples of component families are doors, windows, equipment, and furniture, as well as annotation tags and callouts.

Family libraries

Creating a family takes planning, particularly if you are creating a family with different types and parameters. So before you spend your time and effort, it is a good idea to explore the content available on the

Internet already. You may find the family you need or something you can quickly modify to meet your needs. It is easier to use or modify an existing family than to create one from scratch.

Autodesk provides a nice library online from which you can download content: <http://revit.autodesk.com/library/html/>. There also other organizations such as AUGI where users can post and download Revit families. Many manufacturing companies are beginning to jump into the Revit wagon and make Revit families of their products. Although some of these product libraries are available online, you might need to ask the individual product vendors for their Revit libraries.

Creating families

To help create new families, Revit comes with template files that have been categorized and preprogrammed with basic parameters applicable to their category.

Do take the time to plan the family you are creating because the template you choose will determine how the family will behave with other elements in the project as well as the set of parameters that will be available for it. Use the following as a checklist of things to think about when creating a family.

1. Family template to use
2. Family category and subcategories for individual elements
3. Parameters to add (dimensional, materials, visibility, etc.)
4. Reference plane relationships and constraints
5. Element visibility at different levels or planes
6. Multiple types

To create a new family, go to the Application menu and click New>Family. In the New Family dialog you will see files with the extension RFT; these are family templates. Select the appropriate template for the family type you want to create. As mentioned above, choose your template carefully as you will not be able to change it afterwards. For example, if you are creating a family that needs a host, such as a wall-mounted light, it will be difficult to change the host element once the family is created.

If you cannot find an appropriate template for your family, you can use one of the “Generic Model” templates. There are also generic templates for all hosted types. These generic templates have not been assigned to any particular family category so it will be up to you to determine the category to which it belongs.

To assign the family to a category, use the Category and Parameters tool from the Family Properties panel inside the Family Editor. You cannot add or delete categories to the list of family categories, so use subcategories to have more control of the visibility of the family elements.

Modeling

When you enter the Family Editor you will see the plan view with two reference planes. It would be beneficial at this point to also think about other reference planes and/or reference lines to which you may want the geometry to be constrained. Reference planes can be used as work planes on which to draw, controlling the location of geometry. Reference lines can be used to form a “parametric skeleton” to guide your geometry—construction lines, of sorts.

Instead of jumping into creating geometric forms right away, take time to construct your reference planes. This will make your modeling effort much easier and it will be crucial for the application of constraints.

Create as many reference planes as you need and name them using the Properties window to help you identify them quickly.

You create geometry by constructing solids, and like many other objects in Revit, these forms will always be drawn in sketch mode or two-dimensionally. There are five methods for creating solids.

- Extrusion: 2D profile extruded along the Z axis of a work plane.
- Blend: composed of two separate profiles, one at the bottom (on the work plane) and one at the top (at a certain distance along the Z axis from the work plane) blended together to create a three dimensional shape.
- Revolve: made of a 2D profile rotated around an axis to compose an arched object of any degree.
- Sweep: 2D profile following a path line on a single work plane.
- Sweep Blend: composed of two 2D profiles, one on each end of a 2D path, blending together along the path to create a 3D shape.

Using the same methods described earlier for creating solids, you can create voids to cut out portions of solid forms.

The void form edges are invisible until you move the cursor over the void area to highlight it. You use the same drafting tools to create and edit solids and voids.

Adding parameters and constraints

Parameters are used to control object behavior, size, material, and visibility. Parameters are what make “parametric” modeling possible because they allow you to control the properties of the model or model element simply by changing variable values. You can also extract information from these parameters to generate schedules and reports.

When creating a family parameter, it is very important that you first determine whether or not you want this parameter to have different values per instance or to affect the entire family type. As explained at the beginning of the article, parameters that affect the entire family type are known as “Type Parameters” while parameters that

change value per instance are known as “Instance Parameters.”

Parameters can be linked to dimensions, arrays, and other parameters. Formulas can be added to parameters to perform computations of other parameter values. Constraints are conditions imposed on an object or objects to establish relationships or control geometry. Constraints are independent from dimensions or parameters. When an object is locked to a dimension, a constraint is established. Then, when the dimension is linked to a parameter, the value of the parameter will dictate the value of the dimension thus controlling the object.

Before creating a solid, I highly recommend that you create reference planes and add the dimensional constraints to the reference planes instead of the solid. Then, constrain the solid to reference planes to establish the relationship between the dimension and the object. Also avoid constraining to other objects. This method will give you better control of the behavior of the family when parameter values change. This is particularly true when there are various shapes that need to move along with other parts of the family. It will also help you test the family behavior with different parameter values before creating any geometry.

Let’s examine a simple example of a cube family to be used as a place holder in a project for different pieces of equipment. This family requires width, length, and height parameters that will need different values for each insertion. Therefore, the parameters will need to be instance parameters.

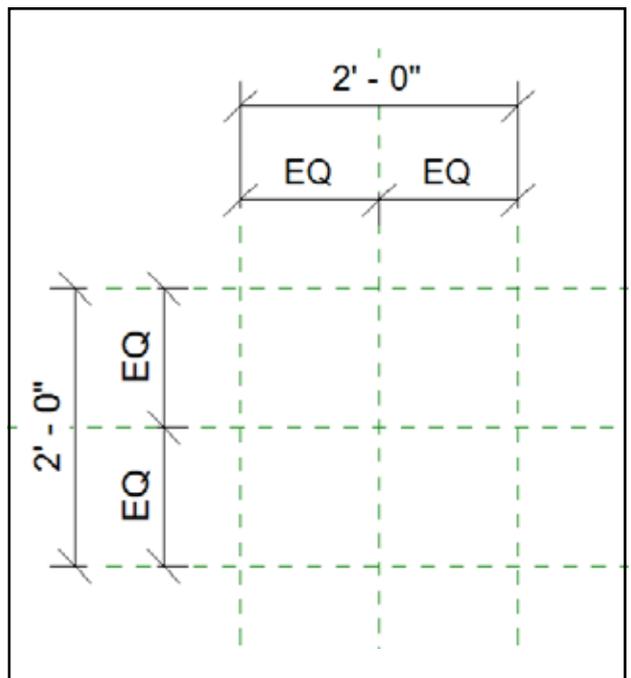


Figure 1: Reference planes and dimensions

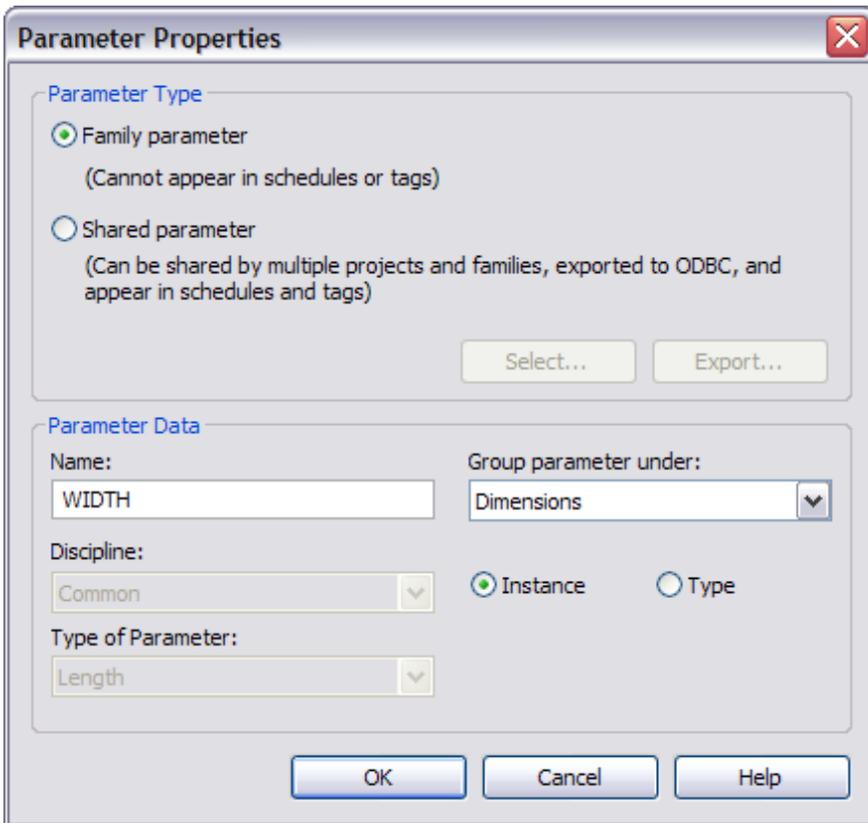


Figure 2: Parameter properties

In this example (Figure 1), I created four new reference planes: front, back, left, and right. Dimensions were added to the reference planes with equalities so that the object grows or shrinks about its center point.

To tie the width dimension to a parameter, select the overall width dimension and click the Label button in the Options Toolbar, then click <add parameter>.

In the Parameter Properties window shown in Figure 2, there are several options you need to select.

1. Parameter Type: Family parameters are specific to the family and their values cannot be tagged. If the parameter's value will be used in a tag use the Shared Parameter type.
2. Name: The name of the param-

eter. The name can be changed at a later time.

3. Group: A parameter category. This will determine where in the Element Properties window the parameter will be shown. Grouping allows better visual organization of your parameter listing.
4. Instance or Type: Determines how the family is affected by this parameter. If you select Instance, each insertion of the family can have a different parameter value. If you select Type, the value of the parameter will affect all insertions of the family of the same type.

3. At this point it is a good idea to test the

Use constraints with caution; over-constraining the form will generate undesirable results.

constraints with different parameter values using the Types tool. If we entered 4 for width and 3 for length, you would see the reference planes moving at equal distances to create a 4 ft. x 3 ft. rectangle (Figure 3).

From an elevation view we can create the reference plane and dimension constraint for the height parameter of the solid form (see Figure 3).

As shown previously for the width and length parameters, the height parameter needs to be labeled to establish the link between the parameter and the dimension. Again, use the Types tool to test the constraint. The more you test along the way as you create constraints, the more assurance you will have that the family will work correctly. This example contains three parameters shown in capital letters to dis-



Figure 3: Established dimensional constraints

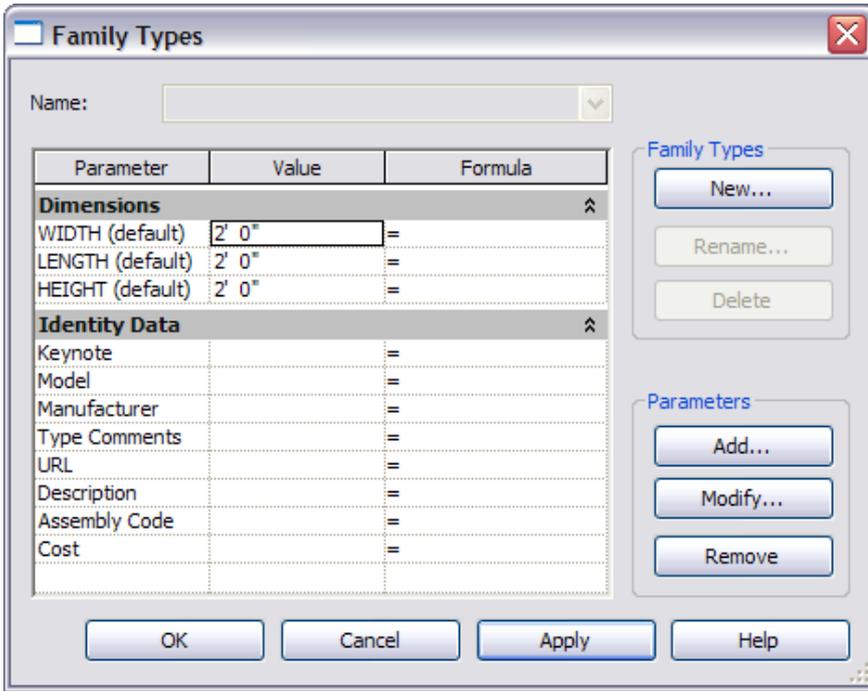


Figure 4: Family parameters

tinguish them apart from other parameters (Figure 4).

We are ready to create geometry! In the

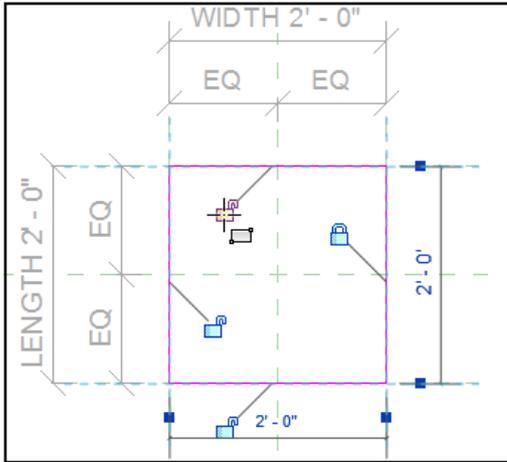


Figure 5: Alignment constraints in sketch mode

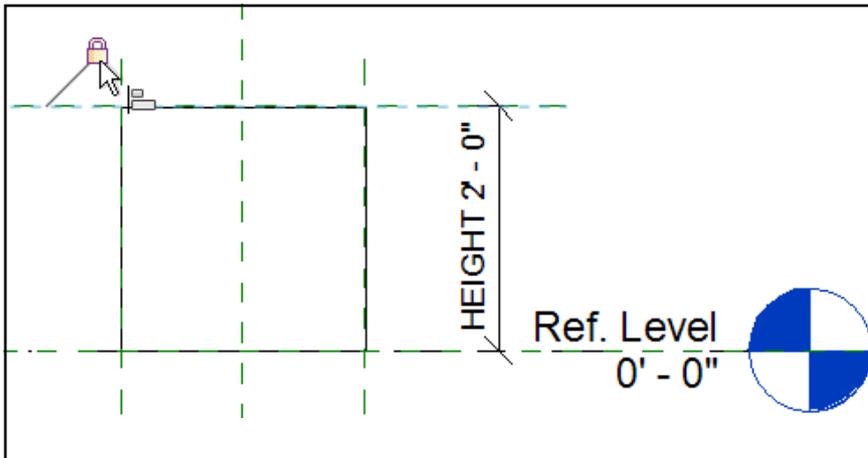


Figure 6: Top of solid constraint

plan view, the cube is created using the Solid Extrusion tool. The Create Extrusion Ribbon bar will appear with all the tools you need to create the extrusion's profile. Solid and void profiles are created in sketch mode. The rectangular profile is drawn using the rectangle drafting tool, aligned with the reference planes.

In Figure 5, notice the little lock symbols tied to each side of the profile. Click on the locks to create an alignment constraint of the profile line with the reference plane.

If you finish the command and did not constrain the profile, go back into sketch mode and use the Align command to constrain the profile to the reference planes. When using the align command, remember to pick the reference

Parametric Design is “a method of linking dimensions and variables to geometry in such a way that when the values change, the part changes as well.”

plane first, then the sketch line. Click the lock symbol to create the constraint.

The Finish Extrusion button exits the sketch mode. The top of the cube needs to be aligned with the top reference plane in an elevation view to establish the height constraint (Figure 6). Test the constraints again in the Parameter Types window to ensure the solid changes when parameter value changes. If it does, you have created a parametric object!

Although this example is a simple cube, the commands shown here are the same regardless of the shape of your profile. As you add complexity to your form, use reference planes to create constraints. Use constraints with caution; over-constraining the form will generate undesirable results.



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Cool Tools: The Subscription Advantage Pack

Recently Autodesk hosted the Blogger Day Invitation to preview the new AutoCAD® Civil 3D® Subscription Advantage Pack. I missed the opportunity to sit in on the event, but was still desperate to see what would take more than an hour to review. Civil 3D add-ons have never been quite that exciting in the past. Autodesk's David Mills sent me a link to a recording of the event so that I could catch up.

There was a great deal of discussion and information passed around during the event, more than can be contained in this article. I'll discuss some of the highlights of what was conveyed, and add a few thoughts along the way, so you can get a feel for my initial impressions.

Peter Funk discussed the tool package contents and implementation and Dana Probert walked everyone through the uses of the tools, while the audience chatted back and forth about what was being discussed, occasionally noting interesting things like Peter's continuously happy disposition. What I saw was neither monotonous nor a simple patch.

The Subscription Advantage Pack (SAP) is a collection of tools that add value to the existing toolset you already have. This fully functional addition contains:

- Point Cloud support
- Roundabout layout
- Visualization and analysis tools
- Transportation productivity tools
- Survey productivity tools

The SAP is available on the Autodesk Subscription website and is available to anyone who is actively participating in an AutoCAD Civil 3D subscription. You must have Civil 3D SP2 installed before attempting this add-on.

After installation, subscribers will find the SAP in the Toolbox, with category headers such as Alignment, Inquiry, Point Clouds, Points, Profile, Roundabouts, Surface, and Visibility Checks.

Point Cloud support

A Point Cloud is simply an object that embodies an encapsulated matrix of points that represent data in 3D space. These are located in mass quantities for visual recognition and verification. The SAP is being used to prepare the market and to stage future integrations into other applications—a springboard. The feature highlights are:

- New point cloud objects
- Control display density, thematic display control
- Ability to snap to points in object

The Point Cloud object is added to the Prospector with all the other Civil objects.

It is created using the Create Point Cloud tool located in the toolbox, which brings up a dialog with all the settings associated.

- Typical Civil object properties, such as Name, Style, Dataset, Display
- Multiple data sources can be imported; wide variety of ASCII, ESRI, and USGS formats
- Colored and Categorized Thematic visual analysis
- Snap to point objects
- Displayed point quantity, size, and count limitation can be adjusted

Point Clouds are cool. Imagine being able to walk the site, preplan your storage better than before, and reduce vertical oversights often overlooked by 2D surveys. However, I am concerned about the impact the dataset will have on a processor and RAM. Currently, there is no way to thin the cloud density.

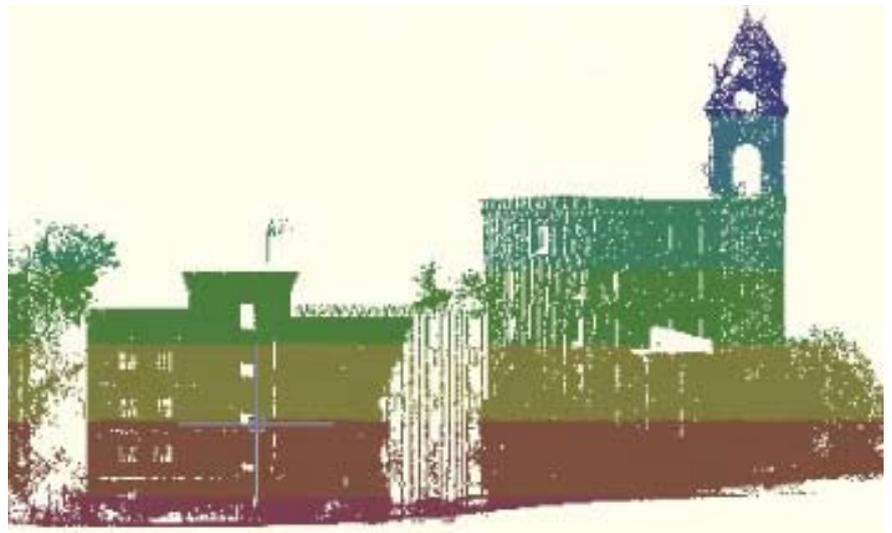


Figure 1

Roundabout layout

I have never cared for roundabouts—until now. This is my favorite part of the SAP. My associate is working a design with three roundabouts that he has had to move three times. I admit I had poor intentions when I teased him with what was coming with the SAP: “Oh, sorry, I guess it’s just a bit too late for your project.”

I should be ashamed, but watching the roundabout entity keep up with Dana Probert during the demonstration as she pulled and pushed it about like a ragdoll just reminds me of how much fun it was teasing my co-worker.

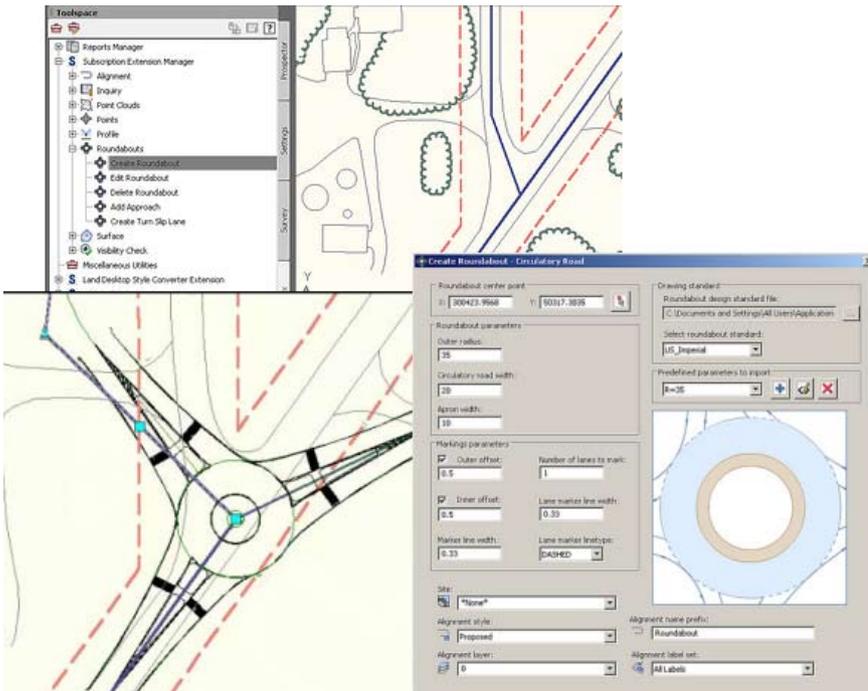


Figure 2

The new tool includes:

- Subscription Advantage UI
- Global Design Standards
- Dynamic Roundabout model

Did I say this thing is cool? Approaches can be added to the object dynamically, even after the object has been created. Design standards are included with settings for offsets, radii, widths, signs, and markings. The required alignments are created by the tool and everything updates as the approach alignments are adjusted. As you move through the creation dialog, the tooltips update into the diagram to reinforce what you are adjusting.

Currently there are no vertical profile capabilities, but this might be just fine. Since profiles are station oriented, major alignment changes usually mean complete profile overhaul.

I do hope that default dynamic profiling

would be added in the future—a checkbox feature that would enable the technician to select the respective approach profiles and the object would interpolate between them.

Cropped surfaces

This tool will be used FIRST! The crop tool brings up a dialog allowing numerous options of what to crop, how to crop, what to do with it. There are style options and dynamic drawing creation features as well.

As soon as the crop is completed, the new drawing opens, loaded with the resulting surface. I can see snapping a portion of a monster EG surface off to a new

we work on some large surfaces).

It would be cool if a checkbox for automatic Dref shortcut creation could be employed during the cropping process.

Surface by GIS data

This is not really groundbreaking technology, but does cut off quite a few steps. The wizard allows the normal data import steps offered in the MAP tools, but adds a few twists.

First you can connect to an active server. Hmm... Then you can specify the region that you are concerned with, instead of the issues we deal with in huge data sets. Nice!

Visualization and analysis tools

The Sight Visibility Analysis tools are divided as follows:

- Drive
- Point to Point line of sight
- Sight Distance Along Corridor
- Zone of Visual Influence

Drive is “eye candy” cool. With 3D blocks for various things such as trees, signs, etc., driving your corridor design is awesome. This tool reminds me of 3D Studio years ago. Set your eye height and visually inspect your design. You’ll have to add your own eye candy 3D blocks.

Point to Point creates an analysis feature that represents the visual impediments along a line of sight from a specified point related to a specified surface. After the target surface is selected, rays are projected from the reference point to as many picked points as desired. Wherever the ray intersects the surface at the specified height, the ray changes color. The feature ends up

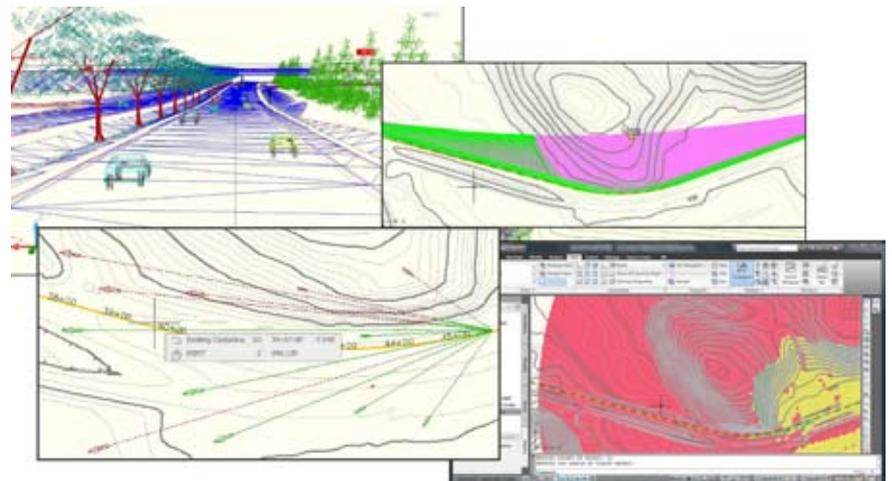


Figure 3

project Dref shortcut folder and adding a reference to a new design. No more trimming and editing for hours on end. (Yeah,

looking like a multicolored starburst.

Sight Distance Along Corridor provides a feature that is a color-coded swath,

superimposed on the corridor representing the clear and obstructed view paths. The respective alignment/profile combinations are specified, intervals, stations, heights, and the target surface. Various sight lines can be selected for display and the properties are set up like a typical civil object.

Zone of Visual Influence creates a circular, color-coded feature that emanates from a picked point, radiating out and delineating anything that lies above a target elevation. I like this one best and would like to see a corridor station-to-station with a maximum offset approach. This way, a longitudinal, non-circular path could be reviewed as well.

Surface and entity analysis

These include:

- Calculate minimum distance between Entities
- Calculate minimum distance between Surfaces
- Calculate vertical distance between Entities

These are all simple analysis tools; two picks and the respective distance is reported to the command line. The location of the result will be shown in the graphics view window.

including blocks, standard entities, AutoCAD and COGO points, and feature lines. Minimum radius detection can be adjusted, and spirals creation is included. A dialog comes up reminiscent of the “best fit curve” of old, allowing us to select the solution desired. This is a fantastic addition and will be nice to use for some of those prescriptive right-of-way designs.

Miscellaneous feature improvements

There are a host of other tools and enhancements that are scattered through the interface.

Transportation Design Tools

- Best fit alignment and profile creation tool
- Split alignment
- Join profile tangents (grade intersection)
- Set PVI by elevation and grade
- Spiral by sweep angle
- Import super elevation from spreadsheet

Survey tools

- Cross breakline utility
- Survey import TTS and SRV formats
- Survey change report
- Survey point and chain edit utility

Final thoughts

My favorite feature is probably the Roundabout entity—and for obvious reasons. It is by far the most robust feature. Currently, my involvement with roundabouts is limited, but their use is on the rise in my geographic area. In the meantime, I’ll be looking forward to more use of the Surface and Visibility tools.

The Point Cloud is kind of exciting and depressing as well. We don’t get much data that would be more useful than a surface model of the same. I once had to do a photogrammetric model of a bridge underpass for a structural engineer to hook up to during a bridge widening as our corridor passed beneath. While photorealistic and quite accurate (if I do say so myself), it was time consuming, which the client paid for dearly. A LiDAR laser scan of the structure pulled in as a Point Cloud database could have proved to be more cost effective and much faster as well.

Thinking about going on Autodesk Subscription? The Roundabout and Surface tools alone would pay for it. This set of add-ons is probably the most advanced and useful ever offered, with the possible exception of the Express Tools package. The Civil 3D 2010 SAP should prove to be a valuable tool.



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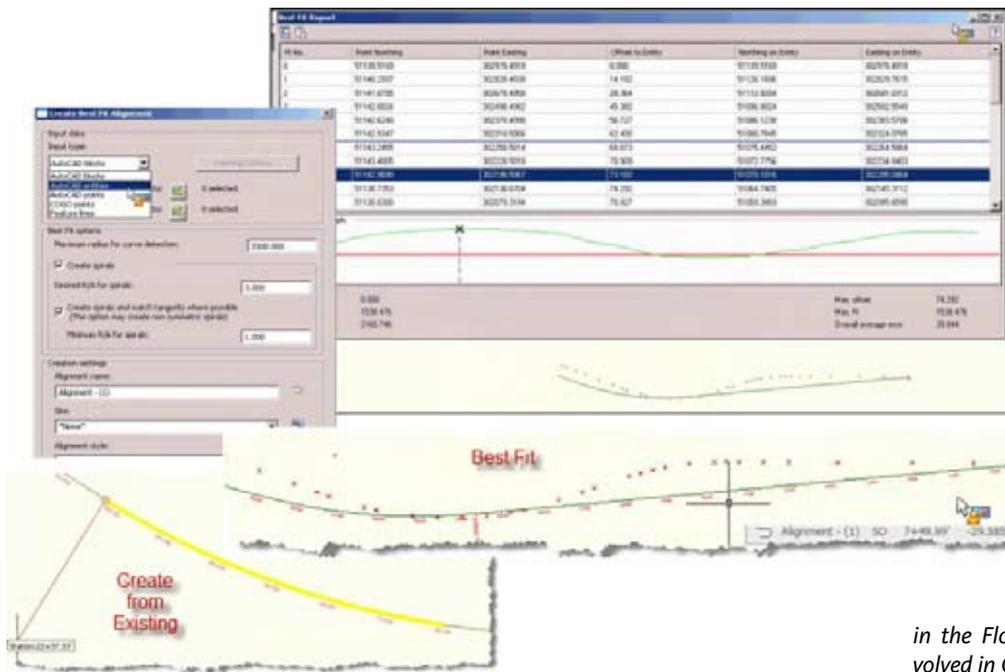


Figure 4

Transportation productivity tools

- Create Alignment from Existing
- Create Best Fit Alignment

Create Alignment from Existing will create a sub-alignment over existing one.

Create Best Fit Alignment allows numerous input entities to be sampled,

General Production Tools

- Save As DGN improvements
- Zoom to point
- Calculate minimum vert distance between surfaces
- Calculate minimum vert distance between entities
- Divide and crop surfaces

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Project Phases in Revit Structure 2010

Project phases inside Autodesk® Revit® Structure offers significant benefits to a project. You can assign a project phase to a building component, a drawing view, or a material takeoff schedule—the possibilities are limited only by your imagination! This article will explore the mechanics of implementing phasing into a project and the benefits of doing so.

Developing a scheme

The first step is to understand the life-cycle of the project. If you were doing a simple building addition you may require only a few phases in your project such as Existing, Demo, and New Construction.

But what if you were working on a project that was going to be larger and span a couple of years? In this case you might want your phases to represent a timeframe. Now you can link that to material takeoffs and have materials delivered to the job site as needed. Figure 2 represents Project Phases broken into six-month timeframes.

Working with your model

When implementing phases in your model, you need to phase your views and your building components. Figure 3 illustrates the Phasing section of the view properties dialog box. The Phase Filter controls

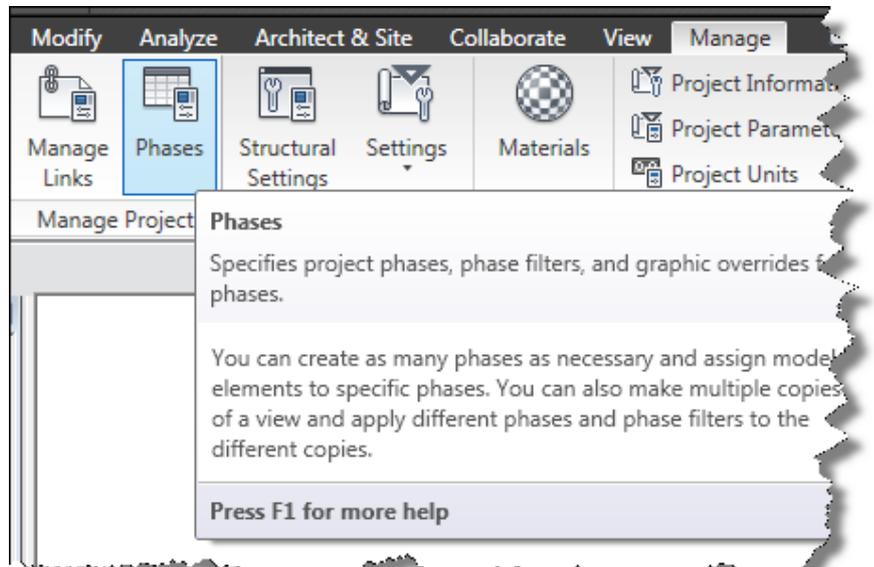


Figure 1: Element properties

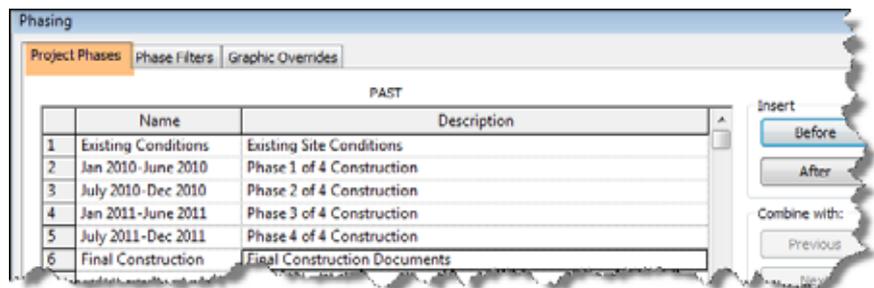


Figure 2: Sample project phases

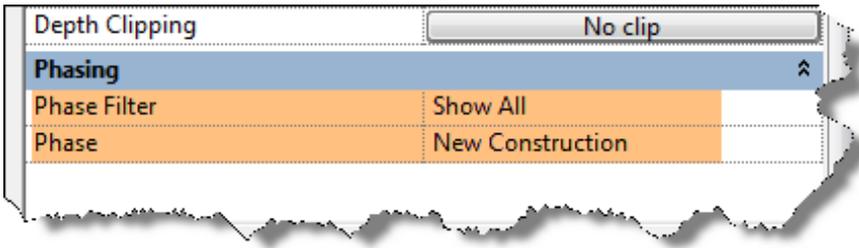


Figure 3: View properties

what will be displayed in the view and the phase will be assigned to any building components you place.

Throughout the process of creating your BIM model you may have to change the phase to which a structural member belongs. What if you had to demolish a structural member in your model? There may be a structure temporarily built during construction that needs to be demolished during the next phase of construction. All of this is controlled by the element properties. In Figure 4, you can see where to specify the phase in which an item is created and the phase in which it is demol-

ished. With this established, the building component will display correctly according to the phase filter applied to the view.

Working with your display

Once you have established a list of all the phases you need during the virtual construction of your BIM model and you have assigned a Phase of Construction to a view, it will be time to work with your display.

Figure 5 shows the various phase filters that can be assigned to a view. Notice to the right of the Filter Name there are columns for New, Existing, Demolished, and Tem-

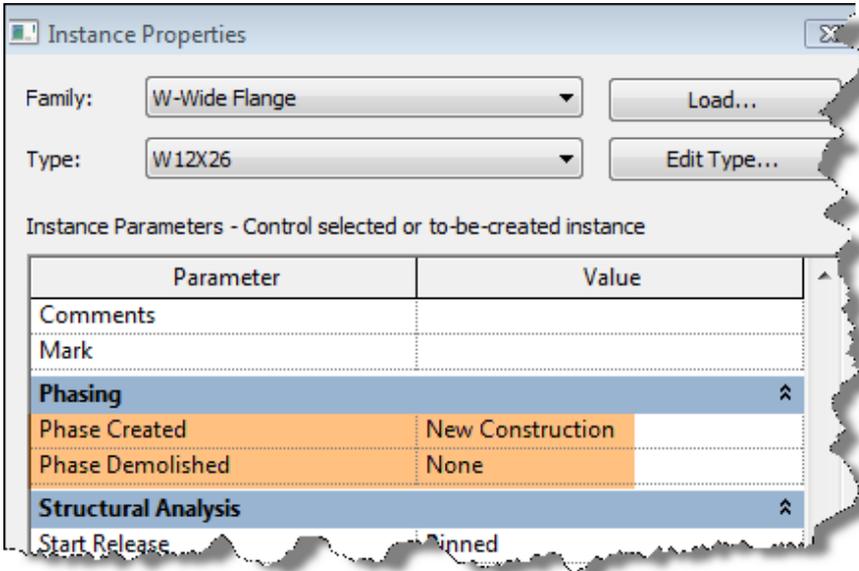


Figure 4: Element properties

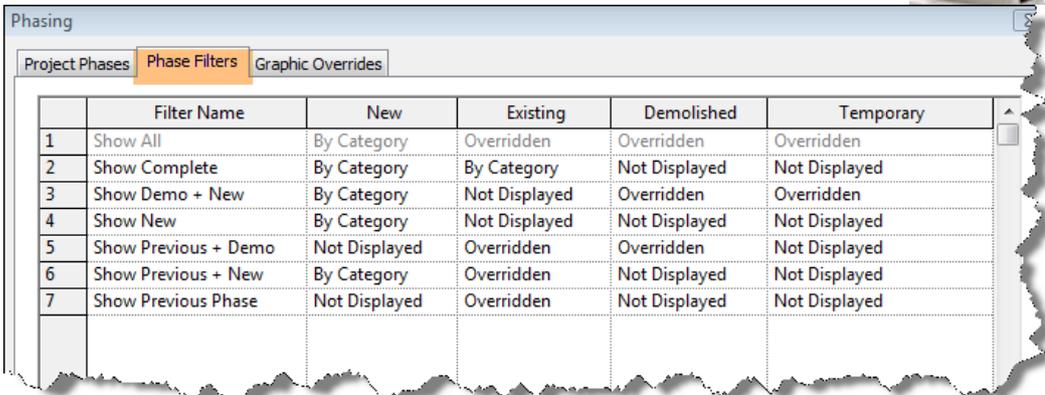


Figure 5: Phase filters

Revit Structure models provided courtesy of SCA Consulting Engineers.



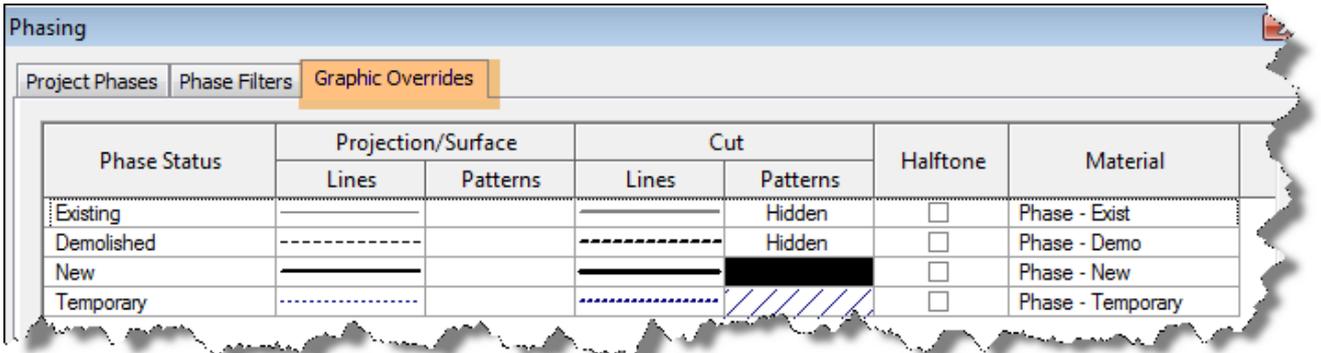


Figure 6: Graphic overrides

porary graphic settings. For the most part, these graphic settings work well. However, by selecting the appropriate column, you can apply a Graphic Override to change the display of those items within the Phase Filter once applied to a view.

Figure 6 shows the Graphic Overrides tab of the Phasing dialog box. These overrides represent what can be applied to your Phase Filters. In this tab, you can change the settings to match your office's CAD standards.

Working with schedules

It is important to remember that a schedule is also a view of the same model database. The image below shows the element properties of a schedule. Just like any other view, you can apply a Phase and a Phase Filter to your sched-



ule. This opens up the possibilities with your schedules.

Let's say your first phase of construction was to place the main building pad and isolated footings along with lower level structural columns. You can pull that Phase out into a schedule, which will allow you to have those materials delivered to the job site at that particular phase of construction. This, in turn, will create an efficient construction process, having only materials on site that are required for that phase

of construction (see Figure 7).

Summary

Phasing offers a whole level of control to your virtual BIM model. Not only can you control your construction documents schedules, as discussed in this article, but there are so many more applications. For example, your Revit model can be viewed by Autodesk® Navisworks® products, which allows you to study your model, perform clash detection with other models, and animate your construction process to help predetermine construction problems virtually before they happen in the field.

You may come across many articles or courseware that explains phasing in Revit as the ability to handle existing and new construction. In my experience, phasing is so much more than that. This article gives you only the basics: where the settings are and how to apply them to your model.

Challenge yourself, expand your knowledge, and take full advantage of your virtual BIM model.

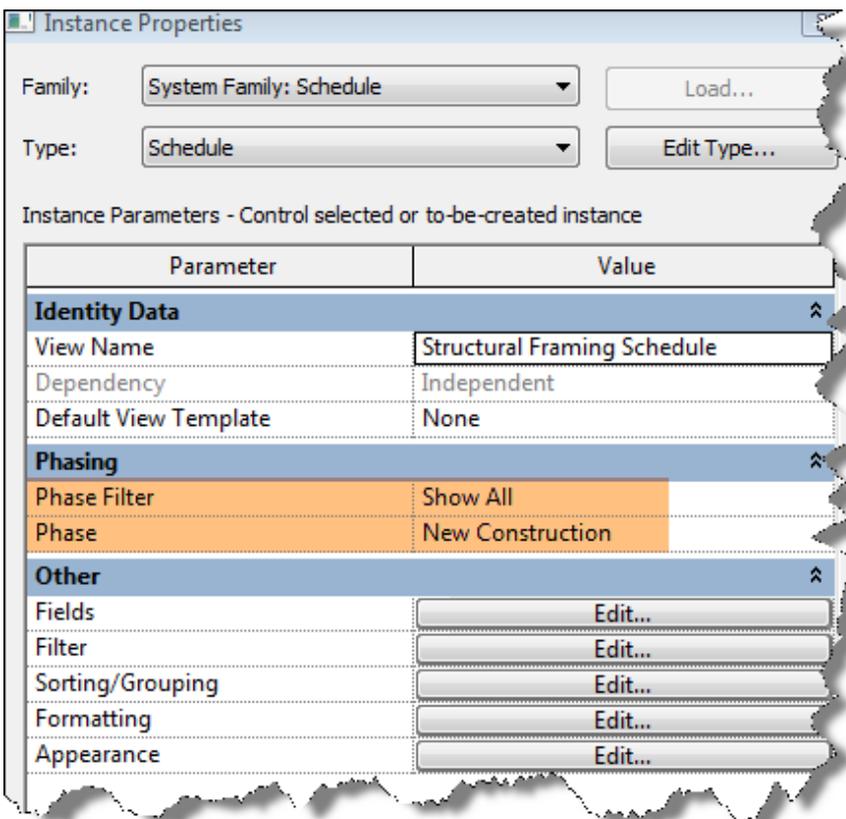


Figure 7: Schedule element properties



Phil Russo began with AutoCAD version 2.5 in 1986. Through the years, he has held positions in the CAD industry as CAD draftsman, CAD manager, applications engineer, and

Autodesk Certified Instructor. Lately Phil's focus has been on the development and implementation of standard practices for the Autodesk Revit product line including Revit Architecture, Revit Structure, and Revit MEP. He currently works at Lindemann Bentzon Bojack, an architectural and engineering firm located in Clermont, Florida. He can be reached at philr@lbbe.com.

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