AUGIWorld

Beyond Autodesk: Are you plugged in?

Also in this issue:
- **How do *you* use AutoCAD Civil 3D?**
- **Groups Inside Revit Structure**

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The Paperopolis Gazette

EXTRA! EXTRA! Bluebeam PDF Revu 8 is released!

Armed with Bluebeam PDF Revu 8, Mighty Bluebeam Saves the Day by Blasting Paper to PDF!
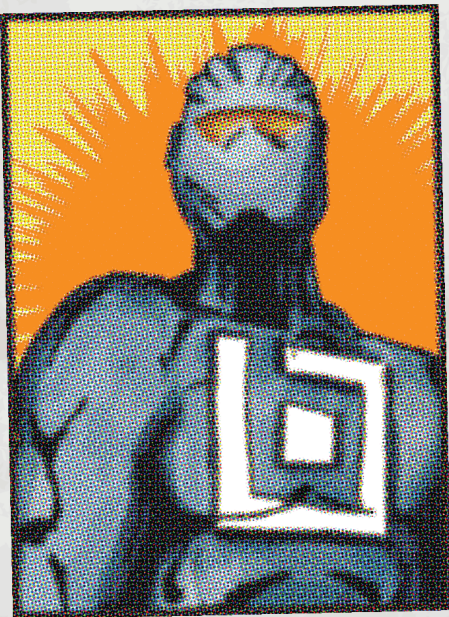
It's a paperless victory for the ages! With the release of Bluebeam PDF Revu 8, Bluebeam is arming designers and builders with new PDF superpowers for digitizing project communication. Integration with SharePoint, a Revit plug-in, and File Access for previewing, organizing and managing PDFs, rescues projects from the evil Paper Pusher. With these new, highly anticipated features, Bluebeam proves that it's not just a solution for PDF creation, markup, and editing, it's so much more!

Revit Plug-in Provides More PDF Creation Power.

In addition to its powerful AutoCAD plug-in, Bluebeam PDF Revu 8 now integrates with Revit for high quality, one-button PDF creation. Nothing can out-match Mighty Bluebeam's secret weapons for Revit users. Select sheets, reorder them and choose custom plot settings to create the right PDF the first time. Add text stamps, bookmarks, file attachments and security to PDFs.
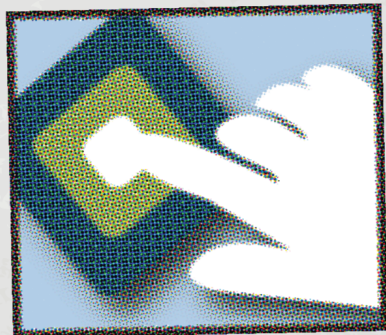
Mighty Bluebeam Proves that Paperless Workflow is Possible.

With special PDF fighting powers, the Mighty Bluebeam helps blast paper to bits and bytes. Redline drawings, respond to RFIs, overlay pages, create punchlists, perform digital takeoffs, and more, electronically in PDF.
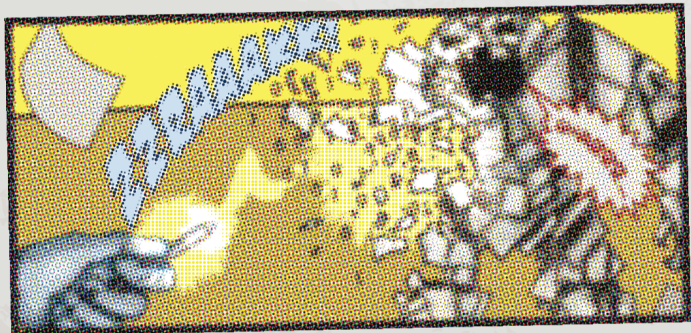
Autodesk Partner Products

It does not take very long for most CAD managers to realize that Autodesk® products are not the only things they need to manage. Working in a design environment brings several tools together in the effort to move a design from concept to completion. Autodesk plays a major part in the process, but others tools fill in areas where special needs may exist.

Third-party or partner products are additional software tools that work inside, alongside, and in cooperation with the CAD and BIM tools that we use every day. These tools embed themselves into the interface or add additional dialog boxes or commands that enable or expand the technology that comes out of the box.

Many of us are working in a mixed house that contains multiple tools and multiple CAD platforms. We may have multiple plotters and we work on multiple projects, using multiple standards, with multiple users. How do we keep it all in order? How many plates are you spinning?

The goals should remain the same no matter what mixture we may have.

We need to establish several overarching perspectives that drive our offices and teams. Keeping these things in mind will help keep the mixture from becoming a poisonous potion.

Unified Document Output – make sure that all tools are producing output that is in line with your standard. Colors, pen weights, plotting output, and documentation consistency is a must.

Fully trained Users – with an expanding set of tools, it is harder to keep everyone up to date on all products. Training needs to be a focus from now on.

Productivity Enhancements – review every tool with the goal of increasing productivity. This may seem like a given, but many tools are selected because someone has used it before or because it is cheap.

Ease of Management – make sure that the tools all work together. Nothing is worse than having one tool make a file unusable by another.

Clean CAD Files – review the creation and editing functions of all the tools to verify that they do not "mess up" your files.

Sharing Documents – when passing files on to others, no product should make them difficult to work with for those outside your firm.

Solid Client Deliverables – the overarching goal of it all—your clients deserve properly working files.

Where do you find third-party products?

Ask those in your firm who are in tune with the tools that you use now. They may know where to find other utilities to increase the impact of what you have already.

Ask the new hires. When someone new joins your firm, sit with them to find out what they used at their previous firm. Find out what the tools did for them. Find out which ones worked and which ones failed.

Ask AUGI. Go to the forums and search or post a question. Look for those who have used the tools you are reviewing and see what they posted. Ask Autodesk and your reseller. The resellers are in the trenches and in tune with what others are using. They hear the successful stories and the troubles that others are having. They know the trends in the industry.

Autodesk also has a webpage with an extensive list… go to http://partnerproducts.autodesk.com
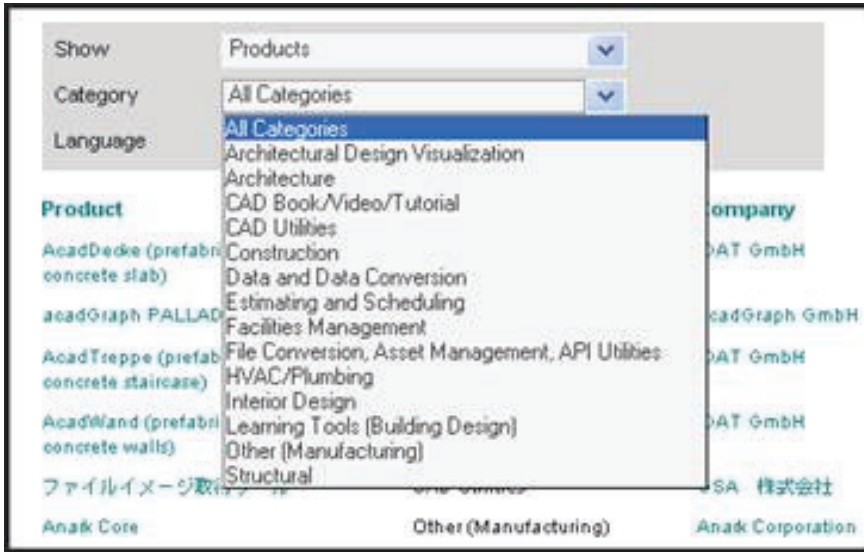
There are lists for CAD and Geospatial and for Media and Entertainment

This site is maintained so that you can find the latest Partner Products. It is great for seeing what is out there. You can search and sift through the available tools and find what you need. You can filter by category and find the ones that apply only to your toolset.

Select from the list of products on the left sash to filter the list.

You can also rummage through the list alphabetically

This is a very valuable list of products. There are too many in there to count. Take a look and enjoy the wide variety of products available to support the Autodesk environment you have created.
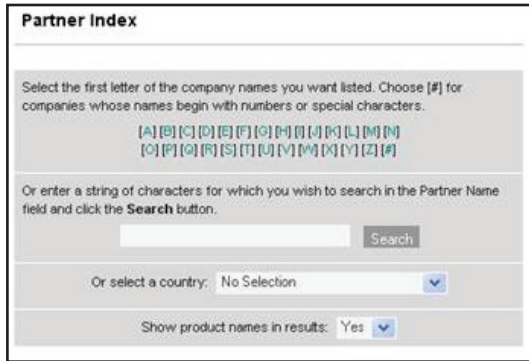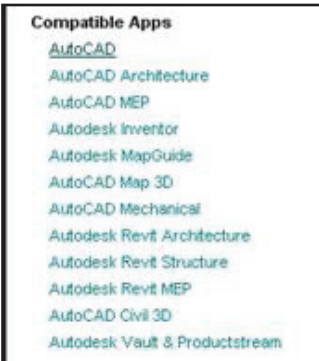
Mark W. Kiker is president of the AUGI Board of Directors. He is a National CAD Standards Project Team Member and team member of the National BIM Standard. Mark is general editor of BLAUGI and also publishes caddmanager.com, the CADD Manager's journal, as well as the caddmanager.com blog. He is a returning faculty member at Autodesk University. He is currently chief information officer for HMC Architects in Ontario, California.

Celebrate 20 Years with AUGI!

Education & Training

Peopleware, Part 2

In the first part of this "CAD and Peopleware" series (*AUGIWorld*, January/February 2010), author Antonio Fontenele discussed the pros and cons of training existing employees versus hiring new professionals to fill open positions. In this issue, Fontenele continues with tips on hiring outside the firm. - *Editor*
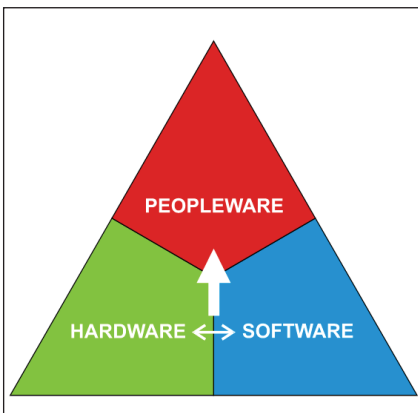
To hire the highly skilled designers needed for CAD positions, you will have to modify your traditional job descriptions to specify the technical skills that the candidates need in order to use AutoCAD® correctly and effectively in your office.

To determine the required skills, review your current projects and the necessities associated with them. Also, consult your existing staff and your CAD manager. You might even check newspapers, magazines, or online job search websites to come up with a list of qualifications your candidates should possess.

Some of the typical qualifications include:
- Architectural, engineering, or design degree from a respected university.
- At least two or three years of experience in a design office.
- Proven experience in the production of contract documents sets, schematic drawings, design presentations, projects, and other drawings. Decide if you need experience in a particular specialization such as hospitals or school buildings, commercial or residential designs. There is an obvious benefit from hiring a

person who has experience in your firm's specialty areas.

- Experience in using other types of software such as Corel, Photoshop, and others.

The hiring process

Once you have finished modifying the qualifications that your ideal candidates should have, you might also need to modify the way you conduct the interview and evaluate your candidates.

An interview of a candidate for a job that requires the use of AutoCAD should include these components:

1. Review of résumé and portfolio. Use these items to obtain information on your candidate's breadth of experience, responsibilities on the previous job, and decision-making capacity. Be sure to check for items such as Autodesk Certification. A certified professional will bring a lot of AutoCAD experience to your company.

2. Review of AutoCAD drawings. While traditional printed drawings can show what the candidate has produced using AutoCAD, what they don't show is how the candidate did the work. A growing number of design offices ask that candidates include DWG files to demonstrate their proficiency level and degree of organization. This file can help you determine not only drawing quality and organization, but also these important elements:

   - Basic drawing configurations such as drawing limits and layer organization.
   - Customization level and reuse of work, indicated by the existence of blocks, text styles, layer standards, linetype styles, and so on. You can measure the customization level when you are opening the files. For example, if you are asked about any absent menu when you open the file, this means menus were personalized. The use of external references (xrefs), typefaces, AutoLISP routines, and other characteristics shows that the file was created in a highly customized system. Another sign of customization can be found after you open the file and access the dialog box RENAME (type RENAME in the command line and press ENTER), which analyzes all the items that are available to be renamed.
   - Intensive use of blocks. You can analyze the blocks, their appearance, name, and insertion point choice.
   - Computer memory usage. Use the

PURGE command and count how many blocks are not in use as unused layers and linetypes present in the drawing. If the file size is large due to the presence of unused content, the candidate for the job position will need training in optimizing AutoCAD resources.

3. AutoCAD tests. Some companies apply tests to evaluate the skills of drafters and designers in their use of AutoCAD. Products such as AutoCAD Evaluator from software house Profisee offers multiple-choice tests. The candidate chooses answers and the software automatically shows the scores and analyzes the results, sorted by question categories. Such tests can be quite useful in discovering a candidate's knowledge level. Remember, though, that these tests cannot evaluate knowledge related to design and project experience.

4. Training center reputation. The reputation of the places from which a candidate received training in AutoCAD can also serve as an indication of their skills in that software. If a candidate's primary training was received at a university, you need to verify that place and its resources to evaluate the validity of that training. If the school was an official Autodesk Training Center, then it has been Autodesk "approved" to certain minimum requirements regarding instructors' competence and computing resources.

5. Information from former employers. You can ask for information about a candidate from his or her former employers and this will help you to analyze his/her dedication, performance, and knowledge.

Salaries and benefits

In many cities, the number of good designers who specialize in CAD is low in relation to the demand for them. Therefore, good designers hope to receive many job offers as well as salaries above the average. Because of this, some design offices opt to train existing employees to help reduce human resources costs. A good, in-house

CAD training program is a welcome benefit to both existing employees and those candidates you wish to hire.

Temporary Jobs

In these economic times, more offices are opting to use temporary employees instead of hiring new staff members. While talented temporary help can sometimes be found through "word of mouth" among industry colleagues or networking websites such as Linked In (www.linkedin.com), for example, many design offices turn to job agencies to help them locate talent.

These agencies maintain a database of designer contacts and take responsibility for the labor documentation. Sometimes they pay the designers, too. Using job agencies, design offices can contract temporary help without having to worry about the details involved in hiring full-time staff.

A good, in-house CAD training program is a welcome benefit to both existing employees and those candidates you wish to hire.

The job agency might do an adequate job of "filtering" candidates and sending you top-notch professionals, but you still must go through the interview process to make sure the candidate in question is a good fit and that his or her skill set matches your requirements. This is particularly true in cases of a long-term assignment.

Many offices discover that the employment of temporary teams is a good way to locate efficient candidates for a defined period.

Agency rules vary, so make sure you understand up front how the temporary employee is to be paid and whether benefits need to be made available. In the event that you decide to offer the temporary employee a full-time job with your firm – which sometimes happens – make sure you understand the agency's policy with regard to that.

Antonio Fontenele is a Brazilian architect, ATC Faculty, AUGI Training Program Faculty, and member of AUGI since 2001. He is an AutoCAD 2009 Certified Associate and AutoCAD 2009 Certified Professional. You can contact him at projeto@antoniofontenele.arq.br.

Beyond Autodesk:
Are you plugged in?

Autodesk has a long history of working with and supporting third-party innovators through formalized programs such as the Autodesk Developer Network (ADN). In this article, Autodesk's Kean Walmsley talks about a program at Autodesk Labs dubbed "ADN Plugin of the Month" (http://labs.autodesk.com/utilities/ADN_plugins), which shines the spotlight on promising new plugins for Autodesk products.

What it is...

Since September 2009, Autodesk Labs (http://labs.autodesk.com) has been hosting free, monthly Autodesk product plugins provided by the Autodesk Developer Network team. A new plugin shows up each month, having been developed either by a member of the technical staff supporting ADN members (Developer Technical Services—the team I'm proud to say that I manage as my "day job") or by a member of the network.

Why it is...

There were two primary drivers behind this initiative: first, to solve real problems that have been frustrating customers, and second, to encourage people to take the plunge and start developing their own plugins for their favorite Autodesk product. Each plugin is provided with full source code that people can extend for their own purposes.

By taking the hood off the implementation of these mini-features, we hope that people will see the relative simplicity—and significant benefit—of developing custom tools that are specific to the needs of their business. Autodesk's success, over the years, has in no small part been due to the belief that tailored software—whether this custom-ization is done in-house or by a third party—allows our customers to maximize the return on their technology investment and greatly streamline their use of our software.

Where it started...

So where did the idea for this initiative originally come from? It all started at the end of April 2009 when Mark Doel, who works for an Autodesk customer in Hong Kong, contacted Autodesk about some frustrations both he and other Autodesk customers have had with the naming convention AutoCAD uses when publishing PDF documents. A member of my team, Gopinath Taget, worked with Mark to identify and implement a solution that would address the problem. On delivering this to Mark, we happened to ask if there were other issues he'd hit that had caused similar frustrations.

Mark went on to describe how he also had issues with the fact that AutoCAD's OFFSET command was unable to offset entities included in external references. So I put together a simple .NET plugin to enable OFFSET to work with geometry from external references, and this tool went on to become OffsetInXref, September 2009's inaugural Plugin of the Month.

Some of you may be wondering what happened to the first tool, which we called RenamePDF: because this tool was implemented using C++—which reduced its relevance for an initiative introducing people the possibilities of programming—we decided it should not be among the first to be published. So far the various plugins published have all been implemented using either VB.NET or C#.

Who does it...

While my team is developing the majority of the plugins being published, early on we realized that many people and companies would have their own tools they would like to share more widely with others, to showcase their skills and get well-deserved community recognition. I posted an invitation on my blog (http://blogs.autodesk.com/through-the-interface) some time before the first plugin was posted which led to a number of our more popular plugins being contributed: Clipboard Manager from Mark Dubbelaar, Layer Reporter from Terry Dotson of DotSoft (http://dotsoft.com), and the code inspiring Facet Curve was provided by Jon Smith of COINS (http://www.coins-global.com).

What's available...

Let's take a look at the plugins posted so far on a month-by-month basis. To access any of the plugins posted in prior months, be sure to visit the updates page at http://labs.autodesk.com/utilities/ADN_plugins/updates).
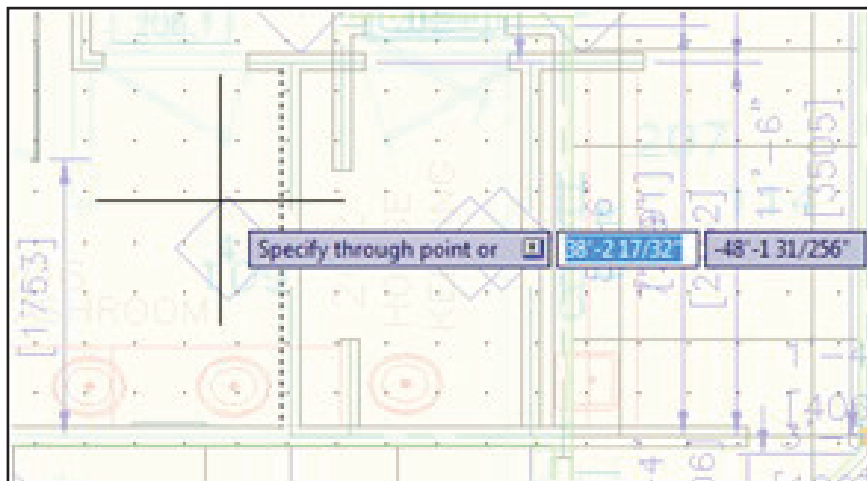
OffsetInXref (September 2009)

This plugin can be used with AutoCAD to enable the OFFSET command to work with the contents of blocks and externally referenced drawings. It's of particular use to civil engineers and other frequent users of OFFSET who work with large, externally-referenced datasets.
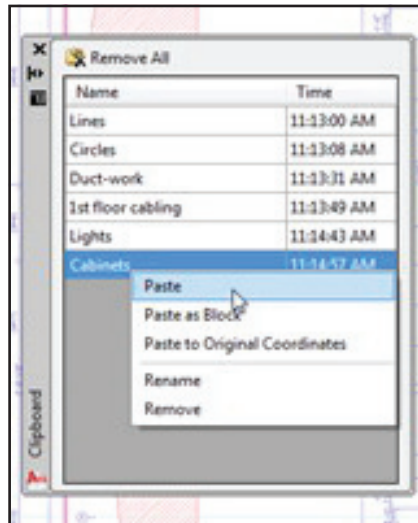

Figure 2: Clipboard Manager for AutoCAD

Clipboard Manager for AutoCAD (October 2009)

This plugin can be used with AutoCAD to manage multiple clipboard entries, storing and renaming them for later use. It's great for moving different sets of content between various open drawings or for creating repeated copies of geometry without using blocks.
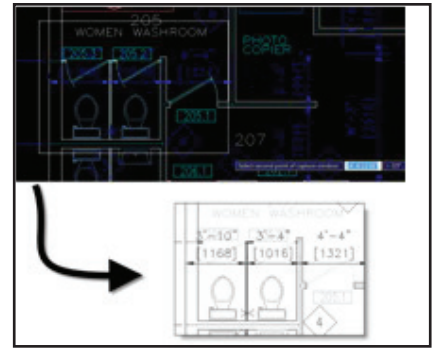

Figure 3: Screenshot for AutoCAD

Screenshot for AutoCAD (November 2009)

This plugin can be used with AutoCAD to simplify the process of capturing images of parts of drawings, or the entire drawing or application windows. As it allows you to remap the background to white and the foreground to black—or to convert the entire image to grayscale—it's a very handy tool for reducing the time needed to document designs in external documents.

Layer Reporter for AutoCAD (December 2009)

This plugin can be used to generate a report of the layers used within an
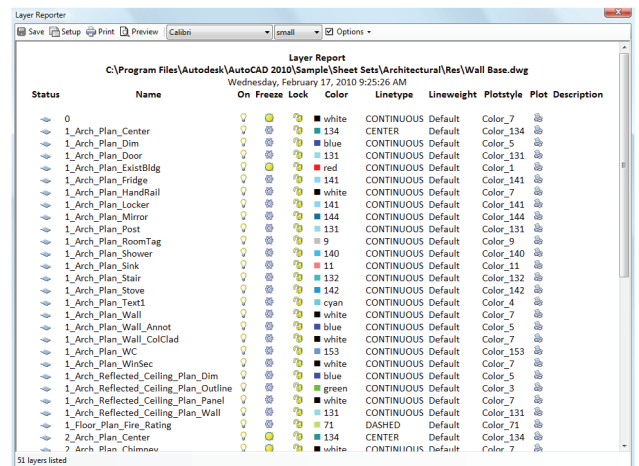
Figure4: Layer Reporter for AutoCAD

AutoCAD drawing. The report formatting can be customized to the needs of the user and these settings will be applied when the tool is used on other drawings, reducing the effort required to generate other such reports. This is a useful tool for CAD managers who need to generate reports on layer usage in particular documents.

Facet Curve for AutoCAD (January 2010)

This plugin can be used to facet 2D and 3D curves in AutoCAD: to approximate their curvature with a number of straight line segments. The faceted output is in the form of a number of lines or a single

Figure 1: OffsetInXref

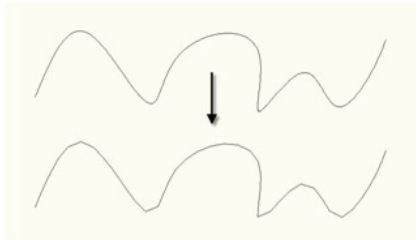*Figure 5: Facet Curve for AutoCAD*

polyline, as selected by the user. This tool will be of use to people needing to export complex curves to an environment—such as a CNC system—that may not support that particular type of object natively.

Figure 6: Screenshot for Inventor

Screenshot for Inventor (February 2010)

This is a version of November's plugin adapted to work with Autodesk Inventor. Use it to capture parts of 2D drawings or 3D parts and assemblies, remapping the foreground and background colors or converting the entire image to grayscale. This is very handy for anyone who needs to quickly capture portions of Inventor models and drawings for inclusion in external documents.

Batch Publish for AutoCAD (March 2010)

This plugin automates the use of AutoCAD's publish command to create DWF and/or PDF files for a folder of DWGs: useful for people who need to
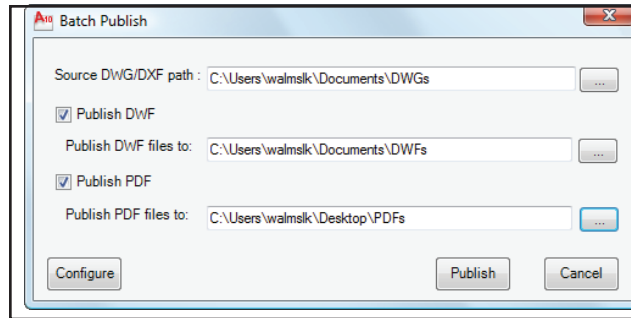

Figure 7: Batch Publish for AutoCAD

maintain lighter-weight versions of their models for viewing and markup.

Wherever possible we've made sure the plugins work for multiple releases of our software: all AutoCAD plugins will work for releases going back to AutoCAD 2007 (both 32- and 64-bit versions, when available) as well as the various, corresponding AutoCAD-based vertical products.

If you would like to propose a prospective plugin of the month—whether you have an idea for a plugin you'd like to see developed or have a plugin you would like to make available to the user community of your favorite Autodesk product—send us an email at labs.plugins@autodesk.com or post a comment on my blog (http://blogs.autodesk.com/through-the-interface).

About the Autodesk Developer Network (http://autodesk.com/joinadn)

Membership in the Autodesk Developer Network (ADN) provides individuals and companies with the help they need to develop software based on Autodesk technology. Some of the benefits include:

- Access to Autodesk software: we provide licenses for your development staff.
- Technical assistance: my team provides training, support, and mentoring around our products' Application Programming Interfaces (APIs).
- Business assistance: members of the

ADN team are available to help with questions companies have about bringing software to market.

- Awareness of new products and APIs: we hold annual conferences and online events to help people get advanced knowledge about future product features, to help companies plan their development activities.

While a good number of the 3,300 companies belonging to ADN are commercial software providers or consultants, more and more customers are joining ADN, having seen the value in a tailored solution.

This year we're also holding our annual DevCamps, where ADN members get the chance to attend a multi-day event held

> A new plugin shows up each month having been developed either by a member of the technical staff supporting ADN members or by a member of the network.

near one of our development centers. This year we have a Manufacturing DevCamp in Lake Oswego, Oregon, from June 2-4 and an AEC DevCamp in Waltham, Massachusetts, from June 7-9. These events are great opportunities to learn about our products and how to develop with them, as well as getting to network with my team and the engineers who build our software.

Kean Walmsley has been with Autodesk since 1995, focusing on providing programming support, consulting, training, and evangelizing Autodesk software to external developers. He has worked for Autodesk in a number of countries: he started his career in the UK and has since moved to Switzerland, the United States, and India. He and his family have now settled back in Switzerland. Kean's current position is Senior Manager of Developer Technical Services (DevTech), the worldwide team of API gurus providing technical services through the Autodesk Developer Network. Kean also spends time blogging about developing on Autodesk platform products at http://blogs.autodesk.com/through-the-interface, a popular Autodesk-related blog.

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Take your AutoCAD® Civil 3D® and Autodesk® Revit® products to a whole new level with solutions from Eagle Point Software. Our easy-to-use third-party applications extend the capabilities of your Autodesk solutions, making it possible for you to get more work done in a shorter amount of time.

For information on any of these solutions, call 800-678-6565 or visit http://www.eaglepoint.com/aw03.

Task Navigator™ for Civil 3D®

Get productive quickly and dramatically improve your implementation of AutoCAD Civil 3D utilizing Task Navigator's integrated learning environment. Take advantage of the 3D modeling capabilities using workflows that guide you to complete your work faster by executing the right AutoCAD Civil 3D commands at the right time in the design process.
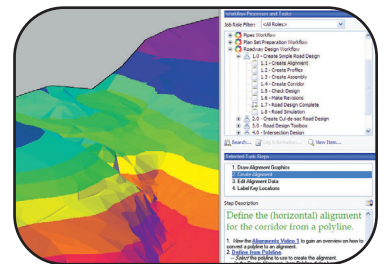
Surveyors' Companion for Civil 3D®

Streamline your survey workflow with a set of tools that leverage proven surveying technology to enable your organization to comfortably and productively move to AutoCAD Civil 3D. Surveyors' Companion cuts through AutoCAD Civil 3D's sophisticated interface and provides simple surveying routines that many AutoCAD Civil 3D users have been wanting for years.
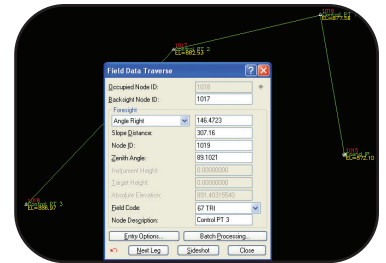
Data Reduction for Civil 3D®

Streamline the AutoCAD Civil 3D survey transfer process with Data Reduction. Whether you are downloading directly from the collector or importing a job already on the PC, shots described in the field using Eagle Point's popular coding methodology come into AutoCAD Civil 3D with proper description key symbology and linework automatically generated.
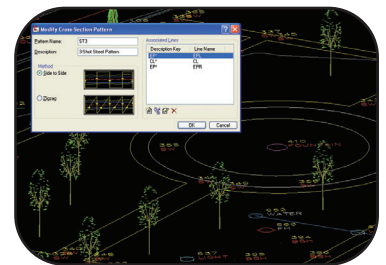
LANDCADD™ for Revit®

Integrate elements of landscape plans, such as planting, site and hardscaping components, within the Autodesk Revit model. Access a wide range of searchable plants to customize planting families and locate trees, shrubs, flowers or ground covers in the model. Direct integration with Autodesk Revit removes the pain of having to design the landscape in AutoCAD and transfer it to Autodesk Revit.
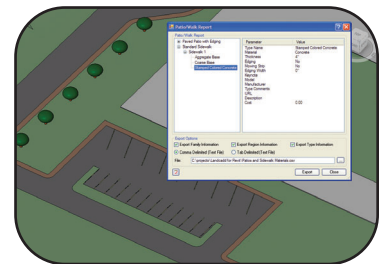
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Creating Schedule Tables in ACA 2010

Schedule tables have evolved through many version of AutoCAD® Architecture software. Schedule tables are created to graphically represent information specific to objects in your drawing. For example, you may want a schedule table for objects such as doors or windows. You may even want a schedule table for room finishes or space inventory. There are many possibilities for the use of schedule tables.

Let's look at how to create a schedule table in AutoCAD Architecture 2010.

Creating schedule table styles

Schedule table styles are used to control the appearance and the content of schedule tables. A schedule table style for the type of schedule table you want to create must be contained in the drawing. When a schedule table style is copied into a drawing, data formats and property set definitions specified in the style are also copied. Property data formats and property set definitions will be discussed later in this article.

Like many entities of ACA, schedule table styles are created and edited in the Style Manager under the Manage tab of the Ribbon. To create a new style, expand Documentation Objects, right-click on Schedule Table Styles, and click new. Enter a name for the new style and hit enter.

Next, you will edit the options for the schedule table style. The eight tabs you have to choose from are as follows.

- **General** is where you would add a description, if desired. You can also click on Notes and add a note and/or a reference document.
- **Default Format** allows you to specify the format you want for your new schedule table style. This includes text appearance, matrix symbol, and cell size.
- **Applies To** enables you to specify which objects you want the schedule table style to track. This could be as simple as a polyline or a door. This could also be several ACA objects, depending on what information you wish to include in your schedule table.
- **Columns** allows you to add columns to represent properties that are reported in the schedule table style. You can also add column headings, edit column data, and edit column placement in your style (see Figure 1).
- **Sorting** lets you specify the sort order of each row within the schedule table style.
- **Layout** allows you to specify the format of the table title, the column headings, and the matrix column headings.

- **Classifications** enables you to assign a group of named properties to various objects. These properties assist in controlling how objects are displayed and scheduled.
- **Display Properties** allows you to specify the visibility, line type, layer, and other display properties of the schedule table style you are creating.

Once your style has been created, you can drag and drop it onto your tool palette for quick access. You can also add the schedule table to the Annotation tab on the Ribbon by using the CUI. I highly recommend doing this if you plan to use your new schedule table style frequently.

Property data formats and property set definitions

Before you create a schedule table, you will need to attach the property sets that are referenced in the schedule table style to the objects and object styles. These attached property sets become the containers for the data that will appear in your schedule table. A schedule table extracts the data from objects and displays it in the table. Data is not saved in the table itself.

Property set definitions are created and edited in the Style Manager under the Manage tab of the Ribbon. To create a new property set definition, ex-
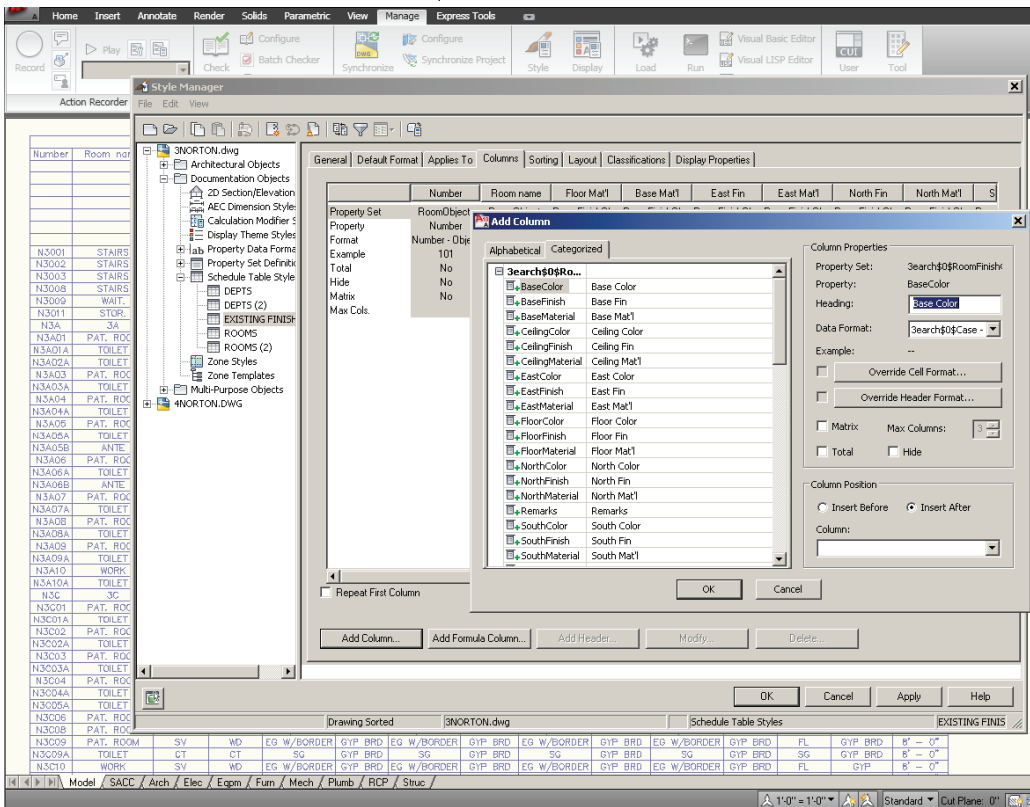
Figure 1: Schedule Table Style – Add Column.

Figure 2: Define a property data format.

pand Documentation Objects, right-click Property Set Definitions, and click new. Enter a name for the new definition and click enter. As with the Schedule Table Style, you will want to check which enti-ties your new Definition Applies To. Now you want to click on the Definition tab and add Property definitions as needed (see Figure 2). Click Apply and OK when you are finished. Property Set Definitions are

added to objects through the properties palette, ex-tended data tab.

A property data format is applied to each defini-tion within a property set definition. Property data formats are created and edited in the Style Man-ager under the Manage tab of the Ribbon. To create a new property data format, expand Documentation Objects, right-click Prop-erty Data Formats, and click new. Enter a name for the new format and click enter.

Now you want to click on the Formatting tab. Here, you will need to specify how you want the formatting to appear. Fill in all information pertinent to the format you are cre-ating. Click Apply and OK when you are finished.

Insert a schedule table

Begin by opening the Annotation tab of the Rib-bon or opening your tool palette (depending on where you placed your new schedule table style) and selecting the Schedule Table you created.

Next, select the objects you wish to include in the schedule table or you can press enter to schedule an external drawing. Objects selected that are not of the type specified for the schedule table will auto-matically be filtered out of the drawing.

Next, you need to specify in the drawing area the in-sertion point for the upper-left corner of the schedule table and then specify the lower-right corner of the table or you can press en-ter to scale the schedule table to the current draw-ing scale (see Figure 3).

If your schedule table contains question marks in any of the cells, the property set definition that contains that property is not attached to an object or object style. If you have empty cells or dashes within cells, this in-
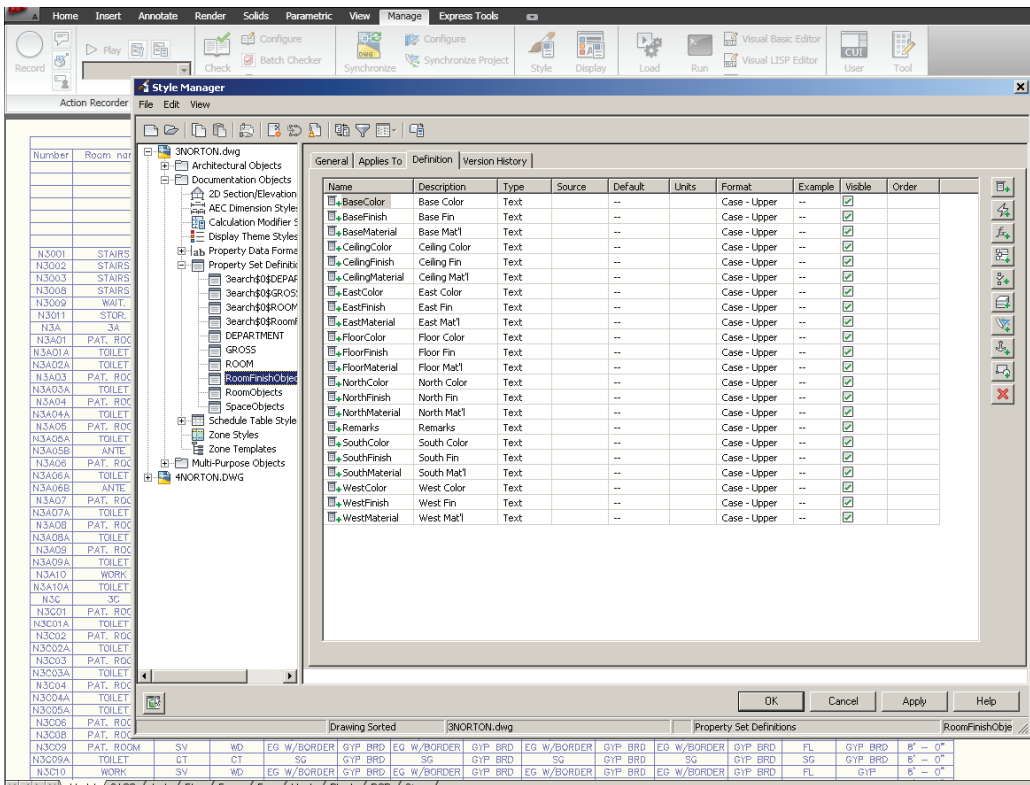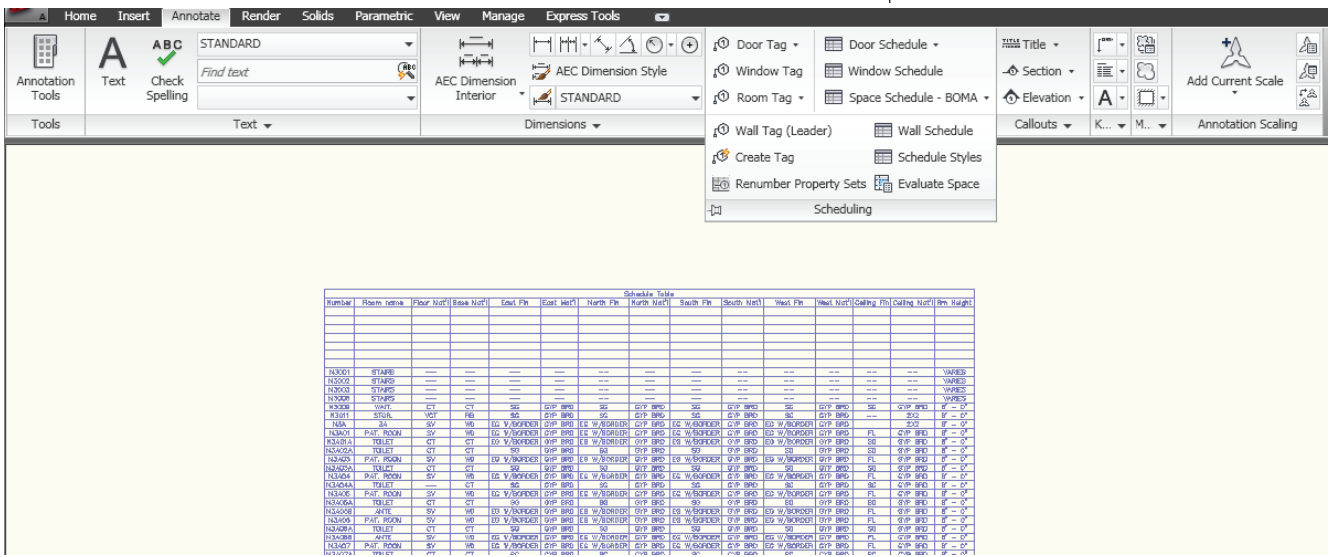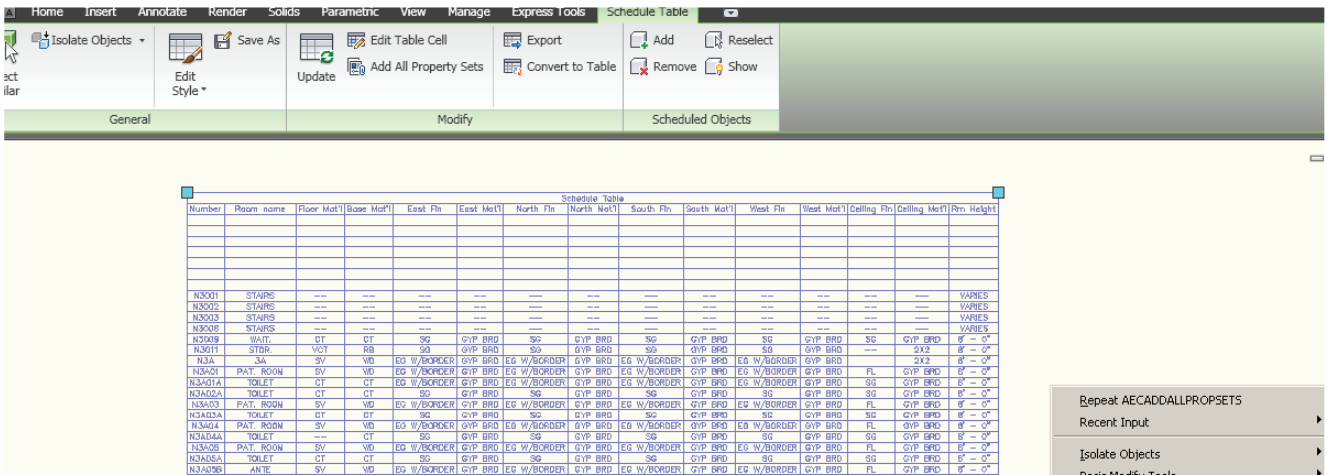
Figure 3: Annotation Ribbon

Figure 4: Update schedule table.

dicates that the property set definition is attached but data is either not available or is not entered for that object or object style.

It is important to note that property data formats, property set definitions, and schedule table styles cannot be changed through RefEdit. Changes made through RefEdit seem to work, but the drawing will revert to the previous settings when saved back to the xref file.

If you are using an xref file and want changes made to the schedule table, you will need to open the xref drawing directly and make your changes there.

Updating a schedule table

A schedule table will update changes automatically when the automatic update option is turned on. This option can be turned on by right clicking on the schedule table style on the tools palette and selecting properties. Under Selection you can choose Add New Objects Automatically.

If this option is turned off, you can manually update a schedule table. To do this, select the schedule table, right-click, and

click Update Schedule Table. Please note that when you select a schedule table in your drawing, the Schedule Table Tab appears in the Ribbon. Updates and edits can be performed straight from the Ribbon. (See Figure 4.)

You can also add objects to or remove objects from a schedule table after it has been inserted in the drawing. All you have to do is select the schedule table, right-click, and click Selection. Next click either Add or Remove, depending on what you want to do. You then select the objects in the drawing that you want to add to or remove from the table and press enter.

Conclusion

Schedule tables are useful and widely used tools in the architecture industry. Creating your own schedule table styles can help increase your productivity. It sure beats manually drawing a table, manually placing text in each cell, then manually updating text changes. I challenge you to go through the steps to create your own
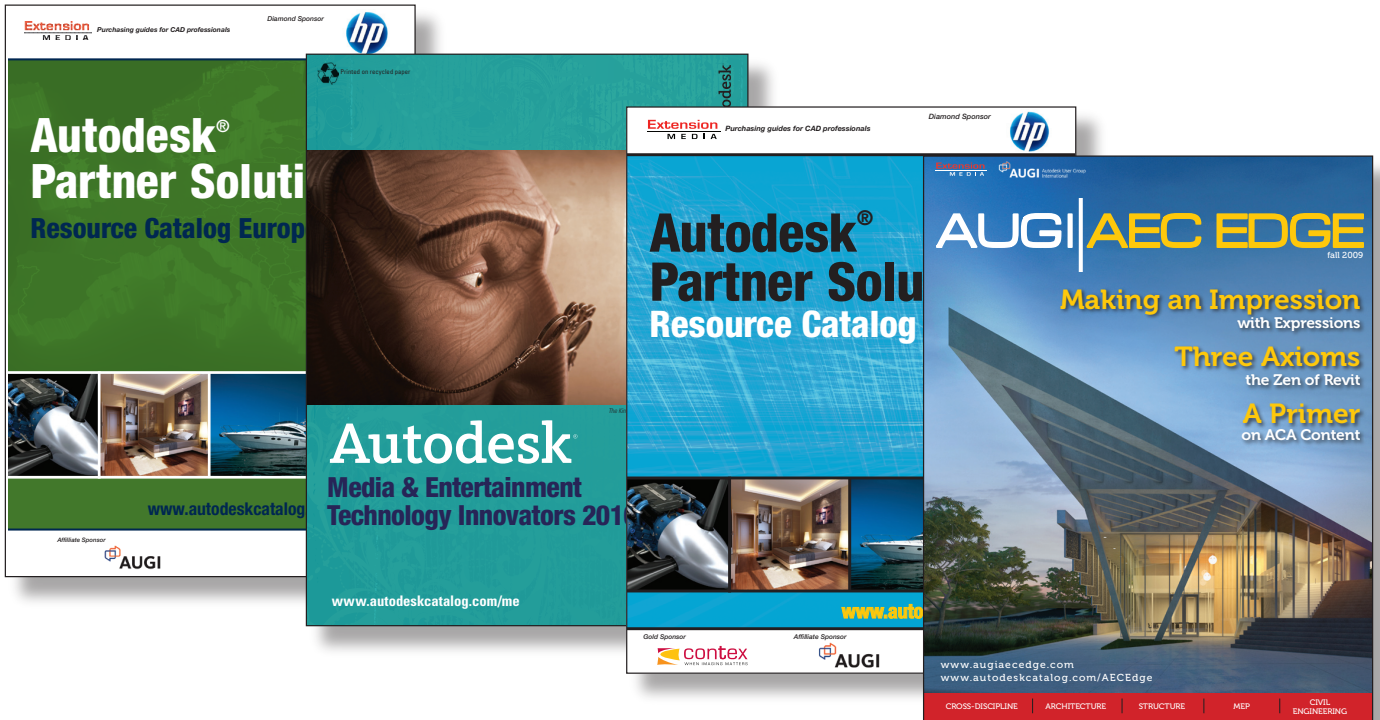
schedule table style and observe the power at your fingertips!
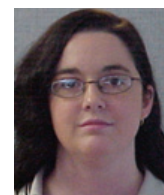
Melinda Heavrin is a CAD Coordinator for Norton Healthcare in Louisville, Kentucky. She can be reached for comments and questions at melindaheavrin@alltel.net.

Put a Shine on Those Floors!
Creating and Finishing Floors in Revit

As a building designer or drafter, you may feel shy about putting energy into modeling floors or slabs. At an extreme, one could probably go for years doing projects in Revit without ever really creating a floor. After all, you can fake them easily enough in plan and elevation views, and who really uses floor schedules anyway?

Readers of my Autodesk® Revit® columns will know by now that I have always advocated making a complete, accurate model as the most effective, efficient, and quickest method of creating your construction documents. Floor objects, properly created and finished, hold and display a wealth of information that is tedious, difficult, or simply not accurate when created by 2D drafting.

In this article I will outline many techniques for creating and managing floors; not all of them will be equally useful to all designers at all times, but knowing how to employ the myriad techniques that Revit holds for working with floors will at some point save you time and grief.

Etch a sketch

The Floor tool on the Home tab in Revit Architecture shows four options: Floor, Structural Floor, Floor by Face, and Floor Slab Edge. (In Autodesk Revit Structure, the Floor tool options are Structural Floor, Architectural Floor, and Slab Edge). In Revit Architecture, you can simply ignore the Structural Floor option. Any floor you create using this has the same instance and type properties as a regular (Architectural) floor, and you cannot tick the Structural box in the instance properties anyway! Structural floors created in Revit Structure will display certain structural properties when viewed in Revit Architecture.
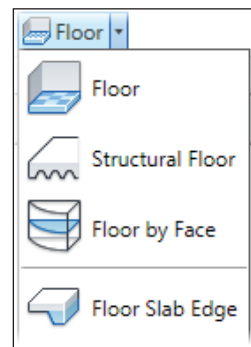
Figure 1: The Floor tool on the Home tab in Revit Architecture.

A word about nomenclature: Revit Architecture makes a distinction between a floor and a slab. Slabs are foundation items, i.e., they support other objects as their primary function. However, the Structural Analysis/Structural Usage field of a floor's instance properties will show Slab, and that same field of a Slab will show Foundation. In Revit Architecture you place a Foundation Slab by using the Foundation tool from the Structural panel on the Home tab.

Floors are sketched items unless you are working with mass objects (Floor by Face). Slab Edges are applied to existing floors.

Both of these techniques will be covered in a later paragraph. You always have to pick Finish Floor when in sketch mode, and sketches have to be complete: no caps, no overlapping lines. You can create and edit floor sketches in plan or 3D views.

Working through a floor sketch is one place to make haste slowly; take the time to create your floor boundary carefully, with appropriate constraints, and it will flex as needed later on. Learn the sketch options (line, rectangle, circle, etc.) so they become second nature; 3D modeling is built on 2D drafting.

Pick 'em

The default floor sketch option is to Pick Walls; Revit assumes that by the time you are creating floors, you have placed at least your external walls. When you pick walls you have a choice to have the floor extend into the wall to a core layer. This will affect how the floor and wall display in section views. You can pick lines as well, such as edges of model objects, lines from a CAD

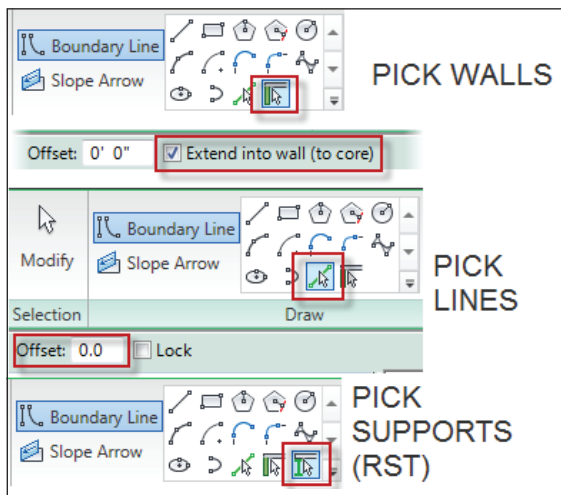Figure 3: Create floors from mass floors.

Figure 2: Pick options for a floor boundary sketch.

file, or grids. When you pick items you can specify an offset. Revit Structure has a Pick Supports option as well.

Pick options, combined with TAB + select, can greatly speed up your sketching and make it more accurate. Whenever possible, do not trace lines endpoint to endpoint. Let the software find the line for you and you can edit your sketch later if the original line is too short or too long. Split, Trim, Extend, Offset, and Align are always available on the Modify tab. Use them constantly to refine floor sketches and your modeling will become precise and confident very quickly.

Mass appeal

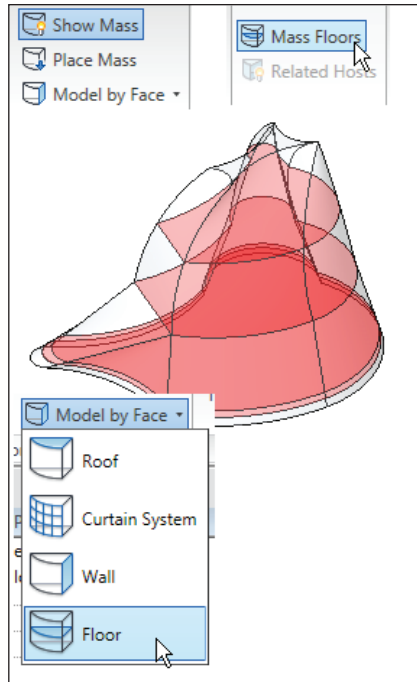When you use Massing as part of Concept Design, you can create floors, walls,

and roofs directly from the mass shape and these can be edited by changing the mass.

Making built floors from masses is a two-step process: create Mass Floors inside the mass, and then use those to create Floor by Face. Select a mass object and click Mass Floors on the context tab that appears. In the dialog, specify the levels for the mass floors. Those remain part of the mass, and toggle on and off along with the host mass by using Show Mass and other visibility controls.

When the mass and its contained floors are visible, it's a quick process to create one or more floors using Floor by Face. This tool is also available on the Massing & Site tab, Conceptual Mass panel, as Model by Face > Floor. You can offset the edge of a floor created this way to allow for the thickness of walls you create by using Wall by Face, and so avoid unwanted intersections. Creating and scheduling floors from mass objects can be a very quick way of deriving area calculations at early stages of a project, while the shape of the building envelope is being developed.

Life on the edge

You can apply Slab Edge objects to floors to represent thickened conditions, as under external walls. These are profile-based hosted sweeps, much like wall

sweeps. Offsetting them produces drop-edge conditions. Walls sitting at slab edges can be modified to have their outside layer (such as brick or block) extend below the nominal base of the wall to meet the edge. This will create correct conditions through any sections cut around the slab edge.
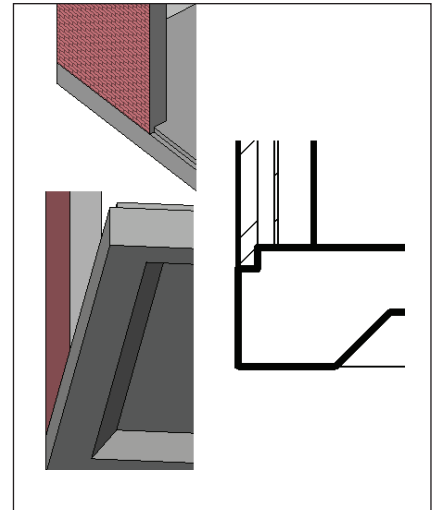

Figure 4: Three views of a floor with offset slab edge under a wall with a base extension. Move the wall and the floor (with edge) will follow.

Views, materials, and paint

Get used to working on floors in 3D views. In fact, create 3D views just for floors! You can hide elements individually or by category to emphasize a floor. You can activate the Section Box of a 3D view to clip the display of walls above and below a floor. You can override the graphics of elements to make them transparent, and you can make materials such as roof and wall coverings partially or totally transparent to enhance visibility of floors. All these settings can be saved in view templates so you can restore a particular view condition quickly.

Use materials with surface patterns when first creating floors, so it will be obvious in plan views when floors are present. It's easy to change the material pattern later if your graphic standards require. When you have many different floor surface materials present, such as tile, carpet, wood, and concrete in close proximity, consider using Split Face and Paint to apply graphic overrides to relevant sections of a single floor's surface to represent the materials, rather than creating separate floors all at exactly the same level. Painted materials will appear in all views that show the surface of the floor.

Floor structure

Floors are made up of parallel layers of material, as are walls, ceilings, and roofs.

Your floors can be as simple or as complex as you desire to represent conditions most effectively. Do you wish to lock ceiling materials to the underside of floor joists so ceilings will move up or down automatically as floor levels adjust during design? It's as simple as creating a layer in the floor structure.
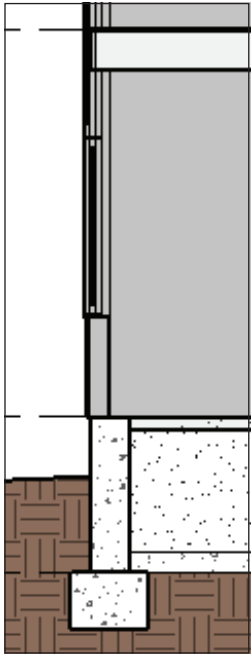
Floors interact with walls based on floor boundary placement, according to wall structure. You can have floor boundaries terminate at wall faces or penetrate the walls by proper use of core layers. This makes sections of wall-floor intersections correct for a variety of conditions with minimal drafting.

Figure 5: Floors and walls meeting.

Framing – on the beam

Floor types that include joists do not create individual joists. These floors, when seen in section, have lines representing the top and bottom edge of a joist. If you create framing plans, consider making your floor type without joists or beams, and use the Beam System tool to place joists in 3D space.

Beam Systems are extremely flexible and very quick. You can use them for beams, joists, rafters, and purlins. Then sections through the floor will be correct for detailing, and framing plans can be exact. If you work in custom residential design, Revit's floor tools can make balconies and mezzanines that will make your clients sigh and the carpenters smile.

Openings

Stairs do not cut holes in floors, so you must make openings for them. This is not a bad thing. You can make openings by editing the floor boundary and adding lines; each loop must be complete and properly drawn. Openings made this way are part of the floor. You can also use the Openings tool on the Home tab. Vertical openings and shafts apply to floors. Hosted openings can be moved and edited separately from
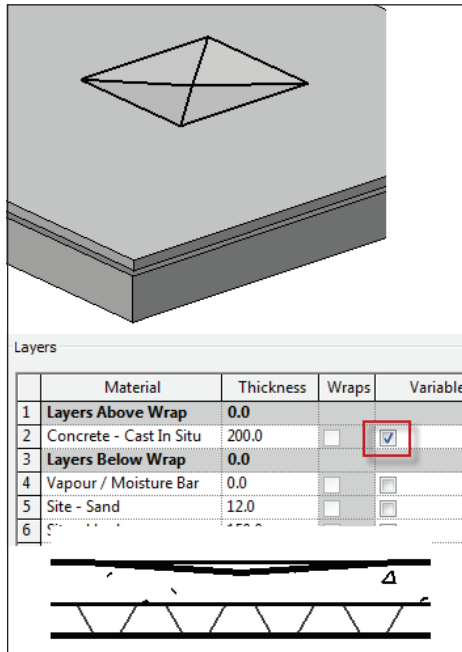
Knowing how to employ the myriad techniques that Revit holds for working with floors will at some point save you time and grief.

Figure 6: Deflections in a floor surface.

the host floor and will join with each other. Shafts are multi-story—very convenient!

Flex for the crowd

You can pitch or warp floors in various ways. Any one line in a floor boundary sketch can define a slope. You can create a Slope Arrow to point in any direction, not only parallel to an edge, but corner to corner, for example. When you select a floor, the Shape Editing panel on the context tab allows you to create splits in the floor by adding deflection points, split lines to provide borders for the splits that the points make, and you can pick supports for the floor, which will move

floor edges to align with the supports. All these changes are 3D and visible in relevant views.

If you wish to represent drainage, for example, by placing set down points in a floor, you need to designate that an appropriate layer of floor material is variable thickness (done in the Type Properties dialog) so the bottom of the floor does not flex with the top, but remains flat.

Floor shape editing tools are not appropriate for creating stepped recesses in floors. For these conditions, bite the bullet and create separate floors of different types according to thickness and align their lower surfaces. If you have practiced any of the floor creation techniques I have gone through in this article, you will have no problem creating complex conditions accurately and quickly!

Chris Fox is the Revit editor for AUGIWorld, and has written numerous articles on Revit Architecture, Revit Structure and Revit MEP. He has written Autodesk Official Training Courseware for Revit Architecture and Revit Structure and Introducing and Implementing Revit Architecture 2010, published by Autodesk Press. Chris recently moved from the US to Australia, and is leading training classes in Revit through corporate, university and technical school contacts there. You can reach him at chris.fox@archimagecad.com.

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Saving Circuits to an Icon Menu

The Save Circuit to Icon Menu tool in AutoCAD® Electrical is used to save the selected portion of a circuit for future use. To save the selected portion of a circuit, choose the Save Circuit to Icon Menu button from the Edit Components panel of the Schematic tab; the Save Circuit to Icon Menu dialog box is displayed, as shown in Figure 1. The options in this dialog box are explained next.

Menu

The Menu toggle button located at the upper right corner in the Save Circuit to Icon Menu dialog box is used to toggle the Menu area. By default, this toggle button is chosen. As a result, the Menu area is displayed on the left in the Save Circuit to Icon Menu dialog box.

Up one level

The Up One Level button is used to display the component symbols that are one level before the current menu in the Menu area.

Views

The Views button is used to change the display of the JIC: Saved User Circuits area. When you choose the Views button, a flyout is displayed. The flyout consists of the Icon with text, Icon only, and List view options. If you choose an
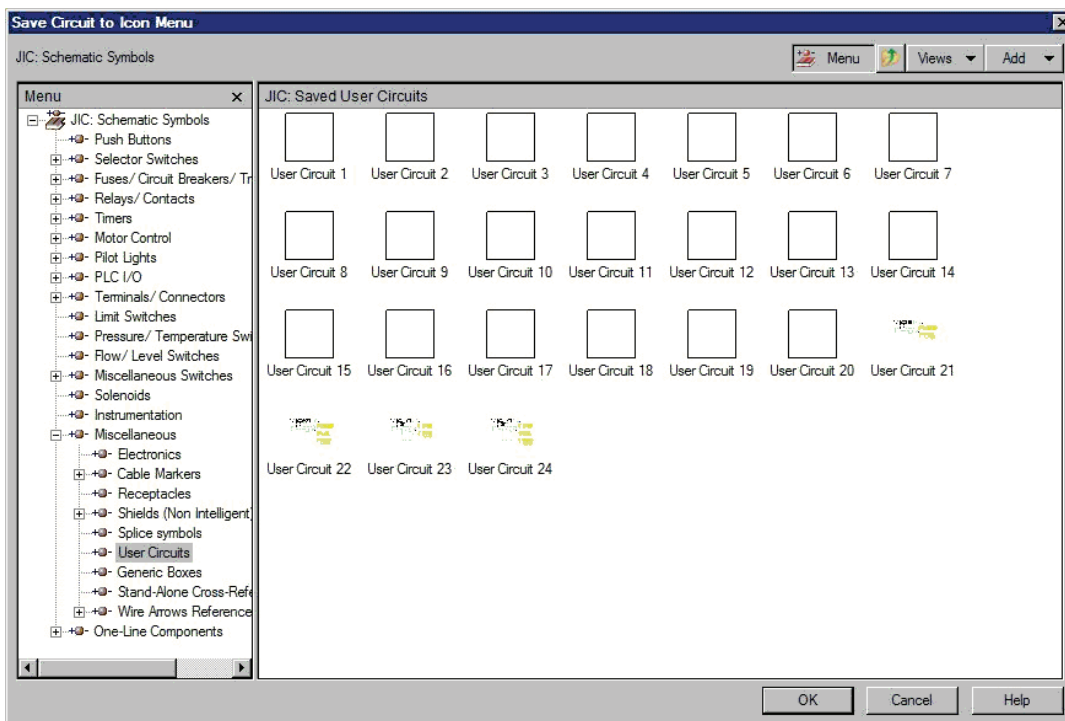

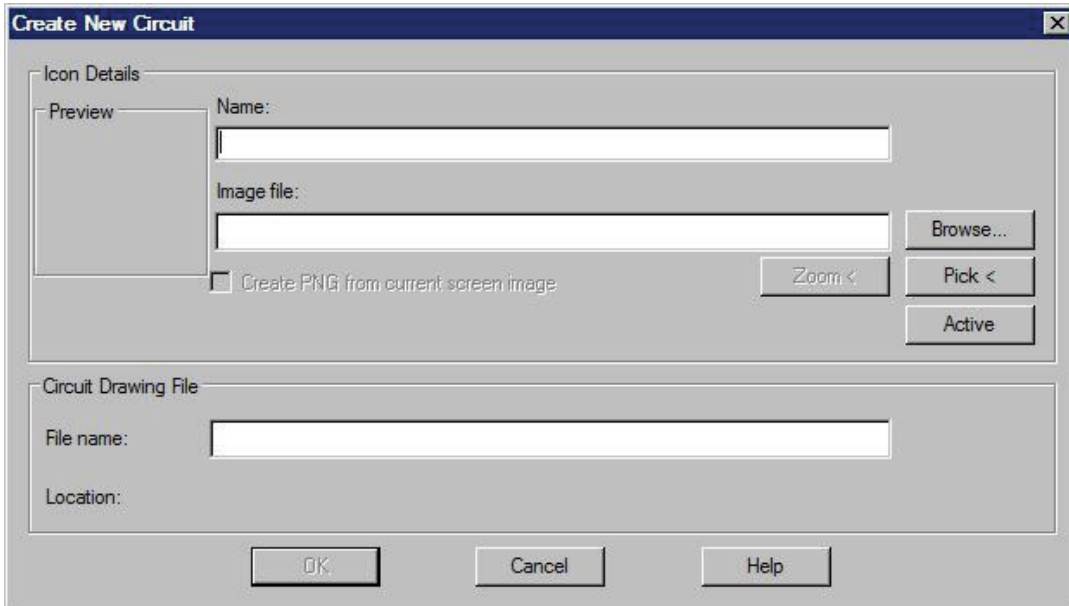*Figure 1: The Save Circuit to Icon Menu dialog box.*

Figure 2: The Create New Circuit dialog box

option from the flyout, a tick mark will be displayed adjacent to that option. By default, the Icon with text option is chosen in the flyout. As a result, icons along with the name of the icon are displayed in the JIC: Saved User Circuits area.

If you choose the Icon only option from the flyout, then the JIC: Saved User Circuits area will display only icons.

If you choose the List view option from the flyout, then the icons along with their names will be displayed in the list form in the JIC: Saved User Circuits area.

The Add button is used to add component, command, new circuit, existing circuit, and submenu icons to the menu. To add a new circuit to the icon menu, choose the Add button displayed at the upper right corner of the Save Circuit to Icon Menu dialog box; a flyout with different options is displayed. Next, choose the New Circuit option from the flyout; the Create New Circuit dialog box will be displayed, as shown in Figure 2.

Now we'll explore the different areas and options in the Create New Circuit dialog box.

Icon Details area

The Icon Details area is used to specify the name of the icon and image for the new icon. This area also displays the preview of an image. Following are the options in the Icon Details area.

Name

Enter a name for the circuit in the Name edit box.

Image file

The Image file edit box is used to specify the image file. To specify the image file,

enter the name of the image file in the Image file edit box manually.

Alternatively, choose the Browse button; the Select image file dialog box will be displayed. In this dialog box, you can browse to the images saved in .sld or .png files format. Select the file from the Select image file dialog box and choose the Open button; the file name will be displayed in the Image file edit box.

You can also choose the Pick < button; the Create New Circuit dialog will temporarily disappear and you are prompted to select the block. After selecting the block, the Create New Circuit dialog box is displayed again and the name of the block will be displayed in the Image file edit box.

In addition, you can specify the active drawing name as an image file in the Image file edit box by choosing the Active button from the Create New Circuit dialog box. On choosing the Active button, the name of the image file will be displayed in the Image file edit box and the location of the image file will be displayed under the Create PNG from current screen image check box.

Create PNG from current screen image

The Create PNG from current screen image check box is used to create the .png file from the current screen image. Once you enter the name of the image file in the Image file edit box, the Create PNG from current screen image check box will be activated and it is selected by default. If you clear the Create PNG from current screen image check box, the Zoom < button as well as the preview of the selected block in the Preview area will not be ac-

tivated. Note that this check box will not be activated if you enter the full path of the image file in the Image file edit box.

Preview Area

The Preview area will be activated only after you enter the name of the image file in the Image file edit box. The preview of the selected drawing or block is displayed in the Preview area.

Circuit Drawing File area

The Circuit Drawing File area is used to define the file name of the new circuit. Also, this area displays the location of the circuit drawing file that is being created.

File name

Specify the file name for the circuit in the File name edit box.

Location

Once you enter file name for circuit in the File name edit box, the path and location of the circuit is displayed on the right of the Location label in the Circuit Drawing File area.

After specifying the parameters in the Icon Details and Circuit Drawing File areas, the OK button becomes available. Choose the OK button; you will be prompted to specify the base point. Specify the base point in the drawing area; you are prompted to select objects.

Select individual objects or all objects at once using the crossing window and then press enter; the Save Circuit to Icon Menu dialog box will be displayed again. You will notice that the circuit is saved as an icon in the JIC: Saved User Circuits area and the preview of the circuit in the form of icon is also displayed in the Save Circuit to Icon Menu dialog box.

Next, choose the OK button to save the changes made in the Save Circuit to Icon Menu dialog box and exit from this dialog box.

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Using Groups Inside Revit Structure 2010

At one point or another if you are working inside Autodesk® Revit® Structure, you will be looking for ways to increase productivity. Like Blocks in AutoCAD®, Revit Families allow you to make global changes to that item in your drawing and/or BIM model. Groups take this concept one step further by allowing you to create a collection of items. These items can contain families, text, or any other item in your Revit Structure Model. Whenever you have more than one item selected, a Multi-Select Ribbon tab will become available. The Create panel in the Ribbon will feature the Create Group tool as shown in Figure 1.

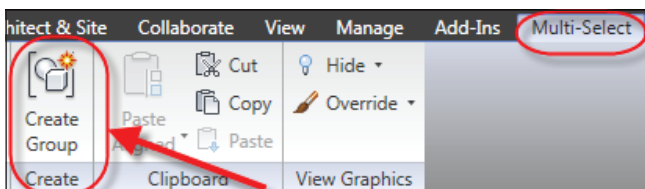Figure 2: Typical beam to column connection.

Figure 1: Create Group tool

Why use groups?

The main reason to use groups is to better manage change. No matter how early or late you are in design development or the construction documentation process, change is inevitable. Groups are a way to help streamline those changes.

Group creation and placement takes thought to ensure that the group will be effective. Groups are most effectively used if there is a repetitive condition in your design. One of these conditions could be something as basic as the way your standard column to beam connections are detailed. Groups are a way to manage these connections. When a group is changed, it will update across all conditions where it was used, thus eliminating the need to manually update each connection.

If groups are used in places that are not repeated throughout your model, they will be ineffective.
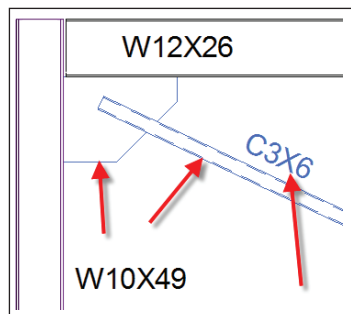
Creating a group

Figure 3: Revit Selection set

Figure 3 shows a typical column to beam connection where the cross bracing and plate have been selected.

Once these items have been selected, the Multi-Select Ribbon tab becomes available. From the Create panel, select Create Group as shown in Figure 1. Once you have selected the Create Group tool, a dialog box will appear as shown in Figure 4. This will allow you to name your Model Group. If there were annotation items selected as well, you will also be prompted in this dialog box to name your Attached Detail Group.
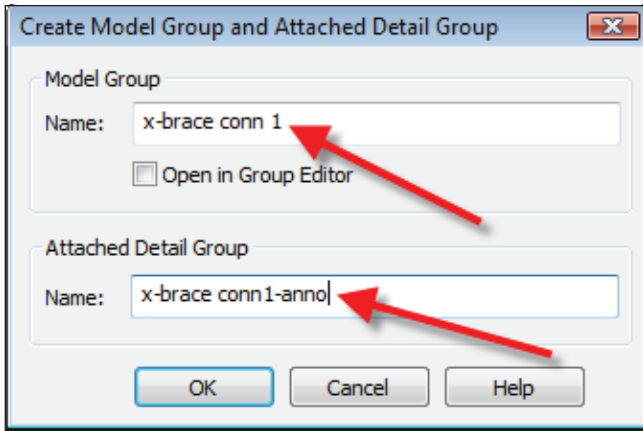
Figure 4: Create Model Group and Attached Detail Group dialog box.

Once you select OK from the Create Model Group and Attached Detail Group Dialog box, your Group will be available in the project browser to drag into other locations in your model.
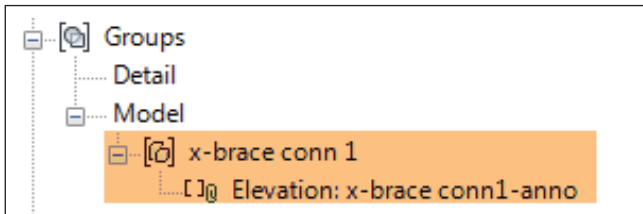

Figure 5: Group in project browser

This typical connection may be used several times in your Revit Structure model. However, there may be instances where the C3x6 X-Brace and the connector plate need to be sized differently. Figure 6 shows another connection where the "C" channel and connector plate have been sized up to handle a different condition.
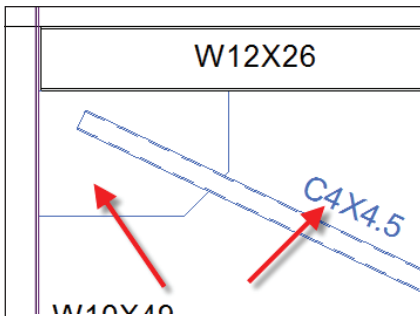

Figure 6: Optional connection

Figure 7 shows two different groups in the project browser. The second group was created by repeating the steps on creating a group previously discussed.
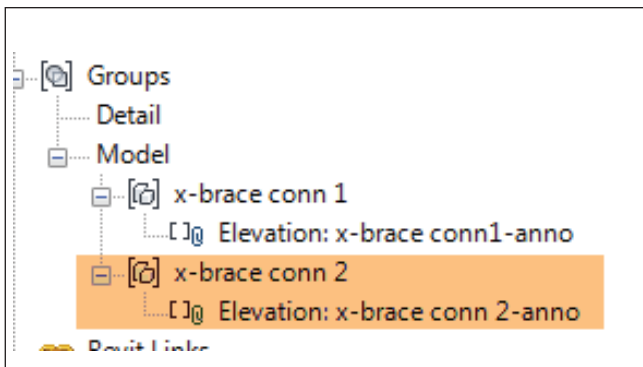

Figure 7: Project browser

Editing a group

When groups are established in your Revit project you can exchange them from the type selector the same way you would exchange a structural column for a different size. Figure 8 shows the type selector after one of the connection groups have been selected.
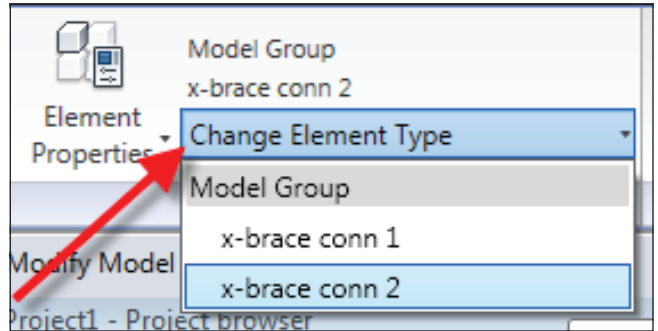

Figure 8: Type selector

To edit your group, simply select your Group and then select the Edit Group tool from the Ribbon panel as shown in Figure 9.
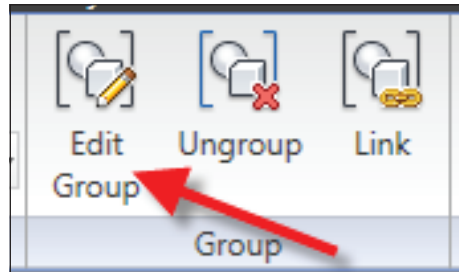

Figure 9: Edit Group tool

Once you select the Edit Group tool you will be in an edit mode and there will be a new Edit Group panel available.
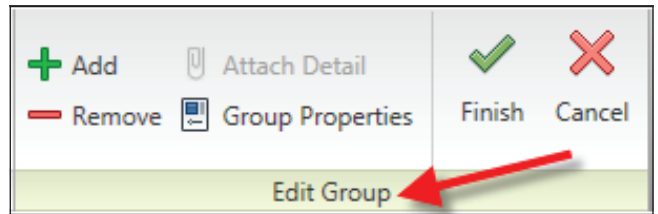

Figure 10: Edit Group panel

The Edit Group panel has tools available to do the following:

Add: The Add tool allows you to add additional components to the group.

Remove: The Remove tool allows you to remove an item from the group.

No matter how early or late you are in design development or the construction documentation process, change is inevitable. Groups are a way to help streamline those changes.
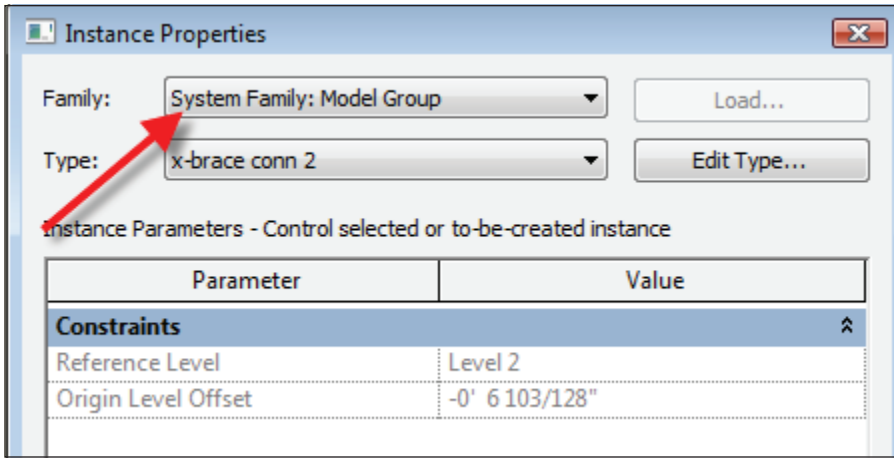
Figure 11: Group properties

Group Properties: Figure 11 shows the group properties dialog box. As you can see, groups are a system family. The only change allowed in the properties dialog box is to select a different group.
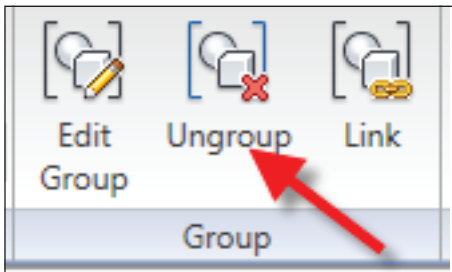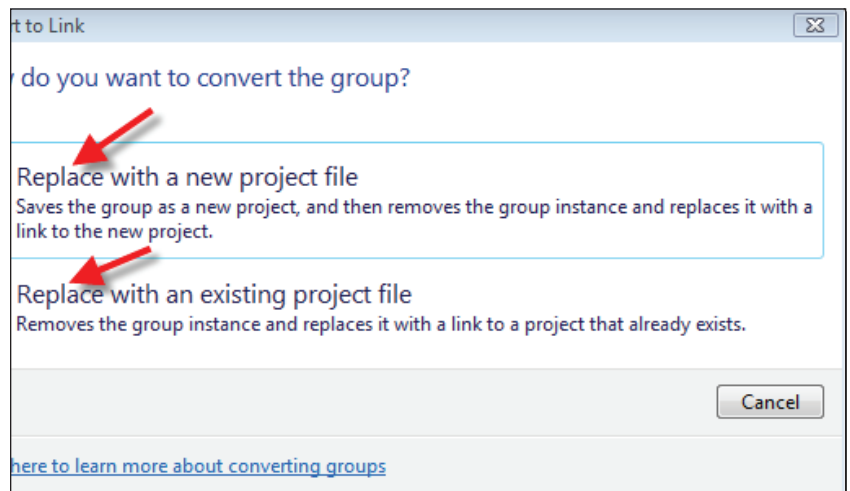

Figure 12: Ungroup tool

Figure 13: Convert to Link

Finish: Once you select Finish, all your group instances in the model are updated to reflect that change.

Cancel: Selecting cancel will discard any changes you made to the group.

If a group is no longer required where one was placed, you can use the ungroup tool, shown in Figure 12. This tool, on the Group panel, is similar to exploding a block in AutoCAD. The elements that belong to the group will return to individual elements like they were before they were grouped.

Sharing your group

The Link tool will turn your group into a linked file that will be stored externally from your model. When you select the Link tool, you will have two options to choose from, as shown in Figure 13.

The First Option, "Replace with a new project file," will create a new Revit Project file and link it back into your model. This option is useful if other projects will need to use this same group. This allows one file that can be maintained and utilized with multiple projects.

The second option, "Replace with an existing project file," will remove your group from the project and replace it with an existing Revit project that you specify.

Conclusion

Using groups in a Revit project will give you better management over typical element configurations in your model. Converting Revit groups into external linked files allows them to be used across the company and is a good way to standardize specific assemblies of elements.

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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Schedules For Life

Schedules are one of the stronger and most versatile features in Autodesk® Revit®. Schedules provide tabular views of element properties that can be grouped and organizeed as needed. Schedules can also provide the means of using project data for performing calculations.

As we will see in this article, Revit schedules can significantly reduce time and effort when entering values to elements with similar properties. They allow you to generate analytical information that goes beyond simple element lists. For example, from an area plan, you can create a schedule to not only list the properties of the area objects such as square footage, but also to use that information to perform occupancy and egress calculations for life safety.

Let's use a simple example of a door schedule. From the door elements you would extract properties such as width, height, mark number, fire rating, location, and so on. You could spend the time to enter the door material and finish information for each door when inserted.

Alternatively, you could create door families with all the finish and material information already in them. But let's face it, more often than not you just want to simply insert a door based on its size and/or

type, and worry about finishes and materials later. Moreover, you may not have all the parameters created in each door family that you actually want to show in the door schedule. This is where the schedule comes to the rescue. You can add fields to a door schedule that will show as door prop-

erties. Then using key schedules, you can enter predefine information for the properties values.

Key schedules

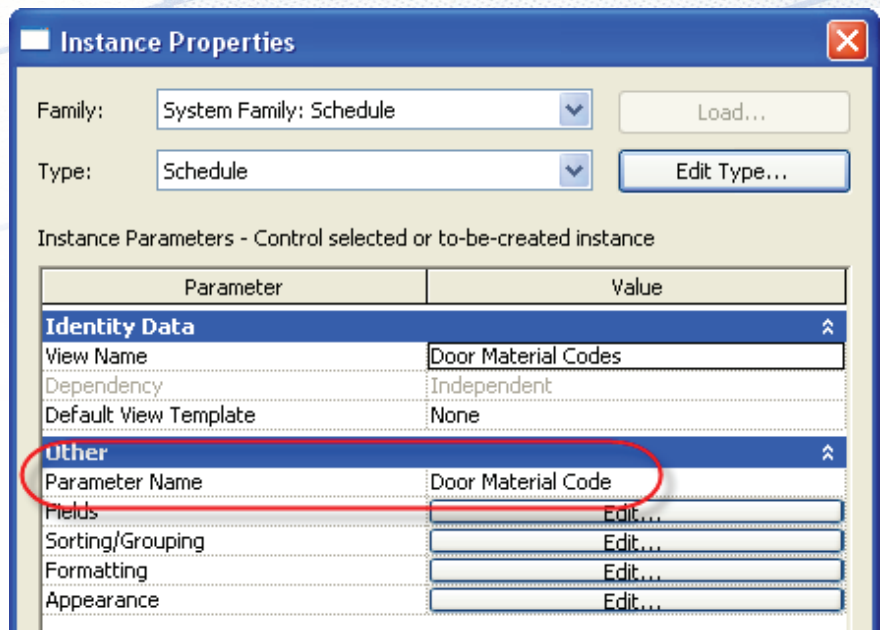A key schedule is nothing more than a schedule that you define. This schedule

Figure 1: Schedule key

has a property called "Parameter name," which becomes a key that will link the information in it to a component schedule (see Figure 1).

You can create these key schedules to predefine information you would like to use in another schedule to fill in field values automatically. A key schedule is created like a regular component schedule. Once a category is selected, the option to make the schedule a key schedule becomes active. Revit automatically generates the name for the schedule key or parameter name (Figure 2), which can be changed later.

After you click OK, the Schedule Properties window will open with one parameter created called Key Name. You can create additional parameters as needed

field values will be entered based on the selected key value.

Schedules for life safety

So far we have touched on how schedules and key schedules work together, but let's look at a real example. The following example is a schedule for calculating occupancy and egress in a hospital building. The building code information for this example is based on the Florida Building Code 2007 (FBC2007).

This schedule uses area objects to create fire compartments for which we want to calculate occupancy loads and egress capacity. First, a gross building area plan was created from a plan view. When creating an area plan using the gross building option, allow Revit to automatically generate

<div style="color:white; background:green;">

Revit schedules can significantly reduce time and effort when entering values to elements with similar properties.

</div>

area fields from the Available Fields list into the Schedule fields list. Click OK to exit the window and you will see a simple table listing the defined areas and their square footages.

To calculate the occupancy load, we need to refer to the building code because occupancy loads are based on the area usage. This is where a key schedule comes in handy. The occupancy load factors for each area type can be predefined in a key schedule so that a type can be assigned to each of the created areas. In this case, I basically copied the information on Table 1004.1.1 from FBC2007 into a key schedule. I called the key "Space Function" and created two additional fields called "Area per occupant", to enter the square footage per occupant, and "Area Unit" to classify the square footage gross or net.

Once I created the key schedule, I added its fields to the area schedule (Figure 3). With all this information we can now create a calculated parameter to determine the occupancy load.
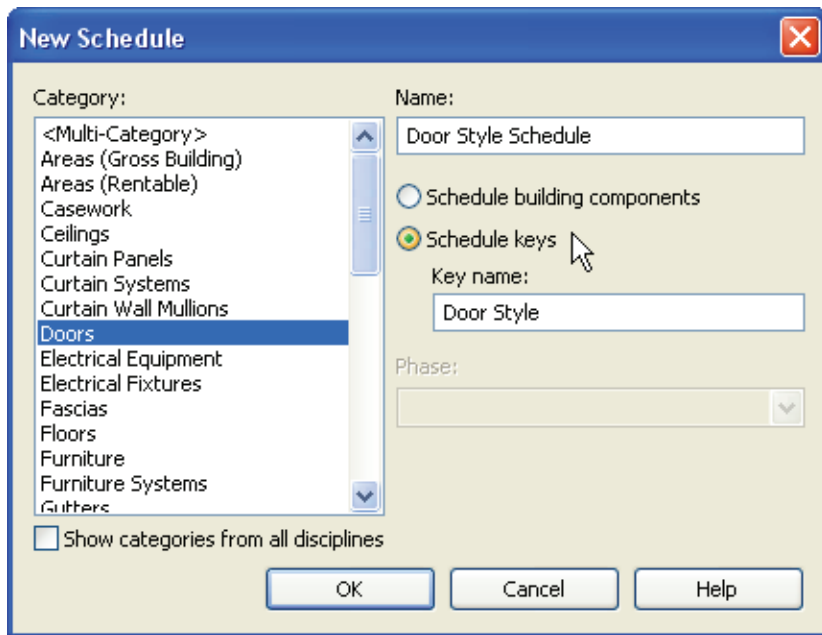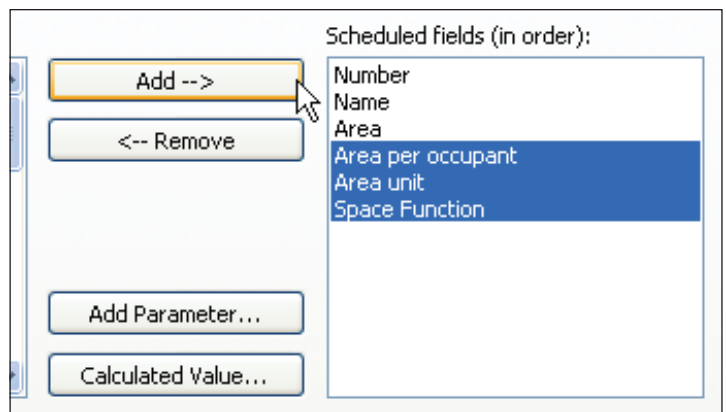
Figure 2: Select option to create a schedule key

to predefine any information you want to have entered automatically in your component schedule.

Continuing with the door key schedule example, we can create fields for door material and finish, frame material and finish, glazing material, hardware set, and so on. The key could indicate the door style number or letter generating a schedule of door styles. Rows in the schedule are created by clicking the New Row button in the context Ribbon bar or the right-click context menu.

To link the key to a component schedule, you add the key and the other fields from the key schedule as fields in the schedule properties window. Select a cell in the schedule key column to display a list of values from the schedule key, allowing you to make a selection. Then all the other

the boundary lines around the perimeter of the building—it makes this task easier. Then create boundary lines to define the separation between compartments.

From the View menu we can create a schedule for area components. Select "Areas (Gross Building)" from the category list. In the Schedule Properties window, move the number, name, and

Figure 3: Add fields from key schedule.

In the Calculated Value window, a simple formula can be used to divide the component's Area parameter value by the Area per Occupant value from the key sched-
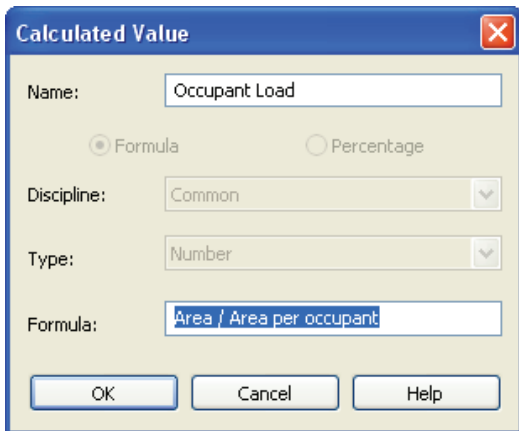
Figure 4: Formula using parameters.

ule (Figure 4). The names of parameters in a formula are case sensitive; therefore, they must be exactly the same as the field names.

Now the area schedule includes a key to select the area function and determine the occupant load factor. That value is then used to calculate the occupant load as shown in Figure 5.

putation. For this example the value "Institutional: 1-2" was assigned to each of the areas to get the correct multipliers.

At this point we need to create calculated parameters that will multiply the occupant load value by the key generated multiplier values in order to compute the required stair and horizontal exit widths. The value from the Occupant Load field is multiplied by the key generated multiplier for horizontal exits, resulting in the required horizontal width for that area or compartment. The formula reads: Occupant Load * Multp HzExit wSprinker where Multp HzExit wSprinker is the parameter name for the horizontal exit multiplier for a structure with sprinklers. The formula needed to calculate the required stair width needs a little more thought.

According to the Code, there is a minimum stair width required for I-2 class structures. Therefore, a decision state-

need to add a shared parameter to each door family to hold the clear width for that door type. The formulas for some door families are somewhat different depending on whether the door is single or double, double egress, sliding, and so on. For example, for a single flush door the clear width calculation is: ((Width - (Thickness + Stop Width)) / 1' * 12) - 0.49. In the formula the result from the parameter arithmetic is divided by 1' to convert from units of length to numbers and multiplied by 12 to get the value in inches. Then 0.49 was subtracted to round off to the lower inch.

Next, two additional parameters are needed in the door schedule (which can be hidden later)—a text field to associate each door with the corresponding building compartment (by typing the compartment name or number as the field value), and a yes/no field to classify whether the door is an egress. That way you can isolate the egress doors in a separate door schedule that totals all the door widths for each of the compartments.

Once you have those totals, you can enter them in the area schedule to compute the provided stair and horizontal exit capacity. The provided stair capacity, the horizontal exit capacity, and the total exit capacity fields are all calculated values that will be added to the area schedule:

- Stair Capacity: Stair Width Provided * Multp Stair wSprinker
- Horizontal Exit Capacity: HzExit Provided / Multp HzExit wSprinker
- Total Exit Capacity: HzCapacity Provided + VrCapacity Provided

where HzCapacity Provided is the total horizontal exit capacity and VrCapacity Provided is the total stair width capacity.

The solution shown in this article for calculating loads and egress may not solve every building scenario—particularly on very complex buildings—but it will give you a rough idea of what the life safety requirements are at a very early stage in your design process.

Figure 5: Schedule with key.

The "Area per occupant" and "Area unit" fields are shown in this example for clarification, but these fields can be hidden if desired. Notice the list that the key generated. The values in the "next to" fields were entered automatically from the key schedule based on the selected value in the key field. The format of the number in the Occupant Load field can be modified in the Formatting tab of the Schedule Properties window.

The rest of the schedule uses the same basic principle. Use a key schedule to enter information that needs to be used in a selection to populate field values.

To calculate the horizontal egress capacity another key schedule was necessary. Table 1005.1 from FBC2007 contains the egress multipliers required for calculating the egress width required according to the occupant load of the area. As shown before, the fields of the Multipliers key schedule are added to the area schedule in order to use the selected values for com-

ment had to be added to the formula to determine if the resulting value of the calculation was less than the width required by code. The formula reads:

if((Occupant Load * Multp Stair wSprinker) < 44, 44, (Occupant Load * Multp Stair wSprinker) where Multp Stair wSprinker is the parameter name for the stair width multiplier for a structure with sprinklers. This means that if the result of the calculation of the two parameters is less than 44 inches, then the value for the cell will be 44; otherwise use the resulting value from the calculation of the two parameters. A similar formula would be needed to compute the required stair door width.

To calculate the provided horizontal exit width, there are a few things that need to be done if we want to extract that information from the model. You may elect to just add up the clear widths of all egress doors and enter them in a schedule field.

On the other hand, if you want the model to provide this information, you would

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Civil 3D – How Do *You* Use It?

At the onset of my training and consulting career, a good friend once said, "People use the application in ways you never envisioned." Since then, I have always been aware of the fact that people across the globe approach things differently due to culture and environmental limitations. So I find it important to ask people about the arena in which they work, and how they use their design application.

No matter where users are from, they will usually find that AutoCAD Civil 3D:

- makes design data easier to establish
- enables faster changes and revisions
- produces more accurate results in a flexible manner
- interacts with other platforms that are of a focused interest

Oh, and there's this item, inspired by the Civil Diva: "I use Civil 3D because it's sexy!" This hasn't come up in any conversations yet, but I'm still hoping it will.

I started asking "How do you use Civil 3D" at Autodesk University (AU) and have posted requests for insight from around the world. This led to some interesting conversations and a few new friendships. Here's a sample of what I found.

The big picture – who is using Civil 3D?

It should be no surprise that it's 80-20 (and, yes, we have an 80-20 ratio for everything). It seems that 80 percent of the people use the application for residential, commercial, and industrial site design.

The remaining 20 percent include those performing geotechnical, geological, infrastructure, mining, research, general-purpose, and others tasks that don't make a lot of noise. Energy, geospatial, and green development arenas are starting to make a greater impact, and we get to hear more and more from those companies involved. Take, for example, Chris Thorn of Scott Wilson Group, who uses Civil 3D to prepare sites for wind farming in Wales. The scope of wind engineering moves beyond the site development into research and analysis. Mark Peterson works for CPP Wind where employees use the application for creating physical models of terrain for analysis in wind tunnels. (That one took me by surprise.)

While at AU, I got some detailed information on 3D modeling in the mining industry. David Sledd of SleddCad Services in Colorado, explained how Civil 3D was currently used to coordinate min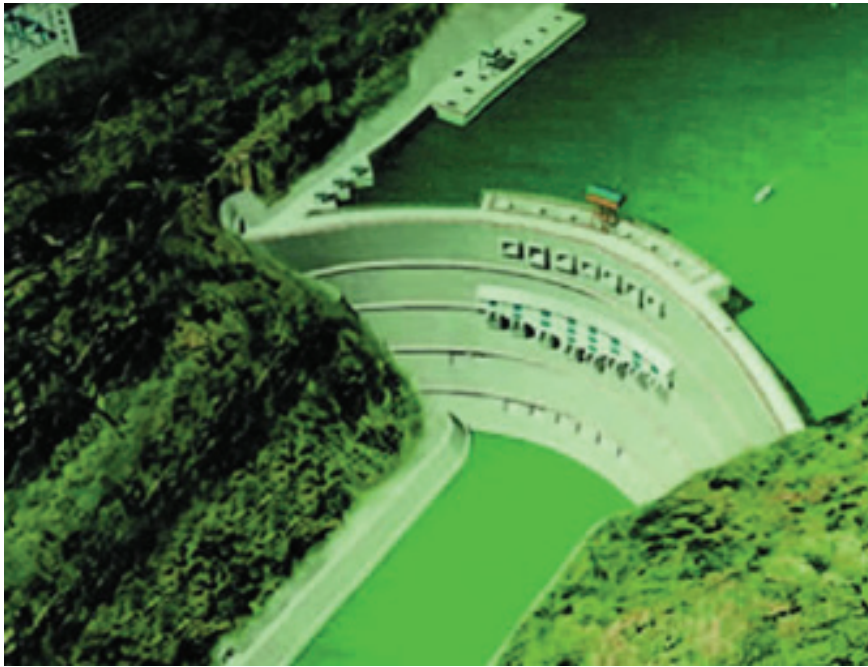ing. He was at AU trying to get some perspective on new ways to make better use of the application's power in that industry.

A look inside

What may not be obvious is that 20 percent are consistently more productive with the application. Those are the users that see the tools inside as just that: tools. They are always pushing forward with new ideas and trying techniques that might seem odd to most. "This program can do almost anything you can imagine," says Andy Whaley of Frederick Ward Associates in Maryland. "I try to tell the users in our company that the imagination is the only limitation of this software."

The majority of the industry centers its application on Corridors. The robust nature and capability of the Corridor cre-

ates a springboard from which numerous things such as FG surfaces drive or guide the remainder of the design.

The defined intent for the use of the corridor tool has blurred tremendously. Leveraging its power and flexibility has become quite popular. I don't remember who decided to use corridors to replace unstable gradings initially, but that guy (or gal) deserves a raise.

Here at GCT, we have used them extensively to model the edge of bermed up parking areas and non-linear cut and fill regions that feature lines and gradings just can't handle. They perform flawlessly in this capacity. The same alignments are being used to design geo-grid walls. That is a slick idea. I love this job.

Material calculations are a big concern everywhere. Chris Thorn develops borrow pits and Crane hardstands for windmill installation using Corridors. Using elevated feature lines to create alignment and profiles, the corridor is created, and the resulting FG surface is netted against the EG surface. The material quantities there are then referenced to the quarry for excavation, using yet another corridor.

Matt Anderson of JAS Engineering in Illinois is a veteran Civil 3D user working in the site preparation arena like most of us. Using Cross Sections to develop material calculations is at the top of his tool list. "Cross-sections are an easily overlooked, but extremely powerful tool to document you earthwork, material, or floodplain quantities.   What I love about cross-section is being able to model a complex floodplain, analyze it, and present cross-sections with material tabulations with Civil 3D very early on in the design process.
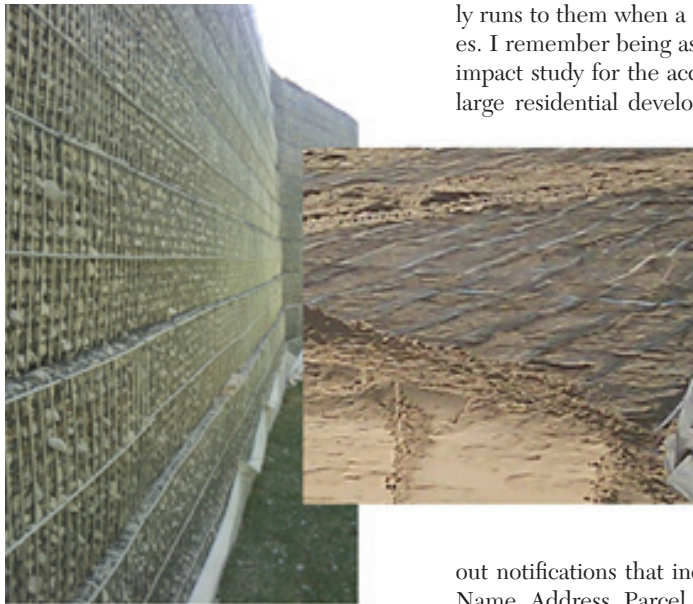
This provides me as engineer, near instant feedback on the impact to the floodplain during design," he says.

Tunnels are not something that comes up often, but I perk up when I hear about them. Let's face it, it's a cool topic. Sean Twomey of New Zealand has provided some good reads on Corridors used for tunnels. Speaking of New Zealand, there was a rumor that 30 percent of the people at AU were from the Australia/New Zealand region. I believe it because 30 percent of the people I spoke with had really cool accents!

Long-time Civil3DReminders blogger and Californian Christopher Fugitt is a programmer with a focus on surfaces. "While corridors are one of the leading factors shaping a design, we use surfaces

leading into and exiting the corridors. While we don't all see them as a driving force, they are the most common object interaction in Civil 3D."

Surfaces are used not only for leveraging other tools and displaying contours, but for watershed delineation as well. Sending the watershed analysis over to Parcels is something I picked up at Autodesk University a few years ago. Combine this with map functionality and you have a powerful platform from which to design. Map overlays with watersheds and Parcels allow for rapidly performed drainage studies. "Not only did I analyze the drainage area, all the area calculations left me with a drafted DA map," comments Andy Whaley about a 250-acre drainage study. "I did it so quick, I took the afternoon off."

Map functionality is popular worldwide and bridges the gap between the geospatial and civil crowds. GIS object interaction is quite powerful and anyone who has taken the time to use the tools undoubtedly runs to them when a suitable need arises. I remember being asked to develop an impact study for the access road of a very large residential development. Map queries overlaying the GIS parcels onto the Corridor daylighting. Custom tools embedded the map data to the impact regions, and collected the data to a spreadsheet that the permit department used to perform its mail out notifications that included the Owner Name, Address, Parcel identification, and how much area was proposed to be impacted.

Since writing the BIM article recently, I have had a few discussions with various people that were quite interested in Civil 3D and its Revit object interaction. I for one am looking forward to how this may affect workflow throughout the world.

We could use some improvement

Globally, our separate cultures create boundaries and make for completely different ways of life. While these differences often divide us, there are some common issues that bind us together. For example, men's and women's struggle to communicate and those particular Civil 3D tools that we really wish would be cleaned up.
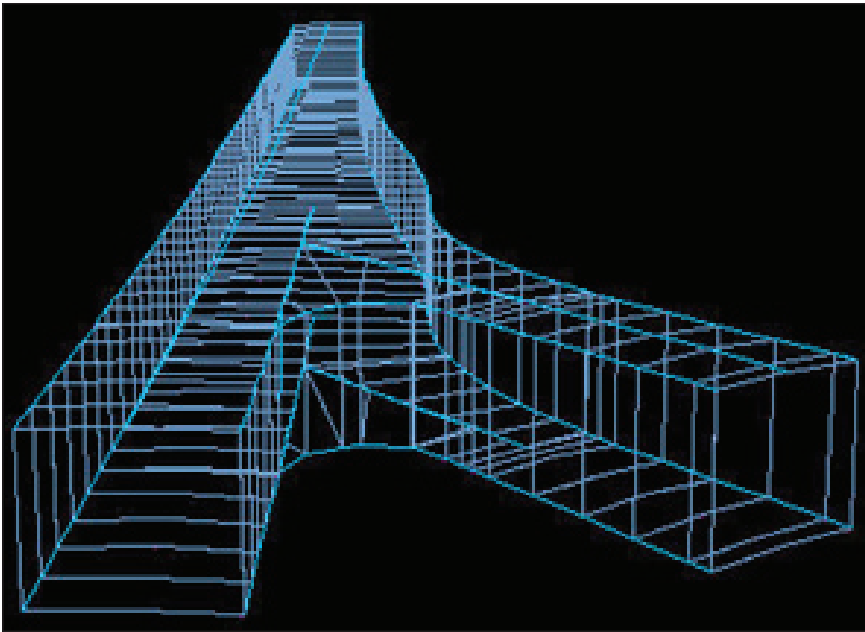
While Parcels are being used in different ways, there are some reservations to their employment. "…Parcels don't lend themselves to a good work flow," comments Mark Spatz, civil engineer at HRG. "You tend to have a layering issue/nightmare since all the parcels are one object type and are placed on the same object layer by default." I agree in some cases. The parcel labeling is wonderful, but you have to really be on task to effectively deal with parcel layers. You have to own them, or they will own you. It's a bittersweet issue. But their organizational capability keeps me coming back for more.

Gradings are on the list. No shocked faces in this crowd. These are really awesome tools, but they are designed to be dynamic and autonomous. Once in place, you are supposed to be able to forget them. Unfortunately, if something gives out during a design change, the gradings are suspect first. They just can't handle any complex configurations.

Ron Couillard at CadSoft talked about some methodology to manage the complexity issues and get better control and stability with these, but they are still somewhat fragile. Most users will either use the resulting daylight and discard the grading object, or avoid them all together.

Some other areas cited for improvement were pipe networks, in which several users noted the need for more development, and the hydrology tools' interface. The lack of visualization tools was mentioned, but recent tools acquired by Autodesk might help fix that.

How far off the beaten path do you go?

I asked everyone to post some out-of-the-ordinary uses and ways to apply AutoCAD Civil 3D. While I'd like to say I appreciate one over another, I decided to let you all do that for yourselves.

When I say off the beaten path, one cat really took it seriously. Steve Boon wrote about 40km of ice road across the tundra with some unusual design requirements.

"This road would have to be built and then used over a single winter, and no construction equipment or vehicle using the road could ever disturb the surface of the ground. All of the road would have to be built from compacted snow and ice "mined" from the surface of frozen lakes. No excavation meant that there would be no gravel or sand available for traction so the client required a maximum profile grade of 2 percent. The whole region is a maze of lakes and creeks which could not be crossed due to the weight of the loads being moved so we had to chase the existing ground contours all over the region searching for a route that could be constructed using fill only."

Any time you can mix Civil 3D and CNC, you have my attention. Mark Peterson piques my interest with his offering: "Creating a TIN surface for an entire Hawaiian island, then exporting it to a CNC Router to manufacture a physical model."

Matt Anderson wrote about a quantity dispute between owner and excavator:

"… They wanted the cut and fills volumes gridded into a small grid. In a short amount of time, I took Civil 3D, did the comparison surfaces, parceled out the few hundred little parcels, and created a multiple parcel output volume report to Excel. I added some color and dazzled both owner

and contractor."

HRG's Mark Spatz utilizes corridor modeling, pipe networks, and grading functionality for site construction of new buildings, roads, and utilities.

"Corridor Modeling is my favorite," he says. "Modeling forcemain, waterline, stream restoration, and pond berms with the Corridor tools. Changing sewer line sizes for an entire system in 10 minutes and having it update all the plan view, profile linework, labels, notes, and tables automatically—all in separate drawings." Mark adds, "I think I initially learned of the concept at AU. We have used this technique for about six months now."

While many would argue that pipe networks are designed for this purpose, pipes won't model a Forcemain through a vertical curve.

Final comments

AutoCAD Civil 3D is one fine lady. A super-powerful, "sexy" platform that takes patience, understanding, and a plan that works well within certain boundaries. Some of the limitations we all just have to figure out the hard way.

As we search for ways to use energy more efficiently and to pursue the next challenge, I look forward to more interaction among people from around the world. It's not that I feel we should all be "globally minded." Rather, it's that being introduced to diverse ways of thinking provides insights into solutions that were not apparent before.

I look forward to receiving more of your uses of AutoCAD Civil 3D and its tools. Feel free to email me with yours. Who knows? It may end up as the topic of my next article.

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Creating a Revit MEP Fire Alarm Family

Truly reaping the benefits of creating Autodesk® Revit® families takes a complete understanding of the family's uses, modeling, parameters, tagging, and scheduling. This tutorial will step through standard practices for creating a Revit MEP fire alarm family and hopefully enlighten you on the major parts of family creation. This example can be used to build other types of families for power, data, security, and hospital, to name a few.

Before starting a new family, carefully consider the best way to group similar devices. In this example, a fire alarm device family is created. Contained in this family are three types of wall-mounted fire alarm devices, as shown in Figure 1 below.
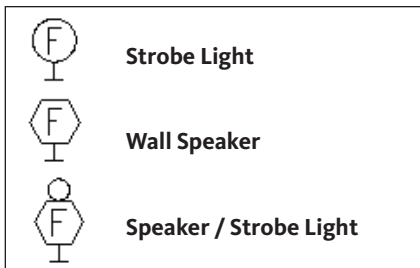

(F)	**Strobe Light**
(F)	**Wall Speaker**
(F)	**Speaker / Strobe Light**

Figure 1

There can be a temptation to include ceiling-mounted versions of these devices in this family, but ceiling- and wall-mounted devices must be created in separate families because they have different orientations to the hosting face.

Before creating a family with multiple types, it pays to think about which devices to group in a family. This will likely be different than the way they were grouped in AutoCAD®.

This family comprises two main parts: annotation line work and modeled solids. The model view or 3D components are created directly in the RFA file containing the family. The symbology for the three types of devices (2D components) will be created as an annotation symbols and linked into the main RFA file. This allows the symbol on plans to grow and shrink based on the scale of the view, while the model portion of the family will not.

Family maintenance and naming conventions

Having a plan on how to store families on a network drive is important. Consider that most MEP consultants will work for multiple architectural clients. This means that multiple versions of Revit products may be required for different projects with different clients. Because Revit is not backwards-compatible, these files will need to be kept separate and modular for ease of upgrading. Figure 2 shows how Acme Engineers handled this problem.
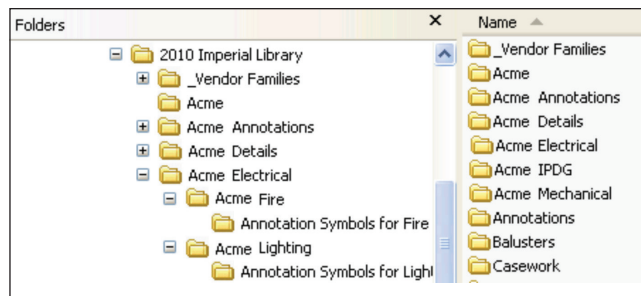

Figure 2

The 2010 Imperial Library has Acme folders underneath which are broken down into disciplines and sub-disciplines. Each sub-discipline has a folder just for the annotation symbols required for the parent folder. There is also a folder for the 2009 Imperial library with the same structure. When new versions of Revit MEP come on line, the previous Acme families can be copied up to the new Imperial Library and users will have a consistent structure to find company content.

Having a good naming convention for families can make or break the users' ability to find and identify needed families. Acme Engineers would name this example family E-Fa Device Wall.rfa.

This naming convention uses the CSI layering convention as a basis and works well for keeping families sorted and searchable. The first letter defines a discipline, followed by a two-letter sub-discipline, and finished with a descriptor. Define standard disciplines and sub-disciplines as shown in the table below.

Disciplines

M	Mechanical	**T**	Technology
E	Electrical		

Sub Disciplines

Hv	HVAC	**Sc**	Security
Li	Lighting	**Pl**	Plumbing
Tc	Telecom	**Fa**	Fire Alarm
Pi	Piping	**AV**	Audiovisual
Po	Power		

Create a 3D model

Revit Families can be created by picking New from the application browser and then Family, and finally selecting an appropriate template. For this example, select Generic Model Face Based. rft template. Face-based families will stick to walls like wall-based, but they do not need the wall to be present in order to exist. It would be counter-productive to lose devices every time a wall is deleted.

In the reference level of the template, use the reference plane tool to create two concentric boxes with reference planes around the origin defined by the reference planes that came with the template, as shown in Figure 3.
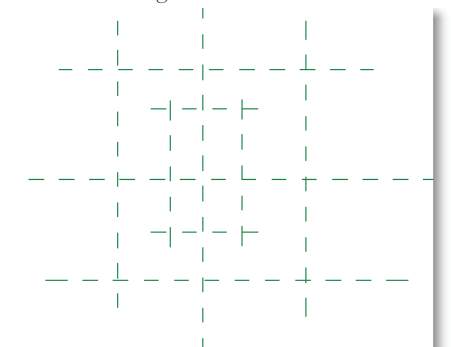

Figure 3

Use dimensions to constrain the reference planes as shown in Figure 4. The outside box is 6"x6" and the inside box is 1"x4".
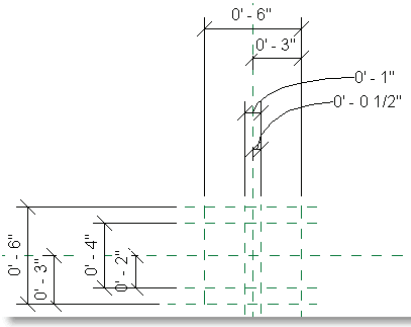

Figure 4

Next, label the dimensions so they can be used as parameters. Do this by selecting a dimension and using the Label tool on the options bar and pick <Add parameter...>. See Figure 5.
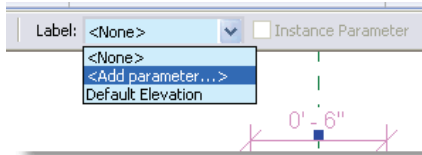

Figure 5

This will open the Parameter Properties dialog. Since this dimension will not be needed in a schedule, use a family parameter type. Give the parameter a name that will identify it well and not conflict with other parameter names in the family. The group option identifies where this parameter will show in the element properties dialog. In this example, (Figure 6) group them under Constraints. Finally, make them instance type parameters so they can be changed on the fly without effecting other instances in the model.
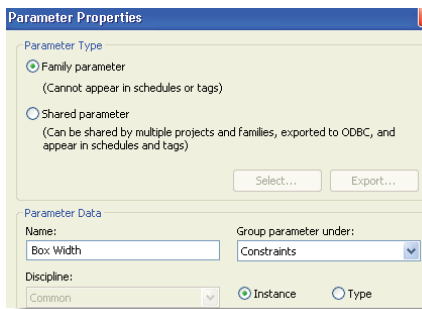

Figure 6

Label the remainder of the dimensions as shown in Figure 7. The half-dimensions are used to keep the reference plane boxes centered on the origin defining planes.
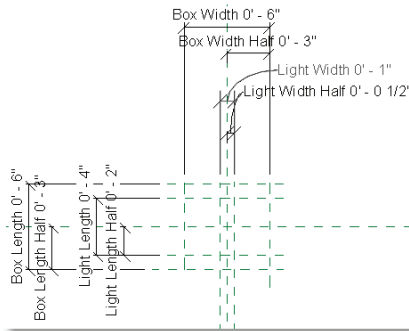

Figure 7

Use the Types tool on the Ribbon to open the Family Types dialog. Here, the Half dimensions can be constrained with formulas as shown in Figure 8. Parameters are case sensitive, so care should be taken when using them in formulas.

Parameter	Value	Formula
Constraints		
Light Width Half (default)	0' 0 1/2"	= Light Width / 2
Light Width (default)	0' 1"	=
Light Length Half (default)	0' 2"	= Light Length / 2
Light Length (default)	0' 4"	=
Default Elevation	4' 0"	=
Box Width Half (default)	0' 3"	= Box Width / 2
Box Width (default)	0' 6"	=
Box Length Half (default)	0' 3"	= Box Length / 2
Box Length (default)	0' 6"	=

Figure 8

Now it is time to add solids for the 3D elements. On the Create tab of the Ribbon, pick the Solid tool and then pick Extrusion (see Figure 9).
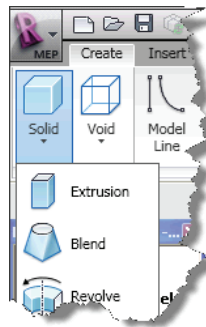

Figure 9

Use the lines tool and follow the reference planes set up for the box and lock them to the planes by clicking on the padlock symbols that appear (Figure 10).
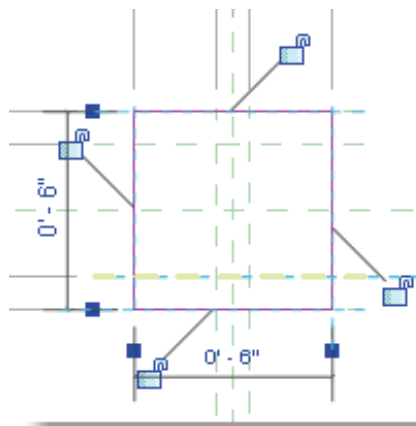

Figure 10

The offset determines how thick the extrusion will be; set it to 1/4". This will produce a box that barely comes off the wall. When done, click the Finish Extrusion tool found near the end of the Ribbon. Repeat this process to make the raised light portion. This time set the offset to 1 ¼". The result should look like the image in Figure 11.
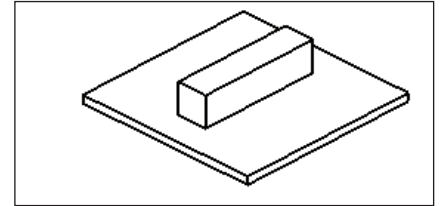

Figure 11

To add a bit of realism, model text can be added to the front face of the box. To do this, go to a 3D view, use the Set tool on the Create tab of the Ribbon to select the front face of the box as the current work plane, then select the Model Text tool on the same tab to add the word "Fire." Use the element properties of the model text to control its size and depth to fit as needed (see Figure 12).
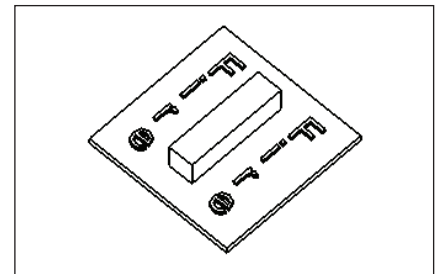

Figure 12

An electrical connector should be added to allow Revit to connect the device to a fire alarm system. Use the Electrical Connector tool on the Create tab of the Ribbon. Change the system type to Fire Alarm using the pull down on the options bar and place the connector on the work plane face of the box (Figure 13).
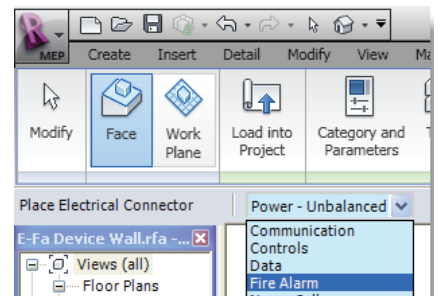

Figure 12

Create annotation symbols for each family type

This family will contain a FA Strobe, a FA Wall Speaker, and a combination FA Speaker/Strobe. 2D symbology for each of these will be created as annotation symbols.

Revit annotation symbols can be created by picking New from the application browser and then Annotation Symbol, and finally selecting an appropriate template. For this example, select Generic Annotation.rft. In this template is a note telling the user to select the correct family category before use. The category is already set to generic annotation, so the note can simply be deleted. Use the Line tool to create the FA Speaker symbol shown in Figure 14.
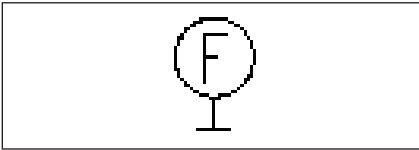

Figure 14

When finished, save the family and use the Load Into Project tool on the Create tab of the Ribbon to load it into E-Fa Device Wall.rfa. Next save as to create the symbology for the FA Strobe and FA Speaker/Strobe annotation symbols (Figure 15).
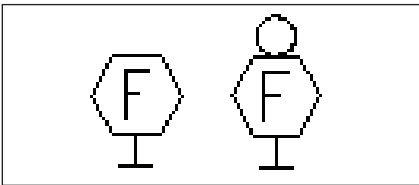

Figure 15

Add annotation types to the RFA family

1. Open E-Fa Device Wall.rfa.
2. Use the Symbol tool to place each of the three annotation symbols just created.
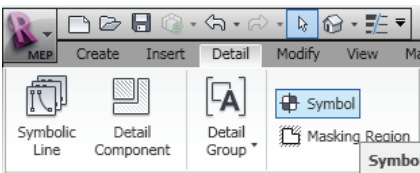3. Use the Family Types tool in the

Figure 16

Design bar to invoke the Family Types dialog.
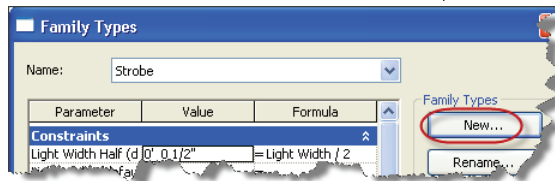4. Select the New button shown below and name three new types; Strobe, Speaker, and Speaker/Strobe.

Figure 17

5. A parameter must be created for each family type. Invoke the Parameter Properties dialog by selecting the Add button in the Family Types dialog.
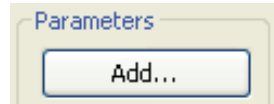

Figure 18

6. Create the Strobe parameter as shown in Figure 19. Repeat for Speaker and Speaker/Strobe. Ensure the parameters are grouped under Graphics and Yes/No and Type parameters are selected.
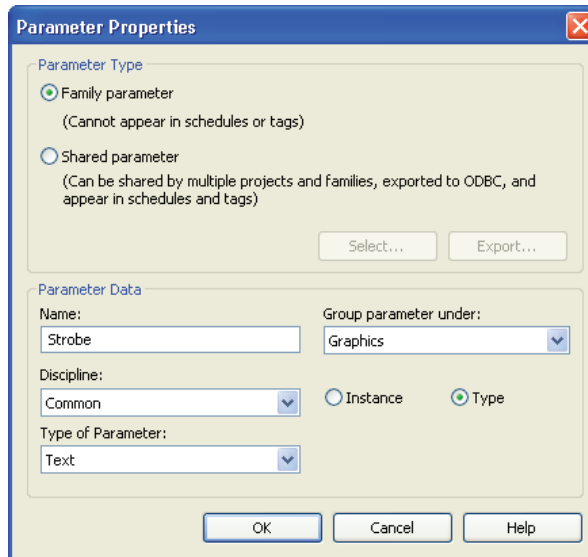

Figure 19

Associate annotation graphics with parameters

1. Select one of the annotation symbols in E-Fa Device wall.rfa using the tab key if necessary and open its properties.
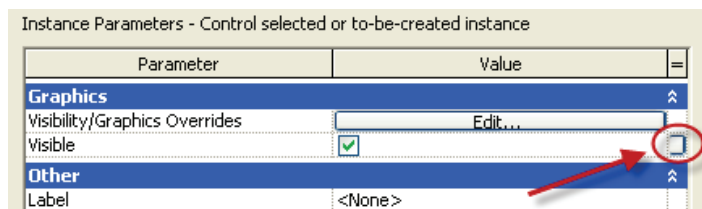

Figure 20

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2. Click on the tiny blank button to the right of the Visible instance parameter (see Figure 20).
3. This will invoke the Associate Family Parameter dialog. Select the appropriate parameter and pick OK, then repeat for each annotation symbol for each family type. This process connects the visibility of the annotation symbol with the correct family type.

Save and load into a new project to flex the family.

Adding shared parameters

In AutoCAD, attributes are used to attach information to blocks. Revit uses parameters for tagging and scheduling. These parameters come in two types—family parameters and shared parameters. Family parameters will not show in schedules or tags. A family parameter has been used to dictate what type of FA device is shown in this example. A shared parameter can be used in schedules and tags and will be required to tag this family with mounting height or strobe candela information. Follow the step below to add shared parameters.

Open E-Fa Device Wall.rfa.
1. Select Family Types on the Ribbon. The Family Types dialog appears.
2. Pick the ADD button under Parameters. The Parameter Properties dialog appears.
3. Select Shared parameter then pick the 'Select' button.
4. In the Shared Parameters dialog select Edit.
5. Create a new group by clicking on Edit in the Edit Shared parameters dialog.
6. Name the new group Fire Alarm.
7. Pick New under the Parameters group to create a new parameter grouped under Fire Alarm.

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8. Add a text type parameter for Mounting Height in the Common discipline.
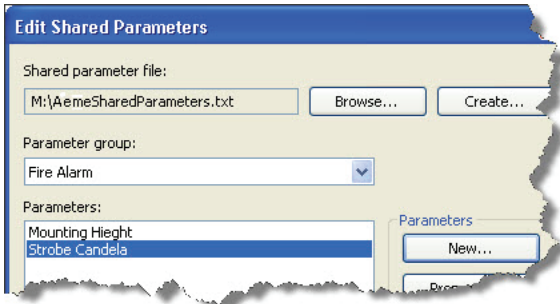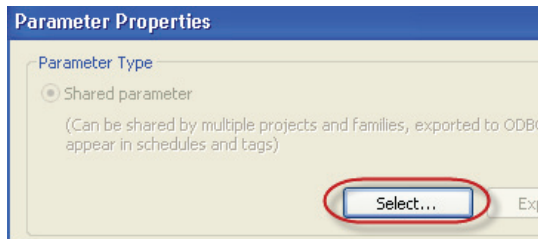9. Repeat for Strobe Candela. Select OK.

Figure 21

10. Switch the parameter group to Fire Alarm. In the Shared Parameters dialog pick Mounting Height. Pick OK to add the Mounting Height parameter to this family.
11. Ensure that Instance is selected in the Parameter Properties dialog. This will enable each instance of this family to have a different Mounting Height.
12. Repeat for Strobe Candela. Select OK to close the dialog.

Create a Tag

The tag for this fire alarm device needs to display one or both of the two parameters created above. The steps to create this tag are shown below.

1. Click New then Family from the application browser and then Annotation Symbol. The New dialog opens; select the Fire Alarm Device Tag.rft template to open the Family Editor. You must use this template to associate this tag to fire alarm devices.
2. Select the Label tool on the Create tab of the Ribbon, and click in the drawing area. The Select Parameter dialog opens.
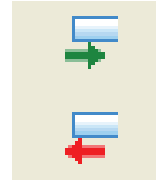

3. Click Add to open the Parameter Properties dialog.
4. Click the Select button to open the Shared Parameters dialog.

5. Select Mounting Height and select OK three (3) times to exit each dialog.

6. Repeat steps 2-5 for the Strobe candela parameter.
7. Add these parameters to the label with the green add button, shown below.

8. Tags can be added to projects by selecting the Tags button on the Options bar when the Tag by Category tool is in use.

The information in this article takes you through family concepts to modeling, adding connectors, annotation symbols, shared parameters, and tagging. This roadmap can be used to produce the Revit MEP families that most firms need to take full advantage of Autodesk Revit MEP.

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