AUGI|World

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Get a Boost from Third-Party Apps

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- Navisworks from a contractor's perspective
- Render Engine Evaluation
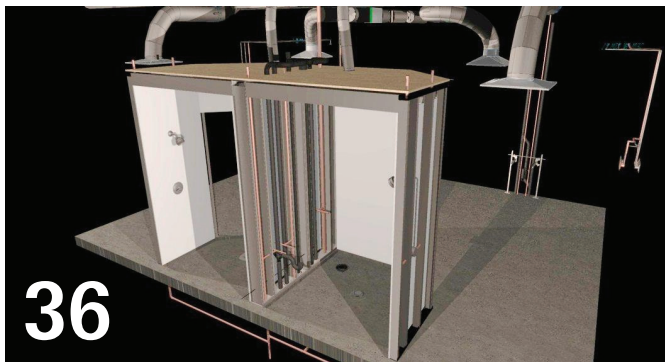- Revit MEP: The Search for Quality Content

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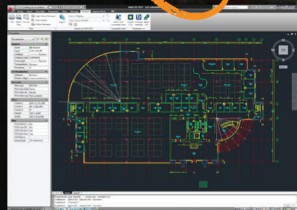
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Editor's Note

In this newest issue of *AUGIWorld* we tap into the world of third-party applications. Several of our articles point out some of the authors' favorites while others go into the specific application of an add-on. Other articles round out with the technical insight that we expect and love to read.

Okay, now for the specifics!

Brian Benton breaks down what third-party apps are with regard to AutoCAD. There are many options out there—even for those who need layout sheet metal bending! Melinda Heavrin exposes how to leverage Google SketchUp with AutoCAD Architecture. Those who don't model in 3D can do so very easily in SketchUp. Christopher Fugitt describes how to get out of the Civil 3D box and take the A-train to success.

This month we get the inside scoop at Autodesk in a great interview with Zach Kron. I think it quite interesting to find out how some of the best movers and shakers at Autodesk got their start and what they do day in and day out.

John Evans invents his own Inventor version by understanding how to apply third-party applications to get the biggest bang for your software money. It is amazing how inexpensive some great apps actually are. Bernie Duncan goes on the hunt for quality Revit MEP content and discovers a whole new industry developing around the delivery of content. Erik Lewis highlights some new, recently released products you should know about. Paul Crickard gets into the matrix, er, database in a Revit Platform article. It isn't just a little Excel spreadsheet anymore. New Content Manager James Salmon explains what owners want and expect from BIM by showing a new process to get the best from BIM and everyone involved.

Elizabeth Shulok explains how to go from Revit Structure and into an analysis application for design, and back again! Read this to find out the right steps (and to find the steps to step over). Chris Lanahan puts on his hard hat to show the perspective of a contractor using Navisworks Manage. Joep van der Steen explains the different rendering tools for 3ds Max and contributes an expert's insight into the most popular options available today.

By this point in my editor's note most readers have wandered off to enjoy the bountiful spread within these pages. By this time I certainly couldn't have anything important left to say, perhaps. ☺ But I do! If you are an avid reader of online content you no doubt know about RSS feeds. Basically an RSS feed is like a wormhole between the content on the web and your inbox. It gives the content provider and you, the reader, a way to streamline the information superhighway (sorry, I couldn't resist).

Lucky reader, you now have the ability to pipe AUGI Library articles right to your inbox! Yeah, cool, I know! So how do you set this up? For that, dear reader, you will need to visit my hidden article in the AUGI Library. You can find the link to this article right here.

So there you go, another great issue of *AUGIWorld* awaits! Dive right in, the water's fine!

David Harrington

Third-Party Apps for AutoCAD

AutoCAD® is a complicated and powerful design tool containing several hundred features, commands, tools, and settings. Users can create almost any type of design with this software, yet very often, they want even more tools—those that don't come installed in AutoCAD. These tools might make drawing and modeling easier, provide features that AutoCAD doesn't, make AutoCAD's features easier to use. Regardless of why users want these added features, the fact is they do. Luckily, Autodesk has provided a means for users and companies to create them. These new or modified tools are often referred to as third-party applications.

WHAT ARE THIRD-PARTY APPLICATIONS?

Third-party applications are programs or routines designed to work inside another program or operating system, that are created by parties other than the creators of the host program or system. The ability to run third-party applications is one of the reasons AutoCAD rose to the top and became the premier CAD system. AutoCAD can run several different types of third-party software including .NET programs, .LSP routines, script files, ObjectARX, ActiveX, and others.

AutoCAD makes it easy for "regular" users to create their own third-party apps through Visual LISP. Visual LISP, a programming tool for creating code in AutoCAD, is a form of the programming language LISP. Visual LISP is a full-featured programming language that can call AutoCAD commands, system variables, and dialog boxes in order to interface with the user. AutoCAD comes with a LISP writer inside; the files are saved in a .LSP file format. These files can be simple command macros or more complicated routines that create, save, and manipulate data. LISP files are so easy to use that users can drag and drop the file into AutoCAD to load it.

The ObjectARX programming environment can be used to customize AutoCAD (and AutoCAD-based products) to gain direct access to AutoCAD's database structure. It also provides access to the graphics system, command definitions, and object-oriented C++ programming interfaces. ObjectARX is a powerful tool that can be used to extend AutoCAD software. The ObjectARX SDK (Software Developers Kit) also includes a managed API, typically known as the AutoCAD .NET API. This API can use any .NET supporting language to further customize AutoCAD and its vertical platforms.

The ActiveX can utilize COM automation. It can use VBA-enabled applications such as Microsoft Office products. It can also be used from AutoCAD add-ins built using Visual LISP, ObjectARX, or the AutoCAD .NET API.

There are many choices for developers who are interested in programming third-party applications for AutoCAD. Which ones are you familiar with? What are the needs and goals for the application?

WHERE CAN I FIND THEM?

AutoCAD third-party applications are easy enough to find. Before the Internet, many AutoCAD-based magazines would provide routines with yearly subscriptions. These days, users only need to conduct a simple Internet search to find the routine they need. Users can also access the AUGI forums to find routines. If you can't find one, or can't find somebody who knows what you are looking for, then perhaps you can find a person to create one for you!

Autodesk has many third-party applications listed on its Partners Products & Services website (http://partnerproducts. autodesk.com/catalog/default.asp). These programs are much more complicated than a simple LISP routine, but many of them can complete your design needs. At this website, users can search by category, product name, company, language, Autodesk product, and more. If you need it, or simply want it, it might be here. Keep in mind that these applications are premium applications. They aren't free, but they are much more advanced.

If you are looking for simple or task-based solutions, then a LISP routine may fit your needs. Try an Internet search with your favorite search engine after you look through the AUGI forums.

CREATING THIRD-PARTY APPLICATIONS

This article cannot cover the many methods for creating a third-party application for AutoCAD, but there are many sources out there. If all you need is to streamline your workflow, then LISP is the way to go. Autodesk comes with a LISP tutorial (in PDF format) and reference guide that can help you. There are also many books, blogs, and AUGI Training Programs that can help you get started.

If you are really serious about creating programs to run inside AutoCAD, then you may want to check out the Autodesk Developer Network (ADN). This network provides insight, tools, helps, and other aids to help you create your very own third-party application for AutoCAD or other Autodesk products.

AUTODESK DEVELOPER NETWORK

The ADN is Autodesk's formal platform for third-party developers. It's not for everybody, but there are many benefits to joining this network. From a business standpoint it provides access to potential customers as well as access to many of Autodesk's sales partners. A big benefit of being part of the ADN is exposure. After all, how can users purchase an application they have never heard of? The ADN also conducts numerous conferences and provides business development consultations. From a business perspective, the ADN can be a big benefit.

Technically speaking, the ADN provides a developer access to nearly all Autodesk software! ADN members are also part of the beta teams. These licenses are not to be used for production purposes, but are for review and development of applications, marketing information, and support. Autodesk software engineers are also available for support and guidance.

Autodesk has its own API (Application Programming Interface) for its products, provided through the ADN. An API is a set of programming rules and/or specifications unique to a program, like AutoCAD. The API provides a way for developers to create code that can communicate with AutoCAD (or other Autodesk products.) If developers get stuck or have questions about Autodesk's API, consultations with Autodesk are available.

JOINING THE AUTODESK DEVELOPER NETWORK

The ADN is not intended for your average user—it was created for developers. There are rules and guidelines to follow as well as qualifications to meet. For example, there must be at least one full time professional software developer on staff. An application must be submitted that includes an agreement (with signature) as well as membership fee. This fee varies depending on the number of individuals in your group that will be using ADN-provided software. The fee also varies by country. Membership is for a calendar year license that runs from January 1 to December 31.

There are three user levels for ADN membership: one user, two to five users, or more than five users. Users are the employees that will be using the ADN software and that will be provided support by Autodesk. There also three levels of service: Standard, Professional, and Premier Partner. The Standard level provides a base level of service for software developers. The Professional service level provides service to developers with a more aggressive schedule and who require more support from Autodesk. The Premier Partner level of service is for developers who are creating major software applications.

CONCLUSION

AutoCAD has become the industry standard in design software. This is a title it has held for decades. One of the reasons AutoCAD became number one is because of the ability to customize it internally and through third-party applications. The average user can program AutoCAD through AutoLISP. Software developers of small add on programs to major program enhancements can also create and run application inside of AutoCAD. If you are a developer or are interested in becoming a developer of third-party applications, consider joining the Autodesk Developer Network (ADN). This network can provide software, training, and support to you and your team

Brian C. Benton is senior engineering CAD technician/designer for Heidt & Associates, Inc, Fort Myers, Florida. Brian has been working with AutoCAD since release 10 in the mechanical, structural, and civil engineering fields. He has been a detailer, drafter, designer, IT assistant, CAD software manager, protector of standards, and proverbial "Help Desk." He can be reached at benton.brian@gmail.com.

Using Google Sketchup with AutoCAD Architecture

In every industry, there are third-party tools that can help in all aspects of drawing quality. AutoCAD® Architecture is certainly no exception. Google SketchUp is an excellent tool with a lot of great capabilities. We will look at some basic tools of Google SketchUp and you can see for yourself how user-friendly this application is.

WHAT IS GOOGLE SKETCHUP?

SketchUp is used by architects and civil engineers for creating, editing, and sharing 3D models. SketchUp drawings can be exported to AutoCAD Architecture very easily. There are two versions of SketchUp: SketchUp Pro and a free downloadable version that is very limited in its use. The free download includes integrated tools for use in uploading to Google Earth. The remainder of this article will discuss SketchUp Pro.

SketchUp is part of the same product family as Google Earth. With this tool, you can import a scaled aerial photograph from Google Earth to SketchUp with the click of a button. This can include topographical information as well.

SketchUp Pro comes with Layout, which is a 2D companion to SketchUp Pro. With Layout you can create professional design documents, dimensioned drawings, and presentation documents from the 3D models you created in SketchUp Pro. When the model is updated in SketchUp Pro, the changes are automatically updated in Layout.

USING SKETCHUP FOR THE FIRST TIME

When using SketchUp for the first time, you may notice a small difference in the navigation system. By going to the Help menu and selecting Help Center, SketchUp Reference Guide, and then Quick Reference Card, you can print a PDF showing some helpful shortcuts. There is a link for SketchUp as well as a link for Layout.

Here are a few tips to help you get started. When using your mouse, the left button is for tool operations and the right button is for the context menu. The middle button (wheel) has several functions: click and drag to orbit, shift click and drag to pan, double click to re-center your view, and scroll to zoom. The spacebar operates the Select tool. You can use ctrl spacebar to add to a selection set, shift spacebar to toggle in and out of a selection set,

ctrl A to select all, and shift ctrl to subtract from a selection set. Print and read the Quick Reference Card before proceeding to use SketchUp.

COMPATIBLE FILE FORMATS
One of the many great features of Google SketchUp is it uses a wide variety of file formats, including DWG, DXF, OBJ, FBX, XSI and WRL. If you don't want to take the time to import a file into ACA, you can also create a screenshot of the file and save it in BMP, JPG, PNG, PDF, EPS, and TIF formats for presentation purposes.

IMPORTING AN AUTOCAD ARCHITECTURE FILE
Now that we've looked a few basic features of SketchUp, let's import a file from AutoCAD Architecture into SketchUp. Begin by opening SketchUp and select the File menu. Next select Import. Under the Preview area, you will see an Options button. Select Options and then select the options that you need in the dialog box that opens. Click OK (see Figure 1). Now you will need to select the file that you wish to import and click open. If you do not see the file you are looking for, be sure to click on the drop down next to File Type to ensure that you are searching for the correct file type. You have now successfully imported a drawing into Google SketchUp! It is important to note that the SketchUp file will have the same 0,0 origin as your AutoCAD Architecture drawing.
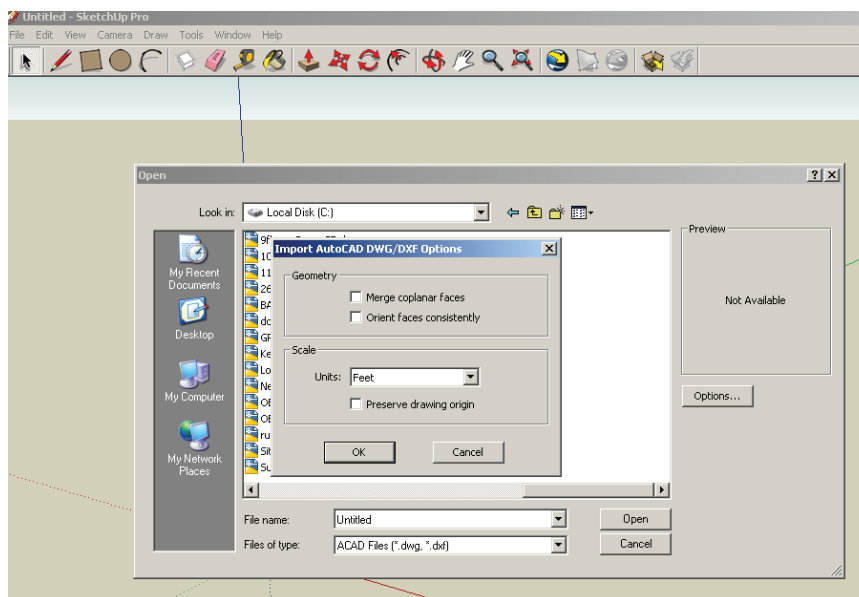

Figure 1: The Import dialog box

CREATING WALLS
Now that you have a drawing imported into Google SketchUp, let's say the walls are in 2D and you want to make them 3D. Well, here's how you do that.

Begin by right-clicking and selecting Make Group. Then select the Line tool and select any corner of the perimeter to start the line. Now, enter the wall height in the Measurements box and press

enter. Next select the Rectangle tool. Begin your rectangle by selecting the endpoint of the line you just drew and end the rectangle at a point on the wall. Continue until all exterior walls are erected. (I have found that it's easier to complete the exterior first.) Now that all exterior walls have been erected and closed, you have created a Face, which is used to build the roof, once you are ready to do so. Next, select the Face and select the Offset tool and enter the thickness for the exterior walls you have just created. Now select the Face and use the Push/Pull tool. Push the Face down to create the interior Face of the walls. This will develop the interior face of the exterior walls so that you can continue to create the interior walls at this point using the steps above.

ADDING DOORS AND WINDOWS
At this point, you have walls created. Now you will need to decide on header heights, door and window sizes, and styles before continuing. Once you are ready, be sure you are in X-ray mode. Now insert the door component you selected and place it by referencing a point on an opening in your imported AutoCAD Architecture file. Continue placing all door components using X-ray mode. Next place all windows using the same method stated above for door placement. For example, if you were placing a window component above an overhead door, you would reference a point on the window and a point on the door.

VIEWING A MODEL IN 3D
A camera is used by SketchUp to represent the model from your point of view. Basically, the program treats you as though you are a camera looking at your model as you work. SketchUp uses several tools for viewing your model in 3D space. These are tools that you are familiar with in AutoCAD Architecture including Pan, Orbit, Zoom and Zoom Extents. Each of these tools can be found on the Camera toolbar.

DYNAMIC COMPONENTS
Dynamic Components can be defined as components that have parametrics. For example, a cabinet component has doors that open and close. A component is only considered dynamic when it has parametric data. Dynamic components will display with a special badge when parametric data is present. Attaching attributes to a component is what makes the component dynamic. Attributes are items such as the component's name, description, location, size, and number of copies. Some attributes are predefined attributes, which means that they are automatically available for every dynamic component. There are also custom attributes that are unique attributes defined by the developer of the dynamic component.

Every attribute of a component has a value that can be a textual string, a number, or the result of a formula. Each attribute and its associated value is called an attribute name/value pair. Formulas can consist of predefined functions, mathematical operators, or the values of other attributes. Functions are shortcuts

product focus
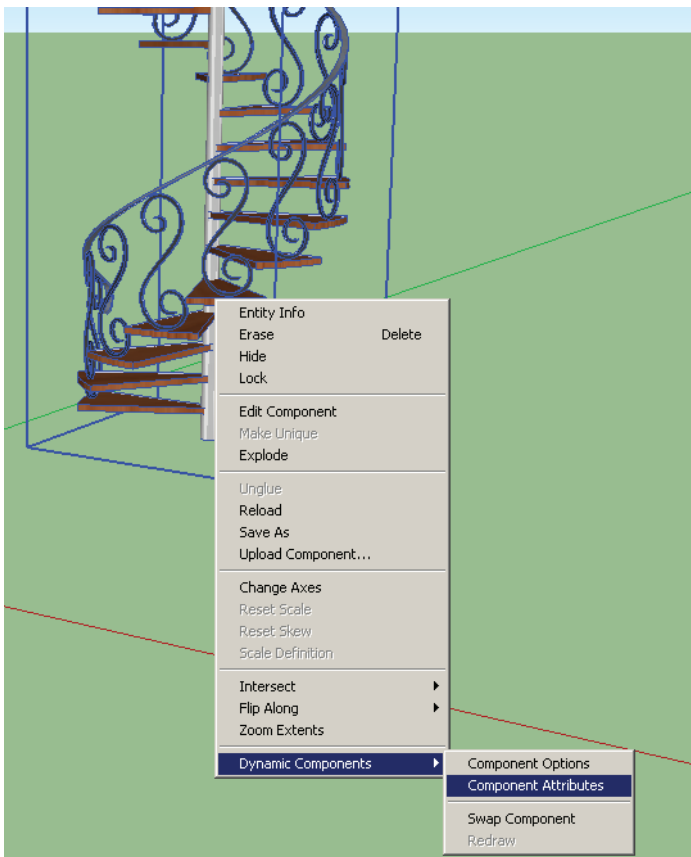
Figure 2: Dynamic components
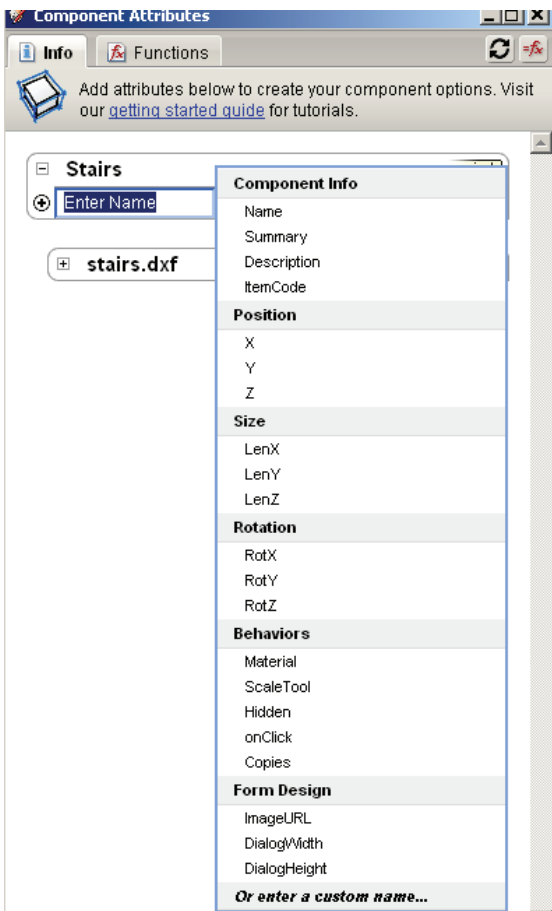
Figure 3: Component attributes

that perform an operation, such as calculating the square root of a number.

It is important to note that all SketchUp users can use dynamic components. However, only SketchUp Pro users can develop dynamic components.

To make a component dynamic, right click on the component, select Dynamic Components and then select Component Attributes (see Figure 2). Select Add Attributes and a dialog box will display with attributes that can be added to your component (see Figure 3). Once you have added the attributes you wish to add, the new dynamic component can be saved to a component file for use later.

EXPORTING A SKETCHUP FILE INTO AUTOCAD ARCHITECTURE

Exporting a Google SketchUp file into AutoCAD Architecture is easy. Once you are ready to export, select the File menu and select Export. Next select 2D Graphic or 3D Model, depending on the file you are exporting. Select the export file type from the dropdown. Since we are exporting to AutoCAD Architecture, you would select AutoCAD DWG. By selecting the Options button at the bottom, you can choose to which AutoCAD version you are exporting and the drawing scale and size. Select OK and then select Export. The export is now complete! It is important to note that you can alternate between ACA and SketchUp multiple times. Your drawing does not have to be complete before importing it into SketchUp or from SketchUp into ACA.
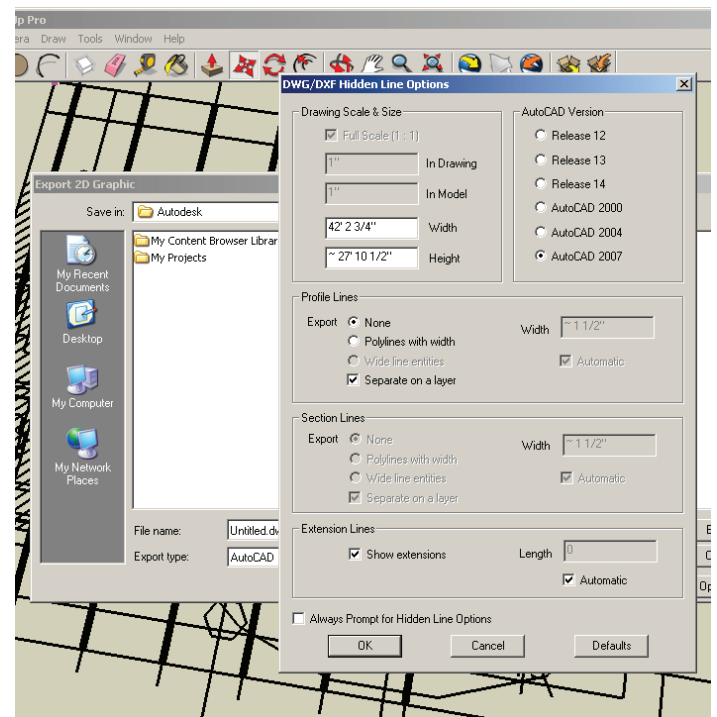
Figure 4: Export dialog box

3D WAREHOUSE

A great feature of SketchUp is the 3D Warehouse, which allows you to search for 3D models made by other users as well

as contribute 3D models of your own. It contains 3D models of buildings, cars, bridges, interior furnishings, and much more. A new feature allows you to search for similarly shaped models instead of relying on a text search, which really saves time when you're in a hurry to find a specific item. The 3D Warehouse holds a wealth of information and can help you design quickly when facing a tough deadline. Best of all, this feature is free for everyone to use!
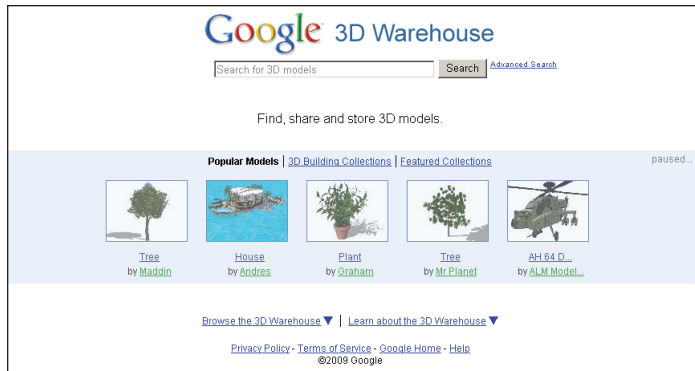
Figure 5: 3D Warehouse

LAYOUT TOOL

SketchUp contains a vast library of colors, textures, shadows, lighting, and more. You are limited only by your imagination when completing renderings in SketchUp. Rendering tools and materials libraries in ACA combined with the tools in SketchUp can produce awesome presentation renderings.

To use the library, select the File menu and select Send To Layout. This will open Layout, a feature included with SketchUp Pro that is used for creating and sharing presentations made from SketchUp. You can add title blocks, save templates, add graphics, and create multi-page documents. Layout gives you more control over color, style, and weight of the lines and faces in your SketchUp model.

CONCLUSION

Google SketchUp has many capabilities for great quality presentation drawings. We've barely scraped the tip of the iceberg—now it's your turn. Download the free version, give it a try, and see how you like it. There is nothing better than going to a meeting with awesome drawings that took only minutes to complete! Need more SketchUp training? SketchUp's Getting Started application includes self-paced tutorials that will introduce you to many tools, techniques, and procedures.

Melinda Heavrin is a CAD Coordinator & Facility Planner for Norton Healthcare in Louisville, Kentucky. She has been using AutoCAD Architecture since release 2000. Melinda can be reached for comments and questions at melinda.heavrin@nortonhealthcare.org.
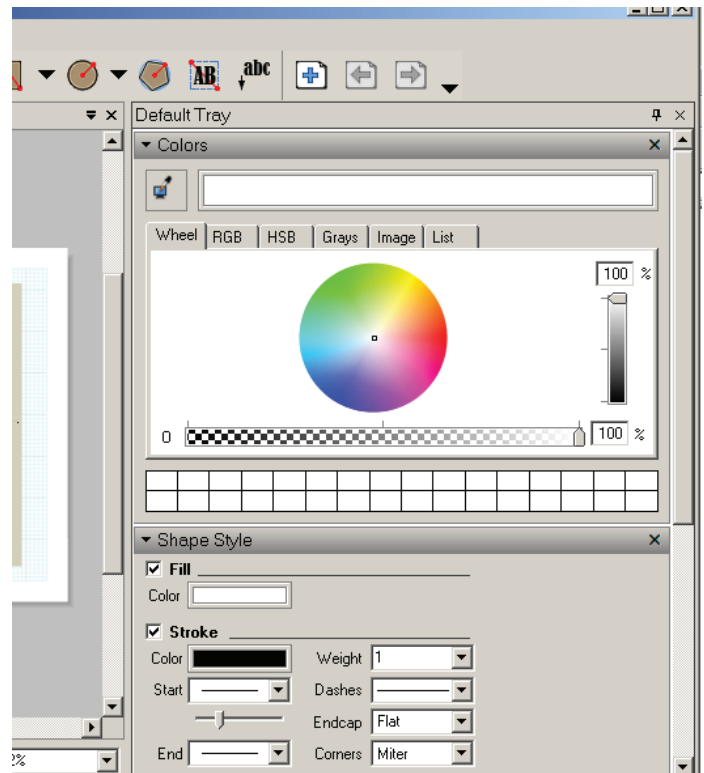
Figure 6: Layout

Figure 7: Layout rendering

by: David Mills

15 Questions with Zach Kron

Senior QA Analyst AEC Strategic Technologies

What's your role at Autodesk, Zach?
If BIM were beer, I would be an official taster at the brewery. My title is Senior Quality Assurance Analyst for AEC Strategic Technology at Autodesk, which is a fancy way to say I'm an old tester of new software used to make buildings. For the last nine months I've been making sure that Vasari, an Autodesk Labs project, works as designed and doesn't hurt anybody. I mostly work with Product Designers, who define how the application SHOULD operate, and Software Developers (Programmers), who implement design specifications. My role is to determine if the ACTUAL application works as intended and ask if the intended functions are appropriate.

How long have you been with Autodesk doing this, and have you held other positions?
I got together with ADSK in 2007, we just had our four year anniversary in March (I gave her fruit and linen). I've been in a QA role for the whole time, although last year I moved from the BIM group to the Strategic Technology group. In both roles I've worked on the Revit platform. The original Revit development team created a fantastically effective automated testing system that makes my official job very efficient. This allows me to spend more time contributing to adjacent roles within the company. For instance, a few of us recently started a "Car Talk" style meeting for trainers and other internal Revit/Vasari users to ask questions and get answers on parametric design methods.

Tell us a little about your background and how you came to be doing what you do now

I'm a recovering architect. After getting a master's degree in architecture, I worked in a few small (4-12 person) offices over the course of eight years before joining Autodesk. Before grad school I was making art and building large-scale art installations for some established designers.

I've always been interested in the art of making tools and the tools for making art, and I think I just got frustrated with the way the offices I worked in used design tools. We did lots of "update the drawing to reflect the model then update the model when you change the drawing. . ." I knew there had to be a better way, and I was lucky to find a place in Revit.

What does a typical day look like at your desk?

Check automated regression "farm" for bad code submittals

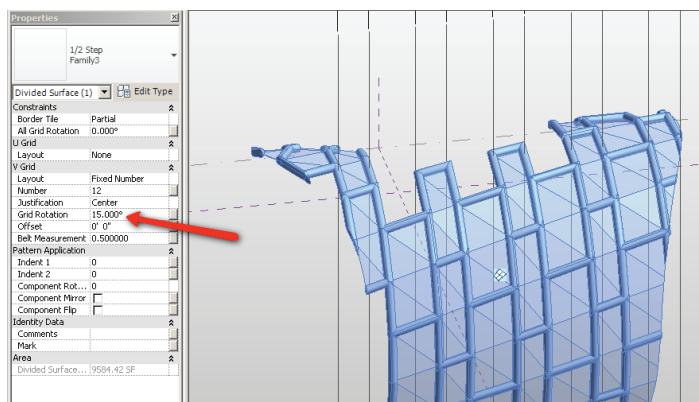| Test Name	0415_1332__Dev_VAS2_20110411_1800 112 Failures of 5074 (including 3 one time) Tails				
AnalysisVisualization\ 175498_BasicCoverage\ 175498_BasicCoverage.txt	FAILURE	713	Folder	Journal	SPR
API\SRD167389\SRD167389.txt	ABORTED [TimedOut]		Folder	Journal	SPR
AppFrame\AppMenu\PublishToSeek.txt	FAILURE	One Time: 38	Folder	Journal	SPR
CEA\193732-AllSpaces\ 193732AllspaceAnalz.txt	FAILURE	0	Folder	Journal	SPR
	ABORTED				

Troubleshoot freaky customer model

Find bugs with freaky customer model and file bugs to software developers to fix.

Error Message :

DO NOT IGNORE. Allocating an insanely big array. Owner of the code that's trying to do this MUST redesign it.: line 181 of Arr.cpp.
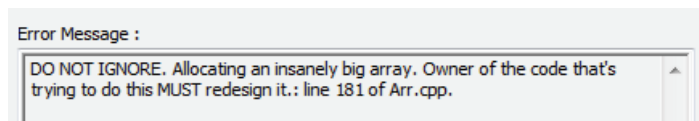
Meet with team to discuss project stuff

Laugh at freaky messages left by developers in code.
' 0:< Thread Pool 1 busy: could not poisonWorkers
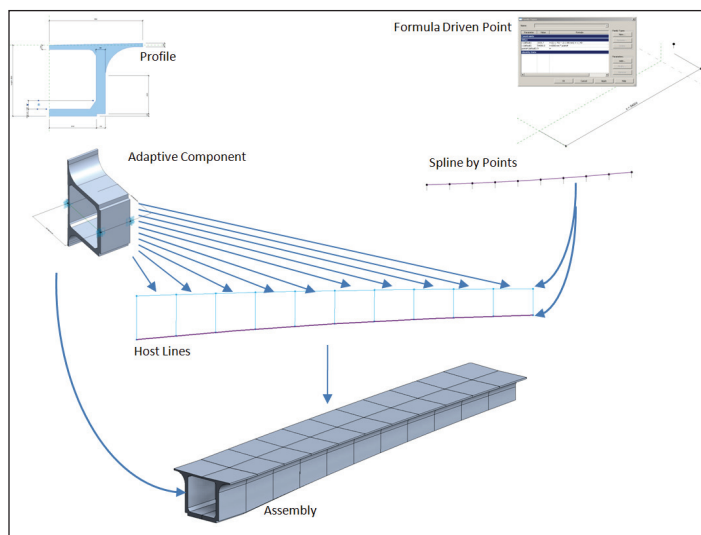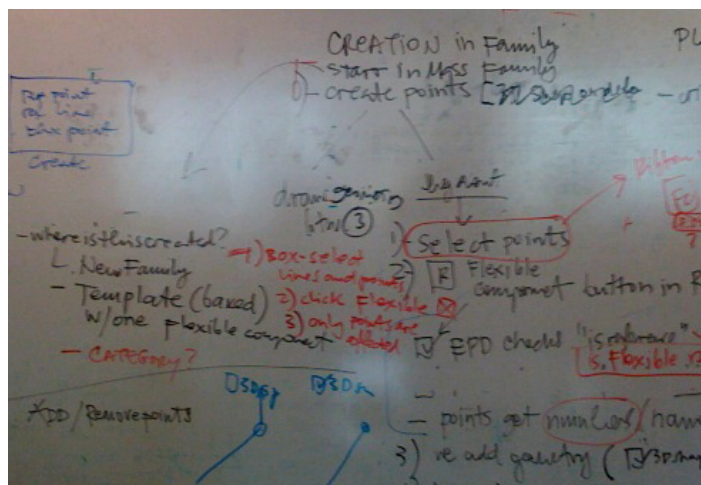
Demonstrate that, yes, you COULD make that thing that those customers were asking about.

Describe the challenges that you and those you work with face.

We are generally building software used to tackle very complicated problems. Finding a balance between making a tool that has tremendous power and making a tool that is elegant to use is hard.

Can you say how many people work with you or perhaps how the work you do is shared?

I work with about 10 people on a daily basis. We're spread over five locations in the US and China, so staying connected is a constant challenge. We plan out a lot of the high level direction and strategies for software development in a group discussion context. Then different roles break out to implement different pieces: storyboards, working code, test plans, sample models and datasets, documentation, marketing. Our group is pretty fluid— Product Designers have their hands in aspects of implementation and testing; Developers heavily guide decisions about how the software looks and feels; and the work I do in testing rolls back into design decisions, documentation, and creation of development tools.

Do you have a role at Autodesk University or other events?

I've been to Autodesk University three times in the last four years. The first two, I went to work at the "AEC Lounge" where we talk to customers about problems they might be having with Revit and figuring out solutions on the spot. Last year I went to present two classes on parametric modeling. I love going to AU. I have these seriously nerdy conversations in bars with folks that I only knew by their online avatars and suddenly we're friends for life.

You've been actively blogging for Buildz. When did you start, how do you decide what to post, and how is readership growing?

I started almost two years ago, around the launch of Revit 2010. We had made some really significant improvements to geometry creation tools that were new and scary to lots of folks. I had been posting loads of pictures and responses to user questions on the Beta forums, as well as repeating the same answers internally on emails. I decided I might as well broadcast these tips and ideas to a larger audience as soon as the product went public. The readership has been growing at a pretty steady pace. Anytime I manage to get a prolonged period of serious blog posts I see a spike, but it seems like there is enough information in the archives now that people can search it for answers and dig back to earlier posts when I'm not actively blogging.

Where do you find the inspiration for your posts?

I'm lucky to work with a wide variety of very smart people: mathematicians, designers, writers, MBAs. Generally, the walk back from a conversation at the coffee machine is when a post will hit me. Ideas come from my seven-year-old son, who asks questions like, "Are wormholes in space and time real?" or looking at stuff that has no business in AEC, like pollen or pineapple skins, and trying to force it through the BIM machine. When I think about these things with the software, it usually produces crashes and/or something that's interesting enough to share with readers. Either way, I get some bugs to report.

I do some practical problem solving based on user questions: "I'm trying to do X with a Y and it keeps doing Z. WTF?" Usually these are hard to abstract to a wider audience, but are really fun when they can be translated.

What are some of your favorite blogs?

For a long time I was only reading Revit blogs, but I started noticing how we're all reading each other's stuff and not wandering outside of our own spheres much. David Rutten, the mind behind Rhino's Grasshopper (a graphical algorithm editor) and now Galapagos, started up a new blog called "I eat bugs for breakfast" with posts about with Evolutionary Solvers, stuff with lots of applications in performance optimization. He talks about it on a concept level rather than through specific software implementations. I think he's really interested in getting people to THINK better rather than use software better. Lately I've been following "but does it float," which has a daily dose of esoteric visual ideas. It's a beautiful and jarring exit from the usual suspects of the Revit blogosphere, but I still find it pretty relevant to my day job somehow. Another great aggregator site is Blogless, which is sort of a daily update of great stuff being made, with a modernist bent.

What sort of things do you do for distraction, hobbies, travel?

The sad thing is that I usually do more of the same things that I do during my day job. I love making parametric models that don't do anything in particular. I find it very relaxing, it's my Sudoku. Lately I've been really interested in Scratch, which is a visual programming and storytelling tool developed for kids. It's absolutely genius and would be so useful for architects, but for now my son and I are just using it to make a video game. Until a huge storm hit this past winter, I had a really extensive grape arbor. Last year it yielded over 300 pounds of grapes that made a really tasty cider and an almost undrinkable wine.

What would we be most surprised to know about you?

I cried at the end of "A River Wild" and I have no idea why. It was a Meryl Streep and Kevin Bacon action movie. I think I was on a bus. I also used to print commodified art for a Marxist puppet theater.

What's the last thing you printed on the 3D printer? What's the next thing you'll print on the 3D printer?

Last thing I printed was a self-supporting masonry arch. I've been using this physics-based, form finding plug-in for Project Vasari called "Nucleus" that allows you to do hanging chain models, among other things. If you populate one of these surfaces with the panelizing tools, you can print the thing out and have a smooth arch structure made of hundreds of unconnected bricks. Next I'm helping a friend at Autodesk print negatives of drinking vessels. He's working with Corning to try using the 3D prints as molds and will cast molten glass into them and then break away the 3D printed formwork.
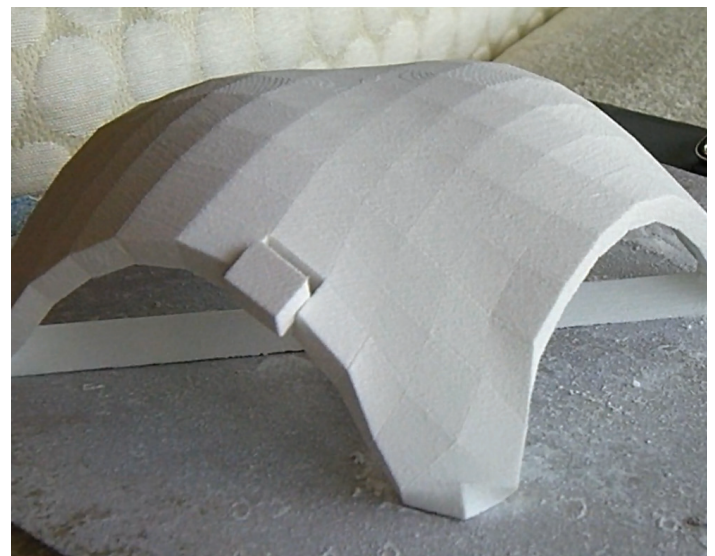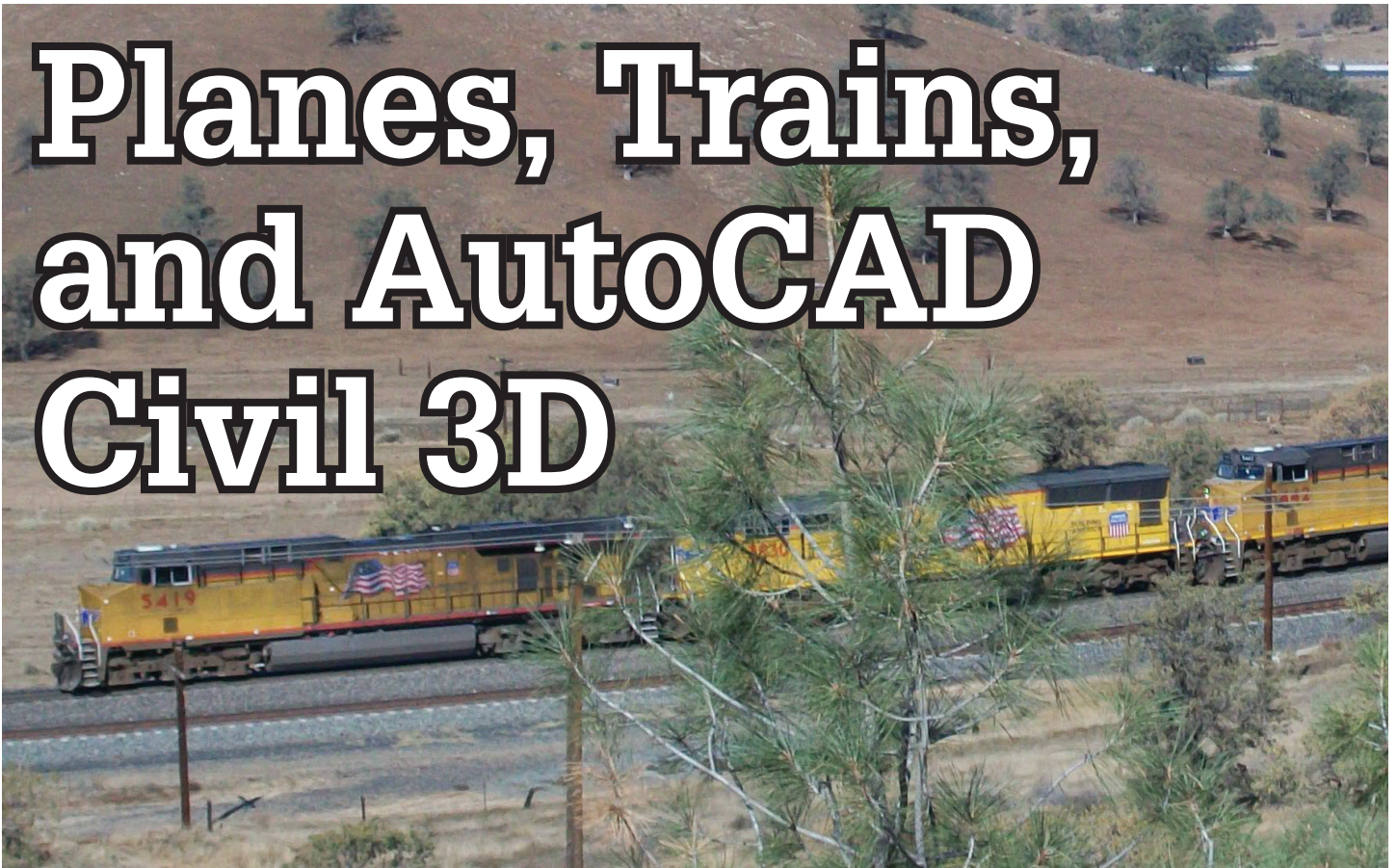

Image from Olimpio DeMarco's 3D Printing in AEC blog: http://3dprintinginaec.blogspot.com

Planes, Trains, and AutoCAD Civil 3D

Using AutoCAD® Civil 3D® out of the box is a lot like taking a train from Point A to Point B. You get where you are going, but on someone else's schedule and pace. The schedule is drawn and out and usually takes you to places you don't really want to go; really, who wants to go to Van Nuys? I'd rather bypass Van Nuys and head straight to Grover Beach.

Taking the train is great and all—you can do things like write articles for *AUGIWorld*, look out the window, see the world go by (at least during the daylight hours), or just kick back and take a siesta. But sometimes it would be nice to be able to customize the trip to meet your own schedule and pace. By customizing AutoCAD® and Civil 3D, we can do just that.

One train trip in AutoCAD that I despised was renumbering sheets in Sheet Set Manager. Some of you may be thinking that trip is nice and easy. Well, that's probably because you take the "commuter train"—typically projects with a dozen or fewer drawings. The projects I was working on took me on cross-country trips like the Coast Starlight—a long-distance train with one to two hundred drawings. After numerous last- minute changes you start to think there has to be a better, quicker way then stopping the forward progress to take five minutes to go through the renumbering process. With customization, the trip is like jumping on a jet airplane. By using the Application Programming Interface (API), it is
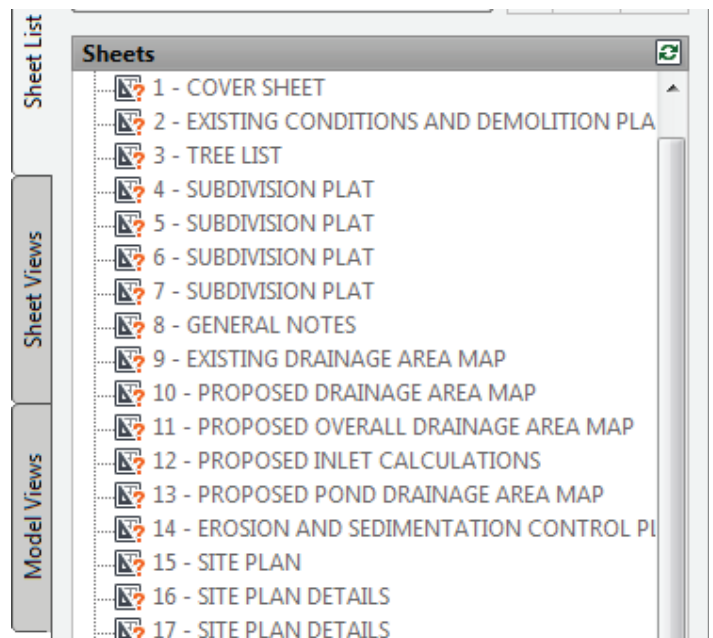
possible to create a custom routine to renumber the sheets in under a minute.

How do you accomplish this feat? Just like taking a jet plane, there are lots of options. You can take the coach route and purchase a third-party program. Hiring someone to create a custom program is like taking a charter flight to the destina-

tion. If you have the time and ability, you can fly yourself and create your own custom program. And, just like flying, there are benefits to each option.

One benefit of taking Coach is the ability to quickly implement the program. Sure, it may be quicker than the train, but it might cause you to deviate from your company's current workflow. Typically it's the cheapest and quickest process to implement. Taking the charter flight provides greater flexibility than Coach. You are able to incorporate your company's requirements into the process and get where you are going on your schedule and at your pace. For instance, your client may have a unique numbering system for each sheet like, for instance, the Naval Facilities Command (NAVFAC), which places a unique plan number on all of the sheets. By getting a customized solution you can renumber the sheets as well as update the NAVFAC numbers in one pass, potentially saving you hours of repetitive renumbering.

Doing it yourself gives you the benefit of the custom charter and, sometimes, the recognition of solving a task that no one really wanted to do. For instance, I recently heard glowing reviews of the Sheet Set Manager renumbering program that I wrote a few years ago. You also get the flexibility of being able to change the code to meet new requirements or, when problems arise, to fix them yourself.

Once you get your flight license you may quickly discover the desire to fix other repetitive tasks such as designing sewer laterals, for example. Unfortunately, Civil 3D doesn't provide the ability to easily design sewer laterals. If the agencies

you work with require labels at the property line showing the invert elevations of the lateral serving the lot, you know what I'm talking about. Not only does the agency want to see the invert elevation, it has crazy criteria like providing a design that meets a minimum and maximum slope and drop requirements if the maximum slope is not achievable.

By using customization, the sewer design process can be automated. The laterals can be connected, or linked to the main line sewer line, and then adjusted to meet the design requirements. So after you submit your first design and then the agency comes back with a comment to move over 0.32' because there isn't a standard distance of 10 feet from the centerline (the 0.32' is really a difference maker after the pipe is installed) you can easily have the laterals adjust to the new location. Move the main line pipe and the laterals can move with it. By doing this you start to turn Civil 3D from a label management program into a program that lets you design.

Another flight I have taken is creating customized subassemblies. Civil 3D is great at creating a database of baselines, assemblies, and subassemblies. But I quickly become frustrated because I'm managing numerous subassemblies of the same type in the same location in numerous assemblies.

Really, if my lane width is going to be constant but my side slopes are varying, I just want to manage that subassembly once—not umpteen thousand times. By creating custom subassemblies I'm able to simplify the management of the corridors. I'm able to utilize fewer assemblies to get the same design output with fewer headaches.

I accomplish this by either using the superelevation to control the side slopes or by using profiles to control what slope the custom subassembly should use. A profile elevation of 2 indicates a slope of 2:1 should be used and likewise an elevation of 3 indicates a 3:1 slope should be used. By using this method, I've reduced the number of regions required in the corridor and made it easier to change where the slopes should change.

Another less obvious benefit is the ability to name the target. I don't know about you, but I find "Surface Target" a bit plain and not very descriptive. I also usually find the subassembly names not the easiest to peruse when looking at all of the targets in a corridor. By naming the target I'm able to find all of the ROW targets a lot quicker. If I worked for a company with strong standards, I'd even skip the targeting and utilize the standard layers. Imagine creating a corridor and having it find the appropriate linework for

Structure Name	Material Type	Elevation Difference	Bottom Ring Size	Top Ring Size	Middle Ring Sizes	Tolerance
		Total	352	352	1806 pieces of 0,45 m 28 pieces of 0,40 m 82 pieces of 0,30 m	
Camin 444	Concrete	4.66	0.15	0.10	9 pieces of 0,45 m 1 pieces of 0,40 m	-0.04
Camin 442	Concrete	4.14	0.15	0.10	8 pieces of 0,45 m 1 pieces of 0,30 m	-0.01

the ROW target based on the layer, no longer having to do the tedious task of selecting the correct alignment or polyline for the targets.

The other day I was working on a project with a varying width criteria. If the corridor link was more than 15 feet it needed to be labeled as "Access Road." If it was less than the criteria, it wasn't to be labeled. The out-of-the-box methodology would be to either create separate regions or apply the appropriate link codes. This is laborious and not much fun. Another method was to create separate code set styles for each case and then apply them to the correct section. Now this project is about 16 miles in length with cross sections shown every 200 feet, so it's a ton of cross sections.

I chose the custom flight and had the custom subassembly assign the appropriate link codes based on its length. I then made sure my code set styles had the matching link codes. I took a potentially long journey of two or three days and turned it into a short jet plane ride. I used the same approach to assign the correct point code on a subassembly of a link with varying widths. The varying widths were causing problems since the labels where overlapping. It seems that some people find that objectionable. My first attempt at resolving the issue was to have numerous code set styles and then applied the correct one to the sections. This was turning out to be problematic, because I'm not perfect and would inadvertently miss one or two. Creating a custom solution ensured that the correct point code was applied.

Another problem that can be solved by customization is getting the information from the model you have created. You've spent all of the time creating the model; wouldn't it be nice to extract the data for reporting purposes that meet your requirements? By modifying the reports or starting from scratch, it is possible to export the information we want in the format we require. For instance, I recently created a pipe

ring report for a customer who required a report showing how many structures there were as well as how many rings would be required to install the manhole structures. The user selects the structures they want the report for and what ring sizes are to be used and then the report provides the total number of sizes rings required, rings per structure and the tolerance of the rings. This is a real time-saver compared to manually performing the report in Excel or by hand. Other reports are possible such as alignment reports or creating closure reports based using polylines instead of parcels.

I've gone off the rails on my train analogy, but I think you start to get the idea. By customizing AutoCAD and Civil 3D we can improve workflows and reporting capabilities. Now instead of complaining that Autodesk hasn't provided a certain feature, we can start to control our own future and provide the features ourselves. If it's something that would make us more productive and save money, why not do it ourselves or have someone else do it for us? We can become more productive.

Christopher Fugitt is a Civil Engineer and has spent the last eight years designing government projects as well as residential subdivisions. Before working as a Civil Engineer, Christopher worked for a General Engineering Contractor on subdivision and mining projects. Christopher earned his B.S. degree in Civil Engineering from California Polytechnic State University, San Luis Obispo. Christopher maintains and authors the Civil 3D Reminders blog at http://blog.civil-3dreminders.com/

Third-Party Inventor Apps

While Autodesk has developed one of the most capable solid modeling environments ever conceived, there are still numerous tasks that designers and engineers feel could be improved. Often, certain industries require more specific technology to avoid the daily redundancy associated with a design. That's where third-party applications come into play.

There are many applications available on the market—some free, others for sale. Every time I look around there are more apps developed for Autodesk Inventor®. Rather than try and hunt down all of them, I decided to highlight some tools that I like, for your benefit.

API

Autodesk furnishes an open API along with Inventor, and anyone with a compiler can develop software that will plug right into Inventor. The Inventor API support includes programming languages such as Microsoft Visual C++, VB, Delphi, C#, and VBA. More information about this can be found on Autodesk Inventor API page.

ADN

The Autodesk Developer Network is one of the best deals around. You pay one fee and get access to numerous applications such as Inventor and AutoCAD. Moreover, ADN members get the inside track on how Autodesk's applications really work. Almost all commercial third-party applications are developed by ADN members. More information about ADN is available at the Autodesk Developers Center.

INTEGRATION

Integration is one of the key components of third-party applications. The capability to operate seamlessly within the Inventor shell is one of the first things I look for in an add-on tool. When I can avoid the tedious exchange of model information, I will. Faced with the choice between two apps—one that is integrated and one that isn't—I will often overlook some shortcomings in order to work more comfortably.

All of the following tools are well integrated and require no exporting of data, with the exception of the last one.

INVENTORCAM

Price hidden behind a reseller, but it ain't free

InventorCAM is a computer-aided manufacturing (CAM) application for computer numeric code (NC)-driven machinery such as lathes and vertical mills.

While it is powerful and capable, the most striking element to Inventor users is how well it is integrated. The super user-friendly interface is established within the Inventor Model environment. You never leave Inventor for anything.

The list of configuration and tool capabilities is endless given the possibilities for this application, so I'll point out a couple of my favorites.

Figure 1: InventorCAM ribbon

Brutally Easy Setup

The first thing I fell in love with about this tool was the integration. The second was the ease of setup.

Every time I used another CAM application, I would ask, "Why can't I just PICK this face or that and get what I EXPECT?" Well that's what InventorCAM thought you should be able to do.

Pick a face and you're there. Not a good enough solution? Additional options such as point and axis definitions as well as offsets and angular settings for all six degrees of freedom are available.
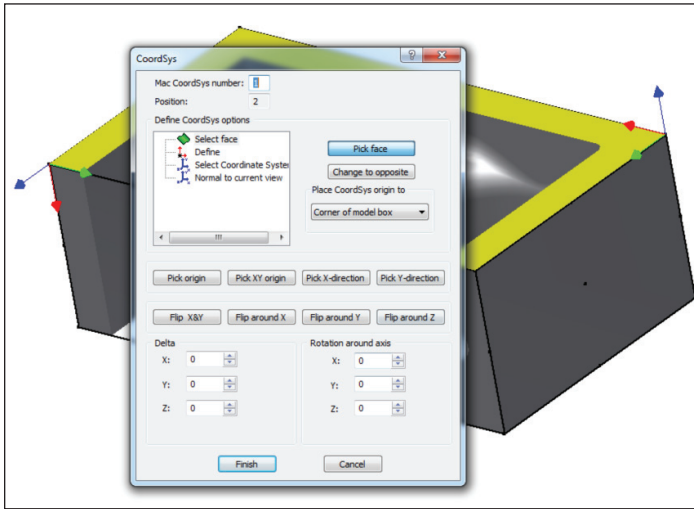
Figure 2: InventorCAM coordinate setup

The basic setup process has been developed in a very logical format. Set the coordinate system, the stock, and targets, then create the operations that you wish to run, such as pocketing and high-speed surfacing. Subsequent geometries are added automatically, and additional machine operations can be defined by the user.

Simulation

Once the operations are calculated, the processes can be simulated in order to develop some visual awareness of exactly what will occur during the process. I am visually oriented, and seeing the process helps me pick up on things I might have overlooked.

InventorCAM offers numerous options from 2D all the way through custom machine geometry simulation for complete clearance analysis. These are all delivered right inside the Inventor environment, using a control dialog.
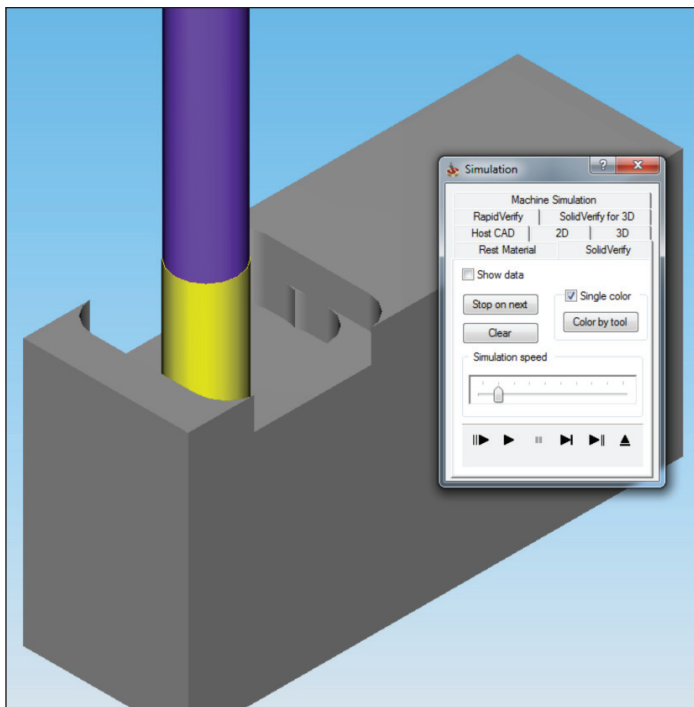

Figure 3: InventorCAM simulation

My favorite is the solid verify, which delivers a fast, simplified simulation but doesn't skimp on accuracy.

Rest Materials

Remaining target materials can be analyzed by running the rest material simulation. InventorCAM compares the original stock to the target, and subtracts the focused operation. It displays the remainders highlighted in red, including operations that have not yet run.
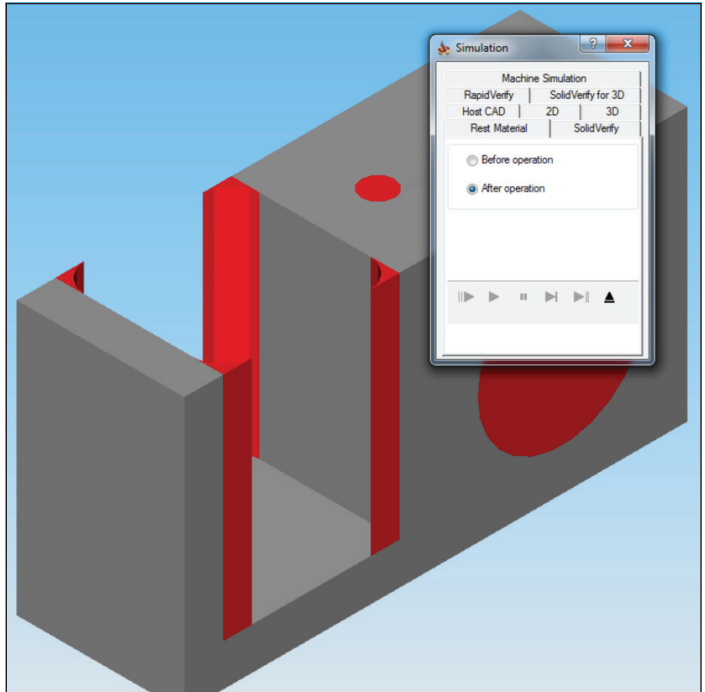

Figure 4: InventorCAM rest material display

The results are displayed in an easy-to-understand method, and deliver a better awareness of what operations need to be modified or which additional operations need to be created.

HSS

I remember chatting with the InventorCAM folks at Autodesk University, discussing how I loved the interface, but was worried about the toolpath intelligence sacrifice offered in other vendor applications. They laughed and asked if I had tried their new High Speed Surfacing (HSS) module.

Let me tell you, the HSS machining operation is a beautiful thing. The setup is easy—just pick the faces that will be contoured, adjust the smoothness settings, and calculate. There are tons of adjustments that can be made, but the basic ones are evaluated and defaulted in. You are up and running in no time… and the results are so pretty. This is the easiest surface operation I have ever encountered.

I'd like to see…

It's hard to say. Short of having someone run it for me, I have yet to run into an area that I felt strongly required adjustment or better interface. Besides, what fun would that be?
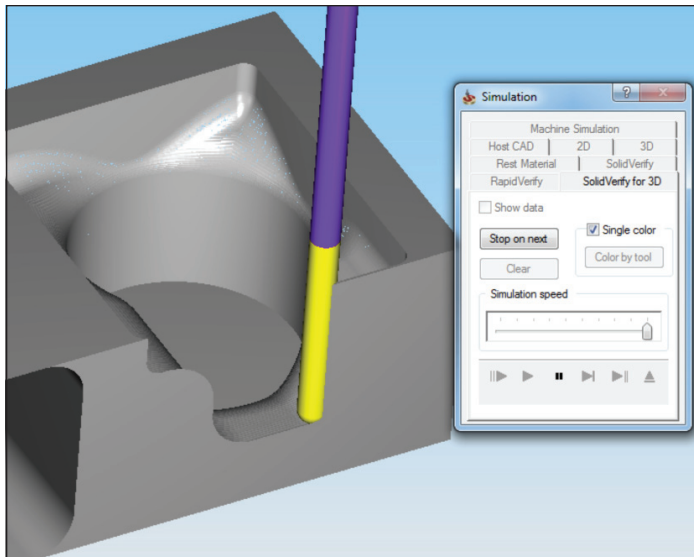
InventorCAM is a work of art.

product focus

Figure 5: InventorCAM's beautiful surfacing

CAMNETICS GEARTRAX

$749 USD

GearTrax is a powerful gear modeling add-in application designed to automate gears and pulleys for all ranges of power transmission complexity.
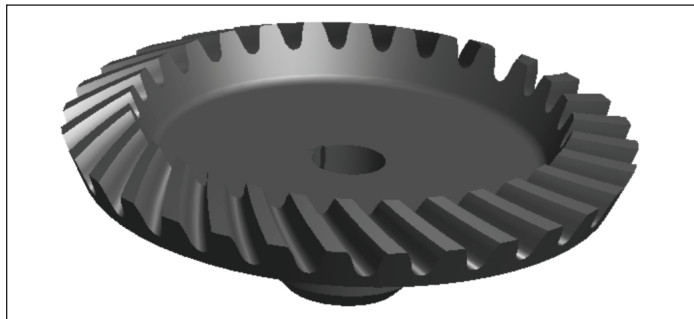

Figure 6: GearTrax Helical Bevel Gear

Features

GearTrax will handle all manner of spur, bevel, and worm gears, as well as various pulleys and sprockets. All Involute tooth geometries are accurate involutes and not approximated. This permits substantially better simulation, as well as quieter teeth when the CAD model is actually being manufactured.

The GearTrax interface has been improved, supports international and plastic gear standards, and offers automatic addendum modification (user correction). Hundreds of mounting styles and ANSI and metric keyways are included.

Optionally, bi-directional use of Excel was permitted in numerous areas of the application. The list goes on and on.

Manufacturing

GearTrax models are also cut extruded from blanks for interference checks and to support those companies that like the gear modeling to
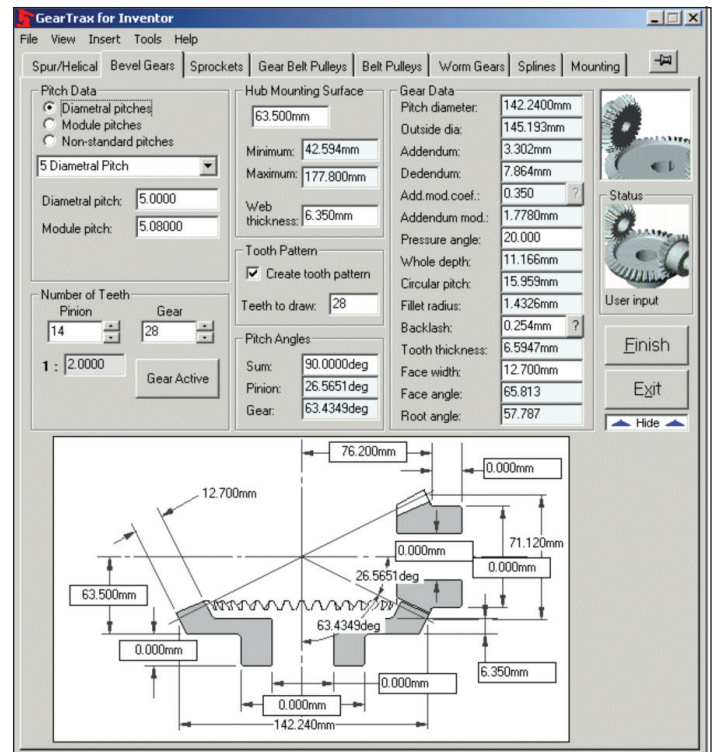

Figure 7: GearTrax interface

follow the manufacturing process. This method produces a superior model, in my opinion.

Fast Creation

While the interface does appear to be overly adorned with parametric settings, the organization was pretty well established. I got in and quickly found the key values that needed to be adjusted, added mounting options, and hit Create. Inventor started, and the gear was created on the spot.

Interestingly, the gear went down very fast. The manufacturer uses subtractive modeling and circular patterning, which has proved problematic for me in the past and is painfully slow. Whatever they have cooking in this program, the geometry seems super stable and very refined.

Model Browser

Each model is created on the fly in the Inventor Model Browser, and the features and geometry are very clean.

Sketch Profiles

The Inventor model can be linked in order to transfer spur gear tooth profile geometry directly to an active sketch. From there you can generate your own gear designs using their profile geometry.

This application is fast, easy, and the models are nice.

I'd like to see…

One drawback is that I could not easily determine how to dynamically link the tool to the components in Inventor. Once the gear was created, that appeared to be the end of it.
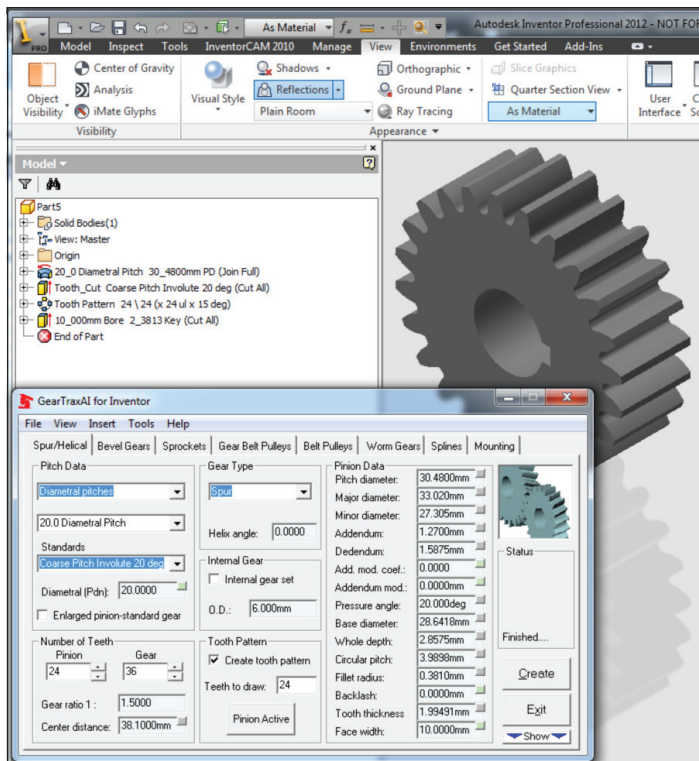
Figure 8: GearTrax model integration

Other issues are that there is no apparent support for assemblies and no analysis was available. For the price, these would have been a deal sealer.

iPropWIZ v5

$80 USD

Sean Dotson and Cubeit developed iPropWiz to work around the problem of Inventor iProperties. What problem? The laundry list of information and no realistic manner in which to access it.

This tool delivers completely configurable control over viewing and manipulating iProperties. Multiple configurations can be saved in order to recall iProperties as you need them—in a single, easy-to-understand interface.

*   iProperties can be renamed
*   iProperties values can be defined by expressions and use any iProperty and part property values
*   Manage units
*   Create and manage lists such as suppliers and clients
*   Develop public and private lists, and control further access
*   Key properties values and mandatory entry can be enforced

iPropWiz is, if anything, thorough. It replaces the old Inventor interface in a way that can be established to meet any company's desires and needs.

Configurations can be copied and modified, and are arranged by Inventor component type, allowing different configurations for parts and assemblies. The configuration can be stored local to a project, or globally in a public server location. Users can switch between the configurations as needed.
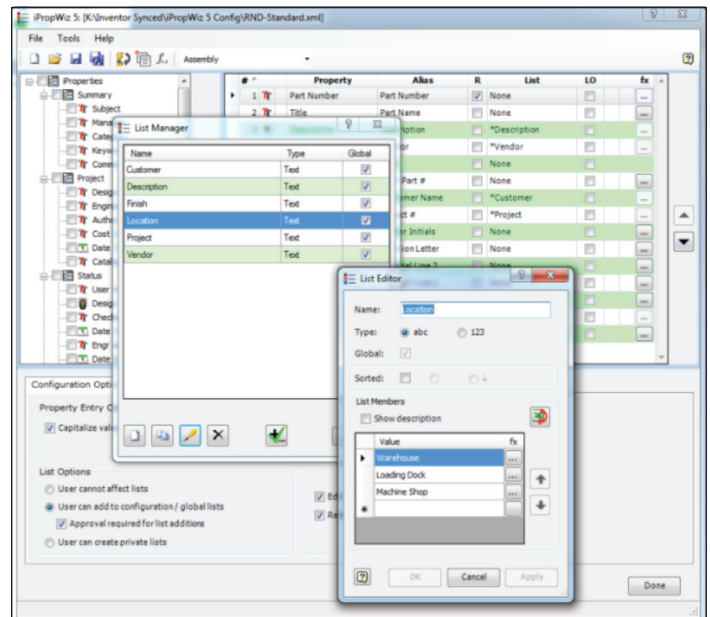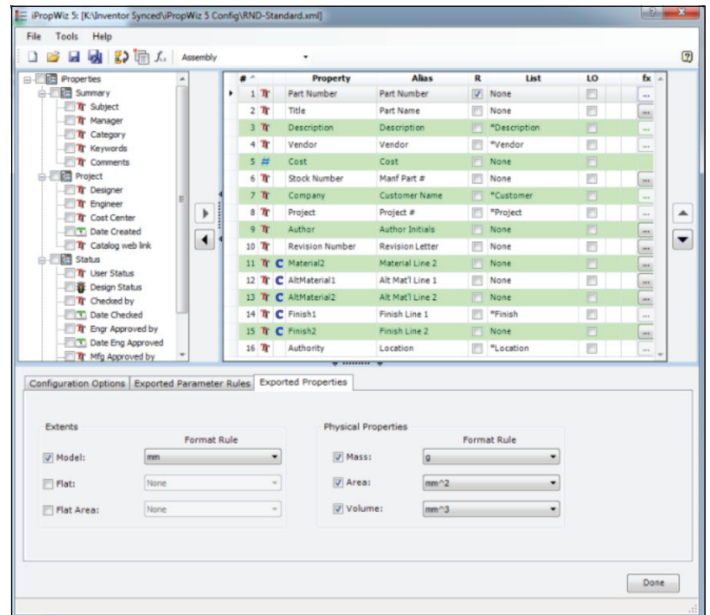

Figure 9: iPropWiz list management
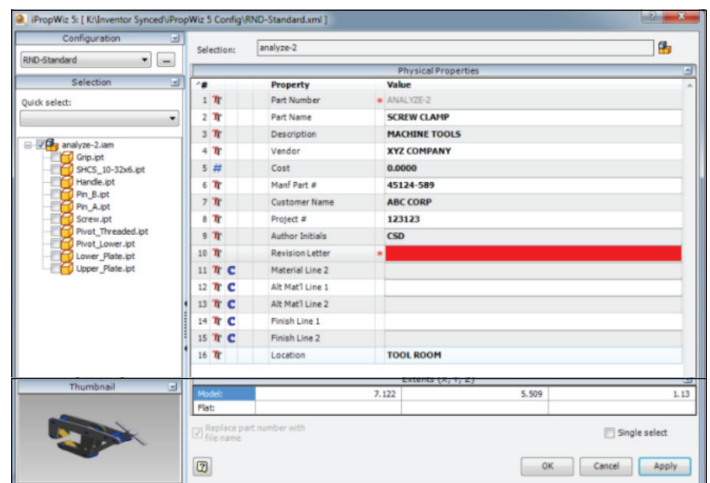

Figure 10: iPropWiz assembly example

Figure 11: iPropWiz mandatory properties

product focus

I'd like to see…

…this installed on my production machine. This is probably the best 80 bucks you'll ever spend.
http://ipropwiz.com

SYCODE STL, 3DS, AND SKP FORMAT IMPORT FOR INVENTOR

$195 USD

Deelip Menezes' SYCODE, now a division of 3D Systems India, is the developer of numerous translation tools for Inventor. Three of these are for Steriolithography (STL), 3D Studio (3DS), and SketchUp (SKP) formats. In this review I selected the STL file, as that is the one I need the most in dealing with 3D printing companies.
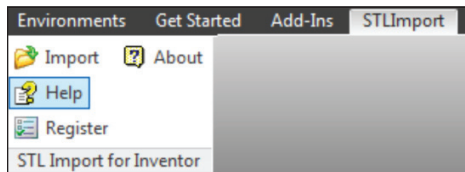
Figure 12: STL import ribbon

Once the installer is completed, the application is added to the ribbon interface, as well as the file access dialogs as a filter.

It's that simple—just install and start accessing the models through every area that you normally would. Place into assemblies, open, and import in part files. What could be simpler?
http://sycode.com/products/index.htm

GEOMATE GRAFICALC

$999 USD

GrafiCalc is a computer-aided engineering (CAE) solution that acts as a stand-alone engineering calculator. The company states that the application will analyze motion simulation, tolerance analysis, and performance modeling.

The application is stand alone, but does provide bi-directional exchanges of data through dxf. While that is a big strike against it in my book, it surely makes up for it in performance. The interface is in 2D and contains numerous options for sketching tools, arrays, dimensions, and constraints.

All the calculations are handled right inside the sketching environment. The company says that GrafiCalc does with geometrical sketching what Excel does for numbers. After seeing it in action, I am pretty impressed—not only by the mathematic capability, but the fact that all manner of analyses are cared for in the same space where the sketching is performed.

The ultimate power of this application lies in its goal solutions. It's like the ultimate equation solver. In all the categories below, goals can be specified and GrafiCalc will solve the variable parameters in order to achieve the goal.

Tolerance Analysis

The tolerance engine simulates motion within specified parameters and then evaluates the affect on constrained sketch geometry. Then target parameters can be selected for iterative analysis and susbsequent solution of expressed goals.
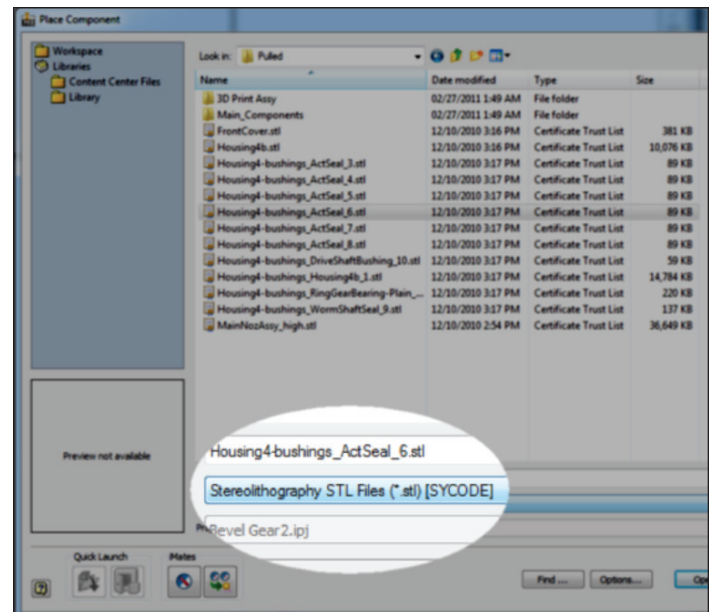
Figure 13: STL import in place component

In Figure 14, the tolerance between two cylinders is evaluated. Deviation, mean, and median values are displayed for the target wheel. Recommended tolerances are given as well, based on the design goals desired. In this case, Six Sigma.
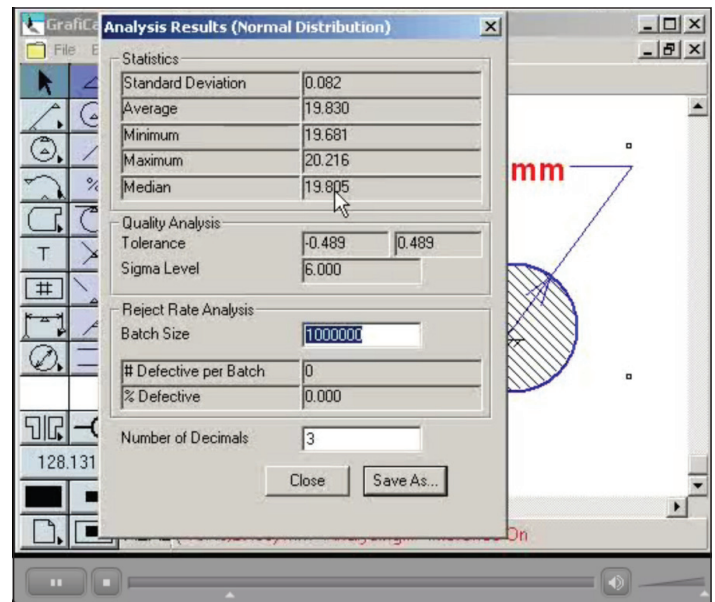
Figure 14: GrafiCalc tolerance analysis

Manufacturing conditions can be backed in based on given tolerances. The analysis engine will display the resulting statistics for the parameter selected. Engineering tolerances can be fed into the dialog to see projected Sigma level and percentage of defective components that will result.

Tolerances can be proposed based on angular, linear, and circular parameters, kinematic motion, and more.

Motion Analysis

GrafiCalc can analyze all manner of mechanisms and moving components through sketched geometry. It evaluates actuator lengths, motion envelopes, kinematics, and more. Calculation macros can be established to feed one parameter from the real-time results of another value that is being driven by iteration. Multiple macros can be applied to the simulation.

Performance Modeling

Moment of inertia, volumes, deflections, load analysis, and just about any engineering principle you can envision are included.

In Figure 15, the heat sink cross sectional thickness goal is being evaluated based on how much heat energy dissipation are required.
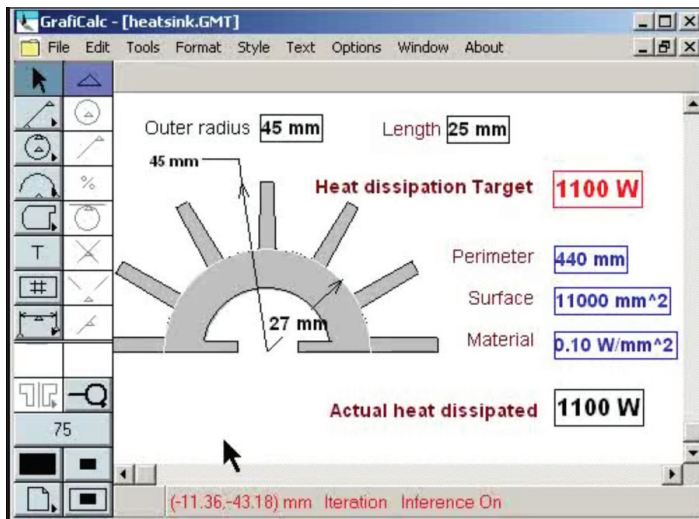

Figure 15: GrafiCalc goal solution

Figure 16 shows allowable deflection as a goal; the beam specifications are altered until the goal is met.
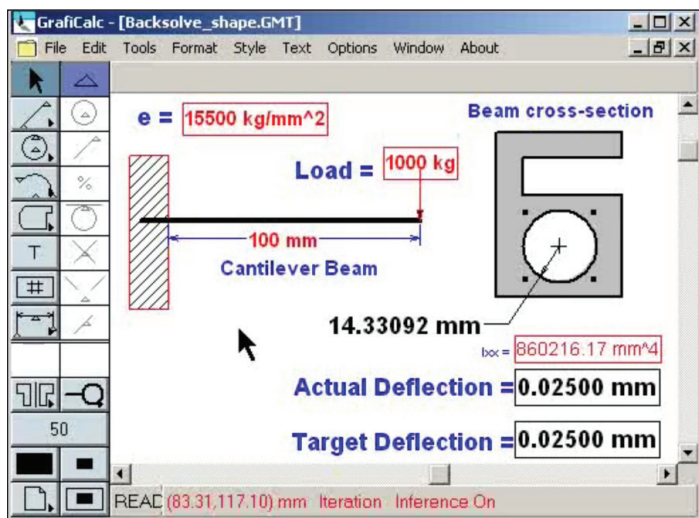

Figure 16: GrafiCalc beam deflection example

While the interface is a bit old, it is kind of cool. It is a whiteboard with sketches tied to equations and parameters in a way that's unorthodox but easy to understand.

GrafiCalc's capabilities and flexible (and unbelievably simplified) interface really delivers in pre-modeling statistical analyis.

I'd like to see…

The tolerancing analysis features are what caught my attention and are why I included it in this article. I expect to see more integration within Inventor. I think this could be done without too much ordeal and would seriously benefit everyone concerned. Additionally, bi-directional, dynamic linking would be sweet.

This product has a huge base of well- established users and the application is obviously good. Unfortunately, if the developers don't fully integrate into Inventor, someone else will.
http://www.graficalc.com/

CONCLUSION

I had hoped to cover a wide cross section of products—in detail, cost, and integration methodologies. All of these applications are worth looking into.

+ InventorCAM – if you need serious CAM technology and you want a great interface, check this out.
+ GearTrax – Super-fast and stable table- driven gear generator with hundreds of options and direct part file creation.
+ STL Import from SYCODE – Best import integration I've seen—right where you need the capabilities.
+ GrafiCalc – Statistical analysis for mechanical engineering, with bi-directional Excel and DXF transfers, and an interesting interface.
+ iPropWiz – (I saved the best for last) At $80 bucks, this configurable headache saver just can't be beat. Configurable iProperties, any way you like 'em!
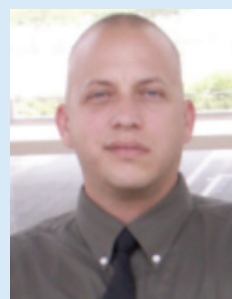
John Evans is an Autodesk Certified Inventor Professional living in the Florida Panhandle, where he provides technical troubleshooting at Gustin, Cothern, and Tucker, Inc. His career through the Aerospace Design, manufacturing, and maintenance spans 24 years and includes a tour in the USAF. John now works as a design consultant and author from his company John Evans Design and manages the blog "Design and Motion", where he combines his passions: Autodesk Inventor, simulation, and motion control. He is a regular attendee of Autodesk University and has recently joined Tekni Consulting as a contributing author for the Creative Inventor training series. He can be reached at john@johnevans-design.net.

product focus

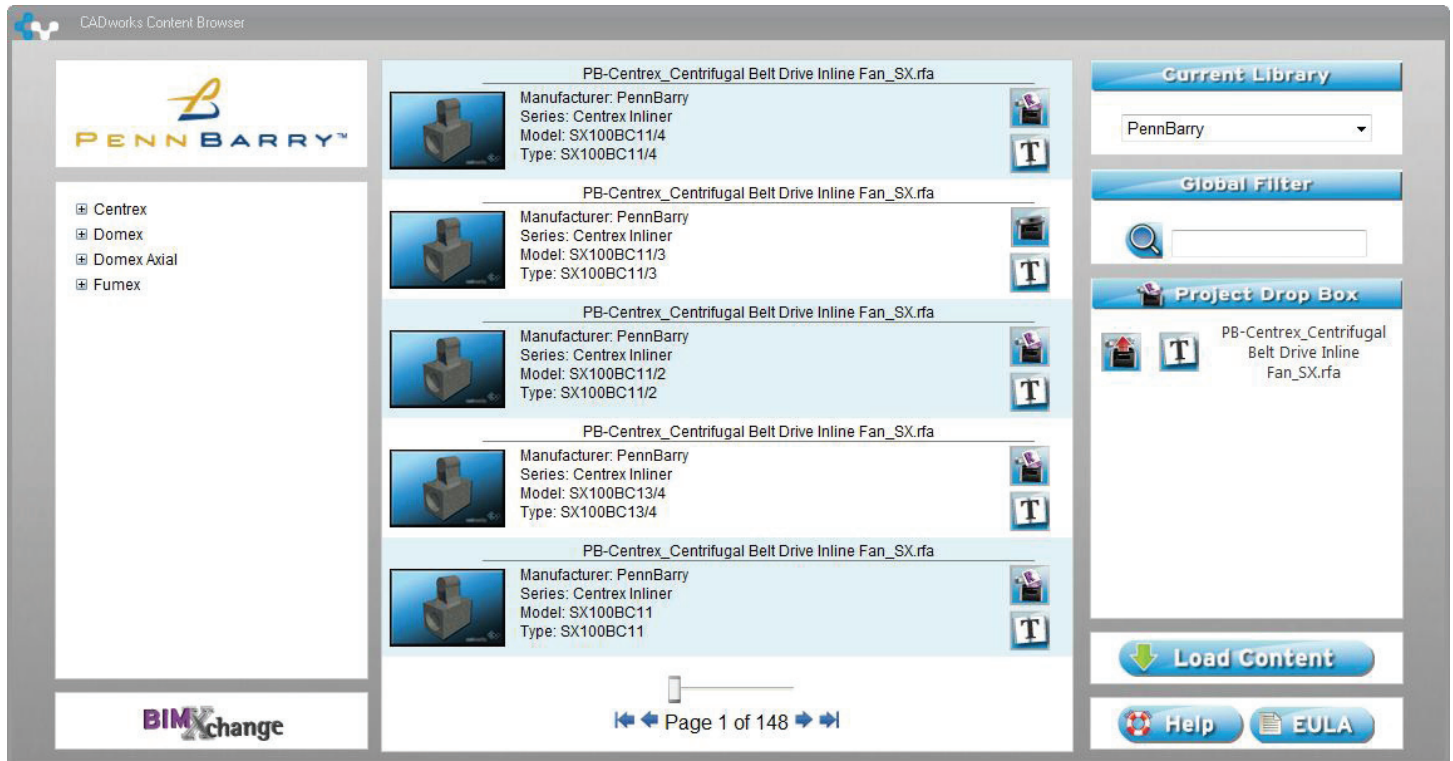# Revit MEP: The Search for Quality Content

Figure 1: BIMXchange interface

When implementing Autodesk® Revit® MEP, most users build strategies for installation, training, workflow, coordination, modeling, and producing construction documents. All are important tasks and need to be considered in any implementation. But many overlook the development, management, and business cost for Revit MEP content.

Let's look at some of the issues surrounding content such as the lack of quality content in the marketplace—a common issue. Sure, there are several websites that provide Revit MEP content, but who are the authors? Are they engineers? Did they test the content on a real project? These are important questions for any Revit MEP user thinking about downloading content from the Internet.

Besides quality, users should consider the strategy for managing thousands of pieces of Revit MEP content. Who will maintain the library? What is the year-over-year cost? How will users access the content?

This article discusses these issues and presents a solution from CADworks called BIMXchange Content Management Solution.

WHAT IS BIMXCHANGE

BIMXchange CMS (Content Management Solution) is an intelligent, lightweight web application that runs directly within Revit. It utilizes CADworks Cloud technology to store, search, and deliver Revit content. Users are able to exchange different libraries of Revit content such as Manufacturer, Generic, or Custom Libraries.

ADVANTAGES OF THE BIMXCHANGE

Navigation of the CADworks BIMXchange, including the tree view shown in Figure 1, is intended to facilitate an engineer's task by mirroring existing manufacturers' categories and organization. Renderings of each product enhance the browser layout by providing a visual preview of the content. To tie it all together, the package includes a custom-branded web page that contains the latest browser download, help, links, and news.

Finding and locating content quickly and efficiently is crucial to the success of usage within a project. Users gain the ability to search the content libraries in each view. These advanced features allow any user to search for values in all parameters of each piece of content. Additionally, all content that is created for any manufacturer library is also included in the CADworks library.

Content is loaded directly into a project from the CADworks Cloud, eliminating the need for a company to manage or backup extensive content libraries. The browser also allows a user to load only the types of each Revit Family that he/she plans to use in the current project. By using only the necessary types, a Revit project file size is minimized, providing increased productivity.

The CADworks Content Browser allows users to access multiple content libraries. Currently, there are five different types of libraries: CADworks General, CADworks Generic, Manufacturer specific, Discipline specific, and Custom (i.e., your company). The CADworks library is a "per seat" license that includes the entire collection of all content created by CADworks and is updated periodically. Manufacturer libraries are specific to projects awarded to CADworks by the manufacturer and contain fully certified content specific to that manufacturer. Discipline specific libraries are just that—libraries that contain only Mechanical, Electrical, or Plumbing/Fire Protection content. Finally, an MEP firm can opt to create Custom libraries that may feature an entire client library, discipline specific breakouts, project specific content, or any variation thereof. Once authenticated, a user can easily navigate between different libraries via a drop-down selection.

INSTALLATION

Navigate to www.cadworks.net/products/bimxchange. To download BIMXchange, select the Revit Content Crower Installers button shown in Figure 2.
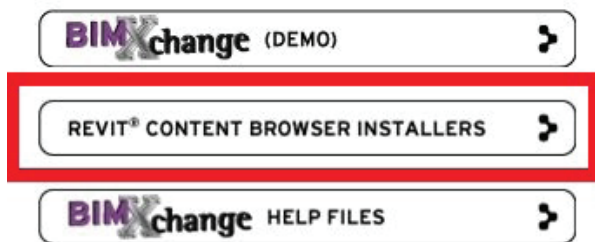

Figure 2: Locating product for download

On the Browser Install webpage, select the appropriate Revit version. Note that some Internet browsers may block this download or flag it as a pop-up. Please verify your Internet browser and network download settings. Choose either Save to a Location or Run the installation from the current link. Once the installer is downloaded, double-click
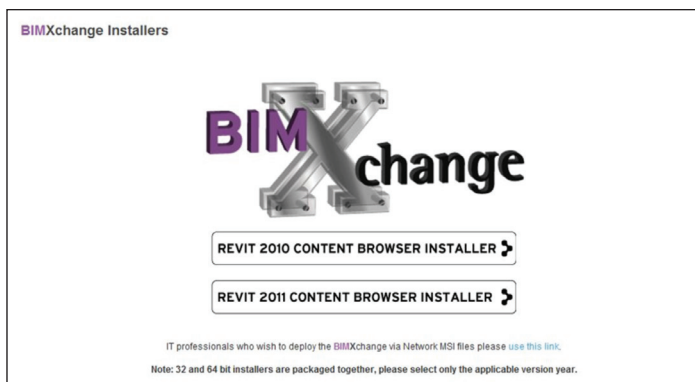

Figure 3: Product selection

BIMXchange 2010 Setup.exe or BIMXchange 2011 Setup.exe to run the setup.

Follow installation wizard prompts and accept the End Users License Agreement to successfully install BIMXchange.

START BIMXCHANGE AND AUTHORIZING LIBRARIES

After installing, users can start BIMXchange directly within Revit MEP. This allows you to quickly access more than 20,000 pieces of content without leaving the Revit MEP environment. Begin by launching Revit MEP and open a new or existing project. Select the Add-Ins Tab from the Revit MEP ribbon and select Setting. To gain access to CADworks libraries you will need to create a new user account by entering your name (first and last), a valid email address, and zip code. After selecting the Create User button, select Authenticate a New Library under Library Manager shown in Figure 4a. Input the 16-digit code where directed. Submit your code and then click Update Info. The application is now licensed. Close the Setting BIMXchange windows.
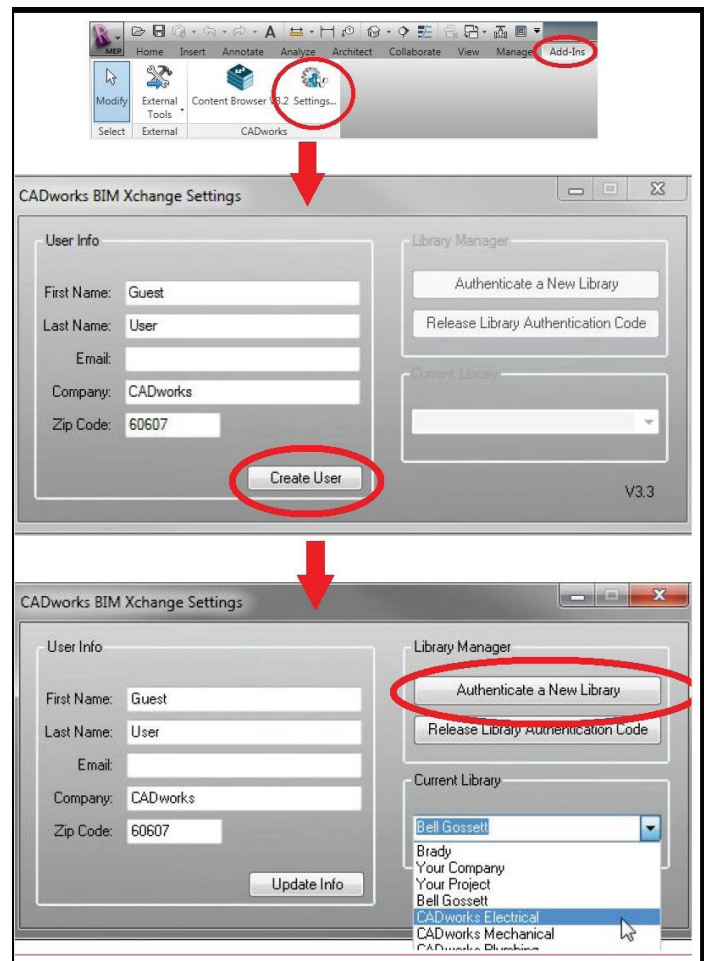

Figure 4a: BIMXchange setting

Inside Revit MEP, on the CADworks panel, select BIMXchange. Once selected, the menu BIMXchange will launch.

If all directions are followed, the browser will appear as shown in Figure 5.
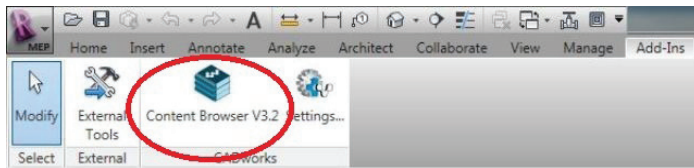
Figure 4b: BIMXchange ribbon

Figure 5: BIMXchange

HOW TO USE BIMXCHANGE

Navigation

BIMXchange includes the creation of manufacturer libraries that, when authenticated through the CADworks Content Browser, allow users to view, search, and upload manufacturer-specific content into their projects. User can navigate the content by expanding the tree in the left pane shown in Figure 6.
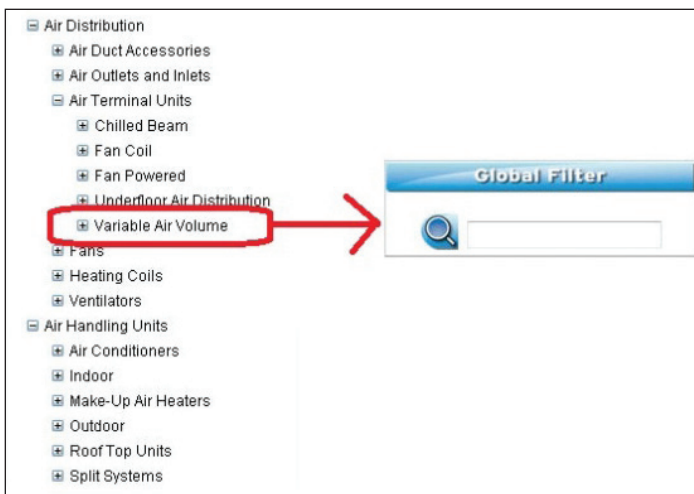

Figure 6: BIMXchange tree view

Users can also search for content types by entering a value in the Global Filter command. This search is a "contains" filter, meaning that if the user has selected an item in the tree, the search will further search the selection set and not the entire library. To return to the main library, select the CADworks logo on the top of the left pane.

Navigation at the bottom of the center pane shown in Figure 7 makes it possible to page through the options that have been selected in the tree or filtered for in the search. The slider above these page arrows provides for more granular page navigation.

Figure 7: Filter slider

To reset the filters and return to the home page select the CADworks logo at the top left hand of the application.

Figure 8: Reset filters

To change between Mechanical, Electrical, Plumbing, and Fire Suppression, simply select the pull-down under Current Library and choose the desired library.
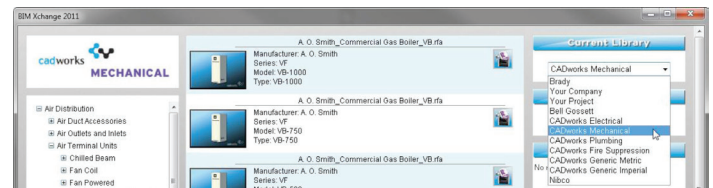
Figure 9: Change libraries

Download and Importing Revit Content

Adding Family types to your Project Drop Box is simple. Click to add the Family type to the Project Drop Box.
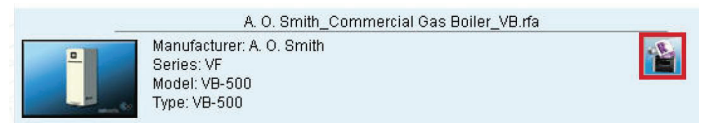
You can also view the Type Catalog of the family by clicking in the button.
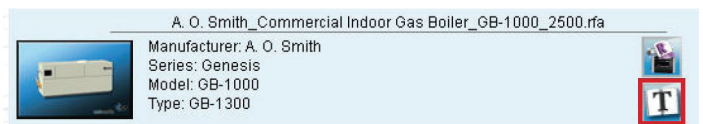
Figure 10 is a sample window of a Type Catalog. In this view it is possible to select multiple types by highlighting them. It is also possible to filter the selections based on options (Contains, Starts With, and others).

Figure 10: Type catalog

Once multiple types of a family are loaded into the Project Drop Box, there will only be one family shown until a different family is added.

Figure 11: Content ready for download

To remove a family and all its types from the Project Drop Box, select

To remove singular instances, select the Type Catalog icon in the Project Drop Box and deselect, or select the following icon in the center pane to remove a singular instance without entering the Type Catalog.

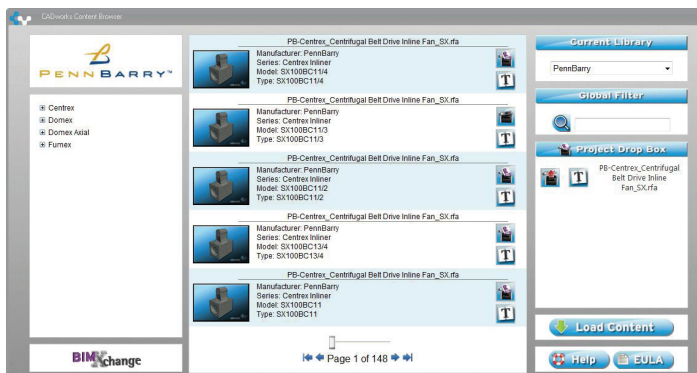Verify the list of items to download in the Project Drop Box and select Load Content. The message below appears on screen, notifying the user of content importing into Revit. Once Complete, the Family dialog box appears.
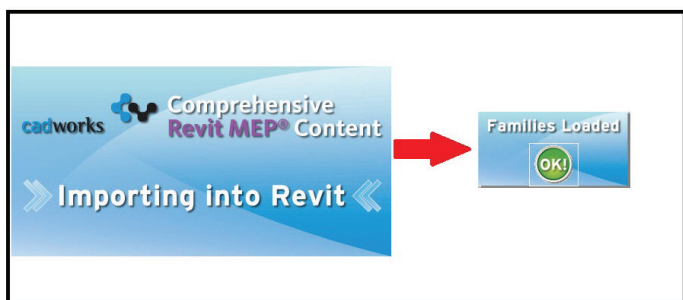
Figure 12: Content confirmation report

To verify that the content was imported into the Revit project, expand the Families category from the Project Browser. Under the Mechanical Equipment category the previously selected CADworks content can be found.
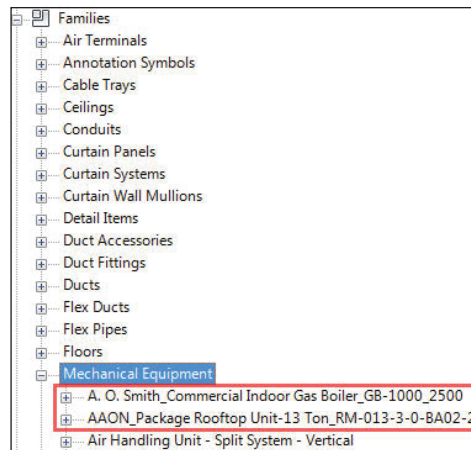
Figure 13: Verify the content has been imported into Revit by viewing Family categories

THE BUSINESS OF CONTENT

Creating, maintaining, and managing Revit MEP content should be a priority for any engineer. Autodesk does a good job of providing generic content with the application, but engineers soon find out that additional content is needed to model complex MEP systems. BIM managers commonly face the decision of developing Revit MEP content internally and/or downloading content from the web. Creating and downloading content have positive and negative factors that need to be considered.

Let's evaluate the decision to developing Revit MEP content internally. A company must consider the cost of creating, testing, and maintaining content libraries. Revit content can be time consuming to create and deploy. Managers should consider the impact of internal creation on project timelines. An experienced modeler can take eight to fifty hours to create a single piece of content.

It is recommended that you contact the manufacturer before developing any content. Many building product manufacturers (BPMs) already support the Revit MEP platform. This will increase with the adoption of Revit MEP.

Bernie Duncan is a past leader for Autodesk AEC Learning Development with more than 20 years of hands-on industry experience within the AECO community. Bernie is the author of the Autodesk Implementation Expert Programs for Architecture, Structure, and MEP. His programs built talent, engaged, and inspired AEC design professionals to bridge the gaps between technology and BIM solutions in the globalmarket place. He can be reached at bduncan@cadworks.net.

Inside Track

by: Erik Lewis

Project Photofly 2.0 photos to 3D models

Project Photofly allows anyone with a common point and shoot digital camera to create near accurate 3D models from photographs using the power of cloud computing. The 3D models can be manipulated through CAD applications or shared with others through YouTube and Autodesk's free* Inventor® Publisher Mobile Viewer application for the iPad, iPhone, and iPod Touch.
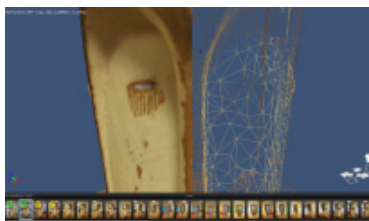
River Analysis Extension for AutoCAD® Civil 3D® and AutoCAD® Map 3D® software

This technology preview of River Analysis makes it easier than ever before to compute water surface profiles for modeling rivers, bridges, culverts, spillways, levees, floodplain and floodway delineations, stream diversions, channel improvements, and split flows.
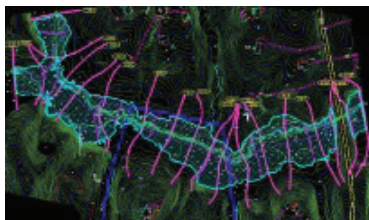
Project Vasari conceptual design and analysis

With an easy-to-use, expressive design tool for creating building concepts, go further with integrated analysis for energy and carbon to get design insight via the cloud. And, when it's time to move the design to production, simply bring your Project Vasari design data into the Autodesk® Revit® platform for BIM.

AUGIWorld brings you recent developments in Autodesk and related software items

iCloud

http://www.apple.com/icloud/

This is the cloud the way it should be: automatic and effortless. iCloud is seamlessly integrated into your apps, so you can access your content on all your devices. And it's free with iOS 5.

CadTools, free 3D and surface utility for AutoCad

Design your civil work in real 3D with this handy tool! Now with Vehicle Turning Simulations (Swept path analysis)

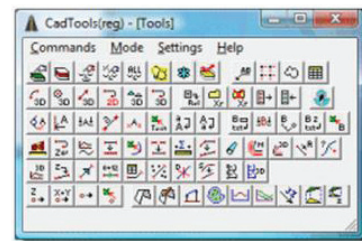CadTools (ToolBox) is developed for Civil Engineers using AutoCAD. There are a number of great software on the market supporting the design process of roads, rails etc. For minor design work CadTools can be very useful, it contains more than 50 commands mostly in real 3D to support your work.

By combining separate commands through the work process you can achieve almost anything you want. When I developed the commands I certainly had some situations in mind but every command can be used in a variety of situations not only in civil work design.

With CadTools you can create your own surface models based on objects in the drawing or import triangles from DWG (other civil software). You can create profiles and cross-sections of multiple surfaces, calculate volumes and plot contours.

It's easy and fun creating real 3D models with CadTools commands, some of these commands can only be found in software that you have to pay money for.

http://www.glamsen.se/CadTools.htm

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Until next issue! If you'd have some news to share with us for future issues please let us know. Likewise, if you are a user of a featured product or news item and would like to write a review, we want to know.

This month's *Inside Track* provided by Mark Kiker.

Revit, in a Database

Building information modeling (BIM) is often seen by outsiders and unfortunately, many insiders, as the creation of a 3D model. Actually, BIM is much more. BIM is about information—architectural design information, systems information, cost information, and schedule information. The information model is equally important, if not more, than the physical model.

Autodesk® Revit® stores not only the location and types of components required to make up the building, but also a host of information about those components—height, length, width, cost, manufacturer, and custom parameters. More often than not, the information included in a model is limited to what is needed to be scheduled in the construction documents. In this article, I will demonstrate how the Revit DB Link plug-in—available in the Autodesk Subscription Center—allows all the information in a model to be exported to a database and imported back into Revit. I will conclude by discussing some of the benefits of having a model in a database.

Figure 1: Link a Revit model with a database.).

REVIT TO ACCESS

The Revit DB Link plug-in is available at the Autodesk Subscription Center. After downloading and installing the file, it will become available under Add-Ins > External Tools > Revit DB Link. When you are ready to export your model, select the plug-in and you will be prompted with a dialog box.

You can export to MS Access via an ODBC link, which will also link to other databases, and MS Excel; however, the plug-in will allow us to go straight to Access.

First, create a new Access database and save it as a 2002-2003 database. Next, select the Revit DB Link plug-in. Under the MS Access tab, highlight [Select a new connection] and click EXPORT. Select the database you created in the first step and click SAVE. If your model is large, the exporting may take several minutes. When the progress bar completes, open the database. You should now have a database with several tables.

Congratulations, you have a Revit model in a database. Now what? Let's modify the database and upload those changes back to Revit.

ACCESS TO REVIT

Once a model has been exported to a database, any changes made in that database can be brought back into the Revit model. These changes can be both attribute modifications such as room occupancy information, and modifications to the components such as wall height.

My model is four walls with a room. I have exported the model to a database and will demonstrate how to modify an attribute and a component. Scroll down to the Rooms table in the database. There will be an "Occupancy" field. In the box, add a number—I added "25." Next, scroll down to the Walls table. Find the "Unconnected Height Field." There should be four entries with the value "20." Modify the heights – I made them 50, 25, 20, and 10. Save the database.

To load the changes back to Revit, select the DB Link plug-in and highlight the connection to the database. Last time we clicked EXPORT, but this time we will click EDIT and IMPORT. As Revit uploads the database, it will prompt you with a list of the tables you can import. First, select the rooms table. Revit will use your default web browser to display a report of

Figure 2: List of Revit tables in Access.
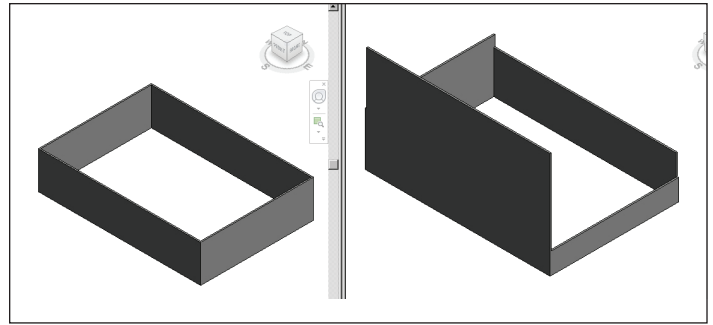
Figure 3: Original and modified models via DBlink.

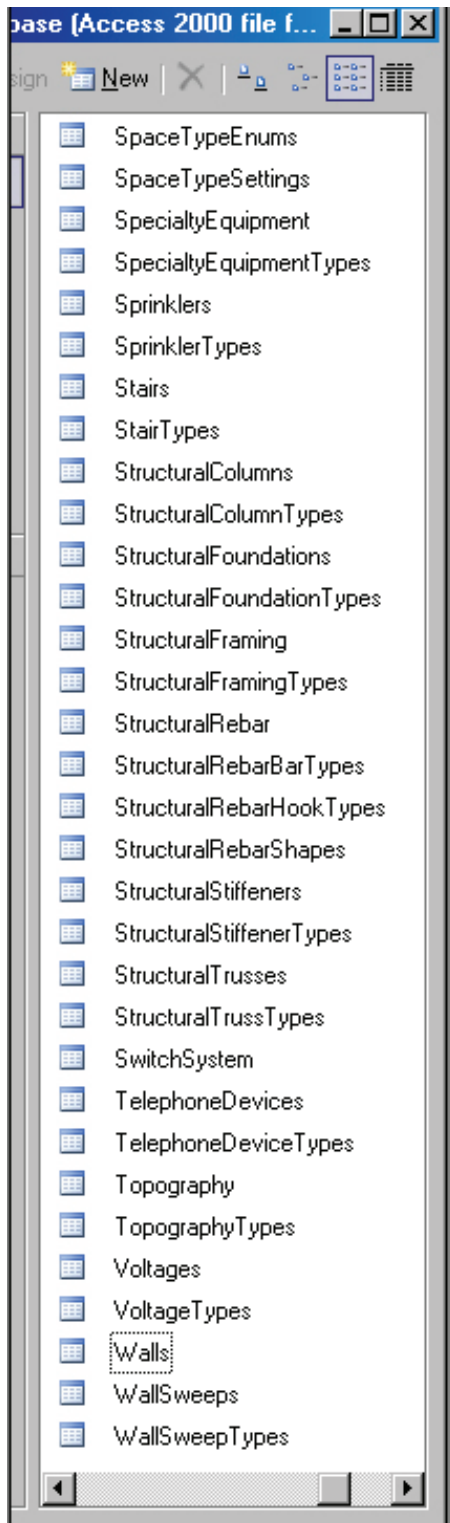the changes that have been made. Notice that there is a list of tables that cannot be imported. Go back to the model and select the room. The occupancy field has been updated. In the model, select a 3D view. Follow the same steps as with the room EDIT and IMPORT, but select the WALLS table. The 3D view will automatically update and the walls are now different heights.

REVIT TO EXCEL

Revit can also export to other databases and MS Excel. To export to Excel, you need to create an ODBC connection. You can either select a new DSN after clicking EXPORT in Revit, or you can create the connection from Windows under Control Panel > Administrative Tools > Data Sources (ODBC). Follow the same steps as exporting and importing from Access.

I know more people may be familiar with Excel than with Access, but it is my opinion that exporting to Access is, in most cases, a better choice. For one, an Excel export can be uploaded back to Revit only one time. The sheet must be deleted and re-exported if you wish to upload it again. If you must use Excel, I would recommend exporting the model to Access and then link the Excel sheets to a table in your database—always going through Access to Revit.
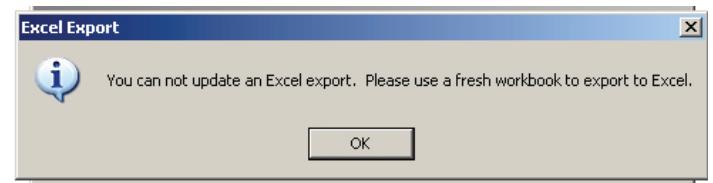
Figure 4: Trying to export to Excel for a second time.

BENEFITS OF REVIT IN A DATABASE

One of the most obvious benefits of having a Revit model in a database is the ability to generate reports and schedules that are much more advanced than those created natively in Revit. Currently, Revit cannot concatenate strings or use an IF statement with text. Access can.

Just as we create project templates in Revit, we can do the same with Access. Because Revit always exports the same way—tables always have the same names and there are set parameters that always export—schedules can be created in advance. Other tools,

such as Pivot tables, queries, and forms can also be created in a template. When the model is exported into the template database, these tools will auto-populate or can be run immediately.

We can create database templates for Revit because when Revit exports to a database, it only writes its data to the database. This even applies to fields within a Revit table. For example, Revit will write out a Wall table. If we add a field to this table in Access, Revit will ignore it when importing the model back to Revit and when exporting it out.

This is important because it means we can load data into a project that may not need to exist within the Revit model. For example, a table with wall assemblies and costs could be loaded into the Access database and joined with the Walls table from Revit. We could then create a report of all assemblies and their costs.

When large amounts of data are added to components in Revit, performance takes a hit. By splitting the model—adding only the necessary information in Revit and joining the rest within Access—we can keep our file sizes down and work more efficiently.

Access allows for the creation of forms. A form is a portal to the database. The creator of the form can select what the user has the ability to query or modify. This gives others in the office the ability to query and modify a model without using Revit. This could be valuable if an employee from marketing needed certain information from models. They could pull this information through the form in the database.

We can take the form concept even further. Databases serve as the back-end to many websites. Through the use of the commonly used programming language PHP, a website can be built and connected to a Revit model which has been exported to a database.

> One of the most obvious benefits of having a Revit model in a database is the ability to generate reports and schedules that are much more advanced than those created natively in Revit.

This would allow queries or modifications of the model from anywhere in the world.

Finally, by separating the modeling from the data entry we can allow the architect and drafters to work on the physical model while another employee updates the database with attributes. After the architect places rooms, he or she can export the model to a database. A coworker can then open the Rooms table and enter the department, room number, and occupancy attributes. Because Revit asks us to select which tables are imported back to the model, we can make sure that only the Rooms table is uploaded. Any changes to other tables that may have occurred by mistake are ignored. Furthermore, because Revit generates an HTML report of the changes made, we have a document trail to show us if any mistakes have occurred and when.

CONCLUSION

Once a Revit model has been exported to a database, the things that can now be done with it are limited only by your imagination. Build web-based or stand-alone front ends to access and modify your model—without knowledge of the Revit API. Bring existing data into a database and join it with the Revit model.

The importance of the "I" in BIM should not be overlooked. Hopefully, I have shown you a way that makes it easier and less costly to add and maintain the data associated with your project. The greatest benefit of the Revit DB Link is the ability to load the data back in to the model, making sure it is always up to date.

Paul Crickard is an educational facility planner in Albuquerque, New Mexico. He is one of the first planners to adopt Revit and Building Information Modeling (BIM) in the preparation of master plans for the state. Currently, he has been working on the integration of Revit and BIM in Geographic Information Systems (GIS). With a Masters degree in Political Science and a background in Community, Regional, and Educational Facility Planning, Paul combines rigorous social science theory and techniques with practical planning and architectural projects. He has presented papers at the United States Naval Academy's Foreign Affairs Conference and the American Journalism Historians Association Regional Conference in Salt Lake City. He has given demonstrations on the use of Revit, BIM, and GIS to the Public School Facility Authority in New Mexico and the Albuquerque BIM505 Users Group. He can be reached at paulcrickard@educationalfacilityplanning.com

Linking Revit Structure to Analysis Applications

More than a dozen analysis applications have bi-directional links to Autodesk® Revit® Structure. These links send structural analytical model data from Revit to the analysis application for structural analysis and often code checks as well. The analysis and design process often results in changes to the model, particularly member size changes, and the analysis links allow those changes to be brought back to Revit. We will look at the process of using a third-party analysis application to design a building modeled in Revit Structure.

The examples illustrated here will use SI Xchange v3.0 for Revit and STAAD.Pro, which will be released this summer. However, most of the issues covered below are applicable to any analysis link.

KNOW THE DIFFERENCES

Every 3D modeling program is different. Not only are the user interfaces different, but the way data is stored varies from program to program. In general, this is not an issue for the user. However, when interoperability comes into play, it is helpful to understand how your analysis application handles data in the model, including how it handles certain modeling conditions such as cantilevers or multistory columns. And it is essential to understand how your analysis link accounts for these types of differences between the two programs.

For example, because STAAD.Pro deals with a finite element model, beams and multistory columns must be discretized where other members frame into them. This is done automatically by SI Xchange so that one physical beam in Revit may correspond to multiple beam elements in STAAD.Pro. SI Xchange assigns a group in STAAD.Pro to the corresponding beam elements so they can be identified and assigned the same design and material properties.
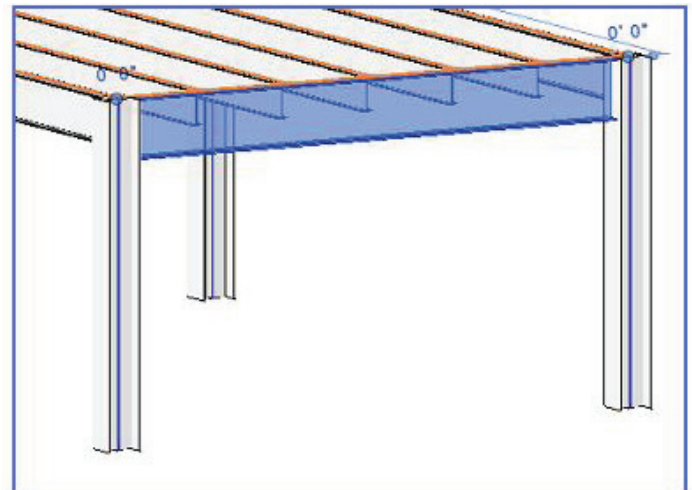

Figure 1: One beam in Revit (top) becomes multiple elements in STAAD (bottom).

Although SI Xchange assigns a group label to all of the elements corresponding to a single Revit member, the user is still able to assign different properties to each individual element inside STAAD.Pro. By understanding how SI Xchange handles this situation, the user can be careful not to assign different member sizes, materials, or rotations to elements belonging to a group generated by SI Xchange. When importing changes from STAAD. Pro, SI Xchange will check that the properties for all elements corresponding to one Revit member are identical and will issue a warning in the log file if any differences are found.

Another common difference between Revit and an analysis application is type or section property names. Although steel sections tend to have standardized names, they can differ between applications. Most analysis links provide some way to overcome these differences through customized settings. In many cases, differences in naming can be resolved automatically by the analysis link if given some additional information from the user, such as mapping of Revit families to a shape and member type.

In some cases, however, this is not possible—and a one-to-one mapping of type names is required. A case in point: STAAD.Pro does not use standardized section property names for all steel shapes. Single angle type L8x8x1in Revit Structure corresponds to L808016 in STAAD.Pro. To accommodate this, SI Xchange provides a text file that maps the STAAD.Pro names to the standardized names for each type.

Another example of an analysis link accounting for differences between model data is how the RAM Structural System link accommodates cantilever beams. In Revit, a cantilever beam is modeled as a separate beam, supported at only one end. In the RAM Structural System, a cantilever is specified as a length at the start or end of a beam, which projects out past the beam's support. To correctly export a cantilever to the RAM Structural System, the user must set the corresponding Start and End Connection properties for the corresponding beams in Revit to Cantilever Moment. On export to RAM, these beams will be merged into one cantilevered beam.

In an another example, RISA's documentation for the Revit 2011 link details how to model X-braces in Revit in order to achieve the correct geometry inside RISA for analysis and design.

CHECK THE SETTINGS

Correct program settings are essential to successful analysis integration. This includes settings in the analysis program and settings in the link itself.

As mentioned above, mapping of Revit type names to the names used by the analysis link is an important step. For standardized names, this can be done automatically; however, an analysis link typically needs some information to help with automatic mapping. In SI Xchange, Revit families are mapped to a shape, category, and material. The link then uses this information to find the correct section size in STAAD.Pro. Although SI Xchange comes preconfigured with mappings to common Imperial and
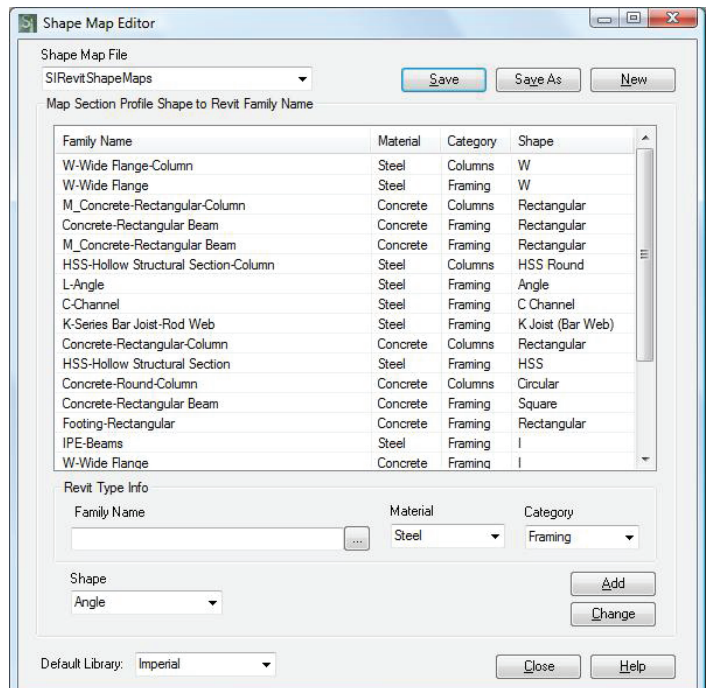

Figure 2: Shape Map Editor in SI Xchange.

Metric families, the Shape Map Editor allows the user to add any families not already included.
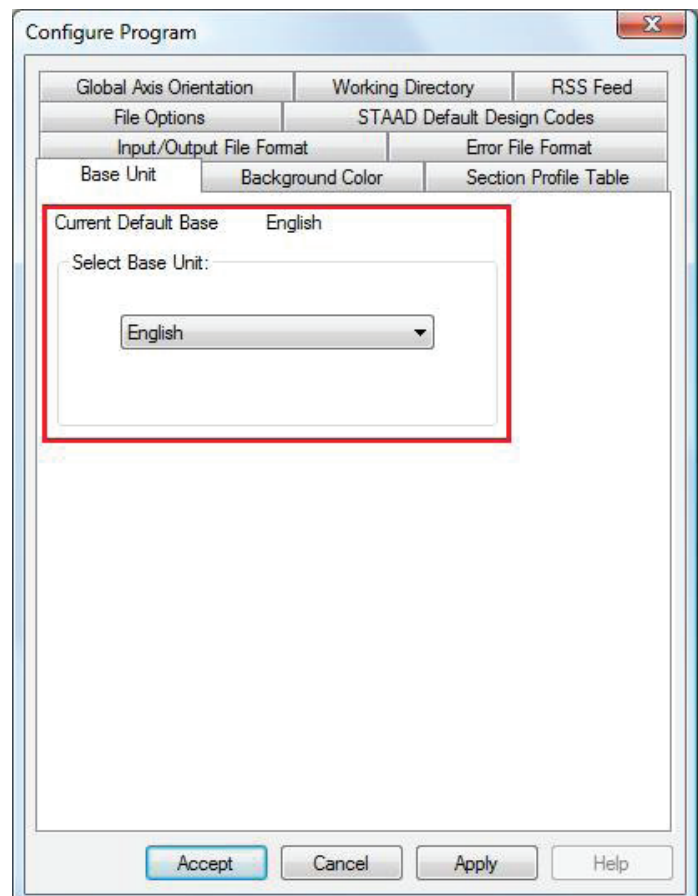

Figure 3: Set units in STAAD.Pro.

Another issue to consider is units. When exporting to STAAD. Pro, it is important to make sure your units are set correctly. Prior to export, be sure to set the Default Base Unit in the Configure Program dialog in STAAD.Pro to match the unit type in the Revit model, either English (Imperial) or Metric.

In the Export to STAAD.Pro dialog, you can also specify inches or feet for Imperial (English) units.
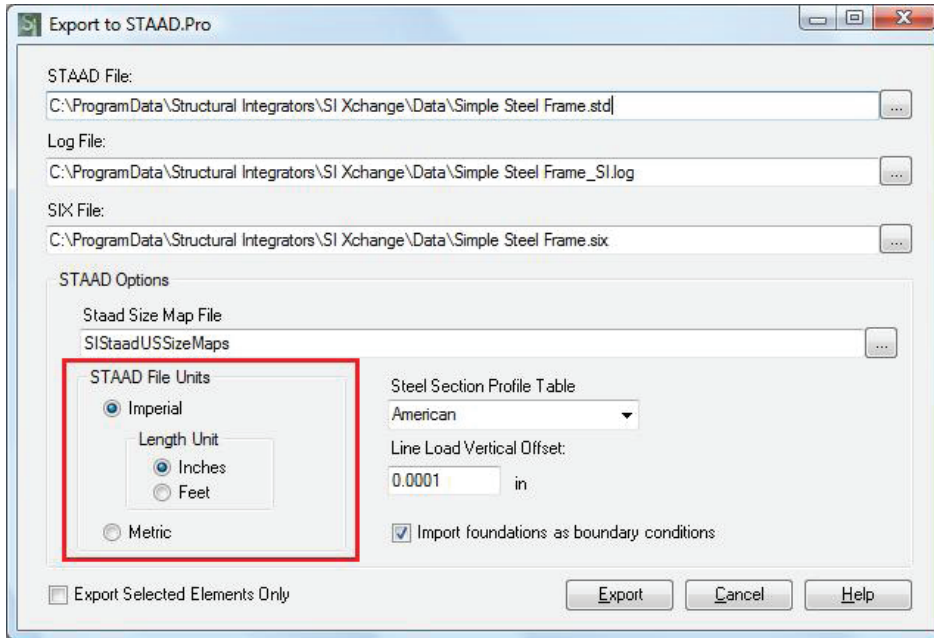

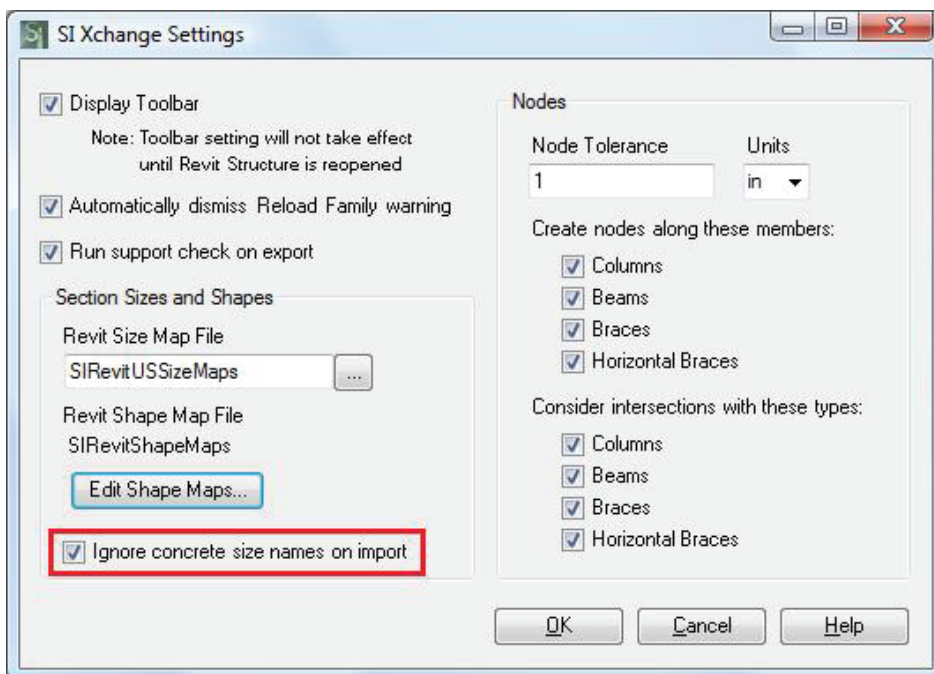Figure 4: Specify unit type on export.

Figure 5: Ignore concrete size names on import.

Each analysis link has its own settings, specific to how that link and corresponding analysis application work. It is important to know what settings are available and how they will affect the outcome of the exchange.

KNOW THE LIMITATIONS

All analysis links to Revit Structure have some limitations. Some data may not be exported from Revit, or may be altered on export, either due to limitations in the link itself, or due to the inability of the analysis application to accommodate the data. For example, an analysis program that cannot handle curved beams may either ignore a curved beam or approximate the curve using a series of straight beams.

Limitations may affect the import of changes from the analysis program as well. One case that comes to mind is dealing with concrete sections from STAAD.Pro. STAAD.Pro does not allow user-assigned names for concrete sections, but instead generates a name based on the shape and dimensions. When importing changes from STAAD.Pro, names of concrete sections will not match the corresponding type names in Revit. For this reason, it is preferable to ignore the names and simply compare shape and dimensions so that the Revit type name is not changed to the STAAD.Pro name. The Settings for SI Xchange allows for this as shown in Figure 5.

It is important to read all of the documentation that accompanies an analysis link so that you understand any limitations and account for them as necessary.

EXPORT THE MODEL

Once you have accounted for any relevant limitations or differences between the Revit Structure model and your targeted analysis model, it is time to export the model. On export, most analysis links have one-time settings to consider. A common option in analysis links is to only export the selected elements from Revit. This is useful for excluding some portion of the model, or analyzing a single story.

When exporting from Revit using SI Xchange, you need to specify three file names. One name is for the STAAD file that will be generated, one is the log file, and one is an SI Xchange file. By default, names for these files are generated based on the Revit Structure project name. The SI Xchange file is an intermediate file that is used to map model data between STAAD.Pro and Revit
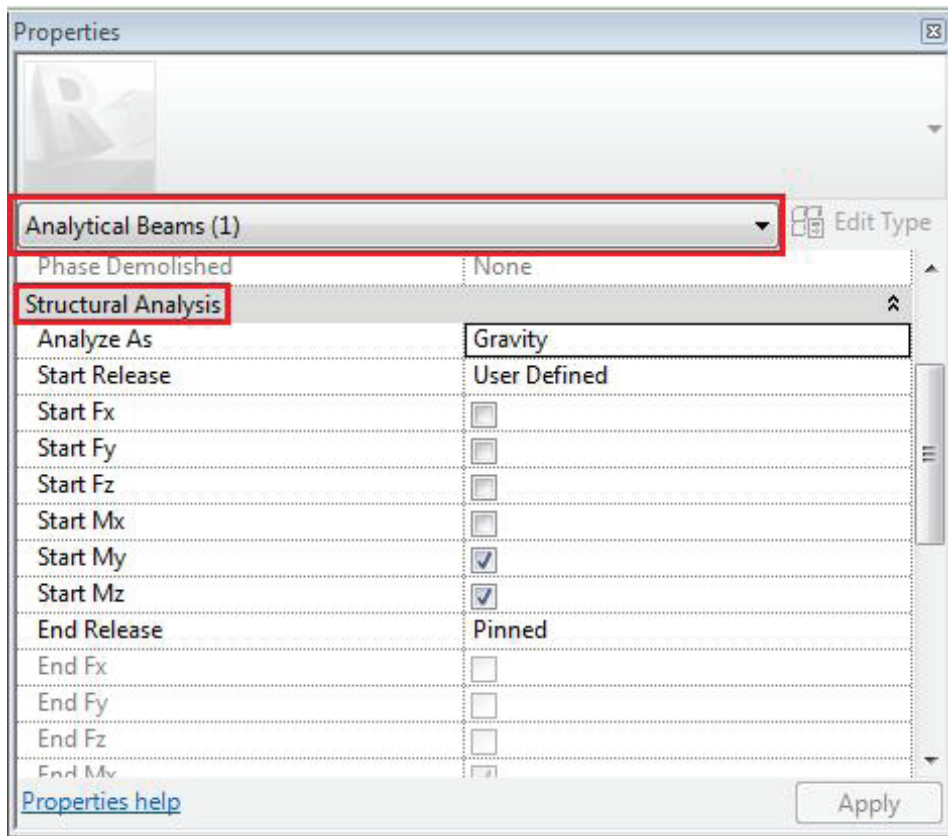
Figure 6: Structural Analysis Properties.

Structure to accommodate the two-way data exchange. This file is required when importing changes back to Revit. RISA uses a similar exchange file in their Revit link.

A useful option offered by most analysis links is the option to export to an existing file. This option updates the model with any changes from Revit, but will leave other data in the analysis model intact. This is useful if the Revit model has been updated after changes have been made in the analysis program to data, like analysis settings, that are not transferred from.

After exporting the model, be sure to look at any error, warning, or log messages generated by your analysis link. SI Xchange will generate a summary of the export indicating if any members failed to export, but you should always click the View Log File button to view a detailed export log to see if there were any issues on export. Sometimes a member will be exported to STAAD, but the type is missing because the corresponding member size was not found in the STAAD table. These types of warnings are only found in the log file.

Once the model is exported and any issues from the export are resolved, you can then analyze and design the model in the analysis application.

IMPORT CHANGES
After running through an analysis and design, the model may have many changes, most noticeably to sizes of members. These changes can be brought back to Revit in order to keep the Revit Structure model accurate. The analysis link may offer one-time

options when importing changes. For example, there may be an option to delete members in Revit if they were deleted in the analysis application. Sometimes it is useful to have members deleted in Revit to keep the model in sync with the analysis model. Alternatively, members not necessary for analysis may have been deleted, but it may not be desirable to have the members deleted in Revit.

After importing, it is important once again to check any warning, error, or log messages to ensure all changes were imported back to Revit.

REVIEW THE MODEL
Once the model has been updated from the analysis link, you can review the changes in Revit. Member information such as type, rotation angle, and material can be viewed in the Properties palette, along with analytical results such as camber and stud information for beams.

In Revit Structure 2012, to view additional structural analysis properties you'll need to select the Analytical option in the drop-down Properties filter near the top of the Properties palette. This is where you can view the Start and End Releases for a member as well as other analytical properties.

The key to successful interoperability between Revit Structure and your analysis application is understanding the differences between the programs, knowing the limitations of the link, ensuring proper settings prior to export and import, and reviewing the results including any messages from the exchange process.

For more information on SI Xchange, please visit the product page at: www.structuralintegrators.com/products/si_xchange.php. For a comprehensive list of Autodesk Revit Structure Analysis and Design Links, visit: usa.autodesk.com/adsk/servlet/item?siteID=123112&id=14407681&linkID=9280963

Elizabeth Shulok is the founder of Structural Integrators, LLC, a software company based in Escondido, California, that provides integration tools for the structural engineering industry. As a software engineer, she has specialized in interoperability issues for over 12 years and has worked extensively with the Revit API for the last 7 years. She can be reached at Shulok@StructuralIntegrators.com.

Navisworks Manage, from a Contractor's Perspective
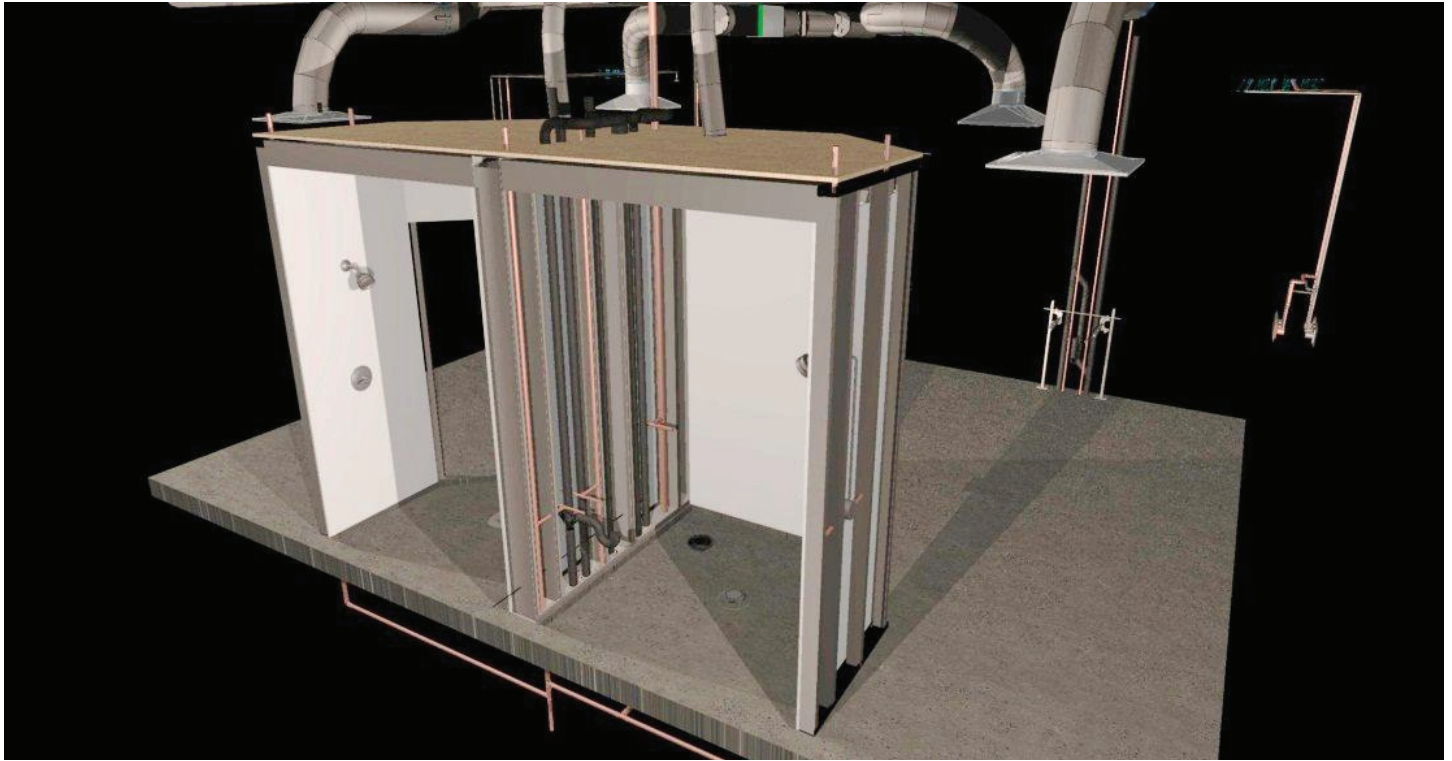
There is more to the saying "a picture is worth a thousand words." For us this statement is very true and has paid off in many different ways using Autodesk® Navisworks® Manage and Presenter as a way to coordinate, get a point across, or deliver what we like to call "the WOW factor."

At first the thought of rendering from a contractor's perspective is almost always seen as a waste of time and money. Why would we as a company be willing to spend any effort on making things look pretty in a picture? You cannot use it for submittals or fabrication; it takes time away from production and essentially is billed as the dreaded word "OVERHEAD." Visuals are everything in this age of 3D BIM and IPD. Trying to coordinate is pretty easy now with the tools we have at our fingertips if we look at things from an outside-the-box approach.

We started a large hospital IPD project last year and for most of the team this type of trade partnership and integrated design with the owner/architect and contractors was a new experience. As a design build mechanical contactor, we are accustomed to the coordination process and very familiar with 3D modeling. Getting in on the ground floor of the design and 3D modeling up front is a huge benefit for us and an opportunity to give some

input into some of the building's design with the architect to get a better-built, cost-effective system for us to build. Prefabrication was a hot item and the obvious choice in cost saving for all trades.

The first task for the design team was designing a prefabricated back-to-back patient restroom that could be designed on the ground in a fabrication environment and then be hoisted into the five-story building as floors were ready. The restroom was on the exterior of the building so they would be lifted and pushed into place with the connected utilities between floors added after installation.

I was tasked with getting the project model off the ground. Starting with the 2D arch plans I created the models walls and slab portions adding plumbing, piping, and ductwork then sent the model to the fire and electrical contractors for them to model their portions. We put it all together in Navisworks and did a couple online group meetings with the owner's rep and the design team. The presentation was good, but in basic Navisworks Manage shaded views it just didn't quite pop for me. So the persistent side of me came out and I started playing with the rendering tools in Manage. I had always been into rendering in AutoCAD with Accrurender and 3ds. So I jumped in with both feet and gave it a shot. The outcome was rewarding and fairly easy. This image

(Figure 1) is the first saved rendering after about 10 test renderings. The best part of the rendering was finding out that half the team had made the image the wallpaper on their workstations. The design was a success and we are in production of the mock-up now.

Let's take an example from a collision/coordination meeting I was in today. The soffit design in the new medical center atrium was too small to fit all the required ductwork supplying the linear diffusers below. Navisworks was the perfect solution to show this situation. This is the typical viewing style for most of us using Navisworks today in the contractor's world and was effective in showing our concern. But with a little bit of time and effort, this viewpoint could transform into an almost photorealistic picture.

I am going to try to use this viewpoint as an example and take you through a fairly easy way to get a life-like rendering. This view (Figure 2) is the basic render style set to full render. This is basically just a shaded view with some shadowing and highlights.

Figure 2

There are seven tabs on the Presenter palette and I will touch on
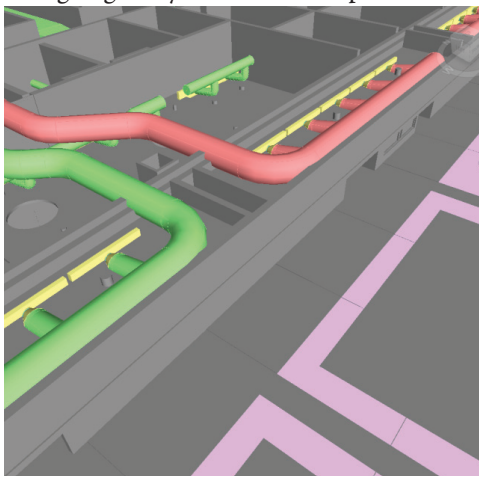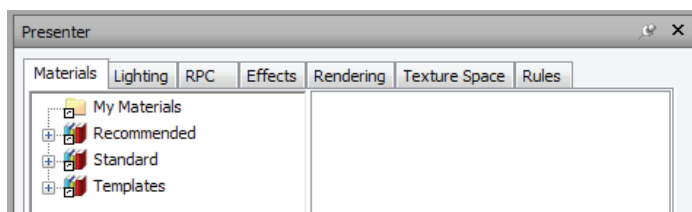

Figure 3

most of them in this article. Figure 3 shows a screen shot of the tabs in Presenter.

The first tab we visit is Materials. The Materials tab is actually really easy to use to create a materials library and apply it to selected items in a variety of ways. You can drag and drop right onto any object, apply it to selection sets or layers by selecting objects and then materials, or choosing a material then the objects. Figure 4 is hitting the render button and Figure 5 is the same rendering after materials are added. Figure 6 is a screenshot of my Materials palette by simply browsing through the library and dragging them into your library on the right side of this tab.

The next tab to visit is Lighting. This is a bit intimidating at first, but trial and error will let you get comfortable pretty quick with
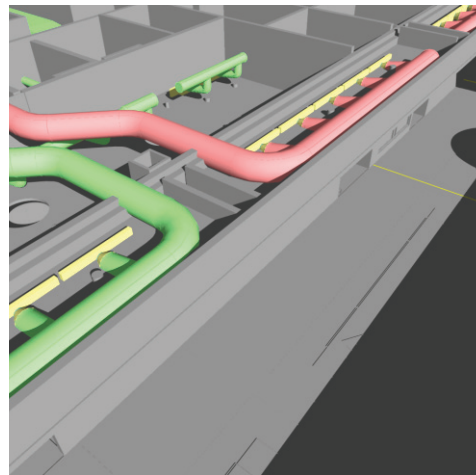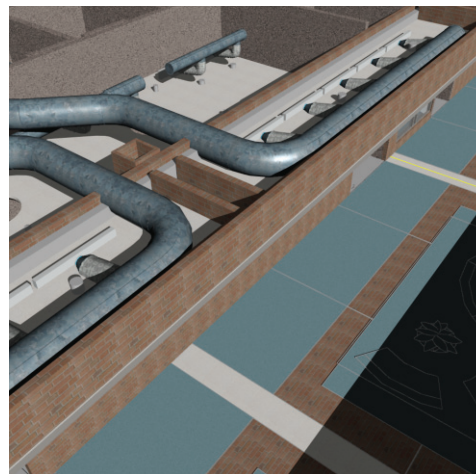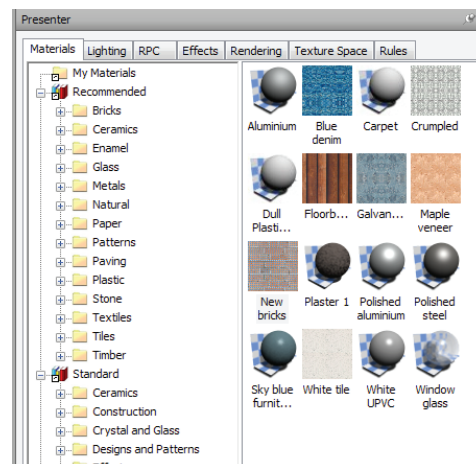

Figure 4

Figure 5

Figure 6

something other than the generic lighting defaults. There are three default light types in a typical model when you start rendering. You can toggle the existing lights on or off and control the intensity as well. I found it is best to keep them around until you are really set on a light to manually insert into the project. Figure 7 shows the default lighting and Figure 8 is after I dragged an environment sky light from the recommended lighting archive onto my lighting palette then un-checked the default lights and hit the render key. This alone made quite a visual difference seen in the rendering (Figure 9).

The next tab to visit is RPC. This tab is used to add fairly realistic people into your renderings. I found that the best way to get through some parts of the software is to just try it and to learn by trial. I added a few people and a tree to my scene and hit the render button. When it rendered I didn't see the people I had inserted. I knew I had just added three people and a tree but where were they? After some digging I discovered that the images are deep inside the Navisworks Manage folder and that I had to browse to them in their individual properties dialog box to get them to show. Figure 10 is the populated rendering.

Navisworks Manage
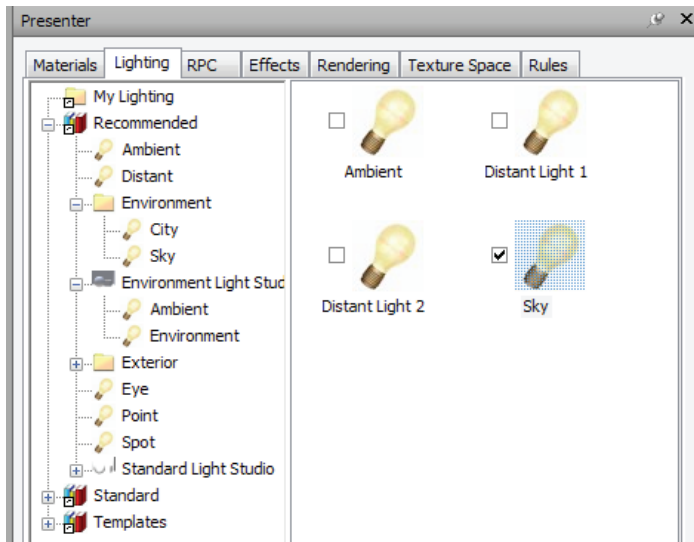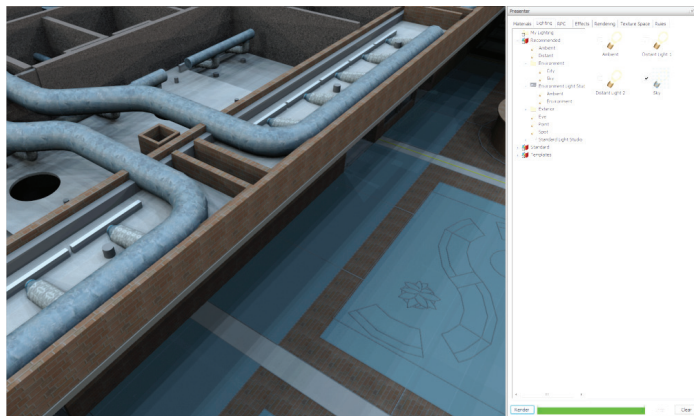
Figure 7

Figure 8

Figure 9

Not really sure if this is normal, but these steps are what I had to go through in putting this demonstration together. Figure 11 is

Figure 10
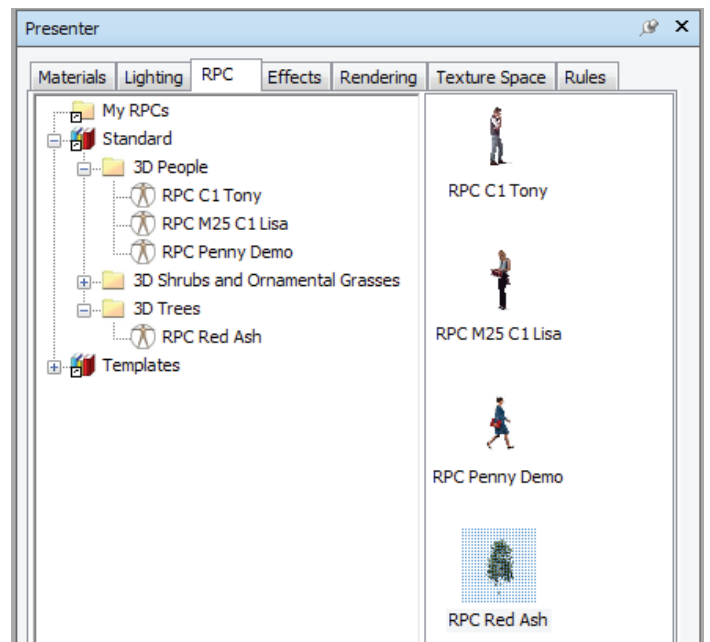
Figure 11

after browsing for the files and Figure 12 is the path to where I finally found them.

The next tab is Effects. This is a fun tab to play with to try different things in your renderings. Under this tab, you can add backgrounds, sky scenes, cloudy sky, and even street or factory scenes. Depending on your desired outcome, this can really add realism to your images. Figure 13 is after adding a cloudy sky from the archive and Figure 14 is after I did the final render-
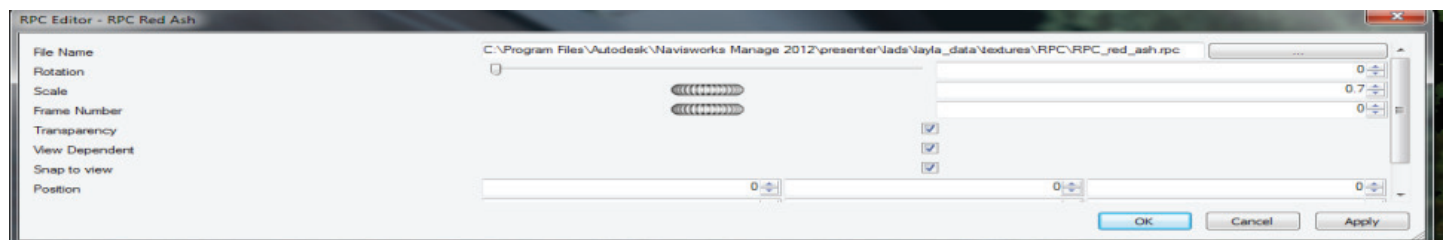
Figure 12

Figure 13

Figure 14

The Rendering tab is next in the Presenter palette and the one where I quickly notice a big difference in the quality of a rendering. You can do test renderings with a low setting (Figure 15) and then when you get set to save the image to a final output you switch to a high quality setting. It's as easy as dragging and dropping the higher setting (Figure 16) render to your palette. You also can do some crazy effects as seen in Figure 17. You can only have one render setting at a time in your palette.

There are two more tabs in the Presenter palette. The Texture Space tab is used for mapping textures to objects. You can think of it as a form of shrink wrap for an object or geometry. You can select an object and apply a jpeg or bitmap image to it through the Materials tab and palette, then in the Texture tab change h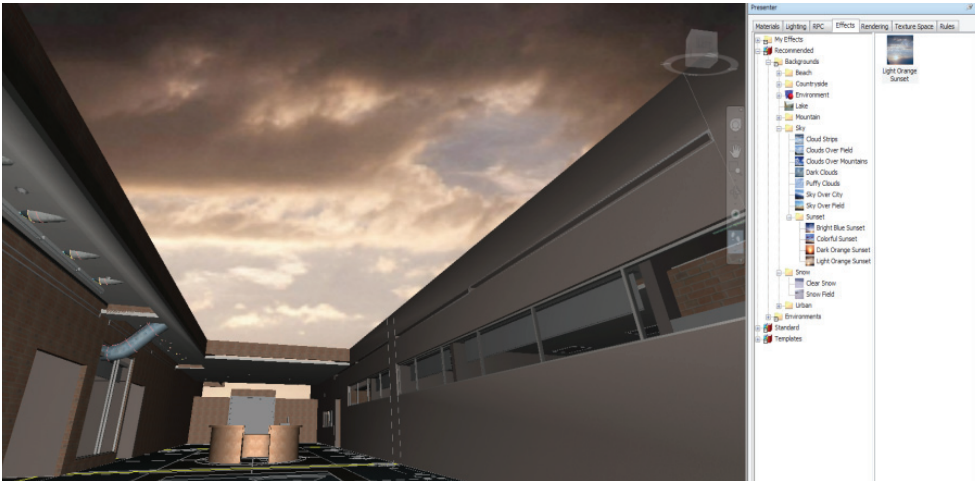ow the image is "wrapped" around the object. An example would be to apply a label to a cylindrical object and then apply a cylindrical texture space or wrap to it. This would make the image curl around the can and look better than just a square image on the front of the object.

ing. Notice the reflection in the window material added earlier. (Pretty realistic!)

There are more really cool things you can do in the Effects tab such as adding foreground fog and background images.

Figure 15

Figure 16

Texture takes some time to master, so my advice is to start simple with a few types of objects. Let's say start with a cylinder, a box, and a sphere in basic AutoCAD®. Import them into Navisworks and try a few different types of texture mapping to the objects (Figure 18).

Navisworks Manage
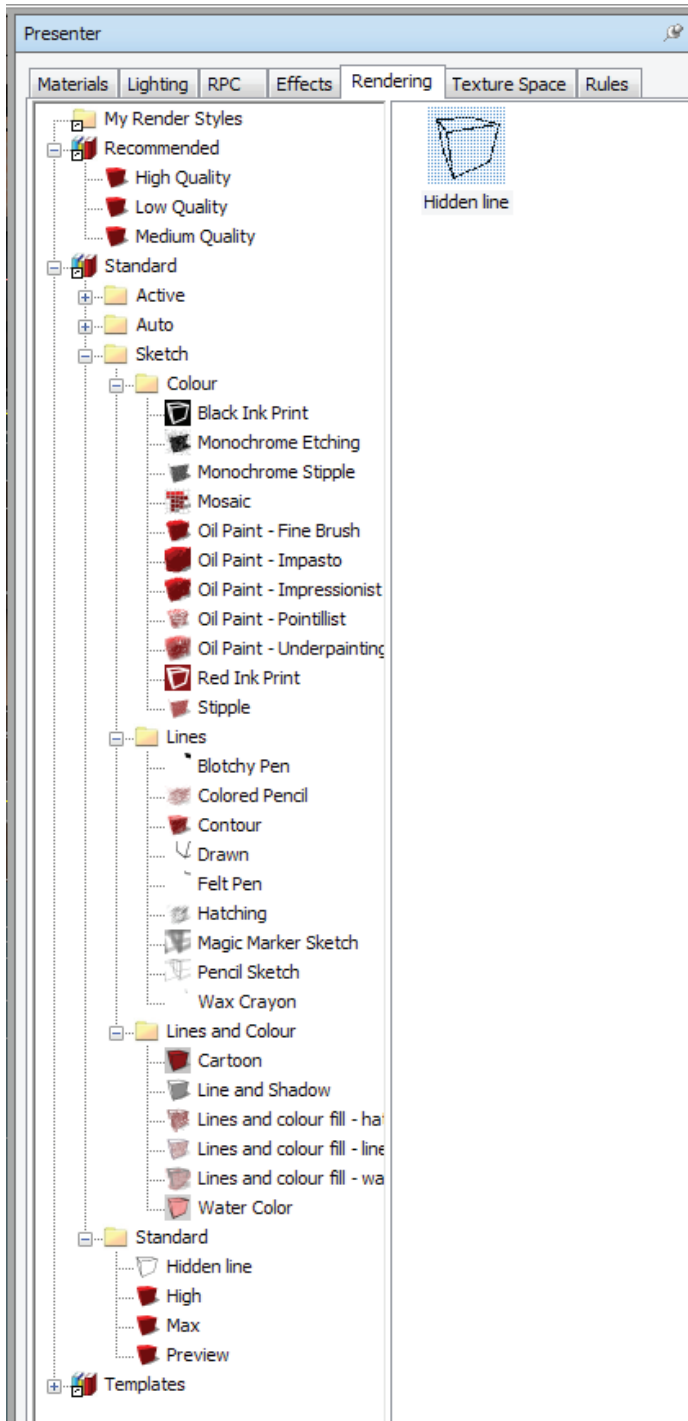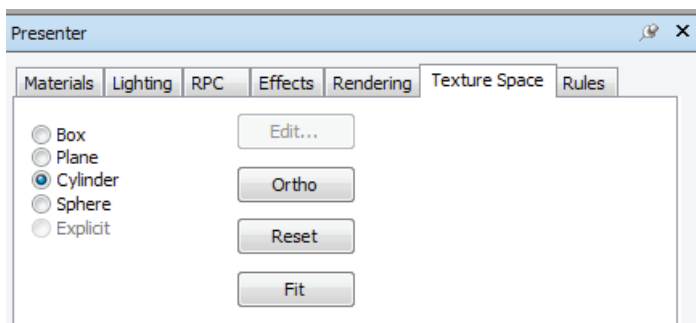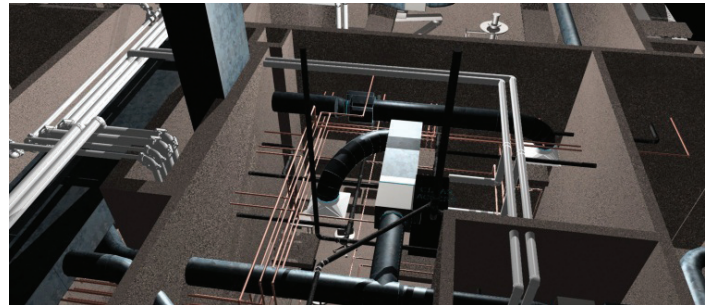
Figure 19

Figure 20

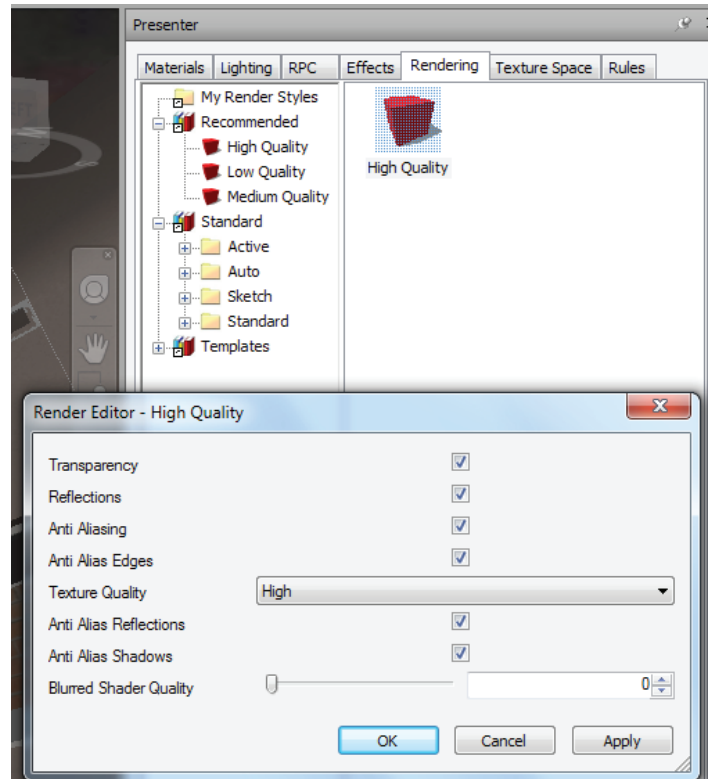The final tab is for setting up rules in the Presenter palette. This is an excerpt from the Navisworks help file and explains it quite clearly; *The Rules tab of the Presenter window allows you to apply materials to models according to certain user-defined criteria, rather than by dragging and dropping onto individual layers, groups or components. For example, all layers that are floors can be assigned a material called "floorboards," without having to manually drag and drop the material on to each floorboard. Each time the model is updated, the rules then just need reapplying, rather than manually reapplying materials to all items.*

With a little patience and practice you can easily render any of your models in Navisworks Manage using Presenter and impress your clients or possibly land that new job if the owner is on the fence about making the big decision.

Good luck and happy rendering.
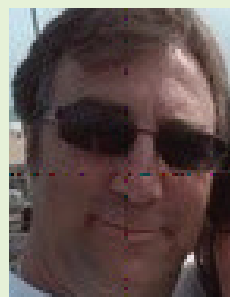
Chris Lanahan is the BIM/Cad Manager at Southland Industries as well as a plumbing designer. He has 18 years experience in design/operation of software. His experience includes: Autodesk University Presenter, AutoCAD® 2D and 3D design for mechanical and plumbing systems, AutoCad MEP Specialist, 3D Solid modeling and rendering in Inventor and Solidworks, Navis Manage Trainer, Lean manufacturing, prototyping, and creating mechanical designs for new and existing construction. His experience also includes 17 years of plumbing as a contractor, designer, estimator and service repair plumber.

Figure 17

Figure 18

Which Render Engine is the Best?

This article explores some of the different rendering tools available for 3ds Max. Together with a few comments on theory and varying approaches to rendering, there is also a brief description of several popular rendering tools in use today.

Which render engine is the best? Sounds like a simple question, but it isn't. "It all depends" would be my answer. Actually the question should be: "What is the best render engine for me in my line of work? I will try to help you define which render engine is best for you and your work, but first you need a basic understanding of render engines. The task of any rendering engine is to calculate the color of the rendered pixels represented, based on lighting materials.

In render engine country there are two main streams—biased and unbiased. Biased basically means that you can define assumptions

the renderer makes during the pixel calculation process. This allows you to tell the rendering engine when to make estimates and when to be specific. Unbiased means that no assumptions can be made. Inside the biased group you will find products such as mental ray, V-Ray, and FinalRender. In the unbiased group there are Fryrender, Maxwell, Iray, and V-Ray RT.

Don't make the mistake of comparing these two main stream types because they are fundamentally different. Inside the unbiased group you usually start a calculation, which will basically never finish, as the render engine keeps on improving the image until you tell it to stop calculating. Inside the biased group a

calculation is finished based on criteria you have told the render engine. Within this biased group you can actually "cheat" the laws of physics, which is totally impossible with the unbiased ones.

A WORD ABOUT PROCESSING: UNDER THE HOOD

These days you hear a lot about CPU and GPU renderers. CPU renderers only use the Central Processing Unit to do their calculations, which can be very complicated algorithms used to achieve certain special types of materials such as skin. GPU renderers do their calculation on the Graphics Processing Unit—in other words, on the graphics card in your PC. GPU renderers are using "simpler" algorithms due to the limitation of the GPU capabilities. Inside the CPU group you will find products such as mental ray, V-Ray, FinalRender, Maxwell and Fry. GPU renderers are Iray, V-Ray RT, and Arion, among others.

The good news is that the GPU processors have a tremendous amount of calculating power on board. The number of cores is easily 96 for cheap cards and go up to the hundreds for more expensive graphics cards. Comparing this to normal CPU numbers, which are 4 or 6 cores, you can understand the difference between these two types of render engines. Usually the GPU render engines are of the unbiased group.

Knowing these basic differences is the first part of the selection process. The next part is asking yourself some simple personal questions, like the following.

1. Do you care about Price ?
If you don't mind paying for a render engine you can choose from a variety of third-party products. The most popular one is V-Ray, but there are loads of others, including FinalRender, Arnold, Maxwell, Fryrender, Octane, and Bunkspeed, to name a few.

If you care about price, remember that 3ds Max comes with a range of render engines included inside the product, so they are free of charge. These are Scanline, Quicksilver, mental ray, and the latest addition, Iray. Don't forget to consider render node pricing when you are looking into a third-party render engine. Network rendering is also free of charge with 3ds Max.

2. Do you need quality or speed ?
There are renderers that can do things faster than others, but they are limited in the quality of the final image. It could very well be that you don't need a 100 percent accurate result in your work, but you need speed most of all. Unbiased render engines tend to be slower, but the quality is impressive and once the calculation is done, you have some smart data at hand. You can easily change day and night inside one render pass of an unbiased renderer, where you would need to make a complete new rendering with a biased render engine.

3. Do you have any knowledge of render engines ?
Remember that learning a new piece of software can be a difficult task. In general, understanding and learning to work with render engines is not an easy task if you really want control over the qual-

ity level of the output or the time it takes to complete an image. Normally the best render engine for you is the one you have used.

4. Do you want to cheat ?
Do you just want to render physically correct images, or do you want to be able to cheat the laws of physics? Do you want to be in total control of settings, or do you just want to push a button and wait and hope for the best? These questions will usually define the choice between biased and unbiased for your purposes.

5. Are you able to communicate with your render engine ?
It's a fact of life that you simply have a better feeling for a certain piece of software just because it speaks your language. So if you have a bad feeling about the UI and terminology inside the renderer, don't select that one; it will never make sense to you.

6. Number of users ?
It might make sense to go for the render engine that simply has the biggest installed base. This will help you to find support inside the forums and will most likely guarantee your investment, both in money and skills, in the long run.

After answering some of these questions, you should know—or at least have a better idea—which one might be the best for you and your work.

By far the most-used biased render engine for 3ds Max is mental ray, probably because it is free of charge and comes with 3ds Max. Autodesk has an agreement with mental images, mental ray's developer, to make the render engine available inside most of the major Autodesk products including AutoCAD, Revit, and Inventor.

A popular commercial third-party engine is V-Ray from Chaos Group. V-Ray is a production-proven render engine that has been on the market for a long time. Its longevity has resulted in a large installed base of dedicated users.

MORE THAN ONE WAY

So let's assume you want to choose between mental ray and Vray. What are some of the most important differences?

Both products allow the artist to make beautiful images, and both products are fast and basically share a lot of the same type of workflow. They both are fully integrated inside 3ds Max, but there are some differences apart from the calculation methods and algorithms that are used. Some of the differences are :
+ Both come with dedicated materials, but mental ray has more presets for type of materials, so this could save you potentially some time.
+ Both are able to render out a sky, but V-Ray has the ability to create 3D clouds inside the sky
+ Both are able to perform displacement (meaning geometry changes based on mapping) but V-Ray handles this better.
+ V-Ray is able to render stereo images by default. This can also be done with mental ray, but you need to know what you are doing as it is not directly inside the UI.

Figure 1: Rendered using Vray.

Figure 2: Ed Winmens, rendered with mental ray.

installed by the 3ds Max user base. Iray comes free of charge and is part of the main 3ds Max application, whereas V-Ray RT is part of the latest V-ray 2 version, which is a set of V-ray (biased) and two V-Ray RT flavors for both CPU as well as GPU.

Again there are some differences, but not so much about what can or cannot be rendered.

The biggest advantage V-Ray RT has over Iray is the fact that it has an interactive mode out of the box, where you can open the RT render window and see your model re-render in real time while working on your model, materials, lights, and so on.

There is also a big technological difference as V-Ray RT is based on OpenCL, which means it could potentially be used with every graphics card and give more or less the same performance. Iray can also be run on different graphics cards, but it prefers the CUDA technology, which is exclusively linked to NVIDIA graphics cards. As Iray is developed by mental images, which is part of NVIDIA, this could potentially be an advantage for Iray in optimum alignment of software and graphics cards to have the maximum amount of render speed.

INVESTIGATE YOUR OPTIONS

Did I give you an answer to my original question about which render engine is the best? No, not really, I have just given you some pointers to help you in the process of choosing the best render engine for you and your line of work. It doesn't really matter which one you choose and, as I said in the beginning, "it all depends."

If you want to learn more about render engines it might be a good idea to go out to the EUE on June 30 and July 1 in Utrecht, the Netherlands, where many workshops and presentations will be given by end users on the different render engines mentioned in this article. To find out more about EUE, check the website www.enduserevent.com. Hope to see you there!

Joep van der Steen has written two books on mental ray inside 3ds Max, runs a local 3ds Max support portal at www.3dstudio.nl, and is the organizer of www.enduserevent.com

As you can see, the differences are there. Experience with both products will lead you to discover that there are always ways to do what you want inside each of these two render engines.

From my point of view the biggest difference between the two is the mentality of the products. V-Ray is more practical and mental ray more technical. This difference is based upon the nature of these two products and the companies that designed them.

An example of what can be considered the more practical nature of V-Ray is the render at mouse pointer. This means you can tell the software to focus all render power on a small point of interest, which is very useful when doing test rendering and tweaking of materials. Another example is the Frame Buffer window. Also, the V-Ray frame buffer allows you to adjust the brightness of the output (Gamma) after the rendering process instead of re-rendering the entire image. These are pretty practical things.

In the unbiased field we meet again with mental images and Chaos Group. This time the render engines are called Iray and V-Ray RT and, though relatively new products, both are already widely

BUILT – BIM to FM©
What Owners Want

Owners want functional digital assets that increase efficiency and productivity over the life cycle of the facility. Antiquated Design-Bid-Build oriented procurement methods ensure that owners don't get what they want.

This article addresses what owners want—vis-a-vis BIM—and how they can get it. Once owners recognize the value of BIM, they want it all and they want it now. Few, however, know what IT is, how to request IT, or how to achieve IT.

IT is a functional digital asset that accurately reflects the data gathered on behalf of the owner during planning, design and construction in a format compatible with the owner's facilities management (FM) software.
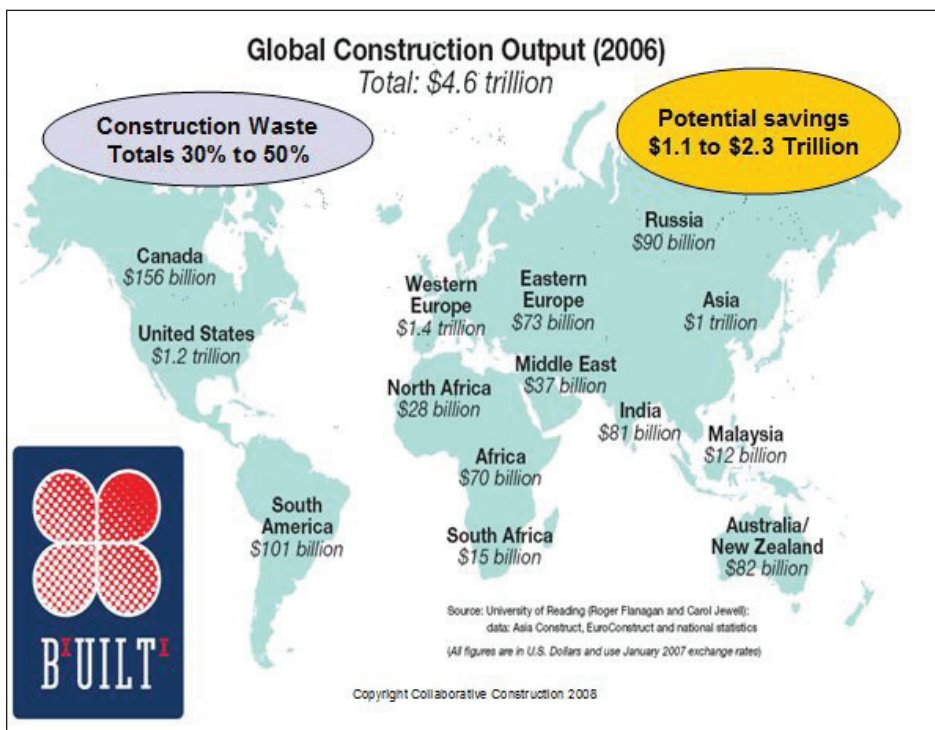
Too few owners realize that planners, designers, constructors, and commissioning agents can deliver digital assets and fewer still know how to request delivery of such assets in a functional format. Those who do are often disappointed, as delivered assets seldom meet expectations.

FUNCTIONAL DIGITAL ASSETS—DAVIDS

Functional digital assets enable Decisions based on Accessible, Valuable, and Informative Data Systems (DAVIDS). Timely intelligent decisions add value to an enterprise. Decision makers with timely access to valuable and informative data make better decisions. Functional digital assets empower leaders to make quicker, more well-informed decisions. This increases success.

Decisions drive our lives, and good judgment is the hallmark of excellent leadership. Excellent leaders want accurate information more quickly. Providing leaders—on an enterprise level—with access to valuable and informative data is common in the military and manufacturing arenas. Even there, however, tapping facilities or infrastructure- based knowledge while making decisions is not the norm. In the AEC industry, many are just beginning to

Global Construction Output (2006)
Total: $4.6 trillion

Construction Waste Totals 30% to 50%

Potential savings $1.1 to $2.3 Trillion

Canada $156 billion

Western Europe $1.4 trillion

Eastern Europe $73 billion

Russia $90 billion

Asia $1 trillion

United States $1.2 trillion

North Africa $28 billion

Middle East $37 billion

India $81 billion

Malaysia $12 billion

Africa $70 billion

South America $101 billion

South Africa $15 billion

Australia/ New Zealand $82 billion

Source: University of Reading (Roger Flanagan and Carol Jewell); data: Asia Construct, EuroConstruct and national statistics

(All figures are in U.S. Dollars and use January 2007 exchange rates)

Copyright Collaborative Construction 2008

recognize the value of functional digital assets and the power those assets have to improve decisions and add value to an enterprise.

Value is a key component from every owner's perspective. Owners plan, design, construct, operate, and maintain facilities for a business purpose. Adding value to services or products validates new facilities. Facilities-centric information aligns operational and maintenance goals with the business purpose of the enterprise.
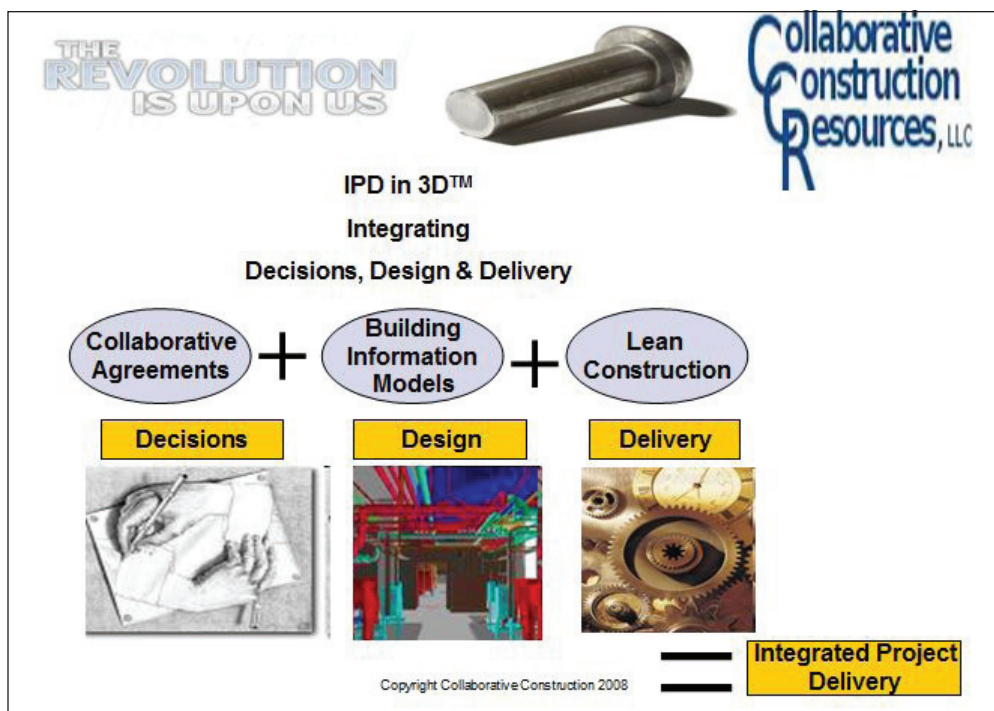
Informative data is data that conveys valuable information to the user. Timely access to such data prompts intelligent, fact-based decisions, which increase efficiency and profits.

Increasing efficiency in the AEC industry puts $1.1 to $2.3 trillion in potential savings in play worldwide, creating an industry in and of itself. Separately, operations, energy, and maintenance costs represent several trillion dollars more from which additional savings can be extracted over the life cycle of a facility. IPD, BIM, and lean processes deliver functional digital assets, which empower decisions that drive increases in efficiency and savings on the trillions of dollars spent over the life cycle of facilities and infrastructure worldwide.

PROCURING FUNCTIONAL DIGITAL ASSETS—BUILT

IPD creates functional digital assets suited to this task, but achieving IPD is hard and the task is complicated by antiquated project procurement methods. Design-Bid-Build, in particular, inhibits the collaborative and cooperative behaviors required to produce functional digital assets. The BUILT System™, pioneered by Collaborative Construction as part of its IPD in 3D™ program, provides a process whereby integrated project delivery (IPD), building information modeling (BIM), and lean construction methods can be deployed effectively and intelligently.

IPD in 3DT refers not only to integrated project deliver and the three-dimensional virtual design and construction software tools that support IPD, but also refers to the 3Ds associated with IPD: Decisions, Design, and Delivery. Those three concepts—aka integrated project delivery (IPD)—require integrated or collaborative agreements, building information modeling, and lean

processes for support. The interrelated nature of these concepts is reflected in the graphic above.

The BUILT System extends the IPD in 3D concept beyond projects and enables users to deploy fully integrated business models in support of IPD, BIM, and lean processes. An effective BUILT System ensures owners receive functional digital assets that empower DAVIDS—Decision makers with Access to Valuable and Informative Data Systems—within the organization.

BUILT is an acronym that refers to facilities and infrastructure—i.e., Buildings—Built by BIM Users Utilizing IPD, and Lean processes and Technologies Today and Tomorrow.

> Knowledge, innovation, networks, and godly decisions made with access to valuable and informative data systems will enable those who master these tools to overcome immense barriers.

In the BUILT System all stakeholders are BIM users. Planners, designers, and owners use BIM in the planning and design phase to lay the foundation for the creation of functional digital assets. Planners and designers authoritatively collect data related to potential building sites, facility programs, and other aspects of the facility and relevant infrastructure. Owners involve end users in the programming phase to ensure compatibility between the facility as planned and designed and the business purposes reflected in the end users activities.

Contractors, construction managers, trade contractors, specialty designers, suppliers, and others use BIM in the BUILT System as well. Each of these stakeholders access functional digital assets relevant to their particular business purpose throughout the planning, design, and construction of a facility and any associated infrastructure.

Users of the BUILT System are encouraged to think outside the box and identify unique BIM users. Additional potential users of BIM data include lenders, sureties, insurers, and others with a stake in the financial health of the project. Ultimately, the use of BIM on a project delivered under the BUILT System will be limited only by the imaginations of the users of the BIM and the capacity of the internet to connect users to functional digital assets in real time.

RFPS & RFQS ON BUILT PROJECTS
Procurement of planning, design, and construction services under the BUILT System differs greatly from the procurement of such services in a Design-Bid-Build environment, or even in a Design-Build setting. Owners who wish to procure services from integrated teams must formulate their requests for services differently and must request those services from planners, designers, and constructors with a very different skill set than those reflected in the Design-Bid-Build environment.

An owner seeking to procure services under the BUILT System is seeking planning, design and construction services from an integrated team. Accordingly, requests for proposals must be directed at integrated teams, not individual planners, constructors, or designers. Typically, when such an RFP hits the streets it creates confusion and angst among stakeholders in the local AEC community because it represents a substantive change in the normal way of doing business.

The biggest change is the requirement that planners, designers, and contractors—along with key trade contractors and suppliers—join forces early on in the process to form integrated teams capable of delivering IPD. These RFPs also mandate the use of BIM and entail the use of an integrated form of agreement among the integrated team members. An RFP that calls for bids from integrated teams fundamentally alters the way those teams are formed, what those teams will deliver, and the structure of the teams' legal relationship.

Private owners have a great deal of control over the process and are essentially free to pick the A Team. Public owners are shackled, to a large degree, by public procurement laws and regulations that control the process where by governmental entities procure planning, design, and construction services.

Collaborative workshops at which concepts central to the BUILT System are introduced to the AEC community increase the BIM IQ of all stakeholders. Members of the AEC community interested in pursuing BUILT-oriented projects learn, through such workshops, how IPD, BIM, and lean process support the BUILT System and what skills are required to successfully deliver a BUILT project.

Collaborative Construction offers collaborative workshops designed to build such skills and also provides IPD facilitation services to integrated teams in the throes of crafting, negotiating, and implementing integrated or collaborative agreements on specific projects.

CONCLUSION
Knowledge, innovation, networks, and godly decisions made with access to valuable and informative data systems will enable those who master these tools to overcome immense barriers. The challenges faced by the AEC industry are vast, but our ideas are bigger and better.

James L. Salmon, Esq. is president of Collaborative Construction Resources, LLC and the creator of the IPD in 3D Program and the BUILT System. James is an attorney, mediator, IPD facilitator, and collaborative consultant who helps stakeholders in the AEC industry implement the BUILT System and negotiate and implement effective integrated agreements. You can reach James at JamesLSalmon@gmail.com.

Been to the Library?
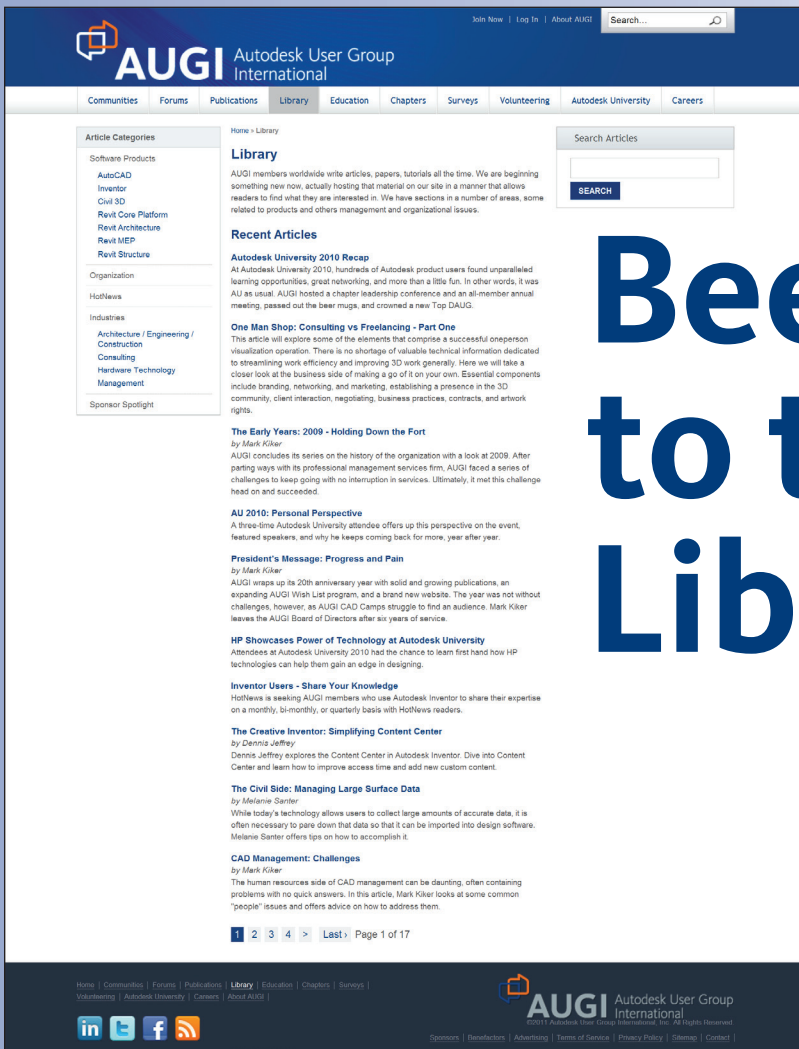
If you've visited www.AUGI.com recently, then you've seen a highly visible improvement in AUGI's member interface. But one of the most exciting features is still flying under the radar and that is the Library. The Library is the home for articles and whitepapers that the membership contribute to the organization. There is a tremendous amount of material generated by members and until now that content 'shelf life' was pretty short. Since magazines come out monthly, an article's time in the spotlight is brief.

Well, no longer! As issues of *AUGIWorld*, *AUGI | AEC EDGE* are replaced by new ones, the staff at AUGI will be posting article content on the website in HTML. The magazine PDFs will stay, of course. Consider the AUGI Library a new area to read some great content. Finding articles from past issues is a breeze, because searching and categorization can now be applied to these articles. In addition, the Library is the real home for *AUGI HotNews,* an email-based monthly publication.

Are you ready to write?

AUGI, through the contributions of members, produces monthly magazines such as *AUGIWorld*. Well the articles in these magazines don't grow on trees! The content comes from members willing to contribute. If you are an AUGI member, you probably use an Autodesk product. Do you know your product pretty well? Have you ever sat down with someone else to explain how Paper Space works, or how to explode polylines, or customize the CUI? These messages you share casually with others are the same messages that others outside of your area need to hear. Just imagine... even though you have been using AutoCAD since R9, today, somewhere in the world, someone started using AutoCAD for the first time. And that expert level change you made to your CUI to work better with your PGP today? Tomorrow someone else will begin that exercise as well and you could save them some time with your insight. So, get out there and join the fun – contribute to your magazines and your fellow members. Share your knowledge and expertise with beginners and advanced users alike. People are ready to hear what you have to say. For more details contact david.harrington@augi.com