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The Official Publication of Autodesk User Group International

June 2013

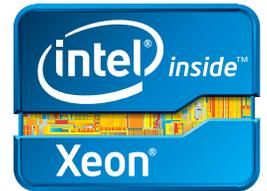
## Get a Helping Hand from Autodesk 3rd Party Apps



### Also in this issue:

- Property Wizardry at Its Finest
- Understanding View Range in Revit MEP
- Backstop Backstory

HP recommends Windows.



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# Editor's Note



# AUGI



Hello, AUGIWorld Reader!

Welcome to another wonderful edition of *AUGIWorld* magazine. We have a great issue ready for you! This issue has the general theme of third-party apps. We asked our authors to consider what third-party application is “doing it” for them. None of our authors are compensated for sharing their thoughts and experiences on their respective products—they write simply for the sheer pleasure of it.

We begin this edition with our own Melinda Heavrin, an avid user of AutoCAD Architecture. She pens her focus on Google SketchUp this time around and enlightens us with how to create, edit, and share. Then we have Scott Moyse, who uses Inventor and is sharing his experience with iPropWiz, property wizardry at its finest!

Then jumping to Revit Architecture where Shaun Farrell and Rory MacTague team up to recount their personal adventures with Revit plug-ins! And then guest author Larry Daubenspeck brings a story of his personal experiences in programming. Michael Beall brings us the AutoCAD tip of the month—how to make a copy of a Qleader arrow.

Returning to the Revit world, Monica Petersen shares her top five tips for selecting quality apps for Revit. And then Christopher Fugitt runs down a list of third-party solutions which play supporting roles when using AutoCAD Civil 3D. Some of the ones Chris mentions seem like real winners!

We have Michael Smith discussing dynamic workflows when using Navisworks Manage. Then we wrap the issue with Jerad Meidinger, a user of Revit MEP who gives us a well-earned lesson for understanding view range settings. Ending our issue this month is the Inside Track article by Lee Ambrosius, who presents a few more new products coming to market.

The cover art this month was provided by Cal Redback (with some assistance by Daniel Hurtubise). Cal takes the idea of reaching out and grabbing a handful of third-party apps to quite a visual impact!

And with this, another issue of *AUGIWorld* rolls out the door and onto your desk. Now just pick it up and enjoy!

Take care,  
*David*

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### Published by:

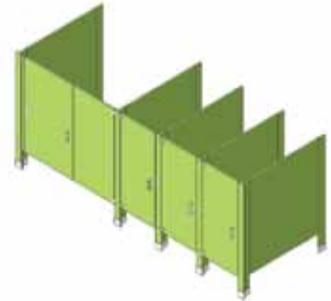
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AUGIWorld (San Francisco, Calif.)  
ISSN 2163-7547





***“We put the info in BIM”***

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# Create, Edit & Share with Google SketchUp



**I**n every industry, there are many third-party tools that can help in all aspects of drawing quality. For AutoCAD® Architecture users, a prime example is Google SketchUp, an excellent tool with a lot of great capabilities.

## 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.

## 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. Please 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 that 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 AutoCAD Architecture, you can 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 INTO SKETCHUP

Now that we've looked a few basic features of SketchUp, let's try importing 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 you need in the dialog box that opens. Click OK (see Figure 1). Now you will need to select the file 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 Files of 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.

## CREATING WALLS

Now that you have a drawing imported into Google SketchUp, consider this: What if the walls are in 2D and you want to make them 3D in SketchUp? 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. The Face is used to build the roof once you are

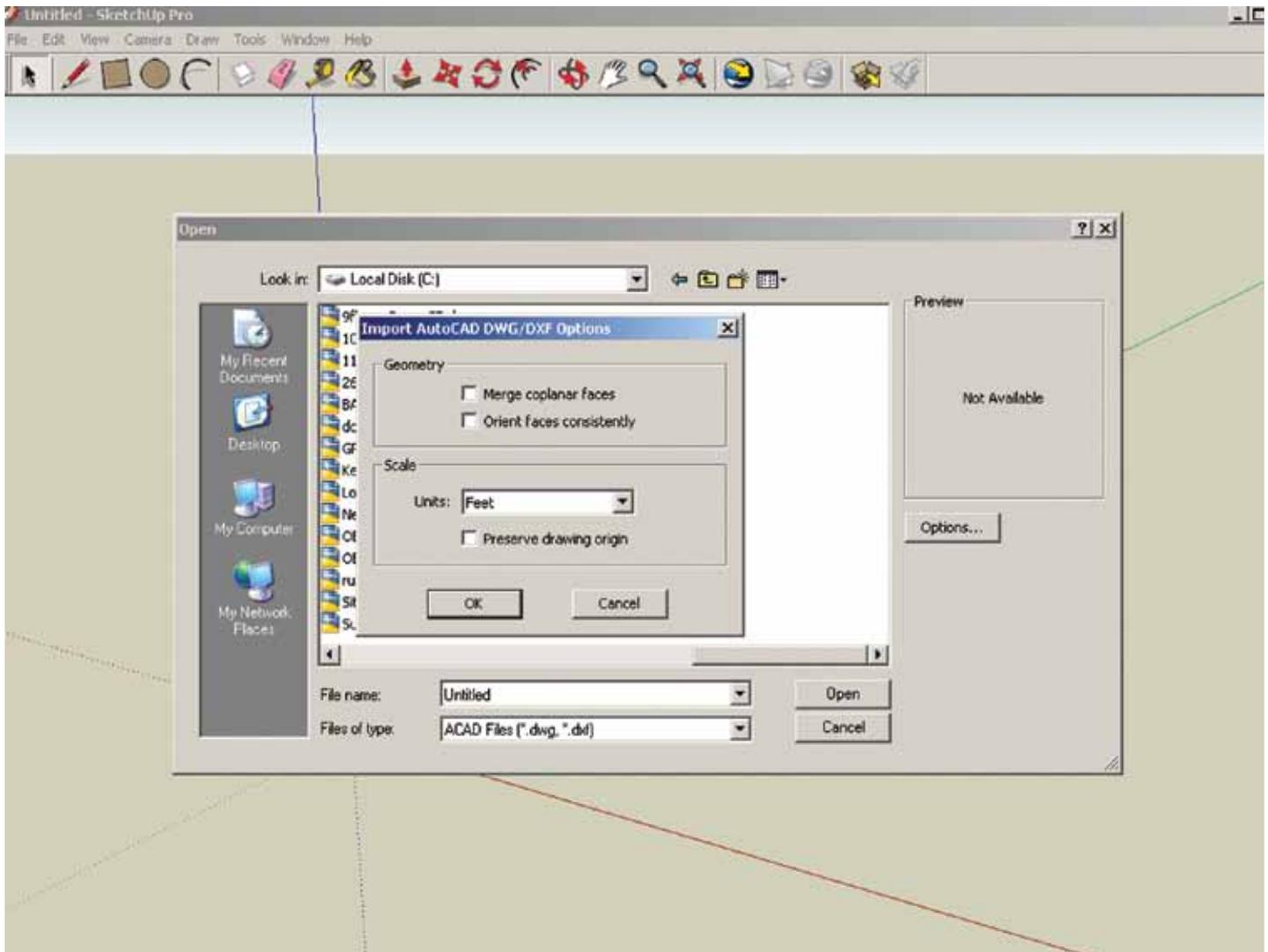


Figure 1: Import options

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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 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 your point of view of the model. 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—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 they are automatically available for every dynamic component. There are also custom attributes, which 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 are called an attribute name/value pair. Formulas can consist of predefined functions, mathematical operators, or the values of other attributes. Functions are shortcuts 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 desired attributes, the

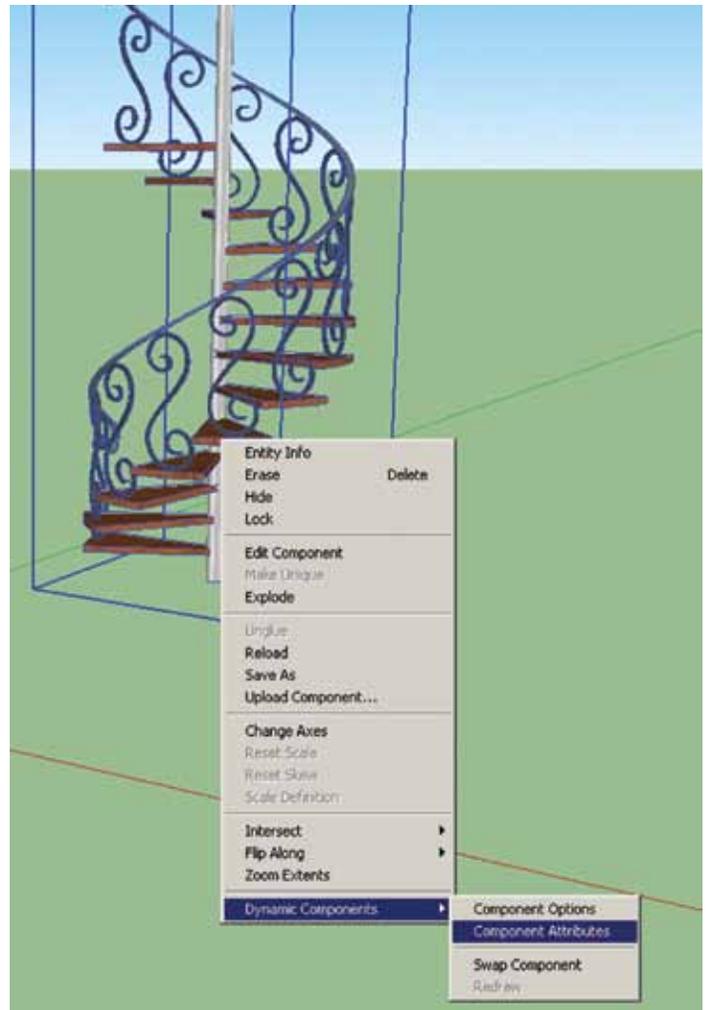


Figure 2: Dynamic components



Figure 3: Component attributes

new dynamic component can be saved to a component file for additional 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 drop-down. Since we are exporting to AutoCAD Architecture, you would select AutoCAD DWG. By selecting the Options button at the bottom, you can choose the AutoCAD version to which you are exporting as well as 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 AutoCAD Architecture and SketchUp multiple times. Your drawing does not have to be complete before importing it into SketchUp or from SketchUp into AutoCAD Architecture.

## 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 allowing you to search for similarly shaped models instead



Figure 5: 3D Warehouse

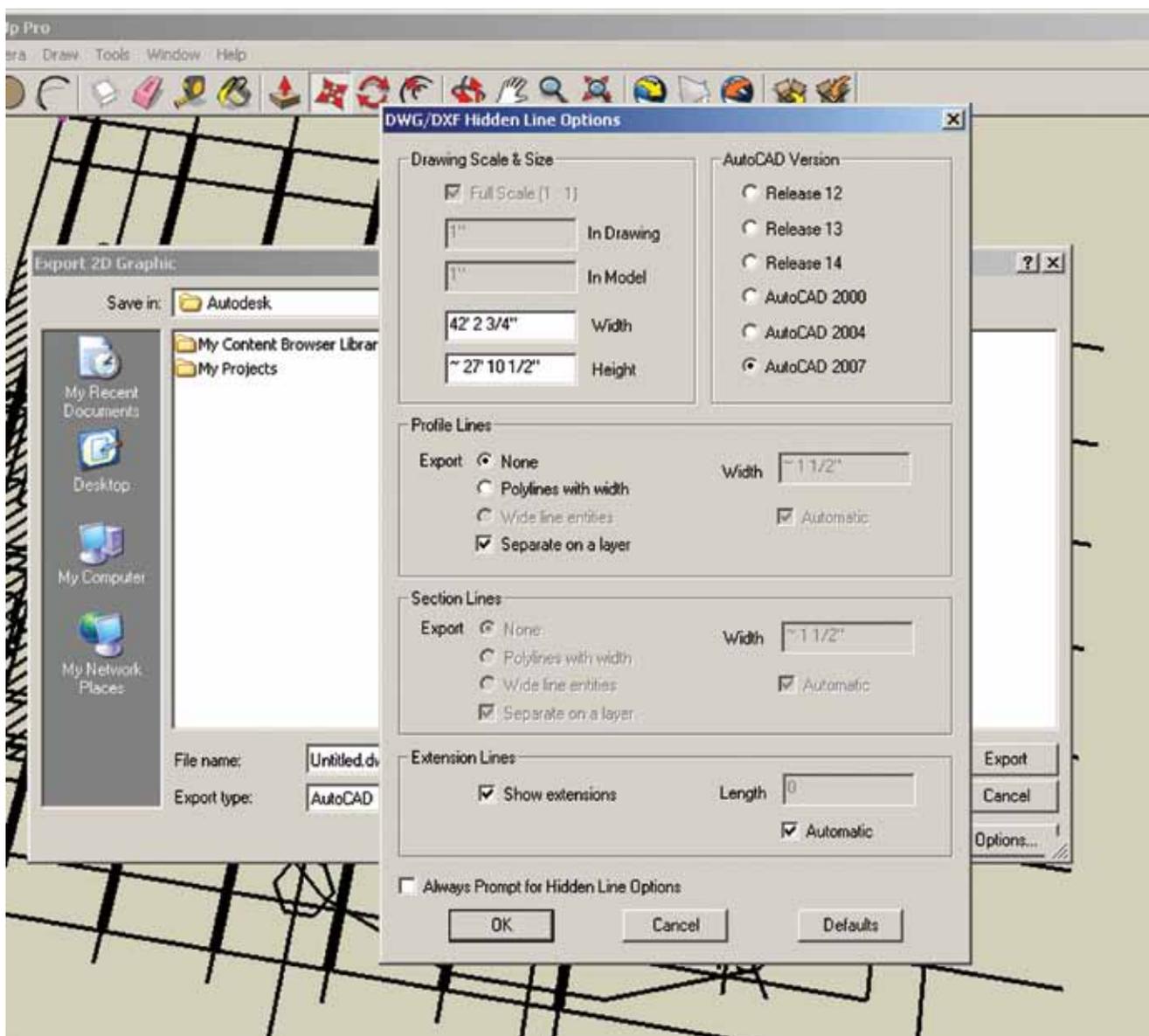


Figure 4: Export dialog box

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of relying on a text search has been added. This really saves time when you're in a hurry to find a specific item. The 3D Warehouse offers a wealth of information and can help you design quickly when facing a tough deadline. Best of all, this feature is free!

## LAYOUT TOOL

SketchUp contains a vast library of colors, textures, shadows, lighting, and others. You are limited only by your imagination when completing renderings in SketchUp. Rendering tools and materials libraries in AutoCAD Architecture, 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. The Layout feature is included with SketchUp Pro and is used for creating and sharing presentations made from SketchUp. You can add title blocks, save templates, add graphics, and create multi-page



Figure 7: Layout rendering

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 in this article, but 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.

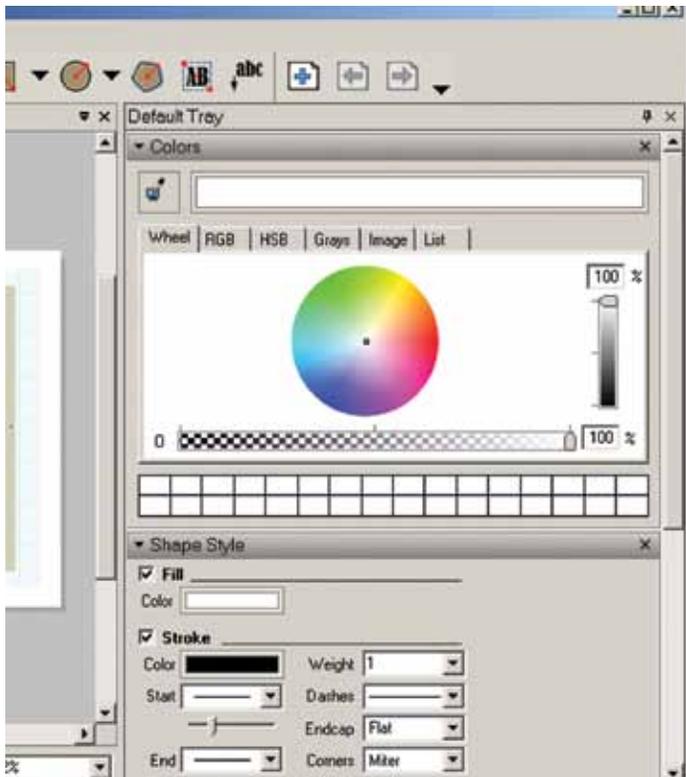


Figure 6: Layout



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](mailto:melinda.heavrin@nortonhealthcare.org).

# Property Wizardry at Its Finest

**IPROPWIZ V6**  
Autodesk Inventor  
iProperties Management Tool

Most of the seasoned Autodesk Inventor® users out there will have heard of iPropWiz. For those who haven't, or for those new to the game, iPropWiz is an Inventor add-in created to simplify and ease the management of component properties. The native Inventor iProperty dialog is clunky to use and, though it supports the creation of custom iProperties, the interface supporting those is horrid. iPropWiz presents all the properties you are interested in, within a single view. Over the years it has matured, moving way beyond just presenting properties to the user. In doing so, it continues to expand into areas within which Inventor performs inadequately.

## IPROPWIZ HISTORY

- ♦ 2002 – iPropWiz V1
- ♦ 2004 – iPropWiz V2
- ♦ iPropWiz V3 (Never Released)
- ♦ Late 2008 - iPropWiz 2009 (V4)
- ♦ 2010 - iPropWiz V5
- ♦ 2013 - iPropWiz V6

Figure 1: iPropWiz V1 property editor

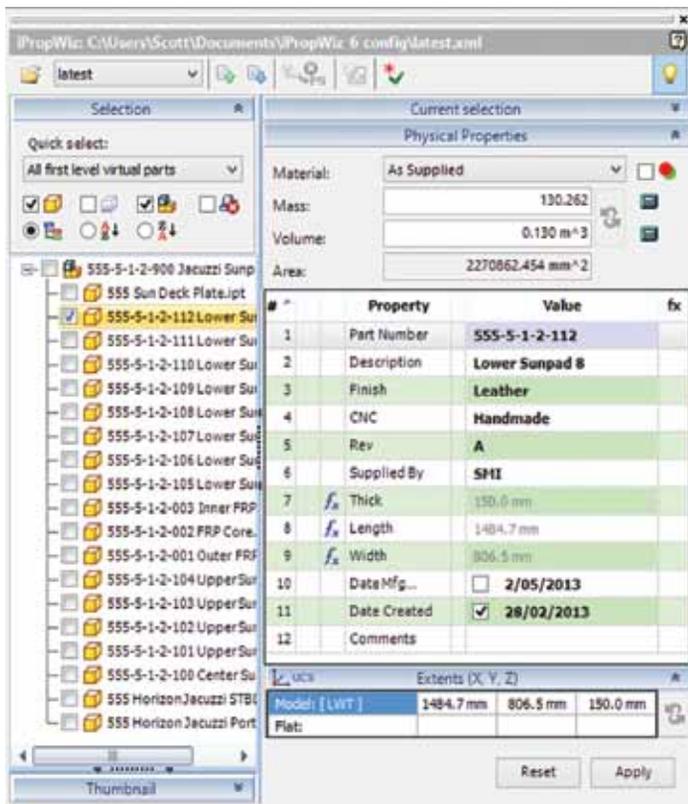


Figure 2: iPropWiz V6 property editor

## A FEW QUESTIONS FOR THE WIZARDS

It has been nearly three years since I last got involved with beta testing iPropWiz V5. I'm at a loss to know where those three years have gone, but I do know they have most likely gone slower for me than for the wiser individuals among us. The upside to these foregone years is we now get to play with iPropWiz V6. I've taken this opportunity to not only fill you in on the new features, but also to ask the product's creators, Sean Dotson and Neil Munro, a few questions.

**Scott:** When and why did you start iPropWiz?

**Sean:** I first wrote iPropWiz in 2002 as a VBA macro. I was tired of users using the wrong fields for properties (Descriptions vs. Title, etc.). It was fairly primitive compared to what we now have.

*Amen to that and thank you for ripping into it.*

**Scott:** Were you both always involved? If not, how did the formidable partnership come to be?

**Sean:** Sometime after V2.2 I knew I was getting over my head in regards to programming. I had turned it into an add-in at this time, but I lacked the skill set to evolve it further. Neil and I had worked together (with Charles Bliss) on Animator, another add-in to do animations in Inventor. Since we worked well together, we partnered on iPropWiz and released v2009 soon after.



Figure 3: Sean Dotson



Figure 4: Neil Munro

**Scott:** Are there any silent contributors to the program, other than the beta testers?

**Sean:** No—just Neil, myself, beta testers, and, of course, the support of our beautiful wives.

**Scott:** What's your favourite new feature in iPropWiz V6?

**Neil:** That's a better question for users, but I like that the new Property Editor is a modeless (non-blocking) window.

*Neil is a user as well, so his opinion very much counts. Exposing the Property Editor permanently like this brings property management to the forefront of the design process. Ideal!*

**Scott:** How would you define iPropWiz V6's primary role?

**Neil:** Practices on how/when properties are filled in are so variable

that we can't tailor it to fit one solution. The ability to make it easy to check and reasonably easy to fill in is probably the best we can do. Encouraging users to fill in property info at the part level, or in small assemblies, is part and parcel of making it as painless as possible.

**Scott:** Where do you see iPropWiz going in the future?

**Sean:** We would like it to become even more engrained into the Inventor workflow. We feel IPW offers the types of features that users want built into the product.

**Scott:** What would be your number one wish list item for the Inventor API to improve iPropWiz?

**Neil:** Better tools for dockable windows in Inventor.

**Scott:** Do you plan to expand it into other products? If not, why?

**Sean:** No. The time to learn other APIs and the costs associated with that mean it's prohibitive.

*I'm sure Neil and Sean would be open to coders from other platforms licensing the iPropWiz brand.*

**Scott:** Can you say roughly how many seats of active iPropWiz there are around the world (including 2009 and later)?

**Sean:** We have roughly 350 separate companies using the product with approximately 2,750 seats sold. However, we know there are some people still using iPropWiz V2.

**Scott:** Without naming names, can you say what is your largest single installation of iPropWiz?

**Sean:** We have a couple of companies with 100 seat installs and several with 50+.

**Scott:** Why can't we purchase and download a licensed version of iPropWiz directly from the Inventor Exchange App store?

**Sean:** It has to do with our licensing structure. We are working with Autodesk to find a way to simplify this.

**Neil:** I would add that we gear our sales to CAD managers or admins, not individual users (although we have lots of those as well). The Configuration Editor/Property Editor concept is there so standards can be better enforced by CAD managers.

**Scott:** How much is iPropWiz V6 going to cost, including upgrade pricing?

**Sean:** We have yet to set pricing for V6.

*I've decided I'm going to ask the following question at the end of every interview I do. Since we all know Sean is mad about sports and some of you may know Neil is a bike nut, I thought it was entirely appropriate.*

**Scott:** Formula One or NASCAR?

**Sean:** I'm not going to answer that one.

*Sean is sick of this debate raging on Twitter and refuses to partake there as well. I think the American in him has to go with NASCAR, while he's torn by the engineer in him going with the technically superior Formula One*

**Neil:** MotoGP, go "2" or go home!

*Full respect to that answer. Those lads are nuts and bloody good fun to watch.*

## WHAT'S NEW

The layout from V5 remains largely unchanged, albeit with an improved user interface experience.

There are quite a few changes with this release. A number of them are subtle, so I will focus on the big ticket features, since you can read the official "What's New/Read me" document to find out everything. Most of the changes are within the configuration editor, so let's start there.

## CONFIGURATION EDITOR

### GENERAL AWESOMENESS

- + Maximum number of characters (see Figure 5).

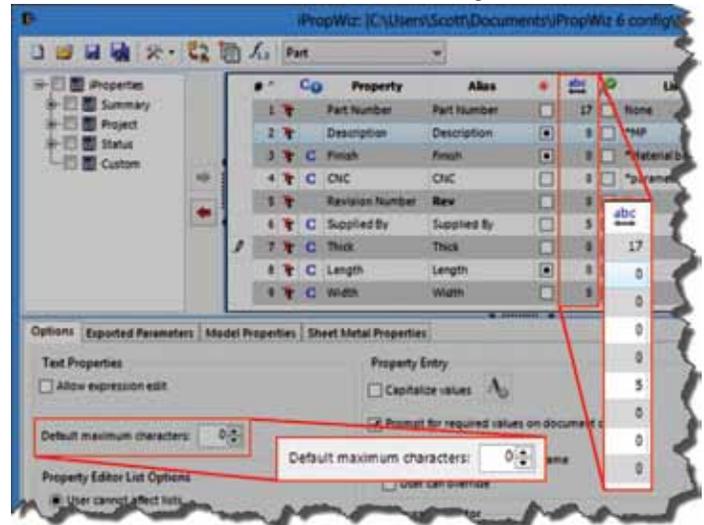


Figure 5: Maximum character settings

- + Drag-and-drop property reordering.
- + Capitalize values by property and configuration.
- + Configuration setting to prompt for unfilled required values when a document is closed.
- + Improved property feedback: Modified aliases are bold; read-only checkboxes are filled in; assign expression buttons indicate availability.
- + Configuration option to allow editing of properties in Inventor library parts.
- + iPropWiz Copy/Paste tools now support copy and paste across different document types, including the choice between copying the expression or the value.

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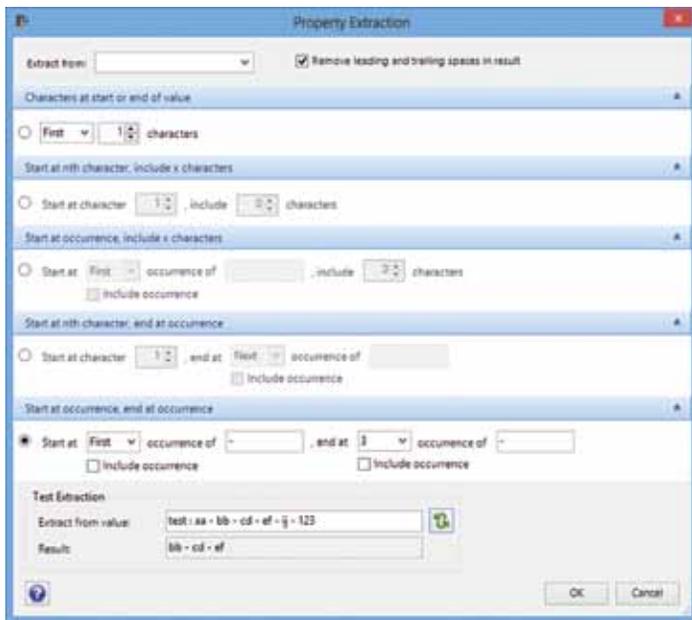


Figure 6: Property extraction tools

- Significant improvements in handling property expressions.

In conjunction with the traditional expression tools available within Inventor but also with iPropWiz, Neil and Sean have introduced a Property Extraction tool (see Figure 6). Using this in combination with expressions will no doubt prove to be very handy. I look forward to getting rid of some iLogic code and those dastardly iLogic event triggers once I set about leveraging this baby.

### New List types:

- Tree list
- Multi-property text list
- Material-based multi-property list
- Parameter-based multi-property list

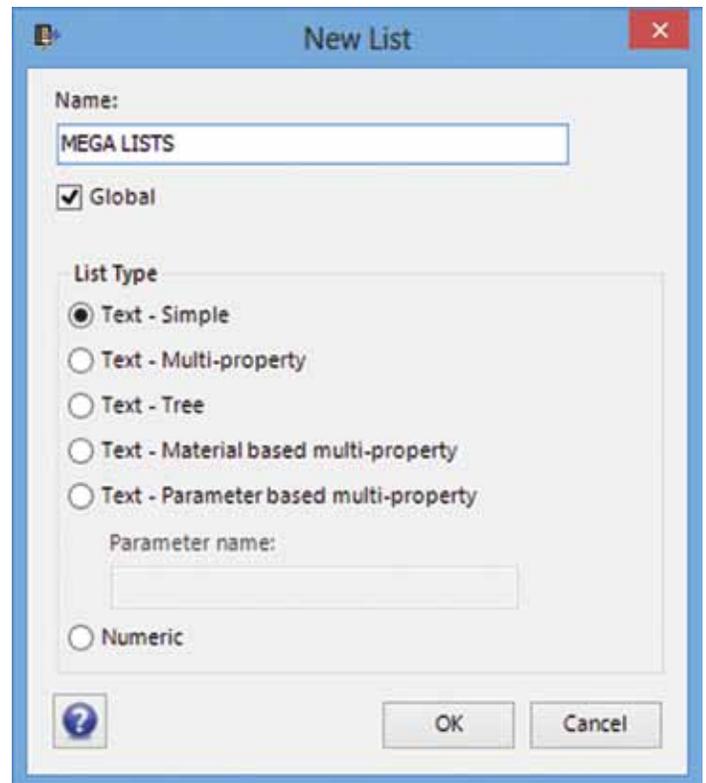


Figure 7: iPropWiz V6 sports clever new list types

The new list types are among the most powerful new features in iPropWiz V6 (see Figure 7). The Multi-Property, Material- and Parameter-based multi-property lists allow the administrator to monitor the value of a targeted property. When that property matches the criteria set by the list rule, it takes control of other preset properties. This can either be in the form of enforcing a value, or chopping and changing lists assigned to these controlled properties. Using material as a good example, steel has a different set of finishing requirements than plastic. These tools allow you to present those options to the user. Very, very cool stuff!

The Tree lists are a bit different. I personally wouldn't have much use for these. However, for companies with huge unruly lists, Tree lists provide a means to organize the list values into logical folders or categories.

- Importing data from Excel into lists has been improved. Commented samples for all list types are provided.

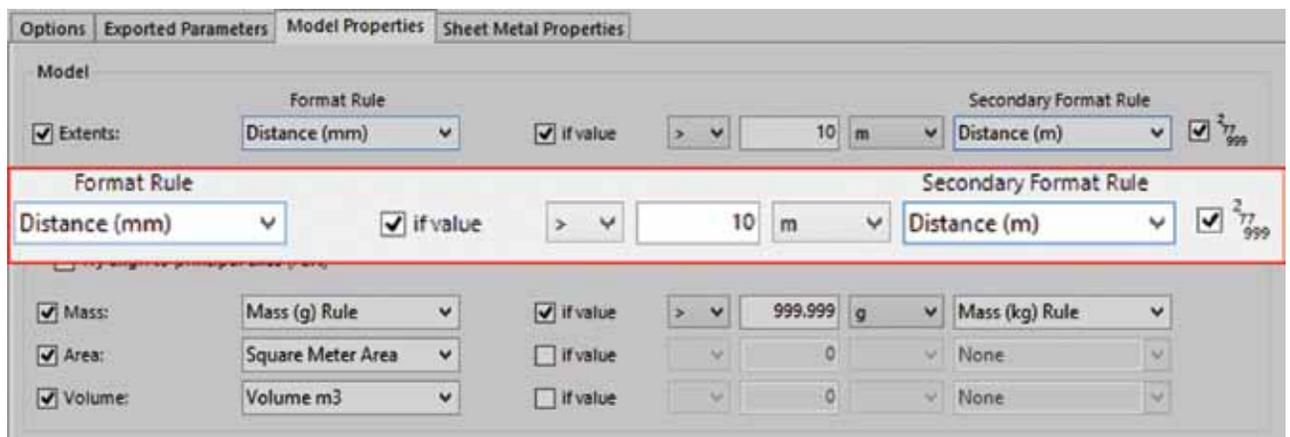


Figure 8: Exported properties secondary format rule

## EXPORTED MODEL AND SHEET METAL PROPERTIES

- All exported properties now support an optional second format rule. A single comparison operator provides the division of “primary” and “secondary” formatting (see Figure 8).
- iPropWiz can now export a set of ordered extents (smallest to largest). This is supported for both model and sheet metal extents.

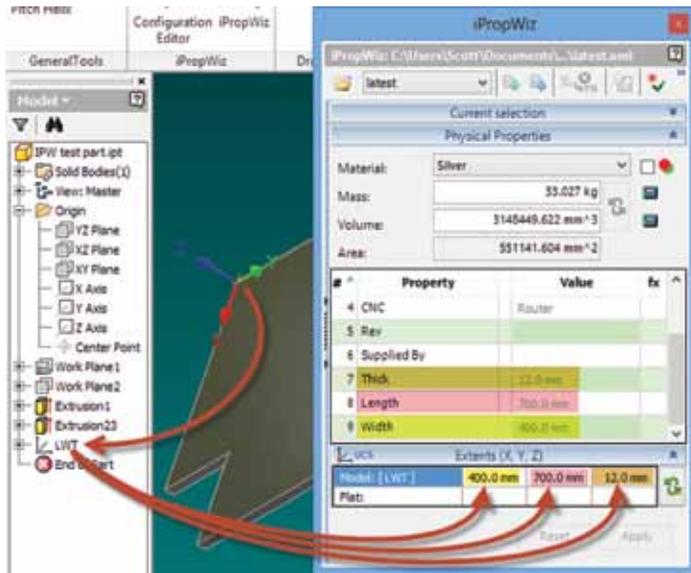


Figure 9: Extents aligned to user-defined UCS

- Two additional model extents calculations:
  - Align to user-defined UCS (see Figure 9).
  - Align to the principle axes.
- Sheet metal properties:
  - Three options for exported flat pattern area: Bounding box, outer loop area, and face area.
  - Additional sheet metal properties can now be exported.

These new features are my favourites by a long way. I'm hugely excited by the possibilities of combining user-defined UCSs with the ordered extents options. This will result in a far quicker way of obtaining reliable overall dimensions for parts lists and BOMs. In addition, this will allow woodworkers to align their UCS X axis with the grain of their parts if they so choose. As a result, they will be able to align the length of their parts with the X axis.

I also have some other very exciting plans, which I have no intention of sharing here (for the time being, at least).

## PROPERTY EDITOR

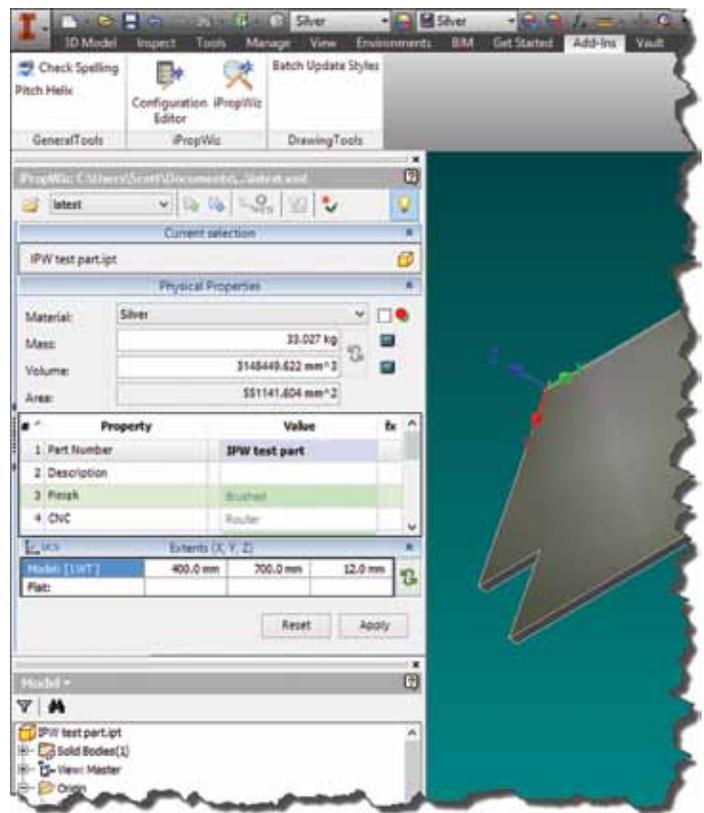


Figure 10: The PE is now dockable and modeless

Starting with the biggie:

- The Property editor is now a modeless, dockable window (see Figure 10), making property management omnipresent.

I don't see the value of docking it myself, unless of course you have a 30" monitor. However, being able to keep it on a second monitor means you are constantly aware and working with the properties fundamental to the design process.

- You can still open and close the PE just like in previous versions; however, now you can also enable or disable it. This is more of a benefit when you have large assemblies open.
- The PE now has a toolbar (see Figure 11) with a number of goodies, including the ability to import and export currently listed properties.

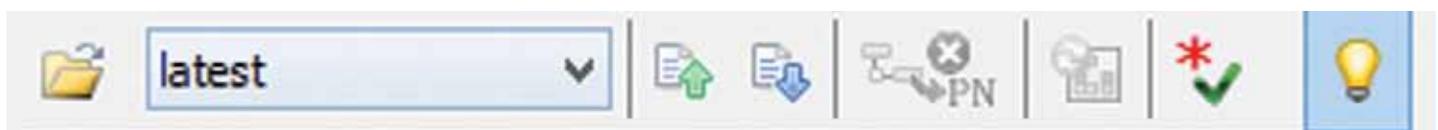


Figure 11: Property editor toolbar

# Inventor 2013

## THE GRID

- Shift and Shift + Tab navigation between cells is now supported. Awesome!
- Pressing 'T' while in a date cell will now set the value to today's date.
- The Comments Property editor now supports pasting of rich text.
- Addition of a Reset button to wipe out non-committed changes.
- Virtual Component properties are now much better supported.
- The document browser.
- A raft of new filters has been added in the quick select list (see Figure 13).

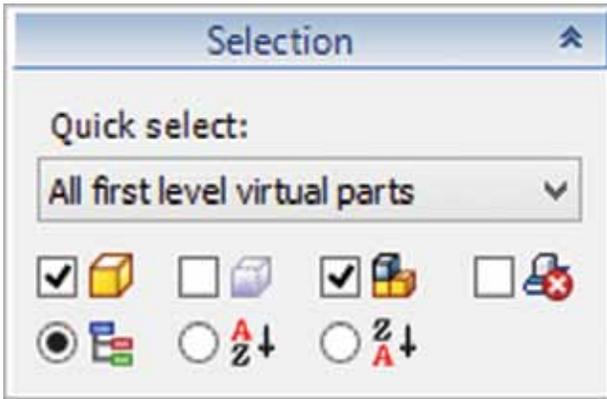


Figure 12: New view types and document type filters

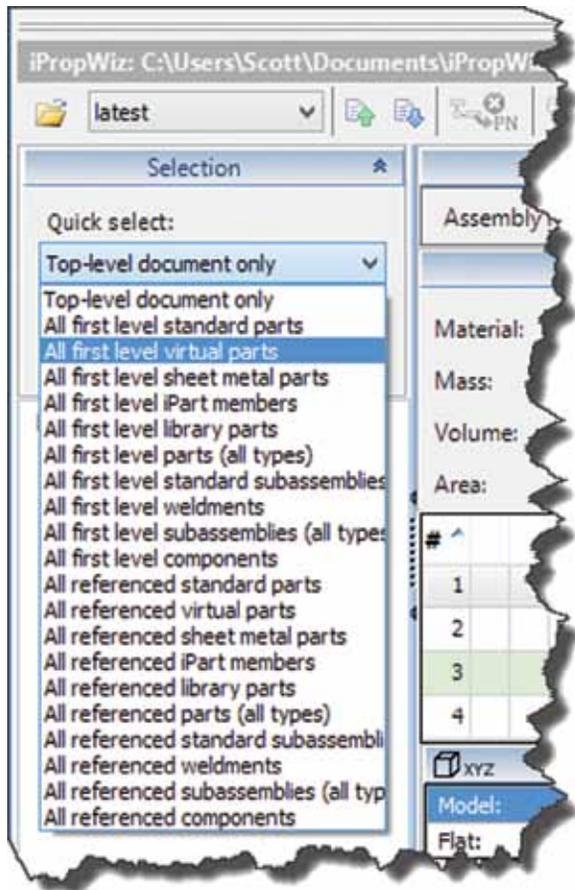


Figure 13: There are many more filters in this release

- New View Types are shown in Figure 12. You can now view the referenced documents in either a flat or sorted view. Of course, you can still use the hierarchical view.
- New Document type filters, including virtual components (see Figure 12).

One of the most annoying aspects of iPropWiz V5 involved making a chunk of property changes, but when you selected another component to edit its properties you realized that, without warning, all your work had been wiped out. It turns out that you have to apply your changes to commit them. Logical really, but easily forgotten. iPropWiz V6 takes care of that by prompting you of pending saves and asking if you want to save them. Not only does this occur when switching selections in the PE, but also in the Inventor browser or by changing the active document. They've really covered all the bases there.

## SOME BORING STUFF YOU NEED TO KNOW

- Supported for Autodesk Inventor 2013 and 2014.
- Automated update of iPropWiz 2009 and V5 configuration and list information.
- \Admin\$ folder renamed to \Admin.
- Limited support for deactivation of a license for installation on a computer with a different name.

## CLOSING THOUGHTS

I'm extremely excited about this release of iPropWiz. It's going to solve a number of problems I've been wrestling with in my office for years. In addition, the tools it provides will improve the productivity of our own in-house productivity add-ins.

People in the Autodesk Inventor community consistently wonder why Autodesk hasn't bought iPropWiz and added it into the product so everyone can benefit. It's hardly expensive, so there's really no reason why every Inventor seat shouldn't just tack this onto their initial purchase cost.

During the review of this article with Neil and Sean, Neil revealed that more than 90 percent of user requests had been implemented in this release. This incredible achievement really shows in the product. The more you tinker with it the more you realize just how good this tool is. The ROI this wizardry affords is a no brainer. Go get it and enjoy a veritable productivity jump.



Scott Moyse is the Design Manager for SMI Design, a high end bespoke interiors company in New Zealand. His background is in Motorsport Engineering & CNC programming. Scott has been using various Autodesk software over the last 10 years. He contributes regularly to DesignandMotion.net - Scott can be reached using Twitter @scottmoyse or scott\_moyse1@hotmail.com

# Adventures with Revit Plug-ins

**S**haun Farrell and Rory MacTague of Zaha Hadid Architects (ZHA), London, UK, examine various plug-ins and add-ons to see what tools are out there and which ones are actually useful. This article covers just a subset of all the tools currently being researched by the practice.

## PART ONE

by Shaun Farrell

I set up the Revit Specialists team within ZHA with the goal of ensuring that tools such as Autodesk® Revit® are used effectively within the practice and that ideas are generated at all levels and acted on. Our team has looked at various tools and continues to do

so. For this article, we have selected Chameleon, Geometry Gym, Revit Extensions, Roombook, Model Review, and Smart Sheets.

## REVIT EXTENSIONS 2013

These tools are available as part of your Autodesk subscription in the Products Enhancement section. On first look they seem to be targeted to engineers with reinforcement, steel, bridges, etc., but there are a few items worthy of note for an architect or any other user.

The Grids Generator tool lets you create levels and grids through an easy data entry wizard, rapidly increasing the initial set up of large or small projects as well as assigning basic Revit components such as columns to these objects. It does, however, create the level markers to the maximized 3D extents, which may or may

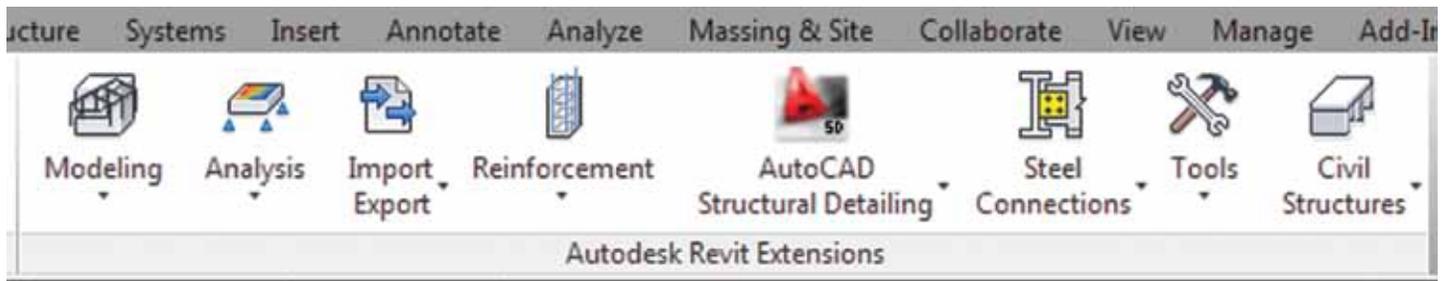


Figure 1: Revit Extension ribbon

# Revit Architecture 2013

not be what you want. Its “older brother,” the Excel-based model generator, is a slightly more complex version that uses Excel instead of the wizard. These tools are only really useful in straightforward structures rather than anything of great complexity.

The Model Compare tool requires you to have two Revit files open in order to compare them. We did this on only small files as an initial test took a couple of minutes to process even the simplest model. The output was a side-by-side comparison of general information, elements, and parameters. This did throw up some interesting possibilities, but we believe that it would take further processing of the output to be really useful for analysing and displaying differences and similarities between files (Figure 1a).

We also found the Element Positioning tool potentially useful. This promised to create position-based tags for elements. For all intents and purposes it did exactly that, using the “mark” field. This is a very useful tool for applying data to a lot of objects at the same time, as far as labeling goes.

## ROOMBOOK AND AREABOOK

Roombook and Areabook are among the more in-depth add-ins we tried. The sheer multitude of options available when these two products are combined would warrant an article on their own. They go some way in overcoming the limitations of the calculation side of the in-built Revit tool with regard to areas and calculation methods. In addition, these products give new users an insight into what is possible to extract from a Revit object.

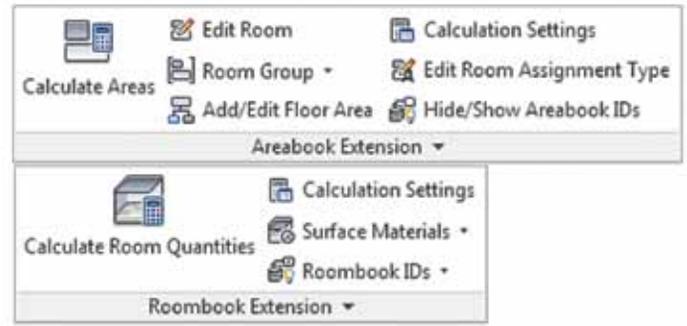


Figure 2: Roombook and Areabook ribbons

The ability to classify rooms with a sub-area type and apply calculation rule percentages by sub-area is a very useful, granular approach to the complex task of the rules for space utilisation. There is, of course, the ubiquitous Excel export, whose default template does not do a bad job of giving a well-presented report.

## MODEL REVIEW

If you have ever used standards checker in AutoCAD® then you will immediately know where this tool is coming from. All I can say is download it and use it today! Whilst it can take some effort to configure the checker to your standards, the sheer range of things it can check out of the box (see Figure 3) makes it worth the effort.

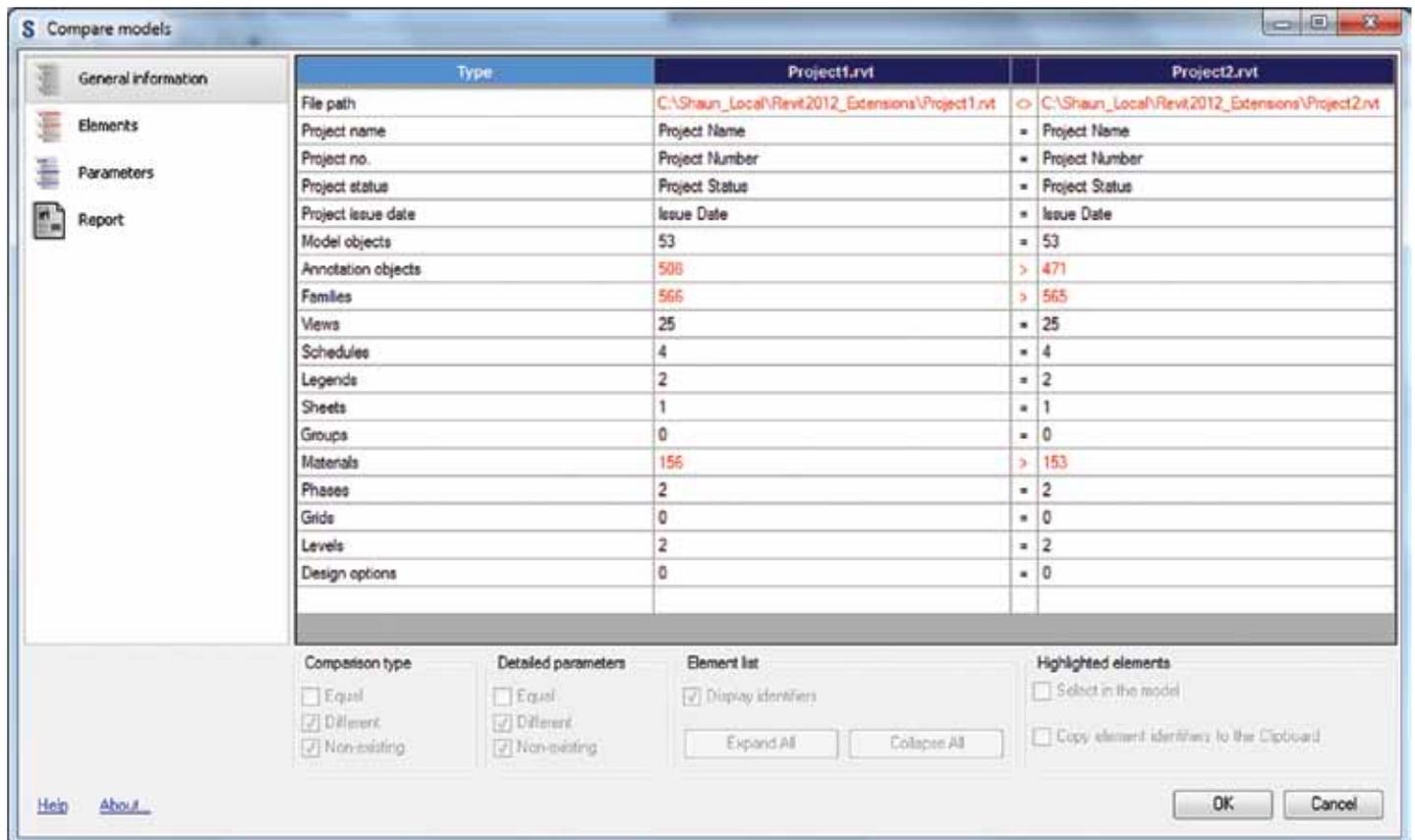


Figure 1a: Model Compare

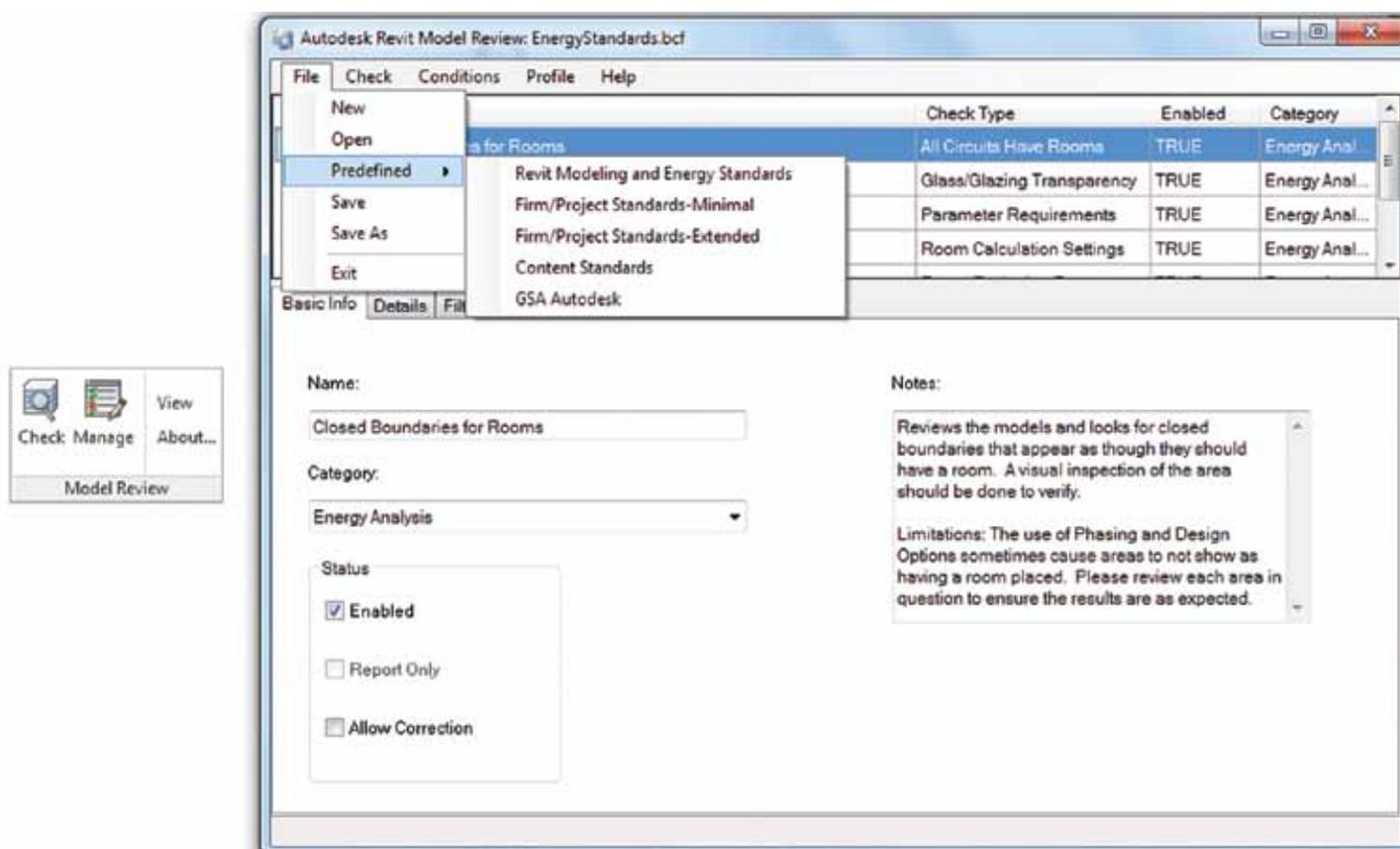


Figure 3: Model Review interface

## SMART SHEETS

Smarts sheets by Tools4Revit is the first of the tools we've reviewed in this article that is not a free tool. This caught our eye for two main reasons: 1) the ability to duplicate sheets including layout, views, and alignments; and 2) the ability to make large numbers of sheets in one go.

Simply set up one sheet how you want it to look and then, using the Smart Sheets tool, you can create a series of drawings using your default drawing as a guide. So at long last you can easily do multiple floors of a tower or more modest buildings with just a few clicks. You can also go back and manage the attached views afterward and swap/update across all sheets or a selection set. Well worth a trial—even just to see how the interface works. Once you have tried the interface, you will immediately be familiar with how the other tools from T4R work.

## PART TWO

by Rory MacTague

## CHAMELEON

### WHY WAS IT CHOSEN?

Chameleon is a lightweight plug-in for Robert McNeel & Associate's Rhino modeler and its companion open source programming tool, Grasshopper. Chameleon promises (amongst other things) to be able to bring geometry from Rhino/Grasshopper (RH/GH) into Revit. It attracted us on a practical level as it was able to get rational metric objects out of Revit and "parametricise" them within RH/GH. It also attracted us on a conceptual level as we were able to

bring Cartesian information directly from RH/GH into Revit, rather than having to bring in the often non-rational topology from which the surfaces and forms were derived.

### WHAT PROBLEM WILL IT SOLVE?

A key problem Revit has is with "shapes-created-in-some-such-other-than-Revit-software"—it doesn't like them and hates you for it, too. Therefore, we experimented with .SAT files from various programs and found that slicing up the forms into surfaces and "panellising" these surfaces to get them into Revit worked, but very slowly, and with often unpredictable results. Linking the .SAT slices into Revit also created headaches with file loading and asset tracking.

Hiroshi Jacobs' Chameleon for Grasshopper & Revit plug-in solved this with a minimum amount of fuss.

### HOW WAS IT INSTALLED?

It is drag and drop into both Revit and Grasshopper, which was perfect for us—a team of Revit users and another team of RH/GH users who could not communicate with each other.

### HOW DID IT PERFORM?

The examples and instructions for the adaptive components and geometry export are very thorough and we were able to transfer from RH/GH a 15-point adaptive component with three levels of nesting (rain-screen panel, secondary strut-work, linings, structure), all of which were themselves adaptive, metric, and producing reporting parameters for scheduling. It did this in less than five minutes of calculation time, having previously taken upwards of an hour with the .SAT process.

# Revit Architecture 2013



We continue to look for solutions as long as there are fresh challenges, and we constantly review the way the current tools work to see if they could be made to work better.

## LESSONS LEARNT FROM INSTALLATION

Firstly, Chameleon is a superb product and its author, Hiroshi Jacobs, should be on your “one-to-watch” list. The ability to install and use the program within five minutes of downloading was key for us at ZHA. Finally, the clear and concise instructions helped as we were able to understand and adapt our work very quickly.

## GEOMETRY GYM

### WHY WAS IT CHOSEN?

Geometry Gym is a series of Grasshopper plug-ins that create within Grasshopper building elements (floor, wall, column...) that are then mapped to their IFC equivalent. This will allow us to export parametrically derived forms, structures, and organisations (*le spécialité de la maison Zaha*), directly into Revit.

### WHAT PROBLEM WILL IT SOLVE?

Currently within ZHA there is a disconnection between the creation of form and the creation of documentation to enable coordination. By unifying within a single workflow, the creation of form and its underlying logic/structure, we hope to both improve the quality of the detailed product and also inform the earlier atectonic design stages with more constructible logic, creating a non-hierarchical discussion between the non-linear parametrical design process and the constituted artifact.

### HOW WAS IT INSTALLED?

We are currently trialing the open source version and a “re-tooled” version made by our Rhino reseller. We have a policy of requiring all new software to be used for a 30-day period, after which a report on its effectiveness is made to the software committee.

### HOW DID IT PERFORM?

We understand that Geometry Gym is both a mature product and is being adapted by a number of engineering firms for their own purposes.

## LESSONS LEARNT FROM INSTALLATION

A practical lesson in that it may be good to earmark a project for

trialing a new process, but if the project comes to a halt, so does the research.

## CONCLUSIONS

There are many plug-ins out there. Some free, some subscription, and some retail. Many do things that Revit really should do out of the box and some delve into specialty areas of modeling or data manipulation/reporting. We continue to look for solutions as long as there are fresh challenges, and we constantly review the way the current tools work to see if they could be made to work better.



*Shaun Farrell, at the time of writing (May 2013), is the Practice BIM Manager for Zaha Hadid Architects and an Autodesk Expert Elite with over 20 years' experience in the architecture, engineering, and construction industry.*



*Rory MacTague is a widely respected BIM Coordinator and Architect at Zaha Hadid Architects with more than 10 years' experience in the AEC industry.*

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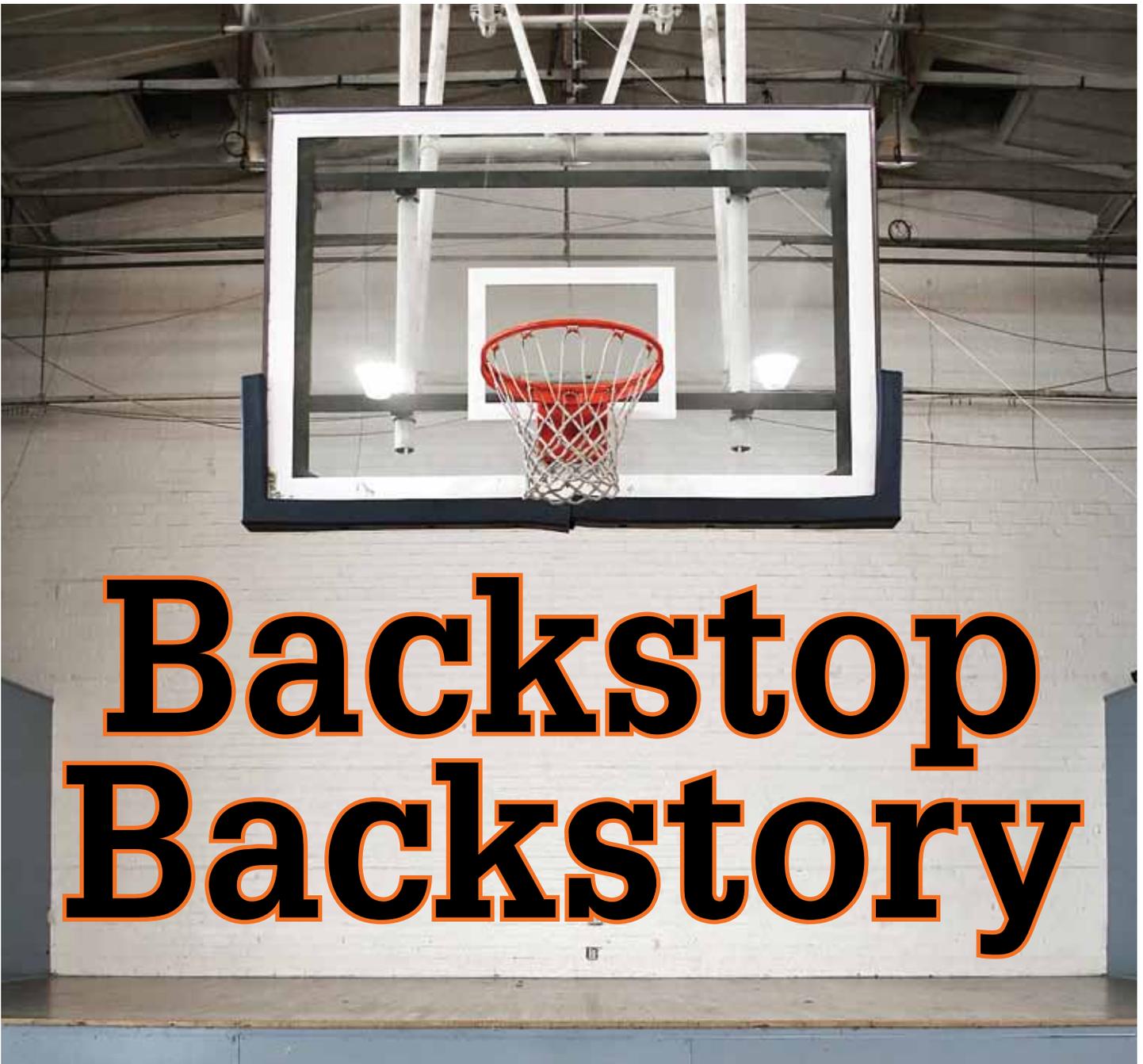


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# Backstop Backstory

**A**nyone who has ever visited a gymnasium for any purpose other than a basketball game has probably noticed the backstops stored up and out of the way. It's funny... when they are down in the playing position, one doesn't even think about it. But fold them up into an unnatural position, and you can spot the few mechanical types in the crowd—staring up at the ceiling, tracing the cable from pulley to pulley, taking note of the bends and twists, and eventually finding the winch somewhere in the maze. The looks on their faces begin as uncertainty, but slowly give way to understanding. They have figured it out, and can now concentrate on other matters. Admit it—you know who you are!

Among other things, my company manufactures such backstops, which get bid on before and during the construction phase. At this point, I should back up and state for the record that we use Autodesk Inventor®. Part of the bid process requires submittal drawings, and the program I'd like to highlight in this article arose out of a need for a "tool," or program, which would automate some rather monotonous tasks in Inventor.

One such program is what we lovingly refer to as the Cable Routine. It allows the CAD designer to sit back and watch while it creates, on the fly, a new part (a cable) within the context of the backstop assembly. For the most part, once launched, the program runs by itself, pausing only to inform the user that it has finished. Only when a cable has to veer off

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# Programming

in some strange direction will the user be asked to point the way—the redirection will come in the form of a click here or there on the next pulley or winch.

The Cable Routine started out in life as a VBA program. A click on a custom toolbar button loaded the program and executed the main macro. When finished, it unloaded itself. But because of the uncertainty of VBA's future, we moved all our VBA code to "dot net." In its current form, this program is an Inventor add-in, created in VB.net, compiled, and available for use on a custom tab on the ribbon.

Creating a part in place is an adventure. If that part is a cable that wraps around several pulleys, it gets downright scary. Rather than bore you with line after line of code, I thought the best thing to get the point across would be to outline the steps taken to get from start to finish. You can then tailor the steps to your own needs.

To find a starting point, let's look at the process in reverse, starting with the desired result and working backward. The goal is to create another component, a cable in this case, which runs from a winch, around some pulleys, and finally gets anchored in some fashion. The cable will be the result of sweeping a round profile along a path. The path will be created by connecting the dots on a sketch, the dots being points within critical components we find in our assembly and project onto the sketch. Our winch has a pre-defined WorkPoint for use as the cable starting point. Most of the other points are center points of pulleys or chain links that have also been projected onto the sketch. A couple of our points must have their locations calculated and created in mid-air, but that's just due to the nature of our product. One of the things I like about pro-



grams such as Inventor is the fact that it is "smart"—an assembly knows what's in itself. So, after some basic housekeeping chores, the first order of business is to take inventory of the relevant components.

Now, you could loop through all the components in the assembly *each time* you needed to find a specific part, but that just seems inefficient to me, so I like to loop just one time and sort them out as I go, in a subroutine I like to call "SearchAndDestroy." It does several things at once as it looks over each component occurrence. It will take note of the relevant components as it finds them and assign them to a variable. I make use of classes for the important items, so I have a Pulley class, a Winch class, a ChainLink class, and so on. These will be properties of the parent Backstop class. Each class will have an Occurrence property that gets assigned to the actual component occurrence. For some items, such as pulleys, I'll also drill down to find the center point (this assumes the part was created with the Center Point at the center; otherwise, you can go into a part's mass properties and get its Center of Mass point) and create a property for its proxy. (Proxies: get to know and love them!)

```
Private _CenterPointProxy As WorkPointProxy
Public ReadOnly Property CenterPointProxy() As WorkPointProxy
    Get
        Dim anObject As Object = Nothing
        Occurrence.CreateGeometryProxy(Occurrence.Definition.WorkPoints.Item("Center Point"), anObject)
        _CenterPointProxy = CType(anObject, WorkPointProxy)
        Return _CenterPointProxy
    End Get
End Property
```

SearchAndDestroy() will also find and delete an existing cable. I found this to be a must if I were to re-run the routine on an assembly. Another benefit of this subroutine is that it will find a component that is unique to a specific model of backstop. Knowing the model comes in handy later for us. It might for you, too.

As stated earlier, the goal is to create a new part. At this point in the program, the new part has to be inserted into the assembly as an empty part template. Its PartComponentDefinition can then be referenced for later use in building the part.

```
'Place an occurrence of the new part.
.Occurrence = Assembly.ComponentDefinitions.Add(.PartDoc.FullDocumentName, IG.CreateMatrix)

'Part component definition.
CableCompDef = .PartCompDef
```

The pulleys in our backstop assemblies do not appear in the top-level of the browser. Instead, they're buried, sometimes nested three or four levels deep inside sub-assemblies and weldments. It's like looking for a needle in a haystack. How do you find these? The answer is: recursion! FindOccurrence is one of the hardest-working subroutines I have. There are variations of this theme out there if you look, but it basically goes like this: Give it the name (or portion of the name) of the component for which you're searching, the top-level assembly being searched, a Boolean flag to indicate when the item has been found, and an empty variable to hold the result. Here is my version:

```
Friend Sub FindOccurrence( _
    ByVal NameToFind As String, _
    ByRef AssyToSearch As ComponentOccurrence, _
    ByRef Found As Boolean, _
    ByRef Result As ComponentOccurrence)

    'This is a recursive function. Just sayin'....

    Dim subOccur As ComponentOccurrence

    If Found Then
        'Do nothing
    ElseIf InStr(AsyToSearch.Name, NameToFind) Then
        Result = AssyToSearch
        Found = True
    ElseIf AssyToSearch.DefinitionDocumentType = DocumentTypeEnum.kAssemblyDocumentObject Then
        For Each subOccur In AssyToSearch.SubOccurrences
            If Found Then
                Exit For
            Else
                'Here is where it calls itself...
                Call FindOccurrence(NameToFind, subOccur, Found, Result)
            End If
        Next
    End If
End Sub
```

Once the major components have been identified and the relevant WorkPoints harvested, the next step is to convert the WorkPoints into SketchPoints (either 2D or 3D), and project them onto a sketch. If all your points lie within a plane, you can get by with a planar sketch, which has its advantages, but it's possible that you'll need a 3D sketch. Our backstops and their cables are such that the vast majority of the cables can be created with a planar sketch. However, there are occasions when the winch will be located off to the side and a 3D sketch will be required, at least for the portion that zigzags through extra pulleys.

The code gets routed through a function, DetermineIf3D, which compares some relevant planes to see whether or not they are coplanar, and then returns either true or false.

```
If Winch.Plane_SideFacing.Plane.IsCoplanarTo(Bank.Plane_SideFacing.Plane) Then
    'If they are co-planar, then we can use the points we have and a 2D sketch only:
    b = False
Else
    'otherwise, we'll also need to select pulleys and add a 3D sketch.
    b = True
End If
```

If the cable is found to require a 3D portion, it means I have to show it where the extra pulleys and winch are located. The subroutine SelectPulleys returns a collection or list of component occurrences. It loops through a selection process, which filters out all but those few part numbers recognized as either pulleys or winches. The user is prompted to pick the pulleys in order, ending with the winch. Once it sees the winch, the loop is exited and the collection is returned. The relevant points are harvested from these component occurrences in the list, converted into SketchPoints3D, and projected onto the sketch. Simple!

```
'Cable's starting point, so the winch.
Dim CableStartPoint3D As SketchPoint3D = Nothing
Dim CableStartPoint2D As SketchPoint = Nothing
If Cable.Is3D Then
    CableStartPoint3D = Cable.SketchProxy.SketchPoints3D.Add(Cable.StartingPointProxy(Winch, Occurrence).Point)
Else
    CableStartPoint2D = Cable.SketchProxy.AddProjectingEntity(Cable.StartingPointProxy(Winch, Occurrence))
End If
```

Once all the sketch points are in place, connect the dots with an array of SketchLines...

```
'These will be 3-D segments since the span is 3D and with 4 points we have:
Dim aSketchLine3D()
SketchLine3D(0) = Cable.SketchProxy.SketchLines.AddByTwoPoints(CableStartPoint3D, Winch.StartingPointProxy(Winch, Occurrence).Point)
SketchLine3D(1) = Cable.SketchProxy.SketchLines.AddByTwoPoints(aSketchLine3D(0).EndSketchPoint, UpperPulleyStartPoint)
SketchLine3D(2) = Cable.SketchProxy.SketchLines.AddByTwoPoints(aSketchLine3D(1).EndSketchPoint, LowerPulleyStartPoint)
SketchLine3D(3) = Cable.SketchProxy.SketchLines.AddByTwoPoints(aSketchLine3D(2).EndSketchPoint, LowerPulleyStartPoint)
SketchLine3D(4) = Cable.SketchProxy.SketchLines.AddByTwoPoints(aSketchLine3D(3).EndSketchPoint, UpperPulleyStartPoint)
SketchLine3D(5) = Cable.SketchProxy.SketchLines.AddByTwoPoints(aSketchLine3D(4).EndSketchPoint, CableStartPoint3D)
```

...or SketchLine3D...

```
'Draw the sketch line.
aSketchLine3D = Cable.SketchProxy.SketchLines3D.AddByTwoPoints(previous3DPt, PulleyPt3D, False)
```

Planar sketches are nice in that the two SketchLines that meet at a SketchPoint can be sent off to a subroutine to RoundTheCorners.

```
Friend Sub RoundTheCorners(
    ByVal TopEdge As FormedEdge, _
    ByVal BottomEdge As FormedEdge, _
    ByVal Start As SketchPoint, _
    ByVal End As SketchPoint, _
    ByVal Radius As Double)

    Dim startSketchProxy As SketchProxy
    Dim endSketchProxy As SketchProxy
    Dim topSketchProxy As SketchProxy
    Dim bottomSketchProxy As SketchProxy

    Dim sketch As Sketch = Nothing
    Dim topSketch As Sketch = Nothing
    Dim bottomSketch As Sketch = Nothing

    sketch = startSketchProxy.Parent.AsSketch
    topSketch = topSketchProxy.Parent.AsSketch
    bottomSketch = bottomSketchProxy.Parent.AsSketch

    'Create the sketch. I realize here we're using a 2D and 3D
    'Sketch together. I don't know if that's the best way, but it works.
    'However, a sketchpoint that got converted to the 3D
    'SketchPoint = topSketchProxy.AddProjectingEntity(
    'SketchPointProxy.Parent.AsSketchPoint, topSketchProxy)

    End Sub
```

Given the desired radius and a few other parameters, a SketchArc can be inserted, and its resulting center relocated to the original vertex. This will make the eventual cable look like it's conforming to the pulley, as illustrated below.

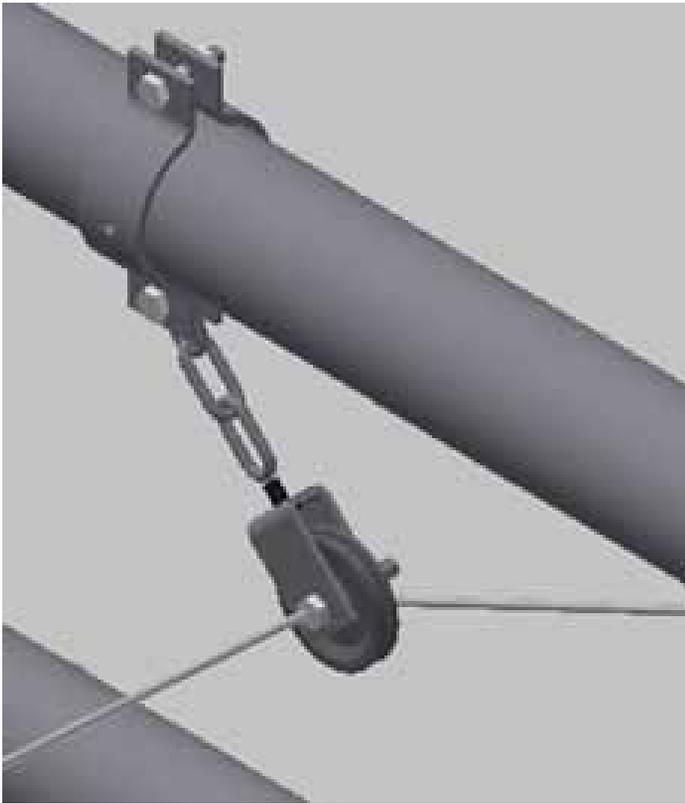


3D sketches, with their properties and methods, do not allow this technique. While it is possible to fillet the corners, the fillet's center information is "Read Only" and cannot be relocated to the original vertex like their 2D counterparts (at least that I have found). Left with the choice, I have opted to leave

# Programming



them alone, so the resulting corners require a bit more imagination on the part of the observer. Even if the corners *could* be rounded and the resulting fillet moved to look like it wrapped around the pulley, the challenge of orienting the pulley to look like it is being pulled in the correct direction is still there. In my example, the pulley and chain are a pre-built subassembly and can't be manipulated, except to spin it around the mounting tube. Like a lot of things, the further away you get, the better it looks!



Once the SketchLine is complete, it is used to create the path:

```
'Create a sweep path.
Cable.SweepPath = CableCompDef.Features.CreatePath(aSketchLine2D(0))
```

We next have to focus on the cable's cross section. Once again working backwards, it will require a sketch, which will require creating a WorkPlane, normal to the path at its endpoint.

Define a new WorkPlane at the endpoint. Then, use the SetByNormalToCurve method to re-orient this new WorkPlane:

```
'Reset the work plane so it's normal to the line.
WkPin.SetByNormalToCurve(aSketchLine2D(0), aSketchLine2D(0).StartSketchPoint)
WkPin.Name = "Cable Origin Work Plane"
```

Then, create the circle, profile, and sweep:

```
'Create a circle representing a cable.
Dim sketch As SketchDef = CableCompDef.Features.CreateSketch
If sketch.Exists Then
    sketch = sketch.Manufacture(11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)
    sketch.Name = "Cable Cross Section Circle"
End If

'Create a profile.
Dim Profile = sketch.Profile.AddProfile

'Create the cable as a sweep feature.
Dim Sweep = CableCompDef.Features.SweepFeatures.AddSweepPath(Cable.SweepPath, Profile, Cable.SweepPath, PartFeatures.PositionalDimensionalOptions)
```

In case you need to know the length of your new cable, try this as a property in your Cable class:

```
Private Length As Double
Public ReadOnly Property Length(ByVal InvApp As Inventor.Application) As Double
Get
    _Length = (InvApp.MeasureTools.GetLoopLength(SweepPath) / 2.54)
Return _Length
End Get
End Property
```

Obviously, I have left out a lot of code in my program, but hopefully, you get enough of the idea to take the ball and run with it. The sample code included with Inventor's Help is a great resource for finding a lot of the missing pieces.



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# And Here's How...

## To Make a Copy of a Qleader Arrow

Multileaders are fine, but I'm a fan of the good old-fashioned Quick Leader [QLEADER].



### INSIGHTS TO QLEADER

- Alias for the Qleader command: LE
- The DIMSCALE value governs the size of the Quick Leader text and arrowhead

### HOW TO COPY THE QLEADER ARROW

1. Confirm your Dimscale value, then set the desired layer to current.
2. Launch the QLEADER command.
3. Enter S to open the Settings dialog box.
4. On the Leader Line & Arrow tab, set the Second Segment to Horizontal, then click OK.
5. Specify the three points for the leader, then enter the text.
6. Click once on any part of the leader line to display the three grips.
7. Click in the arrowhead grip, and put another one where you want it!

**GOLD STAR TIP:** Create the leader in the 'Source' drawing for your blocks that you put on a tool palette. Now block the leader and add it to your palette. In the Properties dialog box for the leader on the palette, set the Explode option to Yes. Good to go!



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# Five Tips for Selecting Quality Apps

**S**o you've conquered the toolset in the most current release of Autodesk® Revit® and optimized the tools in a production setting. However, time will reveal the flows and limitations of any program. Let's take a look at how third-party applications will help you break through the technology ceiling and propel your productivity to new levels.

Luckily for all of us, Autodesk gives us access to customization tools found through Revit API and SDK. API (Application Programming Interface) is a source code interface that an operating system, library, or service provides to support requests made by computer programs. The API gives us the code fragments for commands that speak directly to the Revit application. SDK (Software Development Kit) provides the framework and instructions on how to format these strings of code into a chronological order for Revit to execute.

```

Lab1PlaceGroup
Execute(ExternalCommandData comma

[TransactionAttribute(TransactionMode.Manual)]
[RegenerationAttribute(RegenerationOption.Manual)]
public class Lab1PlaceGroup : IExternalCommand
{
    public Result Execute(
        ExternalCommandData commandData,
        ref string message,
        ElementSet elements)
    {
        //Get application and document objects
        UIApplication uiApp = commandData.Application;
        Document doc = uiApp.ActiveUIDocument.Document;

        //Define a Reference object to accept the pick result.
        Reference pickedRef = null;

        //Pick a group
        Selection sel = uiApp.ActiveUIDocument.Selection;
        pickedRef = sel.PickObject(ObjectType.Element,
            "Please select a group");
        Element elem = pickedRef.Element;
        Group group = elem as Group;
    }
}
    
```

Figure 1

Since 2006, Autodesk has been providing open access to Revit API and third-party development tools. This source code enables users and developers to customize the functionality of Revit and enhance the variety of ways Revit interfaces with other systems.

The Revit Developer Network is a rapidly growing group of users focused on harnessing the power of the Revit API and making custom utilities for the rest of the industry. With all the custom applications that are beginning to surface it can be difficult to weed out the good apps from the great apps. Many developers are releasing similar tools with similar features. It can be challenging to pick the right tool for the job. Here are five key factors that will help us identify a quality app.

- 1. What is the potential ROI (Return on Investment) for this utility?** Although there are several free apps that feature basic tools, the more powerful tools on the market are going to range from \$5 to \$2,000 (on subscription or one-time payment). Take time to analyze the cost associated with using your standard workflow and the potential savings utilizing a specialized app. Most developers offer a 30-day trial period; use this time to evaluate the app against your other similar options before committing to purchase.
- 2. Will the app require any training or is the tool intuitive to use?** A \$2 app and a \$200 app are only good investments to the degree they are used. If you happen to find a good tool with a complex interface, inquire about training resources, user guides, or tutorials available through the developer. Spread the knowledge—make documentation available from your internal wiki; do a scrum on new features to keep your customization current.
- 3. Does the developer offer trouble shooting or tech support?** We've all heard the horror story of risks taken on untested technology. Depending on how the add-on is integrated into a project, this could make or break your efficiency. If all else fails, Autodesk has an approved list of third-party apps that meet certain criteria. These are a safer bet, although the better tool might be a risk worth taking.
- 4. Does the developer have a history of providing updates to align with newer releases of Revit and other interfacing programs?** Dependency on an add-on could result in unintended consequences of dictating if or when you'll be able to upgrade to newer releases of software over the lifecycle of a project.
- 5. What credentials does the developer have to reinforce it is producing quality products?** Many seasoned developers are connected through Autodesk's partner program or involved in the Revit

Developer Network. This can quickly make the difference between a clean, reliable app and one that is prone to crashing or corrupting project files.



Figure 2

As with any new technology, it is best practice to shop around and test out add-on applications, especially before committing to buy them or before deploying them in a production environment. Here are a handful of starter apps you may wish to consider.

## STARTER APPS

**D|C|Tools by D|C|CADD** – This isn't your typical re-number tool. Many of the free apps that address numbering functions are specific to elements such as rooms only or doors only. In addition to re-numbering capabilities for both doors and rooms, this tool also allows re-number by type or instance of several family categories such as Casework, Electrical Fixtures, Electrical Equipment, Floors, Furniture, Grids, Lighting Fixtures, Parking, Specialty Equipment, Structural Columns, Walls, and Windows. There are also utilities included for changing case for Revit text and updating door parameters. The D|C|Tools application is a free download and can be found on the Autodesk Apps Exchange site: <http://apps.exchange.autodesk.com/RVT/Home/Index>

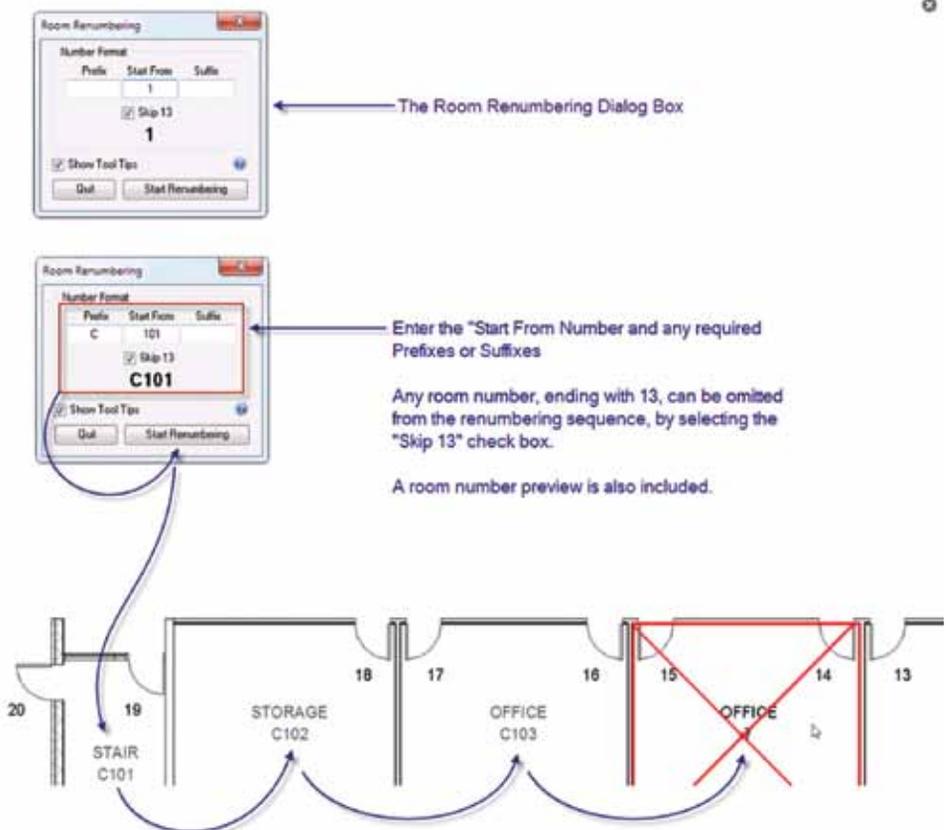


Figure 3

# Revit 2013

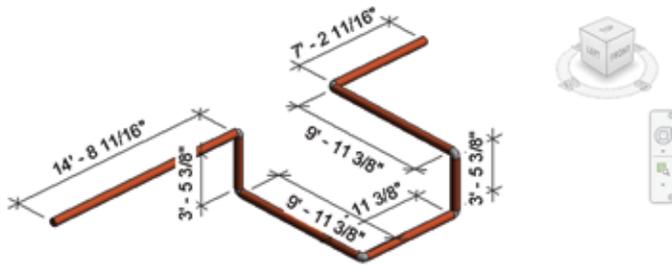


Figure 4

**Easy Dimension** by Shanghai YeahSo Software Co., Ltd. – This little tool enables you to add dimension strings by element. Simply choose the type of dimension string and select the category of elements to measure. Though not all categories are available from the selection list, the basics include grids, walls, lines, ducts, pipes, cable trays, and conduit. In an MEP environment this could prove to be a great time saver in documentation or shop drawing production. Easy Dimension is a free download and can be found on the Autodesk Apps Exchange site or at <http://www.yeahso.cn/en/revitproducts>

**View Template Controller** by CASE Inc. – This easy-to-use tool enables you to visualize and change view template assignments for any and all

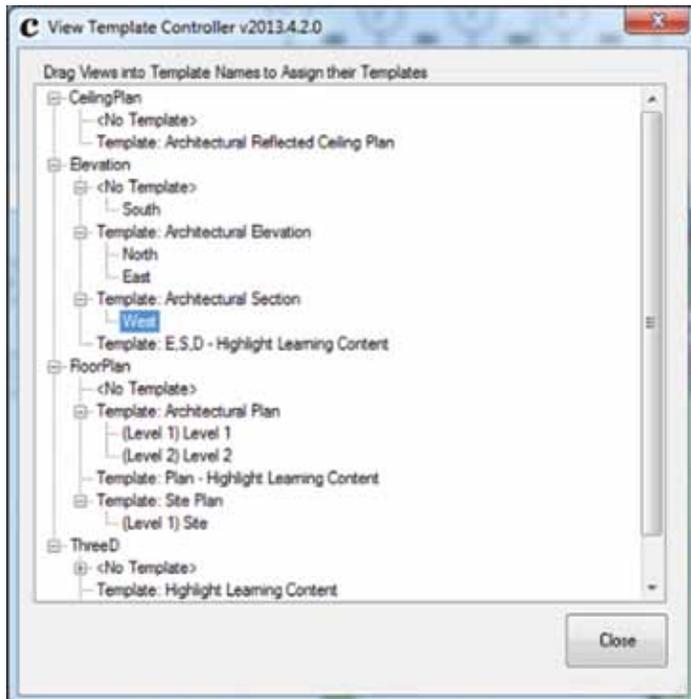


Figure 5

views in the model. Unassigned views can be dragged and dropped into the view template header and the view template will apply automatically. This is a quick and easy way to ensure that views are all formatted to a standard and consistently across the entire project. View Template Controller is a free download and can be found on the developer's website: <http://www.apps.case-inc.com/content/view-template-controller>

**Ideate BIM Link 2013** by Ideate – Database migration can sometimes be a little tricky because the limitations (or lack of limitations) on editing rights can leave your data open for

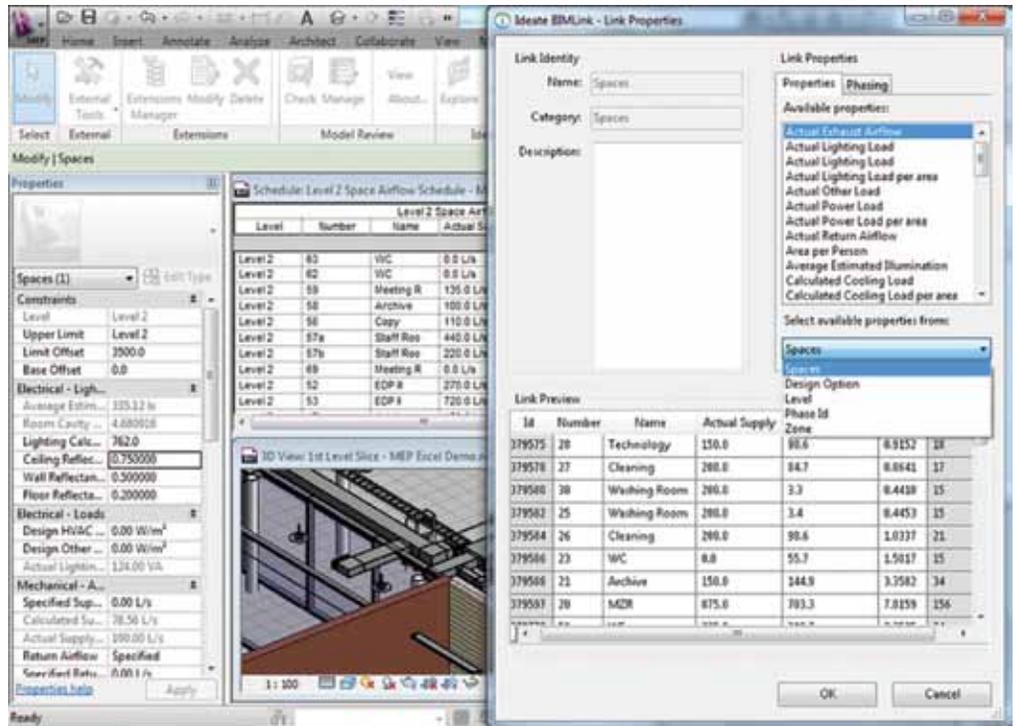


Figure 6

corruption or tampering by non-Revit users. I found Ideate BIM Link has a safe balance of editing controls and was easy to customize the export and import settings. Another excellent feature is the summary of updates that are itemized before importing data back into Revit. Ideate BIM Link is available as a free 30-day trial and capable of exporting/importing up to 25 columns of data. Ideate Revit DB link 2013 can be found on the Autodesk Apps Exchange site or at <http://www.ideatebimlink.com/>

There are a lot of places to find the growing number of apps and add-ons available on the web today. Let's take a look at the most common sites for showcasing third-party developer applications.





Figure 7

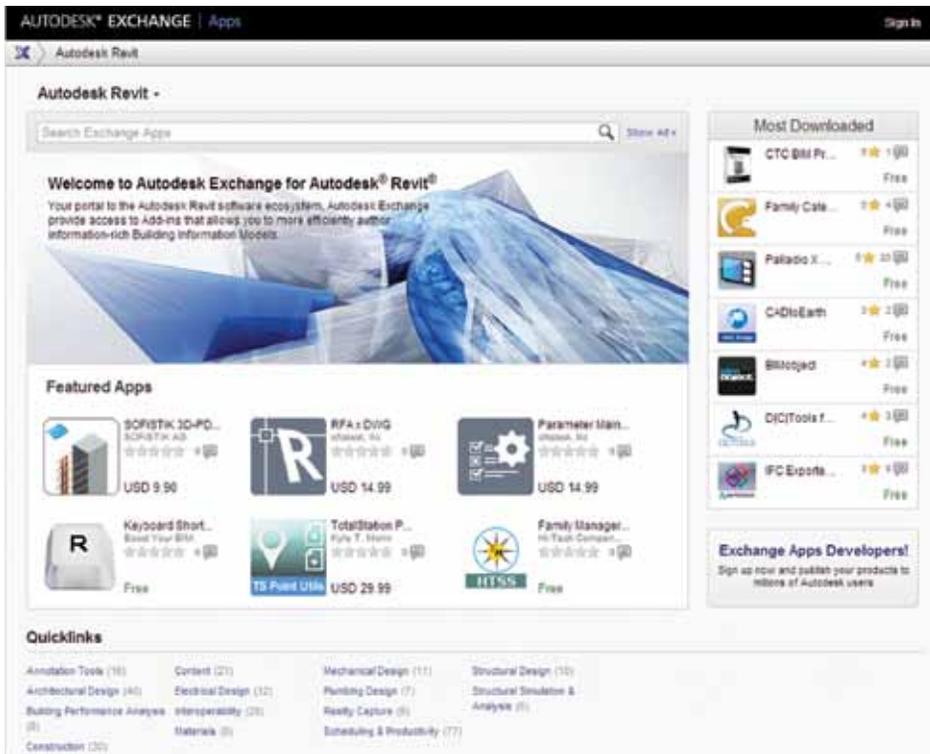


Figure 8

**Autodesk Apps Exchange** – This is a web service provided by Autodesk that makes it easy to search and download plug-in extensions, companion applications, content, and learning materials to customize and extend many Autodesk design products. This is the most common location to find Autodesk-supported third-party applications. The apps exchange site is accessible directly from the Revit UI by clicking on the blue and gray “X” icon docked in the InfoCenter located above the ribbon.

**Autodesk Labs** – This site outlines some of the most innovative new technologies being tested for customers in design-based industries. Labs provides public, free, early access to prototypes, technology previews, and experimental web services. Much of what is offered here is still in conceptual development, but it’s a great testing ground for new apps and emerging technologies. Most of what you’ll find here is not recommended in a production environment.

**Autodesk Partner Products & Services** – This is a great source that showcases add-on applications authored by developers from around the world. Add-ons are available in a variety of different languages. Most applications are in the higher price range, but by

contrast are very powerful and tend to expand on tools used for managing manufacturing and fabrication data.

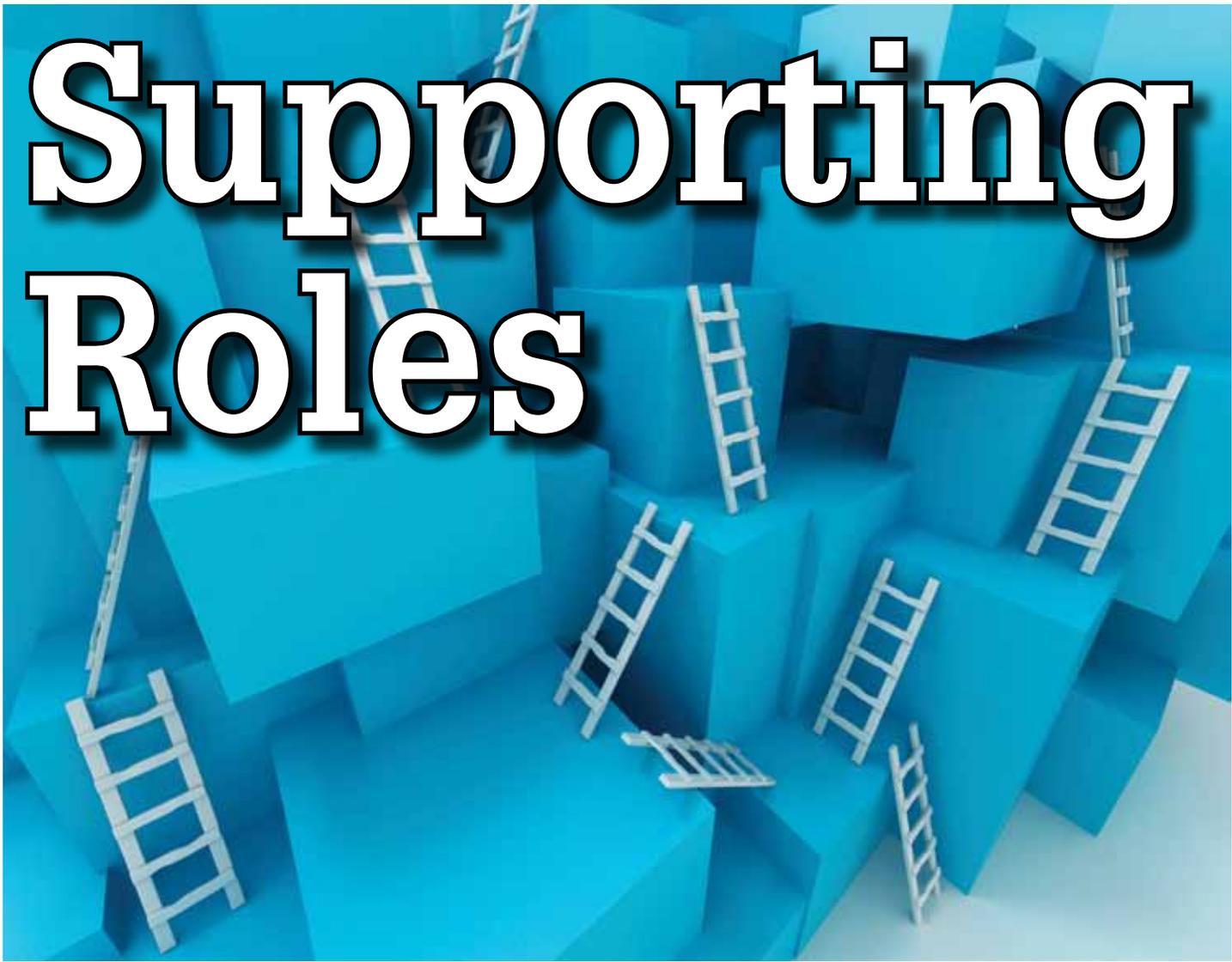
**Individual Company Sites** – There are many apps beyond the Autodesk umbrella of approved products and developers. Some of these developers are individuals with a passion for coding and developing customized technologies. Some developers are actually companies in the AEC industry that are choosing to share their custom apps with users outside the corporate loop. Whatever the case may be, I would recommend a little extra testing and research to weed out the novice applications from the professional ones.

With all the complexities and challenges in the modern AEC industry, you will find that knowing the ins and outs of the Revit tools is the threshold of maximizing the software. Third-party applications can enhance your project as well as your process. Truth be told, there is always the real possibility that the tool you need just hasn’t been developed yet. Dare I say, there may *not* be an app for that...yet.

The best third-party app could be the one you create yourself. If you’re interested in learning more about third-party application development, visit Autodesk’s Revit API network to explore applications in development and review tutorials and educational resources on developing custom Revit add-ons.



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**A**s I go through the requirements for putting together a grading plan, it becomes clear that many tasks required to put together a plan set are missing from Autodesk® Civil 3D®. This is where third-party applications help to fill in the gaps. This article will cover some of the third-party applications that are available for use with AutoCAD Civil 3D.

**SINCPAC**

The tools contained within SincPac from Quux Software are focused primarily on survey-related commands. The product contains three modules Drafting, Points, and Power. There are more than 100 commands combined with all the modules—too many to cover in the limited space in this article. One command I find useful is the PGAddRemovePoints. This command facilitates the organization of point groups by making it easy to add and remove points from point groups without going through multiple dialog boxes for each point group.

In the Drafting module there is the ParcelOffset command. This command, the first one I learned in the product, draws parcel lines

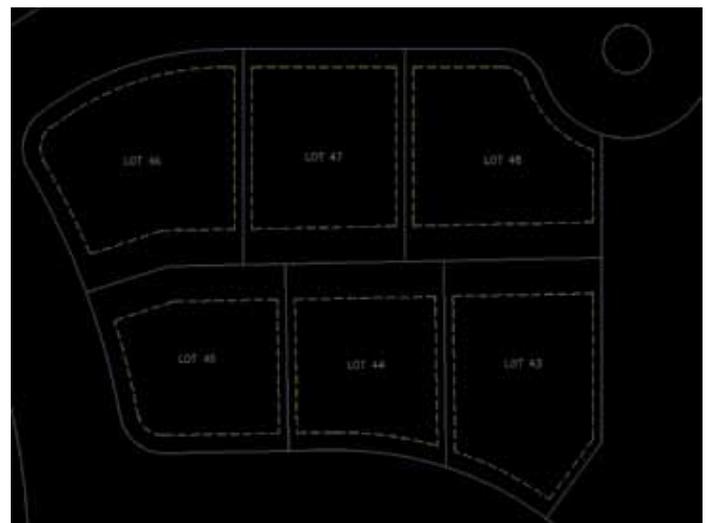


Figure 1: SincPac

offset from the sides of the actual parcel lines. These lines typically represent the buildable area of the parcel. This command alone saved me eight to ten hours of offsetting and trimming polylines for a large subdivision project.

## Sample output

Run	Pipe Size	From MH	To MH	3.000-4.00	4.000-5.00	5.000-6.00	Average	Length
STM - (34)	0.45	stm28	stm29	60	66	0	4.001	125.1508
STM - (35)	0.525	stm29	stm30	0	75	0	4.5	74.20179
STM - (36)	0.525	stm30	stm31	0	18	0	4.581	17.17059
STM - (37)	0.6	stm31	stm32	0	31	30	4.997	60.53977
STM - (38)	0.75	stm32	stm33	0	0	27	5.508	26.98421
STM - (39)	0.3	stm34	stm35	76	2	0	3.677	77.74686
STM - (40)	0.3	stm35	stm36	8	6	0	3.996	13.73999
STM - (41)	0.375	stm36	stm29	45	36	0	4.029	80.43963

ManHole	MH Size	Rim Eleva	Sump Elev	Depth
stm29	1.5	182.84	178.24	4.6
stm28	1.5	184.12	180.68	3.44
stm31	1.5	181.81	177	4.81
stm30	1.5	181.93	177.4	4.53
stm33	1.5	181.77	176.03	5.74
stm32	1.5	181.65	176.3	5.35
stm36	1.5	183.36	179.31	4.05
stm35	1.5	183.54	179.52	4.02
stm34	1.5	184.45	181.08	3.38
Total Depth:				39.9

Figure 2: Steltman Software

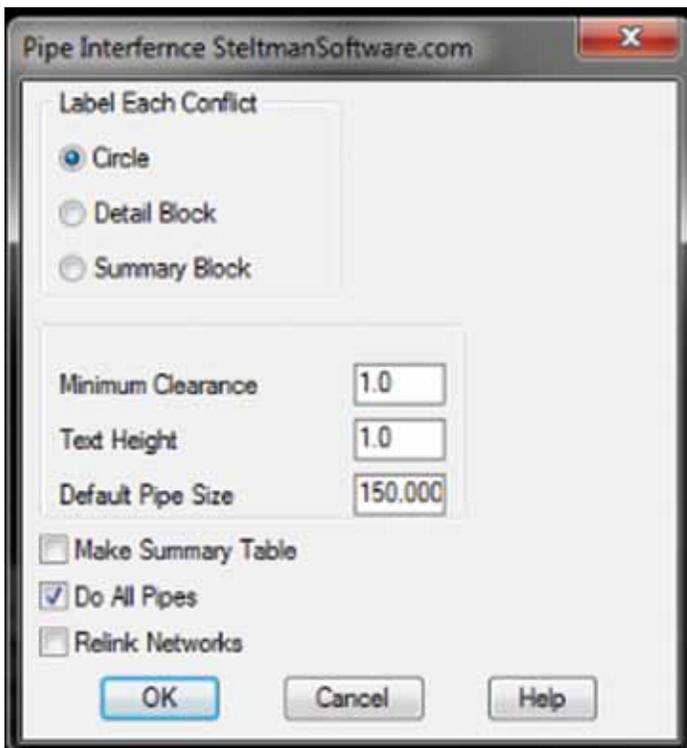


Figure 3: Pipe interference dialog, Steltman Software

Summary Table

Pipe Interference Table			
Location	obvert	Invert	difference
1	89.529	89.936	0.259
2		89.145	Intersect

Figure 4: Pipe interference table, Steltman Software

## STELTMAN SOFTWARE

Steltman Software is a long-time provider of third-party applications for Land Desktop and Civil 3D. There is a plethora of commands available in the software package they provide. Some new commands created are related to pipe networks. One new command identifies pipe interferences. Sometimes we need to identify pipe conflicts with other objects, whether it is pipe representations as polylines or minimum separation distance from an object that Civil 3D doesn't represent. The tool provides either a table of conflicts or a block at the location of the interference.

Civil 3D may contain the ability to output the lengths of pipes and the count of structures. Unfortunately, this doesn't take into account the most important cost component of installing pipe and structures. The depth of the pipe or structure is important in determining the installation costs.

The pipe depths report provides the option to calculate the depths from either the top or the bottom of the pipe. The report may be either output to the drawing or into Microsoft Excel. The depths are based on a user-selected surface. The user may determine the depths range for the pipes. This is important because pipes and ground usually slope and don't always have a constant depth along the pipe.

Civil 3D isn't the most user friendly when modifying pipe and structure information, especially when you have to modify many properties at the same time. The Pipe2Excel command facilitates the exporting of pipe and structure data to Excel and then the reimporting the data. Not all of the pipe and structure properties are modifiable. While not all of the properties are modifiable, it also comes in handy if you need to export the data to Excel to be used in another program for reporting information.

## CIVIL 3D POWER TOOLS

One of the under-developed tools in Civil 3D is reporting. Unfortunately, there isn't an easy way to export out design information from Civil 3D. You only get it one way, and that one way was determined six or seven years ago. Modifying the code, either .NET or XLS, is a bit complicated and takes skills that civil engineers or drafters don't normally possess.

An alternative is the Visual Report Designer, which utilizes a graphical user interface to construct the reports by dragging and dropping information at the desired location on the reports. In addition to placing model properties, complex custom calculations may be performed. Besides outputting to reports, the program is also capable of inserting the reports directly into a drawing. This is useful to fill in the table appearance deficiency in Civil 3D.

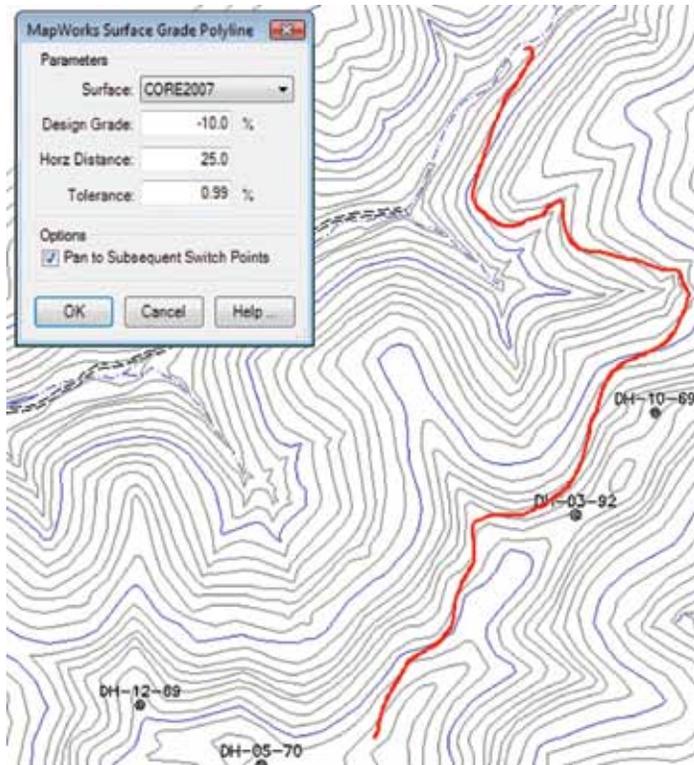


Figure 5: DotSoft's MapWorks

## SAVOY COMPUTING

Savoy Computing provides numerous tools to do projects related to pavement design. Products include verifying turning radius of vehicles, roundabout design, rail design, and airport design. I found the demonstration of the roundabout design appealing. It incorporated both the vertical and horizontal design elements required for a roundabout. This is a well-rounded offering. Not only is the grading taken care of, but the software also draws the stripping and signs.

## TRANSOFT SOLUTIONS

Transoft Solutions provides competing products to Savoy Computing. Much of what I wrote for Savoy Computing applies to Transoft Solutions products. If you are in the market, I'd suggest you look at both products and then decide which one works best for your workflows and design methodologies.

Recently, Transoft Solutions released a new version of AutoTURN. The newest version features a large update of the vehicle libraries, reflecting changes for AASHTO, Caltrans, Florida PPM, and Wisconsin DOT vehicles. If you are a user in Israel you'll be happy to know there are several updates to reflect the unique vehicle requirements in Israel.

## STANDARDS MANAGER

Managing Civil 3D styles may cause headaches as sharing and modifying styles across drawings is problematic. Fortunately, CAD Masters has developed a solution to help limit this frustration. The product utilizes a database to store the Civil 3D styles and settings.

The styles may be imported into drawings as needed. This helps reduce drawing bloat due to having numerous unneeded styles or layers in a drawing. I found the product easy to use, though it does take some work to create the standards to put in the database. But once you do the groundwork, it is easier to have a consistent look across drawings and projects.

## DOTSOFT

Another company providing solutions to civil designers is DotSoft. Their Civil/Survey offering is called MapWorks, which contains numerous commands to help you design. One tool I find especially intriguing is the Grade Poly command. It lets the user select a point and a grade. A polyline is then drawn along a surface at the slope provided. It makes it easy to find a preliminary route a road should take up or down a hill.

If you perform mining design you might want to take a look at the mining tools DotSoft provides. There are tools to report quantities in tonnage, which, in mining, is a more appropriate unit of measure than volume.

## OTHERS

This article doesn't represent a complete list of the third-party applications available. There are numerous others that provide their own solution to civil engineering design problems. The next time you are faced with a time consuming task, take a few minutes and see if there is a product available that would cut the time to do the task. If you don't find such a tool, the third-party application developer may be willing to create one for you. It wouldn't hurt to ask.

## DISCLAIMER

I have done work with some of the products mentioned in this article or have received free versions of the products in the past. The U.S. government suggests that I disclose these facts in my article writing.



*Christopher Fugitt is a civil engineer who has worked in both design and construction. He is the owner and blogger at Civil 3D Reminders and currently provides civil engineering-related services through his company, Civil Reminders.*



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# Dynamic Workflow

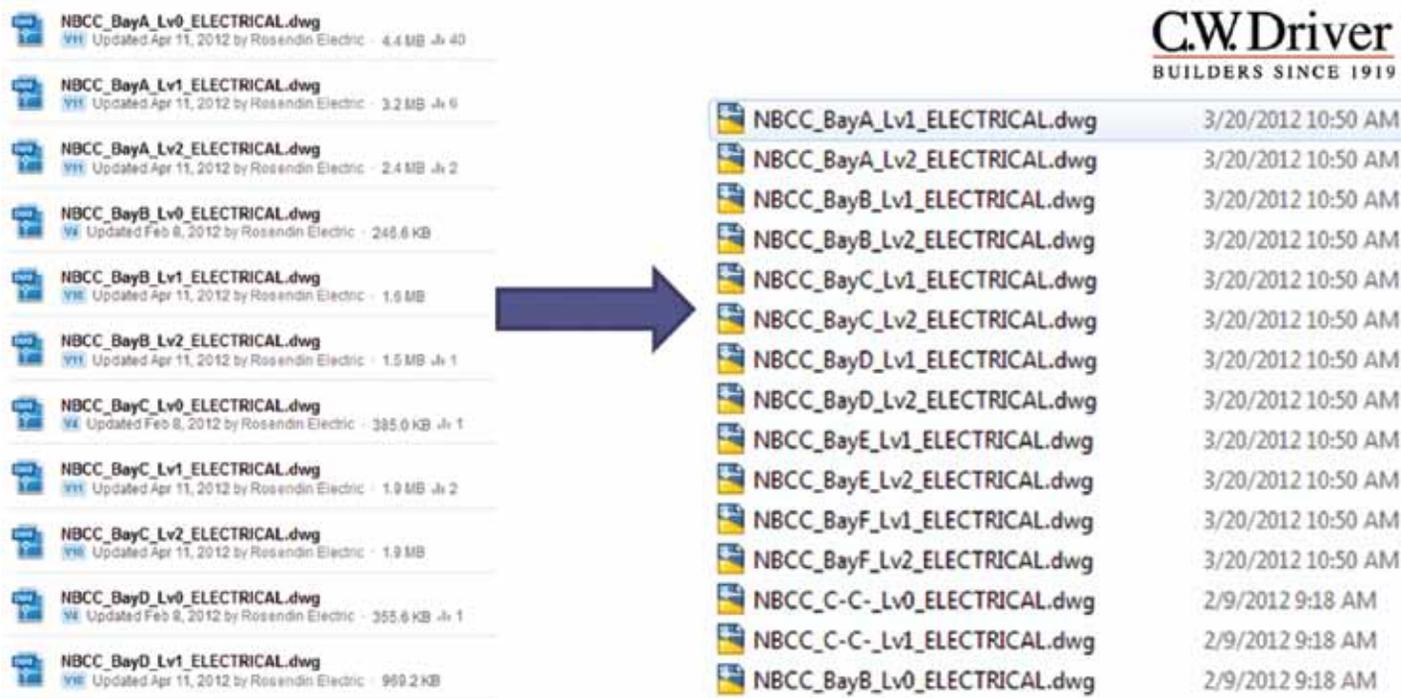


 Autodesk® Navisworks® can read a wide variety of file formats and aggregate them together. The two different file types that can be saved from Navisworks are nwd and nwf. The nwd file type contains all the geometry, metadata, timeliner information, animator sequences, and markups. This file is a static file and does not update geometry when the original authoring file is updated. The nwf file type contains metadata, timeliner information, animator sequences, and markups. It does not contain any model geometry—the nwf file references the original authoring files and displays the geometry shown in those files. When one of the authoring files' is updated, the nwf will update the geometry displayed in Navisworks.

## NWF WORKFLOW

Understanding the workflow of nwf is critical for success. The first activity you must perform is to obtain all the model geometry you wish to review in Navisworks. Often this is a collaborative effort and some sort of ftp site is used. One of the fundamental ground rules for exchanging files is that the files retain the same name version to version. Keeping the same name allows the local file to be overwritten by the new file. Because the nwf is based on filename and file path, overwriting the old file tells Navisworks that it needs to re-cache all the information in the new file.

I have heard significant discussions about version control with the names not changing to reflect a change in the version. Sophisticated file exchange sites such as box.com take care of versioning for you.



## FTP Site

## Navisworks Directory

Figure 1: Naming changes

The benefits that are gained by using the same name far outweigh the chaotic method of including a date or version in the filename.

Once the models have been aggregated and the old files overwritten by the new files, it's time to open the nwf. Navisworks will automatically create new cache files for any files that were updated.

If you have Navisworks open and you update a model, simply click the refresh button on the quick access toolbar to refresh the geometry in Navisworks. If you get an error that says the file is

in use, you need to change an option in Navisworks. Click the Application Button > Options > Model > Performance and click the checkbox next to Close NWC/NWD files on load. This will tell Navisworks to release the files in Windows Explorer after it loads the files into the system. You can then overwrite the files and refresh them in Navisworks.

## NWF SEARCH SETS

Following the nwf standard workflow is critical to prevent loss of work. During the course of a project you will undoubtedly need to test a set of items against another set of items. Or perhaps you need to always hide a certain set of items. For example, suppose you receive a model from the architect that always contains a mechanical system. You want to maintain all the geometry in the architectural model except the mechanical system. You need a set to hide the mechanical system in Navisworks.

The two types of sets in Navisworks are selection sets and search sets. Selection sets create a group of selected geometry into a collection. In Navisworks 2014, if you group objects in a dwg into a selection set and update

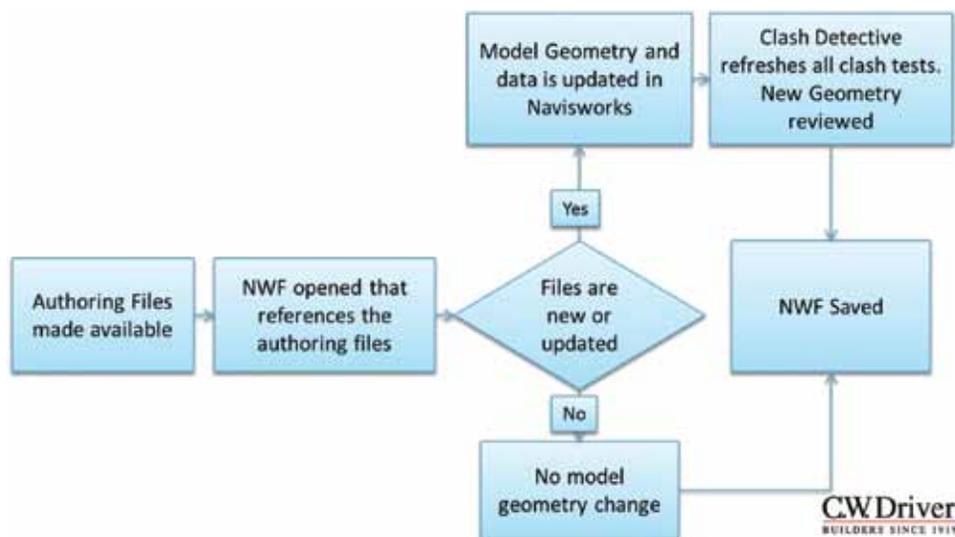


Figure 2: nwf workflow

# Navisworks Manage 2014

the dwg file, your selection set will no longer contain the previously selected geometry. This is true even if you do not change the geometry that was contained in the selection set. These sets should be considered temporary sets and should not be depended on over the iterative coordination process.

Search sets are dynamic in nature and will update as the geometry in Navisworks changes. Search sets are queries defined by the user to aggregate model geometry into a collection. A best practice is to use search sets for all clashes to maintain a dynamic relationship. For example, if you are clashing the mechanical system against the ceiling system, it is best to create a search set that contains the mechanical geometry and test it against another search set that contains the ceiling geometry.

Often, these sets will need to cover multiple files. In this example, suppose you had a file naming convention which stated that all mechanical filenames were to include the word Mech. You could easily create a search set with the definition shown in Figure 3. The ceiling search set is even more critical because often the ceiling geometry is contained in the larger architectural file. By creating the search criteria to find all ceilings, you are able to extract just the ceiling geometry for testing. When the mechanical and architectural models are updated, their search sets will find the geometry changes and the clash test can simply re-run to review the changes.

Category	Property	Condition	Value
Item	Source File Name	Contains	mech

Figure 3: Mechanical search set

Some might wonder what is the point of setting up a search set that contains the mechanical files instead of simply selecting the mechanical filenames in the Select tab of the Clash Detective. The reason the search set is better is because it will capture any new models that are appended into the project.

Suppose you start out with six mechanical files on a floor, then midway through coordination a change order adds a new system

to the mechanical contract and the mechanical contractor creates a new mechanical file for that system. If you used a search set, you simply append in the new file and re-run all your clashes. If you didn't use a search set, you will have to open every mechanical test and add the new file in the Select tab.

Another reason to use search sets in the Clash Detective is so you can export your clash tests for use in other projects. If you define all your clash tests with search sets, you can export you clash tests from the Clash Detective in an xml file. You can then import this xml file into other Navisworks projects. When imported, not only will the Clash Test be populated, but all the search sets will be imported as well.

## CLASH DETECTIVE

The Clash detective can only truly manage files when an nwf file is used. Following a good workflow, you would set up all your clash tests with search sets and run the clash tests. Anyone who has used Navisworks knows that hundreds and even thousands of clashes can be found in a test. Part of good model management involves grouping clashes together into constructability issues.

A constructability issue can be defined as a localized area of clashing objects. For example, suppose you have a hallway with a cable tray that is running through the ceiling down the entire hallway. Navisworks would identify this as hundreds of clashes. The fix to these hundreds of clashes is the same, so rather than show hundreds of clashes, it is better to show just one clash representing the entire constructability issue. All the other clashes associated with this constructability issue will be reviewed by the nature of the containing clash.

To group clashes into constructability issues I recommend the following workflow. First, group all the clashes found into one large group. Using the Clash Detective display tools, click the Hide Other tool. All geometry that is not in conflict will be hidden.

Navigate to a problem area and select the geometry associated with the constructability issue. Click the filter tool and choose inclusive. All the clashes shown in your folder are clashes associated with

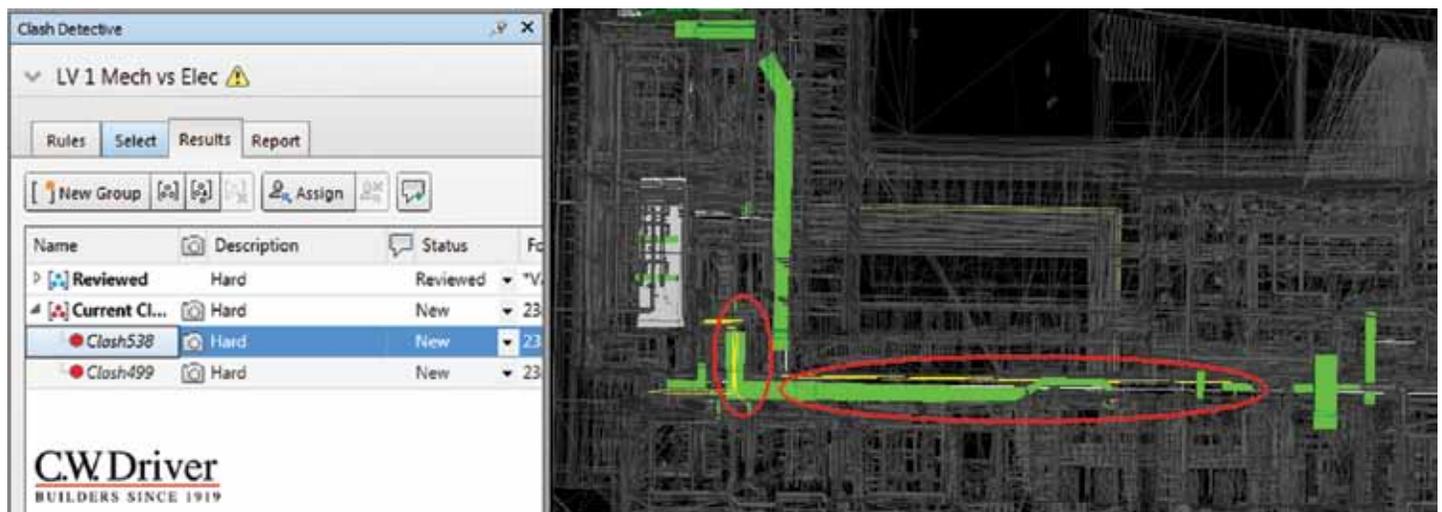


Figure 4: Hallway constructability issue

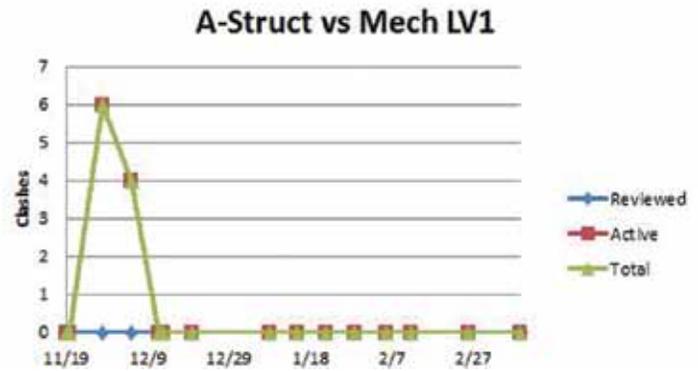
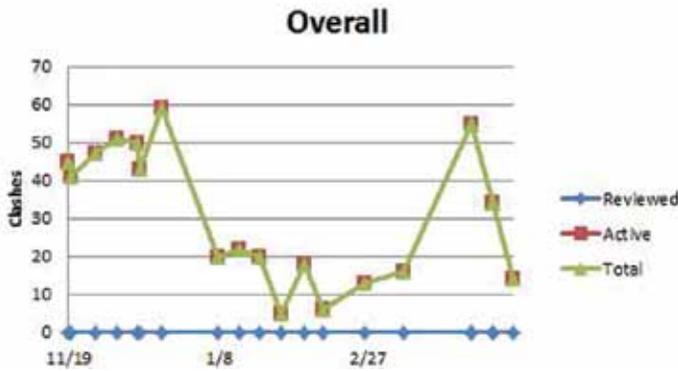


Figure 5: Progression graphs

the selected constructability issue. Mark one of these clashes up to represent the entire group. Move this clash to a folder named Constructability Issues. Mark the status of the rest of the clashes to Reviewed and move them to a folder named Reviewed. Remove your filter and move to the next constructability issue. Because you removed the clashes associated with the first constructability issue from the original folder, they will not appear in the scene view when you click Hide Other. This allows you to know with confidence you have reviewed every single constructability issue in the model.

The best part about the above workflow is that revisions become much faster. When model geometry is updated, you simply re-run your clashes. Group all the new clashes into a big folder. Go to your current clashes and select all the geometry associated with them. Click the filter button and move all the clashes in the new group that have been filtered into the Reviewed folder, because you know your current clashes already contain the information displayed in the new clashes. This eliminates hours of work and makes your report extremely useful and accurate.

One note of caution about the Resolved status: Navisworks will change the status of any clash to Resolved if the original clashing geometry is moved in any way. Because your clashes are representing many clashes as a constructability issue, you must review these clashes and change the status to Active if the entire constructability issue was not fixed. Compact the clash test to remove any truly resolved constructability issues.

If you are following a workflow that establishes constructability issues and persists them until they are resolved, you can easily see which parties are not actively changing their models per the documentation in the Clash Detective. You can create variance reports by reviewing the date the clash was found. If you are commenting the constructability issue during the meeting and making assignments, you can manage the parties involved with the issue. In essence, by taking notes during the meeting you are generating a hot list. If you are really sophisticated, you can even use statistical regression to mark the changes in progression by graphing results from meeting to meeting.

I have heard from many individuals that marking up files and grouping as described above takes too much time. To this, I always

ask how they handle their workflows. Many say they simply load new models into Navisworks, create clash tests, and run the tests. They then eyeball issues and create viewpoints. This method is inefficient. When you simply eyeball issues, you tend to waste time and overlook critical issues. Even worse is when an individual runs the clashes for the first time during a meeting. This method wastes everyone's time because no forethought has gone into what constructability issues need to be reviewed first.

The other issue with the eyeball method of creating viewpoints is you lose the ability to simply generate viewpoints from the Clash Detective. If you do all the markups using the clash viewpoints, you can simply generate all your viewpoints from the Clash Detective. They will even be grouped into folders for each clash test, making it easy for the parties involved in a clash to know the constructability issues for which they are accountable.



Michael N. Smith is a BIM Manager for C.W. Driver, a large general contractor in Southern California. The firm is highly regarded throughout the design and construction industry for implementation of BIM innovations on each project, and for creating customized software plug-ins to increase the efficiency of the latest software releases. Michael is a guest author and technical editor of *Mastering Navisworks 2013* and instructor for *Cad Learning's Navisworks Series*. He has spoken at Autodesk University, ASHE PDC, CASH, and other conferences. Most recently he started *Blink Forward*, a revolutionary approach to hyperlinking all construction documents together. *Blink Forward* links both forward and backward, allowing for a lean paperless environment. He can be reached at [msmith@cwdriver.com](mailto:msmith@cwdriver.com), or at 909.945.1919.

# Understanding View Range

**W**hen determining why an element in the Revit plan view is not displaying, a user may try to troubleshoot the situation by referring to the View Range. Although the View Range concept itself is easy to comprehend, a full understanding of it requires more than a basic understanding of Revit. With a little bit of clarification regarding definitions and some hands-on practice, View Range concepts can easily be understood. While this article primarily addresses Autodesk® Revit® MEP, the discussion provided within can also apply to Autodesk® Revit® Structure and Autodesk® Revit® Architecture software.

The goals for this article are to decode terminology, to deliver meaningful strategies for visualizing View Range, and to suggest ways for users to confidently set the View Range for desired results.

## FLOOR PLAN VERSUS CEILING PLAN

Although four common terms are used to define the View Range, each term has a different definition depending on whether the view is a floor plan or a ceiling plan. A user needs to know that the definitions that apply to a ceiling plan may not apply the same exact way to a floor plan, even though the wording and framework are the same. Fortunately, a small visual cue exists to help users remember which set of rules applies. This visual cue is explained in the Second Term: Cut-plane and Third Term: Bottom sections of this article, as it relates to the ability/inability to modify View Range parameters.

## ACCESSING VIEW RANGE

Users can access the View Range with just a few clicks. First, the floor plan or ceiling plan must be opened using the project browser. Once the floor plan or ceiling plan is open, the View Range button becomes available in the Properties panel (see Figure 1).

Clicking the View Range button brings up a dialog box similar to Figure 2 listing four parameters: Top, Cut-plane, Bottom, and View Depth. Each term is explained in more detail in the following four sections.

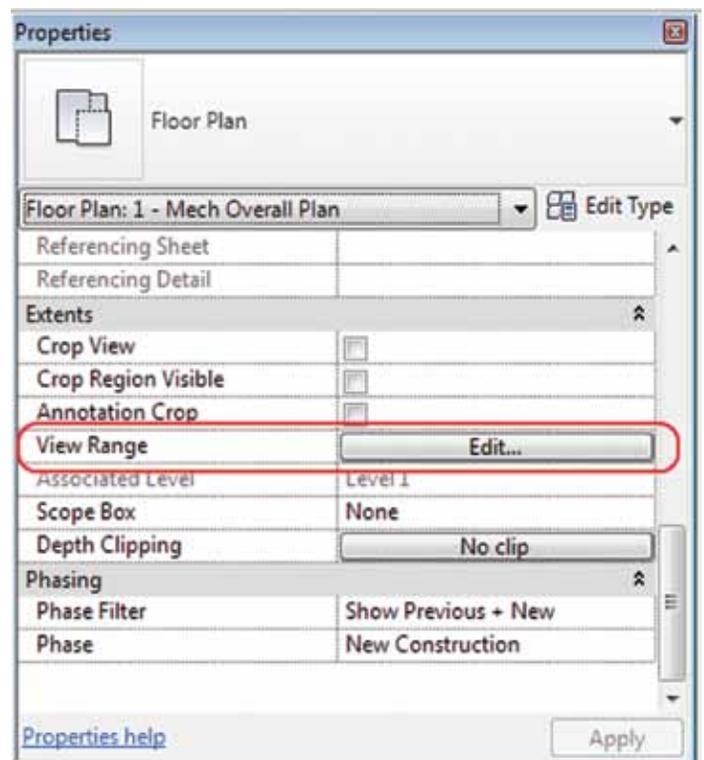


Figure 1: The View Range button must be clicked to access the View Range. The button can be found near the bottom of the Properties menu, as indicated by the scroll bar.

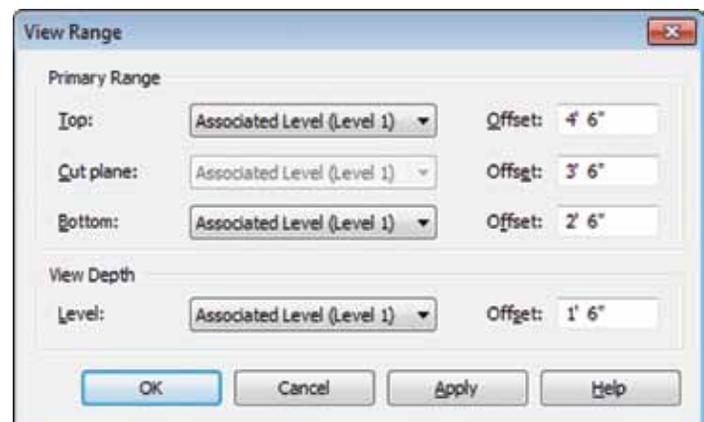


Figure 2: The View Range dialog box has four parameters to set.

## FIRST TERM: TOP

The first term in the View Range dialog box is called Top. For both floor plans and ceiling plans, Top is a modifiable parameter. The Top View Range parameter (for both floor and ceiling plans) indicates that any element above the Top will not display.

Most often, the best settings for Top are to the Level Above with an offset of 0'0". Some circumstances may require higher or lower requirements than this offset, which can be adjusted to meet individual user needs.

Top is by far the most intuitive of all the View Range parameters. If only all of the parameters were like Top, an article on View Range would simply not be necessary. Alas, the other View Range parameters are not nearly so intuitive.

## SECOND TERM: CUT-PLANE

Cut-plane is the second term in the View Range dialog box. From a section point of view (POV), this parameter is always at an elevation lower than Top. In a floor plan, Cut-plane is a fully modifiable term, allowing users to set both its association and the offset. In ceiling plans, Cut-plane is only a semi-modifiable term. The association is always locked to the associated level, but its offset can be set by the user.

The Cut-plane setting controls how the linked file items (such as windows within walls) display. If the Cut-plane is set at a level where it will cut a window, the window will display in the wall. If the Cut-plane does not cut the element, it will not be displayed. For these reasons, a good offset value to use is 4'0".

A fun way to think about Cut-plane is to envision a typical "doggy door" for a small dog such as a Chihuahua. The doggy door would be low to the ground, below a 4'0" Cut-plane. The Chihuahua may be concerned that its door is not modeled in the plans and will begin to yip out of sadness. (Poor little Chihuahua!) If the doggy door was scaled to accommodate a horse instead, the door would be cut by the Cut-plane and would be displayed in the plan view. (What a happy horse!)

## THIRD TERM: BOTTOM

The third term in the View Range dialog box is called Bottom. From a section POV, this term would be at an elevation lower than the Cut-plane. Bottom is the level where anything located below is not desired for display.

When working with floor plans, Bottom is most commonly associated with the level of the floor plan. Although it is usually best to leave this item at a 0'0" offset, there may be times when other offsets are preferred such as rooms with raised floors.

With respect to ceiling plans, working with Bottom can get a little hairy. In fact, an easy trick to remember this is to think "hairy bottoms." First off, one will notice that Bottom is not even a modifiable parameter, as it is grayed out and deactivated. Bottom's offset and association are the same as the Cut-plane's; changing the offset of the Cut-plane will also change the offset of Bottom. Users

may feel a loss of control and surmise Revit has temporarily locked the values, but it is more of a simplification for ceiling plans. This just forces everything that is cut by Bottom (and simultaneously the Cut-plane) to be viewed consistently across ceiling plans.

## FOURTH TERM: VIEW DEPTH

View Depth is by far the oddest parameter to set. While the first three parameters are somewhat intuitive (i.e., Top is always toward the top of the building and Bottom is always toward the bottom of the building), View Depth takes a divergent approach.

In ceiling plans, View Depth is toward the top of the building. In floor plans, View Depth is toward the bottom of the building. From the traditional section view POV, this qualifies View Depth as a homonym (same spelling/pronunciation, different definition). To overcome the confusion this may cause, users must realize the difference and mentally adapt the definition to the surrounding environment (ceiling plan versus floor plan).

A great way to mentally adapt the definition is to first envision a floating eyeball that changes position and aim-direction depending on whether the view is a ceiling plan or a floor plan. This eyeball symbolizes the location where an eyeball would have to be to see the intended view. In ceiling plans, the eyeball lies on the ground and looks up at the ceiling. In floor plans, the eyeball is mounted to the ceiling and looks down at the ground. This eyeball symbolism can be seen in Figure 3.



Figure 3: Distinction of eyeball location for ceiling plans versus floor plans. Note: the eyeball is really only useful for the View Depth parameter.

Here is a good definition to follow: View Depth is always the furthest level away from the eyeball's location. Following this rule "semi-eliminates" the homonym problem. The worded definition of it is the same, but the physical location and relationship it has with other View Range parameters behaves like a homonym. Hence, the problem is only semi-eliminated. Whichever way the user prefers to think of the View Depth, the term will be a homonym one way or another.

## FLOOR PLAN VIEW DEPTH

In a floor plan, remember that the eyeball is mounted to a ceiling and aimed down. By obeying the rule that the View Depth is always the furthest location away from the eyeball, the View Depth is located at or below the Bottom.

Typically, users will want to have the floor plan's View Depth parameters set to be associated with the associated level, at a 0'0"

# Revit MEP 2013

offset. In other circumstances, it may be useful to see objects that are mounted in the floor, such as floor boxes, underground pipes, and embedded conduit. If that functionality is desired, a floor plan's View Depth is the parameter to customize. For graphical usefulness, there will be a small visual distinction for those objects falling in the area between Bottom and View Depth.

## CEILING PLAN VIEW DEPTH

In a ceiling plan, remember that the eyeball is on the ground, aimed up. Following the rule that the View Depth is always furthest from the eyeball, View Depth is located at or above the Top. From a section POV, this is the opposite location when compared to the floor plan. This is counter-intuitive when viewing the parameter list, as the View Depth parameter is still the fourth item down, which is the same for the dialog of floor plans.

Typically, users will want to have the ceiling plan's View Depth parameter set to be associated with the Level Above, at a 0'0" offset. For situations in which users wish to see further above the Top, the View Depth is the parameter to adjust. Just like a floor plan, there will be a small visual distinction for those objects falling in the area between Top and View Depth. Situations where this could prove useful vary from routing a conduit to stub through the ceiling at a certain spot to seeing the light fixtures at the top of an elevator shaft.

## VIEW DEPTH OBJECT DISPLAYS

As indicated previously, anything that is between the View Depth and Bottom (for floor plans) and View Depth and Top (for ceiling plans) always has a special display setting applied to it. This can be useful for designers to visually understand that the object displayed is below the floor plan's Bottom or above the ceiling plan's Top. To control how this behavior works, one must go into the Revit project's Line Styles and access the project's <Beyond> setting as shown in Figure 4. After expanding the list for lines, the <Beyond> setting can be modified for desired settings.

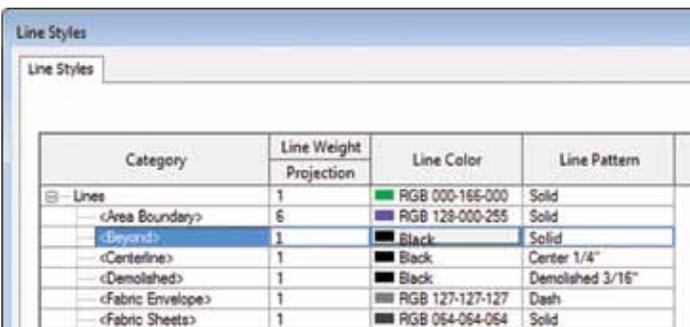


Figure 4: The Line Styles dialog box can be accessed via Manage ribbon -> Settings panel -> Additional Settings dropdown -> Line Styles button.

Note that this only applies to the objects that would not otherwise be displayed if the View Depth was set to its more traditional values, level with the Top (ceiling plans) or Bottom (floor plans). Beware! It is a project setting, so the entire project will display based on these modifications. Figure 5 shows an example of the impact the <Beyond> setting from Figure 4 has on a sample floor plan used for demonstration purposes.

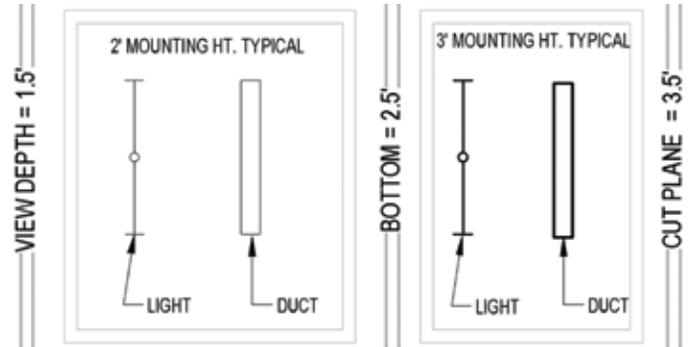


Figure 5: This floor plan View Range example shows <Beyond> settings in action. Notice the objects located between the floor plan's Bottom and View Depth display at lineweights consistent with the <Beyond> settings from Figure 4.

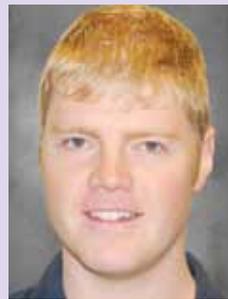
## FOOLPROOF RULES

The main thing to remember about View Range is that there are rules for ceiling plans and rules for floor plans. Confusion occurs when one set of rules is applied to the wrong type of plan. Here are the rules:

1. For floor plans, the eyeball is mounted high, looking down. The order of levels below it (from closest to farthest) is Top, Cut-Plane, Bottom, and View Depth.
2. For ceiling plans, the eyeball is mounted low, looking up. The order of levels above it (from closest to farthest) is Bottom, Cut-Plane, Top, and View Depth.

## CONCLUSION

View Range affects every single view in a Revit project. It may be a necessary stepping stone when troubleshooting visibility/graphics issues. If View Range must be changed, the concepts can become rather difficult to wrap one's mind around. Fortunately, with enough practice and the right mindset, it can become a quick, easy task.



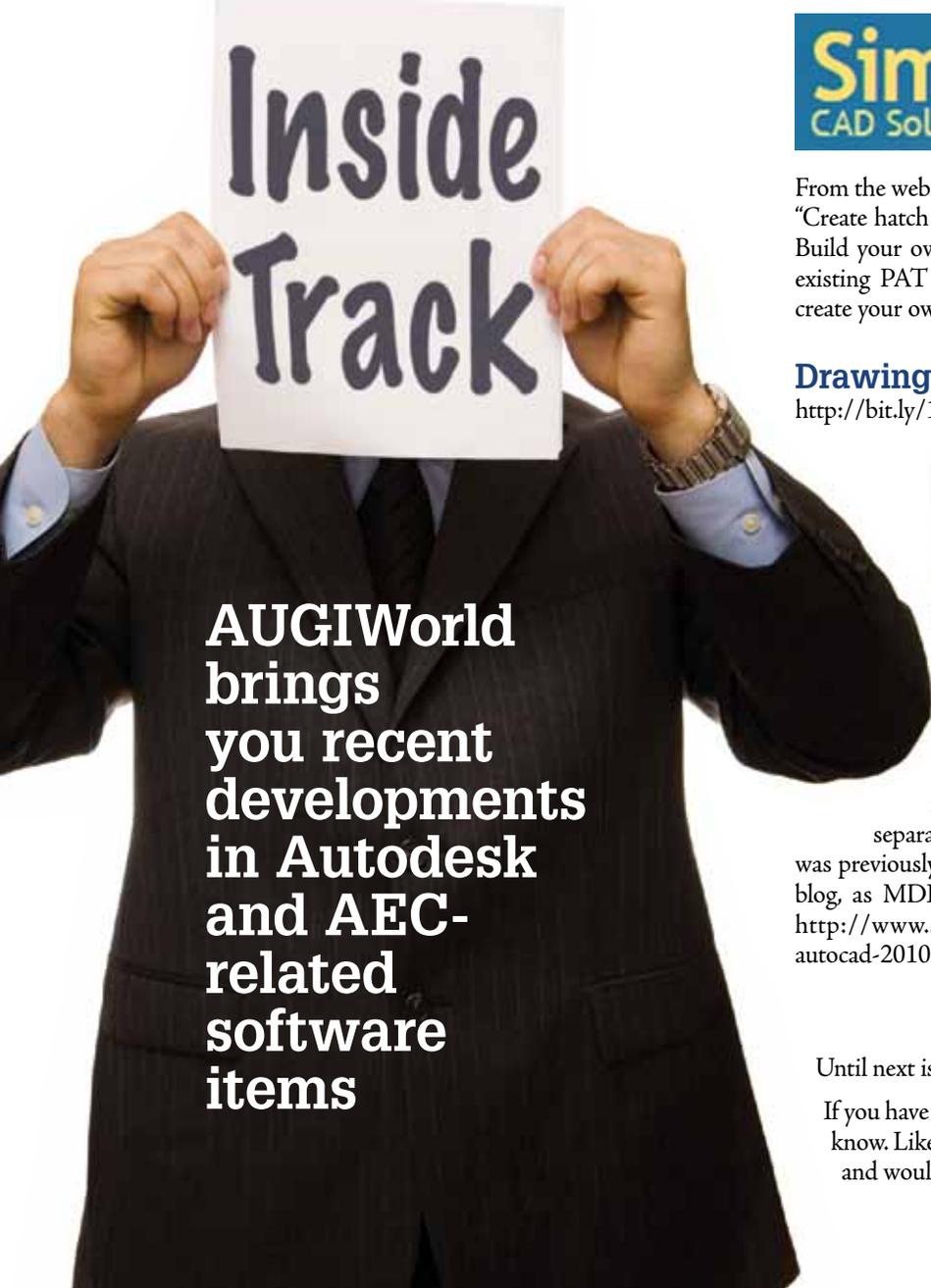
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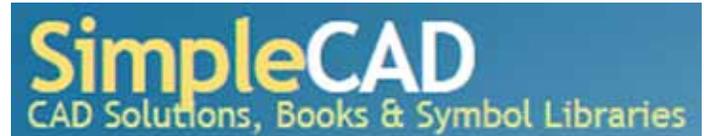
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