November/December 2010

# AUGI World

The Official Publication of Autodesk User Group International

# Rebirth: AutoCAD for Mac

## *Also in this issue:*

- X-Games MMXI
- Civil Visualization: A Beginner's Look
- Turning the Tables on OLE Excel Files
- Predicting BIM's Future

TWENTIETH AUGI 1990-2010 ANNIVERSARY

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# The CAD Manager

Usually in *The CAD Manager* column, you see great advice by managers for managers. As a guest columnist in this space, I would like to change the perspective a little. As a drafter, I will be speaking directly to my peers, but with significant information for managers to digest as well. After all, recognizing and acknowledging many different perspectives is what good managers do.

Nobody wants to disappoint his or her manager, but to what lengths will people go to look good in their manager's eyes? How far are we willing to stretch our honesty and integrity to seem like a hero for a day? It probably happens more often than we would admit, but are we really aware of the damage caused by the artificial appeasement of our managers?

When you consider a CAD manager's responsibilities, among the most important is getting as much out of the CAD staff as possible. This includes various strategies that often contrast with drafters' interests. The deadline gets pushed to next week, but the manager conveniently forgets to tell the drafting staff, hoping to get that same crunch time effort out of them for a couple more days. I'm sure we have all been there at one time or another. Perhaps the most innocent of these strategies is to heap mounds of work on the drafter to ensure there is never an idle moment. It may not feel innocent when you're on the receiving end of it, but it is an honest attempt at getting the most out of a drafter without deception. In fact, in some situations you may owe them thanks for the reality check.

Inevitably, THE question is asked. "How long will it take you to get through this?" That's when the drafter begins to contemplate not only the amount of effort that will be required, but how the answer will reflect on his or her perceived productivity. No one wants to seem slow and unproductive, so the estimate can tend to be skewed towards less time. Often, the drafter overestimates his productivity, which can create tension as the drafter realizes how much the pace will need to sharpen in order to meet the expectation that they have essentially just set for themselves.

This is a simple example of the kind of seemingly innocent sleight of hand that can cause damage to everyone on the team and the company as a whole. In this case, the drafter is feeling unreasonable tension and expectation, the project manager feels better about the progress than he should, which could lead to financial misrepresentation in the books, and the deadline has probably now turned into a crunch when all of this plays out.

This could easily have been avoided. The drafter could have been straightforward with the manager and come away looking better. Being frank about the amount of work in front of you and making accurate estimates is essential. This allows the drafter to represent himself as a good manager in his own right. It allows the manager to make informed decisions and plan the work effectively. The quality of the work has also likely been affected. You've heard the old adage: "Do you want it fast, accurate, or cheap? Pick any two." Well, if quality work relates to the accurate part and crunch time pressure relates to the fast part, the outcome is clear. The less crunch, the higher the quality and vice versa. The manager may have even anticipated it being too much work for one person in the timeframe and was ready to give the drafter some help. After hearing the workload was no problem, he decided no help was needed.

Turning away work is another difficult but necessary responsibility. If you spread yourself too thin and unrealistically try to give everyone what they want when they want it, you will ultimately fail. It is much more productive to ensure that everyone involved is aware of what is on your plate and when they can expect attention. This is especially true when it involves standing your ground against senior management.

Many drafters and graduate engineers will drop everything at the simplest request of a senior manager even if the request doesn't require their immediate attention. This leaves more pressing issues undone. The senior manager should be informed if there is something pressing before the drafter agrees to jump on their request. This allows a prudent decision about which task is more critical. The senior manager depends on drafters and graduate engineers to tell them these types of things, whether

they state it publicly or not.

On a related side note, this thinking also applies to new ideas. If you have a good idea or a way to improve a process, share it. Whether the idea is specifically used or not, your input may bring up a point that needs to be addressed, which may lead to improvements in the future. The key to sharing new ideas is to always be sure you know what you are talking about.

Obviously, good decision making is paramount to being a good manager. This requires honest and accurate information from the people in the trenches. A manager can't make a good decision in a room full of yes men. Managers must be given the real story in order to make good decisions about progress, organization, staffing, and so on. If the manager doesn't have full access to the honest truth, decisions will be based on faulty information. Needless to say, this is not good for anyone. Ironically, at some point things go south and everyone looks bad, including the drafter. This in spite of the fact the whole purpose of the deception was to improve standing.

The other side of this is for the drafter to allow the manager to do his or her job. Managers are human and develop habits like anyone else. If the drafting staff constantly bails out mediocre management decisions, issues can arise. Managers may enjoy the fact they are doing a terrific job, except that they may not be doing very well at all. One example of this is overtime being used excessively. Overtime is a tool at a manager's disposal—a life-saving inefficient tool to be avoided unless needed in most cases (staffing shortages notwithstanding). If there are always volunteers for excessive overtime, the manager will likely be more apt to use it. It may sound like I'm implying this is the manager's fault, but that isn't where I'm going. This all falls back on the drafters that feed these habits.

Let me paint a picture of a situation to illustrate. A drafter volunteers for overtime on a regular basis. It's very helpful, but the manager gets used to the crutch. Work gets to the drafter later for each deadline. He makes larger and increasingly unreasonable concessions to the client. His perception of a greater flexibility is introducing inefficiency and lost profit to his projects and stress to his team. In the meantime, the drafter's overtime is increasing to the point he is tired of working so many hours, but has now developed a reputation to uphold and continues despite growing animosity for the others who come and go on a regular schedule. Eventually, there is a breaking point and the drafter complains to management about being singled out to work so many hours. No matter the solution, this has affected everyone negatively. Usually, the effects are more discrete than this example, but you can see how staff and project performance can be affected by these actions.

Ultimately, being recognized for quality work comes with integrity. Hold yourself to a high standard of ethics and professionalism and always consider what affect your actions will have on the rest of the staff and the company as a whole. Managers need honest feedback to make good decisions. Just as important, they need to be given the opportunity to do their job. Managing time, resources, and staff is of utmost importance in our industry and those responsible for the decisions should be fully engaged.

*Steve Simmons has been a drafter/modeler with Walter P Moore for 10 years where he has worked on many high-profile projects including the U.S. Census Bureau headquarters and the Toyota Center in Houston, Texas. He attentively follows advancements in BIM technology and enjoys sharing knowledge and solutions with others. Steve can be reached at ssimmons@walterpmoore.com.*

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# A Quick Look at Revit Curtain Walls

Curtain walls are one of the basic elements topics learned when starting with Autodesk® Revit®. Although curtain walls are easy to make, they also can be used to create some complex panel systems. The more you understand how to construct a curtain wall object, the more you realize the versatility of these objects.

To simply define it, a curtain wall object is a panelized wall system divided by horizontal and vertical grids. Regular wall objects consist of layers, but curtain walls are building components consisting of panels. The curtain panels can be glazing as well as walls, doors, windows, and nested curtain walls, allowing you to create all sorts of facades. Mullions are profile-based objects that are placed on the curtain grids to define the edges of the curtain panels.

Out of the box, Autodesk Revit 2011 has three types of curtain walls defined: Curtain Wall 1, Exterior Glazing, and Storefront. The Curtain Wall 1 type consists of a single panel of glass material, the simplest form of the curtain wall. It is good to keep this type in the project "as is" because it gives you a good starting point to create curved glazing systems, nested grids, and so on. The Exterior Glazing Type creates horizontal and vertical grids automatically at distances specified in the type's definition. No mullions profiles are defined in this type. The Storefront type has all of its components defined and placed automatically when the wall is created. From those types you could define the glazing systems you most commonly use in your work for interior storefronts and exterior curtain wall systems, and have them ready to use in a project template.

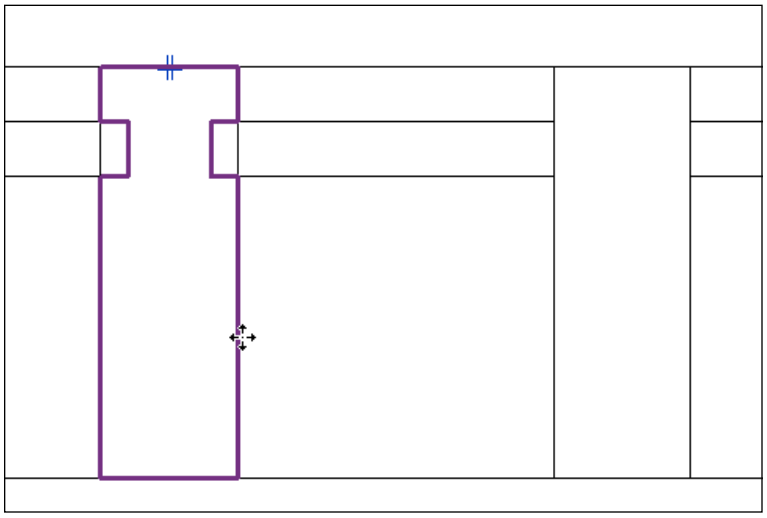

*Figure 1: Mullion profiles*

In this article we will look at the creation of a typical curtain wall system from scratch, including defining all of its components. While we are talking about curtain walls, why not define a real-life curtain wall system? For the purpose of this exercise we will use the Kawneer 1600 curtain wall system with 1" glazing. The 1600 curtain wall mullion profiles are 2.5" wide by 7.5" inches deep.

## Mullions and panels

My advice here is don't spend time trying to create a detailed mullion profile. In most cases, a simple rectangle is sufficient to represent the mullion correctly. A more accurate representation of the mullion can be done in a detail view later on. Even a simple profile as the left mullion shown in Figure 1 may be more than it is necessary. Consider this: to create this mullion we

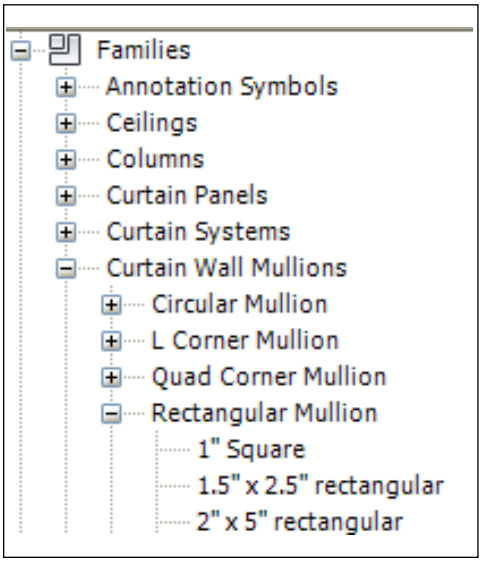


*Figure 2: Project browser*

Project Browser under the Families > Curtain Wall Mullions section (see Figure 2). To duplicate a type, select and right-click with the mouse, then select Duplicate in the popup menu.

In the Type Properties window (Figure 3) you can specify the width and depth of the mullion as well as its position within the curtain wall. Notice that to specify the width there are two parameters, Width on side 2 and Width on side 1. Equal values center the mullion on the grid line.

The offset parameter is very important as it will determine the mullion location with respect to the curtain wall justification line. For the type of curtain wall system in this example the offset is set to -3¾" so that the exterior face of the mullion aligns with curtain wall justification line. This makes it easier to control where to draw the curtain wall and align it with other building components.

Revit has other mullion types for corners and in various shapes, such as round and trapezoid mullions. You can duplicate them to create new types with different dimensions. But you cannot change their profile; only rectangular mullions can be assigned other profiles.

In the curtain panel Type Properties dialog you can specify the thickness and location of the system panel. As shown in Figure 3 above, the new curtain panel type Glazing 1" – 1.5" offset has the Offset parameter value set to 1½" and the Thickness parameter value set to 1". This value will locate the center of the panel 1½" from the curtain wall justification line. Therefore, the exterior face of the curtain panel will be 1" from the exterior face of the system.

## Putting it all together

Now that we have the mullions and panel types required we can assigned them to a new curtain wall type and specify the system's dimensions in the curtain wall Type Properties window (see Figure 4). First, determine if you would like the curtain wall to be hosted by a wall, in which case you would check the Automatically Embedded parameter. When placed in the wall, the curtain wall will create the opening automatically. Next, select the panel type to be used as a default in the system– in this example, Glazing 1" – 1.5" offset.

In the Vertical and Horizontal Grid Pattern sections of the Type Properties dialog, you will specify the spacing of grids. The options are None, Fixed Distance, Fixed Number, Maximum Spacing, and Minimum Spacing. Even if you predefine the grid spacing in this window you can always go back and change a grid location by unpinning the grid from the system making it independent.

The following sections of the curtain wall Type Properties dialog allow you to specify the mullion types to be used for vertical and horizontal mullions and all four borders of the curtain wall object. Even if the mullion profile of the border is the same as the center mullions, you may want to consider creating separate mullion types for the borders with a profile that will include the shim, particularly if the curtain wall will be hosted by concreted walls. This will make a dimensionally correct opening in a wall. To add a shim to the mullion cre-

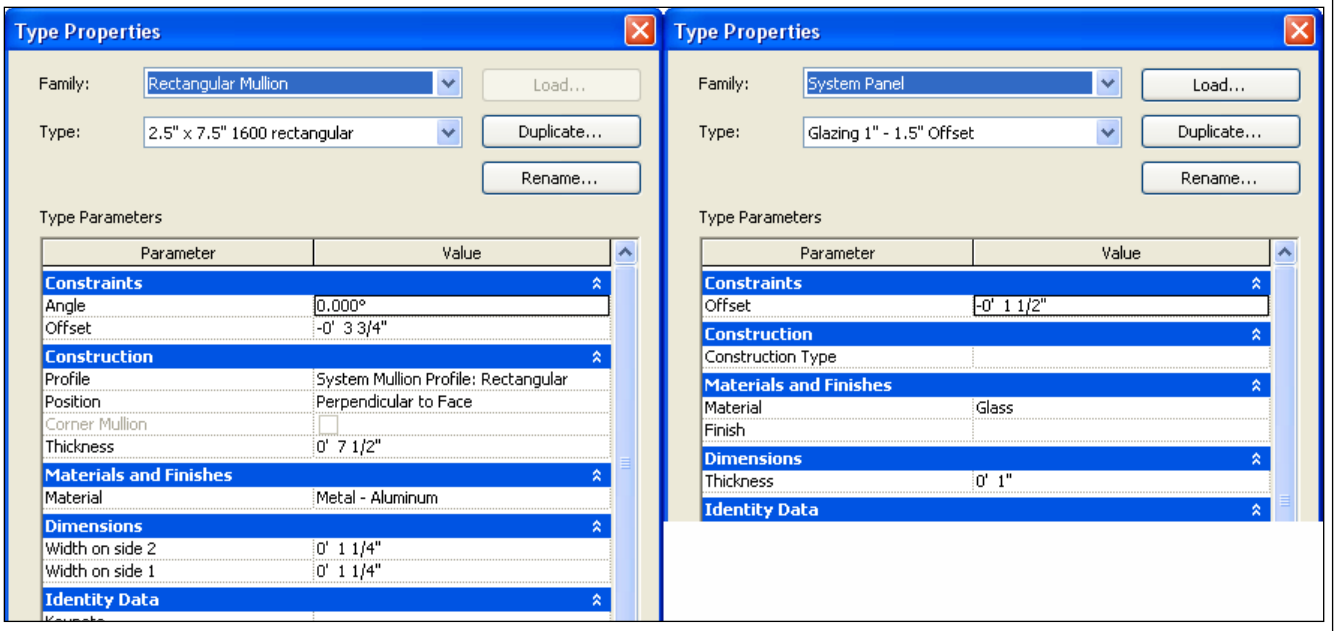


*Figure 3: Mullion and curtain panel type properties*

would need to create a profile family for this mullion shape.

Because the profile defines the width of the mullion, the glazing panels stop at the edges of the mullion creating an unwanted line in front of the indentation. To get rid of the line you could add a masking detail component in the profile family. When you consider all the work involved in creating that mullion profile, you quickly realize that none of those steps are really necessary. The simple rectangular shape shown on the right of Figure 1 is sufficient to represent this mullion. Revit already has a rectangular mullion type by default, so we just need to duplicate the mullion type and change the dimensions to match the desired mullion size.

The mullion families can be found in the

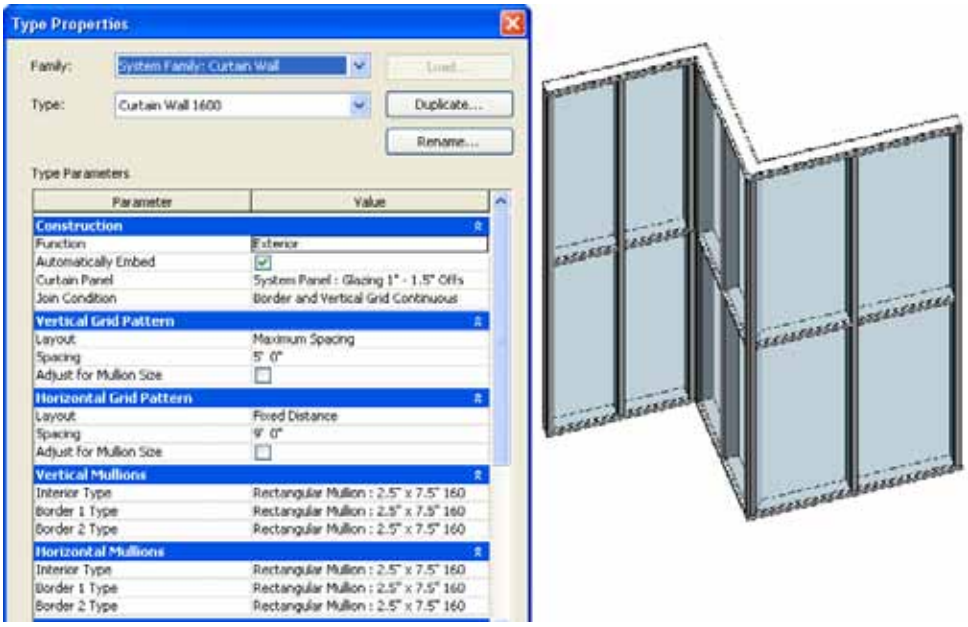


*Figure 4: Curtain wall type properties*

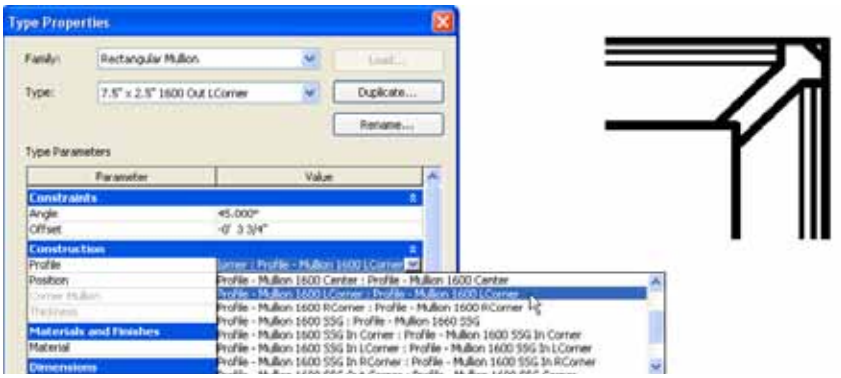


*Figure 5: Rectangular mullion with user created profile*

ate a detail component for the shim and inserted it in the profile family.

Now let's take a look at the outside and inside corner conditions. The curtain wall system requires a 45 degree outside corner mullion and the available types do not really work in the curtain wall we are trying to create. In this case, it is necessary to create a mullion profile and assigned it to a new rectangular type mullion. Figure 5 shows the mullion profile and its properties.

In the example shown in Figure 5 it was necessary to create two profiles, left and right. Each profile was drawn to show only half of the 2½" wide mullion body. Then a detail component masking region of the entire mullion profile was place on top. Because the mullion is set at an angle of 45 degrees, the curtain panel is stopped at the point where the mullion crosses the center line of the system. The full mullion profile would have kept the glazing back too far, never touching the mullion. By splitting the mullion in half, the intersection of the mullion and the centerline of the system allow the panel to butt up against the mullion.

You can change the mullions at the corners once the curtain wall has been placed. Since mullions are automatically assigned per the curtain wall type definition you need to unpin the mullions you want to change in order to assigned them a different type. Once you have selected a mullion, use Select Mullions>On Grid Line tool in the context popup menu to select all the mullions along that grid. The inside corner of the Kawneer 1600 curtain wall used in this example is a lot simpler because you only need to used an "L" corner profile.

Some curtain wall types, like some all glass systems, use either glass or metal fittings instead of mullions. In the case of metal fittings you can insert the metal fitting family right in the glazing panel family since it has no mullions. You may have to create a few types, but once you have done one the rest will be duplicates with some modifications.

## Doors and windows

To include a door in a curtain wall object, move the mouse to edge of the bay where you want to place the door and hit the Tab key until the panel is selected. Then select a new door type from the Type Selector. The same method can be used to include windows, walls or even to nest other curtain walls.

To include a door in this curtain wall example a new door family is required that will include a frame ¾" wide on the jambs and 1 ¾" wide at the head. Without this additional frame the door would not look correct and would be dimensionally incorrect. With the method described previously, the door can be added to the curtain wall. You may also want to include a parameter in the door family to control the offset of the door from the face of the curtain wall mullion.

Revit curtain walls can be used to create many other building elements besides glazing systems. They can be as simple as one piece of glass or very complex with many different embedded components. Avoid the temptation of putting too much detail in them because that detail may be multiplied all over your building; let a Detail View handle the particular condition.

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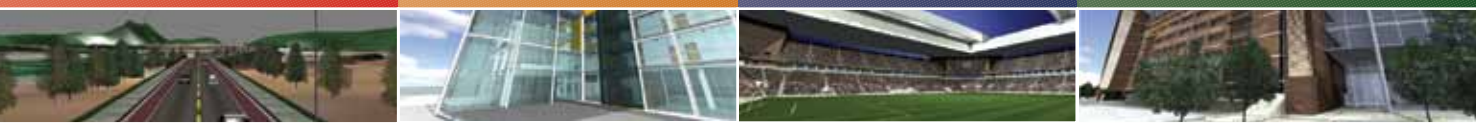

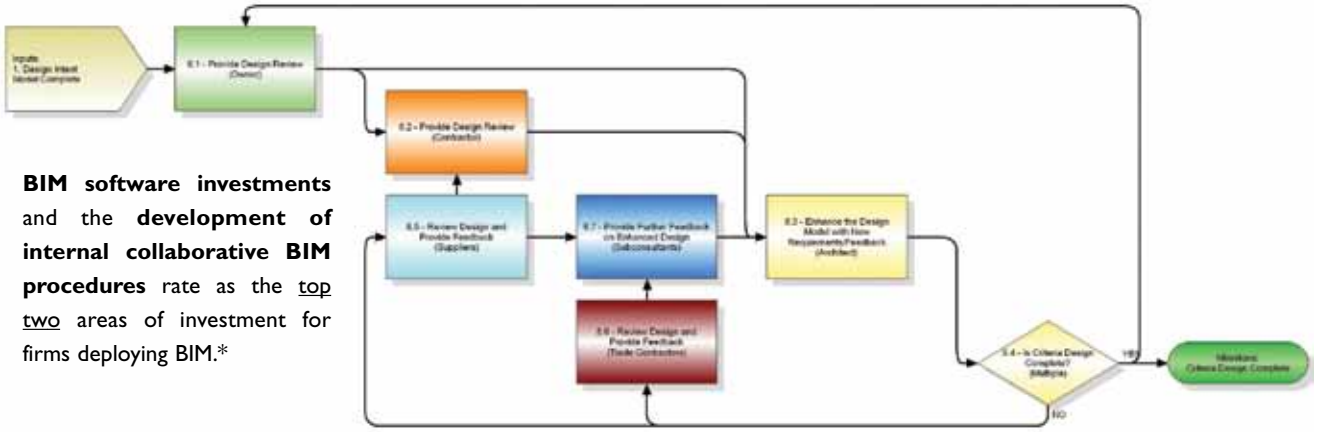

**BIM software investments** and the **development of internal collaborative BIM procedures** rate as the top two areas of investment for firms deploying BIM.*

Half of the AEC industry is using BIM - up 75% over the last 2 years.*

# Are You Ready?

Government agencies and owners are now specifying Building Information Models in project deliverables. This drives AE firms and General Contractors to demand that consultants and trade contractors operate in an integrated, collaborative project environment.

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*McGraw Hill Construction SmartMarket Report, 2009.

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# X-Games MMXI

## *Going Beyond Revit with Extensions*

*Editor's note:*

At the time I wrote this article, I heard that *AUGIWorld* will be undergoing a change of focus in 2011. *AUGI | AEC EDGE* will be the publishing container for articles on building design applications, including all flavors of Revit. If it's time to bid *AUGIWorld* goodbye, I do so with affection and gratitude, and I look forward to being part of *AUGI | AEC EDGE* in the future. Thanks to all the people who have worked for years contributing to and producing the various AUGI publications, which have always been dedicated to providing users of Autodesk software with assistance.

For those not versed in dead European languages (one relic of a misspent youth, in my case), MMXI means "2011" in Latin. :)

*–Chris Fox, AUGI Revit Editor*

I've taught many Autodesk® Revit® classes and led quite a few implementation sessions in the past few years, and watching people "get" the actualities and implications of 3D modeling for architectural and structural work has always been enjoyable. As people understand and begin to explore the possibilities of working in 3D, their horizons expand. Plus—since Revit is a construction document production application, and not simply for concept design—productivity can increase all throughout the design cycle.

Even with Revit's parametric change engine, smart pages, and macro abilities, however, there are times when designers can end up wishing for something a little bit more than vanilla Revit. Aren't there a few more ways to create things in batches? Can't we get a little more 3D content here and there without having to make in-place families? If you purchase Revit on subscription, the answer to these questions might just be yes.

## Check your subscription benefits

I'm not here to tout subscription as the way to acquire your design software. Every user and company has to make individual decisions about its tools. I have been a long-time subscriber because it has made financial sense to me.

If you or your company has a subscriber relationship with Autodesk, you owe it to yourself to log in to the subscription center and take a look at what is available there. I should mention to people reading this who might not be Revit users, the unseen benefits of subscription that I'm going to explore soon might well be available for your design application—check it out!

The larger your company, and the more Autodesk applications you use, the longer the list of updates and enhancements you will see on the subscription site. If it's a BIM manager's job to do this, be sure to ask her or him to check for product mid-cycle updates, if nothing else.

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|---|---|---|
| ArchVision RPC Content for AutoCAD Architecture 2011 and AutoCAD MEP 2011 | Design Content | 2010-04-30 |
| Autodesk Green Building Studio | Documentation | 2010-04-16 |
| Globe Link for Autodesk Revit 2011 | Extension | 2010-04-16 |
| Autodesk Revit DB Link 2011 | Extension | 2010-04-16 |
| Autodesk Revit Model Review 2011 | Extension | 2010-04-16 |
| Batch Print for Autodesk Revit 2011 | Extension | 2010-04-16 |
| Revit Extensions for Autodesk Revit Architecture 2011 | Extension | 2010-04-16 |
| Worksharing Monitor for Autodesk Revit 2011 | Extension | 2010-04-16 |

*Figure 1 shows a partial list of Extensions for the AutoCAD Revit Architecture application bundle*

**Batch Print for Autodesk Revit 2011**

Release Date: 2010-04-16

Batch Print provides an easy way to print a large number of drawings (views and sheets) from a Autodesk® Revit® Architecture 2011, Autodesk® Revit® Structure 2011, or Autodesk® Revit® MEP 2011 software project.

After preparing the default printer and the Revit software project, use Batch Print to send any number of drawings to the printer and to control the order in which they print. When you start the print job, Batch Print manages the printing of the drawings, requiring no further interaction from you. If desired, you can monitor the progress of the print job using a status dialog.

Batch Print is compatible with the 32-bit and 64-bit versions of Revit Architecture 2011, Revit Structure 2011, and Revit MEP 2011 software.

**Download**

English *(msi - 1131Kb)*

*Figure 2 shows the link for downloading the Batch Print extension.*

My own product suite is Revit Architecture + AutoCAD Architecture Suite, so items you see in the figure below pertain to RAC and ACAD. The list is at least three times longer than we can fit in an illustration. If your portfolio contains Structure or MEP, the list will be considerably longer.

## Undocumented aliens

Enhancements and extensions carry their own documentation, but that's not always going to be as complete as a novice might wish for. So, you will have to be ready to experiment with extensions to determine their value and usefulness for you (much like the Express tools of AutoCAD).

Extensions change each product release cycle, and there are versions dating back to 2009 available on the site. I don't know of any collated list that will compare extension feature lists (hey, that's part of their charm), so consider downloading and testing a few of the listed packages. Extensions are packaged as zip files or self installing msi files. The individually marked

extensions such as Batch Printer are pretty self-explanatory.

## A la carte menu

Once you have downloaded and installed your chosen extensions, you access them from the Add-Ins tab on the ribbon, on either the External Tools drop-down menu on the External panel or the Extensions Manager icon from the Extensions panel, as shown in Figure 3. Your lists will almost certainly vary from the one shown.

## What do they do?

The best thing I can tell you about which extensions to try, and what to expect from them, is to take a look at the possibilities yourself!

Do you feel the need of a better external database link, over and above schedule export to spreadsheet applications? Try the DB Link Extension and tie into Access.

Need a Revit Batch Print routine? 'Nuff said…

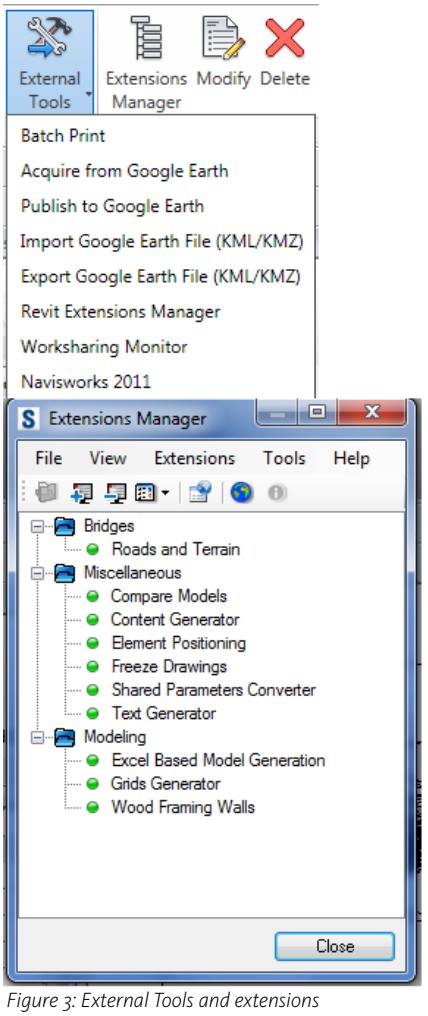


*Figure 3: External Tools and extensions*

BIM/CAD Managers: would you like an independent application to monitor network traffic and central file save rates on workset projects? Take a look at the Worksharing Monitor. It does not need to be run from inside Revit, although it can. The extension installs a desktop icon.

BIM Managers, Part 2: Check out the Compare Models extension, which will inventory projects and families for adherence to company/client/best practice standards of model construction for compliance, and provide corrections.

## Extend yourself

The extensions listed above are utilities that can speed up production, enhance data extraction, and provide management with tools, but if I really tell the truth, they are a bit boring, no?

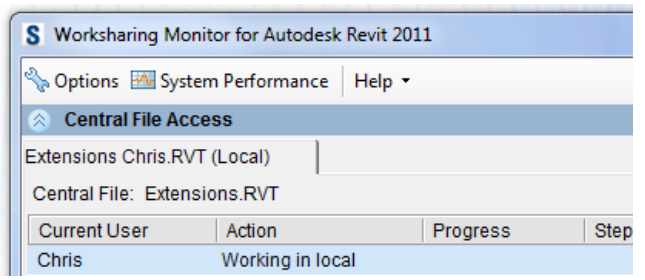


*Figure 4: Worksharing Monitor Interface*

Want to put your models into Google Earth or import Google Earth information into a Revit project? Hey, there's an app—oops, extension—for that.

How about automatic grid/level generation? Do you want that supersized with walls, columns, and beams, too? See the Grids Generator in Figure 3? Dare to dream, baby!

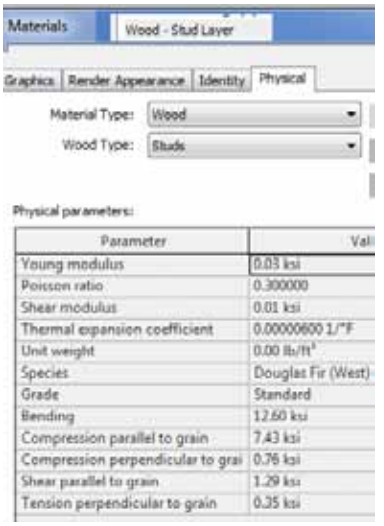


*Figure 5: Wood Materials properties*

Residential designers: would you like to be able to illustrate wall framing around openings, or show studs, plates, and blocking, without having to place individual or custom beams/columns/whatevers? You owe it to yourself to try the Wood Framing Walls extension. The trick to this one (which, being an extension, is not really documented) is to give one or more of your wood materials the proper physical properties, as shown in Figure 5.

To use the Wood Framing extension in a project, select a wall, activate the extension, and fill out the dialog about members.

## Go green

The last extension I want to cover is Green Building Studio. This independent software company was purchased by Autodesk a few years back. GBS is a web-based energy analysis package. One logs on, enters building design and location data, and creates analytical runs to gauge energy performance. You iterate runs while revising design criteria to optimize your building performance.

I think Autodesk has made a terrific decision to make GBS available to subscribers at no cost. There is nothing to download, you simply go to the GBS site, enter your subscription information and create projects. The GBS database includes locations and weather statistics from all over the world. You can now benchmark all your designs for energy performance practically for free; all it takes is the time to get familiar with GBS and start using it. What are you waiting for? You can separate yourself from the competition, quantify smarter designs ,and make a real difference while leveraging your subscription dollar.

Above all, when working with Revit extensions, take them in the spirit in which they are offered. Don't expect the same rigorous polish that you see with the rest of Revit's interface and programming, but run with the x-citing possibilities they open up.

Good luck, and good extending!

*Chris Fox has written numerous articles on Revit Architecture, Revit Structure and Revit MEP. He has written Autodesk Official Training Courseware for Revit Architecture and Revit Structure and Introducing and Implementing Revit Architecture 2010, published by Autodesk Press. Chris recently moved from the US to Australia, and is leading training classes in Revit through corporate, university and technical school contacts there. You can reach him at chris.fox@footprint3d.com.*

# Rebirth: AutoCAD for Mac

Technology is an ever-changing landscape, with hardware and software that never makes it past the concept stage to the ones that change the way we work and live forever. AutoCAD® is one of those software programs that has stood the test of time, and has changed the way many of us draft and model the products or buildings that we create or construct.

Many AutoCAD users have only ever known the Windows release. Over a decade ago, AutoCAD was available on more than just Windows. It ran on a variety of operating systems including DOS and Mac OS. On August 31, 2010, Autodesk sent a buzz through the design industry that has not been felt in a while with the announcement of AutoCAD® for Mac®.

## Perfect blend

If you took AutoCAD and a Mac and tossed it in a blender you would simply have a mess, which is best left to the folks that do the 'Will it blend?' video series (willitblend.com). However, if you build AutoCAD from the ground up natively for the Mac, you end up with a 'perfect blend' of the two, resulting in AutoCAD for Mac. Figure 1 shows the AutoCAD for Mac user interface (UI).

AutoCAD for Mac looks and feels like AutoCAD, but it also supports many Mac-centric features. One of these includes the use of the Dock to switch between open drawings, create a new drawing, and access recently opened drawings. Another Mac-centric feature is the ability to view your drawings using Cover Flow in Finder and menu bar search. Figure 2 shows the Dock menu, results of a menu bar search, and drawings in Cover Flow view.

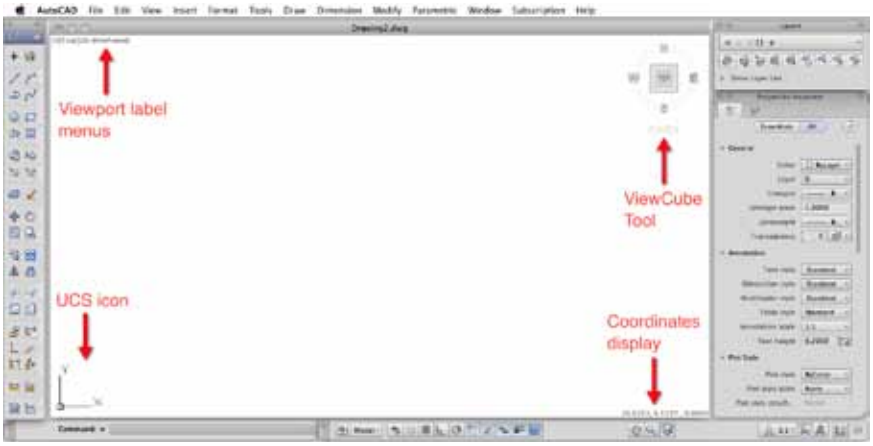


*Figure 1: AutoCAD user, meet Mac UI; Mac UI, meet AutoCAD user.*

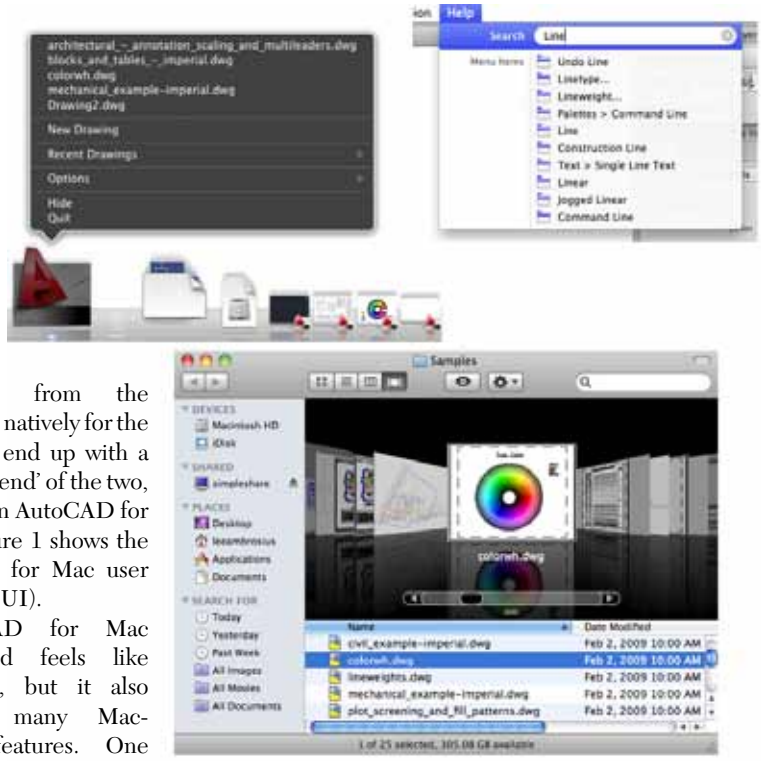

*Figure 2: Some of the native Mac features integrated into AutoCAD for Mac.*

AutoCAD for Mac supports standard input devices such as the keyboard and mouse. It also supports Mac-specific input devices such as Magic Mouse and Magic Trackpad.

## AutoCAD with a Mac twist

Looking at AutoCAD for Mac, you should see some elements that look familiar to you and some that don't. Some that look familiar are the drawing window, command line, and status bar. Even then, they each have some hidden tricks up their sleeves. After those three elements, it is pretty much all new.

Along the top of the screen is the Mac OS menu bar, which you can use to access many of the commands that AutoCAD for Mac offers. In addition to using the Mac OS menu bar to start a command, you can use the Tool Sets palette located along the left side of the screen.

The Tool Sets palette is kind of a mix of the ribbon and toolbars often found in Windows applications. At the top of the Tool Set palette is the Tool Sets button, which allows you to choose the Drafting, Annotation, or Modeling tool set (see Figure 3). Each tool set is made up of multiple tool groups, and each tool group contains buttons and flyouts.

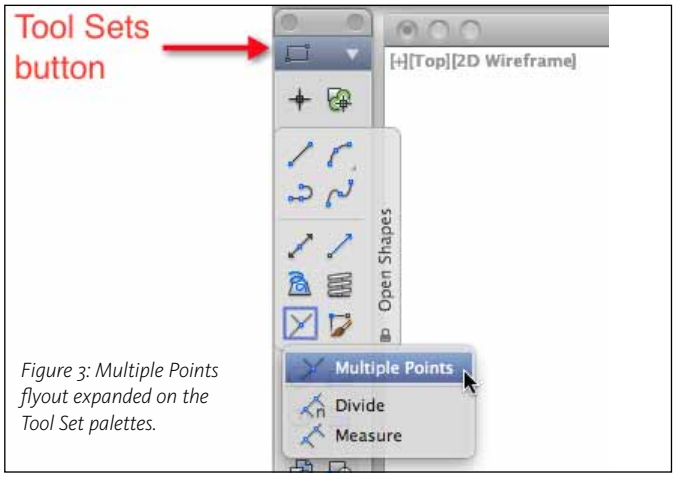


*Figure 3: Multiple Points flyout expanded on the Tool Set palettes.*

The drawing area is where you create and edit your designs. The following tools can be found in the drawing area (see Figure 1).

- Viewport label menus (upper-left) – Allows you to toggle the display of the ViewCube tool, change the number of viewports displayed in model space, switch to a named or preset view, and set a visual style current.
- ViewCube tool (upper-right) – Used to rotate the view of the current drawing and to get constant feedback of your current viewing angle.
- UCS icon (lower-left) – Displays the current orientation of the working plane.
- Coordinates display (lower-right) – Displays the current location of the crosshair cursor in the drawing area.

The Layers palette along the right side of the screen allows you to create and manage layers, set a layer current, and use one of the layer tools, which freeze or turns off the layer an object is on and much more. Clicking the Show Layer List disclosure triangle allows you to expand the palette so you can create and edit the layers in the current drawing.

The Properties Inspector located below the Layers palette allows you to edit the properties of the current drawing when no objects are selected, the properties of selected objects, or the properties of the selected layer in the Layers list of the Layers palette. Figure 4 shows the Layers and Properties Inspector palettes.

The command line and status bar are located along the bottom of the screen. You enter commands and options in the input area of the command line to tell AutoCAD which task you want to perform. AutoCAD for Mac supports many of the commands you are already familiar with from AutoCAD, and you can also use your favorite command aliases to start a command.

The status bar allows you to access general drafting aids. If you click the disclosure triangle on the right side, you can access the 3D drafting tools. The command line can also be expanded by clicking the disclosure triangle to the right of the input area.

Beyond the UI, AutoCAD for Mac can open and save the same drawing file format used by AutoCAD 2011. This allows you to pick which version of AutoCAD—Windows or Mac—you want to use without having to worry about saving a drawing to a different format when working with other AutoCAD users.

## Navigating a drawing and switching layouts

When working on a drawing, you will most likely need to change the view of your model to see a different area or switch layouts. AutoCAD for Mac supports navigation commands such as Pan, Zoom, and Orbit. You can also use the ViewCube tool and your pointing device to change the current viewpoint.

When using the Magic Mouse or Magic Trackpad, you can perform many different gestures to pan, zoom, and orbit the design in your drawing. One of the cool navigation features is the ability to press and hold down the space bar to enable panning, which is great when you are using a laptop without a mouse or when you have a mouse without a middle button.

Switching layouts in AutoCAD for Mac is done via the QuickView dialog box (see Figure 5) or status bar. Click the Show Drawings & Layouts button on the status bar to display the QuickView dialog box. The left side of the QuickView dialog box allows you to activate or manage open drawings, while the right side allows you to set current or manage the layouts in the current drawing.

## Customizing the environment

AutoCAD for Mac can be extended to adapt to the way you and your com-

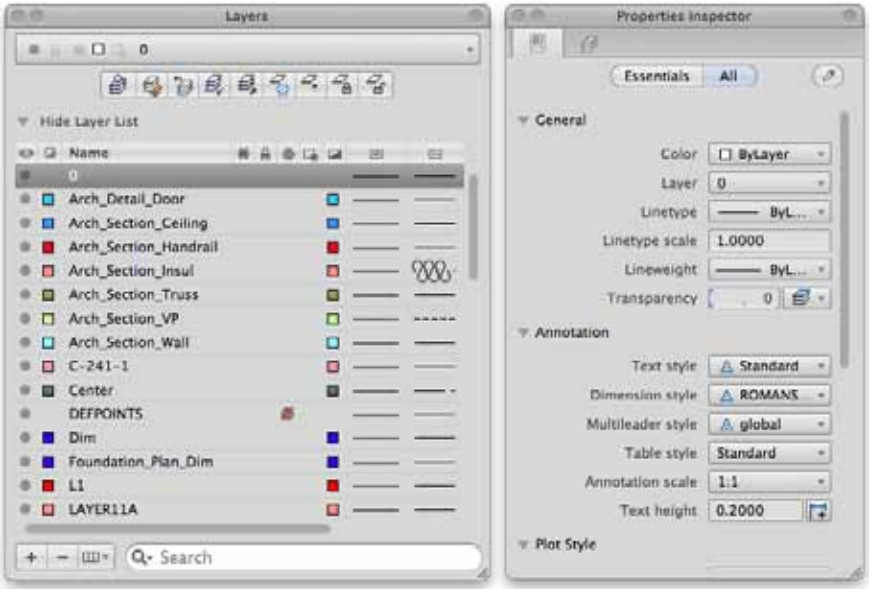


*Figure 4: Organize layers and properties with the Layers and Properties Inspector palettes.*

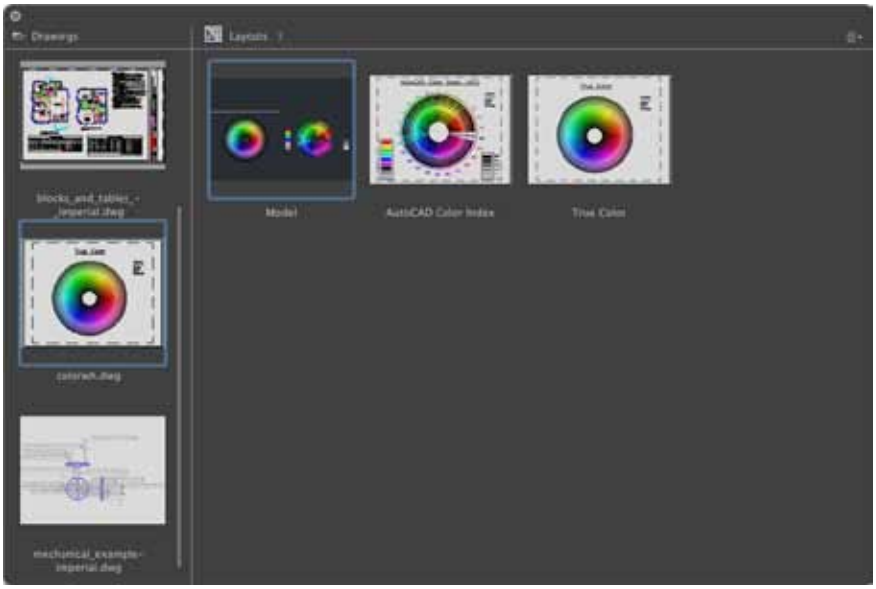

*Figure 5: Manage open drawings and layouts in the current drawing with QuickView.*

pany work. Many of the customization files that you use today with AutoCAD 2011 or an earlier release can be used with AutoCAD for Mac with few or no modifications required.

You can extend and customize AutoCAD for Mac in the following ways:

- Command Aliases (PGP) – Custom shortened command names.
- Scripts (SCR) – Command sequences that can be run to reduce repetitive tasks.
- Hatch Pattern (PAT) – Custom hatch patterns that can be used with the Hatch command.
- Linetype Pattern (LIN) – Custom linetypes that can be assigned to objects and layers.
- AutoLISP (LISP) – Custom routines that allow you to automate repetitive tasks and create custom commands. Visual LISP and DCL are not supported.
- ObjectARX (Bundle) – Custom applications that allow you to extend AutoLISP and create custom commands. ObjectARX applications can contain dialog boxes unlike AutoLISP routines. ObjectARX files built for AutoCAD 2011 are not compatible with AutoCAD for Mac.
- Customize User Interface (CUI) – Definitions of items on the menu bar and in tool sets. You use the Customize dialog box (see Figure 6) to customize the menus on the Mac OS menu bar and tools that are displayed on the Tool Sets palette.

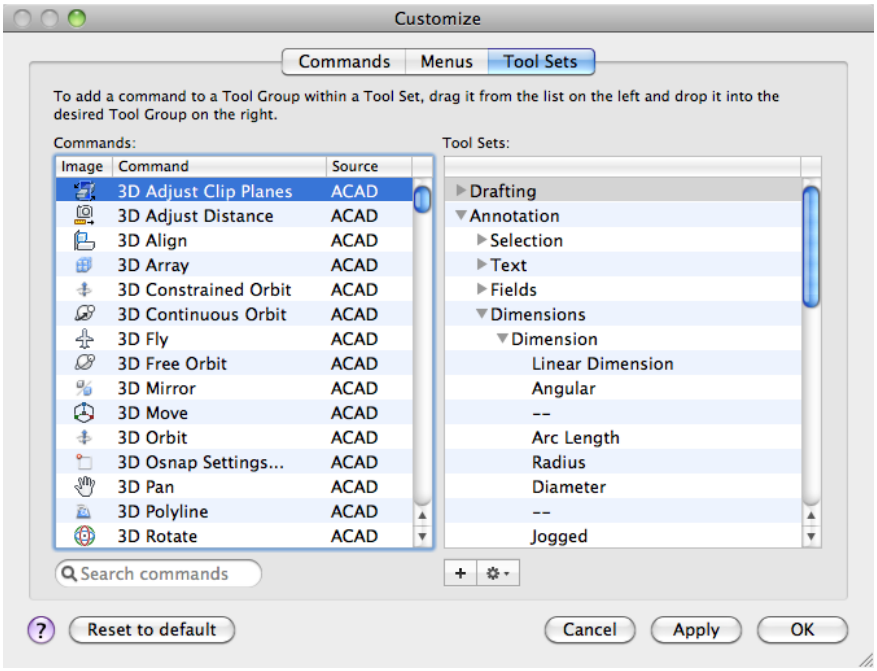


*Figure 6: Customize dialog box that allows you to tailor the UI to your needs.*

## Conclusion

My first AutoCAD experience was with Release 12 and I have used every release since then. When I first started using AutoCAD for Mac, it had a very familiar feeling and I was able to get up and running in a very short time. AutoCAD for Mac truly embodies the heart of AutoCAD and the spirit of a Mac.

But, as with any software application, AutoCAD for Mac might not be the best fit for you and your company. Existing AutoCAD users, you have a choice to stick with the Windows version or move to the Mac version. If you choose to move to the Mac version, you will need to work with your local reseller.

However, if you are running AutoCAD under Windows on a Mac via Parallels or Bootcamp, you might want to take a close look at AutoCAD for Mac. Most new users to AutoCAD for Mac will most likely be students who already have Macbooks. Students will be able to download AutoCAD for Mac this fall at http://www.autodesk.com/education.

If you are upgrading from older hardware or have not upgraded in a while, you might want to consider AutoCAD for Mac as well. AutoCAD for Mac is a stable program and a welcomed addition to the growing list of professional applications on the Mac these days.

For additional information on AutoCAD for Mac, see http://www.autodesk.com/autocadformac or contact your local Autodesk reseller. By the time you read this article, a free trial should also be available to download and install.

*Lee Ambrosius is a Sr. Technical Writer in the PSEB division at Autodesk, Inc. and works on AutoCAD and AutoCAD LT. He is the author of two AutoCAD books and technical editor to books such as Mastering AutoCAD for Mac and AutoCAD 2011 and AutoCAD LT 2011 Bible. Lee can be reached via e-mail at lee_ambrosius@hyperpics.com. Follow him on his blog at http://hyperpics.blogs.com or on Twitter at http://twitter.com/leeambrosius.*

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# Civil Visualization: A Beginner's Look

I recently decided to take on the task of civil visualization for an ongoing water treatment facility project. The primary task is to combine the various disciplines, including AutoCAD® Civil 3D®, AutoCAD® Plant, and Autodesk® Revit® Architecture, into Autodesk® Navisworks® to provide a viewable model for the customer. Additionally it was desired to produce images or videos of the site for a photorealistic look at the project. Since Navisworks isn't designed for such a task; Autodesk® 3ds Max Design will be utilized for that task. Thus far in the process I've received training on Navisworks and 3ds Max Design and have created preliminary civil models and viewed them in both products. This article will convey my thoughts on the process to date, illustrating the strengths and weaknesses of the current Autodesk civil visualization solution.

## Navisworks

Navisworks provides a way to bring together 3D models from a variety of software programs. While the product page for Navisworks indicates that the software provides the ability for photorealistic visualization, it does not appear possible with Civil 3D surfaces. Any surface masks applied to the surface are ignored, and the surface is turned into a solid color. This makes it difficult to provide an accurate appearance of the different surface materials. One solution to this inconvenience is to create a surface for each different type of surface material such as concrete, pavement and grass. Not an ideal solution.

While the project I'm working on doesn't include corridors, importing corridors provides a much better import experience. The materials are assigned to the corridor through the code style set. This feature makes it really easy to view the surface in Navisworks. While in Civil 3D the links of the corridor are presented as hatches, in Navisworks it appears similar to a collection of planar objects.

Navisworks is a joy to explore 3D models using the tools provided. I especially enjoy spending time with my new friend Max. He may be a bit odd, making sure never to face me, but is a great guide for navigating the 3D model. Max either walks, runs, or flies through the model. In addition to Max, Navisworks provides a method to animate scenes. Animation allows Max to open doors or trigger different actions as he meanders through the 3D model.

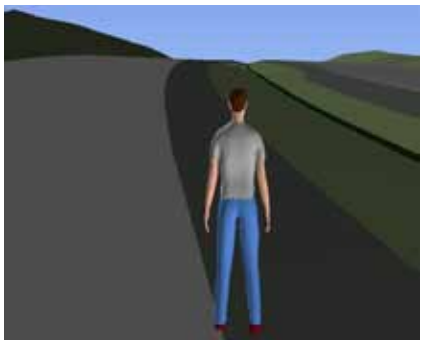

*Figure 1: Max*

If you are utilizing a version of Navisworks that allows for simulation modeling, it is possible to provide a 4D representation of the model. The fourth dimension is time. While this feature works well for non-civil objects, civil objects are a bit more problematic. In order to convey the earthwork timeline it would take several surfaces or corridor objects. This contrasts to non-civil objects such as a building where you have actual objects such as doors, windows, and structural members. A case of civil visualization where this may come in handy is showing the progression of mass grading, base placement, and pavement.

One item to watch out for is the mapping of materials. Make sure the same material folder is set up for both Civil 3D and Navisworks' association with DWG/DXF folders. Access the dialog box from the Navisworks N, the Options button.

## 3ds Max Design

3ds Max Design is marketed as a product oriented towards architects, designers, civil engineers, and visualization specialists. As a civil engineer stepping into the product, I have to say it is a bit overwhelming with its myriad options. For instance, the program provides for an accurate daylight system based on where the project is located. While the daylight is easy to add to a scene, figuring out what the orbital scale should be may be a bit daunting the first time. It turns out the orbital scale needs to be sufficient to illuminate the entire scene. The daylight system allows the scene to reflect the sunlight of the project's location.

When you are a new user, it is important to add the daylight system. It's a bit discouraging to start rendering the scene only to find that the screen is black and you're left wondering what went wrong. If your screen is black, it is most likely because you didn't set up a daylight scene or lights.

For civil visualization, Autodesk recently purchased Dynamite VSP from 3am Solutions in the United Kingdom and renamed the product Civil Visualization Extension. It is available through Autodesk's Subscription program. The program allows you to bring civil models into 3ds Max via a relatively easy user interface. The extension provides for automatic environmental settings such as a standard sky or optional fog settings. The workflow is a bit clunky as you have to open Civil 3D and run the Export to Dynamite command from the Toolbox under Subscription Extension Manager. The export creates a .vsp3d file, which contains object information from the drawing. The file is then imported into 3ds Max through Dynamite VSP. Hopefully, in future versions the integration will be seamless.

My first impression of the extension is that it's intended primarily for corridor objects and existing surfaces. The extension does a fabulous job of creating a 3ds Max surface based on the corridor model from Civil 3D. Based on the corridor, objects such as vehicles, trees, signs, and drive through cameras are placed automatically based on object placement styles. This greatly decreases the time required to set up a scene and the styles can be saved for use on other projects.

When it comes to projects without a corridor object, the creation of a scene is harder. Once again, masks applied to a surface do not show up as expected for a

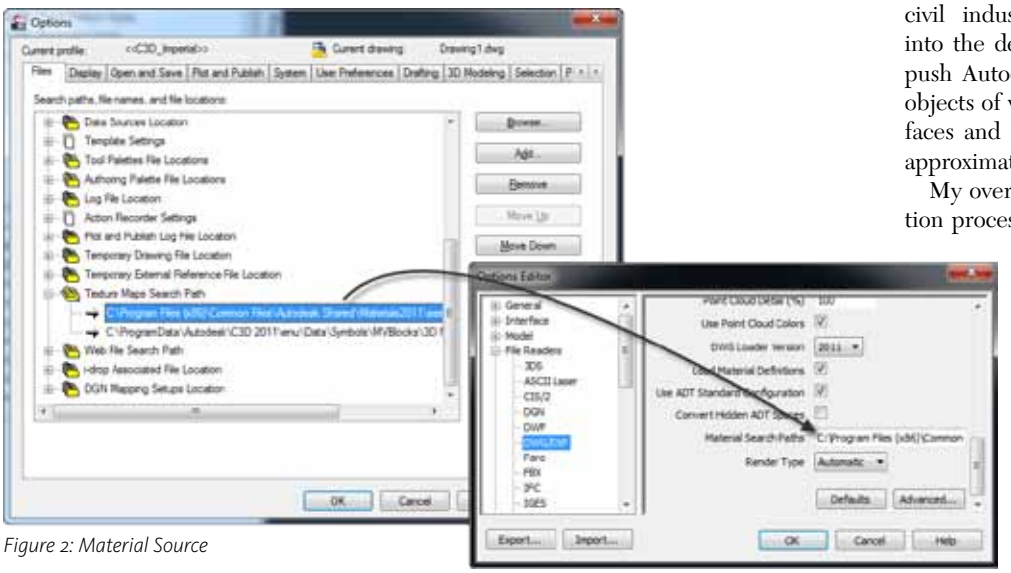

Figure 2: Material Source

civil industry incorporates visualization into the design process, the industry will push Autodesk to provide building block objects of what we design rather than surfaces and feature lines that represent an approximation of the designs.

My overall feeling of the civil visualization process is that it is daunting to learn and apply to projects. I'm sure that as I better understand Navisworks and 3ds Max, how to accomplish civil visualization in an efficient manner will become clearer. Overall, the process appears workable, but definitely could use improvements on the software side to facilitate the process from design to visualization.

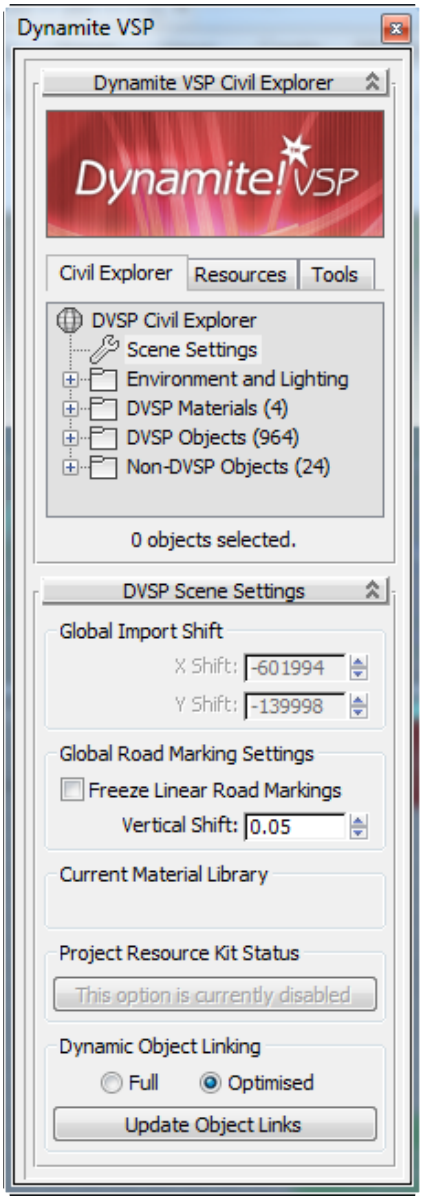


Figure 3: Dynamite VSP

novice. To create a surface with multiple materials, multiple surfaces need to be created, each encompassing the various material types of surface such as concrete, pavement, and grass. The extension does allow for the creation of swept objects utilizing object styles. The creation of curbs, gutters, railings, and bridges may help alleviate the need for creating multiple surfaces.

The extension also assists in applying materials. Materials have to be the most complicated, yet integral, part of creating a model in 3ds Max. Materials control how objects appear, how light reflects off the surface, and the texture of an object. Materials can be simple or extremely complex. The picture of the material editor shown in Figure 4 contains the material for a street lamp. Each of the materials is applied to a different surface of the street lamp object. For a beginner creating a material for this purpose, it can get confusing with multiple layers of the material editor.

## Civil 3D

In exploring these other products, it drives home my feeling that Civil 3D is the weak link in the civil visualization process. The lack of actual building block objects such as curbs, gutters, and pavement hinders the ability to seamlessly go from design to visualization. Other products such as Autodesk Revit have it easier because there are objects representing the design, such as windows, doors, and walls. A corridor provides a method to create the building products, but as the deficiencies in time modeling in Navisworks shows, the subentities of the corridor objects are top surface representations of roadway components rather than actual objects that make up the roadway. I'm hopeful as the

*Christopher Fugitt is a Civil Engineer and has spent the last eight years designing government projects as well as residential subdivisions. Before working as a Civil Engineer, Christopher worked for a General Engineering Contractor on subdivision and mining projects. Christopher earned his B.S. degree in Civil Engineering from California Polytechnic State University, San Luis Obispo. Christopher maintains and authors the Civil 3D Reminders blog at http://blog.civil3dreminders.com/*

Figure 4: Material Editor

# File Share with Confidence

It seems like such a simple task. You need to share your AutoCAD® drawing file with someone else. You email the .dwg file, right? Actually, there are many options for sharing your design. Let's examine some of them.

First, of course, you can simply save your drawing in the same file format for the AutoCAD version you are using. If you choose this option, will the intended recipient be able to open it? Will they see it as you intended? Will all the necessary files be there?

You can SAVE AS and choose an older file format to send the file. But even that is not foolproof. If you are using the annotative scaling, your drawing may appear without annotation showing at all or showing inappropriately. After all, your recipient's AutoCAD version may not have had this technology available "back in the day."

So that your recipient can view your annotations correctly with a version of AutoCAD developed prior to annotation scaling, you need to go to your Options dialog box (my favorite method is right-clicking in the command line but you can choose Options any way you like) and the Open and Save tab. Under this tab you will not only see the version in which your file is saved as a default, but immediately under this you will see two options that refer to previous versions.

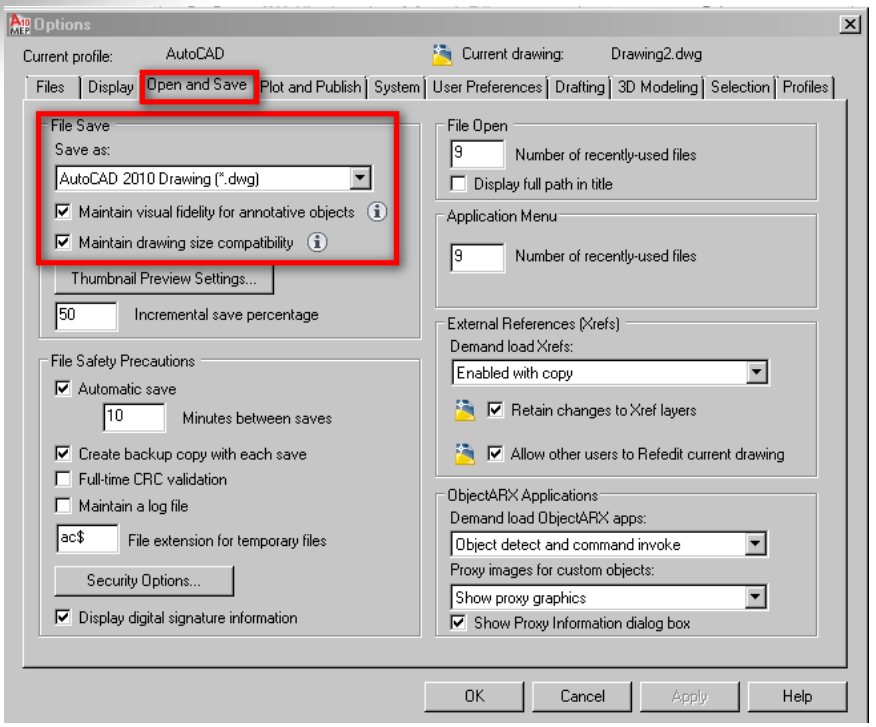


*Figure 1: You start on the Options dialog.*

The option "Maintain visual fidelity for annotative objects" should be checked if you are sharing your file, or potentially sharing your file, with an earlier version. This will take your various annotation

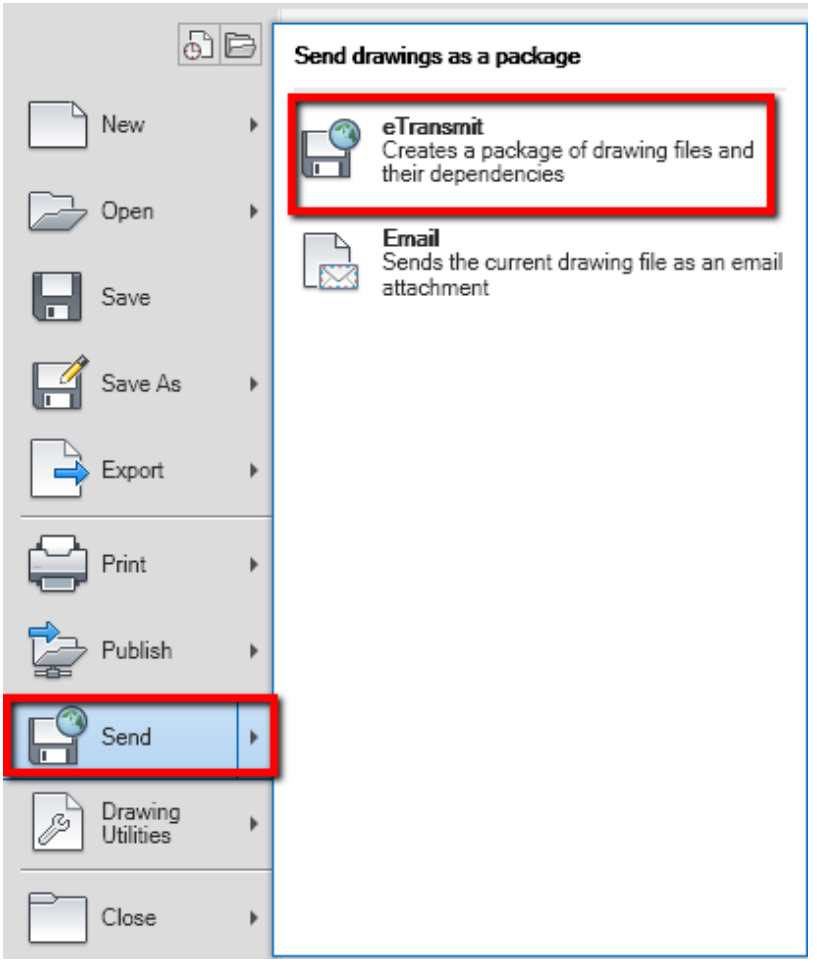


*Figure 2: Find the eTransmit tool on the Application Menu.*

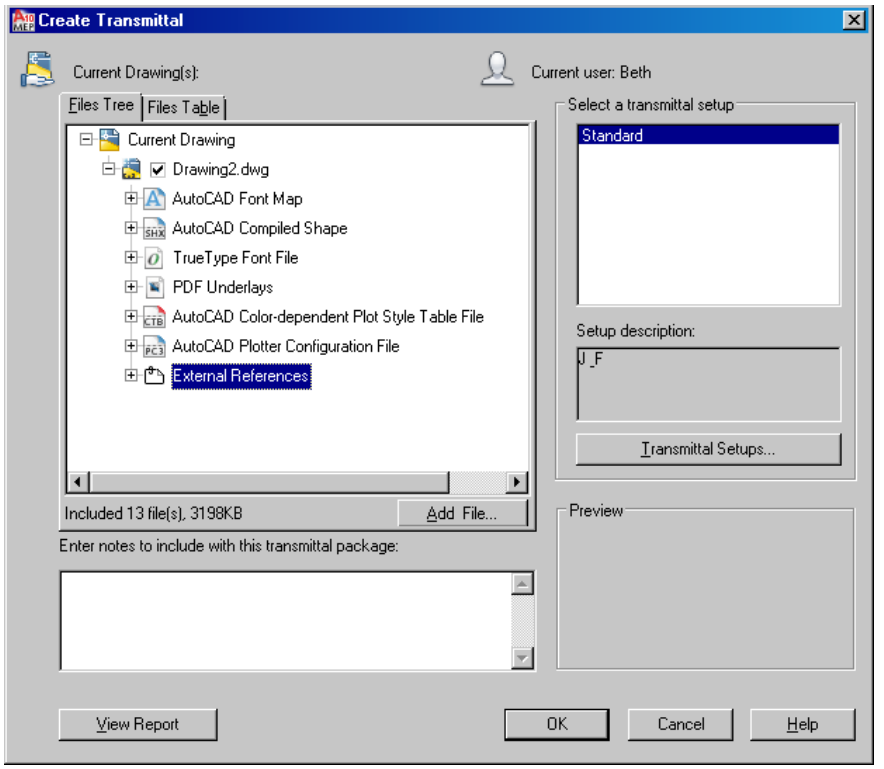


*Figure 3: The Create Transmittal dialog.*

scales and break them into layers, which is no different than the method we used before we had annotation scaling.

Let's say that you have viewports at 1/4" = 1' (scale factor of 48) and 1/96" = 1' (scale factor of 96). While you see only the desired annotation for that scale factor in your viewport, the user with the earlier version receiving your file will see layers with "dim 48" or "dim 96" in the name. They will be able to turn on and off layers and control what we control now with annotation visibility.

Now, let's look at a different scenario. You have a number of external references associated with a file. You may even have special fonts and, of course, you have your own plot style. Rather than just sending the file and have the xrefs missing (you know how annoying that is when YOU receive one?) or having the recipient call you to ask for the missing file, why not use one command to ensure you send all the information needed?

eTransmit automatically takes all the files associated with your drawing and combines them in one .zip file. The command has evolved over the years and continues to improve. It's one of my "can't live without" tools in AutoCAD.

You can see that there is a tree of types of files included in this eTransmit package. If you have .pdf unerlays or external references they will be included. You can also add files with the Add File button. They don't even have to be AutoCAD files. You might add Word documents, Excel spreadsheets, or photos.

You can save your settings or preferences by selecting the Transmittal Setups button.

While there is a lot I can delve into about just this one command, there is not space in this article to do so. You will see that you can set the drawings to be saved back as an earlier version right here during the eTransmit process or purge the drawings. One of my favorites is "Set default plotter to none." You know how annoying it is to open someone else's drawing and get the message that HPxxx plotter cannot be found? Don't you wish everyone used eTransmit and sent files to you with a 'none' plotter? I sure do!

This brings us to our last scenario, which is sending a file to someone who doesn't have AutoCAD. You may have heard about .dwf files and Design Review, which are my personal favorites. There are other .pdf viewers that allow markups such as Bluebeam, for example. One of the newer features in AutoCAD is the ability to create .pdf files without additional software required. The most common way to cre-

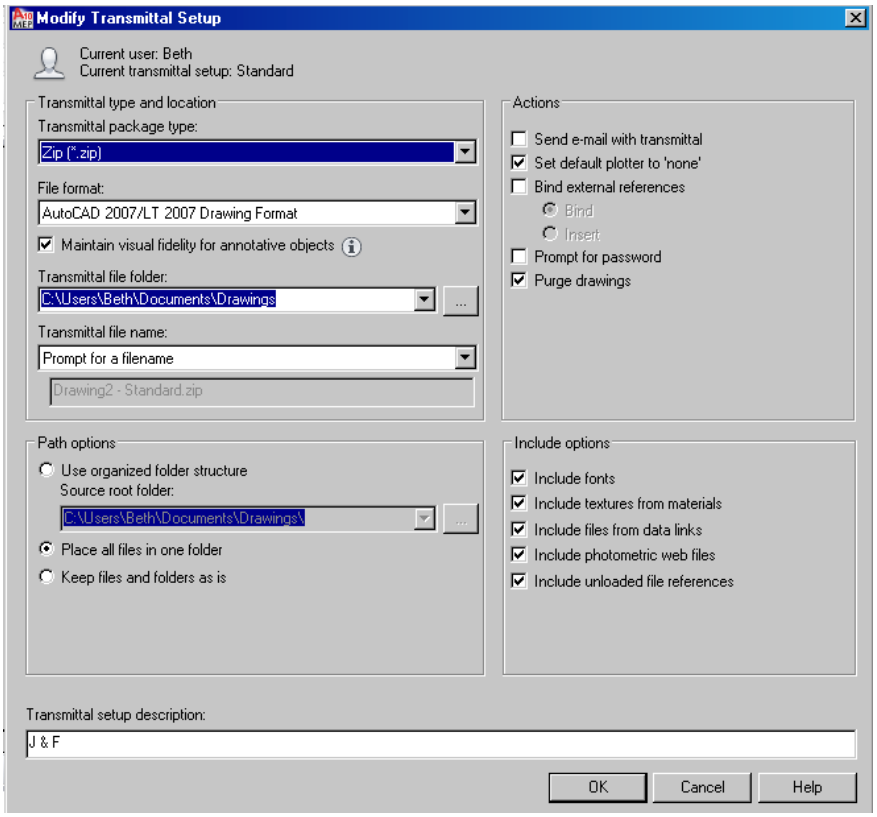


*Figure 4: Using the Modify Transmittal Setup dialog.*

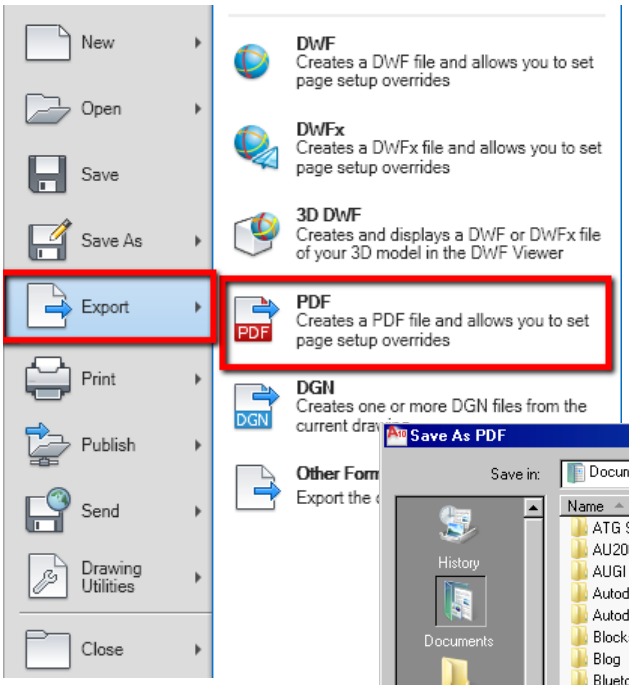


*Figure 5: Access the Export > PDF tool from the Application Menu.*

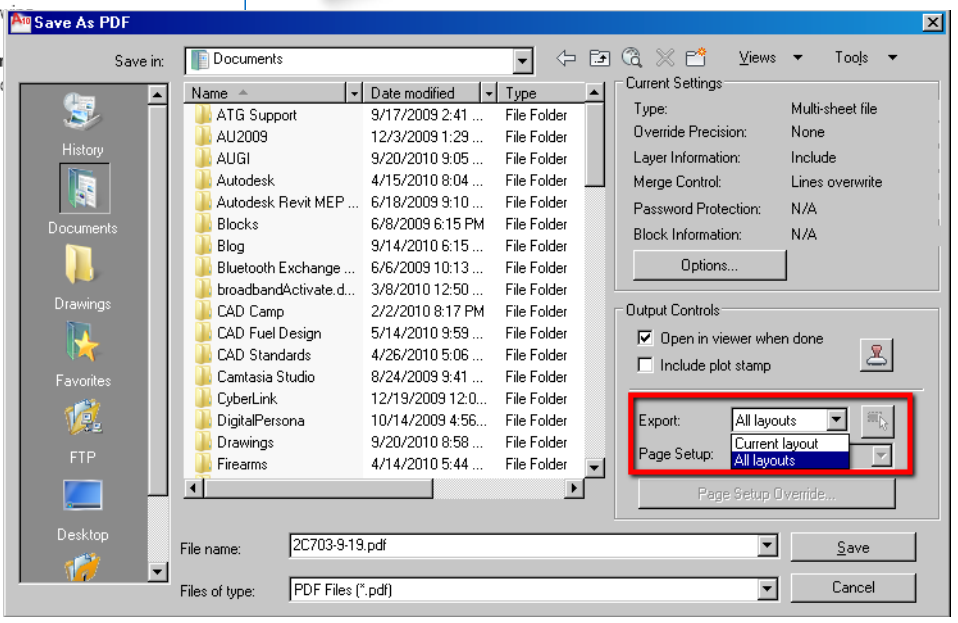


*Figure 6: What layouts do you want to PDF?*

ate a .pdf file is from the PLOT command choosing DWG to PDF as the plotter. But there is actually an easier way.

Choose Export from your Menu Browser and select PDF. This command will allow you to create .pdf files from all your layouts in the file rather than sheet by sheet. You can create one multisheet .pdf file the same way many other software packages do. And you can do this in large sheet sizes as well. This makes it handy if you need to send to a contractor who is going to plot out your .pdf files on full size sheets.

The Export flyout also provides you with access to creating various types of .dwf files, .dgn (Microstation) files, and other formats.

When you have multiple layouts, you will have an opportunity to plot a single layout or all layouts so you can make one .pdf file of all your layouts.

AutoCAD provides you multiple options for sharing files. There are more options available from Autodesk, but that's a topic for another time. Now shouldn't you get back to sending that file?

*Beth Powell owns CAD Fuel Design. She produces drawings for the fueling industry and provides training and support for AutoCAD and AutoCAD MEP. Her blog is http://bethscadblog.blogspot.com/. She can be reached at beth@cadfuel.com.*

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# Turning the Tables on OLE Excel Files

If you're like me, you can remember a time when creating a table inside AutoCAD was a "hand crafted" process. It involved manually offsetting grid lines and painstakingly placing text inside each cell. Back then, the only task worse than creating a table was editing one.

With AutoCAD 14, table creation improved through the use of OLE objects. This meant we could create our table in programs such as Microsoft Excel, and then paste a "screenshot" of the table into the CAD file. By double-clicking on the screenshot, you could launch Excel where you could edit the data, thus creating a fresh image. This new OLE workflow was so much easier than the manual method; it became a standard that many people still use today.

In AutoCAD 2005, table creation was once again made easier with the introduction of the table object. For the first time, tables built inside AutoCAD had the same powerful features found in Microsoft Excel.

Over the years, the table functionality within AutoCAD has improved to the point that an OLE workflow is no longer necessary. In most cases, you can actually do more with an AutoCAD table than you can with an OLE object.

Read on to find out how!

## Creating a table in three clicks

If you've never created an AutoCAD table before, you'll be surprised how easy it is. It's essentially a "three-click" process. Step 1: Click the TABLE icon to launch the command. (You can find it in the Annotation panel of the ribbon.) Step 2: When the dialog box appears, click OK. Step 3: Click on screen to place the table.

That's it. You've just created your first table and you're ready to start inserting data.

I know what you're thinking: "We never established the number of columns or rows, nor did we set widths and heights." You are correct, but since this table is a dynamic object, we can make those adjustments at any point in the future.

Think of this initial table as a ball of clay that you can sculpt into your final design.

## Navigating from cell to cell

Before we can learn about table navigation, we need to define a starting point. Try this… Click ONCE inside any cell. Notice the cell is highlighted, and AutoCAD displays the Table Cell tools in the ribbon as shown in Figure 1.

Now that we've established our starting point, here are the keyboard shortcuts we can use to move around.

Move Down = ENTER
Move Up = SHIFT + ENTER
Move Right = TAB
Move Left = SHIFT + TAB

Using these shortcuts we can quickly navigate to (and edit) any cell in the table.

It's important to note that each cell has two "selection levels" depending on whether you're editing cell formatting or data. Here's how it works.

If you SINGLE-CLICK to select a cell, AutoCAD displays the Table Cell tools. If you DOUBLE-CLICK to select a cell, AutoCAD displays the Text Editor. See Figure 2.

Anyone who has used Microsoft Office will notice the Table Cell tools mimic the functionality of Microsoft Excel, while the Text Editor mimics the functionality of Microsoft Word. Having such a large (and familiar) toolset makes AutoCAD tables very powerful, while still being intuitive to navigate and edit.

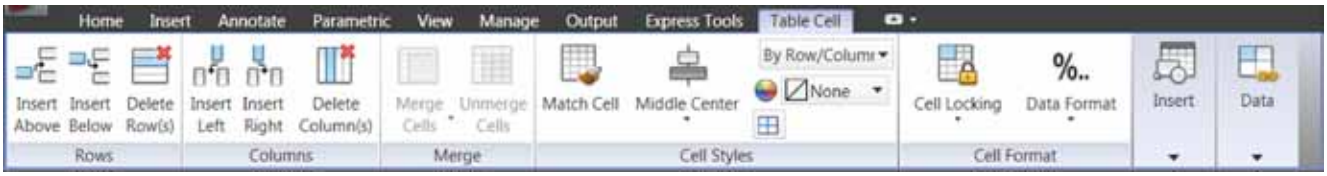



*Figure 1: The AutoCAD Table Cell tab contains many of the same features found in Microsoft Excel.*

*Figure 2: The AutoCAD Text Editor tab contains many of the same features found in Microsoft Word.*

## Controlling the grid size

Resizing a table is a simple matter of adjusting grips. See Figure 3.

If you select the table grid, AutoCAD will display several "general purpose" grips for resizing the overall table and columns. As you can see, you have control over virtually every grid line. If you have any ques-

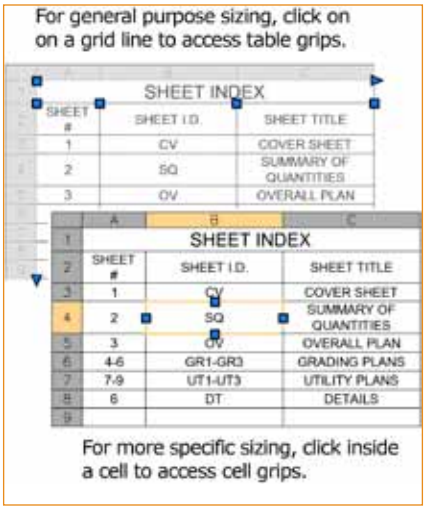



*Figure 3: Table objects can be resized using grips.*

tions about the function of a grip, place your cursor over it and AutoCAD will tell you its function.

To target changes to a specific area of the table, click inside a cell to access the grips used to resize a single row or column.

In most cases, these grips are the only tool you'll need to tailor your grid size.

At this point, you may be wondering if it's possible to assign precise measurements to the table or cells. Yes it is, and you can do it through the Properties Palette. Try this…

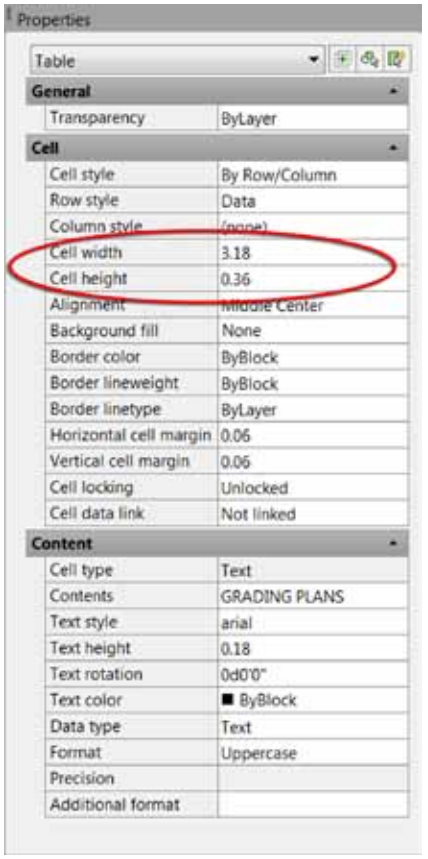



*Figure 4: Most table properties can be modified using the Properties Palette.*

Step 1: Ensure the Properties Palette is visible on screen. If necessary press Ctrl+1 to turn it on. Step 2: Select a table by clicking on a grid line. Step 3: Look in the Table group inside the Properties Palette to find settings that control the overall width and height of the table. Step 4: Go back to the table and select a single cell by clicking inside it. Step 5: Check the palette again to find settings controlling the cell height and width. See Figure 4.

So whether you're creating a simple table for displaying data, or incorporating a precisely sized table into your title block geometry, AutoCAD gives you complete control over your grid dimensions.

## Formatting the data

Each table cell acts like a miniature MTEXT object. To insert data, double-click inside any cell to access the text editor. From here, you can enter text, numeric values, dates, coordinates, or whatever you like.

Note that, just like in Microsoft Excel, AutoCAD will format the data based on what you enter.

Try this…

Step 1: Start a new drawing and create a table using the "three-click" method mentioned earlier. Step 2: Double-click inside a cell, input a value of 10 and press Enter to accept the value and move down one cell. Step 3: In this cell, type NOTE and press Enter. Step 4: In this cell, type DEC 10 and press Enter.

Your final table should look similar to Figure 5.

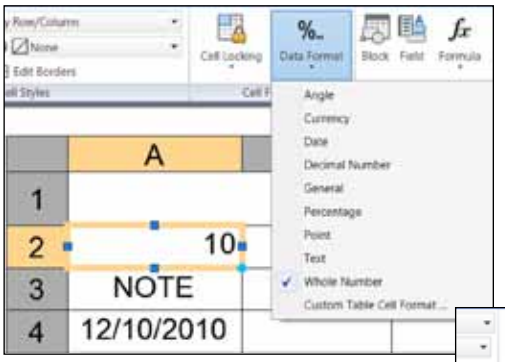



*Figure 5: Use the Data Format menu to control the display of cell data.*

By default, AutoCAD recognized the first entry as being a number, and right-justified it within the cell. The word NOTE was treated as text and placed center justified. The final entry of DEC 10 was assumed to be a date, and was formatted using the default settings.

This is a function of the data format that is applied to each cell. By default, every cell is assigned a "general" format. This means AutoCAD determines the best way to display the data. To verify this, click in an empty cell and open the Data Format menu in the ribbon to check the setting.

Now click in a cell that contains data and check the menu again to see the formatting AutoCAD assigned to the cell. See Figure 5. Using the Data Format menu, we can override AutoCAD's "best guess," and assign our own data formatting to the cells.

Try taking the concept even further by selecting the Custom Table Cell Format option to specify text formatting, prefixes and suffixes, precisions, as well as many other settings designed to standardize the appearance of your data.

Tip: To apply formatting to multiple cells, click/hold inside a cell and drag a selection window that crosses desired cells. Once cells are selected, use the Data Format menu to apply formatting to all.

Bonus Tip: Don't forget the Properties Palette! Once you've selected multiple cells, change their data format using the palette options, or try changing other settings like text heights, cell margins, and justification. See Figure 4.

## Inserting formulas

Table data doesn't have to remain as "static." Just like in an Excel worksheet, AutoCAD tables can apply mathematical calculations to the contents of cells. This means we can always be certain that our subtotals and percentages are accurate, regardless of the number of times we update the data.

Here's how it works.

Take a look at the table in Figure 6. Let's say that we need to calculate the total area of the site. In order to find the total, we need to add up the areas of each land use. As you can see in Figure 6, I have already selected a cell where I will place the total.

From here, I will open the Formula menu in the ribbon and select

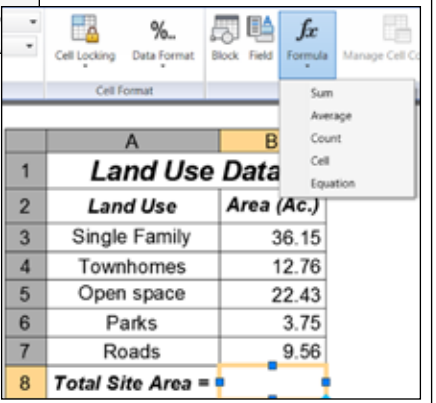



*Figure 6: The Formula menu can be used to find the sum of multiple cells.*

Sum. Next, I will create a window selection by clicking inside cell B3 and again inside cell B7 to show AutoCAD the cells I'd like to add.

AutoCAD then displays =SUM(B3:B7) inside my target cell. At this point I can press Enter to accept the formula and see the value. (You were probably wondering, and you're right, you can use the Text Editor to create your own custom formulas!)

Notice the total area is displayed with a gray background. Don't worry, this background is "non-printable" and simply represents that the value is the result of a calculation. Now that the total area has been found, try adjusting its decimal precision using the Data Format menu mentioned earlier.

Whenever possible try to make your table do the calculations for you. The more you can automate the data, the less chance you'll have to introduce mathematical errors.

## Customizing columns and rows

As I mentioned before, we can think of a "three-click" table as being a mere starting point from which to build the table we need. In most cases, achieving our final table design will involve adding or removing columns and rows. Fortunately, the table tools in AutoCAD make it easy to customize a table. Try this…

Step 1: Create a table using the "three-click" method mentioned earlier. Step 2: Click to select a cell. Step 3: Experiment with the tools in the Rows and Columns panels of the ribbon. See Figure 1.

Notice that you can easily delete the selected column/row or insert a new column/row based on the location of the selected cell. Using these tools you can quickly modify any table to fit your data.

## Inserting blocks into cells

Have you ever created a legend for your construction drawings? Chances are you used text or MTEXT for the descriptions and then painstakingly aligned the symbols alongside.

Well, in addition to text, tables are also capable of holding blocks which makes them the perfect alternative to the traditional "manual" legend. Take a look at the legend in Figure 7.

Believe it or not, this legend was created as a table.

Now I know what you're thinking: "Why don't we see the gridlines?" We'll talk about hiding the grid in a little bit. In the meantime, let's look at how to insert a block into a table cell. Try this…

Step 1: Open a DWG file that contains at least one block. Step 2: Create a "three-click" table. Step 3: Click to select a cell, and then right-click and choose Insert – Block from the menu. Step 4: In the dialog box (see Figure 8) select your block and click OK.

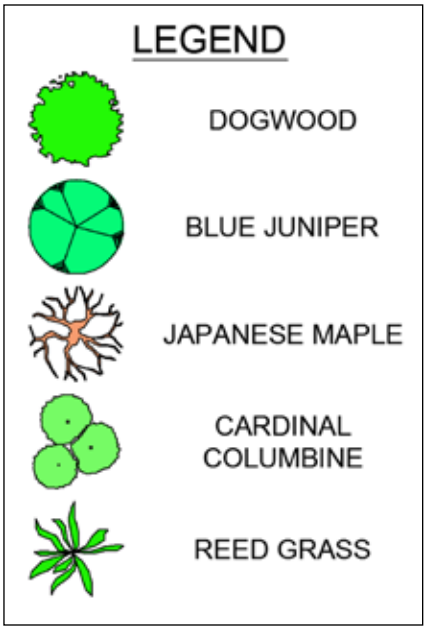



*Figure 7: Tables are a perfect choice to create legends.*

By default the block will be inserted via "Auto-Fit" so it will always size itself to match the cell size. (Be sure to experiment with the other options!)

Table objects may be one of the best methods for creating a legend. By using a table, your legend can be treated as a single object, while also being very easy to edit.

## Creating a table style

Generally speaking, a table can be broken down into three types of cells; Title cells, Header cells, and Data cells. Each cell type is capable of having its own visual style. These styles are all saved together as

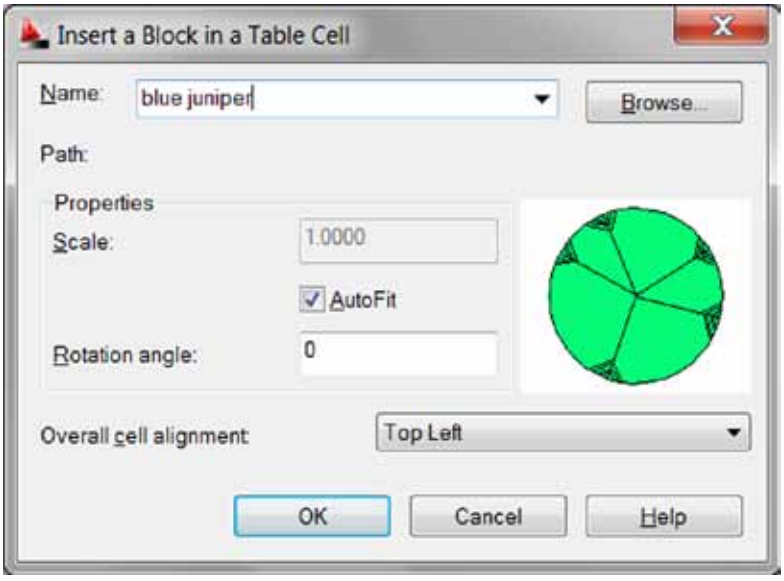



*Figure 8: Table cells can also accommodate blocks.*

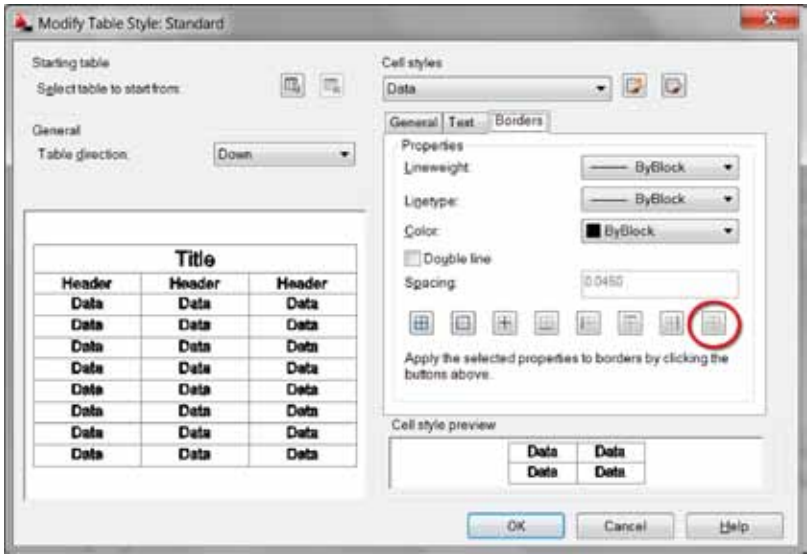



*Figure 9: Table styles are defined using an editor much like the dimension style editor.*

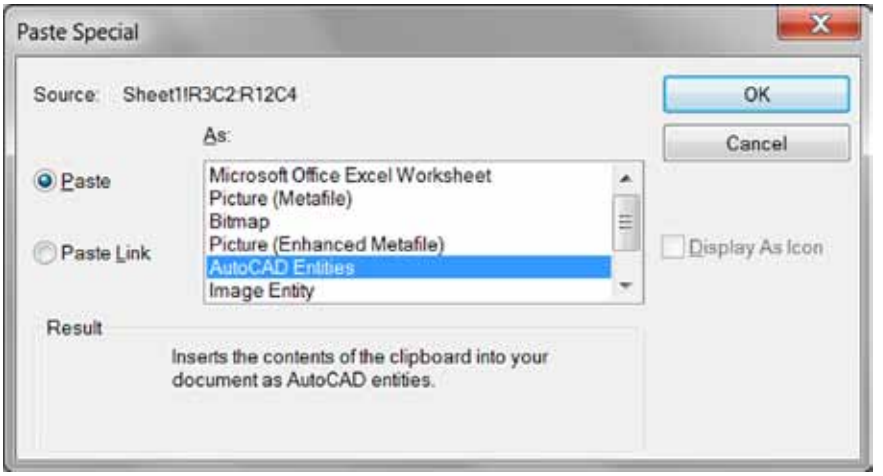



*Figure 10: Using Paste Special, clipboard data can be inserted as AutoCAD entities.*

a single table style. In the same way a dimension style controls the display of a dimension, a table style controls the display of a table.

To access the table style editor, type TS at the command line and press Enter. In the dialog box, you can create a new style or modify an existing one. Click Modify to launch the editor. See Figure 9.

Notice you can see a preview of the current style displaying the three types of cells. On the right side of the dialog, you can open the Cell Style menu to select which cell "type" you'd like to modify—Title, Header, or Data. Once you've made your selection, you can use the tabs below (General, Text, and Borders) to control its appearance.

To create the legend in the previous example, I used a table style in which all three cell types utilized a border setting of "none." Note the circled icon in Figure 9.

Using a table style you can assign colors to the grid lines, text, and backgrounds. You can also preset text heights and rotations. Generally speaking, you have a great deal of control; you are only limited by your desire to experiment!

## Importing a table from Microsoft Excel

When you're working on a project as part of a team, you may need to incorporate tables provided by others. Many times those tables will be created as Microsoft Excel files.

This isn't a problem, because you can easily convert an Excel table into an AutoCAD table using the Windows clipboard. Here's how.

Step 1: Open an Excel file and select the cells that make up a table. Step 2: Press Ctrl+C to copy the cells to the clipboard. Step 3: Launch AutoCAD, and open the drawing where you'd like to place the table. Step 4: At the command line, type PASTESPEC and press Enter. Step 5: In the dialog box, (see Figure 10) select AutoCAD Entities and click OK.

And that's it! You've just converted an Excel table into an AutoCAD table. Now I'm not going to lie to you—your converted table may need some minor tweaking to make it look just right. The important thing is that the converted data will conform to the current table style and perfectly match your CAD standards.

## Linking table data between AutoCAD and Excel

Not only can we convert an Excel table into AutoCAD entities, we can also link the AutoCAD table to the original Excel file. This way if the data is updated in Excel, we will see the changes reflected in our AutoCAD drawing.

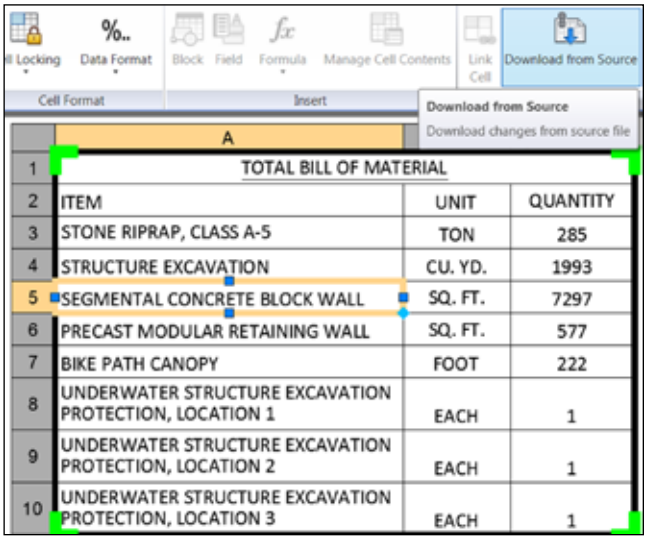
To create such a link, follow the same steps outlined in the previous example. The ONLY difference is at Step 5. In the dialog box, make sure you select the PASTE LINK button first, and then select AutoCAD Entities.

Now your new table not only conforms to a table style, it's also linked to the original Excel file.

Test the link this way.

Make a change to the data in Excel and save the file. Then switch over to AutoCAD, select any cell, and choose "Download from Source" from the ribbon. See Figure 11. Notice the AutoCAD table is once again synchronized with the Excel file.

When working as part of a project team, data links allow others to take ownership of the data shown on construction drawings. Once a link has been established, it's very easy for another team member to revise the CAD drawings by simply updating an Excel file.




| | A | | |
|---|---|---|---|
| 1 | TOTAL BILL OF MATERIAL | | |
| 2 | ITEM | UNIT | QUANTITY |
| 3 | STONE RIPRAP, CLASS A-5 | TON | 285 |
| 4 | STRUCTURE EXCAVATION | CU. YD. | 1993 |
| 5 | SEGMENTAL CONCRETE BLOCK WALL | SQ. FT. | 7297 |
| 6 | PRECAST MODULAR RETAINING WALL | SQ. FT. | 577 |
| 7 | BIKE PATH CANOPY | FOOT | 222 |
| 8 | UNDERWATER STRUCTURE EXCAVATION PROTECTION, LOCATION 1 | EACH | 1 |
| 9 | UNDERWATER STRUCTURE EXCAVATION PROTECTION, LOCATION 2 | EACH | 1 |
| 10 | UNDERWATER STRUCTURE EXCAVATION PROTECTION, LOCATION 3 | EACH | 1 |

*Figure 11: Use the Download from Source option to update a linked AutoCAD table from an Excel file.*

## Conclusion

Tables are one of the most versatile, dynamic, and powerful tools available inside AutoCAD. They allow us to take charge of our data, using many of the same familiar tools found in both Microsoft Excel and Word combined!

After everything we've looked at, we have only seen the tip of the iceberg. There is still much to explore!

Spend a little time with this feature, and you'll be surprised at how easy it is to organize and automate your data. With more practice, you'll find that there are opportunities to use AutoCAD tables almost everywhere.

In time, you may look back and tell stories about the "old days" when data was displayed using screenshots!

*Jeff Bartels is the Sr. Engineering Technician at Wills Burke Kelsey Associates where he works with Civil 3D and AutoCAD. He is the author of ten AutoCAD training titles for Lynda.com. Jeff is also on the faculty at Elgin Community College in Illinois, where he teaches the Advanced AutoCAD courses. Jeff can be reached via e-mail at jbartels@real-worldcad.com Follow him on Twitter – @JeffBartels where he regularly posts AutoCAD tips and shortcuts.*

# One Man Shop: Consulting vs. Freelancing *Part One*

This article will explore some of the elements that comprise a successful one-person visualization operation. There is no shortage of valuable technical information dedicated to streamlining work efficiency and improving 3D work generally. Here we will take a closer look at the business side of making a go of it on your own.

Essential components include branding, networking, and marketing, establishing a presence in the 3D community, client interaction, negotiating, business practices, contracts, and artwork rights.

## Getting started

Presentation equals perception. Establishing your identity and branding that identity is fundamental to generating a steady stream of work. Think of yourself as a company, and present yourself as such. You are a professional consultant, not just a lone artist taking on freelance work.

For example, my studio, Onion 3D, is not incorporated. However it is a DBA and I am a sole proprietor. I occasionally sub jobs out, but for the most part I do all the work myself. This makes things more manageable at tax time.

Consistency – Successful branding is more important that one might initially think, and it's not just for large corporations. Branding relies on consistency. This consistency indicates credibility, reliability, and inspires confidence in you. On the graphical side, design your logo and create a style guide which dictates your color palette, specific font, standard spacing, and so on. Limit your palette to one or two main colors. You can also have an accent color for specific situations. Be sure the logo translates well in black and white, or

*Figure 1: Website, business card, invoice, email template, letterhead*

design a version specifically for faxes, copies, and the like. Adhere to this guide in all communications and representations of your business self. First off, you'll need to create a website, email template, and hard copy template. Apply the style guide to all other documents including invoices, agreements, contracts, advertising, business cards, and any other documents you use for the business.

## Website

If you are a visualization expert, your website should be about your viz work, not your web skills. Your site should be distinctive, clean, and simple to navigate. Don't be fancy here; your site indicates the way you communicate and how you'll interact with the client. In lieu of splashy intros and 3D flash slideshows, it is best to keep your design clean. Proofread your copy. Then proofread it again. Don't skip this step—typos damage your professional image and compromise the confidence you are looking to engender. What is a client supposed to think of your attention to detail if you have misspellings in your first communication? This goes for everything you do, so make proofreading second nature.

## Email template

The email template should be simple, with your logo at the top left and a footer with contact info. The logo should be a link to your site. Always use your chosen font. When choosing your standard font be aware that your goal is to show the world what you want them to see. Don't let the look of your copy be decided by what your client's computer thinks is close to what you've called for. To help standardize your look, choose a common font and alter it slightly with color, grey scale, or experiment with size. This is a good example of balancing richness versus reach.

## Raise your visibility

Involve yourself actively in the 3D community. Post your work on sites specific to your chosen field. Gamers can skip arch viz sites, and vice versa. Do more than just browse 3D sites. Participate by posting work and it is important to comment on others' work. Though not geared specifically to attracting clients, these sites help to keep you current, and expand your visibility online. There will be more listings for you on search engines. Update your online portfolios, follow other group members and communicate with them regularly. To further increase your visibility, be sure to update your friends and connections as you achieve new professional milestones. I recommend that you avoid showing work only on picture sharing websites. These have their place, but it not a good idea to send a prospective client a link to your work stored on a social networking site.

## Nuts & bolts

When negotiating with clients, ideally you'll have a written contract for every job. Sometimes you'll be required to sign a non-disclosure agreement (NDA) before a job can move forward. It is important that you have your own standard agreement which establishes terms to be accepted by both you and the client. Address image ownership. Although possibly not the best business practice, I will typically only require that the images I produce are mine to use in my portfolio. Not every job will yield work that you want in your portfolio. It's still good to remain consistent and get your agreement signed. Avoid non-compete agreements and non-comp clauses in contracts. These are typically for employees, but you may see one from time to time. Avoid it even if the job is very lucrative. You may have other clients who need you, and you should be there for them.

Negotiate the revision process. I cannot stress enough the importance of this. If you quote a job at a flat fee, you must establish a limit to the number of rounds in the back-and-forth tweaking process. Beyond this limit your work becomes an additional service to be paid hourly. That's it, take it or leave it. Skipping this step is a sure way to lose your shirt on a job.

Also, if the client company is small or new, get in writing that there is indeed the budget to cover your fee before you proceed. If you don't establish this expressly, several things can happen, all of which are bad. Excessive unpaid revisions will chew up your fee and take time away from other jobs. If you don't address this up front you may be perceived as an amateur and treated as such. In further negotiations you could be in a position of weakness. This goes back to the importance of being perceived as a professional visualizer and not a hungry student. Even if you don't accept the job you are more likely to be paid for any time spent, than if you are vague or seem unsure about your role in the professional relationship.

## Payment structure and terms

Here is another opportunity to project professionalism. This is important because it means that you are a dependable professional, not just a talented artist who may or may not be reliable. Your fee is a function of the time you estimate to complete the project, time actually spent, the client's budget for the job, and your expenses. I apply the "rule of thirds" to payment. The first third is due upon agreement to do the job, before any work has been done. The next third is due upon written approval of a low resolution version of the finished project. The balance is due upon delivery of the final product. If this is not acceptable to a client it can speak volumes as to how you'll be treated. Payment up front means that you are committed to each other to complete the job.

Have I ever done a job for a less than an ideal fee because the result would strengthen my portfolio or add a high-profile client to my list? Well, yes. But make this the exception rather than the rule. Also keep your drafts small and just enough to get the point across. Some like a watermark on drafts, but this appears paranoid and indicates you've been burned before, which suggests that you allowed yourself to be duped.

## Competition

Compete where you have the edge. Maintaining excellent client relations and communication are areas where you can outshine the competition. It may not be possible to under-price offshore competition, but there are other measures of your value to a client. Here is where direct communication and responsiveness come into play. Being local, fast, and talented can give you the advantage. Most designers I know would much rather discuss their projects face to face with the visualizer, rather than send off information and wait to see if they got it right. Language barriers and time zone-related delays work to your benefit.

## Conclusion

With repeat clients you will have an established relationship; you both know what to expect from the process and each other. If you are working with a new client it is your job to be consistent. This inspires confidence and respect. Occasionally you will be seen as a skilled laborer rather than a talented artist. In such cases—indeed in all cases—your job is to be professional, cool-headed, and easy to work with. Good luck!

*Tom Cipolla is a digital artist specializing in architectural visualization. Born in New York, he trained as a sculptor and transitioned to working digitally in 2000. Tom has taught foundry practice, sculpture, drawing, and 3D software. His company, Onion3d, is a consulting and animation studio located in South Boston, Massachusetts.*

# Predicting BIM's Future

It's no secret that technology changes fast and frequently. In fact, the rate of change appears to be increasing and shows no signs of stopping despite recent economic conditions. Nowhere is this more evident than in the AEC industry primarily because of this thing called BIM.

As with all technology, and BIM is no exception, there are a range of philosophies with respect to adoption. There are those on the bleeding edge of technology and on the opposite end of the spectrum are those who prefer to take a wait-and-see approach. The one thing they all have in common is they want to know where technology is heading in the future. The bleeding edge crowd wants to know so they can start moving in that direction, while the wait-and-see folks want to know so they don't bother implementing current technology if it's going to change and not be around long.

While nobody can predict the future, we can get a general feel for where things are headed if we stop and look at some of the clues. One of the best ways can often be to look outside your own industry. We can't predict any particular technology or software and we certainly can't predict a timeline.

What we can get is a fairly accurate feeling of where things are heading so when the future nears, we're not caught off guard. This is critical if we don't want to adopt technology in a quick reactionary way without fully realizing the true purpose of what we aim to accomplish.

## Rhetoric versus reality

Before we can look to the future, it's prudent to look at where we are and where we've been. This gives us a historical trajectory, which starts us out in the correct general direction.

It wasn't that long ago, just a few years actually, that many people started hearing about BIM. They didn't know what it was exactly, but they sensed it was something big and they needed to jump on the bandwagon even if they didn't know where it was heading at the time. Concurrently, Autodesk's marketing machine kicked into high gear, and soon BIM became synonymous with Autodesk® Revit®. Early adopters upgraded many if not all their Architectural Desktop or Building Systems licenses to Revit, After all, we'll all be using Revit for everything soon and AutoCAD will be dead in a few short years.

Things have certainly changed from that view. There are still those that think BIM equals Revit and that Revit is not CAD and there will likely always be some who view it that way. But those firms that have been operating in the BIM world for a while now are now realizing what CIOs and seasoned IT professionals have known for some time. It's not about the software, it's about the business processes and the value that can be leveraged with technology. Software or technology absent a business purpose is pointless.

## What is BIM?

So this brings us to this question: What is BIM? As we describe the following business process, keep in the back of your mind the following question: "Does this sound like BIM?"

There's a large electrical utility with more than two dozen fossil, renewable,

and nuclear generating facilities. Their non-destructive examination engineers routinely schedule facility outages for testing, inspection, and maintenance of the steam piping systems. From their corporate intranet, they select the facility on which they are working. They can then select which generating unit is shut down. From there, they are presented with a number of systems; maybe they select the Boiler Feed Recirculation on the 10th mezzanine level.

At this point a drawing is displayed giving the engineer a visual depiction of the piping for that area. They can select any pipe, tee, elbow, fitting, or valve, which brings up a menu. They have the option of reviewing the testing procedures or examining last test results and signoffs. They can review the specifications for when the piping needs to be replaced and look at the replacement history of that particular item.

Does this sound like all the things BIM has promised us? It sure does to me. Would it then surprise you if I told you this was done more than 15 years ago using DWF files generated from 2D piping isometrics, created and maintained in AutoCAD LT by a group of engineers who don't know what a block attribute is let alone a drawing layer?

I'm not making this up—it's 100 percent true. It's a story I share often when users tell me that the software isn't ready yet to do BIM or that you need Revit to do BIM. BIM is what you make it. It doesn't need to be Revit. If you think you need to wait until the software does what you want it to, by the time that comes, you'll want something different. No software is ever ready because we keep expanding our creative ideas about how it can improve our processes and increase value to our business.

## Alternative industry insight

One way to get a sense of where BIM is heading is to look at other industries. We've all heard that history repeats itself, so let's look back for where what's happening to us now has happened to people before.

One of the obvious answers is the manufacturing sector. Adoption of 3D from 2D in the AEC industry is skyrocketing. It's "new" and "exciting," but this same transition happened years ago in manufacturing. That industry is using 3D parametric software that generates section and auxiliary views automatically and updates them instantly. But they didn't come up with a new acronym like BIM, it's still CAD, just 3D parametric CAD. Revit isn't BIM, it's

3D parametric CAD that was designed for BIM. AutoCAD Architecture/MEP is also CAD that can do BIM but wasn't really designed with BIM in mind. Finally, AutoCAD is CAD that can also do BIM, but you'll have to jump through a few hoops to make it do BIM.

So what is BIM if it's not Revit? Again, looking at the manufacturing sector where we see another three-letter acronym called PLM (Product Lifecycle Management). Sounds like what BIM is, only described with more intuitive verbiage. PLM, or BIM for that matter, isn't a software package, it's a methodology or process where you leverage existing information and link it together with information from other processes. This provides more value to the information (the whole is greater than the sum of the parts) by making it more accessible to a larger audience.

Do you have to do BIM? What about 3D? There are still manufacturers working in 2D, and those using parametric 3D often haven't tackled PLM. For most manufacturers, there's actually a lot less value potential in PLM than there is for BIM in the AEC industry, but we'll get to that later.

Likewise, I don't doubt there will be 2D used in construction for some time, and even use of 3D in Revit without actually doing anything with the information. By and large, the types of projects for which these firms will compete will not greatly overlap. The HVAC contractor won't be prefabricating plumbing supports in 3D for your residential home or even light commercial project, and the 2D firms won't be performing technically challenging healthcare projects.

## The value of BIM

Another way to determine where BIM is going is by looking at the value propositions it brings. I heard a story a while back of an architect who was just getting on the Revit bandwagon. He told the project owner of all the great things Revit could do—estimate HVAC and piping systems, determine install labor, and even fabricate those systems directly from Revit. Seems as though everything he was selling was related to the mechanical sub, while he himself couldn't tell you the number of pounds of drywall screws in his project.

Everybody on the team must use Revit. The mechanical sub was going to use an AutoCAD-based system and was told he was behind the times. What this person didn't know was that many mechanical subs have been drawing with intelligent 3D systems for, in many cases, more than 10 years.

Every major third-party application that supports prefabrication of duct and piping systems runs in AutoCAD and none run in Revit. Revit just can't handle the amount of data required to support that level of prefabrication.

This isn't to say architects don't understand BIM. On the contrary, most architects are well versed in BIM and were there before most contractors. Instead, I'm trying to point out some of the common misunderstandings surrounding BIM. The AIA even released a position statement in December 2009 that states each trade should use the software best suited for their industry.

From an owner's perspective, do they want to pay more to have a mechanical sub use software not well suited to them? Or do they want to support efficient prefabrication, which means more quality work performed in a controlled environment that's more efficient? This also translates to smaller crews on the job site for less time, significantly reducing construction time and increasing safety at the same time. There's real tangible value there for an owner.

As each firm transitions to BIM, they should have knowledge of BIM from three

different perspectives. First, each firm must understand BIM's value from their own internal perspective. What values does it give to their company? Second, what value can it give the owner or customer? What does your BIM have (or could have) that provides value to the owner? This may even differentiate you from your competitors. And third, what's BIM's value for your fellow trade partners? Do they have information that you could use? Do you have information that would help them? If you want to know where BIM is heading, look for the unrealized potential that it has to bring value to these three perspectives.

## Future technology

If you look at BIM in the AEC industry, there seems to be lot more momentum for BIM than PLM in the manufacturing sector, despite PLM being around for quite some time. The reason is that there's more waste in construction than in manufacturing.

In 2007, the return on equity (ROE) for all US industries was 17.9 percent. For construction, it was only 9 percent. While many manufacturers run machines 24/7, some estimates indicate the average construction worker operates at 40 percent efficiency. Perhaps they're waiting for someone or something. Maybe they're moving from here to there, looking for materials, fixing unforeseen problems.

This is one reason the lean manufacturing principles that Toyota pioneered (again from manufacturing) are now making headway in the AEC industry in the form of lean construction and lean design. This is what BIM is all about—managing risk, reducing waste, and adding value.

Let's look at clash detection in Autodesk® Navisworks®. Everybody seems to love it. Yet, from my perspective, it's a non-value-added activity. It's not "lean," according to Toyota's principals.

When was the last time an owner hired someone to run piping through a concrete floor without a penetration? Or run a cable tray into a structural beam? The owner is willing to pay to put everything in the right place, not the wrong place and then pay again to correct the issue.

All Navisworks does is takes problems from the field and move them into the office where they're a lot less costly (managing risk). While this is infinitely better than what we were doing, it's fair to say that the next evolution of software should help us design in such a way as to prevent the issue in the first place. And if there is an issue, the software should provide routing suggestions.

Providing feedback to the user as to the material costs and/or fitting count (field labor) if the duct is moved versus the piping. We're not here yet, but there's huge untapped potential so it's not unreasonable to think this is where we're heading.

What about our CAD software? Revit was created as a parametric design tool. It wasn't designed to hold the volumes of information BIM wants to it carry. Revit is not Oracle or SQL Server and shouldn't be used as such. For a couple years I've advocated removing the "I" (information) from Revit.

On the surface this sounds crazy; you want an intelligent CAD application to perform BIM. But all that data is linked to other things and can be more easily managed from a real database, which is linked to the CAD model. There's a lot of history with this approach.

The geospatial or geographic information systems (GIS) industry, a market well served by Autodesk I might add, uses an external database linked to CAD models. Autodesk's manufacturing group uses Autodesk Vault for data management. Vault uses an external database linking to CAD models; the models don't host all the data. Even Autodesk's arch rival Bentley, which has done "BIM" in the oil/gas and petro chemical arena before anyone coined the term BIM, uses CAD models linked to an external database.

By the way, Bentley's ProjectWise Server and Explorer software that a number of AEC forms are using for data management is essentially the same as Autodesk's Vault software previously focused in manufacturing, but not getting visibility in the AEC industry.

Over the last year, I've seen an increasing number of large progressive A/E firms advocating the same thing during various conferences. Less than half a year ago, I started hearing leaked rumors of a future BIM vision within Autodesk that included an external database link.

As I write this article (September 2010), I heard for the first time an Autodesk representative publicly say the data should be managed in a proper database such as Oracle or SQL, suggesting the rumors are true. I have no prior knowledge, but would not be surprised that by the time you're reading this or around the same time as Autodesk University 2010 you might see or hear more of these clues.

## Summary

To summarize, BIM isn't about software. It's about managing risk. It's about tying together a lot of information we already had and linking it to a CAD model. It's about broadcasting that information to a wider audience and reducing the amount of time we recreate or search for the information.

We can get a feel for where things are going by looking at other industries and seeing how similar change occurred and what processes were improved with technology and what waste was reduced or eliminated using technology. So here are my predictions.

BIM will increasingly reach the facility owner for operations and maintenance as well as the field personnel on the construction site—two areas in which BIM is just starting to scratch the surface.

Technologies such as Total Station or Laser Scanning have stormed the field and software such as Vela Systems is bringing the data in BIM to the field. Virtual and augmented reality technologies will further evolve and perhaps one day allow a construction worker to see what and where he's suppose to perform his work.

Navisworks or other products will increasingly transition from problem detection to problem prevention, while BIM software such as Revit will move the information from CAD into a database. This is where I see BIM heading. How about you? Email your thoughts on where BIM is heading to dyoung@southlandind.com.

*Darren Young is the Systems Integration Manager for Southland Industries, a design-build mechanical contractor in Irvine, California. An Autodesk Registered Developer, Darren has been automating CAD systems in the Manufacturing and Construction industries for nearly two decades.*

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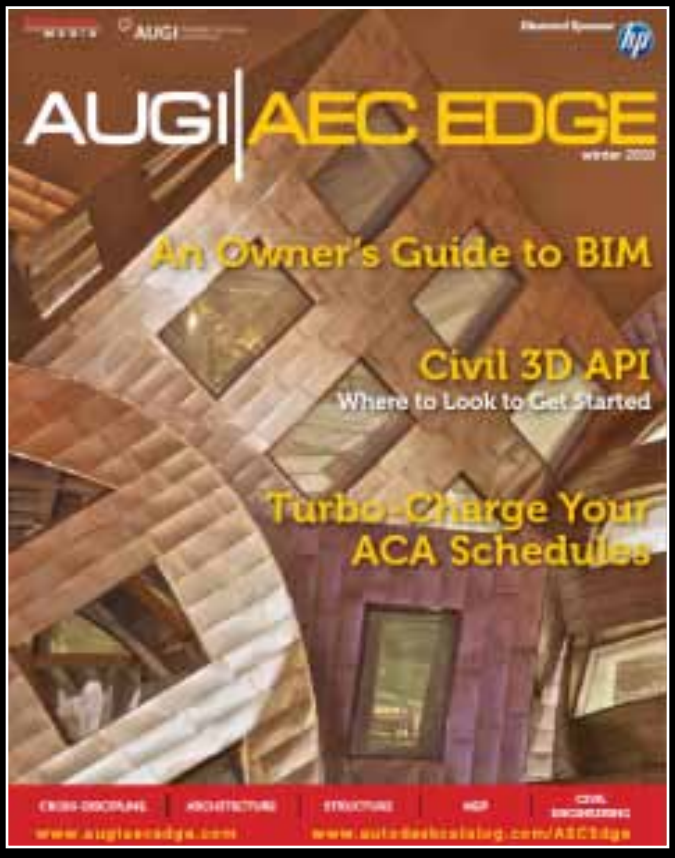


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# Quantifying BIM

Since the first mention of Building Information Modeling, people have sought to quantify what defines BIM. There are plenty of "official" definitions, but most agree that BIM is a process that includes the exchange of quantifiable, calculable information within the context of a 3D model. The result should produce a database of building information that can be queried exactly as one might query the Internet.

The Internet can be searched with browsers such as Mozilla Firefox or Google Chrome. Similarly, the Building Information Model should be searchable with differing software including Autodesk® Revit®, Newforma, Archibus—whatever software best provides the needed functionality. Whether in design, construction, operation, or maintenance mode, the required information must be accessible.

To bring the level of consistency required to share information in this way, many groups have put forth BIM standards. This article looks at some of the major BIM standard documents seeking to quantify BIM.

## The AIA E202 Building Information Modeling Protocol Exhibit

The AIA put together the AIA E202 Building Information Modeling Protocol Exhibit in 2008 to help quantify BIM in the design phase. The E202's strength is in defining the level of development of the individual model elements, and their intended use at each stage of design. They are rated at levels 100, 200, 300, 400, and 500. Loosely interpreted, a level of 100 would be the level of detail one might expect at schematic design (SD), 200 at design development (DD), 300 at construction documents (CD), 400 in a construction model, and 500 would be like an 'as built'. The exact definitions make more sense for walls doors and windows than for light fixtures, duct, and data devices, but the document leaves room for interpretation (good and bad). After the definitions are set at the beginning of the document, the E202 includes a table arranged by the CSI Master Format system and stage of design. This table allows the team to assign a level of development to each model element at each phase of the design whether using the classic design phases or those defined in an Integrated Project Delivery (IPD) method. The table also allows the ability to assign responsible parties to each element at each phase.

Lastly, the document leaves an area for clarifications, comments, and provisos. This is a catch-all area where anything left unsaid or unclear can be explicitly written out and added to the contract.

The E202 establishes a good sense of the reliability of the model elements at any given time and clarifies the use of the model and model elements.

## BIM Execution Plans

BIM Execution Plans, like the one developed by Penn State, take a much more detailed view that spans through building construction. A BIM execution plan often combines the entire team including the architect, engineers, the general contractor, and subs with the owner to address the detailed issues of how detailed the models should be, as well as how and when the models are exchanged, the format of the models, communication procedures, quality control of the model, the model structure and even the definition of project contacts, organizational roles and staffing.

Good execution plans begin with a 'statement of the intensions' for the project. Everyone must agree to the BIM goals for the project. With the end game in mind, reasonable, incremental steps to reach those goals can be incorporated into the plan. Each step can have associated responsible parties and expected outcomes.

A practical difference between the E202 document and execution plans is the inclusion of the owner in the BIM execution plan. It is expected that owners will become more involved in the BIM process with the intertwining of BIM and sustainable design, as well as the financial benefits of lean construction.

## ConsensusDOCS 301 Building Information Modeling (BIM) Addendum

The ConsensusDOCS 301 addendum also came out in 2008, and is endorsed by the AGC, COAA, SMACNA, NECA, NASBP, ASI, and NASFA among others. It begins by setting the general principals of the document. These include which model wins in the event of multiple models, contract parties' responsibilities, and what takes precedence when the addendum conflicts with other contract documents.

This is followed with a section on information management. This section puts the responsibility of selecting an information manager for the project in the owner's hands, and leaves the right to replace the

information manager at any point with the owner. The information manager acts as a model manager, controlling access to the models. This person is responsible for security of the model, backups and stability of the model, and maintaining logs of who, when, and how the model is accessed.

The 301 then calls for the information manager to create a BIM execution plan and lead meetings pertaining to the plan. The points of the plan outlined in the 301 addendum seek to cover the level of detail elements as well as the details of the BIM process. It touches on requests for information, change orders, coordination, even the use of a BIM website for the project and co-location of team members. Risk allocation and the intellectual property rights sections round the document out. While this document covers a considerable amount of topics, it doesn't seem to have the instant recognition the AIA brings with the E202.

## The National BIM Standard

The National BIM Standard, which was last updated in October 2009, contains about 200 pages covering an overview, principals, and methodologies of BIM. While this is bound to be one of the most comprehensive endeavors in defining the BIM process so far, it is currently unfinished. The majority of this document covers what BIM is for, how it was developed, and where it might go. The most interesting and maybe the most useful part is a spreadsheet known as the NBIMS Capability Maturity Model. This spreadsheet seeks to define a team's ability in a BIM process by rating a range of differing capabilities. The spreadsheet will return a rating of Not Certified, Minimum BIM, Certified, Silver, Gold, or Platinum, depending on how the responder rates his or her firm. This document leaves wiggle room to bump up ratings based off interpretation of the spreadsheet, in which long legal-like descriptions force initial users to often take their best guest at where their rating should be. The National BIM Standard does assess a firm's BIM maturity before a project has even begun. With so many firms just entering into BIM, having a tool to predict their capability can be highly useful.

## AEC (UK) BIM Standard

Released in November 2009, the AEC (UK) BIM Standard recognizes the NIBS's National BIM Standard, and strives to create the foundation for a global standard. This standard covers resource sharing, data segregation, model naming and configuration, graphical versus non-graphical data, workflows for complete BIM and mixed CAD production, modeling standards, component detail level, data exchange, and the concept of the Project Integration Model (PIM). This is one of the most specific and concise standards, and well worth review when contemplating BIM standards for a firm.

## Conclusion

It is difficult to say if one standard will rise above the others at this point. It will take a lot of firms finding out what works for them, and the market will swing where the demand lies. If firms don't make an informed vote now, by participating in BIM projects and determining the best practices for their work process, they will live with the consequences of the market's decision when the dust settles. All aboard the BIM train, people. The industry is moving on.

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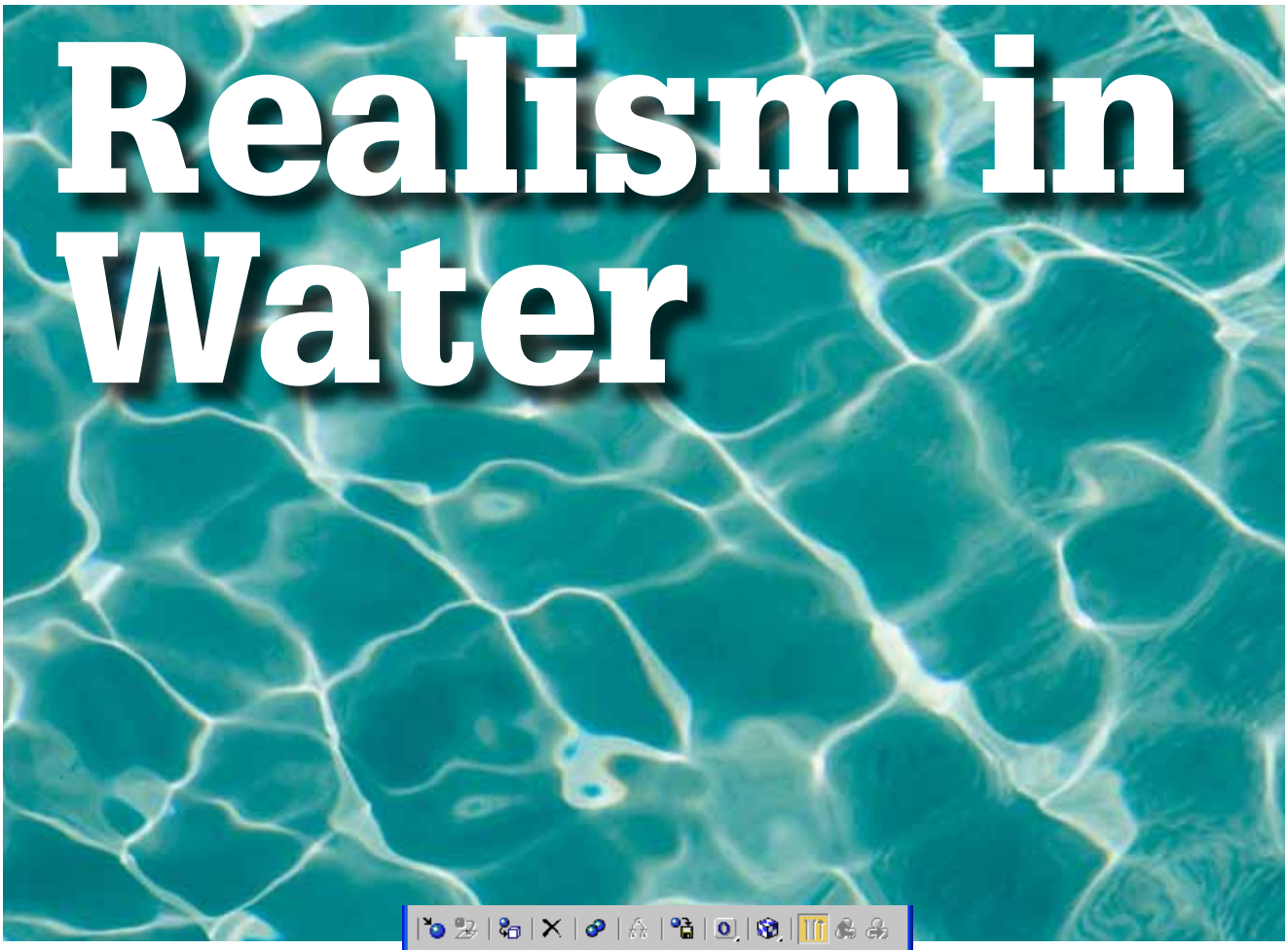
# Realism in Water



When water features are a major focal point in your design, the water inside the feature has to have equal billing in the show. Too often, the subtlety of the reflective/refractive properties of water is overlooked, which makes the water end up looking gooey or extremely metallic. In this article we are going to go over the process of creating some realistic water using the Arch & Design mental ray shader in Autodesk® 3ds MAX 2011.

## Scene setup

The scene setup is straightforward insofar as we are using only the basic mental ray daylight system with both sun and sky enabled. Click the systems button in the create panel and create a daylight system by dragging the compass. In the indirect illumination tab, enable Final Gather and adjust the preset slider to the Medium preset. Set the Diffuse bounces spinner to a value of two. In the renderer tab, set the Samples per Pixel values to 1 and 4 for the min and max respectively. All the Spatial Contrast spinner values should be adjusted to 0.03. See Figure 1.

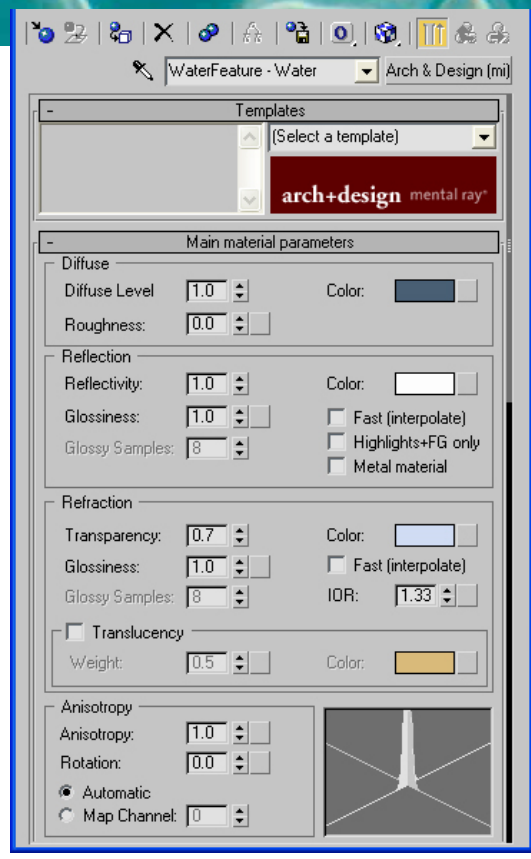



*Figure 1*

## Water material

We begin the look of our water surface by selecting an Arch & Design material from the list and renaming the material, appropriately, to Water. Apply the material to the geometry in the scene that is your water surface. The following settings are for the pictured scene, but could easily be adjusted for water of any color, depth, and overall appearance such as oceans, rivers, and streams.

So with our material named and selected, in the main material parameters rollout, click on the diffuse color swatch and change the diffuse color values to .063, .114 and .176. In the reflection group the reflectivity and the glossiness spinner values should be set to a value of 1.0 and the color swatch should be white. In the refraction group the transparency value should be .7 and the glossiness should be set to white. The color swatch should be set to .639, .725, and .898. The IOR (Index of Refraction) value should be set to 1.33,

which is the real-world IOR for water. In the BRDF rollout, be sure that the "By IOR" is checked on. See Figure 2.

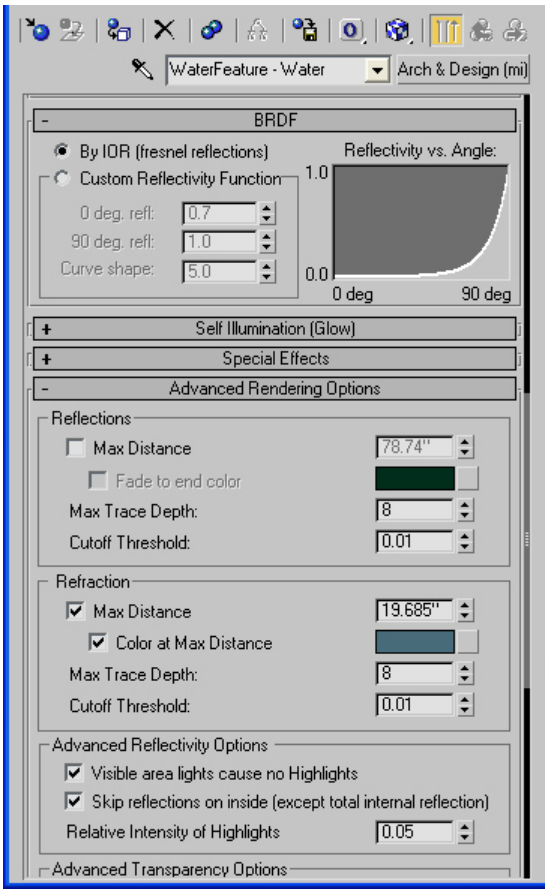



*Figure 2*

## Water material – advanced

To bring our water material a few more steps toward realism, we are going to have to make a few more important adjustments. We want to try and establish a sense of depth to our water in a way that has some scene relevance. In the Advanced Rendering Options rollout, in the refraction group, we want to enable Max Distance as well as the Color at Max Distance checkboxes. The Max distance spinner value should be the measured distance in your scene from the top of the water geometry object to the bottom of the floor object. You can acquire this value by using the tape measure object in the helpers part of the create panel. The color at Max Distance color swatch should be similar to the diffuse color swatch, but can be lighter or darker depending on what is required in the scene. This is the color that the water will be at the maximum depth as indicated by the Max Distance value.

## Water surface

There are a few ways that you can convey the perturbation in the surface of the water. You can animate the geometry explicitly with modifiers such as noise, wave, and ripple, which change the actual mesh topology. Another method is using displacement mapping as well as bump/normal maps. Mental ray also has a built in shader specifically for handling the movement of water surfaces called Ocean and is part of the LumeTools collection of shaders. This shader allows you to control wave size and quantity as well as myriad other controls to produce the look and feel you want.

## Things to try

It's a good idea to familiarize yourself with the effects that changing the Max Distance and Color at Max Distance values have on the overall look of your water. It is also well worth your time to experiment with caustics. It may take a lot of trial and error to get the settings you require, but the subtle effect that it has greatly enhances the quality of the overall render. So experiment and have fun!

*Dwayne D. Ellis is the lead 3D computer animator at Hrycay Consulting Engineers, a firm specialising in motor vehicle accident reconstruction. He is also the founder of Lifeseyes Studios and can be reached at dwayne_ellis@yahoo.com.*

# Slab Creation and Editing

This article will review basic slab editing in Autodesk® Revit® Structure. A slab in Revit is a system family. Although this tool has limitations, you can always revert to modeling components to address more complex situations.

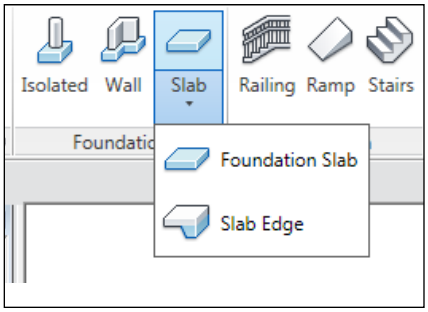



*Figure 1: Slab tool*

Figure 1 shows the slab tool found on the Foundation panel of the Home ribbon tab.

## Creating a slab

When creating a slab you will have the typical sketch tools available to you. Although basic rules apply, you cannot have overlapping closed lines. Figure 2 shows a basic slab sketch. The inner closed shape will create a hole in the slab because it is a closed sketch within the outline of the main slab.

The type properties of a slab gives you access to the slab structure. Figure 3 shows the core of the slab is a six-inch precast concrete layer surrounded by the core

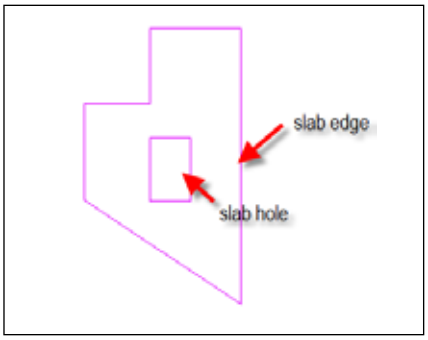



*Figure 2: Slab sketch*

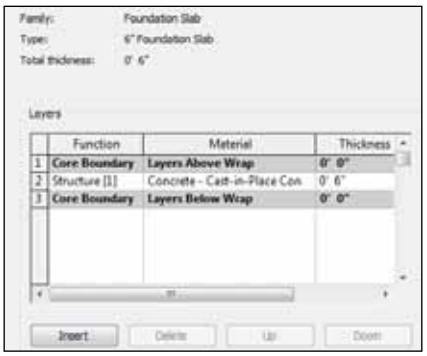



*Figure 3: Edit Assembly dialog box*

boundaries. You can use the Edit Assembly dialog box to add and remove layers above and below the core boundary.

We will now focus on slab editing and the creation of more complex slabs.

## Editing a slab edge

Once a slab is defined in your project, you will need to create an edge condition. It may be for a turned down edge under the slab for a sidewalk or a curb above the slab, but you will need to create a profile to achieve this. The profile is the shape of your edge condition and is created as a family and loaded into your project.

When you create a profile, you will start a new family creation and select the profile.rte as your starting template. Figure 4 shows a sketch of a profile that will be used as a monolithic edge condition under a basic slab. The point that your profile will attach to the slab is also indicated in Figure 4. Sketching your profile relative to how you intend to attach it to the slab edge is important, so that later you are not applying vertical and horizontal offsets to position it correctly.

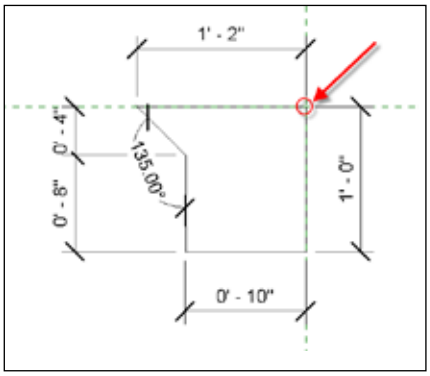



*Figure 4: Profile sketch*

When the profile is completed and saved, it can be loaded into your project. Once this is done, it can be applied to your slab. Figure 5 shows the slab edge tool found in the

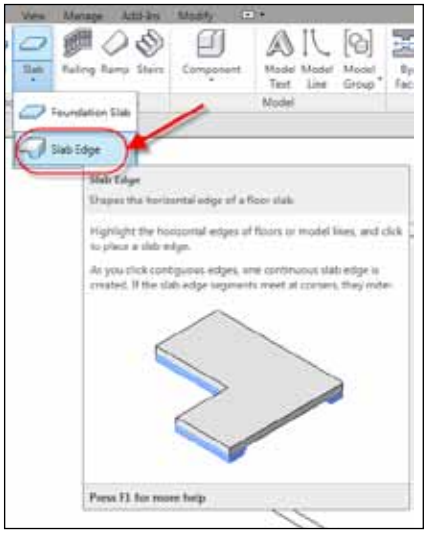



Figure 5: Slab edge tool

drop-down portion of the slab tool on the Foundation panel.

The slab edge is a system family. Under the type properties you can apply your Profile sketch as shown in Figure 6. Revit allows some control over your profile. You can horizontally and/or vertically offset your profile, depending on how you want it attached to the selected edge of your slab. You can also specify an angle to control your profile. Figure 6 also shows the result after the slab edge has been assigned.

Hint: If you need to apply a slab edge

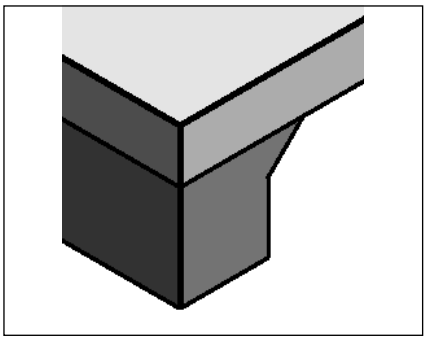


Figure 6: Slab edge attached to slab

to a sloped slab, assign it to the slab before you assign the slope. If you wait to apply it to the slab after it has been sloped, Revit will only allow you to assign the slab edge to edges that are not sloped.

When a slab is selected you can edit the sketch to change the shape or add a slope. To add a slope, select Edit Sketch, which will give you the original line work active from when you created the slab. Select the edge where you want to start your slope.

Figure 8 shows how to assign a slope to your slab. When the edge of your slab is selected, place a checkmark in the box next too "defines slope." This can be found in your type selector toolbar area. Once

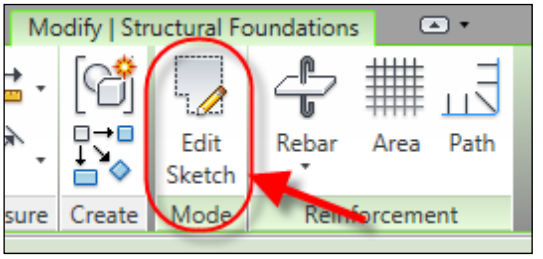



Figure 7: Edit sketch

this box is checked you will have a slope icon on your selected line. Select the slope icon and Revit will allow you to input your slope.

Figure 9 shows the side view of the slab once the slope has been assigned. Notice that the edge condition stays on the slab after the slope is applied.

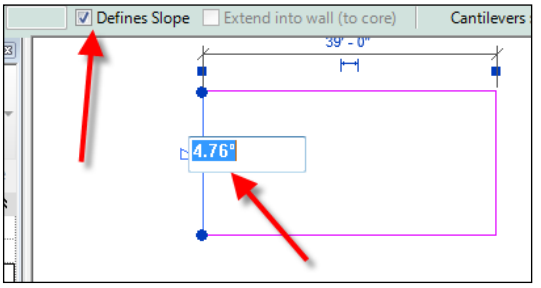



Figure 8: Assign a slope

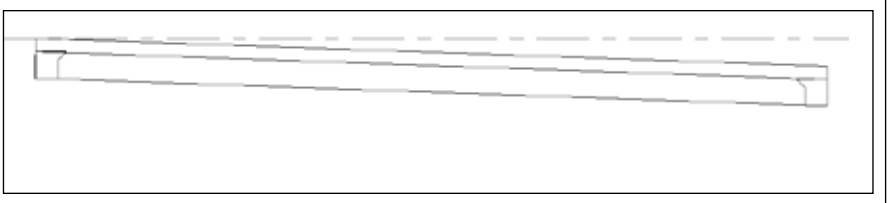


Figure 9: Sloped slab

## Warped slab

Now, let's discuss the creation of a warped slab. A common application for this would be a commercial flat roof. Typically, a flat roof has a slope in it to direct the rain water to roof drains. Most of the time, from a pedestrian point of view, the warped roof is hidden behind a parapet. The next group of tools we will review are the Modify Roof tools. These tools are not available for foundation slabs so we will sketch out

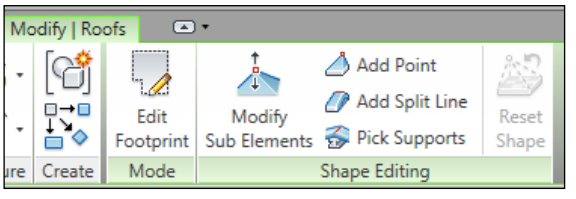



Figure 10: Modify Roof tools

a flat roof in the same manner as we did for a basic foundation slab.

Once a basic flat roof has been sketched, we can utilize a couple of the shape editing tools, Add Point and Add Split Line. Each of these tools will place a control feature on your flat roof.

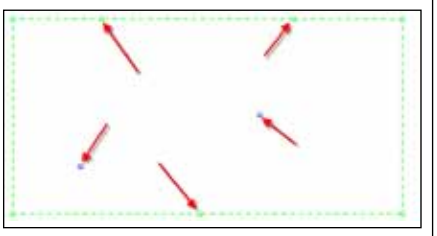


Figure 11: Placing control points

Add Point can be used to specify where your roof drains will be located. Add Split Line can be used to define a ridge control point to help direct the rain water and add a sloping plane in your flat roof. First use Add Point to place drain locations. You will notice that when you are placing the drain locations, the graphical representation of your roof changes as seen in Figure 11.

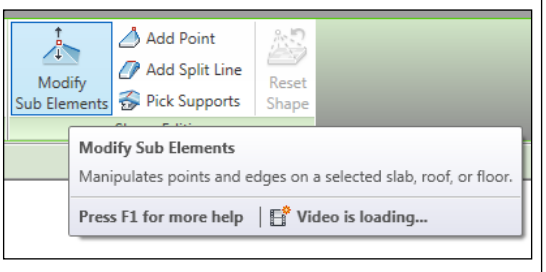



Figure 12: Modify Sub-elements

Once you have placed your drain locations, use the Modify Sub-elements tool (shown in Figure 12) to adjust the elevation of your drains. As you assign values to your drain, you will see additional slope lines automatically added to your roof shown in Figure 13.

While you are in the Modify Sub-elements mode, each individual plane and/or point can be adjusted. Figure 14 shows a highlighted edge segment of the roof which can now be controlled by adjusting its elevation. This is a newly created segment because of the drain placed along that edge.

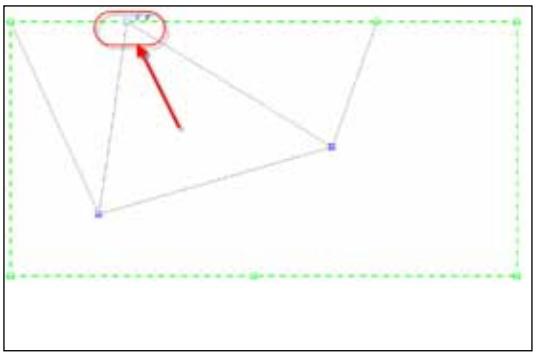


*Figure 13: Sloped roof planes*

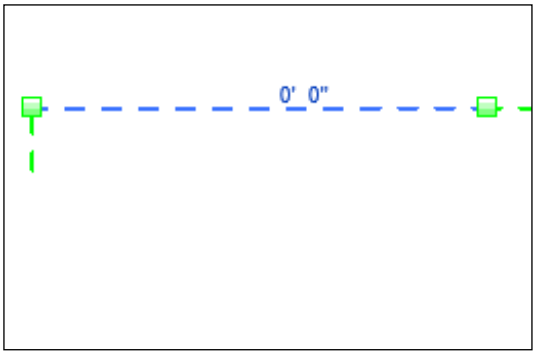



*Figure 14: Roof segment created*

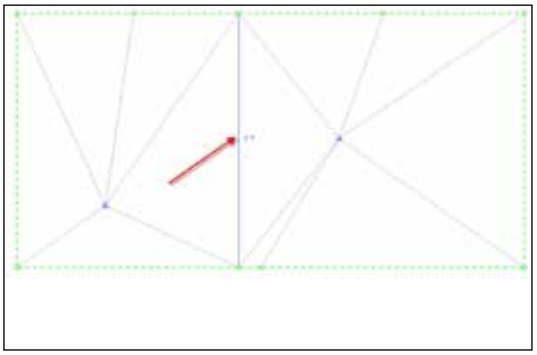


*Figure 15: Roof segment created*

Adding a split line is done by selecting a start and endpoint for the ridge you want to add. This newly created ridge line can be used to split the roof plane for an adjusted slope as needed, to direct the drainage. Figure 15 shows a split line created. From the figure, you can see how the roof slope automatically adjusted to this newly created control plan on the roof surface.

## Spiral slabs

Another tool that is useful in slab design is the ramp tool. An application for the ramp tool would be a spiral ramp for a parking garage. Once you define your floor-to-floor heights and your ramp requirements, you can create a ramp to meet those needs and copy it up to the various levels. Figure 16 shows an example of a spiral ramp, because this is a ramp and not a slab or roof. You have to get creative to adjust edge conditions. Ramps accept railings, so you can create a railing family with the correct profiles to achieve the desired outcome.

When creating a railing family to place on your ramp, remember the material you are using. Figure 17 shows a 30" concrete half wall with a metal railing mounted on top. By applying cast-in-place concrete material on the half wall railing, this can be included in a material takeoff for calculating yards of concrete required for the project.

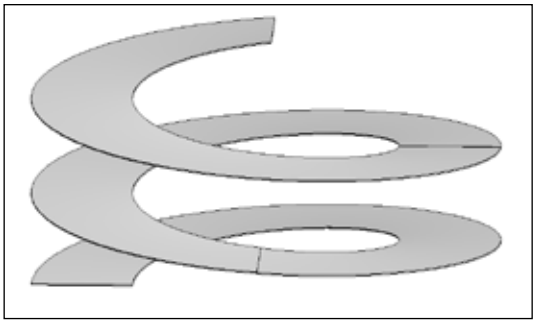


*Figure 16: Spiral concrete ramp*

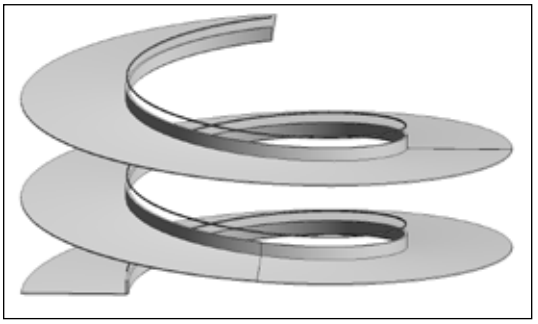


*Figure 17: Spiral ramp with railing attached*

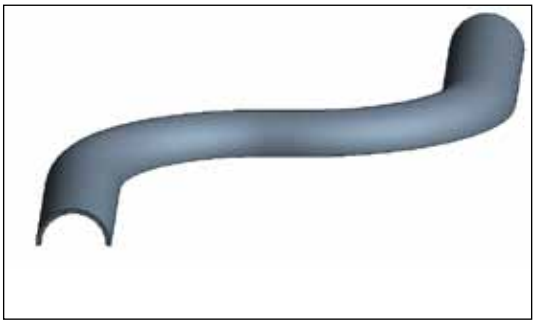


*Figure 18: Canopy created with a solid sweep*

## Modeling

In this article, we have examined utilizing standard tools such as slabs, roofs, and ramps to generate different types of slabs in our model. This is relevant to accurately depict our designs and aid in material takeoffs and the creation of our BIM model. Remember the vast amounts of different shapes that can be created with modeling tools including blends, sweeps, and extrusions. Our goal is to create a set of construction documents and produce accurate BIM information with added material takeoffs. Figure 18 shows a sample canopy created with a solid sweep. When modeling components you must assign them the correct category and apply the intended material. Sometimes, when involved in Revit modeling the important details on the BIM side are forgotten. Assigning the correct category and material will go a long way in creating your constructions documents and controlling visibility settings.

## Summary

This information gives you an idea of the tools and possibilities available for modeling slabs inside Autodesk Revit Structure. Please feel free to contact me with questions or to share your creative ideas. I am always interested in seeing the unique ways in which users are working with Revit. Good luck.

*Phil Russo began with AutoCAD version 2.5 in 1986. Through the years, he has held positions in the CAD industry as CAD draftsman, CAD manager, applications engineer, and Autodesk Certified Instructor. Lately Phil's focus has been on the development and implementation of standard practices for the Autodesk Revit product line including Revit Architecture, Revit Structure, and Revit MEP. He currently works at Lindemann Bentzon Bojack, an architectural and engineering firm located in Clermont, Florida. He can be reached at philr@lbbe.com.*

The AUGI Board of Directors, the various editors, and membership at large, would like to express sincere thanks to the authors in *AUGIWorld* 2010 who provided such excellent technical content. Without the dedication and desire to share their expertise, we would not have the many articles to read, enjoy and ultimately learn from. We additionally would like to express sincere thanks to our sponsors and advertisers who contributed their support for AUGIWorld 2010. Without their support the infrastructure to actually produce the magazine, in fact, would not exist.

A tip of the hat to all!

*Thanks!*

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