Moving Toward Mastery: Tips for Beginners & Others

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  The Long and Short of It

- **Inventor Sketching**
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- **Linking a Revit**
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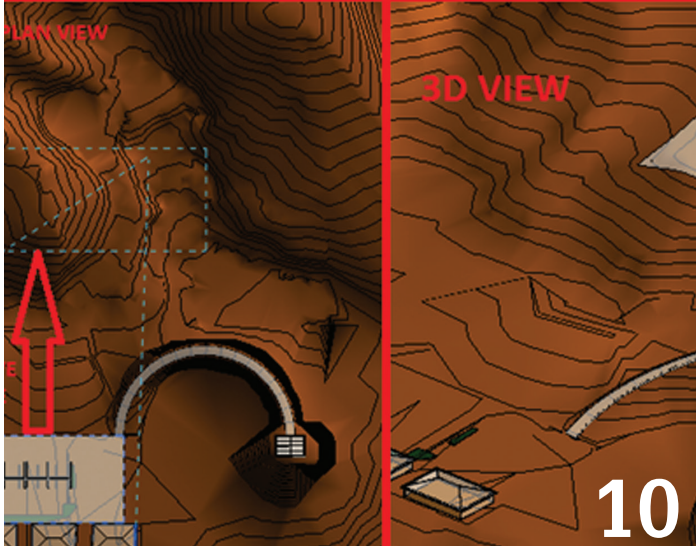
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AUGIWorld

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Editor's Note

Welcome, dear reader!

You have just opened another packed *AUGIWorld* magazine and this time we have some extra goodies! We have been making some refinements to our publication suite at AUGI and will be bringing some favorites from *HotNews* over into prime time, in *AUGIWorld*.

Every month we try to theme out our content for *AUGIWorld* and this month some of our content should give a lift to those budding Autodesk software users. And other authors are again tackling some important issues in their respective areas of expertise. Ok, ready? Let's go!

We begin this month with some advice by Curt Moreno for the AutoCAD professional whose career is just beginning. And then following in the AutoCAD steps, our trainer Michael Beall shares a quick tip for making a hatch transparent in AutoCAD.

Next we have a wonderful piece by Marcello Sgambelluri that explains creating hardscape and site topographies in Revit Architecture 2014. Sticking with the architecture tract, Melinda Heavrin explores dimensioning in AutoCAD Architecture 2014.

Moving on to other industries, we have Phil Russo laying out for our edification how to use scope boxes and plan regions in Revit Structure 2014. And we welcome to *AUGIWorld* our esteemed author Mark Kiker, who brings his CAD Manager column to the publication. He's got the long and short of it—I must check this out myself!

Going mechanical for a moment, Mike Thomas shows us his sketching tips and tricks for Inventor 2014. And that's followed with an article from author Israel Uriel, who demonstrates a game assets workflow in 3ds Max.

Moving on to our favorite acronym, MEP, Todd Shackelford examines linking a project in Revit MEP 2014. And we close out the issue with our monthly Inside Track column by Lee Ambrosius who brings us news on Autodesk CAM 360, Tally, and Coins.

And with that we present to you the February 2014 issue of *AUGIWorld* magazine. Have you considered writing yet?

Take care,
David Harrington

BIM Library

ARCAT has the most comprehensive collection of BIM objects you will find, available free of charge and without registration.

The ARCAT BIM Library is also accessible in the ARCAT app, with editing capabilities in the AutoCAD 360 app.
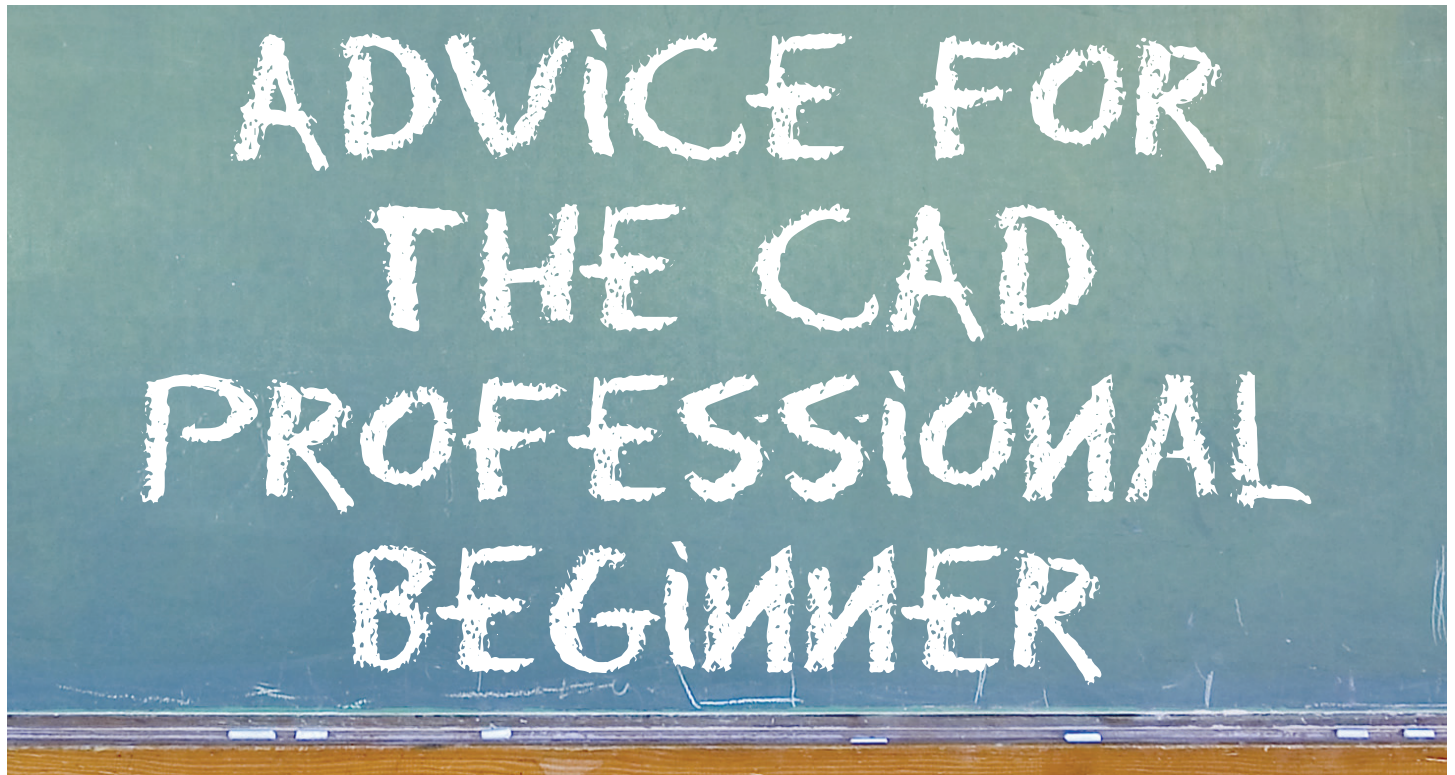
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AutoCAD 2014

by: Curt Moreno

ADVICE FOR THE CAD PROFESSIONAL BEGINNER

So you have decided to get into the interesting world of AutoCAD® design and drafting? Perhaps you are a young person, just out of the traditional education path and want to begin your first career. Perhaps you are a more mature person graduating from a non-traditional education path or you are just changing careers. Whatever your situation, a career as a CAD professional can be creative and fulfilling.

While there are many different CAD packages and design disciplines out there in the world, if you are reading this article then you are most likely working with the AutoCAD product from Autodesk. Or perhaps your firm uses one of the many AutoCAD platform-based "vertical" products such as AutoCAD® MEP or AutoCAD® Civil 3D®. Whatever the case, we are going to look at some great pointers that every user new to the world of AutoCAD and life as a CAD professional should know.

THE BASICS

Each year brings a new version of AutoCAD that is a bit better, a bit more capable, and features a bit of new technology. These days the list of features in "vanilla" AutoCAD is about two and a half miles long. From basic drawing tools to advanced rendering/lighting systems, AutoCAD's features make it one of the most capable and versatile design applications in the world.

Approaching a program that has more than 1,700 different commands is enough to intimidate even the most hardcore geek. So how do "beginners" get their heads around the task at hand? Fortunately, there is no need to begin your CAD career working with 1,000 commands in order to tackle thousands of tasks.

Instead you just get a working set of 18 tools under your belt!

If you are asking yourself how it is that fewer than 20 tools can set you on your path to a productive and satisfying career, just take a look at the list.

Align	Insert	Plot
Arc	Line	Polyline
Circle	Linetype	Spell
DimLinear	LTScale	Style
Erase	MLeader	Trim
Extend	Mtext	XRef

This simple collection of commands can be brought together to accomplish nearly all of the tasks that your new career may require. While you may find one or two more commands to be essential to your new life, this collection makes for a fine starting point.

Figure 1

The importance of the matter is that you realize AutoCAD presents an environment in which there is a multitude of tools, and methods in which these tools can be used. Is the RECTANGLE command a faster method in which to create a rectangle than using the LINE or POLYLINE command? Y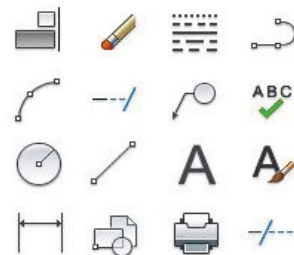es, but good foundation knowledge of the most basic commands ensures that you are never caught at a loss to create the necessary linework to complete a drawing.

BE THAT TYPE OF CAD PROFESSIONAL

In my experience there is one facet of training that is sorely lacking in the skill set of most new CAD professionals. That is not to say there are not many great and talented people joining the industry every year. Still, the one skill that is often missing from the toolboxes of those new to the ranks is typing commands into the Command Line.

Autodesk has made great efforts to standardize the layout and iconography of its user interfaces across the product catalog, but there is still no more efficient way to navigate the AutoCAD corridors than to know your commands in their written form. If you doubt this logic, then simply take a moment and compare the methods of entering any given command. On the one hand you could go to the ribbon, locate the correct panel in the correct tab, and then first search the correct icon and then possibly open a flyout menu to find your desired command. By comparison, you could just type out a written command for something common such as MTEXT, for example.
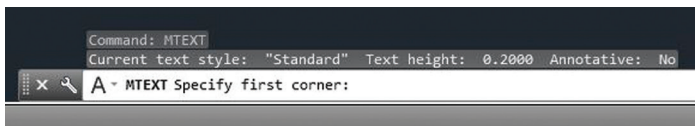
Figure 2

Of course, like any worthwhile skill, this "dark art" takes a bit of practice to master. First you must commit several of your favorite AutoCAD commands to memory. Never fear—AutoCAD helps with this by providing the command line text at the bottom of every ribbon tooltip. Just hover over the icon for your chosen tool and a tooltip will appear, giving you all manner of useful information, including the command's written form!

Second, you should learn the most effective manner in which to type these commands. Since I am right-handed, I have learned to type my commands exclusively using my left hand while almost never taking my right hand off the mouse. This arrangement provides me with the maximum efficiency to enter my commands while continuing to work my mouse. Try some different arrangements and see what works best for you.

THE 4-COLOR MARKUP SYSTEM

Now that you have collected your personal set of essential tools to help you produce your work and you are practicing to become more efficient at creating your drawings, it is time to discuss another key skill. In the life of every CAD professional a few markups will come. One day I am going to put that into a fortune cookie because it is every bit as true as "You will meet a tall stranger," except that mine is useful.

As a CAD professional, working with architects, engineers, and designers will be a large part of your daily life. A common part of the discussion between design professionals and CAD professionals are designs that evolve through iterations of markups passed back and forth. Having a well-defined system of notation that is used in a uniform manner can make this process far more efficient and pleasant than it could be otherwise.

One common method of marking up drawings for exchange between designers and CAD professionals is the 4-Color Markup System. In this system, notations are categorized into four distinct colors, each one representing a specific type of notation, as follows.
- Red – Linework or text items that should be added to the drawing file.
- Green - Linework or text items that should be removed to the drawing file.
- Blue – Questions or comments to the drafter.
- Yellow – Items that have been completed/checked.

While this color layout is fairly common, any combination of colors can work in your office. Red is an almost universal color for revisions, but separating items that should be added or revised from those that should be removed from the drawing will make the iterative process of design more efficient and less maddening. Another interesting tip is for each CAD professional in your office to have a signature color for use on completed/checked items. For instance, I have used purple highlighters as a signature color to make identifying sheets that I had worked on as simple as noticing there was purple ink on the page.

What matters most is that you apply whatever standard is used in your office in a uniform way that respects the system that is already established. Or, if a system is not in place, that you show initiative and lead by example in bringing order to the chaos of the iterative design process.

LEARN TO KEEP LEARNING

Whether you are fresh from college, an occupational training program, or on-the-job training, you are probably relieved to be done with the learning and eager to start your new career. It is an exciting time filled with an exciting new job and exciting new projects. Still, to think that the part of your career where you learn new skills has come and gone would be a mistake. Just like most careers that fall into the category of "knowledge work," your career as a CAD professional will involve a continuous process of training and evolving your skill set.

Autodesk, and other CAD product developers, are in a continuous cycle of development that brings new releases. In the case of Autodesk, new versions of AutoCAD and related products are
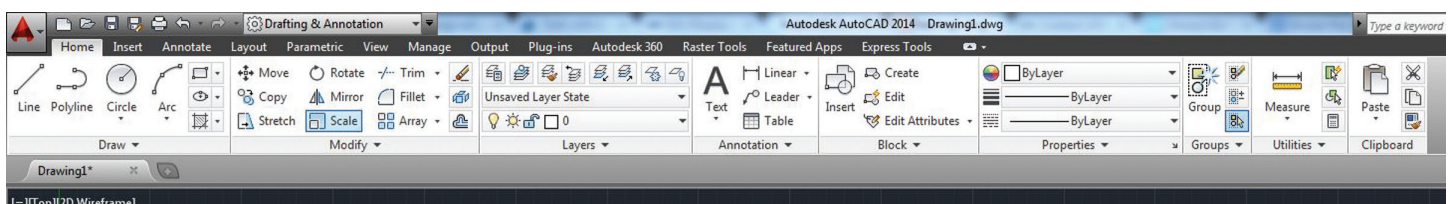
Figure 3

AutoCAD 2014

released each year. Each one bringing improved processes, new features, and more powerful CAD engines. It may appear obvious that keeping up with this constant change is important. You would think so, wouldn't you?

The reality of the matter is that the world economy is always becoming more competitive and this is no less true in the CAD industry than in any other. Therefore, it is imperative that you keep your skills up to par in order to use the latest technology to its fullest.

The simplest strategy to accomplish this is also, quite fortunately, the easiest. All you have to do is keep up with the releases. Don't let years go by without improving your skills. With each new release take the time to learn the new features, adjust to the improved features, and always be on the lookout for improved workflows and how they can apply to your chosen discipline. News on new releases, features, training, and tips are as close as the nearest computer with an Internet connection. Developer websites, blogs, and video sites such as YouTube are all treasure troves of training information just waiting for your attention.

Developers spend millions of dollars a year creating in-product documentation such as tutorials, help systems, and, in many cases, new "on-demand" peer assistance methods that allow you to get help from developer-supported communities. Additionally, many developers, including Autodesk, offer official certification programs to provide industry-wide standards of achievement to not only give merit to CAD professionals who achieve a certain level of skill, but also to give newcomers to the industry a target to aim for in terms of developing a well-rounded skill set.

From day one, your #1 job is not your job—it is to be in a continuous training mode so you can do your job better!

TAMING THE WILD CAREER

Thinking about your "job" brings me to the last point that I believe every CAD professional who is new to the industry should take to heart—thinking about your career.

I have met too many CAD professionals who have gone to great lengths to get the job they have. They have either gone to school and incurred large debt to graduate with a 2- or 4-year degree or they have put in hard work to learn these skills in addition to their normal workloads. Whatever course they have taken, it is usually a dedicated and chosen one. And yet so many of them view their position as a "job" and not a "career."

They come to work and do their job just fine. The problem is that this mentality sets them up to do just that—their job—for years and years. On the surface that may seem like a good thing, but stability is not much comfort without advancement, and advancement requires career-focused thinking. By all means, you should do your "job" and do it well. But you should also be looking to the future and thinking about where you would like to be in 5 or 10 years. You should have a mind toward the skills and certifications that will help you reach these new plateaus and the path, however vague it may be, that will take you there.

Too many times I have heard one of two excuses on why people do not put their all into the "job" they have now.

A. "This is just the job I have now and when I find the perfect job/company, then I will give it my all," or

B. "This is good enough. I just want to do my job."

In his book, *So Good They Can't Ignore You: Why Skill Trumps Passion in the Quest for Work You Love*, Cal Newport says that a career that is untamed "can bring you into dangerous territory" and both of the above excuses are prime examples.

Do not allow your career to be untamed. Treat your new career as a CAD professional with the respect you would give a large, complex piece of machinery or a wild animal. Because, much like your new career, both of these things can be marvelous and beautiful, but if they are not treated with the proper caution and an educated approach, they can be very dangerous. Not treating your career with caution and an educated approach can, at best, have you in exactly the same spot doing the exact same work for 20 years. At worst, you could lose your job.

CONCLUSION

You have entered an exciting time in your life where your hard work is beginning to pay off. You are starting a new career where you can put your hard-earned skills to work and begin to contribute to the industries that help craft the world we live in!

As a new CAD professional working with AutoCAD or one of its vertical products, you are following in the steps of literally millions of men and women who have helped design some of the most important advances in history. Reflect on that as you sit down and double click on the little red icon with the "A" shaped graphic. Your mouse links you to the pens, pencils, and quills that designed the first airplanes, cathedrals, and pyramids! Be excited when you start your work and you will almost always be certain to work on more of the exciting things that your new life as a CAD professional can offer.

Based in Houston, Texas, Curt Moreno is a CAD Coordinator for a civil engineering firm and the owner and editor of the Kung Fu Drafter blog. He began using AutoCAD with Release 10 and has spent the past 20+ years working with various Autodesk products including AutoCAD, Civil 3D, Map 3D, and SketchBook Designer. Curt is also a freelance content creator, featured Autodesk University speaker, and training content developer. In his spare time Curt writes, games, and spends time with his dog and horses.

And Here's How to…
Make a Hatch Transparent

Send to Front, Send to Back … or Transparent? Depending on what you want your final output to look like, you will want to choose accordingly.

A transparent hatch is most readily experienced when using the Solid hatch pattern, although any pattern can be used. In the illustration, the solid hatches are drawn on a layer with a color assignment of Black with a transparency value of 50.

## HOW TO ASSIGN HATCH TRANSPARENCY

1. Set the desired layer to current, then launch the Hatch command to display the contextual Hatch tab.

2. For clarity purposes, set the Pattern type to Solid.

3. The Hatch Transparency slider is really clunky, so simply enter a transparency value. The higher the number, the easier it is to see through the hatch.

4. In the illustration, the hatch on the left side has the Draw Order as "Send to Back." The hatch on the right side has the Draw Order as "Bring to Front." The properties for the furniture and text are the same on both sides.

MAJOR MEMO: When plotting a drawing with transparencies, be sure to check the box in the Plot dialog box to "Plot Transparency." (Otherwise, you're going to have a very wet plot and need another toner cartridge right away.)

Michael E. Beall (B. Arch.) won the AU 2013 Speaker Award for Hands-on Labs and is an Autodesk Authorized Author. He is the owner of CAD Trainer Guy, LLC in Shelbyville, KY and has been presenting onsite CAD training around the planet since 1982. Contact him anytime at michael.beall@cadtrainerguy.com, on LinkedIn at www.linkedin.com/in/cadtrainerguy/ or give him a call at 502.500.2267.
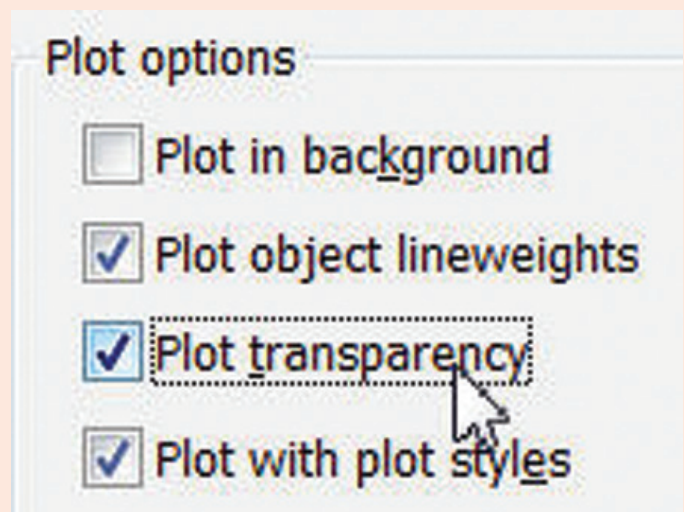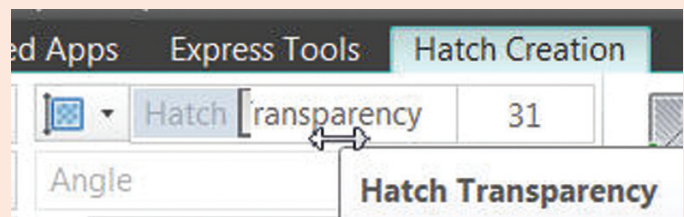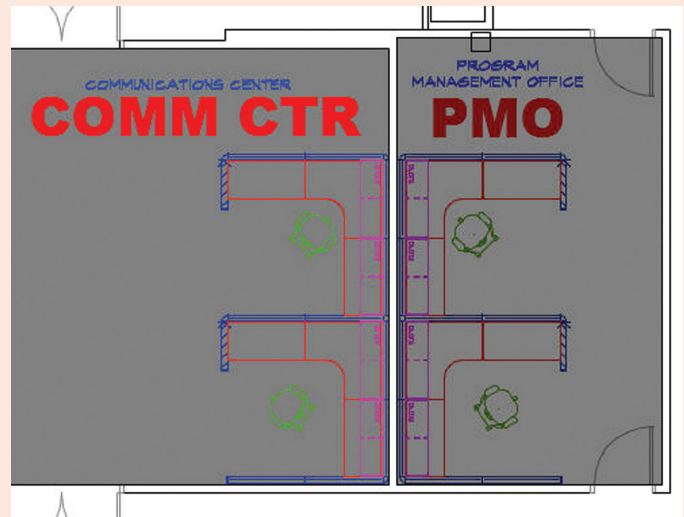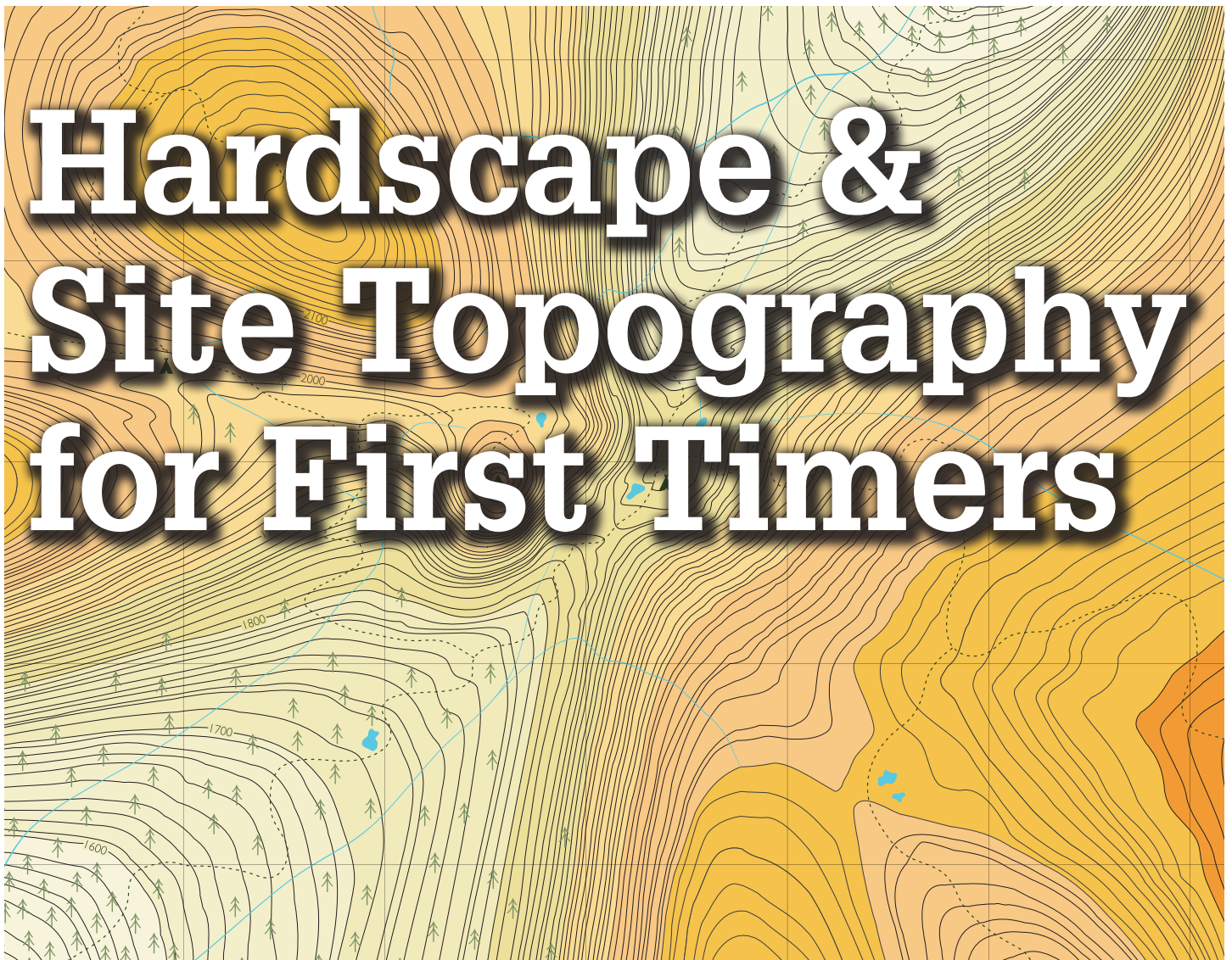
Hardscape & Site Topography for First Timers

Are you a beginner in Autodesk® Revit®? Are you a beginner at using the topo modeling tools in Revit? Are you a beginner at using methods to create hardscape elements that follow site topography exactly? If you answered yes to any of these questions, then you are a beginner in regards to the material covered in this article and you need to read on! If you answered no, read on as well—this article may just illustrate that there is more out there to know.

SITE TOPOGRAPHY: A LOVE/HATE RELATIONSHIP

I first thought that the site topography modeling tools in Revit were "clunky" compared to other Revit modeling tools, but over time I learned to respect them. It's not that they are clunky; they just use a different set of rules so it is understandable that some Revit users do not like them.

I have also heard, and once believed, that it was frustrating working with site topo elements because they do not like to "interact" with other elements. I hope this article will help you appreciate the site topography tools and give you a better understanding and better tools and methods to work with site topography.

To do this correctly, the methods presented include modeling and importing elements that are used only for the creation of other elements. These are called "sacrificial elements" or "guide entities" because their sole purpose is to be used as temporary aids in the modeling and creation of other final elements.

PARKING LOT THAT WILL DYNAMICALLY ADJUST

In this example we will explore how to create a parking lot so that when it is moved it will dynamically adjust to the shape of the topography or it will automatically adjust if the topography is adjusted.

1. Create any topo and locate the shape and size of the parking lot.
2. Go to the site plan—go to the Site Tab> Split Region. Draw a rectangular boundary as shown in Figure 1 to represent the extents of the parking lot. The final boundary is shown in Figure 1.
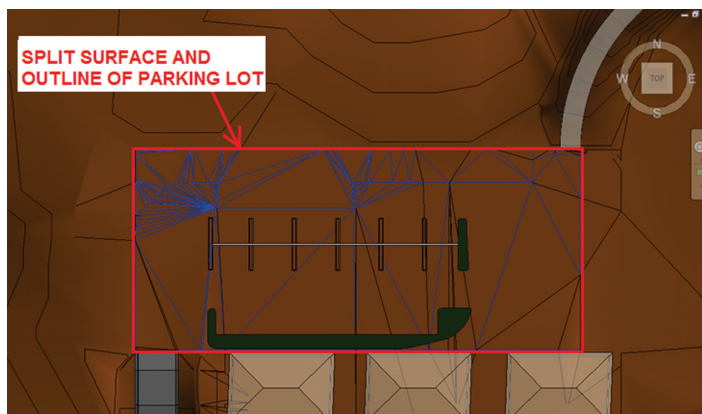
Figure 1: Parking lot location

3. Go back to the default 3D view and select the "split surface" element, which is now a separate topography element.
4. Isolate and export that new split topography element as a dwg. Make sure not to export all the temporarily hidden elements. Save the file exported dwg file.
5. Undo the split surface command (or merge the surfaces) so that there is no "hole" in the site topography element. Insert the newly exported dwg as origin to origin, level orient to view, in the project environment. It is also a good idea to change the color to black and white so the mesh lines are easier to see as shown in Figure 2.
6. The dwg insert should line up perfectly with the site topography element. You know you have it in the right location when there are many mesh lines that show up in the same location as the topo, as in Figure 2.
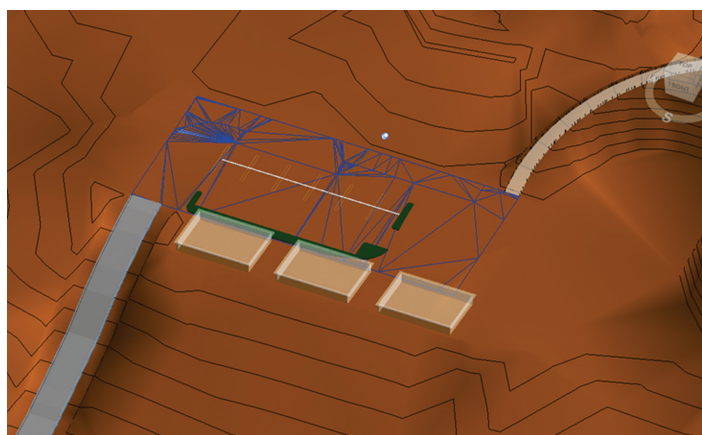

Figure 2: Parking lot imported dwg

7. Build entourage families—build the guides and place the families.

Yes, I said entourage families. You will use entourage families to host the path geometry. Why do this? Entourage families and a few others (I prefer entourage families) are the ONLY families that host to site topography (at this time). Meaning when you place an entourage family on a site topo it will follow the site topo even if the family is moved. Therefore, if you host the entire lot to entourage families and the entourage families are hosted to the topo, then when the entourage families move the lot moves as well—all the while following the topo surface. Also, if the site

topo were to change, then the lot that is hosted on the entourage families will also change!

To build an entourage family that is usable, simply open the entourage family titled "Van" then delete everything and go to the left elevation view. Add a vertical model line that starts at the origin of the family and extends straight up. Place a parameter on the height and call the parameter "HT."

Although making a parameter out of the height is not required, I prefer to do it so in the future I am able to adjust the height of my path in the "z" direction as shown in Figure 3. Finally, change the settings of the family to be always "vertical." This will make sure that the family "line" always points up. Save the file and load it into the project.
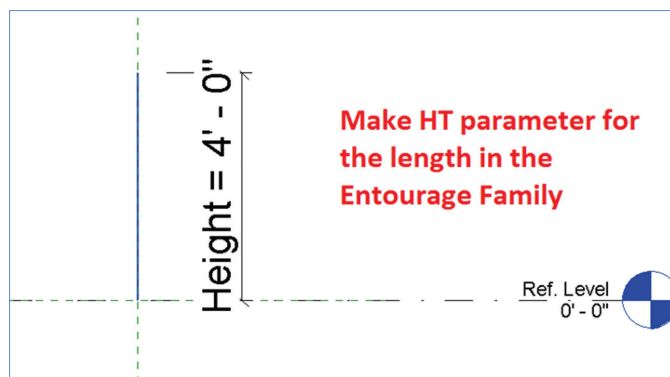

Figure 3: Parking lot dwg

The only reason that you imported the dwg into the project environment was so the entourage families have a "guide" or something to "click" or "snap" to. Otherwise these families will not "snap" to topography.

Add one entourage family and array the rest as shown in Figure 4. In this example there were 44 arrayed families in the long direction and 11 in the short direction of the parking lot as shown. The number of families you place is entirely up to you; however, the more families, the more adaptable the parking lot will be when it is placed on undulating topography.
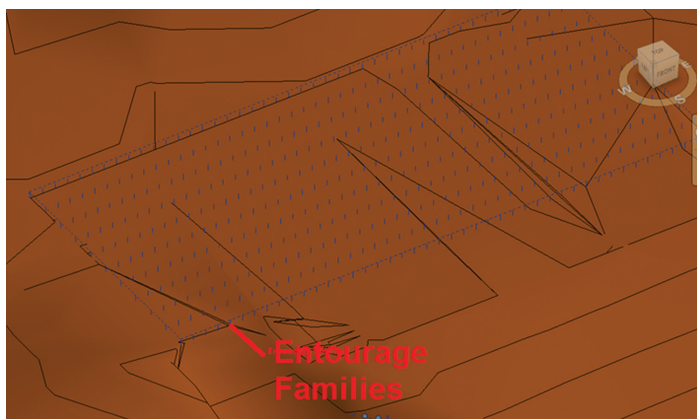

Figure 4: Parking lot entourage

8.   Build the rig

Host the nodes of the splines that will make up the parking lot surface to the entourage line families that you just placed in the previous step.

Simply host a point anywhere along each line—it doesn't matter where, as long as they get hosted (as shown in Figure 5), then make a spline thru points. Select all the splines (as reference lines) and select "make form." Note: It is easier if you isolate the entourage families when doing this step.
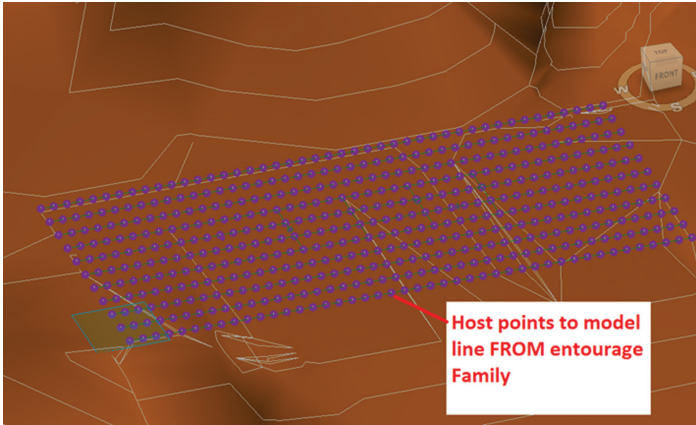

Figure 5: Parking entourage with hosted nodes

9.   When that is completed, select all the nodes and make a parameter to set the relative location of the nodes to the bottom of the line or equal to "0".
10.   Build the parking lot by simply activating the Roof by Face command and select the mass surface. The new "road" should look like Figure 6.
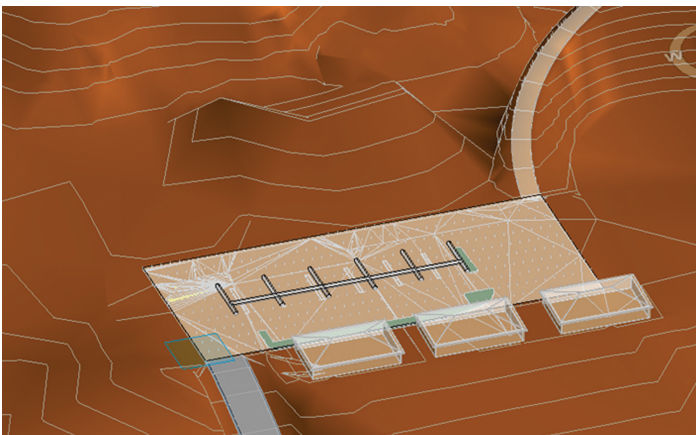

Figure 6: Parking lot with mass rig

11.   The fun part is to now move the lot out of its current location from the flat part below the helical path and watch it dynamically adjust to the topo surface. To do this, go to a 3D top view and simply select all the entourage families that are being used to "host" the splines. I found it helpful to place all the families in a group. Move the entourage families and

watch what happens. The results are shown in Figure 7. This parking lot and site were used to illustrate an extreme example of a topo shape and in common practice you will not likely see a parking lot need to take this final shape.
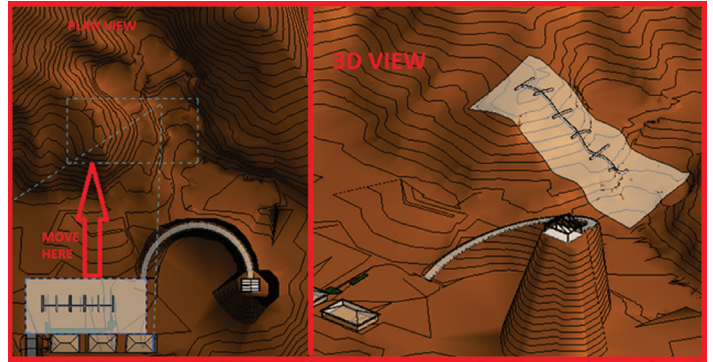

Figure 7: Parking lot adjusting to topo

HOW TO MODEL HELICAL SITE TOPO

In this section you will be creating a helical mountain. To create a mountain out of the topo tools you first have to create a "guide" family.
1.   Create a new project with a simply flat topo element.
2.   Start an in-place mass.
3.   Place a circle at the base of the project and use the grids of the project as a guide.
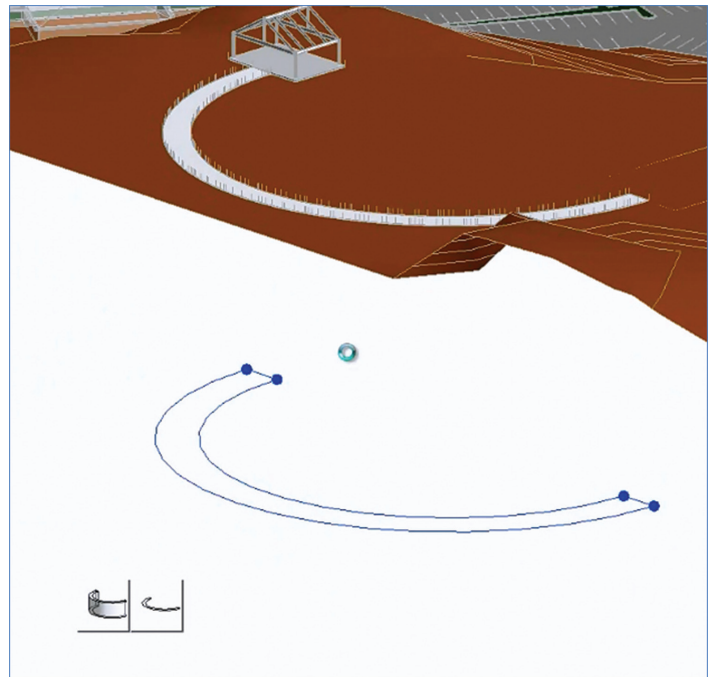4.   Break the circle into two semi-circles as shown in Figure 8.

Figure 8: Create two semi-circles

5.   Select each semi-circle and click "create form."
6.   Simply grab the top end of the extruded half cylinder node and drag to desired height. Behold, a helix in Revit as shown in Figure 9.
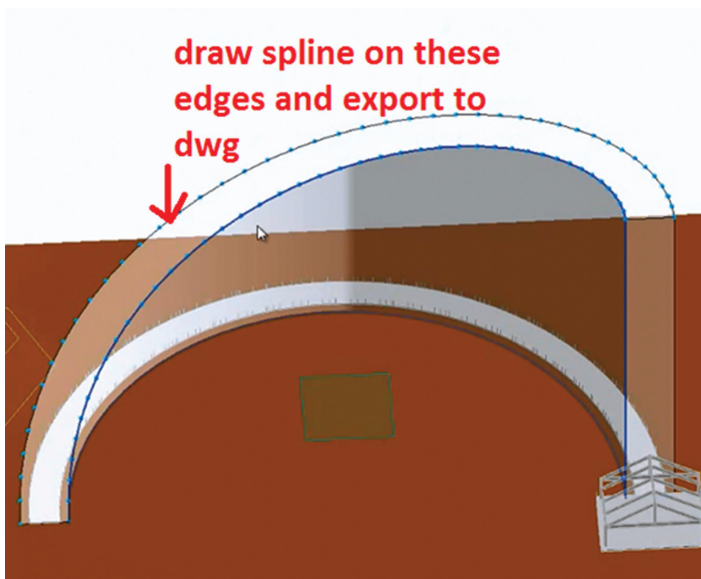
Figure 9: A helix in Revit

7. Instead of dividing the edges, simply draw a curve along each edge using the Spline Thru Points command and the "follow surface" option turned on. Isolate the edges one at a time and export them to a dwg file as shown in Figure 9.

8. Import each edge of the helical path separately so that you now have two dwg files.

9. Select the topography element, select edit surface, and select Create from Import. Select one of the imported dwgs and you should see the topo be modified to follow the helical edge. Repeat for the other edge as shown in steps 1, 2, and 3 in Figure 10.
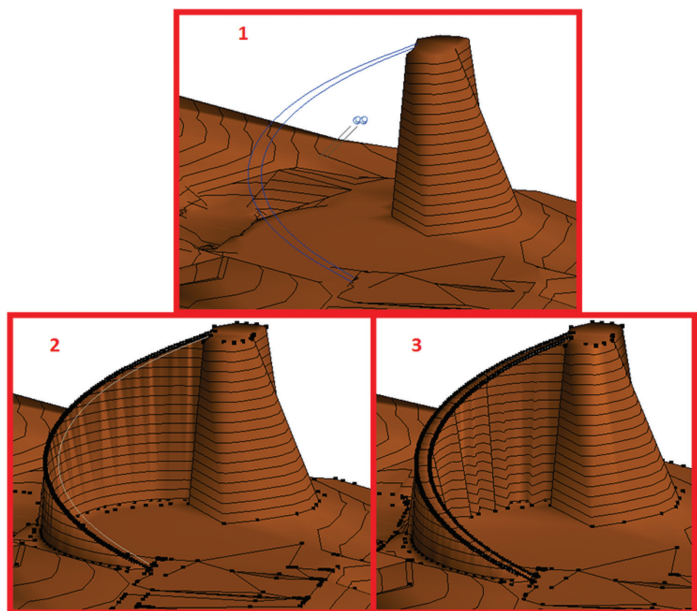

Figure 10: Selection steps for helix

SOIL AROUND A RETAINING WALL

In this section you will be shaping existing topo around the near and far side of a retaining wall.

1. Open your existing project or create a topo surface and a concrete retaining wall.

2. Create a new in-place mass and simply draw a curve where you would like the top of the soil to be located on the upper portion of the wall at the face of wall. Do the same for the lower portion of the soil. You should have two mass curves that are shown in Figure 11.
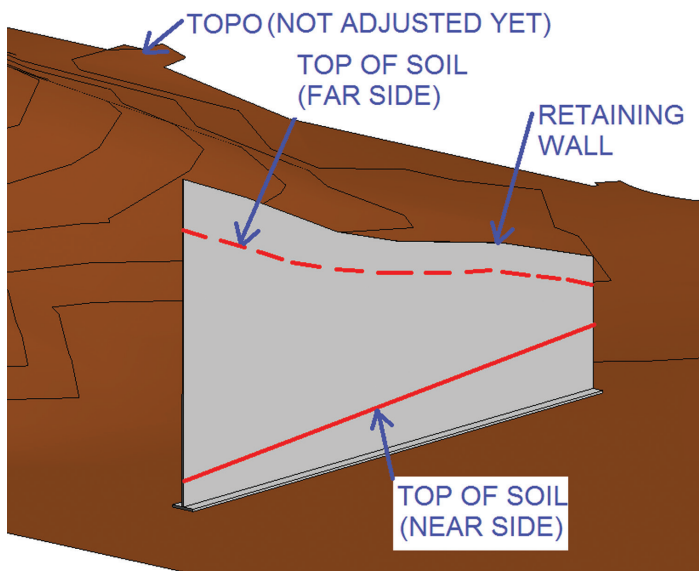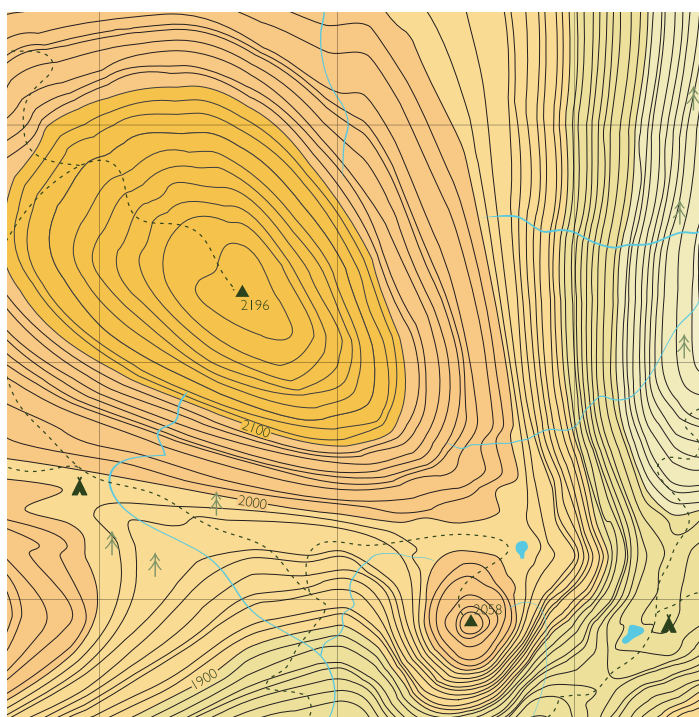

Figure 11: Top of soil at high and low locations

Revit Architecture 2014

Note: The divided nodes are used as a guide to place the topo surface nodes and they must be lined up horizontally in order to create the effect of the continuous topo surface being at two elevations.

3. To ensure that the divided nodes on each curve lines up horizontally you will need to locate the nodes via the "intersect" divided node command. To use this, you have to draw gridlines (or named reference lines) at equal plan spacing. A good rule of thumb is to make at least 12 divisions/gridlines. Once the gridlines are placed at equal spacing, select each curve separately and select the divide path command and select intersect and select the gridlines. The final divided node location should look similar to Figure 12.

4. Now that the divided nodes are in place, it's time to place the topo points on top of the divided nodes. To modify the topo, simply change to a top-down view in 3D and edit the topo and place points at each divided node. Change to a 3D side view and move the nodes vertically, in elevation, to the divided node.
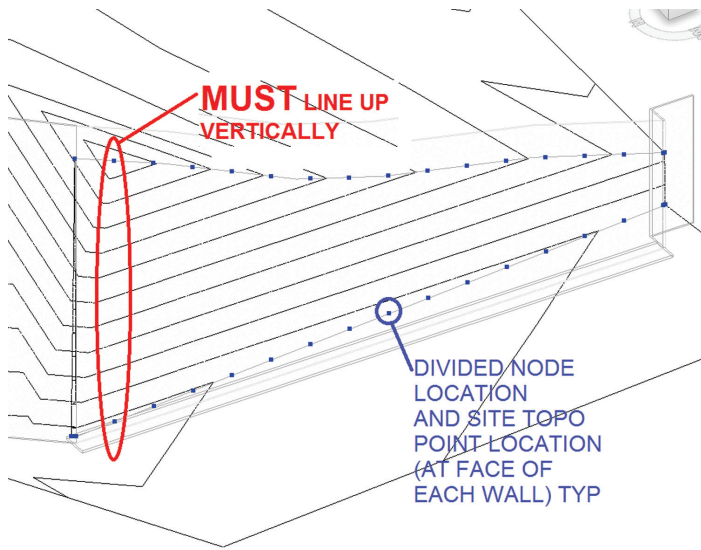

Figure 12: Divided node and topo point locations

5. Finish the topo and a section through your topo should look similar to Figure 13.

Note: In order for the soil to be retained at a different elevation on each side of the wall, the topo surface has to be hidden within the concrete wall.
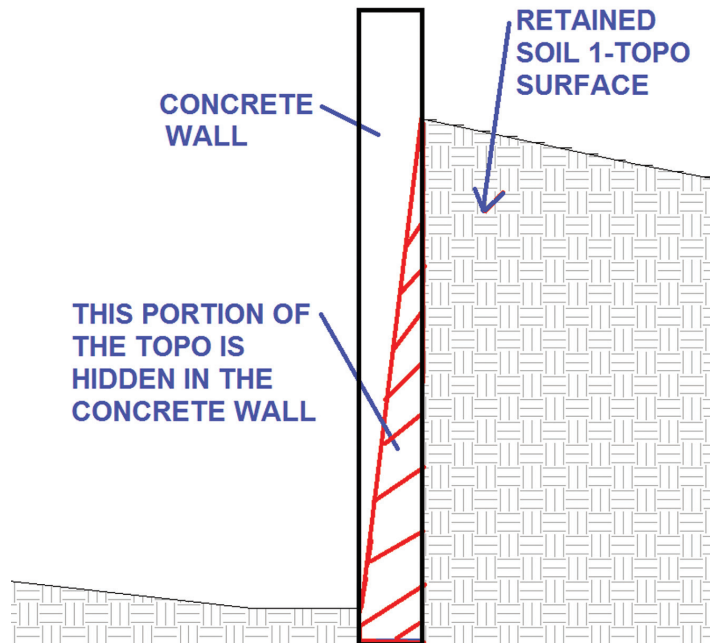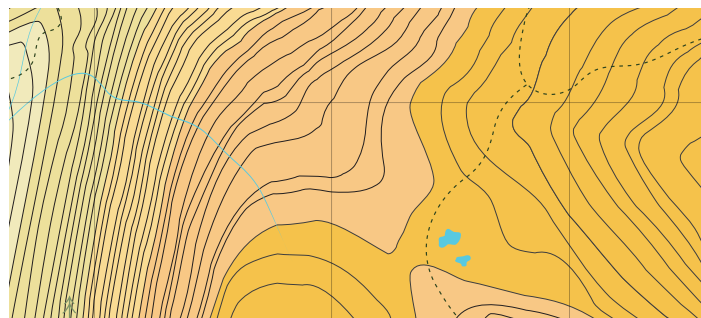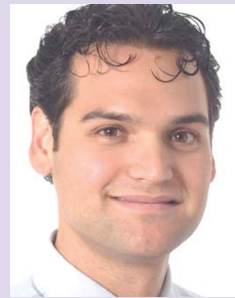

Figure 13: Section thru retaining wall

Marcello Sgambelluri is the BIM Director at John A. Martin & Associates Structural Engineers in Los Angeles, California. He has been using Autodesk products for more than 15 years including AutoCAD, 3ds Max, and Revit. Marcello is heavily devoted to helping advance the use and knowledge of BIM solutions within the AEC community. He is well known for modeling elements and creating workflows that others have thought not possible. He also frequently presents at Autodesk University and at The Revit Technology Conference where he has been voted the top-rated speaker two years in a row at both conferences. He has worked on many well-known projects in the past including the Walt Disney Concert Hall in Los Angeles, the Stata Center at MIT, and the Tom Bradley International Terminal Expansion at Los Angeles International Airport. Marcello received B.S. and M.S. degrees in Civil Engineering and is a licensed Civil and Structural Engineer. He can be reached via email: marcellojs@hotmail.com, Twitter: @marcellosgamb, or at his blog site: www.therevitcomplex.blogspot.com

Dimensions in ACA

Dimensioning is simply the process of adding measurement annotation to a drawing. Dimensions can be created for a variety of object types in many orientations. The basic types of dimensioning are Linear, Radial, Angular, Ordinate, and Arc Length. Linear dimensions can be horizontal, vertical, aligned, rotated, baseline, or continued (chained).

With more than 70 dimensioning-oriented settings in the Dimension Styles Manager, you can control nearly every aspect of the appearance of dimensions. If you save your dimension styles in a drawing template (dwt) file, they will be available every time you start a new drawing. To simplify drawing organization and dimension scaling, it is recommended that you create dimensions on layouts rather than in model space.

In addition to traditional AutoCAD dimensioning, AutoCAD® Architecture provides more intelligent and automated AEC Dimension objects. Thoughtful creation of AEC dimension styles can greatly improve productivity during the construction documents phase of a project. Another benefit of AEC dimension styles is that as AEC objects, they can be controlled with the AutoCAD Architecture display system and can be scale-dependent. The same AEC dimension can be used for any number of scales in the drawing.

Dimensions can be associative, non-associative, or exploded. Dimension associativity defines the relationship between geometric objects and the dimensions that give their distance and angles. There are three types of associativity between geometric objects and dimensions.

- Associative dimensions automatically adjust their locations, orientations, and measurement values when the geometric objects associated with them are modified. These are created when the DIMASSOC system variable is set to 2.
- Non-associative dimensions are selected and modified with the geometry they measure. Non-associative dimensions do not change when the geometric objects they measure are modified. These are created when the DIMASSOC system variable is set to 1.
- Exploded dimensions contain a collection of separate objects, rather than a single dimension object. These are created when the DIMASSOC system variable is set to 0.

AutoCAD Architecture 2014

A dimension is considered partially associative when only one end of the dimension is associated with a geometric object. You can use the DIMREASSOCIATE command to reassociate non-associative dimensions. Dimensions associated to model drawing views may lose their associativity if the drawing is opened and re-saved in a pre-2012 release of AutoCAD®.

CREATE A DIMENSION STYLE

A dimension style is a named collection of dimension settings that controls the appearance of dimensions, such as arrowhead style, text location, and lateral tolerances. You can create dimension styles to specify the format of dimensions quickly and to ensure that dimensions conform to industry or project standards.

When you create a dimension, it uses the settings of the current dimension style. If you change a setting in a dimension style, all dimensions in the drawing that use the style update automatically. You can create dimension substyles that use specified settings for different types of dimensions. You can override a dimension style with dimension settings that deviate from the current dimension style.

To create a dimension style, begin by clicking the Home tab on the ribbon, Annotation panel, then select Dimension Style. In the Dimension Style Manager, click New. In the Create New Dimension Style dialog box, enter a name for the new dimension style and click Continue. In the New Dimension Style dialog box (Figure 1), click each tab and make any changes for the new dimension style. Click OK and then Close to exit the Dimension Style Manager.
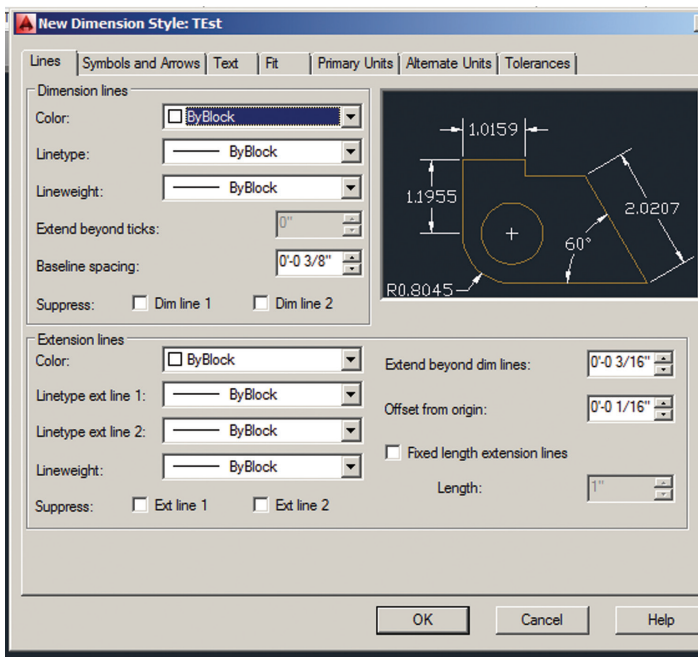

Figure 1: New dimension style

DYNAMIC DIMENSIONS

When you use grips to change the dimension or angle of an object, temporary dimension objects show you the changes you are making. You can use Dynamic Input to enter a precise value instead of moving a grip. This is active by default and selecting a grip displays a text box in which you can enter the desired value for the associated dimension or angle. Click Dynamic Input on the application status bar to toggle this off. Three types of dynamic dimensions display on grips.

1. Focal dimensions display highlighted in a white rectangular box. If you type a value while a dynamic dimension is focused, the edit box is displayed at the dimension text location.
2. Editable dimensions display based on the drafting settings you specify. If you press TAB while a dynamic dimension is focused, the dimension focus shifts forward to the next editable dimension.
3. Non-editable dimensions display in black text. These dimensions typically display the current value of a property that you can modify with a grip.

You can apply different settings, such as the color of the dynamic dimension text box, on the Dynamic Input tab in the Drafting Settings dialog box (see Figure 2). You can select the color of grips and the dynamic dimension linetype on the AEC Editor tab in Options. It is important to note that when a dimension edit box is displayed, pressing Enter sets the value of the property that you are editing and ends the grip operation. Pressing Tab sets the value, changes the focused dimension, and continues the same grip-editing operation.
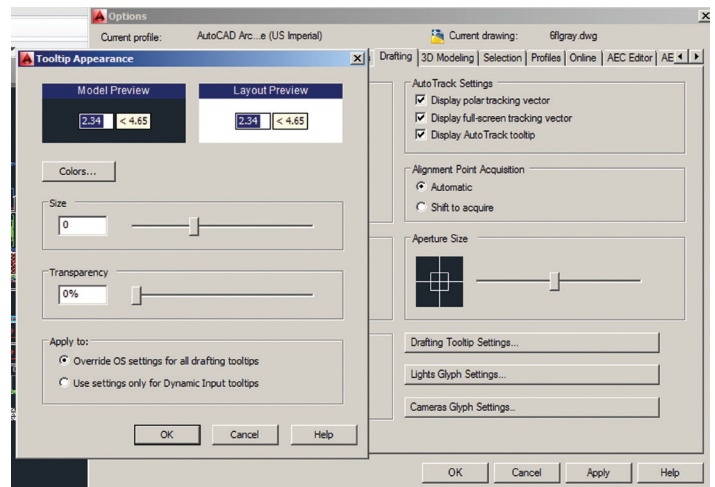

Figure 2: Dynamic input appearance

AEC DIMENSIONS

In AutoCAD Architecture, you can dimension object points specified in the AEC dimension style, points on objects picked in the drawing, or user-specified points in the drawing. AEC dimensions associated with objects update when the object changes. User-specified points are not associative and have to be changed manually if necessary. An AEC dimension can contain both associative and non-associative points. For example, you can create an AEC dimension that dimensions a wall, a multi-view block representing a floor drain, and user-specified points selected anywhere in the drawing.

When you select an AEC dimension, various grips are displayed. You can use the grips to add and remove dimension points, move dimension chains, change the offset of extension lines and override wall component dimensions. When dimensioning wall components, you have the option of using the center of the component or either side as the dimension point. You can also dimension wall components according to their structural function. Grips for the individual component dimension points allow you to override style-defined dimension points on walls to accommodate special cases. The dimension values in an AEC dimension are calculated from the actual current dimensions of associated objects. You can override a value with a manually inserted value.

The AEC dimension style defines objects to dimension in the AEC dimension and the display of the AEC dimension. You can create and edit AEC dimension styles, import and export AEC dimension styles between drawings, and purge AEC dimension styles that are not in use. When you create, purge, import, export, or edit styles, you access the Style Manager. The Style Manager provides a central location in AutoCAD Architecture where you can work with styles from multiple drawings and templates.

You can create an AEC dimension tool from any AEC dimension style. You can drag the style from the Style Manager onto a tool palette. You can then specify default settings for any AEC dimensions created from the tool. To create an AEC dimension, begin by clicking the Annotate tab on the ribbon, Dimensions panel (see Figure 3), and select one of the available dimension tools there. Select the objects or points you want to dimension and press Enter. Click where you want to insert the AEC dimension.

There are a few best practices for AEC Dimension Styles to keep in mind.

* Make your dimension styles scale-dependent where possible by using different AutoCAD dimension styles with different settings for "Overall Scale." By changing display configurations, you can use a different display representation for dimension styles that adjusts to different scales and detail levels.
* It is not necessary to store AEC Dimension styles or the AutoCAD dimension styles on which they are dependent for display in the template drawing. Instead, you can use the tool properties to import them as needed from a style library.
* If you have configured the "Dimension" and "Type" parameters of your wall style components, you should take advantage of

this in the AEC Dimension's "Content" settings for the "Wall Width" dimension parameters by specifying "From Style" or "Structural from Style."

DIMENSIONING A PROJECT

In the documentation phase of a project, you create detailed dimensions of objects. AEC dimensions can be attached to objects in a drawing or to objects in an external reference. You can dimension objects in source drawings such as elements or constructs, or you can dimension them in higher-level drawings such as views or sheets.

Begin by opening the project drawing in which to add a dimension. This may not be the drawing in which the object to be dimensioned is located. It may be a drawing that references the object. Open the tool palette that you want to use and select an AEC dimension tool. On the Properties palette, expand Basic General and select a style. In the drawing area, select the objects to dimension and press Enter. Specify the position of the new dimension.

* If you want to insert the dimension group parallel to or perpendicular to the dimensioned object, then drag the cursor in the desired direction and click in the drawing at the desired insertion point.
* If you want to insert the dimension group at a specified rotation, then enter "r" (Rotation) on the command line and press Enter. Then enter a rotation angle, press enter, and click in the drawing at the desired insertion point.
* If you want to insert the dimension group aligned parallel to an object other than the dimensioned object, enter "a" (Align) on the command line and press Enter. Then select the object in which to align the dimension group. Press Enter and click in the drawing at the desired insertion point.

CONVERTING AUTOCAD DIMENSION TO AN AEC DIMENSION

For each AutoCAD dimension point, a non-associative AEC dimension point is created. The resulting AEC dimension has the properties of the AEC dimension tool you select. You can edit these properties after creating the AEC dimension.

To do this, open the tool palette you want to use, right-click an AEC dimension tool, and click "Apply Tool Properties to," then select AutoCAD Dimension (see Figure 4). Select the AutoCAD
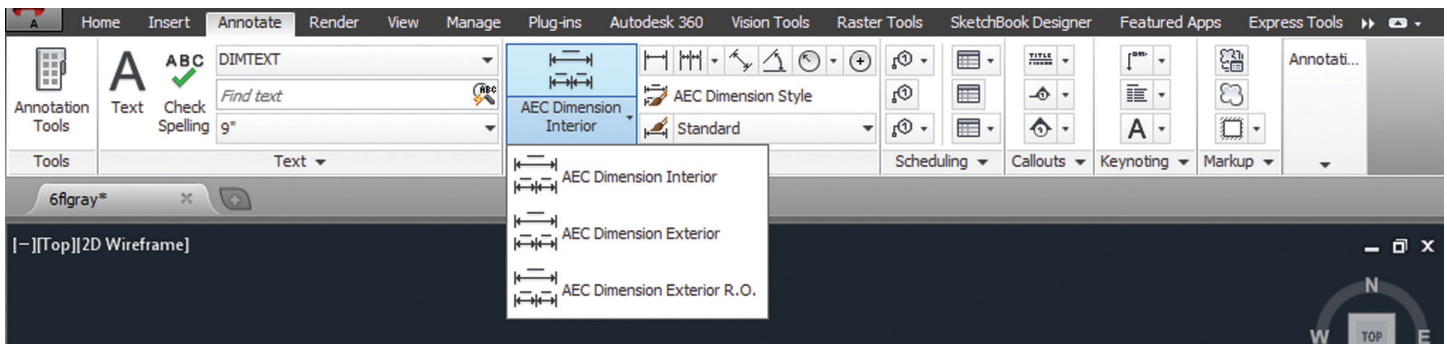

Figure 3: Dimension panel

dimensions and press Enter. Specify the position of the AEC dimension by clicking the desired position in the drawing. The AEC dimension can be placed above or below the object. Drag the mouse to set the direction of the dimension. The extension lines are drawn into the opposite direction.

It is important to note that the angle you specify here is calculated in relation to the UCS and not to the dimensioned object. When prompted to erase the original AutoCAD dimension, press Enter to keep the AutoCAD dimension or enter y (Yes) to erase it. If you selected only one AutoCAD dimension, then the new AEC dimension is inserted at the same position as the AutoCAD dimension. If you selected more than one AutoCAD dimension, then the new AEC dimension is inserted according to your specifications.
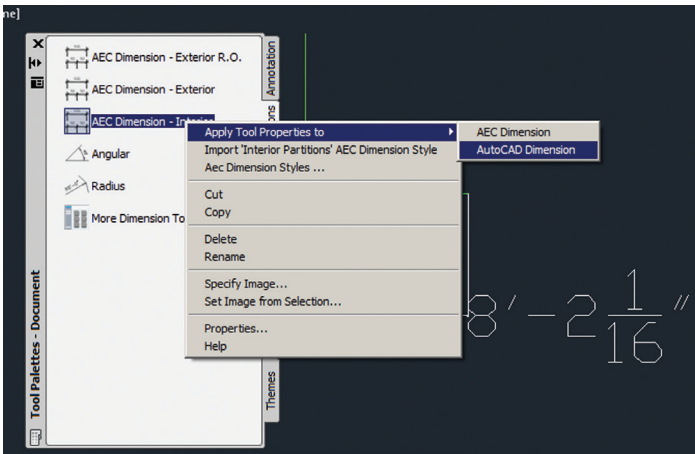
Figure 4: Convert to AEC dimension

MODIFYING DIMENSION TEXT

After you create a dimension, you can move, rotate, or replace the dimension text. You can move the text to a new location or back to its home position, which is the position defined by the current dimension style. You can move dimension text to the left, right, or center along the dimension line or to any position inside or outside the extension lines. A quick and simple way to do this is by using grips. If you move text up or down, the current vertical alignment of the text relative to the dimension line is not changed, so the dimension and extension lines are modified accordingly.

Hover over a dimension text grip to quickly access the following functionality:
* Stretch – This is the default grip behavior. If the text is positioned on the dimension line, Stretch moves the dimension line farther away or closer to the object being dimensioned. If the text is positioned away from the dimension line, with or

without a leader, Stretch moves the text without moving the dimension line.
* Move with Dim Line – Positions text on the dimension line and moves the dimension line farther away or closer to the object being dimensioned.
* Move Text Only – Positions the dimension text without moving the dimension line.
* Move with Leader – Positions the dimension text with a leader line to the dimension line.
* Above Dim Line – Positions the dimension text above the dimension line (left of the dimension line for vertical dimensions).
* Center Vertically – Positions the dimension text so the dimension line cuts through the vertical center of the text.
* Reset Text Position – Positions the dimension text back to its default position based on the active dimension style.

Clicking on an AEC dimension brings up the AEC Dimension tab on the ribbon, which allows for many editing capabilities (see Figure 5). If you wish to return the dimension text back to its original location, select the dimension text, hover over the text grip, and click Reset Text Position.

CONCLUSION

Dimensioning in AutoCAD Architecture contains many capabilities to ensure quality, accurate measurements within your drawing. There is a lot you can do with dimensions, so take a few minutes to sit down and explore all the capabilities. You may be surprised at all you can do!
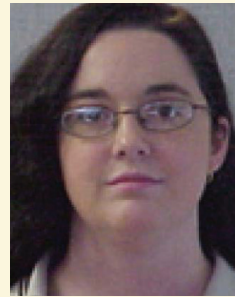
Melinda Heavrin is a CAD Coordinator & Facility Planner for Norton Healthcare in Louisville, Kentucky. She has been using AutoCAD Architecture since release 2000. Melinda can be reached for comments and questions at melinda.heavrin@nortonhealthcare.org.
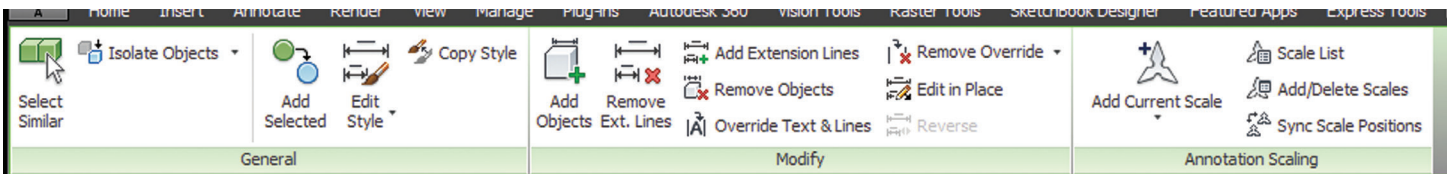

Figure 5: Modify dimension

Scope Boxes and Plan Regions

In this article we are going to look at two tools in Autodesk® Revit® Structure that help with consistency and visibility in your Revit Structure model. The first is the Scope Box tool and how scope boxes relate to your datum elements in your model. The second one is a plan region and how it helps with plan view visibility.

SCOPE BOX

Datum elements such as levels and grids associate themselves to scope boxes. This gives the user control over visibility and consistent placement of these elements.
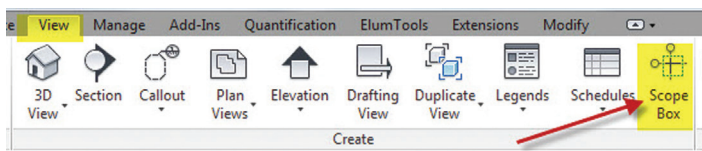
Figure 1: Scope box tool

When you have a datum element such as a level or grid selected, you can assign a scope box to those elements in the properties box as shown in Figure 2 below.
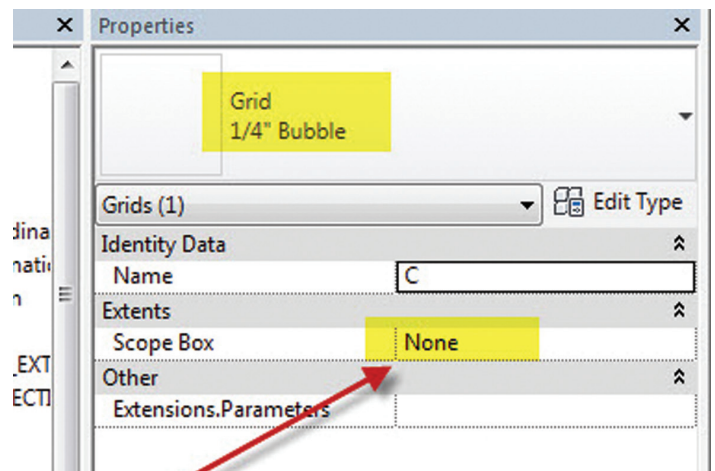

Figure 2: Assigning a scope box to a datum element

Once your datum elements are associated to a scope box you can adjust the size of the scope box and the datum element follows along. The datum elements must cross the scope box; if the scope box is adjusted and does not cross the datum element you will get an error like the one shown in Figure 3 below.
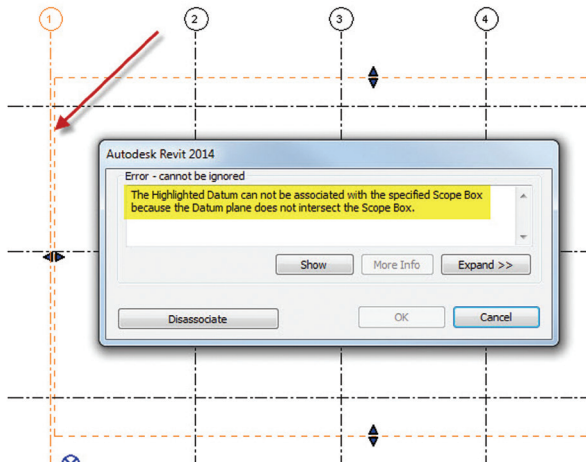

Figure 3: Scope box error

Scope boxes are created in a plan view and can be associated to any related views in the project. With a scope box selected, you can name it appropriately and access the visibility control of other views to display the scope box and associated datum elements.
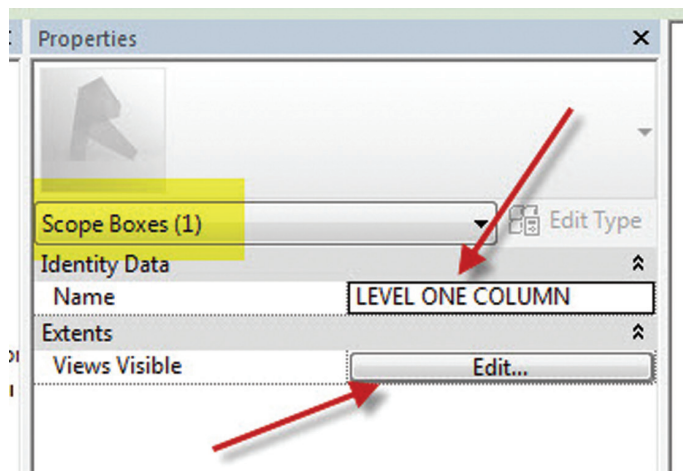

Figure 4: Scope box visibility access

When working in the 3D modeling environment, you may need to display some framing that is located outside your view range for a particular plan.
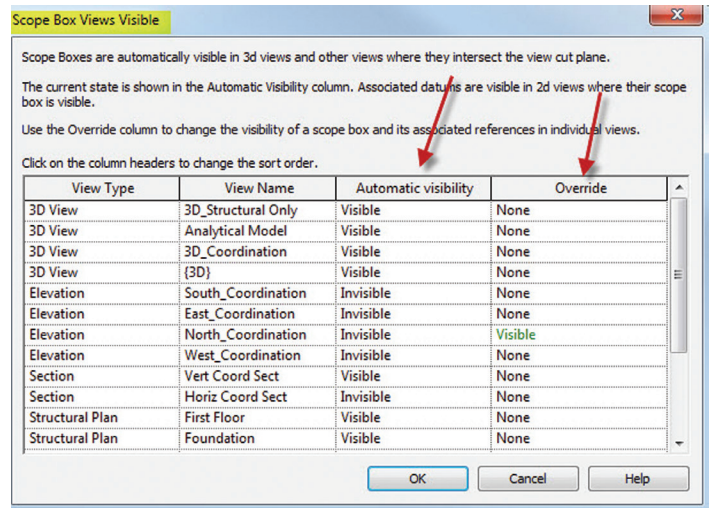

Figure 5: Visibility control of scope box

Figure 5 shows the Scope Box Views Visible dialog box that allows users to make the scope box visible in other associated views in the project. This is useful not only to display the datum elements, but also to keep them consistent from the associated scope box.

PLAN REGION

When working in the 3D modeling environment, you may need to display some framing that is located outside your view range for
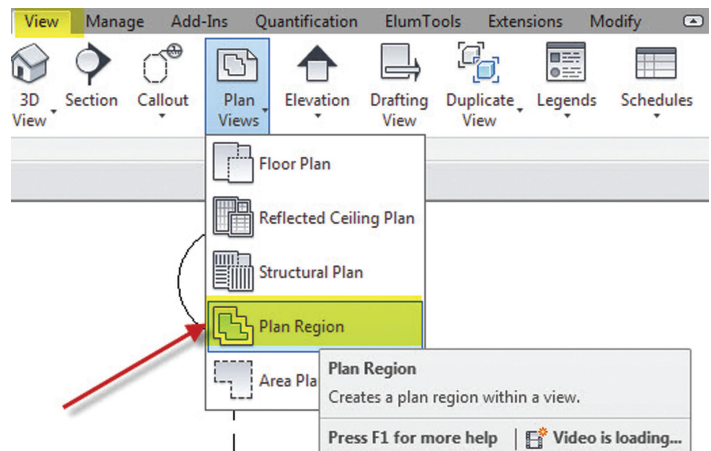

Figure 6: Plan region tool

> *When working in the 3D modeling environment, you may need to display some framing that is located outside your view range for a particular plan.*

a particular plan. Instead of making another floor framing plan to show this, you can use a plan region to have a custom view range for just one area in your plan.

Figure 7 shows an area that has some beams connected to the columns shown. However, the beams are not being displayed because they are above the view range. If the view range is adjusted for the entire view to accommodate showing these beams, you may lose other structural members in the view. So in a case such as this where you need to display this framing to avoid creating an entire new floor framing plan, a plan region is ideal.
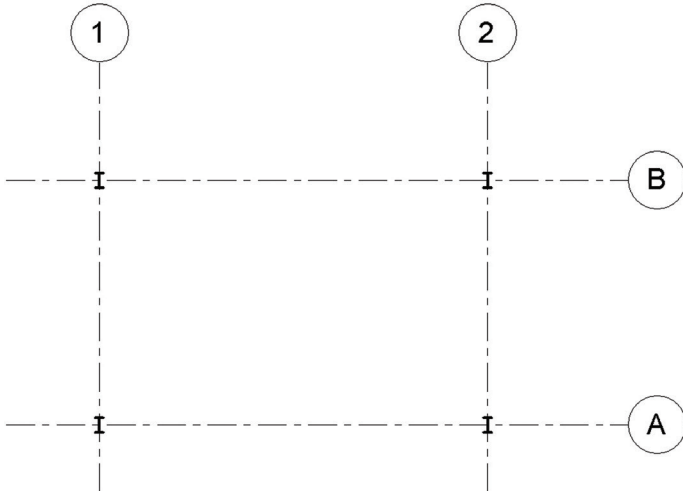

Figure 7: Columns shown, but beams out of view range

Once you activate the plan region tool, your model is grayed out and you are in a sketch mode to outline the area for which you want to adjust the view range.
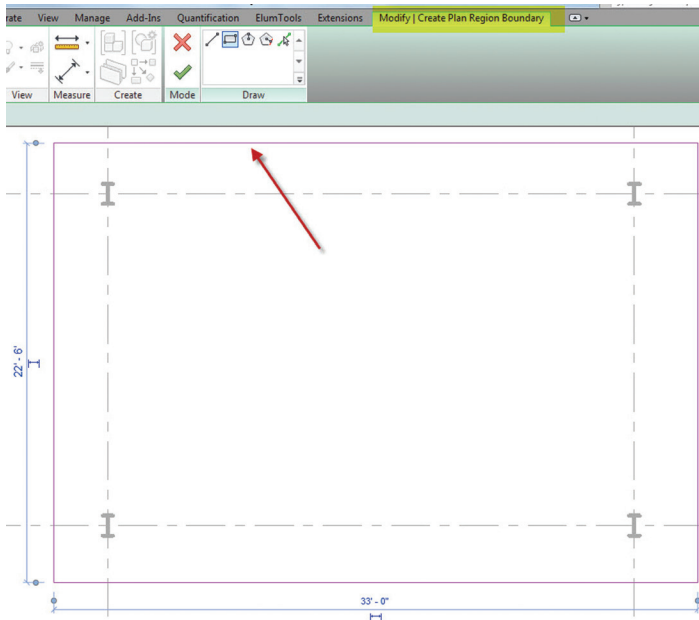

Figure 8: Sketch view range

Figure 9: Plan region view range

Select your plan region after you complete the sketch. You can adjust the view range in the Properties box. This adjustment will only affect the visibility of the area defined by the plan region and will leave the rest of your framing plan the same.
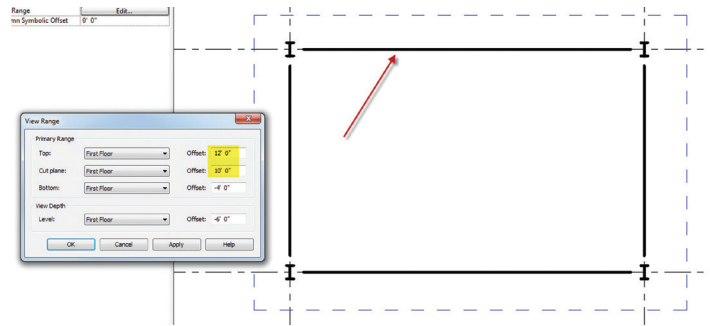

Figure 10: Plan region results

Figure 10 shows the result—displaying the beams that were not visible with the standard view range assigned to the floor framing plan. This technique is ideal for showing mezzanine areas.

SUMMARY

The scope box and plan region tools should be part of your everyday workflow when developing your construction documents.

Philip Russo began with AutoCAD version 2.5 in 1986. Through the years he has held positions in the CAD industry as CAD Draftsmen, CAD Manager, Sr, Applications Engineer, and is a Certified Autodesk Instructor. Lately Phil's focus has been on the implementation of standard practices for the Revit platform. He currently holds the position of Corporate BIM Applications Manager at O'Brien & Gere Limited, an engineering firm located in Syracuse, New York. Phil can be reached at phil.russo@obg.com

CAD Manager

by: Mark Kiker

The Long and Short of It

In life and in work there are those who play the long game and those who play the short game. If you are unfamiliar with these terms, you may want to think about golf.

In golf, the long game is the drive from the tee. More distance is what you want. Distance with trajectory—hit the ball long and straight (or with purposeful hooks and slices). The next shot may be from the fairway and you still need distance, but want to avoid obstacles, such as water and sand, which might cause problems. With these kinds of shots, you look at how

you might set yourself up for success and make the short game work.

The short game is near the green, where chipping, pitching, and putting take over. Finesse and accuracy are crucial in these efforts. Reading the undulations of the green and having just enough stroke to get to the hole, but not far beyond. With these strokes, you look at being effective within several yards or feet of the pin.

You have to be proficient at both of these approaches to get better at golf. Being good at only one will not advance your prowess on

In a nutshell, you need to plan for the long game and execute for the short game.

the links. Take too many shots to get to the green and no matter how good you are with a putter, the strokes add up. Get to the green quickly and then blow the shorter shots and the game goes out the window. Golf is not an easy game to master. And lest you think I am good at it, I must confess that I have played only once in the last 20 years.

I am not a golfer, but I am a manager. The two may have more in common than you think. Let's move to the work world and see how this applies to technology management. You need to know when to play the long game and when to play the short game with technology so that you are maximizing your effectiveness.

Playing the long game with CAD Management can be equated to other slogans that might help with understanding. Slow and steady wins the race. Inch by inch, everything's a cinch. Lose the battle, but win the war. All of these reflect taking a longer view at the overall goal and moving forward in measured steps.

Those who play the long game take a much longer look at everything they attempt to do. They are looking farther down the line than others. They are planning for the long haul. When they start a planning process they look beyond the initial rollout to the problems that may be encountered further on. They think of deployment, management, and maintenance. They know that today's efficiency upgrades might be lost as the software stretches into the future.

When working with people comes into play, they look toward the end of the effort even from the beginning. They are making progress even when it looks like they are stalled or moving backwards. In meetings and discussions, they seek to move the effort forward even against resistance. They see that even a small stride forward, a small compromise by others, is still progress.

Playing a short game has its slogans, also. Strike while the iron is hot. When opportunities knocks, open the door. There is no time like the present. All of these emphasize the need to move forward quickly to capitalize on a good thing.

Short game players want to get moving quickly and seek early wins so that others can see progress. They start moving and adjust as they go. They know that taking too long to define the next move may cripple their efforts. They make course corrections on the fly.

In a nutshell, you need to plan for the long game and execute for the short game.

Make your plans taking everything into account and stretch your thinking out as far as you can. Think about Plan B before you start executing Plan A. Get as much input as you can and ponder your options. Think long and hard, and then think again. Get it all on paper and have others review it.

Then execute for the short game. Move as quickly as possible. Before others take away the opportunities, maximize them. Move past the planning and into the execution phase as soon as you can. Stop talking and start doing. If you are going to fail, fail fast, and recover faster. Generate energy and keep the energy high. Create a sense of urgency so that others catch the feeling and start moving faster.

When working with others you may need to balance their efforts by working the other side. If they appear to be working the long game, then you may need to employ short game tactics. If they are moving with short game speed, you may need to slow things down a little with some long game thinking. Be nimble and adjust as you see others working without balance.

Don't get caught in one rut or the other. If you are a short game player then force yourself to plan more. If you tend toward extended planning periods, then start your actions and tasks a little sooner, prior to completing the planning phases.

By employing the long and short game methods you can master the CAD Management arena by planning well and executing with excellence.

Mark Kiker has more than 25 years of hands-on experience with technology. He is fully versed in every area of management from deployment planning, installation, and configuration to training and strategic planning. As an internationally known speaker and writer, he is a returning speaker at Autodesk University since 1996. Mark is currently serving as Director of IT for SIATech, a non-profit public charter high school focused on dropout recovery. He maintains two blog sites, www.caddmanager.com and www.bimmanager.com.

Sketching Tips & Tricks

At Autodesk University 2013, I was fortunate to be selected to present four classes. The class that had the best reaction and the most interaction was the class I presented on Auotdesk Inventor® Sketching. I presented this class in a tips & tricks style, which went over well. After all, who doesn't love to learn new things to shave some time off common, day-to-day activities?

[The class was MA1743 "Sketching with Autodesk Inventor" for those who want to look it up on the Autodesk University website.]

Before I dive into the content, the first question always asked is, "Where did you get all of these tips, tricks, and suggestions?"

First would be from my 14+ years of using Inventor. A person picks up a lot by just using the software for that length of time.

There's an old saying: "It's not what you know, it's who you know." But with Inventor, it's really both. I'm always on the lookout for any step that will reduce the time or amount of work needed to get things done. I've gained significant insight by watching others using the software, across multiple industries.

I would love to give credit to each and every person from whom I was able to get a little "nugget" of information; unfortunately, I have forgotten most of the sources. However, here are some of my current favorite places from which to get information on using Inventor to its fullest:

- Autodesk Knowledge Network (AKN) – Replaces the Autodesk Wiki
- Design and Motion (Scott Moyse and John Evans)
- TEDCF Publishing: Autodesk Inventor Tips & Tricks
- CAD Geek Speak Blog
- Paul Munford (aka the CAD Setter Out)
- Inventor From the Trenches (Curtis Waguespack)
- Autodesk Digital Prototyping Blog
- IMAGINiT Manufacturing Solutions Blog (Mark Flayler)

Without further delay, here are the top tips and tricks from my presentation.

WORKING WITH SKETCH PLANES
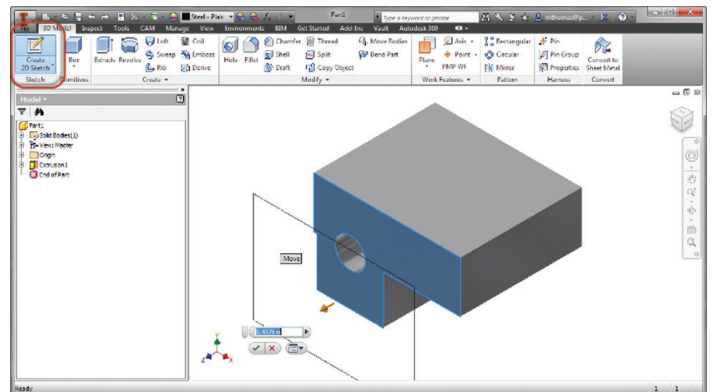### *Quickly Creating an Offset Workplane*

Figure 1

You can generate an offset workplane with a sketch on it in one step. With the Create Sketch command active, drag off the desired face and you will be prompted for the offset distance for the workplane.

Sketches Used to Define Work Features

Sketch geometry, especially lines, can provide an easier method for creating difficult-to-locate work features.

For an example, look at Ben Curtin's example Inventor Holes at a Compound Angle on the Tata CAD Geek Speak blog
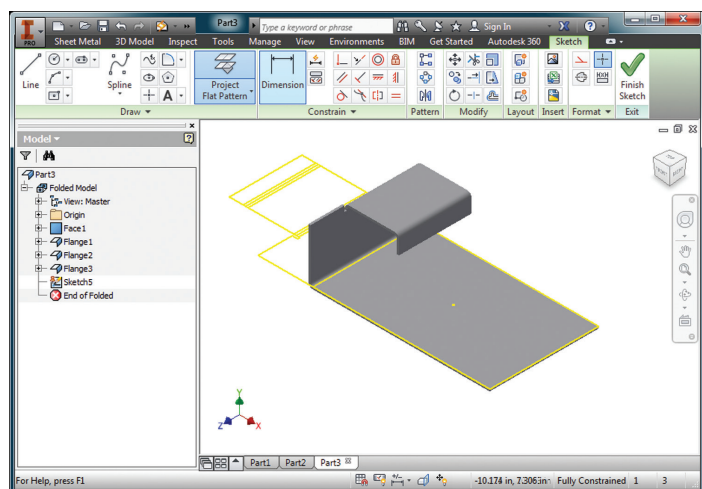
Project Flat Pattern

Figure 2

The Inventor Help feature defines this command as "Unfolds a disjointed face or faces into the sketch plane."

Project Flat Pattern is great for the situations where you don't need the overhead and advanced options of the Sheet Metal Unfold/Refold features—just wanting to reference existing geometry edges.
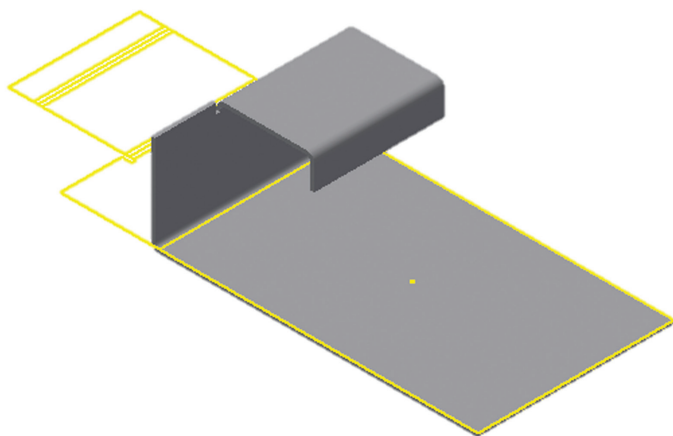

Figure 3

CREATING GEOMETRY

Dynamic Input

Dynamic Input is a way of working with sketch geometry that was originally introduced in AutoCAD®, but has been available in the sketch environment for the past few releases of Inventor. It "provides a Heads-Up Display (HUD) interface near the cursor to help you keep your focus in the sketching area."

Input boxes will appear as you are creating 2D geometry showing transitional dimensional information about your geometry and it allows you to define the size of the object as you are creating it, evening creating the dimension.
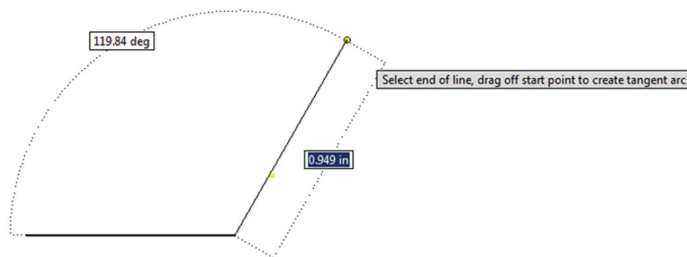

Figure 4

A key aspect of working with Dynamic Input is the TAB key toggles between the various options, whereas ENTER will accept the sizes.

Values entered become dimensions when accepted [disable Persistent Dimensions if you don't want dimensions created]. Dimensions are only created on the inputs for which you entered a value.

Some Things Work Like AutoCAD

There are many time-savers in Inventor that mimic AutoCAD, in a good way. Anything, big or small, that saves time is a good thing, as even the little time-savers over a day or week can add up.

- Just like AutoCAD, the spacebar repeats the last command.
- Just like AutoCAD, when drawing a line you can right-click and close the line.
- Similar to how with AutoCAD polylines you can switch between arcs and lines in the same command, you can, within Inventor, drag in the line command to create an arc.

Sketching Lines

When sketching lines there are some press-and-hold options to generate constrained lines or temporarily switch into a tangent arc creation mode.
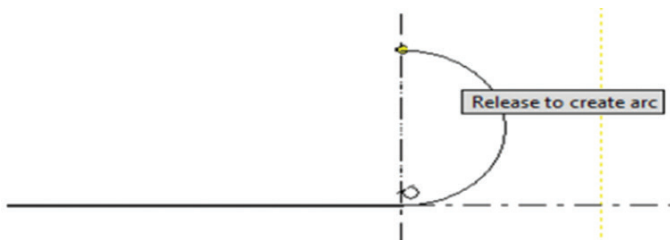

Figure 5

Inventor 2014

- If you press-and-hold off the end of any point, Inventor will generate a tangent arc from that point.
- If you press-and-hold and drag away from a line or arc, Inventor will create a perpendicular line.
- If you press-and-hold and drag tangent-like from an arc or circle, you will create a tangent line. If you continue to press-and-hold as you create the line you can snap tangent at the other end as well.
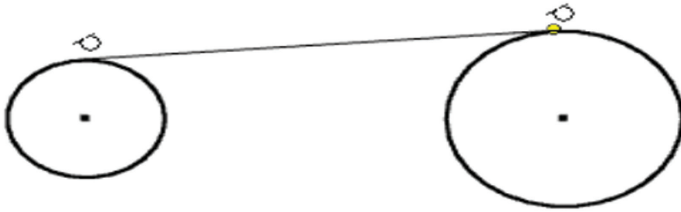

Figure 6

Use Split to Adjust Geometry

We can use the Split feature to take a line or other curve and divide it into two or more sections.

When geometry is broken apart using the Split feature the geometry remains constrained, meaning it is a great method to generate construction geometry or to create points to snap to.
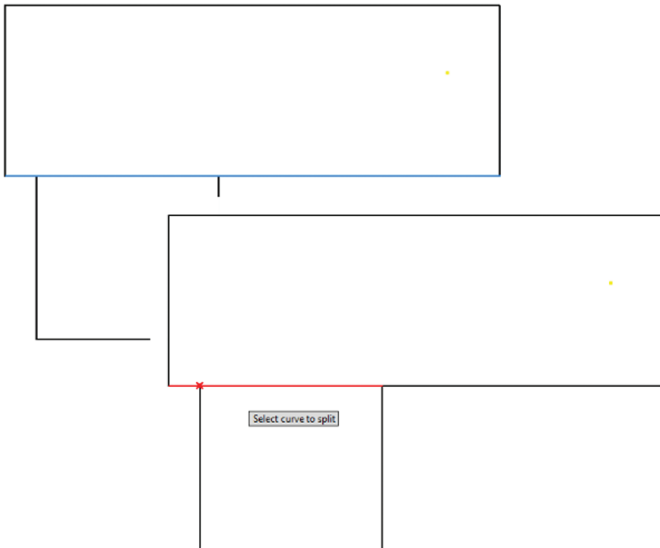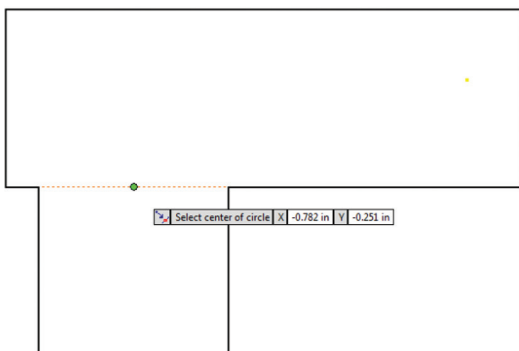

Figure 7

Figure 8

Text in the Sketch Environment

Text can be added to any sketch and then embossed or extruded to add features to your model. This can be used to generate things such as part numbers, dates, place of manufacture, brand names, and logos stamped, engraved, or etched into the component.
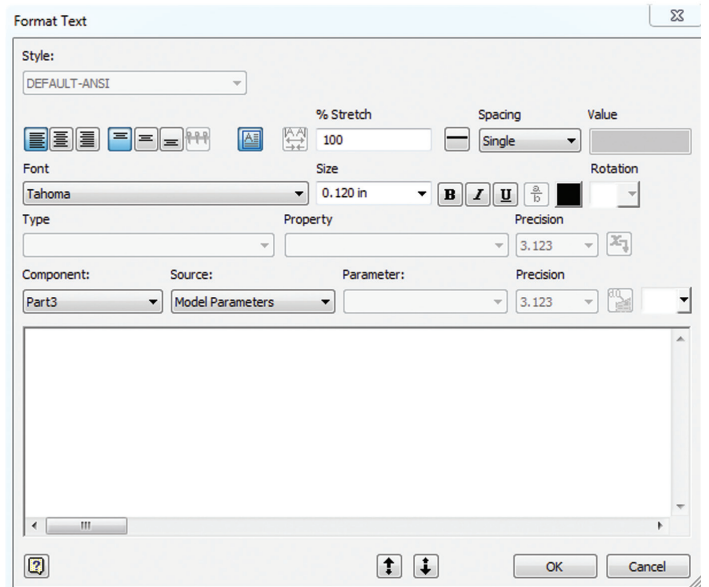

Figure 9

Sketched text can include model parameters, meaning that as the parameters update so does the text. The location of the text can be parametrically positioned by the insertion point or the text box can be enabled, providing more fine-tuned positioning.

Geometry Text functions similarly, but will conform the text to a selected object—for example, wrapping the text to an arc.

Figure 10

Make Project Geometry Work for You

By default, when you project geometry from one part into another it is made adaptive and remains linked to the other component. While it is adaptive and associated with the other component, you cannot make changes to the project geometry because it will update as the other component changes.

You can override this behaviour by holding CTRL while you are projecting geometry. The geometry will be projected fixed in place opposed to adaptive.

Adaptivity has its pros and cons and can be a very powerful tool when you intend to use it. Unfortunately, the default behaviour makes it too easy to accidently or inadvertently make things adaptive.

You can disable the Cross part geometry projection options in the Application Options (Assembly tab) to flip the default behaviour. With these options disabled, you'd have to hold CTRL when projecting geometry to make it adaptive.
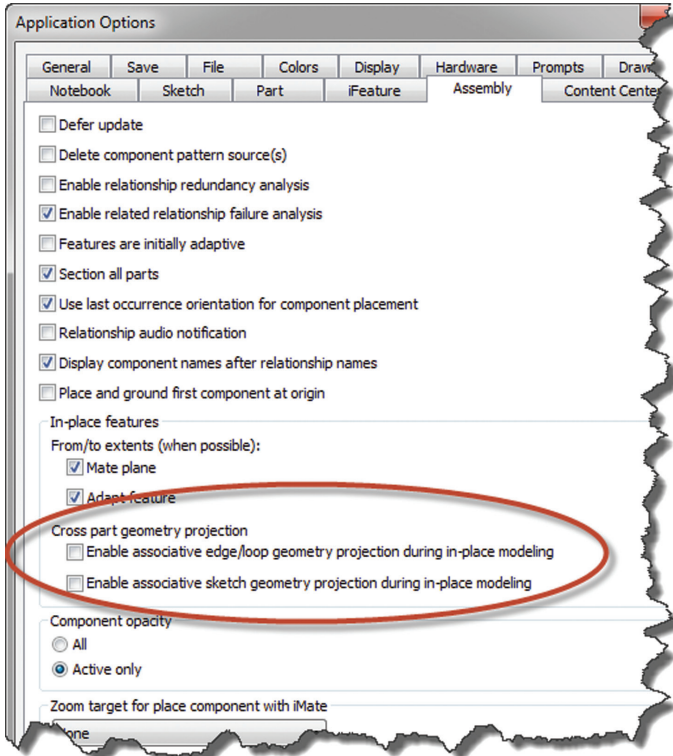

Figure 11

If you haven't done so yet, I highly recommend disabling the two Cross part geometry project options so you do not accidentally create adaptive, cross-part associative geometry.

When geometry is projected from another component but not made adaptive, Inventor applies fix constraints to ground the component in place. You could Show Constraints and delete all the fix constraints, but there is a faster way. Select all the geometry you want to be free so you can dimension or constrain, then right-click and select Remove Fix Constraints. This will remove all fix constraints on the selected geometry.

CONSTRAINTS & DIMENSIONS

Constraints control the geometric relationships, such as parallel or tangent, between sketch entities.

Always Follow the KISS Rule (Keep It Simple, Stupid!)

+ Stability before size. Add constraints and then add dimensions. Consider accepting the default dimensions if you are expecting "big" changes to the size of your sketch geometry. To help avoid sketch flipping issues, change the smaller dimension values first, then move on to the larger ones. Remember that the first dimension sets the scale of the sketch.
+ Use geometric constraints as much as possible. Apply constraints first, then dimension, which is more efficient and reduces the clutter. Constraints typically represent the things

that are assumed on a drawing when not dimensioned.

+ Be lazy and keep it simple. There is a fine line between efficiency and laziness: Don't try to be everything to everyone with one sketch. Instead of making one sketch to be used for every feature in the model, follow one of the golden rules of sketching: KISS—one sketch per feature.
+ Only create in the sketch what you can work with easily. The moment sketching becomes work to fully constrain, your sketch is too complicated.
+ Fillets. These are best as features and should be avoided in the sketch—the same is true with chamfers, mirroring, and most patterns. These types of sketch elements over-complicate the sketch and are better controlled as features. [Why are these tools there, then? You may run into rare cases where you have to use them.]
+ Fully constrain your sketches! To quote Curtis Waguespack, "The importance of fully constraining your sketches in Inventor cannot be overstated." To make the behaviour of your Autodesk Inventor sketches more predictable, constrain your sketch to the 'Origin' (0,0,0).
+ Bonus Tip: You can have Inventor auto-project the origin point by enabling "Auto project part origin on sketch create"—[Tools>Application options>Sketch tab]. Be careful with fix constraints—you should never need more than one.

Horizontal and Vertical Alignment
The horizontal and vertical constraints can be used to align points either horizontally or vertically. The center point shown in Figure 12 is constrained so that it lines up horizontally with the midpoint of the vertical line and vertically with the midpoint of the horizontal line. The circle will remain constrained to these points even as the rectangle changes in size.
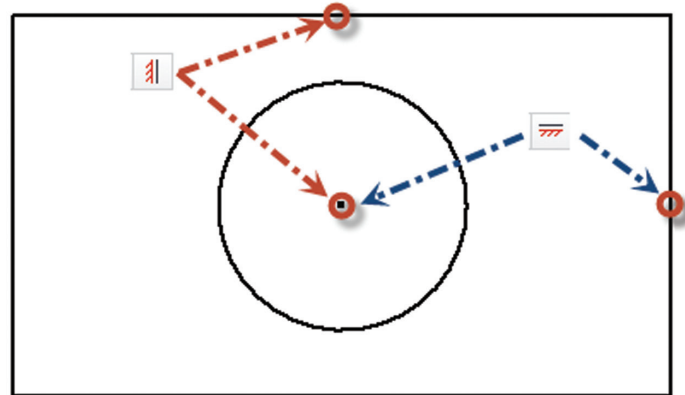

Figure 12

Make Automatic (Inferred) Constraints Work for You
Constraints are automatically applied as you sketch, but you can make this work in your favour. This auto-constraining is referred to as constraint inference. What Inventor infers is dependent on the existing geometry, the type of object you are creating, the Constraint Options, and if Constraint Persistence is enabled.

You can adjust the geometry from which the auto-constraint is being inferred by hovering (rubbing) over another object. For example, if your new line is snapping parallel (without exiting the
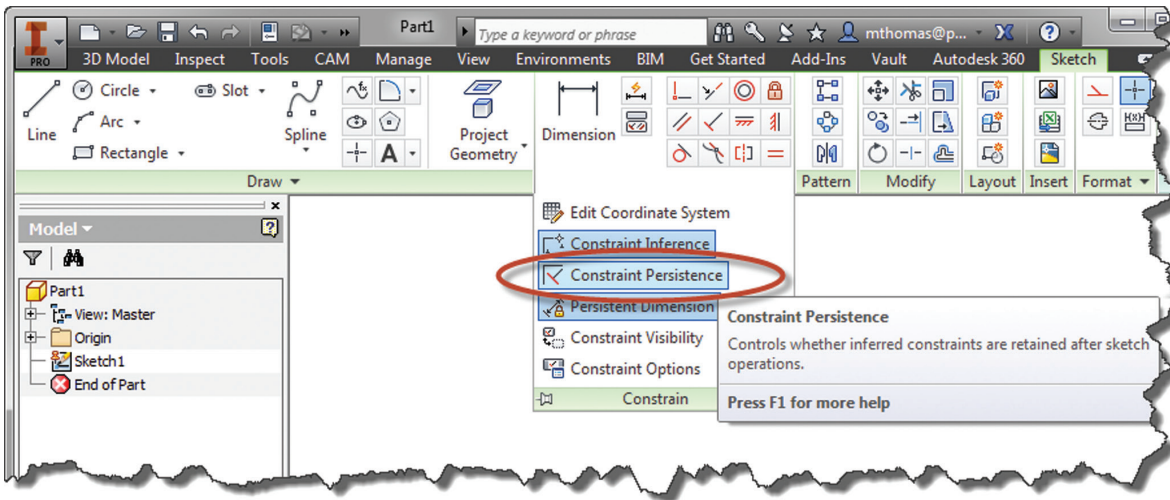
Figure 13

line) you can hover over a line 90 degrees to it and your new line will now snap perpendicular.

If your new geometry is inferring constraints in a fashion you do not want, you can hold CTRL as you sketch and no constraints (except for coincident) will be automatically created. You can then add the constraints of your liking. Additionally, you can disable Constraint Persistence on the Constrain Panel flyout.
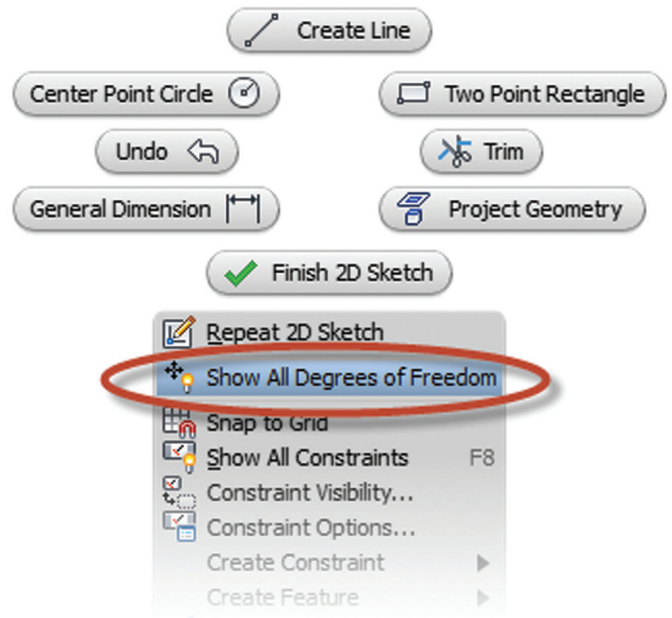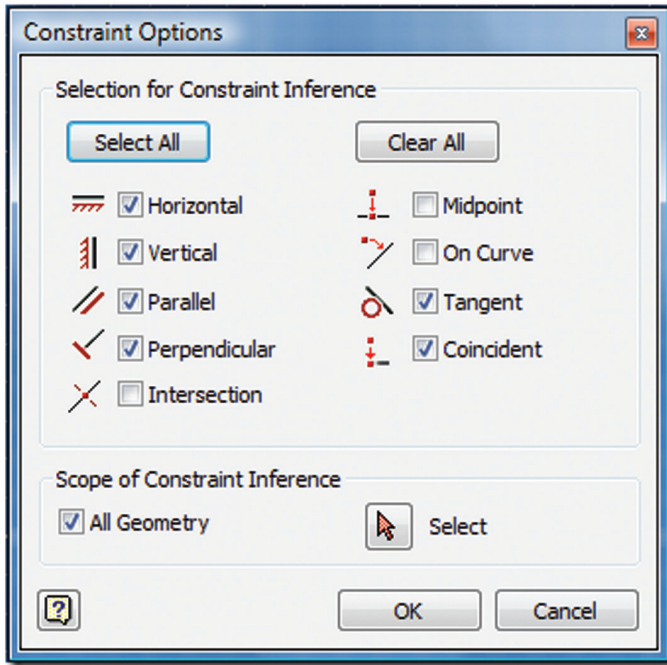

Figure 14

Constraint Options (available on the Constrain flyout) control which constraints will be inferred during sketching.

Use Degree of Freedom to Find Under-Constrained Geometry
Use Degree of Freedom to help find unconstrained, partially constrained, or fully constrained geometry. The easiest method to
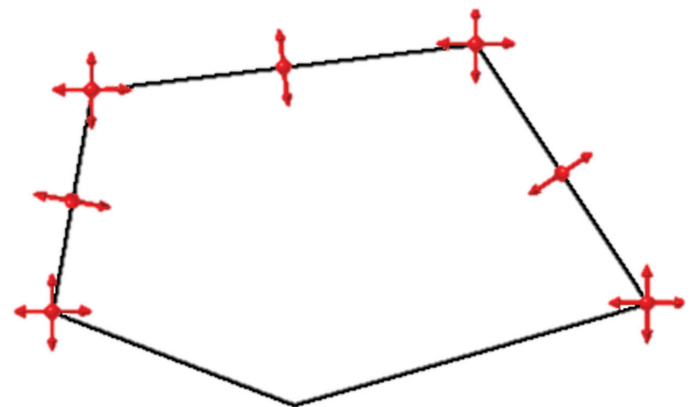

Figure 15

Figure 16

access is via the right-click menu "Show All Degrees of Freedom." The DOF symbols will update as you constrain your geometry.

Dimension Smartly

Center lines can be used to create Revolved Sketch Dimensions, which is a great way to dimension revolved parts such as Shafts.
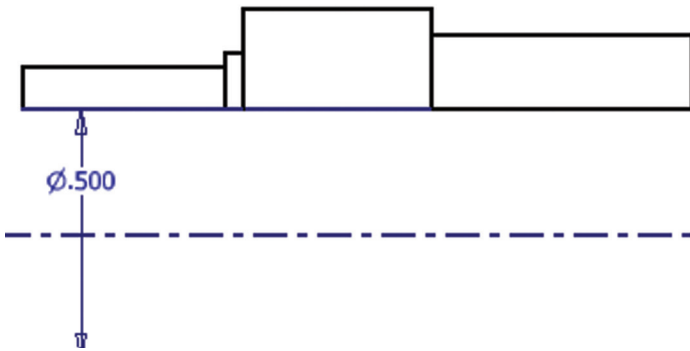

Figure 17

Figure 20

You can create tangent dimensions if you know where to pick (keep moving until you see the icon change).
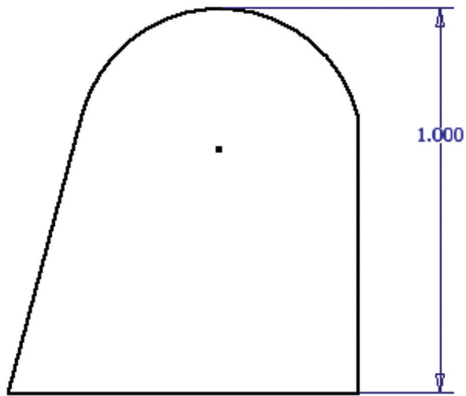

Figure 18

There are many opportunities where using rectangles, polygons, and/or offset can create the basis of hole patterns more easily, smarter, or in cases where the hole pattern is non-rectangular or non-circular.

Save a step and build more intelligence by naming your parameters on the fly.
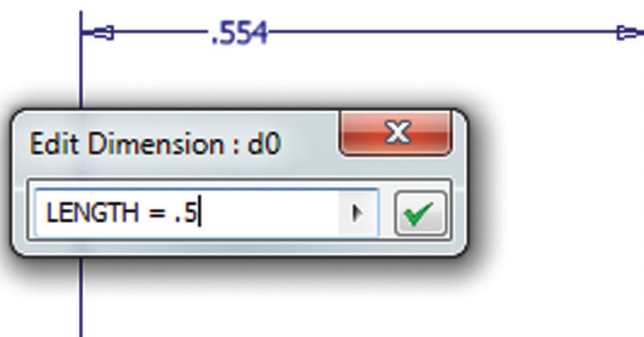

Figure 19

Figure 21

Use Sketches and Sketch Points to Build Hole Patterns

Any point in the sketch can be used as a hole center (not just hole centers) and you can quickly change points to hole centers by selecting the points and adjusting their format.
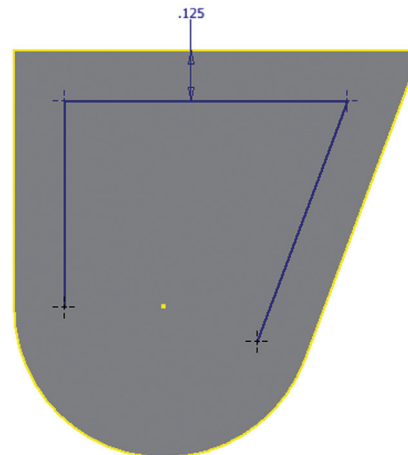
Figure 22

Figure 23

Figure 24

SKETCH BLOCKS

Similar to AutoCAD, blocks allow for the grouping of objects into a singular rigid shape. But this isn't AutoCAD. Why should I use sketch blocks?

* In some situations, especially with a lot of geometry, it is easier to move and rotate portions or the entire sketch by first grouping it as a block and completing the operation on the single block entity.
* Sketch blocks provide a great mechanism to test function before fit and form, even using the part sketch in an assembly.
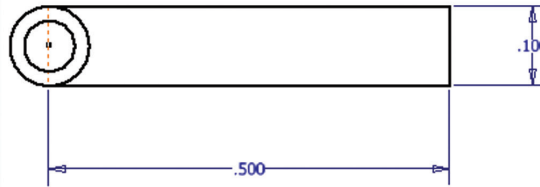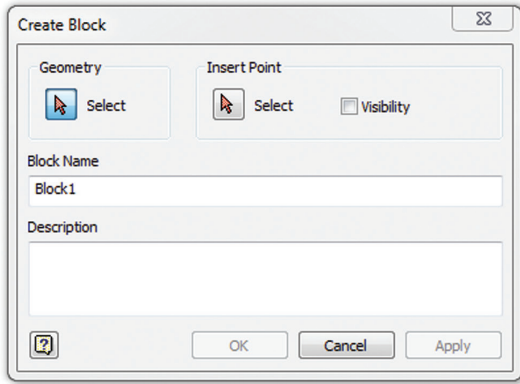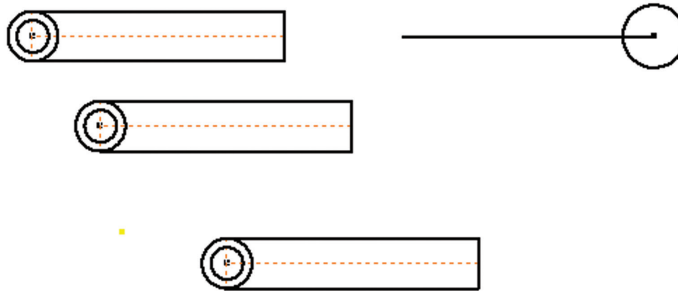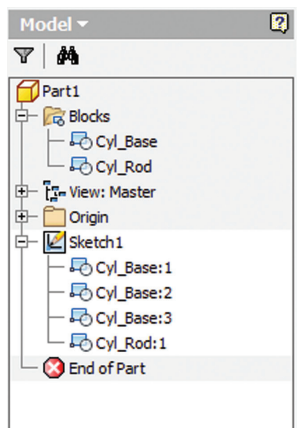* Sketch blocks are the basis for the Layout feature to generate an assembly and parts.

Creating a block with Inventor is similar to creating blocks in AutoCAD: You specify the name, objects, and insertion point. [The insertion point is the point where the block is inserted when placed into your sketch.]

Note: AutoCAD Blocks can be easily translated into Inventor Sketch Blocks as well.

The block instances will appear with the sketch, and the block definitions will be listed at the top of the browser.

Blocks can be constrained as any other 2D Sketch object using the Constraints (Horizontal, Colinear, Coincident, etc.) and Dimensions.
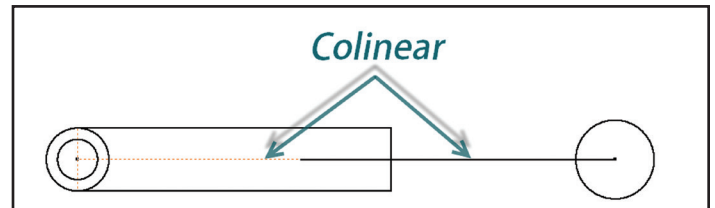
Mike Thomas was honored as the Most Distinguished Graduate from CAD/CAM Engineering Technology at SIAST, Kelsey Campus. He is a specialist in the manufacturing industry with strong knowledge on the Autodesk mechanical products supplemented with a solid understanding of document management, hardware, networking, and other Autodesk technologies. He is now the Technical Services Manager for Prairie Machine & Parts and is responsible for overseeing the engineering department's technical operations and the department's strategic technical growth. Mike recently started contributing to Design & Motion (www.designandmotion.net) and can be found on twitter (@aurbis).

Game Assets Workflow

In this tutorial, I will show you an overview of a workflow for creating game assets ready to use in the CryEngine SDK.

The main focus of the tutorial is to discuss every step required to model, unwrap, bake, texture, and export a game asset using 3ds Max® tools and CryEngine plug-ins.

Software used: 3ds Max 2014, Photoshop CC, CryEngine 3

The first step is to get the reference images required before starting to model. Get as much information about the asset you can. Sketches of your own creations are great as well.

For this tutorial I choose a plasticade type barricade asset. Now it's time to organize the process:

1. Getting References: blueprints, sketches of the model

2. Modeling Process: high poly and low poly

3. Unwrapping process

4. Baking Process: normal map

5. Texture Process: diffuse, AO, and specular

6. Exporting Process: textures, objects, and collisions

7. Testing Process: using CryEngine

3ds Max 2014

MODELING PROCESS

We are going to use two versions of our asset—the high poly version and the low poly version of the model, which is the one we are going to export.

The high poly is the detailed version of our model; the polygon count is higher. The low poly version is less detailed and has less polygon density. When we talk about game assets, we focus on the low poly version because a game engine has to render tons of objects and there is usually a polygon budget to care about if we want a scene to render at a high frame rate.

In Figure 1, we have both meshes of the same model. Remember to name the meshes to identify them properly.

Tip: Use the Viewport statistics to control the density of your low poly mesh—press Hotkey 7.
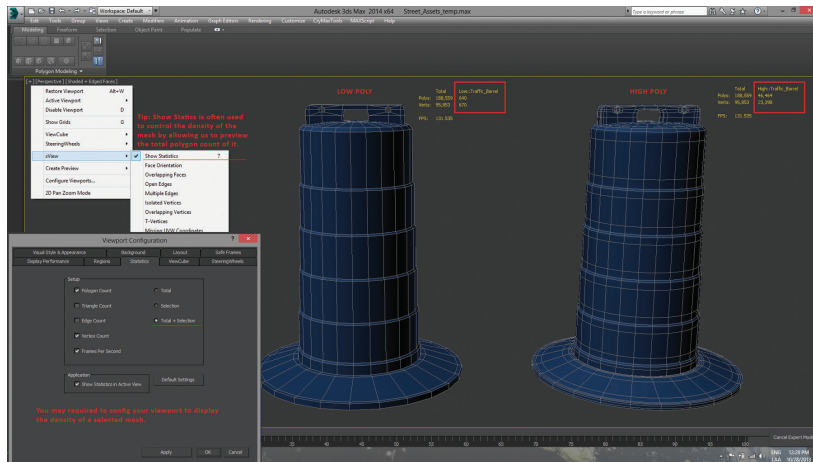

Figure 2: Unwrapping phase

Figure 1: Low poly and high poly meshes

You can see the differences in the polygon count between both meshes, the high poly mesh has better quality over the low poly, which is okay. Later we will do the normal bake over the low poly to get the details we lost.

UNWRAP PROCESS

In order to paint over the mesh, we need to unfold the seams of it—make it a decal sheet, a 2D template where we will start the painting texture process. Unwrapping a mesh can be an overwhelming task, but don't worry—once you practice the process you will be able to do it faster.

Unwrapping the low poly mesh:
1. Use a checker texture to identify stretching UVs
2. Apply UVW Unwrap Modifier
3. Unwrap

Tip: The checker texture will help you by showing where the texture is stretching and also will help with normalizing the texels.
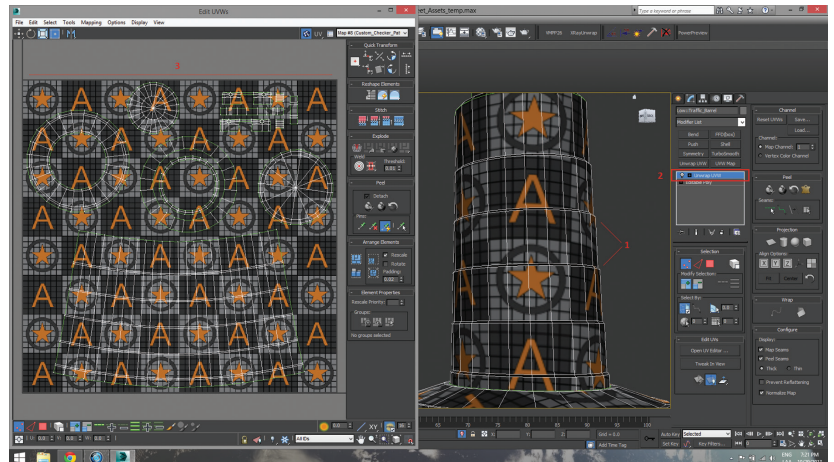
In Figure 2, you can see how the texture is finished. You can have variations of your UVs layout—just make sure it is normalized.

BAKING PROCESS

Once we have the unwrap layout and both versions of the mesh, it is time to start baking the normal. 3ds Max offers an option to allow us to bake the normal. Normal maps add the details of the high poly mesh that we missed when we created the low poly mesh.

To start the baking process in 3ds Max we need to:
1. prepare the meshes, move them, and fit them correctly.
2. Select your game model, the low poly mesh, and apply the projection modifier.
3. on the projection modifier options, under Reference Geometry, pick the High Poly Mesh.
4. adjust the cage if needed. It is required to wrap the entire model.

Tip: Sometimes it is better to reset the cage and increase the amount 0.1.
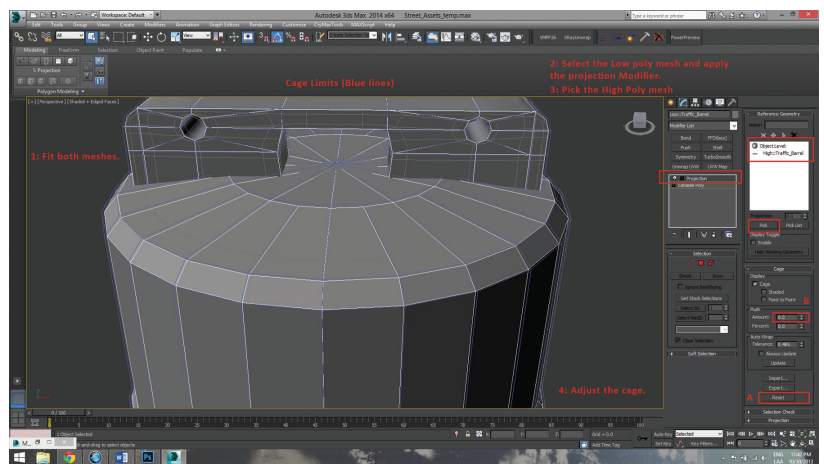

Figure 3: Baking process 01

Once you are done adjusting the cage, it is time to proceed to setting up the RenderToTexture feature.

1. Select the low poly mesh and open RenderToTexture (shortcut 0), or Rendering - RenderToTexture.
2. Select the output directory of the baked maps.
3. In Render Settings, enable Global Supersampler to Max 2.5 (see Figure 4).
4. In Projection Mapping, enable and choose projection.
5. In Projection Options, pick up the face tangent under Normal Map Space.
6. In Mapping Coordinates, SubObjects, pick up Use Existing Channel.
7. In Output, select ADD and add normalsMap and pick up the size 1024 x 1024.
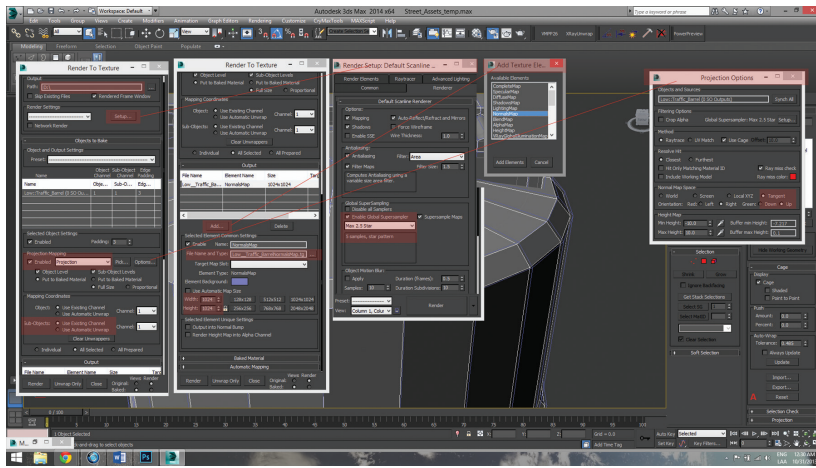8. Choose file name and type. I prefer to use TGA extensions.
9. Render.

Figure 4: Setting up RenderToTexture

Note: You can see the results in the output directory. If the render shows red color of some of the parts it means that you are required to adjust the cage because some rays are missing. The same happens if you got a wave-like effect on your normal.

When the baking is done you will have to edit the normal map using Photoshop. Just clean up any artifacts or holes produced in the baking process. Use the NVIDIA Normal Map filter plug-in in Photoshop to get more control over your normal map.

Tip: NDO plug-in for Photoshop is another great tool for enhancing your normal maps.

TEXTURE PROCESS

Diffuse, specular, and normal maps are used most often to create the game assets. Sometimes other maps such as ambient occlusion, height map, cavity map, and others are used to create more details over the model. For the purpose of this workflow, we are going to use only the diffuse, specular, and normal maps.

Use Photoshop to do the textures. Diffuse texture is the color of the object; the specular texture has the "shininess" values of the object (the more white, the more shiny). For example, metal will be whiter and normal maps that were already done "fake" the lightening of bumps, creating more details over our objects.

Save your map as .DDS or .TGA. TGA is "heavier," while .dds is more optimized; .DDS is preferable.

EXPORTING PROCESS

For exporting, we are going to use CryEngine tools for 3ds Max. At the end of this article you will find the links to download and install the tools needed in the workflow. Remember to properly name the objects, materials, and exported files.

Textures: Use Crytek shader and put the textures on each map slot of the material. Use Material sub/Object for the purpose. Material id 1 for the render mesh and material id 2 for the proxy (collisions), assign the materials id on each object corresponding to its id. Another thing to consider is to open the CryEngine before you export the materials.

Objects: Create a dummy object and move it to position 0,0,0 and attach the low poly mesh to it. Place the low poly mesh above the grid. You will have to attach the collisions to the mesh and the mesh to the dummy.
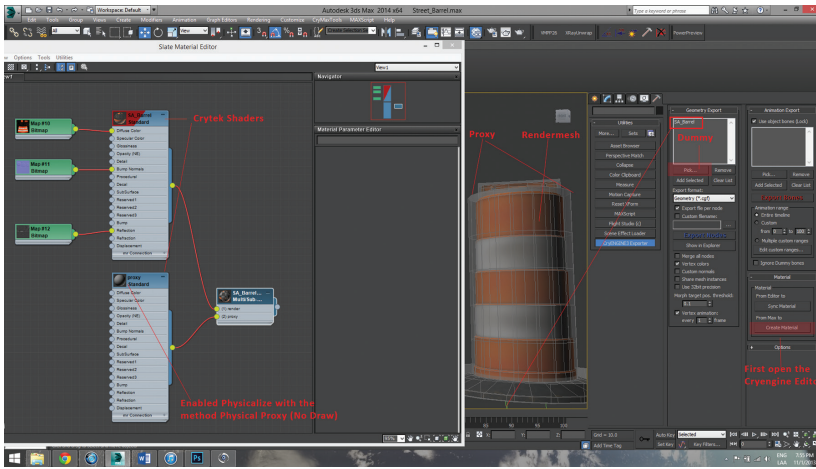
3ds Max 2014

Figure 5: Exporting process

You should see three materials slots: For "proxy" (the name of the collision material) choose shader, No draw. And in the main material (assigned to the low poly material):

- Shader: Illum
- Surface Type: The one that represents the object such as plastic or metal.
- Textures Maps: Assign your textures on each main slot of the type of map you have created.

Now, go to Brush, then place your model. You now would be able to test it.

Collisions: Create primitives to surround the low poly mesh and name as $physics_proxy_01 in incremental if you use more than one.

Tip: Use Crytiff plug-in for Photoshop to save the materials properly.

Note: It is important that you create a new folder in the gameSDK Directory.

For example:
C:\Cryengine\GameSDK\Objects\Street Assets.

Figure 6: Testing process

TESTING THE ASSET IN CRYENGINE EDITOR

Finally, open the CryEngine Editor, test it in any level, and when the level is opened press "M" to browse the materials, search for the material you just created, and configure them.
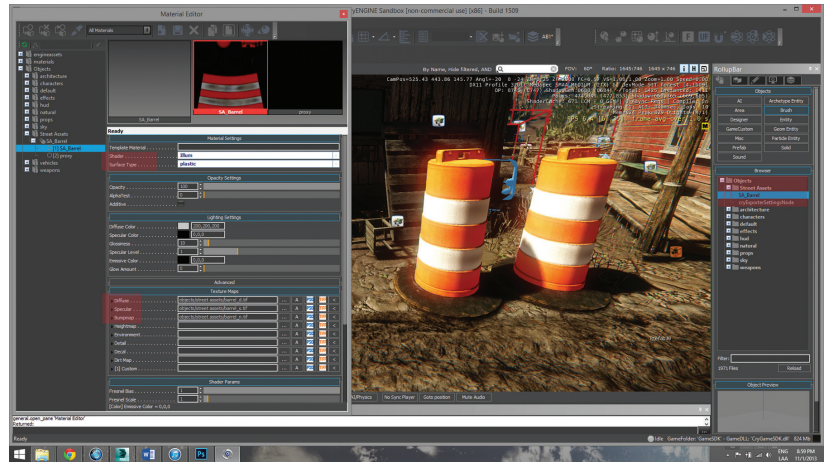
The main goal of this tutorial is to show you a workflow for creating game assets for CryEngine. Some tips and tricks appeared and I really hope you take the best from it. The link below has information of how to set up the CryEngine in 3ds Max and Photoshop. Feel free to email comments and suggestions—I'd like to hear from you.

http://freesdk.crydev.net/display/SDKDOC3/Getting+Started

Israel Uriel is a CG freelance artist from Mexico. He studied Systems Engineering at The Technological Institute of Higher Education of Monterrey. After working as a freelancer web designer, Israel dedicated his time and effort to follow his passion as a 3d artist. He is passionate about hard surfaces advanced modeling and game asset creation. Contact him at izrael_net@hotmail.com.

Linking a Revit Project for MEP

Using Autodesk® Revit® for MEP can be daunting on its own. Leveraging work sharing and file linking to fully utilize the power of Revit can make the whole process a nightmare. This article will outline some tried-and-true methods for assembling a fully linked and work shared Revit project from a MEP perspective that minimizes confusion and maximizes coordination. The short version encompasses the seven steps below. Different firms with different needs should make any necessary adjustments.

1. Clean up the architectural and structural files.
2. Use a standard startup project file that is work shared.
3. Redirect the linked the files.
4. Copy monitor the architectural linked file's levels.
5. Create views.
6. Add spaces.
7. Make sheets.

Revit MEP 2014

Figure 1

CLEAN UP ARCHITECTURAL AND STRUCTURAL FILES

To keep file sizes small and projects moving quick, it's a good idea to make a copy of the original architectural and structural Revit files and remove unneeded data from them.

Use the Open command to browse out the files. Before clicking the Open button, check the Detach from Central and Audit options (see Figure 1). This will break the connection to the original central files and also audit them for any detectable issues.

Accept the warning dialog that appears when the Audit box is checked. Choose "Detach and Preserve Worksets" if asked in the Detach Model from Central dialog.

To reduce its file size, switch to a useable floor plan view and close all hidden views. In the Project Browser, delete all view types except Floor Plan views by selecting the view and selecting Delete out of the right-click menu or by using the Delete key on the keyboard. Enlarged and dependent views should also be deleted. Use the same procedure to delete Schedules and Legends.

Review linked files and detach any unneeded Revit, CAD, DWF, or Point Clouds using the Manage Links tool in the Manage tab (Figure 2).

Delete all the sheets. Ensure that the views attached to those sheets are not inadvertently deleted if needed. Avoid selecting the views under sheets by using the minus sign to the left of the sheet name to hide the views used on the sheet.

On the Insert tab, select the Manage Links tool and remove all irrelevant links. If unsure, leave the link loaded. On the Manage tab, select Purge Unused.

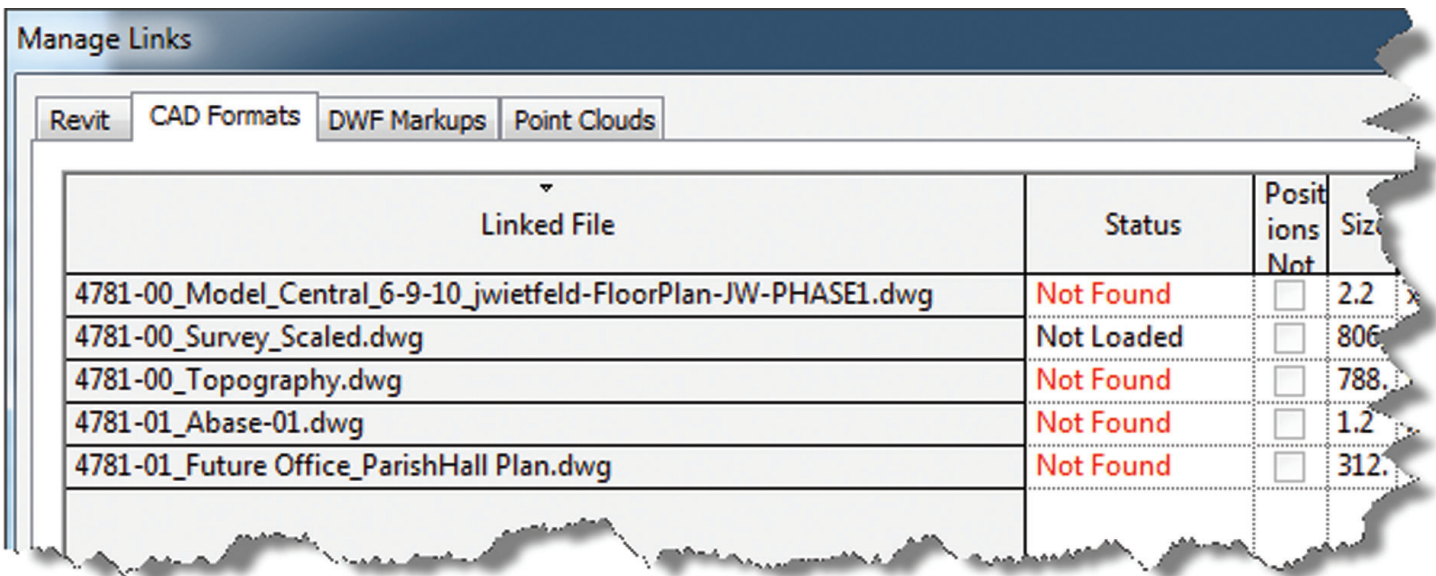Click OK in the Purge Unused dialog box to purge unused families. Repeat until there is nothing left to purge.
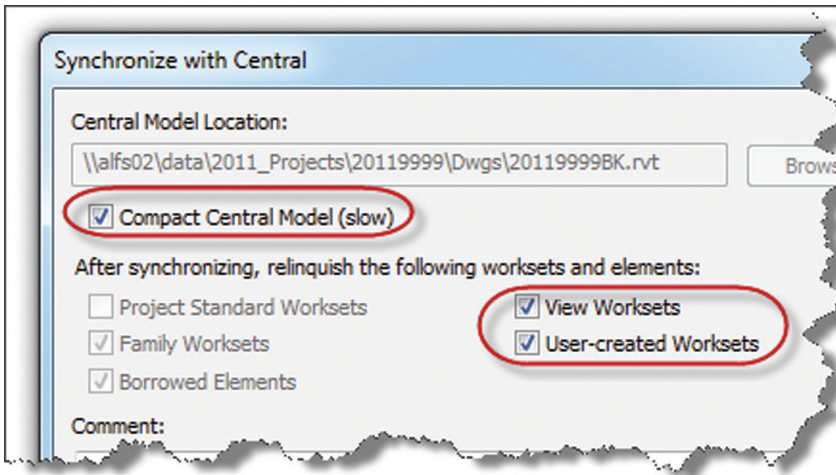

Figure 2

Figure 3

Use the Sync to Central tool to save the project; check the box to Compact Central Model, and all of the "relinquish worksets and elements" boxes possible.

STANDARD STARTUP PROJECT

In this example, a starter project is used. The starter project is created with "dummy" architectural and structural files already linked. All the standards of a template file are included in the starter project with some notable additions. Worksets are created in the starter file that will translate directly into the new MEP Revit file made from it. This keeps workset naming standard and complete every time and saves the time it takes to create worksets. View templates can be created that
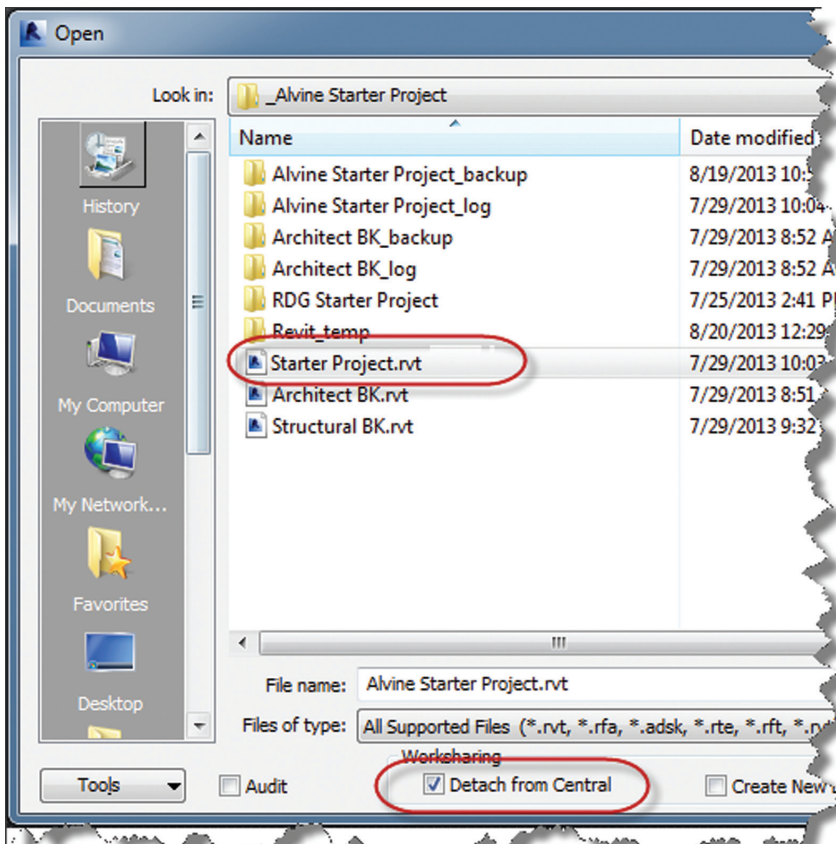

Figure 4

set workset visibility for the differing disciplines. Standard sheets can be set up including symbol legend sheets, plan sheets, and schedule sheets. Placing schedules on sheets allows for each schedule to have each column individually tweaked in a standard manner that will be consistent from job to job and user to user.

Open the starter project, making sure to detach from central (see Figure 4).

When prompted, detach and preserve worksets.

Save As to the appropriate job folder using the any standard naming convention.

REDIRECT LINKED THE FILES
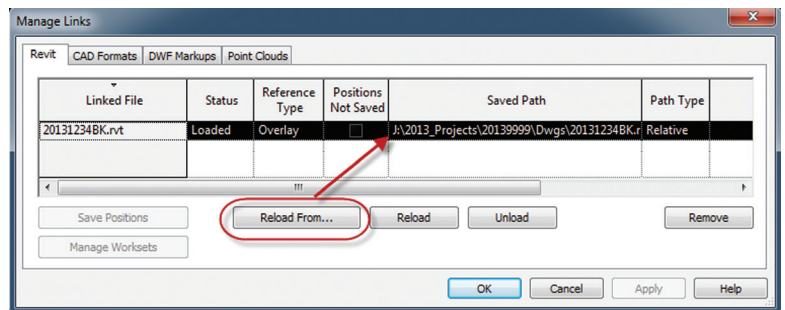Use the Manage Links tool to reload the newly created architectural and structural backgrounds.

Figure 5

COPY MONITOR LEVELS
There are a lot of things that can be copy monitored from the source architectural file, but at a minimum, the levels should be copied.

1. In the Project Browser, make an elevation view the current view.
2. Go to Collaboration tab and pick the Copy/Monitor tool, then Select Link. See image on the right.
3. Select the building model.
4. Click Copy in the ribbon. Select Multiple in the Options bar if desired.
5. Individually click on each imported level of the building model. Allow time for the Revit to process the information after each click. Accept any warnings that may appear.
6. Click Finish in the ribbon to close the Copy/Monitor menu.

CREATING VIEWS
Floor plan views should be created for each floor based on the copy/monitored levels in the architectural file. In the Properties of the floor plans views, templates can be assigned to control

Revit MEP 2014

the views, giving a consistent look in all disciplines on all sheets for the entire project. Views can be created in the "old school" fashion, but IMAGINiT makes an add-in tool that creates views based on view templates and phases. Just select the phase of views needed and the templates to create views for, and click OK.
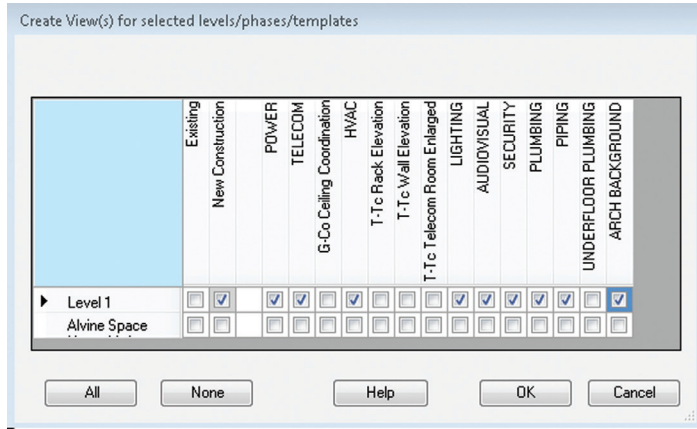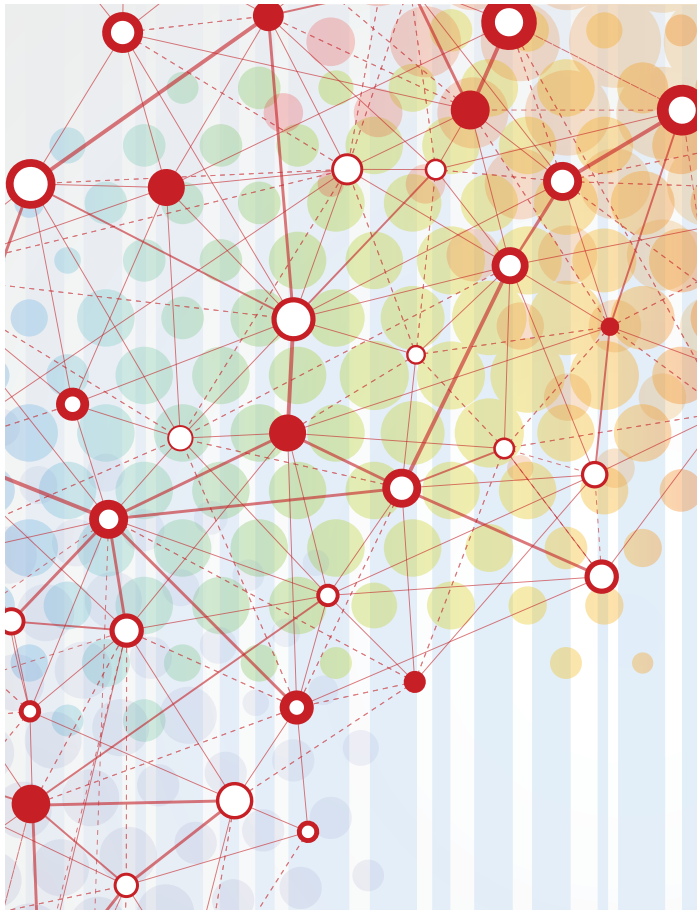

Figure 6

This handy add-in can create all the views needed for a 50-story high rise in seconds, greatly reducing the time required to set up an MEP project. There are more and more add-ins created and shared every day. Individual firms should keep an eye out for those uniquely suited to their needs.

ADDING SPACES

Room names and numbers are shown in individual views by tagging spaces in the MEPT model. Once spaces are added to the model, they can be tagged in plan or reflected ceiling plan view individually.

1. To add spaces, first select the linked BK file. In the Properties palette, click the Edit Type button then check the Room Bounding check box. This allows the architectural walls to be used as boundary objects when placing spaces.
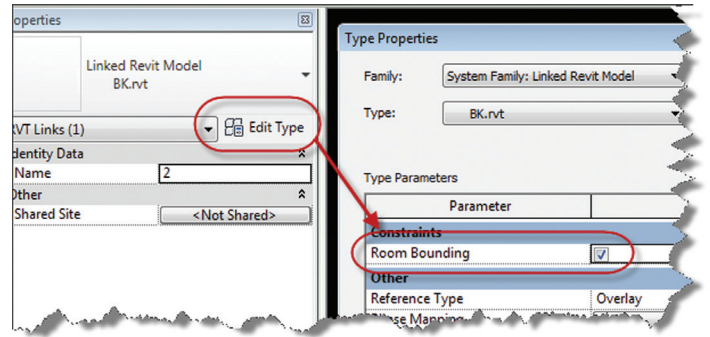

Figure 7

2. Go to the Analyze tab and select the Space tool. The ribbon shifts to the Modify | Place Space contextual tab. In this tab select the Place Spaces Automatically tool ensuring the Tag on Placement option is highlighted.
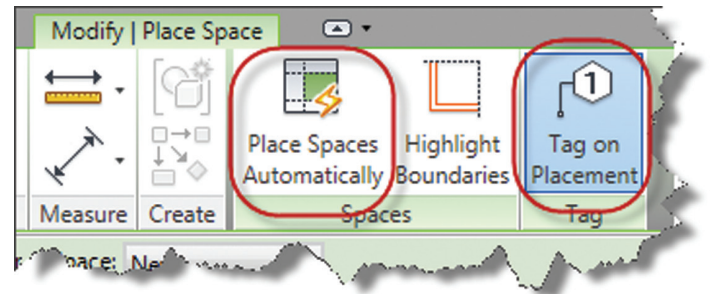

Figure 8

3. Revit will alert how many spaces were created and display any associated warnings for spaces that could not be created. Close these dialogs. The newly created room tags should be visible. If they are not, make sure Space tags are checked under the Annotations tab of the Visibility Graphics dialog.
4. There may be unoccupied spaces.
5. In all other views, use the Tag All Not Tagged tool on the Annotate tab. Select the Space Tag category and click OK to tag all the spaces per view.
6. If using the model for mechanical calculations, panel schedules, or Com Check, run the Space Naming tool on the Add-Ins tab of the ribbon after all spaces have been placed. This tool should be rerun before any calculations are performed to ensure all spaces are accounted for and accurate.
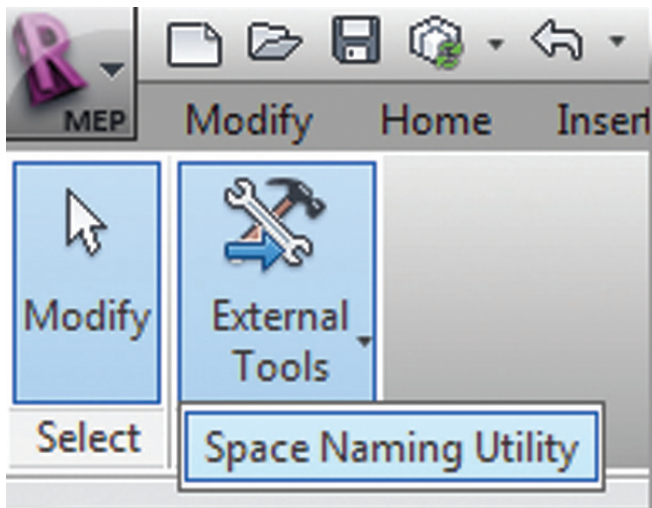
Figure 9

7. For each level, the upper limit for spaces must be changed. Select everything on a given level and use the Filter tool on the ribbon to select only the spaces.
8. In Properties, change the upper limits of the spaces to the Alvine Space Upper Limit Level.
9. Repeat steps 7 and 8 for each level with spaces.

Spaces can be used just to annotate room and give areas, but if volumes are required, there is more to do. Figure 10 shows a section through a space where the offset for the space is above the building but volumes are not being calculated.
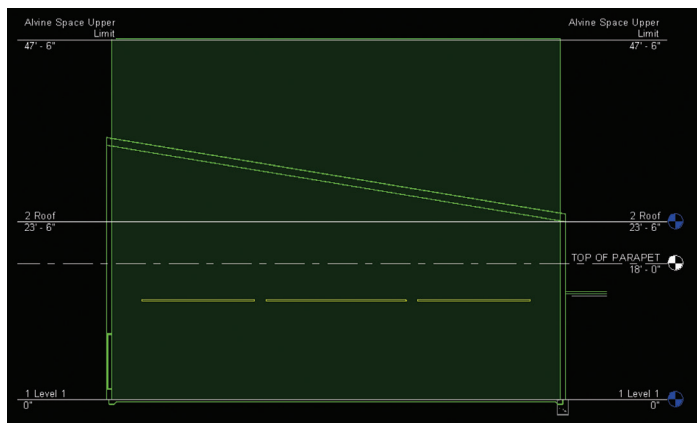

Figure 10

To ensure volumes are calculated, go to the Room panel of the Architectural tab and click the radio button next to Areas and Volumes.
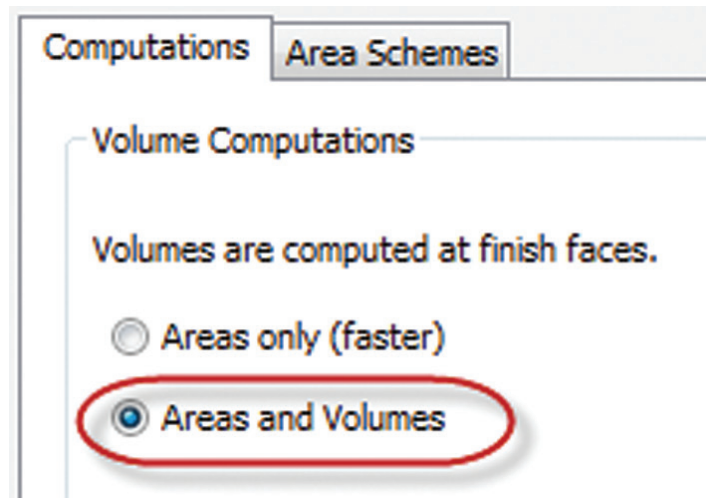

Figure 11

With areas and volumes being calculated, a section through a space is still necessary to make sure the volume generated is what is really required. Image shows a typical space where the offset has not been set to a level higher than the sloped roof.
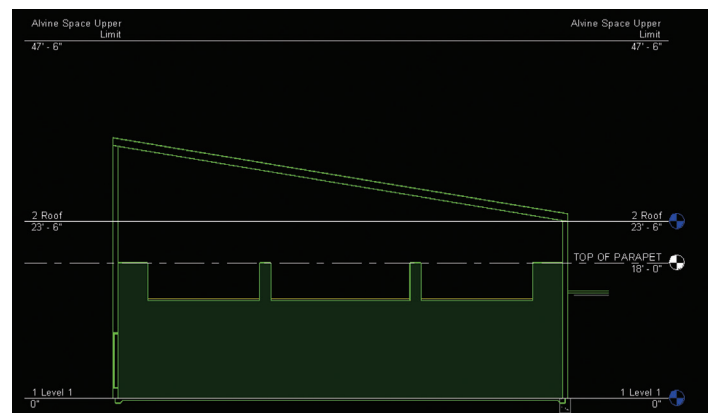

Figure 12

With areas and volumes being calculated, a section through a space is still necessary to make sure the volume generated is what is really required.

Revit MEP 2014

The image below shows another example of the space doing a great job showing the volume of the room with a notable exception. The floating ceilings in the architectural model have been set to "room bounding," which stops the space from going through the ceiling.
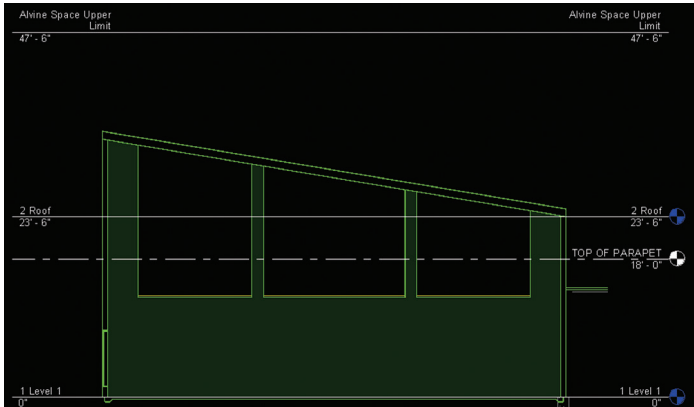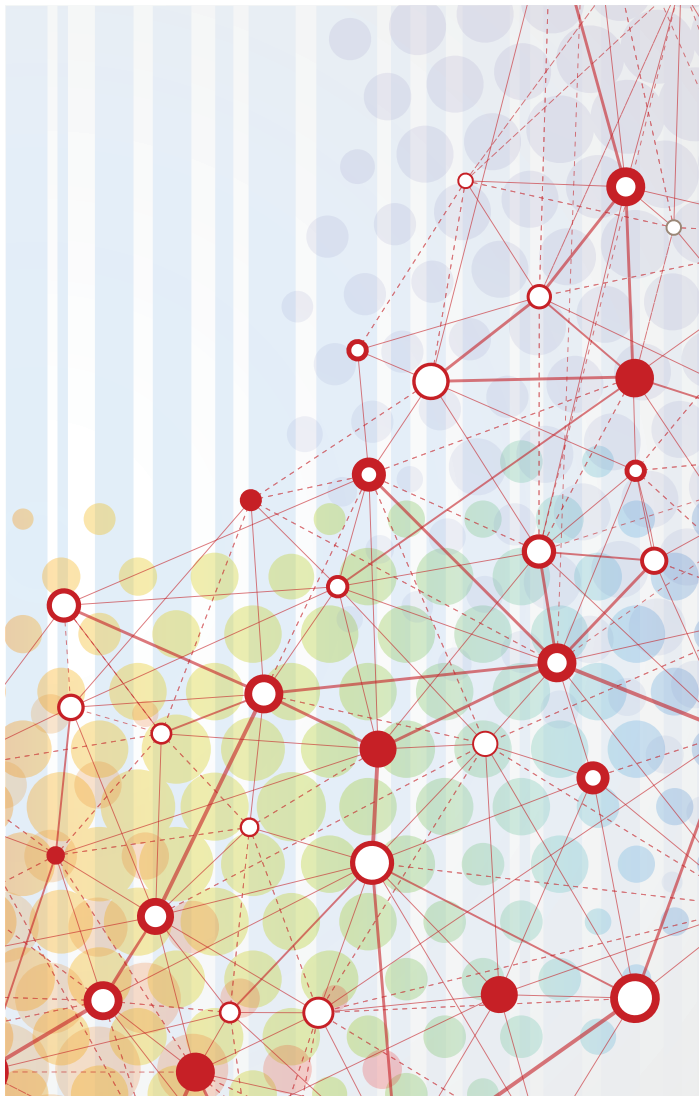

Figure 13

To solve this issue, the room bounding setting must be changed in the linked file. The upshot is to be very sure the volumes reported in the model are the volumes that are required. The adage "garbage in garbage out" applies.

MAKE SHEETS

Once a set of views is completed, the corresponding sheets should be created and cropped to accommodate all levels and disciplines. Use the Sync to Central tool to save the Central file. Check the box to "Compact Central Model," and all of the "relinquish worksets and elements" boxes possible.
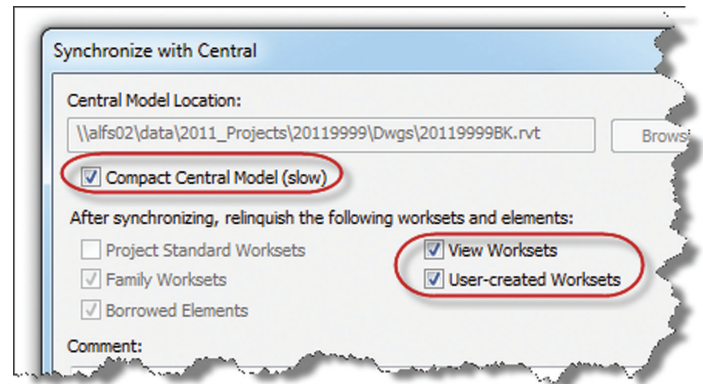

Figure 14

Close the new Central MEP file. It is ready to be worked on by all disciplines.

There are certainly more ways to set up projects and different firms will have different needs, but hopefully you will find something in this article that will augment your current process.

It is fair to say that the set up of Revit projects has evolved over the years. It is logical to assume that Revit itself will change, third-party apps will continue to be released and address new issues, and the needs of design professionals will continue to change. The real job here is to continue to evolve along with technology to keep your processes aligned with your customers' needs.

Todd Shackelford is the BIM Manager for Alvine Engineering, the Co-Director of the Central States Revit Workshop, and an instructor at the University of Nebraska. Todd writes about Revit and AutoCAD on his Blogs CAD Shack and the Lazy Drafter. A Revit 2013 Certified Expert and frequent Autodesk University speaker, tweet @ShackelfordTodd or email at tshackelford@alvine.com to contact Todd.

Autodesk CAM 360

http://bit.ly/1gnDUOK

Autodesk® CAM 360 is a CAM solution that is powered by the cloud. According to Autodesk, it is the world's first CAM in the cloud.

"The only CAM solution that combines CNC programming, simulation, and design with real-time collaboration and online project and data management in one easy-to-use product. With Autodesk® Fusion 360 modeling built right in, users will make short work of routine tasks such as model prep and defeaturing. Best of all, you'll be able to work with all the CAD formats you're familiar with; making you more productive right from the start.

CAM 360 breaks down the barriers of traditional CAD/CAM by giving users access to professional CNC programming tools to program their machining projects regardless of where their CAD data comes from or what operating system and hardware they prefer. From 2D to 3D, Autodesk® Inventor® to SolidWorks® Software, or PC to Mac – CAM 360 has you covered."

AUGIWorld brings you recent developments in Autodesk and AEC-related software items

Tally

http://bit.ly/KMzR4O

Tally™ is an application that works with Autodesk® Revit® to help analyze a whole building and quantify the environment impact of the building materials.

"Tally is a Revit application that allows architects and engineers to quantify the environmental impact of building materials for whole building analysis as well as comparative analyses of design options. While working on a Revit model, the user can define relationships between BIM elements and construction materials from the Tally database. The result is Life Cycle Assessment on demand, and an important layer of decision-making information within the same time frame, pace, and environment that building designs are generated. As a Revit application, Tally is easy to use and requires no special modeling practices."

COINS Auto-Section Box

http://bit.ly/1hBOgyv

Auto-Section Box by COINS is an add-on for Autodesk® Revit® and allows you to quickly create and manage both temporary and permanent views.

"The COINS Auto-Section Box tool gives you tremendous speed and agility over managing three-dimensional views when analyzing model areas of particular interest. It allows you to quickly create temporary and permanent views to be used for immediate interrogation of the model or for construction document deliverables. This works by allowing you to focus on the model instead of managing views or a view's properties."

In addition to the new version of the Auto-Section Box tool, COINS has released a new version of its Parameter Report tool for Autodesk Revit – http://bit.ly/KGXz1z.

"With the investigative power of the Parameter Report tool you can find, figure out, and fix—fast! Drastically reduce repetitive object parameter edits and significantly minimize time to investigate modeling issues.

Quickly view, sort, copy, and edit object parameters, instance or type, for a category or family. For example, instantly copy all, or selected, room names and numbers to space names and numbers, or change all columns in every conference room to not be room bounded. As well, visually inspect, in combination with the included Auto-Section Box, to reveal where your selections are located. For example, visually identify all walls on level one that are not referenced to a level but are unconnected."

Until next issue!

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