AUGIWorld

The Official Publication of Autodesk User Group International

February 2016

The Essentials: Advice for Beginners

Also in this issue:
- BIM for Beginners
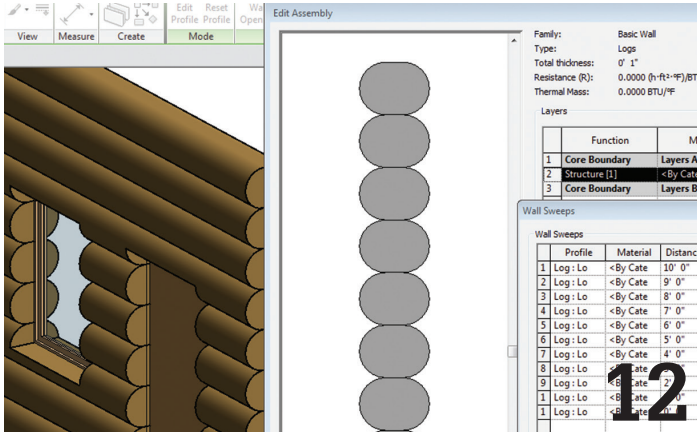- ACA Annotations
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AUGIWorld

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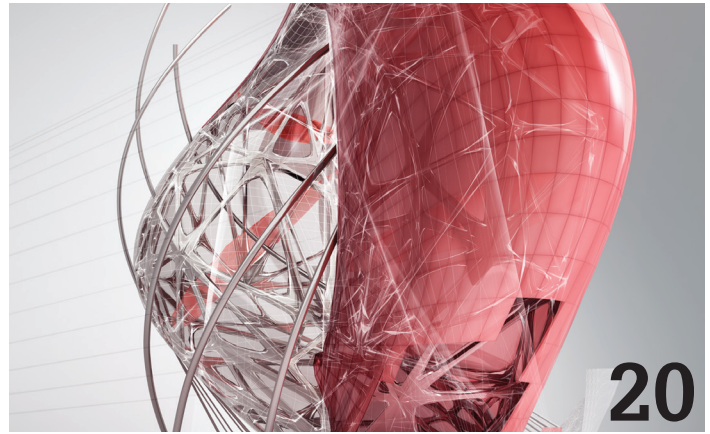
Letter from the President

A LOOK BACK AT AUTODESK UNIVERSITY 2015

Another Autodesk University has come and gone. I thought I would take a few minutes of your time and describe the event from AUGI's perspective.

There is a lot of work for AUGI that goes on behind the scenes before the event even starts. The logistics of supplying materials and setting up the booth was ably overseen by David Harrington, AUGI's Director of Operations.

Planning and preparation for AUGI's Annual General Meeting also began several months before the event. Kate Morrical, Scott Wilcox, and myself worked on various aspects (more on that later.)

Autodesk's opening main stage event started with Lynn Allen (AUGI's Sweetheart) being escorted onto the stage by a squad of Imperial Stormtroopers, setting a Star Wars theme that was evident throughout the conference. The rest of the main stage event was well-paced and inspirational. I know there are folks that skip opening keynotes, but they missed out on a great one.

AUGI hosted a luncheon to invited volunteers on the opening day to acknowledge their contributions to AUGI and to seek their input. Volunteers such as these are very important to AUGI. The directors wanted to let them know that their efforts are recognized.

The AUGI Annual General Meeting was held in a large room filled to capacity. AUGI continued the Star Wars theme by starting the meeting with an opening crawl similar to the movies. Scott worked tirelessly to create it. It introduced Lynn Allen. She talked briefly and then invited me onstage. I recognized two of our strategic partners, Autodesk and HP. I then spoke about AUGI's features. Just as I was going to start talking about the AUGI Wish List I was "interrupted" by Kate Orthographica (Morrical) running up on the stage seeking AUGI-Wan Kenobi (myself). As the dialog progressed, we were joined by Curt Linedrawer (Moreno). This skit was used to introduce the AUGI Wish List (also giving me a great excuse to buy a quality lightsaber to use during the skit!) When the skit was complete I invited Brenda Discher from Autodesk onstage to accept the entire list. The meeting concluded with the distribution of the AUGI beer glasses and the start of the AUGI Reception (formerly known as the AUGI Beer Bust) in the exhibit hall.

The conference concluded the next day with another main stage event in which a couple of Stormtroopers were in the room. At the closing party I was asked to escort the Stormtroopers for the night, thanks to my lightsaber. That lightsaber was borrowed by many of the attendees who wanted photos of themselves wielding the lightsaber against the Stormtroopers.

AU is not just about the main stage events. The classes and the networking are the real reasons to be there. If you did not get a chance to go, not all is lost. You can still access many of the classes at au.autodesk.com/au-online.

I hope to see you at Autodesk University 2016 (note, November 15-17) so start planning soon!

Until next time,

R. Robert Bell
AUGI President

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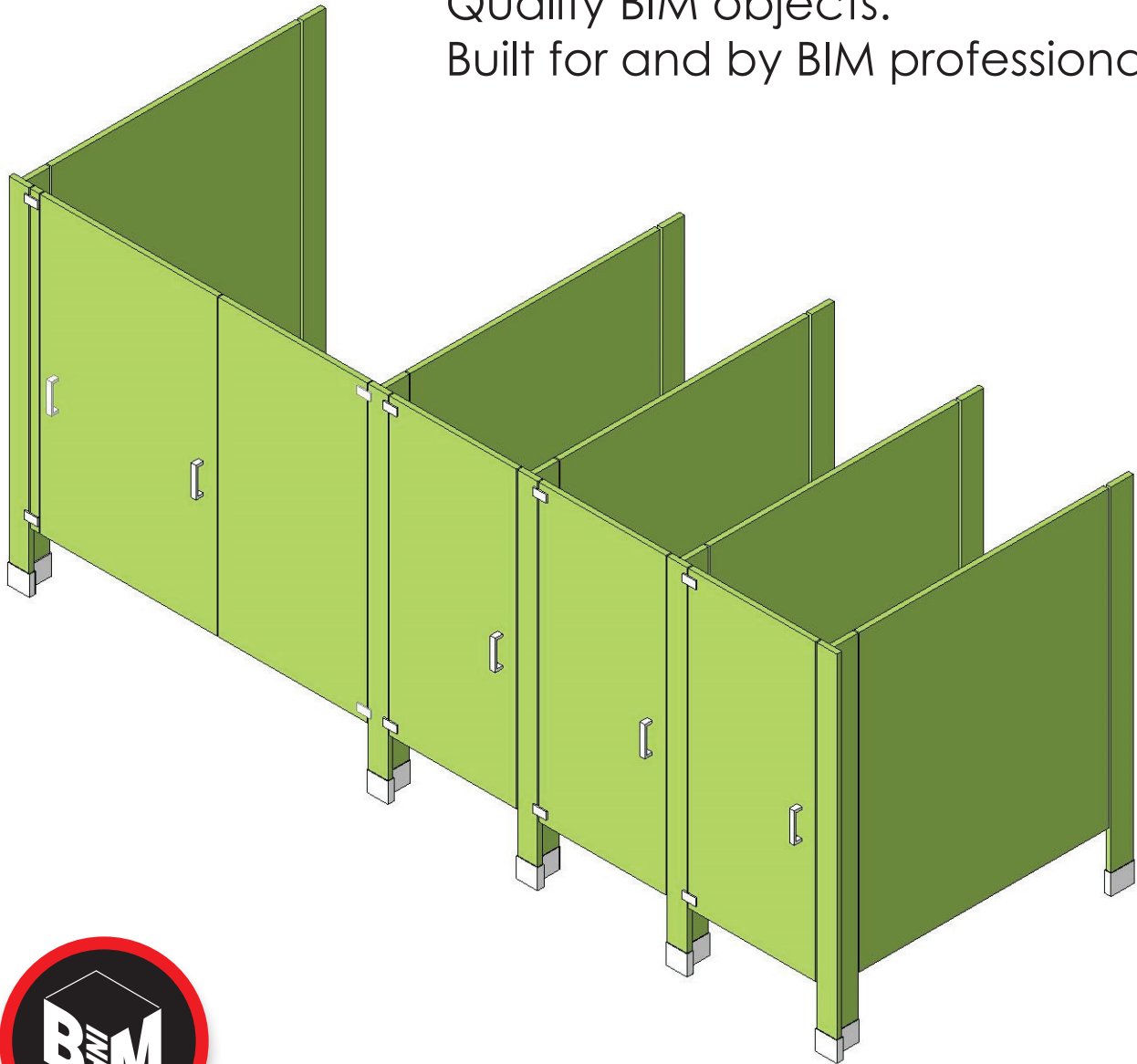
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At the Risk of Repeating Myself, Let Me Repeat That

To be an effective Tech Manager, people need to know what you are thinking, developing, standardizing, structuring, or managing. That happens via communication. I have spoken and written much on this topic. Good managers must be good communicators. When I read anything that emphasizes the need for good communication, I am further convinced that it is critical to success.

I recently read an article online by Paul Leonardi, Tsedal Neeley, and Elizabeth Gerber, titled "How Managers Use Multiple Media: Discrepant Events, Power, and Timing in Redundant Communication." This article states, "Several recent studies have found that managers engage in redundant communication; that is, they send the same message to the same recipient sequentially through two or more unique media." I have found that to be true; in fact, I find that when I interact with higher levels of leadership and management, I hear the same message many times over many conversations and through many kinds of media. Then I looked back and noticed that I do the same thing. I tell the same story, deliver the same message, and transfer the same data many times in many ways.

But the article did not stop there. What the authors found when they dug deeply into the data and compared statistics between managers with positional power and those without is where my take away came from. Positional power is the "formal authority associated with holders of a particular position" i.e., The Boss.

THE RESEARCH – MEDIA PAIRING, MESSAGE DELIVERY, TIMING, AND REDUNDANCY

The authors' research and review of prior studies uncovered two types of communications that entail multiple media methods.

They call it Media Pairing—the method of using differing tech and non-tech tools to get the message delivered.

The first is synchronous pairing, which is two or more media employed at the same time. A typical synced pairing is being on the phone in a conference call and connecting to others via a back channel such as desktop chat, texting, or Google Hangouts. While the call is in progress you are checking the reactions of others, fact-checking statements made, or joking around with sarcastic remarks about the speaker. All at the same time. There is much research on this type of pairing and how it distracts or undermines good communication by slicing up the focus of the manager.

The second type of Media Pairing is sequential pairing. This is the one the authors focus on, while admitting they spent less time studying this pairing. Sequential pairing happens much more often than synchronous pairing. A typical sequential paring is the use of one media followed by another. It might be a face-to-face conversation followed by a summarizing email or a text followed by a phone call.

They further classify communications by dividing it between instant and delayed messages. Instant are real-time tools such as IM, group chat, face-to-face, and phone. Delayed is email, texting, voice mail, forum postings, etc.

The unique nature of their research was to see how these sequential pairing methods of instant and delayed communications are used by managers. Further they looked at managers who had positional power and those who did not. Positional power is "formal authority associated with holders of a particular position" (did I just repeat myself?). Bosses can tell you what to do because you work for them or are below them in the org chart. Non-positional power stems from persuasion (we work together, but I am not your boss). Tech managers live in the world of non-positional power most of the

time. They have to get things done while working through and with people who do not directly report to them.

The researchers further narrowed their analysis to redundant communication methods used when disruptive anomalies (they call them "discrepant events") were introduced into the workflow. These events include project delays, broken equipment, do-over processes that failed the first time through, departure of key team players, etc. Items like these tend to make projects go awry and miss deadlines.

All that being said, here is their question. "How do discrepant events, power, and communication timing affect the use of redundant communications?"

WHAT THEY FOUND

The authors found that managers with positional power responded to disruptive anomalies in workflow with delayed single media messages, then with unplanned, multiple, instant, redundant messages. Managers with no positional power responded with planned, multiple, instant, redundant messages followed up by redundant delayed messages. To put it another way, the bosses expected their orders to be followed, so they gave orders, often delayed and indirect. When the orders were not followed, they communicated multiple times directly with staff. "Do this," then later… "Do this now," then even later… "Don't do that—do this."

Those managers who were not the boss communicated with team members via single instant "requests" or negotiations, followed by planned redundant messages. They talked first and then documented the agreed upon plan to the point of being redundant. They document what they have already said. They document the agreed upon process or conclusion of the "buy in" discussion they have just completed via many delayed media such as email, texts, project timelines, charts, etc.

Managers with power tend to give directives and then follow up with motivation (often negative). Managers without power, like most of us in tech management positions, tend to motivate and persuade, followed up with redundant documentation of the planned direction.

The findings show that 21 percent of messages sent by managers without power are redundant. Only 12 percent of messages from managers with power display redundancy. Managers without power must remind and persuade. Managers with positional power expect to tell people once and be done with it. Tech managers usually do not have positional power over those they work with. They need to get things done through people with whom they have no positional clout. To do this, they need to communicate well. To do this they get better results when they are redundant in their communications.

DIDN'T I JUST SAY THAT?

So my takeaway after reading the article is that repeating yourself is not bad; it is actually good. Most managers know that, but do we actually plan on repeating ourselves? Moving from instant

TECH MANAGER – A NEW TITLE
I have started using the term Tech Manager. I use this as an all inclusive title for CAD, BIM, CAM, CAFM, 3D Design, Makers, and so many other manager titles. I think the term "tech manager" embodies the breadth of duties and responsibilities that have grown past CAD, embraced BIM, and fully encompass design, production, manufacturing, fabrication, and management using Autodesk and other technical design tools. The areas of influence and impact for this position often bleed into all areas of technology use within a firm. It includes skills and talents on the technical side, the art of management, the coordination of production, the guiding of projects, and the oversight of people.

communication to delayed communication methods is better when working with folks who do not report directly to you. Garnering support and ensuring positive team momentum are key ingredients in the world where tech managers live every day. By using direct, sequential, instant communication methods and tools first, followed by planned indirect, delayed communication to document the agreed upon approaches, your chances of keeping things running smoothly are increased.

So plan on giving the same message via multiple venues and media. Send it in an email, post it on a forum, stick it into weekly updates, add it to the standard meetings, write it in a newsletter… whatever it takes. You are more effective when you repeat yourself.

Tech managers usually do not have the power to just order people around. This study shows that it is more effective for managers without positional power to talk with people first, using their persuasion and negotiation skills to define direction and provide motivation. Then to move to redundant communication methods such as email and reminders to document the agreed direction and keep momentum and focus going. Repeat as needed. As Yogi Berra said, "It's like Déjà vu, all over again."

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.

by: Jerad Meidinger

PRODUCT FOCUS

Two-Click Coordination
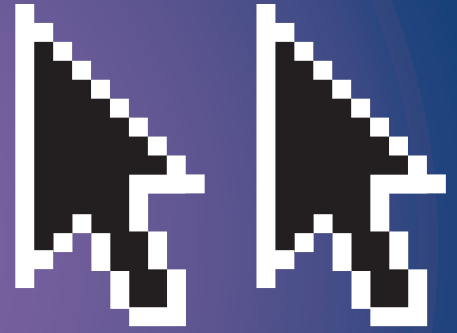
Imagine the increased amount of coordination that could be accomplished if the coordination procedure consisted of two mouse clicks followed by visual inspection of each sheet. Could it really be that simple? Pinch yourself—you're not dreaming. This is actually possible with just an extra ounce of setup effort or post-start effort!

This article shows the "behind-the-scenes" procedure that can empower any Autodesk® Revit® user (expert or novice) to visually coordinate Revit model elements without this Revit user needing to add views or tinker with the visibility/graphics dialog box. This procedure can be done in the comfort of the view where the user is primarily displaying information. The impact on model size is negligible, and the procedure has a very low technical difficulty.

THE POWERFUL POTENTIAL

Here is an example of the electrical power plan displaying all mechanical and plumbing in the power floor plan with two clicks:

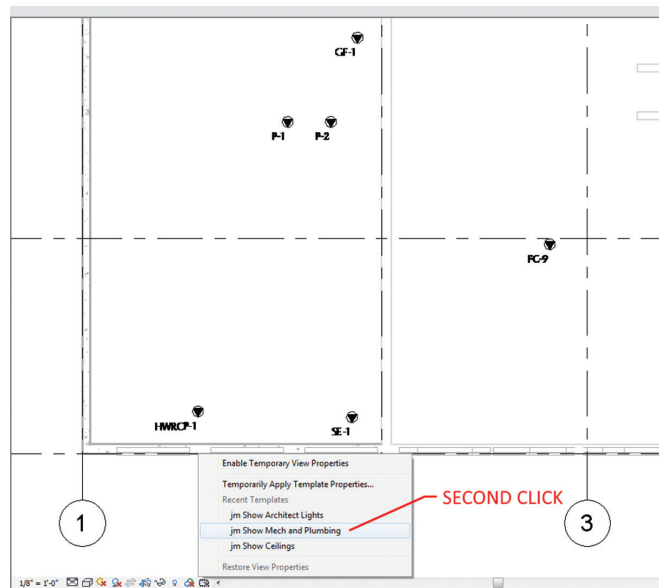*Figure 1: First click and initial view showing power connections*

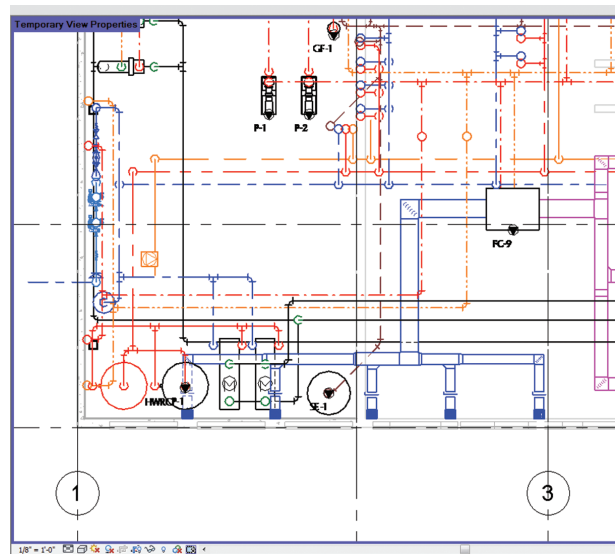*Figure 2: Second click. Buckle up or be prepared to jump for joy*

Figure 3: Results of second click. Displaying mechanical and plumbing temporarily in the power floor plan

PROCEDURE FOR PROJECT SETUP

While the procedure above is very simple, getting to that point of simplicity requires a little bit of extra work after the project has been set up. This procedure can be utilized in existing projects, using the same procedures shown. The following paragraphs outline the procedure, which could be implemented into any basic project setup that the company may already have in place.

The first thing to know about the project setup is that it utilizes view templates. If the company's Revit designers are not comfortable with view templates, this is perfectly okay! The only person who needs to be comfortable with the view templates is the person setting up the project, and if he or she sets up Revit projects, this person probably already knows and utilizes view templates extensively.

The first piece of information to gather is to find out what the users need to coordinate. Experienced designers will know what coordination items will be important down the road, but newer designers may not know the answers quite yet. Good questions to ask the designers include:

1. What items do light fixtures need to coordinate with?
2. What does mechanical ductwork need to coordinate with?
3. Does mechanical piping need to see where electrical equipment is located?
4. Are there any cross-discipline items that would be useful for designers to have quick access to while designing?
5. How do design elements in one discipline affect other disciplines? Whose design takes priority?

Once this is understood, devise a plan for how many view templates this will require and which model(s) need to have it. If possible, it can be beneficial to combine a few coordination items into one view template. This can reduce the size of the list users must navigate through, making for a more pleasant user experience. The example shown at the start of the article can be used when electrical designers need to coordinate the physical location of mechanical equipment locations that need electricity. The next example will show how light fixtures from the electrical model can be coordinated with diffusers from the mechanical model. A similar procedure can be done for any other coordination items; over time, these will reveal themselves.

This procedure is best done after all links for a project have been received and linked into the model. Worksets should already be created in the working model and filters (if any) should already

be created and placed wherever deemed necessary. If these are not already set up, the view templates may need to be revisited once again at a later time and readjusted.

1. Click the Temporary View Properties button, and select Enable Temporary View Properties.
   + Note: The Temporary View Properties button is located in the bottom of the Revit window, near the Scroll Left button – see Figure 4.
   + There will be a purple border surrounding the view that indicates that temporary view properties are enabled.

2. Open the Visibility/Graphics dialog box and modify the visibility graphics until the items to be coordinated are shown.
   + Note: This is a good time to solicit help from the company's most experienced Revit personnel as this is the most time-consuming process for this procedure. Every company sets up projects differently, so the difficulty and time will vary from company to company.

3. Once the view has the coordination items showing simultaneously, save these view properties as a new view template.
   + (View Ribbon -> View Templates Dropdown -> Create Template from Current View).
   + Pick a meaningful name that gives a good description, such as "jm Show Mechanical Diffusers."
   + Note: Prefacing the view template with initials of the originator can help direct questions to the right person if any arise. It can also psychologically stop well-intentioned users from messing with the template.

4. Once the name has been decided on, a dialog box will then pop up that has an "Include" column. Uncheck all of these checkboxes except the ones necessary for the proper display (potentially Worksets, Filters, Model Categories, and Links) – see Figure 5.

5. For the Discipline parameter, change to Coordination, but leave the Include column unchecked. Note: This will allow users to easily filter to coordination-oriented view templates.

6. Once the included columns are toned down to the necessities and the Discipline parameter is set to Coordination, press the OK button.
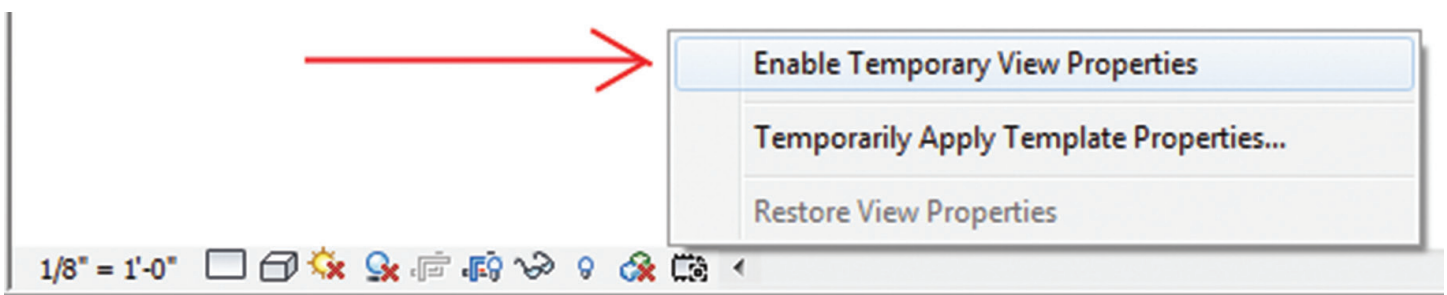

Figure 4 – Enabling Temporary View Properties

7. Remove the temporary view properties from the view in place and ensure that the view looks how it was originally shown. Note: Use the Temporary View Properties button located in the bottom of the Revit window, near the Scroll Left button.

TESTING THE NEW VIEW TEMPLATE

Once everything is back to its original state, it is time to test the procedure to make sure it works properly for users. If everything was done properly, this new view template should make it possible to quickly display the coordination items.

To do the testing, utilize the procedures outlined in the next two sections. If everything works properly, the desired coordination items will show. The following two sections can also be useful as guides for new users.

INITIAL PROCEDURE FOR REVIT PRODUCTION STAFF

This section outlines the initial procedure, followed by the simpler procedure for future coordination efforts. Once the model has been set up properly this procedure allows the coordination to happen.

1. Click the Temporary View Properties button, and select Temporarily Apply Template Properties…
   - Note: The Temporary View Properties button is located in the bottom of the Revit window, near the Scroll Left button – see Figure 6.

2. After the window pops up, change the Discipline Filter to Coordination.

3. Choose the View Template that has been set up for coordinating the desired items.

4. Press OK.
   - Note: The border around the view will change colors, indicating that temporary view properties are enabled. The top-left corner will also display "Temporary View Properties."

5. Once coordination has been completed, turn off the Temporary View Properties via the button that enabled the
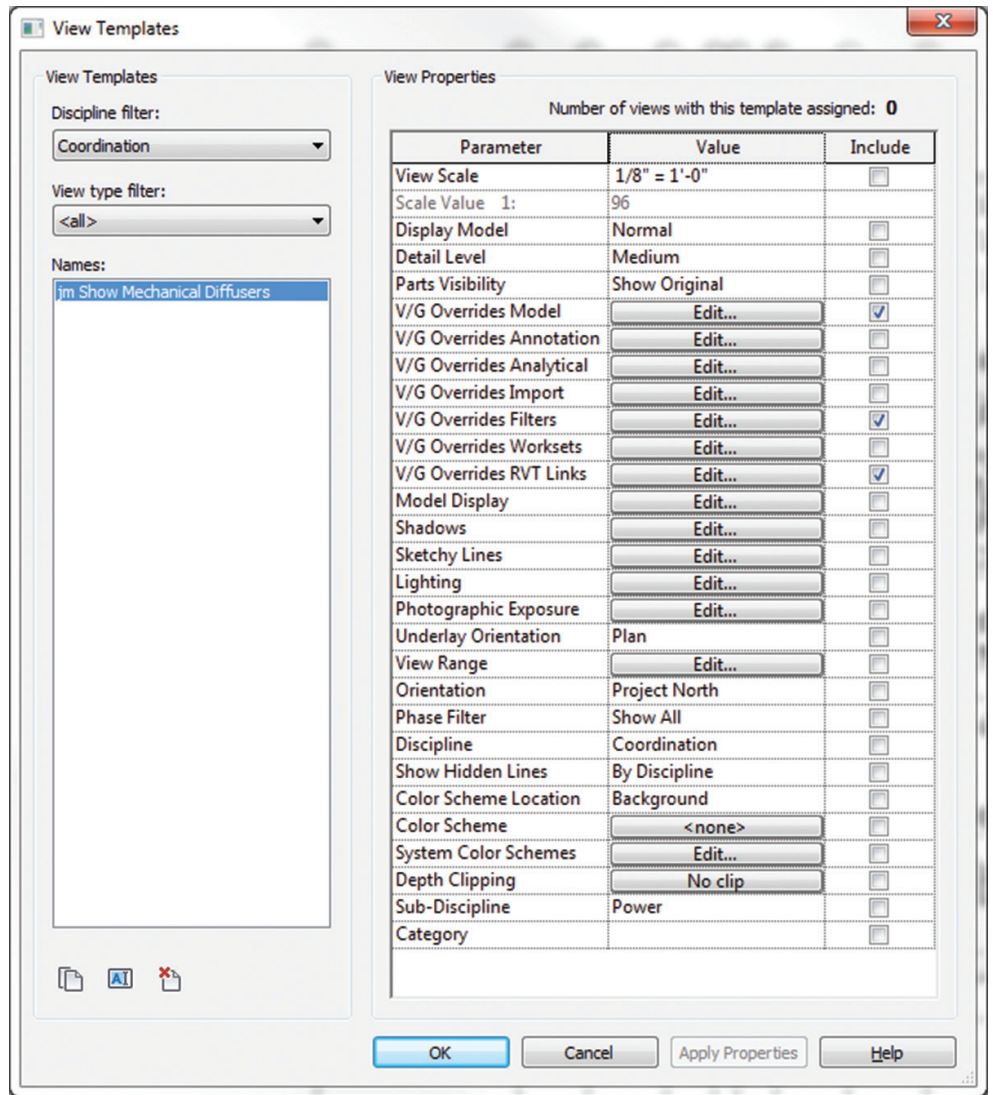
Figure 5: Uncheck the unnecessary options from the "Include" column
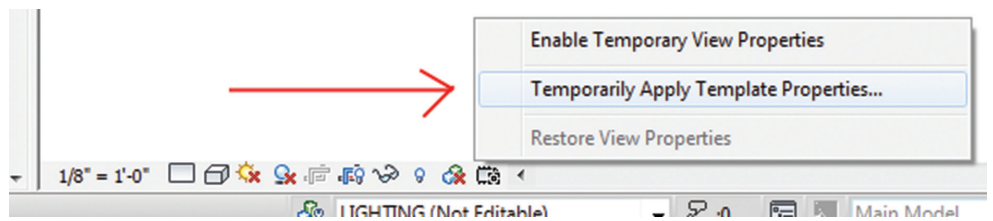
Figure 6: Click on Temporarily Apply Template Properties…

temporary properties originally.
   - Note: Because these view properties are temporary by nature, the user can forget to do this step and not cause any model problems. This can help bring peace of mind to both the end user and the BIM manager on the project.

SUBSEQUENT PROCEDURE FOR REVIT PRODUCTION STAFF

That was a little more than two clicks, but the great part about using this procedure is that next time the user does this, he or she can get there with merely two mouse clicks. Revit automatically
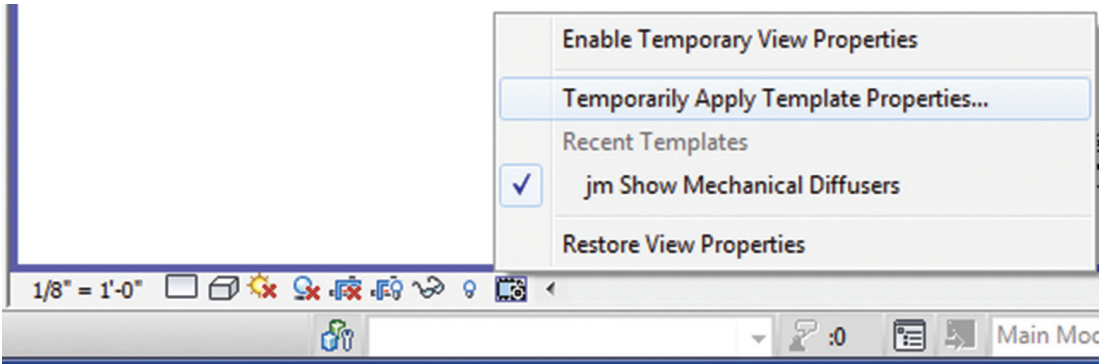
Figure 7: Recent view template properties are automatically added by Revit

Figure 8: Example of lighting plan that has used temporary view templates to show diffusers

Educating users can be as simple as printing the pages of this article and fielding questions as users read and walk through the process. As one of the author's first work-release coworkers said, "Work Smarter, Not Harder," as he was loading the lemonade container onto a push-cart destined for the conference room. (Author was hand-carrying the water container to the conference room.)

CONCLUSION

With proper experience and user input, it is possible to set up a project for more successful coordination across disciplines. As the company's Revit production staff becomes comfortable with this method, chances are they will like it and request more items for coordination. As the coordination view templates begin to grow, coordination efforts become simpler and better-coordinated drawings can be produced quickly.

Another highlight of this method comes from the fact that it was done using view templates. These templates can be easily reused in future projects via the Transfer Project Standards button in the Manage tab of the ribbon. There may still be the need for some minor tweaks, but naming and model categories will already be complete.

populates a "Recent Templates" list local to each user's machine for each project. The new procedure for subsequent coordination becomes:

1. Click the Temporary View Properties button, and select the proper view template from the Recent Templates list.

2. Once coordination has been completed, turn off the Temporary View Properties.

As one can see, it is a much easier process the second time around, as the procedure requires only two clicks of the mouse. What a fabulous incentive for users to do coordination this way!

It now merely becomes an educational activity to show users how to use the newly implemented coordination technique, and fortunately, this has already been written up for reuse in the early sections of this article.

If this has sparked anyone into a grassroots effort for utilizing this method at the office, clothing assistance can be found at jeradical.com/viewtemplates.html.

Jerad Meidinger is an Electrical Engineer and Revit MEP Certified Professional. His email address is jerad@jeradical.com.

Don't Over Kick the Revit Coverage
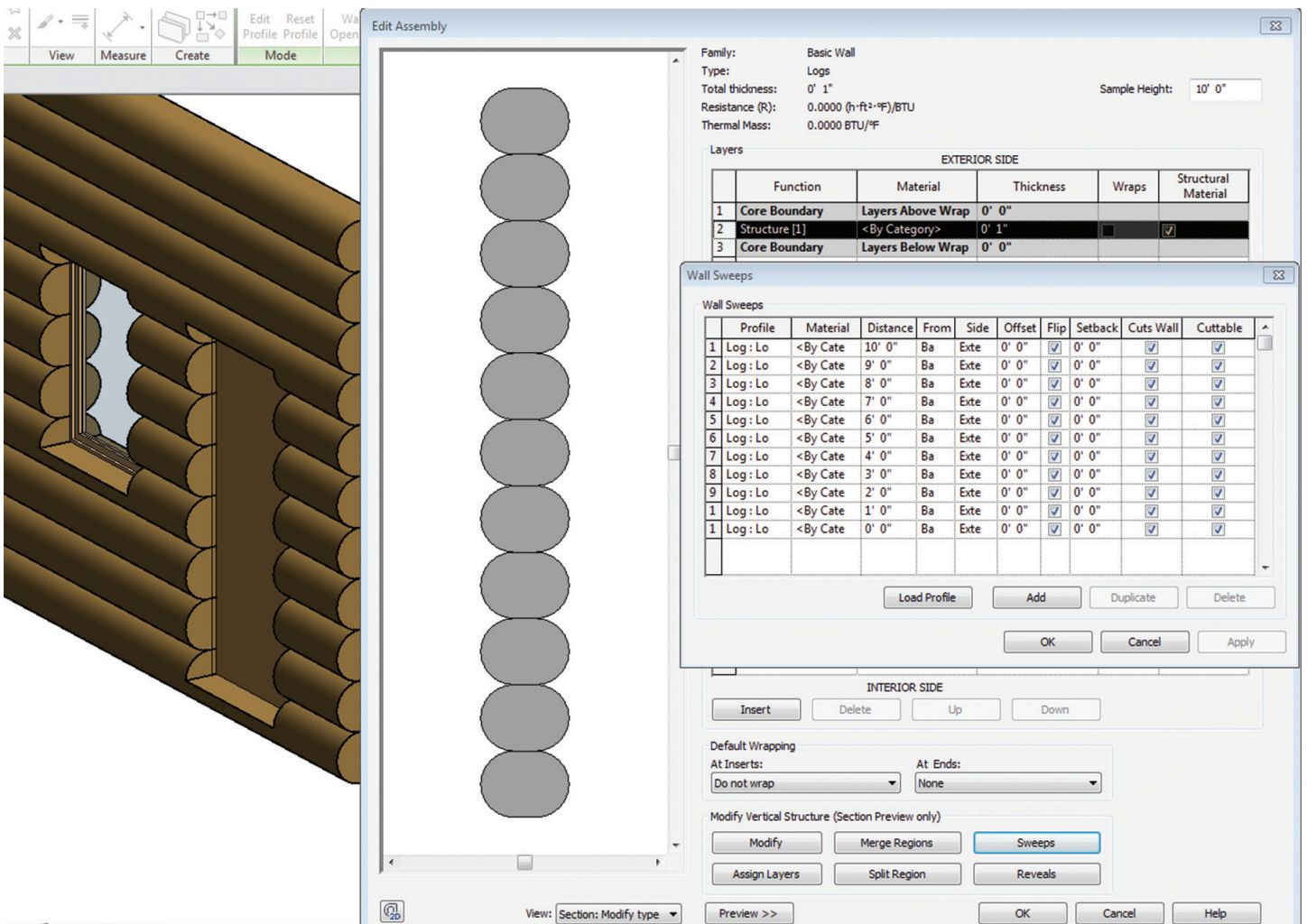
The simple solutions, especially if you aren't aware of them, are often the best—no matter their complexity!

First off let me expand on a piece of advice I try to live with:

Until the impossible time when we know everything, let alone "remember" everything in software X (Revit in this case) we need to keep our egos in check by not assuming or thinking that we know the best possible course to take. Even if that course worked in the past, there may still be new methods that are better, so keep an open mind and challenge even your own methods to see if further refinement and excellence can be achieved.

Keep a sense that you will learn something new and that it's possible at any moment. Keep in mind that there is always something new to learn. Even for the "experts" (me included), this is a fight every day—using my supposed knowledge to function while keeping, always keeping, a view to the unknowns that repeatedly seem just out of sight… until they are realized ;)

If we think we know something, it is quite likely we are misrepresenting the facts with our beliefs and/or perceptions, which is too often a very tenuous foundation. If you do some reading on the Dunning-Kruger Effect you may find some pathways open to evaluating oneself and others.

Socrates, Einstein, Hitchens, and so many other normal and amazing people have kept a sense of unending growth and exploration of ideas. Unless we are greater than our greatest minds throughout all of history (and we are not), just back off from thinking we know anything, let alone everything. Philosophy 101, humility and reason!

I was dropping in on RevitForum.org a while back, as I am wont to do, and saw a post asking how to build a log building. I have seen many methods out there and yet I have never seen perhaps the simplest one, but does that mean it doesn't exist "out there"? No—it is just that I never saw one. So here's my solution that may be (read as: IS) often overlooked in Revit.

To create log walls, use Embedded Wall Sweeps! This will work beautifully in many, if not most, log cases.

EMBEDDED WALL SWEEPS

1. Make a profile
   - Save the profile ;)
   - Load the Profile (Really Jay? Well, yeah… into a project as well… lol ;)

> Keep a sense that you will learn something new and that it's possible at any moment. Keep in mind that there is always something new to learn.

2. Edit/Duplicate a Wall family
   - Set the wall thickness (to the flat part of the joints?)
     - This is where one's geometry may need to be planned (As in: YES, PLAN THIS OUT!)
3. Set the embedded wall sweeps to the proper heights and offsets
   - Notice the quick example I created would (probably) like to have its top and bottom sweeps to be different, depending on the design (Remember: PLAN THIS OUT!)
4. Hit Apply to see the preview (Use Section if you haven't stumbled onto that yet)
5. Hit "OK" until you are back in the project (Yes, an "OK and COMPLETE" button would STILL be useful in many Revit editing dialogs. Hear us, Dev Team?)
6. Use the walls :D

As my posting/reply in the forum said, this works unless the walls want to mitre. If that's the need, then either apply Wall Sweeps (or similar) to a flat wall or use a void to cut the ends off of these.

Enjoy, and consider that the simplest solution is often the best policy when it comes to workflows. Just be aware that this does not infer how complex a solution may or may not be—just that it's the most effective (in this conversation: simplest) solution and is employed to maximize outcomes.

Architecture | Technology | Creativity
These are Jay B. Zallan's professional passions: an intense and well experienced Virtual Design and Construction BIM Leader; Designer; Artist and an AEC technologist. As an AECO leader, Jay brings unique and proven insights into business and creative processes, focusing on large project realization and large team collaboration with direction toward shared goals. He brings strategies leveraging technologies: both human and otherwise; building teamwork toward efficient project execution and delivery. With more than 20 years of AECO experience, Jay enjoys a varied and diverse portfolio of Architecture and Art. He is an Autodesk Expert Elite member, President of the Los Angeles Revit Users Group, AUGIWorld magazine Revit Architecture Editor, and a member of Graphic Standards' BIM Advisory Board. Jay's speaking and presenting experience includes several engagements at Autodesk University, RTCNA, RTCEUR as well as a lecturer on Creativity and Architecture at the University of Southern California, Cal Poly, LACMA, as well as various AIA and CSI events.

PRODUCT FOCUS

What Makes Revit Structure Different

I have two young boys, 4 and 2, and I love watching them learn. However, there are so many times when they get frustrated because they do not understand how something works. For example, I played games with both of them on the iPad before they fully understood the basic functionality. Later, I would find them trying to play the same games, but they would be stuck at a certain step.

The frustration and anger from an 18-month-old can be quite comical. But once the boys mastered the basic functionality, it wasn't long before they were exploring their iPad games on their own.

Mastery learning is the same as the age-old saying, "You have to learn to walk before you can run." This same concept of mastery learning also applies to Autodesk® Revit®. You have to learn how to model before you can analyze and document. Otherwise, what are you really creating—a model or drawings?

The structural tools in Revit are similar to all the other tools. For example, you can still place or sketch elements. However, structural elements and families behave a little differently than other families. My goal is to point out some of those differences by focusing on

some areas in Revit that are different on the structural side and are important to understand during the design phase.

There are four features within the structural tools in Revit that have some unique behaviors: the structural analytical model, the Material for Model Behavior parameter, the Section Shape parameter, and trusses.

STRUCTURAL ANALYTICAL MODEL

To begin, you should understand that an analytical model is created along with the physical structural model. The structural analytical model is created in Revit so that the physical model can be analyzed. However, your company may not use this analytical model for analysis. The good thing is that the analytical model can be turned off, if needed. Nonetheless, you should realize that it is being created in the background unless you disable it.

The structural analytical model can also be used for other purposes such as advanced modeling and QA/QC of the physical model. You do not have to concern yourself with these advanced topics when you are getting started with Revit—just realize that the structural analytical model can have purposes other than strictly analysis.

An analytical model is made up of a set of structural member analytical models. Each structural element you place in a project with Enable Analytical Model selected in the Properties palette will contain a structural member analytical model. Structural columns, structural framing elements such as beams and braces, structural floors, structural walls, and structural foundation elements can have structural member analytical models.

To get a better sense of the analytical model, start a new project using a default Revit structural project template. Once the project is open, you can see the default views in the Project Browser. In addition to the standard Level 1 and Level 2 views, there are Analytical views for these levels, as well as an Analytical Model 3D view.

When you start one of the tools to place an element that can contain a structural member analytical model, you can control whether or not the analytical model is created with the element's instance properties. In the Properties palette, under Structural, pay attention to Enable Analytical Model. This parameter is selected by default.

Just to see how it works, create a few columns, beams, and structural walls with Enable Analytical Model selected. Then switch to the Level 2 – Analytical structural plan. For the Analytical views, the display of the analytical model is turned on. The display of the analytical model can easily be toggled on and off. There is a control in the View Control bar to toggle the display: Hide Analytical Model/Show Analytical Model. You can also turn on the visibility of the analytical model along with the physical model if you wish.

Switch to the Analytical Model 3D view. Once again, the visibility of the structural analytical model is turned on in this view. An analytical model is a simplified 3D representation of the full engineering description of a structural physical model. The analytical model consists of those structural components, geometry, material properties, and loads that together form an engineering system.
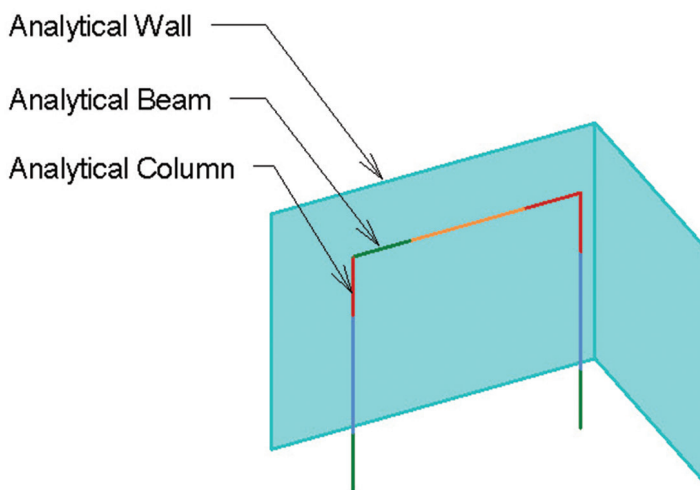
As for the actual structural member analytical models, you can select them like any other Revit element. When selected, you can view the instance parameters in the Properties palette. However, be aware that if you move one of these analytical models, the physical structural element will be moved as well. And if you move a structural element, the analytical model will move because they are linked.

You must be aware of the structural analytical model when creating structural elements. After a structural analytical model has been created, you can use it to analyze the structural design. You can run consistency and member support checks, apply boundary conditions, and add loads. Autodesk also provides additional structural analysis tools that you can use to analyze and check your structure from within the Revit environment. These tools are not part of the standard Revit installation, though. The analytical model can also be linked to an external structural analysis program such as RISA or ETABS.

MATERIAL FOR MODEL BEHAVIOR

When I first started learning how to use the structural tools in Revit, I was confused with the different parameters for the different materials of beams and columns. In other words, I could not figure out what controlled the different parameters for the various materials of beams and columns. For example, steel beams and concrete beams are in the same category, they are created with the same family template, they are placed with the same tool, and so on and so forth. Looking back now, the answer is simple! The Material for Model Behavior parameter in the family controls how the elements will behave in the project environment.

First of all, you must realize that beam and column families are loadable families. Typically, elements that are defined by a path are in system families such as walls, ducts, pipes, etc. This is not always
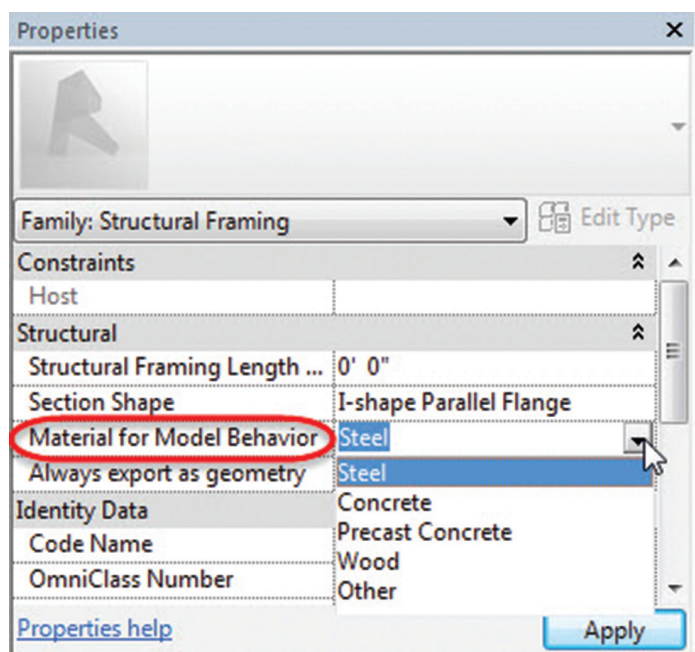

Figure 1: Sample view of structural member analytical models

Figure 2: The Material for Model Behavior parameter can be controlled in the Family Editor

the case, but for the most part it is. Beams and columns are also defined by a path. In other words, the geometry is determined by the length of the path. The cross-sectional geometry, on the other hand, is determined by a loadable family for beams and columns.

When you open a beam or column family in the Family Editor, pay attention to the parameters in the Properties palette. One is Material for Model Behavior. The available options are Steel, Concrete, Precast Concrete, Wood, and Other.

The option you select then controls several behaviors for elements of that family that are placed in the project. It controls the parameters that are available, cutbacks from other structural elements, joining behaviors, shape handles that will be available, and whether or not the element will be able to host reinforcement. So, you can see that this is a very important parameter to set correctly from the beginning of creating a family.

While you may not copy a steel beam family to create a concrete beam family, you may be tempted to copy a precast concrete beam family. While this may not be best practice, just ensure that you change the Material for Model Behavior parameter. Or if a beam or column family is not behaving properly, check this parameter first.

SECTION SHAPES

The Section Shape parameter was a new feature added to structural framing elements in 2015. If I had to describe what this parameter added to structural design with one word, it would be "consistency."

This parameter provides additional dimension and structural analysis properties that you can use in external analysis and code checking applications. These additional parameters ensure accurate data exchange with structural analysis, code checking, and steel detailing applications.

The reason is because the additional dimension and structural analysis parameters that they add to the family are standard across each family that the shape is added to. The parameter values can be modified as needed, but the parameters remain the same.

As far as controlling the geometry of the family, you can create as many parameters as necessary. These parameters may vary from family to family, which is a problem when it comes to analyzing the design. So instead of trying to standardize every single parameter that controls the geometry of structural framing families, you can simply add a section shape type.

Think of it this way: If two people start from scratch to build a wide flange beam family, are they going to use the same dimensions and parameters to control the cross-sectional geometry? Will they even use the same general layout of reference planes? With the answer being "probably not," then how will there be consistency in analysis, detailing, and code checking when various structural framing elements are used? Autodesk's solution to this issue was Section Shapes.
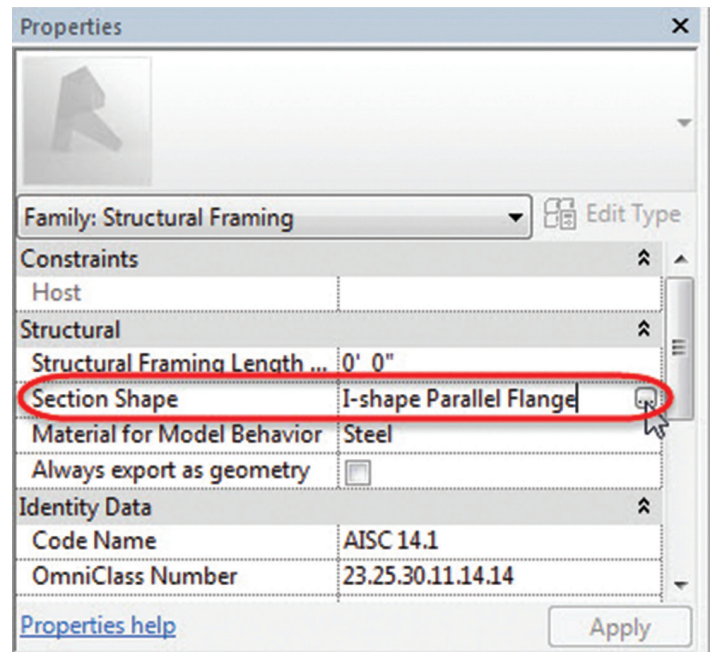

Figure 3: The Section Shape parameter can be controlled in the Family Editor

As with the Material for Model Behavior parameter, the Section Shape parameter can be controlled in the actual family. In the Family Editor, pay attention to the Section Shape parameter in the Properties palette. When you click in this field, you can click the More button in order to open the Structural Section Properties dialog. In this dialog, simply choose the appropriate section shape.
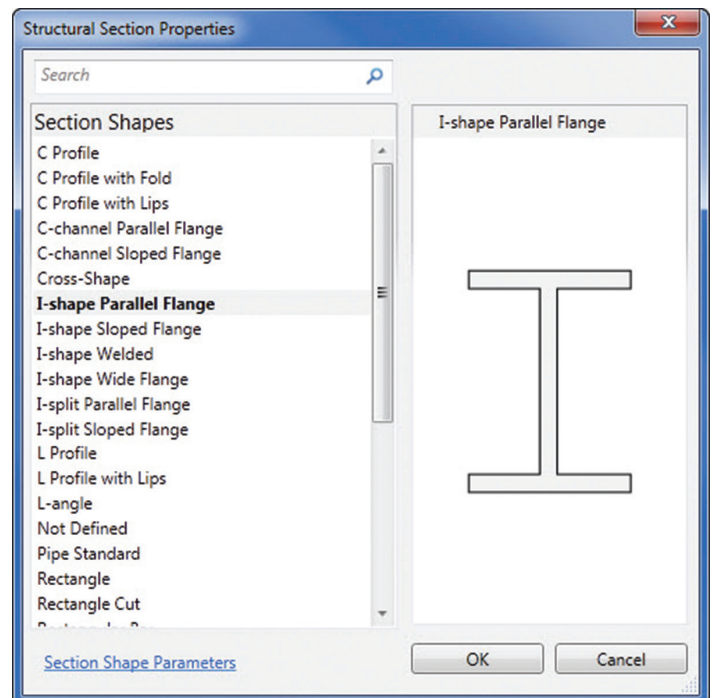

Figure 4: Apply a Section Shape by selecting the appropriate shape in the Structural Section Properties dialog

Once the family has a section shape applied, additional type parameters will be available in the project environment. These parameters do not control the actual geometry of the family. They

are just available for external analysis, code checking, and detailing, so that each family with the specified Section Shape applied will have the same parameters available for calculations. Inside of Revit, the parameters can be used in schedules.

TRUSSES

Trusses in Revit are made up of structural framing elements. Essentially, truss elements host structural framing elements to model actual truss designs. The difference here is that truss families are not structural framing elements—they are profiles. Once loaded into a project, the profiles will host structural framing elements.

Trusses are still model elements. However, when you open or create a truss family, you will notice that the tools are a little different. You do not create actual forms to model the geometry. Instead, you create profile lines to model the top chord, bottom chord, and webs.

The actual geometry of the structural framing elements hosted on the truss are controlled in the structural framing families.

The design of trusses in Revit actually simplify things. Due to trusses hosting structural framing elements, you do not have to create all this geometry in the family. Just think of the difficulties that would occur if you had to.

Additionally, when you create truss elements in a project, there is one thing you must understand. In the Type Properties for a truss, you can control the Top Chords, Vertical Webs, Diagonal Webs, and Bottom Chords. While you should specify all the parameters, the Structural Framing Type is critical. This is where you control the structural framing type that will be hosted to the associated truss profile.

When set to the default Set Framing Type option, the last used structural framing element in Revit will be the member that is
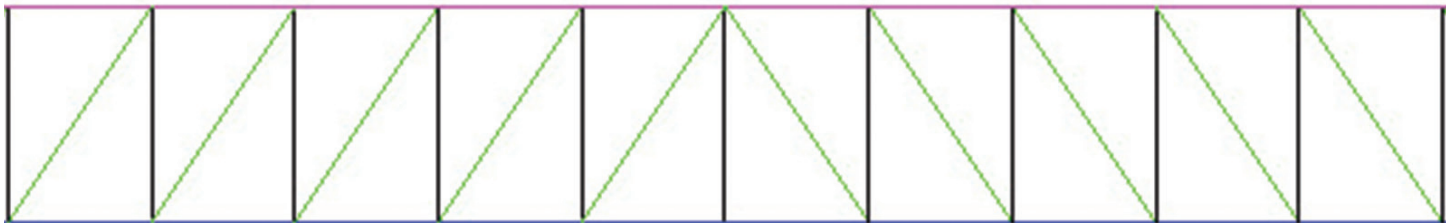

Figure 5: Truss families consist of profiles that define the top chord, bottom chord, and webs
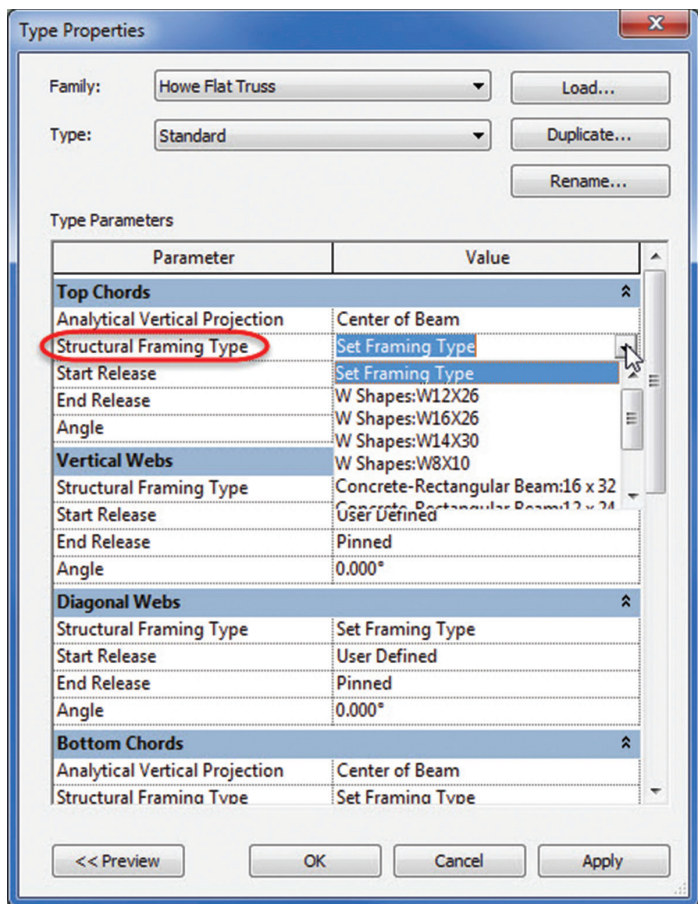

Figure 6: The Structural Framing Type used in the truss can be controlled in the Type Properties

hosted to the truss. In other words, if you just placed a concrete beam, then that concrete beam type will be placed in the truss. In order to avoid the wrong framing elements being used, you can explicitly define them in the truss type parameters. You may want to create multiple types in order to have various options. Just be aware of this functionality with trusses.

CONCLUSION

Revit is a very powerful building information modeling tool. As with any tool, it is critical to understand its full potential so you can maximize the output you get from that tool. These four features within the structural tools do not make up an exhaustive list of all the differences from traditional Revit tools, but they are important things to understand. Frustration and anger from grown adults is not always comical… ;)

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by Robert Green

Understanding Your Processor Options

HP Z Workstations and Mobile Workstations present a wide array of choices for Autodesk users but they all have something in common – an Intel processor that powers them. Recent HP workstation introductions, including the Z240 desktop workstation, take advantage of new Intel technology to deliver maximum computing power. To illustrate your options better we'll consider the configuration possibilities for the Z240 in several different CAD usage cases.

Processors

Name	Cores	Clock Speed (GHz)	Intel® Turbo Boost Technology[1]	Cache (MB)	Memory Speed (MT/s)	Hyper-Threading	Integrated Graphics	Featuring Intel® vPro™ Technology	TDP (W)
Intel® Xeon® processor E3-1280v5	4	3.7	4.0	8	2133	Y	N/A	Y	80W
Intel® Xeon® processor E3-1270v5	4	3.6	4.0	8	2133	Y	N/A	Y	80W
Intel® Xeon® processor E3-1245v5	4	3.5	3.9	8	2133	Y	Intel HD Graphics P530	Y	80W
Intel® Xeon® processor E3-1240v5	4	3.5	3.9	8	2133	Y	N/A	Y	80W
Intel® Xeon® processor E3-1230v5	4	3.4	3.8	8	2133	Y	N/A	Y	80W
Intel® Xeon® processor E3-1225v5	4	3.3	3.7	8	2133	N	Intel HD Graphics P530	Y	80W
Intel® Core™ i7-6700 processor	4	3.4	4.0	8	2133	Y	Intel® HD Graphics 530	Y	65W
Intel® Core™ i5-6600 processor	4	3.3	3.9	6	2133	N	Intel® HD Graphics 530	Y	65W
Intel® Core™ i5-6500 processor	4	3.2	3.6	6	2133	N	Intel® HD Graphics 530	Y	65W

[1]The specifications shown in this column represent the maximum turbo frequency with one core active. Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

Figure 1: Processor options for the Z240 from HP's web site.[1,2,3,4]

CORES AND HYPER-THREADING

A brief look through the processors chart in Figure 1 shows that most Intel® Xeon® E3 12xxv5 and the Core™ i7 series processors include hyper-threading capabilities with four available cores. In these processors hyper-threading allows two threads per core as opposed to only one for non-hyper-threaded processors like the Core™ i3/i5.

Given the large performance boost to be gained, only Intel® Xeon® E3 and Core™ i7 series processors with hyper-threading should be specified for Autodesk workstations.

(Source: https://software.intel.com/en-us/articles/performance-insights-to-intel-hyper-threading-technology)

CLOCK SPEED IS KING

The processors chart also shows that the maximum clock speed (or, more accurately, frequency) for the new Intel® Xeon® E3 12xxv5 quad-core series reaches up to 3.7GHz (the speed available when all four cores are active) and up to 4.0GHz in Turbo Boost mode (when only a single core is active). Since most Autodesk CAD applications run primarily on a single processor core we can draw a couple of conclusions based on the user's software profile.

1. For users working with a single application (and little else) the highest available Turbo Boost speed is of principle importance. To maximize single core processing rates the Xeon® X3-1280/1270 or the Core™ i7-6700 processors should be specified.

2. For those users who have several application processes running concurrently, maximum clock speed and Turbo Boost speed must be specified. To maximize both speeds the Xeon® X3-1280 is the clear winner.

MEMORY ARCHITECTURE AND SPEED

Of course no processor can do its job without memory (RAM) so the speed and architecture of memory supported by the processor is of substantial concern. As seen from the chart both the Xeon® E3 and Core™ i7 processors support 2133 MHz DDR4 memory – a 33% improvement in memory speed from the 1600MHz DDR3 memory Intel processors supported just a year ago. While there is some technical debate as to whether

Figure 2 - The Z240 (upright) and Z240 SFF Workstations.

DDR4 is always faster than DDR3 memory, it is rapidly becoming the industry standard which makes it a smarter choice for new workstations.

Another major consideration in memory specification is the support for error correcting code (ECC) memory which is only supported on Xeon® processors. For aggressive simulation and analysis applications like finite element or energy balance calculations ECC memory prevents single bit memory errors that can cause expensive data corruption or system crashes. In these usage cases Xeon® processors with ECC memory should be specified.

Finally, as with all Intel processors, the best processor performance is always achieved by installing the same types of memory modules in all four memory slots. For example, to load a workstation with 16GB of memory choose 4, 4GB modules rather than 2, 8GB modules and be sure to install the fastest speed memory supported by the processors (in this case 2133MHz as shown in the chart).

(Source on ECC memory: http://www.intel.com/content/www/us/en/processors/xeon/the-value-of-ecc-memory-for-servers.html)

INTEGRATED GRAPHICS

As seen in the integrated graphics column of the chart, the highest speed Xeon® processors available on the Z240 Workstation[2] do not support integrated graphics while the Core™ i7 processors do. This may be a consideration for primarily 2D AutoCAD users who do not require a high power graphics processor card. For these 2D users specifying a Core™ i7-6700 processor would provide an Autodesk certified GPU on the processor itself, thus saving the cost of an add-on card now while being upgradable at a later date.

STAVING OFF OBSOLESCENCE

Unlike any other component of a workstation, the motherboard chip set and processor can't be upgraded later so the processor capabilities you buy today will dictate the performance of your workstation for years to come. For this reason, you should carefully consider the software usage scenarios your users will experience over the next several years and purchase the type of processor that will serve them best for the lifetime of the workstation. Especially in AEC and Manufacturing environments where many software applications tend to update frequently and model sizes only grow larger, the highest speed Xeon® E3 and Core™ i7 processors are strongly recommended.

WRAPPING UP

If this is the year your company will purchase new workstations be sure to specify the right processor using the guidelines set forth in this edition of Tech Insights and you'll experience the best performance possible.

ABOUT HP

HP helps you stay ahead of the curve with professional desktop and mobile workstations designed for large and complex datasets, dispersed teams, and tight deadlines. HP Z Workstations, built for Pros with Intel® Inside®, deliver the innovation, high performance, expandability, and extreme reliability you need to deliver your 3D CAD projects in less time. To learn how to configure a HP Z Workstation, visit the HP and Autodesk page at www.hp.com/go/autodesk. Start saving now!

ABOUT ROBERT GREEN

Robert Green provides CAD management consulting, programming, speaking, and training services for clients throughout the United States, Canada, and Europe. A mechanical engineer by training and alpha CAD user by choice, Robert is also well known for his insightful articles and book, Expert CAD Management: The Complete Guide. Reach Robert at rgreen@greenconsulting.com

1. Intel® Xeon® E3 processors can support ECC memory; Intel® CoreTM i5/i7 processors only support non-ECC memory.

2. Table represents HP specific processor selections that are not representative of the full Xeon® E3 v5 line.

3. Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

4. Intel® Hyper-Threading Technology (Intel® HT Technology) requires a computer system with an Intel® Processor supporting Intel HT Technology and an Intel HT Technology enabled chipset, BIOS, and operating system. Performance will vary depending on the specific hardware and software you use. See www.intel.com/products/ht/hyperthreading more.htm for more information including details on which processors support Intel HT Technology.

PRODUCT FOCUS

Annotations in AutoCAD Architecture

AutoCAD® Architecture 2016 contains great annotation abilities. Annotations are basically notes or other types of explanatory objects (or symbols) that are commonly used to add information to a drawing. Typically, annotation objects are scaled differently than the views of the drawing and depend on the scale of how they should appear when plotted. You can control the method that an annotation object is scaled by defining the object either as non-annotative or annotative. Non-annotative objects require a fixed size or scale that is calculated based on the scale used to plot the drawing. Annotative objects automatically adjust to display uniformly at the same size or scale regardless of the scale of the view. Some examples of annotative objects are keynotes, notes and labels, dimensions, hatches, tables, blocks, and callouts. Let's look at some of these.

KEYNOTES

Keynoting is a consistent way of annotating the different types of drawings in a set of construction documents to identify building materials or to provide special instructions. AutoCAD Architecture provides a flexible, tool-based method of inserting keynotes that are linked to a keynote database and can be modified globally as well as individually. This method supports both reference keynoting (where the keynote key corresponds to a section in an accompanying specification and may appear on

AutoCAD Architecture 2016

different drawings) and sheet keynoting (where keynote keys are sequentially numbered for each drawing).

AutoCAD Architecture supplies pre-specified keynotes for its size-specific default detail components and for architectural objects that represent assemblies with multiple components. For variable-size objects and material definitions, a keynote classification group is pre-specified and you specify a size when the keynote is inserted. For detail components, these keynotes and groups are based on the widely used MasterFormat 2004 standard maintained by the Construction Specifications Institute (CSI). For assemblies, the CSI Uniformat standard is used. However, because the software accommodates multiple keynote databases, it also supports other common or locally developed keynoting systems, so your localized version of AutoCAD Architecture may vary. Whatever the source of the keynote, you can also associate it with a particular object style or material definition. This lets you use the keynote insertion tools on individual components of an object or on linework in two-dimensional (2D) sections or elevations. In cases where no keynotes are pre-specified, you select a keynote from the available database. You can also configure a keynote insertion tool to insert a particular keynote, regardless of the insertion point.

In addition to tools for inserting keynotes (derived from the basic annotation tool), the software includes tools for generating keynote legends that list selected keynotes from one or more drawing sheets and help you to quickly locate all instances of a particular keynote. You can also generate a keynote legend for a drawing prior to inserting keynotes; in this case the legend would include all keynotes that are likely to be used.

Keynotes used in AutoCAD Architecture are stored in Microsoft Access databases. There are two default keynote databases:

- AecKeynotes: This database is used for keynoting individual detail components and materials according to the Construction Specifications Institute (CSI) MasterFormat 2004 standard.

- AecKeynotes-Assemblies: This database is used for keynoting architectural objects that are assemblies of multiple components. These keynotes are based on the CSI Uniformat standard.

To accommodate proprietary office standards and other project-specific keynoting schemes, you can modify the default databases or you can create your own databases using either Microsoft Access or the editing functionality provided with the software. You can also configure keynote databases to control which ones are available for assigning to individual projects and to specify the order in which they are searched.
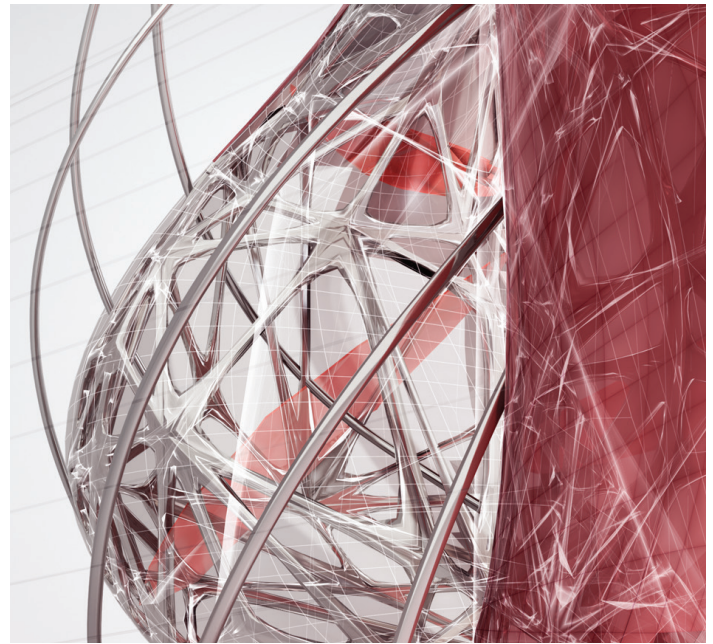
NOTES AND LABELS

Text can be created in various ways. For short, simple entries, single-line text should be used. To create single-line text, begin by selecting the Text panel on the Annotation tab of the Ribbon. Next, select the Text drop-down and select Single Line (see Figure 1). Specify the insertion point for the first character. If you press Enter, the program locates the new text immediately below the last text object you created, if any. Now, specify the height of the text.

Please note that this prompt is displayed only if text height is set to 0 in the current text style. A rubber-band line is attached from the text insertion point to the cursor. Click to set the height of the text to the length of the rubber-band line. Next, specify a text rotation angle. You can enter an angle value or use your pointing device and then enter the text. At the end of each line, press Enter and then you can enter more text as needed. It is important to note that text that would otherwise be difficult to read (if it is very small or very large) is displayed at a legible size and is oriented horizontally so you can easily read and edit it. If you specify another point during this command, the cursor moves to that point, and you can continue typing. Every time you press Enter or specify a point, a new text object is created. When ready to end the command, press Enter on a blank line.

For longer entries with internal formatting, multi-line text (mtext) can be used. To create multi-line text, begin by selecting the Text panel on the Annotation tab of the ribbon. Next, select the Text
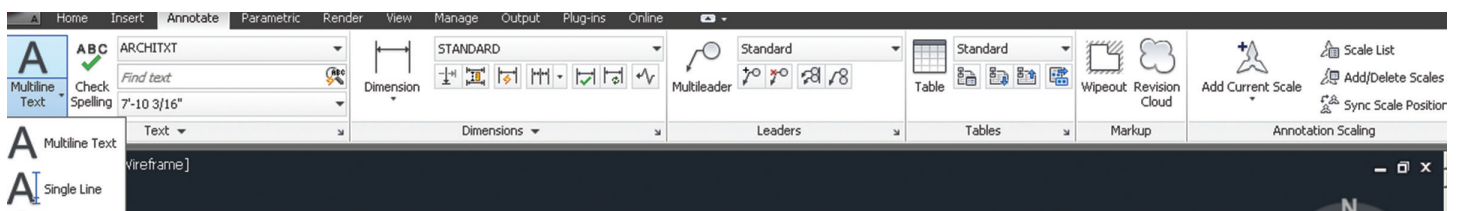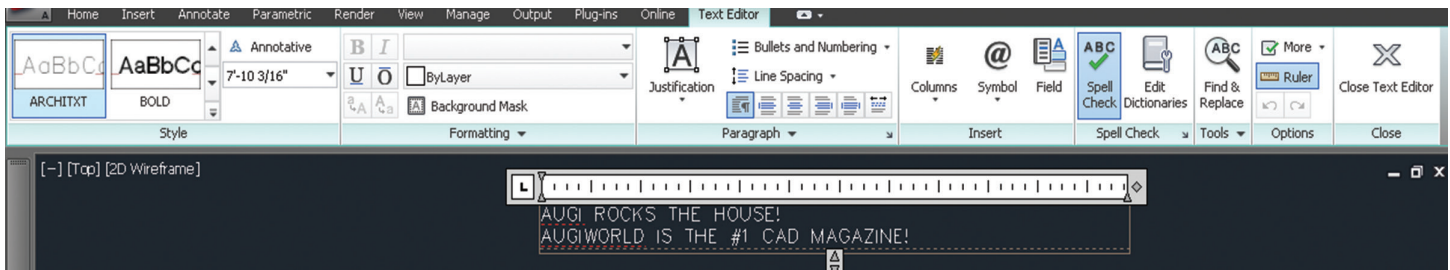

Figure 1: Create text

Figure 2: Text Editor

drop-down and select Multi-Line (see Figure 1). You can also simply use the command MTEXT. Specify opposite corners of a bounding box to define the width of the multi-line text object. The MText ribbon Contextual tab will be displayed. If you wish to indent the first line of each paragraph, drag the first-line indent slider on the ruler. If you wish to indent the other lines of each paragraph, drag the paragraph slider. To set tabs, click the ruler specifically where you want a tab stop. Now you can enter text.

Although all entered text uses the current text style, which establishes the default font and format settings, you can use several methods to customize the text appearance. There are several tools that can change text scale and justification, find and replace text, and check for spelling errors. You can override the current text style by selecting either a few letters, a word or a paragraph. To select one or more letters, click and drag the pointing device over the characters. To select a word, you will need to double-click the word. To select a paragraph, you will need to triple-click the paragraph.

Now, on the ribbon you can format the changes (see Figure 2). If you wish to change the font of the selected text, select a font from the list. If you wish to change the height of the selected text, enter a new value in the Height box. It is important to note that the MText height value is reset to 0 if its default height is not modified during creation. If you wish to format text in a TrueType font with boldface or italics, or to create underlined or overlined text for any font, click the corresponding button on the ribbon. It is important

to note that SHX fonts do not support boldface or italics. Now to apply color to selected text, choose a color from the Color list. Click Other to display the Select Color dialog box. To save your changes and exit the editor, click in the drawing outside the editor.

CALLOUTS

Callout tools allow you to define portions of the building model as details, sections, and elevations. These portions are placed in model space views created for the callout. A model space view is a portion of a view drawing that may be displayed in its own viewport on a layout tab of a drawing. A model space view has its own name, description, display configuration, layer snapshot, drawing scale, layer state, and view direction. Model space views are an evolution of the Named Views concept of AutoCAD Architecture; however, as opposed to Named Views, model spaces views have a defined boundary. You can place a model space view containing a detail, section, or elevation in the current view drawing, an existing project view drawing, or a new project view drawing.

You can use callouts to create specific, enlarged views of the building model. Typically, you detail components to a detail to call out items that are not included as part of the building model, like bolts and connectors, or detailed brick hatches. You can also use callouts to generate sections or elevations of an existing section or elevation. For example, you could create a section of the building model, and then create an enlarged detail from part of the section. To that detail, you could then add detail components for the construction document.
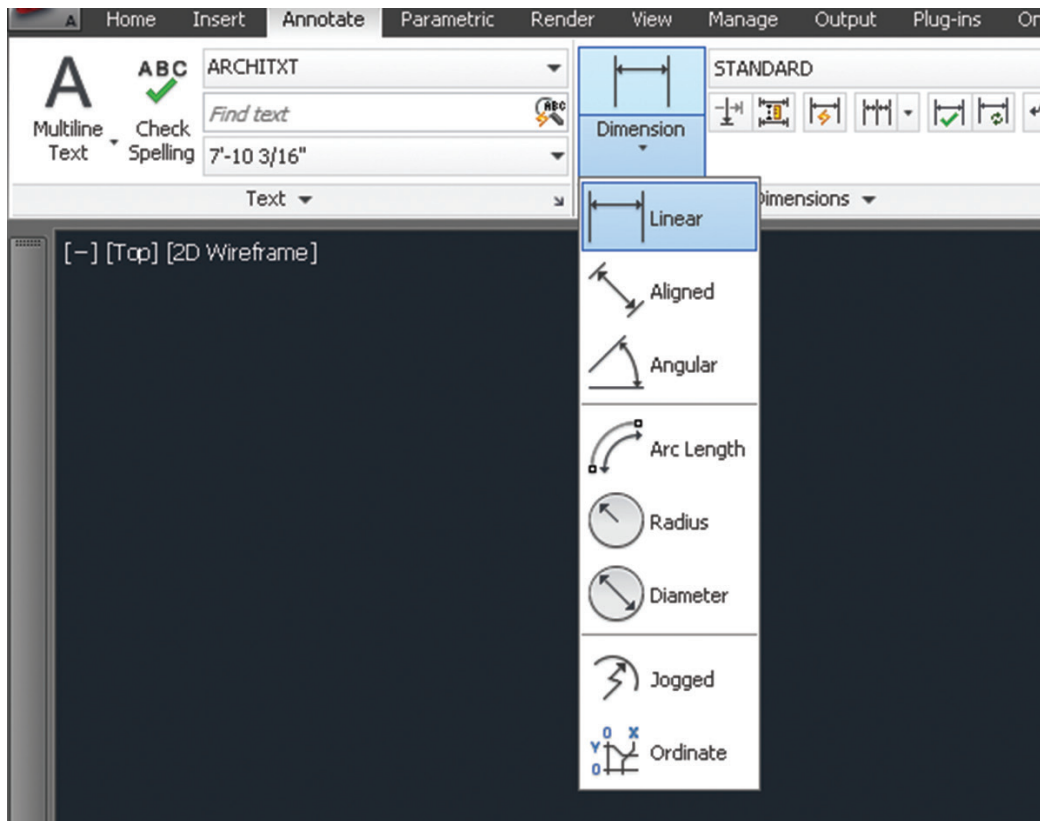
AutoCAD Architecture 2016
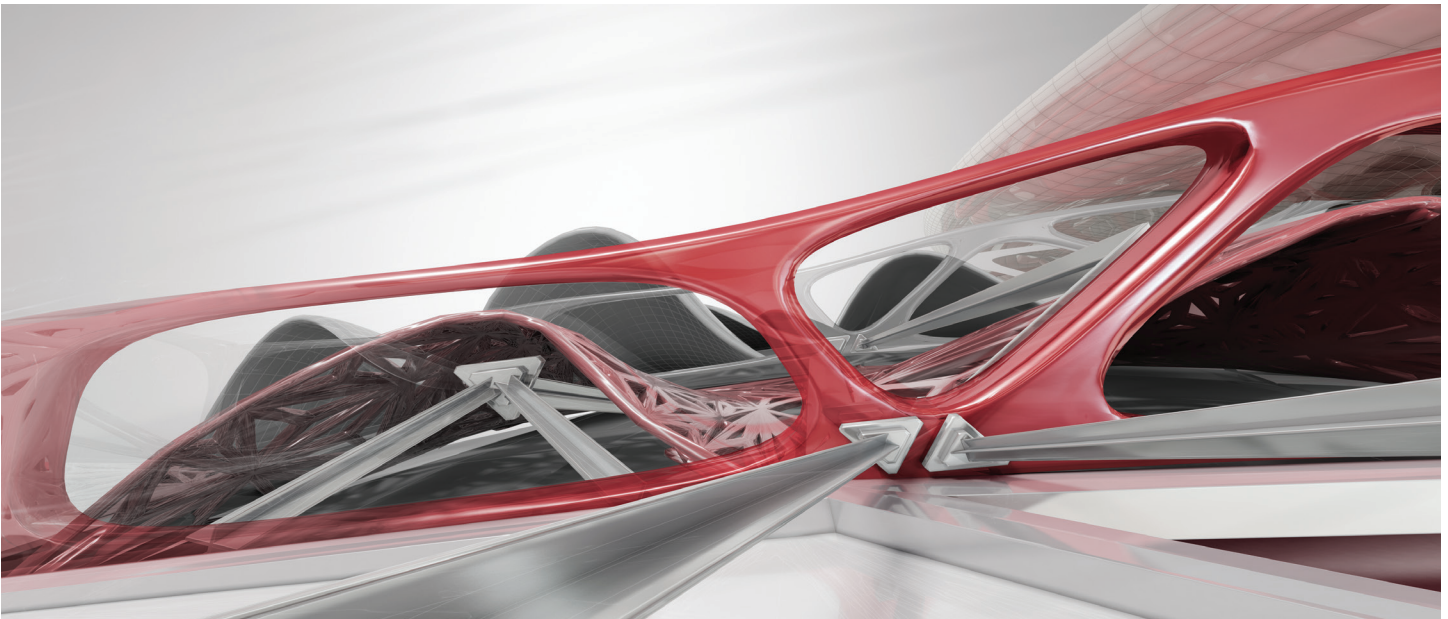
Figure 3: Create dimension

DIMENSIONS

Dimensions can be either associative, non-associative, or exploded. Each of these can be quickly defined as follows:

+ Associative dimensions – Automatically adjust their locations, orientations, and measurement values when the geometric objects associated with them are modified. Dimensions in a layout may be associated to objects in model space. The DIMASSOC system variable is set to 2.
+ Non-associative dimensions – Selected and modified with the geometry they measure. Non-associative dimensions do not change when the geometric objects they measure are modified. The dimension variable DIMASSOC is set to 1.
+ Exploded dimensions – Contain a collection of separate objects rather than a single dimension object. The DIMASSOC system variable is set to 0.

You can determine whether a dimension is associative or non-associative by selecting the dimension and then use the Properties palette to display the properties of the dimension. A dimension is considered associative even if only one end of the dimension is associated with a geometric object. The DIMREASSOCIATE command displays the associative and non-associative elements of a dimension. The Quick Select dialog box can also be used to filter the selection of associative or non-associative dimensions.

The DIMREGEN command may need to be used to update associative dimensions after panning or zooming, after opening a drawing that was modified with an earlier release, or after opening a drawing with external references that have been modified. Although associative dimensions support most object types that you would expect to dimension, they do not support hatches, multi-line objects, 2D solids, images, DWF, DGN, and PDF underlays.

When selecting objects to dimension, make sure that the objects you select do not include a directly overlapping object that does not support associative dimensioning such as a 2D solid. It is important to note that associativity is not maintained between a dimension and a block reference if the block is redefined. Also, associativity is not maintained between a dimension and a 3D solid if the shape of the 3D solid is modified.

To create a dimension, begin by selecting the Dimension panel on the Annotation tab of the ribbon. Next, select the Dimension drop-down and select the type of dimension you wish to create (see Figure 3). In the drawing, select beginning and ending points for the dimension, select text placement, and hit Enter.

HATCHES

A hatch object displays a standard pattern of lines and dots used to highlight an area or identify a material such as stone or concrete. It can also display a solid fill or a gradient fill. Hatches and fills can be created by using the HATCH command.

By default, bounded hatches are associative, which means that the hatch object is associated with the hatch boundary objects and changes to the boundary objects are automatically applied to the hatch. To maintain associativity, the boundary objects must continue to completely enclose the hatch.

The alignment and orientation of a hatch pattern is determined by the current location and orientation of the user coordinate system, in addition to controls in the user interface. Moving or rotating the UCS is an alternate method for controlling hatch patterns.

It is important to note that, by default, a preview of the hatch displays as you move the cursor over enclosed areas. If you need to improve the response time in large drawings, you can turn off the hatch preview feature with the HPQUICKPREVIEW system variable.

Hatch patterns can be dragged and dropped into your drawing from the Design Center. To do this, begin by selecting the Home
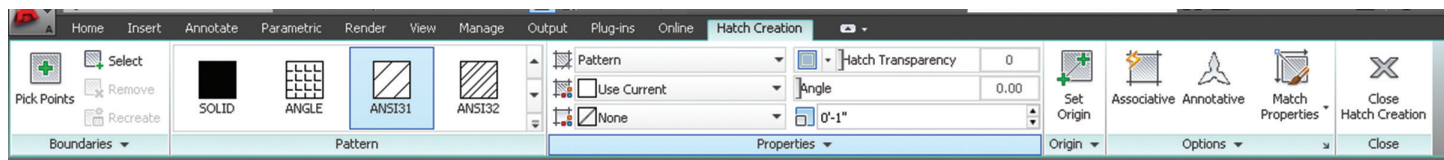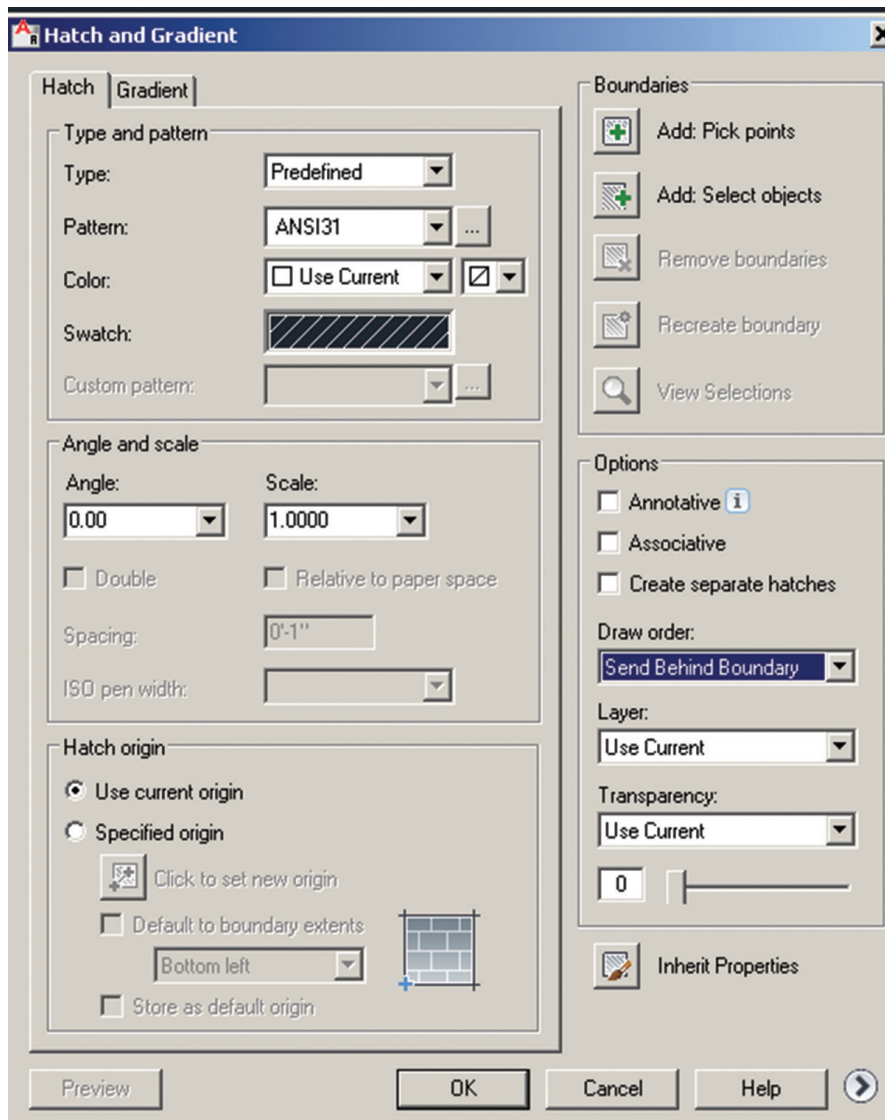
Figure 4: Hatch creation

Figure 5: Hatch editor

to load the hatch patterns into the content area of Design Center. From the content area of Design Center, drag a hatch pattern into an enclosed area in your drawing or onto a tool palette. It is important to note that if the hatch pattern scale is too large or small, an error message is displayed. You can adjust the scale for any hatch pattern by selecting it to display the Hatch Editor tab.

If you wish to hatch or fill areas, begin by clicking the Home tab, Draw panel of the ribbon. On the Hatch drop-down, select Hatch. Now, on the Properties panel, select one of the options from the Hatch Type drop-down list. On the Pattern panel, click a hatch pattern or fill. Specify a point inside each area to be hatched. On the ribbon, make any adjustments as needed (see Figure 4). On the Properties panel, you can change the hatch type and colors or modify the transparency level, angle, or scale for the hatch.

This is optional, but if you like you can expand the Options panel and select one of the draw order options from the bottom drop-down list (see Figure 5). You can change the draw order of the hatch so the hatch is displayed either behind or in front of the hatch boundary, or behind or in front of all other objects. Now, press Enter to apply the hatch and exit the command.

If you wish to hatch selected objects, begin by clicking the Home tab, Draw panel of the ribbon. On the Hatch drop-down, select Hatch. On the Boundaries panel, click Select. Select the objects that you want to hatch. Press Enter to apply the hatch and exit the command.

tab, Draw panel of the ribbon. On the Hatch drop-down, select Hatch. This will open the Design Center toolbar. On the toolbar, click Search. In the Search dialog box, select Hatch Pattern Files from the Look For drop-down list. Now, from the In drop-down list, select the drive where the program is installed and confirm that Search Subfolders is selected. On the Hatch Pattern Files tab, in Search for the Name, enter * (asterisk) and then click Search Now. The default hatch pattern file is acad.pat or acadiso.pat.
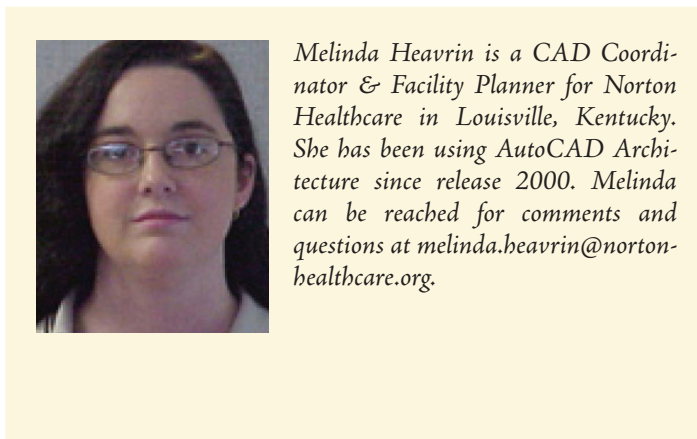
The search results may display the same file in different locations. It is important to note that you can add the PAT file to Favorites by selecting the file and clicking the Favorites button. A shortcut to the PAT file is displayed in the Favorites folder in the Design Center folders list. In the search results, double-click the filename

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@norton-healthcare.org.

CAD Advice from an Expert Elite

You have just decided you want to be a CAD drafter or designer. Maybe you are midway through your career and have a passion for CAD and would like to make a change. In my long career, I have seen many people look at my screen and say, "That looks like fun, I would like to work in AutoCAD." All of those lines and colors and many of us get a big monitor, too. It is fun.

That being said, it is hard work as well. Being a good CAD drafter and/or designer takes fundamental knowledge of drafting and design as well as the patience to make things not only look right on screen, but also have the data organized and controlled within the CAD file itself. These are my tips on how to build your skills as a beginner and some reminders for long-term users not to forget the rules, standards, and guidelines of drafting and design that have been in place for many years.

When you start AutoCAD® 2016 you will be taken to a default start tab with LEARN and CREATE buttons as shown in Figure 1.

Figure 1: LEARN - CREATE

AUTOCAD ORIENTATION

Notice how the LEARN button has a 6 next to it and the CREATE section shows no number at all. The number 6 indicates that there are six new videos posted on new tools and or features within the software. All beginners as well as experienced users should view these small video tutorials. Figure 2 showns the What's New topic with a new features video on AutoCAD. Upon selecting the CREATE button shown in Figure 1 you have the option to start a new drawing, open up recent drawings, and sign-in to your A360 online account.
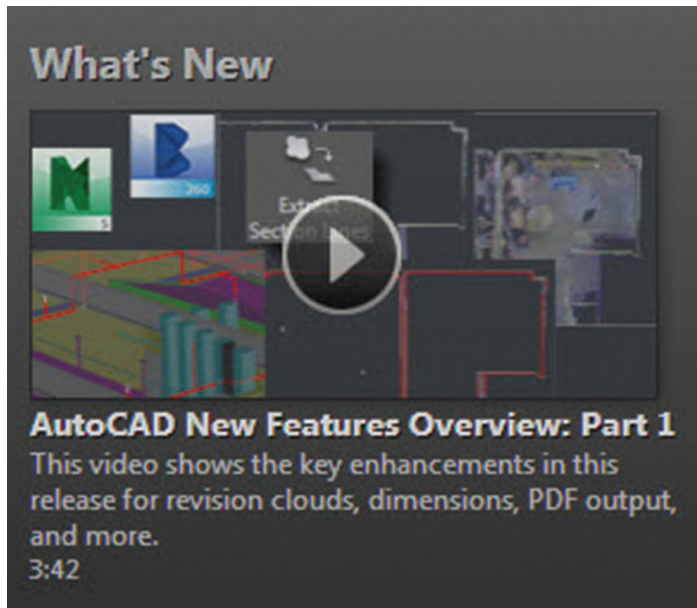

Figure 2: What's New videos

The middle section of the LEARN window contains "getting started" videos and feature videos for AutoCAD. These videos are typically under five minutes in length and are intended to get you familiar with the topic to explore further. The feature videos will cover a specific topic that may not be considered a basic or introductory video for AutoCAD. Some of you may turn these features off because they take time to load and you believe you are beyond the basics. Yes, you can change system variables to launch AutoCAD without these resources, but I suggest you take a look at them prior to turning off.

LEARN – CONNECT – EXPLORE

When you go to the Autodesk University website you see the terms learn, connect, and explore. That is exactly what I believe this next section is indended to accomplish. The first window contains learning tips where you can scroll through simple tips designed to help beginners as well as experienced users. Even advanced users may find something in here that they are unaware of. You can use the arrow keys to scroll through helpful learning tips as shown in Figure 3 or select "More information," which will take you to the help file for a more detailed description of the tip provided.

Next up comes Connect and Explore. You will be provided with online resources to help you improve your skills and continue to grow and learn with the software as shown in Figure 4.
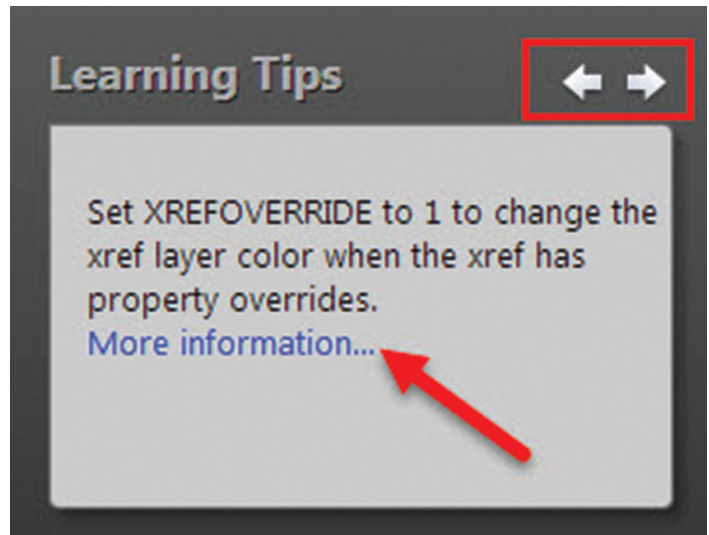

Figure 3: Learning Tips
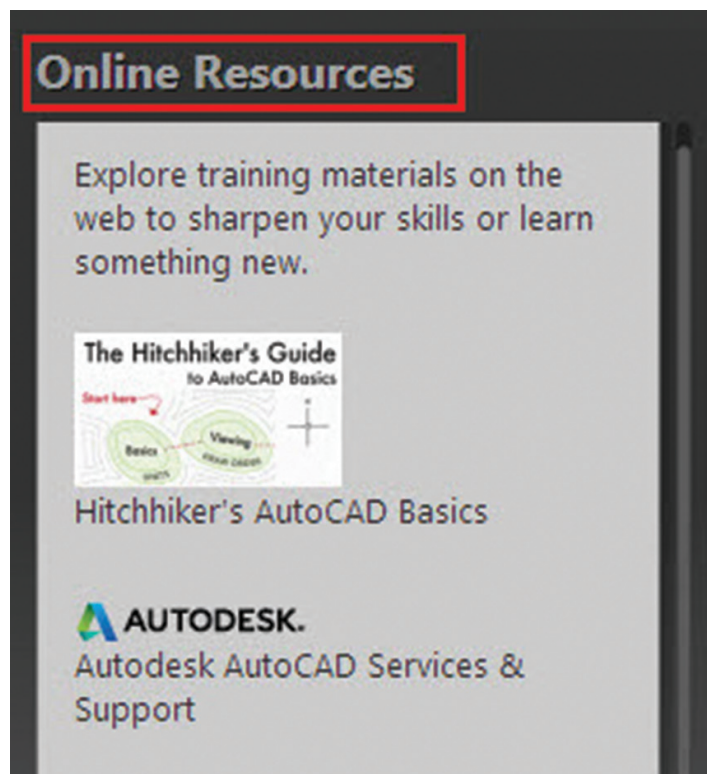
Figure 4: Online Resources

THE HITCHHIKER'S GUIDE TO AUTOCAD BASICS

Every time an experienced user or even a beginner (as shown in the photo on the previous page) asks me, "I want to learn AutoCAD, where do I start"? I always send them to the Hitchhiker's Guide to AutoCAD Basics. I love this option in AutoCAD. Even as an experienced user I went through the entire guide to understand and view the workflow that is being presented. When you first launch the guide you will read the following statement: "This guide is a great place to get started if you just completed your initial training,

AutoCAD 2016

Figure 5: Hitchhiker's Guide to AutoCAD Basics

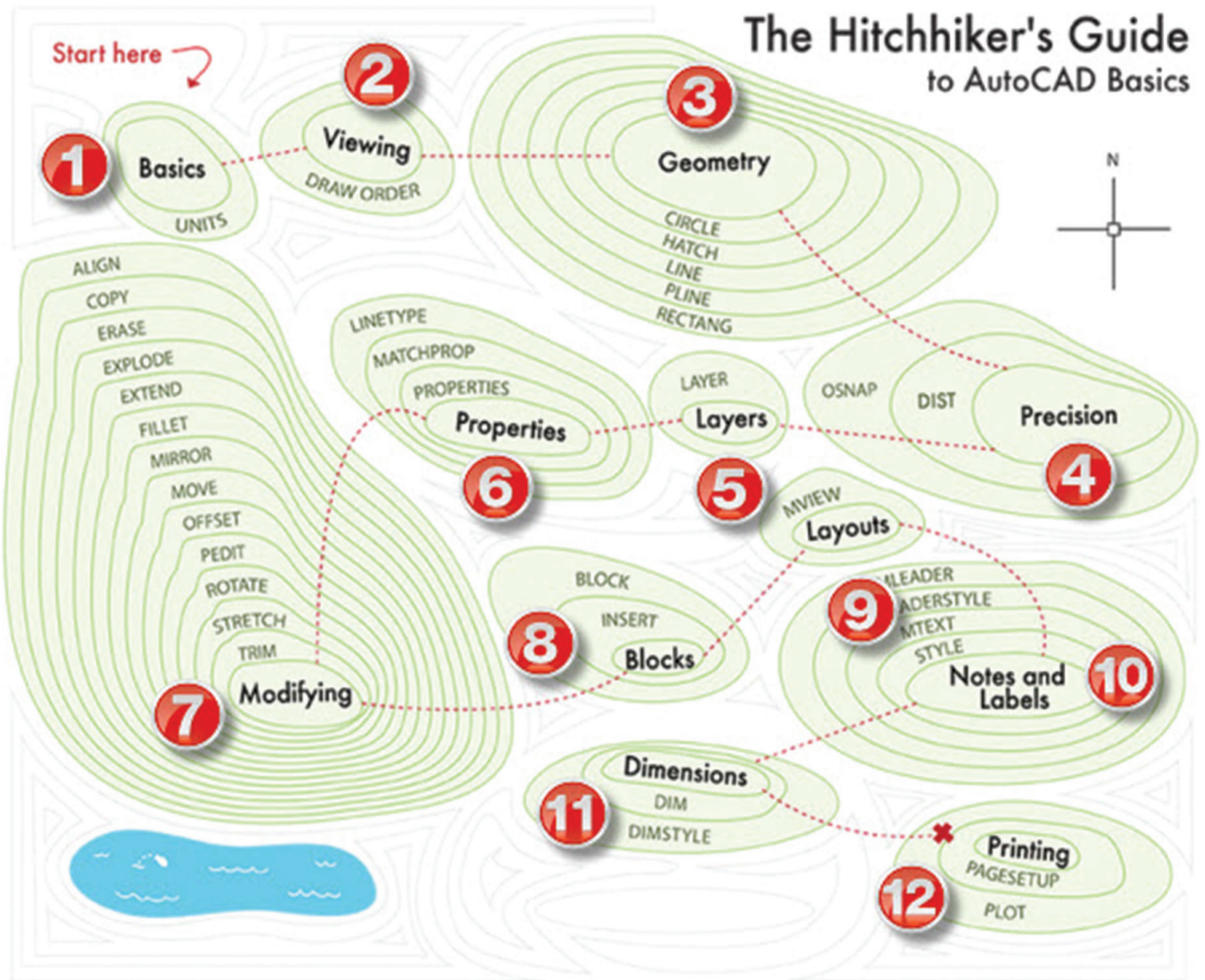or to refresh your memory if you use AutoCAD only occasionally. The included commands are grouped together according to types of activity, and are arranged to follow a general workflow." I could not have said it any better.

There are 12 major topics, which are shown in bold in in Figure 5. This is designed as you would develop a workflow. You start with the basics, setting up a drawing and getting to know your software. You end with printing or publishing your project. All drafting and design projects have a start and end point; typically starting with the setup (basics) and ending with an output (printing).

Within the interactive map simply select the bold text and you will be taken to a knowledge base article showing you how to use the command during design and to help improve workflow. Scroll down on the web page for a more outlined approach by showing the topic as a link. Both ways are effective and retrieve the same results.

Did you know if you hover over a command (be patient) AutoCAD will give you a description of what the command does and in some cases it will display an example (Figure 6)? Not all commands have visual examples, but all commands offer you the option of selecting F1, which will take you to the help menu for more information about the command.

AUTOCAD ADVICE

The help menu within AutoCAD will provide you with a more in-depth description of the command and examples on how the command may be used during workflow.

AUTODESK UNIVERSITY

Autodesk University does not just happen once a year. You can learn anytime anywhere 24/7 with online classes and video tutorials to help you become more proficient. As the site states, "Get insights from industry experts, sharpen your skills, and explore what's possible using Autodesk products—in person and
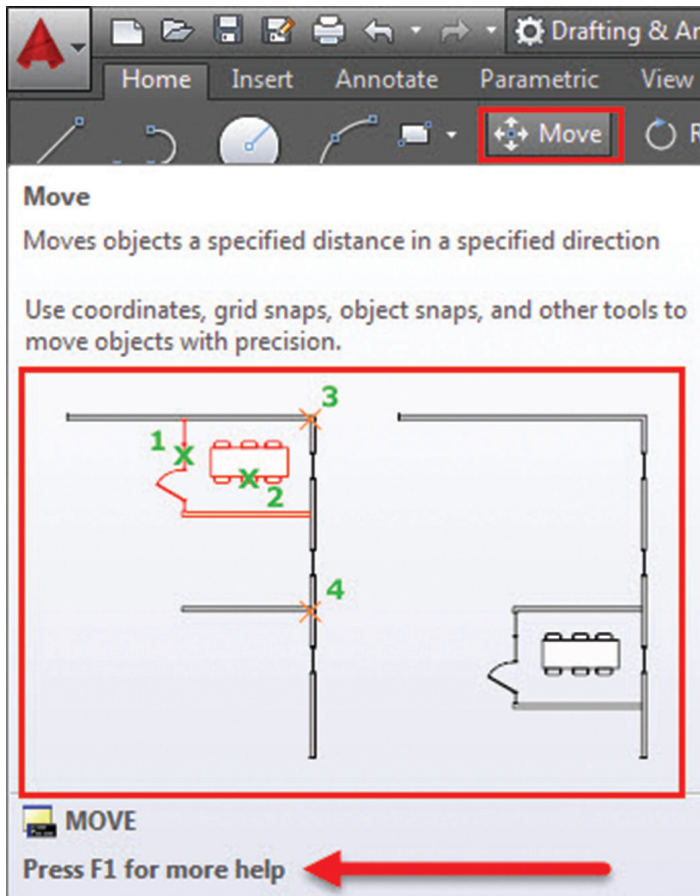
Figure 6: F1 provides additional information about commands

online." Simply create an online account then load up your personal AU section with all the free online learning tools you need. Autodesk University offers online classes to help you get the most out of Autodesk products and services, and share your knowledge with others.

AUTODESK COMMUNITY

Get stuck while working with AutoCAD or any other software product from Autodesk? Visit the community. If you are curious about the community I suggest you take a look at Chris Benner's class at Autodesk University 2015. My friend and fellow Expert Elite member presented a class on the community and how we can help you as you progress in your career using design tools. His class, titled "XI10614 - The Power of the Autodesk Community," is designed to bring awareness to the community and how you can find resources to help you as you begin your career or continue to improve your professional status even to the point of becoming an Expert Elite member.
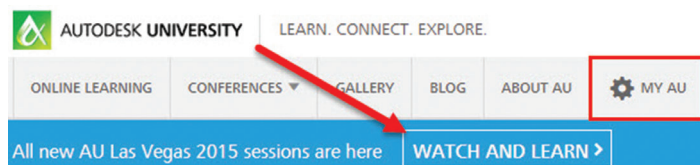

Figure 7: Autodesk University

The Autodesk Community shares product-use information and comprises people helping others solve product issues and promote best practices to assist you in your daily design activities. Visit the forums and post a question. I am confident a member of the community will be right there to provide advice and the answer you need.

Figure 8: The Autodesk Community

CONCLUSION

The world we live in today rotates around technology and new developments in engineering, science, and medicine. Computer-aided design and drafting play an important role in many areas of technology improvements. We as beginners and seasoned professionals are using design tools to solve complex problems.

This has become part of the norm within the industry as we grow and evolve as a society depending upon new and improved technologies. You may want to be a CAD drafter, a CAD designer, 3D modeler, or move into graphic design using CAD software to obtain the results. The choice is yours so take your time and make the right choice—the one that motivates you to go to the office, solve problems each day, and become a leader in your field.

As an Expert Elite member at Autodesk I am drawn to helping others, which also helps me become a better CAD manager and CAD designer. Helping others succeed and solve problems puts a smile on my face. Use the tools available and be prepared for an exciting challenge as you enter a career in CAD or continue to improve as a leader. Are you up to the challenge?

Sam Lucido is a CAD Services Manager with Haley and Aldrich, Inc. He has more than 25 years of experience involving design, user support, and customization. Sam is professionally certified in AutoCAD, an Expert Elite Member, and recently completed his fourth year speaking at Autodesk University. He uses his vast knowledge about AutoCAD to help provide support to engineering and design teams with monthly tip sheets and online training. You can find him at CADProTips.com and he can also be reached at lucido1373@gmail.com

BIM for Beginners: An Introduction to Building Information Modeling within Infrastructure Projects

Building information modeling (BIM) is not a specific software program. It is a streamlined process that allows us to make better decisions about project design based on reliable information analysis. BIM is an approach to the entire project life cycle, including design, construction, and facilities management. The BIM process supports the ability to coordinate, update, and share design data with team members across disciplines. It helps engineers better predict a project's performance to increase safety, constructability, and sustainability before it is built, thus facilitating better decision making and more economic project delivery. In this article, I focus on three key benefits of working with BIM models which include:

+ Data-rich models
+ Reduced rework
+ High-impact visuals

DATA-RICH MODELS

In an infrastructure project, BIM facilitates more design alternatives by spending more time during the project planning phase analyzing data rich models. The traditional, drafting-centric workflow makes evaluation of what-if scenarios inefficient and cost prohibitive. This is due to the disconnected processes of design, analysis, and documentation. Figure 1 diagrams the cost savings found through the ability to impact project performance earlier in the design workflow, when the cost of making design changes is low.

Today's infrastructure planners are expected to evaluate multiple design alternatives, recommend solutions, and help capture
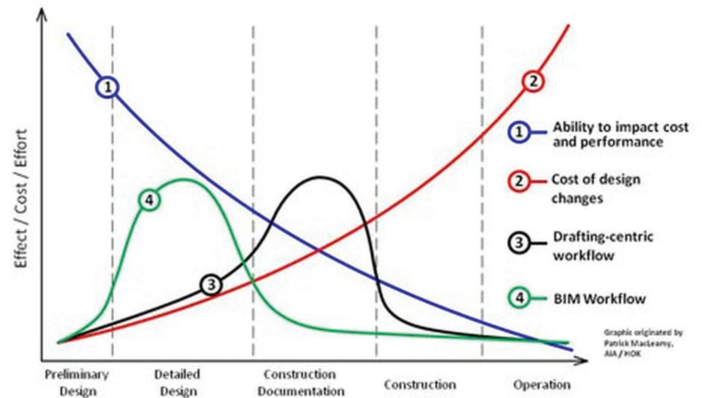

Figure 1: BIM workflow versus traditional workflow

stakeholder buy-in before design begins. They do this with the help of geographic information system (GIS) professionals. GIS data is available from many different sources. Agencies around the world recognize the benefits of sharing information such as terrain data, parcel linework, soil data, land use information, wetland data and much more, as shown in Figure 2. Depending on where your project is located, you can find a lot of data online. Design teams need to be able to effectively aggregate and present the data in a way that is easily understood.

HIGH-IMPACT VISUALS

Often, a 3D model is the easiest way to understand all the data and how it fits together. Many stakeholders and the general public
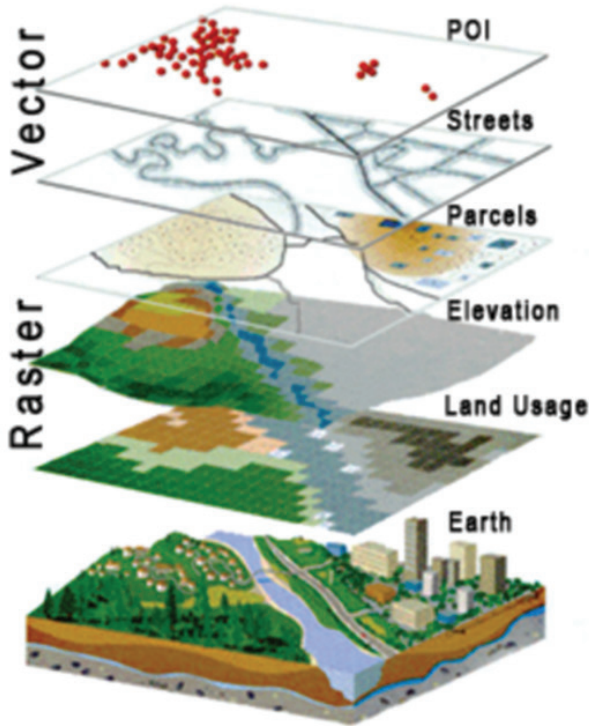
Figure 2: GIS data types aggregated together

definitely benefit from seeing the data inside a 3D model because they often do not understand 2D plan sets. Luckily, InfraWorks® 360 software provides a streamlined solution for gathering the initial site data while creating high-impact visuals. By taking advantage of Model Builder, design teams can quickly create a data-rich model by simply indicating where the project location is, as shown in Figure 3.

From this, a 3D model is created and stored in the cloud, which contains terrain data, aerial images, existing roadways, buildings,
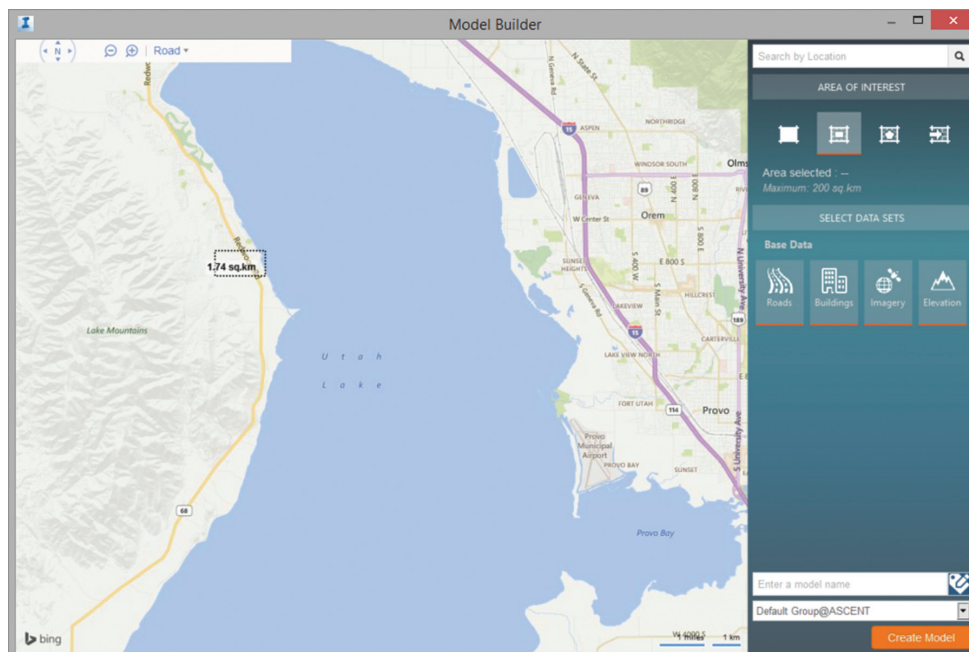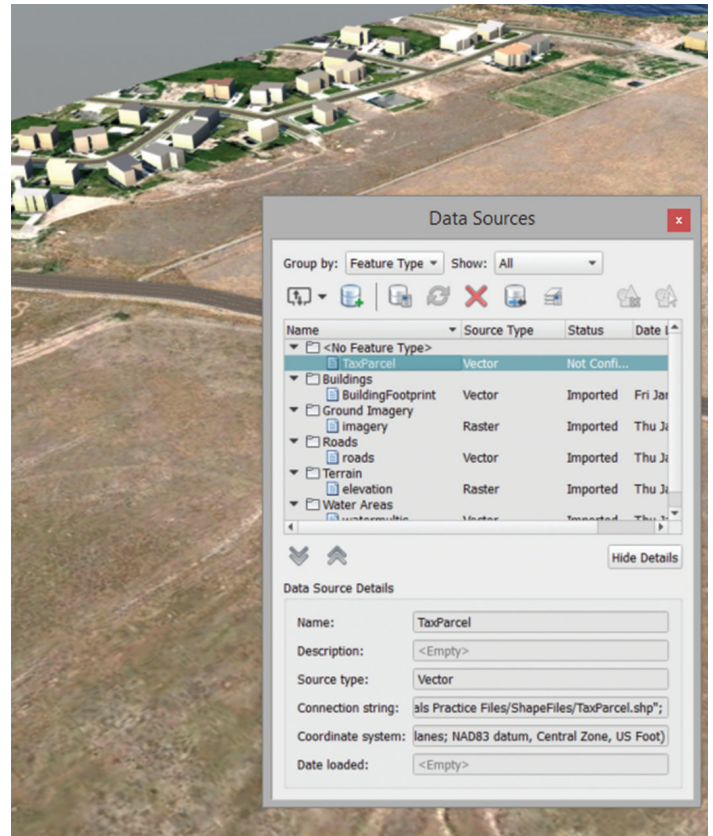

Figure 4: Data sources

and water features. Additional data can be added as necessary using the Data Sources palette shown in Figure 4. Several different types of data can be added to the 3D model. The following is a partial list:

+ File Data Sources
+ 3D model
+ AutoCAD® Civil 3D® DWG
+ Autodesk IMX
+ Autodesk® Revit® RVT
+ Bentley DGN
+ Point Cloud
+ Raster
+ SHP
+ SQLite
+ SketchUp
+ Database Data Sources
+ Oracle
+ MySQL
+ SQLServerSpatial
+ PostgreSQL
+ WFS
+ Generic (includes OSGEO, OGR, Autodesk, etc.)

If additional data is required for the project, make sure you download all the files associated with it. This ensures that you have everything you need. For example, if you find a shape file for your project, you must download the .dbf file to

Figure 3: Model Builder

Figure 5: GIS dataset for floodplains in Utah

see the data behind the linework. It is also important to download the projection file (*.prj) so that the Autodesk InfraWorks 360, AutoCAD Civil 3D, and AutoCAD® Map 3D software all know how to automatically re-project the dataset into the project's coordinate system. Figure 5 shows all the files associated with a floodplain dataset for Utah.

REDUCED REWORK

The best part of a BIM workflow is the reduction of costs correlated with the reduction of rework. The ideal project uses data created in early stages of the project design all the way through the design and construction process. Assuming you are following the workflow shown in Figure 6, let's take a look at where data can be reused and what software is best to use for each task.

Project Planning

I prefer to use Autodesk InfraWorks 360 for all the steps in the project planning phase. With Model Builder, you can define the project extents and establish the existing conditions in a matter of minutes. Then I use conceptual road tools to lay out several design options to provide to the client. Once they select the best conceptual design to move into preliminary design, then I create a new proposal based on that design.

Preliminary Design

If you have the Road Design, Bridge Design, and Drainage Design

modules for Autodesk InfraWorks 360, then I would continue using InfraWorks for the preliminary design. Right-clicking on a conceptual road allows you to turn it into a design road, as shown in Figure 7. The benefit of doing this is that you can add design parameters to the roads such as curve type, curve radius, tangent lengths, and design speed. You can also have more control over the vertical design because you can view profile views of the design roads. Let's not forget that you can also use cloud computers to calculate the optimal horizontal and vertical layouts of design roads. This is a priceless feature since you can run the calculation in the background while you continue working on other aspects of the design.
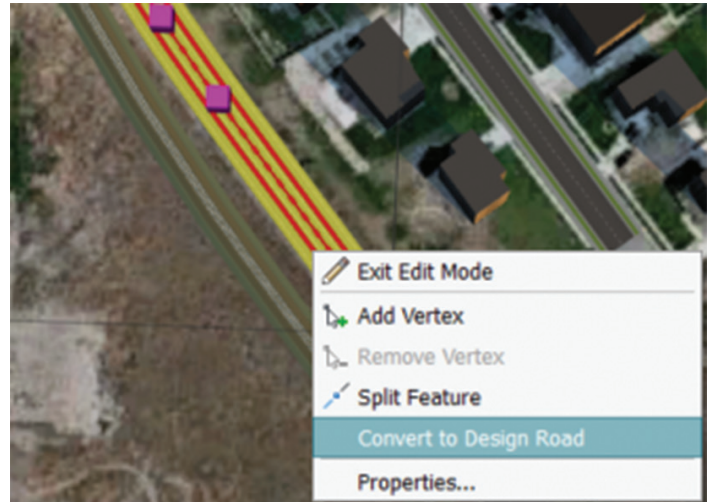

Figure 7: Conceptual road to design road

Detailed Design

Once you have created and selected the preliminary design to move forward with, it is time to create the more detailed design. This involves taking the design from Autodesk's InfraWorks 360 software into the AutoCAD Civil 3D software. Fortunately, the newer versions of software provide the capability to open an Autodesk InfraWorks 360 model in AutoCAD Civil 3D directly, saving a lot of rework.

In AutoCAD Civil 3D software, make any required adjustments to the alignments and profiles that came from the InfraWorks 360 software and design the typical cross-sections of the roads to create
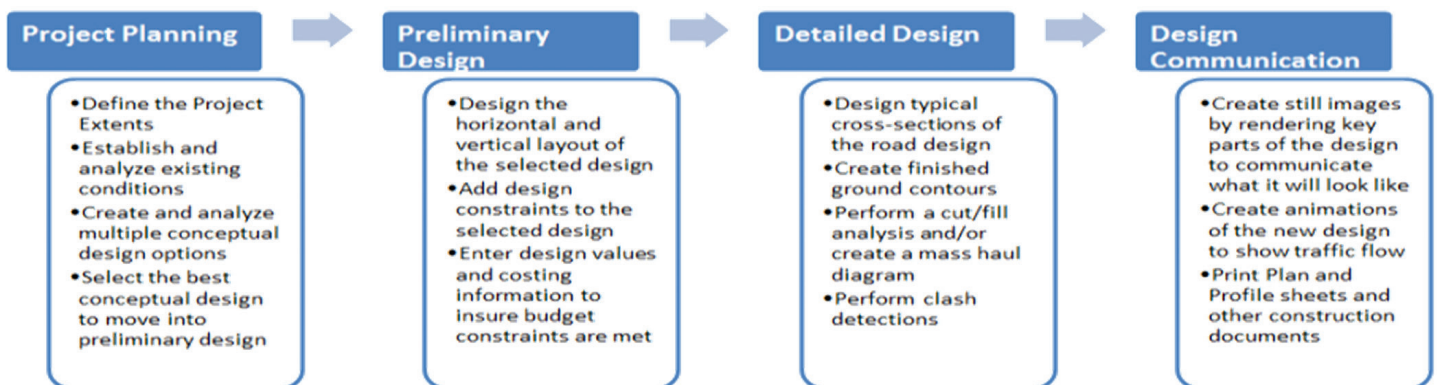

Figure 6: Typical infrastructure project workflow

Figure 8: InfraWorks model inside Navisworks

the finished ground contours. Finish up any other finite grading with grading objects and breaklines. If it is a sub-division project, lay out parcels. Last but not least, add annotation as necessary.

This is also a great time to move the design into Autodesk Navisworks® to perform clash detections to ensure that all the various disciplines parts line up properly. You have two options here:

1. Export an .FBX file from InfraWorks 360 to import into Navisworks.
2. Open the AutoCAD Civil 3D drawing file directly in Navisworks.

The benefit of taking the design from InfraWorks to Navisworks is that the textures and materials come across perfectly. The drawback is that every piece of the design is called mesh in the selection tree, making it more time consuming to hide specific items, as shown in Figure 8.

Design Communication

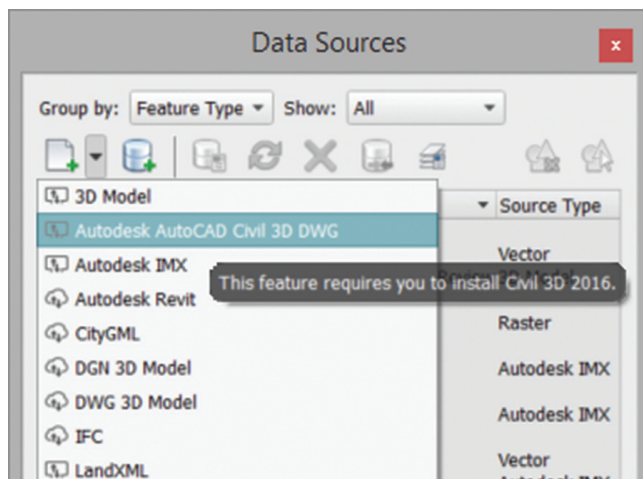When it comes to Design Communication, you use AutoCAD

Civil 3D software to print the plan and profile sheets and either InfraWorks 360 or 3ds Max to create renderings and animations.

To use 3ds Max, open the AutoCAD Civil 3D drawing. In the Output tab, Export panel, click Export to 3ds Max. To use Autodesk InfraWorks 360, create a new proposal using the master proposal as the base. Then connect to a data source and select Autodesk AutoCAD Civil 3D DWG in the file data types, as shown in Figure 9.

Construction

When the project is ready for construction, take the design back into Autodesk Navisworks. The Timeliner tool adds a fourth dimension by allowing you to connect tasks in the construction schedule with objects in the model. This creates a construction simulation, which automatically updates if the schedule changes.

Operation

Of course, any one of the models or all of the created models can be handed off to the facilities manager or government agency in charge of maintaining the new infrastructure once construction is complete. This saves time and money when resurfacing, remodeling, or rehabilitation needs to take place.

I hope this gives you a nice introduction on how to use a BIM workflow within infrastructure projects and makes moving to a BIM workflow easier for you. Until next time, happy modeling.

Figure 9: Add a data source to round trip back to InfraWorks

Michelle Rasmussen started in the Air Force working in the Civil Engineering unit as a surveyor, designer, and construction manager in the early 1990s. She has worked for both municipalities and consulting engineering firms as an engineering/GIS technician where she completed transportation studies, environmental impact studies, and drafted subdivision and site plans. She has been training people on Autodesk products since 2000 and is currently an author for ASCENT (ascented. com) where she writes books for Autodesk infrastructure software products such as AutoCAD Civil 3D, Autodesk InfraWorks 360, AutoCAD Map 3D, and Autodesk Navisworks.

3ds Max 2015
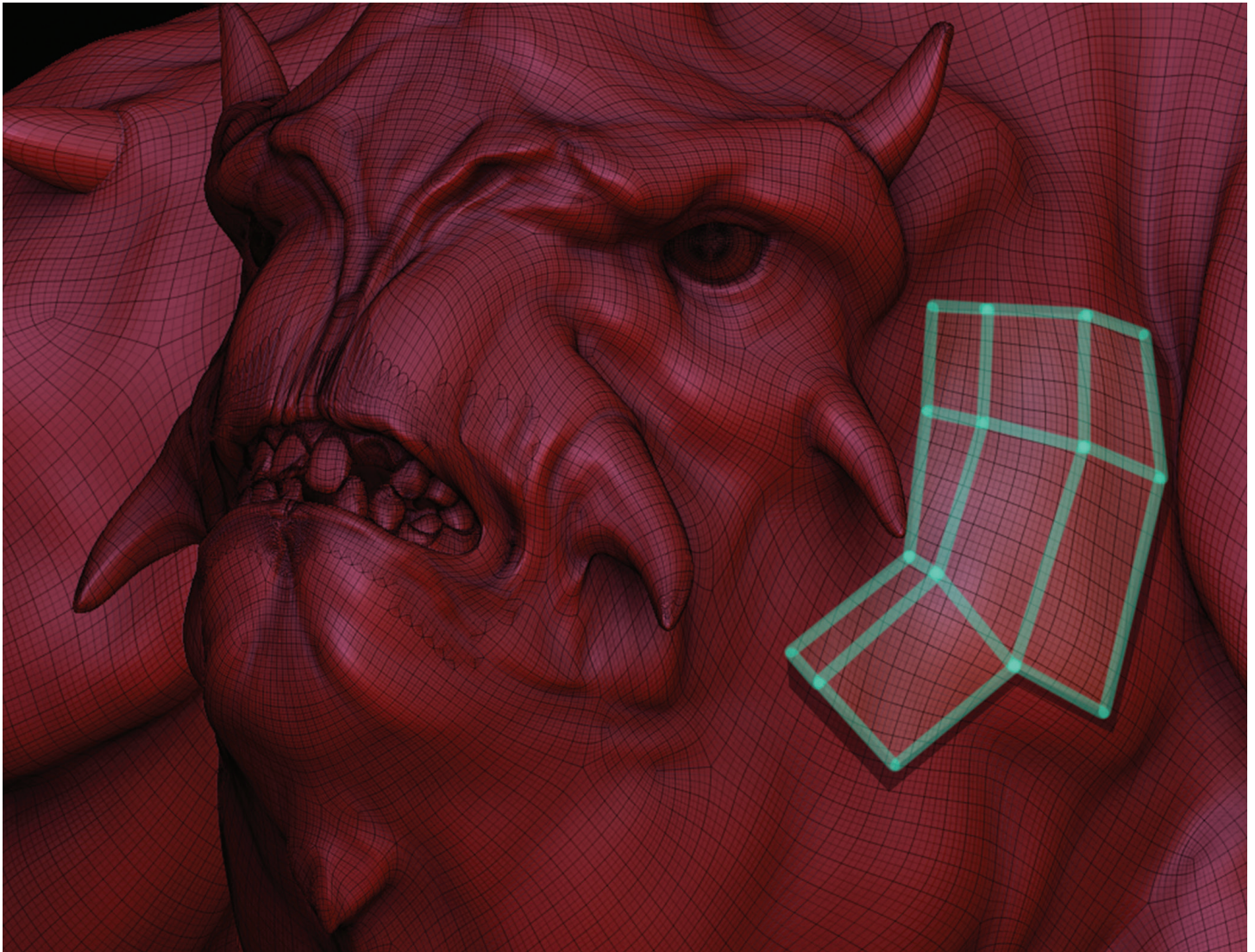
by: Brian Chapman

Retopologizing a Mesh in 3ds Max

Figure 1: The concept of Retopology

Digital sculpting is like modeling with super powers. With tablets and technology, the ability to create extremely high-poly models is literally at the tips of our fingers. Millions of polygons are pinched, pushed, and pulled as if we are sculpting the creation from clay in our own hands. While it's fun to play supreme being where we can create anything in our imagination, we can't deny the limited use for a model having eleven million polygons like that shown in Figure 1.

Using Autodesk® Mudbox®, 3ds Max®, or other software, artists sculpt detailed objects from a digital piece of clay. By quickly creating complex models with the ability to alter them on the fly, users can explore ideas very quickly during the initial stage of creation. This
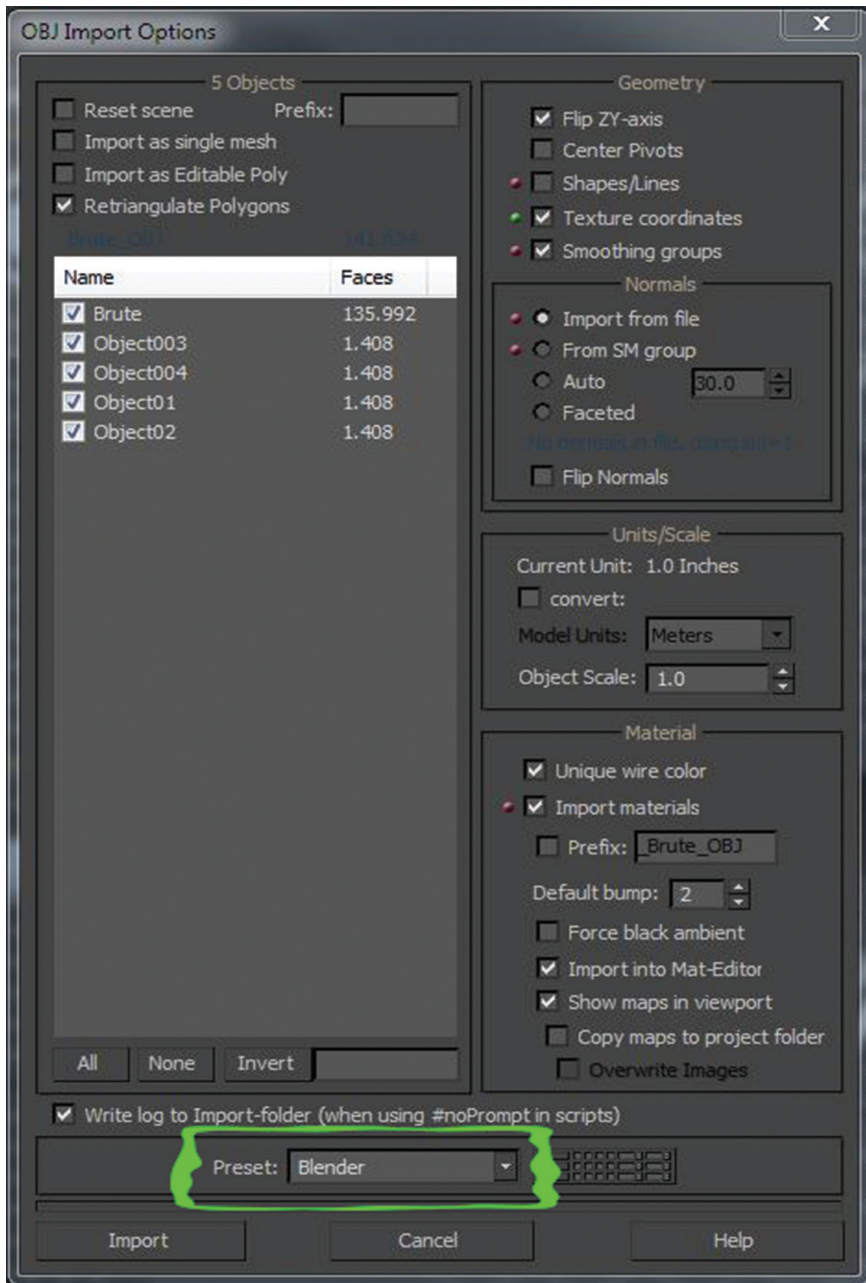
Figure 2: Import options

allows artists to gain control over a part of production that has a strategic impact on a project's budget during its initial phase. Once the initial model is complete though, it needs to be converted to something that can be used for practical applications. Part of this process is called retopologizing.

Retopologizing a model is essentially reconstructing an object from scratch. It allows artists to unwrap a mesh and properly apply textures and materials so they do not appear distorted or stretched in the final render. It reduces stress on computer processors and graphic cards, allowing the computer to more quickly calculate lighting, refractions, reflections, shadows and more based on the reduced number of polygons. For objects such as characters, it allows 3ds Max to display muscles and bone distortions more realistically, which can also be animated more efficiently. For game assets, it helps creators generate higher resolution models when close to the camera and one with less resolution for objects further away, which reduces stress on the system and allows flexibility to provide more content.

3ds Max introduced a specific set of tools to simplify the retopology process. The process is like tracing something on paper, except in 3D. So let's gets started with our tutorial.

If another software platform was used to construct the original model, the first step is to import the model into 3ds Max. Figure 2 displays a screen shot of our import options using the common OBJ format. Note the bottom of the dialog box, which allows us to load preset import settings based on common modeling applications available today. This should serve as a reminder that while many applications export to common file formats (such as OBJ or FBX) there are subtle differences between the files themselves that may need to be accounted for during import. Also, note that files do not always import at the proper location and may need to be repositioned.
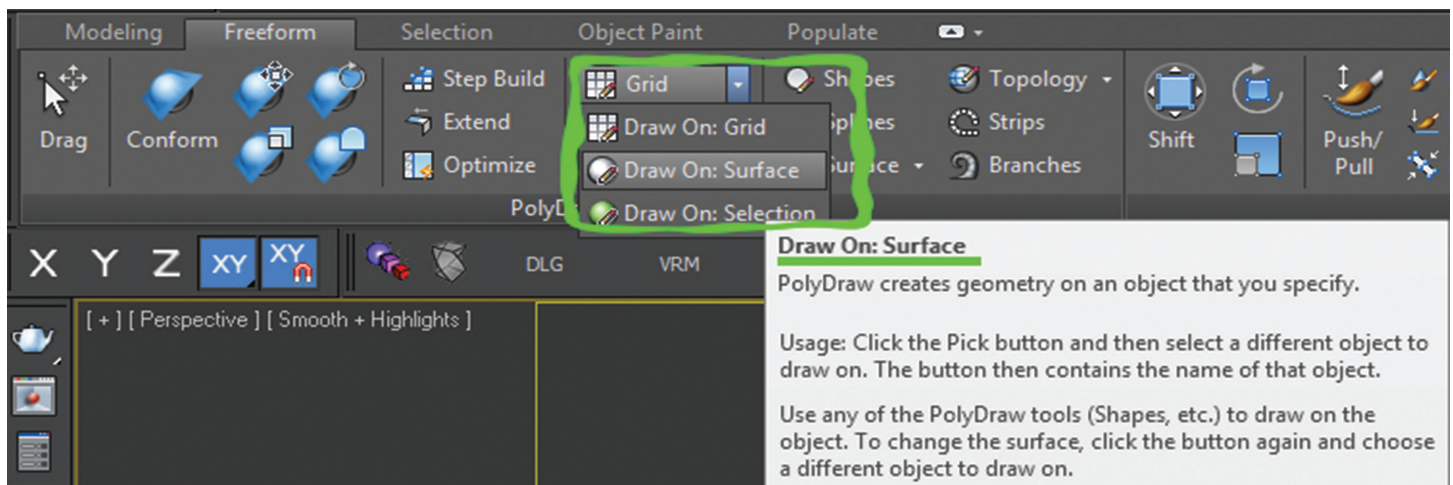

Figure 3: The Freeform tab
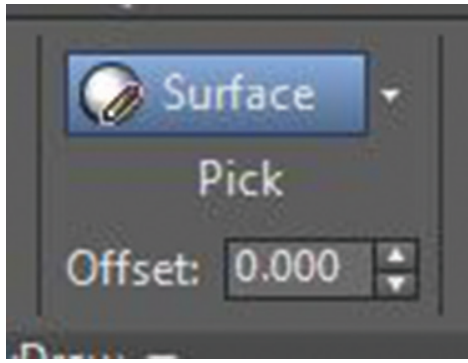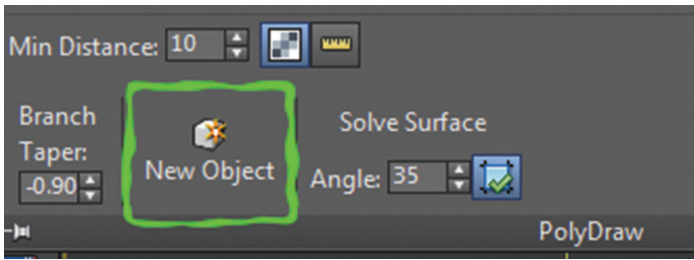
3ds Max 2015

Figure 4: Offsets

Figure 5: New Object

Next, select the imported mesh and convert it to an editable poly. With our imported mesh selected, we'll want to direct our attention to the "Freeform" tab. There we need to select the option to draw on the surface displayed, as shown in Figure 3.

When prompted, we'll need to select the surface of the object. Alternately, we could choose the Draw on: Selection option. Please note that the selection is not stored in memory, and if you were to restart a session of 3ds Max you'll need to complete the operation again. At this point we can start to trace our object in 3D with or without an offset shown in Figure 4.

This option controls the distance our new mesh will be constructed from the surface we selected. The primary benefit of using an offset is that the newly created mesh won't get lost in minor deviations on our selected high-poly surface. Once that's complete, we need to select the "PolyDraw" drop down menu and choose "New Object" shown in Figure 5 to start our new mesh.

There are a few options to start constructing a new mesh at this point in the process. Many prefer to start with the "Strip" selection shown in Figure 6 by selecting the option then clicking and dragging across the surface we wish to trace.
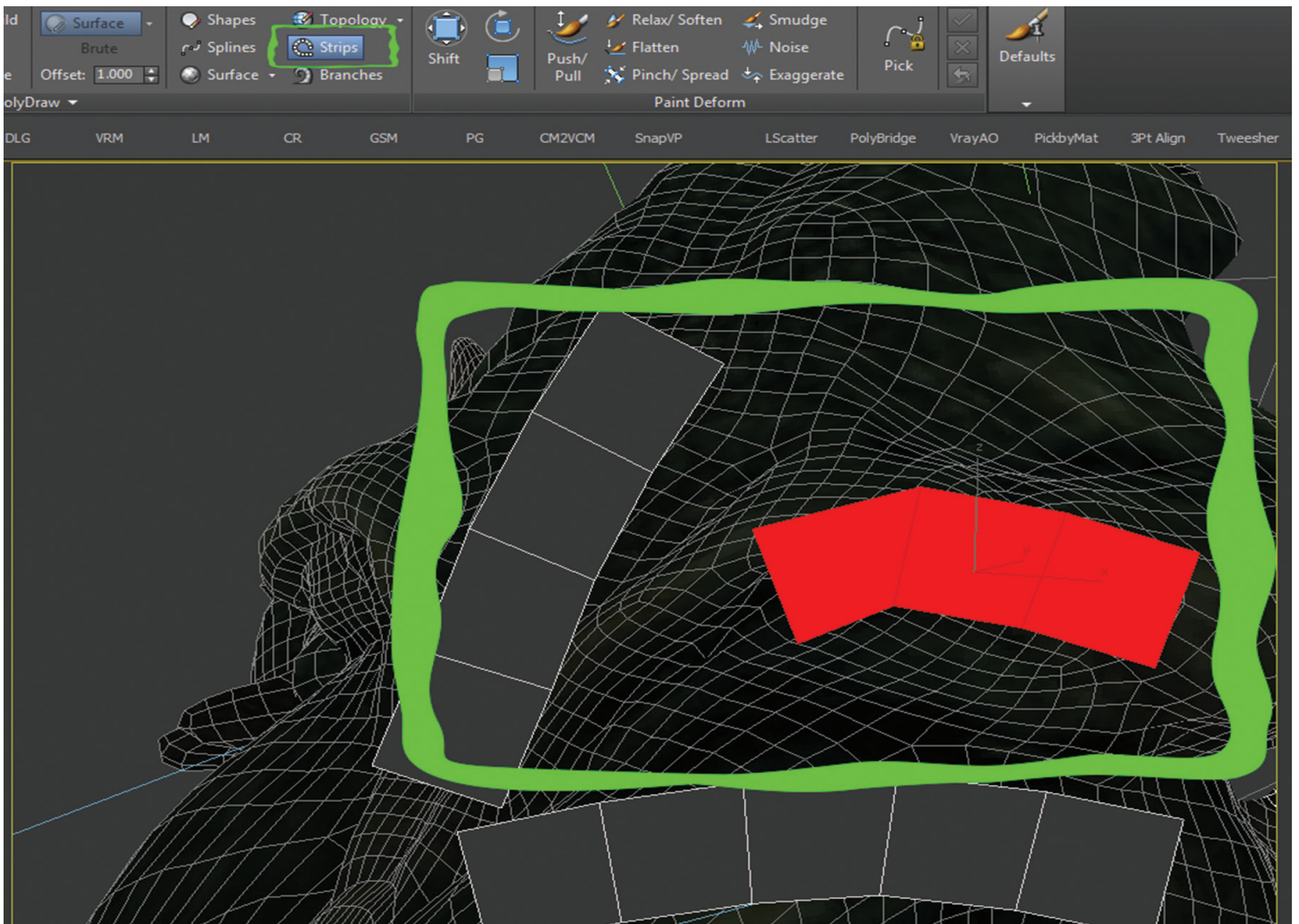

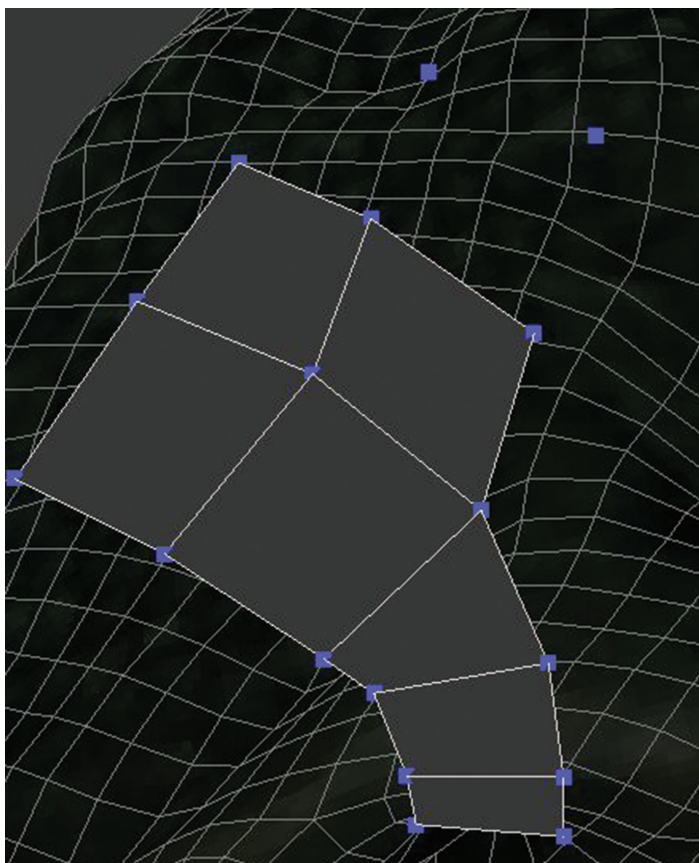Figure 6: Tracing with the Strip option

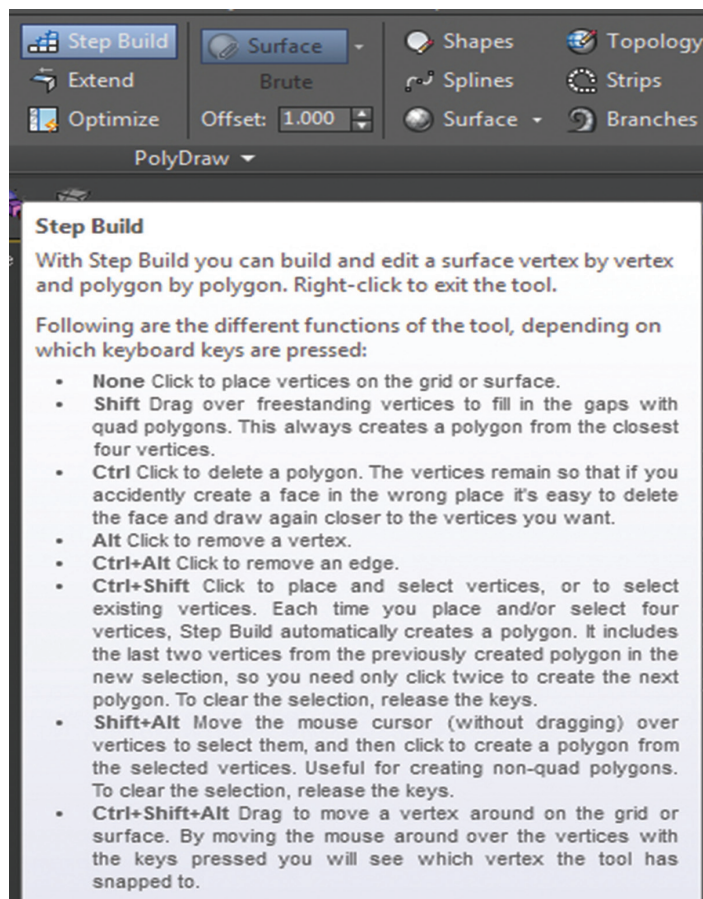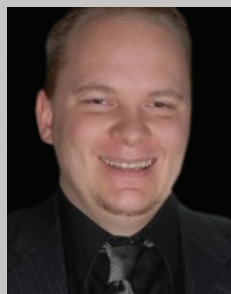Figure 7: Step building – point and face construction

Figure 9: Rigged and retopologized high-resolution character with texture

Personally I prefer to start with the "Step Build" option. Step Build gives us the ability to click important points on our surface and close them, creating a face and giving us precise control over the construction of each face as shown in Figure 7.

Step building is a simple process. Just select four points on the object representing four corners of a face, then hold shift and drag diagonally across them to create the face. If we hold the mouse over the Step Build option, we see the various methods to assist us with creating our new mesh as shown in Figure 8.

Other tools such as splines and topology are available, which allow the construction of lines that simply form faces of a mesh when they overlap. In the end, the retopologizing is basically taking a very complex object and converting it to an object that can maintain a decent resolution but can be easily textured and animated like that shown in Figure 9.

Step Build

With Step Build you can build and edit a surface vertex by vertex and polygon by polygon. Right-click to exit the tool.

Following are the different functions of the tool, depending on which keyboard keys are pressed:

- **None** Click to place vertices on the grid or surface.
- **Shift** Drag over freestanding vertices to fill in the gaps with quad polygons. This always creates a polygon from the closest four vertices.
- **Ctrl** Click to delete a polygon. The vertices remain so that if you accidently create a face in the wrong place it's easy to delete the face and draw again closer to the vertices you want.
- **Alt** Click to remove a vertex.
- **Ctrl+Alt** Click to remove an edge.
- **Ctrl+Shift** Click to place and select vertices, or to select existing vertices. Each time you place and/or select four vertices, Step Build automatically creates a polygon. It includes the last two vertices from the previously created polygon in the new selection, so you need only click twice to create the next polygon. To clear the selection, release the keys.
- **Shift+Alt** Move the mouse cursor (without dragging) over vertices to select them, and then click to create a polygon from the selected vertices. Useful for creating non-quad polygons. To clear the selection, release the keys.
- **Ctrl+Shift+Alt** Drag to move a vertex around on the grid or surface. By moving the mouse around over the vertices with the keys pressed you will see which vertex the tool has snapped to.

Figure 8: Step Build methods

Brian Chapman is creator of Pro-Cad. Net and Senior Designer for Slater Hanifan Group, a civil engineering and planning firm dedicated to superior client service. Brian can be reached at procadman@pro-cad.net.

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by: Brian Andresen

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http://www.autodesk.com/products/bim-360-glue/overview

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BIM 360 DOCS OVERVIEW
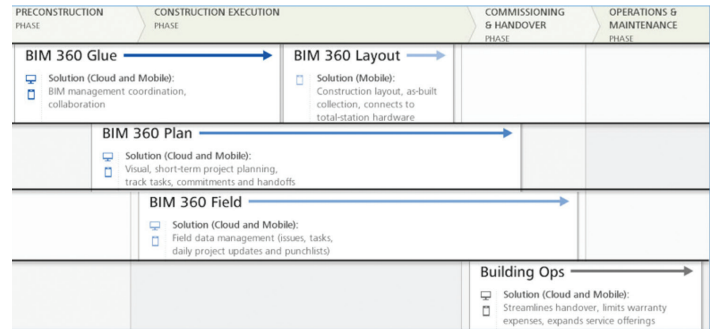
http://www.autodesk.com/products/bim-360-docs/overview

BIM 360™ Docs delivers a complete, connected solution to manage all 2D plans, 3D models, and other project documents. Built specifically for the AEC industry, and designed to connect designers, owners, contractors, and construction project teams.

FIELD MANAGEMENT WITH BIM 360

http://www.autodesk.com/products/bim-360-field/overview

BIM 360™ Field is field management software for 2D and 3D environments that combines mobile technologies at the construction site with cloud-based collaboration and reporting. BIM 360 Field puts critical information into the hands of those in the field, helping to improve quality, safety, and commissioning for construction and capital projects of all types.

PRODUCTION PLANNING WITH BIM 360 PLAN

http://www.autodesk.com/products/bim-360-plan/overview

The BIM 360™ Plan web service for vertical construction contractors supports lean construction practices. Use BIM 360 Plan cloud and mobile software to help build more reliable project work plans, and to help reduce waste associated with overproduction, excess inventory, and task rework.

MOBILE FACILITIES MANAGEMENT

http://www.autodesk.com/products/building-ops/overview

Autodesk Building Ops is a mobile-first building maintenance solution that helps general contractors deliver a better handover experience. For building owners, Building Ops helps them to begin operations on day one and better meet the needs of their workforce.

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. Contact brian.andresen@augi.com