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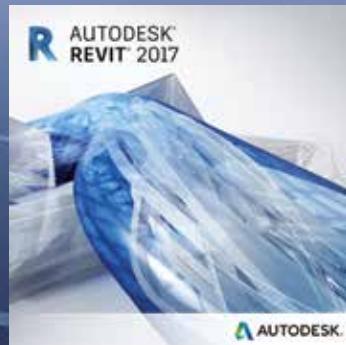


AUGIWorld

The Official Publication of Autodesk User Group International

May 2016

Introducing Autodesk 2017



Also in This Issue

- Helping 2D Subcontractors in a 3D World
- Resistance Is Fruitful
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contents

product focus

6



- 6 Revit Architecture**
Features, Fixes, and Enhancements
- 10 Revit Structure** Making New Connections
- 14 Revit MEP** FABulous
- 20 BIM Construction**
Helping 2D Subcontractors in a 3D World

10



- 26 AutoCAD** New Features, Great and Small
- 30 AutoCAD Architecture**
Performance Enhancements in ACA
- 34 AutoCAD Civil 3D**
Enhance Your Workflows
- 40 3ds Max**
New Release, Packed with Improvements

26



columns

- 4 Letter from the President**
- 18 CAD Manager**
Resistance Is Fruitful

34



- 24 Tech Insights**
- 39 Inside Track**

Letter from the President



AUGI

DISSEMINATING KNOWLEDGE



I'm willing to bet that you know a lot. Even if you are new to your industry you have the valuable perspective of a fresh viewpoint. Those of you who have been in the industry for a longer time will have a lot of knowledge stored in your head.

Mentoring folks is important because it gets some of that knowledge out of your head and into the heads of others. But mentoring is usually seen as a one-on-one relationship. If you are really skilled at what you do, this can create quite a bottleneck. What approaches do you take to spread your knowledge?

One thing I do is make the concerted effort to document the resolution to every support item that is referred to me. Yes, this takes time. Not only do I have to determine the resolution, but then I need to spend an extra 15-30 minutes to write something. Trust me: the effort is worth it.

I usually document resolutions in a wiki on our intranet. The great thing about this approach is that it is a living document that is easy to cross-link. If there is a resolution that can apply to several issues, the resolution can be linked to all of those issues.

I'm not really talking about a technical support database. What I am doing with the wiki is effectively creating a best practices manual for specific applications. After a few years of doing this, there is little that hasn't already been documented in the wiki. The best thing about this is that when an issue comes in, I don't have to struggle to remember the resolution. I can send the user a link to the specific wiki article. This has ultimately resulted in less time being spent by me on the same issues and has formed quite a store of knowledge that is available to anyone in the company.

Consider the AUGI Forums as just such a resource for disseminating knowledge. If you have a question, you can search the Forums and see if there is a resolution. If you can't find an answer, then asking the question on the Forums will generate a response that often leads to a resolution. But don't ignore the value of your own contributions. If you see a question asked on the Forums and you think you have a solution, offer that knowledge. Think of it as mentoring one-on-thousands. Talk about being effective!

On another note, I must announce that Shaun Bryant has stepped down as a director. Shaun has served on the Board for more than five years and the Board will miss his perspective and enthusiasm for AUGI.

R. Robert Bell
AUGI President

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Features, Fixes, and Enhancements



ADSK DevOps: "Hey, you got snoo in your hair."

RVT: "Yeah, what's snoo?"

ADSK DevOps: "Not much, what's new with you?"



Yeah, ikr, anyhow it's a new Revit® release cycle and as long as they happen we will continue to bring you all the new and exciting, if not simply "known," enhancements and "features" for Revit 2017.

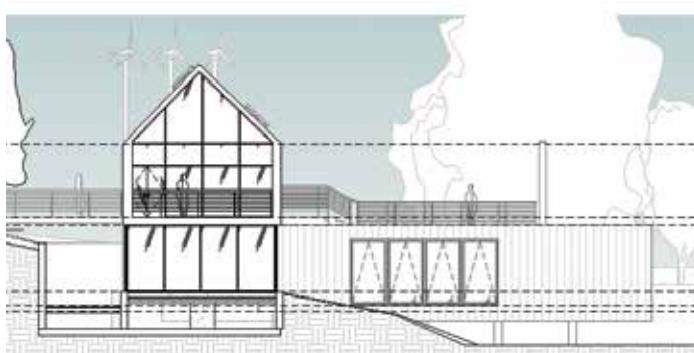


Figure 1: Illustrating Depth Cueing's added granularity and clarity that can now be brought to bear in Revit Elevations and Sections

This piece will focus on the Architectural, Platform-flavoured enhancements. We (and when I say 'we', I mean 'I') will not list all the possible other flavoured enhancements (API, MEP, Structure) that should abound in this issue...and in the help menu ;)

FEATURES

Elevation and Section View Depth Graphics (see Figure 1 and rejoice; it's a nice start)

"Allow" or "Disallow" Wall Join during wall creation is available.

The new(ish) "Multistory Stair" feature allows user to create a multi-story stair, which can contain one or more stair components.

The multistory stair is a level-based stair that is created by selecting the stair component and the levels to which to align the stair (see Figure 3).

Users can add or delete stair components by level and maintain the overall properties for the multistory stair.

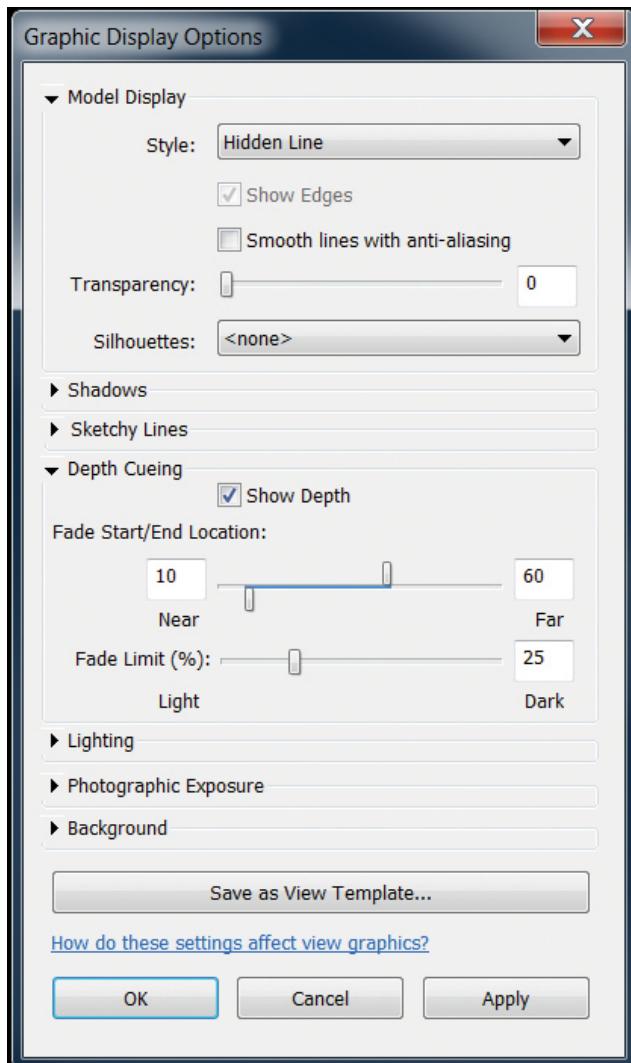


Figure 2: Depth Cueing settings

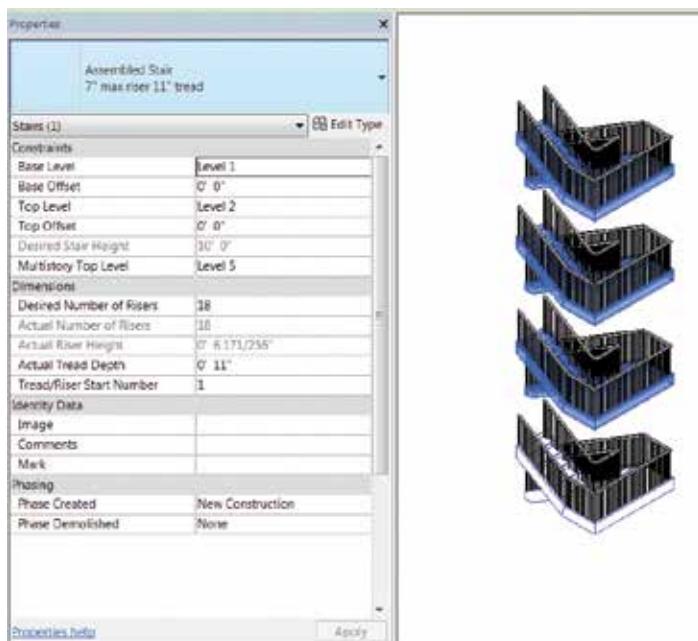


Figure 3: Multistory Stairs under selection

ENHANCEMENTS

- Copy is available in a Camera view.
- Preview of Railings in the creation type dialog.
- Railings can now be hosted and adjusted to the top faces of floors, roofs, and walls.

Energy – Simulation

- Added a help link to the Energy Settings dialog.
- Streamlined the Energy Settings dialog by moving parameters for advanced settings to the Advanced Energy Settings dialog, which is accessible from the Energy Settings dialog.

Graphics – Rendering

- Implemented a file size limit of rendering output to 2G to avoid system failure.
- Improved stability when rendering with Autodesk Raytracer.

IFC

- Corrected an issue with IFC Export so that openings consisting of multiple voids in floors are placed correctly.
- Corrected the orientation of certain surfaces in the IFC file when performing an IFC4 Design Transfer View export.
- Enhanced the IFC user interface to reflect the alternate UI previously available as an add-in. See the online help for details.
- Improved IFC Export by removing redundant and disallowed styles of information.
- Import/Export/Link DWF
- Corrected an issue that might cause Export DWFx to fail if properties contain invalid characters.

Point Clouds

- Improved the “Cannot link point cloud” dialog to use a Close button rather than Cancel.

Stairs

- Fixed a crash that could occur when using the Stair command in a specific model.
- Resolved an issue where part of a stair landing is missing in 3D views.

Walls

- Resolved the issue that the attached wall is not updated when the roof is edited.

Revit Architecture 2017

PLATFORM ENHANCEMENTS

Graphics – Display

- Added ToolTips to provide information about the Depth Cueing feature.

Linked RVT Files

- Refined the Manage Links dialog to improve alignment of command buttons for a more consistent user interface.

Parameters

- For global parameters and the Family Editor, moved the Label field for dimensions from the Options Bar to the ribbon, and made the list of parameters in the Label combo box searchable. YAY!

BTW: Do you use Global Parameters? This is one for all the control freaks and creative types who like to use data to push other data around. The ways these can be used is just beginning to be explored. Where can you take Global Parameters? Where *can't* you?

UI Frameworks

- Fixed behavior issues when working with large DPI settings.

Annotation – Dimensions

- Corrected an issue in which witness lines for some types of dimensions extend beyond expected end points.
- Fixed a crash that could occur when creating aligned dimension on specific rvt files.

Assembly Views

- Fixed an issue with the new dialog for creating assembly views.

Ceiling

- Fixed an issue where the Auto-Ceiling tool highlighted a boundary, but was not able to place a ceiling.

Constraints

- Corrected a worksharing issue to prevent a reporting global parameter from being applied to a multi-segmented dimension.

Content

- Fixed a nested family issue in the Japanese family “2 Layer Sliding_Shoji.rfa”.
- Improved the function of UK door families by fixing a center alignment issue.

Curtain System

- Fixed an issue with creating a new grid line on the attached curtain wall file.

Family

- Fixed a crash that occurred when two families were loaded into a project and the category of one family was changed mid-load.
- Fixed an issue in using Copy and Paste for instances of a structural family.
- Fixed an issue that prevented some complex families from being placed in the project.

Family Editor

- Fixed an issue that prevented the purge of unused materials in the Family Editor.

File Corruption

- Fixed an issue that could cause Revit to crash when Mechanical Settings are validated.

Graphics – Display

- Corrected an issue so that Revit link geometry displays correctly when the “Draw visible elements only” option (occlusion culling) is turned on, regardless of the zoom level.
- Fixed an issue with decal mirroring.

Graphics – Image Import/Export

- Fixed an issue with inverted color for monochrome PNG files inserted into Revit.

Groups

- Fixed an issue where face-hosted families in a group did not rotate correctly when the group was rotated by 90 degrees. *Finally ;)*

Keyboard Shortcuts

- Corrected an issue so that reserved keyboard shortcuts display in ToolTips.

Object Styles

- Corrected an issue so you cannot create subcategories whose names contain trailing spaces.

Parameters

- Fixed a problem that allowed global parameters to be associated with parameters in a nested family.
- Fixed an issue in the Associate Global Parameter dialog in which a new global parameter is not created if the currently selected item in the dialog has not changed.
- Fixed an issue where family parameters with type selectors could be driven by unrelated types from the project using global parameters.

Print

- Corrected an issue with non-rectangular crop regions in wireframe printing.
- Fixed a print and export issue with non-rectangular crop regions and MEP elements in hidden line views.
- Improved consistency of printing with non-rectangular crop regions.
- Improved stability when printing a large number of sheets to PDF.

Properties Dialog

- Corrected an issue so that when you are placing air terminals, changes to properties in the Properties palette are correctly saved.

Revisions

- Fixed a crash that could occur when cancelling the Sheet Issues/ Revisions dialog after making changes.

Schedules

- Fixed an issue with handling conditional formatting in schedules.
- Improved stability when using schedules.

Sketching

- Fixed an issue when transforming sketched elements (e.g., mirroring a floor).

UI Frameworks

- Corrected an issue for add-ins so the component avoids indexing issues resulting from the add-in's on-the-fly ribbon panel modification.
- Corrected an issue so that a ribbon drop-down menu does not obscure its button.
- Corrected an issue so that Revit can start normally, even if the WINDIR environment variable on the computer is not set properly.
- Corrected an issue so that when you display a ToolTip from a drop-down tool in the ribbon, the ToolTip has a background to obscure graphics behind it.
- Corrected an issue to avoid an OLE error after double-clicking on a Revit file and selecting upgrade.
- Fixed a crash that could occur when exiting the System Inspector.
- Updated the Exchange Apps links to the new links for the Autodesk App Store.

Upgrade

- Fixed a crash that occurred during upgrade.
- Fixed an electrical connection issue that could prohibit a project from being upgraded.

View – Other

- Fixed a crash that could occur when rebar elements were regenerated if no cut plane was available.
- Fixed an issue that resulted in incorrect graphics when applying Rotate True North to a view with a non-rectangular crop region.

Worksharing

- Fixed a crash that would occur when checking the document's worksharing status during a Sync with Central operation.

Background Processes

- Corrected an issue to ensure that when you cancel the editing of a group and the background process is being used for a calculation, the cancel operation is completed as expected.
- Fixed a crash that could occur when using Reload Latest while a background calculation is in progress.

There you have it! Revit 2017 may appear close to 2016R2, but these enhancements, combined with the enhancements to all Revit flavours create a stabilizing release that points to a future of big things. As all releases go, there may be some undocumented adjustments, so keep your eyes open and remember: look at all the buttons!



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 BIM & VDC leader, Jay brings unique & qualified insights into the business & creative processes of Architecture, focusing on large projects and large teams through communication, collaboration and shared goals. Jay brings proven strategies, leveraging technology, both human and mechanical, building teamwork toward efficient project delivery

Mr. Zallan has more than 20 years of Architectural experience and enjoys a varied & diverse portfolio of Architecture and Art

Jay is an Autodesk Expert Elite member, President @ Los Angeles Revit Users Group, AUGIworld magazine Revit Architecture Editor and Graphic Standards' BIM Advisory Board

A speaker at Autodesk University, Revit Technology Conference(s) and lecturer on Creativity & Architecture at the University of Southern California, Cal Poly, LACMA, as well as various AIA & CSI events



Structural Connections in Revit® 2017 allow the user to place a Generic Connection placeholder, load the Structural Connection family from an add-in, and extract detailed information via parameters for coordination, detailing, and fabrication. The improvements include more detailed geometry and code checking.

THE PLACEMENT

The Structural Connection tool is located on the Structure tab (obviously) on the Connection Panel (just as obvious!). Click the connection tool and then select the members to be connected.

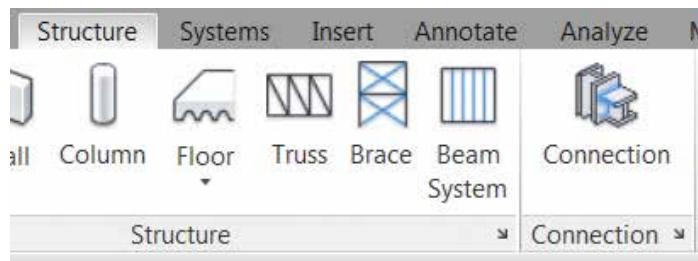


Figure 1: Structural Connection tool

The Generic Connection is created as a placeholder representation of the connection. The solid blue dot indicates the primary member, in this case the column.

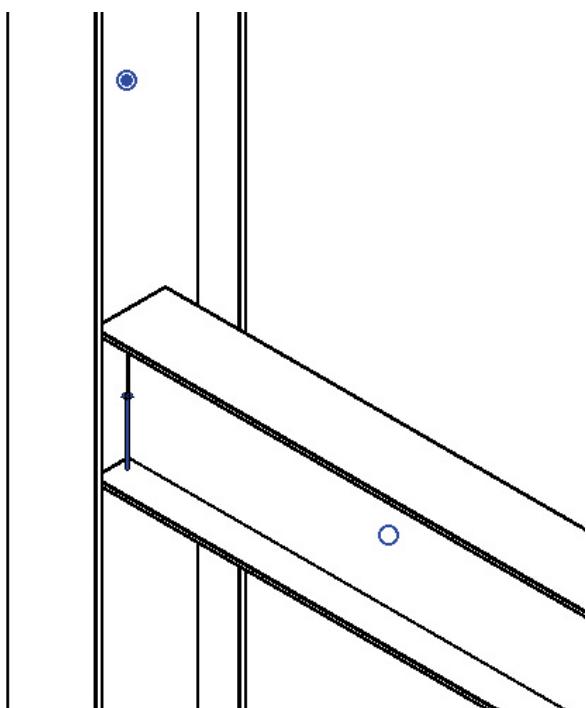


Figure 2: Primary Member

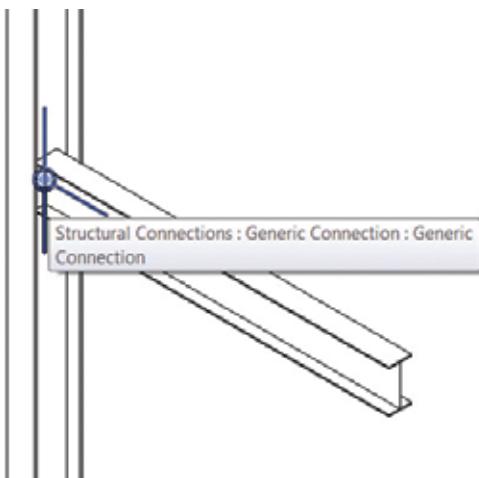


Figure 2a: Generic Connection

Structural Connections use standard Revit object parameters. Parameters may also be added to the connections as required. Unique parameters for connections include the Approval Status (set by the

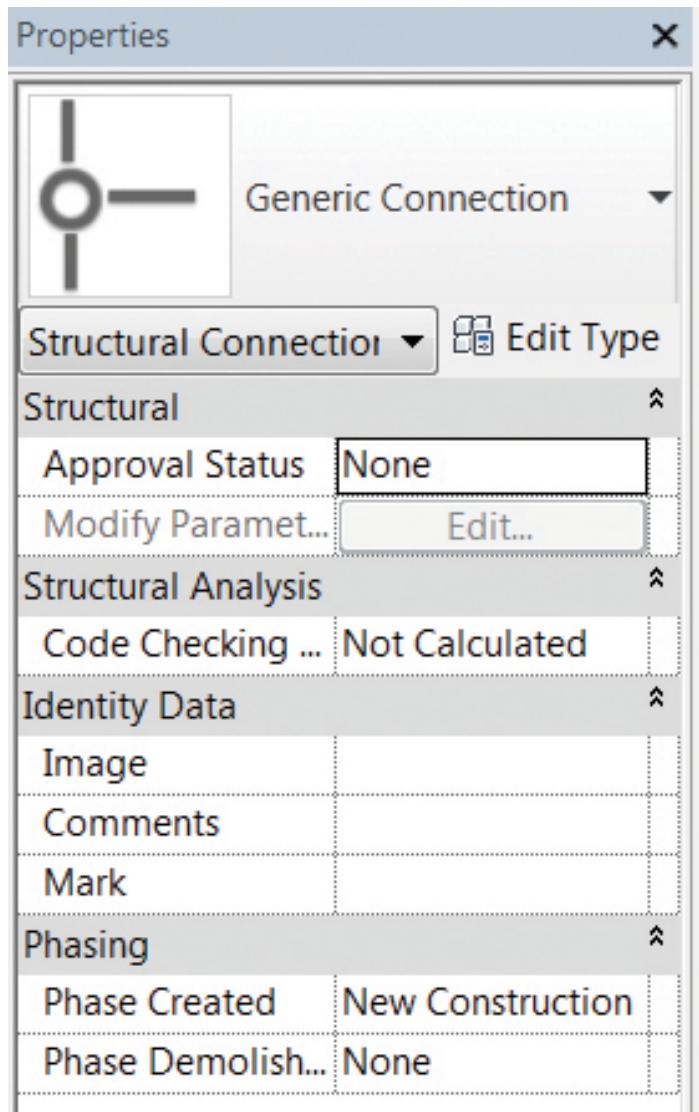


Figure 3: Approval Status and Code Checking

user) and the Code Checking Status, which can either be set by the user or populated by Code Checking when verified. The Approval Status is updated by the Parameters tab under Manage-Settings panel-Structural Settings-Connection Settings.

KEEPING UP APPEARANCES

Structural Connections are part of an add-in for Revit 2017, available as a separate download in the Subscription Center. Once the Generic Connection is set, you can go to the Structural Connection Settings on the Manage tab to load the connections needed.

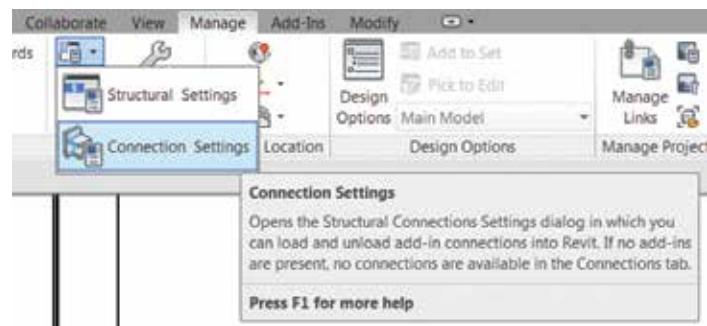


Figure 4: Structural Connection Settings – Manage tab

The Structural Connection Settings (as of this writing) offers 22 options for Structural Connections. Select any or all of the connections to load into the project. This dialog box also gives you options to remove connections, as well as a tab to set the Approval Status Parameters as mentioned previously.

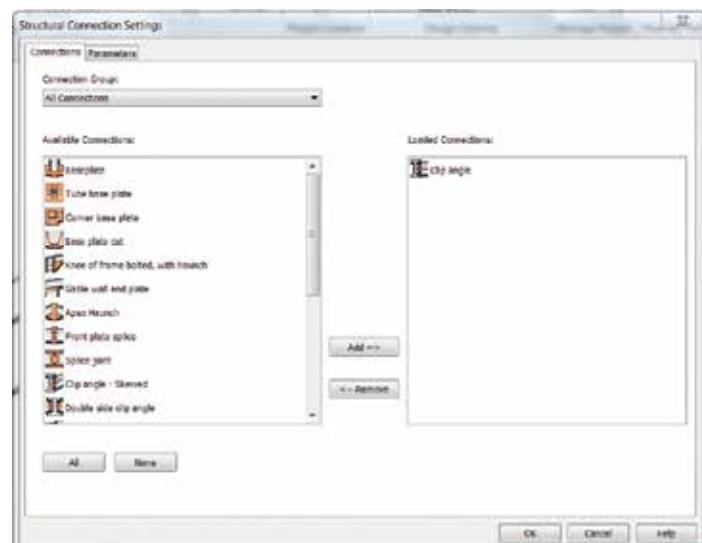


Figure 5: Structural Connection Settings dialog

Revit Structure 2017

After the connections are loaded, click to select the Generic Connection and apply the desired Connection as you would a family type, in the Properties dialog box. It should be noted that the connection is shown differently depending on the Detail Level of the view. The connection placeholder will show in the Coarse level of detail, the angles (in this instance) will show in the Medium detail level, and the bolts will appear in the Fine detail level.

CONNECTION CONFIGURATIONS

The actual configuration of the Structural Connections can be modified in the Modify Parameters contextual panel that appears when the connection is selected. Within this dialog box is a plethora of settings that can be used to adjust sizes of plates, bolts, welds, and apply Code Checking to the connection.

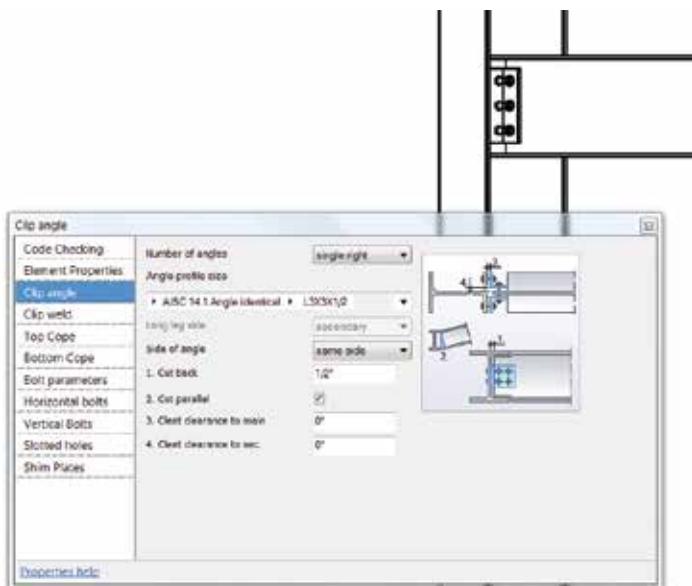


Figure 6: Modify parameters of the Structural Connection

As always, use discretion when modeling connections. Depending on the size of the model, showing all connections may be detrimental to the health of the project file. My philosophy is always to model only what is necessary, what is relevant, and what is useful in terms of visualization and parameters. The rest is just fluff!

THE OTHER STUFF

Other improvements and enhancements to Revit Structure 2017 include the addition of a *Height Offset From Level* parameter that is applied to both footing and slab foundation objects so that they will schedule in the same column.

Another new feature is the ability to attach structural columns to isolated foundations and footings (piers). Much like attaching the Top/Base to a floor or roof, the columns will now attach to the top surface of the foundation. In the case of a stepped footing, the column will adjust its length accordingly. If the foundation moves vertically, the column will adjust automatically.

The last feature I'll highlight is the Bent Fabric Sheet for reinforcement. While previous versions provided a flat fabric sheet, Revit Structure 2017 now gives the option for a Bend Sketch within the Fabric Sheet tool on the Reinforcement panel in Revit. The parameters for geometry include Bend Diameter, Bend Directions (Major or Minor), and the Longitudinal Cut Length.



Figure 7: Bent fabric sketch

WHAT'S IT WORTH?

Upgrades are a pain. I get it. But with the general enhancements to the Revit 2017 platform, the reconfiguration of background processing, the upgrades to the Structural Connections, and the other miscellaneous features too numerous to name, I do think that upgrading to Revit Structure 2017 will be a worthwhile investment.



Kimberly Fuhrman, LEED AP BD+C, is a 20+ year fanatic of Autodesk products in both architecture and civil design. She is a Revit Architecture Certified Professional, a participant in Autodesk's Inside the Factory event (formerly Revit Gunslinger), an Autodesk University speaker, and a member of the Expert Elite program. She serves on the Market Leadership Advisory Board for USGBC-Central Pennsylvania, and on several college advisory boards. She is the Revit Structure Content Manager for AUGIWorld, and in her spare time, writes for the CAD Panacea blog.

BIM Is A Lot Less Complicated



Once You Know How It All Fits Together

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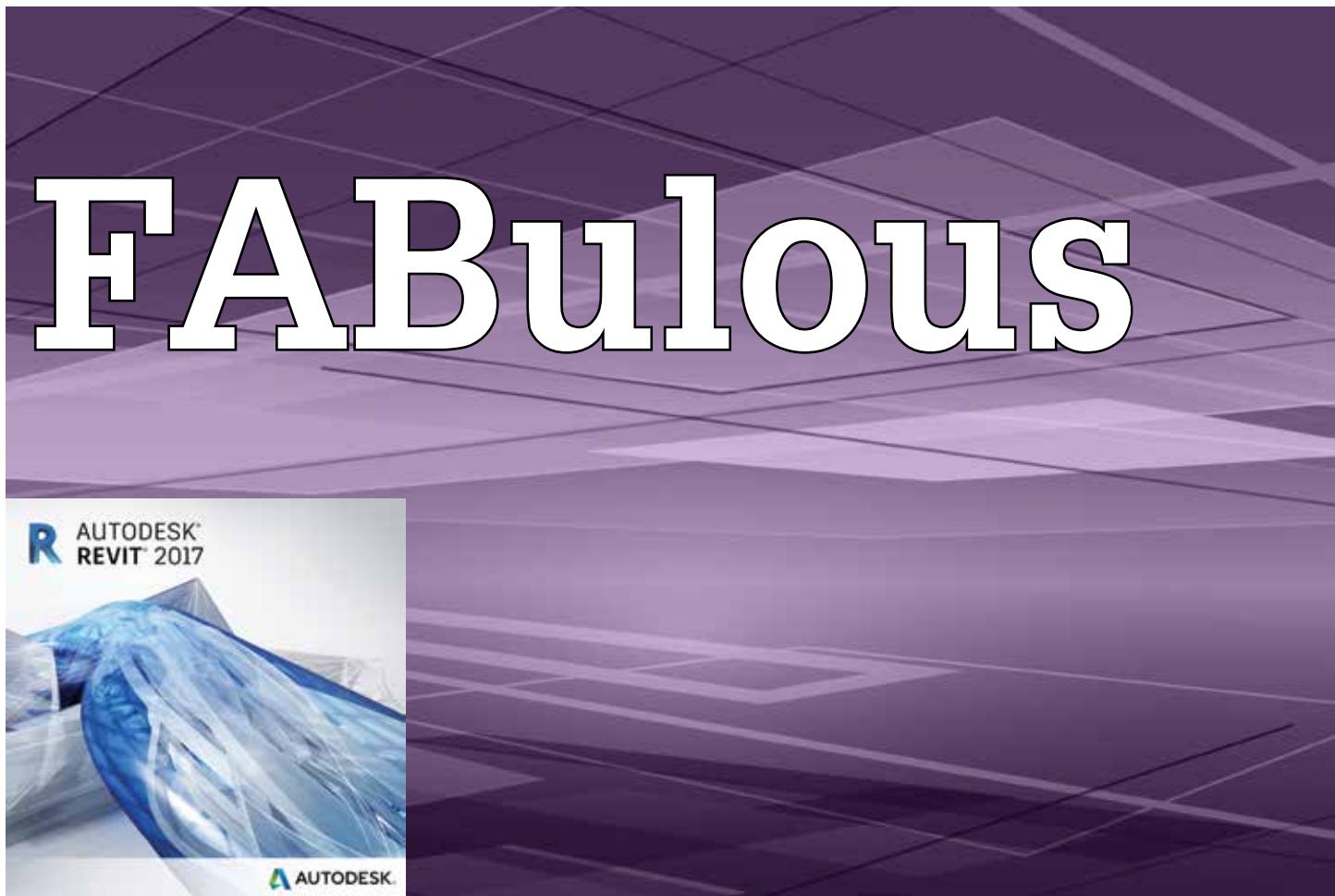


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More than ever, Autodesk is looking to connect the dots between nurturing ideas and making reality. For the MEP user, this has meant a steady progression toward fabrication workflows for HVAC. This includes the introduction to quite a few tools.

First in line is the Design to Fabrication tool. This tool allows generic Autodesk® Revit® MEP elements to be converted into a fabrication model, side-stepping the long-used method of redrawing. Users can simply select a group of ducting or piping system, and then pick the Design to Fabrication tool (Figure 1).

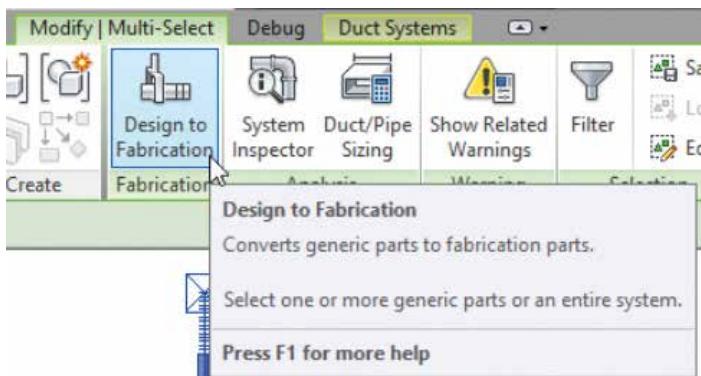


Figure 1

Revit will display a set of compatible services for the selected elements. Choose the appropriate service to convert the elements (Figure 2).



Figure 2

This version has some limitations with sloped duct and pipe. Accessories, terminals, equipment, dampers, and flex are not yet supported. Open ends and elevation changes for mains to run outs may also cause issues. It's clear this is a first go, but it is a necessary step toward simplifying the fabrication workflow.

Once Fabrication parts are placed, parts can be merged and lengths can be optimized with the aptly named Merge Parts and Optimize Lengths tools.

The Route and Fill tool will route the required fabrication parts between two open connectors. Revit offers multiple solutions to make the connection; users can filter the available parts to refine the available solutions.

Tees, valves, dampers, and other inline equipment can now be added into runs, not just the ends, with the Insert Part tool (Figure 3).

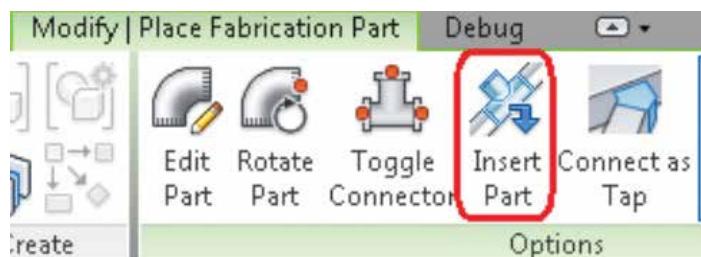


Figure 3

The Connect as Tap tool allows any fabrication part to tap into a flat section of rectangular or oval duct.

Right-click on a fabrication part connector and select Quick Connect to route a connector on another fabrication part with a simple click and drag.

Fabrication parts now have an enhanced rotation tool, making three-dimensional rotations a whole lot more straightforward (Figure 4).

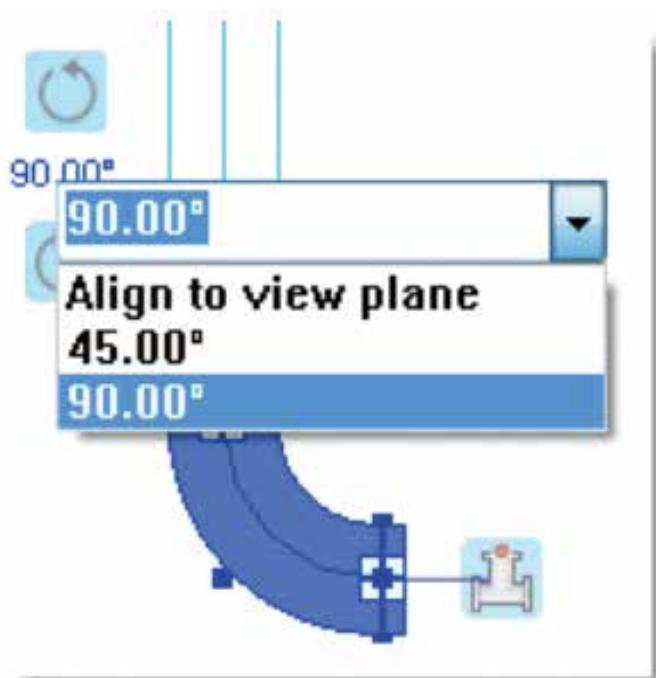


Figure 4

MECHANICAL DESIGN FEATURES

HVAC designers can now specify an ASHRAE table for tap junction fittings, making pressure drop calculations more accurate (Figures 5 and 6).



Figure 5

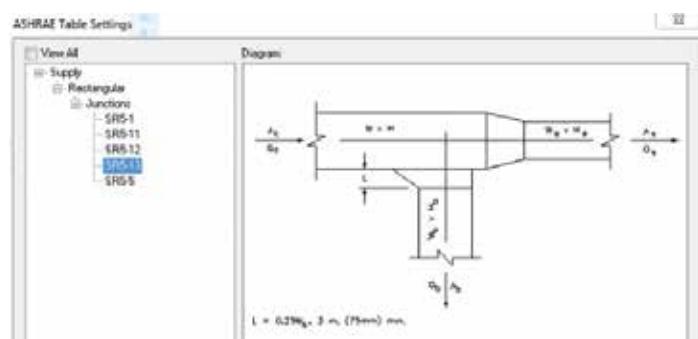


Figure 6

Ducts and wall display performance has been improved in two ways. First, by only regenerating walls and ducts that are visible on screen at any given time. Second, Revit now reduces walls and ducts to simplified lines when they are displayed very small on the screen.

A new parameter type has been added to address temperature change. A change in temperature will be represented by the parameter of type "Temperature Difference," and is available to Electrical, HVAC, and Piping disciplines.

ELECTRICAL DESIGN FEATURES

On the Electrical side, users will no longer have to choose between "None" and the only distribution system that will function when placing a panel. If only one system will work, Revit will automatically select it. "None" will still be an option where there are multiple or no functioning systems available. While this is not a breakthrough feature by a long shot, it is a convenience that will be insanely easy to get used to.

Another electrical perk is the ability to define the default circuit rating of circuits and spares. If you don't like 20Amps and 0Amps, just change the defaults in the Electrical settings dialog under "General."

The most important electrical update is the ability to pick how to sum electrical power. In previous versions, Revit used varying methods to sum electrical power, which resulted in inconsistencies. The user will choose from a "Sum True Load and Reactive Load" method and a "Sum Apparent Load and True Load" method. Users that have complained about subpanel loads not equaling distribution panel loads will now have finer control over how Revit sums loads.

Revit MEP 2017

PLATFORM FEATURES

So things have not exactly burned up with strictly MEP updates, but there have been quite a few platform changes that will affect the MEP user. Most notably are the changes to the text editor. These have been long awaited and it wouldn't be hard to find a mess of MEP folks willing to give up discipline advances for a decent text editor. So, what did we get? (See Figure 7)



Figure 7

For anybody who has ever tried to put a short specification on a sheet, or just had a very readable set of notes in Word that became a huge chunk of words in Revit, the Revit text editor has taken another step into multilevel lists. Bulleted and numbered lists were introduced previously, but now use the Tab key to create sublists to parent lists. The inverse can be done with a Shift-Tab combination. Shift-<Enter> can be used to add blank spaces between lists. The results can look something like the example below.

1. Top Level List
 - + Sub level list
 - + Sub level list

2. Top Level List
 - + Sub level list
 - + Sub level list

Subscript, Superscript, and convert to CAPs tools have also been added (Figure 8). These options should work fine for text entered on the screen, but users importing text from AutoCAD® should check the option to "Maintain Visual Fidelity" rather than "Maintain Editability."

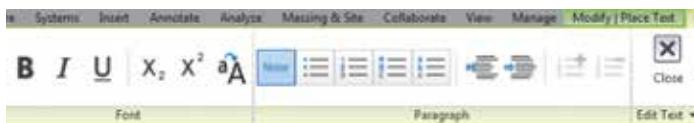


Figure 8

Worth noting is that this version of Revit has changed the way it measures text height to better align with AutoCAD. In the past, the distance was measured from the font base line to an ascender line. If you are confused you are not alone. The height of a font is now measured from the bottom to the top of a capital letter E. What does this mean to us? All text will change slightly. Upgraded text may change where it wraps and text may seem bigger or smaller. What happens is based off the font used, so keep an eye out for the differences.

Users can now create Calculated Parameters in tags by picking a discipline and creating a formula from the values in the tags' cat-

egory. Text, Yes/No, and numeric parameters can be used in the formula, allowing users to tag just about any calculated value.

You can pin tags and they will stay put when the tagged elements are moved. The leader will increase or decrease as required.

Tags will no longer relocate to the original location when the leader is switched, turned to On, Off, or Free End. It will also no longer change its shape when switched between Free End and Attached End.

There is now a search function inside the family types dialog that gets users to the parameter they need right away. For those who have been dealing with more and more complex families, having this search function is a real time-saver and a good habit to get into the more you hear the words BIG Data.

Parameters can also be combined in schedules using the Combine Parameter tool. A suffix, prefix, and separator can be added during the combination or added later (Figure 9).

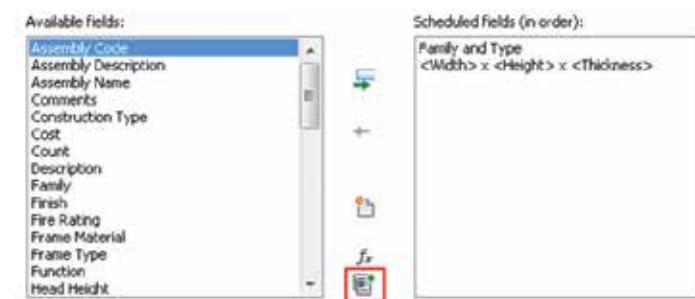


Figure 9

View templates for schedules have been added (Figure 10). These will be highly intuitive to anyone who has used view templates in the past. In fact it is the same drill, just with schedule parameters instead of view parameters.

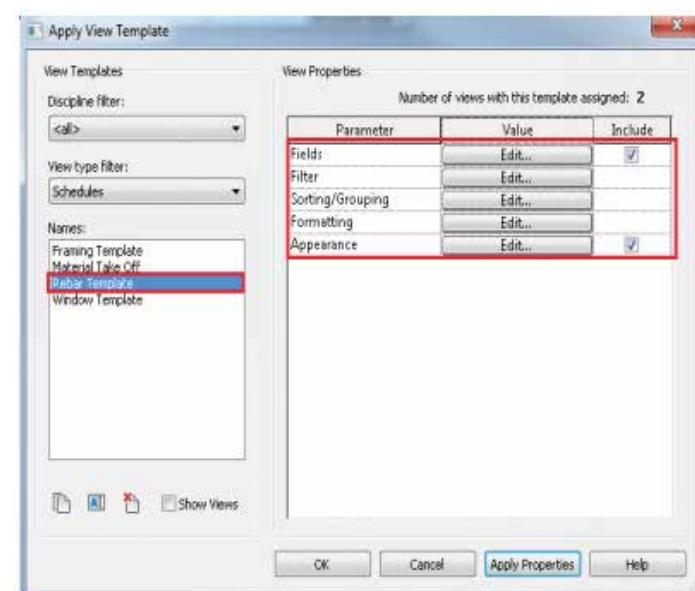


Figure 10

Revit will constrict users to only those parameters that can apply. That means if you try to apply a diffuser schedule template to a light fixture schedule, you will only be able to control parameters grouped under "Appearance" because the appropriate fields just don't exist. Similar to view templates you can assign them and apply them to schedules. It might make sense to assign an Appearance template to all schedules, and then apply schedule-specific templates to individual schedules. In this way, if a style change is required per a client's needs, it can quickly be assigned to a whole project without changing anything else.

I am personally excited about the ability to cancel prints in progress. When printing or exporting, Revit now provides a convenient "Cancel" button in the lower left-hand corner of the screen. Click it, tell Revit you are sure, and you are clear to make more changes and print again (Figure 11).

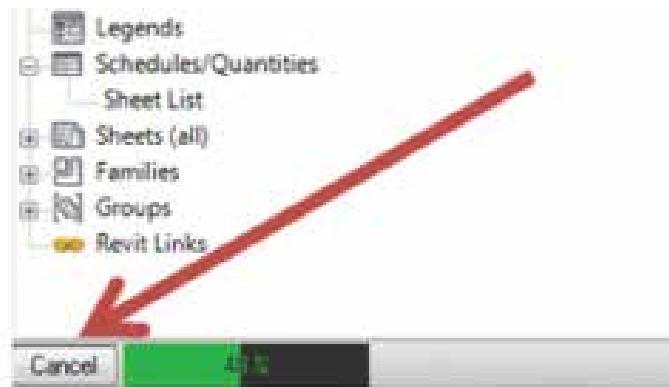


Figure 11

The filters dialog now has a tree structure that separates the Selection-based filters from the Rules-based filters (Figure 12). It might sound simple and not all that helpful, but my guess is that we will not want to go back after just a little bit of real use.

Global parameters have been introduced. Global parameters are project-level parameters that can be associated to dimensions and instance parameters. Think about global parameters as a family parameter that applies to a whole project. Find the new Global parameter tool in the Manage tab with Project parameters and Shared parameters.

What's a use for a global parameter? There will undoubtedly be more than one initially thinks. For now think about when one element might drive another. You could set a global offset for the length pendant fixtures drop, then change them all at

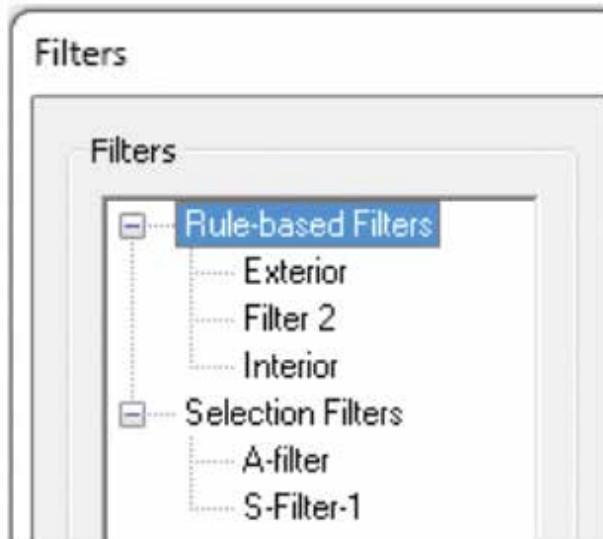


Figure 12

once, or associate the material of face plates to a global parameter to switch from ivory to off-white in a single step.

This go around Autodesk has made strides in text editing, usability, and fabrication. Years of steady steps continue this year and I am sure the users will be excited to make the jump. This particular release includes some game changers in Global Parameters, Schedule Templates, and Fabrication strides. The way families are put together will change, standard procedures and best practices will change, and logos will change. Change is good, folks. Dive in and enjoy.



Todd Shackelford provides strategic BIM leadership for Alvine Engineering. He is the Revit MEP Content Manager for AUGIWorld magazine, and an Industry Fellow at the University of Nebraska. A regional advocate for Revit and BIM, he was instrumental in forming the Omaha BIM Collaborative and the Central States Revit Workshops, where he served as Co-Director. He authors two blogs: CAD Shack and The Lazy Drafter. A Revit 2013 Certified Professional, Todd is driven by a desire to make BIM easy. Tweet Todd @ShackelfordTodd or email him at tmshackelford@gmail.com





Resistance Is Fruitful



Last month we discussed how resistance to change that you are initiating would come at some point because you are a change agent pressing forward with new technology. The pushback might be strong or weak; focused or random; rational or illogical. But it will come. Most resistance should be viewed as valuable. It is a warning flag that some people do not align with the change as you expected. It is a warning that something "might" be wrong. It may not uncover the exact problem, but it does reflect the fact that there is a need to take a closer look. Now we look at ways to move resistance from frustrating to fruitful.

REENGAGE

First – don't avoid the resisters. You should not be working around them, or sidelining their voices. If you do not talk to them, others will. They may taint your message of positive change or get others to pause a little more than they would have. You need to be interacting with them to uncover the issues and address them. So when you interact... what do you do?

REVIEW

Most folks are not out to sabotage your efforts. They really have their own positive reason for resisting. It might be personal, as in trying to avoid work. Or it might be protection akin to saving their job. It might be that they are seeking the good of the firm and think that the new tools or change in methods is actually going to end very badly. So take the time to review what they are saying. You should be curious about their pushback. Why are they resisting? Have you asked them about it and listened to their perspective? Seek to have them quantify or clarify and reduce it to simple topics that provide enough detail that you can respond. Don't just let them say it's a stupid idea. Ask why they believe it is stupid. When they reply, repeat back to them what you are hearing. Paraphrase and restate what they have presented. Make sure you have it right. Do not take a stance that views them as "opposing" you; they just have a differing view. It may not be wrong, just different.

RESTATE

Sometimes people just do not understand what you are saying. If they bring up incorrect assumptions, then restate your perspective. Draw a picture, maybe literally on a white board, of the goals, steps, and outcome you are expecting. Have them comment on your statements so that you again have a clear outline of their stance and they understand yours. Ask questions or make statements like "Tell me more about..." or "What would happen if we...?" or "Why do you think this will not work?" Do not take a judgmental stance. Try not to say that the person is "wrong" or "failing to see" something. That might put them on a defensive stance and they resist even more. Your job is to coax and convince, not conflict with them. People just do not like being told what to do.

REGROUP

There may be a better time to approach the resistant person. You may need to let them cool off or just give them some time for your idea to sink in. Change is hard, especially if you are caught off-guard. Some ideas may be too bold. Some folks may need time to marinate in the juices of the concept. It may make sense to give some team members more time to get a hold of the change and see where it might be taken. After some time has passed, circle back and discuss the idea again. Do not just put them out of the loop and move on without them. You need these voices that challenge your thinking.

REEXAMINE

Take a look at the data again. Are your time savings legit? Does your cost cutting really make sense? Ask them if they have data to back up their statements, but not in a challenging way. Show the data that supports your point of view first. Get them to look at your data on paper or posted on a white board or computer screen. Take away the eyeball-to-eyeball showdown and look at another point in the room. It really can cut the tension to not stare/glare directly at the person, but rather look at another focal point.

REIMAGINE

After you have examined the framework that others propose, rethink your own. Every idea could use some refinement. Don't just pass off resisters as "not getting it." They have a point of view that needs to be taken into account. Now that you have the resisters' perspective correctly framed, reimagine the goals that you have. Can you include some of their ideas? Can you alleviate some of their concerns? Is there a way to achieve both their targets and yours? Can you change something on your side that would give them a little breathing room? Can their suggestions make your plan better?

REMOVE

Don't be afraid to actually take something off the table. You may be better off moving some of the harder changes off the early schedule and moving them to the end. You could delay them for another time. Make them transitional as they phase in over a few months or several projects. Too much change can be as bad as too little. Get them to agree to make a change in the future. Then come back later and remind them that they agreed and it is time to move forward.

RESTART

Just throw the whole thing out and start again. This might seem like giving into the resisting voices, but it may not be. If you repack-age the ideas, come back with another timeline, move the changes to another department first, or make some other change in the plan, the resisters may calm down and be given time to see others embrace the change and then want to get on board.

SO MANY OPTIONS...

I have used every one of these approaches in differing measures at differing times. They all might work for your situation. It takes a sharp Tech Manager to work with people who might resist a change, even when you know it will save time and money. When you encounter resistance, pushback, or even rebellion, do not write it off. Take the time to review your options, regroup, and make the change again.

While these tips might help when you encounter resistance, it might be better to reduce it before it happens. The best way to make changes to other peoples' workflow might be done by building relationships first (this takes time), then listening to them, including them in defining and planning the change, and then enabling them to make the adjustments on their own terms/timeline. You will need to move them forward, as some changes may not be optional, but working with them early and staying connected will always produce the best results.



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.

Helping 2D Subcontractors in a 3D World



I have worked on many projects for design and construction firms creating and providing training on BIM processes. Throughout this time I have noticed, as I'm sure most of us have, some apprehension to implement and utilize this type of technology. Although BIM has shown great returns for many projects, the implementation has been slow in developing. This slow development has contributed to companies of all sizes putting BIM on the back burner in anticipation of a sure thing or at least knowing that they have been successful in doing what they have always done.

BIM can create some headaches and isn't always easy to incorporate, especially in areas of the U.S. that haven't quite adopted this technology. The reason for this is simple—some areas of the country don't have the manpower or money to invest in learning and customizing BIM. If the complete team isn't utilizing BIM on a given project, that project can come to a crashing halt when all of the elements aren't modeled or well-coordinated. All it takes is one discipline that isn't modeled or coordinated and the project might as well be in 2D. Although this can happen in design firms, it is especially exaggerated in subcontracting firms. The following information has been written for subcontractors, but can be used for general contractors and design firms as well.

When an owner requires BIM on a project, it can produce a varying number of problems for a company that hasn't instituted BIM. One of the main reasons I started AEC BIM Services is because I saw a

need for this exact instance. Sometimes, when BIM is being used on a project, it's easy to get caught up in the 3D aspect and assume every element is coordinated because it has been modeled. There can be a disconnect between the modeler and the project manager/foreman because each other's job descriptions don't always cross paths. We sometimes put aside everything we have learned from our 2D processes throughout time and rely on 3D processes in which all may or may not fit our personnel or company. I have noticed many subcontractors that were completely lost in the 3D world. It wasn't their fault. They never had to worry about producing from this technology and they have always been able to build without it. What is hard to realize, before BIM implementation, is the typical LEAN approach. You don't realize there is a problem until you look for it. The data, coordination, and collaboration are enough to save many hours and produce a better, more sustainable outcome.

In a typical project using BIM, the owner requires BIM because of the benefits imagined. The GC isn't usually chosen because of their knowledge of 3D technologies. Even if the GC is well-versed in BIM, they really only provide coordination efforts to the team. It is left up to the subcontractor to complete their models and, most of the time, their own coordination. This can be an impossible task especially since the typical subcontracting firm doesn't have the personnel required to model and coordinate in 3D. So, what does the subcontractor do? They could start looking at anyone on the project team that can produce 3D and try to hire them

for modeling and coordination purposes. This isn't the ideal situation because the other team members are trained in producing their specific discipline and are already too busy as it is. Granted, it can work, but it is not ideal.

Hiring an outside firm is a viable option. Third-party BIM firms have a good number of resources and usually have personnel that are trained in all disciplines. It's hard to know what to expect, especially if it is the first time hiring a BIM firm.

STEPS FOR A TYPICAL PROJECT

- The BIM firm will meet with the project manager and/or the foreman for that project and explain the options the subcontractor has. This can range from 3D modeling and coordination services to Total Station layout to prefabrication modeling. I use a form that has all of the appropriate options listed on it, which I complete while sitting with the subcontractor (see Figure 1).

BIM Project - Overall Checklist

Project Name: _____
Date: _____

Project Number: _____
Project manager: _____

Check which BIM tasks we would like to pursue on this project. The sections already marked are completed on every project that includes BIM.

Proposal Phase:

- Request for Proposal Modeling
- BIM Presentation/Modeling for Interview

Preconstruction (Cont.):

- Self-Perform Model
- Concrete F
- Masonry
- Steel
- Safety Modeling
- BIM in the Prefabri

Detail Design Phase:

- Opportunity for Assist in Design modeling
- Site Creation/Modeling

Figure 1: BIM checklist

- After all of the options are selected, a quote will be issued for services. This quote will contain project understanding, schedule for completion, and a cost of services breakdown. At AEC BIM Services we issue a lump sum quote based off of some information for the project. So the first number quoted is the last number quoted. Most firms, however, issue an hourly rate.
- After the quote is accepted, the BIM firm will then grab any bit of information they can from sketches to CAD files for use while modeling the building system. Most often the BIM firm will sit down with the subcontractor to go over their specific building standards as these will need to be incorporated in the model. If there has been a design model created for this discipline, it will also be used as a guide.
- The BIM firm will then take the information given and create a model while working with the subcontractor to assure buildability and coordination with the other disciplines.
- The BIM firm will participate in all of the appropriate coordination meetings and conference calls with the project team throughout completion of the building system. It is the intent of the BIM firm to act in the best interest of the subcontractor.

- When the coordination is complete, shop drawings will be created with dimensional and elevation information (see Figures 2 and 3). These shop drawings are accurate and can be used in the field during construction.



Figure 2: Mechanical dimensional sheet

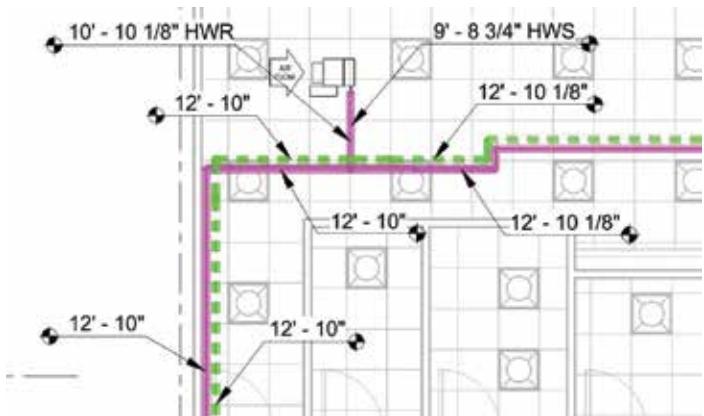


Figure 3: Mechanical elevation sheet

- After construction, an As-Built model will be used as the deliverable as well as the drawings that were produced (see Figure 4).



Figure 4: Coordinated As-Built example

BIM Construction

It is imperative throughout this whole process that the BIM firm explains to the subcontractor exactly what is happening at every stage of construction and the lines of communication are open.

After completion of the initial project it will be time for the subcontractor to start making a plan for future BIM projects. One of the first items to consider is the extent the subcontractor can go to produce BIM in the future. Is it cost effective, are there available personnel in the area, will there be enough projects to sustain a BIM department are some of the questions that need to be asked. If it isn't beneficial to start a BIM department, a third-party BIM company should suffice. However, if the need persists and a BIM department is in the subcontractors' future, here are a few items to consider:

- A meeting with the IT department will help further the understanding of what needs to be purchased such as hardware, software, and additional network space.
- Templates need to be created. Templates must contain company standard information such as Annotation Symbols, specific company building elements, and company Titleblocks. The template also needs to be configured to match company standards. Settings such as lineweights, linetypes, system information, and annotations are just a few.
- An in-house company BIM standards manual is needed for continuity in modeling and processes. This manual will lay out which families to use in certain instances. In 3D, more so than 2D, it is essential for all BIM personnel to be on the same page because of the ramifications of poor coordination.
- It is always a good idea to create a BIM Project Execution Plan, at least for in-house use. This plan will help to identify project demands, possible BIM issues to consider, and ownership of elements and processes. There are a lot of good examples of execution plans online, namely the Penn State University and Indiana University examples.
- A training program needs to be set up. In a typical BIM department there will be a BIM Manager who has the responsibility to complete high-level tasks and train less-experienced employees. I have always found that training during a project is way more efficient than training from a book using example models. Training on a real project allows the inexperienced user real-world experience and, at the same time, a project is being completed. This cuts down significantly on overhead costs.

A third-party BIM services firm can help with all of the above items. The main issue with transitioning to Revit is that it takes expert-level experience to create families and customize templates and standards. This family creation and customization needs to be done in the beginning of BIM transition. Therefore, either an expert level user has to be hired in the beginning or a third-party



Parameter	Value	Formula
Operation	*	
Analytical Properties		
Analytic Construction	<None>	*
Visual Light Transmittance	*	
Solar Heat Gain Coefficient	*	
Thermal Resistance (R)	*	
Heat Transfer Coefficient (U)	*	
Data		
Standard Bolt (default)	<input checked="" type="checkbox"/>	*
Short Bolt (default)	<input type="checkbox"/>	*
Long Bolt (default)	<input type="checkbox"/>	*
Half Bolts (default)	<input type="checkbox"/>	= or(and(Standard Bolt, Short Bolt), or(and(Standard Bolt, Long Bolt), and(Short Bolt, Half Bolts)))
Other		
Washer Clamp Quantity Formula (default)	1.000000	= if((Panel Height < 4' 0 3/12/256", 0.5, 1)
Time Needed (default)	10.000000	= if((Panel Width < 1' 0 3/12/256", 10, 10)
Standard Bolt Quantity Formula (default)	17	= if(Standard Bolt, ((Panel Height / 1') * 2) + 1), 0)
Standard Bolt Quantity (default)	17	= if(Half Bolts, (Standard Bolt Quantity Formula / 2), Standard Bolt Quantity)
Short Bolt Quantity Formula (default)	0	= if(Short Bolt, ((Panel Height / 1') * 2) + 1), 0)
Short Bolt Quantity (default)	0	= if(Short Bolt, (Short Bolt Quantity Formula / 2), Short Bolt Quantity)
Panel Quantity (default)	1	= 1
Long Bolt Quantity Formula (default)	0	= if(Long Bolt, ((Panel Height / 1') * 2) + 1), 0)
Long Bolt Quantity (default)	0	= if(Half Bolts, (Long Bolt Quantity Formula / 2), Long Bolt Quantity)
Identity Data		

Figure 5: Custom family example

firm can handle this while training entry-level personnel at the same time (see Figure 5).

Transitioning to Revit will be a daunting task, but one that will help to save time, money, and create more efficient projects. One thing to note: if any company elects to create a BIM department, it is important that there be substantial buy-in from upper level management. There are an abundance of firms that elect to start a BIM department without this buy-in, and they eventually go back to pre-BIM standards.



Matthew Hill is the owner of a BIM services firm named AEC BIM Services. AEC BIM Services is experienced with 3D cutting-edge technology that will help your firm to be more technologically efficient at a reasonable price. Matthew has more than 20 years of CAD experience with 10 years of industry experience specializing in design and construction BIM project management. He is responsible for implementing and continuously improving BIM processes including the connection of BIM to design and subcontractor coordination, site technologies, efficiency modeling, and project execution planning. Matthew has directed the use of 3D software and processes for the creation of Revit models and families to seamlessly run efficient projects.

www.linkedin.com/in/matt-hill-a881911b

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- Intel® Core™i7-6700K to 4.5GHz	- Intel Core i5/i7 3.3-4.2GHz TB	- New E5-v4 Intel Xeon®Processor
- Intel Z170A C.S. PCIe 3.0	- 6/8MBCache 4Cores/8Threads	- 15/55MB Cache, 4 to 44 Cores
- 16GB-DDR4 2666 to 3000MHz	- 8GB DDR4 2133MHz to 64GB	- 32GB DDR4 ECC Reg to 512GB
- NVIDIA®Quadro® K1200 4GB	- New NVIDIA®Quadro® Mx000M	- New NVIDIA®Quadro® M2000
- 256GB SSD Samsung® PRO	- 500GB SATA6 Hybrid 8GB SSD	- 512GB SSD Samsung® PRO
- 74 in 1 Card Reader, USB 3.1	- 15.6/17.3" 1920x1080NR LED	- 74 in 1 Card Reader, USB 3.1
- Xi®MTower Silent Compact Tower	- Speakers,Camera,Mike & Wi-Fi	- Xi®MTower Silent Compact Cube
- MS Windows® 7/10 Prof. -Linux®	- Microsoft® Windows® 7/10-64Bit	- MS Windows® 7/10 Pro-Linux®
4-Core i7-6700K 4.1GHz \$ 1,949	i5-6600 3.3GHz M1000M \$1,749	16-C 2xE5-2620v4 3GHzTB \$ 2,889
4-Core i7-6700K 4.5GHz \$ 2,549	i7-6700K 4.2GHz M3000M \$2,449	44-C 2xE5-2699v4 3.6G.TB \$11,499

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by Robert Green

Why You Can't Afford Cheap Computers



As Autodesk users we've seen great advances in software functionality in recent years. From solar analysis in Revit to stress computation packages that run with Inventor or even realistic point cloud visualization in AutoCAD, the design software we use can do more and more. But how can this powerful software provide real value to us if it is forced to run on an old, slow (or both) consumer grade computer? And for that matter does it make sense for expensive design and engineering talent to sit idly by while these old/slow computers take way more time than they should to complete a task? These are the questions we'll examine in this month's Tech Insights.

COST JUSTIFICATION 101

Here's the conundrum: Everyone would love to have a new high-powered workstation but how can we be sure it makes sense to purchase one? To answer the question a few parameters must be understood, including the following:

New workstation cost. What will a new workstation, like HP's Z240 SFF, cost?

User labor cost. What is the labor cost of the user who'll receive the new workstation? The more the user makes the easier it will be to justify a new workstation – more on that in the next section.

Maintenance costs. How much does it cost to maintain an old PC? Contrast this cost with the comprehensive 3-year limited warranty that all HP workstations include.

Knowing these parameters will allow you to understand the complete cost and savings picture so you can compute your cost justification.



Figure 1 - HP Z240 SFF (left) and Tower Workstations offer great performance at reasonable prices.

THE COSTS OF OLD COMPUTERS

The first question that must be examined is exactly what old computers cost your company. At this point someone in accounting will probably say, "Old computers don't cost us anything because they're already paid for!" But using the well-known equation Time=Money, old computers really can rack up substantial costs as compared to a well-equipped HP Z240 SFF Workstation. Consider the following:

Slow task completion. The older computer simply takes longer to perform a task than it otherwise would on the Z240 SFF.

Crashing and restarting. For complex processes - like rendering or visualization - older computers with less RAM and no SSD can sometimes lock up. Any time it takes to restart the process and reclaim lost work is time lost.

Inability to multitask. With today's high power design software, it is possible to perform analysis in the background while design continues, or to create animations/renderings while working with a spreadsheet or AutoCAD session in the foreground. With the Turbo Boost speeds of today's Intel® processors, high bandwidth SSD's and certified graphics GPUs, these background processes can move right along while the foreground applications receive maximum processor frequencies for fast, freeze free performance.

Extra support time. Keeping an old computer with obsolete hardware running can sometimes be costlier than you think. IT time spent supporting obsolete graphics cards and the expense of fixing old hardware quickly adds up where the new workstation would have none of these issues.

Your challenge is to figure out how many hours a user experiences these types of problems per year to arrive at a total number of wasted hours per year for each old computer in your office.

TIME = MONEY = SAVINGS

To convert the wasted time you tallied in the last step into money you'll need the labor rate of the user sitting at the computer. Simply multiple the labor rate times the wasted hours per user in a given year and you'll have a solid savings estimate. Obviously, a \$22/hr drafter will present less savings potential than a \$38/hr rendering specialist or a \$55/hr mechanical engineer will, but you may be surprised at how it all adds up.

Consider the \$55/hr mechanical engineer's case if a one hour per week time savings can be achieved. At 48 work weeks per year the annual wasted time for this engineer equals a whopping \$2640 (48 weeks * 1 hr/wk * \$55/hr). And if you consider that a new workstation (with a three-year life span) will actually save an hour per week for a full three years the savings goes up to \$7920.

By substituting the drafter's or rendering specialist's labor rates you'll arrive at three-year savings of \$3168 and \$5472, respectively.

THE FINAL JUSTIFICATION

A quick visit to the HP web site allows you to configure an HP Z240 SFF with a 3.5 GHz Intel® Xeon® processor, 16 GB RAM, a 256 GB Z Turbo Drive SSD¹, a 1 TB hard drive¹, and a 2 GB NVIDIA® Quadro® 620 graphics processor² for \$1499³.

Remember when the accountant said, "Old computers don't cost us anything because they're paid for" in an earlier section? Now we can confidently make the case that these older computers really do cost money based on our time savings studies.

Further, we can see that investing in a new \$1499 Z240 SFF Workstation is actually a money maker if we consider the case of the mechanical engineer. Equipping the engineer with a new \$1499 workstation can start saving \$2640 per year which can pay for the new workstation in 29.5 weeks.

IN SUMMARY

Why continue to slow your high cost users down with slow, crashing obsolete computers when you can actually profit from high power, low cost workstations like HP's Z240 SFF? While your user time savings and labors costs will likely vary from the scenarios presented here, you can use the same methodology to make smart workstation purchasing decisions in your organization. You may find that those old "paid for" computers are really costing you.

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 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.

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. For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and up to 36 GB (for Windows 8.1 and 10) of system disk is reserved for system recovery software.

2. Some 3D graphics only available as AMO and are not available on small form factor configurations.

3. Price based on HP.COM build your own configuration data. Prices, specifications, availability and terms may change without notice.

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AutoCAD® 2017 is out and, like most releases of any program, there are several small updates and at least one big new tool or improvement. AutoCAD 2017 gives users several behind-the-scenes updates that perhaps only managers will notice, some interface tweaks (as usual), a pile of “small things,” new dynamic centerline tools, a more streamlined set of A360 tools, a new program to handle files for 3D printing, performance enhancements (using a computer’s GPU to process linework) and the best new tool in AutoCAD, the ability to import PDF geometry!

BEHIND THE SCENES AND MANAGEMENT CHANGES

There are plenty of behind-the-scenes improvements that most users won’t even notice, but CAD managers and IT departments will be interested. If your company has more than one type of AutoCAD license, then the new License Manager will help. Install AutoCAD, then on the first start up you tell it what type of license you have. The Infocenter now has a button that installs licensing information. If you are using a network license and lose connection

to that server, a pop-up window appears where you can save all of your work and shut down or manually save and shut down while a timer counts down.

The Migrate Custom Settings tool offers a new interface. It does a better job of detecting a user's custom settings and displaying them in a more intuitive format.



Figure 1: The new Migrate Custom Settings dialog has a new interface

After AutoCAD 2017's initial install the new AutoCAD Desktop App appears. A shortcut is also installed on the Windows taskbar. It does not require a user to be signed in, but it will offer more information and be more useful. This new app replaces the Autodesk Application Manager tool from previous releases. It is a "companion" program that alerts users when security, hotfix, and service pack updates are available. It is also a portal for learning content. It is subscription aware and provides subscription-only updates and content. Any relevant updates can be displayed in a "card" showing what is available.

USER INTERFACE ENHANCEMENTS

The user interface seems to be tweaked each release and 2017 follows that trend. This next item addresses AUGI Wish List item #3 by providing the ability to increase the default size of some dialog boxes and the ability to resize others. Their sizes will be maintained the next time AutoCAD 2017 is opened. Users can resize these dialog boxes: Select File, Insert, Page Setup Manager, Object Grouping, Layer States Manager, Edit Attributes, Enhance Attribute Editor, Move or Copy (Layout tabs), Drawing Properties, Security options, Load/Unload Applications, Open VBA Project, and Drawing Units.

ToolTips now has a control that will delay the display of rollover tips when hovering over a command with the cursor. To adjust these settings, go to the Display tab on the Options dialog box.

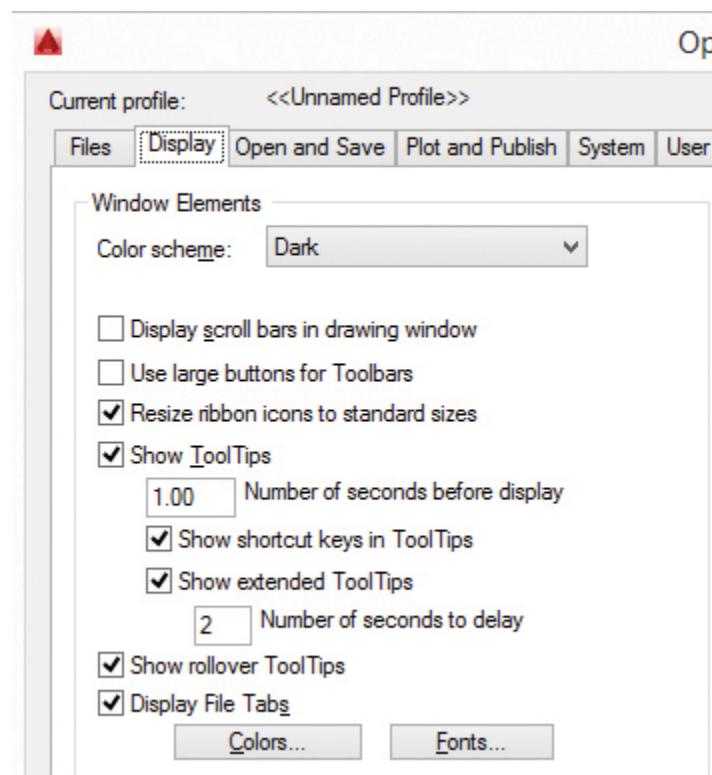


Figure 2: Here you can control how long it takes for ToolTips to display

THE SMALL THINGS

There are several "small" improvements or additions that were made in AutoCAD 2017.

- Security Options has been updated to allow AutoCAD to trust any file or folder that is saved in the Program Files folder. The Trusted Path controls show this now.
- The Load/Unload Applications button is now found on the Applications panel of the Manage tab on the ribbon.
- AutoCAD Units has a new length option, US Survey Feet.
- If the Pickfirst setting is turned off (set to 0) AutoCAD will now provide an alert when objects are selected and the delete key is pressed. The alert notifies you that the current settings won't allow this type of action. This dialog box warning can be turned off.
- There is a new setting in the HPLAYER controls that allows a non-existent layer to be assigned to a hatch or fill as the default layer.
- Line smoothing is now supported during editing tools where a preview is created. This will make it easier to see what will happen when a change is made.
- AutoCAD 2017 now supports displaying linewidths to Dot linetypes. Linetypes that are dash and dot combinations now display dots as round objects, not squares as in previous versions. Users can also snap to the gaps in dashed or dot linetypes. Turn this behavior on/off using LTGAPSELECTION.

NEW ANNOTATION TOOLS AND SETTINGS

There are a few new annotations tools and settings in AutoCAD 2017. The TEXTEDIT command now includes a new mode option. Users control this new mode using the TEXYEDITMODE system variable. It allows users to edit more than one text option without having to restart the command. Start the Textedit command and select the Multiple (type in M or select Multiple on the command line). When Multiple mode is in use keep selecting text objects for editing. There is also an UNDO option that allows users to undo previous editing operations.

There are two new tools that create centerlines. They are Center Mark and Centerline and both are associative. These tools can be found in the Centerline panel on the Annotate ribbon tab. The Center Mark tool makes an associative object at the center of an arc, circle, or polygonal arc. If those objects are moved, the center mark updates accordingly. The Centerline tool creates an associated object of a specific linetype between specified objects. These new marks can be unassociated using the CENTERDISASSOCIATE command. They can be re-associated using the CENTERREASSOCIATE command.

There are several system variables that control the appearance of these objects: CENTEREXE (controls the extension length), CENTERMARKEXE (controls the center mark extension length), CENTERLTYPE (controls the linetype used), CENTERLAYER (sets the layer used), CENTERSCALE (sets the linetype scale used), and CENTERCROSSGAP (sets the length of the central cross in the middle of an arc or circle). Both new center line objects can be edited with grips or through the Properties palette. The CENTERRESET command resets centerlines and center marks to the default settings.

CONNECTING TO THE CLOUD AND SHARING FILES

The A360 ribbon tab has been updated. Older commands have been removed as have tools that are used less often. The AutoCAD Online ribbon panel and the AutoCAD 360 web tool have been removed. Design Feed is no longer displayed by default and the tool has been removed from the panel, but is still accessible using the DESIGNFEEDOPEN command.

Now to share files in AutoCAD 2017 use the Share Design View tools. Access this new tool from the Publish flyout on the Application menu or from the A360 ribbon tab using ONLINEDESIGNSHARE. Users can publish views of drawings to the cloud with "stakeholders." This allows users to protect their DWG files. Stakeholders viewing the drawings don't need to log into A360 or have AutoCAD-based products installed. Users publishing the views/drawings must be logged into A360 to do so. These drawings can be viewed through a browser. From the viewer, users can navigate the drawing, make measurements, look at object properties, turn layers off and on, and more. A link to the view/drawing can be shared with others by email, messaging, or posted online.

When users purchase an AutoCAD subscription they will also have access to AutoCAD 360 Pro. The Pro version of AutoCAD 360 has markup tools, the ability to make changes in real time, add text, connect to external cloud storage services, access advanced layer management, and the ability for users to work offline and sync changes once connected again.

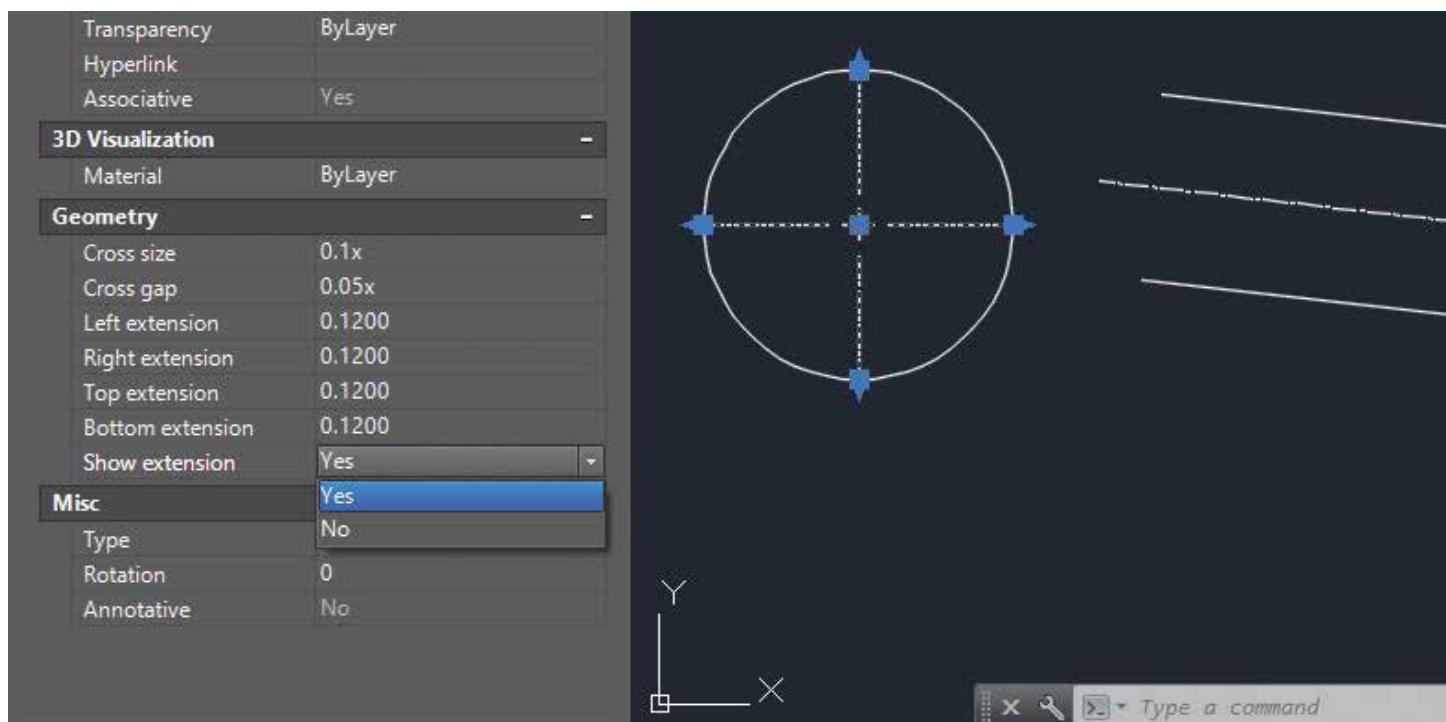


Figure 3: AutoCAD's new Centerline marks can be edited in the Properties panel just like other dimension objects

3D PRINTING TOOLS

AutoCAD 2017 has two 3D printing options. One creates a .STL file that can be sent to a printing service. The other opens the file in a new program called Print Studio that comes with AutoCAD 2017. Use 3DPRINTSERVICE to create the .STL file (formerly 3DPRINT) or use the command 3DPRINT to open the files in Print Studio. Print Studio provides tools to help prepare models for specific printers or materials.

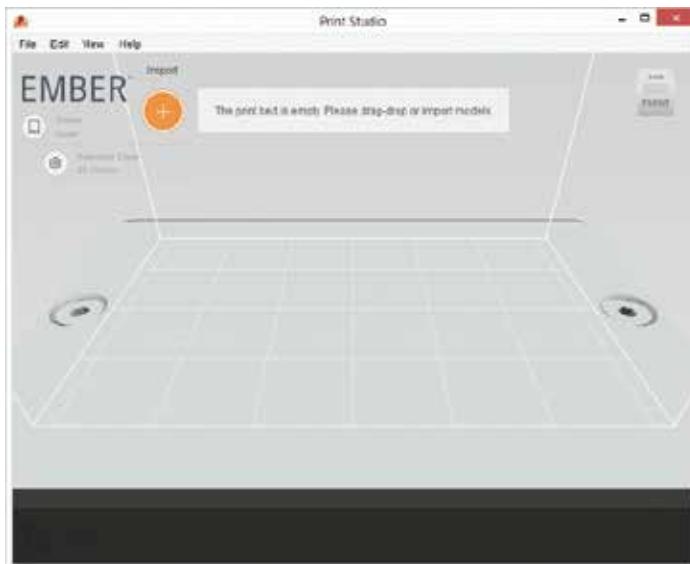


Figure 4: The Print Studio print bed is where you add files to print in a 3D printer and prepare them for printing

PERFORMANCE ENHANCING FEATURES

AutoCAD 2017 will now work with 2D graphics more efficiently because it can take advantage of the computer's graphics processing unit (GPU). Linetypes that only include dashes and dots are now generated by the GPU. It is not solely reliant on the CPU. Graphics are now cached in the GPU memory, which will make panning and zooming more responsive. AutoCAD 2017 also takes advantage of a new 3D graphics subsystem. This allows users to view and orbit 3D models with visual styles without experiencing degradation.

IMPORTING PDF FILES – THE REASON YOU WANT AUTOCAD 2017

Perhaps the biggest new tool in AutoCAD 2017 is the ability to import linework, TrueType text, and raster images from PDF files. There are two ways of importing PDF linework into your AutoCAD files. One way is to use the Import command. This will open the Import File dialog box where PDF files have been added as an option. Once a PDF file has been selected users can choose which page to import from a multi-page PDF document, specify scale, rotation, and insertion point (similar to inserting a block), control what type of data is imported (geometry, solid fills, text, raster), control how layers are assigned, and

set different post-processing options for the imported geometry. Extracted raster images are attached as .PNG files; the “apply linewidth properties” applies linewidths from the PDF file. When turned off, all imported geometry is given AutoCAD’s default linewidth. There is also an “Infer linetypes from collinear dashes” option that inspects collinear dashes and dots and replaces them with a single polyline in the AutoCAD file. If turned off, each dash in the PDF file will be its own AutoCAD object in the DWG file.

The new command PDFIMPORT gives users the options to import geometry from a PDF file or from a PDF underlay that is already referenced in the DWG file. Importing from a PDF underlay will also give users the option to import the entire file or allow a rectangular or polygonal boundary around a specific area of the PDF. Selecting a PDF underlay in the current DWG file will activate the PDF Underlay contextual ribbon where the PDF Import button can be found.

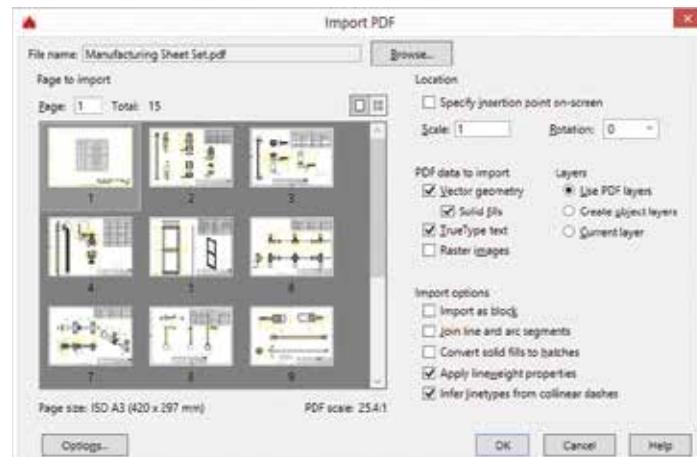


Figure 5: Users get to control how PDF geometry is converted in the Import PDF settings

WHAT DO YOU THINK?

Do these new features, updates, tweaks impress you? Depress you? Is the new PDF import tool exciting or a boring, never-use tool? Are there too few new items for your tastes?



Brian Benton is a Senior Engineering Technician, CAD Service Provider, technical writer, and blogger. He has more than 19 years of experience in various design fields (Mechanical, Structural, Civil, Survey, Marine, Environmental) and is well versed in many design software packages (CAD, GIS, Graphics). He is Cadalyst magazine's Tip Patroller, AUGI HotNews Production Manager, and Infinite Skills AutoCAD training video author. Contact him at cad-a-blog.com.



USER INTERFACE



T

here are several enhancements to the user interface in AutoCAD® Architecture 2017.

- Several dialog boxes are now resizable: APPLOAD, ATTEDIT, DWGPROPS, EATTEDIT, INSERT, LAYERSTATE, PAGESETUP, and VBALOAD.
- The preview areas are expanded in several dialog boxes used for attaching files and saving and opening drawings.
- You can turn on the new LTGAPSELECTION system variable to be able to select objects in the gaps of non-continuous linetypes as if they were set to a continuous linetype.

- You can choose whether to use the AutoCAD crosshairs cursor or the Windows arrow cursor in the drawing area using the CURSORTYPE system variable.
- You can specify the delay timing for basic tooltips in the Options dialog box, Display tab.
- You can easily send your 3D models from AutoCAD Architecture to Autodesk Print Studio for automatic final preparation prior to 3D printing. Print Studio support includes Ember, Autodesk's high-precision, production-quality (25-micron surface finish) manufacturing solution. This feature is available only for 64-bit AutoCAD Architecture.

STYLES BROWSER

The Manage Content Library dialog now allows you to add a directory to the Content Library. There is also a checkbox to include all subdirectories. To add a directory of drawings to the Styles Browser content library, select “Manage Content Library...” (see Figure 1) from the Drawing File drop-down list. Select Add Folder... then browse to the directory you would like to add and click Open. If there are subfolders in the directory which you want to include, check Include Subfolders.

A360 has been added to the Select Drawings dialog for the Content Library. This allows styles to be shared among geographically dispersed teams.

You can check the status of the Styles Browser palette using the AECSTYLESBROWSERSTATE system variable. You can close the Style Browser palette using STYLESBROWSERCLOSE command.

You can change the size of the Preview Images in the Styles Browser. You can choose from four different sizes: large, medium, small, and details. There are some Object Types that do not have any Preview (Documentation Objects and some Multipurpose Objects). They will show Details view by default and for those Objects the View Direction, Color Selector, and Preview Size controls will be disabled. An informative tooltip is also provided, which includes the full name of the style, full path of the drawing file the style belongs to, and shows four views of the style. The Preview image can be viewed in 10 different view directions. This view direction is applicable per object type and is persistent across sessions. View direction can be set when the preview size is small, medium, or large. The details view will have the View Direction control disabled.

You can select a background color to be applied to the preview image for better visibility. This background color is also applicable per object type and is persistent across sessions. You can set the background color when the preview size is small, medium, or large. The details view will have the color control disabled. The background color is very useful in case of Light theme, where the background color will enhance the preview of the styles.

After setting the Drawing Source and Drawing File, you can hide these controls to make more area available for the Style Preview images in the Styles Browser gallery by clicking on the control for Expand-Collapse. You can turn off the preview image in the Properties palette to reduce the scrolling needed. Once the Preview image is turned off, a binocular button appears, which in turn will be used to access the Styles Browser. The Styles Browser will be invoked by clicking on the Browse button of the Properties Palette to display Styles. Once in an Objectadd command, users can still change the Object type from the Styles Browser and can start the new objectadd command for a different Objecttype.

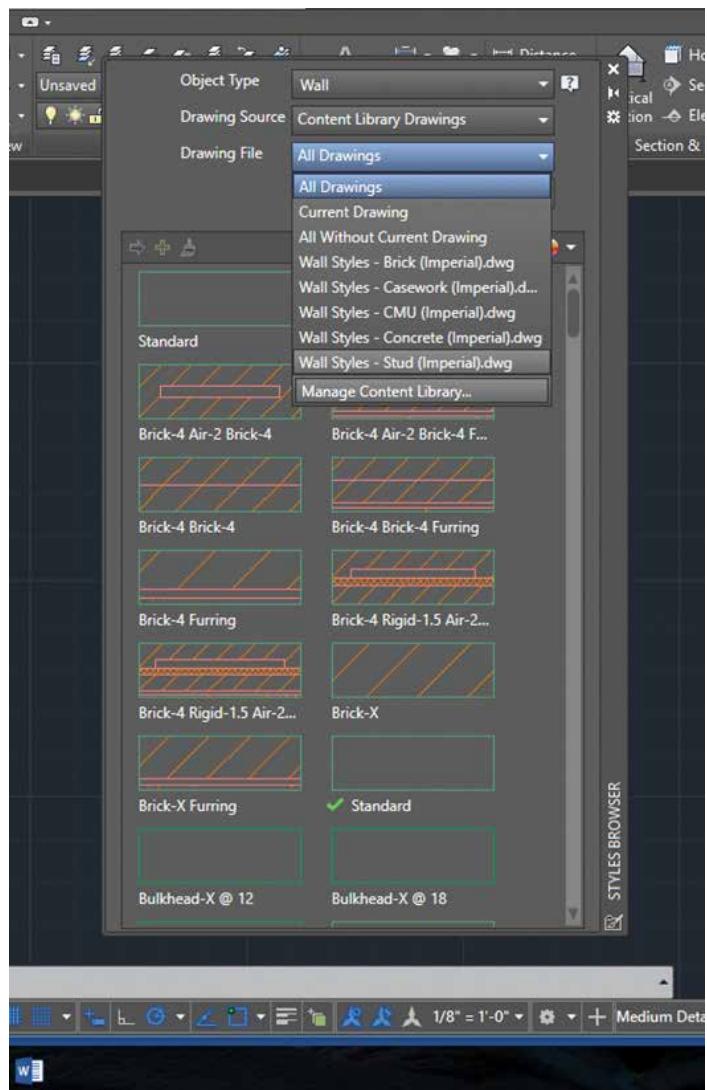


Figure 1: Manage Content Library

ROOF OUTLINE EDIT

The ability to modify a roof outline using grips has now been completed. All of the previous capabilities for the edge and vertex grips are still present. When a vertex is added, both edges will have the same properties as the initial edge. When a vertex is removed, the properties of the lower numbered edge will be used on the resulting edge. The Edges/Faces worksheet, launched from the Properties palette, shows the number of each edge (see Figure 2).

Many of the slab or roof slab properties that you can edit using grips can also be edited on the Properties palette. In cases where multiple selected objects have the same value for a property, you can change the value for all the objects with a single entry on the Properties palette. This palette also provides access and enables you to attach hyperlinks, notes, or files to slabs or roof slabs.

AutoCAD Architecture 2017

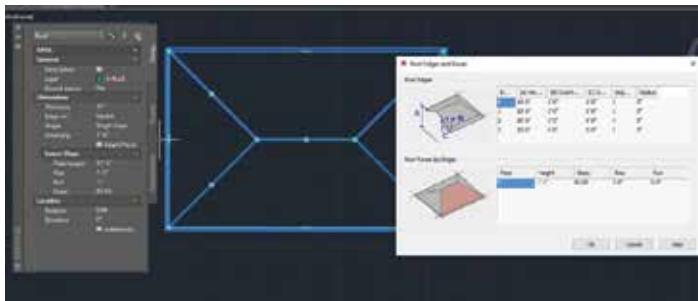


Figure 2: Edges/Faces worksheet

SHARE DESIGN VIEWS

You can publish design views to a secure, anonymous location within Autodesk A360. You can share views of your design by forwarding a generated link to the people that you specify without releasing the DWG file itself. Access to these views is provided by any supported web browser and does not require recipients to have an Autodesk A360 account or install any additional software. Supported browsers include Chrome, Firefox, and other browsers that support WebGL 3D graphics.

EDIT LIVE SECTION – XREF SUPPORT

This feature has been extended to support top-level Xref attachments (see Figure 3). In addition to the right-click menu, this command now appears on the 2D Section Result contextual ribbon. When the command starts, the Live Section from the Section defining line will be displayed in the same orientation as the 2D Section Result, with the Hidden Visual Style. You can select objects in a top-level Xref for editing. The Edit Reference in Place command will run transparently. You can select multiple objects that are in the same Xref for editing. This feature now supports nested Xrefs and blocks. Once you are done with all the modifications in the section result you can click on the Exit button in the “Edit In View” panel. Whether or not you modify the Xref, dialog boxes for confirmation of the changes are displayed.

At this point, you can Cancel to return to the Edit Live Section. Selecting OK will save or discard the changes, depending on the previous selection. If “Save,” the Xref will be saved and reloaded and the Section result refreshed. If you cancel at this point, the workflow of the command will be broken—that is, the Edit Live Session will be closed. But the Edit In Place session will be active and you will need to use the Edit Reference panel on the ribbon to exit. However, if you previously picked “save changes,” the selected Section result will be refreshed when you exit Edit Live Section, although the changes are not made in the Xref.

Grip states have been added to the Section line to allow it to be modified without having to recreate it. You can now add a vertex or a parallel jog using the midpoint grip of a segment, or remove a vertex with its endpoint grip. The start and end points can only be moved.

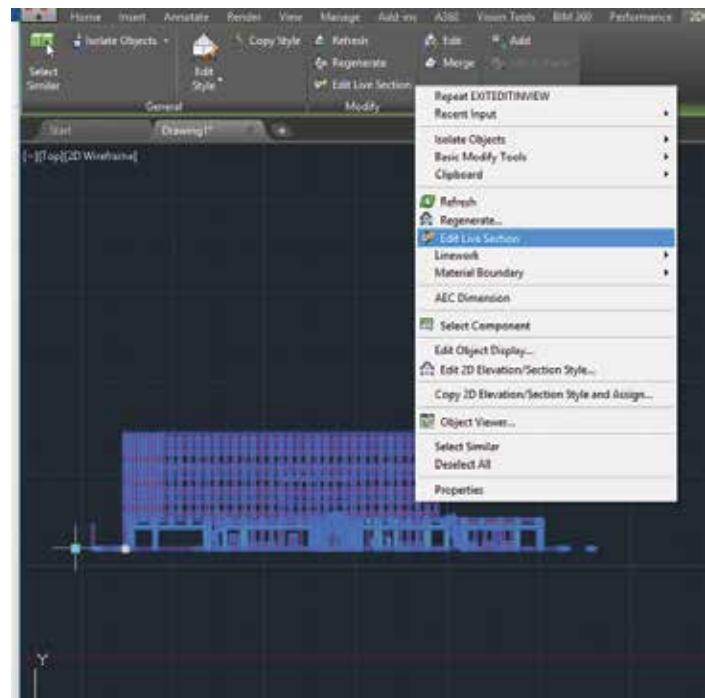


Figure 3: Edit Live Section Xref

“SHAPE” KEYWORD

When adding several objects, you will see a new option, "SShape." The objects this pertains to are walls, curtain walls, railings, slabs, roof slabs, and roof (the option for Roof is "Create Type" because of the existing "Shape" option). Using "SShape" keyword you can easily create shapes such as Rectangle, Circle, Polygon, and Polyline for these objects. With this enhancement in AutoCAD Architecture 2017 you can draw regular polygon shape boundaries much faster and more accurately. With the Polyline option, you can also add curves in objects that do not support an "Arc" option in the usual Add process. In addition, it is much easier to create tangential curves for objects such as walls. When adding a Roof with this option, tracking OSNAP can be used to get precise results.

DIM COMMAND ENHANCEMENTS

The DIM command has been significantly enhanced and is now accessible from the ribbon. Options within the DIM command are now displayed at the command line and in the right-click menu, eliminating the need for you to remember which options are available and how to enter them (see Figure 4). However, even the need to specify Dimension options is significantly reduced. Now the DIM command automatically creates appropriate dimensions based on the type of objects you select. A preview as you pass the cursor over those objects enables you to see the resulting dimension before you actually create it. The DIM command further simplifies creating dimensions by eliminating prompts to modify the dimension text and angle. Instead, the default values are automatically applied. Mtext, Text, and Text Angle options are available from the command line and right-click menus if you choose to

change them. When using the Baseline or Continue options, you are automatically prompted to select the first extension line origin. Regardless of which type of dimension you create, the DIM command remains active, enabling you to easily place additional dimensions until you exit the command.

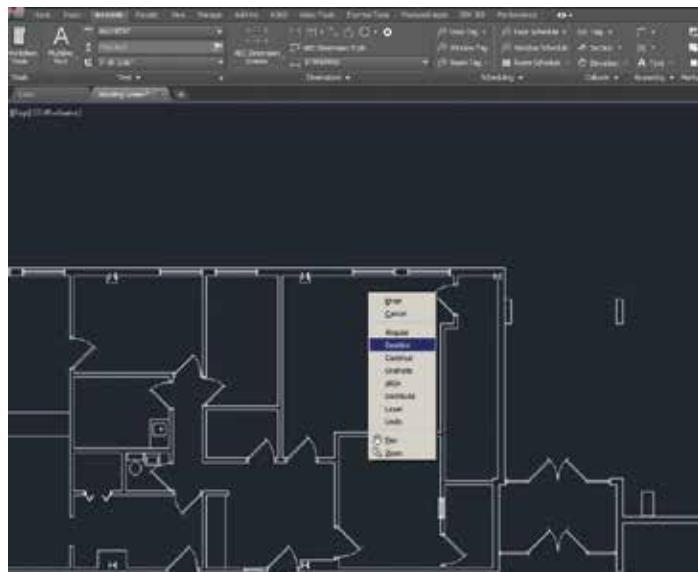


Figure 4: DIM options right-click menu

PDF SUPPORT

You can now import the geometry, fills, raster images, and TrueType text from a PDF file into the current AutoCAD Architecture drawing. The PDF data can come from either an attached PDF in the current drawing or from any specified PDF file. The precision of the data is limited by the precision of the PDF file and of the supported object types. Some properties such as PDF scale, layers, linewidths, and colors can be preserved.

TrueType fonts in MText and Text with any formatting options as well as Polygonized text, SHX text, and Unicode characters are now searchable in PDF output files. PDF plotting performance for drawings that contain a large amount of text, polylines, and fill patterns is improved. The Export to DWF/PDF Options dialog box has been split into two separate dialog boxes—one for DWF and one for PDF. Both are accessible from the Output ribbon tab. PDF Options now include the PDF quality and font handling controls as well as new controls for hyperlinks and bookmarks (see Figure 5). The hyperlinks control enables you to include hyperlinks from the drawing in the PDF file. The bookmarks control exports sheets and named views as bookmarks so that you can easily navigate between them when viewing the PDF file.

When using the Plot tool to create PDF files, you can now choose from four predefined PDF presets, offering a quick way to apply different PDF output options that meet various needs. If you select any PDF pc3 from the Printer/Plotter drop-down list, a PDF Options button is displayed, providing convenient access to the

PDF Options dialog. Similar PDF presets and options controls are available when creating PDF files using the Export to PDF and Batch Plot tools.

The Sheet Set Manager has also been updated to support these PDF enhancements. Layout names are automatically displayed as page labels in the PDF file, making it easy to identify sheets when viewing the PDF.

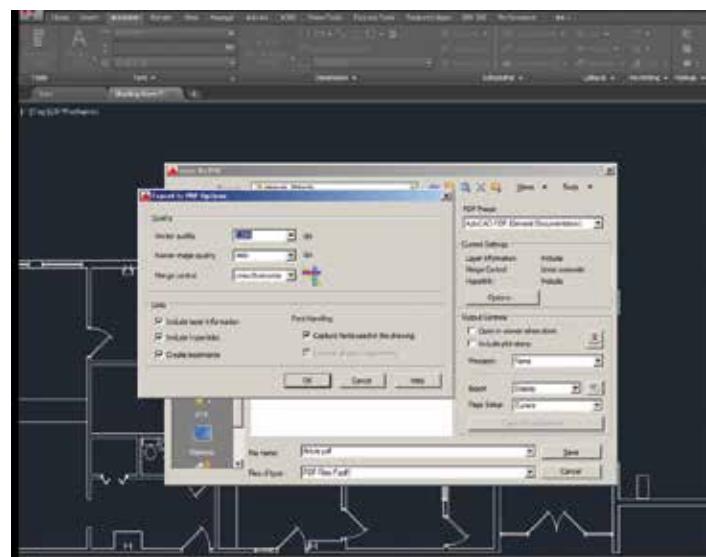


Figure 5: Export to PDF options

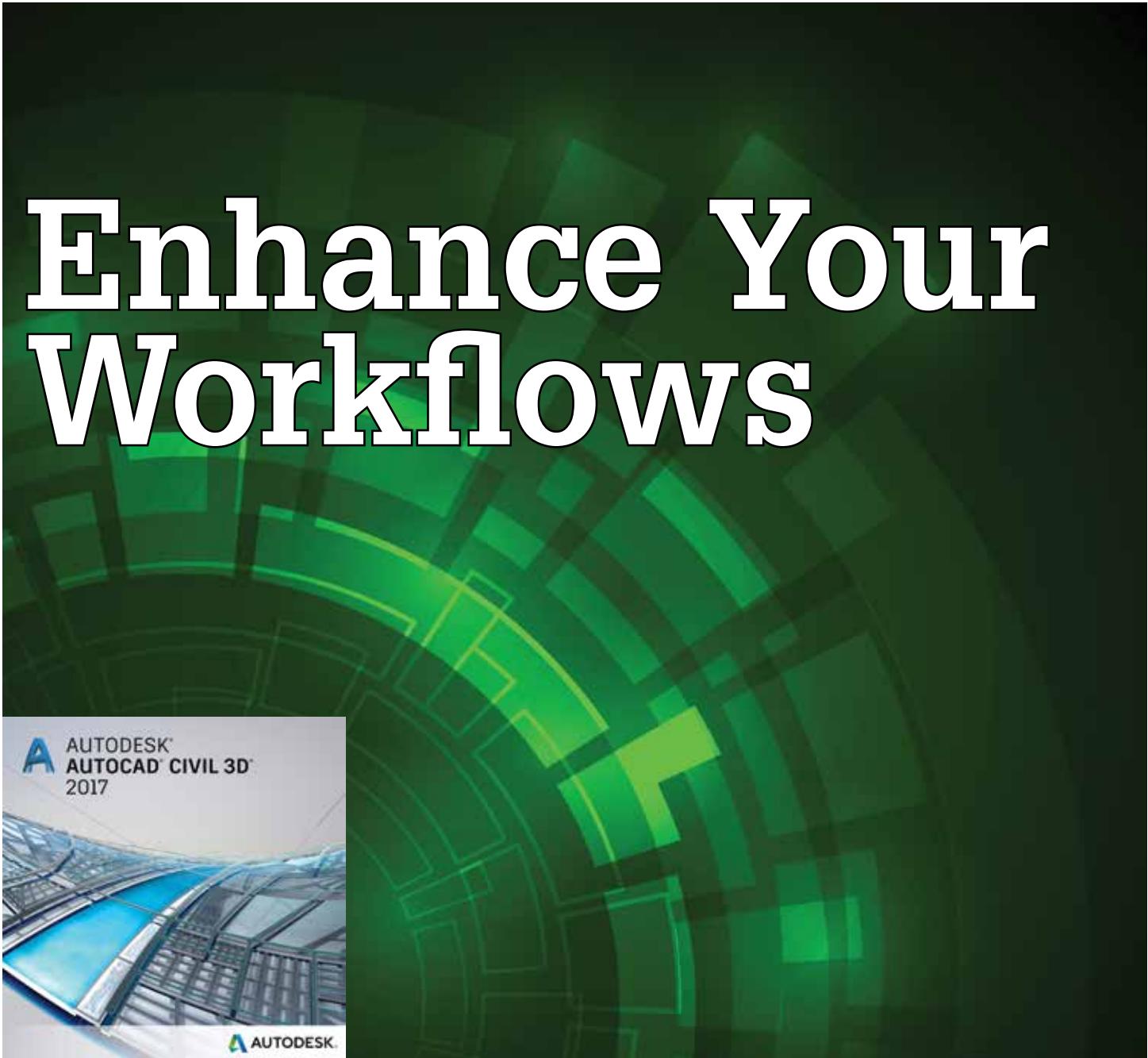
OTHER PERFORMANCE ENHANCEMENTS

Other performance enhancements I have noticed in AutoCAD Architecture 2017 are:

- The performance and reliability of 3DORBIT has been improved for rendered visual styles, especially for models with a large number of small blocks containing edges and facets.
- The performance of 2D panning and zooming operations has been improved.
- The visual quality for linetypes has been improved.
- The performance of object snapping has been improved by skipping geometric center (GCEN) computation for polylines with a huge number of segments.



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



It's that time again! Tis the season for new releases of the Autodesk products—where we all rush to install the moment it hits our account... or do we? Are you one who waits until the inevitable SP1 comes out? Maybe you skip all the odd numbered years? Or maybe you are still in LDT world (or others) and are contemplating Civil 3D?

Either way, I truly believe that AutoCAD® Civil 3D® 2017 is by far the best and most productive release so far and you may just want to get to it no matter what your past preferences may be.

This article looks at some of the top new features within AutoCAD Civil 3D 2017 and may help you make your decision to download and install today.

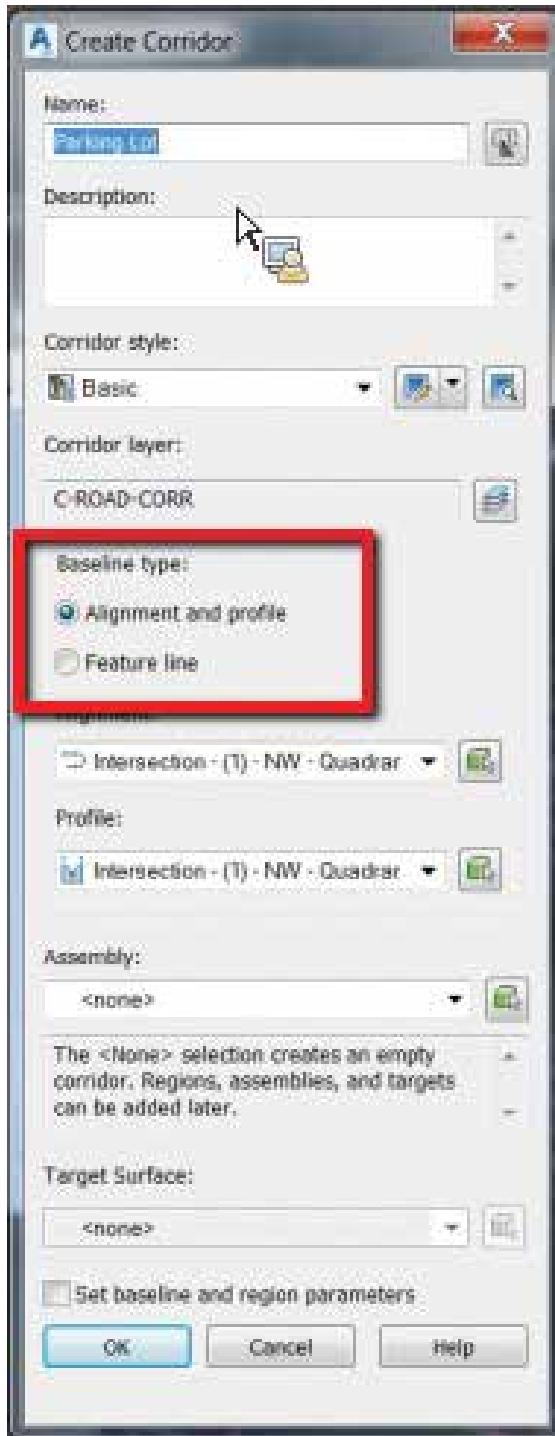
FEATURE LINE AS CORRIDOR BASELINE

I thought about saving the best for last, but the first feature I am going to highlight is something I have been asked since the very beginning of Civil 3D and I should just get right to the point! If you have ever run a corridor or designed a parking lot using feature lines, I'm sure you have asked yourself, "Can I use an assembly on a feature line? Should I corridor a parking lot?"

Yesterday the answer was NO! But today is a new day and this feature has finally arrived.

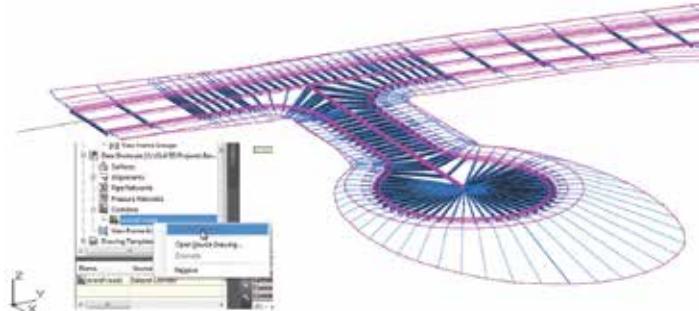
In addition to alignments and profiles, feature lines can now be used as corridor baselines. Feature lines can also be selected when creating the corridor and when adding baselines.

A parking lot is a good example of where to apply this new workflow. When I design a parking lot, I typically design the edge of pavement in order to see true slopes of asphalt. I then use the stepped offset command to give me flow line and/or back of curb elevations, and sometimes I may use grading objects to keep some level of dynamics. But now you can add the feature line to a corridor along with a curb and gutter assembly and have a much more dynamic and accurate surface.



ABILITY TO DATA SHORTCUT (DREF) CORRIDORS

You can now create data shortcuts for corridors so they can be referenced in other drawings. When data shortcuts are created for a corridor, shortcuts are also created for the alignments and profiles that make up the corridor baselines.



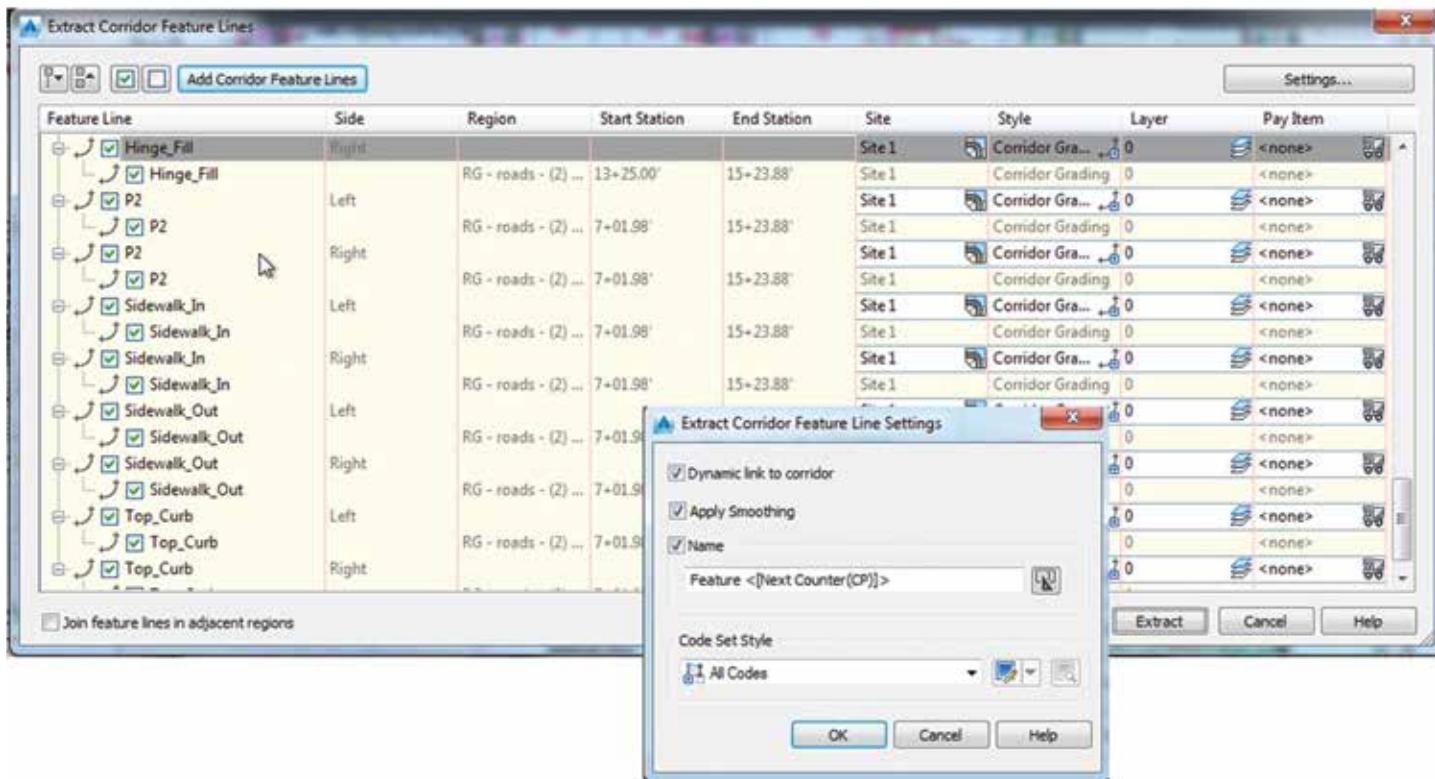
This creates the ability to even further streamline workflows. You can create your sample lines, sections, materials takeoff, etc all in separate drawings. This will help during the design process and allow the corridor to continue to be designed/edited while others work on sections, surfaces, quantities, etc. This may also help in the breakup of large corridor models into smaller sections.

EXTRACT CORRIDOR FEATURE LINES WORKFLOW

(In 2016 Productivity Pack #2)

The functionality of extracting feature lines and keeping them dynamic has been in Civil 3D for as long as I can remember. However, this functionality has now been enhanced with many new options. The options for selecting which feature lines to extract include:

- Extract all feature lines at once
- Select them one by one
- Define Station Range
- Select a subset based on a corridor region or a simple polyline



By selecting a polyline, you will then be given the option of which feature lines to include/exclude for the extraction procedure. Select the settings option to choose whether or not to dynamically link them to the corridor. You can choose to add them to a site, or now use the "Siteless" feature line options.

ate Reference command, or by selecting them and dragging them into the drawing. I will repeat the last sentence....**DRAG AND DROP YOUR DREFs ONTO YOUR SCREEN!**

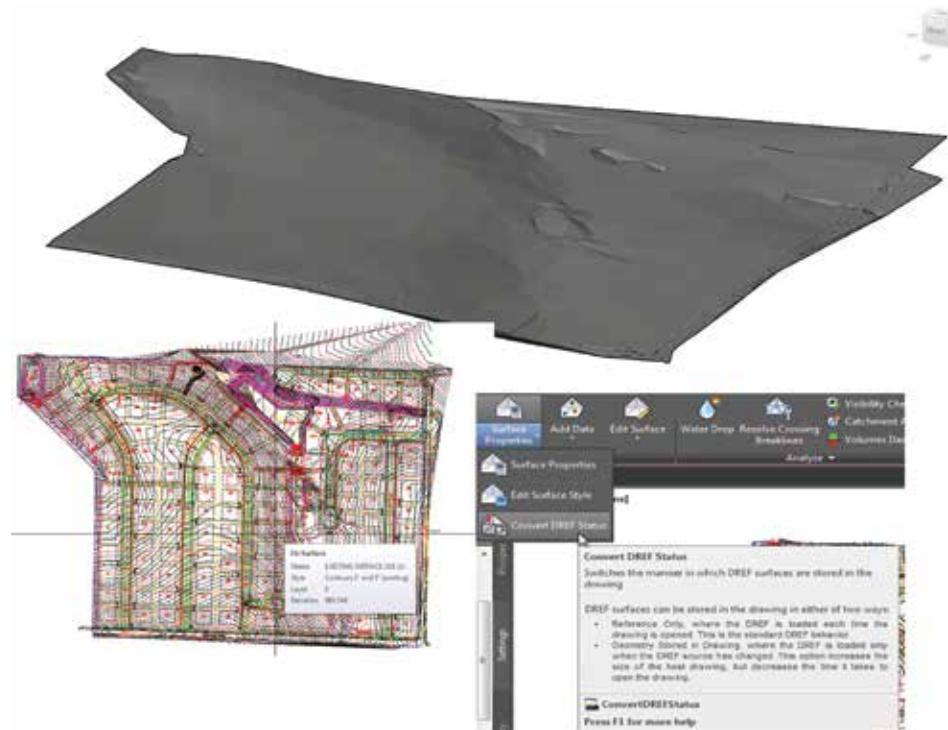
DATA SHORTCUT (DREF) MANAGEMENT

Subfolders for References – You can now create subfolders to help organize model data. This is similar to the way Alignments work with the subfolders for different alignment types.



Simply right-click an object collection or a data shortcut collection and click Create Folder. Existing objects can be dragged-and-dropped into the new folders and folders can be nested inside other folders.

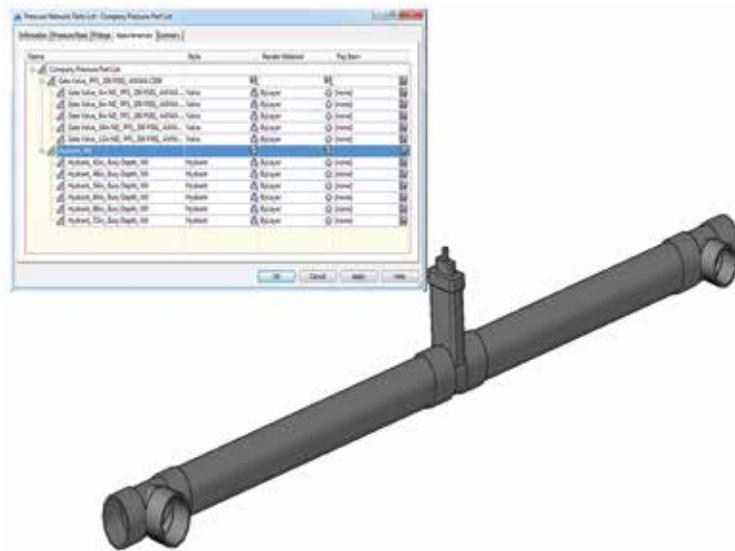
Streamlined Creation of References – You can now create multiple data shortcut references at once—either by right-clicking the data shortcuts and selecting the Cre-



PRESSURE PIPE CONTENT

Ever since the pressure pipe tools were introduced they lacked one important thing—out-of-the-box content. People wanted more content, relevant content, and accurate content. I think this is one of the reasons the adoption of the pressure pipe tools hasn't been very high.

But in Civil 3D 2017 the content has been greatly increased. There is no one size fits all, and pressure pipe workflows and construction materials vary across the nation, but take a look at the content catalog in 2017 and you will be thoroughly impressed.



Release 2017 will include Pressure Pipe Content for HDPE, PVC, and Steel Pipes. Additional Fittings and Valves have been included also for Flanged Fittings and Mechanical Fittings.

ADVANCED ROUNDABOUT DESIGN

Roundabout-related features from Autodesk Vehicle Tracking have been integrated into AutoCAD Civil 3D, enabling the creation of a new type of roundabout object in AutoCAD Civil 3D.

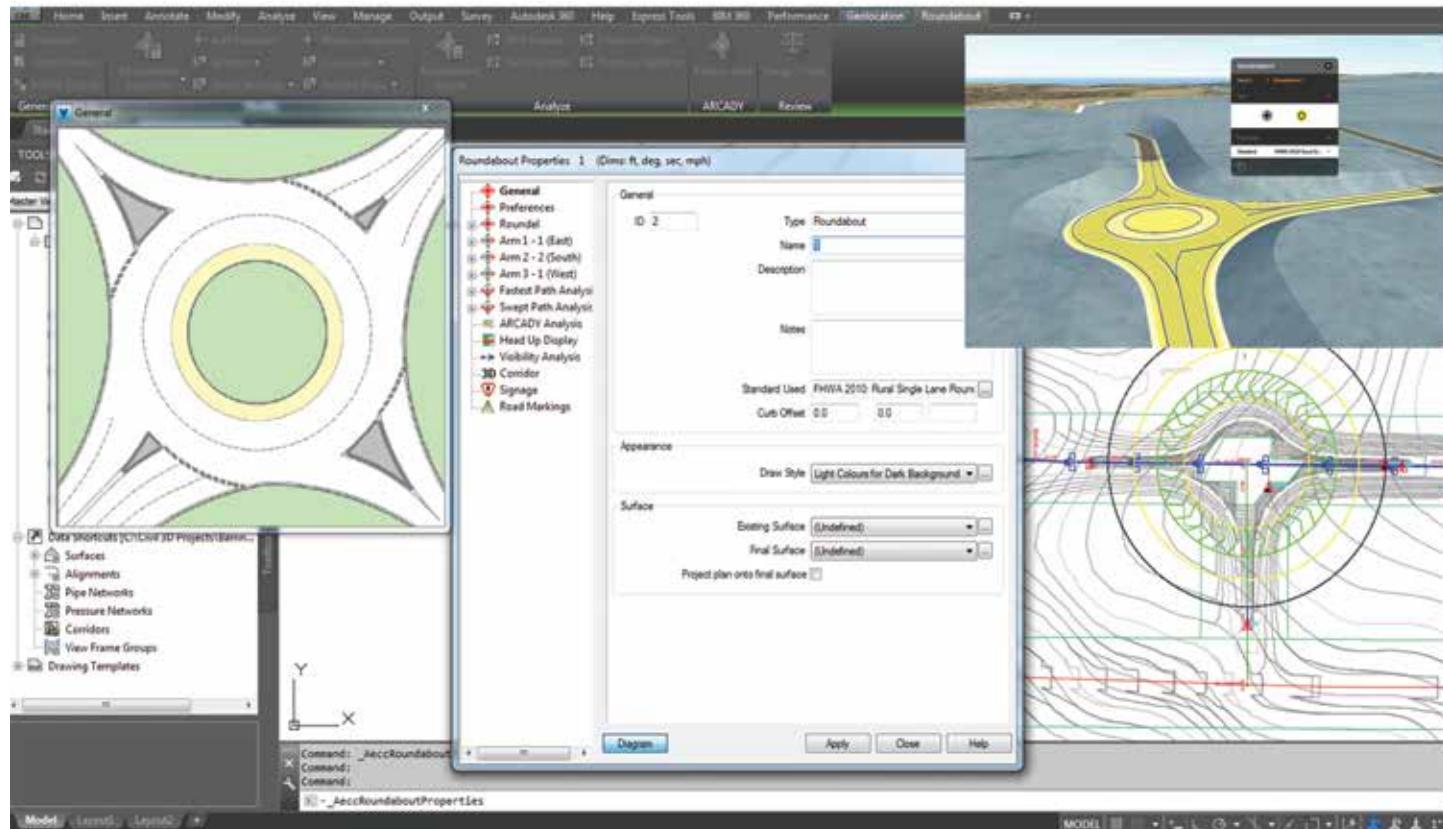
In addition, Roundabout designs from Autodesk InfraWorks 360 can now be brought into AutoCAD Civil 3D drawings.

MISCELLANEOUS FEATURES

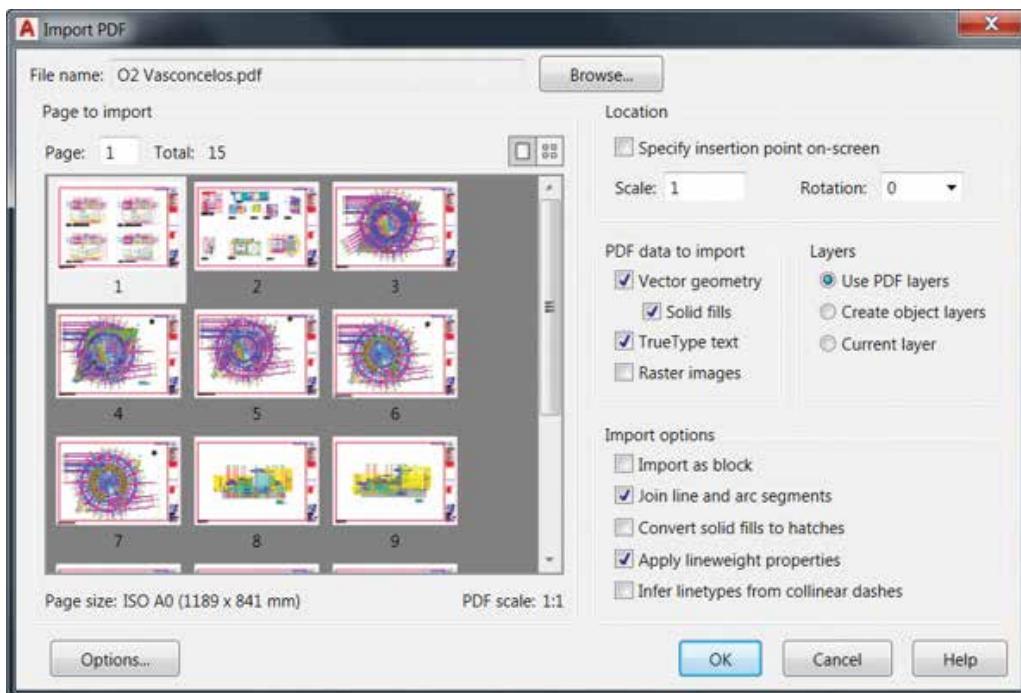
Most, if not all, of the Productivity Pack enhancements have been rolled into the software, along with other subscription perks throughout the 2016 release. See the article in AUGIWorld April 2016 on Productivity Packs for more information.

Here are a few additional enhancements to note:

- Corridor solids display and extractions
- Siteless option for feature lines: Feature lines that are created outside of a site do not interact with each other, so you do not need to specify the style priority for them like you do with feature lines that exist in the same site.



AutoCAD Civil 3D 2017



- Corridor model accuracy: Where corridor tangents intersect at a corner, and where the corridor is created at a fixed width, the inner and outer corners of corridors are cleaned up automatically to improve modeling efficiency and accuracy.
- Bowties fixes (interior corners)
- Deflection behavior at corners
- BIM Information Association
- Reference styles utility: Styles in a drawing can now be synchronized with the styles in external reference templates. Reference templates simplify the management of drawing styles and keep them up to date.

AUTOCAD 2017

As usual, Civil 3D will include all the base product enhancements of AutoCAD® 2017. See the AutoCAD 2017-related article in this issue for detailed information, but I did want to mention the following enhancement that I think may be a great addition to your workflow.

Create Geometry from PDF

You can now import geometry from a PDF file or underlay into the current drawing as AutoCAD objects! You can import all geometry or specify an area on screen. I think this is a fantastic addition and something that I'm sure will be widely used.

From your PDF, you can specify:

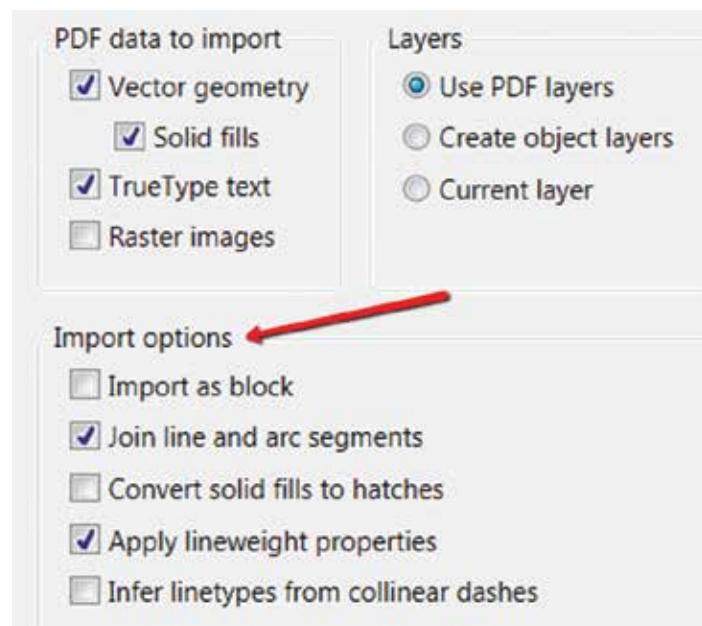
- The type of data imported from the PDF (geometry, solid fills, text, and raster objects)
- How layers are assigned to imported objects
- Different post-processing options for imported geometry

CONCLUSION

As I mentioned in the opening, I truly believe that AutoCAD Civil 3D 2017 is by far the best release. There may not seem like a ton of new features, but the new features and enhanced features will help in your everyday workflows.

I would love to hear from you regarding the new features and features you would like to see added or enhanced, so feel free to call or email me anytime.

Now let the Wish List for 2018 begin!



Shawn Herring is a civil engineer based out of Utah. Shawn has been a part of the design engineering community for roughly 12 years in all aspects of design, construction and software implementations. He has implemented and trained companies across the Country on Civil 3D and other infrastructure tools and their best practice workflows. Shawn can be reached for comments or questions at awautocadcivil3dcm@audi.com.

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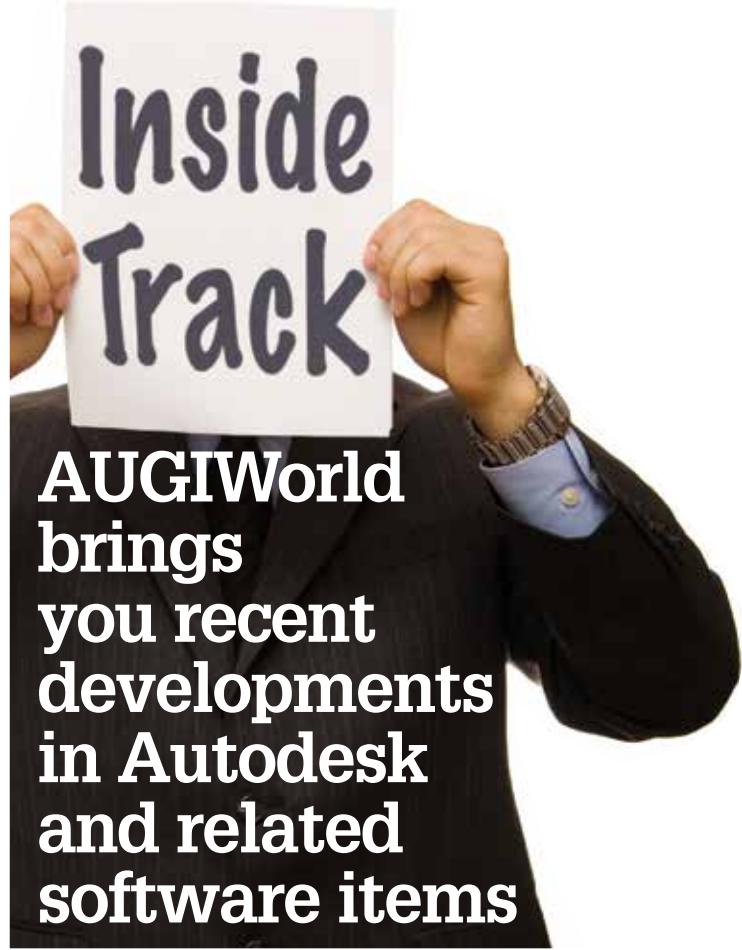
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WOOD PRODUCT BEAMS AND JOISTS FOR AEC

This application, created in conjunction with AEC Design Services, provides an easy way to create wood beams, joists, rafters, plates, hips and valleys, along with tags and beam schedule. This module provides not only the members, but also the MVBlock (tag), Property Set Definition, and Schedule table style. All this is contained in one dialog, accessed by one command—no need to access various palettes and ribbon tabs or do any complicated setup.

<https://photosynth.net/default.aspx>



MICROSOFT PHOTOSYNTH

Photosynth is a powerful set of tools for capturing and viewing the world in 3D. You can share your creations with your friends on Facebook, or embed them in your own blog or website.

Photosynth offers two styles:

- **Panorama** – Shoot a panorama when you can capture everything from a single location with a single zoom level. Great for giving a sense of what it feels like to be in one particular place.
- **Synth** – Good for capturing different sides or details of an object. Synths were the original experience on this site, and they remain its unique feature.

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: brian.andresen@augi.com

New Release, Packed with Improvements



3ds Max® is one of the most powerful 3d applications available in the world. This release takes it to an even higher level, packed with tons of updates and performance boosts on and under the surface. In this article I'll talk about a few.

THE INTERFACE

Some will be excited to know that behind the interface updates are efforts to accommodate high-resolution 4K monitors while making it simpler to personalize workflows and experience. The stylistic format provides modern panel displays and icons perfect for plug-in and script development while adhering to symbols similar to others in the design industry.



Figure 1: Interface

MODELING

Modelers will be happy to find improvements to performance as well as new modeling tools including local aligned coordinates and point-to-point selection/preview. One feature I'd like to point out specifically is the improved bevel profile modifier, which presents multiple presets and options to quickly create interesting and unique objects.

MCG (MAX CREATION GRAPH)

Max Creation Graphs (MCGs) continue to receive love and attention from the Max development team. For those who are not familiar with MCGs, I'd describe them as creation tools constructed from a node-based environment that can be shared in the design community. With a multitude of improvements and additions, MCG is becoming a very powerful system for generating and controlling Max content including, but not limited to animation, shapes, time-related nodes, simulations, physics, polygons/elements, arrays, and more. With tons of new operators and compounds introduced with 2017, we can expect more interesting and powerful tools to show up on the market. A great example of an MCG is the Push Limited MCG modifier provided by Elara Systems at www.elarasystems.com displayed in Figure 3.

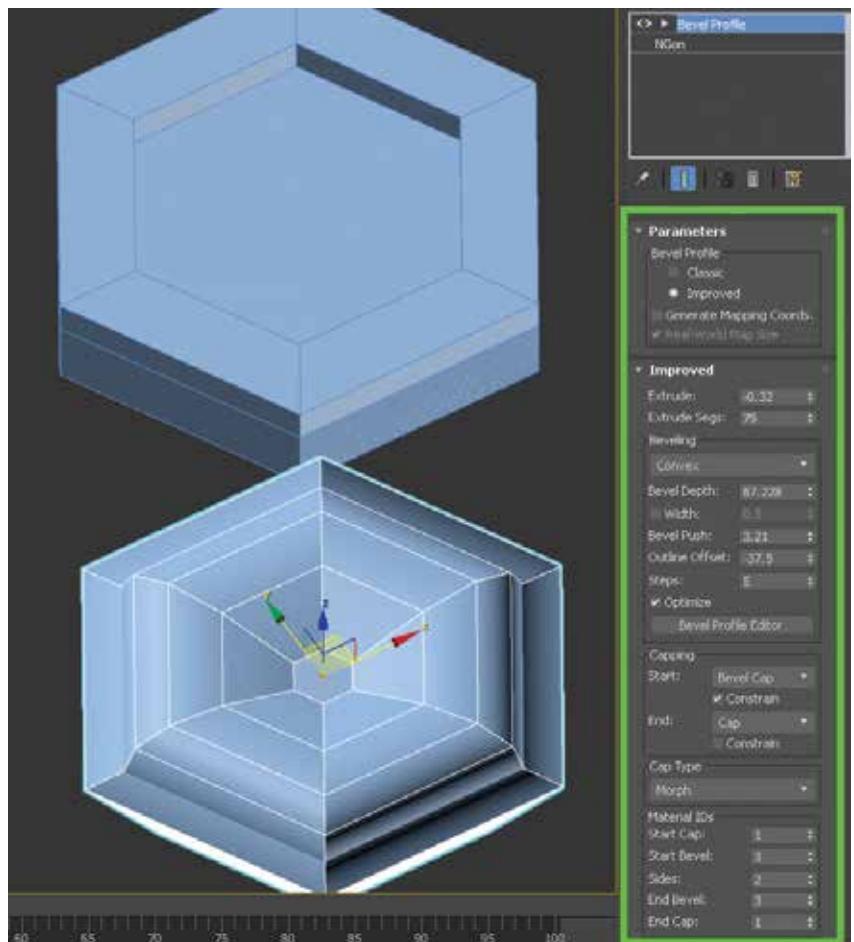


Figure 2: Bevel profile update

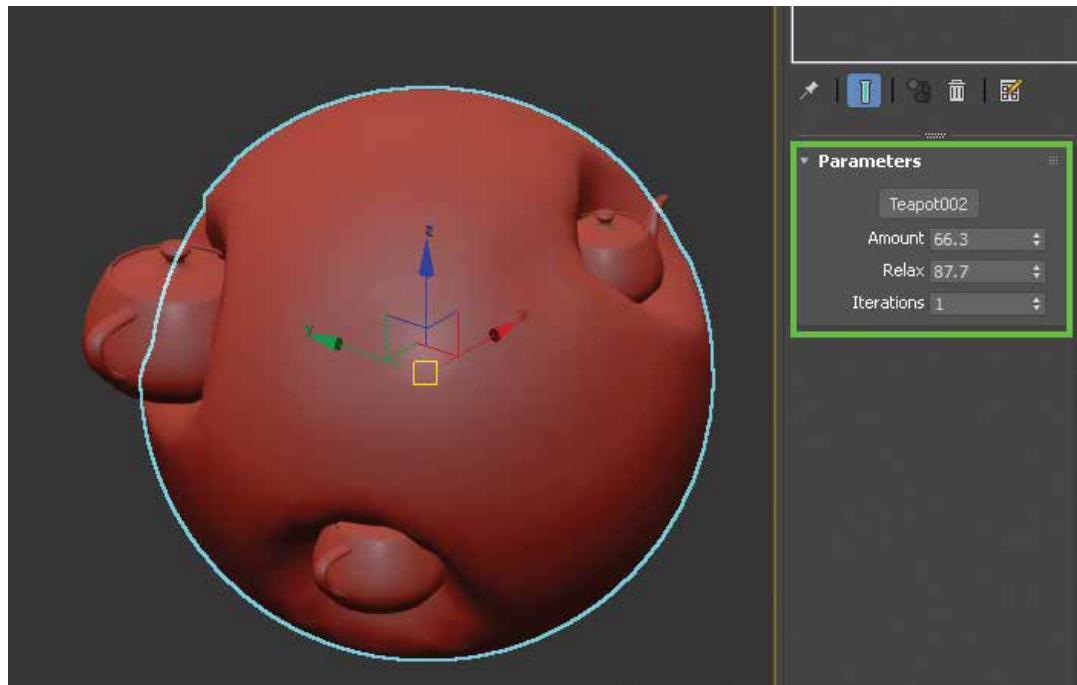


Figure 3: MCG example tool

PYTHON

The development team made it clear with 2017 that Python is a priority. With a multitude of updates to provide Python access, in-

tegration, and support throughout Max, users will have the ability to manipulate Max with greater control and power. With improvements such as native support for parenting and docking of Python tools, the inclusion of all PySide libraries, MaxScript Editor Python language support, and more, I expect users will find more efficient ways to improve their workflows.



Figure 4: ART example

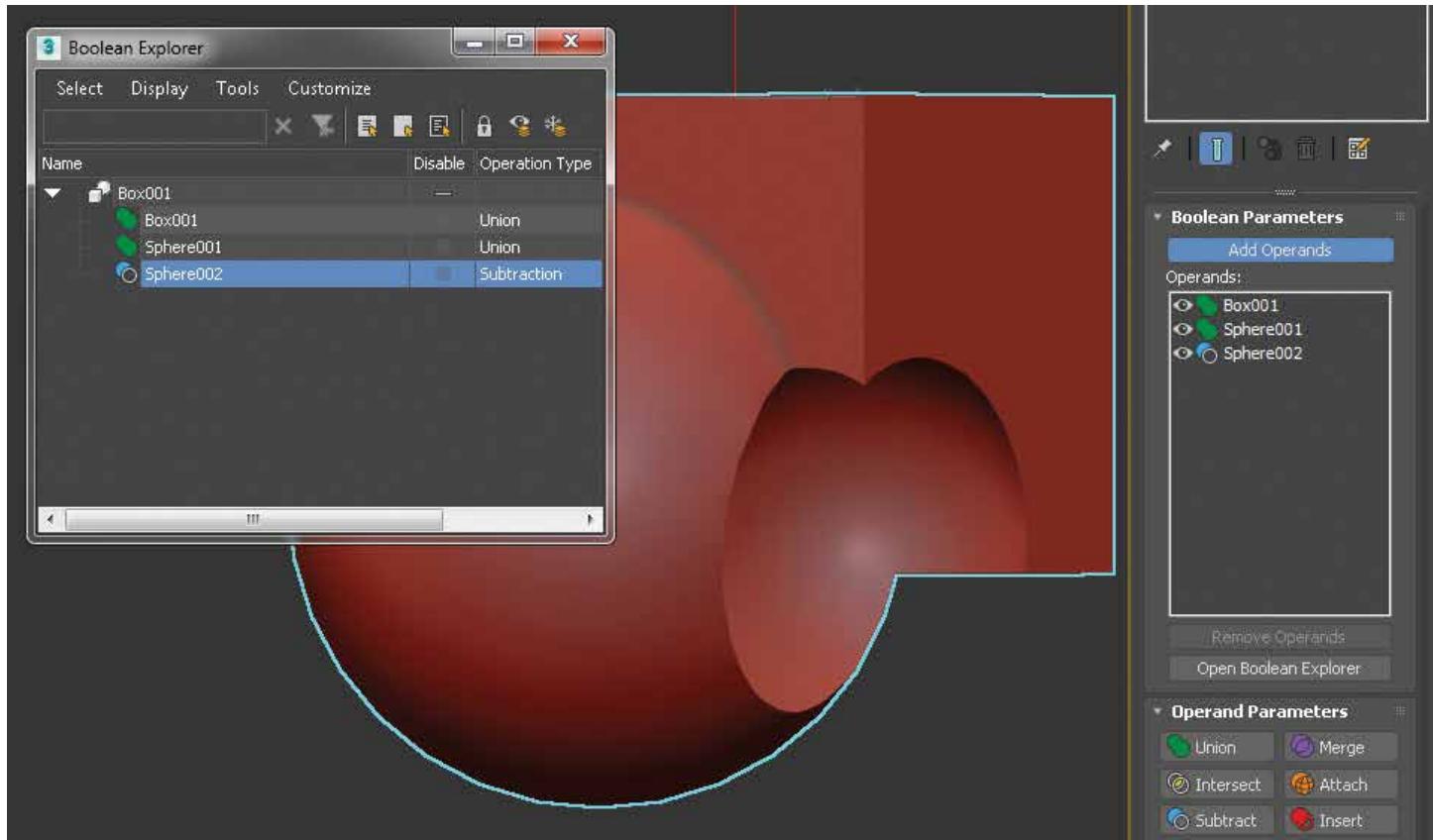


Figure 5: Nested Boolean example

ART

ART is a completely new renderer. Constructed to enhance workflows and provide a rapid real-time solution for rendering, ART will help studios generate workflows to produce high-end results efficiently and within budget. With ART comes a new physical material, sun and sky, as well as a scene converter.

BOOLEAN

With an explorer and nested Boolean control, Booleans have become more fun than ever. With the ability to stack and restack Booleans we have unlimited control to create just about any combination we wish.

VIEWPORT

There's an enormous number of improvements and updates to viewports. Some include deformed mesh performance improvements with GPU-based mesh builder for DX11 mode, static object performance improvements, Poly/Mesh sub-object edit performance improvements, DarkerEdge mode for back-facing wireframes, selection outline clarity, configuration presets, material overrides, and a new DX Mode (my favorite). In any case, the Max development team and our friends at Autodesk make it clear they have plenty of love for their Max clients and continue to work hard to enhance our working experience.

UVS

With 2017, users will quickly find UVs have had a tremendous update. From editor performance, peeling, brushes, selections, and more it can be argued that the efficiency in workflows with UVs should increase considerably. If working with UVs is a primary part of your production pipe line and you haven't upgraded, I'd recommend a serious review.

CONCLUSION

These are just a few of the updates and improvements to 3ds Max 2017. Like I said, it's packed full of them. Updates to the UDIM, Maps, Alembic tool, Scene Explorer, Animation, Morphers, Trackview (another favorite), Spinners, the Motion Panel, Modifier Stack (right-click menu even if empty), general performance, TextPlus, Skinning, and Stingray Live Link make it obvious that a future of design with Max looks brighter every day.



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@procad.net.

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