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AUGIWorld

The Official Publication of the AUGI Design Community
January 2020

The Best of 2019

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- Tips & Tricks for AutoCAD Civil 3D and 3ds Max
- Please, Don't (Just) Blame the Tech
- Revit API Starter Kit



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Letter from the President



GREETINGS!

Welcome to a brand new year of AUGIWorld! January is a fresh start and the beginning of a new decade. I always look forward to a new year, and of course, the futile attempt at following through on those New Year's resolutions! The new year is a great time to set new goals for the year, both personally and in business. As of this writing I have not settled on what those will be, but I am certain that none of them will involve giving up chocolate!

The promise of a new year also brings hope. I want to share with you my hopes for AUGI in 2020. First, I hope that you, our members, find value in your membership. We have some amazing partners who offer our members some pretty awesome benefits. In addition to our free membership (yes, FREE!), we have two paid levels of membership that offer additional discounts and benefits. Check them out on the AUGI website!

My second hope for AUGI is that this would be a year of exponential growth, not just in numbers but in substance. As I have said before, this is an independent volunteer user group. That means we rely on our members for content for the forums and for *AUGIWorld*. And by "members" we mean YOU!

We certainly appreciate those of you who regularly contribute to either or both of our formats. While we try to engage partners to provide tangible benefits to our members, the true purpose of a "user group" is to share knowledge and support one another in the industry. My hope is that you will consider your own contribution to the greater good of AUGI this year. Write one article. Answer a forum question. Engage with other users on the forums and in social media. Our LinkedIn groups have become very popular! We now have the ability to discuss all forms of design software technology. This should open a whole new world for AUGI—both online and in print. As I shared at our Annual General Meeting in November, we are nearing the 500,000-member mark. That is awesome in itself, but imagine if every one of those members contributed something to AUGI this year!

Finally, my hope for AUGI this year is that we continue to be a driving force in the industry, connecting our users to the people who make the technology and tools that we use every day. We are working to update our Wish List system and hope that you will continue to share your wishes. Those wishes go directly to our software developers, so know that you are truly being heard!

Let's move AUGI forward together in 2020. Good luck on those resolutions!

Happy New Year!

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AUGI President

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TIPS

That Never Get Old



Here are a few tips that help improve the experience when working with 3ds Max®.

1. NON-DESTRUCTIVE EDITS WITH THE MODIFIER STACK

It's no secret that the modifier stack is an incredibly powerful tool unlike any available in other applications. The stack provides the ability to apply modifications with an infinite number of ways to review and control their impact on our objects. Using the stack ensures there is a record of the decisions we've made so we can always return our object to its original state. Generally speaking, users limit themselves to the basic abilities of the modifiers and param-

eters within them. One important behavior that gets overlooked is that we can make sub-object modifications to our selections and store those changes using the stack. We can bend, manipulate, change, or delete polygons, vertices, or entire chunks of our objects while having the option to return to the original form any time. The trick is to apply the Edit Poly modifier before making sub-object modifications. See Figure 1 for an example.

2. GENERATE TOPOLOGY

The Topology tool manipulates the edges of an object based on templates provided and input parameters. We can use this tool to build a wide range of objects including brick walls, stone walkways, abstract art, and much more. See Figure 2.

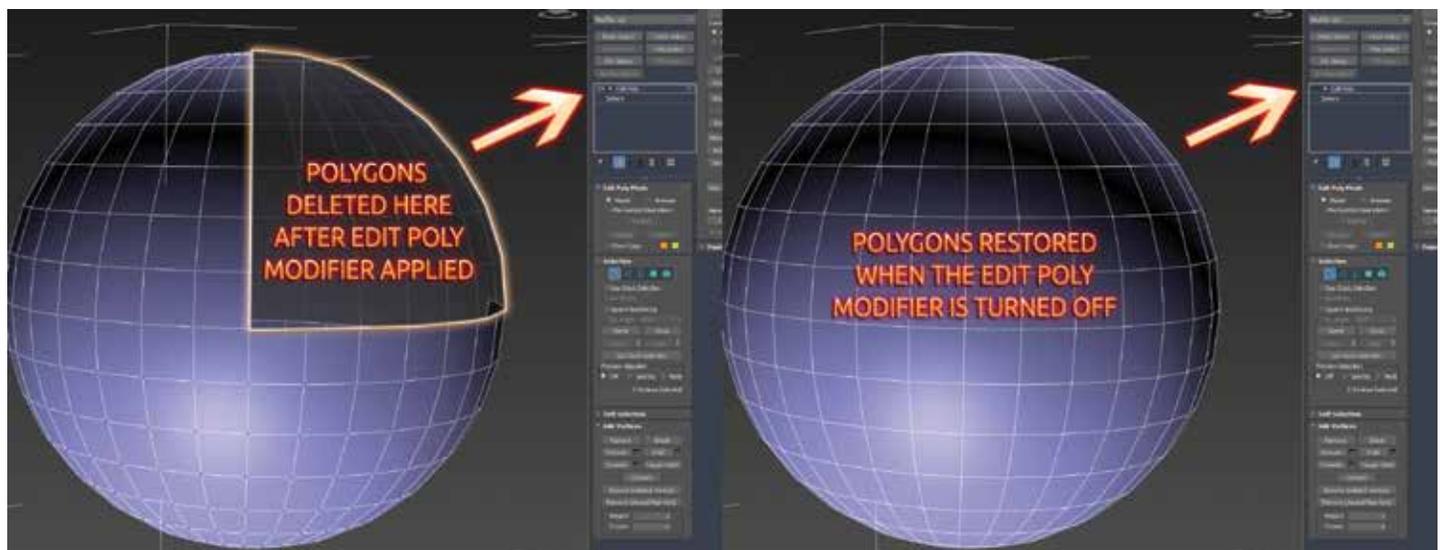


Figure 1: Sub-object modifications and modifier stack

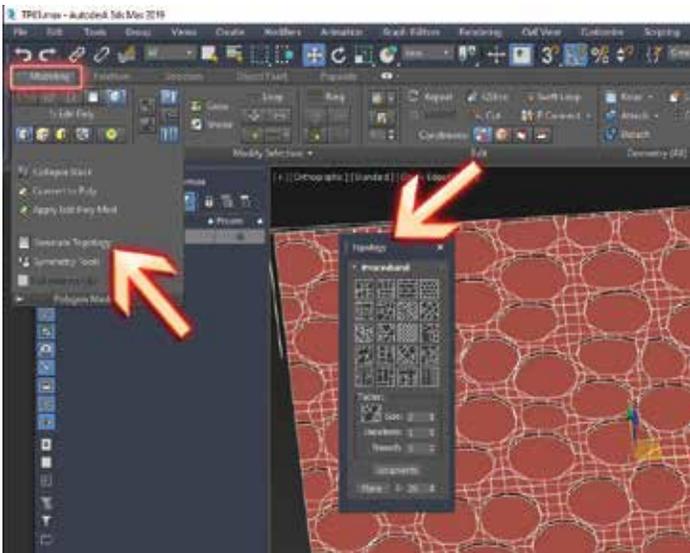


Figure 2: Generate Topology tool

3. EDGE DISTANCE

The Edge Distance option with soft selection restricts the selection to contiguous faces. This is particularly useful when selecting protruding parts of objects where a portion is difficult to see or select. See Figure 3 for example.

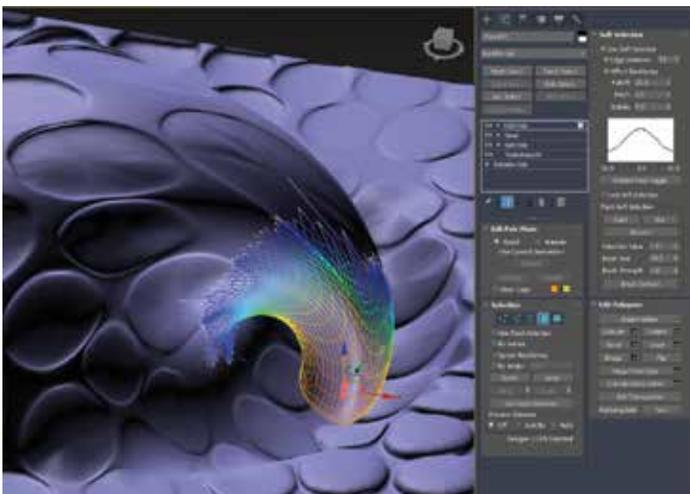


Figure 3: Soft selection with Edge Distance

4. SUB-OBJECT EDITING

The default shortcuts to enter the sub-object editing mode of an Editable Poly are 1 through 5. For example, if I want to edit the vertices of an Editable Poly I've selected, I would press the number 1 on my keyboard. For the faces, I'd type in number 4. To exit the mode, we have to ensure the Keyboard Shortcut Override toggle is set to Off. With the override off, we can press the key again to exit. See Figure 4.



Figure 4: Keyboard Shortcut Override

5. REMOVING MATERIALS

Within the More button of the Utilities tab lies a trove of tools. One I'd like to present is the UVW Remove tool. While the UVW option of the tool works only on collapsed editable meshes, the Material Removal option works on anything selected. See Figure 5.

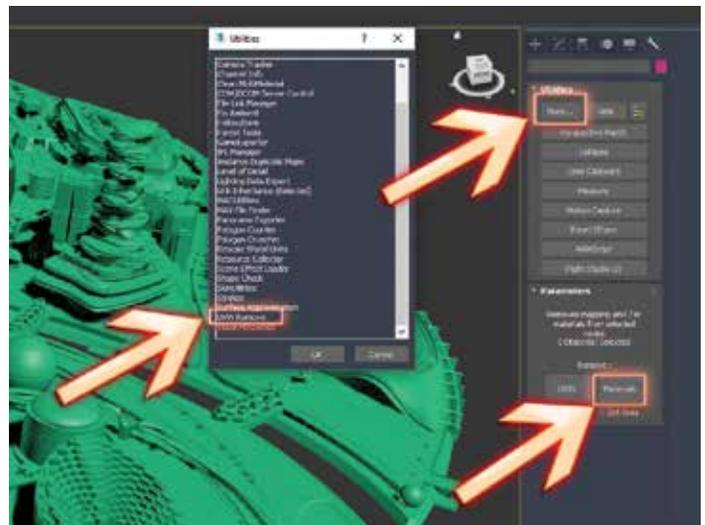
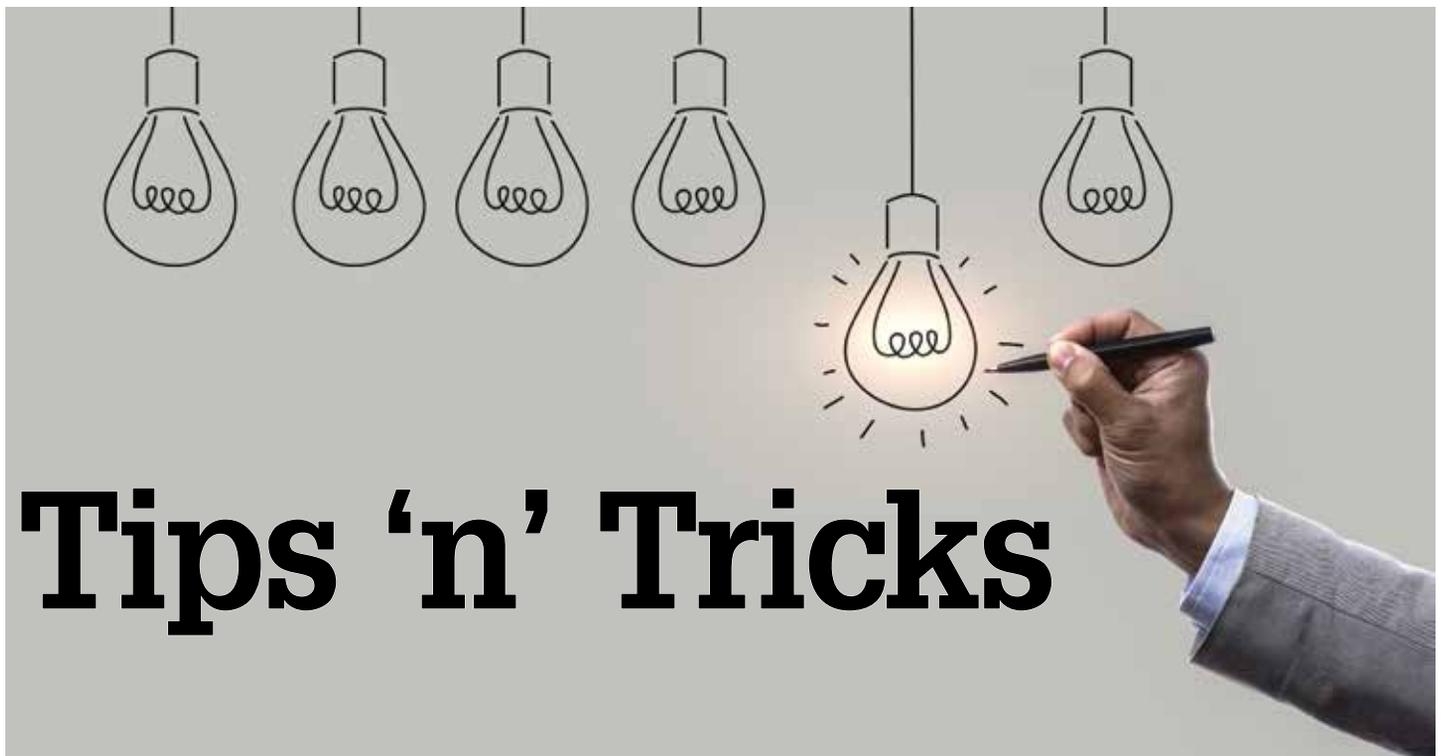


Figure 5: UVW Remove



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Tips 'n' Tricks



There are a lot of little things that go unnoticed in AutoCAD® Civil 3D®—probably due to the fact that there are a million icons and commands! Whether they are hidden away within your Toolbox, or several layers deep within the ribbon, there are some really good tools that are often overlooked. Here are some of my favorite little tasks, some new, and some oldies but goodies!

PROFILE CROSSING TOOL (NEW IN 2019)

This is a great tool added to 2019.2. You can add crossings to profile views to identify where linear objects cross the profile relative to the parent alignment (Figure 1). This takes the Project Objects tool just a step further.

You can use the profile crossing tool to add crossings and labels to profile views for the following types of objects:

- + Alignments
- + Profiles
- + Feature lines
- + Survey figures
- + 3D polylines

When you add crossings to a profile view, you specify which marker and label styles to apply to the crossings. You can set up unique styles for each type of crossing object so you can display and label them differently.

I've been using this often for intersection/crossing alignments. Crossing alignments are shown as vertical lines in the profile view because they do not have elevations, but you can specify an elevation value for the crossing alignment labels.

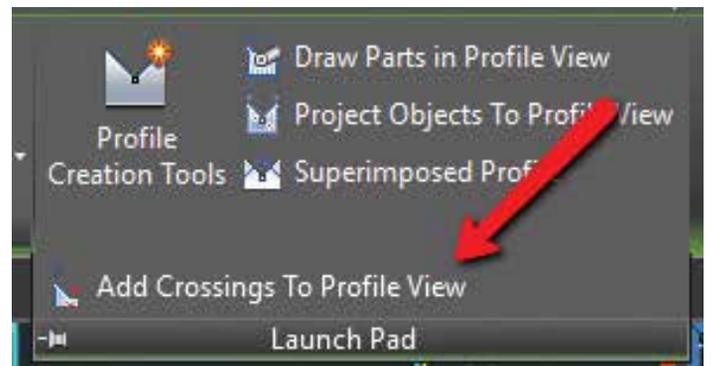


Figure 1

Select your profile view and now on the ribbon, under the Launch Pad panel, you will find the Add Crossings To Profile View command.

You then select the object(s) you wish to project, evoke the command, and you get the dialog box shown in Figure 2. For example, the alignment can be projected, and crossing markers, label styles, and auto or user set elevations assign!



Figure 2

PROJECT OBJECTS TO PROFILES

This has been around awhile, but don't forget about this tool. You can select a profile view, from the Launch Pad panel of the ribbon, select Project Objects to Profile View and pretty much add any object to your profile (Figure 3).

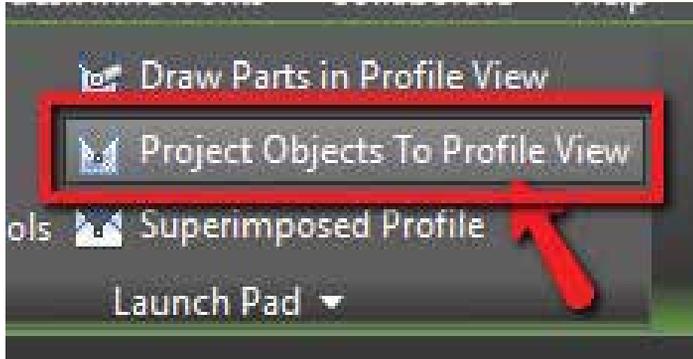


Figure 3

This is especially helpful when needing to see the elevation of a feature line, for example (I use feature lines for dry utilities), or when you want to project a test pit/bore hole info into profile. You can also use this for projecting 2D objects. For example, if you have a streetlight, sign, or fire hydrant block, you can select your view, launch the command, and project the block, along with customized label, into your profile (Figure 4).

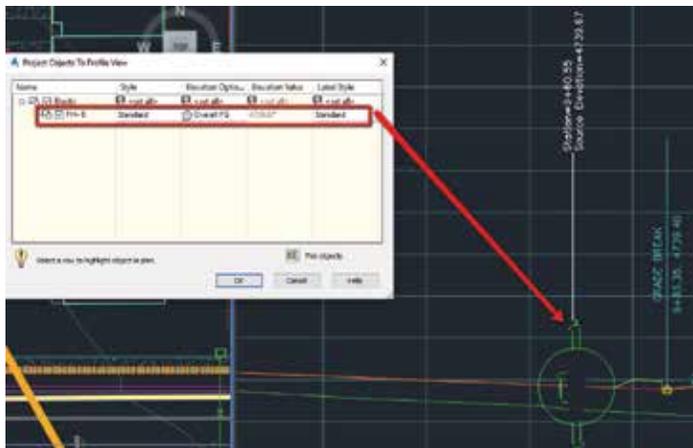


Figure 4

TRANSPARENT COMMANDS (NOW IN RIBBON)

I don't see transparent commands used as much as I once did. Maybe when Civil 3D introduced the ribbon, people turned off the toolbar? Not sure, but now the transparent commands are located on the ribbon (Figure 5), making them easier to read and simple to use. A few I use often are:



Figure 5

1. **POINT OBJECT** – When drawing breaklines, feature lines or for any reason you want to snap to the node of the point and pick up the elevation, USE THIS! You don't have to snap on the actual node—just select any part of the point label or point marker and it knows what to do from there.
2. **POINT NUMBER** – Want to draw a line snapping from point to point in sequential order? Just evoke the command and key in the numbers (i.e., 212-272).
3. **PROFILE Tools** – There are several great commands for laying out items in plan or profile. Give some of them a shot sometime!

COMPARE DRAWINGS

Compare two revisions of a drawing!

I think this is a fantastic addition to AutoCAD-based products such as AutoCAD Civil 3D. You can now quickly review changes to drawing features such as 2D linework, Civil 3D objects (pipes, surfaces, etc), text, and pretty much anything within your drawings. It's available in the main Application menu when no drawing is active or under Drawing Utilities when there is a drawing active. You can also access it from the new Collaborate ribbon tab (Figure 6).



Figure 6

Once you select DWG Compare, the dialog box will ask you to select which two drawings to compare. It will then create a third drawing with the two overlaid. Prior to selecting Compare, you can modify the color choices if you wish (Figure 7).



Figure 7

The results of the comparison are displayed in an automatically created third drawing. Three categories of objects, or parts of objects, are displayed—those which are located only in the first drawing (GREEN), those which are located only in the second drawing (RED), and those which are identical in the two drawings (GREY). See Figure 8.

AutoCAD Civil 3D

A contextual Compare ribbon tab lets you to control the appearance of results. This tab has three groups of controls: Comparison, Compare Filter, and Change Set.

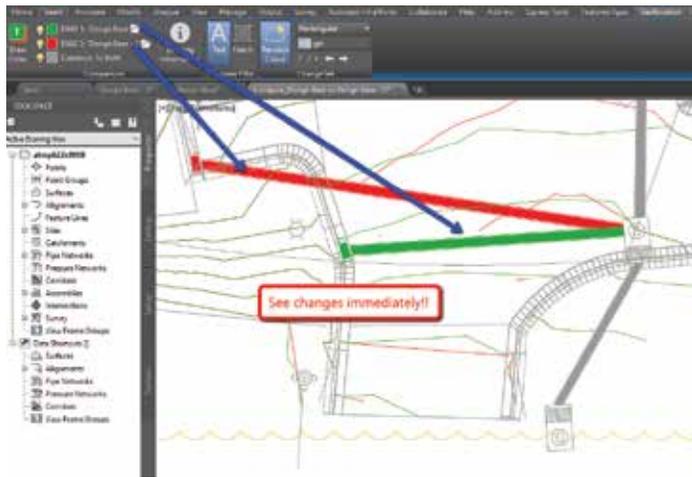


Figure 8

Again, this may seem like a simple task, but for quick reviews, client/city meetings, and simple clashes, this tool is a great addition for 2019!

EXPORT LINETYPES TO .LIN FILE

Why is this not a built-in function of AutoCAD, you ask? WHO KNOWS?? Many times you have linetypes in a file but not the associated linetype file (.lin). But there is a fantastic FREE tool from CAD Studio (www.cadstudio.cz) that allows you to export linetype definitions (incl. shape + text info) from an AutoCAD DWG drawing back to .lin file. This tool is called LinOut and is a simple LISP to install and use.

QGIS

We are working with larger data than ever before. Drone data and aerial imagery are now at the tips of our fingers anytime we want them. Some raster images can be many GB in size and resolution that Civil 3D can't handle. If you have ever tried to import a GeoTiff (or other image types), and you get the "Invalid Image" warning, then QGIS is exactly what you need (Figure 9).

This is a FREE open source software tool that allows you to quickly and easily reduce the size of large images, and even translate to other coordinate systems if you'd like. Just go to www.qgis.org and download it.

You simply drag and drop your image into the QGIS desktop, right-click on your layer (image), and export to a new rendered image.

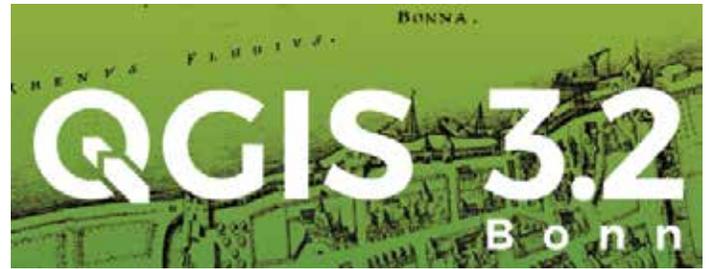


Figure 9

STAGE STORAGE ANALYSIS

Need a quick volume analysis from a pond, for example? Need that analysis every 0.25' within the pond? The Stage Storage Tool in Civil 3D is your new best friend!

First, you need to decide what interval you need to report on. Your surface style will control the results/interval within the report. For example, if I want the following pond volumes in 0.50' intervals, I simply edit the surface style to display the correct interval prior to running the analysis.

After you have edited your style, select the surface you wish to analyze, and from the Analyze panel of the ribbon, choose Stage Storage (Figure 10).

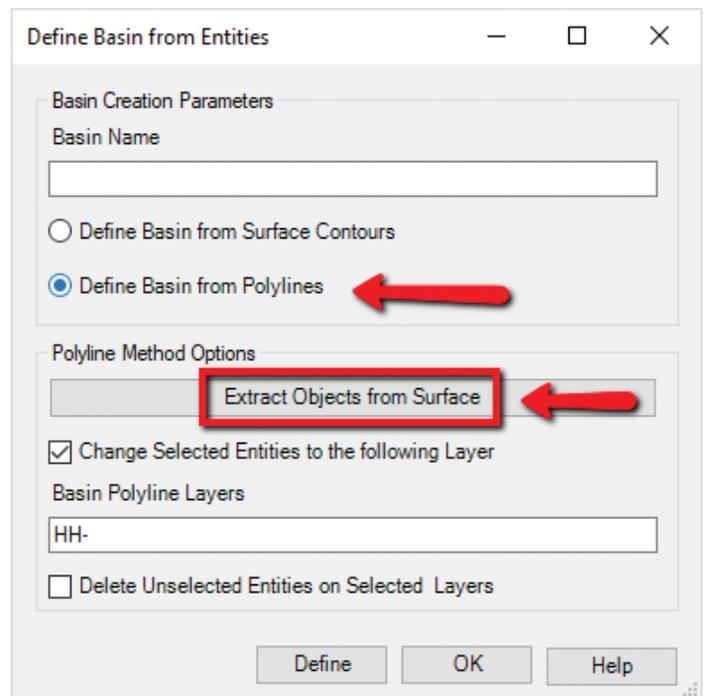


Figure 10

This will launch the report dialog box, fill in the blanks as needed and select Define Basin. You want to then select Define Basin from Poly-lines, and select the Extract Objects from Surface (Figure 11).

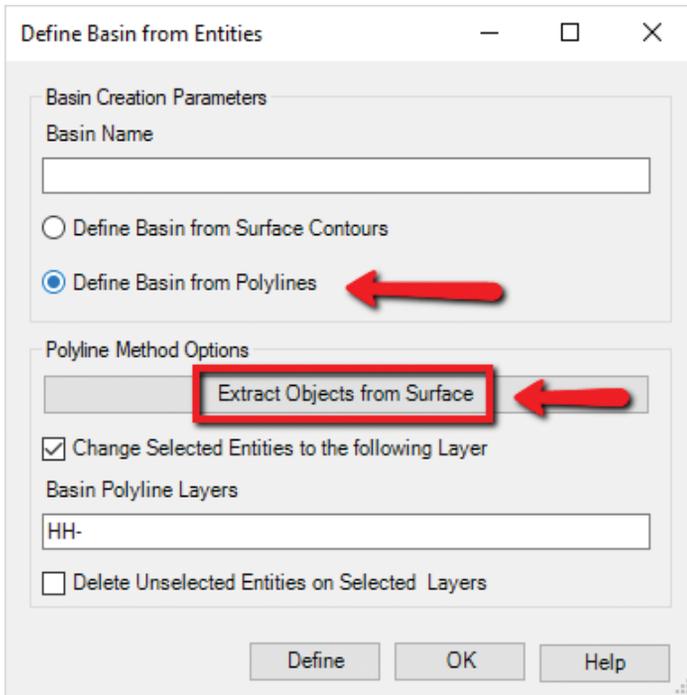


Figure 11

Select the surface, select Define back on the dialog box and select up to the polyline you wish to analyze. The dialog box should reappear with your results (Figure 12). You can save this report to a text file, or even better, save it as a file to be used within SSA!

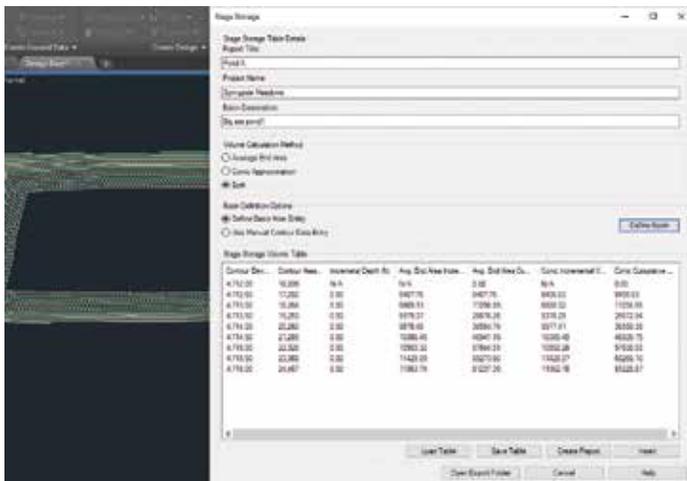


Figure 12

A FEW MORE HIDDEN GEMS!

Export Legal Description

Explore the toolbox for many reports that you can export. You can customize these reports as well. One that I use almost daily is the legal description writer. This saves me a ton of time!

Drag & Drop Shapefiles (or other GIS data)

Did you know you can just drag and drop a Shapefile (and other

GIS data) right onto your model space screen and it imports and even reprojects? Simple, huh? Give it a shot—just grab the shapefile and throw it in there and see what happens!

Quick Profile/Section

I use a quick profile almost daily. Draw a line, select the line, right-click and choose Quick Profile. This is a simple way to see a profile or section with creating an alignment. However, it is a temporary graphic, so this would be the one and only time I tell you to explode it! I typically do some annotation, then window the entire profile view and explode.

There is also a Quick Cross Section creator (Figure 13). It is found on the Toolbox tab of Prospector, under Misc Utilities and within the surface options.

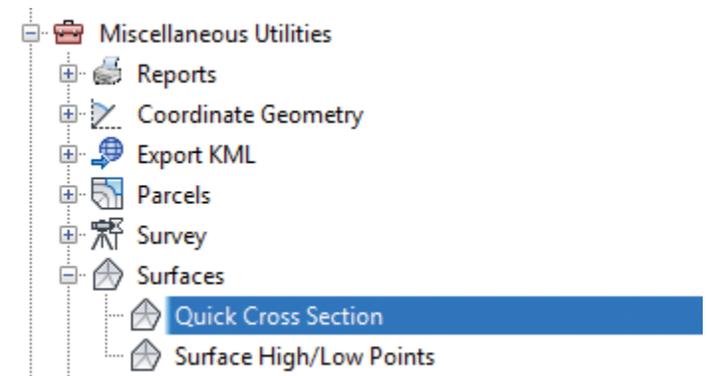


Figure 13

CONCLUSION

As you know, Civil 3D can be like fishing with dynamite! There are so many commands, icons, ribbons, and settings that you can't conceivably know where everything is, especially items you use only once or twice a year. Hopefully, this article helped refresh your memory on some old tools and/or introduced you to some new ones.

As always, I am interested to hear what you think and see how we can improve upon this topic. I always enjoy the feedback on what tips or tricks you use in your workflow.



Shawn Herring has been a part of the design engineering community for roughly 14 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 including many reality capture workflows. Shawn can be reached for comments or questions at awautocadcivil3dcm@augi.com.

Please, Don't (Just) Blame the Tech



While traveling home I read “Software That Should Be Unifying the AEC Industry Is Impeding Progress and Innovation” by Carl Galioto, president of HOK, and it inspired me to crack open the computer on the plane instead of finishing the last episode of Ozark I was halfway through from the first flight. If you know me, you know that’s some crazy stuff: I can’t start a book, TV show, or movie without finishing it in one sitting (which leads to some epic late nights on some books). So this article clearly got me worked up.

Now, to be clear, it is a well-written article that makes some great points and highlights some of the challenges facing our industry as a whole with current software solutions. I love some of the observations, in particular this quote that got me out of my seat, shouting hallelujah:

“If we think of software and technology as tangential to the “real” problem of creating buildings, then we have lost. It is essential that we think of technology as the means by which the art, science and craft of building is achieved in a collaborative and holistic environment that bridges the AEC industry.”

Preach it, Carl, preach it! So I highly recommend you read it and share your own thoughts about it. Ultimately, I agree with probably 90 percent of the article’s content. At the detailed level, I’ve felt those pains as a user, BIM manager, VDC director, and purchaser of the products we have to choose from. But scattered throughout the observations and frustrations that I so completely relate to is a tone of blame that just broke my heart. This bit is the most obvious:

“We cannot wait for the software vendors to develop better tools. We must demand more from them...”

Basically the last three paragraphs are a call to action to “demand” vendors provide the tools to lead our industry to the promised land of integrated data systems and integrated delivery. Because clearly it is the vendors that are withholding said software and preventing the industry from moving forward. *Right...*

Why, Carl, WHY? Our industry is already plagued with a “blame the other guy” mentality. It is a cold day in hell when a prominent industry leader stands up and says, “*It’s our fault. We screwed this one up, and we need to fix it.*” Mad props to the few who have! Instead, I almost always hear: “*The Contractors screwed up the estimate.*” or “*The Architects gave us crappy drawings.*” And so on. I’m just sick of it. And, while this article started so well, it ultimately ends up pointing the finger of blame squarely at technology and the software and hardware vendors that make it. Oh well...

Now, you may be thinking: “*Who are you to talk, Kelly? You work at a software vendor. #bias dude...*”

But hey, I worked at the Beck Group for 10 years, and Beck has gone farther than most firms by functionally combining an architecture firm and a construction company into a single operational business. So we constantly struggled against the software not supporting the level of cross-discipline collaboration that we desperately needed. I have been in Waltham and Manchester (The Gracelands of Revit) talking to Anthony Hauk and Jim Lynch ad nauseam about why they need to fix this. I’m all for fixing it. But, there’s a really **really** ugly reality—the BIG problem—that this article glosses over in a single sentence. ONE SENTENCE:

“We live with it every day and fully realize how contractual barriers limit software interoperability and the efficient flow of information.”

Come on, Carl! So you want us to build software that you contractually can’t use?? I’m pretty sure that’s going to be a flop. When cloud-based project information management systems came out, everyone complained that they needed an on-site disconnected version for their government jobs because they couldn’t use web-connected systems on those projects. They didn’t all jump up and down shouting, “Hooray, let’s stick it to the man!” When umpteen companies created tools to share models between the contractor and the architect, guess who used them? Almost no one, because the contracts don’t recognize BIMs or 3D models of any kind as contract documents. When BIM 360 got that awesome feature to automatically print drawings to PDF when the model changed so the contractor would have up-to-the-minute updated drawings, everyone in the industry looked gleefully at each other and whispered **#awkward** behind their hands because (GASP) until it has been approved for construction by the owner, the contractor would be financially at risk if they used them. So, without further ado, in direct response:

Carl, I work at a company that is trying to solve two of the many remaining problems that prevent the vertical construction industry from reducing the rampant waste that comes from mistakes and miscommunication—and that means our software that straddles

the silos you so eloquently lament. We’re doing what you’re demanding, and let me tell you it is a really tough row to hoe.

We make software that helps automate the process of generating 3D models and BIMs from reality capture data. Our software can cut in half (or more!) the time it takes to turn a laser scan into a useful as-built model to serve as an accurate basis of design.



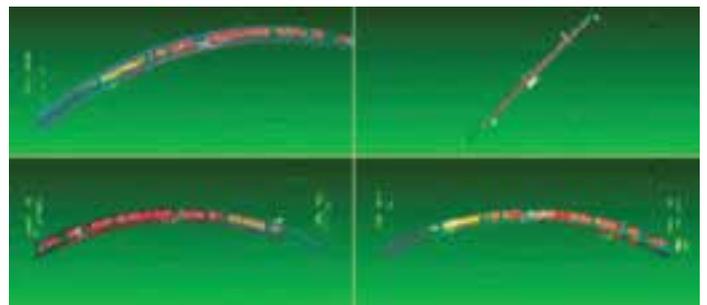
Let’s face it, this is a HUGE problem plaguing adaptive reuse projects. In a perfect world, architects and engineers would be falling over themselves trying to buy our software. We’d be fighting off hordes of angry, credit-card-wielding studio zombies who want to work 40-hour weeks instead of 60-hour weeks. But, in reality, the #1 thing I hear from A and E prospects is:

“That isn’t our contractual responsibility; we don’t want to take on any liability for the as-built drawings to be correct.”

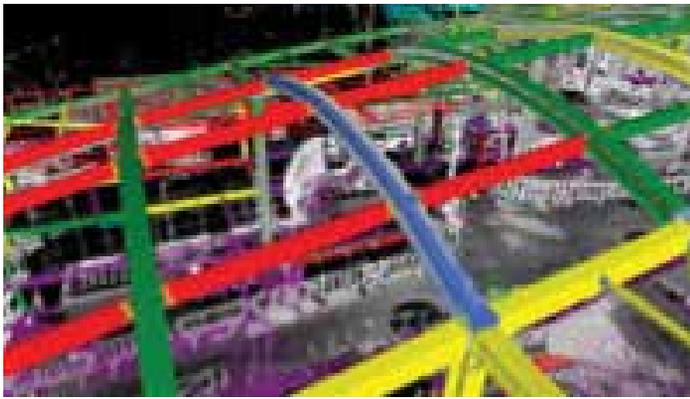
If that wasn’t awful enough, I even got this lovely addition recently:

“If we use your software we’re worried it implies a level of accuracy that will put us implicitly at risk.”

We also make software that allows the kind of quality management practices that have only existed in high-end manufacturing in the past. If you have a coordinated model that you’re using as a basis for fabrication and installation in the field, and have a site team capable of running a laser scanner, we can automate the comparison of a laser scan to a 3D model to such an extent that you can check 100 percent of the installed work in the same time it used to take to spot check 5 percent of said work using traditional methods.



Revit Architecture



So basically, we made software that can provide an extremely efficient path to fine-grained progress tracking, validation of conformance to specs, and ultimately establish accountability for the trades to follow the coordinated model. This conveniently short circuits the massive issues we have in turning over accurate as-built drawings and models to our owners. After all, if it is built in the intended spot, the shop drawings ARE the as-builts. So surely, we'd need razor wire and Blackwater private security at the gate at all our conference appearances to manage the unruly mobs of general contractors desperate to buy our kit to solve all their problems! HA! And don't call me Shirley! Instead, the most common thing I hear is:

"Well, if the owner found out how much stuff was wrong we'd be out of a job."

...or...

"Quality is really the subcontractor's responsibility, and we don't want to take on that risk."

...or...

"We make most of our money through change orders; this would basically eliminate most of our profit on construction jobs."

That's my personal favorite. But I shouldn't be surprised. One of my first times working with ClearEdge3D to try and implement EdgeWise at Beck, I had to explain that since some of our scan-to-BIM service work was on negotiated hourly rates set in advance that we would never use EdgeWise on those jobs because it would cut our revenue in half (or worse!). So I've seen it from both sides.

Are there firms that find ways to apply our technology to their operations without crossing the legal demilitarized zones that exist between disciplines? Of course! (I still have a job, after all!) Are there firms that leverage unique business models to get around some of those DMZs and use our technology more effectively as a result? Of course! But I can't tell you how much of a battle each and every initial sale is, despite our active customers' willingness to unabashedly interject into private conversations to rant and rave about how amazing our software is once you realize how much time it can save you.

So here's the reality. Our industry is sick. Fifty shades of grey perverse. And, 95 percent of that weird, nasty, adversarial S&M stuff we live with day to day as our "normal operations" in this business comes from our contracts. Those standard contracts upon which most contracts are based (in the US) are authored by the AIA and the AGC. And, this isn't unique to the US. The truth is:

"WE DID THIS TO OURSELVES!"

It took us 75 years to screw things up this bad, but by George we did it! Hip, hip, hooray!

Technology companies are FAR more agile than our AEC firms when it comes to adjusting their strategies to changes in the industry; even "uge" ones like Autodesk or Bentley. Like, an order of magnitude more agile. "We" (the royal "we" meaning "technology companies") can shift gears in months, not years. Technology companies are also driving some of the changes in formats and standards (IFC, E57, etc...); we're closely engaged in industry think-tanks; we're sponsoring and leading initiatives in industry organizations like the AIA, AGC, CSI, USIBD, etc; we're driving the use of the cloud to enable collaboration; we're working to change contracts and legal language to make new technologies possible to use on highly secure projects through certifications and other programs. Are we doing it in a somewhat self-serving way? Sure. We're businesses. Our job is to make money (something the architectural profession seems to have forgotten at some point in the distant past). But, we ARE pushing the industry forward in ways we believe we can influence ourselves.

It's not like we're your over-protective bro who's holding you back from a fight to defend your girlfriend's honor at some crappy bar in the middle of nowhere. We might, however, be your bro that you asked in advance to make a show of holding you back so you didn't actually have to fight, but your girlfriend would still be impressed because you "stood up for her." That seems like a way more accurate (although still totally misogynistic) analogy in this situation. Fortunately, in this analogy your "girlfriend" is the owner. You know, the ones with all the real power and money in this scenario. So don't get too upset at me for using it. It works because we've all seen that jerk at a bar playing like he's going to beat someone else up because they said something they shouldn't have, but then keeps hitting some invisible wall every time he puffs up and thrusts himself at some other dude.

"Hold me back, Bro!"

Also, "we" ARE providing tools that break down or bridge the silos. Those tools exist. They exist in the applications your firm and every other design or construction firm worth noting is using. For instance: You do realize that C4R can allow contractors and architects and engineers to work collaboratively on the same BIM all at the same time, right? How's that for breaking down silos? But the industry doesn't use silo-busting (or silo-ignorant) functionality because it is contractually off limits. So, that functionality sits there like Beatrix Kiddo in a coma as its muscles atrophy and companies move on to find other less-silo-busting uses for the technol-

ogy they built. Unlike in "Kill Bill," it never wakes up and busts in Buck's head with a door, steals his inappropriately named vehicle, and drives off into the sunset to exact revenge on the baddest posse of assassins that Quentin Tarantino could imagine. That's not reality. In the real world, the architects, engineers, and contractors get together and hire a bunch of lawyers to see to it that it never wakes up evil "pirate-nurse" style.

We don't live in a "Field of Dreams" industry unburdened by regulation or standards where if the technology company builds it, "they" will come. We work in one of the most highly regulated industries (by volume of regulation) that exists. I've seen countless start-ups and big-company initiatives go bust in the last 15 years because they ignored that constricted reality and dreamed too big in their own silo-busting, industry-disrupting ways. Technology companies could build the coolest, most integrated, most open technology infrastructure possible—invest billions in making something truly revolutionary that could bring our professions into the 21st century (and beyond!)—and they'd go bankrupt doing it because no one would be there to use it. Just a cool product sitting in a cornfield with no one to play ball...

But Kevin Costner would be so proud!

So, Carl, while I whole-heartedly agree with your frustration, your observations, and your desire to change the status quo, it isn't the vendors of our software and hardware that the industry needs to focus our demands for change upon. "WE" (everyone in and adjacent to the AEC industry including owners, designers, builders, fabricators, suppliers, etc.) should be focusing our demands upon our own industry organizations to not only support, but to enable this change. All of us (including technology vendors) share blame for the mess we're in. Our technology is absolutely a speed bump on the road to industry nirvana. But that speed bump sits behind a Great Wall of China-sized edifice made of decades of risk-averse contracts, disclaimers, court precedents, and God only knows what else our industry "advocacy" groups' hired lawyers piled up to point the fingers of blame in so many directions no one can figure out who's blaming whom when projects go wrong. I've been brought in as an expert witness on litigations—and it is like an Abbott and Costello "Who's on first" comedy act—but somehow disturbingly sad at the same time.

Let's demand that those same groups (like the AIA and AGC) start dismantling that wall so we can all individually get back to what we presumably got into this industry to do in the first place:

Making amazing places, and making a reasonable amount of money doing it.

Once we knock down that so-big-you-can-see-it-from-space barrier; then by all means let's grind down that speed bump Autodesk and others have put in our path by letting their interoperability and multidisciplinary collaboration efforts atrophy. But just removing the speed bump isn't going to do a damn thing by itself, and that's why I wanted to cry at the end of the article. Over-simplification is a skill required for any decent architect to succeed, but that doesn't mean it should be over-employed when all it does is obfuscate the

real challenges that something as small as a project or as large as an entire industry currently face.

On the bright side (*sarcasm*), if we don't fix it ourselves, WeWork, Katerra, and other developer/owner/operator led vertical integrations will just eventually push traditional AEC firms to the undesirable margins of the industry, leaving only the rare starchitect (a thing), starengineer (barely a thing), and starcontractor (totally not a thing) to carry on the banner of our professions as a stand-alone service to the universe. Huzzah! Alas, that is probably the most likely outcome at this point. It will take decades to come to pass, but make no mistake—that is a train coming toward you in the tunnel. It isn't moving fast, but it is coming whether you're ready for it or not.

But, hey, that's all my unsolicited opinion on rhetorical display. (Grandiloquent, even?) Take it with a grain (or entire ocean's worth) of salt as you see fit. And no, dear reader, I don't know Carl from Adam, but sometimes it is fun to talk to people you don't know and who aren't there as if they were listening. Or maybe I'm crazy. Or both. One thing's for sure—one-sided arguments are always easier to win. ;-)

See you around the blogosphere, C-train! (my new rapper nickname for my buddy Carl!)



Kelly Cone, LEED AP, is Vice President of Product Management for ClearEdge3D Inc. In his words: "I am passionate about process and technology innovation and how they can change industries and people's lives. My education is in architectural design and documentation, but my experience within the AEC space is far more varied. I have implemented various practice technologies into design, estimating, and construction teams and workflows; worked on amazing projects such as the SaRang Global Ministry center in Seoul as a designer, and Renzo Piano's addition to the Louis Kahn Kimbell Art Museum as a contractor; and have had the privilege of growing and leading one of the most talented VDC & Process Innovation teams in the industry. Those experiences have taught me there is a better way to create our built environment, and I want to make that way become a reality. As a first step in that journey, I have joined ClearEdge3D to help them develop the tools necessary for design and construction firms to get the most out of reality capture within the AEC industry; with the goal of closing the gap between the virtual and real world."

It Takes a Village



Implementing Autodesk® Revit® Structure 2020 in your own office can be a difficult task, especially if you try to do it alone. Can you ask for help from your Local Revit User Group of Revit Structure experts? Would you like to learn and share Revit Structural experiences and knowledge with others? Come explore some findings with us, Rick and Adam, as we share ideas to help you implement a local knowledge-sharing user group in your office, hometown, suburb, or city.

WE ALL HAVE QUESTIONS

You can implement a new workflow and if you're lucky, implement new software, but if you want to really understand how Revit Structure is utilized in the big picture, you may have to implement a new local user group. The more you learn about other disciplines, the better your understanding of Revit, BIM, and VD&C, and the more you realize what you don't know. To find the answers, you must look outside your comfort zone. Do not be afraid to ask questions. That may just be the greatest lesson in BIM.

To help better your greater understanding, you may want to consider trying to kickstart a local knowledge base user group, based on BIM and VD&C in general. A Revit Structure Focus

Group within your new or existing user group will help you bridge the gap.

1 + 1 = A GROUP

We could learn by ourselves, or we could share that knowledge and learn together. Find someone local who is also interested in learning and sharing together, then you two can work as a team. As you two share stories and visions for the group over lunch, write your ideas down to help bring your dreams to fruition. You can both ask around and check for other people who may be interested. The next thing you know a group is formed. It's helpful to learn the basics of what others are doing with all the many aspects of BIM and VD&C. You don't have to fully understand all these new workflows and technologies, but at least make note of them for future investigation and possible implementation.

CHECK OUT THE AUGI WEBSITE

If you get connected with the AUGI Website, you can read up on all there is to know about Local User Groups (<https://tinyurl.com/AUGI-LUG>) and download PDFs to help you such as the *User Group Handbook* (see Figure 2) and the *Local User Group Leaders and Content Admins Guide* (see Figure 3). If you're not an AUGI Member, join today. It's free!

The *User Group Handbook* contains multiple ideas and suggestions and is the most in-depth resource we've been able to help



Figure 1

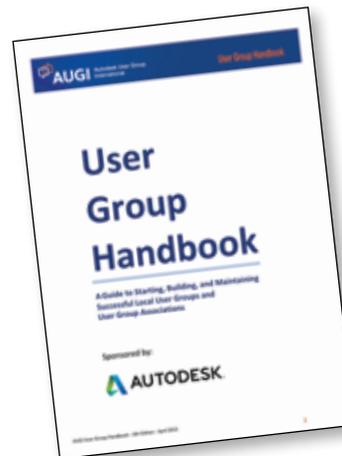


Figure 2: User Group Handbook (<https://tinyurl.com/AUGI-UGH>)

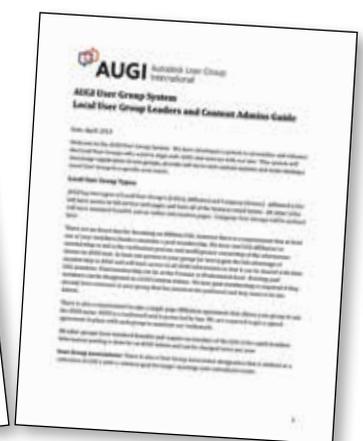


Figure 3: User Group System Leader Guide (<https://tinyurl.com/AUGI-LUGLDR>).

you with your user group. Take the time to read this and utilize tried-and-true methods from the experts at AUGI.

A FLYER FOR YOUR FIRST MEETING & THE 5 “W”S

Your first meeting flyer is very exciting to create and should answer: who, what, when, where, and why. RSVP information is also important, as is a thorough review for misspellings and to ensure correct RSVP addresses. A flyer that can be printed in color should also print well in black and white as not everyone has access to a color printer. Refreshments and games are nice, but not mandatory when it comes to putting that information on the flyer. Here are more ideas and questions to ask.

What Exactly Is This?

Our first meeting goals for a local knowledge sharing user group were to help introduce group ideas, share our vision of group collaboration, and a call for participation! Our first meeting flyer went something like this:

“This group is for those who want to learn and share BIM and VD&C knowledge and ideas with the Local AEC industry. Whether you’re a Drafter, Architect or Engineer, young or old, Student or Teacher, Expert or Novice, in the office or in the field, we want to learn, share and collaborate with you!”

This can help you find other folks who are learning and utilizing BIM, VD&C, and, hopefully, Revit Structure. You can also learn from other disciplines, workflows that can help you interact with other trades and software. This will help build stronger relationships between the models and the field. You can also research what the GCs and various trades within your construction community are looking for in your model. Are they able to utilize any of the BIM, if at all? Often, they may still need exports in DWG format for documentation and/or fabrication purposes, etc. Go find out!

Who?

Who should join? Who do we want to present? Do you even want to have presenters? Who wants to sponsor, or do you even want sponsors? We chose to hold off on allowing sponsors for the first meeting so we could ask the group if we should allow sponsors. Sponsors often can host, provide food and/or drink, present software, lead discussions, teach groups, and offer various services.

Who is going to help organize these events? Who wants to help/volunteer? Who wants to be collaborative and who will show up? Some experts may live too far away and not be able to arrive on time due to traffic and job requirements. Maybe they can eventually attend online. Sometimes folks will also want to attend from other parts of the state, country, or even around the world! Streaming video of the meeting online brings its own challenges, but also the reward of input from worldwide experts.

When?

Which day of the week is best for the group to meet? Many people are not super motivated on Monday or may have important meetings that day. Fridays are not good either as most people want to



Figure 4: Let’s learn the Ubuntu philosophy “I am because we are” “the belief in a universal bond of sharing that connects all humanity”

start the weekend. Take note of those current and future team members who are willing to meet on the weekend—they are serious movers and shakers, possibly a little more passionate than the average Joe. So while the weekend may not be good for a first meeting, it should not be ruled out for future meetings. Think of a “hacker style” or multiday meeting that will produce game-changing ideas.

Tuesdays, Wednesdays, and Thursdays are probably your safest bet, but should still be cross checked with other local group meetings and events to ensure everyone will be available. Also check the various sporting events, championships, and so on. Even the NFL Draft could be your competition.

Where?

The first meeting location should be big enough to accommodate a collaborative environment. One option may be placing chairs in a circle as opposed to a classroom-style environment. You do not want to be the only one talking and you want everyone to be heard well, so a roundtable setup might work.

If you ask, you may be surprised to find that many group members will be willing to host the event at their facility, which is great! Be sure you also make note of that, then follow up and help set that in motion. You can also look into renting small spaces around your city or town—look at IHOP or maybe a sushi place. We’ve always thought it would be cool to rent out a small movie theater for one of the meetings!

Having enough space, enough chairs, enough drinks, enough food and/or snacks can all be a little stressful, so RSVP should be requested while advertising the event. Again, on the day of the event, be sure to ask the attendees if anyone is willing to host future meetings. One idea is to move the event around to encourage experts who live further from the big city to join in and share their expertise.

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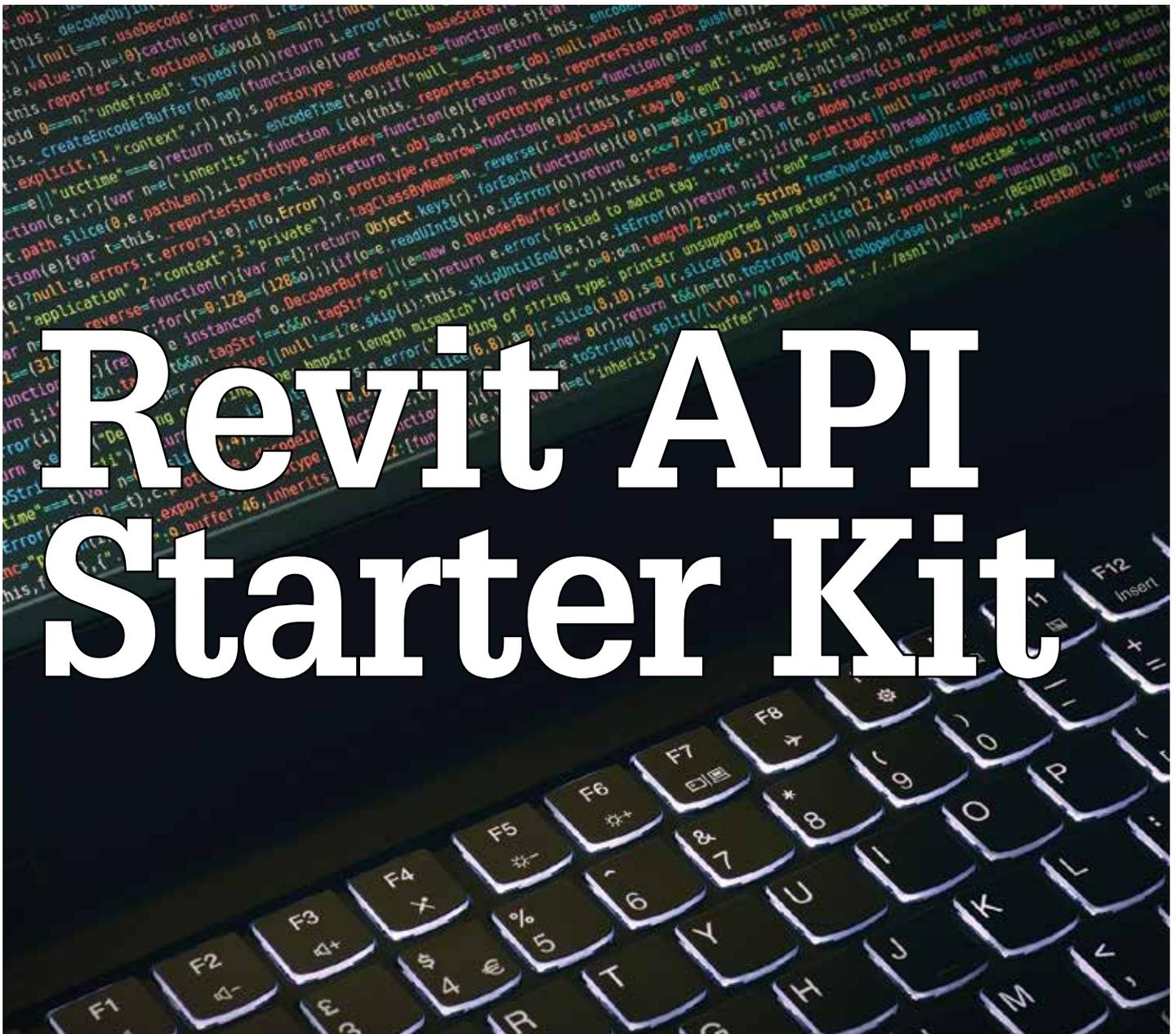
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Revit API Starter Kit

We all have some tedious, mundane tasks we would like to automate. Perhaps it is the dream button you have had on the wish list for years. Or it's a company standard that just isn't user friendly. Either way, you don't want to spend your precious time on tasks you can do while mentally checked out. As an employer, you don't want your employees unengaged in what they are doing when they could be performing valuable work. You also don't want them to feel unvalued, being asked to spend their time on menial tasks. Automation provides a win-win for the team. But where to start?

This article is intended to be a starter kit for programming. You'll find lots of links throughout to help you along your way. I know this may be coming to you in a printed format, I like it printed myself, but for what we are trying to do here, I'd recommend looking up this article on AUGI's website so the hyperlinks will work. I'm

not going to pretend to teach you everything in one article. Rather, I want to give you the tools that will help you along the way.

First let's discuss the various flavors of programming with Revit®. For many tasks you don't need a full blown programmed add-in. Dynamo is all the rage these days, but it is not without its own drawbacks. There are also macros, with pros and cons, and then there are full blown add-ins that take a bit more to get going, but with many advantages the others lack.

DYNAMO

Dynamo (Figure 1) is one way to get the power of programming without having to code at all. It is called visual programming. It now comes free from Autodesk and is installed with Revit. It comes with a large supply of commands, known as nodes, that can get you going pretty well. Soon after you start playing with Dynamo you'll discover other people

are generously donating their efforts in creating packages of new nodes. You'll get hooked on these nodes and build some truly awesome graphs (collections of nodes and connecting wires to do a task).

Then just as different versions of Revit get released, different corresponding versions of the API get released, and so do different versions of these nodes. Keeping everyone in your organization current on the nodes and the graphs created for them can be challenging. I will often use Dynamo for tasks unique to a project—things I don't expect to need again on future projects. That's not at all to say you can't save your work and reuse it later. I do that all the time. If a graph is robust enough, you can send it to users and they can run it in Dynamo Player. It is a user interface that hides the nodes and wires of the graph by giving users a Run button. It even allows for user input for specific variables.

One awesome resource in the Dynamo realm is John Pierson, aka sixtysecondrevit. He offers tremendous support to the Dynamo community, maintains the Rhythm package of nodes, and a blog at: <https://www.sixtysecondrevit.com/>.

There are a lot of free tutorials on Dynamo. If you are looking for a video training package, BIM After Dark by the The Revit Kid offers a Dynamo class titled DIY Dynamo. It costs around \$250.

<http://diydynamo.com/>

application—you have to pick one. Macros saved within the project file can be used by any user who opens that file. Macros saved in the application are saved to the user's Revit configuration. These macros can be used on any model file, but only by the user who created the macro, which makes sharing them among many users cumbersome. All in one project is easy, and that project can be the company template—then everyone gets all the macros. However, they also get a pop-up every time they open Revit asking if they want to enable macros. This gets old fast. There is a setting under Revit options that will allow you to always enable macros, but you might want to run that by your firm's security team first.

I will often use application macros for repeatable tasks I perform, but not necessarily ones I expect others to need to use. For example, I maintain the project templates. If I need to make a change across all of them, I have a macro I edit each time to automate that change across all the various view templates. I rarely ever use the project-based macros due to the annoying pop-up everyone gets. But if I were to use it, it would be to solve a project-specific problem and I would be comfortable with its use by others on the project.

Macros are a good gateway into learning to program before diving into a class on programming and installing specialized software to learn. Harry Mattson at Boost Your BIM blog has a great online course. You'll pay about \$150 for the Udemy class, but it does a

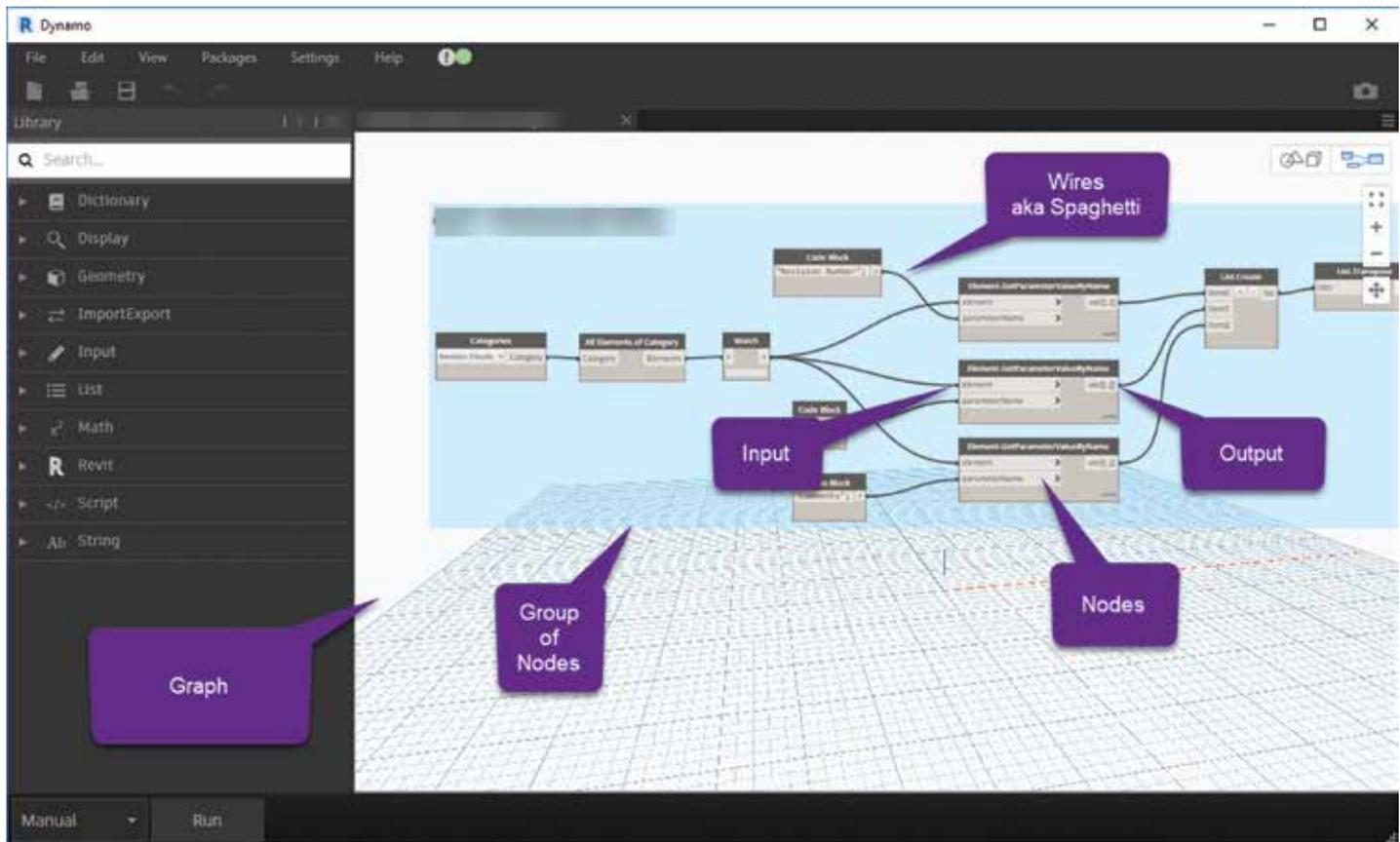


Figure 1

MACROS

Macros are a powerful tool, but they have some hefty drawbacks, too. Macros can reside either in the active project file or within the

great job of explaining the commands and how to use them from the macro environment. This environment is a lightweight programming editor and compiler known as Sharp Develop (Figure 2). It is very similar to Visual Studio, which we will discuss later.

Revit MEP 2020

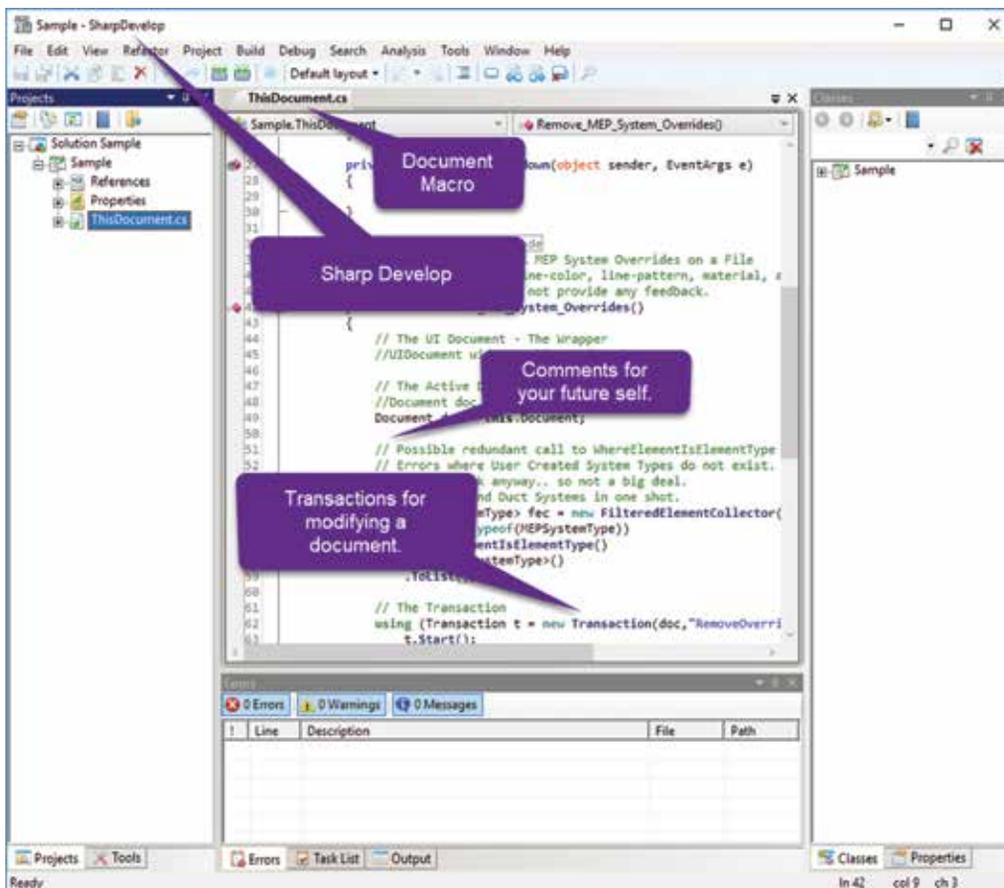


Figure 2

Another great resource is Michael Kilkelly at ArchSmarter. He has a great seven-step starter for writing macros.

<https://archsmarter.com/first-revit-macro/>

<https://www.udemy.com/>

<https://boostyourbim.wordpress.com/>

ADD-INS

Add-ins are a bit more work upfront. They are just as powerful as Dynamo and Macros, but more rigid. Users are not able to open up the hood and edit what is happening. Add-ins offer the ability to add your own buttons to the ribbon, though this is not required. Because of the environment they are created in, they have better tools for debugging and figuring out why things are going awry. They are also much easier to share and maintain across a large company.

Minimum Requirements

There are just two elements required for Revit to acknowledge and implement an add-in. First, it needs to read a “.add-in” manifest file. This file must be stored in one of two places.

C:\ProgramData\Autodesk\Revit\Addins\2019

or

C:\Users\userName\AppData\Roaming\Autodesk\Revit\Addins\2019

This file tells Revit that an add-in exists and where to find the second requirement, a “.dll” file. This .dll file is the output of compiling your code in Visual Studio. When you run your code via Visual Studio, it is compiling it and creating this .dll file in the “bin” folder of your project. Compiling is the process of converting the written code from C# into machine language the computer understands.

Programming

If someone remembers their programming classes from college, that’s great, but not required. There are free resources available to learn programming. Here you’ll need to decide which language to learn. My recommendation would first be C sharp, aka C#. The reason is all of the supporting documentation, including sample code, is provided in C#. That makes using copy and paste much easier if it’s the same language you understand. That’s not the only one though. Visual Basic and Python

are excellent choices, but may require more translation, which could be troublesome for a beginner.

You don’t need to enroll in the local community college, though that would be a great start. On the frugal side of things, Microsoft offers a free online Fundamentals for Beginners C# Programming course. All it requires is a free Microsoft account.

This course gave me a good understanding of the functions and grammar of C#. It also talked me through downloading and installing Microsoft’s Integrated Development Environment (IDE), called Visual Studio, called Visual Studio (Figure 3).

Visual Studio comes in various flavors ranging from free to several hundred dollars. I recommend the use of the Visual Studio Community Edition, free for individuals for both free or paid apps. If your company has more than 250 PCs or generates over \$1 million in revenue, then you’ll need to be honest and pay the \$500 for the Professional version or the Enterprise Edition.

<https://docs.microsoft.com/en-us/visualstudio/get-started/csharp/?view=vs-2019>

<https://visualstudio.microsoft.com/vs/community/>

If you are creating your own add-in using Visual Studio I’d highly advise you to download and install the Revit Add-in Project template for Visual Studio. Just like Revit has project templates for new projects, Visual Studio has templates for programming new projects.

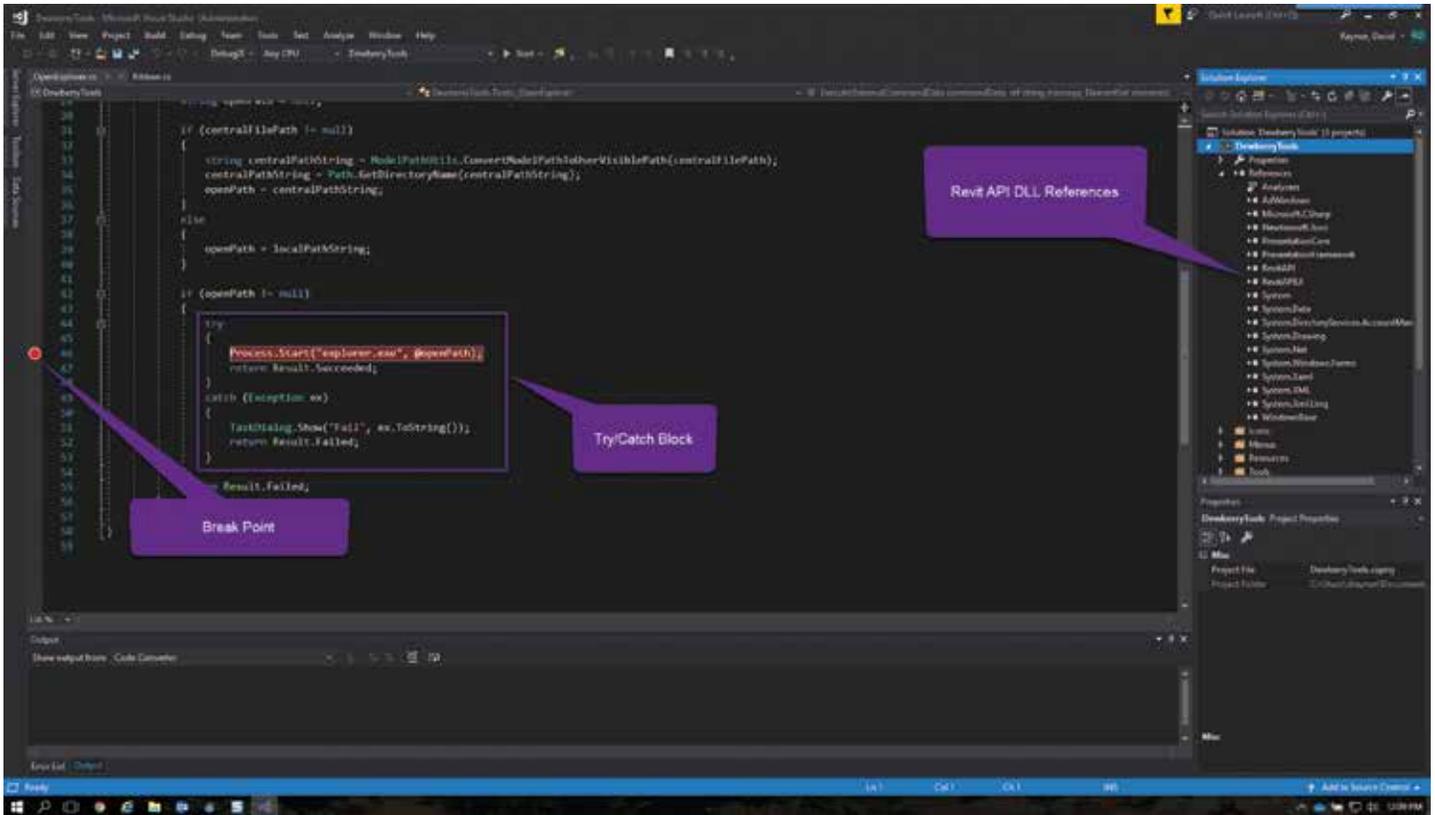


Figure 3

This template is stored on Github. Let me explain what Github is. When multiple programmers are working on a single project, they will use Version Control, which is a way to track what changes have been made to the files in a project, and by who, as well as being a convenient centralized storage location. It is really very similar to a Revit workshare-enabled project. There is a master repository you can think of as a central file. Individuals download a local copy, called a branch, which is a copy of the master. They will edit the code in their branch, adding or editing features until they have a fully functional tool. Then they will merge their branch back to the master, or sync their local copy with the central file. This way the master is always a functioning version of the software, with the latest features being added to it in a functional state.

Github is one of many similar services that use a form of version control called Git, thus the name Github. Many users will make their work public on these sites, giving you access to their master branches. This is called an open source project. You can choose to contribute to these projects with your own branches, or download versions for yourself. Be sure to read and honor the terms of use.

<https://github.com/jeremytammik/VisualStudioRevitAddinWizard>

While you are hanging out on Github, be sure to download Revit Lookup, a must have add-in for peeking under the hood at the database that is driving Revit. It allows you to select an item in Revit and explore the properties of that element, hidden from the users' view, but exposed in the API. You can view items such as the x,y,z coordinate, or to find out if a parameter is an integer value or a string acting like an integer. If you want to see what the compiler sees, this is the tool you need.

<https://github.com/jeremytammik/RevitLookup>

There is a huge programming community outside of Revit API work and many are very active on a blog called Stack Overflow. You can find answers to all kinds of programming questions there.

<https://stackoverflow.com/>

That covers the basic tools you'll need in your programming toolkit. Now we get started focusing on the tools for working with Revit. You'll need to download the Revit Software Developers Kit, aka the Revit SDK. This kit contains many shiny gems, including the documentation for the Automated Programmable Interface, or API. Don't be intimidated by all the acronyms. Just as the buttons and icons on the screen are the Graphical User Interface or GUI, the computer can send the same commands to Revit without going through the GUI. For almost any command you have access to with the GUI, there is a counterpart for the API. The Documentation just tells you how to use it and what information it's expecting.

Another great resource for the documentation is the website Revit API Docs. One advantage to this website is it searches all versions of the API, whereas the documentation only covers one specific version. Just as a new version of Revit is released every year, so a version of the API is also released. Some years they change how the tools in the API work to be more concise, optimize performance, or enable new features. This means one year's command may not work, or at least not the same way as in previous years. The older commands will have been depreciated over a year, allowing you to transition to the new command, and then finally unsupported the next year. Just like Microsoft offers free training

Revit MEP 2020

on learning a programming language, Autodesk offers a few free training examples, also accessed via the Revit SDK website. Then there is the community that supports users just like you, learning to use and write code. Jeremy Tammik, aka The Building Coder, maintains an incredible blog with tons of sample code.

<https://thebuildingcoder.typepad.com/>

<https://www.revitapidocs.com/>

PROGRAMMING SPECIAL TOPICS

Visual Studio Settings

This topic alone could drive you mad. Visual Studio supports and works with countless programs and not all have the same requirements. Therefore, there are some specific settings you have to get right for everything to work.

<https://forums.autodesk.com/t5/revit-api-forum/advice-on-debugging-c-in-visual-studio/td-p/6496811>

Breakpoints

As you start your program it is invaluable to peek at what is happening and step through the program, watching how variables are read and manipulated. Setting specific points at which to stop is done using a Breakpoint.

<https://docs.microsoft.com/en-us/visualstudio/debugger/using-breakpoints?view=vs-2019>

Transactions

Through the API you can query and gather all the information you need, display it, or export it any way you like. If you plan to make a change to the Revit file in any way it must be done within a transaction block. A block is just code contained within a set of brackets. Transaction blocks not only enable the document to be modified, but also show up as an undo-able action from the user interface. Transactions can be grouped together while others can happen in quick succession. Sometimes it's necessary to perform a transaction to determine some piece of information, save that information to a variable in your code, and then undo the transaction. Whatever the task may be, you'll need to be familiar with transactions.

<https://knowledge.autodesk.com/search-result/caas/CloudHelp/cloudhelp/2016/ENU/Revit-API/files/GUID-BE-CA30DB-23B4-4E71-BE24-DC4DD176E52D-htm.html>

Try/Catch Blocks

Think of this as a safety net. You are trying to do something, but if it fails, catch it, and tell me why it failed. This is just good practice and will save you time troubleshooting. Also, if one part of a program fails, it can swallow the error and proceed, allowing you to skip over some problematic situations.

<https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/try-catch>

Multi-Version Support

Every version of Revit has a corresponding API.dll file that must be included in the Visual Studio References. Also, every tool you create will compile to create a ".dll" file. To keep from going mad with all the different versions, you'll want to follow Konrad Sobon's guide on setting up Multi-Version Targeting. This will likely be a topic to investigate after you have developed your first add-in. With next year's release of Revit, you realize you may need to copy all that work into a new Visual Studio project for the next year's Revit version. This technique allows you to keep all your source code in one project, and build to multiple versions.

<https://archi-lab.net/how-to-maintain-revit-plug-ins-for-multiple-versions/>

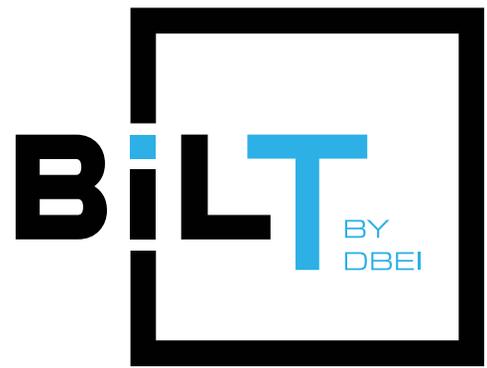
Keep With It

These are the tools and resources I use regularly. When I started on this journey I had never written a program. It had been years since I had any programming training in college and that knowledge was long gone. I was determined to automate a task that wasted hours of time per week and had no end in sight. I was very motivated, to say the least.

I didn't succeed initially. The first successful run was months after I started. I also recruited a friend to help me over a few humps. Don't be afraid to ask for help when you hit a roadblock. It was worth it many times over. Not just the value of the tool I had created, but the skill I had developed. I have found programming to be one of the most addictive activities I have ever started. Maybe I need to get out more! Then again, I get to use my words to write programs that create models that then get built in real life. Simply put, I use my words to build buildings. You can't get much closer to magic than that.



Currently, David Raynor works at Dewberry as an Application Specialist (BIM Manager) for Revit MEPS. He develops content for all trades and frequently travels to various offices teaching staff the Dewberry way of working in Revit. To help with consistency and efficiency, he maintains and supports all Revit API coding efforts. When not working, he can be found wandering the mountains, camping, kayaking, or skiing. He lives just south of Raleigh, North Carolina, with his family of three amazing kids and a supportive, understanding, wonderful wife.



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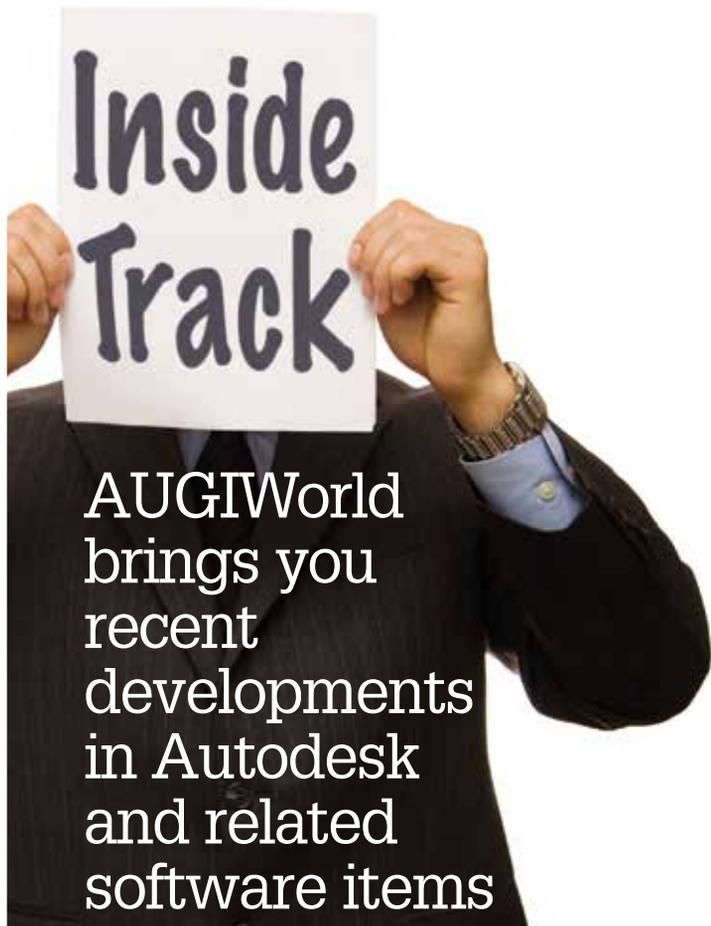
V-RAYMTL CONVERTER

<https://maxtools.3dzver.ru>
Autodesk 3ds Max
Version: 2020 , 2019 , 2018 , 2017



V-RayMtl Converter is a professional tool for automating time-consuming processes such as converting materials and other scene components (lights, cameras, proxy, etc.). from different renderer engines into V-Ray, as well as to reverse the conversion of V-Ray materials into Standard materials (which is very useful for game developers, 3d modelers, etc.).

This is a new version of the maxscript known as “VRayMtl Converter.” This next-generation version was launched after the version 2.5 and has new features and improvements: support for more materials, maps, and other scene components, additional selection of materials for conversion, and more flexible options for converting and fixing the scene and its components.



EQUATION DRIVEN CURVE

<http://codereclaimers.com>
Autodesk Fusion 360



This add-in creates 3D curves from user-supplied parametric equations.

A live preview is shown in Autodesk® Fusion 360™ as the parameters are updated, and when the command is executed, the curves are created in the current sketch. If no sketch is currently open, a new sketch is created to contain the created curve.

CLASH PREVENTOR

<http://www.birdtools-developers.com>
Autodesk Revit
Version: 2020 , 2019 , 2018 , 2017



Clash Preventor is an add-in for Autodesk® Revit® that allows users to prevent clashes by running clash prevention tests while they work.

The tool automatically tests modified elements for clashes. A manual mode also exists, which allows users to check selected elements, visible in view elements, or all elements for clashes.

Users can filter elements by category, knowing that Revit Links and IFC links are supported by this tool as well.

When clashing elements are detected, users are allowed to navigate and visualize clashes in 3D by automatically creating a section box around the elements with the ability to tile all open views when they proceed to solve the clashes for better visualization.

The built-in Clash Browser automatically generates a Clash Report that simplifies the clash resolution process and can be exported to an Excel-compatible file format, which can be also imported later on.

This tool is a huge timesaver as it prevents clashes without wasting users' time, and because it helps reduce clashes it then reduces the time usually wasted on detecting and solving clashes through conventional clash detection tests.

Note: Company multi-seat license available for a discounted price. Visit the website for more information:

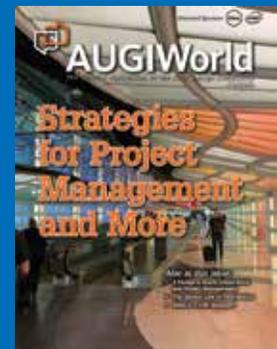
<http://www.birdtools-developers.com/shop.html>

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

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Spending Money

In the December issue, I spoke of the need to develop an annual budget to make your Strategic Plan a reality. I mentioned how most people outside of tech do not know the cost of technology initiatives. They mostly see consumer-level pricing on hardware and have no idea what a really good workstation might cost.

I stated that what I was writing about was not how to save money, but how to spend it. So now we have to discuss how you should spend your money.

A budget is a planning document. Just like the Strategic Plan, it maps out the direction you are taking with the money you have to spend. It should reflect the same initiatives your Strategic Plan has taken. So if your Strategic Plan is big on hardware spends, the budget should reflect that. If you are moving into new software arenas, the budget should lean that same way. When someone reads your budget, it should speak the same language as your Strategic Plan. It mirrors the same focus and targets—it just does it via a spreadsheet with numbers verses words.

A SPENDING FRAMEWORK

A budget is not the final approval to spend the money. I have heard a lot of folks say... “We have the money, it’s in my budget”. I have been caught short when I have depended on the money being there. Every firm has different ways of managing the cash flow and funds that are earmarked for technology. Just because you have an approved budget does not mean that your firm has the money set aside in a bank vault just waiting for you to spend it. Your budget needs to follow the spending calendar your firm may have. If your firm is light on income at the first of the year, avoid putting major buys in front of them at that time. If they are cash fat in June/July, then set renewals and new purchases at that time.

CASH FLOW IS KING

When it comes time to spend the money you have gotten approval for, you need to go back and verify that the purchase can be made at this time. Be prepared for a negotiation on some items if they can be put off for a month or two. You should also give warning shots for big ticket items that are coming. Don’t surprise the finance folks. They have a lot of spending and know what is coming. They need to be prepped for large spends and the regular flow of tech renewals. When cash is tight, push off what you can. If it is critical, then make sure they know that. Others may be able to stave off spending if you are in dire need.

WHAT ABOUT A WINDFALL?

Every once in a blue moon, you might get a windfall. This would be a time when funds flow easier than others. It might be a new project that is starting, opening a new branch office, or a savings that comes from better vendor discounts. When this happens, you need to know where your spending will go. Your Strategic Plan might contain some contingency items and your budget might also. I did mention that I add some small amount for R&D to my budget. But I also add several items that are not in the budget, but at the bottom called contingency funds. This would be part of the budgeting conversation, but you are not really asking them to approve that spending, just know that when/if there is an opportunity, this is where you will spend it. You need to be ready at the drop of a hat for spending when the opportunity presents itself. When someone says there might be some money to spend, then the first department that can claim it might get it. Be ready.

HOW TO CREATE A WINDFALL

You will not often have someone coming to you asking how you can spend their money, so you need to look for opportunities to create a windfall. This would come at the points I mentioned above—a new project starting or a new office opening. When that happens, go talk to those who may need new hardware and software. Mention that this might be a good time to not only expand on areas needed, but to look to new ventures in technology and processes

that might help the new project proceed. It might be a good time to rethink office layouts and workflow as you design the layout of the new space. Remember, these things should have been thought about prior to an opening coming along.

MOVING THE MONEY AROUND

I have a perspective, and it has been shared by those who have overseen my budgeting approvals, that the bottom line dollars are where we need to focus—not each line item. In other words, the total budget outlay needs to be managed, but not tied down to each line item. I have underspent and overspent on many individual line items, but the overall is what the firm is concerned about. If they need me to not spend as much as the budget outlined because of faltering fund flow, then they do not really tell me where to cut, just that I need to cut.

So throughout the year I may move money around by saving here to spend there. I may delay an initiative and push it into the next budget cycle if I need to spend in another area. The flip side of that is that I tend to spend the most important money up front. The items that I see as critical get the first funds. Near the end of the fiscal year, I may be called on to scrimp. I do not want to scrimp on the critical items. Critical items would be called that in your Strategic Plan. If there is a list of items in your plan, the most important are at the top. Spend there first.

CONCLUSION

So now that you have a Strategic Plan, budget, and know how to spend that money, go out and get it done. Review your strategic plan every three months and review the budget once a month and at any large spend. By doing these two things, your spending will be strategic, understood, and well executed. You can’t ask for more than that. Well... a few thousand more dollars would always help.



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.

THANK YOU!

AUGI wishes to thank the following *AUGIWorld* authors and volunteers for their contributions to AUGI in 2019. The growth and success of our organization would not be possible without the dedication of these talented individuals who share their knowledge with their fellow AUGI members.

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Jisell Howe

Todd Rogers

Kelly Cone

Brian Johnson

Philip Russo

Mark Conway

Mark Kiker

Kevin Sanders

Ken Farr

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