AUGIWorld

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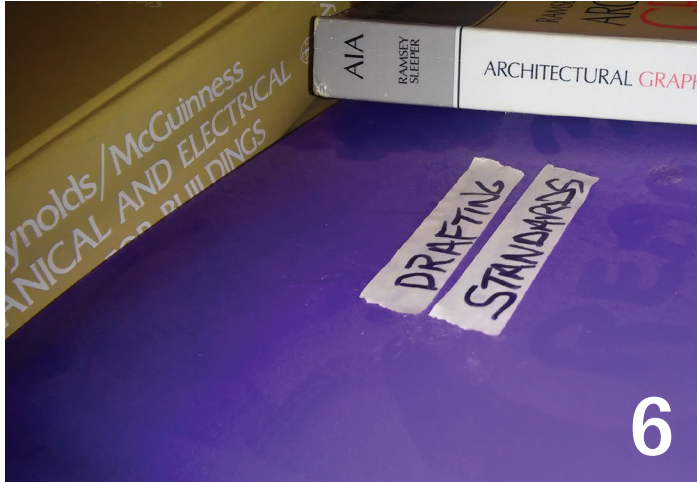Of course it's reliable. It's built with over 30 years of HP Z know-how.

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contents

product focus

6

20

24

28

columns

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Letter from the President

AUGIWorld

TRAINING (AGAIN?)

This month's issue of *AUGIWorld* is focused on the topic of training. This means that this is the third time this year that my letter to you is focused on the topic of training (I looked it up.) I could write about something else and ignore the theme of this issue. However, I feel that training is a crucial element to a company's bottom line. I'm more than happy to discuss the topic further, precisely because I am passionate about training.

In my letter to you in July, I mentioned trying to get your company to put a two- or three-day productivity training protocol in place. I'd like to expand on this.

Yes, it may be difficult to change management's attitude if there is not a culture of training in place, especially when you're talking about onboarding. My recent experience with a large company could be eye-opening to you, so I'm going to share it. Granted, I am talking about a large company that is publically owned. This is vastly different from a smaller company with private owners. But the principles apply, no matter the size of company.

This company has some mandatory training that new hires are required to take. The amount of training that is required varies depending on the position. The interesting part is that this mandatory training is for things that are required by human resources. Think about that for a minute…

The human resources department deems that some training is so critical that every person that becomes part of the organization MUST take the training. The subjects and the length of time for this HR training are immaterial to my point. The important takeaway is that you cannot avoid the training if you want to work for the company.

What about training in the design-related applications on which your company depends? Are your new people being formally trained in your company's standards and best practices? Aren't these the very things that have a huge impact on overall productivity and deliverable quality? Does management see that such training MUST take place?

Aren't those interesting questions?

The reason that HR makes some training mandatory is because there is a huge risk involved if someone acts in a way that is inappropriate. This is important to the company. What about the risk to the company when someone does not understand how to use their tools? Or what about the issues that can arise when someone doesn't know the standards and best practices used by the company to produce quality deliverables? Isn't this just as important to your company from a risk perspective?

Mandatory training should not be left solely to the discretion of human resources. It is also critical for your design staff.

R. Robert Bell
AUGI President

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Why Your Training Fails

Training programs are often like a gym membership. Expectations and enthusiasm are high in the beginning, but attention wanes and almost any other task becomes a higher priority. Training gets boiled down to a one-and-done new hire speech and a dusty standards manual. Ultimately, the lack of training success becomes a top to bottom irritant to all that never seems to result in an action. The result is a never ending source of complaints such as, "I was never trained on that!" and "Why are we making these basic mistakes over and over again?" If any of this rings a bell, it's because more training programs fail than flourish. Why? I propose it is because successful training is just a part of the larger goal employee success, which translates into a successful company. There are basic steps that apply no matter the size or function of the company in question. This article will walk through the basic steps in a comprehensive employee success program.

STEP ONE: GOALS

Take the time to quantify what the goals are. It sounds easy, but that is not necessarily true. Setting appropriate goals is the single most important step toward success and the place where most companies go wrong. A good place to start is to ask everybody. Yeah, ask everybody. A couple of things will happen when the entire company is engaged. One, there will be a diverse set of goals from "I want to learn whatever specific task" to "Make the company more profitable." When compiled, the feedback will reveal perceived issues and give focus to which goals are most important. Chances are, problems will be exposed that leadership hasn't considered. The second, and more important, result of asking the entire company is that the mere question is an announcement of proactivity, an invitation to participate, and that inclusion that makes everyone a stakeholder in the success of the program. Whatever ideas surface, ensure all the goals developed support the overarching goal of employee success.

Depending on company size, the data may get a bit overwhelming. Use logic to group similar goals together as the same, just phrased differently. Use care to really understand what the writer meant, and do not assume. It is okay to contact the writer for clarification. This process should reduce the data by about 80 percent. At this point the remaining goals can be separated into three categories based on simple sequencing: Foundational goals, Growth goals and Prestige goals. Foundational goals must be completed before other goals can be obtained. They also represent items that there is no doubt can and should be done. Growth goals are a natural progression from foundational goals and represent above and beyond, time and money savings, or a process change. Prestige goals represent paradigm shifts and moonshot thinking. They take extraordinary effort and offer high payoffs. The growth and prestige goals provide a compass for the company's long-term efforts that will also influence the foundational goals. Knowing the ultimate direction of the company, smarter decisions will be made on a daily basis.

STEP TWO: ACTIONS

Goals will only be obtained by taking action. What actions to take must be agreed upon. An example of a foundational goal may be that drafters must be fast and accurate. In order to be fast, drafters should comply with standards. Therefore an actionable item is to ensure that there is a single source standards manual that is known and assessable to all drafters. To improve accuracy, a quality assurance program will be instituted. That is easy to say, but hard to do.

In the case of the standards manual, if it is developed by committee, consensus may only be a dream and the whole process can and will stagnate and die at this step. Taking action means finding a way forward in these situations. It could mean electing a leader, flipping a coin, or arbitration to power through disputes. It is meaningful to reassure team members that the goals are more important than the actions—i.e., don't lose the war just to win a battle. In the case of implementing a quality assurance program to improve accuracy, this step is mandatory. It requires a clear understanding of expectations from all and consistent enforcement. No one wants to be known as the CAD Police, but image if there were no police in your town. The vast majority of people would continue to obey the law (standards), but a few will have no reason not to speed, steal, or do worse. Once some are emboldened to break the law, others will follow. Keeping with the analogy, bringing law enforcement to a town that hasn't had it, well, be prepared and principled in your deployment.

STEP THREE: TRAINING

People have to know, without question, what to do. Often, a standards manual is developed and the story ends. Knowing that different people have differing preferred learning styles and that our overarching goal is employee success, accommodating differing learning styles is a high-pay activity. For those who learn by reading, a well-written standards manual is a must. As a reference, it should be easy to navigate and follow the workflow it intends to document. No one has ever complained about too many images in a manual, and if there is a technical writer available, that person should be reviewing the manual for consistency and understandability.

Some prefer visual training, necessitating a video library. Larger firms may have the deep pockets to purchase a video training service, making this step slightly more straightforward, but smaller firms can be quickly overwhelmed by what it costs to purchase a service and what it takes to produce video content internally. Some good advice when it comes to standards manuals and video training is to stick to the high payoff activities that tie directly to the established goals. There are countless procedures that can be documented, but perhaps drawing setup should be documented first as it is an activity that not only happens daily, but also sets the stage for every standard that comes after. Also, recognize there are two categories of training: 1) company standards and procedures; and 2) software specific. It is easy enough to direct users to software-specific training videos online. With minimal maintenance, a YouTube channel could be created or a simple Word document with hyperlinks to company approved videos can be produced. No matter the size of the company, standards procedures videos unique to the firm are best produced in house. A quick search of the Internet will result in some good choices for free and affordable video capture tools.

For those who prefer interactive training, having a trainer or mentor is the way to go. Companies are often attracted to crowd sourcing training—often, assigning the role of mentor to whomever a new employee might be sitting next to. In an environment where everybody already interprets the standards the same this might work, but if consistency is a goal, the best way to ensure it is with a consistent trainer. It is much easier for a small firm to have a single source trainer than a large one. That being said I know of at least one international design firm that has a single trainer who travels the globe to ensure consistent messaging.

A final thought on training: do not operate under the impression that it is ever complete. Training should be a constant. To combat turnover, attrition, and complacency try theming each month of the year with a training topic such as "Basics," "Tips and Tricks," and "Scheduling." Additionally, institute on-demand training where employees need only ask to get updated or advanced training. No one should ever feel that there is a barrier to training.

ROLES

In 1993 R.I.M. Dunbar released a paper entitled, "Co-Evolution of Neocortex size, Group Size and Language in Humans." In that paper Dunbar hypothesizes that there is a cognitive limit of 150 people that any one person can maintain a stable relationship with. Dunbar drew a correlation from the size of 36 primates' neocortex and the size of their social groups to derive the equation that predicts 147.8 stable social groups in humans. The data is reinforced by census data on village and tribe sizes in many cultures.

Christopher Allen suggested in 2004 in his paper, "The Dunbar Number as a Limit to Group Sizes," that the Dunbar number is a single data point in the curve of functional group sizes. He indicated that the optimal small group size is between 5 and 9. Dunbar's number and Christopher Allens' group size should be kept in mind when tackling how and who to assign to the many support roles in an employee success program. Of the roles listed below, a single individual may be responsible for all of them at a very small company, or an ever expanding number of individuals may be required as the company size grows.

Revit MEP 2017

TRAINER

A trainer must be an outgoing person focused on the students' understanding, not finishing the material. This takes determination, the ability to recognize when things aren't sinking in, and the ability to switch tactics on the fly. Trainers have to be highly technical and passionate enough about employee success to follow up early and often after initial training to ensure that success.

QUALITY ASSURANCE

Whoever reviews projects and drawings must be able to clearly communicate the conditions of the review, then be impeccably consistent in providing feedback. Reviewers should be detailed, pragmatic, and diplomatic. Above all, reviews need to have a bit of a thick skin to endure the often bad way some will receive the feedback they must give.

MANAGER

BIM Manager, CAD Manager, or whatever title they get, the manager must motivate staff. That can come from their ability to see the big picture—not just at the company, but also how the company fits within a larger industry context overlaid with the changes and lack of changes from Autodesk. That visionary role must lead to a "how are we going to get there" navigator role, which requires exceptional communication skills. Ultimately the manager will end up being the decider and must also be able to deal with the fact that not everyone will be happy with their decisions.

With the goals, actions, training, and leadership roles defined, an understanding of the skills makeup and expectations of design staff should be understood. Traditionally, job descriptions fill this void. Companies with HR departments may have very regimented job descriptions that leave the common employee with clarity only on the fact that they should be able to lift 50 lbs., even though they never have had a 50 lb. mouse or keyboard to contend with. By contrast, small firms may not have formal job descriptions at all. In either event, leadership and employees should share an understanding of the expectations of the job. At a minimum, every job should have two levels. Level One can perform all the standard duties assigned, and Level Two, which is able to adapt to unusual circumstances independently and also provide leadership to Level One employees.

Anecdotal evidence suggests smooth running firms consist of 80 percent Level One drafter/designers who are capable of pulling the levers on demand in normal situations, and 15 percent Level Two independent thinking drafter/designers who actively seek to improve personal performance as well as company procedures. This leaves 5 percent with the odd combination of being technically adept, socially engaged, and a software Jedi. Members of this group not only see the big picture, but are skilled at manipulating the masses toward common goals. When this mix is off, it is palatable and affects every facet of production. Interestingly, companies naturally gravitate to this mix as a matter of human nature.

In the end, there are a billion possible points of failure for having a well-trained confident team. As the gym membership analogy in the opening paragraph suggests, there are just as many "cure all" training solutions out there as weight loss and fitness solutions. The truth is, eat right and exercise has always been the solution and employee success takes the same

constant effort over a long period of time. You can't wish it into existence, it is hard work and dedication, and in this case it also comes with a price tag. The highest levels in the company have to see a return on the investment to fund it. They will also have to have a strong confidence in the team and know that they can and will achieve the goals. This brings us to documenting efficiency every step of the way. Look for objective indicators of efficiency and monitor them through the process. They will indicate what is working and what is not. They will also validate to senior management that the company's investment is paying off.

Todd 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 Todd at tmshackelford@gmail.com

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by Robert Green

HP Brings Blended Reality Computing to AU 2016

Autodesk University (AU) offers a great learning environment packed with informative classes and show floor demonstrations of interest for Autodesk users – including great offerings from HP. So when you're not attending classes – like HP's Reinventing Reality with Breakthrough Graphics, VR, and Workstation Technology - there's still plenty to learn by visiting HP Inc. at the booth on the show floor. The show floor will be open on Tuesday from 11:30AM to 3PM and 6 to 9PM, Wednesday from 11:30AM to 5PM and Thursday from 11:30AM to 3PM so you can see and touch HP products while talking to HP application engineers in person.

At AU 2016 HP will focus on a blended offering of technologies that encompass the entire ecosystem of 3D design, scanning, printing and hardware technologies that combine to make Autodesk users more productive while lowering the cost of ownership of cutting edge new products. Here are a few of the technologies that will be featured and some information on what technologies will be demonstrated:

HP WORKSTATIONS

From mobile to small form factor desktop to high end multiprocessor equipped options it wouldn't be an HP booth without workstations. The following systems will be available for your inspection:

HP Z840 Workstation running 3ds Max with Vray. Heavy duty computational power iron for CAD analysts and rendering professionals is the only way to describe the Z840. Supporting one or two (2) Intel Xeon® processors (up to 44 cores total), up to 1 TB of high speed ECC RAM, up to 2 TB of solid state disc capacity via the HP Z Turbo Drive Quad Pro[1], professional 4K graphics and Thunderbolt™ the Z840 is a high bandwidth, no compromises workstation for analytical, simulation and rendering professionals.

HP Z240 TWR with Intel's i7-6700K 4.2 GHz Processor and Z Turbo Drive G2 SSD's. A high speed single processor workstation at a price point that maximize price/performance ratios in lightly threaded 2D and basic 3D CAD applications like AutoCAD, Revit and Inventor. At up to 4.2 GHz processing speed, up to 64 GB of high speed DDR4 memory, professional graphics and the new NVMe based Z Turbo Drive G2 (yielding up to 4X speeds over conventional SSDs) the Z240 TWR has been dubbed the CAD Monster.

ZBook Studio G3, ZBook 15 G3, ZBook 17 G3. Sleek mobile workstations that are easy to carry yet pack the punch and work ethic of a desktop. Supporting a variety of Intel® Core™ i7 and Xeon® processors, 32 (ZBook Studio G3) or 64 GB of RAM along with Z Turbo Drive G2 solid state disk and a variety of full HD resolution monitors/graphics with external ports the ZBook Workstations can power through most CAD workflows yet are light enough to place in an overhead baggage compartment with ease.

HP SPROUT

Sprout is an augmented reality 3D exploration environment that uses multiple cameras, a pen/touch interface and a rotating table scanner to allow scanning, visualization and even interfacing to 3D printers. Sprout will be demonstrating Autodesk SketchBook and Stingray integration as well as Edddison software's walk through technology.

HP Zvr VIRTUAL REALITY DISPLAY

Like Sprout, the HP Zvr display simply immerses you in a 3D visualization environment that must be experienced. By donning a pair of special glasses the 24" diagonal stereoscopic 3D display tracks the motion of your head so you

can simply "look at" an object in a virtual 3D field then using the 3D stylus you can explode assemblies to look inside objects[2]. The Zvr display will be demonstrating multiple 3D assemblies, parts explosions and cross-sectioning. There's almost no way to describe working with the Zvr – you simply have to put on the glasses and try it for yourself.

3D SCANNING

DAVID SLS-3D Stereo Structured Light Scanner

The HP/DAVID SLS-3D is a mobile scanner that can be positioned easily in front of any object up to 19.5" (500mm) in size to capture geometry and color information via a single click in the included DAVID software. Full 360° models can be created from multiple scans – each taking 2 to 10 seconds depending on resolution settings - which are facilitated by the ease of movement around the object which are processed by the DAVID software. The SLS-3D is connected to any typical computer via 2 USB 3.0 ports to facilitate ease of use in virtually any environment and the DAVID software can export 3D information in industry standard OBJ, STL or PLY formats.

HP Jet Fusion™ 3D 4200 Printer

The product of decades of research, the HP Jet Fusion™ 3D 4200 printer brings production ready reliability and throughput to 3D printing using their proprietary voxel (volumetric pixel) controls to achieve optimal part mechanical properties to create functional prototypes. The platform can address more than 340 million voxels per second, enabling precision[5] at much faster build speeds[3]. Manufacturing companies, in-house model shops and 3D print service bureaus can print superior quality physical parts up to 10 times faster[3] and at half the cost[4] of current 3D print systems.

HP PageWide and DesignJet Multifunction Printers

And of course it wouldn't be an HP booth without wide format printing devices. A variety of devices will be on display including the HP PageWide XL 4500 (a 40" wide format, monochrome/color device delivering up to 12 D size prints per minute in color or mono output formats), the HP DesignJet T830 (a 36" wide format multifunction print/scan/copy device with Wi-Fi sharing), and the HP DesignJet T2530 (a 36" wide format multifunction print/scan/copy device delivering professional-quality color output for CAD/GIS applications.)[6]

WRAPPING UP

As the process of design becomes more virtual and fabrication becomes more driven by 3D printing processes it becomes apparent that CAD users need to be aware of all the hardware that supports their CAD workflow. By stopping by the HP booth at AU you'll be able to experience technologies you may not be aware of yet as well as getting an update on how technology is progressing in more traditional

technologies like workstations and printers. If you're taking the time to attend AU be sure to allocate an hour to check out the wide range of products HP is showing.

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

PRODUCT FOCUS

Revit "WFRC" Methods: Walls, Floors, Roofs & Ceilings

Editor's note: In a desire to open this forum up to many voices, we present an author with a deep passion for bringing Revit understanding to others. Although English is not Behzad's main language we present this article in the hopes that the methods written about come through nonetheless and come through adding value. Without further ado, please enjoy the concepts herein and get down with WFRC.

In the process of building we can have many problems and mistakes. These problems mostly come from misunderstandings about the workflows and details for construction. To solve these important issues in construction and installation is worth our attention. To reduce the cost of overworking, designers can use details that help coworkers and construction teams in the building industry.

To start the discussion of enhancing production workflows there are some new and not-so-new tools that can be used to these ends. Create Part is an example of one of these and it has been available in Revit since 2012.

Designers and engineers need to present project parts such as walls, floors, roofs, and ceilings as best they can. 2D and 3D presentation are the two primary ways to explain intended detail to others.

According to design processes, the use of parts can be used as a base idea where each view of a presentation could be different and variable for our intended needs.

We first want to have quick look at 3D presentation methods by explaining the advantages and disadvantages of each method. Then we'll introduce a new method and compare the new method with the previous one.

QUICK LOOK AT CURRENT METHODS

Always in need of improving our workflows for better results, we want to improve the method for 3D presentations. With this step-by-step, you might find some improvements. Let's see…

1. **Detailing the Structure of a System Family: Wall, Floor, Roof, Ceiling (WFRC)**

I should say this is the base for all methods we are using in ® Revit®. You can try to add more objects with the tools in the Edit Structure dialog.
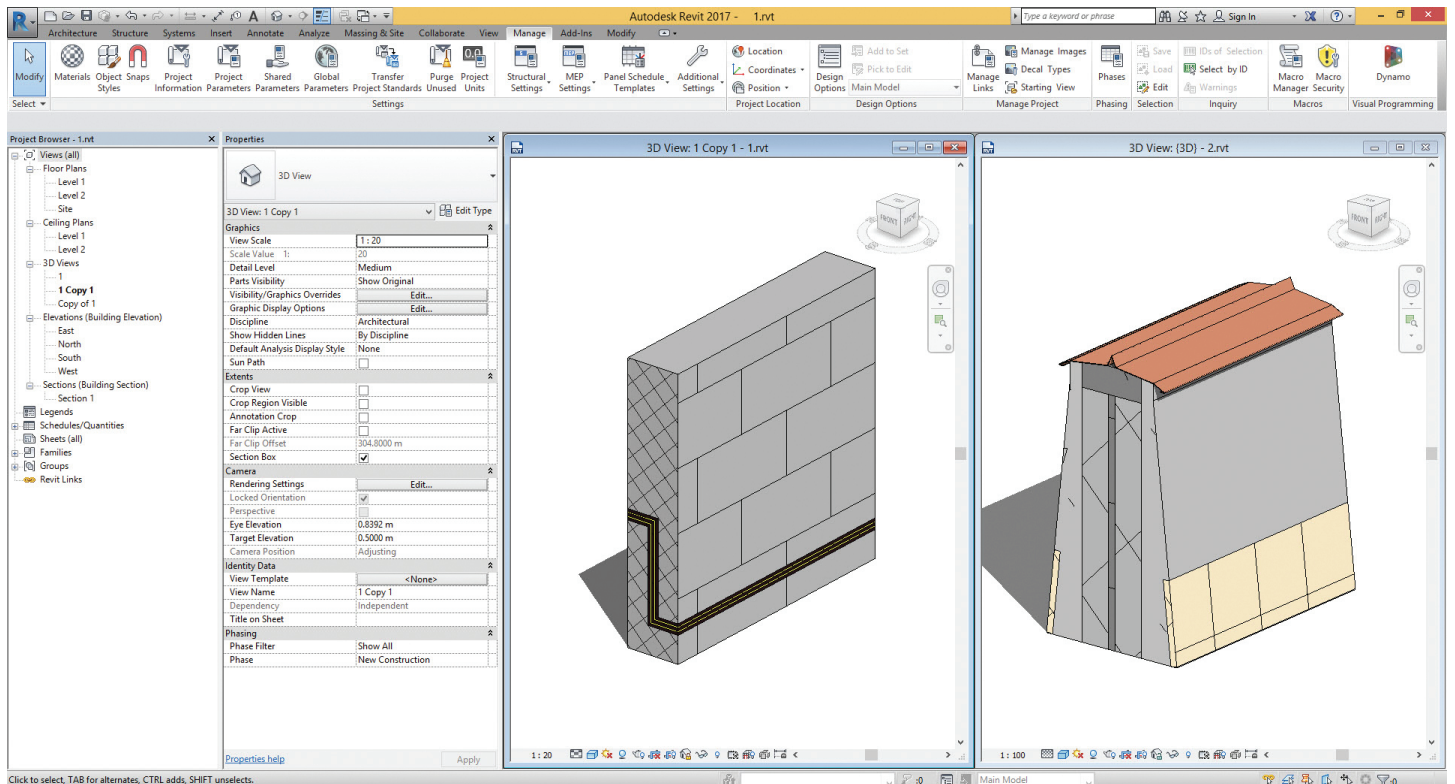
Figure 1: Modeling with WFRC Edit Structure dialog
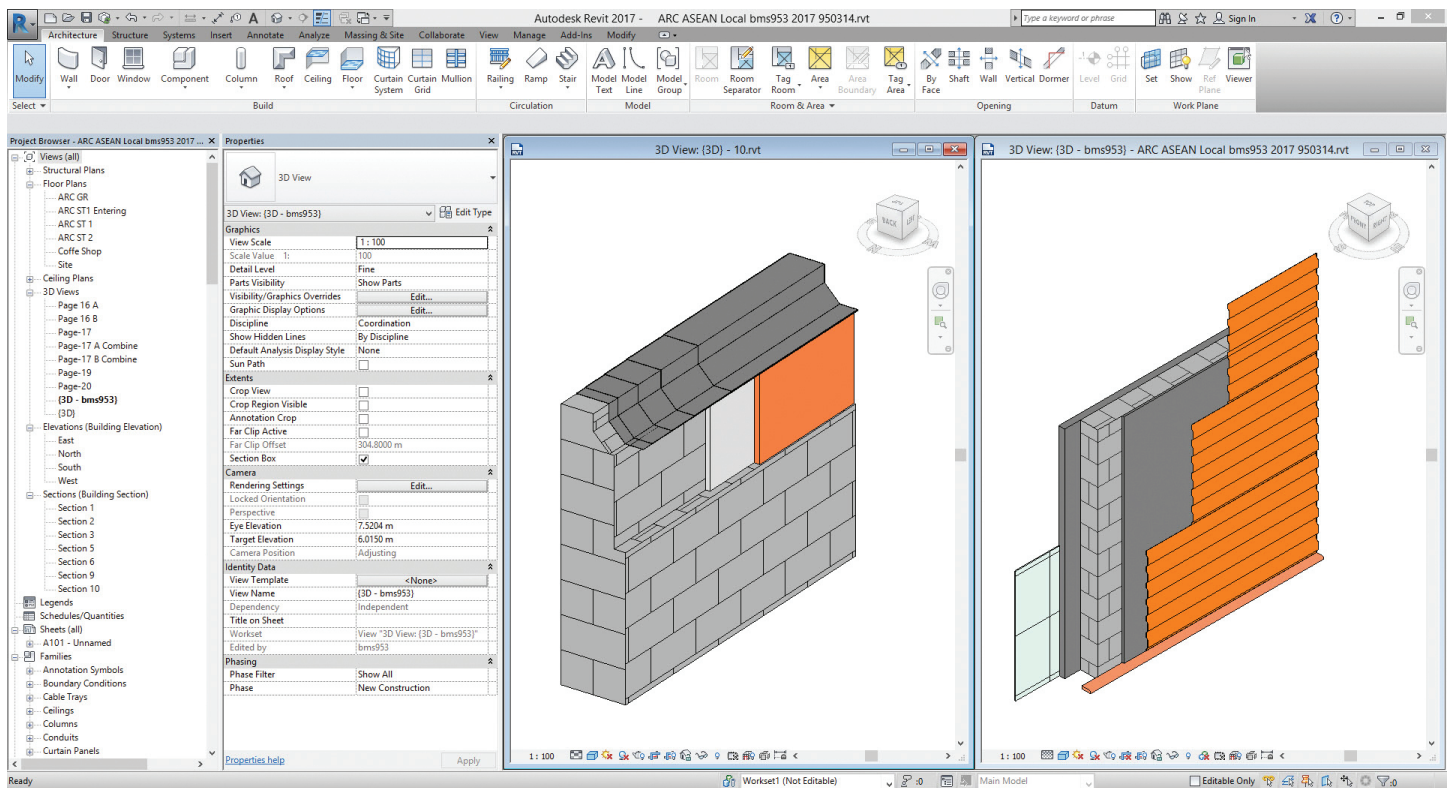
Figure 2: Modeling with WFRC Edit Structure Dialog and Create Part command

Advantages:

+ Base rule for most of detailing method.

+ Fast modeling.

+ Simple method.

+ Overall scheduling is okay (not for special detail).

+ Do not need complex tricks or tips.

Disadvantages:

+ Limited ability for detailing particularly in the vertical elements.

+ Many limitations in pattern details.

+ Limits for creating free space as a Layer.

2. Combination of WFRC Modeling and Create Part Command

This command, released in the 2012 version of Revit, gives us a huge ability for 3D detailing.

Advantages:

+ Create parts according to layers and split area in the WFRC structure.

+ Many options for extend model and detail after the parts are created.

+ Create Schedules from parts that are created with the Create Part command.

Disadvantages:

+ Part shapes and geometry are coming from the layers in the WFRC structure dialog.

+ Many weaknesses in pattern details.

+ Still no option for vertical component because we have all wall layers in the horizontal extend.

3. Combination of WFRC Modeling Create Part Command and Place Component tools

Now we have WFRC modeling and we can extend our model with the Create Part command, but we are still missing something—for example, some vertical parts such as stud, some fastening parts, and many other things that we are not able to create with regular tools in Revit. We can add solid objects with the Place Component command.

Advantages:

+ Include the advantages that we talked in the previous method.

+ Add solid model and new shapes with family modeling.

Disadvantages:

+ Cannot add detail over the shapes of the parts that are coming from the Create Part command.

Many Revit teams use phasing, creating a "prior" phase to place models where they don't interfere with the main project model.
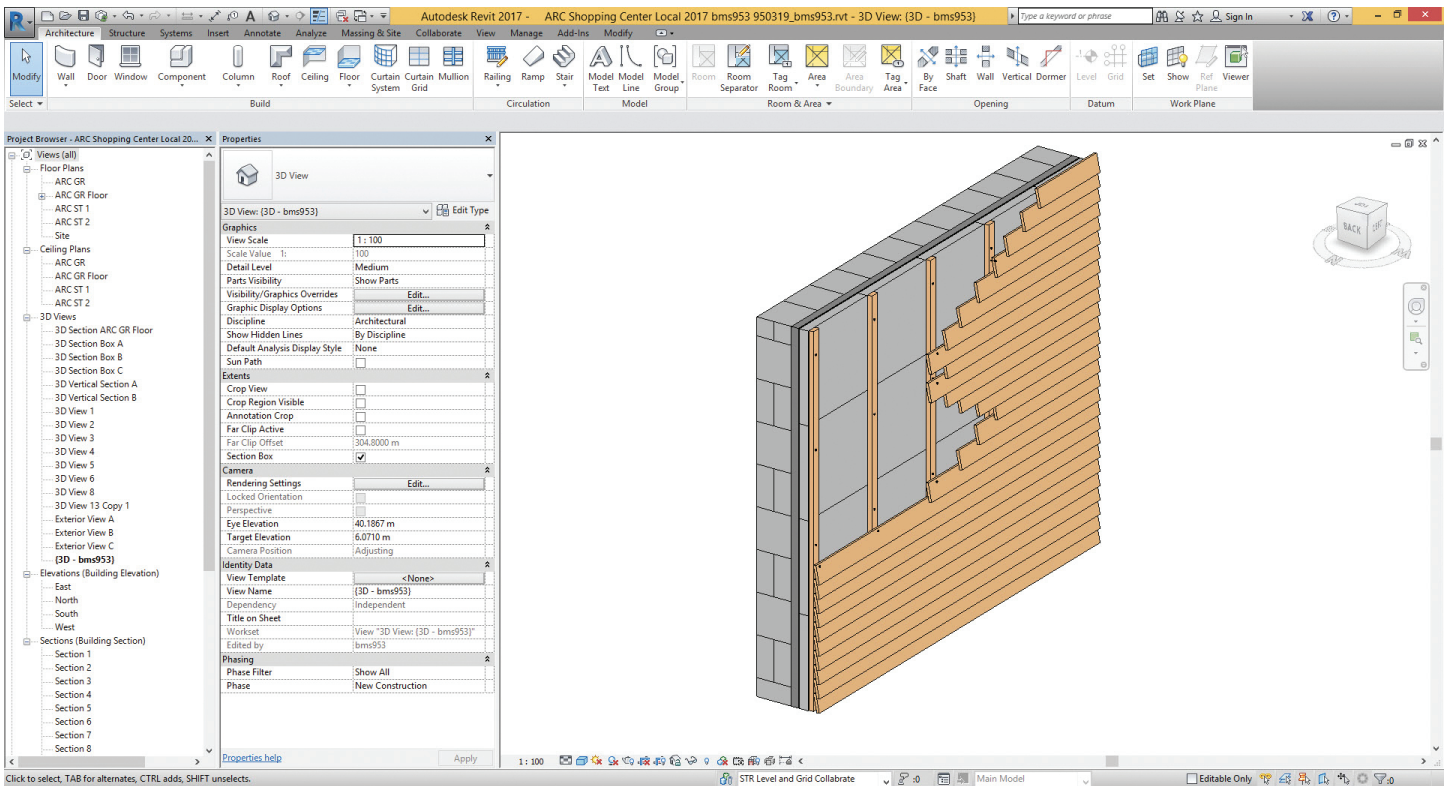
Figure 3: Modeling with WFRC Edit Structure dialog, Create Part command, and Family

Example: Imagine you want to present your detail in 3D view where you have floor with the circle boundary and windows, shade, and furniture.

INTRODUCTION WITH THE BASE CONCEPT OF NEW METHOD

We can call the new method Combination of All Commands for Detailing According to Priority (CACDAP).

Workflow for This Method

You can create the regular parts of building in the project area, like you always did, but I'm talking about WFRC categories.

The procedure for the next step is different from the previous.

The first difference is about the changing priority in Create Part Command and Place Components. Now you can use Place Component at first, then use Create Part.

The second difference is about the why we need the Place Components command. In the previous method I said we use this tool for adding solid models over the WFRC categories, but now we want to cut some volume for WFRC categories in the project area when we need 3D presentation.

As you see this is a simple change in the priority of commands and little change in the cut with family. The result is completely perfect and useful.

Now I will show you how you can use this method in different situation.

EXAMPLES

Exterior Finish Layer Sample

In this example (see Figure 4) we are modeling an exterior wall, cutting the layers to different offsets, and also adding some bevels.

For Create detail like this you need a wall width regular layer in the exterior side as stone. Remember the thickness of the stone layer is important for which family we want to place on the exterior face of the wall.

Also you need a family width Void Form shape and you will remember to turn on "Cut with Voids When Loaded."

After all of the preparation you need to create your project without any concern for presentation. Make a duplicate from 3D view or create a camera view, place the Void Form family on the exterior
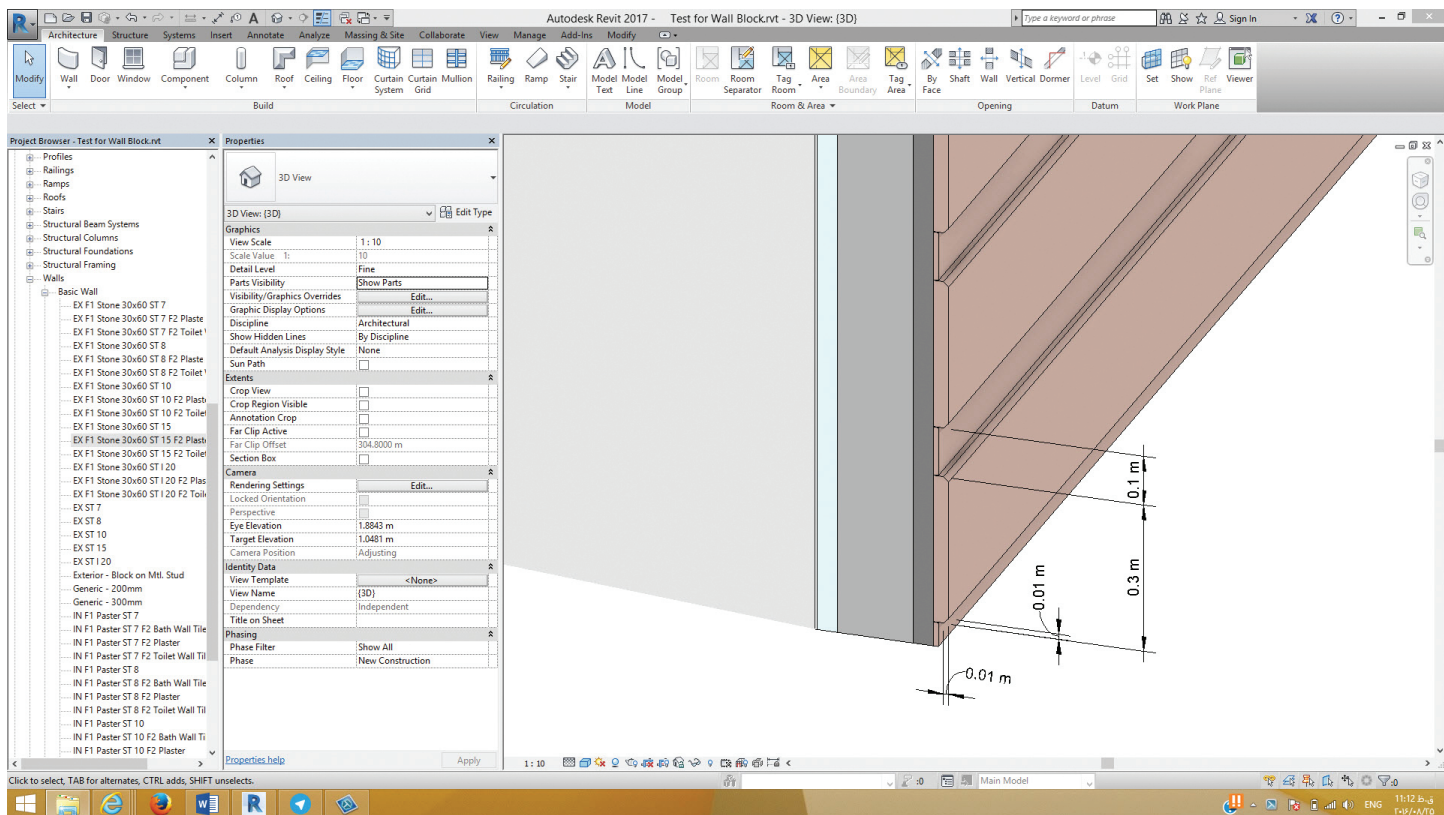
Figure 4: The method for exterior layers of walls
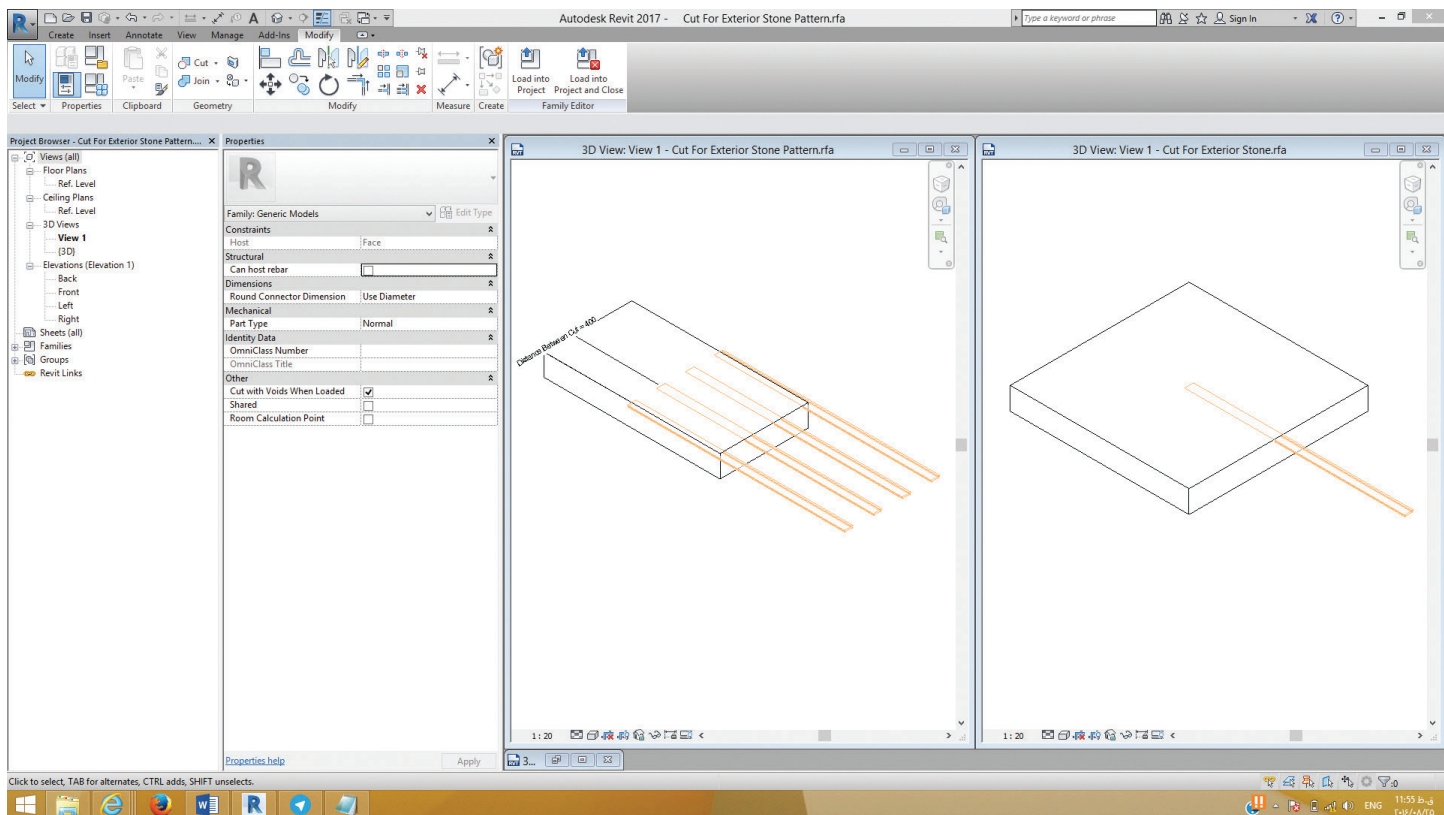
Figure 5: Cut for exterior stone patterns

Revit Architecture
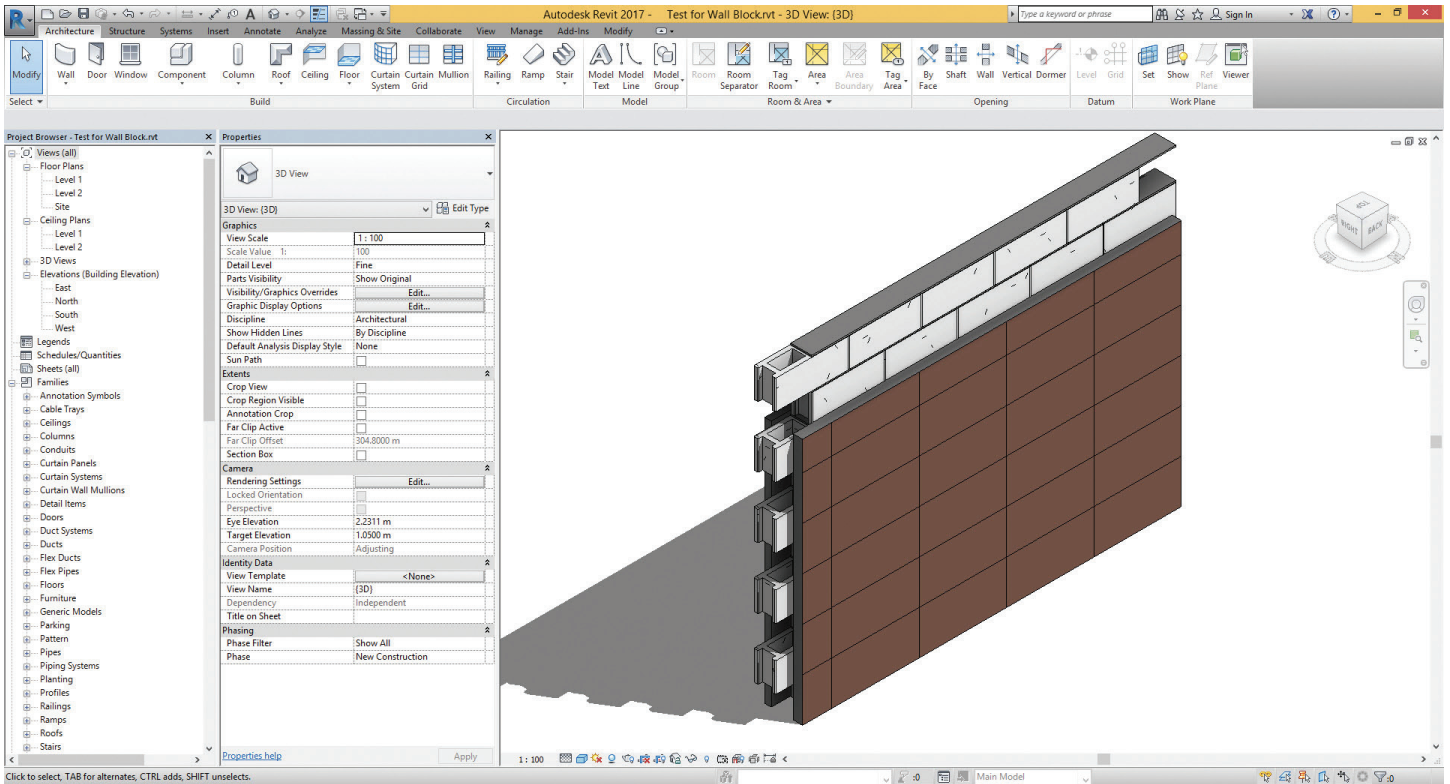
Figure 6: Structure layer

face of the wall, use the Cut command from the Modify ribbon, select which wall you need to present, and then select Void family. To finish the procedure, you can select the wall and run the Create Part command.

Structure Layer Sample

The whole procedure is the same with exterior side, but you can add some Solid Form into the family for adding some detail over the wall.

As you see in Figure 6, we have some bricks in the structure layer of the wall and you can see we need to cut with Void Form from the wall and fill this area with Bricks. You don't need to place two families on the wall—you can manage the entire family, creating a Bricks family and a Cement family, then put all of them into the new family. I prefer to use face-based family—you can create a Void form into the target family and make cuts from the host object and create some relation between the length, width, and depth according to the number of columns, rows, and the depth of brick.

Now in the project area you can create wall and then go to the Plan View and run the Place Component command. You need to put your cursor over the line of structure layer and press the Tab key on your keyboard to highlight this line. Now you are able to place your family.

Cut and bricks are automatically created and now you can select the Wall and Brick family, then you can use the Create Part command.

Floor Example

With this workflow you can present a floor with all the detail you need.

Advantages:

At first you have all of the advantages of the previous method, but what about another one?

- You can create a 3D presentation depending on what you modeled in the project area.
- You are able to create many shapes off patterns with the different dimension according to the layer of the WFRC family and Void Form family.
- This is a simple rule for creating detail without any extended knowledge.

BASIC ADVICE FOR BETTER RESULTS

- Create a library for yourself with some regular shapes such as Stud, Bricks, and Fastening Part.
- Create a library for yourself with the regular shape for cut from the WFRC categories and remember: in most situations when you want create a pattern like a tile or stone cut, paving, and so on, it is better to use the Cut family instead of Solid.
- You can bring many Fastening Parts from Autodesk Inventor®.
- Face-based family is the best type of family for detailing this way, but you can use other types as well.
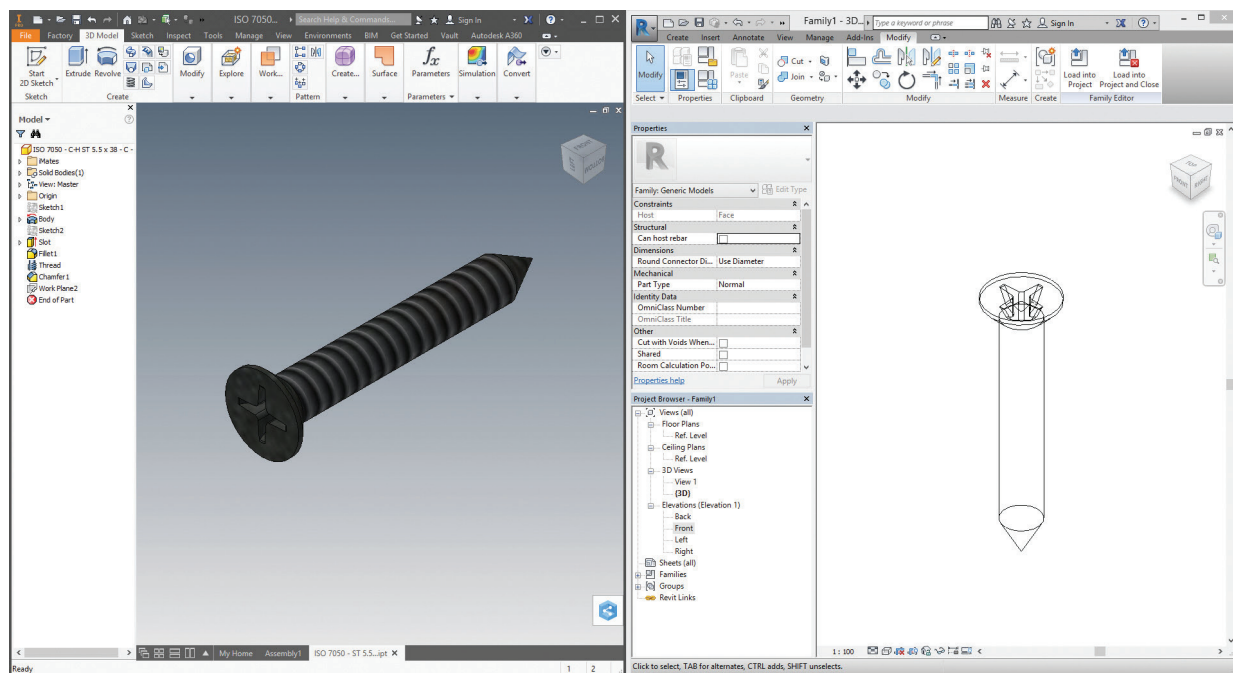
Figure 7: Fastening part
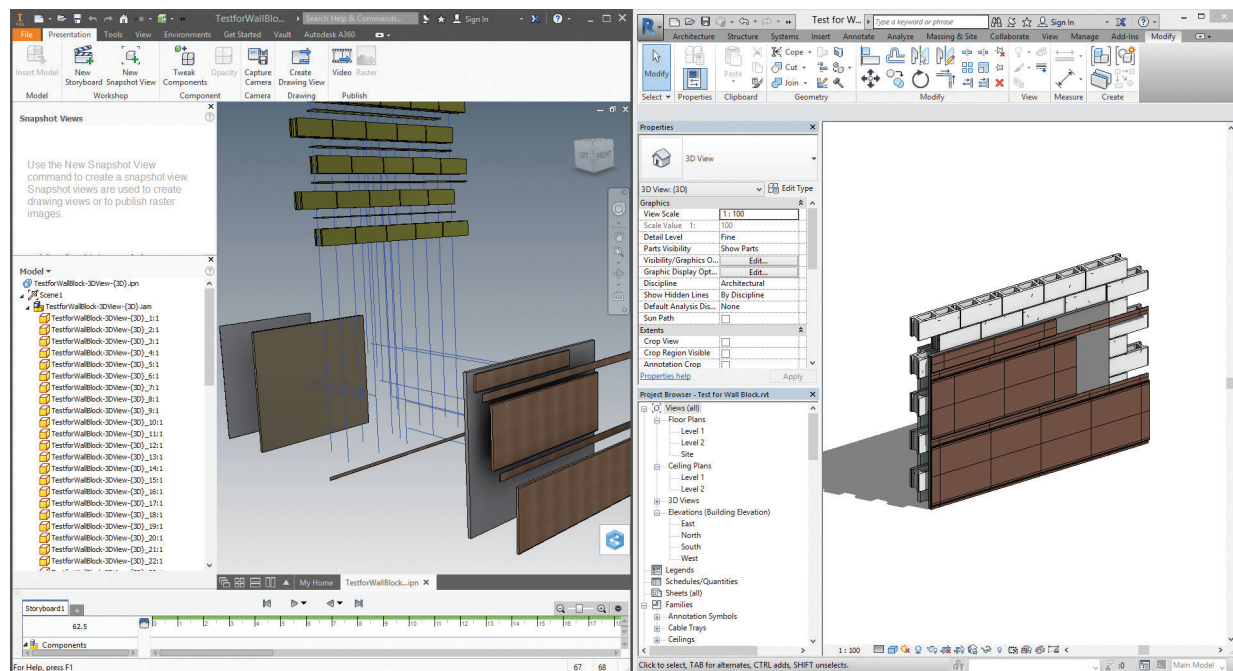
Figure 8: Inventor IPN

EXPORT FINAL RESULT TO INVENTOR AND CREATE IPN FILE

Now you have everything you need in the final result. I prefer to export the detail parts to SAT format and import the file to Inventor in Assembly mode.

You have opportunity to make an IPN file for showing how these parts should be assembled over and over (Figure 8).

Behzad Meskini is a BIM manager, BIM trainer, 3D modeler, and 3D modeling software trainer. He has more than 19 years of experience with 3D modeling software and is an Certified Professional in 3ds Max, AutoCAD, Inventor Pro, and Revit Architecture, Structure, and MEP. Behzad volunteers as an beta tester and was a speaker at Autodesk University ASEAN 2016.

GHD Perth: Time really is money when it comes to large BIM projects

Expectations are high on GHD Western Australia's latest project with the client requesting a LOD500 operations and maintenance model as part of the project BIM deliverables. With such a major undertaking ahead of them, the team had to find ways to be more efficient with time says BIM Coordinator Belinda Thompson.

The $2 billion project is an 8-kilometre-long stretch of underground tunnel and rail including three stations, ancillary buildings, cross passages, and egress shafts all being designed and modelled using both Autodesk and Bentley platforms.

"This is definitely the most complex BIM project the Perth GHD office has undertaken with 90% of it being modelled in Revit. Revit works great for straight up and down buildings but does not lend itself well to linear projects, especially 8km ones."

One of the most time consuming parts of the project was creating weekly exports from the model.

"The lead for each discipline across the project had to export Navisworks files and PDFs on a weekly basis. We are only a third of the way into building the model and already each of the hundreds of files take 8 minutes to convert. Naturally sometimes they would fall behind and so often we didn't have the files when we needed them."

"We would also get various quirks in the final product as each team member would have minor differences in their settings for export options.

RTV Tools' Xporter PRO is an add on for Revit that automates documentation processes allowing users to schedule automatic exports of prints and digital files such as DWG, DWF, PDF, IFC and Navisworks, all unattended.

> **We're saving 24 hours every week, that's $80,000.00 over a year.**
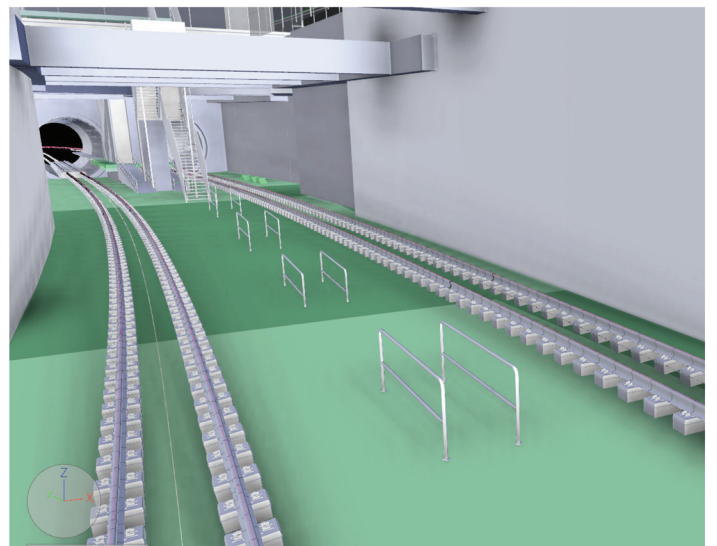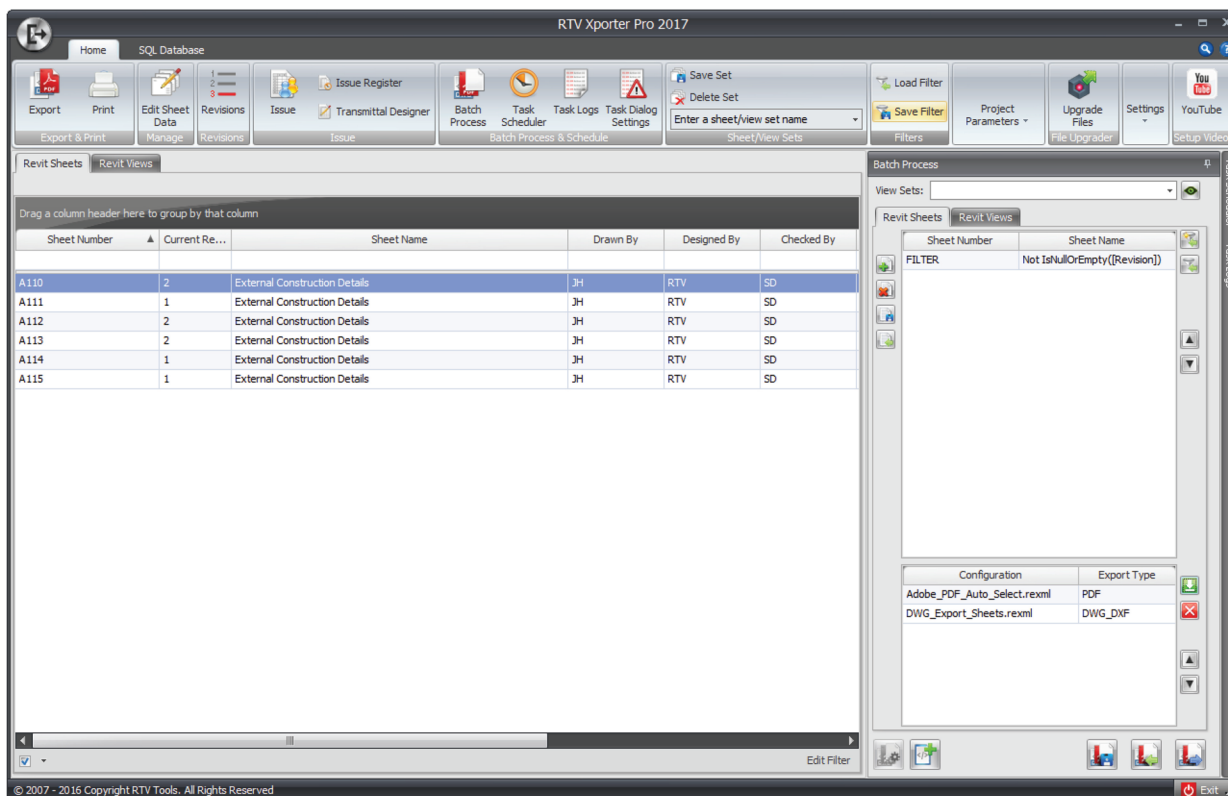
Figure 1: RTV Xporter PRO main application interface

"We had been using RTV Xporter to export PDFs and NWCs on our Architectural and Building Services projects in Perth but it wasn't until we faced the thought of exporting 300 models that we looked into the schedule function of the Pro edition of the software. Instead of each discipline lead doing weekly exports we gave the software to one person who got it up and running – and now the process is completely automated."

"Yes, it is saving us a lot of time, and management is happy because of the impact it has had on the project's bottom line.

> **with projects increasingly growing in scale the industry needs tools to automate BIM processes.**

"We're currently saving 8 minutes multiplied by 180 Revit files equalling 24 hours every week. Over the course of our two-year design phase that is 2,300 hours saved. In just one year we are looking at saving $80,000.00. That is a brilliant return on investment for a software that costs under USD$50," says Belinda.

"The output is also standardised because no one is changing the export settings. Now every file in the federated model is showing the same information."

With projects increasingly growing in scale the industry needs tools to automate BIM processes in order to meet realistic time frames and allow the project team to focus on the final BIM deliverables.

"There is much more to BIM than just developing design drawings using a 3D software package."

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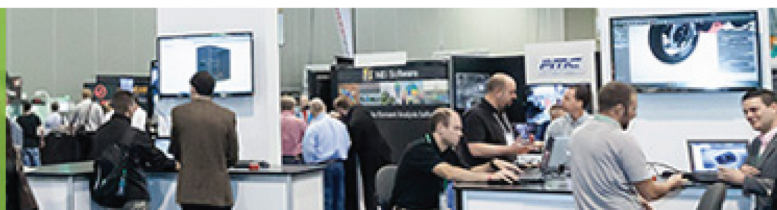
In-House Revit Training – Yay or Nay?

If your firm provides in-house trainings on a regular basis, consider yourself lucky! I have worked for firms that did not provide specific training, or maybe sporadically when new software was implemented. Often, there is a senior technician showing the new person "how we've always done it," and that sometimes nefarious technique is handed down from generation to generation. Ok, that may be a little dramatic, but you get the picture.

WHAT'S IT GOING TO COST?

Part of the reason companies choose not to provide in-house training is the old "time = money" argument. Yes, training costs both time and money. However, as an investment, quality training can greatly improve efficiency and productivity. Learning to use the software correctly eliminates those legacy practices that may actually be detrimental to the design process. As an example, I once worked for a firm that did not provide formal software training until a software upgrade required it. An outside consultant was brought in, and it was realized that we were using the software the WRONG way all along! That was when I understood the need for continual learning.
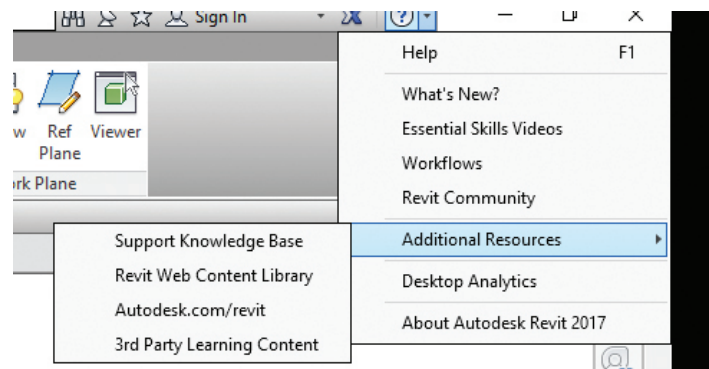
Figure 1: Revit Structure Help

Part of my current responsibilities include providing monthly Revit® training to our architectural and structural staff. You read that right. Monthly trainings! How many Revit topics could there be? I've been doing this for over two years, and still going, so there is always something users can learn.

WHERE DO WE START?

First, you need to decide if someone in your firm is capable (and willing!) to provide training. An advantage to having someone in-house would be that person's first-hand knowledge of the company standards and types of projects that your firm does.

If no one in-house can step up to the plate, there are many options out there. Your Autodesk reseller is a good resource, as is Lynda.com, AUGI user groups, and other Autodesk online resources. Keep in mind that even with "customized" training from an outside source, it is likely the training you receive will be more general in nature. I'm not saying you can't get good training elsewhere, just that having someone who is immersed in your workflow will be more in tune with what your staff deals with on a day-to-day basis.

It is ideal if you have a training room or conference room to use for trainings. This eliminates the distractions of phone calls and work. If not, work with what you have, but try to keep the focus on the training.

EVERY MONTH?

Not necessarily! Every company is different, and it really depends on the availability of staff and workload. Training is written into my job description, so it is part of my responsibilities and expectations. For many companies that do not have someone specifically

| Title	Revit Training Group 2
Location	Conference Room 1
Start Time	9/13/2016 11:00 AM
End Time	9/13/2016 12:30 PM
Description	
Category	Meeting
All Day Event	
Recurrence	Every 1 month(s) on the second Tuesday

Figure 2: Training schedule

tasked with training, it's an overhead expense that takes away from billable time. Maybe trainings occur quarterly instead.

Monthly trainings are a big commitment, not only in the actual training, but also in the preparation time that should also be considered. For every one-hour training, figure on several hours of prep time. This may be compounded by providing handouts or sample models.

On the flip side, having a one-hour monthly or quarterly training may actually be easier than sending the entire staff to an external training for a full day or a few days at a time. The training schedule can be flexible to match workload. For instance, when an important deadline is looming and I know quite a few users won't attend Revit training, I can easily re-schedule to accommodate as many people as possible. It may take some time to establish a training schedule that works for the majority of your users.

WHAT ARE THE TOPICS?

Start with the basics. Even seasoned users will pick up on some tips or tricks they weren't using before. It will be a good refresher for them, and good practice for a new trainer. A Revit Structure training may consist of simple grids and columns, then on to framing or foundations.

Keep the trainings relevant to what your users do. There is no point in reviewing MEP systems or furniture plans in a structural office.

Once you get a few trainings under your belt, you can set a schedule for training topics. I like to list a few topics, but I will also keep note of common issues that users are having, and use that as the next training topic. You can also poll your users to see what they feel they need training on. Don't be surprised if some of the responses you get are topics you've already covered! There is nothing wrong with going back and repeating a training topic once or twice. If you keep getting the same request from the same person, maybe some additional one-on-one training is necessary, or refer them to other resources. Don't bore the rest of the staff with repeated trainings, but certainly address the person having difficulty.

HOW DO WE TRAIN SO PEOPLE LEARN?

Along with varying topics, vary the training style. You are training technical people. Hands-on trainings work well, but create an entirely different logistic nightmare (who has extra computers or laptops to use for training?). Occasionally, we will forgo a specific training topic, and simply have a "project workshop" where we discuss specific Revit challenges users are dealing with in their current projects.

Revit Structure 2017
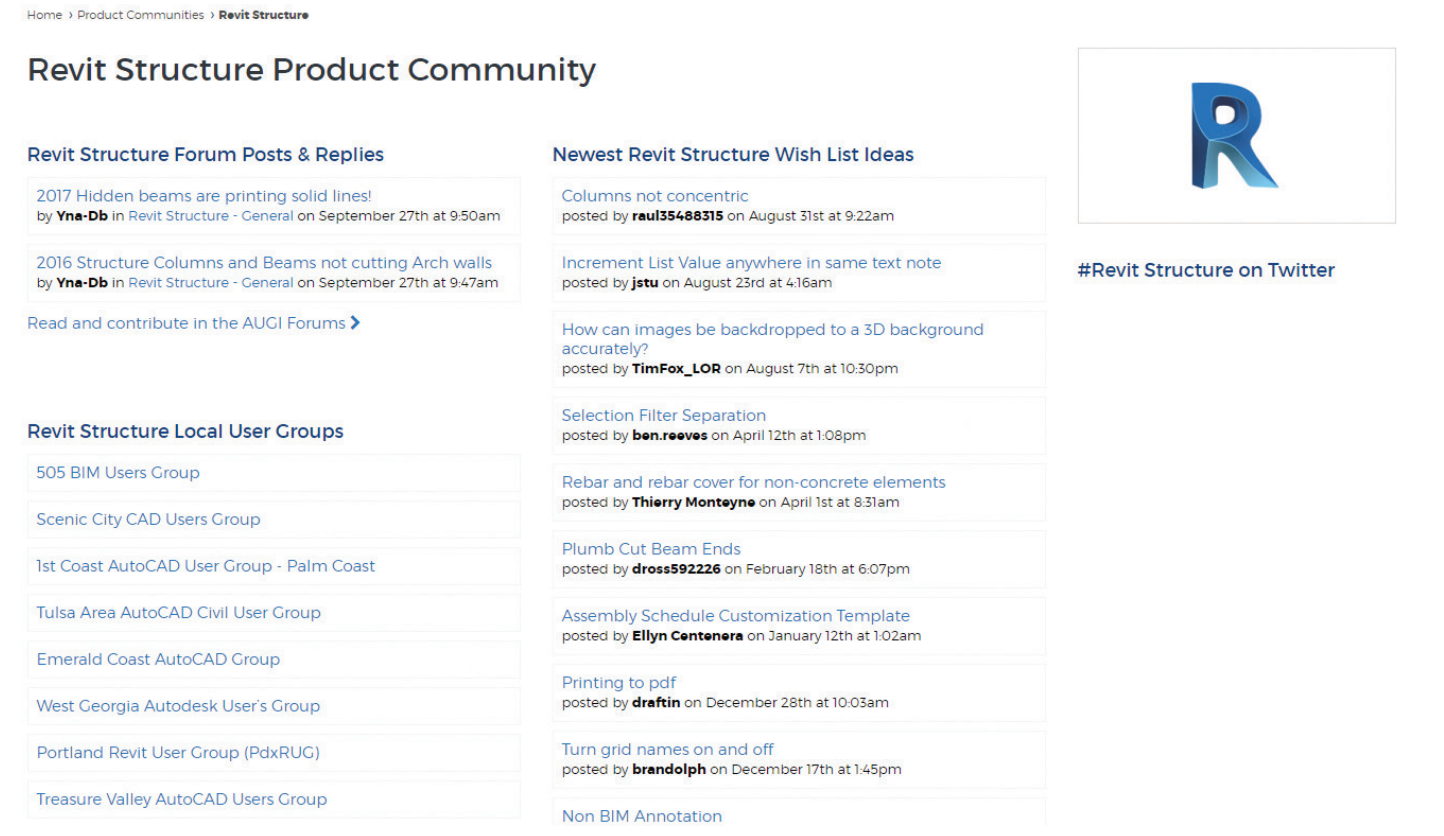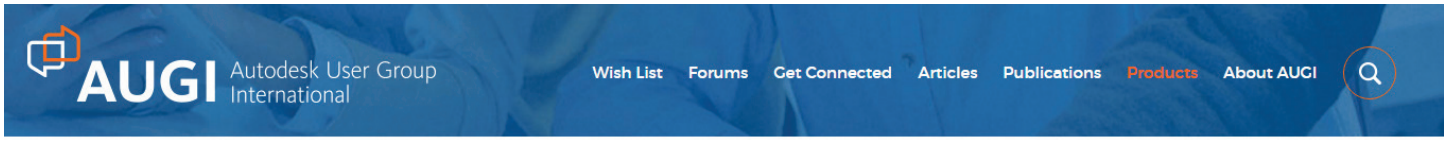
Figure 3: AUGI Website – Revit Structure

Get to know your users. This is where most external trainings fall short. By working with users every day, you will begin to learn their specific skill-sets, habits, and learning styles. You'll know the guy who has to have every handout, and you'll know the gal who would rather watch a video than read a book. You may not be able to customize your trainings every time for every person, but you will be able to adjust and accommodate as much as possible.

Another approach to training would be to have your "power users" provide a training one month. Have them come up with a topic and prepare the training. There may be users that have more knowledge than you know. Having them involved in the training will let them know that you appreciate their skills.

TRAIN THE TRAINER

Whoever provides training has to be at least one step ahead of the rest of the staff. Provide opportunities for the trainer to attend seminars and conferences (like Autodesk University!). Purchase books and other resources to inform and equip your Revit Strainer. Plug them into local user groups (check the AUGI website for a list of LUGs: https://www.augi.com/products/community/revit-structure). The better equipped

the trainer, the better the trainings will be. Plus, they can also follow industry trends and network among peers.

BETTER THAN NOTHING!

No matter what, any additional training is better than no training at all. Anything that you can give your staff to help improve their skills will give them confidence and greater productivity. The investment of training is always worth it!

Kimberly Fuhrman, LEED AP BD+C, Assoc. AIA, is the BIM Manager for LSC Design in York, Pennsylvania. She is a Revit Certified Professional, Expert Elite, Autodesk Developer Network member, and Revit Structure Content Manager for AUGIWorld. Follow her @FuhrmanKimberly and check out her blog posts on cadpanacea.com.

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Training the Trainer

It is quite thrilling to be asked for a contribution, for this issue focused on training, by a publication which documents the world of the Autodesk power user. Though this is not the first time I have provided a contribution, the feeling that I experienced, when asked to do so, is about the same as I felt when I was asked to teach my first AutoCAD® class. I recall feeling a small measure of confidence due to my passion for the subject matter, but certain dread at the thought of communicating that passion in an informative manner.

For any subject matter expert, the day will probably arrive when they are asked to transfer their knowledge to others. The required knowledge transfer may be carried out in a live setting, or created for "on-demand" access by learners. No matter how it is presented, there are considerations that any prospective trainer can make, which will increase the ease of that knowledge transfer and provide a positive experience for all involved.

There are many reasons why professional experts are asked to provide training to their peers—possibly despite their lack of training experience. These considerations may simply be budgetary. They may be as complex as the standards and practices that are unique to the organization.

Whatever the reasoning, there can be a level of uncertainty involved in preparing and presenting effective training. This article is intended to provide a primer on the fundamentals of effective training, to help prospective—and possibly terrified—experts to create training that will be well received and retained.

THE 'BLOOM'ING INSTRUCTOR

At the outset of any training experience, the trainer first needs to ask, "Is my target audience going to really learn this?" The answer should be, "Yes, of course!" However, the depth of that learning is up to you to determine. When preparing your training, consider Bloom's Taxonomy of learning to help determine that depth. There are six levels in the cognitive domain of Bloom's Taxonomy. The higher up one advances, the closer one is to the mastery of a concept.

"Knowledge," the most basic level, means that learners can simply remember the presented material. Some trainers may think that this is sufficient—but how many times has an employee broken protocols that they were aware of? "Mastery" may be too much to ask from a lunch-and-learn session, but getting your learners to the higher levels of understanding is not.

Clearly identifying your learning objectives and outcomes to match that intended level of understanding is critical when planning your training. You can define your expectations to your learners by using verbs or action words to describe your intended outcomes. Doing so also provides an ongoing guide to your training as you develop and eventually deliver it.

THE VARK LEARNING STYLE MODALITIES

Having set the expectations of your training using the principles of Bloom's Taxonomy, it's important to consider the particular learning style of your audience. Even seasoned trainers, with meticulously crafted training materials, can find that they have missed the mark because they did not consider the learning styles of their audience. There are a number of learning style definitions, each with their own merits. For this article I will refer to VARK, an acronym that defines sensory modalities, which describe how learners receive information.

Visual

The Visual learner prefers to receive knowledge by way of charts, maps, diagrams, graphs, and symbols. Those with a visual preference will find that a drawn symbol or diagram, which describes the relationship between concepts, to be much more demonstrative than a text-based explanation.

Auditory

The Aural or Auditory modality is defined by a preference for "heard or spoken" information. Aural learners learn best from lec-tures, media, and group discussions. Often, aural learners want to sort things out vocally. They may repeat their own words, or those of the trainer—or ask already answered questions. It is critical that trainers identify and accept aural learners, and see this activity as engagement, not as a distraction.

Read/Write

The Read/Write learner prefers that information is displayed in text form. Not surprisingly, many professional trainers prefer this mode of learning. Read/write learners are often well versed in PowerPoint and other text-based software. They make and follow lists, create diaries, and use dictionaries and thesauri.

Kinesthetic

The Kinesthetic modality refers to learning that is experiential and practical. Kinesthetic learners prefer demonstrations and simulations, case studies, practical studies, and applications.

It is very rare that a learner can be identified by a single learning style. Those who do not have a dominant mode are defined as multimodal. There are two multimodal learning types.

VARK Type One learners can be flexible in how they communicate and can switch between modes depending on what or who they are working with. They prefer context, and choose a single mode to match the situation.

AutoCAD 2017

UTILIZING LEARNING CYCLES

A learning cycle defines how a trainer will structure the class. Although there are a number of learning cycle types, I will focus on the one I use, as part of my experience with the Autodesk Certified Instructor program. The 'Lecture / Demonstration / Activity' learning cycle is very effective for all training situations because it can engage all learning style combinations and keeps the training moving. If well timed, you can develop multiple cycles into your session.

The Lecture portion is traditionally the first part of the learning cycle. In this part, you "tell" the learner what you want them to learn. Start with an introduction to the session, state your learning objectives, and expand on those objectives. The lecture material can be reinforced in a handout, or developed on a whiteboard.

VARK Type Two learners are best served by a learning experience when all of their multiple modalities have been stimulated. They take more time to gather information from each mode. Because of this, they may be seen as procrastinating or careless. However, they often develop a fuller understanding of the subject matter as a result.

LEARNING ENVIRONMENTS—MORE THAN A LOCATION

Although the learning location itself is critical, the type of learning environment that you create will in many ways define the success of your training. There are three environments for learning, which are the most relevant in a professional training setting.

"Active Learning" is the instructional approach that engages learners through study materials. You can keep learners engaged in an active learning environment by creating opportunities for open dialog and activities. Class discussions, debates, or in-class games such as "Jeopardy"—are excellent examples of active learning in the training room.

"Problem-Based Learning" has the learner gain an understanding of a subject by having them experience an open-ended problem. Its main goals are to aid learners in developing flexible knowledge, problem-solving skills, collaboration skills, and intrinsic motivation.

In the "Cooperative Learning" environment, learners work in groups to complete activities that are related to the desired training objective. Unlike individual learning, which can be seen as a competition, cooperative learning can capitalize on each team members' resources and skills.

With these learning methods, the trainer's role changes from information provider to facilitator or coach. It should be apparent that the best professional learning sessions are some combination of these three learning environments. The measures of this combination must be considered based on the location, your subject matter, and the intended audience.

In the Demonstration section, you will further "show" the learner the concept, by "doing" it. Here, you will walk through the concept which you discussed in the lecture section, using step-by-step instructions. The demonstration should be appropriately timed and have definable steps. You should also have these steps documented in your training materials, so that the learner is able to review and replicate them in the activity.

The Activity section of the learning cycle empowers learners to work on the concept for themselves. This is also an excellent time to interact with and assess the learners. During this assessment period, you can identify and challenge faster learners, or provide extra attention to slower learners. This assessment time will also help you to confirm that your learning objectives are being met.

PREPARATION IS SUCCESS

Preparation is critical for any training session, but it is especially so if you are asked to create that training as an "on-top-of-your-existing-workload" exercise. Daunting as it may be, it is possible to create engaging and informative training provided that the following simple steps are followed:

1. Specify training objectives and outcomes.

2. Present subject matter in a logical order.

3. Emphasize the most important points. Ask yourself, "What do trainees absolutely need to have or need to know how to do?"

4. Customize training materials to reflect your company's personality. Relate information to your company's policies and procedures, etc.

5. Write a training session plan.

6. Plan for Q and A and assessment blocks.

PREPARING THE TRAINING SPACE

Training room preparation is extremely important. Even if your training space is a cafeteria or other work area, you need to prepare it properly for your learners. The best learning environments all have sufficient lighting, adequate and comfortable seating, comfortable environmental conditions, and appropriate technical equipment.

Make sure that the area will accommodate the trainees comfortably. No one is happy to learn if they are standing or crowded. Make sure you have enough learning materials for the trainees. Ensure that your technical equipment is working properly. The need for proper preparation cannot be overstated. Trainees will always judge the trainer on how prepared the training environment is, and so they should.

PREPARING YOURSELF

Many times, especially with lectures, training is conducted in front of large groups. This can be an issue for those experts who are not comfortable public speakers. This is a simple process for overcoming speaker nervousness:

1. Put everything in perspective. Trainees are there to learn from you. They want you to be a good trainer, because they'll get more out of the training. Focus on them and their understanding. Don't worry about "performing." It's more than okay to be nervous—it's great! Nervous energy can create an energetic session, which your learners will appreciate.

2. Prepare your body. Familiarize yourself with the training environment, including the lighting, temperature, and layout. Balance your liquid intake so that you avoid a dry throat during class. Avoid drinking too much liquid, for obvious reasons. Finally, you may want to explore mental relaxation or breathing techniques.

3. Practice, Practice, Practice. Practice will improve your presentation skills and boost your confidence. Doing so also helps you to prepare for any unexpected technical issues that may occur, and to create contingency plans.

PREPARING YOUR TRAINEES

Finally, you need to prepare your trainees to ensure a productive training session. You want the trainees to be excited about their investment of time. Consider distributing these pre-training materials to put trainees in a receptive frame of mind and motivated to learn.

1. A session agenda with your learning objectives defined. Trainees who might be anxious will be put at ease when they know what will be covered ahead of time. You will benefit when trainees are thinking about the training beforehand.

2. Pre-session activities, such as case studies, to go along with the session agenda. You can include simple open-ended questions and ask trainees to be prepared for a brief discussion on the case study.

3. Expectation questionnaire, asking what trainees expect from the session. Use the results to customize the session, while still meeting the training objectives.

THE TRAINED TRAINER

Being asked to provide training to your peers can be a daunting experience. However, it should be received as a show of trust and confidence by your professional superiors. The ability to invest others with your perspective and experience can be incredibly valuable for your whole organization. Certainly the first of these added values is in time and currency, but there is an added value to internal training. It can create opportunities to boost morale and encourage team growth. Finally, a well-crafted and delivered training session will build trust and pride in your learners towards the organization, which is possibly the most beneficial byproduct of a well-trained team.
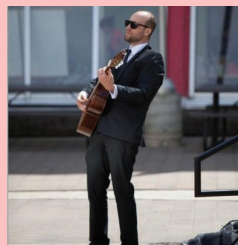
William Myers is the Technical Systems Manager with Global eTraining, a world leader in online skills training. He is an Autodesk Certified Instructor for AutoCAD, Revit Architecture, and Inventor, and continues to express his passion for training and CAD/BIM at Digital School, an Autodesk Training Centre in Edmonton Alberta. William has grown with both organizations and their mother company, Brattberg Enterprises, which recognized him as their Employee of the Year for 2016.

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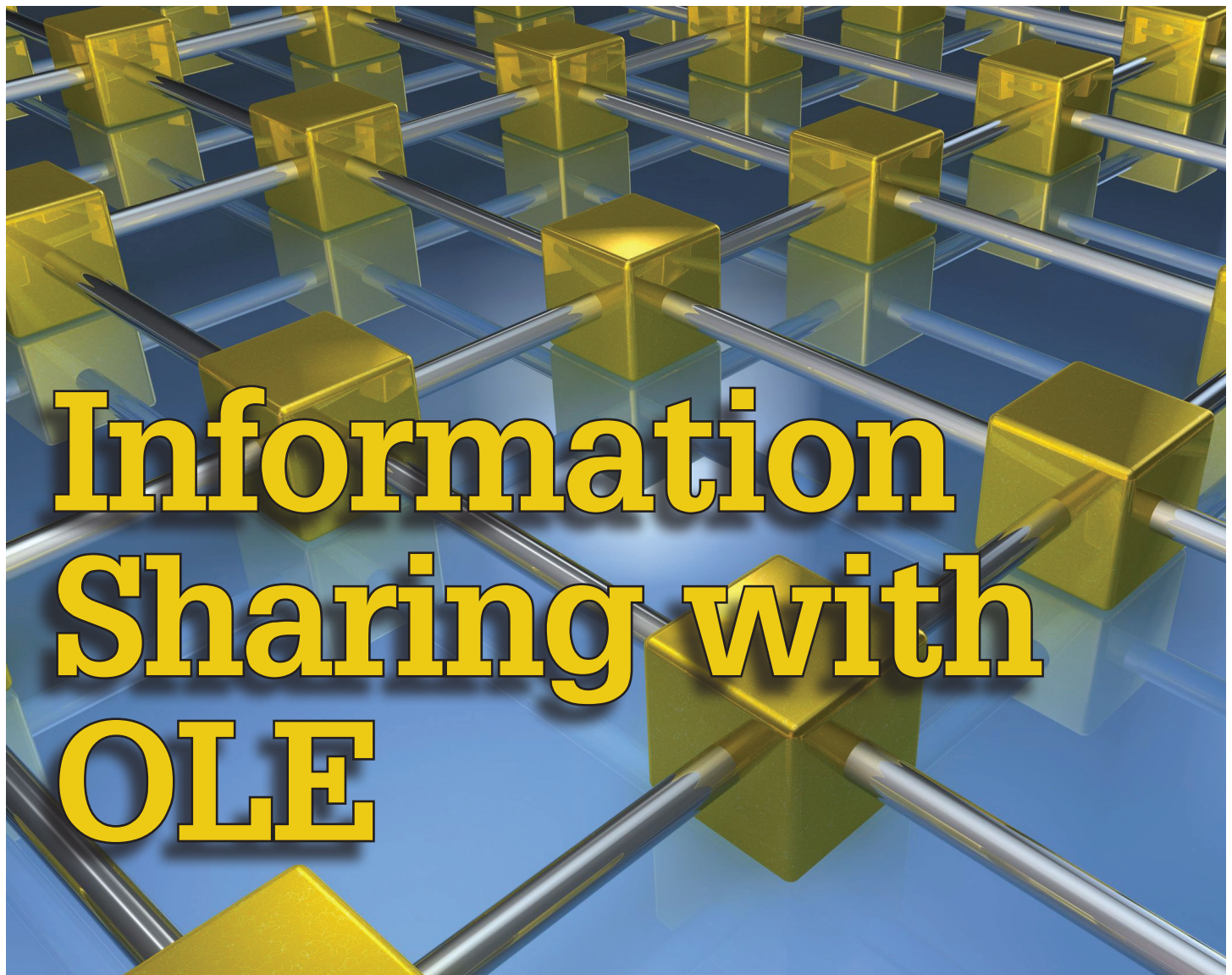
Information Sharing with OLE

bject Linking and Embedding (OLE) is a Microsoft Windows feature that allows you to copy or move information from one application to another while you retain the ability to edit the information in the original application. Basically, OLE combines data from different applications into one document. For example, you can create an AutoCAD® Architecture drawing that contains all or part of a Microsoft Excel spreadsheet.

OLE is a great way to use information from one application in another application, which can be useful for presentations, etc. To use OLE, you need both source and destination applications that support OLE. Information from one document into another document can be inserted by either linking or embedding the information. Both linked and embedded OLE objects can be edited from within the destination application. However, linking and embedding store information differently so it is important to ensure that you are using the correct option for the situation. The relationship between embedding and linking is similar to that between inserting a block and creating an external reference. An embedded OLE object is a copy of information from another document.

When you embed objects, there is no link to the source document and any changes made to the source document are not reflected in destination documents. Embed objects if you want to be able to use the application that created them for editing, but you do not want the OLE object to be updated when you edit information in the source document. A linked object is a reference to information in another document. Link objects when you want to use the same information in more than one document. Then, if you change the original information, you need to update only the links in order to update the document containing the OLE objects. You can also set links to be updated automatically. When you link a drawing, you need to maintain access to the source application and the linked document. If you rename or move either of them, you may need to reestablish the link.

Let's look further into using OLE objects with AutoCAD Architecture. We will use Microsoft Excel as an example.
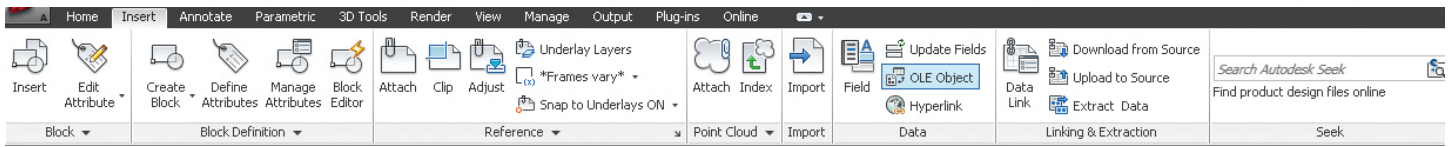
Figure 1: OLE Object Tool

IMPORTING OLE OBJECTS

You can use one of the following methods to insert information from Excel as an OLE object:

* Cut or copy information from an existing Excel file and then paste it into the ACA drawing.

* Import an existing Excel file.

* Open Excel from within the ACA drawing by double-clicking on it and create the information that you want to use.

When the Excel information is inserted into your ACA drawing, you will need to specify an insertion point. By default, the OLE object is displayed with a frame that is not plotted. OLE objects are opaque and they will plot as opaque. This means that they hide objects in back of them. OLE objects are supportive of draw order. The display of OLE objects can be controlled in one of two ways:

* Set the OLEHIDE system variable to either display or suppress the display of all OLE objects within paper space, model space or both.

* Freeze or turn off a layer to suppress the display of OLE objects on that layer.

When OLE objects with text are printed, the text size is approximated by the text size in the source application, Excel. It is important to note that OLE objects in ACA drawings are not displayed or plotted in external references or block references.

EMBED OLE OBJECTS

An embedded OLE object is simply a copy of information from another document. For example, a copy of an Excel spreadsheet in AutoCAD Architecture. When you embed objects, any changes made to the source document are not reflected in destination documents because there is no link to the source document. You should embed objects only if you want to be able to use the application that created them for editing, but you do not want the OLE object to be updated when you edit information in the source document.

To embed an OLE object in a drawing, open the document you wish to embed, select, right-click, and copy the information. Next open your ACA drawing, right-click, and paste the information.

Another way to do this is to open AutoCAD Architecture, go to the Insert tab on the ribbon, Data panel, OLE Object (see Figure 1). This will bring up the Insert Object dialog box. Next select Create New. Under Object Type, select an application and click OK (see Figure 2), which will open Excel (or whichever application you choose). Now create the information you wish to insert and

save the document. In Excel's File menu, select Exit and Return. Close Excel and the object is now embedded in the AutoCAD Architecture drawing.

If needed, you can adjust the text size. To do this, select the OLE object, right-click, select OLE, and then select Text Size. This opens the OLE Text Size dialog box. Now you can select a font, point size, and text height. When finished, click OK.
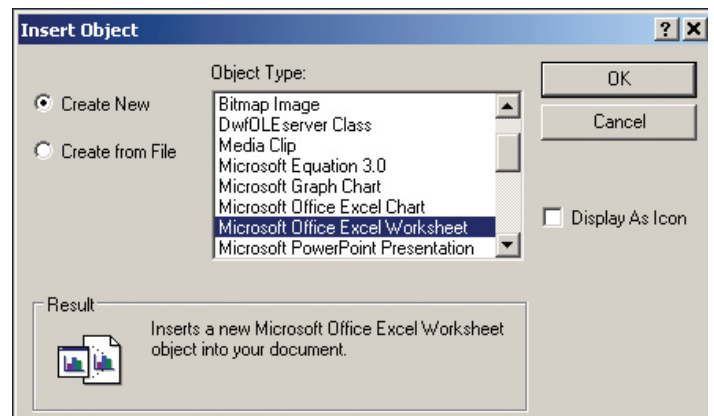
Figure 2: Create New

LINK OLE OBJECTS

A linked OLE object is simply a reference to information that is located in another document. Link objects when you want to use the same information in more than one document. If you change the original information, you only need to update the links in order to update the document that contains the OLE objects. Links can be set to update automatically. It is important to note that when you link a drawing, you need to maintain access to both the source application and the linked document. If you rename or move either of them, you may need to reestablish the link.

To link a file as an OLE object, go to the Insert tab of the ribbon in AutoCAD Architecture, Data panel, OLE Object. This will bring up the Insert Object dialog box. Select Create From File (see Figure 3). Next browse and find the file you wish to use. Click Link and then select OK. Now you will need to select where you wish the OLE object to appear.

To link part of a file as an OLE object in a drawing, begin by opening ACA and Excel. Select the information in Excel you want to link and copy it to the Clipboard. In ACA, click the Home tab on the ribbon, Clipboard panel, Paste drop-down and then Paste Special. In the Paste Special dialog box, click Paste Link. Paste Link pastes the contents of the Clipboard into the current drawing

AutoCAD Architecture 2017

and also creates a link to the file in the source application. If you click Paste, the Clipboard contents are embedded instead of linked so it is important to select Paste Special. In the "As" box, select the data format you want to use and click OK.
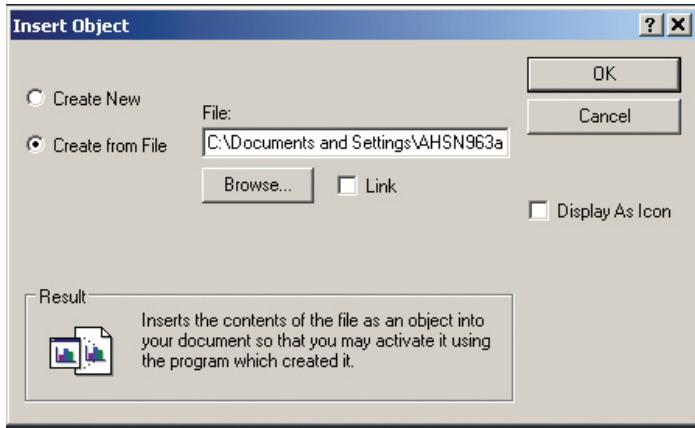

Figure 3: Create from File

EXPORTING OLE OBJECTS

You can link or embed a view of an AutoCAD Architecture drawing within another application that supports OLE, such as Excel. The COPYLINK command copies the view in the current ACA viewport to the Clipboard and you can then paste the view into the destination document. If you paste an unnamed view into a document, it is assigned a view name such as OLE1. Then, if you exit the drawing you will be prompted to save your changes to the newly named view. In order to establish the link and to save the view name, OLE1, you must save the drawing.

You can select objects and embed them in documents created by other applications. Embedding will place a copy of the selected objects within the destination document. If you use AutoCAD Architecture to edit the OLE object from within the destination document, the object is not updated in the original drawing.

To embed objects in another document, begin by opening AutoCAD Architecture and selecting the objects that you wish to embed, right-click, and select Copy. The selected objects are now copied to the Clipboard. Open Excel and open a new or existing document. Paste the clipboard contents onto the spreadsheet, following the instructions for embedding the Clipboard contents given by Excel.

To link a view to another document, begin by opening AutoCAD Architecture and save the drawing that you want to link, so that it has a drawing name. If multiple viewports are displayed, you will need to select a viewport. Next, enter COPYLINK at the command prompt. Then open a new or existing document in Excel. Paste the clipboard contents into the document, following Excel's procedures for inserting linked data (see Figure 4). The inserted OLE object is displayed in the document and can be edited from AutoCAD Architecture through Excel.
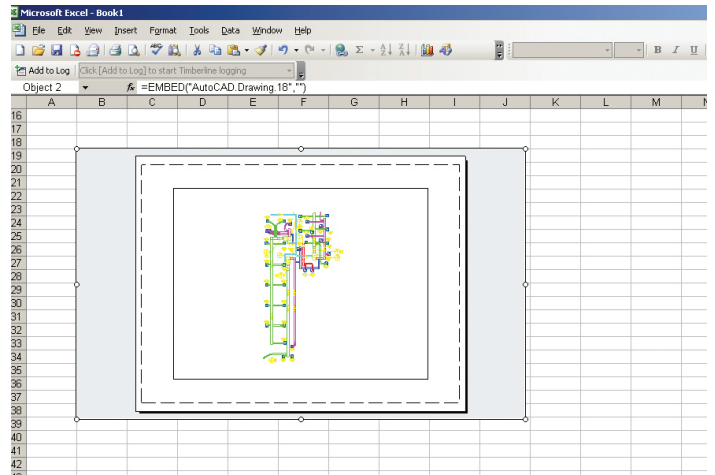

Figure 4: Copylink drawing in Excel

EDITING OLE OBJECTS

Linked or embedded OLE objects can be edited in a drawing by double-clicking the object to open the source application. You can use any selection method to select OLE objects and then you can use most editing commands, the Properties palette, or grips to make changes. When grips are used to change the size of an OLE object, the shape of the object does not change as long as the aspect ratio is locked in the Properties palette. If you have resized an OLE object and wish to restore it to its original size, select the OLE object, right-click, and select OLE Reset. It is important to note that the following editing commands are not available for OLE objects: **BREAK, CHAMFER, FILLET,** and **LENGTHEN**.

Before looking at how to edit OLE objects, it is important to understand the difference between editing a linked object versus an embedded object. The document that contains a linked drawing stores the drawing's file location. You can edit a linked drawing either from the destination application or in the source program. The program must be loaded or accessible on the system along with the document you are editing. An ACA drawing that is embedded within a document can be edited only from within the destination application. You will need to double-click the OLE object to start the program. Editing the original drawing in the program has no effect on documents in which that drawing is embedded.

To edit a linked ACA drawing from within the destination application, begin by opening the document that contains the linked drawing (for example, a Microsoft Excel file). Double-click the linked drawing and the drawing will open. You can also select the OLE object, right-click and select AutoCAD Drawing Object, and then Edit (see Figure 5). Next modify the drawing as necessary and click File menu and select Save when done. To return to Excel, click the File menu and hit Exit. The drawing is now changed in all documents that have links to it.

To edit a linked drawing in the source application, begin by starting the program and opening the linked drawing. Make modifications to the drawing and view as necessary. Save the changes when

finished. Update the link in the destination document if necessary. The drawing is changed in all documents that have links to it.

To edit embedded objects, begin by opening the Excel document that contains the embedded AutoCAD Architecture objects. Double-click the embedded objects to start the ACA program and display the objects and modify them as necessary. Save changes to the embedded objects by clicking the File menu and selecting Update. Now return to the destination application by clicking the File menu and selecting Exit.

To control the display of OLE objects in AutoCAD Architecture, enter the command OLEHIDE. Now enter one of the following values:

0 – Displays OLE objects in both paper space and model space.

1 – Displays OLE objects in paper space only.

2 – Displays OLE objects in model space only.

3 – Does not display OLE objects.

You can also control the display of the OLE frame within a drawing. To do this, enter OLEFRAME at the command prompt. Then enter one of the following values:

0 – Frame is not displayed and is not plotted.

1 – Frame is displayed and is plotted.

2 – Frame is displayed, but is not plotted.

type of object. The higher the plot-quality setting, the more time and memory are used to plot.

The Plotter Configuration Editor can also be used to adjust OLE plot quality. The Graphics option displays a Raster Graphics dialog box with a slider that controls OLE plot quality. It is important to note that nested OLE objects may cause problems. For example, an OLE object that is not in the current view plane is not plotted, but the frame is plotted based on the setting of the OLE-FRAME system variable.

To set the plot quality for OLE objects, begin by clicking the Tools menu and selecting Options. In the Options dialog box, select the Plot and Publish tab and then in the OLE Plot Quality list, select one of the following settings (see Figure 6):

+ Monochrome – For text spreadsheets

+ Low Graphics – For color text and pie charts

+ High Graphics – For photographs

+ Automatically Select – Plot-quality setting assigned based on the type of file

Click Apply to continue setting options or click OK to close the dialog box if you are finished.

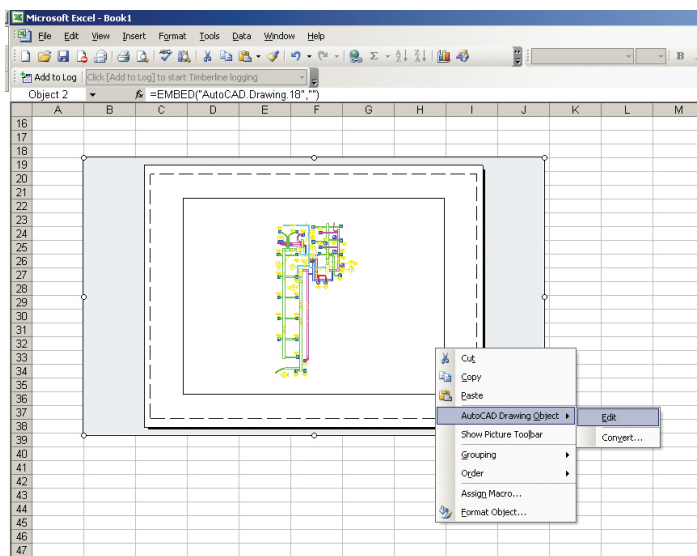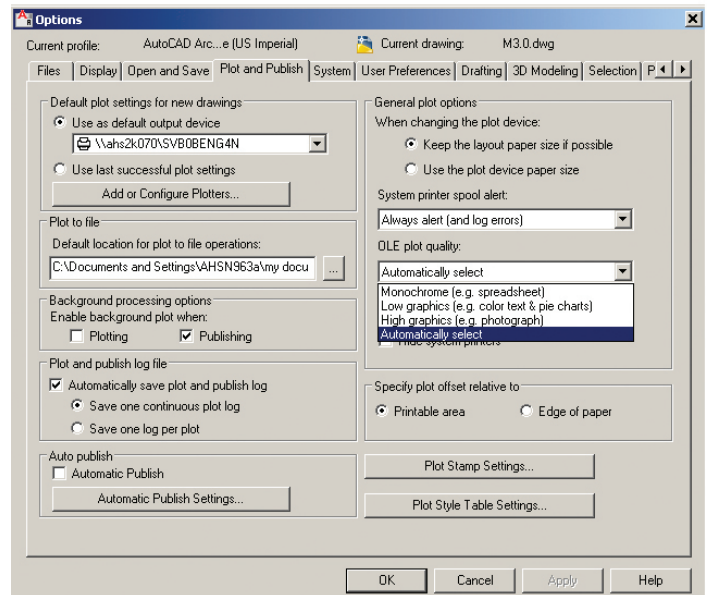
Figure 6: OLE plot quality

Figure 5: Edit OLE object

CONTROLLING PLOT QUALITY

When a raster plotter is used, OLE objects are treated as raster objects. Since large, high-resolution, color-rich rasters can be expensive to plot, the OLEQUALITY system variable can be set to control how each OLE object is plotted. The default setting is Automatically Select and it assigns a plot-quality level based on the

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.

Thoughts on Training

As a CAD manager, I strive to have the best CAD team in the industry and "training" is essential in achieving that goal. While we all think about it and could benefit by it, it is always a struggle to identify the most effective way to deliver training that will be retained once the instructor has left the room.

got training?

While my approach to training and learning may differ from most, it has resulted in an overall increase in content retention.

PREGAME

Here are a few things to ask yourself before you start calling firms to fly in and train your team.

1. Who needs training?
2. When should training be scheduled?
3. What is the best type of training to accomplish long-term goals?

TRAINEE

My intent when hiring is to identify people who have skills in different areas. I have a team of three designers (Mike, Roger, and Julie). Each possesses a unique set of expertise, personality, and learning style.

Mike is my number one go-to guy! He can do it all—grading, corridors, TIN editing, pressure pipes, etc.—the list goes on and on. He is a superstar! Mike will not benefit from additional training, but Roger and Julie will.

Roger is a 30-year CAD user who has had few opportunities over the years to really dive into anything other than "vanilla" CAD or LDD. As a result, he is behind. C3D training is exactly what he needs.

Julie falls between Mike and Roger. She knows the civil engineering and LDD, but has only dabbled with C3D. She needs help using feature line tools, TIN editing, and removing "bow ties" from corridors, etc. I want the training tailored more toward her needs. She has the civil experience, understands the software, and has the potential to be Mike 2.0 once the proper training is delivered. This will allow me to have two superstars that can assist with Roger's transition into C3D.

What about the CAD manager, though? Shouldn't he stay up to date?

SCHEDULE

We encounter the same scenarios: "Sorry we are too busy to schedule training" or "Our utilization is low and training is not billable."

I was faced with those exact obstacles, but I rolled the dice and it paid off! Our current workload was relaxed, creating an ideal time to think training. Civil 3D expert Shawn Herring with ProSoft was my first choice.

TRAINING

Training these days comes in all shapes, sizes, and formats. Let's explore a few.

Books/Manuals (Hard Copy)

For many "old school" CAD guys, brand new users, or Autodesk book collectors, a book or manual is the preferred way to go. Maybe it's having something concrete to grasp onto, highlight in, or just simply add to a collection. However, those days are over—at least for me and my team.

"Live" Training – Using a Book from the Shelf

Typically, it's always the bad experiences that people remember (e.g., bad restaurants, bad movies), but in my case, it was bad in-person training that stuck with me.

Early in my career, a former employer flew in a CAD "expert" for a three-day training session. After day one, I was ready to give up. The trainer could not answer a single question about the software unless it was in the book. Literally, not a single one! In my opinion, the worst way to train is straight out of a manual. Even if you have a stellar trainer, following a manual is not effective.

While books and manuals can be contoured to fit most scenarios, they will rarely be exact. For example, projects in the book are always different from your firm's projects. Autodesk styles are used by pretty much all resellers and trainers, and good firms have created their own. I only recommend this type of training to brand new C3D users.

Bottom Line: Training from "out-of-the-box" templates and cookie-cutter examples only ensure that you will continue to pay for support or additional training. If done right, you could have knocked out the training in Round One. The training that my team received from Shawn was relevant to the work we do and used our specific projects and templates.

Google and the World Wide Web

In my opinion, the Internet is the most underutilized tool in the software world. I Google everything! If I can't remember the command to blank out a field in the SSM, I Google it (alt+0160...in case you are wondering). You have to leverage the tools you have and in this case it's www.something. All users should utilize the web.

AutoCAD Civil 3D 2017

Web-based – Live Training

One novelty that has emerged is instructor-led, web-based training. I do not recommend this method of training. Although this may be a cost-effective solution for some companies, the absence of an actual instructor could hurt users. For example, if multiple users were on a GoToMeeting call with an instructor, how would the instructor bounce from person to person and help them? It would be very difficult. An in-person trainer is my preference—given the trainer is knowledgeable.

Open Forum – Live Training

This is by far the best training method in my opinion. There is no real agenda or set number of chapters to cover, just Q&A. Users cover specific road blocks with the software and the problems are instantly solved. As mentioned previously, I had the pleasure of having Shawn Herring visit my office for two separate training sessions. The first was a basic introduction to C3D 2017, while the second targeted advanced topics including corridors, Infraworks, Recap, and grading.

Multiple users with all levels of experience attended the training. After the training, I took a poll and all users said it was the best training they ever had. Shawn had all the answers, he was prepared and very professional. We worked on actual projects using our templates, and he gave suggestions on specific best practices for better workflow. My team and I were able to asked pointed questions and we received solutions and suggestions that increased productivity!

" GEORGE IS STRUGGLING WITH THE ON-LINE CAD TUTORIAL."

CONCLUSION

While I am advocate of training, I believe that it has to be structured in a way that is meaningful. What I call open forum-live training has had the largest impact, in my experience. Yes, I can find similar answers in a book or on the web, but

not as quickly. I believe in web solutions, but often users have trouble properly wording the search. They know what they want to find, but are unable to put it into the correct words to receive the proper information.

Live training takes it to a whole new level. Simply ask the question and get the answer. I recommend open forum-live training over any other type of training I have mentioned.

Before you decide on the type of training, decide which training best suits your needs and the needs of your team. All the training in the world could be provided, but if it does not target the correct audience, then it is a waste of time and money.

> ## Success is no accident. It is hard work, perseverance,
> learning, studying, sacrifice and most of all, love of what you are doing or learning to do
>
> Pele

Throughout his 12-year career, Phillip Lynch has played an instrumental part in a variety of civil engineering and survey design projects, with his primary focus being on civil 3D management and surveying. He has successfully created and implemented C3D templates and CAD standards for 28 internal offices for use on a $90 million program. In addition, Phillip has trained multiple offices in C3D and established a solid workflow for each. Using the latest GPS technology, he has surveyed multiple stream restoration projects, miles of underground utilities, and hundreds of stormwater structures and bridges. He can be reached for questions or comments at Phillip.Lynch@amecfw.com

Abundant Training Resources for InfraWorks

For the last 19 years I have worked in the civil engineering field performing different tasks from surveying to site civil design. Throughout those years, I used several different design software products—from AutoCAD® R12 to Land Desktop and now AutoCAD® Civil 3D® and InfraWorks® 360. To perform the tasks given to me I had to take advantage of any training available for each design software. Finding the training method that best fit my needs was something I learned over time.

Twenty years ago, there were limited options for training. Most training was hands-on and a few books. Fast forward to the present day, we face an overwhelming amount of training resources including eLearning, blogs, handouts, CAD boot camps, YouTube, customized in-person training, and much more. Though all these are great and unique in their own way, the ability to learn a design software such as InfraWorks 360 is really up to the users and their learning method.

As a CAD manager I have provided hands-on and online training to numerous civil technicians, architects, surveyors, EITS, and engineers. The #1 item I stressed to everyone is that the software is only as good as the user. Users who don't understand the software will struggle with it and won't get the end results they want. In turn, they may get discouraged and also feel that software does not perform efficiently. To remedy this situation, I would try to discover which learning methods best works for each individual user.

What I have learned from my experiences is that there are four different types of learning methods: video presentation, repetition, reading material, and live one-on-one training. In this article, you will learn how to access free video training and also training material.

VIDEO PRESENTATIONS

One way users can learn how to use InfraWorks 360 is through video presentations. Today, users can easily go online and find several online training companies such as Lynda.com, CAD-1, Global eTraining, Ascent, and more.

Though there are many available training resources, most are not free. But fear not—Autodesk provides an online training video library resource directly accessible from the InfraWorks 360 Help menu.


Tutorials for InfraWorks 360

While in InfraWorks 360, simply click the help menu icon at the top right corner of the user interface. You are provided with several options for helpful resources such as Online Help, Getting Started, Tutorials, and much more. To access pre-recorded training videos, simply click the **Tutorial** option. This will send you to the online Autodesk InfraWorks 360 2017 site where you can watch videos ranging from the basics to design concepts, collaboration, and communication.

Another great source for video training is the **Getting Started** option from the Help menu. Getting Started provides a vast video library of InfraWorks 360 material. For example, when you select the InfraWorks 360 Roadway Design Tutorials, you are provided videos for Road Enhancements, Optimization, Intersections and roundabouts, and much more.

Welcome to Autodesk InfraWorks 360 Learning
Learn from the experts

Another great video source for InfraWorks 360 training is the **Autodesk InfraWorks 360 YouTube** channel, which provides access to various design topics and pre-recorded webcasts hosted by Autodesk. Because YouTube is also a mobile app, it has become a quick and easy way to access Autodesk training videos.
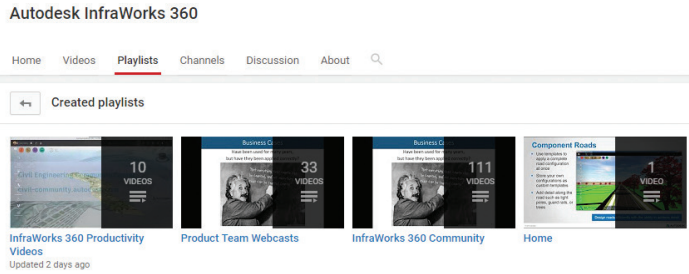
Video training has become just another great way for users to learn various Autodesk design software such as InfraWorks 360.

READING MATERIAL

Training books have been around for many years and were one of the most popular ways to learn and train. I remember for years purchasing books on everything from Autodesk Land Desktop to AutoCAD Civil 3D. Having direct access to training books and handouts was always great and convenient. Now, we have even more access to reading material for various design software online and via mobile devices

Autodesk University and AUGI are the two best places to browse through hundreds of customized training for numerous design software. Autodesk University online classes are a great source for both beginners and advanced users seeking training material. Autodesk University contains a vast library of videos and handouts that users can access for free. Each class can vary from a specific subject to a general overview of InfraWorks 360.

AUGI has become another great source for finding training material and helpful articles over various Autodesk design software. The *AUGIWorld* magazine you are reading and other resources provide users with helpful tips & tricks and also design methods when working with InfraWorks 360 and other design software.

The InfraWorks 360 Community is another great online source for training, giving users answers and helpful tips for using InfraWorks 360. The InfraWorks Community provides access to the InfraWorks 360 forums where you can post questions on a specific task or design tools when using InfraWorks 360. The InfraWorks 360 Ideastation is the best place to submit ideas to the Autodesk development team on how they can make the software more efficient and user friendly. The InfraWorks 360 InfraTips is a great source for finding advance tips and tricks on various InfraWorks tasks.

Finally, the **InfraWorks Online Help** is among the best places to get step-by-step training and procedures when using InfraWorks 360 for the first time or using a few of the advance design tools. InfraWorks 360 online provides in-depth material on design tools and understanding InfraWorks 360.

In order to advance in today's workforce, training is crucial. With the help of Autodesk and others, users can easily access free online training material and videos in order to become more proficient and productive with InfraWorks 360.

Tony Carcamo is the CAD/Design Manager for BIG RED DOG Engineering Consulting in Dallas, Texas. He has 19 years of experience in the civil engineering field, performing different tasks from surveying and platting to site & utility design. In addition, Tony has also spent several years performing Autodesk software implementation and CAD management. He is also a blogger, sits on several Autodesk committees and council groups, is president of the DFW BIM Infrastructure User Group, is a certified professional in AutoCAD Civil 3D and InfraWorks 360, and is an Autodesk Expert Elite member.

Autodesk's Design for Industry Challenge

I had the chance to discuss Autodesk initiatives in the educational arena recently with Torie Anderson, Senior Manager of Strategic Partners & Initiatives, Autodesk Education Experiences. Autodesk is constantly rolling out new opportunities for students all over the planet. The latest challenge illustrates that.

In this Q&A, Torie discusses Design for Industry, an Autodesk initiative aimed at connecting students with industry professionals. Autodesk is currently in the process of wrapping up the Design for Space challenge—the first in the series of challenges, bringing students from 70 countries to a common platform to demonstrate their skills to industry.

Through this program, students will gain access to a wealth of resources to build their proficiency, including Autodesk Fusion 360, the 3D CAD, CAM, and CAE tool that connects an entire project development process in a single, cloud-based platform.

AUGI: Why did Autodesk start this initiative?

T. A.: We're focused on connecting students with industry professionals to help the next generation of engineers, designers, and architects build real-life design skills necessary for future careers. With Design for Industry, partners gain access to future employees and can leverage the program to test uses for Autodesk software and tools.

AUGI: What does Autodesk hope to achieve with students?

T. A.: Autodesk continues to empower students to learn skills and use the tools necessary for future employment. Additionally, Design for Industry seeks to engage a wealth of students across seventy countries to participate in challenges against their peers for access to industry professionals and other incentives.

Industry professionals and experts will engage students through webinars, videos, and more to help them to understand the demand for these critical skills required to transition well to industry, which helps prepare them for their future careers.

AUGI: What skills are you testing and what are you looking for from entries/designs?

T. A.: Industry professionals will participate as judges to select winners based on the following criteria:
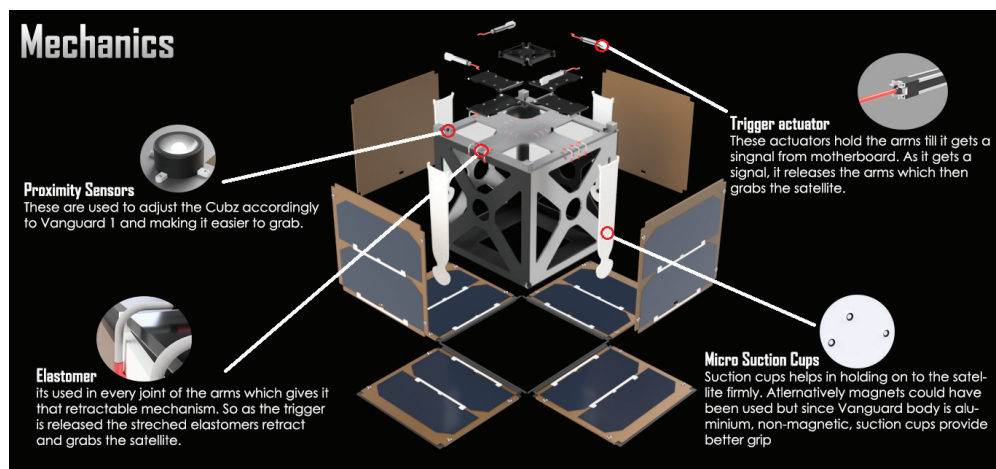
- Innovation and Inventiveness: The design "pushes the envelope" and enhances user experience.
- Software Skills: Degree of technical skill demonstrated and quality of design submitted based on technical requirements.
- Suitability to Purpose: Degree to which the design is useful and suited to serving its purpose well, providing a positive user experience.
- Creativity: Degree to which the entry reflects cleverness and originality of thought to support the challenge which adds value.

AUGI: How can entering help the careers of young engineers?

T. A.: Industry professionals and experts engage students through webinars, videos, and more to help them to understand the demand for these critical skills required to transition well to industry, which helps prepare them for their future careers.

AUGI: How do students get involved?

T. A.: Interested students can sign up through the Design for Industry website, www.autodesk.com/designforindustry

Mechanics

Trigger actuator
These actuators hold the arms till it gets a signal from motherboard. As it gets a signal, it releases the arms which then grabs the satellite.

Proximity Sensors
These are used to adjust the Cubz accordingly to Vanguard 1 and making it easier to grab.

Elastomer
its used in every joint of the arms which gives it that retractable mechanism. So as the trigger is released the streched elastomers retract and grabs the satellite.

Micro Suction Cups
Suction cups helps in holding on to the satellite firmly. Alternatively magnets could have been used but since Vanguard body is aluminium, non-magnetic, suction cups provide better grip

AUGI: Is this focused only on engineering students?

T. A.: While the initial Design for Industry challenges support students in engineering and industrial design fields, as the program continues, the scope will be broadened to support additional disciplines in postsecondary and secondary education (mostly high school students in secondary).

AUGI: Can you provide some real world stories of students interacting with industry leaders/designers?

T. A.: The first challenge is currently wrapping up and winners were just announced. They will be provided connections with industry leaders and designers coming up soon; stay tuned!

AUGI: Is the software provided to students for free? Is the software training provided, also?

T. A.: Autodesk provides students, educators, and schools with free access to the tools and content they need to unlock their creativity, cultivate a love for design, and prepare for successful careers in design. Beyond our free software for educators and students, we also offer the Autodesk Design Academy: a constantly growing collection of lessons, projects, and courses that help educators support students as they develop technical skills and creative confidence; this can be accessed at www.academy.autodesk.com.

AUGI: What was the last competition and who were the winners? Awards? Prizes?

T. A.: Autodesk is just wrapping up its first Design for Industry challenge—Design for Space.

The challenge: You have been hired by a space agency to assist in collecting Vanguard 1, an out-of-commission satellite launched in 1958. Your mission is to design a cube satellite using the CubeSat standard considering deployable components necessary to secure or de-orbit the Vanguard 1 as part of a salvage mission for posterity. It is up to you to determine the best way to secure the Vanguard 1 by designing components that will fit within the defined dimensions of a cube satellite and for transport in space. Remember, once the satellite deploys, components may need to expand beyond the confines of the defined CubeSat standard dimensions.

Winners have been announced (see sidebar). Awards for top designs include cash prizes and virtual mentoring sessions with a judge: NASA astronaut, Yvonne Cagle; co-inventor of the CubeSat standard and CalPoly engineering professor, Jordi Puig-Suari; or Field Ready principle designer and co-founder, Dara Dotz.

AUGI: Is there another competition coming?

T. A.: More Design for Industry challenges are in the works, including initiatives aimed at designing for home and office and automotive. Partner companies to be announced soon.

CONGRATULATIONS TO THE WINNERS OF THE 2016 AUTODESK DESIGN FOR SPACE CHALLENGE.

https://academy.autodesk.com/design-space-2016-winners - winning designs

1ST - SHARATH NAIK
India

2ND - SAMUEL FROESCHKE
Germany

3RD - CHRISTOPHER SCARBOROUGH
United States

4TH - TEJA BALU
India

5TH - JOY MUKHERJEE
India

6TH - JUAN SEPULVEDA
United States

7TH - VARUN RAJ
India

8TH - ISHAAN MEHTA
India

9TH - BRIAN MCCANN
United States

10TH - ARCHI SAEED
Jordan

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

by: Brian Chapman

PRODUCT FOCUS

Reaching Out with 3ds Max

Figure 1: Egyptian Hieroglyphics

Humans strived to communicate values, purpose, and interests through art long before they communicated through writing. Explicit or not, the need to communicate our thoughts, concepts, and ideas in visual form is perhaps one of the greatest factors driving us to move forward. Through art, we work to engage or entice each other, shift or seed ideas, solve problems, develop ideology or theology, and change the nature of people or entire cultures themselves. Through it all, humanity considers these ideas to shape our futures and continue to improve as we press forward.

I consider this point for the simple fact that while this pertains to all humanity, we should remember that it can be more difficult to reach certain people than others. The beauty of art, especially 3D art using applications such as 3ds Max®, is that we can reach out and communicate to those who might have been out of reach before.

GLOBAL IMPACT

It's important to consider that as population grows, the education of those around us should be considered. Education is important to increase understanding of one another, respecting one another's ideas, and working together. As digital artists, consider that while we can share our knowledge and experience by teaching, there are often language barriers and technical challenges that make reaching out beyond our own regions difficult.

Figure 2: Classroom Concept from Converted Train Cart

I make this point because I'd like to present an example of an alternative way I found to have a global impact without leaving my home. By joining an online volunteer program, I receive notifications from organizations who require assistance with the particular skills I have listed in my profile. In this particular case the organization was Cercle Social. Cercle Social is working to provide education to disadvantaged youth in Benin. Their goal was to convert standard transport (train) carts into solar-powered class rooms utilizing Raspberry Pi workstations for learning. An extremely cost-effective and efficient idea, but they had no particular way to communicate the idea. Using 3ds Max we rendered the concept to effectively present the idea, which would help raise capital that could lead to bettering the lives of struggling children in the region. By reaching out through available avenues online, we can make large impacts to the global community using the skills we've worked hard to refine and master without ever leaving the comfort of our workplace or studios.

OPPORTUNITIES

Many of us don't consider that 3ds Max can be used beyond the movie, visualization, or game industry, but it can. With a unique ability to generate custom content in so many formats, we can communicate ideas to those who might have difficulty understanding them otherwise. I'll present an example.

When I was a teenager I had the chance to visit various parts of the world as part of a student program. I had the opportunity to visit the Louvre in France, the Palace of Versailles, the British Museum, the Great Barrier Reef, and so much more. Seeing those particular monuments was extraordinary and had an enormous impact on my life. However, I remember that nearly every place I went—every museum, parliament, and cultural building—had one particular rule: don't touch anything.

Now imagine someone who is blind. The ability to touch something is the only way a visually impaired person can gather a sense of what that object might look like. Asking a blind person to not touch something is like telling a person with normal vision to close his or her eyes and watch a movie.

PERCRO (Perceptual Robotics Laboratory), an Institute in Pisa, Italy, is one organization that understands this challenge. Their project, Pure-From, was an effort to create a 3D art museum featured with stereo vision, tactile stimuli, and 3D printed art (some that can be generated using 3ds Max) to provide those with visual challenges the unique opportunity to touch and visualize their displays in a way no other museum would allow.

By using 3ds Max we can look for opportunities to reach others in ways that are unique and unexpected, but can have an enormous impact to those who might appreciate it the most. This can include those with physical challenges, unique learning needs, advanced education, and much more.

VIRTUAL REALITY

With the release of virtual gear in the last year or so, virtual reality offers a unique opportunity to present nearly any idea in any way imaginable. 3ds Max and its ability to generate 360-degree videos is one of the most efficient and powerful applications in the industry to create content for virtual reality systems. To create a simple 360-degree video, I'll present the steps below using a 3ds Max Free camera and V-Ray Adv renderer.

Step One. With Vray Adv set as renderer, select the V-Ray tab. For the Image Sampler choose "progressive." See Figure 3 for example.
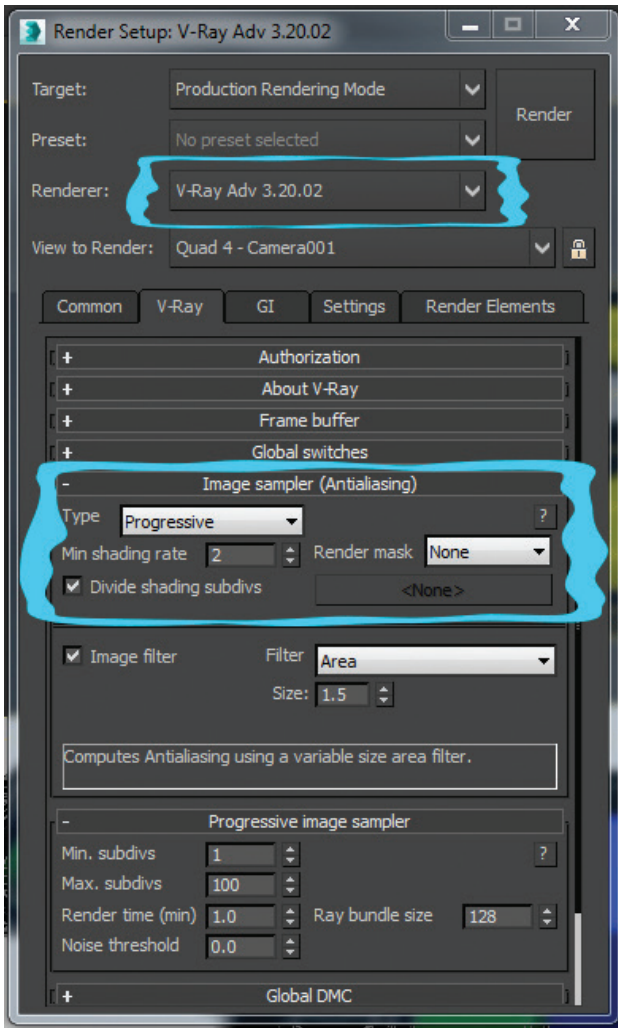
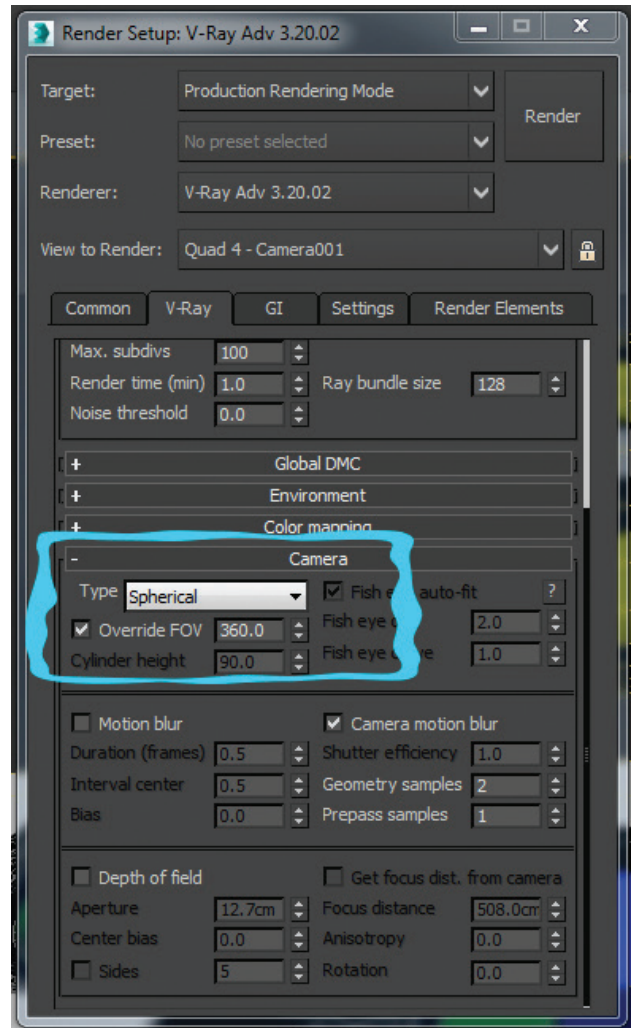# 3ds Max 2017

Figure 3: Step One

Figure 4: Step Two

Step Two. Expand the Camera category and select the Spherical type. Override the FOV (Field of View) for the entire 360 degrees. See Figure 4 for example.

That's it. Simply render your project and you're done (see Figure 5). From here you can add the necessary metadata to the image or video using various free tools available online, or work with various video editing software applications to upload the videos to You-Tube or wherever you like.

CONCLUSION

While it's essential to continue our own education it's also important to remember how we can participate in the education of others. With the power of 3ds Max and hard work, we can help society to move forward, change ideas, and take part in shaping the future.
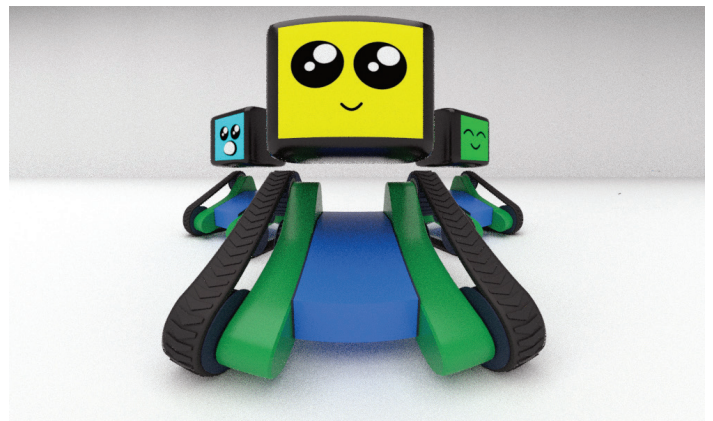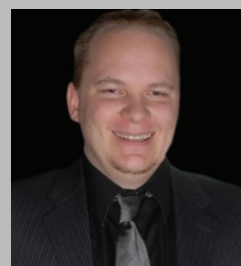

Figure 5: Final result

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HOTGEAR PROJECT APPS

The HotGear project was founded by Johnes Hou, who began using Autodesk® Revit® in 2014 as a BIM Modeler. After doing the repetitive work day after day, Johnes began looking for an automated solution and started developing the tools for his daily work.

Currently there are three separate apps available for download. These include the following:

HotGear Project – Element Merger: Quickly Join/Unjoin/Switch/Cut/Uncut each element on an Autodesk Revit selection. https://apps.autodesk.com/RVT/en/Detail/Index?id=5107614544912335749&appLang=en&os=Win32_64

HotGear Project – Wall Join Controller: Quickly change the wall join type for each wall in an Autodesk Revit selection. https://apps.autodesk.com/RVT/en/Detail/Index?id=80286704156493680&appLang=en&os=Win32_64

HotGear Project – Parameter Explorer: Filter, modify, and check elements parameters, including synchronizing data with Excel, override, and temporary isolate elements. https://apps.autodesk.com/RVT/en/Detail/Index?id=5052462497514539721&appLang=en&os=Win64

http://visual-integrity.com/
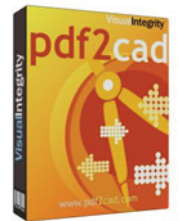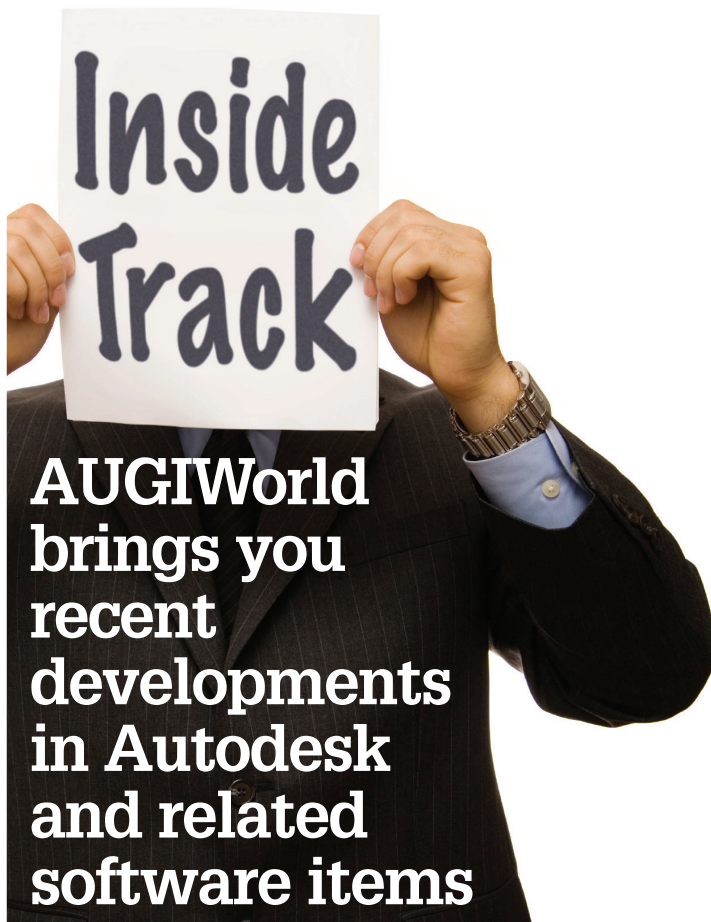
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+ Contains an option to ignore text, images, or paths during conversion
+ Maps fonts for high fidelity file match
+ Scales page to match original dimensions of file
+ Separates layers in CAD drawings based on color or other definitions
+ Dashed/dotted lines as segments
+ Command-line version and Windows DLL are available
+ Features expanded support for non-standard fonts
+ Contains an option to remove or outline hatches/fills
+ Offers improved reporting on errors and warnings
+ Features a streamlined interface for faster/easier conversions

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