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# AUGIWorld

The Official Publication of Autodesk User Group International

February 2019

# Tips for Beginners

## *Also in this issue:*

- Effectively Training the Masses
- Annotations in AutoCAD Architecture
- The Modifier Editor in 3ds Max



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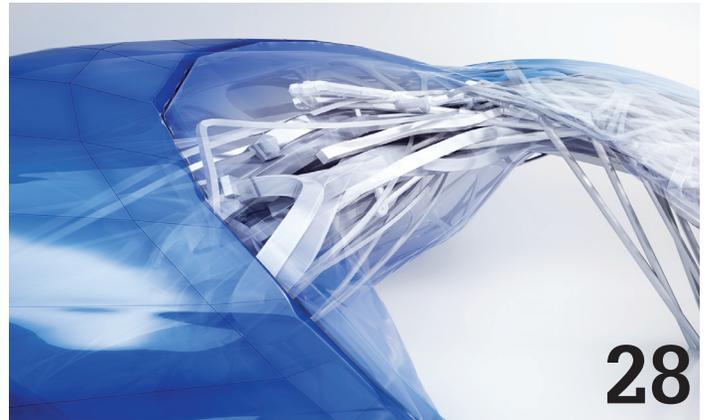


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# Letter from the President



# AUGI

## GREETINGS!

**F**ebbruary in Pennsylvania can be downright dreary! I am fairly certain I was meant to live somewhere warmer than this... perhaps Texas or Arizona would be nice this time of year. Sometimes the shortest month of the year can feel like the longest. By now, those New Year's resolutions have probably been long forgotten. It's cold, it may or may not snow, and things that are vibrant green in warmer months, right now are drab brown. The ground is either frozen or mud. We look forward to warmer months and new beginnings all around us.

This month is our Beginners' issue. Do you remember when you were beginning your career? The first time you double-clicked the icon on a brand new piece of software? Or sometimes it feels that way, no matter how long you've been using it? We all started somewhere, and somehow learned our way around, right or wrong. Maybe you had formal training, or if you are a nerd like me, you actually read a textbook or manual. The AUGI forums are a great place for newbies to find answers, and one of the resources I used when starting my career over a quarter-century ago.

Having taught many different courses on AutoCAD and Revit, I feel like I enjoy the introductory classes the most. I think it's the "A-HA!" moment, when a concept finally clicks and the student feels empowered with newfound skills. It is that sense of accomplishment that doesn't come from my lecture or demonstration, but from the student applying that information and making it work for themselves.

Many times, the students will discover different ways to do something that I hadn't told them, or (\*gasp\*) that I didn't know myself! That's perfectly fine with me, because I enjoy continual learning. I often tell students who have been sent to trainings by their employers and may have more advanced skills that even if it is a beginner course, I hope they learn some tips and tricks they may not know.

If anyone ever says they have learned everything they need to know about anything, don't believe it! There is always something new to learn, and there are always different perspectives when it comes to design. Just because your way works doesn't mean someone else's way that also works is wrong! What is the old saying? There is more than one way to skin a cat! (Side note: I'm not sure why that is even a saying, and I'm not sure I want to know!) Be open to new or different techniques. You may find something that works better than what you are currently doing.

I hope you will discover something new in this issue, whether you have been using the software for many years or have just clicked that icon for the first time. Our AUGI authors are excited to share their experiences with all of you, novice or pro. My hope is that you will, in turn, share that knowledge with others you meet. And sometimes it helps to take a "beginner" perspective when it comes to software. Take an introductory training or read a new manual. Visit the AUGI forums and participate in the discussions there. You never know what you might learn!

Happy February!  
Kimberly

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# New Year's Resolutions: Effectively Training the Masses





Each year the training staff in most civil engineering and infrastructure firms along with senior management sit down and discuss how they can train their staff effectively without affecting the bottom line and show a return on investment (ROI). The questions are endless: How? When? Who? What? Let's see if we can simplify these questions and develop a training plan that is expandable, repeatable, and fits almost any size firm.

## REALITY OF TRAINING PROGRAMS

In war, before you enter a battle you create a battle plan. Before a coach enters a big game, he or she develops a game plan. There is a theme—the plan. The plan is the backbone of any successful training program. In this article I will give you some tips on how to create a plan and successfully implement it in your company while showing a better ROI than with traditional training plans.

Traditional training plans in the past used a “let's throw things on the wall and see what sticks” approach. For example, gathering everyone in a conference room and going through slide after slide of a PowerPoint presentation, hoping that 100 percent of the information presented was digested and will be used in the firm.

However, through countless studies we know that just about 10 percent of that information is retained. Some of the attendees were checking fantasy football, some dozed off because of the monotone presentation. Any way you slice it, this common approach does not show ROI. Do the math. Say you had 20 employees @ \$100 an hour billable rate, plus the presenter spent 10 hours creating the presentation, plus lunch, lost billable time, etc. Easily your training—that was retained at 10 percent of the information—just cost your business more than \$3,000 dollars. That is not a ROI! That is throwing money out the window.

So how can you create a training plan that can show a ROI and have your staff retain more information?

## MAKING A PLAN

There are many schools of thought on the best way to train employees. One of the latest methods that has shown some success is the 70/20/10 Training Model. This model breaks training into three buckets based on how people retain information.

### 70/20/10 Training Model

- 70% of training should be on the job
- 20% of training should be by a mentor
- 10% of training should be classroom based

The 70/20/10 is a model that can be adapted to any type of training or program. Let's adapt this to a civil consulting or infrastructure company. Let's reverse these numbers (10/20/70) and adapt it to a learning format.

- 10% of training should be overview and introductory
- 20% of training should be hands on

- 70% of training should be on the job

As you can see, the above plan turns the 70/20/10 method on its head and shows a timeline of a training plan.

## DEVELOPING THE PLAN

Okay, you are now ready to tackle development of your plan. This is the backbone of your training program so I recommend you don't rush this. You need to take the time and make sure the plan can answer these three questions with a YES!

- Is it repeatable? Can I document this plan and its contents and recreate as business changes and grows?
- Is it expandable? Can I expand the training plan as training needs vary and the company grows?
- Does it fit our company? Does the training plan fit the company structure and its future expansion plans?

Making the plan repeatable is the backbone of the ROI. If you are constantly reinventing the wheel versus modifying the material due to new information you will never show a return on your investment. How do you do this?

- Gather the training materials you have to date and decide which content is relevant, which content is digestible, and which content should be used as the basis for your plan.
- Develop tracks or buckets for types of training and put your retrieved information in the appropriate bucket.
  - Technical (Civil 3D, Hydrocad, etc.)
  - Administrative (Office Suite, IT, etc.)
  - Theory (Earthwork, Grading, Hydrology, etc.)
  - Soft Skills (email etiquette, how to deal with coworkers, etc.)
- Document the training by putting together a syllabus and training descriptions, and make it accessible to all staff.

**IN WAR, BEFORE YOU ENTER A BATTLE YOU CREATE A BATTLE PLAN. BEFORE A COACH ENTERS A BIG GAME, HE OR SHE DEVELOPS A GAME PLAN. THERE IS A THEME—THE PLAN. THE PLAN IS THE BACKBONE OF ANY SUCCESSFUL TRAINING PROGRAM.**

# AutoCAD Civil 3D 2019

## Example Syllabus:

Civil 3D Technical

- ♦ Overview of Grading in Civil 3D 1 hour (1 class)
- ♦ Grading a commercial site – 2 hours (3 classes)
- ♦ Grading a residential site– 1 hours (3 classes)
- ♦ Earthwork calculations- 2 hours- 1 class

Total Hours – 12 hours

## Example Description:

Hands on Grading – Building surrounds

Trainer: Mike Smith

Description: In this class we will show you the basics of civil grading in and around the building to properly drain water away from the building.

Learning Objectives:

- Grading of sidewalks to provide positive pitch away from the building.
- Providing area drains at low points where stormwater is trapped

The above will make the plan expandable and will allow you a matrix for adding and modifying the plan as your business changes and grows over time.

This will also be made to fit your company using a flexible guideline to the training approach.

Let's dive a little deeper into the types of training and typical timelines for execution of the plan.

## 10% – OVERVIEW TRAINING (MONTH 1)

Okay, you are now ready to tackle development of your plan. You have put together your framework and made sure it can grow with your company.

These are the overview classes (see red text in the syllabus) that will serve as an introduction to the future hands-on classes. They should be short (under an hour), concise, show the big picture, and create momentum for the future classes. Staff should be coming out of these trainings hungry for the next training. It's the appetizer to the main course. These should be PowerPoint based or the equivalent and should be overview in nature.



## 20% – HANDS-ON TRAINING (MONTH 2-4)

You now have your staff's attention and they are eager to learn. Now you start phase II, which is the basis of the learning model. This training phase should be task oriented and conducted in a small class size (4-8 people). This training should be hands on (see green text in the syllabus) and show real-world examples that can be used in future real-world projects.

## 70% – ON-THE-JOB TRAINING (MONTH 5-12)

Studies show that information is lost if not put into practice within 30 days. Therefore, the trainers need to be in contact with the engineers and project managers on implementation of these new techniques on their projects. The explanation of the learning curve and buy-in is essential to the success of the program.

## WHO SHOULD DO THE TRAINING?

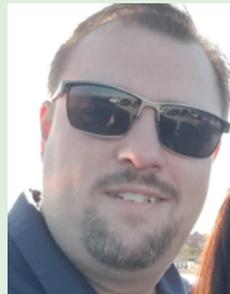
This question is not easily answered because each training class requires different experience to effectively teach. I typically like to have the peers of the trainees actually do the training when possible. This creates a feeling of ownership for the trainer and makes learning from your peer easier for the trainee. This "train the trainer" approach also makes the plan expandable and repeatable as mentioned before.

## KEEPING THE PLAN RELEVANT

How do you keep your plan relevant? This requires feedback and honest communication with both trainers and trainees through surveys, questionnaires, and communication between management and staff.

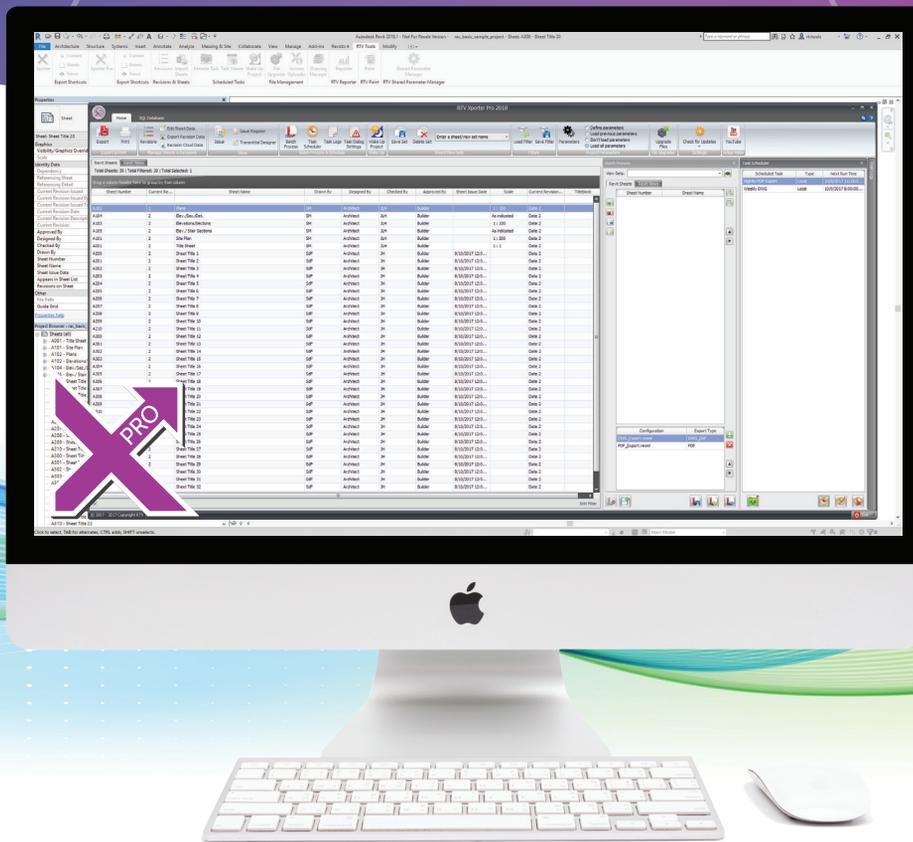
## CONCLUSION

There are myriad ways to train your staff. I hope this plan can help you navigate this path and achieve a return on your investment with increased efficiency and a more knowledgeable staff. Remember, the plan is a living, breathing document and should change as your business needs change.



Kevin Sanders is a Senior Project Manager/CAD Specialist at Samiotes Consultants, Inc. in Massachusetts. He has been in the civil engineering and infrastructure field for more than 20 years and has developed training programs for several years as well as being a speaker at Autodesk University. Kevin can be reached for comments or questions at [civiltrainer76@gmail.com](mailto:civiltrainer76@gmail.com).

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**M**any organizations have made the choice to switch from 2D drafting (e.g., AutoCAD®) to 3D modeling (Autodesk® Revit®) over the last 10 years or so, but there are still some out there who haven't yet jumped ship.

Let's not forget those who are coming into our industry and are just starting out and need to come to grips with things for the first time, just like when people started with drawing boards many years ago. They needed to understand drawing using pens and pencils at scale in the drawing offices.

If you are one of those people just starting out with Revit, you may feel there is a fair amount to learn, and I won't lie—there is.

It is interesting that on many projects I have been involved in over the last 13 years or so I would still produce 2D drawings for the construction teams to build on site. This is still the case today.

When I switched to using Revit Structure, we were not even being asked for Building Information Modeling (BIM) or for 3D as part of the delivery. When we started out, none of the architectural or building services practices we worked with had even moved into using any 3D modeling software solutions. So even though we were using Revit to build models, we still issued drawings in DWG and PDF formats.

A major part of using Revit is the families we all use to create the components within the models to meet the specific needs of each project built.

## REVIT FAMILIES

Families are the main building blocks in Revit. A family is a group of elements with a common set of properties, called parameters, and a related graphical representation. They can be structural elements such as columns and beams, foundations, reinforcement, or nonstructural such as doors, windows, luminaires, or even annotation elements such as tags, dimensions, drawing frames, and so on.

On installation of Revit you get a basic standard library to use, which should be good enough to start modeling simple structures. Once you start building more complex structures, you're likely to require further families creation.

## REVIT FAMILY TYPES

There are three types of families used within Revit: system families, loadable families, and in-place families.

### System Families

System families are embedded within a project template or project file, so they are not loaded into a model, but can be transferred from one file to another. They are the basic building elements such as walls, wall foundations, floors and roofs, drawing frames, gridlines, levels, dimensions, etc. So when creating new types, you are required to take a copy of an existing family and modify its parameters.

It is recommended that as you create new types during a project, you transfer them over to your company template file. Then you will have a library of types to choose from once you start a new project. Alternatively, you could have a basic library in your template with system families that are used most often, then have another template/project file which holds your company's complete library of system families.

### Loadable Families

Loadable families are created independently of the model and loaded into the model as required. They are created using their own template file (RFA), are customizable and allow the creators to set up a library of types. These can also be called component families. They are separate from the template file and can be loaded into a project, which helps reduce the size of your company template file.

### In-Place Families

These are bespoke elements that you may create directly within a project, not outside like loadable families. In-place families allow you to create families similar to loadable families, but also allow the creation of free form or custom shapes not possible to create

as a system family, such as walls, floors, or roofs. Note that these cannot be exported to other projects.

Before you create an in-place family in your project consider that it may be better to create a system or loadable family as you may need to use it again outside of your current project.

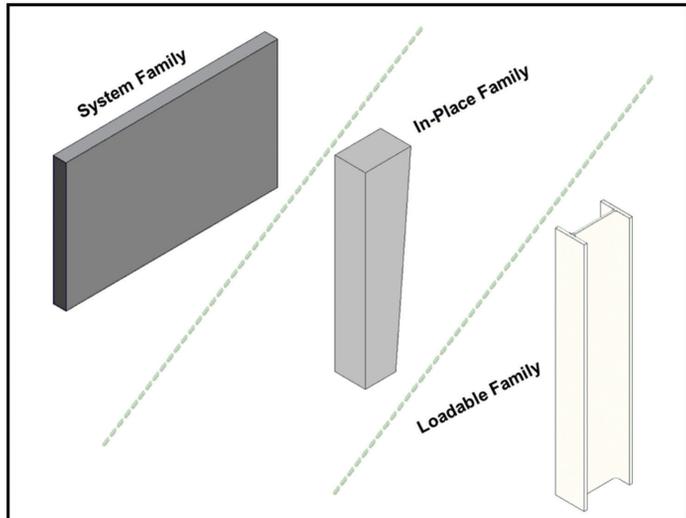


Figure 1: Family types

Each family is part of a category, which is a classification for families (e.g., structural columns, structural framing, etc.). Families are grouped and sorted by category in the template/project file found within the project browser.

A family type can have any number of variations for users to choose from (e.g., different column sizes).

As part of a family they have Instance and Type properties. The instance properties contain information or settings applied to that individual element, such as column constraints top and bottom. If this is changed, it will affect only that instance of the family.

Under the type properties there are the parameters set for that family type. (e.g., steel column default dimensions, structural section geometry, etc.) This will be the same across the whole project for that type, no matter how many times it is placed. If any changes are made to the type parameters, the change will affect all families of that type within the project.

## HOSTED OR STAND-ALONE

Families can be host based, which means they are dependent on another element to host them such as a wall, floor, ceiling, roof, or even a face of another object.

Stand-alone families are elements such as a column or maybe a piece of furniture that do not need to be hosted to another element.

## FAMILY CREATION

When creating your own families, before you even start you really need to plan it out first. For example, if you're creating a new foundation, ask yourself: is it going to be a system, in-place, or

loadable family? Well, it is not going to be a system family and an in-place family doesn't seem to be the most logical. Therefore, a loadable family is the best option. It can be used across all projects—you can make one or a parametric family with multiple sizes included.

I have set up a family creation procedure, which I ask members of my team to follow when creating any family. A few questions can be included at the start to help planning the type of family it needs to be.

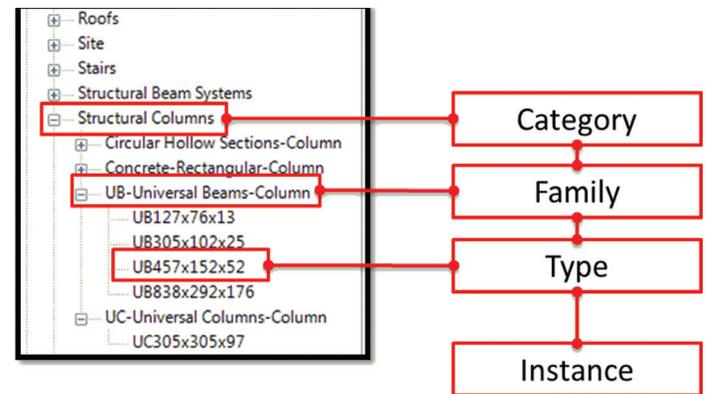


Figure 2: Family element

## FAMILY CREATION (TEMPLATES)

It can be so easy to just select any family template, but you really need to consider what you're actually creating. If it is a grid head, there is a family called *Metric Grid Head.rft*. If it is a foundation, *Metric Structural Foundation.rft*. These will give you the basic settings you should need for those types of families. Bear in mind that there are some generic family templates that help if it is a face, floor, or wall-based family, for example. You can use one of the default families and edit it, but be careful as you are editing a family you did not create.

**Tip:** When you start creating families and find you're adding the same standard parameters or information to all families of the same type, why not create a new standard template with those included to save time later?

## FAMILY CREATION (FAMILY EDITOR)

If you are creating or modifying a loadable family, the Family Editor is the place to do it in Revit.

**Tip:** I recommend opening an existing family first and taking a look around to see how the family has been created.

When building a family, don't complicate things by adding loads of complex geometry or constraints, which may not be required. If it isn't needed, then why add it? You can always come back later and include it if required.

You will need to include some parameters to help constrain the geometry and add technical data for the family. Make sure you choose the right parameter types. Family parameters are created in the family editor, but don't appear in schedules or tags. Shared

# Revit 2019 – Structure

parameters are created in an external text file and can be placed into multiple families or projects. These appear in schedules or tags.

**Tip:** Make sure you test the family as you create it. You don't want to get to the end and find it doesn't work. Then you will find yourself spending more time trying to find the problem.

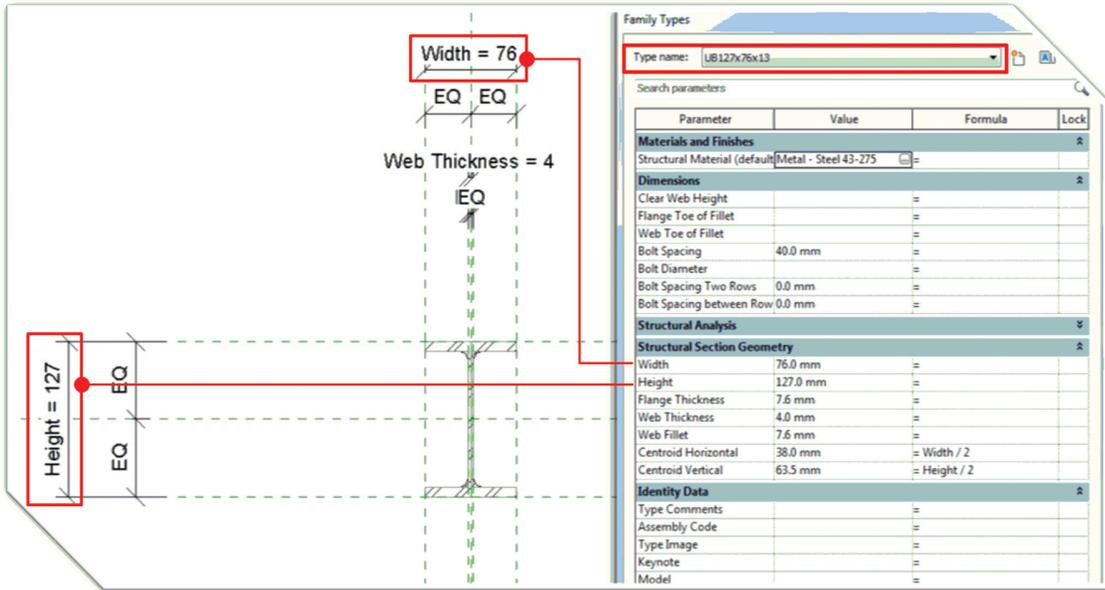


Figure 3: Family geometry

## REVIT FAMILY LIBRARY

On installation of every version of Revit, you will find it installs your country default content library locally to your machine. If you have several versions installed, then you will have a library for each version. To start out you can use these, but I would recommend copying them over to a server or cloud-based storage and change the default paths to the network. Thus, every user is accessing the same families.

**Note:** When creating any new families, think about in which versions they will be used. You don't want to spend a large amount of time creating one in 2019 then find you need it in 2017. You will have to create it all over again.

Many manufacturers have built their products as Revit families, which are generally available to download from the manufacturers' websites or other product host websites like BIM Object (<https://www.bimobject.com/>), which now hosts all the content formerly on Autodesk Seek.

## FAMILY CREATION TRAINING

You do not need to be an expert in Revit to understand how to create or modify families, but a basic understanding of how Revit works is required. Then when you are creating or testing families you can understand how it should work in a project environment. Now some people can learn by just having a go by themselves, but others prefer some formal training. You can search for your local Autodesk Certified Training Center here: (<https://www.autodesk.com/training-and-certification/authorized-training-centers>).

You will train with a Certified Autodesk Training Instructor at either one of the training centers or at your site in a traditional classroom format. This can be costly, but from my previous experience it is worth paying for.

Your other options are to buy a training manual from places like Amazon or local bookstores. Then have a go at learning by following the steps in the manual. Now bear in mind you won't get an expert to help you if you get stuck, and you will need to rely on colleagues or forums online to help you.

Alternatively, more and more people are considering online learning sites such as CADLearning, Global eTraining, or LinkedIn Learning. The training content is generally written by Certified Autodesk Instructors and these options offer support and can be cheaper than training

at a certified training center. Finally, another option I highly recommend is Autodesk University online learning (<https://www.autodesk.com/autodesk-university/>). These are the classes hosted at many of the conferences Autodesk hosts across the globe and they are FREE.

## FINAL THOUGHTS

Don't be put off from creating your own Revit families—we all start somewhere. Just remember to plan it first by asking yourself a few questions. This will help you create the correct family type, geometry, and include the right information/data.

Good luck and happy family creation!



Gareth Spencer is currently the CAD and BIM Manager at The University of Manchester in the UK. He was previously a trusted application engineer, consultant, and BIM specialist at two of the UK's Autodesk Platinum Resellers. He is a certified professional in Revit Architecture and Structure. Gareth has been a speaker at Autodesk University Las Vegas (twice) and London (once). Follow him on Twitter @TheDarkAsset, his blog <https://thedarkasset.wordpress.com> or email [gareth.spencer@live.com](mailto:gareth.spencer@live.com).

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# The Modifier Editor

There are dozens (if not hundreds) of functions we need to become familiar with as beginners to 3ds Max®. Because the Modifier Editor and modifiers are essential to using 3ds Max, I thought it would be a good function to discuss.

to stack on top of each other. Alternately, if we select any of our modifiers in the list, the next one we add will insert itself above it. We can also drag and drop the modifications in the stack as well as add the same type of modifications multiple times.

Each type of Modifier includes a set of parameters that we can adjust to obtain different results. I'll discuss some of them related to Figure 1. To create the object seen in Figure 1, I added 100

## MODIFIERS

I'd argue that the modifier stack is the most powerful component of 3ds Max. It is also very unique to the software. With it we can learn almost everything 3ds Max is capable of, simply by selecting our object and seeing the list of modifications we can make. The primary tool to make these modifications is called the Modifier Editor. The editing box allows us to apply as many modifications to our object as we wish, and stack (or re-stack) the modifications in any order. See Figure 1.

In the Modifier Editor, you'll see I started with a plane at the bottom of the list. The modifications to our objects are listed in order from the bottom to the top. As we add modifications, they continue

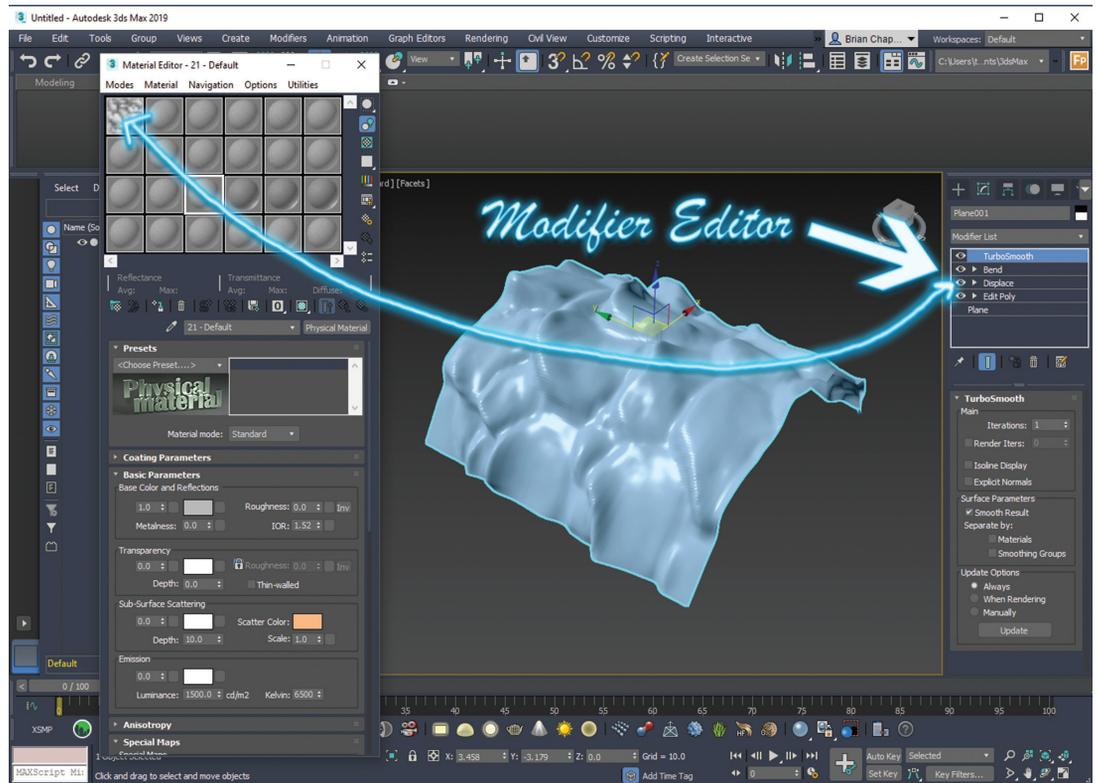


Figure 1: Modifier Editor

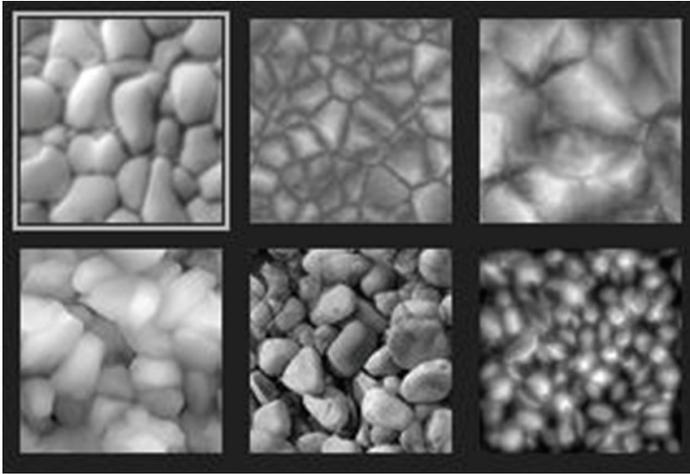


Figure 2: Displacement maps

areas will control the mounds in displacement, whereas the dark areas are the crevices.

In the parameters for the displacement modifier, I added strength and blur, and selected the image I used for my displacement. The strength controls how much the image affects the object. I then added the Bend Modifier and adjusted the angle in the X-Axis. Last but not least, I added the TurboSmooth Modifier to smooth out some of the unwanted detail and noise. See Figure 3 for the steps in detail.

Additional functions are available in the editor. For example, we can use the eye next to each item to turn them off. The arrow next to each modifier generally contains more controls to adjust our objects in finer detail. The icons below the editor give us more advanced controls that we learn as we dive deeper into the software.

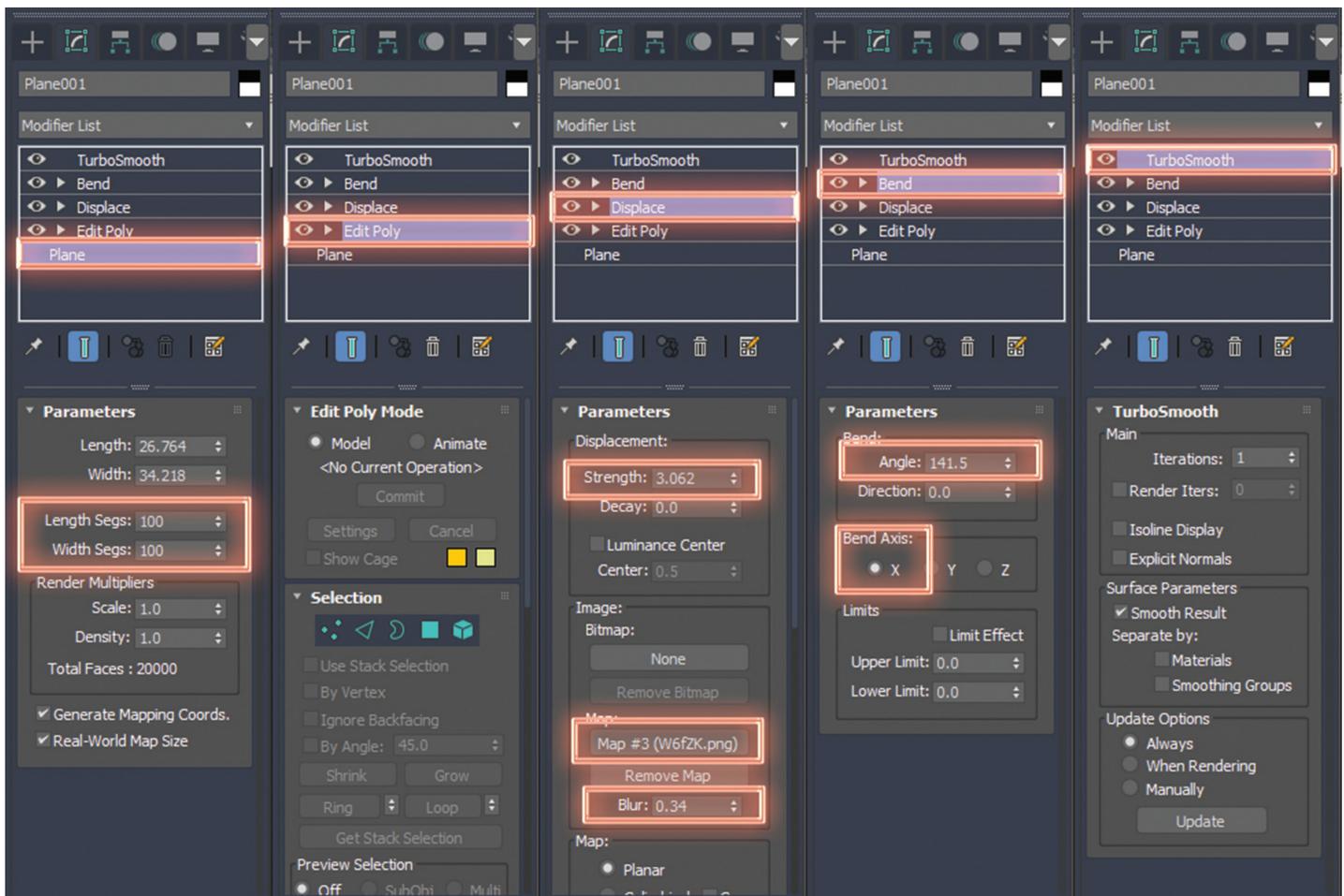


Figure 3: Modifier Editor example

segments to the plane for the length and width. Next, I added the Edit Poly modifier from the Modifier List. I did this out of habit really—it is useful to manually add or adjust an object with more intricate detail if needed by giving us all the functions of an editable poly. After that, I added the displace modifier, which is what generates the bumps (or displacement) you see in the object. It can't generate the bumps on its own, though. It needs an image to get the height values (a depth map basically). See Figure 2 for a sample of images that can be used for displacement. The whiter



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## REPAIR



<https://bit.ly/2CZO6B6>

This app activates commands that allow you to clean and correct files of AutoCAD®, according to good practices for this subject. When you receive a file from another company and it is oversized or your work process slows down, you should run this command.

## Chainage



<https://bit.ly/2SKxeDR>

This allows chainage/station marks to be created dynamically along lines, arcs, and polylines. Settings such as text height, text offset, justification, precision, tick length and tick position can be adjusted on-the-fly for precise display of chainages to suit any needs.

## Dynamo for Autodesk Fusion 360



<http://amcbridge.com>

The add-in supports a bidirectional data exchange between Autodesk® Fusion 360™ and Dynamo

Studio, allowing users to create visual logic for Fusion 360 parameters update.

It provides the ability to use a visual editor environment to modify Fusion 360 model parameters, view and use them in complex logical graphs. Fusion 360 parameters will be automatically updated from Dynamo Studio using custom input and output nodes.

## MaxMounts Pro 2.0



<https://oormi.in/software-01.html>

MaxMounts Pro 2.0 is a maxscript for 3ds Max® that creates realistic mountains, terrains, and other features like stones and rivers. It is interactive, fast, and easy to use—needs just one click for beginners and has a rich set of parameters for advanced users.

Script features:

- + Single-click mountain creation
- + Multiple resolutions from high to low poly
- + Tons of parameters; infinite variety
- + Add and edit individual peaks
- + Valleys and rivers
- + Stone creation tool
- + Saving and loading of presets
- + Built-in materials
- + River map creation
- + Add custom maps
- + Output is editable poly; materials are common
- + 3ds Max materials; fully editable
- + Free updates and support

## Dimensions By Line

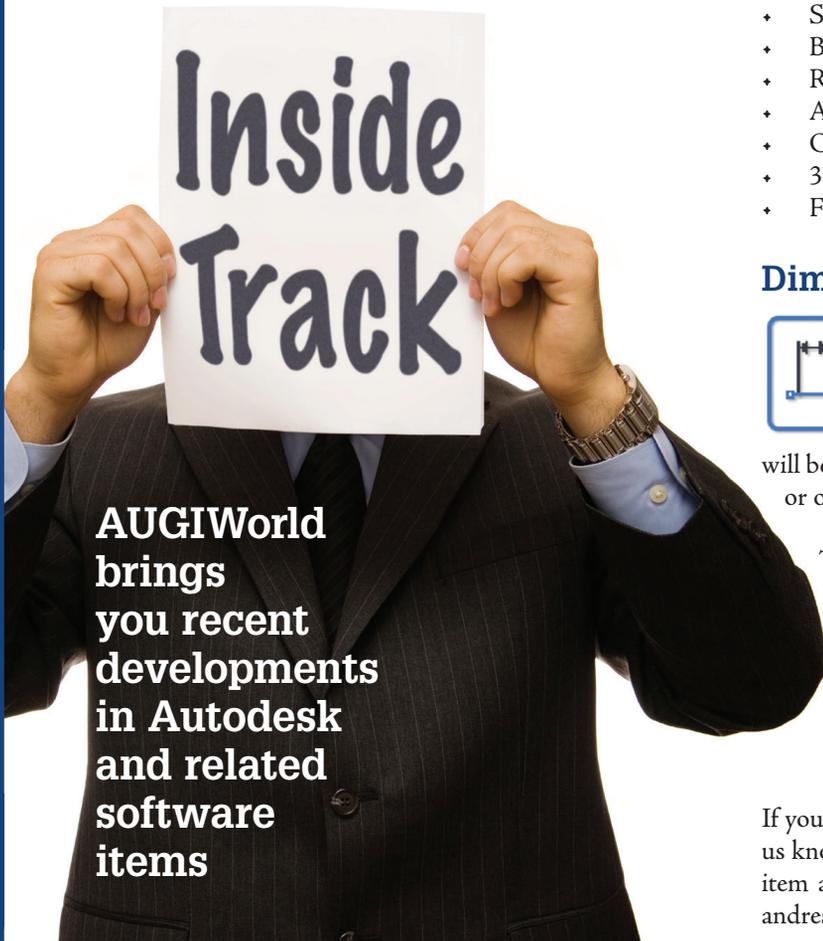


<https://bit.ly/2AEIBGt>

This plug-in allows you to place dimensions on the plan or section view along the conditional line formed by the two indicated points. Elements that will be dimensioned and ways of dimensioning (in the center and/or on the sides) are specified in the working configuration.

This plug-in works with: walls, parts, floors, grids, columns, structural columns, model lines, room separation lines, ramps, rebars, trusses, structural framing, ducts, pipes, cable trays, conduits, equipment (mechanisms), air terminals, windows, doors, and even linked projects! Only on view plans and not for all categories.

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# Start, Stop, Continue



As you read the articles I write, you hopefully have gotten the idea that I think planning is paramount. “Fail to Plan, Plan to Fail”—a catchy quote I heard a very long time ago, attributed to Ben Franklin or Churchill and reused by many. I also think that planning should be a structured process. (Actually, I think most everything should be a structured process—be it high-level strategic planning or just planning the next upgrade to the software.) Sometimes it is quick and easy planning and other times it is rigorous. There are simple stages you can go through to begin and mature the planning process, but each needs to be stepped through in specific order to gain the full impact. I want to present one of the steps I include when I am trying to review where we are and where to go next.

When I am doing strategic planning or just want to review the current environment for tech expansion, I pull together key individuals, maybe 5 to 7 or even up to 10. We gather in a room for about an hour and I do what I call Start-Stop-Continue. I got this from something I read. Trouble with reading so much, you seldom can remember exactly where you got an idea, but I have been doing this for maybe 10 years or so.

## GATHER

At the meeting, we discuss ground rules before we start. It is a facilitated meeting and I take the lead. Participants must follow my

lead and be cordial. We respect everyone. No idea is too outlandish and nothing is sacred. Things we have been doing for years get the same review. Do not assume that an item is agreed upon until everyone really agrees. Don't let people pull rank. We are all just thinking out loud. No talking until it is time. When people start talking, the conversation will wander from one topic to the next without structure if you let the team just talk. People will dwell on a topic too long. They will start problem solving on a single idea. So when it is time to talk, I lead the discussion. We move on when I suggest it and stop chasing down rabbit trails. The meeting needs to be controlled.

Begin the meeting by reviewing the categories for the ideas. Write the column headings on the white board with enough room to stick multiple notes under each.

## IDEATE

Next, pass out sticky note pads and markers—same color for everyone. Remind everyone to not talk or discuss. Each person is to write down tech items, processes, procedures, standards, hardware, and software that they want to Start using, Stop using, or Continue using. Quick items are put in abbreviated form to fit on a 3x3" sticky. By having these categories, you tap into the general slant of each person. Some may be creative thinkers or want to push forward and they can spit out several “Start” topics off the top of their heads. Others may be critical thinkers and know exactly what to Stop doing that is unproductive or losing money. Still

## What are we not doing now that we should start doing?

### What are we still doing that should stop?

### What should be continued and improved?

others might know the core value of certain things that should be Continued. They may want to make some adjustments, but keep that item going at full speed because it is core to the value the firm brings to clients.

#### POST

As meeting participants write down items, they get out of their chairs and stick them on the white board under the appropriate headings. Start has the posted noted under it for things they think we should start doing. Stop has posts under it for things that we should stop doing. Continue holds those items to continue with some possible adjustments. It may also hold those items to continue and not change at all. The Continue column will usually have the least number of items. It is a way for someone to say, "Don't touch this."

As the people come up to the board, they are not to ponder other people's postings—just write down what they think. No names on the notes yet. Some may figure out who wrote what, but that is not a big deal. At this point, they are just writing the item they want to address. There are no bad ideas or unacceptable comments (other than personal attacks).

When the rate of people postings their notes slows down... maybe 10 minutes or less, then announce that you will stop posting soon... any last items? They can read what is posted, but not critique. Done? Good. Now stop posting and start reviewing. First gather similar items under each heading. You would be surprised how many people have the same idea. Just stick the similar notes on top of each other. This shows that the item got multiple backers who want to see something happen related to the topic. If you are confused over what someone wrote, then ask who wrote it and what they meant. Do not discuss the value of the idea, just clarify the meaning. Everyone should be willing to clarify what they wrote, even the negative things. Again—no critique or in-depth discussions yet. Just get the items grouped and clarified.

Now rank them as to priority. Some discussion can be done here. You can tally by most votes (duplicate stickies), or peel off the notes and arrange them by priority, or just pick the most obvious. Remember, there are no unacceptable ideas at this point. If they are unpopular, then move them down the list, but do not remove or discard them.

#### DISCUSS

Now go through items one by one and see how much traction each one will get. Begin with the Start column. This is always a good

point to begin discussions because these are new ideas, or at least they are things that you are not doing now. Do not plan on how they will be put into effect—this is not a tactical planning session. This is just to make a list of where to focus your efforts.

Move to Stop and continue the talk. Be gentle with these. Some of the longer term employees may love an old program, tool, or process and they may even have created it. Keep in mind that stopping is much harder than starting. Old habits die hard. Transitions take a long time to sink in.

Now do the Continue column. I sometimes call this Continue/Adjust. Don't just assume that you keep everything as it is for issues on this list. Think about how they might be refined to get more horsepower out of the tools or process. Some tweaking might be in order. Many firms continue a value-added process for too long without making minor adjustments that can capitalize on the good that they want to continue.

#### PLAN

Now begin the planning process. There is bound to be something on your three lists that everyone can get behind. Make a plan to move forward on this and other ideas that are at the top of the lists. Before leaving the meeting, set a time/date for another meeting. Review/define action items and assign tasks—who does what by when? Then when you gather again, you can move to the tactical part of planning—getting things done.



*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](http://www.caddmanager.com) and [www.bimmanager.com](http://www.bimmanager.com).*

# Exploring Annotations in ACA



**A**utoCAD® Architecture 2019 contains great annotation abilities. Annotations are basically notes or other types of explanatory objects (or symbols) that are commonly used to add information to a drawing.

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

## KEYNOTES

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

AutoCAD Architecture supplies pre-specified keynotes for its size-specific default detail components and for architectural objects that represent assemblies with multiple components. For variable-size objects and material definitions, a keynote classification group is pre-specified and you specify a size when the keynote is inserted.

For detail components, these keynotes and groups are based on the widely used MasterFormat 2004 standard maintained by the Construction Specifications Institute (CSI). For assemblies, the CSI Unifomat standard is used. However, because the software accommodates multiple keynote databases, it also supports other common or locally developed keynoting systems, so your localized version of AutoCAD Architecture may vary.

Whatever the source of the keynote, you can also associate it with a particular object style or material definition. This lets you use the keynote insertion tools on individual components of an object or on linework in two-dimensional (2D) sections or elevations. In cases where no keynotes are pre-specified, you select a keynote from the available database. You can also configure a keynote insertion tool to insert a particular keynote, regardless of the insertion point.

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

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

- ♦ **AecKeynotes:** This database is used for keynoting individual detail components and materials according to the Construction Specifications Institute (CSI) MasterFormat 2004 standard.
- ♦ **AecKeynotes-Assemblies:** This database is used for keynoting architectural objects that are assemblies of multiple components. These keynotes are based on the CSI Uniformat standard.

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

## NOTES AND LABELS

Text can be created in various ways. For short, simple entries, single-line text should be used. To create single-line text, begin by selecting the Text panel on the Annotation tab of the ribbon. Next, select the Text drop-down and select Single Line (see Figure 1). Specify the insertion point for the first character. If you press Enter, the program locates the new text immediately below the last text object you created, if any. Now specify the height of the text. Please note that this prompt is displayed only if text height is set to 0 in the current text style. A rubber-band line is attached from the text insertion point to the cursor. Click to set the height of the text to the length of the rubber-band line. Next, specify a text rotation angle. You can enter an angle value or use your pointing device and then enter the text. At the end of each line, press Enter and then you can enter more text as needed.

It is important to note that text that would otherwise be difficult to read (if it is very small or very large) is displayed at a legible size and is oriented horizontally so you can easily read and edit it. If you specify another point during this command, the cursor moves to that point, and you can continue typing. Every time you press Enter or specify a point, a new text object is created. When ready to end the command, press Enter on a blank line.

For longer entries with internal formatting, multi-line text (mtext) can be used. To create multi-line text, begin by selecting the Text panel on the Annotation tab of the ribbon. Next, select the Text drop-down and select Multi-Line (see Figure 1). You can also simply use the command MTEXT. Specify opposite corners of a bounding box to define the width of the multi-line text object. The MText ribbon contextual tab will be displayed. If you wish to indent the first line of each paragraph, drag the first-line indent slider on the ruler. If you wish to indent the other lines of each paragraph, drag the paragraph slider. To set tabs, click the ruler specifically where you want a tab stop. Now you can enter text.

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

Now, on the ribbon, you can format the changes (see Figure 2). If you wish to change the font of the selected text, select a font from the list. If you wish to change the height of the selected text, enter a new value in the Height box. It is important to note that the MText height value is reset to 0 if its default height is not modified during creation. If you wish to format text in a TrueType font with boldface or italics, or to create underlined or overlined text for any font, click the corresponding button on the ribbon. It is important to note that SHX fonts do not support boldface or italics. Now, to apply color to selected text, choose a color from the Color list. Click "Other" to display the Select Color dialog box. To save your changes and exit the editor, click in the drawing outside the editor.

## CALLOUTS

Callout tools allow you to define portions of the building model as details, sections, and elevations. These portions are placed in model space views created for the callout. A model space view is a portion

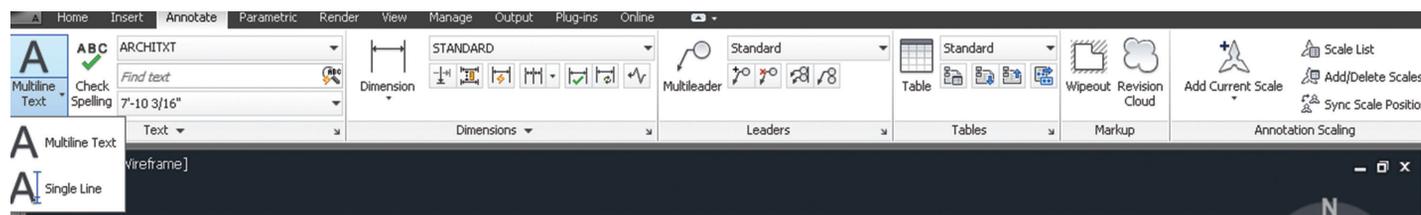


Figure 1: Create text



Figure 2: Text editor

# AutoCAD Architecture 2019

of a view drawing that may be displayed in its own viewport on a layout tab of a drawing. A model space view has its own name, description, display configuration, layer snapshot, drawing scale, layer state, and view direction. Model space views are an evolution of the Named Views concept of AutoCAD Architecture, but as opposed to Named Views, model spaces views have a defined boundary. You can place a model space view containing a detail, section, or elevation in the current view drawing, an existing project view drawing, or a new project view drawing.

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

## DIMENSIONS

Dimensions can be either associative, non-associative, or exploded. These are quickly defined as follows:

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

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

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

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

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

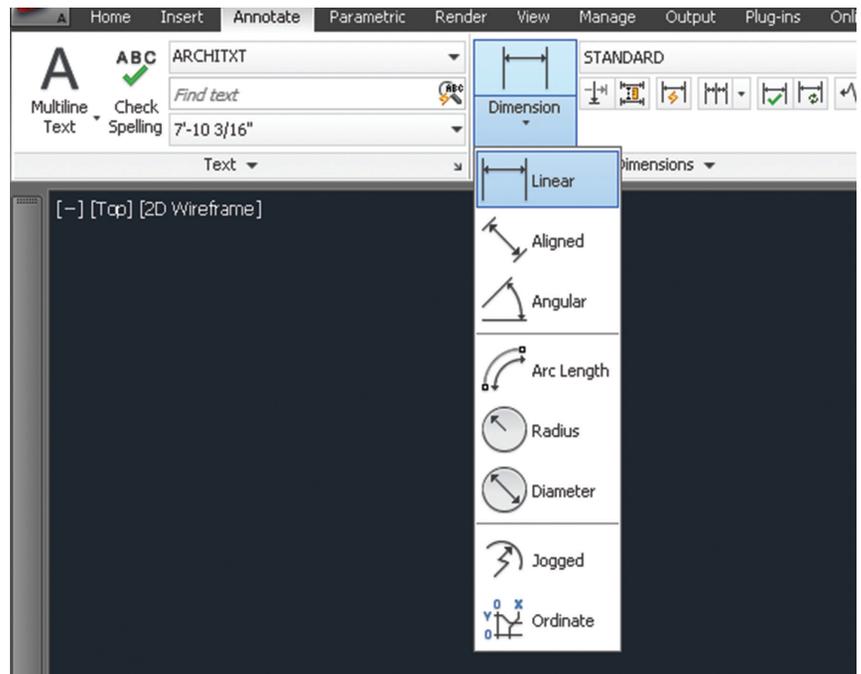


Figure 3: Create dimension

## HATCHES

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

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

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

It is important to note that, by default, a preview of the hatch displays as you move the cursor over enclosed areas. If you

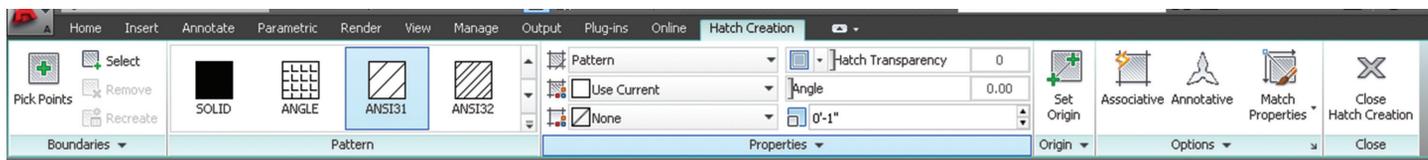


Figure 4: Hatch creation

need to improve the response time in large drawings, you can turn off the hatch preview feature with the HPQUICKPREVIEW system variable.

Hatch patterns can be dragged and dropped into your drawing from the Design Center. To do this, begin by selecting the Home tab, Draw panel of the ribbon. On the Hatch drop-down, select Hatch. This will open the Design Center toolbar. On the toolbar, click Search. In the Search dialog box, select Hatch Pattern Files from the Look For drop-down list. Now, from the In drop-down list, select the drive where the program is installed and confirm that Search Subfolders is selected. On the Hatch Pattern Files tab, in Search for the Name, enter \* (asterisk) and then click Search Now. The default hatch pattern file is acad.pat or acadiso.pat.

The search results may display the same file in different locations. It is important to note that you can add the .pat file to Favorites by selecting the file and clicking the Favorites button. A shortcut to the .pat file is displayed in the Favorites folder in the Design Center folders list. In the search results, double-click the filename to load the hatch patterns into the content area of Design Center. From the content area of Design Center, drag a hatch pattern into an enclosed area in your drawing or onto a tool palette. It is important to note that if the hatch pattern scale is too large or small, an error message is displayed. You can adjust the scale for any hatch pattern by selecting it to display the Hatch Editor tab.

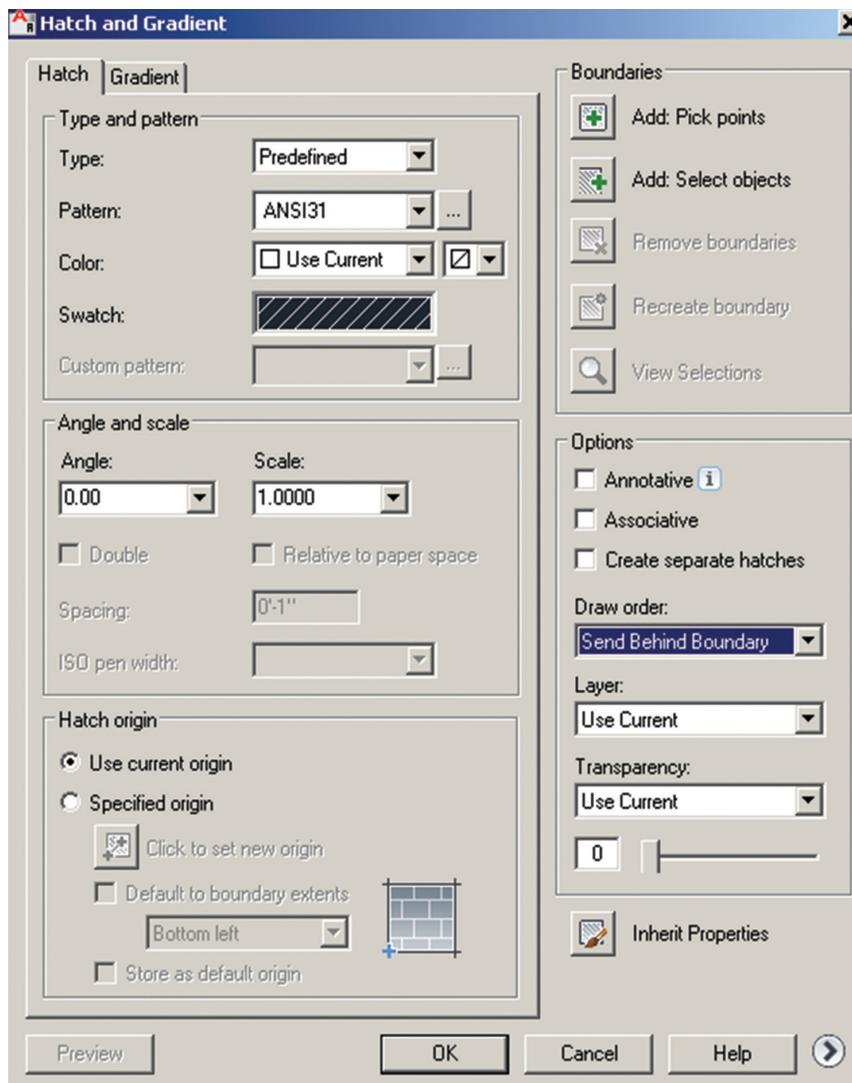


Figure 5: Hatch editor

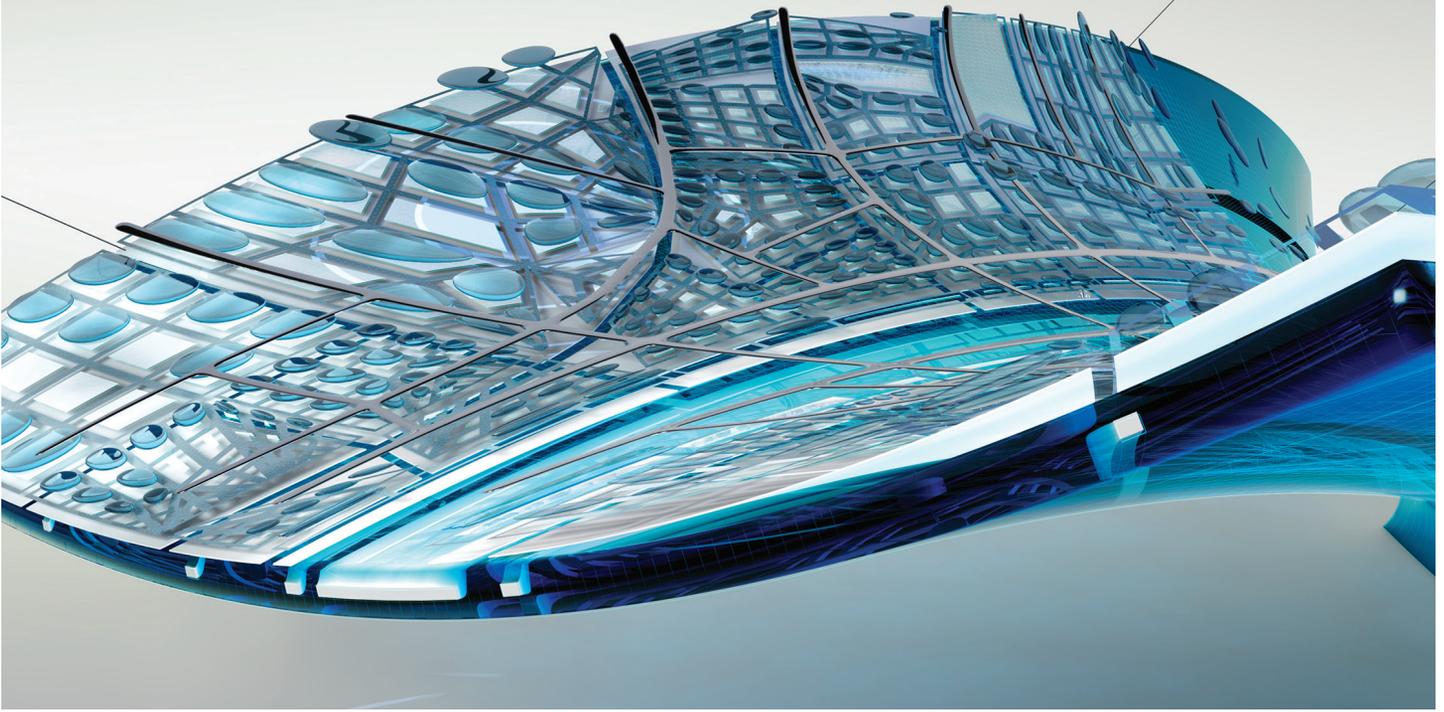
If you wish to hatch or fill areas, begin by clicking the Home tab, Draw panel of the ribbon. On the Hatch drop-down, select Hatch. Now, on the Properties panel, select one of the options from the Hatch Type drop-down list. On the Pattern panel, click a hatch pattern or fill. Specify a point inside each area to be hatched. On the ribbon, make any adjustments as needed (see Figure 4). On the Properties panel, you can change the hatch type and colors or modify the transparency level, angle or scale for the hatch. If you like, you can expand the Options panel and select one of the draw order options from the bottom drop-down list (see Figure 5). You can change the draw order of the hatch so the hatch is displayed either behind or in front of the hatch boundary, or behind or in front of all other objects. Now, press Enter to apply the hatch and exit the command.

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



Melinda Heavrin is a CAD Coordinator & Facility Planner in Louisville, Kentucky. She has been using AutoCAD Architecture since release 2000. Melinda can be reached for comments and questions at [melindahavrin@windstream.net](mailto:melindahavrin@windstream.net).

# InfraWorks for Beginners



For the past several years Autodesk has made great strides in making InfraWorks® a more powerful preliminary engineering design software in order to meet design demands by user. With InfraWorks, designers can design complex roads and bridges for public infrastructure projects as well as simple site 3D models. In addition, designers can also create preliminary drainage storm systems within roads and run drainage watersheds calculations. With that being said, for beginners it is important to get a good understand of the types of GIS data and also types of roads.

## IMPORTING GIS DATA

What makes InfraWorks such powerful preliminary design collaboration software is its ability to import various types of file format data. With InfraWorks, designers can import 3D models such as .3ds, .dae, .dxf, .obj, and .fbx file formats. Typically, these file formats are created from Navisworks®, 3ds Max® and Revit®. Other popular 3D model file formats are Revit (.rvt and .rfa) and SketchUp .skp formats.

For beginners, it is important to understand there are two basic types of GIS data: vector and raster data. Vector data is a real-world geometry object that contains metadata. Metadata contains attributes or data that comes with the vector geometry object. A few examples of vector data are roads, city furniture, coverage areas, parcels, trees, bridges, 3D models, buildings, and water features. Typically, metadata is stored in XML and HTML. Shapefiles, another great example of vector data, come with many metadata support files such as .shx, .dbf, .prj, and .sbx. When importing vector data into InfraWorks, you will have to configure the data because InfraWorks will not know what type of object you are importing (Figure 1).

Raster data are images such as aerial and satellite imagery. This type of GIS data does not contain metadata, but some contain georeferenced data, meaning they have a coordinate system data embedded or a support file that contains the coordinate system data. A great example is a world file (.jgw) that comes with a .jpg aerial file (Figure 2).

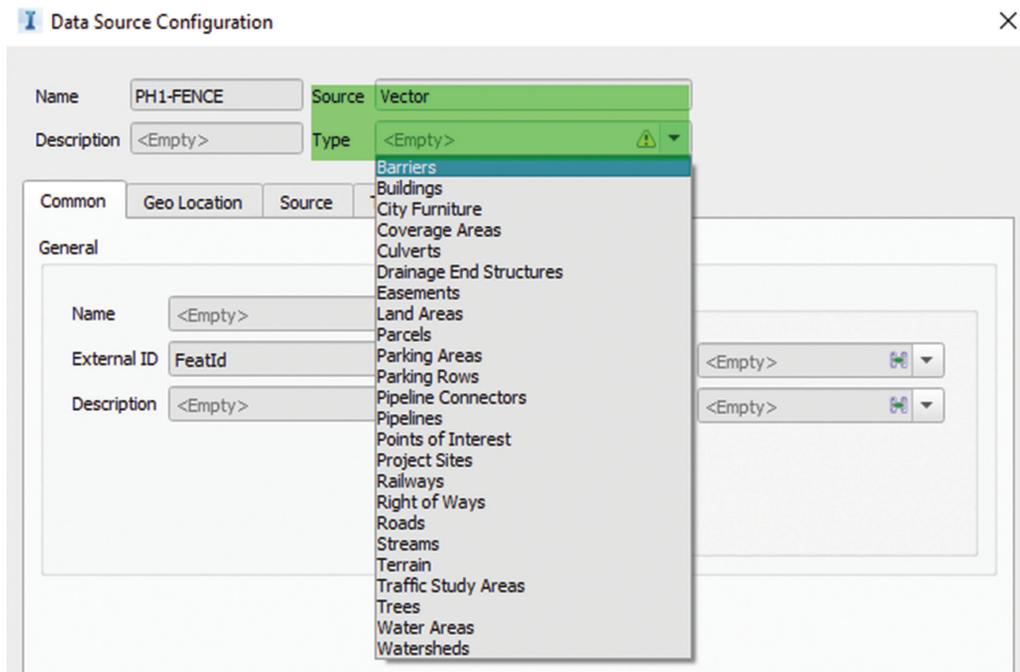


Figure 1

Surface terrain or topographic data can be vector or raster format but are typically imported as raster format. A few examples of raster terrain data is .asc, .img, .sid, .tif, .tiff, and .xml files (Figure 3). Raster files do not have to be configured when you import into InfraWorks.

If you use Model Builder to create a new model, the aerial imagery that is downloaded by InfraWorks comes in roughly at 85 percent resolution as default. To improve the aerial resolution, simply double click on the imagery file within the Data Sources panel to open the Data Source Configuration dialog box (Figure 4). Select the Raster tab, and at the bottom under Bing Maps, select 19 @ ground resolution from the pull-down list. You will notice a slightly better resolution quality once you click the Close & Refresh button.

File Format	Picture File Extension	World File Extension
Erdas Image	*.img	*.igw
jpeg	*.jpg/*.jpeg	*.jgw
MrSID	*.sid	*.sdw
TIFF	*.tif/*.tiff	*.tfw

Figure 2

File Format	Picture File Extension	World File Extension
ArcInfo ASCII	*.asc	
Digital Elevation Model	*.dem	
Erdas Image	*.img	*.igw
jpeg	*.jpg/*.jpeg	*.jgw
MrSID	*.sid	*.sdw
TIFF	*.tif/*.tiff	*.tfw

Figure 3

## ROAD DESIGN

InfraWorks provides two methods for sketching out roads and highways: planning roads and component roads. Planning roads is the simplest method to sketch out a roadway when vertical design is not important. Component roads provides numerous preliminary engineering design features and tools that a user can take advantage of to accurately design their roadway.

Planning roads are used purely for visual display for simple render exhibits or models. Within the Stack, designers can edit a few attributes of a planning road such as style, style rule, lanes, direction, and horizontal geometry. When you create a new model with Model Builder, the roads downloaded into your model are



Figure 4

# InfraWorks

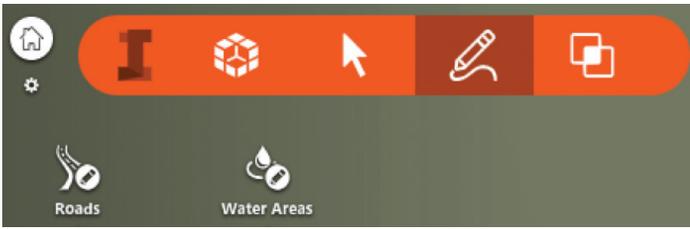


Figure 5

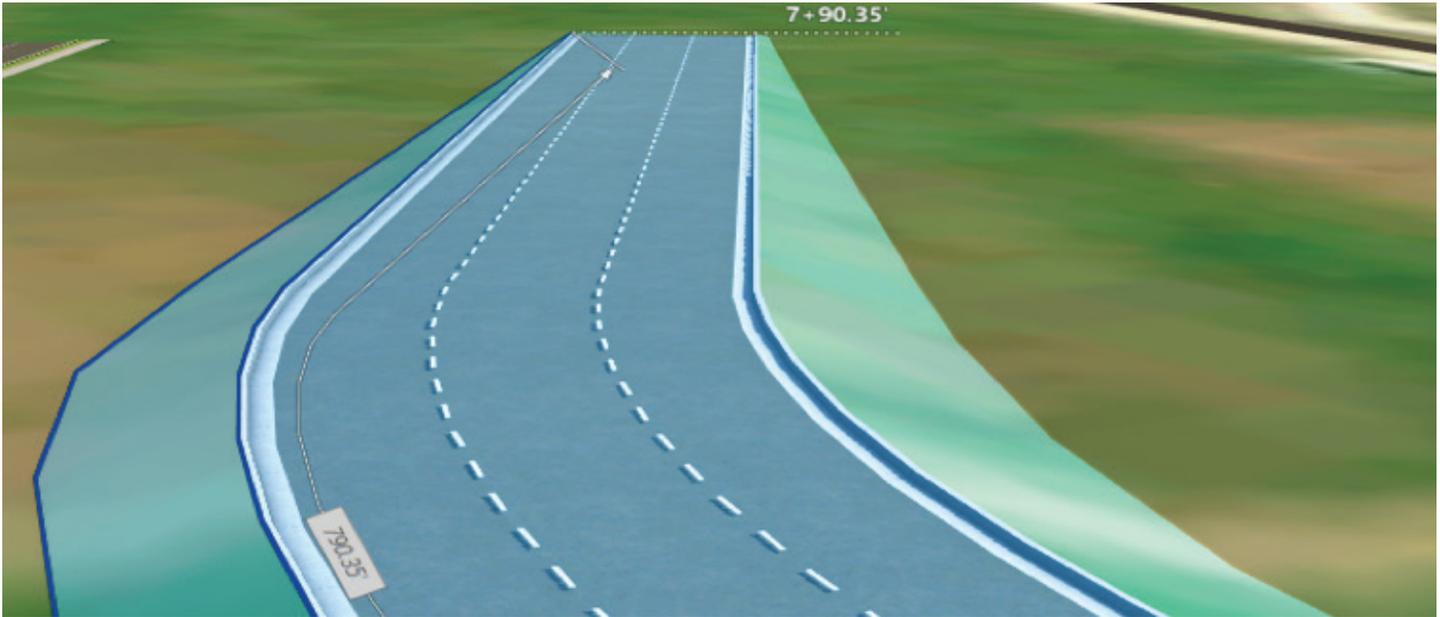


Figure 6

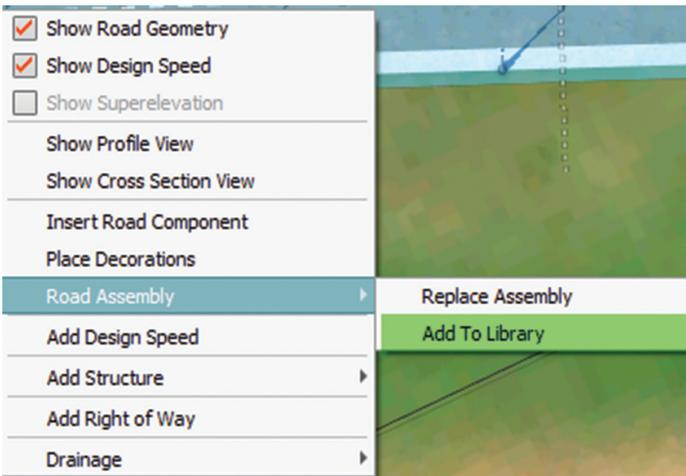


Figure 7

planning roads. InfraWorks allows users to convert planning roads to component roads by simply selecting any planning road, right-clicking, and selecting Convert to Component Road.

You can find the planning roads tool within the Intelligent Tools, Build-Manage & Analyze Your Infrastructure Model, Create Conceptual Design Features (Figure 5).

To create preliminary engineered design roads, designers will need to use the Component Roads design tools. Components roads consist of assembly parts that can represent curbs, sidewalks, lanes,

and medians. InfraWorks can display profile and section view of the component roads to better design roadways per local or state requirements. With component roads, designers have more precise vertical and horizontal control of their design roadway.

Controlling roadside grading and materials is just another added feature that designers can take advantage of with component roads (Figure 6).

Though InfraWorks provides many component road sections and single part assemblies, designers will still have to create custom road sections. Once you create a custom component road, you can add it to the Styles library for later use by simply selecting the component road, right-clicking, and selecting Road Assembly and Add to Library option (Figure 7).

In conclusion, for InfraWorks beginners, it is important to understand the difference between raster and vector GIS data and road styles.



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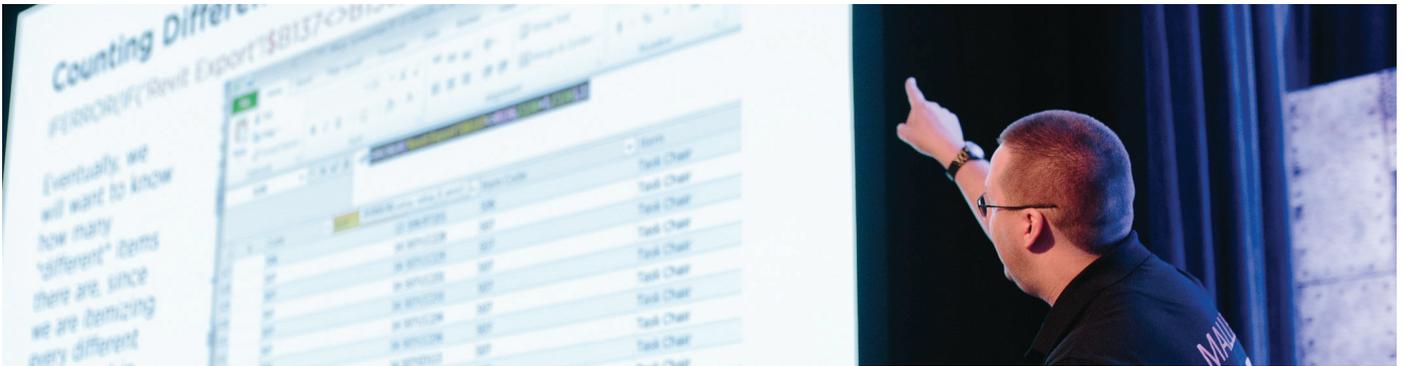
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# To Host or Not to Host



**F**amilies are the building blocks of an Autodesk® Revit® model. According to the Revit help file, “A family is a group of elements with a common set of properties, called parameters, and a related graphical representation.” They are the “things” that contain and display information in the model. In Revit terms, without families there would not be a Revit model.

Because families are so integral to a Revit model, it might be said that a proper grasp of Revit itself requires a proper grasp of families. However, the topic of families is a broad subject with several layers of complexity. In this article we will explore just one aspect of families: hosted versus unhosted.

There are three basic types of families: system, loadable, and in-place families. System families include elements like walls, duct, piping, and conduit. These family “systems” cannot exist outside of a project or template (.rvt or .rte, respectively).

In contrast, a loadable family is one that can exist externally from a project or template. These families have their own file type (.rfa) and can be created and modified independently of a project or template. Because these families can be stored in external file locations, they can then be loaded into projects on-demand, hence the term loadable families. When modifying or opening a loadable family, it is automatically opened in what is called the family editor, providing functions and controls specifically for family creation and management—different from what you would see in a project or template.

Lastly, in-place families are those that are neither a system nor a loadable family. They are project specific and generally reserved for unique scenarios where a loadable family is not pragmatic. In-place families are the least used kind of family.

From an MEP perspective, loadable families make up the vast majority of the kinds of elements that get placed in a model: air terminals, duct accessories, pipe fittings, mechanical equipment, electrical equipment, electrical fixtures, data devices, security devices, etc. Placing content in these Revit categories is what gives families their “intelligence” and also provides visibility controls for that content within a project.

There are several considerations when planning to create a loadable family. The help file does a pretty good job stressing the importance of planning what your family needs before just jumping in and beginning. Why? Because some decisions, once made, are not easily undone. Some properties cannot be toggled on and off. Understanding the desired behavior of the finished family and how to achieve it is essential to creating a successful family.

One such important consideration when creating a family is what Revit refers to as “hosting.” In the most basic terms, families are referred to as either being hosted or unhosted. Within each camp there is then further specification. Technically all family content in Revit is hosted, be it a wall, ceiling, level, or face. But the terms as they are used have taken on special meaning.

## HOSTED FAMILIES

A hosted family is one that requires a host in order for the family to be placed in the model. Types of hosts can vary and include walls, ceilings, roofs, and faces (the face of the hosting element; still hosted but less specific). For example, if a family is built to be wall hosted, that family can be placed only if a wall is available in the host model. This approach has its advantages. One is that geometry within the family can respond to properties of the wall, such as wall thickness.

Another consideration is that placement of the loaded family is a littler easier. During placement, if an acceptable host is not found

it cannot be placed. When an acceptable host is found, the family “sees” orientation of the host and responds accordingly. Proper placement is therefore less manual.

However, for most MEP uses, hosted families of this type are not practical. For starters they do not work across linked models. Very few projects have all disciplines working in the same model, so the most common approach is to have the architectural model(s) linked in as a background. In this approach, a wall-hosted family could not be placed in the MEP model because the walls exist in the linked model, not the host model.

Another rather large disadvantage is that if the host is deleted the hosted element(s) is also deleted. This makes sense (you can’t really have a door without a wall) but in terms of coordination across teams, deleting a wall could have unintended consequences. The deleted wall would also remove any light fixtures, air terminals, or electrical fixtures hosted to that wall.

A compromise of sorts are face-based families. These families look for the “face” of other elements, but not specifically a wall or ceiling, etc. This allows them to retain some of the automatic nature of the hosted family types. They see and orient to faces that can act as hosts. They work across linked models. If the hosting element is moved, the family will move with it when updated. If the hosting element is deleted, the family remains, unlike ceiling-, wall-, or roof-hosted families.

How a family is hosted is one of those properties that is not easily changed. It is a decision made at the beginning of family creation and cannot be changed later. Ten years ago or so, when MEP for Revit was beginning to catch on and manufacturers were beginning to offer more Revit content for download, this was a fairly common dilemma. What is the solution in this case? A convoluted process where you copy/monitor the hosted family which creates a face-based version of the family. Further adjusting and tweaking is still required, but it is often the best option compared to rebuilding content from scratch.

Face-based families also have two key characteristics that are important to MEP workflows. First, face-based families have a parameter called Default Elevation. This a hard-coded parameter that only exists in face-based families. It tells the family at what elevation (height) to be placed. This parameter only applies when placing content in plan views (not 3D or section) and only applies at instance placement. Changing the default elevation parameter value will not affect already placed elements and it also cannot be scheduled (Figure 1).

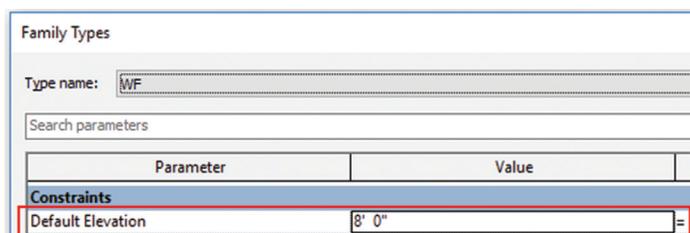


Figure 1

Secondly, certain family categories of face-based families have another important parameter to be aware of: Maintain Annotation Orientation (Figure 2). Because nested generic annotations are a common workflow in MEP, this forces those nested generic annotations to appear correctly in plan view. All the “device” categories have this parameter (data device, fire alarm device, electrical fixture, etc). Mechanical equipment, electrical equipment, and lighting fixtures do not.

There is a caveat: this only works if the element is parallel to the plan view. For example, if a ceiling or bottom of deck is sloped, the family will correctly host but the nested generic annotation will not be visible. A tag or other means will have to be used.

Face-based families do have some shortcomings compared to hosted family types. For one, they do not respond to the properties of the hosting element—wall thickness, for example—like other hosted types.

Second, while it is a positive that a family placed on a face will respond and move accordingly if that host is moved, it can also be a negative. If a ceiling moves too much in the vertical, it can cause duct connected to air terminals to have to “disconnect.”

Furthermore, the hosting information of a face-based family is tied to the element ID of the host. In order for the family to move with the hosting element, the hosting element must be moved—it cannot be deleted and redrawn.

There is also a known issue where the elevation of a face-based family placed in vertical (on a wall) is relative to the bottom of the wall. Therefore, if the bottom of the wall is changed, the face-based

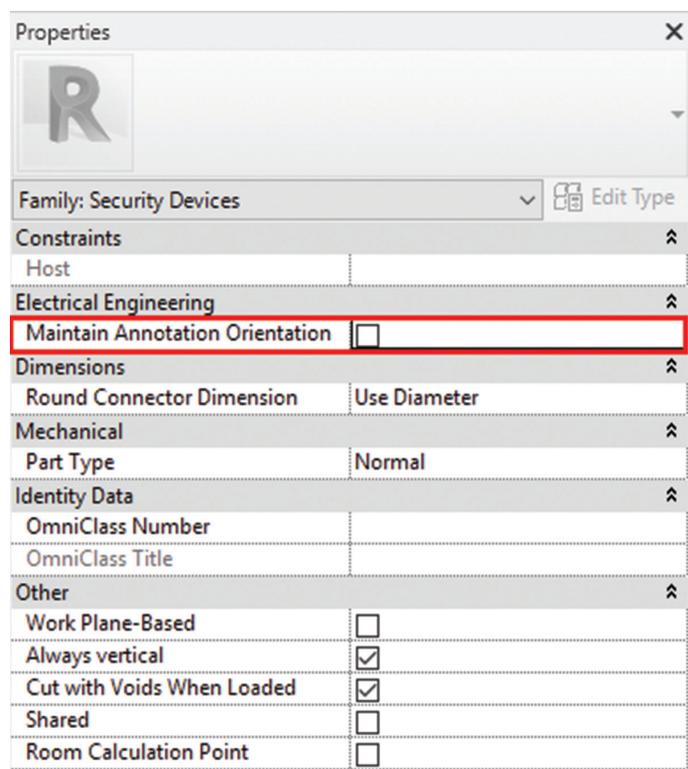


Figure 2

# Revit 2019 – MEP

elements on that wall will also move (incorrectly) in vertical. It is cases like this where automatic movement of face-based families can still go mysteriously “missing” when a linked model is updated, requiring users to find the elements that moved unexpectedly.

Revit does have a feature called Reconcile Hosting (Figure 3) to help find elements that have lost their host. Revit calls these elements “orphaned.” This can aid in finding elements or discovering where changes were made in the linked model(s).



Figure 3

## UNHOSTED FAMILIES

If all this sounds like too much trouble the other option is unhosted families (non-hosted/not hosted). As mentioned earlier, these families are still technically hosted. Unhosted families are hosted by a level. As such, I have gotten in the habit of calling them level-based families.

While these families lack the “intelligence” of seeing and orienting to model geometry, this can also be seen as increased flexibility. Translation: unhosted families can be placed independent of geometry (or reference planes), even if walls, ceilings, or floors are not in the model yet.

Both face-based and level-based families can easily be moved or copied in plan view, albeit differently. In plan view, a face-based family is constrained to the vertical face of its host. It can easily be move or copied along the face of that host. Moving or copying to

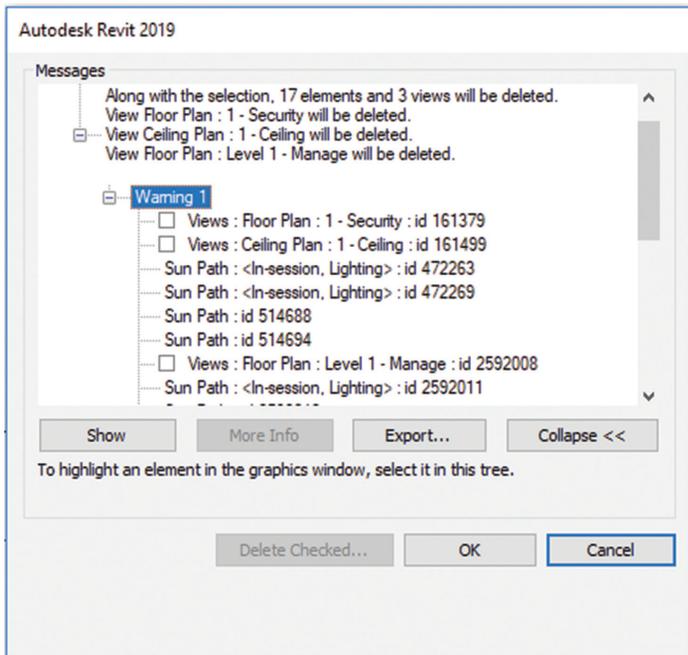


Figure 4

a different face requires it to be “unconstrained,” if using the move or copy command. Two other methods are to use Pick New Host or Create Similar.

For a level-based family, its constraint is the level. Its level association can be changed if desired. It can be moved or copied easily in plan view, but rotation must be achieved manually. This can be done using the Rotate command or by using the spacebar, which will rotate it in 90° increments.

One area of difficulty for level-based families is placement on sloped elements or planes. Taking a sloped ceiling or deck as an example, in plan view the symbol may look correct,

but in 3D or section the element will not be oriented correctly to the ceiling or deck. Because it cannot be rotated in the project, the solution is to build rotation parameters into the family to control its 3D geometry.

Unlike face-based families, a level-based family WILL BE deleted if its host, a level, is deleted in the project. Thankfully with Revit 2019, we are now warned that elements, not just corresponding views, will be deleted if the level is deleted (Figure 4).

Level-based families have an option to make them “work plane based” (Figure 5), which is as easy as toggling a checkbox in the family editor. This allows them to be hosted to faces and planes, but they will not host to vertical faces in plan view like face-based families.

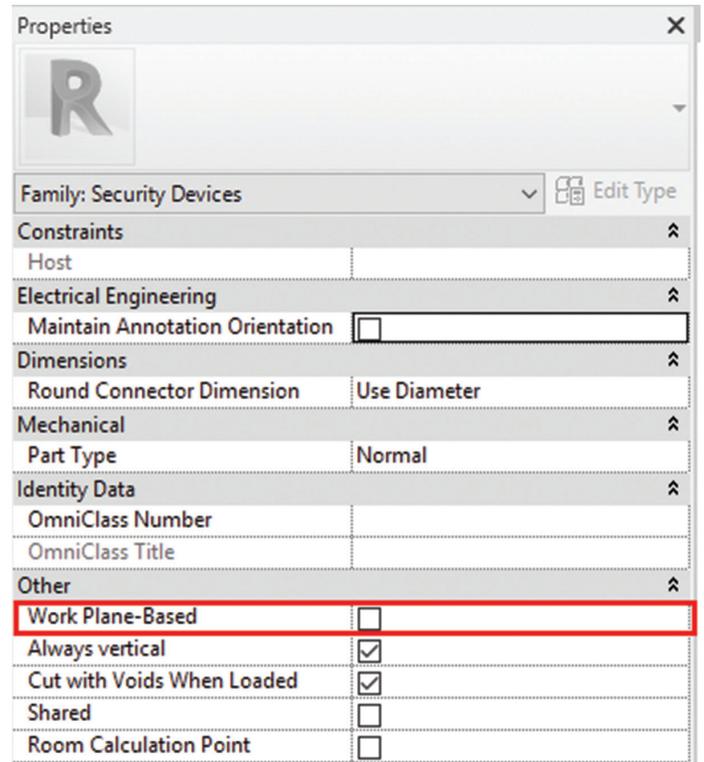


Figure 5

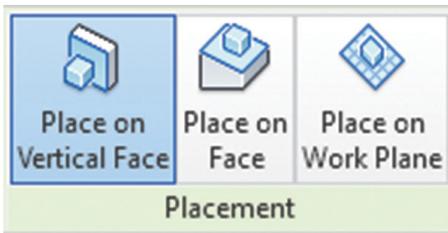


Figure 6

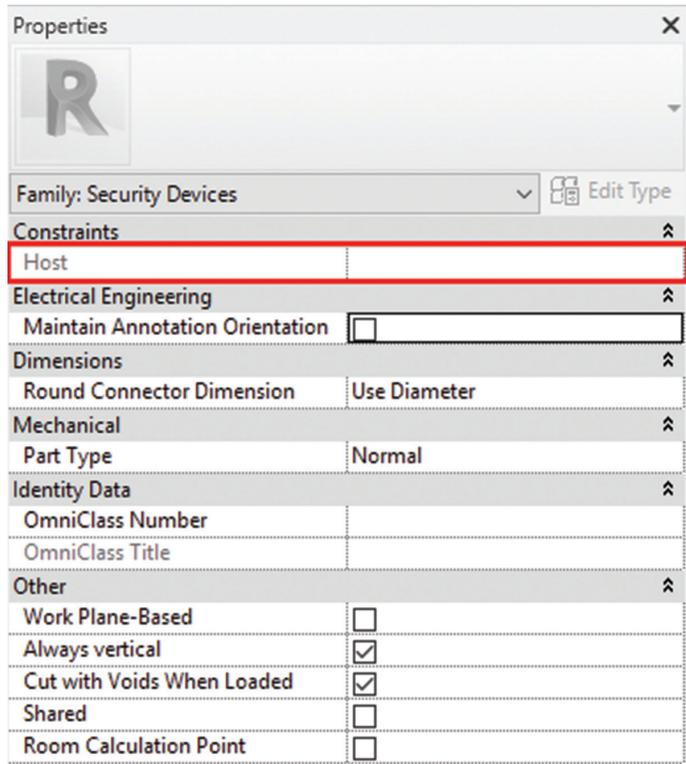


Figure 7

Want to know if a family is face based or level based? In a project, Revit offers many visual cues. When placing, if you see “Place on Vertical Face,” “Place on Face,” and “Place on Work Plane” in the ribbon (Figure 6), you know it is a face-based family. Also, a face-based family will display a stop sign and the family or nested generic annotation, if using, will not be visible when placement is not possible because a suitable host is not found. Conversely, a level-based family will not have these options in the ribbon and the family or nested generic annotation is always visible, assuming it is within the view range.

In the family editor you can determine if a family is hosted or unhosted by looking at its Constraints parameter properties (Figure 7). If it is hosted it will say wall, ceiling, etc. If it is face based it will say face. And if it is unhosted/level based, the value will be empty.

## FINAL THOUGHTS

One area where level-based families have a clear advantage over face-based families is when it comes to grouping. Groups and

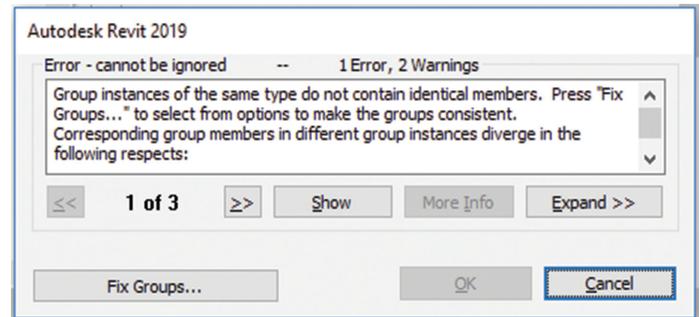


Figure 8

face-based families simply do not get along. You can make a group containing face-based families, but try to use that group in the model by rotating it or placing on other levels and watch the errors fly and the confusion set in (Figure 8).

So, hosted or unhosted families—what is the best choice? That depends. I was a die-hard advocate for face-based families, but now I take more of a calculated risk approach. It certainly depends on the desired goal and behavior of the family and project. Take a security camera as an example. It tends to be a unique placement, not replicated in the same location on multiple levels and not tied to a physical system, like duct or piping. This is a good candidate for a face-based family.

Now consider data devices as another example. These tend to be duplicated, depending on furniture and office layouts. A situation like that can typically benefit from groups to quickly and easily lay out devices. Thus, a level-based family may be a good choice.

This article has barely scratched the surface on the topic of Revit families. New user or seasoned veteran, when building Revit families it is always wise to consider the choices, and their consequences, before embarking on creating families. Over time, a library of families can be built to meet a multitude of scenarios and project requirements. To host or not to host? The choice is yours!



*Nathan Mulder has more than 10 years of experience in the AEC industry. He is currently the BIM and CAD Manager for Guidepost Solutions, a global leader in investigations, compliance, and security consulting, offering design services for security, telecom, and technology systems. A Revit MEP Electrical Certified Professional, Nathan is always looking for ways to fully leverage software to improve the project design and management process. Contact him at mulder.nathan@gmail.com or on LinkedIn.*

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