AUGIWorld

Industry Insights

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AUGIWorld

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Letter from the President

GREETINGS!

Welcome to December! This is my favorite time of the year! I love being able to spend time with my family and although things may be a bit challenging this year, we are certainly trying to make the best of it. Our Christmas tree went up the day after Thanksgiving, and we are excitely shopping, wrapping gifts, and baking cookies. Yum! My kiddos are too old to believe in Santa, but as a mom I still write "From Santa" on some of their gifts. These are just some of the traditions that we look forward to every year.

Speaking of traditions, our Annual General Meeting (AGM) is held the week of Autodesk University. Because of the virtual format of AU this year (thanks, COVID!) and because the AUGI reach is expanding beyond just Autodesk products, we are hosting our AGM virtually and independently from AU. The AGM will be held on December 9th, 2020, at 3:00 p.m. Eastern Time. We will have our favorite emcee, none other than Lynn Allen! We will also have other exciting presenters, presentation of our Wish List to Autodesk, news from the year, and a look ahead. AUGI has had a fantastic year and we are excited about what the future holds for our organization. You do not want to miss it! There will be a link to the AGM on the AUGI website (augi.com). Please watch your email for further details. We will certainly miss seeing those of you who attend AU in person, but we are thrilled at the possibility of reaching even more of our members with this virtual event.

This month's *AUGIWorld* issue is dedicated to Industry Insights. I think the coolest thing about our magazine is that it is written by people like you and me who are working in the industry day in and day out. With the different social media platforms available, it is easier than ever to keep tabs on the direction of your particular field. Our authors this month have been working diligently to bring you their own industry insights relative to design software.

As we look to the close of 2020 (and what a year it has been!) we are so very grateful for our members, volunteers, authors, and board members. We could not be the organization that we are today without each of you. I hope that the holiday season will bring you a fond moment to cherish even in the midst of the chaos that has been 2020. Now where did I put those chocolate chips??

Cheers!

Kimberly

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3ds Max – Industry Insights

Acceleration of online activity helps to boost 3D in the digital universe. As 3ds Max professionals standing at the forefront of the 3D realm, we can take advantage of the momentum. For this article, we will present areas expanding in this era of acceleration and how we can take advantage of it.

MACHINE LEARNING AND AI

Machine learning is advancing in technology at an incredible speed, impacting nearly every industry. We encounter machine learning daily. Netflix, Google, and Amazon use machine learning to target users to offer suggestions for content, searching, and shopping. Machine learning helps solve complex problems from estimating cancer risk, to determining the price of homes.

I will present a simple (perhaps crude) explanation of the machine learning process. Imagine ten people in a room. Five have red shirts, and five have blue shirts based on various characteristics of the people. We present a problem for the computer: determine which shirt ten different people should be wearing. The computer will attempt

to accomplish these tasks using complex algorithms. This process is called machine learning. A key strength of machine learning is the computer's ability to accept and review near-infinite levels of data. For example, in the scenario with the ten people I provided, we could limit the computer to only having the gender of the people or input everything from what types of films the people like to anomalies in their DNA. The computer will attempt to categorize and classify data, making their decision based on that input. With the ability to accept infinite levels of information, no requirement for sleep, never aging, becoming exhausted, or dying, machine learning has extraordinary advantages.

So, let me explain how this impacts us who work with 3D. To generate professional 3D content, manipulating video and photography is one of our most common tasks. A few of these

Figure 1

tasks include up-resing, denoising, tiling, perspective correction, and object-aware/content fill. In each of these cases, developers are working to apply machine learning to use the data available to help categorize, classify, and analyze the pixels on images (or frames in a video's case) to determine how to adjust them. So, let's talk about these cases.

Figure 4 – Creating Seamless Textures

Up-resing: Increasing the size of an image. Traditionally, when we change an image resolution from 100 pixels by 100 pixels to 800 pixels by 800 pixels, the process leaves us with a mosaic and Minecraft-worthy graphic. Machine learning methods allow us to increase the size of an image with better quality. Figure 1 shows the difference between an image scaled up traditionally versus one scaled up using up-res technology. Pay attention to the pixelation (mosaic pattern) on the roof with the traditional one compared to the higher quality image resized using up-res technology.

In most applications, we have the option to choose our method for the up-res. Take a look at Figure 2, a scaled-up portion of the image demonstrating the differences between up-resing in Photoshop using the Nearest Neighbor method versus up-resing using the Bicubic Smoother. The Bicubic option seems to apply a software gradient to the upper edge. Essentially, it is an antialiasing effect.

Figure 2
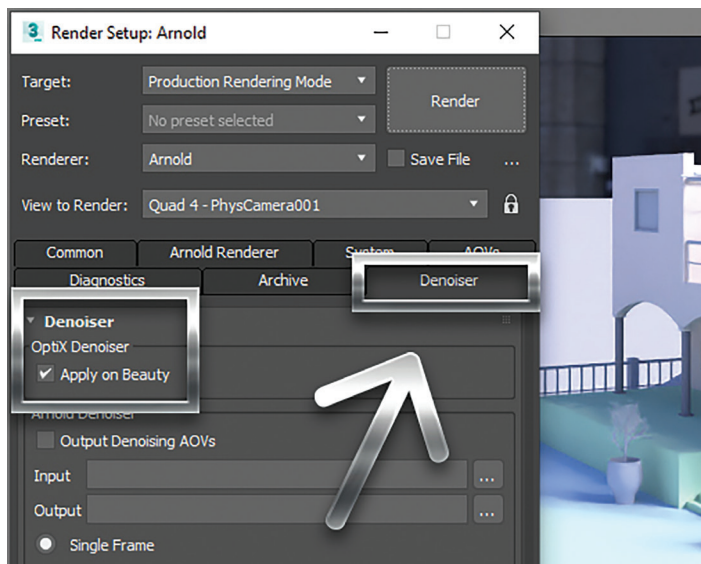
Figure 3 – Denoiser

Denoise: Removing unwanted pixels from an image. In the past, reducing render time meant unacceptable quality, resulting in sub-standard images covered with unwanted pixel dust (specks). Denoise technology allows us to remove those specks, producing an acceptable image with shorter render times. With 3ds Max 2021, you will find the Denoiser tab inside the Render Settings displayed in Figure 3.

Tiling: Duplicating a texture across an object. Before procedural tools, creating seamlessly tiled textures was a manual process. We would take a photo of a texture (a wall, for example) and shift it so that the top left corner of the image was centered, then extract the center portion of the original image and combine it with that to get a tileable texture. Before and after, we would have to clean up anomalies. Figure 4 demonstrates the process.

Perspective correction: Cameras in real and digital worlds present images with distortion. Perspective correction fixes this distortion. Additionally, perspective correction is applied to align objects with their environment. See Figure 5, where I imported a 3D model from 3ds Max into Adobe Dimension, then used the environment match tool to adjust the perspective and produce a product rendering; this makes it appear so that my product (in this case, a toy house) rests on the top of a table or desk.

Figure 5 – Product Presentation with Adobe Dimension

Object-aware/content fill: Removing a portion of an image and filling it back in with content matching the surrounding area. This tool increases the speed we can remove unwanted content for our renders quickly. See Figure 6, where I selected the general area of the elements I wanted to remove on the left of the image, and the

Machine Learning and AI

result produced displayed on the right. This process takes only a few seconds to complete.

VIRTUAL INFLUENCERS

The next item making waves in the 3D industry is virtual influencers.

Figure 6 – Content-Aware Fill
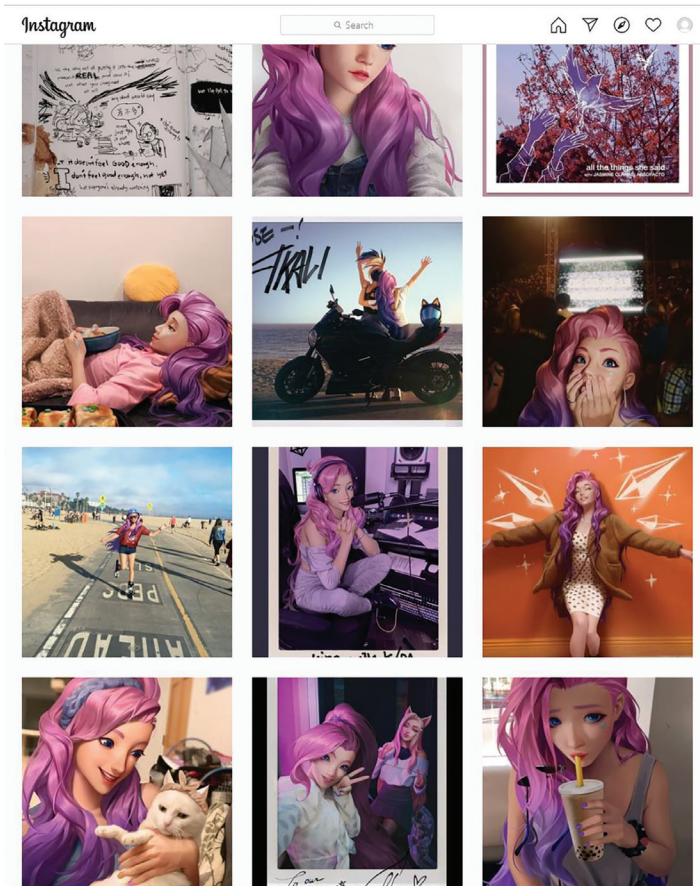
Figure 7 – Screen Shot of Instagram Account for Seraphine, Champion Character and Fake Popstar by Riot Games

With the internet making available influencers in epic proportions, investors are becoming more interested in capturing the market. Business Insider Intelligence estimates brands increasing their annual budget for influencer marketing from eight billion to fifteen billion.

Today, like it or not, influencers aren't just our favorite sports players representing their underwear, socks, or shoes anymore. They now come in 3D complete with environments, animations, shorts, music, dancing, have feelings, become brand ambassadors, fashion models, and even wear masks. Take a look at Figure 7. Riot Games created social media accounts where they act out the life of one of their champion characters online, Seraphine, who is a songwriter, producer, and pop star. Fans follow the life of Seraphine as she cooks, plays guitar, travels, and more.

Why would investors be interested in this, you ask? Well, they do not have to pay 3D characters. The characters don't die, don't get drunk, don't get addicted to drugs (unless they want them to), don't lick donuts at a donut shop (also, unless they want them to), can speak every language, and can reach any place in the world at the same time. Now, couple that with machine learning and imagine what you get. If you want to learn more, visit VirtualHumans.Org.

SUMMARY

As creators using 3ds Max, it is essential to pay attention to trends to avoid wasting time, money, and effort while capturing opportunities as they appear and producing the best content possible. It is crucial to use the tools available to us to create content efficiently. If you rendered a scene realizing it was a bit too small, try up-resing. If you want faster render times, try reducing the setting, then denoise it. If you wish to present your product well, import it to Adobe Dimension and match its perspective to the prebuilt environment. If you want to remove objects from a video to camera track and insert your proposed building, use object-aware and content-fill tools available in Adobe products. Finally, even if you always wanted to be an influencer but thought you couldn't, maybe you can create one.
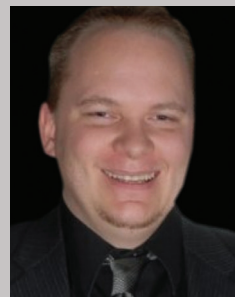
Brian Chapman is an Autodesk Authorized Developer, Digital Artist, Designer, and a CAD Application Specialist for an engineering firm located in Las Vegas, Nevada. Brian shares tips and tricks at procad.blog with a portfolio of digital artwork and renderings at emptypawn.com. Brian's email is procadman@pro-cad.net

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Civil 3D 2021

by: Jim Coppinger

Civil Corridors – We Don't Always Need Them

In the Civil CAD world, most of us know how to work with roadway corridors. We have fumbled thru at least the basics of developing center/baselines and attaching assemblies to help us get the 3D modeling that we need to generate our final road grading. From there, if we have the patience and appropriate training, we can work from corridor limits outward to start developing lot or pad site grading designs. Let's face it though: none of this is quick, easy, or in any way user friendly. Most of us do everything we can to avoid the endless struggle that is corridor creation and the myriad steps it entails for us to get such basic design information.

Well, how about we work our entire 3D grading design without ever touching a corridor or an assembly?

I know, you're thinking I'm going to talk about some cool new software or plugin that you need to buy, right? Nope. I am talking about handling everything you need, from the centerline of road layout thru final grading, using nothing but tools you're already comfortable with. Don't believe me? Just follow along with me in this article and you will! For this article, I am going to be using Civil 3D for my design tool (It doesn't really matter which version you're working with.)

We begin with a simple Alignment. Alignment creation is one of the easiest, and fastest, processes in grading design. It is where corridors begin and it's where we are going to start our "corridor free" design journey as well. Use the "Alignment Creation Tools" option, or "Create Alignment from Objects" to begin your design from a polyline you've already drawn on screen. Either way, we are
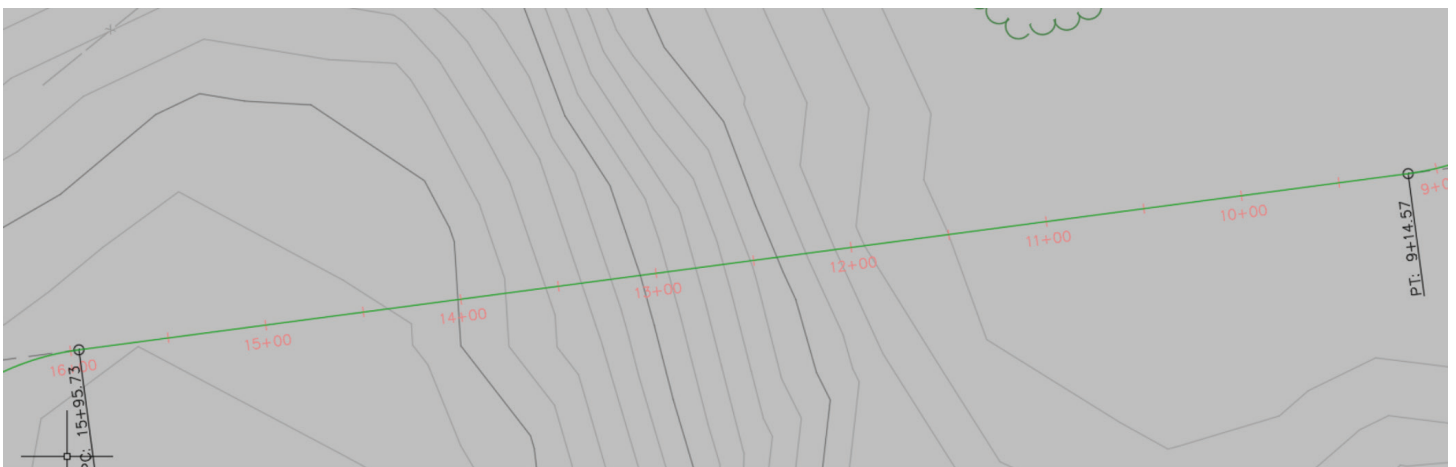
Figure 1: Simple 2D Alignment

just looking to get a 2D layout of where the road goes, as shown in figure 1.
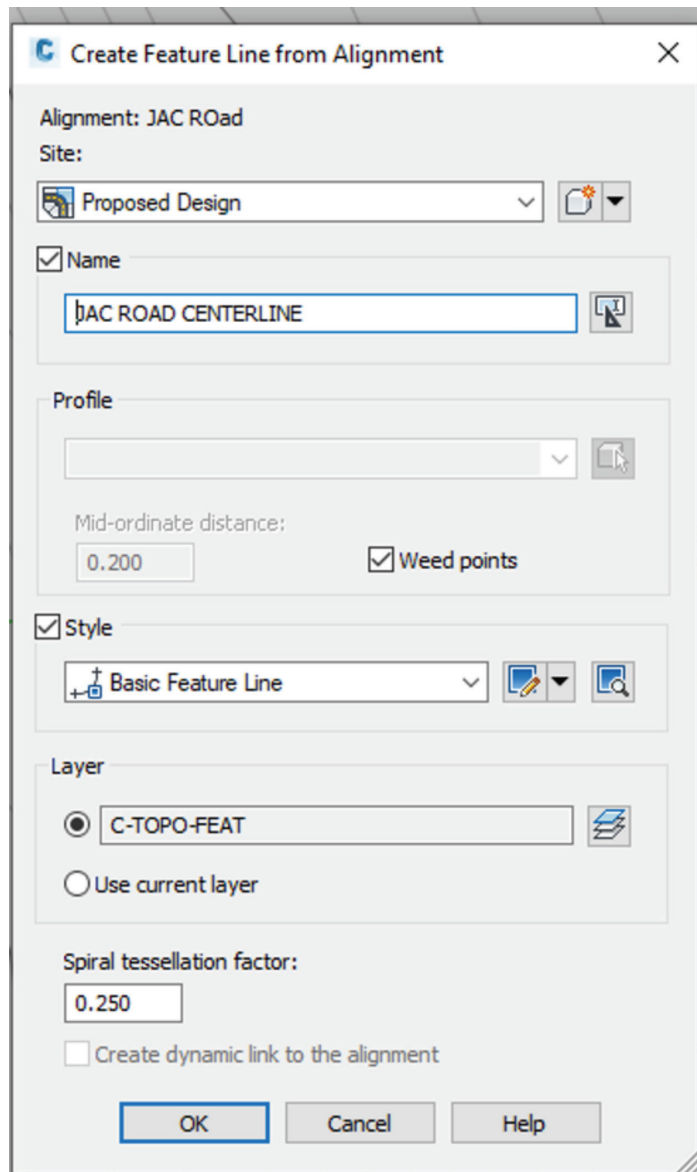
Figure 2: Feature Line Dialog

Just what you would do to start a corridor, right? Then you would move into creating profiles, assemblies, regions, etc. Instead, all we are going to do here is use the "Create Feature Line from Alignment" tool. The system will allow you to create a Feature Line, to which we can quickly add slopes, and elevations at all needed stations, PC/PT, etc. Just select your alignment, then fill out the dialog (figure 2) and select OK.

Once we've got a Feature Line, we can go into the Feature Line Elevation Editor off the ribbon bar (see figure 3) and we can adjust the specific elevations at each bend point on our design, or even change the grade in/grade out values to set fore/back slopes at the centerline of our road.

Once we've set all the elevations for the centerline, we can use the "Create Feature Line From Stepped Offset" tool, to easily offset from the centerline to our EOP/ETW at a -2% Grade to allow for the cross-slope of the roadway (see figure 4). These offsets calculate their elevations by adding/subtracting the % value you enter for grade and multiplying by the distance of the offset (i.e. 12' for a typical lane, etc.). Essentially, it is a simple rise/run calculation.

I can use the same tool, to "offset" top of curb, back of curb, sidewalks, easement lines, etc. each with their own slope controls between line segments. The idea is to structure a "wireframe" of your site, using simple offset feature lines. Once you have established those, you can do two different things (see figure 5).

1. Grade Side Lots Using Feature Lines
This is pretty simple; you're just going to use the basic Feature Line commands to generate the grades at the sides of individual lots. You can snap to specific points on your frontage (see below) or easement and begin creating side lot lines, using Feature Line slope/grade/elevation tools to control how the sides of each lot go up and down. This makes it easy to create swales and/or berms between properties, perpendicular to the offset lines we created.

2. Grade Using Parcel Tools
A lot of folks do not realize that Parcel Segments can have elevation and fore/back slopes applied to them in exactly the
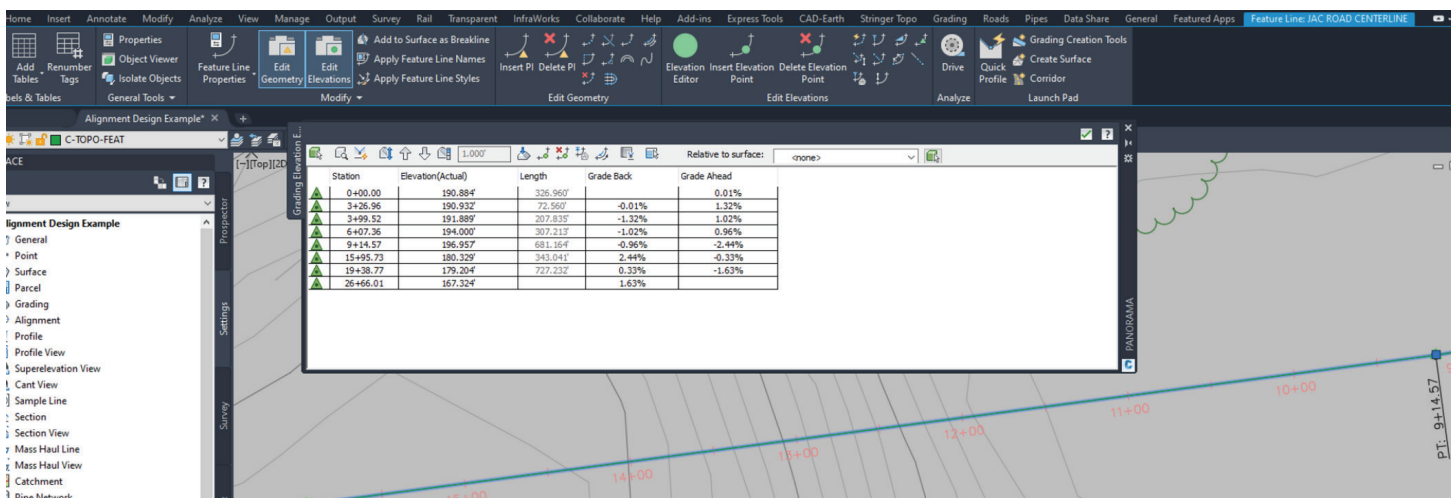
Figure 3: Feature Line Elevation Editor

Civil 3D 2021

way that a Feature Line can. That means we can take advantage of the Parcel Layout tools and create dozens of lots at once, say for a subdivision, and have each already set at grades we can use for building a 3D surface. That is an immense time saver and can dramatically speed up the grading process. *NOTE: The key thing here is that Feature Lines themselves cannot be used as Parcel definitions but use the eXplode command on them once and they're 3d Polylines, with elevations, which work just fine!*
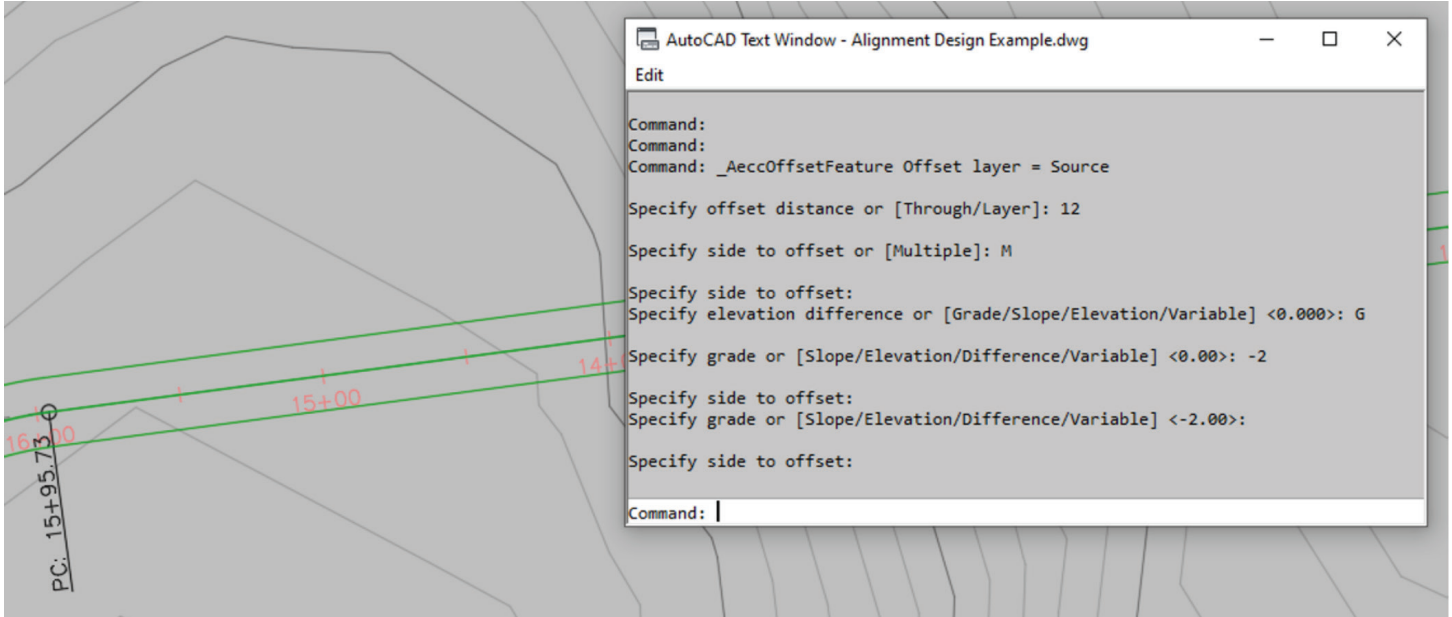
Figure 4: 12' Offsets Created @ 2% Cross-Grade
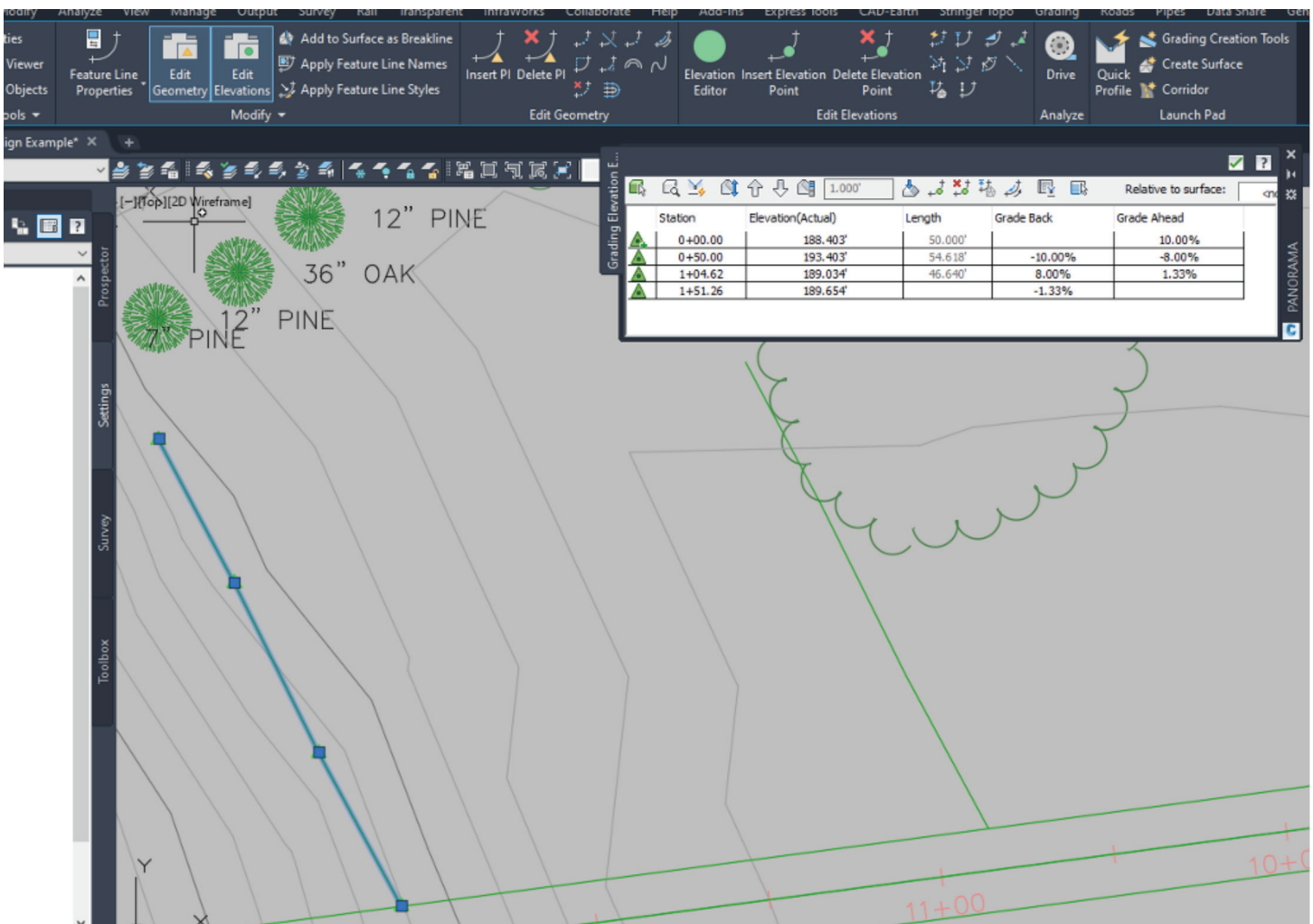
Figure 5: Grade Side Lots Using Feature Lines
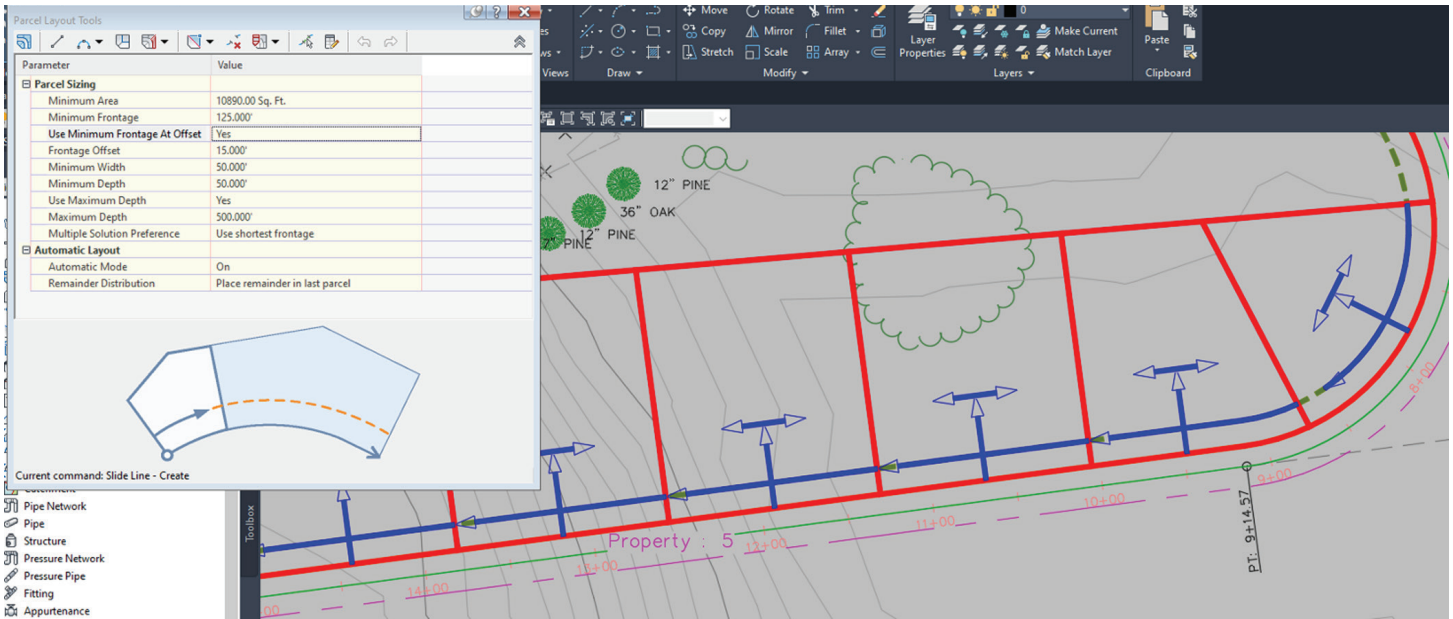
Figure 6: Parcel Creation Tools
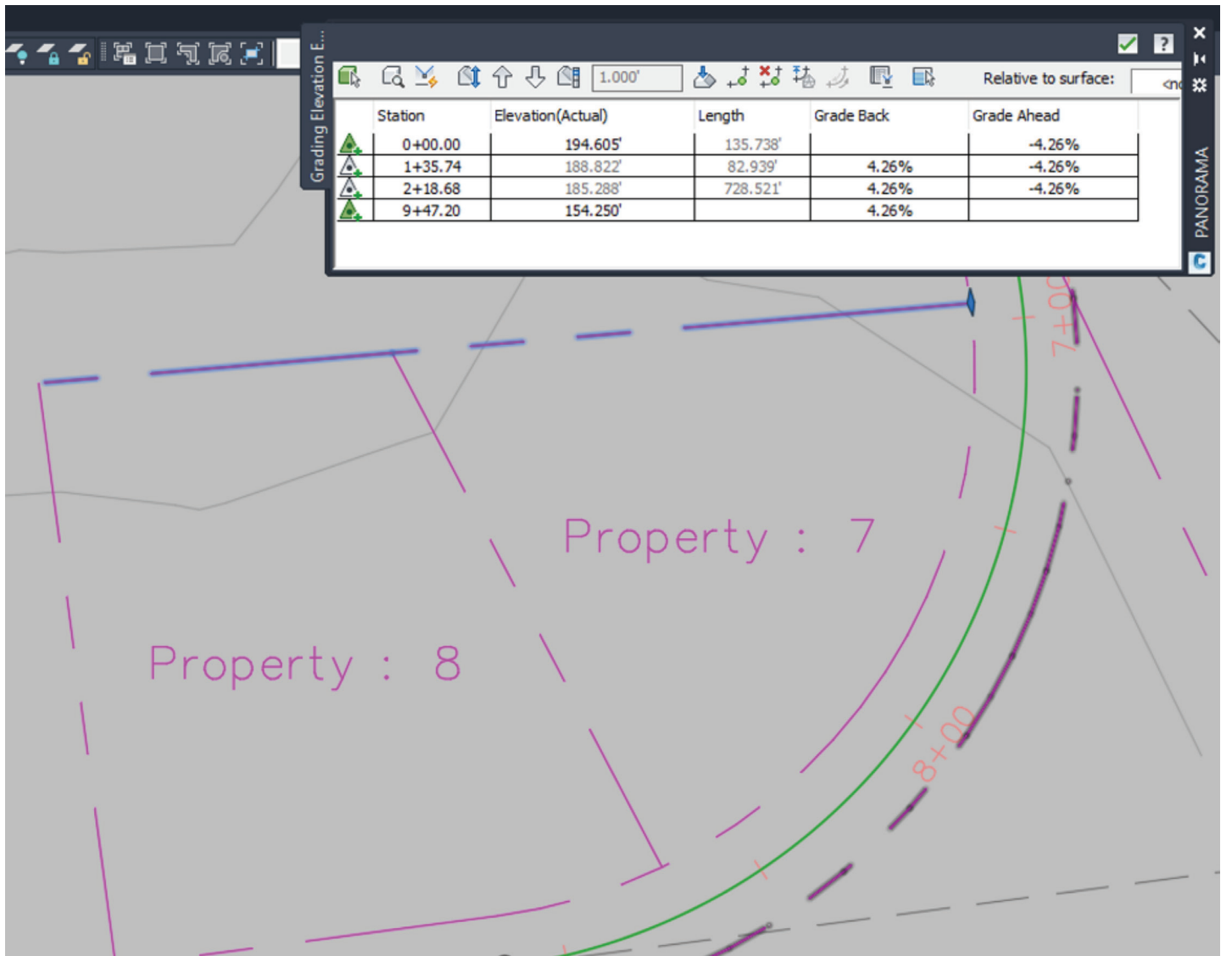
Figure 7: Parcel Segment with Elevations

Civil 3D 2021

Once the parcels are laid out, you can click on them and run the "Elevation Editor" tool to view/modify the elevation and slopes for each parcel segment and PI (see figure 7). This methodology is much faster than manual placement of side lots, but there are some limits to the initial editing of the side lot parcel segments. You will have to eXplode them in order to add/remove PI's (vertices). By default, the side lines are straight slopes that go from front yard to rear yard.

Ok, so these are all great tools, but what is the point here? After all, I said we were going to develop our grading surfaces with these tools, not just some parcels and curb lines! Well, that is the purpose of our wireframe structure: we've developed a series of linear objects, with elevations at each vertex, that we can now use as source objects from which to define a grading surface.

All we have to do is create a new surface, just the way you normally would, then use the feature lines and parcel segments we designed as "Breaklines" within that surface (yup, just pick them all as breaklines in one shot – it's that easy!) You will see that your road, curbs, sidewalks, swales, side lot controls – everything we've done are incorporated into the surface and we get the final contouring done for us in seconds, shown in figure 8.

The big thing to note here is that –as I promised—we never touched an assembly, corridor, or profile, yet we have a fully developed and accurate road design. Not just that, but we've even completed the surrounding grading design and all of our controls (feature lines, etc.) that are still dynamically linked to the surface so that if we need to go back and update the design later on, we just change slopes/elevations of the features and the surface adjusts. That is important because, let's face it, every design we create is going to change a hundred times before we get to the final submittal. Editing simple feature lines and alignments is far easier for most of us than getting into the Corridor Section Editor or dealing with the confusions

of assemblies and sub-assemblies with corridor region targets and vertical vs. horizontal code controls! Don't worry if you're not sure what all those things are, if you follow the process I've outlined in this article, you may never need to!

I will sum it all up by saying this: Corridors are fantastic tools, and they are wonderful for doing full blown roadway designs. If, however, all you really need for your project is the finished grading design and a few standard pavement details, then Corridors are a time-consuming overkill that you will want to avoid. Stick with simple tools that you know how to use and get your projects done in days, instead of weeks.

Jim Coppinger has over 30 years' experience in the design/build industry, working in estimating, project management, and both architectural/civil design. With decades of practical experience for large design/build firms throughout the U.S., Mr. Coppinger brings a real-world voice to the construction technology arena. He is also a noted speaker and writer on best practices for implementing practical software solutions in the AEC community. Since founding ZenTek Consultants in 2016 with his partner Rocco Parisi, they have helped hundreds of firms implement, configure, and optimize their design/build workflows. Mr. Coppinger is also the host of The CADDle Call podcast - the leading, nationally acclaimed resource on design/build technology.
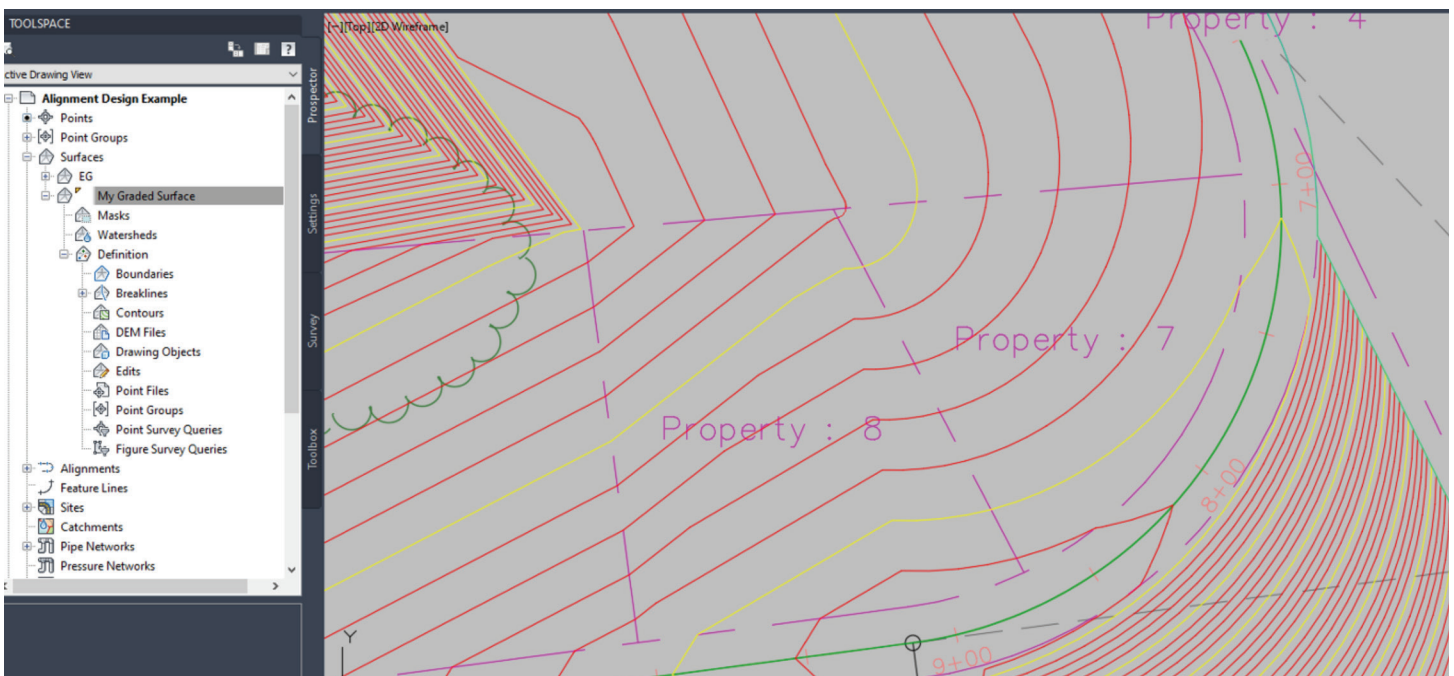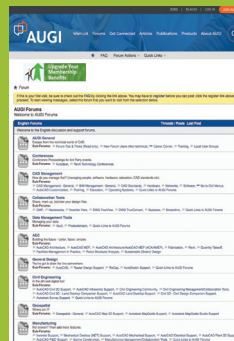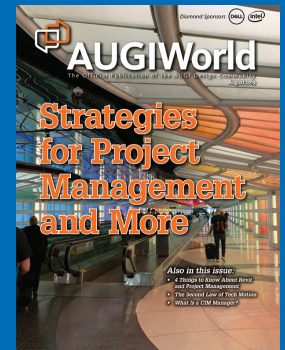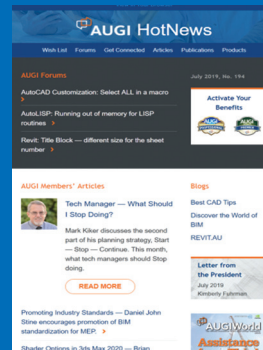
Figure 8: Finished Graded Surface

Tech Manager

by: Mark Kiker

Checklists

It seems like people love checklists, or they hate them. Personally, I love them. (So does Santa) But they do not apply to everything. I would suggest you not have a checklist for proving you love your spouse. You may use a checklist when a big event is coming, but not to prove you love them. "See, I love you… I said it three times last week, as per the checklist and I made the bed once last week on my designated day. Of course I love you." Checklists do however apply to a lot of things at work… and so I use them.

Back in Mid-2016, I wrote an article on Task Lists for *AUGIWorld*. Task Lists are a listing of the things I need to get done. That article provided ideas on why you need to manage your time and prioritize your work. I ended the article with ideas for making the Task List. Go back and read that when you have time.

Now I move on to the Checklist. But wait, aren't they the same thing? They may look like it, but a Checklist differs from a Task List. Task Lists help you not forget to do something. Once completed, they can be removed from the list. Checklists organize what you need to do, review, or do over and over. It helps you not to forget something because the Task you are doing has become routine. It also assists you in training others. Checklists also help you verify that things are included, excluded, added, or removed.

NATIONAL CHECKLIST DAY

You may have missed it. It was on October 30th. According to nationaltoday.com, there are several reasons why we love checklists…

A. It keeps you organized.
    Do you have a truckload of things to do and you don't know where to start? First things first with a checklist. This will help you organize your thoughts and your tasks.

B. It makes things visual.
    Putting all your tasks down in your checklist will help you see what you need to get done in its entirety. In case you forget anything, you have a visual reminder. Consider color-coding your list.

C. It brings a sense of accomplishment.
    It feels amazing to check off each completed task. When you do the hard tasks first, for the rest of the day, all your remaining tasks seem easier.

I agree with all of these and want to add a few more.

D. It helps you repeat the same things again and again. When defining a process, this is critical. As you work through the checklist, you can add or remove things as you think of more or think of ways to expedite efforts.

E. It helps training others or have people help you out. With a checklist, anyone can step in and take over, or learn to do it themselves.

F. It helps you review all the items needed and may uncover automation opportunities or areas where you can reduce the checklist by uncovering non-needed items.

G. It helps you NOT assume things are done. With a checklist, you can verify that everything is in place and completed.

H. It lets you "trust but verify" – one of my mottos. Sure, I think I do a good job, but check the list to see if I did it all. Sure, I think you are good at what you do, but I check the list to make sure nothing slips through the cracks.

Checklists can be for procedures and processes. They can be in a specific order and numbered so that one thing is done before another. They can be simple check boxes and list out what is to be included or excluded. Like a list of what to take when you go camping. They can be grouped or free flowing. What makes the checklist is that they do not tell you how to do things, just what needs to be completed.

Occupational Safety and Health Administration (OSHA), under the US Department of Labor, has a checklist for your computer workstation ergonomics. It helps you verify that you have thought

of everything needed for comfort, health, and productivity. You can see it here - https://www.osha.gov/SLTC/etools/computerworkstations/checklist_evaluation.html

It takes into account your posture, chair, monitor, keyboard, mobile devices, accessories and more. Go check it out and see how you fair in your home office or work location.

Here is a highlight…

MONITOR – Consider these points when evaluating the monitor and its placement.

1. The monitor has sufficient adjustability so the top of the screen is at or below eye level so the user can read it without bending their head or neck down/back.

2. Adjustability is sufficient so users with bifocals/trifocals can read the screen without bending the head or neck backward.

3. There is sufficient room so the monitor can be placed at a distance which allows the user to read the screen without leaning head, neck, or trunk forward/backward. (Generally, about 18 to 20 inches or arm length)

4. Monitor position is directly in front of the user, so they do not have to twist head or neck.

5. If multiple monitors are used, the position of the primary monitor is directly in front of the user and the other monitors are directly beside it. If time is split evenly between monitors, they are next to each other within a comfortable viewing angle with minimal head movement.

6. Glare (from windows, lights) is not reflected on screen causing the user to squint or assume awkward postures to clearly see information on the screen.

7. Monitor brightness and contrast is adjusted for comfort.

I did pretty good on this section, but others need some work.

Way back in the dark ages, I made a CAD Review Checklist for reviewing files prior to sending them to clients or consultants. You can see it at http://www.caddmanager.com/CMB/2007/01/cad-file-review-checklist/

Here is a portion:

+++++++
Checklist for reviewing CAD Files:

1. Directory Structure
   a) Are the folders correctly named?
   b) Are there any unneeded folders?
2. Files and File names
   a) Are the filenames correct?
   b) Are there any junk files that should be removed?
3. Layers
   a) Is the layer list clean?

b) Are the layer names correct?
c) Are the objects on the right layer?
d) Are the linetypes correct?
4. XREF Attachments
   a) Are the attachments on the right layer?
   b) Are they in the correct location?
   … much more
+++++++

IDEAS FOR CHECKLISTS

Here are some ideas and I am sure that you can come up with many more:
✓ New project setup
✓ Computer setup/refresh/swap – what needs to be done when giving a user a new computer
✓ Diagnosing a file problem
✓ Creating content for CAD libraries
✓ Revit Family development
✓ Project archiving
✓ Training checklist
✓ When vetting software for purchase
✓ Quality Assurance – when accepting files/models from others
✓ Checking files against CAD Standards

Once created, always look for things to add to the list or remove. Checklists are never static. As you learn new lessons, add items to the checklist.

WHEN NOT TO USE A CHECKLIST

Like I mentioned, expressing love to a spouse, or child may not be the best use of a checklist. Others might be when you are in a pinch and need to act fast. No time to go get out the checklist. Stop the bleeding and then go look for the list. And when you are researching options, no checklist may be viable once you really do not know where you might end up. Checklists usually are developed once you have an idea of what is needed.

So, you have a good starting point. Now go out and make some checklists or review the ones you have… but first check off "reading AUGIWorld" from your list.

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.

Inside Track

by: Brian Andresen

Welcome to *AUGIWorld* Inside Track! Check out the latest opportunities to advance your skills, processes, and workflows in your firm with the most current AEC-related software and hardware updates available.

ParametricText

https://apps.autodesk.com/FUSION/en/Detail/Index?id=2114937992453312456&appLang=en&os=Win64

Autodesk Fusion 360

ParametricText is an Autodesk® Fusion 360™ add-in for creating Text Parameters in sketches.

Text parameters can be pure text or use parameter values by using a special syntax. There is also a special parameter, that contains information about the document's version and saves date.

All parameters are stored within the document upon save. The texts are always "rendered" in the sketches, so they can be viewed without having the add-in. However, to correctly update the values, the add-in is needed.
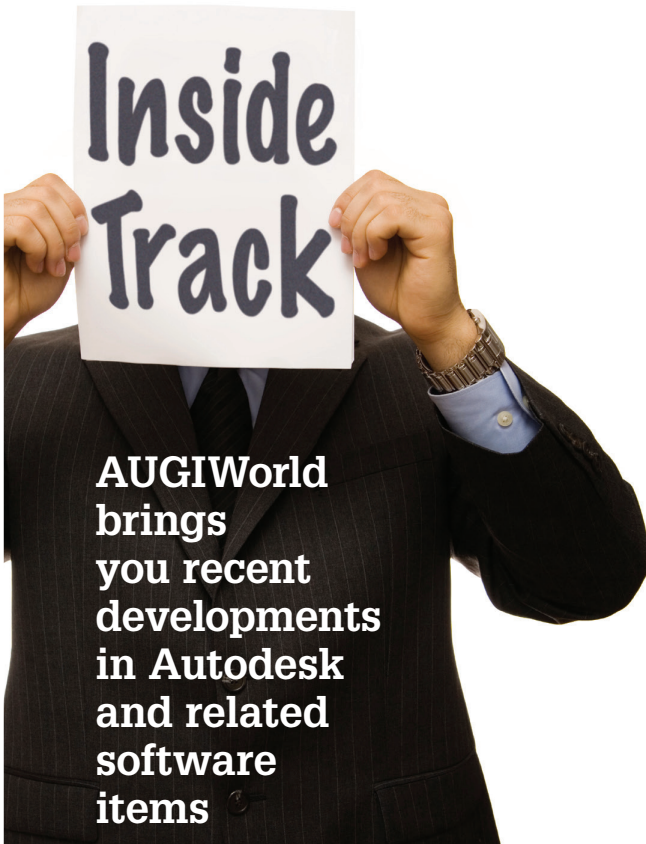
AUGIWorld brings you recent developments in Autodesk and related software items

If you have some news to share with us for future issues, please let us know. Likewise, if you are a user of a featured product or news item and would like to write a review, we want to know. brian.andresen@augi.com

MEP_UpDown

https://apps.autodesk.com/RVT/en/Detail/Index?id=5443718852969449845&appLang=en&os=Win64

Autodesk Revit
Version: 2021 , 2020 , 2019 , 2018

It helps edit level offset up or down for coordination of MEP elements. With just split and input value, this add-in redraws elements automatically. MEP elements are duct, pipe, cable tray, and conduit. It can reduce modeling time and improve model quality.

MuM Multitool

https://apps.autodesk.com/INVNTOR/en/Detail/Index?id=3826146264845665861&appLang=en&os=Win64

Autodesk Inventor: 2021 , 2020 , 2019 , 2018
Autodesk Inventor Professional: 2021, 2020, 2019, 2018

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Printing all IDW drawings from an assembly (IAM): Print all the drawings belonging to an assembly (IAM) without having to open each file individually. You can easily choose which files you want to print like and, thanks to predefined print templates, these are output in the correct format as desired.

Consolidate and display technical iProperties: A quick overview gives you an overview of the most important technical and physical properties of iProperties. For example, material, weight, volume, total length, parameters set to export, or detailed sheet metal parts are displayed.

Dimension favorites: Recurring dimension specifications such as tolerances, fits, dimensions, diameters, or special characters are configured once and can then be retrieved again and again and easily managed. In the inking mode, text can be highlighted in color; e.g. as a special note for the production.

Collective data for surface characters: Collective specifications for surface details are automatically compiled and updated at the click of a button thanks to MuM Multitool for Inventor.

Fits list: MuM Multitools for Inventor creates tolerance tables on Inventor drawings and automatically fills them with the corresponding fits. Updates automatically apply in the list.

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Virtual Desktops

by: Brian Smith and Andrell Laniewicz

We've heard it many times: Virtual Desktops (VD) are going to be the future. Those of us who use Revit enjoy laughing at that statement. We've tested them and had countless problems with Virtual Desktop Infrastructure (VDI) Graphics Processing Units (GPUs). Or, ran into limitations with Revit as Revit only utilizes one core of a GPU, so why pay for a VD that can handle heavy work loads when it would be underutilized. We've also had some less-than-fun interactions with Remote Desktop Connections (RDCs) and Virtual Private Networks (VPNs).

While Revit still only uses one core, the rest of the industry has made leaps and bounds in progress. It is worth a look now.

WHAT IS VDI?

If you are – or were – anything like me, those series of words and acronyms would send me running. My eyes would glaze over, and I would think 'this is for IT'. Well, if you are – or were – also like me, you've experienced how BIM and IT have a sordid history. Since I know where you're coming from, I'll make the following as painless as I can!

VDI is the concept of taking a localized computer system, or resources, and putting them on a server. This server can be local to a company or cloud based and hosted around the country, or even world. VDI has been around for a while – so long that it has a connotation in our head usually around an old server in our IT person's closet office.
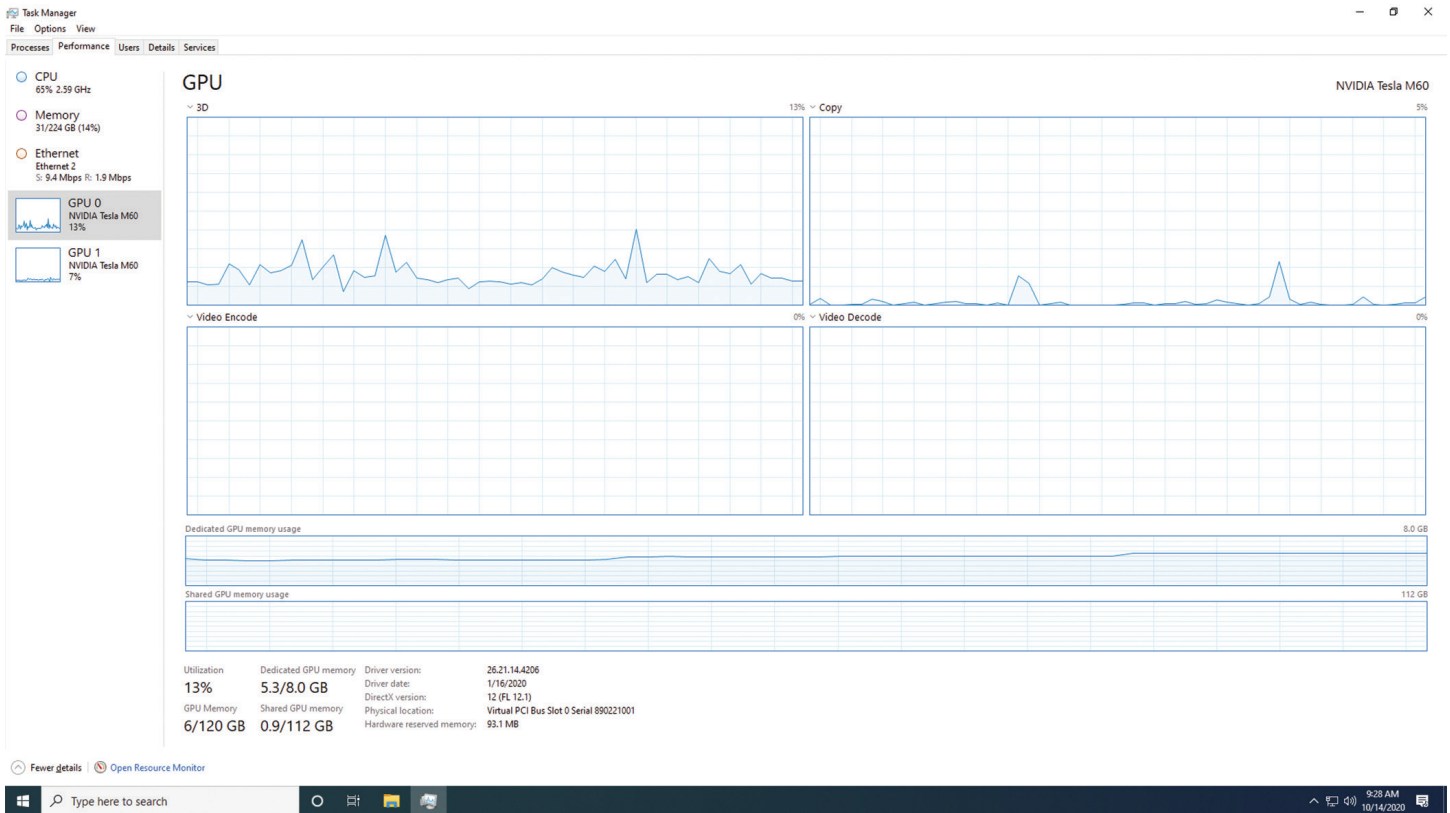
Figure 1

Today, you are far more likely to hear "Virtual Desktop" in association with the company that you are purchasing the solution from. For example, WVD or Windows Virtual Desktop. Virtual Desktops are smoother and more cost efficient than ever.

Today's Virtual Desktops have multiple users accessing a shared pool of resources from a host system or network of host systems capable of handling all anticipated users. Host systems are usually made up of servers, which are interconnectable computers dedicated and optimized to perform specific tasks. The host system or network provides whatever processing power and memory is needed for its users, scaling up and down dynamically. How is that even possible? As demand grows, additional hardware resources are engaged to meet the demand. Over time, as the user base and software needs grow, hardware is added or upgraded (figure 1).

Each user has a local profile on this 'supercomputer' and functions as if the user were entirely on their own computer, but they can access it from any computer remotely (figure 2).

WHY WOULD YOU USE A VIRTUAL DESKTOP?

Virtual desktops alleviate a lot of IT Infrastructure challenges.

Are you having issues with bandwidth or connectivity when doing work remotely or over VPN? Virtual Desktops are a window into work that is actually happening in the remote host system. There's no need for enormous files to be transferred back and forth over the user's personal network connection. The files, software, and resources are in the same bubble, with optimized connections to each other. This effectively bypasses bottlenecks from VPNs or your personal computer's network.

Have your IT costs gone up more than anticipated trying to keep up with software demands? With Virtual Desktops, you do not need a high-end computer for every user to connect to the host system. You can have a thin client (cheap computer) connect with a Virtual Desktop further reducing hardware costs. Virtual Desktops are also scalable, so you only pay for what you need when you need it. Within a short period of time, a baseline of the costs and usage would be established and therefore it is highly predictable. Think of it as a monthly subscription cost or fee instead of an upfront capital expense.

Is it difficult to keep everyone updated, on the correct versions, and to troubleshoot when there are differences and quirks that accumulate between every user's computer? Virtual Desktops give your IT team centralized control over deployment, management, and updates with a lower failure rate. End-user experience is customizable, but access control is centralized. If something goes wrong, a new profile can be 'spun up' to allow a user to keep working while Virtual Desktop with an issue can be tested and sent through the troubleshooting battery of tests. That means less down time.

Have you tried a VDI solution before and had problems with multiple monitors? Today's Virtual Desktops support that!

Virtual Desktops
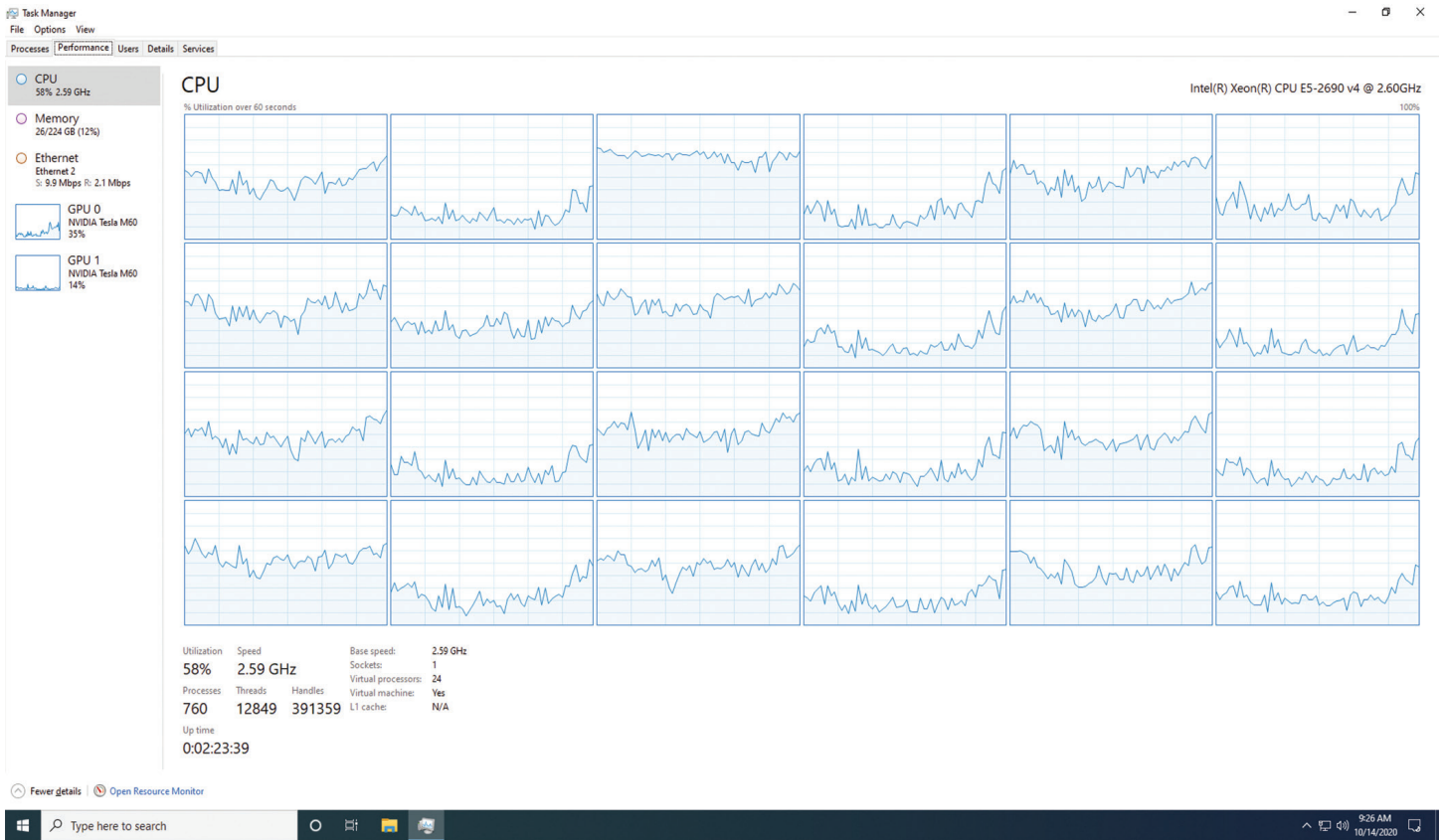
Figure 2
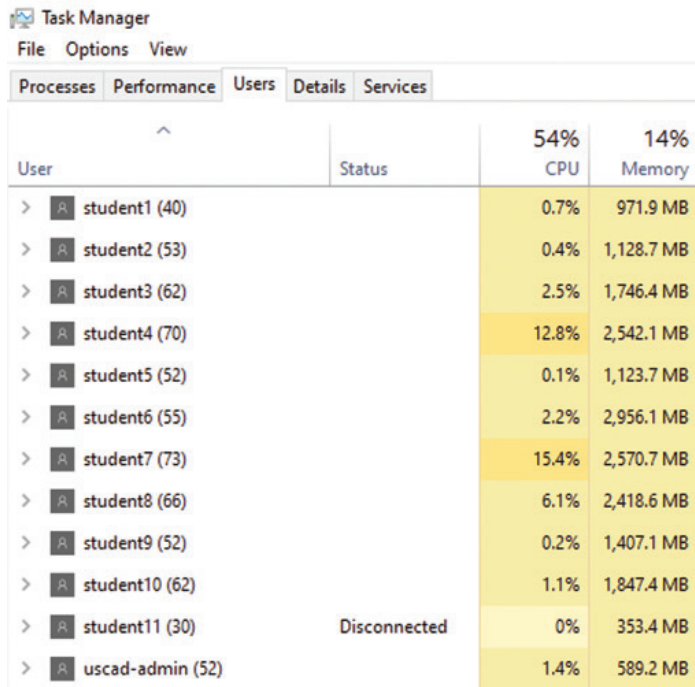
Figure 3

WHAT DO YOU NEED TO CONSIDER ABOUT VIRTUAL DESKTOPS?

Licenses. If you decide to go with a Windows Virtual Desktop, every user will need a Windows 10 Enterprise account. This is one of the ways WVD stands out. WVD runs on Windows 10 with elements of Windows Server built in that allow multiple concurrent interactive sessions. Every user will have their own Windows Profile. Autodesk also requires Single-User Sign On (figure 3).

Usage. You will need to have a good idea of the number of users, the applications required, and the uptime your organization would need. Uptime being the time your users would need access to the systems. Starting off with more than enough resources to meet demands is important for success, adoption, and getting that baseline cost as accurate and quickly as possible. You can always scale down later.

Training. This is not a big consideration but should be talked about. Users will need to understand which icon/software to open – so many symbols and names are similar. Further, if you do not have device redirect/passthrough as a solution, users will need to know how to get data from a local USB or other drive to the Virtual Desktop. The option to passthrough and connect the physical desktop to the virtual desktop is a real time and sanity saver!

WHAT CHALLENGES EXIST WITH VIRTUAL DESKTOPS?

There are still minimum network and IT infrastructure requirements. Users will need their networks to handle 15/15 Mbps with 150ms latency or less. What is that? The 15/15 is referring to the upload and download speeds of your internet. Mbps is Megabits per second. Most users in urban and suburban areas who have internet at home should be able to get this easily. 150ms is saying 150 milliseconds. And finally, by latency, that is the delay between

> **LOCAL OUTAGES ARE LESS OF A PROBLEM. WITH BACKUPS AND REDUNDANCIES HANDLED BY AN OFF-SITE PROVIDER, LESS THINGS GO WRONG AND FOR A SHORTER TIME PERIOD, WITHOUT THE NEED FOR INTERVENTION BY YOUR INTERNAL IT TEAM.**

Brian Smith is a Cloud Solutions Specialist with many years of IT experience. He works with Panzura, BIM 360, Office 365, Azure, AWS, and more. He is skilled at interacting with all levels of personnel within an organization and can address client concerns quickly, accurately, and efficiently. Mr. Smith helps clients with consulting, configuration, and deployment of cloud services to meet their current and future IT needs. Brian brings the knowledge of an IT Manager for Systems Administration, Software Deployment, User Management, and Virtualization together to make sure Cloud Solutions meet the needs of clients. Mr. Smith has assisted U.S. CAD's clients throughout their cloud solutions product lifecycle, including: introduction, demonstration, proof of concept, deployment, configuration, training, support, upgrades, and expansion.

the time you click and when something happens. Humans start to notice and get annoyed at a delay of more than 150 milliseconds (which is less than half the time it takes you to blink an eye!).

Traditional VDIs may have additional issues. For example, custom commands on a computer that a user has programmed may not translate to the virtual desktop. WVD has a lot of those hiccups worked out.

FINAL THOUGHTS

Windows Virtual Desktop works with Azure (a cloud storage solution) to make it virtually seamless to transition to a virtual workspace instead of a robust physical one. U.S. CAD uses this solution for our training: USCAD Cloud Workstation. We also have guest accounts set up for testing, demoing, and use for those who might be interested in seeing if a solution like this would work for them.

Local outages are less of a problem. With backups and redundancies handled by an off-site provider, less things go wrong and for a shorter time period, without the need for intervention by your internal IT team.

A technology partner can provide a Turn-Key Implementation service to help get everything set up, including configurations, deployments, and application installations while providing Best Practices and Tips to end-users. They can even help set up time-based scaling of the solution or autoscaling by threshold numbers. Remember, you pay for the uptime! Use these options to keep that cost as low as possible.

Andrell Laniewicz has working in the VDC world since 2011. During this time, she has been involved in everything from Model Coordination, 4D, 5D, and Quantification to Proposals, Site Logistics, and more. She has worked for General Contractors and MEP Design to Fabrication firms. She has taught BIM for Construction Management at Universities, presented at Autodesk University and BiLT, and consistently delivers social media content. At U.S. CAD, Andrell works with clients to evaluate their existing workflows, implement solutions and technology, and providing training to get clients to their ultimate end goal. She focuses on Revit, Navisworks, BIM 360, FormIt, and MSuite within Architecture, Construction, and Fabrication. She has her Certificate of Management in Building Information Modeling from AGC of DC.

PRODUCT FOCUS

Drones - Accuracy and Opportunity for Surveyors

Drones, drones, drones! Over the past few years this may be the biggest industry trend for land surveyors and civil engineers. And, probably just as important of a shift as GPS data collectors.

I started a surveying firm in 2010 with a focus on ALTA surveys, general boundary and topo projects, mass volume calculations, as well as construction staking. We then got into a little LiDAR scanning. Then, we really jumped into aerial data capture about 5 years ago and have never looked back!

I love data capture, whether from the ground or from the air, and trying to keep up with the daily technology trends and advances can sometimes be overwhelming. I thought I would put together this article on some of the lessons we've learned over the past few years when it comes to utilizing a drone in our survey department.

Figure 1

INDUSTRY CHALLENGES

Talent Gap - Some things we face daily in the survey industry is the talent gap that seems to be getting wider and wider every year. Here in the State of Utah, the average age of a licensed land surveyor is 57! The year over year decrease in licensed surveyors throughout the western states has been cut almost in half in the past decade, which is alarming in many ways. Getting kids 13-17, college aged students, and even the non-traditional 30+ crowd interested in a "blue collar" career isn't easy. However, with the rapidly increasing use of drones for survey, I can see an upward trend of younger men and women getting excited about the world of land surveying.

Schedule - Resolving schedule conflicts to meet client deadlines has always been a juggling act. Just as with everything else in life, people want and demand immediate results. Clients, rightfully so, want their project to be #1 priority, no matter the scope or size. Deploying drones can help speed the data capture up, getting near immediate results and actionable data in a fraction of the time as traditional field gathering.

Safety - Keeping crews safe when working on hard-to-access projects like steep terrain, busy rights-of-way and fenced yards is always a priority. Couple that with the average age of surveyors, and you may struggle, or even pass on projects that have any sort of physical barriers. Gathering data from the air can supplement those hard to survey areas and keep your crews safe from some of these project types.

Adding drones to your toolbox helps address each of these challenges.

Important Note:
!! Drones are NOT a replacement for your field crews!!

THE EQUIPMENT

For the sake of this article, I will not get into RTK drones or LiDAR drones, but will focus mainly on photogrammetry. I also will not tell you that you HAVE to buy XYZ drone.

Aside from your standard day to day survey equipment, the selection of drones in the marketplace can be pretty overwhelming! It seems like every day I am sent a new article or news story about a new drone hitting the market. I have used several different drones over the past few years. Some that I have used are:

- DJI Phantom 4 Pro (v2) – This is a fantastic drone for just getting started, and your accuracies for most project will be more than acceptable. And at the price point you can afford to take the training wheels off and not be afraid to crash! There is also a great entry level RTK option with the P4P.
- DJI Inspire and/or Matrice 200 – These drones are bigger drones with a few more capabilities such as interchangeable cameras. The Inspire and the M200 can swap payloads out. For our stuff, we use the x4s and x5s camera, as well as an additional camera for thermal needs.

Figure 2

- DJI Matrice 300 w/ RTK – I just got one and will let you know soon on what I think!
- Yuneec H520 – Even in high wind environments, which we face a lot, this drone has held its own when it comes to data quality, battery life and stability.
- SenseFly eBee and WingtraOne – For fixed wing drone enthusiasts, these seem to be very popular options.

THE ACCURACIES – COMPARING ACCURACIES

Clearly the most important thing in land surveying, in my opinion anyway, is ACCURACY! I believe this to be one of the main reasons surveyors are hesitant to add this tool to the toolbox. There are 2 different accuracies to consider when capturing data.

Absolute accuracy is the amount of error between a model and a known point on planet earth. Absolute accuracy must be measured against a global coordinate system, such as NAD83 or WGS84.

Relative accuracy effectively measures the accuracy between points within a single project. For example, if you need to measure a building footprint, it does not matter if that footprint is in Utah or Arizona as long as the measurement itself correct.

Factors that contribute to accuracy issues:
- Flight Altitude – (Careful!! – Low Flight could lead to GCP issues)
- Overlap – 75 frontlap x 75 sidelap is ideal but could be brought down to 70x65 if needed.
- Lighting - (Poor or Inconstant – Shadows/Bright Lights)
- Type of Terrain - Vegetation v. Hardscape
- Geography / Topography - (Steep (without proper GCP / Flight Planning)
- Quantity of Ground Control (Proper Distribution of GCP)
- Camera Quality – In my opinion, although important, this is the least important of all factors. If other sources of error are present, then a better camera will NOT improve accuracy at all. A 20mp camera with proper workflow should yield extremely accurate data.

What is GSD? You will hear, or have heard, the term GSD when it comes to drone flights. This is something you will want to be aware of when fully understanding accuracies. The Ground Sample Distance is the distance between center points of each sample taken of the ground. So basically, the GSD is how big each pixel is on the ground. The GSD is determined by the geometry of the camera and its altitude above the ground.

Here are a couple of calculators I like to use when calculating GSD.
- https://www.propelleraero.com/gsd-calculator/
- https://support.pix4d.com/hc/en-us/articles/202560249-TOOLS-GSD-calculator

Figure 3 shows a screen shot comparing accuracies via total station, RTK GPS and Photogrammetry.

TIME TO TAKE FLIGHT

There are many softwares out there for flight planning/mapping. We will discuss the processing software in an upcoming section, and many of these same listed companies have both the flight mapping capabilities as well as the final processing capabilities.

I personally use SiteScan from ESRI (formerly 3DRobotics) for my site mapping AND processing. I have been looking more into Drone Deploy and Propellor. Below is a bit more info on each of those. Links to their website can be found in the software section of this article.

- *SiteScan from ESRI* - Increase efficiency by creating and sharing advanced 3D flight plans between your pilots. Overlay 2D and 3D data from ArcGIS Online and ArcGIS Enterprise for enhanced flight safety and data capture quality. Manage your data in the field and upload it to the cloud.
- *DroneDeploy* - Capture maps, photos, panoramas, and videos all from one app
- *Propellor* - Map and measure your worksite yourself, with browser-based 3D surveys.
- *DJI Ground Station (GS) Pro* - Conduct automated flight missions, manage flight data on the cloud, and collaborate across projects to efficiently run your drone program.

THE FIELD PREP

No, you cannot just show up to a site, deploy a drone, and expect to take a nap while the drone magically does your job for you…yet!

There are many things to do prior to flying the drone. Gain FAA approval if needed, set ground control points (GCP), "prepare" the site by calling in Blue Stakes (811, Julie, etc), paint some stuff, plan which flight pattern you will use, etc, etc, etc. And each site has its own challenges that need addressed. There is no "one flight fits all" scenarios for most firms. A bit more explanation on these is below:

- FAA Approval – Aside from the requirement of becoming Part 107 Certified for commercial pilots, some projects may require FAA approval to fly within controlled airspace. Plan ahead, as some locations may take time and some locations may be immediate.

Flight Height (ft)	Vertical Accuracy (ft)			Horizontal Accuracy (ft)		
	Total Station	RTK GPS	Drone Photogrammetry*	Total Station	RTK GPS	Drone Photogrammetry*
100	0.003	0.033 – 0.082	0.029 – 0.087	0.003	0.033 – 0.082	0.029 – 0.058
150			0.044 – 0.132			0.044 – 0.088

Figure 3

- Ground Control Points (GCP) - Ground control is essential in ensuring accuracy of your flight linework/DTM deliverables. GCPs are marked points on the ground that have a known geographic location. GCPs coordinates are used by drone mapping software to accurately position the collected data in relation to the real world. Think of a flight at 400' compared to a flight at 200' with identical GCP quantity. GCPs can be as simple as using a can of paint (typically for hard surfaces) or using one of many methods of target creation.

NOTES:
Not all GCP targets are created equal! I prefer a brightly colored 24"x24" target that can easily be identified for manually GCP tagging, or even automatic tagging in some software.

GCP placement is very important. Flight altitude is key to proper planning of GCP placement. Low altitude flights typically result in the need for additional GCP's.

Figure 4

- ***Paint some stuff!*** We try to call in blue stakes to paint underground utilities such as gas, telecom, fiber optics, etc. And in developed areas, I typically send my survey crew out to mark things such as manhole depths, flow direction, etc. Having all this data in your images can really save unnecessary trips out to the site and answer questions immediately as to not slow down the design process.

- Flight Patterns – There are several flight options in most drone mapping software's, but 2 patterns remain consistent across all platforms.
    - Area Survey (NADIR) – This pattern typically consists of no oblique images.
    - Crosshatch – For Example, this flight pattern goes East-West, then flies the same area North-South. This pattern typically has a 35-degree gimbal angle for oblique images.

So, which flight pattern is right for you? 95% of the 500+ flights I have done the past few years have been done using the area survey option. I have tested over and over the need for a cross hatch pattern, but for most projects the data value just isn't there. You would think that more coverage is better right? Instead, the cross hatch causes an increase in field time, an increase in data processing time, an no
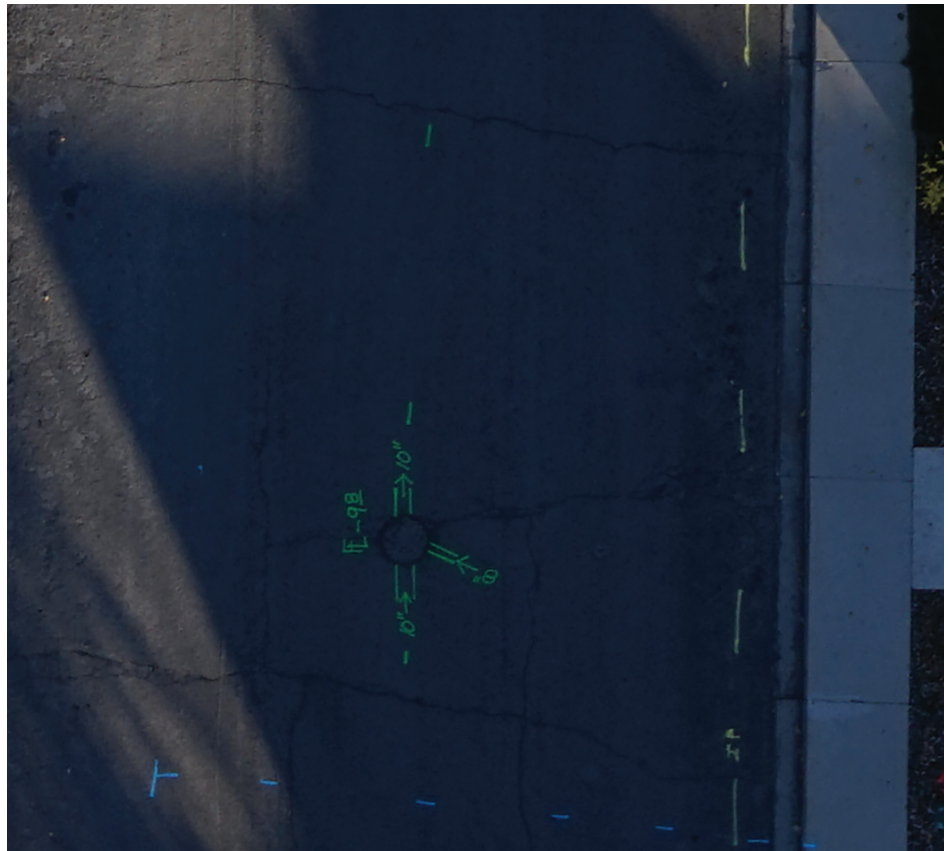

Figure 5

real major measurable benefit in accuracy. However, crosshatch survey is at times needed. For areas with highly repetitive land, like crops and dense vegetation and verticality concerns, a cross hatched pattern may be useful. We do a lot of ALTA surveys of
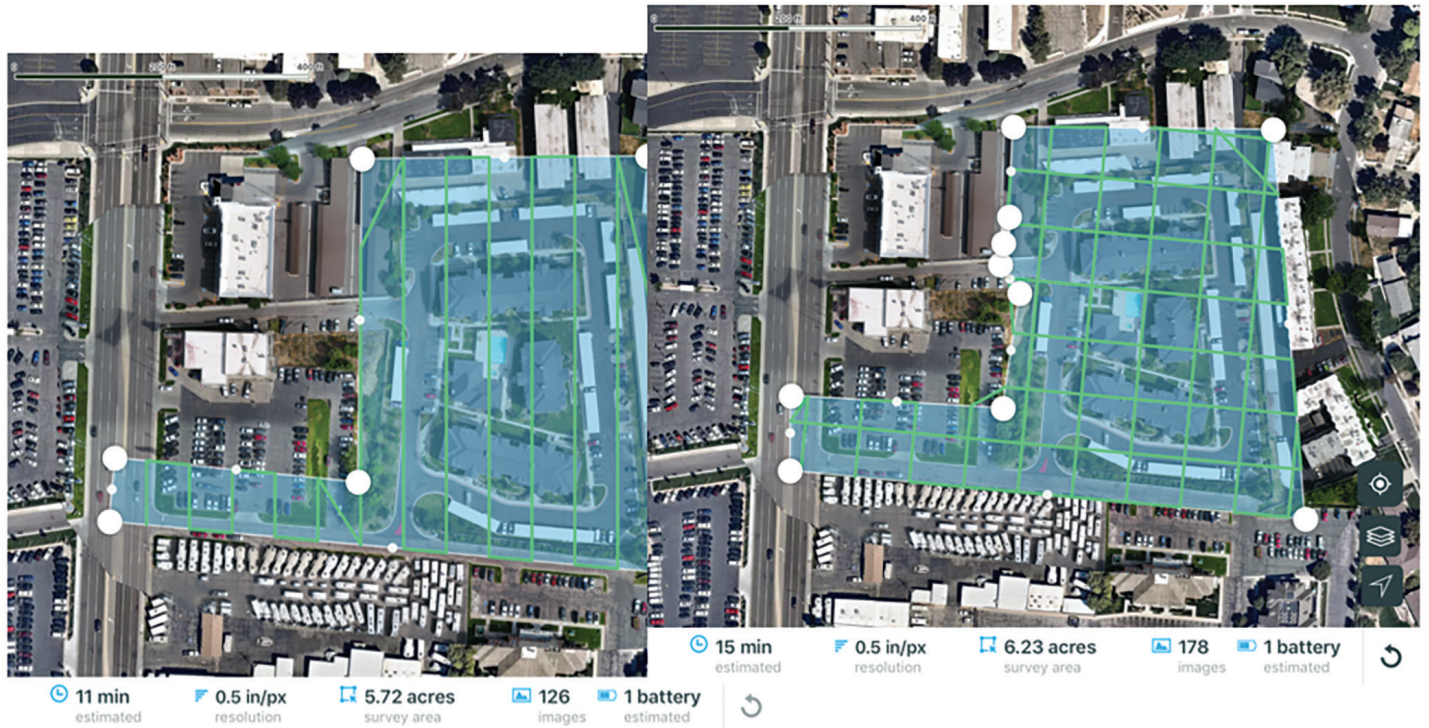
Civil

| 11 min estimated | 0.5 in/px resolution | 5.72 acres survey area | 126 images | 1 battery estimated |

| 15 min estimated | 0.5 in/px resolution | 6.23 acres survey area | 178 images | 1 battery estimated |

Figure 6

apartment complexes, and with all the buildings and vegetation, we sometimes use the crosshatch pattern.

If you would like to see some data from each type of flight pattern, feel free to email me and I will send one of the projects where we've used both options for comparison purposes.

Figure 6 shows the above-mentioned flight types, and the flight data difference between the 2.

THE PROCESSING SOFTWARE

This conversation sometimes gets just as heated as politics or religion! Many people swear that their software is the best and most accurate. As I mentioned, I personally use ESRI SiteScan for everything and have for years. I have tested others, and while some have other bells and whistles, I have really liked working with all aspects of SiteScan. I have a pretty lengthy wish list of items, but with the recent purchase of SiteScan by ESRI I can really see a bright future and some exciting new features coming. I will leave it at that and provide links to some of the most popular photogrammetry on the market.

SiteScan from ESRI - https://www.esri.com/en-us/arcgis/products/site-scan-for-arcgis/overview

DroneDeploy - www.dronedeploy.com

Propellor - https://www.propelleraero.com/

Autodesk ReCap Photo - https://www.autodesk.com/products/recap

Typical Processed Data Deliverable – Most photo processing software delivers the same data types, with a few exceptions. You

would expect to get the following data once processed:

+ Orthomosaic (.tiff) – A high quality, ortho-rectified image is always available and can be used within almost any design software.
+ DEM (.tiff) – Raw data - unfiltered
+ DTM (.tiff) – Auto filtered to remove manmade objects and vegetation
+ Contours:
  + Shapefile
  + DXF (DTM and DEM)
+ Point Cloud
  + LAS
  + RCS – Autodesk ReCap format
  + LAZ

ORTHO IMAGE USE

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

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

You simply drag and drop your image into the QGIS desktop, right click on your layer (image) and export to a new rendered image!! This can take a 2GB image, reduce it to 200MB and not lose the quality of image you would expect from your flight data.

Figure 7

VIRTUAL SURVEYOR

The fact that this simple machine that flies through the air, captures photos and then somehow returns usable, actionable data is just fantastic!! But what do we do in production software such as AutoCAD, Civil 3D and Bentley with the data? We can bring it into ReCap (or LAS) file, then what? Connect some dots, draw some lines, but it all just seems too much of a manual process.

I've been in the reality capture industry for years and have really taken to the drone space, but have always struggled in creating a useable existing conditions map from the data within Civil 3D… until now!!

A couple years back I got introduced to Virtual Surveyor (https://www.virtual-surveyor.com/) and feel that this is one of the best, if not THE best, tools out there to bridge that gap between drone and CAD.

You can easily accelerate your survey workflows with the productivity tools in Virtual Surveyor (VS). The software produces the bulk of the output. You only need to review, remove, and add some points or breaklines to complete the job.

You will see that Virtual Surveyor is a simple, easy to use user interface. There is not a ton of overbearing tools within the software. Along the left side you will find your project data. As you create layers for points, breaklines, topo, etc., they will show up in this dialog box. Simply export the data out to CSV or DXF and bring it into your CAD platform.

CONCLUSION

This could be a 30 page "article" in order to go through all the detail necessary, but AUGI probably wouldn't like the Herring Takeover of this edition! So hopefully my attempt at condensing the information was found to be helpful in some way. At a minimum, it opens up your mind to some things to think about whether you are a seasoned vet or just thinking about adding a drone to your survey toolbox.

I would love to hear from you regarding your experiences or questions regarding drone use in the survey industry, so feel free to call or email me anytime.

Shawn has been a part of the design engineering community for roughly 16 years in all aspects of design, construction and software implementations. He has implemented and trained companies across the Country on Civil 3D and other infrastructure tools and their best practice workflows. Shawn is co-owner of Region Engineering & Surveying in Utah and RealityOne based out of Utah but with offices in several locations. Shawn can be reached for comments or questions at sherring@ regionengineering.com.

Revit MEP and BIM 360

by: Eric Wing

Industry Insights

If you use LinkedIn in any capacity, then you are getting blasted with Industry Insights. Most of these insights are coming from vendors that are trying to justify using their products. I cannot blame them, I would too. That was me back when BIM consulting was a novelty. Now it is a giant commodity, and I certainly pick and choose my engagement in that technical space. Of course, I do the BIM presentations, but I never thought 15 years later I'd be giving the same presentation. Either people do not get it, or the value still is not compelling enough for folks to jump over. I do not know of anybody going out of business for not using BIM. I wouldn't know.

I keep saying BIM, and this is AUGI, so I suppose I am going to talk about BIM and Autodesk. It's funny, I just got back into AUGI after about a 10-year hiatus. It was the Autodesk User Group International up until about a year ago. Now it is kind of not - it is just AUGI. Sort of like Kentucky Fried Chicken is just KFC. Who knows the behind the scenes activity that takes place with a shift like this. I can speculate…and I do, but I am sort of glad I had nothing to do with it. I think if I had a fan base of hundreds of thousands of people testing out my software and providing training on it for free, I would be pretty grateful. But that is just me. Consider me old school.

REVIT

So, let's look at the state of Revit. What is the insight here? The big thing is that letter that went out to Autodesk. I know it was specific to Revit as it pertains to architecture, and I am now the MEP guy here, but it's relatable. After reading it a couple times (as I often have to do with anything I read), I got out of it that the price to have Autodesk products has raised into the stratosphere, with almost zero improvements, and an insanely convoluted breakdown of what bundle…or package does what, but it's been the AUGI wish list that gets ignored year after year.

All that being said, and I know it looks like I'm bashing Autodesk, but there's no serious competition out there. My company has every CAD flavor there is out there. My CEO and CTO will purchase almost anything I ask to make sure we are best positioned for the future. Revit simply blows the competition away. Man, it could be better in so many areas, but come on…Microstation? Let us come to our senses here folks.

So, let us dial it back a bit. I started using Revit because my personal production increased. Even when I was the AutoCAD guru and was awful at Revit…back when George Bush was in his first term. Revit for electrical did not have conduit or cable tray. Yikes. I literally saw people come to me with tears in their eyes with horror stories of trying to slope sanitary piping. We can do those things

now. Most of the discussions I am involved with on the Revit MEP side are engineering discussions. Not drafting discussions. Which is the direction I have been pushing for years. I do think Autodesk is dedicated to the fact that we are using engineering software. Firms that stick to the belief that CAD is CAD and engineering is engineering are making a mistake that is costing them. They do not see it because the process of having redlines from an engineer to the drafter back to the engineer back to the drafter is the way they do business. Getting 2% +/- on a project is the industry standard right? I will put one of my engineers at C&S that is awesome at Revit up against a team of 3 or even 4 engineers somewhere else that doesn't know Revit any day.

BIM 360

I love it. I have to say I really liked the concept right when it came out and I started putting our Revit projects into it immediately. It's hard to imagine now setting up a file share site so we can copy the architect's model and overwrite the existing one on our server, then send them all of our MEP models to do the same. Wowza! Thank goodness we started using it too, because once we were all forced to work from home in every one of our offices across the country, I truly believe it allowed us to seamlessly transition almost effortlessly.

That being said… The reason not much effort was made to update Revit was because of just that. Actually, the construction side of this. Autodesk went on an apparent buying spree and allocated a ton of their resources over to construction. I cannot say if that worked or not. I find the construction management side of BIM 360 convoluted and arduous. It could be just be me. What really makes me nervous is it is seeping into the way I like to set up Revit models on the design side. Here is my process:

1. Setup a BIM 360 project.
2. Workshare my models to the BIM 360 project.
3. Tell my engineers and architects the project is ready. Go do your work and as always, sync with central often!

That is easy right? It seems now they want you publishing changes in addition to syncing... I think, then there are duplicate folders all over the place with duplicate models that you need to actually "consume" to get updates from other trades, when the other trades want to publish their changes. You need to set up groups and workspaces with a weird timeline chart. Not for me. I do not know what is going on with that but if my three steps stop working, I am going to need to join a certain club that has 12 steps. Since my company uses both BIM 360 and Procore, it seems like Procore is the application that is more widely accepted. Procore is probably too big for Autodesk to acquire, so it looks like that rivalry will be going on for quite a while.

All that being said, we are definitely being pushed off of our local servers. Which is a good thing. My company uses Amazon Web Services (AWS) and Panzura for our file distribution. It is awesome. We switched over to it about 6 years ago. It was rough, but man did it pay off. It seems to me, like an "untethered" future is what AEC firms need to be pushing for. I know COVID has

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clouded my judgement, but the future is in the cloud. Having a solid strategy to be able to actually work in huge Revit models and AutoCAD files is where we all need to get to.

Eric Wing lives in Syracuse NY where he is the Director of BIM Services for C&S Companies. Eric is a popular speaker at events around the country speaking on many BIM-related topics. Eric has authored several books including Autodesk's official training guide for their BIM solution "Revit" called Revit for Architecture No Experience Required. Eric is also an author for LinkedIn Learning where he has authored around 60 full courses on BIM management, Revit, AutoCAD MEP, Navisworks and Virtual Design and Construction (VDC). Eric has truly been a leader in the architecture, engineering and construction industry since the conception of BIM and 3D design, and has specialty skills in BIM coordination, training and development of technical staff along with daily application of these tools on multi scale, multi-disciplinary projects. Eric is also currently a Professor at Syracuse University teaching BIM and Advanced BIM at the School of Architecture, and at the School of Engineering. Eric has also taught courses at the Rochester Institute of Technology and Clarkson University on the subjects of Analytical tools for Facility Management, BIM, and Integrated Project Delivery.

BIM/Technical Consultants Role

by: Gareth Spencer

Industry Insights of a Consultant

If you read through my article in last month's *AUGIWorld* you would have read about how things have changed over this year. This month I would like to elaborate on this from a BIM/Technical Consultants role and how things have changed with software such as Autodesk Revit.

BIM/TECHNICAL CONSULTANT

A BIM/Technical Consultant role can mean many things to different organizations, but for me it has become a role which I undertake everyday working for an Autodesk Reseller here in the UK. It must be a very diverse role because of the nature of how our industry is today. This said many of our roles across the industry have become more diverse due to industry standards, processes, technology, moving to digital ways of working and everyone needing to work collaboratively.

Why don't you think back to when you first started out in your role and how much has it changed for you. I hope, which is for the better.

SOFTWARE

Let's go back to 2007 before I was a BIM Consultant and I had just started working at a large multi-discipline engineering company as a Senior Structural Technician here in the United Kingdom and was introduced to Autodesk Revit for the first time. Back then, we were starting to move into a modeling approach to design instead of 2D

drafting on AutoCAD or basic structural analysis design software. At that time, we were not even thinking about Building Information Modeling (BIM). Although, some people had started talking about it, many people had not even heard of it. For us it was just about how we could produce 3D models to improve how we design our structural models, then produce our drawings from a model.

Even if we were to roll back even further to 2005 and 2006 when Revit Structure and MEP released.

Roll on a few years later in 2009, and I remember reading about the new interface in this magazine called *AUGIWorld* (Issue 2) about the Autodesk 2010 software releases. Thinking no, why has Autodesk now moved to a ribbon in Revit? Autodesk's first stab at
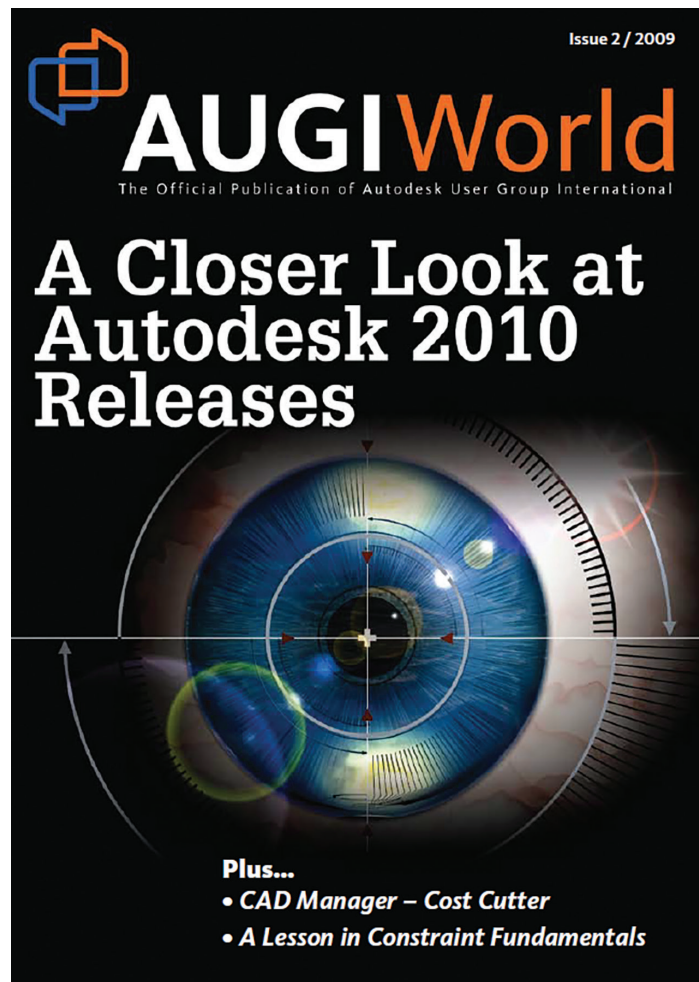
the layout was not great. I am sure those who used it would agree. It did take some getting used to and then it was changed again the year later.

For me, and many other civil and structural engineering firms, Revit has become an integral part of the design process. Not just helping model up the potential built asset but push directly into design analysis software such as Autodesk Robot Structural Analysis and others. Even having the ability for engineers to design and model the frame in Robot. Then, push it into Revit to complete the design and detailing to produce construction issue drawings.

Using model software has not been without its challenges as well. Like I mentioned earlier, other consultants not using 3D model software and only producing 2D drawings makes coordinating information harder.

COLLABORATIVE WORKING WOULD NOT HAPPEN LIKE IT DOES ON TODAY'S PROJECTS WHERE WE DO HAVE THE WHOLE DESIGN TEAMS MODELING THEIR PART OF THE STRUCTURE IN A SOLUTION WHICH WILL PROVIDE A 3D MODEL.

One area for me which did not make sense was being able to create concrete structures. But not having the full functionality to detail the rebar to standards or code here in the UK until 2014. The Revit extensions did not really work to UK standards and one big problem we came across was the bending radius was not always correct. So, we had to spend so much time creating 2D details, plans, sections, and elevations to then detail using 3rd party add-ons to AutoCAD such as CADS RC. This was a great tool to help produce the rebar drawings and schedules, but if things changed, we would need to update information twice. Really it could have been done once and then checked.

COLLABORATION
Collaborative working would not happen like it does on today's projects where we do have the whole design teams modeling their part of the structure in a solution which will provide a 3D model. Whether it is all in Revit or using another solution and providing IFC (Industry Foundation Class) which is an open file format specification not controlled by a single software vendor. Linking

BIM/Technical Consultants Role
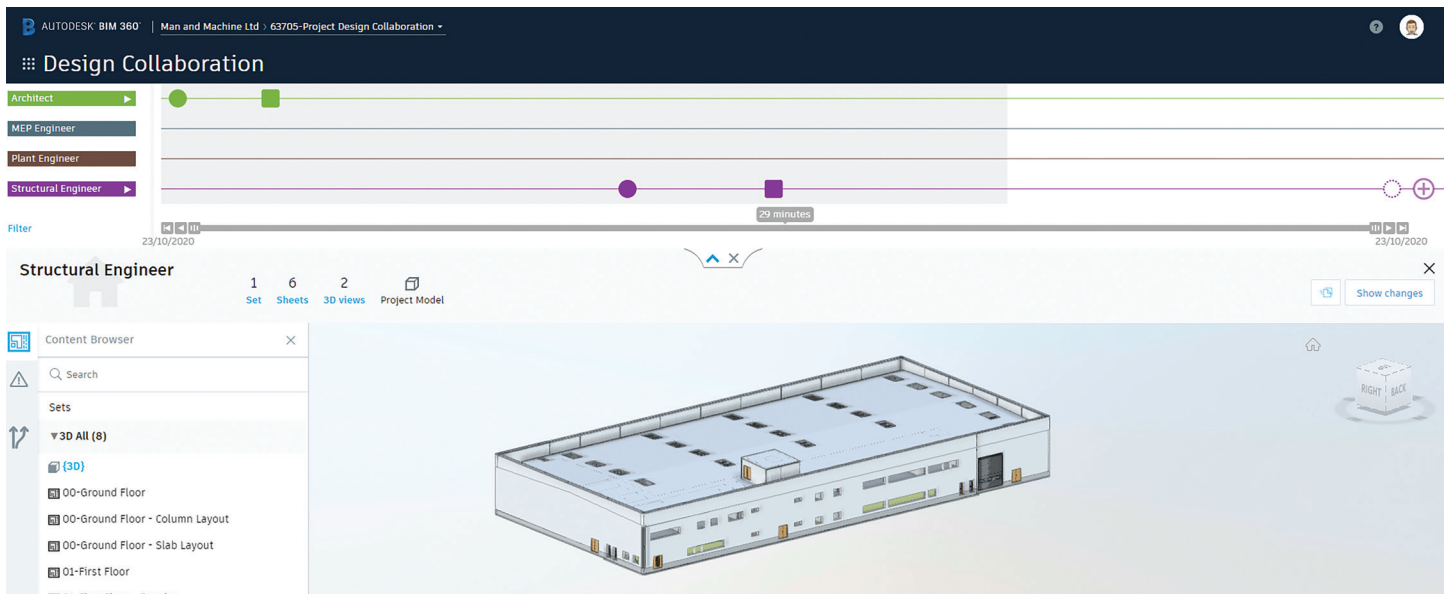
BIM 360 Design Collaboration

other discipline models in and coordinating their information with yours to enhance the design process. Even using Revit's work sharing tools to allow multiple members of the same design team to work on the model at the same time. This only really started around mid to late 2010 with the Architect on projects. The building services were a lot slower on the uptake of modeling. It was difficult at times trying to coordinate builders' work holes for things like ductwork and pipework through concrete walls. Checking 2D drawings in plan, section, and elevation to align the holes on the walls.

Today we are even collaborating in the cloud using Autodesk BIM 360 Design Collaboration, which has really enhanced how we work on our projects. It can be on the live model, a regular shared model or design freeze model.

This can really reduce the time spent sharing models, coordinating design changes, or sharing the model information without having to open a model locally using either Revit or another viewing application. Not to mention, the fact you can see this information from anywhere as it directly through the cloud and each design team can control what it is shared and when.

One thing that is most certain today, is the number of software platforms many of us use whilst undertaking our job role. Personally, I use AutoCAD, Revit, Navisworks, BIM 360 Docs, on the regular. And just to top it off, some Civil 3D and InfraWorks. That is just Autodesk software. There is also Enscape for rendering and walkthroughs, Microsoft Teams, Word, Excel, PowerPoint, Zoom, GoToMeeting, Amazon WebSpace, etc. The list is endless. Roll back 20 years and it would just be AutoCAD, Microsoft Word, and Excel. How things have changed. It is good that we can now buy many of the softwares we use as a collection of tools and not by product.

HARDWARE

I found an old Autodesk Revit Structure training manual from

2009, and in it, it talked about memory usage.
To minimize possible instability in Revit Structure when its uses operating system memory, you can:
+ Restart Revit Structure regularly.

If you receive a message that the current session's memory usage is approaching the operating system limit, save your work as soon as possible and restart Revit Structure. If you are using a work shared environment, save your local file, restart Revit Structure, and then save to central.
+ Enable the 3GB feature on your Windows® operating system to improve performance on 32-bit machines.
+ Run Revit Structure on a Windows 64-bit operating system.
+ Reduce the number of loaded DWG and RVT links.
+ Reduce the number of loaded RVT and RFA files.
+ Limit the number of views open. If you have multiple views open, you can quickly close all hidden views by clicking Window menu > Close Hidden Windows.

We would be using Windows XP SP2 or Windows Vista on 32-bit machines which were limited to 4GB of virtual address space. If you were lucky you may have made the switch to a 64-bit machine. You would need 3GB of free disk space on a 32-bit machine and 5GB on a 64-bit machine. We did come unstuck a few times as the disk space was only about 300GB at that time, which sounded a lot at the time, but it soon filled up.

If we look at the specification today on Revit 2021, you are going to need a minimum 64-bit Windows 10 operating system, Single or Multi-Core Intel, Xeon, i-Series processor, or an AMD equivalent with SSE2 technology. The memory needs to be a minimum 8GB on the entry level going up to 32GB running large or complex models. Just to install the application you need 30GB free disk space. Hopefully, you will not have issues with disk space today.

One of the big questions today that has been asked many times is, "Are we delivering the information which is actually required by the client?" or are we just including thousands of unneeded data fields within a model and wasting time including them. I know many design consultants who use the Revit families provided by the supply chain and end up stripping out so many non-required data parameters.

I guess this is a question that will continue for a long time to come. Along with, "Do we actually need the data within the model, or should it be stored outside in a database?" But, for the structure's delivery not much of that information is needed to operate an asset like a building. Something like a bridge would be a key part of the asset.

SUPPORTING CLIENTS

I do not know many clients, if any, who actually used a 3D model of their assets ten years ago to manage, maintain or operate their asset. Today, more and more are and it has become a standard requirement for many projects. A big problem is that clients have the skills, knowledge, training, and even the know-how to use a 3D as-built as-constructed model whilst operating their own asset.

I have yet to see an actual as-built or constructed asset model which matches the actual built assist. Many of those models have been issued by the design team and the contractor has only updated major changes in the model or added assist data. Whoever creates these models does not tend to think about the end user and what they intend to do with it. Models are only created with the purpose of the creator and maybe the contractor/manufacturer. Which really makes me think, Why? The end user will need to spend further time, money and resources amending to suit. Also, this problem will open sources like IFC. These are like a 3D PDF. You cannot edit them, and you are better off with the native format.

The integration with existing systems and CAFM systems is generally not easy and can mean a big change and cost for the owner/operator to ensure they do. Which many see the cost and scrap the idea. Then, continue how they did previously.

Trying to render something in Revit on a 32-bit machine would take hours, even with some simple settings. So, trying to do something in a higher resolution could take anywhere up to 24 hours to render, then praying it or the computer would not crash, or be a power outage. Then, it was still not the best render. Now, the options are endless with tools such as Enscape, Twinmotion, Unity, and many others.

BRIDGING THE GAPS

Over the last few years, Autodesk and other software vendors have been addressing the gap between designers and manufacturers or fabricators by improving interoperability. They then take the manufacturers model information and design model information and push it from one software to another reducing rework, such as a curtain wall from Revit to Inventor, or Steel frame in Revit to Advanced Steel.

DATA

Many project requirements ask for BIM to be delivered. And as we all know, BIM is not producing a Revit model with some data attached to the elements modeled within. It is a process in which the model is a small, but integral part. When a project starts, the client, lead designer, contractor sets out what their information requirements will be and within that will be specific data delivery requirements. That could be data to manage, maintain or operate the asset through the life cycle of that process (e.g. location, asset id, manufacturer, asset no, warranty expiry date, etc). This data could be included as general information attached to the elements within the model, or structured as part of an IFC, COBie schema.

Gareth Spencer is an experienced BIM Consultant at Man and Machine (Autodesk Platinum Reseller) in the UK, with a demonstrated history in the computer software industry. Skilled in Autodesk software such as AutoCAD, Revit, Navisworks, and BIM 360. Also certified professional in Revit Architecture and Structures. Speaker at Autodesk University in Las Vegas and London. Follow Gareth via Twitter @TheDarkAsset, on his blog https://garethspencer.com or email gareth.spencer@live.com.

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