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# AUGIWorld

The Official Publication of Autodesk User Group International

August 2015

## How Autodesk Software Fosters Collaboration

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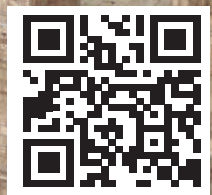
- BIM Project Break Down
- Enhanced Presentation Tools in Inventor
- Finding a Great Idea





# PROJECT SOANE

A worldwide BIM crowdsourcing effort to virtually reconstruct Sir John Soane's treasured Bank of England.



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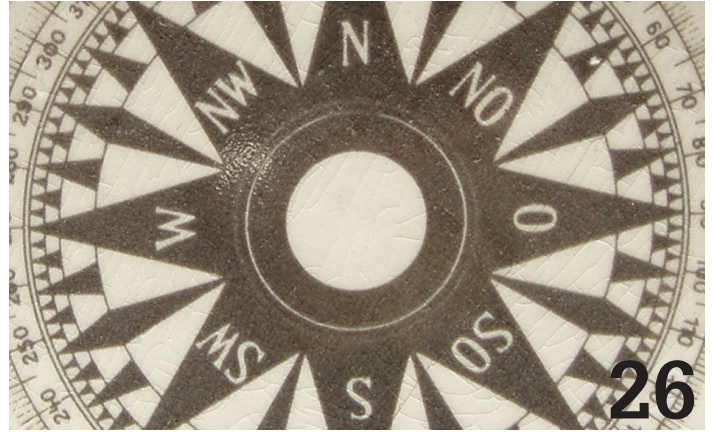




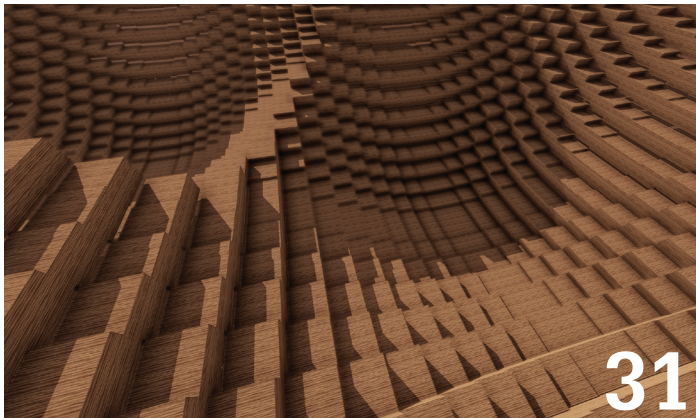
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# Letter from the President



# AUGI

## SUMMER TIME!

**S**ummer has really kicked into high gear in the Northern Hemisphere. For those of you in the Southern Hemisphere, I hope the winter has not been too rough.

Along with summer comes the grand American tradition: the road trip. It is difficult to truly appreciate the sheer size of the United States or Canada until you are “forced” to drive across large portions of it. From an airplane and 35,000 feet up, it looks like cars along the roads are barely moving. And when you are driving that car on a long road trip, it can seem like that is true.

When you take the time to stop and see the sights along the way (even though that adds time to the trip) that is where you gain a true appreciation for the country through which you are traveling. It may sound silly to stop and see that huge ball of twine or a palace made of corn, but life is not just about work. Stop at those scenic overlooks or drive 20 miles out of your way to see something you might never see again.

## HOW DOES THIS RELATE TO AUGI?

AUGI is nowhere near as large as the US or Canada, but it is an organization of hundreds of thousands of people that use the same applications you use, have issues similar to yours, and need advice and help at times—just like you.

AUGI could not exist without the support provided by volunteers. There are so many ways in which you add diversity and experience to AUGI through volunteering. Just as a road trip across a vast continent exposes you to a multitude of things you might never have seen, the more you “explore” AUGI by volunteering your time and experience, you will gain so much more than you might think.

Some of my best memories of AUGI are related to the times I was volunteering in one area or another. Sure, there was effort. After all, there is no first class seating in a car driving across the country. But I learned things, I showed others how to deal with their issues, and I developed friendships that last to this day.

I encourage you to try and take a “vacation” from your day-to-day work and see what you can do for AUGI that brings you some satisfaction. Contact Donnia, our Volunteer Manager, at [volunteering@augi.com](mailto:volunteering@augi.com) for ways in which you can help.

R. Robert Bell  
AUGI President

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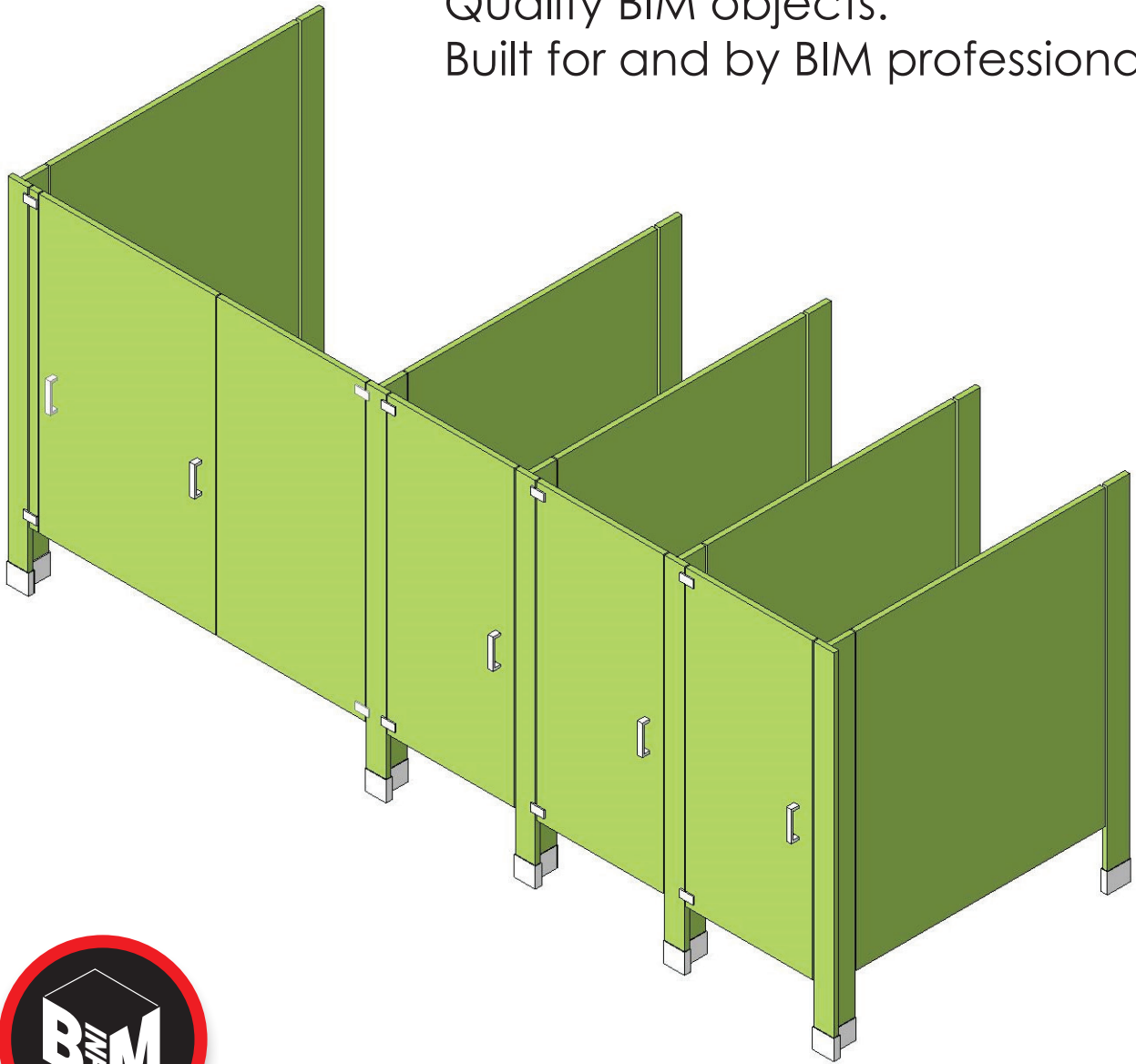
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# Presentation Enhancements

Something wonderful happened around the year 2011. Autodesk introduced a new product called Autodesk Inventor® Publisher. That product brought a new way of exploding assemblies, as well as documenting these. It was fantastic, and gave everyone a nicer environment to deal with exploded view documentation—much nicer than the archaic Presentation environment in Inventor.

Unfortunately, Publisher was a bit of a resource hog, and while rumors of its demise are still circulating, the product is still selling on the shelf; Autodesk, always guarded with its plans, is only willing to say that there is no definitive plan to stop it.

Additionally, true to Autodesk's statement that Autodesk Inventor is being continued into the future as their go-to mechanical engineering CAD software, 2015 and 2016 releases have delivered a very nice set of enhancements. One of these is the Presentation environment, the topic of this article.

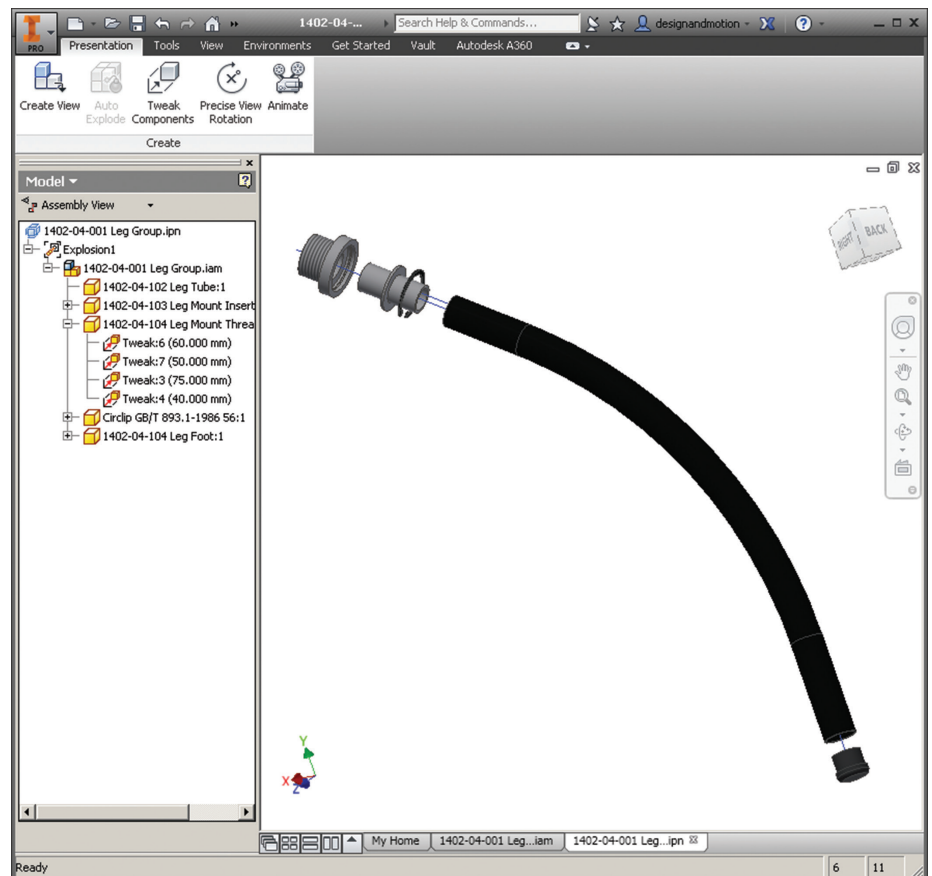


Figure 1: Inventor 2016 Presentation environment



While these enhancements are not a replacement for Publisher, they do make creating exploded views much simpler and smoother. The following is a list of the changes and a few of my observations.

## USER INTERFACE CHANGES

The terminology such as tweaks and trails are all the same, but the way you manipulate items is different.

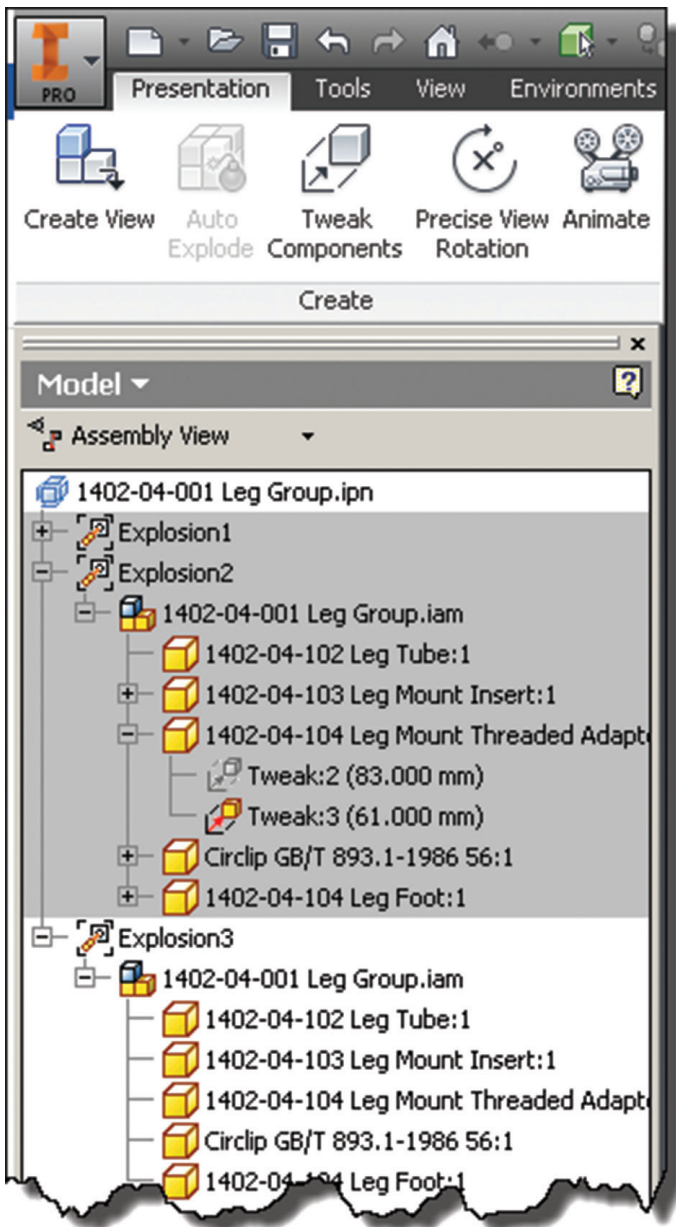


Figure 2: Presentation ribbon and browser

### Selection Priority

Selection Priority of Components, Parts, and Trails has been added to the Quick Access Toolbar.

### Create View and Explosions

Users can create numerous explosions in a single Presentation file using the Create View command on the ribbon. Each retains the position and trail settings independently.

### Design View Representations

Users can connect Assembly Design View Representations to individual explosions and make these associative (or not) if desired. So far it appears as though it only affects the visibility and appearance, but not the camera angle.

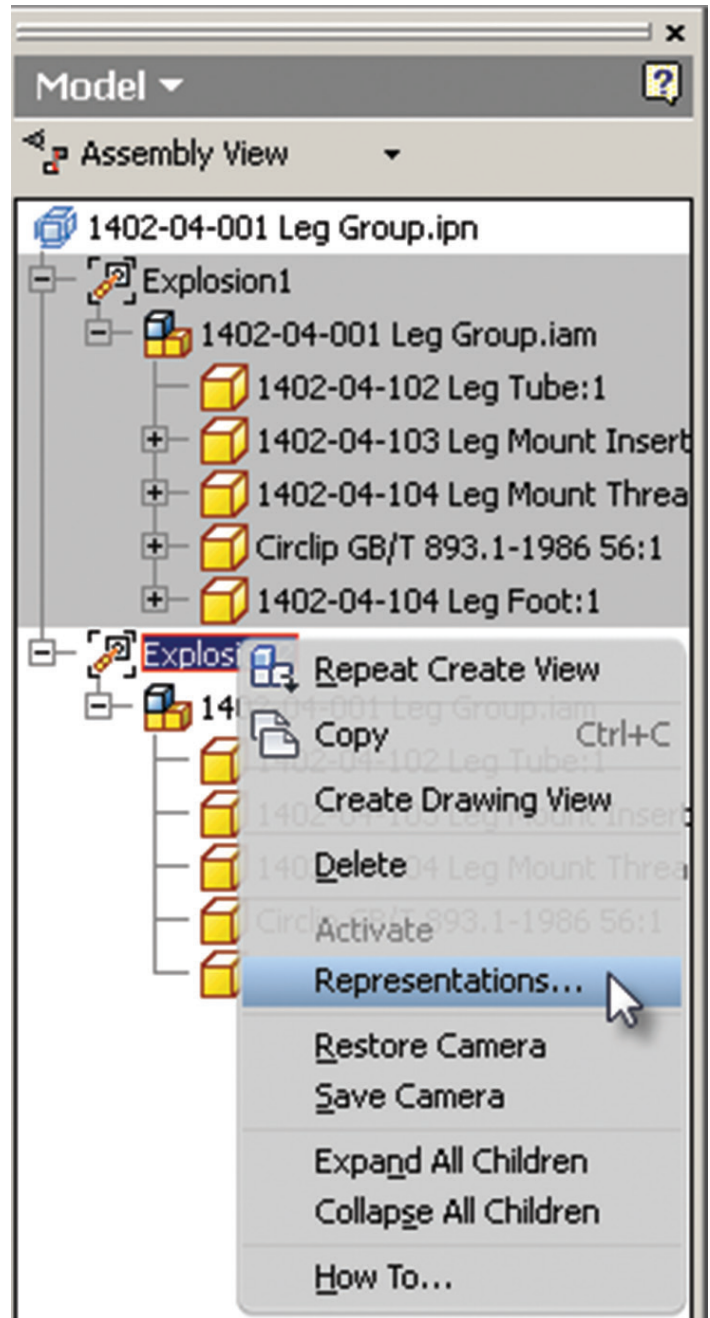


Figure 3: Representations on the Explosion view context menu

Note: the association with Assembly Design View Representations is one-way. Attempting to make alterations such as appearance will invoke a dialog asking you to disassociate the representation.



# Inventor 2016

## Presentation Browser Modes

The Presentation browser can be viewed in one of three different modes:

- Assembly View
- Tweak View
- Sequence View

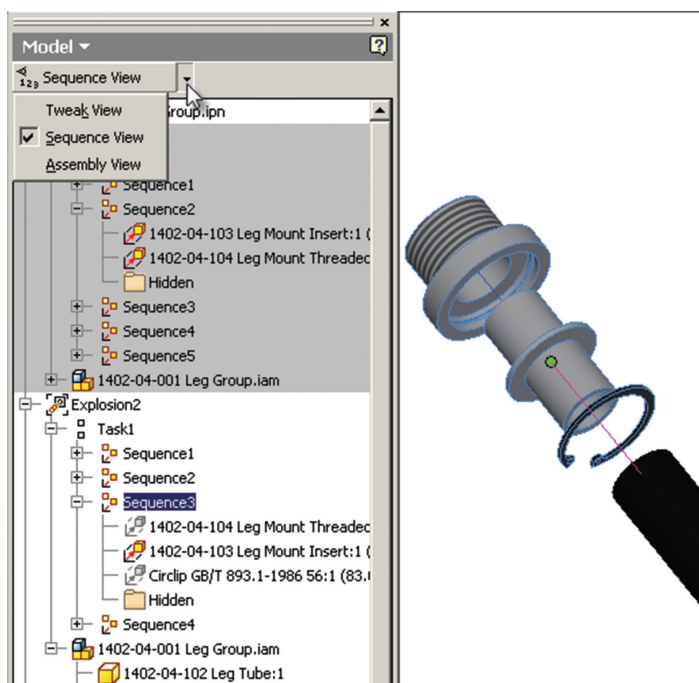


Figure 4: Presentation browser in Sequence View mode

Each of these displays the assembly tree along with a list of the respective features, with components organized under these in expanding branches.

## Auto-Explode

Auto-Explode has been enhanced and added to the ribbon and the Create View command. The command remains inactive on the ribbon until an assembly header is selected.

## MANIPULATION CHANGES

The terminology such as tweaks and trails are all the same, but the way you manipulate items is different.

### Tweaks

I have to say that I am quite impressed with the ease and intuitiveness of the command. The command starts as expected in noun or verb mode, meaning you can select a component(s) and start the Tweak command, or start the command and select the desired components. Once started, the mini-toolbar appears.

**Move** – Creates tweaks in a single-use scenario, clearing the selection set made during the last operation when Apply is picked.

**Continuous Move** – Functions the same as Move, but keeps the selection set active until components are removed or the command is ended.

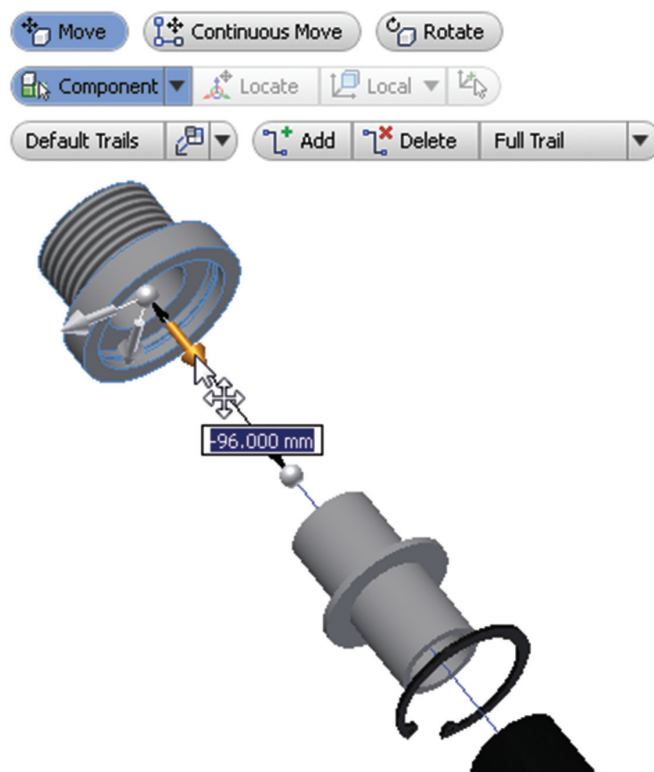


Figure 5: Component tweaks and the tweak mini-toolbar

**Rotate** – Creates rotation tweaks.

### Component and Part Selection Toggle

**Locate** – Associates the Move Triad with a part, at a selected feature, and aligns to that part's local coordinates by default.

**Local and World Coordinate toggle** – Switches the Move triad orientation between the two options.

**Align Triad button** – This allows users to align the Move triad to the axes of geometries within the part that the triad has been associated with.

**Default Trails** – The options under the pull-down are:

- None
- All Components – Trails applied to all components
- All Parts – Trails applied to all Parts
- Single Parts – Trails applied to only a single part (This I love; it makes cleaner exploded views easier)

**Add Trail** – This creates an additional Trail during the current tweak operation.

**Delete Trail** – Deletes the current operation's trail.

**Full/Single Trail toggle** – option applied to the Add and Delete function.

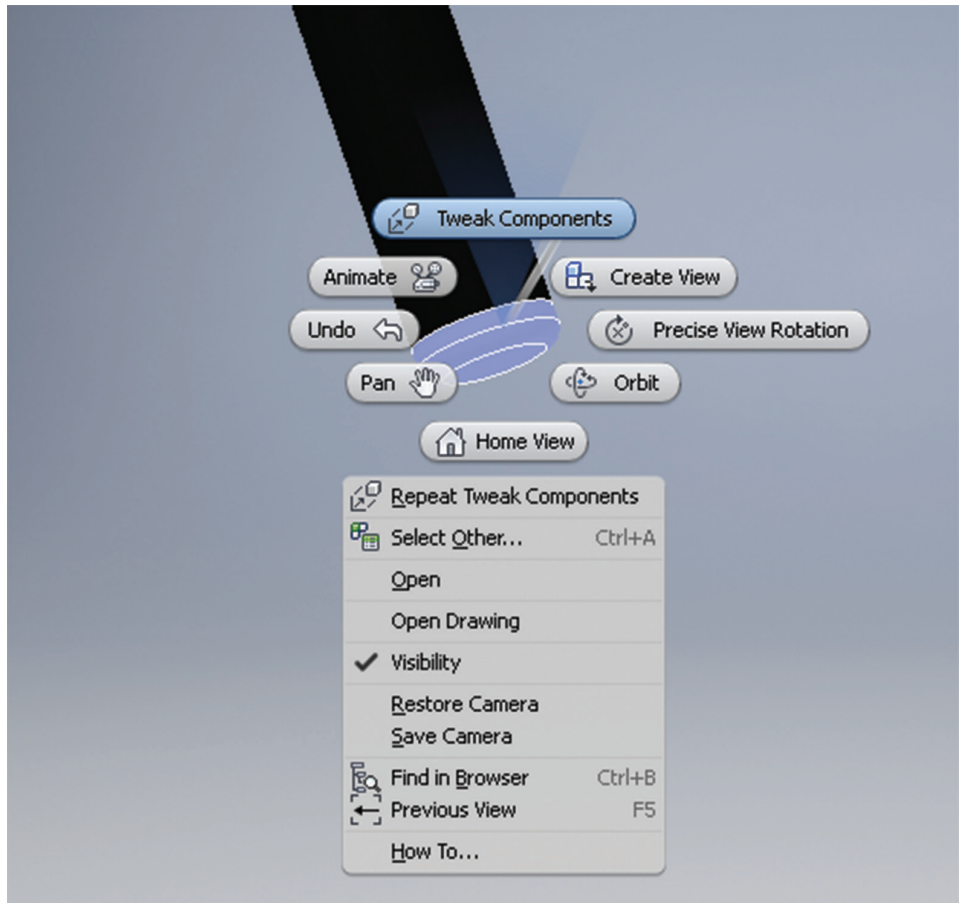


## USING THE TOOLS

The first thing that I like about tweaking parts is starting with the triad placement. After selecting a part geometry to set the triad, that same component is automatically selected (default) to tweak, if one wasn't already selected (you can always select something else if desired). The triad takes on the part's coordinate alignment, and away you go.

The next thing I really like is component selection on the fly. If a tweak is in progress, selecting other components will automatically snap them into the tweak relative to their respective locations prior to starting.

The effect is as if you had selected them all from the onset. This works really well with the single trail option. Select a single part, as well as the single trail option, and when you are satisfied with the placement, pick the remaining parts you wish to include. These will snap to the new location without creating individual trails for each. Then pick Apply before moving on.



When I tried to use the Auto-Explode *Figure 6: Component context menu*

feature, the command errored-out, noting that the joints and constraints that I used were inadequate. I adjusted one set of constraints from an automated Mate/Flush combination to the almighty Insert constraint. When I tried again, the process automated without a glitch. I think this is a logical solution to making something as awkward as Auto-Explode work in a predictable manner by limiting its behavior to coincide with the logical joint placement. Joints such as Mate/Flush are too arbitrary for Auto-Explode to do anything useful.

I must say that changes to the Presentation environment make it much more comfortable to use. The changes are far more intuitive and the mini-toolbar actually works well in this application.

Will it replace Publisher? No! (I wouldn't want it to.)

Is there more room for improvement? Yes.

However, this is a great start to an overhaul that is long overdue. I actually enjoyed using the Presentation environment for a change.



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*by Robert Green*

# SSD Technology Update

CAD users always want the fastest hardware and best performance - it just seems to be in our DNA – so anything that can upgrade the performance of our workstations is of great interest. In this month's edition of Tech Insights we'll examine why new solid state disk (SSD) technology found in HP's Turbo Drive G2 are so effective at increasing workstation performance and share some technology advancements that make SSD's even more attractive for CAD users.

## IT'S ALL ABOUT DATA

Of course any workstation has to have a fast processor, ample memory (RAM) and a graphics processor (GPU) to manipulate CAD data into plots, renderings and the results you see on your screen, that much is a given. But what many fail to recognize is the part of the workstation that brings the data to the processor in the first place – the storage disks.

But simply put, all the processing, RAM and GPU's in the world won't make your system perform well if they are hampered by a slow mechanical hard drive. To see just how stark the data transfer contrasts are look at the read and write performance data in Figure 1. Here we see a standard 7200 rpm mechanical hard drive attached to a SATA 3 disk controller delivering only 160 MB/s of data while older SSD drives deliver about 550 MB/s – a 3x improvement.

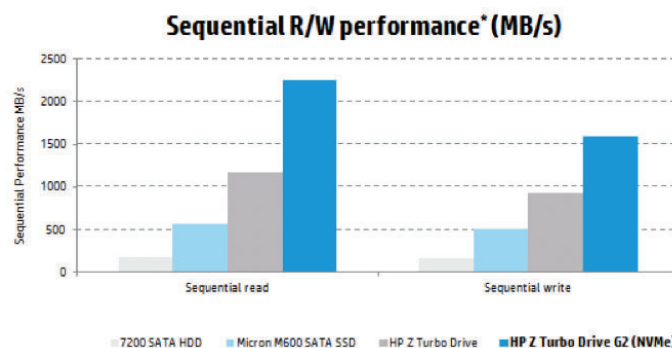


Figure 1 - Comparative data transfer rates for various storage drive systems.

Big performance gains become apparent when stepping up to the PCIe based HP Z Turbo Drive family. Installed as an add-in card, these drives plug directly into a PCIe expansion slot that can take advantage of the full bandwidth of the mother board's

circuitry rather than having to pass through a slow disk controller. The gains (as seen in Figure 1) allow the new HP Z Turbo Drive G2 (using PCIe 3.0 technology) to outperform conventional SSD drives by a factor of 4.

But where the speed comparison becomes staggering is when new SSD technology is compared to the maximum transfer rates of mechanical hard drives. With an HP Turbo Drive G2 reading 2,200 MB/s compared to a mechanical



Figure 2 – HP's Z Turbo Drive G2 NVMe PCIe SSD installs in an expansion slot rather than in a drive bay.



hard drive's 160 MB/s a comparative performance advantage factor of almost 14 is realized.

## SSD METRICS

SSD's performance advantages for CAD are huge because CAD applications and their model files are very large and, therefore, take a lot of time to pull from disk. If you've ever waited impatiently for your CAD application to start up and then load a model while watching the hard drive status light on your workstation blink like crazy you know this to be true. And even after initial loads are performed subsequent operations like renderings, analysis and plotting also require substantial read/write access to the hard disk (watch the hard disk light for proof of this). All things considered, it becomes apparent very quickly that your workstation is only as fast (or slow) as its storage drive thus making SSD technology a huge advantage.

Another particular advantage of the new HP Turbo Drive G2 controller technology (NVMe) is its ability to perform much higher in random read tasks. In fact, HP Z Drive G2 technology performs random reads almost 3 times faster than prior generation SSD technologies. While we all know that keeping our disks defragmented is a great idea, the reality is it doesn't always happen so having the best random read/write performance available is another key metric for speeding data throughput.

## SSD'S PAY YOU BACK

By equipping your workstation with a large enough SSD to contain your operating system, application software, and the models for your current projects, you'll greatly reduce disk access and get all the performance your processor, RAM, and GPU can deliver. You'll notice faster system boot up, much faster application loading and greatly enhanced application performance. If you think about SSD's from a perspective of saving user time you'll start to see a strong economic justification for SSD's emerge. The \$550 cost of a 512 GB HP Z Turbo Drive G2 can yield very high ROI over a few years.

Consider that if an engineer can save 15 minutes per day due to an SSD's higher performance that will mean 180 hours time savings over a three year workstation life span (assuming 240 work days per year). If the engineer is paid \$50/hour then the total savings is a staggering \$9000. A similar calculation for a \$17/hour CAD tech would yield \$3060 in savings. (Note: ROI is an estimate. Run some sample calculations with your own time savings and labor cost numbers to see how great your savings potential can be.)

## REAP THE BENEFITS

With all the attention being paid to cores, RAM and GPU's these days it is sometimes easy to overlook the best performance bargain you can get – high performance SSD's. While your exact performance gain with SSD's will vary based on the applications you use, the reality is that the time savings an HP Turbo Drive G2 SSD can provide should more than pay for itself. In fact, SSD's can deliver an impressive return on investment (ROI) rates yet only cost a few hundred dollars to install.

Does your IT department think they are saving money by not configuring CAD workstations with SSD's? If so show them (and your boss) your sample calculations and show them that they can't afford NOT to include SSD's in all workstations.

## ABOUT HP

HP helps you stay ahead of the curve with professional desktop and mobile workstations designed for large and complex datasets, dispersed teams, and tight deadlines. HP Z Workstations, built for Pros with Intel® Inside®, deliver the innovation, high performance, expandability, and extreme reliability you need to deliver your 3D CAD projects in less time. To learn how to configure a HP Z Workstation, visit the HP and Autodesk page at [www.hp.com/go/autodesk](http://www.hp.com/go/autodesk). Start saving now!

## ABOUT ROBERT GREEN

Robert Green provides CAD management consulting, programming, speaking, and training services for clients throughout the United States, Canada, and Europe. A mechanical engineer by training and alpha CAD user by choice, Robert is also well known for his insightful articles and book, Expert CAD Management: The Complete Guide. Reach Robert at [rgreen@greenconsulting.com](mailto:rgreen@greenconsulting.com)



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# BIM Project Break Down



Owners, professional engineers, architects, and other stakeholders in the AEC industry are focused on Building Information Modeling (BIM). They are often more concerned with what goes in models than the process of BIM. In the end, a BIM process must be well managed to be successful. Putting more attention on management and less on modeling can have a high payoff.

Let's explore the practice of BIM as it affects the entire lifecycle of a project. BIM can be defined as how all stakeholders of a project contribute data from all perspectives into a process of design, construction, and management from inception to ownership utilizing powerful, adaptive software.

BIM can be broken down into key aspects of a project:

- A. Information Gathering and Organizational Management
- B. 3D Modeling Management
- C. Building Analysis Management
- D. Time and Resource Management
- E. Monetary Management

- F. Construction Management
- G. Building Lifecycle Management

## INFORMATION GATHERING AND ORGANIZATIONAL MANAGEMENT

Information gathering not only requires the contribution of ideas to the knowledgebase, but more so the organization of this information into a concise, structured, accessible database from which to draw information and utilize that information effectively at every stage of a project. The standard building information model will require information such as all 3D elements, property data, parameters, and metadata. It requires a library of standard parts to allow for a fluid design process. It requires up-to-date and valid information. It requires information from vendors, suppliers, manufacturers, and others. The data required to make a proper 3D model for the BIM process is key to ensuring everyone is working with informative content. As professionals, we create the 3D model considering all the information gathered in a (hopefully) cohesive, adaptable, "breathing" model. All the information gathered must be in a central location in which everyone can build upon.



The information gathered for the project is not just 3D modeling content. It must include all types of data such as emails, correspondences, photos, videos, and specifications, to name a few. A quality project dictates that all information must be considered as part of the final deliverables to the owner...not just a set of As-Built documents.

With all this information, it is sometimes difficult to understand what data to include and what data to exclude. It is safe to assume that the data we need will not only be contained in the model, but also on a central server. How this information is organized is also vital.

Companies can struggle with how to organize BIM and CAD standards. We are fortunate to have industry standards available to us such as US National CAD Standard, National BIM Standards, Construction Criteria Base CAD Standards, and Building Information Modeling Standards from GSA, among others. Anyone can do a quick Google search for this information and utilize it in any project. These standards provide guidelines to how and what information should be organized. Figure 1 features one such standard.

From a BIM Standards “Server” level, everyone who contributes to the project wants to know how to organize their files/folder structure to make it easy to work on a project. Unfortunately, every company works on projects in a unique way. Because of this, a “one size fits all” hierarchy list of folder structures does not exist. Consider this basic example:

```

Year
  Project Number and Name
    Drawings
    Correspondences
    CAD Library
    BIM Library
    Specifications
    Marketing Material
    Addendums
    RFI's
    Change Orders
  
```

Although at first glance this looks plausible, it has inherent flaws in structure. Notably, the ability for consultants and clients to tap into and contribute to this folder structure is lacking.

From a BIM Standards “Cloud” level, we are concerned about how everyone can tap into a central location for all communications,

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Figure 1

data sources, and content. We are so entrenched these days into digital technology and the immediacy of how information transfers from one piece of tech to another. The BIM management of the project must be accessible from any device, at any time, and in any form factor. It should not be restricted to a particular operating system, a particular software file type, etc. It must be able to store, manage, control, and distribute the data to any contributor in any manner necessary.

From a BIM Standards Construction level, we are concerned about how this information transfers to a constructible model and a construction workflow to ensure the creation of the project efficiently and quickly while still providing profitability. To organize this information, the “system” needs to be able to quickly transition from a design mode to a construction mode and back at the flick of a switch. Whether the end user who is requesting the information is a drywall installer or a CEO of the firm, the construction information needs to be managed and organized to allow for risk mitigation at the highest level.

From a BIM Standards correspondence level, how do we manage and control the information such as phone calls, emails, photos, etc.? There are data management solutions such as Autodesk Vault, but this system, like others, requires proper setup and education in order to use it effectively. Nonetheless, some type of organizational database management system must be in place in order to keep everything organized.

The first hurdle we face is how all the information is gathered and organized cohesively before anything can begin.

# Revit MEP 2016

## 3D MODELING MANAGEMENT

MEP engineers are concerned about the content used to generate the models. Unfortunately, Autodesk® Revit® MEP content that comes out of the box is not that extensive. It is easy to control, customize, create, modify, and manage the systems. Although this seems like a limitation, the ability to use manufacturer- and vendor-specific families lends to easy design and creation of the design intent model.

What about a model that is not a design intent model? If a constructability model is required, is the content available? Is it manufactural? Is it correct? This is an issue that has plagued 3D modeling in design for quite some time. Luckily, things are changing. There are third-party applications that interface with Revit and allow for easy integration of true components for construction processing. In fact, this year Autodesk has introduced Fabrication-specific parts within Revit 2016 that truly integrates free-flow design and constructible modeling. These manufacturer-specific parts come directly from industry standard databases created specifically for this purpose.

Great! We have the parts...we can "rebuild him." Not so fast. Just because we have the parts and tools necessary to design to construction the model properly, does that mean that the model is true to accuracy? In order for the ultimate in 3D constructability modeling, the knowledge of the professional must be transferred to the end users who are creating the content. If you don't know how it's put together, then it doesn't work...period!

So how do we manage this information? Companies who have

invested in this approach lean towards custom API programming to make it work. Those who cannot afford this approach rely on Autodesk to provide a method within the software being used. We can obviously grab all the content and just place it on our servers or in our cloud storage locations, but it isn't managed well. Data management solutions such as Vault may help.

In the end, managing our 3D model becomes tedious and sometimes feels like a burden if not controlled properly.

## BUILDING ANALYSIS MANAGEMENT

What forms of analysis do we provide for our clients as services? Do we concern ourselves with energy analysis, design iteration analysis, or a variation? No matter what type of analysis we perform on our model, this information also needs to be managed properly. We should concern ourselves with the engines that are used to do the analysis. Without properly understanding the nature and engineering behind the software/hardware we use to do the analysis, the results could be misleading. Fortunately, Autodesk provides tools such as Autodesk Green Building Studio, Autodesk Ecotect Analysis, and a host of other products to get at the heart of wind, solar, heat and energy analysis.

So once the 3D model is digested, what information is retrieved? How is it organized? How is it presented to the end user? How functional and easy is it to perform various iterations for multiple design situations? These basic questions need to be answered in order to understand how we manage the data. For example, Autodesk Green Building Studio provides several methods for displaying the analytical data (see Figures 2 and 3).

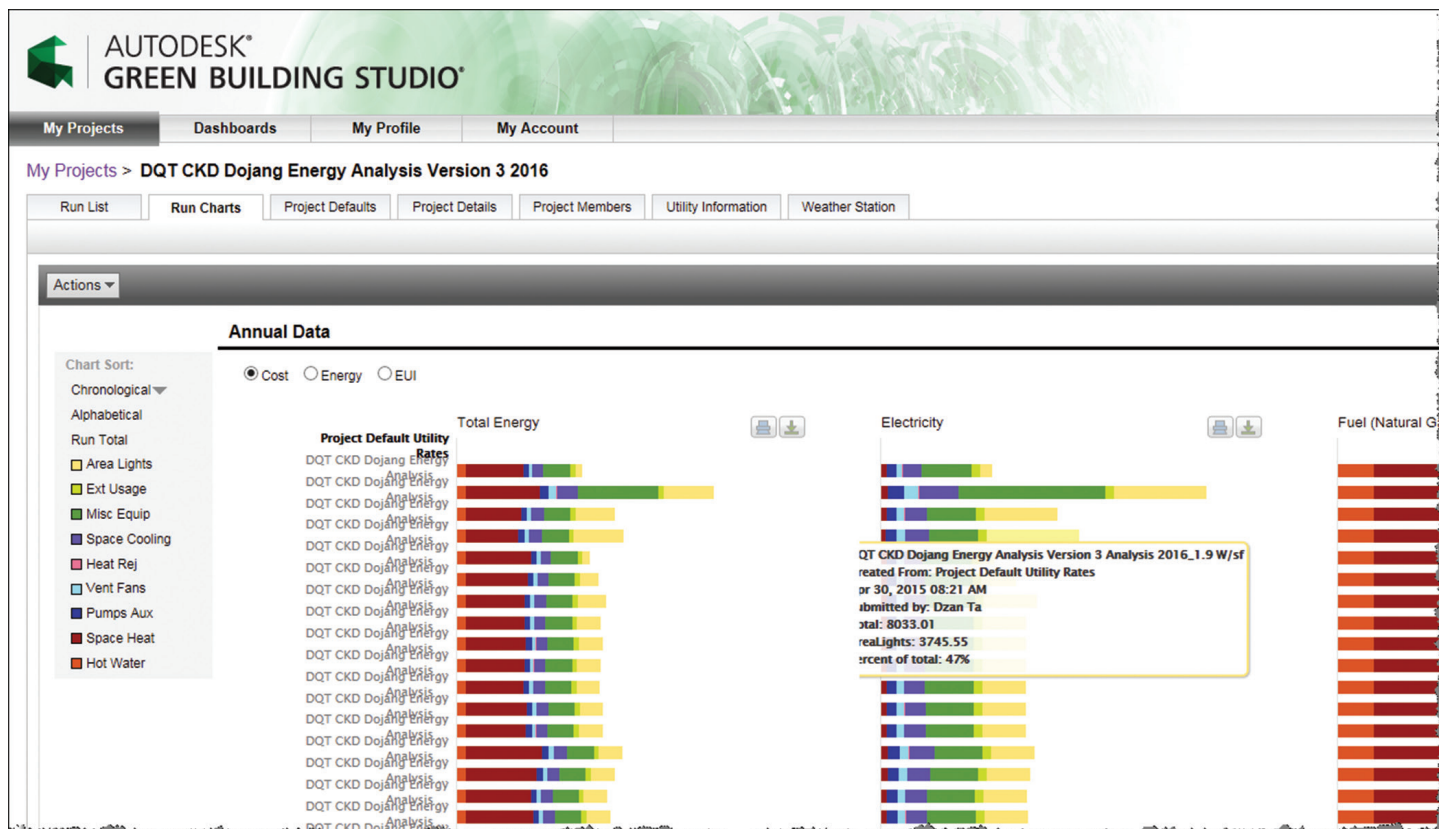


Figure 2



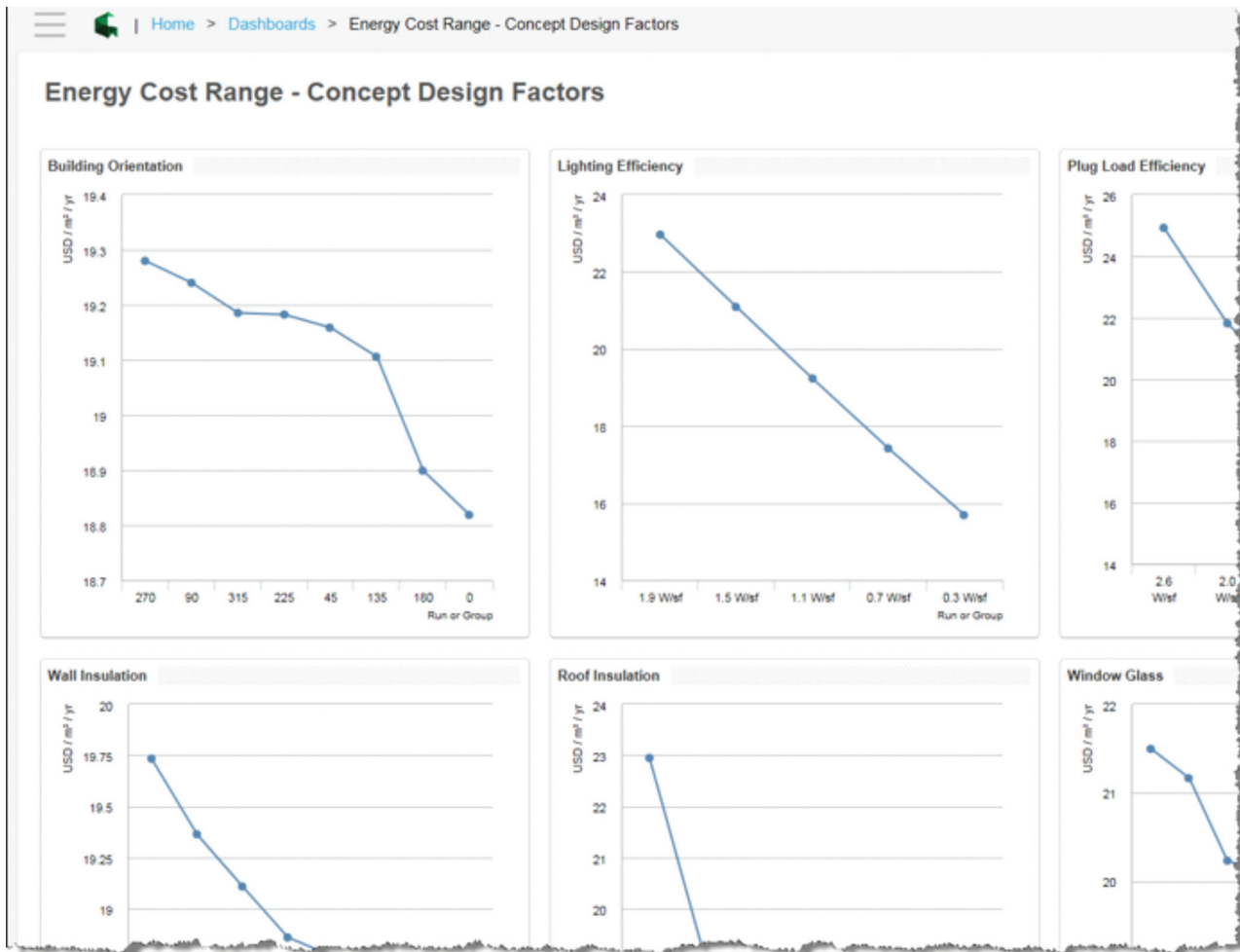


Figure 3

When considering the analysis management aspect, we must also consider how the information transfers from software to software. To what file formats can the data be exported? What file formats can be imported into the accompanying software? Lastly, can the information be “round-tripped” between software? The flow of the information needs to be seamless in order to allow the analysis portion of the project work properly. If these factors are considered, management of the information will be easier.

## TIME AND RESOURCE MANAGEMENT

Time is money. The more time we waste, the more money we lose. How do we manage the time we have and the resources available at any given time? Professionals spend upwards of 10+ hours a day working feverishly on our “to-do” list and never seem to get ahead. As with anything we do, schedules are made, modified, thrown away, and rebuilt. Getting a handle on what is important and focusing on what is absolutely necessary at that moment in time while still thinking three steps ahead is a goal we all strive for. So how do we manage the time and resources?

One method is to wake up earlier to allow for time to organize our thoughts for the day. If we spend just 30 minutes to gather our thoughts and calm our mind for the day, our stress level drops and our ability to foresee what the day will look like will be remarkably easy.

Another method is to write a “To-Do” list ranked by level of importance. If we control our list of priorities, we can organize our resources such as materials, talents, people, and equipment to the right place at the right time. Having a TD list also means we have to chip away at that list as quickly and as efficiently as possible...but how?

A third method which lends a hand to method two is to manage the people and talent around us. We know we cannot do everything ourselves, even though we want to. We have talented people all around us. Why not put them to work for us? Why not ask for their help? Knowing who to ask for help and when is just as important as knowing what needs to be done. My eldest brother taught me that you do not go to college to get a degree. You go to college to learn how to think. For example, when he has a pressing issue that needs to be addressed and he doesn't know the answer, he doesn't worry. He knows to call on the experts in the field to help him and relies on their knowledge to get the issue resolved.

So the management of our time and resources is dependent on talent, patience, focus, and direction, which in the end lead to money...maybe lots of it.

## MONETARY MANAGEMENT

So now that we can focus and manage our content, 3D model data, analytical data, time, resources, and talents, how does this

# Revit MEP 2016

affect our monetary situation on a project? How do we manage the amount of money needed to ensure a successful project? Let's focus on money for a second.

We worry about the project budget. We worry about making the payroll. We worry about the bank loans needed to fund the cost of the project. We worry about paying every stakeholder the necessary amounts of money they need in order to keep them going. That is an immense management process. How do we manage?

Your company's CFO can be your best friend. The CFO ensures the profitability of the company and the projects now and into the future. Use the CFO! Seriously, we did not go to school for business management. We went to school to become professional engineers. Let us do our thing, and let's use the CFO to do his or her thing to get what we want...plain and simple. I would rather give the management of money and the projects' financial responsibilities to the one member of the team who handles money best. Not only would I rely on and request the CFO's help on managing the money, I would ask him or her to teach me how to think about the monetary aspects of each and every project so that I can be ahead of the game on the next project.

## CONSTRUCTION MANAGEMENT

MEP engineers are concerned to a certain degree with the construction of the project and how the information is managed. We rely on the general contractor and sub-contractors to manage the construction of the project to ensure it is built properly. However, we must ensure that our part of the project process is correct. For example, if there is a custom HVAC unit that needs to be installed on the roof, how do we manage that task? Do we work with the GC hand in hand during the installation? Do we call on the structural engineer early to ensure the structure can handle the load? Do we rely on the manufacturer of the custom unit to help us with instructions to provide to the installers? All of these issues and concerns and many more are addressed more often than we realize during the construction of a project.

How do we manage the GC? Are we giving the GC the correct up to date information at the right time? Are we holding back decisions and information that affect his construction timeline? Who handles the creation of the construction timeline? Do we rely on the GC's expertise to tell us how long systems are built on site? All of these questions must be answered and ultimately, the entire team needs to be educated and informed of all the answers to these questions and many more.

Construction management isn't just managing the raw materials, equipment, and people needed to build the project at the right time. Construction management is also about predicting the outcome long before anything happens. At the heart of construction management is the risk management involved in any project. The more risk the GC can avert, the more profitable the project is. If managers can foresee what issues may arise such as a ductwork/piping interferences, they can prevent them from happening and can avoid a costly mistake.

In the end, we must work closely with the GC and communicate clearly and concisely the information needed to ensure a proper building of systems for the project.

## BUILDING LIFECYCLE MANAGEMENT

The owner is concerned about how much money is spent to maintain the building. If we can provide MEP systems that are efficient, buildings with the lowest renewable and recyclable design, with the best structural design for the lowest price, and if the GC can build the project with the future in mind, the owner wins!

Things to consider when we speak about Building Lifecycle Management:

- \* Cost of energy annually
- \* Cost of equipment replacement (lights, plumbing, etc.)
- \* Cost of landscaping materials annually
- \* Cost of materials such as paint, roofing, etc.
- \* Timeline of when parts of the building need replacing/renewing

Don't consider only those previously mentioned, but imagine we are the owners of the project. What would we want in our design of the project to ensure the lowest recurring costs on an annual basis?

Lastly, do we design for the owner a project that is meant to last for 25 years, 10 years, 5 years, etc.? Knowing the owner's intent for use of the project will give us initial foresight as to what materials and resources to use and manage. This will ensure not just a profitable project, but also one in which the lifecycle costs eventually break even and bring profit to the owner long term.

**BIM...Building Information Management** is about all the following:

- \* Time Management
- \* Profitability Management
- \* Building Design and Engineering Management
- \* Construction Management
- \* Lifecycle Management
- \* Owner Expectation Management
- \* and...your Expectations and Management



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# Collaboration Motivation

It's like being in a tsunami... the collaborative environment has arrived in our offices and suddenly we have several tools to make our job efficient and successful. While the tools are very good and easy to manage, the change is not easy at all.

We are going to see in this article how Autodesk® Revit® Structure and its users work in this type of environment.

## COLLABORATIVE WORK AND REVIT STRUCTURE

Revit Structure has brought us the capability to work collaboratively in a project. It allows all members of the team to work in the same files for calculation, modeling, or analysis. The exchange of information occurs in "real time," allowing full coordination between the other different disciplines involved, the quick visualization of the impacts in the design process, and the facilitation of team decision making.

Revit Structure is a very simple, easy, and complete tool for modeling in 3D. Each component has the right behavior within the model, and the interface is clear and intuitive. The creation of families is also very simple, thanks to the available templates.

With these properties, it would seem easy to make the change from the old structural software to Revit Structure. But, unfortunately, while the advantages of all these features are clear and well-known and can facilitate and optimize our job, the process of implementation is, as I wrote in the introduction, not easy at all.

The use of Revit in a collaborative environment is perfect only when all the members of the team completely understand the new process of real-time collaboration. The process works well when they consider the consequences of their job for the rest of the team, and when they have good educational training about the new way of working.



I could write pages and pages about collaboration within Revit Structure. In fact, for me this is the first and main feature of Revit, maybe for my personal experience as a user, and always in large-scale projects.

I'm going to summarize the collaboration tools, but first I would like to speak briefly about the misunderstandings of this new environment.

## THE FIRST MISUNDERSTANDING

When using Revit, your first impression could be that you are making a beautiful 3D model of your discipline. However, the real feature of this software is the amount of information you are inserting in this model and thus, sharing with the rest of the team and disciplines.

The way of working has changed extremely and Revit allows us to work with real-time information. This requires a good understanding and management of in-progress data.

The communication and coordination between all the participants become the main requirements to work in an efficient environment, as well as being proficient enough to use the collaboration tools within the software.

In working with Revit these last few years, I have met many really good Revit modelers, but a very, very small group of good team players. Companies with vast Revit experience, teachers of Revit, experienced users, etc. are often having problems related with the coordination in their project.

While making a good model is important, the understanding of the collaborative behavior is paramount for the success of these projects.

## COLLABORATIVE EDUCATION

In my experience, the best way to solve the difficulties of working in a collaborative environment is simply education. The training of the team should be mainly focused on team building, and the use and importance of the collaboration tools.

Nowadays, the best worker is the best team player, and each member has to learn how to fit in for the best efficiency within the team. For the first time in our industry, we have to forget the individual fight for success, the competition to be the best... for the first time we are not doing our best work by ourselves.

This is the more difficult challenge due the big change in our mindset: the fight for power seems to be part of human nature. Who is now the best? Who is going to be the next CEO of

the company? I'm not sure at all... but obviously it won't be the disruptive ones. Unfortunately, the collaboration is often affected by the will of power.

We need to train people with high skills to develop their abilities in this environment, and we need leaders capable of encouraging and engaging this kind of person to achieve the best result, the best performance, the best process. To do so, these leaders have to be able to recognize the skills and abilities of each member and help them understand this new way of working.

## THE CHANGE IN THE WORKFLOW PROCESS

While good planning of work was a key action when working with individuals, now the results are better, thanks to the training as team players. How, what, and when to exchange information with the rest of the team and understanding the model as a data base in real time for all members is a mandatory skill for a good Revit user.

To achieve this, we must establish fluent communication—through email, instant messages, etc.—and schedule frequent meetings to speak about the progress of the project and coordination issues.

A deep knowledge of the standards, and the establishment of protocols and efficient workflows are other tools to ensure the quality of our project.

## THE COLLABORATION TOOLS IN REVIT STRUCTURE

Revit Structure has multiple tools to allow a good collaborative environment. They are located in the Collaborate tab of the ribbon, and they are easy and intuitive to use if you have the training and understand the importance of using these tools (see Figure 1 below).

When we are working in a project as a team member, we use the Worksharing features of Revit Structure. This is possible by creating Worksets, the main tool for worksharing. We'll examine these tools briefly, but I encourage all Revit users to read the Revit Help within the program to learn more about them, giving special emphasis to the best practices in collaboration using Revit.

## CENTRAL MODEL AND LOCAL MODELS

Worksharing always requires careful planning and management. If we are working in a Revit file where no one else is going to work, we don't need to enable worksharing through the use of Worksets because they are not justified, and they shouldn't be used for different purposes.

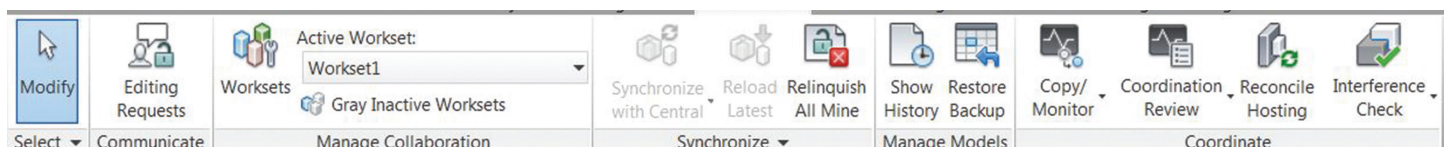


Figure 1: Revit collaboration tools

# Revit Structure 2016

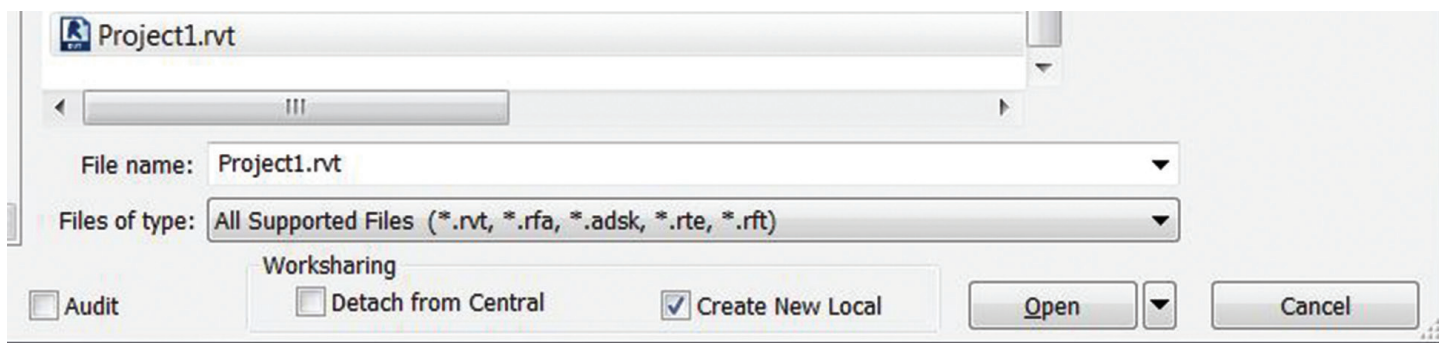


Figure 2: Creating a new Local File

However, if we are working in a file where other people are going to work, we must enable Worksharing. This is possible at any stage of the model, and allows each team member to make changes and work simultaneously.

To accomplish this, we have to create Worksets and save the project as a Central Model. Every modeler must create a Local File by opening the Central Model, selecting the Create New Local box, and “saving as” a file in a local folder. The Central Model then becomes the master project model for a Workshared project, and the Local Models are the copies of the project model that reside on the computer system of each team member who is working on the model.

When Worksharing is used to distribute project work among team members, each member uses a local model to work on his or her Workset (functional area).

Team members periodically save their changes to the Central Model so that others can see the changes and update their Local Models with the latest project information. We can use the Reload Latest command to update our copy of the project without changing the Central Model. This practice saves time by eliminating the need to reload the model during the save-to-central process.

It is a good practice for Revit users to create a local copy of the Central Model every day, and schedule the sync differently from other users.

It's also recommended to Save to Central with the Compact Central File (slow) option selected. This option is used to reduce file size when saving workset-enabled files. The process of compacting rewrites the entire file and removes obsolete parts in order to save space. Because the compact process takes more time than a normal save, it is strongly recommended that you only do this when workflow can be interrupted.

## WORKSET MANAGEMENT

A workset is the collection of elements in a Workshared project. It's important to think about the worksets early in the project, clearing the way to split the model for the best organization of all users who are going to be collaborating for the entire lifecycle of the model.

We can create worksets following different criteria, and in every

company, team, or project it will depend on the way of worksharing, as described below.

- For structural models, where there is one person working in steelwork and other one working in concrete components, the worksets could be “Steelwork” and “Concrete.”
- In other structural models with a different distribution of the tasks, they could be “Columns,” “Beams,” “Slabs,” “Walls,” and so on.
- In other disciplines such as architecture, worksets typically define discrete functional areas such as interior, exterior, site, or parking. For building systems engineering, worksets can delineate functional areas such as HVAC, electrical, plumbing, or piping.





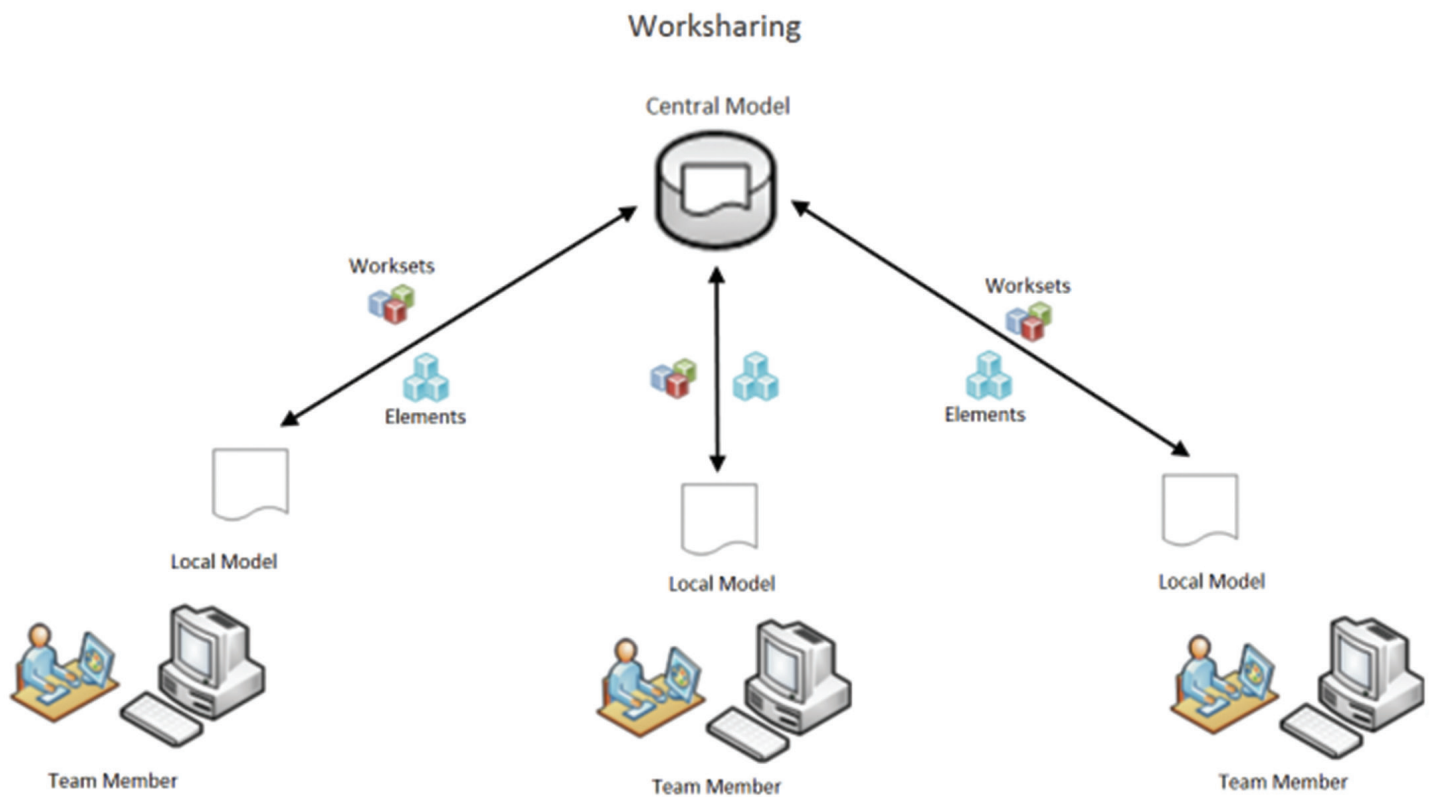


Figure 3: Revit Worksharing

## EDITING WORKSETS

### Workset Owner

Every workset should have an owner responsible for the content and its consistency within the whole model. This ownership can be temporary while the person is working in a specific group of objects, or can be permanent during the creation of the model. It's recommended to have a responsibility matrix, so that everyone understands work divisions and project schedules.

We control the ownership of worksets through the Worksets dialog box. It's a good practice to make editable only the workset where we are working, taking exclusive ownership of all objects in it. Only one user can exclusively edit each workset at a given time. All team members can view worksets owned by other team members, but they cannot always make changes to them. This restriction prevents potential conflicts within the project.

### Workset Borrower

It is possible to borrow an element from a workset that you do not own. When you borrow an element from a workset, your user name is listed in the Worksets dialog as a borrower. Your name also displays on the Properties palette for the Edited By parameter.

The simplest way to borrow an element is to make a change to the element. If the workset to which the element belongs is not owned by another user, you automatically become the borrower of the element and can make changes.

If you are editing an element owned by other team member, a

message displays allowing you to place a request to borrow the element. The owner receives automatic notification of your request and you receive a notification message when the request is either granted or denied.

If the element is being modified by its owner, the same message displays indicating that you cannot edit the element until the owner resaves the element to Central, relinquishes it, and you reload the latest.

When you synchronize with Central Model, borrowed elements are relinquished by default.

## OPENING WORKSETS

When we are working in a workshared project, we can select the worksets to open. By opening only selected worksets and leaving others closed, performance improves. This is very useful when we are working in large and heavy models and we don't need to see all the elements.

Closed worksets are not visible in a project, so less time is required for common operations such as opening files, opening views, redrawing the screen, and snapping. It's a good practice to close unneeded worksets to release allocated RAM for use in memory-intensive tasks such as printing and exporting.

You can open worksets from the Open dialog when you initially open your workshared project, or you can open them from the Worksets dialog in the project.

# Revit Structure 2016

## MONITORING COLLABORATIVE WORK

Project coordinators will have responsibility for certain tasks to guarantee the best result in a collaborative environment.

The first thing to do is to ensure that all of the team members know the processes, protocols, standards, and best practices or, in other cases, facilitate the necessary documentation or training.

After that, prepare the files with the objects to share for all the team members such as grid, levels, views, templates, project coordinates, and shared coordinates, etc. This is a very important task for achieving the consistency between the different files of the project.

It is best practice to specify the default view that is opened when the Central or any Local Model is open. Use a simple view where you post project information or notices to share with team members whenever they open the model.

It is recommended to periodically open the Central file with the Audit option selected and then save the file. If corrupted elements are encountered during the audit, they are deleted if possible, and the user is notified.

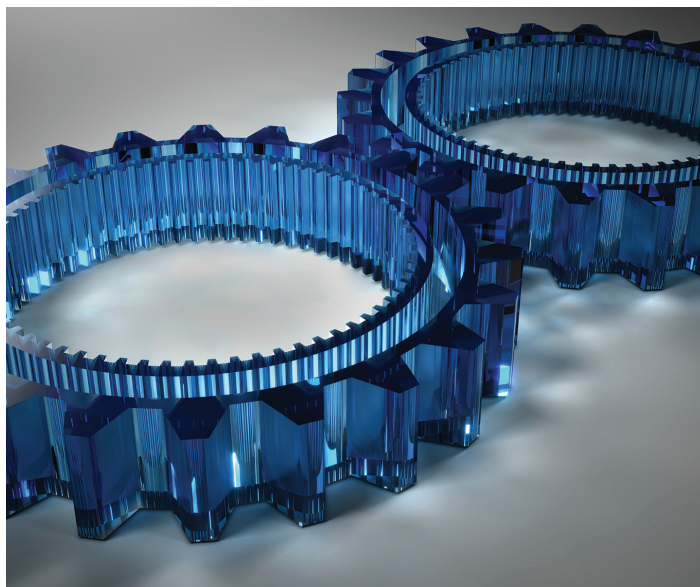
Ensuring that a sufficient number of backups are being created is also recommended. At a minimum, you should have at least one backup for each member of your worksharing team in order to increase the likelihood that each team member's data is saved as part of the backups.

Checking out a workset may occasionally be of use if certain model elements, such as the building grid or linked files, need to be protected from accidental change. In that event, BIM managers or team leaders can check out a workset containing project elements that should not be casually edited or relocated.

There are different tools within the program to use for the best coordination.

- **Copy/Monitor**, to ensure that design changes to levels, grids, and other elements such as columns, walls, floors, and openings are communicated across teams.
- **Coordination Review**, to review warnings about changes to the monitored elements, communicate with other teams working on the same project, and resolve issues regarding changes to the building model.
- **Interference Check**, which identifies elements that interfere with one another in a project or between the host project and a linked model, and it can be used on all of the elements in a project or specific categories of elements.

For example, by selecting the beams in the current project, and ducts in the linked MEP project, the interference report will identify any interference conditions between those elements. This report can be viewed in the Revit project, or it can be exported to an HTML file. Once the situation has been fixed by either moving the beam or the duct work, the tool can be run again, and the interference will be removed from the report.



## THANK YOU FOR COLLABORATING

The AEC industry is changing and the workflow process has become so different that adoption is challenging. The lack of good workflows and the new problems we are facing every day are balanced with the enthusiasm of the professionals in this sector. Collaboration is not only in the office, but also everywhere around our profession. A new work culture is born and we have great tools to make our job easier.

I would like to thank all the BIM Coordinators in my company because they are always supporting the rest of the people with the same role—sharing their experience, their knowledge, resources, etc. I would like to mention that we are using Slack as a tool to do so.

Thank you to my Google community “Revit Structure” because they share all their information with the rest of the world. To each one of the 555 people—today—that joined the group to learn and share, my apologies for my lack of attention lately!

Thank you to all AUGI members because we are joining our voices, efforts, passions, experiences, and knowledge. Thank you to Kimberly Fuhrman for making possible this Collaboration article, and thank you to Autodesk for making it possible to meet Kimberly and other contacts at AU 2014.



*Lola Carbajal works as a BIM Coordinator in Foster + Partners. She first started working with Revit as a Structural Revit Technician and is a passionate user of this software and its capabilities. In her current role, she is implementing Revit in large-scale projects, establishing the best workflows and protocols for the best coordination and collaboration of all the members of a huge team.*



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# Architects Modeling for Construction

What a novel thought, an architect modeling FOR construction... intentionally. I say that due to the countless times that I have heard things like “That is the contractors’ responsibility”, etc. I humbly say to that: [Expletives Redacted ;)]

## STUD RAILS, 3D GRIDS, AND SURCHARGE REVIT FAMILIES

Modeling elements that are typically either left out of models or only provided as details, such as the surcharge family, is a huge mistake in my opinion and makes project coordination more difficult than it needs be (as it is difficult enough when everyone is modeling everything). These and other simple additions to a BIM have good Coordination ROI.

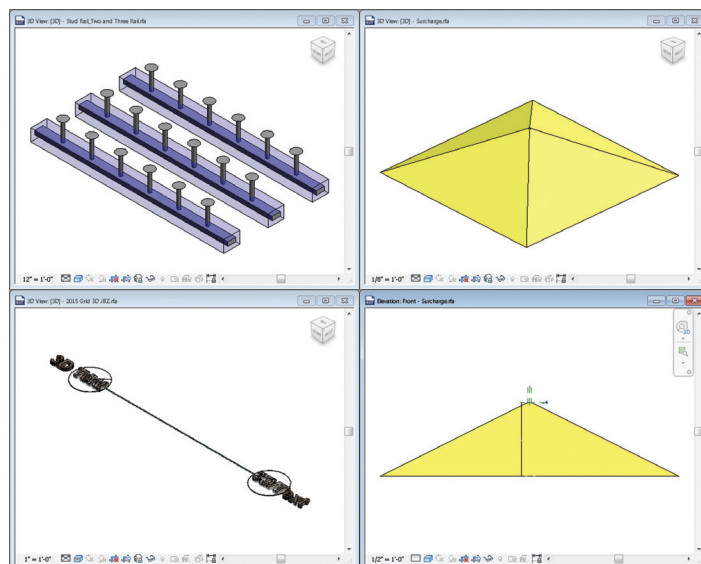


Figure 1



Figure 2

The surcharge components, for instance, take a short time to input—like one or so per building, BUT the impact of having these



in the design BIM and onward will pay huge dividends during coordination, construction, etc. Download this surcharge family directly from: <https://app.box.com/s/lv0f7l6hz6au2xojydg>

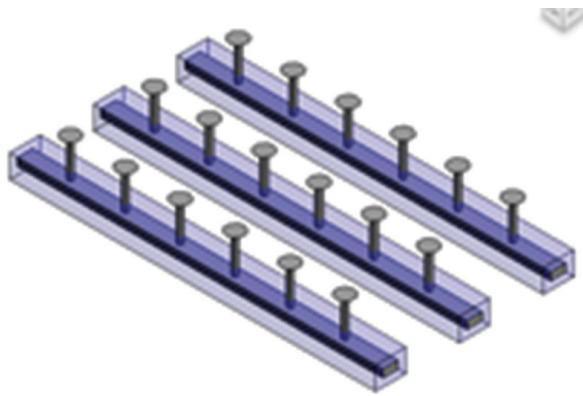


Figure 3

The Stud Rails above come in two flavors: 2-Rail and 3-Rail and include “Column Width”—a good start to modeling your project specific ones. These are very sneaky in their importance. How many times has someone tried to place a pipe, etc. too close to a concrete column-to-beam intersection and then the pipes don’t fit in reality-world; then a change order (or 10) and, voilà, how many thousands of dollars did that just cost? Again, as opposed to modeling these and catching the potential conflicts when we are simply pointing at models, not improperly built systems in the field.

Say you don’t care? Say “that’s the contractors’ responsibility?” Not if you want to create models that bring (or start to bring) back architecture and architects to the “master builder” level, as the industry once viewed them.



Figure 4

The 3D Grid is purely for coordination and mostly for Navisworks®, since its Heads-Up-Display (HUD) grids and levels are, well, less than optimum IMHO. The 3D Grid can be had from: <http://cad-vs-bim.blogspot.com/2013/10/3d-grids-in-revit-oldie-but-goodie-done.html>

PLUS! There are some other cool add-ons at: <http://revitcoaster.blogspot.com/2014/07/bimconsortium-revit-addin-update-new.html>. One of these applies these 3D Grids in the same place and length as the grids internal to Revit, as well as copies a set to each level included! Thanks, Troy Gates @TroyGates, for the add-ons :D

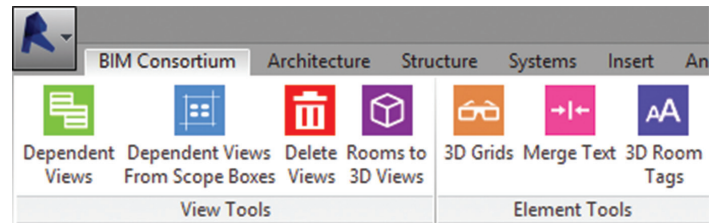


Figure 5

BIM Consortium tools (to date). So, there are three (or more ;) “easy” things we can do to save literally thousands of dollars with negligible effort.

I’d say that when these processes are used it lifts the whole floor for our teams and projects and, after all, isn’t that the ideal we should strive for on each new endeavor undertaken? Cheers!



*These are Jay B. Zallan’s professional passions: an intense and well experienced Virtual Design and Construction, BIM Leader, Designer, Artist and an AEC technologist*

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

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


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

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

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# Bringing It All Together with the Project Navigator

 The Project Navigator in AutoCAD® Architecture is the main point where you work with a project. The Drawing Management environment within the AutoCAD Architecture Project Navigator helps you organize, create, and access all your project drawings in one unified interface. Creating sheets for plotting is easier with the streamlined coordination that is built into the Project Navigator.

The Project Navigator has four tabs that you can use to enter project data. These tabs correspond to the main phases of project creation: general project information, creating building data (constructs), and creating building documentation (views and sheets). I will present an overview of each of these and then we'll look at them more in depth.

## PROJECT CATEGORIES OVERVIEW

Each of the basic categories is represented by a folder in the Drawing Explorer within the project structure that helps you to organize your project files. For every building project in AutoCAD Architecture, the following basic category structure is displayed on the Project tab of the Project Navigator palette:

- ♦ **<ProjectName>** – the top node in the project, which is represented by a folder with the project name.
- ♦ **Constructs** – the default category for constructs within the

project. When you create a construct, it is saved into the Constructs category.

- ♦ **Views** – the default category for view drawings in the project. When you create a view drawing, it is saved into the Views category. It is important to note that if you create model space views within a view drawing, they will be placed under the view drawing in the same category as the view drawing itself.
- ♦ **Sheets** – sheets in the project can be viewed in two ways: the Sheet Set View and the Explorer View. Each of these views will be discussed in more detail later in the article.

The main category structure listed above is fixed, but you can create subcategories and subcategory trees within this structure. Subcategories typically represent aspects of your workflow.

These subcategories can be set up in different ways. For example, you might set up subcategories by discipline, by view type (presentation, section, and rendering), or by sheet type (floor plan, ceiling plan, and elevation). It is important to note that you cannot mix basic category types. For example, you cannot create a Construct subcategory within the Views category.

Categories offer excellent organization for a project. Even small building projects contain a large number of individual drawings that can be difficult to track. By putting them into descriptive



categories, you can quickly find the correct files you need for your project.

## THE PROJECT TAB

The Project tab on the Project Navigator tool palette is where you enter information that pertains to the entire project. The Project tab allows you to do the following:

- Change project properties
- Launch the Project Browser
- Launch the Content Browser to access the project library
- Add, modify, and delete levels
- Add, modify, and delete divisions
- Synchronize the project with project standard styles and display setting
- Enable and configure project standards
- Refresh the project
- Close the current project

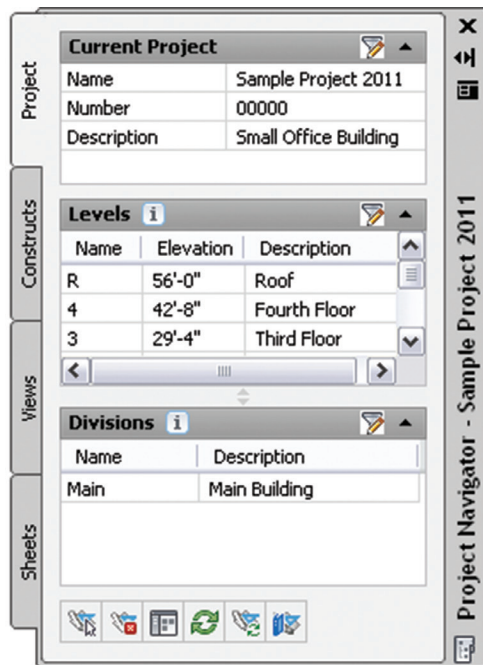


Figure 1: Project tab

## THE CONSTRUCTS TAB

The Constructs tab of the Project Navigator tool palette is where you add the basic building objects for your project. Constructs are basically the main building blocks of the building model. A construct represents one unique portion of a building, such as a building core or an entire floor. You will need to assign a construct to a level (floor) and a division (area of the floor) within the project. For example, you could assign an architectural construct named Interior Partitions—Second Floor/West Wing to the second level and the west wing division of the building. Constructs can span more than one level, which is useful for objects such as curtain walls.

The Constructs tab allows you to do the following:

- Open and close existing construct drawings
- Add, modify, and delete constructs within the project

- Create categories for constructs
- Launch the Content Browser to access the project library

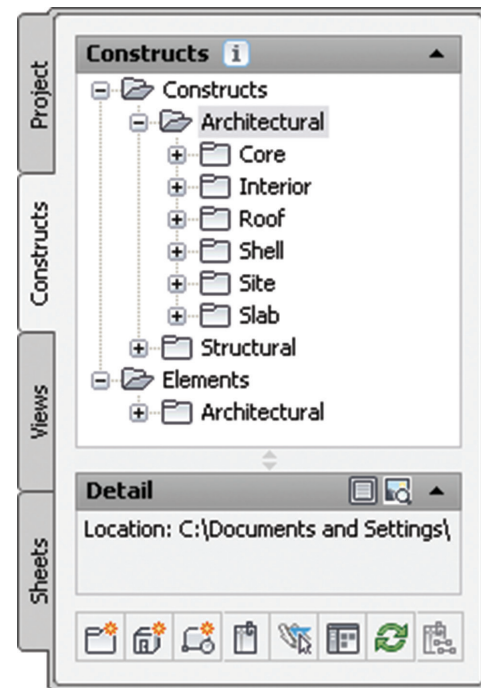


Figure 2: Constructs tab

## THE VIEWS TAB

The Views tab of the Project Navigator tool palette is where you can create individual views of your building data. Views contain constructs and are the primary location for you to add annotation such as notes, tags, and dimensions within the project. After you have created a view drawing, you can then create model space views within it.

After the structure of the building project has been defined and constructs have been assigned to both levels (floors) and divisions (area of the floor), you can then start to create view drawings within the project. A view drawing references any number of constructs to present a specific view of the building project. In order to create a view drawing, you must first decide which portion of the building you wish to look at and which type of view you wish to generate. View drawings will automatically reference the appropriate constructs in accordance to their level/division assignments within the building. For example, to create a floor plan of the west wing of the second floor, you would create a view that references all constructs that are assigned to the second floor and the west wing.

The Views tab allows you to do the following:

- Open and close view drawings
- Add, modify, and delete model space views
- Add, modify, and delete general views, detail views, and section/elevation views
- Change the contents of view drawings
- Create categories for view drawings
- Launch the Content Browser to access the project library

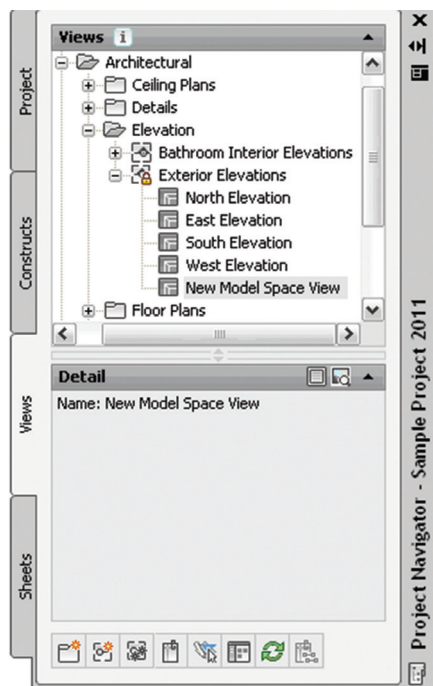


Figure 3: Views tab

## THE SHEETS TAB

The Sheets tab of the Project Navigator tool palette is where you create and organize sheets for your project. Sheets reference views and are used for plotting drawings. The Sheets tab is also where you manage the project sheet set. This is where you will perform tasks such as creating a table of contents, managing page setups, or publishing to a plotter, a PDF, or a DWF file. The buttons at the top of the Sheets tab let you view sheet information in either of two ways: the Sheet Set View or the Explorer View.

The Sheet Set View is a tree view of the project sheet set in which you have access to all publishing capabilities. The Sheet Set view allows you to do the following:

- ✦ Add, modify, and delete sheets in the project
- ✦ Open and close sheet views
- ✦ Assign numbers to sheet views
- ✦ Insert a table of contents
- ✦ Electronically transmit the sheet set
- ✦ Archive the sheet set
- ✦ Create sheet selections for specific tasks
- ✦ Manage page and publishing options
- ✦ Launch the Content Browser to access the project library
- ✦ Publish the sheet set to a plotter, a PDF, a DWF file, or to an alternate page setup

The Explorer View is a view of the folder structure and sheet drawings in the project. The Explorer View allows you to do the following:

- ✦ Open, close, and delete sheet drawings
- ✦ Create categories for sheet drawings
- ✦ Launch the Content Browser to access the project library

Sheets are organized into sheet subsets in the Sheet Set View. Sheet subsets are a logical structure. The sheet folder category does

not need to be identical to the sheet subset in which the sheet is placed. To avoid confusion, however, it is recommended that you have parallel structures in the sheet set and the sheet categories. You can rearrange sheets into different subsets within the Sheet Set View, but that will not change their physical location in the category or folder. Also, when you remove a sheet from a sheet subset in the Sheet Set View, only the reference of the sheet to the subset is removed. The layout itself and its containing sheet drawing are not deleted from the Sheets folder or subfolder.

In the Explorer View, sheet drawings are placed in folder categories. When you create sheets or sheet views within a sheet drawing, they are placed in the sheet drawing.

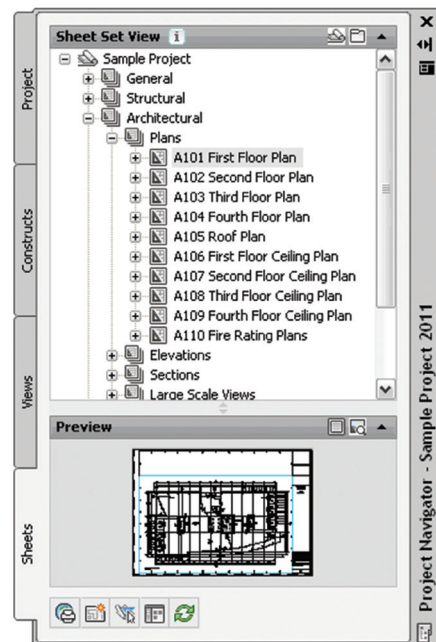


Figure 4: Sheet Set view

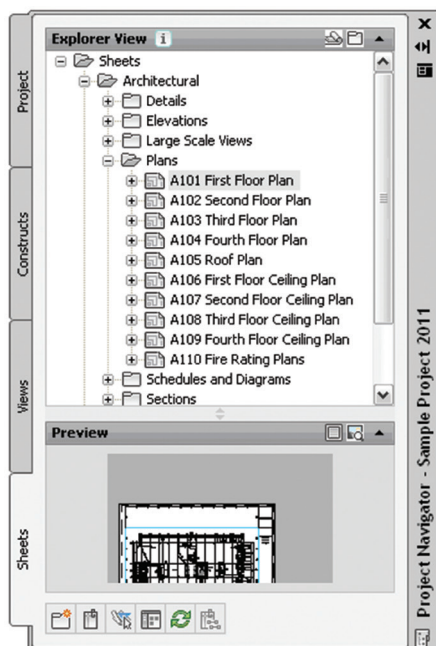


Figure 5: Explorer view



## THE DRAWING EXPLORER

The Drawing Explorer is a tree view that is common to the Constructs, View, and Sheets tabs of the Project Navigator. This is where the drawing files are organized. With the exception of the Project Tab, each tab of the Project Navigator has a Drawing Explorer tree where the associated project drawing files are displayed.

Drawing files belonging to a project are displayed on their respective tabs in the Drawing Explorer tree view. This tree view lists the drawings within their category. You can drag and drop, or copy and paste drawing files in the Drawing Explorer.

## EXTERNAL REFERENCES

The Drawing Management feature uses external references (xrefs) as a means to create a project and maintain it. Elements are referenced into constructs, constructs are referenced into views, and views are referenced into sheets. The mechanism of referencing is identical to the regular AutoCAD External References Management feature; however, the background methods employed have additional features.

Xrefs that are created in drawing management can automatically make use of project data, while those that are created manually through the xref palette or command line cannot. If you are working in a project environment, the best practice for referencing project drawings into other project drawings is to use the Project Navigator rather than the standard AutoCAD Xref Manager. The AutoCAD Xref Manager cannot differentiate between project drawings and non-project drawings. If you reference a non-project

file into a project file by mistake, you cannot use the full Drawing Management functionality on that file.

It is important to keep the following considerations in mind when working with a project:

- Do not delete any XML files generated by the Drawing Management feature as they are vital for the project.
- Use the Project Navigator to create, modify, and reference project files within the project. If you want to use existing non-project files in a project, convert them to project files first.
- Drawing Management supports the use of relative paths for external references. In the project setup, you can decide whether to use full paths or relative paths. Working with relative xref paths makes moving the project and transmitting it easier and reduces the need to repath the project.

## REFRESHING THE PROJECT NAVIGATOR

When multiple people are working on the same project simultaneously, one person's Drawing Explorer view on the Project Navigator palette can become out of sync with the changes of another. To prevent this situation, refresh the Project Navigator by clicking Refresh Project so that all items are updated to reflect the current project status. It is highly recommended that this is done frequently during a project session if there are multiple people working on the same project.

On the Quick Access toolbar, select Project Navigator. Next, select the tab where you want to refresh the file tree. Finally, select Refresh Project.

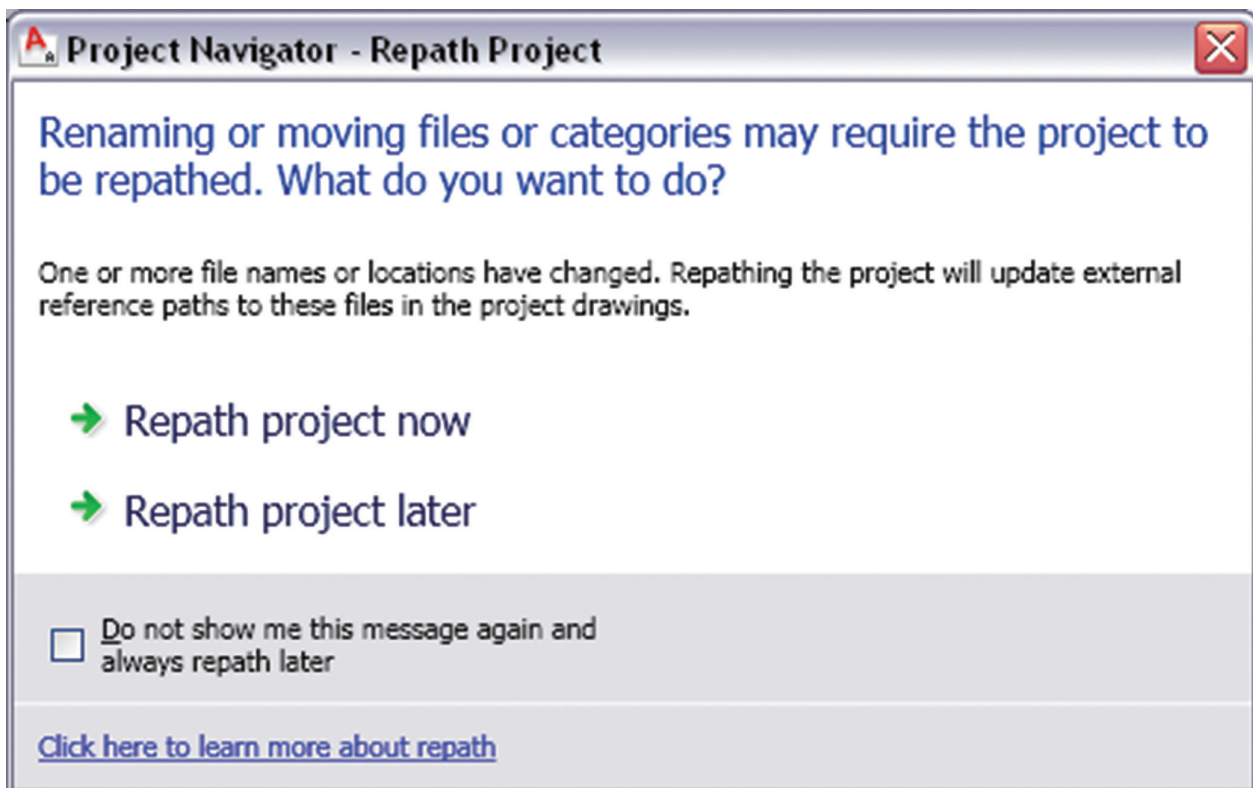


Figure 6: Repath Project dialog box

# AutoCAD Architecture 2016

## REPATH THE PROJECT

A repath is necessary after you make any of the following changes within the project:

- Rename a project file
- Move the project to a different location
- Move a project file to a different category
- Move a subcategory from one category to another

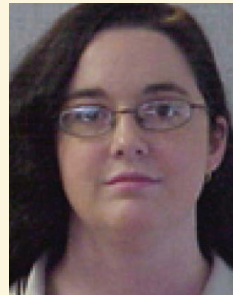
In addition to updating the project files, repathing will also update the paths of support files, images, and schedules that are referenced in the project drawings.

When you zip a project and then send it to another user who unpacks the project to a different location on another computer, the project will be updated in its new location when it is set current for the first time on the new computer. However, this will update only if all project paths were correct and current when you zipped them. If you have moved the project to another location on your computer before zipping it and not repathed it before zipping, the repathing on the new user's machine will not work correctly. Before you zip and send a project, you must make sure that all external reference paths in the project are valid.

You have the choice of repathing a single project file, all files in a category, or all files in the project. On the Quick Access toolbar,

select the Project Navigator. Next, change the name or the location of a project file or project folder in the Drawing Explorer. The Project Navigator - Repath Project dialog box will display (see Figure 6). Specify when you want the repathing to be done (Repath Now or Repath Later).

It is important to note that when you repath a project that was saved in a version of AutoCAD Architecture prior to 2010, the drawings are saved in the new file format. You will no longer be able to open these drawings in a version of AutoCAD Architecture prior to 2010. Synchronizing a project with the project standards will also save the project drawings in the new file format.



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# Parametric Dimensioning in AutoCAD

**S**ome designers think that AutoCAD® is simple “Stone Age” software, which makes drawings based upon user inputs with no relation between corresponding features of geometry. To some extent that is true, but AutoCAD can make intelligent geometries that can retain design intent and some veteran users avoid using these parametric tools.

I surely want to encourage users to use these parametric tools and in this article I will try to introduce you to simple yet powerful features of AutoCAD parametric tools.

## WHY CONSTRAIN DRAWINGS AT ALL?

When making assembly drawings it is often required that one feature of a drawing remains related to other features with certain parameters, hence making the complete drawing a single unit.

In a simple, non-parametric drawing, if you change dimension or orientation of any feature it will not affect other related geometries, which can result in serious errors for these kinds of assembly drawings. Parametric dimensioning is a smart alternative in these situations.

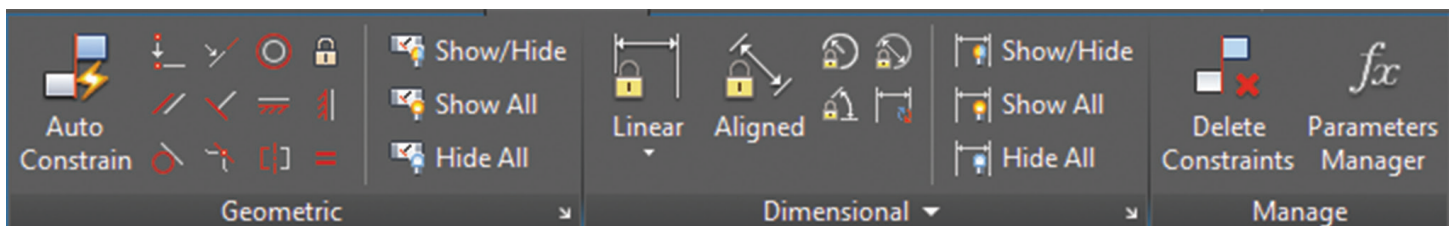


Figure 1: The Parametric tab in AutoCAD 2016





Figure 2: Constraints status toggle

Autodesk considers parametric tools so important that it dedicated an entire ribbon tab to it. A dedicated status toggle is also provided with the sole purpose of creating geometric constraints automatically. Figures 1 and 2 are snapshots of the Parametric tab and Infer Constraints Status toggle, respectively, from AutoCAD 2016.

## TYPES OF CONSTRAINTS

Broadly, constraints have been divided in two types—geometric and dimensional.

Geometric constraints are designed to specifically restrict degrees of freedom of geometry according to some defined set of restrictions. For example, a perpendicular constraint will restrict a line to remain at an angle of 90 degrees with respect to another line. In this scenario, the length of both lines does not matter—only their orientation in plane is restricted.

Dimensional constraint is used to restrict dimensional values of geometries such as length, radius, and angle. In this case, orientation of an object is not at all controlled.

## PARAMETRIC DIMENSIONING IN ACTION

Let's use an example of this very simple geometry (see Figure 3).



Figure 3: Sample geometry

Let's assume that we want to apply the following constraints on this geometry

- Length of the outer rectangle should always remain twice its width.
- Radius of the green circle should be one fourth the length of the rectangle.
- The circle should always remain in the geometrical center of the rectangle.

Let's first start with geometric constraints. From the Geometric panel of Parametric tab, select Equal Constraint and click on both longer lines of the rectangle. Now exit this command and repeat this process again on the shorter lines of rectangle.

Go to the Dimensional panel of Parametric tab and select linear.

Now click close to the left top left vertex of this rectangle and then close to the top right vertex of this rectangle. A dimension d1 with length of rectangle will appear. Click on the drawing area to place this dimension.

Again select linear from the Dimensions panel and click close to the end points of any shorter lines. A dimension d2 will appear. Double-click dimension d2 thus formed and change its value to  $d1/2$ . This will ensure that width of the rectangle always remains half its length.

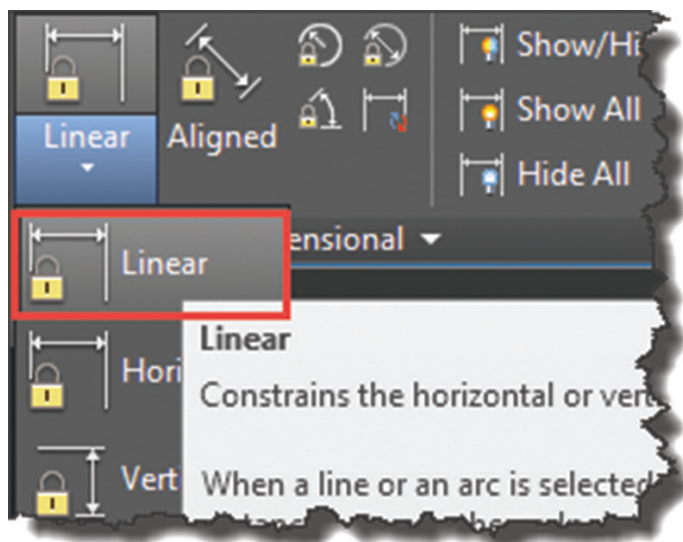
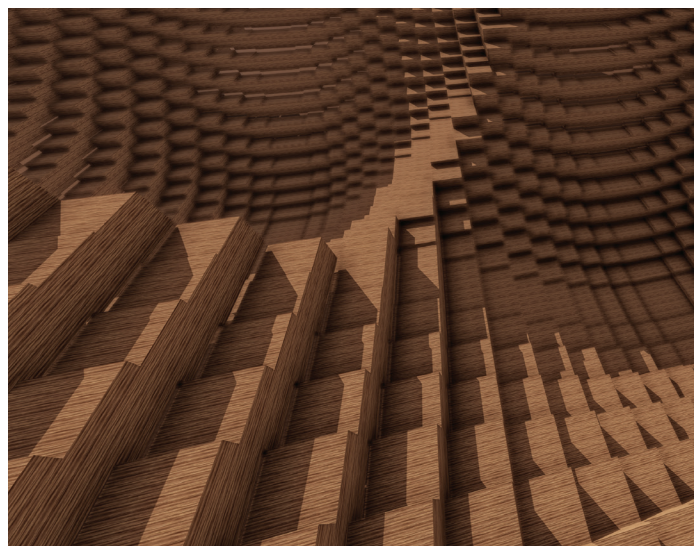


Figure 4: Linear command

Now click on Radius on the Dimensions panel of Parametric tab and click on the green circle. Place the dimension in the drawing area and change rad1 value thus formed to  $d1/4$ . This will ensure the radius of the circle always remains one fourth the length of the rectangle.





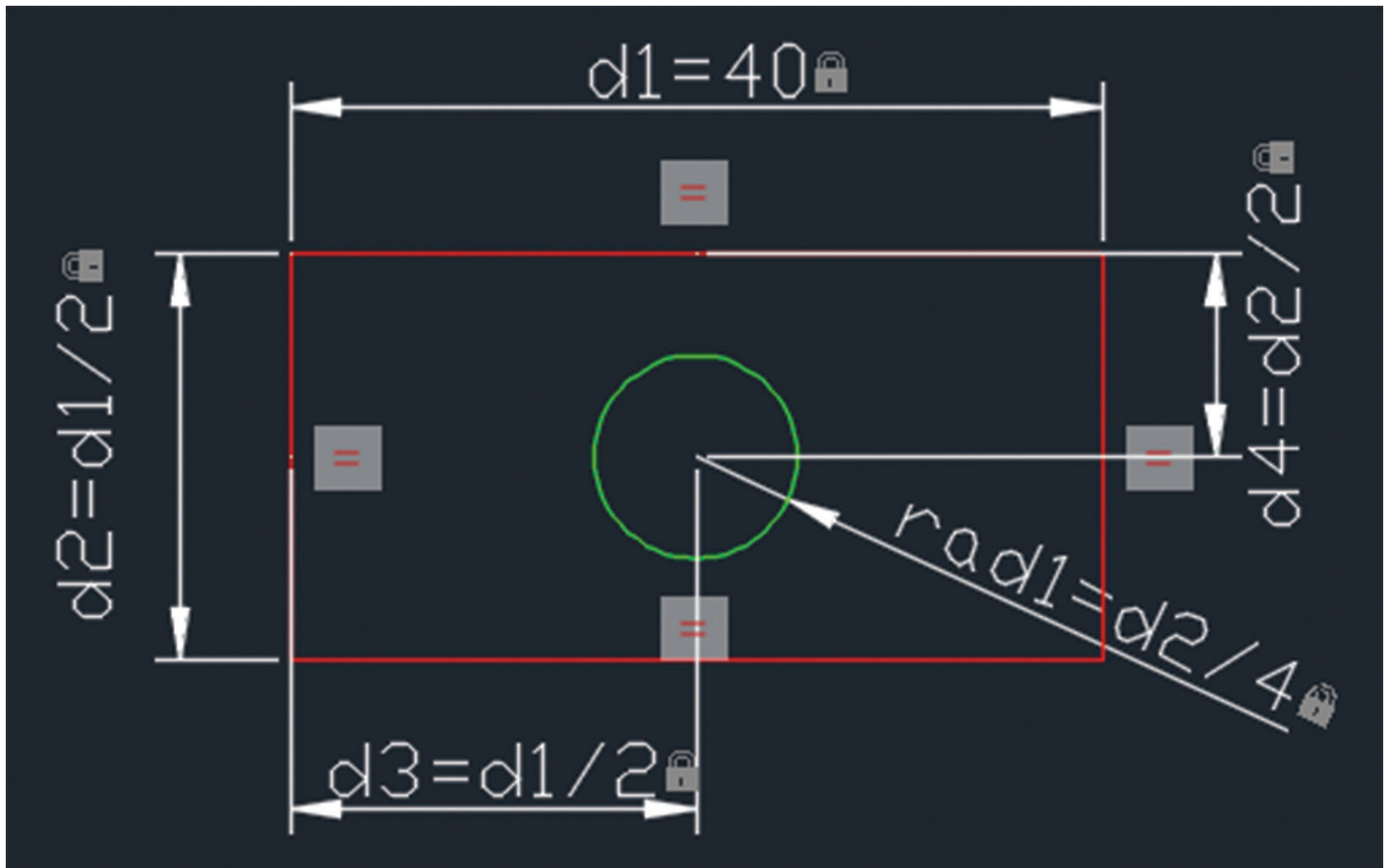


Figure 5: Circle at the geometrical center of the rectangle

Click on Linear on the Dimensions panel and click at a point close to the center of the vertical line on the left of the rectangle, and then click on the circle. A dimension d3 will be formed. Change the value of d3 to d1/2. Again click on Linear and click on the center of the longer line of the rectangle and click on the circle. Now change the value of dimension d4 to d2/2. These settings will ensure that the circle remains at the geometrical center of the rectangle (see Figure 5).

## TESTING THE GEOMETRY

Now let's check whether our geometry conforms to the criteria laid down by us earlier. Double-click on the d1 dimension and change its value to 40 units. Instantly, all other related dimensions will get updated to conform to our criteria. Check this with other values of d1 as well and every time it will conform to our criteria.

## USING PARAMETERS MANAGER

I have used division parameters throughout this example for defining one dimension with respect to others. I have used parameter such as  $d2=d1/2$  and  $rad1=d1/4$ . AutoCAD permits many more parameters including multiplication, addition, subtraction, logarithmic, and exponential values. You have plenty of parameters to select for your geometry and with these parameters you can design a fairly complex parametric geometry with ease.

## CONCLUSION


Constraints are a great tool if you are working with drawings where you need to maintain design intent. It can ease the design process and increase accuracy by reducing manual calculations for geometrical features.



Jaipakash Pandey is a Mechanical Engineer, blogger, corporate trainer, and educator. He has worked in the diecast industry and many training institutions and delivered training to corporate clients in CAD software, primarily AutoCAD. Jaipakash is currently working as senior analyst (CAD) for Ramboll, a leading engineering and design consulting group. You can reach him with comments or questions at his blog, SourceCAD.

# Autodesk Infrastructure Design Suite: Your All-Purpose Collaboration Tool



 Collaboration is an essential component of any project, whether it's a BIM (Building Information Modeling) project, an IPD (Integrated Project Delivery) project, or a project using traditional project delivery methods.

Autodesk has integrated collaboration tools into the Infrastructure Design Suite software to make collaboration more efficient and effective. Regardless of if your organization uses BIM, these collaboration tools (which you may not realize you already have at your fingertips) could be beneficial to your projects.

## COLLABORATION IN CIVIL 3D

### Data Shortcuts

Regardless of the size of your team or project, Data Shortcuts in AutoCAD® Civil 3D® can help improve your collaboration with others. Data Shortcuts allow you to share Civil 3D objects such

as Surfaces, Alignments, Profiles, and Pipe and Pressure Pipe Networks with others while maintaining the object properties and functionality. For example, a surveyor can create an existing Surface in a file, then that Surface can be shared with a civil engineer as a data reference, allowing the Engineer to target the existing Surface with Grading Objects, Corridors, and Pipe Networks in their own Civil 3D file. In addition, the Civil engineer can alter how the existing Surface looks in his file by changing the Surface Style. This also protects the surveyor's surface data from accidentally being modified or deleted during the project.

Another benefit of using Data Shortcuts is the ability to split project tasks between multiple designers on the same project. Two designers could be working on the same design, one concentrating on building a Corridor for the project, while the other one works on laying out a drainage system for the site using Pipe Networks.



Each could Data Shortcut the other's design into their working file, getting automatic updates of the data being changed by the other designer. Data Shortcuts are a great tool for local collaboration during your internal design and documentation.

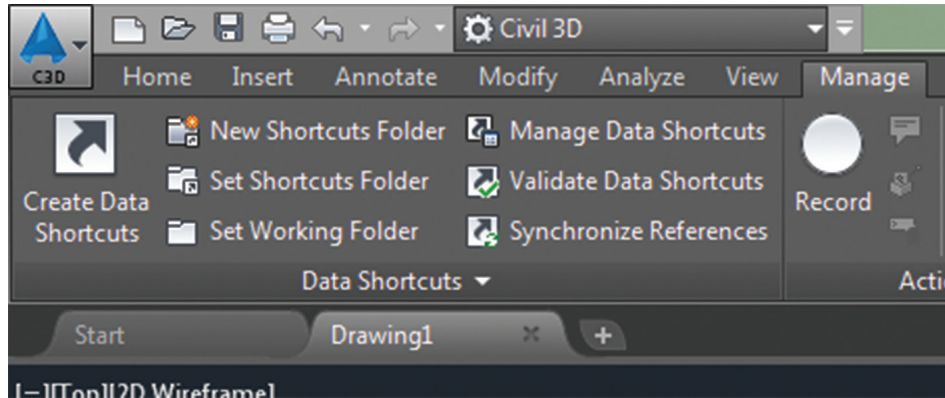


Figure 1: Data Shortcut tools in the Civil 3D ribbon

## Prior Version Compatibility

Another new feature in recent releases of Civil 3D is the ability to open files created in newer versions. This prior version compatibility allows Civil 3D users to collaborate with other users, offices, consultants, or clients—even if they aren't using the same version of Civil 3D. Most objects in Civil 3D 2014, 2015, and 2016 are backward-compatible with Civil 3D 2013. Be a little careful with this one, as not all object features are compatible with previous versions.

## Civil 3D and GIS

When GIS data is available, it can be an essential source of information during the planning of a project. Civil 3D provides you access to many of the tools available in AutoCAD® Map 3D, Autodesk's GIS software solution, though the Planning and Analysis Workspace. Having access to these tools allows you to import, export, and utilize GIS data within your designs. Shapefiles created from GIS software can be imported directly into Civil 3D as basic AutoCAD® objects for use in your files. Objects can also be exported from Civil 3D as shapefiles to share data with a GIS system. You can also use the Map 3D tools to collaboratively work directly in a GIS database. Using a data connection, Civil 3D users can connect to a GIS database, load, modify, or create GIS data,

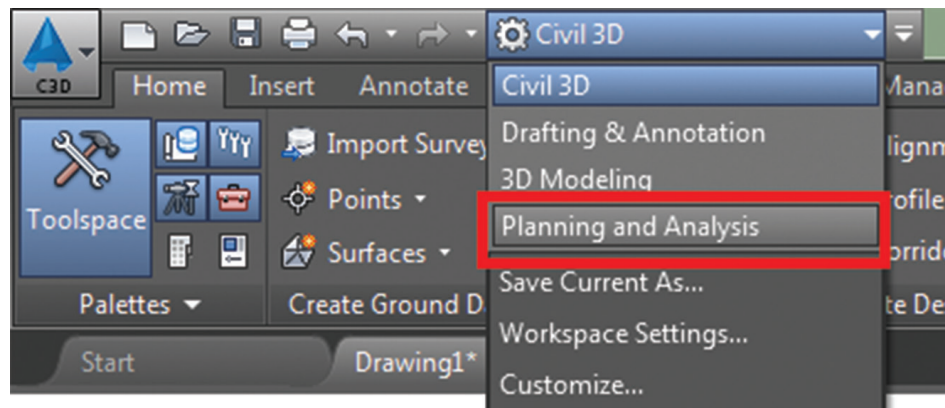


Figure 2: Planning and Analysis Workspace

and then merge the new data back into the GIS database. Civil 3D (2015 and 2016) can also export data in KML format, for import into Google Earth or other software packages.

## BIM 360 Glue

If your organization uses BIM 360™ Glue®, Civil 3D can now export design data directly to the online coordination service for review and analysis. In addition, Civil 3D can “pinpoint” clashes detected in BIM 360 Glue within your Civil 3D model, allowing you to make the necessary modifications then resubmit the model to BIM 360 Glue. You must install the BIM 360 add-in during installation/deployment, or download it from the Autodesk website. This workflow can provide complete collaboration with a project team.

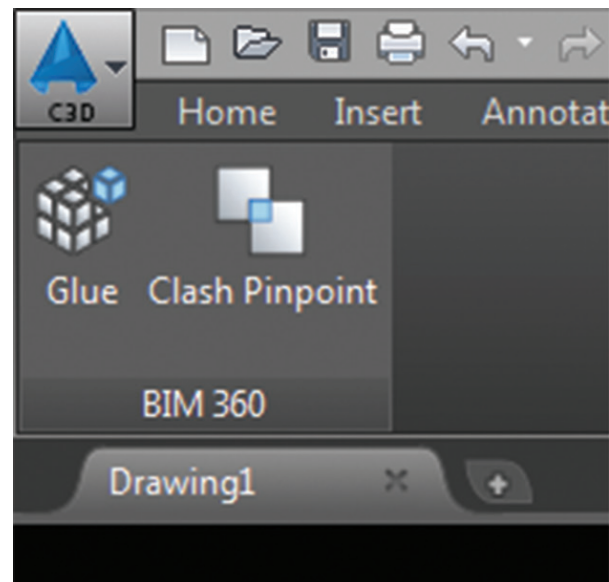


Figure 3: BIM 360 tools in the ribbon

## Industry Foundation Class (IFC)

In a perfect world, everyone collaborating on a single project is using the same software, or at least software from the same software company. In reality, though, you may be asked to collaborate with others who are using software tools that aren't developed by Autodesk. Starting in Civil 3D 2016, IFC files can now be imported into your file or exported from your design. The IFC file format bridges the gap between different software solutions by using an independent industry standard format that is compatible with most BIM software tools. Civil 3D objects must be converted to 3D solids before being exported in IFC format. Civil 3D includes tools to convert Surfaces, Corridors, and Pipe and Pressure Networks to 3D solids.

# AutoCAD Civil 3D 2016

## COLLABORATION IN THE INFRASTRUCTURE DESIGN SUITE

### Civil 3D and Revit

Many times Civil 3D users are required to collaborate with an architect or structural engineer who is using Revit. There are two ways to collaborate with other consultants using Revit software. First, Revit users can export a 3D view of their model as an ADSK file, which can then be imported into Civil 3D as a Building Site object. Building Site objects can also be assigned a Civil 3D Style to control the display of the 3D model in plan, section, and model views. Using a Building Site instead of

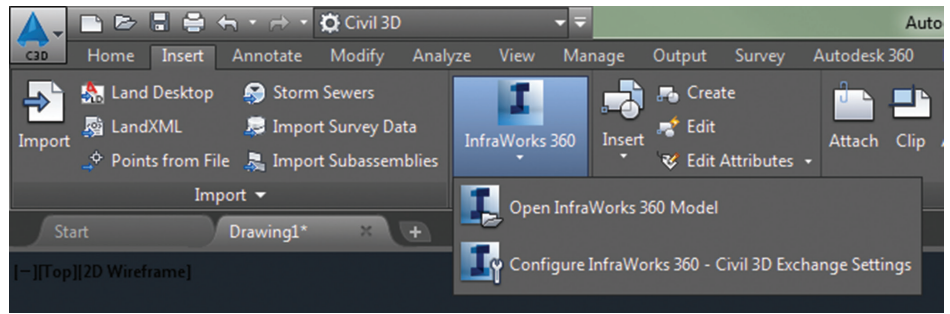


Figure 5: InfraWorks integration tools (Civil 3D 2016)

can open InfraWorks® models directly in Civil 3D. The most recent version of InfraWorks 360 also added a new Civil 3D DWG data import option that imports objects directly into the InfraWorks model. Although these tools are new (and probably need some additional functionality) this opens the door for collaboration either within a company or with clients, assuming these tools continue to be developed.

With these tools, schematic design and design options could be created in InfraWorks by project managers or lead designers, then passed along to other designers or drafters for final design and documentation in Civil 3D. There are also tools available to automate creation of plan and profile sheets in Civil 3D from design roads in InfraWorks.

With the new import tool, Civil 3D designs can also be opened in InfraWorks 360 to create visualizations, or to study alternate design options with your design team or the client.

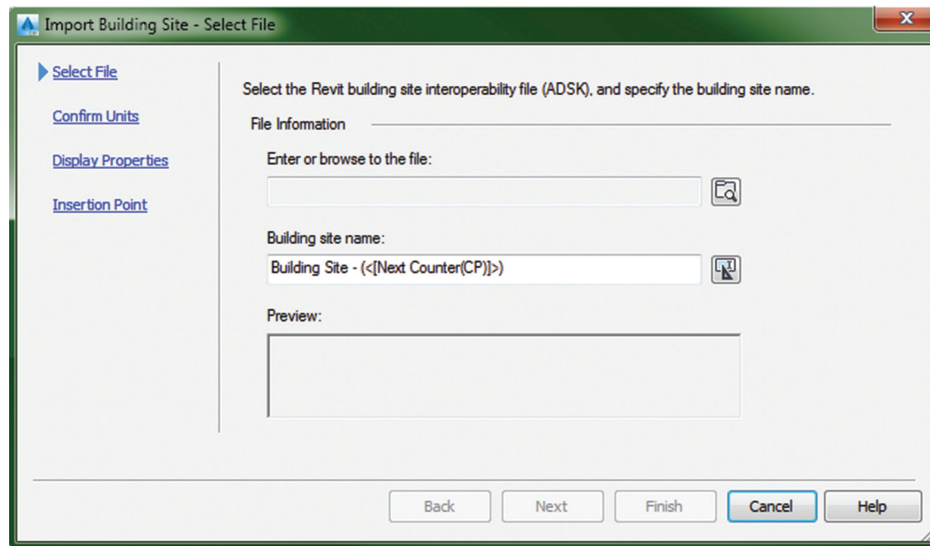


Figure 4: Building Site dialog box

importing an exported DWG file also provides the ability to update the model within the Civil 3D file as updates are submitted by other consultants working on the project.

Another tool available from Autodesk is the Shared Reference Point tool (subscription required). This tool allows you to specify reference points in Civil 3D, then export those points as an XML file to be imported into Revit, where the same two reference points are specified. Once these are set in Revit, you can export ADSK or DWG files from Revit and when they're loaded into Civil 3D, they will drop right into the correct true North orientation while still allowing the Revit users to work in project North. In addition, the Shared Reference Point tool will also work when exporting from Revit to Autodesk Navisworks® for additional collaboration opportunities.

### InfraWorks 360

Starting with Civil 3D 2016 (also available in Civil 3D 2015 Productivity Pack 1 with subscription), you

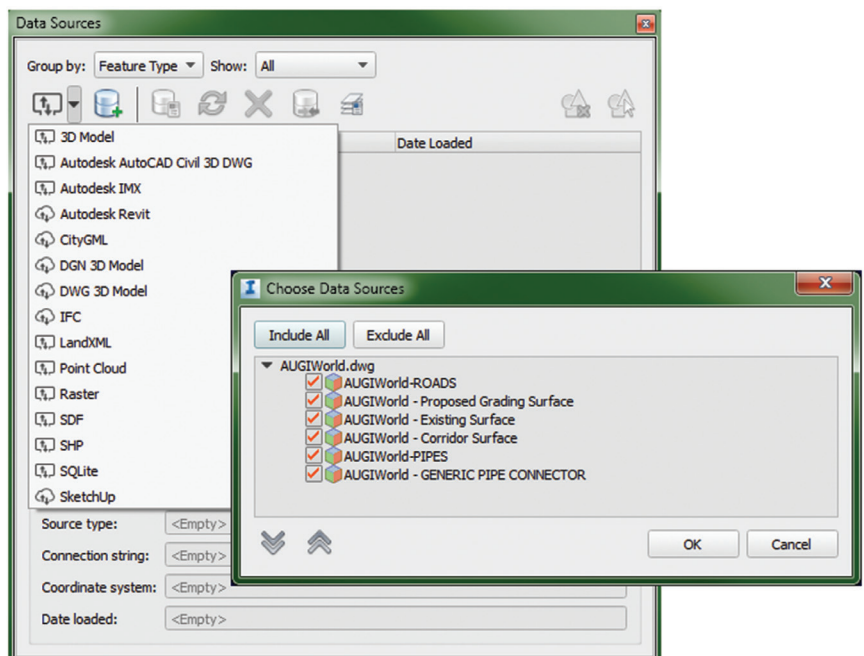


Figure 6: Civil 3D files as a Data Source in InfraWorks



### C3D and Navisworks

Civil 3D can export files in the NWC format, allowing designs to be opened, appended with other models, and reviewed using Navisworks. This is important on projects where BIM model coordination is required, but can also be useful for reviewing designs during internal reviews or reviewing projects with clients. Civil 3D objects such as Surfaces, Corridors, Pipe Networks, and Grading Objects can be reviewed in Navisworks. The ability to append these objects to a Navisworks project model provides a centralized data set that can be beneficial when collaborating with other teams or consultants.

## COLLABORATION IN THE FIELD

### InfraWorks 360 App

InfraWorks models can also be shared with others by publishing Scenarios. Scenarios are a snapshot of an InfraWorks model that can be viewed using a web browser or on the InfraWorks 360 iPad app. Users viewing Scenarios can navigate the InfraWorks model, control layer visibility, and even use the GPS functionality in the iPad to locate and view the model in real-world situations. Imagine the impact of being able to take the client out to their site and allow them to view the model of their completed project draped over the existing site conditions.

### AutoCAD 360 Mobile

Civil 3D files can also be shared using the AutoCAD® 360 app, which allows multiple users to collaborate on the same DWG file, adding comments, photos, and markups that can be viewed by others accessing the file. This can be helpful for collaboration between project stakeholders from different offices, or communicating with staff in the field.

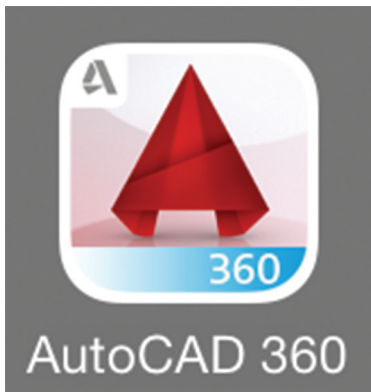


Figure 8: AutoCAD 360 App



Figure 7: InfraWorks scenario viewed in the InfraWorks 360 App

beneficial to improving collaboration on your projects. Hopefully this article was a helpful introduction to some of these tools, and will lead you to dig into one or more of these topics to improve your current processes, or begin to communicate, collaborate, and coordinate more effectively using the tools you already own.



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## CONCLUSION

With all of these tools built into the Infrastructure Design Suite, project collaboration, whether internally with a small team or on a large-scale BIM project, is definitely possible. Integrating Autodesk collaboration tools could be

# Creating Visual Effects with Atmospheric Apparatus and Rayfire



Figure 1: The destruction of Bot 329





This is a simple tutorial to demonstrate how 3ds Max® can be used for visual effects.

To start I'll discuss the Atmospheric Apparatus. The atmospheric apparatuses are used to generate fire, fog, or even volume light effects and consists of three different gizmos: the box, the cylinder, and a sphere. These gizmos act as a visual reference to help to define the boundaries of the effects, which will only be visible in the render. In my case I chose to explode Bot 329 and use the Atmospheric Apparatus to display the fireball and smoke, which you'll see represented in Figure 1.

To do this I selected the helper icon under the Create tab in the Command panel, which is where I selected the drop-down list and chose the sphere apparatus shown in Figure 2. Simply placing the gizmo at the center of my explosion and adjusting its size to the approximate size of the explosion I want gave me a visual reference I could work with while I continued with my project.

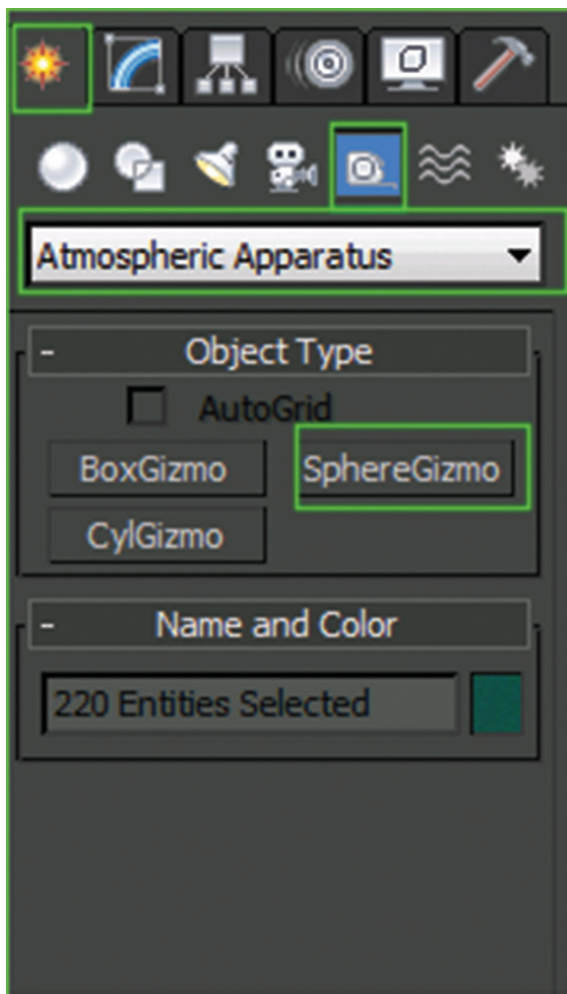


Figure 2: The Atmospheric Apparatus panel

Once the gizmo had been placed and sized I adjusted its settings by selecting the Modify tab shown in Figure 3 where I simply selected the fire effect shown in Figure 4, then pressed OK.

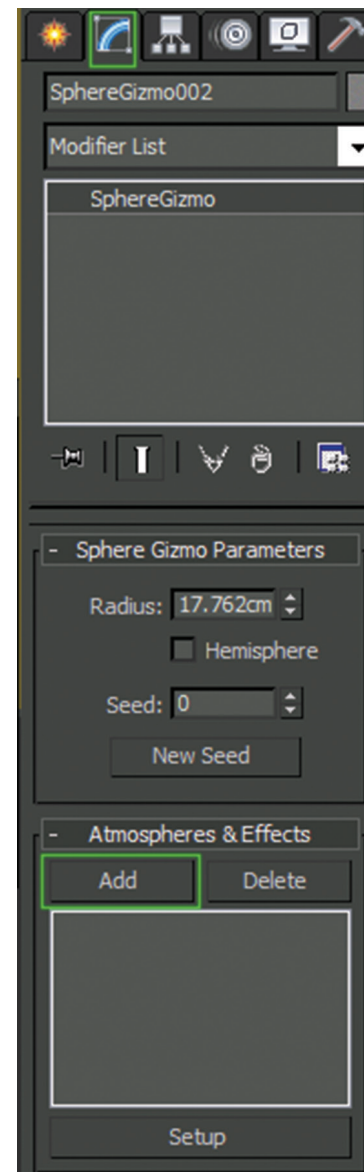


Figure 3: Sphere Gizmo Modifier tab

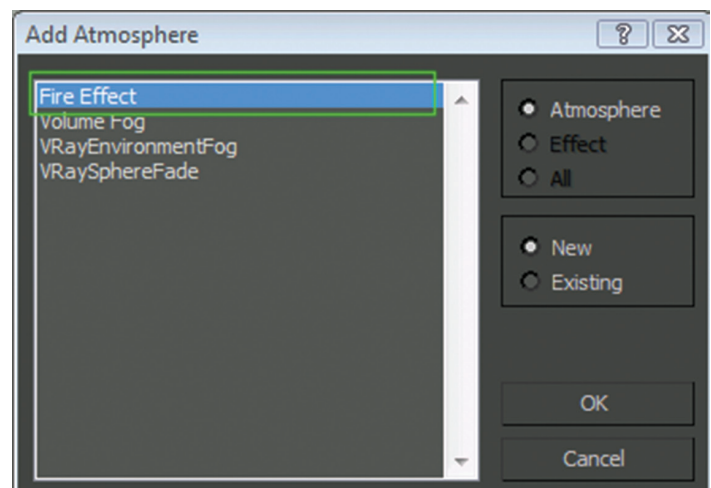


Figure 4: Adding the Atmospheric effect

# 3ds Max 2015

When the effect was added I selected Setup at the bottom of the Modifier panel, where I scrolled down to Effects and selected the fire effect I've added to my scene. I continued to scroll down until I found the Fire Effect Parameters where I adjusted the colors, size, characteristics, and explosion type to fit my needs.

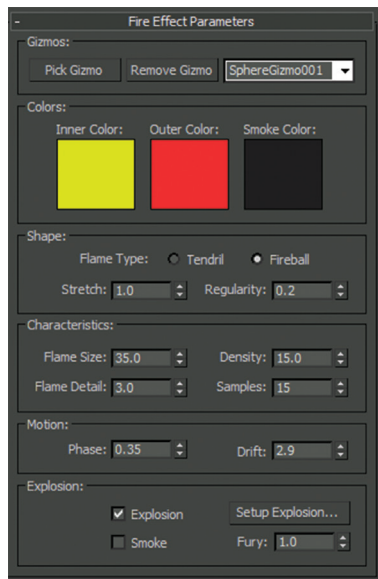


Figure 5: Effect parameters

Although it's possible to use 3ds Max software's built-in tools to destroy my bot, I used a plug-in I like called Rayfire. To initialize Rayfire I selected my entire bot then chose Rayfire in the drop-down list located on the Create tab in the Command panel under geometry shown in Figure 6.

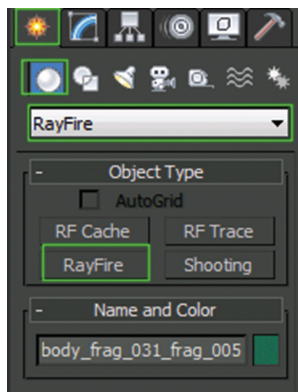


Figure 6: Opening Rayfire

Selecting the Rayfire button opens the primary utilities. Here I selected the bot and added it to the dynamic/impact objects shown in Figure 7 and chose the material (heavy metal for my case).

At this point I decided I wanted to fragment my bot to generate more debris. I selected the Fragment tab, altering the fragment type and adjusting the values to my liking. When the values were set, I chose Fragment as shown in Figure 8 to break my bot into segments that could act based on Rayfire's Physics.

Finally, I selected Physics and chose Bake to animate the explosion from frames 0 to 100.

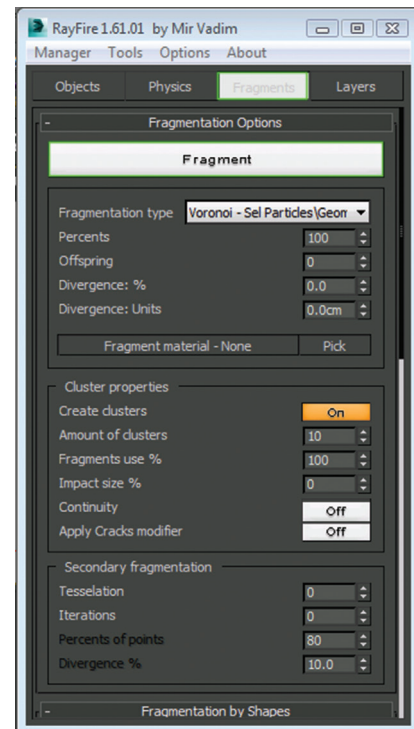


Figure 7: Adding objects

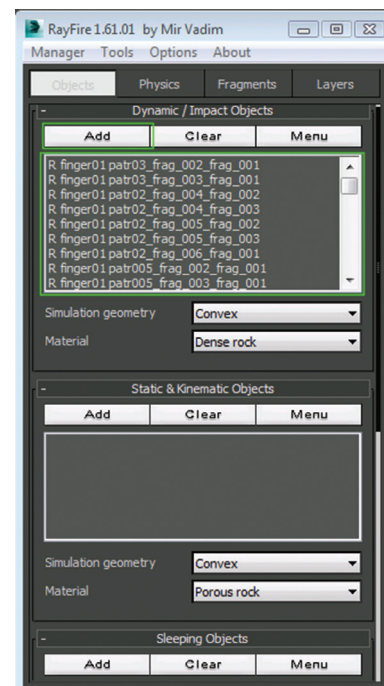


Figure 8: Fragmenting objects



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# What a Great Idea!

➡ **M**oving technology and people forward can be a daunting task. When a great idea comes along, you want to capitalize on it. With a measured approach and a plan of attack, it can be managed well. Project management processes can assist as you break down larger initiatives into measurable tasks and milestones. Efforts of staff, users, managers, and others should not be random, but rather focused on success as everyone moves in the same direction with the same set of goals. Each stakeholder must be taking part in the planning, prep, testing, and deployment of tools and upgrades that you roll out.

Let's take a look at a four-step approach that I have used over and over to provide the framework for success when an innovative idea comes along. It starts with a flash of insight and ends with a concrete change or expansion of technology use.

## STEP ONE: THE IDEA

It has been said that ideas are cheap. This is because they seem so easy to come by. They pop in and out of your head at random times throughout the day. Some seem good at the time and others seem like wild stabs in the dark. Most of them are passed over due to inattention or time constraints. Some linger and prompt deeper thought. Some are given life and transform your processes.

I often wonder when I hear a good idea... "where did that come from?" "How did the person come up with that idea?" I kick myself sometimes and comment... "Why didn't I think of that?" And how many of us have said, "Why didn't we think of that sooner?" Maybe that is why I like the show "Shark Tank" so much. It is interesting

to hear the negotiations by the celebrity investors, but the best part is the short presentations that are given by the inventors of the products or services they are pitching. The one to two minute presentations frame the idea and present it, but the lights go on (or off) for the investors almost instantly. You can almost hear them say "That is a great idea." And you better hope they don't say, "I'm Out."

If you pause and observe, you will hear many good ideas floating around for improving your tech environment, saving time and money, or just advancing the tools you are using. If you listen well, you may hear 10 to 20 ideas in a week, if not a single day. Users, managers, clients, vendors, and so many more frequently drop them into conversations throughout the day. Some are wild ventures into fantasy, but most are valid attempts to respond to problems, get around troubles, or improve the status quo.

These ideas may be directly provided through statements that start with "We should..." or "Here is what I am doing." Others are tossed around like leaves blowing in the wind and come at you prefaced with "Wouldn't it be nice if..." or "There should be a button that..." No matter how they might be spoken, ideas are all around us.

## ADJACENT POSSIBILITIES

In his book, *Where Good Ideas Come From* (Riverhead Books - October, 2010), Steven Johnson puts out the thought of "adjacent possibilities." It is the concept of one door leading to another. It is how we get from here to there. Johnson points out that most successful ideas are just that—adjacent to the existing norm. Those ideas that are not so adjacent tend to struggle or fail and are deemed "ahead of their time."





One example in the book demonstrates the concept of adjacency. The Apollo 13 rescue mission needed a way to scrub carbon dioxide from the Lunar Module or the astronauts would be poisoned by the breath they were exhaling. You remember the scene in the Ron Howard movie... They toss a pile of random equipment on a table at Mission Control and hold up a real carbon scrubber and challenges the team to create "one of these" using "nothing but that." The answer was defined by the adjacency of the items on the table. The answer came from existing items.

## CAPTURING IDEAS

Gather ideas by jotting them down. You may want to run some to ground by talking them out at the time they come up, but I have taken notes and reviewed them later for a more thoughtful review. Be ready with a pen and notepad, or type them into your smartphone. They come at you during breaks, lunchtime, during meetings on differing topics, and during formal efforts to troubleshoot and reinvent. Most of them fly by and no one really takes notice. When they pop into a conversation, some may chuckle and think "Yeah... right." But you should not let them pass between your ears without stopping them for pondering later.

## MAKING IDEAS BETTER

One thing I know is that a shared idea gets better. No one can think of everything. The sharing of an idea tends to make others improve on it. As quick as lightning, you can find improvements in your thinking just by letting others know your thoughts. They will contribute and build upon what you came up with. Or when someone shares an idea, you can be the refiner and improver. It helps to share them and not to hoard good ideas.

When you share, it allows others to connect the dots. They add their knowledge and experience, which make the original even more focused. It tunes the idea in on the main area of need or repair. Sharing allows others to contribute, and contributions move a notion to a solution. When you share you increase the options (adjacencies) by adding items to the random equipment on the table from our prior illustration.

Your technology environment is the pile of equipment. Your ability to try, test, attempt, and succeed is framed by what you have now. People, process, procedure, program, and more contribute to that pile. By capturing ideas, you can see what tomorrow might bring.

Next month we will look at how to move ideas to tangible, working successes. Until then, start brainstorming and chatting up the ideas.



*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).*



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