

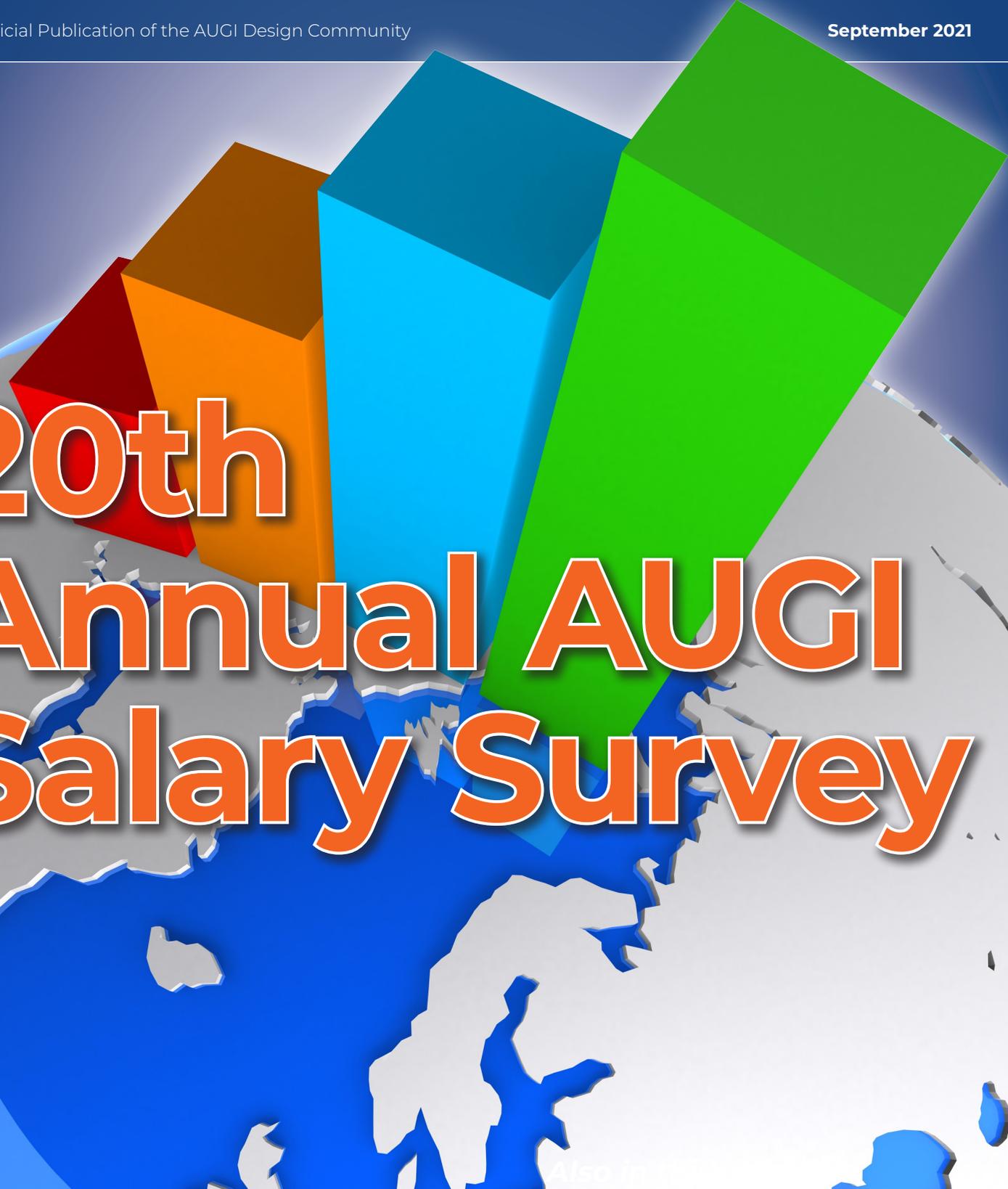
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September 2021



# 20th Annual AUGI Salary Survey

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*CORRECTION: The AUGIWorld editorial staff regrets that Jason Peters was not properly credited on the BIM title page with writing the "BIM Management Mistakes To Live By" article in the August 2021 issue. We are grateful for his contribution.*

# From the President



## HELLO AUGI MEMBERS!

I am so happy that autumn has finally arrived! I love this time of year. The weather starts to get cooler (here in Utah anyway), the leaves start to show their color and school starts! It's also my birthday this month, so there's that to celebrate. On that note, I can hardly believe I'll be 53 this month. I'm not sure where the time has gone to, but I'm thinking that family, work, and volunteering for everything are the culprits!

During the fall in the business world, we have less people on vacation and work moves at a quicker pace. This means more clients booking engagements and me on the road more (or doing more online training).

This month's AUGI issue is dedicated to the AUGI annual salary survey. I hope you all took a moment to contribute to the survey, if not, make sure to do so next year. This is a well-loved issue and the most popular issue of the year, with good reason!

There are also a variety of articles, besides the salary survey, in this month's issue of *AUGIWorld*. Look for "Coordination Views in BIM 360 Simplified" along with many others.

I hope you enjoy perusing this issue!

*"Learn from the mistakes of others. You can't live long enough to make them all yourself."* Eleanor Roosevelt

My best regards to all of you,

KaDe

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# Future Value to Model- Based Deliverables

**C**lients are beginning to require an integrated approach to enhance their existing Asset Management solutions. In response, the AEC industry has started to evaluate multiple vendors, organizations, and technologies to develop proven solutions that allow

for seamless migration of all design intelligence data into a federated model. These solutions will be leveraged for interdisciplinary coordination, Model-Based QC, Model-Based Deliverables, and most importantly enable a streamlined continuation of asset management, well beyond design.

## WHERE ARE WE NOW?

Often times I hear that we in the AEC industry are in the paper business and that our jobs essentially all come down to producing drawings. With that in mind, there has always been a heavy focus on ensuring that the sheets of paper displaying our designs, those that are expected to be constructed/built from, are of the utmost quality and held to a very high standard. Although Building and Civil Information Modeling (BIM | CIM) has been around for over half a century, wide-scale adoption and implementation across the entire AEC industry has only truly been increasing over the past couple decades, to varying degrees. Although we've all be anticipating and preparing for this digital transformation into BIM | CIM, we have continued our reliance on printouts and paper processes to be the "Official Form" of design submittals, design reviews, communications, and overall coordination/collaboration between all project stakeholders.

We've also been witnessing, over the past few years in particular, the many advancements being made in cloud collaboration, mixed reality, as well as design and review platforms and technologies, that are enabling us to maintain some level of digital integrity throughout the project lifecycle. Technology enthusiasts and evangelists have been attempting to push adoption for several of these new solutions, even when faced with major skepticism and pushback among some within the industry. There's a saying that it takes an outside disruptor to force change. There couldn't be any more truth to that statement, than in this case.

Recent events have pushed AEC firms to shift Business Strategies and focusing on increased adoption and implementation for these new cloud-based solutions and digital transforming technologies. What was once considered as a "Nice Have" by the vast majority has quickly become a "Must Have" and essential to operations. Where the industry still appears to be falling short though, is in the development of a proven solution for transferring all design intelligence into a federated model that can, not only be leveraged for interdisciplinary coordination, Model-Based QC, and Model-Based Deliverables, but also one that will allow for a streamlined continuation of upkeep through construction and asset and facility management.

Over the past couple decades, we've seen a growing trend in requests for electronic files to

be delivered in addition to hard copy deliverables upon completion of major project milestones. Model-Based Deliverables alone has many different interpretations, as AEC firms are being requested to submit anything from PDFs representing the hardcopy deliverables, to Design Files (DWGs, RVTs, DGNs, etc.), to static exports of modeled design elements/components (LandXML, DTM, TIN, SHP, etc.). Although there is potential for these Model-Based Deliverables to provide a comprehensive digital design package, they often times require reconstruction, supplementation, and manipulation to integrate with platforms and technologies being leveraged for Construction, AI/ML, AR/VR/MR, Asset Management, etc.

In the meantime, Software Vendors continue to upgrade their respective products/platforms to streamline the Model-Based Deliverable hand-off process. Recent updates to major platforms are allowing for a more fluid, connected, and dynamic, workflow that AEC firms can leverage to deliver models to additional project stakeholders with minimal data loss. In order to accommodate these additional stakeholders, we need to establish a workflow matrix detailing what types of content, Level of Detail (LOD) of content, Metadata translations required, potential integration solutions, etc. that can be presented to additional stakeholders at project initiation, to ensure that all stakeholders fully understand the level of effort required for the anticipated Model-Based Deliverable itself.

To ensure that AEC firms are providing additional project stakeholders an accurate model, there will need to be additional levels of Quality Assurance and Quality Control (QA/QC) being implemented throughout the project life-cycle prior to delivery for the next phase. At a minimum, QA/QC Model Checks should be performed prior to each major project milestone, where level of QA/QC will be contingent on the LOD of the Model-Based Deliverable agreed upon at project initiation. Traditional QA/QC checks of design models have been heavily focused on paper processes. Recent advancements with cloud-based collaboration platforms are allowing for a seamless approach to maintaining the digital integrity of BIM | CIM designs. As we embrace this digital transformation in Model-Based Deliverables, we can begin to incorporate new workflows and processes for checking our BIM | CIM models via a model-based approach, instead of continuing to rely on paper

processes and visual checks to verify conformance and constructability of our designs. We can begin to incorporate Automation processes that can tap into APIs and interrogate our models and associated metadata built into BIM | CIM elements being developed. Embracing the Automation aspect will allow for streamlined Model-Based QA/QC and Deliverable solutions to be implemented and will also provide enough flexibility for adjustable criteria to be incorporated, yielding varying results based on agreed upon LOD of Model-Based Deliverable at project initiation.

## THE CHALLENGE

The first big question right now is, “What is the best approach to incorporate a streamlined solution that is capable of such integrations?” Taking a huge step back, we must consider all formats in which we can properly exchange our design models and associated data. When repetitive use of specific design and collaboration tools are part of your everyday workflow, it’s way too easy to keep the blinders on and focus only on what is in front of you, and only leverage what you know. Client project requirements often dictate preferences of vendor solutions and software applications to be leveraged throughout the project lifecycle. From a design standpoint, there is typically a heavy focus on streamlining integrations between all applications being leveraged throughout the design and pre-construction collaboration phases of a project. Beyond design, there has been a separate focus on streamlined integrations with extended design software platforms and technologies to enable Rendering, AI/ML, AR/VR/MR, Asset Management, etc. Instead of thinking about these as an after-thought, we need to develop strategies from the get-go that will allow for streamlined integration throughout the entire project life-cycle, well beyond design.

The second big question right now is, “What format of data can be read in all phases of a project life-cycle?” We know that there are many limitations when it comes to translating and transferring modeled components and associated data across many products and platforms. Some formats are easier to translate/transfer, and are specifically tailored to work well with any one vendor’s solutions. But is that a reality? Can we force all project stakeholders to leverage only one vendor’s

solutions? Yes, there are some instances where this type of cohesion can occur, but those situations are very rare in this day and age, and certainly should not be considered an end-all solution.

Going beyond the formatted exchange of file and associated data, another major question that needs to be considered is, “Where will this data reside and how will it be managed thereafter?” When we think about what a current handoff process looks like, we tend to go back to the paper deliverable mindset where we can now wash our hands of the product once delivered. As we start having discussions with all project stakeholders at project initiation and develop the workflow matrix detailing integrations required throughout the project life-cycle, we also need to take into consideration the Common Data Environment (CDE) in which these model and data exchange files will reside in, that will facilitate, and act as a gate keeper for, continued maintenance and upkeep. CDE determinations can be equally as important as determining the data exchange format, as some CDE’s are limited in file and data format integrations and support.

## THE SOLUTION

As we investigate model and data translations that can be read in the majority of platforms and technology solutions in today’s world, we come across LandXML and IFC as being the most frequently leveraged formats that will allow for some level of streamlining model and data translations. LandXML has been heavily relied on, from a Civil standpoint that is, throughout the AEC industry for over two decades. It has been welcomed by many major vendors supporting AEC, with varying levels of integration into their respective technology solutions. LandXML lives and breathes for everything being mentioned thus far, but is not an option when it comes to the vertical (building/structure) side. On the horizontal side, LandXML supports intelligently modeled components fairly well, but lacks support for all accompanying/ supporting design elements and geometry. LandXML provides a solution that will essentially take your Civil-Based modeled components and associated metadata, and then export it to a document organized by a Schema that deconstructs the modeled components in written format. LandXML leverages a Standard or Universal Schema, which is absolutely necessary when it comes to driving consistency with how we are integrating our models into other platforms and technologies.

Similarly, IFC provides a solution much like LandXML where modeled components and associated metadata can also be translated/transferred via a Schema that deconstructs your modeled components. Although IFC has been around for slightly longer than LandXML, there has historically been a primary focus on integrations supporting the vertical (buildings/structures) side of AEC...until recently that is. There is currently a huge development and focus underway to build up the Model-View Definitions (MVDs) and Schema to account for major components being created in support of the horizontal (civil) side of AEC. Furthermore, IFC does provide translation for additional modeled components that aren't necessarily intelligent in nature. In our quest for developing a streamlined model and data exchange solution, taking into account for LOD requirements along with involved disciplines and anticipated integrations, we have 2 potential options in front of us: LandXML (in limited situations) and IFC.

Thinking about the handoff process itself, and establishing an agreed upon CDE in which our federated model will ultimately reside in, IFC can streamline model and data exchanges on a much wider range than LandXML. We are also witnessing many major vendors supporting IFC and focusing on integration capabilities within their design and collaboration platforms. The overall AEC support of IFC has been gaining a lot of traction over the past few years, and is providing an environment where all project stakeholders have enough flexibility to leverage the products/platforms that they are most comfortable with, and not have to worry as much about loss of model and data exchange fallouts. This overall IFC support is also promoting a tremendous amount of Innovation as we shift from the Paper to Digital processes and workflows across the industry.

## CONCLUSION

As mentioned, on the horizontal side, IFC is still relatively new and there are a lot of unknowns. With that being said, I can understand some of the hesitation for firms to fully jump on board as it is another new technology solution that is currently facing some level of skepticism. Although IFC for horizontal designs is still in its infancy, there are many benefits in its current state to incorporate IFC into your workflows and deliverables. One of the key components to strategizing IFC adoption for all project stakeholders, is to take into consideration

model and data preparation itself. IFC can only go so far at this stage and requires varying levels of model and data preparation for it to be a viable solution. Model and metadata translations from native to IFC format will need to be fully vetted to ensure that we are integrating these digital solutions best we can.

Probably the biggest shortfall I'm still seeing though, is that IFC is still another static export, ultimately producing a snapshot of current state. Yes, we have the ability to import IFC back into native software, but requires us to manually remove previous versions of modeled components within our existing files. Ideally, I'd like to see some level of conflict/version resolution being incorporated into the import process. With IFC MVDs, Schemas, integrations and tools still being developed, we have opportunities left and right to develop innovative approaches to integrate and streamline model and data exchanges through all required digital processes. This will allow for model and data exchange to ultimately fulfill our quest for producing a fully federated model.



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# Tips on Lighting



Figure 1 – Concept Art

Lighting is arguably the most critical element in 3D. For 3-dimensional content, lighting guides the viewer's eye and provides a tone that invokes emotions relative to the scene. Lighting helps describe shapes, form, and depth. For this reason, it's essential to understand the more advanced features of lighting for the construction of content. I'll discuss some of those in this article.

## THE IMPACT OF GLOBAL ILLUMINANCE

Global illumination is a primary component for lighting scenes, consisting of both indirect light and direct light. Generally speaking, direct lighting comes from a source like a light bulb, while Indirect lighting is produced by everything else. Since every object on the planet has a reflection level, light rays bounce off objects, lighting adjacent objects accordingly. So, let's explore how these influence a scene.

For visualization, a sky is generally the light source. It's important to understand that the sky doesn't just influence exterior scenes but also the interior. Light rays cast from the sky bounce around both interior and exterior elements to produce ambient light. This color of the light from the sky sets the tone of an entire scene, influencing the color of objects and shadows themselves. The exposure level of that sky can also influence the scene, making it more or less dramatic. Lastly, the sky light's color can mix with source lights (say a light bulb) for undesirable results. For example, a standard color scheme used in art, especially in cinematic content, consists of blue skies and gold lights. However, a light from a fire source, such as a candle or fireplace, is orange, and when mixed with a blue and orange environment, can generate light that is peach or magenta. In 3D rendering, this can be less than desirable. For this reason, it is vital to pay attention to the attenuation (or radius) that your objects and light influence one another. Pay attention to how the color of your sky influences

your lights and how your lights impact one another, especially in primary areas of influence like the one displayed in Figure 2.

Finally, the length of the attenuation is essential. The software will generally limit calculations needed to save on rendering time using the length of the influence of light. The longer the length, the more time it takes to calculate. As you can imagine, this grows exponentially the more lights we have. The same concept applies to light from distance sources, such as a direct light used to generate shadow. The lower the direct light (mimicking the sun), the longer the shadows; generally speaking, this can mean more calculation time on rendering as the lights influence more objects in a scene.

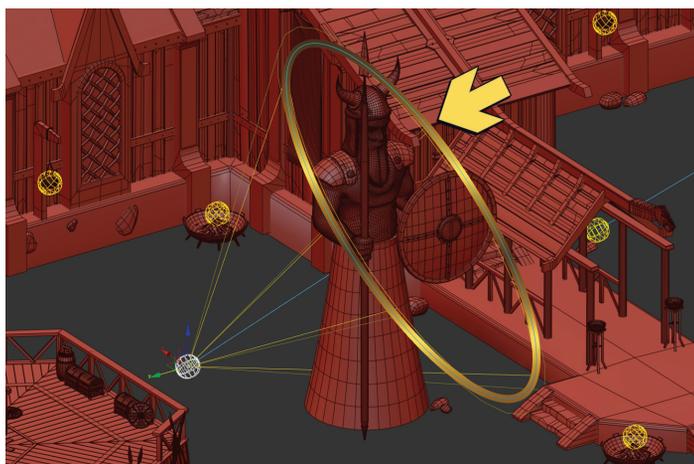


Figure 2 – Zone of Influence

## PROJECTION OF RAYS FOR INTERIOR LIGHTING

A typical exercise in visualization is placing light sources outside windows to project lights into an exterior. Projecting lights this way allows us to cast light in exciting ways to create more dramatic scenes. However, users are often unaware that the types and colors of the lights they use can betray them. The first mistake is not matching the hue of the light from the window to the light source and sky that is casting ambient light around a scene. The clash of colors automatically exposes an issue. The second mistake is not choosing the proper light source. Light sources cast shadows differently. Refer to Figure 3, where I display more natural lighting using a good light source on the left of the image on the right, where I used an incorrect light source to expose the problem.

Essentially, the problem lies in the rays of the light source themselves. Light rays appear more parallel the further they are from an object. For light projecting from sun or moon, you would expect the rays to be parallel, which means its shadow should essentially be parallel as well. However, point lights placed near objects don't project parallel rays. The rays diverge 360-degrees from that source, causing shadows from objects it hits to diverge considerably.

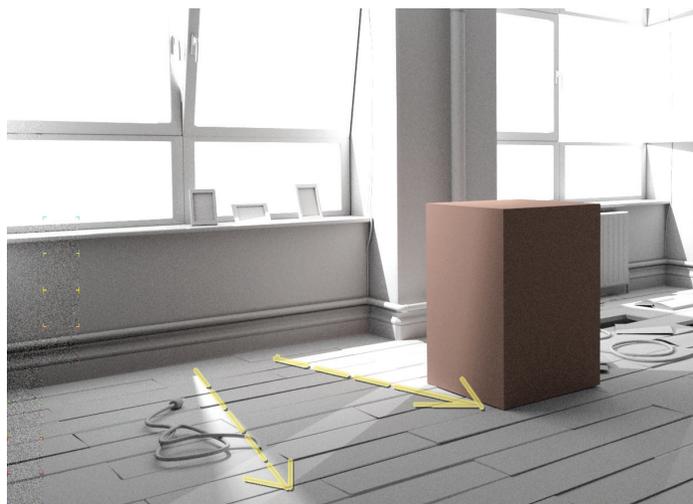
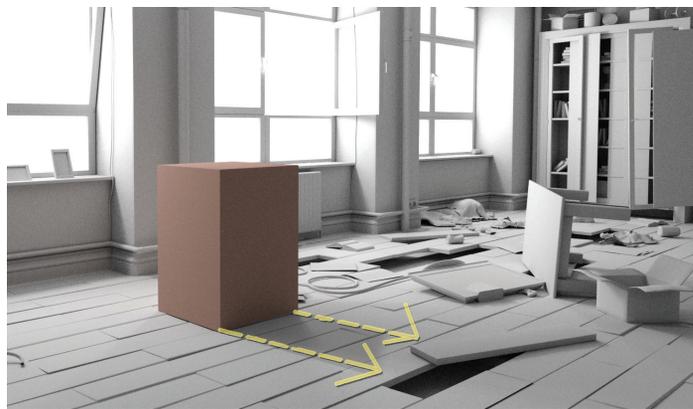


Figure 3 – Light Rays Casting Shadows



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# Coordination Views in BIM 360 Simplified

I really like it when coordination is easy. So much so that when I see a new feature come out that deals with coordination, I'm all over it. Usually, I find that it is either too convoluted to really implement in my workflow, or it just ... "jumps software" too much. (Exporting models from Revit and Civil 3D and needing to configure object

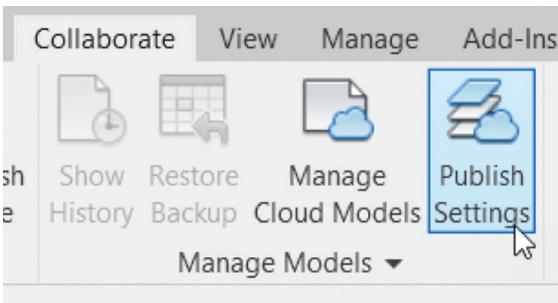
enablers for specific versions agitates me). So, when I saw this little < Share icon start showing up in BIM 360 and Revit I had a geek flare up and had to get me some. For those of you who do not know what a geek flare up is, it is a physical reaction to technology that is only cured by spending the weekend in front of your computer and consuming hot pockets.

OK, I'm getting off track again. Here's how this works. We can now share 3D views with all trades linked together where all you need to have on your computer is an internet browser. That means that all project members can slice and examine a project without having to be a Revit or Navisworks user. Granted there's no clash detection here but I find that actually looking at a model with all trades incorporated negates the need for agonizing clash detection the day before the thing goes out the door. Below are the steps to share a view in BIM 360.

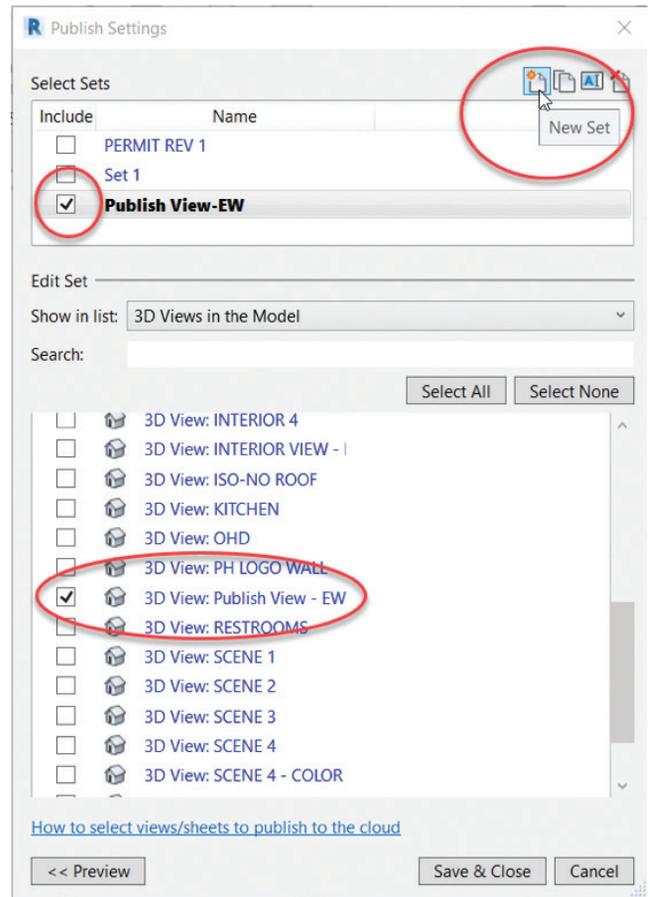
## PUBLISH SETTINGS

By using the existing publish dialog we can set up a view to include all of your links, visibility settings and detail level. Here's how it works:

1. Open the model you wish to publish.
2. Go to a 3D view and duplicate it (with or without detailing, it doesn't matter).
3. Rename the view to **Publish View** (or something that makes sense to you, I don't really care).
4. Turn on all of the links you want to see.
5. Set the **Detail Level** to **Fine**.
6. Go to the **Collaborate** tab
7. Go to **Publish Settings**



8. Under Selection Sets, click the **New Set** button.
9. Call it **Publish View** (I usually put my initials there just so people know how cool I am).
10. For Show in List, select 3D Views in the Model.
11. Select the **3D View: Publish View**
12. Make sure you check the Publish View name in the Selection Sets. See the proceeding screenshot.



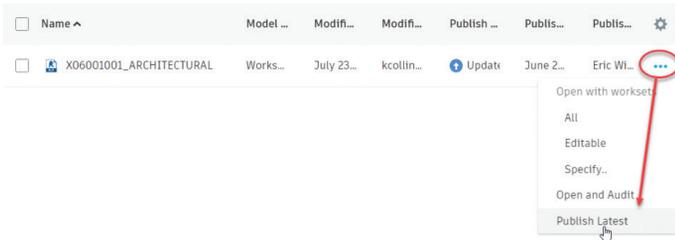
13. Save and Close
14. Sync the model and close out.

Here's what you've done. You just set up a view that will be used throughout the project. Now when you want people to see the updated version, all you need to do is publish the model. That's what we'll look at next!

## PUBLISHING A MODEL IN BIM 360

Now for the easy part. Publishing. You can rest assured that the published view will look exactly the way you want.

1. In Revit, find your project in the BIM 360 category.
2. Go to the folder that contains your model you just set the publish view up in.
3. All the way to the right of the dialog, you will see a settings button. (I think the nerds are calling it the kebab button now...sheesh!)
4. Select **Publish Latest**.



You will be greeted with a large descriptive dialog. Click **Publish**.

Depending on the size of the model, the process time will vary.

OK, the model is published. Now it's time to go find it and share it with your team.

1. Go to the BIM 360 project in your internet browser.
2. Go to Document Management.



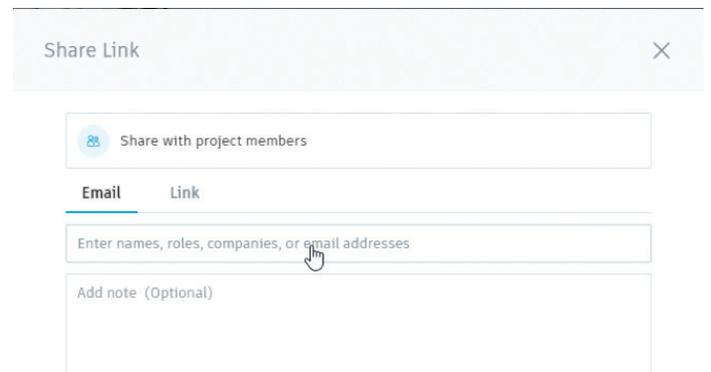
3. Go to the folder where the model is. If you see the blue wheel of progress spinning it's not quite cooked yet. You'll need to wait.



4. When it's ready, open the model. Select **Publish View**.
5. On the right side of the black header bar, click the settings button.
6. Select Share.



7. Chose the project members you would like to send the view to. You can either copy a hyperlink, or send it in an email. If you click on the **Enter Names...** fields a list of team members will pop up. Select who you want to share with.



So, there we go! I really get a lot of use out of this feature. Granted, if we want full clash detection Navisworks is still the go-to, but I think this is pretty awesome and really darn easy!



*Eric Wing lives in Syracuse NY where he is the Director of BIM Services for C&S Companies. Eric is a popular speaker at events around the country speaking on many BIM-related topics.*

*Eric has authored several books including Autodesk's official training guide for their BIM solution "Revit" called Revit for Architecture No Experience Required. Eric is also an author for **LinkedIn Learning** where he has authored around 60 full courses on BIM management, Revit, AutoCAD MEP, Navisworks and Virtual Design and Construction (VDC)*

*Eric has truly been a leader in the architecture, engineering and construction industry since the conception of BIM and 3D design, and has specialty skills in BIM coordination, training and development of technical staff along with daily application of these tools on multi scale, multi-disciplinary projects.*

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*Eric has also taught courses at the Rochester Institute of Technology and Clarkson University on the subjects of Analytical tools for Facility Management, BIM, and Integrated Project Delivery.*

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# Assume it's Your Fault

**W**hen something goes wrong with a design file, people come running to you. They ask for help. You provide it. That is the way it works. Supporting end users is one of your main tasks. When people come running, you go into troubleshooting mode and start asking a lot of questions. You may get to the root of the problem really quick and get them back on track, but other times the problem runs deeper than a quick fix.

When troubles take longer to fix, I go beyond question. This article is not about questions, it is about attitude. Some support staff want to place blame or deflect blame. They want to see what “others” have done that caused the trouble. It may very well be that “someone else” has created this problem, but I usually do not start with that perspective. Here is where I suggest you start...

## ASSUME IT'S YOUR FAULT

Yep, that is where I start. I think about anything that I might have done that caused others to have problems. I know that when things are changed, (i.e. configs, data sets, libraries, families) it can cause what appears to be unrelated problems. It may take a while for them to appear and it may not look like it is related to their issues, but I suggest you think about what you have done first and eliminate that as a suspected cause. I have had many people tell me that after I changed something totally unrelated, they think it was making their problems arise. “You know that plotter you just replaced on the third floor, well it made the coffee maker in the break room no longer work”, (I am kidding, but they try to connect things that are not associated).

It is so easy to think that others have caused the derailments. You should not start with that. You

should start with yourself and the things that you have done. Then you can move on to other things, but first look to your own hands as a probable cause.

**Think about everything you changed or updated.** Check everything you did recently. Was it a week or even a month ago? It still might impact projects that finally start using what you created or adjusted. Just think for a while about the recent past and how it might disturb current events. It might not be something you just changed, but it is worth thinking about before you think about others.

When what you have done is in doubt, double check. Ask others to verify that you did it right. We all get it wrong sometimes. Having someone else look over your work is a good way to get a fresh set of eyes and new ideas into the mix. They may notice something that you overlooked; like, some slight adjustment that needs to be done. They may just ask, “Why did you do it that way?” Which can send your thoughts down another road, and you might come up with the fix. Let others help.

**Put it back the way it was.** If you can turn back the clock and remove the adjustments to see if that fixes the current issue. If it does, then you have some work to do. If removing the changes does not fix the issue, then you can move on to other things. And if you can’t roll back the clock, then make sure that in the future, you do have a way to “go back” to a prior version or state (like a backup or copy of edited files).

**If it was you, admit it.** It is easy to deflect blame by ducking and jiving, or tossing out “tech jargon” that the end user does not understand. If your changes caused a problem, just admit it. Tell them that you did not know it would cause the issue and apologize. Offer to help make up lost time by lending a hand. Let them know that you will be more cautious next time and do a little more homework.

## OWN IT TILL IT’S FIXED

**Don’t pass it off to others.** When you have eliminated yourself as the cause of an issue, don’t just leave it to others. What more can you do? What more should you do? You are the support person that others depend on. Don’t take an attitude of it

being, “Not my problem anymore”. Stick with it until it is fixed. Others may help you figure things out, but you need to stay involved, which leads to the next attitude.

**Stay with it.** Once you are involved with a problem, own it until the end. Others may actually take on the problem, but you still need to circle back and verify that it was all working when others are involved. Let’s say that you find out that it was a network problem and not a file problem when a model won’t update or open. You bring in the network person and they take the problem on. They work and get it fixed. When it is back up and running, check in with the end user to verify that everything is okay. Also check with the network team to find out the root cause and what it took to fix it. If it comes up again and you know the cause/fix, you might recognize it.

It may not take a long time to think through what you have been doing lately and realize that the problem you have now is unique and not connected to anything you have done. But something may have changed even if it was not your doing. So now you can move on to other troubleshooting techniques to define the cause and develop corrective measures. But at the start, make sure you review how anything that you did might have contributed to other people’s problems.



*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).*

# Successful Collaboration

BEVY OF SOFTWARE PROGRAMS ENSURE WALTER P MOORE PROVIDES EXCEPTIONAL UNDERGROUND UTILITY DESIGN FOR WALMART'S HOME OFFICE.



**T**he new Walmart Home Office campus will occupy approximately 350 acres in the heart of Bentonville, Arkansas, and includes more than 30 buildings including office buildings, service buildings, parking decks, and amenity buildings. The project officially broke ground in 2019 and is currently being constructed in several phases.

Sustainability is a leading driver behind the campus design. Highlights of Walmart's sustainability efforts on their new home office include regionally sourced materials for mass timber construction, energy-efficient lighting and HVAC, and 10+ acres of lakes for stormwater collection for smart irrigation and rainwater reuse. The Walmart campus will also feature thousands of trees, shrubs, and grasses to

provide habitat for wildlife, shade paths and bike trails, and reconnect associates with nature.

Walmart's new headquarters are designed with their associates and community in mind. The design includes buildings with ample natural light, expanded food offerings, convenient parking, fitness and wellness options, and a childcare facility, all within a modern, fully connected campus.

Global engineering firm Walter P Moore is responsible for several key design parameters of the new Walmart campus, which include grading, utility design and installation, low impact development drainage system, and stormwater detention that provides reusable water for irrigation, a high-performance water system that

controls stormwater releases based on downstream capacity, more than 10 acres of lakes, and a highly efficient multimodal transportation network.

## COMPLEX CAMPUS DESIGN

In 2019, Walter P Moore began the offsite infrastructure, campus mass grading, and underground major utility design and installation packages for the new campus.

The project was divided into five construction zones—with Zone 2 divided into north and south to better control the construction phasing. The utility package spanned all five zones, which essentially make up the entire 350-acre campus, which is equivalent to 265 football fields. Each zone included multiple utility laterals, or service connections, which are the connections from the main trunk line utility mains to each building.

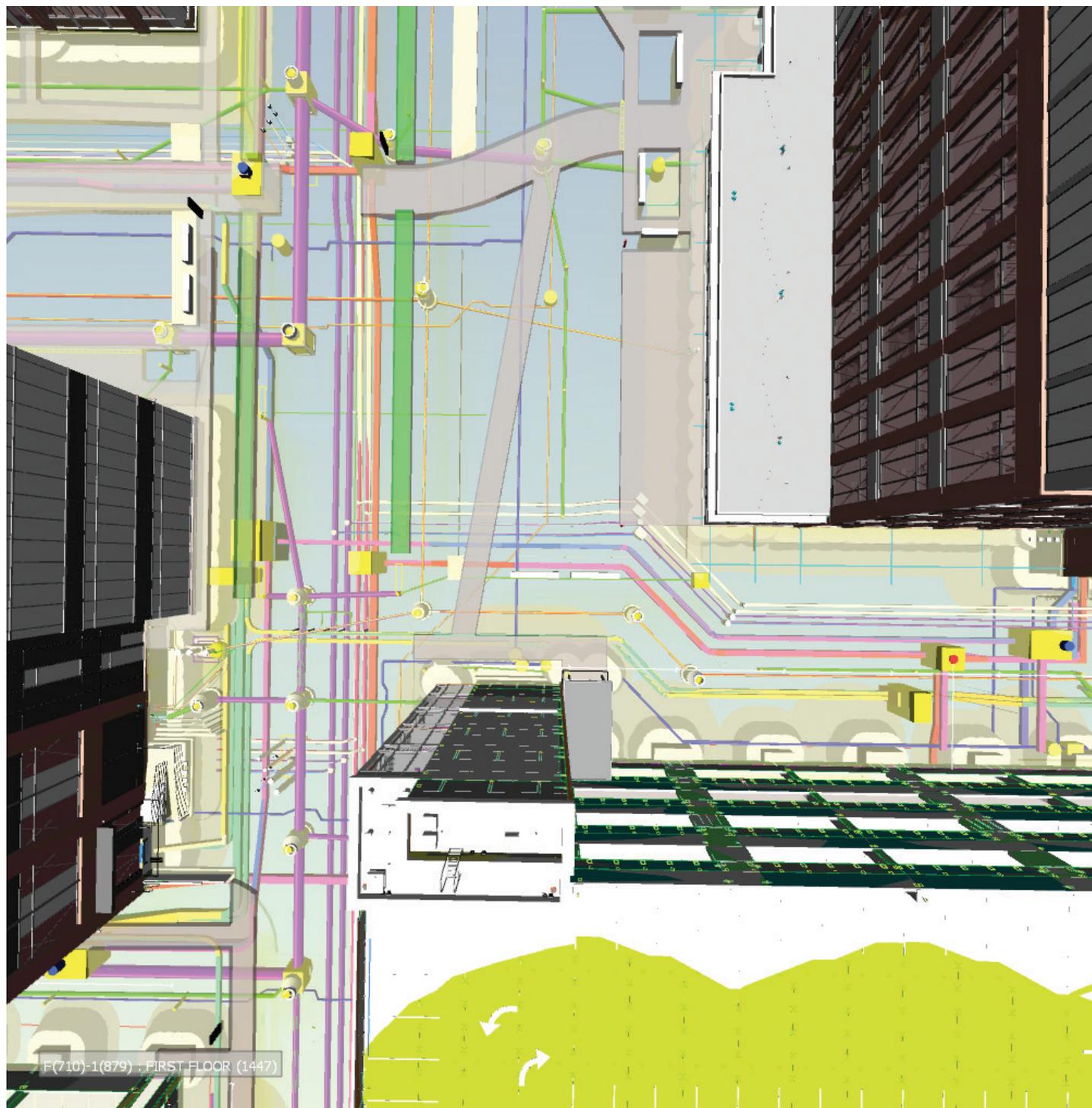


Figure 1

The complex makeup of utilities that serve the offices, service buildings, parking decks, and amenities throughout the campus include hydronics (chilled/hot water service/return), sanitary and storm sewer, electrical (primary and emergency), water (potable and non-potable), gas, and fiber optic cable and communication ductbanks—the protected pathways for buried electrical and data cables.

Numerous miles of pipe and ductbank have been intricately woven throughout the entire campus to avoid clashing and to adapt to the changing grades of each zone.

Walter P Moore's initial construction package began with the installation of the major underground utilities due to the greater constraints in regard to the complexity of routing the extensive system of utilities within specified corridors. The hydronic

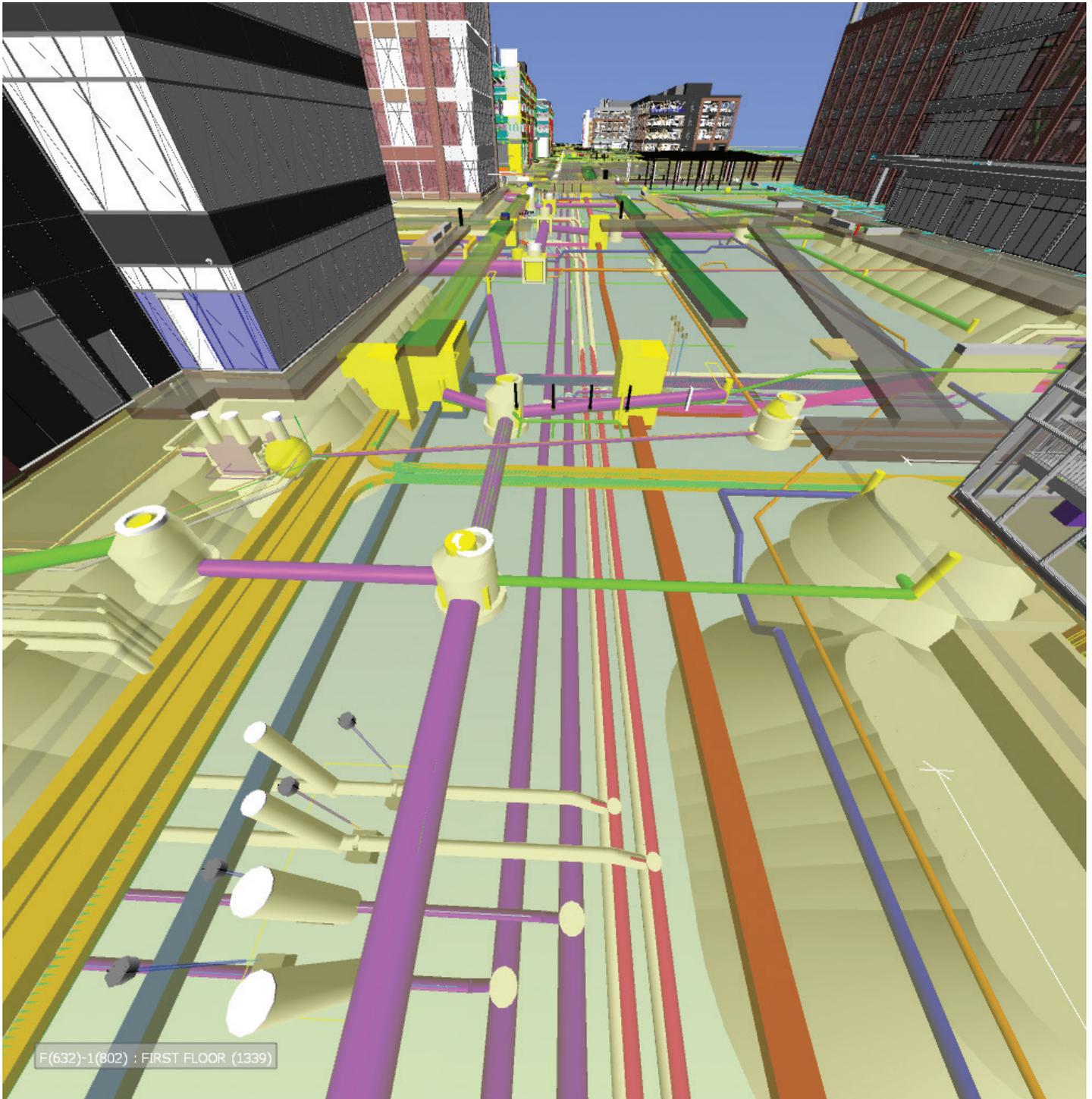


Figure 2

utilities were designed first because they require a more consistent elevation to minimize the distribution piping pressure drops. Sanitary and storm sewer were the next utilities designed because they are gravity-fed lines with varying slope requirements which limits the flexibility of depth where they can be routed. Electrical, fiber optic cable, and communication utilities followed, which are constrained by a set amount of vertical or

horizontal bends allowed between structures. Finally, water and gas were installed last because they can be more easily adjusted to maneuver through and around the previously described utilities.

One of the first challenges for the Walter P Moore team involved the resolution of clashing of major underground utilities and maintaining cover through the various phases of work because the utilities were designed before the final grading of

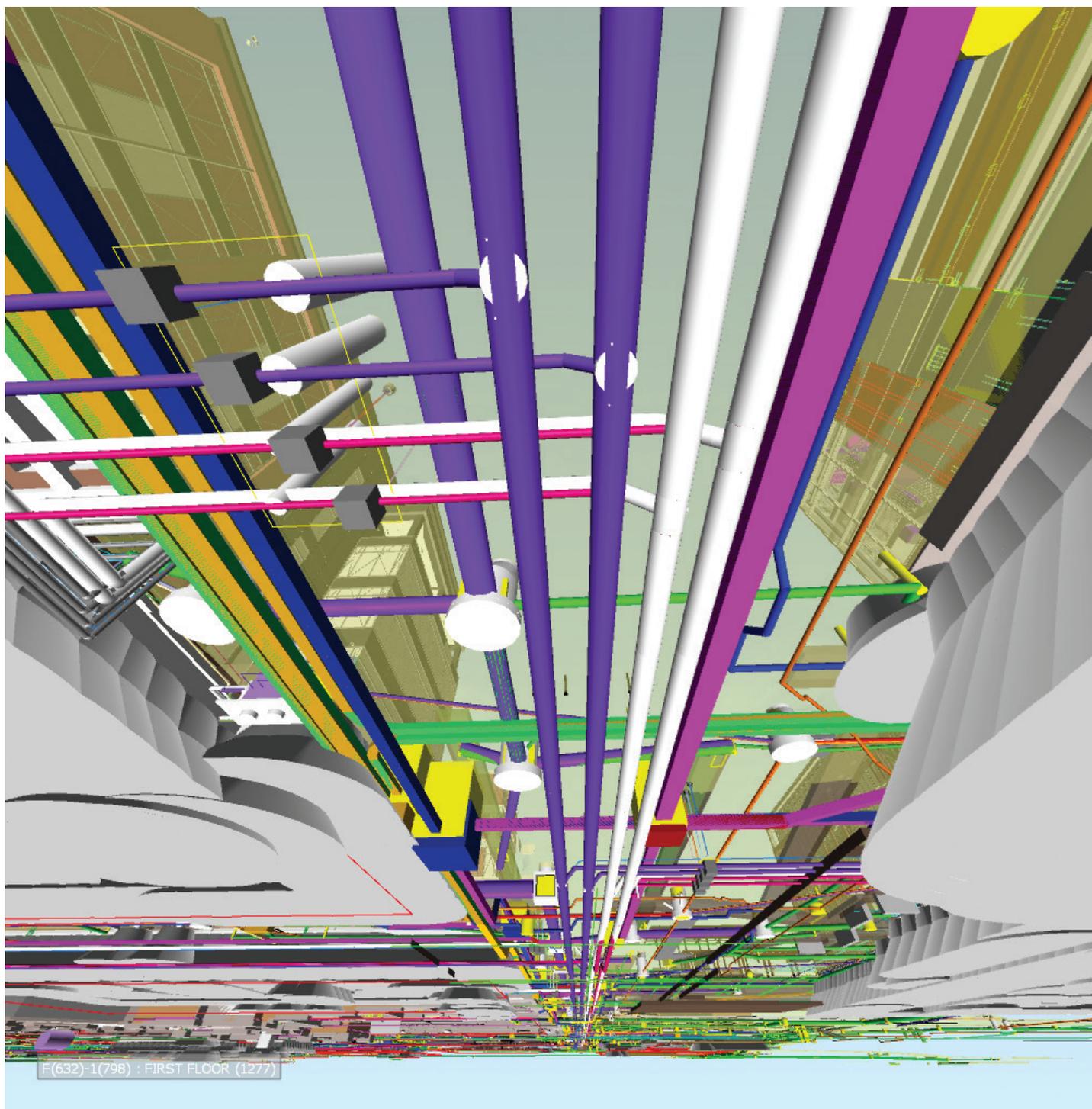


Figure 3

each zone and the micro (surface) drainage—the optimized drainage system around the developed zones—were finalized. The grading of each zone was adjusted after the mass grading of the site and as the development components started for each zone. The micro drainage included the fine-tuning of the sizes and location of drainage pipes in each zone as the surface grading for each zone was finalized. The drainage adjustments included roof drain connections, landscape inlets, and bollard drain connections. Additionally, the team had to address, and avoid where possible, conflicts between the utilities and the rock layer that was evident and varied in elevation throughout the campus. It was especially difficult for the contractor to excavate through the rock in order to place utilities. In some instances, it was unavoidable, and special measures were taken to blast through the rock to accommodate the utilities.

The Walter P Moore team is currently working with the general contractor and their subconsultants to identify conflicts, determine phasing, and meet with the trenching and excavation team to understand construction sequencing with impacted design and utility sections. The firm is also working with the installation team on an ongoing basis for real time field changes to ensure there are no impacts to future utilities still being designed.

## INITIAL CLASH DETECTION

From the onset of the design for the 350-acre campus, regular clash detection sessions were held for the utilities using Navisworks' Clash Detector. By using the software, the utility design team, and the zone teams, were able to compare one, or multiple utilities, to find the minimum clearance tolerances in the complex weave of utilities. The clash rules, which were established for minimum clearances as required by the City of Bentonville, Arkansas Department of Health, and best management practices were set at certain distances per the specific utility. For example, there must be a minimum of 18-in. of clearance when a water line is crossing over or under a wastewater line.

Concurrently, the geopiers—a ground improvement method that prestresses soil using soil replacement or displacement technology to strengthen soft soil with piers of aggregate—required careful coordination to adjust point of connections at the buildings and avoid their zones of influence. The zones of

influence involve a cone of compacted soil around each pier that cannot be disturbed because it would compromise the integrity of the pier. Ultimately, the footprint of each cone was quite large, and they ended up clashing into each other forming a solid zone of influence that could not be crossed. However, the Walter P Moore team was able to carefully coordinate with the building design consultants and the geopier consultant for all the utility points and their interactions with the zones of influence. This was accomplished by raising the laterals over the geopiers and/or lowering the elevation of geopiers. Some utilities were shifted to avoid the zone of influence, while others were left as is with the understanding that the geopiers would be constructed around the utility which would allow for difficult or no future access to this portion of the utility.

Furthermore, ongoing utility adjustments were made as the project site and building design progressed. For example, horizontal and vertical clearance between utilities varied and had to be maintained as they were adjusted on a weekly basis because each zone was in a different phase of design and installation. When Zone 1 was completed, Zone 2N received updated building layouts and the utilities had to be rerouted. The utilities were rerouted around the updated building, which required additional conflict checks.

## PROPER COLLABORATION & DESIGN

At the epicenter of the ever-fluid utility design for the campus was Autodesk's Cloud Collaboration—formerly known as BIM 360—which was used throughout the design to facilitate coordination between the design teams and contractors. Cloud Collaboration is the new platform for collaboration between design consultant teams and project-related disciplines, and it is expected to become the required alliance platform for construction projects in the future. As a result, it was the first time Walter P Moore had ever used the platform for a civil infrastructure project.

Using Cloud Collaboration, design changes and issues were caught and fixed more rapidly, with minimum effect on the overall design process. Furthermore, the design and construction documentation can live in the same place as the project files. This includes, but is not limited to, RFI's, material lists, punch lists, and more.

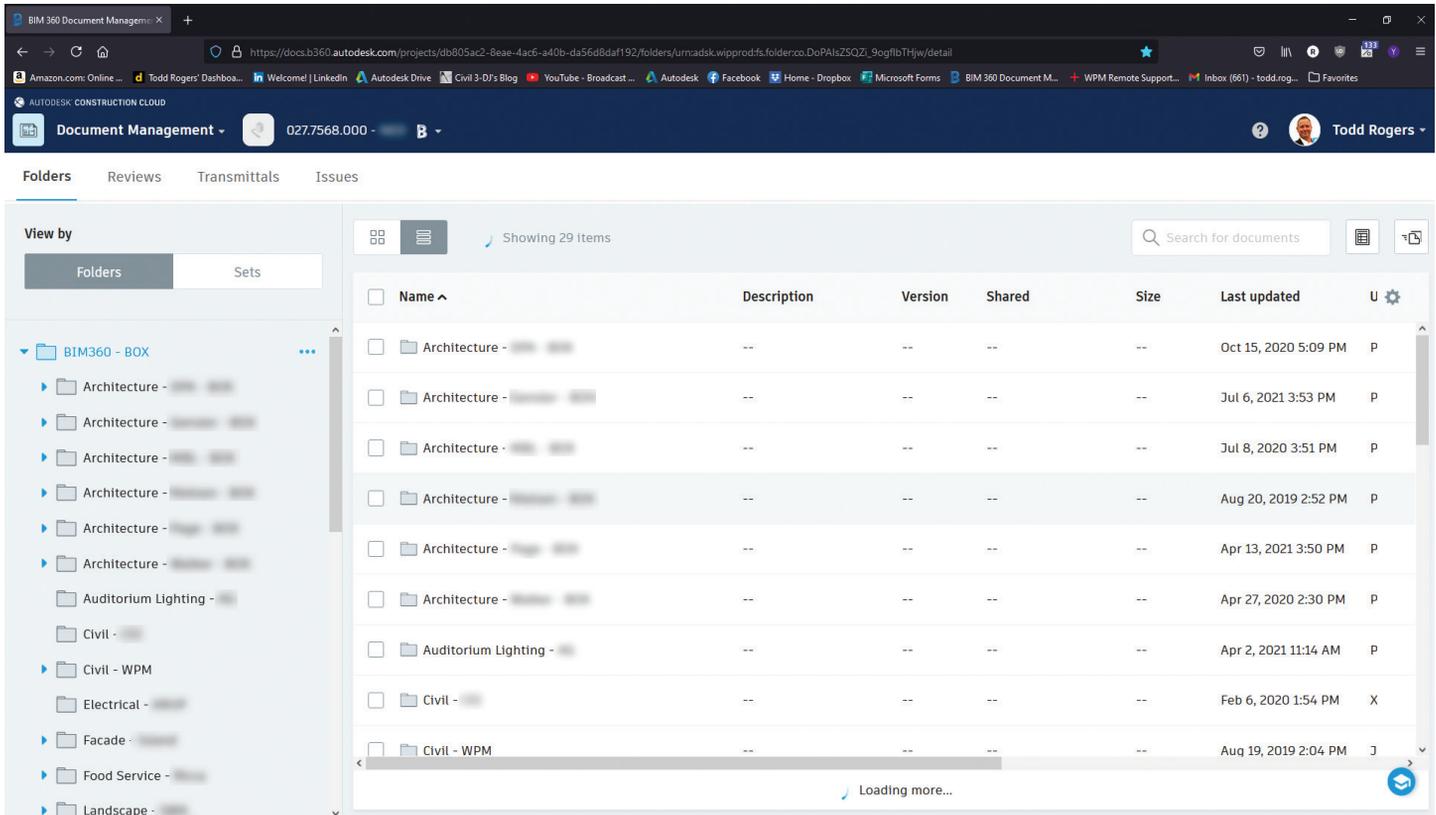


Figure 4

The use of Cloud Collaboration benefits both the design team and contractor because all work in the platform can either be done in the office or the field, the latter of which is the main intention of the platform. Any changes made in the field are instantly synched up with the project designs within Cloud Collaboration.

For the project, Walter P Moore primarily used Cloud Collaboration as a file transfer platform. It allows users to view project models, which were the basis of the construction model, from within the program because it has the ability to read more than 83 file types. The design team using Cloud Collaboration can also view, markup, and collaborate design intent.

## EFFECTIVE CLASH SOLUTIONS

Due to the complexity of the campus utility design, Navisworks' Clash Detection was used to identify clashes. The utility design team and each zone team were tasked with running clash detection and provided reports on a regular basis.

All of the clashes for the campus design were run as hard clashes to provide more accuracy when managing the operation. Any clashes identified

were then discussed during the scheduled weekly design and zone team meetings. Because the clashes occur after a clash detection is run in the program, the design team had the option of marking the clash with either: New, Active, Resolved, Approved, or Resolved.

The clash reports were then generated with a thumbnail view as well as a brief report about each clash. To ensure all clashes were addressed and resolved, special internal meetings were scheduled if the conflict was considered critical to design and/or construction.

For example, the Walter P Moore team would gather all the clash reports in Zone 1 and notify the zone project manager. The team would then determine which utility should be adjusted. If the adjustment involved coordination with landscaping, this would be discussed during the zone team's weekly meeting. Concurrently, the contractor also ran their own clash reports and discussed their results during a weekly model coordination meeting.

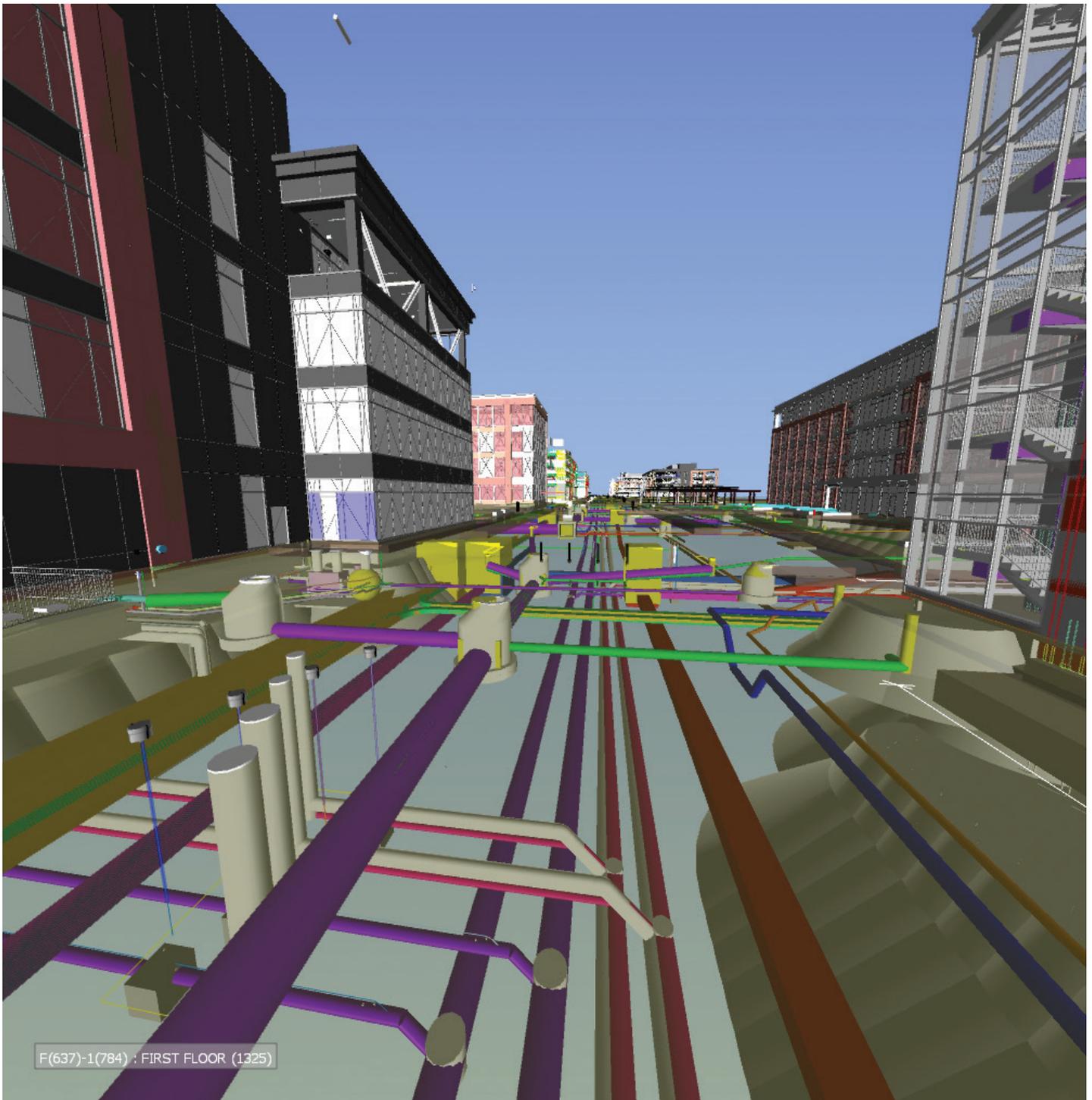


Figure 5

## ADDITIONAL CRITICAL PLATFORMS

Overall site management and planning using Civil 3D and Revit were also critical components to the campus. Walter P Moore established the shared coordinates on the project site, which were set on a right-of-way line, and then exported to an XML file for the other design team consultants to use as it related to their project scope.

Each utility on the campus has its own Civil 3D model drawing with a pipe network and structures specific to the respective utility. The structures were created in Civil 3D to match the actual size of the structure on the campus, per the site drawings, to help determine actual clashes with the structures.

Furthermore, data shortcuts were developed for each of the Civil 3D models. The design team could

then add these data shortcuts to their site drawings and develop profiles to show all utility crossings. Any change to a model would then be automatically reflected in the site drawings and profiles.

Civil 3D models were uploaded weekly to produce a federated model—where all design team consultants were combined into one working 3D model—which was then provided to the contractor. Instead of creating entirely new 3D models from scratch, the federated model was used to create views by specific project phases or the individual trades. Walter P Moore and the other design team consultants that uploaded any data to Cloud Collaboration were appended to the federated model on a weekly basis.

The federated model was used for the campus to see what was occurring within the design as well as to visually see what the layout may look like once construction is completed. For example, it allowed users to visualize a tunnel crossing under a street from the perspective as if the user were viewing the tunnel onsite in real-time. The federate model includes utilities, grading contours, roads, sidewalks, buildings, building foundations, landscape, bridges, tunnels, ramps, retaining walls, and anything else that can be envisioned on the campus. Users have the ability to zoom in and out of the various elements of the model in order to measure clearances between the various utilities.

Any discrepancies between the different project teams' Civil 3D models were identified and discussed during weekly meetings. In addition, the contractor would inform the design team of the construction sequencing during these meetings to focus on any utilities that would be installed in the near future. The 3D model was updated faster than the drawings, which also made the campus unique because the contractor was building off the model instead of the drawings.

Furthermore, the contractor produced a 3D model of their own and any deviation from Walter P Moore's model had to be reviewed. As portions of Walter P Moore's and the contractor's models were coordinated, they were considered set and ready for construction. In order to keep track of these variations, the contractor incorporated the use of BIM Tracker to create conflict reports, which were then assigned to the appropriate team. This provides a tracking system for both the design teams and the contractor of each individual issue

and how it was resolved. It was a process that required much foresight and coordination with the design consultant teams and throughout this process Walter P Moore was Walmart's liaison between the contractor and the design teams.

## CONSTANT COMMUNICATION

The ability to review the utilities in the software platforms used for the campus resulted in faster conflict identification and resolution. The design teams and the contractor were able to understand the issues immediately by seeing all of them in 3D or in real-time. Identifying the issues early saved time and money on reconstruction efforts.

Project managers were assigned for each of the utilities, which meant an abundance of internal meetings and coordination with each of the five zones, utility, mass grading, and infrastructure project managers. Ongoing coordination with the architect, landscape architect, and MEPs (design consultant team) was also critical. Additional coordination with the contractor and their subcontractors was conducted as the utility design advanced to the final stages.

Due to the abundance of moving parts, site components, different phases of design, and the number of utilities for the campus, it would have been impossible not to collaborate—either with the bevy of software programs or the regular building team meetings—to provide a successful design.



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*Ted Vuong, PE, LEED AP, ENV SP, is a principal and managing director of civil engineering at Walter P Moore. He can be reached at [tvuong@walterpmoore.com](mailto:tvuong@walterpmoore.com).*

# 20th Annual AUGI Salary Survey

**AUGI is happy to celebrate our 20th member survey! Since 2002, you have contributed to a unique resources for yourself and your peers**



Please keep an eye out for email blasts, social media channel updates and the forums next summer so you can participate, too!

**W**e appreciate those members who were able to take the time to participate in this year's survey. However, survey participation has fallen again this year, so, if you are reading this and do not remember seeing the email bulletins with the survey link and salary content, please be sure to go to [augi.com/account](http://augi.com/account) to ensure your email address is current. If you need help accessing your account, reach out to [membership@augi.com](mailto:membership@augi.com). Then check [augi.com/account/email-subscriptions](http://augi.com/account/email-subscriptions) to ensure 'Bulletins' is checked 'Yes'.

As long as you're on the site, you might also want to register yourself in the Resource Directory, so other members know if you are available for work, and add categories so potential clients can find your specialty. [augi.com/resource-directory](http://augi.com/resource-directory)

As always, when members take the survey, they are asked to reply with the details from their last fulltime role, and to indicate any job changes such as layoffs or furloughs in later questions. Our 'Hot Topic' page this year is dedicated to the impact the pandemic may have had on our jobs and the adaptability of our teams. Fortunately, those reporting wage and benefit reductions are half of what they were last year.

The first question people have with regard to our salaries, is always the differences in Cost of Living in

various areas. Metropolitan areas and rural areas can be costly or affordable no matter the location, so be sure to check additional resources for those variances. For example, according to the ETC Salary Calculator, an Architectural Drafter with an Associate's degree and 6-10 years of experience could make a median of \$57,000 a year in Tennessee, and \$65,000 a year in the New York City metro area.

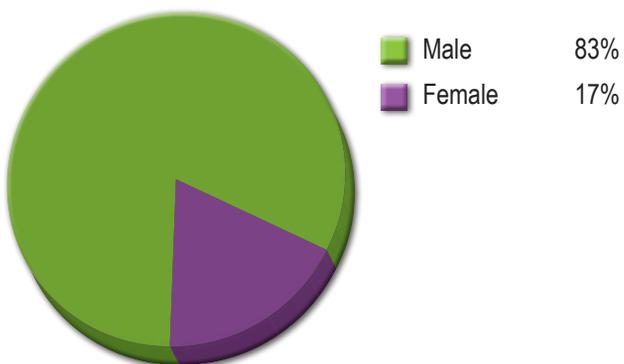
I am a big fan of [wwwIndeed.com/Salary](http://wwwIndeed.com/Salary), the ETC Salary Calculator, Glassdoor, as well as industry-specific surveys from other professional organizations. The salaries reported here (in US dollars, as participants were given a link to a currency convertor) reflect salary and bonuses for those who work 40 hours a week, and are calculated to exclude overtime pay.

Ten years ago, only 15% of our members worked remotely, but increased to 50% today. A recent poll on our site showed that over 30% of members are looking for a new job due to remote work being taken away. On our look back page, you can see that perceptions of job security for our members aren't that bad at the moment (but, that might be due to the members we expected to hear from, but, didn't, who might have pulled that number down).

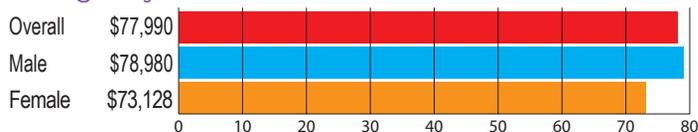
Designer remains our most common job title, so we have one page specifically addressing that role.

## DEMOGRAPHICS

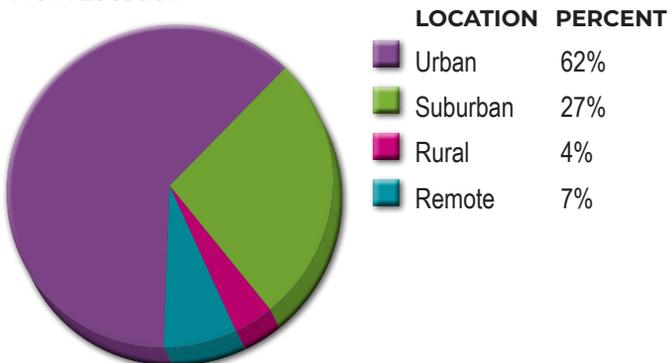
### Employee Gender



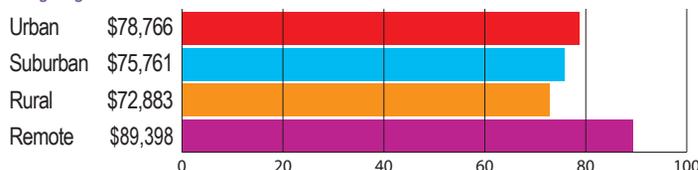
### Average Pay



### Work Location



### Pay by Work Location



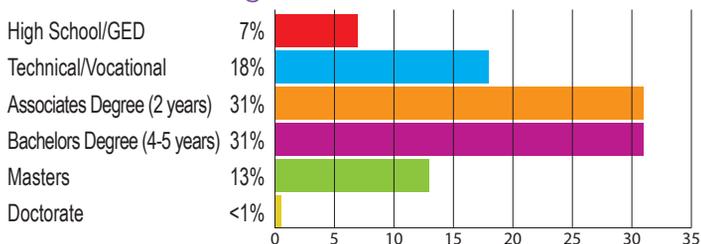
**Urban workers have gone down almost 10% since 2019. Remote workers increased from 2% to 7% in that time.**

### Average Pay by Education Level

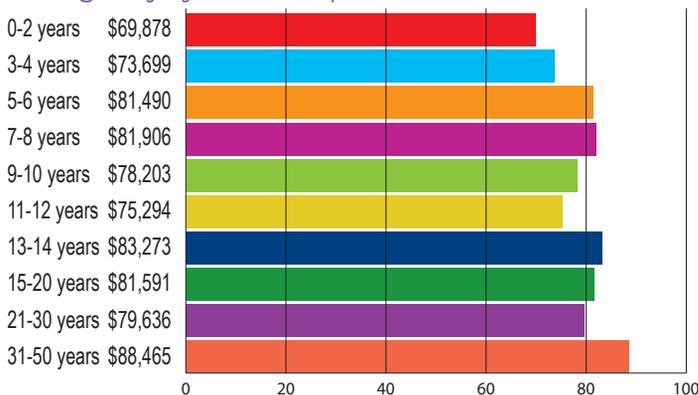
(for those with 5 or fewer years of experience)



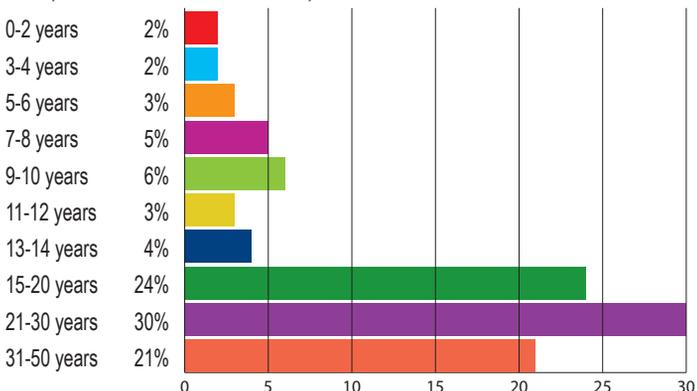
### Education Level/Degree Attained



### Average Pay by Years of Experience



### Respondents' Years of Experience



**Check out these resources for additional information on pay:**

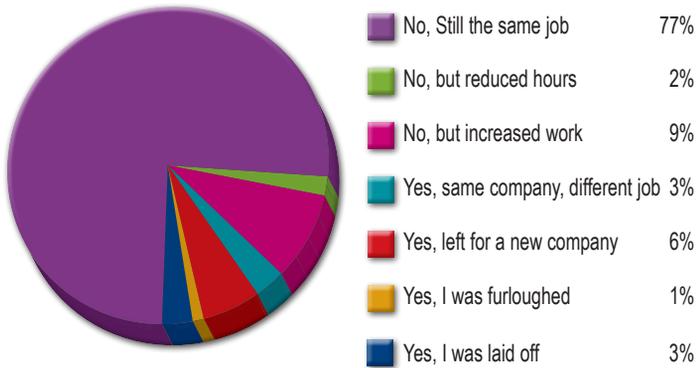
**Indeed.com/salary**  
**Salary.com**  
**Payscale.com**

**ETC Salary Calculator**  
**Glassdoor**

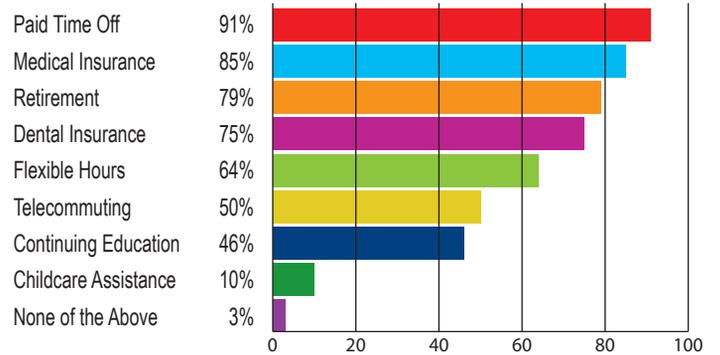
**Search for other professional organizations related to your market, or administrative services like TriNet, to get more niche data.**

## COMPANY DATA

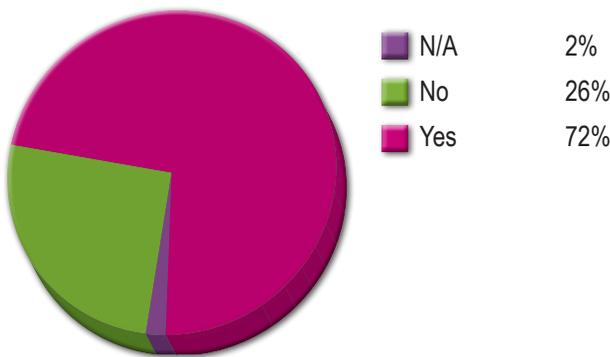
### Change in Employment?



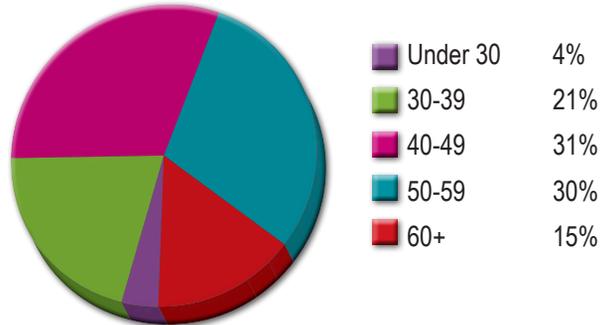
### What Benefits Are Available to You?



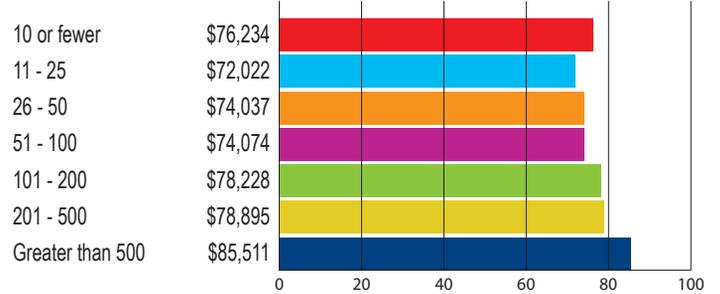
### Does Your Company Have a Human Resources Department?



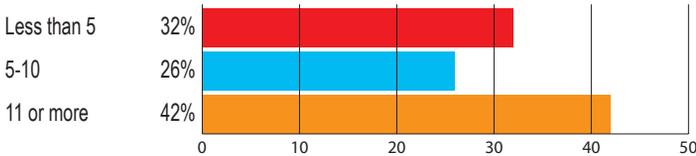
### Age of Respondents



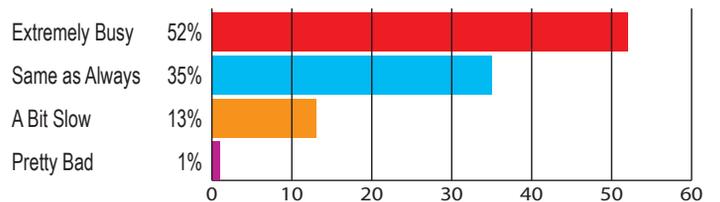
### Average Pay by Company Size (Number of Employees)



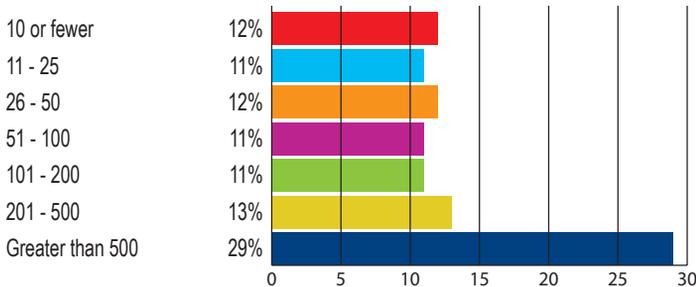
### How Many Years Have You Worked for Your Current Employer?



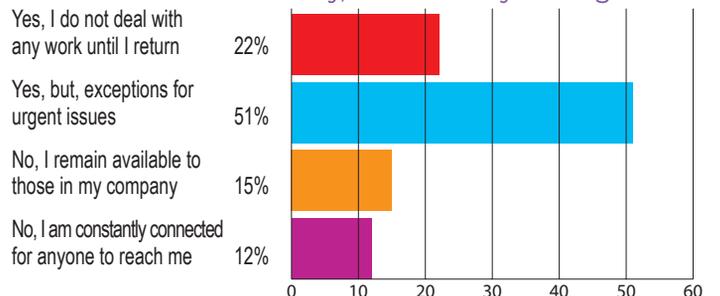
### Current Workload



### Number of Employees in Company



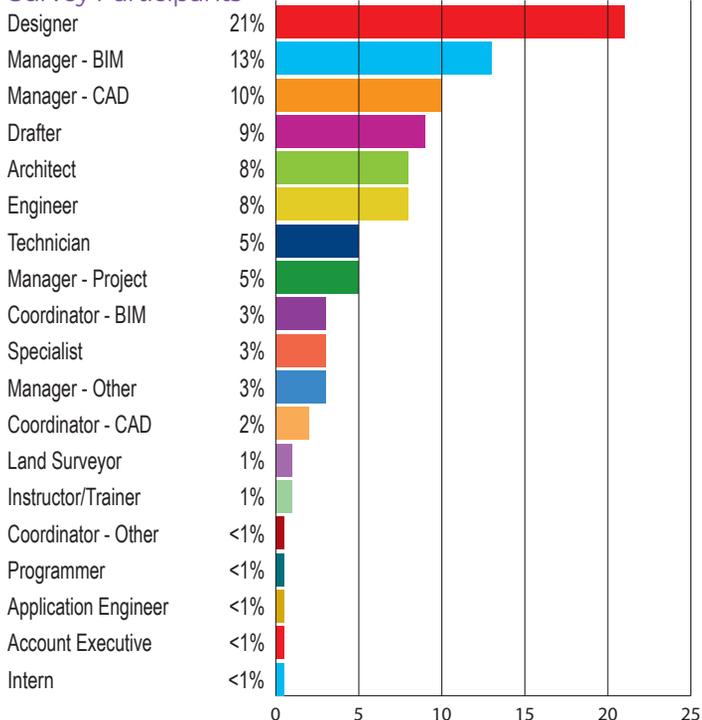
### When You Leave for the Day, Are You Really Leaving Work?



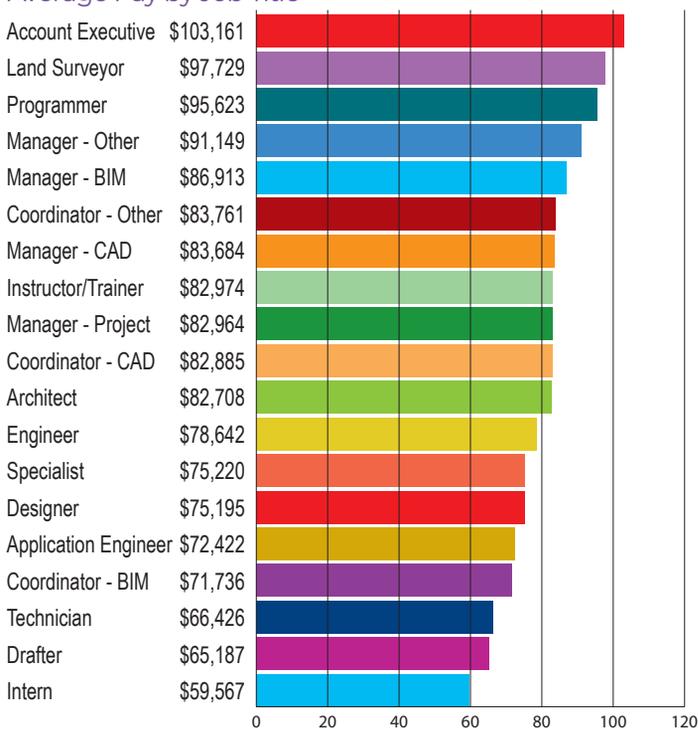
**The ability to telecommute remains at 50%. That is a big jump over the 15% who reported this benefit a decade ago.**

## JOB TITLES

### Survey Participants

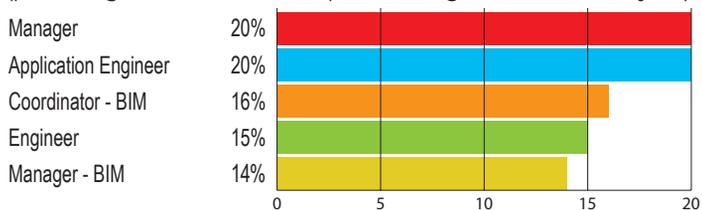


### Average Pay by Job Title



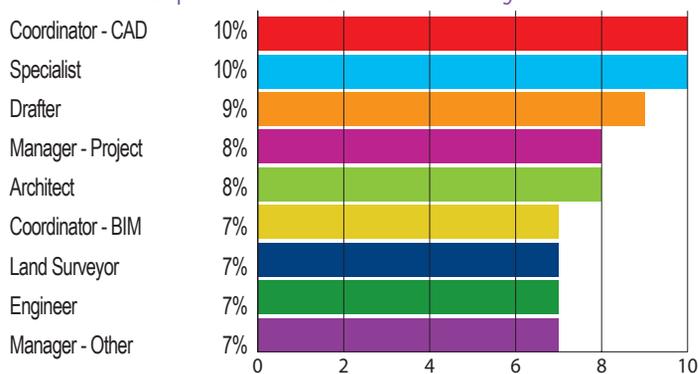
### Jobs with the Highest Mobility

(percentage of each title who reported being in a new role this year)

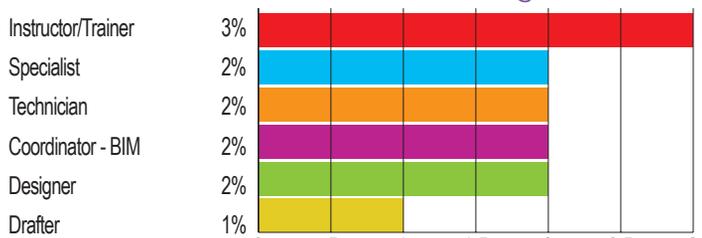


**Reminder: All reported average pay is based upon a 40 hour workweek. It would include potential bonuses, but, is calculated to exclude overtime pay.**

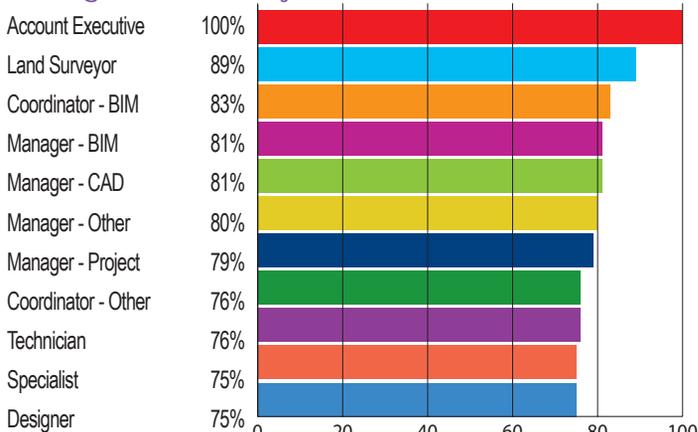
### Users Who Experienced a Decrease in Pay



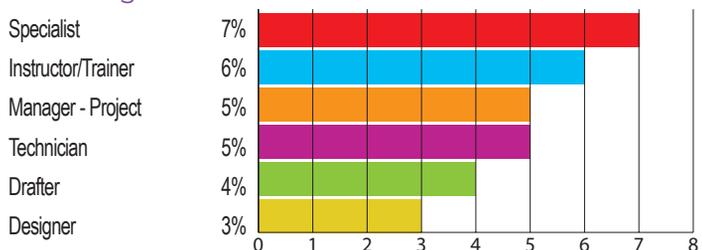
### Percent of Each Job Title who were Furloughed



### Feelings of Job Security

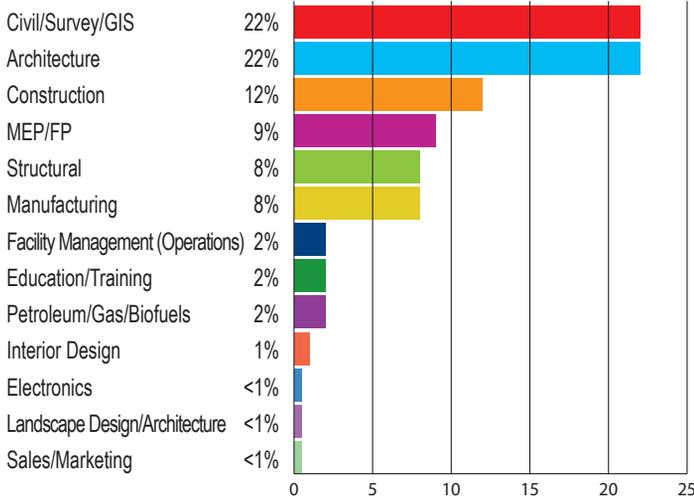


### Percentage of Each Job Title who were Laid Off

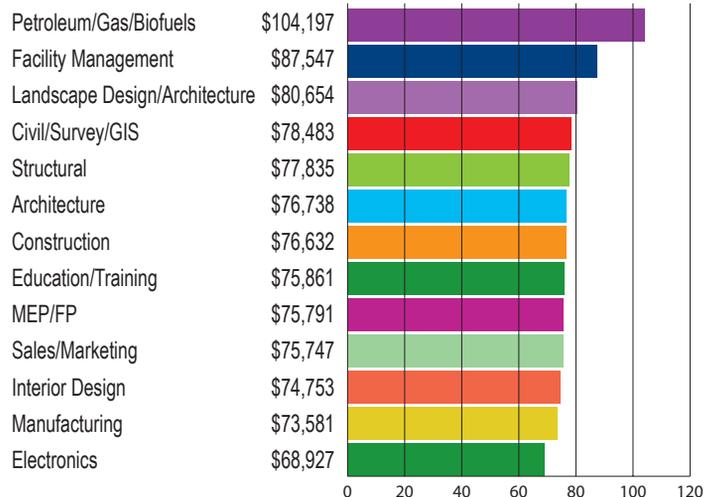


## INDUSTRY/DISCIPLINE

### Survey Participants



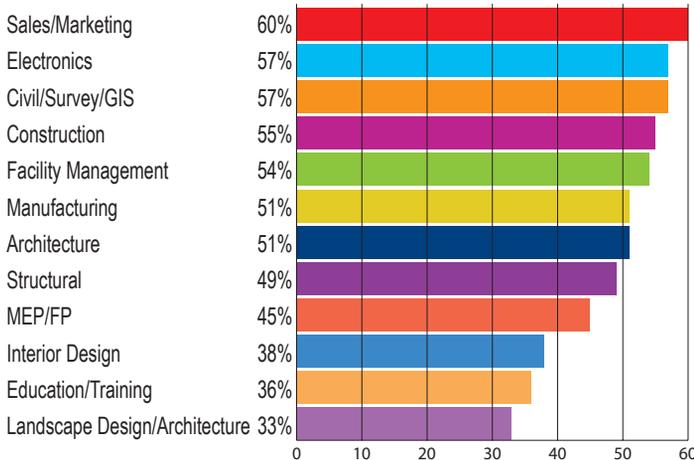
### Average Pay by Field/Industry



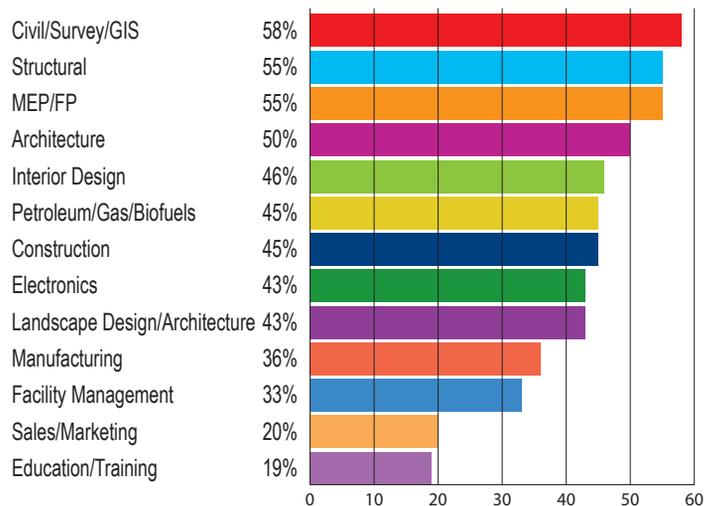
**For the first time ever, Architecture is not our most popular industry.**

**Civil has matched their participation rate of 22.18%!**

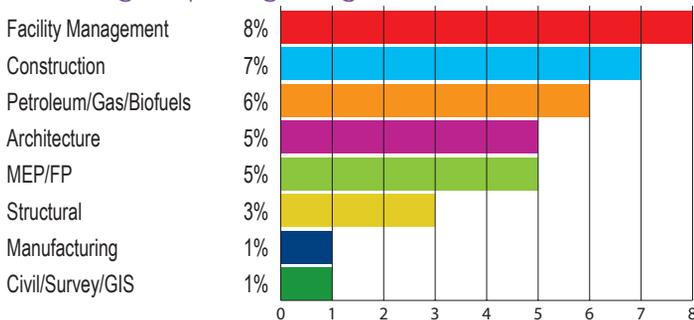
### Percentage with Extremely Busy Workload



### Percentage of Each Industry Reporting Staffing Increases



### Percentage Reporting Being Laid Off



**The average age of an AUGI member is 43.**

**Fields with higher than average ages are Landscape Design/Landscape Architecture and Manufacturing.**

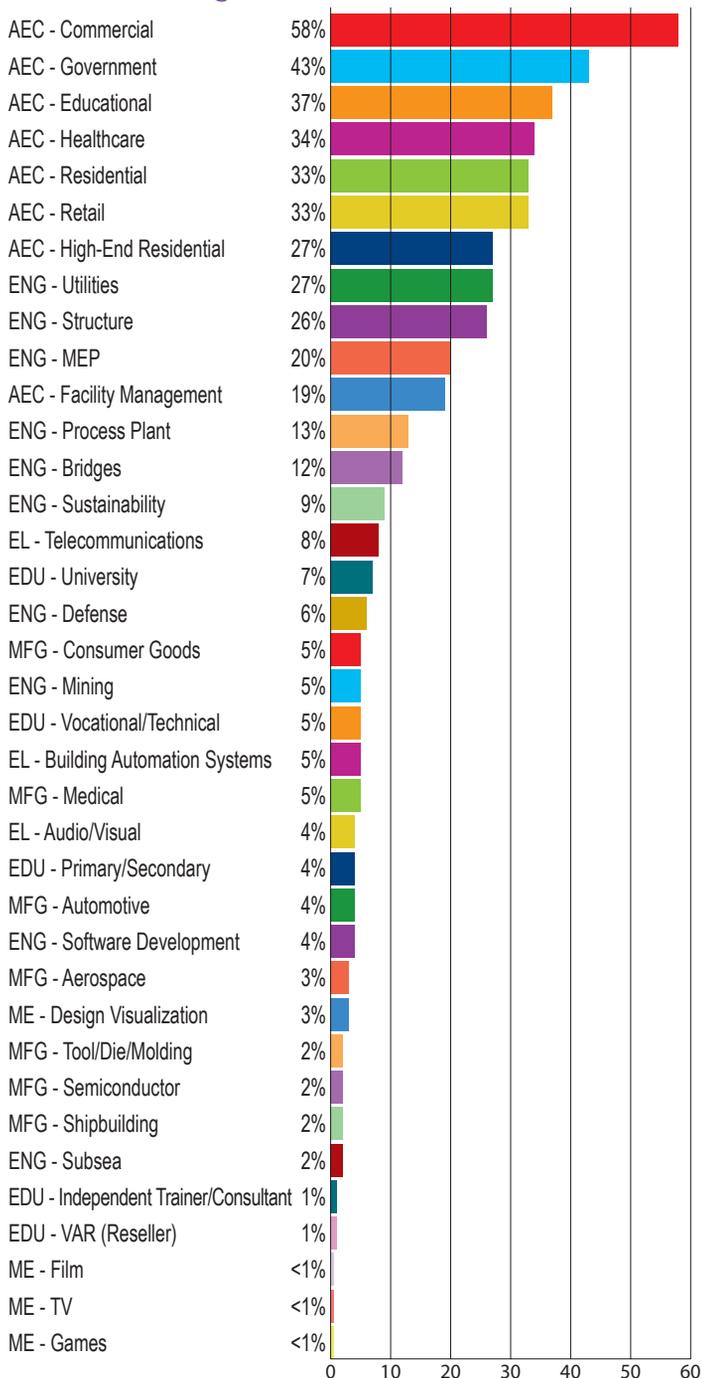
**Is your company tackling the idea of succession and knowledge documentation?**

**17% of the industry is female.**

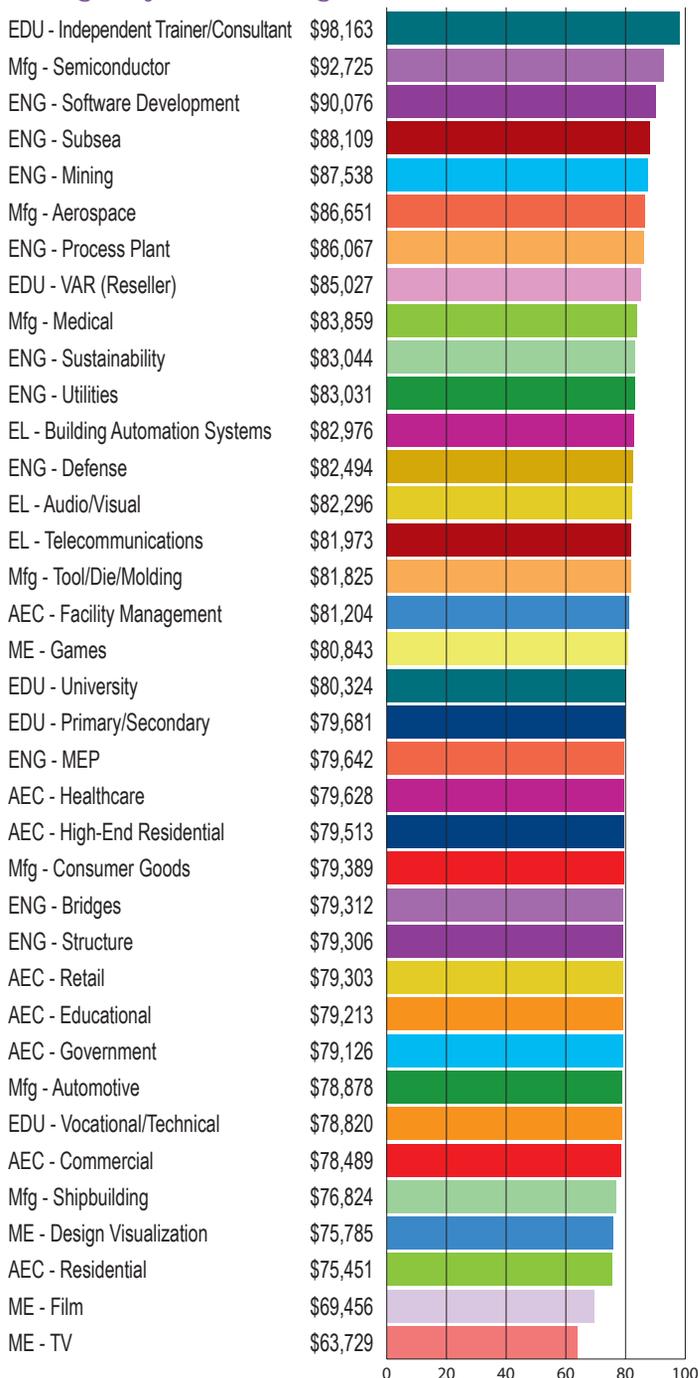
**Fields with lower than average representation are Construction, Structural, Civil, Manufacturing, and Fuels.**

## MARKETS SERVED - INDUSTRY SPECIALTIES

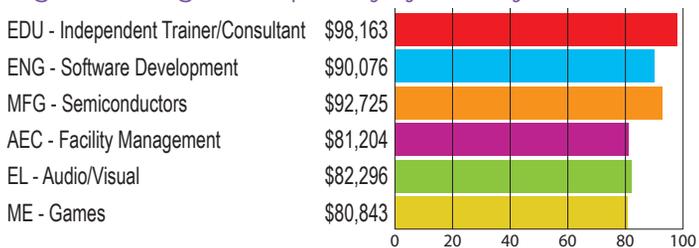
### Size of Market Segments



### Average Pay of Market Segments



### Highest Average Paid Specialty by Industry

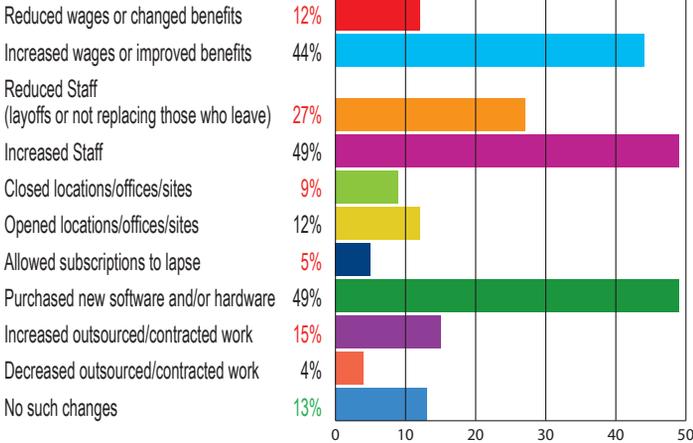


### Lowest Average Paid Specialty by Industry

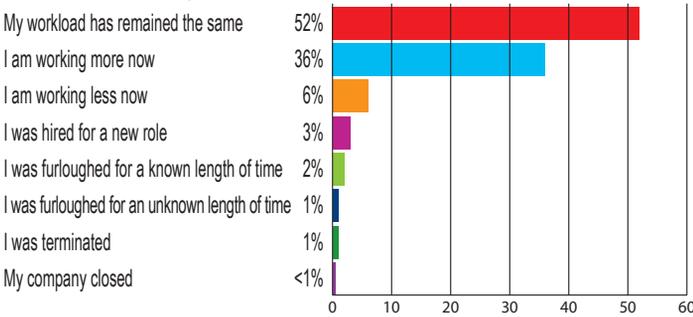


## HOT TOPICS

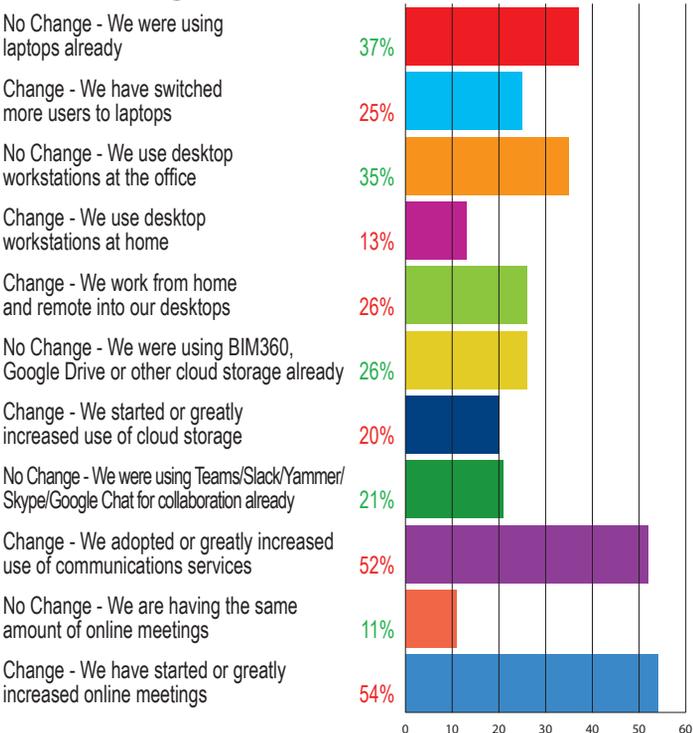
### Has Your Company Done Any of the Following in the Past Year?



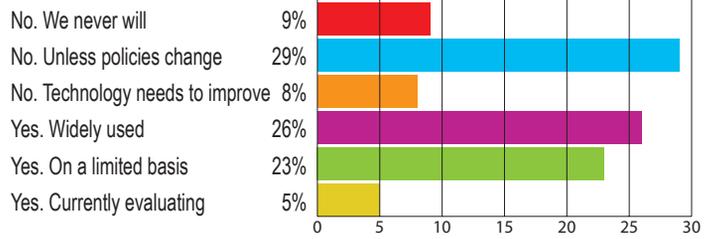
### How Has Your Workload Changed Since the Pandemic Began?



### How Has Your Technology Usage Changed Since the Pandemic Began?

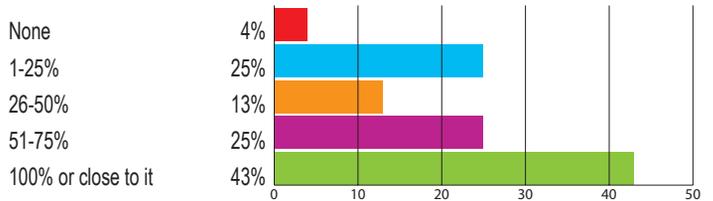


### Do you use CAD/BIM in Cloud?



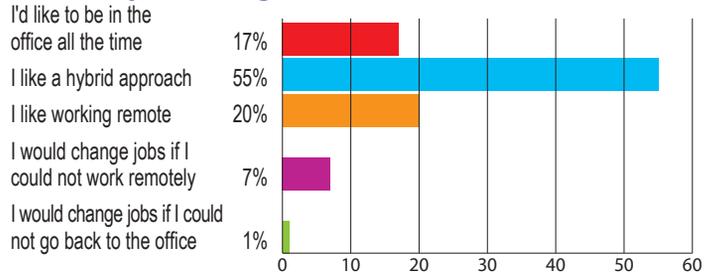
**"No" responses on cloud usage have fallen from 83% in 2013, to 46% currently.**

### How much of your company is back in the office now?



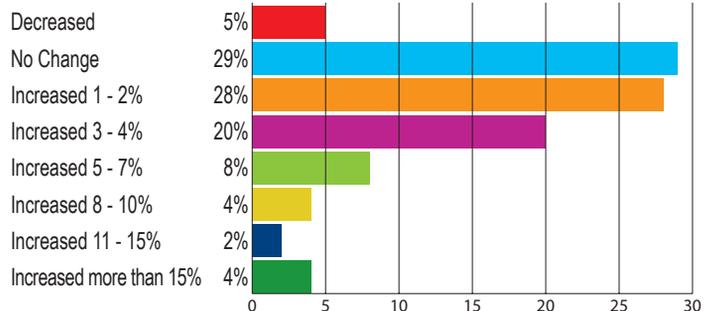
**More desktop workstations moved back to the office, cloud storage usage has increased and use of collaboration/meeting solutions increased since last year.**

### What are your feelings on remote work?



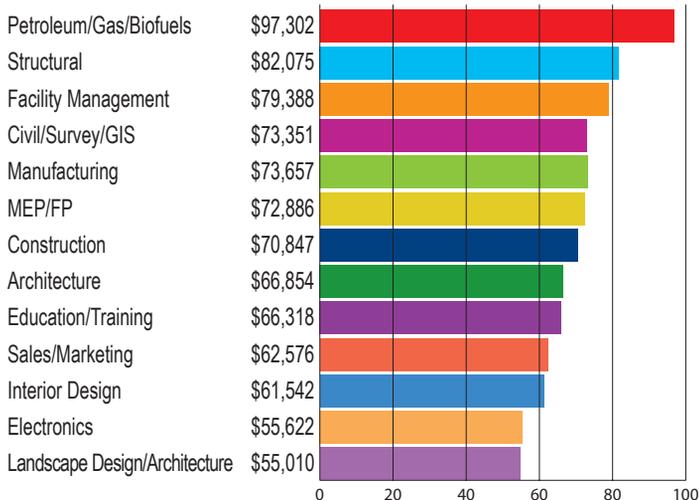
**Wage reductions dropped from 20% to 12%. Wage increases improved from 32% to 44%. Staff reductions decreased from 36% to 27%. Staff increases improved from 35% to 49%.**

### Has Your Salary Changed in the Past Year?

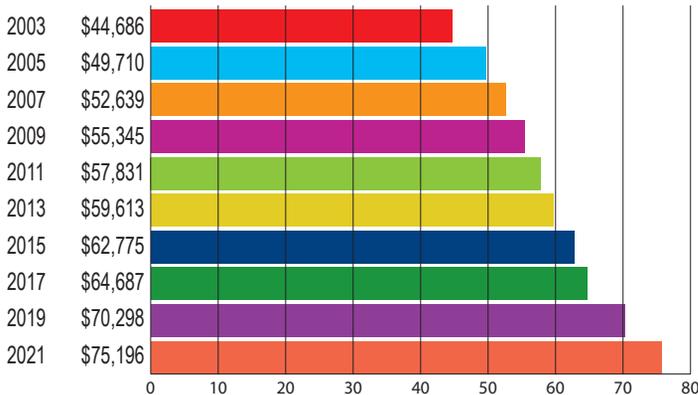


## DESIGNER CLOSE-UP

### Average AUGI Designer Salary by Industry



### Historical Average Designer Pay

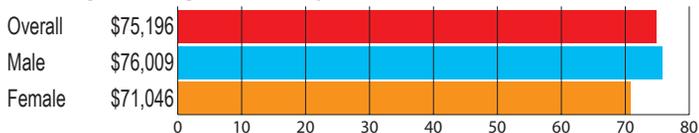


**52% of Designers report the ability to telecommute.**

**20% of Designers report the ability to telecommute.**

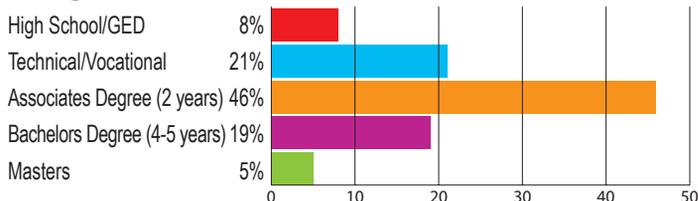
**Average age of Designers is 48.**

### Average Designer Salary



**11 years working for their current company.**

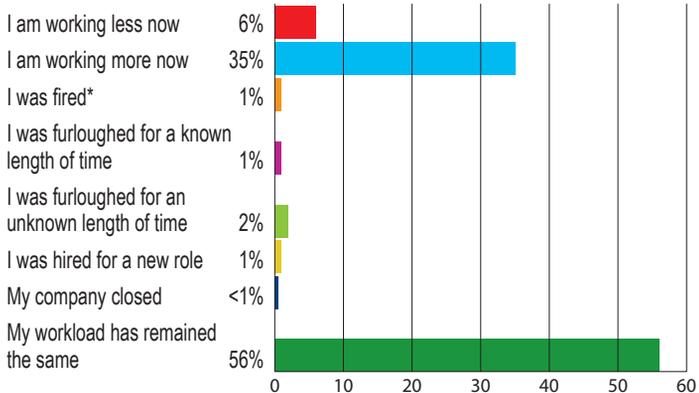
### Designer Education Levels



**46% of Designers rate their workload as Extremely Busy, the same as reported in 2020, which is a significant increase over prior years**

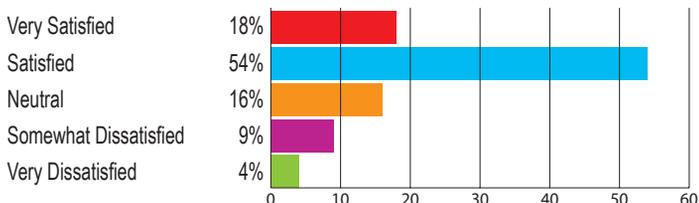
**82% of designers feel Secure in their jobs.**

### How Has Your Workload Changed Since the Pandemic?



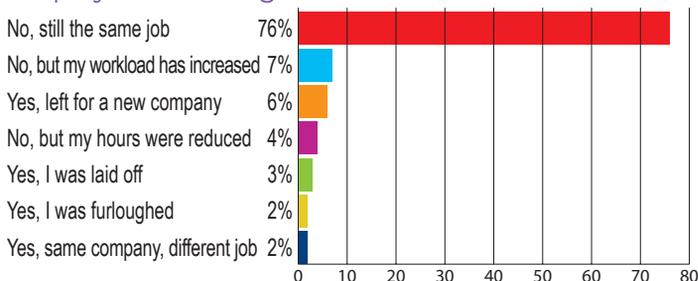
**70% of Designers can work flexible hours.**

### Level of Job Satisfaction



**Have 22 years of experience in the industry.**

### Employment Change in the Past Year

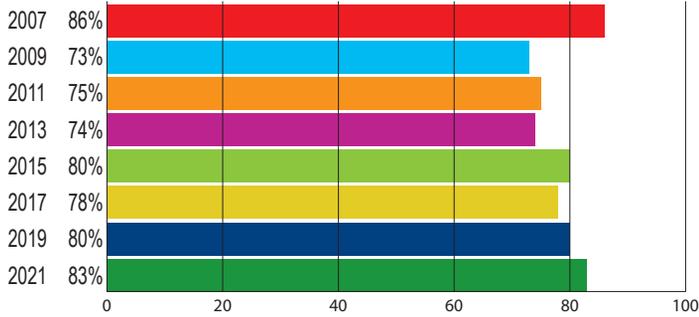


**28% of designers have not received a raise in the past year. 5% report having been laid off\***

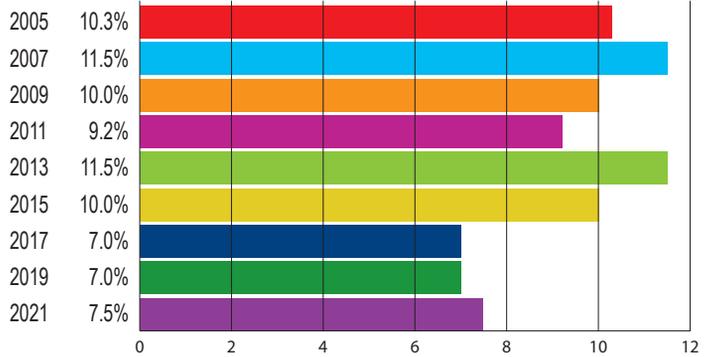
**\*Job status was reported early on in the survey, workload changes were an optional question at the end, so had fewer replies.**

## A LOOK BACK

Percentage of Users Who Feel Secure

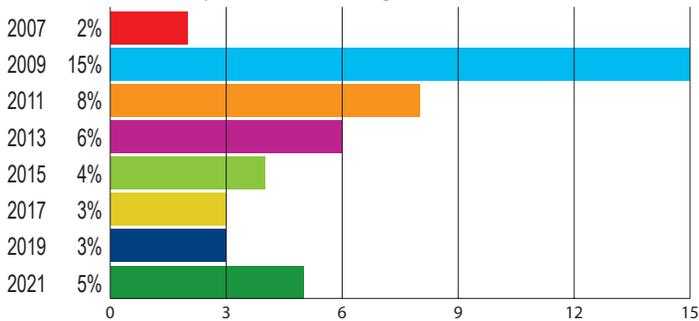


Percentage of Gender Pay Difference\*

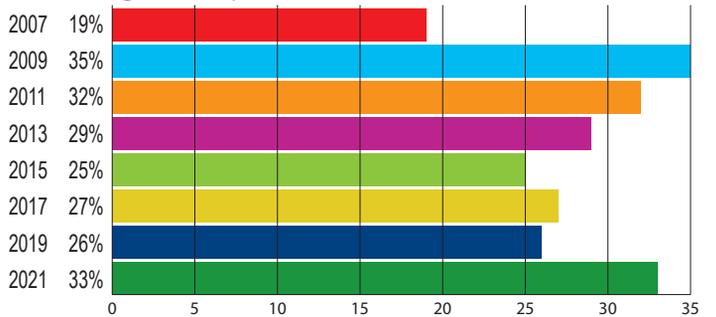


\* these numbers reflect a 40 hour workweek

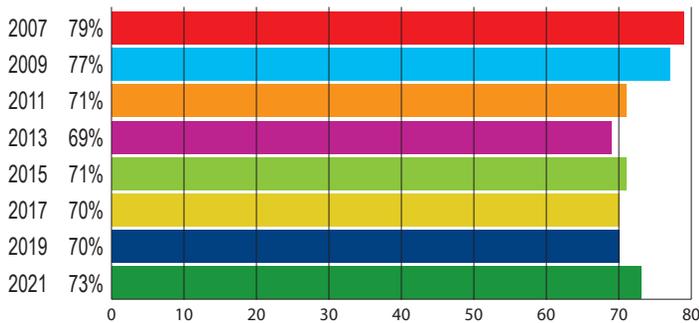
Percent Who Experienced a Pay Decrease



Percentage of Respondents Who Received No Raise



Percent of Users Who Are Satisfied

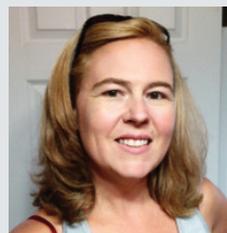


**While the percentage of Designers has remained steady over the years, the volume of members of the title of Drafter has shrunk from 28% in 2002 to just 9% today.**

**A recent AUGI poll has shown that 60% of our members are currently looking to leave their companies.**

**Reasons for leaving include being dissatisfied, companies rescinding remote work policies, and because they are currently under-employed.**

**Dissatisfaction stemmed from lack of raises and promotions, to conflicts with leadership and lack of support, among others.**



Melanie Stone is a CAFM/ IWMS Specialist supporting ARCHIBUS, FMInteract, Tririga or similar. She served as an AUGI Director/Officer for over 6 years and is currently involved with the STLRUG. Melanie can be reached at [mistressofthedorkness@gmail.com](mailto:mistressofthedorkness@gmail.com) or found on Twitter as @MistresDorkness

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### BIDLIGHT-2022

<https://bidlight.com>

**Autodesk Revit**

**Version: 2022**

BidLight is an Estimation Platform for the AEC industry. We provide a SaaS solution that helps Architects, Engineers, and Estimators estimate projects more efficiently. With the click of a button, you can estimate an entire project in less than 10 minutes.

Bidlight provides an easy-to-use estimation environment, where all the prices are up to date including inflation values. To readjust your materials or catalogs, drag and drop different components between catalog, material, and unmatched views. The tool is designed to save you time and effort. After exporting your estimate and 2D takeoff you can share your report with your clients/Contractors/ and teammates.



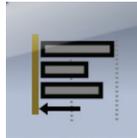
### FLAY

[https://apps.autodesk.com/ACD/en/Detail/Index?id=7021100717958412164&appLang=en&os=Win32\\_64](https://apps.autodesk.com/ACD/en/Detail/Index?id=7021100717958412164&appLang=en&os=Win32_64)

**Autodesk AutoCAD, AutoCAD Electrical, AutoCAD Mechanical, AutoCAD Architecture, AutoCAD MEP, and AutoCAD Plant 3D: 2018 to 2022**  
**Autodesk® Civil 3D®: 2018 to 2022**  
**Autodesk AutoCAD P&ID: 2017**

Flay is a force-layer reactor that automatically places predefined objects (drawing commands or specified blocks) to predefined layers.

Using a text file (.TAB) with the list of commands and layers, you can force AutoCAD to e.g., place all texts to the layer "ANNOTATIONS", place all hatches to the layer "HATCHING" and dimensions to the "DIMS" layers with predefined layer colors. You can also set block names which should be inserted to predefined layers - e.g., all Chair\* and Table\* blocks to the Furniture layer.



### EXPRESS AUTOALIGN

[https://apps.autodesk.com/ACD/en/Detail/Index?id=173683083572395733&appLang=en&os=Win32\\_64](https://apps.autodesk.com/ACD/en/Detail/Index?id=173683083572395733&appLang=en&os=Win32_64)

**Autodesk AutoCAD: 2018 to 2022**  
**Autodesk AutoCAD Electrical: 2018 to 2022**  
**Autodesk AutoCAD Mechanical: 2018 to 2022**  
**Autodesk AutoCAD Architecture: 2018 to 2022**

You can easily align the selected elements in the drawing. Alignment options are Left, Center, Right, Up, Down, Horizontal, and Vertical.



### FYENITE

<https://fyenite.com/>

**Autodesk Inventor: 2018 to 2022**  
**Autodesk Inventor Professional: 2018 to 2022**

FYENITE is a CAD automation platform (through which all types of CAD automation are run - file management, bulk modifications, configuration, and whatever the future holds).

FYENITE allows users to build both savable and shareable workflows that execute automation tasks by dragging and dropping files and configuring them accordingly. Furthermore, a GUI is automatically generated for the workflow for ease of collaboration and repeatability. For example, a user can drag several parts into their workflow, modify several parameters in each part, run the workflow, and Autodesk® Inventor® processes all the files per the user's inputs - this same workflow can be executed again with different parameter values. Another example, say a user needed to make the same change to the title block of 100 drawings, FYENITE would allow the user to drag these drawings into their workflow, link their properties together such that only one input needs to be entered, and run the workflow, having Inventor process the files accordingly. Additionally, users could export the outputs described above to several formats within the same workflow.

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



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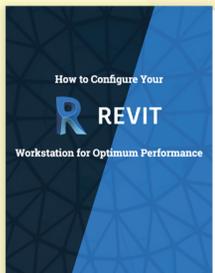


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