



STRUCTURETONE

Organization *Insights*

Govan Brown | LF Driscoll | Pavarini Construction | Pavarini McGovern

The Tech Issue >>



Scan here to download our new *STO Insights* App and see our new technology in action!



What's Inside:

4 Tech on Display
Red Hat Boston

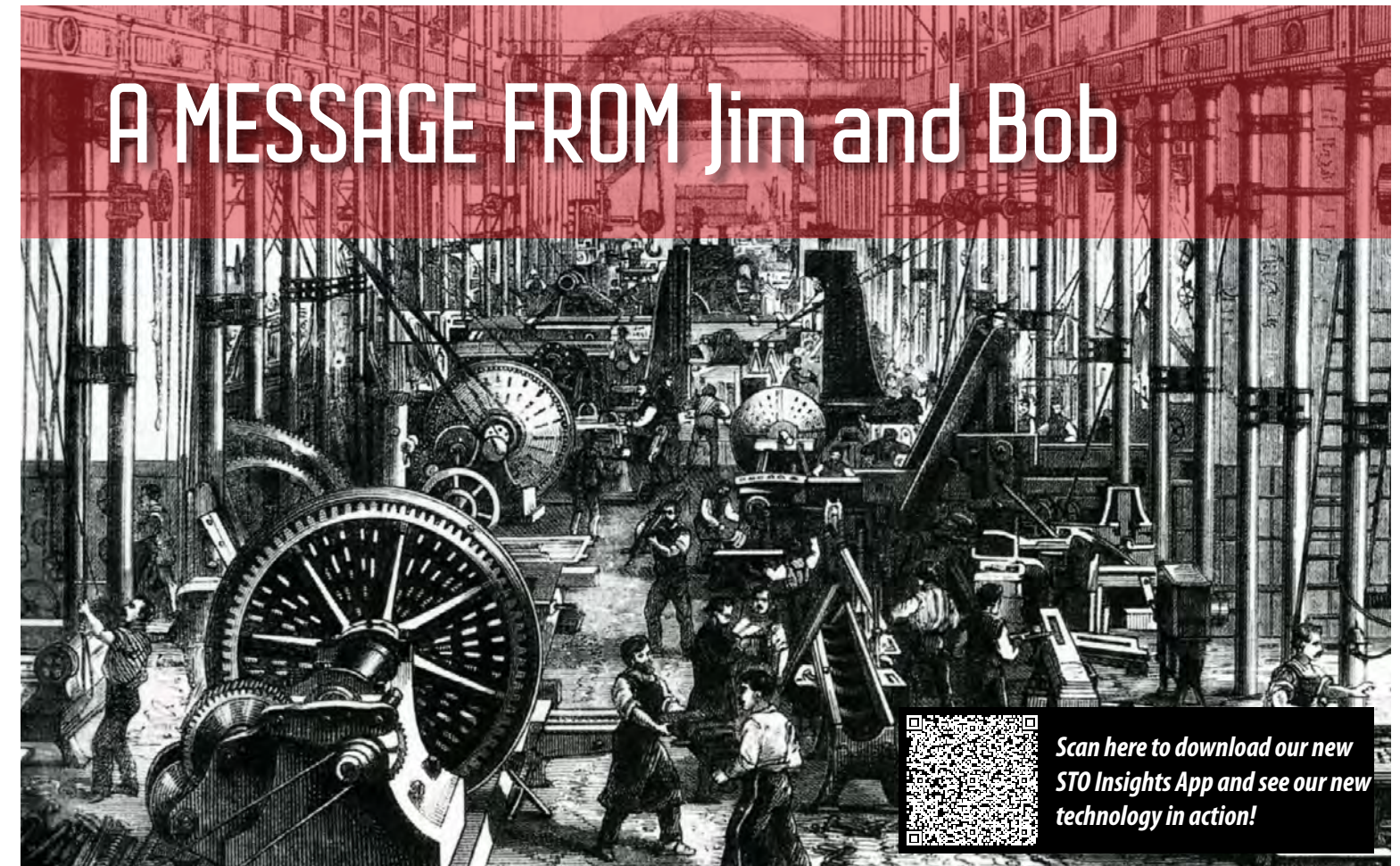
8 3D Printing for Problem Solving
3D models go beyond presentations

16 Taking Coordination to the Next Level
Axalta's Global Innovation Center

22 The View From Above
Drones for construction

IN THIS ISSUE >>

- 3 A Message from Jim and Bob**
Construction is embracing the "Fourth Industrial Revolution"
- 4 Tech on Display: Red Hat Boston**
Red Hat's new Boston offices
- 6 Real-Time Construction**
Cloud-based tools bring the office to the field
- 8 3D Printing for Problem Solving**
Using 3D printed models for more than visualization
- 10 Virtual Master: The Evolving Role of VDC**
Q&A with PMG's Victoria Della-Peruta
- 12 Speed, Communication and Consistency**
3D modeling in the cloud
- 14 Changing Styles, Changing Spaces**
Danone's White Plains, NY HQ
- 18 Digital Transformation**
How technology is changing the industry
- 20 Structure Tone Philadelphia**
Expanded and enhanced
- 22 The View From Above**
Using drones for construction
- 26 Parametric Modeling**
A new tool for estimating
- 28 Scheduling in the Digital Age**
Q&A with Paul Gabriel of Aegis
- 31 Altered Reality**
Bringing data coordination into the field



SPECIAL FEATURES

- 16 Taking Coordination to the Next Level**
Axalta's Global Innovation Center
- 21 Harnessing Big Data**
How data can help improve construction
- 24 Advanced Metrics**
Unilever's high-tech, ultra-sustainable HQ
- 30 Giving Back: EcoRise**
Teaching sustainability in our schools



We are now in what experts are calling the "Fourth Industrial Revolution." The first, of course, came with the invention of machine tools around the turn of the 19th century. The second involved a period of intense industrialization through the World Wars, prompted by large-scale iron and steel production, electricity and the advent of the railroads. The term was resurrected in the 2000s when economists labeled the digital age the Third Industrial Revolution. Now we're into the fourth—the era of big data, robotics, artificial intelligence and the other incredible technologies that have changed our world over the last decade.

The AEC industry essentially missed the Third Industrial Revolution. While other industries were completely shifting their product delivery model to leverage the power of the digital age, our industry largely stuck to its typical processes. Did our industry miss out? Construction comes to fruition in the field, and until mobile devices gave us that 24-hour access to information, much of that work had to be done the old-fashioned way.

But that era is over. The digital transformation of our industry is well underway, and it's changing everything. Thanks to cloud-based tools and mobile devices, our teams can collaborate with the entire project team anytime, anywhere. With advanced virtual modeling applications like 3D printing, augmented reality, parametric model estimates and collaborative precoordination, we're able to test out and find solutions to construction problems without the time and costs of RFIs and change orders.

This issue of STO Insights highlights some of the innovative technologies our organization has embraced to ensure we're leveraging technology to build even better. We have even embedded technology into the issue itself—from links to animations in our digital copy to augmented reality images through our new STO Insights app. We're excited to see where these technologies will take our industry next and how they will continue to help the entire project team create a better building experience.

James K. Donaghy
Executive Chairman

Robert Mullen
CEO

©Copyright Structure Tone, LLC, 2018

Structure Tone Organization Insights is a publication of the Structure Tone corporate marketing department | 330 W. 34th Street, New York, NY

Editor, Alison Smith | Art Director, Sarah Lembo | Senior Proofreader, Kari Mullen | Contributing Writer, Breanna Ahern

The Structure Tone organization refers to a group of separate legal entities including Structure Tone, LLC, Structure Tone Southwest, LLC, Structure Tone International Limited (UK), Structure Tone Limited (Dublin), Pavarini Construction Co., LLC, Pavarini McGovern, LLC, L.F. Driscoll Company, LLC and Govan Brown, as well as their subsidiaries, joint ventures, divisions or affiliates. Each member company is an independent legal entity operating and providing services solely under its own name.

Locations: Austin, Boston, Calgary, Dallas, Dublin, Edmonton, Hartford, Houston, London, New York, Ottawa, Philadelphia, San Antonio, Stamford, Toronto, Vancouver, Winnipeg, Woodbridge

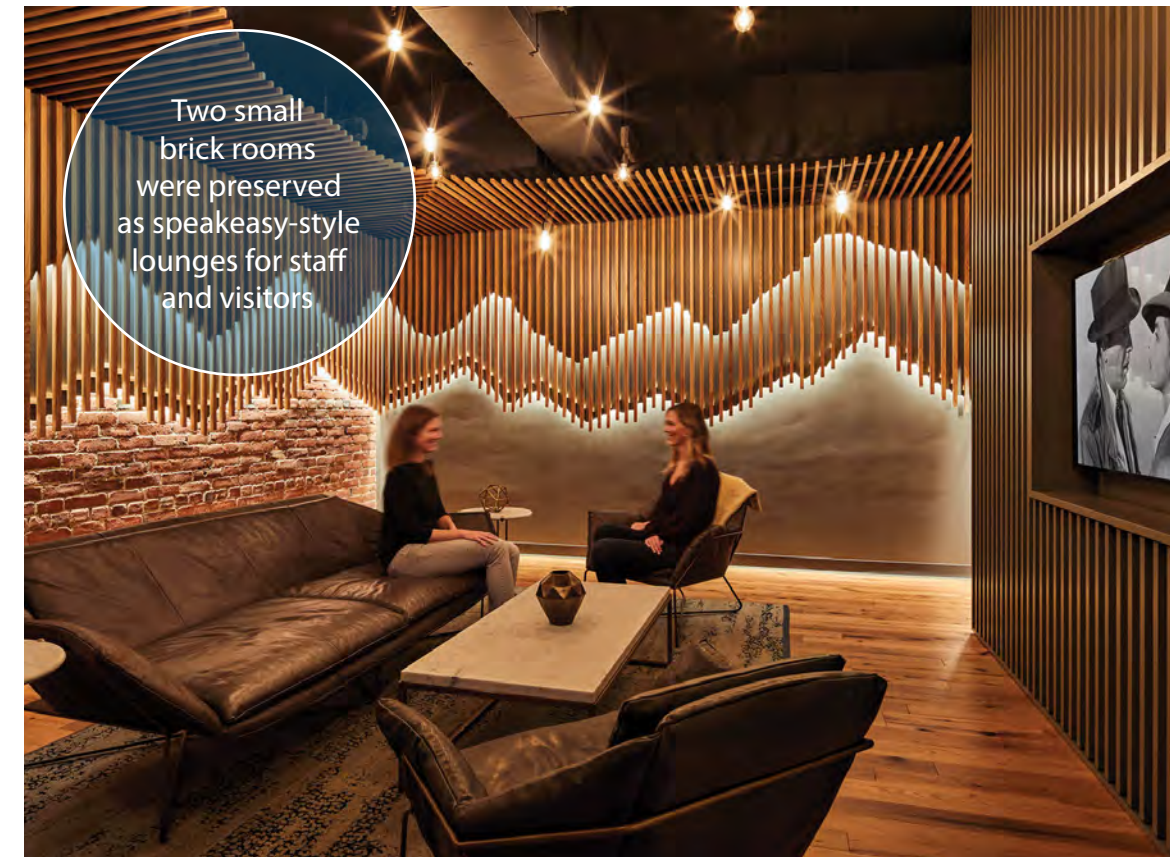


A floor-to-ceiling display screen spans the main staircase and helps visually connect the two floors

Tech on Display: Red Hat Boston

"It's all about being open and collaborative."

So said Jan Mark Holzer, senior consulting engineer at technology firm Red Hat, while giving a tour of the company's new Boston offices. While his comment referred to the office design, he may as well have been talking about Red Hat's business itself.



Two small brick rooms were preserved as speakeasy-style lounges for staff and visitors

The company is a global leader in what's called "open-source" technologies, or an approach to software development in which the source code is shared openly so that other software developers can collaboratively work together to improve and advance the technology. Red Hat's Boston-area team works hard to help its clients take advantage of open-source technology, but their suburban office 40 miles northwest of Boston made it difficult to invite customers to see their work in person or to attract the best and brightest talent.

"It was part of our own evolution as a company," says Danny Seaton, Red Hat's senior director of Global Workplace Solutions, Americas. "We started developing back-office solutions in a closet. But as the dynamics of our business have changed and we realized where open source could take us, we also had to think strategically about where we needed to be and make the appropriate investment."

PRESERVING HISTORY

That investment became Red Hat's new Executive Briefing Center, Open Innovation Labs & Engineering Lab in Boston's "Innovation District." Transforming a former candy manufacturing plant, the new 40,000sf space reflects Red Hat's modern brand image, but also maintains the historical integrity of the building, seamlessly blending the 150-year-old building's original brick-and-beam construction with ultra-modern technology.

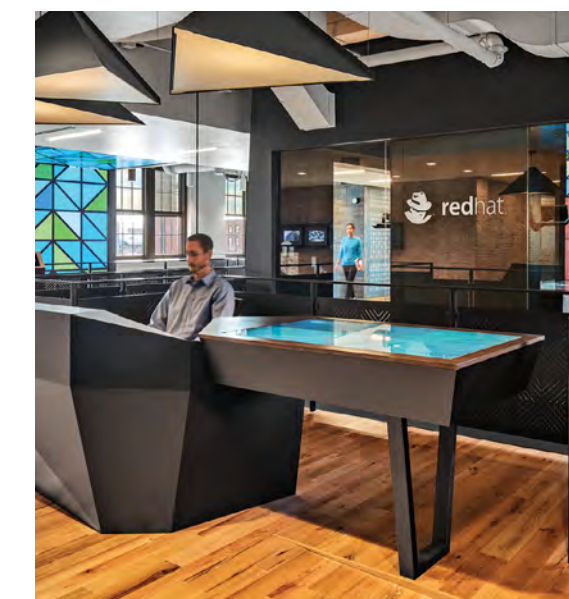
To maintain the aesthetic but improve the structural integrity of the building, the Structure Tone team

used both new steel and "sistering" of new and old beams for additional bracing. They also considered the sound attenuation of an open, brick-and-wood space, including acoustical spray, sound masking and "floating" floors where the wood was installed over gyprocrete and a padding substrate.

All that new steel meant moving in huge pieces of materials. Rather than rely on the freight elevator, the team removed the windows and hoisted up steel as needed—which came in handy for other elements as well. "We took advantage of such a large opening while we had it," says Structure Tone project manager Carl Frank. "We used that opportunity to move in all the materials for the stairs and the large A/V quilt wall as well."

EMBRACING THE FUTURE

Equally important was ensuring the new space showcases the nature of the company's work—which means technology is everywhere. An in-



Above ▲ Touchscreens throughout the office are connected through a master ecosystem

Project Details

- Size:** 40,000sf
- Client:** Red Hat
- Architect:** IA Interior Architects
- MEP Engineer:** AKF Group
- A/V Consultant:** Downstream
- Owner's Rep:** Colliers International
- Services:** Construction Management
- Sector:** Commercial
- Completion:** June 2017

tegrated system of touchscreens connects to a master technology "ecosystem" to allow collaboration and connectivity across the office, no matter where you are. To make that ecosystem work without sacrificing the office's aesthetic, the Structure Tone team neatly organized the cabling to run between exposed ceilings and inaccessible hard ceilings as well as connect to multiple IDF closets.

"We worked really closely with the project team," says Frank. "We were constantly on the phone or at the site with the audio/visual designers and the architects and engineers to adjust the system designs to make sure those systems would be built effectively and efficiently."

While the abundant technology is functional for staff and clients, it also communicates what makes Red Hat special. "There's not a lot of Red Hat branding here," says Holzer. "It's really a very subtle and reinforcing message of technology through the video room, all the touchscreens, the brand new technologies. We even pushed our own IT people a little out of their comfort zone."

MAKING CONNECTIONS

So far employees and customers alike have been singing the office's praises.

"It's definitely helped establish us as a serious enterprise player," says Holzer. "Many customers have come back multiple times already."

In fact, according to Red Hat, the company averaged 75 customer visits a year to its suburban office. In just the first six months of opening the downtown space, they have had 110 customer visits, plus hosted over 40 large-scale events.

As Red Hat puts it, technology thrives in the open. Their new hub in Boston's Innovation District is proving just that. ◀

All photos these pages: Robert Benson Photography

Real-Time Construction

Coordinating the many moving parts of a construction job—and keeping all parties up to speed—has always been one of the most challenging aspects of the construction manager’s job. The process of documenting change can be tedious: go back to the trailer or office to get the paper drawings, log the proposed change in an RFI and staple that to the documents, share that back to the project team, print out new paper documents and so on.



Tools like PlanGrid also help the efficiency and accuracy of the QA/QC process

But now with the advent of cloud-based tools and technologies, project teams and clients are able to work together in real time, in the field, to quickly work out any issues and keep the project moving forward.

ALL IN THE CLOUD

One example of these tools is PlanGrid. Structure Tone started trying out PlanGrid several years ago as these cloud-based platforms entered the market. In Texas, the first project Structure Tone Southwest employed it on was a 67,000sf data center for a major mission critical client—and the results were incredible. “Everything we had to go back to the trailer to see before, we could now see in the field,” says Tracy McWhorter, Structure Tone Southwest director of quality systems. “All of our project information was at our fingertips.”

How it works, essentially, is all of a project’s documentation—from drawings, specs and photos to RFIs and punchlists—are stored in the cloud. Every

team member with access to the project can view, mark up, comment on or add to those documents through the app on their mobile device. Any changes are automatically synced to each team member’s device, meaning they can see and react to them in real time, no matter if they’re on site, in an office or anywhere else.

This kind of accessibility has a number of major benefits for the project and the team:

- 1. Efficiency.** To state the obvious, with that real-time access, all the previous steps of documenting and sharing information on paper are eliminated, making the entire process more efficient.
- 2. Teamwork.** Another benefit is the shared access to all of this information makes it much easier for a project team to coordinate and communicate. “It really invites everyone into the process,” says McWhorter. “Our subs use the tool as well, which really makes us feel like
- 3. Punchlists.** That teamwork includes the designers as well. Not only can they also access all the information in PlanGrid, but they can even use the tool to avoid added site visits, including the punchlist process. “The architects sent across their site walk reports, and within seconds we could work from those right in PlanGrid,” McWhorter says. “When it came time to do the punchlist, they could simply look at the before and after photos and did not even have to walk the site a final time before sign-off.”
- 4. QA/QC.** The access and transparency of using tools like PlanGrid has also helped with managing quality, from the construction team to the owner. “A lot of owners now are educated about the construction process and want to know how it’s going,” McWhorter says.

one united team. We can track issues easily and they don’t have to go through us for information. It’s all there.”



Laser scanning helps the team determine the best path for key data center infrastructure

“We can walk through everything with them in PlanGrid and show them which areas we’re especially focused on for QA/QC. It’s powerful!”

Below ▼
With cloud-based tools, a project team can see up-to-date documents and make decisions, right from the field

UP, UP AND AWAY

Since that first PlanGrid project, Structure Tone Southwest has been using cloud-based tools regularly, including for the same mission critical client’s expanding facilities. And the client has loved the experience, particularly when it comes to how it benefits the approach to quality assurance. “I haven’t seen another GC that goes as in-depth into the drawings, specifications, code and reports to pull out the finite detail,” says Brad Gover, senior project manager at Critical Project Services. “It has clearly set STSW apart.”

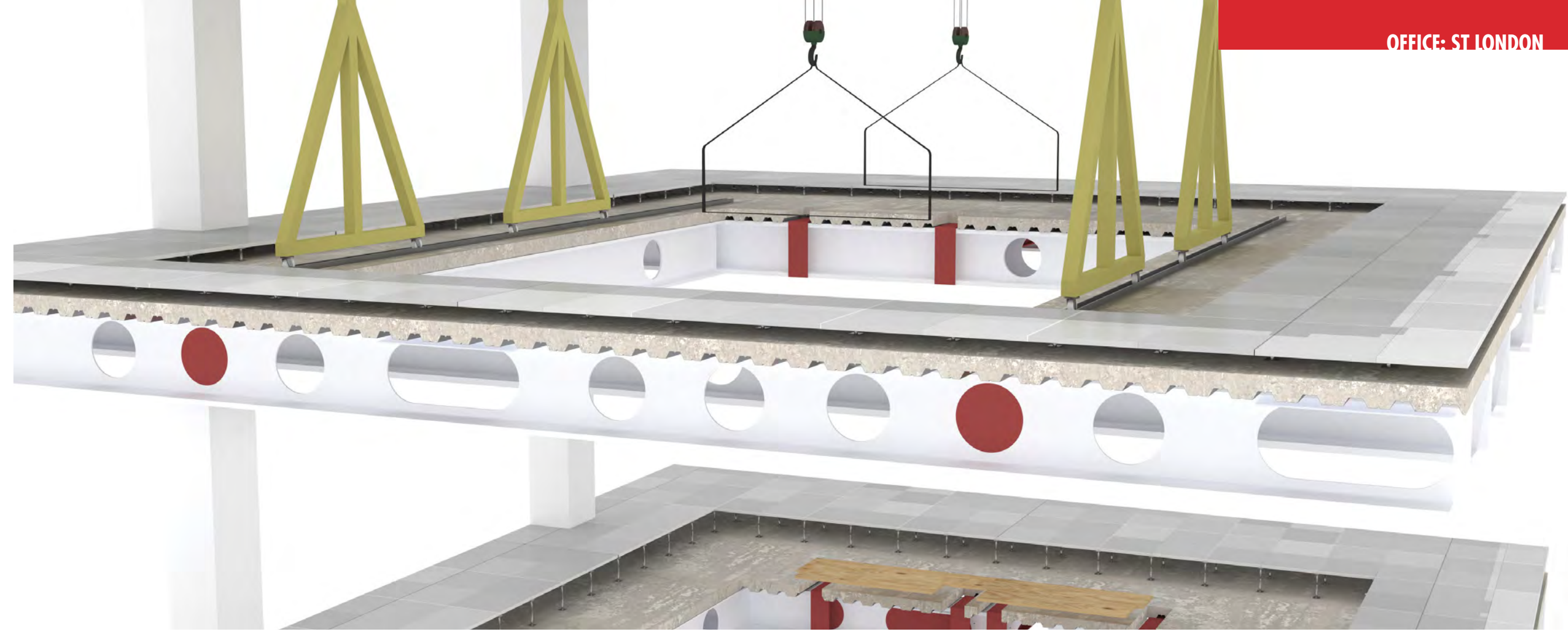
The team continues to build on that success, experimenting with ideas for maximizing and even improving these kinds of tools for even more project efficiencies.

“We’re testing out integration of tools like PlanGrid with some of our other programs so things like submittals can be approved in one system and uploaded automatically to the other” says McWhorter. “We have really just begun to see what we can do with platforms like these in the future.” ◀



3D PRINTING FOR PROBLEM SOLVING

As 3D printing technology has evolved, the continued applications for design and construction have evolved along with it. What has been primarily used as a presentation tool—essentially an easier and faster version of the traditional architectural model—has become something more. Today, firms can use printed 3D models to not only showcase how a project will come together, but solve construction challenges along the way.



MODEL BEHAVIOUR

When Structure Tone London was preparing its plan to fit out Ashurst's new London law offices, they knew the firm had two main design goals: 1) to foster collaboration and 2) to represent their local and global brand. From a construction perspective, they also knew the project involved a heavy focus on high-level services coordination, and that connecting the central staircase through the slab would be a challenge.

That challenge presented the perfect opportunity to test out the design via 3D modeling—not only to work out construction solutions for the staircase, but also to showcase those solutions in a feature that embodies their connectivity and branding goals.

"This has become part of our process for interrogating elements of the design to ensure principles are administered," says Chris Bailey, Structure Tone creative design manager. "It also allows us to demonstrate an understanding of the key design components, such as staircases, in terms of performance, alignment and dynamics."

Developing the model and its printed representation also helped pull together Structure Tone's project team before actual work began. To create the model, Bailey and his team reviewed the staircase design with their subcontractors to determine how exactly the staircase would interface



Above ▲ Using the 3D printed model, the project team can physically see how the staircase will come together

with the slab. Using point cloud scan data, he then created not only a 3D model that physically demonstrates that interface, but also a [video animation that illustrates the build sequence](#).

"The combined package packs quite a visual punch," Bailey says. "And it sets our team up well to

work with the design team as construction begins since we can use our 3D technical skills to work alongside the designers to update the drawings and models as changes occur."

GOING LIVE

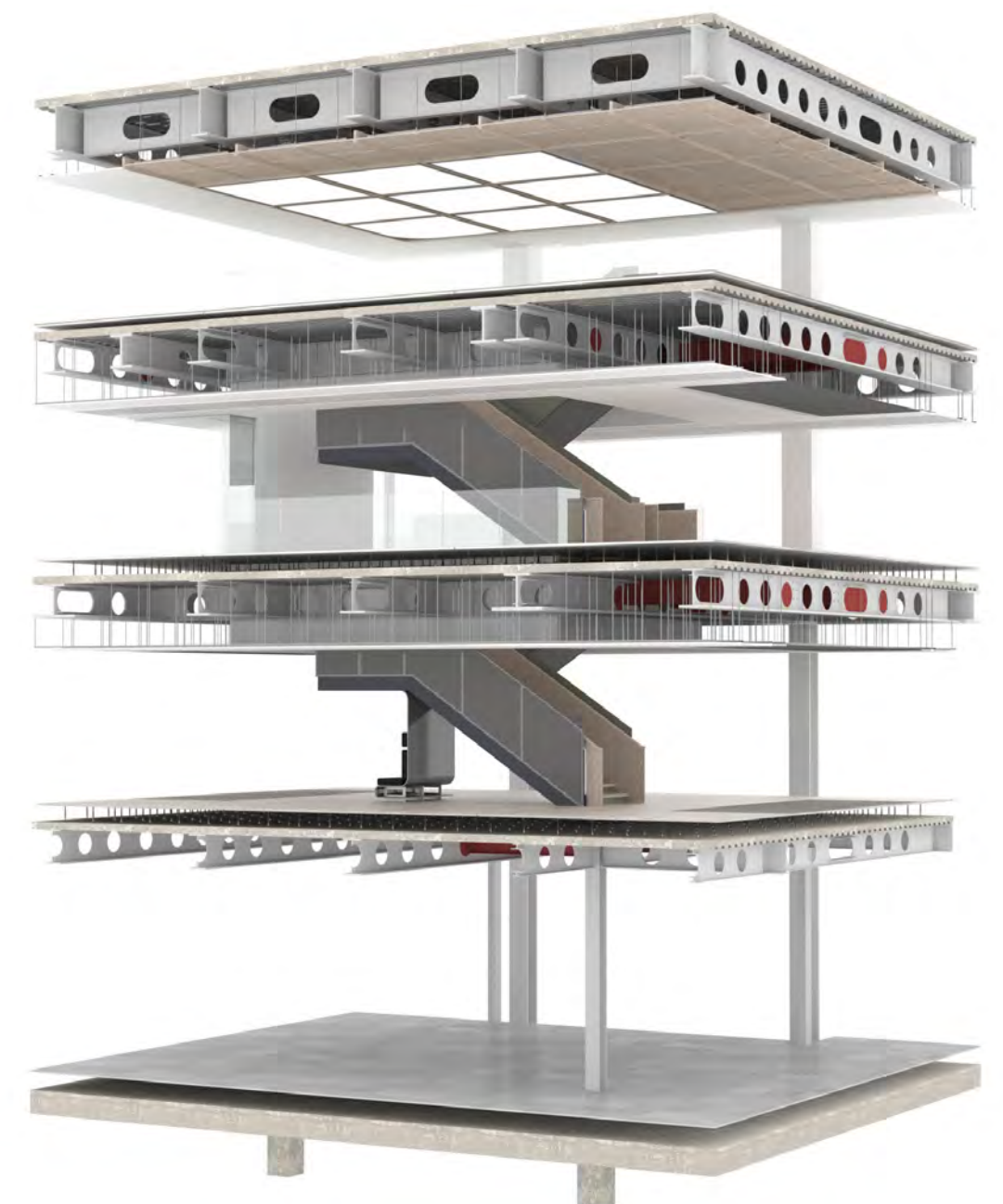
In fact, the Structure Tone London team is now working toward moving 3D printing beyond the early stages of a project into live construction, tackling the special detail areas that pose construction challenges as they're discovered.

"As the technology has evolved, 3D modeling and printing has become incredibly efficient," says David Walsh, Structure Tone senior project manager. "In just a few days' time, we can test out design changes, print them in 3D and physically look at the model together while on the job site. That saves the project the time and costs of what could have been multiple rounds of revisions and reviews."

An added benefit of producing the models is the client can use them in their own internal communications, from presentations to employees and stakeholders to simply keeping them on display in their lobby.

"Our aim is to keep the models in use wherever they can aid project delivery," says Bailey. "We're constantly finding new ways that they help as we hone our own modelling techniques and collect lessons learned from every project." ◀

Above and Below ▲▼ Video animations complement the printed model to illustrate the build sequence



◀ Back to Cover

◀ Previous page

▶ Next page

☰ Table of Contents



VIRTUAL MASTER: THE EVOLVING ROLE OF VDC

In the early days of virtual design and construction (VDC), it was seen as a differentiator, an edge for firms like Pavarini McGovern (PMG), who were pushing the limits of technology and innovation. But times have changed. Today's clients have come to expect VDC in every stage of the project. From site logistics and safety plans, to construction sequencing and field coordination, clients, stakeholders and permitting agencies want to understand more about projects than ever before, and they are relying on the construction managers to share that information in an easy, visual way.



Above ▲
Victoria Della-Peruta, VDC coordinator

When PMG wanted to expand their VDC capabilities, they looked to the field to find someone with the right combination of technical skills and construction management experience to do the job. Enter Victoria Della-Peruta. Here we speak with her about the path that brought her to virtual construction, how it's changing things at PMG and where she sees this technology headed next.

Q: How did you get into the construction industry, and into VDC specifically?

A: I come from a construction family, and since I was a kid I've always been fascinated by the industry. I studied architecture in school and focused on digital media. Between school terms, I interned with PMG, learning the ropes by assisting with RFIs, shop drawings and submittals and other work of that nature. Upon graduating, I stayed on with PMG as a full-time assistant project manager. I found that with my architecture background

and CADD skills, I could manipulate plans and documents directly from the field, which helped save the time normally needed for rounds of revisions and reviews. After seeing a couple of projects through to completion—330 Hudson Street, a major commercial office repositioning, and 100 East 53rd Street, a new 62-story luxury condominium tower—I realized I was ready to take on more responsibility and opportunities to use VDC. At the same time, PMG intended to enhance our VDC offerings by creating a leadership position. It was a perfect storm!

Q: Describe your role.

A: I am PMG's VDC coordinator. The job is structured a little differently than what people might expect. We're involving visualization throughout the entire lifecycle of the project—starting with the proposal. I work with marketing, the general super and the project team to bring the project

approach and schedule to life through 3- and 4-D visualizations, including logistics and sequencing at various project stages. These realistic visualizations help us demonstrate our thoughtfulness and professionalism, and help us win work.

During preconstruction, I help coordinate the BIM models with our design team and subs to make sure we tackle any clashes or issues before we get into the field. I also help with site safety plans for the DOB and DOT, and logistics models for neighborhood communications plans.

Q: What kinds of projects are you working on?

A: I have been helping with visualization and coordination for clients like RFR, Hines, Brookfield and SJP, to name a few. As a recent example, Brookfield required an immediate turn-around on an overall site logistics plan for their entire city block at Manhattan

West. I worked directly with the project team to coordinate their revisions right away, which helped streamline the whole process.

Q: What do you think are the next innovations in VDC?

A: Virtual and augmented reality has already begun popping up in our industry. It's amazing how quickly this industry is advancing before our eyes. When I began using these programs, virtual and augmented reality were not as prevalent or accessible. Now, practically every house with a child between 10 and 20 has a headset for their PS4 or phone. At PMG, I would like to start using it more to visualize tight spaces and difficult conditions in the field and plan how we'll manage those before construction begins. We're also starting to see robots becoming more of a reality. Robots are already being used for layout and 3D scanning of as-built conditions. I expect these kinds of innovations will only continue to automate even more of the process. ◀

SPEED, COMMUNICATION AND CONSISTENCY: 3D MODELING IN THE CLOUD

By housing the model in the cloud, the project team can access the most up-to-date version

By now, nearly everyone in the world of design and construction is using some form of building information modeling, from architects and engineers to general contractors and their subs. But because each of these players has different programs, different tools and different capabilities, working a project through the BIM process can sometimes get clunky. “Things can get bottlenecked,” says Ali Militano, virtual modeling coordinator for Structure Tone. “Typically, everyone is waiting for the BIM coordinator to create an aggregated model, share it back with the team and issue class reports, then wait again for everyone to make their revisions. Then we create a new merged model, and the cycle continues. This really slows the collaboration process.”

But with ever-evolving BIM technologies like AutoDesk’s BIM 360 Glue, the project team can alleviate that bottleneck by having the latest model—and its previous iterations—“living” in the cloud with shared access across the team.

MODEL MASTERS

Tools like BIM 360 Glue essentially handle the update and consolidation process for the team. Every time a project team member “Glues” a re-

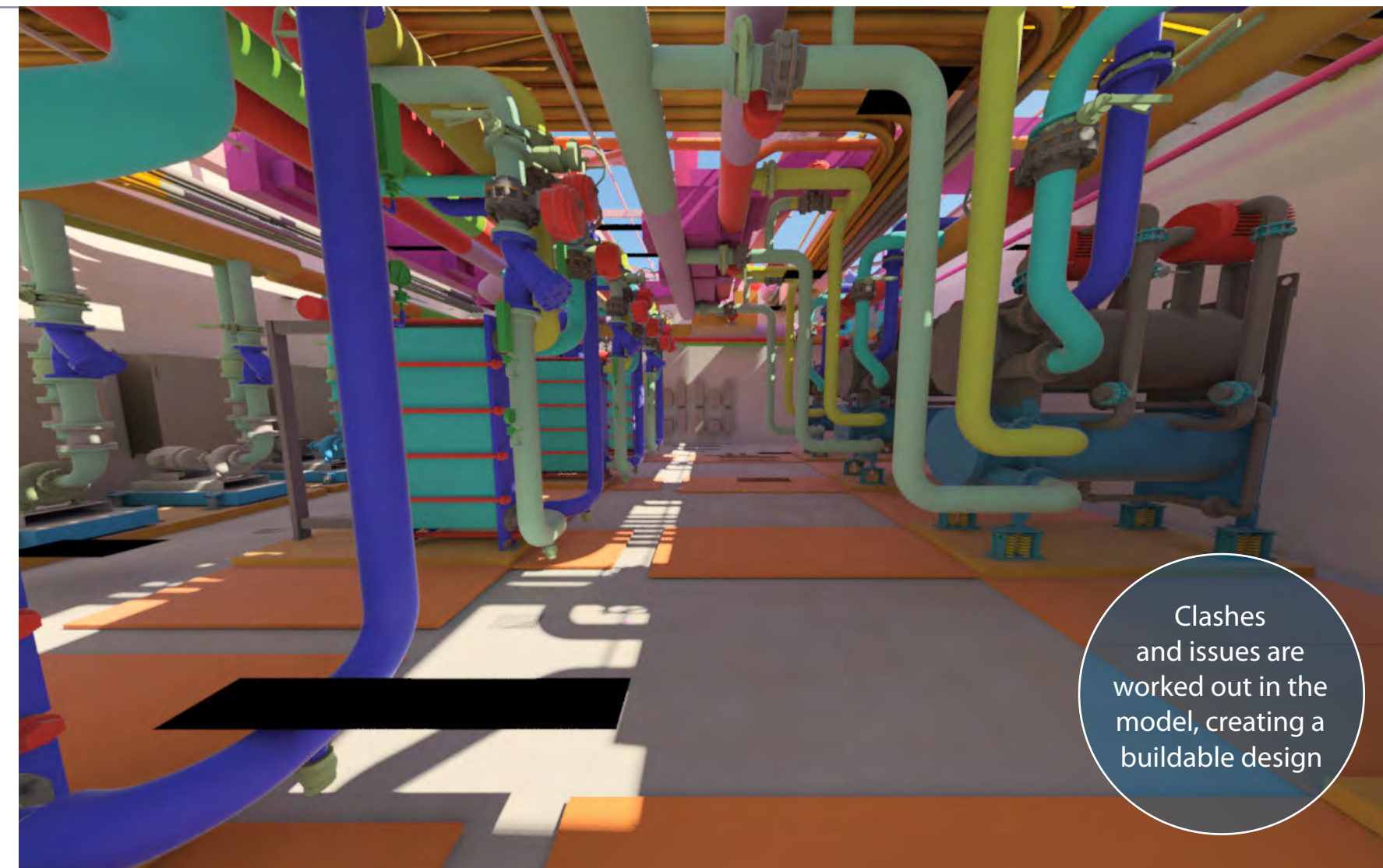
vised model, the system automatically makes the change to the master model. While the modeling itself is still left to each party and their modeling software of choice (AutoCAD, Revit, etc.), they can easily upload their model directly to Glue, which converts the changes into the master, ensuring everyone has ready access to the most up-to-date version in one shared platform.

Available on desktops and tablet devices, team members who aren’t involved in the modeling itself can also view the model to help solve issues. For field staff, that kind of immediate access has been invaluable.

“I have it right on my tablet so I can take a look at the model whenever a question comes up,” says Kiera Brady, a Structure Tone superintendent currently working on the new Hudson Yards headquarters of Time Warner, now part of AT&T and renamed Warner Media. “I’ll get a call from a sub to come show him the model so we can take measurements or manipulate the view to help solve whatever issue he’s having. It’s incredible how many subs find me to reference the model.”



Above ▲ Modeling tools help ensure unique spaces like Warner Media’s amphitheater meet their vision



Clashes and issues are worked out in the model, creating a buildable design

DREAM TEAM

This kind of collaboration also helps build a stronger, more unified team. By working on the BIM process together from the time the entire team comes on board throughout completion, everyone remains on the same page and understands where things are going.

“For some jobs, the BIM process starts in the early phases and then is kind of thrown by the wayside as things get going,” says Douglas Kruser, Structure Tone project manager for the Warner Media project. “With this process, we have to put in a lot of time upfront together, but it really alleviates headaches and potential delays down the road.”

For a job like Warner Media’s 1.5Msf offices, making sure all the people and parts are organized can be a major challenge. BIM 360 Glue has helped with that too. “Projects at Hudson Yards are so large and complex with many phases, and each phase with different subcontractors,” says Militano. “In Glue we can see all the users, manage access and create folders by each floor or phase, etc., with everything centralized in one place. For projects of this size, that’s incredibly helpful.”

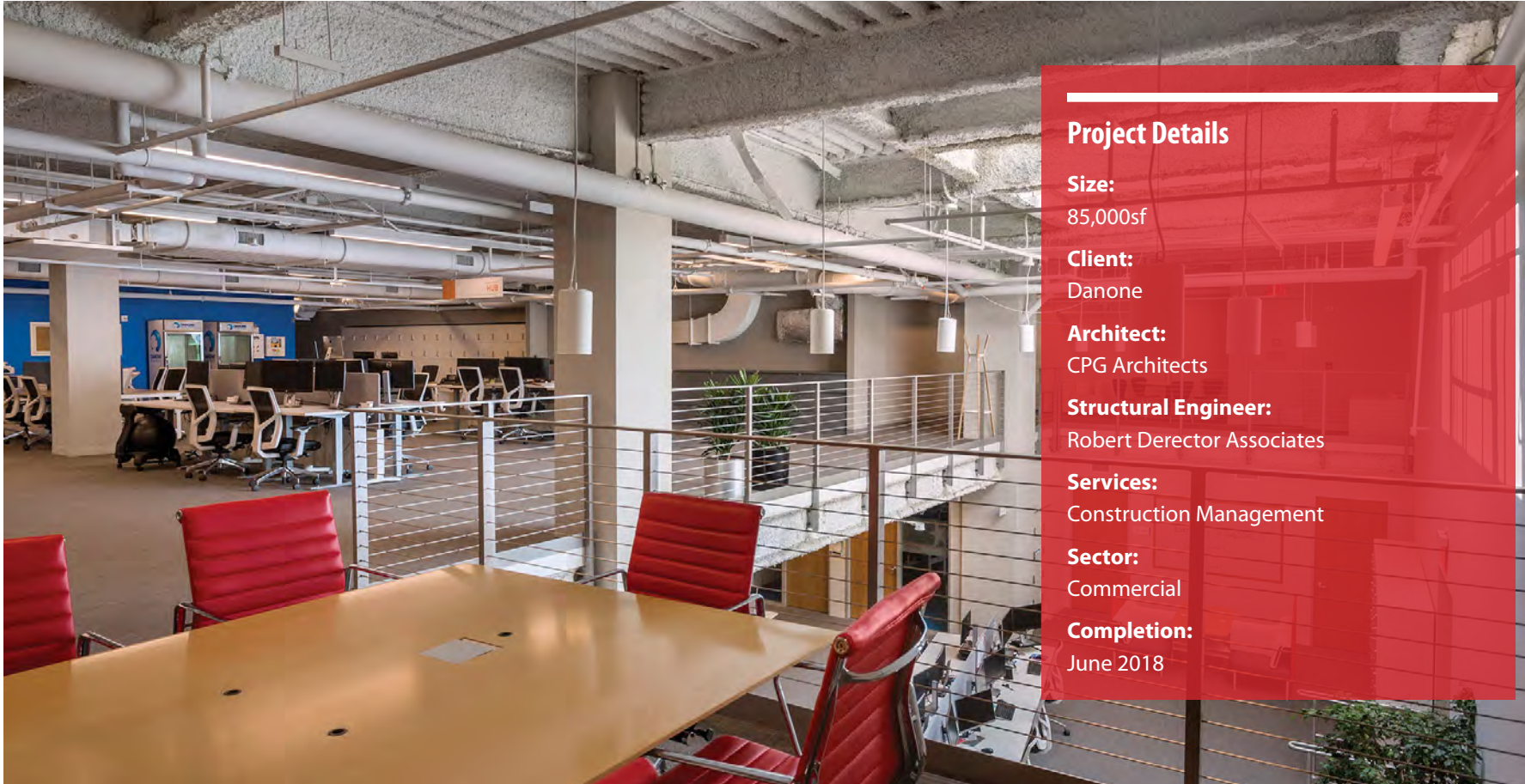
Clients love that organization and efficiency as well. Warner Media project staff can view the model themselves to see where things stand, and the team can walk through the model together, remotely or in person, if they need to quickly describe a proposed change and its effects.

“Rather than trying to describe a change, we can show them visually in the model how it may—or may not—affect the space,” says Militano. “They really see that the impacts are not as bad as they may have thought, or that they make the most sense to the overall picture. That kind of communication has made our relationship with the client even that much better.” ◀



Above ▲ 3D modeling can make sure complex infrastructure fits into the space as designed

Danone's new HQ unites its regional employees in a vibrant downtown location



Project Details

Size:
85,000sf

Client:
Danone

Architect:
CPG Architects

Structural Engineer:
Robert Derector Associates

Services:
Construction Management

Sector:
Commercial

Completion:
June 2018

Above ▲ The new offices were designed to support community, collaboration and innovation

CHANGING STYLES, CHANGING SPACES

Danone's White Plains, NY HQ

The modern workplace has evolved considerably in just the last 10 years. The shift from segmented perimeter offices and center cubicles to open-plan, collaborative spaces happened quickly—and is still happening. That physical change, of course, reflects the more philosophical shift in work styles that has come with a more globally connected workforce and changing generational preferences.

Danone, the parent company of such brands as Dannon yogurt and Evian water, embraced this collaborative way of working years ago but their physical workplaces were still catching up. When the opportunity arose to move their US headquarters, the company seized the chance to stay in White Plains, New York but create a new space that better fits their employees' needs.

The solution? Renovating the fourth floor of a downtown White Plains shopping center into a new headquarters that unites Danone's over 400 regional employees in one large, collaborative floorplan.

"Being within walking distance to restaurants, shopping and mass transit are important for our company," said Dessislava Miteva, Danone's senior vice president of human resources. "Similarly, an efficient and flexible design better matches the changing style of our workplace."

RAISED EXPECTATIONS

Transforming a former retail space into an 85,000sf workplace meant basically going back to the drawing board. But because the lower three floors were still occupied by retail businesses—grocery, sporting goods and furniture stores—the construction team couldn't simply gut the place and start over.

"It was built to be a store, not an office space, so there was a lot of new construction involved," says James Dunn, project manager for Pavarini Construction. *"But because the building is occupied nearly all the time, that took a lot of planning. The logistics were the hardest part."*

With shopping center hours and 24-hour cooling units for the grocery store, there were few to no windows for shutting down building services or working up from the lower floors. The Pavarini team had to map out every element—and communicate it clearly to the building managers and tenants—to ensure the work didn't impact their businesses.

One solution that made a huge difference was the decision to build a raised floor. "We compared the risks and benefits of getting approval from the tenant below to work through their ceiling, within their limiting time constraints, versus building a raised floor for all the floor work," says Dunn. "A raised floor turned out to be more cost efficient and easier to build and allowed us to work below the floor on our own schedule."

The raised floor also came in handy for building the office's 15,000sf addition over an existing parking garage. Parking garages are designed with a

series of pitches to avoid rain water from pooling. While that's a good thing for parking, it's a problem for construction. With a surface that varied by as much as 1.5 feet, the team coordinated elevations well ahead of construction to match the new addition floor with the raised floor of the interior. As such, the plane from the addition to the raised floor is practically seamless and accommodates the finishes the client desired, from resilient wood to large-format ceramic tiles.

ON THE GRID

Building the addition on the parking lot also posed an even trickier challenge: weight. The structural load of a parking garage floor isn't as high as that of an office floor. In other words, to build an office on the garage, the team had to significantly rein-

force the structure and get creative to avoid compromising the integrity of the structure as a whole.

First, they designed the structural steel package in smaller pieces so that lighter components could be lifted up separately and then bolted and welded the sections once in place. Next, the team used the parking garage's as-built structural drawings to assess where the strongest structural supports were located. Then they painted grid lines over the surface to show the critical paths along which the cranes could travel. With those space limitations, the steel contractor used a spider crane, whose versatility allowed them to "unfold" the crane on the grid lines, pick up the steel, swing it into place and then fold the crane back up and move it back along the grid line tracks to the next location.

"Usually you can just move your crane over to the next spot, but we couldn't do that in this case," says Dunn. "We essentially built a structurally reinforced 'roadway' for the crane and steel to move around in this delicate structural environment."

FINISH LINE

Finally, with the substantial core and shell work completed, the team focused on the interior fit-out. But another challenge remained: leaving the time and access to integrate Danone's internal IT systems as late in the game as possible. "They were reusing a lot of their systems from their existing office, like wayfinding and room scheduling," says Dunn. "Because they were still using those systems in their office, we had to organize everything so those systems could be installed as close to the move as possible."

With their beautiful new, collaborative, central workplace, Danone's employees now have the flexibility and the downtown amenities they were hoping for. And the Pavarini team has a project that tells the story of nearly their entire expertise.

"This project had core and shell, tenant fit-out, selective demo, building new elevators, building new risers, cutting out curtainwall—it really had everything," says Dunn. *"We're extremely proud of the experience and how it turned out."* ◀



Above ▲ Danone's "tasting room" uses red lighting to mask colors so tasters can focus on taste alone

Intensive precoordination helped make Axalta's Global Innovation Center a success



The ACT process helped ensure the MEP systems worked with the design



Scan here to download our new STO Insights App and see our new technology in action!

TAKING COORDINATION TO THE NEXT LEVEL: Axalta's Global Innovation Center

Nine different types of laboratories. Seven demolished buildings. Over 175,000sf of new build. A patented "regenerative thermal oxidizer" unit. And, of course, offices. These are just some of the special features of Axalta's new Global Innovation Center in Philadelphia's Navy Yard. The new center is home to the paint and coatings firm's global research, product development and technology initiatives that will, as the company puts it, "ensure Axalta sets the pace for coatings technology around the world."

From a construction perspective, such a complex effort takes careful, focused coordination and communication between the design and construction teams to make sure the many specialized features and functions will mesh with the necessary features and functions of a building and its infrastructure.

That's where the Structure Tone/LF Driscoll Advanced Coordination Team (ACT) comes in. This team of virtual construction experts calls on their MEP and field expertise to integrate the design and construction building models and resolve potential problems on the spot, rather than rounds of clash detection and redesign. ACT works with the design teams to insert specific solutions—from beam penetration sizes to pipe fittings—into the models, on the spot. As a result, subcontractors

have a fully coordinated, ready-to-build set of documents before construction even begins.

"When an owner asks to cut three months off the schedule, upfront planning and precoordination efforts come to mind immediately," says Ken Innella, LF Driscoll vice president. "Resolving coordination issues after awarding subcontracts or in the middle of the coordination process can stop you dead in your tracks. By doing precoordination fit tests, you take away one of the possible impediments in fast-track construction."

PRE-ACT: A BUILDABLE DESIGN

So, as soon as Axalta awarded the project to LF Driscoll, ACT got to work, partnering with the design team to refine the design through a coordinated model.

"We worked on the design together as we developed the construction documents," says Clayton Lyons, ACT virtual modeling manager. *"We were able to help supplement the design team's resources to make sure the design was buildable and ready for construction to begin."*

This collaborative precoordination paid off in more ways than one. As ACT and the design team worked on the model, they discovered the wall dimensions indicated in the model did not match up to the dimensions of the specified wall type. In other words, the model makes its measurements based on the dimensions of the wall type speci-

All photos these pages: Helkin Mason Photography, LLC

fied in the contract documents. When those dimensions aren't quite right, it affects the measurements throughout the model.

"What we were seeing wasn't adding up with the wall types we saw labeled there," Lyons says. "If we moved forward, rooms would have been up to 6 inches smaller and the critical casework wouldn't have fit into the design."

To solve the problem, Lyons and his team worked directly with the architects to update the model and adjust the interior accordingly. "It was an efficient, collaborative way to make this design work that definitely saved time over the usual route of clash detection, RFIs, design revisions and the like," says Lyons.

Similarly, while going through the modeling process, the ACT group detected a discrepancy in the building drains.

"We've worked on several lab buildings, and we noticed that the drains specified for this project weren't going to be code compliant," says Xinan Jiang, ACT project coordinator. *"The chemicals they would be using need a specific type of drainage and disposal system, so we helped redesign things a bit to include it."*

RE-ACT: FIELD PROBLEMS SOLVED

Once the building design models were set, LF Driscoll started in on construction, including digging trenches for some of the underground infrastructure. But as the underground modeling wrapped up, the project team realized a change in the civil engineering design was not reflected in the plumbing drawings, meaning all of the drainage and sanitary piping needed to come up an extra foot. That change, of course, meant the building design would have to shift as well.

ACT jumped in to help, working with the engineer to redesign the piping so that stormwater could exit the building under the slab at the right elevations, and with the architects to adjust the interior to accommodate the reworked configuration. "That design change could have put a complete halt to all construction," says Donal Lyons, ACT virtual modeling manager. "By working together on the spot, the team redesigned everything within four days and basically maintained the schedule."



Above ▲ The center features nine different testing labs

The ACT group remained "on call" throughout the duration of the project, too, helping LF Driscoll's subs work through any challenges by trying out solutions in a coordinated model.

"The complexities of such a unique lab building, with custom air handling systems, an entire central utility plant, custom paint spray booths, purifying exhaust equipment and other special features certainly came with some construction challenges," says Innella. "Combine those with a corporate headquarters on the other side of the wall, and it takes a special form of collaboration to ensure it all blends together. This extra team of problem-solvers helped us achieve Axalta's impressive vision." ◀





Mobile technologies are especially transforming the AEC industry

Digital Transformation: How Technology Is Changing the Industry

In the fast-paced world of construction technology, staying ahead of the curve is the only way to stay in the game. Structure Tone's vice president of information technology, **Terry Robbins**, gathered four of the sharpest minds in construction tech to share their insights at Structure Tone's annual board retreat: **Zach Aarons**, cofounder and partner at MetaProp, **Allen Emerick**, digital advisor and architect at Microsoft, **Joseph Joseph**, head of the design technology studio at Gensler and **Robert Otani**, chief technology officer at Thornton Tomasetti Inc. The discussion centered on the digitization of the AEC industry and how technology is reframing the way the industry serves its clients. Here are some highlights.

Robbins: How have you seen digital transformation improve efficiencies in industries outside of AEC?

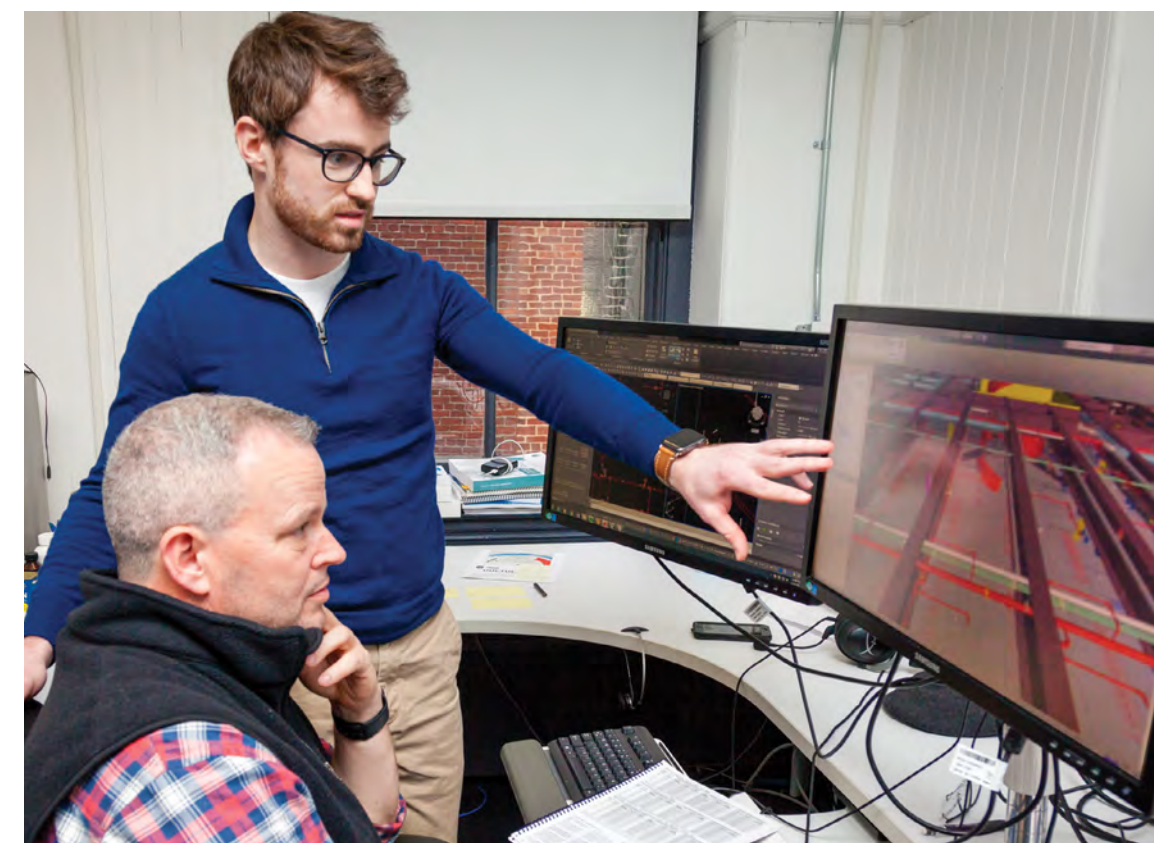
Emerick: Digital transformation is, first and foremost, about business transformation. It's not just about the technology, it's about how companies implement the technology to change the way they do business, deliver a service and provide unique value to their customers and marketplace. Those companies who are innovative with their use of technology are driving profitability much more effectively than their competition. Again, it's not about implementing technology for technology's sake. It's about leveraging technology to provide a competitive advantage and many industries are doing that very successfully.

Robbins: How do you see digital transformation impacting the AEC industry specifically in the next few years?

Aarons: With digital transformation comes cut-throat competition, including from nontraditional players who were not really competing in this space before. On the startup side, we're seeing startups being built by smart technologists in combination with construction professionals. They build tools developed by construction people for construction people. On the other hand, there are companies entering the construction technology space who are deliberately not hiring any construction people. They want people who think totally differently. That means firms in the AEC space may want to go outside of their usu-

al path, possibly investing in startups, partnering with large and small tech companies and embracing a culturally lean methodology to how you approach certain problems.

Joseph: The challenge to implementing transformative technology in our field is the means, methods and mindset in the field have not changed as quickly as in other industries. We may have access to collaborative computing, virtual computing, artificial intelligence—you name it. But we might be limited by contractual methodologies and traditional approaches to project execution.



Robbins: How is your organization using technology to transform your business?

Otani: First, we're leveraging the power of data, which includes data collection and knowledge capture. How do we harness the knowledge of our 2,000 employees so that a person sitting in China can have an answer from the smartest person in the company? Furthermore, how do we capture our seasoned employees' experience before they retire? We're also focusing on training. It only took 25 structural drawings to build the 100-story John Hancock building in Chicago. If we were to do the same set of drawings today, that number would be over 150 because of the process we have all become accustomed to. This is a human issue, which is why training is going to be a huge factor in the future of our industry.

Aarons: Part of the problem is the current way we collaborate requires multiple drafts. Once everybody starts collaborating in a rich 3D environment, you'll only have one set of drawings. This is already happening on the basic interiors level. There are tools where people collaborate in real time, and the budget changes as you change fixtures. There are similar concepts coming down the road that will be applied on a larger scale. For example, if we had to change a building from concrete to steel, the technology would automatically pull in the most up-to-date bids of steel in that particular area. This information would then flow directly into your cost assessment. This collaborative, interactive BIM environment would essentially eliminate the need for multiple drafts.

Robbins: What are some transformative technologies you think will shape the future of the AEC industry?

Emerick: We see this concept of digitally connected buildings, connected spaces and connected cities

as the direction of the future. It's not just about delivering a physical building. It's the combination of physical and digital elements, which together create a new type of asset. This means utilizing data to be smarter about the energy consumption usage and the end user's experience.

Aarons: We're excited about the possibility of 3D printed, fire-rated sheetrock. I've also seen robotic drywall laying, so maybe one day you'll just have one person overseeing the robots that are creating interior walls. It breaks the whole assembly down to a science.

Otani: This would also alleviate some of the pressure the entire industry is feeling with the labor shortage.

Robbins: Many clients are going through their own digital transformations. What kind of digital experience should they expect from their partners?

Joseph: It's easy to forget that the most important part of implementing all this revolutionary technology isn't to streamline our own internal processes, but to improve the client's experience. Today, our clients want to engage in a flexible, predictable and confident design and delivery process. They don't want to hear that the schedule is too tight. They don't want to hear that it's going to cost 15 cents per square foot instead of 12. They want to know that we have the sophistication, the agility and the mindset to limit their risk downstream. They want to be sure we're giving them the best bang for their buck, based on experiential and engaging technology. Helping our clients solve real problems and make better decisions is what the AEC's digital transformation is truly about. ◀



Above ▲
Terry Robbins, VP of information technology, STO



Above ▲
Zach Aarons, cofounder and partner, MetaProp



Above ▲
Allen Emerick, digital advisor and architect, Microsoft



Above ▲
Joseph Joseph, design technology studio head, Gensler



Above ▲
Robert Otani, CTO, Thornton Tomasetti Inc.



Back to Cover



Previous page



Next page



Table of Contents



STRUCTURE TONE PHILADELPHIA: Expanded and Enhanced

Since the birth of the nation, Philadelphia has been an anchor of US culture and economy, particularly on the East Coast. That's why, in 2006, Structure Tone officially opened an office in the City of Brotherly Love, establishing a local team for the firm's expanding client base.

And expand it did. In the last 12 years, the Philadelphia office has nearly tripled in size as the team not only managed the construction projects of existing clients, but also developed a strong portfolio of Philly-based clients, such as Five Below, Spark Therapeutics and Comcast Spectacor, owners of the Philadelphia Flyers. With so much growth and more expected, by early 2017 it was clear: they needed to expand their workspace. But the team didn't want to leave their prime Center City location and close proximity to the majority of their clients. Luckily, fate was on their side.

"We looked into several options, but it turned out our own building on Walnut Street could accommodate an expansion," says Dermid Kelly, regional vice president of Structure Tone Philadelphia. "We would be able to double the size of our space and upgrade our workplace, all while staying close to our client base. It was a win-win."

With the decision made, the Structure Tone Philadelphia team got to work with one of its frequent project partners, developing schematic designs with L2Partridge. The team's own experience

in building the offices of their clients was a key source of inspiration.

"We've built so many amazing spaces for companies large and small," says Kelly. "This was our opportunity to draw from those ideas and show off our handiwork in our own workplace."

The renovated, 6,000sf space now features a beautiful blend of high-end features and finishes that echo the past and present of the city, from sleek glass partitions, polished concrete floors and exposed ceilings to brick and wood accents. In fact, reclaimed wood adorns all corners of the space, including the reception desk, sliding barn doors and benches.

So far, employees are loving their new and improved space—and it's been a nice attraction for the many new hires the growing firm has added since the renovations began.

"I came on board just as demo started," says Brooke Richardson, operations administrator. "I can really see how working in such a wonderful space motivates everyone to do a good job and work hard." ◀

Project Details

Size:
6,000sf

Architect:
L2Partridge

Broker:
CBRE

Services:
Preconstruction,
Construction Management

Sector:
Commercial

Completion:
November 2017

Photo, top left: Michael Verzella, courtesy of Structure Tone



HARNESSING BIG DATA TO IMPROVE CONSTRUCTION

by Terry Robbins, STO vice president of information technology

It's no secret that mobile technologies and "big data" have revolutionized the way the world operates. Industries such as retail, transportation, finance and communications have entirely shifted their business models thanks to the ever-advancing information and capabilities new technologies can offer.

It's no different in the construction industry. New technologies are hitting the market almost every day, helping to make our jobs easier and our clients happier. But while we're now able to share and access information more easily and efficiently, this is only the beginning. We still face some sizeable challenges in truly harnessing the power of the information and data these systems afford us.

Structure Tone, for example, is piloting and implementing all types of new technologies to improve our processes and benefit our staff and our clients. From drones and virtual models to cloud-based collaboration tools, we are capturing more information than ever before. However, for the most part, these systems target discreet aspects of the construction process and don't necessarily "talk" to each other. In other words, there is still a major opportunity to integrate these disparate systems to leverage this wealth of data in a meaningful way.

And that's just within our own organization. This same challenge is magnified throughout the AEC industry. Architects are embracing single-point solutions for facets of the design process—as are engineers, subcontractors, vendors and so on. How do we collectively take advantage of this information, both upstream and downstream, so we work together more effectively?

Our industry has its own form of "big data," and our challenge now is to use it. Buildings have always been fundamentally "dumb." You build it, you occupy it, you maintain it and you exhaust it as the cost of upkeep continues to rise.

But if we were to build "smart" buildings—buildings that provide constant input about their own health—owners could maintain those facilities much more efficiently and effectively, significantly extending the life of their investment.

This advancement is already happening. Sensors have been in buildings for years now, but they have primarily focused on monitoring and flagging issues with individual systems, such as a security breach or an HVAC malfunction. The shift to a truly "smart" building—or even a smart city—has come with tying these individual systems into a master network that can tell us everything from how many degrees the temperature changes each day to the paths people take most to move through the building. This abundance of detailed data creates a whole new avenue of opportunity for our industry to both proactively and reactively build and manage facilities to significantly extend their lives.

The information age is beginning to make its mark on construction, and we are embracing it.

But this new age also means adjusting the skill set of our professionals. Our people must not only have the ability to use these new tools, but also understand the data they're seeing and how to act on it. That is our job, after all—to find the most effective, most efficient ways to build a space that meets the vision and needs of our client. Technology, and the abundance of data it provides, has opened the doors of possibility like never before. ◀

STSW has licensed drone pilots who capture project footage

THE VIEW FROM ABOVE: Drones for Construction

Although drones got their start in military operations, they have become engrained in almost every aspect of our culture, from package delivery to wedding photography. Drones are becoming increasingly useful for construction too, especially for large-scale, out-of-the-ground projects.

In Dublin, Ireland, the Structure Tone team has been using drones regularly for some of their large mission critical facilities, which include sites up to several hectares in size. "Drones are beneficial in particular for preliminary high-level surveys of hard-to-reach places," says Jason Monks, Structure Tone Dublin's Mission Critical project director. "We tend to use them for roof inspections to verify quantities of work completed for both upstream and downstream valuations."

Drone imagery, says Monks, has also been especially helpful in sharing progress with project owners, many of whom are not local to the project site. "Many of our data center clients are in remote or international locations and do not have the available time to make regular visits to the site to monitor progress. Drone imagery makes those updates easy."

MORE THAN JUST PICTURES

Sharing project progress is the most obvious benefit of using drone technology. As AmerisourceBergen began construction on their new, 300,000sf offices in Carrollton, Texas, they requested [regular drone imagery](#) to see how the massive complex was progressing.

"In the past, we would have taken progress photography once a week or so and shown that to our client at meetings," says Jamie Pierce, Structure Tone Southwest senior project engineer. "But with drones, we can show them the whole picture, not just fragmented pieces. It gives them a really good idea of how the project is moving along, from the site work to the tilt walls and the rest of the exterior."

But drones have become helpful above and beyond progress updates. Construction teams are now using them in a number of ways to benefit a project.

Planning. Drones can help the construction team map out project logistics, materials delivery or other elements. "If we're working on a roof we haven't worked on before, we could fly a drone up there to see where we can put down materials, where we can mark safety tie-offs and other information," says Ryan Rendon, a Structure Tone Southwest project engineer and licensed drone pilot based in Dallas.

Design. Rendon says he has also had the design team ask for drone imagery as project elements change. "For one of our projects, the architect had no roof access. They asked us to use our drone for some roof shots so they could see exactly what they were working with and how to incorporate that into their design updates."



Above ▲

Drones are ideal for capturing progress of large-scale, ground-up construction projects

Modeling. Similarly, some project team members are using drones to collect information for virtual models. "An excavator we recently worked with used the drone every day," says Bryankodee Hatcher, another of Structure Tone Southwest's licensed drone pilots and a project engineer based in Austin. "They would use the drone to laser scan the

site and enter that data into their models to see the daily changes in elevations."

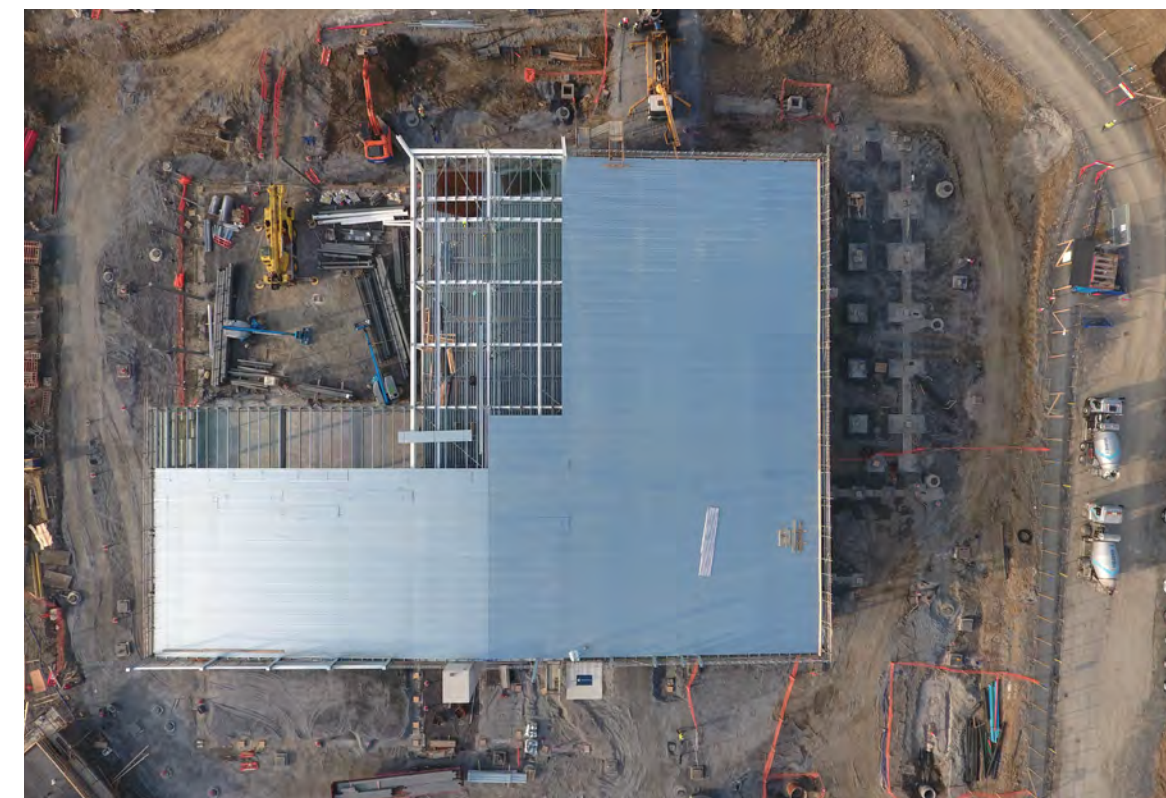
Safety. While it's not yet standard practice, Rendon says drones could be used to confirm site safety as well. "We could use a drone to make sure anyone working on a high surface is properly tied off and following our safety protocols."

Community engagement. Drone imagery has also become an incredibly handy marketing tool, particularly for community relations. "We had a TV outside of our construction trailer where we played drone video on loop," says Rendon. "It was a great way to share what was happening with the project with anyone who was interested."

Internal communications. Hatcher says his team has even used their drone internally to share information and boost team morale. "In addition to collecting project information, we've used the drone for some tasks outside of project requirements. When we had our all-hands safety stand-down, I took photos with the drone."

Clients have been quick to realize the benefits of using drones.

"More owners are going to this drone progress approach, and I think it will soon become standard for ground-up projects," says Hatcher. "From day one to turn-over, we're able to give our client and the entire project team a very good idea of how a project is progressing." ◀



Above ▲

Views from above are critical to assessing roof conditions or progress



The project enclosed a former courtyard to create what is now called the Marketplace



The workspace areas offer a variety of seating types

ADVANCED METRICS: Unilever's High-Tech, Ultra-Sustainable HQ

"Together we can change how the world does business." That's the big, bold message greeting visitors to Unilever's website. In their newly renovated US headquarters, the global consumer goods company is quite visibly working toward that goal.

"For us, it's all about sustainability, productivity, collaboration, agility and thriving in the more connected digital world that we live in today," says Ian Dunning, Unilever's North America service delivery director for workplace services.

Designed by Perkins + Will and developed by OVG Real Estate, Normandy Real Estate Partners and Mesirow Financial, the 325,000sf campus in Englewood Cliffs, New Jersey was redesigned to align with Unilever's Sustainable Living Plan, which targets cutting the company's environmental footprint in half by 2030.

"The campus was originally built in the 1960s so workplace efficiencies at that time were drastically different than today's culture and potential energy goals," says Kevin Herb, Structure Tone project

executive. "The renovations were designed to cut water use, carbon emissions and total energy use by 50 percent, all while making it a more flexible, healthy and supportive workplace for employees."

DATA-DRIVEN

The project involved renovating five existing buildings and enclosing a courtyard into a sixth, now known as the Marketplace. Many of the design's sustainable features cross into both programs, from daylighting and greenhouse gas reductions to water quality and biophilia, all of which support the project's goals of achieving LEED Platinum and WELL Silver certification.

But the most advanced addition to the campus is its bGrid system, a smart technology system that helps the buildings most effectively and efficiently use resources—including people. In this system, the first of its kind in a US workplace, all employees have an option to enable an app on their mobile device that

collects and stores data about their movements throughout the day, their temperature and lighting preferences and other factors. It then uses that data to group people and schedule meeting points to improve both building efficiency and employees' sense of connection to each other and the campus.

"You come into work in the morning and look at your phone to see what areas are available for you," says Herb. "If there aren't enough people to fill the building that day, the building systems in certain areas will be throttled back to bare essentials."

The system works through a complex series of sensors throughout the campus that measure different factors of the buildings' uses and functions throughout the day. Each sensor is connected back to an IDF closet and then to the building's data center, where computers process and analyze the data to adjust the building's use accordingly. In all, incorporating the bGrid technology involved installing over 15,000 sensors throughout the buildings.

INNOVATION IN ACTION

For such a large campus, making these upgrades across five buildings was a big job—with the added challenges of a very active, very large workplace. "There are close to 1,500 employees working on campus, who all need parking," says Anthony LiSanti, Structure Tone project manager. "So with staff moving around and the construction crews

on site, finding parking and space for our trailers and materials was like a giant game of Tetris."

The total effort took just 17 months, a monumental feat for such a large project. After seeing the final results and how Unilever's employees have responded to their new workplace, the entire team could not be more proud of the results. ◀

"What Unilever and their team have accomplished has never been done in America," Herb says. *"Being part of a cutting-edge project like this, it's exciting."*



All photos these pages: ©Garrett Rowland Photography

Above ▲ **The new, sustainable office supports Unilever's goals to reduce the company's environmental footprint**

Project Details

- Size:** 350,000sf
- Client:** Mesirow Financial, OVG/Normandy
- Architect:** Perkins + Will
- Engineer:** AMA Consulting Engineers
- Owner's Rep:** Cushman & Wakefield, The Cadence Group
- Services:** Construction Management
- Sector:** Commercial
- Completion:** November 2017

PARAMETRIC MODELING: A New Tool for Estimating

In the integrated project delivery, or IPD, approach to construction projects, collaboration is the name of the game, and efficiency is the optimal goal. In this model, the entire project team—from the owner and the design team to the general contractor and the suppliers—work together from the very beginning with their eye on achieving agreed-upon targets. One such target is the budget. Rather than estimate costs based on a design, this approach reverses it, using a “target value design” process to design the project toward a target budget right from the start.

As LF Driscoll and the PennFIRST joint venture team began work on Penn Medicine’s new 1.5Msf patient pavilion, the IPD system called for a more integrated, collaborative way of approaching the estimating process. The architects needed a practical way to understand quickly how their design choices were affecting the budget as they developed the design. Enter parametric modeling.

drawings of the massing to define the building geometry, which then controlled the costs,” says Michael Dikon, LF Driscoll’s estimating team lead for the Penn Medicine project. “Then we extracted fundamental blocks to analyze the cost data behind them as each section came into shape. As the architects played with the design, we could evaluate quantities and which scenarios were more or less expensive.”

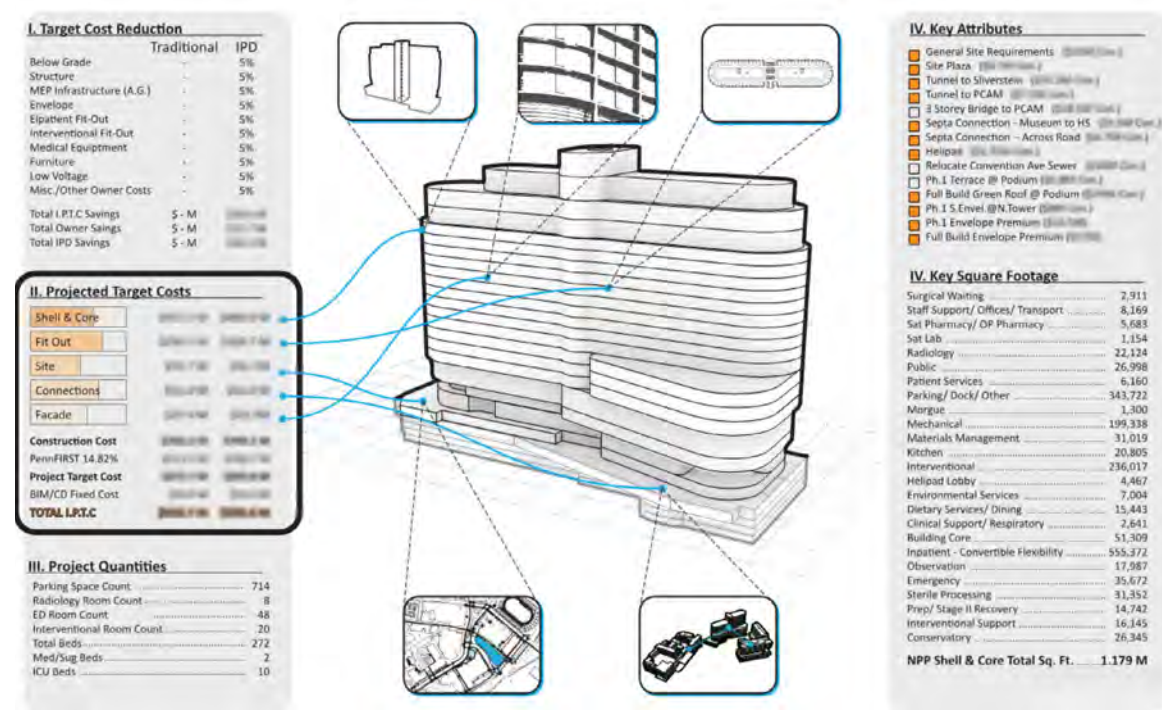
The models have been immensely helpful to the design and construction team in working seamlessly toward their shared IPD goal. But it’s also been a useful communication tool for explaining the cause and effect of certain changes to Penn Medicine.

“We wanted more of a real-time look at assessing the design drawings for cost estimates” says Matthew Guinan, LF Driscoll project director for the Penn Medicine project. *“With parametric modeling, we integrate an Excel document with the Revit model to adjust the cost data as the model changes.”*

HOW IT WORKS

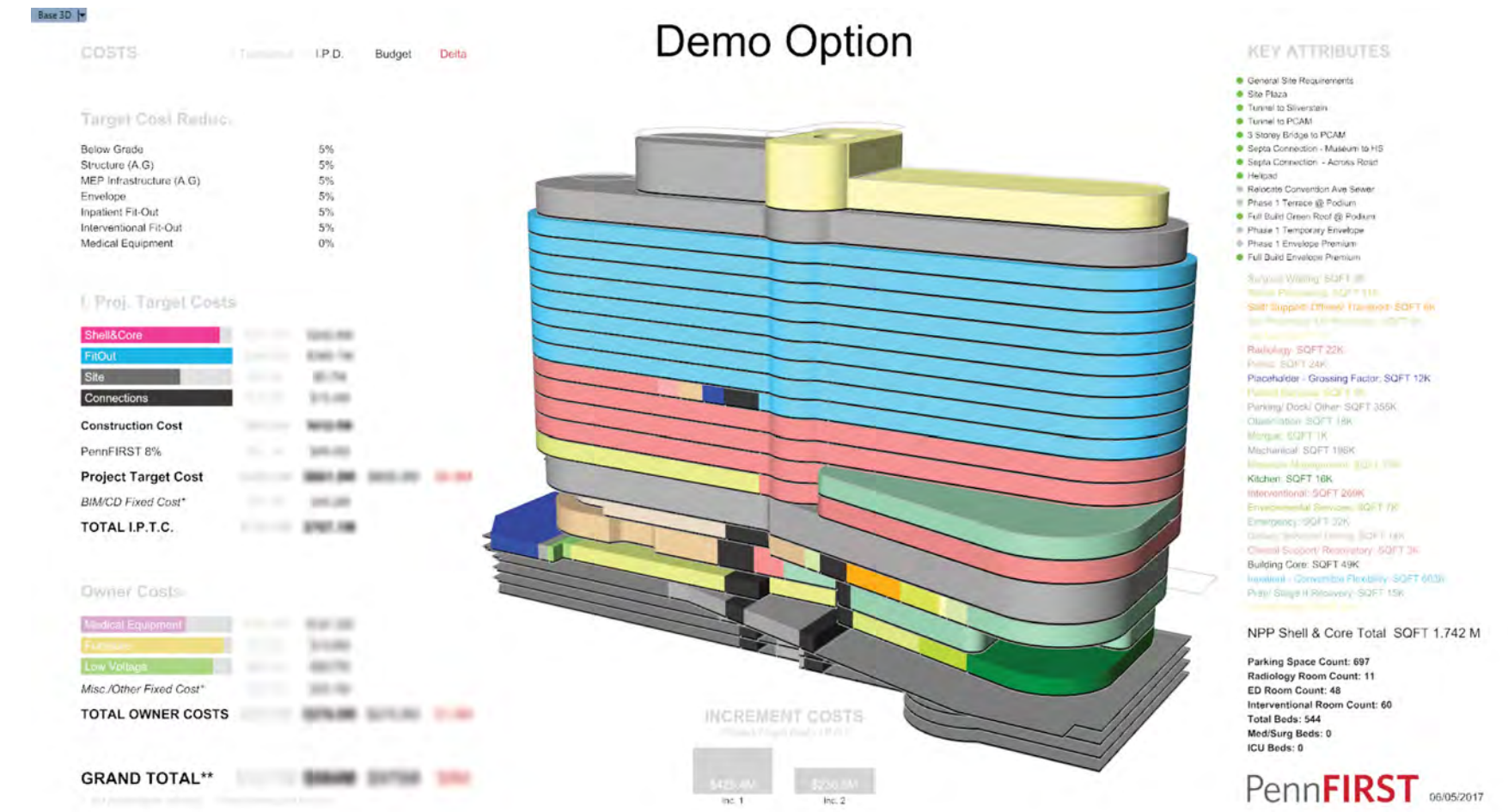
In parametric models, pre-programmed rules create relationships between elements in the model and the underlying data. In other words, the model can link geometric changes to cost metrics for the materials used in the affected design features. For example, if the shape of the building’s exterior is altered, those changes would automatically be reflected in the pricing of the façade materials. Or if the design specifies a particularly expensive type of door, the model can indicate how adding or removing other features can allow the project to keep as many of those doors as possible.

For the Penn Medicine project, that cost data was added to over time as elements of the design came together. “We created a concept estimate from 2D



Above ▲ Parametric modeling demonstrates the relationship between program attributes and costs

“It definitely makes for easier conversations with the team,” Guinan says. *“Whether it’s a request they make or a change we’re recommending, we can put it into the model and show them the resulting cost data. They can decide then and there if they want to make that change or find a different way to adjust the design.”*



Above ▲ Users can adjust various project elements to see the effect on the budget

THE RIGHT FIT

For an integrated project delivery approach where large-scale efficiency is the ultimate goal, parametric modeling makes perfect sense. But it’s not necessarily right for every project—nor does it eliminate the role of an experienced team.

“The effort you have to put into the model at the beginning takes a lot of time and probably doesn’t make sense for small projects,” says Dikon. “You have to have full-time estimating support, not only for the overall process but also to evaluate the data coming out of the model to ensure it all makes sense.”

In the case of the Penn Medicine pavilion, the combination of an IPD system, experienced team and parametric model has been a success—and the proof is in the numbers.

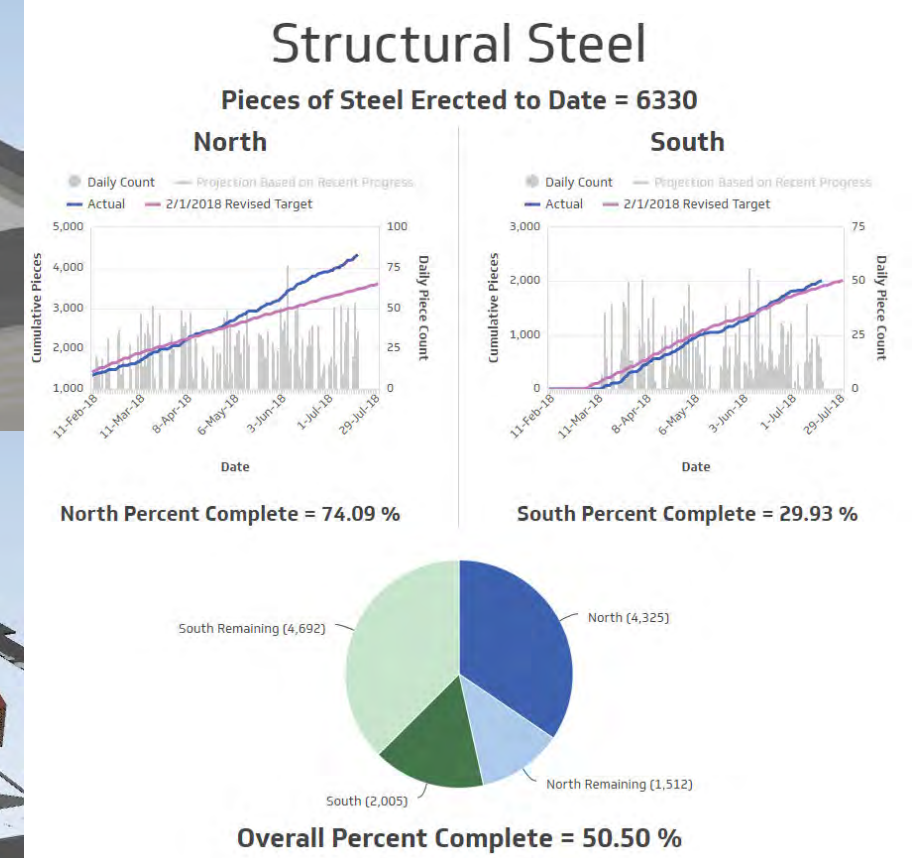
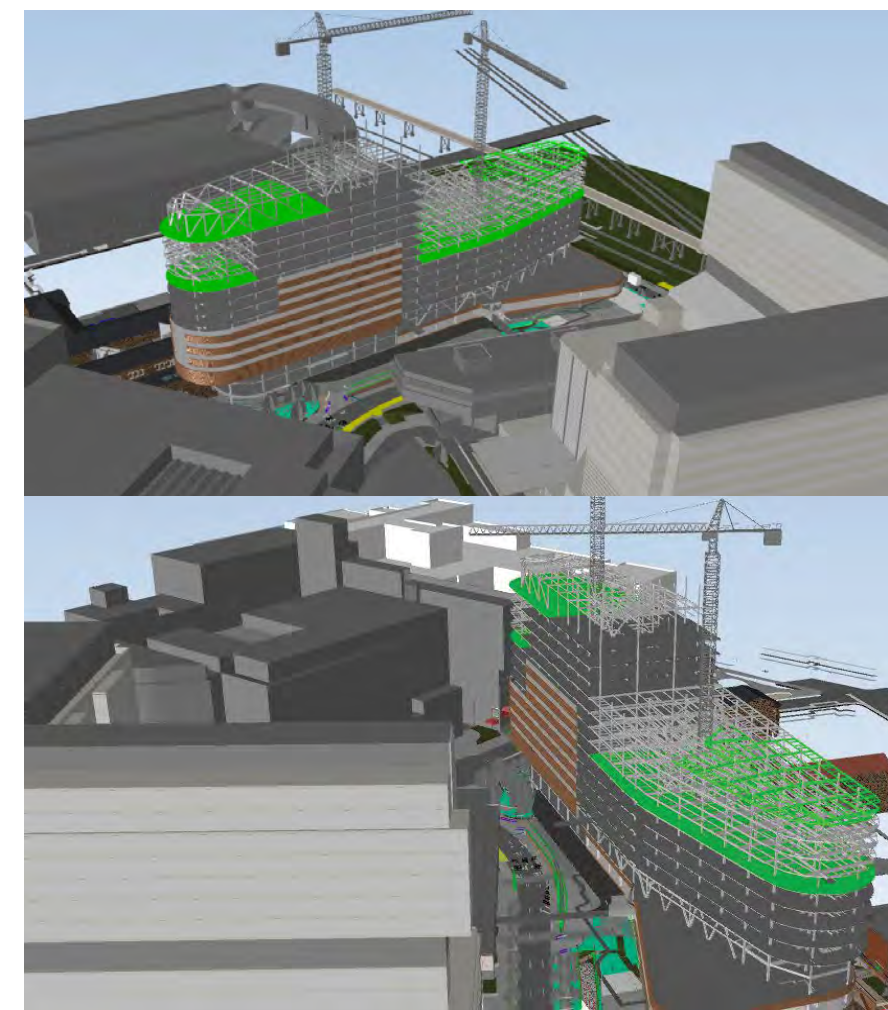
“From the original estimates of the project, we started about 10% over the owner’s budget,” says Dikon. “Through parametric modeling and the Target Value Design approach, the project has continuously been within 2% of the targets.”



Above ▲ The team can use the model to visually compare the costs of various design options

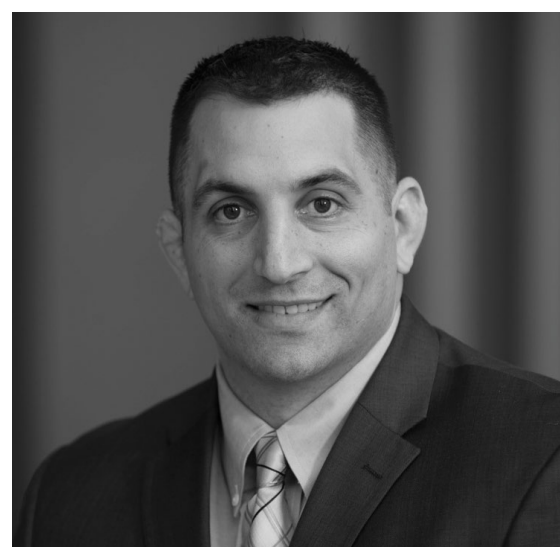


Tracking the progress of the exterior helps inform the schedule for the interior



Above ▲

Customized dashboards help track specific elements of the schedule in real time



Above ▲
Paul Gabriel, Aegis Project Controls

Scheduling in the Digital Age: Q&A with Paul Gabriel of Aegis

Technology has long played a key role for project controls and scheduling consultants like Aegis. But when the company joined the team building Penn Medicine's new pavilion project, the need to innovate and collaborate through technology became that much more important. Here Paul Gabriel, regional vice president at Aegis, shares how new technologies are improving the scheduling process and the relationships among the project team.

Q: How did you get involved in the Penn Medicine project?

A: Aegis is a project controls company supporting projects all over the country. When the PennFIRST team was awarded the project, they knew because it was so large and unique they might need a full-time scheduling resource. We have worked with Balfour Beatty on several major projects before, who introduced us to LF Driscoll.

Q: How—and why—is your approach to scheduling different for this project?

A: The scope and complexity of this project challenged us to bring something different than the traditional scheduler role. This project required

more flexibility and analysis. Traditionally, we'd sit with the superintendent and project managers, create a schedule and then distribute that schedule to the subcontractors as the way things will go. In the integrated project delivery (IPD) model being used to build the Penn Medicine pavilion, we've engaged the key subcontractors, owner and architects/engineers to develop the schedule together. We work through any challenges together, and the subcontractors feel like they're invested in the process. It definitely takes putting in more effort early on and including more people than usual, but now everyone is involved and committed to the final product.

Q: How are virtual construction technologies changing the scheduling process?

A: Gantt charts are hard to read. When we realized we could use virtual models as another tool, we thought, "We have to do this." Construction is very complex. It's very helpful for everyone on the team to see how the building is being built, what the relationships are and how all of that relates to the interior work schedule. So we created a 4D model based on the 3D Revit architectural model. We assign activities from the schedule and map them to the 3D elements. Users can run that model based on a time sequence so it shows how it's all being built. So now we have a [2-minute-long video file](#) that shows everyone what should be happening when. We show this in weekly coordination meetings and can pan around the model, stopping at various points to discuss certain key elements. You can also add in cost data to make it a 5D model, or even owner information like O&M manuals to make a 6D model to create a full lifecycle model from design through operation.

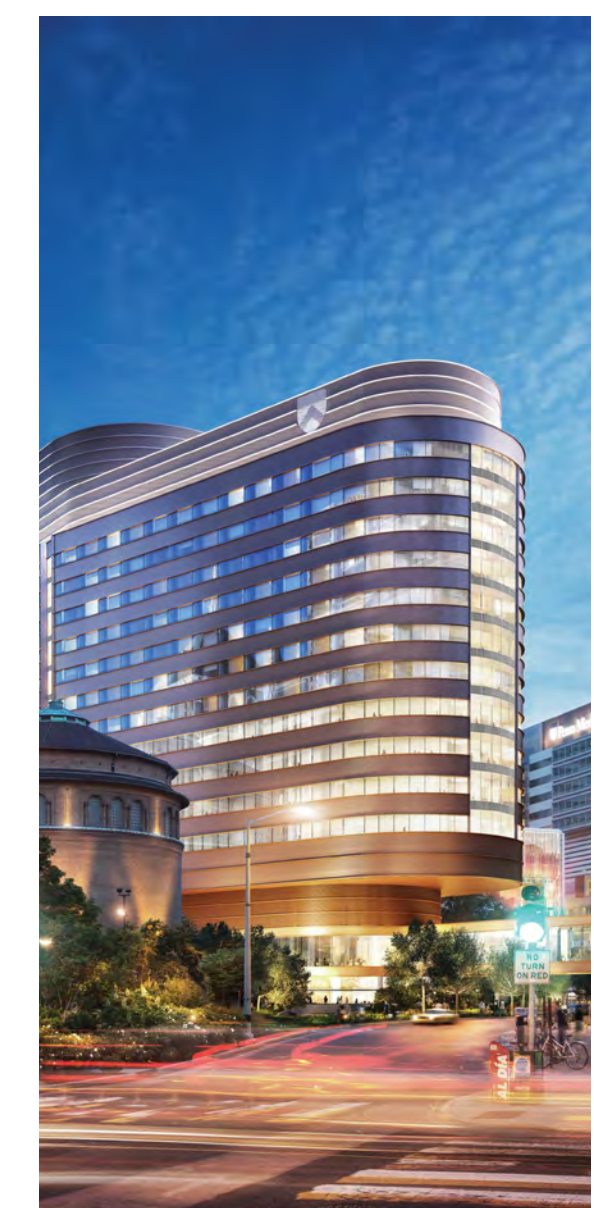
Q: In what other ways is technology driving innovation in scheduling?

A: While technology platforms are the backbone of scheduling, new technologies are helping us display and use analytics in real time to inform what we do. We're not necessarily using tools that are innovative, but we're using them in innovative ways, like creating real-time dashboards that link to Excel files and QR codes that link to resources.

For example, we have a daily tracker of steel progress and production. We created a Google spreadsheet where the field team can input the number of steel pieces per day. That data is applied to a graph and analysis, which allows us to see how we're trending on a daily basis. Sometimes those production-heavy activities can be overlooked. We're trying to use this kind of information on a daily basis to see how we can gain time even in small ways.

Q: What do you think is next for these technologies when it comes to project scheduling?

A: As more projects develop 3D models early on, it will become more standard to see scheduling models on projects. It's a really helpful tool for the team to see the logistics. As jobs become larger, more complicated and on tighter urban sites, these tools will help us all visualize the potential challenges and risks very early on. Those issues have cost implications—and anything we can do to save time and save money makes for happier relationships between the construction manager, their subs and the owner. ◀



Right ▶
Penn Medicine rendering



GIVING BACK: EcoRise

Math, science, art, technology, even fitness—you name it, and there’s a curriculum for it. But after years of working with disadvantaged youth in the US and abroad, Gina LaMotte, the founder of EcoRise, noticed a severe gap in available content for teachers on sustainability topics. Now, 10 years later, Gina heads the Austin, Texas-based nonprofit which aids teachers in over 500 schools across the nation in educating students of all ages on sustainable design and social entrepreneurship.

Unique in subject and method, EcoRise’s one-of-a-kind curriculum aims to engrain sustainable behavior in today’s youth to create lasting and meaningful change tomorrow. The program is project-based, so students are constantly encouraged to take risks and step outside their comfort zones. “Unlike in conventional classrooms, EcoRise students take an active role in their own learning,” says LaMotte. “For us, the classroom is a space where young people exercise innovative thinking, develop leadership skills and create sustainable solutions for the real issues they see in their communities.”

This project-based strategy certainly paid off for one Texas school district when a group of 7th- and 8th-grade students decided to take a closer look at their campus’ water consumption. Through careful analysis, the students discovered their school’s outdoor irrigation system was operating for too long and at inefficient times during the day. They came up with an adapted watering schedule that would save the district thousands of gallons of water—and dollars—and sent their proposal to the district’s facilities director. Floored by the students’ proposal, the director replied saying not only would he implement the students’

suggestions on their campus, but he would reevaluate the water usage at all the campuses in his district.

“There’s a level of boldness and idealism that young people have which allows them to imagine new approaches to the issues we face as a society,” LaMotte says. *“If we don’t unleash these ideas, we’ve missed a huge opportunity.”*

EcoRise provides a different experience for teachers as well. Everyone in the organization has a background in education and, therefore, truly understands what it means to work in a school system. Most educators are not sustainability experts, so providing excellent support and teacher-friendly resources is essential to the EcoRise goal.

“Comradery is one of our top organizational values,” says LaMotte. “We build that bond with our teachers to help them create the change they’ve always envisioned in their classrooms.”

Since its start in 2008, EcoRise has grown from serving one public high school in Austin to serving nearly 100,000 students to date—and they’re not slowing down anytime soon. This year, EcoRise is making their first big splash in NYC, and Structure Tone has joined them as a gold partner. This is also the first summer that teacher ambassadors will be trained in teacher support at host locations, and Structure Tone’s New York headquarters is hosting the first sessions in the city. As trained ambassadors, these teachers will be fully equipped to help teachers in their own communities and extend the organization’s reach even further.

For LaMotte and EcoRise, it’s all about placing students at the center of social and sustainable behavior change. “The opportunity to redesign every system we rely upon is a huge, creative and fun challenge. Our mission is to inspire these young people to face it head-on.”



All photos this page: ©Courtesy EcoRise

◀ Back to Cover

◀ Previous page

▶ Next page

☰ Table of Contents



Augmented, virtual and mixed reality tools have blurred the lines between the digital and physical worlds of construction, allowing for more efficient data management, more effective models and enhanced collaboration. Realizing the value of this cutting-edge technology, we’ve started experimenting with the Microsoft HoloLens to streamline one of the most time-consuming processes for construction managers: installation verification.

The current verification process involves a full 3D laser scan of the space, which is then imported into modeling software, translated to a clash-detection program and finally reviewed back in the office. This complex method produces an enormous amount of data that requires time and expertise to convert into useful information. Thankfully, altered reality tools like the HoloLens can eliminate some of these steps.

Unlike virtual reality goggles that immerse individual users in a completely digital environment, and augmented reality tools that project digital objects onto the user’s physical environment, the HoloLens is a mixed reality headset that combines these two systems. Integrating AR and VR capabilities enables the device to place holographic objects into the user’s physical surroundings which they can interact with using gesture, gaze or voice commands.

Designed to maximize efficiency, the HoloLens allows 3D models to be exported directly to the mixed reality environment, completely cutting out the data coordination steps. This seamless transfer of information is a game-changer when it comes to verification and clash detection. The project team can immediately picture the design models on a floor-by-floor basis, see where elements are supposed to be installed and verify whether the subcontractors have done so correctly—without even leaving the field.

The HoloLens also adds value to our models. Revit or Navisworks models can be imported to the headset and be used for field ver-

ification, design or editing. Armed with MR technology, the team can quickly edit digital mockups and see the impacts in a 3D space. Considering the time and labor that goes into building each of these virtual representations, extending their life and usefulness into the field is invaluable.

Plus, the HoloLens’ mobile and collaborative capabilities provide the project team with a new level of freedom. This untethered and self-computing machine allows them to visualize georeferenced models anywhere on the jobsite without being hindered by lengthy wires or spotty Wi-Fi. Furthermore, MR offers users a more social and realistic digital experience. Multiple users wearing HoloLens headsets have the ability to visualize the same digital 3D space, interact with the same holographs and discuss project mockups in a way that users wearing closed-vision VR goggles cannot.

However, these benefits are only the beginning for this transformative technology. While no one’s completely sure of what’s next for MR, one upcoming possibility is integrating hand-held laser scanners that can piece together and tie in small areas of renovations directly into the models and the 3D space. For now, LF Driscoll and the Structure Tone organization are focusing on getting our clients involved with altered reality. We’re looking forward to implementing holographic, tabletop projection models into our presentations to provide clients with a comprehensive representation of our plan to help them build their dream space while ensuring these technologies can be used safely in the field.



Visit Us: [structuretone.com](https://www.structuretone.com)

Follow Us:     


Back to
Cover


Table of
Contents