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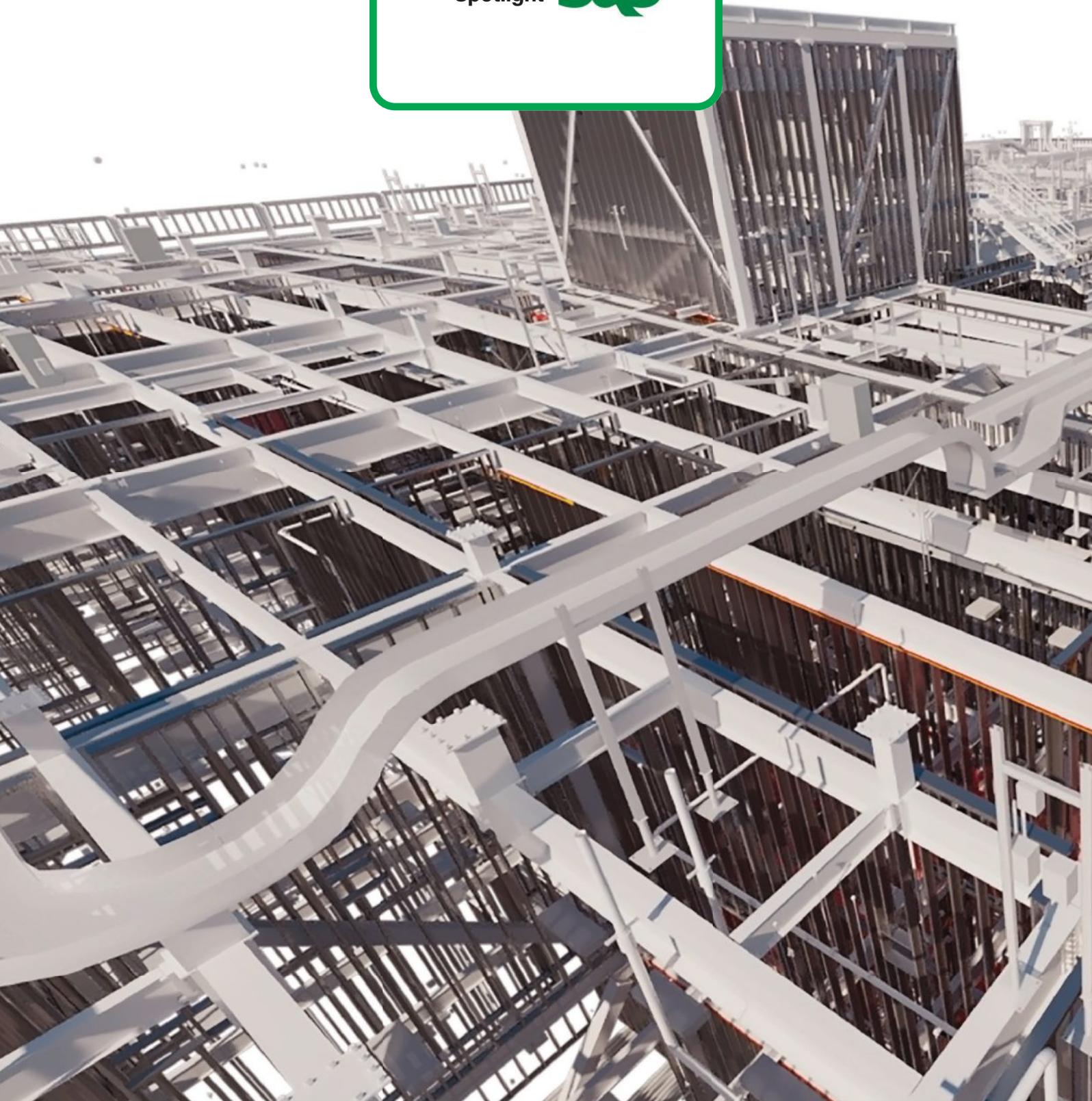
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GOES WAY
BEYOND
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KHS&S Contractors:

Looking Forward Is in the Company's DNA

Going Beyond BIM, KHS&S Uses Computational Design, Parametric Data and Digital Fabrication to Meet Precise Specs

By Don Procter



In

an era when the once-unimaginable building project is now buildable—a time when architects employ sophisticated software to create ever-complex building shapes and forms—the building community faces the challenge of matching designers at their game.

One company that is embracing the challenge is KHS&S Contractors, a California-based design-assist wall and ceiling contractor. The constructability hurdles the company sees with complicated designs has been the impetus for it to turn to computational design tools and digital fabrication. Simply put, the contractor breaks down complex designs into 3D models and uses the resulting data to provide precise specifications for the fabrication of each piece or element that goes into a project.

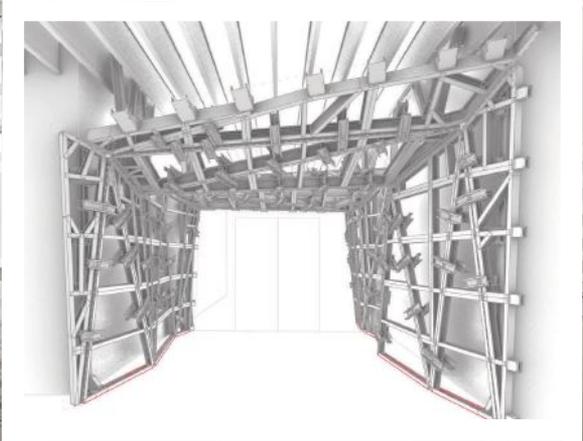
Computational design (CD) automates processes to produce the strict tolerances required for precision fabrication. CD software can even design the most complicated geometric shapes to meet exacting specifications.

“It’s when you let the design or an aspect of the design be computed for you by using the parametric data for the best outcome,” explains Ronan Frias, director of construction design, the research and development arm of KHS&S.

It allows precision fabrication and labeling before each piece is sent to a job site for easy installation,



The KHS&S Fabrication Facility in Riverside, Calif., enables efficient preconstruction assembly and effective installation once moved on site.



PANEL MAX

he points out, adding that CD and digital fabrication are more than just a tool for KHS&S. “It’s an approach to construction, adding value in all areas of the process,” he says.

Benefits of Technology

Architects have made use of the technology for several years, but it is relatively new in the construction field. “As we see more difficult designs and the use of other software, the only way to tackle the constructability solutions ... is to be able to utilize computational design tools ourselves,” Frias says.

Frias points out the value-added benefits of CD include accurate project estimating, concise materials engi-

He points out that now KHS&S can build complex and detailed information drawing sets that are easy to follow because “you can demonstrate every single condition easily,” thereby avoiding manual labor.

By comparison, a conventional approach to design is more apt to see quality control issues, increased material waste and excess labor because the project is digitally built piece-by-piece to generate drawings for manufacturing and construction.

Building Those “Wild Ideas”

Because the technology eliminates repetitive tasks and accomplishes multiple functions quickly and accurately, it supports KHS&S’s commitment



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neering, a direct connection to finite engineering analysis, cost savings and automated responses to design change orders.

Ultimately, CD eliminates re-work, helping to ensure scheduling is on time.

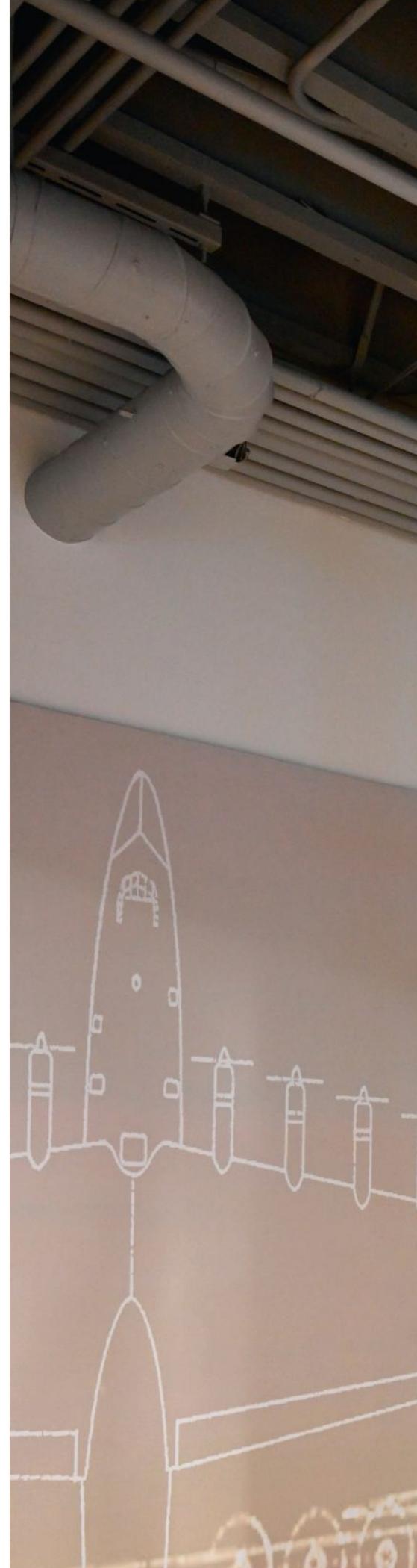
“If each piece is unique, its fabrication needs to be unique,” explains Rob Walter, senior vice president of KHS&S. “To speed up tooling and manufacturing, you have to leverage the computational design to digital fabrication components. You are taking a lot of man-hours out of the field.”

The benefits don’t stop there, Walter says, noting CD also offers re-usability of workflows between projects.

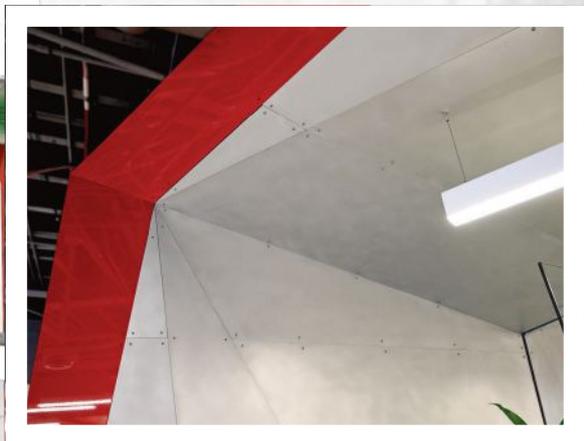
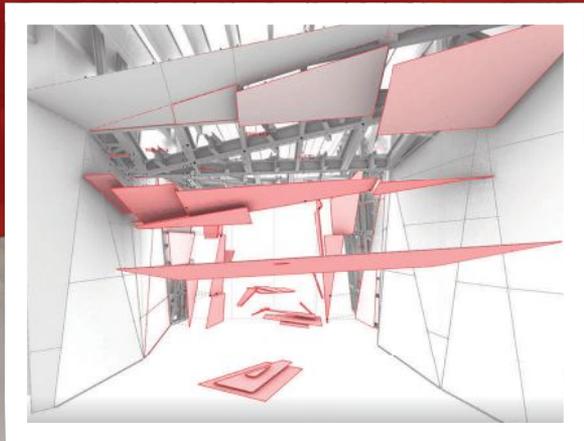
to Lean practices, adds Walter. A leader in Lean manufacturing, KHS&S uses steel roll-forming technology to complete digital fabrication. It shifts framing from the field to a controlled manufacturing facility where quality and precision can be guaranteed.

Frias says iconic projects can be a draw for field crews because of the creative outlet, but computational design and digital fabrication can make them more efficient in the field even on the more mundane projects.

Adds Walter, while CD technology is being used by KHS&S to meet innovative design requirements on segments of at least 40 projects in states like California and Utah (and also at casinos in Las Vegas), the



Recently completed computational design and digital fabrication project, The Portal located in Playa Vista, Calif.



contractor is applying the same toolsets to traditional wall and ceiling work “to push the boundaries of prefabrication and to expand the constraints that we are willing to tackle.”

“There’s a lot of buy-in from the field looking for those types of efficiencies with digital fabrication or computational design,” points out Frias.

Even on a number of the more conventional designs, architects will include signature features that require “solid-base modelling and free-form shapes,” says Walter. “This work is really affecting a majority of our revenue.”

And there is good reason for the shift to grow in the architectural community. Using a cost-effective, precise automated system allows architects to build their “wildest ideas,” he says, citing architect Frank Gehry

as one of the pioneers who pushed the architectural envelope to extremes with sweeping curves and sculptural forms.

An Example

One of KHS&S’s more unusual projects has been the design and construction of “complex geometry” for the creation of a portal for a medical office space in Playa Vista in the Silicon Beach area

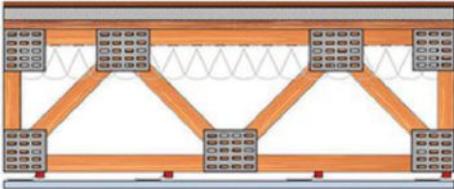
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of Los Angeles. “The trick was how to achieve complex geometry simply and do it efficiently,” Walter says of the project completed last year.

KHS&S took a digital model and developed it to produce the design concept through The SLAM Collaborative, an architecture firm offering integrated construction services, landscape architecture, structural engineering and interior design. ▶





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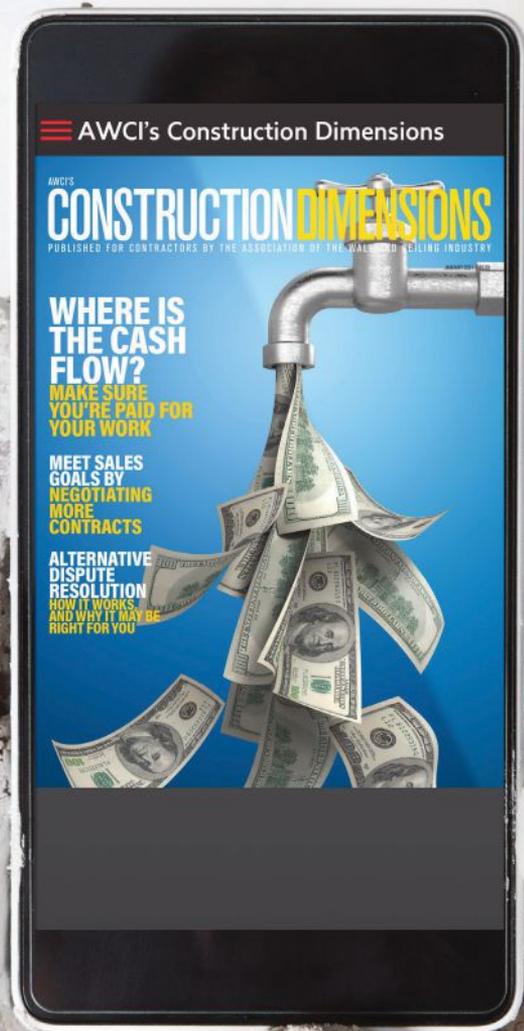
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Leveraging prefabrication technology such as steel roll-forming to improve project schedules, costs and quality

KHS&S, alongside a firm called STUDIO, created a custom algorithm for the fabrication process of the structure, comprised of aluminum panels and steel studs. They employed an automated system that was then applied to the architect's model.

Mock-ups and prototypes were verified—even taking into account a 1/8-inch radius in the steel stud section—before the model of the portal's segments were fabricated and then pre-assembled at KHS&S's warehouse, Walter says. The complex portal was disassembled in large segments prior to reassembly on site.

The project was completed on time

and within budget—a significant achievement in part because the portal started well after the building was underway.

Walter says by providing its own design assist to tackle the portal's complex geometry, KHS&S eliminated the need for secondary structural components that are typically employed on projects like it.

It's not the first time, nor does KHS&S expect it will be the last time it is called in late in the game. "We regularly get design teams who are eager to find a partner to make something that could have been cost prohibitive or is facing a time constraint now," Walter says.

While the contractor creates complex models at its fabrication facility in Southern California, it also will outsource jobs it is not tooled up to do in-house.

There is sometimes a risk and always a cost to innovation, but Frias points out that innovation is engrained in the employer's culture "if a culture of innovation equates to landing a job that pays for itself."

Aside from production benefits, prefabrication improves health and safety standards for workers not just because it is done in a controlled working environment but also because it minimizes crew size on a job site.



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No Limits on Design

Walter says KHS&S was forward-thinking two decades ago when it started using CAD software for 2D elements for work such as metal cutting and stenciling for murals. In 2008 it came out with Rockwork Panelization System, a cost-saving system that reduced construction labor by leveraging digital scanning, proprietary software and custom fabrication equipment. ▶

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It was the beginning of the integration of data that broke down the 3D models into sections to create individual building panels. “The industry was starting to evolve and we were using a whole host of different toolsets, and now we’re seeing a far better integration of design and manufacturing tools,” the senior vice president points out.

Frias sees plenty of room for future project opportunities as technology grows and designers expand their toolset partnerships with progressive partners.

“There is no limit to what can be designed,” Walter adds, noting that KHS&S has to remain open to new tools/technology and be willing to take some risks to tackle the challenges.

He ponders what role robotics could play in the industry, even for the installation of drywall. “We have seen the advent of mobile devices and Cloud systems providing more data in the field. How will that be even more accessible and relevant to the craft laborer—the eyes and the ears of what is really happening out there and what is needed to achieve these designs?”

Driven by its construction design model, the contractor is taking a serious stab at robotic layouts for walls and ceilings. While it is no stranger to the field—having conducted trial applications as far back as a decade—a recent test trial on two floors of a Northern California project has taken it forward, opening the door for more applications throughout the state and further afield, Frias says.

Other contractors have stepped into this arena as well, but KHS&S was looking at a possible partnership with a robotics company at press time that could put it in the lead, or near to it.

Frias says having tools at his fingertips to investigate rapid technological growth in the wall and ceiling industry in 2021 “is a great place to be. Our core purpose to do everything better is in alignment with how technology is moving.”

Walters believes KHS&S “can help



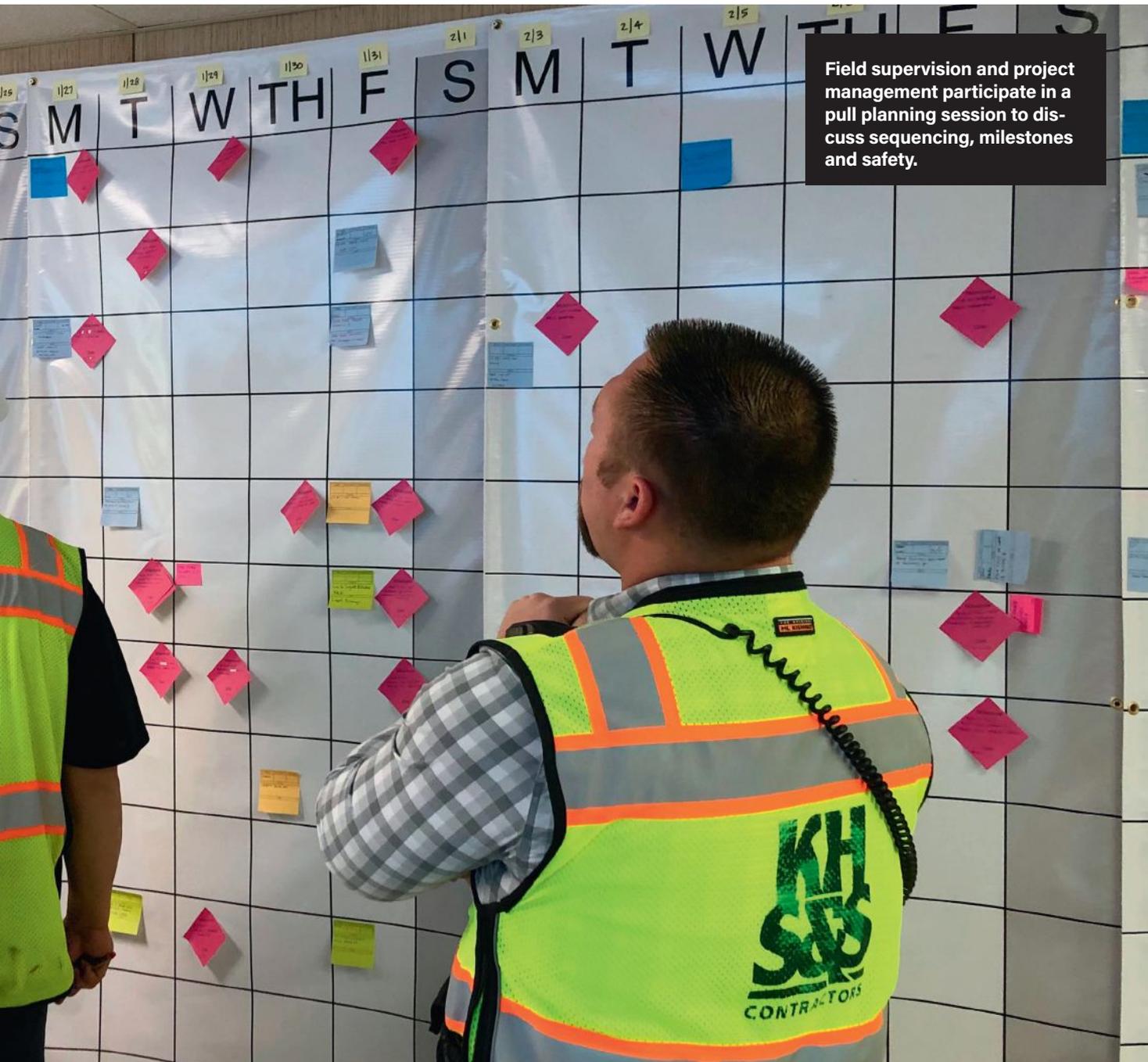
change the arc of development and leave a mark in the industry” on a number of levels. “I feel like we are at a fabulous time.”

A Growing Client List

Walter says it is in the company’s DNA to look forward—to defy the limits of conventional approaches to building. “We’ve always been drawn to things that are outside of the box and quite often they end up being iconic projects that push the edge of

what designers are trying to do,” he says. “Our mindset is one of wanting to differentiate ourselves (from other contractors).”

KHS&S has established a reputation among progressive architects, general contractors and owners for being computational design savvy. Universal Studios, Disney, Apple and a number of major Las Vegas casino owners are among its clients, he points out. The company has also partnered with well-known architects such as the



Field supervision and project management participate in a pull planning session to discuss sequencing, milestones and safety.

Cunningham Group, WATG, Atkins, and it is a familiar name to such major builders as PCL, AECOM, Skanska, Holder and Swinerton.

The company's growth in the emerging field is seeded in its construction design division where 13 employees work toward a common goal to improve pre-construction and construction design details and components through R&D. The group brings various disciplines to the table, including architecture, engineering

and mechanical.

Frias stresses that to create workable designs the contractor is committed to "constructability input" from experienced field personnel as well. "There's great collaboration not just between the architects, designers and structural but also with our field personnel," he says. "The project foreman or super building a job is in preconstruction with us to help us on how they would build things."

Ultimately, Frias says it results in

accurate estimating and materials being prefabricated precisely, which leads to improved quality control. ●

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Don Procter is a freelance writer in Ontario, Canada.

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Naomi Martin, marketing and communications manager for KHS&S Contractors, Anaheim, Calif., contributed to this article.