

SMART SOLUTIONS

SUMMER 2018

Helping contractors save money and enhance productivity



Thanks to the flexibility of the Victaulic products and the convenience of Milwaukee cordless tools, the Shinn Mechanical team was so efficient at joining pipe that they outpaced the team laying the precast road panels.

Shinn Mechanical Couples Milwaukee Tool and Victaulic to Go Extra Mile on Seattle Tunnel Project

Under pressure to make up for lost time on a huge tunneling project, **Shinn Mechanical Inc.** used cordless **Milwaukee** tools to install **Victaulic** grooved couplings on an innovative piping design, shaving months off the original schedule. “Pairing Victaulic couplings with Milwaukee tools allowed us to finish a job scheduled to take eight months in only 10 weeks,” said Mike Shinn, company founder.

Setbacks Squeeze Schedule

Seattle’s SR 99 tunnel project is a 2.5-mile, four-lane, automobile tunnel. Part of the Alaskan Way Viaduct Replacement Program, it will replace the original viaduct, built in the 1950s, with an underground tollway that bypasses downtown Seattle, clearing the way for new public space on the city’s waterfront.

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Couts Cures Concrete with Uponor Thermal Cooling

Novel Use Keeps Integrity of World’s Largest Concrete Pour

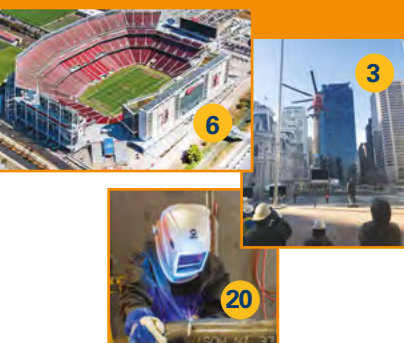
For a record-setting continuous concrete pour, **Couts Heating and Cooling, Inc.** installed more than 20 miles of **Uponor** radiant tubing



Couts installed Uponor radiant tubing for the concrete foundation of the Wilshire Grand Center in Los Angeles, CA, the tallest U.S. building west of the Mississippi. The lightweight PEX tubing was resilient and easy to install.

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SMART SOLUTIONS

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and enhance productivity

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MCAA

Adding Value to Your Supply Chain



Better Together

This issue of *Smart Solutions* demonstrates the benefits of a good partner. For example, Shinn Mechanical Inc. shaved months off a timeline by using cordless products from MILWAUKEE TOOL to install Victaulic grooved couplings on an innovative piping design. Close coordination with Jay R. Smith Mfg. Co. allowed Pan-Pacific/Murray Company to deliver plumbing solutions for a new NFL stadium. Herman Goldner Co., Inc. turned to SPX Cooling Technologies for a new cooling tower system, then brought in Erickson Incorporated to conquer the formidable challenge of installing it in a busy, urban site. MacDonald-Miller Facility Solutions worked with KEY2ACT and XO Technologies to create KEY2ACT's See software, powered by XO—video technology that helped land a huge national contract. Brandt has used Viega products almost exclusively for more than a decade, citing their reliability and ease of use.

Sustainable Solutions

Meeting clients' energy efficiency and sustainability goals remains a priority. Since Muir-Chase Plumbing installed Zurn Retrofit Pint urinal systems throughout the Caltech campus, the university is saving water and money each year. ACCO Engineered Systems used Daikin Self-Contained air conditioning units to help Levi's Stadium become the first NFL stadium to achieve LEED® Gold certification. For a record-setting continuous concrete pour, Coutts Heating and Cooling, Inc. laid down Uponor radiant tubing to create a thermal cooling system to ensure integrity during curing for a project that also used a slew of green construction—and deconstruction—techniques to save millions.

Tech = Time, Money Saved

Member contractors continue to cut costs and increase productivity with digital solutions. Wm. T. Spaeder Company saved weeks of layout time using DEWALT HangerWorks™ software. JEC Service Co. credits MobiliForms from iBusiness Technologies with saving the company at least \$500,000 a year by slashing time spent on paperwork. With a Trimble® TX6 Scanner and RealWorks® Office software, Arden Engineering Constructors mapped an entire office campus in just four hours, saving days of labor while creating an accurate digital as-built model.

Using KEY2ACT's Connect technology to gather building data during a year-long retrofit project, Brandt found and fixed glitches in the products it was installing—without going over schedule. With Viewpoint software, Western Allied Mechanical, Inc. cut RFI response time from days to minutes.

Expert Advice

In this issue, get expert advice on how to avoid rework with better collaboration and more efficient processes (PlanGrid), use newer welding approaches and technologies to improve quality and save time (Miller Electric), and select and set up sit/stand workstations to increase worker comfort and productivity (CNA). Through MCAA, supplier partners and member contractors are teaming up to be better together.

Joseph Pikus, Chair

Herman Goldner Keeps Costs Low and Efficiency High with SPX Cooling Tower

When the Centre Square commercial office complex needed a new cooling tower system, HVAC contractor **Herman Goldner Co., Inc.** turned to **SPX Cooling Technologies** to address the building needs, then brought in **Erickson Incorporated** to conquer the formidable challenge of installing the system in a busy, urban site. Located in the heart of Philadelphia at 1500 Market Street, the Centre Square buildings, at 417' and 490', were too tall for the use of a traditional crane, and the extended road closures and weights associated with a tower crane were prohibitive. The existing Marley field-erected cooling tower

was decommissioned and demolished in December 2017, and the project schedule required the new system to be online for the start of cooling season; therefore, knock down delivery and assembly was also eliminated as an option due to sheer material volume and potential weather delays.

Crossflow vs. Counterflow

The original 6,000-ton capacity tower was constructed from wood and field-built in place before the building was completed in 1973. Still in use until its demolition, the tower had reliably serviced the building's cooling system for 44 years.

original 1973 cooling tower, the new tower saved costs by reducing capital equipment expenditures and field installation labor. Additionally, the final design provides the building with built-in redundancy and extra capacity for future expansion. The decision to select a crossflow-style tower as opposed to a counterflow tower was primarily driven by reduced winter cooling loads, requiring variable flow conditions across the towers.

Limited Installation Options

Faced with the high-traffic location and aggressive schedule, a helicopter pick, although challenging, was the best solution to set the eight modules of the four-cell Marley NC cooling tower. Erickson was selected to safely pick and set the cooling tower. The demolition and installation processes required extensive strategic planning.

First, the prior system had to be demolished and removed from the building, while providing continued cooling service to tenant spaces. This step posed its own set of challenges. The existing field-erected tower's 100' x 30' x 30' wooden structure, along with piping and components such as fans and motors, had to be efficiently dismantled and brought down a freight elevator for disposal. At the same time, a temporary bypass cooling system had to be devised to provide limited cooling while the final tower cell was demolished.

Next, the logistics of delivery, including weights and timing of a helicopter lift, had to be coordinated. "Fortunately, the days selected were bright and sunny, and the lifts went off without a hitch," said Bob McCracken, Herman Goldner senior account executive. In the case of this particular installation, the



Through careful planning and coordination, Herman Goldner ensured that eight new Marley NC cooling towers were successfully placed in a downtown Philadelphia office building on schedule and in time for occupants to keep cool as temperatures rose outside.

After first considering a counterflow-style cooling tower, the Marley® NC® crossflow cooling tower was selected for its high quality of construction, robust ability to service variable flow conditions, flexible mounting options, competitive pricing, and strong technical support. The engineering team determined that the buildings required only four cooling tower cells at 1,250 tons each under full load conditions. With 5,000 tons of cooling capacity, compared with the 6,000 of the

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Spaeder Saves Weeks on Layout with DEWALT HangerWorks

To meet an engineer’s demanding criteria for embedding hanger assemblies into concrete slabs for a new seven-story building, **Wm. T. Spaeder Company** used **DEWALT HangerWorks™** software, not only achieving the difficult task but saving weeks of layout time as well. HangerWorks also improved the prefabrication process by enhancing labeling and reporting in Spaeder’s building information modeling (BIM) program.

Jonathan Marsh, chief technology officer and division manager of virtual design and construction at Spaeder, based in Erie, PA, was so pleased with the outcome, he posted

his thoughts on LinkedIn. “The craziest hanger load on slab validation we have ever done,” wrote Marsh. “A big thank you to DEWALT HangerWorks for saving us weeks!”

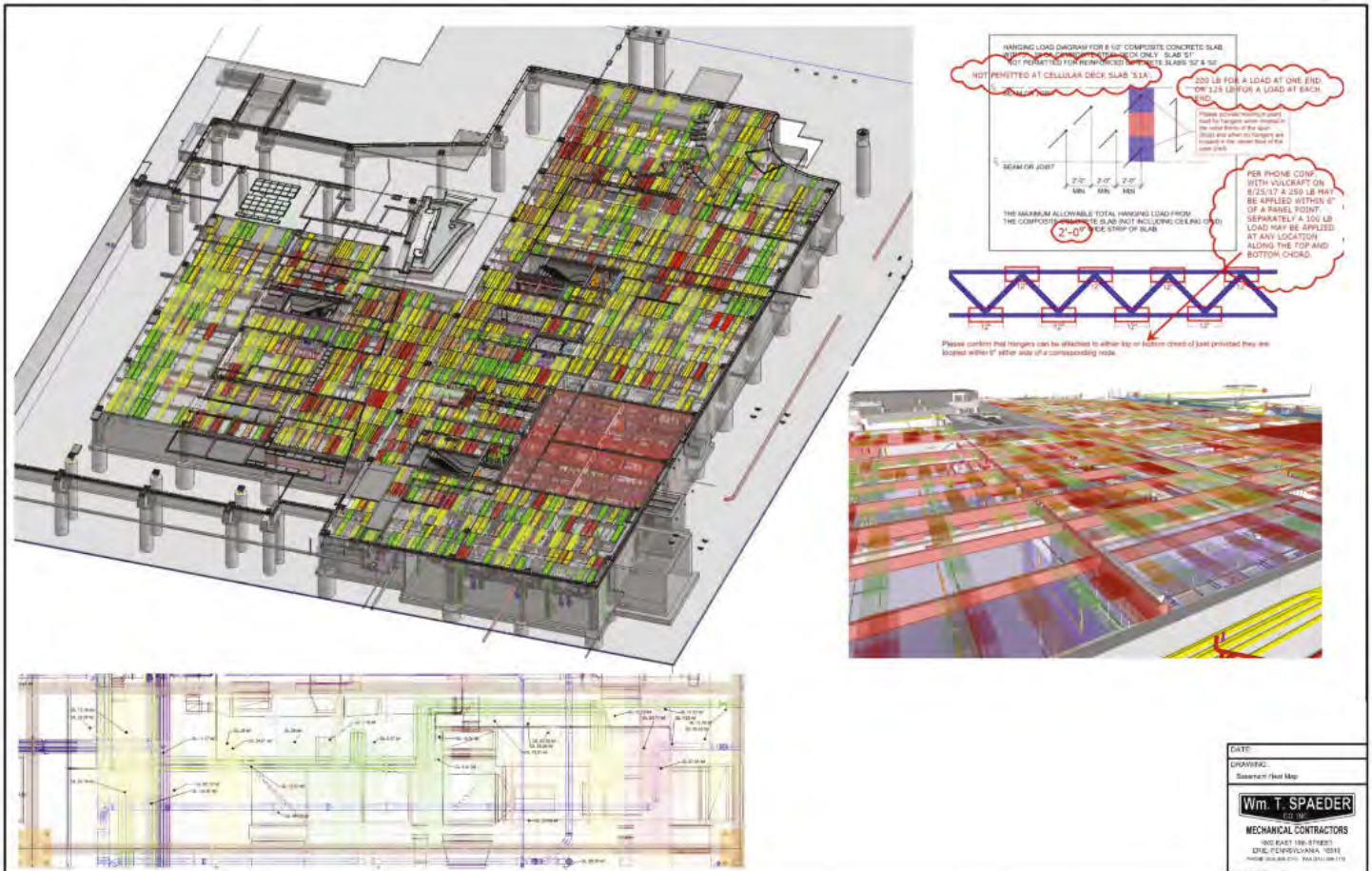
Extra Caution, Extra Headaches

Because of an experience with structural failure caused by overloaded slabs, the engineer for this project was determined to be particularly cautious about the loads added to the slabs as the mechanical and electrical systems were coordinated for the building. At first, the engineer wanted to avoid any attachments to the slab. After discussion with the construction management team, the engineer gave Spaeder an alternative. They would

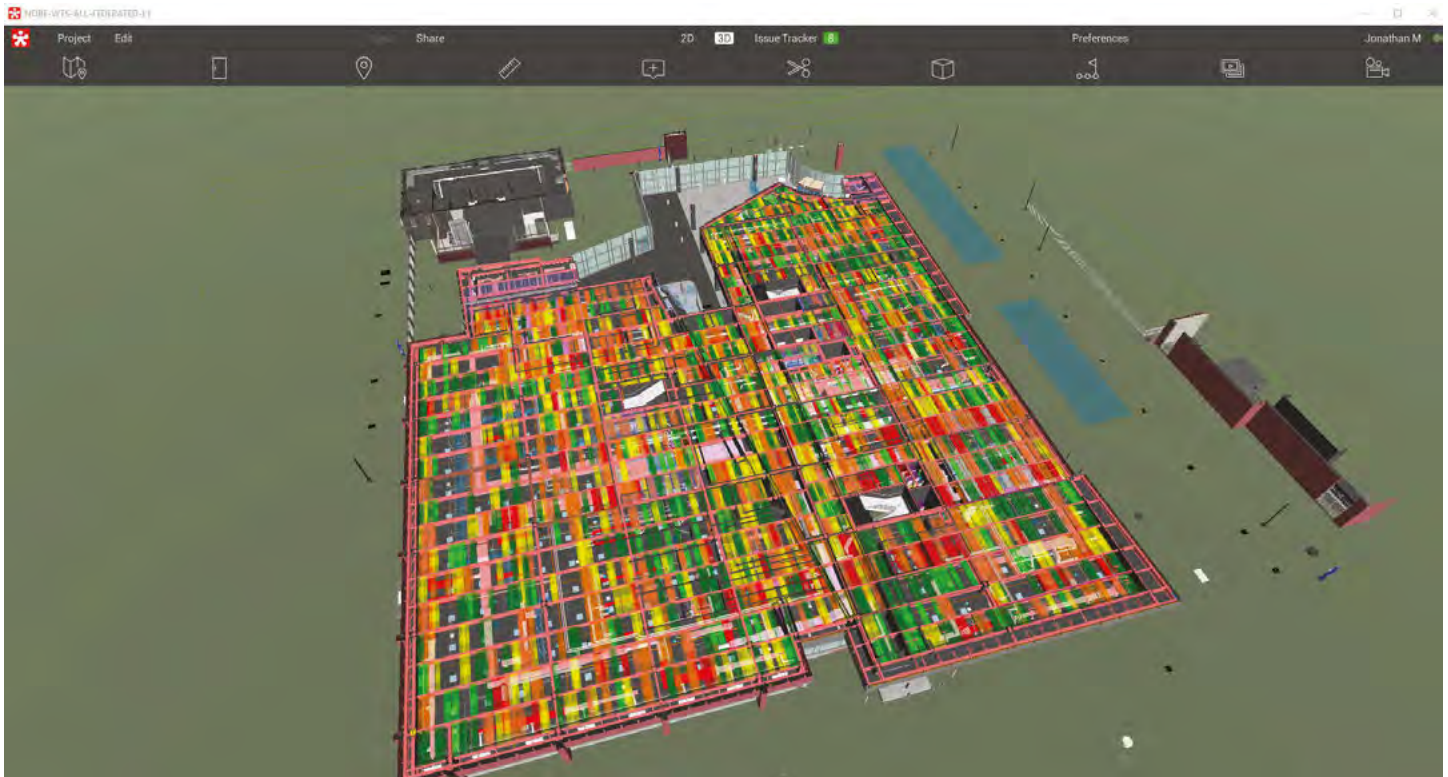
be permitted to hang from the slab as long as they used concrete embeds prior to the pour and could demonstrate to the engineer’s satisfaction that they had met specific criteria.

The engineering criteria were not as simple as circles or squares surrounding each embed location. The criteria represented accumulative loads for a section of concrete 2’ wide and extending from one beam to another at every hanger location. The engineer gave Spaeder maximum weights for areas of overlap and even specific criteria based on distance from beams.

These demands could have posed a giant engineering nightmare, because



Spaeder modified the heat map using HangerWorks, attached it to the various hanger rods throughout their model, then gathered load data to demonstrate to the engineer that all the criteria had been met.



The heat map feature in DEWALT's HangerWorks, shown here, was perfect for communicating the areas of impact to the slab loads resulting from the coordination process, ultimately saving Spaeder weeks of time in hanger layout.

the building needed approximately 25,000 hangers embedded in the slab. In fact, the criteria were so complex they required three pages of explanation. The challenge was presented to three separate subcontracting companies, who also needed to find a way to come together and work out the best available slab loads to accommodate all the building systems. Finally, all of this coordination, design, and planning had to happen fast. Construction of the building had begun, and anything in the slab had to have an embed installed prior to pouring concrete.

Handled with HangerWorks

DEWALT's HangerWorks software is a plug-in for Autodesk Revit™ that automates the placement and design of hangers and seismic bracing for mechanical, electrical, and plumbing (MEP) systems. Complex engineering calculations are built in to the tool that enable it to size hanger

assemblies based on the weights of the MEP system, including contents (e.g., water, wire, or air), and determine hanger locations based on building code requirements and user-defined project standards. With HangerWorks, Spaeder tackled two critical problems.

First, HangerWorks allowed Spaeder to make basic point load calculations for loads that were not static. Given the involvement of multiple subcontractors, the team needed to balance all of the systems' weights to avoid overloading any areas of the slab. With real-time reporting of loads, Spaeder could easily and quickly relocate hangers to redistribute loads to areas of the slab with available capacity.

Second, HangerWorks succeeded in communicating the slab loads graphically in a way that everyone could understand and that alleviated the

engineer's concerns. The heat map feature in HangerWorks proved to be the perfect tool to communicate the areas of impact to the slab loads resulting from the coordination process. While the criteria given to Spaeder by the engineer were too complex to allow for use of the out-of-the-box heat map, Spaeder used HangerWorks to create a modified heat map, which they attached to the various hanger rods throughout their model. Those rods then provided individual load reports, allowing Spaeder to successfully demonstrate to the engineer that all the criteria had been met.

Moreover, the HangerWorks heat map provided a guide to enable the building owner to make good decisions about future installations within the building. "Upon creation of our first heat map and presentation to the engineer, Spaeder received applause from the owner's representatives

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ACCO Installs Daikin Self-Contained HVAC Systems, Helps 49ers Stadium Score LEED Gold

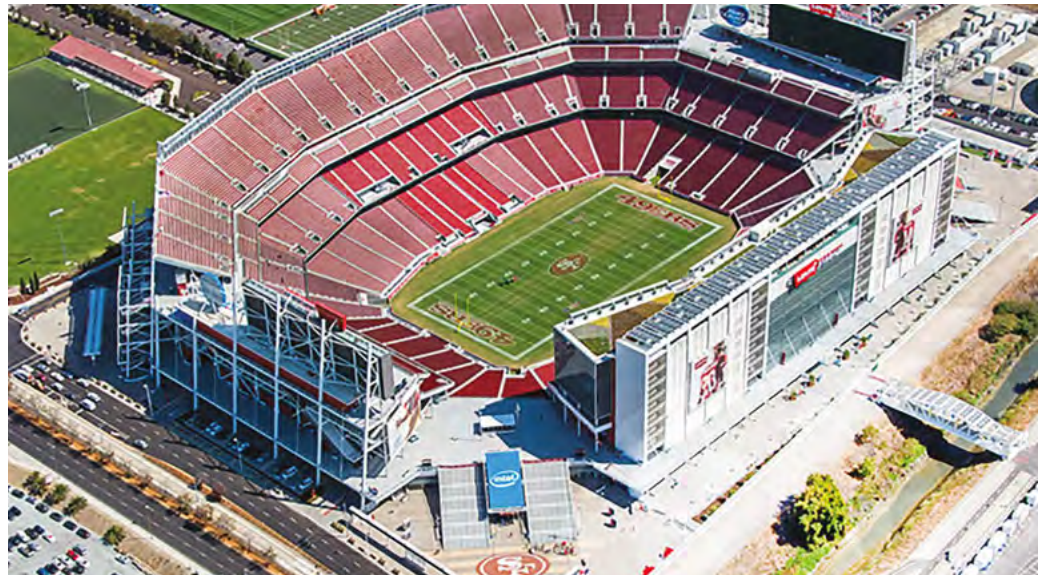
By working closely with **Daikin** on design and modeling, **ACCO Engineered Systems** successfully installed 875,000 tons of sheet metal, miles of condenser and hot-water piping, and 21 large-capacity Daikin Self-Contained air conditioning (AC) units on a fast-track schedule with no room for delays. The energy-efficient HVAC systems helped the premier \$1.2-billion Levi's Stadium, home of the San Francisco 49ers, become the first NFL stadium to achieve LEED® Gold certification.

Tall Order, Short Timeline

Stadium construction began in April 2012 and was scheduled to finish in time for the first preseason 49ers game in August 2014. The South Bay microclimate and energy performance were chief considerations for mechanical, electrical, and plumbing (MEP) systems. Thermal comfort of the football players and visitors' comfort were also considerations.

A condenser, tower water system for heat rejection of the packaged AC units, and a highly efficient heat pump for the domestic hot water system were determined to be the best HVAC solution for the stadium. Mechanical equipment also had to meet the energy performance requirements for LEED Gold certification and the California Energy Commission's Title 24 Building Energy Efficiency Standards.

The entire HVAC system was specified as variable flow with enhanced controls to optimize the performance and improve energy savings. The ventilation system was specified as centralized VAV with airside economizer. As part of the energy modeling, the equipment and system evaluation was critical because of the



Levi's Stadium is the first NFL venue to achieve LEED Gold certification, thanks in part to ACCO's swift installation of tons of sheet metal, miles of condenser and hot-water piping, and 21 large-capacity Daikin Self-Contained AC units on a fast-track schedule.

unique peak demand of event days, such as football games and concerts.

Daikin water-cooled Self-Contained AC units were the clear choice given the equipment specifications and "required on job" dates. While commercial grade AC equipment was the engineering baseline, the flexibility of using an original equipment manufacturer was important so that contractors could incorporate preheat coils, air flow measuring stations, and control interfaces such as smoke control. The efficiency of the Daikin Self-Contained AC units and the refrigerant specifications exceeded the minimum requirements for Title 24 standards.

Equipment room space was at a premium both in the belly of the stadium and in the upper luxury suites and office areas. The compact design of the 21 large-capacity Self-Contained AC units, sized up to 100 tons each, enabled the designers to save space in the equipment rooms by having fewer

units. The units were semi-customized to include preheat coils for winter conditions. Normally, the hot water coils would be ordered separately. For this project, the Daikin engineers were able to insert the hot water coil into the standard cabinet, which also saved space. In addition, some of the stadium mechanical rooms are located near occupied spaces; the plenum fans on the Daikin Self-Contained AC units generate less noise than similar models of other manufacturers, so they met the stadium's low noise requirement.

Complex Construction Schedule

To speed the construction effort, Levi's Stadium was developed in a sequenced plan for logistics, stocking, and installation. The facility was built as three independent projects running concurrently: suite tower section, bowl side (main and upper concourses), and event level (lower bowl). The construction sequence was incorporated as part of the engineering efforts to avoid start-up issues, given the common ductwork and

pipng systems between the suite tower, bowl side, and event level.

ACCO installed the sheet metal, piping, and HVAC systems, maintaining cleanliness in compliance with indoor air quality standards for LEED certification. Daikin worked closely with ACCO by providing 3D CAD files of the 100-ton water-cooled Self-Contained AC units to assist with the modeling of the equipment rooms, ductwork, and piping systems. The modeling and design efforts made for a smooth installation process.

Building the stadium required complex sequencing among various trades. ACCO alone employed 125 engineers and field personnel to design and install the sheet metal and condenser and hot-water piping. Deliveries of materials and equipment, including preassembled ducts and piping components, were made on a just-in-time basis, with multiple daily transfers made to the jobsite from a nearby receiving yard.

On-Time Opening

As part of the ventilation system start-up, local and factory Daikin technicians were on site to verify the packaged AC unit controls. Work included preparing the interfaces to the stadium's building automation

systems (BAS), firmware updates, and operational settings among numerous HVAC applications. Start-up and commissioning efforts began in summer 2013 to ensure the entire construction and operations teams were synced for a successful delivery of MEP, various BAS, and food service systems. Systems were operational in time for the stadium's soft-opening event in April 2014 to include commissary and other early move-in spaces.

After a record-setting and fast-tracked building process, Levi's Stadium hosted the first 49ers preseason game and received LEED Gold Certification for Building Design and Construction of a new facility. Visitors can view a live dashboard display, located inside the stadium near the 49ers Museum, featuring current energy measurements, water and air monitors, and other dynamic green features.

After the inaugural season in 2014, the HVAC systems were reevaluated, and performance was compared with the energy modeling. The Daikin Self-Contained units performed as specified.

On February 7, 2016, Levi's Stadium was the proud host of Super Bowl



Daikin worked closely with ACCO by providing 3D CAD files of the 100-ton water-cooled Self-Contained AC units to assist with the modeling of the equipment rooms, ductwork, and piping systems, which made for a smooth installation process.

50 and accommodated nearly 72,000 visitors.

For more information, visit www.DaikinApplied.com.

DEWALT

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and members of the design and coordination team for having met the challenge and been able to pull together a workable solution," said Marsh.

Prefab Pays Off

Had DEWALT HangerWorks served only to provide engineering calculations, it would have been well worth Spaeder's investment,

Marsh observed. HangerWorks also delivered on the prefabrication side, enabling Spaeder to automate their BIM of materials, hanger spool sheet, and prefabrication labels. By quickly modifying their existing hanger fabrication workflows to work in conjunction with HangerWorks, Spaeder leveraged the software's enhanced reporting functions to produce better labels, improved fabrication drawings, and more useful field installation drawings. The drawings included

information vital to the foreman's understanding of the installation process and helped with sizing of strut channel and other secondary support materials. In addition, Spaeder ended up being paid to lay out fire protection and sheet metal anchors, as they were already controlling the hangers for all the trades on the project.

For more information, visit anchors.dewalt.com/anchors.

Jay R. Smith Mfg. Co. and Pan-Pacific/Murray Company Team Up for New LA Stadium

Close coordination with **Jay R. Smith Mfg. Co.** is helping the mechanical design-assist subcontractor **Pan-Pacific/Murray Company** (PPMC) tackle a tough job: building the NFL's most massive stadium complex.

At 3.1 million square feet, the Los Angeles Stadium and Entertainment District at Hollywood Park will house not just a 70,000-seat stadium but also a hotel, offices, retail spaces, residences, and restaurants.

Pan-Pacific Senior Project Manager Carl Wisdom and Purchasing Agent Andrew Glendinning will tell you that what particularly stands out in a job of this scale is the sheer volume of the plumbing involved—despite all their experience working on substantial projects.

Given that extraordinary volume, you want to do as much prefabrication work as possible, and that takes precise coordination and collaboration between all parties involved, from the

supplier to the contractor, as well as other trades working on the project. The demand for coordination can be seen with something as standard as the installation of drains needed to remove water from the stadium's seating area risers.

Team Work

The stadium seating area of the arena was precast in concrete. Structural precast risers and tubs (the front row of each deck) were cast offsite in sections that stretched up to 45' in length and weigh in at about 30 tons each. Then they were shipped to the stadium for installation.

Jay R. Smith Mfg. Co. scupper drains (1520T-G-U-SSM) were located in the tubs to remove water and debris running through the stadium during wash downs and weather events. The drains would eventually be installed in forms used to cast the concrete. However, they first needed to be prepped and protected for the pour.

The prepped drains were then delivered to PPMC, which added the specified nipple for the waste portion of the pipe and protected the threads from concrete using a foam gasket. Once all the preparation work was complete, PPMC shipped the scupper drains for the pour. After installation of each section at the stadium, all PPMC needed to do was go in, make their connection, and install the grate onto the drains.

Coordinating on a Game Plan

The carriers, however, were a different story. To put things into perspective, the project has more than 2,700 lavatories, urinals, and toilets throughout the stadium, and each fixture required a carrier. Wisdom said PPMC elected not to preorder the carriers, as there was a good chance they would run into trouble nailing down the number of right, left, and back-to-back connections needed. If anything changed in the plans, they would then have to go back to Smith and revise the order.

It seemed like a good call at the time, but Wisdom said that decision led to a deficit of carriers when they were needed. While Smith knew precisely which types of carriers they would need to manufacture for the project, they also had to fight against the clock to complete the order. To add to that slow start out of the gate, Smith had to modify 75 percent of the carriers to fit the low-profile, floor-mounted back outlet water closets installed throughout the stadium.

To help PPMC meet their goals and avoid further delay, Smith preassembled every carrier by attaching the barrel, faceplate, and nipple before shipping. This way, once PPMC had the preassembled pieces, they could immediately start prefabricating each



Jay R. Smith Mfg. Co. scupper drains (1520T-G-U-SSM) were integrated into the forms used to cast the concrete stadium seating sections. Smith and PPMC worked together to speed up the preparation for the precast, so that after the sections were installed, PPMC could quickly make connections and install the grate onto the drains.

To help speed up this process, Jay R. Smith Mfg. Co. removed the finished grate and added protection by covering the drain opening with fiberboard, then adding layers of tape to bring it flush with the precast. To ensure Smith understood the magnitude of what was coming their way (259 scupper drains) and to allow time to prep the drains as required, PPMC ordered the drains far in advance.

battery of lavatories, urinals, and water closets.

“Smith is jumping through hoops to get them to us on time,” said Glendinning.

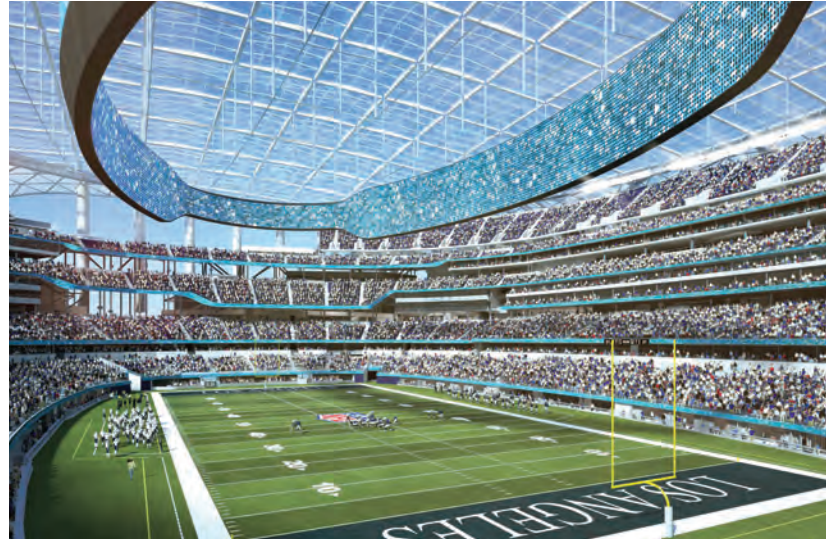
Smith engineers said that PPMC would be the last customer to need modifications on the carriers to accommodate similar low-profile water closets that are appearing more and more on job specifications. Creating high-quality, contractor-friendly products that help make a job go smoother and faster is a high priority for Smith. To that end, what were considered modified carriers for this job are now available as standard figures in the Smith catalog.

Marching Toward the End Zone

Ground was broken on the new stadium in 2015, and it is expected to be finished by 2020. Once it is complete, it will be the world’s most expensive stadium, coming in at just under \$5 billion. The Los Angeles Stadium and Entertainment District at Hollywood

Park will be the home of the NFL’s Los Angeles Chargers and Los Angeles Rams. It will also host Super Bowl LVI in February 2022, the College Football National Championship game in 2023, and the opening and closing ceremonies of the 2028 Olympic Games.

In addition to the stadium, the district will include the new NFL Media headquarters; a 6,000-seat performing arts venue; 780,000 square feet of office space; 890,000 square feet of retail space; 300 hotel rooms; 2,500 modern residences; 25 acres of



The Los Angeles Stadium and Entertainment District at Hollywood Park will be the home of the NFL’s Los Angeles Chargers and Los Angeles Rams as well as restaurants, hotels, offices, residences, and more. By coordinating closely with Smith, PPMC has been able to use prefabrication to keep its part of the building process on track.

public parks, open space, pedestrian walkways, and bicycle paths; and family and fine dining.

For more information, visit www.jrsmith.com.

SPX COOLING TECHNOLOGIES

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Philadelphia Eagles’ two playoff games in January 2018 had to be considered, as lifts like this one require street closures and traffic diversion in the area during the delivery window.

Planning Makes Perfect

Ultimately, Erickson set all eight units in under two-and-a-half hours. The successful and timely delivery was the result of thorough planning and execution by the Goldner team. Prefabrication of the structural steel framing, catwalks, and piping enabled them to prepare the installation site for the new towers prior to setting them. With careful planning, the demolition, lifts, and installation were not

only successful, but also safe for all involved.

The cooling tower installation was successfully completed on schedule and in time for the 2018 cooling season without sacrificing product performance, quality, or project safety. The One Centre Square installation provided several insights for the field:

- Helicopter installations, when permitted by municipal authorities, can be a cost-effective solution for new cooling tower systems on tall and inaccessible commercial buildings.
- Careful planning (start to finish, with contingency plans) by the HVAC contractor from

predemolition through commissioning can make for a successful, timely, and safe project.

- Crossflow cooling towers configured with “variable flow” nozzles can provide a more robust turn-down for reduced-load conditions than pressurized distribution-style counterflow cooling towers.
- Exemplary teamwork and collaboration among the HVAC contractors, engineers, vendors, various trades, and building owners can keep a complex installation safe, on schedule, and on budget.

For more information, visit <http://spxcooling.com>.

VICTAULIC

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To bore the full length of the tunnel, a 57'-diameter boring machine was built specifically for the project. Called "Bertha" after Bertha Knight Landes, the city's first female mayor, it was the world's largest earth pressure balance tunnel boring machine.

Bertha set to work on the SR 99 tunnel in 2013, boring from south to north. The project progressed as planned until Bertha hit a steel pipe, causing serious damage to part of its main bearing seal system. For two years, workers excavated a recovery pit to allow the unit's cutter head to be removed for repair.

By the end of 2015, Bertha was back at work but was stopped in her tracks again in January 2016 when a barge in Elliott Bay damaged some piers and a sinkhole developed near the project site. Until a safer worksite could be ensured, work was suspended, resulting in a hiatus that lasted until April. A year later, Bertha reached the north end of the tunnel.

After two years of delays, the tunnel had finally been fully excavated, but the work was not nearly complete. Now, the state wanted to make up for lost time.

Creative Design Saves Time

The contracts for the project's major construction programs had been awarded years in advance. With the tunnel finally completed, work began immediately. A team began setting precast panels to create a road deck, and specialists started on the electrical and construction work.

Tasked with installing the enormous drain system for the tunnel, Shinn Mechanical was one of several companies on the worksite. It had won the job by designing a customizable header that decreased fabrication time



Shinn Mechanical engineered its own swivel joint to custom-fit the angle and the dimensions for each joint, fabricating the parts in a single day. With Victaulic's Style W77 coupling, "We were able to cut our pipe to length and install the two-bolt couplings without mitering any joints," said Mike Shinn, company founder.

in the curved tunnel, where every pipe had to be custom fit. Instead of trying to find an existing part that could be modified, Shinn Mechanical took things a step farther. "We came up with a better design," said Shinn. "We are innovative, and we're always looking for more cost-effective solutions."

Shinn Mechanical engineers designed a swivel joint that uses a pivot to allow the angle and the dimension to be fitted for each joint. Two plates slide against one another at a set point in the middle to allow the

The capacity, reliability, and compatibility of the Milwaukee tools "enabled us to maximize work hours in a challenging environment."

— Mike Shinn, Founder,
Shinn Mechanical Inc.

arms to be adjusted to accommodate varying tie-ins. Workers took measurements to determine the angles, and Shinn used those dimensions to fabricate the parts in a single day, cutting a three- to four-day turnaround into 24 hours.

With these parts in hand, Shinn Mechanical was ready to begin the

largest tunnel project it had ever undertaken, and the company looked to its trusted partners for execution.

Partnering for Success

Victaulic and Milwaukee Tool brought nearly two centuries of collective experience to the table. Shinn explained that the reliability and ease of installation of Victaulic couplings has made them the grooved mechanical coupling of choice for Shinn Mechanical.

The gradual bend in the tunnel limited pipe lengths for the drain system to 28', requiring approximately 350 pipe joints on the main line alone. With pipe diameters ranging from 2" to 20", pipe size presented as much of an installation challenge as the number of joints.

"Victaulic's Style W77 coupling was exactly what we needed for the SR 99 tunnel project," said Shinn. "We were able to cut our pipe to length and install the two-bolt couplings without mitering any joints."

Flexibility combined with a grooved joint that is easy to install in tight spaces and accommodates deflection made Victaulic's Style W77 AGS™ flexible coupling the right component for the curved tunnel. This one-of-a-kind coupling with

a two-piece housing eliminated the need to flange or weld, allowing for a safer and faster installation of the large-diameter pipe. Victaulic's Installation-Ready™ technology, which improves efficiency under normal circumstances, was invaluable on a worksite where spare parts could be more than a mile away.

“There was no extra walking to get forgotten parts,” Shinn said, and that minimized unproductive time. “I didn't consider any other coupling for this job.”

The drain Shinn Mechanical installed carries rain and surface runoff, as well as water laden with brake dust, oil, and gasoline deposited by the cars using the tunnel. A proprietary Victaulic nitrile gasket, designed for use with petroleum-based products, was supplied with the Style W77 coupling Shinn Mechanical wanted for this project.

Right Tools for the Job

Wet conditions, limited access to electrical power, and long distances to the work area precluded the use of corded tools on the jobsite. Shinn Mechanical looked to Milwaukee's industry-leading M18 FUEL™ technology for impact wrenches, band saws, vacuums, drills, and stand lights, which were indispensable in the dark tunnel. All these tools run on the same 18-volt battery system, meaning the Shinn Mechanical team did not have to spend valuable time searching for the right batteries and chargers—everything was completely compatible. This kind of tool reliability meant work in the tunnel could progress without interruption to rapidly install the drain line.

However, because of the massive amount of 20" Victaulic couplings, Shinn was skeptical that cordless tools would be up to the task. “We had zero confidence cordless tools would work on those [couplings],”

said Shinn. “But as soon as we fastened down the first coupling with the cordless Milwaukee impact wrench, we were blown away that it was actually able to deliver the torque to get the job done.”

The Milwaukee Tool impact wrenches proved to be a perfect match for installing the Victaulic couplings. Providing 1,400 foot-pounds of break-away torque, these tools aptly tackled the myriad of coupling sizes. And they could do all of it without the hassle of pneumatic hoses.

“The tools performed without a hiccup,” Shinn said. “They were seamless, which enabled us to maximize work hours in a challenging environment.”

Milwaukee's cordless stand lights were particularly critical to the project because they could provide light when the tunnel was without electricity. These lights not only illuminated huge areas, but they also held up to the wet conditions deep in the tunnel. Each light stood on support legs that could be immersed in water with no detriment to the tool or its light output.

The Shinn Mechanical team was so efficient at joining pipe that they

“Pairing Victaulic couplings with Milwaukee tools allowed us to finish a job scheduled to take eight months in only 10 weeks.”

— Mike Shinn, Founder,
Shinn Mechanical Inc.

outpaced the team laying the precast road panels. “It turned into a bit of a competition, but most days, we'd end our shift with 10' of pipe sticking out the front end of the road,” Shinn explained.

More than two miles of the line was hydrotested without a single leak.

“We've done a lot of tunnel work in the area,” Shinn said, “but there has never been anything like this in the state of Washington.”

Leveraging its trusted partnerships, Shinn Mechanical delivered an innovative and durable solution in record time. The tunnel is scheduled to open as soon as fall 2018.

For more information, visit www.victaulic.com and www.milwaukeetool.com.



The gradual bend in the 2.5-mile long tunnel limited pipe lengths to 28 feet, which required approximately 350 pipe joints on the main line alone and made Victaulic's flexible coupling the ideal choice. Shinn Mechanical found that Milwaukee's cordless stand lights not only lit up the dark tunnel but also stood up to the harsh conditions.

Arden Engineering Constructors Slashes Man-Hours by 90 Percent with Trimble Scanner and Software

For a recent retrofit, Arden Engineering Constructors knew that an accurate as-built assessment of the project was essential to ensure a smooth process, so they put their Trimble® TX6 Scanner and RealWorks® Office software to the test. The scan took one field worker about 4 hours, compared with an estimated 32-man hours for manual measurements—a labor savings of 90 percent.

Technology Investment Pays Off

Several years ago, Bill Cameron, building information modeling (BIM) manager for Arden Engineering Constructors recalled, the company began to see a substantial uptick in the number of RFPs for MEP and HVAC systems renovation and retrofit jobs, as opposed to new construction projects. As a first step, such work typically requires an accurate picture of preconstruction conditions. For every pipe and duct in a HVAC system, for example, there are numerous hangers, sleeves, and other components precisely positioned within the structure to support it. An as-built model gathers precise measurements for all relevant MEP elements of the building, so contractors can determine current conditions and assess the impact of the redesigned system. The conventional method for generating as-builts for MEP systems is to measure and record all components across the building site by hand. To modernize this process, Arden Engineering Constructors sought out 3D scanners and point cloud modeling alternatives.

Already a loyal user of Trimble technology, including Trimble PipeDesigner 3D and SysQue® for Autodesk Revit™ MEP, the team

adopted the Trimble TX5 laser scanner and later the TX6 scanner along with RealWorks office software. They chose the Trimble TX6 3D laser scanner because it provided the speed, quality, and range to make in-field data collection fast and efficient. RealWorks allowed them to create 3D deliverables. Arden Engineering Constructors estimated that the TX6 scanner paid for itself after about four projects with increased speed and accuracy of gathering as-built preconstruction data.

“One of the biggest benefits of the TX6 scanner is the high-speed scanning and consistent accuracy. We estimated it would have taken about four days or 32 man-hours to complete an as-built assessment manually.”

—Bill Cameron, BIM Manager,
Arden Engineering Constructors

Cutting Days Down to Hours

For a new and retrofit project for a small biopharmaceutical facility located in Cambridge, MA, Arden Engineering Constructors took on a project that included HVAC, controls, balancing and fabrication work, and the addition of a roof mezzanine. Phase 1 of the project required them to set up a temporary boiler and chiller plant to service the existing nine-building campus, which featured 644,771 square feet of laboratory, office, and retail space across nearly eight acres. It also included all remodeled and installed duct work for the

existing area and the addition to support the next phase of the project. Phase 2 involved integrating the chill water plant, new chillers, and new chilling towers.

Completing an accurate as-built assessment of the project was essential to ensure that retrofitting of additional MEP systems would not clash. Arden Engineering Constructors used the Trimble TX6 3D laser scanner to gather the precise 3D location of surfaces, HVAC components, objects, and duct work. Scans were conducted outside and indoors with scanning speeds of 500,000 points per second and a scanning range of 80 meters standard on most surfaces (and 120 meters with an optional upgrade). Cameron said each scan took approximately seven minutes, and all the scans were completed over a four-hour period. During each, the scanner collected millions of data points, also called a point cloud.

“One of the biggest benefits of the TX6 scanner is the high-speed scanning and consistent accuracy,” said Cameron. “We estimated it would have taken about four days or 32 man-hours to complete an as-built assessment manually.”

Cameron continued, “With the Trimble scanner, we had access to high-quality data fast, and we were able to quickly capture clean data even in bright sunlight. We scanned this project as sort of a favor to the contractor on site, so they didn’t have to put it out to bid. That saved them approximately \$10,000 and helped us secure future phases of the project.”

From Data to 3D

After the scan, the data were exported

into Trimble RealWorks software to register, analyze, model, and create 3D deliverables. RealWorks essentially segments the cloud data into bite-sized pieces, which is easier for CAD modeling software to digest.

Using RealWorks, Arden Engineering Constructors modeled the point cloud's specific MEP components and exported these solid objects to the 3D design package, Autodesk Revit, for finish detailing activities. The point cloud served as a starting point for MEP system detailing efforts and was used to determine the project design impacts on the existing structure. Once the laser scan of point cloud data was converted, the team used SysQue to inject greater intelligence into the 3D BIM model. With SysQue, Arden Engineering Constructors was able to include real-world content in the design, including detailing, fabrication, manufacturing, and installation specifications. The model was viewed in Revit, then exported to Autodesk's Navisworks software, which created a snapshot of the project including models, the scene's environment, viewpoints and redlines, and measurements for coordination among trades.

"After we scanned the building, we forwarded that information on to the construction manager on the project," said Cameron. "The point cloud from the scanner and RealWorks gave us a clear and accurate picture of what we were looking at for phase 2 of the project. We also liked that the point cloud data from the scan folded seamlessly into our Revit, SysQue, and Navisworks workflow."

A Step Ahead

Cameron believes Trimble scanning technology along with the ability to convert point clouds into modeled 3D components help set Arden Engineering Constructors apart as a leading HVAC and MEP services

contractor. The team can tackle complex projects for customers and offer comprehensive and innovative solutions that save time and money and meet the industry's highest quality standards.

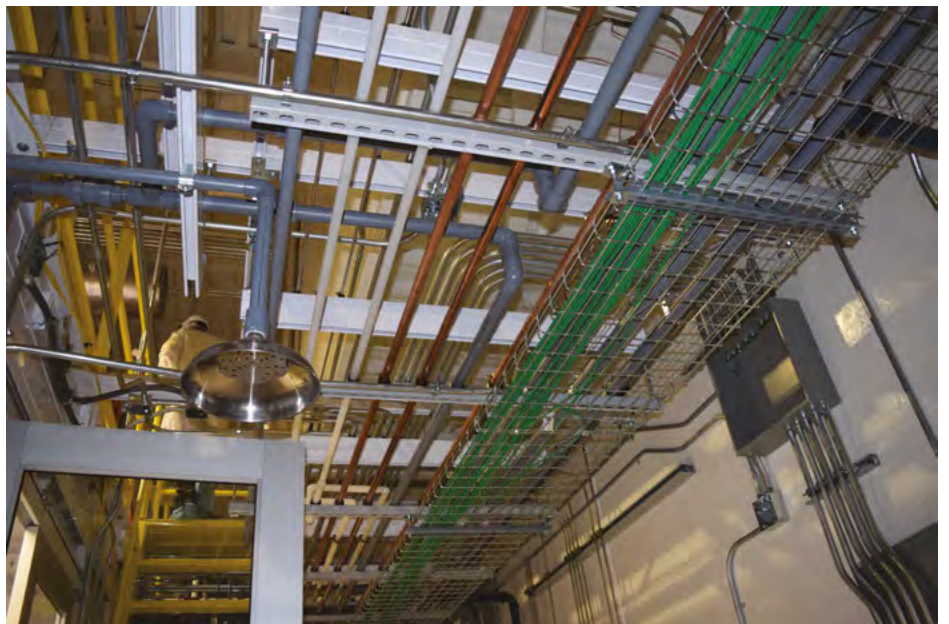
"We see the industry trending towards relationships, more than pure dollars and cents," said Cameron. "Customers want to know that we can provide complete MEP services including balancing how our scope of

work on a project impacts all other trades and the project's overall cost. Trimble's 3D scanner and software helps us do this and it fits into our BIM workflow. It's just one more reason why we're positioned much better to help customers in the MEP and mechanical services space because we're thinking big picture."

For more information, visit mep.trimble.com.



Arden Engineering Constructors relies on Trimble's TX6 Scanner to capture a building's MEP details much faster and more accurately than workers measuring by hand. Using RealWorks software in concert with their other BIM programs, they translate the data into digital models that are essential to effective planning and coordination among all the contractors involved.



Muir-Chase Saves Caltech Gallons with High-Efficiency Zurn Urinals

Since **Muir-Chase Plumbing** installed **Zurn Retrofit Pint** urinal systems in every bathroom across campus, Caltech is saving 6,056,130 gallons of water and \$42,393 per year. Californians know the value of every drop of water, and the world-renowned science and engineering institute in Pasadena recognizes the importance of being a responsible steward of water resources.

Caltech's plumbing shop regularly retrofits its water systems, from cooling towers to plumbing fixtures. But even with its own in-house experts, Caltech needed more bandwidth to make a campus-wide upgrade happen. Fortunately, opportunity and timing aligned.

The City of Pasadena Water & Power (PWP) approached Caltech about its water conservation programs. Metropolitan Water District of Southern California, regional water supply wholesaler, teamed up with PWP to offer water-saving services and valuable rebate incentives. The water conservation team visited Caltech's impressive 124-acre campus.

With oversight from the institute's plumbing experts, the team completed the efficiency studies and offered water-saving options, along with the calculated project costs after rebate and the return from future savings.

Caltech decided to retrofit its restroom urinals campus-wide. It would take time and resources, but the program rebate offset some of the project costs, providing a faster payback. The project also benefitted the institute and surrounding communities. Every flush uses gallons of water—a shared, limited resource in California.

“We completed smaller urinal retrofit projects consistently over the past several years, but we needed to really move the meter with regard to water consumption,” said John Onderdonk, director of sustainability programs at Caltech. “The program fit our initiative and wouldn't have been possible



Since Muir-Chase Plumbing installed Zurn Retrofit Pint urinal systems in every bathroom across campus, Caltech, the world-renowned science and engineering institute in Pasadena, is saving 6,056,130 gallons of water and \$42,393 per year.

without collaborative effort by the whole project team.”

Zurn's highly efficient urinals optimize flow by using more power with less water. Today, Caltech's upgraded urinals consume 87-percent less water than traditional urinals that use 1 gallon per flush, exceeding the 30-percent threshold set by LEED for green buildings. Caltech is already looking into future project investments, such as low-flow faucets and toilets.

For more information, visit www.zurn.com.

Brandt Impressed by Viega ProPress Efficiency

Tools Pay for Themselves Quickly by Minimizing Installation Time

For the new Texas headquarters of a major worldwide corporation, Brandt Construction chose Viega for chilled water and domestic water—a “no-brainer,” because the company does nearly all its work with Viega product. “Viega is dependable, and Viega's people in town support us really well,” said Craig Hawkins, project executive. “Pressing with Viega is tremendously efficient versus brazing

or soldering. We've tried other similar products and had issues with them or the quality doesn't seem to be as good as the ProPress®.

“We've been using Viega for a long time,” Hawkins continued. “The first project I remember using press on was the Plano Presbyterian Hospital, around the mid-2000s. We have a standard spec set up for all our work, and



Brandt uses Viega ProPress almost exclusively because of its reliability and ease of use; the company says it has saved countless dollars in installation time as a result.

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Are Your Office Workers Getting the Same Level of Ergonomics Care as Your Jobsite Workers?

Who Needs a Sit/Stand Workstation and How to Set It Up

Over the past few years, a greater focus has been placed on employee health and wellness as it relates to the issue of sitting versus standing at a computer workstation. The number of sit/stand workstations is on the rise, causing employees to ask the question, "Is a sit/stand workstation right for me?" Working in the same location for hours can affect concentration and muscles, which can in turn affect work productivity. CNA offers this guidance on how to maximize comfort while working at a computer

workstation and reduce pain and injuries.

Living More Sedentary Lives

Sedentary behavior is a significant health risk and a major contributor to obesity, type 2 diabetes, cancer, and cardiovascular disease. Sedentary jobs have risen 83 percent since 1960 and now account for 43 percent of all U.S. jobs. One study found that an extra hour of sedentary time per day was associated with a 22-percent increase in type 2 diabetes and

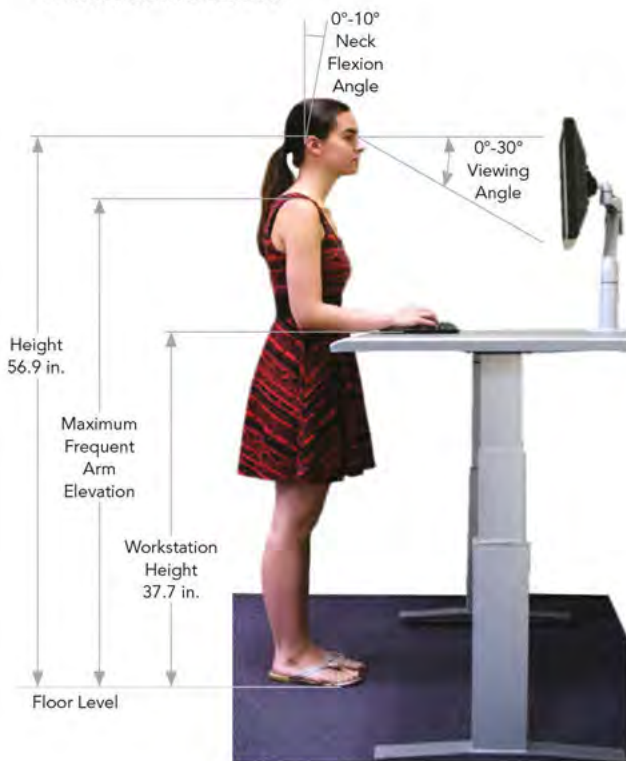
a 39-percent increase in the odds of developing metabolic syndrome. Another estimated that prolonged sitting is responsible for 430,000 deaths across 54 countries and that sedentary behavior is the number-two risk factor for mortality, second only to smoking.

Sitting

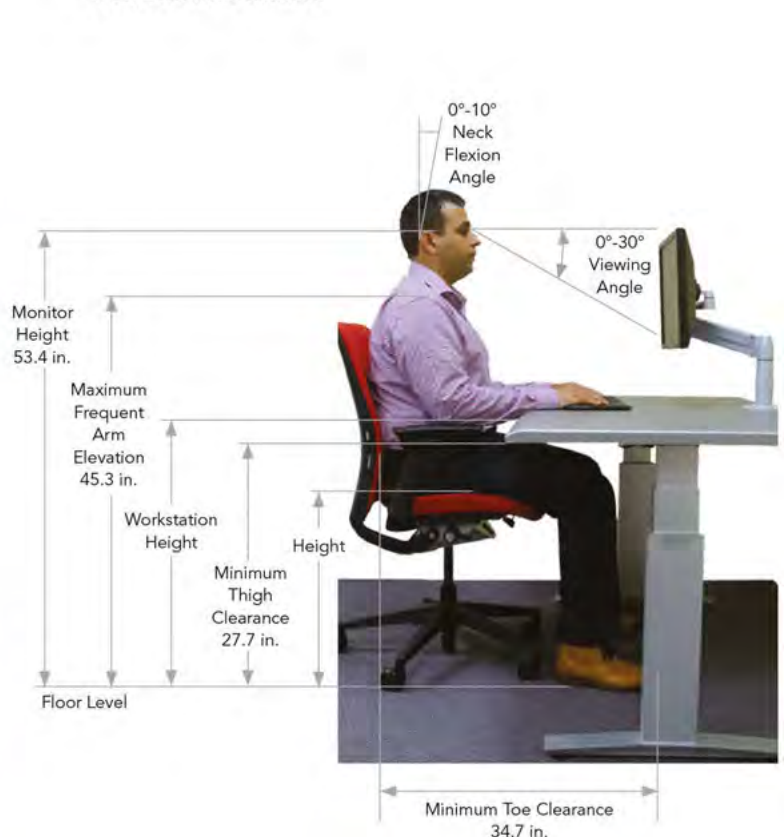
Sitting at a typical office workstation can increase disc pressure in the low back, placing the body into a static posture and thus increasing the risk

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Name: Sue Smith
Gender: Female
Height: 5'0"
Workstation: Standard



Name: Joe Smith
Gender: Male
Height: 6'2"
Workstation: Standard



Whether sitting or standing, follow these guidelines for setting up individual workstations.

CNA

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of heart and kidney disease. With this in mind, more organizations are taking proactive steps to identify and address sitting during the workday.

Standing

On the other hand, prolonged standing work is associated with its own health problems. Standing puts greater strain on the circulatory system and on the legs and feet, and the performance of many motor skills is reduced. Prolonged standing is associated with the development of varicose veins. In addition to health risks, workers may see a decrease in dexterity when working while standing.

What Are the Advantages of Standing?

- An increase in metabolic activity (20-percent increase in calories burned)
- Reduced strain on the lower back
- Increased muscle activity
- Fewer complaints of discomfort
- Improved mental clarity

Is There a Solution?

The combination of sitting and standing through the workday seems to offer the best solution to this issue. The human body responds best to a balance of both dynamic and static activity, and a sit/stand workstation could meet these needs.

Who is the ideal candidate for a sit/stand workstation? Employees not experiencing pain or discomfort from sitting and who can get up and move on a frequent basis may not need to alter how they work. However, employees who experience discomfort or pain in the back or upper extremities and who do not get up from their

workstations very often may benefit from this solution.

A company should evaluate who needs a sit/stand workstation very carefully, as employees with orthopedic issues (e.g., conditions affecting the ankle, knee, or hip), inflammation, or joint disease may not be able to stand. In addition, some overweight individuals may not feel comfortable standing at a desk under any circumstances.

Design Best Practices

- Alternate between sitting and standing on a regular and frequent basis. For example, spend 20–30 minutes standing and then sit for 45 minutes to an hour.
- When standing:
 - » Wear good supportive shoes, not shoes with a heel.
 - » Use a foot rest to raise one foot off the ground, changing the tilt of the pelvis.
 - » Do not stand in a static posture; move from side to side.
- Provide height-adjustable work surfaces with keyboard trays that will fit both sitting and standing users.
- The keyboard and mouse should be at the same level—at or slightly below elbow height.
- Make sure the keyboard, mouse, and monitor height are set at the correct level for the employee in either the sitting or standing position.
- Place the monitor approximately an arm's length away. The top of the screen should be slightly below eye level, with the brightest light source to the side and not directly over the monitor.

- The employer should provide training and education on how to adjust workstations to accommodate individuals of different sizes and heights. Education should focus on the fundamentals of ergonomics and the benefits of good neutral postures.
- Employees should change positions on a regular basis. Individuals can walk around to get a drink of water, make copies, or speak to a colleague, for example.

Summary

Users of a sit/stand workstation can get the most benefit by incorporating more movement into a workday. Employees should alter their posture often through the day and not stay in one position for an extended period of time—whether sitting or standing.

For more information about CNA, visit www.cna.com/riskcontrol.

Modified from the CNA Risk Control Bulletin "The Sit/Stand Paradox." The information, examples and suggestions presented in this material have been developed from sources believed to be reliable, but they should not be construed as legal or other professional advice. CNA accepts no responsibility for the accuracy or completeness of this material and recommends the consultation with competent legal counsel and/or other professional advisors before applying this material in any particular factual situations. "CNA" is a registered trademark of CNA Financial Corporation. Copyright © 2018 CNA. All rights reserved.

Brandt Finds and Fixes Problems During Installation with Connect from KEY2ACT

Using KEY2ACT's Connect technology to gather building data during a year-long retrofit project, Brandt found glitches in the products it was installing and was able to fix them before completing the work—without going over schedule. Brandt also uses Connect during commissioning to validate a building's entire system at one time, which has proven invaluable.

The largest MEP services contractor in Texas, Brandt is dedicated to helping customers lower operating costs and increase efficiency by designing, building, servicing, and retrofitting energy-efficient building systems. To keep their competitive edge, they aim to make themselves so valuable that their customers would not think of leaving. Brandt actively seeks out advanced technological tools to provide the best customer service possible.

The Power of Data

Connect is a cloud-based solution that pulls data from a building automation system to identify trends and pinpoint potential problems before



With data from KEY2ACT's Connect cloud-based solution, Brandt can validate a building's entire system at once, not just the 10 percent of equipment that is normally commissioned during new construction, so they know everything is working the way it should when the job is complete.

they happen. The solution works with all industry building automation systems and requires only one easy-to-install unit per building. Brandt first started using Connect around 2012.

On a recent job, Brandt was contracted to upgrade a 25-year-old Trane control system. The project included fan-powered box (FPB) replacements and the retrofit of VAV boxes with new air dampers and controls. About 250 VAV retrofits were required, and the entire project was scheduled to take one year.

As the new controllers were being installed, Joe Spry, Brandt's commissioning controls supervisor, started evaluating the boxes' performance using Connect. About a month into the changeout, Connect's data revealed sporadic CFM power and pressure readings in most of the retrofitted VAV boxes and some of the new FPBs.

After trying a few different things, the team found a different brand of pressure sensor that provided a more stable reading. Even though almost 50 percent of the boxes had already been installed, Spry and his team were able to install the new pressure sensors in all the boxes before the project's scheduled end time.

Brandt also found two other glitches during the project. First, control of the electric reheat in the FPBs was not performing per the sequences, but thanks to Connect, the issue was identified and the team was able to make the proper changes early in the project. Second, Connect helped Brandt find several overcooled areas in the building, which led to the decision to change out a handful of VAV



Gary Coulson, a senior HVAC technician for Brandt, uses a clamp meter to check electrical circuits. Connect from KEY2ACT lets Brandt turn data from buildings and equipment into action, pinpointing potential problems before they occur.

boxes to smaller boxes. Quickly identifying and correcting issues within the project's original timeframe created a better experience for the customer and a smoother project for Brandt.

"Finding these issues during the project made the fixes easier, because we were still mobilized in the install mode," Spry said. "It also reduced the number of comfort complaints as the project progressed."

100-Percent Commissioning

With Connect, Brandt can validate a building's entire system at once, not just the 10 percent of equipment that is normally commissioned during new construction. Spry described the value of 100-percent commissioning as "unbelievable." He noted, "We come off a job with more confidence that there's no issues with the way things operate, the way they're sequenced to operate."

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UPONOR

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to create a thermal cooling system that would ensure the integrity of the concrete as it cured. Applying this new technique, Couts not only smoothed the way for this rapid, massive project, it also benefitted from the ease of installation. The PEX tubing's "extreme flexibility made it fast and easy to install around the rebar in the base of the structure," said Mike Martin, Couts piping department manager.



For a record-setting continuous concrete pour, Couts installed more than 20 miles of Uponor radiant tubing to create a thermal cooling system that would ensure the integrity of the concrete as it cured.

Green Construction and Deconstruction

At 1,100' tall and 73 stories, the Wilshire Grand Center in Los Angeles, CA, is the 10th tallest building in the United States and the tallest building west of the Mississippi. A structure of this magnitude requires precise engineering to ensure the building's integrity while also incorporating creative and thoughtful design elements to meet the owners' LEED® Gold certification requirements.

The first decision was to deconstruct the original, 1.1-million-square-foot building, built in 1951, instead of demolishing it, so that some materials could be recycled rather than go to the landfill. The concrete was crushed into material that can be sold as Class II Base for structural fills, roads, or building pads. The steel beams were sent to a local foundry and melted down to make recycled reinforcing bars. This "green" deconstruction of the old building saved the developer \$4 million, making it not only good for the environment but also good for business.

Record-Setting Concrete Pour

After deconstruction, the focus turned to the design of the new, \$1.2-billion structure. The base for the 2.1-million-square-foot building required a 21,200-cubic-yard concrete foundation located 84' below street level. To place that kind of concrete mass required a world-record continuous pour.

Completed in less than 19 hours, the 82 million pounds of concrete set a Guinness World Record for the largest continuous pour in a 24-hour period. To ensure structural integrity of the foundation's massive slab, the design specified a hydronic radiant cooling system to draw off the heat as the concrete cured—a new trend that is becoming more popular for large concrete projects such as building foundations and bridges.

According to Martin, the idea of thermal cooling came from an engineer in Minnesota who was looking to redirect the heat and keep an even temperature in the slab to prevent cracking after it cured. To keep the slab at the proper temperature, the team at Couts installed more than 100,000 feet of 3/4" PEX tubing from Uponor that intertwined through the rebar of the foundation. The tubing was used to convey 40° F water throughout the system to maintain an even temperature that was not to exceed 160° F as the concrete was poured and then cured.

"The lighter weight of PEX made it easier to move around the jobsite," said Martin. "Also, PEX is very forgiving. The installers were walking on it and dumping concrete on it, and it never damaged the pipe. Plus, any kinks in the pipe were easily repaired with a quick shot of heat from a heat gun, which is a big advantage for PEX-A type tubing. This eliminated the need to add in couplings in the slab."

Couts installed the radiant tubing at 6" on center and dropped it down 18' from the 8" HDPE supply header before looping it back up. Once the radiant tubing installation was complete, the concrete pour began. It was a steady, organized plan that required more than 400 workers, eight concrete plants, 208 mixers, and more than 2,000 truckloads.

During the pour, the 40° F water, sourced from a chiller system featuring a 40,000-gallon storage tank, began running through the system. The thermal cooling system pumped water throughout the tubing for two weeks while being continuously monitored by 24 sensors to ensure proper system temperatures. After the two-week timeframe, the water was removed from the system and



Mike Martin, Couts piping department manager, said Uponor's PEX tubing's "extreme flexibility made it fast and easy to install around the rebar in the base of the structure."

the tubing was filled with grout and remained in the slab.

Cooling Catches On

To date, the Wilshire Grand stands as a testament to new construction trends that promote business-smart sustainable design and "green" deconstruction, an idea that is likely to gain traction as older buildings make way for new structures. And, according to Martin, concrete thermal cooling will also continue to increase as more and more professionals look to smarter building practices to make structures of higher performance.

In fact, Martin noted, many general contractors are reaching out to Couts to install thermal cooling systems for similar applications. Since the Wilshire Grand, Couts has completed two bridges with concrete thermal cooling, and Martin estimated the trend will continue to grow.

For more information, visit www.uponor-usa.com.

JEC Service Co. Saves \$500,000 per Year with MobiliForms from iBusiness Technologies

iBusiness Technologies' MobiliForms solution "saves the company in excess of \$500,000 annually," said JEC Service Co. Service Manager Sean Thurston, by increasing labor efficiencies in the field and office. Since the company adopted MobiliForms, field staff complete their startup checklists, project management records, work orders, and timesheets on Apple iPads® for instant transmission. Thurston estimated that JEC's 20 field technicians save at least an hour a day using this approach, which quickly adds up to substantial savings for the business.

A thriving HVAC, mechanical, and sheet metal contractor based in Waltham, MA, JEC's leadership knew that going paperless was essential to their mission and continued growth. After carefully evaluating the options, they selected MobiliForms because of its strong track record among MCAA and MSCA members and because it did not require them to change their software.

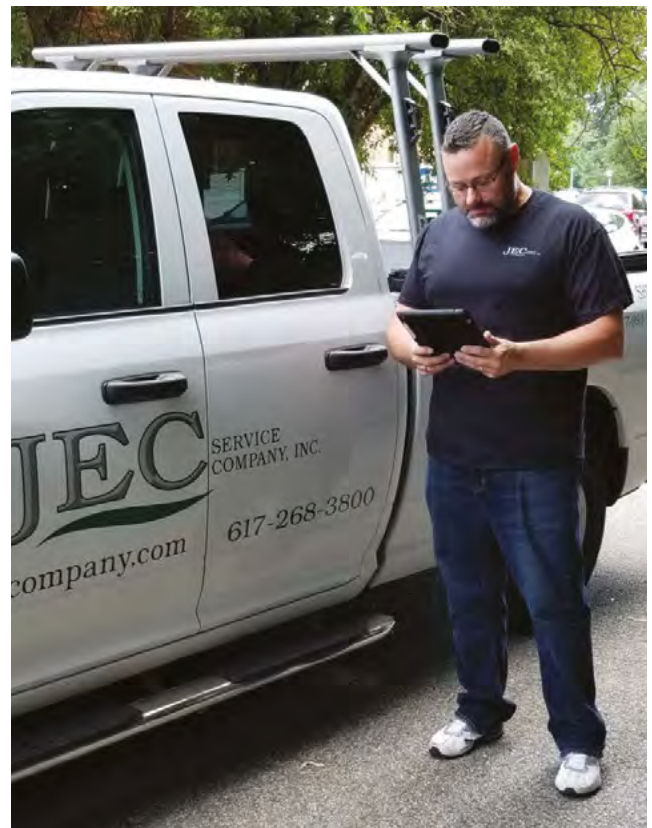
"We couldn't live without it," said Director of Operations Paul Donato. "It paid for itself quickly, and the functionality is incredibly valuable for our 20-plus field techs." Real-time data, tight record-keeping, and historic documentation positively impact operations for the

entire company. MobiliForms' cloud storage has proven to be an essential collaborative tool for JEC. In addition, the company found it easy to deploy because it did not require any changes to their existing backend software.

For more information, visit ibusiness-tech.com or contact Steve Metzman at 215-850-5565 or steve.metzman@iBusiness-Tech.com.

"We couldn't live without [MobiliForms]. It paid for itself quickly and the functionality is incredibly valuable."

—Paul Donato, Director of Operations, JEC Service Company



Sean Thurston, JEC service manager, enters customer data into MobiliForms. He estimated that the software saves the company \$500,000 a year.

Explore the Latest Welding Technologies to Improve the Bottom Line

Wasted time and lost productivity are enemies in any welding operation. Many companies have seen significant productivity increases, without sacrificing quality, by converting from traditional welding processes such as stick or TIG to advanced wire processes, such as pulsed MIG and Regulated Metal Deposition (RMD®), a modified short-circuit MIG process from **Miller Electric Mfg. LLC**. These processes offer consistent weld quality and travel speeds that are three to four times those of stick or TIG.

A modified short-circuit MIG process such as RMD offers easy weld pool control thanks to more forgiveness to variations in stickout and gun angle. This helps reduce operator training time, along with delivering quality arc performance that helps boost productivity. This process also produces less spatter and eliminates the need for backing gas, saving time and money.

Pulsed MIG offers better fusion and fill at the toes of the weld, higher travel speeds and deposition rates,

and shorter changeover time, because the same wire and gas can be used with modified short-circuit MIG processes.

Improve Efficiency and Quality

Using newer welding approaches and directing the arc energy where it is needed allows novice and experienced welders to improve their skills. A more consistent arc is also easier to manipulate to ensure good fusion, resulting in better weld quality and less rework.

Advances in remote control welding technologies, such as also ArcReach® technology from Miller, gives welders complete control of parameters at the weld joint using the wire feeder or remote—eliminating the need to walk back to the power source to make changes. These technologies also reduce the likelihood of trips and falls.

Benefits of Advanced Technology

Many financial and business benefits can be realized by converting from traditional welding techniques and processes to more advanced solutions.

- **Increased productivity.** New machines can pay off quickly in increased productivity and other factors. For operations struggling to find and retain skilled welders, productivity improvements can help meet demands while making the most of the current workforce. If you source fabricated components from regions where labor costs are high, productivity

improvements provide a significant cost reduction.

- **Reduced scrap loss.** With stick welding, a common goal for welders is to achieve stub loss (the portion of the electrode not deposited in the weld) of 2–3”, which translates to “planned scrap” of 16 to 25 percent of each electrode. Converting from stick to a wire process eliminates stub loss costs and produces labor savings because it is a more productive process.
- **Fewer failures and rework.** Consistent arc performance and filler metal selection are key to achieving higher first-time weld pass rates. Processes and technologies that offer more consistent arc performance can help reduce the time and money spent on weld failures and rework. A high level of rework impacts quality and can lead to delays, disrupting the entire flow of the construction process. (For more about the cost of rework and how to avoid it, see “Four Ways Specialty Contractors Can Reduce Construction Rework,” on page 22.)

The Bottom Line

Understanding the potential productivity gains offered by advanced processes and new technologies can help ensure that jobs are completed on time and on budget. Change can be difficult, but companies willing to accept some level of risk might be rewarded with faster project completion, potential cost reductions, and better utilization of assets. Proper training is key to mitigating the risk.

For more information, visit www.millerwelds.com.



Advanced welding processes such as pulsed MIG and RMD offer consistent weld quality and increased productivity thanks to travel speeds that are three to four times those of stick or TIG.

Silicon Valley's Western Allied Streamlines Field Work, Office Processes with Viewpoint Technology

Based in the San Francisco Bay Area, design-build contractor **Western Allied Mechanical, Inc.** has been using **Viewpoint** software for over a decade. As a result, it has streamlined project management and processes—for example, cutting RFI response time from days to minutes.

Western Allied adopted Spectrum, a completely integrated construction enterprise resource planning (ERP) software, in 2005. The move helped Western Allied significantly modernize its operations, drastically reducing its reliance on paper and manual processes—like spreadsheets and duplicative data entry into disparate construction management solutions—to facilitate workflows, accounting, and financial reporting. Several years later, when Spectrum became the first construction ERP to move to the cloud, Western Allied took advantage of the easy, browser-based access to construction data and collaboration tools in real time to further improve productivity.

Opening the Box

Operations Manager Jim Jeffrey said Western Allied really committed to “opening the box”—that is, taking full advantage of Spectrum’s features. The company deployed Spectrum’s document imaging functionality throughout the company, implemented deep reporting and business intelligence tools, and tracked productivity in its sheet metal and piping shop. As a result, it has streamlined project management and job compliance tasks.

“Using Spectrum’s job compliance features really helped in keeping us on track, knowing when all of our

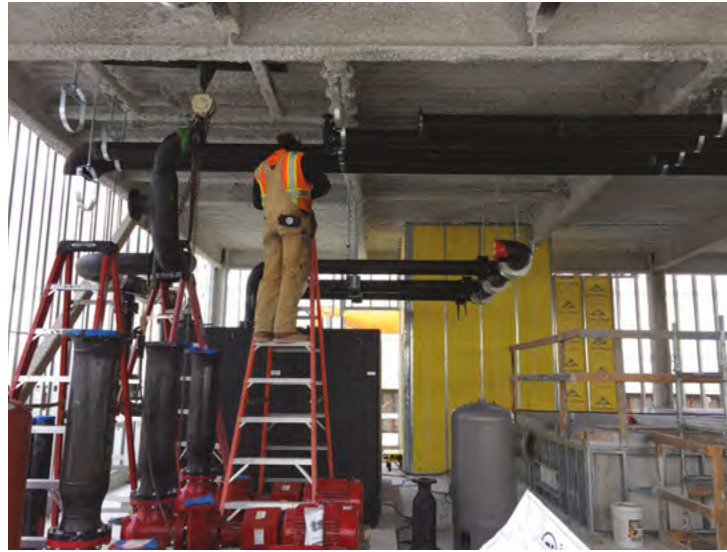
compliance documents are completed,” said Project Administrator Donna Nielson. “It makes it very easy to see, with Spectrum’s dashboard, when you’re out of compliance. You can just click on that dashboard item and drill down.”

Western Allied has taken part in several product and new functionality beta tests with Spectrum and Viewpoint. This year, it is beta testing both Viewpoint Team™ and Viewpoint Field View™ products.

“We’re finding Team to be a very powerful program. It allows for the compilation and organization of submittals and RFIs and other project documents. It has shortened our RFI response time from days to literally minutes,” Jeffrey said.

“Field View, meanwhile, allows the field to provide on-the-fly issues logs and punch list documents to be sent to project manager and office support personnel,” Jeffrey continued. “This has been both a refinement and a boon to our field QA/QC issues. This product has and will speed up the zero punch process that we employ.”

Western Allied has also embraced Viewpoint’s Service Tech solution, increasing efficiency among technicians in the field and for back-office processes. The company can now keep a digital history and enhance scheduling of its entire service department—that is, everything from electronic dispatch to time keeping



With Viewpoint’s Field View technology, Western Mechanical’s workers in the field can quickly complete and send punch lists to project manager and office support personnel. “This product has and will speed up the zero punch process that we employ,” said Operations Manager Jim Jeffrey.

and site history to work orders and purchase orders.

“When I saw Service Tech, I was really excited because it looked to be just what we needed,” said CFO Jeff Pierce. “We wanted a solution where we could push out work orders, service calls, and preventative maintenance tasks and be able to get the time back in and facilitate the billing process quicker. For a CFO, that’s always important.”

Keeping pace with the changing technology and landscape of the field is important to Western Allied. “We have clients that are very dynamic companies, and their needs can change even between the time you’ve started a project and when you’ve delivered it,” said Jeffrey.

Western Allied was awarded Viewpoint’s 2017 Innovator of the Year for Spectrum. Watch the company’s full story from the link in the online version of this story.

For more information, visit viewpoint.com.

Four Ways Specialty Contractors Can Reduce Construction Rework

Rework plagues owners, managers, and subcontractors alike. It is one of the biggest reasons for stagnant and declining productivity and steals hours, days, and even months from projects. In some cases, it causes such severe missed deadlines and budget overruns that subs fail to meet contracts, facing legal consequences or, at the very least, the potential loss of their good name and future business.

Much of the rework that is seen as a “necessary evil” by subcontractors can be avoided through better collaboration and more efficient processes. With these tips from [PlanGrid](#), you can learn the common causes and effects of rework—and avoid the need to fix what has already been built.

Common Causes of Construction Rework

First and foremost, it pays to understand why rework crops up:

- **Design changes and errors:** Plans change frequently for a myriad of reasons; mistakes happen, or there is a misalignment between what is designed and what can actually be built.
- **Missing documents and details:** The information that teams need is hard to come by or, even more commonly, the information is not available when it is needed.
- **Lack of collaboration:** Work environments may fail to encourage teamwork and might even create adversarial relationships between stakeholders.
- **Poor communication:** Teams may be unable to exchange information

while in the field, especially when project data are stored in a trailer hundreds of yards, if not miles, away.

- **Ineffective procurement:** Teams may fail to get supplies on time or get the wrong materials and supplies altogether.
- **Schedule pressures:** Problems can arise when rushing to meet a deadline or failing to adhere to designs or quality standards.

How Much Does Construction Rework Add Up?

The consequences of construction rework can significantly undercut your bottom line or even bankrupt you if the owner or other major project stakeholder is unhappy enough to litigate. According to some estimates, between 4 and 6 percent of total project cost is due to rework, and that is only counting direct cost or what is reported. This estimate fails to capture all the little side projects and do-overs that suck up so much of a worker’s time and job materials.

If rework is not properly documented, subs can end up taking the blame and footing the bill for a large portion of it. Even if the worst does not happen, rework still results in lost money, lost time, and massive frustration.

One of the biggest challenges to meeting final project deadlines and intermediate markers is productivity. Unfortunately, rework is one of the biggest productivity sucks. In some cases, it can negatively impact productivity by up to 300 percent. A full 30 percent of all work performed by construction companies is simply just fixing something that was not done right the first time.

Losing time and money is a source of serious discontent for everyone on a project—especially the boots on the

ground. Rework takes a toll on morale, with subs having to tear down work they thought was already complete. In turn, worker frustration can negatively impact productivity and motivation, which begins a new cycle of lost time and money, and on it goes.

Four Ways to Reduce Rework in Construction

Most rework results either from missteps in the early stages of a project or from systemic problems that plague a project throughout. Here are four ways specialty contractor teams can reduce rework.

1. Ditch Paper and Manual Processes

It’s simple: using paper and relying on outdated technology—such as Excel spreadsheets and lengthy email threads—lead to consistent errors and miscommunication. These methods do not track changes in real time. Subcontractors are forced to trek long distances to an office for information they need, and then it is often too late to make good use of it. Instead, go digital and adopt technology to automate some of those tedious and typically error-ridden administrative processes like submittals.

2. Align Project Teams Early On

When all stakeholders and subcontractors on a project treat their jobs as independent of others, chaos is likely to prevail. Rather than letting havoc reign, consider working towards more collaborative delivery methods that treat everyone on the project as part of one firm. When team members are aligned at the start of a project, motivations shift from “How can I do my part?” to “How can we complete the project together?”

3. Improve Field Communications

Communicating in the field is hampered by many roadblocks,

resulting in frustrations, delayed schedules, and, yes, rework. Cloud-based technology and collaboration software allow team members to keep each other up to date about changes and make sure plans reflect the latest, regardless of whether the jobsite has cell or internet service. The right software provides instant access to your project documents, is easy to use, and keeps communications centralized so everyone knows what is happening in real time.

4. *Set Quality Standards*

Project closeouts are often delayed because of concerns about the quality of subcontractor work. To reassure general contractors and prove things were done correctly the first time, adopt systematic standards for processes, workflows, tools, and equipment. Institute a system of checks and balances to ensure quality assurance and quality control measures are consistently met to reduce the potential of construction rework.

At the end of the day, rework starts with early action. If you understand the most common causes and take immediate and concrete steps to alleviate the potential for problems, you are far less likely to suffer at its hands. By keeping these tips in mind, you can avoid cost overruns, missed deadlines, and unhappy general contractors and owners.

For more information, visit www.plangrid.com.

VEIGA

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I'd say probably 98 percent of our work is Viega. Really, it's a Brandt standard." The new campus includes several office buildings and a specialty building, plus multiple parking garages on about 100 acres of land. The main plant has five 1,200-ton chillers and five cooling towers to deliver the chilled water to the buildings. That work was all done in ProPress Copper, sizes 3" and smaller. Approximately 75 restrooms across the campus receive hot and cold water run via ProPress as well.

"We used a lot of fittings," Hawkins said. "A lot."

Hawkins pointed out that Brandt has a large stock of ProPress guns, and that it is easy to train new employees on them. At first, he said, the cost of tooling was concerning to some, but after so many years and countless dollars saved on installation time, everyone can see how quickly the tools pay for themselves. Plus, the ease of use of ProPress is important for the way Brandt runs their installations.

"We have a pretty rigid policy. Every joint that's made, it has to be signed off by the installer. He puts his employee number on the joint," Hawkins explained. "In our many years of use, we might have had

a couple of issues, but they were installation issues, not issues with the fittings."

Viega District Manager Joel Armstrong lent a hand at the beginning of the project, training some of the employees working on the installation to make sure everyone was on the same page. Hawkins said Brandt usually conducts a refresher course for large projects like these so that there are no issues down the line during installation.

Brandt's crew of approximately 170 workers plumbed the entire multi-building project, finishing in August 2017.

For more information, visit www.viega.us/en/homepage.html.

KEY2ACT

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With Connect, Brandt also has more independence when it comes to data acquisition and it can better partner with controls vendors. "I don't have to rely now on the controls contractor," said Spry. "If I can tell him he doesn't have to create all his trends to take up all his memory, that I've got it, then we're in a partnership. Some of the major controls vendors in our

area, now when I come onsite, they understand exactly what I'm doing and how I'm going to be there to utilize my software to help them finish their checkouts."

Stellar Tech Support

Brandt has been using Connect for several years now, and during that time Spry has been impressed not only with the product but also with the team behind it. Response times are quick, and suggestions for product

improvements are often implemented. If Brandt comes across an issue that they cannot quite solve on their own, KEY2ACT is quick to help, Spry said. "I've had solutions within 30 minutes," he continued. "It's the best tech support I've been associated with.

"For me, KEY2ACT is the most powerful tool I have for what I do in my job."

For more information, visit www.KEY2ACTConnect.com.

MacMiller Sees Bright Future with XOi Vision

Video Technology Attracts Customers, Speeds Payment

Within 90 days of adopting the XOi Vision™ platform's field service management program See, MacDonald-Miller Facility Solutions (MacMiller) landed a huge national account, based in part on the company's use of video technology. With See, MacMiller technicians can easily link video and photos to customer accounts through mobile devices.

Growing Demand for Digital Communication

MacMiller is a full-service design-build mechanical contractor that focuses on making buildings work better. Their clients include Nike, Boeing, and Microsoft. MacMiller wanted technology to help set the company apart from competitors, improve customer engagement, and empower employees to communicate better with each other. Company executives identified mobility and collaboration technology as two key growth drivers of success.

MacMiller recognizes that strong customer engagement is vital in service-oriented trades. Trust must be earned, which is especially challenging when customers work offsite or in regional offices, affording little or no opportunity for face-to-face contact. New and younger customers demand a higher level of communication and collaboration from their field service providers. MacMiller executives worked with technology partner KEY2ACT and XOi Technologies to create KEY2ACT's See software, powered by XOi.

Seeing Is Believing

From MacMiller's perspective, one of the biggest Vision benefits is the opportunity it provides to increase customer engagement. Much of the work done by MacMiller, like pipe

and duct work, is hidden behind walls. Video and photo documentation allows customers to see exactly what technicians are doing.

At the start of each job, technicians wearing smart glasses record a short video showing the equipment to be maintained or repaired, while introducing themselves and describing the work they plan to do. Photos and video are automatically streamed to the cloud, creating one central repository of visual evidence. At the end of the job, technicians record another video summing up their work. When the call summary report is emailed to the customer, it contains a link to access the visual content.

See how XOi Vision integrates into KEY2ACT to provide techs with a seamless experience:
<https://youtu.be/fJdnryqDGjg>

"While there are incredible operational efficiencies that enable mobility and collaboration for our staff through telepresence and increased accountability, the real benefit of this technology is that our customers can now witness firsthand the current state of their building through a multimedia experience," said Bradd Busick, MacMiller's chief information officer.

Service Foreman Travis Espheter added, "To me, the coolest thing is the customer's reaction when they get it. They're pretty shocked that there is this technology out there."

Video Documentation Speeds Payment

The ability to better understand the work completed helps customers pay bills faster, with fewer phone calls to MacMiller. A large site may have



MacMiller Service Technician Neal Henry uses smart glasses equipped with a camera and software powered by XOi technology to capture his work onsite. MacMiller finds that customers pay their invoices more quickly when they can see exactly what work has been done.

20–50 service calls in a month, and when the customer reviews a bill, they often cannot remember the details associated with each charge. Access to pictures and video clarifies each job.

See improves customer engagement and delivers a service experience that differentiates MacMiller from competitors. Instead of spending customer meetings going over bills and work orders, service managers focus on future projects. See also helps attract new customers.

As MacMiller CEO Gus Simonds said, "Anytime we can get some more client engagement creates a higher level of trust. If we can help that building operator make a better decision about something, then I think he'll be more confident about what MacDonald-Miller can do for him."

For more information, visit www.xoi.io or call 800-230-7047.