Technology leads to safer, more efficient construction work

By SETH WALLACE

In the beginning, there was a plan, there was material and there was manpower. These three components have been the cornerstone of one of the most basic human needs — to build shelter — since time immemorial.

More specifically, anthropologists date the beginnings of what we broadly refer to as "construction" to roughly 7,000 years ago. As the Stone Age ended, humans began to delve into more complex and ambitious shelters. We left behind the hunter-gatherer lifestyle with its animal skin tents and began to manipulate timber, copper and iron. In China, evidence of wood joining has been dated as far back as 5,000 BC.

Jump in as we hit the turbo button on the Wayback Machine: from mud and adobe brick in Mesopotamia, we learned to cut and move stones in Egypt to build the pyramids; the Greeks gave us plumbing and the crane; Roman cement (hydraulic lime mortar) built an empire that lasted 1,000 years and temples still standing today.

By the time the Black Death finally left Europe in the Middle Ages, we'd mastered the rib vault, the segmented arch bridge and the blast furnace. Towering alabaster spires popped up all over Christendom, enabled by advances in Gothic architecture and spawning grand castles.

The spine of America was forged in the works of the U.S. and Bethlehem Steel companies and as America's urban centers crowded with immigrants and former soldiers after the Civil War, the only way to build was up. Along with Levi's, Coca-Cola and democracy, America's best-known export may be the skyscraper.

If we're going to build something, we still need a plan, materials and manpower but this is the 21st century! Axe-hewn logs have given way to structural composite lumbers and when the B.F. Goodrich Co. in 1926 commercialized polyvinyl chloride (PVC), it opened the door to an entirely new way to pipe and wire buildings.

The march of technology is unstoppable, and construction and building trades are some of the industries in which its impact can be most clearly seen. Construction technology doesn't just allow companies to move faster and do more — it's fundamentally altering how employers and employees are interacting with each other and their projects.

"I wouldn't say it's less complicated, but technology has taken away a lot of mistakes and a lot of lost time," said Pike Co. Executive Vice President Ted Orr, whose four decades in the business have given him a front-row seat to an explosion in innovation.

Starting from the very beginning of a project, all the information in the design phase is preserved on a dynamic, widely accessible computer server — no longer on a master set of blueprints, draft books or the imaginations of client and vendor.

Cataloged under the broad term of building information modeling (BIM), it's "been an amazing journey," according to Kyle Sayers, executive vice president and chief operating officer of Rochester's LeChase Construction.

"Most of our clients come to us with a need and an idea that isn't much beyond a need and an idea," Sayers said. "And we can use (BIM) to turn a picture, or if they say, 'we need X amount of square footage for Y program inside,' into a 3-D model and we can show them and talk about something that actually has form. Within hours, we can provide a comprehensive model with a precise budget and schedule."

A "sophisticated construction" operative in 1996, when Sayers started at LeChase, was required to possess a familiarity with the classic computer aided design (CAD) software, which produced 2D specs at a then-revolutionary rate and is still in wide use today.

But we don't live in a 2D world. Now with BIM modeling and logistic plans, combined with mobile geo-position satellite (GPS) technology, critical information about a job site can be auto-loaded "with everything you need."

"We can pinpoint to a fraction of an inch what would otherwise take a surveyor hours and hours to calculate," Sayers said. "It's a remarkable evolution and is tremendously efficient."

One of the alchemists behind LeChase's BIM magic — and what else can you call making a house appear out of thin air? — is Chris Preston, a 2006 Alfred State grad who now oversees what he calls "an exciting period of exploring new technology."

Orr **Sayers** **Preston**

"It's a great design tool, estimating tool and communication tool for customers," Preston said. "When we build something for customers, maybe it's the first time for them and they're not super well-versed in the process so the advantages to these models is helping communicate. If (the clients) want a door, you can draw a door, and it'll give you the height, width, manufacturer, depth. Every element is smart."

While Preston and his team are hard at work in the lab, Sayers says he remembers a time before the switch to computing-based construction — and doesn't want to go back.

"Technology really fosters and enables collaboration and information sharing out in the field," he said. "Back when, we'd have a roll of drawings, maybe a thousand drawings, and they'd be in the trailer and maybe three or four people would see them per day."

Now, tablet computers like iPads are the standard.

"Our folks in the field no longer are equipped with drawings rolled up under their arms," Sayers said. "Whenever an architect makes a change, it's updated in real time; workers can see it on touch screen monitors. If you're putting pipes together or wiring a building, you can call up the relevant section. It's a huge point of efficiency."

We've got the plans and we've got the materials but it's the "folks in the field" who ultimately are putting the project together. For construction firms like LeChase, which has "the safety of our team as a core value of our organization," Sayers said "awesome, revolutionary changes" are happening.

Work sites can be hazardous places, and it's a constant effort of vigilance to make sure everyone stays safe and stays responsible for their safety and the safety of others. But what if you could ease that burden by showing workers potential threats before they become disasters?

"We're good at avoiding high-risk hazards," Sayers said. "It's the mundane, everyday tasks that we're now working on."

It's called MindForge, a propriety technology currently in LeChase's R&D. By harnessing augmented reality (AR) software, Sayers says it's not science fiction to think soon, workers could be equipped with a heads-up-display similar to aircraft pilots.

"With these hardhats and glasses, we'll be able to see hazards in real time, right in front of people, reminding them to enhance their safety precautions," Sayers said.

Then there's one of the biggest obstacles facing construction companies: No matter how much funding companies around the nation and world pour into their tech budgets, there's one element no one can control—the elements themselves.

There's a reason it's called "construction season" in Western New York when the ground thaws and we finally put away the shovels and ice scrapers. With BIM software leading the way, construction companies are finding a way to extend their effective dates.

With all the architectural specs and 3-D modeling completed, workers can get down to business in "the perfect environmental conditions."

"It could be an electrical system put together on a bench then shipped, or mechical systems, we do whole bathroom and wall systems," said Orr. "Compared to whether it's the summertime and it's 90 degrees or it's the wintertime and it's snow and ice, any time you can do work indoors, you're going to be saving time."