

New tech changes

how design, construction happens



Cory Westholms uses a scanner to help map a building project.

COURTESY LAMP RYNEARSON



A robotic scanner can shorten surveying time and increase accuracy.

COURTESY LAMP RYNEARSON

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Not since the invention of the nail gun has the construction industry encountered so many technological developments that are revolutionizing—and streamlining—how builders design, construct and renovate buildings.

Indeed, if you Google “construction tech” and look at the lists of technology taking the industry by storm, you’ll see virtual reality and augmented reality, drones, robotics, building information modeling, exoskeletons for workers, wearable tech to promote safety and more.

The changes are coming at a rapid pace, enabling architects, engineers and contractors to speed through jobs like never before, with greater precision and attention to detail, and with greater customer satisfaction to boot.

Fortune magazine recently asserted that the construction industry nationwide, which has lagged behind other industries in use of technology, could gain \$1.6 trillion in savings if it

brings its productivity in line with other sectors of the economy.

In conversations with a few Boulder Valley and Northern Colorado companies in the building trades, here are a few real-world applications of technology that at one time was confined to the holodeck on Star Trek or super secret national defense strategies.

Geomatics

Engineering firm Lamp Ryneerson, with offices in Omaha, Kansas City, Lakewood and Windsor, groups several new technologies under the geomatics label. Geomatics is the collection and analysis of data related to the earth’s surface. Traditional surveying fits into that definition, but so do digital scanning of surfaces or structures, bathymetry or underwater topography, and volumetric surveying.

In essence, the company uses new digital tools to gather and then map data points in ways that help the company create three-dimensional models of things like mine shafts or reservoir bottoms. Lamp Ryneerson has

hired a technologist from the gaming industry to marry engineering data with 3D gaming presentations that simply and accurately portray what a customer needs to see to make decisions about a project.

“We’re able to show investors what they’re investing in,” said Warren Headlee, geomatics group leader for the company.

Depending on the scanner used, the company can achieve representations of vast areas on or under the earth accurate to the centimeter or millimeter. It used the technology recently to make certain that a massive, pre-built bridge to be set in place with multiple cranes would actually hit the pre-built attachment points. It did.

Bathymetric technology uses a GPS unit on top of the water and a sonar unit underwater. Using either a remote control boat or manually operated boat, the firm traverses a reservoir to determine capacities and whether any areas need to be dredged to provide more storage space for water.

The company recently surveyed



Cory Westholms shows a drone that is used to help produce a topographical scan of projects.



COURTESY LAMP RYNEARSON

Jackson Reservoir near Fort Morgan — a process that took about 40 hours. Before this technology, surveying the lake bottom might not have been possible with any degree of accuracy.

Cory Westholms, who works from the Windsor office, said he and others

from the engineering company recently provided information necessary for flood recovery work on an area southwest of Berthoud. Floodwaters changed a creek channel to go around a dam. Using aerial topography generated with a drone, the company mapped the area

before and after the repairs.

“It took a couple of days [with the drone] and we have more data than we’ve ever had with traditional methods,” said Westholms. Before this technology, it would have taken weeks to do the traditional surveys, he said.

Up on the roof

Commercial roofers, also, are using drones to help them determine the best approach to handle roof restorations. Drones can accurately map roofs, but equally as important, using

Please see **Tech**, page 8

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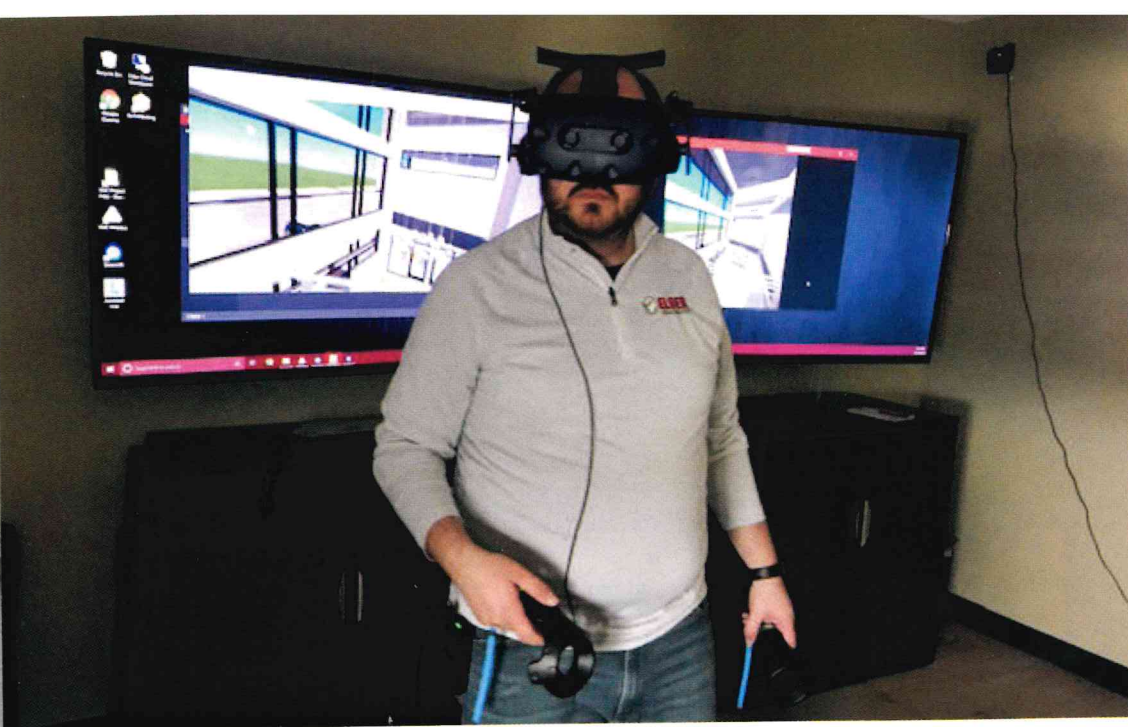
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Jaren Allred wears the goggles from a virtual reality system often used to help customers see a project before it is built.

Tech, from 7

infrared technology can help determine where heat loss is occurring and what areas might need special attention.

Bill Steeves, who operates Roof Restoration Inc., a Loveland company, said that material choices have enabled his company to help building owners restore roofs less expensively than had been the case in the past.

It depends, of course, on roof conditions and the circumstances where the building exists, he said. But often he can apply thermoplastic polyolefin, or TPO, roofs or silicone roof coatings to bring down costs.

TPO is applied from large rolls. Silicone is applied as a liquid that hardens. Depending on the process, the cost might be as low as \$3 or \$4 per square foot.

Unlike most roofing products, silicone is manufactured without petroleum components, and it doesn't degrade under the ultraviolet rays from the sun.

"It isn't a cure-all, but on viable candidates it saves money and energy," Steeves said. Silicone is also fairly

stable in price because it's made from an abundant natural element.

Virtual Reality/Augmented Reality

VR and AR are techniques that use real data — such as locations of walls or furniture — and extend that reality using computer simulation so that participants can have a near-real-life feel for how they fit in the environment.

And regional architectural firms and contractors are finding that they can improve their services to customers by employing it.

While the technology is sweeping the industry, a couple of the firms that began using it in the past year are Rodwin Architecture in Boulder and Elder Construction with headquarters in Windsor.

They've found that the technology increases accuracy of design and construction, prevents errors and gives the owner of building projects a pre-construction look at how they'll interact with the space being built for them.

It can be especially useful

for small manufacturers or medical professionals or retailers that might build only one or two structures in a career.

"They [the owner] might not understand the spatial relationships that are represented on a drawing," said Jaren Allred, virtual design and construction manager for Elder.

Elder has a dental office specialty niche, among others, and Allred cited a specific application that the firm has used.

"A dentist [using VR] can sit in an exam room and see exactly where a tool will be placed within the design. The dentist might want it five inches one way or another to avoid having to reach for it," he said.

VR can also bring in data such as the position of the sun at all times of the day and year. That can permit an outdoor balcony, for example, to be visualized at times when it is most likely to be used. VR permits Elder to make changes before construction is underway or done.

Scott Rodwin, owner of Rodwin Architecture, designs

both commercial and residential structures. He said it's particularly useful in a couple of instances.

"A first-time builder of a home might not be used to seeing blueprints," he said. Virtual reality gives that owner of a new home a chance to experience it while it can be easily changed.

In commercial projects, which have larger open spaces, the customer is able to see how light enters the space, how finishing textures look, whether there are reflections, Rodwin said.

"Houses have individual rooms but a commercial structure like a restaurant has large spaces and the overall ambiance of the building needs to be considered," Rodwin said.

He recently designed a restaurant, and the VR enabled the customer to move through the whole space, to see the palette of materials, and to get a sense for how lighting and colors would work.

The technology has become powerful because of changes in how buildings are designed. No longer are building plans created on a drafting table with a T-square and pencils of multiple densities and points.

"Architects were trained to visualize in three dimensions but convert to two dimensions," Rodwin said. Now, building plans are created in three-dimensions instead of two using digital programs. And all the data from the 3D program can be exported to a virtual reality or augmented reality program to create a pre-construction experience.

Allred said he considers himself fortunate to work for a company that embraces technology. "We want to be a disrupter in the industry, to be ahead of things and to make ripples in how things work," Allred said. VR and AR provide that opportunity.