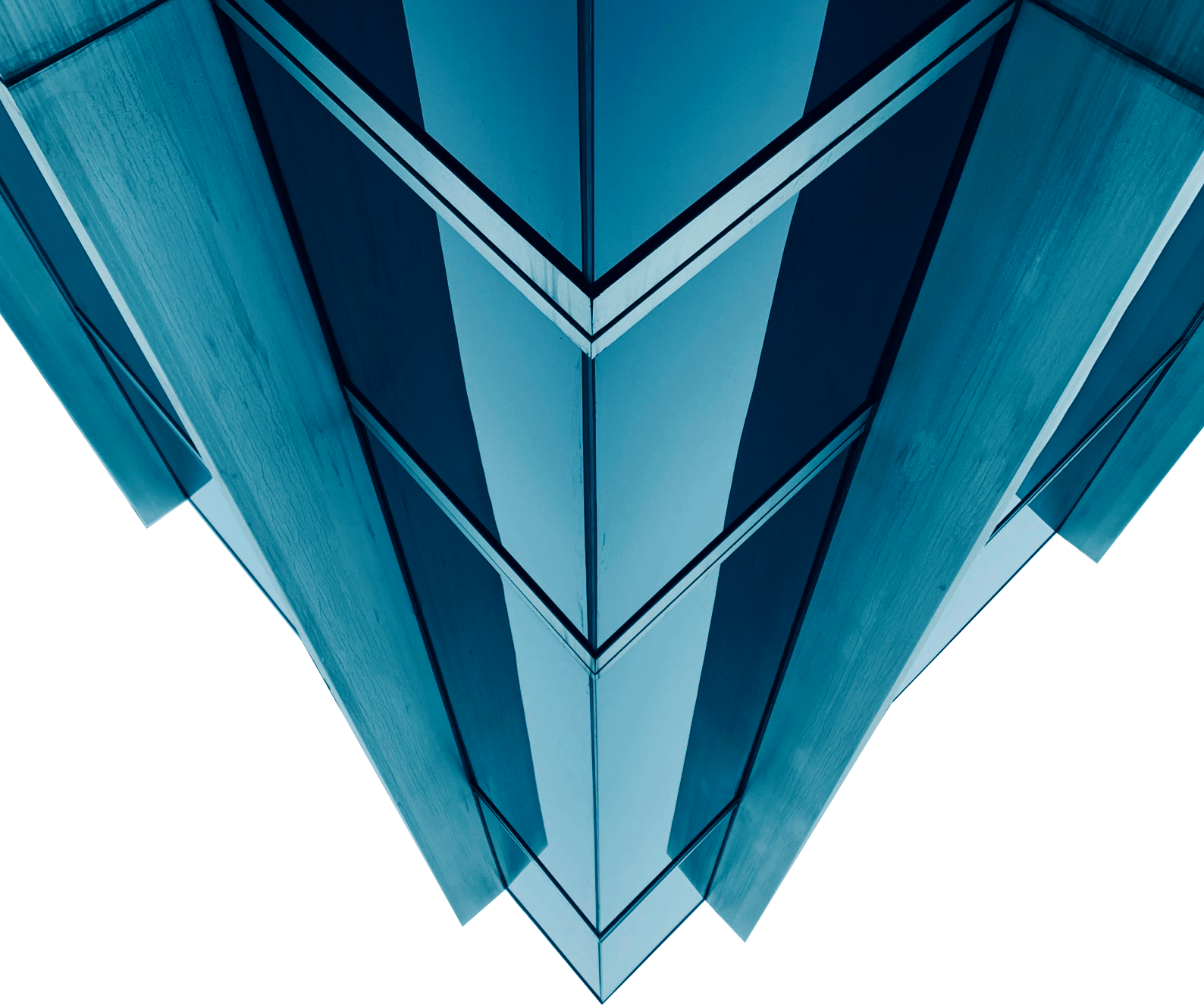




aurigo®

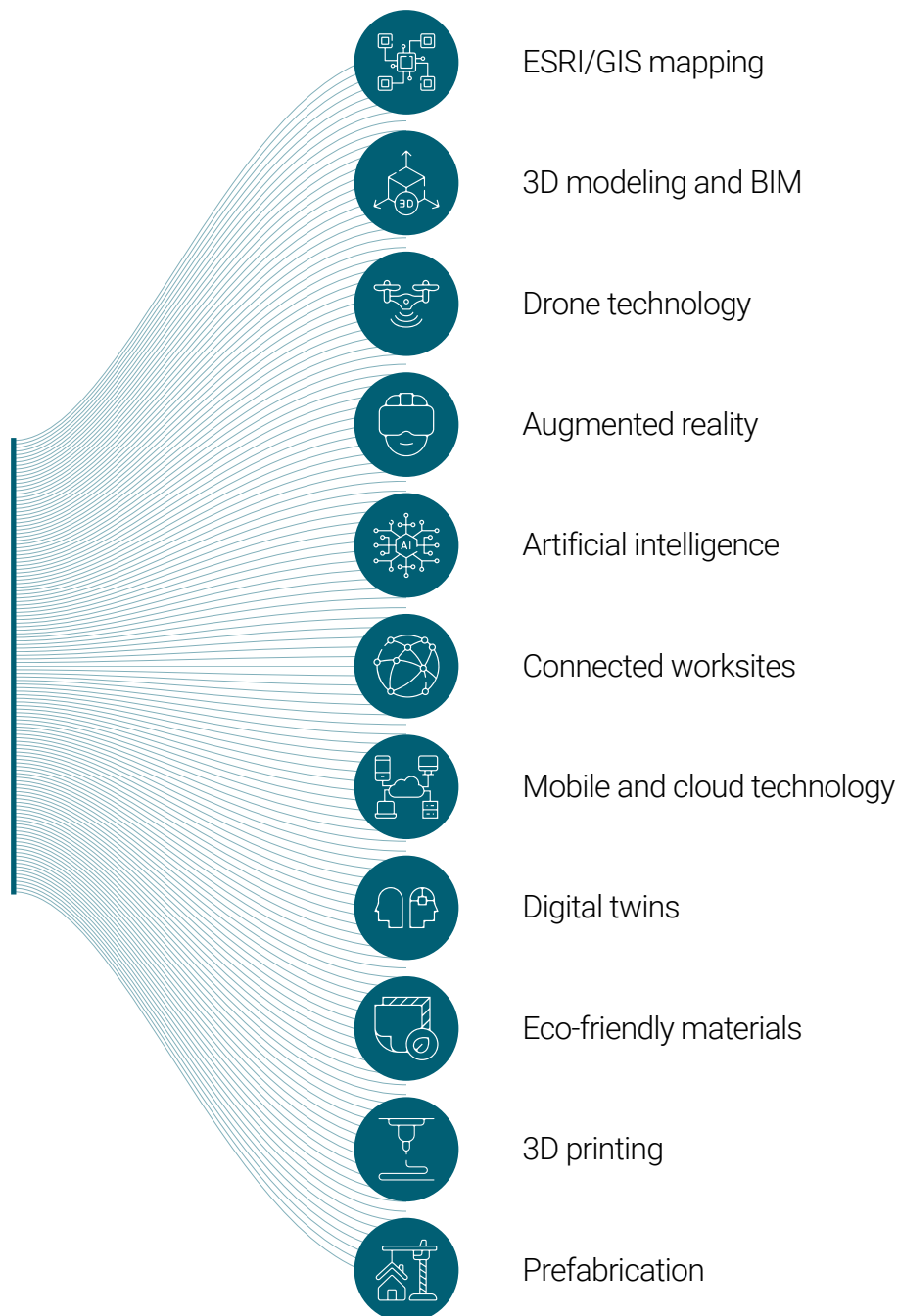
technologies

CHANGING THE WORLD OF CONSTRUCTION

In a [2016 report](#), Imagining Construction's Digital Future, McKinsey noted that "the construction industry is ripe for disruption." Fast forward five years, and the disruption has arrived in full force. However, this disruption is just the change the industry needs to boost productivity, reduce cost, schedule overruns, and digitally catch up with other industries. The 2016 McKinsey report predicted higher-definition surveying and geolocation, next-generation 5D Building Information Modeling (BIM), digital collaboration and mobility, the Internet of Things (IoT), advanced analytics, and future-proof construction design would be technology disruptors that would shape future projects.

Many new technological advances have made their way to the construction industry. Some are new and exciting tools, while others have been around for a while and keep improving with time. These technological advances are paving the way for the industry to boost productivity, increase transparency, and prepare for more sustainable and eco-friendly buildings. With the Infrastructure Investment and Jobs Act (IIJA) allotting [\\$100 million](#) towards technology over the next five years, now is the time to explore and onboard new technology and upgrade existing programs.

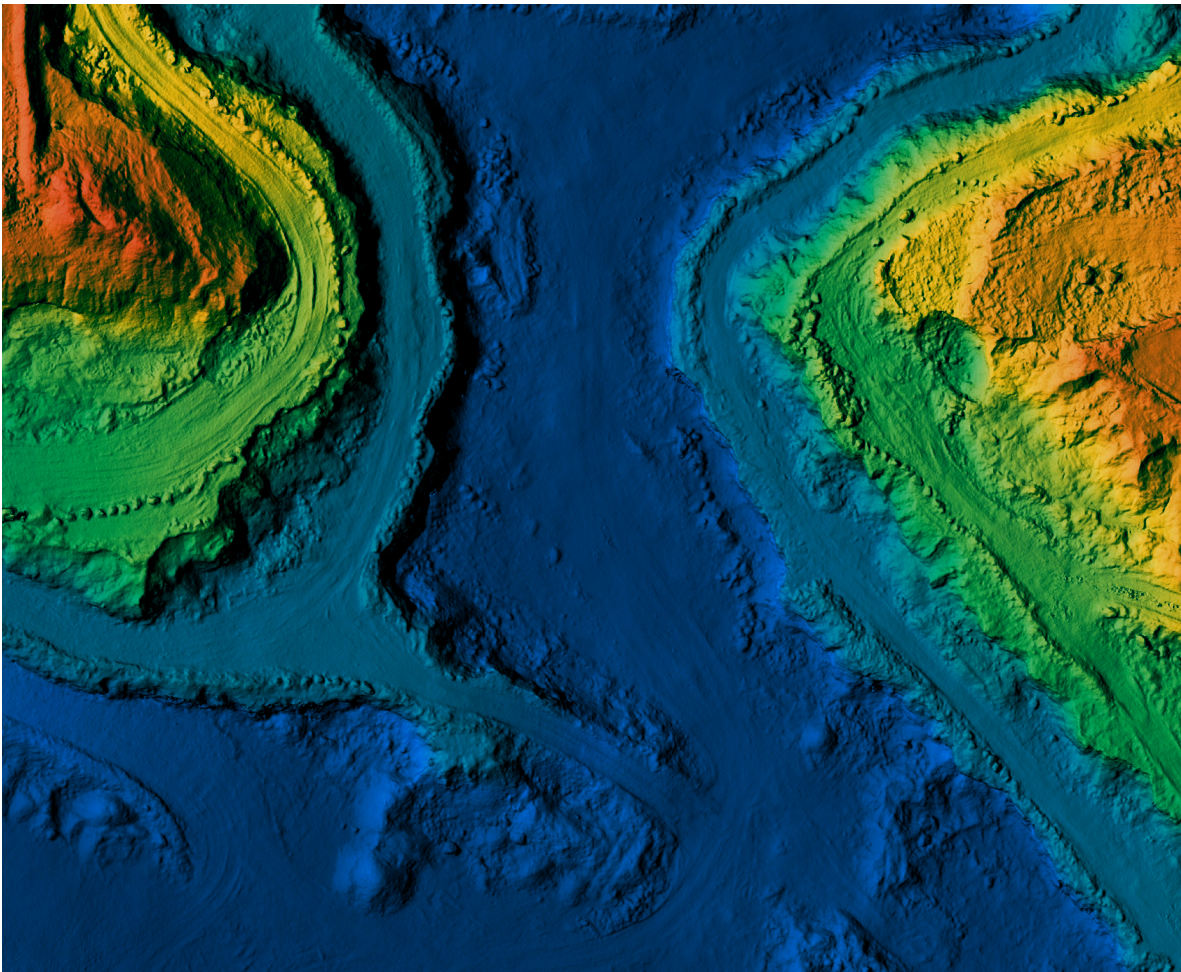
TECHNOLOGIES THAT WILL SHAPE CONSTRUCTION AND CAPITAL PROJECTS



ESRI/GIS mapping

You are likely familiar with geomapping tools by now. In the simplest terms, geomapping uses location information to display data. A [Geographical Information System](#) (GIS) connects your data to a map, integrating location data with descriptive information. In nearly every field of construction, agencies are using GIS technology to get accurate representations of data and locational considerations.

You're equipped for sound decision making when using geomapping with other tools, such as 3D surveying software. You can use these powerful tools together by overlaying GIS information with sophisticated land survey images. Building these interactive maps will help your organization work more collaboratively from the same data set. And, as this technology grows more sophisticated by the year, smart building habits will help mitigate risks.



3D modeling and BIM

While 3D surveying and geomapping are used in the early days of a construction project, 3D or 4D (or even 5D!) modeling and Building Information Modeling (BIM) are increasingly common tools being used for built assets. BIM is a representation of the physical and functional characteristics of a project. It can be something as simple as an electrical outlet or something more significant, like a gas line.

The use of BIM will last throughout the entire building life cycle, from planning to maintenance to operations. Beyond that, BIM can be integrated with design, cost, and schedule in a 3D output.

According to the [McKinsey](#) study, 75% of those that adopted BIM reported a positive return on their investment. And that was five years ago. They also reported shorter project life cycles and savings on paperwork and material costs.

'[Green BIM](#)' is a new terminology used in green building. Using BIM technology can help architecture, engineering, and construction firms to improve sustainability in the built environment. Furthermore, it can allow architects and engineers to integrate and analyze environmental issues in their design over the asset's life cycle.



Drone technology

Drone technology has gained popularity, and there has been mainstream adoption across many industries over the past decade, with use on construction sites becoming commonplace. In fact, drone adoption in construction has outpaced other industries, such as agriculture and real estate, with a [239% increase](#) in adoption. Drones can be used to record images and videos, survey, inspect, and manage construction sites. With the use of aerial images, construction professionals can map projects, create status updates, and integrate with sophisticated analytic tools. Images

captured by a drone can even be integrated into BIM technology to give a comprehensive view of a project.

Beyond land and project site imaging, drones can also be used to keep track of equipment and vehicles with a quick flyover. According to the [National Equipment Register](#), over \$300 million worth of construction equipment is stolen from job sites every year, with less than 25% of it recovered. Drones can provide a quick and easy way to surveil job sites, improve security, and curtail theft.



Aurigo is currently working with robotics experts at the University of Florida to explore the use of automated drone technology to support quality assurance during and after construction. The Autonomous Drone Program aims to redefine how owners and contractors inspect Infrastructure in the future.

Augmented reality

Imagine if you could step into the walls of a building and see what's behind it. Or maybe a team member can't be on a jobsite but needs to see something specific. That's what you can achieve if you combine your BIM technology with Augmented Reality (AR). These technologies already exist; some construction sites use the high-tech duo together. [In a survey and trend analysis of AR and VR \(Virtual Reality\) adoption](#), researchers found that AR and VR technology used in the Architecture, Engineering, and Construction (AEC) industry will see

'strong growth' in the next five to ten years. The use of AR in construction will improve collaboration and improve safety through the use of embedded information.

Construction workplace fatalities cost the industry billions per year. These incidents can be significantly reduced with safety training programs through AR. From visualizing the 3D data of on-the-job hazards to enhancing site inspections with AR, incorporating AR into your projects is more common than ever.



Artificial intelligence

In its simplest terms, sentiment analysis, or Artificial Intelligence (AI), uses technology to review a set of data for positive, negative, or neutral tones. It can also scan for emotional feedback, such as happiness, frustration, anger, and so on, and then automatically weigh this feedback in an easy-to-read format for your team. Using sentiment analysis to consider areas such as public feedback can eliminate a considerable amount of time spent processing and understanding the data, offer real-time analysis, and ensure the data you get back on each project is consistent. [Potential savings](#) from data analytics and related technologies, such as AI, may amount to as much as 10% to 15%

of total construction costs.

This cutting-edge technology can review, analyze, and instantly categorize comments for you based on each comment's sentiment and feedback. A real-time dashboard and reporting system can show you comments, distribution over a region, public rating score, comment disposition, and more for each project and campaign.

AI can also be used to run autonomous devices such as drones and vehicles, monitor equipment, tools, and supplies, and take your surveillance systems to the next level.



Connected worksites

The [Internet of Things](#) (IoT) describes physical objects (or groups of such objects) embedded with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the internet or other communications networks. IoT will make your entire capital program work together more effortlessly, from the technologies listed above to your construction management systems.

With team members in the field and the office, having systems feed information to one another brings a whole new efficiency level to a project. Having multiple software tools feeding data to each other ensures that the data you access is up-to-date, leaving less room for errors and reducing project risks. In fact, the [adoption of IoT](#) has soared in

the construction industry and will continue to see rapid growth over the coming years.

An example of IoT in construction is BIM technology adapting automatically to changes and updates in real-time. Autonomous trucks, drones, and other robotic devices will drive information through software systems, including your construction management system. [As McKinsey states](#), “in addition to the opportunities from the Internet of Things, the greater use of digitization in the construction-planning process and on the construction site itself is enabling firms to capture data that paper could not. Moreover, the insights gained through the adoption of advanced analytics in construction projects can help to improve efficiency, timelines, and risk management.”



Mobile & cloud technology

What would the IoT be without mobile and cloud technology? These days, many standard software and tools rely heavily on mobile and cloud technology. In fact, the IJJA has allocated \$100 million specifically for the use of mobile and cloud-based technologies. You can access your information anytime, anywhere, using your mobile device. Real-time data exchange between a jobsite, project managers, and stakeholders is becoming the norm.

Cloud-based software systems allow you to save and access crucial documents, contracts, approvals, and more in one location. Whether for capital planning, construction, or maintenance, having access to this detailed documentation at any stage of your project can make your project less susceptible to common risks. Storing information safely and securely will give your team insight into the status, schedule, issues, and details for every asset, parcel, and project.



Digital twins

A digital twin is essentially a digital model of a process, product, service, or in construction's case, a digital replica of a physical building. [Thomas Kaiser](#), SAP Senior Vice President of IoT, says, "Digital twins are becoming a business imperative, covering the entire life cycle of an asset or process and forming the foundation for connected products and services. Companies that fail to respond will be left behind." In 2019, [Gartner suggested](#) that 75% of

organizations would implement digital twins by the end of 2022.

Backed by IoT technology, digital twins can use real-time data to manage and update a physical asset through the cloud. Optimize schedules, stay on top of details, and ensure safety through the use of digital twins. Additionally, digital twins will help construct more energy-efficient buildings and use resources more effectively.



Eco-friendly materials

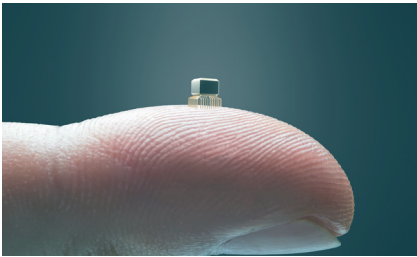
A much newer concept, eco-friendly materials, is gaining traction as the U.S. moves toward net-zero carbon goals over the next several years and looks for more affordable building options as costs of materials soar. Construction materials will make up a [\\$1.4 trillion global industry](#) by 2026, so new technologies, such as self-healing concrete, aerogels, and nanomaterials, can lower material costs, speed up

construction, improve safety, and quality.

According to the [World Green Building Council](#), the construction industry generates an estimated [39%](#) of the world's carbon emissions.

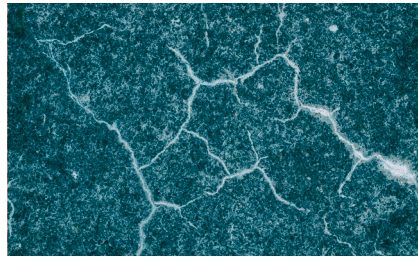
Implementing sustainable design, engineering, and construction practices will power relevant data to track, measure, and reduce emissions and waste throughout the project life cycle.

So, what are some of the cutting-edge technologies?



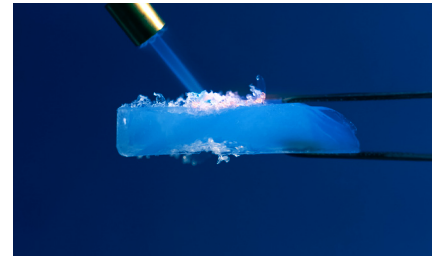
Nanomaterials

Nanomaterials will prove to be another vital tool in combating CO2 emissions in concrete production. [Nanotechnology](#) is the imaging, modeling, measuring, design, characterization, production, and application of structures, devices, and systems at a tiny scale. There are different types of nanotechnologies and materials being developed to aid in diverse construction areas, from paint to glass to concrete. Nanomaterials are strong yet ultralightweight materials that can potentially substitute for steel reinforcements in structures and foundations. However, they are still at the research stage.



Self-healing concrete

Surprisingly, by a [recent estimate](#), concrete production is responsible for around 9% of global CO2 emissions, more than three times the airline industry. If the industry were a country, it would be the third-largest climate polluter in the world. With self-healing concrete, whenever a tiny crack forms, the calcium carbonate fills it in, and a millimeter-scale crack can be filled within a day, preventing larger cracks from forming.



Aerogels

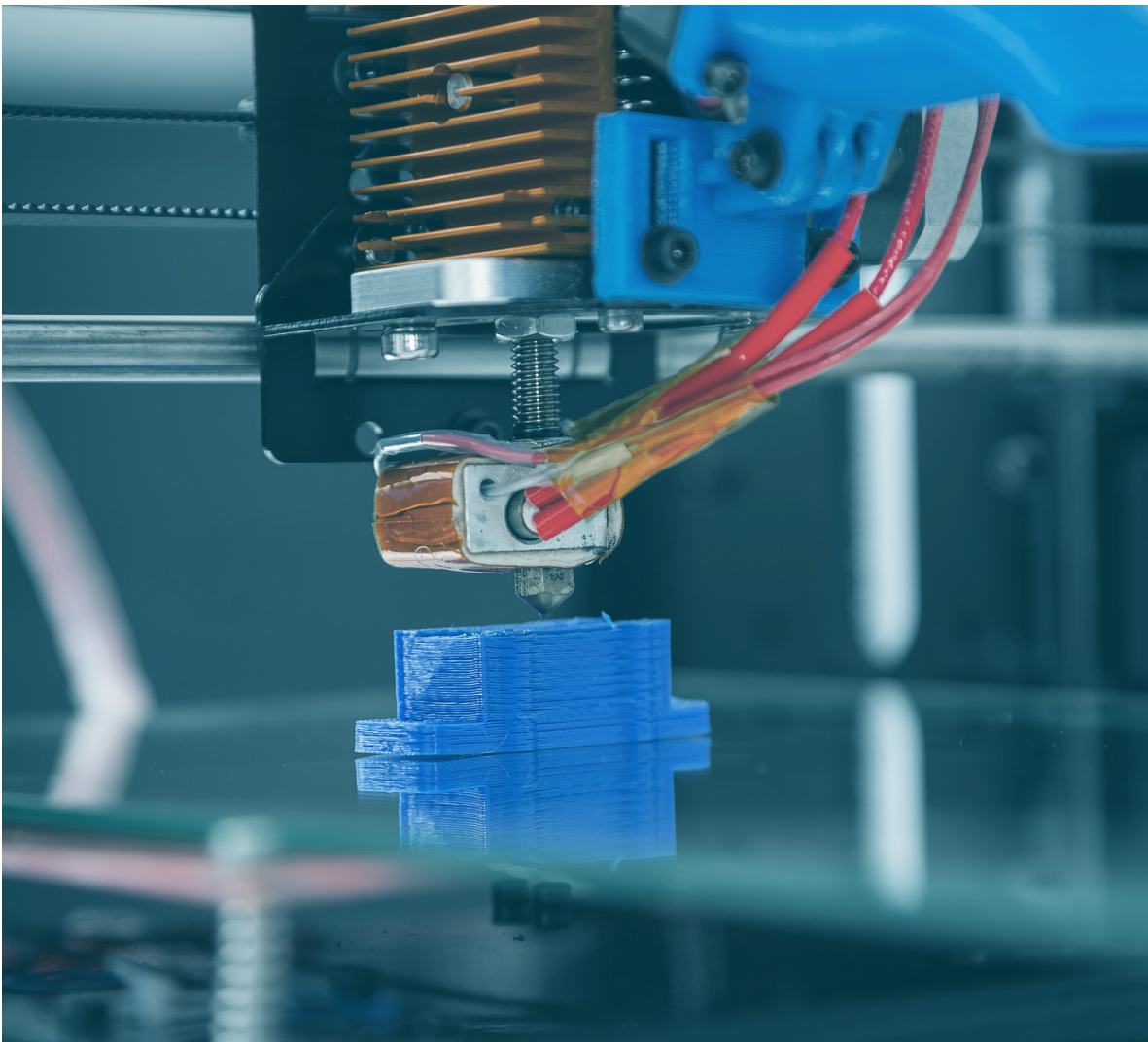
Aerogels are a sustainable building material used for insulation. Using aerogel insulation will boost the efficiency of the building. Formed by removing liquid from a gel, [aerogels](#) are synthetic low-density materials, and it will be exciting to see how this material is used in the future.

Curious to learn more about sustainability in the construction space?
Here is a list of [innovative sustainable construction practices](#) seen in diverse pockets across the world.

3D printing

There are various [3D printing methods](#) used in construction, with the main ones being extrusion (concrete, wax, foam, polymers), powder bonding (polymer bond, reactive bond, sintering), and additive welding. While still in the infancy stages of development, 3D printing at a large scale can produce submodules and concrete structures to be assembled on-site.

The 3D printing construction [market size](#) was estimated to be \$3 million in 2019 and is projected to reach \$1.5 billion by 2024. With capabilities to improve efficiency, sustainability, and building safety, 3D printing in the technology sector will continue to grow in availability over the next decade.



Prefabrication

Thanks to new tools like 3D printing and emerging eco-friendly materials, [prefabricated \(prefab\) buildings](#) and materials will continue to see growth. With prefabricated buildings, factory-made components or units are transported and assembled on-site to form the complete building. Prefab buildings can significantly boost efficiency. The process of prefabricated buildings has become so efficient in China that a builder in Changsha built a [ten-story building](#) in 28 hours and 45 minutes! While that may be a stretch, it is estimated that using prefabricated

materials can nearly cut the time of construction in half. Many retail companies such as Aldi and McDonald's are using prefabricated buildings to quickly open new sites.

Prefabricated buildings are surprisingly cost-effective, as well. Between savings on materials and time, modular building can help bring down project costs. Using prefab materials can also lead to greater jobsite safety. Since materials are created in a factory, there is [less risk](#) for moisture, environmental hazards, and dirt problems.



About Aurigo Software

Aurigo builds software that helps build the world. Aurigo is an AI-native company that helps capital owners connect planning, construction, and operations in a single environment, improving decision-making and execution. Trusted by over 300 organizations across infrastructure and facilities, Aurigo manages more than \$450 billion in capital programs, with over 40,000 projects throughout North America. Aurigo is a privately held U.S. corporation headquartered in Austin, Texas, with global offices in Canada, South Africa, and India.

Learn more at www.aurigo.com

Schedule a demo

Schedule your demo today to learn how Aurigo Masterworks can help your organization streamline information, accurately track and forecast, prioritize projects and help you save time and money.



Aurigo Software Technologies Inc.
Austin, Texas

sales@aurigo.com | (512) 640-3377

aurigo.com