

# EVOLVING TRENDS

## THE FUTURE OF CONSTRUCTION TECHNOLOGY & MATERIALS IN OMAN



# CONSTRUCTION TECHNOLOGY AND MATERIAL TRENDS

Construction technology and material trends are shifting. The truth is that as challenges pertaining to costs, both current and expected increases, time, and safety concerns continue to grow, new technology and trends must be addressed to reduce these challenges.

While these innovations are focused on future improvements, there are specific industry challenges in Oman that we must identify to move forward. Specifically, here in Oman, as in many other jurisdictions, we have a competitive and very fragmented construction industry, which seems extremely resistant to new materials and technology. Construction productivity globally has only improved 1% annually compared to 3.6% for manufacturing over past 20 years (McKinsey). At MEC, we believe the improvements in productivity in Oman are significantly less. To ensure Oman stays competitive with the industry trends, MEC has identified where the industry is moving, and how companies can confidently integrate these new solutions to answer the challenges the industry is currently experiencing.

In our world, we are seeing an increase in requirements for projects to be completed on time and within budget. Pressures on the commercial performance of the asset are much more important than say 10 years ago and the competitive pressures on designers and contractors are significantly increased. We do not see this changing in the next decade, so we must focus on how to reduce these pressures while remaining competitive.



The need for more flexibility from planning authorities, in our opinion, together with much more collaboration with contractors, subcontractors, suppliers, designers and PM/QS professionals is needed to make step changes in construction productivity.

Collaboration, we believe, should relate to contractual relationships (such as Integrated Project Delivery and Whole Life Costing), the promotion of new materials and technologies to build faster, more economically, and safer.



At MEC, we believe collaboration is key to identifying, and then introducing construction technology and material trends. To meet the increasing pressures of the industry, we continue to stay on top of global trends and innovations for the ultimate benefit of Oman and the Sultanate of Oman.

Below are some of the insights we've identified that will reduce, if not eliminate, many of the current challenges and problems Oman's construction industry is facing.

## **MATERIAL TECHNOLOGY**

Materials are changing. The technology being invented is focused on cost and energy reduction, transforming how buildings are being developed. Below are a few of the material technologies improving the industry as a whole.

### **HYDROCERAMICS**

This smart material is a hydrogel that is embedded in blocks. This then absorbs moisture and has shown to improve temperature levels in homes and office buildings alike. This provides potential to reduce HVAC requirements, helping to reduce overall electricity demand caused by traditional air conditioning, and costs involved with installation and monitoring.

### **LIGHT GENERATING CEMENT**

Imagine light without electricity. That is exactly what light generating cement does. A phosphorescent cement, this material absorbs solar energy to produce light without electricity. The uses for this type of material are endless, including lighting pathways, highways, and buildings, often for up to 12 hours. This helps to reduce energy consumption and waste, while bringing numerous environmental benefits.

### **TEXTILE REINFORCED CONCRETE**

High performance meets concrete with textile reinforced concrete. Due to its light, thin, load bearing components, along with its resistance to corrosion, this high efficiency material will replace re-bars and complex shapes, helping to reduce material consumption.

### **GREEN CONCRETE**

This concrete, which utilizes graphene-concrete composites, is revolutionizing the construction industry. Environmentally friendly, more durable, and twice as strong, green concrete has the potential to reduce the thickness of structural elements, overall loading and reduced foundation design. This material is one to watch as it changes the types of materials we use.



## **DRONES**

In 2018, commercial drone use in the United States alone was up 239% from the previous year. While there is still a need for formal regulation in how drones are used, they are a potential game changer for projects when it comes to mapping and assessing risk. Drones will help to create strong 3D maps to help gather and analyse information, monitor site progress, and identify potentially costly issues before they become cost prohibitive.

## **GREEN TECHNOLOGY**

Similar to innovations in construction materials regarding safety and environmental impact, there is a large focus on green technology. With continued research and development in green technology, the industry is already benefiting both in waste reduction and energy consumption. Highlights we've identified as potential benefits for clients include:

### **3D PRINTING**

The capability to print full structures allows for an increase in construction speed while reducing both waste and construction costs.

### **SOLAR SPRAY**

A transparent solar spray transforms windows into solar cells, providing the ability to generate electricity from both natural and artificial light.

### **FLOOR SYSTEMS**

Converting human foot traffic into electrical energy is green technology at its finest with this innovative, cost-effective approach.

### **LEED AND BREEAM BUILDINGS**

Both LEED and BREEAM continue to improve their requirements, ensuring that developments are being constructed in an environmentally healthy manner, while ensuring better health quality and safety for building tenants.

## **CONSTRUCTION WASTE REDUCTION**

There has been a growing focus on reducing waste on the construction site, both to improve safety hazards and reduce costs. As such, reducing inefficiencies is crucial to reduce construction waste. Specific trends we're seeing for waste reduction include using standard grids and material sizes, offsite construction and just-in-time deliveries, and emphasizing reduce, reuse, recycle, and only then dispose. The industry as a whole is becoming more cognizant of reducing waste and Oman's industry must do the same to ensure safe, quality, and cost-effective projects.



## **MODULAR AND PREFABRICATION**

Modular and prefabrication buildings are making waves in residential, commercial, and hospitality markets as they improve quality and safety, reduce on-site labour requirements and timelines, and ensure a more effective, streamlined project. For example, modular steel flooring panels are manufactured with mechanical, engineering, and plumbing (MEP) requirements designed to reduce costs, optimize materials, and achieve performance while remaining compliant. To date, a 32-story prefab multifamily residential tower in New York is demonstrating the power of a prefab modular building. For MEC, the primary benefits we see arising from this include reduction of imported labour needs, enhanced quality standards and an increase to local population involvement.

## **BETTER SAFETY EQUIPMENT**

Safety must be at the core of all projects to ensure any cost benefits or risk reductions. The innovations in materials are continually improving for safer projects, focused field workers, and less injuries on site. The following technology and material trends will continue to improve the safety of construction.

### **WEARABLE TECHNOLOGY**

Sensors on this technology assists with worker location.

### **BOOTS**

Boots are crucial to worker safety. Innovations here include the addition of WiFi access, ensuring workers remain connected while onsite.

### **PERSONAL EQUIPMENT**

Designed lighter and better fitting personal protection equipment, including harnesses, allows workers to focus on their work, not ill-fitting equipment.

### **EXOSKELETONS**

Construction is repetitive and labour-intensive on the body. Exoskeleton technology provides support for heavy, repetitive lifting work, helping to keep workers healthy.





## **BUILDING INFORMATION MANAGEMENT**

Building Information Management (BIM) is a project management tool based on 3D modeling. This provides a digital representation of the physical and functional characteristics of the facility, allowing for better foresight and management of the programs and costs in real estate developments. A useful collaboration tool for all stages in the construction process, BIM allows for any clash detections at an early stage, reducing the variations in the design stage. This, along with collaboration from all parties involved, has seen reduction of costs and waste is reduced and timelines are compressed because of streamlining and proactive issue identification.

## **AUTOMATION**

Regardless of industry, automation is growing. Within the construction industry, we are seeing this in the form of robotic masons. With the development of robotic masons, benefits are vast as the current skilled labour force ages out of the industry, without the same number of skilled labourers filling this gap. As such, robotic masons have the potential to remove repetitive and redundant tasks (e.g. bricklaying), while improving the safety of workers. In addition, robotic masons have shown to lay between 300 and 400 bricks an hour, compared to the average 65 – 70 of a labourer, reducing construction time, within reducing site safety.





## ABOUT MEC

MEC see a wide range of construction and material trends that, if embraced, could help improve construction productivity, quality, safety of workers, improved cost and programs for construction projects. These technologies and materials can support projects best when considered early in a project's lifecycle. MEC can assist at the early stage of the project to look at innovative systems from a cost/time perspective and can, through our Project Management team help to embed in the design phase and eventual implementation in the development of the project.

For support in identifying the construction technology or material trends for your next project, visit [www.majaneng.com](http://www.majaneng.com) or contact Kevin Ellis at [k.ellis@majaneng.com](mailto:k.ellis@majaneng.com).

### SOURCES

Al Mehdar, Zainab. (2018, September 11). The Future of Smart Cement. Retrieved from: <https://www.giatecscientific.com/education/the-future-of-smart-cement/>

Creighton, Jolene. (2016, October 31). New Flooring Tech Generates Electricity Through Your Footsteps. Retrieved from: <https://futurism.com/new-flooring-tech-generates-electricity-through-your-footsteps>

DroneDeploy. (2018, May 29). 2018 Commercial Drone Industry Trends. Retrieved from: <https://blog.dronedeploy.com/2018-commercial-drone-industry-trends-70b83e0a2e6f>

Materiability. (2017). Hydroceramic. Retrieved from: <http://materiability.com/portfolio/hydroceramic/>.

McKinsey Global Institute. (2017, February). Reinventing Construction: A Route to Higher Productivity. Retrieved from: <https://www.mckinsey.com/~media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/reinventing%20construction%20through%20a%20productivity%20revolution/mgi-reinventing-construction-executive-summary.ashx>

SGL Group. Textile reinforced concrete – new materials for construction applications. Retrieved from: [https://www.sglgroup.com/cms/international/innovation/future-carbon-technologies/sustainable-construction/index.html?\\_\\_locale=en](https://www.sglgroup.com/cms/international/innovation/future-carbon-technologies/sustainable-construction/index.html?__locale=en)

University of Exeter. (2018, April 23). Scientists create innovative new green concrete using graphene. Retrieved from: <https://phys.org/news/2018-04-scientists-green-concrete-graphene.html>