With DfMA, the Full Potential of Industrialized Construction Is Revealed

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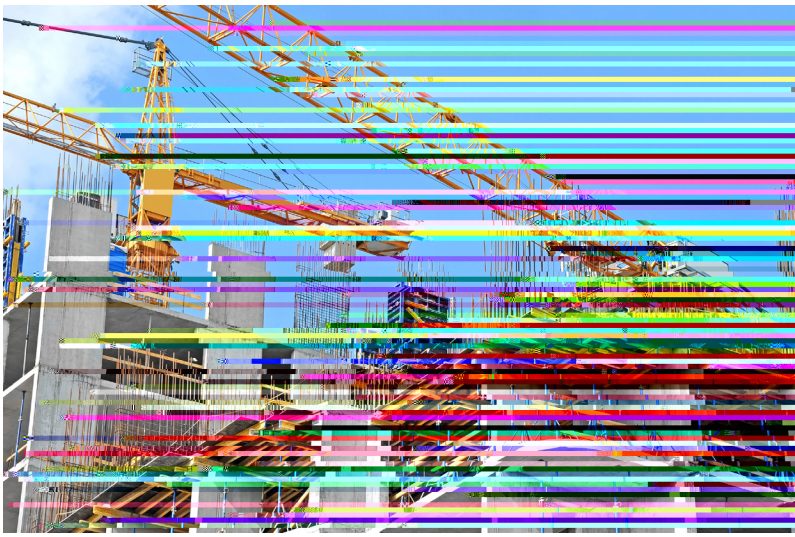
With trillions of dollars' worth of new structures to house, employ, and service the planet's exploding population in the pipeline, the pressure is on to build and build fast. But construction can be a chaotic affair. Pandemics, extreme weather, and geopolitical unrest can break supply chains and smash delivery schedules. Skills shortages make builds harder to deliver on time and on budget.

So how are companies in architecture, engineering, and construction (AEC) responding? It isn't easy to strip time, cost, and uncertainty out of a build - especially when advances such as composite ˛ooring, ready-made cladding, and bolt-together systems of every stripe have already streamlined construction processes to the hilt.

The answer for many is to rip a page from manufacturing's playbook with a process called design for manufacturing and assembly, or DfMA. DfMA forms part of the growing trend of industrialized construction and manufacturing-informed design, in which building systems and even entire buildings come together as separate but connectable products. DfMA encompasses a set of design choices that enables the productive use of manufactured products and prefabricated assemblies. In other words, building products and assemblies are manufactured ef˛ciently off-site in manufacturing facilities, then delivered on-site where they can be pieced together quickly, making assembly easier.

One of DfMA's earliest proponents is London-based design and engineering ˛rm Bryden Wood. Two decades ago, the



company recognized the need for an approach that blended the ef˛ciency and certainty of mass production with the highly bespoke, hands-on business of construction.

Every new structure requires assembly. The question Bryden Wood asked was simply, should it be brick by brick and pipe by pipe or involve connecting large, prebuilt assemblies and modules - cutting costs and realizing process improvements along the way?

Massive Needs, Limited Capacity

"Everyone's been talking about this for decades," says Jaimie Johnston, head of global systems at Bryden Wood. "What's

really brought DfMA to the fore are the aging demographic in construction, concerns about sustainability, and predictions of the world's population hitting 11 billion by 2100. All those people on the way need housing and education, health care, water and electricity, data center capacity, and so on. The needs of humankind are undeniable, but our capability to deliver these is critically uncertain."

Bridging that gap requires a serious course correction, Johnston

“We plugged in some key parameters and it automatically generated a data set that described the building and became the basis for the BIM model,” he says. “It was so fast that whenever we made a change to the building, rather than go back and adjust the model, we just generated a new one, which took about 20 minutes. In productivity terms, that was a game changer for us.”

The gains in terms of accuracy and time saved have also been impressive. Because the platforms arrive precut and standardized, time and materials spent ﬁxing and adjusting to tolerance problems typically encountered by ﬁnishing trades was cut to almost zero.

This productization of building components and manufacturing-informed design enabled the Forge complex to generate 30% less embodied carbon than in a normally constructed building. As a result, it’s the ﬁrst building to meet the UK Green Building Council’s deﬁnition of a net-zero of ﬃce.