



## Designing and building ... buildings and components

*by Marc Margulies, AIA*

Your automobile was built in about 40 hours, and it was assembled from pre-manufactured parts from all over the world. Parts for your television and cell phone came from a variety of factories because that is the most efficient way to design and produce a cost-effective, high-quality product. You have the option of designing your own computer configuration over the web, based on your own needs and assembled to your specifications.

Increasingly, buildings are being designed and constructed in a similarly efficient manner, which can be good for both the economy and the environment. While there remains a significant amount of on-site labor and craftsmanship required to build our offices, homes, schools, and public structures, we are rapidly learning to take advantage of the efficiency of pre-manufactured components. This is clearly the wave of the future, and will allow architects and builders to focus on the important issues of function and design.

The process has been gradual, but within the past 10 years there has been a huge increase in momentum. The mechanical and electrical components were the first “off-the-shelf” items to become available; we’ve been able to buy air conditioning and heating units, light fixtures, and elevator machinery produced in

factories for years. Likewise, furniture manufacturers have produced panels and electrical systems for “cubicles” since the 1950s, because the flexibility and ease of assembly was appealing to the marketplace. The newest trend is to design and specify as many products as possible that are factory produced, and delivered to the construction site “just-in-time”.

The advantages are not just financial. For architects, being able to rely on fully researched and factory-tested components relieves them of the responsibility and liability for complex systems and material interactions. For example, a window system that has been engineered to be energy efficient, waterproof, durable, and easy-to-install is likely a better choice than one designed from scratch. Interior partition walls are increasingly being pre-manufactured and shipped to reduce wasted materials, production energy, and labor. Raised floor systems allow full distribution of componentized electrical, low voltage, heating and air conditioning without having to fabricate individual and unique pieces of ductwork or cabling, while allowing much easier and faster installation and reconfiguration. Light fixtures can be selected that are pre-wired with connectors so that they can simply be snapped into a wiring

harness that is controlled by a sophisticated energy management software program. Carpet tile can be manufactured from recycled automobile tires and installed without objectionable adhesives, meeting “green” design standards. Exterior wall systems arrive on a truck such that they can be picked up and placed seamlessly.

### **EVEN TOOLS GET INTO THE ACT**

Even the more traditional construction is being streamlined. Gone are the days of hand tools in favor of cordless and pneumatic efficiency. Expanses of drywall can efficiently be installed with one worker wielding a screw gun, another using machinery to tape and spackle everything above six feet, while a third works only from six feet down. Laser systems align everything precisely. Steel girders and beams are manufactured to precise tolerances directly from the computer systems used to design them. And, of course, computer aided design is ubiquitous, with the promise of the ability, through Building Information Modeling (BIM), of being able to order the exactly specified materials and quantities directly from the architect’s electronic drawings.

Traditionalists will be skeptical that creativity will be hampered and that buildings will become increasingly homogeneous as we select our materials from a catalogue or the web.

That concern is ill-founded, since the clear direction in manufacturing is the increased flexibility through computer-aided design and manufacturing. All in all, the factory is a cleaner, greener, faster, and cheaper place to construct building parts. To the extent that we can plan for the construction site to be a place of assembly rather than manufacturing in the rain and snow, our urban environments will be cleaner, quieter, and safer, and our buildings will be more reliable and more efficient. Philosophically, this approach also allows a closer collaboration between the relative experts in each of the fields of design, manufacturing, production, assembly, and operation. Our world has become too technologically complex for any one person to be fully knowledgeable about how to deliver high quality in all aspects of design and construction, so an increasingly componentized approach is eventually going to make our buildings as well constructed as our cars, cell phones, and computers.

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