## Design-Build and the Structural Engineer

A Call for Leadership By Ciro Cuono, P.E.

esign-Build, though not new as a delivery method for building projects, appears to be on the rise. Traditionally known as the Master-Builder method, it is a means of building where one party holds responsibility for both the design and the construction. The Master-Builder method was the only method before the now ubiquitous design-bid-build project structure. The Romans for example, famous for their roads, aqueducts, and amphitheaters, did not design a project, bid it out to subcontractors, and then select the low bidder to build it, but rather designed and built structures in a collaborative, somewhat simultaneous fashion. In building a house for a client during Colonial times, one party, such as a master carpenter, was responsible for delivering the general layout and exterior details, selecting structural members, and completing construction. In this way, the carpenter acted as the architect, engineer, and builder simultaneously. The concept of design, bid, and build arose out of the natural specialization of the architect, engineer, and builder in the post-1850s world, where modern structural engineering was born and separated from architecture, and architects and builders fully separated as distinct and separate entities.

A century ago, an architect or engineer might be expected to design both the structural framing of a building and the heating and cooling equipment. However, the building environment of today, like most fields, is continually becoming more specialized and complex. Every 3 years, codes get a little thicker, new products and techniques continuously come online, and more highly specialized knowledge is developed.

Given the development of the field into specialized areas and the foreseeable continuation of high-depth knowledge, the idea of a single person Master-Builder is virtually impossible. Just like a country doctor in another era may have acted as an internist, surgeon, and obstetrician, today that would be unheard of, impracticable, and potentially dangerous. Therefore, the Master-Builder paradigm can only exist as a team effort among a group of specialists – an oligarchy of architects, engineers, and builders who work together to design and build a joint project as one team. While the idea of design-build is not new, I believe it will continue to gain more market share in the AEC industry for a few reasons:

- Technology: 3-D modeling programs, ease of file transfer and sharing. Greater technological sophistication of builders all will lead to increased and more natural collaboration.
- Competition: Increased competition in the AEC industry as a whole, including from emerging firms abroad, will lead to innovation, including inventiveness of delivery methods and construction techniques.
- 3) *Prefabrication*: Prefabrication of building components and whole buildings is likely to increase. This will doubtless be a natural evolution from 3-D modeling and manufacturing technology. Prefabrication of components like concrete panels and structural insulated panels is basically a design-build endeavor. It seems logical that this will eventually extend to whole buildings and, therefore, the whole design and build effort.

In the current state of practice, most designbuild projects are either builder-led or architect-led with some exceptions. In builderled projects, a general contractor provides design-build services and hires an architect and consultants to provide the design. In contrast, in an architect-led project, the architect, in conjunction with consultants, designs the projects and then hires a general contractor or acts as a construction manager and hires the various sub-contractors. In either case, the structural engineer is not in charge. Why is this? Why can the structural engineer not be in charge? Structural engineers design the primary and most crucial part of a building and we lead, in the literal sense, the construction effort. After all, buildings are not mechanical systems or excavation sites or facades - they are structures, and structure always goes first.

One can envision a future where structural engineers seize a leadership role and morph into a design-build paradigm in which they own and operate companies that design and build the foundations and framing systems of buildings and have, on staff, collaborative and capable specialists such as architects, technicians, civil and mechanical engineers, and seasoned construction professionals. In this concept, an Owner still retains a design Architect to put the Owner's vision on paper (or in a model) and then the Owner hires a company to complete the design and build it. In this vision of the future, a company that the Owner hires is a design-build company led by structural engineers who complete a traditional design role and act as master coordinators for the rest of the design and construction effort with fellow specialists.

Currently, in some states, a design-build model, as outlined above, is not allowed under one entity, and the design needs to be under a separate contract. However, the benefits of this design-build system are many. First, this would put structural engineers on top of the food chain, leading to more consistency in fees. Fees would no longer be simply fees but would have to be truly thought of as a percentage of the entire construction cost. Secondly, this would lead to greater efficiency of design. Designs could be more daring and less simplified if the structural engineer knows they have control over what happens in the field. Thirdly, working cooperatively and directly with sub-contractors who build structures (an invaluable experience that many structural engineers have had) would bring better and direct training in constructability and practicality. Additionally, this forced leadership role would elevate structural engineering practice and help to attract future talent.

I view this model as the future of our business, coming full circle to something close to the Master-Builder idea, albeit through broad-scale cooperation of highly trained specialists in varied backgrounds. While this model may not be attractive to all structural engineers, the idea of leadership and collaboration should be a goal common to all engineers.

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