Engineering for Life

By Kenneth D. O'Dell, P.E., S.E.

As a new engineer, I was at a site one afternoon struggling over a portion of a project not installed per plan. The contractors' position was that the plan asked for something that was not done. The design team's point was that they should have qualified their bid if the contractor knew this was not possible. My role was to defend specifying that the elevator guide rails for a 2-story wood framed building with less than 10-foot story heights needed to span floor-to-floor (i.e., a guide rail support tube would not be provided). While the details were eventually worked out, the outcome of this experience is the more important story.

As the argument progressed, the owner's representative for the project, a therapeutic equestrian center where horses could nurture children and young adults with disabilities, joined the conversation. He commented that he understood the tension of the situation we were trying to solve, but he asked that we turn around and witness the reason for the building in the first place. As we turned, a young boy was climbing into the saddle of his horse for the day. The smile on his face was big, but the care expressed in the eyes of his aide was equally powerful. This was the day I learned structural engineers don't design beams and columns or shear walls or elevator guide rails. Instead, we design places where life happens.

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This experience shaped my view of structural engineers' impact on communities and society. We all know teachers develop our children, doctors cure our ills and keep us healthy, truck drivers deliver everything we need from manufacturer and farm to market, and grocery and retail team members make sure the shelves are stocked with everything we need; the list is almost limitless. But what do all of these have in common? Every school, hospital, bridge, airport, retail store, warehouse, apartment, hotel room, home, and more was realized through the impact and contribution of a structural engineer. Without the structural engineer, the built environment and all that relies on it would not be possible. Structural engineers design the fabric of society…what greater impact is there?

Structural engineering creates the underlying support of buildings and infrastructure. As many explain, structural engineering provides the bones and muscles of a project. When coordinated with other parts of a building, these skeletons create safe structures available to the community for use in securing opportunities to live, work, play, and, hopefully, thrive. For structural engineers, it is exciting to bring new structures out of the ground. But engineers don't just address new buildings. An incredible inventory of existing buildings could live for a longer time. Engineers are needed to help maintain, renovate, and retrofit existing buildings to ensure they remain safe and secure.

Unfortunately, natural and man-made hazards often require structural engineers' involvement in the repair of damaged structures as well. Following disasters, the structural engineering profession is called upon to support search and rescue efforts, stabilize vulnerable structures, provide post-disaster safety assessments of buildings before re-occupancy, and work with owners and communities to restore buildings to full function. In these efforts, the structural engineer fulfills their greatest duty to protect and safeguard the health, safety, and welfare of the communities they serve.

Structural Engineering is a dynamic profession, constantly improving by learning from past events and developing new approaches based on emerging technologies, systems, and materials. The ability to adapt and use creative technologies such as virtual reality to experience the building before it is built, drone mapping to capture the structure of an existing building, and advances in computer technology and analytical tools provide multiple avenues for structural engineers to support the profession. The built environment is established within building codes and standards, which provide performance criteria to ensure structures meet the occupants' needs. These documents are not static; they are regularly updated based on input from structural engineers involved in research and code development activities. Many of these activities result from lessons learned during and after real-world and hands-on experiences with hazards and disasters and the need to respond to societal changes.

Future-proofing the built environment includes protecting cultural heritage and preserving the historic fabric of our building inventory, thereby ensuring cultural lessons are not lost in the hustle of progress. It also means taking purposeful steps in creating a sustainable response to change. Whether it is continually minimizing the carbon footprint and impact of our buildings on the climate, assessing the condition of existing buildings to ensure they remain capable of serving society, or ensuring structures have the resilience to recover from a disaster event, structural engineers impact the very fabric of who we are and how we interact.

Engineering graduates joining the profession are commonly tasked with simple assignments as they hone skills and build experience leading to ever-expanding responsibilities. Early efforts narrowly focused on discrete elements or systems can make it hard to see the larger outcome. As careers progress, the larger outcome can be seen as the complete structural system or, often, the complete building. However, most users of structures do not see the complexity of the engineered solution, nor do they feel the dynamic collaboration necessary to make it happen. Instead, people feel and value their experience within the built space. In serving our communities, our opportunity is to see engineering as a way to impact the experience people feel every day, not just when the wind blows or when the earth shakes.

Our challenge is to embrace the engineer's role as more than engineering for structures, but rather Engineering for Life.▪

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