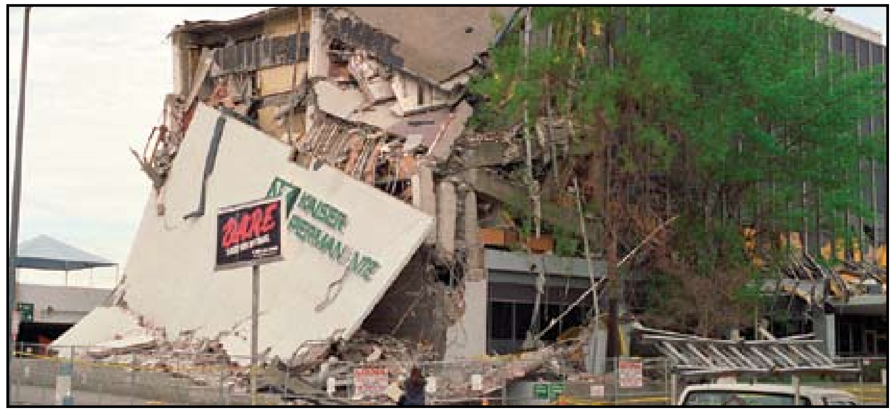
An Industry Evolved

Looking Beyond Local Codes to Create Unified Standards of Good Practice

By Zak Kostura, M.Eng, EIT, LEED AP



Beneath the surface of the wider engineering community lies a sea of individualistic enterprise: engineers comprising firms working tirelessly to advance within their industry. Blowing apart the delusional conventions of the forty-hour work week, most are well-accustomed to investing long hours in the pursuit of timely and impressive structural designs, and honing internal skills and capabilities. By modern standards, such sacrifice is key to the competitiveness of a firm within the industry. But a given firm has only partial control over its level of absolute success. It can control where it falls within the market for engineering services, but the market in turn is driven by the collective actions of the industry. Decisive acts of the engineering community as a whole are the most powerful means of advancing the industry itself, and enhancing the esteem of the contemporary engineer.

Ask an engineer to envision the industry in the future, to stab at a definition for the general notion of *advancement* within the field of engineering, and one is certain to evoke a unique and tailored response. Yet the vast multitude of individual viewpoints within the engineering community is stitched together by several common and fundamental ideals, diverging only slightly in the way in which those ideals are to be achieved. At their core, engineers envision an environment where they have greater freedom and improved resources to design and realize structures with better resilience, economy, and efficiency.

What is implied within this advancement is an elevation in the standards of good practice, and in turn, the expectations of clients and the engineering industry itself.

It seems to be understood by most engineers that, for such changes to come about, the industry must also ensure establishment of laws and statutes that protect the practicing professional. Free from undue liability, individual firms have the opportunity to innovate in times of complacency, and assist in times of unforeseen catastrophe.

It is in times of catastrophe that we can most clearly see the desire of the engineering community to foster self-improvement. Over the past seven years, the attacks of September 11th, 2001 and Hurricane Katrina in 2005 are two memorable instances after which the engineering industry has looked within itself to see what it can do differently. And this instinctive routine is unsurprising. Structural failure pervades the notion of widespread disaster. The collapse of buildings often constitutes a massive portion of the overall death toll, and the aftermath of such failures often makes for the most powerful imagery that inevitably results from a cataclysmic event. These images are burned into our minds: recovery workers standing atop the rubble of the Twin Towers or along the axis of entire neighborhoods replete with decimated buildings.

From these failures, engineers often learn many lessons. Even before Hurricane Katrina and the World Trade Center attacks, there was the Northridge earthquake, which devastated parts of Los Angeles in 1994, and produced the strongest ground motions ever instrumentally recorded in an urban setting in North America. Lasting only 15 seconds, this sudden but generally foreseeable event led to the acknowledgement of many structural realities.

"The Northridge earthquake showed engineers a lot of things." Leo Argiris, a principal at Ove Arup and Partners in New York, provides a brief account of several examples. "Moment frames fail; buildings are subjected to vertical ground acceleration during earthquakes; and soil can liquefy. Those were all acknowledged after Northridge." Many of the ramifications stemming from cataclysmic events such as earthquakes are widely known well in advance of the events themselves. But it is sometimes not enough for the unthinkable to be thought of; it must actually happen – somewhere, at least – for anything substantial to be done about it at home.

To many, the first logical step in the wake of a catastrophic event is a detailed review of local building code in an effort to understand how, if at all, the sudden and abnormal conditions imposed on the structure or structures have been addressed. While reading the code after such events can be a relatively straight-forward endeavor, changing them never is.

"Changes to local code can take more than a decade, and meaningful changes can take upwards of a generation," explains Argiris, who accompanies his statement with a shoulder gesticulation that suggests those changes can be laborious as well. He is quick to note that modifications made to local code are nothing short of amendments to local law. Even with an event such as Northridge to inspire such motions, thorough research must be conducted by universities and independent institutions such as the National Institute of Standards and Technology (NIST). Such studies provide insight that may be used by industry associations such as the Applied Technology Council (ATC) or the National Council on Structural Engineers Associations (NCSEA) to create design guidelines that serve as technical recommendations; however, their consideration by design professionals today is noncompulsory. Guidelines are only adopted by local codes following lengthy review and appeal involving not only representatives of the field of engineering, but also real estate professionals and local officials.

Even when proposed changes make it through to the code review committee, their adoption is often piecemeal – a result of substantial compromise amongst the numerous interests seated at the table. Initial changes to design code can sometimes lack full engineering justification, as is the case with current seismic joint regulations on the spacing of buildings in New York City to prevent damage caused by the interaction of adjacent structures during earthquakes, or "pounding." Intense negotiations between structural and real estate interests within the committee resulted in a mandated setback of only one inch for every fifty feet of height, a measure simply insufficient to guard against the effects of pounding.

"When it came to pounding, we didn't use the UBC (Universal Building Code). The number the committee ultimately came up with was completely unrelated," recalls Irwin G. Cantor, co-founder of the engineering firm Cantor Seinuk and full-time structural consultant to New York real estate developers such as Tishman Speyer Properties. While the engineering industry is certainly justified in their aims at the code committee table, Cantor convincingly illustrates the understandable realism behind the objections by real estate representatives on the code review committee.

Irwin Cantor's breadth of perspective arises from his multiplicity of roles. An honorary member of the Structural Engineers Association of New York (SEAoNY), he has worked intimately with both the structural engineering and real estate industries for decades. He co-chairs the Structural/Foundation Committee of the city Model Code Program and reviews the economic implications of proposed changes to established regulations. The engineers' concerns about issues such as pounding are important, he acknowledges, however building setbacks lead to substantial losses in saleable floor space. Such losses are immediate and inevitable. They would serve as the cost of preventative measures for major events that have not occurred here, and may not happen anytime soon. New York, after all, isn't Northridge.

The interaction between engineers and developers at the code committee table is an indication of the sliding scale against which threat severity is measured. The perceived threat of a catastrophic event – either natural or manmade – is impacted substantially by local politics and economy, geography and location, and the very nature of the building against which the threat is posed. This final factor is particularly insightful for developers at the bargaining table, as the resulting code will ultimately govern a broad range of buildings, only some of which may be vulnerable to a specific threat. Cantor describes this quandary as the issue of "threat-dependent versus threat-independent buildings."

Such issues are discussed at length amongst the code committee, which is commissioned in New York City by the mayor's office. According to Cantor, it is a high priority within this office to maintain "cost neutrality" across changes to the building code. The prosperity of the engineering industry and the city at large are in part governed by that of the real estate market. It is essential to keep local development affordable and attractive. Nevertheless, Cantor concedes that, "at the end of the day, nothing that is cost neutral will be a major improvement over what we have now."

The fundamental problem in attempting to create safer buildings by fixing local code is that the code itself is influenced by far more than simple engineering justification. The final form of a revised and reissued code represents the instantaneous point of collision between a series of largely irreconcilable interests, including engineers, real estate developers, public officials and politicians throughout the city and state.

Local building codes will never completely be what engineers want them to be. But perhaps they don't need to. By definition, codes represent a set of minimum baseline requirements. Codes are not a benchmark for good practice unless the engineering community defines them as such.

continued on next page

The key to establishing the principles of good design is consensus amongst the subcomponents of the industry. Through a facilitating organization comprised of a substantial cross section of the field, engineers can establish and prioritize a set of design aspects. The focus of the organization should be set not by current code deficiency, but rather on the basis of palpable dissent: if firms are approaching the same issue in a manner that is different from other firms or other entities within the design process, a steering group should be convened. With a relatively short timeline, the groups should work to set forth principles of good design that can be adopted by the facilitating organization and, in turn, its constituencies.

Reaching consensus is difficult, even in the absence of the other interests that frequent the negotiating table at code committee meetings. But it is in the best interest of the industry to do so, particularly on contentious issues such as redundancy, progressive collapse, and fire protection measures. Facilitation of this industry-wide approach will allow engineers to control and narrow the breadth of workmanship and quality of engineering services by setting widely acknowledged standards of good practice. Through those standards of good practice, the industry will empower itself to set the criteria under which design firms are considered reputable.

The consensus amongst engineering firms is then shifted, from minimum requirements established by local code to internally structured standards of good practice, facilitated and published by local engineering organizations and driven by credible delegates within steering groups. Safe within the established standards of good practice, individual engineering firms would gain more leverage within the design process to drive the appropriate balance between divergent factors such as building safety, economy and aesthetic uniqueness – a balance often set by externalities overlooked by modern code, such as the level of threat dependency of the specific structure.

Local organizations and steering groups are also an essential tool behind unified advocacy, and allow the engineering industry to come together behind progressive legislation that permits engineers to practice without undue fear of litigation. This requires more than the efforts of a few motivated engineers. Only the weight of an entire industry can accelerate the passage of essential legislation.

Collectively, the fragments of the engineering community throughout the country have the capacity to command the direction of the industry in the future. To do so ensures greater control over the standards of good practice that are unbounded by the limits of individual firms, and empowers engineers to advance the process of structural design and the legislation that governs those efforts. We work tirelessly in the pursuit of prosperity within the field of engineering; should we not act to ensure the field itself is headed in the right direction? The key to realizing that capacity is consensus and unity at an industry level. Through unity, the shared fundamental vision of the industry, and the heightened esteem of those within it, will evolve.▪

*Zak Kostura is a practicing structural engineer with Arup. Mr. Kostura also currently serves as lead editor of several industry-related publications, including the quarterly publication for the Structural Engineers Association of New York (SEAoNY) and the international Council on Tall Buildings and Urban Habitat (CTBUH). He is an adjunct lecturer at the College of Architecture at the New York Institute of Technology. Zak may be reached via email at **zak.kostura@arup.com**.*

This article was originally published in the Fall 2006 issue of SEAoNY *Cross Sections*, and is reprinted with permission.