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## A Tall Order

by Joe McCarthy

The past year has seen an alarming number of tower crane accidents. Historically, there are usually few or no catastrophic accidents involving tower cranes used in building construction each year in the United States, but four occurred over a four-month span in 2008: one each in Miami and Las Vegas, and two in New York.

As was seen in each case, tower crane accidents are dramatic, staggering catastrophes that can kill and injure many, and inflict damage to the construction site and surrounding buildings that takes weeks to clear. Since tower cranes are often used in dense urban areas, more eyewitnesses also make these accidents more spectacular and newsworthy. The immediate finger-pointing and call to action is followed by talk of tougher laws, heightened regulation, more inspections and certifications, and better maintenance and training. Eventually, thorough investigations begin to find and punish those deemed responsible.

Although this year's headline-grabbing accidents do not necessarily indicate a negative trend in safety, the question remains: why so many, and why now?

Ultimately, there is not one single answer but a confluence of challenges and realities. The first comes at the beginning of the construction project when the project manager chooses the site. At this point, site and building engineering, crane selection, site assembly and operation all affect the degree of danger.

Due to its massive size—the common tower crane has a 250-foot vertical mast and a



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250-foot horizontal boom, and with its 40,000-pound lift capacity can erect a 15- to 20-story building-the crane is delivered to the site in components about 20-30 feet long and on-site assembly begins with installation of a reinforced concrete foundation of up to 30 square feet and 12 feet deep. The components are then bolted together and to the foundation, with each bolt forming a critically important connection. As floors are added, braces from the mast to the building structure are installed for support and to restrain the mast motion due to wind and boom rotation.

Often, however, sites are either too small (such as a location where the building covers all the land area) or the building is too high to permit use of mobile cranes and hoists. If the building is higher than the 250-foot mast can service, the crane must be "jumped" or "climbed," which means a larger telescoping component of the mast will enclose a normal sized component to extend its reach. To do this, the connecting bolts must be removed so that hydraulic jacks can lift the upper parts of the mast and the boom. Then another mast section is inserted and the bolts are reinstalled.

Since the crane is always moving in the wind and jumping introduces many changes in critical structural connections, this procedure is a very dangerous operation. The accident on East 51st Street in New York last March, for example, occurred during a similar process.

Despite the complexity of the procedure, this is a relatively routine procedure. It can easily become complicated even for professionals, however, since most critical crane assembly and operations have no uniform quality standards. Riggers, who perform the crane assembly, for example, have limited recognized certification. Operating engineers, who operate the crane, remain without certification in around 35 states.

Since the crane is jumped every six to 10 weeks, the riggers only come to the job site for these "jumps." But given that continuous daytime construction work on the building is the norm, tower crane jumping usually takes place at night or on weekends and absolutely must be completed in time for operations to resume the following morning. So the work is typically done in darkness by workers who are frequently fatigued and unfamiliar with the job site-and maybe the crane itself.

Inspections are designed as a safeguard to counteract all these dangers. OSHA is one body that can conduct inspections, but its regulations from 1971 lag current crane technology. Though OSHA, other regulators and industry groups have been working together to develop new standards, there has been no actual progress thus far. Many cities and counties and some states thus maintain inspectors, but they are usually related to local building departments, which have standards that are far from uniform and sometimes even contradictory.

Complicating matters even further is the unalterable fact that tower cranes are temporary structures. This means they are not covered by building codes and that the knowledge of the inspectors is spotty and the jurisdiction is controversial. The crane in the May collapse on East 91st Street and First Avenue in New York, for

example, had been inspected by city inspectors after its last jump and deemed compliant with regulations. A city crane inspector had also been present at the site the day before the collapse. Still, the crane fell. The lesson is that inspection alone cannot ensure safety.

The recent boom in high-rise residential and office construction also produced another problem that peaked last year. The demand for tower cranes has been so great in the past few years that all existing cranes for multi-state regions were already in use. So instead of working with the crane manufacturers' models that were customary in the area and familiar to the inspection personnel, older, unfamiliar equipment was sometimes put in service. An older Kodiak brand crane was in use during the May New York collapse, for instance.

It was this factor that appeared to accelerate the rate of disastrous crane failures in 2008. The failures centered around very small connection devices and their proper and timely installation and removal. A piece of metal about the size of a hot dog can separate a safely operating crane from one that crashes to the street below. And this connection often occurs at the intersection of design responsibility, and is influenced by the judgment of the rigger.

Certification of operators and riggers may increase their authority to say no to unsafe conditions without fear of firing. In September, the U.S. Department of Labor announced draft regulations that would now require nationwide testing and certification of all crane operators. Recognizing that new personnel qualified to train and test tens of thousands of operators will not be available immediately, however, the draft suggests that third party testing organizations, audited employer programs, U.S. military-issued qualifications, or a state or local government licensing programs all may be used. Ultimately, such a diverse and hasty effort should not be expected to uniformly improve quality and safety.

So the construction manager must spearhead this effort for immediate and long-term improvement. With the exception of inspectors, they choose, hire and pay all the parties who design, manufacturer, erect and operate the crane. They have more control than any other party to coordinate the diverse standards. The challenge is to recognize that this is a serious and complex task. Integrating construction management and technology cannot be left to the field personnel and safety officer alone. Upper management's commitment and support is required for success.

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