The Structural Engineer Expert and the Code

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Reviewed by the CASE Risk Management Program

This is the fifth article in our series about risk management. In the previous four articles, we defined risk management, discussed the structural engineer's responsibilities, presented some easy things to do to reduce the chance of a claim and related claims to business practice. In this article, we will discuss one of our biggest problems. Us. We are not only the victims, but we are also the perpetrators. Too often we are doing it to ourselves by testifying as advocates against other engineers and writing overly complex codes.

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There is nothing like the sinking feeling of being served with a complaint for damages well in excess of your insurance and gross billings. I remember one that arrived at the door on Christmas Eve. The claim was for 10 million dollars from the lender on a 12-story office building; the allegation was that the design did not conform to the building code. In what follows, I have modified the details somewhat to disguise the claim and protect the innocent and guilty.

Near the completion of the 12-story office building, the lender foreclosed on the developer's loan for non-performance. The lender hired an engineer to conduct a due diligence investigation of the design and construction, before placing the property on the market for sale. The hired engineer was a respected structural engineer in the community and near retirement age. He had limited experience as an expert. After an investigation, he concluded that the exterior curtainwall might fall off the building in the event of a high wind or earthquake. The city got involved, the sidewalks were closed, the building never opened and lawsuits resulted.

The exterior wall was a strip window system. The design consisted of the exterior stucco, bonded to a cement board and attached to a metal stud frame. The frame was supported on the slab and was attached with powder-actuated fasteners through a stud track, located inside the edge of slab reinforcement.

The code section that was allegedly violated was last seen in the 1997 UBC and reads as follows:

1997 UBC Section 1633.2.4.2 Exterior Elements

6) Fasteners embedded in concrete shall be attached to, or hooked around, reinforcing steel or otherwise terminated to effectively transfer forces to the reinforcing steel.

The powder-actuated fasteners did not hook around the edge of slab reinforcement, and in the opinion of the engineer did not "effectively" transfer forces to the reinforcing steel. Despite calculations that showed the elastic capacity of the system was several times that required to resist the largest earthquakes, the structural engineer *advocated* for his client and insisted that the design was in violation of the code and by definition, in a claim situation, unsafe and below the standard.

The defense was expensive; the settlement was nearly $500,000.

There are two issues at play, the first concerns experts *advocating* the position of their clients. The second is the code (we do it to ourselves).

The engineering expert had many years of design experience, but did not "like" powder-actuated fasteners. He had never used them in his designs and, during testimony, it was clear he had never investigated available literature on their use. Moreover, he had never performed structural design of curtainwall systems but believed that curtainwall structural design wasn't different from the design of the primary structure, the "same engineering concepts are used".

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Expert testimony is an attractive line of work for some engineers. The hourly fees are higher than design work. The expert in this claim billed in excess of six figures before it was all done. But, many lawyers expect their experts to *advocate* their client's position, often at the expense of the facts and objectivity.

In the field of forensic engineering, the politically correct word for unethical practice is *advocacy*. It is considered unethical to *advocate* the client's cause. But, it is not unethical to support one's own professional opinion. Sometimes it is hard to distinguish the difference, but if you are on the receiving end of an expert *advocating* for his client, you will know the difference. Webster's New World Dictionary defines advocate as "a person who pleads or argues **another's** cause in a dispute". It is the attorney's job to *advocate* for the client, not the expert professional engineer.

The Forensic Engineering Practice Committee of ASCE, in their publication *Guidelines for Forensic Engineering Practice* defines an expert as: "Any individual whose knowledge, skill, education, training, professional experience, **absence of bias** and **peer recognition** indicate superior knowledge about a particular field of endeavor such that the foundation exists to provide **factual and authoritative conclusions and opinions**" [emphasis provided].

The courts have a less restrictive definition of an expert. Instead of defining an expert relative to peers, the courts define an expert relative to the layperson. The courts do not restrict *advocacy* testimony. They encourage it. However, the profession (ASCE) considers it unprofessional.

Before accepting an assignment as a professional expert, some study of this specialized field of engineering is required. The ASCE *Guidelines for Forensic Engineering Practice* is a good place to start. For our example claim, had our colleague taken the time to study the subject of expert testimony and powder-actuated fasteners, the claim probably would not have happened.

Taking a job as an expert requires careful evaluation before accepting the assignment. It is no different than accepting a job to design a building. Once accepted, it is hard to back out, and your attorney client will likely constantly badger you to be an *unethical advocate*. It often comes down to what words you use, not the facts or technical conclusions. And that brings us to our second issue in the example claim: the codes.

Building codes are the law. They are full of words and not analysis or drawings. Code language has become too detailed and too complex. They are written without the benefit of trial designs to verify the impact on design

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and our profession. Commentaries justify the provisions, but do little to explain how to use the code through examples.

But who writes them? For the most part, we do. Today, the structural provisions of the code originate in committees of ASCE, ACI, AISC, TMS and others. Generally, the committees are composed of a balance of interests; most have the education, knowledge and skills of structural engineers.

In the above example, the code *trap* developed after several precast concrete exterior wall panels separated from a building during an earthquake. It was written and supported by the structural engineers. The provision is meaningful in this context, but perhaps not applicable as applied in our claim. And, current codes have changed the provision to allow elastic response. But, no doubt new *traps* have been created. Code changes are continuously generated and accumulated every three years into a new code. There is no end. In the long term, perhaps we can do a better job of writing the codes and checking them with trial designs, but for now the risk management challenge is to keep up with the changes. Violation of the code may be very expensive.

In summary, claims against structural engineers require experts to testify against us. More ethical behavior on the part of experts would reduce claims. The complexity of the codes makes it more difficult to practice within the standard defined by the codes. Professional practice and risk management require us to study the ever-changing codes and be able to conform to their provisions.▪

Risk Management Recommendation: If you are an expert or want to be an expert, read the ASCE *Guidelines for Forensic Engineering Practice* and avoid *unethical advocacy* for your client. Study and conform to the codes. And, remember to read the next and final article.

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