The practice of special inspections

Significance of the current environment, a brief history, and goals for the future

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Building code provisions for special inspections require comprehensive inspection and testing of a building's structural elements, as well as some designated, non-structural building systems during construction. These code-mandated inspections are usually paid for directly by the owner. Although the code does not require that the structural engineer of record (SER) actually perform any of the inspections, it has been long recognized that when the SER does take an active role in performing inspections, the quality of construction improves and the SER's risk and liability for the project is reduced. There is probably no single act that an engineer can do that is as effective at reducing his or her liability exposure as performing inspections during construction.

Significance of avoiding inspections

We have all become victim to years of bad risk-management advice from our insurance companies. Starting in the 1970s, insurance companies advised architects and engineers to avoid performing inspections of their projects. If we did, by chance, happen to find ourselves at a construction site, we were advised that whatever we did, under no circumstances should we call the experience an "inspection." It was okay to call it a "site visit" or maybe just an "observation." The theory was, if you were to actually inspect the construction, you could become liable for any construction defects that you did not catch. The last three decades of claims history has proven this to be poor advice.

Why were we all so willing to follow this bad advice? First, most engineers are accustomed to the very orderly and rational world of performing detailed calculations in a climate-controlled office. A construction site, with all of its dirt and chaos, can be a very threatening place to an engineer. It is much more pleasant to remain in the office. Besides, engineers have a lot of work to get done, especially dealing with all of those unreasonable deadlines. Second, as business owners, it seems we always lose money on construction-phase services. By the time we are through processing all of those shop drawings, there is little fee left for performing site visits during construction. It is just too easy to entrust all of the inspection work to a testing laboratory. The engineer can even make the contractor responsible for the cost of inspections, although the owner ultimately pays. The contractor and testing labs are professional after all, aren't they?

> If you actually perform some of the special inspections for the projects that you have designed, you might be surprised by how easy it is to find a lot of things being done wrong. Additionally, you will find out how easy it is to correct errors during construction rather than after the building is occupied and something does go wrong.

The harsh reality is that projects seldom get built in strict compliance with an engineer's drawings. If you believe that simply showing something on a drawing or writing it into a specification is all that you need to do to get a structure built the way you designed it, you couldn't be more wrong. It is not that the contractor is intentionally taking liberties with your design, but all of the tradesmen may not fully understand the subtleties of your drawings or your design intent. In other cases, the tradesmen may make honest mistakes (nobody is perfect as the saying goes); or they just get lazy. Consequently, it is not uncommon for construction defects to happen, and once they are covered over, nobody is

of special inspections.

Simply including inspection requirements into a model building code is not enough to make them a reality. SEAs must conduct educational programs for building officials and lobby government officials to enforce the special inspection provisions in the building code. People, including building owners, must be convinced that it is important and beneficial to have effective inspection of building construction.

This may sound like a lot of effort, but it is worth it. In many states the hard work of the SEAs has paid off and, with the commitment of local SEAs in the remaining states, it is possible to make special inspections a reality nationwide.

Conclusions

We encourage all structural engineers to promote the enforcement of the special inspection requirements of the building code currently in use in most of the country. We then suggest that you determine if your firm is capable of doing some of the inspections included in the special inspections chapter of the building code; and if your firm is capable of performing such inspections, you must train your inspectors to perform the inspections properly to minimize liability from the poor performance of the inspections. Most importantly, special inspections will further reduce the risk of construction errors and ultimately the risk of insurance claims. ■

The **Risk Management Program** (RMP) is organized as a program of the American Council of Engineering Companies' (ACEC) Coalition of American Structural Engineers (CASE). The group's mission is to enhance risk management, loss prevention, and claims management techniques of the structural engineering profession. To learn more, visit www.acec.org/RMP. The Guide to Special Inspections and Quality Assurance is available from www.acec.org/case.

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tend to perform all of the inspections and testing. The building officials often administer the inspection and testing program themselves. It is common in the West for individual inspectors to be certified under the ICC (formerly ICBO) Special Inspector Certification program. For example, in Portland, Ore., the building official actually pre-qualifies all special inspectors and maintains a list of approved inspectors. On the West Coast, it is very unusual for structural engineers to perform special inspections of their projects, or to even administer the special inspection program.

In the eastern states, the SER often takes a leadership role in the special inspection process. It is common for the SER to define the special inspection program and prepare the statement of special inspections for submission to the building official. It is not unusual for the SER to perform some of the inspections and to delegate the testing to a testing laboratory or geotechnical engineer. The building officials review the inspection reports, but rely on the engineer to oversee the inspections and testing.

Some jurisdictions, such as in Florida and Fairfax County, Va., have adopted their own special inspection requirements that are very different from those contained in the IBC. In these jurisdictions, an engineer, but not necessarily the SER, must administer the special inspection program. In other jurisdictions such as in Wisconsin and the Carolinas, Chapter 17 has been deleted from the building code, or made optional.

Until recently, Illinois had a statute known as the Structural Work Act, which was an act that was originally intended to create a safe workplace by making the owner and the contractor responsible for accidents and injuries at the jobsite. Before the start of the Workers Compensation insurance system, this statute was considered to be a great impetus for the improvement of jobsite safety because both the property owner and the contractor became liable for the injuries, including death, of a workman. Unfortunately, over the many years of its existence, the courts expanded the definition of a contractor to include those architects and engineers who visited the jobsite, especially if they gave any directions to the contractor regarding means and methods of construction or jobsite safety. To the dismay of trial lawyers, the Illinois Structural Work Act was repealed, creating a renewed interest for architects and engineers to visit the jobsite during construction. However, it should be noted that most contracts between structural engineers and their clients still state that the structural engineer is not responsible for the means and methods of construction or for jobsite safety. As always, the structural engineer should comply with the requirements of his agreement with his client and provide no more or no less than the agreement states.

Building code enforcement — Enforcement of the IBC Chapter 17 by building officials has been sporadic and inconsistent across the country. Most building officials, particularly in rural areas, but all too often in large metropolitan areas as well, have chosen to ignore Chapter 17 altogether. Many building officials are unaware that Chapter 17 even exists, while others just choose to ignore it. In some municipalities, there are amendments to the code, which legally eliminate Chapter 17.

If a building official does not insist on special inspections, few owners will volunteer to fund the inspection and testing program, no matter how much the engineer recommends they be done.

Working for change

In areas where local Structural Engineering Associations (SEAs) are strong, influential, and have made special inspections a priority, such as Connecticut, Massachusetts, Georgia, Alabama, and Minnesota, it has made a big difference in getting special inspections enforced by building officials and motivating engineers to take a leadership role. The SEAs in other states, such as Michigan, are in the process of lobbying for implementation

the wiser — at least until something goes wrong.

There are generally three types of "inspections" related to structural engineering portions of a project: site observations, testing, and special inspections.

Site observations are the site visits performed by the engineer in accordance with the requirements of his or her basic services agreement with the client. Site observations are used to determine if the work is being performed in general compliance with the construction documents.

Testing are the detailed tests mandated by the specifications prepared by the engineer. They include such tasks as weld testing, high-strength bolt torque tests, concrete cylinder tests, and soil compaction tests. These tests are normally contracted and paid for by the owner and are intended to determine compliance of materials and their installation with the contract documents.

Special inspections are the building-code-mandated inspections. The SER is responsible for the establishment of the special inspection program for each project based upon specific requirements contained in the building code. Some of these inspections can be performed by the SER, while qualified testing laboratories may perform others. Some of the inspections performed by the SER might include rebar placement, checking the number of composite studs, or similar tasks, while those performed by the testing laboratories might include those indicated in the above. All work relating to special inspections is not normally included in the SER's basic services agreement, but could be provided either as additional services under his agreement with the client or, more often, under a direct contract with the owner.

If you actually perform some of the special inspections for the projects that you have designed, you might be surprised by how easy it is to find a lot of things being done wrong. Additionally, you will find out how easy it is to correct errors during construction rather than after the building is occupied and something does go wrong. You may find that the contractor makes more of an effort to do a better job if he knows the engineer will be inspecting the work himself. The contractor may even develop a new respect for the engineer. Therefore, the provision of site visits by the SER and the performance of the code-mandated special inspections should result in fewer claims against the SER. Since special inspections are not normally included in your basic services, you actually can be paid additional fees to reduce your liability exposure and improve the quality of construction. It doesn't get any better than that.

Errors can be easily corrected when SERs manage special inspections. Inspectors on this jobsite reported that the anchor bolts were found to be in the correct location, but not perfectly plumb.

Without special inspections, construction errors that compromise structural integrity could easily be covered up, only to be revealed if and when a problem occurs. For example, the contractors ran out of concrete while casting this pile cap, but assured the inspectors that they would top it off with the next pour.

Building code history

The International Conference of Building Officials' (ICBO) Uniform Building Code (UBC) has had inspection requirements since the first edition in 1927. The term *special inspections* was first used in the UBC in 1961. The Building Officials and Code Administrators' (BOCA) National Building Code first introduced special inspection provisions in 1988. The provisions generally remained in the subsequent BOCA codes. The UBC and the BOCA codes had a slightly different philosophy and emphasis, which resulted in very different special inspection implementation approaches in UBC jurisdictions from BOCA jurisdictions.

When the International Code Council's (ICC) International Building Code (IBC) was first issued in 2000, it merged the UBC and the BOCA special inspection requirements into its Chapter 17. We were hopeful that the widespread adoption of the IBC would result in a more uniform and encompassing practice of special inspections across the country. Unfortunately, this did not happen.

Regional differences — The country seems to be divided by the Mississippi River with regard to the practice of special inspections. In the western states, structural engineers do not play much of a role in the special inspection process. Testing laboratories