CASE is Twenty

This is the first of several articles outlining the history of CASE's first twenty years.

2007 marks the twentieth anniversary of CASE's existence. In 1987, a small group of structurals led by Richard Williams of Virginia, George Nishimura of Hawaii and Tom Wosser of California met in Dallas, TX to discuss the possibility of expanding ACEC's Structural Committee in to a full fledged coalition, a new concept at the time recently recognized by ACEC. That committee had been approached by the then DPIC Insurance Company with the message that liability claims against structurals were getting out of hand and something had to be done.

The organizers decided on two major thrusts. One was to rally the structurals within ACEC and try to get them to join a coalition, and the other was to initiate some projects designed to address the problems structurals were having at the time. They got fifty firms to join initially and, with financial support from ACEC, were able to begin work on three projects…1) National Guidelines, 2) Contract Documents, and 3) Insurance Options. The first was to write *National Guidelines for the Structural Engineer of Record* (SER). Its purpose was to give firms and their employees a guide for establishing structural engineering services and provide a basis for dealing with clients and negotiating contracts. It described the relationship that customarily exists between the structural engineer of record and other design team members, and laid the basis for negotiating fair and reasonable compensation. All members of CASE got a free copy of this publication and all new members still do.

Twenty years ago, it was not that uncommon for a structural engineer to work on a handshake and not have a written contract at all. Insurers at the time noted that this was a practice whose time had run out and had to end. Both DPIC and Victor O. Schinnerer Inc/CNA advised CASE that members should have a written contract on each and every project. Thus arose the second of the three projects. A task force was formed in an effort to mitigate this unacceptable situation. They examined the two major existing contract forms at use in the industry…EJCDC (Engineers Joint Contract Documents Committee) and AIA (American Institute of Architects) and found them to be appropriate in many situations. However for projects of less than full design-type buildings, the task force suggested a shorter *Limited Services Agreement* be developed by CASE. In addition where the SER may not feel the AIA or EJCDC documents are appropriate, the task force suggested CASE develop an *Owner/SER Agreement*. This document also contained a matrix of services that became very popular with CASE members and allowed them to negotiate with the client what was and was not included in their services. These were documents number 1 and 2 in the list that became 16 CASE documents.

The third effort of the new CASE group was a committee to monitor insurance companies or as it was called Insurance Options Committee. As long as SEs continued to pay the highest rates of all disciplines, they would actively monitor the insurance industry. They also considered starting their own insurance company called a risk purchasing group which had just been passed into law. This was abandoned when DPIC started SERMC (Structural Engineers Risk Management Council), which basically served the same purpose and opened an additional insurance option.

CASE also started a Technical Peer Review program. Its purpose was to minimize the liability exposure of structural firms by reviewing their technical procedures. It wrote a TPR manual and even did several TPR's before the program was ceded to SERMC, which reimbursed firms for having a TPR.▪

Understanding Performance Based Fire Protection

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CASE Fire Protection Committee

The structural system of most buildings or assemblies has significant redundancy when considered as a whole frame. This means that local failure can be tolerated if an alternative load path is available. For the fire limit state this means fireproofing, or matching the structural design to a tested assembly, is not the sole means of providing stability to meet the life safety requirement of the building code.

Structural fire engineering, the application of structural mechanics to design structures for fire temperatures rather than relying on the results of standard furnace testing, has had major advances over the last ten years due to intensive research and development worldwide.

Using a performance-based approach including structural and heat transfer analysis, the forces generated in a structural frame as a result of restrained thermal expansion and material degradation at high temperatures can be quantified and designed for.

Courtesy of Brenda Schwartz

This approach allows changes and specific detailing to be made to normal-temperature structural designs, enhancing their elevated-temperature response.

In essence, performance based design of structures for fire is about treating fire as a load like wind, seismic or gravity loading and not necessarily about keeping the structure at low temperatures.▪

Why Should We Care About Fire Protection?

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When you ask a structural engineer about fire protection, the response is often predictable — "I don't have to worry about that, fire protection is the architect's responsibility." And when you suggest that the structural engineer should take a more active role in fire protection, the response is again predictable — "Sure, just another thing we have to worry about and not get paid for." This reaction is characteristic of professionals who aspire to diminish their role in the projects they work on. It is human nature to resist change. Changing one's attitudes and ways requires effort and comes with new risks, perils and challenges. It is much more comforting to anchor ourselves to a stable rock, keep our heads down and try to weather the sea of change around us. But then we wonder why our profession has lost respect and prestige. Why are we not viewed as leaders? The rest of the world just doesn't understand us — they don't appreciate the good we do for society protecting the world from overstressed structural elements.

Fortunately, not all members of our profession share these attitudes. There is a growing segment of our profession that believes that structural engineers should take more of a leadership role and embrace opportunities to become more involved in the design of our projects. We can do more than number crunching and beam sizing. We have a duty to society to engineer building structures that can survive not just blizzards, hurricanes and earthquakes, but also fires. The tragic events of 9-11-01 have made it clear that we can do a better job.

Designing effective structural fire protection is an increasingly technical challenge that requires participation from all members of a project design team, not just the architect. It is not that architects have been remiss in their duty of designing fireproofing, it is just that they are often overwhelmed by the challenges of designing and specifying dozens of technical building systems, right down to the door hardware and toilet partitions, and fire protection does not always get the attention it deserves. If structural engineers are going to truly be supportive members of the design team, they need to assist their architectural clients in designing effective structural fire protection.

Architects do not have any special training in fire protection. Architectural schools barely mention the topic. Architects are expected to teach themselves a myriad of technical subjects including zoning regulations, building codes, waterproofing systems, cladding systems, window systems and sometimes even structural systems. These are not easy subjects to just "pick up" and master while working in a design office, especially for individuals who entered the profession with a background in art. When it comes to fire protection, some architects will just fake it and see if it gets past the Building Official. We can do better.

It is expected that the Mechanical/Electrical/Plumbing (MEP) engineer will be responsible for the design of active fire protection systems such as sprinkler systems, smoke evacuation systems, exit signage and fire detection/alarm systems.

There is no question that the architect should remain solely responsible for the design of fire egress systems such as stair towers, protected corridors and travel ways. These elements are integral to the architectural design.

But when it comes to the passive fire protection of the structural beams, columns and slabs, the time has come for the structural engineer to take a little more responsibility. The prescriptive building code requirements are not particularly difficult for a structural engineer to master. Compared to most of the structural analysis tasks we are called upon to perform every day, these prescriptive fire protection requirements are pretty easy stuff.

Courtesy of Brenda Schwartz

The building code defines five construction classifications for buildings, with sub-classifications within each. The architect, with assistance from the structural engineer, must select which construction classification a particular building fits into and follow all of the rules that correspond with that particular classification.

The code limits the height and floor area for buildings of each construction classification based on the type of occupancy, the presence of sprinklers and fire vehicle access. The more inherently fire resistant the construction, the larger the building may be.

For each construction classification, the building code specifies minimum fire endurance ratings for major building elements including floor structures, roof structures, columns and bearing walls. The architect and engineer must select documented fire test results that substantiate the fire endurance of each of the building elements. Each documented fire test has requirements for things like concrete thickness and cover, type of aggregate, minimum beam size, gauge and make of metal deck, etc. If the structural design does not satisfy all of the fire test requirements, the test results are not valid.

The fire endurance rating of the structural floor and roof systems is dependent on the degree of thermal restraint inherent in the structure. This is clearly a determination that an architect is not equipped to evaluate.

The rules for prescriptive fire protection design seem confusing at first, but with a little practice they are not difficult to master. For the vast majority of buildings the prescriptive methods will result in a reasonably fire safe building and there is no need to go beyond them. Occasionally there are situations where the prescriptive approach mandates an impractical or undesirable solution. For these instances, there are performance methods that may be implemented. While performance based fire protection often calls for the expertise of a fire protection specialist, some of the more routine performance based solutions can be mastered by a structural engineer.

The CASE Fire Protection Committee, with cooperation from NCSEA, is drafting a *Structural Engineer's Guide to Fire Protection*. This document is scheduled for release in late 2007, and is intended to assist those structural engineers who are interested in learning more and becoming more involved in the fire protection of the building structures they design.▪