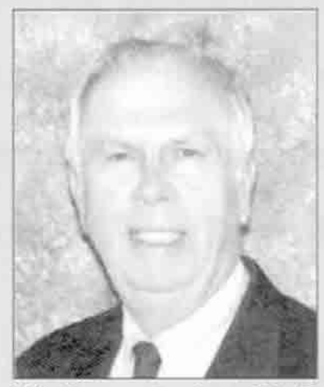
Special Interview

NCEES President, Dr. W. Gene Corley



W. Gene Corley, Ph.D., P.E., S.E.,
Senior Vice President CTL Group

We are happy to contact you for this email interview to help Structural Engineers in Korea with your expertise and experience. We appreciate your time with us and I am sure your answers to our questions would be a great help in improving structural safety system in Korea.

ISSUE 1 NCEES

W. Gene Corley, Ph.D., P.E., S.E., accepted the position of president of the National Council of Examiners for Engineering and Surveying. Having served a year as NCEES president-elect, Corley will now be president for the 2007-2008 terms.

In Korea, certain building design(16 levels or higher, 30m span or more, multi-purpose buildings) must be done by the Structural Engineer or an engineer with equivalent education and experience.

Are there similar systems in the United States? In other words, if one is qualified with enough experience, is s/he treated equivalent to a Professional Engineer without any certified exam?

ANSWER

In all United States jurisdictions (states, territories, and the District of Columbia) a licensed engineer or architect must design all structures other than one family or two family residences and some agricultural structures. Regardless of other qualifications, people who are not licensed cannot serve as structural engineer / architect for structures "used by the public". For structures not involved with public safety, (these may include agriculture structures and some industrial facilities not for human occupancy) a license is not needed.

Some states have more restrictive requirements. Fourteen states have some type of structural engineering credentials. Some of these states require passing a sixteen hour Structural Engineering Exam to be qualified to do structural engineering.

In all jurisdictions, architects are required to pass a long exam that includes a structural engineering section. After passing this exam, architects are permitted to do structural design in most places. Architects who graduate from University as Architectural Engineers often become licensed Structural Engineers, rather than licensed architects.

ISSUE 2 Structural Safety System

You had been appointed to lead the team of engineers in the FEMA/ASCE Structural Engineering Institute investigation of the World Trade Center collapse on September 11, 2001.

In a few weeks, it is the 7th anniversary of the 9/11 terror. I believe there have been many improvements in the disaster management system since the 9/11 in the United States.

After 9/11, were there any changes in building codes or design standards for the structural safety of tall buildings?

Were there any lessons to tell us about the building frame systems or any other structural problems in the investigation of the World Trade Center collapse?

ANSWER

Study of collapse of the World Trade Center buildings disclosed several things need to be done when designing a building to resist attack. One of the most important findings is that buildings need to be redundant (have multiple load paths) and be robust (able to carry the load with part of the structure destroyed). Another major finding is that the fire proofing needs to stay attached to the building if an attack occurs. The building should also be designed to remain standing if it has a complete "burn out", i. e., all materials in the building burn.

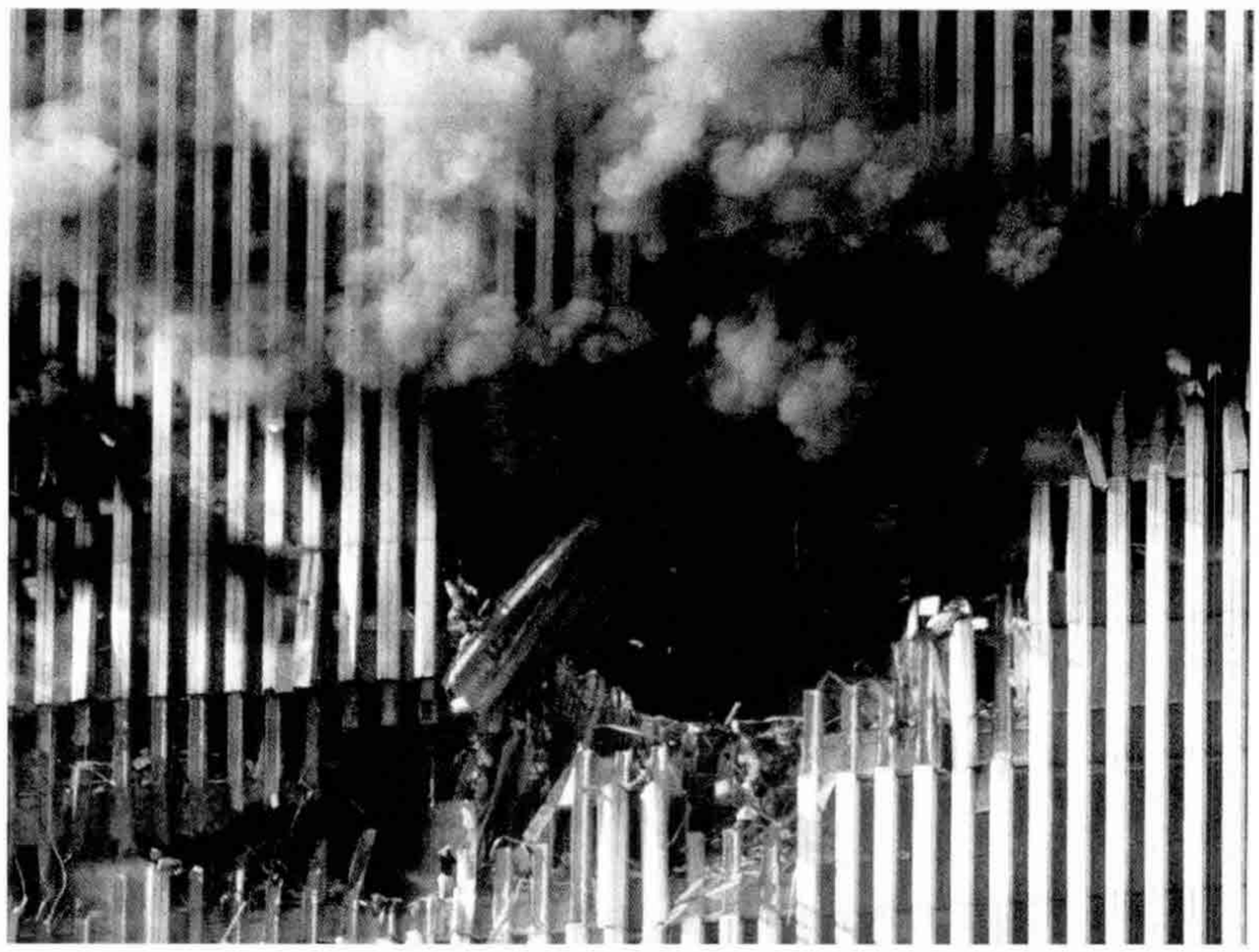
I will be covering these items and some non-structural issues in my presentation.

ISSUE 3 Scope of work for Structural Engineers

We believe you have already heard of the collapse of "Sampung Department Store" occurred on June 29, 1995 (You can watch the video from www.ksea.or.kr)

It was a catastrophe resulted in death and missing of 508 people and injury of 937. A Structural Engineer who conducted structural calculations and diagnosed safety of the building before the collapse was arrested on June 30, 2008 for the failure of warning the possibility of a collapse and not recommending evacuation of the people in the building. Even if he was able to predict the accident, it must be difficult for him to foretell the exact time.

An architect who designed the Sampung Department Store did not reflect structural calculations in his design and did not coordinate with the Structural Engineer on the revised



calculations in the modification of the structural plans. In addition, he failed to obtain the approval from the administrative office for the design modification, for which he was accused on July 25, 1995.

As a result, the architect was punished for mismanagement of the structural design drawings. Fundamentally, the system is to be blamed as it allowed architects to handle field of his non-expertise

In Korea, only structural calculations are required to be done by a Structural Engineer. Preparation of structural design drawings and supervision of building construction by Structural Engineer are not mandatory since Building Act and Certified Architects Act define as these roles are intrinsic business of architects. In the case of Sampung, the only responsibility of the Structural Engineer was to participate in the initial structural calculation. He was not aware of any design revisions or field changes and has never been notified of any load increases during construction.

Prior to this accident, Professional Engineer Act was enacted in Korea and Structural Engineers appeared since 1975: some 800 in building and 900 in civil. The Professional Engineer exam can be taken by the qualified persons with 7 or more years of experience after graduation of related study and its passing rate is only 5-10%.

In the United States, how is the scope of work divided

between architect and Structural Engineer? If different by the State, could you tell us a typical?

Also, how are the roles and responsibilities of Structural Engineers defined to secure structural safety until completion of the building construction (design phase, construction phase, and maintenance phase after completion)? What kind of legislative devices are there in connection to building construction?

Suppose an accident like Sampung case occurred in the United States, who is responsible for the collapse between the architect and Structural Engineer? Or is it the State law defined someone non-expert, is it the ordinance, or an administrative disaster? Whose fault is it?

In the United States there are approximately 20,000 engineers licensed to do structural engineering. Minimum requirements are four years of college level education from an accredited school, four years of experience, and passing of 16 hours of exam. For those states that provide for structural credentials, it is required that an additional 16 hours of exam dealing with structures be passed. In addition, most states with structural designations require a minimum of 18 semester hours of classes in structural design and analysis at the University level.

Note that pass rates on the 16 hour Structural Exam are around 30% to 60%.

ANSWER

In the United States, the architect in usually responsible for the layout of the building, fire proofing requirements and appearance. The Structural Engineer is responsible for structural analysis, sizing structural elements and strength of the structure. The architect and Structural Engineer normally work together throughout the design phase to coordinate the design. Each design professional signs and seals there part of the design, the architect signs and seals the "A" drawings and the Structural Engineer signs and seals the "S" drawings. Only the person who signs and seals the drawing can make changes in it. The architect cannot change the structural or the structural drawings and cannot change the building dimensions without the approval of the Structural Engineer.

As noted in the answer to Issue 1, either the architect or Structural Engineer can do the entire job in many states.

After the design phase there are two common methods of delivery of the constructed building. The most common arrangement is that contractors will submit bids on the work called for in the drawings and specifications. Usually, the "lowest bidder" is awarded the job. From that point on, the contractor usually goes back to the architect only to clarify things that are not understood. Job supervision is commonly done by government and by hired firms that specialize in construction.

Another way of constructing buildings is for the owner to use a team made up of the architect, Structural Engineer and contractor. A contract "price" is negotiated with the team. All three parties then work together throughout the duration of the project.

In all cases, design documents can be changed only by the one who signs and seals them. Also, the building must be constructed according to the plans.

When things go wrong in the United States, the civil court system decides who is at fault and who pays. This is done with a jury and using "expert witnesses". The experts normally are licensed as architects or Structural Engineers. In

rare cases, engineers may be tried in the criminal court system. State courts are used for most disputes. Federal courts are used if the project is owned by the federal government.

ISSUE 4 Participation of Structural Engineer during structural design and construction

As mentioned before, the structural drawings are prepared by the architects in Korea.

The current system in Korea does not require participation of Structural Engineer at construction site for verification of structural safety and inspection of construction progress.

In addition, Structural Engineers do not actively involve in general process including structural design modification, construction changes or inspection of building construction. They provide technical support passively only when requested from the outside.

Who prepares structural drawings in the United States, and who is responsible for them? If Structural Engineers are not responsible, what kind of problems do you think there will be?

In the United Stated, how does Structural Engineers get involved during the construction to fulfill their duty? What do you think is the best way for Structural Engineer to participate during construction for quality and safety of the structures?

ANSWER

In the United States the architect or Structural Engineer may be the lead designer. Commonly though, the Structural engineer is hired by the architect. The architect is responsible for architectural work and the Structural Engineer is responsible for structural work. Neither can change the others work. Any changes in plans must be approved by the person who is responsible.

The best way for a project to be constructed is for the Structural Engineer to be involved to completion. However, in the United States the Structural Engineer often has little involvement after the design phase.

ISSUE 5 In relation to liability insurance of Engineer

In Korea, Structural Engineers are required only for structural calculations for buildings higher than 16 levels, and architects, not necessarily an expert, prepare structural drawings and conduct supervision of the design. In addition, there are no rules or regulations regarding structural supervision. Therefore, we assume that insurance companies think it is difficult for Structural Engineers to buy liability insurance as the Engineer's responsibility and right is unclear.

I understand that liability insurance of the Engineer is mandatory for design documents, building supervision, and structure supervision. What types of insurance are there for the Engineer's work and what are the liability limits? Also what is your opinion on necessity of the liability insurance?

In the United States, how are the compensations determined for the accidents due to engineer's misconducts or damages to the private properties? Also could you tell us what the coverage of the compensation is?

ANSWER

In the United States engineers carry "Errors and Omissions"insurance. This covers things that go wrong. Insurance policies usually have a face value of around $1,000,000. However, the policies cover each job separately. The actual amounts paid can exceed $1,000,000. Commonly the cost of lawyers and experts exceed the value of the policy. In the United States, the Architect and Structural Engineer are personally liable up to the limit of their assets.

Insurance covers anything that the Structural Engineer does wrong in the design.

ISSUE 6 General

In Korea, there are over ten ongoing high-rise building projects with higher than a 100-story. A recent trend of these

projects follows the twisted outlook. How do you view this phenomenon in a structural engineering aspect?

Also, how does the concept of the sustainability has been reflected upon the structural design?

Thank you!

ANSWER

Structural Engineers are often asked to do unusual projects. The "twisted" look is currently popular everywhere. Licensed Structural Engineers should be able to safely design the structure for these buildings. Although the "twisted" look does present some challenges for obtaining stability, Licensed Structural Engineers should be able to do the designs.

Dr. W. GENE CORLEY

PROFESSIONAL PROFILE

As Senior Vice President, Dr. Corley serves as CTL Group's managing agent for professional and structural engineering, and leads structural evaluation projects related to industrial, transportation and parking facilities, bridges, and buildings. His wide range of experience includes evaluation of earthquake- fire- and blast damaged buildings and bridges; investigation of distress in prestressed concrete structures; repair of parking garages damaged by corrosion; evaluation and repair of high-rise buildings, stadiums, silos and bridges; design and construction or repair of prestressed conventionally reinforced, precast and cast-in-place concrete, foundations and structural steel facilities. Dr. Corley is one of the world's foremost experts in analyzing buildings damaged by bombs,

earthquakes, fire, and tornadoes. He led the federal investigation into the

September 11, 2001, collapse of the World Trade Center's twin towers. He also

conducted the investigation of the 1995 collapse of part of the Murrah Federal

Building caused by the Oklahoma City bombing, and served as expert advisor

during the investigation and trial resulting from the 1993 fatal fire at the Branch

Davidian complex in Waco, Texas.

EDUCATION

Ph.D. in Structural Engineering: University of Illinois at Urbana-Champaign,1961

REGISTRATIONS

Licensed Structural Engineer : State of Illinois

Licensed Professional Engineer : State of Illinois

Registered Civil Engineer :California, Hawaii

Registered Professional Engineer : States of Alabama, *ETC. 26 STATES*

Chartered Engineer : *FI Struct E. UK*

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers - Honorary

National Society of Professional Engineers - Fellow

National Council of Structural Engineers Associations

Founding Member, Board of Directors, President 1996-97

American Concrete Institute - Honorary

Building Seismic Safety Council

Former Vice-Chairman and Founding Member, Board of Direction

Chicago Committee on High Rise Buildings

Member and Former Chairman

Earthquake Engineering Research Institute

Great Lakes Chapter - Member and Former President

International Standards Organization, Committee TC-71, Concrete - Chairman

National Association of Railroad Safety Consultants and Investigators - Member

National Council of Examiners for Engineering and

Surveying - President Elect

2006-2007

RILEM - Member

Structural Engineers Association of Illinois - Former President

PUBLISHED WORKS

Dr. Corley has published over 170 papers and books with more than 90 on

bridge design and/or seismic design. A publication list is available on request.

Representative published work includes:

"World Trade Center-Building Performance Study," Proceedings, Beutscher

Bautechnik-Tag 2003 Vortrge, Hamburg, Germany, April, 2003, pp. 101-108.

"Applicability of Seismic Design in Mitigating Progressive Collapse," NIST

Workshop, July 2002.

"World Trade Center Building Performance Study: Data Collection,

Preliminary Observations, and Recommendations," Federal Emergency

Management Agency Mitigation Directorate, FEMA 403, Washington, D.C.,

May 2002.

"Learning from Collapses: From Oklahoma City to the World Trade Center,"

Tenth Annual Kavanagh Memorial Structural Engineering Lecture, The

Pennsylvania State University, April 4, 2002.

"Structural integrity and the Oklahoma City bombing", "Concrete Construction,

A Hanley-Wood Publication, Addison, Illinois, December 2001, Vol. 46,

No. 12, pp. 29-30.

"Lessons learned from the Oklahoma City bombing", "Learning from

Construction Failures, Whittles Publishing, Scotland, UK, 2001, pp. 227-268.