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Jacksonville Parking Garage Collapse - 5 YEAR REVIEW

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December 6th 2007, the 6-story parking garage that was under construction across the street from the police station in downtown Jacksonville, Florida collapsed suddenly and without warning. The collapse resulted in the death of one worker and the injury of 20 more. The following review is based on the investigations conducted by and the documents obtained from the Occupational Safety and Health Administration (OSHA) and the Florida Board of Professional Engineers (FBPE).

What Type of Building Was It?

The structure that collapsed was a 6-story parking garage. The parking garage was being constructed utilizing cast-in-place simple reinforced concrete columns, cast-in-place reinforced and post-tensioned concrete beams, and cast-in-place post-tensioned concrete slabs. The parking garage sat atop its own foundations and was structurally independent from the 23 story high-rise it was to service.

Who Was Involved?

According to OSHA's May 2008 report, the key participants in the project included:

- > **Structural Engineer of Record:** Soheil Rouhi
- > **Threshold Inspector:** Timothy Frazier
- > **Formwork (Shoring) Designer:** Patent Construction Systems
- > **Formwork (Shoring) Inspector:** Darrell Setser (In Responsible Charge)
- > **Formwork (Shoring) Inspector:** Stuart Holtz (Field Inspector)
- > **General Contractor:** Choate Construction Company
- > **Formwork (Shoring) Contractor:** Southern Pan Services Company
- > **Concrete Subcontractor:** A. A. Pittman & Sons



What Caused the Collapse?

In short, the collapse did not appear to have been the result of one single mistake. Instead the collapse appears to have been the result of a collection of tragically avoidable errors committed by as many as six (6) companies, five (5) engineers and countless construction personnel. OSHA and the FBPE focused their investigations and disciplinary efforts on two major areas: construction and engineering inspection related to the formwork (shoring and reshoring), and engineering design and inspection related to the project as a whole.

⇒ Formwork (Shoring and Reshoring)

The formwork plans were prepared by the formwork (shoring) designer. These plans called for the shoring and reshoring to extend all the way to the ground. However, it was learned that the shoring and reshoring below the 3rd level had been removed shortly before the

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concrete on the 6th floor was placed. Within its May 2008 report, OSHA states “There are conflicting reports about why Southern [Pan Services Company] removed the reshores under the 3rd level despite the fact that the Patent drawing showed the reshores extending down to the 1st level.” Nonetheless, the shoring was removed and construction continued.

FBPE’s records state that the shoring and reshoring field inspector (**Stuart Holtz**) depended principally on information provided verbally by the contractor and in fact never reviewed the reshoring drawings until after the collapse. FBPE’s records also state that the threshold inspector (Timothy Frazier) failed to determine that a professional engineer who specializes in shoring design had inspected the shoring and reshoring for conformance with the plans.

⇒ Engineering Design and Inspection

The structural design drawings were signed and sealed by the engineer of record (**Soheil Rouhi**). OSHA reported that, while the construction of the parking garage included many minor and major issues, “the difficulties were compounded by the fact that the SER [structural engineer of record] was not forthcoming in resolving the questions, and had a nonchalant and dispassionate attitude towards the structure he designed.” OSHA also stated that the “SER denied this during an interview with OSHA.” In addition, it was learned that reinforcing steel had been left out and/or misplaced during the construction.



OSHA reported the following related to the design of the structure:

- > From the flexural aspect, the beam design was deficient under code prescribed load and phi factors.
- > The shear stirrups were significantly under-designed for the factored dead and live loads and did not meet the code requirements.
- > Of the eight columns, all except H4 were determined to be deficient as per the prescribed codes, based upon the 5,000 psi concrete, the strength specified by the SER.
- > The column C4 was considered the most critical. For load case No.1, C4 was barely able to support the dead loads even when the phi factor was not considered. This is the most serious design flaw in the structure.

FBPE’s records state that the engineer of record (**Soheil Rouhi**) issued drawings that were materially deficient with respect to the design of the beams, the design of the columns, and the design of the beam-to-column connections. FBPE’s records also state that the threshold inspector (**Timothy Frazier**) failed to adequately inspect the construction of the load bearing structural elements.

Who Has Been Held Responsible?

According to OSHA’s news release dated June 3, 2008:

Recognizing that OSHA only has jurisdiction over the construction industry and not the design professionals, OSHA initially cited the general contractor (**Choate Construction Company**) along with one (1) subcontractor (**Southern Pan Services Company**) for

“These employers are experienced in this type of construction and know all too well that disaster can occur when engineering drawings are not adhered to, or are modified, as occurred in this tragic collapse, without the approval of a Professional Engineer.”

Mr. James Borders, OSHA Area Director

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safety violations related to the collapse. OSHA also cited one (1) subcontractor (*A. A. Pittman & Sons Concrete Co.*) for violations related to record keeping. In this news release OSHA quotes its area director James Borders as saying “*These employers are experienced in this type of construction and know all too well that disaster can occur when engineering drawings are not adhered to, or are modified, as occurred in this tragic collapse, without the approval of a professional engineer.*”

The OSHA report can be viewed in greater detail at: http://www.oshrc.gov/foia/Rpt_SouthernPanServCo.pdf.

According to FBPE’s records:

Recognizing that the FBPE has jurisdiction only over licensed engineers and not the construction industry or unlicensed individuals, the FBPE cited a total of four (4) different engineers within three (3) different organizations.

Soheil Rouhi - Structural Engineer of Record

- License was permanently retired prior to revocation.
- He is not eligible for engineering licensure in the State of Florida.
- Fine & Costs of \$3,621.00

Timothy Frazier - Threshold Inspector (Engineer in Responsible Charge)

- License was reprimanded and suspended for three (3) years.
- Special Inspector certification was revoked and he is not eligible for recertification in the State of Florida.
- Required to complete ethics classes.
- Fine & Costs of \$3,621.00

Darrell Setser - Formwork (Shoring) Inspector (Engineer in Responsible Charge)

- License was reprimanded and placed on probation for one (1) year. He agreed not to provide these services in the future.
- Required to complete concrete inspection and ethics classes.
- Fine & Costs of \$4,003.75

Stuart Holtz - Formwork (Shoring) Inspector (Field Inspector)

- License was reprimanded and placed on probation for one (1) year.
- Required to complete concrete inspection and ethics classes.
- Fine & Costs of \$8,712.00

For More Information

If you would like to review FBPE records in greater detail they can be found at www.fbpe.org/legal/disciplinary-actions.

In light of Florida’s recent rule changes, it is highly recommended that those licensees whose practice includes threshold inspections familiarize themselves with all of the statutory (F.S. 471) and administrative code (F.A.C. 61G15) requirements for threshold inspections.

For the most current provisions included in **Chapter 471, Florida Statutes** and the **F.A.C. Rules 61G15-18 through 61G15-37** as they relate to the practice of engineering in the State of Florida, go to *Legal* section of FBPE’s website at www.fbpe.org.

This article was written by FBPE Board Vice Chair, William C. Bracken, P.E., S.I., CFM. Mr. Bracken is the President and Principal Engineer for Bracken Engineering located in Tampa, Florida. He is a licensed Special Inspector and Professional Engineer in the State of Florida, as well as a licensed P.E. in 24 other states. Mr. Bracken’s experience includes working as an engineer and a subject matter expert on structural, building envelope, general civil, floodplain and forensic engineering projects. He also serves as a Structures Specialist to Florida’s Urban Search and Rescue program.

Mr. Bracken is currently serving his first term as Vice Chair on the Florida Board of Professional Engineers.