NOVEMBER 11 2009 MEETING

Wednesday, November 11, 2009
5:00 - 6:30 pm

TECHNICAL PROGRAM

Detective Engineering: Causes of Distress in Concrete

Speaker: Dr. David W. Fowler, Ph.D., P.E., with University of Texas, Austin, Austin TX, Tel. 512-232-2575

Dr. Fowler has earned B.S. and M.S. degrees in Architectural Engineering at The University of Texas at Austin, and a Ph.D. in Civil Engineering at the University of Colorado at Boulder. He has been a professor at The University of Texas at Austin since 1964, where he teaches courses in concrete repair, concrete materials, and forensic engineering.

PRESENTATION SUMMARY

To an audience of about 105 at the HESS Club, Dr. Fowler gave a slide presentation titled, "Forensic Engineering: Causes of Distress in Concrete".

Dr. Fowler introduced the topic by defining Forensic Engineering, stating that Forensic Engineering is the "Science of the relation between engineering and the law." He further stated that Forensic Engineering is a relatively new specialty in engineering and, for our purposes, that it is essentially related to failures of structures and/or their components. In this regard, Forensic Engineers essentially perform autopsies on structures to determine why the building or component failed and how to repair it.

Qualifications required for a Forensic Engineer included:

- The engineer must be an expert in the field of practice
- The engineer must be ethical
- The engineer must be a "detective" who enjoys digging for the truth and is willing to think "outside the box"

Dr Fowler then discussed the meaning of Failure, indicating that, in structural terms, failure means "not performing as intended." Failure, therefore, does not require damage, death, or similar severe consequences. It can include such things as:

- Floor vibrations, either when walked on or by passing vehicles
- Uneven cooling of rooms in a structure
- Ponding of water on a parking lot
- Spalling of new concrete
- Differential movement of a foundation

A series of famous failures was then discussed, which included:

- The Leaning Tower of Pisa - Foundation Failure
- The Tay Bridge in Scotland - Structural Failure of Beams/Girders
- The Hyatt Regency Hotel Elevated Walkway Collapse - Structural Failure of Connectors
- The Tacoma Narrows Bridge Collapse - Vibration Failure

- The "Big Dig" tunnel project in Jew Jersey - Collapse of Ceiling Panels

Dr. Fowler then addressed the approach to a Forensic Engineering problem as requiring use of the "Scientific Method". This essentially involves:

- Stating the problem
- Making observations
- Identifying possible causes of failure
- Testing the possible causes of failure using tests, calculations, literature, etc.
- Selecting the most likely cause of the failure

In this regard, Dr. Fowler pointed out that sometimes one must make the best conclusion possible, and that a definite causation may not be found. In other words, the answer may be "yes, no, or maybe."

Dr. Fowler also gave many case histories on concrete failures with causes ranging from shrinkage cracks to Alkali-Silica Reactions (ASR). In one case he found that the ASR expanded and shoved a concrete pavement 5 feet. He reiterated that rebar does not keep concrete from cracking, it keeps the cracks from getting wider.

To download a copy of Dr. Fowler's slide presentation, click **here**

To read a summary of Dr. Fowlers previous presentation to the FPA click here:

PAST PRESENTATIONS (click here)