APRIL 2008 MEETING

Wednesday, April 9, 2008

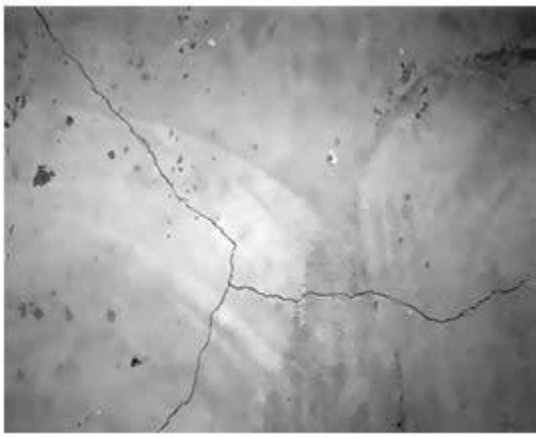
TECHNICAL PROGRAM

Which Way Is It Moving? - **Guidelines for Diagnosing Heave, Subsidence and Settlement**

Speaker: Ron Kelm, P.E., Forensic Engineers Inc., Houston TX , Tel. 713-468-8100

PRESENTATION SUMMARY

To an audience of about 80, Mr. Kelm, president of Forensic Engineers Inc., chair of the FPA's Structural Committee, interim chair of the Geotechnical and Repair Committees, and a licensed professional engineer with BSCE and MSCE degrees, presented a paper that he and Nicole Wylie, P.E. authored titled, "*Which Way Is It Moving?* - Guidelines for Diagnosing Heave, Subsidence and Settlement".



Heave, subsidence, and settlement are all descriptions of soil movement that commonly affect residential and other lightly loaded foundations in the Houston area. Lay people in the local foundation industry commonly refer to all three movement types as simply "settlement". Mr. Kelm addressed these three movement types including their definitions, causes, diagnoses, and symptoms. In addition, he discussed other less common movement types that affect foundations in the Houston area.

Mr. Kelm said that many foundation repair contractors in the business of lifting foundations do not guarantee their work for upward movements caused by heave, rather only the downward movements caused by subsidence and settlement. Misdiagnoses of heave, subsidence, and settlement are common, sometimes invalidating foundation repairs and warranties, and are usually due to the lack of understanding of the mechanisms behind each type of movement. He said that in order to determine the root cause of a foundation performance problem, the forensic engineer first has to correctly diagnose the type of movement.

Mr. Kelm said that misdiagnoses of foundation movement types is minimized if the forensic engineer provides a Level C investigation and report in accordance with Section 3.3 of the Foundation Performance Association's Document No. FPA-SC-13-0, *"Guidelines for the Evaluation of Foundation Movement for Residential and Other Low-Rise Buildings".* He also said that misdiagnoses are further minimized if the forensic engineer performs foundation monitoring per the Foundation Performance Association's Document No. FPA-SC-12-0, *"Guidelines for Evaluating Foundation Performance by Monitoring".*

Mr. Kelm gave a dozen or more unique symptoms for each common movement type for the forensic engineer to look for when evaluating the movement type. He also presented two less-common movement types that his company has found in the Houston area: "Active Fault Slippage" and "Root Heave", giving some symptoms for each. He said there are other movement types as well, so the forensic engineer needs to make sure he or she observes sufficient symptoms to fit one of the three common movement types to the problem before diagnosing the foundation movement. The symptoms he gave are detailed in the paper he presented, but he summarized with these symptoms:

- When *heave* is present there will be an available moisture source nearby
- When *subsidence* is present there will be mature trees or other large vegetation nearby and the movement will be cyclical
- When *settlement* is present the ultimate shear strength of the clay supporting a slab-on-grade at the grade beam bearing level will be below 0.5 TSF

To download the paper Mr. Kelm presented, click here

To download Mr. Kelm's slide presentation, click here

To read a summary of Mr. Kelm's November 2000 FPA presentation, titled, "Geophysical Testing for Assessing the Cause of Movement in Foundations", click here.

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