C34 Got Cracks? Identifying and Preventing Damage Caused by Soils Movement

Michael D. McDowell, MS, Ninyo & Moore, 3001 South 35th Street, Suite 6, Phoenix, AZ 85034*

The goal of this presentation is to describe to the forensic community and/or humanity the cause and effect relationship between soils movement and construction defects.

This presentation will impact the forensic community and/or humanity by identifying problematic soils and demonstrating preventative measures for commonly occurring soil problems that result in loss of use and/or functionality of structures. By increasing the understanding of engineers, design professionals, and homeowners, multi-million dollar law suits and expensive repairs can be avoided.

Several components go into the design and construction of a home or structure. Some of these components include a preliminary soils investigation, structural design, and building pad preparation. Should any of these components fail to adequately account for expansive or collapsible soils, the result could be devastating. This presentation provides basic geotechnical information about expansive/collapsible soils and the potential for adverse effects to structures.

This presentation has four objectives: (1) to provide an overview of expansive soils and the basics of geotechnical engineering; (2) to identify conditions leading to construction defects resulting from soils movement; (3) to describe the difficulties inherent in identifying construction defects caused by soils movement; and (4) to describe how modifications to landscape or drainage may result in damage to structures.

Rapid development and multi-million dollar jury awards involving construction defects have brought an increase in litigation to the western and southwestern United States– particularly in California, Nevada, and Arizona. Construction defects caused by expansive (or collapsible) soils are frequently among the primary allegations made in class-action lawsuits. Adequately sampling and testing on-site soil samples prior to construction, the potential for soil movement and resultant damage can be mitigated. An adequate laboratory-testing program may include in-situ moisture content and dry density, gradation analysis, Atterberg limits, expansion index tests, response-to-wetting tests, and soil classification per the Unified Soil Classification System (USCS).

An engineer or design professional can identify problematic soils with adequate laboratory data. With this data an engineer can modify standard foundation and structural designs to mitigate the potential damage caused by expansive/collapsible soils. Without detailed information engineers may under-design a structure or even make erroneous assumptions that result in loss of use and/or functionality. However, in some cases it is not the engineer, but rather, the homeowner that creates the problem. Homeowners may modify the drainage or landscaping around their homes and alter the pre-existing moisture content of soil. This action may result in significant soils movement and damage to the home.

Soils are heterogeneous and can vary greatly from one site to the next. Factors such as soil type, percent clay, plasticity, density, moisture content, and placement during the earthwork operations, which vary from home to home, will affect soil behavior. Because each home is different, care must be taken to adequately evaluate site-specific soils conditions before alleging construction defects resulted from soils movement. Some distress, such as drywall cracking, cannot be differentiated from that which can be expected from normal shrinkage of construction materials such as concrete, stucco or wood.

Modifications to landscape or drainage are some of the most common factors leading to soils-related damage in homes. By altering the preconstruction moisture content of soil, homeowners may inadvertently cause soils to expand or collapse resulting in cracked walls, floors, and foundations.

Soil, Construction Defect, Litigation

 ** Presenting Author*