C34 Construction Defects Resulting in Threats to Human Health and Unanticipated Expenses - Case Studies From the Ground Up

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The goal of this presentation is describe to the forensic community the cause and effect relationship between water intrusion and observable construction defects, as well as the relationship between construction defects and mold or other indoor air quality complaints. By increasing the under- standing of engineers, design professionals, and homeowners, multi- million dollar law suits and expensive repairs can be avoided.

This presentation has four objectives: (1) to identify various condi- tions leading to construction defects; (2) to describe the difficulties inherent in identifying construction defects; (3) to describe how homeowner modi- fications or design changes may result in damage to structures and/or unsafe living conditions; and (4) to present case studies to identify primary and secondary construction defects. This presentation contains case studies that provide environmental information to show the cause and effect rela- tionship between construction defects and other issues that may threaten human health and result in expensive repairs.

Construction defects caused by water intrusion and substandard con- struction practices are frequently among the primary allegations made in lawsuits. Construction defects may create opportunities for other issues that are more expensive and problematic than the construction defect itself. The primary effect of elevated vapor emissions is typically flooring failures. However, water damaged walls and mold may be a more costly effect of this type of water intrusion. In one case, elevated vapor emission test results of 12 lbs/1,000 sqft/24 hours exceeded the generally accepted flooring industry standard of 3 to 5 lbs/1,000 sqft/24 hours and resulted in delaminated flooring. Although, there was little visual evidence to support a mold claim, the owner felt it necessary to perform an indoor air quality survey and mold survey to assess this issue associated with moisture intrusion. The remediation to the flooring was relatively inexpensive, but the long-term cost and human health impacts from potential mold or indoor air quality complaints may not be determined for many years to come.

Unusual building materials may also lead to indoor air quality issues that threaten human health if are not handled properly. In a separate case, a homeowner complained of an ammonia odor in the home which went unidentified for several months. Extensive sampling and various scientific approaches were required to identify this less common construction defect associated with a chemically-modified insulation. This particular insu- lation produced an ammonia off-gas of more than 10 parts per million (ppm) which was more than the action level derived from the ATSDR Toxicological Profile for Ammonia. The no-observed-adverse-effect level identified in this profile for long term exposures was 9.2 ppm for ammonia in the air and the Minimal Risk level developed from the same data was 0.1 ppm in air. After the source of the ammonia was identified, the exterior paneling of the home was removed and new insulation was installed. Without a comprehensive understanding of the building process and chemical nature of building materials, this indoor air quality issue may have gone unresolved.

Modifications to landscape or drainage are some of the most common factors leading to soils-related damage in homes. By altering the pre-con- struction moisture content of soil and creating new drainage channels, homeowners may inadvertently cause soils to expand or collapse resulting in cracked walls, floors, and foundations. Elevated interior moisture levels and visible moisture intrusion may result from soils-related damage and are sometimes easier to identify than the primary construction defect hidden beneath the surface. For this reason, the secondary defect may be addressed without identifying the primary source of the problem. By adequately investigating construction defects (e.g. warped flooring or mold) the source of the construction defect may be recognized. Elevated moisture readings and visible mold observed in homes are generally the best clues regarding these source construction defects.

This presentation will provide a better understanding of both geotech- nical and environmental issues that face design professionals with the aide of several case studies. The cause and effect relationships between primary and secondary construction defects will also be discussed in an effort to help design professionals prevent or mitigate potentially hazardous situations.

Construction Defect(s), Mold, Soil(s)

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