

PROJECT PROFILE

EVALUATION OF PYRITIC SHALE EXPANSION AT A MANUFACTURING PLANT

D'Appolonia was retained to perform a geotechnical evaluation for identification of the cause(s) of floor slab and interior partition wall heave and cracking observed at an industrial manufacturing facility in Kentucky. Our scope of work included assessment of potential damages and development of appropriate remedial measures and associated costs. Our evaluation included review



Observed heave and cracking of the floor at manufacturing plant.

of design and construction documents, reconnaissance of the building interior and exterior, review of floor slab and building column level survey data, and sampling and testing of mine spoil fill and underlying shale bedrock samples



Drilling through interior floor slab.

obtained from boreholes drilled through the building floor slab.

Construction of the plant was completed in 1994 on the site of a former ridge, such that a portion of the building lies over a few feet of mine spoil underlain by shale bedrock and the remainder of the building lies over mine spoil that significantly increases in thickness in away from the ridge. The building is a steel frame structure with masonry and steel exterior walls and masonry and drywall interior partition walls.

Heave and cracking of floor slabs and interior partition walls in the southeastern portion of the building were reported within a year following completion of construction and have subsequently continued for more than 10 years. Floor slabs now exhibit elevation changes of more than 4 inches over short distances and abrupt elevation changes with respect to building column piers. Interior masonry wall cracking has progressed to the extent that there is some concern over future stability of these walls.

D'Appolonia performed an extensive site reconnaissance, conducted an exploratory drilling and sampling program, and arranged for selected soil samples to be tested for total inorganic sulfur content. The results of the laboratory testing program indicated sulfur contents ranging up to 3.1 percent. Pyritic sulfur contents greater than 1 per-



Heave in concrete slabs adjacent to building.

cent are considered to indicate highly expansive material. Testing also indicated the oxidation level of the tested



Deformation of floor and partition wall due to heave of shale.

materials was about 12 percent, indicating that there was potential for considerable additional heave of the underlying shale bedrock.

D'Appolonia developed recommendations for remediation of the structure. These included excavation of expansive material at the surface, sealing the exposed surface and backfilling with non-expansive material, and support of floors and partition walls on a system of new columns and grade beams. Preliminary costs for implementation of these recommendations were also developed.