



# NOTICE TO ENGINEERS

## Considerations When Laboratory Testing Soil Treated With Condor SS Soil stabilizer

When utilizing electrochemical soil stabilizers, it is common to experience results in the field that are not consistent with those obtained in the laboratory. Often, field observations demonstrate a higher level of success in stabilizing the soil mass than standard laboratory testing is able to confirm. The following information is reprinted in an effort to assist technicians in obtaining more accurate results in the lab.

### Excerpts From “Non-Standard Stabilizers”, FHWA-FLP-92-011, Final Report, July 1992

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“Soils and aggregates treated in the laboratory with chemical stabilizers generally show improvement in standard test results, including Atterburg Limits, CBR, unconfined compression, Proctor density, and linear shrinkage in expansive soils, but results are often erratic and marginal, and may be considered inconclusive by laboratory managers looking for profound changes.”

“Some of this problem may be due to a failure to adopt adequate modifications to procedures which permit the chemicals to perform as they do in the field. The use of metal pans and mixing implements may provide one source of interference.”

“Chemical stabilization is an ion exchanging phenomena in which the stabilizer ions exchange with ions in the clay lattice. Both aluminum and iron provide exchangeable ions to the system in close proximity that may interfere with the normal processes, either before the stabilizing reaction takes place, or afterwards (4).”

“In the electrolyte process, particularly with the sulfonated oils, a hydrogen clay is formed by the treatment. Again the metal ions will interfere with the exchange processes underway. If this occurs before the hydrogen ion and the osmotic pressure gradients have had ample opportunity to exude the ionized water from the clay lattice, the water will remain after treatment and the sample will fail to show the full improvement occurring in the field where the metal ions are not available in such proximity.”



“Likewise the mixing and curing procedures should duplicate field conditions as closely as possible to avoid interference with normal processes. The molding moisture for the linear shrinkage test (AASHTO T92) should be at optimum rather than in excess of the liquid limit as used for untreated soils because the treated soils will not take on excess moisture in the field.”

“In the case of the electrolyte sulfonated oils, the sample must be saturated with the stabilizer solution, thoroughly aerated, and then allowed ample time to dry thoroughly, four full days with drainage from the bottom of the container, in an environment free from metal ions, prior to preparation to testing. This drying period increases the density and prevents future penetration of moisture into the lattice structure.”

“Because the chemical stabilizers reduce moisture sensitivity, the Atterburg limits tests may provide misleading results. While moisture can be mechanically forced into the stabilized sample in the laboratory, moisture does not have similar access to the stabilized soil in the field due to the loss of capillarity that has resulted from the treatment.”

“Two extremely important soil and aggregate properties substantially affected by the chemical stabilizers are probably not adequately measured by the standard testing procedures. These properties are capillarity and cohesion. Treatment with any of the stabilizers discussed here results in reduction or elimination of and an increase in the permanent cohesion. Lambe (15) has provided a procedure for measuring the capillary head that may be appropriate for comparing stabilized materials with an untreated sample. The USFS PNW materials laboratory in Portland, OR has developed a split ring tension test that may provide a better measure of cohesion than the unconfined compression test.”

References:

(4) James K. Mitchell, Fundamentals of Soil Behavior, John Wiley & Sons, Inc., 1976, pp 49-54, 112-134, 260-269, 353-373.

(15) T. William Lambe, Soil Testing For Engineers, John Wiley, N.Y., 1951

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