Laboratory Evaluation of Expansive Soils

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Clay soil that expands beneath a structure after construction can cause upward heaving of slabs and footings, resulting in buckling of foundation walls due to excessive lateral forces on the walls. Identification of expansive soil during the design phase of a project is important, so that mitigation measures may be implemented during construction to prevent future slab and foundation distress.

Two primary factors that contribute to soil expansion are changes in soil moisture content and the percentage of clay particles in the soil. Clay soil that is dry, or desiccated, tends to expand as water from an external water source is absorbed by the soil. The higher the percentage of clay particles in a soil, the greater amount of water that can be absorbed, resulting in a greater swell potential.

Laboratory testing to identify potentially expansive soil include Natural Moisture Content (ASTM D2216), Particle Size Analysis (ASTM D422), Atterberg Limits (ASTM D4318), and Expansion Index Testing (ASTM D4829).

In accordance with the Building Code of New York State (BCNYS), expansive soil is defined as soil that exhibits the following:

1. Plasticity index of 15 or greater, as determined in accordance with ASTM D4318; and

2. More than 10 percent of soil particles pass a No. 200 sieve, as determined in accordance with ASTM D422; and

3. More than 10 percent of soil particles are less than 5 micrometers in size, as determined in accordance with ASTM D422.

Per the BCNYS, the above tests are not required to be performed if the expansion index of the soil is less than 20, as determined in accordance with ASTM D4829.

ATL can perform the laboratory test methods to identify expansive soil. For more information, contact Brian Barnes, PE, at 315-735-3309, info@atlantictesting.com, or visit AtlanticTesting.com.

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