



29 January, 2002

Western Pozzolan
417-355 Scott Road
Doyle, CA 96109

RE: Summary of Testing for Lassenite Product

In recent months, we have performed a series of physical and chemical tests on the calcined pozzolan that constitutes your Lassenite product. Herein, I shall summarize these results addressing the moisture retention, capillarity, expansion, and compaction properties of the pozzolan.

MOISTURE RETENTION

In a number of different tests, including the ASTM F 726-99 water adsorbency test, we have measured the moisture retention properties of the pozzolan. The calcined pozzolan retained between 92 and 102% of its mass in water based on the ASTM standard method. The results from the tests run last May are attached here.

The material thus exhibits strong moisture retention properties when compared with ordinary soils or even some of commercially available soil additives.

In December, Don D. Haller and Malcom Beck of Texas concluded their farming experiments using Lassenite supplemented soils. As shown in the attached memo from Mr. Haller, experimental plantings of cabbage and broccoli in both control and Lassenite augmented soils demonstrated that the retained moisture is benefiting the plant growth dramatically. A 20% pozzolan in soil mixture seems to ensure consistent delivery of moisture to the plants' root systems.

CAPILLARITY

The wicking ability or conduit effect of the pozzolan has been observed in a number of informal trials. Subcontracting AMEC Earth and Environmental, we sought to formally evaluate this property of the material. The experimental design included two clear plastic capillarity tubes of 2 ¼ inches diameter and 18 inches height. Raw parent soil was loosely packed into one of the tubes, while a 20% Lassenite soil mixture was packed into the other. Placing the tubes in a tray of water, the capillary rise of water with time was monitored in both tubes. After two days of testing, the water column in the Lassenite blend was 11.5 inches above the water line, while the water rose to only 2.75 inches above the water line in the parent soil.

This dramatic improvement in the capillarity of the soil with the addition of Lassenite is strong evidence of the product's ability to evenly distribute moisture throughout the soil column. I have attached the letter from AMEC Earth and Environmental describing the experiments and results in detail.

EXPANSION

Because of the concerns raised by expansive soils, it is important to document a soil additive's expansion characteristics. While one would not expect significant expansion from the highly siliceous material, the test results confirmed these expectations. AMEC Earth and Environmental performed a standard expansion test and found no expansion. A specimen of pure pozzolan was tamped into a ring and compressed at 100 pounds per square inch. Once settled, the sample was saturated and monitored for expansion. The technicians observed none.

COMPACTION

The ability of a soil additive to aerate a soil is a function of the compaction properties of the material. If the product compacts dramatically, soil porosity will decrease, resulting in a less aerated soil. There is a standard compaction test performed by soils testing labs. AMEC Earth and Environmental performed this test on a 20% blend of pozzolan with a parent soil.

After moisture conditioning, a parent soil was compacted to standardized conditions, at which point a dry density of 108.4 pounds per cubic foot and a moisture content of 8.8% was determined. The porosity of this raw compacted soil was 34.6%. The 20% blend of pozzolan and soil was similarly compacted. The resulting density was 80.8 pounds per cubic foot with moisture content of 7.1%. The resulting porosity in the blend was 50.5%, a 46% improvement in porosity in the Lassenite blend.

The Lassenite blended into the soil resulted in a dramatic improvement of porosity, attesting to the material's inherent ability to improve the aeration of soils. Again, the experiment and the results are summarized in the attached letter from AMEC Earth and Environmental.

Yours sincerely,

R. Patrick Highsmith
Chief Geochemist