

GEOSCIENCE ENGINEERING AND TESTING, INC.

GEOTECHNICAL & MATERIALS ENGINEERS

June 16, 1993

City of Alvin
216 West Sealy
Alvin, Texas 77511

Attn: Mr. Duane Hengst, P.E.
City Engineer

Reference: EN-1 Road Stabilizer

Dear Mr. Hengst:

As per your request, Geoscience Engineering & Testing, Inc. has completed a limited evaluation of the road stabilizer EN-1. Our study was directed toward the addition of EN-1 to a cement stabilized soil to determine what effect the stabilizing agent would have on the compressive strength characteristics.

A sample consisting of pulverized asphaltic concrete and crushed limestone was used for our test sample. The material was sieved through a No. 4 sieve and any coarse materials were removed and discarded. A total of 36 samples were prepared and mixed with varying amounts of type 1 portland cement and a diluted solution of EN-1. The EN-1 was diluted at a ratio of 360 parts water to 1 part EN-1. Additional water was added to bring the mixture to approximately 13 percent moisture content. The samples were molded using a standard Proctor mold and cured for 3 days prior to testing.

It should be noted that the manufacturer does recommend that the EN-1 be diluted at a rate between 200-500 to 1. This dilution also brings the corrosivity to below EPA standards as defined in EPA 1110. We chose a ratio of 360 to 1 because of convenience. At this ratio, an addition of 3 percent solution was equal to the manufacturers recommendation of 1 gallon EN-1 to 33 cubic yards of base material.

The following chart illustrates the results of our tests.



COMPRESSIVE STRENGTH PSI			
	0% EN-1	3% EN-1	5% EN-1
0% Cement	NA	28	33
2% Cement	97	146	216
4% Cement	110	185	252
6% Cement	155	225	307

Based upon these test results, we have concluded that the addition of EN-1 has enhanced the effects of the portland cement as evidenced by an increase in compressive strength. Although these results were encouraging it was our opinion that actual field tests be performed.

On June 1, 1993 a pilot project was started at Baybrook Mall in Houston, Texas. The base material was designed to incorporate 60 pounds of portland cement per square yard at a depth of 12 inches. The cement content was reduced to 35 pounds per square yard with the addition of EN-1 at a rate 1 gallon per 33 cubic yards of base material.

The following benefits were noted:

1. A cost savings of approximately \$0.75 per square yard of subgrade.
2. Dust from the subgrade was eliminated.
3. The setting time for the cement was extended allowing the contractor more time to manipulate the soils and to work on larger areas each day.

As of the date of this letter, we have completed approximately 150,000 square feet of subgrade and are satisfied with the performance of the EN-1 as an additive with cement stabilized soils.