Research Report No. 11

A RAPID METHOD FOR SOIL CEMENT DESIGN

LOUISIANA SLOPE VALUE METHOD

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SYNOPSIS

This report is concerned primarily with the development of a laboratory design procedure calculated to reduce the testing time for determination of minimum cement content for soil cement construction.

The testing program covered some 274 different soil samples representing a major portion of the State. The samples selected were those materials which would be suitable for construction purposes without any previous treatment.

A minimum compressive strength requirement could be established for various AASHO soil groups that would meet the PCA criteria. However, this method would not be economically desirable in that it would lead to the use of excessive cement on a large portion of the samples tested.

Consequently, a method which would make maximum use of compressive strength criteria as correlated with the Wetting-Drying Test (AASHO T 135-57) was devised. The Louisiana "Slope Value Method," as it is called, is based on the premise that there is a relationship between the durability of soil cement mixtures at selected cement contents and the slope of the unconfined compressive strength line at identical cement contents. A procedure for this method is given in the Appendix.

This method, in addition to reducing the testing time by approximately 70 per cent, is at least as accurate as the Wetting-Drying Test and incorporates many of the virtues of the latter.

The Louisiana "Slope Value Method" shall be evaluated with respect to the Wetting-Drying Method for a period of approximately one year in order to further observe its practicality.

A RAPID METHOD FOR SOIL-CEMENT DESIGN

LOUISIANA SLOPE VALUE METHOD

INTRODUCTION

The current procedure used by the Louisiana Department of Highways for laboratory design of cement stabilized soil base and subbase courses is taken from standard AASHO test methods, patterned after Portland Cement Association criteria. These methods have been used by the Department for more than a decade and have proven to be very satisfactory without any significant failures. However, they have the disadvantage of involving extensive laboratory work covering a rather long period of time which is not always desirable. The need for a faster test method became apparant under an accelerated construction program when the Louisiana Department of Highways required contractors to furnish the soil for soil-cement stabilization. In an attempt to eliminate some of the rather tedious laboratory test procedures mentioned above, the Research Unit instigated this study in cooperation with the U. S. Department of Commerce, Bureau of Public Roads, in July, 1961.

This paper, then, is concerned primarily with the development of a laboratory design procedure calculated to reduce the testing time for determination of minimum cement content for soil-cement construction. It is not the intent of this report to discuss the relative merits of other procedures, but rather to establish a correlation between the "Wetting and Drying Test of Compacted Soil - Cement Mixtures" (ASTM D 559-57 or AASHO T 135-57) and a 7-day compressive strength requirement in order to take advantage of the proven qualities of the accepted standard method.

It will be pointed out that a minimum compressive strength requirement is neither necessary nor desirable in this procedure, although an attempt

is made to arrive at some conclusion as to a minimum compressive strength guide for satisfactory soil-cement results.

SCOPE

When this research program was first conceived, it was decided that the best solution to the problem would be to establish a minimum compressive strength to be required for satisfactory soil-cement stabilization. This approach also agreed with flexible pavement design procedures and possibilities of employing high intensity rollers in bituminous hot-mix construction. In other words, the ideal solution would be to establish a minimum compressive strength to be obtained which would satisfy both the Portland Cement Association criteria for satisfactory soil-cement stabilization, and a desired strength based on design considerations.

With this in mind, the investigation was to be conducted in five phases:

(1) Determination of in-place strengths of existing soil-cement projects to cover predominant materials and climatic conditions in Louisiana and laboratory behavior of similar material.

(2) Correlation of satisfactory pavement behavior to in-place soil-cement strength data.

(3) Establishment of a laboratory correlation of unconfined compressive strength and wetting-drying test losses of samples molded at identical cement contents and moisture conditions.

(4) Determination of the in-place 7-day strengths of soil-cement projects in construction, and laboratory behavior of similar material.

(5) Development of a shrinkage test and correlation of it with the extent of cracking in an effort to determine the optimum desirable moisture and cement content of soil-cement mixtures.

Soon after the work was started, it was obvious that: 1) Compressive strength versus the wetting-drying test relationship of soil-cement mixtures is much too complex to be accurately defined by some minimum or maximum strength value especially when soils of different types and geologic origin are encountered. 2) In-place strength data obtained from existing projects as compared to the laboratory behavior of what was

presumed to be similar untreated material was too erratic to offer any conclusions. However, the results obtained from phase (3) looked promising, and it was felt that all efforts should be concentrated in this area.

MATERIALS TESTED

In the sampling pattern for soils, every effort was made to cover all the different soil types and conditions encountered in Louisiana. The emphasis was placed on the southern half of the State since the most troublesome areas, engineering wise, are encountered in this region. The distribution of these samples is geographically illustrated in Figure 1 with detailed information given in Table I in the Appendix.

The testing program covered some 274 different soil samples. Fifteen per cent of the samples represented A-2-4 and A-3 groups, 53 per cent were A-4 soils and the remaining 32 per cent represented the A-6 group. Since the present construction specifications exclude the use of A-6 materials having plasticity indices of more than 15 without prior lime treatment, this study was generally confined to soils with a maximum plasticity index of 15.

The cement used in this investigation was commercially available Type I Portland Cement meeting AASHO Designation M 85-60.

TEST PROCEDURES

The soil samples were prepared and tested in accordance with the various methods listed below:

AASHO Designation: T 87-49 (LDH Designation: 411-58) - Standard Method of Dry Preparation of Disturbed Soil Samples for Test.

LDH Designation: TR 406-56 - Alternate Mechanical Method of Determination of the Liquid Limit of Soils-One Point Liquid Limit.

AASHO Designation: T 90-54 - Standard Methods of Determining the Plastic Limit of Soils.

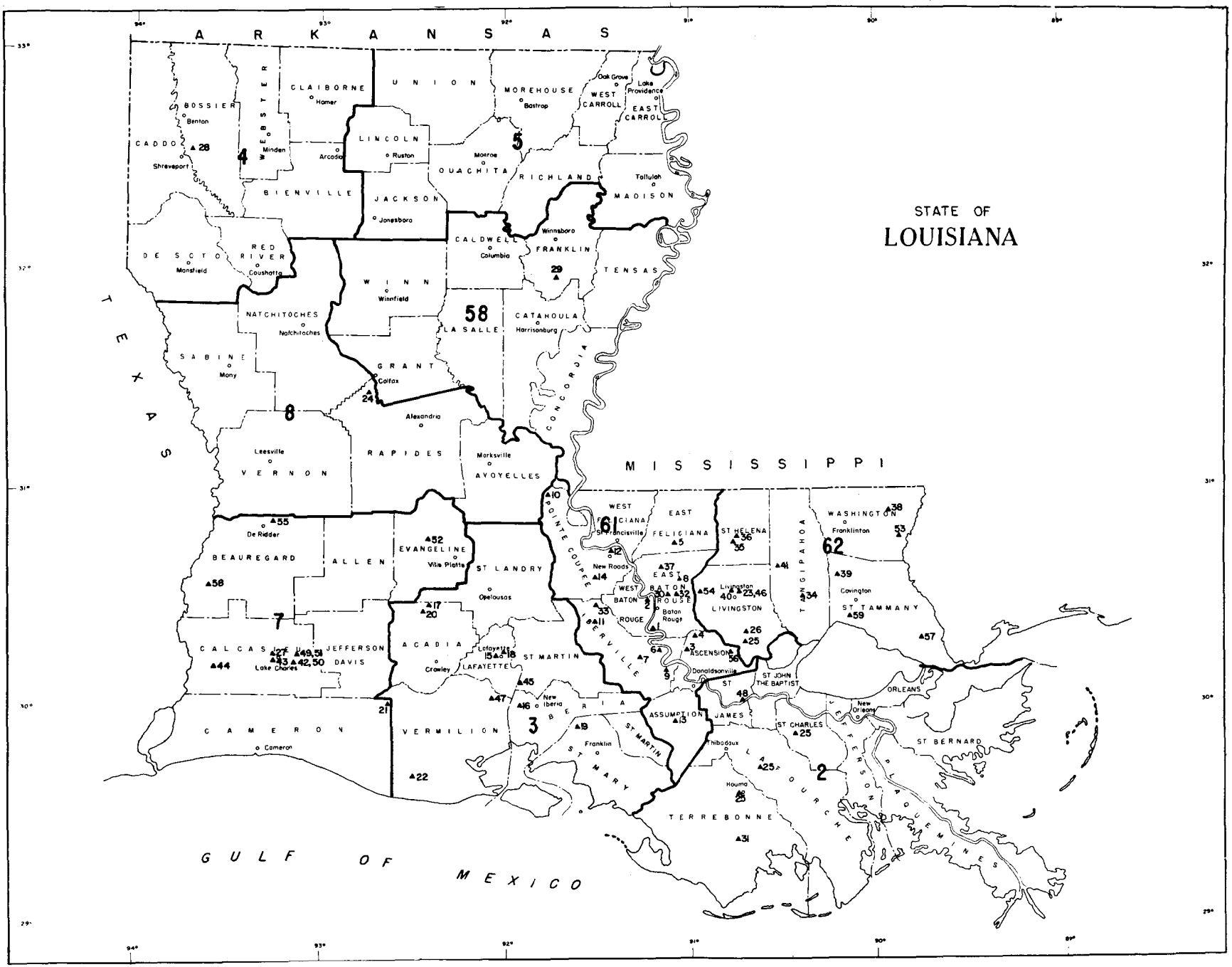


Figure 1 - Locations of Samples Tested.

AASHO Designation: T 91-54 - Standard Method of Calculating the Plasticity Index of Soils.

AASHO Designation: T 99-49 - Standard Methods for the Compaction and Density of Soils.

LDH Designation: TR 407-51 - Standard Method of Mechanical Analysis of Soils.

AASHO Designation: M 145-49 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

AASHO Designation: T 134-57 - Standard Methods of Test for Moisture-Density Relations of Soil-Cement Mixtures.

AASHO Designation: T 135-57 - Standard Methods of Wetting and Drying Test of Compacted Soil-Cement Mixtures.

Method for Determining the Amount of Cement by Weight for Soil Compaction (Nomograph or Formula) - Soil-Cement Laboratory Handbook, Portland Cement Association, pp. 36, 37.

The method of molding the laboratory soil-cement cylinders for unconfined compressive strength determination is identical to the method of molding the Wetting-Drying Test specimen, except that at the end of the 7-day curing period at 100% relative humidity, the specimens are capped with a commercial capping compound (trade name: Vitrobond) in a specially designed capping mold. The specimens are immersed in water for a period of four hours, then tested for unconfined compressive strength in a hydraulic machine set at a rate of 0.05 inches per minute with the machine running idle. A detailed test procedure is given in the Appendix.

DISCUSSION OF TEST RESULTS

Since a rather voluminous amount of data was compiled in the course of this study, it would be in order to discuss the test results under the following headings for purposes of clarification.

A. In-place strengths of existing soil-cement projects.

B. Minimum desirable compressive strength.

C. Laboratory correlation of unconfined compressive strength and Wetting-Drying Test losses.

D. Development of a rapid soil-cement design method correlated with the Wetting-Drying Test.

E. Accuracy of the "Louisiana Slope Value Method."

A. IN-PLACE STRENGTHS OF EXISTING SOIL-CEMENT PROJECTS:

A summary of the data obtained from the soil-cement projects studied is given in Table II in the Appendix. For detailed information refer to Appendix Tables III through LIX. Twenty-one projects were studied varying in age from one to four years. Although considerable data was gathered only very general trends are indicated due to the scatter pattern of the results as follows:

1. On any one project showing relatively the same roadway condition throughout its length, the compressive strength values vary, on an average, from 400 to 1400 psi.

2. On all projects studied, the compressive strength varies from a low of 140 psi to a high of 2800 psi.

3. On the projects that contain the optimum percentage of cement as determined in the laboratory, and appear to be adequately stabilized, the compressive strength of the base reaches a limiting value of 900 to 1500 psi in a period of about three years.

4. Where the roadway cement content is in excess of the laboratory indicated value, the roadway strengths run in the neighborhood of, or exceed, 1500 psi.

B. MINIMUM DESIRABLE COMPRESSIVE STRENGTH

The data obtained from laboratory tests are given in Tables XXIV through LIX in the Appendix. As the compilation of data from various tests progressed, it was believed that an average compressive strength could be obtained for certain soil types meeting the PCA criteria for optimum cement content as determined by the Wetting-Drying Test. For each soil specimen tested, unconfined compressive strength and the corresponding wetting-drying loss at each percentage of cement were plotted on a combined graph, as shown in Figure 2.

Cement contents, indicated on the horizontal axis, are given in terms of per cent by weight rather than volume to avoid the variation due to changes in density. The minimum cement content required is determined by point (a) which is the intersection of the wetting-drying loss line with the allowable loss line. It follows that this particular soil specimen would develop a strength of 245 psi to meet the wetting-drying loss criteria as indicated by point (b). In other words, 245 psi would be the minimum strength requirement for this soil if stabilization criteria were applied through a measure of strength instead of wetting-drying loss.

However, it soon became apparent that all of the observations did not follow such a pattern as neatly as explained above. In about 40 per cent of the total number of observations made, the wetting-drying loss line was too flat to intersect the allowable loss line. This condition is illustrated in Figure 3. It will be seen that this type of a strength versus wetting-drying loss relationship is at least not too well defined if not totally irrational. For laboratory molded specimens, selection of cement contents on the high side instead of the minimum values which would actually produce failure was one of the main factors responsible for this condition. Much better laboratory curves would have been obtained through a better selection of cement contents for testing purposes. This point shall be discussed later.

Figure 4 shows the unconfined compressive strengths of soil-cement specimens containing the minimum percentage of cement as required by the Wetting-Drying Test and the PCA criteria. The points plotted are not necessarily measured strength values at condition failure. They are in most cases obtained by interpolating or extrapolating strength and wetting-drying loss versus cement content relationships for each individual soil sample tested as explained in the previous paragraphs. Those values which could not be extrapolated with some degree of confidence have been excluded.

A study of Figure 4 leads to the following observations which are quite interesting:

1. Within any AASHO soil group tested, as the soil specimens require more cement to meet the PCA criteria, the strengths developed at these cement contents also increase. This is indicated by the ascending slopes of the lines which represent an approximate average of the scatter pattern.

2. The rate of increase in strength with corresponding increases in the cement content to meet the maximum allowable loss is the highest in A-2-4 and A-3 groups, intermediate in the A-4 group and lowest in the A-6 group. Actually, the slope of the strength line is almost flat in the A-6 group. In other words, no matter how much cement it takes to adequately stabilize an A-6 soil, the average strength gain at that cement content is not appreciably higher than the average strength of another soil which will require a much lower cement content. The same point can further be discussed and elaborated on through the use of Figure 5 a, b, c, d. These charts illustrate the compressive strength-Wetting-Drying Test loss for A-2-4 and A-3, plastic and non-plastic A-4 and A-6 soils.

If an arbitrary minimum compressive strength requirement of 350 psi were selected for A-2-4 and A-3 groups shown in Figure 5 a, 24 per cent of the soils that would normally stabilize at the indicated cement contents would either completely fail or require a higher cement content. The soils that would be suitable using the Wetting-Drying Test and would fail this minimum compressive strength are shown in the shaded area.

If an arbitrary minimum compressive strength of 300 psi is specified for A-4 and A-6 soils (Figure 5 b, c, and d), the percentage of soil specimens that would pass the Wetting-Drying Test and yet fail this minimum compressive strength requirement would be 33 per cent for non-plastic A-4 soils, 49 per cent for plastic A-4 soils and 44 per cent for A-6 soils. Here again, the areas where the soils would pass the Wetting-Drying Test and fail the arbitrarily specified compressive strength test are shaded. In other words, in soil stabilization, the use of a minimum compressive strength value as a criterion for the selection of the minimum adequate cement content will result in the elimination of a large percentage of soils that would perform satisfactorily.

These observations suggest the following conclusions:

1. The minimum strength required for various AASHO soil groups to meet the PCA criteria applied through the Wetting-Drying Test is not a constant but varies as a function of other parameters (i.e. physical, chemical properties, etc.) which could not be established by this research program.

2. Minimum compressive strengths required for various AASHO soil groups to meet the PCA criteria can be established to insure that

all the specimens tested would meet the PCA criteria. However, this method would not be economically desirable leading to the use of excessive cement on a large portion of the samples tested.

C. LABORATORY CORRELATION OF UNCONFINED COMPRESSIVE STRENGTH AND WETTING-DRYING TEST

A different approach to arrive at a correlation between the compressive strengths and the Wetting-Drying Test losses was tried by incorporating individual strength versus Wetting-Drying Test relationships on combined charts where the boundaries of families of curves could be defined as follows:

1. For each soil specimen tested the compressive strength and the corresponding wetting-drying loss were plotted versus the cement content (Figure 6 a).

2. Soil specimens tested were divided into (1) A-2-4 and A-3, (2) A-4 with a plasticity index of less than 3, (3) A-4 with a plasticity index of more than 3, and (4) A-6 groups. Individual Strength-Loss-Cement Content curves available for each group were superimposed on one chart (Figure 6 b).

3. For each group the boundaries of the lines in Figure 6 b were defined as in Figure 6 c.

4. Boundaries for each group were divided into several segments by drawing reference lines 1, 2, and 3, and 1 A, 2 A, and 3 A. (Figure 6 d).

The problem was to predict the expected critical loss and thereby the minimum cement requirement based on known observations of compressive strength assuming the latter is an indirect measurement of the undefined factors involved in the reaction of soil with cement. It was also assumed that there is a relationship between the rate of strength increase of a sample with additional cement and its expected strength at the cement content necessary to stabilize it. To accomplish this, a trial and error approach was utilized where the general relationship in Figure 6 d was assumed to represent the idealized correlation between the wetting-drying loss and strength for corresponding soil groups.

In order to predict the minimum cement content, one investigator would give his partner a set of 7-day unconfined compressive strengths of soil specimens molded at varous cement contents from laboratory

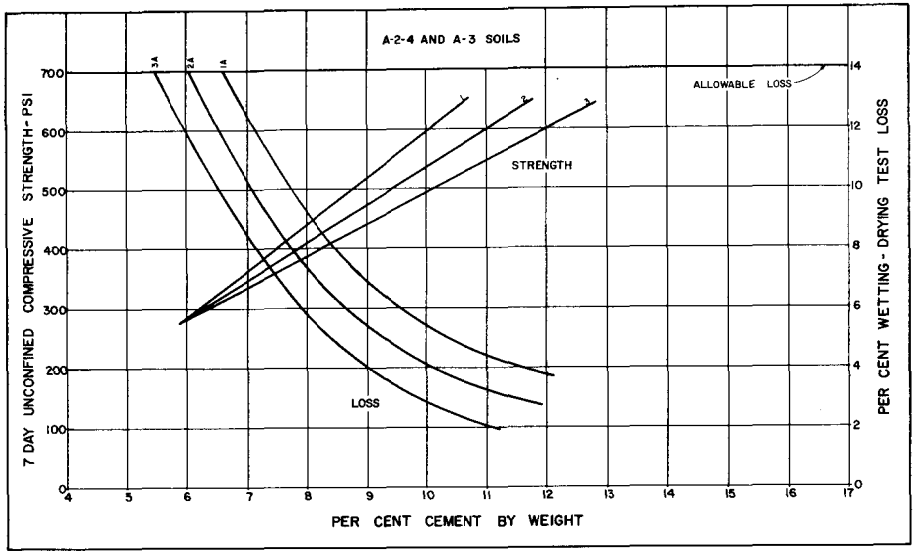
data. The other investigator would proceed to plot these values within the boundaries of the strength family of curves, orient and locate the corresponding Wetting-Drying Test loss curve, and then tell his partner his estimate of the required cement content for adequate stabilization. This latter point was defined by intersecting the estimated loss line with the allowable loss line for that material. Tabulations of the accuracies were kept by comparing estimates with actual laboratory observations.

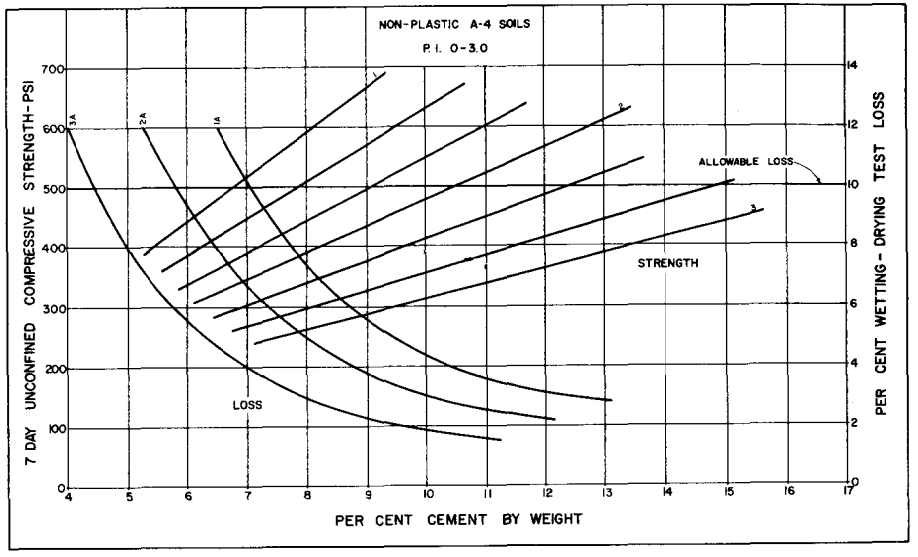
Various curve fitting techniques were employed, trying to better the accuracy. Finally, the method which gave the best results was as follows:

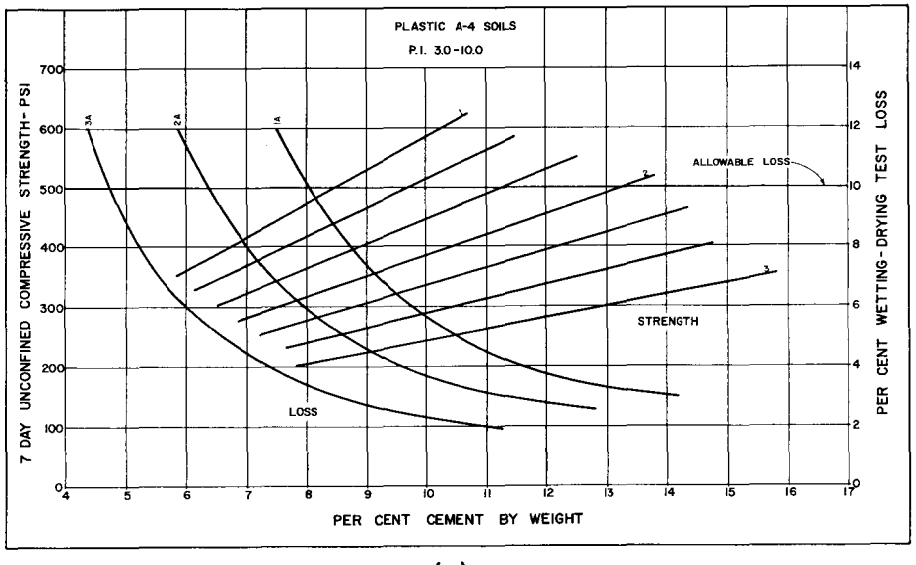
To determine the necessary amount of cement for soil-cement stabilization without having to run the Wetting-Drying Test, it will first be necessary to mold duplicate briquettes at three different cement contents. After the 7-day unconfined compressive strength values are determined, they are plotted on the corresponding correlation chart. This usually determines a straight line. The relationship of this straight line to lines 1, 2 and 3 is noted and corresponding curve bearing the same relationship to match curves 1 A, 2 A and 3 A is drawn (Figure 7). The intersection of this curve with the maximum permissible loss as recommended by Portland Cement Association for various materials determines the cement content to be recommended for the material being tested. In this curve fitting method, the slope of the particular strength curve in relation to lines 1, 2 and 3 appears to be a determining criterion of the behavior of the cement treated material. A strength line starting off between lines 2 and 3 and climbing up with a slope parallel to line 1 exhibits the properties of a material with a strength line lying between lines 2 and 1 with a slope parallel to the slopes of the family of curves in this portion of the chart. In other words, the rate of strength increase by increasing the cement content seems to be the governing parameter in determination of a minimum cement content to insure adequate soil-cement stabilization.

Idealized wetting-drying loss strength correlation charts are shown in Figure 8 a, b, c and d for various soil groups. A summary of test results is given in Table LXI through LXIV in the Appendix.

It is interesting to note that the relationship of lines 1, 2 and 3 to match curves 1 A, 2 A and 3 A is reversed for A-6 soils. This means that, in the A-2-4, A-3 and A-4 groups, those soils that develop strength at a higher rate than another soil in the same group also develop higher







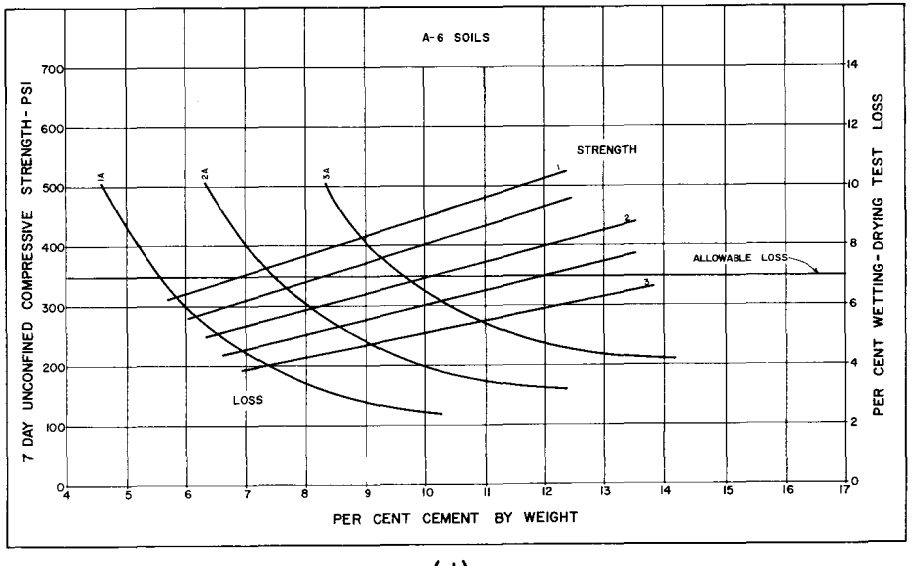


Figure 8 *Family of Curves for Strength Versus Wetting-Drying Loss Relationships of Various Soils.*

wetting-drying losses or require more cement to stabilize them. This situation is reversed for A-6 soils where those soils developing strength at a higher rate develop lower losses or require less cement to stabilize.

This rather unexpected reversal of trend regarding coarser grained soils in the A-2-4, A-3 and A-4 groups can probably be best explained in terms of the angle of internal friction, cohesion, and the contribution of these two properties to the overall results of the Wetting-Drying Test. However, this study was not oriented to investigate these specific characteristics. Nevertheless, reference is made to Figure 4 and Figure 8 for a qualitative explanation.

In Figure 4, where the average strengths of groups of soils are plotted versus a constant wetting-drying loss, (i.e. 14% for A-2-4 and A-3, 10% for A-4, and 7% for A-6 soils) it is seen that in the coarser grained soil groups, as in Figure 4 b, addition of cement induces a gain in strength without a definite effect on wetting-drying losses. The harder the soil is to stabilize, the more strength it develops. Therefore, as in Figure 8, if a soil develops a relatively high rate of strength increase, it also develops a relatively high wetting-drying loss.

On the other hand, for finer grained A-6 soils, as in Figure 4 d, the addition of cement is directly reflected in the wetting-drying losses without an appreciable gain in strength. In other words, when a certain degree of strength is achieved through the addition of cement, stabilization requirements are also satisfied. Therefore, if an A-6 soil develops a relatively high strength, it develops a relatively low wetting-drying loss as can be seen in Figure 8 d.

D. DEVELOPMENT OF A RAPID SOIL CEMENT DESIGN METHOD CORRELATED WITH THE WETTING-DRYING TEST

The preceding discussion has been concerned with the general development of the correlation charts shown in Figure 8.

The next logical step was to find some method of arriving at the same results without having to depend so strongly on personal interpretation. Several methods were tried with varying degrees of success from which evolved the "Louisiana Slope Value Method."

The slope value method is simply a mathematical expression of the previously described "trial and error" method. It is based on the premise that there is some tangible relationship between the susceptibility of

soil-cement mixtures to additional cement, as expressed by the slope of the 7-day unconfined compressive strengths developed at respective cement contents, and the Wetting-Drying Test losses realized at identical cement contents.

Figures 9 through 12 represent the previously discussed Figure 8 incorporating "slope values" calibrated or located to result in the best available accuracy to replace the arbitrary lines identified as 1, 2, 3 and 1 A, 2 A, and 3 A.

The slope value is defined as the difference in strength (psi) at successive cement contents divided by the difference in the corresponding cement contents (per cent by weight).

A further refinement was made in that out of the three strength determinations at successive cement contents, the maximum difference was used for A-2-4, A-3 and A-4 soils and the minimum for A-6 soils. The necessity for making such a discrimination was primarily dictated by the fact that a higher degree of correlation was obtained by using it. Furthermore, it is also a reflection of the same behavior pattern as discussed in the previous section and is consistent with the fact that coarser grained soils are more sensitive to changes in cement content than fine grained soils.

A detailed procedure for the use of the "Louisiana Slope Value Method" is given in the Appendix.

At this point it should be recognized that very low cement contents such as from 1 per cent to 4 per cent by weight are mainly of academic significance in the laboratory and not too feasible for use in soil-cement construction with the predominant soil types in Louisiana. It was therefore decided to use an arbitrary minimum cement content of 5 per cent by weight to analyze and evaluate the laboratory data which were not well defined. This minimum figure of 5 per cent by weight was agreed on after reviewing all the available soil-cement test data in the Department's laboratory. Since the objective of the testing program was to arrive at a practically feasible and workable method, it was felt that imposing such an arbitrary boundary condition would be in order.

E. ACCURACY OF SLOPE VALUE METHOD

To test the accuracy of cement content determinations made by use of the correlation charts as compared to that obtained by the 12 cycle wetting-

drying loss method, available laboratory results were compared with the values obtained from the charts. A "hit" was considered when the cement content by both methods was equal. Any value greater than ±2.0 per cent was considered a "miss." All determinations were made on the charts to the nearest higher whole number, i.e. 6.2 per cent by weight was considered as 7 per cent by weight. A summary of the accuracy determinations of the charts is given in Table I.

It shall be seen that 93 per cent of the predictions for the cement content made through the use of the correlation chart for A-2-4 and A-3 soils agree with the laboratory determined cement requirements within +2.0 per cent. Only 7 per cent of the observations show within -1 per cent and this does not necessarily mean that any or all of this 7 per cent will result in failures. The chart for non-plastic A-4 soils shows an accuracy of 80 per cent within +2.0 per cent cement content with 9 per cent within -2 per cent, and the plastic A-4 chart shows 93 per cent within +2.0 per cent with some 3 per cent within -2 per cent.

The correlation chart for A-6 soils which contains 90 observations shows a comparable accuracy of 79 per cent within +2.0 per cent cement content and 4 per cent of the values within -2.0 per cent. However, this chart does show a marked increase (15%) in the number of observations which require more than 2.0 per cent cement content than that determined by the Wetting-Drying Test method. None of the charts show cement predictions that were greater than 2 per cent less than the optimum obtained by the Wetting-Drying Test except the A-6 chart with 1 per cent.

The preceding paragraphs describe the accuracy of the correlation charts on the basis of all data, including those observations which have an arbitrarily assigned minimum cement content. When comparing this accuracy with the accuracy obtained by deleting the data with this assigned value, it shall be seen that there is very little change in the total accuracy, that is, within +2 per cent cement content. For example, the accuracy within +2 per cent cement content decreased 4 per cent (from 93% to 89%) for both the A-2-4 and A-3 chart and the plastic A-4 chart; one per cent for the non-plastic A-4 chart; and increased 5 per cent for the A-6 chart. This indicates that the value assigned (5% minimum) to those observations, which could not normally be included, has a sound basis and allows the use of a significant increase in data. Figure 13 a, b, c and d are graphical illustrations of the comparable accuracy of the two methods. The solid curve on each figure represents the accuracy with all observations included and the dashed curve represents only those observations which, when plotted, actually intersect

TABLE I

ACCURACY OF CEMENT REQUIREMENT DETERMINATIONS THROUGH USE OF CORRELATION CHARTS AS COMPARED WITH THOSE OBTAINED FROM WETTING-DRYING TEST LOSSES

A-2-4 AND A-3 SOILS

	Total	Excluding 5% Minimum Values
Number of Observations	41	28
Hits	27%	39%
+1% Cement	29%	29%
+2% Cement	37%	21%
-1% Cement	7%	11%
-2% Cement	0%	0%
Greater than +2% Cement	0%	0%
Greater than -2% Cement	0%	0%

NON-PLASTIC A-4 SOILS

	Total	Excluding 5% Minimum Values
Number of Observations	46	28
Hits	41%	54%
+1% Cement	28%	18%
+2% Cement	11%	7%
-1% Cement	7%	11%
-2% Cement	2%	3%
Greater than +2% Cement	11%	7%
Greater than -2% Cement	0%	0%

TABLE I (Cont.)

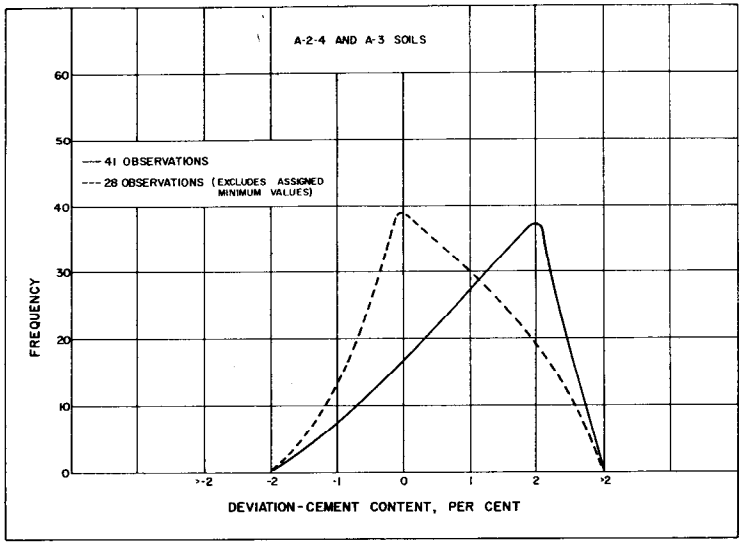
ACCURACY OF CEMENT REQUIREMENT DETERMINATIONS THROUGH USE OF CORRELATION CHARTS AS COMPARED WITH THOSE OBTAINED FROM WETTING-DRYING TEST LOSSES

PLASTIC A-4 SOILS

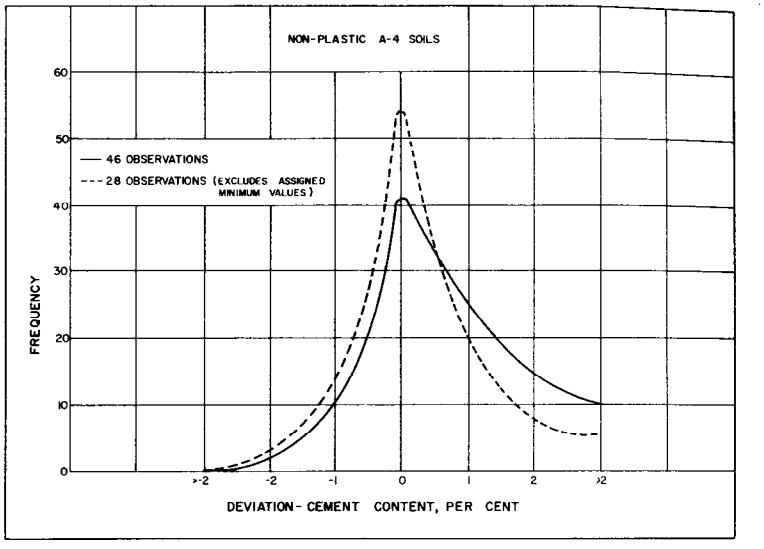
	Total	Excluding 5% Minimum Values
Number of Observations	97	37
Hits	21%	41%
+1% Cement	20%	24%
+2% Cement	52%	24%
-1% Cement	2%	5%
-2% Cement	1%	3%
Greater than +2% Cement	4%	3%
Greater than -2% Cement	0%	0%

A-6 SOILS

	Total	Excluding 5% Minimum Values
Number of Observations	90	69
Hits	41%	53%
+1% Cement	24%	22%
+2% Cement	15%	10%
-1% Cement	3%	4%
-2% Cement	1%	1%
Greater than +2% Cement	15%	9%
Greater than -2% Cement	1%	1%



(a)



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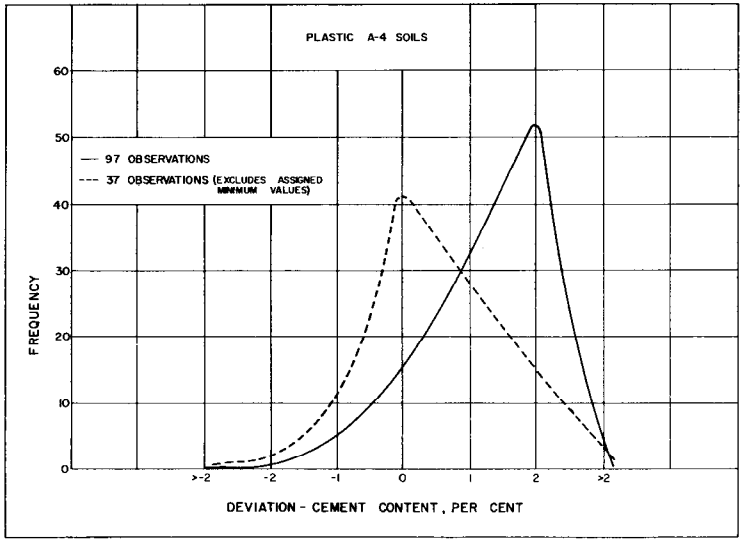

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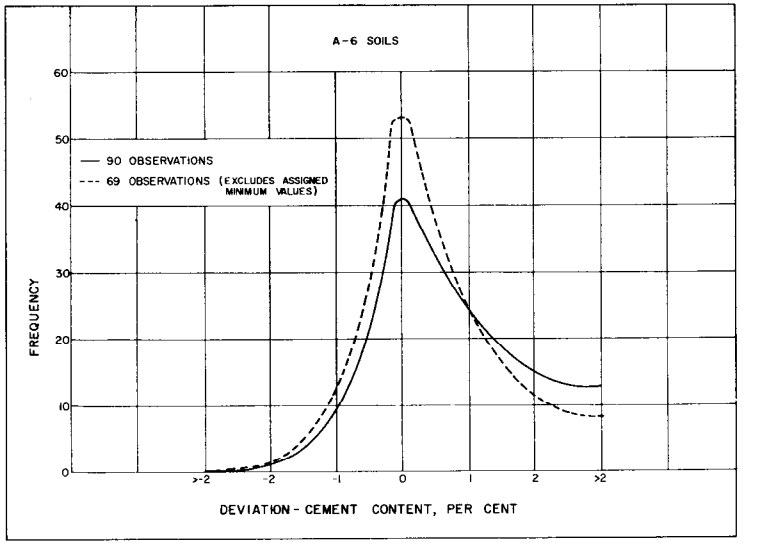

(d)

Figure 13 - Observed Deviation in Minimum Cement Content as Determined by the Wetting - Drying Test and the Louisiana Slope Value Method.

the appropriate allowable loss line. It is readily apparent that the inclusion of all data shifts the accuracy level from zero per cent deviation to +2 per cent deviation in cement content on both the plastic A-4 chart and A-2-4, A-3 chart. The non-plastic A-4 and the A-6 chart show approximately 12 per cent decrease in accuracy at 0 per cent deviation with no shift in either direction.

In addition, a partial analysis using statistical concepts was made to determine a comparison of the standard deviation of the recommended cement contents of the two methods utilizing the formula:

$$S = \sqrt{\frac{\Sigma (x - \bar{x})^2}{N}}$$ where:

S = standard deviation
$\bar{x}$ = mean of the observations
x = each observation
N = number of observations

The results of this analysis are as follows:

Type of Soil	Number of Observations	Wetting-Drying Test Standard Deviation	Chart Standard Deviation
A-2-4, A-3	28	0.911	0.350
A-4 (Plastic)	37	1.126	0.519
A-4 (Non-plastic)	28	0.772	1.070
A-6	69	1.786	1.710

The standard deviations were determined on the basis of only those observations where the Wetting-Drying Test loss line intersected the allowable loss line and therefore does not include any of the observations with an assigned minimum value of 5 per cent cement content. In all cases, except the non-plastic A-4 group, the standard deviation of the chart method is less than that of the Wetting-Drying Test method and the difference in the non-plastic A-4 group does not appear significant.

In conclusion, considering the reproducibility of the Wetting-Drying Test, it can be stated that the "Louisiana Slope Value Method" is just as accurate, if not more so, than the former.

Before this procedure is accepted as a standard routine method, it should

be used in conjunction with the presently employed methods for a period of one year to accumulate additional data and to study any deficiencies that may be encountered.

CONCLUSIONS

1. A method, using correlation curves, has been devised for determining minimum cement content requirements for soil-cement stabilization of A-2-4, A-3, A-4 and A-6 soils with a resulting accuracy of more than 90 per cent on the safe side as determined by the Wetting-Drying Test.

2. Use of correlation curves to determine minimum cement requirements shall effect an important saving in time, reducing the necessary testing time of at least 32 days, excluding preliminary work, to approximately 7 days.

3. The accuracy of the compressive strength method is not dependent upon a great deal of procedural control due to the relative simplicity of the test method.

4. Since the compressive strength is directly correlated with the criteria established by the Portland Cement Association, it includes most of the relationships to field performance that have already been established by the latter.

5. A minimum compressive strength requirement would not necessarily result in the most economical cement requirement due to the fact that different soil-cement mixtures exhibit different strengths at similar degrees of durability.

6. The minimum compressive strength required for various AASHO soil groups to meet PCA criteria applied through the Wetting-Drying Test is not a constant but varies as a function of other parameters (i.e. physical, chemical properties, etc.).

7. The unconfined compressive strength values of cores obtained from existing soil-cement projects vary from 140 psi to 2800 psi. On any single project showing relatively the same roadway conditions throughout its length, the compressive strength values vary, on an average, from 400 psi to 1400 psi.

8. On projects where the cement content of the roadway is in excess of the laboratory indicated value, the strengths of the roadway cores are in the neighborhood of, or exceed, 1500 psi.

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APPENDIX

Method of Rapid Design for

THE CEMENT CONTENT OF SOIL-CEMENT MIXTURES

by

THE LOUISIANA SLOPE VALUE METHOD

LDH TR 422-63

Scope

1. This method is intended for determining the minimum cement requirement for design use in the construction of soil-cement base and subbase courses.

Test Methods

2. (a) Soil samples shall be prepared in accordance with AASHO Designation: T 87-49 (LDH Designation: 411-58) Standard Method of Dry Preparation of Disturbed Soil Samples for Test.

(b) Soils shall be classified in accordance with AASHO Designation M 145-49 - The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

(c) The moisture-density relations of the soil-cement mixture shall be determined by adhering to AASHO Designation: T 134-57 - Standard Methods of Test for Moisture-Density Relations of Soil-Cement Mixtures.

(d) Specimens for unconfined compressive strength determinations shall be molded in accordance with Paragraph 4, ASTM Designation: D 559-57 - Wetting and Drying Tests of Compacted Soil-Cement Mixtures.

(e) The compressive strength specimen shall be tested in accordance with ASTM Designation: D 1633-59T with the following exceptions:

(1) Test specimens shall have a diameter of 4.0 inches and a height of 4.6 inches.

(2) Specimens shall be moist room cured at approximately 100% relative humidity for a period of seven days.

(3) Immediately upon removal from the moist room, the specimens shall be measured for height and diameter, capped with a commercial capping compound (Trade Name: Vitrobond or gypsum plaster), and immersed in clean water for a period of four hours prior to testing.

Procedure

After the soil is classified, a range of cement contents is selected according to the following: A-2-4, A-3 and A-4 should be molded at cement contents ranging from 5% to 9% by weight, and the range for A-6 soils should be from 6% to 10% by weight.

A minimum of two (preferably three) cylinders are molded at each of the three cement contents selected, tagged and cured in the moist room for the required 7 days, after which the samples are measured, capped and immersed in water for 4 hours prior to testing for unconfined compressive strength. Upon completion of the compressive strength, the appropriate "slope values" are determined by the following formula:

$$\text{Slope Value} = \frac{B - A}{Y - X} \times \frac{1}{100} \text{ or } \frac{C - B}{Z - Y} \times \frac{1}{100}$$

Where:

A = Unconfined compressive strength at the lowest cement content.

B = Unconfined compressive strength at the median cement content.

C = Unconfined compressive strength at the highest cement content.

X = Lowest cement content by weight.

Y = Median cement content by weight.

Z = Highest cement content by weight.

"Maximum Slope Value" represents the highest value obtained from the above expression and is used for A-2-4, A-3, and all A-4 soils with plasticity indices of ten or less. "Minimum Slope Value" would be the lowest value derived from the above formula and is used for the A-6 group of soils. For example:

Point	Cement Content % by Weight	Failure Stress PSI
A	5.08	342
B	6.89	455
C	8.77	603

$$\text{Maximum Slope Value} = \frac{603 - 455}{8.77 - 6.89} \times \frac{1}{100} = 0.79$$

$$\text{Minimum Slope Value} = \frac{455 - 342}{6.89 - 5.08} \times \frac{1}{100} = 0.62$$

The appropriate slope value is then located on the on the appropriate chart or on the following table for the minimum cement content requirement.

MINIMUM CEMENT REQUIREMENT

USING THE LOUISIANA SLOPE VALUE METHOD

Soil Classification	Slope Value Type	Slope Value	Min. Cement Requirement by Weight,%
A-2-4, A-3	Maximum	0.46 - 0.60	6
		0.61 - 0.85	7
Non-plastic A-4 (P.I. 0.0 - 3.0)	Maximum	0.24 - 0.36	5
		0.37 - 0.56	6
		0.57 - 0.90	7
		0.91 - 0.94	8
Plastic A-4 (P.I. 3.0 - 10.0)	Maximum	0.18 - 0.20	5
		0.21 - 0.30	6
		0.31 - 0.67	7
		0.68 - 1.25	8
A-6	Minimum	0.17 - 0.21	10
		0.22 - 0.25	9
		0.26 - 0.27	8
		0.28 - 0.31	7
		0.32 - 0.36	6

Note: Slope values which vary greatly from the limiting values should be verified by the complete Wetting-Drying Test (AASHO Designation: T 135-57).

TABLE I (Cont.)

DISTRIBUTION OF SAMPLES TESTED

Project No.	Location	Lab. Nos.	Parish	Map Numbering System	District
713-12-97	Ulysses Avenue Extension in Baton Rouge	Comp. B	East Baton Rouge	32	61
229-03-07	State Route La. 411 Rosedale-Maringouin	Comp. A,C	Iberville	33	61
278-02-04	Robert-Osceola Highway	Comp. C	Tangipahoa	34	62
271-02-05	Corbin-Pine Grove Highway	Comp. B	St. Helena	35	62
271-03-04	Pine Grove-Greensburg Highway	Comp. A,B,C	St. Helena	36	62
817-30-06	Zachary-Slaughter	Comp. B	East Baton Rouge	37	61
859-08-05	Pine-Varnado	Comp. C, D, F	Washington	38	62
852-05-06	Live Oak Church-Onville Highway	Comp. B	St. Tammany	39	62
269-01-04	Oldfield-Little River Highway	Comp. A,B	Livingston	40	62
452-02-36	Ponchatoula-Pass Manchac	Comp. C,D	Tangipahoa	41	62
450-30-06	Junction I-16 River Bridge Lake Charles Interstate Highway	Comp. B,C	Calcasieu	42	07
740-00-24	Lake Charles Expressway	Comp. A	Calcasieu	43	07
810-25-01	Niblett Bluff Road-Vinton Highway	Comp. A,B,E,F	Calcasieu	44	07
213-07-04	Cade-Youngsville Highway	Comp. C	St. Martin	45	03
269-02-06	Oldfield-Little River Highway	Comp. B,C	Livingston	46	62
857-63-02	Abbeville-New Flanders Highway	Comp. C	Vermilion	47	03
256-03-14	St. Elmo Levee Setback	Comp. A	St. James	48	02

TABLE I (Cont.)

DISTRIBUTION OF SAMPLES TESTED

Project No.	Location	Lab. Nos.	Parish	Map Numbering System	District
450-02-31	Toomey-Vinton Highway	Sample No. Y,Z	Calcasieu	49	07
450-30-07	Lake Charles By-Pass Cane Lane-Lake Street	Comp. B,C	Calcasieu	50	07
450-02-29	Vinton-Sulphur Highway	Comp. A	Calcasieu	51	07
204-02-03	Pine Prairie-Bayou Chicot Highway	Comp. A,B,F	Evangeline	52	07
30-03-09	Sun-Bogalusa Highway	Comp. A,C	Washington	53	62
262-02-09	Range Street (Denham Springs)	Comp. Z	Livingston	54	62
806-01-03	Route No. La. 1146 Ikes-Vernon Parish Line Highway	Comp.E,F	Beauregard	55	07
713-11-11	St. Amant Community Road	Comp. D	Ascension	56	61
450-18-03	Pontchartrain Bridge-Slidell Highway	Comp.X,Y,Z	St. Tammany	57	62
191-01-05	Bancroft Oil Fields-Fields Highway	Comp.A,B,C	Beauregard	58	07
59-01-10	Madisonville-Covington Highway	Comp.A,B,C	St. Tammany	59	62

TABLE XXIV

ROADWAY DATA

Project No. 194-03-02

Name PECAN ISLAND HIGHWAY

Lab. No.	Coring Location	Depth of Stabilization (In)	Soil Cement Condition	Description of Road Surface
700771	3 1/2' Rt. C/L	8	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700772	3 1/2' Lt. C/L	7 1/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700773	3 1/2' Rt. C/L	4	crumbled - no core	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700774	3 1/2' Lt. C/L	5 3/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700775	3 1/2' Rt. C/L	6	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700776	3 1/2' Lt. C/L	6 3/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700777	3 1/2' Rt. C/L	8	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700778	3 1/2" Lt. C/L	7 3/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700779	7 3/4" Lt. C/L	7 3/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.
700780	5 3/4" Rt. C/L	5 3/4	Good	Surface good - no visible cracks - no patchwork - some ravelling - surface is generally smooth.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669930	314	0.47	3.0	8.9	5*	6
	407		2.7	10.9		
	496			12.9		
669932	484	0.85	7.4	8.9	7	7
	646		4.8	10.8		
	795		2.9	12.9		
669933	440	0.81	11.0	8.6	8	7
	602		6.1	10.6		
	746		3.7	12.5		
669934	488	0.80	5.1	9.0	7	7
	648		2.7	11.0		
	751		1.6	13.1		
669945	277	0.56	14.7	5.3	6	6
	384		7.8	7.2		
	466		3.6	9.2		
669947	240	0.77	17.1	5.6	7	7
	392		10.0	7.6		
	546		3.7	9.6		
700752	409	0.55	6.4	5.2	5*	6
	513		2.7	7.1		
	576		1.1	9.0		
700771	375	1.03	15.5	5.3	6	7
	561		5.8	7.1		
	711		3.4	9.1		

* Assigned minimum values.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700772	314	0.67	17.6	5.4	7	7
	438		8.9	7.4		
	571		3.8	9.4		
700773	267	0.88	12.7	5.1	6	7
	363		3.2	7.0		
	521		2.4	8.8		
700774	260	0.53	13.6	5.2	6	6
	344		4.8	7.0		
	445		2.1	8.9		
700775	237	0.47	-	5.4	5*	6
	330		46.5	7.4		
	400		9.9	9.4		
700776	199	0.66	6.4	5.1	6	7
	294		2.1	6.9		
	420		2.4	8.8		
700778	259	0.74	7.9	5.1	5	7
	319		2.9	6.9		
	459		1.6	8.8		
700779	306	1.94	10.2	5.3	5	7
	435		5.3	7.2		
	610		2.1	8.1		
700780	250	0.57	7.7	5.2	5	6
	345		3.7	7.0		
	454		2.4	8.9		

* Assigned minimum values.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700787	327	1.20	16.3	3.3	5*	7
	418		4.9	4.9		
	634		1.5	6.7		
700814	301	0.83	4.1	7.0	5*	7
	467		1.9	9.0		
	611		1.0	11.0		
700818	223	0.57	9.8	7.0	7	6
	336		4.0	9.0		
	391		2.0	11.0		
700824	289	0.88	8.0	7.0	6	7
	457		3.7	9.0		
	632		2.2	11.0		
700761	403	0.64	7.5	7.3	7	7
	487		3.9	9.3		
	622		3.0	11.4		
700762	330	0.64	7.6	7.3	7	7
	458		3.0	9.3		
	686		1.4	11.4		
Project No. 30-03-09 Sample No. A	226	1.34	16.4	6.0	7	7
	406		6.9	8.0		
	673		3.1	10.0		
Project No. 30-03-09 Sample No. C	438	1.22	4.1	6.0	5*	7
	682		1.8	8.0		
	769		2.0	10.0		

* Assigned minimum values.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	397	0.66	10.7	3.0	5	7
59-01-10	529		3.7	7.0		
	-		1.5	9.0		
Project No.	415	1.24	5.9	4.0	5*	7
262-02-09	530		2.3	5.0		
Composite Z	654		1.7	6.0		
Project No.	346	1.39	-	4.1	6	7
269-02-06	451		10.8	5.8		
Composite B	701		4.8	7.6		
Project No.	203	0.88	14.2	4.1	5	7
269-02-06	326		4.8	5.8		
Composite C	476		2.3	7.5		
Project No.	-	0.29	7.6	5.5	5*	6
450-02-29	117		6.5	7.5		
Composite A	177		4.8	9.6		
Project No.	418	0.83	13.5	5.2	6	7
450-02-31	520		5.7	7.0		
Sample No. Y	686		3.2	9.0		
Project No.	375	1.35	7.1	5.0	5*	7
450-02-31	512		2.9	6.8		
Sample No. Z	755		1.1	8.6		
Project No.	-	1.35	19.2	6.0	5*	7
450-18-03	361		17.5	8.0		
Sample No. X	631		7.3	10.0		

* Assigned minimum values.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	485	1.08	3.7	6.0	5	7
450-18-03	701		1.0	8.0		
Sample No. Y	891		0.7	10.0		
Project No.	166	0.79	20.2	5.4	7	7
450-30-06	217		9.1	7.3		
Composite B	375		6.0	9.3		
Project No.	221	0.73	12.7	5.2	6	7
450-30-06	360		6.7	7.1		
Composite C	392		4.5	9.1		
Project No.	266	1.16	10.4	5.4	5	7
450-30-07	487		4.7	7.3		
Composite B	341		2.5	9.3		
Project No.	262	0.74	4.5	4.8	5*	7
452-02-36	388		2.5	6.5		
Composite C	503		1.7	8.2		
Project No.	122	0.90	-	5.3	8	7
740-00-24	215		13.6	7.2		
	395		8.4	9.2		
Project No.	409	1.52	15.8	6.0	7	7
806-01-03	651		8.5	8.0		
Composite E	955		4.9	10.0		
Project No.	495	1.11	3.6	6.0	5*	7
806-01-03	607		2.8	8.0		
Composite F	828		1.5	10.0		

* Assigned minimum values.

TABLE LXI

SUMMARY OF TEST RESULTS
A-2-4 AND A-3 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	428	1.23	3.6	4.8	5*	7
859-08-05	569		1.9	6.5		
Composite C	778		1.9	8.2		

* Assigned minimum values.

TABLE LXII

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669925	660	0.93	4.0	9.0	6	9
	836		2.7	10.9		
	944		2.4	13.0		
669931	425	0.50	6.4	9.2	8	6
	533		3.3	11.2		
	642			13.4		
669946	276	0.43	14.9	5.5	6	6
	358		9.2	7.5		
	443		4.9	9.5		
669948	313	0.61	9.7	5.3	6	7
	428		4.4	7.2		
	538		3.0	9.2		
669952	281	0.73	12.6	5.3	7	7
	412		7.8	7.1		
	533			9.1		
669953	296	0.51	15.7	5.5	6	6
	394		5.9	7.4		
	496		4.5	9.4		
669954	326	0.84	14.2	5.3	7	8
	494		7.1	7.3		
	619		3.7	9.2		
669975	270	0.38	11.6	5.5	7	6
	321		6.9	7.5		
	400		4.0	9.6		

TABLE LXII (Cont.)

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669976	168	0.60	8.2	5.7	5	7
	288		5.0	7.7		
	336		2.9	9.8		
669979	236	0.65	15.2	5.4	6	7
	359		5.8	7.3		
	475		3.9	9.3		
669980	248	0.42	11.0	5.4	6	6
	329		6.2	7.3		
	412		5.6	9.3		
669984	336	0.57	3.7	9.5	5*	7
	455		2.9	11.6		
	547		2.8	13.8		
669985	371	0.27	4.8	9.3	5	5
	430		3.1	11.4		
	490		3.1	13.6		
669986	350	0.57	6.0	9.4	7	7
	469		3.4	11.5		
	519		1.7	13.7		
669988	520	0.33	2.8	9.5	5	5
	593		1.4	11.7		
	665		1.0	13.9		
669997	221	0.31	3.8	7.6	5	5
	282		1.8	9.6		
	326		1.2	11.8		

* Assigned minimum values.

TABLE LXII (Cont.)

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670003	232	0.73	4.2	7.4	5*	7
	377		3.1	9.4		
	445		2.0	11.5		
670011	324	0.51	4.2	7.3	5*	6
	426		3.0	9.3		
	466		2.5	11.4		
670012	285	0.43	6.2	7.4	6	6
	371		3.7	9.4		
	450		3.1	11.5		
670013	271	0.34	5.2	7.3	5*	5
	333		3.9	9.3		
	404		3.3	11.4		
670014	260	0.49	5.3	7.3	6	6
	341		2.8	9.3		
	444		2.2	11.4		
670015	322	0.44	6.7	6.9	6	6
	409		5.3	8.7		
	496		3.4	10.7		
670017	308	0.54	3.4	7.4	5*	6
	366		2.3	9.5		
	480		2.2	11.6		
670018	283	0.37	4.3	7.6	5*	6
	330		3.1	9.6		
	411		2.3	11.8		

* Assigned minimum values.

TABLE LXII (Cont.)

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670019	365	0.47	3.6	7.4	5*	6
	437		3.1	9.5		
	535		2.2	11.6		
670020	250	0.26	4.0	7.5	5*	5
	305		2.6	9.6		
	355		2.5	11.7		
670472	623	0.49	2.9	8.1	5*	6
	632		2.7	9.9		
	725		2.0	11.8		
670476	232	0.32	10.2	5.5	6	5
	295		5.3	7.5		
	349		3.4	9.5		
670477	232	0.28	13.7	5.5	6	5
	288		5.7	7.5		
	319		4.0	9.6		
670478	199	0.27	8.2	5.5	5	5
	251		5.9	7.4		
	307		3.7	9.5		
670479	205	0.58	13.5	5.6	6	7
	243		5.1	7.5		
	365		3.7	9.6		
670480	217	0.37	10.5	5.5	6	6
	290		5.1	7.5		
	354		3.4	9.6		

* Assigned minimum values.

TABLE LXII (Cont.)

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670481	225	0.34	8.0	5.6	5	5
	292		5.2	7.6		
	348		4.3	9.6		
670482	237	0.37	8.6	5.6	5	6
	313		5.4	7.6		
	390		2.9	9.7		
670492	178	0.27	5.8	5.5	5*	5
	231		3.7	7.5		
	250		2.9	9.5		
700751	342	0.78	5.2	5.1	5*	8
	455		2.9	6.9		
	603		2.1	8.8		
700753	455	0.52	3.9	5.0	5*	6
	467		2.3	6.8		
	565		0.8	8.7		
700754	377	0.67	4.2	5.1	5*	7
	498		2.1	6.9		
	583		1.3	8.8		
700826	403	0.91	3.6	8.0	5*	8
	585		2.4	10.0		
	757		1.9	12.0		
Project No. 191-01-05 Composite A	282	0.83	8.1	5.0	5	8
	435		4.2	7.0		
	600		2.6	9.0		

* Assigned minimum values.

TABLE LXII (Cont.)

SUMMARY OF TEST RESULTS
NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	120	0.44	26.4	3.7	6	6
229-03-07	193		9.3	5.5		
Composite A	280		4.5	7.5		
Project No.	197	0.27	3.2	5.7	5*	5
204-02-03	238		2.9	7.7		
	294		1.4	9.8		
Project No.	237	0.44	3.5	5.6	5*	6
256-03-14	325		3.2	7.6		
	395		2.0	9.7		
Project No.	279	0.78	4.9	6.0	5*	8
450-18-03	414		2.9	8.0		
Composite Z	569		1.0	10.0		
Project No.	296	0.65	4.7	5.3	5	7
450-30-07	419		2.2	7.2		
Composite C	514		2.2	9.2		
Project No.	301	0.44	4.2	5.3	5*	6
810-25-01	384		2.7	7.2		
Composite A	447		0.8	9.1		

* Assigned minimum values.

TABLE LXIII

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669927	434	0.37	4.1	9.4	7	7
	511		4.1	11.5		
	586		2.8	13.6		
669928	343	0.94	6.8	10.0	9	8
	398		4.1	12.2		
	624		2.8	14.6		
669929	411	0.32	6.7	10.0	9	7
	481		3.8	12.2		
	525		2.9	14.5		
669936	425	0.53	5.7	7.1	5*	7
	525		4.9	9.0		
	602		3.7	11.0		
669937	228	1.25	7.8	7.3	7	8
	466		4.5	9.2		
	563		2.3	11.3		
669939	432	0.86	11.9	7.4	8	8
	483		8.8	9.4		
	664		3.9	11.5		
669941	411	0.32	10.2	7.3	7	7
	475		5.1	9.3		
	538		3.4	11.4		
669942	319	0.50	7.6	7.3	7	7
	405		4.5	9.3		
	509		2.8	11.4		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669943	345	0.75	6.4	7.4	7	7
	456		3.4	9.4		
	614		2.8	11.5		
669944	419	0.48	5.7	7.1	5*	7
	512		4.0	9.0		
	607		3.0	11.0		
669949	300	0.70	6.3	5.3	5*	7
	433		4.0	7.2		
	524		3.5	9.1		
669950	273	0.40	10.0	5.5	6	7
	349		7.1	7.4		
	374		4.8	9.4		
669951	279	0.56	18.3	5.6	8	7
	375		9.7	7.6		
	493		6.7	9.7		
669960	253	0.42	3.8	7.6	5*	7
	342		3.5	9.7		
	395		2.9	11.8		
669961	232	0.31	4.9	7.8	5*	7
	301		2.6	10.0		
	351		2.6	12.2		
669962	241	0.45	3.3	7.8	5*	7
	336		2.4	9.9		
	386		2.6	12.2		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	149	0.34	6.2	6.0	6	6
713-11-11	217		3.5	8.0		
Sample D	-		2.9	10.0		
Project No.	215	0.35	2.6	6.0	5*	6
713-12-97	285		3.5	8.0		
	372		2.6	10.0		
Project No.	365	0.31	4.9	5.2	5*	6
810-25-01	465		3.8	7.1		
Composite B	527		2.4	9.1		
Project No.	319	0.22	5.0	5.4	5	10
810-25-01	415		3.1	7.2		
Composite E	457		3.0	9.1		
Project No.	235	0.35	6.3	5.5	6	6
810-25-01	326		3.7	7.5		
Composite F	395		1.4	9.5		
Project No.	172	0.29	6.4	5.7	7	7
817-30-06	272		5.6	7.7		
	336		2.6	9.9		
Project No.	131	0.36	7.4	4.5	5	6
852-05-06	200		3.7	6.4		
	290		2.5	8.4		
Project No.	115	0.33	6.6	6.0	6	6
857-63-02	-		3.3	7.7		
Composite C	187		2.4	9.9		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	334	0.44	9.7	5.0	6	6
859-08-05	409		3.4	6.7		
Composite D	495		1.6	8.6		
Project No.	338	1.30	7.3	5.1	6	6
859-08-05	457		3.6	7.0		
Composite F	-		1.9	8.6		

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670498	147	0.43	3.6	5.9	5*	7
	170		2.7	8.0		
	270		1.8	10.3		
670500	238	0.38	2.9	5.7	5*	7
	314		1.7	7.7		
	387		0.6	9.8		
670502	238	0.46	4.1	5.7	5*	7
	334		0.9	7.8		
	429		0.9	10.0		
700380	141	0.26	2.7	7.8	5*	6
	195		2.4	9.9		
	248		1.2	12.1		
700382	197	0.44	2.7	7.7	5*	7
	189		2.6	9.8		
	202		2.4	12.0		
700711	127	0.65	6.2	5.8	5*	7
	264		3.6	7.9		
	299		2.6	10.1		
700712	184	0.44	4.5	5.6	5*	7
	264		3.7	7.6		
	352		2.3	9.6		
700714	148	0.34	5.0	5.8	5*	7
	220		3.3	7.9		
	279		2.4	10.1		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700715	147	0.49	6.2	5.7	5*	7
	131		3.8	7.7		
	234		2.4	9.8		
700717	176	0.36	6.9	5.7	6	7
	248		3.2	7.7		
	306		3.2	9.8		
700718	136	0.21	4.3	6.0	5*	6
	183		2.7	8.2		
	225		2.1	10.4		
700721	201	0.25	4.2	7.5	5*	6
	253		4.2	9.6		
	394		2.5	11.7		
700722	310	0.20	3.1	7.4	5*	6
	353		2.2	9.5		
	395		2.2	11.6		
700724	236	0.46	3.1	7.5	5*	7
	328		2.3	9.5		
	397		2.0	11.6		
700725	174	0.30	4.0	7.6	6	6
	236		3.7	9.7		
	280		1.1	11.9		
700726	209	0.29	2.8	7.5	5*	6
	270		3.7	9.6		
	329		2.5	11.7		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle :%	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	189	0.52	4.4	5.0	5*	6
269-02-06	293		3.8	7.0		
	449		2.7	9.0		
Project No.	288	0.51	5.4	5.0	5*	6
269-02-06	465		4.2	7.0		
	567		2.4	9.0		
Project No.	214	0.24	8.7	4.3	5	9
271-03-04	375		4.8	6.2		
Composite A	421		4.5	8.1		
Project No.	116	0.78	7.9	4.6	6	6
271-03-04	264		4.7	6.5		
Composite B	-		3.4	8.5		
Project No.	128	0.38	8.0	4.6	6	6
271-03-04	251		5.4	6.5		
Composite C	326		3.9	8.5		
Project No.	123	0.18	10.3	4.7	6	10
271-02-05	383		3.3	6.8		
	421		2.1	8.9		
Project No.	83	0.42	15+	3.7	6	6
278-02-04	159		6.9	5.5		
Composite C	-		4.0	7.5		
Project No.	237	0.29	8.8	5.2	6	7
452-02-36	289		4.4	7.0		
Composite D	356		3.5	8.9		

* Assinged minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
Project No.	165	0.86	24.2	5.0	6	6
59-01-10	-		5.7	7.0		
Sample C	287		4.3	9.0		
Project No.	234	0.31	8.0	5.0	6	6
191-01-05	349		4.8	7.0		
Sample B	411		5.5	9.0		
Project No.	294	0.38	5.8	5.0	5	6
191-01-05	441		3.7	7.0		
Sample C	516		3.2	9.0		
Project No.	362	0.20	5.2	5.6	5	10
204-02-03	402		2.9	7.6		
	537		2.0	9.7		
Project No.	150	0.12	4.4	5.7	5*	10
213-07-04	176		2.9	7.8		
	252		2.0	9.9		
Project No.	90	0.24	34.4	3.6	9	9
229-03-07	135		20.8	5.5		
Composite C	182		11.5	7.5		
Project No.	223	0.10	5.0	5.4	5*	10
269-01-04	265		3.1	7.3		
Composite A	285		1.7	9.3		
Project No.	245	0.56	7.5	5.3	6	6
269-01-04	357		5.2	7.3		
Composite B	-		3.0	9.2		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700788	213	0.70	6.8	3.6	5*	6
	378		4.0	5.4		
	517		2.8	7.4		
700809	258	0.10	6.5	10.0	10	10
	391		4.1	12.0		
	410		4.0	14.0		
700812	458	0.13	4.4	11.0	9	10
	483		4.7	13.0		
	547		3.9	15.0		
700815	425	0.83	4.1	10.0	6	6
	409		3.3	12.0		
	574		2.5	14.0		
700829	234	0.17	3.4	10.0	10	10
	275		2.1	12.0		
	309		2.1	14.0		
700831	250	0.17	5.6	10.0	10	10
	283		3.7	12.0		
	316		2.0	14.0		
700832	279	0.14	5.4	10.0	9	10
	314		3.8	12.0		
	342		2.9	14.0		
700833	305	0.28	2.7	10.0	5*	7
	305		2.7	12.0		
	361		1.8	14.0		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700741	210	0.32	9.4	5.4	7	6
	273		5.3	7.4		
	341		2.5	9.4		
700746	243	0.35	7.9	5.5	6	6
	330		4.3	7.5		
	404		2.6	9.6		
700747	217	0.38	7.4	5.6	6	6
	289		4.8	7.5		
	367		2.3	9.6		
700748	227	0.40	7.4	5.6	6	6
	311		4.3	7.6		
	390		3.1	9.6		
700750	215	0.29	9.2	5.4	7	7
	270		5.5	7.3		
	345		3.1	9.3		
700759	318	0.28	8.9	5.4	7	7
	441		5.3	7.3		
	497		4.4	9.3		
700777	189	0.29	14.0	5.4	8	7
	244		6.2	7.3		
	340		2.8	9.3		
700784	205	0.66	6.1	3.6	5*	6
	324		5.0	5.4		
	462		2.2	7.4		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700381	147	0.17	8.7	7.8	9	10
	184		2.4	10.0		
	159		2.1	12.2		
700713	163	0.29	5.8	5.6	5*	7
	223		4.6	7.7		
	310		17.7	9.8		
700716	178	0.31	6.3	5.6	6	6
	239		4.8	7.6		
	317		4.0	9.7		
700719	157	0.30	17.8	5.7	9	7
	222		12.4	7.7		
	286		5.4	9.8		
700720	220	0.29	2.4	5.6	5*	7
	278		1.5	7.6		
	356		2.9	9.7		
700723	205	0.22	10.9	7.5	10	10
	252		6.5	9.6		
	379		4.7	11.7		
700728	236	0.19	4.8	7.5	5	10
	275		4.0	9.6		
	355		3.4	11.8		
700734	126	0.19	4.0	8.2	6	10
	173		2.7	10.5		
	216		2.4	12.8		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670497	152	0.19	4.3	6.0	5*	10
	198		3.4	8.2		
	241		3.0	10.5		
670499	178	0.28	4.8	6.0	5	7
	236		2.4	8.1		
	296		1.8	10.4		
670501	204	0.31	4.7	5.7	5	6
	269		2.6	7.8		
	374		1.5	9.9		
670503	256	0.12	2.3	7.5	5*	10
	282		1.7	9.6		
	373		1.7	11.7		
670504	218	0.28	2.4	7.8	7	7
	280		3.3	10.0		
	363		2.4	12.2		
670505	174	0.03	5.9	7.8	8	10
	247		3.0	10.0		
	254		2.7	12.2		
670506	230	0.18	5.7	7.8	8	10
	269		3.3	10.0		
	352		2.1	12.2		
670507	287	0.28	7.1	7.7	8	8
	349		3.8	9.9		
	414		2.7	12.1		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670473	205	0.23	15.2	5.6	8	9
	251		7.2	7.6		
	364		4.9	9.6		
670474	217	0.16	17.5	5.6	9	10
	248		8.5	7.6		
	337		6.3	9.7		
670483	241	0.25	16.3	5.7	8	9
	304		6.6	7.7		
	356		6.9	9.8		
670484	195	0.29	7.4	5.7	6	7
	253		4.7	7.7		
	328		3.8	9.8		
670485	205	0.18	23.2	5.6	10	10
	285		11.7	7.6		
	322		7.5	9.7		
670487	236	0.32	6.9	5.5	6	6
	297		4.0	7.4		
	396		2.8	9.5		
670489	251	0.22	13.8	5.3	7	9
	291		6.5	7.1		
	340		4.3	9.1		
670496	185	0.29	5.0	5.7	5*	7
	246		4.1	7.8		
	327		2.9	9.9		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670024	271	0.23	10.6	7.6	9	9
	319		6.0	9.7		
	378		4.9	11.8		
670458	231	0.22	12.9	7.7	10	10
	274		6.4	9.7		
	337		5.0	11.9		
670459	228	0.09	7.1	7.7	8	10
	284		4.5	9.8		
	303		3.6	11.9		
670461	313	0.28	5.4	7.5	5*	7
	369		4.3	9.5		
	346		2.9	11.7		
670467	400	0.20	4.7	9.4	8	10
	442		3.3	11.5		
	510		3.6	13.7		
670468	291	0.21	7.3	9.5	10	10
	352		2.8	11.6		
	398		2.8	13.8		
670470	416	0.10	2.9	8.8	5*	10
	437		2.3	10.8		
	584		2.1	12.8		
670471	415	0.36	2.9	8.9	5*	6
	493		2.6	10.9		
	564		2.9	12.9		

* Assigned minimum values.

TABLE LXIV (Cont.)

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669993	288	0.30	3.5	7.6	5*	7
	264		2.9	9.7		
	351		1.2	11.9		
669994	255	0.15	5.8	7.9	8	10
	297		3.2	10.0		
	331		2.1	12.3		
669995	337	0.32	5.3	7.4	7	6
	423		2.9	9.4		
	490		2.2	11.5		
669996	210	0.18	3.9	7.8	9	10
	206		4.5	9.9		
	244		1.8	12.1		
669998	219	0.11	3.9	7.8	9	10
	242		3.5	9.9		
	286		1.5	12.1		
669999	262	0.14	3.4	7.7	5*	10
	291		2.6	9.8		
	334		1.1	12.0		
670000	348	0.29	4.3	7.4	6	7
	406		2.5	9.4		
	524		1.7	11.5		
670023	203	0.17	8.7	7.8	9	10
	240		5.4	10.0		
	309		3.9	12.2		

* Assigned minimum values.

TABLE LXIV

SUMMARY OF TEST RESULTS
A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Minimum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669926	437	0.20	6.8	9.7	10	10
	481		4.6	11.9		
	574		3.7	14.1		
669935	264	0.20	11.0	7.4	10	10
	303		6.1	9.4		
	396		4.0	11.5		
669938	360	0.32	13.0	7.1	11	6
	438		10.1	9.1		
	503		6.7	11.1		
669959	282	0.27	5.5	7.7	8	8
	338		3.5	9.8		
	413		3.4	11.9		
669964	289	0.36	4.3	7.7	6	6
	365		2.9	9.8		
	475		2.9	11.9		
669977	170	0.17	23.2	5.6	10	10
	258		14.0	7.6		
	292		7.0	9.6		
669991	324	0.21	3.1	7.5	5*	10
	365		0.0	9.5		
	431		1.7	11.6		
669992	313	0.10	2.8	7.4	5*	10
	375		2.3	9.4		
	395		2.0	11.5		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700737	101	0.23	5.0	7.7	5	6
	134		1.8	9.9		
	185		1.7	12.1		
700739	130	0.24	2.5	8.2	5*	6
	146		2.4	10.5		
	203		1.2	12.9		
700740	149	0.30	3.8	7.7	5*	6
	186		2.9	9.8		
	256		1.4	12.1		
700742	223	0.35	12.7	5.5	7	7
	293		4.9	7.5		
	353		2.3	9.6		
700743	213	0.31	11.5	5.4	6	6
	274		6.5	7.4		
	333		4.5	9.4		
700744	225	0.32	6.5	5.5	5	7
	286		3.9	7.4		
	342		2.8	9.5		
700745	229	0.52	6.8	5.5	5	7
	274		3.4	7.5		
	384		2.3	9.6		
700749	285	0.42	5.4	5.5	5*	7
	349		3.1	7.5		
	437		2.3	9.6		
700755	290	0.57	4.4	5.3	5*	7
	362		2.7	7.3		
	471		2.2	9.2		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669987	339	0.37	4.8	9.5	5	7
	417		3.7	11.6		
	475		2.0	13.8		
669989	411	0.67	3.1	9.3	7	7
	492		1.0	11.3		
	640		1.0	13.5		
669990	361	0.32	4.8	9.5	7	7
	426		2.6	11.6		
	496		1.4	13.8		
669997	221	0.31	3.8	7.6	5	7
	282		1.8	9.6		
	326		1.2	11.8		
670001	187	0.21	5.4	7.5	6	6
	232		1.7	9.6		
	272		1.7	11.8		
670002	332	0.36	4.9	7.7	5*	7
	353		3.2	9.7		
	432		2.0	11.9		
670004	291	0.39	4.8	7.4	5*	7
	346		3.1	9.4		
	427		2.3	11.5		
670005	236	0.23	4.8	7.4	5*	6
	269		3.2	9.5		
	317		3.1	11.6		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
669963	255	0.44	3.5	7.7	5*	7
	320		2.3	9.8		
	416		2.0	12.0		
669971	392	0.40	9.6	5.5	6	7
	472		4.2	7.5		
	525		3.4	9.5		
669972	243	0.44	8.4	5.4	5	7
	330		5.2	7.4		
	413		4.3	9.4		
669973	229	0.39	4.8	5.5	5*	7
	307		3.7	7.5		
	322		2.0	9.5		
669974	328	0.40	6.8	5.7	5	7
	413		3.5	7.8		
	496		-	9.9		
669978	188	0.37	13.5	5.7	7	7
	235		6.5	7.8		
	312		4.4	9.9		
669981	342	0.36	3.7	9.5	5*	7
	415		3.4	11.6		
	495		2.0	13.8		
669983	446	0.33	4.1	9.2	5*	7
	485		3.0	11.3		
	555		1.9	13.4		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700786	288	1.04	6.9	3.4	5*	8
	465		3.7	5.1		
	567		2.4	7.0		
700795	599	0.64	2.5	6.8	5*	7
	417		1.6	8.6		
	539		1.3	10.5		
700817	250	0.32	3.5	8.0	5*	7
	313		1.8	10.0		
	309		0.5	12.0		
700830	258	0.17	2.2	10.0	5*	5
	280		1.6	12.0		
	314		1.3	14.0		
Project No. 59-01-10 Composite B	236	0.45	5.4	5.0	5*	7
	325		3.2	7.0		
	407		1.6	9.0		
Project No. 204-02-03	199	0.58	4.1	5.7	5*	7
	315		2.3	7.7		
	362		2.0	9.8		
Project No. 450-30-06	262	0.28	9.9	5.2	6	6
	315		5.9	7.1		
	-		3.5	9.0		
Project No. 855-13-05 Composite A	185	0.31	11.7	6.0	7	7
	247		4.2	8.0		
	302		2.7	10.0		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
700756	306	0.49	3.7	5.5	5*	7
	389		3.4	7.5		
	486		2.2	9.5		
700757	153	0.37	5.0	5.5	5	7
	223		2.5	7.4		
	289		2.2	9.4		
700758	309	0.45	5.4	5.5	5*	7
	398		3.4	7.5		
	416		2.0	9.5		
700760	299	0.76	5.7	5.2	5*	8
	436		4.0	7.0		
	526		2.2	9.0		
700781	181	0.64	3.9	3.5	5*	7
	297		3.6	5.3		
	382		2.5	7.1		
700782	185	0.59	4.4	3.6	5*	7
	291		3.6	5.4		
	363		2.5	7.3		
700783	166	0.66	6.8	3.6	5*	7
	154		2.2	5.5		
	285		2.3	7.5		
700785	189	0.87	4.9	3.3	5*	8
	293		2.6	5.0		
	449		3.4	6.8		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670465	423	0.48	3.9	8.6	5*	7
	467		3.0	10.5		
	559		2.0	12.4		
670466	394	0.91	4.1	8.6	5	8
	464		3.3	10.6		
	636		1.5	12.5		
670475	246	0.39	9.9	5.4	6	7
	302		4.7	7.3		
	379		4.1	9.3		
670486	185	0.57	6.7	5.4	5*	7
	293		4.2	7.3		
	350		4.5	9.2		
670488	204	0.40	6.0	5.3	5*	7
	273		4.1	7.2		
	353		2.7	9.2		
670493	61	0.44	4.6	5.9	5	7
	126		2.1	8.0		
	222		2.1	10.2		
670494	258	0.50	4.6	6.0	5*	7
	367		3.0	8.2		
	446		2.1	10.4		
670495	157	0.48	4.4	5.8	5*	7
	258		2.4	7.9		
	316		0.6	10.0		

* Assigned minimum values.

TABLE LXIII (Cont.)

SUMMARY OF TEST RESULTS
PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Maximum Slope Value	Lab. Briquettes Wet-Dry Loss After Full Cycle %	Cement Content % By Weight	% Cement By Weight Recommended By Wet-Dry Test	% Cement By Weight Recommended By Chart
670006	187	0.18	5.2	7.4	5*	5
	224		3.7	9.5		
	243		2.3	11.6		
670007	211	0.22	4.6	7.4	5	6
	257		3.1	9.5		
	298		2.3	11.6		
670008	279	0.35	4.8	7.5	6	7
	320		2.0	9.6		
	393		1.4	11.7		
670009	230	0.36	6.2	7.4	6	7
	275		2.6	9.4		
	351		2.5	11.5		
670010	264	0.42	4.4	7.4	5*	7
	348		3.1	9.4		
	-		-	11.5		
670460	331	0.49	4.9	7.5	5*	7
	391		2.6	9.6		
	494		3.1	11.7		
670463	372	0.41	3.1	8.5	5*	7
	450		2.3	10.4		
	495		2.3	12.4		
670464	450	0.38	3.3	8.5	5*	7
	522		2.5	10.4		
	548		2.5	12.4		

* Assigned minimum values.

RESEARCH PUBLICATIONS

1. Concrete Pavement Research. H. L. Lehmann and C. M. Watson, Part I (1956), Part II (1958)

2. Use of Self-Propelled Pneumatic-Tired Rollers in Bituminous Construction and Recommended Procedures. A Special Report, 1958.

3. Use of Expanded Clay Aggregate in Bituminous Construction. H. L. Lehmann and Verdi Adam, 1959.

4. Application of Marshall Method in Hot Mix Design. Verdi Adam, 1959.

5. Effect of Viscosity in Bituminous Construction. Verdi Adam, 1961.

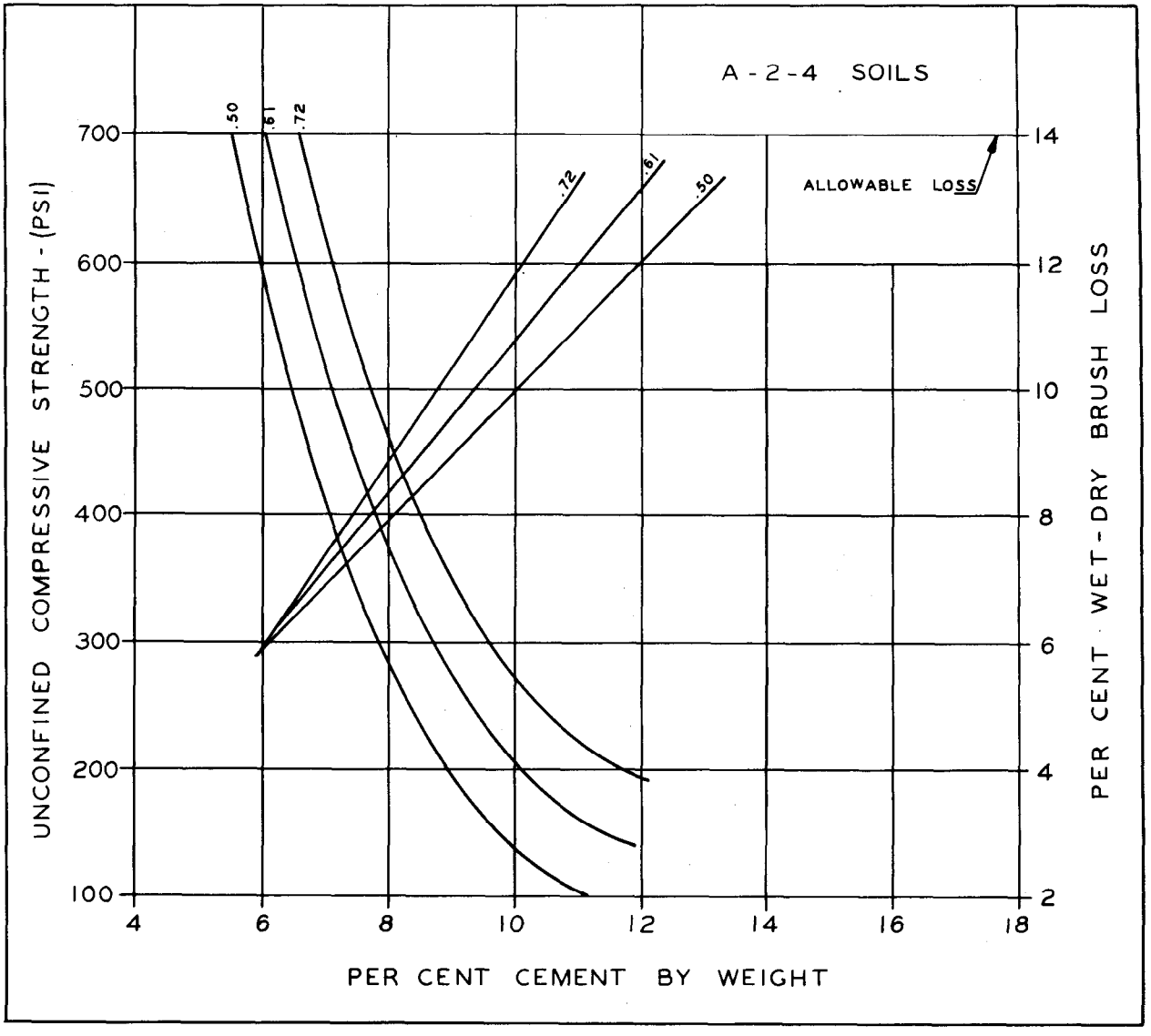
6. Slab Breaking and Seating on Wet Subgrades with Pneumatic Roller. J. W. Lyon, Jr., January 1963.

7. Lightweight Aggregate Abrasion Study. Hollis B. Rushing, Research Project No. 61-7C, February 1963.

8. Texas Triaxial R-Value Correlation. Harry L. Roland, Jr., Research Project No. 61-1S, March 1963.

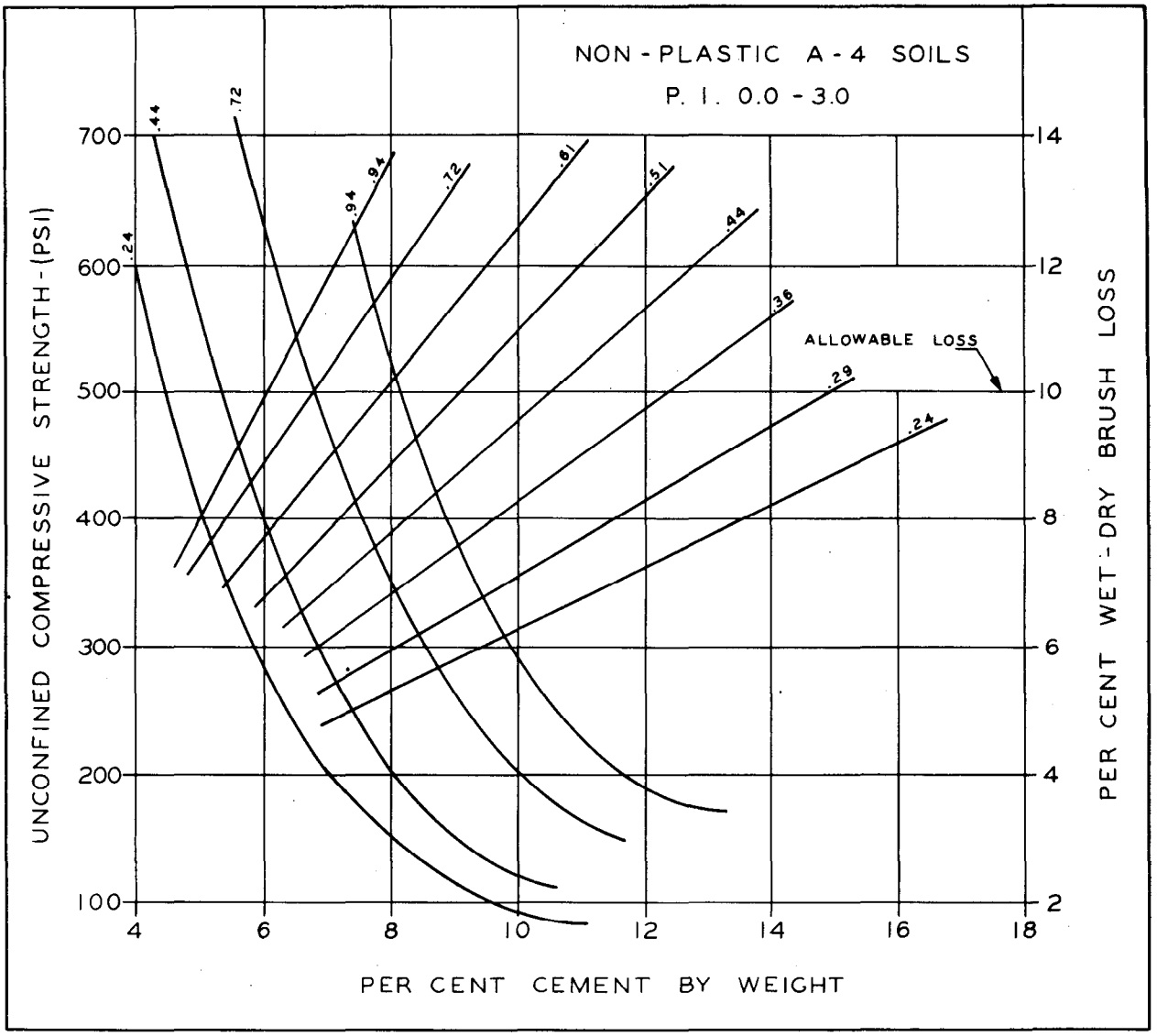
9. Asphaltic Concrete Pavement Survey. S. C. Shah, Research Project No. 61-1B, April 1963.

10. Compaction of Asphaltic Concrete Pavement with High Intensity Pneumatic Roller. Part I. Verdi Adam, S. C. Shah and P. J. Arena, Jr., Research Project No. 61-7B, July 1963.



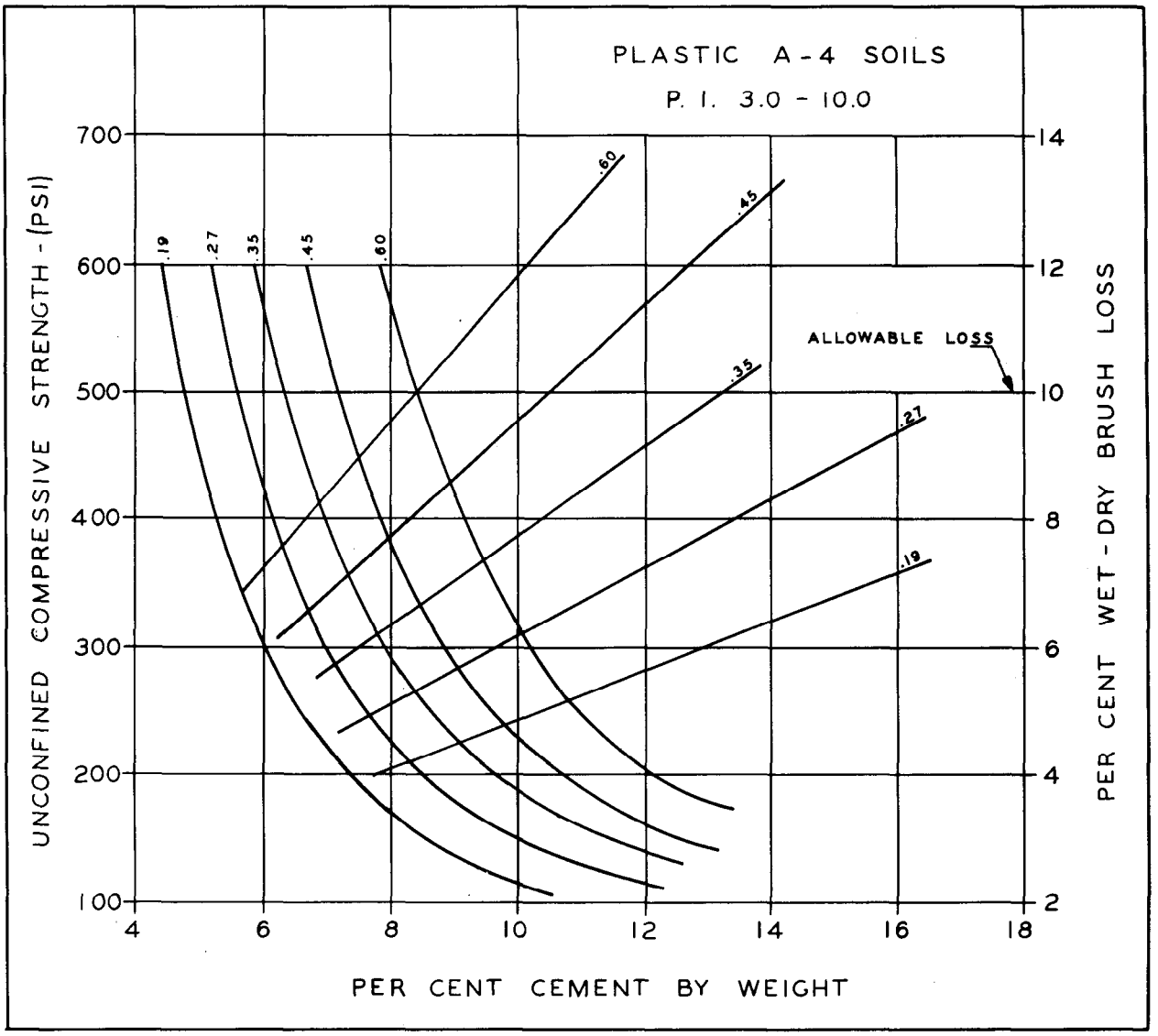
WET - DRY BRUSH LOSS — STRENGTH RELATIONSHIP

FIG. 1



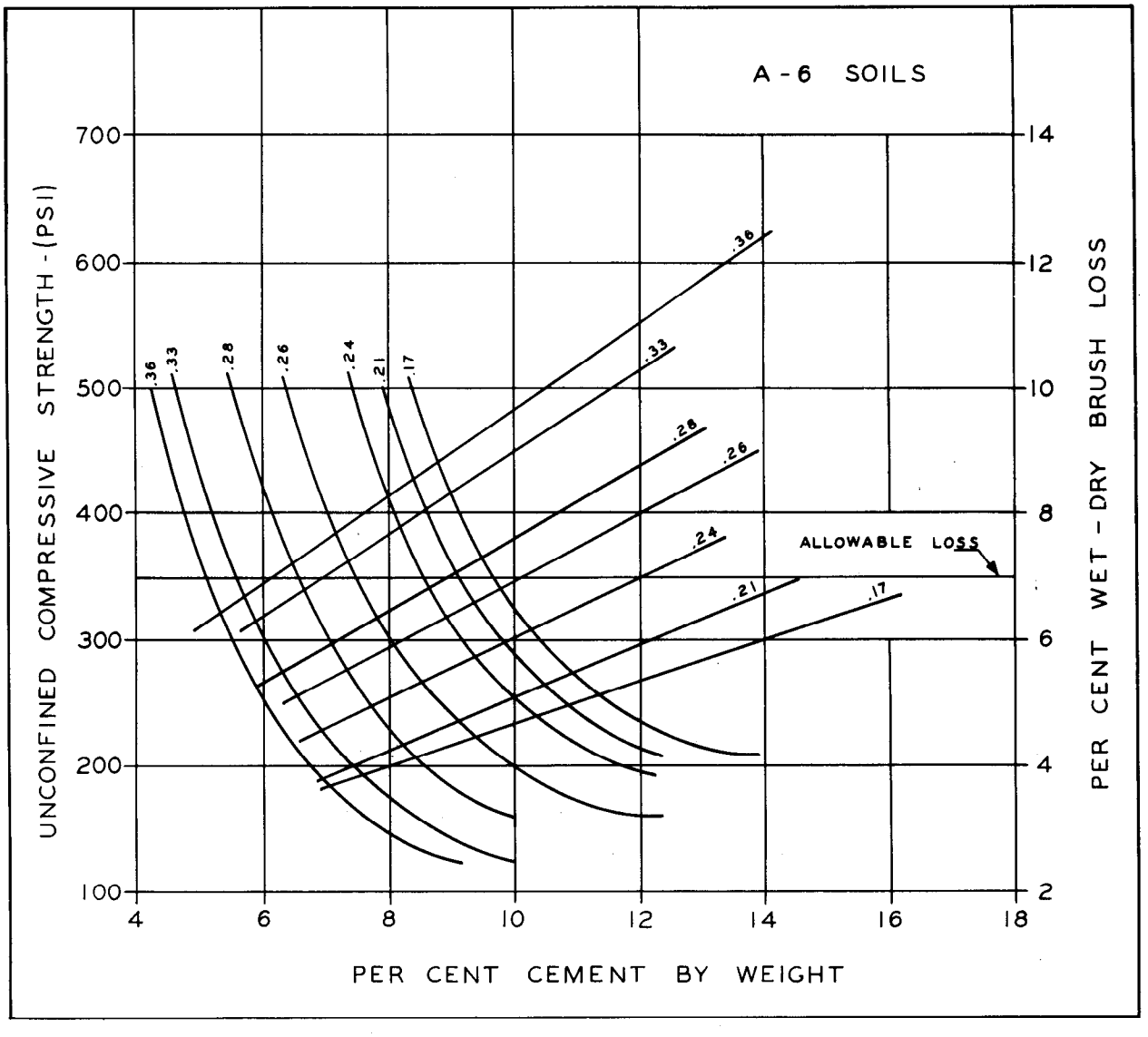
WET - DRY BRUSH LOSS — STRENGTH RELATIONSHIP

FIG. 2



WET - DRY BRUSH LOSS — STRENGTH RELATIONSHIP

FIG. 3



WET - DRY BRUSH LOSS — STRENGTH RELATIONSHIP

FIG. 4

maximum slope value group, whereas, materials of class A-6 exhibit a high strength-low brush loss relationship and are considered in the minimum slope value group.

To test the accuracy of cement content determinations made through the use of charts in compliance with the minimum cement content requirements as recommended by the Portland Cement Association through the use of 12 cycle wet-dry brush loss method, available laboratory results were compared with the values obtained from the charts. A "hit" was considered when the minimum cement requirement through the use of both methods came out to be equal in cement content by weight. Anything greater than ± 2.0% cement content was considered a "miss." All determinations were made to the nearest highest cement content, i.e., 6.2% by weight would be called 7% by weight. A summary of the determination of the accuracy of the charts is given in Table I.

It shall be seen that 80% of predictions of minimum cement content made through the use of the chart for A-2-4 soils agree with laboratory determined cement requirements within plus or minus 1.0%; however, it is felt that due to the limited number of observations, this chart can only present an indication of the trend of this material. Non-plastic A-4 soils show an accuracy of 85% within plus or minus 1.0 per cent cement content and plastic A-4 soils show 77% accuracy within plus or minus 1.0 per cent cement content. Seventy-five per cent of the results of A-6 soils were within plus or minus 1.0 per cent accuracy range.

The use of correlation charts for determining minimum cement requirement also provides for a considerable factor of safety

as only 7 per cent of some 151 observations showed a lower cement requirement than did the actual wet-dry brush test.

Table 1

Accuracy of Cement Requirement Determinations Through Use of Correlation Charts as Compared With Those Obtained From Wet-Dry Brush Losses

A-2-4 Soils

Number of Observations	10	
Hits	40%	
± 1.0%	40%	80%
± 2.0%	10%	
Greater than ± 2.0% (Miss)	10%	

Non-Plastic A-4 Soils

Number of Observations	41	
Hits	51%	
± 1.0%	34%	85%
± 2.0%	15%	
Greater than ± 2.0% (Miss)	0	

Plastic A-4 Soils

Number of Observations	52	
Hits	33%	
± 1.0%	44%	77%
± 2.0%	15%	
Greater than ± 2.0% (Miss)	8%	

A-6 Soils

Number of Observations	48	
Hits	48%	
± 1.0%	27%	75%
± 2.0%	17%	
Greater than ± 2.0% (Miss)	8%	

Conclusions

Interim conclusions drawn from this study to date are:

1. Seven-day unconfined compressive strength of soil-cement can be successfully correlated with 12 cycle wet-dry brush test with an accuracy ranging from 70 to 85 per cent within plus or minus 1 per cent cement content by weight on individual observations. For a series of observations, as would be the case in a study of a soil-cement stabilization project, the resulting accuracy should be better than these figures.
2. Use of correlation curves in determining minimum cement content requirement for soil-cement stabilization results in values which are more than 90% on the safe side. Figures are not available on the accuracy of the wet-dry brush test; however, a short program is planned to establish the reproducibility of brush test results.
3. Use of correlation curves in determining minimum cement requirements shall effect an important saving in time, reducing the necessary testing time of 35 days, excluding preliminary work, to approximately 7 days.

TABLE II

SUMMARY OF TEST RESULTS FOR A-2-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669930	314	3.0	8.9
	407	2.7	10.9
	496		12.9
669932	484	11.1	8.9
	646	6.1	10.8
	795	3.7	12.9
669933	440	7.4	8.6
	602	4.8	10.6
	746	2.9	12.5
669934	488	5.1	9.0
	648	2.7	11.0
	751	1.6	13.1
669945	277	14.7	5.3
	384	7.8	7.2
	466	3.6	9.2
669946	276	14.9	5.5
	358	9.2	7.5
	443	4.9	9.5
669947	240	17.1	5.6
	392	10.0	7.6
	546	3.7	9.6
Project No.			
452-02-36	262	4.5	4.8
	388	2.5	6.5
	503	1.7	8.2
450-30-06	166	20.2	5.4
	217	9.1	7.3
	375	6.0	9.3
450-30-06	221	12.7	5.2
	360	6.7	7.1
	392	4.5	9.1

TABLE III

SUMMARY OF TEST RESULTS
FOR NON-PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669925	660	4.0	9.0
	836	2.7	10.9
	944	2.4	13.0
669928	343	6.8	10.0
	398	4.1	12.2
	624	2.8	14.6
669931	425	6.4	9.2
	533	3.3	11.2
	642		13.4
669940	348	11.4	7.2
	423	5.9	9.2
	520	2.7	11.2
669943	345	6.4	7.4
	456	3.4	9.4
	614	2.8	11.5
669948	313	9.7	5.3
	428	4.4	7.2
	538	3.0	9.2
669949	300	6.3	5.3
	433	4.0	7.2
	524	3.5	9.1
669952	281	12.6	5.3
	412	7.8	7.1
	533		9.1
669953	296	15.7	5.5
	394	5.9	7.4
	496	4.5	9.4
669954	326	14.2	5.3
	494	7.1	7.3
	619	3.7	9.2
669975	270	11.6	5.5
	321	6.9	7.5
	400	4.0	9.6

TABLE III

SUMMARY OF TEST RESULTS
FOR NON-PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669976	168	8.2	5.7
	288	5.0	7.7
	336	2.9	9.8
669979	236	15.2	5.4
	359	5.8	7.3
	475	3.9	9.3
669980	248	11.0	5.4
	329	6.2	7.3
	412	5.6	9.3
669984	336	3.7	9.5
	455	2.9	11.6
	547	2.8	13.8
669985	371	4.8	9.3
	430	3.1	11.4
	490	3.1	13.6
669986	350	6.0	9.4
	469	3.4	11.5
	519	1.7	13.7
669988	520	2.8	9.5
	593	1.4	11.7
	665	1.0	13.9
669997	221	3.8	7.6
	282	1.8	9.6
	326	1.2	11.8
670007	211	4.6	7.4
	257	3.1	9.5
	298	2.3	11.6
670011	324	4.2	7.3
	426	3.0	9.3
	466	2.5	11.4

TABLE III

SUMMARY OF TEST RESULTS
FOR NON-PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670012	285	6.2	7.4
	371	3.7	9.4
	450	3.1	11.5
670013	271	5.2	7.3
	333	3.9	9.3
	404	3.3	11.4
670014	260	5.3	7.3
	341	2.8	9.3
	444	2.2	11.4
670015	322	6.7	6.9
	409	5.3	8.7
	496	3.4	10.7
670018	283	4.3	7.6
	330	3.1	9.6
	411	2.3	11.8
670020	250	4.0	7.5
	305	2.6	9.6
	355	2.5	11.7
670476	232	10.2	5.5
	295	5.3	7.5
	349	3.4	9.5
670477	232	13.7	5.5
	288	5.7	7.5
	319	4.0	9.6
670478	199	8.2	5.5
	251	5.9	7.4
	307	3.7	9.5
670479	205	13.5	5.6
	243	5.1	7.5
	365	3.7	9.6

TABLE III

SUMMARY OF TEST RESULTS
FOR NON-PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670480	217	10.5	5.5
	290	5.1	7.5
	354	3.4	9.6
670481	225	8.0	5.6
	292	5.2	7.6
	348	4.3	9.6
670482	237	8.6	5.6
	313	5.4	7.6
	390	2.9	9.7
670492	178	5.8	5.5
	231	3.7	7.5
	250	2.9	9.5
700717	176	6.9	5.7
	248	3.2	7.7
	306	3.2	9.8
700732	131	3.3	8.0
	156	3.5	10.3
	206	1.8	12.6
700735	147	4.7	8.0
	195	2.1	10.2
	265	3.2	12.4
700737	101	5.0	7.7
	134	1.8	9.9
	185	1.7	12.1
700740	149	3.8	7.7
	186	2.9	9.8
	256	1.4	12.1
Project No. 229-03-07	120	26.4	3.7
	193	9.3	5.5
	280	4.5	7.5

TABLE IV

SUMMARY OF TEST RESULTS
FOR PLASTIC A-4 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669927	434	4.1	9.4
	511	4.1	11.5
	586	2.8	13.6
669929	411	6.7	10.0
	481	3.8	12.2
	525	2.9	14.5
669936	425	5.7	7.1
	525	4.9	9.0
	602	3.7	11.0
669937	228	7.8	7.3
	466	4.5	9.2
	563	2.3	11.3
669939	432	11.9	7.4
	483	8.8	9.4
	664	3.9	11.5
669941	411	10.2	7.3
	475	5.1	9.3
	538	3.4	11.4
669942	319	7.6	7.3
	405	4.5	9.3
	509	2.8	11.4
669944	419	5.7	7.1
	512	4.0	9.0
	607	3.0	11.0
669950	273	10.0	5.5
	349	7.1	7.4
	374	4.8	9.4
669951	279	18.3	5.6
	375	9.7	7.6
	493	6.7	9.7
669960	253	3.8	7.6
	342	3.5	9.7
	395	2.9	11.8

TABLE IV

SUMMARY OF TEST RESULTS
FOR PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669961	232	4.9	7.8
	301	2.6	10.0
	351	2.6	12.2
669962	241	3.3	7.8
	336	2.4	9.9
	386	2.6	12.2
669963	255	3.5	7.7
	320	2.3	9.8
	416	2.0	12.0
669971	392	9.6	5.5
	472	4.2	7.5
	525	3.4	9.5
669972	243	8.4	5.4
	330	5.2	7.4
	413	4.3	9.4
669973	229	4.8	5.5
	307	3.7	7.5
	322	2.0	9.5
669974	328	6.8	5.7
	413	3.5	7.8
	496		9.9
669978	188	13.5	5.7
	235	6.5	7.8
	312	4.4	9.9
669981	342	3.7	9.5
	415	3.4	11.6
	495	2.0	13.8
669983	446	4.1	9.2
	485	3.0	11.3
	555	1.9	13.4
669987	339	4.8	9.5
	417	3.7	11.6
	475	2.0	13.8

TABLE IV

SUMMARY OF TEST RESULTS
FOR PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669989	411	3.1	9.3
	492	1.0	11.3
	640	1.0	13.5
669990	361	4.8	9.5
	426	2.6	11.6
	496	1.4	13.8
670001	187	5.4	7.5
	232	1.7	9.6
	272	1.7	11.8
670002	332	4.9	7.7
	353	3.2	9.7
	432	2.0	11.9
670004	291	4.8	7.4
	346	3.1	9.4
	427	2.3	11.5
670005	236	4.8	7.4
	269	3.2	9.5
	317	3.1	11.6
670008	279	4.8	7.5
	320	2.0	9.6
	393	1.4	11.7
670009	230	6.2	7.4
	275	2.6	9.4
	351	2.5	11.5
670006	187	5.2	7.4
	224	3.7	9.5
	243	2.3	11.6
670463	372	3.1	8.5
	450	2.3	10.4
	495	2.3	12.4
670460	331	4.9	7.5
	391	2.6	9.6
	494	3.1	11.7

TABLE IV

SUMMARY OF TEST RESULTS
FOR PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670466	394	4.1	8.6
	464	3.3	10.6
	636	1.5	12.5
670475	246	9.9	5.4
	302	4.7	7.3
	379	4.1	9.3
670464	450	3.3	8.5
	522	2.5	10.4
	548	2.5	12.4
670486	185	6.7	5.4
	293	4.2	7.3
	350	4.5	9.2
670488	204	6.0	5.3
	273	4.1	7.2
	353	2.7	9.2
670493	61	4.6	5.9
	126	2.1	8.0
	222	2.1	10.2
670502	238	4.1	5.7
	334	0.9	7.8
	429	0.9	10.0
700380	141	2.7	7.8
	195	2.4	9.9
	248	1.2	12.1
700711	127	6.2	5.8
	264	3.6	7.9
	299	2.6	10.1
700712	184	4.5	5.6
	264	3.7	7.6
	352	2.3	9.6

TABLE IV

SUMMARY OF TEST RESULTS
FOR PLASTIC A-4 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
700722	310	3.1	7.4
	353	2.2	9.5
	395	2.2	11.6
700725	174	4.0	7.6
	236	3.7	9.7
	280	1.1	11.9
700726	209	2.8	7.5
	270	3.7	9.6
	329	2.5	11.7
700727	207	5.9	7.5
	232	4.8	9.6
	312	2.3	11.7
700729	169	3.4	7.6
	205	3.1	9.7
	256	2.0	11.8
700731	128	4.0	8.3
	151	3.4	10.7
	154	1.8	13.1
700733	121	4.2	8.0
	162	3.3	10.2
	206	1.2	12.4
700736	140	3.6	8.1
	160	2.7	10.3
	177	3.0	12.6
Project No. 450-30-06	262	9.9	5.2
	315	5.9	7.1
		3.5	9.0

TABLE V

SUMMARY OF TEST RESULTS
FOR A-6 SOILS

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
669926	437	6.8	9.7
	481	4.6	11.9
	574	3.7	14.1
669935	264	11.0	7.4
	303	6.1	9.4
	396	4.0	11.5
669959	282	5.5	7.7
	338	3.5	9.8
	413	3.4	11.9
669964	289	4.3	7.7
	365	2.9	9.8
	475	2.6	11.9
669977	170	23.2	5.6
	258	14.0	7.6
	292	7.0	9.6
669994	255	5.8	7.9
	297	3.2	10.0
	331	2.1	12.3
669995	337	5.3	7.4
	423	2.9	9.4
	490	2.2	11.5
669996	211	3.9	7.8
	206	4.5	9.9
	244	1.8	12.1
669998	219	3.9	7.8
	242	3.5	9.9
	286	1.5	12.1
670000	348	4.3	7.4
	406	2.5	9.4
	424	1.7	11.5

TABLE V

SUMMARY OF TEST RESULTS
FOR A-6 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670023	203	8.7	7.8
	240	5.4	10.0
	309	3.9	12.2
670024	271	10.6	7.6
	319	6.0	9.7
	378	4.9	11.8
670458	231	12.9	7.7
	274	6.4	9.7
	337	5.0	11.9
670459	228	7.1	7.7
	284	4.5	9.8
	303	3.6	11.9
670461	313	5.4	7.5
	369	4.3	9.5
	346	2.9	11.7
670467	400	4.7	9.4
	442	3.3	11.5
	510	3.6	13.7
670468	291	7.3	9.5
	352	2.8	11.6
	398	2.8	13.8
670473	205	15.2	5.6
	251	7.2	7.6
	364	4.9	9.6
670474	217	17.5	5.6
	248	8.5	7.6
	337	*6.3*	*9.7*
670483	*241*	*16.3*	*5.7*
	304	6.6	7.7
	356	6.9	9.8

TABLE V

SUMMARY OF TEST RESULTS
FOR A-6 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670484	195	7.4	5.7
	253	4.7	7.7
	328	3.8	9.8
670485	205	23.2	5.6
	285	11.7	7.6
	322	7.5	9.7
670487	236	6.9	5.5
	297	4.0	7.4
	396	2.8	9.5
670489	251	13.8	5.3
	291	6.5	7.1
	340	4.3	9.1
670496	185	5.0	5.7
	246	4.1	7.8
	327	2.9	9.9
670499	178	4.8	6.0
	236	2.4	8.1
	296	1.8	10.4
670501	204	4.7	5.7
	269	2.6	7.8
	374	1.5	9.9
670504	218	2.4	7.8
	280	3.3	10.0
	363	2.4	12.2
670505	174	5.9	7.8
	247	3.0	10.0
	254	2.7	12.2
670506	230	5.7	7.8
	269	3.3	10.0
	352	2.1	12.2

TABLE V

SUMMARY OF TEST RESULTS
FOR A-6 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
670507	287	7.1	7.7
	349	3.8	9.9
	414	2.7	12.1
700381	147	8.7	7.8
	184	2.4	10.0
	159	2.1	12.2
700713	163	5.8	5.6
	223	4.6	7.7
	310	17.7	9.8
700716	178	6.3	5.6
	239	4.8	7.6
	317	4.0	9.7
700723	205	10.9	7.5
	257	6.5	9.6
	379	4.7	11.7
700734	126	4.0	8.2
	173	2.7	10.5
	216	2.4	12.8
Project No. 229-03-07	90	34.4	3.6
	135	20.8	5.5
	182	11.5	7.5
278-02-04	83	15+	3.7
	159	6.9	5.5
		4.0	7.5
271-03-04	214	8.7	4.3
	375	4.8	6.2
	421	4.5	8.1
271-03-04	116	7.9	4.6
	264	4.7	6.5
		3.4	8.5

TABLE V

SUMMARY OF TEST RESULTS
FOR A-6 SOILS
(CONT.)

Lab. No.	Lab. Briquettes Unconfined Comp. Strength (psi)	Lab. Briquettes Wet-Dry Brush Loss After Full Cycle %	Cement Content % by Weight
271-03-04	128	8.0	4.6
	251	5.4	6.5
	326	3.9	8.5
271-02-05	123	10.3	4.7
	383	3.3	6.8
	420	2.1	8.9
269-01-04	245	7.5	5.3
	357	5.2	7.3
		3.0	9.2
817-30-06	172	6.4	5.7
	272	5.6	7.7
	336	2.6	9.9
859-08-05	334	9.7	5.0
	409	3.4	6.7
	495	1.6	8.6
859-08-05	338	7.3	5.1
	457	3.6	7.0
		1.9	8.6
852-05-06	131	7.4	4.5
	200	3.7	6.4
	290	2.5	8.4
452-02-36	237	8.8	5.2
	289	4.4	7.0
	356	3.5	8.9