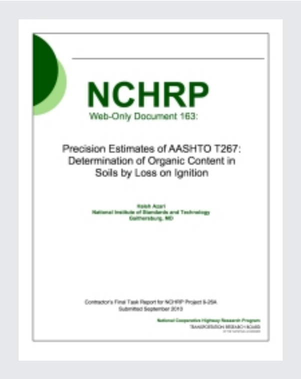
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Precision Estimates of AASHTO T267: Determination of Organic Content in Soils by Loss on Ignition

Precision Estimates of AASHTO T267: Determination of Organic Content in Soils by Loss on Ignition

DETAILS

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Arizona DOT Materials Group, Phoenix, AZ
North Carolina DOT Materials and Tests Unit Soils Laboratory, Raleigh, NC
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ABSTRACT

This report presents the results of an interlaboratory study (ILS) to prepare precision estimates for the AASHTO T267 test method used for the determination of organic content in soils by loss of ignition. The materials for the ILS included sand, silt, and clay each blended with 2%, 5%, and 8% finely ground walnut shells as the organic material. A total of 27 laboratories provided results of percent organic content of three replicates of each soil-organic blend. The results indicated that the repeatability and reproducibility precisions are the same for different levels of organic content of each soil-organic blend, but significantly different for different soil types. A precision statement for AASHTO T267 is proposed based on the precision estimates computed in this study.

CHAPTER 1- INTRODUCTION AND RESEARCH APPROACH

1.1 Background

As part of NCHRP 9-26, The AASHTO Materials Reference Laboratory has been conducting a series of research studies to determine or update estimates of precision for various AASHTO test methods. The AASHTO T267 "Determination of organic content in soils by loss on ignition" [1] lacks precision estimates. Therefore, AASHTO Highway Subcommittee on Materials (HSOM) has requested that precision estimates be developed for this test method. An interlaboratory study (ILS) was designed to develop the precision estimates for AASHTO T267.

1.2 Problem Statement

The engineering properties of soils are affected by organic materials. The determination of amount of organic content in soils is important in evaluation of base and subbase for a pavement construction. In this respect, the levels of accuracy and precision of organic content measurements would affect the overall performance of a pavement. The AASHTO T267 test method is currently lacking precision estimates that would define the accuracy requirements for the organic content determination. Therefore, the goal of this ILS study is to determine the repeatability and reproducibility precisions of organic content measurements in soils using the AASHTO T267 test method.

1.3 Research Objectives

The overall objective of this study is to determine precision estimates for the AASHTO T267, "Determination of Organic Content in Soils by Loss on Ignition" test method. The change in precision estimates of organic content with the change in mass percentage of organic material and soil type is also being investigated here.

1.4 Scope of Study

The scope of the project involved the following major activities:

I. Design and conduct an interlaboratory study (ILS):
   a. Select the soil types.
   b. Select the organic material.
   c. Select the laboratories to participate in the study.

II. Analyze the measured data to determine the within laboratory and between laboratories variability.

III. Develop precision estimates for AASHTO T267 test method based on the computed variability statistics.

IV. Prepare a precision statement for AASHTO T267 using the developed precision estimates.

V. Make conclusions and recommendations based on the findings of the study

CHAPTER 2- DESIGN AND EXECUTION OF THE ILS

To obtain a reliable measurement of organic content in soils, it is essential to develop precision estimates for the AASHTO T267 test method. In this respect, the AASHTO Subcommittee on Materials has requested the precision estimates of AASHTO T267 to be developed. An interlaboratory study was designed and conducted in which three different soil types, blended with three different percentages of organic material, were analyzed. The following sections will report the details of the design of the ILS. The approach used for the design of the ILS was based on ASTM E691-07, "Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method" [2]. As specified in E691, the development of a precision statement required participation of a minimum of 6 laboratories. The precision estimates in this study were developed using the data collected from 27 laboratories.

2.1 Test Specimens

The samples prepared for the ILS included 500 g of each of the three types of soils (silt, clay, and sand) that were blended with three different percentages (2%, 5%, 8%) of fine walnut shell grit as the organic material. Also, 100 g of each of the three soil types with no additional organic material were provided to the laboratories in order to determine the inherent level of organic material of each soil type. A total of 360 bottles were sent to 30 different laboratories, each receiving 12 bottles of samples. The instructions requested the operators to take three 20-g representative specimens from each bottle and heat them in the ignition oven as conforming to AASHTO T267 test method.

2.2 Test Apparatus

The apparatus used for determining the organic content include drying oven, balance conforming to M231 class G1, muffle furnace capable of maintaining a continuous temperature of 455 ± 10°C, evaporating dishes, and desiccators as requested in Sections 3.1 to 3.7 of AASHTO T267. A turbula machine was used during the sample preparation for homogeneous blending of the soil and organic material.

2.3 Participating Laboratories

The laboratories for participation in the AASHTO T267 ILS were selected based on their performance in soil proficiency sample testing. The laboratories were ranked by their scores earned through accreditation process. The laboratories with the highest ranking of 5 were contacted and thirty of those laboratories, which responded positively, were selected for the study. The results of testing T267 ILS samples were received from 27 laboratories.

2.4 Interlaboratory Sample Preparation and Shipping

A total of 360 bottles were shipped to different laboratories in sets of four bottles from three types of soils. The four bottles of each soil type contained four different percentage of organic material of 0%, 2%, 5%, 8%. In each bottle, there was three times the material needed for testing three replicate samples. The samples were subjected to blending in their bottles using a turbo machine for duration of 2 minutes and at a speed of 60 revolutions per minute in order to obtain homogeneous mixtures of organic content and soils.

2.5 Interlaboratory Study Instructions

The laboratory participants were provided with the testing instructions and data sheets to record the data. The laboratories were asked to shake the bottles thoroughly before taking representative samples. Then take three 100-g representative samples according to T267 test method and from each take 20-g test specimens to place in ignition oven. The laboratories were requested to follow AASHTO T267 to measure the mass of samples to the nearest 0.01 g before and after the test. The instruction and the data sheet are provided in Appendix A.

CHAPTER 3- INTERLABORATORY TEST RESULTS AND ANALYSIS

3.1 Test Data

The test data collected from laboratories included three replicate measurements of organic content of 12 soil-organic material blends consisted of three soil types and four percentages of ground walnut shells. This totaled in 36 measurement data from each laboratory. Among the 30 laboratories selected, 27 laboratories submitted full sets of measurements in every soil type. The measured data and the related statistics corresponding to clay, silt, and sand blends are provided in Appendices B, C, and D, respectively. Tables B-1, C-1, and D-1 of the appendices present the data and Figures B-1, C-1, and D-1 demonstrate the median, the maximum, and the minimum organic content values. To be able to compare the percentages of organic material measured with the percentages of organic material added, the measured organic content data were adjusted for the amount of organic material inherent to each soil. Table s B-2, C-2, and D-2 and Figures B-3, C-3, and D-3 provide the adjusted percent organic content data. In each of the figures, the middle point of each data point represents the adjusted median and the lower and upper bars represent the adjusted minimum and maximum data values, respectively.

3.2 Method of Analysis

Test results of the ILS were analyzed for precision in accordance to ASTM E 691[2]. Prior to the analysis, any outlier data was eliminated by following the procedures described in E691 for determining repeatability (S_r) and reproducibility (S_R) estimates of precision. For each set of data, the h and k statistics, representing the between and within laboratory consistency, were used to identify the outlier data. Data exceeding the critical *h* and *k* values were eliminated as described in Sections 3.3. Once identified for elimination, the same data were eliminated from any smaller subsets analyzed. Figures B-2, C-2, and D-2 of Appendices B, C, and D provide the graphical representations of the computed and critical h- and k- statistics.

3.3 Analysis of Results

Multiple sets of data in each soil type were eliminated based on the critical h and k values. After eliminating the outlier data, the averages, the repeatability and reproducibility standard deviations of the data were determined. The eliminated unadjusted data are shown shaded in Table B-1, C-1, and D-1 and demonstrated in Figures B-2, C-2, and D-2 of Appendices B, C, and D. The eliminated adjusted data are shown shaded in Table B-2, C-2, and D-2 and demonstrated in Figure B-3, C-3, and D-3 of the appendices. The S_r and S_R precision estimates were determined using the remaining data conforming to E 691 method.

A summary of statistics of the measurements is shown in **Error! Reference source not found.**. The comparison of the design and measured organic content values in the table indicates that every soil has a certain percentage of inherent organic material. The inherent organic content of the soils are observed in the 0% column in Tables B-1, C-1, and D-1 of Appendices B, C, and D. As indicated, clay has the most amount of inherent organic material, whereas sand has the least amount. Upon subtracting the inherent organic contents from the measured organic contents, the average of the measured values agree closely with the design values as shown in table of the adjusted values (Table 3-2).

In addition to the adjusted averages, Table 3-2 also provides the adjusted variability of the measurements. It is indicated from Table 3-2 that the standard deviation of the measurements for sand increases with the increase in the percentage of organic material. The increased variability of the sand blend with higher percentages of organic material indicates segregation of organic material during shipment. This could be explained by the non-cohesive nature of sand that does not allow adhering sand particles to ground walnut shell grits. The tests of statistical significance in the next section would determine if the differences in averages and variability of measurements were significant for the different organic contents and different soil types.

Table 3-1: Summary of Statistics of organic content measurements after elimination of outlier data

Soil Type	Design Organic Content	No. of Labs	Average Measured Organic Content	S_x	Repeatability		Reproducibility	
					1s (S_r)	D2s	1s (S_R)	D2s
Clay	0%	27	3.03	0.981	0.277	0.785	1.018	2.880
Clay	2%	25	5.38	0.925	0.287	0.813	0.966	2.735
Clay	5%	26	8.29	0.985	0.259	0.732	1.017	2.879
Clay	8%	24	11.16	0.787	0.233	0.661	0.819	2.319
Silt	0%	26	0.95	0.369	0.122	0.346	0.388	1.098
Silt	2%	25	6.06	0.378	0.129	0.366	0.544	1.540
Silt	5%	25	2.92	0.529	0.155	0.437	0.408	1.154
Silt	8%	25	8.93	0.379	0.195	0.551	0.424	1.199
Sand	0%	25	0.32	0.140	0.052	0.147	0.149	0.422
Sand	2%	26	5.55	0.362	0.219	0.621	0.363	1.027
Sand	5%	25	2.43	0.292	0.430	1.216	0.555	1.570
Sand	8%	26	8.59	0.631	0.396	1.120	0.741	2.097

Table 3-2: Summary of Statistics of organic content measurements after subtracting the inherent organic content

Soil Type	Source-Design	No. of Labs	Average	S_x	Repeatability		Reproducibility	
					1s (S_r)	D2s	1s (S_R)	D2s
Adj. Clay	2%	26	2.25	0.505	0.282	0.798	0.576	1.630
Adj. Clay	5%	25	5.32	0.498	0.246	0.697	0.554	1.567
Adj. Clay	8%	24	8.28	0.519	0.232	0.655	0.566	1.602
Adj. Silt	2%	25	1.97	0.313	0.129	0.366	0.338	0.956
Adj. Silt	5%	25	5.05	0.262	0.155	0.437	0.302	0.856
Adj. Silt	8%	26	7.93	0.368	0.196	0.556	0.415	1.176
Adj. Sand	2%	25	2.07	0.262	0.216	0.610	0.337	0.953
Adj. Sand	5%	25	5.14	0.534	0.397	1.124	0.660	1.869
Adj. Sand	8%	25	8.24	0.683	0.372	1.054	0.774	2.192

3.4 Statistical Tests for Significance

Tests of statistical significance on the ILS data were performed using *t*-test and *F*-test. All *t*-tests assumed an independent one-sample t distribution for 1% level of significance. The t-test was to determine if the difference in the average adjusted mass percentage of burned organic material were statistically significant from the added percentage of organic material. The *F*-test was to determine if S_r and S_R precision estimates of the properties for different soil types with various organic material percentages were significantly different. The results of the tests for statistical significance on the averages and standard deviations of the measured organic content are discussed in the following sections.

3.4.1 Comparison of the Measured and Target Averages

A t-test was performed for comparison of the average adjusted burned organic mass percentage and the added mass percentage of organic material. The results of the t-test for 1% level of significance are provided in Table 3-3. As observed from the table, for all soil types, the adjusted mass percentages of organic material are statistically the same as the amount of the organic material added to the soils. It is indicated from the table that the smallest rejection probability values correspond to the clay blends specifying that clay has the highest inherent organic content compared to the other two soil types.

Table 3-3: Results of t-test for comparison of the average measured mass percentages with the added mass percentages of the organic material

Compare	Degrees of Freedom	Critical t	Computed t	Rejection Probabilities	Decision
2% Clay	26	2.479	1.974	0.0591	Accept
5% Clay	26	2.479	2.376	0.0252	Accept
8% Clay	26	2.479	2.329	0.0279	Accept
2% Silt	26	2.479	-0.264	0.7939	Accept
5% Silt	26	2.479	1.118	0.2738	Accept
8% Silt	26	2.479	-0.933	0.3594	Accept
2% Sand	25	2.485	0.715	0.4812	Accept
5% Sand	26	2.479	1.380	0.1793	Accept
8% Sand	26	2.479	1.632	0.1147	Accept

3.4.2 Comparison of the Standard Deviations of Measurements

The *F*-test was performed to determine if S_r and S_R precision estimates of the properties for different organic contents were significantly different. The standard deviations that are not significantly different would be pooled in development of the precision estimates. The F-test was conducted on standard deviations of different organic contents of the three soil types at 1% level of significance. A rejection probably value smaller than 0.01 would indicate that the differences between standard deviations are significant. The results of the tests for statistical significance are shown in Table 3-4 through Table 3-10 and are discussed in the following sections.

3.4.2.1 Comparison of the Standard Deviations of Clay Blends

The results of *F*-test on within and between-laboratory standard deviations of organic content measurements of clay blends are shown in Table 3-4 and Table 3-5. As shown in the tables, the rejection probabilities for comparison of both within and between-laboratory variability of the clay samples are all greater than 0.01 indicating that their standard deviations are the same and therefore, they can be combined.

Table 3-4: Results of F-test on comparison of within laboratory variability of measurements of clay for 1% level of significance

Compare	Within Standard Deviation	Degrees of Freedom	Critical F	Computed F (S_r)	Rejection Probability	Decision
2% vs. 5%	0.282 vs. 0.246	25 & 24	2.64	1.311	0.2550	Accept
2% vs. 8%	0.282 vs. 0.232	25 & 23	2.69	1.482	0.1732	Accept
5% vs. 8%	0.246 vs. 0.232	24 & 23	2.70	1.131	0.3851	Accept

Table 3-5: Results of F-test on comparison of between-laboratory variability of measurements on clay for 1% level of significance

Compare	Between Standard Deviation	Degrees of Freedom	Critical F	Computed F (SR)	Rejection Probability	Decision
2% vs. 5%	0.576 vs. 0.554	25 & 24	2.64	1.083	0.4237	Accept
2% vs. 8%	0.576 vs. 0.566	25 & 23	2.69	1.036	0.4681	Accept
8% vs. 5%	0.566 vs. 0.554	23 & 24	2.676	1.045	0.4568	Accept

3.4.2.2 Comparison of the Standard Deviations of Silt Blends

The results of F-test on within and between-laboratory standard deviations of organic content measurements of silt blends are shown in Table 3-6 and Table 3-7. As shown in the tables, the rejection probabilities for comparison of both within and between-laboratory variability of the silt samples are all greater than 0.01 indicating that their standard deviations are the same and they can be combined.

Table 3-6- Results of F-test on comparison of within laboratory variability of measurements on silt for 1% level of significance

Compare	Within Standard Deviation	Degrees of Freedom	Critical F	Computed F (S_r)	Rejection Probability	Decision
5% vs. 2%	0.155 vs. 0.129	24 & 24	2.66	1.430	0.1936	Accept
8% vs. 2%	0.196 vs. 0.129	25 & 24	2.64	2.310	0.022	Accept
8% vs. 5%	0.196 vs. 0.155	25 & 24	2.64	1.615	0.1222	Accept

Table 3-7: Results of F-test on comparison of between-laboratory variability of measurements on silt for 1% level of significance

Compare	Between Standard Deviation	Degrees of Freedom	Critical F	Computed F (S_R)	Rejection Probability	Decision
2% vs. 5%	0.338 vs. 0.302	24 & 24	2.66	1.247	0.2965	Accept
8% vs. 2%	0.415 vs. 0.338	25 & 24	2.64	1.514	0.1567	Accept
8% vs. 5%	0.415 vs. 0.302	25 & 24	2.64	1.888	0.0620	Accept

3.4.2.1 Comparison of the Standard Deviations of Sand Blends

The results of F-test on within and between-laboratory standard deviations of organic content measurements of sand blends are shown in Table 3-8 and Table 3-9. As shown in the tables, the rejection probabilities of two out of three comparisons for each within and between-laboratory variability are smaller than 0.01 indicating that the variability of measurements on sand blends with 5% and 8% organic material are significantly larger than those of the blend with 2% organic material. It is speculated that the non-adhesive nature of sand has contributed to the increase in measurement variability. The more walnut shell grits were added to the sand particles, the more non-adhered organic material were available to segregate. Due to the significant difference in variability values, the standard deviations of the sand blend with 2% organic material would not be combined with those of the sand blend with 5% and 8% organic material.

Table 3-8: Results of F-test on comparison of within-laboratory variability of measurements on sand for 1% level of significance

Compare	Within Standard Deviation	Degrees of Freedom	Critical F	Computed F (S_r)	Rejection Probability	Decision
5% vs. 2%	0.397 vs. 0.216	24 & 24	2.66	4.006	0.0020	Reject
8% vs. 2%	0.372 vs. 0.216	24 & 24	2.66	3.399	0.0048	Reject
5% vs. 8%	0.397 vs. 0.372	24 & 24	2.66	1.179	0.3770	Accept

Table 3-9: Results of F-test on comparison of between-laboratory variability of measurements on sand for 1% level of significance

Compare	Between Standard Deviation	Degrees of Freedom	Critical F	Computed F (S_R)	Rejection Probability	Decision
5% vs. 2%	0.660 vs. 0.337	24 & 24	2.66	2.474	0.0008	Reject
8% vs. 2%	0.774 vs. 0.337	24 & 24	2.66	4.911	0.0001	Reject
8% vs. 5%	0.774 vs. 0.660	24 & 24	2.66	1.985	0.2205	Accept

3.5 Combining of Similar Standard Deviations

The precision estimates for the organic content measurements are computed after combining the standard deviations that were not significantly different. As mentioned previously, repeatability and reproducibility standard deviations corresponding to clay or silt blends with different percentages of organic material were not significantly different. In this respect, the variability values were combined as presented in Table 3-10. For the sand blend, because of the significant difference between variability of measurements, the statistics of the blend with 2% organic material could not be combined with those of the blends with 5% and 8% organic material. Since in the field the inherent amount of organic material in sand is typically low (<2%), the standard deviations of the sand blends with 2 % organic material was used as the repeatability and reproducibility standard deviations for the sand blend materials as presented in Table 3-10.

Table 3-10: Combined standard deviations of the soil blends with various organic contents

Blend Type	Repeatability std (%)	Reproducibility std (%)
Clay	0.25	0.57
Silt	0.16	0.35
Sand	0.21	0.35

To examine if the standard deviations can be further combined, an F-test was conducted to examine the significance of the difference between variability of various soil types. The results of statistical F test for 1% level of significance are provided in Table 3-11. As shown in the table, for the clay, the repeatability of measurements is significantly different from that of the silt blend and its reproducibility is significantly different from that of both silt and clay blends. Nevertheless, the repeatability and reproducibility of the silt and sand blends are the same. Therefore, the variability of clay should be presented separately from that of silt and clay, while the standard deviations of silt and sand could be combined.

Table 3-11: Results of F test for comparison of standard deviations of organic content measurements of various soil blends

Compare	Degree of Freedom	Critical F	Repeatability Repro			ducibility		
			Computed F(S_r)	Rejection Probability (S_r)	Decision	computed F(S_R)	Rejection Probability (S_R)	Decision
Clay vs. silt	74 & 74	1.72	2.45	<0.0001	Reject	2.54	<0.0001	Reject
Clay vs. sand	74 & 24	2.37	1.40	0.1786	Accept	2.62	0.0050	Reject
Silt vs. Sand	24 & 74	2.05	1.75	0.0355	Accept	1.03	0.4422	Accept

3.6 Precision Estimates of AASHTO T267

In developing the precision estimates for AASHTO T267, the standard deviations corresponding to the soil blends with similar variability would be combined and for those with different variability would be used separately. In this respect, the repeatability and reproducibility standard deviations of silt and sand, which were not significantly different, were combined. However, the standard deviations of clay, which were significantly different from those of silt and clay were not combined. Table 3-12 presents single operator and multilaboratory estimate of variability (1s) and the allowable difference between two results (d2s) for organic content measurements of the soil blends. A proposed precision statement for NCHRP T267 based on the precision estimates in Table 3-12 is provided in Appendix E.

Table 3-12: Precision estimates for measurement of organic content of soil

Condition of Test and Test Property	Standard deviation, % (1s)	Acceptable Range of Two Results, % (d2s)
Single-Operator Precision:		
Clay	0.25	0.72
Silt and Sand	0.19	0.54
Multilaboratory Precision:		
Clay	0.57	1.60
Silt and Sand	0.35	1.00

CHAPTER 4- CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Reliable determination of organic content of a soil is an integral part of evaluating suitability of a soil for pavement applications. AASHTO T267 test method “Determination of Organic Content in Soils by Loss on Ignition” lacks precision estimates, which are required for reliable measurement of organic content. An interlaboratory study was designed and conducted for the purpose of preparing precision estimates for AASHTO T267. Samples from three types of soils (clay, silt and sand) were each blended with three different percentages (2%, 5%, and 8%) of fine walnut shell grits as organic material and sent to 30 laboratories for organic content measurement. The laboratories were instructed to test three replicates of each organic content level of each soil type. The results were obtained from 27 different laboratories. Based on the results of AASHTO T267 interlaboratory study, the following conclusions are reached:

- Clay has the most amount of inherent organic material and sand has the least amount of inherent organic material.
- The within-laboratory and between-laboratory standard deviations were very consistent for different organic content levels of clay or silt blend. Therefore, for these two blends, the standard deviations corresponding to 2%, 5%, and 8% organic material were pooled together.
- For the sand blend, the within-laboratory and between-laboratory standard deviations of 5% and 8% organic content were significantly larger than those of 2% organic content. Therefore, the standard deviations corresponding to different organic content levels were not pooled together.
- The large variability in measurement of organic content of sand blends with 5% and 8% organic material is speculated to be caused by segregation of organic material during shipment due to non-adhesive nature of sand.
- Since sand has typically less than 2% organic material in its natural state, the precision estimates for sand were prepared based on the standard deviations of the blend with 2% organic content and the standard deviations corresponding to 5% and 8% organic content were not included in precision estimate development.
- The within-laboratory and between-laboratory standard deviations of the silt and sand blends were statistically similar and they were combined.
- The within-laboratory and between-laboratory standard deviations of the clay blend were significantly different from those of sand and silt blends and were reported separately.

Based on the results of the ILS described in this report, a precision statement was prepared for AASHTO T267 that includes separate precision estimates for clay blends and combined precision estimates for silt and sand blends. The proposed precision statement is provided in Appendix E.

4.2 Recommendations

Currently, AASHTO Test Method T267 lacks precision estimates that would define the accuracy requirements for organic content measurements in soils. It is recommended that the precision statement in Appendix E, which is prepared based on analysis of the data collected through an interlaboratory study be published in AASHTO T267.

REFERENCES

1. AASHTO Standard Specifications for Transportation Materials and Methods of Sampling and Testing (Part 2A – Tests), Twenty-Ninth Edition, American Association of State Highway and Transportation Officials, Washington, DC. 2009.

2. ASTM Standards on Precision and Bias for Various Applications, Fifth Edition, West Conshohocken, PA, 1997.

APPENDIX A- INSTRUCTIONS AND DATA SHEET FOR AASHTO T267 ILS

Instructions to the Participants of the ILS for AASHTO T267,"Determination of Organic Content in Soils by Loss on Ignition"

1. Each lab should have received total of 12 bottles (6 large, 3 medium, and 3 small bottles).

2. The bottles have marked as the following:

    a. N-Sand, D-Sand, P-Sand, H-Sand

    b. N-Silt, D-Silt, P-silt, H-Silt

    c. N-Clay, D-Clay, P-Clay, H-Clay

3. Thoroughly mix the content of each bottle by shaking the bottles well.

4. Follow Section 4 of AASHTO T267 to take three 100-g representative samples from each of the medium and large bottles (D-, P-, and H- samples).

5. Place the entire content of the N- samples and the 100-g samples from D-, P-, and H- samples in containers and dry them in an oven at 110 ± 5°C (230 ± 9°F) to constant mass. Remove the samples from the oven, place them in a desiccator and allow them to cool.

6. Take three 20-g test specimens from the N-samples. Mark them according to the specimens' names in the enclosed worksheet.

7. Take three 20-g test specimens from each of the 100-g mixtures. Mark them according to the specimens' names in the enclosed worksheet.

8. Place the specimens into tared crucible or porcelain evaporating dishes and determine the mass to the nearest 0.01 g.

9. Follow the instructions in Section 5.2 and 5.3 of T267.

10. Record the weights before and after ignition in the data sheet provided.

11. Calculate the organic content of each specimen as a percentage of the mass of the oven-dried soil as explained in Section 6 of T267.

12. Record the percentage of organic matter to the nearest 0.01 percent in the provided data sheet.

13. Please send the data to AMRL through email: hazari@amrl.net

Data Sheet for Entering AASHTO T267 ILS Data

Sample Type	weight (g) Dish	Weight (g) Before Ignition, Soil	Weight (g) After Ignition, Soil+Dish	Organic Content (%)
N-Clay 1				
N-Clay 2				
N-Clay 3				
D-Clay 1				
D-Clay 2				
D-Clay 3				
P-Clay 1				
P-Clay 2				
P-Clay 3				
H-Clay 1				
H-Clay 2				
H-Clay 3				

Sample Type	weight (g) Dish	Weight (g) Before Ignition, Soil	Weight (g) After Ignition, Soil+Dish	Organic Content (%)
N-Silt 1				
N-Silt 2				
N-Silt 3				
D-Silt 1				
D-Silt 2				
D-Silt 3				
P-Silt 1				
P-Silt 2				
P-Silt 3				
H-Silt 1				
H-Silt 2				
H-Silt 3				

Sample Type	weight (g), Dish	Weight (g) Before Ignition, Soil	Weight (g) After Ignition, Soil+Dish	Organic Content (%)
N-Sand 1				
N-Sand 2				
N-Sand 3				
D-Sand 1				
D-Sand 2				
D-Sand 3				
P-Sand 1				
P-Sand 2				
P-Sand 3				
H-Sand 1				
H-Sand 2				
H-Sand 3				

APPENDIX B- ORGANIC CONTENT OF CLAY BLENDS AND COMPUTED ASTM E691 STATISTICS

Table B-1: Unadjusted Organic content (%) of three replicates of clay blends in the ILS and the computed statistics according to ASTM E 691

	Clay				X_bar				S				h			
Lab No	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%
1	3.28 3.47 3.07	5.57 5.75 5.55	8.72 8.64 8.74	11.69 11.53 11.65	3.27	5.62	8.70	11.62	0.199	0.115	0.054	0.085	0.25	0.36	0.38	0.32
2	1.90 1.90 1.85	4.00 3.85 4.20	7.35 6.90 6.90	10.10 10.00 9.90	1.88	4.02	7.05	10.00	0.029	0.176	0.260	0.100	-1.16	-1.10	-1.29	-1.34
3	4.01 3.88 4.00	6.49 6.12 5.60	9.30 9.10 9.22	12.09 11.61 12.30	3.97	6.07	9.21	12.00	0.073	0.450	0.103	0.350	0.96	0.76	0.90	0.71
4	2.89 2.75 3.01	4.34 4.41 4.92	8.05 7.78 8.02	10.33 10.98 10.79	2.88	4.56	7.95	10.70	0.126	0.317	0.146	0.336	-0.14	-0.61	-0.37	-0.62
5	3.20 2.67 2.47	5.20 4.75 4.43	8.24 7.65 7.39	11.27 10.61 10.31	2.78	4.79	7.76	10.73	0.377	0.387	0.436	0.491	-0.25	-0.39	-0.57	-0.59
6	4.13 4.15 4.19	5.95 6.79 6.72	9.27 9.43 9.63	13.15 13.18 13.12	4.16	6.49	9.44	13.15	0.031	0.466	0.179	0.031	1.15	1.13	1.14	1.89
7	0.50 0.65 0.55	2.00 2.00 1.94	7.36 7.39 7.40	10.79 10.42 10.58	0.57	1.98	7.38	10.60	0.076	0.035	0.021	0.186	-2.51	-2.94	-0.95	-0.73
8	1.53 1.53 1.53	3.87 3.85 3.88	6.98 7.05 7.09	9.78 9.71 10.05	1.53	3.87	7.04	9.85	0.000	0.014	0.052	0.182	-1.52	-1.23	-1.30	-1.50
9	4.00 4.10 3.95	5.95 5.95 5.75	8.90 8.95 8.30	11.65 11.75 11.55	4.02	5.88	8.72	11.65	0.076	0.115	0.362	0.100	1.01	0.59	0.40	0.35
10	5.12 5.03 5.12	7.37 7.28 7.46	10.66 10.83 11.04	14.53 14.30 14.45	5.09	7.37	10.84	14.43	0.053	0.094	0.191	0.117	2.10	1.93	2.57	3.20
11	2.16 2.17 2.24	4.66 4.62 4.73	7.33 7.54 7.64	10.57 10.53 10.51	2.19	4.67	7.50	10.54	0.044	0.056	0.158	0.031	-0.85	-0.51	-0.83	-0.79
12	3.95 3.80 3.76	6.42 6.37 6.46	9.36 9.27 9.38	11.98 11.90 11.98	3.84	6.42	9.34	11.95	0.100	0.045	0.059	0.046	0.83	1.07	1.03	0.66
13	1.69 2.02 2.25	4.95 5.57 4.98	6.83 7.40 7.96	11.47 11.59 11.29	1.99	5.17	7.40	11.45	0.281	0.350	0.565	0.151	-1.06	-0.06	-0.94	0.14
14	1.68 1.61 1.72	3.87 3.80 3.84	7.33 7.19 7.14	10.19 10.17 9.90	1.67	3.84	7.22	10.08	0.053	0.039	0.100	0.164	-1.38	-1.26	-1.12	-1.26
15	4.97 4.28 3.78	6.07 6.21 6.30	9.73 9.77 9.73	12.73 11.36 11.11	4.34	6.19	9.74	11.73	0.598	0.116	0.023	0.872	1.34	0.87	1.45	0.44
16	3.29 2.31 2.93	6.28 5.09 5.54	8.29 8.57 8.14	11.46 11.41 11.66	2.84	5.64	8.33	11.51	0.496	0.601	0.218	0.132	-0.18	0.37	0.01	0.21
17	3.08 2.54 2.74	5.14 5.09 5.19	8.16 7.91 8.23	10.62 10.63 10.70	2.79	5.14	8.10	10.65	0.273	0.050	0.168	0.044	-0.24	-0.08	-0.22	-0.68
18	3.00 3.00 2.97	5.47 5.50 5.39	8.37 8.78 8.46	10.45 10.34 10.34	2.99	5.45	8.54	10.38	0.017	0.057	0.215	0.064	-0.04	0.20	0.22	-0.96
19	3.16 4.19 3.64	5.57 4.06 4.73	6.73 7.65 6.98	9.93 12.35 11.54	3.66	4.79	7.12	11.27	0.515	0.757	0.476	1.232	0.65	-0.40	-1.22	-0.04
20	2.96 3.44 3.43	6.22 5.77 6.34	9.08 8.76 9.17	11.79 11.42 11.19	3.28	6.11	9.00	11.47	0.274	0.300	0.215	0.303	0.26	0.80	0.69	0.16
21	3.44 4.14 4.24	6.25 5.49 6.18	9.00 9.41 9.11	12.36 11.92 12.33	3.94	5.97	9.17	12.20	0.436	0.420	0.212	0.246	0.93	0.67	0.87	0.92
22	2.54 3.45 2.85	6.39 6.33 6.55	8.92 8.98 9.05	11.67 11.62 12.02	2.95	6.42	8.98	11.77	0.463	0.114	0.065	0.218	-0.08	1.08	0.67	0.47
23	2.89 2.80 2.39	4.43 4.14 4.03	6.84 7.17 7.29	10.82 11.95 11.29	2.69	4.20	7.10	11.35	0.267	0.207	0.233	0.568	-0.34	-0.93	-1.24	0.05
24	3.60 3.39 3.58	5.12 5.23 4.98	8.20 8.12 8.08	11.23 11.30 11.12	3.52	5.11	8.13	11.22	0.116	0.125	0.061	0.091	0.51	-0.11	-0.19	-0.10
25	2.36 3.00 2.77	5.13 4.28 3.91	7.16 12.10 8.43	10.82 10.70 10.71	2.71	4.44	9.23	10.74	0.328	0.623	2.565	0.063	-0.32	-0.71	0.93	-0.58
26	2.97 2.96 3.44	5.00 5.50 5.00	8.25 7.43 7.47	11.88 11.33 11.44	3.12	5.17	7.72	11.55	0.274	0.289	0.462	0.291	0.10	-0.06	-0.61	0.25
27	2.81 2.87 3.31	5.89 5.73 5.90	8.29 8.00 7.47	10.87 10.87 10.52	3.00	5.84	7.92	10.76	0.273	0.095	0.416	0.202	-0.03	0.55	-0.41	-0.57
Number of Labs With Data					27	27	27	27	27	27	27	27	27	27	27	27

	k				X_bar_corr				S_corr			
Lab No	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%
1	0.72	0.37	0.10	0.23	3.27	5.62	8.70	11.62	0.199	0.115	0.054	0.085
2	0.10	0.56	0.47	0.27	1.88	4.02	7.05	10.00	0.029	0.176	0.260	0.100
3	0.26	1.44	0.19	0.96	3.97	6.07	9.21	12.00	0.073	0.450	0.103	0.350
4	0.45	1.02	0.26	0.92	2.88	4.56	7.95	10.70	0.126	0.317	0.146	0.336
5	1.36	1.24	0.78	1.35	2.78	4.79	7.76	10.73	0.377	0.387	0.436	0.491
6	0.11	1.49	0.32	0.09	4.16	6.49	9.44	13.15	0.031	0.466	0.179	0.031
7	0.28	0.11	0.04	0.51	0.57	FALSE	7.38	10.60	0.076	FALSE	0.021	0.186
8	0.00	0.04	0.09	0.50	1.53	3.87	7.04	9.85	0.000	0.014	0.052	0.182
9	0.28	0.37	0.65	0.27	4.02	5.88	8.72	11.65	0.076	0.115	0.362	0.100
10	0.19	0.30	0.34	0.32	5.09	7.37	10.84	FALSE	0.053	0.094	0.191	FALSE
11	0.16	0.18	0.29	0.08	2.19	4.67	7.50	10.54	0.044	0.056	0.158	0.031
12	0.36	0.14	0.11	0.13	3.84	6.42	9.34	11.95	0.100	0.045	0.059	0.046
13	1.01	1.12	1.02	0.41	1.99	5.17	7.40	11.45	0.281	0.350	0.565	0.151
14	0.19	0.12	0.18	0.45	1.67	3.84	7.22	10.08	0.053	0.039	0.100	0.164
15	2.15	0.37	0.04	2.39	4.34	6.19	9.74	FALSE	0.598	0.116	0.023	FALSE
16	1.79	1.92	0.39	0.36	2.84	5.64	8.33	11.51	0.496	0.601	0.218	0.132
17	0.98	0.16	0.30	0.12	2.79	5.14	8.10	10.65	0.273	0.050	0.168	0.044
18	0.06	0.18	0.39	0.17	2.99	5.45	8.54	10.38	0.017	0.057	0.215	0.064
19	1.86	2.42	0.86	3.37	3.66	FALSE	7.12	FALSE	0.515	FALSE	0.476	FALSE
20	0.99	0.96	0.39	0.83	3.28	6.11	9.00	11.47	0.274	0.300	0.215	0.303
21	1.57	1.34	0.38	0.67	3.94	5.97	9.17	12.20	0.436	0.420	0.212	0.246
22	1.67	0.36	0.12	0.60	2.95	6.42	8.98	11.77	0.463	0.114	0.065	0.218
23	0.96	0.66	0.42	1.55	2.69	4.20	7.10	11.35	0.267	0.207	0.233	0.568
24	0.42	0.40	0.11	0.25	3.52	5.11	8.13	11.22	0.116	0.125	0.061	0.091
25	1.18	1.99	4.62	0.17	2.71	4.44	FALSE	10.74	0.328	0.623	FALSE	0.063
26	0.99	0.92	0.83	0.80	3.12	5.17	7.72	11.55	0.274	0.289	0.462	0.291
27	0.98	0.31	0.75	0.55	3.00	5.84	7.92	10.76	0.273	0.095	0.416	0.202
Number of Labs With Data	27	27	27	27	27	25	26	24	27	25	26	24

X_dbl_bar / Sx				Sr / SR				h Critical				k Critical				Corrected X_dbl_bar / Sx				Corrected Sr / SR			
3.02	5.23	8.32	11.31	0.277	0.313	0.555	0.365	2.62	2.62	2.62	2.62	2.23	2.23	2.23	2.23	3.02	5.38	8.29	11.16	0.277	0.287	0.259	0.233
0.981	1.106	0.983	0.974	1.006	1.135	1.083	1.019									0.981	0.925	0.985	0.787	1.018	0.966	1.017	0.819

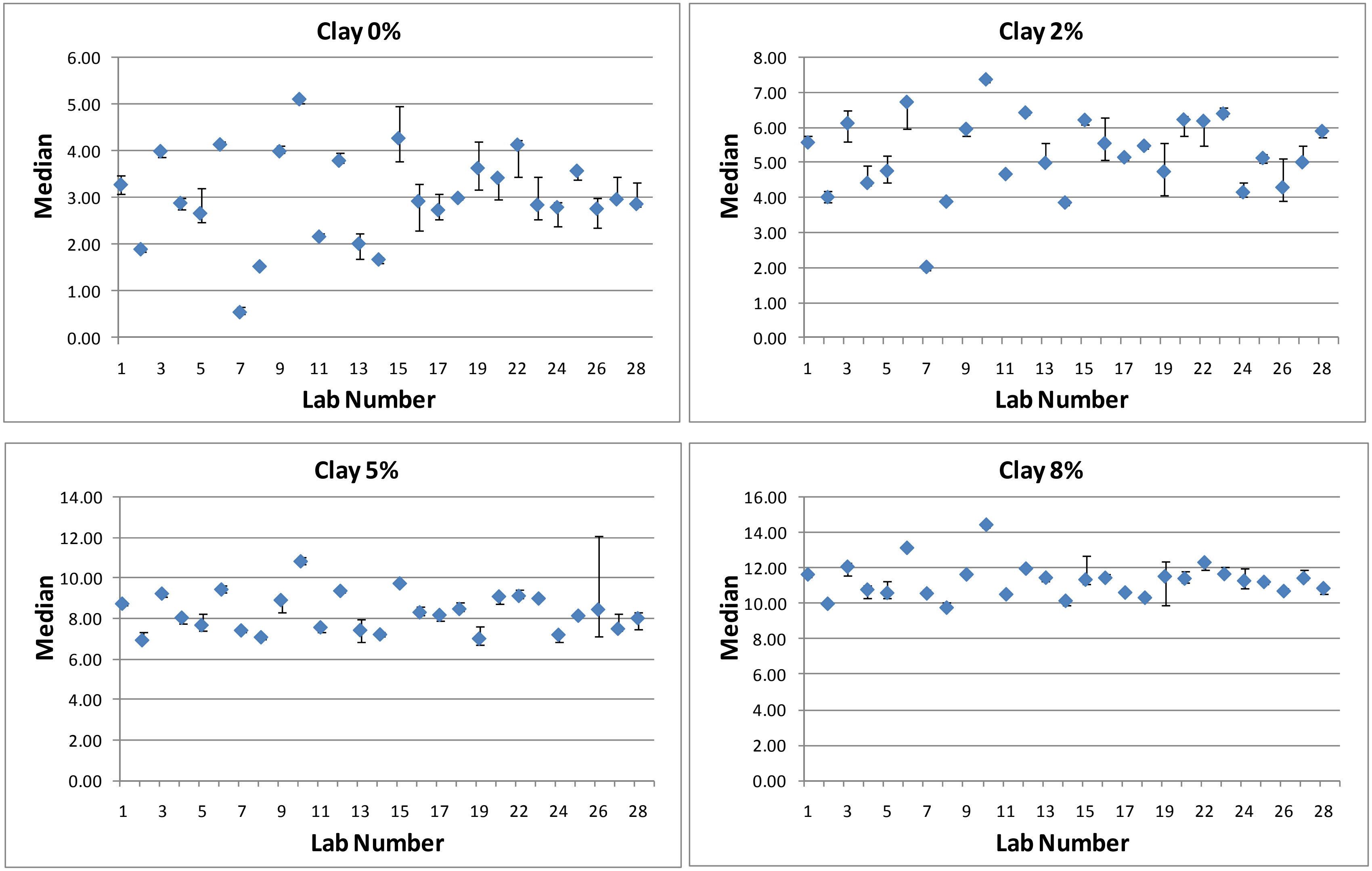


Figure B-1: Unadjusted Median organic content values of clay and the corresponding error bands

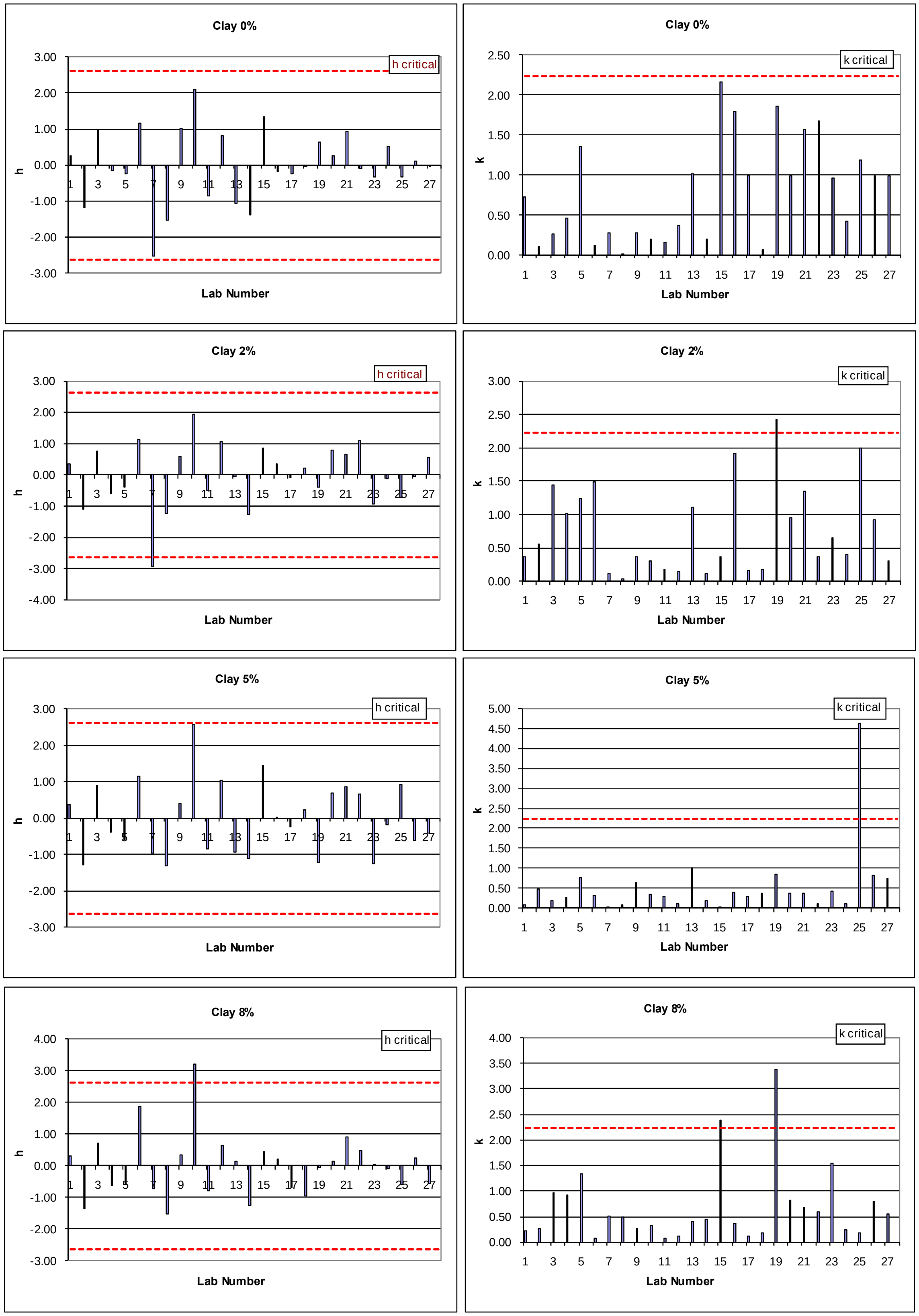


Figure B-2: h and k consistency statistics of organic content measurements of clay

Table B-2- Adjusted organic content (%) of three replicates of clay blends in ILS and the computed statistics according to ASTM E 691

	Adjusted Clay			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%
1	2.29	5.45	8.41	2.35	5.42	8.35	0.115	0.054	0.085	0.27	0.20	0.10	0.37	0.10	0.23	2.35	5.42	8.35	0.115	0.054	0.085
	2.48	5.36	8.25																		
	2.27	5.46	8.37																		
2	2.12	5.47	8.22	2.13	5.17	8.12	0.176	0.260	0.100	-0.13	-0.20	-0.26	0.56	0.47	0.27	2.13	5.17	8.12	0.176	0.260	0.100
	1.97	5.02	8.12																		
	2.32	5.02	8.02																		
3	2.53	5.34	8.12	2.10	5.24	8.03	0.450	0.103	0.350	-0.19	-0.08	-0.40	1.44	0.19	0.96	2.10	5.24	8.03	0.450	0.103	0.350
	2.15	5.13	7.65																		
	1.63	5.26	8.33																		
4	1.46	5.16	7.45	1.67	5.07	7.82	0.317	0.146	0.336	-0.98	-0.35	-0.74	1.02	0.26	0.92	1.67	5.07	7.82	0.317	0.146	0.336
	1.52	4.90	8.10																		
	2.04	5.14	7.91																		
5	2.42	5.46	8.49	2.01	4.98	7.95	0.387	0.436	0.491	-0.36	-0.49	-0.53	1.24	0.78	1.35	2.01	4.98	7.95	0.387	0.436	0.491
	1.97	4.87	7.83																		
	1.65	4.61	7.53																		
6	1.79	5.11	9.00	2.33	5.29	9.00	0.466	0.179	0.031	0.23	-0.01	1.12	1.49	0.32	0.09	2.33	5.29	9.00	0.466	0.179	0.031
	2.63	5.28	9.03																		
	2.57	5.47	8.97																		
7	1.43	6.79	10.22	1.41	6.82	10.03	0.035	0.021	0.186	-1.46	2.35	2.75	0.11	0.04	0.51	1.41	6.82	FALSE	0.035	0.021	FALSE
	1.43	6.82	9.85																		
	1.37	6.83	10.01																		
8	2.34	5.45	8.25	2.34	5.51	8.32	0.014	0.052	0.182	0.24	0.33	0.05	0.04	0.09	0.50	2.34	5.51	8.32	0.014	0.052	0.182
	2.32	5.52	8.18																		
	2.35	5.55	8.52																		
9	1.93	4.88	7.63	1.87	4.70	7.63	0.115	0.362	0.100	-0.63	-0.92	-1.03	0.37	0.65	0.27	1.87	4.70	7.63	0.115	0.362	0.100
	1.93	4.93	7.73																		
	1.73	4.28	7.53																		
10	2.28	5.57	9.44	2.28	5.76	9.34	0.094	0.191	0.117	0.14	0.71	1.66	0.30	0.34	0.32	2.28	5.76	9.34	0.094	0.191	0.117
	2.19	5.74	9.21																		
	2.38	5.95	9.37																		
11	2.47	5.14	8.38	2.48	5.31	8.35	0.056	0.158	0.031	0.51	0.03	0.10	0.18	0.29	0.08	2.48	5.31	8.35	0.056	0.158	0.031
	2.43	5.35	8.34																		
	2.54	5.45	8.32																		
12	2.58	5.52	8.14	2.58	5.50	8.12	0.045	0.059	0.046	0.69	0.32	-0.26	0.14	0.11	0.13	2.58	5.50	8.12	0.045	0.059	0.046
	2.53	5.43	8.06																		
	2.62	5.54	8.14																		
13	2.96	4.84	9.48	3.18	5.41	9.46	0.350	0.565	0.151	1.80	0.18	1.86	1.12	1.02	0.41	3.18	5.41	9.46	0.350	0.565	0.151
	3.58	5.41	9.60																		
	2.99	5.97	9.30																		
14	2.20	5.66	8.52	2.17	5.55	8.41	0.039	0.100	0.164	-0.07	0.39	0.20	0.12	0.18	0.45	2.17	5.55	8.41	0.039	0.100	0.164
	2.13	5.52	8.50																		
	2.17	5.47	8.23																		
15	1.73	5.39	8.39	1.85	5.40	7.39	0.116	0.023	0.872	-0.66	0.16	-1.41	0.37	0.04	2.39	1.85	5.40	FALSE	0.116	0.023	FALSE
	1.87	5.43	7.02																		
	1.96	5.39	6.77																		
16	3.44	5.45	8.62	2.79	5.49	8.67	0.601	0.218	0.132	1.09	0.30	0.60	1.92	0.39	0.36	2.79	5.49	8.67	0.601	0.218	0.132
	2.25	5.73	8.57																		
	2.70	5.30	8.82																		
17	2.35	5.37	7.83	2.35	5.31	7.86	0.050	0.168	0.044	0.27	0.03	-0.66	0.16	0.30	0.12	2.35	5.31	7.86	0.050	0.168	0.044
	2.30	5.12	7.84																		
	2.40	5.44	7.91																		
18	2.48	5.38	7.46	2.46	5.55	7.39	0.057	0.215	0.064	0.48	0.39	-1.41	0.18	0.39	0.17	2.46	5.55	7.39	0.057	0.215	0.064
	2.51	5.79	7.35																		
	2.40	5.47	7.35																		
19	1.91	3.07	6.27	1.12	3.46	7.61	0.757	0.476	1.232	-2.00	-2.85	-1.06	2.42	0.86	3.37	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	0.40	3.99	8.69																		
	1.07	3.32	7.88																		
20	2.94	5.80	8.51	2.83	5.73	8.19	0.300	0.215	0.303	1.16	0.67	-0.15	0.96	0.39	0.83	2.83	5.73	8.19	0.300	0.215	0.303
	2.49	5.48	8.14																		
	3.06	5.89	7.91																		
21	2.31	5.06	8.42	2.03	5.23	8.26	0.420	0.212	0.246	-0.32	-0.10	-0.03	1.34	0.38	0.67	2.03	5.23	8.26	0.420	0.212	0.246
	1.55	5.47	7.98																		
	2.24	5.17	8.39																		
22	3.44	5.97	8.72	3.48	6.04	8.82	0.114	0.065	0.218	2.35	1.15	0.85	0.36	0.12	0.60	3.48	6.04	8.82	0.114	0.065	0.218
	3.38	6.03	8.67																		
	3.60	6.10	9.07																		
23	1.74	4.15	8.13	1.51	4.41	8.66	0.207	0.233	0.568	-1.29	-1.38	0.59	0.66	0.42	1.55	1.51	4.41	8.66	0.207	0.233	0.568
	1.45	4.48	9.26																		
	1.34	4.60	8.60																		
24	1.60	4.68	7.71	1.59	4.61	7.69	0.125	0.061	0.091	-1.14	-1.06	-0.93	0.40	0.11	0.25	1.59	4.61	7.69	0.125	0.061	0.091
	1.71	4.60	7.78																		
	1.46	4.56	7.60																		
25	2.42	4.45	8.11	1.73	6.52	8.03	0.623	2.565	0.063	-0.88	1.90	-0.39	1.99	4.62	0.17	1.73	FALSE	8.03	0.623	FALSE	0.063
	1.57	9.39	7.99																		
	1.20	5.72	8.00																		
26	1.88	5.13	8.76	2.04	4.59	8.43	0.289	0.462	0.291	-0.30	-1.09	0.22	0.92	0.83	0.80	2.04	4.59	8.43	0.289	0.462	0.291
	2.38	4.31	8.21																		
	1.88	4.35	8.32																		
27	2.89	5.29	7.88	2.84	4.92	7.76	0.095	0.416	0.202	1.18	-0.58	-0.83	0.31	0.75	0.55	2.84	4.92	7.76	0.095	0.416	0.202
	2.73	5.00	7.88																		
	2.90	4.47	7.53																		

Number of Labs With Data	27	27	27	27	27	27	27	27	27	27	27	27	26	25	24	26	25	24
	X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
	2.21	5.30	8.28	0.313	0.555	0.365	2.62	2.62	2.62	2.23	2.23	2.23	2.25	5.32	8.28	0.282	0.246	0.232
	0.541	0.646	0.635	0.598	0.789	0.702							0.51	0.50	0.52	0.576	0.554	0.566

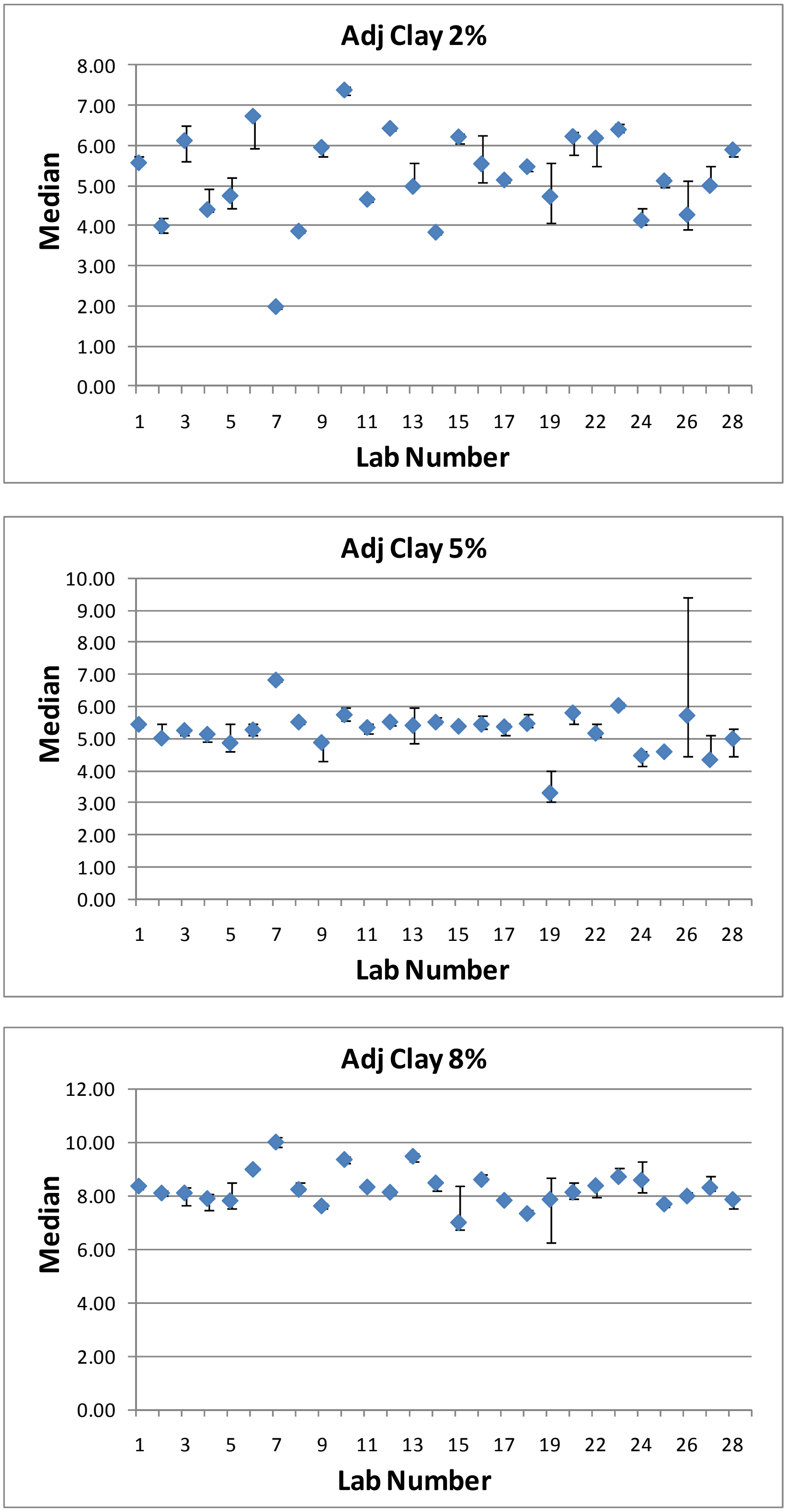


Figure B-3: Median Adjusted organic content values of clay and the corresponding error bands

APPENDIX C- ORGANIC CONTENT OF SILT BLENDS AND COMPUTED ASTM E691 STATISTICS

Table C-1: Unadjusted organic content (%) of three replicates of silt blends in the ILS study and the computed statistics according to ASTM E 691

	Silt				X_bar				S				h				k				X_bar_corr				S_corr			
Lab No	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%	0%	2%	5%	8%
1	0.69	2.79	6.08	8.68	0.72	2.81	5.97	8.71	0.021	0.024	0.114	0.048	-0.68	-0.25	-0.21	-0.44	0.13	0.11	0.38	0.20	0.72	2.81	5.97	8.71	0.021	0.024	0.114	0.048
	0.74	2.84	5.99	8.76																								
	0.72	2.81	5.85	8.68																								
2	0.60	2.65	5.05	8.75	0.63	2.65	5.33	8.82	0.058	0.050	0.275	0.076	-0.90	-0.55	-0.89	-0.19	0.35	0.22	0.92	0.32	0.63	2.65	5.33	8.82	0.058	0.050	0.275	0.076
	0.60	2.60	5.35	8.90																								
	0.70	2.70	5.60	8.80																								
3	0.88	3.37	6.65	8.73	0.89	3.35	6.55	8.78	0.045	0.019	0.145	0.095	-0.20	0.73	0.39	-0.29	0.27	0.08	0.49	0.39	0.89	3.35	6.55	8.78	0.045	0.019	0.145	0.095
	0.86	3.35	6.38	8.88																								
	0.94	3.33	6.62	8.71																								
4	0.84	2.65	5.73	8.66	0.85	2.69	5.75	8.63	0.037	0.086	0.022	0.112	-0.33	-0.48	-0.45	-0.62	0.22	0.38	0.07	0.46	0.85	2.69	5.75	8.63	0.037	0.086	0.022	0.112
	0.82	2.63	5.74	8.50																								
	0.89	2.79	5.77	8.72																								
5	0.80	2.88	5.79	9.09	0.94	2.95	5.74	8.97	0.121	0.133	0.214	0.101	-0.08	-0.01	-0.46	0.16	0.72	0.59	0.71	0.42	0.94	2.95	5.74	8.97	0.121	0.133	0.214	0.101
	0.98	3.10	5.93	8.91																								
	1.03	2.86	5.51	8.92																								
6	1.43	3.40	6.38	9.62	1.60	3.48	6.45	9.30	0.172	0.083	0.206	0.279	1.72	0.98	0.29	0.90	1.03	0.37	0.69	1.16	1.60	3.48	6.45	9.30	0.172	0.083	0.206	0.279
	1.78	3.56	6.28	9.10																								
	1.59	3.49	6.68	9.18																								
7	0.35	1.72	3.32	8.53	0.37	1.71	4.86	8.48	0.029	0.023	1.338	0.161	-1.63	-2.28	-1.38	-0.96	0.17	0.10	4.46	0.67	0.37	1.71	FALSE	8.48	0.029	0.023	FALSE	0.161
	0.40	1.68	5.58	8.30																								
	0.35	1.72	5.69	8.61																								
8	0.67	2.43	5.85	8.87	0.51	2.56	5.83	8.73	0.176	0.125	0.033	0.116	-1.24	-0.71	-0.37	-0.38	1.05	0.55	0.11	0.48	0.51	2.56	5.83	8.73	0.176	0.125	0.033	0.116
	0.54	2.59	5.79	8.68																								
	0.32	2.67	5.84	8.65																								
9	0.75	2.65	6.40	8.95	0.72	2.63	6.18	9.03	0.104	0.029	0.189	0.104	-0.68	-0.58	0.01	0.30	0.62	0.13	0.63	0.43	0.72	2.63	6.18	9.03	0.104	0.029	0.189	0.104
	0.60	2.65	6.10	9.15																								
	0.80	2.60	6.05	9.00																								
10	1.48	3.34	6.88	9.60	1.33	3.41	6.88	9.97	0.131	0.282	0.007	0.327	0.99	0.83	0.74	2.42	0.78	1.25	0.02	1.35	1.33	3.41	6.88	9.97	0.131	0.282	0.007	0.327
	1.29	3.16	6.87	10.21																								
	1.23	3.72	6.88	10.11																								
11	1.05	3.38	5.92	9.75	1.10	2.74	5.94	9.74	0.108	0.554	0.021	0.066	0.35	-0.39	-0.25	1.90	0.64	2.47	0.07	0.27	1.10	FALSE	5.94	9.74	0.108	FALSE	0.021	0.066
	1.22	2.41	5.93	9.67																								
	1.02	2.43	5.96	9.80																								
12	1.71	3.97	6.35	9.29	1.68	3.96	6.44	9.30	0.031	0.050	0.201	0.017	1.94	1.86	0.28	0.90	0.18	0.22	0.67	0.07	1.68	3.96	6.44	9.30	0.031	0.050	0.201	0.017
	1.65	3.91	6.67	9.29																								
	1.69	4.01	6.30	9.32																								
13	0.63	2.74	6.42	8.61	1.33	2.80	6.41	9.08	0.607	0.052	0.130	0.456	0.98	-0.28	0.25	0.41	3.62	0.23	0.43	1.89	FALSE	2.80	6.41	9.08	FALSE	0.052	0.130	0.456
	1.66	2.83	6.54	9.12																								
	1.70	2.83	6.28	9.52																								
14	0.52	2.56	10.64	8.78	0.53	2.55	10.42	8.66	0.018	0.032	0.196	0.155	-1.19	-0.74	4.46	-0.55	0.11	0.14	0.65	0.64	0.53	2.55	FALSE	8.66	0.018	0.032	FALSE	0.155
	0.51	2.51	10.35	8.72																								
	0.55	2.57	10.27	8.48																								
15	1.66	3.24	6.75	9.12	1.59	3.42	6.59	9.12	0.061	0.254	0.142	0.045	1.69	0.86	0.43	0.50	0.36	1.13	0.47	0.19	1.59	3.42	6.59	9.12	0.061	0.254	0.142	0.045
	1.56	3.31	6.52	9.08																								
	1.55	3.71	6.49	9.17																								
16	0.64	3.19	5.89	9.14	0.73	3.21	5.98	9.21	0.108	0.029	0.090	0.081	-0.64	0.47	-0.21	0.70	0.65	0.13	0.30	0.33	0.73	3.21	5.98	9.21	0.108	0.029	0.090	0.081
	0.85	3.19	5.98	9.30																								
	0.70	3.24	6.07	9.20																								
17	0.50	2.09	5.39	8.40	0.49	2.14	5.40	8.53	0.050	0.087	0.091	0.200	-1.28	-1.48	-0.81	-0.84	0.30	0.39	0.30	0.83	0.49	2.14	5.40	8.53	0.050	0.087	0.091	0.200
	0.44	2.09	5.32	8.43																								
	0.54	2.24	5.50	8.76																								
18	0.98	3.48	6.00	8.91	1.32	3.33	5.98	9.11	0.297	0.266	0.035	0.298	0.97	0.69	-0.21	0.46	1.78	1.18	0.12	1.24	1.32	3.33	5.98	9.11	0.297	0.266	0.035	0.298
	1.49	3.48	5.94	8.96																								
	1.50	3.02	6.00	9.45																								
19	0.97	3.14	6.08	8.86	0.77	2.89	5.80	8.51	0.170	0.234	0.291	0.308	-0.53	-0.12	-0.39	-0.89	1.02	1.04	0.97	1.28	0.77	2.89	5.80	8.51	0.170	0.234	0.291	0.308
	0.67	2.84	5.83	8.39																								
	0.68	2.68	5.50	8.28																								
20	1.39	3.43	6.31	9.52	1.27	3.45	6.32	9.32	0.132	0.126	0.180	0.754	0.83	0.91	0.15	0.95	0.79	0.56	0.60	3.13	1.27	3.45	6.32	FALSE	0.132	0.126	0.180	FALSE
	1.30	3.58	6.14	9.96																								
	1.13	3.33	6.50	8.49																								
21	1.23	3.19	6.10	9.16	1.27	3.21	6.15	9.17	0.032	0.015	0.078	0.050	0.81	0.47	-0.03	0.60	0.19	0.07	0.26	0.21	1.27	3.21	6.15	9.17	0.032	0.015	0.078	0.050
	1.29	3.21	6.11	9.22																								
	1.28	3.22	6.24	9.12																								
22	0.79	3.26	5.90	8.47	0.81	3.21	5.79	8.57	0.020	0.078	0.099	0.203	-0.43	0.48	-0.41	-0.76	0.12	0.35	0.33	0.84	0.81	3.21	5.79	8.57	0.020	0.078	0.099	0.203
	0.83	3.12	5.72	8.43																								
	0.81	3.25	5.74	8.80																								
23	1.05	3.24	6.27	8.70	1.00	3.12	6.10	8.66	0.087	0.107	0.150	0.035	0.09	0.32	-0.08	-0.55	0.52	0.48	0.50	0.14	1.00	3.12	6.10	8.66	0.087	0.107	0.150	0.035
	0.90	3.10	6.00	8.64																								
	1.05	3.03	6.02	8.64																								
24	0.89	2.78	6.36	8.90	0.94	2.85	6.27	8.90	0.046	0.087	0.129	0.030	-0.07	-0.18	0.09	0.00	0.27	0.39	0.43	0.12	0.94	2.85	6.27	8.90	0.046	0.087	0.129	0.030
	0.95	2.95	6.32	8.87																								
	0.98	2.83	6.12	8.93																								
25	0.51	1.92	5.45	7.44	0.60	1.77	5.67	7.71	0.162	0.193	0.200	0.237	-0.99	-2.16	-0.53	-2.71	0.97	0.86	0.67	0.98	0.60	1.77	5.67	FALSE	0.162	0.193	0.200	FALSE
	0.51	1.84	5.83	7.79																								
	0.79	1.55	5.74	7.89																								
26	1.47	3.50	6.40	9.00	1.31	3.93	6.26	8.57	0.271	0.800	0.223	0.387	0.94	1.79	0.08	-0.75	1.62	3.56	0.74	1.60	1.31	FALSE	6.26	8.57	0.271	FALSE	0.223	0.387
	1.47	4.85	6.37	8.46																								
	1.00	3.43	6.00	8.25																								
27	0.85	2.79	5.79	8.71	0.80	2.85	5.72	8.78	0.039	0.056	0.067	0.085	-0.44	-0.19	-0.49	-0.27	0.23	0.25	0.22	0.35	0.80	2.85	5.72	8.78	0.039	0.056	0.067	0.085
	0.80	2.85	5.69	8.77																								
	0.77	2.90	5.66	8.88																								
Number of Labs With Data					27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	26	25	25	25	26	25	25	25

X_dbl_bar / Sx				Sr / SR				h Critical				k Critical				Corrected X_dbl_bar / Sx				Corrected Sr / SR			
0.97	2.95	6.18	8.90	0.167	0.225	0.300	0.241	2.62	2.62	2.62	2.62	2.23	2.23	2.23	2.23	0.95	2.92	6.06	8.93	0.122	0.129	0.155	0.195
0.369	0.546	0.951	0.442	0.394	0.576	0.982	0.484									0.369	0.529	0.378	0.379	0.388	0.544	0.408	0.424

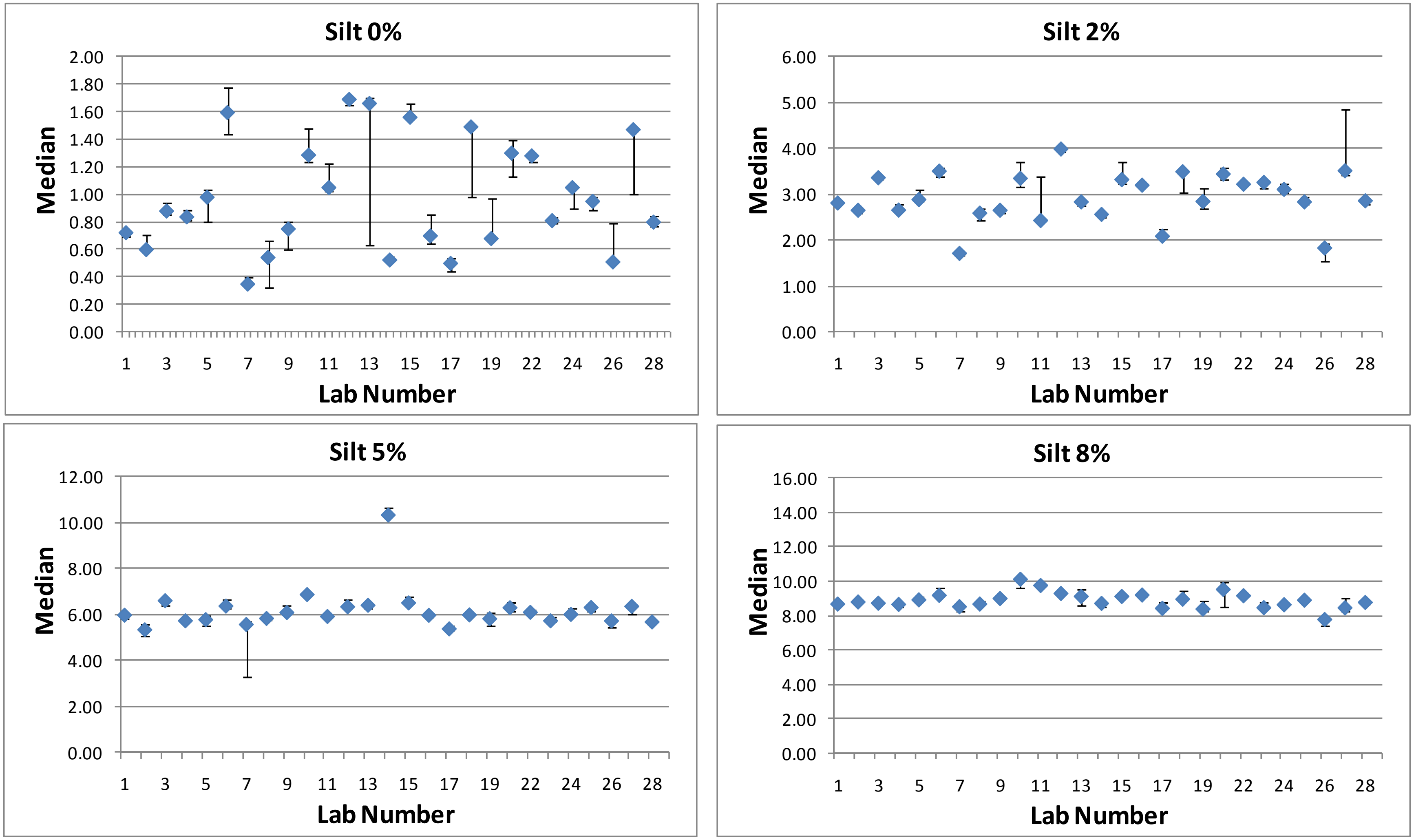


Figure C-1: Unadjusted Median organic content values of silt and the corresponding error bands

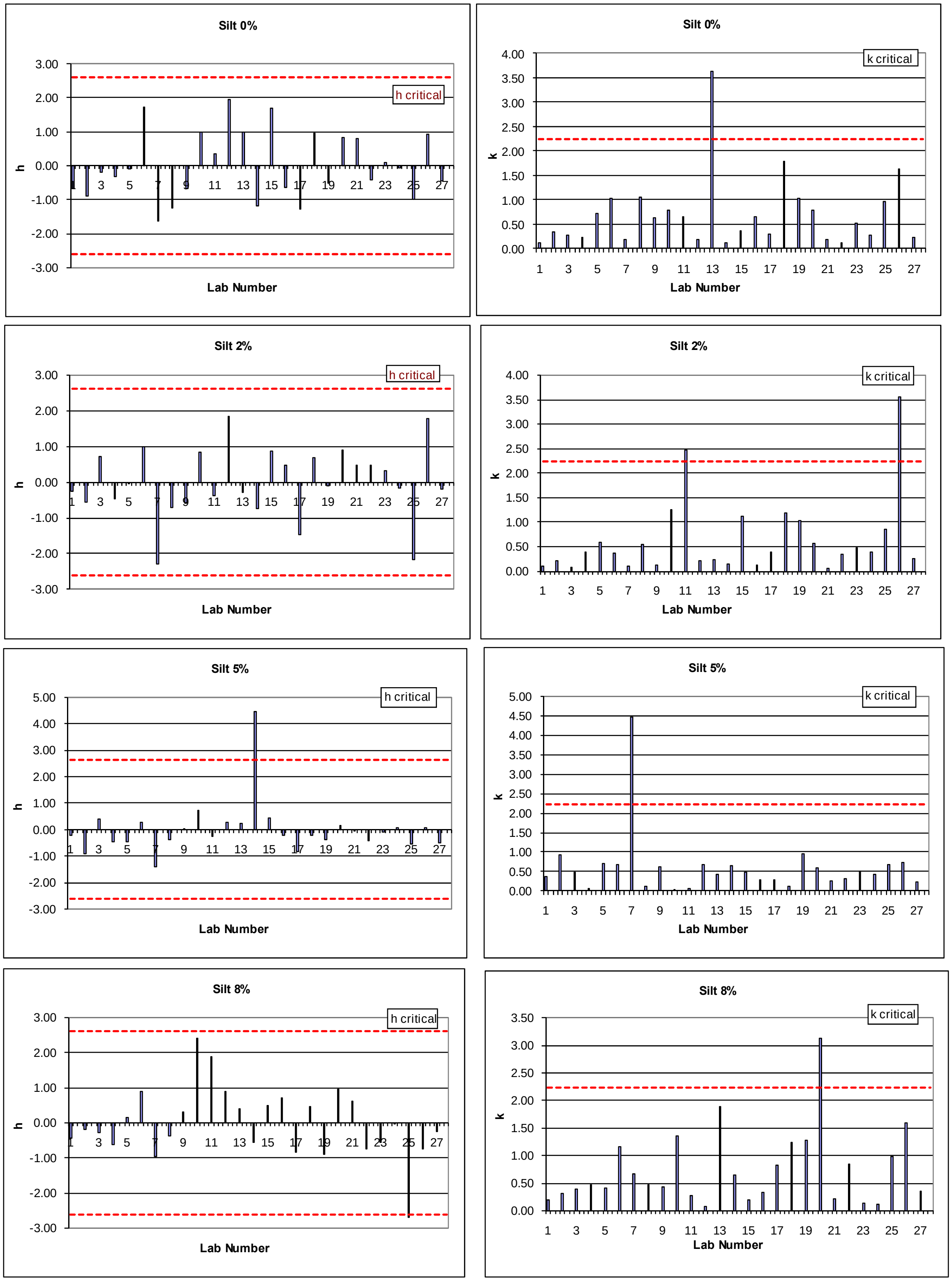


Figure C-2: h and k consistency statistics of organic content measurements of silt

Table C-2: Adjusted organic content (%) of three replicates of silt blends in the ILS study and the computed statistics according to ASTM E 691

	Adjusted Silt			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%
1	2.08	5.36	7.96	2.10	5.26	7.99	0.024	0.114	0.048	0.34	0.05	0.15	0.11	0.38	0.20	2.10	5.26	7.99	0.024	0.114	0.048
	2.12	5.27	8.04																		
	2.09	5.14	7.96																		
2	2.02	4.42	8.12	2.02	4.70	8.18	0.050	0.275	0.076	0.10	-0.52	0.69	0.22	0.92	0.32	2.02	4.70	8.18	0.050	0.275	0.076
	1.97	4.72	8.27																		
	2.07	4.97	8.17																		
3	2.47	5.76	7.84	2.46	5.66	7.88	0.019	0.145	0.095	1.42	0.46	-0.15	0.08	0.49	0.39	2.46	5.66	7.88	0.019	0.145	0.095
	2.46	5.49	7.99																		
	2.44	5.73	7.82																		
4	1.81	4.88	7.81	1.84	4.90	7.78	0.086	0.022	0.112	-0.43	-0.32	-0.42	0.38	0.07	0.46	1.84	4.90	7.78	0.086	0.022	0.112
	1.78	4.90	7.66																		
	1.94	4.92	7.87																		
5	1.94	4.85	8.15	2.01	4.81	8.04	0.133	0.214	0.101	0.08	-0.41	0.28	0.59	0.71	0.42	2.01	4.81	8.04	0.133	0.214	0.101
	2.16	4.99	7.97																		
	1.92	4.57	7.98																		
6	1.79	4.78	8.02	1.88	4.85	7.70	0.083	0.206	0.279	-0.30	-0.37	-0.66	0.37	0.69	1.16	1.88	4.85	7.70	0.083	0.206	0.279
	1.96	4.68	7.50																		
	1.89	5.08	7.58																		
7	1.35	2.95	8.16	1.34	4.50	8.11	0.023	1.338	0.161	-1.94	-0.73	0.49	0.10	4.46	0.67	1.34	FALSE	8.11	0.023	FALSE	0.161
	1.31	5.21	7.93																		
	1.35	5.32	8.24																		
8	1.92	5.34	8.36	2.05	5.32	8.22	0.125	0.033	0.116	0.21	0.11	0.80	0.55	0.11	0.48	2.05	5.32	8.22	0.125	0.033	0.116
	2.08	5.28	8.17																		
	2.16	5.33	8.15																		
9	1.93	5.68	8.23	1.92	5.47	8.32	0.029	0.189	0.104	-0.20	0.26	1.06	0.13	0.63	0.43	1.92	5.47	8.32	0.029	0.189	0.104
	1.93	5.38	8.43																		
	1.88	5.33	8.28																		
10	2.00	5.55	8.27	2.07	5.55	8.64	0.282	0.007	0.327	0.27	0.35	1.94	1.25	0.02	1.35	2.07	5.55	8.64	0.282	0.007	0.327
	1.83	5.54	8.87																		
	2.38	5.55	8.77																		
11	2.28	4.82	8.65	1.64	4.84	8.64	0.554	0.021	0.066	-1.02	-0.38	1.96	2.47	0.07	0.27	FALSE	4.84	8.64	FALSE	0.021	0.066
	1.31	4.83	8.57																		
	1.33	4.86	8.70																		
12	2.29	4.67	7.61	2.28	4.76	7.62	0.050	0.201	0.017	0.89	-0.46	-0.88	0.22	0.67	0.07	2.28	4.76	7.62	0.050	0.201	0.017
	2.23	4.99	7.61																		
	2.33	4.62	7.64																		
13	1.41	5.09	7.28	1.47	5.08	7.75	0.052	0.130	0.456	-1.55	-0.13	-0.50	0.23	0.43	1.89	1.47	5.08	7.75	0.052	0.130	0.456
	1.50	5.21	7.79																		
	1.50	4.95	8.19																		
14	2.03	10.11	8.25	2.02	9.89	8.13	0.032	0.196	0.155	0.11	4.80	0.54	0.14	0.65	0.64	2.02	FALSE	8.13	0.032	FALSE	0.155
	1.98	9.82	8.19																		
	2.04	9.74	7.96																		
15	1.65	5.16	7.53	1.83	5.00	7.53	0.254	0.142	0.045	-0.46	-0.22	-1.11	1.13	0.47	0.19	1.83	5.00	7.53	0.254	0.142	0.045
	1.72	4.93	7.49																		
	2.12	4.90	7.58																		
16	2.46	5.16	8.41	2.48	5.25	8.48	0.029	0.090	0.081	1.49	0.04	1.52	0.13	0.30	0.33	2.48	5.25	8.48	0.029	0.090	0.081
	2.46	5.25	8.57																		
	2.51	5.34	8.47																		
17	1.60	4.90	7.91	1.65	4.91	8.04	0.087	0.091	0.200	-1.01	-0.31	0.28	0.39	0.30	0.83	1.65	4.91	8.04	0.087	0.091	0.200
	1.60	4.83	7.94																		
	1.75	5.01	8.27																		
18	2.16	4.68	7.59	2.00	4.66	7.78	0.266	0.035	0.298	0.06	-0.57	-0.42	1.18	0.12	1.24	2.00	4.66	7.78	0.266	0.035	0.298
	2.16	4.62	7.64																		
	1.70	4.68	8.13																		
19	2.37	5.31	8.09	2.11	5.03	7.74	0.234	0.291	0.308	0.39	-0.18	-0.55	1.04	0.97	1.28	2.11	5.03	7.74	0.234	0.291	0.308
	2.07	5.06	7.62																		
	1.91	4.73	7.51																		
20	2.16	5.04	8.25	2.17	5.04	8.05	0.126	0.180	0.754	0.57	-0.17	0.32	0.56	0.60	3.13	2.17	5.04	FALSE	0.126	0.180	FALSE
	2.31	4.87	8.69																		
	2.06	5.23	7.22																		
21	1.92	4.83	7.89	1.94	4.88	7.90	0.015	0.078	0.050	-0.13	-0.33	-0.10	0.07	0.26	0.21	1.94	4.88	7.90	0.015	0.078	0.050
	1.94	4.84	7.95																		
	1.95	4.97	7.85																		
22	2.45	5.09	7.66	2.40	4.98	7.76	0.078	0.099	0.203	1.26	-0.24	-0.49	0.35	0.33	0.84	2.40	4.98	7.76	0.078	0.099	0.203
	2.31	4.91	7.62																		
	2.44	4.93	7.99																		
23	2.24	5.27	7.70	2.12	5.10	7.66	0.107	0.150	0.035	0.42	-0.12	-0.76	0.48	0.50	0.14	2.12	5.10	7.66	0.107	0.150	0.035
	2.10	5.00	7.64																		
	2.03	5.02	7.64																		
24	1.84	5.42	7.96	1.91	5.33	7.96	0.087	0.129	0.030	-0.21	0.12	0.07	0.39	0.43	0.12	1.91	5.33	7.96	0.087	0.129	0.030
	2.01	5.38	7.93																		
	1.89	5.18	7.99																		
25	1.32	4.84	6.83	1.17	5.07	7.10	0.193	0.200	0.237	-2.45	-0.14	-2.30	0.86	0.67	0.98	1.17	5.07	7.10	0.193	0.200	0.237
	1.23	5.23	7.19																		
	0.95	5.14	7.29																		
26	2.19	5.09	7.69	2.61	4.94	7.26	0.800	0.223	0.387	1.90	-0.27	-1.88	3.56	0.74	1.60	FALSE	4.94	7.26	FALSE	0.223	0.387
	3.54	5.06	7.15																		
	2.12	4.69	6.94																		
27	1.98	4.99	7.90	2.04	4.91	7.98	0.056	0.067	0.085	0.18	-0.31	0.13	0.25	0.22	0.35	2.04	4.91	7.98	0.056	0.067	0.085
	2.05	4.89	7.97																		
	2.10	4.86	8.07																		
Number of Labs With Data				27	27	27	27	27	27	27	27	27	27	27	27	25	25	26	25	25	26

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
1.98	5.21	7.94	0.225	0.300	0.241	2.62	2.62	2.62	2.23	2.23	2.23	1.97	5.05	7.93	0.129	0.155	0.196
0.332	0.975	0.362	0.379	1.005	0.412							0.31	0.26	0.37	0.338	0.302	0.415

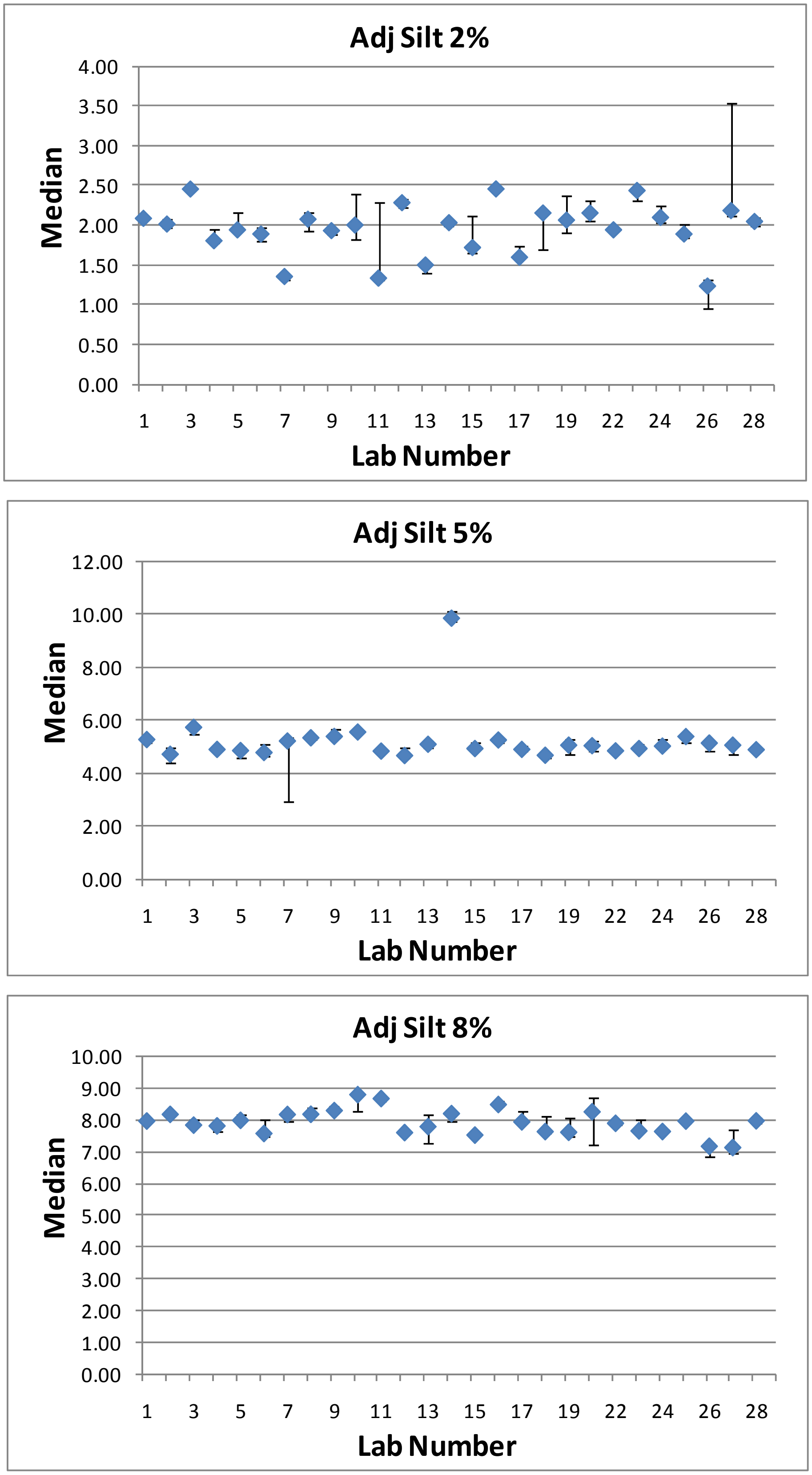


Figure C-3: Adjusted Median organic content values of silt and the corresponding error bands

APPENDIX D- ORGANIC CONTENT OF SAND BLENDS AND COMPUTED ASTM E691 STATISTICS

Table D-1: Unadjusted organic content (%) of three replicates of sand blends in the ILS and the computed statistics according to ASTM E 691

Lab No	Sand 0%	Sand 2%	Sand 5%	Sand 8%
1	0.32	2.93	6.59	9.00
	0.35	2.28	5.62	8.82
	0.31	2.19	5.92	9.77
2	0.10	2.05	4.85	9.00
	0.10	2.05	4.60	8.80
	0.10	2.00	4.35	8.40
3	0.32	2.38	5.00	8.22
	0.32	2.19	5.06	8.77
	0.34	2.31	5.60	8.42
4	0.39	2.78	5.74	9.10
	0.37	2.44	5.63	8.96
	0.37	2.55	5.27	8.33
5	0.44	2.51	5.32	8.61
	0.39	2.49	6.32	9.16
	0.29	2.37	5.38	9.00
6	0.45	2.54	5.83	9.00
	0.60	2.64	5.19	8.92
	0.44	2.24	5.30	8.56
7	0.00	1.45	3.15	8.03
	0.00	1.11	3.37	8.63
	0.00	1.60	3.12	8.53
8	0.05	2.71	5.78	8.93
	0.05	2.47	6.05	7.86
	0.04	2.59	4.55	8.57
9	0.50	2.50	5.40	8.10
	0.40	2.60	5.30	8.70
	0.45	2.45	5.35	8.80
10	0.57	2.30	6.34	9.44
	0.40	2.28	6.53	10.28
	0.59	2.94	5.87	9.81
11	0.15	1.99	5.74	7.64
	0.15	2.08	5.94	7.73
	0.19	2.03	5.68	7.65
12	0.55	2.87	6.31	8.17
	0.52	2.61	5.96	8.98
	0.51	2.44	5.31	9.08
13	0.20	2.37	5.87	8.59
	0.23	2.16	4.87	8.38
	0.39	2.51	5.60	9.73
14	0.25	2.77	5.91	8.60
	0.25	2.65	5.58	8.88
	0.29	2.86	5.02	9.54
15	0.45	2.70	5.81	8.97
	0.40	2.81	5.46	9.40
	0.35	2.59	6.08	9.07
16	0.35	2.40	5.52	7.98
	0.30	2.04	5.20	7.66
	0.30	2.08	5.18	7.47
17	0.52	2.70	5.60	8.30
	0.40	2.40	5.65	8.65
	0.39	2.68	4.94	8.13
18	0.49	2.94	5.37	7.43
	0.50	2.48	5.37	8.25
	0.49	1.99	5.47	7.84
19	0.20	2.55	4.46	8.27
	0.20	2.11	5.62	8.01
	0.29	2.20	6.03	8.46
20	0.34	1.81	5.45	6.49
	0.35	2.43	4.80	8.78
	0.45	2.08	4.39	7.92
21	0.25	2.89	5.98	9.67
	0.25	2.85	6.05	9.71
	0.25	2.83	6.10	9.42
22	0.35	2.87	5.84	8.81
	0.40	2.71	5.96	8.93
	0.35	2.56	5.77	8.46
23	0.15	2.08	5.58	8.88
	0.20	2.09	5.87	9.75
	0.35	2.62	6.41	8.81
24	0.27	2.10	5.55	8.67
	0.25	2.09	5.49	8.54
	0.28	2.08	5.65	8.68
25	0.51	2.92	6.28	9.51
	0.47	3.11	5.83	8.93
	0.50	3.30	4.67	7.97
26	0.50	2.00	7.32	7.84
	1.00	1.99	5.11	6.97
	0.99	1.40	5.50	7.50
27	0.35	2.47	5.73	7.36
	0.32	2.36	5.19	6.96
	0.33	2.22	5.39	7.16

Lab No	X_bar 0%	X_bar 2%	X_bar 5%	X_bar 8%	S 0%	S 2%	S 5%	S 8%	h 0%	h 2%	h 5%	h 8%	k 0%	k 2%	k 5%	k 8%
1	0.33	2.47	6.04	9.20	0.025	0.407	0.497	0.502	-0.10	0.21	0.97	1.00	0.33	1.84	1.05	1.12
2	0.10	2.03	4.60	8.73	0.000	0.030	0.250	0.306	-1.44	-1.03	-1.53	0.28	0.00	0.14	0.53	0.68
3	0.33	2.29	5.22	8.47	0.012	0.099	0.332	0.279	-0.10	-0.29	-0.45	-0.14	0.16	0.45	0.70	0.62
4	0.38	2.59	5.55	8.80	0.014	0.173	0.242	0.412	0.20	0.56	0.12	0.37	0.19	0.78	0.51	0.92
5	0.37	2.46	5.67	8.92	0.076	0.076	0.561	0.283	0.18	0.18	0.34	0.57	1.03	0.34	1.19	0.63
6	0.50	2.47	5.44	8.83	0.087	0.209	0.342	0.232	0.90	0.23	-0.07	0.42	1.17	0.95	0.72	0.52
7	0.00	1.39	3.21	8.40	0.000	0.251	0.137	0.321	-2.02	-2.87	-3.93	-0.25	0.00	1.14	0.29	0.72
8	0.05	2.59	5.46	8.45	0.001	0.119	0.798	0.548	-1.76	0.56	-0.03	-0.16	0.01	0.54	1.69	1.22
9	0.45	2.52	5.35	8.53	0.050	0.076	0.050	0.379	0.63	0.36	-0.22	-0.04	0.67	0.35	0.11	0.85
10	0.52	2.51	6.25	9.84	0.108	0.373	0.337	0.420	1.03	0.32	1.33	2.01	1.45	1.69	0.71	0.94
11	0.16	2.03	5.79	7.67	0.023	0.045	0.136	0.049	-1.06	-1.03	0.53	-1.38	0.31	0.20	0.29	0.11
12	0.53	2.64	5.86	8.74	0.021	0.217	0.507	0.499	1.08	0.71	0.66	0.29	0.28	0.98	1.07	1.11
13	0.27	2.35	5.45	8.90	0.102	0.176	0.517	0.726	-0.41	-0.13	-0.06	0.54	1.37	0.80	1.10	1.62
14	0.26	2.76	5.50	9.01	0.021	0.108	0.452	0.481	-0.48	1.05	0.04	0.70	0.29	0.49	0.96	1.08
15	0.40	2.70	5.78	9.15	0.050	0.110	0.311	0.225	0.33	0.88	0.53	0.92	0.67	0.50	0.66	0.50
16	0.32	2.17	5.30	7.70	0.029	0.197	0.191	0.258	-0.16	-0.63	-0.31	-1.33	0.39	0.89	0.40	0.58
17	0.44	2.59	5.40	8.36	0.072	0.168	0.396	0.265	0.55	0.57	-0.14	-0.31	0.97	0.76	0.84	0.59
18	0.49	2.47	5.40	7.84	0.006	0.475	0.058	0.410	0.88	0.22	-0.13	-1.12	0.08	2.15	0.12	0.92
19	0.23	2.29	5.37	8.25	0.052	0.232	0.814	0.226	-0.67	-0.30	-0.19	-0.48	0.70	1.05	1.72	0.50
20	0.38	2.11	4.88	7.73	0.061	0.311	0.535	1.157	0.22	-0.82	-1.04	-1.29	0.82	1.41	1.13	2.58
21	0.25	2.86	6.04	9.60	0.000	0.031	0.060	0.157	-0.55	1.33	0.98	1.63	0.00	0.14	0.13	0.35
22	0.37	2.71	5.86	8.73	0.029	0.155	0.096	0.244	0.14	0.92	0.65	0.28	0.39	0.70	0.20	0.55
23	0.23	2.26	5.95	9.15	0.104	0.309	0.421	0.524	-0.65	-0.37	0.82	0.92	1.40	1.40	0.89	1.17
24	0.27	2.09	5.56	8.63	0.015	0.013	0.081	0.079	-0.45	-0.87	0.15	0.11	0.21	0.06	0.17	0.18
25	0.49	3.11	5.59	8.80	0.022	0.191	0.830	0.778	0.89	2.06	0.19	0.38	0.29	0.87	1.76	1.74
26	0.83	1.80	5.98	7.44	0.286	0.344	1.180	0.438	2.87	-1.70	0.86	-1.75	3.84	1.56	2.50	0.98
27	0.34	2.35	5.44	7.16	0.016	0.127	0.272	0.201	-0.05	-0.13	-0.07	-2.18	0.21	0.58	0.58	0.45
Number of Labs With Data	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27

Lab No	X_bar_corr 0%	X_bar_corr 2%	X_bar_corr 5%	X_bar_corr 8%	S_corr 0%	S_corr 2%	S_corr 5%	S_corr 8%
1	0.33	2.47	6.04	9.20	0.025	0.407	0.497	0.502
2	0.10	2.03	4.60	8.73	0.000	0.030	0.250	0.306
3	0.33	2.29	5.22	8.47	0.012	0.099	0.332	0.279
4	0.38	2.59	5.55	8.80	0.014	0.173	0.242	0.412
5	0.37	2.46	5.67	8.92	0.076	0.076	0.561	0.283
6	0.50	2.47	5.44	8.83	0.087	0.209	0.342	0.232
7	0.00	FALSE	FALSE	8.40	0.000	FALSE	FALSE	0.321
8	0.05	2.59	5.46	8.45	0.001	0.119	0.798	0.548
9	0.45	2.52	5.35	8.53	0.050	0.076	0.050	0.379
10	0.52	2.51	6.25	9.84	0.108	0.373	0.337	0.420
11	0.16	2.03	5.79	7.67	0.023	0.045	0.136	0.049
12	0.53	2.64	5.86	8.74	0.021	0.217	0.507	0.499
13	0.27	2.35	5.45	8.90	0.102	0.176	0.517	0.726
14	0.26	2.76	5.50	9.01	0.021	0.108	0.452	0.481
15	0.40	2.70	5.78	9.15	0.050	0.110	0.311	0.225
16	0.32	2.17	5.30	7.70	0.029	0.197	0.191	0.258
17	0.44	2.59	5.40	8.36	0.072	0.168	0.396	0.265
18	0.49	2.47	5.40	7.84	0.006	0.475	0.058	0.410
19	0.23	2.29	5.37	8.25	0.052	0.232	0.814	0.226
20	0.38	2.11	4.88	FALSE	0.061	0.311	0.535	FALSE
21	0.25	2.86	6.04	9.60	0.000	0.031	0.060	0.157
22	0.37	2.71	5.86	8.73	0.029	0.155	0.096	0.244
23	0.23	2.26	5.95	9.15	0.104	0.309	0.421	0.524
24	0.27	2.09	5.56	8.63	0.015	0.013	0.081	0.079
25	0.49	3.11	5.59	8.80	0.022	0.191	0.830	0.778
26	FALSE	1.80	FALSE	7.44	FALSE	0.344	FALSE	0.438
27	0.34	2.35	5.44	7.16	0.016	0.127	0.272	0.201
Number of Labs With Data	26	26	25	26	26	26	25	26

	0%	2%	5%	8%
X_dbl_bar / Sx	0.34	2.39	5.48	8.56
	0.170	0.350	0.577	0.641
Sr / SR	0.074	0.221	0.472	0.448
	0.180	0.394	0.694	0.738
h Critical	2.62	2.62	2.62	2.62
k Critical	2.23	2.23	2.23	2.23
Corrected X_dbl_bar / Sx	0.32	2.43	5.55	8.59
	0.142	0.292	0.362	0.631
Corrected Sr / SR	0.051	0.219	0.430	0.396
	0.150	0.363	0.555	0.741

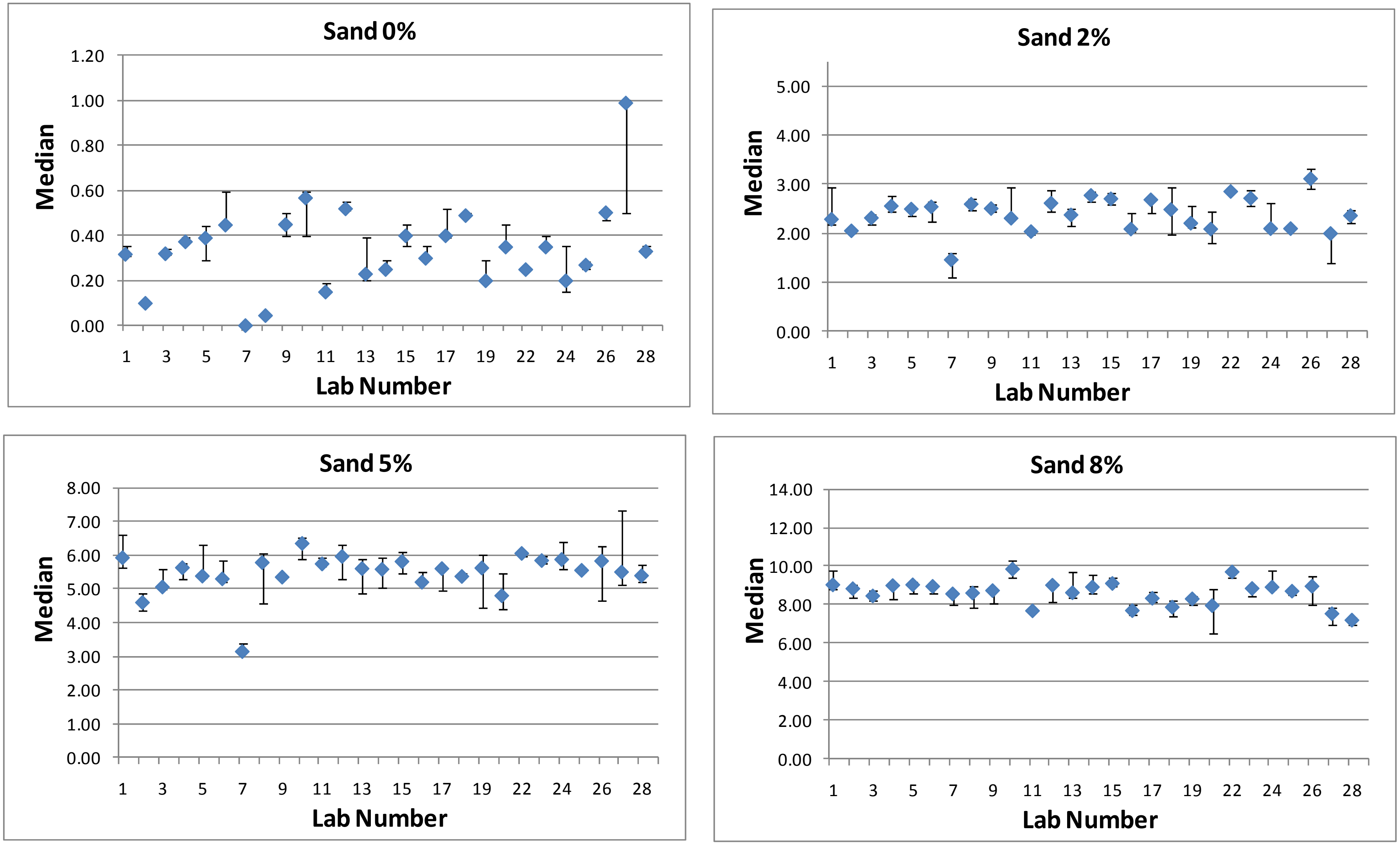


Figure D-1: Unadjusted Median organic content values of sand and the corresponding error bands

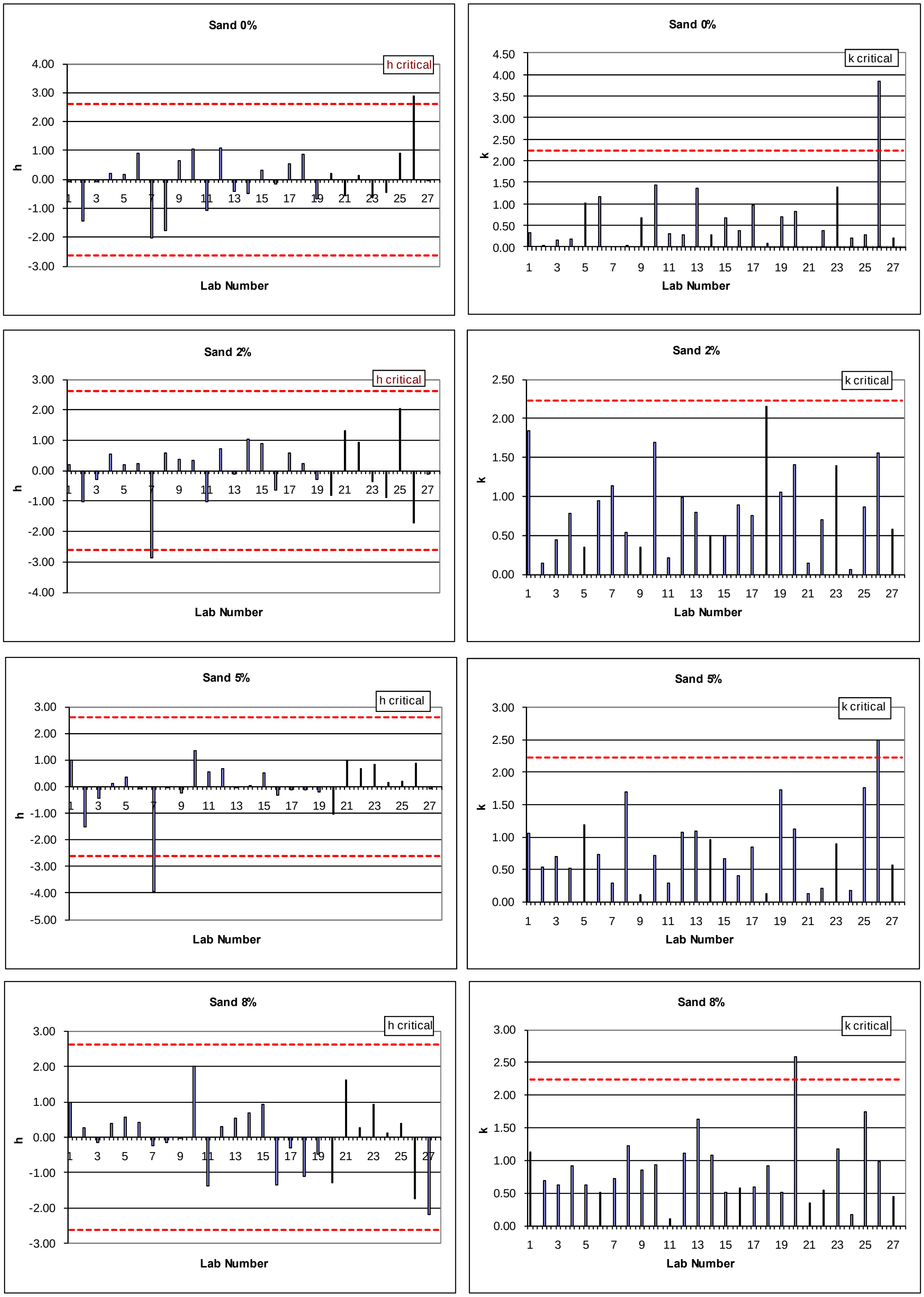
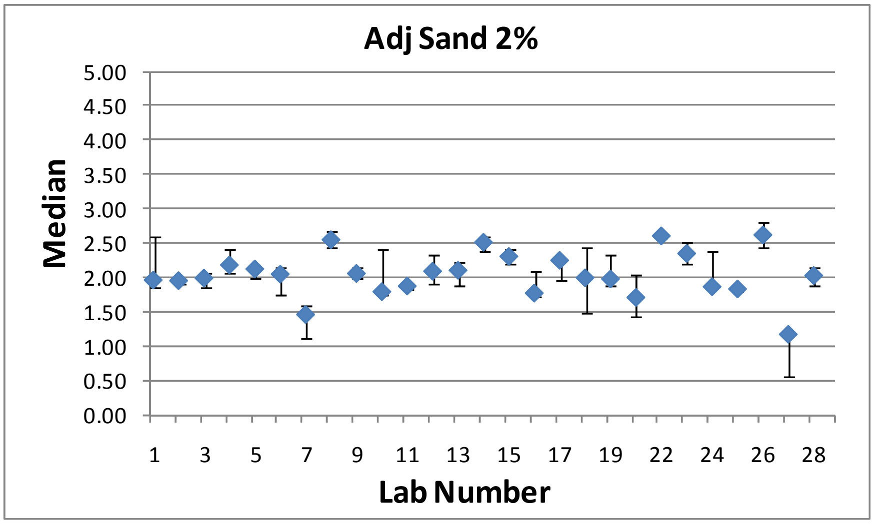


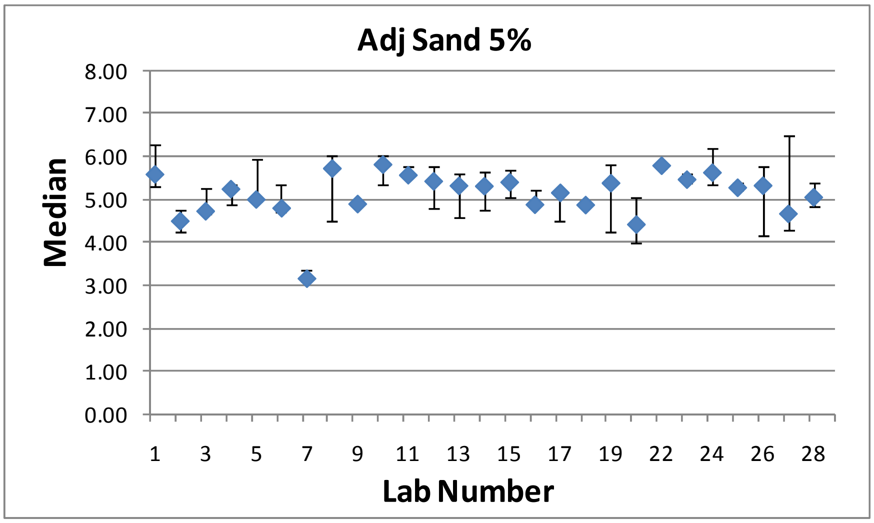
Figure D-2: h and k consistency statistics of organic content measurements of sand

Table D-2: Adjusted organic content (%) of three replicates of sand blends in the ILS and the computed statistics according to ASTM E 691

	Adjusted Sand			X_bar			S			h			k			X_bar_corr			S_corr		
Lab No	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%	2%	5%	8%
1	2.61 1.95 1.86	6.26 5.29 5.60	8.67 8.50 9.44	2.14	5.72	8.87	0.407	0.497	0.502	0.26	1.13	0.97	1.84	1.05	1.12	2.14	5.72	8.87	0.407	0.497	0.502
2	1.95 1.95 1.90	4.75 4.50 4.25	8.90 8.70 8.30	1.93	4.50	8.63	0.030	0.250	0.306	-0.34	-1.24	0.62	0.14	0.53	0.68	1.93	4.50	8.63	0.030	0.250	0.306
3	2.05 1.86 1.98	4.68 4.73 5.28	7.89 8.44 8.10	1.97	4.90	8.14	0.099	0.332	0.279	-0.24	-0.47	-0.10	0.45	0.70	0.62	1.97	4.90	8.14	0.099	0.332	0.279
4	2.40 2.06 2.18	5.36 5.25 4.90	8.72 8.58 7.95	2.21	5.17	8.42	0.173	0.242	0.412	0.47	0.07	0.30	0.78	0.51	0.92	2.21	5.17	8.42	0.173	0.242	0.412
5	2.14 2.12 2.00	4.95 5.95 5.01	8.24 8.79 8.63	2.08	5.30	8.55	0.076	0.561	0.283	0.10	0.32	0.50	0.34	1.19	0.63	2.08	5.30	8.55	0.076	0.561	0.283
6	2.04 2.15 1.74	5.33 4.70 4.80	8.50 8.42 8.07	1.98	4.94	8.33	0.209	0.342	0.232	-0.21	-0.37	0.17	0.95	0.72	0.52	1.98	4.94	8.33	0.209	0.342	0.232
7	1.45 1.11 1.60	3.15 3.37 3.12	8.03 8.63 8.53	1.39	3.21	8.40	0.251	0.137	0.321	-1.90	-3.75	0.27	1.14	0.29	0.72	1.39	FALSE	8.40	0.251	FALSE	0.321
8	2.66 2.42 2.54	5.73 6.01 4.51	8.89 7.81 8.53	2.54	5.42	8.41	0.119	0.798	0.548	1.42	0.55	0.29	0.54	1.69	1.22	2.54	5.42	8.41	0.119	0.798	0.548
9	2.05 2.15 2.00	4.95 4.85 4.90	7.65 8.25 8.35	2.07	4.90	8.08	0.076	0.050	0.379	0.05	-0.46	-0.19	0.35	0.11	0.85	2.07	4.90	8.08	0.076	0.050	0.379
10	1.78 1.76 2.42	5.83 6.01 5.36	8.92 9.76 9.29	1.99	5.73	9.32	0.373	0.337	0.420	-0.18	1.16	1.64	1.69	0.71	0.94	1.99	5.73	9.32	0.373	0.337	0.420
11	1.83 1.92 1.87	5.58 5.78 5.52	7.48 7.57 7.49	1.87	5.62	7.51	0.045	0.136	0.049	-0.51	0.95	-1.04	0.20	0.29	0.11	1.87	5.62	7.51	0.045	0.136	0.049
12	2.34 2.08 1.91	5.78 5.43 4.78	7.64 8.45 8.55	2.11	5.33	8.22	0.217	0.507	0.499	0.18	0.38	0.01	0.98	1.07	1.11	2.11	5.33	8.22	0.217	0.507	0.499
13	2.10 1.89 2.24	5.60 4.60 5.33	8.32 8.11 9.46	2.07	5.17	8.63	0.176	0.517	0.726	0.07	0.07	0.61	0.80	1.10	1.62	2.07	5.17	8.63	0.176	0.517	0.726
14	2.51 2.38 2.60	5.65 5.32 4.76	8.34 8.62 9.28	2.50	5.24	8.74	0.108	0.452	0.481	1.29	0.20	0.78	0.49	0.96	1.08	2.50	5.24	8.74	0.108	0.452	0.481
15	2.30 2.41 2.19	5.41 5.06 5.68	8.57 9.00 8.67	2.30	5.38	8.75	0.110	0.311	0.225	0.72	0.48	0.79	0.50	0.66	0.50	2.30	5.38	8.75	0.110	0.311	0.225
16	2.08 1.72 1.76	5.20 4.88 4.86	7.66 7.34 7.15	1.86	4.98	7.39	0.197	0.191	0.258	-0.55	-0.30	-1.22	0.89	0.40	0.58	1.86	4.98	7.39	0.197	0.191	0.258
17	2.26 1.96 2.24	5.16 5.21 4.50	7.86 8.21 7.69	2.16	4.96	7.92	0.168	0.396	0.265	0.31	-0.34	-0.43	0.76	0.84	0.59	2.16	4.96	7.92	0.168	0.396	0.265
18	2.45 1.99 1.50	4.88 4.88 4.98	6.94 7.76 7.35	1.98	4.91	7.35	0.475	0.058	0.410	-0.21	-0.44	-1.28	2.15	0.12	0.92	1.98	4.91	7.35	0.475	0.058	0.410
19	2.32 1.88 1.97	4.23 5.39 5.80	8.04 7.78 8.23	2.06	5.14	8.02	0.232	0.814	0.226	0.02	0.01	-0.29	1.05	1.72	0.50	2.06	5.14	8.02	0.232	0.814	0.226
20	1.43 2.05 1.70	5.07 4.42 4.01	6.11 8.40 7.54	1.73	4.50	7.35	0.311	0.535	1.157	-0.92	-1.24	-1.27	1.41	1.13	2.58	1.73	4.50	FALSE	0.311	0.535	FALSE
21	2.64 2.60 2.58	5.73 5.80 5.85	9.42 9.46 9.17	2.61	5.79	9.35	0.031	0.060	0.157	1.60	1.28	1.67	0.14	0.13	0.35	2.61	5.79	9.35	0.031	0.060	0.157
22	2.50 2.34 2.19	5.47 5.59 5.40	8.44 8.56 8.09	2.35	5.49	8.37	0.155	0.096	0.244	0.85	0.69	0.23	0.70	0.20	0.55	2.35	5.49	8.37	0.155	0.096	0.244
23	1.85 1.86 2.39	5.35 5.64 6.18	8.65 9.52 8.58	2.03	5.72	8.91	0.309	0.421	0.524	-0.05	1.14	1.03	1.40	0.89	1.17	2.03	5.72	8.91	0.309	0.421	0.524
24	1.83 1.82 1.81	5.28 5.22 5.38	8.40 8.27 8.41	1.82	5.30	8.36	0.013	0.081	0.079	-0.65	0.31	0.22	0.06	0.17	0.18	1.82	5.30	8.36	0.013	0.081	0.079
25	2.43 2.61 2.81	5.78 5.33 4.17	9.01 8.43 7.47	2.62	5.09	8.30	0.191	0.830	0.778	1.63	-0.08	0.13	0.87	1.76	1.74	2.62	5.09	8.30	0.191	0.830	0.778
26	1.17 1.16 0.57	6.49 4.28 4.67	7.01 6.14 6.67	0.97	5.15	6.61	0.344	1.180	0.438	-3.11	0.02	-2.37	1.56	2.50	0.98	FALSE	FALSE	6.61	FALSE	FALSE	0.438
27	2.14 2.02 1.88	5.40 4.86 5.06	7.03 6.62 6.83	2.01	5.10	6.83	0.127	0.272	0.201	-0.10	-0.06	-2.04	0.58	0.58	0.45	2.01	5.10	6.83	0.127	0.272	0.201
Number of Labs With Data				27	27	27	27	27	27	27	27	27	27	27	27	26	25	26	26	25	26

X_dbl_bar / Sx			Sr / SR			h Critical			k Critical			Corrected X_dbl_bar / Sx			Corrected Sr / SR		
2.05	5.14	8.21	0.221	0.472	0.448	2.62	2.62	2.62	2.23	2.23	2.23	2.09	5.21	8.25	0.215	0.430	0.396
0.348	0.513	0.679	0.392	0.642	0.771							0.28	0.35	0.67	0.349	0.549	0.774





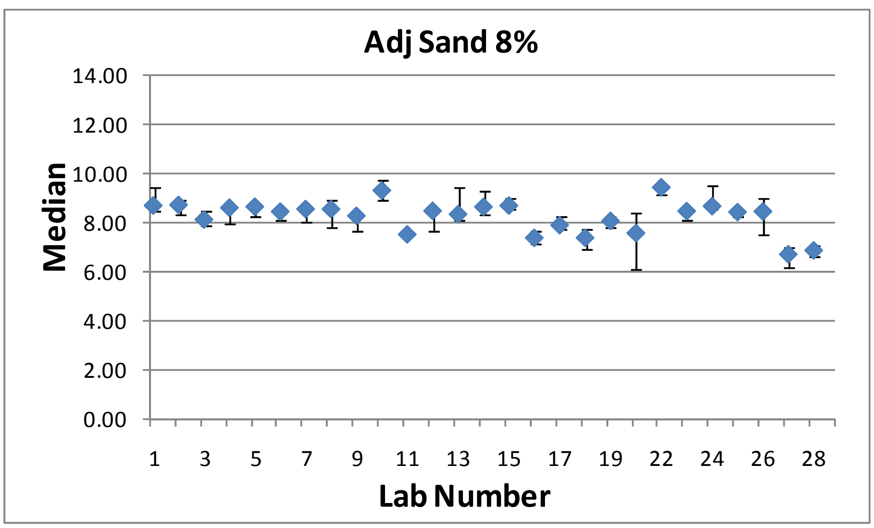


Figure D-3: Adjusted Median organic content values of sand and the corresponding error bands

APPENDIX E- PRECISION STATEMENT FOR AASHTO T267

PRECISION STATEMENT FOR AASHTO T267, "DETERMINATION OF ORGANIC CONTENT IN SOILS BY LOSS ON IGNITION"

1 Precision and Bias

1.1 Precision - Criteria for judging the acceptability of percent organic content in soils obtained by this method are given as follows:

1.1.1 Single-Operator Precision (Repeatability) – The figures in Column 2 of Table 1 are the standard deviations that have been found to be appropriate for the organic mass percentage of soil samples. Two results obtained in the same laboratory, by the same operator using the same equipment, in the shortest practical period of time, should not be considered suspect unless the difference in the two results exceeds the single-operator limits given in Table 1, Column 3.

1.1.2 Multilaboratory Precision (Reproducibility) – The figures in Column 2 of Table 1 are the standard deviations that have been found to be appropriate for the organic mass percentage of soil samples. Two results submitted by two different operators testing the same material in different laboratories shall not be considered suspect unless the difference in the two results exceeds the multi-laboratory limits given in Table 1, Column 3.

Table 1 – Precision Estimates for AASHTO T267

Condition of Test and Test Property	Standard deviation, % (1s)	Acceptable Range of Two Results, % (d2s)
Single-Operator Precision:		
Clay	0.25	0.72
Silt and Sand	0.19	0.54
Multilaboratory Precision:		
Clay	0.57	1.60
Silt and Sand	0.35	1.00

[a] These values represent the 1s and d2s limits described in ASTM Practice C670.

Note – The precision estimates are based on the analysis of test results from 27 laboratories participated in an AMRL interlaboratory study. The data consisted of organic content measurements of clay, silt, and sand blends with 2%, 5%, and 8% of organic material. The details of this analysis are in *NCHRP Web-Only Document 163*.

1.2 Bias– No information can be presented on the bias of the procedure because no comparison with the material having an accepted reference value was conducted.