The 2011 CANADIAN ASPHALT MIX EXCHANGE PROGRAM (CAMEP)

2011 Detailed Report (May 2011)

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ABSTRACT

Forty eight Canadian engineering organizations participated in the 2011 CANADIAN ASPHALT MIX EXCHANGE PROGRAM. The exchange provides an opportunity for participants to compare their test results to those of other laboratories. It provides a mechanism for review and refinement of existing test methods and equipment. The exchange evaluates the volumetric and mechanical properties of an asphalt-aggregate mixture using Marshall mix design procedures, the gyratory compactor, and the ignition oven.

This report documents the test results for the year 2011 CANADIAN ASPHALT MIX EXCHANGE PROGRAM.

The complete report is available on the internet at the following address:
http://www.highways.gov.sk.ca/Camep11/

1 INTRODUCTION

The Canadian Asphalt Mix Exchange Program (CAMEP) is part of the Canadian Asphalt and Mix Program (CAMP). The Asphalt Mix Exchange Program is operated by a steering committee under the umbrella of the Canadian User Producer Group for Asphalt (CUPGA).

In 2011, forty eight laboratories from across Canada obtained samples for the 2011 Canadian Asphalt and Mix Program. These laboratories represent 9 government/municipal agencies and 39 private/consulting firms.
There are three parts to the 2011 Canadian Asphalt Mix Exchange Program:

- Marshall Mix Design Procedures,
- SHRP Gyratory Compactor,
- Ignition Oven.

Forty six labs participated in the Marshall Mix Design Procedures (9 government/municipal and 37 private/consulting). Twenty six laboratories participated in the Gyratory Compactor part of the exchange program (8 government/municipal and 18 private/consulting). Forty six laboratories participated in the Ignition Oven testing (8 government/municipal and 38 private/consulting).

Participation in the exchange program is voluntary. The results cannot be used for pre-qualification or specification purposes as previously indicated in this report. Laboratory results are confidential and are presented using a randomly assigned laboratory number that is known by the particular laboratory and the co-ordinating agency only. The order of the participating laboratories shown in Tables 17, 18, and 19 is not related to the laboratory numbers used in the other tables contained in this report.

The exchange program is operated on an annual basis. Samples are shipped to participants in February. Test results are returned to the co-ordinating agency by the end of March and the final report is made available in late May.

For 2011, each laboratory paid a participation fee of $350 for the first part and $75 for every part thereafter. The cost to participate in all three parts is $500. The participation fee is used to cover the costs associated with operating the asphalt mix exchange program. The participation fee is reviewed at the CAMP annual meeting that is held in conjunction with the Canadian Technical Asphalt Association annual conference. Mix exchange packages are shipped collect to the participating laboratories.

Saskatchewan Ministry of Highways and Infrastructure is the co-ordinating agency for the mix exchange program. The responsibilities include:

- developing participant lists
- providing instructions for handling and testing of the materials
- supplying data collection forms
- arranging and co-ordinating material suppliers
- preparing, packaging and shipping aggregate and asphalt samples
- collecting and compiling the test data
- preparing a final report that is available to all participants
- preparing a final report for the CTAA (Canadian Technical Asphalt Association) Annual Proceedings.

2 ASPHALT MIX COMPONENT

The asphalt mix, consisting of processed aggregates, was used for a Saskatchewan Highways and Infrastructure hot-mix paving project on Highway No. 1, east of Regina.

2.1 Asphalt Cement

All the asphalt cement samples are supplied from the same batch of asphalt by Moose Jaw Refinery Inc. of Moose Jaw, Saskatchewan. The asphalt cement is 150/200A penetration grade. To ensure consistency, the following values are used in the exchange:

- Specific gravity = 1.030
- Mixing temperature = 145 °C
- Compaction temperature = 135 °C

2.2 Mineral Aggregate

The mineral aggregate is from Saskatchewan Ministry of Highways and Infrastructure pit number 72I-234, a glacial gravel deposit. The aggregate has the gradation shown in Table 1.

TABLE 1: Mix Exchange Aggregate Gradation

Canadian Metric Sieve Size	Percent Passing
16.0 mm	100.0 %
12.5 mm	100.0 %
9.0 mm	89.6 %
5.00 mm	64.9 %
2.0 mm	47.4 %
900 µm	35.8 %
400 µm	21.4 %
160 µm	8.5 %
75 µm	5.2 %
Note: Filler relative density = 2.70	

3 PARTICIPANT SAMPLE PACKAGES (MARSHALL MIX)

Each asphalt mix exchange participant package contains seventeen prepared aggregate samples and two litres of asphalt cement. The aggregate samples are prepared by splitting raw aggregate samples on each of the sieves shown in Table 1. The weight of each individual sieve size, to be combined for the exchange aggregate samples, is established through a trial and error process. Each aggregate test sample is prepared by weighing the individual size components and recombining them.

The following samples are distributed:

Eight (8) 1,200 gram samples for Marshall Compaction Briquettes.
Three (3) 2,000 gram samples for Asphalt Mix Maximum Theoretical Density.
Three (3) 2,000 gram samples for Coarse Aggregate Relative Density.
Three (3) 1,000 gram samples for Fine Aggregate Relative Density.

4 INSTRUCTIONS TO PARTICIPANTS (MARSHALL MIX)

4.1 Aggregate Relative Density and Water Absorption

Three determinations are made on each of the individual pre-weighed coarse and fine aggregate samples. The coarse aggregate density is obtained by following ASTM C127 Standard Test Method for DENSITY, RELATIVE DENSITY (SPECIFIC GRAVITY), AND ABSORPTION OF COARSE AGGREGATE. The fine aggregate density is determined by following ASTM C128 Standard Test Method for DENSITY, RELATIVE DENSITY (SPECIFIC GRAVITY) AND ABSORPTION OF FINE AGGREGATE. Both aggregate densities are reported to four (4) significant figures.

The following interpretative revisions to ASTM C128 were agreed to at the 1989 Canadian Asphalt Mix Exchange meeting. All participants are to incorporate the following into their procedures:

1. The fine aggregate should again be washed after the 24 hour immersion period.
2. For the cone test, do not refill the cone after each tamping.

During the May 29, 1989 General Technical Meeting, most agencies indicated that a fan is used to dry aggregate when determining the aggregate specific gravity (as allowed by ASTM). This procedure is to be incorporated by all participants.

The water absorption for the two aggregates is determined during the aggregate relative density testing in accordance with the respective ASTM procedures. The combined percentage water absorption is based on a blend of 35.1 % of the average held on the 5.0 mm sieve and 64.9 % of the average passing the 5.0 mm sieve.

4.2 Maximum Theoretical Density

During the November 2005 CAMP technical meeting it was agreed that only one test method for the Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures is required. The test method shall follow AASHTO T 209; the only deviations from AASHTO T 209 are:

- the 2000g aggregate samples provided shall be mixed at 145°C
- the mix samples shall be conditioned for four hours at the compaction temperature of 135°C.

The results for this Theoretical Maximum Specific Gravity and Density test will be used for determining the air voids of the Marshall briquettes and the percent asphalt absorption.

If for some reason the aggregate mass varies from that specified, the asphalt cement mass should be calculated based on the new aggregate mass to achieve an asphalt cement content of 5.70% by weight of dry aggregate.

4.3 Asphalt Mix and Briquette Preparation

Eight (8) briquettes with an asphalt cement content of 5.70 % (by weight of dry aggregate) are prepared separately by adding 68.4 g of asphalt cement to the 1,200 gram aggregate samples.

Three (3) MTD samples with an asphalt cement content of 5.70 % (by weight of dry aggregate) are prepared by adding 114.0 g of asphalt cement to the 2,000 gram aggregate samples.

Participating labs are asked to adjust the amount of asphalt to obtain 5.70 % asphalt content (by dry weight of aggregate) if for some reason their aggregate samples are not 1,200 g or 2,000 g.

<u>Mixing</u>

The following procedures are used to ensure uniformity in preparation of the briquettes and MTD samples:

1. Aggregate shall be heated for 12 hours minimum at a temperature of 110 ± 5 °C prior to adding asphalt cement.
2. Mixing shall be done at 145 °C using a **"buttered"** mixing pan. The mixing pan should not be totally clean but should contain the residue from previous mixing that is left after scraping with a spoon and/or spatula.
3. The asphalt cement added should be the percentage specified and no allowance should be made for asphalt cement that is left sticking to the sides of the mixing pan.
4. All mixing is to be done by hand using a spoon and a spatula.
5. Mixing of samples for Marshall Briquettes and MTD shall be done one at a time. Do not combine samples for mixing purposes.

<u>Compaction</u>

A total of eight (8) briquettes are manufactured, four (4) by hand compaction and four (4) by mechanical compaction.

Hand compaction is 75 BLOWS to each face at 135 °C. Mechanical compaction is based on the equivalent blow count to each face that each laboratory correlates to 75 blows of the hand hammer at 135 °C.

The following procedures are used to ensure uniformity in briquette preparation:

1. The compaction pedestal shall follow specifications from AASHTO T245 Standard Test Method for RESISTANCE TO PLASTIC FLOW OF BITUMINOUS MIXTURES USING MARSHALL APPARATUS and shall be secured to a solid concrete slab.
2. For a bevelled compaction hammer, the thickest part of the compaction foot shall be placed toward the chain of the mechanical compactor at the start of compaction.
3. Manufactured briquettes will be air cooled for one hour before removal from the compaction moulds.
4. The briquettes shall be removed from the compaction moulds by applying a constant pressure to the full face of the mould and not by applying blows to the face.
5. Briquettes are manufactured one at a time. Do not combine samples.

Marshall Mix Design Characteristics

The following procedures are used to determine Marshall Mix Design Characteristics:

1. Bulk specific gravity and density determination for briquettes shall be as specified in ASTM D2726 Standard Test Method for BULK SPECIFIC GRAVITY AND DENSITY OF NON-ABSORPTIVE COMPACTED BITUMINOUS MIXTURES.
2. Marshall Stability and flow determination for briquettes shall be as specified in AASHTO T245 Standard Test Method for RESISTANCE TO PLASTIC FLOW OF BITUMINOUS MIXTURES USING MARSHALL APPARATUS.
3. Bulk specific gravity, Marshall Stability, and flow testing on the briquettes shall be performed 24 hours after the briquettes have been compacted.
4. Flow shall be measured using flow meters on each guide rod. The average flow value is recorded if hand flow meters are used. Please specify if some other method is being used.

4.4 Calculated Data

For the four (4) hand compacted and four (4) mechanically compacted briquettes, each lab uses their determination of the aggregate bulk density, the bulk density of the compacted mixture and the maximum theoretical density of the asphalt-aggregate mixture to compute:

- percent voids in the mineral aggregate (*VMA*)
- percent air voids (*AV*)
- percent voids filled (*VF*)

The void characteristics are calculated using the following formulae:

Percent Voids in the Mineral Aggregate (*VMA)*

$$VMA = 100 - \left(\frac{G_{mb}}{G_{sb}} \times \frac{100}{100 + P_b} \right) \times 100$$

Percent Air Voids (*AV*)

$$AV = 100 \times \left(1 - \frac{G_{mb}}{G_{mm}} \right)$$

Percent Voids Filled with Asphalt (*VF*)

$$VF = \left(\frac{VMA - AV}{VMA} \right) \times 100$$

Percent Water Absorption (*WA*)

$$WA = \left(\frac{B - A}{A} \right) \times 100$$

Where: Units

G_{mb}	=	bulk density of the compacted mixture	(g/cm^3)
G_{sb}	=	bulk density of the aggregate	(g/cm^3)
P_b	=	asphalt content of the mix (% by weight of dry aggregate)	(%)
G_{mm}	=	maximum theoretical density of the asphalt-aggregate mixture	(g/cm^3)
B	=	weight of saturated surface dry aggregate	(g)
A	=	dry weight of aggregate	(g)

4.5 Mechanical Compaction Equipment Data

Each laboratory must provide a description of the mechanical compaction equipment used. This required information includes:

- number of blows,
- mass of the compaction hammer (kg),
- drop of the hammer (mm),
- type of spring in the hammer,
- thickness of the compaction foot (mm),
- the high and low thickness (if the compaction foot is bevelled),
- type of base (rotating or stationary),
- type and trade name of the mechanical compactor (e.g., home-made, Soil test, Pine Instrument, double acting, etc.).

5 PARTICIPANT SAMPLE PACKAGES (GYRATORY COMPACTOR)

Each gyratory sample package contains three 4,700 g aggregate samples and asphalt cement of sufficient quantity to allow for a 5.39 % asphalt content (by total weight of mix).

6 INSTRUCTIONS TO PARTICIPANTS (GYRATORY COMPACTOR)

6.1 Preparation Instructions

Complete instructions and a data sheet are included in the package to ensure uniformity between the labs. Three specimens are prepared and tested.

The following gyratory compaction guidelines are used:

1. Mixing Temperature = 145 °C
2. Compaction Temperature = 135 °C
3. N_{Design} = 75 gyrations
4. Asphalt Content: 5.39 % by total weight of mix (267.9 grams are added to each sample)
5. If for some reason the aggregate mass varies from that specified, the labs are to adjust the asphalt mass so that the desired asphalt content is maintained.

Aggregate Preparation

The following procedures are used to prepare the aggregate:

1. The aggregate is placed in a pan and heated in an oven for two to four hours until the mixing temperature is reached. The oven temperature is set approximately 15 °C higher than the mixing temperature. All the mixing implements are heated at the same time.
2. The asphalt binder is heated to the desired mixing temperature.
3. A forced draft mixing oven is preheated to 135 °C for use in short term aging of the test specimens.

Mixture Preparation

The following procedures are used to prepare the mixture:

1. Place the hot mixing bowl on a scale and zero the scale.
2. Charge the mixing bowl with the heated aggregates and dry mix thoroughly.
3. Form a crater in the blended aggregate and weigh the required asphalt into the mixture to achieve the desired batch weight.
4. Remove the mixing bowl from the scale and mix the asphalt and the aggregate until the aggregate is thoroughly coated.
5. Place the mixture in a flat shallow pan to an even thickness of 21-22 kg/m^2 and put the pan in the forced draft oven at 135 °C.
6. Short term age the specimen for 2 hours in accordance with AASHTO R30.
7. Repeat this process for each specimen.
8. Proper timing of the gyratory compaction steps can be achieved by spacing approximately 20 minutes between mixing each specimen and proceeding with compaction.

6.2 Compaction of Specimens

The compaction of the specimens and the determination of the bulk density will be conducted in accordance with AASHTO T312 and AASHTO R35.

6.3 Gyratory Compactor Characteristics

The bulk density at 75 gyrations is determined after the specimens are compacted with the gyratory compactor.

7 PARTICIPANT SAMPLE PACKAGES (IGNITION OVEN)

Each ignition oven participant package contains three 1,500 gram aggregate samples, three asphalt mix samples and one asphalt cement sample. The three aggregate samples are used to calibrate the ignition oven; the three asphalt mix samples are used for the ignition oven tests.

8 INSTRUCTIONS TO PARTICIPANTS (IGNITION OVEN)

8.1 Calibration

Calibration testing is done using three of the aggregate samples. The ignition oven calibration is done at an asphalt content of 5.2 by dry weight of aggregate (4.94% by total weight of mix). Three samples are prepared separately by adding 78.0 grams of asphalt to the aggregate sample in order to obtain the desired 5.2 % asphalt content. The three samples are used to determine a correction factor for the ignition oven and aggregate. If for some reason the aggregate mass varies from that specified, the labs are to adjust the asphalt mass so that the desired asphalt content is maintained.

Mixing

The following process is used to ensure uniformity in mixing the samples:

1. Aggregates shall be heated for 12 hours minimum at 110 $\pm$ 5 °C prior to adding asphalt.
2. Mixing should be done at 145 °C using a "**buttered**" mixing pan. The mixing pan should not be totally clean but should contain the residue from previous mixing that is left after scraping with a spoon and/or spatula.
3. The asphalt cement should be added in the amount specified and no allowance should be made for asphalt that is left sticking to the sides of the mixing pan.
4. All mixing should be done by hand using a spoon and a spatula.
5. After the sample is mixed, record the mass of the total mixture to 0.1 gram as M_{PC1}.
6. Repeat the process for the other two samples and record the total mass of the mixture to the nearest 0.1 gram as M_{PC2} and M_{PC3}.

Testing

The following process was used to ensure uniformity in ignition oven testing:

1. After the samples are prepared, the asphalt content will be determined using:
   - ASTM D6307 STANDARD TEST METHOD FOR ASPHALT CONTENT OF HOT-MIX ASPHALT BY IGNITION METHOD.

2. After the asphalt is burned off in the ignition oven, determine the mass of the remaining sample to 0.1 gram and record it as M_{AC1}, M_{AC2}, and M_{AC3}. The masses recorded as M_{AC1}, M_{AC2}, and M_{AC3} should correspond to the samples that have masses of M_{PC1}, M_{PC2}, and M_{PC3} respectively.

Calculations

A correction factor for the calibration samples is determined.

1. Calculate the measured percent mass loss (C_{SX}) for each sample using the equation in ASTM D6307:

$$C_{Sx} = (\frac{M_{PCx} - M_{ACx}}{M_{PCx}} \times 100) - \%AC$$

Where: Units

C_{Sx}	=	Measured mass loss of the calibration sample.	(%)
x	=	Calibration sample number, where x = 1 or x = 2 or x = 3.	
M_{PCx}	=	Total mass of the mixture calibration sample prior to ignition.	(g)
M_{ACx}	=	Total mass of the mixture calibration sample after ignition.	(g)
$\%AC$	=	Percentage of the actual asphalt cement in the mix by mass of the total mix.	(%)

2. Calculate the average calibration factor (CF) using the following equation:

$$C_F = \frac{C_{S1} + C_{S2} + C_{S3}}{3}$$

Where: Units

C_F	=	Average measured mass loss of the calibration sample expressed as a (%) percentage.	
C_{S1}	=	Measured mass loss of calibration sample 1.	(%)
C_{S2}	=	Measured mass loss of calibration sample 2.	(%)
C_{S3}	=	Measured mass loss of calibration sample 3.	(%)

8.2 Testing of premixed asphalt samples

After the correction factor is determined, ignition oven testing is completed on the other three premixed asphalt mix samples. The asphalt mix samples have been pre-mixed with a predetermined amount of asphalt that is known only to the coordinating agency.

Preparation of asphalt mix samples

1. In accordance with AASHTO T308 or ASTM D6307, oven dry each hot mix sample at a temperature of 105°C ± 5°C to constant mass.
2. Record the mass of the total mixture to the nearest 0.1 gram as M_{PT1}.
3. Ensure the sample has been softened enough to distribute evenly in the sample basket.
4. Repeat the process for the other two samples and record the mass of the total mixture to the nearest 0.1 gram as of the total mixture to the nearest 0.1 gram as M_{PT2} and M_{PT3}.

Testing

The following process is used to ensure uniformity in the ignition oven testing:

1. After the samples are prepared, the asphalt content will be determined using AASHTO T308 or ASTM D6307.
2. After the asphalt is burned off in the ignition oven, determine the mass of the remaining samples to 0.1 gram and record it as M_{AT1}, M_{AT2}, and M_{AT3}. The masses recorded as M_{AT1}, M_{AT2}, and M_{AT3} should correspond to the samples that have masses of M_{PT1}, M_{PT2}, and M_{PT3} respectively.

Calculations

1. Calculate the corrected asphalt content ($\%AC_x$) using the equation in ASTM D6307:

$$\%AC_x = \left(\frac{M_{PTX} - M_{ATX}}{M_{PTX}} \times 100\right) - C_F$$

Where: Units

$\%AC_x$	=	Measured percent asphalt content by mass of the oven-dry. HMA sample.	(%)
C_F	=	Calibration factor as determined above, expressed as a percentage.	(%)
x	=	Testing sample number (1, 2 or 3).	
M_{PTx}	=	Total mass of the mixture testing sample prior to ignition.	(g)
M_{ATx}	=	Total mass of the aggregate remaining after ignition.	(g)

2. Calculate the asphalt content percent ($\%AC_x$) by mass of the oven dry HMA for each sample and record on the result sheet.
3. Compute and record the asphalt content ($\%AC_x$) by dry weight of aggregate for each sample and record on the test result sheet. Use the following equation:

$$\%AC_{DRY\ WEIGHT\ AGGREGATE} = \frac{\%AC_{OVEN\ DRY}}{1-\left(\frac{\%AC_{OVEN\ DRY}}{100}\right)}$$

The results shown in Table 16.1 provide asphalt content by total mass of mixture.

9 SUMMARY OF TEST RESULTS

9.1 Background

The 2011 asphalt mix exchange test results are analysed using ASTM test procedure E691, Standard Practice for Conducting an Inter-laboratory Study to Determine the Precision of a Test Method.

The repeatability standard deviation, s_r, is a measure of the variability that can be expected within-laboratory under repeatability conditions. It usually refers to the single operator variability that can be expected when the operator, equipment, equipment calibration, and environment (temperature, humidity, etc.) have a minimal effect on the variability of test results within a lab.

The reproducibility standard deviation, s_R, is a measure of between-laboratory variability. It refers to the variability that can be expected when the operator, equipment, equipment calibration, and environment (temperature, humidity, etc.) have a significant effect on the variability of test results between different labs.
The *k* consistency statistic is used to examine the consistency of test results within a laboratory. This value indicates how a lab's within-laboratory variability (under repeatability conditions on a particular material) compares with the within-laboratory variability of all the other laboratories combined. The *k* consistency statistic is calculated for each lab and then compared to a critical value, k_{crit}. If a lab's *k* consistency statistic exceeds the critical value, then it is likely that they are having problems repeating test results in their laboratory. The critical value is determined using a statistical calculation based on an F-Test at a 0.5% level of significance. The critical value is a function of the level of significance, the number of labs involved in the testing and the number of replicate samples.

The h consistency statistic is used to examine the consistency of test results between laboratories. This value indicates how a lab's average test result (under repeatability conditions on a particular material) compares to the average obtained by all of the other laboratories involved in the testing program. The h consistency statistic is calculated for each lab and compared to a critical value, h_{crit}. If a lab's h consistency statistics exceeds the critical value, then it is likely that they are having problems correlating test results with other laboratories. The critical value is determined using a statistical calculation based on a Student's t-Test at a 0.5% level of significance. The critical value is a function of the level of significance and the number of labs involved in the testing.

The level of significance is the probability of incorrectly deciding that two data sets are different when in fact they are the same. At a 0.5% level of significance, only 1 in every 200 times will a lab be identified as having some type of testing problem; when in fact they do not. ASTM E691 Standard Practice for Conducting an Inter-laboratory Study to Determine the Precision of a Test Method suggests that a 0.5% level of significance is appropriate for this type of analysis.

9.2 Test Results

A summary of the results for each test procedure used in the Marshall Mix, Gyratory Compactor, and Ignition Oven parts of the exchange is presented in Table 20. The following information is provided:

- The average value
- The repeatability and reproducibility standard deviations
- The 95% confidence limits for repeatability and reproducibility
- The labs that exceed or are close to the critical *h* or *k* statistics.

As an example, for the Bulk Density of the Coarse Aggregate in Table 20, the average value reported by all of the laboratories is 2.6670. The repeatability standard deviation, s_r, is 0.0070 and reproducibility standard deviation, s_R, is 0.0163.

The 95% confidence limit for repeatability is computed with the following equation:

$$\text{95\% Repeatability Confidence Limit} = 1.96 * \sqrt{2} * s_r$$

The 95% confidence limit for repeatability means that approximately 95% of all pairs of test results on a given material from within a laboratory can be expected to differ in absolute value by $1.96 * \sqrt{2} * s_r$. For example, the Bulk Density of the Coarse Aggregate 95% Confidence Limit for Repeatability is computed to be $1.96 * \sqrt{2} * 0.0070 = 0.0195$. This means that approximately 95% of all pairs of test results on a given material from within a laboratory can be expected to differ in absolute value by 0.0195. In other words, two test results from the same lab on the same material will be considered suspect if they differ in absolute value by more than 0.0195.

The 95% confidence limit for reproducibility is computed with the following equation:

$$\text{95\% Reproducibility Confidence Limit} = 1.96 * \sqrt{2} * s_R$$

The 95% confidence limit for reproducibility means that approximately 95% of all pairs of test results on a given material from between laboratories can be expected to differ in absolute value by $1.96 * \sqrt{2} * s_R$. For example, the Bulk Density of the Coarse Aggregate 95% Confidence Limit for Reproducibility is computed to be $1.96 * \sqrt{2} * 0.0163 = 0.0451$. This means that approximately 95% of all pairs of test results on a given material from between two laboratories can be expected to differ in absolute value by 0.0451. In other words, two test results from different labs on the same material will be considered suspect if they differ in absolute value by more than 0.0451.

Table 20 indicates which labs have between-laboratory consistency statistics (*h* consistency statistic) that exceed (Labs Out *h*-stat) or are close (Labs Close *h*-stat) to the critical between-laboratory consistency statistic, h_{crit}. This table also shows the laboratories that have within-laboratory consistency statistics (*k* consistency statistic) that exceed (Labs Out *k*-stat) or are close (Labs Close *k*-stat) to the critical within-laboratory consistency statistic, k_{crit}.

If a lab has a between-laboratory consistency statistic (*h* consistency statistic) that exceeds the critical between-laboratory consistency statistic, h_{crit}, then its average test result is significantly different from the average obtained by the other laboratories. It may have difficulty correlating to other laboratories and should investigate its testing equipment and procedures.

Using Bulk Density of Fine Aggregate from Table 20 as an example, lab 19 has a between-laboratory consistency statistics (*h* consistency statistic) that exceeds the critical consistency statistic, h_{crit}. The laboratory average test results are significantly different from the average obtained by the other laboratories. They may have difficulty correlating to other laboratories and should investigate their testing equipment and procedures.

If a lab has a between-laboratory consistency statistic (*h* consistency statistic) that is close to the critical between-laboratory consistency statistic, h_{crit}, then its average test result is not significantly different from the average obtained by the other laboratories. However, the lab may want to consider taking precautions to ensure that there are not any problems with its testing procedures and equipment.

If a lab has a within-laboratory consistency statistic (*k* consistency statistic) that exceeds the critical within-laboratory consistency statistic, k_{crit}, then its within-laboratory standard deviation is significantly different from that obtained by all of the laboratories combined. The laboratory is having problems repeating test results in its own laboratory and should investigate its testing procedures and equipment.

Using Bulk Density of Coarse Aggregate from Table 20 as an example, labs 11 and 45 have a within-laboratory consistency statistic (*k* consistency statistic) that exceeds the critical consistency statistic, k_{crit}. The within-laboratory standard deviation is significantly different from that obtained by all of the laboratories combined. They may have problems repeating the test results in their own lab and should investigate their testing procedures and equipment.

If a lab has a within-laboratory consistency statistic (*k* consistency statistic) that is close to the critical within-laboratory consistency statistic, k_{crit}, then its within-laboratory standard deviation is not significantly different from that obtained by all of the laboratories combined. However, the lab may want to consider taking precautions to ensure that there are not any problems with its testing procedures and equipment.

10 ADDITIONAL INFORMATION

The complete set of test results is presented in Appendix A (Tables 1.1 – 11.1). Graphs representing the k-consistency statistic, for within laboratory variability, and the h-consistency statistic, for between laboratory variability, are also included in Appendix A.

A comparison of the three previous year’s and this year’s results is attached as Table 21 in Appendix A.

The definitions and formulae for the statistical equations used in the analysis of the test results are included in Appendix B. Additional elaboration on the statistical analysis can be found in ASTM E691 Standard Practice for Conducting an Inter-laboratory Study to Determine the Precision of a Test Method.

The entire report is available for viewing and/ or printing from the following Internet address: http://www.highways.gov.sk.ca/Camep11/

Questions pertaining to the Canadian Asphalt Mix Exchange Program can be directed to:

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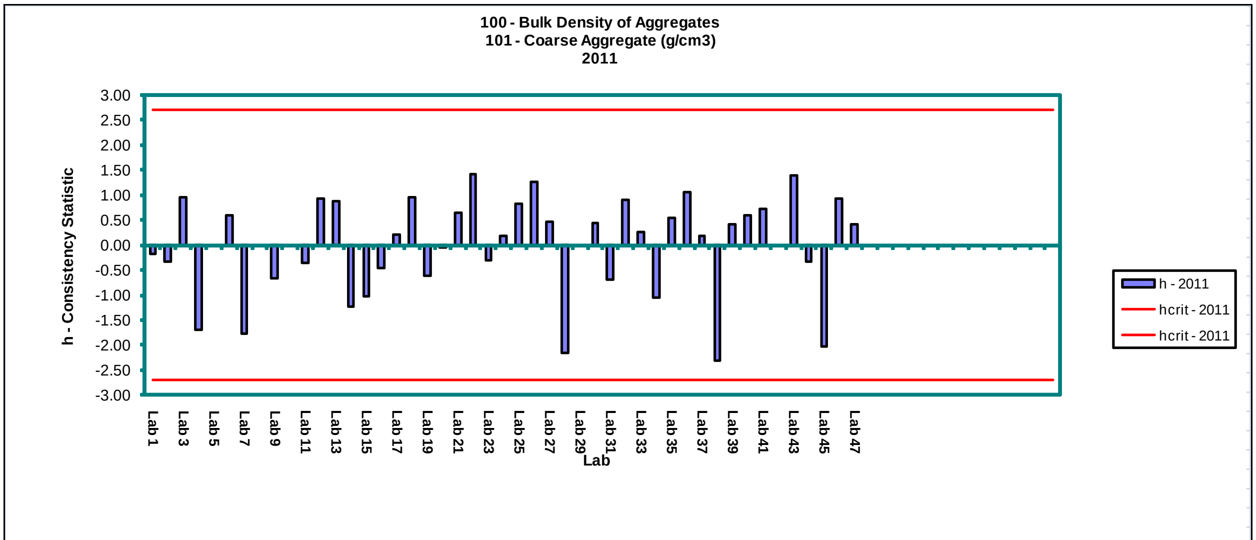
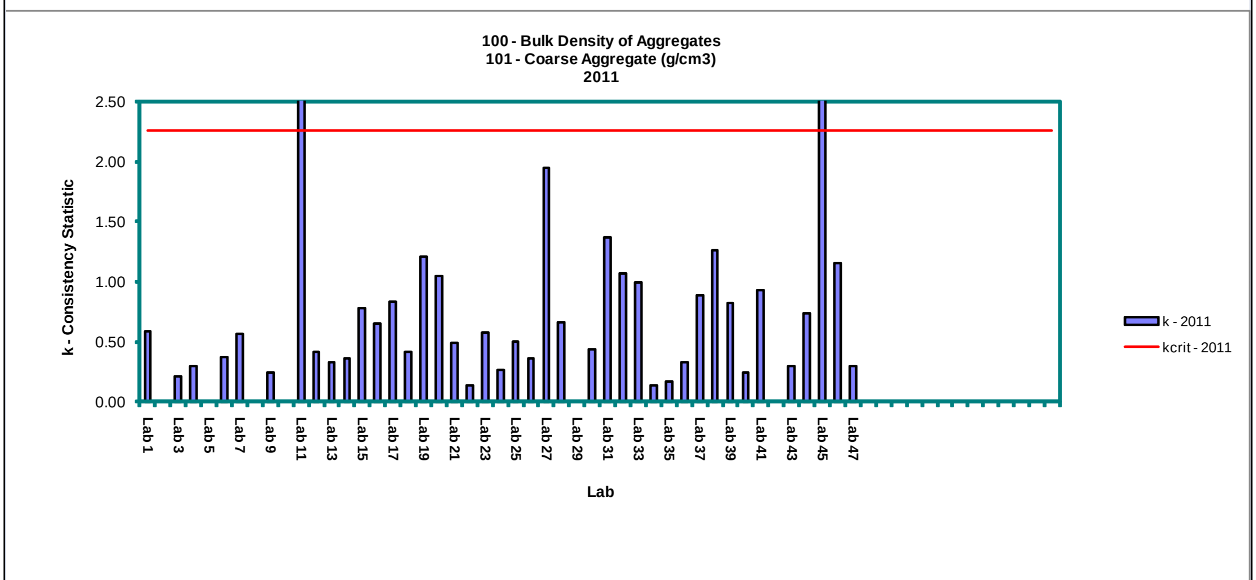
Appendix A

Table No. 1.1

100 - Bulk Density of Aggregates 101 - Coarse Aggregate (g/cm3) 2011													
Data					n =	3	$(X_{ave})_{ave}$ =	2.6670	s_r =	0.0070	Check s_{Xave} =	0.0152	
					p =	42	s_{Xave} =	0.0152	s_{R*} =	0.0163	r = 2.8 s_r =	0.0195	
					Significance Level =		0.5%		s_R =	0.0163	R = 2.8 s_R =	0.0451	
Lab #	**x_1**	**x_2**	**x_3**	**x_4**	**X_{ave}**	**s**	**d**	**s^2**	**h - 2011**	**k - 2011**	**hcrit - 2011**	**hcrit - 2011**	**kcrit - 2011**
Lab 1	2.6630	2.6610	2.6690		2.6643	0.0042	-0.0027	0.0000	-0.18	0.59	2.69	-2.69	2.26
Lab 2	2.6620	2.6620	2.6620		2.6620	0.0000	-0.0050	0.0000	-0.33	0.00	2.69	-2.69	2.26
Lab 3	2.6832	2.6802	2.6814		2.6816	0.0015	0.0146	0.0000	0.96	0.21	2.69	-2.69	2.26
Lab 4	2.6430	2.6390	2.6420		2.6413	0.0021	-0.0257	0.0000	-1.69	0.30	2.69	-2.69	2.26
Lab 5											2.69	-2.69	2.26
Lab 6	2.6740	2.6790	2.6750		2.6760	0.0026	0.0090	0.0000	0.59	0.38	2.69	-2.69	2.26
Lab 7	2.6360	2.6400	2.6440		2.6400	0.0040	-0.0270	0.0000	-1.78	0.57	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	2.6560	2.6560	2.6590		2.6570	0.0017	-0.0100	0.0000	-0.66	0.25	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	2.6800	2.6620	2.6430		2.6617	0.0185	-0.0054	0.0003	-0.35	2.63	2.69	-2.69	2.26
Lab 12	2.6780	2.6830	2.6830		2.6813	0.0029	0.0143	0.0000	0.94	0.41	2.69	-2.69	2.26
Lab 13	2.6790	2.6790	2.6830		2.6803	0.0023	0.0133	0.0000	0.87	0.33	2.69	-2.69	2.26
Lab 14	2.6510	2.6460	2.6480		2.6483	0.0025	-0.0187	0.0000	-1.23	0.36	2.69	-2.69	2.26
Lab 15	2.6450	2.6540	2.6550		2.6513	0.0055	-0.0157	0.0000	-1.03	0.78	2.69	-2.69	2.26
Lab 16	2.6560	2.6650	2.6590		2.6600	0.0046	-0.0070	0.0000	-0.46	0.65	2.69	-2.69	2.26
Lab 17	2.6660	2.6770	2.6680		2.6703	0.0059	0.0033	0.0000	0.22	0.83	2.69	-2.69	2.26
Lab 18	2.6800	2.6850	2.6800		2.6817	0.0029	0.0146	0.0000	0.96	0.41	2.69	-2.69	2.26
Lab 19	2.6640	2.6610	2.6480		2.6577	0.0085	-0.0094	0.0001	-0.62	1.21	2.69	-2.69	2.26
Lab 20	2.6698	2.6716	2.6581		2.6665	0.0073	-0.0005	0.0001	-0.04	1.04	2.69	-2.69	2.26
Lab 21	2.6790	2.6790	2.6730		2.6770	0.0035	0.0100	0.0000	0.65	0.49	2.69	-2.69	2.26
Lab 22	2.6895	2.6882	2.6876		2.6884	0.0010	0.0214	0.0000	1.40	0.14	2.69	-2.69	2.26
Lab 23	2.6600	2.6600	2.6670		2.6623	0.0040	-0.0047	0.0000	-0.31	0.58	2.69	-2.69	2.26
Lab 24	2.6677	2.6708	2.6710		2.6698	0.0019	0.0028	0.0000	0.18	0.26	2.69	-2.69	2.26
Lab 25	2.6760	2.6830	2.6800		2.6797	0.0035	0.0126	0.0000	0.83	0.50	2.69	-2.69	2.26
Lab 26	2.6890	2.6860	2.6840		2.6863	0.0025	0.0193	0.0000	1.27	0.36	2.69	-2.69	2.26
Lab 27	2.6703	2.6895	2.6631		2.6743	0.0136	0.0073	0.0002	0.48	1.94	2.69	-2.69	2.26
Lab 28	2.6370	2.6290	2.6370		2.6343	0.0046	-0.0327	0.0000	-2.15	0.66	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	2.6770	2.6730	2.6710		2.6737	0.0031	0.0066	0.0000	0.43	0.43	2.69	-2.69	2.26
Lab 31	2.6670	2.6550	2.6480		2.6567	0.0096	-0.0104	0.0001	-0.68	1.37	2.69	-2.69	2.26
Lab 32	2.6880	2.6810	2.6730		2.6807	0.0075	0.0136	0.0001	0.89	1.07	2.69	-2.69	2.26
Lab 33	2.6710	2.6780	2.6640		2.6710	0.0070	0.0040	0.0000	0.26	1.00	2.69	-2.69	2.26
Lab 34	2.6500	2.6510	2.6520		2.6510	0.0010	-0.0160	0.0000	-1.05	0.14	2.69	-2.69	2.26
Lab 35	2.6760	2.6740	2.6760		2.6753	0.0012	0.0083	0.0000	0.54	0.16	2.69	-2.69	2.26
Lab 36	2.6860	2.6820	2.6820		2.6833	0.0023	0.0163	0.0000	1.07	0.33	2.69	-2.69	2.26
Lab 37	2.6650	2.6770	2.6680		2.6700	0.0062	0.0030	0.0000	0.19	0.89	2.69	-2.69	2.26
Lab 38	2.6390	2.6350	2.6220		2.6320	0.0089	-0.0350	0.0001	-2.30	1.26	2.69	-2.69	2.26
Lab 39	2.6800	2.6700	2.6700		2.6733	0.0058	0.0063	0.0000	0.41	0.82	2.69	-2.69	2.26
Lab 40	2.6770	2.6740	2.6770		2.6760	0.0017	0.0090	0.0000	0.59	0.25	2.69	-2.69	2.26
Lab 41	2.6850	2.6720	2.6770		2.6780	0.0066	0.0110	0.0000	0.72	0.93	2.69	-2.69	2.26
Lab 42											2.69	-2.69	2.26
Lab 43	2.6860	2.6900	2.6890		2.6883	0.0021	0.0213	0.0000	1.40	0.30	2.69	-2.69	2.26
Lab 44	2.6593	2.6680	2.6589		2.6621	0.0051	-0.0050	0.0000	-0.33	0.73	2.69	-2.69	2.26
Lab 45	2.6560	2.6460	2.6070		2.6363	0.0259	-0.0307	0.0007	-2.02	3.68	2.69	-2.69	2.26
Lab 46	2.6860	2.6860	2.6720		2.6813	0.0081	0.0143	0.0001	0.94	1.15	2.69	-2.69	2.26
Lab 47	2.6750	2.6710	2.6740		2.6733	0.0021	0.0063	0.0000	0.41	0.30	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
Additional Statistics			Minimum X_{ave}		2.6320	r = 2.8 s_r =		0.0195	h_{crit} =	2.69			
			Maximum X_{ave}		2.6884	R = 2.8 s_R =		0.0451	h_{crit} =	-2.69			
			Check s_{Xave} =		0.0152				k_{crit} =	2.26			
Where:	x_1....x_n =	Individual Test Result			Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages						
	X_{ave} =	Cell Average				s_{Xave} =	Standard Deviation of Cell Averages						
	n =	Number of Test Results per Cell				s_r =	Repeatability Standard Deviation						
	s =	Cell Standard Deviation				s_{R*} =	Interim Reproducibility Standard Deviation						
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)				s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})						
	s^2 =	Cell Variation				h =	Between Laboratory Consistency Statistic						
	p =	Number of Laboratories				k =	Within Laboratory Consistency Statistic						
							0.0000						
					n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000	





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Betw een Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Betw een Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 1.2

100 - Bulk Density of Aggregates
102 - Fine Aggregate (g/cm3)
2011

Data						
n = 3	$(X_{ave})_{ave}$ =	2.6344	s_r =	0.0064	Check s_{Xave} =	0.0146
p = 42	s_{Xave} =	0.0146	s_{R^*} =	0.0155	r = 2.8 s_r =	0.0177
Significance Level = 0.5%			s_R =	0.0155	R = 2.8 s_R =	0.0430

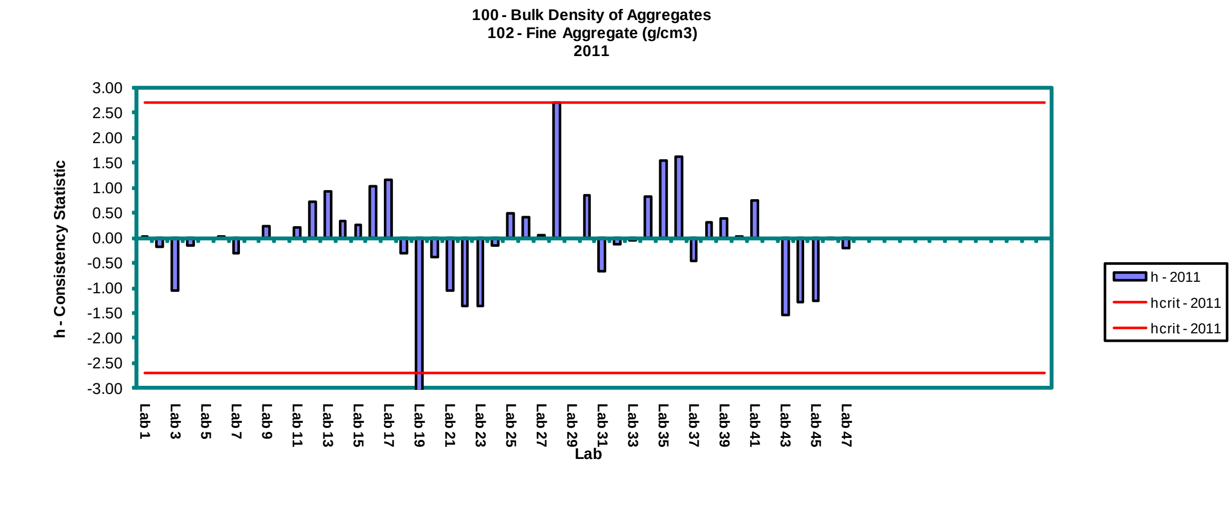
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.6360	2.6340	2.6350		2.6350	0.0010	0.0006	0.0000	0.04	0.16	2.69	-2.69	2.26
Lab 2	2.6300	2.6330	2.6320		2.6317	0.0015	-0.0028	0.0000	-0.19	0.24	2.69	-2.69	2.26
Lab 3	2.6192	2.6193	2.6188		2.6191	0.0003	-0.0153	0.0000	-1.05	0.04	2.69	-2.69	2.26
Lab 4	2.6400	2.6220	2.6350		2.6323	0.0093	-0.0021	0.0001	-0.14	1.46	2.69	-2.69	2.26
Lab 5											2.69	-2.69	2.26
Lab 6	2.6340	2.6380	2.6330		2.6350	0.0026	0.0006	0.0000	0.04	0.41	2.69	-2.69	2.26
Lab 7	2.6310	2.6300	2.6290		2.6300	0.0010	-0.0044	0.0000	-0.30	0.16	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	2.6340	2.6370	2.6430		2.6380	0.0046	0.0036	0.0000	0.24	0.72	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	2.6350	2.6400	2.6380		2.6377	0.0025	0.0032	0.0000	0.22	0.39	2.69	-2.69	2.26
Lab 12	2.6410	2.6470	2.6470		2.6450	0.0035	0.0106	0.0000	0.72	0.54	2.69	-2.69	2.26
Lab 13	2.6480	2.6430	2.6530		2.6480	0.0050	0.0136	0.0000	0.93	0.78	2.69	-2.69	2.26
Lab 14	2.6380	2.6410	2.6390		2.6393	0.0015	0.0049	0.0000	0.34	0.24	2.69	-2.69	2.26
Lab 15	2.6400	2.6380	2.6370		2.6383	0.0015	0.0039	0.0000	0.27	0.24	2.69	-2.69	2.26
Lab 16	2.6520	2.6510	2.6450		2.6493	0.0038	0.0149	0.0000	1.02	0.59	2.69	-2.69	2.26
Lab 17	2.6530	2.6500	2.6510		2.6513	0.0015	0.0169	0.0000	1.16	0.24	2.69	-2.69	2.26
Lab 18	2.6290	2.6360	2.6250		2.6300	0.0056	-0.0044	0.0000	-0.30	0.87	2.69	-2.69	2.26
Lab 19	2.6090	2.5890	2.5710		2.5897	0.0190	-0.0448	0.0004	-3.06	2.98	2.69	-2.69	2.26
Lab 20	2.6333	2.6252	2.6284		2.6290	0.0041	-0.0055	0.0000	-0.37	0.64	2.69	-2.69	2.26
Lab 21	2.6200	2.6190	2.6180		2.6190	0.0010	-0.0154	0.0000	-1.06	0.16	2.69	-2.69	2.26
Lab 22	2.6140	2.6156	2.6137		2.6144	0.0010	-0.0200	0.0000	-1.37	0.16	2.69	-2.69	2.26
Lab 23	2.6110	2.6130	2.6200		2.6147	0.0047	-0.0198	0.0000	-1.35	0.74	2.69	-2.69	2.26
Lab 24	2.6319	2.6317	2.6334		2.6323	0.0009	-0.0021	0.0000	-0.14	0.15	2.69	-2.69	2.26
Lab 25	2.6420	2.6430	2.6400		2.6417	0.0015	0.0072	0.0000	0.49	0.24	2.69	-2.69	2.26
Lab 26	2.6400	2.6360	2.6450		2.6403	0.0045	0.0059	0.0000	0.40	0.71	2.69	-2.69	2.26
Lab 27	2.6353	2.6388	2.6315		2.6352	0.0037	0.0008	0.0000	0.05	0.57	2.69	-2.69	2.26
Lab 28	2.6840	2.6680	2.6700		2.6740	0.0087	0.0396	0.0001	2.71	1.37	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	2.6480	2.6460	2.6470		2.6470	0.0010	0.0126	0.0000	0.86	0.16	2.69	-2.69	2.26
Lab 31	2.6260	2.6280	2.6200		2.6247	0.0042	-0.0098	0.0000	-0.67	0.65	2.69	-2.69	2.26
Lab 32	2.6320	2.6330	2.6330		2.6327	0.0006	-0.0018	0.0000	-0.12	0.09	2.69	-2.69	2.26
Lab 33	2.6370	2.6310	2.6330		2.6337	0.0031	-0.0008	0.0000	-0.05	0.48	2.69	-2.69	2.26
Lab 34	2.6510	2.6470	2.6420		2.6467	0.0045	0.0122	0.0000	0.84	0.71	2.69	-2.69	2.26
Lab 35	2.6580	2.6570	2.6560		2.6570	0.0010	0.0226	0.0000	1.54	0.16	2.69	-2.69	2.26
Lab 36	2.6580	2.6600	2.6560		2.6580	0.0020	0.0236	0.0000	1.61	0.31	2.69	-2.69	2.26
Lab 37	2.6280	2.6260	2.6290		2.6277	0.0015	-0.0068	0.0000	-0.46	0.24	2.69	-2.69	2.26
Lab 38	2.6540	2.6410	2.6220		2.6390	0.0161	0.0046	0.0003	0.31	2.52	2.69	-2.69	2.26
Lab 39	2.6400	2.6400	2.6400		2.6400	0.0000	0.0056	0.0000	0.38	0.00	2.69	-2.69	2.26
Lab 40	2.6360	2.6360	2.6320		2.6347	0.0023	0.0002	0.0000	0.02	0.36	2.69	-2.69	2.26
Lab 41	2.6460	2.6460	2.6440		2.6453	0.0012	0.0109	0.0000	0.75	0.18	2.69	-2.69	2.26
Lab 42											2.69	-2.69	2.26
Lab 43	2.6130	2.6110	2.6120		2.6120	0.0010	-0.0224	0.0000	-1.53	0.16	2.69	-2.69	2.26
Lab 44	2.6286	2.6162	2.6025		2.6158	0.0131	-0.0187	0.0002	-1.28	2.05	2.69	-2.69	2.26
Lab 45	2.6350	2.5920	2.6210		2.6160	0.0219	-0.0184	0.0005	-1.26	3.44	2.69	-2.69	2.26
Lab 46	2.6330	2.6340	2.6360		2.6343	0.0015	-0.0001	0.0000	-0.01	0.24	2.69	-2.69	2.26
Lab 47	2.6330	2.6290	2.6320		2.6313	0.0021	-0.0031	0.0000	-0.21	0.33	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26

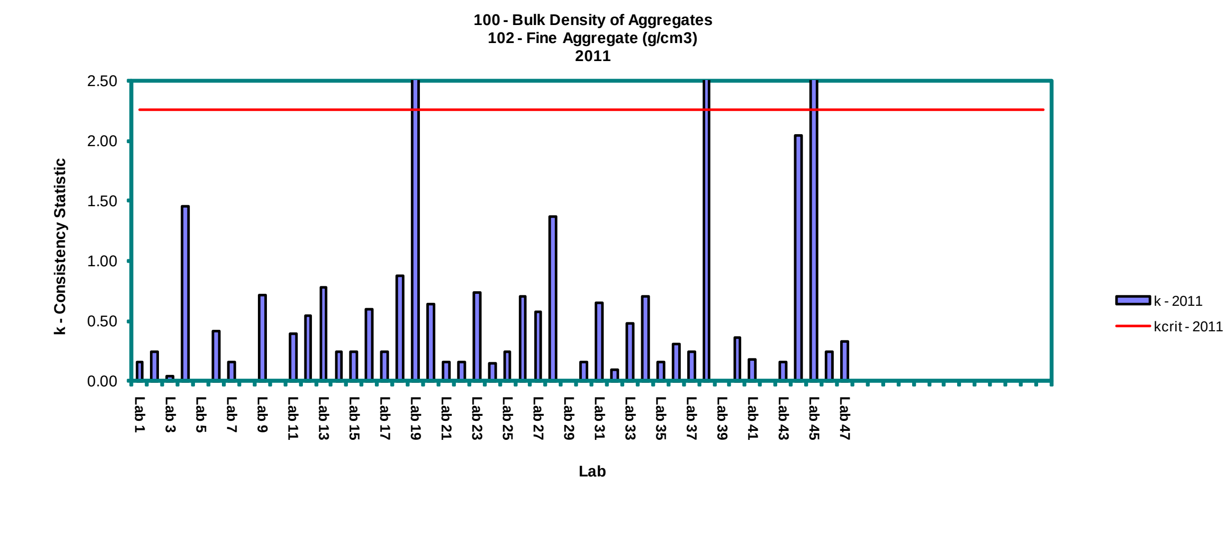
Additional Statistics						
Minimum X_{ave}	2.5897	r = 2.8 s_r =	0.0177	h_{crit} =	2.69
Maximum X_{ave}	2.6740	R = 2.8 s_R =	0.0430	h_{crit} =	-2.69
Check s_{Xave} =	0.0146			k_{crit} =	2.26

Where:	$x_1....x_n$ =	Individual Test Result	Where: $(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation	s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n = FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 2.1

200 - Water Absorption
201 - Absorption Fine Aggregate (%)
2011

Data					
n =	3	$(X_{ave})_{ave}$ =	1.0629	s_r =	0.0723	Check s_{Xave} =	0.1221
p =	42	s_{Xave} =	0.1221	s_{R^*} =	0.1357	r = 2.8 s_r =	0.2005
Significance Level =		0.5%		s_R =	0.1357	R = 2.8 s_R =	0.3760

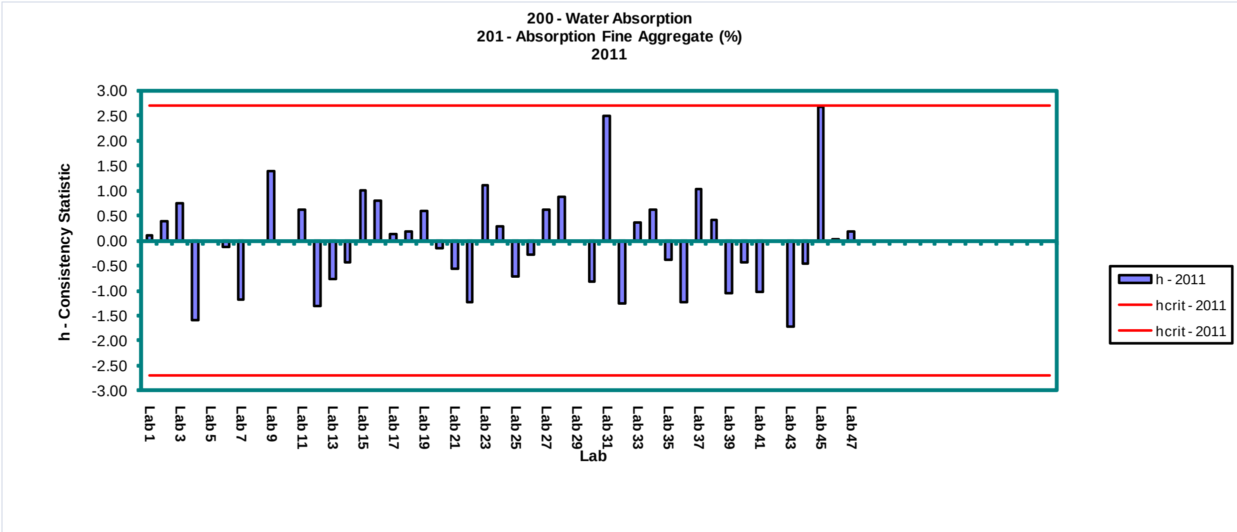
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	1.0700	1.0600	1.1000		1.0767	0.0208	0.0138	0.0004	0.11	0.29	2.69	-2.69	2.26
Lab 2	1.1080	1.1120	1.1080		1.1093	0.0023	0.0464	0.0000	0.38	0.03	2.69	-2.69	2.26
Lab 3	1.1531	1.1549	1.1546		1.1542	0.0010	0.0913	0.0000	0.75	0.01	2.69	-2.69	2.26
Lab 4	0.8490	0.8420	0.9190		0.8700	0.0426	-0.1929	0.0018	-1.58	0.59	2.69	-2.69	2.26
Lab 5											2.69	-2.69	2.26
Lab 6	1.0310	1.0430	1.0640		1.0460	0.0167	-0.0169	0.0003	-0.14	0.23	2.69	-2.69	2.26
Lab 7	0.9410	0.8930	0.9240		0.9193	0.0243	-0.1436	0.0006	-1.18	0.34	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	1.2500	1.2200	1.2300		1.2333	0.0153	0.1704	0.0002	1.40	0.21	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	1.1400	1.1100	1.1700		1.1400	0.0300	0.0771	0.0009	0.63	0.41	2.69	-2.69	2.26
Lab 12	0.9400	0.8700	0.9000		0.9033	0.0351	-0.1596	0.0012	-1.31	0.49	2.69	-2.69	2.26
Lab 13	0.9800	0.9600	0.9700		0.9700	0.0100	-0.0929	0.0001	-0.76	0.14	2.69	-2.69	2.26
Lab 14	0.9470	1.0580	1.0220		1.0090	0.0566	-0.0539	0.0032	-0.44	0.78	2.69	-2.69	2.26
Lab 15	1.2590	1.1670	1.1310		1.1857	0.0660	0.1228	0.0044	1.01	0.91	2.69	-2.69	2.26
Lab 16	1.1960	1.1140	1.1740		1.1613	0.0424	0.0984	0.0018	0.81	0.59	2.69	-2.69	2.26
Lab 17	1.0930	1.0520	1.0920		1.0790	0.0234	0.0161	0.0005	0.13	0.32	2.69	-2.69	2.26
Lab 18	1.0810	1.0910	1.0800		1.0840	0.0061	0.0211	0.0000	0.17	0.08	2.69	-2.69	2.26
Lab 19	1.1400	1.1200	1.1500		1.1367	0.0153	0.0738	0.0002	0.60	0.21	2.69	-2.69	2.26
Lab 20	1.0520	0.9890	1.0960		1.0457	0.0538	-0.0172	0.0029	-0.14	0.74	2.69	-2.69	2.26
Lab 21	0.9820	0.9760	1.0220		0.9933	0.0250	-0.0696	0.0006	-0.57	0.35	2.69	-2.69	2.26
Lab 22	0.9200	0.8900	0.9300		0.9133	0.0208	-0.1496	0.0004	-1.22	0.29	2.69	-2.69	2.26
Lab 23	1.2460	1.2020	1.1510		1.1997	0.0475	0.1368	0.0023	1.12	0.66	2.69	-2.69	2.26
Lab 24	1.1411	1.0657	1.0840		1.0969	0.0393	0.0340	0.0015	0.28	0.54	2.69	-2.69	2.26
Lab 25	0.9840	0.9680	0.9780		0.9767	0.0081	-0.0862	0.0001	-0.71	0.11	2.69	-2.69	2.26
Lab 26	1.0500	1.0300	1.0100		1.0300	0.0200	-0.0329	0.0004	-0.27	0.28	2.69	-2.69	2.26
Lab 27	1.1000	1.1200	1.2000		1.1400	0.0529	0.0771	0.0028	0.63	0.73	2.69	-2.69	2.26
Lab 28	1.0500	1.2400	1.2200		1.1700	0.1044	0.1071	0.0109	0.88	1.44	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	0.9650	0.9870	0.9360		0.9627	0.0256	-0.1002	0.0007	-0.82	0.35	2.69	-2.69	2.26
Lab 31	1.2400	1.3400	1.5200		1.3667	0.1419	0.3038	0.0201	2.49	1.96	2.69	-2.69	2.26
Lab 32	0.9100	0.8700	0.9500		0.9100	0.0400	-0.1529	0.0016	-1.25	0.55	2.69	-2.69	2.26
Lab 33	1.1000	1.0100	1.2100		1.1067	0.1002	0.0438	0.0100	0.36	1.39	2.69	-2.69	2.26
Lab 34	1.1130	1.1160	1.1860		1.1383	0.0413	0.0754	0.0017	0.62	0.57	2.69	-2.69	2.26
Lab 35	1.0000	1.0300	1.0200		1.0167	0.0153	-0.0462	0.0002	-0.38	0.21	2.69	-2.69	2.26
Lab 36	0.9100	0.9600	0.8700		0.9133	0.0451	-0.1496	0.0020	-1.22	0.62	2.69	-2.69	2.26
Lab 37	1.2330	1.1190	1.2170		1.1897	0.0617	0.1268	0.0038	1.04	0.85	2.69	-2.69	2.26
Lab 38	1.1400	1.2000	1.0000		1.1133	0.1026	0.0504	0.0105	0.41	1.42	2.69	-2.69	2.26
Lab 39	0.9000	0.9000	1.0000		0.9333	0.0577	-0.1296	0.0033	-1.06	0.80	2.69	-2.69	2.26
Lab 40	1.0000	1.0200	1.0100		1.0100	0.0100	-0.0529	0.0001	-0.43	0.14	2.69	-2.69	2.26
Lab 41	0.8600	0.9600	0.9900		0.9367	0.0681	-0.1262	0.0046	-1.03	0.94	2.69	-2.69	2.26
Lab 42											2.69	-2.69	2.26
Lab 43	0.9090	0.8170	0.8350		0.8537	0.0488	-0.2092	0.0024	-1.71	0.67	2.69	-2.69	2.26
Lab 44	1.0010	1.0610	0.9570		1.0063	0.0522	-0.0566	0.0027	-0.46	0.72	2.69	-2.69	2.26
Lab 45	1.1800	1.2800	1.7100		1.3900	0.2816	0.3271	0.0793	2.68	3.89	2.69	-2.69	2.26
Lab 46	0.9450	0.9570	1.2900		1.0640	0.1958	0.0011	0.0383	0.01	2.71	2.69	-2.69	2.26
Lab 47	1.0700	1.0800	1.1100		1.0867	0.0208	0.0238	0.0004	0.19	0.29	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26

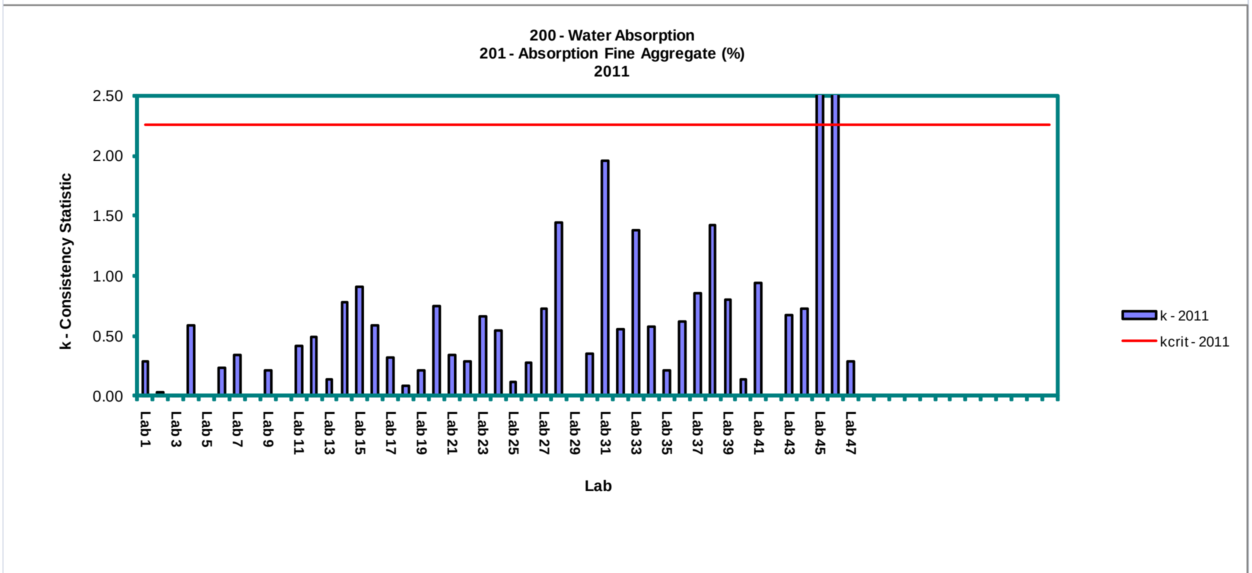
Additional Statistics					
Minimum X_{ave}	0.8537	r = 2.8 s_r =	0.2005	h_{crit} =	2.69
Maximum X_{ave}	1.3900	R = 2.8 s_R =	0.3760	h_{crit} =	-2.69
Check s_{Xave} =	0.1221			k_{crit} =	2.26

Where:		Where:	
$x_1....x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation	h =	Betw een Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 2.2

200 - Water Absorption
202 - Absorption Coarse Aggregate (%)
2011

Data					
n =	3	$(X_{ave})_{ave}$ =	1.0248	s_r =	0.0557
p =	42	s_{Xave} =	0.1734	s_{R^*} =	0.1792
Significance Level =		0.5%		s_R =	0.1792

Check s_{Xave} =	0.1734
r = 2.8 s_r =	0.1543
R = 2.8 s_R =	0.4968

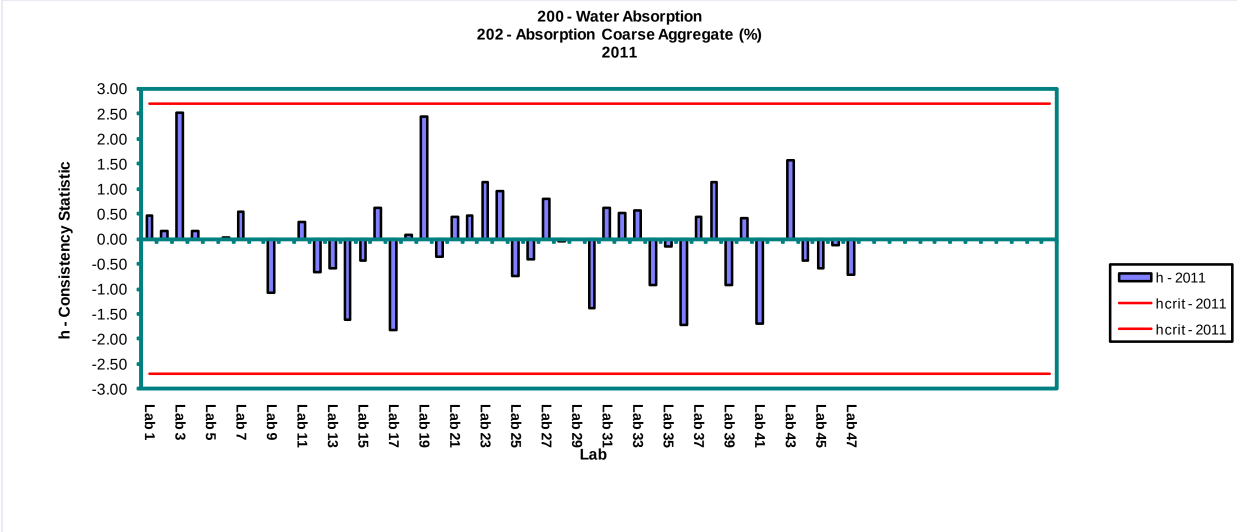
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	1.0200	1.1300	1.1600		1.1033	0.0737	0.0786	0.0054	0.45	1.32	2.69	-2.69	2.26
Lab 2	1.0770	1.0270	1.0560		1.0533	0.0251	0.0286	0.0006	0.16	0.45	2.69	-2.69	2.26
Lab 3	1.4599	1.4637	1.4679		1.4638	0.0040	0.4391	0.0000	2.53	0.07	2.69	-2.69	2.26
Lab 4	1.0750	0.9620	1.1230		1.0533	0.0827	0.0286	0.0068	0.16	1.49	2.69	-2.69	2.26
Lab 5											2.69	-2.69	2.26
Lab 6	1.0270	1.0290	1.0290		1.0283	0.0012	0.0036	0.0000	0.02	0.02	2.69	-2.69	2.26
Lab 7	1.0970	1.1340	1.1280		1.1197	0.0199	0.0949	0.0004	0.55	0.36	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	0.8300	0.8200	0.8700		0.8400	0.0265	-0.1848	0.0007	-1.07	0.48	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	1.1100	1.0500	1.0900		1.0833	0.0306	0.0586	0.0009	0.34	0.55	2.69	-2.69	2.26
Lab 12	1.0300	0.8500	0.8500		0.9100	0.1039	-0.1148	0.0108	-0.66	1.87	2.69	-2.69	2.26
Lab 13	0.9500	0.9500	0.8700		0.9233	0.0462	-0.1014	0.0021	-0.59	0.83	2.69	-2.69	2.26
Lab 14	0.7890	0.6540	0.7890		0.7440	0.0779	-0.2808	0.0061	-1.62	1.40	2.69	-2.69	2.26
Lab 15	0.9420	0.9500	0.9600		0.9507	0.0090	-0.0741	0.0001	-0.43	0.16	2.69	-2.69	2.26
Lab 16	1.1320	1.1940	1.0650		1.1303	0.0645	0.1056	0.0042	0.61	1.16	2.69	-2.69	2.26
Lab 17	0.7040	0.7240	0.7030		0.7103	0.0118	-0.3144	0.0001	-1.81	0.21	2.69	-2.69	2.26
Lab 18	1.0100	1.0510	1.0500		1.0370	0.0234	0.0122	0.0005	0.07	0.42	2.69	-2.69	2.26
Lab 19	1.4400	1.4600	1.4400		1.4467	0.0115	0.4219	0.0001	2.43	0.21	2.69	-2.69	2.26
Lab 20	0.9250	0.9470	1.0120		0.9613	0.0452	-0.0634	0.0020	-0.37	0.81	2.69	-2.69	2.26
Lab 21	1.0650	1.1200	1.1180		1.1010	0.0312	0.0762	0.0010	0.44	0.56	2.69	-2.69	2.26
Lab 22	1.1100	1.1300	1.0800		1.1067	0.0252	0.0819	0.0006	0.47	0.45	2.69	-2.69	2.26
Lab 23	1.2900	1.2560	1.1153		1.2204	0.0926	0.1957	0.0086	1.13	1.66	2.69	-2.69	2.26
Lab 24	1.1508	1.2289	1.1917		1.1905	0.0391	0.1657	0.0015	0.96	0.70	2.69	-2.69	2.26
Lab 25	0.9040	0.8840	0.8970		0.8950	0.0101	-0.1298	0.0001	-0.75	0.18	2.69	-2.69	2.26
Lab 26	0.9400	0.9800	0.9400		0.9533	0.0231	-0.0714	0.0005	-0.41	0.41	2.69	-2.69	2.26
Lab 27	1.0300	1.3200	1.1400		1.1633	0.1464	0.1386	0.0214	0.80	2.63	2.69	-2.69	2.26
Lab 28	0.9700	1.1300	0.9500		1.0167	0.0987	-0.0081	0.0097	-0.05	1.77	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	0.7450	0.7860	0.8260		0.7857	0.0405	-0.2391	0.0016	-1.38	0.73	2.69	-2.69	2.26
Lab 31	1.1400	1.1500	1.1000		1.1300	0.0265	0.1052	0.0007	0.61	0.48	2.69	-2.69	2.26
Lab 32	1.1300	1.1100	1.1000		1.1133	0.0153	0.0886	0.0002	0.51	0.27	2.69	-2.69	2.26
Lab 33	1.0700	1.1900	1.1100		1.1233	0.0611	0.0986	0.0037	0.57	1.10	2.69	-2.69	2.26
Lab 34	0.7450	0.8670	0.9890		0.8670	0.1220	-0.1578	0.0149	-0.91	2.19	2.69	-2.69	2.26
Lab 35	0.9900	0.9900	1.0100		0.9967	0.0115	-0.0281	0.0001	-0.16	0.21	2.69	-2.69	2.26
Lab 36	0.7500	0.7000	0.7300		0.7267	0.0252	-0.2981	0.0006	-1.72	0.45	2.69	-2.69	2.26
Lab 37	1.1050	1.0910	1.1120		1.1027	0.0107	0.0779	0.0001	0.45	0.19	2.69	-2.69	2.26
Lab 38	1.2500	1.2000	1.2100		1.2200	0.0265	0.1952	0.0007	1.13	0.48	2.69	-2.69	2.26
Lab 39	0.9000	0.9000	0.8000		0.8667	0.0577	-0.1581	0.0033	-0.91	1.04	2.69	-2.69	2.26
Lab 40	1.0800	1.1000	1.1100		1.0967	0.0153	0.0719	0.0002	0.41	0.27	2.69	-2.69	2.26
Lab 41	0.7200	0.7200	0.7600		0.7333	0.0231	-0.2914	0.0005	-1.68	0.41	2.69	-2.69	2.26
Lab 42											2.69	-2.69	2.26
Lab 43	1.2970	1.2760	1.3170		1.2967	0.0205	0.2719	0.0004	1.57	0.37	2.69	-2.69	2.26
Lab 44	0.8210	1.0220	1.0050		0.9493	0.1115	-0.0754	0.0124	-0.44	2.00	2.69	-2.69	2.26
Lab 45	0.8900	0.9400	0.9400		0.9233	0.0289	-0.1014	0.0008	-0.59	0.52	2.69	-2.69	2.26
Lab 46	0.9510	1.0200	1.0400		1.0037	0.0467	-0.0211	0.0022	-0.12	0.84	2.69	-2.69	2.26
Lab 47	0.8600	0.9600	0.8800		0.9000	0.0529	-0.1248	0.0028	-0.72	0.95	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26

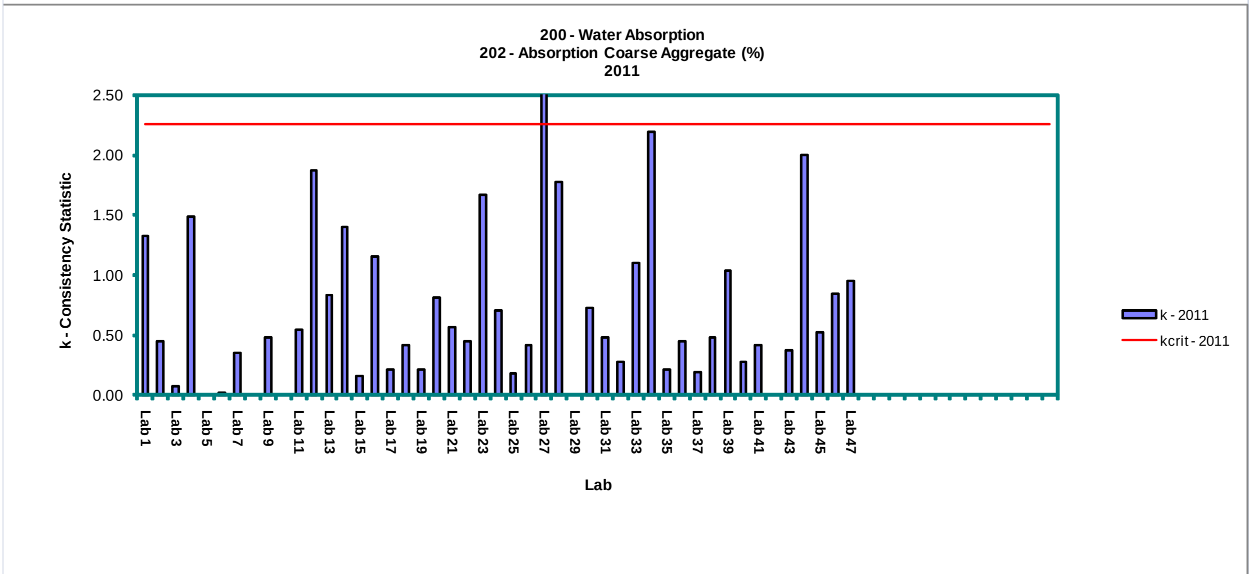
Additional Statistics					
Minimum X_{ave}	0.7103	r = 2.8 s_r =	0.1543	h_{crit} =	2.69
Maximum X_{ave}	1.4638	R = 2.8 s_R =	0.4968	h_{crit} =	-2.69
Check s_{Xave} =	0.1734			k_{crit} =	2.26

Where:		Where:	
x_1....x_n =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 3.1

300 - Theoretical Max. Specific Gravity and Density Test
302 - Modified Rice (g/cm3)
2011

Data					
n =	3	$(X_{ave})_{ave}$ =	2.4753	s_r =	0.0046	Check s_{Xave} =	0.0113
p =	42	s_{Xave} =	0.0113	s_{R^*} =	0.0119	r = 2.8 s_r =	0.0128
Significance Level =		0.5%		s_R =	0.0119	R = 2.8 s_R =	0.0331

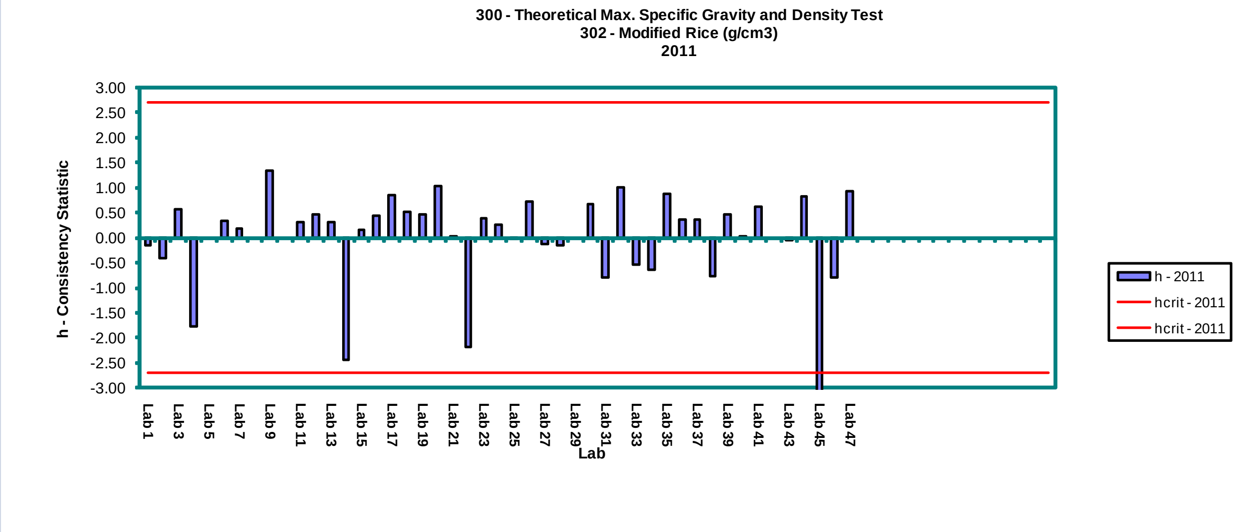
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.4730	2.4730	2.4750		2.4737	0.0012	-0.0016	0.0000	-0.14	0.25	2.69	-2.69	2.26
Lab 2	2.4700	2.4680	2.4740		2.4707	0.0031	-0.0046	0.0000	-0.41	0.66	2.69	-2.69	2.26
Lab 3	2.4817	2.4817	2.4817		2.4817	0.0000	0.0064	0.0000	0.57	0.00	2.69	-2.69	2.26
Lab 4	2.4510	2.4570	2.4580		2.4553	0.0038	-0.0199	0.0000	-1.76	0.82	2.69	-2.69	2.26
Lab 5											2.69	-2.69	2.26
Lab 6	2.4800	2.4790	2.4780		2.4790	0.0010	0.0037	0.0000	0.33	0.22	2.69	-2.69	2.26
Lab 7	2.4760	2.4770	2.4790		2.4773	0.0015	0.0021	0.0000	0.18	0.33	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	2.4910	2.4880	2.4920		2.4903	0.0021	0.0151	0.0000	1.33	0.45	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	2.4770	2.4830	2.4760		2.4787	0.0038	0.0034	0.0000	0.30	0.82	2.69	-2.69	2.26
Lab 12	2.4830	2.4800	2.4790		2.4807	0.0021	0.0054	0.0000	0.48	0.45	2.69	-2.69	2.26
Lab 13	2.4770	2.4760	2.4830		2.4787	0.0038	0.0034	0.0000	0.30	0.82	2.69	-2.69	2.26
Lab 14	2.4460	2.4450	2.4520		2.4477	0.0038	-0.0276	0.0000	-2.44	0.82	2.69	-2.69	2.26
Lab 15	2.4740	2.4800	2.4770		2.4770	0.0030	0.0017	0.0000	0.15	0.65	2.69	-2.69	2.26
Lab 16	2.4800	2.4820	2.4790		2.4803	0.0015	0.0051	0.0000	0.45	0.33	2.69	-2.69	2.26
Lab 17	2.4870	2.4850	2.4830		2.4850	0.0020	0.0097	0.0000	0.86	0.43	2.69	-2.69	2.26
Lab 18	2.4820	2.4820	2.4790		2.4810	0.0017	0.0057	0.0000	0.51	0.38	2.69	-2.69	2.26
Lab 19	2.4770	2.4750	2.4900		2.4807	0.0081	0.0054	0.0001	0.48	1.77	2.69	-2.69	2.26
Lab 20	2.4880	2.4850	2.4880		2.4870	0.0017	0.0117	0.0000	1.03	0.38	2.69	-2.69	2.26
Lab 21	2.4770	2.4760	2.4740		2.4757	0.0015	0.0004	0.0000	0.03	0.33	2.69	-2.69	2.26
Lab 22	2.4511	2.4511	2.4495		2.4506	0.0009	-0.0247	0.0000	-2.18	0.20	2.69	-2.69	2.26
Lab 23	2.4840	2.4800	2.4750		2.4797	0.0045	0.0044	0.0000	0.39	0.98	2.69	-2.69	2.26
Lab 24	2.4766	2.4790	2.4789		2.4782	0.0014	0.0029	0.0000	0.26	0.29	2.69	-2.69	2.26
Lab 25	2.4740	2.4790	2.4720		2.4750	0.0036	-0.0003	0.0000	-0.02	0.78	2.69	-2.69	2.26
Lab 26	2.4790	2.4870	2.4840		2.4833	0.0040	0.0081	0.0000	0.71	0.88	2.69	-2.69	2.26
Lab 27	2.4760	2.4699	2.4761		2.4740	0.0036	-0.0013	0.0000	-0.11	0.77	2.69	-2.69	2.26
Lab 28	2.4610	2.4840	2.4760		2.4737	0.0117	-0.0016	0.0001	-0.14	2.53	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	2.4780	2.4880	2.4830		2.4830	0.0050	0.0077	0.0000	0.68	1.09	2.69	-2.69	2.26
Lab 31	2.4690	2.4700	2.4600		2.4663	0.0055	-0.0089	0.0000	-0.79	1.20	2.69	-2.69	2.26
Lab 32	2.4880	2.4870	2.4850		2.4867	0.0015	0.0114	0.0000	1.01	0.33	2.69	-2.69	2.26
Lab 33	2.4730	2.4680	2.4670		2.4693	0.0032	-0.0059	0.0000	-0.52	0.70	2.69	-2.69	2.26
Lab 34	2.4660	2.4670	2.4710		2.4680	0.0026	-0.0073	0.0000	-0.64	0.57	2.69	-2.69	2.26
Lab 35	2.4850	2.4880	2.4830		2.4853	0.0025	0.0101	0.0000	0.89	0.55	2.69	-2.69	2.26
Lab 36	2.4820	2.4810	2.4750		2.4793	0.0038	0.0041	0.0000	0.36	0.82	2.69	-2.69	2.26
Lab 37	2.4770	2.4810	2.4800		2.4793	0.0021	0.0041	0.0000	0.36	0.45	2.69	-2.69	2.26
Lab 38	2.4650	2.4680	2.4670		2.4667	0.0015	-0.0086	0.0000	-0.76	0.33	2.69	-2.69	2.26
Lab 39	2.4780	2.4870	2.4770		2.4807	0.0055	0.0054	0.0000	0.48	1.20	2.69	-2.69	2.26
Lab 40	2.4770	2.4750	2.4750		2.4757	0.0012	0.0004	0.0000	0.03	0.25	2.69	-2.69	2.26
Lab 41	2.4810	2.4820	2.4840		2.4823	0.0015	0.0071	0.0000	0.62	0.33	2.69	-2.69	2.26
Lab 42											2.69	-2.69	2.26
Lab 43	2.4790	2.4710	2.4740		2.4747	0.0040	-0.0006	0.0000	-0.05	0.88	2.69	-2.69	2.26
Lab 44	2.4720	2.4783	2.5035		2.4846	0.0167	0.0093	0.0003	0.82	3.62	2.69	-2.69	2.26
Lab 45	2.4400	2.4240	2.4350		2.4330	0.0082	-0.0423	0.0001	-3.73	1.78	2.69	-2.69	2.26
Lab 46	2.4710	2.4660	2.4620		2.4663	0.0045	-0.0089	0.0000	-0.79	0.98	2.69	-2.69	2.26
Lab 47	2.4870	2.4840	2.4860		2.4857	0.0015	0.0104	0.0000	0.92	0.33	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26

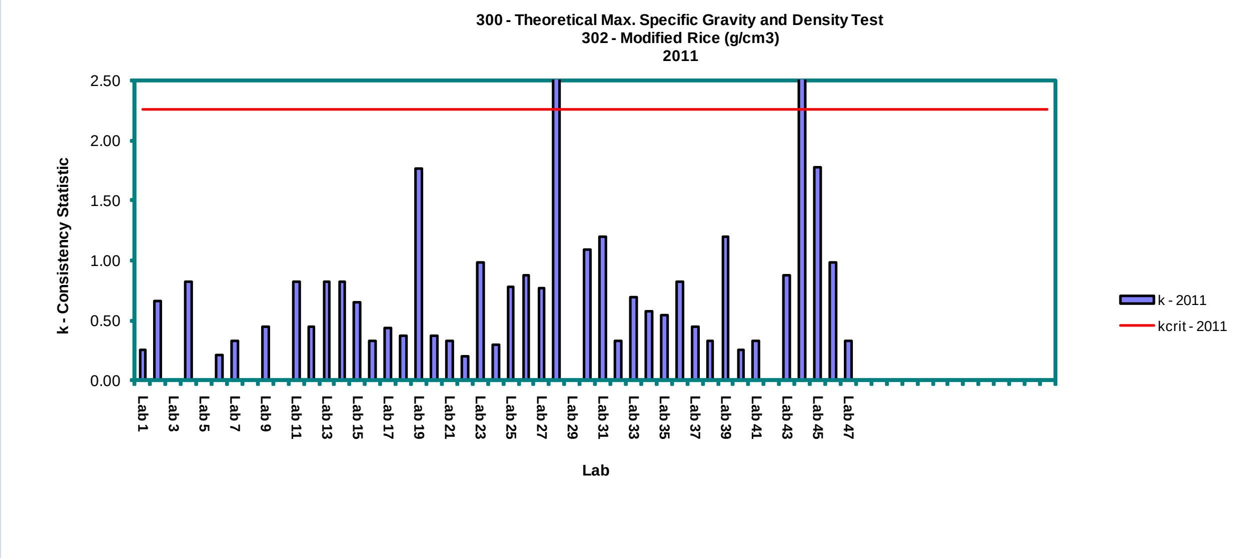
Additional Statistics						
	Minimum X_{ave}	2.4330	r = 2.8 s_r =	0.0128	h_{crit} =	2.69
	Maximum X_{ave}	2.4903	R = 2.8 s_R =	0.0331	h_{crit} =	-2.69
	Check s_{Xave} =	0.0113			k_{crit} =	2.26

Where:			Where:	
x_1....x_n =	Individual Test Result		$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 4.1

400 - Hand Compaction
401 - Bulk Density (g/cm3)
2011

Data						
n = 4	$(X_{ave})_{ave}$ =	2.3668	s_r =	0.0054	Check s_{Xave} =	0.0122
p = 40	s_{Xave} =	0.0122	s_{R^*} =	0.0130	r = 2.8 s_r =	0.0150
Significance Level =	0.5%		s_R =	0.0130	R = 2.8 s_R =	0.0361

Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.3870	2.3660	2.3850	2.3730	2.3778	0.0100	0.0110	0.0001	0.90	1.85	2.68	-2.68	2.03
Lab 2	2.3530	2.3470	2.3500	2.3480	2.3495	0.0026	-0.0173	0.0000	-1.42	0.49	2.68	-2.68	2.03
Lab 3	2.3500	2.3490	2.3520	2.3520	2.3508	0.0015	-0.0160	0.0000	-1.32	0.28	2.68	-2.68	2.03
Lab 4	2.3820	2.3750	2.3930	2.4040	2.3885	0.0127	0.0217	0.0002	1.78	2.36	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	2.3720	2.3740	2.3700	2.3690	2.3713	0.0022	0.0045	0.0000	0.37	0.41	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	2.3580	2.3520	2.3580	2.3520	2.3550	0.0035	-0.0118	0.0000	-0.97	0.64	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	2.3590	2.3600	2.3620	2.3520	2.3583	0.0043	-0.0085	0.0000	-0.70	0.81	2.68	-2.68	2.03
Lab 12	2.3630	2.3640	2.3610	2.3630	2.3628	0.0013	-0.0040	0.0000	-0.33	0.23	2.68	-2.68	2.03
Lab 13	2.3830	2.3720	2.3810	2.3760	2.3780	0.0050	0.0112	0.0000	0.92	0.92	2.68	-2.68	2.03
Lab 14	2.3750	2.3790	2.3810	2.3810	2.3790	0.0028	0.0122	0.0000	1.00	0.52	2.68	-2.68	2.03
Lab 15	2.3861	2.3808	2.3836	2.3842	2.3837	0.0022	0.0169	0.0000	1.39	0.41	2.68	-2.68	2.03
Lab 16	2.3790	2.3780	2.3800	2.3750	2.3780	0.0022	0.0112	0.0000	0.92	0.40	2.68	-2.68	2.03
Lab 17	2.3580	2.3500	2.3540	2.3640	2.3565	0.0060	-0.0103	0.0000	-0.85	1.11	2.68	-2.68	2.03
Lab 18	2.3860	2.3850	2.3880	2.3920	2.3878	0.0031	0.0210	0.0000	1.72	0.57	2.68	-2.68	2.03
Lab 19	2.3450	2.3480	2.3570	2.3540	2.3510	0.0055	-0.0158	0.0000	-1.30	1.02	2.68	-2.68	2.03
Lab 20	2.3618	2.3591	2.3660	2.3620	2.3622	0.0028	-0.0046	0.0000	-0.37	0.53	2.68	-2.68	2.03
Lab 21	2.3540	2.3560	2.3560	2.3570	2.3558	0.0013	-0.0110	0.0000	-0.91	0.23	2.68	-2.68	2.03
Lab 22	2.3652	2.3758	2.3750	2.3731	2.3723	0.0049	0.0055	0.0000	0.45	0.90	2.68	-2.68	2.03
Lab 23	2.3540	2.3520	2.3530	2.3580	2.3543	0.0026	-0.0125	0.0000	-1.03	0.49	2.68	-2.68	2.03
Lab 24	2.3960	2.3899	2.3888	2.3965	2.3928	0.0040	0.0260	0.0000	2.14	0.74	2.68	-2.68	2.03
Lab 25	2.3800	2.3830	2.3790	2.3730	2.3788	0.0042	0.0120	0.0000	0.98	0.78	2.68	-2.68	2.03
Lab 26	2.3680	2.3690	2.3690	2.3690	2.3688	0.0005	0.0020	0.0000	0.16	0.09	2.68	-2.68	2.03
Lab 27	2.3670	2.3720	2.3700	2.3710	2.3700	0.0022	0.0032	0.0000	0.26	0.40	2.68	-2.68	2.03
Lab 28	2.3760	2.3780	2.3780	2.3740	2.3765	0.0019	0.0097	0.0000	0.80	0.35	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	2.3640	2.3610	2.3660	2.3730	2.3660	0.0051	-0.0008	0.0000	-0.06	0.94	2.68	-2.68	2.03
Lab 31	2.3420	2.3480	2.3550	2.3630	2.3520	0.0091	-0.0148	0.0001	-1.21	1.68	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	2.3750	2.3760	2.3760	2.3790	2.3765	0.0017	0.0097	0.0000	0.80	0.32	2.68	-2.68	2.03
Lab 34	2.3420	2.3370	2.3530	2.3440	2.3440	0.0067	-0.0228	0.0000	-1.87	1.24	2.68	-2.68	2.03
Lab 35	2.3720	2.3690	2.3720	2.3680	2.3703	0.0021	0.0035	0.0000	0.28	0.38	2.68	-2.68	2.03
Lab 36	2.3760	2.3760	2.3720	2.3780	2.3755	0.0025	0.0087	0.0000	0.72	0.47	2.68	-2.68	2.03
Lab 37	2.3780	2.3760	2.3790	2.3760	2.3773	0.0015	0.0105	0.0000	0.86	0.28	2.68	-2.68	2.03
Lab 38	2.3400	2.3660	2.3480	2.3740	2.3570	0.0157	-0.0098	0.0002	-0.80	2.91	2.68	-2.68	2.03
Lab 39	2.3800	2.3700	2.3710	2.3730	2.3735	0.0045	0.0067	0.0000	0.55	0.84	2.68	-2.68	2.03
Lab 40	2.3660	2.3660	2.3670	2.3650	2.3660	0.0008	-0.0008	0.0000	-0.06	0.15	2.68	-2.68	2.03
Lab 41	2.3530	2.3590	2.3590	2.3790	2.3625	0.0114	-0.0043	0.0001	-0.35	2.10	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	2.3590	2.3560	2.3560	2.3640	2.3588	0.0038	-0.0080	0.0000	-0.66	0.70	2.68	-2.68	2.03
Lab 44	2.3577	2.3578	2.3603	2.3556	2.3579	0.0019	-0.0089	0.0000	-0.73	0.36	2.68	-2.68	2.03
Lab 45	2.3570	2.3520	2.3530	2.3480	2.3525	0.0037	-0.0143	0.0000	-1.17	0.69	2.68	-2.68	2.03
Lab 46	2.3540	2.3570	2.3600	2.3560	2.3568	0.0025	-0.0100	0.0000	-0.82	0.46	2.68	-2.68	2.03
Lab 47	2.3570	2.3750	2.3660	2.3660	2.3660	0.0073	-0.0008	0.0001	-0.06	1.36	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

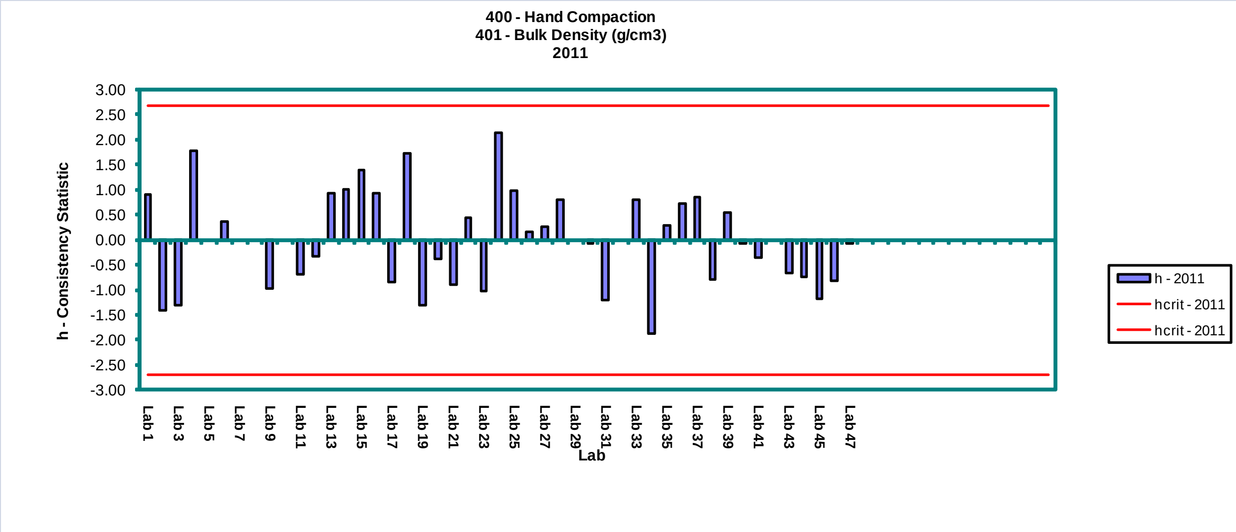
Additional Statistics						
	Minimum X_{ave}	2.3440	r = 2.8 s_r =	0.0150	h_{crit} =	2.68
	Maximum X_{ave}	2.3928	R = 2.8 s_R =	0.0361	h_{crit} =	-2.68
	Check s_{Xave} =	0.0122			k_{crit} =	2.03

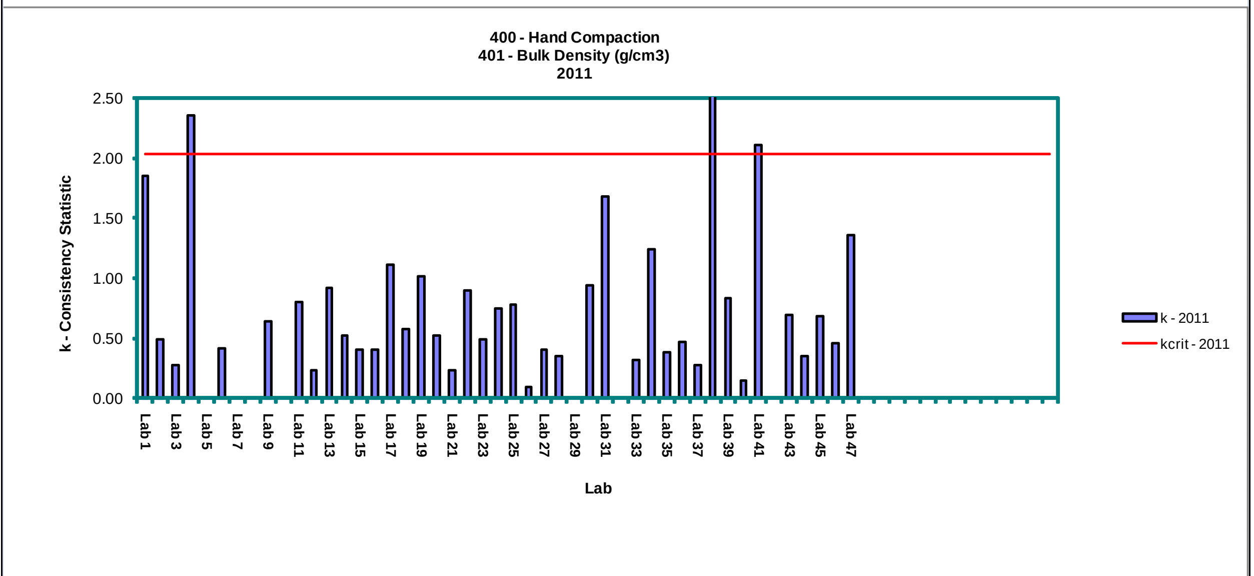
Where:
- $x_1 .... x_n$ = Individual Test Result
- X_{ave} = Cell Average
- n = Number of Test Results per Cell
- s = Cell Standard Deviation
- d = Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)
- s^2 = Cell Variation
- p = Number of Laboratories

Where:
- $(X_{ave})_{ave}$ = Average of Cell Averages
- s_{Xave} = Standard Deviation of Cell Averages
- s_r = Repeatability Standard Deviation
- s_{R^*} = Interim Reproducibility Standard Deviation
- s_R = Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
- h = Between Laboratory Consistency Statistic
- k = Within Laboratory Consistency Statistic

0.0000

n = FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 4.2

500 - Mechanical Compaction
501 - Bulk Density (g/cm3)
2011

Data						
n = 4	$(X_{ave})_{ave}$ =	2.3682	s_r =	0.0069	Check s_{Xave} =	0.0109
p = 27	s_{Xave} =	0.0109	s_{R*} =	0.0124	r = 2.8 s_r =	0.0191
Significance Level =	0.5%		s_R =	0.0124	R = 2.8 s_R =	0.0344

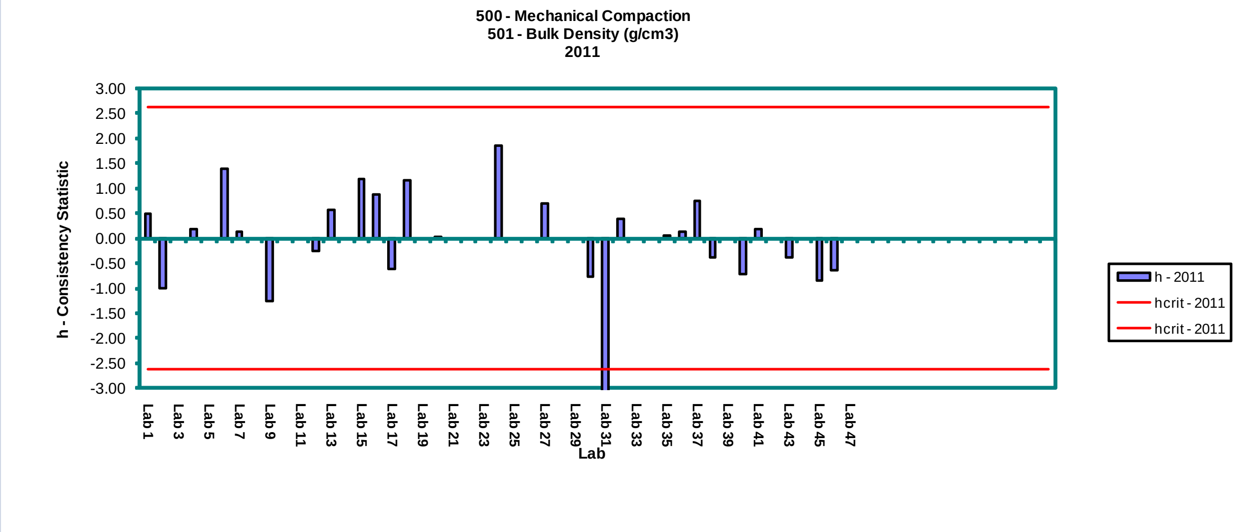
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.3770	2.3790	2.3690	2.3690	2.3735	0.0053	0.0053	0.0000	0.49	0.76	2.62	-2.62	2.02
Lab 2	2.3570	2.3590	2.3570	2.3560	2.3573	0.0013	-0.0110	0.0000	-1.00	0.18	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	2.3670	2.3670	2.3710	2.3760	2.3703	0.0043	0.0020	0.0000	0.19	0.62	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	2.3880	2.3770	2.3850	2.3830	2.3833	0.0046	0.0150	0.0000	1.38	0.68	2.62	-2.62	2.02
Lab 7	2.3560	2.3730	2.3750	2.3740	2.3695	0.0090	0.0013	0.0001	0.12	1.31	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	2.3590	2.3520	2.3500	2.3570	2.3545	0.0042	-0.0137	0.0000	-1.26	0.61	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	2.3630	2.3650	2.3650	2.3690	2.3655	0.0025	-0.0027	0.0000	-0.25	0.37	2.62	-2.62	2.02
Lab 13	2.3710	2.3750	2.3760	2.3760	2.3745	0.0024	0.0063	0.0000	0.58	0.35	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	2.3807	2.3812	2.3710	2.3912	2.3810	0.0082	0.0128	0.0001	1.18	1.20	2.62	-2.62	2.02
Lab 16	2.3790	2.3770	2.3770	2.3780	2.3778	0.0010	0.0095	0.0000	0.88	0.14	2.62	-2.62	2.02
Lab 17	2.3530	2.3530	2.3860	2.3540	2.3615	0.0163	-0.0067	0.0003	-0.61	2.38	2.62	-2.62	2.02
Lab 18	2.3780	2.3810	2.3810	2.3830	2.3808	0.0021	0.0125	0.0000	1.15	0.30	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	2.3644	2.3698	2.3726	2.3670	2.3685	0.0035	0.0002	0.0000	0.02	0.51	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	2.3895	2.3867	2.3890	2.3879	2.3883	0.0012	0.0201	0.0000	1.84	0.18	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	2.3680	2.3820	2.3770	2.3760	2.3758	0.0058	0.0075	0.0000	0.69	0.84	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	2.3690	2.3500	2.3550	2.3650	2.3598	0.0088	-0.0085	0.0001	-0.78	1.27	2.62	-2.62	2.02
Lab 31	2.3230	2.3410	2.3510	2.3210	2.3340	0.0145	-0.0342	0.0002	-3.14	2.10	2.62	-2.62	2.02
Lab 32	2.3690	2.3670	2.3770	2.3770	2.3725	0.0053	0.0043	0.0000	0.39	0.76	2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	2.3690	2.3710	2.3700	2.3650	2.3688	0.0026	0.0005	0.0000	0.05	0.38	2.62	-2.62	2.02
Lab 36	2.3680	2.3700	2.3700	2.3700	2.3695	0.0010	0.0013	0.0000	0.12	0.15	2.62	-2.62	2.02
Lab 37	2.3760	2.3770	2.3740	2.3780	2.3763	0.0017	0.0080	0.0000	0.74	0.25	2.62	-2.62	2.02
Lab 38	2.3660	2.3420	2.3740	2.3740	2.3640	0.0151	-0.0042	0.0002	-0.39	2.20	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	2.3610	2.3640	2.3590	2.3580	2.3605	0.0026	-0.0077	0.0000	-0.71	0.38	2.62	-2.62	2.02
Lab 41	2.3680	2.3650	2.3710	2.3770	2.3703	0.0051	0.0020	0.0000	0.19	0.74	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	2.3560	2.3720	2.3630	2.3650	2.3640	0.0066	-0.0042	0.0000	-0.39	0.96	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	2.3590	2.3590	2.3650	2.3530	2.3590	0.0049	-0.0092	0.0000	-0.84	0.71	2.62	-2.62	2.02
Lab 46	2.3710	2.3560	2.3550	2.3630	2.3613	0.0074	-0.0070	0.0001	-0.64	1.08	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

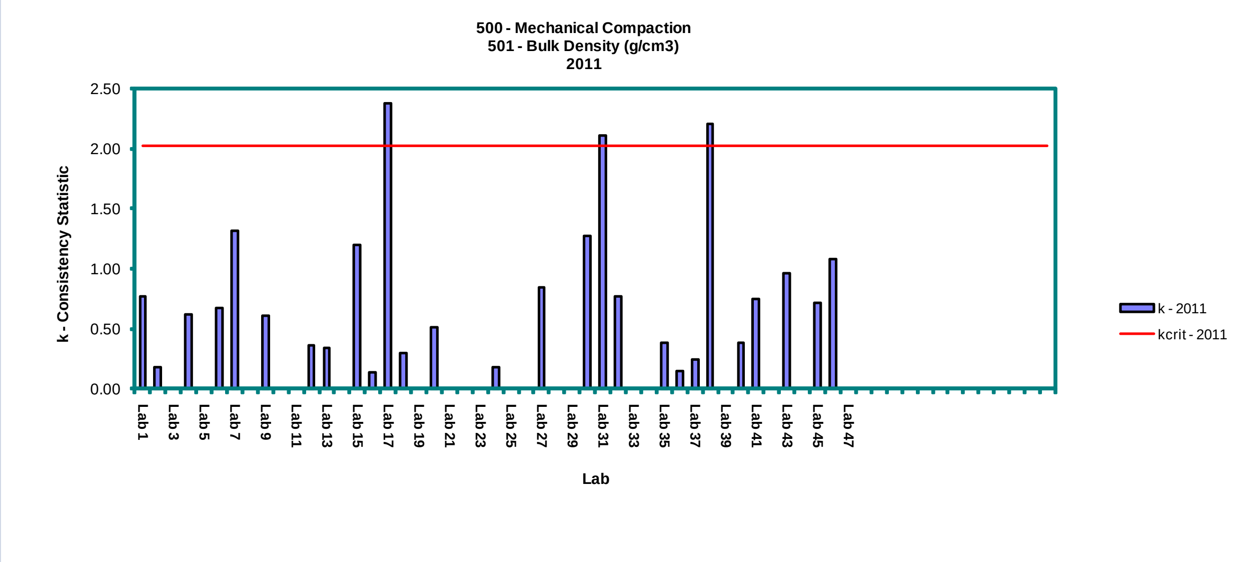
Additional Statistics						
	Minimum X_{ave}	2.3340	r = 2.8 s_r =	0.0191	h_{crit} =	2.62
	Maximum X_{ave}	2.3883	R = 2.8 s_R =	0.0344	h_{crit} =	-2.62
	Check s_{Xave} =	0.0109			k_{crit} =	2.02

Where:		Where:	
$x_1 .... x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Betw een Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1 \ldots x_n$ =	Individual Test Result	Where: $(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation	s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic	r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic	R =	95% Confidence Limit for Reproducibility

Table No. 5.1

400 - Hand Compaction
402 - Marshall Stability (kN)
2011

Data						
n =	4	$(X_{ave})_{ave}$ =	9.9787	s_r =	0.6916	Check s_{Xave} = 1.7965
p =	40	s_{Xave} =	1.7965	s_{R^*} =	1.8937	r = 2.8 s_r = 1.9170
Significance Level =	0.5%			s_R =	1.8937	R = 2.8 s_R = 5.2492

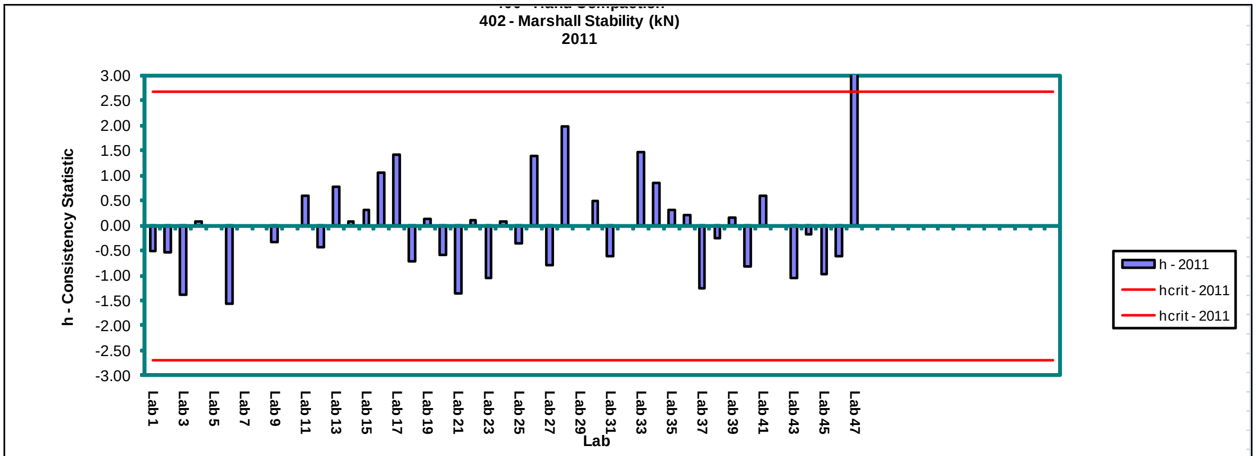
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	11.5000	7.3000	8.9000	8.6000	9.0750	1.7595	-0.9037	3.0958	-0.50	2.54	2.68	-2.68	2.03
Lab 2	9.2140	9.0000	8.7860	9.0000	9.0000	0.1747	-0.9787	0.0305	-0.54	0.25	2.68	-2.68	2.03
Lab 3	7.7000	7.3800	7.4900	7.3800	7.4875	0.1509	-2.4912	0.0228	-1.39	0.22	2.68	-2.68	2.03
Lab 4	9.9640	9.7500	9.8570	10.8260	10.0993	0.4923	0.1206	0.2424	0.07	0.71	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	6.6100	8.0500	6.5000	7.5000	7.1650	0.7407	-2.8137	0.5486	-1.57	1.07	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	9.3480	9.3480	9.2610	9.5660	9.3808	0.1301	-0.5979	0.0169	-0.33	0.19	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	11.0300	10.8700	11.2400	11.1200	11.0650	0.1559	1.0863	0.0243	0.60	0.23	2.68	-2.68	2.03
Lab 12	9.2000	8.8000	9.5000	9.3000	9.2000	0.2944	-0.7787	0.0867	-0.43	0.43	2.68	-2.68	2.03
Lab 13	11.1500	10.7570	11.2030	12.3010	11.3528	0.6627	1.3741	0.4392	0.76	0.96	2.68	-2.68	2.03
Lab 14	9.6000	11.5000	9.2000	10.2000	10.1250	1.0046	0.1463	1.0092	0.08	1.45	2.68	-2.68	2.03
Lab 15	10.7800	10.7710	10.7040	9.8690	10.5310	0.4426	0.5523	0.1959	0.31	0.64	2.68	-2.68	2.03
Lab 16	12.0000	11.8000	11.7000	12.0000	11.8750	0.1500	1.8963	0.0225	1.06	0.22	2.68	-2.68	2.03
Lab 17	13.0240	11.8920	13.3310	11.9180	12.5413	0.7454	2.5626	0.5556	1.43	1.08	2.68	-2.68	2.03
Lab 18	8.7000	8.6000	8.7000	8.7000	8.6750	0.0500	-1.3037	0.0025	-0.73	0.07	2.68	-2.68	2.03
Lab 19	10.6700	10.0100	9.7300	10.5300	10.2350	0.4404	0.2563	0.1940	0.14	0.64	2.68	-2.68	2.03
Lab 20	8.6200	8.7000	8.0800	10.3200	8.9300	0.9667	-1.0487	0.9345	-0.58	1.40	2.68	-2.68	2.03
Lab 21	7.9000	7.7000	7.0000	7.6000	7.5500	0.3873	-2.4287	0.1500	-1.35	0.56	2.68	-2.68	2.03
Lab 22	10.2000	10.0000	9.9000	10.5000	10.1500	0.2646	0.1713	0.0700	0.10	0.38	2.68	-2.68	2.03
Lab 23	7.5600	7.7830	8.2120	8.8410	8.0990	0.5638	-1.8797	0.3179	-1.05	0.82	2.68	-2.68	2.03
Lab 24	10.2874	10.0166	9.9629	10.1789	10.1115	0.1490	0.1328	0.0222	0.07	0.22	2.68	-2.68	2.03
Lab 25	9.6810	9.4780	9.1820	8.9300	9.3178	0.3299	-0.6609	0.1088	-0.37	0.48	2.68	-2.68	2.03
Lab 26	12.2000	12.2000	13.4000	12.2000	12.5000	0.6000	2.5213	0.3600	1.40	0.87	2.68	-2.68	2.03
Lab 27	8.7000	8.4000	8.8000	8.4000	8.5750	0.2062	-1.4037	0.0425	-0.78	0.30	2.68	-2.68	2.03
Lab 28	13.4000	12.8000	15.2000	12.8000	13.5500	1.1358	3.5713	1.2900	1.99	1.64	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	10.8480	10.6080	10.9440	11.1360	10.8840	0.2195	0.9053	0.0482	0.50	0.32	2.68	-2.68	2.03
Lab 31	7.0000	8.0000	9.7000	10.8000	8.8750	1.6998	-1.1037	2.8892	-0.61	2.46	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	11.6000	12.9000	12.5000	13.5000	12.6250	0.7974	2.6463	0.6358	1.47	1.15	2.68	-2.68	2.03
Lab 34	11.2000	11.5000	11.6000	11.8000	11.5250	0.2500	1.5463	0.0625	0.86	0.36	2.68	-2.68	2.03
Lab 35	10.1000	10.9000	10.3000	10.9000	10.5500	0.4123	0.5713	0.1700	0.32	0.60	2.68	-2.68	2.03
Lab 36	10.6000	11.0000	9.4000	10.4000	10.3500	0.6807	0.3713	0.4633	0.21	0.98	2.68	-2.68	2.03
Lab 37	7.7500	7.7000	7.7500	7.7500	7.7375	0.0250	-2.2412	0.0006	-1.25	0.04	2.68	-2.68	2.03
Lab 38	9.4660	10.4170	8.5840	9.5900	9.5143	0.7502	-0.4644	0.5628	-0.26	1.08	2.68	-2.68	2.03
Lab 39	11.1000	10.7000	9.5000	9.8000	10.2750	0.7500	0.2963	0.5625	0.16	1.08	2.68	-2.68	2.03
Lab 40	8.5000	8.7000	8.5000	8.3000	8.5000	0.1633	-1.4787	0.0267	-0.82	0.24	2.68	-2.68	2.03
Lab 41	10.0400	10.8100	11.3000	11.9800	11.0325	0.8173	1.0538	0.6680	0.59	1.18	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	8.3880	7.6920	8.3880	7.9820	8.1125	0.3394	-1.8662	0.1152	-1.04	0.49	2.68	-2.68	2.03
Lab 44	10.4000	9.0000	9.1000	10.2000	9.6750	0.7274	-0.3037	0.5292	-0.17	1.05	2.68	-2.68	2.03
Lab 45	8.7000	8.8000	8.3000	7.2000	8.2500	0.7326	-1.7287	0.5367	-0.96	1.06	2.68	-2.68	2.03
Lab 46	8.5800	9.0010	9.1200	8.8920	8.8983	0.2317	-1.0804	0.0537	-0.60	0.34	2.68	-2.68	2.03
Lab 47	13.9420	16.7480	15.3000	17.0170	15.7518	1.4227	5.7731	2.0242	3.21	2.06	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

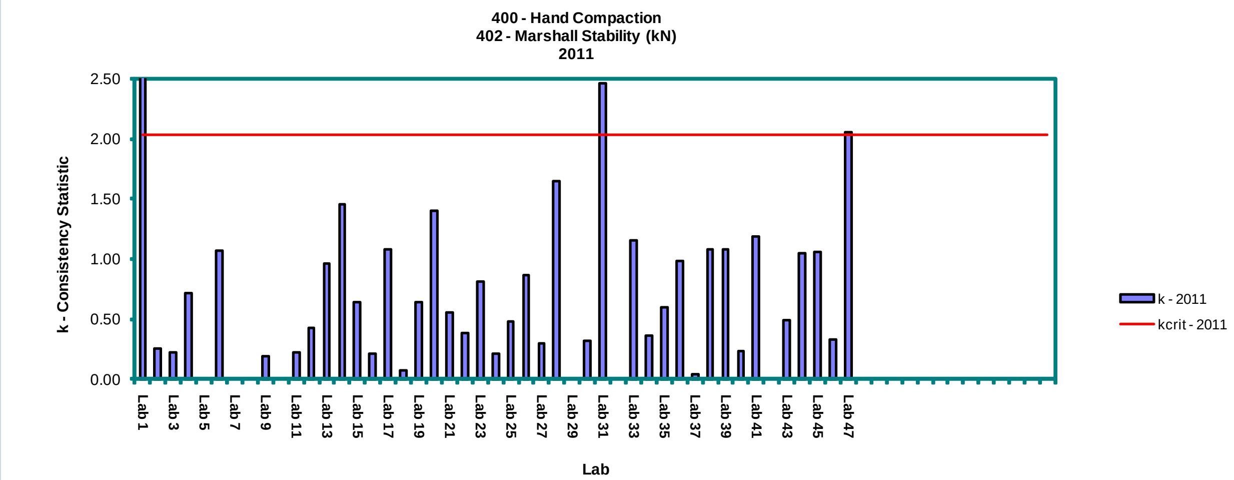
Additional Statistics						
	Minimum X_{ave}	7.1650	r = 2.8 s_r =	1.9170	h_{crit} =	2.68
	Maximum X_{ave}	15.7518	R = 2.8 s_R =	5.2492	h_{crit} =	-2.68
	Check s_{Xave} =	1.7965			k_{crit} =	2.03

Where:			Where:	
$x_1....x_n$ =	Individual Test Result		$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 5.2

500 - Mechanical Compaction
502 - Marshall Stability (kN)
2011

Data						
n =	4	$(X_{ave})_{ave}$ =	9.8058	s_r =	0.5324	Check s_{Xave} = 1.6808
p =	26	s_{Xave} =	1.6808	s_{R*} =	1.7429	$r = 2.8\ s_r$ = 1.4757
Significance Level =		0.5%		s_R =	1.7429	$R = 2.8\ s_R$ = 4.8311

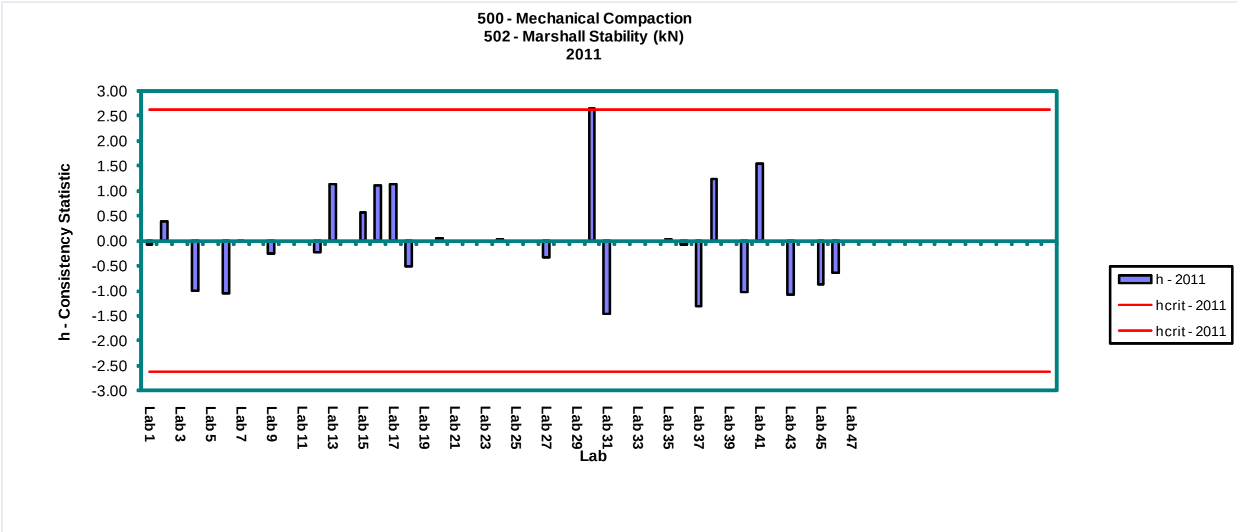
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	9.4000	9.7000	10.3000	9.4000	9.7000	0.4243	-0.1058	0.1800	-0.06	0.80	2.62	-2.62	2.02
Lab 2	11.5710	10.2860	10.0710	9.8570	10.4463	0.7700	0.6405	0.5929	0.38	1.45	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	7.5000	7.6000	9.0000	8.3570	8.1143	0.7036	-1.6915	0.4951	-1.01	1.32	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	8.0500	7.6900	8.6200	7.8800	8.0600	0.4012	-1.7458	0.1610	-1.04	0.75	2.62	-2.62	2.02
Lab 7	10.1680	9.4660	10.0510	9.5230	9.8020	0.3590	-0.0038	0.1289	0.00	0.67	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	9.3480	9.4350	9.3480	9.3050	9.3590	0.0546	-0.4468	0.0030	-0.27	0.10	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	9.6000	9.2000	9.3000	9.6000	9.4250	0.2062	-0.3808	0.0425	-0.23	0.39	2.62	-2.62	2.02
Lab 13	11.7080	12.0090	11.3930	11.7210	11.7078	0.2517	1.9020	0.0633	1.13	0.47	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	11.1550	10.7710	10.7620	10.4350	10.7808	0.2944	0.9750	0.0867	0.58	0.55	2.62	-2.62	2.02
Lab 16	11.6000	11.4000	12.0000	11.7000	11.6750	0.2500	1.8692	0.0625	1.11	0.47	2.62	-2.62	2.02
Lab 17	11.7090	11.8560	11.2050	12.1270	11.7243	0.3870	1.9185	0.1498	1.14	0.73	2.62	-2.62	2.02
Lab 18	8.7000	8.9000	9.1000	9.1000	8.9500	0.1915	-0.8558	0.0367	-0.51	0.36	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	9.9100	9.1700	10.4100	10.0800	9.8925	0.5245	0.0867	0.2751	0.05	0.99	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	10.0166	9.7469	9.9091	9.7469	9.8549	0.1322	0.0491	0.0175	0.03	0.25	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	9.3000	9.5000	9.5000	8.7000	9.2500	0.3786	-0.5558	0.1433	-0.33	0.71	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	13.1920	13.7640	14.3040	15.7440	14.2510	1.0940	4.4452	1.1968	2.64	2.05	2.62	-2.62	2.02
Lab 31	5.6000	8.2000	8.8000	6.8000	7.3500	1.4364	-2.4558	2.0633	-1.46	2.70	2.62	-2.62	2.02
Lab 32											2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	9.7000	10.1000	10.2000	9.4000	9.8500	0.3697	0.0442	0.1367	0.03	0.69	2.62	-2.62	2.02
Lab 36	9.7000	9.1000	10.4000	9.6000	9.7000	0.5354	-0.1058	0.2867	-0.06	1.01	2.62	-2.62	2.02
Lab 37	7.7500	7.7500	7.5000	7.5000	7.6250	0.1443	-2.1808	0.0208	-1.30	0.27	2.62	-2.62	2.02
Lab 38	11.9400	11.9830	11.8510	11.6770	11.8628	0.1355	2.0570	0.0184	1.22	0.25	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	8.1000	8.4000	8.0000	7.9000	8.1000	0.2160	-1.7058	0.0467	-1.01	0.41	2.62	-2.62	2.02
Lab 41	11.9900	13.3700	12.8600	11.4700	12.4225	0.8531	2.6167	0.7278	1.56	1.60	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	8.0980	8.0400	7.9240	7.9820	8.0110	0.0749	-1.7948	0.0056	-1.07	0.14	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	8.8000	8.7000	7.5000	8.3000	8.3250	0.5909	-1.4808	0.3492	-0.88	1.11	2.62	-2.62	2.02
Lab 46	9.0720	8.7530	8.6230	8.3990	8.7118	0.2812	-1.0940	0.0791	-0.65	0.53	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

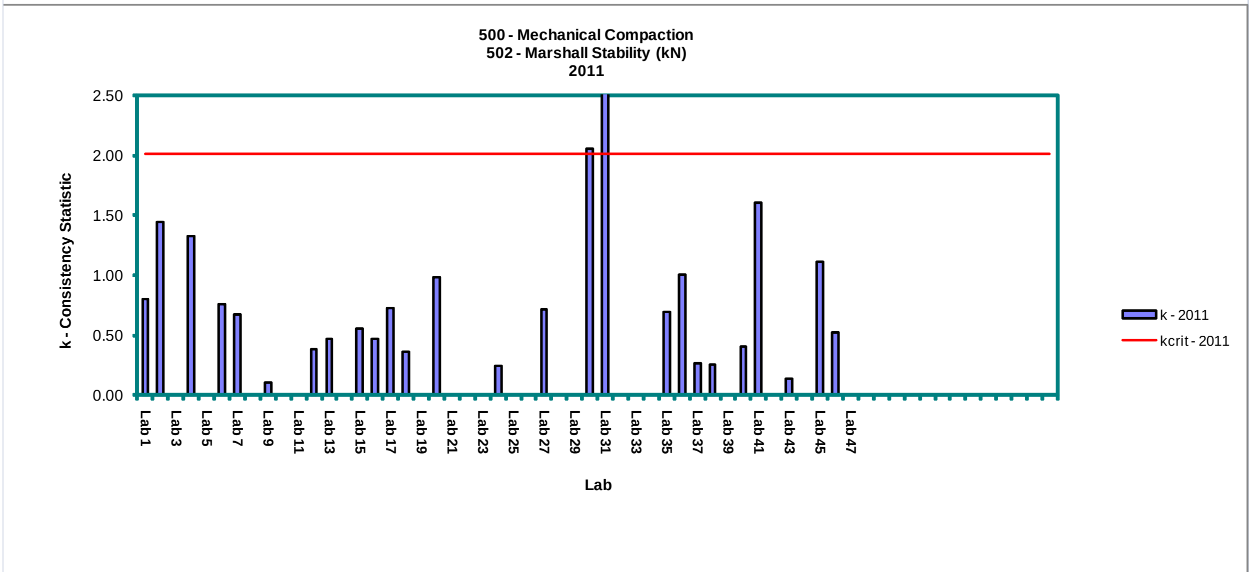
Additional Statistics						
	Minimum X_{ave}	7.3500	$r = 2.8\ s_r$ =	1.4757	h_{crit} =	2.62
	Maximum X_{ave}	14.2510	$R = 2.8\ s_R$ =	4.8311	h_{crit} =	-2.62
	Check s_{Xave} =	1.6808			k_{crit} =	2.02

Where:			Where:	
	$x_1 \ldots x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Betw een Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Betw een Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 6.1

400 - Hand Compaction
403 - Flow (mm)
2011

Data					
n =	4	$(X_{ave})_{ave}$ =	2.3046	s_r =	0.2515
p =	40	s_{Xave} =	0.3818	s_{R*} =	0.4395
Significance Level =		0.5%		s_R =	0.4395

Check s_{Xave} =	0.3818
r = 2.8 s_r =	0.6970
R = 2.8 s_R =	1.2183

Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.2900	2.0300	2.2900	2.5400	2.2875	0.2082	-0.0171	0.0434	-0.04	0.83	2.68	-2.68	2.03
Lab 2	1.8125	1.7500	1.7500	1.7500	1.7656	0.0313	-0.5390	0.0010	-1.41	0.12	2.68	-2.68	2.03
Lab 3	2.0000	1.5000	1.5000	2.0000	1.7500	0.2887	-0.5546	0.0833	-1.45	1.15	2.68	-2.68	2.03
Lab 4	2.8125	2.6250	2.8125	2.7500	2.7500	0.0884	0.4454	0.0078	1.17	0.35	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	2.9000	1.1000	1.6000	1.3000	1.7250	0.8098	-0.5796	0.6558	-1.52	3.22	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	1.8000	1.6000	2.0000	2.0000	1.8500	0.1915	-0.4546	0.0367	-1.19	0.76	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	2.0000	2.0000	2.0000	2.0000	2.0000	0.0000	-0.3046	0.0000	-0.80	0.00	2.68	-2.68	2.03
Lab 12	2.7300	2.6500	2.5400	2.7600	2.6700	0.0983	0.3654	0.0097	0.96	0.39	2.68	-2.68	2.03
Lab 13	2.8000	2.6000	2.8000	2.9000	2.7750	0.1258	0.4704	0.0158	1.23	0.50	2.68	-2.68	2.03
Lab 14	2.5400	2.0300	2.8000	2.5400	2.4775	0.3225	0.1729	0.1040	0.45	1.28	2.68	-2.68	2.03
Lab 15	2.3000	2.2000	2.4000	2.0000	2.2250	0.1708	-0.0796	0.0292	-0.21	0.68	2.68	-2.68	2.03
Lab 16	2.5000	2.5000	2.4000	2.5000	2.4750	0.0500	0.1704	0.0025	0.45	0.20	2.68	-2.68	2.03
Lab 17	1.9000	1.6000	2.2000	1.9000	1.9000	0.2449	-0.4046	0.0600	-1.06	0.97	2.68	-2.68	2.03
Lab 18	2.2000	2.2000	2.2500	2.3000	2.2375	0.0479	-0.0671	0.0023	-0.18	0.19	2.68	-2.68	2.03
Lab 19	1.9000	2.1000	1.5000	2.1000	1.9000	0.2828	-0.4046	0.0800	-1.06	1.12	2.68	-2.68	2.03
Lab 20	2.2400	2.2500	2.3700	2.8900	2.4375	0.3074	0.1329	0.0945	0.35	1.22	2.68	-2.68	2.03
Lab 21	1.8000	1.9000	1.8000	1.9000	1.8500	0.0577	-0.4546	0.0033	-1.19	0.23	2.68	-2.68	2.03
Lab 22	2.5000	2.0000	2.2500	2.2500	2.2500	0.2041	-0.0546	0.0417	-0.14	0.81	2.68	-2.68	2.03
Lab 23	2.8000	3.0000	3.3000	3.3000	3.1000	0.2449	0.7954	0.0600	2.08	0.97	2.68	-2.68	2.03
Lab 24	2.6924	2.7432	2.6924	2.7178	2.7115	0.0243	0.4069	0.0006	1.07	0.10	2.68	-2.68	2.03
Lab 25	2.0360	2.1190	2.0740	2.1600	2.0973	0.0539	-0.2073	0.0029	-0.54	0.21	2.68	-2.68	2.03
Lab 26	2.2000	2.3000	2.1000	2.1000	2.1750	0.0957	-0.1296	0.0092	-0.34	0.38	2.68	-2.68	2.03
Lab 27	2.5000	2.4000	2.6000	2.4000	2.4750	0.0957	0.1704	0.0092	0.45	0.38	2.68	-2.68	2.03
Lab 28	2.5000	2.3000	2.3000	2.0000	2.2750	0.2062	-0.0296	0.0425	-0.08	0.82	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	2.3750	2.3750	2.3500	2.2000	2.3250	0.0842	0.0204	0.0071	0.05	0.33	2.68	-2.68	2.03
Lab 31	2.3000	2.1000	2.1000	2.2000	2.1750	0.0957	-0.1296	0.0092	-0.34	0.38	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	2.0000	2.3000	2.3000	2.3000	2.2250	0.1500	-0.0796	0.0225	-0.21	0.60	2.68	-2.68	2.03
Lab 34	2.5000	3.0000	2.7500	3.2500	2.8750	0.3227	0.5704	0.1042	1.49	1.28	2.68	-2.68	2.03
Lab 35	2.3000	2.5000	2.0000	2.3000	2.2750	0.2062	-0.0296	0.0425	-0.08	0.82	2.68	-2.68	2.03
Lab 36	2.3750	2.2500	2.2500	2.3000	2.2938	0.0591	-0.0108	0.0035	-0.03	0.23	2.68	-2.68	2.03
Lab 37	1.9000	1.8000	1.9000	1.9000	1.8750	0.0500	-0.4296	0.0025	-1.13	0.20	2.68	-2.68	2.03
Lab 38	2.3000	2.2000	2.0000	2.3000	2.2000	0.1414	-0.1046	0.0200	-0.27	0.56	2.68	-2.68	2.03
Lab 39	2.5000	2.8000	2.3000	2.5000	2.5250	0.2062	0.2204	0.0425	0.58	0.82	2.68	-2.68	2.03
Lab 40	2.4000	2.2000	2.3000	2.3000	2.3000	0.0816	-0.0046	0.0067	-0.01	0.32	2.68	-2.68	2.03
Lab 41	2.2022	2.5146	2.3368	2.2301	2.3209	0.1415	0.0163	0.0200	0.04	0.56	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	2.1300	1.8800	1.7000	1.9000	1.9025	0.1763	-0.4021	0.0311	-1.05	0.70	2.68	-2.68	2.03
Lab 44	3.7500	4.5000	2.5000	3.2500	3.5000	0.8416	1.1954	0.7083	3.13	3.35	2.68	-2.68	2.03
Lab 45	2.0300	2.2900	2.0300	2.2900	2.1600	0.1501	-0.1446	0.0225	-0.38	0.60	2.68	-2.68	2.03
Lab 46	2.2800	2.4800	2.2300	2.3900	2.3450	0.1121	0.0404	0.0126	0.11	0.45	2.68	-2.68	2.03
Lab 47	2.7000	2.3420	2.9690	2.8960	2.7268	0.2805	0.4222	0.0787	1.11	1.12	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

Additional Statistics						
	Minimum X_{ave}	1.7250	r = 2.8 s_r =	0.6970	h_{crit} =	2.68
	Maximum X_{ave}	3.5000	R = 2.8 s_R =	1.2183	h_{crit} =	-2.68
	Check s_{Xave} =	0.3818			k_{crit} =	2.03

Where:

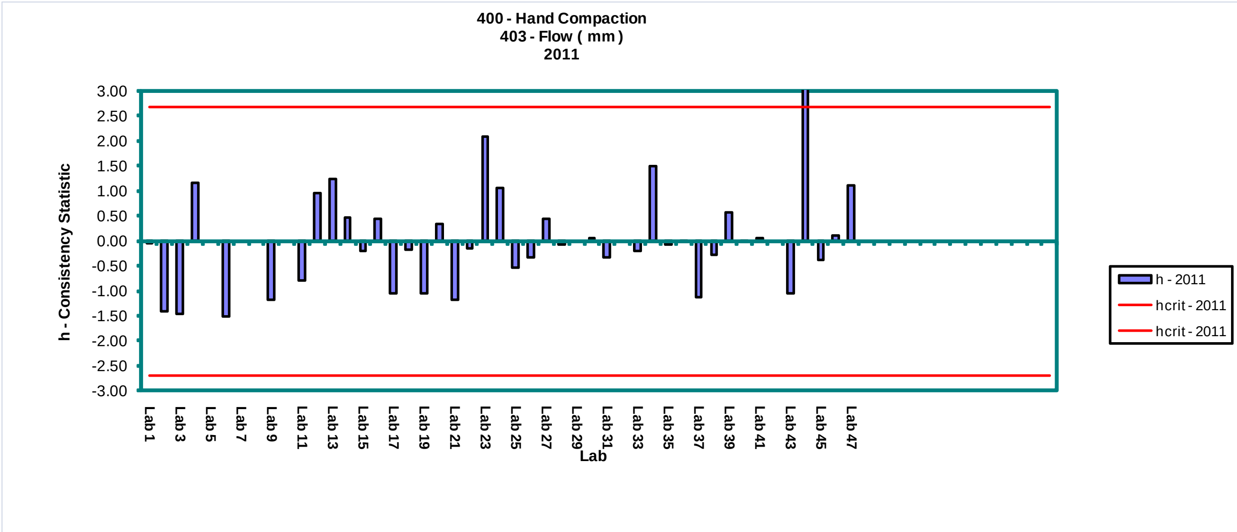
x_1....x_n =	Individual Test Result
X_{ave} =	Cell Average
n =	Number of Test Results per Cell
s =	Cell Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)
s^2 =	Cell Variation
p =	Number of Laboratories

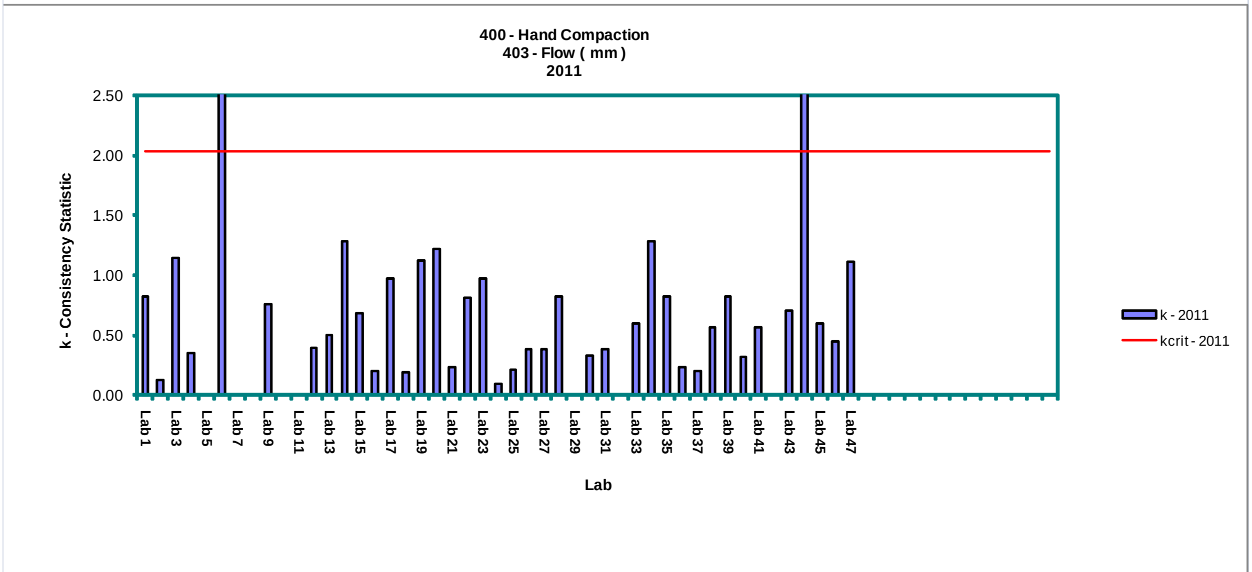
Where:

$(X_{ave})_{ave}$ =	Average of Cell Averages
s_{Xave} =	Standard Deviation of Cell Averages
s_r =	Repeatability Standard Deviation
s_{R*} =	Interim Reproducibility Standard Deviation
s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
h =	Between Laboratory Consistency Statistic
k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Betw een Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Betw een Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 6.2

500 - Mechanical Compaction
503 - Flow (mm)
2011

Data						
n =	4	$(X_{ave})_{ave}$ =	2.1805	s_r =	0.1481	Check s_{Xave} = 0.3408
p =	26	s_{Xave} =	0.3408	s_{R*} =	0.3641	r = 2.8 s_r = 0.4105
Significance Level =		0.5%		s_R =	0.3641	R = 2.8 s_R = 1.0093

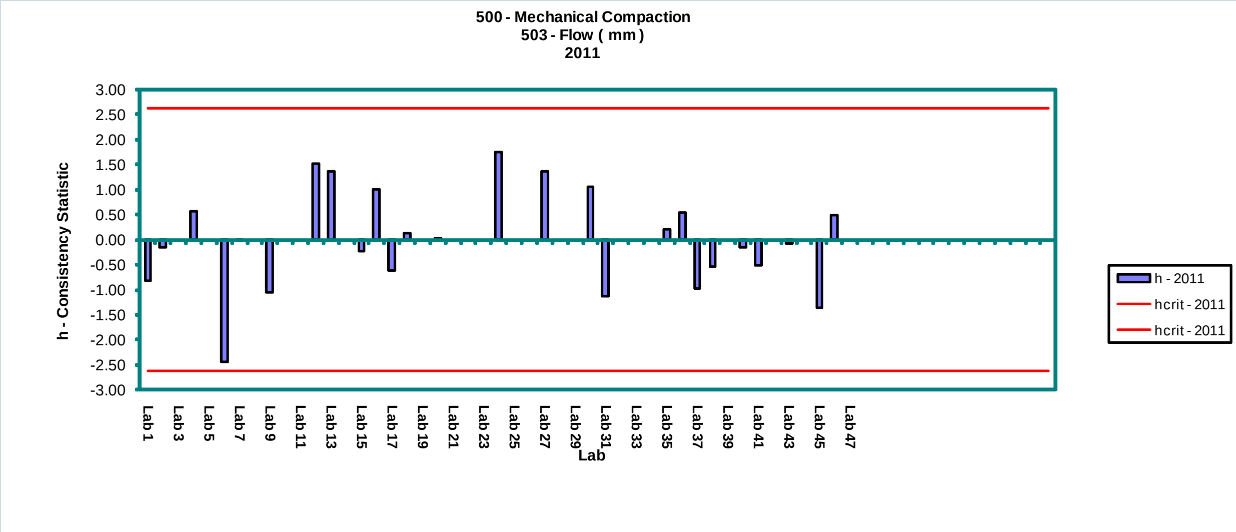
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	1.7800	1.7800	2.0300	2.0300	1.9050	0.1443	-0.2755	0.0208	-0.81	0.97	2.62	-2.62	2.02
Lab 2	2.3750	2.0625	2.0000	2.0625	2.1250	0.1693	-0.0555	0.0286	-0.16	1.14	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	2.4375	2.2500	2.3750	2.4375	2.3750	0.0884	0.1945	0.0078	0.57	0.60	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	1.4000	1.3000	1.3000	1.4000	1.3500	0.0577	-0.8305	0.0033	-2.44	0.39	2.62	-2.62	2.02
Lab 7	2.4000	1.9000	2.1000	2.3000	2.1750	0.2217	-0.0055	0.0492	-0.02	1.50	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	1.7000	1.9000	2.0000	1.7000	1.8250	0.1500	-0.3555	0.0225	-1.04	1.01	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	2.8000	2.7000	2.6300	2.6800	2.7025	0.0714	0.5220	0.0051	1.53	0.48	2.62	-2.62	2.02
Lab 13	2.6000	2.8000	2.6000	2.6000	2.6500	0.1000	0.4695	0.0100	1.38	0.68	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	2.1000	2.2000	2.1000	2.0000	2.1000	0.0816	-0.0805	0.0067	-0.24	0.55	2.62	-2.62	2.02
Lab 16	2.5000	2.6000	2.5000	2.5000	2.5250	0.0500	0.3445	0.0025	1.01	0.34	2.62	-2.62	2.02
Lab 17	2.0000	2.0000	2.0000	1.9000	1.9750	0.0500	-0.2055	0.0025	-0.60	0.34	2.62	-2.62	2.02
Lab 18	2.2000	2.2000	2.2500	2.2500	2.2250	0.0289	0.0445	0.0008	0.13	0.19	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	2.1400	2.1400	2.1000	2.3500	2.1825	0.1132	0.0020	0.0128	0.01	0.76	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	2.7686	2.7432	2.7940	2.7940	2.7750	0.0243	0.5944	0.0006	1.74	0.16	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	3.0000	2.7000	2.5000	2.4000	2.6500	0.2646	0.4695	0.0700	1.38	1.79	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	2.3750	2.6500	2.6250	2.5000	2.5375	0.1267	0.3570	0.0160	1.05	0.86	2.62	-2.62	2.02
Lab 31	1.8000	1.8000	1.7000	1.9000	1.8000	0.0816	-0.3805	0.0067	-1.12	0.55	2.62	-2.62	2.02
Lab 32											2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	2.4000	2.2000	2.1000	2.3000	2.2500	0.1291	0.0695	0.0167	0.20	0.87	2.62	-2.62	2.02
Lab 36	2.4250	2.4250	2.3500	2.2750	2.3688	0.0718	0.1882	0.0052	0.55	0.48	2.62	-2.62	2.02
Lab 37	1.9000	1.8000	1.9000	1.8000	1.8500	0.0577	-0.3305	0.0033	-0.97	0.39	2.62	-2.62	2.02
Lab 38	1.9000	2.2000	1.8000	2.1000	2.0000	0.1826	-0.1805	0.0333	-0.53	1.23	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	2.2000	2.1000	2.1000	2.1000	2.1250	0.0500	-0.0555	0.0025	-0.16	0.34	2.62	-2.62	2.02
Lab 41	2.0701	1.9406	2.0142	1.9837	2.0022	0.0544	-0.1784	0.0030	-0.52	0.37	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	2.1300	2.2500	2.0000	2.2500	2.1575	0.1193	-0.0230	0.0142	-0.07	0.81	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	1.2700	1.5200	1.7800	2.2900	1.7150	0.4362	-0.4655	0.1903	-1.37	2.95	2.62	-2.62	2.02
Lab 46	2.2800	2.2400	2.2400	2.6300	2.3475	0.1893	0.1670	0.0358	0.49	1.28	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

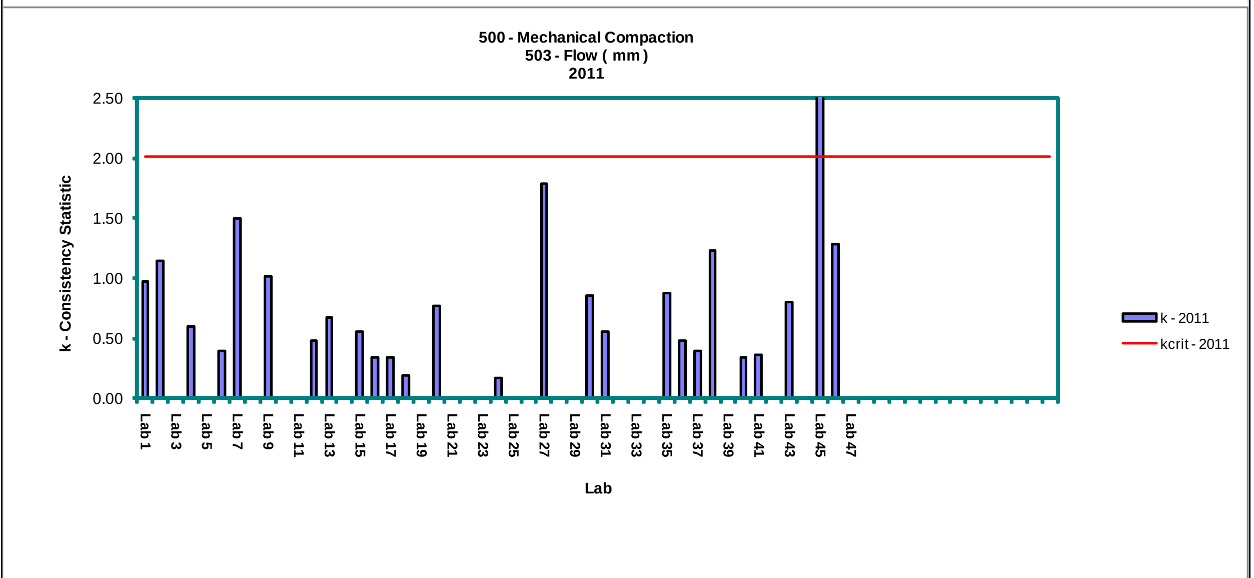
Additional Statistics					
Minimum X_{ave}	1.3500	r = 2.8 s_r =	0.4105	h_{crit} =	2.62
Maximum X_{ave}	2.7750	R = 2.8 s_R =	1.0093	h_{crit} =	-2.62
Check s_{Xave} =	0.3408			k_{crit} =	2.02

Where:		Where:	
$x_1 \ldots x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 7.1

400 - Hand Compaction
404 - VMA (%)
2011

Data						
n =	4	$(X_{ave})_{ave}$ =	15.4838	s_r =	0.1938	Check s_{Xave} = 0.4481
p =	40	s_{Xave} =	0.4481	s_{R*} =	0.4785	r = 2.8 s_r = 0.5371
Significance Level =		0.5%		s_R =	0.4785	R = 2.8 s_R = 1.3264

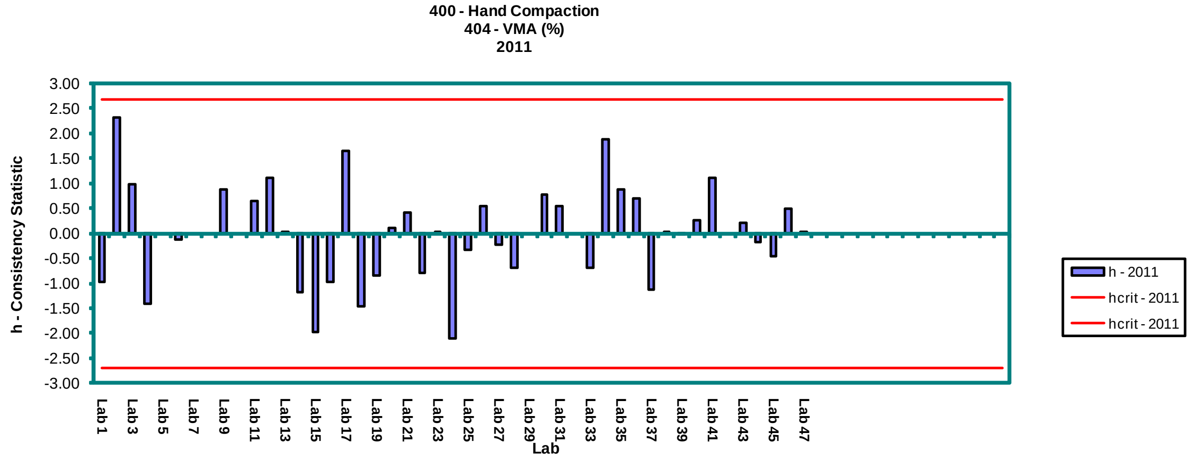
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	14.7000	15.5000	14.8000	15.2000	15.0500	0.3697	-0.4338	0.1367	-0.97	1.91	2.68	-2.68	2.03
Lab 2	16.4000	16.6000	16.5000	16.6000	16.5250	0.0957	1.0412	0.0092	2.32	0.49	2.68	-2.68	2.03
Lab 3	15.9000	16.0000	15.9000	15.9000	15.9250	0.0500	0.4412	0.0025	0.98	0.26	2.68	-2.68	2.03
Lab 4	15.1000	15.3000	14.7000	14.3000	14.8500	0.4435	-0.6338	0.1967	-1.41	2.29	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	15.4000	15.3000	15.5000	15.5000	15.4250	0.0957	-0.0588	0.0092	-0.13	0.49	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	15.8000	15.9000	15.8000	16.0000	15.8750	0.0957	0.3912	0.0092	0.87	0.49	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	15.8000	15.7000	15.6000	16.0000	15.7750	0.1708	0.2912	0.0292	0.65	0.88	2.68	-2.68	2.03
Lab 12	16.0000	15.8000	16.1000	16.0000	15.9750	0.1258	0.4912	0.0158	1.10	0.65	2.68	-2.68	2.03
Lab 13	15.3000	15.7000	15.4000	15.6000	15.5000	0.1826	0.0162	0.0333	0.04	0.94	2.68	-2.68	2.03
Lab 14	15.1000	14.9000	14.9000	14.9000	14.9500	0.1000	-0.5338	0.0100	-1.19	0.52	2.68	-2.68	2.03
Lab 15	14.5000	14.7000	14.6000	14.6000	14.6000	0.0816	-0.8838	0.0067	-1.97	0.42	2.68	-2.68	2.03
Lab 16	15.0000	15.0000	15.0000	15.2000	15.0500	0.1000	-0.4338	0.0100	-0.97	0.52	2.68	-2.68	2.03
Lab 17	16.2000	16.4000	16.3000	16.0000	16.2250	0.1708	0.7412	0.0292	1.65	0.88	2.68	-2.68	2.03
Lab 18	14.9000	14.9000	14.8000	14.7000	14.8250	0.0957	-0.6588	0.0092	-1.47	0.49	2.68	-2.68	2.03
Lab 19	15.3400	15.2100	14.8900	15.0000	15.1100	0.2028	-0.3738	0.0411	-0.83	1.05	2.68	-2.68	2.03
Lab 20	15.5400	15.6400	15.3900	15.5500	15.5300	0.1036	0.0462	0.0107	0.10	0.53	2.68	-2.68	2.03
Lab 21	15.7000	15.7000	15.7000	15.6000	15.6750	0.0500	0.1912	0.0025	0.43	0.26	2.68	-2.68	2.03
Lab 22	15.4000	15.0000	15.0000	15.1000	15.1250	0.1893	-0.3588	0.0358	-0.80	0.98	2.68	-2.68	2.03
Lab 23	15.5100	15.5800	15.5500	15.3600	15.5000	0.0976	0.0162	0.0095	0.04	0.50	2.68	-2.68	2.03
Lab 24	14.4284	14.6426	14.6784	14.3926	14.5355	0.1458	-0.9483	0.0213	-2.12	0.75	2.68	-2.68	2.03
Lab 25	15.2920	15.1850	15.3270	15.5410	15.3363	0.1493	-0.1476	0.0223	-0.33	0.77	2.68	-2.68	2.03
Lab 26	15.8000	15.7000	15.7000	15.7000	15.7250	0.0500	0.2412	0.0025	0.54	0.26	2.68	-2.68	2.03
Lab 27	15.4928	15.3143	15.3857	15.3500	15.3857	0.0771	-0.0981	0.0059	-0.22	0.40	2.68	-2.68	2.03
Lab 28	15.2000	15.1000	15.1000	15.3000	15.1750	0.0957	-0.3088	0.0092	-0.69	0.49	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	15.9000	16.0000	15.8000	15.6000	15.8250	0.1708	0.3412	0.0292	0.76	0.88	2.68	-2.68	2.03
Lab 31	16.1000	15.9000	15.6000	15.3000	15.7250	0.3500	0.2412	0.1225	0.54	1.81	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	15.2000	15.2000	15.2000	15.1000	15.1750	0.0500	-0.3088	0.0025	-0.69	0.26	2.68	-2.68	2.03
Lab 34	16.4000	16.6000	16.0000	16.3000	16.3250	0.2500	0.8412	0.0625	1.88	1.29	2.68	-2.68	2.03
Lab 35	15.8000	15.9000	15.8000	16.0000	15.8750	0.0957	0.3912	0.0092	0.87	0.49	2.68	-2.68	2.03
Lab 36	15.8000	15.8000	15.9000	15.7000	15.8000	0.0816	0.3162	0.0067	0.71	0.42	2.68	-2.68	2.03
Lab 37	15.0000	15.0000	14.9000	15.0000	14.9750	0.0500	-0.5088	0.0025	-1.14	0.26	2.68	-2.68	2.03
Lab 38	16.1000	15.2000	15.8000	14.9000	15.5000	0.5477	0.0162	0.3000	0.04	2.83	2.68	-2.68	2.03
Lab 39	15.2000	15.6000	15.6000	15.5000	15.4750	0.1893	-0.0088	0.0358	-0.02	0.98	2.68	-2.68	2.03
Lab 40	15.6000	15.6000	15.6000	15.6000	15.6000	0.0000	0.1162	0.0000	0.26	0.00	2.68	-2.68	2.03
Lab 41	16.3000	16.1000	16.1000	15.4000	15.9750	0.3948	0.4912	0.1558	1.10	2.04	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	15.5700	15.6800	15.6800	15.3900	15.5800	0.1369	0.0962	0.0187	0.21	0.71	2.68	-2.68	2.03
Lab 44	15.4000	15.4000	15.3000	15.5000	15.4000	0.0816	-0.0838	0.0067	-0.19	0.42	2.68	-2.68	2.03
Lab 45	15.1000	15.3000	15.3000	15.4000	15.2750	0.1258	-0.2088	0.0158	-0.47	0.65	2.68	-2.68	2.03
Lab 46	15.8000	15.7000	15.6000	15.7000	15.7000	0.0816	0.2162	0.0067	0.48	0.42	2.68	-2.68	2.03
Lab 47	15.8000	15.2000	15.5000	15.5000	15.5000	0.2449	0.0162	0.0600	0.04	1.26	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

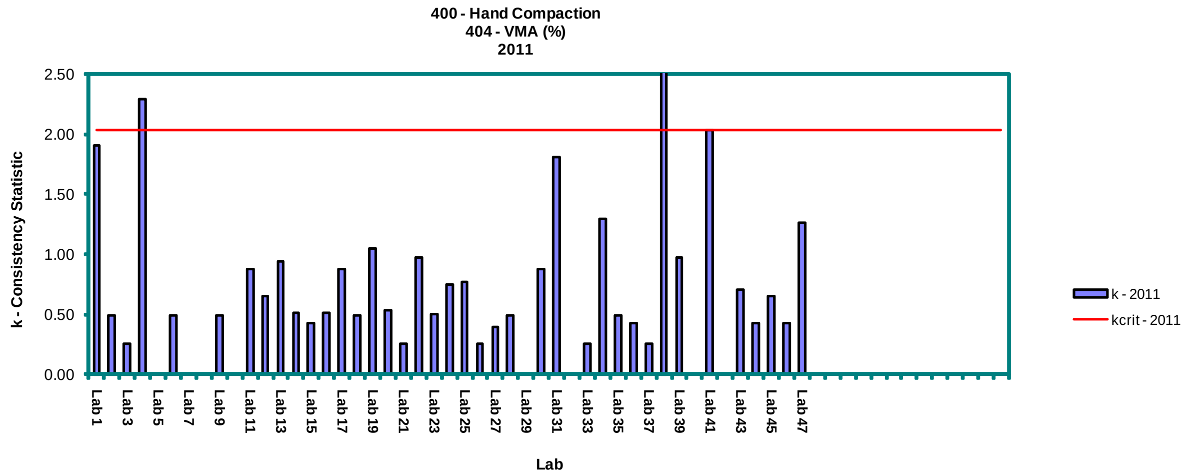
Additional Statistics						
	Minimum X_{ave}	14.5355	r = 2.8 s_r =	0.5371	h_{crit} =	2.68
	Maximum X_{ave}	16.5250	R = 2.8 s_R =	1.3264	h_{crit} =	-2.68
	Check s_{Xave} =	0.4481			k_{crit} =	2.03

Where:			Where:		
	$x_1 \ldots x_n$ =	Individual Test Result		$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Betw een Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Betw een Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 7.2

500 - Mechanical Compaction
504 - VMA (%)
2011

Data					
n = 4	$(X_{ave})_{ave}$ = 15.4748	s_r = 0.2421	Check s_{Xave} = 0.4614		
p = 27	s_{Xave} = 0.4614	s_{R*} = 0.5068	r = 2.8 s_r = 0.6710		
Significance Level = 0.5%		s_R = 0.5068	R = 2.8 s_R = 1.4049		

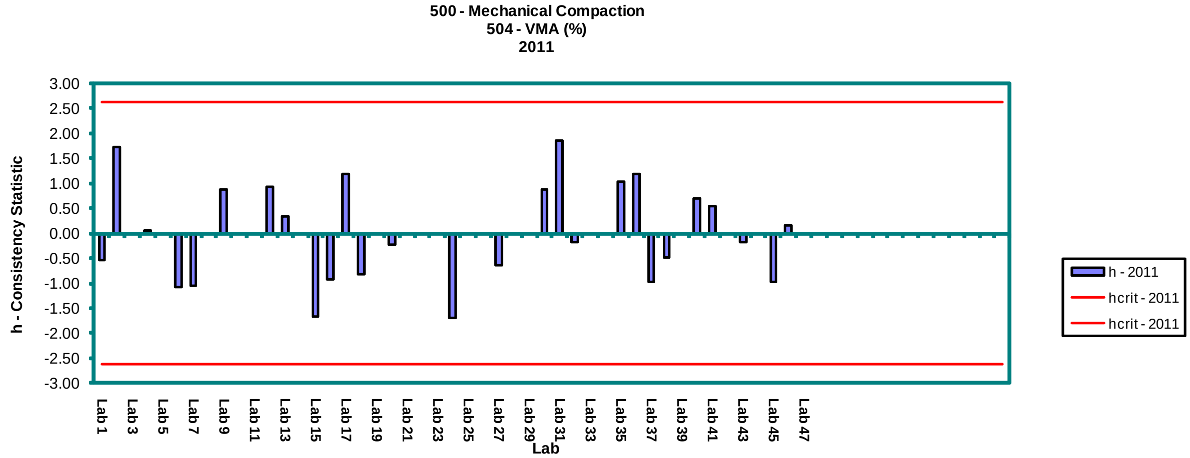
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	15.1000	15.0000	15.4000	15.4000	15.2250	0.2062	-0.2498	0.0425	-0.54	0.85	2.62	-2.62	2.02
Lab 2	16.3000	16.2000	16.3000	16.3000	16.2750	0.0500	0.8002	0.0025	1.73	0.21	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	15.6000	15.6000	15.5000	15.3000	15.5000	0.1414	0.0252	0.0200	0.05	0.58	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	14.8000	15.2000	14.9000	15.0000	14.9750	0.1708	-0.4998	0.0292	-1.08	0.71	2.62	-2.62	2.02
Lab 7	15.4700	14.8600	14.7900	14.8300	14.9875	0.3229	-0.4873	0.1043	-1.06	1.33	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	15.7000	16.0000	16.0000	15.8000	15.8750	0.1500	0.4002	0.0225	0.87	0.62	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	16.0000	15.9000	15.9000	15.8000	15.9000	0.0816	0.4252	0.0067	0.92	0.34	2.62	-2.62	2.02
Lab 13	15.7000	15.6000	15.6000	15.6000	15.6250	0.0500	0.1502	0.0025	0.33	0.21	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	14.7000	14.7000	15.1000	14.3000	14.7000	0.3266	-0.7748	0.1067	-1.68	1.35	2.62	-2.62	2.02
Lab 16	15.0000	15.1000	15.1000	15.0000	15.0500	0.0577	-0.4248	0.0033	-0.92	0.24	2.62	-2.62	2.02
Lab 17	16.3000	16.3000	15.2000	16.3000	16.0250	0.5500	0.5502	0.3025	1.19	2.27	2.62	-2.62	2.02
Lab 18	15.2000	15.1000	15.1000	15.0000	15.1000	0.0816	-0.3748	0.0067	-0.81	0.34	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	15.4500	15.2600	15.1600	15.6000	15.3675	0.1962	-0.1073	0.0385	-0.23	0.81	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	14.6426	14.7498	14.6784	14.7141	14.6962	0.0461	-0.7786	0.0021	-1.69	0.19	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	15.4571	14.9573	15.1358	15.1715	15.1804	0.2069	-0.2944	0.0428	-0.64	0.85	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	15.7000	15.7000	16.2000	15.9000	15.8750	0.2363	0.4002	0.0558	0.87	0.98	2.62	-2.62	2.02
Lab 31	16.7000	16.1000	15.7000	16.8000	16.3250	0.5188	0.8502	0.2692	1.84	2.14	2.62	-2.62	2.02
Lab 32	15.5200	15.5900	15.2300	15.2300	15.3925	0.1898	-0.0823	0.0360	-0.18	0.78	2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	15.9000	15.9000	15.9000	16.1000	15.9500	0.1000	0.4752	0.0100	1.03	0.41	2.62	-2.62	2.02
Lab 36	16.1000	16.0000	16.0000	16.0000	16.0250	0.0500	0.5502	0.0025	1.19	0.21	2.62	-2.62	2.02
Lab 37	15.0000	15.0000	15.1000	15.0000	15.0250	0.0500	-0.4498	0.0025	-0.97	0.21	2.62	-2.62	2.02
Lab 38	15.2000	16.0000	14.9000	14.9000	15.2500	0.5196	-0.2248	0.2700	-0.49	2.15	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	15.8000	15.7000	15.8000	15.9000	15.8000	0.0816	0.3252	0.0067	0.70	0.34	2.62	-2.62	2.02
Lab 41	15.8000	15.9000	15.7000	15.5000	15.7250	0.1708	0.2502	0.0292	0.54	0.71	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	15.6800	15.1100	15.4300	15.3600	15.3950	0.2344	-0.0798	0.0550	-0.17	0.97	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	15.0000	15.0000	14.8000	15.3000	15.0250	0.2062	-0.4498	0.0425	-0.97	0.85	2.62	-2.62	2.02
Lab 46	15.2000	15.7000	15.8000	15.5000	15.5500	0.2646	0.0752	0.0700	0.16	1.09	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

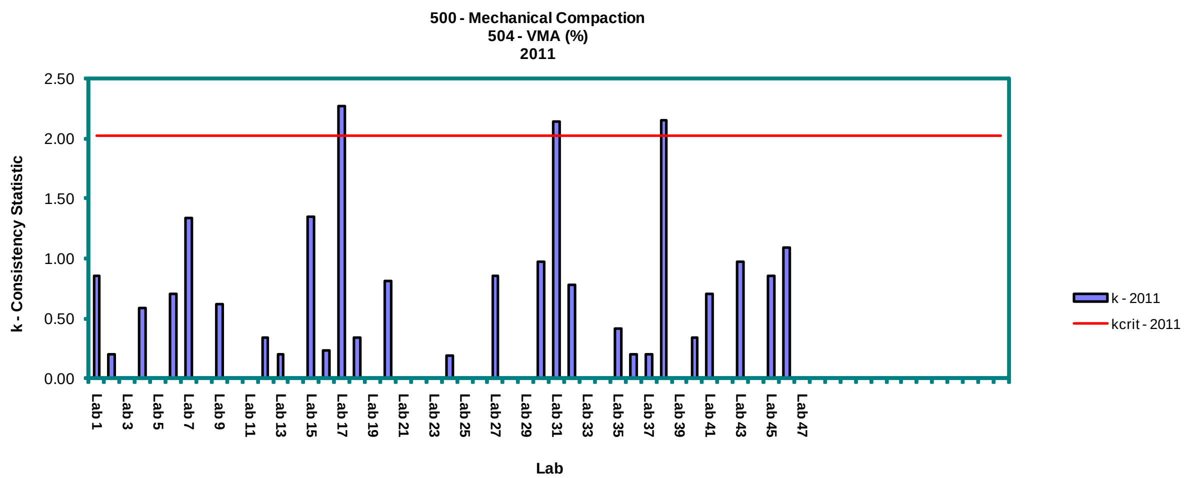
Additional Statistics	Minimum X_{ave}	14.6962	r = 2.8 s_r = 0.6710	h_{crit} =	2.62
	Maximum X_{ave}	16.3250	R = 2.8 s_R = 1.4049	h_{crit} =	-2.62
	Check s_{Xave} =	0.4614		k_{crit} =	2.02

Where: $x_1 \ldots x_n$ =	Individual Test Result	Where: $(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n = FALSE	$(X_{ave})_{ave}$ = #DIV/0!	s_r = 0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 8.1

400 - Hand Compaction
405 - Air Voids (%)
2011

Data						
n =	4	$(X_{ave})_{ave}$ =	4.3588	s_r =	0.2221	Check s_{Xave} = 0.6708
p =	40	s_{Xave} =	0.6708	s_{R*} =	0.6978	r = 2.8 s_r = 0.6155
Significance Level =		0.5%		s_R =	0.6978	R = 2.8 s_R = 1.9343

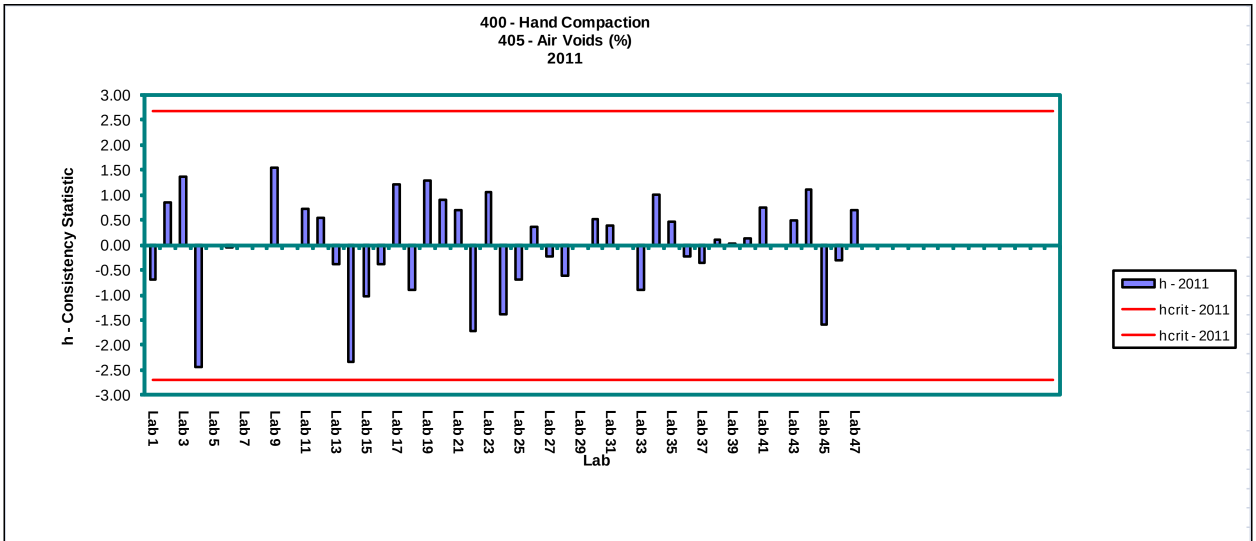
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	3.5000	4.4000	3.6000	4.1000	3.9000	0.4243	-0.4588	0.1800	-0.68	1.91	2.68	-2.68	2.03
Lab 2	4.8000	5.0000	4.9000	5.0000	4.9250	0.0957	0.5662	0.0092	0.84	0.43	2.68	-2.68	2.03
Lab 3	5.3000	5.4000	5.2000	5.2000	5.2750	0.0957	0.9162	0.0092	1.37	0.43	2.68	-2.68	2.03
Lab 4	3.0000	3.3000	2.5000	2.1000	2.7250	0.5315	-1.6338	0.2825	-2.44	2.39	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	4.3000	4.2000	4.4000	4.4000	4.3250	0.0957	-0.0338	0.0092	-0.05	0.43	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	5.3000	5.5000	5.3000	5.5000	5.4000	0.1155	1.0412	0.0133	1.55	0.52	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	4.8000	4.8000	4.7000	5.1000	4.8500	0.1732	0.4912	0.0300	0.73	0.78	2.68	-2.68	2.03
Lab 12	4.8000	4.5000	4.8000	4.8000	4.7250	0.1500	0.3662	0.0225	0.55	0.68	2.68	-2.68	2.03
Lab 13	3.9000	4.3000	4.0000	4.2000	4.1000	0.1826	-0.2588	0.0333	-0.39	0.82	2.68	-2.68	2.03
Lab 14	3.0000	2.8000	2.7000	2.7000	2.8000	0.1414	-1.5588	0.0200	-2.32	0.64	2.68	-2.68	2.03
Lab 15	3.6000	3.8000	3.7000	3.6000	3.6750	0.0957	-0.6838	0.0092	-1.02	0.43	2.68	-2.68	2.03
Lab 16	4.1000	4.1000	4.0000	4.2000	4.1000	0.0816	-0.2588	0.0067	-0.39	0.37	2.68	-2.68	2.03
Lab 17	5.1000	5.4000	5.3000	4.9000	5.1750	0.2217	0.8162	0.0492	1.22	1.00	2.68	-2.68	2.03
Lab 18	3.8000	3.9000	3.7000	3.6000	3.7500	0.1291	-0.6088	0.0167	-0.91	0.58	2.68	-2.68	2.03
Lab 19	5.5000	5.3000	5.0000	5.1000	5.2250	0.2217	0.8662	0.0492	1.29	1.00	2.68	-2.68	2.03
Lab 20	4.9800	5.0900	4.8100	4.9800	4.9650	0.1156	0.6062	0.0134	0.90	0.52	2.68	-2.68	2.03
Lab 21	4.9000	4.8000	4.8000	4.8000	4.8250	0.0500	0.4662	0.0025	0.70	0.23	2.68	-2.68	2.03
Lab 22	3.5000	3.0000	3.1000	3.2000	3.2000	0.2160	-1.1588	0.0467	-1.73	0.97	2.68	-2.68	2.03
Lab 23	5.0800	5.1600	5.1200	4.9200	5.0700	0.1052	0.7112	0.0111	1.06	0.47	2.68	-2.68	2.03
Lab 24	3.3153	3.5575	3.5978	3.2750	3.4364	0.1648	-0.9224	0.0271	-1.38	0.74	2.68	-2.68	2.03
Lab 25	3.8380	3.7170	3.8790	4.1210	3.8888	0.1694	-0.4700	0.0287	-0.70	0.76	2.68	-2.68	2.03
Lab 26	4.6000	4.6000	4.6000	4.6000	4.6000	0.0000	0.2412	0.0000	0.36	0.00	2.68	-2.68	2.03
Lab 27	4.3250	4.1229	4.2037	4.1633	4.2037	0.0873	-0.1551	0.0076	-0.23	0.39	2.68	-2.68	2.03
Lab 28	4.0000	3.9000	3.9000	4.0000	3.9500	0.0577	-0.4088	0.0033	-0.61	0.26	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	4.8000	4.9000	4.7000	4.4000	4.7000	0.2160	0.3412	0.0467	0.51	0.97	2.68	-2.68	2.03
Lab 31	5.0000	4.8000	4.5000	4.2000	4.6250	0.3500	0.2662	0.1225	0.40	1.58	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	3.8000	3.8000	3.8000	3.6000	3.7500	0.1000	-0.6088	0.0100	-0.91	0.45	2.68	-2.68	2.03
Lab 34	5.1100	5.3100	4.6600	5.0200	5.0250	0.2718	0.6662	0.0739	0.99	1.22	2.68	-2.68	2.03
Lab 35	4.6000	4.7000	4.6000	4.8000	4.6750	0.0957	0.3162	0.0092	0.47	0.43	2.68	-2.68	2.03
Lab 36	4.2000	4.2000	4.3000	4.1000	4.2000	0.0816	-0.1588	0.0067	-0.24	0.37	2.68	-2.68	2.03
Lab 37	4.1000	4.2000	4.0000	4.2000	4.1250	0.0957	-0.2338	0.0092	-0.35	0.43	2.68	-2.68	2.03
Lab 38	5.1000	4.1000	4.8000	3.7000	4.4250	0.6397	0.0662	0.4092	0.10	2.88	2.68	-2.68	2.03
Lab 39	4.1000	4.5000	4.5000	4.4000	4.3750	0.1893	0.0162	0.0358	0.02	0.85	2.68	-2.68	2.03
Lab 40	4.5000	4.4000	4.4000	4.5000	4.4500	0.0577	0.0912	0.0033	0.14	0.26	2.68	-2.68	2.03
Lab 41	5.2400	4.9900	4.9900	4.1900	4.8525	0.4571	0.4937	0.2090	0.74	2.06	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	4.6700	4.8000	4.8000	4.4700	4.6850	0.1559	0.3262	0.0243	0.49	0.70	2.68	-2.68	2.03
Lab 44	5.1000	5.1000	5.0000	5.2000	5.1000	0.0816	0.7412	0.0067	1.10	0.37	2.68	-2.68	2.03
Lab 45	3.1000	3.3000	3.3000	3.5000	3.3000	0.1633	-1.0588	0.0267	-1.58	0.74	2.68	-2.68	2.03
Lab 46	4.3000	4.1000	4.0000	4.2000	4.1500	0.1291	-0.2088	0.0167	-0.31	0.58	2.68	-2.68	2.03
Lab 47	5.2000	4.5000	4.8000	4.8000	4.8250	0.2872	0.4662	0.0825	0.70	1.29	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

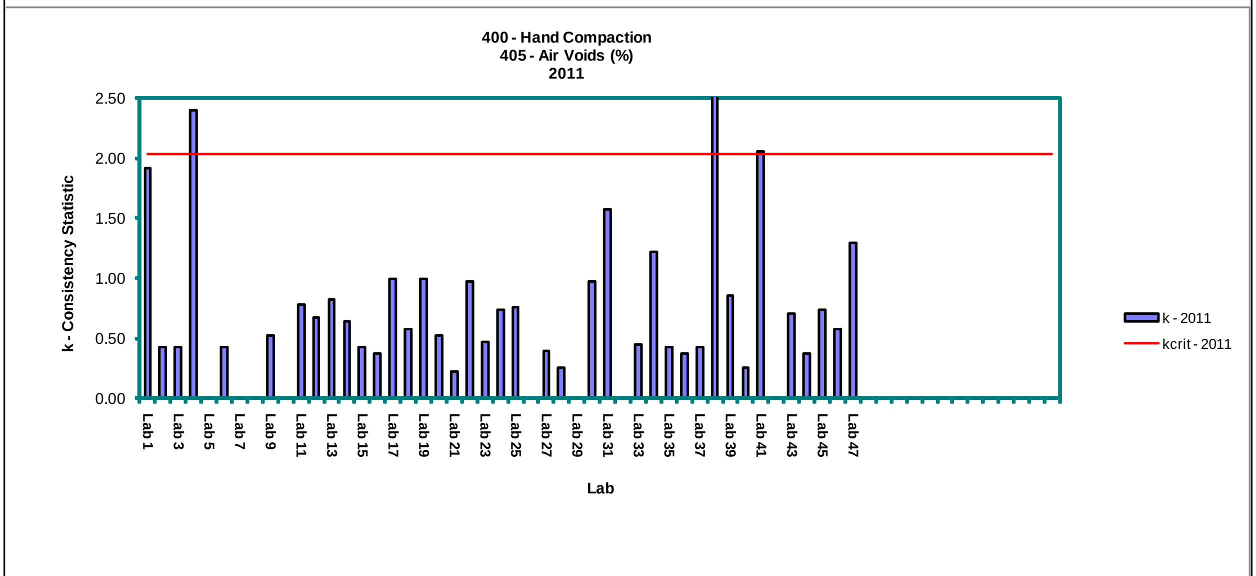
Additional Statistics					
Minimum X_{ave}	2.7250	r = 2.8 s_r =	0.6155	h_{crit} =	2.68
Maximum X_{ave}	5.4000	R = 2.8 s_R =	1.9343	h_{crit} =	-2.68
Check s_{Xave} =	0.6708			k_{crit} =	2.03

Where:		Where:	
$x_1 \ldots x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1 \ldots x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		$s_{X_{ave}}$ =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 8.2

500 - Mechanical Compaction
505 - Air Voids (%)
2011

Data					
n =	4	$(X_{ave})_{ave}$ =	4.3360	s_r =	0.2758	Check s_{Xave} =	0.5500
p =	27	s_{Xave} =	0.5500	s_{R*} =	0.5996	r = 2.8 s_r =	0.7645
Significance Level =		0.5%		s_R =	0.5996	R = 2.8 s_R =	1.6621

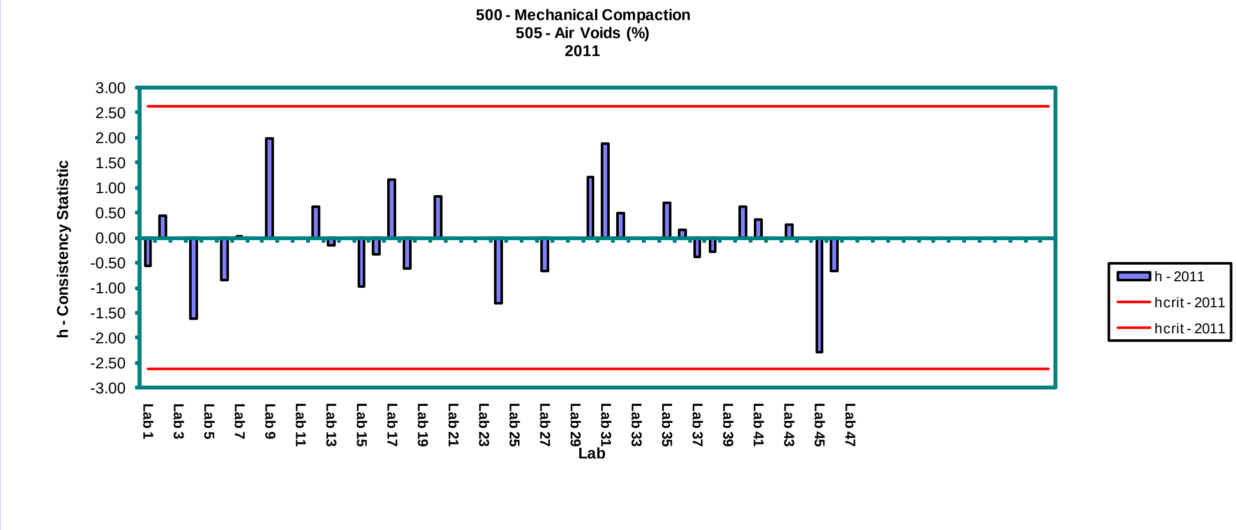
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	3.9000	3.8000	4.2000	4.2000	4.0250	0.2062	-0.3110	0.0425	-0.57	0.75	2.62	-2.62	2.02
Lab 2	4.6000	4.5000	4.6000	4.6000	4.5750	0.0500	0.2390	0.0025	0.43	0.18	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	3.6000	3.6000	3.4000	3.2000	3.4500	0.1915	-0.8860	0.0367	-1.61	0.69	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	3.7000	4.1000	3.8000	3.9000	3.8750	0.1708	-0.4610	0.0292	-0.84	0.62	2.62	-2.62	2.02
Lab 7	4.8900	4.2000	4.1200	4.1600	4.3425	0.3665	0.0065	0.1343	0.01	1.33	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	5.3000	5.5000	5.6000	5.3000	5.4250	0.1500	1.0890	0.0225	1.98	0.54	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	4.8000	4.7000	4.7000	4.5000	4.6750	0.1258	0.3390	0.0158	0.62	0.46	2.62	-2.62	2.02
Lab 13	4.4000	4.2000	4.2000	4.2000	4.2500	0.1000	-0.0860	0.0100	-0.16	0.36	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	3.8000	3.8000	4.2000	3.4000	3.8000	0.3266	-0.5360	0.1067	-0.97	1.18	2.62	-2.62	2.02
Lab 16	4.1000	4.2000	4.2000	4.1000	4.1500	0.0577	-0.1860	0.0033	-0.34	0.21	2.62	-2.62	2.02
Lab 17	5.3000	5.3000	4.0000	5.3000	4.9750	0.6500	0.6390	0.4225	1.16	2.36	2.62	-2.62	2.02
Lab 18	4.1000	4.0000	4.0000	3.9000	4.0000	0.0816	-0.3360	0.0067	-0.61	0.30	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	4.8800	4.6600	4.5500	5.0500	4.7850	0.2237	0.4490	0.0500	0.82	0.81	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	3.5575	3.6785	3.5978	3.6382	3.6180	0.0521	-0.7180	0.0027	-1.31	0.19	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	4.2846	3.7187	3.9208	3.9612	3.9713	0.2342	-0.3647	0.0549	-0.66	0.85	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	4.6000	5.4000	5.2000	4.8000	5.0000	0.3651	0.6640	0.1333	1.21	1.32	2.62	-2.62	2.02
Lab 31	5.8000	5.1000	4.7000	5.9000	5.3750	0.5737	1.0390	0.3292	1.89	2.08	2.62	-2.62	2.02
Lab 32	4.7400	4.8300	4.4200	4.4200	4.6025	0.2139	0.2665	0.0458	0.48	0.78	2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	4.7000	4.6000	4.7000	4.9000	4.7250	0.1258	0.3890	0.0158	0.71	0.46	2.62	-2.62	2.02
Lab 36	4.5000	4.4000	4.4000	4.4000	4.4250	0.0500	0.0890	0.0025	0.16	0.18	2.62	-2.62	2.02
Lab 37	4.1000	4.1000	4.2000	4.1000	4.1250	0.0500	-0.2110	0.0025	-0.38	0.18	2.62	-2.62	2.02
Lab 38	4.1000	5.0000	3.8000	3.8000	4.1750	0.5679	-0.1610	0.3225	-0.29	2.06	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	4.7000	4.5000	4.7000	4.8000	4.6750	0.1258	0.3390	0.0158	0.62	0.46	2.62	-2.62	2.02
Lab 41	4.6300	4.7500	4.5100	4.2300	4.5300	0.2227	0.1940	0.0496	0.35	0.81	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	4.8000	4.1500	4.5100	4.4300	4.4725	0.2674	0.1365	0.0715	0.25	0.97	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	3.1000	3.1000	2.8000	3.3000	3.0750	0.2062	-1.2610	0.0425	-2.29	0.75	2.62	-2.62	2.02
Lab 46	3.6000	4.2000	4.2000	3.9000	3.9750	0.2872	-0.3610	0.0825	-0.66	1.04	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

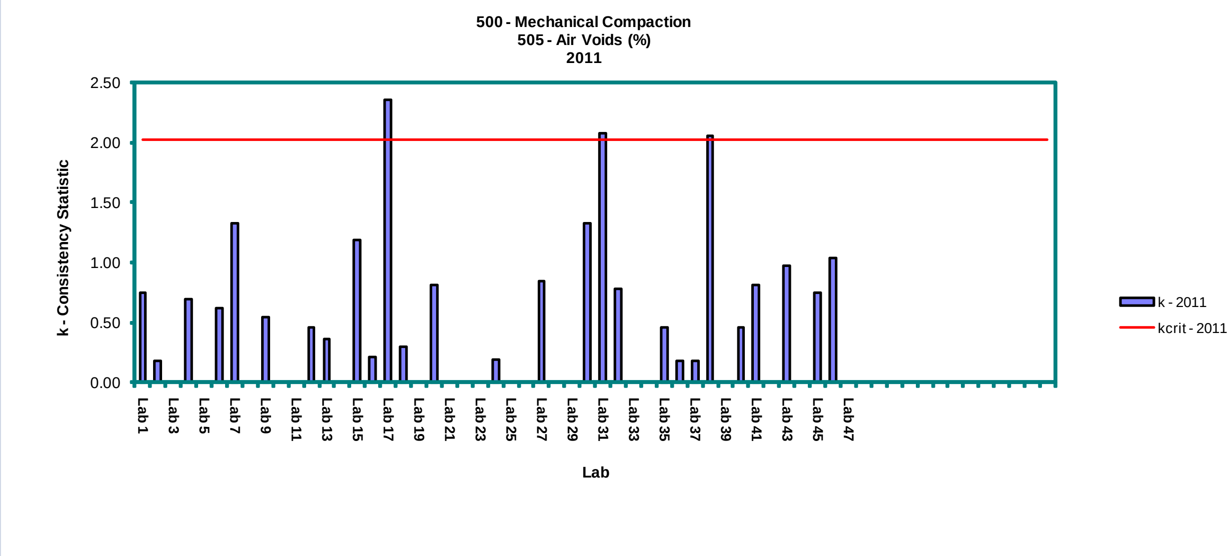
Additional Statistics						
	Minimum X_{ave}	3.0750	r = 2.8 s_r =	0.7645	h_{crit} =	2.62
	Maximum X_{ave}	5.4250	R = 2.8 s_R =	1.6621	h_{crit} =	-2.62
	Check s_{Xave} =	0.5500			k_{crit} =	2.02

Where:			Where:	
x_1....x_n =	Individual Test Result		$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation		h =	Betw een Laboratory Consistency Statistic
p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1 \ldots x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 9.1

400 - Hand Compaction
406 - Voids Filled with Asphalt (%)
2011

Data					
n =	4	$(X_{ave})_{ave}$ =	71.9111	s_r =	1.1753
p =	40	s_{Xave} =	3.8949	s_{R*} =	4.0257
Significance Level =		0.5%		s_R =	4.0257

Check s_{Xave} =	3.8949
r = 2.8 s_r =	3.2577
R = 2.8 s_R =	11.1585

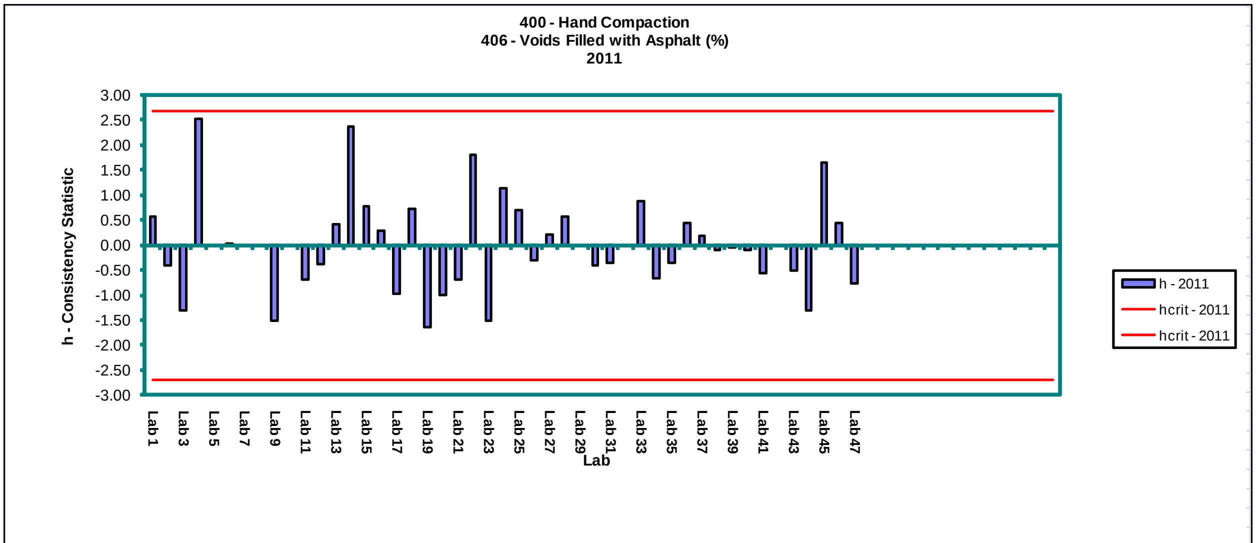
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	76.2000	71.6000	75.7000	73.0000	74.1250	2.1930	2.2139	4.8092	0.57	1.87	2.68	-2.68	2.03
Lab 2	70.9000	69.9000	70.3000	70.1000	70.3000	0.4320	-1.6111	0.1867	-0.41	0.37	2.68	-2.68	2.03
Lab 3	66.6000	66.5000	67.0000	67.0000	66.7750	0.2630	-5.1361	0.0692	-1.32	0.22	2.68	-2.68	2.03
Lab 4	80.3000	78.3000	82.7000	85.5000	81.7000	3.1070	9.7889	9.6533	2.51	2.64	2.68	-2.68	2.03
Lab 5											2.68	-2.68	2.03
Lab 6	72.1000	72.5000	71.6000	71.6000	71.9500	0.4359	0.0389	0.1900	0.01	0.37	2.68	-2.68	2.03
Lab 7											2.68	-2.68	2.03
Lab 8											2.68	-2.68	2.03
Lab 9	66.5000	65.4000	66.5000	65.6000	66.0000	0.5831	-5.9111	0.3400	-1.52	0.50	2.68	-2.68	2.03
Lab 10											2.68	-2.68	2.03
Lab 11	69.6000	69.4000	69.9000	68.1000	69.2500	0.7937	-2.6611	0.6300	-0.68	0.68	2.68	-2.68	2.03
Lab 12	70.0000	71.5000	70.2000	70.0000	70.4250	0.7228	-1.4861	0.5225	-0.38	0.62	2.68	-2.68	2.03
Lab 13	74.5000	72.6000	74.0000	73.1000	73.5500	0.8583	1.6389	0.7367	0.42	0.73	2.68	-2.68	2.03
Lab 14	80.2000	81.1000	81.6000	81.6000	81.1250	0.6602	9.2139	0.4358	2.37	0.56	2.68	-2.68	2.03
Lab 15	75.5000	74.3000	74.9000	75.0000	74.9250	0.4924	3.0139	0.2425	0.77	0.42	2.68	-2.68	2.03
Lab 16	72.7000	72.7000	73.3000	73.3000	73.0000	0.3464	1.0889	0.1200	0.28	0.29	2.68	-2.68	2.03
Lab 17	68.4000	67.0000	67.7000	69.5000	68.1500	1.0661	-3.7611	1.1367	-0.97	0.91	2.68	-2.68	2.03
Lab 18	74.3000	74.1000	74.8000	75.8000	74.7500	0.7594	2.8389	0.5767	0.73	0.65	2.68	-2.68	2.03
Lab 19	64.3000	65.0000	66.6000	66.1000	65.5000	1.0424	-6.4111	1.0867	-1.65	0.89	2.68	-2.68	2.03
Lab 20	67.9600	67.4600	68.7400	67.9400	68.0250	0.5297	-3.8861	0.2806	-1.00	0.45	2.68	-2.68	2.03
Lab 21	68.8000	69.4000	69.4000	69.2000	69.2000	0.2828	-2.7111	0.0800	-0.70	0.24	2.68	-2.68	2.03
Lab 22	77.4000	79.7000	79.5000	79.1000	78.9250	1.0468	7.0139	1.0958	1.80	0.89	2.68	-2.68	2.03
Lab 23	62.2500	66.8800	67.0700	67.9700	66.0425	2.5726	-5.8686	6.6185	-1.51	2.19	2.68	-2.68	2.03
Lab 24	77.0224	75.7045	75.4892	77.2453	76.3654	0.8964	4.4542	0.8035	1.14	0.76	2.68	-2.68	2.03
Lab 25	74.8990	75.5200	74.6930	73.4810	74.6483	0.8539	2.7371	0.7291	0.70	0.73	2.68	-2.68	2.03
Lab 26	70.6000	70.8000	70.8000	70.8000	70.7500	0.1000	-1.1611	0.0100	-0.30	0.09	2.68	-2.68	2.03
Lab 27	72.0839	73.0782	72.6777	72.8775	72.6793	0.4293	0.7682	0.1843	0.20	0.37	2.68	-2.68	2.03
Lab 28	74.0000	74.4000	74.4000	73.6000	74.1000	0.3830	2.1889	0.1467	0.56	0.33	2.68	-2.68	2.03
Lab 29											2.68	-2.68	2.03
Lab 30	69.8000	69.4000	70.3000	71.8000	70.3250	1.0500	-1.5861	1.1025	-0.41	0.89	2.68	-2.68	2.03
Lab 31	68.6000	69.7000	71.1000	72.6000	70.5000	1.7340	-1.4111	3.0067	-0.36	1.48	2.68	-2.68	2.03
Lab 32											2.68	-2.68	2.03
Lab 33	75.0000	75.2000	75.2000	75.8000	75.3000	0.3464	3.3889	0.1200	0.87	0.29	2.68	-2.68	2.03
Lab 34	68.9000	68.0000	70.9000	69.3000	69.2750	1.2121	-2.6361	1.4692	-0.68	1.03	2.68	-2.68	2.03
Lab 35	70.9000	70.3000	70.9000	70.1000	70.5500	0.4123	-1.3611	0.1700	-0.35	0.35	2.68	-2.68	2.03
Lab 36	73.7000	73.7000	72.9000	74.1000	73.6000	0.5033	1.6889	0.2533	0.43	0.43	2.68	-2.68	2.03
Lab 37	72.8000	72.4000	73.0000	72.4000	72.6500	0.3000	0.7389	0.0900	0.19	0.26	2.68	-2.68	2.03
Lab 38	68.2000	73.2000	69.7000	74.9000	71.5000	3.0865	-0.4111	9.5267	-0.11	2.63	2.68	-2.68	2.03
Lab 39	73.0000	71.0000	71.3000	71.5000	71.7000	0.8907	-0.2111	0.7933	-0.05	0.76	2.68	-2.68	2.03
Lab 40	71.5000	71.6000	71.6000	71.4000	71.5250	0.0957	-0.3861	0.0092	-0.10	0.08	2.68	-2.68	2.03
Lab 41	67.9000	69.0000	69.0000	72.8000	69.6750	2.1469	-2.2361	4.6092	-0.57	1.83	2.68	-2.68	2.03
Lab 42											2.68	-2.68	2.03
Lab 43	69.9800	69.4100	69.4100	70.9400	69.9350	0.7219	-1.9761	0.5211	-0.51	0.61	2.68	-2.68	2.03
Lab 44	66.8000	66.8000	67.3000	66.4000	66.8250	0.3686	-5.0861	0.1358	-1.31	0.31	2.68	-2.68	2.03
Lab 45	79.3000	78.2000	78.4000	77.3000	78.3000	0.8206	6.3889	0.6733	1.64	0.70	2.68	-2.68	2.03
Lab 46	73.1000	73.7000	74.3000	73.5000	73.6500	0.5000	1.7389	0.2500	0.45	0.43	2.68	-2.68	2.03
Lab 47	67.1000	70.4000	69.0000	69.0000	68.8750	1.3549	-3.0361	1.8358	-0.78	1.15	2.68	-2.68	2.03
Lab 48											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03
											2.68	-2.68	2.03

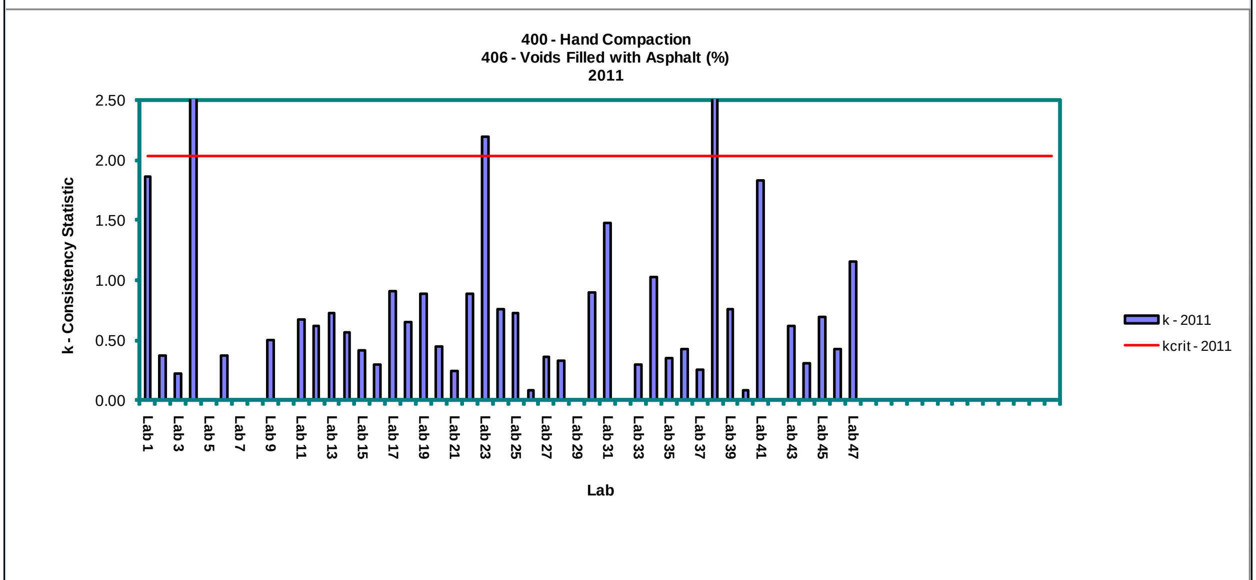
Additional Statistics						
	Minimum X_{ave}	65.5000	r = 2.8 s_r =	3.2577	h_{crit} =	2.68
	Maximum X_{ave}	81.7000	R = 2.8 s_R =	11.1585	h_{crit} =	-2.68
	Check s_{Xave} =	3.8949			k_{crit} =	2.03

Where:		Where:	
$x_1 \ldots x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 9.2

500 - Mechanical Compaction
506 - Voids Filled with Asphalt (%)
2011

Data							
n =	4	$(X_{ave})_{ave}$ =	72.0499	s_r =	1.3767	Check s_{Xave} =	3.0043
p =	27	s_{Xave} =	3.0043	s_{R^*} =	3.2323	$r = 2.8\ s_r$ =	3.8161
Significance Level =		0.5%		s_R =	3.2323	$R = 2.8\ s_R$ =	8.9593

Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	74.2000	74.7000	72.7000	72.7000	73.5750	1.0308	1.5252	1.0625	0.51	0.75	2.62	-2.62	2.02
Lab 2	71.7000	72.1000	71.6000	71.6000	71.7500	0.2380	-0.2998	0.0567	-0.10	0.17	2.62	-2.62	2.02
Lab 3											2.62	-2.62	2.02
Lab 4	77.0000	77.0000	77.8000	78.9000	77.6750	0.8995	5.6252	0.8092	1.87	0.65	2.62	-2.62	2.02
Lab 5											2.62	-2.62	2.02
Lab 6	75.0000	73.0000	74.5000	74.0000	74.1250	0.8539	2.0752	0.7292	0.69	0.62	2.62	-2.62	2.02
Lab 7	68.4000	71.7400	72.1500	71.9400	71.0575	1.7796	-0.9923	3.1668	-0.33	1.29	2.62	-2.62	2.02
Lab 8											2.62	-2.62	2.02
Lab 9	66.2000	65.6000	65.0000	66.5000	65.8250	0.6652	-6.2248	0.4425	-2.07	0.48	2.62	-2.62	2.02
Lab 10											2.62	-2.62	2.02
Lab 11											2.62	-2.62	2.02
Lab 12	70.0000	70.4000	70.4000	71.5000	70.5750	0.6449	-1.4748	0.4158	-0.49	0.47	2.62	-2.62	2.02
Lab 13	72.0000	73.1000	73.1000	73.1000	72.8250	0.5500	0.7751	0.3025	0.26	0.40	2.62	-2.62	2.02
Lab 14											2.62	-2.62	2.02
Lab 15	74.3000	74.4000	72.3000	76.6000	74.4000	1.7569	2.3502	3.0867	0.78	1.28	2.62	-2.62	2.02
Lab 16	72.7000	72.2000	72.2000	72.7000	72.4500	0.2887	0.4002	0.0833	0.13	0.21	2.62	-2.62	2.02
Lab 17	67.5000	67.5000	73.7000	67.1000	68.9500	3.1723	-3.0999	10.0633	-1.03	2.30	2.62	-2.62	2.02
Lab 18	72.7000	73.3000	73.3000	73.7000	73.2500	0.4123	1.2002	0.1700	0.40	0.30	2.62	-2.62	2.02
Lab 19											2.62	-2.62	2.02
Lab 20	68.4400	69.4600	70.0100	67.6400	68.8875	1.0558	-3.1624	1.1148	-1.05	0.77	2.62	-2.62	2.02
Lab 21											2.62	-2.62	2.02
Lab 22											2.62	-2.62	2.02
Lab 23											2.62	-2.62	2.02
Lab 24	75.7045	75.0607	75.4892	75.2741	75.3821	0.2771	3.3323	0.0768	1.11	0.20	2.62	-2.62	2.02
Lab 25											2.62	-2.62	2.02
Lab 26											2.62	-2.62	2.02
Lab 27	72.2809	75.1380	74.0959	73.8905	73.8513	1.1808	1.8015	1.3944	0.60	0.86	2.62	-2.62	2.02
Lab 28											2.62	-2.62	2.02
Lab 29											2.62	-2.62	2.02
Lab 30	70.7000	65.6000	67.9000	69.8000	68.5000	2.2583	-3.5498	5.1000	-1.18	1.64	2.62	-2.62	2.02
Lab 31	65.3000	68.4000	70.3000	65.0000	67.2500	2.5489	-4.7998	6.4967	-1.60	1.85	2.62	-2.62	2.02
Lab 32	69.4600	69.0200	70.9800	70.9800	70.1100	1.0205	-1.9398	1.0415	-0.65	0.74	2.62	-2.62	2.02
Lab 33											2.62	-2.62	2.02
Lab 34											2.62	-2.62	2.02
Lab 35	70.3000	70.7000	70.5000	69.6000	70.2750	0.4787	-1.7748	0.2292	-0.59	0.35	2.62	-2.62	2.02
Lab 36	72.1000	72.5000	72.5000	72.5000	72.4000	0.2000	0.3502	0.0400	0.12	0.15	2.62	-2.62	2.02
Lab 37	72.8000	72.6000	72.0000	72.8000	72.5500	0.3786	0.5002	0.1433	0.17	0.27	2.62	-2.62	2.02
Lab 38	73.1000	68.6000	74.8000	74.7000	72.8000	2.9063	0.7502	8.4467	0.25	2.11	2.62	-2.62	2.02
Lab 39											2.62	-2.62	2.02
Lab 40	70.5000	71.2000	70.2000	70.1000	70.5000	0.4967	-1.5498	0.2467	-0.52	0.36	2.62	-2.62	2.02
Lab 41	70.7000	70.1000	71.3000	72.7000	71.2000	1.1136	-0.8498	1.2400	-0.28	0.81	2.62	-2.62	2.02
Lab 42											2.62	-2.62	2.02
Lab 43	69.4100	72.5300	70.7500	71.1400	70.9575	1.2837	-1.0924	1.6480	-0.36	0.93	2.62	-2.62	2.02
Lab 44											2.62	-2.62	2.02
Lab 45	79.7000	79.7000	81.1000	78.4000	79.7250	1.1026	7.6752	1.2158	2.55	0.80	2.62	-2.62	2.02
Lab 46	76.5000	73.4000	73.2000	74.9000	74.5000	1.5341	2.4502	2.3533	0.82	1.11	2.62	-2.62	2.02
Lab 47											2.62	-2.62	2.02
Lab 48											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02
											2.62	-2.62	2.02

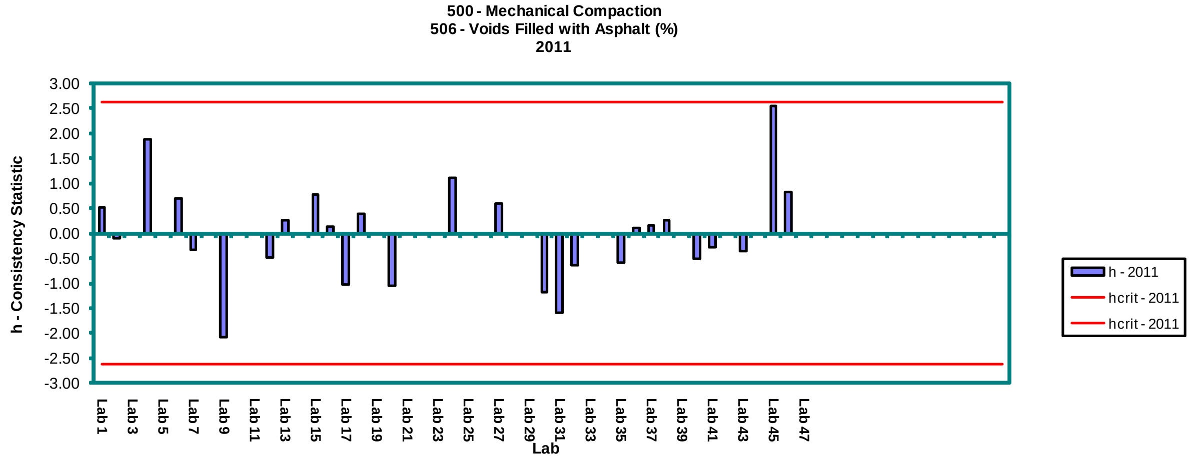
Additional Statistics						
Minimum X_{ave}	65.8250	$r = 2.8\ s_r$ =	3.8161	h_{crit} =	2.62
Maximum X_{ave}	79.7250	$R = 2.8\ s_R$ =	8.9593	h_{crit} =	-2.62
Check s_{Xave} =	3.0043			k_{crit} =	2.02

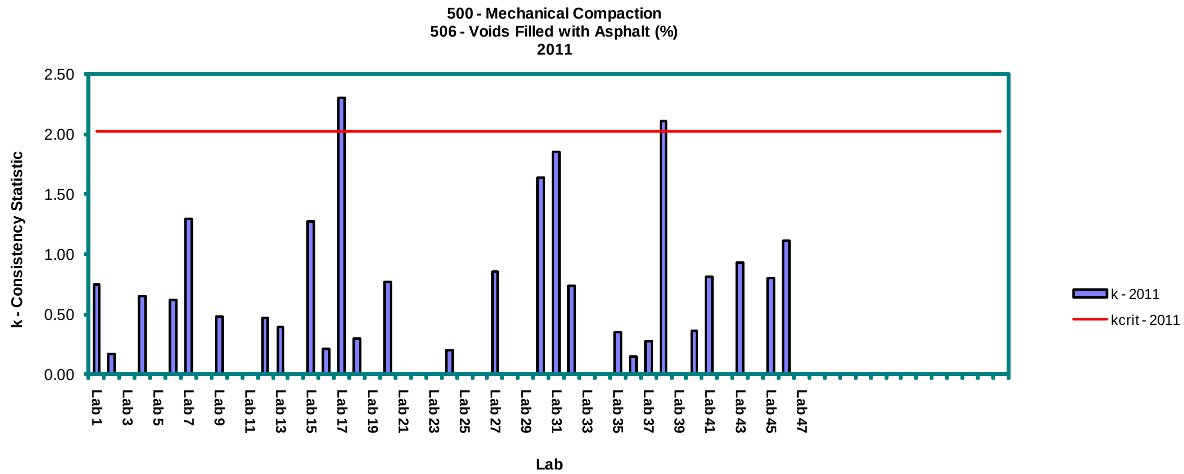
Where:

$x_1 \ldots x_n$ =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} =	0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 10.1

600 - Gyratory Compaction
602 - Bulk Density 75 Gyrations (g/cm3)
2011

Data						
n =	3	$(X_{ave})_{ave}$ =	2.4088	s_r =	0.0070	Check s_{Xave} = 0.0130
p =	23	s_{Xave} =	0.0130	s_{R^*} =	0.0142	r = 2.8 s_r = 0.0195
Significance Level =		0.5%		s_R =	0.0142	R = 2.8 s_R = 0.0393

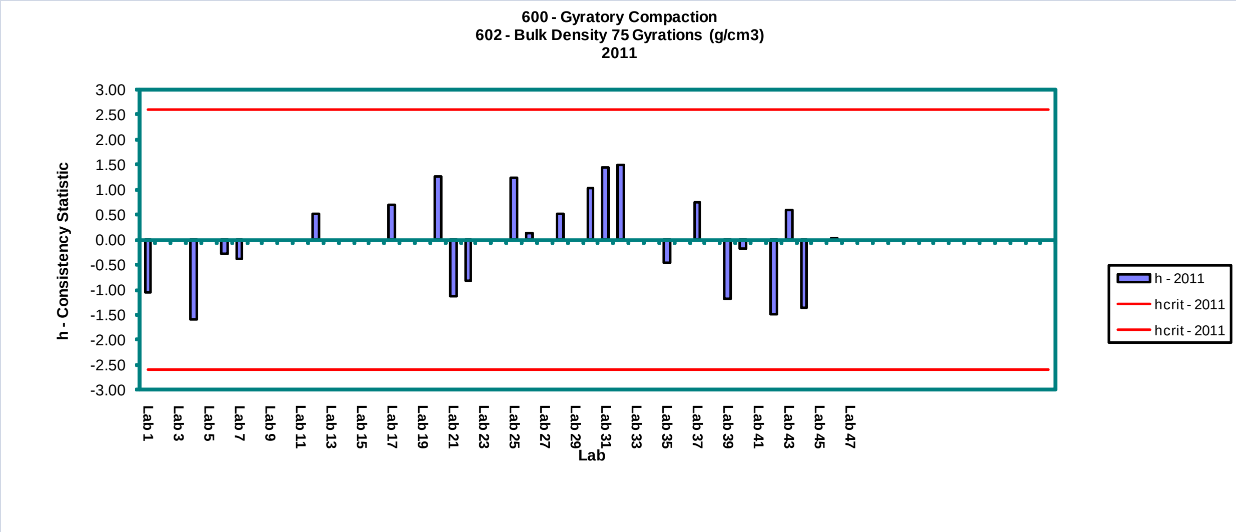
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	2.4000	2.3900	2.3960		2.3953	0.0050	-0.0135	0.0000	-1.04	0.72	2.59	-2.59	2.22
Lab 2											2.59	-2.59	2.22
Lab 3											2.59	-2.59	2.22
Lab 4	2.3830	2.3880	2.3940		2.3883	0.0055	-0.0205	0.0000	-1.58	0.78	2.59	-2.59	2.22
Lab 5											2.59	-2.59	2.22
Lab 6	2.3970	2.4070	2.4120		2.4053	0.0076	-0.0035	0.0001	-0.27	1.09	2.59	-2.59	2.22
Lab 7	2.3990	2.4020	2.4110		2.4040	0.0062	-0.0048	0.0000	-0.37	0.89	2.59	-2.59	2.22
Lab 8											2.59	-2.59	2.22
Lab 9											2.59	-2.59	2.22
Lab 10											2.59	-2.59	2.22
Lab 11											2.59	-2.59	2.22
Lab 12	2.4080	2.4160	2.4230		2.4157	0.0075	0.0068	0.0001	0.53	1.07	2.59	-2.59	2.22
Lab 13											2.59	-2.59	2.22
Lab 14											2.59	-2.59	2.22
Lab 15											2.59	-2.59	2.22
Lab 16											2.59	-2.59	2.22
Lab 17	2.4230	2.4140	2.4170		2.4180	0.0046	0.0092	0.0000	0.71	0.65	2.59	-2.59	2.22
Lab 18											2.59	-2.59	2.22
Lab 19											2.59	-2.59	2.22
Lab 20	2.4220	2.4250	2.4290		2.4253	0.0035	0.0165	0.0000	1.27	0.50	2.59	-2.59	2.22
Lab 21	2.3980	2.3910	2.3940		2.3943	0.0035	-0.0145	0.0000	-1.12	0.50	2.59	-2.59	2.22
Lab 22	2.4012	2.3974	2.3963		2.3983	0.0026	-0.0105	0.0000	-0.81	0.37	2.59	-2.59	2.22
Lab 23											2.59	-2.59	2.22
Lab 24											2.59	-2.59	2.22
Lab 25	2.4220	2.4260	2.4270		2.4250	0.0026	0.0162	0.0000	1.25	0.38	2.59	-2.59	2.22
Lab 26	2.4120	2.4110	2.4090		2.4107	0.0015	0.0018	0.0000	0.14	0.22	2.59	-2.59	2.22
Lab 27											2.59	-2.59	2.22
Lab 28	2.4140	2.4160	2.4170		2.4157	0.0015	0.0068	0.0000	0.53	0.22	2.59	-2.59	2.22
Lab 29											2.59	-2.59	2.22
Lab 30	2.4240	2.4160	2.4270		2.4223	0.0057	0.0135	0.0000	1.04	0.81	2.59	-2.59	2.22
Lab 31	2.4270	2.4290	2.4270		2.4277	0.0012	0.0188	0.0000	1.45	0.16	2.59	-2.59	2.22
Lab 32	2.4440	2.4420	2.3990		2.4283	0.0254	0.0195	0.0006	1.51	3.62	2.59	-2.59	2.22
Lab 33											2.59	-2.59	2.22
Lab 34											2.59	-2.59	2.22
Lab 35	2.4030	2.4050	2.4010		2.4030	0.0020	-0.0058	0.0000	-0.45	0.28	2.59	-2.59	2.22
Lab 36											2.59	-2.59	2.22
Lab 37	2.4160	2.4210	2.4190		2.4187	0.0025	0.0098	0.0000	0.76	0.36	2.59	-2.59	2.22
Lab 38											2.59	-2.59	2.22
Lab 39	2.3910	2.3850	2.4050		2.3937	0.0103	-0.0152	0.0001	-1.17	1.46	2.59	-2.59	2.22
Lab 40	2.4090	2.4060	2.4050		2.4067	0.0021	-0.0022	0.0000	-0.17	0.30	2.59	-2.59	2.22
Lab 41											2.59	-2.59	2.22
Lab 42	2.3900	2.3880	2.3910		2.3897	0.0015	-0.0192	0.0000	-1.48	0.22	2.59	-2.59	2.22
Lab 43	2.4150	2.4150	2.4200		2.4167	0.0029	0.0078	0.0000	0.61	0.41	2.59	-2.59	2.22
Lab 44	2.3860	2.3890	2.3990		2.3913	0.0068	-0.0175	0.0000	-1.35	0.97	2.59	-2.59	2.22
Lab 45											2.59	-2.59	2.22
Lab 46	2.4070	2.4110	2.4090		2.4090	0.0020	0.0002	0.0000	0.01	0.28	2.59	-2.59	2.22
Lab 47											2.59	-2.59	2.22
Lab 48											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22
											2.59	-2.59	2.22

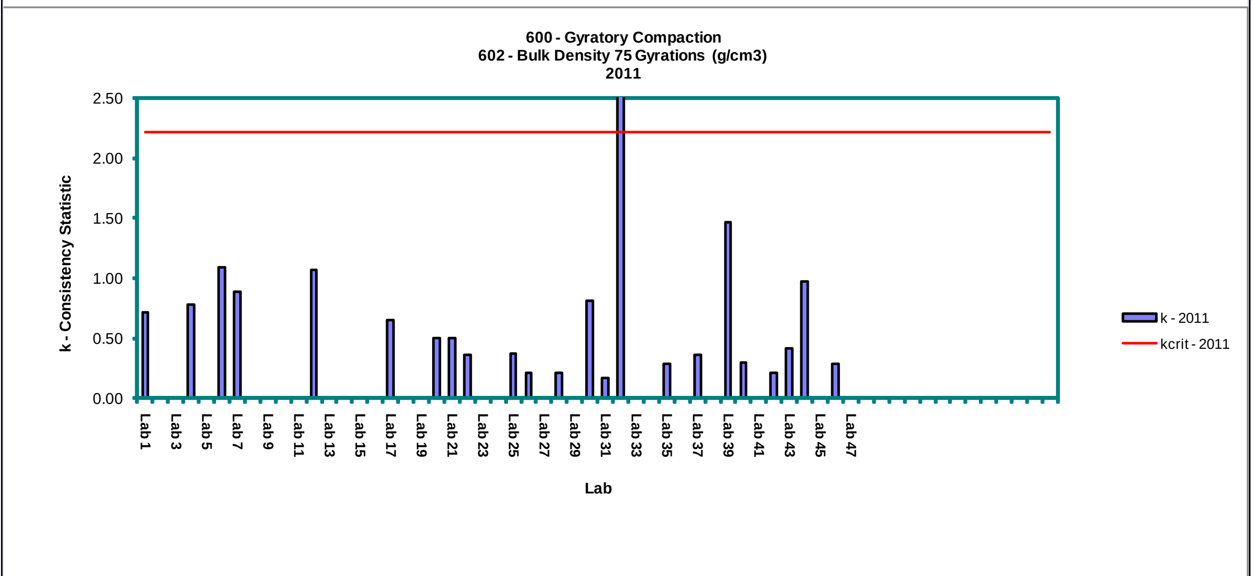
Additional Statistics						
	Minimum X_{ave}	2.3883	r = 2.8 s_r =	0.0195	h_{crit} =	2.59
	Maximum X_{ave}	2.4283	R = 2.8 s_R =	0.0393	h_{crit} =	-2.59
	Check s_{Xave} =	0.0130			k_{crit} =	2.22

Where:			Where:	
x_1....x_n =	Individual Test Result		$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 11.1

700 - Ignition Oven
701 - Asphalt Content by Ignition Oven (%)
2011

Data					
n =	3	$(X_{ave})_{ave}$ =	5.1719	s_r =	0.0873
p =	42	s_{Xave} =	0.2031	s_{R*} =	0.2153
Significance Level =		0.5%		s_R =	0.2153

Check s_{Xave} = 0.2031
$r = 2.8\ s_r$ = 0.2420
$R = 2.8\ s_R$ = 0.5966

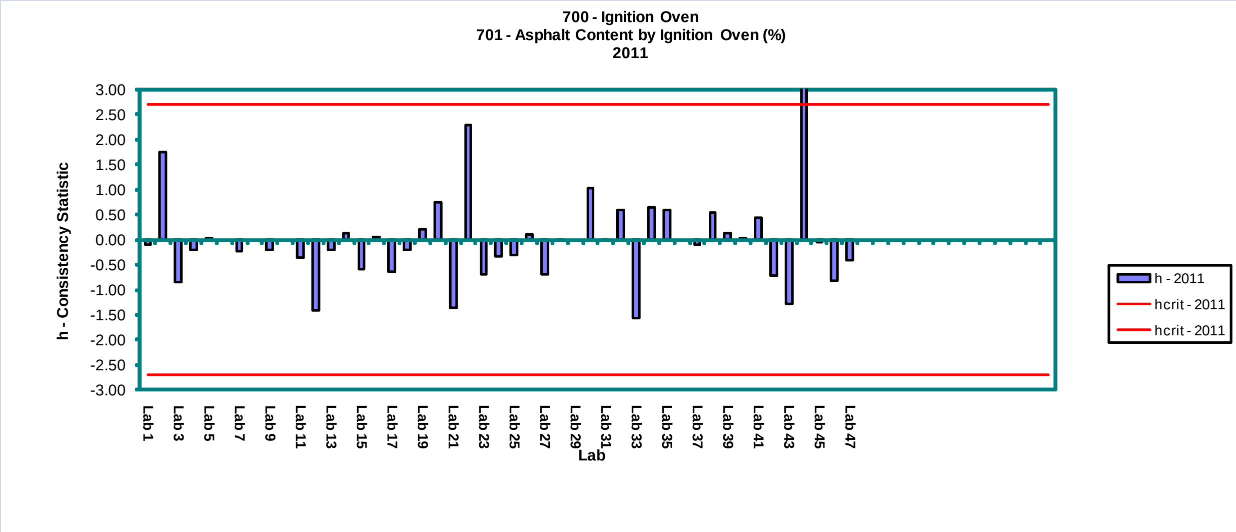
Lab #	x_1	x_2	x_3	x_4	X_{ave}	s	d	s^2	h - 2011	k - 2011	hcrit - 2011	hcrit - 2011	kcrit - 2011
Lab 1	5.1400	5.1600	5.1500		5.1500	0.0100	-0.0219	0.0001	-0.11	0.11	2.69	-2.69	2.26
Lab 2	5.5100	5.4800	5.5900		5.5267	0.0569	0.3547	0.0032	1.75	0.65	2.69	-2.69	2.26
Lab 3	4.9800	5.0000	5.0200		5.0000	0.0200	-0.1719	0.0004	-0.85	0.23	2.69	-2.69	2.26
Lab 4	5.1600	5.1600	5.0700		5.1300	0.0520	-0.0419	0.0027	-0.21	0.60	2.69	-2.69	2.26
Lab 5	5.2200	5.2900	5.0200		5.1767	0.1401	0.0047	0.0196	0.02	1.60	2.69	-2.69	2.26
Lab 6											2.69	-2.69	2.26
Lab 7	5.1600	5.1000	5.1100		5.1233	0.0321	-0.0486	0.0010	-0.24	0.37	2.69	-2.69	2.26
Lab 8											2.69	-2.69	2.26
Lab 9	5.3100	5.1000	4.9900		5.1333	0.1626	-0.0386	0.0264	-0.19	1.86	2.69	-2.69	2.26
Lab 10											2.69	-2.69	2.26
Lab 11	5.0600	5.1100	5.1300		5.1000	0.0361	-0.0719	0.0013	-0.35	0.41	2.69	-2.69	2.26
Lab 12	4.9000	4.9100	4.8500		4.8867	0.0321	-0.2853	0.0010	-1.40	0.37	2.69	-2.69	2.26
Lab 13	5.1600	5.1500	5.0800		5.1300	0.0436	-0.0419	0.0019	-0.21	0.50	2.69	-2.69	2.26
Lab 14	5.3200	5.1500	5.1200		5.1967	0.1079	0.0247	0.0116	0.12	1.24	2.69	-2.69	2.26
Lab 15	5.0500	5.0100	5.1000		5.0533	0.0451	-0.1186	0.0020	-0.58	0.52	2.69	-2.69	2.26
Lab 16	5.1330	5.2060	5.2030		5.1807	0.0413	0.0087	0.0017	0.04	0.47	2.69	-2.69	2.26
Lab 17	5.0300	5.0100	5.0900		5.0433	0.0416	-0.1286	0.0017	-0.63	0.48	2.69	-2.69	2.26
Lab 18	5.1700	5.0700	5.1600		5.1333	0.0551	-0.0386	0.0030	-0.19	0.63	2.69	-2.69	2.26
Lab 19	5.3700	5.2300	5.0400		5.2133	0.1656	0.0414	0.0274	0.20	1.90	2.69	-2.69	2.26
Lab 20	5.3000	5.3400	5.3300		5.3233	0.0208	0.1514	0.0004	0.75	0.24	2.69	-2.69	2.26
Lab 21	4.9500	4.9800	4.7600		4.8967	0.1193	-0.2753	0.0142	-1.36	1.37	2.69	-2.69	2.26
Lab 22	5.7000	5.6400	5.5700		5.6367	0.0651	0.4647	0.0042	2.29	0.75	2.69	-2.69	2.26
Lab 23	4.9800	4.9600	5.1500		5.0300	0.1044	-0.1419	0.0109	-0.70	1.20	2.69	-2.69	2.26
Lab 24	5.0950	5.1161	5.1021		5.1044	0.0107	-0.0675	0.0001	-0.33	0.12	2.69	-2.69	2.26
Lab 25	5.2580	4.9930	5.0800		5.1103	0.1351	-0.0616	0.0182	-0.30	1.55	2.69	-2.69	2.26
Lab 26	5.2000	5.1900	5.1900		5.1933	0.0058	0.0214	0.0000	0.11	0.07	2.69	-2.69	2.26
Lab 27	4.9400	5.0500	5.1100		5.0333	0.0862	-0.1386	0.0074	-0.68	0.99	2.69	-2.69	2.26
Lab 28	5.1200	5.2300	5.1500		5.1667	0.0569	-0.0053	0.0032	-0.03	0.65	2.69	-2.69	2.26
Lab 29											2.69	-2.69	2.26
Lab 30	5.5200	5.2700	5.3500		5.3800	0.1277	0.2081	0.0163	1.02	1.46	2.69	-2.69	2.26
Lab 31	5.1700	5.2000	5.1300		5.1667	0.0351	-0.0053	0.0012	-0.03	0.40	2.69	-2.69	2.26
Lab 32	5.3200	5.3400	5.2100		5.2900	0.0700	0.1181	0.0049	0.58	0.80	2.69	-2.69	2.26
Lab 33	4.8700	4.8200	4.8700		4.8533	0.0289	-0.3186	0.0008	-1.57	0.33	2.69	-2.69	2.26
Lab 34	5.3400	5.2500	5.3200		5.3033	0.0473	0.1314	0.0022	0.65	0.54	2.69	-2.69	2.26
Lab 35	5.0700	5.2100	5.5900		5.2900	0.2691	0.1181	0.0724	0.58	3.08	2.69	-2.69	2.26
Lab 36											2.69	-2.69	2.26
Lab 37	5.1600	5.1500	5.1400		5.1500	0.0100	-0.0219	0.0001	-0.11	0.11	2.69	-2.69	2.26
Lab 38	5.3300	5.2300	5.2800		5.2800	0.0500	0.1081	0.0025	0.53	0.57	2.69	-2.69	2.26
Lab 39	5.1900	5.2200	5.1800		5.1967	0.0208	0.0247	0.0004	0.12	0.24	2.69	-2.69	2.26
Lab 40	5.1700	5.1800	5.1700		5.1733	0.0058	0.0014	0.0000	0.01	0.07	2.69	-2.69	2.26
Lab 41	5.2100	5.2900	5.2900		5.2633	0.0462	0.0914	0.0021	0.45	0.53	2.69	-2.69	2.26
Lab 42	5.0102	5.0384	5.0371		5.0286	0.0159	-0.1434	0.0003	-0.71	0.18	2.69	-2.69	2.26
Lab 43	5.0600	4.9200	4.7500		4.9100	0.1552	-0.2619	0.0241	-1.29	1.78	2.69	-2.69	2.26
Lab 44	6.1200	5.9200	6.0000		6.0133	0.1007	0.8414	0.0101	4.14	1.15	2.69	-2.69	2.26
Lab 45	5.2500	5.1500	5.0800		5.1600	0.0854	-0.0119	0.0073	-0.06	0.98	2.69	-2.69	2.26
Lab 46	5.0300	4.9800	5.0000		5.0033	0.0252	-0.1686	0.0006	-0.83	0.29	2.69	-2.69	2.26
Lab 47	5.2000	5.0000	5.0600		5.0867	0.1026	-0.0853	0.0105	-0.42	1.18	2.69	-2.69	2.26
Lab 48											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26
											2.69	-2.69	2.26

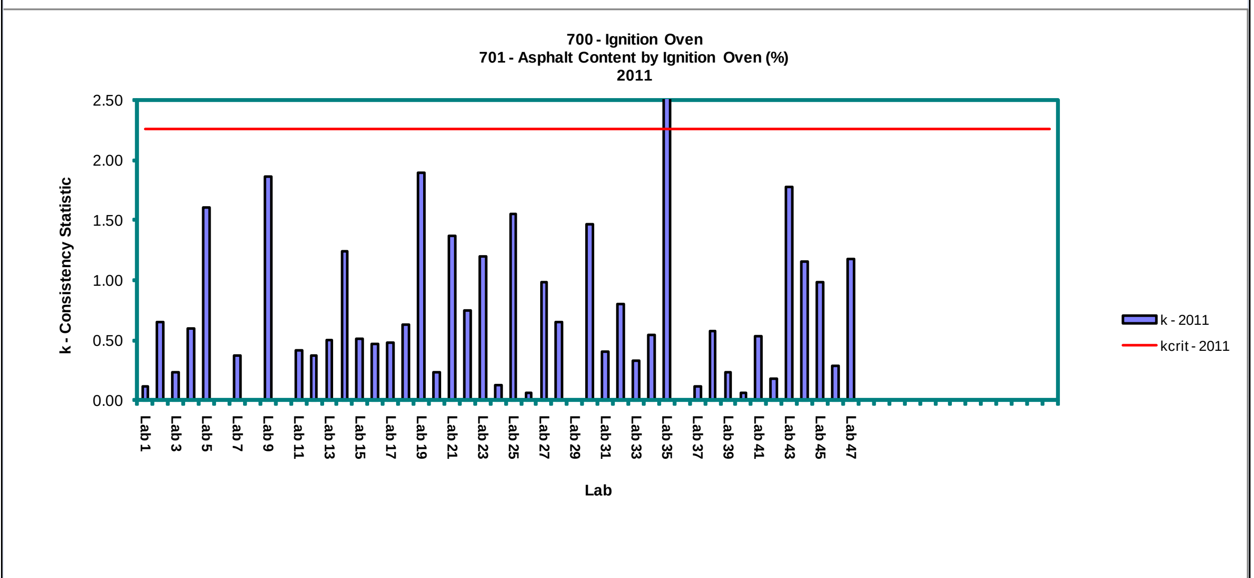
Additional Statistics						
	Minimum X_{ave}	4.8533	$r = 2.8\ s_r$ =	0.2420	h_{crit} =	2.69
	Maximum X_{ave}	6.0133	$R = 2.8\ s_R$ =	0.5966	h_{crit} =	-2.69
	Check s_{Xave} =	0.2031			k_{crit} =	2.26

Where:		Where:	
x_1....x_n =	Individual Test Result	$(X_{ave})_{ave}$ =	Average of Cell Averages
X_{ave} =	Cell Average	s_{Xave} =	Standard Deviation of Cell Averages
n =	Number of Test Results per Cell	s_r =	Repeatability Standard Deviation
s =	Cell Standard Deviation	s_{R*} =	Interim Reproducibility Standard Deviation
d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)	s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R*})
s^2 =	Cell Variation	h =	Between Laboratory Consistency Statistic
p =	Number of Laboratories	k =	Within Laboratory Consistency Statistic

0.0000

n =	FALSE	$(X_{ave})_{ave}$ =	#DIV/0!	s_r =	0.0000	Check s_{Xave} = 0.0000





Where:	$x_1....x_n$ =	Individual Test Result	Where:	$(X_{ave})_{ave}$ =	Average of Cell Averages
	X_{ave} =	Cell Average		s_{Xave} =	Standard Deviation of Cell Averages
	n =	Number of Test Results per Cell		s_r =	Repeatability Standard Deviation
	s =	Cell Standard Deviation		s_{R^*} =	Interim Reproducibility Standard Deviation
	d =	Cell Deviation (X_{ave} - $(X_{ave})_{ave}$)		s_R =	Reproducibility Standard Deviation (Larger of s_r and s_{R^*})
	s^2 =	Cell Variation		h =	Between Laboratory Consistency Statistic
	p =	Number of Laboratories		k =	Within Laboratory Consistency Statistic
	h_{crit} =	Critical Between Laboratory Consistency Statistic		r =	95% Confidence Limit for Repeatability
	k_{crit} =	Critical Within Laboratory Consistency Statistic		R =	95% Confidence Limit for Reproducibility

Table No. 17 Participating Labs
CAMEP 2011 (Marshall Mix)

- ADI Limited
  Saint John, NB
- AME Materials Engineering
  Caledon, ON
- AMEC Earth & Environmental Ltd.
  Lloydminster, AB
- AMEC Earth & Environmental Ltd.
  Saskatoon, SK
- AMEC Earth & Environmental Ltd.
  Dartmouth, NS
- AMEC Earth & Environmental Ltd.
  Red Deer, AB
- Clifton Associates Ltd.
  Regina, SK
- DBA Engineering Ltd.
  Vaughan, ON
- EBA Engineering Consultants Ltd.
  Nanaimo, BC
- EBA Engineering Consultants Ltd.
  Edmonton, AB
- Golder Associates Ltd.
  Edmonton, AB
- Island Asphalt Company
  Victoria, BC
- John Emery Geotechnical Engineering Ltd.
  Toronto, ON
- Lafarge Construction Materials
  Nanaimo, BC
- Levelton Consultants Ltd.
  Abbotsford, BC
- Manitoba Infrastructure & Transportion
  Winnipeg, MB
- Maritime Testing (1985) Limited
  Dartmouth, NS
- Ministere Des Transports Du Quebec
  Quebec, QC
- Ministere Des Transports Du Quebec
  Quebec, QC
- Ministry of Highways and Infrastructure
  Regina, SK
- PEI Dept. of Transport. & Public Works
  Mt. Stewart, PEI
- Thurber Engineering Ltd.
  Edmonton, AB
- Lafarge Construction Materials (Spy Hill)
  Calgary, AB
- Almor Testing Services Ltd.
  Calgary, AB
- AMEC Earth & Environmental Ltd.
  Burnaby, BC
- AMEC Earth & Environmental Ltd.
  Edmonton, AB
- AMEC Earth & Environmental Ltd.
  Regina, SK
- AMEC Earth & Environmental Ltd.
  Calgary, AB
- Clifton Associates Ltd.
  Calgary, AB
- Clifton Associates Ltd.
  Saskatoon, SK
- EBA Engineering Consultants Ltd.
  Lethbridge, AB
- EBA Engineering Consultants Ltd.
  Calgary, AB
- Genivar
  Red Deer, AB
- Gov. of Newfoundland and Labrador
  St. John's, NL
- J.R. Paine and Associates Ltd.
  Edmonton, AB
- Lafarge Construction Materials
  Calgary, AB
- Levelton Consultants Ltd.
  Nanaimo, BC
- M&B Technical Testing Services Ltd.
  Calgary, AB
- Manitoba Infrastructure & Transportion
  Winnipeg, MB
- McIntosh Lalani Engineering Ltd.
  Calgary, AB
- Ministere Des Transports Du Quebec
  Montreal, QC
- Ministry of Highways and Infrastructure
  Saskatoon, SK
- Municipal Group of Companies
  Bedford, NS
- Peto MacCallum Ltd.
  Toronto, ON
- Lafarge Construction Materials
  Saskatoon, SK
- Lafarge Construction Materials (Bow river Qc)
  Calgary, AB

Table No. 18 Participating Labs
CAMEP 2011 (Gyratory Compactor)

- ADI Limited
  Saint John NB
- AMEC Earth & Environmental Ltd.
  Burnaby BC
- EBA Engineering Consultants Ltd.
  Lethbridge AB
- Gemtec Limited
  Fredericton NB
- Gov. of Newfoundland and Labrador
  St. John's NL
- J.R. Paine and Associates Ltd.
-
- Lafarge Construction Materials
  Calgary AB
- M&B Technical Testing Services Ltd.
  Calgary AB
- Maritime Testing (1985) Limited
  Dartmouth NS
- Ministere Des Transports Du Quebec
  Quebec QC
- Ministere Des Transports Du Quebec
  Quebec QC
- Ministry of Highways and Infrastructure
  Regina SK
- PEI Dept. of Transport. & Public Works
  Mt. Stewart PEI
- AME Materials Engineering
  Caledon ON
- DBA Engineering Ltd.
  Vaughan ON
- EBA Engineering Consultants Ltd.
  Calgary AB
- Genivar
  Red Deer AB
- Imperial Oil
  Edmonton AB
- John Emery Geotechnical Engineering Ltd.
- Levelton Consultants Ltd.
  Abbotsford BC
- Manitoba Infrastructure & Transportion
  Winnipeg MB
- McIntosh Lalani Engineering Ltd.
  Calgary AB
- Ministere Des Transports Du Quebec
  Montreal QC
- Ministry of Highways and Infrastructure
  Saskatoon SK
- Municipal Group of Companies
  Bedford NS
- Peto MacCallum Ltd.
  Toronto ON

Table No. 19 Participating Labs
CAMEP 2011 (Ignition Oven)

- ADI Limited
  Saint John, NB
- AME Materials Engineering
  Caledon, ON
- AMEC Earth & Environmental Ltd.
  Lloydminster, AB
- AMEC Earth & Environmental Ltd.
  Saskatoon, SK
- AMEC Earth & Environmental Ltd.
  Dartmouth, NS
- AMEC Earth & Environmental Ltd.
  Red Deer, AB
- Clifton Associates Ltd.
  Regina, SK
- DBA Engineering Ltd.
  Vaughan, ON
- EBA Engineering Consultants Ltd.
  Nanaimo, BC
- EBA Engineering Consultants Ltd.
  Edmonton, AB
- Genivar
  Red Deer, AB
- Gov. of Newfoundland and Labrador
  St. John's, NL
- J.R. Paine and Associates Ltd.
  Edmonton, AB
- Lafarge Construction Materials
  Calgary, AB
- Levelton Consultants Ltd.
  Nanaimo, BC
- M&B Technical Testing Services Ltd.
  Calgary, AB
- Manitoba Infrastructure & Transportion
  Winnipeg, MB
- McIntosh Lalani Engineering Ltd.
  Calgary, AB
- Ministere Des Transports Du Quebec
  Quebec, QC
- Ministry of Highways and Infrastructure
  Regina, SK
- PEI Dept. of Transport. & Public Works
  Mt. Stewart, PEI
- Thurber Engineering Ltd.
  Edmonton, AB
- Lafarge Construction Materials (Spy Hill)
  Calgary, AB
- Almor Testing Services Ltd.
  Calgary, AB
- AMEC Earth & Environmental Ltd.
  Burnaby, BC
- AMEC Earth & Environmental Ltd.
  Edmonton, AB
- AMEC Earth & Environmental Ltd.
  Regina, SK
- AMEC Earth & Environmental Ltd.
  Calgary, AB
- Clifton Associates Ltd.
  Calgary, AB
- Clifton Associates Ltd.
  Saskatoon, SK
- EBA Engineering Consultants Ltd.
  Lethbridge, AB
- EBA Engineering Consultants Ltd.
  Calgary, AB
- Gemtec Limited
  Fredericton, NB
- Golder Associates Ltd.
  Edmonton, AB
- Imperial Oil
  Sarnia, ON
- John Emery Geotechnical Engineering Ltd.
  Toronto, ON
- Lafarge Construction Materials
  Nanaimo, BC
- Levelton Consultants Ltd.
  Abbotsford, BC
- Manitoba Infrastructure & Transportion
  Winnipeg, MB
- Maritime Testing (1985) Limited
  Dartmouth, NS
- Ministere Des Transports Du Quebec
  Montreal, QC
- Ministry of Highways and Infrastructure
  Saskatoon, SK
- Municipal Group of Companies
  Bedford, NS
- Peto MacCallum Ltd.
  Toronto, ON
- Lafarge Construction Materials
  Saskatoon, SK
- Lafarge Construction Materials (Bow river Qc)
  Calgary, AB

Table No. 20 Summary of 2011 CAMEP Report

								Labs Out		Labs Close	
Test		Average	S_x	S_r	S_R	$2.77S_r$	$2.77S_R$	h-stat	k-stat	h-stat	k-stat
Marshall Mix											
Bulk Density of	Coarse Aggregate	2.6670	0.0152	0.0070	0.0163	0.0195	0.0451		11, 45		
Aggregates (g/cm^3)	Fine Aggregate	2.6344	0.0146	0.0064	0.0155	0.0177	0.0430	19	19, 38, 45	28	
Water Absorption	Fine Aggregate	1.063	0.122	0.072	0.136	0.201	0.376		45, 46	45	
(%)	Coarse Aggregate	1.025	0.173	0.056	0.179	0.154	0.497		27		
Theor. Max. Specific Gravity & Density	Modified Rice	2.475	0.0113	0.0046	0.0119	0.0128	0.0331	45	28, 44		
Bulk Density	Hand Compaction	2.367	0.012	0.0054	0.013	0.015	0.036		4, 38, 41		
(g/cm^3)	Mech. Compaction	2.368	0.011	0.007	0.012	0.019	0.034	31	17, 31, 38		
Marshall Stability	Hand Compaction	9.979	1.80	0.70	1.89	1.92	5.25	47	1, 31, 47		
(kN)	Mech. Compaction	9.806	1.68	0.53	1.74	1.48	4.83	30	30, 31		
Flow (mm)	Hand Compaction	2.3	0.38	0.25	0.44	0.70	1.22	44	6, 44		
	Mech. Compaction	2.2	0.31	0.15	0.36	0.41	1.01		45		
VMA (%)	Hand Compaction	15.5	0.12	0.19	0.48	0.54	1.33		4, 38		41
	Mech. Compaction	15.5	0.16	0.24	0.51	0.67	1.40		17, 31, 38		
Air Voids (%)	Hand Compaction	4.4	0.67	0.22	0.70	0.62	1.93		4, 38, 41		
	Mech. Compaction	4.3	0.55	0.28	0.60	0.76	1.66		17, 31, 38		
Voids Filled	Hand Compaction	71.9	3.9	1.2	4.0	3.3	11.2		4, 23, 38		
With Asphalt (%)	Mech. Compaction	72.0	3.0	1.4	3.2	3.8	9.0		17, 38		
Gyratory Compaction											
Bulk Density (g/cm^3)	75 Gyrations	2.409	0.013	0.0070	0.014	0.020	0.039		32		
Ignition Oven											
Asphalt Content (%)	By Mass of Oven-Dry	5.2	0.208	0.087	0.215	0.242	0.597	44	35		

Legend:

s_x = Standard Deviation
s_r = Repeatability Standard Deviation
s_R = Reproducibility Standard Deviation
$2.77s_r$ = 95% Confidence Limits for Repeatability (k-stat)
$2.77s_R$ = 95% Confidence Limits for Reproducibility (h-stat)
CAMEP = Canadian Asphalt Mix Exchange Program
VMA = Voids in Mineral Aggregate
MTD = Maximum Theoretical Density

Table No. 21 Comparison of 2011, 2010, 2009 and 2008 CAMEP Results

Test		2011 Results				2010 Results				2009 Results				2008 Results			
		Average	S_x	S_r	S_R	Average	S_x	S_r	S_R	Average	S_x	S_r	S_R	Average	S_x	S_r	S_R
Marshall Mix																	
Bulk Density of	Coarse Aggregate	2.6670	0.0152	0.0070	0.0163	2.6709	0.0171	0.0083	0.0184	2.6709	0.0191	0.0059	0.0197	2.6736	0.0136	0.0052	0.0143
Aggregates (g/cm^3)	Fine Aggregate	2.6344	0.0146	0.0064	0.0155	2.6376	0.0136	0.0097	0.0157	2.6380	0.0202	0.0085	0.0214	2.6440	0.0173	0.0051	0.0178
Water Absorption	Fine Aggregate	1.063	0.122	0.072	0.136	1.039	0.224	0.077	0.232	0.973	0.168	0.071	0.178	0.938	0.296	0.074	0.302
(%)	Coarse Aggregate	1.025	0.173	0.056	0.179	1.106	0.203	0.041	0.217	1.067	0.120	0.052	0.128	0.888	0.177	0.071	0.186
Theor. Max. Specific Gravity & Density	Modified Rice	2.475	0.0113	0.0046	0.0119	2.470	0.0197	0.0129	0.0224	2.476	0.0149	0.0042	0.0153	2.485	0.0134	0.0040	0.0137
Bulk Density	Hand Compaction	2.367	0.012	0.0054	0.013	2.373	0.013	0.0047	0.014	2.379	0.013	0.0153	0.019	2.382	0.012	0.0155	0.018
(g/cm^3)	Mech. Compaction	2.368	0.011	0.007	0.012	2.388	0.010	0.005	0.011	2.378	0.013	0.0080	0.015	0.023	0.015	0.0050	0.015
Marshall Stability	Hand Compaction	9.979	1.80	0.70	1.89	9.807	1.90	0.78	2.02	10.001	2.33	0.79	2.43	9.102	1.86	0.53	1.92
(kN)	Mech. Compaction	9.806	1.68	0.53	1.74	9.914	1.84	0.50	1.89	9.910	2.46	0.65	2.52	8.668	1.61	0.52	1.67
Flow (mm)	Hand Compaction	2.3	0.38	0.25	0.44	2.4	0.41	0.25	0.46	2.5	0.56	0.24	0.60	2.3	0.40	0.21	0.44
	Mech. Compaction	2.2	0.31	0.15	0.36	2.4	0.36	0.19	0.39	2.5	0.62	0.27	0.66	2.3	0.38	0.19	0.41
VMA (%)	Hand Compaction	15.5	0.12	0.19	0.48	15.3	0.47	0.17	0.49	15.2	0.58	0.20	0.61	15.2	0.61	0.17	0.63
	Mech. Compaction	15.5	0.16	0.24	0.51	15.3	0.45	0.16	0.47	15.3	0.50	0.20	0.53	15.2	0.60	0.19	0.62
Air Voids (%)	Hand Compaction	4.4	0.67	0.22	0.70	4.1	0.59	0.19	0.61	3.9	0.55	0.23	0.59	4.1	0.47	0.19	0.50
	Mech. Compaction	4.3	0.55	0.28	0.60	3.9	0.53	0.19	0.56	4.0	0.54	0.19	0.57	4.2	0.57	0.21	0.60
Voids Filled	Hand Compaction	71.9	3.9	1.2	4.0	73.5	3.6	1.0	3.7	74.5	4.7	1.1	4.8	72.8	2.7	1.0	2.8
With Asphalt (%)	Mech. Compaction	72.0	3.0	1.4	3.2	74.4	3.3	1.0	3.4	74.1	3.1	1.0	3.2	72.5	3.3	1.0	3.4
Gyratory Compaction																	
Bulk Density	134 Gyrations													2.400	0.013	0.0042	0.013
	75 Gyrations	2.409	0.013	0.0070	0.014	2.414	0.014	0.0051	0.015	2.441	0.018	0.0052	0.019				
(g/cm^3)	86 Gyrations													2.379	0.014	0.0043	0.014
	7 Gyrations													2.220	0.032	0.0207	0.037
Air Voids (%)	86 Gyrations													3.59	0.57	0.18	0.59
VMA (%)	86 Gyrations													14.0	0.58	0.16	0.59
Voids Filled (%)	86 Gyrations													74.3	3.3	0.9	3.4
Ignition Oven																	
Asphalt Content (%)	By Mass of Oven-Dry	5.2	0.208	0.087	0.215	5.2	0.239	0.101	0.252	4.9	0.201	0.066	0.208	5.1	0.140	0.076	0.153

Legend:

s_x = Standard Deviation
s_r = Repeatability Standard Deviation
s_R = Reproducibility Standard Deviation
$2.77s_r$ = 95% Confidence Limits for Repeatability (k-stat)
$2.77s_R$ = 95% Confidence Limits for Reproducibility (h-stat)
CAMEP = Canadian Asphalt Mix Exchange Program
VMA = Voids in Mineral Aggregate
MTD = Maximum Theoretical Density

Appendix B

Formulas Used in Calculating Precision Results

x = Individual test result

n = Number of test results per lab

p = Number of laboratories

$\bar{x}$ = Lab Average = $\dfrac{\sum_{1}^{n} x}{n}$

x_a = Average of lab averages = $\dfrac{\sum_{1}^{p} \bar{x}}{p}$

s = Lab standard deviation = $\sqrt{\dfrac{\sum_{1}^{n} (x-\bar{x})^2}{(n-1)}}$

d = Lab standard deviation = $\bar{x} - x_a$

s_{Xave} = Standard deviation of lab averages = $\sqrt{\dfrac{\sum_{1}^{p} d^2}{(p-1)}}$

s_r = Repeatability standard deviation = $\sqrt{\dfrac{\sum_{1}^{p} s^2}{p}}$

s_R = Reproducibility standard Deviation

= the larger of s_r and $\sqrt{(s_{Xave})^2 + (s_r)^2 \times \dfrac{(n-1)}{n}}$

h = The between-laboratory consistency statistic = $\dfrac{d}{s_{Xave}}$

k = The within-laboratory consistency statistic = $\dfrac{s}{s_r}$

Reference: ASTM E691, Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method.