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DETERMINING the DEGREE of AGGREGATE DEGRADATION After Using the NCAT ASPHALT CONTENT TESTER.

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Final Report August 1997

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The purpose of the research conducted was to determine if aggregate degradation takes place and to measure the possible degree of degradation after bituminous mixtures are heated inside the NCAT Asphalt Content Tester. A study was conducted which compared the orginal aggregate blend (Control specimens) to the residual aggregate blend (Experimental specimens) obtained after several bituminous mixtures were heated inside the NCAT Asphalt Content Tester. The Control specimens and the Experimental specimens used to produce the bituminous mixtures were the result of an aggregate sample which was split three times. Two methods of analysis were used to review the gradation results. It was determined after reviewing both methods of analysis, that the gradations of the bituminous mixtures used in the study were not statistically different after being heated inside the NCAT Asphalt Content Tester. The aggregate gradation correction factors that were required in this study were relatively low (less than one percent) and were needed only in a few instances. However, this might not be true in all instances.

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- 2. Data Used To Calculate the 95% Confidence Interval Figures
- 3. Data From the Students t-Test
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- **1. Frequency Figures for Each Sieve Size**
- 2. Data Used to Calculate Frequency Figures

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1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) is phasing out chlorinated solvents used in the United States. These solvents have been used in the past to remove the asphalt cement (AC) from bituminous mixtures allowing aggregate gradations to be performed. The NCAT Asphalt Content Tester (an ignition oven) has been introduced as an alternative to the solvent extraction method. It works by removing (physically burning away) the AC from the bituminous mixture.

Several companies manufacture ignition ovens, including Barnstead/Thermolyne, Troxler, and Gilson Corporation. The Barnstead/Thermolyne equipment is known as the National Center for Asphalt Technology (NCAT) Asphalt Content Tester and was used to generate the data in this paper. The ignition oven and the NCAT Asphalt Content Tester refer to the same equipment in this document.

1.1 Background

In June of 1995, the Colorado Department of Transportation purchased and received six NCAT Asphalt Content Testers manufactured by Barnstead/Thermolyne Corporation. The Central Laboratory located in

Denver, Colorado retained two of the ovens and distributed the remaining four ovens to different Regions throughout Colorado. One oven in the Central Laboratory was set up (electrically wired and vented) for use. The NCAT Asphalt Content Tester was then evaluated concerning its effect on aggregate gradations from different bituminous mixtures.

2.0 PURPOSE

The purpose of this experiment was to determine if aggregate degradation occurs in a bituminous mixture when heated inside the NCAT Asphalt Content Tester. In addition, if aggregate degradation does occur, to quantify the extent of the degradation.

3.0 APPARATUS

3.1 NCAT Asphalt Content Tester.-The NCAT Asphalt Content Tester is a forced-air ignition furnace, with internal balance, capable of maintaining a temperature of 538° C (1000° F). The NCAT Asphalt Content Tester consists of an electronic housing unit, an oven chamber and an exhaust chamber. The electronic housing unit is located underneath the oven chamber and is separated by an air space. This area of the unit houses the electronic controls as well as the internal scale used to monitor weight loss. The oven chamber is located in the middle of the unit. The oven chamber is heated electrically using ceramic heating elements. A hearth tray located inside the oven chamber is supported by ceramic tubes which extend down to the internal scale. The accuracy of the internal scale balance is verified by placing calibrated weights on the hearth tray at room temperature. The exhaust chamber is located above the oven chamber. An exhaust fan and filters are used to control the smoke and fumes while testing.

3.2 Basket Assemblies--Two stainless steel 2.36mm (No. 8) mesh perforated basket assemblies were nested on top of each other with a drip pan located on the bottom of the assembly. This configuration allowed the bituminous mixture increased surface area exposure and facilitated more complete burning of the AC.

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3.3 Asphalt Mixer and Mixer Bowl--A HOBART mechanical mixer (Model N50) with an approximate capacity of 5 liters and capable of mixing approximately 1250 grams of aggregate.

3.4 External Scale--An AND 20 kg capacity scale accurate to 0.1 gram was used in this experiment.

3.5 No. - 200 Wash Sieve Screen--A 304.8 mm (12 inch) diameter 0.075 mm (No. 200) sieve was used to wash the minus 0.075mm (No. 200) material from the Experimental and Control specimens before performing the subsequent gradation analysis on the remaining aggregate.

3.6 Set of Nine 203.2 mm (8 inch) Diameter Sieves--A set of sieves having a 203.2 mm (8 inch) diameter, with sieve openings conforming to ASTM E-11. The sieve sizes used were: 12.5 mm, (1/2 inch); 9.5 mm, (3/8 inch); 4.75 mm, (No.4); 2.3 mm, (No.8); 1.18 mm, (No.16); 0.625 mm, (No.30); 0.3 mm, (No.50); 0.15 mm, (No.100): and 0.075 mm, (No.200). A ROTAP mechanical sieve shaker (Model RX-29) was used to separate the aggregate into different particle sizes.

3.7 Set of Three 304.8mm (12 inch) Diameter Sieves--A set of three 304.8 mm (12 inch) diameter sieves with screen sizes of + 9.5 mm (+ 3/8 inch), + 4.75 mm

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(+ No. 4) and - 4.75 mm (- No. 4) were used to separate the aggregate into three different particle sizes prior to using the riffle sample splitter.

3.8 Riffle Sample Splitter--A sample splitter with 12, 37.5 mm (1 1/2 inch) equal width chutes was used to split the aggregate. Four chute catch pans were used.

3.9 Miscellaneous Equipment--A pan having dimensions of approximately (L x W x H) 38 x 38 x 5 cm was used for containing the residual aggregate after ignition. A steel wire brush was used to remove residual aggregate from the steel basket assembly after AC burn off.

4.0 PROCEDURE

4.1 Sources of Aggregate

Six aggregate sources were selected from various geographical areas which represented some of the varying aggregate types found within Colorado.

 Table 1. Aggregate Source, Absorption, Mineralogy, Specific Gravity and

 Location

AGGREGATE	CRSE/FINE	MINERALOGY	CRSE/FINE	LOCATION
SOURCE	AGGR.		AGGR.	
	WATER		SPG	
	% ABSORB		(AASHTO)	
	(AASHTO)			
Franciscotti	0.9, N/A	Sandstone	2.66, 2.59	Walsen-
		Shale		burg
Ralston	0.72, 1.03	Quartz	2.77, 2.75	Denver
		Diorite		
Valco/Rocky	0.9, 0.8	Decomposed	2.62, 2.61	Colo.
Mtn./Cas		Granite		Springs
Irwin Windsor-	0.8, 0.4	Feldspar	2.61, 2.66	Fort
Stute				Collins
Monk	0.8, N/A	Granite	2.64, N/A	Limon
Pagosa Trout	2.1, 1.7	N/A	2.54, 2.51	Pagosa
Lakes				Springs

4.2 Aggregate Set Up

Six different (10000 gram) aggregate sources of grading CX, 12.5 mm (1/2 inch) nominal maximum, were set up together using six different aggregate blend formulas.

4.3 Separating and Splitting Aggregate

In a attempt to reduce segregation, the 10K gram samples were separated into three different sieve sizes, + 9.5 mm (+ 3\8), + 4.75 mm (+ No.4) and - 2.36 mm (- No.4) using three 304.8 mm (12 inch) diameter sieves. The three different sizes of aggregate were split individually three times using a riffle sample splitter. The aggregate from each of the three sieve sizes were combined which resulted in eight specimens of approximately 1250 grams each. This method was used to increase the probability for an even split when the larger aggregate sizes were dropped through the riffle sample splitter. To further reduce the margin of error between specimens, the four Control and four Experimental specimens were collected from alternate sides of the sample splitter.

4.4 Combining with Hydrated Lime and Water

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All eight (approximately 1250 gram) aggregate specimens from each of the six aggregate sources were mixed with one percent hydrated lime and approximately four percent water, oven dried inside a $121^{\circ}\pm 5$ C (250° F) oven for 6 \pm 1 hours and then cooled to room temperature. Removing the moisture was important since aggregates that have high absorption values may retain moisture which may cause the aggregate to "pop" (break apart changing the gradation) inside the NCAT Asphalt Content Tester.

4.5 Treatment of Control Specimens

The Control specimens were stored on a shelf at room ambient temperature and humidity until gradations could be performed as described in Section 4.7

4.6 Rational for Mixing the Experimental Specimens with AC

Mixing the aggregate specimens with asphalt cement was thought to be an important factor since these specimens would be exposed to higher temperatures (greater than 538° C (1000° F)) inside the ignition oven (compared to aggregate only specimens) as the asphalt cement burns. Aggregate mixed with asphalt typically burns in the oven at 600° C (1112° F) to 700° C (1292° F). These higher temperatures may increase the probability that the aggregate degrades. In addition, the aggregate which will be evaluated for gradation during the life of construction projects will also be mixed with asphalt cement when determining asphalt cement content.

4.6.1 Treatment of Experimental Specimens

The four Experimental specimens were re-heated again inside a 148 +/- 5° C (300° F) oven for 3 \pm 1 hours and mixed with approximately five percent AC, (Conoco AC-10).

The bituminous mixture specimens were placed inside the NCAT Asphalt Content Tester (at a set point temperature of 538° C (1000° F)) immediately after the mixing process and tested per CPL-5120, see Appendix E. The AC in the bituminous mixture was ignited and burned away leaving the residual aggregate. The residual aggregate was cooled for approximately one-half hour inside the basket assembly and then collected in a steel pan. The Experimental specimens were stored on a shelf (less than 24 hours) until gradations could be performed per Section 4.7

4.7 Gradations

Gradations following AASHTO T 27 (Sieve Analysis of Fine and Coarse Aggregates) and T 11 (Amount of Material Finer Than 0.075 mm Sieve in Aggregate) were performed on each of the eight specimens from each of the

11

six aggregate sources. A ROTAP mechanical sieve shaker was used as described in Section 3.1, to separate the aggregate into different size fractions.

Table 2. Number of Gradations Performed per Sieve Size

Sieve Size	No. of Control Specimens Per Aggregate Source	No. of Exp. Specimens Per Aggregate Source	No. of Aggregate Sources	Total No. of Grad. Per Sieve Size
Each of the nine sieve sizes	4	4	6	48

4.8 Methods of Analysis

There were two methods used to analyze the gradation results after using the ignition oven.

4.8.1 First Method of Analysis (Comparison of the Mean of the Experimental and Control Specimens)

The first method of analysis compared the mean of the gradations between the four Experimental and four Control specimens. The "mean difference" for the percent passing each sieve size for each aggregate source was calculated by subtracting the average (mean of the four Control specimens) of the original design gradation from the average (mean of the four Experimental specimens) of the residual aggregate specimens after using the NCAT Asphalt Content Tester.

In addition, Confidence Interval and Frequency graphs were generated. The Student's t-Test for a paired two sample comparison was also used to determine if the gradation results from the Control and Experimental specimens were statistically from the same population set. A 95 % confidence level was used. The t-test data was also used to generate the Confidence Interval figures (1).

4.8.2 Second Method of Analysis (One-to-One Comparison between Experimental and Control Specimens)

The second method compared the gradation results between the Experimental and Control specimens on a one-to-one basis. All possible combinations of the Experimental and Control specimens were paired per sieve size and their percent differences were calculated. The sample standard deviations were

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calculated for each of the nine sieve sizes. The standard deviations calculated from each of the sieve sizes were compared to the single standard deviations found in the precision statement of AASHTO T 27.

5.0 GRADATION RESULTS AND DISCUSSION

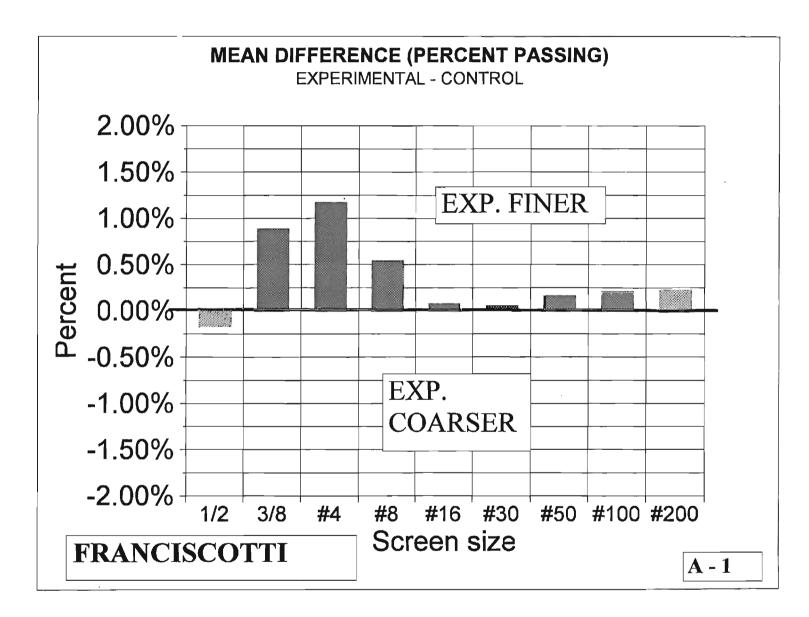
5.1 Analysis Method One (Aggregate Gradation Results)

In Sections 5.1.1 - 5.1.6 and 6.1.1 - 6.1.4 the "mean difference" refers to the average of the percent passing the four **Experimental** specimens minus the average of the percent passing the four **Control** specimens calculated for each of the sieve sizes.

5.1.1 Mean Differences Between the Control and Experimental Specimens Illustrated for the Franciscotti Aggregate Source

Figure 1. represents the mean differences calculated for each sieve size for the Franciscotti aggregate source. The analysis, data and figures for all of the aggregate sources can be found in Appendix A. Figure 1. Mean Differences Illustrated For Each of the Nine Sieve Sizes

Representing The Franciscotti Aggregate Source



After the mean differences for the percent passing each sieve size were calculated for the six aggregate sources, 45 out of the 54 sieves had more material passing each sieve, (the Experimental specimens were finer than the Control specimens).

The mean differences for the percent passing each sieve size were greater than 1.0 percent, but less than 1.75 percent for only three out of the 54 sieves tests (nine sieve sizes times six aggregate sources). The 9.5 mm (3/8 inch) sieve sizes from the Monk and Ralston aggregate source, and the 4.5 mm (No.4) sieve size from the Franciscotti aggregate source were the only sieves in which there were mean differences that were greater than 1.0 percent. The remaining 51 sieve test mean differences were all less than 1.0 percent.

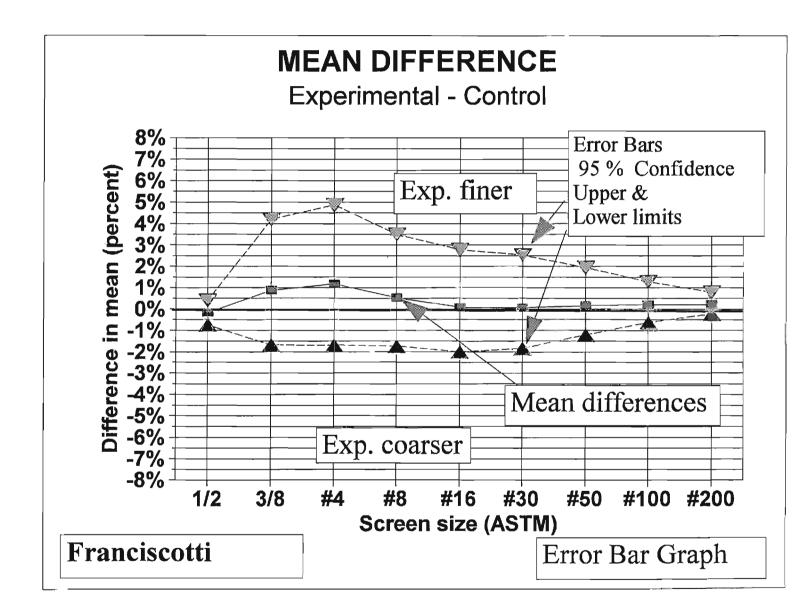
5.1.2 Confidence Interval Figure Displaying the Upper and Lower Limits for the Franciscotti Aggregate Source

Figure 2. is a graphical representation illustrating the upper and lower confidence intervals for the Franciscotti aggregate source. The remaining illustrations representing the other aggregate sources may be found in Appendix B. The data used to calculate the confidence interval limits were generated by applying the Student's t-test for paired samples. The data used to generate the figures may also be found in Appendix B.

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Figure 2. Confidence Intervals Representing the Upper and Lower Limits For

The Franciscotti Aggregate Source

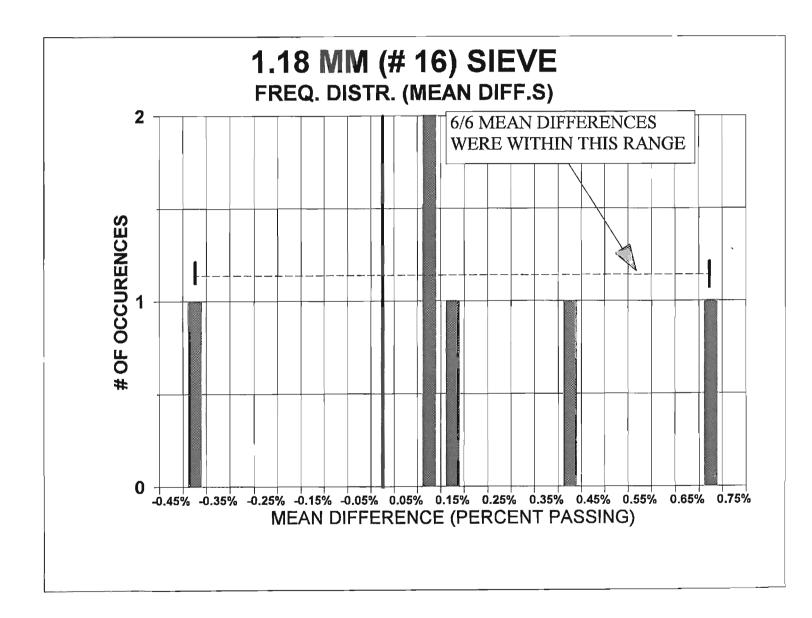


5.1.3 Frequency Distribution Illustrating the Mean Differences for the 9.5 mm (3/8) Sieve Size

Figure 3 represents the range between the mean differences for each of the six aggregate sources for the 9.5 mm (3/8) sieve size. The remainder of the figures representing the other sieve sizes used in this study may be found in Appendix C. The figures demonstrate that the range between the lowest and highest mean differences were normally less than 1.0 percent. Occurrences which deviated further away from the concentrated group of the mean differences may have been due to the splitting or mechanical mixing process, or the aggregate may have degraded during ignition process.

Figure 3. Frequency Distribution Displaying The Mean Differences

Representing The 1.18 mm (# 16) Sieve



5.1.4 Frequency Distribution for the 54 Sieve Tests

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Figure 4 represents the frequency distribution of the mean differences for the 54 sieve tests. The mean calculated for the "mean differences" as defined in Section 4.8 for all of the 54 sieve tests was 0.32 percent.



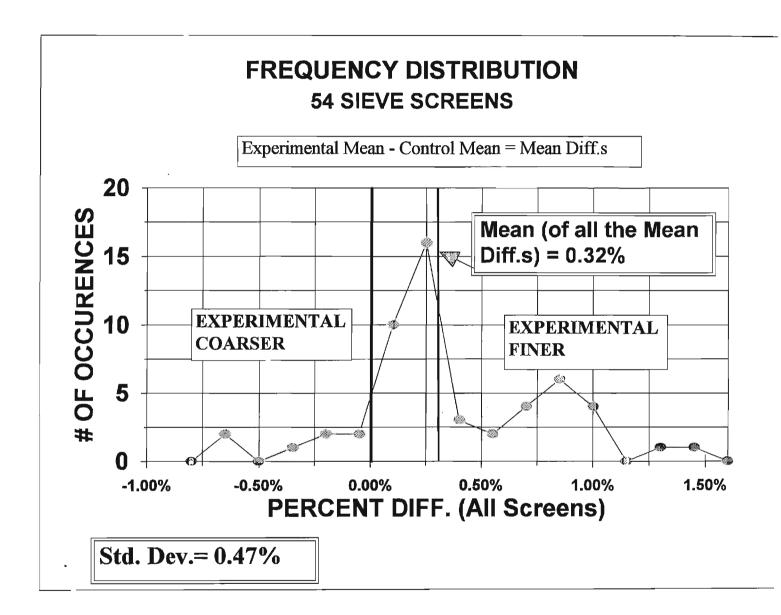


Table 3. Data used to generate Figure 4.

NCAT OVEN GRADATION STUDY

1/2 1/2 1/2 1/2 1/2 1/2	-0.17% -0.78% -0.03% 0.03%	12.5 12.5	-0.80%	frequency
1/2 1/2 1/2	-0.78% -0.03%		-0.80%	•
1/2 1/2	-0.03%	12.5	-0.65%	0 2
1/2		12.5	-0.50%	2
		12.5	-0.35%	1
	0.08%	12.5	-0.20%	2
1/2	0.24%	12.5	-0.05%	2
3/8	0.88%	9.5	0.10%	10
3/8	1.44%	9.5	0.25%	16
3/8	-0.30%	9.5	0.40%	3
3/8	0.53%	9.5	0.55%	2
3/8	1.68%	9.5	0.70%	4
3/8	0.11%	9.5	0.85%	6
#4	1.17%	4,75	1.00%	4
#4	0.81%	4.75	1.15%	0
#4	0.80%	4.75	1.30%	1
#4	0.07%	4.75	1.45%	1
#4	0.10%	4.75	1.60%	0
#4	0.23%	4.75		
\$78	0.54%	2.3		
#18	0.19%	2.3		
#6	0.80%	2.3		
#8	0.38%	2.3		
#8	-0.77%	2.3		
#8	0.86%	2.3		
#16	0.07%	1,18		•
#16	0.15%	1.18		
#16	0.05%	1.18		
#16 #16	0.36%	1.18 1.18		
#16	-0.41% 0.67%	1.18		
#30	0.05%	0.625		
#30	0.18%	0.625		
#30	-0.21%	0.625		
#30	0.71%	0.625		
#30	-0.10%	0.625		
#30	0.64%	0.625		
#50	0,16%	0.3		
#50	0.22%	0.3		
#50	0.13%	0.3		
#50	0.92%	0.3		
#50	-0.00%	0.3		
#50	0.65%	0.3		
#100	0.20%	0.15	-	
#100	0.16%	0.15		
#100	0.16%	0.15		
#100	0.87%	0.15		
#100	0.13%	0.15		
#100	0.58%	0.15		
#200	0.22%	0.075		
#200	0.12%	0.075 0.075		
#200 #200	0.04% 0.76%	0.075		
#200	0.81%	0.075		
#200	0.39%	0.075		
STDS	0.47%			
MEAN	0.32%			

5.1.5 Experimental Specimens that Appeared Coarser after Using the NCAT Asphalt Content Tester

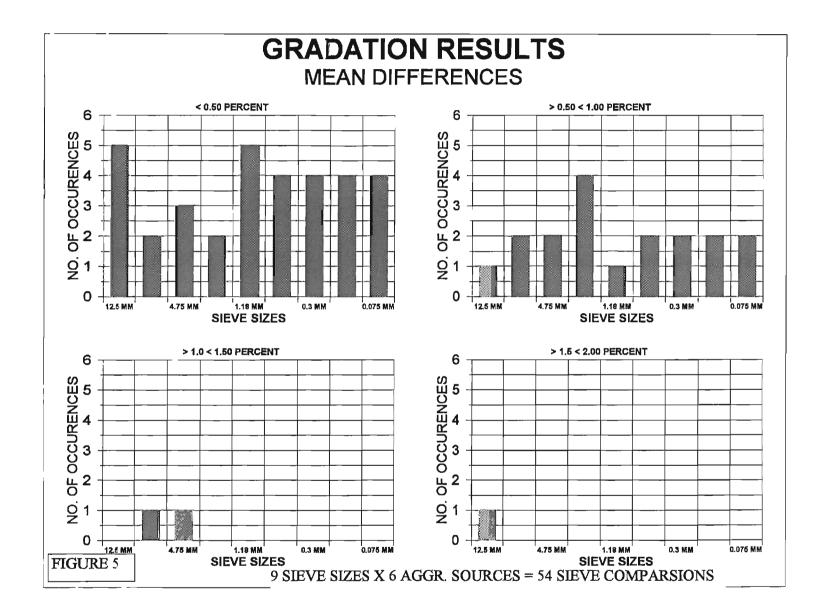
In some cases, when the mean differences were calculated for each sieve size after using the NCAT Asphalt Content Tester, the Experimental specimens appeared to be coarser. The 12.5 mm (1/2 inch) sieve from the Ralston aggregate source and the 12.5 mm (1/2 inch) and the 9.5 mm (3/8) sieve size from the Valco/Rocky Mountain aggregate source are examples of this. See Section 6.1.2 for an explanation of cases like these.

5.1.6 Summary of Results Using Analysis Method One

The results showing the ranges of the mean differences for the six different aggregate sources are shown in Figure 5.

Figure 5. Summary of the Gradation Results (Mean Differences, Analysis

Method One)



Reviewing Figure 5 reveals that the ranges of the mean differences for the 54 sieve tests were generally less than 1.0 percent. Thirty three were less than 0.5 percent, eighteen were less than 1.0 percent, two were less than 1.5 percent and one was less than 2.0 percent.

Ninety four percent of the calculated mean differences for the percent passing each sieve screen were less than 1.0 percent. Only six percent of the mean differences were greater than 1.0 percent.

5.2 Analysis Method Two- Aggregate Gradation Results

The standard deviations were calculated using the percent differences from each of the 16 possible paired combinations between the four Experimental and four Control specimens for each individual sieve size. The single standard deviations from the precision statement in AASHTO T 27 were then subtracted from their respective sieve size standard deviations calculated from the 16 possible paired combinations.

5.2.1 AASHTO T 27 Precision (Single Operator)

The precision statement for an aggregate sample which was split one time is given in AASHTO procedure T 27. The precision (for a single operator) in

determining the gradation per aggregate size is given in Table 4.

The estimates of precision for the method listed in AASHTO T 27 are based on results from the AASHTO Materials Reference Laboratory Reference Sample Program, with testing conducted by this method and ASTM C 136. The data is based on the analyses of more than 100 paired test results from 40 to 100 laboratories. The values in the table are given for different ranges of percentage of aggregate passing one sieve and retained on the next finer sieve. The Table uses ASTM C 670 Practice for Preparing Precision Statements for Test Methods For Construction Materials (3). The data for the aggregate gradations tested in this study for the percent of aggregate passing one sieve and retained on Table 5.

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METHODS OF SAMPLING AND TESTING

TABLE I Precision Percent Acceptable Range of Size of Test Results Fraction Coefficient of (D2S Standard Bctwccn Variation Deviation percent)" Consecutive (1S percent), (D2S),4 (IS), Percent Sieves Percent Percent of Average Percent Coarse Aggregates: ^C 85° 30° Single-Operator 0 to 3 1.40 4.0^o 3 to 10 Precision 10 to 20 0.95 2.7 20 to 50 1.38 3.9 35° ^م99 Multilaboratory 0 to 3 -----_ Precision 3 to 10 1.06 3.0 10 to 20 1.66 4.7 20 to 30 2.01 5.7 30 to 40 2.44 6.9 40 to 50 3.18 9.0 Fine Aggregates: Single-Operator 0 to 3 0.14 0.4 Precision 3 to 10 0.43 1.2 . 10 to 20 0.60 1.7 2 20 to 30 0.64 1.8 30 to 40 0.71 2.0 40 to 50 Multilaboratory 0.21 0 to 3 0.6 5. A. Precision 3 to 10 0.57 4.1.6 dp 1 3 10 to 20 0.95 2.7 20 to 30 1.24 3.5 30 to 40 1.41 4.0 634 Jac 24 : 40: to 50

⁴ These numbers represent, respectively, the (1S) and (D2S) as described in ASTM C 670. ⁶ These numbers represent, respectively, the (1S percent) and (D2S percent) limits as described in ASTM C 670.

C 670. ⁶ The precision estimates are based on coarse aggregates with nominal maximum size of 19.0 mm (⁴/₄ in.). ⁶ These values are from precision indices first included in T 27. Other indices were developed in 1982 from more recent AASHTO Materials Reference Laboratory sample data, which did not provide sufficient information to revise the values as noted.

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Table 4 from the AASHTO T 27 procedure, allows a single standard deviation for the gradation blends used in this experiment with a range between 0.95 and 1.4 percent for coarse material and a range between 0.14 and 0.64 percent for fine material using a single operator. The values depend on the percentage passing one sieve and retained on the next finer sieve.

Table 5. Percent of Aggregate Passing One Sieve and Retained on the Next

Finer Sieve for Each Aggregate Source

and the state of the second second				
FRANCISCOTTI				
<u>XPERIMENTAL</u> SIEVE SIZE	AGGREGATE DESCRIPTION	PERCENT PASSING EACH SIEVE SIZE	PERCENT PASSING ONE SIEVE AND RETAINED ON THE NEXT FINER SIEVE	B AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS
1/2	COARSE	99.66%		PRECISION (1S),%
3/8	COARSE	70.52%	29.14%	1.38
#4 #8 #16 #30 #50 #100 #200	FINE FINE FINE FINE FINE FINE	45.84% 33.61% 24.79% 17.36% 11.32% 7.30% 4.60%	24.69% 12.23% 8.82% 7.43% 6.04% 4.02% 2.69%	0.64 0.60 0.43 0.43 0.43 0.43 0.43 0.14
	÷			
VINDSOR/IRWIN				
WINDSOR/IRWIN KPERIMENTAL SIEVE SIZE	AGGREGATE DESCRIPTION	PERCENT PASSING EACH SIEVE SIZE	PERCENT PASSING ONE SIEVE AND RETAINED ON THE NEXT FINER SIEVE	B AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS
<u>XPERIMENTAL</u> SIEVE SIZE SIEVE SIZE	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY
<u>XPERIMENTAL</u> SIEVE SIZE SIEVE SIZE 1/2	DESCRIPTION	EACH SIEVE SIZE 99.81%	AND RETAINED ON THE NEXT FINER SIEVE	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1S),%
<u>XPERIMENTAL</u> SIEVE SIZE SIEVE SIZE	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION
XPERIMENTAL SIEVE SIZE 1/2 3/8 #4 #8	DESCRIPTION COARSE COARSE FINE FINE	99.81% 80.17% 59.51% 43.91%	AND RETAINED ON THE NEXT FINER SIEVE 19.64% 20.66% 15.60%	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1S),% 0.95 0.64 0.60
XPERIMENTAL SIEVE SIZE 1/2 3/8 #4 #8 #16	DESCRIPTION COARSE COARSE FINE FINE FINE FINE	99.81% 80.17% 59.51% 43.91% 32.09%	AND RETAINED ON THE NEXT FINER SIEVE 19.64% 20.66% 15.60% 11.82%	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1S),% 0.95 0.64 0.60
XPERIMENTAL SIEVE SIZE 1/2 3/8 #4 #8 #16 #30	DESCRIPTION COARSE COARSE FINE FINE FINE FINE FINE FINE	BACH SIEVE SIZE 99.81% 80.17% 59.51% 43.91% 32.09% 22.67%	AND RETAINED ON THE NEXT FINER SIEVE 19.64% 20.66% 15.60% 11.82% 9.42%	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1S),% 0.95 0.64 0.60 0.43
XPERIMENTAL SIEVE SIZE 1/2 3/8 #4 #8 #16	DESCRIPTION COARSE COARSE FINE FINE FINE FINE	99.81% 80.17% 59.51% 43.91% 32.09%	AND RETAINED ON THE NEXT FINER SIEVE 19.64% 20.66% 15.60% 11.82%	AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1S),% 0.95 0.64 0.60

SIEVE SIZE 1/2 3/8 #4 #8 #16 #30 #50 #100 #200 MONK KPERIMENTAL SIEVE SIZE	DESCRIPTION COARSE COARSE FINE FINE FINE FINE FINE FINE FINE FIN	98.17% 81.19% 66.56% 41.61% 26.68% 16.92% 8.99% 5.01% 2.74%	AND RETAINED ON THE NEXT FINER SIEVE	(1S),%
1/2 3/8 #4 #8 #16 #30 #50 #100 #200 MONK XPERIMENTAL SIEVE SIZE	COARSE FINE FINE FINE FINE FINE FINE	81.19% 66.56% 41.61% 26.68% 16.92% 8.99% 5.01%	14.63% 24.95% 14.93% 9.77% 7.93% 3.97%	COMBINATION: PRECISION (D2S),% 0.6 0.64 0.6 0.43 0.43 0.43
3/8 #4 #8 #16 #30 #50 #100 #200 MONK KPERIMENTAL SIEVE SIZE	COARSE FINE FINE FINE FINE FINE FINE	81.19% 66.56% 41.61% 26.68% 16.92% 8.99% 5.01%	14.63% 24.95% 14.93% 9.77% 7.93% 3.97%	0.6 0.64 0.43 0.43 0.43
#4 #8 #16 #30 #50 #100 #200 MONK KPERIMENTAL SIEVE SIZE	FINE FINE FINE FINE FINE FINE	66.56% 41.61% 26.68% 16.92% 8.99% 5.01%	14.63% 24.95% 14.93% 9.77% 7.93% 3.97%	0.6 0.64 0.43 0.43 0.43
#8 #16 #30 #50 #100 #200 MONK (PERIMENTAL SIEVE SIZE	FINE FINE FINE FINE FINE	41.61% 26.68% 16.92% 8.99% 5.01%	24.95% 14.93% 9.77% 7.93% 3.97%	0.64 0.6 0.43 0.43 0.43
#16 #30 #50 #100 #200 MONK (PERIMENTAL SIEVE SIZE	FINE FINE FINE FINE	26.68% 16.92% 8.99% 5.01%	14.93% 9.77% 7.93% 3.97%	0.6 0.43 0.43 0.43
#30 #50 #100 #200 MONK (PERIMENTAL SIEVE SIZE	FINE FINE FINE	16.92% 8.99% 5.01%	9.77% 7.93% 3.97%	0.43 0.43 0.43
#100 #200 MONK (PERIMENTAL SIEVE SIZE	FINE FINE	8.99% 5.01%	3.97%	0.43 0.43
#200 MONK (PERIMENTAL SIEVE SIZE				
MONK (PERIMENTAL SIEVE SIZE	FINE	2.74%	2.28%	0.14
(PERIMENTAL SIEVE SIZE				
ľ	AGGREGATE	PERCENT PASSING	PERCENT PASSING ONE SIEVE	_
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE NEXT FINER SIEVE	B AASHTO T 27 AFTER 1 SPL AGGREGATI ONLY 100 PAIRED TEST RESULT
SIEVE SIZE				PRECISION (1S),%
1/2	COARSE	99.29%		_
3/8	COARSE	81.99%	17.30%	0.95
#4	FINE	64.10%	17.89%	0.60

3/8	COARSE	81.99%	17.30%	0.95
#4	FINE	64 .10%	17.89%	0.60
#8	FINE	41.67%	22,43%	0.64
#16	FINE	29.43%	12.24%	0.60
#30	FINE	21.19%	8.24%	0.43
#50	FINE	13.53%	7.65%	0.43
#100	FINE	7.85%	5.69%	0.43
#200	FINE	4.34%	3.50%	0.43

PERIMENTAL	4			
SIEVE SIZE	AGGREGATE	PERCENT PASSING	PERCENT PASSING ONE SIEVE	-
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	<u> </u>
			NEXT FINER SIEVE	AASHTO
				Т 27
				AFTER 1 SF
				AGGREGA
				ONLY
				100 PAIRE
				TEST RESU
				PRECISIO
				(1S),%

SIEVE SIZE				
1/2	COARSE	99.7 9%		
3/8	COARSE	74.15%	25.64%	1.38
#4	FINE	61.42%	12.73%	0.60
#8	FINE	45.51%	15,91%	0.60
#16	FINE	35.18%	10.33%	0.60
#30	FINE	25.81%	9,37%	0.43
#50	FINE	11.86%	13.95%	0.60
#100	FINE	5.01%	6.85%	0.43
#200	FINE	2.77%	2.24%	0.14

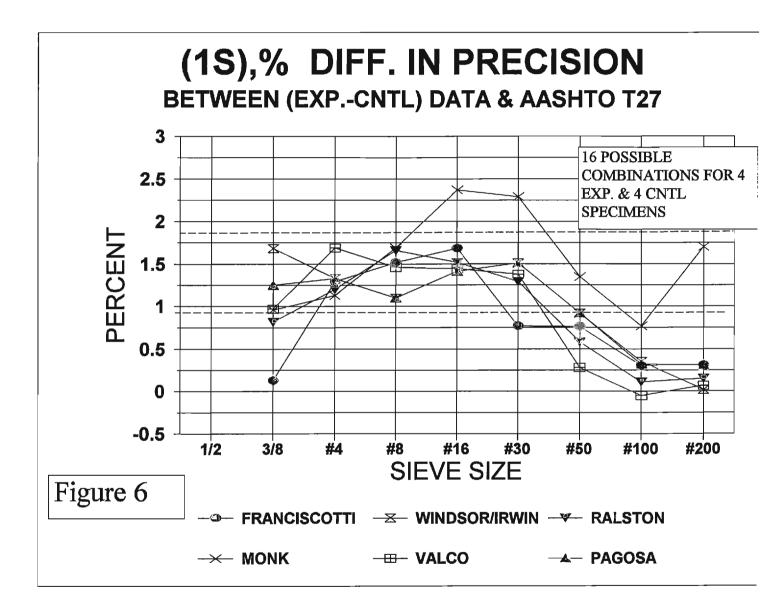
PAGOSA EXPERIMENTAL				
SIEVE SIZE	AGGREGATE DESCRIPTION	PERCENT PASSING EACH SIEVE SIZE	PERCENT PASSING ONE SIEVE AND RETAINED ON THE NEXT FINER SIEVE	B AASHTO T 27 AFTER 1 SPLF AGGREGATE ONLY 100 PAIRED TEST RESULT PRECISION (1S),%

SIEVE SIZE					
1/2	COARSE	100.00%			
3/8	COARSE	75.54%		24. 46%	1,38
#4	FINE	51.29%		24.25%	0.64
#8	FINE	36.74%		14.55%	0.60
#16	FINE	26.02%		10.72%	0,60
#30	FINE	18.76%		7,26%	0.43
#50	FINE	13.00%		5.76%	0.43
#100	FINE	8.80%		4.20%	0.46
#200	FINE	6.13%	33	2.6 7%	0.14

5.2.2 (Experimental - Control) Data Minus AASHTO T 27 (Single Standard Deviation Data)

Figure 6 represents the differences between the standard deviations for the aggregate specimens that were split three times, mixed with asphalt cement, and then heated inside the NCAT Asphalt Content Tester minus the single split precision of a paired aggregate sample. The differences in the standard deviations are due to the splitting, mechanical mixing, and heating of the aggregate inside the NCAT Asphalt Content Tester. There appears to be between 0.9 percent to 1.75 percent difference for the 9.5 mm (3/8), 4.75 mm (#4), 2.36 mm (#8), 1.18 mm (#16), and 0.60 mm (#30) sieves. There is less of a difference for the smaller sieve sizes of between 0.0 and 0.75 percent difference for the 0.30 mm (#50), 0.15 mm (#100) and the 0.075 mm (#200) sieve sizes.

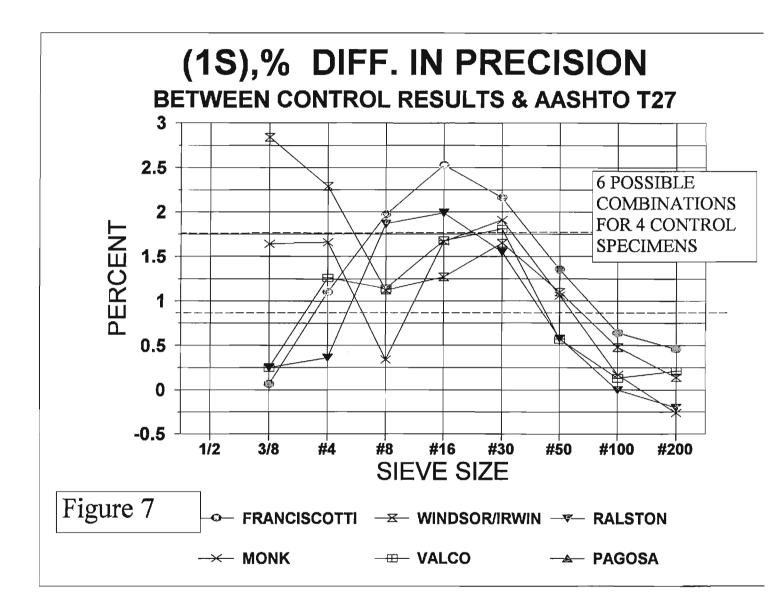
Figure 6. (Experimental - Control Data) Minus AASHTO T 27 (Single Standard Deviation Data)



5.2.3 Control Data Minus AASHTO T 27 (Single Standard Deviation Data)

In a attempt to measure the error induced when the aggregate was split three times the standard deviations of the percent differences were also calculated from the six possible paired combinations using the four Control specimens only.

The single standard deviations from the precision statement in AASHTO T 27 were also subtracted from the standard deviations of each respective sieve size from the six possible paired combinations. The results are illustrated in Figure 7. Figure 7 represents the (Control specimens) aggregate that were split three times but not mixed with asphalt cement or heated inside the NCAT Asphalt Content Tester.

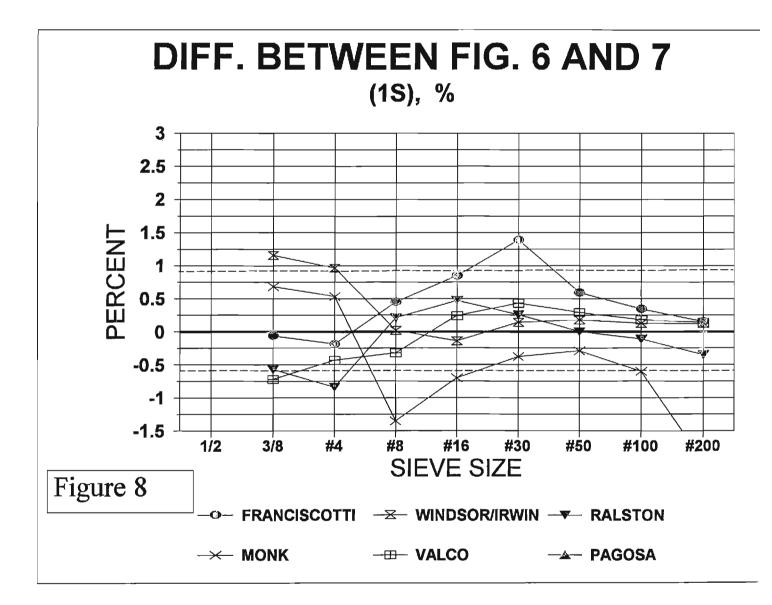


5.2.4 (Single Standard Deviation Data, Figure 8)

In an attempt to reveal the effects that the ignition oven may have had on the aggregate, the differences between the standard deviations for Figure 6 and Figure 7 were determined.

The differences between the single standard deviations for Figure 6 and Figure 7 are illustrated in Figure 8.

Figure 8. Difference Between Figure 6 and Figure 7 (Single Standard Deviation)



5.2.5 Summary of Results Using Analysis Method Two

The area which contains the majority of the points plotted for the percent difference in precision were reduced from a upper and lower range of +0.75 to +1.8 percent for Figure 6 to a upper and lower range of -0.6 to +0.6 percent for Figure 8. The percent differences in standard deviations were significantly reduced when the error due to splitting was alleviated.

5.3 Application of Correction Factors

Correction factors may be required to compensate for possible aggregate degradation inside the ignition oven.

Note: The data obtained from this experiment represents only the aggregate that was tested, individual aggregates should be tested separately for their susceptibility to degradation when placed inside the NCAT Asphalt Content Tester. Anyone using the ignition oven to determine aggregate gradation from a bituminous mixture should be aware of the possibility that aggregate sources other than the ones used in this study may degrade more under the high temperatures present inside the NCAT Asphalt Content Tester.

5.3.1 Testing for the Possibility of Aggregate Degradation

Aggregate degradation may be tested for by splitting a sample of a <u>known</u> gradation one time, producing paired specimens. The sample shall meet the minimum test weight requirements specified by AASHTO 27 (Section 6.4 - Sampling). One of the paired aggregate specimens shall be mixed with the appropriate amount of water and hydrated lime and dried in an exhaust oven at the proper mixing temperature along with the asphalt sample. The aggregate specimen and the asphalt sample shall be removed from the

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exhaust oven and mixed with the asphalt using a mechanical mixer. The bituminous mixture is than heated inside the ignition oven and tested. The other paired specimen shall be treated as the Control specimen as specified in Section 4.0 of this paper.

This procedure shall be repeated three times using three separate known aggregate gradation samples from the same source. The percent differences from each sieve size for the paired specimens shall be calculated for each of the three samples. The standard deviation shall be calculated using the results of the percent differences between the Control and Experimental specimens.

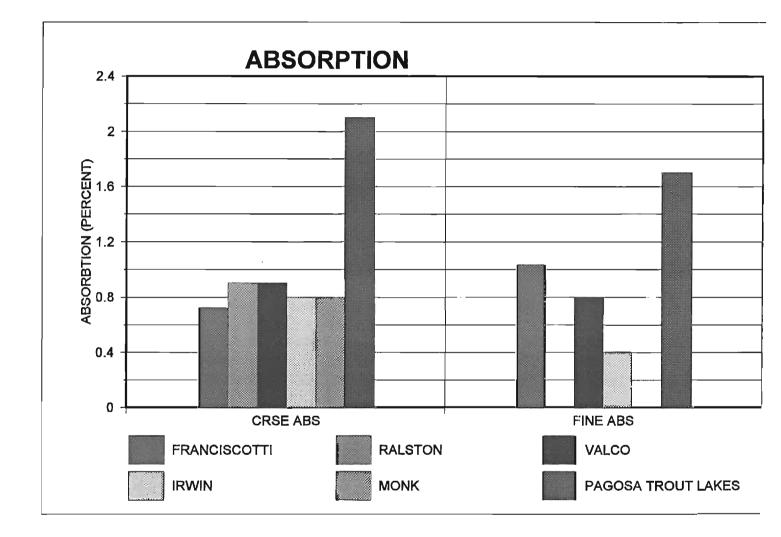
If the standard deviation calculated for the three samples exceeds the single standard deviation (1S),% limits as stated in AASHTO T 27, a correction factor will be required. The correction factor will be equal to the calculated standard deviation minus single standard deviation stated in AASHTO T 27. A correction factor will be required on any sieve size in which the calculated standard deviation for that sieve exceeds the (1S),% single standard deviation limits set fourth in the precision statement of AASHTO T 27. See Appendix D for the correction factors that were required using Analysis Method Two. See FUTURE RESEARCH Section 9.0 for additional information regarding this subject.

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5.4 Aggregate Absorption Values

The porosity of an aggregate is generally indicated by the amount of water it absorbs when soaked in water. A porous aggregate will also absorb asphalt which will tend to make a bituminous mixture dry or less cohesive. The aggregate sources with higher absorption values did not demonstrate more degradation than aggregate sources with lower absorption values. Absorption values for the aggregate sources evaluated are shown in Table 1. The absorption values for each aggregate source are illustrated as follows on the following page.

Figure 9. Absorption Values for Each Aggregate Source



6.0 CONCLUSION

6.1 Analysis Method One

6.1.1 Mean Differences Between The Experimental and Control Specimen Gradations

The residual aggregate from the Experimental specimens were found to be finer than the Control specimens after performing a gradation analysis (45 out of the 54 sieve tests. This would indicate that there was some degradation caused by the NCAT Asphalt Content Tester or through the mechanical mixing process. However, the mean differences for the percent passing each sieve size between the Experimental and Control specimens were relatively low (less than 1.5 percent for nearly all the sieve sizes analyzed from each aggregate source).

6.1.2 Experimental Specimens that Appeared to be Coarser after Using the NCAT Asphalt Content Tester

In a few instances (see Section 5.1.5) the Experimental specimens appeared to be more coarse (less material passed through the sieves) after using the NCAT Asphalt Content Tester, this was a probably a result of the splitting or mechanical mixing process and <u>not</u> due to the ignition oven.

6.1.3 Possible Reasons for the Variation in Gradation Results

Possible reasons for the variances in gradation include several factors such as high temperature degradation, mechanical mixing and the splitting process.

6.1.4 Student's t-test

The data from each from the different sieve sizes for each of the aggregate sources clearly demonstrates the t-test statistic (t) is less than the t critical two tail. This means that one can be 95% confident that the two data sets came from the same population set. (See Appendix B).

6.1.5 Summary of Analysis Method One

Since the mean differences between the Experimental and the Control specimens for the percent passing each sieve size were less than 1.5 percent for nearly all the sieve sizes analyzed (coarse and fine aggregate) it may be deduced that heating the six bituminous mixture sources using the NCAT Asphalt Content Tester had only a small affect on the gradation. <u>The gradations between the Experimental and the Control specimens were not statistically different.</u>

6.2 Analysis Method Two (One to One Comparison)

6.2.1 (Experimental - Control) Data Minus AASHTO T 27 Gradation Data (Single Standard Deviation)

The differences in the single standard deviations for all of the sieve sizes ranged between 0.0 to 2.5 percent. The differences were due to either the splitting, mechanical mixing or aggregate breakdown inside the NCAT Asphalt Content Tester or a combination of all these effects.

6.2.2 Control Data Minus AASHTO T 27 Gradation Data (Single Standard Deviation)

The standard deviations for each sieve size were calculated after the percent differences were determined by combining different paired specimens using only the Control specimens. The standard deviations from each sieve size was subtracted from each of the AASHTO T 27 standard deviations respectively. The result of this subtraction represent the affect on the standard deviations for each sieve size after the aggregate was split three times. Nearly all of the significant differences between the standard deviations for the Control specimens and the AASHTO T 27 data were alleviated. (See Section 6.2.3) Therefore, it may be deduced that any

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difference between the single standard deviations given in AASHTO T 27 and the standard deviations calculated for the Control data was due to the error induced when the aggregate sample was split three consecutive times using a riffle splitter.

6.2.3 Figure 8 (Single Standard Deviation)

As shown in Figure 8, the percent differences between the standard deviations straddled the zero percent line. This would indicate that the percent differences measured were due largely to the differences caused when the aggregate sample was split three times, and not due to the mechanical mixing or heating of the aggregate inside the NCAT Asphalt Content Tester. This would also indicate that the aggregate did not degrade excessively after using the ignition oven. When the differences between the standard deviations for Figure 6 and 7 were compared to the standard deviations given in AASHTO T 27 only a small number of sieve sizes required a correction factor. Most of the correction factors were less than 1.0 percent. The correction factors that were required may be found in Appendix D.

6.3 Absorption Values

The absorption values of the aggregates that were tested did not appear to

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have affected the results of the gradations after using the NCAT Asphalt Content Tester after the moisture was removed per Section 4.4. The gradations of the aggregates with high absorption values were not noticeably different from the aggregate with low absorption values.

6.4 Summary of Analysis Methods One and Two

It may be deduced from analysis methods One and Two that the NCAT Asphalt Oven may have caused a slight amount of aggregate degradation. However, only a small number of the sieves required any correction factor, almost all correction factors were less than 1.0 percent. The test method listed in Section 5.3.1 may be used to determine the degree of aggregate degradation.

7.0 RECOMMENDATION

* The NCAT Asphalt Content Tester may be used for determining gradations of bituminous mixtures.

* Use of the NCAT Asphalt Content Tester can replace the use of chlorinated solvents for determination of AC content and aggregate gradation.

* Correction factors will be required for aggregate that is found to degrade inside the NCAT Asphalt Content Tester. See Section 5.3. Exceeding the precision limits set fourth in AASHTO T 27 shall be used as a reference in determining the requirement for gradation correction factors. Some types of aggregate (e.g. aggregate which contains oil shale on the Colorado West slope) may degrade excessively and unpredictably inside the ignition oven. For these types of aggregate the ignition oven may not be effective in determining gradation.

8.0 FUTURE RESEARCH

Aggregate degradation research may also be conducted by using only one aggregate specimen, without adding asphalt cement. This could be done by comparing the gradation of the specimen before using the ignition oven to the gradation after heating the same aggregate specimen inside the ignition oven for specified amount of time. This would provide a more instantaneous and time efficient method, if a technician in the field is questioned or suspects aggregate degradation (due to the particular mineralogy) is taking place when the specimen is heated inside the ignition oven.

Note: This method would not account for the elevated temperatures that would be present inside the oven chamber when asphalt cement is mixed with the aggregate. These temperatures would typically exceed the oven chamber set point of 538° C (1000° F).

9.0 REFERENCES

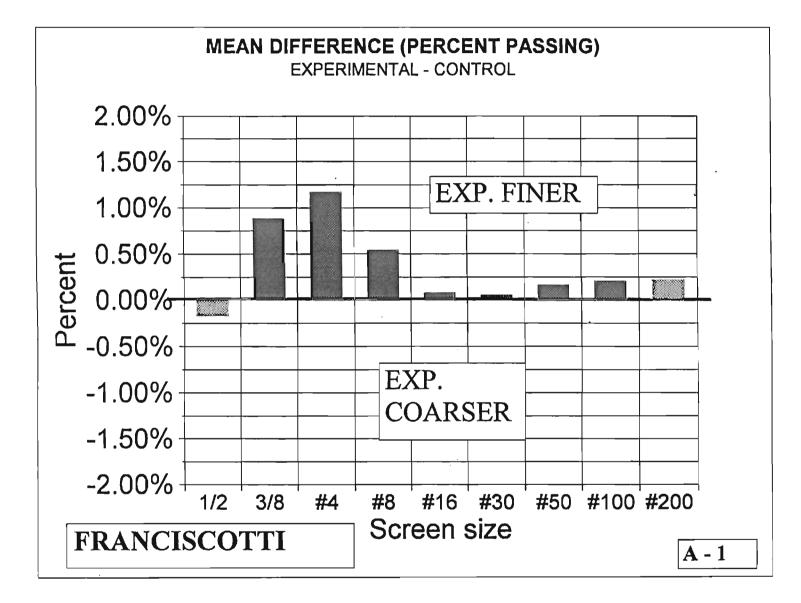
(1) Snedecor, W.G., and W.G. Cochran, Comparison of Two Samples, Chapter 6, *Statistical Methods* Eighth Edition. Iowa State Press, Ames Iowa 50010 1989, pp 84-86.

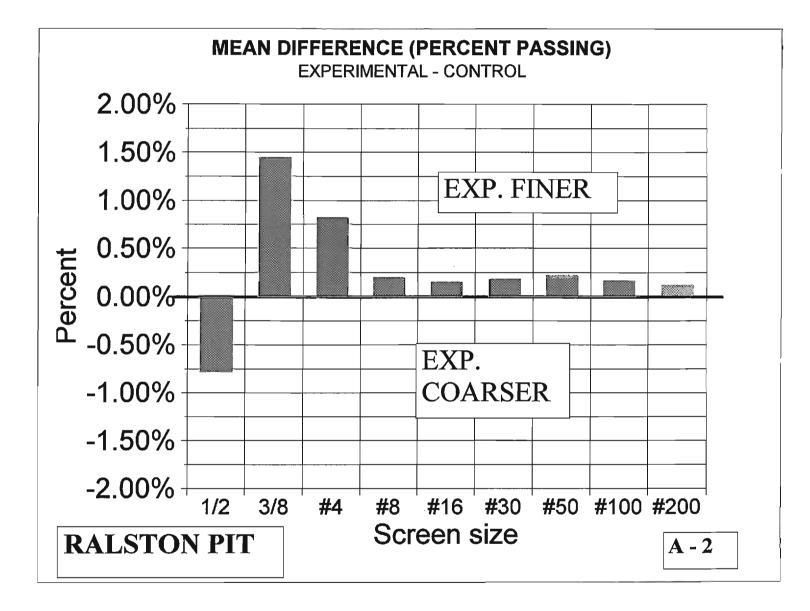
(2) 1995 Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Seventeenth Edition, AASHTO T 27 Section 10.0 precision, pp 30-31.

(3) 1996 ANNUAL BOOK OF ASTM STANDARDS, Concrete and Aggregates Volume 04.02, C 670 - 91a Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials pp 48-49.

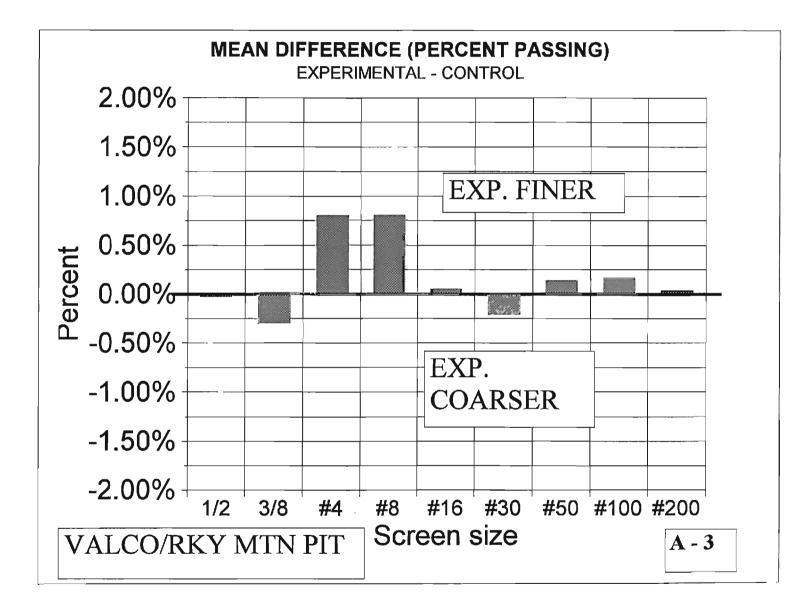
APPENDIX A

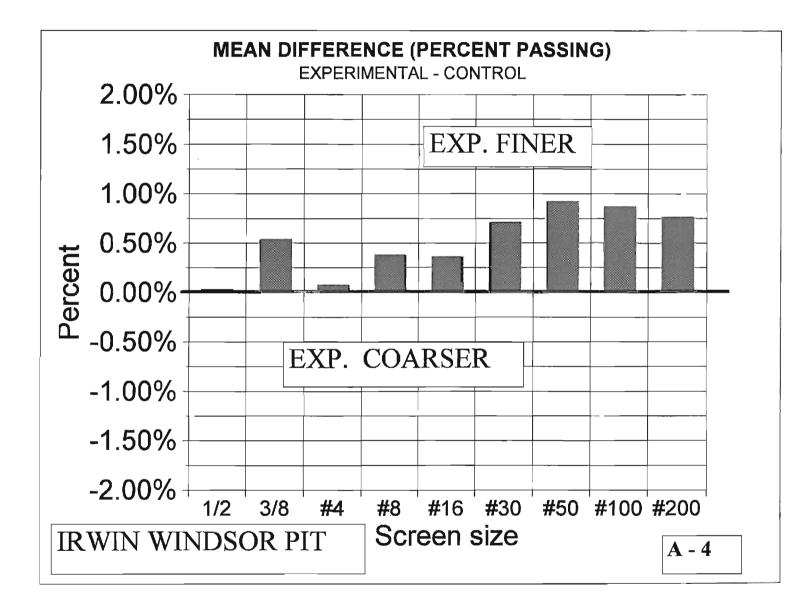
- * Mean Difference Figures for Aggregate Sources
 - * Data Used to Calculate Mean Differences

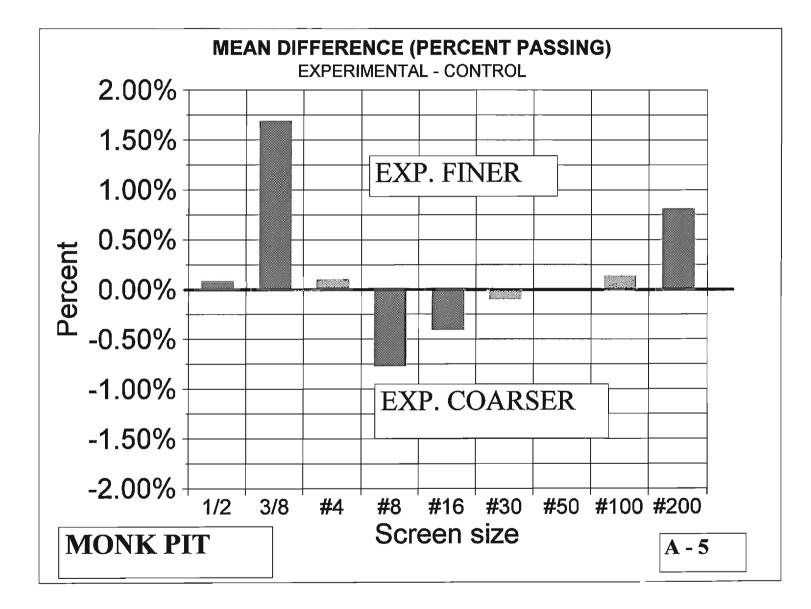


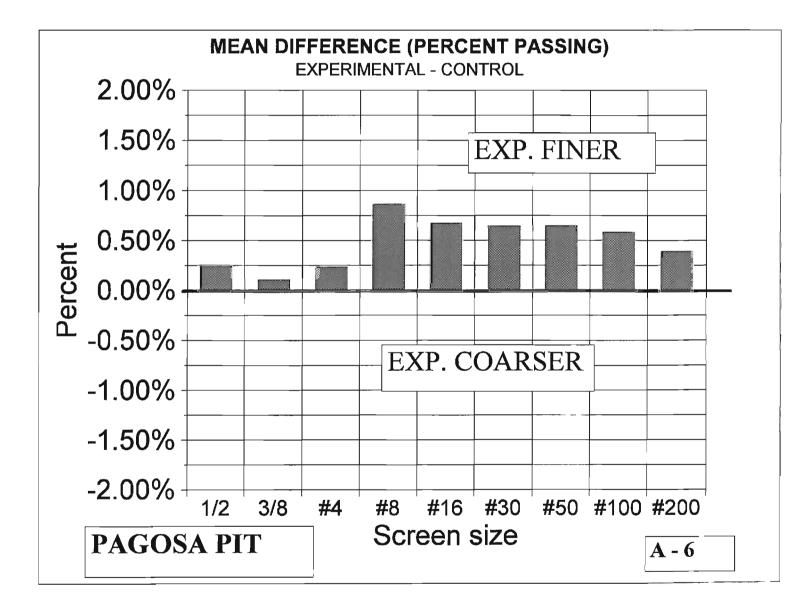


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DATE: 8-13-96 SUMMARY OF t- TEST PAIRED TWO-SAMPLE FOR MEANS AND GRADATION RESULTS

GRADATION COMPARISON OF AGGREGATE MIXED WITH ASPHALT AND PLACED IN NCAT ASPHALT CONTENT OVEN (EXPERIMENTAL) VS. THE SAME AGGREGATE LEFT IN IT'S ORIGINAL STATE (CONTROL).

SIX AGGREGATE SOURCES ANALYZED

STUDENTS T - TEST EMPLOYED

PROBABILITY OF A LARGER VALUE P(T<=t) two-tail: > .05

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EXPERIMENTAL

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
596X-1	99.49%	71.45%	46.37%	32.88%	24.16%	17.23%	11.32%	7.27%	4.53%
596X-2	99.41%	69.52%	45.01%	33.65%	24.84%	17.34%	11.30%	7.35%	4.73%
596X-3	99.73%	70.47%	46.14%	33.72%	24.46%	16.77%	10.82%	6.98%	4.38%
596X-4	100.00%	70.66%	45.83%	<u>34.17%</u>	25.69%	18.11%	11.83%	7.59%	4.76%
MEAN	99.66%	70.52%	45.84%	33.61%	24.79%	17.36%	11.32%	7.30%	4.60%
STD DEV	0.26%	0.79%	0.59%	0.53%	0.66%	0.55%	0.41%	0.25%	0.18%
CONTROL									
	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
596X-5	99.59%	67.61%	42.44%	30.68%	22.43%	15.40%	9.78%	6.16%	3.78%
596X-6	100.00%	70.25%	44.52%	33.86%	26.36%	19.04%	12.45%	7.88%	4.80%
596X-7	100.00%	69.59%	44.26%	31.81%	23.13%	16.02%	10.40%	6.75%	4.25%
596X-8	9 9.72%	71.11%	47.45%	35.91%	26.94%	18.78%	12.00%	7.58%	4.69%
MEAN	99.8%	69.6%	44.7%	33.1%	24.7%	17.3%	11.2%	7.1%	4.4%
STD DEV	0.2%	1.5%	2.1%	2.3%	2.3%	1.9%	1.3%	0.8%	0.5%
MEAN DIFF	-0.2%	0.9%	1.2%	0.5%	0.1%	0.1%	0.2%	0.2%	0.2%
s sub D bar	0.18%	1.05%	1.17%	0.93%	0.85%	0.78%	0.56%	0.34%	0.18%
Mean DIFF + 3.18	0.40%	4.21%	4.88%	3.50%	2.77%	2.53%	1.94%	1.28%	0.79%
Mean DIFF - 3.18;	-0.75%	-1.7%	-1.7%	-1.7%	-2.0%	-1.9%	-1.2%	-0.6%	-0.2%
t	-0.9457	0.8431	1.0010	0.5779	0.0881	0.0675	0.2831	0.6005	1.2101
t critical two-tail	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824
tonnou, mo tan	J. TOL I				J. IVE I				

RALSTON PIT: EXPERIMENTAL

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NCAT-1	97.60%	79.72%	65.03%	41.77%	27.93%	18.37%	10.02%	5.62%	3.01%

NCAT-2 NCAT-3 NCAT-4	98.76% 98.11% 98.23%	81.80% 80.78% 82.45%	66.62% 65.69% 68.90%	41.02% 40.10% 43.55%	26.01% 24.91% 27.88%	16.29% 15.42% 17.59%	8.48% 8.09% 9.35%	4.65% 4.55% <u>5.24%</u>	2.44% 2.56% 2.93%
MEAN STD DEV	98.17% 0.5%	81.19% 1.2%	66.56% 1.7%	41.61% 1.5%	26.68% 1.5%	16.92% 1.3%	8.99% 0.9%	5.01% 0.5%	2.74% 0.3%
CONTROL									
SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
non-NCAT-5	99.08%	77.93%	64.19%	39.97%	25.14%	15.68%	8.22%	4.54%	2.43%
non-NCAT-6	98.96%	79.61%	66.04%	42.76%	27.84%	17.75%	9.30%	5.04%	2.59%
non-NCAT-7	99.08%	79.69%	66.05%	39.76%	24.77%	15.39%	8.08%	4.60%	2.63%
non-NCAT-8	98.69%	81.77%	66.71%	43.18%	28.40%	18.15%	9.48%	5.22%	2.83%
MEAN	98.95%	79.75%	65.75%	41.42%	26.54%	16.74%	8.77%	4.85%	2.62%
STD DEV	0.2%	1.6%	1.1%	1.8%	1.8%	1.4%	0.7%	0.3%	0.2%
MEAN DIFF	-0.8%	1.4%	0.8%	0.2%	0.1%	0.2%	0.2%	0.2%	0.1%
s sub D bar	0.3%	0.3%	0.5%	0.7%	1.0%	1.0%	0.6%	0.3%	0.2%
Mean DIFF + 3.18	0.12%	2.52%	2.50%	2.51%	3.25%	3.24%	2.00%	1.19%	0.64%
Mean DIFF - 3.18;	-1.68%	0.36%	-0.87%	-2.13%	-2.95%	-2.89%	-1.57%	-0.86%	-0.41%

0.2640

3.1824

0.1508

3.1824

0.1820

3.1824

0.5009

3.1824

0.3872

3.1824

0.7109

3.1824

VALCO/ROCKY MOUNTAIN/CAS PIT:

.4

-2.7599

3.1824

4.2590

3.1824

1.5376

3.1824

t

t critical two- tail

CONTROL									
	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NON NCAT-5	100.00%	75.67%	61.68%	45.32%	35.54%	26.49%	12.05%	5.00%	2.78%
NON NCAT-6	99.51%	73.90%	59.11%	43.30%	33.20%	24.21%	10.84%	4.49%	2.54%
NON NCAT-7	99.76%	75.41%	61.56%	45.86%	36.79%	27.68%	12.58%	5.29%	3.03%
NON NCAT-8	100.00%	72.81%	60.13%	44.37%	35.00%	25.71%	11.43%	4.61%	2.56%
MEAN	99.82%	74.45%	60.62%	44.71%	35.13%	26.02%	11.73%	4.85%	2.73%
STD DEV	0.2%	1.3%	1.2%	1.1%	1.5%	1.5%	0.8%	0.4%	0.2%
EXPERIMENTA	L								
NCAT-1	100.00%	71.69%	60.00%	43.43%	33.15%	24.23%	11.29%	4.86%	2.75%
NCAT-2	99.62%	72.94%	60.56%	45.85%	36.40%	27.19%	12.62%	5.26%	
NCAT-3	99.55%	75.29%	60.34%	44.62%	34.36%	25.03%	11.39%	4.81%	2.75%
NCAT-4	100.00%	76.69%	64.7 <u>7%</u>	48.14%	36.83%	26.80%	12.13%	<u>5.10%</u>	2.80%
MEAN	99.79%	74.15%	61.42%	45.51%	35,18%	25.81%	11.86%	5.01%	2.77%
STD DEV	0.2%	2.3%	2.2%	2.0%	1.7%			0.2%	0.0%
MEAN DIFF	-0.0258%	******	0.7965%	0.7997%	0.0527%	-0.2101%	0.1306%	0.1604%	0.0356%
s sub D bar	0.07%				1.45%	1.35%	0.68%	0.29%	0.08%
Mean DIFF + 3.18	0.19%		5.43%				2.30%	1.07%	0.30%
Mean DIFF - 3.18;		-5.46%	-3.84%	-3,63%	-4.57%	-4.52%	-2.04%	-0.75%	-0.23%
t	-0.3823	-0.1842	0.5468	0.5747	0.0363	-0.1551	0.1918	0.5621	0.4266
t critical two- tail	3.1824			3.1824	3.1824	3.1824	3.1824	3.1824	3.1824

Irwin Winsor/Stute Pit:

CONTROL

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NON NCAT-5	100.00%	80.67%	59.97%	43.01%	31.60%	22.14%	13.88%	8.29%	4.99%
NON NCAT-6	99.70%	81.64%	60.27%	44.14%	31.81%	22.03%	13.90%	8.57%	5.49%
NON NCAT-7	100.00%	75.87%	56.65%	42.17%	30.19%	20.18%	12.33%	7.46%	4.67%
NON NCAT-8	99.40%	80.37%	60.86%	44.82%	33.32%	23.51%	14.71%	8.82%	5.34%
Mean	99.78%	79.64%	59.43%	43.54%	31.73%	21.96%	13,71%	8.29%	5.12%
STD DEV	0.3%	2.6%	1.9%	43.54 <i>%</i> 1.2%	1.3%	1.4%	1.0%	0.6%	0.4%

EXPERIMENTAL

NCAT-1 NCAT-2 NCAT-3	99.78% 99.45% 100.00%	79.98% 82.21% 78.89%	58.65% 60.11% 58.50%	44.50% 42.64% 42.87%	33.76% 30.06% 31.01%	24.42% 20.80% 21.76%	15.79% 13.37% 14.02%	9.73% 8.47% 8.76%	6.10% 5.59% 5.59%
NCAT-4	100.00%	79.60%	60.78%	45.63%	33.53%	23.71%	15.34%	9.66%	6.25%
Mean STD DEV	99.81% 0.3%	80.17% 1.4%	59.51% 1.1%	43.91% 1.4%	32.09% 1.8%	22.67% 1.7%	14.63% 1.1%	9.16% 0.6%	5.88% 0.3%
MEAN DIFF s sub D bar	0.0298% 0.20%	0.5331% 0.9%	0.0742% 0.7%	0.3760% 0.6%	0.3577% 0.8%	0.7092% 0.8%	0.9207% 0.6%	0.8704% 0.3%	0.7577% 0.2%
Mean DIFF + 3.18	0.66%	3.34%	2.17%	2.44%	2.94%	3.18%	2.70%	1.98%	1.47%
Mean DIFF - 3.18:	-0.60%	-2.28%	-2.02%	-1.69%	-2.23%	-1.76%	-0.86%	-0.24%	0.05%
t	0.1509	0.6041	0.1129	0.5791	0.4401	0.9133	1.646	2.5009	3.4088
t critical two- tail	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824

MONK PIT:

EXPERIMENTAL

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NCAT-1	99.47%	82.21%	62.56%	38.03%	25.14%	17.44%	11.11%	6.52%	3.17%
NCAT-2	98,53%	83.61%	65.02%	42.68%	30.80%	22.54%	14.76%	9.57%	7.91%
NCAT-3	99.16%	81.68%	64.78%	43.70%	31.90%	23.41%	14.84%	7.91%	3.14%
NCAT-4	100.00%	80.47%	64.06%	42.26%	29.88%	21.37%	13.44%_	7.38%	3.15%
MEAN STD DEV	99.29% 0.6%	81.99% 1.3%	64.10% 1.1%	41.67% 2.5%	29.43% 3.0%	21.19% 2.6%	13.53% 1.7%	7.85% 1.3%	4.34% 2.4%

CONTROL

SIEVE SIZE	1/2	3/8	#4	#8	#16	# 30	#50	#100	#200
NON NCAT-5	99.50%	80.09%	62.74%	41.40%	28.90%	20.54%	13.15%	7.66%	3.72%
NON NCAT-6	99.24%	78.83%	63.42%	43.15%	31.60%	23.12%	14.77%	8.27%	3.63%

NON NCAT-7	98.59%	82.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7.28%	3.55%
NON NCAT-8	99.50%	79.58%	63.54%	42.81%	30.48%	21.81%	<u>13.73%</u>	7 <i>.</i> 66%	3.23%
MEAN	99.21%	80.31%	64.01%	42.44%	29.84%	21.28%	13.54%	7.72%	3.53%
STD DEV	0.4%	1.7%	1.6%	0.8%	1.5%	1.5%	1.0%	0.4%	0.2%
MEAN DIFF	0.08%	1.68%	0.10%	-0.77%	-0.41%	-0.10%	-0.00%	0.13%	0.81%
s sub D bar	0.30%	1.22%	0.66%	0.96%	1.50%	1.42%	0.90%	0.53%	1.16%
Mean DIFF + 3.18	1.03%	5.57%	2.19%	2.29%	4.36%	4.42%	2.86%	1.83%	4.49%
Mean DIFF - 3.182	-0.86%	-2.20%	-2.00%	-3.84%	-5.17%	-4.62%	-2.87%	-1.57%	-2.88%
t	0.2835	1.3797	0.1465	-0.8018	-0.2719	-0.0694	-0.0025	0.2444	0.6962
P(T<≔t) two-tail	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824	3.1824

PAGOSA TROUT LAKES CONTROL

	1/ 2	3/8	#4	#8	#16	#30	#50	#100	#200
Non NCAT-1	99.74%	73.50%	46.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33%
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.5 2 %	9.64%	6.63%
Non NCAT-3	99.46%	72. 27%	47.95%	32.01%	22,27%	15.76%	10.59%	6.97%	4.74%
Non NCAT-7	99 .79%	79. 37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%
Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.94%	7.99%	5.64%
MEAN STD DEV	99.76% 0.2%	75.43% 2.8%	51.05% 4.2%	35.87% 3.9%	25.34% 3.2%	18.12% 2.4%	12.35% 1.7%	8.22% 1.1%	5.74% 0.8%

EXPERIMENTAL

NCAT-4	100.00%	76.34%	52.40%	35.85%	25.35%	18.28%	12.53%	8.36%	5.83%
NCAT-5	100.00%	74.63%	50.46%	37.59%	27.07%	19.71%	13.81%	9.44%	6.61%
NCAT-6	100.00%	75.65%	51.00%	36.76%	25.63%	18.29%	12.65%	8.59%	5.94%
MEAN	100.00%	0.75538	0.51287	0.367354	0.260173	0.1876162	0.129988	0.087975	0.061266
STD DEV	0.0%	0.9%	1.0%	0.9%	0.9%	0.8%	0.7%	0.6%	0.4%
MEAN DIFF	0.2404%	0.1059%	0.2332%	0.8630%	0.6749%	0.6446%	0.6469%	0.5799%	0.3885%

S sub d bar = Sample std./ sqrt (n)

S sub d bar = mean diff./ t

t = mean diff./ S sub d bar

95 % Confidence limits = Mean diff. +/- 3.1824 * S sub d bar

n = 4, # of differences

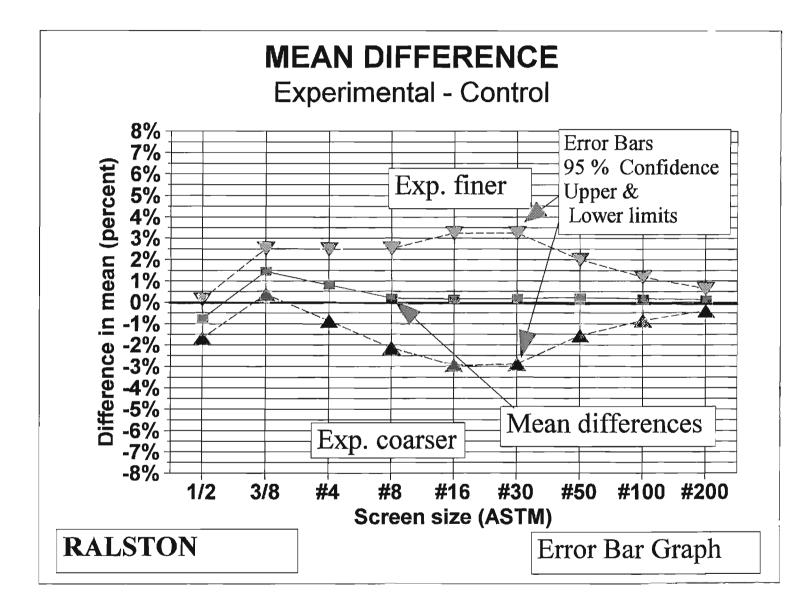
APPENDIX B

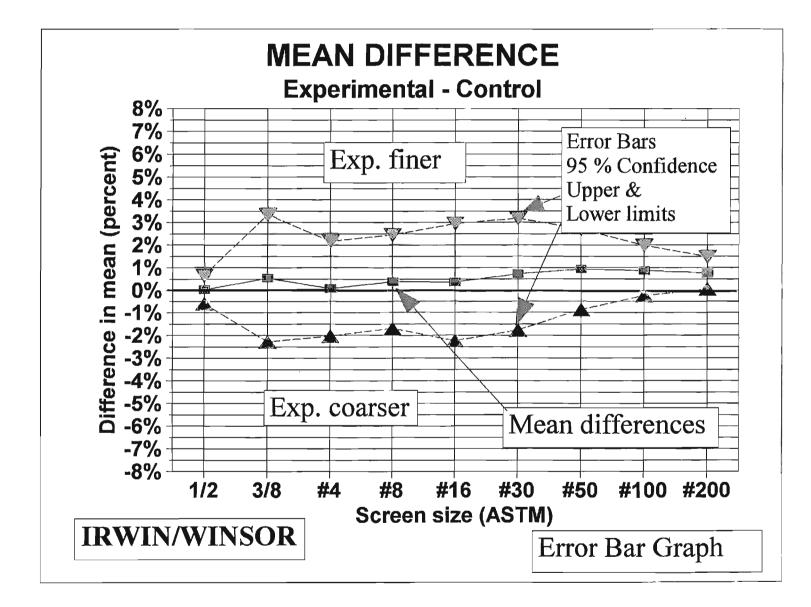
* Confidence Interval Figures For Each Aggregate Source

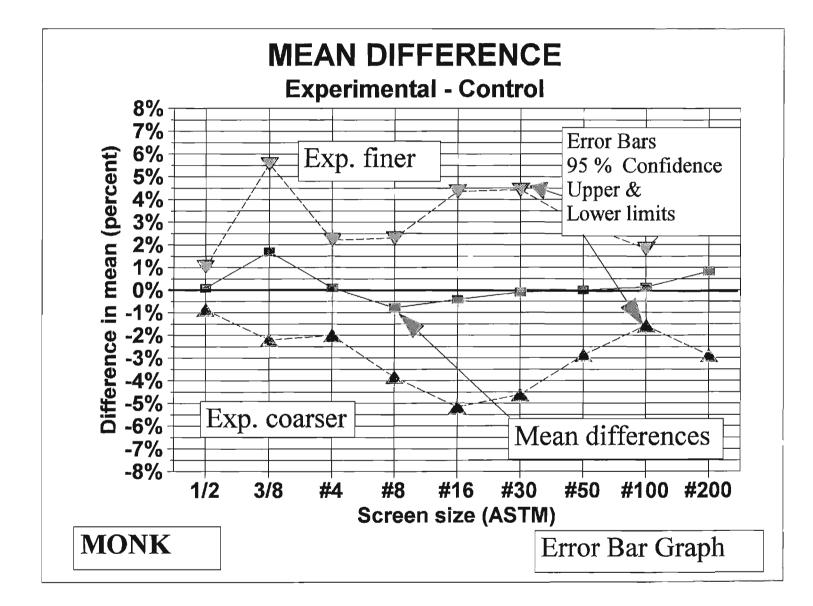
* Data Used to Calculate the 95 % Confidence Intervals

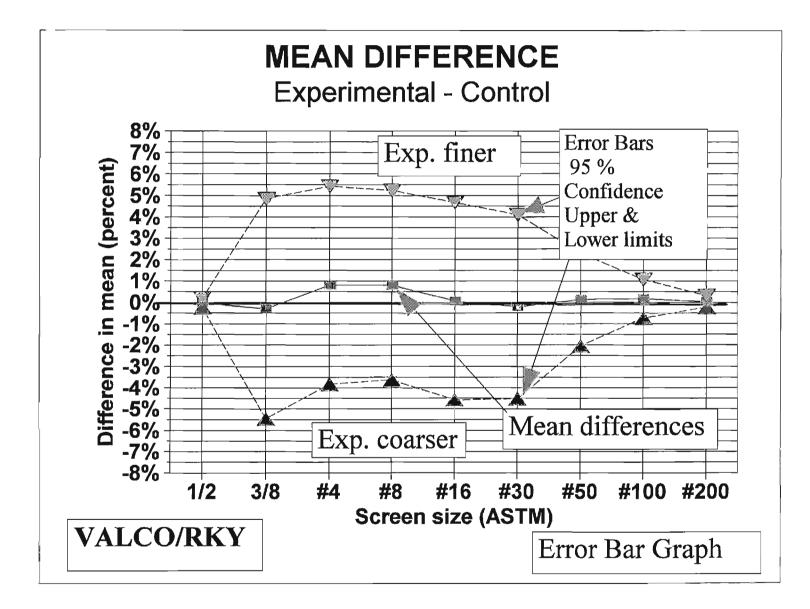
* Data From the Students t-Test

* Gradation Results From Each Aggregate Source









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FRANCISCOTTI

12 SIEVE

t-Test Paired Two-Sample for Means

	Varfable 1	Variable 2
Maan	0.896571615532207	0.998279004583418
Variance	7.01361800214759E-06	4.25007356707682E-06
Observations	4	4
Pearson Correlation	-0,162551178281695	
Pooled Veriance	5.6318457846044E-06	
Hypothesized Mean Difference	o	
đ	3	
t	-0,94568411494538	
P(T<=0 one-tail	0.207038447871417	
t Critical one-tail	2,3533634343976	
P(T<=1) two-tail	0,414076895742834	
t Oritical two-tail	3.18244630501052	

3/8 SIEVE

(-Test: Paired Two-Sample for Means

1-Test Paired Two-Sample for Means		
	Variable 1	Variable 2
Mean	0.705212855172953	0.696401229010712
Variance	6.30737551868694E-05	0.000221684436618976
Observations	4	4
Pearson Correlation	-0.643644645092483	
Pooled Variance	0.000142379095902616	
Hypothesized Mean Difference	٥	
ď	3	
t	0.843056745071967	
P(T=0 one-tail	0.230552644460696	
t Ortical one-tail	2.3533634343976	
P(TC) have-tail	0.451105688921795	
t Critical two-tall	3.18244630501062	

#4

t-Test: Paired Two-Sample for Means

1-Test: Paired Two-Sample for Means		
	Variable 1	Variable 2
Mean	0.458362137793419	0,44668143058799
Variance	3.526206513365025-05	0.00043060127318459
Observations	4	4
Pearson Correlation	-0.321795041909436	
Pooled Variance	0.000232931669159104	
Hypothesized Mean Olderance	0	
ď	3	
t	1.00053548574475	
P(T<=t) one-tall	0.195389008274358	
t Critical one-tail	2.3533634343976	
P(T the-tail	0.390779616548712	
t Critical two-tail	3,18244630501062	

æ

t-Test Paired Two-Sample for Means

	Variable 1	Variable 2
Mean	0.336057513064696	0.330680000615908
Variance	2.6573177522128E-05	0.000532481043717379
Observations	4	4
Pearson Correlation	0.870732286698803	
Pooled Variance	0.000280527110619772	
Hypothesized Mean Difference	0	
đ	3	
t	0.577986260532656	
P(T<≕t) one-tail	0.301901347739717	
t Critical one-tall	2.3533634343976	
P(T<=1) two-tail	0.603602695479434	
t Critical two-tail	3,18244630501062	

#16

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t-Test: Paired Two-Sample for Means

	Variable 1	Variable 2
Moan	0.247896848247481	0.247149436820667
Variance	4.35655882272443E-05	0.000513064796500453
Observations	4	4
Pearson Correlation	0.898451619703346	
Pooled Variance	0.000278315192363843	
Hypothestzed Mean Difference	0	
ď	3	
t	0.0880856430137138	
P(T c=t) one-tail	0.457679587721309	
t Critical one-tail	2.3533634343976	
P(Toot) two-tail	0.935359175442618	
t Critical two-tail	3.18244630501062	

#30

I-Test Paired Two-Sample for Means

	Variable 1 Variable 2
Mean	0.17361325 0.17308811
Variance	3.0802E-05 0.00034895
Observations	4 4
Pearson Correlation	0.66341098
Pooled Variance	0,00018967
Hypothesized Mean Difference	0
đ	3
t	0.06748688
P(T<=t) one-tail	0.47522009
t Critical one-tail	2,35336343
P(T<=t) two-tail	0.95044019
t Critical two-bail	3.18244631

#50

t-Test Paired Two-Sample for Means

Variable 1	Variable 2
0.11317147	0.11158303
1.7116E-05	0.0001607
4	4
0.49479551	
6.8909E-05	
٥	
3	
0.28311106	
0.39775177	
2.35336343	
0.79550353	
3.18244631	
	0.11317147 1.7116E-05 4 0.49479551 8.6909E-05 0 3 0.28311106 0.39775177 2.35336343 0.79550353

F(00

I-Test: Paired Two-Sample for Means Variable 1 Variable 2

Variable 1 Variable	
0.07295878 0.0709	209
6.34565-08 6.11296	5-05
4	- 4
0.54348712	
3.97376-05	
٥	
3	
0.60050419	
0.2952529	
2.35336343	
0.5905058	
3.18244631	
	0.07255478 0.0705 6.3456E-08 6.11294 4 0.54346712 3.3737E-05 0 3 0.60050419 0.2952529 2.35336343 0.6905058

#200

t-Test Paired Two-Sample for Maa	Variable 1	Variable 2
Mean	0.04602038	0.04383227
Variance	3.3147E-06	2.1637E-05
Observations	4	4
Pearson Correlation	0.70093696	
Pooled Variance	1.2476E-05	
Hypothesized Mean Difference	0	
đ	3	
t	1.21006399	
P(T<=t) one-tail	0.15645147	
t Critical one-tall	2.35336343	
F(T<=t) two-tail	0.31290293	
t Critical two-tail	3.18244631	

P(T<=t) one-tail t Critical one-tail

P(T <=t) two-tail

t Critical two-tail

t-Test: Paired Two-Sample for Means

1/2 SIEVE

RALSTON

Mean

đ

Variance

16 SIEVE t-Test: Paired Two-Sample for Means

t-Test: Paired Two-Sample for Means	
	Variable 1 Variable 2
Mean	0.98174771 0.98954466
Variance	2,254E-05 3.346E-06
Observations	4 4
Pearson Correlation	-0.3474716
Pooled Variance	1.294E-05
Hypothesized Mean Difference	0
df	3
	•
t	-2.759911
P(Tort) one-tail	0.03507877
t Critical one-tail	2.35336343
P(T<=t) two-tail	0.07015754
t Critical two-tail	3.18244631
	3/8 SIEVE
t-Test; Paired Two-Sample for Means	
•	Variable 1 Variable 2
Mean	0.81187931 0.79747499
Variance	0.00014316 0.00024654
Observations	4 4
Pearson Correlation	0.91539077
Pooled Variance	0.00019485
Hypothesized Mean Difference	0
ď	3
t	4.25910261
P(Tori) one-tail	0.01186793
t Critical one-tail	2.35336343
P(T<=0) two-tail	0.02373587
t Critical two-tall	B 4 BB 4 4 BB 4
	3,18244631
Conce (works)	3,16244031
	3,18244031 # 4 SIEVE
I-Test: Paired Two-Sample for Means	# 4 SIEVE
I-Test: Paired Two-Sample for Means	# 4 SIEVE
I-Test: Paired Two-Sample for Means	# 4 SIEVE
	# 4 SIEVE Variable 1 Variable 2
L-Test: Paired Two-Sample for Means Mean Variance	8 4 SLEVE Variable 1 Variable 2 0.66559565 0.65746052
L-Test: Paired Two-Sample for Means Mean Variance Observations	8 4 SIEVE Variable 1 Variable 2 0.66558565 0.65746052 0.00028672 0.00011771
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation	8 4 StEVE <u>Variable 1 Variable 2</u> <u>0.66559565 0.65746052</u> <u>0.00028672 0.00011771</u> <u>4</u> <u>0.7959884</u>
I-Test: Paired Two-Sample for Means Means Verlance Observations Pearson Correlation Pooled Variance	8 4 SIEVE <u>Variable 1</u> <u>Variable 2</u> <u>0.66558565 0.65746052</u> <u>0.00028672 0.00011771</u> <u>4</u> 4 0.7959684 0.00020222
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference	8 4 StEVE Variable 1 Variable 2 0.66558565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference of	\$ 4 SIEVE Variable 1 Variable 2 0.66558555 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.000202222 0 3
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference di t	8 4 StEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00026672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0 one-tail	<i>8</i> 4 SIEVE <u>Variable 1</u> <u>Variable 2</u> <u>0.66559565</u> <u>0.65746052</u> <u>0.00028672</u> <u>0.00011771</u> <u>4</u> <u>4</u> <u>0.7959884</u> <u>0.00020222</u> <u>0</u> <u>3</u> <u>1.53762578</u> <u>0.11087201</u>
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0) one-tail t Ortical one-tail	#4 SIEVE Variable 1 Variable 2 0.66558565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11067201 2.35336343
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0 one-tail P(T<=0 two-tail P(T<=0 two-tail	8 4 SIEVE Variable 1 Variable 2 0.66558555 0.65746052 0.00028672 0.00011771 4 4 0.7959684 0.00020222 0 3 1.53762578 0.11087201 2.35336343 0.22174403
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0) one-tail t Ortical one-tail	#4 SIEVE Variable 1 Variable 2 0.66558565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11067201 2.35336343
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference di t P(T<=0) one-tail t Critical one-tail P(T<=0) two-tail t Critical two-tail	8 4 SIEVE Variable 1 Variable 2 0.66558555 0.65746052 0.00028672 0.00011771 4 4 0.7959684 0.00020222 0 3 1.53762578 0.11087201 2.35336343 0.22174403
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0) one-tail P(T<=0) two-tail t Ontical two-tail # 8 SIEVE	8 4 SIEVE <u>Variable 1</u> <u>Variable 2</u> <u>0.66558565 0.65746052</u> <u>0.00028672 0.00011771</u> <u>4</u> <u>4</u> 0.7959884 0.00020222 0 <u>3</u> 1.53762578 0.11067201 2.35336343 0.22174403 <u>3.18244631</u>
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference di t P(T<=0) one-tail t Critical one-tail P(T<=0) two-tail t Critical two-tail	8 4 SIEVE <u>Variable 1</u> <u>Variable 2</u> <u>0.66558565 0.65746052</u> <u>0.00028672 0.00011771</u> <u>4</u> <u>4</u> 0.7959884 0.00020222 0 <u>3</u> 1.53762578 0.11067201 2.35336343 0.22174403 <u>3.18244631</u>
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference off t P(T-ot) one-tail t Critical one-tail P(T-ot) two-tail t Critical two-tail s & SIEVE I-Test: Paired Two-Sample for Means	8 4 SIEVE <u>Variable 1</u> <u>Variable 2</u> <u>0.66558565 0.65746052</u> <u>0.00028672 0.00011771</u> <u>4</u> <u>4</u> 0.7959884 0.00020222 0 <u>3</u> 1.53762578 0.11067201 2.35336343 0.22174403 <u>3.18244631</u>
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference df t P(T<=0) one-tail P(T<=0) two-tail t Ontical two-tail # 8 SIEVE	8 4 SIEVE <u>Veriable 1</u> <u>Variable 2</u> 0.66558565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11067201 2.35336343 0.22174403 3.18244631
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference off t P(T-ot) one-tail t Critical one-tail P(T-ot) two-tail t Critical two-tail s & SIEVE I-Test: Paired Two-Sample for Means	8 4 SIEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00026672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11097201 2.35336343 0.22174403 3.18244531 Variable 1 Variable 2
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference di t P(T<=0) one-tail t Critical one-tail P(T<=0) two-tail t Critical two-tail s \$ SiEV/E t-Test: Paired Two-Sample for Means Mean	#4 SiEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 153762578 0.11087201 2.35336343 0.22174403 3.18244631 Variable 1 Variable 2 0.41610039 0.41417486
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference di t P(Tort) one-tail P(Tort) one-tail P(Tort) two-tail t Ortical one-tail P(Tort) two-tail t Ortical two-tail s & SIEVIE t-Test: Paired Two-Sample for Means <u>Mean</u> Variance Observations	#4 SiEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00028672 0.00011771
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference off I P(T-ot) one-tail P(T-ot) one-tail P(T-ot) one-tail P(T-ot) one-tail P(T-ot) two-tail I Critical two-tail S & SIEVE I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation	8 4 SIEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00026672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11087201 2.35333343 0.22174403 3.16244631 Variable 1 Variable 2 0.41610039 0.41417486 0.00021474 0.00032428 4 0.61819305
I-Test: Paired Two-Sample for Means Mean Verlance Observations Pearson Correlation Pearson Correlation Pearson Correlation Pearson Correlation P(T<=0) ene-tail t Ortical one-tail P(T<=0) ene-tail t Ortical one-tail t Ortical two-tail t Ortical two-tail s & SIEV/E I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance	# 4 SiEVE Variable 1 Variable 2 0.665559565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11087201 2.35336343 0.22174403 3.18244631 Variable 1 Variable 1 Variable 2 0.41610039 0.411417486 0.00021474 0.00032428 4 4 0.61813935 0.00026951
I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference of t P(Tort) one-tail t Ortical one-tail P(Tort) one-tail t Ortical one-tail P(Tort) one-tail t Ortical two-tail # 8 SIEVE I-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance Hypothesized Mean Difference	# 4 SiEVE Variable 1 Variable 2 0.66559565 0.65746052 0.00026672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11067201 2.35336343 0.22174403 3.18244631 Variable 1 Variable 1 Variable 2 0.41610039 0.41417466 0.00021474 0.00032428 4 4 0.61819305 0.00026951 0 0
I-Test: Paired Two-Sample for Means Mean Verlance Observations Pearson Correlation Pearson Correlation Pearson Correlation Pearson Correlation P(T<=0) ene-tail t Ortical one-tail P(T<=0) ene-tail t Ortical one-tail t Ortical one-tail t Ortical two-tail s & SIEV/E t-Test: Paired Two-Sample for Means Mean Variance Observations Pearson Correlation Pooled Variance	# 4 SiEVE Variable 1 Variable 2 0.665559565 0.65746052 0.00028672 0.00011771 4 4 0.7959884 0.00020222 0 3 1.53762578 0.11087201 2.35336343 0.22174403 3.18244631 Variable 1 Variable 1 Variable 2 0.41610039 0.411417486 0.00021474 0.00032428 4 4 0.61813935 0.00026951

0,40443023

2.35336343

0.80886046

3.18244631

srizbie Z	t-Test: Paired Two-Sample for I	
41417486	Mean	
00032428	Variance	
4	Observations	
	Pearson Correlation	
	Pooled Variance	
	Hypothesized Mean Difference	
	ď	
	t	
	P(T<=t) one-tail	
	t Critical one-tail	
	P(T<=t) two-tail	
	t Critical two-tail	
	t-Test; Paired Two-Sample for I	

		A A A A A A A A A A A A A A A A A A A
Observations	4	4
Pearson Correlation	0.331600138833067	
Pooled Variance	0.00028054500079011	
Hypothesized Mean Difference	0	
đ	3	
t	0.15075737952589	
P(T<=t) one-tail	0.444866700356124	
t Critical one-tail	2.3533634343976	
P(T<=t) two-tail	0.889733400712248	
t Critical two-tail	3,18244630501062	
	# 30 SIEVE	
t-Test Two Sample Assuming Equa	at Variance	
· · ·	Variable 1	Variable 2
Mean	0.169186751435183	0.167432700899705
Variance	0.000172927756376044	0.000198533563873232
Observations	4	4

Variable 1

0.266844164264627

Variable 2

0.000219484107466921 0.000341605894113272

0.265375743859607

	4114414141414140	V. IVI 434/ 00088/ V3
Variance	0.000172927756376044	0.000198533563873232
Observations	4	4
Pooled Variance	0.000185730660124635	
Hypothesized Mean Difference	0	
ď	6	
t	0.182018402418259	
P(T<=1) one-tail	0.430781054561881	
t Critical one-tail	1.94318028004358	
P(T<=t) two-tail	0.861562109123762	
t Onlical two-tail	2.44691185086496	

#50 SIEVE

t-Test: Paired Two-Sample for Means Variable 1 Variable 2 Mean Variance 0.0494567268253932 0.0876883207793596 5,2074692428217E-05 7.5475181521397E-05 Observations 4 4 Pearson Correlation 0.0170905978089687 6.3774936974808E-05 Pooled Variance Hypothesized Mean Difference n 3 0.387266354760011 P(T c=t) one-tail 0.362199404648422 t Critical one-tail 2.3533634343976 P(T<=t) two-tall 0.724396809296844 t Critical two-tail 3.18244530501062 #100 SIEVE Moons Variable 1 Variable 2 0.0485190478493572 0.0501330266025405 1.1158010520335E-05 2.5438105040976E-05 4 4 -0.104866731527322 1.8298057780655E-05 0 3 0.509560059939925 0.322738791213532 2.3533634343976 0.645477582427065 3 18244530501062 # 200 SIEVE Means t-Test: Paired Two-Sample for Means Variable 1 Variable 2 Variable 1 Variable 2 0.0261979987726052 Меал Mean 0.0273632896500255 7.7899446355805E-06 2,71984951585E-06 Variance A Observations Pearson Correlation -0.02557034075969 Pooled Variance 5.2548970757151E-06 Hypothesized Mean Difference 0 3 0.710979718642712 0.264194679803404 2.3533634343976 P(T<=t) one-tail t Critical one-tail 0.528389359606808 P(T<=t) two-tail

3.18244630501062

đ

t Critical two-tail

1/2 SIEVE

IRWIN/WINSOR/STUTE PIT

Variable 1	Variable 2
0.9980638	0.9977661
6.821E-06	8.148E-06
- 4	4
-0.039627	
7.485E-06	
0	
3	
0.1509246	
0.4448061	
2.3533634	
0.8896123	
3.1824463	
	0.9980638 6.821E-06 4 -0.039627 7.485E-06 0 3 0.1509246 0.4448061 2.3533634 0.8696123

3/8 SIEVE

t-Test: Paired Two-Sample for Means

-	Variable 1	Variable 2
Mean	0.8017083	0.7963775
Variance	0.0002043	0.0006591
Observations	4	4
Pearson Correlation	0.7520273	
Pooled Variance	0.0004317	
Hypothesized Mean Difference	0	
ď	3	
t	0.6041332	
P(T-=t) one-tail	0.2941913	
t Critical one-tall	2.3533634	
P(T-==1) two-tail	0.5883826	
t Critical two-tail	3.1824463	

4 SIEVE

t-Test: Paired Two-Sample for Means

	Variable 1	Variable 2
Meen	0.5950921	0.5943496
Variance	0.0001241	0.0003589
Observations	4	4
Pearson Correlation	0.7347129	
Pooled Variance	0.0002415	
Hypothesized Mean Difference	0	
ď	3	
t	0.1129463	
P(Tort) one-tail	0.4586035	
t Critical one-tail	2.3533634	
P(Tort) two-tall	0.9172071	
t Critical two-tail	3,1824463	

#8 SIEVE

1-Test: Paired Two-Sample for Means

	Variable 1	Variable 2
Meen	0,4391126	0.4353525
Variance	0.0001995	0.0001395
Observations	4	4
Pearson Correlation	0.510758	
Pooled Variance	0.0001695	
Hypothesized Mean Difference	0	
đ	3	
t	0.5791473	
P(T≪=t) one-tali	0.301556	
t Critical one-tall	2.3533634	
P(T<=t) two-tail	0.6031119	
t Critical two-tail	3.1824463	

#16 SIEVE t-Test: Paired Two-Sample for Means Variable 1 Variable 2 Mean 0.3208848 0.3173074 Variance 0.0003397 0.0001634 Observations 4 4 Pearson Correlation 0.5068478 Pooled Variance 0.0002515 Hypothesized Mean Difference 0 đ 3 0.4401451 P(T<=t) one-tail t Critical one-tail 0.3448067 2.3533634 P(T<=t) two-tail t Critical two-tail 0.6896135 3,1824463 # 30 SIEVE t-Test; Paired Two-Sample for Means Variable 1 Variable 2 0.2267257 0.2196333 0.0002817 0.0001871 Mean Variance Observations 4 0.4956221 Pearson Correlation Pooled Variance 0.0002344 Hypothesized Mean Difference 0 đ 3 0.9132575 P(T<=t) one-tail 0.2142233 t Critical one-tail 2.3533634 P(T<=t) two-tail 0.4284465 t Critical two-tall 3,1824463 # 50 SIEVE t-Test; Paired Two-Sample for Means Variable 1 Variable 2 0.1462659 0.1370587 0.0001272 9.905E-05 Mean Variance Observations 4 0.449435 Pearson Correlation Pooled Variance 0.0001131 Hypothesized Mean Difference ٥ đ 3 1.6445927 t P(T<=t) one-tail 0.0993011 t Critical one-tail 2.3533634 P(T<=t) two-tall 0.1986023 t Critical two-tall 3,1824463 # 100 SIEVE t-Test: Paired Two-Sample for Means Variable 1 Variable 2 0.091571 0.0828668 4.057E-05 3.481E-05 Mean Variance Observations 4 4 0.3582937 Pearson Correlation Pooled Variance 3.769E-05 Hypothesized Mean Difference 0 đ 3 2.5008765 P(T<=t) one-tail 0,0438195 t Critical one-tail 2.3533634 P(T<=t) two-tail 0.0876389 t Critical two-tail 3.1824463 # 200 SIEVE t-Test: Paired Two-Sample for Means Variable 1 Variable 2 0.0588157 0.0512384 Mean

Miccui I	V.0300101	0.0012004	
Variance	1.166E-05	1.343E-05	
Observations	4	4	
Pearson Correlation	0.2128736		
Pooled Variance	1.255E-05		
Hypothesized Mean Difference	0		
df	3		
t	3.4088882		
P(T<=t) one-tail	0.0210925		
t Critical one-tail	2.3533634		
P(T<=t) two-tail	0.0421851		
t Critical two-tail	3.1824463		

•

LTest Paired Two-Sample for Means

isen Infince Seenetions Peoled Variance Peoled Variance Nypothesized Mean Diffe

MONK

16 SIEVE

1-Test Paired Two-Sa mple for Means

0.00016878 0.00028775	Variable 1 Variable 2 0.81992515 0,80308183		2,18244631	0,79523758	2,35336343	0,39761879	0.28349248	4	0	2.80946-05	0.39744909	•	1.7821E-05 1.8368E-05	0.89291102 0.9920696	Variable 1 Variable 2	
Mean Variance	t-Test Paired Two-Sample for Means	S to Steve	t Critical two-tail	P(Tort) two-tail	t Critical one-tail	P(T<=t) one-tail	~	Đ	Hypothesized Mean Difference	Pooled Variance	Pearson Correlation	Observations	Varlance	Mean		Since of additionant points of the states
0.211860607852394 0.212846106462435 0.000885111077372572 0.000228111019201636	u Variable 1		3, 18244630601062	0.803346453959337	2.3533634343976	0.401673226979669	-0.271887135585949	u.	0	0.000651611178617224	0.236087262272219	•	0.000885608479368379 0.000217613877866028	0.294305369553428	Variable 1	0
0.212045106462435	Varlable I												0.000217613877866028	0.298374462583359	Variable 2	

P(Ter) and tal 1 Critical and tal P(Ter) two-tal 1 Critical two-tal 1 Critical two-tal 3 B alone

feet: Paired Two-Sample for Means

	Variable 1	Variable I
Mean Variance	0.211860607852394 0.212846106462435 0.000825111019201636	0.212845106462435
Observations	•	
Peanson Correlation	0.148236875301085	
Pooled Variance	0.000461611048287148	-
Hypothesized Mean Ofference		
9	L,	
~	-0.0694612390377643	
P(l'cal) one-bil	0.474496536484124	
1 Critical one-fail	23533634343976	
P(Ted) Workl	0.94893278968247	
(Critical Iwo-tail d 60 SUEVE	1.18244630501062	

t-rest instruct (we-delapse for means	
Variable 1	Variable 2
0.135347476584374	0.136389994990134
0.00030228021688432	1.3011647548095-05
•	•
0.213952464794077	
0.000197647432365302	
. 0	
-0.00250391617219616	
0.439079680390799	
23553634343976	
0.995150360781598	
1, 14244630501062	

1

P(T-c) and bi Collect one fail P(T-c) two-fail Collect two-fail

0.146403903 0.446403833 2.285336343 0.852251767 1.16244631

Hons Valence Observations Preservation Preservations Preservations Hypothesized Houri Diffe

5

0.57105776

V=rtable 1 0.64103271 0.0001221

Hant Paired Two-Sample for Means

Alled and fi College and fi Alled and fi Alled and fi College and fi

1.37967217 0.13076855 2.26336343 0.36163711 3.16244631

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Variable 1 0.3 (1922515 0.000 16875 4 -0.3 (1950015 0.00022877

2

A 1997 L FIGHT (MANAGERING AN INCOME		
	Variable 1	Variable 2
Mean	0.0784615175207884	0.0771502364751656
Variance	0.000164847195124347	1.00303304125915-05
Obeenations	•	•
Petraon Constation	0.646981793223401	
Pooled Variance	9.074126276846865-05	
Hypothesized Mean Difference	0	
Ð.		
*	0.244425415661785	
P(Tort) one-tail	0.411332564615251	
t Critical one-tail	2.3533634343976	
P(T'set) two-tail	0.822665129230502	
t Critical two-tail	3,16244630501062	
# 200 SIEVE		

Observations Paarson Controlation Proted Variance Hypothesized Mean Difference

0.0212687

Vartable 1 0.419899 0.00062412

Variable 2 0.42441763 5.7345E-05

Fleet Paired Two-Sample for Means

P(Tong one-tail t Orlical one-tail P(Tong buo-tail t Orlical buo-tail

-0.801756855 0.24066124 2.36536543 0.46132246 3.182446511

4-Test Pained Two-Sample for Means		
	Variable 1	Variable 2
Mean	0.0434130554004854	0.0353457378191753
Variance	0.000564552534702789 4.5899128031601E-06	4.5899128031601E-06
Observations	•	•
Pearson Correlation	0.314661444365681	
Pooled Vartance	0.000284571223752975	
Hypothesized Mean Difference	0	
A	S S	
-	0.696191405735769	
P(T c=t) one-tail	0.268199448921774	
I Critical one-tail	2.3533634343976	

P(T'==1) two-tail t Critical two-tail

0.536398897843548 3.18244630501062

Page: D = 5

VALCO/ROCKY MOUNTAIN/CAS PIT

I-Test Paired Two-Sampie for Means	1/2 SIEVE	
	Variable 1	Variable 2
Moen	0,0970335	0.9981915
Variance	5.786E-06	5.388E-06
Observations	4	- 4
Peerson Correlation	0.8374793	
Pooled Verlance	5,587E-06	
Hypothesized Mean Difference	0	
ď	3	
t	-0.3823281	
P(T<=0) one-tail	0.3638478	
t Critical one-tail	2,3533634	
P(T==0 two-tail	0.7276955	
(Critical two-fail	3.1824463	

t-Test. Paired Two-Sample for Means	3/6 STEVE		
·	Variable 1	Variable 2	
Meers	0.741515	0.7444998	
Verlance	0,0005069	0.0001801	
Observeform	4	4	
Peerson Correlation	-0.5963528		
Pooled Verlance	0.0003445		
Hypothesized Meen Difference	0		
ď	3		
t	-0.1842071		
P(T<=t) one-tell	0.4327996		
(Critical one-tail	2,3533634		
P(T<=0 two-twi	0.8655992		
t Critical two-tail	3.1624463		

l-Test; Paired Two-Sample for Means	114 SIEVE		
	Variable 1	Variable 2	
Meen		0.6062019	
Verlence	0.0005058	0.0001513	
Observations	4	- 4	
Peerson Correlation	-0.3460494		
Pooled Verlance	0.0003266		
Hypothesized Mean Difference	0		
ď	3		
t	0.5468147		
P(Tort) and tail	0.3112771		
1 Critical one-tail	2.3533634		
P(T<=i) lao-lai	0.6225541		
1 Criticit two-tail	3,1824463		

#8 SIEVE LTest Paired Two-Semple for Mar

4-Test: Paired Two-Sample for Mean	5	
_	Variable 1	Variable 2
Mean	0,4561052	0.4471086
Verience	0.0004039	0.0001267
Observations	4	4
Pearson Cornelation	-0.53873	
Pooled Variance	0.0002653	
Hypothesized Mean Difference	0	
đ	3	
1	0.5747119	
P(T<=t) one-tal	0.3028769	
t Critical one-tail	2.3533634	
P(T<=0 luo-lai	0.6057537	
Critical two-fail	3,1824463	

16 StEVE 1-Test Paired Two-Sample for Means

1-Test Paired Two-Sample for Mea	ns	
	Variable 1	Variable 2
Moen	0.3518497	0.3513228
Variance	0.0002998	0.0002221
Observations	4	- 4
Peerson Correlation	-0.6148216	
Pooled Variance	0.0002609	
Hypothesized Mean Difference	0	
ď	3	
t	0.0363915	
P(T≪t) one-tai	0.4866281	
t Critical one-tail	2,3533634	
P(T<=0) two-tal	0.9732563	
t Ortifical two-tail	3,1824463	

1-Test: Paired Two-Sample for Means	# 30 SIEVE	
	Variable 1	Variable 2
Mean	0.2581033	0.2602045
Variance	0,0001999	0.0002112
Observations	- 4	4
Pearson Correlation	-0.7647108	
Pooled Variance	0.0002056	
Hypothesized Mean Difference	0	
đ	3	
t	-0.1551552	
P(T<=1) one-tail	0.4432752	
t Critical one-tail	2.3533634	
P(T<=0 two-tail	0.8865504	
t Critical two-tail	3.1824463	

1-Test Paired Two-Sample for Means	# 50 SIEVE	
	Variable 1	Variable 2
Mean	0.1185568	0.1172532
Variance	3.976E-05	5.672E-05
Observations	4	4
Pearson Correlation	-0.9363357	
Pooled Variance	4.824E-05	
Hypothesized Mean Difference	0	
ď	3	
t	0,191764	
P(T<=t) one-tail	0.4300663	
t Critical one-tail	2.3533634	
P(T<=0 two-tail	0.8601727	
t Ortical two-tail	3,1824463	
	# 100 SEVE	
I-Test Paired Two-Semple for Meens		
•	Variable 1	Variabie 2
Mean	0.0500736	0.0464693
Verlance	4.423E-06	1.3396-05
Observations	4	- 4
Pearson Correlation	-0.9593147	
Pooled Variance	8,9065-05	
Hypothesized Mean Difference	0	
ď	3	
t	0.5621059	
P(T<=0 one-test	0.3066531	
t Critical one-tail	2.3533634	
P(T<=0 two-tail	0.6133061	
Critical two-tail	3.1824463	

1# 200 SIEVE 1-Test Paired Two-Sample for Means Variable 1 Variable 2 0.0278792 0.0273064 2.4386-07 6.26-06 4 -0.7852009 2.7226-06 0 3 0.4265007 Meen Variance Observations Poeted Variance Pooted Variance Hypothesized Meen Difference of 3 0.4266037 0.3492147 2.3533634 0.6984294 3.1824463 1 P(Toot) one-tail ! Critical one-tail P(Toot) two-tail ! Critical two-tail

B-9

MONK MIX

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GRADATION COMPARISON USING THE NCAT OVEN TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

TABLE A REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE NCAT OVEN

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	A A	-				TABU 8	~		
IA	AGGREG	ATE 1 =	ie unori	,	18				NON NC
Gredetler X 11-01-85			NCAT MONK-		×	Gradation Analysia 11-01-95		Lab #	MONK6
Sieve	Weight ret such sleve						Weight ref		
\$ 1/2						1 1/2			
1	6.1	100.00% 89,47%		correct gradation		1 1/2		100.00% 99.50%	
346	199.4	42.21%				3/6	241.9	80.09%	
#4	227 A	62.56%			•	#4	216.3	52.74%	
#15 #/16	263.9 149.2	38,03% 25,14%				. #8 #16	266 155.8	41,40%	
#30	89.2	17.44%	,			#30	104.2	20.54%	
#50	73.2	11.11%				#5 0	82.1	12,15%	
#100 #200	63,1 36,8	6.52% 1.17%				#100 #200	68,4 49,1	7,86% 3,72%	
-#200	3					-6700	2.8		
-200 ve						-200 west	43.6		
Tolat	1157,4					Totat	1246.4		
Gradation X 11-01-05	I	Lab#	NCAT MONK	2		Gradation Analysis 11-01-85	I	Lab #	NON NC/ MONICE
Sieve	Weight nut					(Weight net much sieve	Percent p each play	anding a size
1 1/2		100.00%		comed any fater		1 1/2	•	100.00%	
1/2	17.6	86.53%		correct gradation		12	8.8	89.24%	
346 84	178.3 222.3	83.61% 65.02%				345	267.2 195	78,43%	
#5		-42.66%				#5	260.5	43.15%	
#16 #30	142 85.5	20,80% 22,54%				#16 #30	148,4 108,9	31,60%	
#50	\$3	14.76%				#50	107.3	14.77%	
#100	62	8.57%				#100	83.6	4.27%	
6200 -6200 -200 wa	19.9 1.2 st 93.3	7,91%	•			#200 -#200 -200 west	59.5 4.2 42.5	X634	
Totat	1195A	****				Total	1284.9		
Gradeties X 15-01-05		Lab #	NCAT						HON NC
		- ·	•	•		Gradation Analysis 11-01-85		Lub #	MONIC-7
Sieve 1 1/2	Weight rut each sieve						Weight ret each sleve		
1		100.00%		correct gradation		1 1/2			
1/2	10.8	89,16%		•		1		100.00%	
36	225.6 216.3	81,55% 64,78%				1/2 3/6	17.3	95.59% 82,73%	
615	272.2	43,70%				#4	201.5	66.32%	
	152.4	31.90%				#5	293.7 172.4	42.41%	
#16 #30		23 414				#16			
#30 #50	109.7 110,7	23.41% 14.84%				#16 #30	107	19.66%	
#30 #50 #100	109.7 1 10.7 89.4	14.84% 7.91%				#30 #50	107	12.50%	
#30 #50	109.7 110,7	14.84%				#30	107		
#30 #50 #100 #200	109.7 110,7 89.4 61.6 3	14.84% 7.91%				#30 #50 #100 #200 -#200	107 88 64,1 45,8 3,3	12.50% 7.28%	
830 850 8100 8200 -#200	109.7 110,7 89.4 61.6 3	14.84% 7.91%		-		#30 #50 #100 #200 -#200 -200 wast	107 88 64.1 45.8 3.3 40.3	12.50% 7.28%	
830 850 8100 8200 -4200 -200 w Total	109.7 110.7 89.4 61.6 3 st 37.6	14.84% 7.91% 3,14%		-		#30 #50 #100 #200 -#200	107 88 64,1 45,8 3,3	12.50% 7.28%	
830 850 8100 8200 -8200 -200 w	109.7 110.7 89.4 61.6 3 st 37.6	14.84% 7.91%		-		#30 #50 #100 #200 -#200 -200 wast	107 88 64.1 45.8 3.3 40.3 1228.2	12.50% 7.25% 3.55%	NON NC
830 850 8700 8700 -8200 -8200 -8200 -200 w Totat	109,7 110,7 89,4 61,6 3 8sf 37,6 1291,5 Weight ref	14.84% 7.91% 3,14% Leb #	NCAT MONK-	4		#30 #50 #100 #200 -#200 -200 wast	107 88 64.1 45.8 3.3 40.3 1228.2	12.50% 7.28%	
630 850 850 8200 -200 w Totat Gradation X 11-01-95 Store 1 1/2	109,7 110,7 89,4 61,6 3 31st 37,6 1291,5	14.84% 7.81% 3.14% Lab # (Percent); ceach slee	NCAT MONK. pessing ve size			630 #100 #200 -200 wast Totat Gradation Analysia 11-01-95 Stove	107 86 64.1 45.8 3.3 40.3 1228.2 Weight ref	12.50% 7.28% 3.55%	NON NC. MONK-8
630 850 8700 -8200 -200 w Total Gradetion X 11-01-95 Sieve	109,7 110,7 89,4 61,6 3 8sf 37,6 1291,5 Weight ref	14.84% 7.91% 3,14% Leb #	NCAT MONK- pessing vs size	4 correct grade@on		630 #100 #200 -200 wast Totat Gradation Analysia 11-01-95 Stove	107 86 64,1 45,8 3,3 40,3 1228,2	12.50% 7.28% 3.55% Leb # Percent p each size	NON NC. MONK-8 wessing weste
630 850 850 8700 -8200 -8200 -200 Total Total Sieve 1 1/2 1 1/2 3/8	109,7 110,7 89,4 61,6 3 set 37,6 1291,5 Weight ref each sion	14.84% 7.81% 3.14% Lab # (Percent ; reach sin 100.00% 100.00% 50.47%	NCAT MONK- pessing resta			630 650 7200 -7200 -200 wast Totat Gradation Analysia 11-01-95 Slove 1 1/2 1	107 86 64.1 45.8 3.3 40.3 1228.2 Weight rate each siew	12.50% 7.23% 3.55% Leb # Percent p each size 100.00%	NON NC. MONK-8 wssing wsize
630 850 8700 -8200 -8200 -200 w Total Gradation X 11-01-95 Sieve 1 1/2 1 1 2,38 ,84	109.7 110.7 89.4 61.6 13 ast 37.6 1291.5 Weight rat each stew 251.5 211.3	14.84% 7.81% 3.14% Lab # (Percent ; reach sim 100.00% 50.47% 64.05%	NCAT MONK- pessing ve size c c c			630 650 7100 7200 -7200 wast Totat Gradation Analysia 11-01-95 Slove 1 1/2 1 1/2	107 86 64,1 45,8 3,3 40,3 1228,2 Wedgit ration each stem 6,7	12.50% 7.28% 3.55% Lab # Percent p each size 100.00% 99.50%	NON NC. MONK-8 wssing wsize
630 850 850 8700 -8200 -8200 -200 Total Total Sieve 1 1/2 1 1/2 3/8	109,7 110,7 89,4 61,6 3 set 37,6 1291,5 Weight ref each sion	14.84% 7.81% 3.14% Lab If (Percent) (each size 100.00% 100.00% 80.47% 64.05%	NCAT MONK- pessing vs size c c c c			630 #50 #100 #200 -200 wast Totat Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4	107 86 64,1 45,8 3,3 40,3 1228,2 Weight ref each siew 6,7 265,1 213,4	12.50% 7.25% 3.55% Leb # Percent p each size 100.00% 99.50% 79.58% 53.54%	NON NC. MONK-8 wasting wasting
630 850 8700 -8200 -200 w Total Total Gradation X 11-01-95 Sleve 1 1/2 1 1/2 3/8 84 84 85 815 815	109,7 110,7 89,4 61,6 3 3st 37,6 1291,5 1291,5 251,5 211,3 280,6 159,5 (09,6	14.84% 7.81% 3.14% Lab # Percent (ceach sim 100.00% 50.67% 64.06% 21.37% 21.37%	NCAT MONK- pessing mistze c c c c c			630 650 #100 #200 -200 wast Total: Gradation Analysia 11-01-95 Slove 1 1/2 1 1/2 3/6 64 64	107 86 64,1 45,8 3,3 40,3 1228,2 Weight ref each siew 6,7 265,1 213,4 275,9	12.50% 7.25% 3.55% Leb # Percent p each size sech size 100.00% 79.55% 79.55% 79.55%	NON NC. MONK-8 wassing waize
630 #50 #200 -#200 -200 w Totat Gradation X 11-01-95 Store 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1 1/2 1/2	109,7 89,4 61,6 3 ast 37,6 1291,5 Weight ret each siow 251,5 211,3 280,6 159,5 102,1	14.84% 7.81% 3.14% Lab # (Percent) (cench sin 100.00% 100.00% 80.47% 64.06% 42.25% 29.86% 21.37% 13.44%	NCAT MONK pessing va size c c c c c c c c c c c c c c c c c c c			630 #100 #200 -200 wast Totat Gradation Analysia 11-01-95 Slove 1 1/2 1 1/2 3/6 6/4 #3 #16	107 86 64,1 45,8 3,3 40,3 1228,2 Weight ref each siew 6,7 265,1 213,4 213,4 213,4 213,4 215,9 164,1	12.60% 7.25% 3.55% Leb # Percent p each size 100.00% 99.60% 79.58% 53.54% 42.61% 30.48%	NON NC. MONK-8 essing e size
630 #50 #200 -#200 -200 w Totat Gradation X 11-01-95 Sieve 1 1/2 1 1/2 3/8 #4 #6 #16 #30 #50 #100 #50 #100	109,7 80,4 81,4 61,6 3 3 ast 37,5 1291,5 1291,5 291,5 211,3 280,6 159,5 109,6 102,1 78 54,5	14.84% 7.81% 3.14% Lab # (Percent) (ceach sim 100.00% 80.47% 90.47% 22.137% 13.44% 7.38% 3.15%	NCAT MONK- pessing va stre c c c c c c c c c c c c c c c c c c c			630 #50 #100 #200 -200 wast Totat Gradation Analysis 11-01-95 Siove 1 1/2 1/2 3/5 6/4 #8 #15 #30 #50	107 86 64,1 45,8 3,3 40,3 1228,2 1228,2 Weight ref esch sieve 6,7 265,1 213,4 275,9 164,1 115,3 107,6	12.50% 7.28% 3.55% 1.60 /f Percent p esch der 100.00% 99.50% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58%	NON NC. MONK-8 assing asize
630 850 850 8700 -8200 -200 Total Total 51eve 1 1/2 1 1/2 38 84 85 816 830 850 8100 8200 -8200 -8200 -8200	109,7 89,4 61,6 3 1291,5 1291,5 1291,5 1291,5 251,5 211,3 211,3 211,3 213,5 215,5 21	14.84% 7.81% 3.14% Lab # (Percent; f ceach sim 100.00% 50.47% 20.85% 21.37% 13.44%	NCAT MONK- pessing va stre c c c c c c c c c c c c c c c c c c c			630 #100 #200 -200 wast Totat Gradation Analysis 11-01-05 Slove 1 1/2 1 1/2 3/6 #4 #6 #16 #50 #100	107 86 64,1 45,8 3,3 1228,2 Weight ref each slow 6,7 265,1 265,1 265,1 116,3 107,6 80,8	12.50% 7.25% 3.55% 2.55% 3.55% Percent p esch siev 100.00% 99.50% 79.55% 63.54% 42.81% 30.48% 21.81% 13.73% 7.65%	NON NC. MONK-8 assing a size
630 #50 #200 -#200 -200 w Totat Gradation X 11-01-95 Sieve 1 1/2 1 1/2 3/8 #4 #6 #16 #30 #100 #100 #100	109,7 89,4 61,6 3 1291,5 1291,5 1291,5 1291,5 251,5 211,3 211,3 211,3 213,5 215,5 21	14.84% 7.81% 3.14% Lab # (Percent; f ceach sim 100.00% 50.47% 20.85% 21.37% 13.44%	NCAT MONK- pessing va stre c c c c c c c c c c c c c c c c c c c			630 #100 #200 -200 wast Totat Gradation Analysis 11-01-95 Siove 1 1/2 1/2 3/5 #4 #5 \$50 \$60 \$60 \$60 \$60 \$60 \$60 \$60 \$6	107 86 64,1 45,8 3,3 40,3 1228,2 1228,2 Weight ref esch sieve 6,7 265,1 213,4 275,9 164,1 115,3 107,6	12.50% 7.28% 3.55% 1.60 /f Percent p esch der 100.00% 99.50% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58% 79.58%	NON NC. MONK-8 assing a size

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GRADATION COMPARISON USING THE NCAT OVEN TABLE A REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE NCAT OVEN

TABLE B REPRES	ENTS THE G	RADATION	I OF THE AGGREGATE AFTER AS		DDED AND BURNT OF	+ inside i		
	TAB	£			TABI	LE		
14	•			18	В			
14	AGGREG	ATE, LIME	ADDED	10				NCAT
Gradatior X			non-NCAT Rel6	x	Gradation Analysis		Leb#	Ral-1
10-26-85		4	K.M-0		10-26-85			
m	141-1-1-1-1	•			M			
Sie/e		Percent per each sieve			Sleve	Weight ret		
1 12					1 1/2			-
1 1/2	11.7	100.00%	correct gradation		1 1/2	20.1	100.00%	
3/6	209	77.93%			3/5	224.4	79.72%	
#4	174.8	64.19%			#4 #8	184.4	65.03¥	
#5 #16	205 165.7	39.97% 25.14%			#16	291.9 173.7	41.77%	
#30	120.3	15.68%			#30	120	18.37%	
#50 #100	94.9 46.7	8.22% 4.54%			#50 #100	104.8 65.3	10.02%	
#200	25.5	2.43%			#200	32.7	3.01%	
-#200 200 wea	2 10 28.0				-#200 -200 weat	2.6 1 35.2		
	n 20.9				-200 -			
Totat	1271.8				Total	1255.1		
			Nen-NCAT					NCAT
Gradetior X 11-01-05		Lab#i	Rai-6		Gradetion Analysia 11-01-95	1	Lab #	Rel-2
Sieve		Percent per			Sieve	Weight rot		
		eech sleve				each sleve		
112		100.00%	correct gradation		1 1/2		100.00%	
1/2	13.8	95.90%			12	15	96.76%	
3/5	256.7	78.61%			3/6	205 183.5	81.80% 65.62%	
	205.8	42.76%			#5	309.4	41.02%	
#16	197.9	27.54%			#16	161.4	26.01%	
#30 #50	133.9	17.75%			#30 #50	117.5	16.29% 8.48%	
#100	66.43	6.04%			#100	46.3	4.65%	
#7200 -#7200	32.6	2.59%			#200 -#200	26.7 2.1	2.44%	
-200 wes					-200 west			
						L 617		
Tota;	1326.63				Total	1206.7		
	1326.63		IN INCAT		Totat	1206.7		NCAT
Gradetior X	1326.63		non-NCAT Kul-7		Total: Gradesion Analysis	1206.7	Lad #	NCAT Ral-3
	1326.63 Weight net	Lab#i Percentpes	kai-7 saing		Totat	1208.7 Weight ref	Percent p	Rel-3 essing
Graduation X 11-01-85 Slove	1326.63 Weight net	Lab# i	kai-7 saing		Totat Gradetion Analysis 11-01-85 Sieve	1208.7	Percent p	Rel-3 essing
Gradetlor K 11-01-85 Sieve 1 1/2 1	1326.63 Weight net each sleve	Lab # i Percent per each sleve 100.00%	kai-7 saing		Totat Gradation Analysis 11-01-95 Siove 1 1/2 1	1206.7 Weight ret each sleve	Percent p each slov 100,00%	Ral-3 essing e size
Gradation X 11-01-85 Sieve 1 1/2 1 1/2	1326.63 Weight nut each sleve 11.3	Lab # i Percent per each slave 100,00% 98,00%	tai-7 setra sitae		Totat Gradetion Analysia 11-01-85 Slove 1 1/2 1 1/2	1208.7 Weight ret each plays 24.2	Percent p each slev 100,00% 96,11%	Ral-3 essing e size
Gradution K 11-01-65 Sieve 1 1/2 1 1/2 3/6	1326.63 Weight nut each sleve 11.3 239.3	Lab # i Percent per each slave 100.00% 98.05% 79.69%	tai-7 setra sitae		Totat Gradation Analysis 11-01-95 Siove 1 1/2 1	1206.7 Weight ret each sleve	Percent p each slov 100,00%	Ral-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #8	1325.63 Weight net each sleve 11.3 239.3 168.2 324.3	Lab # 1 Percent per each slove 100,00% 99,05% 79,69% 66,05% 29,76%	tai-7 setra sitae		Totat Gradation Analysis 11-01-85 Sieve 1 1/2 1 1/2 3/6 #4 #5	1208.7 Weight ret each slove 24.2 222.2 193.4 325	Percent p each slow 96,11% 80,78% 65,69% 40,10%	Rel-3 essing e size
Gradettor X 11-01-85 Sieve 1 1/2 1 1/2 3/6 #4 #8 #15	1326.63 Weight ret each slove 11.3 239.3 160.2 324.3 184.9	Lub # 1 Percent pas each aleve 100,00% 99,06% 79,69% 66,05% 39,76% 24,77%	tai-7 setra sitae		Totat Gradation Analysia 11-01-05 Slove 1 1/2 1 1/2 3/6 #4 #8 #16	1208.7 Weight ret each sieve 24.2 22222 193.4 325 194.6	Percent p each slow 96,11% 80,78% 65,69% 40,10% 24,91%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #8 #16 #30 #50	1326.63 Weight ret each sleve 11.3 160.2 324.3 164.9 115.7 90.2	Lub # 1 Percent pas each sleve 100.00% 99.05% 99.05% 66.05% 39.76% 24.77% 15.39% 6.06%	tai-7 setra sitae		Total: Gradation Analysis 11-01-05 Sieve 1 1/2 1 1/2 3/6 #4 #8 #16 #30 #50	1208.7 Weight ret each slove 24.2 222.2 193.4 325 194.6 94	Percent p each slev 100.00% 98.11% 80.78% 65.69% 40.10% 24.91% 15.42% 8.09%	Rel-3 essing e size
Gradettor K 11-01-65 Sieve 1 1/2 1 1/2 3/5 8/4 4/8 4/15 6/30 8/50 8/50 8/100	1326.63 Weight nut each slove 11.3 239.3 166.2 324.3 164.9 115.7 90.2 43	Lub # 1 Percent per each aleve 100,00% 98,00% 79,69% 66,05% 29,76% 24,77% 8,06% 4,60%	tai-7 setra sitae		Total: Gradation Analysia 11-01-05 Slove 1 1/2 1 1/2 1 1/2 3/6 #4 #8 #16 #30 #16 #100	1208.7 Weight ret each slow. 24.2 222.2 193.4 328 194.6 121.6 94.4 4.5.4	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #8 #16 #30 #50	1326.63 Weight ret each sleve 11.3 160.2 324.3 164.9 115.7 90.2	Lub # 1 Percent pas each sleve 100.00% 99.05% 99.05% 66.05% 39.76% 24.77% 15.39% 6.06%	tai-7 setra sitae		Total: Gradation Analysis 11-01-05 Sieve 1 1/2 1 1/2 3/6 #4 #8 #16 #30 #50	1208.7 Weight ret each slove 24.2 222.2 193.4 325 194.6 94	Percent p each slev 100.00% 98.11% 80.78% 65.69% 40.10% 24.91% 15.42% 8.09%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #3 #15 #30 #30 #50 #100 #200	1326.63 Weight not each slow: 11.3 239.3 168.2 324.3 168.2 324.3 164.5 90.2 43 24.2 3 24.3 24.2	Lub # 1 Percent per each aleve 100,00% 98,00% 79,69% 66,05% 29,76% 24,77% 8,06% 4,60%	tai-7 setra sitae		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #50 #100 #200	1208.7 Weight ret each slow 2222 193.4 328 194.6 121.6 94 45.4 2255	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 3/6 #4 #8 #16 #30 #50 #100 #200 -#200	1326.63 Weight not each slow: 11.3 229.3 168.2 324.3 168.2 324.3 115.7 90.2 43 24.2 1.3 24.2 1.3 h 31.2	Lub # 1 Percent per each aleve 100,00% 98,00% 79,69% 66,05% 29,76% 24,77% 8,06% 4,60%	tai-7 setra sitae		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #16 #100 #50 #100 #200 -#200 -200 wash	1208.7 Weight ret each sleve 24.2 222.2 193.4 32.8 194.6 121.6 94 45.4 25.5 1.9 30.9	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Grudetlor K 11-01-85 Sieve 1 1/2 1 1/2 3/4 #4 #8 #16 #30 #30 #30 #30 #30 #30 #30 #30 #30 #30	1326.53 Weight net each sieve 11.3 239.3 168.2 324.3 168.2 324.3 168.2 324.3 168.2 31.4 24.2 1.3 h 31.2 1233.6	Lab # 1 Percent per each slove 90,00% 91,00% 79,59% 66,05% 39,76% 24,77% 15,39% 8,06% 4,60% 4,60%	kul-7 sing size correct gradation		Total: Gradation Analysis 11-01-85 Sieve 1 1/2 1 1/2 3/6 #14 #16 #16 #16 #16 #50 #100 #200 -#200	1208.7 Weight ret each slow 2222 193.4 328 194.6 121.6 94 45.4 2255	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #8 #16 #730 #700 #700 #700 #7200 -200 was Tota: Gradation X	1326.53 Weight net each sieve 11.3 239.3 168.2 324.3 168.2 324.3 168.2 324.3 168.2 31.4 24.2 1.3 h 31.2 1233.6	Lab # 1 Percent per each slove 90,00% 91,00% 79,59% 66,05% 39,76% 24,77% 15,39% 8,06% 4,60% 4,60%	kai-7 sting alze correct gradation		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #16 #100 #50 #100 #200 -#200 -200 wash	1208.7 Weight ret each sleve 24.2 222.2 193.4 32.8 194.6 121.6 94 45.4 25.5 1.9 30.9	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Grudetlor K 11-01-85 Sieve 1 1/2 1 1/2 3/4 #4 #8 #16 #30 #30 #30 #30 #30 #30 #30 #30 #30 #30	1326.63 Weight not each sleve 11.3 239.3 166.2 324.3 166.2 324.3 166.2 324.3 164.9 115.7 90.2 43 24.2 13 h 31.2 1233.6 Vieight not	Lab # 1 Percent per each slove 90,00% 91,00% 91,00% 66,00% 39,70% 24,77% 2,63% 15,39% 2,63% 2,63% 2,63%	kul-7 sing size correct gradation non-NCAT Ral-8		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #16 #100 #50 #100 #200 -#200 -200 wash	1208.7 Weight ret each sleve 24.2 222.2 193.4 32.8 194.6 121.6 94 45.4 25.5 1.9 30.9	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/6 #14 #15 #100 #100 #100 #100 #200 -200 wes Totat Gradation X 11-01-95 Sieve	1326.63 Weight not each sleve 11.3 239.3 166.2 324.3 166.2 324.3 166.2 324.3 164.9 115.7 90.2 43 24.2 13 h 31.2 1233.6 Vieight not	Lab # 1 Percent per each slove 90,00% 90,05% 90,05% 80,05% 80,05% 80,05% 15,35% 8,06% 4,60% 4,60% 4,60%	kul-7 sing size correct gradation non-NCAT Ral-8		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #16 #100 #50 #100 #200 -#200 -200 wash	1208.7 Weight ret each sleve 24.2 222.2 193.4 32.8 194.6 121.6 94 45.4 25.5 1.9 30.9	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rai-3 essing e size
Gradatlor K 11-01-85 Sieve 1 1/2 1/2 3/6 #4 #6 #30 #100 #700 #700 -200 west Totat Gradatlor X 11-01-85	1326.63 Weight net each sleve 11.3 239.3 166.2 324.3 166.2 324.3 164.9 115.7 90.2 43 3 24.2 13 164.3 12 1233.6 V/eight net each sleve	Lab # 1 Percent per each slove 90,00% 91,00% 90,00% 15,30% 24,77% 2,63% 15,39% 8,60% 4,60% 4,60% 2,63% 2,63% 2,63% 2,63% 2,63% 15,00%	kul-7 sing size correct gradation non-NCAT Ral-8		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #30 #50 #100 #200 -#200 #200 -#200 #50 #100 #1200 -#200 #1200 -#200 #1200 -#200 #1200 -#100 -#100 -#1000 -#100 -#1000 -#1000 -#100 -#100 -#100 -#1000 -#	1208.7 Weight ret each sieve 24.2 222.2 193.4 328 194.6 121.6 94.4 54.4 25.5 1.9 30.9 1281.7	Percent p each slow 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55%	Rel-3 essing e size
Gredation K 11-01-85 Sieve 1 1/2 1/2 3/6 #13 #16 #30 #100 #7200 -7200 wss Totat: Gradation X 11-01-95 Sieve 1 1/2 1 1/2 1/2 1/2 1/2 1/2 1/2 1/	1326.63 Weight net each sieve 11.3 239.3 1662 3243 164.9 115.7 90.2 43 242 133 164.9 115.7 90.2 43 242 133.6 1233.6 V/eight net each sieve 16.2	Lab # 1 Percent pes each slove \$100,00% \$100,00% \$100,00% \$20,07% \$2,53% \$2,63% Lab # 1 Percent pes each slove \$28,59%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-05 Sieve 1 1/2 1 1/2 3/6 #16 #30 #16 #30 #100 #200 -200 wash Total: Gradation Analysis 11-01-95	1208.7 Weight ret each slow 24.2 222.2 193.4 328 194.6 121.6 94 45.4 25.5 1.9 30.9 1281.7	Percent p each story 98,11% 80,78% 80,78% 40,10% 24,91% 45,65% 4,55% 2,56%	Ref-3 essing e size
Gradation K 11-01-85 Sieve 1 1/2 1/2 3/4 #4 #3 #15 #300 #500 #100 #200 -#200 #200 -#200 #200 -#200 #50 #1/2 1-01-85 Sieve 1 1/2 1 1/2	1326.63 Weight net each sleve 11.3 239.3 166.2 324.3 166.2 324.3 164.9 115.7 90.2 43 3 24.2 13 164.3 12 1233.6 V/eight net each sleve	Lab # 1 Percent per each slove 90,00% 91,00% 90,00% 15,30% 24,77% 2,63% 15,39% 8,60% 4,60% 4,60% 2,63% 2,63% 2,63% 2,63% 2,63% 15,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #4 #8 #16 #30 #50 #100 #200 -#200 #200 -#200 #50 #100 #1200 -#200 #1200 -#200 #1200 -#200 #1200 -#100 -#100 -#1000 -#100 -#1000 -#1000 -#100 -#100 -#100 -#1000 -#	1208.7 Weight ret each sieve 24.2 222.2 193.4 328 194.6 121.6 94.4 54.4 25.5 1.9 30.9 1281.7	Percent p each story 100,00% 98,11% 80,78% 80,78% 40,10% 24,91% 15,42% 8,09% 24,91% 15,42% 8,09% 2,56% Lab # Percent p	Ref-3 essing este
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Gradation K 11-01-85 Sieve \$ 1/2 3/6 #4 #8 #15 #30 #50 #700 #7200 -#7200 -200 was Totat Gradation X 11-01-95 Sieve \$ 1/2 1 1/2 3/8 #4 #8 #10 #30 #7200 -200 was Totat Gradation X 11-01-95 Sieve \$ 1/2 1 1/2 3/8 #4 #8 #10 #7200 -200 was Totat Gradation X 11-01-95 Sieve \$ 1/2 1/2 3/8 #4 #8 #10 #7200 -200 was \$ 1/2 \$ 3/8 #4 #8 #10 #7200 \$ 200 was \$ 1/2 \$ 3/8 #4 #8 #4 #8 #4 #8 #4 #8 #4 #8 #4 #8 #4 #8 #4 #8 #16	1326.53 Weight net each sieve 11.3 239.3 168.2 324.3 168.2 43 242 133 242 133.6 1233.6 V/eight net each sieve 16.2 2100 186.8 291.9 183.3	Lab # 1 Percent per each slave 90,00% 91,00,00% 91,00% 24,77% 4,60% 4,60% 4,60% 4,60% 4,60% 4,60% 4,60% 91,53% 100,00% 98,59% 81,77% 66,71% 43,18% 26,3%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-95 Slove 1 1/2 1 1/2 3/6 #10 #100 #200 -#200 -#200 -200 wash Total: Gradation Analysis 11-01-95 Slove 1 1/2 1	1208.7 Weight ret each sieve 24.2 222.2 193.4 325 194.6 121.6 124.6 124.6 124.6 124.7 19.9 30.9 1281.7 Weight ret	Percent p each story 100,00% 98,11% 80,78% 80,78% 40,10% 24,91% 15,42% 8,09% 24,91% 15,42% 8,09% 2,56% Lab # Percent p	Ref-3 essing este ste ste este
Gradatlor K 11-01-85 Sieve i 1/2 1/2 3/6 #14 #16 #30 #50 #100 #7200 -200 wess Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #16 #30 #7200 -200 wess Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #16 #30 #7200 -200 wess Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #6 #6 #7200 -200 wess Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #6 #7200 -200 wess i 1/2 1/2 -200 wess i 1/2 i 1/2 -200 wess i 1/2 i 1/2 -200 wess i 1/2 i 1/2 -200 wess i 1/2 i 1/2 -200 wess i 1/2 i 1/2 i 1/2 -200 wess i 1/2 i 1/2 -200 wess i 1/2 i 1/2 i 1/2 i 1/2 i 1/2 i 1/2 -200 wess i 1/2 i 1/2	1326.53 Weight net each niew; 11.3 239.3 168.2 324.3 164.9 115.7 90.2 43 242.1 33.4 1233.6 Vfeight net each siew; 162.2 210.1 165.6 291.9 163.3 127.1 107.6	Lab # 1 Percent per each slave 100.00% 80.05% 20.5% 20.7% 15.30% 2.63% 2.63% Lab # 1 Percent per cach slave 100.00% 98.59% 80.77% 66.71% 43.16% 28.40% 18.15%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Cradation Analysis 11-01-05 Sieve 1 1/2 3/6 #4 #5 #100 #200 -200 wash Total: Gradation Analysis 11-01-05 Sieve 1 1/2 3/6 #100 #200 -200 wash Total: 11-01-05 Sieve 1 1/2 1 1/2 3/6 #100 #200 -200 #20	1208.7 Weight ret ench slow: 24.2 222.2 193.4 328 194.6 124.6 194.6 124.6 194.6 124.2 25.5 1.9 30.9 1281.7 Weight ret each slow: 21.4 190.3	Percent p each story 100,00% 90,11% 80,78% 80,78% 24,91% 15,42% 8,03% 4,55% 2,56% 15,42% 8,03% 4,55% 2,56%	Ref-3 essing e size NCAT Ral-4 e size
Gradation K 11-01-85 Sieve 1 1/2 3/6 #4 #8 #15 #300 #500 #700 #700 -7200 west Totat Gradation X 11-01-85 Sieve 1 1/2 3/8 #4 #6 #10 #700 -7200 west Totat Gradation X 11-01-85 Sieve 1 1/2 3/8 #4 #6 #10 #700 #	11.3 1326.63 Weight net esch sieve 11.3 239.3 168.2 324.3 168.2 3124.3 168.2 1233.6 V/eight net esch sieve 16.2 2100 186.8 291.9 163.3 127.1 107.6 52.8	Lab # 1 Percent per each slow 90,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-05 Slove 1 1/2 1 1/2 1 1/2 3/6 #10 #200 -#	1208.7 Weight ret ench slove 24.2 2222.2 193.4 325 194.6 121.4 45.4 25.5 19 30.9 1281.7 Weight ret esch slove 21.4 190.3 163.5	Percent p each size 100,00% 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55% 2,56% 15,42% 8,09% 4,55% 2,56% 100,00% 88,23% 82,23% 88,23% 88,23%	Rel-3 essing estee stee estee
Gradatlor K 11-01-85 Sieve i 1/2 1/2 3/6 #14 #16 #30 #50 #100 #7200 -200 wss Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #16 #30 #7200 -200 wss Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #16 #30 #7200 -200 wss Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #6 #7200 -200 wss Totat Gradatlor X 11-01-95 Sieve i 1/2 3/8 #4 #6 #7200 -200 wss i 1/2 -200 wss i 1/2 -200 wss i 1/2 -200 wss i 1/2 i 1/2 -200 wss i 1/2 -200 wss i 1/2 -200 wss i 1/2 -200 wss i 1/2 -200 wss i 1/2 i 1/2 -200 wss i 1/2 -200 wss i 1/2 i 1/2 -200 wss i 1/2 i 1/2 i 1/2 -200 wss i 1/2 i	1326.53 Weight net each niew; 11.3 239.3 168.2 324.3 164.9 115.7 90.2 43 242.1 33.4 1233.6 Vfeight net each siew; 162.2 210.1 165.6 291.9 163.3 127.1 107.6	Lab # 1 Percent per each slave 100.00% 80.05% 80.05% 80.75% 24.77% 15.33% 8.06% 4.60% 4.60% 4.60% 4.60% 4.60% 8.07% 98.69% 100.00% 98.69% 81.77% 66.71% 43.18% 28.40% 18.15%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Cradation Analysis 11-01-05 Sieve 1 1/2 3/6 #4 #5 #100 #200 -200 wash Total: Gradation Analysis 11-01-05 Sieve 1 1/2 3/6 #100 #200 -200 wash Total: 11-01-05 Sieve 1 1/2 1 1/2 3/6 #100 #200 -200 #20	1208.7 Weight ret ench slow: 24.2 222.2 193.4 328 194.6 124.6 194.6 124.6 194.6 124.2 25.5 1.9 30.9 1281.7 Weight ret each slow: 21.4 190.3	Percent p each story 100,00% 90,11% 80,78% 80,78% 80,78% 24,91% 15,62% 2,66% 2,56% 15,62% 2,56% 100,00% 98,24% 82,45% 2,56% 100,00% 98,23% 82,45% 2,7,88% 63,90% 43,55% 2,7,88% 100,00% 1	Ref-3 essing e size NCAT Rai-4 e size
Gradation K 11-01-85 Sieve i 1/2 1/2 3/6 #4 #8 #16 #30 #50 #100 #7200 -87200 -200 west Totat Gradation X 11-01-95 Sieve i 1/2 3/8 #4 #6 #6 #6 #7200 -87200 -200 west Totat Gradation X 11-01-95 Sieve i 1/2 3/8 #6 #6 #6 #7200 #7200 -87200 #7200 -87200 #720	1326.53 Weight net each slow; 11.3 239.3 168.2 324.3 164.9 115.7 90.2 43 242.1 33 164.9 115.7 90.2 43 242.1 33.6 1233.6 Vfeight net each slow; 162.2 210 186.6 291.9 163.3 127.1 107.6 52.8 29.7 1.8	Lab # 1 Percent per each slow 90,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-85 Sieve 1 1/2 1/2 3/6 #14 #3 #16 #30 #50 #100 #200 -200 wash Total: Gradation Analysis 11-01-95 Sieve 1 1/2 3/8 #4 #5 \$1-01-95 Sieve 1 1/2 3/8 #4 #5 \$1-01-95 Sieve 1 1/2 3/8 #4 #5 \$1-01-95 Sieve 1 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	1208.7 Weight ret ench slove 24.2 2222.2 193.4 325 194.6 121.6 94 45.4 25.5 19 30.9 1281.7 Weight ret esch sleve 21.4 190.3 163.5 305.9 189.1 124.2	Percent p each size 100,00% 98,11% 80,78% 65,69% 40,10% 24,91% 15,42% 8,09% 4,55% 2,56% 100,00% 88,23% 82,45% 68,90% 43,55% 27,88% 17,59%	Rel-3 essing e size size e size
Gredation K 11-01-85 Sieve i 1/2 1/2 3/6 #4 #8 #16 #300 #7200 -200 wess Totat Gradation X 11-01-95 Sieve i 1/2 3/8 #4 #8 #16 #300 #7200 -200 wess Totat Gradation X 11-2 1/2 3/8 #4 #8 #16 #7200 -200 wess *7 *7 *7 *7 *7 *7 *7 *7 *7 *7	1326.53 Weight ret each niew 11.3 239.3 168.2 324.3 184.9 115.7 90.2 43 24.2 1.3 184.9 115.7 90.2 43 24.2 1.3 164.9 1233.6 V/eight ret each siew 16.2 210 185.8 291.9 163.3 127.1 107.6 52.8 29.7 1,0 167.6 29.6 10 167.6 29.7 10 167.6 29.7 10 167.6 29.7 10 167.6 29.7 10 17.7 10 10 10 10 10 10 10 10 10 10 10 10 10	Lab # 1 Percent per each slow 90,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-05 Sieve 1 1/2 1/2 3/6 #16 #30 #100 #200 -200 wash Total: Gradation Analysis 11-01-95 Sieve 1 1/2 1 1/2 3/8 #16 #30 #100 #200 -200 wash Total: 11-01-95 Sieve 1 1/2 1/2 3/8 #16 #30 #100 #200 -200 wash Total: 11-01-95 Sieve 1 1/2 1/2 3/8 #16 #30 #100 #200 -200 wash Total: 11-01-95 Sieve 1 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	1208.7 Weight ret ench slow. 24.2 222.2 193.4 328 194.6 121.6 194.6 124.6 194.6 124.2 25.5 194.6 124.1 25.5 194.6 1281.7 Weight ret ench slow. 21.4 190.3 163.5 305.9 189.1	Percent p each story 100,00% 90,11% 80,78% 80,78% 80,78% 24,91% 15,62% 2,66% 2,56% 15,62% 2,56% 100,00% 98,24% 82,45% 2,56% 100,00% 98,23% 82,45% 2,7,88% 63,90% 43,55% 2,7,88% 100,00% 1	Ra-3 essing e size NCAT Ra-4 e size
Gredetlor K 11-01-85 Sieve 1 1/2 1/2 3/6 #14 #16 #30 #50 #100 #200 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 1 1/2 3/8 #4 #16 #30 #50 #100 #200 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 200 wes 1 1/2 200 wes Tote: Gredetlor X 11-01-95 Sieve 1 1/2 200 wes 200 wes 	1326.53 Weight net each slow; 11.3 239.3 168.2 324.3 164.9 115.7 90.2 43 242.1 33 164.9 115.7 90.2 43 242.1 33.6 1233.6 Vfeight net each slow; 162.2 210 186.6 291.9 163.3 127.1 107.6 52.8 29.7 1.8	Lab # 1 Percent per each slow 90,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Gradation Analysis 11-01-95 Sieve 1 1/2 1/2 3/6 #14 #3 #16 #30 #50 #100 #7200 -200 wash Total: Gradation Analysis 11-01-95 Sieve 1 1/2 1/2 3/8 #14 #3 #50 #7200 -200 wash Total: 1/2 1/2 3/8 #14 #3 #15 #100 #7200 -200 wash Total: 11-01-95 Sieve 1 1/2 1/2 3/8 #14 #3 #15 #17 #200 #7200	1208.7 Weight ret each slove 24.2 222.2 193.4 328 194.6 121.6 94 45.4 25.6 19 30.9 1281.7 Weight ret each slove 21.4 190.3 163.5 305.9 189.1 124.2 99.4 49.6 27.8 129.4 29.4 29.4 29.4 29.4 29.4 29.4 29.4	Percent p each size 100,00% 98,11% 80,78% 80,65% 40,10% 24,91% 15,42% 8,09% 4,55% 2,56% 100,00% 88,23% 82,45% 68,90% 43,55% 27,88% 17,59% 9,35%	Rel-3 essing e size NCAT Ral-4 e size
Gredation K 11-01-85 Sieve i 1/2 1/2 3/6 #4 #8 #16 #300 #7200 -200 wess Totat Gradation X 11-01-95 Sieve i 1/2 3/8 #4 #8 #16 #300 #7200 -200 wess Totat Gradation X 11-2 1/2 3/8 #4 #8 #16 #7200 -200 wess *7 *7 *7 *7 *7 *7 *7 *7 *7 *7	1326.53 Weight ret each niew 11.3 239.3 168.2 324.3 184.9 115.7 90.2 43 24.2 1.3 184.9 115.7 90.2 43 24.2 1.3 164.9 1233.6 V/eight ret each siew 16.2 210 185.8 291.9 163.3 127.1 107.6 52.8 29.7 1,0 167.6 29.6 10 167.6 29.7 10 167.6 29.7 10 167.6 29.7 10 167.6 29.7 10 17.7 10 10 10 10 10 10 10 10 10 10 10 10 10	Lab # 1 Percent per each slow 90,00%	kal-7 sing site correct gradation non-NCAT kal-8 sing size		Total: Cradation Analysis 11-01-85 Slove 1 1/2 1/2 3/6 #4 #5 #16 #30 #70	1208.7 Weight ret each slow 24.2 222.2 193.4 328 194.6 129.1 30.9 1281.7 Weight ret each slow 21.4 190.3 163.5 305.9 189.1 124.2 99.4 49.6 27.8 1.7	Leb # Percent peach size 100,00% 98,11% 80,78% 65,65% 40,10% 24,91% 15,42% 8,09% 4,55% 2,56% 100,00% 98,245% 82,45% 93,55% 27,88% 17,59% 9,35% 5,24%	Rel-3 essing e size NCAT Ral-4 e size

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Totat

PAGOSA TROUT LAKES

GRADATION COMPARISON USING THE NCAT OVEN TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE NOAT OVEN

INDUE 0		TABL	E						TABLE		
		A									
14							18		NCAT		
		PURE AGO									
Oradation	n X		Lab #	#27x-1	non-NCAT		X		n Analysia	Lab #	6271-4
10-10-85								10-10-05			
	Sleve	Weight reta							Sime		L Parcent pessing
		work sleve	each slev	e elze						each slew	e each pleve alos
	1 1.2								1 1/2		
	1		100.00%		correct gradation				1		100.00%
	1/2	3	60.74%						1/2		100.00%
	3/8	305	73,50%						3/6	200.1	
	#4	314,3	46.45%						*	291.4	
	et	153,3							M	188.4	
	#16	122.2	22,75%						#15	131.7	
	60C	77 A 54.1	10.00%						630 150	95.8 60.7	
	#10C	40.0	7.57%						#100	40.7	
	#200	-0,5	5.33%						#200	31.3	
	-#200	34	9.44.16	•					-#200	23	
	-200 west								-200 wash	 EL	
	-200 86.00	s 38,6							-240 10250		•
	Tetat	1162.2							Totat	1183	I Contraction of the second
24							28				
											HCAT
Gradetter	Analysis		Carlo #	62h+2	BOR-NCAT			a Analysia		Lab #	8275-5
10-10-85							10-10-85				
	Slert	Weight rate	Percent p	eeeing				Eleve -	Weight retained in	Percent pi	eseing .
		and deve	each eleve	a altar					each place	weath share	a allas
	1 1/2							1 1/2			
	1		100.00%		correct gradation			1		100,00%	
	1/2	2.6	88,80%					1/2		100.00%	
	3/6	301.1	76.09%					54	284.0		i i i i i i i i i i i i i i i i i i i
	#4	283.4	\$4,75%					44	217.0		
	et	177.8	41.27%					#	16		
	#16	154	29.00%					#16	126.3		,
	#30	110.2	21.25%					#30	95 B		
	#50	81.8	14.52%					#50	69.2		
	ercoc	64,A	6,64%					e100	\$0,1		
	\$200	39,7	6,63%	•				#200	30.5		
	-#200	2.5						-4200	2.1		
	-300 veel	• • • • •						-300 week	i 47.3		
	Tetat	1318.6						Tetat	1202.1	,	
34											
							38				
Gradeline NL-10-85	Analysis	1	Lab #	6274-3	Sun-NCAT	x	Graduties	. Analysis		Lab #	6271-6
	Sime	Weight rate	Percent m	and the				Sieve	Weight retained in	Percent pe	coded
		each sleve							each plays	which slove	
	1 1/2							1 1/2			
	1		100.07%		served gradation			1		100.07%	
	1/2	6.8	98,45%		-			1/2		100.00%	
	3/8	348.8	72.27%					3/8	302.6		
	44	312	47,85%					#4	286,5		
	#8	204,4	32.01%					#5	153.7		
	#14	125	22.27%					#16	125.6		
	630	63.5	15.76%					630	47.1		
	450	60.2	10.58%					#50	70.4		
	610 0	46.5	6.87%					#100	\$2.3		
	\$200	28.6	4,74%					#200	727		
	-#200	- 4						-#200	2.1		
	-200 weak	56.E						-200 weat	26.0		
	Totat	1282.7						Tetat	1183,8		
											NCAT
44											

Oradation 10-10-05 Lab # 62711-7 Ren-HCAT Arcalysia Weight ret: Percent pessing each sizes such sizes star Sleve \$ 1/2 1 1/2 3/E 64 65 616 630 650 6100 6200 -200 -200 -200 waste 100.00% 99.79% 79.37% 56.00% 36.61% 27.73% 20.00% 13.62% 6.91% 6.34% correct gra-2.6 254 290.8 216.3 135.4 96.2 79.4 56.5 32 1.2 77.7 §244.1

Total:

5.

5A,				
Graduation Analysis 10-10-85	1	Lad #	627±-8	non-NCAT
Sieve	Weight retaile each sleve			
1 1/2				
1		100.001	6	correct gradation
1/2		100.001	6	
3/8	310.2	75.031	6	
64	309.5	50.121	6	
#5	197.7	34.201	6	
#16	127.2	24.371	6	
#36	85,4	17.495	6	
#50	(1)	11.941	6	
#100	49	7.991	6	
#200	29.2	5.649	6	
-#200	1.1			

-

-200 wash 69 1242.3 Total

B-12

Franciscotti

Totat

1299.6

596x MIX

GRADATION COMPARISON USING THE NCAT OVEN TABLE A REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE NCAT OVEN

~ ~		TABLE A				8	E		
18		AGGREGATE, LI		non-NCAT		1B NCAT			
10 -24-8 5						10-23-95			
	Sieve	Weight retained in each sieve	Percent passing each sieve size			Sleve	Weight retained in each sieve	Percent passing sech sieve size	
	1 1/2		DECI NAME NE			1 1/2	GEUT MEYE		
	1		100.00%			1		100.00%	6
	1/2	6,1	1 99.59%	i		1/2	6.1	99.49%	6
	3/6	396,4	67.61%			3/5	336.1	71,45%	6
	#4	312.1	1 42.44%			#4	300.6	i 46.37%	6
	#15	145.7	7 30,68%			#13	161.6	32,68%	٤
	#16	102.1	3 22,43%			#16	104.5	24.16%	6
	#30	87.2				#30	83.1	17,23%	6
	#50	69.6				#50	70.8		
	#10C	44.9				#100	48.6		
	#200	29.5	5 3.78%			#200	32.8		L
	-#200 -200 west					-#200 -200 west	2.7		
			-						
	Totat	1239.7	1			Total	1 196.5	i	
IA.						Gradetio 10-23-05	Analysis	Lab #	50
		AGGREGATE, LIN	AE ADDED	son-NCAT		Sieve	Weight retained in	Percent passing	
iredetior	rX		Lub II	596a-6		1 1/2	each sleve	each sleve stop	
	Sieve	Weight retained in	Percent pessing			1		100,00%	
		each slove	each sleve size			1/2	72		
	1 1/2		100.00%			346 #4	365.6 299.7		
	1		100.001			84	239,7 138,9		
	1/6	\$73.6				#16	130.9		
	#4	323				#30	91.8		
	#8	133.4				#50	73.6		
	#16	94.2				£100	48.3		
	#30	91.9				4200	32		
	#50	82.8	12,45%			-#200	23		
	#100	57.A				-200 west	65.6		
	#200	38.6							
	-#200	3.8 1 56.5				Totat	1222.9		
	Totat	1255.6	,			Gredetic: 10-23-95	Analysis	Lub#	59
						Sieve	Weight retained in each sleve	Percent passing each sieve size	
						1 1/2			
H A			non-NCAT			1		100.00%	
indatior	. •	AGGREGATE, LIN	Lab#	696x-7		1/2 3/5	3.4 263.6		
0-24-95	•			opon-r		#4	302.3	46.14%	
	Slove	Weight rotained in	Percent pessing			#5	154,3	83.72%	
		each plove	each sleve size			#16	115		
	1 1/2					#30	95,6		
	1		100.00%			#50	74		
	1/2		100,00%			#100	47.7	6.95%	
	3/8	391,1				#200	32.3		
	#4	325.7				-#200	4.6		
	#8	160.1	31.81%			-200 wash	49.8		
	#16	111.7	23.13%						
	#16 #30	111.7 91.4	23.13%			Total	1242.6		
	#16 #30 #50	111.7 91.4 72.2	23.13% 16.02% 10.40%			Totat	1242.6		
	#16 #30 #50 #100	111.7 91.4 72.2 47	23.13% 16.02% 10.40% 6.75%			Totat	1242.6		
	#16 #30 #50 #100 #200	111.7 91.4 72.2 47 32.1	23.13% 16.02% 10.40% 6.75% 4.25%					1 ab W	£0
	#16 #30 #50 #100 #200 -#200	111.7 91.4 72.2 47 32.1 4.1	23.13% 16.02% 10.40% 6.75% 4.25%			Gradetion	1242.6 Analysia	Lab#	59
	#16 #30 #50 #100 #200 -#200 -200 wast	111.7 91.4 72.2 47 32.1 4.1 50.6	23.13% 16.02% 10.40% 6.75% 4.25%) Analysia Weight retained in	Percent passing	59
	#16 #30 #50 #100 #200 -#200	111.7 91.4 72.2 47 32.1 4.1	23.13% 16.02% 10.40% 6.75% 4.25%			Gradetion 10-23-95	Analysis		59
	#16 #30 #50 #100 #200 -#200 -200 wast	111.7 91.4 72.2 47 32.1 4.1 50.6	23.13% 16.02% 10.40% 6.75% 4.25%			Grudation 10-23-95 Sleve) Analysia Weight retained in	Percent passing each sieve size 100.00%	
	#16 #30 #50 #100 #200 -#200 -200 wast	111.7 91.4 72.2 47 32.1 4.1 50.6	23.13% 16.02% 10.40% 6.75% 4.25%			Gradation 10-23-95 Sieve 1 1/2 1 1/2	n Analysis Weight retained in each sieve	Percent passing each sieve size 100.00% 100.00%	
-•	#16 #30 #50 #100 #200 -200 wash Totat	111.7 91.4 72.2 47 32.1 4.1 50.6	23.13% 16.02% 10.40% 6.75% 4.25%			Gradetion 10-23-95 Sleve 1 1/2 1 1/2 3/8	n Analysia Weight retained in each sieve 370.1	Percent passing each sleve size 100.00% 100.00% 70.66%	
-A Fradation	#16 #30 #50 #100 #200 -200 wash Totat	111.7 91.4 72.2 47 32.1 4.1 50.6	23.13% 16.02% 10.40% 6.75% 4.25%			Grudetion 10-23-95 Sleve 1 1/2 1 1/2 3/8 1/4	n Analysis Weight retained in each sieve 370,1 313,1	Percent passing each sieve size 100.00% 100.00% 70.66% 45.83%	
-A iredatior 0-24-95	#16 #30 #50 #100 #200 -#200 -200 wash Totat	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , UM	23.13% 16.02% 6.75% 4.25% non-NCAT #E ADDED Lab #			Gradetion 10-23-95 Sieve 1 1/2 1 1/2 3/8 #4 #8	n Analysia Weight retained in each sleve 370,1 313,1 147,1	Percent passing each slove size 100.00% 100.00% 70.66% 45.83% 34.17%	
-A iredatior 0-24-95	#16 #30 #50 #100 #200 -200 wash Totat	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , LIM Weight retained in	23.13% 16.02% 10.40% 6.75% 4.25% 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16	n Analysia Weight retained in each sieve 370,1 313,1 147,1 107	Percent passing each sieve size 100.00% 100.00% 70.66% 45.83% 34.17% 25.69%	
-A iradatior 0-24-95	#16 #30 #50 #200 #200 -200 wash Totat	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , UM	23.13% 16.02% 6.75% 4.25% non-NCAT #E ADDED Lab #			Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30	n Ansiyula Weight retained in each sieve 370.1 313.1 147.1 107 95.6	Percent passing each sleve size 100.00% 70.66% 45.83% 34.17% 18.11%	
-A iradatlor 0-24-95	#16 #30 #100 #200 #200 -#200 -200 with Totat Sieve 1 1/2	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , LIM Weight retained in	23.13% 16.02% 10.40% 6.75% 4.25% A 25% A 2	596x-8		Grudetion 10-23-95 Sieve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50	n Analysia Weight retained in each sleve 370,1 313,1 147,1 107 95,6 79,2	Percent passing each sieve size 100.00% 100.00% 70.65% 45.83% 34.17% 25.69% 18.11%	
-A Sredatlor 0-24-95	#16 #30 #50 #100 #200 -#200 -200 wash Totat Sieve 1 1/2 1	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , LIN Weight retained in each slove	23.13% 16.02% 10.40% 6.75% 4.25% 3 8 8 8 8 8 9 8 9 8 9 9 100.00%	596x-8		Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50 #100	n Analysia Weight retained in each sieve 370,1 313,1 147,1 107 95,6 79,2 63,5	Percent passing each sleve size 100.00% 70.66% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59%	
-A iredatior 0-24-95	#16 #30 #50 #100 #200 -#200 -#200 Total X Sieve 1 1/2 1 1/2	111.7 91.4 72.2 47 32.1 50.6 1286 A3GREGATE , Like Weight retained in each slove 3.6	23.13% 16.02% 10.40% 6.75% 4.25% 5 non-NCAT 4.25% 5 Percent passing each size size 100.00% 99.72%	596x-8		Grudation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50 #100 #1200	Ansiyula Weight retained in each sieve 370.1 313.1 313.1 147.1 107 95.6 79.2 63.5 35.6	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iredatlor 0-24-95	#16 #30 #50 #100 #200 -200 wash Totat X Sleve 1 1/2 1 1/2 3/6	111.7 91.4 72.2 47 32.1 50.6 1286 A3GREGATE , Lik Weight retained in each slave 3.6 371.8	23.13% 16.02% 10.40% 6.75% 4.25% 4.25% Percent passing each size size 100.00% 99.72% 7.1.11%	596x-8		Grudetion 10-23-95 Sieve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50 #100 #200 #200	n Analysia Weight retained in each sieve 370.1 313.1 147.1 107 95.6 79.2 63.5 3.56 3.8	Percent passing each sieve size 100.00% 100.00% 70.65% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iradatior 0-24-95	#16 #30 #50 #200 -200 wash Totat Sleve 1 1/2 1 1/2 3/6 #4	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , Lik Weight retained in each slove 36.6 371.6 307.6	23.13% 16.02% 10.40% 6.75% 4.25% 4.25% 5 7 4.25% 5 7 100.00% 5 99.72% 100.00% 5 99.72% 1,11% 1,41%	596x-8		Grudation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50 #100 #1200	n Analysia Weight retained in each sieve 370.1 313.1 147.1 107 95.6 79.2 63.5 3.56 3.8	Percent passing each sieve size 100.00% 100.00% 70.65% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iradatlor 0-24-95	#16 #30 #50 #100 #200 -200 wish Totat Sieve 1 1/2 1 1/2 3/6 #4	111.7 91.4 72.2 47 32.1 1 50.6 1286 A3GREGATE , Like Weight retained in each slove 3.6 371.8 307.5 150	non-NCAT ME ADDED Lab # Percent passing each sleve size 100.00% 99.72% 71.11% 47.45% 3.591%	596x-8		Grudetion 10-23-95 Sieve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #50 #100 #200 #200	n Analysia Weight retained in each sieve 370.1 313.1 147.1 107 95.6 79.2 63.5 3.56 3.8	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iradatlor 0-24-95	#16 #30 #50 #200 -200 wash Totat Sleve 1 1/2 1 1/2 3/6 #4	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , Lik Weight retained in each slove 36.6 371.6 307.6	23.13% 16.02% 10.40% 6.75% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 5.25%	596x-8		Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #100 #200 -#200 -200 wash	Ansiyula Weight retained in each sieve 370,1 313,1 313,1 147,1 107 95,6 79,2 63,5 33,6 3,8 56,3	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iradatlor 0-24-95	#16 #30 #50 #200 -200 wish Totat 1 1/2 1 1/2 3/5 #4 #30	111.7 91.4 72.2 47 32.1 1 50.6 1286 A3GREGATE , Lik Weight retained in each slave 371.8 307.6 150	Ron-NCAT 4 25% 6 75% 4 25% 6 75% 4 25% 6 75% 4 25% 6 75% 4 25% 7 5% 7 6 75% 7 6 75% 100.00% 9 9.72% 100.00% 9 9.72% 100.00% 9 9.72% 100.00% 100.0	596x-8		Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #100 #200 -#200 -200 wash	Ansiyula Weight retained in each sieve 370,1 313,1 313,1 147,1 107 95,6 79,2 63,5 33,6 3,8 56,3	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iradatlor 0-24-95	#16 #30 #50 #100 #200 -200 wash Totat X Sleve 1 1/2 1 1 1/2 3/6 #4 #8 #15	111.7 91.4 72.2 47 32.1 4.1 50.6 1286 A3GREGATE , Like Weight retained in each sleve 31.6 371.8 307.6 150 116.6	23.13% 16.02% 10.40% 6.75% 4.25% 5 6 75% 4.25% 5 75% 4.25% 5 75% 75% 75% 75% 75% 75% 75%	596x-8		Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #100 #200 -#200 -200 wash	Ansiyula Weight retained in each sieve 370,1 313,1 313,1 147,1 107 95,6 79,2 63,5 33,6 3,8 56,3	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
-A iredatior C-24-95	#16 #30 #50 #100 #200 -200 wish Totat Sieve 1 1/2 1 1/2 3/6 #4 #15 #30 #50	111.7 91.4 72.2 47 32.1 50.6 1286 A3GREGATE, Lik Weight retained in each slove 3.6 371.8 307.6 150 116.6 106.1 88.1	23.13% 16.02% 10.40% 6.75% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 4.25% 5.35%	596x-8		Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #100 #200 -#200 -200 wash	Ansiyula Weight retained in each sieve 370,1 313,1 313,1 147,1 107 95,6 79,2 63,5 33,6 3,8 56,3	Percent passing each slove size 100.00% 100.00% 45.83% 34.17% 25.69% 18.11% 11.83% 7.59% 4.76%	
4-A Gredatior 10-24-95	#16 #30 #50 #100 #200 -200 wash Totat X Sieve 1 1/2 1 1/2 1 1/2 3/6 #4 #8 #15 #15 #50 #100	111.7 91.4 72.2 47 32.1 1 50.6 1286 A3GREGATE , Lik Weight retained in each sleve 3.6 371.8 307.6 150 116.6 106.1 88.1 57.4	23.13% 16.02% 10.40% 6.75% 4.25% 4.25% 10.40% Percent passing each sieve size 100.00% 99.72% 100.00% 99.72% 100.00%	596x-8	B-13	Gradation 10-23-95 Sleve 1 1/2 1 1/2 3/8 #4 #8 #16 #30 #100 #200 -#200 -200 wash	Ansiyula Weight retained in each sieve 370,1 313,1 313,1 147,1 107 95,6 79,2 63,5 33,6 3,8 56,3	Percent passing each sieve size 100.007 70.665 45.833 34.177 25.699 18.115 11.833 7.599 4.769	****

IRWIN/WINSOR/STUTE P 647x MIX

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GRADATION COMPARISON USING THE NOAT OVEN TABLE A REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

TABLE B REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE N

TABLE A

NON NOAT					
NON-NCAT			NCAT		
-5			-1		
			1/2	2.9	99.78%
			3/8	258.7	79.98%
			#4	278.8	58.65%
			#8	184.9	44.60%
1/2		100.00%	#16	140.3	33.76%
3/8	246.5	80.67%	#30	122.1	24.42%
#4 #8	263.9	59.97 %	#50 #100	112.8	15,79%
#16	216.2 145.4	43.01% 31.60%	#100 #200	79.1 47.5	9,73% 6,10%
#30	120.6	22.14%	-#200	6.4	0. TO M
#50	105.3	13.88%	-200 wesh	73.3	
#100	71.3	6.29%			
#200	42.1	4.99%	Total:	1306.6	
-#200	10.8				
-200 wash	52.6				
Totai:	1274.9				
-6			-2		
1/2	4	99.70%	1/2	6.4	89,45%
3/8	243.2	81.64%	3/8	199.7	82.21%
#4	267.8	60.27%	#4	255.9	60.11%
#8	217.1	44.14%	# 6	202.3	42.64%
#16	166.1	31.61%	# 16	145.8	30.06%
#30	131.7	22.03%	#30	107.2	20.60%
#50	109.4	13.90%	#50	86.1 56.7	13.37% 6.47%
#100 #200	71,8 41,5	8,57% 5,49%	#100 #200	33.3	5.59%
-#200	6.1	0.43 %	-#200	41	J.J5 M
-200 wash	67.8		-200 wesh	60.7	
Total:	1346.5		Totat:	1158.2	
-7	?		C		
		100 004			400.004
1/2 3/8	276.7	100.00% 75.87%	1/2 3/8	273.2	100,00% 78,89%
N4	220.5	56,65%	575 #4	263.9	58.50%
#8	166,1	42.17%	88	202.3	42.87%
#16	137.3	30.19%	#16	153.6	31.01%
#30	114.9	20.18%	#30	119,6	21.76%
#50	90	12.33%	#50	100.3	14.02%
#100	55,8	7.46%	#100	68	6.7 6%
#200	32	4.67%	#200	41.1	5,59%
-#200 -200 wash	7.5 46,1		-#200 -200 wash	5.6 66.7	
	43,1			00.7	
Total:	1146,9		Totat	1294.3	
-8			-4		
1/2	7.6	99.40%	1/2		100.00%
3/8	242.5	BO.37 %	3/8	253.7	79.60%
#4	248.6	60.86%	#4	234.2	60.78%
#8	204,3	44.82%	#8 #16	188.4 150.5	45.63% 33.53%
#16 #30	146.6 125	33.32% 23.51%	#16	122.2	23.71%
#50	112.1	14.71%	#50	104.1	15.34%
#100	75	8.62%	#100	70,6	9,66%
#200	44.3	5.34%	#200	42.5	6.25%
-#200	10,2		-#200	4.7	
-200 wash	57.9		-200 wash	73	
Total:	1274.1		Total:	1243.9	

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VALCO/ROCKY MOUNTAIN 688x Mix

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GRADATION COMPARISON USING THE NCAT OVEN TABLE & REPRESENTS THE GRADATION OF THE AGGREGATE WITH NO ASPHALT ADDED

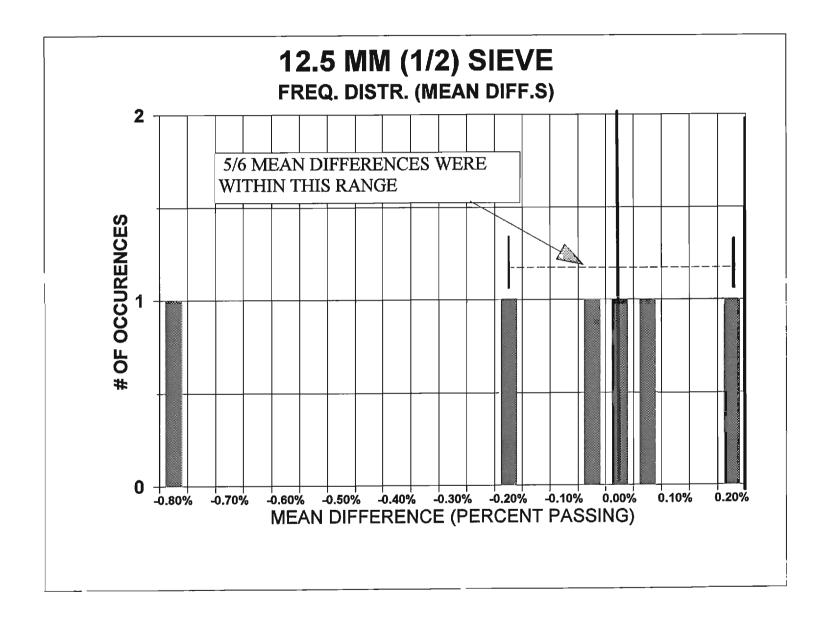
TABLE B REPRESENTS THE GRADATION OF THE AGGREGATE AFTER ASPHALT WAS ADDED AND BURNT OFF INSIDE THE NCAT OVEN

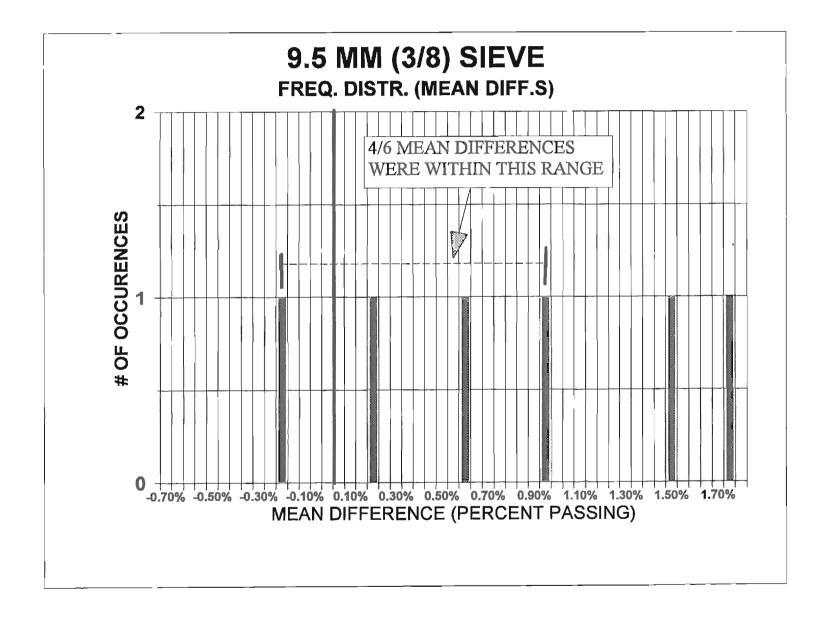
	TABL	E	TABL	E		TABLE	
			8				
NON-NCAT			NCAT			NCAT	
-5							
-			4				
1/2		100.00%	1/2		100.00%		100.00%
3/8 84	171.1	75.67% 61.68%	3/8 #4	144.4		349.5 144.4	71.69% 60.00%
#6 #16	200.1 119.6	45.32% 35.54%	#8 #16	204.5 126.9	43,43% 33,15%	204.5 126.9	43.43% 33.15%
#30	110.7	26.49%	#30	110.2	24.23%	120.0	24.23%
#50	176.6	12.05%	#50	159.7	11.29%	159.7	11.29%
#100 #200	86.2 27.1	5.00% 2.78%	#100	79.4	4.86%	79.4	4.86%
-#200 -200 wesh	27 31.3	210%	#200 -#200 -200 wash	25.1 3,1 30.6	2.75%	26.1 3.1 30.8	2.75%
Total:	1222.9		Totat	1234.6		1234.6	
6			-2				
1/2	5.9	99.51%	1/2	4.8	99.62%	4.8	89.62%
3/6	311	73.90%	3/8	340.5	72.94%	340.5	72.94%
#4 #8	179.7 192	59.11% 43.30%	#4 #8	157.9 187.7	60.56% 45.85%	157,9 167,7	60,56% 45,85%
#16	122.6	33.20%	#8 #16	120.6	36.40%	120.6	36.40%
#30	109.2	24.21%	#30	117.5	27.19%	117.5	27.19%
#50	162.3	10.84%	#50	185.9	12.62%	185.9	12.62%
#100	77.2	4,49%	#100	\$3.9 \$0.7	5.26%	83.9	5.26%
#200 -#200	23.6 2.4	2.54%	#200 -#200	30.7 3.9	2.85%	30.7 3.9	2.85%
-200 wesh	28.5		-200 wash	32.5		32.5	
Totat	1214.4		Totat	1275.9		1275.9	
7	_		-3	_			
1/2 3/8	3 307,5	99.76% 75.41%	1/2 3/8	5.3 285.5	99.55% 75.29%	5.3 285.5	99.55% 75.29%
#4	174.9	61.56%		175.9	60.34%	175.9	60.34%
#8	196.3	45.86%	#8	184.9	44.62%	184.9	44.62%
#16	114.5	36.79%	#16	120.8	34,36%	120.8	34.36%
#30 #50	115.1 190.6	27.68% 12.58%	#30 #50	109.8 160,5	25.03% 11.39%	109.8 160.5	25.03% 11.39%
#100	92.1	5.29%	#100	77,4	4.81%	77.4	4,81%
#200	28.5	3.03%	#200	24.2	2.75%	24.2	2.75%
-#200 -200 wash	1.9 36.4		-#200 -200 wash	2.2 30.2		2.2 30.2	
Total:	1262.8		Total:	1176.7		1176.7	
8			-4				
			1/2		100.00%		100.00%
1/2	350 3	100.00%	3/8	303.9	76.69%	303.9	76.69%
3/8 #4	358.3 167.1	72.81% 60.13%	#4 #8	155.4 216.9	64.77% 48.14%	155.4 216.9	64.77% 48.14%
#8	207.7	44.37%	#16	147.4	36.83%	147.4	36.83%
#16	123.5	35.00%	#30	130.8	26.80%	130.8	26,80%
	122.4	25.71%	#50	191.3	12.13%	191.3	12.13%
#30	168.2	11.43% 4.61%	#100 #200	91.6 30	5.10% 2.80%	91.6 30	5.10% 2.80%
#50	898	H, V I /		3.9	20076		
	89.8 27	2.56%	-#200	3,3		3.9	
#50 #100 #200 -#200	27 3.1		-200 wash	32.6		32.6	
#50 #100 #200	27						

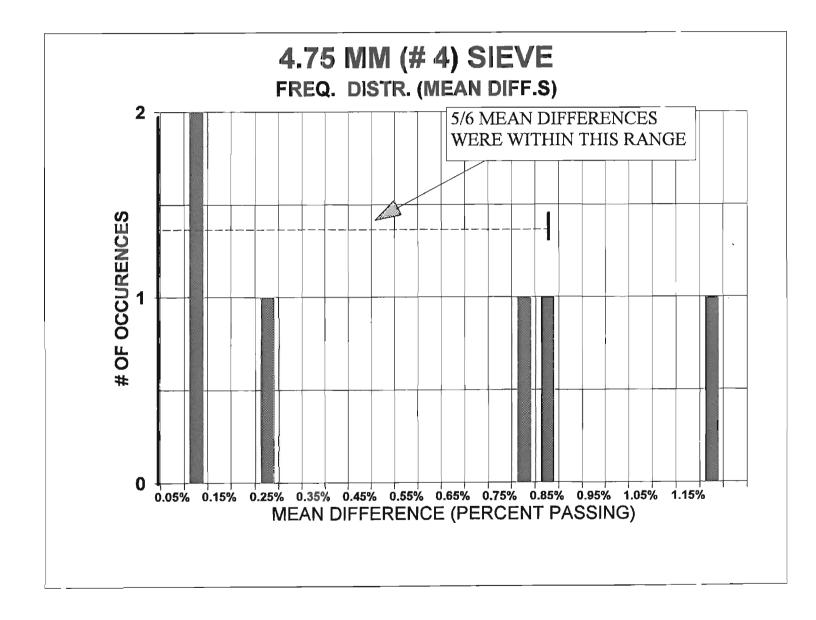
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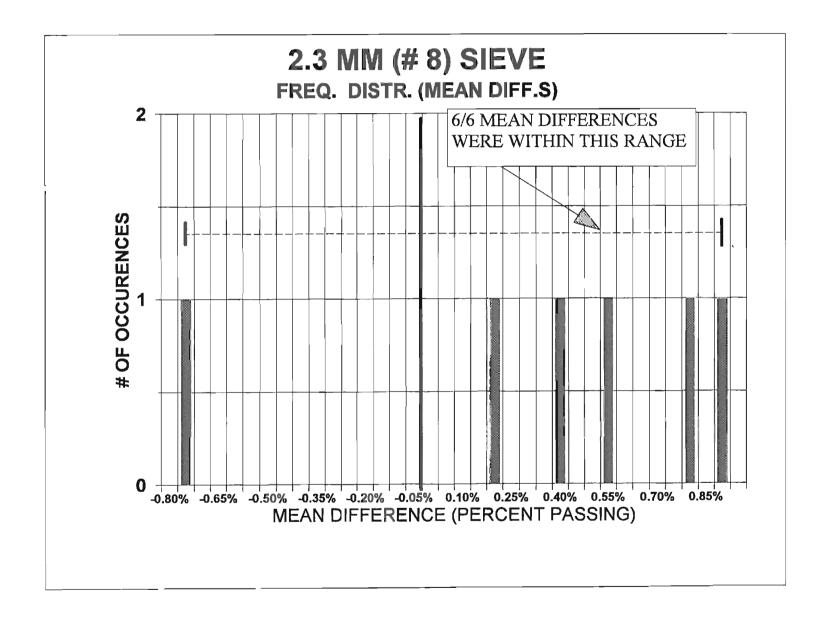
APPENDIX C

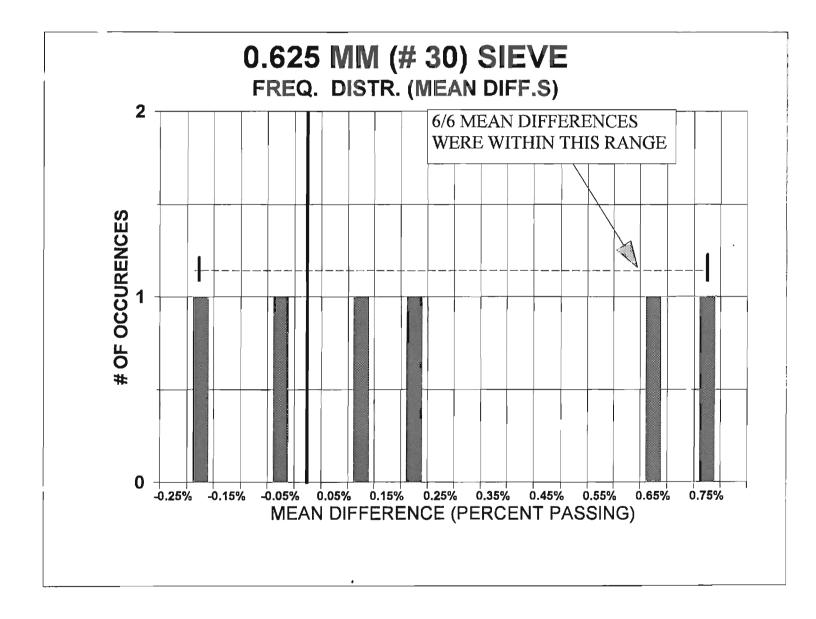
* Frequency Figures for Each Sieve Size

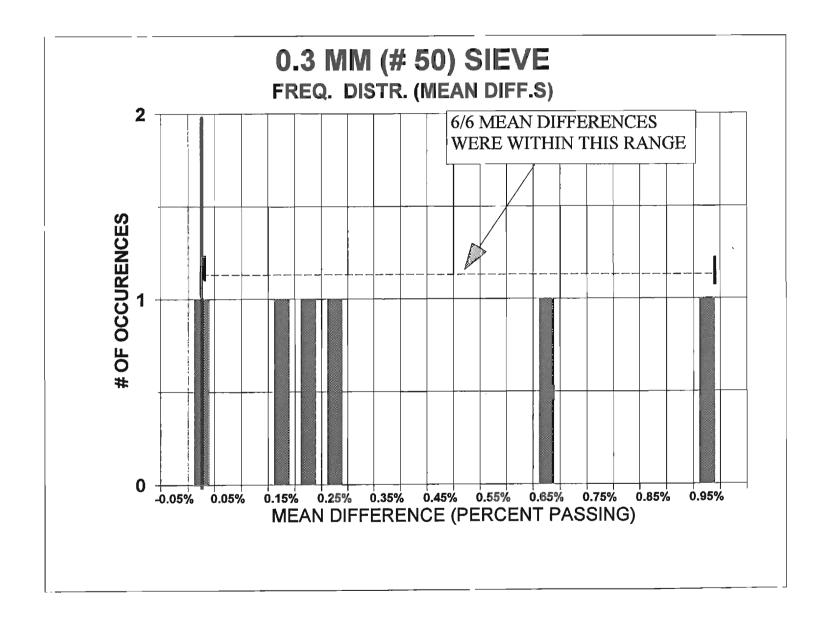


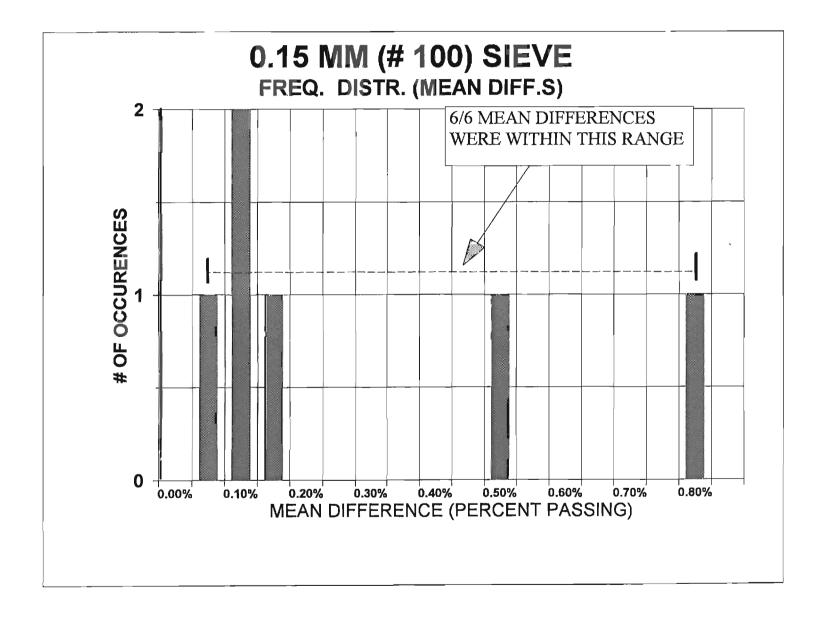


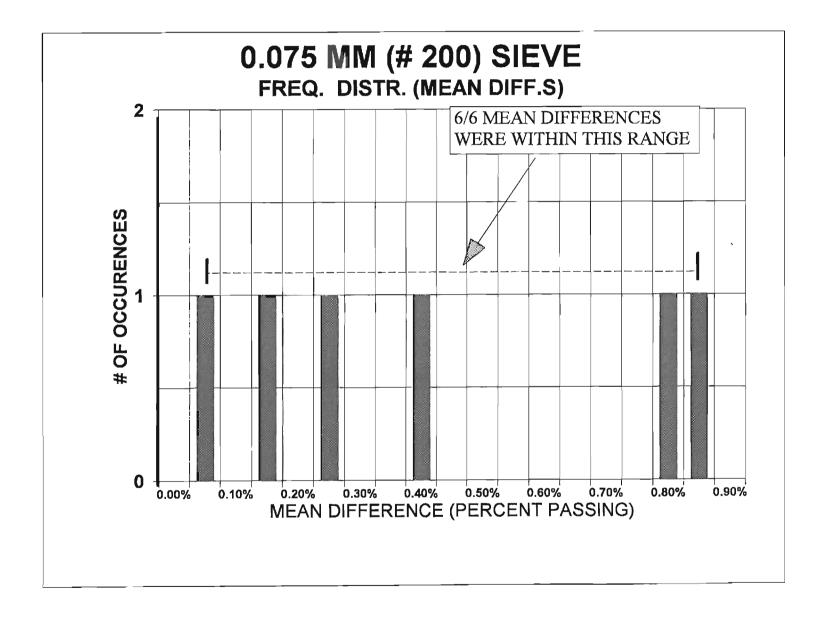












APPENDIX D

METHOD TWO

- * Data Used to Create Figure 6
- * Data Used to Create Figure 7
- * Data Used to Create Figure 8

* Determination of Correction Factors Using Analysis Method Two

DATA USED TO GENERATE FIGURE 6

FRANCISCOTTI

WINDSOR/IRWIN

SIEVE SIZE	AGGREGATE	DEDCENT DASSING	ERCENT PASSING ONE SIEV			DIFF.
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	A	B	BETWEEN
			NEXT FINER SIEVE	AFTER 3 SPLITS		COLUMN A - COLUMI
				STANDARD DEVIATION	T 27	
				OF THE	AFTER 1 SPLIT	
				PERCENT DIFF.S	AGGREGATE	
				BETWEEN EXP.	ONLY	N
				AND CONTROL SPECIMENS		$\left \right\rangle$
				ALL POSSIBLE	TEST RESULTS	$\langle \rangle$
				COMBINATIONS		$\langle \rangle$
				PRECISON	PRECISION	PRECISION
				(1S),%	(1S),%	(1S),%
1/2	COARSE	99.66%		0.30	1. <i>I</i>	
3/8	COARSE	70.52%	29.14%	1.51	1.38	0.13
#4	FINE	45.84%	24.69%	1.93	0.64	1,29
#8	FINE	33.61%	12.23%	2.12	0.60	1.52
#16	FINE	24.79%	8.82%	2.11	0.43	1:68
#30	FINE	17.36%	7.43%	1.20	0.43	₽,77
#50	FINE	11.32%	6.04%	1.19	0.43	\$76
#100	FINE	7.30%	4.02%	0.73	0.43	1,29 1,82 1,82 8,77 8,76 4,30 6,31
#200	FINE	4.60%	2.69%	0.45	0.14	0.31

EXPERIMENTAL						
SIEVE SIZE	AGGREGATE		ERCENT PASSING ONE SIEV	SINGLE OPERATOR P		DIFF.
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	A	B	BETWEEN
			NEXT FINER SIEVE	AFTER 3 SPLITS	AASHTO	COLUMN A - COLUMN B
				STANDARD DEVIATION	T 27	
				OF THE	AFTER 1 SPLIT	
				PERCENT DIFF.S	AGGREGATE	
				BETWEEN EXP.	ONLY	
				AND CONTROL SPECIMENS	100 PAIRED]
				ALL POSSIBLE	TEST RESULTS	
				COMBINATIONS		
				PRECISON	PRECISION	PRECISION
				(1S),%	(15),%	(1S),%
SIEVE SIZE				• • •		• • •
1/2	COARSE	99.81%		0.35		
3/8	COARSE	80.17%	19.64%	2.63	0.95	1,58
#4	FINE	59.51%	20.66%	1.97	0.64	
#8	FINE	43.91%	15.60%	1.70	0.60	19
#16	FINE	32.09%	11.82%	2.01	0.60	1.41
#30	FINE	22.67%	9.42%	1.94	0.43	1.51
#50	FINE	14.63%	8.05%	1.35	0.43	0.52
#100	FINE	9.16%	5.47%	0.78	0.43	133 13 134 134 134 134 134 135 14 135 135 135 135 135 135 135 135 135 135
#200	FINE	5.88%	3.28%	0.45	0.43	6.02

WINDSORARWIN

RALSTON						RALSTON
EXPERIMENTAL SIEVE SIZE	AGGREGATE DESCRIPTION	PERCENT PASSING EACH SIEVE SIZE	ERCENT PASSING ONE SIEV AND RETAINED ON THE	SINGLE OPERATOR P	RECISION B	DIFF. BETWEEN
			NEXT FINER SIEVE	AFTER 3 SPLITS	AASHTO	COLUMN A - COLUMN B
				STANDARD DEVIATION	T 27	
				OF THE	AFTER 1 SPLIT	
				PERCENT DIFF.S	AGGREGATE	
				BETWEEN EXP.	ONLY	
				AND CONTROL SPECIMENS	100 PAIRED	
				ALL POSSIBLE	TEST RESULTS	
				COMBINATIONS		
				PRECISON	PRECISION	PRECISION
				(1S),%	(15),%	(18),%
				COMBINATIONS	COMBINATIONS	
				PRECISON	PRECISION	
				(D1S),%	(D2S),%	
SIEVE SIZE	COARSE	98.17%		0.57		
3/8	COARSE	81.19%	16.99%	1.77	0.95	0.87
#4 -	FINE	66.56%	14.63%	1.8	0.6	1.2
#8	FINE	41.61%	24.95%	2.3	0.64	1.66
#16	FINE	26.68%	14.93%	2.12	0.6	1.67
#30	FINE	16.92%	9.77%	1.72	0.43	1.29
#50	FINE	8.99%	7,93%	1.01	0.43	0.58
#100	FINE	5.01%	3.97%	0.54	0.43	1.555 1.422 1.432 4.338 4.434 9.455
#200	FINE	2.74%	2.28%	0.29	0.14	0.45

SIEVE SIZE	AGGREGATE	PERCENT PASSING	ERCENT PASSING ONE SIEV	SINGLE OPERATOR P	RECISION \	DIFF.
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	A .	В	BETWEEN
			NEXT FINER SIEVE	AFTER 3 SPLITS	AASHTO	ÇOLUMN A - COLUMN
				STANDARD DEVIATION	T 27	
				OF THE	AFTER 1 SPLIT	
				PERCENT DIFF.S	AGGREGATE	
				BETWEEN EXP.	ONLY	
				AND CONTROL SPECIMENS	100 PAIRED	
				ALL POSSIBLE	TEST RESULTS	
				PRECISON	PRECISION	
				(1S),%	(15),%	(1S),%
				COMBINATIONS		• \``
				PRECISON		\
				(D1S),%		7
SIEVE SIZE	_			• •		¥
1/2	COARSE	99.29%		0,59		
3/8	COARSE	81.99%	17.30%	1,91	0,95	4.95
#4	FINE	64.10%	17.89%	1.73	0.60	1-13
#9	FINE	41.67%	22.43%	2.33	0.64	1.69
#16	FINE	29.43%	12.24%	2.97	0.60	2.37
#30	FINE	21.19%	8.24%	2.72	0.43	2.29
#50	FINE	13.53%	7.65%	1.78	0.43	135
#100	FINE	7.85%	5.69%	1.2	0.43	237 229 136 0.77 1.7
200	FINE	4.34%	3.50%	2.13	0.43	12

DATA USED TO GENERATE FIGURE 6

						VALCO
SIEVE SIZE	AGGREGATE	PERCENT PASSING	ERCENT PASSING ONE SIEV	SINGLE OPERATOR P	RECISION	DIFF.
	DESCRIPTION	EACH SIEVE SIZE	AND RETAINED ON THE	A	В	BETWEEN
			NEXT FINER SIEVE	AFTER 3 SPLITS	AASHTÓ	COLUMN A - COLUMN E
				STANDARD DEVIATION	Ť 27	
				OF THE	AFTER 1 SPLIT	
				PERCENT DIFF.S	AGGREGATE	1
				BETWEEN EXP.	ONLY	
				AND CONTROL SPECIMENS	100 PAIRED	
				ALL POSSIBLE	TEST RESULTS	í -
				COMBINATIONS		
			~	PRECISON	PRECISION	PRECISION
				(1S),%	(18),%	(15),%
				COMBINATIONS		
				PRECISON		
				(D1S),%		
SIEVE SIZE						
1/2	COARSE	89.79%		0.30		
3/8	COARSE	74.15%	25.64%	2.35	1.38	9.97
- #4	FINE	61.42%	12.73%	2.29	0.60	4:00
#8	FINE	45.51%	15.91%	2.06	0,60	1:48
#16	FINE	35.18%	10.33%	2.04	0.60	144
#30	FINE	25.81%	9.37%	1,81	0.43	148 148 139 0.28 436 0.97
#50	FINE	11.86%	13.95%	0.88	0.60	0.28
#100	FINE	5.01%	6.85%	0.38	0.43	-0:05
#200	FINE	2.77%	2.24%	0.21	0.14	0.07

PAGOSA						PAGOBA
EXPERIMENTAL SIEVE SIZE	AGGREGATE DESCRIPTION	PERCENT PASSINGE EACH SIEVE SIZE	RCENT PASSING ONE SIEV AND RETAINED ON THE NEXT FINER SIEVE	SINGLE OPERATOR PI A AFTER 3 SPLITS STANDARD DEVIATION OF THE PERCENT DIFF.S BETWEEN EXP. AND CONTROL SPECIMENS ALL POSSIBLE COMBINATIONS PRECISION (15),% COMBINATIONS PRECISION (D15),%	RECISION B AASHTO T 27 AFTER 1 SPLIT AGGREGATE ONLY 100 PAIRED TEST RESULTS PRECISION (1\$),%	DIFF. BETWEEN COLUMN A - COLUMN B PRECISION (15),%
\$IEVE SIZE 1/2 3/8 #4 #16 #10 #50 #100 #200	COARSE COARSE FINE FINE FINE FINE FINE FINE FINE	100.00% 75.54% 36.74% 26.02% 18.76% 13.00% 8.80% 6.13%	24.46% 24.25% 14.56% 10.72% 7.26% 5.76% 4.20% 2.67%	0.35 2.63 1.97 1.7 2.01 1.94 1.35 0.78 0.45	1.38 0.54 0.60 0.43 0.43 0.43 0.43	2286. 1.3 1.3 1.41 1.41 1.41 0.92 0.92 0.92 0.92

	ID CONTROL SPECIMENS

	1 <i>1</i> 2	3/8	#4	#8	#16	#30	#50	#100	#200
	-0,10%	3.83%	3 93%	2 20%	173%	1.83%	1.54%	1.10%	0.75%
	-0.51% -0.51%	1.20%	1.85%	-0.98% 1.07%	-2 20% 1.04%	1.83%	-1.13%	-0.61%	-0.27% 0.28%
	-0.23%	0.33%	-1.09%	-3 03%	-2.78%	0.62%	-0.67%	-0.31%	-0.16%
	-0:59%	-073%	0.49%	-0.21%	4.52%	-1.71%	-1.15%	-0.53%	-0.07%
	-0.59%	-0 07%	0 75%	1 84%	1.72%	-1.71%	0.90%	0.60%	0:48%
	-0.31%	-1 60%	-2.45%	-2 26%	-2:10%	-1.44%	.0:69%	-0/23%	0.04%
	-0.18%	1.90%	2.57%	2.96%	2.41%	-0.27%	1.62%	1.19%	0.95%
	-0.27%	0.88%	1 88%	1 91%	1.34%	0.75%	0.41%	0.23%	0.12%
	0,00%	-0 65%	-1 32%	-2.19%	-2 47%	0.75%	-1.18%	-0.60%	-0.32%
	0,14%	2.85%	3 70%	3 03%	203%	1.37%	1.03%	0.81%	0 59%
	-0,27%	0.22%	1.62%	-014%	-4 90%	-0.62%	-1.63%	-0.90%	-0.42%
	0.28%	-0,46%	-1 62%	-1 74%	-1 25%	-0 67%	-0.17%	0.01%	0.07%
	0.41%	3.04%	3 40%	3.49%	3.25%	-0.67%	2.04%	1.42%	0.98%
	0.00%	0,41%	1.31%	031%	-0.67%	-0.93%	-0.62%	-0.29%	-0.04%
16 COMBINATIONS	0.00%	1.07%	1.57%	2.36%	2.66%	0.27%	1.42%	0.84%	051%
MEAN	-0.17%	0.88%	1.17%	0.54%	0.07%	0.04%	0.16%	0.20%	0.22%
STD. DEV.	0.30%	1.51%	1.93%	2.12%	2.11%	1.20%	1.19%	0.73%	0.45%

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
	4,48%	1.79%	0.84%	1 80%	2.80%	2,70%	1.81%	1.07%	0.58%
	-4.36%	0.11%	-1 01%	-0.99%	0 09%	0.63%	0.73%	0.57%	0.43%
	4.43%	0.04%	-1 02%	201%	3 16%	2.98%	1.94%	1.02%	0.38%
	0.12%	-2.04%	-1.68%	-3.00%	-0 47%	0.22%	0.54%	0.39%	0.18%
	-0,20%	2 19%	0.58%	-1 74%	-1 83%	-1.46%	-0.82%	-0,39%	-0,15%
	-0,32%	2.11%	0 67%	1 26%	1.24%	0.90%	0.40%	0.05%	-0,19%
	0,06%	0.03%	-0:09%	-2.16%	-2 39%	-1.86%	-1.00%	-0.57%	-0,39%
	-0,39%	3 87%	2.43%	3.41%	0 88%	0.61%	0.26%	0.11%	0.01%
	-0,97%	1.09%	-036%	0.33%	0.14%	0.03%	0.01%	-0.05%	-0,08%
	-0,58%	-0.99%	-1.02%	-3.08%	-3.49%	-2.73%	-1.39%	-0.68%	-0.27%
	-0.97%	2.84%	1.50%	0.12%	-0.22%	-0.25%	-0.13%	0:00%	0,13%
	0,39%	1,17%	-0 35%	-3 20%	-2.93%	-2.32%	-1.21%	-0:49%	-0.03%
	-0.47%	0.69%	2.20%	0 38%	-0.52%	-0.57%	-0.13%	0.01%	0.10%
	-0.85%	4.52%	4,72%	3.58%	2.74%	1.91%	1.13%	0.69%	0.50%
	0.73%	2.85%	2.87%	0.79%	0.04%	-0.16%	0.05%	0.19%	0.35%
16 COMBINATIONS	-0.12%	2.77%	2.85%	2,79%	3.11%	2.19%	1.27%	0 64%	0.30%
RALSTON					100 T 1 70				
MEAN	-0.58%	1.44%	0.81%	0.14%	0.15%	0.18%	0.22%	0.16%	0.12%
STD. DEV.	0.57%	1.77%	1.80%	2,30%	2.12%	1.72%	1.01%	0.54%	0.29%
	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
	0.00%	-3.98%	-1.69%	-1.89%	-2/39%	2.26%	-0.75%	-0 14%	-0.03%
	0.49%	-2.21%	0.89%	0.13%	-0.05%	0.02%	0 45%	0.37%	0.20%
	0.24%	-3.72%	-1.57%	-2.43%	-3.84%	3 45%	-1 29%	-0 43%	-0 29%
	0.00%	-4.12%	-0.14%	-0.94%	-1.85%	-1 48%	-0.14%	0.25%	0 18%
	011%	-0.97%	1.45%	2.55%	3 20%	2 98%	1 77%	0.77%	0.81%
	-0 14%	-2.48%	-1.00%	-0.01%	-0 39%	-0.49%	0.04%	0.03%	-0 18%
	-0 38%	0.13%	0.43%	1,48%	1.40%	1.48%	1 19%	0 65%	0 29%
	-0.38%	-2.74%	4,12%	0.53%	0.86%	0 70%	057%	0 25%	0.07%
	-0.21%	-0.12%	-1.22%	4.23%	-2,43%	-2.65%	-1 20%	-0.48%	-0 28%
	40.45%	2.48%	0.21%	0.26%	-0,64%	-0.68%	-0.04%	0 20%	0.19%
	-0.45%	-0.39%	-1.34%	-0.69%	4.48%	-1,45%	-0 66%	-0 19%	-0.03%
	0.04%	1.38%	1.23%	1,33%	1.46%	0.82%	0.54%	0.32%	0.21%
	0.00%	3.88%	4 54%	3,77%	1.83%	1.09%	0.70%	0.49%	0.23%
	0.00%	1.02%	3 09%	282%	1.29%	0.31%	0.08%	0.10%	0.02%
	0,49%	2.79%	5.66%	4.84%	3.63%	2.59%	1.28%	0.61%	0.26%
16 COMBINATIONS	0.24%	1.28%	3.21%	2.28%	0.04%	-0.88%	-0.46%	-0.19%	-0.23%
VALCO									
MEAN	-0.03%	-0.30%	0.80%	0.80%	0.05%	-0.21%	0.13%	0.18%	0.06%
	-0.03% 0.30%	-0.30% 2.35%	0.80% 2.29%	0.80% 2.06%	0.05% 2.04%	-0.21% 1.81%	0.13% 0.88%	0.16% 0.38%	0.06% 0.21%

FRANCISC										FRANCISCOT	т								
			EXPERIM	ENITAL - CI															
			#4						#205		1/2	3/8	#	#8	#18	#30	#50	#100	#206
594-1	£2.4 9%			32.68%		17.23%	11.32%	7.27%	4.53% EXP.	585X-1	89,49%	71.45%	48.37%	32.66%	24.16%	17.23%	11.32%	7.27%	4.53% EXP.
5960(-5	67.59%		42.44%	30,68%		16.40%	9.78%	0.10%	3.78% CONTROL	598X-0	100.00%	70.25%				19,04%	12.45%	7,88%	4.80% CONTROL
N DIFF	-4.10%	3.63%	3.93%	2.20%	1.73%	1.83%	1.54%	1.10%	0.75%	% DIF	-0.51%	1,20%	1.65%	-0,98%	2.20%	-1.81%	-1.13%	-0.61%	-0.27%
696X-Z	87,41%	69,52%	45.01%	33.65%	24.84%	17.34%	11.30%	7.35%	4.73% EXP.	698X-2	89.41%	69.52%	45,01%	33.85%	24.84%	17.34%	11.30%	7,35%	4.73% EXP.
695X-6	100,00%	70,25%	44.52%	33.86%	28.36%	19.04%	12,45%	7.88%	4,80% CONTROL	686X-7	100.00%	89,59%	44.26%	31.81%	23,13%	10.02%	10.40%	8.75%	4.25% CONTROL
% DET	-0,59%	-0.73%	0.49%	-0.21%	-1.52%	-1.71%	-1.15%	-0.53%	-0.07%	% DIFF	-0.59%	-0.07%	0.75%	1.84%	1,72%	1.32%	0.80%	0.40%	0.48%
586X-3	99.73%	70.47%	46.14%	33.72%	24.48%	16.77%	10.82%	6.98%	4.38% EXP.	546X-3	99.73%	70.47%	46.14%	33.72%	24.46%	16.77%	10.82%	6.98%	4.38% EXP.
698X-7	109.00%	89.58%	44.25%	31.61%	23,13%	16.02%	10,40%	6,75%	4.25% CONTROL	588X-0	99.72%	71.11%		35.91%	28.84%		12.00%	7.58%	4.03% CONTROL
DIFF	-4.27%	0.86%	1.66%	1.81%	1.34%	0.75%	0.41%	0,23%	0.12%	% DIFF	0.00%	-0.85%		-2.19%	-2.47%	-2.00%	-1.18%	-0.60%	-0.32%
596X-4	100.00%	70.66%	45.83%	34.17%	25.69%	18.11%	11.83%	7,59%	4,76% EXP.	596X-4	100.00%	70.68%	45,83%	34,17%	25.69%	18,11%	11.83%	7.59%	4.78% EXP.
596X-8	\$2.72%	71.11%	47.45%	35.01%	26.94%	16.76%	12.00%	7,68%	4.69% CONTROL	5961-6	89.58%	67.01%	42,44%	30.68%	22.43%		9,78%	6.16%	3.78% CONTROL
K DIFF	0.28%	-0.4B%	-1.62%	-1.74%	-1.25%	-0.67%	-0.17%	0.01%	0.07%	% DIFF	0.41%	3,04%	3,40%	3.49%	3.25%	2.71%	2.04%	1.42%	0,94%
RALSTON																			
GIEVE SIZE	1/2	\$/8	#4	11	#18	#30	#50	#105	#200	SIEVE SIZE	40	3/3	#4	-		100			-
NCAT-1	57.60%	79.72%	65.03%	41.77%	27.93%	18,37%	10.02%	5,62%	3.01% EXP.	NCAT-1	1/2 97.60%	79.72%	65.03%	41.77%	27.93%	19.37%	#50 10.02%	#180 5.82%	3.01% EXP.
NOD-NCAT-5	97,00%	77.83%	64.19%	39.07%	25.14%	15,68%	6.22%	4.54%	2,43% CONTROL	non-NCAT-0	96,98%	79.81%	68,04%		27.84%				
% DIFF	48%	1.79%	0.84%	{.50%	2.80%	2.70%	1.81%	1.07%	0.58%	% DIFF	1.36%	0.11%	-1,01%	42,76%	0.09%	17.75%	9.30%	5.04% 0.57%	2.50% CONTROL 0.43%
A DET	- 4,90 %	1./075	0.0476	1.0070	2.00%	2.70%	1.0175	1,0776	0.00	7 DIFF	-1.4076	0.1175	-1,015	-0.8674	0.08%	0.037	0.73%	4,014	0.4-376
NCAT-2	98.76%	61,80%	66.62%	41.02%	26.01%	18,29%	8.48%	4.65%	2,44% EXP.	NCAT-2	98.76%	61.60%	66.62%	41.02%	26.01%	16.29%	8.48%	4.65%	2.44% EXP.
hon-NCAT-6	98.96%	79.61%	05.04%	42.76%	27.64%	17.75%	8.30%	5.04%	2.59% CONTROL	non-NCAT-7	99,06%	79.59%	66.05%	39.76%	24.77%	15.39%	6.08%	4.60%	2.63% CONTROL
% DIFF	-0.20%	2.19%	0.58%	-1.74%	-1.83%	-1.46%	-0.82%	-0.39%	-0.15%	X DEF	-0,32%	2,11%	0.67%	1_26%	1.24%	0,90%	0.40%	0.05%	-0.19%
NCAT-J	88.11%	60.78%		40.10%	24.91%	15.42%	8.09%	4.55%	2,58% EXP.	NCAT-J	98.11%	60.78%	85,69%			15.42%	6.09%	4.55%	2.56% EXP.
non-NCAT-7	\$2,08%	79.69%	66.05%	39,76%	24,77%	15.39%	8.08%	4.60%	2.83% CONTROL	non-NCAY-8	98.69%	61.77%	86.71%	43.18%	28.40%	18.15%	9,48%	5.22%	2.83% CONTROL
% DIFF	-0.97%	1.09%	-0.36%	0.35%	0.14%	0.03%	0.01%	-0.05%	-0.08%	X DIFF	-0.58%	-0.98%	-1.02%	-1,08%	-3.48%	-2,73%	-1.39%	-0.(3%	-0.27%

VALCO/ROCKY MOUNTAIN/CAS PIT:

NCAT-4 <u>non-NCAT-8</u> % Diff

	1/2	3/8	#4	#1	#18	#30	#60	#100	#200
NCAT-1	100.00%	71.69%	60.00%	43.43%	33,15%	24.23%	11.29%	4.66%	2.75% EXP.
NON NCAT-5	100.00%	75.67%	61,68%	45,32%	35,54%	28.48%	12.05%	6,00%	2,78% CONTROL
% DIFF	0.00%	£88%	-1.89%	-1,89%	-2.39%	-2,28%	-0.75%	-0.14%	-0.03%
NCAT-2	\$7.62%	72.94%	60.56%	45.85%	38,40%	27.19%	12.62%	5.26%	2.85% EXP.
NON NCAT-#	02:51%	73.90%	59,11%	43,90%	33.20%	24.21%	10.84%		2.54% CONTROL
	0,11%	-0,97%	1.45%	2.55%	3.20%	2.96%	1.77%	0.77%	0.31%
NCAT-3	99,55%	75.29%	60.34%	44.82%	34,36%	25.03%	11.39%	4.81%	2.75% EXP.
NON NCAT-7	99.76%	75.41%	61,56%	45.00%	30.79%	27.08%	12.56%	5,20%	3.03% CONTROL
	-5.21%	-0.12%	-1,22%	-1.23%	-2.43%	-2.68%	-1.20%	-0.46%	-0.28%
NCAT-4	100.00%	78.63%	84.77%	48.14%	36,83%	26,80%	12.13%	5.10%	2.80% EXP.
HOH NCAT-8	109.90%	72,81%	60,13%	44.37%	35,00%	25.71%	11.43%	4.61%	2.50% CONTROL
	0.00%	3,88%	4.84%	3,77%	1.63%	1.09%	0.70%	0.40%	0.23%

98,23% 82.45% 88,90% 43,55% 27,86% 17,59% 9,35% 5,24% 2,93% EXP. 98,89% 81,77% 69,71% 43,18% 28,40% 18,15% 9,45% 5,22% 2,85% CONTROL -0.47% 0,69% 2,20% 0,38% -0.52% -0.55% -0.13% 0,01% 0,10%

Invin Windson/Stute Pft:

	1/2	3/8	#4	#8	816	#30	#58	#100	#200
NCAT-1	99,78%	79.98%	58,85%	44,60%	33,78%	24.42%	15.79%	8.73%	8,10% EXP
NON NCAT-5	100.00%	80,67%	59.97%	43,01%				6.20%	
% DNFF	-0.22%	-0.68%	-1,32%	1.40%	2.16%	2.26%	1.80%	1.44%	1.11%
NCAT-2	£7.45%	82,71%	80,11%	42,64%		20.80%	13.37%	6,47%	
NON NEAT-E	99.7 <u>0</u> %		60.27%	44.14%		22.03%	13.90%	8.57%	
% DIFF	-9.20%	0.58%	-0.16%	-1.50%	-1.75%	-1.23%	-0.54%	-0.10%	0.11%
NCAT-3	100.00%	78.89%	56.50%	42.87%		21.76%	14.02%	8.76%	5.59% EXP
NON NCAT-7	100.00%	75.87%	66.63%	42.17%		20.18%		7.46%	4.67% CONTROL
% OFF	5,00%	3.02%	1.65%	0,71%	0.81%	1.69%	1.00%	1.30%	0.01%
NCAT-4	105.00%	79.60%	60.78%	45.83%	33,53%	23.71%	15.34%	9.68%	0.25% EXP
NON NCAT-4		80.37%	60.88%	44.82%		23.61%			
% DIFF	0.60%	-0.77%	-0.08%	0.81%	0.21%	0.20%	0.63%	0.84%	0,90%

SIEVE SIZE	1/2	3/8	#4		#16	#30	#50	#100	#200
NCAT-1	100.00%	71.69%	60.00%	43,43%	33,15%	24.23%	11.29%	4,68%	2,75% EXP.
non-NCAT-4	\$9.51%	73.90%	50,11%	43,30%	33.20%	24,21%	10.84%		2,54% CONTROL
X DIFF	0.49%	-2.21%	0.89%	0.13%	-0.05%	0.02%	0.45%	0.37%	0.20%
NCAT-2	99.82%	72.94%	60.58%	45.85%	38.40%	27.19%	12.62%	5.28%	2.85% EXP.
BOD-NCAT-7	99.76%	75.41%	61.56%	45.68%	36.79%	27.68%	12.58%	5,29%	
% DIFF	-0.14%	-2.48%	-1.00%	-0.01%	-0.39%	-0.49%	0.04%	-0.03%	-0,18%
NCAT-S	89.55%	75.29%	60,34%	44.62%	34,38%	25.03%	11,39%	4.81%	2.75% EXP,
NOT-NCAT-S	100.00%	72.01%	60,13%	44.37%	35.00%	25,71%	11,43%	4.61%	2.56% CONTROL
% DIFF	-0.45%	2.48%	0.21%	0.26%	-0.84%	-0.66%	-0.04%	0.20%	0.19%
NCAT-4	100.00%	75,69%	64.77%	48,14%	36.83%	26.90%	12.13%	5.10%	2.80% EXP.
non-NCAT-5	100,00%	75.67%	61.66%	45.32%	35,54%	28.49%	12.06%	5,00%	2.78% CONTROL
X N	0.00%	1.02%	3.09%	2,02%	1.29%	0,31%	0.08%	0,10%	0.02%

NCAT-4 98.23% 82.45% 88.80% 43.55% 27.69% 17.59% 8.35% 5.24% 2.93% EXP. non-NCAT-5 99.06% 77.93% 84.19% 38.87% 25.14% 15.58% 8.22% 4.54% 2.45% CONTROL % DBF -0.85% 4.52% 4.72% 3.58% 2.74% 1.81% 1.13% 0.69% 0.50%

	1/2	3/8	#4	#8	#(8	#30	#50	#100	#209
NCAT-1	99.78%	79.98%	60.65%	44,50%	33.76%	24.42%	15.79%	8.73%	6.10% EXP
non-NCAT-4	99.70%	61.64%	60.27%	44.14%	31,01%	27.03%	13,90%	8.57%	5.49% CONTROL
% DIFF	0.08%	-1.66%	-1.62%	0,35%	1.95%	2.39%	1.68%	1,16%	0.61%
NCAT-2	99,45%	62.21%	60.11%	42.84%	30.06%	20.80%	13.37%	8,47%	5.58% EXP
non-NCAT-7	100,00%	75.07%	58.65%	42.17%	30.19%	20.18%	12.33%	7.46%	4.67% CONTROL
% DIFF	-0.55%	0.33%	3.48%	0.48%	-0.14%	0.82%	1.04%	1.01%	0.92%
NCAT-3	100.00%	78,89%	68.50%	42.07%	31.01%	21.76%	14.02%	6.76%	5.50% EXP
NOR-NCAT-I	99.40%	BO.37%	60,86%	44.62%	33.32%	23.51%	14.71%	8.82%	5.34% CONTROL
K DIFF	0,60%	-{.48%	-2,36%	-1.05%	-2.31%	-1.74%	-0,69%	-0.06%	0.24%
NCAT-4	100.00%	79.00%	60.78%	45.83%	33.53%	23.71%	15.34%	9.65%	8.25% EXP
non-NCAT-6	100.00%		59,97%	43.01%	31.60%	22.14%	13,88%	6,29%	4.53% CONTROL
X DIFF	0.00%	-1.06%	0.81%	2.82%	1.03%	1.58%	1.46%	1.37%	1,20%

FRANCISCOTTI

	1/2	3/8	#4	#B	#14	1310	#58	4100	#200		1/2	3/8	#4	#8	#18	#30	#50	#108	#200
596X-1	03,48%	71,45%	48.37%	32.88%	24.16%	17,23%	11,32%	7.27%	4.53% EXP.	696X-1	99.49%	71.45%	48.37%	32.88%	24,16%	17.23%	11.32%	7.27%	4,53% EXP.
596X-7	100.00%	59.69%	44,28%	31.81%	23.13%	10.02%	10.40%	0.75%	4.25% CONTROL	596X-B	99,72%	71.11%	47.45%	35,91%	28,04%	18,78%	12,00%	7,58%	4.68% CONTROL
% DIFF.	-0.51%	1.06%	2.11%	1.07%	1.04%	1.21%	0.02%	0.52%	0.28%	% DIFF.	-0.23%	0.33%	-1.09%	-3.03%	-2.76%			-0.31%	-0.10%
596X-2	E2.41%	69.62%	45.01%	33.85%	24.84%	17.34%	11.30%	7.35%	4.73% EXP.	598X-2	09.41%	69,52%	45.01%	33.65%	24.84%	17.34%	11.30%	7.35%	4.73% EXP.
586X-8	87,72%	71.11%	47.45%	35.91%	28.94%	18.78%	12,00%	Y.66%	4.63% CONTROL	5963(-5	69.59%	67,81%	42.44%	30,68%	22.43%	15.40%	9,78%	6,18%	3.78% CONTROL
% DIFF.	-0.31%	-1.60%	-2.45%	-2.20%	-2.10%	-1,74%	-0.(3%	-0.23%	0.04%	% ONFF.	-0.16%	1.90%	2.57%	2.00%	2,41%	1.94%	1,52%	1.19%	0.95%
596X-3	£0.73%	70.47%	48.14%	33.72%	24,48%	16.77%	10.82%	6.96%	4.36% EXP.	596X-3	99.73%	70,47%	46.14%	33.72%	24.46%	16.77%	10.82%	6,98%	4.38% EXP.
596X-5	e3.59%	87.01%	42.44%	30,09%	22.43%	16,40%	9,78%	0.16%	3,78% CONTROL	584X-8	100.00%	70.25%	44.52%	33.86%		10.04%	12.45%	7.88%	4,80% CONTROL
W DIFF.	0.14%	2,85%	3,70%	3,03%	2.03%	1,37%	1.03%	0.81%	0.50%	% DIFF.	-0.27%	0.22%	1.82%	-0.14%	-1.90%	-2,27%	-1.65%	-0,90%	-0.42%
586X-4	103.00%	70,86%	45,83%	34.17%	25.03%	18,11%	11.83%	7.59%		586X-4	100.00%	70.66%	45.83%	34.17%	25.63%	10.11%	11.63%	7.58%	4.78% EXP.
596X-6	100.00%	70,25%	44.52%	33.86%	26,36%	10.04%	12.45%	7.66%	4.80% CONTROL	696X~7	100.00%		44.20%	31,81%		10,02%	10,40%	8.75%	4,25% CONTROL
% DEF.	9,00%	0.41%	(,31%	0.31%	-0,67%	-0.83%	-0.82%	-0.29%	-0.04%	% DOFF.	0.00%	(.07%	1.57%	2.36%	2.56%	2.09%	1.42%	0.84%	0.61%

RALISTON										
SEVE SIZE	1/2	3/1	- 14	#1	#16	#30	#50	#100	#200	
NCAT-1	67.60%	79.72%	65.63%	41.77%	27.83%	10.37%	10.02%	5.62%	3,01%	EXP.
DOG-NCAT-7	69.08%	78.63%	66,05%	39,76%	24,77%	15.38%	8.06%	4.00%	2.03%	CONTROL
% DIFF	-1.48%	0.04%	-1.02%	2,01%	3.18%	2.08%	1,04%	1.02%	0.38%	
NCAT-Z	\$5.78%	81,80%	60.62%	41.02%	28,01%	16.28%	8,48%	4.05%	2.44%	EXP.
non-NCAT-I	\$1,69%	81.77%	66.71%	43.18%	28.40%	(0.15%	8.48%	5,22%		CONTROL
N DIFF	V.06%	0.03%	-0.09%	-2.16%	-2.36%	-1.00%	-1.00%	-0.57%	-0.38%	
NCAT-3	\$2.11%	80.78%	65.69%	40.10%	24.01%	15.42%	8.09%	4.55%	2.56%	
non-NCAT-5	S2,08%	77.93%	64.19%	39.97%	25,14%	15,63%	8.22%	4.54%		CONTROL
% DIFF	.97%	2,84%	1,50%	0.12%	-0.22%	-0.25%	-0.13%	0.00%	0.13%	
NCAT-4	61.23%	82,45%	68.90%	43.55%	27.88%	17.68%	9.36%	5.24%	2.03%	EXP.
RON-NCAT-8	61.96%	78.61%	66.04%	42.78%	27.84%	17.75%	9.30%	8.04%	2.50%	CONTROL
% DIFF	-2,73%	2.85%	2.87%	0.79%	0.04%	-0.15%	0.05%	0.10%	0.15%	

VALCO/ROCKY MOUNTAIN/CAS PIT:

SIEVE SIZE	1/2	3/8	#4	#1	#18	#36	1150	#108	#206	
NCAT-1	09, 00%	71.63%	80.00%	43.43%	33.15%	24.23%	11.29%	4.86%	2.75%	EXP.
non-NCAT-7	\$7,76%	76.41%	81.66%	45,88%		27,68%	12.58%	5.29%	3.03%	CONTRO
% DIPP	0.24%	-3.72%	-1.57%	-2.43%	-3.84%	-3.45%	-1.29%	-0.43%	-0.28%	
NCAT-2	\$3.82%	72.94%	80.58%	45.85%	38.40%	27.19%	12.62%	5,26%	2.65%	EXP.
non-NCAT-\$	100,00%	72.81%	60.13%	44.37%	35,00%	25,71%	11.43%	4,81%	2.58%	CONTROL
% DIFF	-38%	0,13%	0.43%	1,46%	1,40%	1,48%	1,19%	0.85%	0,28%	
NCAT-S	99.55%	75.29%	60.34%	44.82%	34.38%	25.03%	11.38%	4.81%	2.75%	EXP.
INCAT-5	100.00%	75.87%	61.66%	45,32%	35.54%	26,49%	12,05%	5.00%	2.76%	CONTROL
A DOPP	-0.45%	-0.38%	1.34%	-0.69%	-1.19%	-1.46%	-0.66%	-0.19%	-0.03%	
NCAT-4	160.00%	78.83%	64.77%	48.14%	30.63%	28,80%	12,13%	5.10%	2.80%	EXP.
NON-NCAT-4	F2.51%		59.11%	43.30%	13,20%	24,21%	10.84%	4.48%	2,54%	CONTROL
S DIFF	0.49%	2.76%	5.65%	4,84%	3,63%	2.59%	1.28%	0.01%	0.25%	

Invin Windsor/Stute Pft:

	1/2	¥1	#4	# 1	#16	#30	#50	#100	#200
NCAT-1	63,78%	79.96%	58.65%	44.50%	33.78%	24.42%	15,78%	9.73%	8.10% EXP
DOD-NCAT-7	100.00%	75,87%	58.65%	42,17%	30,19%	20,18%	12.33%	7.40%	4.07% CONTROL
S DIFF	- 22%	4.11%	2.00%	2.33%	3.57%	4.24%	3.46%	2.27%	1.43%
NCAT-2	£3,45%	62.21%	50.11%	42.64%	30.06%	20.80%	13.37%	8.47%	5.59% EXP
DOD-NCAT-4	\$1.40%	60.37%	80.86%	44.82%	33.32%	23.51%	14.71%		5,34% CONTROL
'S DIFF	0.04%	1.83%	-0.75%	-2.18%	-1.28%	-2.71%	-1.34%	-0.35%	0.25%
NCAT-J	103.00%	78.68%	58.50%	42,87%	31.01%	21.76%	14.02%	8.70%	5.59% EXP
NON NCAT-5	103.00%	80.07%	69.97%	43,01%	31,60%	22,14%	13.68%	8,29%	
% DIFF	6.00%	-1,77%	-1.46%	-0.13%	-0.60%	-0,38%	0.13%	0.47%	0.00%
NCAT-4 NOT-NCAT-6	100.00%	79.60% 81.64%	60.78% 60.27%	45.63% 44,14%	33,53% 31,81%	23,71% 22,03%	15.34%	9.66% 8.57%	8.25% EXP 5.48% CONTROL
T DIFF	0.30%	-2.04%	0.61%	1.48%	1.72%	1.63%	1.44%	1.02%	0.76%

SEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#10D	#200
NCAT-1	67.60%	79,72%	65,03%	41.77%	27.03%	18.37%	10.02%	5.62%	3.01% EVP.
non-NCAT-I	08.09%	61.77%	66.71%	43.18%	28.40%	18,15%	8.48%	5.22%	2,63% CONTROL
% OJFF.	-1.09%	-2.04%	-1.08%	-1.40%	-0.47%	0.22%	0,54%	0.39%	0.18%
NCAT-Z	98.76%	51.60%	66.82%	41.02%	28,01%	18.29%	8.48%	4.05%	2.44% EXP.
non-NCAT-5	99.06%	77.83%	64.18%	38.87%	25.14%	15.68%	8.22%	4,54%	2.43% CONTROL
V. DEFF.	-0.32%	3.87%	2.43%	1.05%	0.88%	0.61%	0.26%	0,11%	0.01%
NCAT-9	98.11%	80,78%	65.68%	40,10%	24.91%	15.42%	8,00%	4.55%	2,56% EXP.
non-NCAT-8	98.95%	79.81%	66.04%	42.78%	27.84%	17.75%	9.30%	5.04%	2.58% CONTROL
Х D. 9.	-0.85%	1.17%	-0.36%	-2,67%	2.03%	-2.32%	-1.21%	-0.49%	-0.03%
NCAT-4	98.23%	82.45%	68.90%	43,55%	27,88%	17.59%	8.35%	5.24%	2.93% EXP.
non-NCAT-7	69.08%	79,69%	66.05%	39,76%	24.77%	15,39%	8.08%	4,60%	2.63% CONTROL
% DIFF.	-0.86%	2.77%	2.65%	3,79%	3.11%	2.19%	1.27%	0.64%	0.30%

SEVE &	0E_1/2	:	3/3	#4	#3	#18	630	#50	#100	#200	
NCAT-1	10	0.00%	71.69%	80.00%	43,43%	33,15%	24.23%	11.28%	4.86%	2.75%	EXP.
non-NGA	T-8 10	0.00%	72.01%	60,13%	44.37%	35.00%	25,71%	11.43%	4.61%	2,50%	CONTRI
X DEF.		0.00%	-1.12%	-0.14%	-0.94%	-1.85%	-1,48%	-0.14%	0.25%	0,16%	
NCAT-2		9,62%	72.94%	60.56%	45.85%	36.40%	27.19%	12.82%	5.26%	2,85%	EXP.
non-NC/	T-6 \$C	0.00%	78.87%	\$1.68%	45,32%	35.54%	26,49%	12.05%	5.00%		CONTRO
X DIFF.		0.38%	-2.74%	-1.12%	0.53%	0.86%	0,70%	0.67%	0.25%	0.07%	
NCAT-3	e	9.55%	75,29%	60.34%	44.62%	34.38%	25,03%	11.38%	4.81%	2.76%	EXP.
non-NCA	T-6 6	19.51%	73.90%	59.11%	43.30%	33.20%	24.21%	10.84%	4,49%		CONTR
% OFF.		0.04%	1,38%	1.23%	1.33%	1.16%	0,82%	0.54%	0.32%	0.21%	
NCAT-I		0.00%	78,69%	64,77%	48,14%	36.63%	28.80%	12.13%	5,10%	2,80%	
non-NC/		9.75%	75.41%	61.58%	45,86%	36.79%	27.68%	12,58%	5,29%		CONTR
S DEP.		0,24%	1.28%	3,21%	2,28%	0.04%	-0.88%	-0,48%	-0,19%	-0.23%	

	172	3/8	#4	#	#16	#30	650	#100	#205
NCAT-1	99.78 ¥	79,95%	58,65%	44.50%	33.76%	24.42%	15.70%	0.73%	6.10% EXP
non-NCAT-	99,40%	80.37%	80.86%	44.82%	33.32%	23.61%	14.71%	6.82%	5,34% CONTRO
% DIFP.	0.37%	-0,38%	-2,21%	-0,33%	0.44%	0.91%	1.08%	0,91%	0.75%
NCAT-2	99,45%	82,21%	80,11%	42,64%	38.06%	20.80%	13.37%	8.47%	5.58% EXP
non-NCAT-5	100.00%	80,87%	59,97%	43,01%	31.60%	22.14%	13.68%	8,29%	4.98% CONTRO
N DIFF.	-0.55%	1,54%	0,15%	-0,38%	-1.55%	-1.34%	0.52%	0,18%	0.61%
NCAT-3	100,00%	79.89%	58.50%	42.87%	31,01%	21,76%	14,02%	8.76%	5.59% EXP
non-NGAT-8	99.70%	61.64%	80.27%	44.14%	31,81%	22.03%	\$3,90%	8,57%	5.49% CONTRO
s birr.	0,30%	-2.75%	-1,76%	-1.27%	-0,80%	-0.26%	0.11%	0.19%	0.10%
NCAT-4	100.00%	79.60%	60.79%	45.63%	33.53%	23,71%	15.34%	9.66%	6.25% EXP
NCAT-7	100.00%	75.87%	66,65%	42.17%	30,19%	20,18%	12.33%	7,46%	4,87% CONTRO
V DIFF.	0.00%	3.73%	4,13%	3,49%	3,34%	3,53%	3.01%	2.20%	1.57%

MONK PIT:

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200	
NCAT-1	Si 47%	02.21%	62.58%	38,03%	25.14%	17.44%	11.11%	6.52%	3.17% EXP	
NON NCAT-6	62.50%	60.09%	62.74%	41.40%	28.00%	20.54%	13.15%	7.66%	3.72% CONTROL	
% DIFF	-0.03%	2.12%	-0.18%	-3.37%	-3.76%	-3,10%	-2.04%	-1.14%	-0.55%	
NCAT-2	65.53%	83.61%	65.02%	42.68%	30.80%	22.54%	14.76%	9.57%	7.91% EXP	
NON NCAT-6	62.24%	73.83%	63.42%	43.15%	31.60%	23.12%	14,77%	8.27%	3.63% CONTROL	
% DIFF	-0.71%	4.78%	1.59%	-0.47%	-0.80%	-0.59%	-0.02%	1.30%	4.27%	
NCAT-3	62.16%	81.68%	64.78%	43.70%	31.90%	23.41%	14.84%	7.91%	3.14% EXP	
NON NCAT-7	98.59%	82.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7,28%	3,55% CONTROL	
% DIFF	0.57%	-1.05%	-1.55%	1.29%	3.53%	3.74%	2.34%	0.63%	-0.41%	
NCAT-4	100.00%	81.47%	64.06%	42.28%	29.88%	21.37%	13.44%	7,38%	3.15% EXP	
NON NCAT-8	99.50%	79.58%	63.54%	42.81%	30,48%	21.81%	13.73%	7.86%	3,23% CONTROL	
% DIFF	0.50%	0.89%	0.52%	-0.54%	-0.60%	-0.45%	-0.28%	-0.28%	-0.09%	

PAGOSA 1	ROUT	KES		15 PO SSI	BLE COM	BINATION	\$		
	1/2	9/8	#4	#E	#16	#30	#50	#100	#290
NCAT-4	100.00%	75.34%	52.40%	35.65%	25.35%	18.28%	12.53%	8,36%	5.83% EXP
Non NCAT-1	80.74%	73,50%	48,45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33% CONTROL
% DIFF	2.26%	2.84%	5.94%	2.59%	2.60%	2.19%	1.44%	0.79%	0.49%
NCAT-5	100.00%	74.63%	50.48%	37.59%	27.07%	19.71%	13.81%	9.44%	6.61% EXP
Non NCAT-2	99.60%	75,99%	54.76%	41.27%	29,60%	21.25%	14.52%	9.64%	6.53% CONTROL
% DIFF	0.20%	-2.36%	-4.29%	-3.68%	-2.53%	-1.54%	-0.71%	-0.20%	-0.02%
NCAT-6	100,00%	75.85%		36.76%	25.63%	18.29%	12.65%	8.59%	5.94% EXP
Non NCAT-3	99,46%	72.27%	47.95%	32.01%	22.27%	15,76%	10.59%	6.07%	4.74% CONTROL
% DIFF	0.54%	3.36%	3.05%	4.75%	3,38%	2.54%	2.06%	1.62%	1.20%

	SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
	NCAT-1	99,47%	82.21%	62.56%	38.03%	25.14%	17.44%	11.11%	8,52%	3.17% EXP
TROL	non-NCAT-6	99.24%	78.83%	63.42%	43.15%	31,60%	23.12%	14.77%	8.27%	3.63% CONTROL
	% DIFF	0.24%	3.38%	-0.86%	-5.11%	-6.46%	-5.69%	-3.66%	-1.74%	-0.46%
	NCAT-2	98.53%	B3.61%	65.02%	42.68%	30.60%	22.54%	14.76%	9.57%	7.91% EXP
TROL	non-NCAT-7	68.59%	B2.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7.28%	3,55% CONTROL
	% DIFF	-0,06%	0,68%	-1.31%	0.27%	2.43%	2,87%	2.28%	2.29%	4.36%
	NCAT-3	99,16%	81.68%	64.76%	43.70%	31.00%	23.41%	14.84%	7.91%	3.14% EXP
TROL	non-NCAT-8	99,50%	79.58%	63,54%	42.81%	30.48%	21.81%	13.73%	7,66%	3,23% CONTROL
	% DIFF	-0.33%	2.10%	1.24%	0.89%	1.42%	1.58%	1.11%	0.28%	-0.09%
	NCAT-4	100.00%	80.47%	64.06%	42.25%	29.88%	21.37%	13.44%	7.38%	3.15% EXP
TROL	non-NCAT-5	\$2.50%	80,09%	82.74%	41.40%	28,90%	20.54%	13.15%	7,86%	3,72% CONTROL
	% DIFF	0,50%	0.37%	1.32%	0.87%	0.98%	0.83%	0.29%	-0.28%	-0.58%

PAGOSA		AKES		15 PO\$\$	BLE COM	BINATION			
	1/2	3/8	#4	#	#16	#30	#50	#100	#200

NCAT-4	100.00%	76.34%	52.40%	35.85%	25,36%	18.28%	12.53%	8.36%	5.83% 8	XP
Non NCAT-3	99.46%	72.27%	47.95%	32.01%	22.27%	15.76%	10.59%	6.97%	4.74% (ONTROL
% DIFF	0.54%	4.07%	4.45%	3.84%	3.09%	2.53%	1.94%	1.39%	1.09%	
NCAT-5	100.00%	74.63%	50.48%	37.59%	27.07%	18.71%	13.81%	9.44%	6,61% 6	ЭХР
Non NCAT-1	99.74%	73.50%	48.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33% (ONTROL
% DIFF	0.26%	1.13%	4.01%	4.33%	4.32%	3.62%	2.72%	1.87%	1.27%	
NCAT-8	100.00%	75.65%	51.00%	36.76%	25.63%	18.29%	12.65%	8.59%	5,94% 6	ХP
Non NCAT-2	99,60%	76,99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63% (ONTROL
% DIFF	0.20%	-1.34%	-3.75%	-4.51%	-3.97%	-2.96%	-1.07%	-1.05%	-0.89%	

MONK PIT:

NCAT-6 Non NCAT-1 % DIFF

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200	SIEVE SIZE	1/2	3/8	#4	#8	#15	#30	#50	#100	#200
NCAT-1	Si,47%	82.21%	62.56%	38,03%	25.14%	17.44%	11.11%	6,52%	3.17% EXP	NCAT-1	99.47%	82.21%	82.56%	38.03%	25.14%	17.44%	11.11%	8.52%	3.17% EXP
non-NCAT-7	66,59%	82.73%	68,32%	42.41%	28.37%	19.66%	12.50%	7.28%	3.55% CONTROL	non-NCAT-8	99.50%	79,58%	63.54%	42.81%	30.48%	21.81%	13.73%	7.66%	3.23% CONTROL
% DIFF	0,88%	-0.52%	-3.76%	-4,38%	-3.23%	-2.23%	-1.39%	-0.76%	-0.38%	% DIFF	-0.02%	2.63%	-0,98%	-4.78%	-5.34%	-4.38%	-2.62%	-1.13%	-0.06%
NCAT-2	98.53%	83.81%	65.02%	42.58%	30,80%	22.54%	14.78%	9.57%	7.01% EXP	NCAT-2	98.53%	83,81%	85.02%	42.68%	30.80%	22.54%	14.78%	9.57%	7.81% EXP
non-NCAT-4	£3.50%	79,58%	63.54%	42.01%	30,48%	21.81%	13.73%	7.66%	3,23% CONTROL	non-NCAT-5	99.50%	80,09%	82.74%	41.40%	28,90%	20.54%	13.15%	7.66%	3.72% CONTROL
% DIFF	-0.97%	4.04%	1.48%	-0.13%	0.32%	0.72%	1.03%	1,91%	4.67%	% DIFF	-0.97%	3.52%	2.28%	1.28%	1,90%	2.00%	1.61%	1.91%	4.18%
NCAT-3	89,16%	61.68%	64,78%	43.70%	31.90%	23.41%	14.84%	7.91%	3.14% EXP	NCAT-3	88.16%	81.68%	64.78%	43.70%	31.90%	23.41%	14.84%	7.91%	3.14% EXP
non-NCAT-5	69.50%	80,09%	62,74%	41,40%	28.00%	20,54%	13,15%	7.66%	3.72% CONTROL	non-NCAT-6	88.24%	78,83%	63.42%	43.15%	31.60%	23.12%	14.77%	8.27%	3.63% CONTROL
% DIFF	-0.34%	1,59%	2.04%	2.30%	3.00%	2.87%	1.63%	0.25%	-0.58%	% DIFF	-0.07%	2,85%	1.38%	0.55%	0.30%	0.28%	0.06%	-0.35%	-0.49%
NCAT-4	100.00%	80.47%	54.05%	42.26%	29.88%	21.37%	13,44%	7.38%	3.15% EXP	NCAT-4	100.00%	80.47%	64,06%	42.26%	29.88%	21.37%	13.44%	7,36%	3.15% EXP
non-NCAT-6	69.24%	78.83%	63.42%	43.15%	31,60%	23,12%	14.77%	8.27%	3.63% CONTROL	non-NCAT-7	98.59%	82.73%	66,32%	42.41%	28.37%	19.66%	12,50%	7.28%	3.55% CONTROL
% DIFF	0.76%	1.64%	0.64%	-0.88%	-1.72%	~1.76%	-1.34%	-0.89%	-0.49%	% DIFF	1.41%	-2.26%	-2.27%	-0.15%	1.50%	1.70%	0.94%	0,10%	-0.40%
PAGOSA T	ROUT LA	KES		15 POSSIS	LE COMB	NATIONS				PAGOSA T	ROUT LA	KES		15 PO SSI E	ILE COMB				
	1/2	2/8	#4	#8	H6	(30)	#50 #	H00 i	200		1/2	3/8	14	-	6 16 -	K30	#50	#100	7200
NCAT-4	109.00%	76.34%	52.40%	35.85%	25.35%	18,28%	12.53%	8.36%	5.83% EXP	NCAT-4	100.00%	76.34%	52.40%	35.85%	25.35%	18.28%	12.53%	8,36%	5.83% EXP
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63% CONTROL	Non NCAT-7	99.79%	79.37%	56.00%	36,61%	27.73%	20.00%	13.62%	B.91%	6.34% CONTROL
S DIFF	0.20%	-0.65%	-2.35%	-5.42%	-4.25%	-2.97%	-1.99%	-1.27%	-0.80%	% DIFF	0.21%	-3.04%	-3,60%	-2.76%	-2.38%	-1.71%	-1.09%	-0.55%	-0.51%
NCAT-5	100.00%	74.63%	50.48%	37.59%	27.07%	19.71%	13.81%	8.44%	8.61% EXP	NCAT-5	100.00%	74.83%	50.46%	37.58%	27.07%	19.71%	13.81%	0.44%	6.61% EXP
Non NCAT-3	\$9.45%	72.27%	47.95%	32.01%	22.27%	15.78%	10.59%	6.97%	4,74% CONTROL	Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.94%	7.99%	5.84% CONTROL
												-0.40%	0.35%		2.70%	2.22%	1.87%	1.45%	0.97%
% DIFF	0.54%	2.36%	2.52%	5.58%	4.61%	3.95%	3.22%	2.47%	1.87%	"% DIFF	0.00%	-0.40%	0.35%	3,30%	2.70%	2.22%	1.87%	1.45%	0.97%

102.00% 75.85% 51.00% 36.76% 25.83% 18.29% 12.85% 8.58% 5.94% EXP 59.74% 73.50% 45.45% 33.26% 22.75% 16.09% 11.08% 7.67% 5.33% CONTROL 5.28% 2.15% 4.54% 3.50% 2.89% 2.20% 1.56% 1.02% 0.81%

N DIT	0,0070	-0.40 %	0.00 /	0.00 14	2		1.01 %		0.01 14	
	1/2	3/8	4	#	#16	#30	#50	#100	#200	
NCAT-4	100.00%	78.34%	52.40%	35.85%	25.35%	18.28%	12.53%	8.36%	5.83%	EXP
Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.84%	7.96%	5.84%	CONTROL
% DIFF	0,00%	1.31%	2.28%	1.65%	0.99%	0.79%	0.59%	0.37%	0.19%	
NCAT-5	100.00%	74.63%	50.46%	37.59%	27,07%	19.71%	13.B1%	9.44%	6.61%	EXP
Non NCAT-7	89.79%	79.37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%	CONTROL
% DIFF	0.21%	-4.75%	-5.54%	-1.02%	-0.86%	-0.29%	0,20%	0.53%	0.27%	
NCAT-8	100.00%	75.85%	51.00%	38.76%	25.83%	18.29%	12.65%	8,59%	5,94%	EXP
Non NCAT-7	99.79%	79.37%	58.00%	38,61%	27.73%	20.00%	13.62%	8,91%	6.34%	CONTROL
% DIFF	0.21%	-3.73%	-5.00%	-1.85%	-2.10%	-1.71%	-0.96%	-0.33%	-0.40%	
NCAT-6	100.00%	75.65%	51.00%	36,76%	25.63%	18.29%	12.65%	8.59%		
Non NCAT-8	100.00%	75.03%	50.12%	34,20%	24.37%	17.48%		7.99%		CONTROL
% DIFF	0.00%	0.62%	0.88%	2,56%	1.26%	0.80%	0.72%	0,60%	0.30%	-

F. -0.41% -1.97% -1.82% -1.13% -0.69% -0.62% -0.52% -0.59% -0.47% F. -0.13% -3.50% -5.02% -5.23% -4.51% -3.38% -2.21% -1.42% -0.91% F. -0.00% 0.68% 0.26% 2.05% 3.24% 3.02% 2.04% 1.13% 0.55% F. 0.28% -0.87% -2.93% -2.05% -0.58% 0.27% 0.45% 0.30% 0.11% F. 0.28% -1.53% -3.19% -4.10% -3.81% -2.76% -1.59% -0.83% -0.44%	RANCISC ONTROL		3/8	#4	#8	#16	#30	#50	#100	#200
F. -0.13% -3.50% -5.02% -5.23% -4.51% -3.38% -2.21% -1.42% -0.91% F. -0.00% 0.66% 0.26% 2.05% 3.24% 3.02% 2.04% 1.13% 0.55% F. 0.28% -0.87% -2.93% -2.05% -0.58% 0.27% 0.45% 0.30% 0.11% F. 0.28% -1.53% -3.19% -4.10% -3.81% -2.76% -1.59% -0.83% -0.44% A -0.07% -1.64% -2.46% -2.27% -1.71% -1.18% -0.77% -0.52% -0.36%	DIFF.	-0.41%	-2.63%	-2.08%	-3.18%	-3.93%	-3.84%	-2.66%	-1.71%	-1.02 %
 F0.00% 0.66% 0.26% 2.05% 3.24% 3.02% 2.04% 1.13% 0.55% F. 0.28% -0.87% -2.93% -2.05% -0.58% 0.27% 0.45% 0.30% 0.11% F. 0.28% -1.53% -3.19% -4.10% -3.81% -2.76% -1.59% -0.83% -0.44% A -0.07% -1.64% -2.46% -2.27% -1.71% -1.18% -0.77% -0.52% -0.36% 	IFF.	-0,41%	-1.97%	-1.82%	-1,13%	-0.69%	-0.62%	-0.62%	-0.59%	-0.47%
F. 0.28% -0.87% -2.93% -2.05% -0.58% 0.27% 0.45% 0.30% 0.11% F. 0.28% -1.53% -3.19% -4.10% -3.81% -2.76% -1.59% -0.83% -0.44% A -0.07% -1.64% -2.46% -2.27% -1.71% -1.18% -0.77% -0.52% -0.36%	FF.	-0.13%	-3.50%	-5.0 2%	-5.23%	-4.51%	-3.38%	-2.21%	-1.42%	-0.91%
F. 0.28% -1.53% -3.19% -4.10% -3.81% -2.76% -1.59% -0.83% -0.44% • -0.07% -1.64% -2.46% -2.27% -1.71% -1.18% -0.77% -0.52% -0.36%	IFF.	-0.00%	0.66%	0.26%	2.05%	3.24%	3.02%	2.04%	1.13%	0.55%
-0.07% -1.64% -2.46% -2.27% -1.71% -1.18% -0.77% -0.52% -0.36%	F.	0.28%	-0.87%	-2.93%	-2.05%	-0.58%	0.27%	0.45%	0.30%	0.11%
	FF.	0.28%	-1.53%	-3.19%	-4.10%	-3.81%	-2.76%	-1.59%	-0.83%	-0,44%
	N , Dev.	-0.07% 0.31%	-1.64% 1.45%	-2.45% 1.75%	-2.27% 2.57%	-1.71% 2.96%	-1.18% 2.59%	-0.77% 1.78%	-0.52% 1.07%	-0.36% 0.80%
		1/2	3/8	#4	#8	#16	#30	#50	#100	#200
<u>1/2 3/8 #4 #8 #16 #30 #50 #100 #200</u>		0 1294	-1 68%	-1 85%	-2 70%	.7 71%	-7 07%	-1 0896	0.50%	0 18%

% DIFF.	0.12%	-1.68%	-1.85%	-2.7 9%	-2.71%	-2.07%	-1.08%	-0.50%	-0.16%
% DIFF.	-0.00%	-1.75%	-1.86%	0.21%	0.36%	0.28%	0.13%	-0.05%	-0.21%
% DIFF.	0.39%	-3.83%	-2.52%	-3.20%	-3.26%	-2.48%	-1.26%	-0.68%	-0.40%
% DIFF.	-0.12%	-0.08%	-0.01%	3.00%	3.07%	2.35%	1.22%	0.45%	-0.05%
% DIFF.	0.27%	-2.16%	-0.67%	-0.42%	-0.56%	-0.41%	-0.18%	-0.18%	-0.24%
% DIFF.	0.39%	-2.08%	-0.66%	-3.41%	-3.63%	-2.76%	-1.40%	-0.63%	-0.19%
MEAN STD. DEV.	0.17% 0.21%	-1.93% 1.20%	-1.26% 0,96%	-1.10% 2.51%	-1.1 2% 2.59%	-0.85% 1.98%	-0. 43% 1.01%	-0.27% 0.43%	-0.21% 0.12%

VALCO/ROCKY MOUNTAIN/CAS PIT

	1/2	3/8	#4	#8	#16	#30	# 50	#100	#200
% DIFF.	0.49%	1.77%	2.57%	2.02%	2.34%	2.28%	1.20%	0.51%	0.24%
% DIFF.	0.24%	0.26%	0.12%	-0.54%	-1.25%	-1.19%	-0.54%	-0.29%	-0.25%
% DIFF.	-0.00%	2.86%	1.55%	0.95%	0.54%	0.78%	0.62%	0.38%	0.22%
% DIFF.	-0.25%	-1.51%	-2.45%	-2.56%	-3.59%	-3.47%	-1.74%	-0.80%	-0,49%
% DIFF.	-0.49%	1.09%	-1.02%	-1.07%	-1.80%	-1.50%	-0.58%	-0.13%	-0.02%
% DIFF.	-0.24%	2.60%	1.43%	1.49%	1.79%	1.97%	1.16%	0.68%	0.47%
MEAN STD. DEV.	-0.04% 0.36%	1.18% 1.63%	0.37% 1.86%	0.05% 1.74%	-0.33% 2.28%	-0.19% 2.24%	0.02% 1.17%	0.06% 0.56%	0.03% 0.35%

DATA USED TO GENERATE FIG. 7							
	\	FRANCISCOTTI					
А	в	DIFF.					
FRANCISCOTTI	AASHTO T 27	а-в					
STD. DEV. (1S)	STD. DEV. (1S)	7					
0.31%		-9					
1.45%	1,38%	0.07%					
1.75%	0,64%	1 1446					
2.57%	0.60%	1,97%					
2.96%	0.43%	2533					
2.59%	0.43%	2 18%					
1.78%	0.43%	1 35%					
1.07%	0.43%	0.54%					
0.60%	0.14%	0,46%					

A RALSTON STD. DEV. (1 <u>8)</u>	B AASHTO T 27 STD. DEV. (1S)	DIFF. A-B
0.21%		
1.20%	0.95%	0.25%
0.96%	0.60%	0.38%
2.51%	0.64%	1.87%
2.59%	0.60%	1.99%
1.98%	0.43%	1:35%
1.01%	0,43%	0.58%
0.43%	0.43%	-0.00%
0.12%	0.14%	4.024

RALSTON

VALCO/ROCKY MOUNTAIN/CAS F

A	в	DIFF.						
VALCO/ROCKY MOUNTAIN/CAS PIT								
STD. DEV. (18)	AASHTO T 27							
0.36% STD, DEV, (1S)								
1.63%	1.36%	0 25%						
1,86%	0.60%	4,25%						
1.74%	0.60%	1 14%						
2.28%	0.60%	1:85%						
2.24%	0.43%	1,81%						
1.17%	0.60%	0.57%						
0.56%	0.43%	0 13%						
0.35%	0.14%	0.21%						

IRWIN/ WINDSOR / STUTE

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	0.30%	-0.98%	-0.30%	-1.14%	-0.21%	0.12%	-0.02%	-0.28%	-0.50%
% DIFF.	0.00%	4.79%	3.32%	0.84%	1.41%	1.97%	1.55%	0.83%	0.32%
% DIFF.	0.€0%	0.29%	-0.89%	-1.82%	-1.72%	-1.36%	-0.82%	-0.53%	-0.36%
% DIFF.	-0.30%	5.77%	- 3.62%	1.98%	1.61%	1.85%	1.57%	1.11%	0.81%
% DIFF.	0.30%	1.27%	-0.59%	-0.68%	-1.51%	-1.48%	-0.81%	-0.25%	0.14%
% DIFF	0.60%	-4.50%	-4.21%	-2.66%	-3.12%	-3.33%	-2.38%	-1.36%	-0.67%
MEAN STD. DEV.	0.25% 0.35%	1.11% 3.79%	0.16% 2.93%	-0.58% 1,72%	-0.59% 1.87%	-0.37% 2.08%	-0.15% 1.53%	-0.08% 0,91%	-0.04% 0.57%
I	NONK P	ſT							
-	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	0.27%	1.26%	-0.68%	-1.75%	-2.70%	-2.58%	-1.62%	-0.60%	0.09%
% DIFF.	0.91%	-2.64%	-3.58%	-1.01%	0.52%	0.88%	0.65%	0.38%	0,17%
% DIFF.	0.01%	0.52%	-0.80%	-1.41%	-1.58%	-1.27%	-0.58%	0.01%	0.49%
% DIFF. % DIFF.	0.01% 0.65%	0.52% -3.90%	-0.80% -2.90%	-1.41% 0.74%	-1.58% 3.22%	-1.27% 3.46%	-0.58% 2.27%	0.01% 0.99%	0.49% 0.08%

 MEAN
 0.11%
 -0.39%
 -0.88%
 -0.58%
 -0.25%
 -0.06%
 0.09%
 0.17%
 0.26%

 STD. DEV.
 0.65%
 2.59%
 2.26%
 0.98%
 2.27%
 2.34%
 1.49%
 0.60%
 0.17%

IRWIN/ WINDSOR / STUTE

Α	В	DIFF.
IRWIN/ WINDS	OR / STUTE	
STD. DEV. (1S)	AASHTO T 27	
0.35%	STD. DEV. (1S)	
3.79%	0.95%	2.84%
2.93%	0.64%	2 29%
1.72%	0.60%	1 12%
1,67%	0.60%	1 27%
2.08%	0.43%	1-65%
1.53%	0.43%	1 10%
0.91%	0.43%	0 48%
0.57%	0.43%	0 14%

MONK PIT

А	в	DIFF.
MONK PIT		
STD. DEV. (1S)	AASHTO T 27	
0.65%	STD. DEV. (1S)	
2.59%	0.95%	1 64%
2.26%	0.60%	1 06%
0.98%	0.64%	0,34%
2.27%	0.60%	1.07%
2.34%	0.43%	1.84%
1.49%	0.43%	1.05%
0.60%	0.43%	0 17%
0.17%	0.43%	0.28%

FRANCISC CONTROL									
CONTROL	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	-0.41%	-2.63%	-2.08%	-3.18%	-3.93%	-3.64%	-2.66%	-1.71%	-1.02%
% DIFF.	-0.41%	-1.97%	-1.82%	-1.13%	-0.69%	-0.62%	-0.62%	-0.59%	-0.47%
% DIFF.	-0.13%	-3.50%	-5. 02%	-5.23%	-4.51%	-3.38%	-2.21%	-1.42%	-0.91%
% DIFF.	-0.00%	0.66%	0.26%	2.05%	3.24%	3.02%	2.04%	1.13%	0.55%
% DIFF.	0.28%	-0.87%	-2.93%	-2.05%	-0.58%	0.27%	0.45%	0.30%	0.11%
% DIFF.	0.28%	-1.53%	-3.19%	-4.10%	-3.81%	-2.76%	-1.59%	-0.83%	-0.44%
MEAN STD. DEV.	-0.07% 0.31%	- 1.64% 1. 45%	-2.46% 1.75%	-2.27% 2.57%	-1.71% 2.96%	- 1.18% 2.59%	- 0.77% 1.78%	-0.52% 1.07%	-0.36% 0.60%
	RALSTON	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	0.12%	-1.68%	-1.85%	-2.79%	-2.71%	-2.07%	-1.08%	-0.50%	-0.16%
% DIFF.	-0.00%	-1.75%	-1.86%	0.21%	0.36%	0.28%	0.13%	-0.05%	-0.21%
% DIFF.	0.39%	-3.83%	-2.52%	-3.20%	-3.26%	-2.48%	-1.26%	-0.68%	-0.40%
% DIFF.	-0.12%	-0.08%	-0.01%	3.00%	3.07%	2.35%	1.22%	0.45%	-0.05%
% DIFF.	0.27%	-2.16%	-0.67%	-0.42%	-0.56%	-0.41%	-0.18%	-0.18%	-0.24%
% DIFF.	0.39%	-2.08%	-0.66%	-3.41%	-3.63%	-2.76%	-1.40% _	-0.63%	-0.19%
MEAN STD. DEV.	0.17% 0.21%	-1.93% 1.20%	-1.26% 0.96%	-1.10% 2.51%	-1.12% 2.59%	-0.85% 1.98%	-0.43% 1.01%	-0.27% 0.43%	-0.21% 0.12%

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VALCO/ROCKY MOUNTAIN/CAS PIT

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	0,49%	1.77%	2.57%	2.02%	2.34%	2.28%	1.20%	0.51%	0.24%
% DIFF.	0.24%	0.26%	0.12%	-0.54%	-1,25%	-1.19%	-0.54%	-0.29%	-0.25%
% DIFF.	-0.00%	2.86%	1.55%	0.95%	0.54%	0.78%	0.62%	0.38%	0.22%
% DIFF.	-0,25%	-1.51%	-2.45%	-2.56%	-3.59%	-3.47%	-1.74%	-0.80%	-0.49%
			,		-10070			0.00,0	
	0.40%	1 00%	1 000/	4.070/	4 000/	1 500/	0 580/	0 1 7 0 (0.000
% DIFF.	-0.49%	1.09%	-1.02%	-1.07%	-1.80%	-1.50%	-0.58%	-0.13%	-0.02%
				_					
% DIFF.	-0.24%	2.60%	1.43%	1.49%	1.79%	1.97%	1.16%	0.68%	0.47%
MEAN STD, DEV.	-0.04% 0.36%	1.18% 1.63%	0.37% 1.86%	0.05% 1.74%	-0.33% 2.28%		0.02% 1.17%	0.06% 0.56%	0.03% 0.35%
					2.2070	2.2 770		0.0070	0.0070
	IRWIN/ V	VINDSOF	R/STUT	E					
	1/2	3/8	#4	#8	#16	#30	#50	#10 0	#200
% DIFF.	1/2 0.30%	3/8 -0.98%	#4 -0.30%	#8 -1.14%	#16 -0.21%	#30 0.12%	#50 -0.02%	#100 -0.28%	#200 -0.50%
% DIFF.									
% DIFF. % DIFF.						0.12%			
	0.30%	-0.98%	-0.30%	-1.14%	-0.21%	0.12%	-0.02%	-0.28%	-0.50%
	0.30%	-0.98%	-0.30% 3.32%	-1.14% 0.84%	-0.21% 1.41%	0.12% 1: 97%	-0.02% 1.55%	-0.28% 0.83%	-0.50% 0.32%
% DIFF.	0.30% 0.00%	-0.98% 4.79%	-0.30% 3.32%	-1.14% 0.84%	-0.21% 1.41%	0.12% 1: 97%	-0.02% 1.55%	-0.28% 0.83%	-0.50% 0.32%
% DIFF.	0.30% 0.00%	-0.98% 4.79%	-0.30% 3.32%	-1.14% 0.84%	-0.21% 1.41%	0.12% 1: 97%	-0.02% 1.55%	-0.28% 0.83%	-0.50% 0.32%
% DIFF. % DIFF.	0.30% 0.00% 0.60%	-0.98% 4.79% 0.29%	-0.30% 3.32% -0.89%	-1.14% 0.84% -1.82%	-0.21% 1.41% -1.72%	0.12% 1:97% -1.36%	-0.02% 1.55% -0.82%	-0.28% 0.83% -0.53%	-0.50% 0.32% -0.36%
% DIFF. % DIFF. % DIFF.	0.30% 0.00% 0.60% -0.30%	-0.98% 4.79% 0.29% 5.77%	-0.30% 3.32% -0.89% 3.62%	-1.14% 0.84% -1.82% 1.98%	-0.21% 1.41% -1.72% 1.61%	0.12% 1.97% -1.36% 1.85%	-0.02% 1.55% -0.82% 1.57%	-0.28% 0.83% -0.53% 1.11%	-0.50% 0.32% -0.36% 0.81%
% DIFF. % DIFF.	0.30% 0.00% 0.60%	-0.98% 4.79% 0.29%	-0.30% 3.32% -0.89%	-1.14% 0.84% -1.82%	-0.21% 1.41% -1.72%	0.12% 1:97% -1.36%	-0.02% 1.55% -0.82%	-0.28% 0.83% -0.53%	-0.50% 0.32% -0.36%
% DIFF. % DIFF. % DIFF.	0.30% 0.00% 0.60% -0.30% 0.30%	-0.98% 4.79% 0.29% 5.77% 1.27%	-0.30% 3.32% -0.89% 3.62% -0.59%	-1.14% 0,84% -1.82% 1.98% -0.68%	-0.21% 1.41% -1.72% 1.61% -1.51%	0.12% 1:97% -1.36% 1.85% -1.48%	-0.02% 1.55% -0.82% 1.57% -0.81%	-0.28% 0.83% -0.53% 1.11% -0.25%	-0.50% 0.32% -0.36% 0.81% 0.14%
% DIFF. % DIFF. % DIFF.	0.30% 0.00% 0.60% -0.30%	-0.98% 4.79% 0.29% 5.77%	-0.30% 3.32% -0.89% 3.62%	-1.14% 0.84% -1.82% 1.98%	-0.21% 1.41% -1.72% 1.61% -1.51%	0.12% 1:97% -1.36% 1.85% -1.48%	-0.02% 1.55% -0.82% 1.57%	-0.28% 0.83% -0.53% 1.11%	-0.50% 0.32% -0.36% 0.81%
% DIFF. % DIFF. % DIFF.	0.30% 0.00% 0.60% -0.30% 0.30%	-0.98% 4.79% 0.29% 5.77% 1.27%	-0.30% 3.32% -0.89% 3.62% -0.59%	-1.14% 0,84% -1.82% 1.98% -0.68%	-0.21% 1.41% -1.72% 1.61% -1.51%	0.12% 1:97% -1.36% 1.85% -1.48%	-0.02% 1.55% -0.82% 1.57% -0.81%	-0.28% 0.83% -0.53% 1.11% -0.25%	-0.50% 0.32% -0.36% 0.81% 0.14%
% DIFF. % DIFF. % DIFF.	0.30% 0.00% 0.60% -0.30% 0.30%	-0.98% 4.79% 0.29% 5.77% 1.27%	-0.30% 3.32% -0.89% 3.62% -0.59%	-1.14% 0.84% -1.82% 1.98% -0.68%	-0.21% 1.41% -1.72% 1.61% -1.51%	0.12% 1:97% -1.36% 1.85% -1.48%	-0.02% 1.55% -0.82% 1.57% -0.81%	-0.28% 0.83% -0.53% 1.11% -0.25%	-0.50% 0.32% -0.36% 0.81% 0.14%

MONK PIT

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	0.27%	1.26%	-0.68%	-1.75%	-2.70%	-2.58%	-1.62%	-0.60%	0.09%
% DIFF.	0.91%	-2.64%	-3.58%	-1.01%	0.52%	0.88%	0.65%	0.38%	0.17%
% DIFF.	0.01%	0.52%	-0.80%	-1.41%	-1.58%	-1.27%	-0.58%	0.01%	0.49%
% DI FF .	0.65%	-3.90%	-2.90%	0.74%	3.22%	3.46%	2.27%	D.99%	0.08%
% DIFF.	-0.26%	-0.75%	-0.12%	0.34%	1.12%	1.31%	1.04%	0.61%	0.40%
% DIFF.	-0.91%	<u>3.</u> 15%	2.78%	-0.40%	-2.10%	-2.15%	<u>-1.23%</u>	-0.38%	0.32%
MEAN STD. DEV.	0.11% 0.65%	-0.39% 2.59%	-0.88% 2.26%	-0.58% 0.98%	-0.25% 2.27%	-0.06% 2.34%	0.09% 1.49%	0.17% 0.60%	0.26% 0.17%

PAGOSA TROUT LAKES

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
% DIFF.	-0.06%	-3.49%	-8.30%	-8.01%	-6.85%	-5.16%	-3.43%	-2.07%	-1.30%
% DIFF.	-0.33%	-7.11%	-8.05%	-6.60%	-5.47%	-4.24%	-3.02%	-1.94%	-1.60%
% DIFF.	-0.26%	-1.53%	-3.66%	-0.94%	-1.62%	-1.40%	-0.85%	-0.42%	-0.31%
% DIFF.	-0. 05 %	-5.8 8%	-9.55%	-5.35%	-4.98%	-3.91%	-2.53%	-1.34%	-1.01%
% DIFF.	0.01%	-2.39%	-1.25%	2.66%	1.87%	1.25%	0.90%	0.73%	0.29%
% DIFF.	-0.20%	1.96%	4.63%	7.07%	5.23%	3.76%	2.58%	1.65%	0.99%
% DIFF.	-0.54%	-2.76%	-2.17%	-2.19%	-2.10%	-1.74%	-1.34%	-1.02%	-0,90%
% DIFF.	-0.21%	4.34%	5.88%	4.41%	3.36%	2.51%	1.68%	0.92%	0. 70%
% DIFF.	0.34%	4.72%	6.81%	9.26%	7.33%	5.49%	3.92%	2.67%	1.89%
% DIFF.	0.28%	1.23%	-1. 49%	1.25%	0.48%	0.33%	0.50%	0.60%	0.59%
MEAN STD. DEV.	-0.10% C.27%	-1.09% 4.05%	-1.71% 5.96%	0.16% 5.83%	-0.27% 4.76%	-0.31% 3.59%	-0.16% 2.48%	-0.02% 1.59%	-0.07% 1.14%

COMBINATIONS:

Where n = sample set, r= parred

6 COMBINATIONS PER AGGREGATE SOURCE

FRANCISCOTTI CONTROL SPECIMENS

0011110									
	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
596X-5	99.59%	67.61%	42.44%	30.68%	22.43%	15.40%	9,78%	6.16%	3.78%
596X-6	100.00%	70.25%	44.52%	33.86%	26.36%	19.04%	12.45%	7.88%	4.80%
% DIFF.	-0.41%	-2.63%	-2.08%	-3.18%	-3.93%	-3.64%	-2.66%	-1.71%	-1.02%
596X-5	99.59%	67.61%	42.44%	30.68%	22.43%	15.40%	9.78%	6.16%	3.78%
596X-7	100.00%	69.59%	44.26%	31.81%	23.13%	16.02%	10.40%	6.75%	4.25%
% DIFF.	-0.41%	-1.97%	-1.82%	-1.13%	-0.69%	-0.62%	-0.62%	-0.59%	-0.47%
596X-5	99.59%	67.61%	42.44%	30.68%	22.43%	15.40%	9.78%	6.16%	3.78%
596X-8	99.72%	71.11%	47.45%	35.91%	26.94%	18.78%	12.00%	7.58%	4.69%
% DIFF.	-0.13%	-3.50%	-5.02%	-5.23%	-4.51%	-3.38%	-2.21%	-1.42%	-0.91%
596X-6	100.00%	70.25%	44.52%	33.86%	26.36%	19.04%	12.45%	7.88%	4.80%
596X-7	100.00%	69.59%	44.26%	31.81%	23.13%	16.02%	1 0.40%	6.75%	4.25%
% DIFF.	-0.00%	0.66%	0.26%	2.05%	3.24%	3.02%	2.04%	1.13%	0.55%
596X-6	100.00%	70.25%	44.52%	33.86%	26.36%	19.04%	12.45%	7.88%	4.80%
596X-8	99.72%	71.11%	47.45%	35.91%	26.94%	18.78%	12.00%	7.58%	4.69%
% DIFF.	0.28%	-0.87%	-2.93%	-2.05%	-0.58%	0.27%	0.45%	0.30%	0.11%
596X-7	100.00%	69,59%	44.26%	31.81%	23.13%	16.02%	10.40%	6.75%	4.25%
596X-8	99.72%	71.11%	47.45%	35.91%	26.94%	18.78%	12.00%	7.58%	4.69%
% DIFF.	0.28%	-1.53%	-3.19%	-4.10%	-3.81%	-2.76%	-1.59%	-0.83%	-0.44%

RALSTON CONTROL

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
non-NCAT-5	99.08%	77.93%	64.19%	39.97%	25.14%	15.68%	8.22%	4.54%	2.43%
non-NCAT-6	98.96%	79.61%	66.04%	42.76%	27.84%	17.75%	9.30%	5.04%	2.59%
% DIFF.	0.12%	-1.68%	-1.85%	-2.79%	-2.71%	-2.07%	-1.08%	-0.50%	-0.16%
non-NCAT-5	99.08%	77.93%	64.19%	39.97%	25.14%	15.68%	8.22%	4.54%	2.43%
non-NCAT-7	99.08%	79.69%	66.05%	39.76%	24.77%	15.39%	8.08%	4.60%	2.63%
% DIFF.	-0.00%	-1.75%	-1.86%	0.21%	0.36%	0.28%	0.13%	-0.05%	-0.21%
non-NCAT-5	99.08%	77.93%	64.19%	39.97%	25.14%	15.68%	8.22%	4.54%	2.43%
non-NCAT-8	9 8.69%	81.77%	66.71%	43.18%	28.40%	<u>18.15%</u>	9.48%	5.22%	2.83%

% DIFF.	0.39%	-3.83%	-2.52%	<u>, -</u> 3.20%	-3.26%	-2.48%	-1.26%	-0 .68%	-0.40%
non-NCAT-6	98.96%	70 .61%	66.04%	42.76%	27.84%	17.75%	9.30%	5.04%	2.59%
non-NCAT-7	99.08%	79.69%	66.05%	<u>39.76%</u>	24.77%	15.39%	8.08%	4.60%	2.63%
% DIFF.	-0.12%	-0.08%	-0.01%	3.00%	3.07%	2.35%	1.22%	0.45%	-0.05%
non-NCAT-6	98.96%	79.61%	66.04%	42.76%	27.84%	17.75%	9.30%	5.04%	2.59%
non-NCAT-8	98.69%	81.77%	66.71%	43.18%	28.40%	18.15%	9.48%	5.22%	2.83%
% DIFF.	0.27%	-2.16%	-0.67%	-0.42%	-0.56%	-0.41%	-0 .18%	-0 .18%	-0.24%
non-NCAT-7	99.08%	79.69%	66.05%	39.76%	24.77%	15.39%	8.08%	4.60%	2.63%
non-NCAT-8	98.69%	81.77%	66.71%	<u>43.18%</u>	28.40%	18.15%	9.48%	5.22%	2.83%
% DIFF.	0.39%	-2.08%	-0.66%	-3.41%	-3.63%	-2.76%	-1.40%	-0.63%	-0.19%

VALCO/ROCKY MOUNTAIN/CAS PIT:

CONTROL

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NON NCAT-5	100.00%	75.67%	61.68%	45.32%	35. 54%	26.49%	12.05%	5.00%	2.78%
NON NCAT-6	99.51%	73.90%	59.11%	43.30%	33.20%	24.21%	10.84%	4.49%	2.54%
% DIFF.	0.49%	1.77%	2.57%	2.02%	2.34%	2.28%	1.20%	0.51%	0.24%
NON NCAT-5		75.67%	61.68%	45.32%	35. 54%	26.49%	12.05%	5.00%	2.78%
NON NCAT-7	99.76%	75.41%	61.56%	45.86%	36.79%	27.68%	12.58%	5.29%	3.03%
% DIFF.	0.24%	0.26%	0.12%	-0.54%	-1.25%	-1.19%	-0.54%	-0.29%	-0.25%
NON NCAT-5	100.00%	75.67%	61.68%	45.32%	35.54%	26.49%	12.05%	5.00%	2.78%
NON NCAT-8	100.00%	72.81%	60.13%	44.37%	35.00%	25.71%	11.43%	4.61%	2.56%
% DIFF.	-0.00%	2.86%	1.55%	0.95%	0.54%	0.78%	0.62%	0.38%	0.22%
NON NCAT-6	99.51%	73.90%	59.11%	43.30%	33.20%	2 4 .21%	1 0.84%	4.49%	2.54%
NON NCAT-7	99.76%	75.41%	61.56%	45.86%	36.79%	27.68%	12.58%	<u>5.29%</u>	3.03%
% DIFF.	-0.25%	-1.51%	-2.45%	-2.56%	-3.59%	-3.47%	-1.74%	-0.80%	-0.49%
NON NCAT-6	99.51%	73.90%	59.11%	43.30%	33.20%	24.21%	1 0.84%	4.49%	2.54%
NON NCAT-8	100.00%	72.81%	60.13%	44.37%	35.00%	25.71%	11.43%	4.61%	2.56%
% DIFF.	-0.49%	1.09%	-1.02%	-1.07%	-1.80%	-1.50%	-0.58%	-0.13%	-0.02%
NON NCAT-7	99.76%	75.41%	61.56%	45.86%	36.79%	27.68%	12.58%	5.29%	3.03%
NON NCAT-8	100.00%	72.81%	60.13%	44.37%	<u>35.00%</u>	25.71%	11.43%	4.61%	2.56%
% DIFF.	-0.24%	2.60%	1.43%	1.49%	1.79%	1.97%	1.16%	0.68%	0.47%

Irwin Windsor/Stute Pit:

CONTROL

	1/2	3/8	#4	#8	#16	#30	#50	#100	#200
NON NCAT-	E 100.00%	80,67%	59.97%	43.01%	31.60%	22.14%	13.88%	8.29%	4.99%
NON NCAT-	E 99.70%	81.64%	60.27%	44.14%	31.81%	22.03%	13.90%	8.57%	5.49%
% DIFF.	0.30%	-0.98%	-0.30%	-1.14%	-0.21%	0.12%	-0.02%	-0.28%	-0.50%
			_						
NON NCAT-		80.67%	59.97%	43.01%	31.60%	22.14%	13.88%	8.29%	4.99%
NON NCAT-	7 100.00%	75.87%	56.65%	42.17%	30.19%	20.18%	12.33%	7.46%	4.67%
% DIFF.	0.00%	4.79%	3.32%	0.84%	1.41%	1.97%	1.55%	0.83%	0.32%
NON NCAT-	E 100.00%	80.67%	59.97%	43.01%	31.60%	22.14%	13.88%	8.29%	4.99%
NON NCAT-	E 99.40%	80.37%	60.86%	44.82%	33.32%	23.51%	14.71%	8.82%	5.34%
% DIFF.	0.60%	0.29%	-0.89%	-1.82%	-1.72%	-1.36%	-0.82%	-0.53%	-0.36%
NON NCAT-	99.70%	81.64%	60.27%	44.14%	31.81%	22.03%	13.90%	8.57%	5.49%
NON NCAT-7	100.00%	75.87%	56.65%	42 .17%	30.19%	20.18%	12.33%	7.46%	4.67%
% DIFF.	-0.30%	5.77%	3.62%	1.98%	1.61%	1.85%	1.57%	1.11%	0.81%
NON NCAT-	99.70%	81.64%	60.27%	44.14%	31.81%	22.03%	13.90%	8.57%	5.49%
NON NCAT-	99.40%	80.37%	60.86%	44.82%	33.32%	23.51%	14.71%	8,82%	5.34%
% DIFF.	0.30%	1.27%	-0.59%	-0.68%	-1.51%	-1.48%	-0.81%	-0.25%	0.14%
NON NCAT-7	100.00%	75.87%	56.65%	42.17%	30.19%	20.18%	12.33%	7.46%	4.67%
NON NCAT-	99.40%	80.37%	60.86%	44.82%	33.32%	23.51%	14.71%	8.82%	5.34%
% DIFF.	0.60%	-4.50%	-4.21%	-2.66%	-3.12%	-3.33%	-2.38%	-1.36%	-0.67%

MONK PIT:

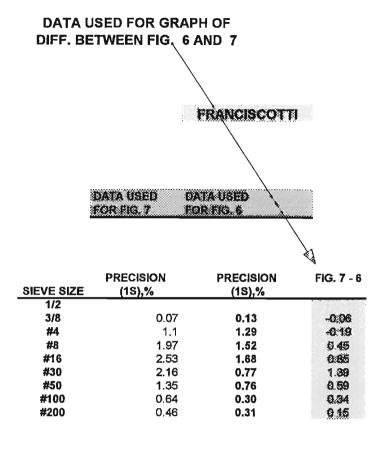
CONTROL

SIEVE SIZE	1/2	3/8	#4	#8	#16	#30	#50	#100	#2 <u>00</u>
NON NCAT-5	99.50%	80.09%	62.74%	41.40%	28.90%	20.54%	13.15%	7.66%	3.72%
NON NCAT-6	99.24%	78.83%	63.42%	43.15%	31.60%	23.12%	1 4.7 7%	8.27%	3.63%
% DIFF.	0.27%	1.26%	-0.68%	-1.75%	-2.70%	-2.58%	-1.62%	-0.60%	0.09%
NON NCAT-	99.50%	80.09%	62.74%	41.40%	28.90%	20.54%	13.15%	7.66%	3.72%
NON NCAT-7	98.59%	82.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7.28%	3.55%
% DIFF.	0.91%	-2 .64%	-3.58%	-1.01%	0.52%	0.88%	0.65%	0.38%	0.17%
NON NCAT-5	99.50%	80.09%	62.74%	41.40%	28.90%	20.54%	13.15%	7.66%	3.72%
NON NCAT-8	99.50%	79.58%	63.54%	42.81%	30.48%	21.81%	13.73%	7.66%	3.23%
% DIFF.	0.01%	0.52%	-0.80%	-1.41%	-1.58%	-1.27%	-0.58%	0.01%	0.49%
NON NCAT-E	99.24%	78.83%	63.42%	43.15%	31.60%	23.12%	14.77%	8.27%	3.63%
NON NCAT-7	98.59%	82.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7.28%	3.55%
% DIFF.	0.65%	-3.90%	-2.90%	0.74%	3.22%	3.46%	2.27%	0.99%	0.08%
NON NCAT-€	99.24%	78.8 3%	63.42%	43.15%	31.60%	23.12%	14.77%	8.27%	3.63%
NON NCAT-8	99.50%	79.58%	63.54%	42.81%	30.48%	21.81%	13.7 <u>3%</u>	7.66%	3.23%
% DIFF.	-0.26%	-0.75%	-0.12%	0.34%	1.12%	1.31%	1.04%	0.61%	0.40%
NON NCAT-7	98.59%	82.73%	66.32%	42.41%	28.37%	19.66%	12.50%	7.28%	3.55%

NON NCAT-8	99.50%	79 .58%	63.54%	42.81%	30.48%	21.81%	13.73%	7.66%	3.23%
% DIFF.	-0.91%	3.15%	2.78%	-0.40%	-2.10%	-2.15%	-1.23%	-0.38%	0.32%

PAGOSA TROUT LAKES CONTROL

CONTROL									
	1/ 2	3/8	#4	#8	#16	#30	#50	#100	#200
Non NCAT-1	99.74%	73.50%	46.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33%
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63%
% DIFF.	-0.06%	-3,49%	-8.30%	-8.01%	-6.85%	-5.16%	-3.43%	-2.07%	-1.30%
Non NCAT-3	99.46%	72.27%	47.95%	32.01%	22.27%	15.76%	10.59%	6.97%	4.74%
Non NCAT-7	99.79%	79.37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%
% DIFF.	-0.33%	-7.11%	-8.05%	-6.60%	-5.47%	-4.24%	-3.02%	-1.94%	-1.60%
Non NCAT-1	99.74%	73.50%	46.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33%
Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.94%	7.99%	5.64%
% DIFF.	-0.26%	-1.53%	-3.66%	-0.94%	-1.62%	-1.40%	-0.85%	-0.42%	-0.31%
Non NCAT-1	99.74%	73.50%	46.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33%
Non NCAT-7	99.79%	79.37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%
⁷ % DIFF.	-0.05%	-5.88%	-9.55%	-5.35%	-4.98%	-3.91%	-2.53%	-1.34%	-1.01%
	00 000/	70.000/		44.070/	00 000/	04.050/	44 5000	0.040/	0.000/
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63%
Non NCAT-7	99.79%	79.37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%
% DIFF.	0.01%	-2.39%	-1.25%	2.66%	1.87%	1.25%	0.90%	0.73%	0.29%
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63%
Non NCAT-2	99.80% 100.00%	75.03%	50.12%	34.20%	29.00%	17.49%	11.94%	9.04% 7.99%	5.64%
% DIFF.	-0.20%	<u>75.03%</u> 1.96%	4.63%	7.07%	5.23%	3.76%	2.58%	1.65%	0.99%
70 DIFF.	-0.20%	1.80%	4.03 /0	1.0170	J.2370	3.7070	2.3070	1.0370	0.3370
Non NCAT-3	99.46%	72.27%	47.95%	32.01%	22.27%	15.76%	10.59%	6.97%	4.74%
Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.94%	7.99%	5.64%
% DIFF.	-0.54%	-2.76%	-2.17%	-2.19%	-2.10%	-1.74%	-1.34%	-1.02%	-0.90%
70 BH 1 7	0.0470	2110/0	£.1170	2.1070	2.,070	111 170	1.0170	1.0270	0.0070
Non NCAT-7	99.79%	79.37%	56.00%	38.61%	27.73%	20.00%	13.62%	8.91%	6.34%
Non NCAT-8	100.00%	75.03%	50.12%	34.20%	24.37%	17.49%	11.94%	7.99%	5.64%
% DIFF.	-0.21%	4.34%	5.88%	4.41%	3.36%	2.51%	1.68%	0.92%	0.70%
Non NCAT-2	99.80%	76.99%	54.75%	41.27%	29.60%	21.25%	14.52%	9.64%	6.63%
Non NCAT-3	99.46%	72.27%	47.95%	32.01%	22.27%	15.76%	10.59%	6.97%	4.74%
% DIFF.	0.34%	4.72%	6.81%	9.26%	7.33%	5.49%	3.92%	2.67%	1.89%
Non NCAT-1	99.74%	73.50%	46.45%	33.26%	22.75%	16.09%	11.09%	7.57%	5.33%
Non NCAT-3	99.46%	72.27%	47.95%	32.01%	22.27%	15.76%	10.59%	6.97%	<u>4.74%</u>
% DIFF.	0.28%	1.23%	-1.49%	1.25%	0.48%	0.33%	0.50%	0.60%	0.59%



RALSTON

SIEVE SIZE			
1/2			
3/8	0.25	0.82	-0.57
#4	0.36	1.2	-0.84
#8	1.87	1.66	0.21
#16	1.99	1.52	0.47
#30	1.55	1.29	0.26
#50	0.58	0.58	-0.00
#100	0	0.11	-0.11
#200	-0.2	0.15	-0.35

VALCO/ROCKY MOUNTAIN/CAS PIT

SIEVE SIZE			
1/2			
3/8	0.25	0.97	-0.72
#4	1.26	1.69	-0.43
#8	1.14	1.46	-0.32
#16	1.68	1.44	0.24
#30	1.81	1.38	0.43
#50	0.57	0,28	0.29
#100	0.13	-0.05	0.18
#200	0.21	0.07	0.14

FIGURE 8

DATA USED FOR GRAPH OF DIFF. BETWEEN FIG. 6 AND 7

IRWIN/ WINDSOR / STUTE

SIEVE SIZE			
1/2			
3/8	2.84	1.68	1.16
#4	2.29	1.33	0.96
#8	1.12	1.1	0.02
#16	1.27	1.41	-0.14
#30	1.65	1.51	0.14
#50	1.1	0.92	0.18
#100	0.48	0.35	0.13
#200	0.14	0.02	0.12

MONK PIT

1/2			
3/8	1.64	0.96	0.68
#4	1.66	1.13	0.53
#8	0.34	1.6 9	-1.35
#16	1.67	2.37	-0.70
#30	1.91	2.29	-0.38
#50	1.06	1.35	-0.29
#100	0.17	0.77	-0.60
#200	-0,26	1.7	-1.96

MEAN

0.02

1. Determination of Correction Factors Using Analysis Method Two

Determinatio	on of Correction	Factors				
	USED FOR GRA ETWEEN FIG. 6					
	FRANCISCOTTI					
	DATAUSED FORHIG.7	DATA USED HOR HIGH O				
	PRECISION	A PRECISION FI	BS VALUE G. 7 - 6	(1S) AASHTO LIMITS	IS THE DIFF. BETWEEN FIG. 6 AND 5 WITHIN (1S) AASHTO	CORRECTION
SIEVE SIZE	(1S),%	(1S),% ष		%	LIMITS ?	REQUIRED (%)
1/2 3/8 #4 #8	0.07 1.1 1.97	0.13 1.29 1.52	0:06 0:19 0:45	1.38 0.64 0.6	Y Y Y	
#0 #16 #30	2.53 2.16	1.68	0.85	0.43 0.43	N N	0.42 0.96 0.18
#50 #100	1.35 0.64	0.76 0.30	1.39 0.59 0.34	0.43 0.43	N Y	
#200	0.46	0.31	0.15	0.14	N	0.01

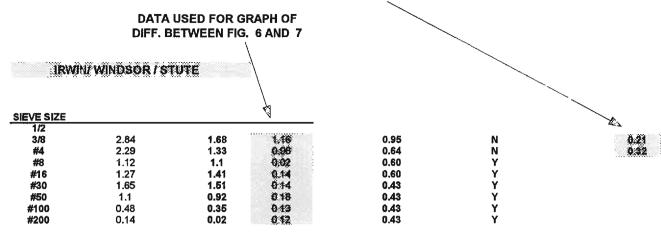
RALSTON

SIEVE SIZE						
1/2						
3/8	0.25	0.82	0:57	0.95	Y	
#4	0.36	1.2	0.84	0.6	N	0.24
#8	1.87	1.66	0.21	0.64	Y	
#16	1.99	1.52	0.47	0.6	Y	
#30	1.55	1.29	0.28	0.43	Y	
#50	0.58	0.58	0.00	0.43	Y	
#100	0	0.11	0.11	0.43	Y	
#200	-0.2	0.15	0.35	0.14	N	0.21

VALCO/ROCKY MOUNTAIN/CAS PIT

SIEVE SIZE					
1/2					
3/8	0.25	0,97	0.72	1.38	Y
#4	1.26	1.69	0.43	0.60	Y
#8	1.14	1.46	0.32	0.60	Y
#16	1.68	1.44	0.24	0.60	Y
#30	1.81	1.38	Ð.43	0.43	Ŷ
#50	0.57	0.28	0.29	0.60	Y
#100	0.13	-0.05	0.18	0.43	Y
#200	0.21	0.07	0.14	0.14	Y

Determination of Correction Factors



MONK PIT

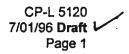
1.64	0.96	0.68	0.95	Y	
1.66	1.13	0.53	0.60	Y	
0.34	1.69	1.35	0.64	N	0.71
1.67	2.37	0.70	0.60	N	0.1
1.91	2.29	0.38	0.43	Y	
1.06	1.35		0.43	Y	
0.17	0.77	0.60	0.43	N	0.17
-0,26	1.7	1.96	0.43	N	1.53
	1.66 0.34 1.67 1.91 1.06 0.17	1.66 1.13 0.34 1.69 1.67 2.37 1.91 2.29 1.06 1.35 0.17 0.77	1.66 1.13 9.53 0.34 1.69 1.35 1.67 2.37 0.70 1.91 2.29 0.38 1.06 1.35 0.29 0.17 0.77 0.80	1.66 1.13 955 0.60 0.34 1.69 1.35 0.64 1.67 2.37 0.70 0.60 1.91 2.29 0.38 0.43 1.06 1.35 0.29 0.43 0.17 0.77 0.60 0.43	1.66 1.13 9:53 0.60 Y 0.34 1.69 1.35 0.64 N 1.67 2.37 0.70 0.60 N 1.91 2.29 0.38 0.43 Y 1.06 1.35 0.29 0.43 Y 0.17 0.77 0.60 N

MEAN

0.47

APPENDIX E

CPL-5120



Colorado Procedure L 5120

Method of Test For

Determination of the Asphalt Binder Content of Bituminous Mixtures By the Ignition Method

1. Scope

1.1 This method of test determines the asphalt binder content of bituminous mixtures by heating the mixture until the asphalt binder fraction of the mix ignites and is burned away. The gradation of the remaining aggregate may then be determined using CP 31. The applicability of this procedure to mixtures containing recycled asphalt pavement (RAP) has not been determined.

1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

Colorado Procedures:

- CP-30 Field Sampling Aggregates for use as Highway Material
- CP-31 Sieve analysis, -200 Washed Gradation
- CP-41 Sampling Fresh Bituminous Paving Mixtures
- CP-55 Method for reducing samples of Hot Bituminous Pavements to Test size
- CP-L 5105 Standard Practice for Preparation of Test Specimens of Bituminous

Mixtures by Means of Gyratory Shear Compactor

CP-L 5115 Standard Method for Preparing and Determining the Density of Bituminous Mixture Test Specimens by Means of the SHRP Gyratory Compactor

3. Summary of Test Methods

3.1 A specimen of bituminous mixture is heated in an oven having a temperature of 538° C (1000° F) until the asphalt binder fraction ignites and is burned away. The asphalt binder content is calculated by dividing the weight loss of the specimen during ignition by the mass of the bituminous mixture before ignition. A correction factor is determined for each bituminous mixture and then applied to the measured asphalt binder content of field produced bituminous mixture.

4. Apparatus

4.1.1 Forced-air ignition furnace, with internal balance, capable of maintaining a temperature of 500° C (930° F) to 650° C (1200° F), having an internal balance thermally isolated from the furnace chamber and accurate at room temperature to 0.1 gram. The balance shall be capable of weighing a 3,500 gram specimen contained in a basket assembly while it is heated. The National Center for Asphalt Technology Asphalt Content Tester (NCAT oven), is an oven containing a temperature compensated internal

scale which has been found to be suitable for determining asphalt binder contents. It is the only oven which currently has been evaluated for the purposes of this procedure.

4.1.2 Forced-air ignition furnace, without internal balance, capable of maintaining a temperature of 500° C (930° F) to 650° C (1200° F) may also be suitable. A testing procedure has not been developed or tested using this type of equipment. Potential users of this type of equipment will need to develop and use a test procedure which can be shown by statistical methods to provide adequate test result accuracy.

4.2 Two tempered stainless steel 2.36 mm (No. 8) mesh perforated basket assemblies, approximate dimensions (L \times W \times H) 26.7 \times 26.7 \times 5.1 cm with 5 cm support legs. The baskets shall be nested. The top basket shall be provided with No. 20 mesh screening on the legs to confine the aggregate.

4.3 Stainless steel catch/drip pan per basket assembly, approximate dimensions (L \times W \times H) of 28.0 \times 28.0 \times 26.cm.

4.4 Oven - A forced draft oven capable of maintaining a temperature of $121 \pm 5^{\circ}$ C.

4.5 *External balance*, at least 10 kg capacity, sensitive to 0.1 g.

4.6 Safety equipment. High temperature face shield, gloves, and a fire resistant long sleeve coat. In addition, a heat resistant surface capable of withstanding a temperature of 650° C and a protective cage capable of surrounding the basket assembly shall be provided.

4.7 *Miscellaneous equipment*: a pan having dimensions of approximately ($L \times W \times H$) 38 x 38 x 5 cm for transferring specimen after ignition, spatulas, bowls, and wire brushes.

5. Reducing Production Samples to Test Size

NOTE 1: The word *specimen* represents a test quantity of bituminous mixture. When the specimen's mass exceeds the capacity of test equipment, it may be divided into multiple units, tested, and the results recombined.

NOTE 2: The word *sample* represents a quantity of bituminous mixture gathered from a stockpile or roadway in accordance with CP-41.

5.1.1 If the bituminous mixture is not sufficiently soft to separate with a spatula or trowel, place it in a pan and warm it in a 121° C (250° F) oven until it can be so handled.

5.1.2 Sampling of HBP shall be done according to CP-30. Two separate, identical specimens shall be selected from each bituminous mixture production sample in accordance with CP-55. The two specimens shall not be combined at any time after they have been taken.

5.2 The specimens shall conform to the mass requirements shown in the appropriate column of Table 1 depending on whether or not an aggregate gradation is required.

6. Determination of Mix Correction Factors Using Laboratory Mixed Specimens

6.1 The results measured by this procedure may be affected by the types of aggregate and asphalt binder contained in the bituminous mixture. To ensure accuracy, a correction factor shall be established for each mix design.

6.2 At least three laboratory produced specimens conforming to the mass requirements of Table 1 (gradation not required) shall be prepared at the design asphalt binder content. Record the weights according to Section 6.2.1

Nominal Maximum Aggregate size, mm	Sieve size	Minimum mass of specimen (g). (If a gradation is required)	Minimum mass of specimen (g). (If a gradation Is not required)
4.75	(no. 4)	1200	1100
9.5	3/8 in.	1200	1100
12.5	1½ in.	1700	1100
19.0	3/4 in.	2200	1500
25.0	1 in.	3000	2200
37.5	1 ½ in.	5500	3300

TABLE 1: Size of Specimen

Some specimen weights specified here may exceed the capacity of the temperature compensated internal oven scale. These specimens may be divided, the separate parts tested and the results recombined.

and follow the instructions for the Preparation of Laboratory Produced Specimens contained within CP-L 5105 or CP-L 5115.

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6.2.1 Before mixing the specimens, record the weights of both the oven-dry aggregate and the asphalt binder contained in each specimen to the nearest 0.1 gram.

6.3 Follow Sections 7.1 through 7.14 to obtain an uncorrected asphalt binder content determination for each of the three specimens.

6.4 Determine the difference, or correction factor, between the actual asphalt binder content and the uncorrected asphalt binder content measured using both the temperature compensated internal oven scale and the external scale for each of the three specimens as specified in Sections 6.4.1 to 6.5. 6.4.1 Determine the actual asphalt binder content for each of the specimens (Section 9.1).

6.4.2 Following Section 7, determine the measured asphalt binder content for each of the specimens using both the external scale (Section 9.2.1) and the temperature compensated internal oven scale (Section 9.2.2).

6.4.3 Determine the correction factors for each of the specimens (Section 9.3).

NOTE 3: If the difference between the lowest and highest correction factor is greater than 0.30 percent, then mix and burn another specimen or specimens until the correction factors determined using three specimens of the same bituminous mixture are within 0.30 percent of each other.

6.5 Calculate the average correction factors for both the external scale and the temperature compensated internal oven scale.

7. Test Procedure

7.1 All production specimens shall be dried as specified in Section 7.1.1. Laboratory mixed specimens which have been exposed to moisture or have been stored at less than 100° C (212° F) for greater than 48 hours shall be dried according to Section 7.1.1. Laboratory mixed specimens which have not been exposed to moisture and which have not been stored at less than 100° C (212° F) for greater than 48 hours shall be heated according to Section 7.1.2.

7.1.1 Specimens as specified in Section 7.1 shall be dried in a 121° C (250° F) oven for 10 \pm 5 hours.

7.1.2 Initially dry specimens (as specified in Section 7.1) shall be heated by placing them into a 121° C (250° F) oven for 3 ± 1 hours.

7.2 Set the test temperature to 538° C (1000° F) by pressing the "TEMP" key on the NCAT oven, entering "538" and pressing the "ENTER" key. Allow a minimum of 2-1/2 hours for the NCAT oven to reach test temperature. Record the temperature set point prior to the initiation of the test.

7.2.1 Enter a correction factor of zero into the NCAT oven keyboard for all mixes by pressing the "CALIB" key, entering "0" and pressing the "ENTER" key. Press the "CALIB. FACTOR" key on the NCAT oven panel to verify that the correction factor is zero. The correction factor is labeled as the "calib. factor" on the NCAT oven tape printout.

7.3 Weigh the empty basket assembly,

consisting of the two baskets and drip pan with wire guards in place, on an external scale and record the weight.

7.4 Remove the top basket of the assembly and evenly distribute approximately ½ of the testing specimen in the bottom basket. Spread the bituminous mixture to a uniform depth in the tray, leaving a gap of approximately 10 mm between the specimen and the edge of the basket. Finer material should be kept near the center of the basket tray.

7.5 Place the top tray onto the bottom tray and load the remaining specimen into the top tray. Place the top cover over the basket and fasten the restraining wire into the slots on the drip tray of the basket assembly.

7.6 Weigh the loaded basket assembly on an external scale and record the weight. Determine the net weight of the mix contained in the basket assembly.

7.7 Press the "WEIGHT" button on the NCAT oven keyboard and enter the weight of the bituminous mixture being tested, rounded to the nearest whole gram, into the temperature compensated internal scale oven and then press the "ENTER" button.

7.8 Tare the temperature compensated scale oven digital readout by pressing a wire into the hole at the right hand end of the display panel.

NOTE 4: Wear protective clothing (Section 4.6) whenever working near the NCAT oven while the oven door is open.

7.9 Open the chamber door. Lift the loaded basket assembly using the locking handle tool and place it into the NCAT oven. Close the oven door and allow 2 to 3 seconds for the oven scale to

stabilize. Compare the external scale reading of the loaded basket assembly weight to the NCAT oven scale reading. Verify that the NCAT oven scale's weight reading equals the weight determined in Section 7.6 within \pm 5 grams. Differences greater than 5 grams or failure of the oven scale to stabilize may indicate that the basket assembly is contacting the interior walls of the oven.

7.10 Initiate the test within 10 seconds of closing the oven door by pressing the "START/STOP" button. This will lock the oven door. After approximately 20 seconds the temperature compensated internal oven scale will zero itself and the digital timer will start running.

NOTE 5: Do not attempt to open the oven door while Error 11 is flashing since the oven's contents may ignite violently. Turn off the oven and allow the contents to cool before opening the oven door.

7.11 Once the specimen weight is stable for a period of 2-3 consecutive minutes the light indicating a stable weight will illuminate without blinking and an audible beep will sound. Press the "START/STOP" button to stop the test and unlock the oven door. Use the locking handle to remove the basket assembly within 5 minutes of the illumination of the light signaling the end of the test.

7.12 Place the hot basket assembly on top of the ceramic cooling plate and place the safety cage over it.

7.13 Remove the printed tape from the temperature compensated internal oven scale and record the weight loss in percent, the temperature compensation, and the calculated asphalt binder content for the specimen. Record the specimen number and retain the printout as a record of the

test.

7.14 Allow a minimum of 35 minutes for the basket assembly to cool to room temperature or until it is warm to the touch. Weigh the basket assembly containing the residual aggregate on an external scale and record the weight.

7.15 Determine the uncorrected asphalt binder content for the external scale and the temperature compensated internal oven scale (Sections 9.2.1 and 9.2.2).

7.16 Determine the corrected asphalt binder content for the external scale and the temperature compensated internal oven scale (Section 9.4)

8. Gradation (Optional)

8.1 Empty the residual aggregate from the baskets into a flat pan. Use a small wire brush to ensure that any residual fines are removed from the baskets. Weigh the residual aggregate on an external scale and record the weight.

8.2 Perform a gradation analysis in accordance with CP 31.

8.3 CDOT has verified that the gradation results are the same with and without exposure to heat for aggregates from a wide variety of sources. However, there may be aggregates which degrade when exposed to the heat required to burn asphalt binder. If aggregate degradation is suspected, or if the test results will be used for project acceptance, Sections 8.3.1 to 8.3.6 may be used to verify whether aggregates have a tendency to degrade.

8.3.1 Obtain a sample of the final aggregate blend in question from a conveyor belt discharge or a stopped conveyor belt according to CP 30.

Method Subject to Revision.

8.3.2 Using a sample splitter, split a sample weighing at least 8 times the sample size specified in Table 1 (gradation required) into 8 specimens having approximately equal mass. Set 4 specimens aside.

8.3.3 Mix 4 of the aggregate specimens with asphalt cement to yield specimens having an asphalt binder content within 0.5 percent of the mix in question.

8.3.4 Test the 4 mixed specimens as specified in Section 7.

8.3.5 Using CP-31, determine the gradation of the 4 specimens which were mixed with asphalt binder and burned. Determine the gradation of the 4 specimens which were set aside in Section 8.3.2.

8.3.6 Calculate the average percent passing each sieve size for the 2 sets of 4 specimens. Compare the average gradation at each sieve size for the two sets of specimens. If the gradation of the aggregate exposed to the heat applied in Section 8.3.4 is more than 3 percent finer than the untreated aggregate on any of the sieves, the aggregate may be sensitive to heat degradation. If the average gradation is within 3 percent on all screens, the aggregate is not sensitive to heat degradation.

8.3.7 If an aggregate has been found to be sensitive to heat degradation in Section 8.3.6, apply a correction factor to the percent passing each screen to account for the degradation caused by the NCAT oven.

9. Calculations

9.1 The actual asphalt binder content of a laboratory mixed specimen is determined as follows:

$$P_{b(actual)} = \frac{W_b}{W_s + W_b} \times 100$$

where,

W_h

- P_{b(actual)} = percent of asphalt binder in specimen
- W_s = weight of aggregate in specimen
 - weight of asphalt binder in specimen

9.2.1 The uncorrected asphalt binder content of a specimen is determined using an external scale as follows:

$$P_{b(uncorr)} = \frac{(W_{m(initial)} + W_{basical}) - (W_{m(initial)} + W_{basical})}{(W_{m(initial)} + W_{basical})} \times 100$$

where,

- P_{b(uncorr)} = uncorrected asphalt binder content, in percent, determined by the mass loss measured on an external scale.
- W_{m(initial)} = Weight of the bituminous mixture specimen before using the temperature compensated internal oven scale measured at 121° C (250° F).
- W_{m(final)} = Weight of the bituminous mixture specimen after using the temperature compensated internal oven scale measured at room temperature.
- W_{basket} = Weight of the empty basket assembly at room temperature.

9.2.2 The uncorrected asphalt binder content of a specimen is automatically calculated by the temperature compensated internal oven's scale software using the bituminous mixture weight input in Section 7.7. At the end of each test, the uncorrected asphalt binder content is printed on a paper tape.

9.3 The mix correction factor is determined for asphalt binder contents determined using each method of measurement (both the external scale and the temperature compensated internal oven scale) as follows:

$$C_f = P_{b(actual)} - P_{b(measured)}$$

where,

- C_r = asphalt binder correction factor determined for a specific method of measurement e.g. using the external or the temperature compensated internal oven scales.
- P_{b(measured)} = uncorrected asphalt binder content of a specimen as determined in Sections 9.2.1 or 9.2.2.

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9.4 The corrected asphalt binder content for field produced specimens using both the external scale and the temperature compensated internal oven scale is determined as follows:

$$P_{b(corr)} = P_{b(uncorr)} + C_{f}$$

where,

P_{b(corr)} = asphalt binder content of field produced specimens corrected for the aggregate and asphalt binder sources.

10. Report

10.1 Report the corrected asphalt binder contents determined using the external scale. Results from the temperature compensated internal oven scale should be reported for information only.