Test Method to Determine the Existence of Segregation in Bituminous Mixtures

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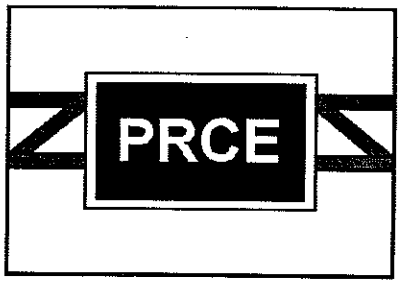

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Appendix E

Field and Lab Data and Analysis Site 3 : US 31 by Muskegon (Random Segregation Area)

Testing and Research Section
Construction and Technology Division
Research Project No. RC-1363
Appendix E

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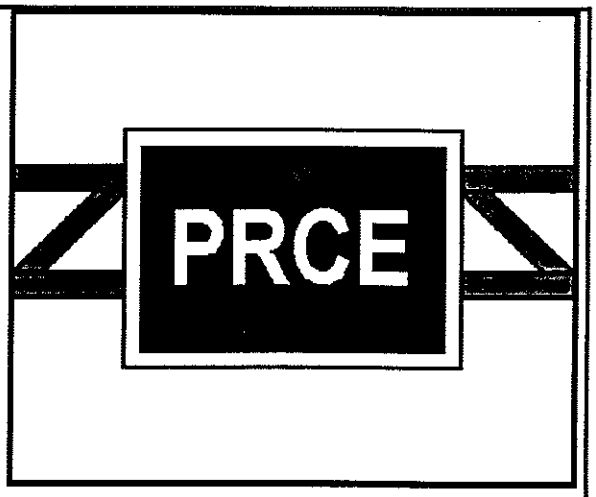

Final Report

Report Number	**Contract Number**
MDOT - PRCE - MSU -1997 -101	94-1699

Title and Subtitle	**Report Date**
Test Method to Determine the Existence of Segregation in Bituminous Mixtures	September 30, 1997

Authors	**TAG Chairperson**
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Sponsoring Agency Name and Address Michigan Department of Transportation Construction and Material Division	

Abstract

Segregation in asphalt concrete pavements is a construction-related problem that has been of concern for many years. However, no quantitative methods to assess segregation are found in any standard specifications. This report shows the progress of a research project to develop an expedient test for segregation. Nuclear density measurements were evaluated as possible indicators of segregation. Two spreadsheet-based programs, MBITSEG1 and MBITSEG2, were developed to perform statistical tests to access the presence of segregation based on differences in density measurements. With this approach, the presence of segregation can be expediently detected and the paving operation can be adjusted. To verify and calibrate the expedient test, seven test sites were selected exhibiting various types and degrees of segregation. Nuclear density measurements, laboratory density measurements and aggregate gradation tests were made at these sites and statistical patterns were analyzed using the programs. Results indicated that the observed trends for air-dry laboratory density and the percent passing No.4 and No.8 sieves are generally similar to those for nuclear measured density. Regression analyses show that nuclear-measured density values are not strongly correlated to lab values, but one-minute nuclear density measurements correlate most closely with air-dry lab density measurements for the surface course.

Key Words : segregation, nuclear density, asphalt pavements, statistical methods, quality control, bituminous mixtures

Nuclear Density Grid Analysis

Pavement Segregation Analysis Spreadsheet
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T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx1
Date: 10/5/95
Description: Samples xx1 (1 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	150.9	147.9	147.5	145.8	144.0	144.1
5	153.4	145.6	148.9	145.4	145.4	147.6
4	149.1	139.7	145.1	144.2	141.8	145.1
3	145.8	142.9	147.2	143.7	145.6	146.7
2	144.1	142.3	143.8	143.4	139.9	144.9
1	146.2	142.0	147.4	146.6	147.5	144.5
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	DIFF !	--	--	--	--	--
6 of 6 test	--	--	--	--	--	--

Clear — *Clears everything for a new problem*
Enter data, or press a key below.

Example — *Enters example segregated data*

Random — *Enters a random sample*

YES ! <-- significant column differences?

Edge

Pavement Segregation Analysis Spreadsheet

T. F. Wolff June 1996

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Location: *Sample Data --Muskegon (random), samples xx1*

Date: *10/5/95*

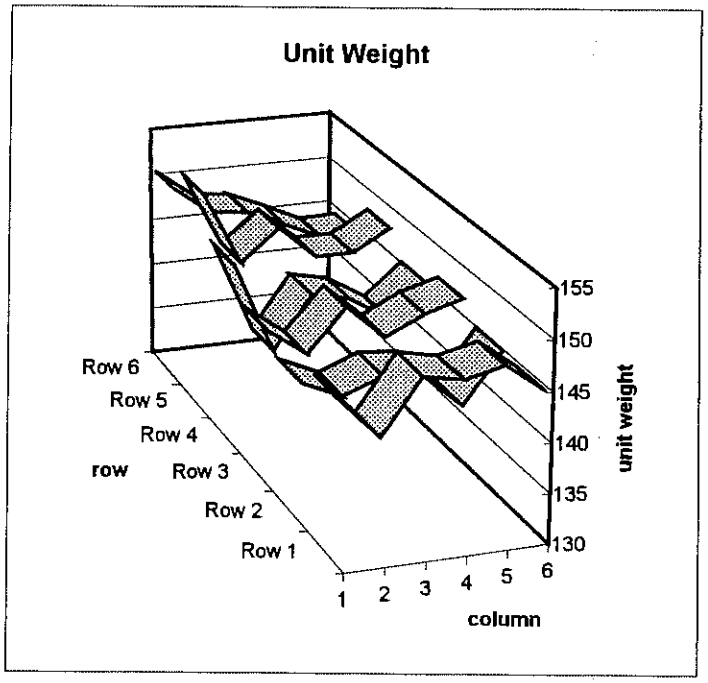
Description: *Samples xx1 (1 min.), unit weight*

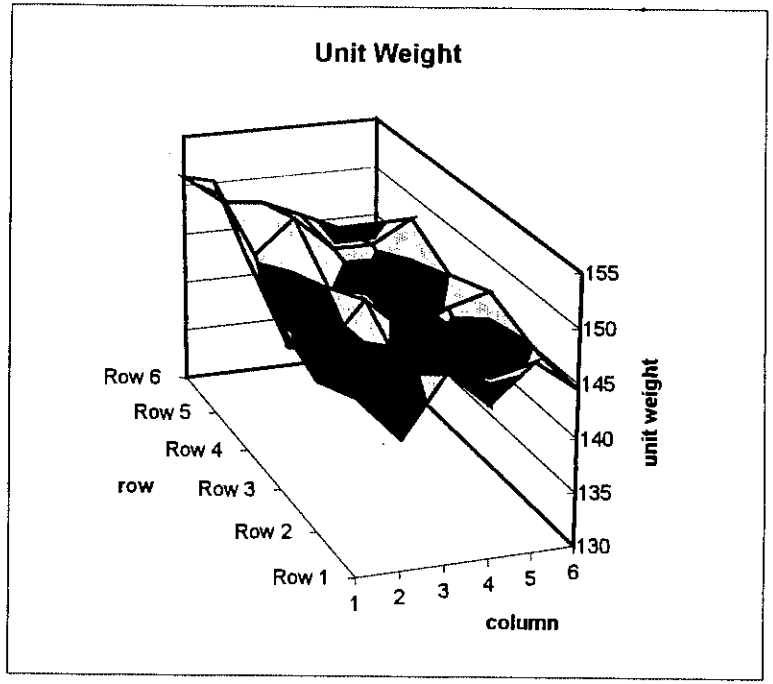
Color 1 *Color Above and Below Average*

Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	150.9	147.9	147.5	145.8	144.0	144.1	146.70	2.630	1.79%
5	153.4	145.6	148.9	145.4	145.4	147.6	147.72	3.128	2.12%
4	149.1	139.7	145.1	144.2	141.8	145.1	144.17	3.214	2.23%
3	145.8	142.9	147.2	143.7	145.6	146.7	145.32	1.687	1.16%
2	144.1	142.3	143.8	143.4	139.9	144.9	143.07	1.772	1.24%
1	146.2	142.0	147.4	146.6	147.5	144.5	145.70	2.113	1.45%
Average	148.25	143.40	146.65	144.85	144.03	145.48	145.44	**145.44**	2.424	1.66%
Std. Dev.	3.513	2.905	1.853	1.274	2.772	1.366	2.280		**2.787876**	
Coeff. of Var.	2.37%	2.03%	1.26%	0.88%	1.92%	0.94%	1.57%			**1.92%**

Location: *Sample Data --Muskegon (random), samples xx1*
Date: *10/5/95*
Description: *Samples xx1 (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet

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Location: *Sample Data --Muskegon (random), samples xx1*

Date: *10/5/95*

Description: *Samples xx1 (1 min.), unit weight*

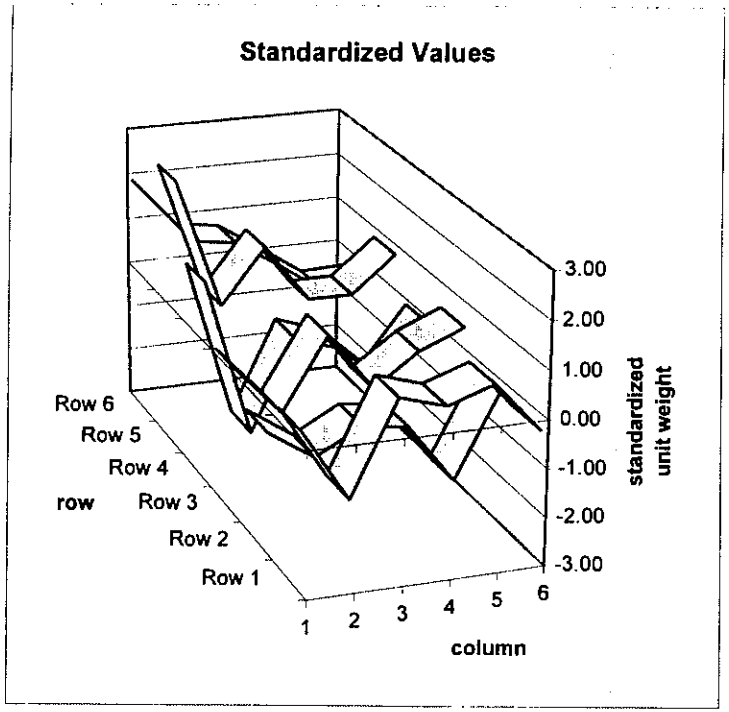
Color 1 *Color Above and Below Average*

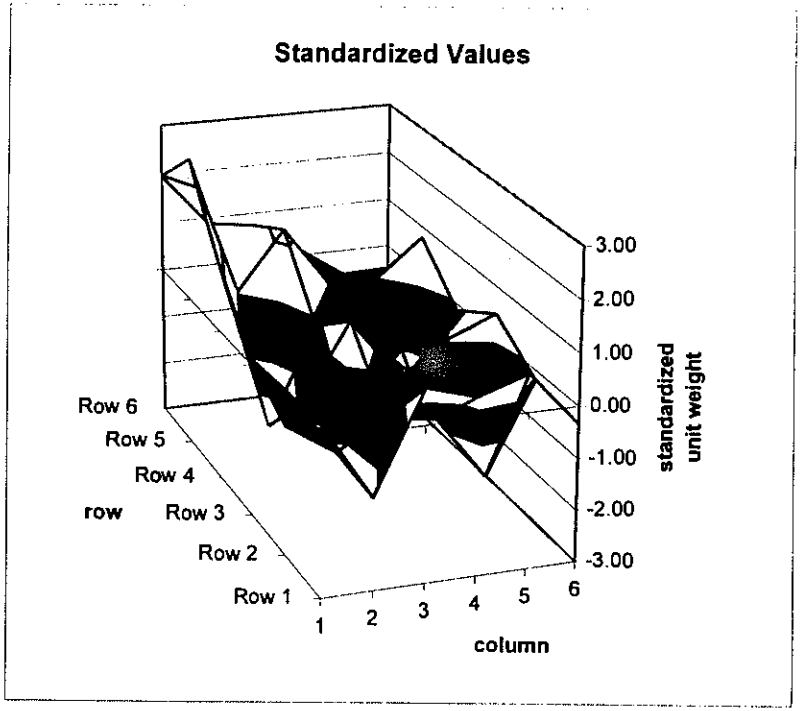
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.96	0.88	0.74	0.13	-0.52	-0.48	0.45	0.943
5	2.85	0.06	1.24	-0.02	-0.02	0.77	0.82	1.122
4	1.31	-2.06	-0.12	-0.45	-1.31	-0.12	-0.46	1.153
3	0.13	-0.91	0.63	-0.63	0.06	0.45	-0.05	0.605
2	-0.48	-1.13	-0.59	-0.73	-1.99	-0.20	-0.85	0.635
1	0.27	-1.24	0.70	0.41	0.74	-0.34	0.09	0.758
Average	1.01	-0.73	0.43	-0.21	-0.51	0.01	0.00	**0.00**	0.869
Std. Dev.	1.260	1.042	0.665	0.457	0.994	0.490	0.818		**1.00**

Location: *Sample Data --Muskegon (random), samples xx1*
Date: *10/5/95*
Description: *Samples xx1 (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
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One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	148.25	2.81	7.871	3.513	12.339
2	143.40	-2.04	4.180	2.905	8.440
3	146.65	1.21	1.453	1.853	3.435
4	144.85	-0.59	0.353	1.274	1.623
5	144.03	-1.41	1.991	2.772	7.683
6	145.48	0.04	0.002	1.366	1.866
sum			15.850		35.385
all data	145.44			2.787876	7.7723

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	95.1022222	5	19.020	**3.22514**	2.533554	0.0189989
within columns:	176.926667	30	5.898			
Total:	272.028889			**Different ?**	1	YES!

ANOVA

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		4.85	1.60	3.40	4.22	2.77
2	4.85		-3.25	-1.45	-0.63	-2.08
3	1.60	-3.25		1.80	2.62	1.17
4	3.40	-1.45	1.80		0.82	-0.63
5	4.22	-0.63	2.62	0.82		-1.45
6	2.77	-2.08	1.17	-0.63	-1.45	

Critical Values

Columns	1	2	3	4	5	6
1		6.21	5.41	5.09	6.10	5.14
2	6.21		4.70	4.32	5.47	4.37
3	5.41	4.70		3.06	4.54	3.14
4	5.09	4.32	3.06		4.16	2.54
5	6.10	5.47	4.54	4.16		4.21
6	5.14	4.37	3.14	2.54	4.21	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0414	0.7356	0.3518	0.2199	0.4844
2			0.0479	0.4796	0.0100	0.0186
3				0.4556	0.1291	0.3036
4					0.0812	0.1659
5						0.5559
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.0262	0.3470	0.0499	0.0436	0.1024
2	0.0262		0.0435	0.2890	0.7073	0.1430
3	0.3470	0.0435		0.0784	0.0835	0.2428
4	0.0499	0.2890	0.0784		0.5268	0.4256
5	0.0436	0.7073	0.0835	0.5268		0.2771
6	0.1024	0.1430	0.2428	0.4256	0.2771	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		1	0	1	1	0	3	1
2	1		1	0	0	0	2	0
3	0	1		0	0	0	1	0
4	1	0	0		0	0	1	0
5	1	0	0	0		0	1	0
6	0	0	0	0	0		0	0

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Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	1	0	0	1
1	0	0	0	0	0
1	0	1	0	1	1
0	0	0	0	0	0
1	0	1	1	1	0
5	2	4	2	2	2

Pavement Segregation Analysis Spreadsheet
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T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx2
Date: 10/5/95
Description: Samples xx2 (1 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	154.1	145.7	149.6	147.9	146.1	145.3
5	152.7	146.5	148.4	145.5	144.1	147.6
4	149.1	142.8	148.4	145.2	141.2	146.0
3	146.6	146.3	145.1	143.7	140.5	143.7
2	143.9	144.3	145.5	144.6	141.0	144.2
1	147.4	145.2	147.0	144.9	145.1	148.7
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	DIFF !	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?
Edge

DATA ENTRY

Pavement Segregation Analysis Spreadsheet

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Location: *Sample Data --Muskegon (random), samples xx2*
Date: *10/5/95*
Description: *Samples xx2 (1 min.), unit weight*

Color 1 *Color Above and Below Average*

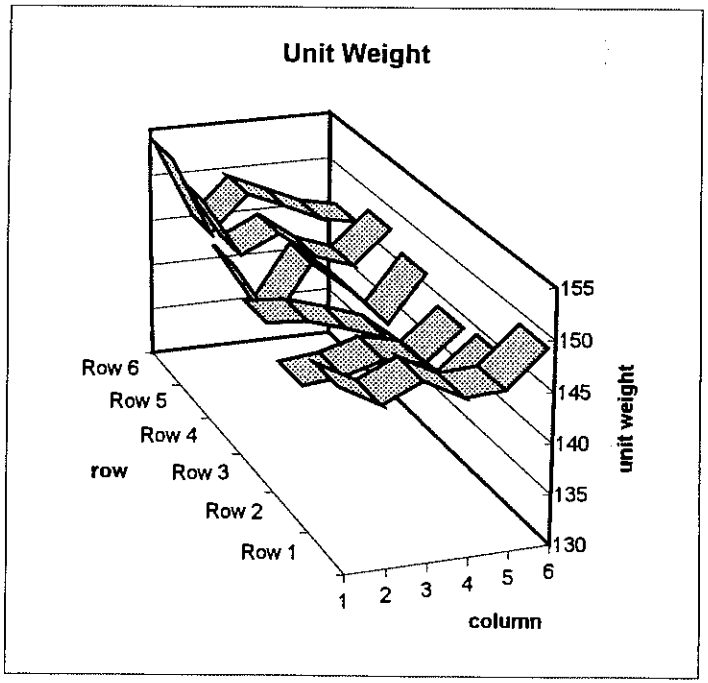
Clear Color

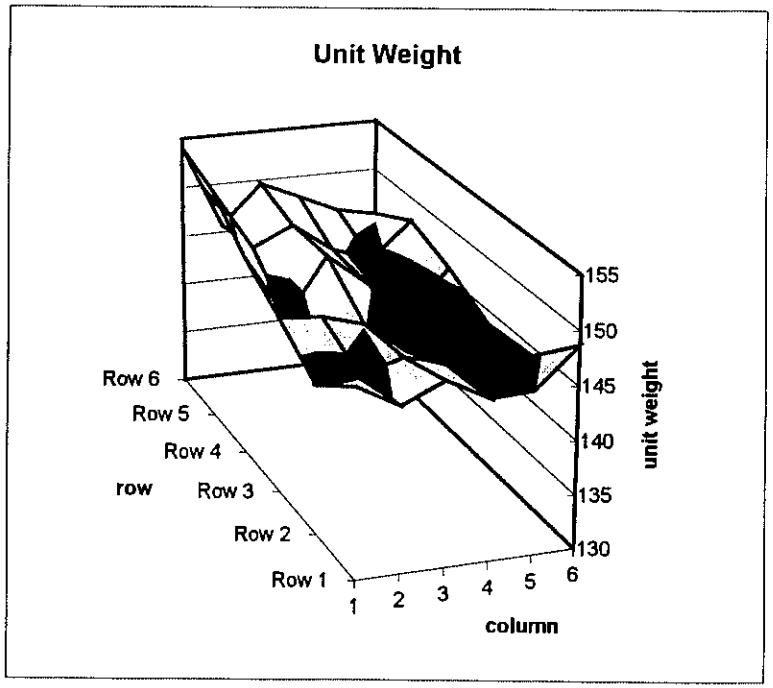
Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	154.1	145.7	149.6	147.9	146.1	145.3	148.12	3.343	2.26%
5	152.7	146.5	148.4	145.5	144.1	147.6	147.47	2.980	2.02%
4	149.1	142.8	148.4	145.2	141.2	146.0	145.45	3.081	2.12%
3	146.6	146.3	145.1	143.7	140.5	143.7	144.32	2.240	1.55%
2	143.9	144.3	145.5	144.6	141.0	144.2	143.92	1.530	1.06%
1	147.4	145.2	147.0	144.9	145.1	148.7	146.38	1.551	1.06%
Average	148.97	145.13	147.33	145.30	143.00	145.92	145.94	**145.94**	2.454	1.68%
Std. Dev.	3.848	1.392	1.782	1.416	2.397	1.941	2.129		**2.838548**	
Coeff. of Var.	2.58%	0.96%	1.21%	0.97%	1.68%	1.33%	1.46%			**1.94%**

Unit Wt Stats

Mskr1xx2.xls

Location: *Sample Data --Muskegon (random), samples xx2*
Date: *10/5/95*
Description: *Samples xx2 (1 min.), unit weight*





Unit Wt Graph

Pavement Segregation Analysis Spreadsheet

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Location: *Sample Data --Muskegon (random), samples xx2*

Date: *10/5/95*

Description: *Samples xx2 (1 min.), unit weight*

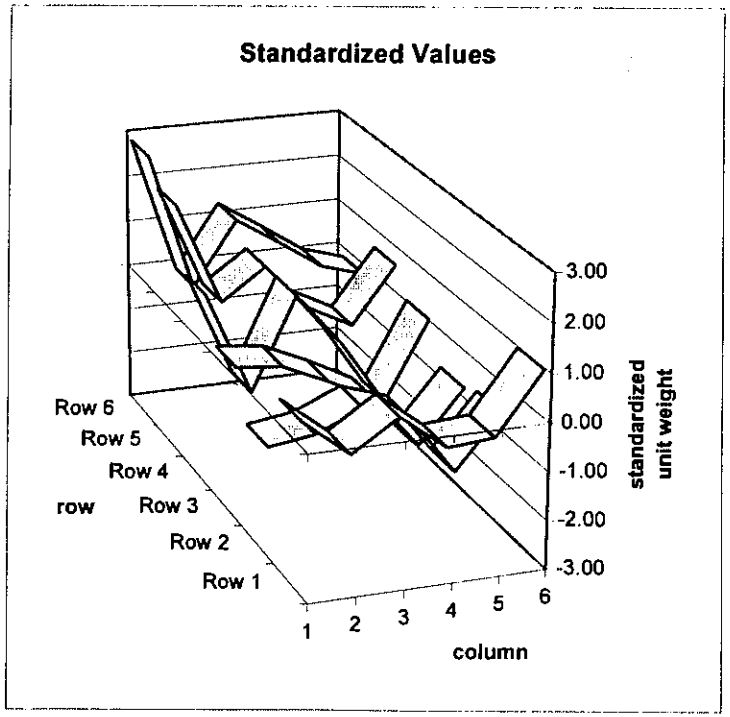
Color 1 *Color Above and Below Average*

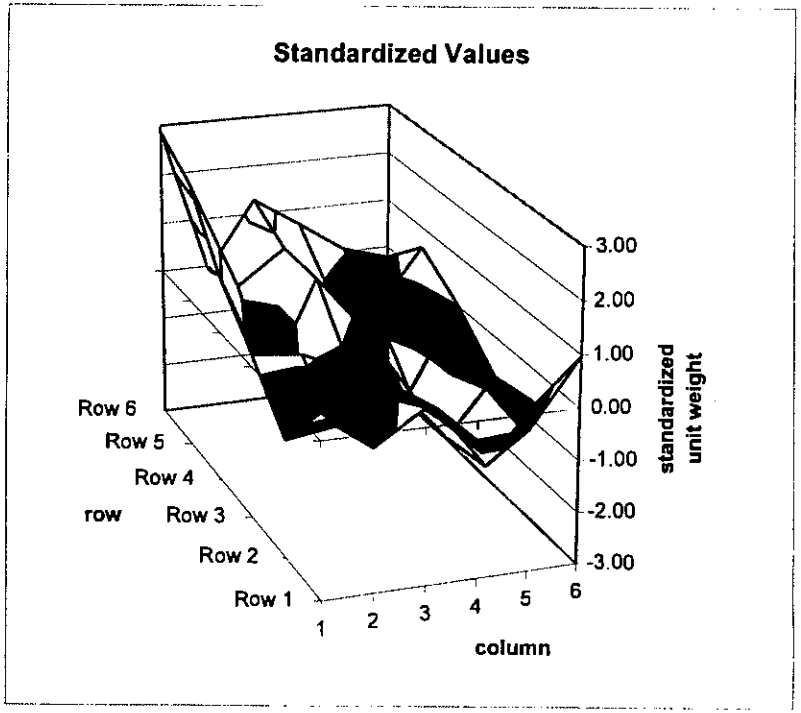
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.87	-0.09	1.29	0.69	0.06	-0.23	0.77	1.178
5	2.38	0.20	0.87	-0.16	-0.65	0.58	0.54	1.050
4	1.11	-1.11	0.87	-0.26	-1.67	0.02	-0.17	1.086
3	0.23	0.13	-0.30	-0.79	-1.92	-0.79	-0.57	0.789
2	-0.72	-0.58	-0.16	-0.47	-1.74	-0.61	-0.71	0.539
1	0.51	-0.26	0.37	-0.37	-0.30	0.97	0.16	0.546
Average	1.07	-0.28	0.49	-0.23	-1.04	-0.01	0.00	**0.00**	0.865
Std. Dev.	1.356	0.491	0.628	0.499	0.844	0.684	0.750		**1.00**

Location: *Sample Data --Muskegon (random), samples xx2*
Date: *10/5/95*
Description: *Samples xx2 (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
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One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	148.97	3.02	9.151	3.848	14.807
2	145.13	-0.81	0.653	1.392	1.939
3	147.33	1.39	1.937	1.782	3.175
4	145.30	-0.64	0.412	1.416	2.004
5	143.00	-2.94	8.653	2.397	5.744
6	145.92	-0.03	0.001	1.941	3.766
sum			20.807		31.434
all data	145.94			2.838548	8.0574

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	124.839167	5	24.968	**4.76581**	2.533554	0.0025311
within columns:	157.168333	30	5.239			
Total:	282.0075					

Different ? | 1 | **YES!**

ANOVA

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		3.83	1.63	3.67	5.97	3.05
2	3.83		-2.20	-0.17	2.13	-0.78
3	1.63	-2.20		2.03	4.33	1.42
4	3.67	-0.17	2.03		2.30	-0.62
5	5.97	2.13	4.33	2.30		-2.92
6	3.05	-0.78	1.42	-0.62	-2.92	

Critical Values

Columns	1	2	3	4	5	6
1		5.58	5.78	5.59	6.18	5.87
2	5.58		3.08	2.71	3.78	3.25
3	5.78	3.08		3.10	4.07	3.59
4	5.59	2.71	3.10		3.79	3.27
5	6.18	3.78	4.07	3.79		4.20
6	5.87	3.25	3.59	3.27	4.20	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	1	0
4	0	0	0		0	0
5	0	0	1	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**1**	**0**	**1**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0197	0.0928	0.5225	0.4480	0.2761
2			0.7255	0.3006	0.0267	0.0189
3				0.4829	0.0653	0.0433
4					0.2760	0.1814
5						0.7296
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.0447	0.3677	0.0533	0.0091	0.1137
2	0.0447		0.0384	0.8412	0.0887	0.4404
3	.0.3677	0.0384		0.0535	0.0052	0.2172
4	0.0533	0.8412	0.0535		0.0705	0.5435
5	0.0091	0.0887	0.0052	0.0705		0.0430
6	0.1137	0.4404	0.2172	0.5435	0.0430	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		1	0	0	1	0	2	0
2	1		1	0	0	0	2	0
3	0	1		0	1	0	2	0
4	0	0	0		0	0	0	0
5	1	0	1	0		1	3	1
6	0	0	0	0	1		1	0

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Above Average? 1= true, 0 = false

1	0	1	1	1	0
1	1	1	0	0	1
1	0	1	0	0	1
1	1	0	0	0	0
0	0	0	0	0	0
1	0	1	0	0	1
5	2	4	1	1	3

Pavement Segregation Analysis Spreadsheet
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T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx3
Date: 10/5/95
Description: Samples xx3 (1 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	151.6	145.2	147.3	151.2	144.0	145.1
5	152.7	145.2	150.1	142.8	146.3	146.1
4	149.7	139.7	147.4	145.2	142.5	145.4
3	148.6	142.8	148.5	146.0	143.3	145.9
2	143.4	139.3	147.2	146.2	141.4	146.0
1	147.3	143.8	148.8	149.0	146.7	147.2
Edge						
Tukey test	--	--	DIFF !	--	--	--
paired t tests	--	DIFF !	DIFF !	--	--	--
6 of 6 test	--	DIFF !	DIFF !	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?

Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random), samples xx3*

Date: *10/5/95*

Description: *Samples xx3 (1 min.), unit weight*

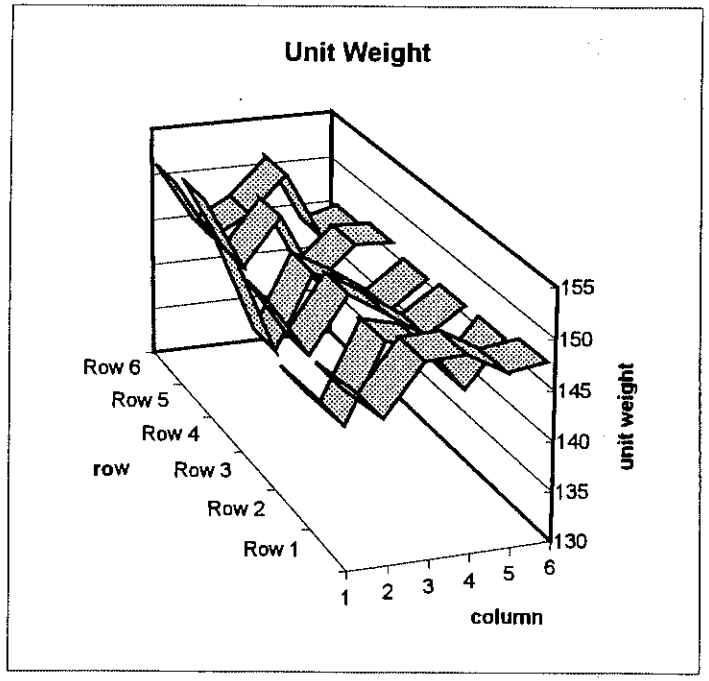
Color 1 *Color Above and Below Average*

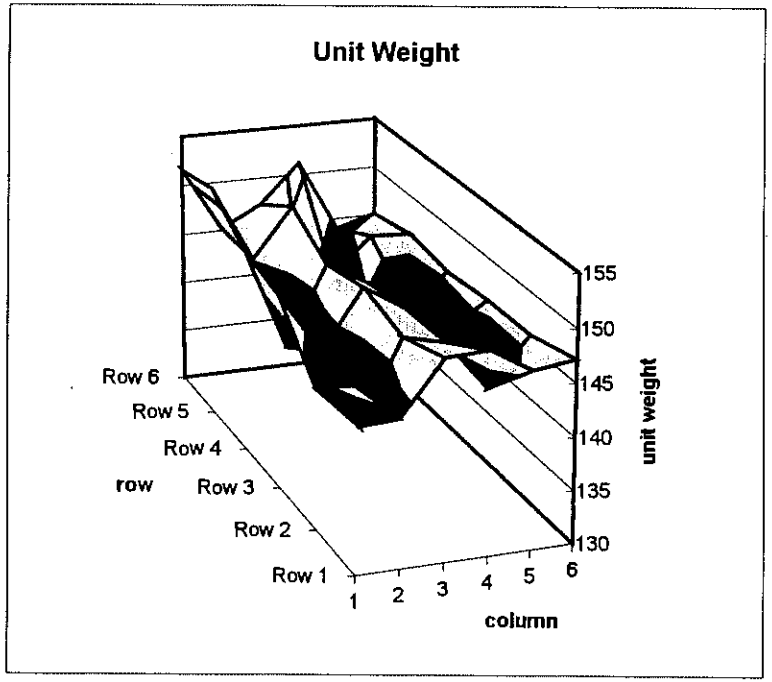
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	151.6	145.2	147.3	151.2	144.0	145.1	147.40	3.280	2.22%
5	152.7	145.2	150.1	142.8	146.3	146.1	147.20	3.579	2.43%
4	149.7	139.7	147.4	145.2	142.5	145.4	144.98	3.532	2.44%
3	148.6	142.8	148.5	146.0	143.3	145.9	145.85	2.466	1.69%
2	143.4	139.3	147.2	146.2	141.4	146.0	143.92	3.106	2.16%
1	147.3	143.8	148.8	149.0	146.7	147.2	147.13	1.876	1.27%
Average	148.88	142.67	148.22	146.73	144.03	145.95	146.08	**146.08**	2.973	2.04%
Std. Dev.	3.325	2.618	1.141	2.957	2.101	0.723	2.144		**3.101688**	
Coeff. of Var.	2.23%	1.84%	0.77%	2.02%	1.46%	0.50%	1.47%			**2.12%**

Unit Wt Stats

Location: *Sample Data --Muskegon (random), samples xx3*
Date: *10/5/95*
Description: *Samples xx3 (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet

T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Sample Data --Muskegon (random), samples xx3*

Date: *10/5/95*

Description: *Samples xx3 (1 min.), unit weight*

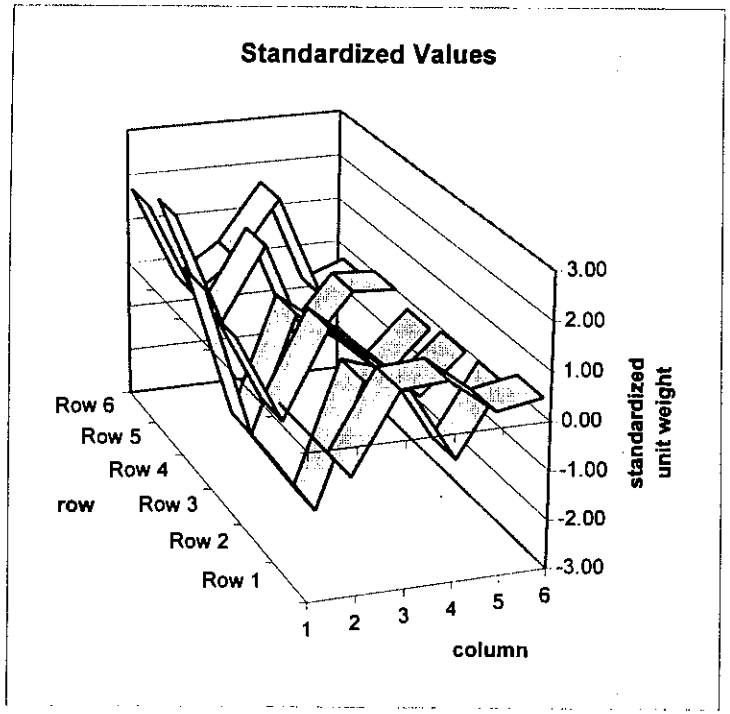
Color 1 *Color Above and Below Average*

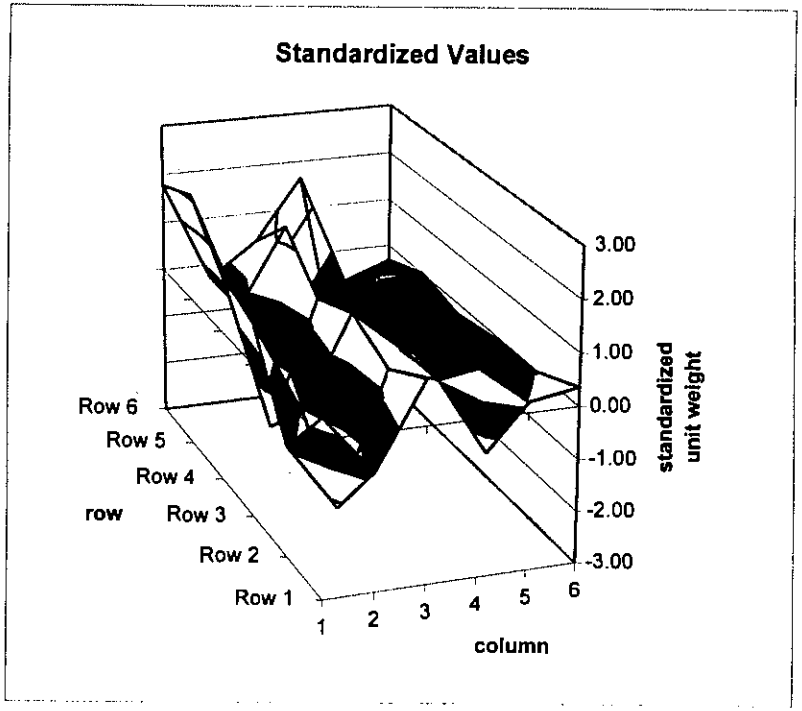
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.78	-0.28	0.39	1.65	-0.67	-0.32	0.43	1.057
5	2.13	-0.28	1.30	-1.06	0.07	0.01	0.36	1.154
4	1.17	-2.06	0.43	-0.28	-1.15	-0.22	-0.35	1.139
3	0.81	-1.06	0.78	-0.03	-0.90	-0.06	-0.07	0.795
2	-0.86	-2.19	0.36	0.04	-1.51	-0.03	-0.70	1.002
1	0.39	-0.74	0.88	0.94	0.20	0.36	0.34	0.605
Average	0.90	-1.10	0.69	0.21	-0.66	-0.04	0.00	**0.00**	0.959
Std. Dev.	1.072	0.844	0.368	0.954	0.677	0.233	0.691		**1.00**

Location: *Sample Data --Muskegon (random), samples xx3*
Date: *10/5/95*
Description: *Samples xx3 (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	148.88	2.80	7.856	3.325	11.054
2	142.67	-3.41	11.655	2.618	6.855
3	148.22	2.14	4.563	1.141	1.302
4	146.73	0.65	0.426	2.957	8.747
5	144.03	-2.05	4.191	2.101	4.415
6	145.95	-0.13	0.017	0.723	0.523
sum			28.707		32.894
all data	146.08			3.101688	9.6205

ANOVA

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	172.244722	5	34.449	**6.28356**	2.533554	0.0004231
within columns:	164.471667	30	5.482			
Total:	336.716389					

Different ? | 1 | YES!

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		6.22	0.67	2.15	4.85	2.93
2	6.22		-5.55	-4.07	-1.37	-3.28
3	0.67	-5.55		1.48	4.18	2.27
4	2.15	-4.07	1.48		2.70	0.78
5	4.85	-1.37	4.18	2.70		-1.92
6	2.93	-3.28	2.27	0.78	-1.92	

Critical Values

Columns	1	2	3	4	5	6
1		5.77	4.79	6.06	5.36	4.64
2	5.77		3.89	5.38	4.57	3.70
3	4.79	3.89		4.32	3.26	1.84
4	6.06	5.38	4.32		4.94	4.15
5	5.36	4.57	3.26	4.94		3.03
6	4.64	3.70	1.84	4.15	3.03	

Critical ?

Columns	1	2	3	4	5	6
1		1	0	0	0	0
2	1		1	0	0	0
3	0	1		0	1	1
4	0	0	0		0	0
5	0	0	1	0		0
6	0	0	1	0	0	
Sum	**1**	**2**	**3**	**0**	**1**	**1**
Different?	**0**	**0**	**1**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0551	0.3343	0.2173	0.9686	0.8662
2			0.2601	0.5908	0.1205	0.0882
3				0.6328	0.4643	0.3766
4					0.3056	0.2475
5						0.9216
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.0049	0.6522	0.2640	0.0129	0.0609
2	0.0049		0.0008	0.0303	0.3422	0.0143
3	0.6522	0.0008		0.2784	0.0016	0.0021
4	0.2640	0.0303	0.2784		0.0983	0.5427
5	0.0129	0.3422	0.0016	0.0983		0.0608
6	0.0609	0.0143	0.0021	0.5427	0.0608	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		1	0	0	1	0	2	0
2	1		1	1	0	1	4	1
3	0	1		0	1	1	3	1
4	0	1	0		0	0	1	0
5	1	0	1	0		0	2	0
6	0	1	1	0	0		2	0

Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	0	1	1	0	0
1	0	1	0	1	1
1	0	1	0	0	0
1	0	1	0	0	0
0	0	1	1	0	0
1	0	1	1	1	1
5	0	6	3	2	2

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random)
Date: 10/5/95
Description: Average of 3 samples (1 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	152.2	146.3	148.1	148.3	144.7	144.8
5	152.9	145.8	149.1	144.6	145.3	147.1
4	149.3	140.7	147.0	144.9	141.8	145.5
3	147.0	144.0	146.9	144.5	143.1	145.4
2	143.8	142.0	145.5	144.7	140.8	145.0
1	147.0	143.7	147.7	146.8	146.4	146.8
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	DIFF !	--	--	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?
Edge

MSKR1AVG.XLS

Pavement Segregation Analysis Spreadsheet

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T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random)*

Date: *10/5/95*

Description: *Average of 3 samples (1 min.), unit weight*

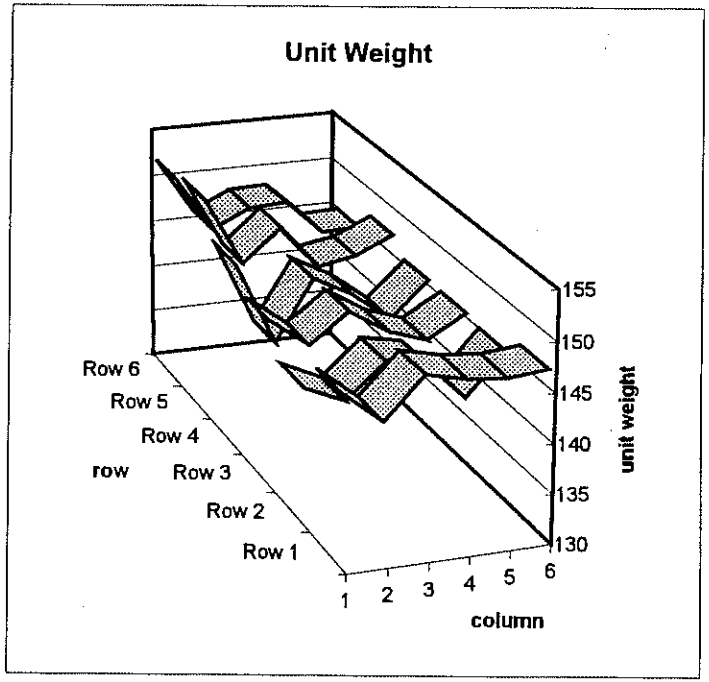
Color 1 *Color Above and Below Average*

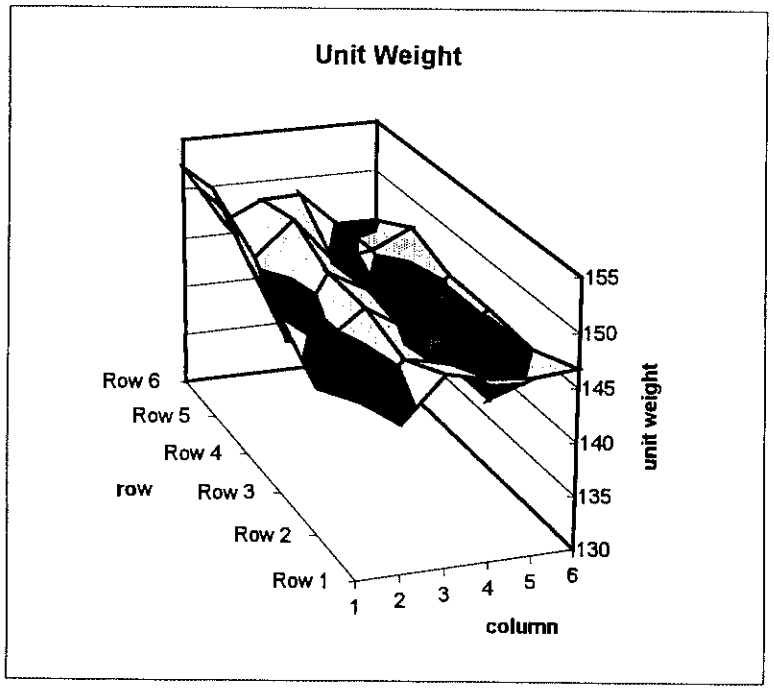
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	152.2	146.3	148.1	148.3	144.7	144.8	147.41	2.813	1.91%
5	152.9	145.8	149.1	144.6	145.3	147.1	147.46	3.125	2.12%
4	149.3	140.7	147.0	144.9	141.8	145.5	144.87	3.188	2.20%
3	147.0	144.0	146.9	144.5	143.1	145.4	145.16	1.583	1.09%
2	143.8	142.0	145.5	144.7	140.8	145.0	143.63	1.878	1.31%
1	147.0	143.7	147.7	146.8	146.4	146.8	146.41	1.407	0.96%
Average	148.70	143.74	147.40	145.63	143.69	145.78	145.82	**145.82**	2.332	1.60%
Std. Dev.	3.476	2.135	1.237	1.576	2.160	0.943	1.921		**2.668981**	
Coeff. of Var.	2.34%	1.49%	0.84%	1.08%	1.50%	0.65%	1.32%			**1.83%**

Unit Wt Stats

Location: *Sample Data --Muskegon (random)*
Date: *10/5/95*
Description: *Average of 3 samples (1 min.), unit weight*





Pavement Segregation Analysis Spreadsheet

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T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random)*

Date: *10/5/95*

Description: *Average of 3 samples (1 min.), unit weight*

Color 1 *Color Above and Below Average*

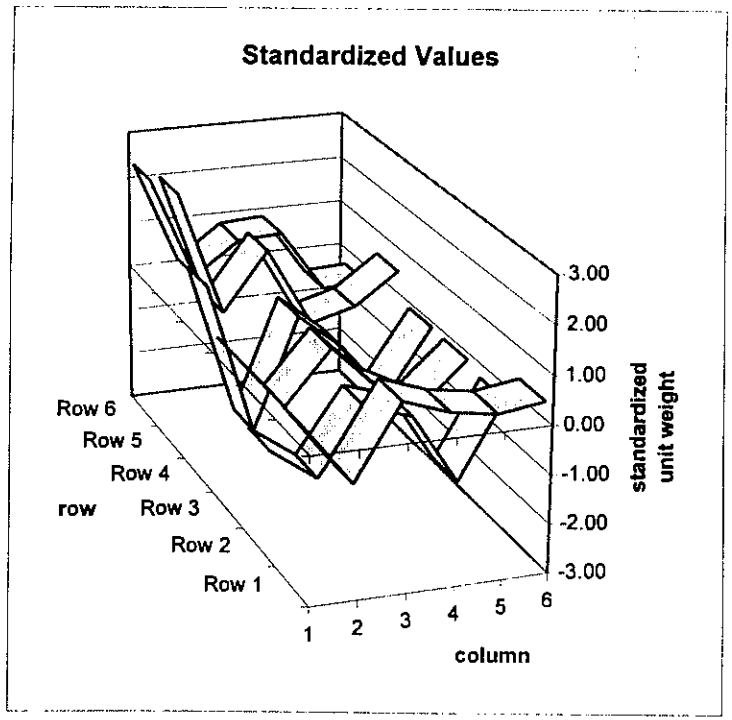
Clear Color

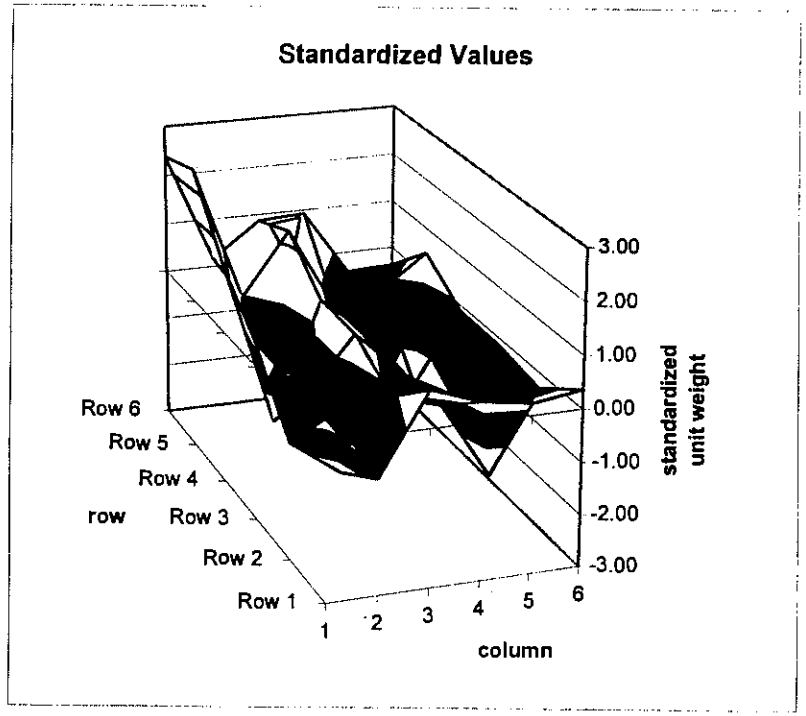
Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.39	0.17	0.86	0.93	-0.42	-0.37	0.59	1.054
5	2.66	-0.02	1.24	-0.47	-0.21	0.48	0.61	1.171
4	1.30	-1.91	0.43	-0.36	-1.50	-0.12	-0.36	1.194
3	0.44	-0.68	0.42	-0.51	-1.01	-0.15	-0.25	0.593
2	-0.76	-1.44	-0.12	-0.41	-1.89	-0.30	-0.82	0.704
1	0.43	-0.81	0.71	0.38	0.23	0.37	0.22	0.527
Average	1.08	-0.78	0.59	-0.07	-0.80	-0.02	0.00	**0.00**	0.874
Std. Dev.	1.302	0.800	0.463	0.591	0.809	0.353	0.720		**1.00**

MSKR1AVG.XLS

Location: *Sample Data --Muskegon (random)*
Date: *10/5/95*
Description: *Average of 3 samples (1 min.), unit weight*





Std Graph

Pavement Segregation Analysis Spreadsheet
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One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	148.70	2.88	8.283	3.476	12.079
2	143.74	-2.09	4.355	2.135	4.557
3	147.40	1.58	2.485	1.237	1.530
4	145.63	-0.19	0.037	1.576	2.485
5	143.69	-2.13	4.552	2.160	4.665
6	145.78	-0.04	0.002	0.943	0.890
sum			19.715		26.206
all data	145.82			2.668981	7.1235

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	118.289681	5	23.658	**5.41655**	2.533554	0.0011488
within columns:	131.031483	30	4.368			
Total:	249.321164			**Different ?**	**1**	**YES!**

ANOVA

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		4.97	1.30	3.07	5.01	2.92
2	4.97		-3.66	-1.89	0.05	-2.05
3	1.30	-3.66		1.77	3.71	1.62
4	3.07	-1.89	1.77		1.94	-0.15
5	5.01	0.05	3.71	1.94		-2.09
6	2.92	-2.05	1.62	-0.15	-2.09	

Critical Values

Columns	1	2	3	4	5	6
1		5.56	5.03	5.20	5.58	4.91
2	5.56		3.36	3.62	4.14	3.18
3	5.03	3.36		2.73	3.39	2.12
4	5.20	3.62	2.73		3.64	2.50
5	5.58	4.14	3.39	3.64		3.21
6	4.91	3.18	2.12	2.50	3.21	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		1	0	0	0
3	0	1		0	1	0
4	0	0	0		0	0
5	0	0	1	0		0
6	0	0	0	0	0	
Sum	**0**	**1**	**2**	**0**	**1**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0160	0.1804	0.3049	0.4676	0.4541
2			0.1589	0.4332	0.0278	0.0211
3				0.8441	0.1387	0.1192
4					0.1850	0.1743
5						0.9743
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.0138	0.4077	0.0769	0.0133	0.0752
2	0.0138		0.0046	0.1111	0.9707	0.0573
3	0.4077	0.0046		0.0558	0.0045	0.0291
4	0.0769	0.1111	0.0558		0.1059	0.8421
5	0.0133	0.9707	0.0045	0.1059		0.0546
6	0.0752	0.0573	0.0291	0.8421	0.0546	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		1	0	0	1	0	2	0
2	1		1	0	0	0	2	0
3	0	1		0	1	1	3	1
4	0	0	0		0	0	0	0
5	1	0	1	0		0	2	0
6	0	0	1	0	0		1	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	0	1	0	0	1
1	0	1	0	0	0
1	0	1	0	0	0
0	0	0	0	0	0
1	0	1	1	1	1
5	1	5	2	1	2

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx1
Date: 10/5/95
Description: Samples xx1 (4 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	148.7	146.3	146.9	146.3	136.3	142.5
5	151.6	147.2	143.2	143.3	138.9	136.4
4	146.8	131.7	143.0	143.8	128.9	142.0
3	143.0	145.5	144.6	144.1	137.8	141.3
2	118.8	137.8	141.0	143.4	142.1	140.6
1	142.4	143.6	142.6	141.9	141.0	136.6
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	--	--
6 of 6 test	--	--	--	DIFF !	--	--

Clear — *Clears everything for a new problem*
Enter data, or press a key below.

Example — *Enters example segregated data*

Random — *Enters a random sample*

no <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random), samples xx1*
Date: *10/5/95*
Description: *Samples xx1 (4 min.), unit weight*

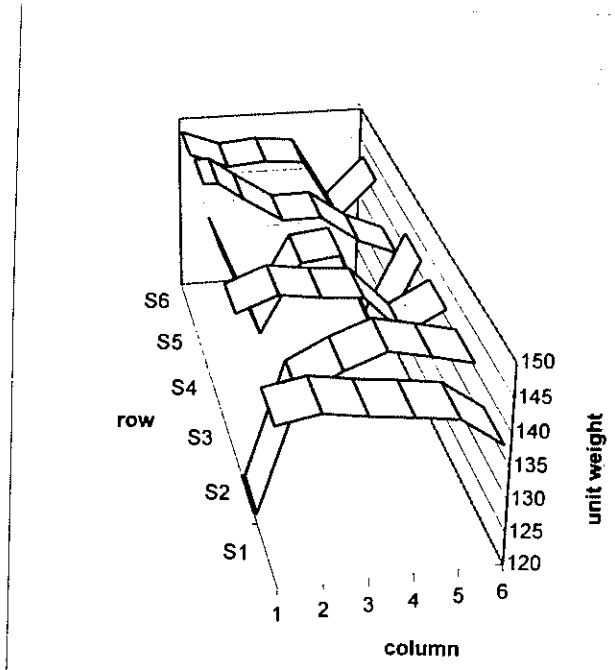
Color 1 *Color Above and Below Average*

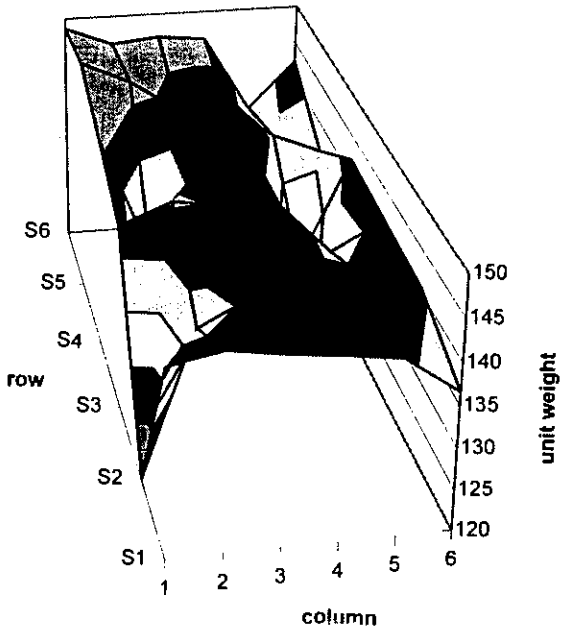
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	148.7	146.3	146.9	146.3	136.3	142.5	144.50	4.497	3.11%
5	151.6	147.2	143.2	143.3	138.9	136.4	143.43	5.495	3.83%
4	146.8	131.7	143.0	143.8	128.9	142.0	139.37	7.258	5.21%
3	143.0	145.5	144.6	144.1	137.8	141.3	142.72	2.810	1.97%
2	118.8	137.8	141.0	143.4	142.1	140.6	137.28	9.245	6.73%
1	142.4	143.6	142.6	141.9	141.0	136.6	141.35	2.479	1.75%
Average	141.88	142.02	143.55	143.80	137.50	139.90	141.44	**141.44**	5.297	3.77%
Std. Dev.	11.827	6.067	2.008	1.439	4.709	2.711	4.794		**5.933651**	
Coeff. of Var.	8.34%	4.27%	1.40%	1.00%	3.42%	1.94%	3.40%			**4.20%**

Unit Wt Stats

Location: Muskegon, Michigan RANDOM SITE
Description: (4 min)Samples xx1, unit weight
File name: mskr4xx1.xls





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Sample Data --Muskegon (random), samples xx1*

Date: *10/5/95*

Description: *Samples xx1 (4 min.), unit weight*

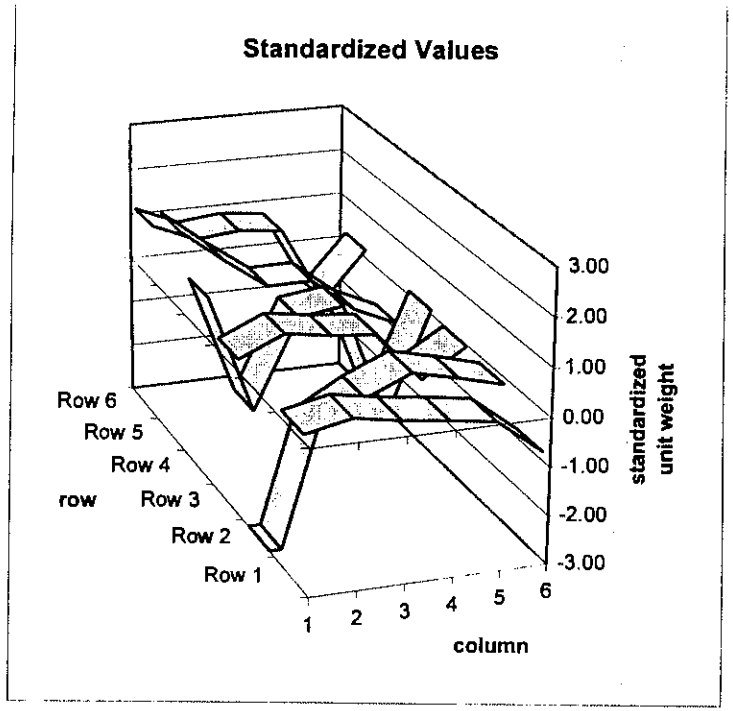
Color 1 *Color Above and Below Average*

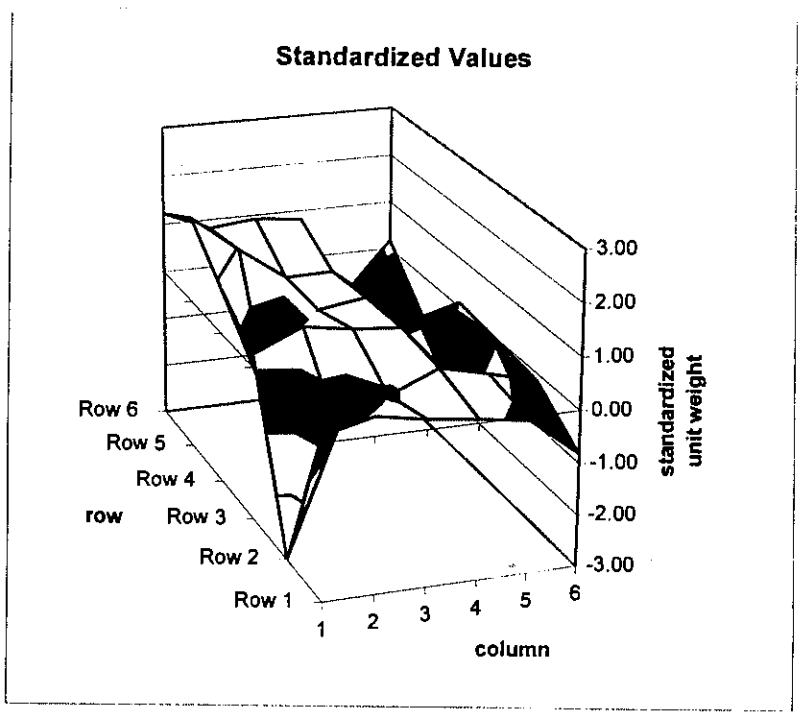
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.22	0.82	0.92	0.82	-0.87	0.18	0.52	0.758
5	1.71	0.97	0.30	0.31	-0.43	-0.85	0.34	0.926
4	0.90	-1.64	0.26	0.40	-2.11	0.09	-0.35	1.223
3	0.26	0.68	0.53	0.45	-0.61	-0.02	0.21	0.473
2	-3.82	-0.61	-0.07	0.33	0.11	-0.14	-0.70	1.558
1	0.16	0.36	0.20	0.08	-0.07	-0.82	-0.02	0.418
Average	0.07	0.10	0.36	0.40	-0.66	-0.26	0.00	**0.00**	0.893
Std. Dev.	1.993	1.023	0.338	0.243	0.794	0.457	0.808		**1.00**

Location: *Sample Data --Muskegon (random), samples xx1*
Date: *10/5/95*
Description: *Samples xx1 (4 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	141.88	0.44	0.195	11.827	139.882
2	142.02	0.58	0.331	6.067	36.814
3	143.55	2.11	4.445	2.008	4.031
4	143.80	2.36	5.562	1.439	2.072
5	137.50	-3.94	15.537	4.709	22.172
6	139.90	-1.54	2.377	2.711	7.352
sum			28.446		212.322
all data	141.44			5.933651	35.2082

ANOVA

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	170.675833	5	34.135	**0.96462**	2.533554	0.4549715
within columns:	1061.61167	30	35.387			
Total:	1232.2875					

Different ? | **0** | **no**

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		-0.13	-1.67	-1.92	4.38	1.98
2	-0.13		-1.53	-1.78	4.52	2.12
3	-1.67	-1.53		-0.25	6.05	3.65
4	-1.92	-1.78	-0.25		6.30	3.90
5	4.38	4.52	6.05	6.30		-2.40
6	1.98	2.12	3.65	3.90	-2.40	

Critical Values

Columns	1	2	3	4	5	6
1		18.11	16.35	16.23	17.34	16.53
2	18.11		8.71	8.50	10.46	9.05
3	16.35	8.71		3.37	6.97	4.60
4	16.23	8.50	3.37		6.71	4.18
5	17.34	10.46	6.97	6.71		7.40
6	16.53	9.05	4.60	4.18	7.40	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.3225	0.3926	0.5407	0.4170	0.1638
2			0.1984	0.6734	0.1915	0.1163
3				0.3165	0.7819	0.4293
4					0.2995	0.1716
5						0.7206
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.9809	0.7407	0.7018	0.4187	0.6973
2	0.9809		0.5698	0.4996	0.1803	0.4534
3	0.7407	0.5698		0.8092	0.0160	0.0243
4	0.7018	0.4996	0.8092		0.0106	0.0110
5	0.4187	0.1803	0.0160	0.0106		0.3047
6	0.6973	0.4534	0.0243	0.0110	0.3047	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	0	0	0	0
2	0		0	0	0	0	0	0
3	0	0		0	1	1	2	0
4	0	0	0		1	1	2	0
5	0	0	1	1		0	2	0
6	0	0	1	1	0		2	0

Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	1
1	1	1	1	0	0
1	0	1	1	0	1
1	1	1	1	0	0
0	0	0	1	1	0
1	1	1	1	0	0
5	4	5	6	1	2

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx2
Date: 10/5/95
Description: Samples xx2 (4 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	150.4	143.7	147.5	143.2	134.7	138.7
5	149.7	145.0	145.0	145.1	137.8	143.2
4	146.9	138.6	145.2	143.0	132.0	138.3
3	143.9	144.1	142.3	143.6	131.5	139.4
2	133.2	140.3	142.0	142.0	139.6	139.7
1	140.1	140.8	141.7	144.2	140.3	147.4
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	DIFF !	--
6 of 6 test	--	--	--	DIFF !	DIFF !	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?

Edge

MSKR4XX2.XLS

Pavement Segregation Analysis Spreadsheet

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T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random), samples xx2*

Date: *10/5/95*

Description: *Samples xx2 (4 min.), unit weight*

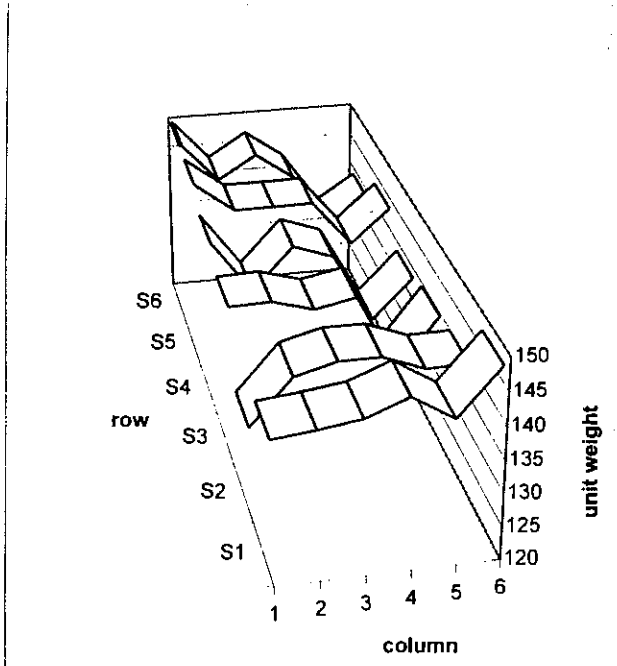
Color 1 *Color Above and Below Average*

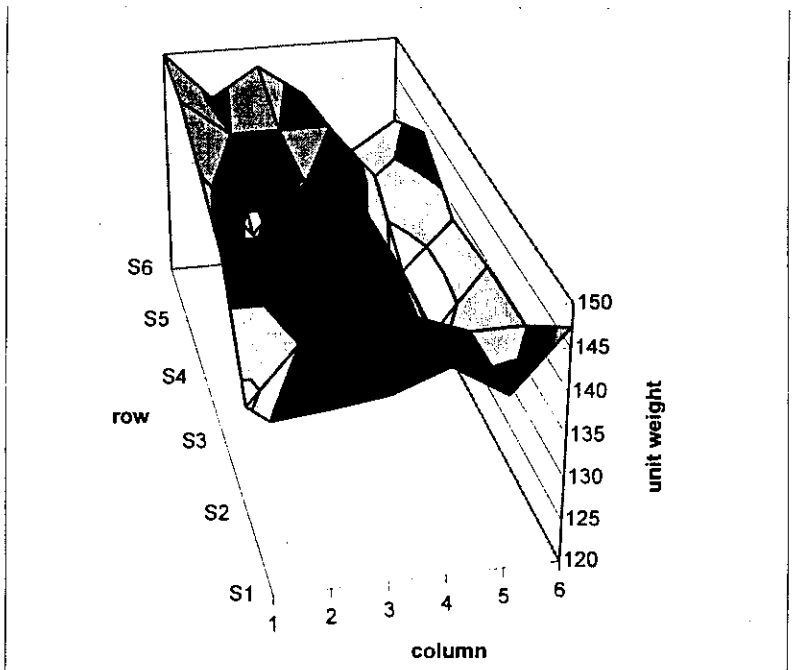
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	150.4	143.7	147.5	143.2	134.7	138.7	143.03	5.708	3.99%
5	149.7	145.0	145.0	145.1	137.8	143.2	144.30	3.853	2.67%
4	146.9	138.6	145.2	143.0	132.0	138.3	140.67	5.474	3.89%
3	143.9	144.1	142.3	143.6	131.5	139.4	140.80	4.879	3.47%
2	133.2	140.3	142.0	142.0	139.6	139.7	139.47	3.252	2.33%
1	140.1	140.8	141.7	144.2	140.3	147.4	142.42	2.863	2.01%
Average	144.03	142.08	143.95	143.52	135.98	141.12	141.78	**141.78**	4.338	3.06%
Std. Dev.	6.538	2.536	2.318	1.063	3.811	3.537	3.300		**4.456637**	
Coeff. of Var.	4.54%	1.78%	1.61%	0.74%	2.80%	2.51%	2.33%			**3.14%**

Unit Wt Stats

Location: Muskegon, Michigan RANDOM SITE
Description: (4 min)Samples xx2, unit weight
File name: mskr4xx2.xls





Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random), samples xx2*

Date: *10/5/95*

Description: *Samples xx2 (4 min.), unit weight*

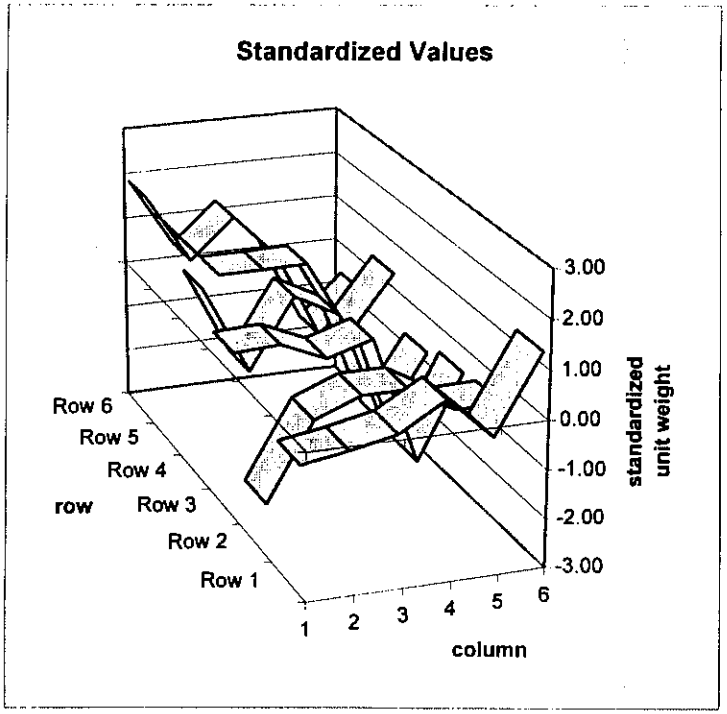
Color 1 *Color Above and Below Average*

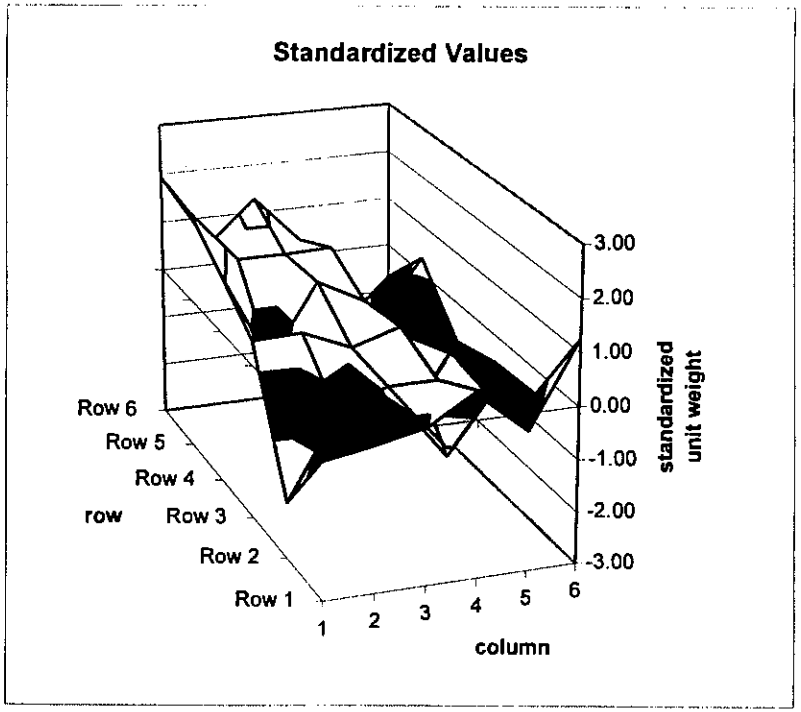
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.93	0.43	1.28	0.32	-1.59	-0.69	0.28	1.281
5	1.78	0.72	0.72	0.74	-0.89	0.32	0.57	0.865
4	1.15	-0.71	0.77	0.27	-2.19	-0.78	-0.25	1.228
3	0.48	0.52	0.12	0.41	-2.31	-0.53	-0.22	1.095
2	-1.93	-0.33	0.05	0.05	-0.49	-0.47	-0.52	0.730
1	-0.38	-0.22	-0.02	0.54	-0.33	1.26	0.14	0.642
Average	0.51	0.07	0.49	0.39	-1.30	-0.15	0.00	**0.00**	0.973
Std. Dev.	1.467	0.569	0.520	0.238	0.855	0.794	0.741		**1.00**

Location: *Sample Data --Muskegon (random), samples xx2*
Date: *10/5/95*
Description: *Samples xx2 (4 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	144.03	2.25	5.075	6.538	42.743
2	142.08	0.30	0.092	2.536	6.430
3	143.95	2.17	4.706	2.318	5.371
4	143.52	1.74	3.014	1.063	1.130
5	135.98	-5.80	33.608	3.811	14.526
6	141.12	-0.66	0.441	3.537	12.510
sum			46.936		82.708
all data	141.78			4.456637	19.8616

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	281.614722	5	56.323	**4.08590**	2.533554	0.0060065
within columns:	413.541667	30	13.785			
Total:	695.156389					

Different ? | 1 | **YES!**

ANOVA

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.95	0.08	0.52	8.05	2.92
2	1.95		-1.87	-1.43	6.10	0.97
3	0.08	-1.87		0.43	7.97	2.83
4	0.52	-1.43	0.43		7.53	2.40
5	8.05	6.10	7.97	7.53		-5.13
6	2.92	0.97	2.83	2.40	-5.13	

Critical Values

Columns	1	2	3	4	5	6
1		9.55	9.45	9.02	10.31	10.13
2	9.55		4.68	3.75	6.24	5.93
3	9.45	4.68		3.47	6.08	5.76
4	9.02	3.75	3.47		5.39	5.03
5	10.31	6.24	6.08	5.39		7.08
6	10.13	5.93	5.76	5.03	7.08	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	1	0
4	0	0	0		1	0
5	0	0	1	1		0
6	0	0	0	0	0	
Sum	**0**	**0**	**1**	**1**	**2**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.1263	0.4999	0.5036	0.3592	0.8178
2			0.5898	0.6542	0.0408	0.2131
3				0.9654	0.1980	0.4830
4					0.2132	0.4804
5						0.6619
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.5112	0.9771	0.8523	0.0262	0.3591
2	0.5112		0.2127	0.2305	0.0085	0.5983
3	0.9771	0.2127		0.6860	0.0014	0.1318
4	0.8523	0.2305	0.6860		0.0009	0.1425
5	0.0262	0.0085	0.0014	0.0009		0.0362
6	0.3591	0.5983	0.1318	0.1425	0.0362	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	1	0	1	0
2	0		0	0	1	0	1	0
3	0	0		0	1	0	1	0
4	0	0	0		1	0	1	0
5	1	1	1	1		1	5	1
6	0	0	0	0	1		1	0

Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	1	1	0	1
1	0	1	1	0	0
1	1	1	1	0	0
0	0	1	1	0	0
0	0	0	1	0	1
4	3	5	6	0	2

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random), samples xx3
Date: 10/5/95
Description: Samples xx3 (4 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	151.3	144.8	147.2	146.2	138.4	138.4
5	151.0	143.9	146.2	145.1	139.4	141.2
4	147.5	138.6	145.1	140.8	134.0	137.9
3	146.0	139.3	144.1	145.0	139.6	142.0
2	141.9	137.0	144.4	143.1	140.4	141.6
1	134.0	144.8	143.8	148.8	146.2	144.3
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	DIFF !	--	--	--
6 of 6 test	--	--	DIFF !	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

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T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random), samples xx3*

Date: *10/5/95*

Description: *Samples xx3 (4 min.), unit weight*

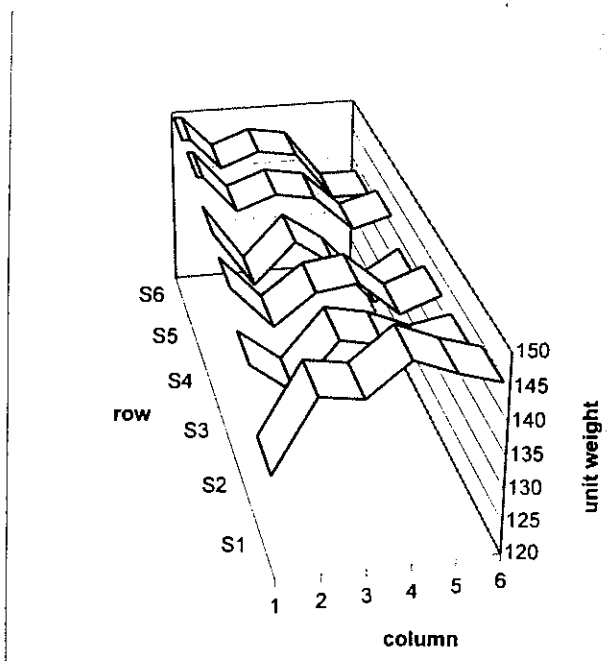
Color 1 *Color Above and Below Average*

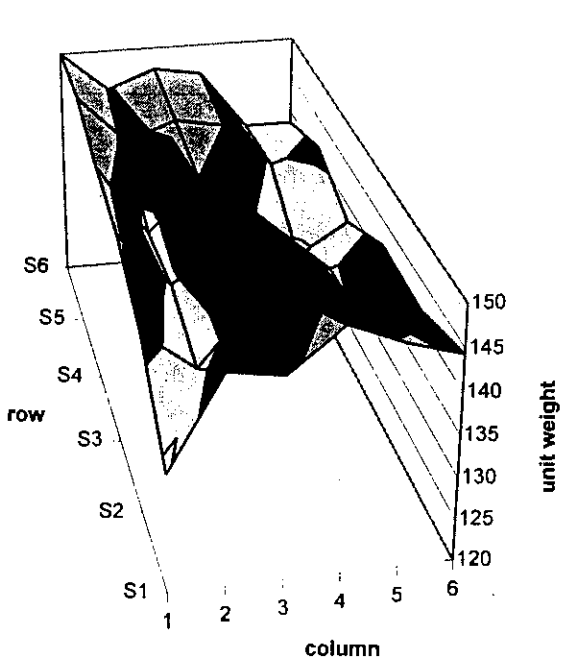
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	151.3	144.8	147.2	146.2	138.4	138.4	144.38	5.116	3.54%
5	151.0	143.9	146.2	145.1	139.4	141.2	144.47	4.068	2.82%
4	147.5	138.6	145.1	140.8	134.0	137.9	140.65	4.954	3.52%
3	146.0	139.3	144.1	145.0	139.6	142.0	142.67	2.821	1.98%
2	141.9	137.0	144.4	143.1	140.4	141.6	141.40	2.551	1.80%
1	134.0	144.8	143.8	148.8	146.2	144.3	143.65	5.058	3.52%
Average	145.28	141.40	145.13	144.83	139.67	140.90	142.87	**142.87**	4.095	2.86%
Std. Dev.	6.528	3.492	1.326	2.719	3.925	2.392	3.397		**4.181785**	
Coeff. of Var.	4.49%	2.47%	0.91%	1.88%	2.81%	1.70%	2.38%			**2.93%**

Unit Wt Stats

Location: Muskegon, Michigan RANDOM SITE
Description: (4 min)Samples xx3, unit weight
File name: mskr4xx3.xls





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

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Location: *Sample Data --Muskegon (random), samples xx3*

Date: *10/5/95*

Description: *Samples xx3 (4 min.), unit weight*

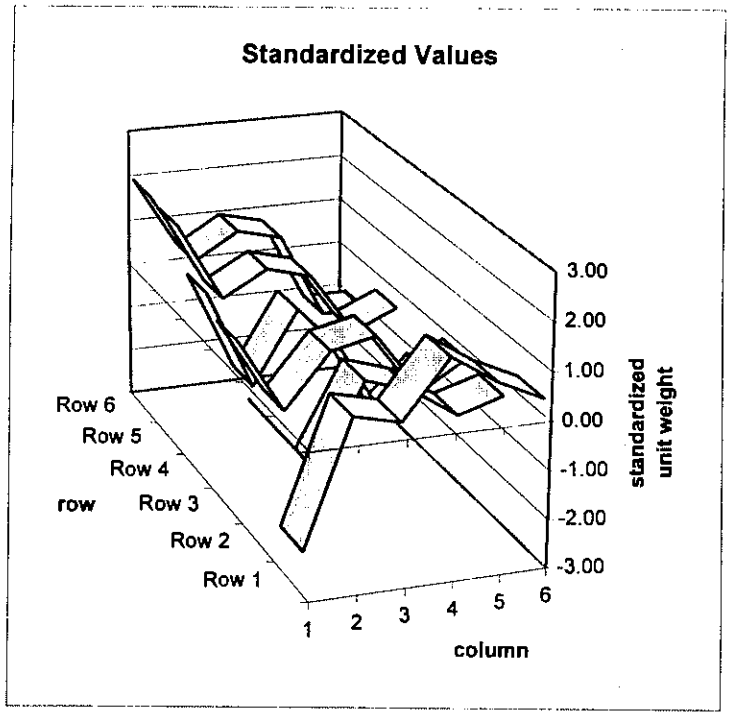
Color 1 *Color Above and Below Average*

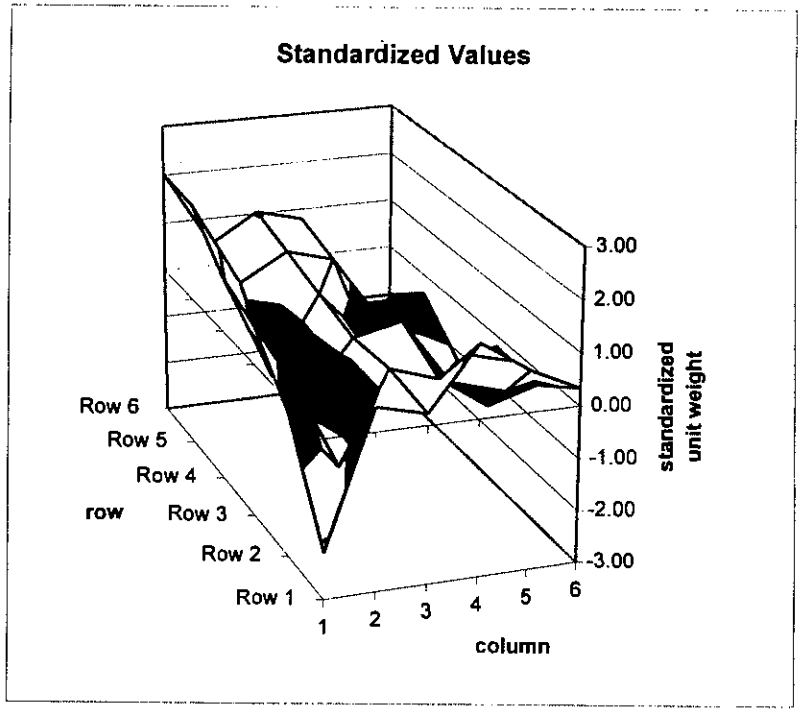
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.02	0.46	1.04	0.80	-1.07	-1.07	0.36	1.223
5	1.94	0.25	0.80	0.53	-0.83	-0.40	0.38	0.973
4	1.11	-1.02	0.53	-0.49	-2.12	-1.19	-0.53	1.185
3	0.75	-0.85	0.29	0.51	-0.78	-0.21	-0.05	0.675
2	-0.23	-1.40	0.37	0.06	-0.59	-0.30	-0.35	0.610
1	-2.12	0.46	0.22	1.42	0.80	0.34	0.19	1.210
Average	0.58	-0.35	0.54	0.47	-0.77	-0.47	0.00	**0.00** 0.979
Std. Dev.	1.561	0.835	0.317	0.650	0.939	0.572	0.812	**1.00**

Location: *Sample Data --Muskegon (random), samples xx3*
Date: *10/5/95*
Description: *Samples xx3 (4 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	145.28	2.41	5.827	6.528	42.614
2	141.40	-1.47	2.159	3.492	12.196
3	145.13	2.26	5.125	1.326	1.759
4	144.83	1.96	3.857	2.719	7.395
5	139.67	-3.20	10.258	3.925	15.403
6	140.90	-1.97	3.879	2.392	5.720
sum			31.105		85.086
all data	142.87			4.181785	17.4873

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	186.628056	5	37.326	**2.63210**	2.533554	0.0434764
within columns:	425.428333	30	14.181			
Total:	612.056389					

Different ? | 1 | YES!

ANOVA

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		3.88	0.15	0.45	5.62	4.38
2	3.88		-3.73	-3.43	1.73	0.50
3	0.15	-3.73		0.30	5.47	4.23
4	0.45	-3.43	0.30		5.17	3.93
5	5.62	1.73	5.47	5.17		-1.23
6	4.38	0.50	4.23	3.93	-1.23	

Critical Values

Columns	1	2	3	4	5	6
1		10.09	9.08	9.64	10.38	9.47
2	10.09		5.09	6.03	7.16	5.77
3	9.08	5.09		4.12	5.64	3.73
4	9.64	6.03	4.12		6.51	4.93
5	10.38	7.16	5.64	6.51		6.26
6	9.47	5.77	3.73	4.93	6.26	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	1
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	1	0	0	
Sum	**0**	**0**	**1**	**0**	**0**	**1**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.3535	0.6863	0.3238	0.7643	0.8079
2			0.4336	0.7485	0.1488	0.2300
3				0.4066	0.3941	0.4881
4					0.1754	0.2281
5						0.9757
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.2278	0.9571	0.8792	0.1010	0.1535
2	0.2278		0.0344	0.0866	0.4378	0.7782
3	0.9571	0.0344		0.8130	0.0090	0.0035
4	0.8792	0.0866	0.8130		0.0243	0.0239
5	0.1010	0.4378	0.0090	0.0243		0.5258
6	0.1535	0.7782	0.0035	0.0239	0.5258	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	0	0	0	0
2	0		1	0	0	0	1	0
3	0	1		0	1	1	3	1
4	0	0	0		1	1	2	0
5	0	0	1	1		0	2	0
6	0	0	1	1	0		2	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	1	1	0	0
1	0	1	0	0	0
1	0	1	1	0	0
0	0	1	1	0	0
0	1	1	1	1	1
4	3	6	5	1	1

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data --Muskegon (random)
Date: 10/5/95
Description: Average of 3 samples (4 min.), unit weight

(updated 7/12/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	150.1	144.9	147.2	145.2	136.5	139.9
5	150.8	145.4	144.8	144.5	138.7	140.3
4	147.1	136.3	144.4	142.5	131.6	139.4
3	144.3	143.0	143.7	144.2	136.3	140.9
2	131.3	138.4	142.5	142.8	140.7	140.6
1	138.8	143.1	142.7	145.0	142.5	142.8
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	--	--
6 of 6 test	--	--	DIFF !	DIFF !	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?

Edge

MSKR4AVG.XLS

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Sample Data --Muskegon (random)*

Date: *10/5/95*

Description: *Average of 3 samples (4 min.), unit weight*

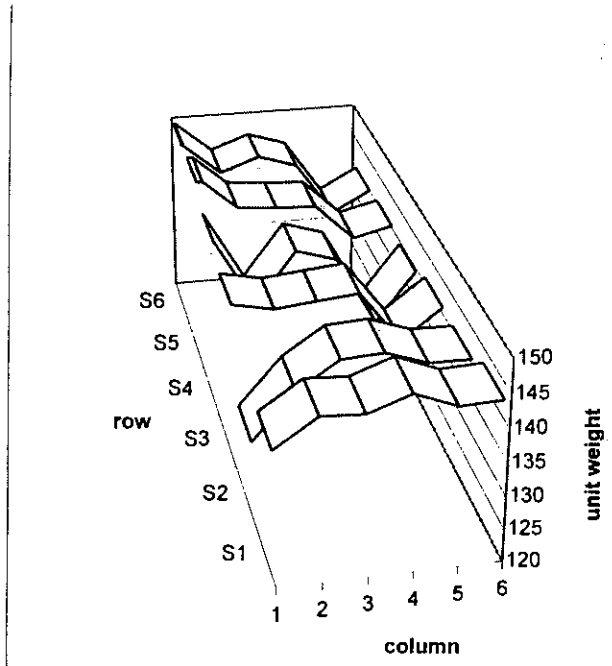
Color 1 *Color Above and Below Average*

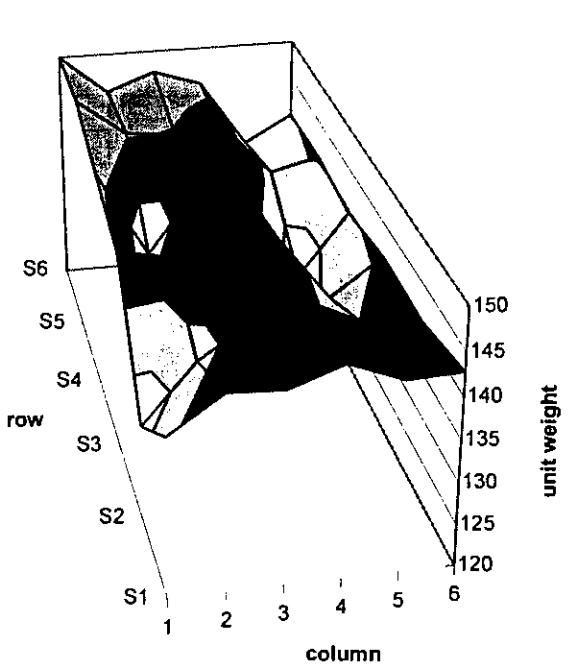
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	150.1	144.9	147.2	145.2	136.5	139.9	143.97	4.979	3.46%
5	150.8	145.4	144.8	144.5	138.7	140.3	144.07	4.256	2.95%
4	147.1	136.3	144.4	142.5	131.6	139.4	140.23	5.653	4.03%
3	144.3	143.0	143.7	144.2	136.3	140.9	142.06	3.088	2.17%
2	131.3	138.4	142.5	142.8	140.7	140.6	139.38	4.268	3.06%
1	138.8	143.1	142.7	145.0	142.5	142.8	142.47	2.000	1.40%
Average	143.73	141.83	144.21	144.05	137.72	140.64	142.03	**142.03**	4.041	2.85%
Std. Dev.	7.490	3.674	1.728	1.120	3.830	1.172	3.169		**4.287263**	
Coeff. of Var.	5.21%	2.59%	1.20%	0.78%	2.78%	0.83%	2.23%			**3.02%**

Unit Wt Stats

Location: Muskegon, Michigan RANDOM SITE
Description: (4 min)Average of 3 samples, unit weight
File name: mskr4avg.xls





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Sample Data --Muskegon (random)*

Date: *10/5/95*

Description: *Average of 3 samples (4 min.), unit weight*

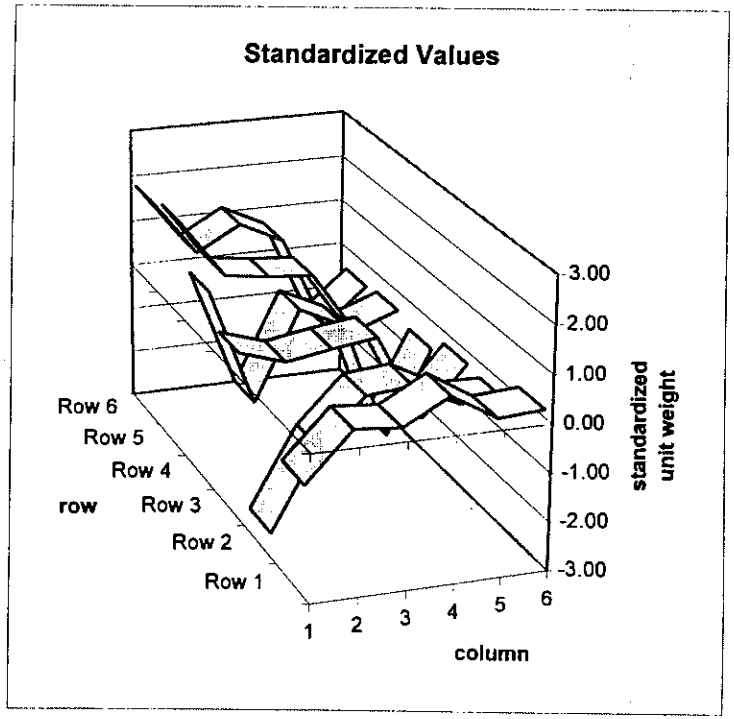
Color 1 *Color Above and Below Average*

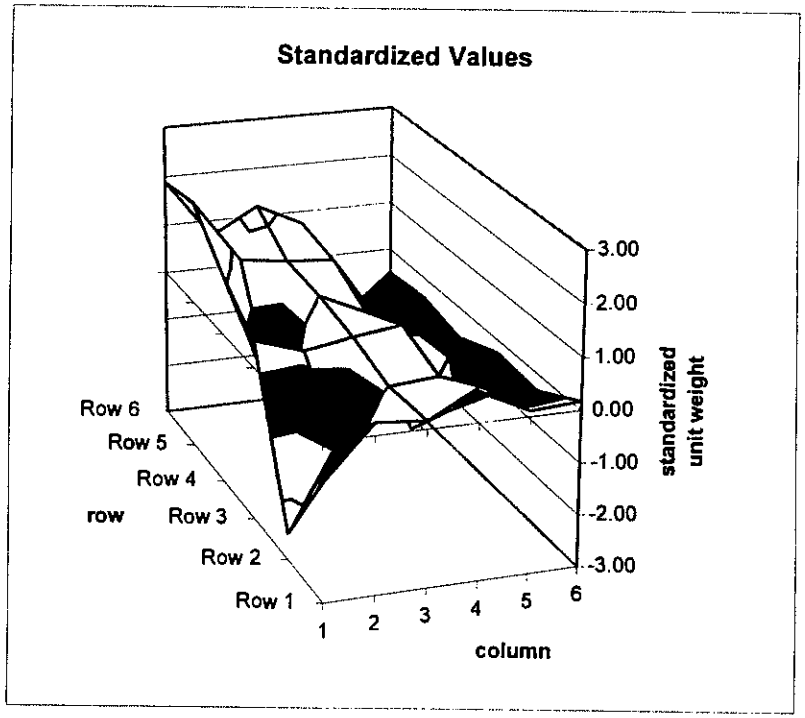
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.89	0.68	1.21	0.75	-1.30	-0.50	0.45	1.161
5	2.04	0.78	0.65	0.58	-0.78	-0.41	0.48	0.993
4	1.18	-1.34	0.56	0.12	-2.43	-0.61	-0.42	1.319
3	0.53	0.22	0.38	0.51	-1.34	-0.26	0.01	0.720
2	-2.50	-0.85	0.10	0.19	-0.31	-0.33	-0.62	0.995
1	-0.75	0.24	0.16	0.69	0.11	0.17	0.10	0.466
Average	0.40	-0.05	0.51	0.47	-1.01	-0.32	0.00	**0.00**	0.942
Std. Dev.	1.747	0.857	0.403	0.261	0.893	0.273	0.739		**1.00**

Location: *Sample Data --Muskegon (random)*
Date: *10/5/95*
Description: *Average of 3 samples (4 min.), unit weight*





Pavement Segregation Analysis Spreadsheet
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One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	143.73	1.70	2.899	7.490	56.103
2	141.83	-0.20	0.039	3.674	13.501
3	144.21	2.18	4.757	1.728	2.987
4	144.05	2.02	4.071	1.120	1.254
5	137.72	-4.31	18.610	3.830	14.671
6	140.64	-1.39	1.934	1.172	1.374
sum			32.310		89.892
all data	142.03			4.287263	18.3806

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	193.861822	5	38.772	**2.58793**	2.533554	0.0462847
within columns:	449.459967	30	14.982			
Total:	643.321789					

Different ? | 1 | YES!

ANOVA

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.90	-0.48	-0.32	6.02	3.09
2	1.90		-2.38	-2.22	4.12	1.19
3	-0.48	-2.38		0.16	6.50	3.57
4	-0.32	-2.22	0.16		6.33	3.41
5	6.02	4.12	6.50	6.33		-2.92
6	3.09	1.19	3.57	3.41	-2.92	

Critical Values

Columns	1	2	3	4	5	6
1		11.37	10.47	10.32	11.46	10.33
2	11.37		5.53	5.23	7.23	5.26
3	10.47	5.53		2.81	5.73	2.85
4	10.32	5.23	2.81		5.44	2.21
5	11.46	7.23	5.73	5.44		5.46
6	10.33	5.26	2.85	2.21	5.46	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	1	1
4	0	0	0		1	1
5	0	0	1	1		0
6	0	0	1	1	0	
Sum	**0**	**0**	**2**	**2**	**2**	**2**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.1395	0.7904	0.3807	0.4250	0.5090
2			0.2413	0.7765	0.0861	0.1173
3				0.5012	0.3719	0.4431
4					0.2131	0.2513
5						0.9719
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.5892	0.8819	0.9209	0.1104	0.3412
2	0.5892		0.1819	0.1882	0.0867	0.4660
3	0.8819	0.1819		0.8499	0.0036	0.0019
4	0.9209	0.1882	0.8499		0.0030	0.0004
5	0.1104	0.0867	0.0036	0.0030		0.1041
6	0.3412	0.4660	0.0019	0.0004	0.1041	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	0	0	0	0
2	0		0	0	0	0	0	0
3	0	0		0	1	1	2	0
4	0	0	0		1	1	2	0
5	0	0	1	1		0	2	0
6	0	0	1	1	0		2	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	0
0	0	1	1	0	0
0	1	1	1	1	1
4	4	6	6	1	1

Specific Gravity Test Data

MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	4/26/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 1 leveling coarse**	**File name:**	mskrr1lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R111	**LC**	1052.4	1053.6	606.1	447.5	446.3	2.354	2.358	
R112	**LC**	863.5	864.8	497.1	367.7	366.4	2.352	2.357	
R113	**LC**	1047.8	1049.1	604.7	444.4	443.1	2.361	2.365	
R121	**LC**	861.3	862.8	505.8	357.0	355.5	2.417	2.423	
R122	**LC**	809.7	811.7	475.6	336.1	334.1	2.415	2.424	
R123	**LC**	774.2	775.9	455.6	320.3	318.6	2.422	2.430	
R131	**LC**	805.4	807.0	470.3	336.7	335.1	2.397	2.403	
R132	**LC**	652.2	653.7	382.3	271.4	269.9	2.409	2.416	
R133	**LC**	728.0	729.9	423.2	306.7	304.8	2.380	2.388	
R141	**LC**	704.7	705.8	412.4	293.4	292.3	2.406	2.411	
R142	**LC**	616.2	617.6	360.1	257.5	256.1	2.398	2.406	
R143	**LC**	773.0	774.7	453.8	320.9	319.2	2.414	2.422	
R151	**LC**	680.3	681.4	400.3	281.1	280.0	2.424	2.430	
R152	**LC**	595.2	596.5	350.0	246.5	245.2	2.420	2.427	
R153	**LC**	560.5	562.2	329.8	232.4	230.7	2.419	2.430	
R161	**LC**	855.1	856.5	502.1	354.4	353.0	2.417	2.422	
R162	**LC**	750.3	752.0	441.2	310.8	309.1	2.420	2.427	
R163	**LC**	774.9	776.3	455.4	320.9	319.5	2.419	2.425	

DR. BALADI

MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/26/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 2 leveling coarse**	**File name:**	mskrr2lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R211	**LC**	837.3	840.1	484.6	355.5	352.7	2.363	2.374	
R212	**LC**	925.6	927.9	534.8	393.1	390.8	2.360	2.368	
R213	**LC**	891.9	896.6	513.8	382.8	378.1	2.342	2.359	broken into two
R221	**LC**	924.1	929.2	540.1	389.1	384.0	2.388	2.407	
R222	**LC**	868.4	870.3	506.7	363.6	361.7	2.394	2.401	
R223	**LC**	921.1	922.9	537.3	385.6	383.8	2.393	2.400	
R231	**LC**	700.0	702.1	409.3	292.8	290.7	2.398	2.408	
R232	**LC**	712.2	714.6	415.6	299.0	296.6	2.390	2.401	
R233	**LC**	623.8	626.8	365.0	261.8	258.8	2.394	2.410	
R241	**LC**	752.4	753.5	436.1	317.4	316.3	2.374	2.379	
R242	**LC**	679.7	680.9	396.2	284.7	283.5	2.392	2.398	
R243	**LC**	625.5	626.7	365.7	261.0	259.8	2.401	2.408	
R251	**LC**	648.9	649.9	377.3	272.6	271.6	2.384	2.389	
R252	**LC**	667.8	668.8	387.6	281.2	280.2	2.378	2.383	
R253	**LC**	665.1	666.5	386.9	279.6	278.2	2.384	2.391	
R261	**LC**	720.8	722.6	420.6	302.0	300.2	2.393	2.401	
R262	**LC**	721.0	723.0	419.3	303.7	301.7	2.381	2.390	
R263	**LC**	766.3	768.8	441.9	326.9	324.4	2.352	2.362	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/27/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 3 leveling coarse**	**File name:**	mskrr3lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R311	**LC**	1079.3	1080.9	621.4	459.5	457.9	2.352	2.357	
R312	**LC**	1046.9	1048.1	604.2	443.9	442.7	2.361	2.365	
R313	**LC**	1079.0	1082.0	624.8	457.2	454.2	2.367	2.376	
R321	**LC**	850.0	851.3	499.1	352.2	350.9	2.417	2.422	
R322	**LC**	857.8	859.1	503.4	355.7	354.4	2.415	2.420	
R323	**LC**	853.9	855.6	499.7	355.9	354.2	2.404	2.411	
R331	**LC**	593.7	595.1	347.9	247.2	245.8	2.407	2.415	
R332	**LC**	665.2	667.0	389.6	277.4	275.6	2.404	2.414	
R333	**LC**	658.0	659.5	385.4	274.1	272.6	2.406	2.414	
R341	**LC**	707.6	708.8	411.3	297.5	296.3	2.383	2.388	
R342	**LC**	587.0	588.2	341.2	247.0	245.8	2.381	2.388	
R343	**LC**	679.2	680.7	394.1	286.6	285.1	2.375	2.382	
R351	**LC**	656.3	657.5	383.6	273.9	272.7	2.401	2.407	
R352	**LC**	647.1	648.1	378.1	270.0	269.0	2.400	2.406	
R353	**LC**	552.6	553.7	323.8	229.9	228.8	2.408	2.415	
R361	**LC**	734.4	735.6	430.6	305.0	303.8	2.412	2.417	
R362	**LC**	754.1	755.4	441.9	313.5	312.2	2.410	2.415	
R363	**LC**	685.0	686.2	403.1	283.1	281.9	2.424	2.430	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/28/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 4 leveling coarse**	**File name:**	mskrr4lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R411	**LC**	983.4	984.9	566.7	418.2	416.7	2.355	2.360	
R412	**LC**	843.0	844.1	487.0	357.1	356.0	2.364	2.368	
R413	**LC**	1028.4	1029.7	596.7	433.0	431.7	2.378	2.382	
R321	**LC**	712.1	713.4	418.3	295.1	293.8	2.417	2.424	
R422	**LC**	707.8	709.0	416.1	292.9	291.7	2.421	2.426	
R423	**LC**	623.1	624.4	365.8	258.6	257.3	2.415	2.422	
R431	**LC**	706.2	707.5	411.7	295.8	294.5	2.392	2.398	
R432	**LC**	565.3	566.4	331.9	234.5	233.4	2.415	2.422	
R433	**LC**	724.3	725.7	421.5	304.2	302.8	2.386	2.392	
R441	**LC**	622.1	623.7	358.5	265.2	263.6	2.352	2.360	
R442	**LC**	592.1	594.1	342.7	251.4	249.4	2.363	2.374	
R443	**LC**	651.9	653.2	377.6	275.6	274.3	2.370	2.377	
R451	**LC**	630.5	632.3	366.7	265.6	263.8	2.381	2.390	
R452	**LC**	648.5	650.1	378.4	271.7	270.1	2.393	2.401	
R453	**LC**	429.4	430.7	252.6	178.1	176.8	2.418	2.429	
R461	**LC**	705.7	707.5	414.3	293.2	291.4	2.413	2.422	
R462	**LC**	666.3	667.5	393.2	274.3	273.1	2.433	2.440	
R463	**LC**	576.9	578.6	338.8	239.8	238.1	2.413	2.423	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/28/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 5 leveling coarse**	**File name:**	mskrr5lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R511	**LC**	675.6	676.9	395.2	281.7	280.4	2.403	2.409	
R512	**LC**	788.1	789.0	461.9	327.1	326.2	2.412	2.416	
R513	**LC**	780.2	781.2	457.2	324.0	323.0	2.411	2.415	
R521	**LC**	620.0	620.7	365.7	255.0	254.3	2.434	2.438	
R522	**LC**	819.1	820.0	480.0	340.0	339.1	2.412	2.416	
R523	**LC**	740.6	741.5	435.6	305.9	305.0	2.424	2.428	
R531	**LC**	679.5	680.5	399.7	280.8	279.8	2.423	2.429	
R532	**LC**	608.9	609.8	357.2	252.6	251.7	2.414	2.419	
R533	**LC**	626.6	627.7	367.8	259.9	258.8	2.415	2.421	
R541	**LC**	635.3	637.0	367.3	269.7	268.0	2.362	2.371	
R542	**LC**	506.1	507.7	294.5	213.2	211.6	2.381	2.392	
R543	**LC**	545.7	546.9	318.3	228.6	227.4	2.392	2.400	
R551	**LC**	486.6	488.1	285.4	202.7	201.2	2.408	2.418	
R552	**LC**	553.8	555.6	318.4	237.2	235.4	2.342	2.353	
R553	**LC**	583.3	584.8	340.9	243.9	242.4	2.398	2.406	
R561	**LC**	482.0	483.7	283.1	200.6	198.9	2.411	2.423	
R562	**LC**	628.4	630.5	366.6	263.9	261.8	2.389	2.400	
R563	**LC**	439.6	441.6	257.2	184.4	182.4	2.395	2.410	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	4/24/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 6 leveling coarse**	**File name:**	mskrr6lc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R611	**LC**	858.4	859.4	500.1	359.3	358.3	2.392	2.396	
R612	**LC**	804.8	806.6	472.3	334.3	332.5	2.413	2.420	
R613	**LC**	864.9	866.5	502.7	363.8	362.2	2.382	2.388	
R621	**LC**	660.7	662.7	398.6	264.1	262.1	2.509	2.521	
R622	**LC**	726.8	728.6	428.9	299.7	297.9	2.431	2.440	
R623	**LC**	751.0	752.9	442.7	310.2	308.3	2.427	2.436	
R631	**LC**	738.1	739.9	434.8	305.1	303.3	2.425	2.434	
R632	**LC**	527.8	529.4	310.2	219.2	217.6	2.415	2.426	
R633	**LC**	597.4	598.5	351.4	247.1	246.0	2.422	2.428	
R641	**LC**	716.2	717.6	418.6	299.0	297.6	2.400	2.407	
R642	**LC**	625.9	627.3	368.1	259.2	257.8	2.420	2.428	
R643	**LC**	833.3	834.3	488.7	345.6	344.6	2.414	2.418	
R651	**LC**	537.5	538.6	315.2	223.4	222.3	2.411	2.418	
R652	**LC**	536.1	537.5	313.3	224.2	222.8	2.397	2.406	
R653	**LC**	561.2	562.4	329.2	233.2	232.0	2.412	2.419	
R661	**LC**	764.9	766.3	447.2	319.1	317.7	2.401	2.408	
R662	**LC**	615.7	617.5	363.1	254.4	252.6	2.427	2.437	
R663	**LC**	587.5	589.3	346.2	243.1	241.3	2.424	2.435	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	4/26/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 1 surface coarse**	**File name:**	mskrr1sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R111	**SC**	1629.4	1630.3	957.4	672.9	672.0	2.423	2.425	
R112	**SC**	1742.9	1745.1	1027.3	717.8	715.6	2.431	2.436	
R113	**SC**	1646.6	1648.4	968.5	679.9	678.1	2.424	2.428	
R121	**SC**	1866.0	1867.3	1102.3	765.0	763.7	2.441	2.443	
R122	**SC**	1743.5	1745.0	1032.4	712.6	711.1	2.449	2.452	
R123	**SC**	1841.8	1843.3	1088.9	754.4	752.9	2.443	2.446	
R131	**SC**	1789.2	1790.6	1050.6	740.0	738.6	2.420	2.422	
R132	**SC**	1740.1	1741.7	1022.6	719.1	717.5	2.422	2.425	
R133	**SC**	1692.0	1694.3	991.3	703.0	700.7	2.410	2.415	
R141	**SC**	1636.8	1637.8	965.2	672.6	671.6	2.435	2.437	
R142	**SC**	1634.4	1635.6	957.7	677.9	676.7	2.413	2.415	
R143	**SC**	1638.5	1639.1	965.2	673.9	673.3	2.432	2.434	
R151	**SC**	1627.2	1627.9	949.8	678.1	677.4	2.401	2.402	
R152	**SC**	1677.7	1678.4	986.2	692.2	691.5	2.425	2.426	
R153	**SC**	1665.9	1666.9	978.2	688.7	687.7	2.420	2.422	
R161	**SC**	1401.9	1403.1	816.4	586.7	585.5	2.392	2.394	
R162	**SC**	1640.5	1641.7	962.4	679.3	678.1	2.417	2.419	
R163	**SC**	1576.9	1578.3	919.6	658.7	657.3	2.396	2.399	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/26/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 2 surface coarse**	**File name:**	mskrr2sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R211	**SC**	1333.2	1338.2	774.5	563.7	558.7	2.374	2.386	
R212	**SC**	1359.2	1362.8	784.2	578.6	575.0	2.355	2.364	
R213	**SC**	1439.4	1443.1	832.5	610.6	606.9	2.363	2.372	
R221	**SC**	1566.6	1577.3	914.8	662.5	651.8	2.381	2.403	
R222	**SC**	1581.8	1588.0	921.7	666.3	660.1	2.383	2.396	
R223	**SC**	1441.9	1451.5	834.3	617.2	607.6	2.352	2.373	
R231	**SC**	1559.3	1562.6	906.6	656.0	652.7	2.382	2.389	
R232	**SC**	1488.6	1494.8	864.4	630.4	624.2	2.371	2.385	
R233	**SC**	1576.1	1578.5	917.3	661.2	658.8	2.387	2.392	
R241	**SC**	1277.6	1280.2	741.1	539.1	536.5	2.375	2.381	
R242	**SC**	1477.5	1480.5	850.5	630.0	627.0	2.350	2.356	
R243	**SC**	1499.3	1501.5	871.2	630.3	628.1	2.382	2.387	
R251	**SC**	1470.1	1477.6	848.1	629.5	622.0	2.347	2.364	
R252	**SC**	1492.7	1494.9	858.9	636.0	633.8	2.350	2.355	
R253	**SC**	1498.0	1502.4	866.8	635.6	631.2	2.364	2.373	
R261	**SC**	1367.9	1371.8	785.7	586.1	582.2	2.341	2.350	
R262	**SC**	1351.9	1355.3	780.2	575.1	571.7	2.357	2.365	
R263	**SC**	1384.5	1387.2	797.6	589.6	586.9	2.353	2.359	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/27/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 3 surface coarse**	**File name:**	mskrr3sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R311	**SC**	1380.7	1382.6	809.1	573.5	571.6	2.411	2.416	
R312	**SC**	1520.5	1522.6	891.1	631.5	629.4	2.411	2.416	
R313	**SC**	1411.6	1413.6	832.1	581.5	579.5	2.431	2.436	
R321	**SC**	1643.9	1646.5	958.4	688.1	685.5	2.393	2.398	
R322	**SC**	1596.1	1599.4	927.2	672.2	668.9	2.379	2.386	
R323	**SC**	1508.9	1515.7	876.2	639.5	632.7	2.370	2.385	
R331	**SC**	1674.2	1675.6	979.7	695.9	694.5	2.408	2.411	
R332	**SC**	1732.1	1734.1	1010.2	723.9	721.9	2.395	2.399	
R333	**SC**	1699.3	1701.1	994.4	706.7	704.9	2.407	2.411	
R341	**SC**	1420.9	1422.8	821.1	601.7	599.8	2.365	2.369	
R342	**SC**	1385.9	1387.4	802.1	585.3	583.8	2.370	2.374	
R343	**SC**	1346.2	1348.2	780.2	568.0	566.0	2.374	2.378	
R351	**SC**	1367.1	1371.3	785.4	585.9	581.7	2.341	2.350	
R352	**SC**	1331.6	1340.3	761.2	579.1	570.4	2.314	2.335	
R353	**SC**	1493.8	1498.7	860.3	638.4	633.5	2.348	2.358	
R361	**SC**	1330.1	1333.2	772.4	560.8	557.7	2.377	2.385	
R362	**SC**	1329.7	1333.3	767.5	565.8	562.2	2.356	2.365	
R363	**SC**	1391.6	1396.6	807.6	589.0	584.0	2.371	2.383	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date	3/28/96	**Highway**	U.S. 31
Tested By	Tony Migaldi	**Site**	Muskegon
Checked By			
Remarks	**Row 4 surface coarse**	**File name:**	mskrr4sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	**Course Description**	**Weight in air (g)**	**SSD Weight (g)**	**Weight in water (g)**	**Volume (SSD) [4-5](cm^3)**	**Volume (air) [3-5](cm^3)**	**Specific Gravity SSD [4/6]**	**Specific Gravity air [3/7]**	**Remarks**
R411	**SC**	1474.0	1475.6	871.2	604.4	602.8	2.441	2.445	
R412	**SC**	1383.0	1384.2	821.6	562.6	561.4	2.460	2.463	
R413	**SC**	1457.6	1458.7	866.1	592.6	591.5	2.462	2.464	
R321	**SC**	1510.4	1519.0	877.6	641.4	632.8	2.368	2.387	
R422	**SC**	1525.5	1531.7	883.1	648.6	642.4	2.362	2.375	
R423	**SC**	1551.0	1559.0	886.7	672.3	664.3	2.319	2.335	
R431	**SC**	1440.9	1443.9	837.2	606.7	603.7	2.380	2.387	
R432	**SC**	1642.3	1644.0	958.0	686.0	684.3	2.397	2.400	
R433	**SC**	1419.2	1421.7	829.1	592.6	590.1	2.399	2.405	
R441	**SC**	1200.1	1201.7	698.0	503.7	502.1	2.386	2.390	
R442	**SC**	1298.0	1299.6	754.0	545.6	544.0	2.382	2.386	
R443	**SC**	1348.7	1351.8	776.8	575.0	571.9	2.351	2.358	
R451	**SC**	1253.1	1258.5	717.2	541.3	535.9	2.325	2.338	
R452	**SC**	1245.2	1251.6	705.8	545.8	539.4	2.293	2.308	
R453	**SC**	1363.9	1369.3	780.2	589.1	583.7	2.324	2.337	
R461	**SC**	1202.6	1205.4	698.7	506.7	503.9	2.379	2.387	
R462	**SC**	1293.0	1295.5	749.8	545.7	543.2	2.374	2.380	
R463	**SC**	1303.8	1306.9	754.7	552.2	549.1	2.367	2.374	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date 3/28/96 **Highway** U.S. 31
Tested By Tony Migaldi **Site** Muskegon
Checked By
Remarks **Row 5 surface coarse** **File name:** mskrr5sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	Course Description	Weight in air (g)	SSD Weight (g)	Weight in water (g)	Volume (SSD) [4-5](cm^3)	Volume (air) [3-5](cm^3)	Specific Gravity SSD [4/6]	Specific Gravity air [3/7]	Remarks
R511	SC	1425.7	1426.6	852.7	573.9	573.0	2.486	2.488	
R512	SC	1574.5	1575.6	936.1	639.5	638.4	2.464	2.466	
R513	SC	1510.3	1511.3	901.2	610.1	609.1	2.477	2.480	
R521	SC	1752.9	1754.0	1040.1	713.9	712.8	2.457	2.459	
R522	SC	1465.1	1467.0	863.1	603.9	602.0	2.429	2.434	
R523	SC	1541.4	1542.4	909.7	632.7	631.7	2.438	2.440	
R531	SC	1816.7	1819.4	1054.8	764.6	761.9	2.380	2.384	
R532	SC	1515.7	1517.4	887.2	630.2	628.5	2.408	2.412	
R533	SC	1598.1	1600.2	935.6	664.6	662.5	2.408	2.412	
R541	SC	1344.8	1346.2	779.2	567.0	565.6	2.374	2.378	
R542	SC	1515.1	1516.2	884.1	632.1	631.0	2.399	2.401	
R543	SC	1496.3	1497.3	870.1	627.2	626.2	2.387	2.389	
R551	SC	1531.5	1534.0	889.1	644.9	642.4	2.379	2.384	
R552	SC	1209.9	1213.4	700.6	512.8	509.3	2.366	2.376	
R553	SC	1393.2	1395.6	809.7	585.9	583.5	2.382	2.388	
R561	SC	1523.7	1526.4	887.1	639.3	636.6	2.388	2.393	
R562	SC	1457.6	1459.6	849.3	610.3	608.3	2.392	2.396	
R563	SC	1507.7	1509.7	876.2	633.5	631.5	2.383	2.387	

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MICHIGAN STATE UNIVERSITY PAVEMENT RESEARCH CENTER OF EXCELLENCE
SPECIFIC GRAVITY TEST DATA

Date 4/24/96 **Highway** U.S. 31
Tested By Tony Migaldi **Site** Muskegon
Checked By
Remarks **Row 6 surface coarse** **File name:** mskrr6sc.xls

1	2	3	4	5	6	7	8	9	10
Specimen Number	Course Description	Weight in air (g)	SSD Weight (g)	Weight in water (g)	Volume (SSD) [4-5](cm^3)	Volume (air) [3-5](cm^3)	Specific Gravity SSD [4/6]	Specific Gravity air [3/7]	Remarks
R611	SC	1625.7	1627.8	971.2	656.6	654.5	2.479	2.484	
R612	SC	1555.5	1557.8	930.1	627.7	625.4	2.482	2.487	
R613	SC	1657.9	1659.4	988.2	671.2	669.7	2.472	2.476	
R621	SC	1678.6	1680.4	994.4	686.0	684.2	2.450	2.453	
R622	SC	1698.0	1699.8	1007.0	692.8	691.0	2.454	2.457	
R623	SC	1734.9	1736.7	1027.9	708.8	707.0	2.450	2.454	
R631	SC	1652.1	1653.8	972.1	681.7	680.0	2.426	2.430	
R632	SC	1621.3	1623.0	955.6	667.4	665.7	2.432	2.435	
R633	SC	1645.0	1646.9	969.4	677.5	675.6	2.431	2.435	
R641	SC	1476.9	1478.0	864.8	613.2	612.1	2.410	2.413	
R642	SC	1492.5	1493.6	876.5	617.1	616.0	2.420	2.423	
R643	SC	1260.4	1261.8	743.6	518.2	516.8	2.435	2.439	
R651	SC	1625.6	1628.7	943.8	684.9	681.8	2.378	2.384	
R652	SC	1459.1	1462.2	851.9	610.3	607.2	2.396	2.403	
R653	SC	1559.9	1562.0	909.3	652.7	650.6	2.393	2.398	
R661	SC	1415.9	1418.1	826.0	592.1	589.9	2.395	2.400	
R662	SC	1548.3	1552.9	901.2	651.7	647.1	2.383	2.393	
R663	SC	1517.9	1522.3	879.3	643.0	638.6	2.367	2.377	

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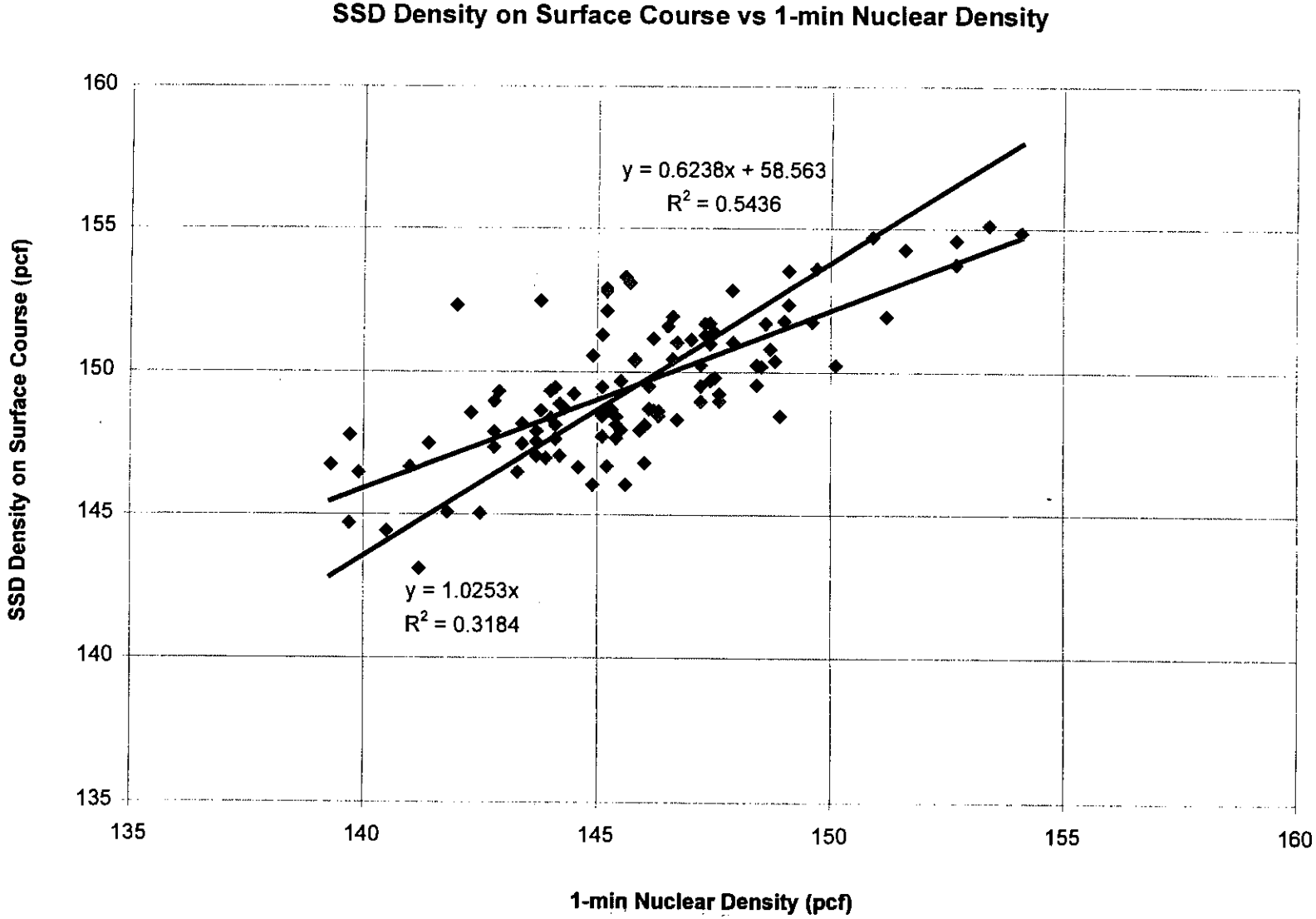
Regression Analysis between Nuclear and Lab Density

Test Number (random)	$\gamma_{nuclear}$ (lbs/ft^3) (1 min.)	$\gamma_{nuclear}$ (lbs/ft^3) (4 min.)	surface coarse				leveling coarse				AVG	AVG
			S.G.$_{SSD}$	S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	S.G.$_{SSD}$	S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	SSD / 2 SC + LC	AIR / 2 SC + LC
111	146.2	142.4	2.423	2.425	151.18	151.30	2.354	2.358	146.92	147.14	149.05	149.22
112	147.4	140.1	2.431	2.436	151.71	151.98	2.352	2.357	146.76	147.06	149.23	149.52
113	147.3	134	2.424	2.428	151.29	151.52	2.361	2.365	147.31	147.56	149.30	149.54
211	144.1	118.8	2.374	2.386	148.13	148.90	2.363	2.374	147.46	148.14	147.80	148.52
212	143.9	133.2	2.355	2.364	146.97	147.50	2.360	2.368	147.29	147.79	147.13	147.65
213	143.4	141.9	2.363	2.372	147.48	148.00	2.342	2.359	146.15	147.20	146.82	147.60
311	145.8	143	2.411	2.416	150.43	150.73	2.352	2.357	146.79	147.08	148.61	148.90
312	146.6	143.9	2.411	2.416	150.45	150.75	2.361	2.365	147.33	147.56	148.89	149.15
313	148.6	146	2.431	2.436	151.69	152.00	2.367	2.376	147.67	148.24	149.68	150.12
411	149.1	146.8	2.441	2.445	152.35	152.58	2.355	2.360	146.94	147.26	149.64	149.92
412	149.1	146.9	2.460	2.463	153.53	153.72	2.364	2.368	147.50	147.76	150.51	150.74
413	149.7	147.5	2.462	2.464	153.60	153.77	2.378	2.382	148.39	148.65	151.00	151.21
511	153.4	151.6	2.486	2.488	155.11	155.26	2.403	2.409	149.94	150.35	152.53	152.80
512	152.7	149.7	2.464	2.466	153.74	153.90	2.412	2.416	150.52	150.76	152.13	152.33
513	152.7	151	2.477	2.480	154.57	154.72	2.411	2.415	150.45	150.73	152.51	152.73
611	150.9	148.7	2.479	2.484	154.70	154.99	2.392	2.396	149.25	149.50	151.98	152.24
612	154.1	150.4	2.482	2.487	154.86	155.20	2.413	2.420	150.56	151.04	152.71	153.12
613	151.6	151.3	2.472	2.476	154.27	154.48	2.382	2.388	148.62	149.01	151.45	151.74
121	142	143.6	2.441	2.443	152.31	152.47	2.417	2.423	150.81	151.18	151.56	151.82
122	145.2	140.8	2.449	2.452	152.80	152.99	2.415	2.424	150.70	151.23	151.75	152.11
123	143.8	144.8	2.443	2.446	152.47	152.65	2.422	2.430	151.16	151.63	151.81	152.14
221	142.3	137.8	2.381	2.403	148.56	149.98	2.388	2.407	149.02	150.17	148.79	150.07
222	144.3	140.3	2.383	2.396	148.72	149.53	2.394	2.401	149.36	149.82	149.04	149.67
223	139.3	137	2.352	2.373	146.75	148.08	2.393	2.400	149.35	149.76	148.05	148.92
321	142.9	145.5	2.393	2.398	149.31	149.64	2.417	2.422	150.83	151.15	150.07	150.40
322	146.3	144.1	2.379	2.386	148.47	148.90	2.415	2.420	150.71	151.03	149.59	149.97
323	142.8	139.3	2.370	2.385	147.90	148.82	2.404	2.411	150.01	150.43	148.95	149.62
421	139.7	131.7	2.368	2.387	147.78	148.94	2.417	2.424	150.85	151.24	149.32	150.09
422	142.8	138.6	2.362	2.375	147.36	148.18	2.421	2.426	151.05	151.41	149.20	149.80
423	139.7	138.6	2.319	2.334	144.70	145.63	2.415	2.422	150.67	151.11	147.68	148.37
521	145.6	147.2	2.457	2.459	153.31	153.45	2.434	2.438	151.89	152.14	152.60	152.79
522	146.5	145	2.429	2.434	151.58	151.86	2.412	2.416	150.49	150.73	151.04	151.30
523	145.2	143.9	2.438	2.440	152.12	152.26	2.424	2.428	151.26	151.52	151.69	151.89
621	147.9	146.3	2.450	2.453	152.85	153.09	2.509	2.521	156.58	157.30	154.72	155.19
622	145.7	143.7	2.454	2.457	153.10	153.34	2.431	2.440	151.70	152.24	152.40	152.79
623	145.2	144.8	2.450	2.454	152.89	153.12	2.427	2.436	151.45	152.00	152.17	152.56

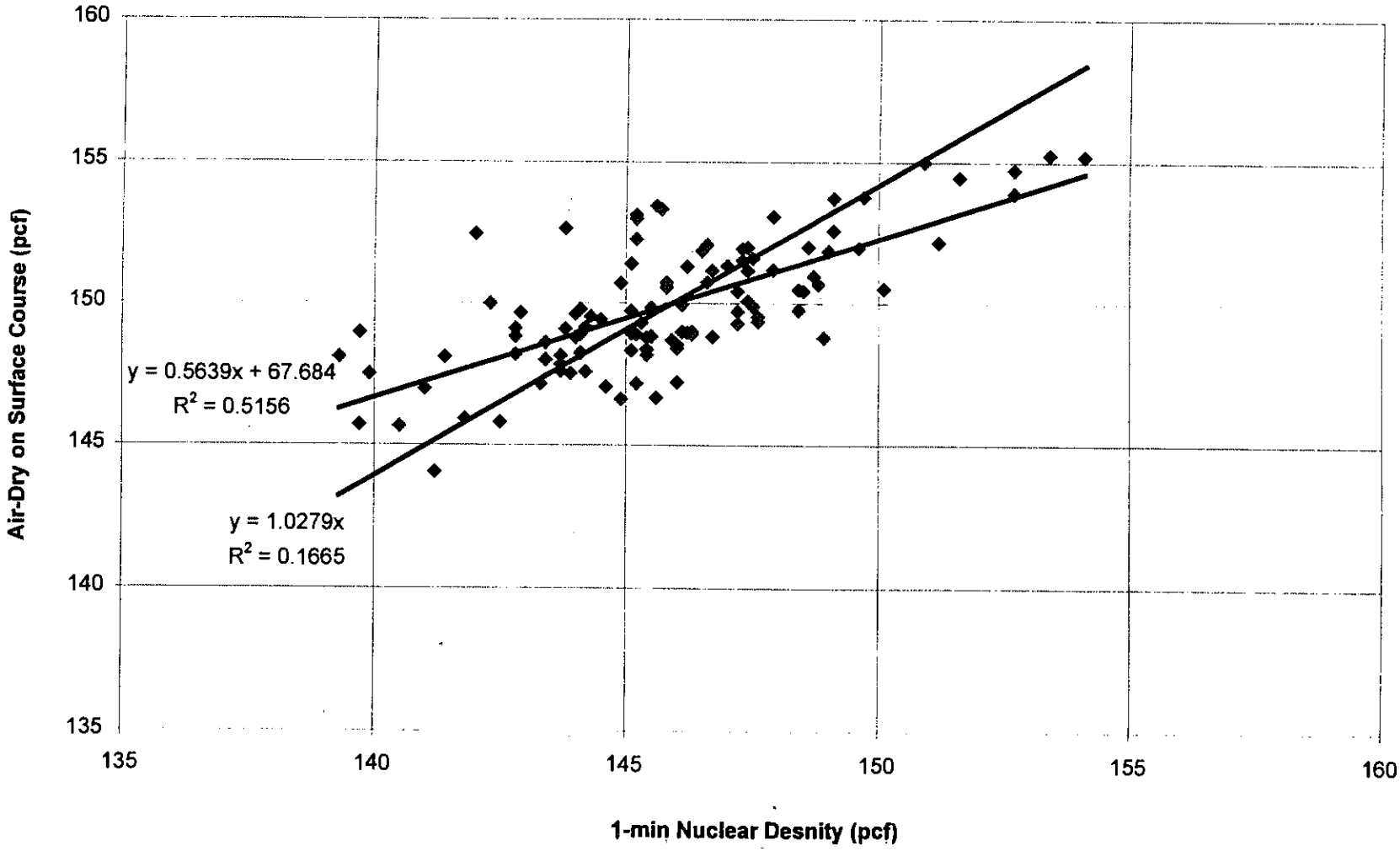
(Random) Test Number	$\gamma_{nuclear}$ (1 min.) (lbs/ft^3)	$\gamma_{nuclear}$ (4 min.) (lbs/ft^3)	surface coarse				leveling coarse				AVG	AVG
			$S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	$S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	SSD / 2 SC + LC	AIR / 2 SC + LC
131	147.4	142.6	2.420	2.422	150.99	151.16	2.397	2.403	149.56	149.98	150.28	150.57
132	147	141.7	2.422	2.425	151.14	151.33	2.409	2.416	150.30	150.79	150.72	151.06
133	148.8	143.8	2.410	2.415	150.39	150.68	2.380	2.388	148.50	149.04	149.45	149.86
231	143.8	141	2.382	2.389	148.64	149.07	2.398	2.408	149.63	150.26	149.13	149.67
232	145.5	142	2.371	2.385	147.96	148.81	2.390	2.401	149.13	149.84	148.55	149.32
233	147.2	144.4	2.387	2.392	148.97	149.28	2.394	2.410	149.40	150.41	149.18	149.85
331	147.2	144.6	2.408	2.411	150.25	150.42	2.407	2.415	150.22	150.72	150.23	150.57
332	145.1	142.3	2.395	2.399	149.48	149.72	2.404	2.414	150.04	150.61	149.76	150.17
333	148.5	144.1	2.407	2.411	150.20	150.43	2.406	2.414	150.14	150.62	150.17	150.52
431	145.1	143	2.380	2.387	148.51	148.94	2.392	2.398	149.25	149.63	148.88	149.28
432	148.4	145.2	2.397	2.400	149.54	149.76	2.415	2.422	150.72	151.13	150.13	150.45
433	147.4	145.1	2.399	2.405	149.70	150.07	2.386	2.392	148.86	149.26	149.28	149.67
531	148.9	143.2	2.380	2.384	148.48	148.79	2.423	2.429	151.22	151.54	149.85	150.16
532	148.4	145	2.408	2.412	150.25	150.48	2.414	2.419	150.64	150.95	150.44	150.72
533	150.1	146.2	2.408	2.412	150.24	150.52	2.415	2.421	150.71	151.08	150.48	150.80
631	147.5	146.9	2.426	2.430	151.38	151.60	2.425	2.434	151.33	151.85	151.35	151.73
632	149.6	147.5	2.432	2.435	151.75	151.97	2.415	2.426	150.71	151.35	151.23	151.66
633	147.3	147.2	2.431	2.435	151.68	151.94	2.422	2.428	151.14	151.54	151.41	151.74
141	146.6	141.9	2.435	2.437	151.95	152.08	2.406	2.411	150.11	150.44	151.03	151.26
142	144.9	144.2	2.413	2.415	150.56	150.71	2.398	2.406	149.66	150.14	150.11	150.43
143	149	148.8	2.432	2.434	151.77	151.85	2.414	2.422	150.64	151.11	151.21	151.48
241	143.4	143.4	2.375	2.381	148.18	148.60	2.374	2.379	148.14	148.43	148.16	148.52
242	144.6	142	2.350	2.356	146.64	147.04	2.392	2.398	149.24	149.61	147.94	148.32
243	146.2	143.1	2.382	2.387	148.65	148.95	2.401	2.408	149.83	150.24	149.24	149.59
341	143.7	144.1	2.365	2.369	147.55	147.82	2.383	2.388	148.67	149.02	148.11	148.42
342	143.7	143.6	2.370	2.374	147.91	148.13	2.381	2.388	148.60	149.02	148.26	148.58
343	146	145	2.374	2.378	148.11	148.41	2.375	2.382	148.21	148.66	148.16	148.54
441	144.2	143.8	2.386	2.390	148.87	149.15	2.352	2.360	146.75	147.26	147.81	148.21
442	145.2	143	2.382	2.386	148.63	148.89	2.363	2.374	147.46	148.14	148.05	148.52
443	145.2	140.8	2.351	2.358	146.70	147.16	2.370	2.377	147.89	148.30	147.30	147.73
541	145.4	143.3	2.374	2.378	148.15	148.37	2.362	2.371	147.38	147.92	147.77	148.14
542	145.5	145.1	2.399	2.401	149.68	149.83	2.381	2.392	148.60	149.25	149.14	149.54
543	142.8	145.1	2.387	2.389	148.97	149.10	2.392	2.400	149.29	149.74	149.13	149.42
641	145.8	146.3	2.410	2.413	150.40	150.56	2.400	2.407	149.76	150.17	150.08	150.37
642	147.9	143.2	2.420	2.423	151.03	151.19	2.420	2.428	151.02	151.50	151.02	151.34
643	151.2	146.2	2.435	2.439	151.94	152.18	2.414	2.418	150.64	150.89	151.29	151.54

(Random) Test Number	$\gamma_{nuclear}$ (1 min.) (lbs/ft^3)	$\gamma_{nuclear}$ (4 min.) (lbs/ft^3)	surface coarse				leveling coarse				AVG	AVG
			$S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	$S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)	SSD / 2 SC + LC	AIR / 2 SC + LC
151	147.5	141	2.401	2.402	149.80	149.89	2.424	2.430	151.26	151.61	150.53	150.75
152	145.1	140.3	2.425	2.426	151.30	151.39	2.420	2.427	151.00	151.47	151.15	151.43
153	146.7	146.2	2.420	2.422	151.03	151.16	2.419	2.430	150.95	151.60	150.99	151.38
251	139.9	142.1	2.347	2.364	146.47	147.48	2.384	2.389	148.77	149.08	147.62	148.28
252	141	139.6	2.350	2.355	146.67	146.96	2.378	2.383	148.41	148.72	147.54	147.84
253	141.4	140.4	2.364	2.373	147.50	148.09	2.384	2.391	148.75	149.18	148.12	148.64
351	145.6	137.8	2.341	2.350	146.05	146.65	2.401	2.407	149.79	150.18	147.92	148.41
352	140.5	131.5	2.314	2.335	144.42	145.67	2.400	2.406	149.78	150.11	147.10	147.89
353	143.3	139.6	2.348	2.358	146.49	147.14	2.408	2.415	150.29	150.71	148.39	148.92
451	141.8	128.9	2.325	2.338	145.08	145.91	2.381	2.390	148.55	149.14	146.81	147.53
452	141.2	132	2.293	2.308	143.09	144.05	2.393	2.401	149.31	149.82	146.20	146.93
453	142.5	134	2.324	2.337	145.04	145.81	2.418	2.429	150.90	151.55	147.97	148.68
551	145.4	138.9	2.379	2.384	148.43	148.76	2.408	2.418	150.26	150.91	149.34	149.84
552	144.1	137.8	2.366	2.376	147.65	148.24	2.342	2.353	146.16	146.80	146.91	147.52
553	146.3	139.4	2.382	2.388	148.64	148.99	2.398	2.406	149.62	150.16	149.13	149.57
651	144	136.3	2.378	2.384	148.39	148.78	2.411	2.418	150.44	150.88	149.41	149.83
652	146.1	134.7	2.396	2.403	149.50	149.95	2.397	2.406	149.60	150.15	149.55	150.05
653	144	138.4	2.393	2.398	149.33	149.61	2.412	2.419	150.49	150.94	149.91	150.28
161	144.5	136.6	2.392	2.394	149.23	149.41	2.417	2.422	150.81	151.16	150.02	150.28
162	148.7	147.4	2.417	2.419	150.81	150.96	2.420	2.427	150.98	151.47	150.89	151.21
163	147.2	144.3	2.396	2.399	149.52	149.70	2.419	2.425	150.95	151.34	150.23	150.52
261	144.9	140.6	2.341	2.350	146.05	146.61	2.393	2.401	149.31	149.83	147.68	148.22
262	144.2	139.7	2.357	2.365	147.05	147.56	2.381	2.390	148.55	149.12	147.80	148.34
263	146	141.6	2.353	2.359	146.81	147.20	2.352	2.362	146.75	147.40	146.78	147.30
361	146.7	141.3	2.377	2.385	148.34	148.82	2.412	2.417	150.50	150.84	149.42	149.83
362	143.7	139.4	2.356	2.365	147.04	147.59	2.410	2.415	150.36	150.72	148.70	149.16
363	145.9	142	2.371	2.383	147.96	148.69	2.424	2.430	151.25	151.63	149.60	150.16
461	145.1	142	2.379	2.387	148.44	148.92	2.413	2.422	150.57	151.12	149.51	150.02
462	146	138.3	2.374	2.380	148.14	148.53	2.433	2.440	151.85	152.24	149.99	150.39
463	145.4	137.9	2.367	2.374	147.68	148.16	2.413	2.423	150.56	151.19	149.12	149.68
561	147.6	136.4	2.388	2.393	148.99	149.35	2.411	2.423	150.46	151.22	149.72	150.28
562	147.6	143.2	2.392	2.396	149.24	149.52	2.389	2.400	149.08	149.78	149.16	149.65
563	146.1	141.2	2.383	2.387	148.71	148.98	2.395	2.410	149.44	150.39	149.07	149.68
661	144.1	142.5	2.395	2.400	149.45	149.77	2.401	2.408	149.85	150.24	149.65	150.01
662	145.3	138.7	2.383	2.393	148.69	149.30	2.427	2.437	151.46	152.10	150.08	150.70
663	145.1	138.4	2.367	2.377	147.73	148.32	2.424	2.435	151.26	151.93	149.50	150.12

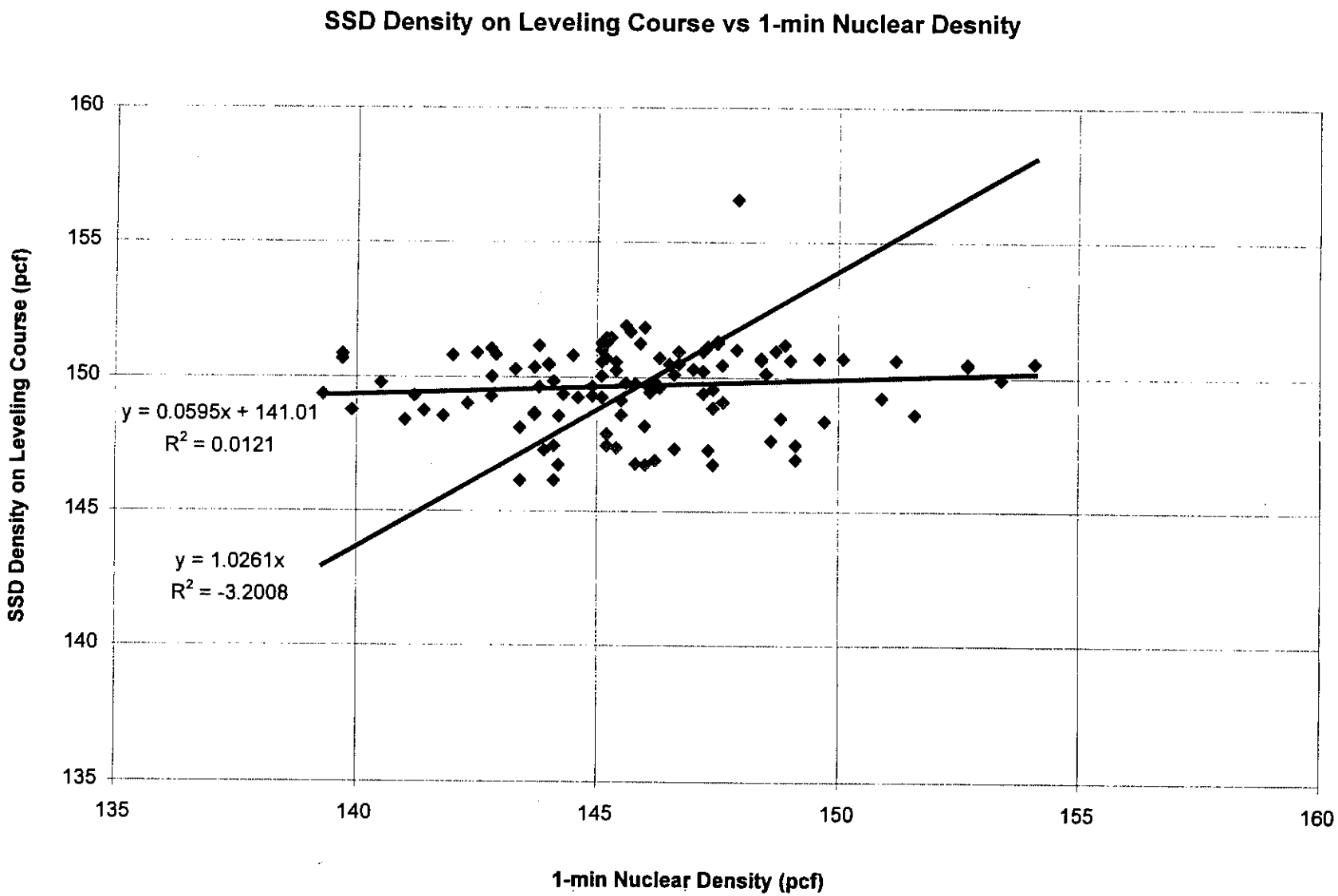

SSD Density on Surface Course vs 1-min Nuclear Density
y = 0.6238x + 58.563
R2 = 0.5436
y = 1.0253x
R2 = 0.3184
SSD Density on Surface Course (pcf)
1-min Nuclear Density (pcf)
160
155
150
145
140
135
135
140
145
150
155
160

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.736923							
R Square	0.543055							
Adjusted	0.538744							
Standard	1.665282							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	349.3504	349.3504	125.9754	9.78E-20			
Residual	106	293.9552	2.773163					
Total	107	643.3056						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	58.61602	8.101458	7.235243	7.63E-11	42.55408	74.67796	42.55408	74.67796
X Variable	0.623444	0.055546	11.22388	9.78E-20	0.513318	0.73357	0.513318	0.73357

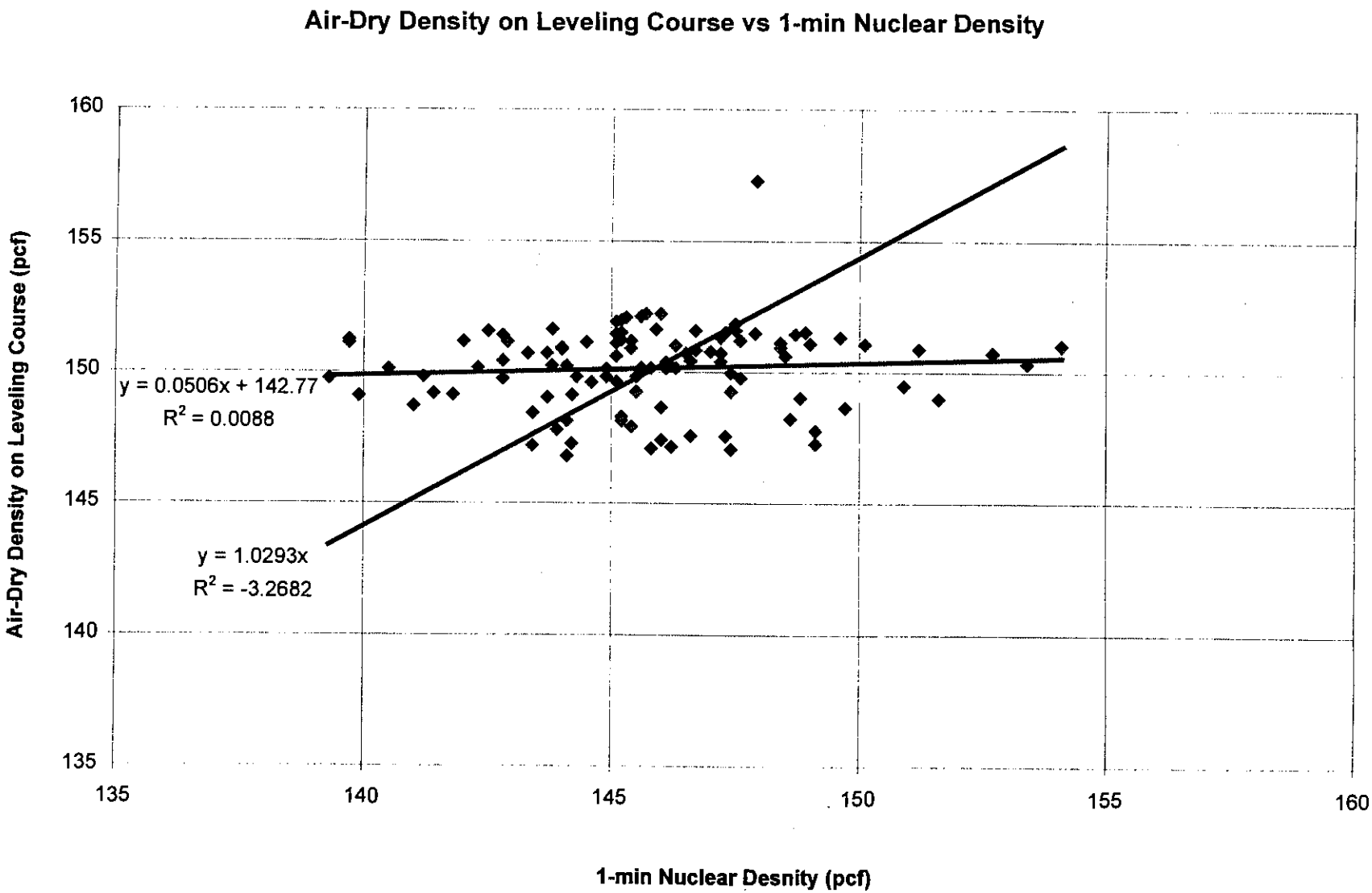
Air-Dry on Surface Course vs 1-min Nuclear Density



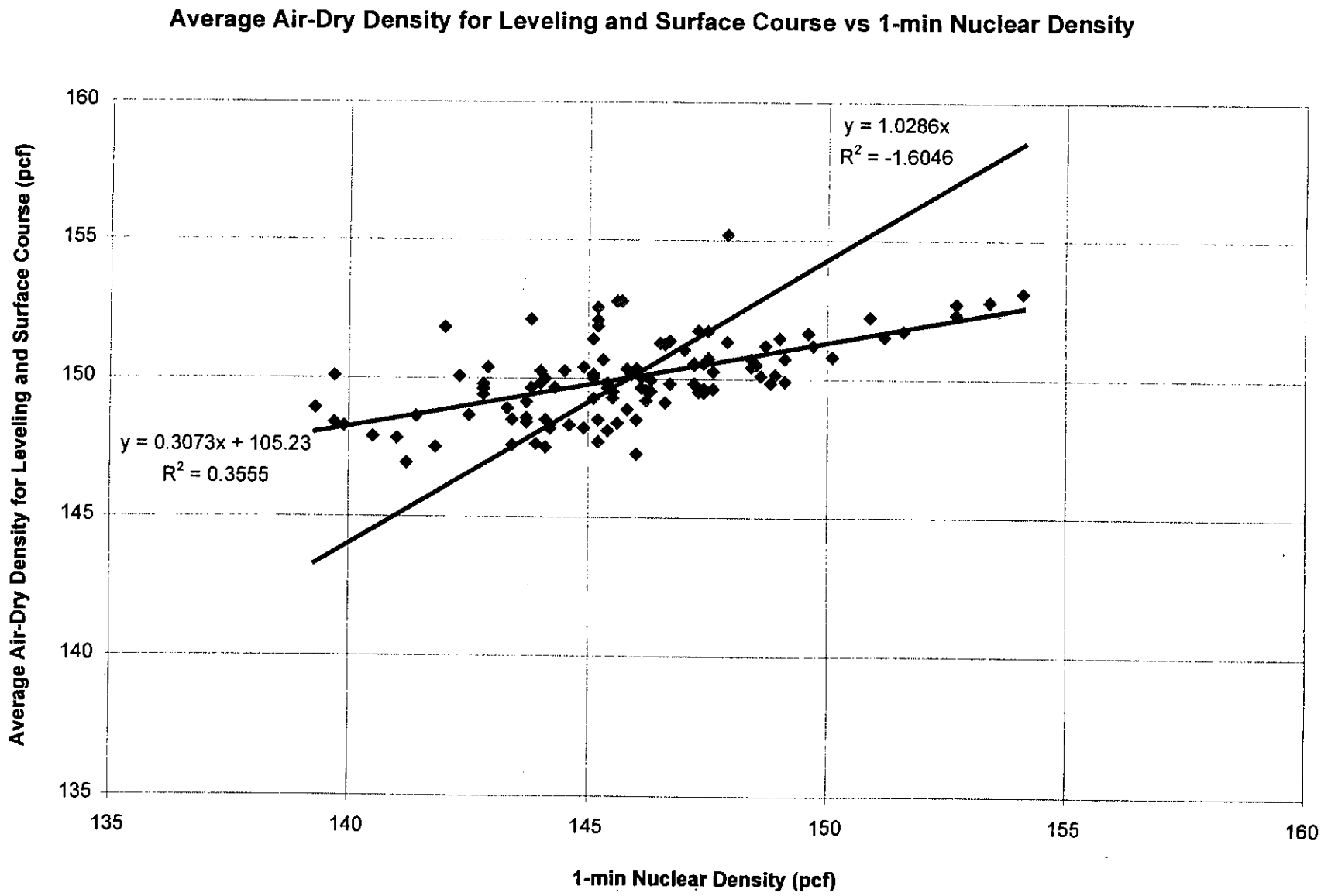
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.718255							
R Square	0.51589							
Adjusted	0.511323							
Standard	1.591973							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	286.2789	286.2789	112.9583	2.14E-18			
Residual	106	268.6439	2.534376					
Total	107	554.9228						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	67.62143	7.744816	8.731186	3.98E-14	52.26657	82.97629	52.26657	82.97629
X Variable	0.564367	0.053101	10.62819	2.14E-18	0.459089	0.669645	0.459089	0.669645


SSD Density on Leveling Course vs 1-min Nuclear Desnity
SSD Density on Leveling Course (pcf)
160
155
150
145
140
135
y = 0.0595x + 141.01
R2 = 0.0121
y = 1.0261x
R2 = -3.2008
135
140
145
150
155
160
1-min Nuclear Density (pcf)

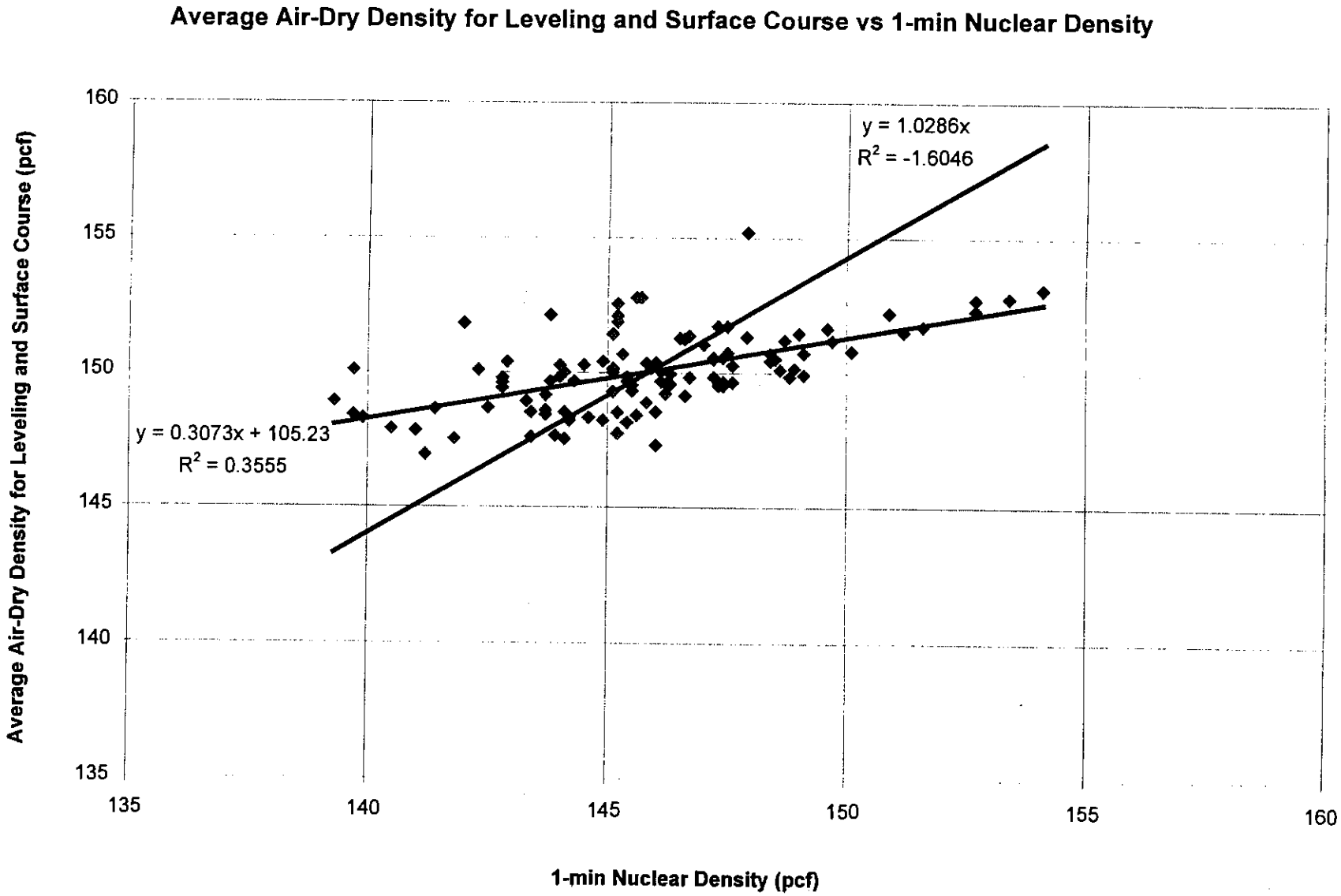
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.110221							
R Square	0.012149							
Adjusted	0.002829							
Standard	1.561053							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	3.176734	3.176734	1.303603	0.256129			
Residual	106	258.3101	2.436888					
Total	107	261.4869						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	141.0106	7.594397	18.56771	4.24E-35	125.9539	156.0672	125.9539	156.0672
X Variable	0.059451	0.05207	1.141754	0.256129	-0.04378	0.162684	-0.04378	0.162684


Air-Dry Density on Leveling Course vs 1-min Nuclear Density
Air-Dry Density on Leveling Course (pcf)
160
155
150
145
140
135
y = 0.0506x + 142.77
R2 = 0.0088
y = 1.0293x
R2 = -3.2682
135
140
145
150
155
160
1-min Nuclear Desnity (pcf)

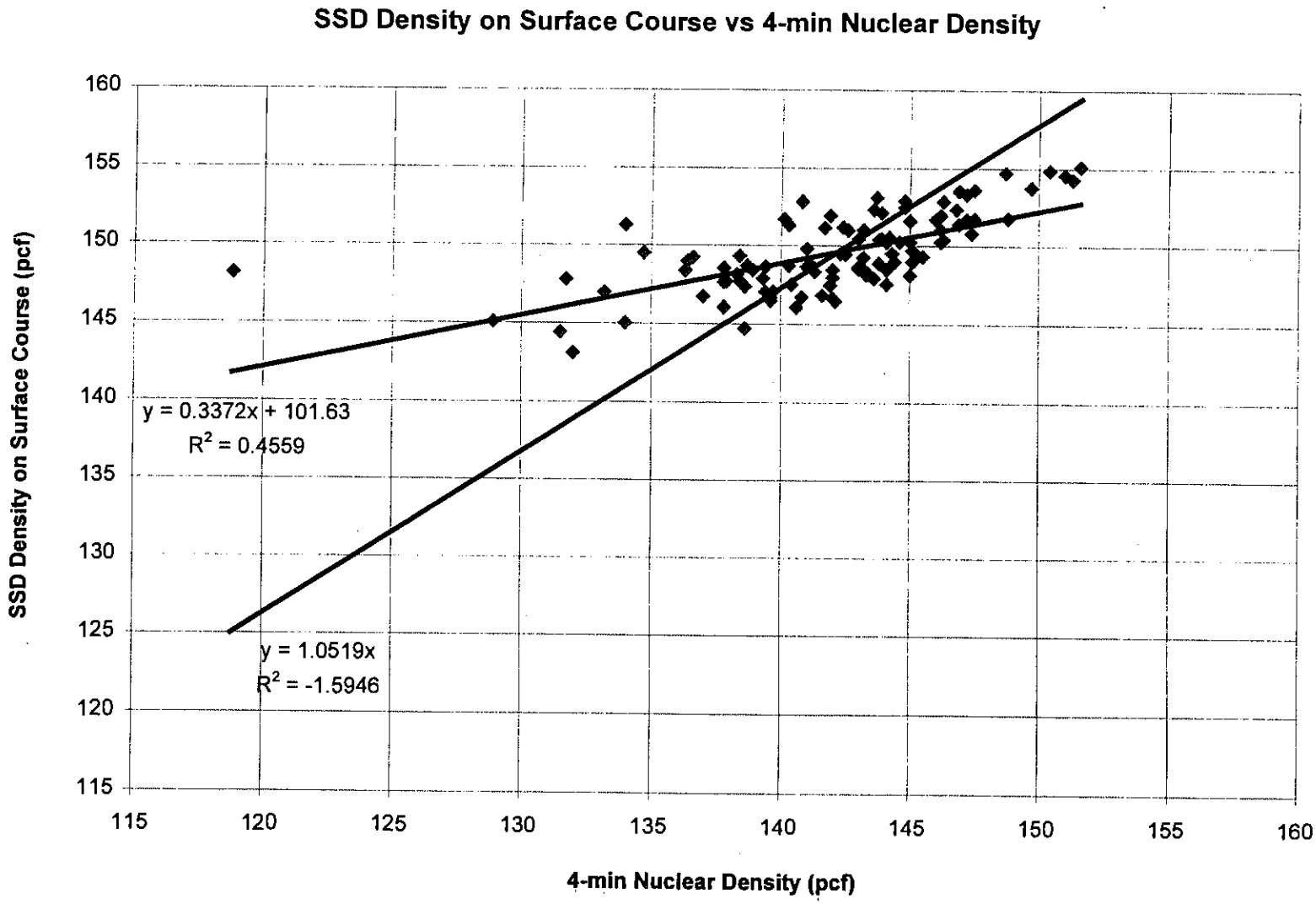
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.093544							
R Square	0.00875							
Adjusted	-0.0006							
Standard	1.567745							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	2.299857	2.299857	0.935729	0.33558			
Residual	106	260.5293	2.457823					
Total	107	262.8291						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	142.7724	7.62695	18.71947	2.18E-35	127.6513	157.8936	127.6513	157.8936
X Variable	0.050584	0.052293	0.967331	0.33558	-0.05309	0.15426	-0.05309	0.15426


Average Air-Dry Density for Leveling and Surface Course vs 1-min Nuclear Density
Average Air-Dry Density for Leveling and Surface Course (pcf)
160
155
150
145
140
135
y = 1.0286x
R2 = -1.6046
y = 0.3073x + 105.23
R2 = 0.3555
135
140
145
150
155
160
1-min Nuclear Density (pcf)

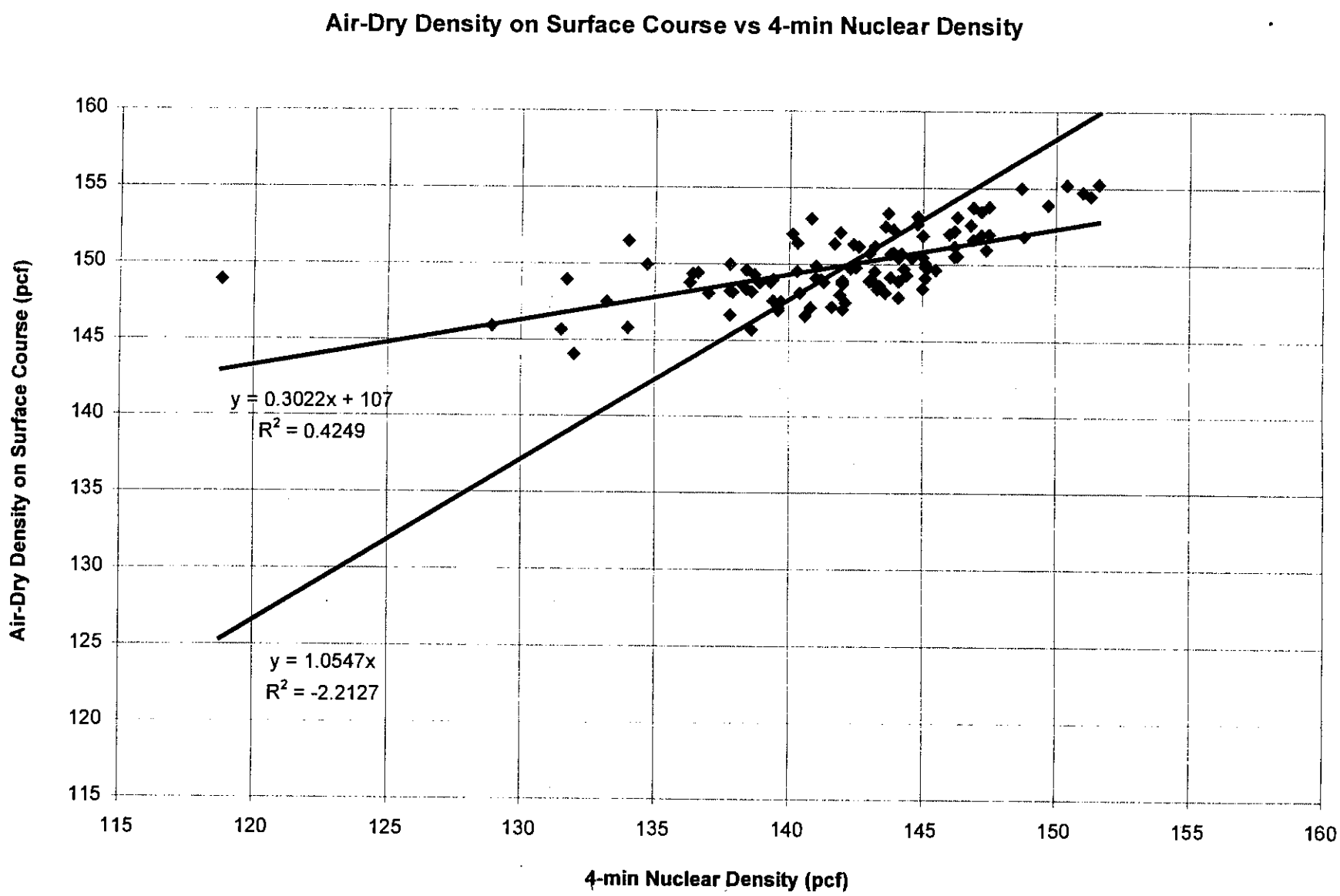
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.626018							
R Square	0.391898							
Adjusted	0.386161							
Standard	1.238527							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	104.7886	104.7886	68.31293	4.33E-13			
Residual	106	162.5986	1.533949					
Total	107	267.3872						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	99.8133	6.025332	16.56561	3.51E-31	87.86748	111.7591	87.86748	111.7591
X Variable	0.341447	0.041312	8.265164	4.33E-13	0.259543	0.423352	0.259543	0.423352


Average Air-Dry Density for Leveling and Surface Course vs 1-min Nuclear Density
Average Air-Dry Density for Leveling and Surface Course (pcf)
160
155
150
145
140
135
135
140
145
150
155
160
1-min Nuclear Density (pcf)
y = 1.0286x
R2 = -1.6046
y = 0.3073x + 105.23
R2 = 0.3555

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.596527							
R Square	0.355845							
Adjusted	0.349768							
Standard	1.204636							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	84.97435	84.97435	58.55664	9.6E-12			
Residual	106	153.8217	1.451148					
Total	107	238.796						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	105.1969	5.860456	17.9503	6.49E-34	93.578	116.8159	93.578	116.8159
X Variable	0.307476	0.040181	7.652231	9.6E-12	0.227813	0.387139	0.227813	0.387139

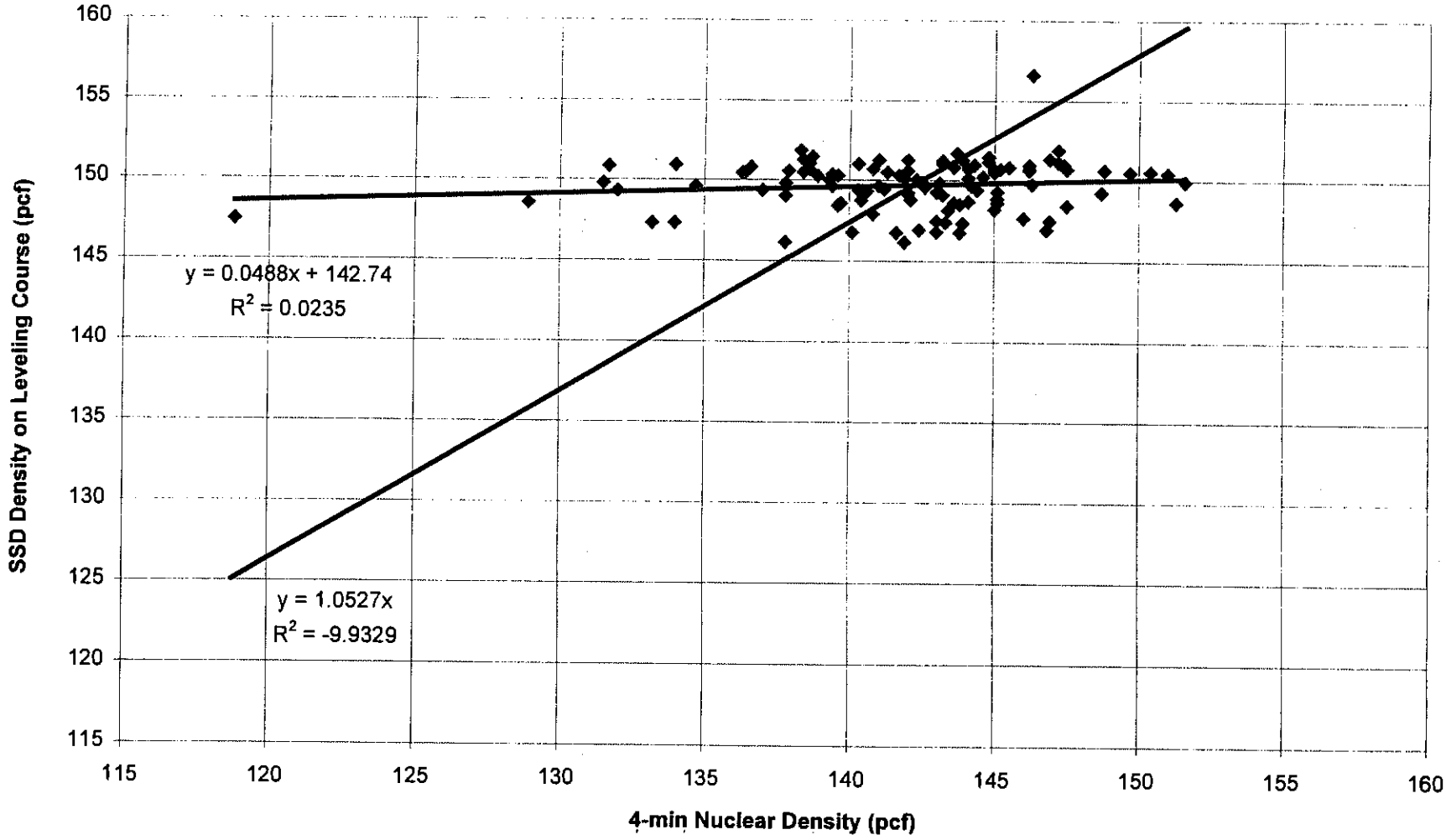

SSD Density on Surface Course vs 4-min Nuclear Density
SSD Density on Surface Course (pcf)
4-min Nuclear Density (pcf)
160
155
150
145
140
135
130
125
120
115
115
120
125
130
135
140
145
150
155
160
y = 0.3372x + 101.63
R2 = 0.4559
y = 1.0519x
R2 = -1.5946

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.674979							
R Square	0.455597							
Adjusted	0.450461							
Standard	1.817674							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	293.0882	293.0882	88.70876	1.14E-15			
Residual	106	350.2174	3.303938					
Total	107	643.3056						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	101.6532	5.086055	19.98664	9.64E-38	91.56956	111.7368	91.56956	111.7368
X Variable	0.337074	0.035788	9.418533	1.14E-15	0.26612	0.408028	0.26612	0.408028


Air-Dry Density on Surface Course vs 4-min Nuclear Density
Air-Dry Density on Surface Course (pcf)
160
155
150
145
140
135
130
125
120
115
y = 0.3022x + 107
R2 = 0.4249
y = 1.0547x
R2 = -2.2127
115
120
125
130
135
140
145
150
155
160
4-min Nuclear Density (pcf)

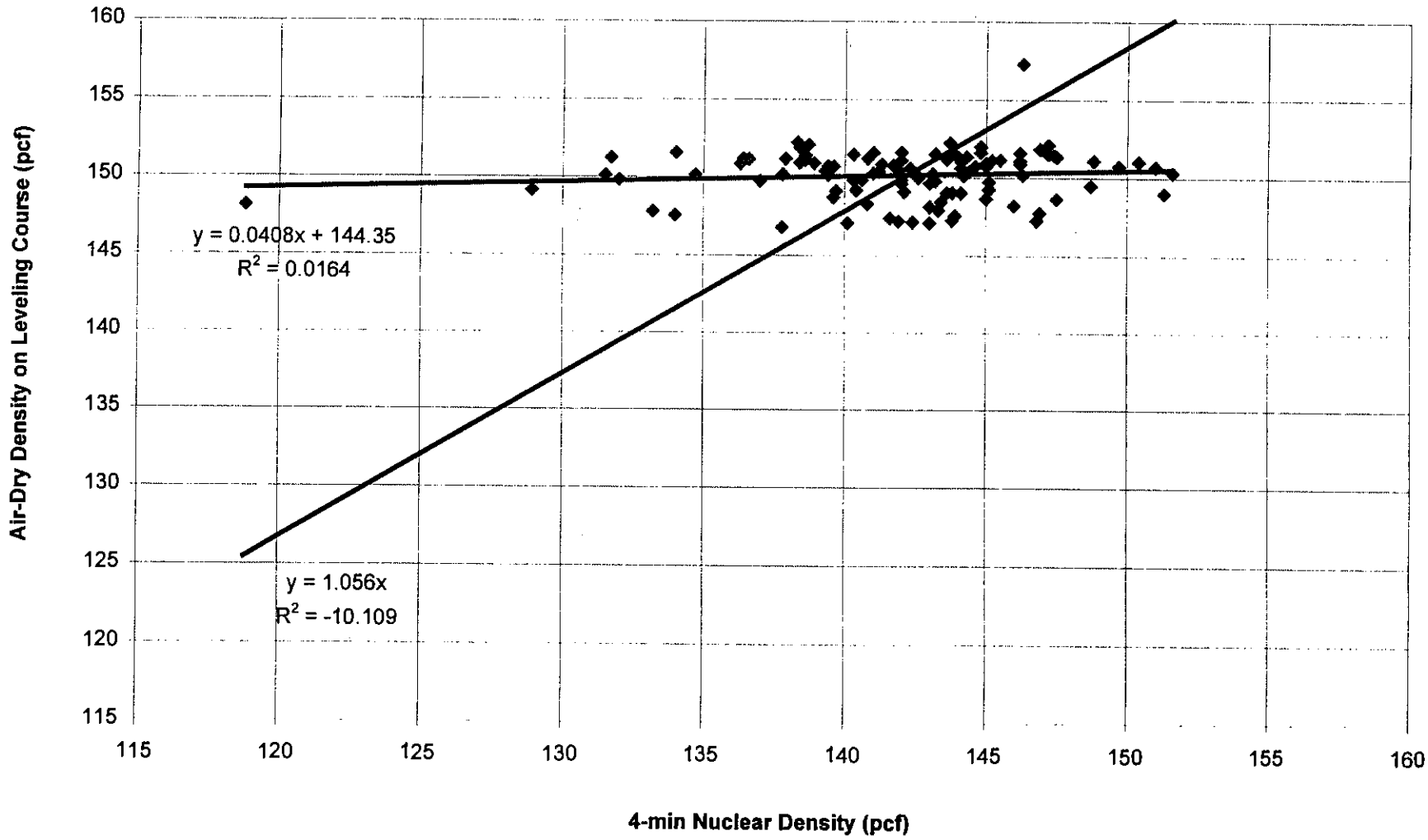
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.65171							
R Square	0.424726							
Adjusted	0.419298							
Standard	1.735405							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	235.6899	235.6899	78.25986	2.2E-14			
Residual	106	319.2329	3.011632					
Total	107	554.9228						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	106.9869	4.855859	22.03254	2.29E-41	97.35969	116.6141	97.35969	116.6141
X Variable	0.302271	0.034169	8.84646	2.2E-14	0.234529	0.370014	0.234529	0.370014

SSD Density on Leveling Course vs 4-min Nuclear Density

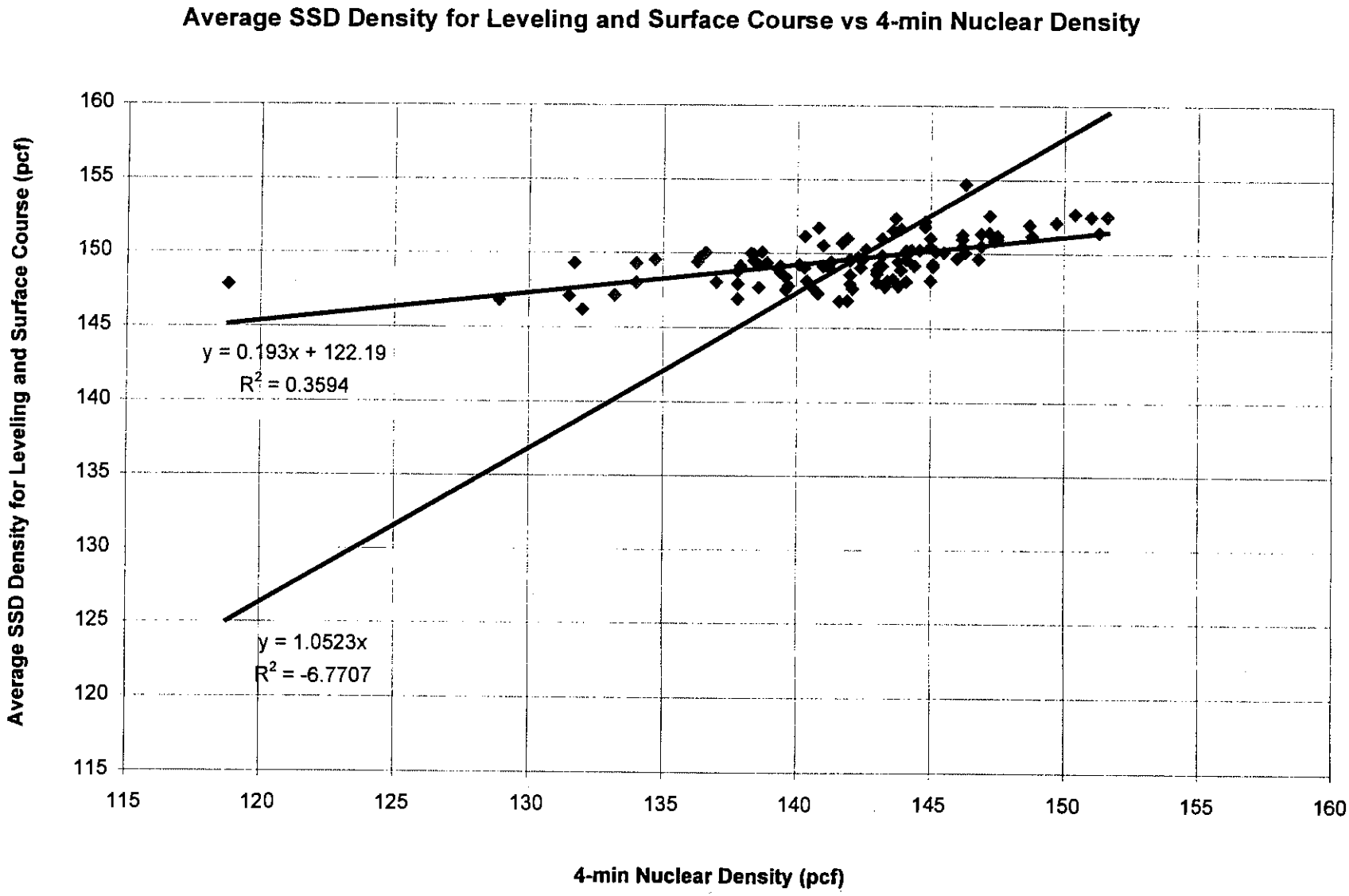


SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.153261							
R Square	0.023489							
Adjusted	0.014276							
Standard	1.552068							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	6.142012	6.142012	2.549702	0.113292			
Residual	106	255.3448	2.408914					
Total	107	261.4869						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	142.7493	4.342859	32.86989	2.06E-57	134.1392	151.3595	134.1392	151.3595
X Variable	0.048796	0.030559	1.596779	0.113292	-0.01179	0.109382	-0.01179	0.109382

Air-Dry Density on Leveling Course vs 4-min Nuclear Density

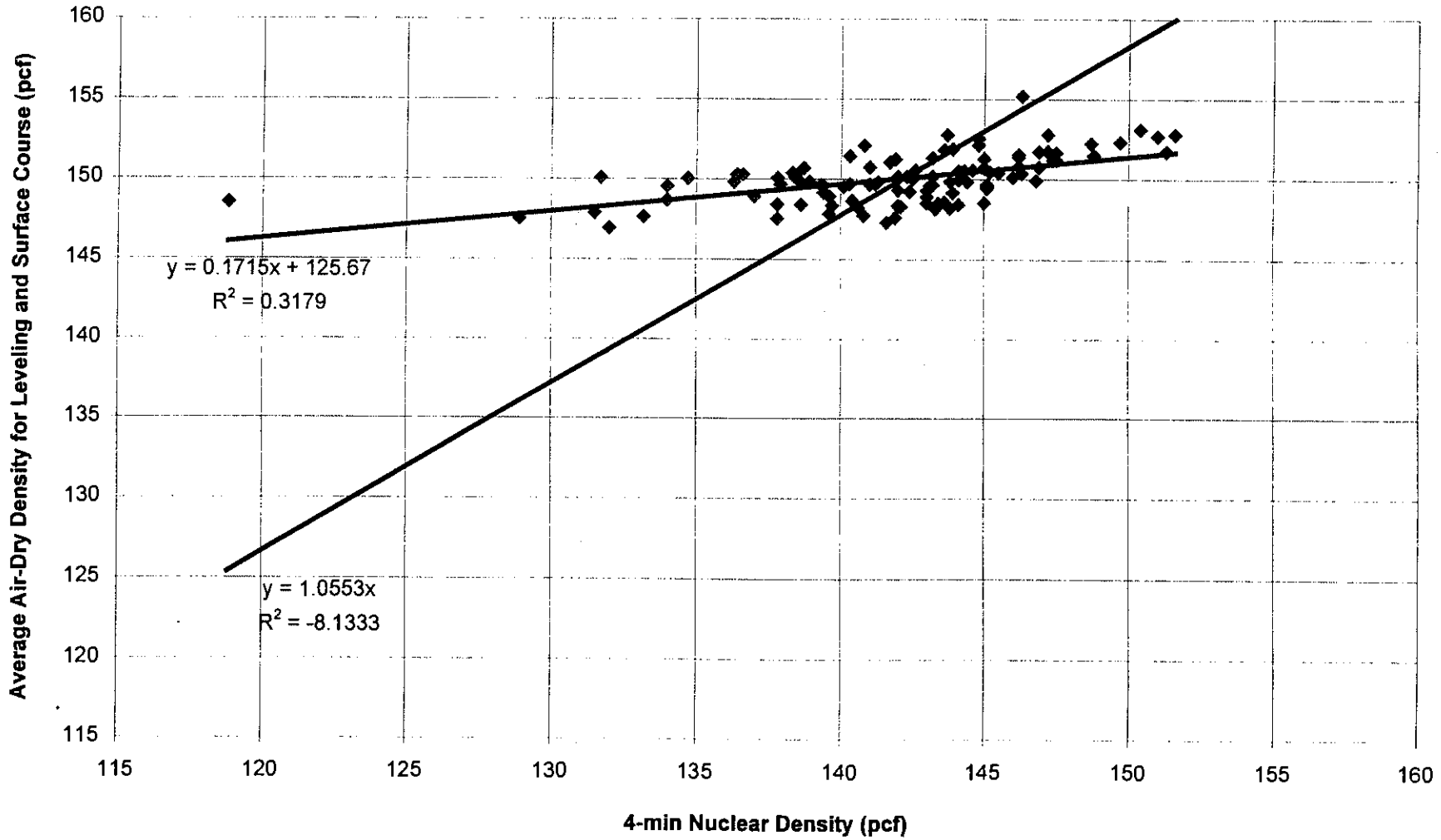


SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.127951							
R Square	0.016371							
Adjusted	0.007092							
Standard	1.561706							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	4.302902	4.302902	1.76426	0.186947			
Residual	106	258.5262	2.438927					
Total	107	262.8291						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	144.348	4.36983	33.03286	1.28E-57	135.6843	153.0116	135.6843	153.0116
X Variable	0.040842	0.030749	1.328255	0.186947	-0.02012	0.101804	-0.02012	0.101804


Average SSD Density for Leveling and Surface Course vs 4-min Nuclear Density
Average SSD Density for Leveling and Surface Course (pcf)
160
155
150
145
140
135
130
125
120
115
y = 0.193x + 122.19
R2 = 0.3594
y = 1.0523x
R2 = -6.7707
115
120
125
130
135
140
145
150
155
160
4-min Nuclear Density (pcf)

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.599259							
R Square	0.359111							
Adjusted	0.353065							
Standard	1.271478							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	96.02165	96.02165	59.39524	7.3E-12			
Residual	106	171.3655	1.616656					
Total	107	267.3872						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	122.2012	3.557738	34.34802	2.9E-59	115.1477	129.2548	115.1477	129.2548
X Variable	0.192935	0.025034	7.706831	7.3E-12	0.143302	0.242568	0.143302	0.242568

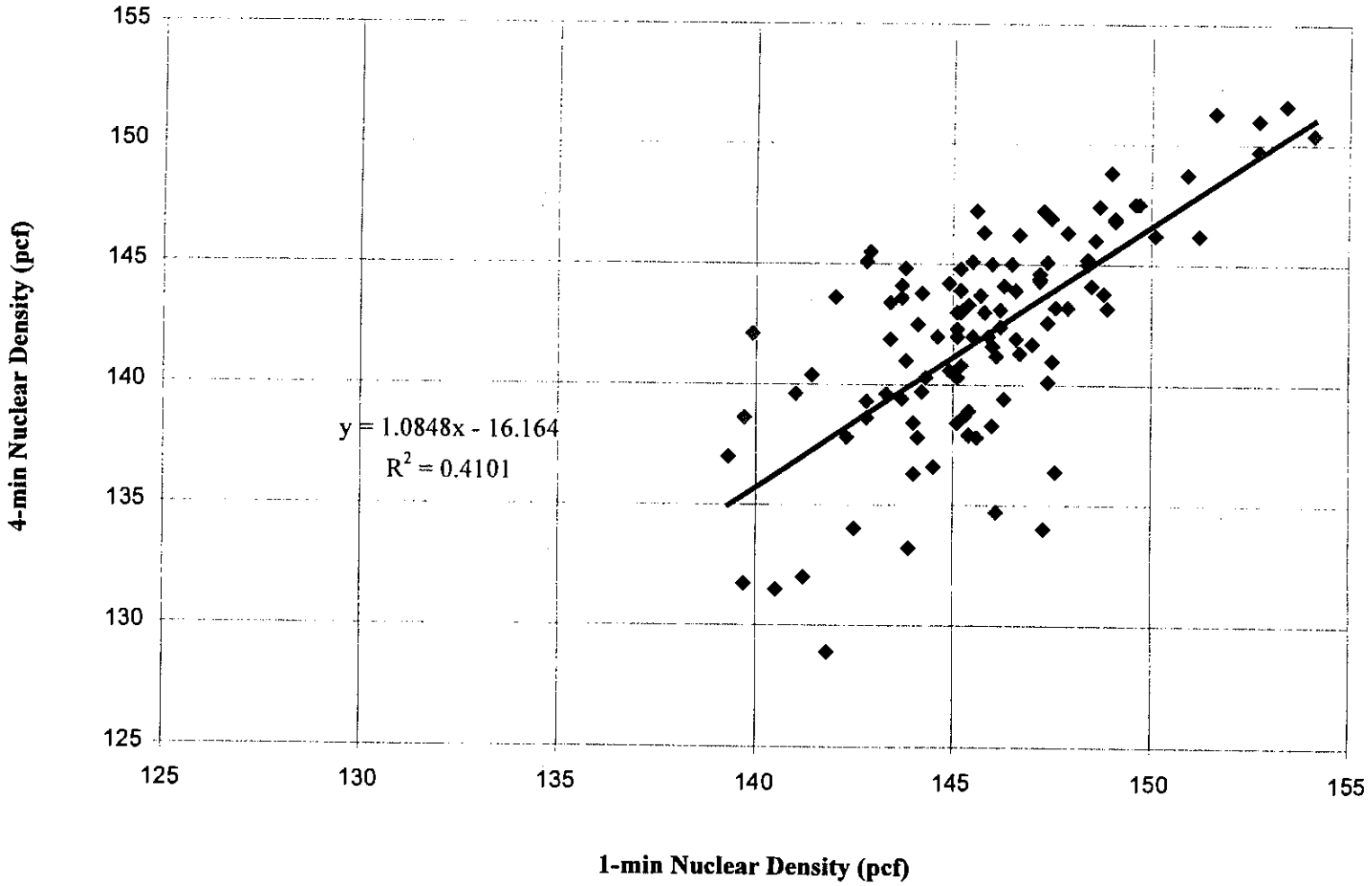
Average Air-Dry Density for Leveling and Surface Course vs 4-min Nuclear Density



avg air sc+lc vs. nuc4

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.563855							
R Square	0.317933							
Adjusted	0.311498							
Standard	1.239579							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	75.92106	75.92106	49.40987	2.1E-10			
Residual	106	162.875	1.536556					
Total	107	238.796						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	125.6674	3.468482	36.23125	1.57E-61	118.7908	132.544	118.7908	132.544
X Variable	0.171557	0.024406	7.029216	2.1E-10	0.123169	0.219944	0.123169	0.219944

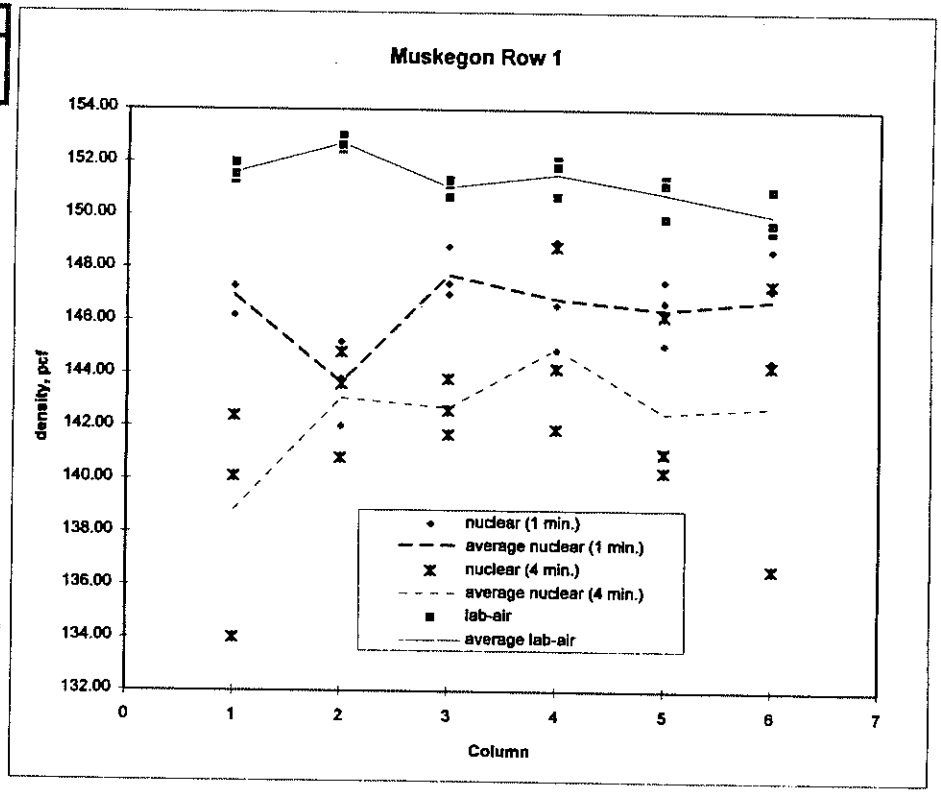
Site 3 Muskegon Random : 1-min Nuclear vs. 4-min Nuclear Density



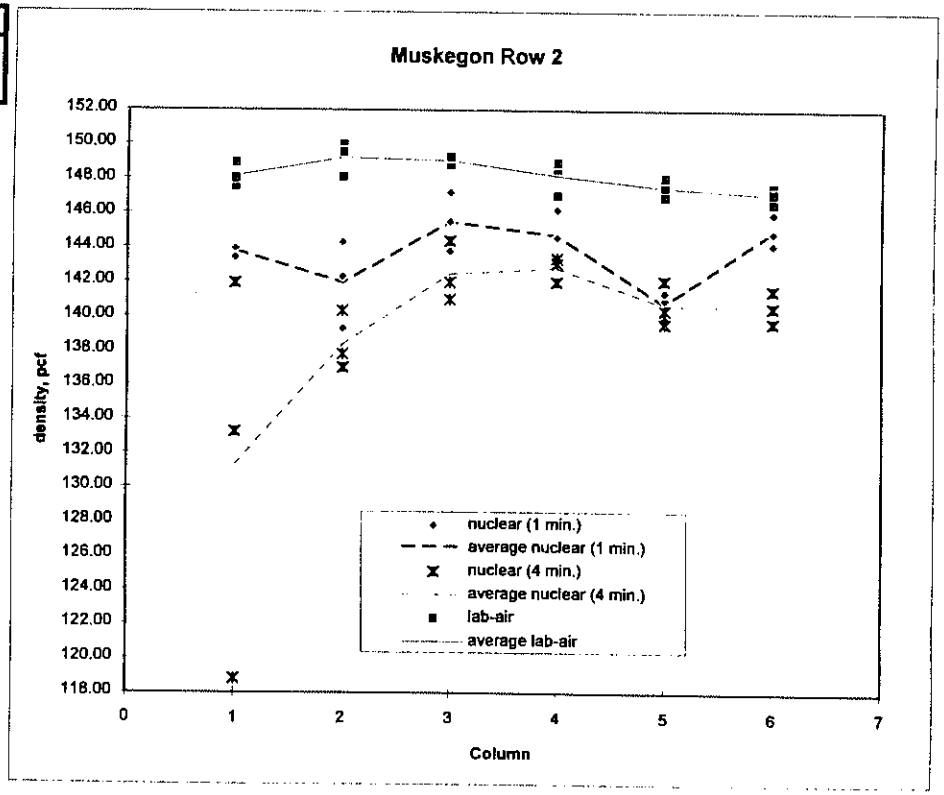
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.640365							
R Square	0.410067							
Adjusted	0.404502							
Standard	3.788976							
Observati	108							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressio	1	1057.797	1057.797	73.68152	8.49E-14			
Residual	106	1521.772	14.35634					
Total	107	2579.569						
	Coefficient	*andard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*wer 95.00*	*per 95.00*
Intercept	-16.1641	18.43306	-0.87691	0.38252	-52.7094	20.38128	-52.7094	20.38128
X Variable	1.084846	0.126383	8.583794	8.49E-14	0.834279	1.335413	0.834279	1.335413

Density Data for Each Row

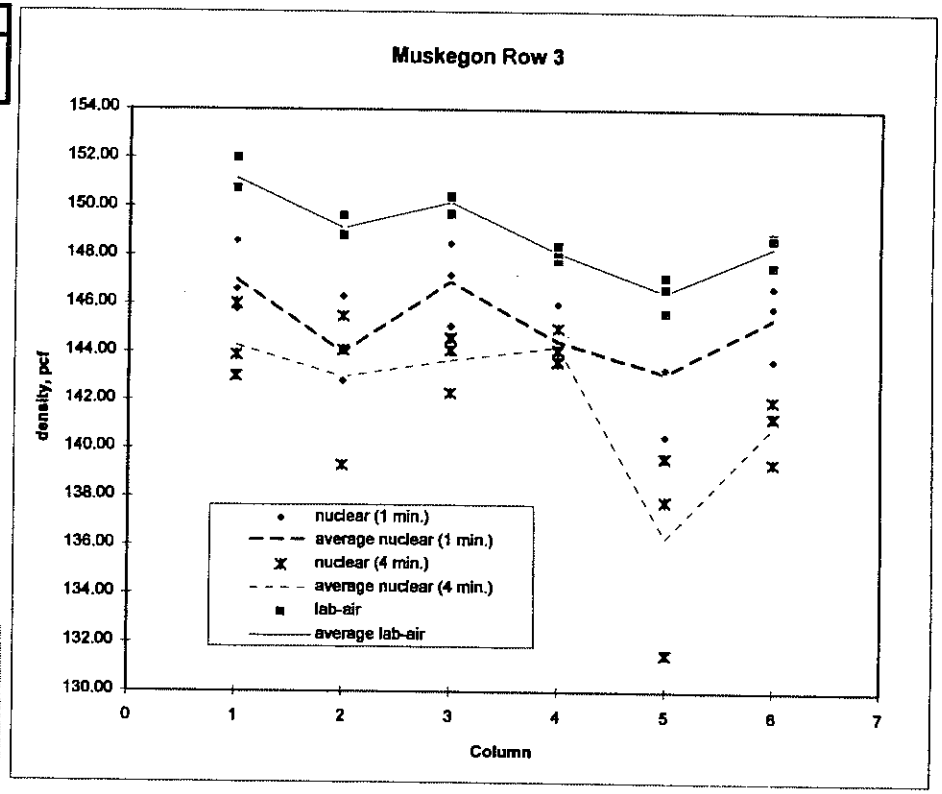
column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface coarse $S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	111	146.20	142.40	2.423	2.425	151.18	151.30
1	112	147.40	140.10	2.431	2.436	151.71	151.98
1	113	147.30	134.00	2.424	2.428	151.29	151.52
2	121	142.00	143.60	2.441	2.443	152.31	152.47
2	122	145.20	140.80	2.449	2.452	152.80	152.99
2	123	143.80	144.80	2.443	2.446	152.47	152.65
3	131	147.40	142.60	2.420	2.422	150.99	151.16
3	132	147.00	141.70	2.422	2.425	151.14	151.33
3	133	148.80	143.80	2.410	2.415	150.39	150.68
4	141	146.60	141.90	2.435	2.437	151.95	152.08
4	142	144.90	144.20	2.413	2.415	150.56	150.71
4	143	149.00	148.80	2.432	2.434	151.77	151.85
5	151	147.50	141.00	2.401	2.402	149.80	149.89
5	152	145.10	140.30	2.425	2.426	151.30	151.39
5	153	146.70	146.20	2.420	2.422	151.03	151.16
6	161	144.50	136.60	2.392	2.394	149.23	149.41
6	162	148.70	147.40	2.417	2.419	150.81	150.96
6	163	147.20	144.30	2.396	2.399	149.52	149.70
1	avg	146.97	138.83				151.60
2	avg	143.67	143.07				152.70
3	avg	147.73	142.70				151.06
4	avg	146.83	144.97				151.55
5	avg	146.43	142.50				150.82
6	avg	146.80	142.77				150.02



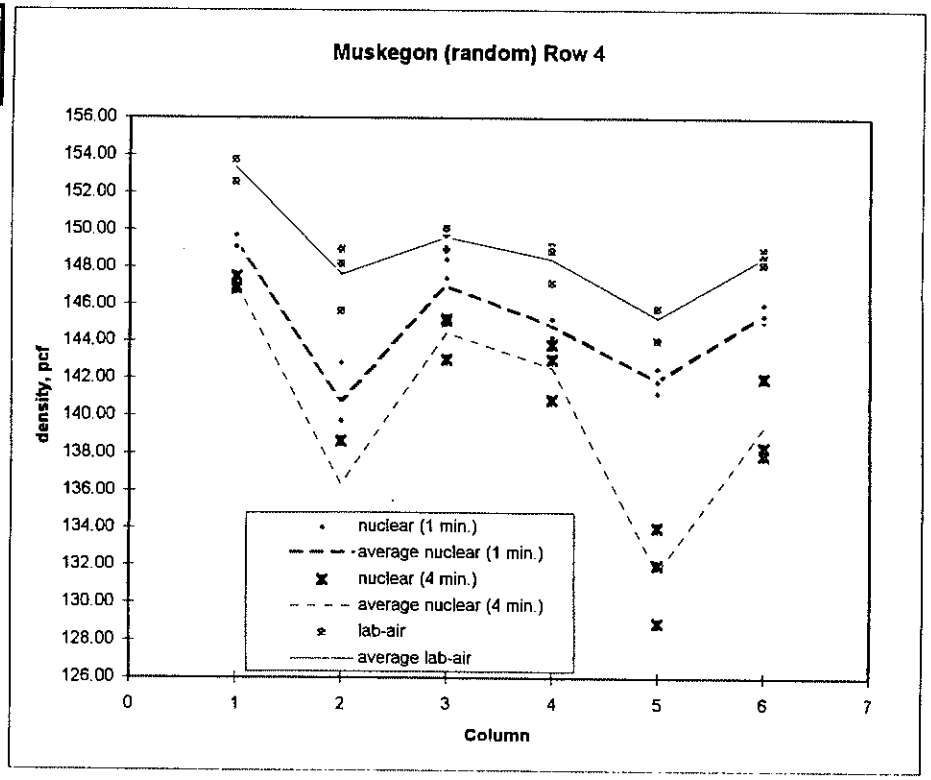
column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface coarse S.G.$_{SSD}$	S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	211	144.10	118.80	2.374	2.386	148.13	148.90
1	212	143.90	133.20	2.355	2.364	146.97	147.50
1	213	143.40	141.90	2.363	2.372	147.48	148.00
2	221	142.30	137.80	2.381	2.403	148.56	149.98
2	222	144.30	140.30	2.383	2.396	148.72	149.53
2	223	139.30	137.00	2.352	2.373	146.75	148.08
3	231	143.80	141.00	2.382	2.389	148.64	149.07
3	232	145.50	142.00	2.371	2.385	147.96	148.81
3	233	147.20	144.40	2.387	2.392	148.97	149.28
4	241	143.40	143.40	2.375	2.381	148.18	148.60
4	242	144.60	142.00	2.350	2.356	146.64	147.04
4	243	146.20	143.10	2.382	2.387	148.65	148.95
5	251	139.90	142.10	2.347	2.364	146.47	147.48
5	252	141.00	139.60	2.350	2.355	146.67	146.96
5	253	141.40	140.40	2.364	2.373	147.50	148.09
6	261	144.90	140.60	2.341	2.350	146.05	146.61
6	262	144.20	139.70	2.357	2.365	147.05	147.56
6	263	146.00	141.60	2.353	2.359	146.81	147.20
1	avg	143.80	131.30				148.13
2	avg	141.97	138.37				149.20
3	avg	145.50	142.47				149.06
4	avg	144.73	142.83				148.20
5	avg	140.77	140.70				147.51
6	avg	145.03	140.63				147.12



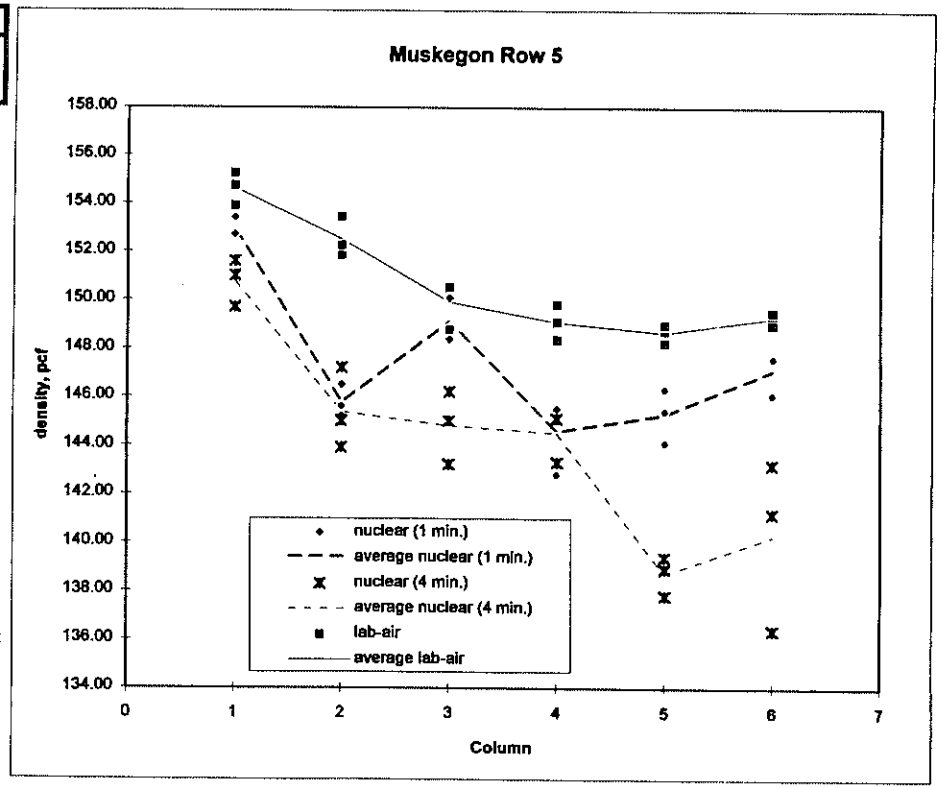
column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface S.G.$_{SSD}$	coarse S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	311	145.80	143.00	2.411	2.416	150.43	150.73
1	312	146.60	143.90	2.411	2.416	150.45	150.75
1	313	148.60	146.00	2.431	2.436	151.69	152.00
2	321	142.90	145.50	2.393	2.398	149.31	149.64
2	322	146.30	144.10	2.379	2.386	148.47	148.90
2	323	142.80	139.30	2.370	2.385	147.90	148.82
3	331	147.20	144.60	2.408	2.411	150.25	150.42
3	332	145.10	142.30	2.395	2.399	149.48	149.72
3	333	148.50	144.10	2.407	2.411	150.20	150.43
4	341	143.70	144.10	2.365	2.369	147.55	147.82
4	342	143.70	143.60	2.370	2.374	147.91	148.13
4	343	146.00	145.00	2.374	2.378	148.11	148.41
5	351	145.60	137.80	2.341	2.350	146.05	146.65
5	352	140.50	131.50	2.314	2.335	144.42	145.67
5	353	143.30	139.60	2.348	2.358	146.49	147.14
6	361	146.70	141.30	2.377	2.385	148.34	148.82
6	362	143.70	139.40	2.356	2.365	147.04	147.59
6	363	145.90	142.00	2.371	2.383	147.96	148.69
1	avg	147.00	144.30				151.16
2	avg	144.00	142.97				149.12
3	avg	146.93	143.67				150.19
4	avg	144.47	144.23				148.12
5	avg	143.13	136.30				146.49
6	avg	145.43	140.90				148.37



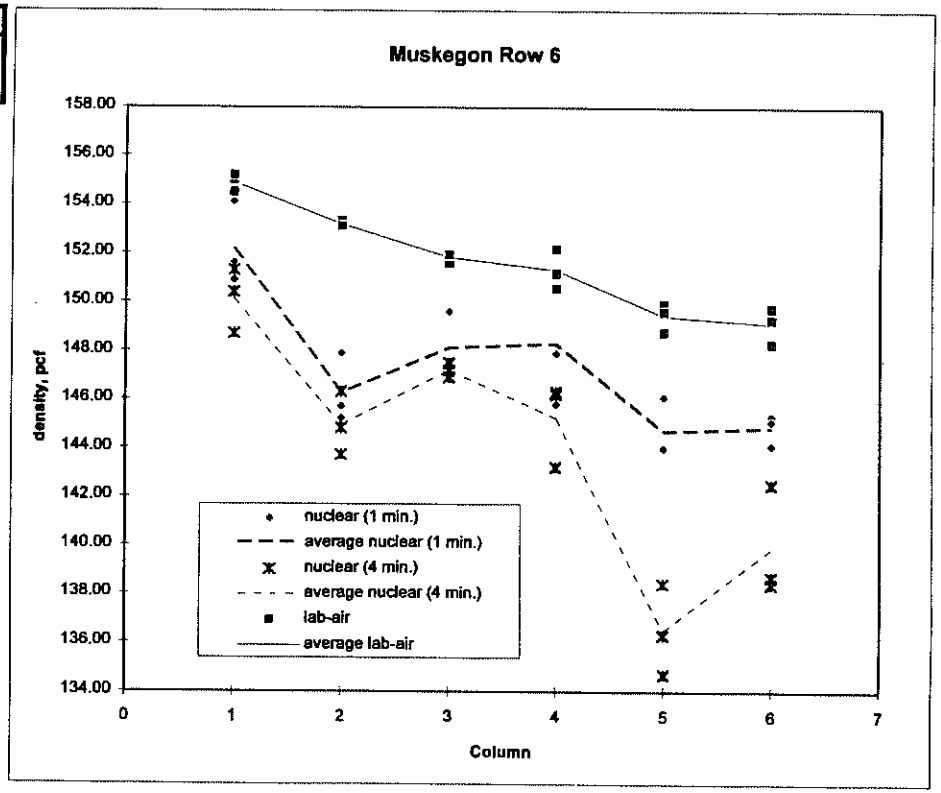
column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface coarse $S.G._{SSD}$	$S.G._{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	411	149.10	146.80	2.441	2.445	152.35	152.58
1	412	149.10	146.90	2.460	2.463	153.53	153.72
1	413	149.70	147.50	2.462	2.464	153.60	153.77
2	421	139.70	131.70	2.368	2.387	147.78	148.94
2	422	142.80	138.60	2.362	2.375	147.36	148.18
2	423	139.70	138.60	2.319	2.335	144.70	145.63
3	431	145.10	143.00	2.380	2.387	148.51	148.94
3	432	148.40	145.20	2.397	2.400	149.43	149.76
3	433	147.40	145.10	2.399	2.405	149.70	150.07
4	441	144.20	143.80	2.386	2.390	148.87	149.15
4	442	145.20	143.00	2.382	2.386	148.63	148.89
4	443	145.20	140.80	2.351	2.358	146.70	147.16
5	451	141.80	128.90	2.325	2.338	145.08	145.91
5	452	141.20	132.00	2.293	2.308	143.09	144.05
5	453	142.50	134.00	2.324	2.337	145.04	145.81
6	461	145.10	142.00	2.379	2.387	148.50	148.92
6	462	146.00	138.30	2.374	2.380	148.14	148.53
6	463	145.40	137.90	2.367	2.374	147.68	148.16
1	avg	149.30	147.07				153.36
2	avg	140.73	136.30				147.58
3	avg	146.97	144.43				149.59
4	avg	144.87	142.53				148.40
5	avg	141.83	131.63				145.26
6	avg	145.50	139.40				148.54



column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface coarse S.G.$_{SSD}$	S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	511	153.40	151.60	2.486	2.488	155.11	155.26
1	512	152.70	149.70	2.464	2.466	153.74	153.90
1	513	152.70	151.00	2.477	2.480	154.57	154.72
2	521	145.60	147.20	2.457	2.459	153.31	153.45
2	522	146.50	145.00	2.429	2.434	151.58	151.86
2	523	145.20	143.90	2.438	2.440	152.12	152.26
3	531	148.90	143.20	2.380	2.384	148.48	148.79
3	532	148.40	145.00	2.408	2.412	150.25	150.48
3	533	150.10	146.20	2.408	2.412	150.24	150.52
4	541	145.40	143.30	2.374	2.378	148.15	148.37
4	542	145.50	145.10	2.399	2.401	149.68	149.83
4	543	142.80	145.10	2.387	2.389	148.97	149.10
5	551	145.40	138.90	2.379	2.384	148.43	148.76
5	552	144.10	137.80	2.366	2.376	147.65	148.24
5	553	146.30	139.40	2.382	2.388	148.64	148.99
6	561	147.60	136.40	2.388	2.393	148.99	149.35
6	562	147.60	143.20	2.392	2.396	149.24	149.52
6	563	146.10	141.20	2.383	2.387	148.71	148.98
1	avg	152.93	150.77				154.63
2	avg	145.77	145.37				152.53
3	avg	149.13	144.80				149.93
4	avg	144.57	144.50				149.10
5	avg	145.27	138.70				148.66
6	avg	147.10	140.27				149.29



column	(Random) Test Number	(1 min.) $\gamma_{nuclear}$ (lbs/ft^3)	(4 min.) $\gamma_{nuclear}$ (lbs/ft^3)	surface coarse S.G.$_{SSD}$	S.G.$_{AIR}$	γ_{SSD} (lbs/ft^3)	γ_{AIR} (lbs/ft^3)
1	611	150.90	148.70	2.479	2.484	154.70	154.99
1	612	154.10	150.40	2.482	2.487	154.86	155.20
1	613	151.60	151.30	2.472	2.476	154.27	154.48
2	621	147.90	146.30	2.450	2.453	152.85	153.09
2	622	145.70	143.70	2.454	2.457	153.10	153.34
2	623	145.20	144.80	2.450	2.454	152.89	153.12
3	631	147.50	146.90	2.426	2.430	151.38	151.60
3	632	149.60	147.50	2.432	2.435	151.75	151.97
3	633	147.30	147.20	2.431	2.435	151.68	151.94
4	641	145.80	146.30	2.410	2.413	150.40	150.56
4	642	147.90	143.20	2.420	2.423	151.03	151.19
4	643	151.20	146.20	2.435	2.439	151.94	152.18
5	651	144.00	136.30	2.378	2.384	148.39	148.78
5	652	146.10	134.70	2.396	2.403	149.50	149.95
5	653	144.00	138.40	2.393	2.398	149.33	149.61
6	661	144.10	142.50	2.395	2.400	149.45	149.77
6	662	145.30	138.70	2.383	2.393	148.69	149.30
6	663	145.10	138.40	2.367	2.377	147.73	148.32
1	avg	152.20	150.13				154.89
2	avg	146.27	144.93				153.18
3	avg	148.13	147.20				151.84
4	avg	148.30	145.23				151.31
5	avg	144.70	136.47				149.45
6	avg	144.83	139.87				149.13



Air-dry Lab Density Grid Analysis

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data -- from Muskegon (random)
Date: 4/26/96
Description: Samples xx1, surface course unit weight in air

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	155.0	153.1	151.6	150.6	148.8	149.8
5	155.3	153.5	148.8	148.4	148.8	149.4
4	152.6	148.9	148.9	149.2	145.9	148.9
3	150.7	149.6	150.4	147.8	146.7	148.8
2	148.9	150.0	149.1	148.6	147.5	146.6
1	151.3	152.5	151.2	152.1	149.9	149.4
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	**DIFF !**	--	--	--	**DIFF !**	--
6 of 6 test	--	--	--	--	**DIFF !**	**DIFF !**

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

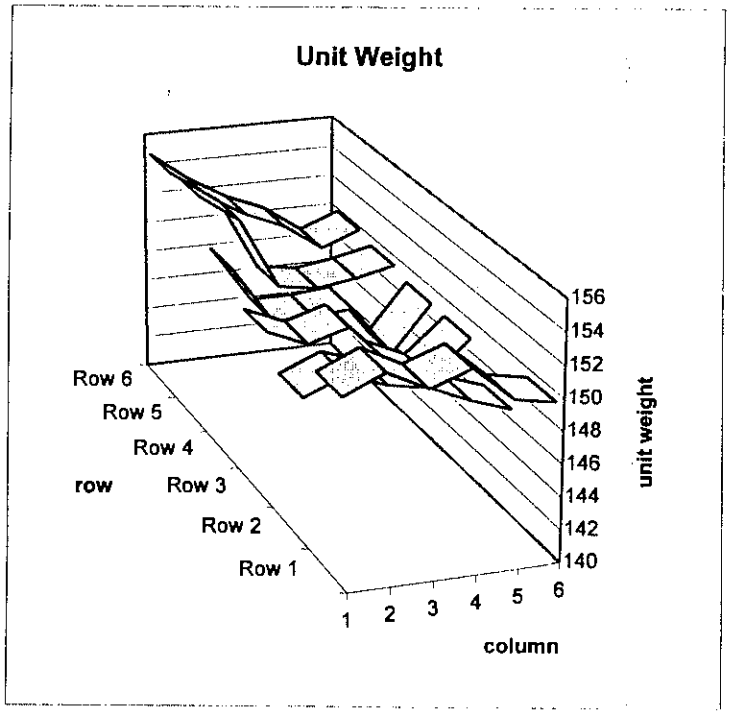
Description: *Samples xx1, surface course unit weight in air*

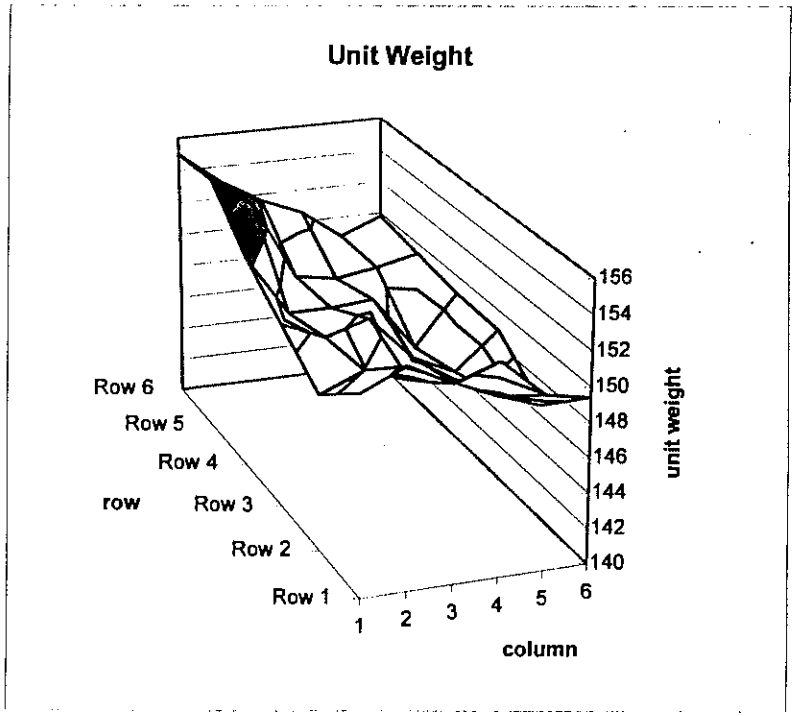
Clear Colors

Color Above and Below Average

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	155.0	153.1	151.6	150.6	148.8	149.8	151.47	2.280	1.51%
5	155.3	153.5	148.8	148.4	148.8	149.4	150.66	2.933	1.95%
4	152.6	148.9	148.9	149.2	145.9	148.9	149.07	2.115	1.42%
3	150.7	149.6	150.4	147.8	146.7	148.8	149.01	1.573	1.06%
2	148.9	150.0	149.1	148.6	147.5	146.6	148.44	1.206	0.81%
1	151.3	152.5	151.2	152.1	149.9	149.4	151.05	1.199	0.79%
Average	152.29	151.26	150.00	149.43	147.91	148.81	149.95	**149.95**	1.884	1.26%
Std. Dev.	2.494	1.962	1.228	1.599	1.495	1.134	1.652		**2.176865**	
Coeff. of Var.	1.64%	1.30%	0.82%	1.07%	1.01%	0.76%	1.10%			**1.45%**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx1, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet T. F. Wolff April 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

Description: *Samples xx1, surface course unit weight in air*

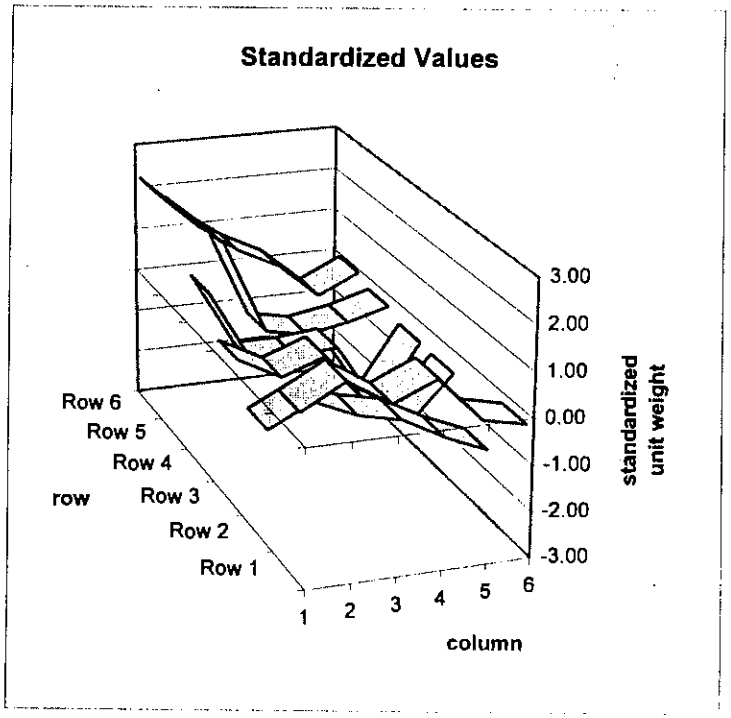
Clear Colors

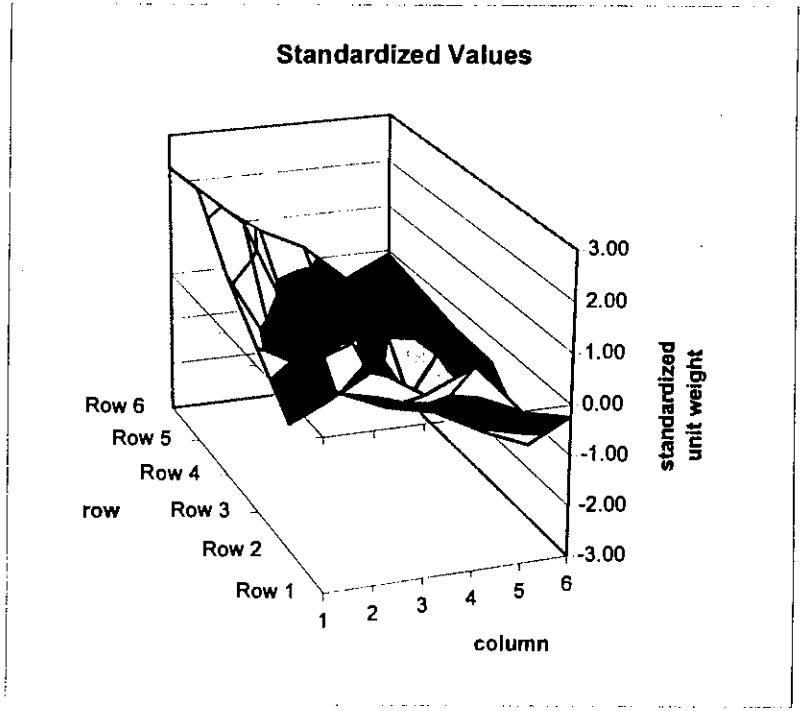
Color Above and Below Average

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.31	1.44	0.76	0.28	-0.54	-0.08	0.70	1.047
5	2.44	1.61	-0.53	-0.73	-0.55	-0.28	0.33	1.347
4	1.21	-0.46	-0.46	-0.37	-1.86	-0.47	-0.40	0.972
3	0.36	-0.14	0.22	-0.98	-1.52	-0.52	-0.43	0.722
2	-0.48	0.01	-0.40	-0.62	-1.14	-1.53	-0.69	0.554
1	0.62	1.16	0.56	0.98	-0.03	-0.25	0.51	0.551
Average	1.08	0.60	0.02	-0.24	-0.94	-0.52	0.00	**0.00**	0.866
Std. Dev.	1.146	0.901	0.564	0.734	0.687	0.521	0.759		**1.00**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx1, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	152.29	2.34	5.486	2.494	6.220
2	151.26	1.31	1.718	1.962	3.851
3	150.00	0.05	0.002	1.228	1.507
4	149.43	-0.52	0.272	1.599	2.556
5	147.91	-2.04	4.159	1.495	2.234
6	148.81	-1.14	1.295	1.134	1.285
sum			12.931		17.654
all data	149.95			2.176865	4.7387

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	77.5863889	5	15.517	**5.27383**	2.533554	0.001362
within columns:	88.2695667	30	2.942			
Total:	165.855956			**Different ?**	**1**	**YES!**

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.03	2.30	2.86	4.38	3.48
2	1.03		1.27	1.83	3.35	2.45
3	2.30	1.27		0.57	2.08	1.18
4	2.86	1.83	0.57		1.52	0.62
5	4.38	3.35	2.08	1.52		-0.90
6	3.48	2.45	1.18	0.62	-0.90	

Critical Values

Columns	1	2	3	4	5	6
1		4.32	3.79	4.04	3.96	3.73
2	4.32		3.15	3.45	3.36	3.09
3	3.79	3.15		2.75	2.64	2.28
4	4.04	3.45	2.75		2.98	2.67
5	3.96	3.36	2.64	2.98		2.56
6	3.73	3.09	2.28	2.67	2.56	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	1	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	1	0	0	0		0
6	0	0	0	0	0	
Sum	**1**	**0**	**0**	**0**	**1**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0037	0.0301	0.0742	0.7702	0.7025
2			0.4948	0.5384	0.1167	0.0166
3				0.9566	0.2525	0.0553
4					0.3068	0.0890
5						0.6086
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.4443	0.0705	0.0394	0.0042	0.0110
2	0.4443		0.2103	0.1067	0.0077	0.0245
3	0.0705	0.2103		0.5067	0.0247	0.1134
4	0.0394	0.1067	0.5067		0.1201	0.4587
5	0.0042	0.0077	0.0247	0.1201		0.2663
6	0.0110	0.0245	0.1134	0.4587	0.2663	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	1	1	1	3	1
2	0		0	0	1	1	2	0
3	0	0		0	1	0	1	0
4	1	0	0		0	0	1	0
5	1	1	1	0		0	3	1
6	1	1	0	0	0		2	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	0	0	0	0
1	0	0	0	0	0
1	0	1	0	0	0
0	1	0	0	0	0
1	1	1	1	0	0
5	4	3	2	0	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data -- from Muskegon (random)
Date: 4/26/96
Description: Samples xx2, surface course unit weight in air

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	155.2	153.3	152.0	151.2	150.0	149.3
5	153.9	151.9	150.5	149.8	148.2	149.5
4	153.7	148.2	149.8	148.9	144.1	148.5
3	150.8	148.9	149.7	148.1	145.7	147.6
2	147.5	149.5	148.8	147.0	147.0	147.6
1	152.0	153.0	151.3	150.7	151.4	151.0
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	--	--
6 of 6 test	--	--	--	--	--	--

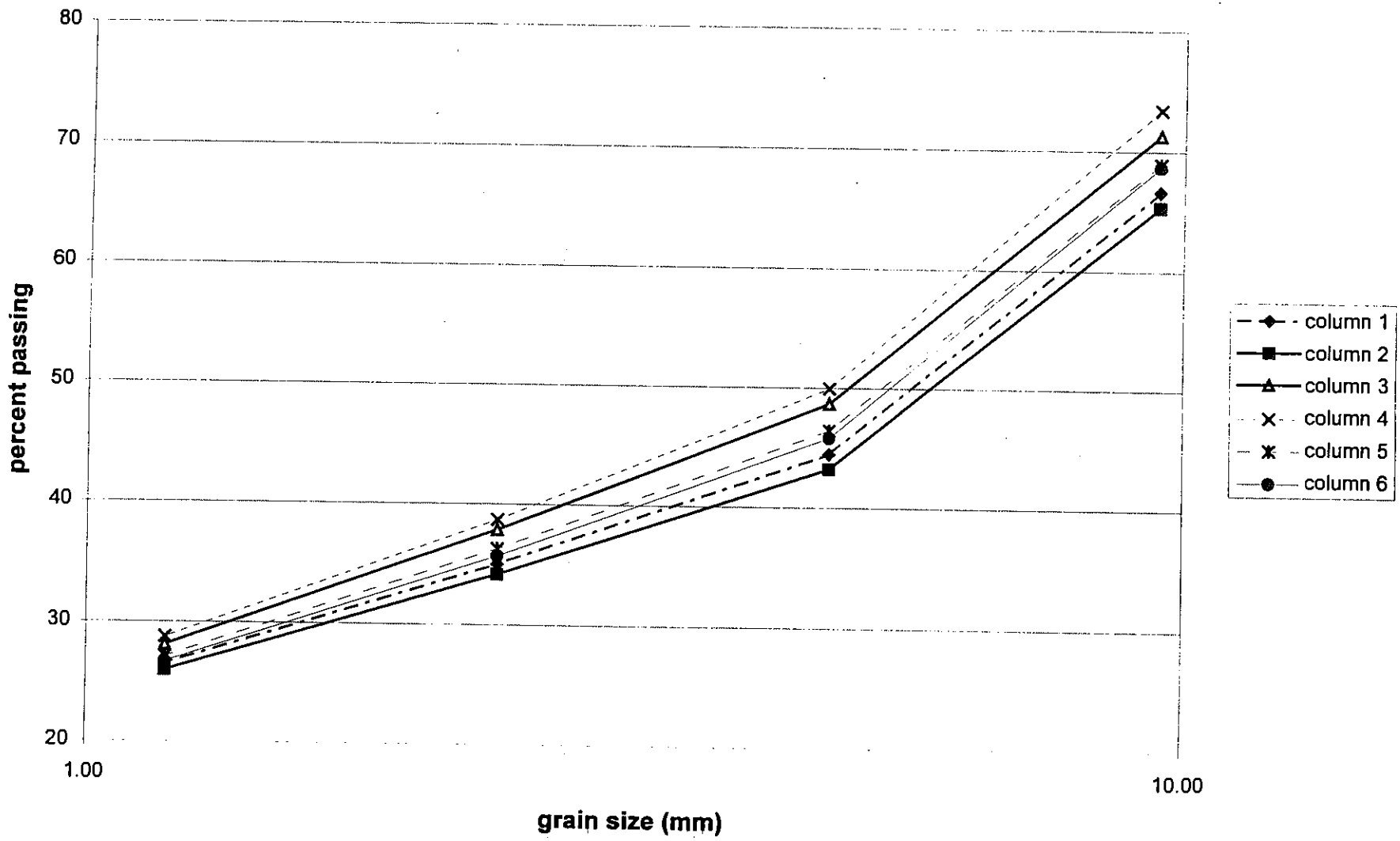
Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

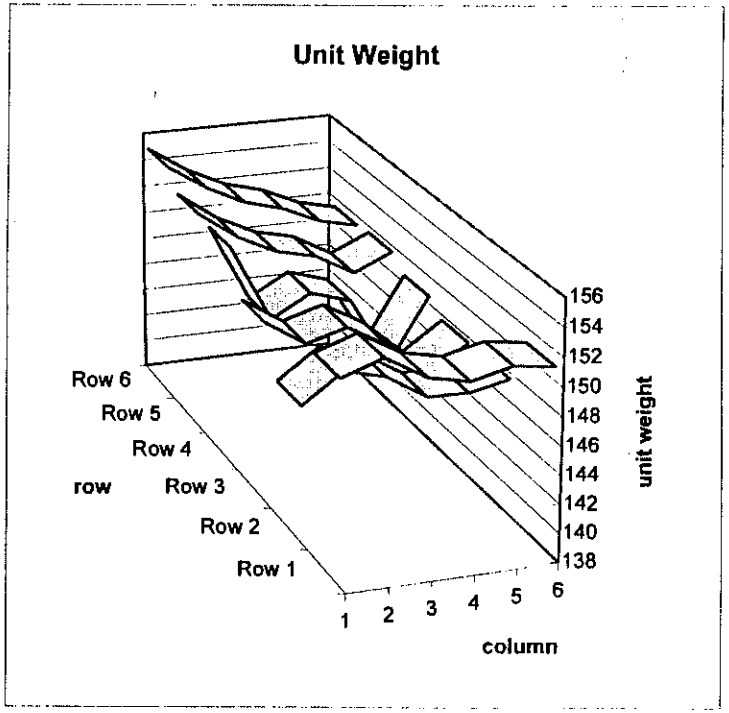
YES ! <-- significant column differences?
Edge

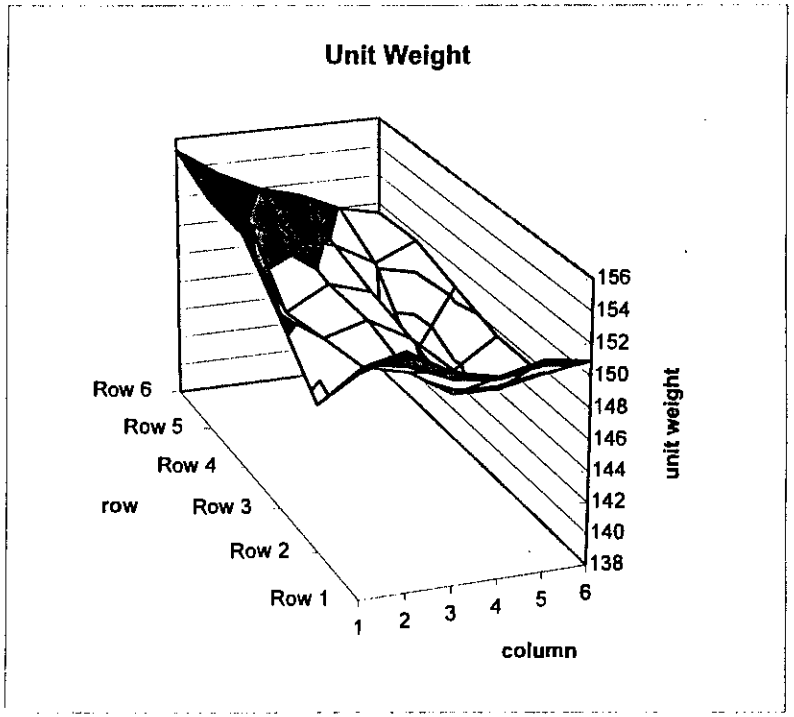
Muskegon Random : Grain Size Distribution Curve (sieve 3/8" ~ no. 16)



Curve Plot (2)

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx2, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

Description: *Samples xx2, surface course unit weight in air*

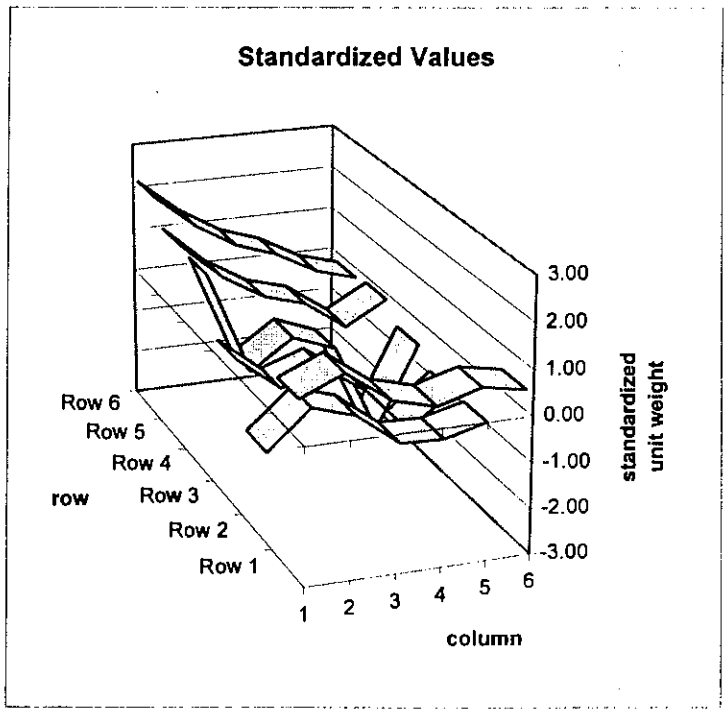
Clear Colors

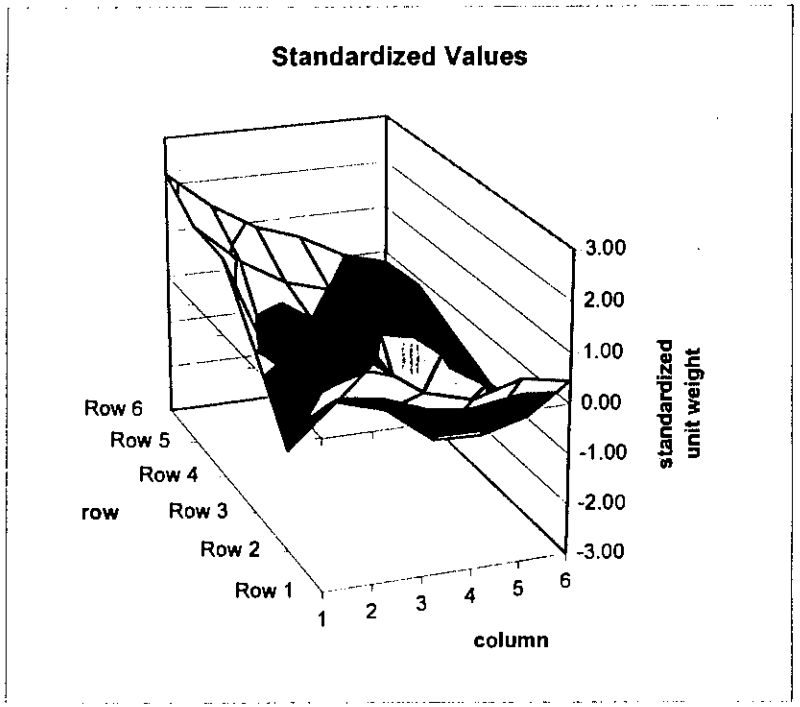
Color Above and Below Average

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.22	1.45	0.87	0.55	0.03	-0.24	0.81	0.913
5	1.68	0.83	0.25	-0.02	-0.68	-0.15	0.32	0.830
4	1.60	-0.71	-0.05	-0.41	-2.43	-0.56	-0.42	1.293
3	0.37	-0.41	-0.06	-0.73	-1.75	-0.95	-0.59	0.738
2	-0.99	-0.14	-0.44	-1.18	-1.21	-0.96	-0.82	0.433
1	0.88	1.30	0.61	0.35	0.63	0.45	0.70	0.343
Average	0.96	0.39	0.20	-0.24	-0.90	-0.40	0.00	**0.00**	0.758
Std. Dev.	1.156	0.922	0.483	0.659	1.133	0.541	0.816		**1.00**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx2, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	152.18	2.30	5.299	2.773	7.688
2	150.80	0.93	0.859	2.212	4.892
3	150.35	0.47	0.223	1.159	1.344
4	149.30	-0.57	0.330	1.580	2.497
5	147.71	-2.16	4.679	2.719	7.392
6	148.91	-0.96	0.927	1.299	1.687
sum			12.317		25.499
all data	149.87			2.398819	5.7543

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	73.9049806	5	14.781	**3.47797**	2.533554	0.0134586
within columns:	127.496583	30	4.250			
Total:	201.401564					

Different ? | 1 | **YES!**

ANOVA

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.38	1.83	2.88	4.47	3.27
2	1.38		0.46	1.50	3.09	1.89
3	1.83	0.46		1.05	2.63	1.44
4	2.88	1.50	1.05		1.59	0.39
5	4.47	3.09	2.63	1.59		-1.20
6	3.27	1.89	1.44	0.39	-1.20	

Critical Values

Columns	1	2	3	4	5	6
1		4.83	4.09	4.35	5.29	4.17
2	4.83		3.40	3.70	4.78	3.49
3	4.09	3.40		2.67	4.03	2.37
4	4.35	3.70	2.67		4.28	2.79
5	5.29	4.78	4.03	4.28		4.11
6	4.17	3.49	2.37	2.79	4.11	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0000	0.0030	0.0659	0.3193	0.7872
2			0.5190	0.4910	0.0136	0.0027
3				0.7920	0.0730	0.0151
4					0.2634	0.0845
5						0.3493
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.3647	0.1667	0.0517	0.0183	0.0259
2	0.3647		0.6649	0.2058	0.0562	0.1012
3	0.1667	0.6649		0.2201	0.0539	0.0711
4	0.0517	0.2058	0.2201		0.2443	0.6519
5	0.0183	0.0562	0.0539	0.2443		0.3523
6	0.0259	0.1012	0.0711	0.6519	0.3523	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	1	1	2	0
2	0		0	0	0	0	0	0
3	0	0		0	0	0	0	0
4	0	0	0		0	0	0	0
5	1	0	0	0		0	1	0
6	1	0	0	0	0		1	0

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
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Above Average? 1= true, 0 = false

1	1	1	1	1	0
1	1	1	0	0	0
1	0	0	0	0	0
1	0	0	0	0	0
0	0	0	0	0	0
1	1	1	1	1	1
5	3	3	2	2	1

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data -- from Muskegon (random)
Date: 4/26/96
Description: Samples xx3, surface course unit weight in air

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	154.5	153.1	151.9	152.2	149.6	148.3
5	154.7	152.3	150.5	149.1	149.0	149.0
4	153.8	145.6	150.1	147.2	145.8	148.2
3	152.0	148.8	150.4	148.4	147.1	148.7
2	148.0	148.1	149.3	149.0	148.1	147.2
1	151.5	152.7	150.7	151.9	151.2	149.7
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	--	--
6 of 6 test	--	--	--	--	--	**DIFF !**

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

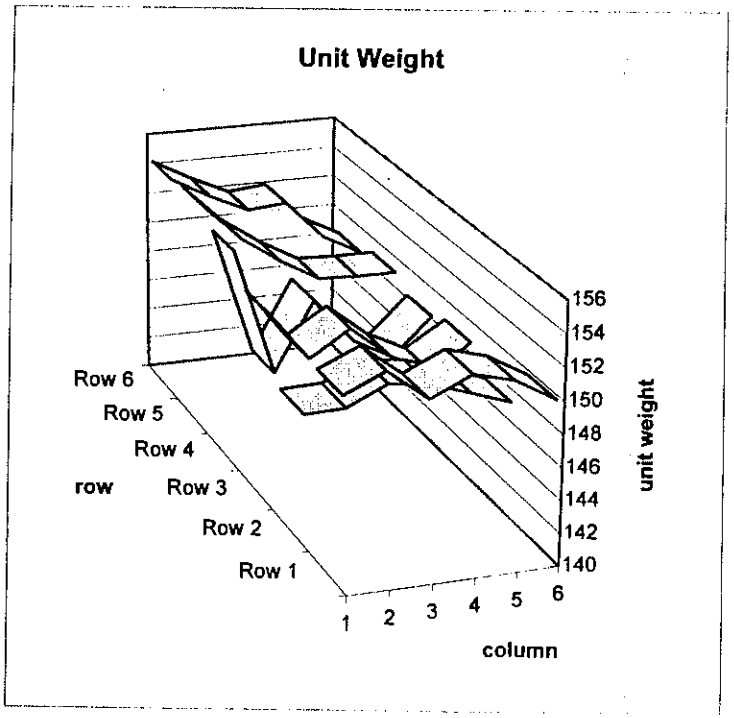
Description: *Samples xx3, surface course unit weight in air*

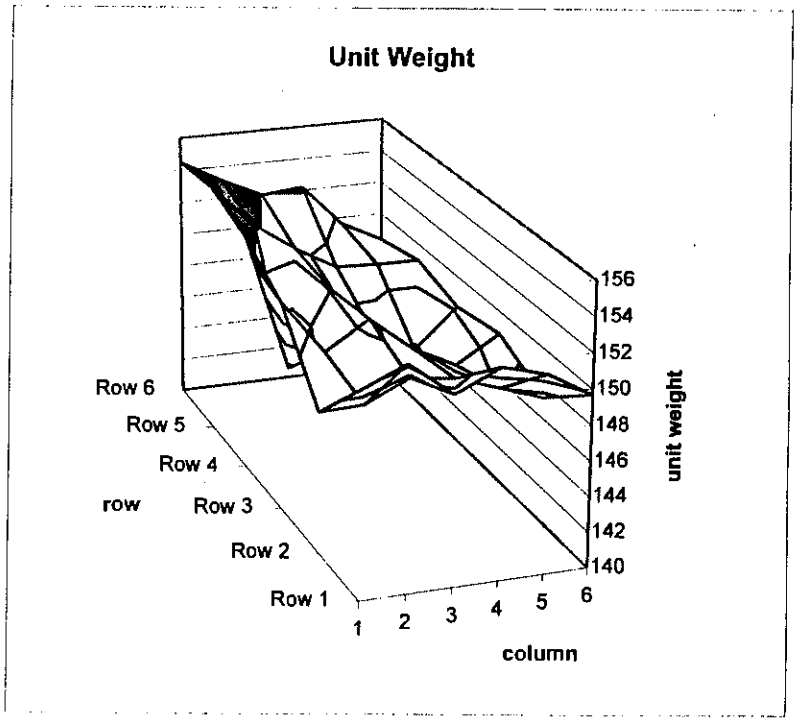
Clear Colors

Color Above and Below Average

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	154.5	153.1	151.9	152.2	149.6	148.3	151.61	2.270	1.50%
5	154.7	152.3	150.5	149.1	149.0	149.0	150.76	2.326	1.54%
4	153.8	145.6	150.1	147.2	145.8	148.2	148.43	3.085	2.08%
3	152.0	148.8	150.4	148.4	147.1	148.7	149.25	1.709	1.15%
2	148.0	148.1	149.3	149.0	148.1	147.2	148.27	0.744	0.50%
1	151.5	152.7	150.7	151.9	151.2	149.7	151.26	1.013	0.67%
Average	152.42	150.09	150.49	149.61	148.47	148.51	149.93	**149.93**	1.858	1.24%
Std. Dev.	2.525	3.033	0.870	1.988	1.887	0.842	1.857		**2.314034**	
Coeff. of Var.	1.66%	2.02%	0.58%	1.33%	1.27%	0.57%	1.24%			**1.54%**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx3, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

Description: *Samples xx3, surface course unit weight in air*

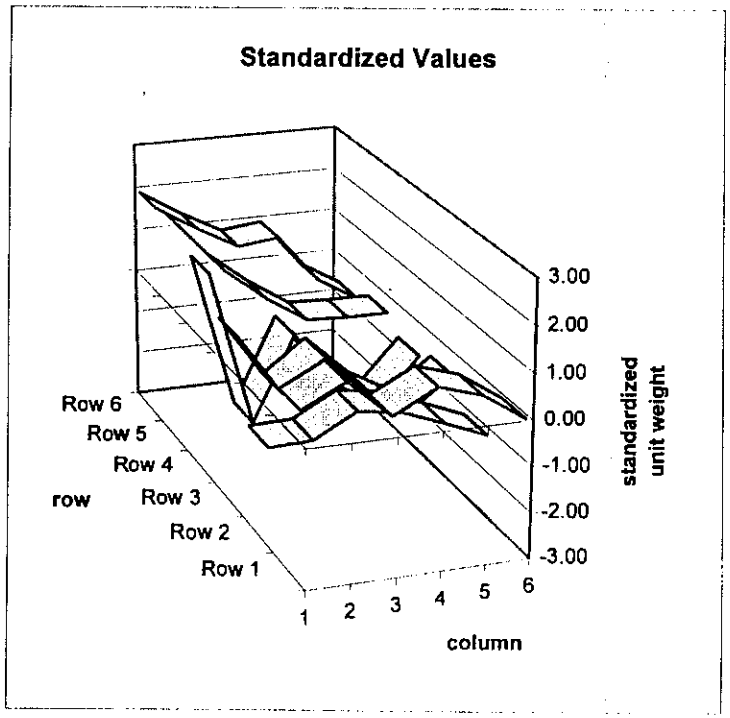
Clear Colors

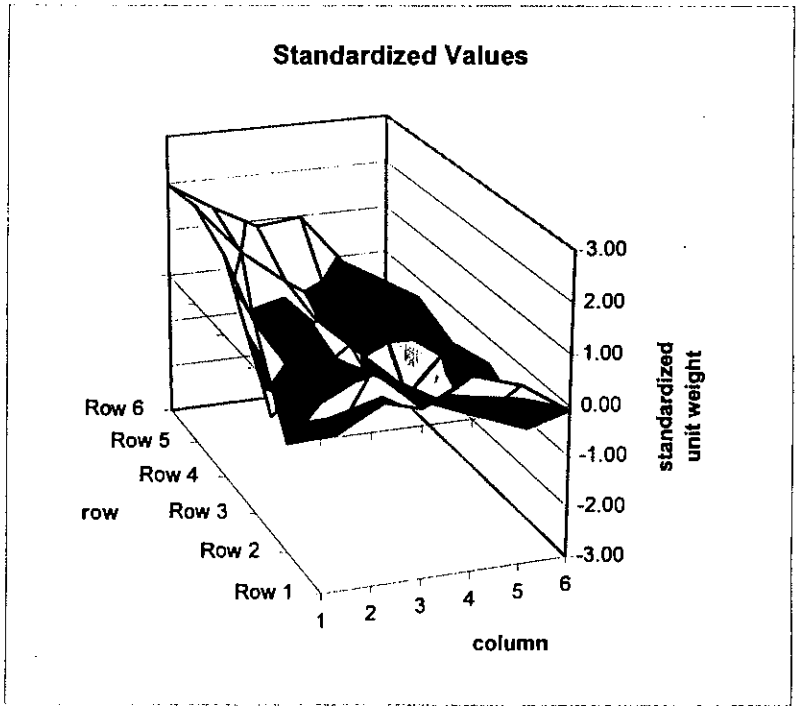
Color Above and Below Average

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.97	1.38	0.87	0.97	-0.14	-0.70	0.73	0.981
5	2.07	1.01	0.26	-0.36	-0.41	-0.41	0.36	1.005
4	1.66	-1.86	0.06	-1.20	-1.78	-0.76	-0.65	1.333
3	0.89	-0.48	0.22	-0.66	-1.21	-0.54	-0.29	0.739
2	-0.83	-0.80	-0.28	-0.42	-0.80	-1.18	-0.72	0.322
1	0.69	1.18	0.32	0.83	0.53	-0.10	0.57	0.438
Average	1.07	0.07	0.24	-0.14	-0.63	-0.61	0.00	**0.00**	0.803
Std. Dev.	1.091	1.311	0.376	0.859	0.815	0.364	0.803		**1.00**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples xx3, surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	152.42	2.49	6.177	2.525	6.376
2	150.09	0.16	0.027	3.033	9.198
3	150.49	0.56	0.310	0.870	0.757
4	149.61	-0.32	0.103	1.988	3.952
5	148.47	-1.46	2.141	1.887	3.559
6	148.51	-1.42	2.020	0.842	0.709
sum			10.778		24.550
all data	149.93			2.314034	5.3548

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	64.6663806	5	12.933	**3.16088**	2.533554	0.0207558
within columns:	122.749917	30	4.092			
Total:	187.416297			**Different ?**	1	YES!

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		2.32	1.93	2.81	3.95	3.91
2	2.32		-0.39	0.49	1.63	1.59
3	1.93	-0.39		0.88	2.02	1.98
4	2.81	0.49	0.88		1.14	1.10
5	3.95	1.63	2.02	1.14		-0.04
6	3.91	1.59	1.98	1.10	-0.04	

Critical Values

Columns	1	2	3	4	5	6
1		5.38	3.64	4.38	4.29	3.63
2	5.38		4.30	4.94	4.87	4.29
3	3.64	4.30		2.96	2.83	1.65
4	4.38	4.94	2.96		3.73	2.94
5	4.29	4.87	2.83	3.73		2.81
6	3.63	4.29	1.65	2.94	2.81	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	1
2	0		0	0	0	0
3	0	0		0	0	1
4	0	0	0		0	0
5	0	0	0	0		0
6	1	0	1	0	0	
Sum	**1**	**0**	**1**	**0**	**0**	**2**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0002	0.0325	0.0588	0.6407	0.7385
2			0.2262	0.9002	0.0313	0.0065
3				0.5839	0.2280	0.0693
4					0.1707	0.0698
5						0.5378
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.1801	0.1074	0.0581	0.0119	0.0049
2	0.1801		0.7663	0.7500	0.2907	0.2456
3	0.1074	0.7663		0.3448	0.0385	0.0025
4	0.0581	0.7500	0.3448		0.3316	0.2404
5	0.0119	0.2907	0.0385	0.3316		0.9616
6	0.0049	0.2456	0.0025	0.2404	0.9616	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	0	1	1	2	0
2	0		0	0	0	0	0	0
3	0	0		0	1	1	2	0
4	0	0	0		0	0	0	0
5	1	0	1	0		0	2	0
6	1	0	1	0	0		2	0

Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	1	1	1	0	0
1	1	1	0	0	0
1	0	1	0	0	0
1	0	1	0	0	0
0	0	0	0	0	0
1	1	1	1	1	0
5	3	5	2	1	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Sample Data -- from Muskegon (random)
Date: 4/26/96
Description: Samples (avg), surface course unit weight in air

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	154.9	153.2	151.8	151.3	149.4	149.1
5	154.6	152.5	149.9	149.1	148.7	149.3
4	153.4	147.6	149.6	148.4	145.3	148.5
3	151.2	149.1	150.2	148.1	146.5	148.4
2	148.1	149.2	149.1	148.2	147.5	147.1
1	151.6	152.7	151.1	151.5	150.8	150.0
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	DIFF !	--	--	--	--	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

YES ! <-- significant column differences?

Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

Description: *Samples (avg), surface course unit weight in air*

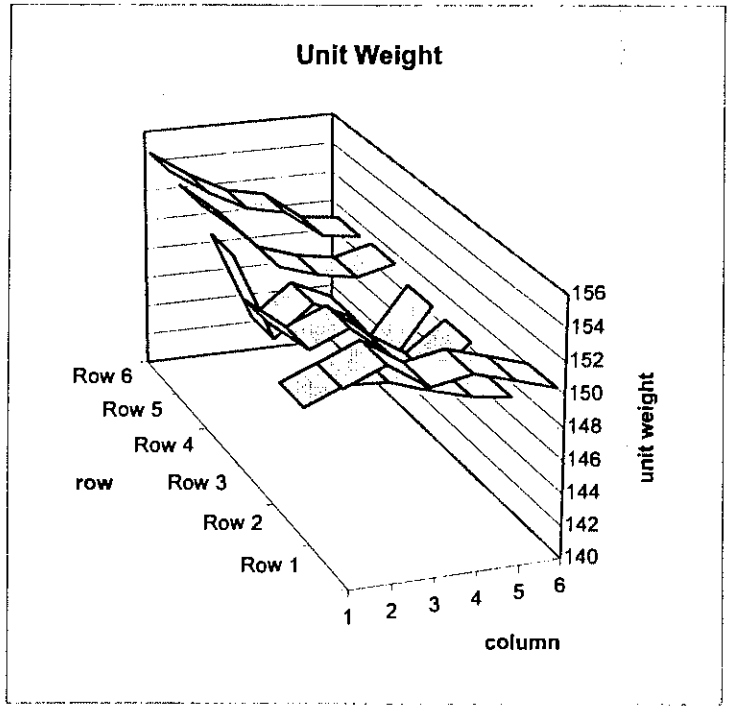
Clear Colors

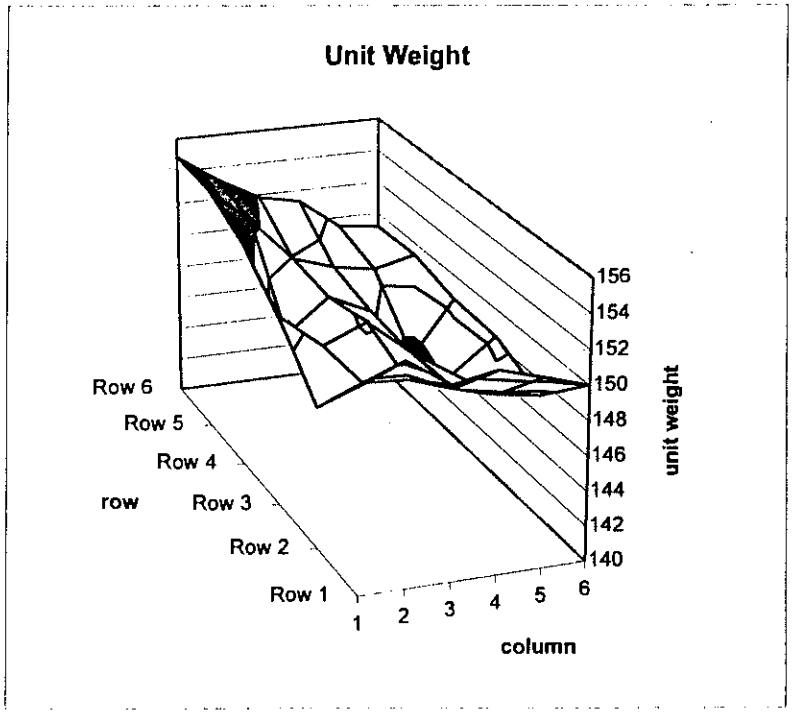
Color Above and Below Average

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	154.9	153.2	151.8	151.3	149.4	149.1	151.63	2.200	1.45%
5	154.6	152.5	149.9	149.1	148.7	149.3	150.69	2.369	1.57%
4	153.4	147.6	149.6	148.4	145.3	148.5	148.79	2.670	1.79%
3	151.2	149.1	150.2	148.1	146.5	148.4	148.91	1.645	1.10%
2	148.1	149.2	149.1	148.2	147.5	147.1	148.20	0.820	0.55%
1	151.6	152.7	151.1	151.5	150.8	150.0	151.29	0.900	0.59%
Average	152.29	150.72	150.28	149.45	148.03	148.74	149.92	**149.92**	1.767	1.18%
Std. Dev.	2.545	2.365	1.014	1.576	2.025	0.989	1.752		**2.222061**	
Coeff. of Var.	1.67%	1.57%	0.67%	1.05%	1.37%	0.66%	1.17%			**1.48%**

MRAIRAVG.XLS

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples (avg), surface course unit weight in air*





Unit Wt Graph

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff April 1996

Location: *Sample Data -- from Muskegon (random)*

Date: *6/14/96*

Description: *Samples (avg), surface course unit weight in air*

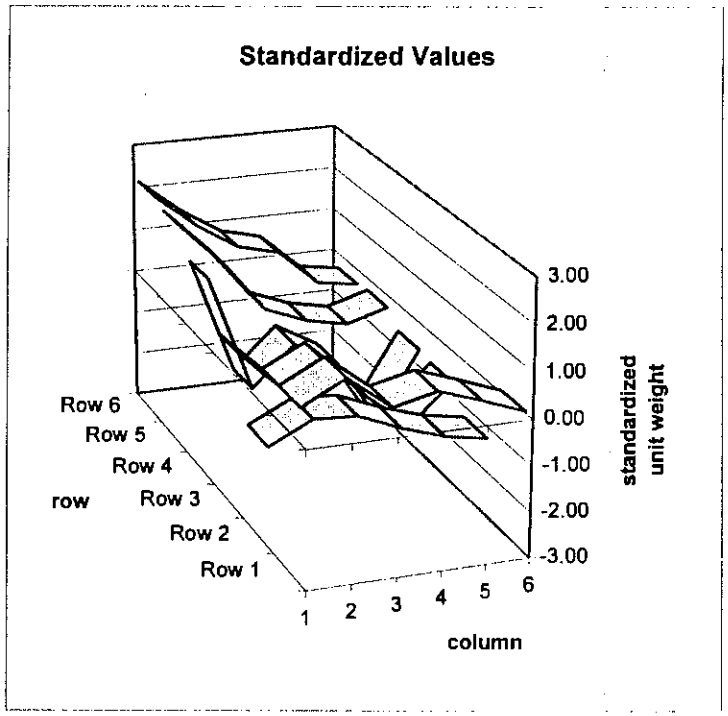
Clear Colors

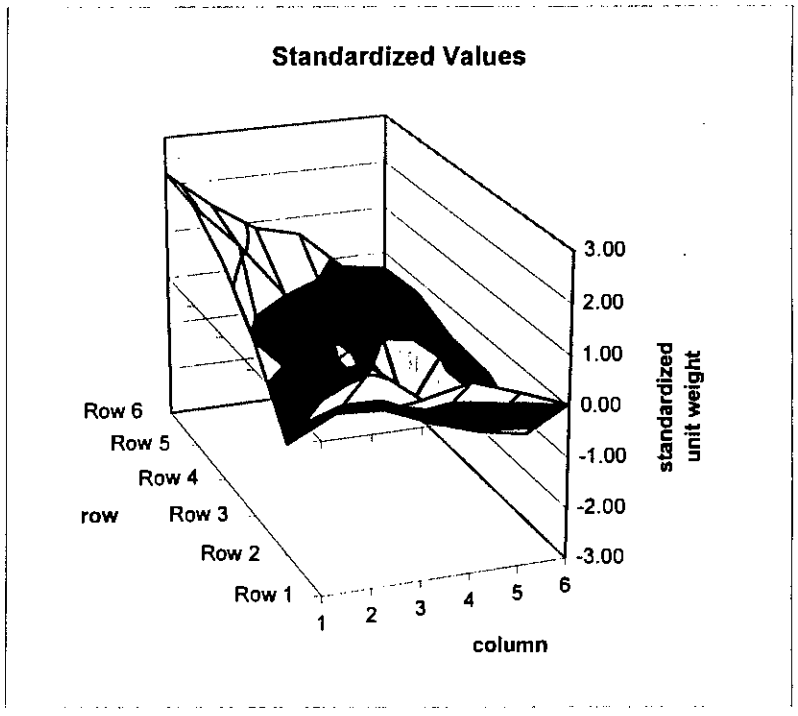
Color Above and Below Average

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	2.24	1.47	0.86	0.63	-0.21	-0.35	0.77	0.990
5	2.12	1.17	0.01	-0.37	-0.56	-0.29	0.35	1.066
4	1.55	-1.05	-0.15	-0.68	-2.10	-0.62	-0.51	1.202
3	0.56	-0.36	0.12	-0.81	-1.54	-0.70	-0.45	0.740
2	-0.80	-0.32	-0.39	-0.77	-1.08	-1.26	-0.77	0.369
1	0.76	1.25	0.51	0.73	0.40	0.05	0.62	0.405
Average	1.07	0.36	0.16	-0.21	-0.85	-0.53	0.00	**0.00**	0.795
Std. Dev.	1.145	1.064	0.456	0.709	0.911	0.445	0.789		**1.00**

Location: *Sample Data -- from Muskegon (random)*
Date: *6/14/96*
Description: *Samples (avg), surface course unit weight in air*





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	152.29	2.38	5.648	2.545	6.478
2	150.72	0.80	0.641	2.365	5.595
3	150.28	0.36	0.128	1.014	1.028
4	149.45	-0.47	0.223	1.576	2.484
5	148.03	-1.89	3.567	2.025	4.100
6	148.74	-1.17	1.378	0.989	0.978
sum			11.585		20.661
all data	149.92			2.222061	4.9376

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	69.5078877	5	13.902	**4.03699**	2.533554	0.0064017
within columns:	103.306519	30	3.444			
Total:	172.814406			**Different ?**	1	**YES!**

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.58	2.02	2.85	4.27	3.55
2	1.58		0.44	1.27	2.69	1.97
3	2.02	0.44		0.83	2.25	1.53
4	2.85	1.27	0.83		1.42	0.70
5	4.27	2.69	2.25	1.42		-0.71
6	3.55	1.97	1.53	0.70	-0.71	

Critical Values

Columns	1	2	3	4	5	6
1		4.73	3.73	4.08	4.43	3.72
2	4.73		3.51	3.87	4.24	3.49
3	3.73	3.51		2.55	3.09	1.93
4	4.08	3.87	2.55		3.50	2.54
5	4.43	4.24	3.09	3.50		3.07
6	3.72	3.49	1.93	2.54	3.07	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0001	0.0110	0.0546	0.5730	0.7317
2			0.3697	0.6191	0.0355	0.0050
3				0.9272	0.1614	0.0354
4					0.2214	0.0716
5						0.4903
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.2925	0.1013	0.0420	0.0093	0.0097
2	0.2925		0.6827	0.2984	0.0605	0.0886
3	0.1013	0.6827		0.3031	0.0354	0.0243
4	0.0420	0.2984	0.3031		0.2062	0.3774
5	0.0093	0.0605	0.0354	0.2062		0.4553
6	0.0097	0.0886	0.0243	0.3774	0.4553	

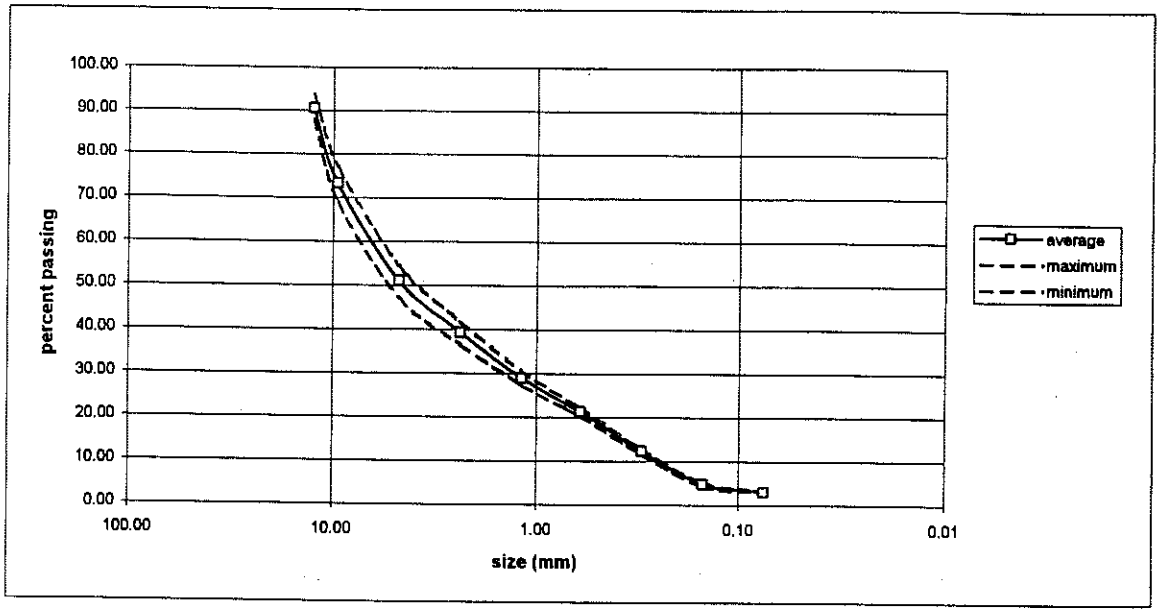
Fail t-test at 0.05 level?

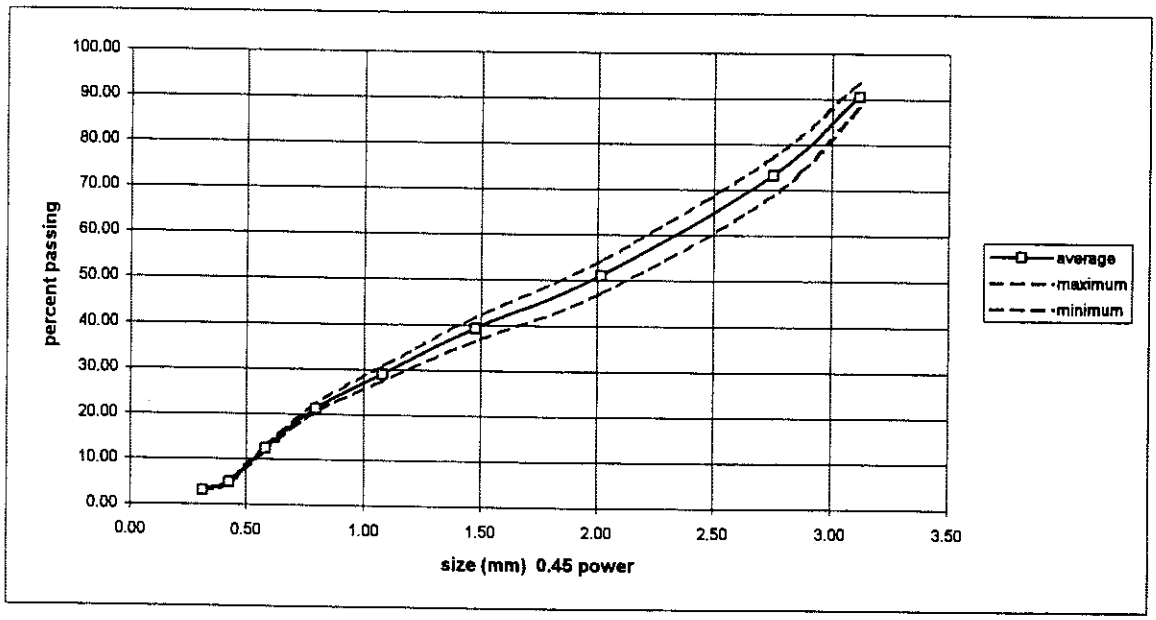
Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	1	1	1	3	1
2	0		0	0	0	0	0	0
3	0	0		0	1	1	2	0
4	1	0	0		0	0	1	0
5	1	0	1	0		0	2	0
6	1	0	1	0	0		2	0

Gradation Plot for Rows and Columns

Muskegon Random Gradation Data file:mrcurv1.xls

Row 1			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 11x	12x	13x	14x	15x	16x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	88.38	88.13	93.58	92.45	93.18	87.87	**90.60**	**2.50**	93.58	87.87	**5.71**
3/8 inch	9.50	2.75	68.79	69.60	77.06	77.05	77.16	69.98	**73.27**	**3.83**	77.16	68.79	**8.38**
No. 4	4.75	2.02	47.15	47.15	54.30	54.38	53.86	49.58	**51.07**	**3.22**	54.38	47.15	**7.24**
No. 8	2.37	1.47	36.45	36.50	41.74	41.71	41.31	38.08	**39.30**	**2.35**	41.74	36.45	**5.28**
No. 16	1.18	1.08	27.46	27.42	30.65	30.47	29.78	28.10	**28.98**	**1.36**	30.65	27.42	**3.23**
No. 30	0.60	0.79	20.47	20.34	22.26	22.14	21.64	20.74	**21.27**	**0.78**	22.26	20.34	**1.92**
No. 50	0.30	0.58	11.60	11.94	12.63	12.36	12.82	12.53	**12.31**	**0.42**	12.82	11.60	**1.22**
No. 100	0.15	0.43	4.86	4.78	4.40	4.76	4.92	5.18	**4.82**	**0.23**	5.18	4.40	**0.78**
No. 200	0.08	0.31	3.09	3.08	2.86	3.08	3.12	3.32	**3.09**	**0.13**	3.32	2.86	**0.46**

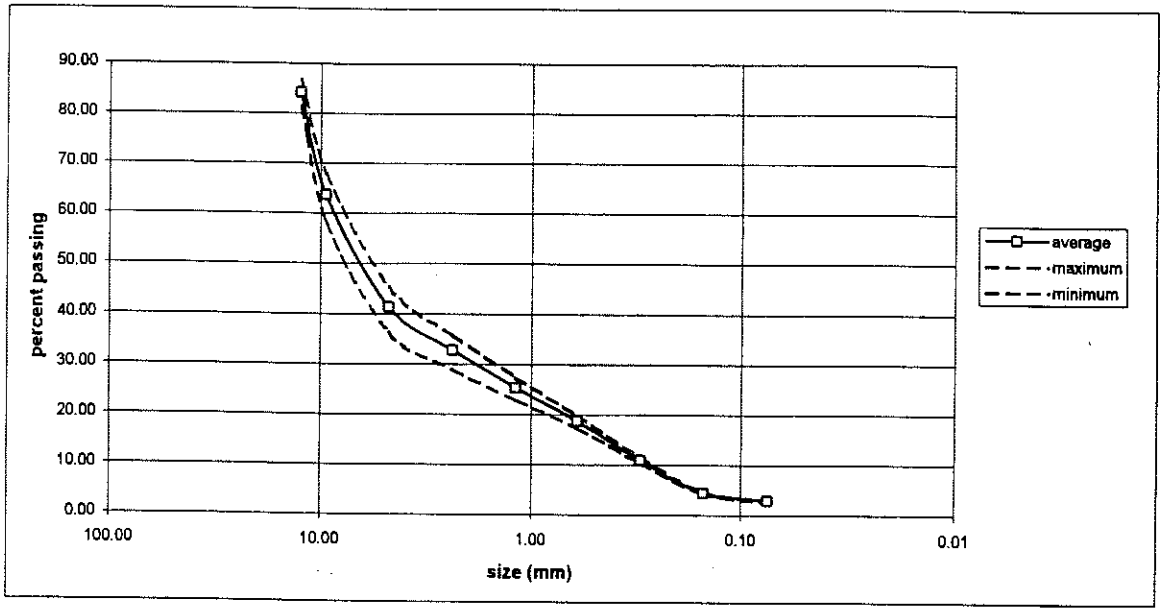


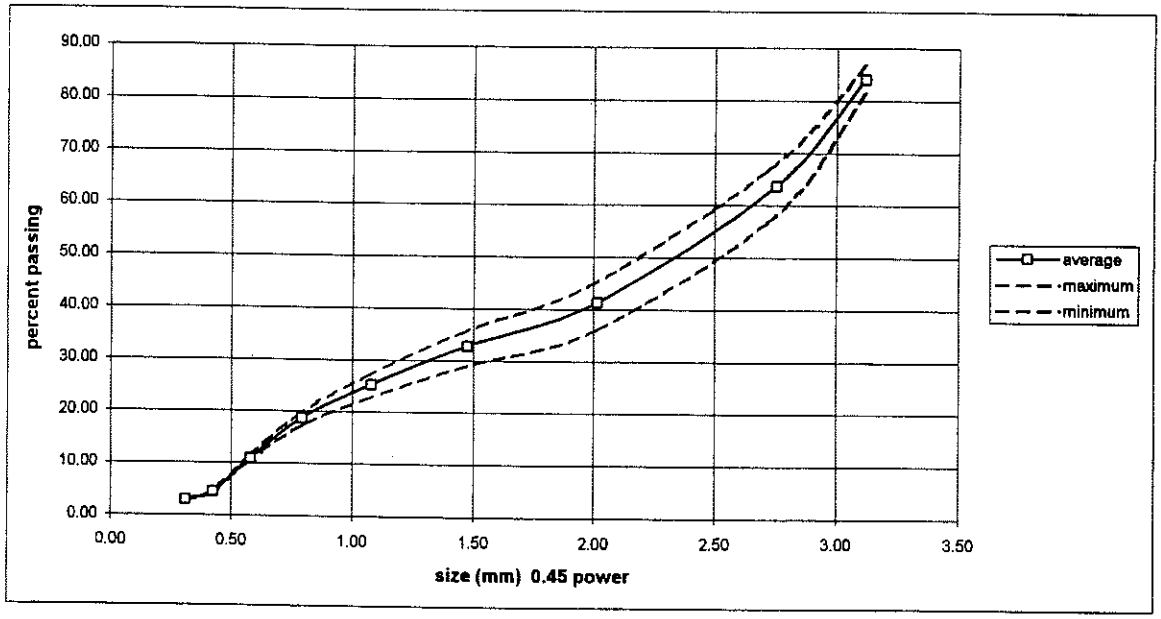


Muskegon Random Gradation Data

file:mrcurv2.xls

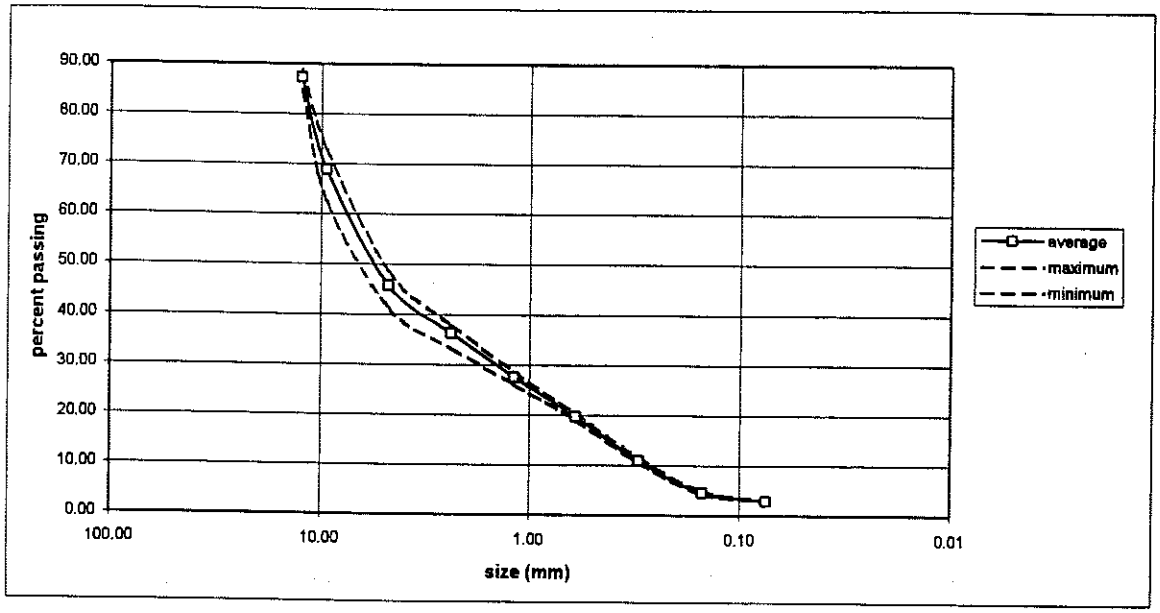
Row 2			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 21x	22x	23x	24x	25x	26x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	81.84	81.27	85.46	85.69	83.87	86.61	**84.12**	**1.99**	86.61	81.27	**5.34**
3/8 inch	9.50	2.75	61.43	58.15	65.44	67.87	63.50	65.82	**63.70**	**3.18**	67.87	58.15	**9.71**
No. 4	4.75	2.02	39.38	36.17	43.14	45.31	42.08	41.88	**41.33**	**2.90**	45.31	36.17	**9.14**
No. 8	2.37	1.47	31.41	28.97	33.96	35.75	33.44	32.90	**32.74**	**2.12**	35.75	28.97	**6.78**
No. 16	1.18	1.08	24.62	22.84	25.83	27.28	25.68	25.30	**25.26**	**1.35**	27.28	22.84	**4.45**
No. 30	0.60	0.79	18.44	17.28	19.16	19.87	18.73	18.58	**18.68**	**0.78**	19.87	17.28	**2.59**
No. 50	0.30	0.58	10.80	10.41	11.36	11.51	10.55	10.76	**10.90**	**0.40**	11.51	10.41	**1.10**
No. 100	0.15	0.43	4.64	4.32	4.60	4.56	4.29	4.44	**4.48**	**0.13**	4.64	4.29	**0.34**
No. 200	0.08	0.31	2.91	2.77	2.99	3.03	2.69	2.88	**2.88**	**0.12**	3.03	2.69	**0.34**

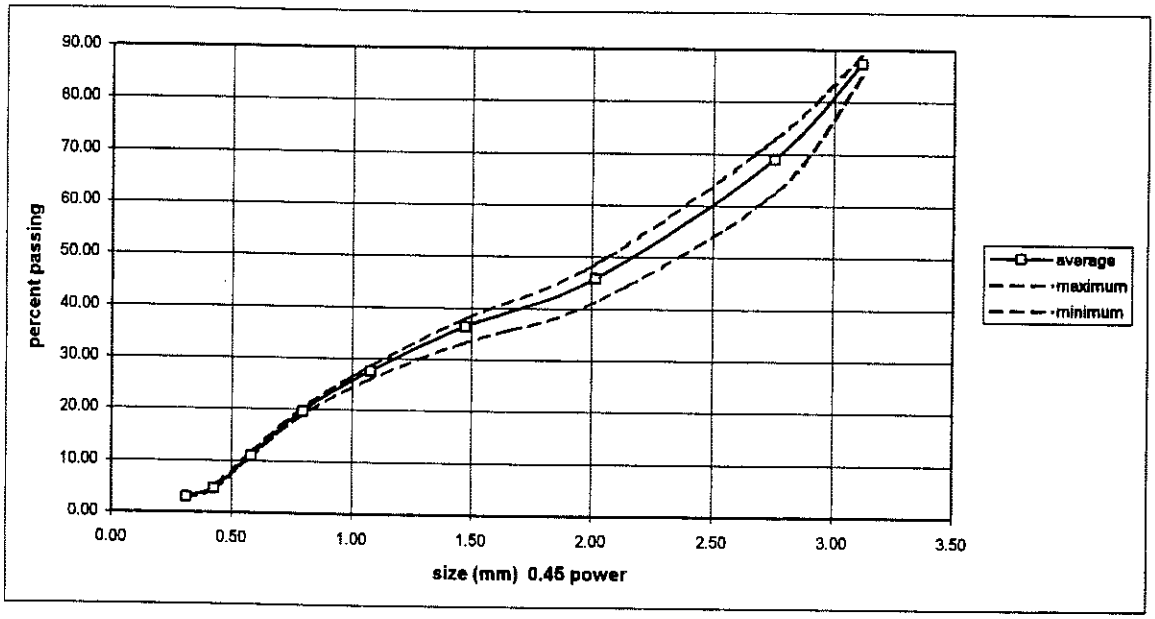




Muskegon Random Gradation Data file:mrcurv3.xls

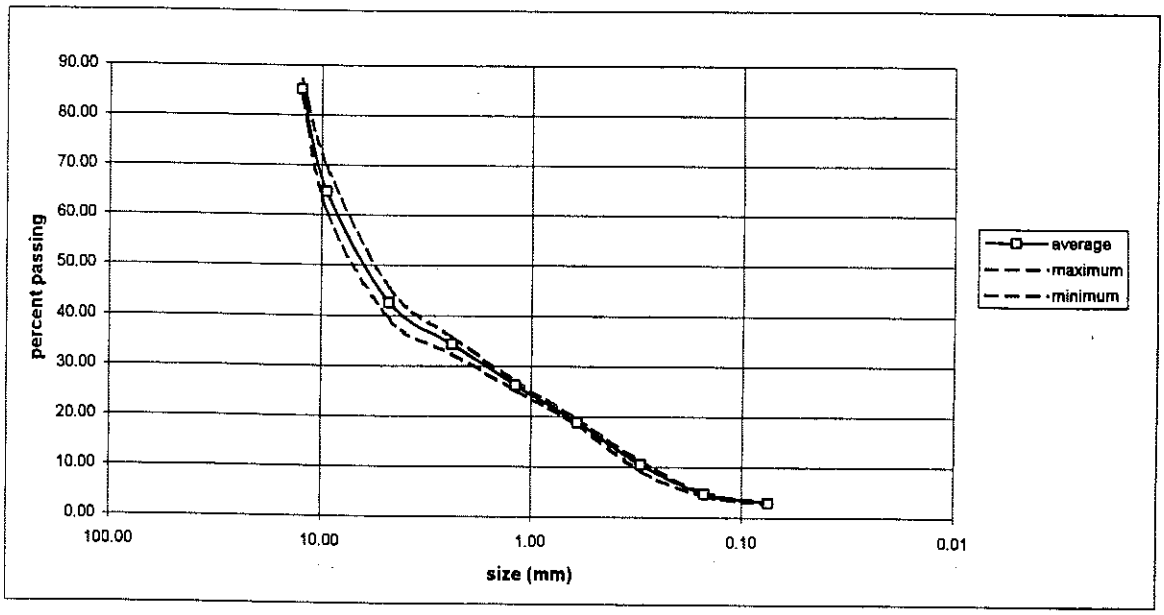
Row 3			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 11x	12x	13x	14x	15x	16x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	84.70	87.95	88.76	88.76	86.99	87.15	**87.38**	**1.38**	88.76	84.70	**4.06**
3/8 inch	9.50	2.75	62.44	70.35	72.74	72.74	68.42	66.96	**68.94**	**3.59**	72.74	62.44	**10.30**
No. 4	4.75	2.02	41.26	47.38	48.57	48.57	45.48	43.44	**45.78**	**2.71**	48.57	41.26	**7.30**
No. 8	2.37	1.47	33.28	37.49	37.89	37.89	36.31	34.82	**36.28**	**1.72**	37.89	33.28	**4.60**
No. 16	1.18	1.08	26.02	28.20	28.51	28.51	27.74	26.56	**27.59**	**0.97**	28.51	26.02	**2.49**
No. 30	0.60	0.79	18.95	20.31	20.16	20.16	19.61	19.07	**19.71**	**0.64**	20.31	18.95	**1.37**
No. 50	0.30	0.58	10.67	11.54	11.05	11.05	10.54	10.58	**10.90**	**0.35**	11.54	10.54	**0.99**
No. 100	0.15	0.43	4.58	4.78	4.50	4.50	4.36	4.89	**4.60**	**0.18**	4.89	4.36	**0.53**
No. 200	0.08	0.31	2.96	3.09	2.93	2.93	2.85	2.85	**2.94**	**0.08**	3.09	2.85	**0.24**

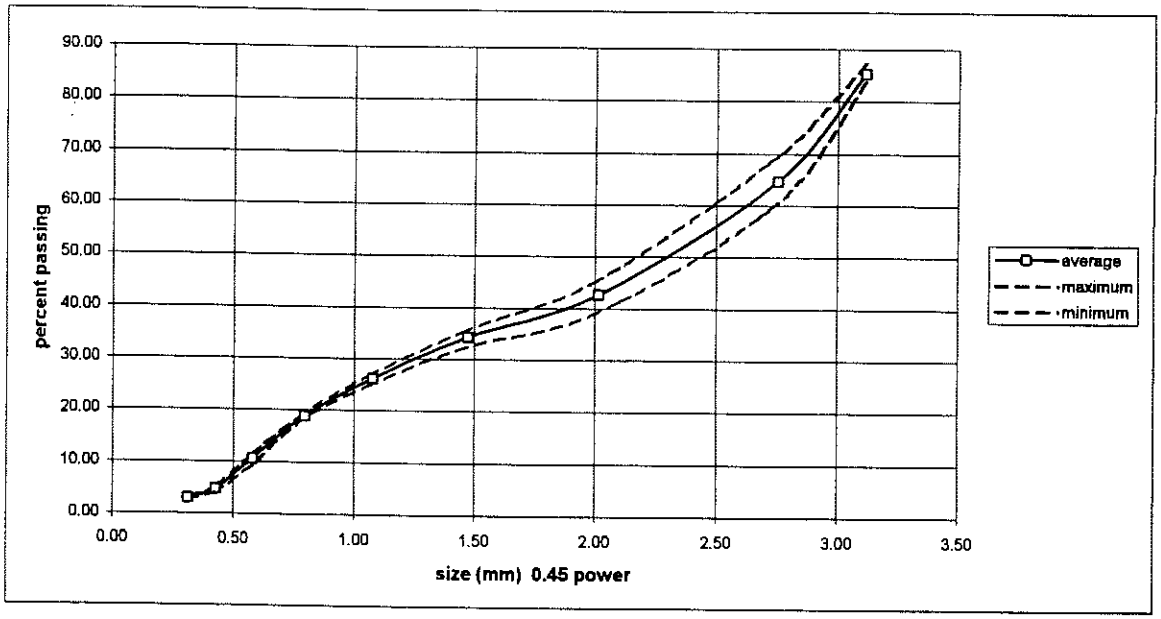




Muskegon Random Gradation Data file:mrcurv4.xls

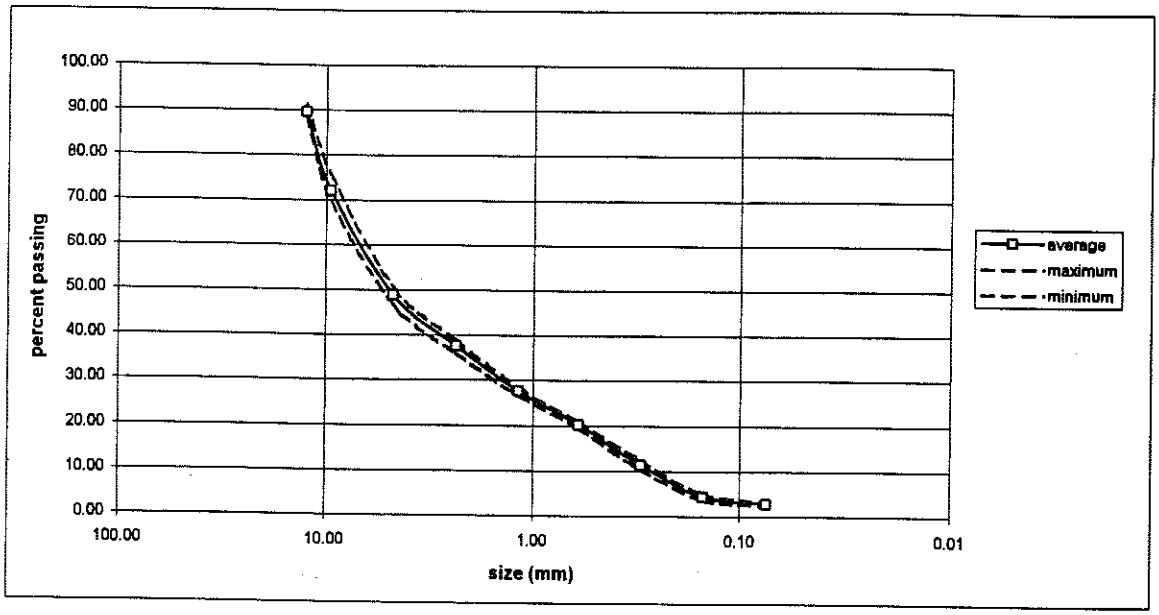
Row 4			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 31x	32x	33x	34x	35x	36x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00		100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	83.61	84.70	83.83		87.05	86.99	**85.24**	**1.50**	87.05	83.61	**3.44**
3/8 inch	9.50	2.75	62.92	60.45	65.80		64.74	69.46	**64.67**	**3.00**	69.46	60.45	**9.01**
No. 4	4.75	2.02	41.22	39.31	43.68		43.23	45.56	**42.60**	**2.15**	45.56	39.31	**6.24**
No. 8	2.37	1.47	33.79	32.38	34.86		34.39	35.76	**34.24**	**1.13**	35.76	32.38	**3.38**
No. 16	1.18	1.08	25.49	25.15	26.52		26.27	27.09	**26.11**	**0.70**	27.09	25.15	**1.94**
No. 30	0.60	0.79	18.73	18.29	19.37		18.40	19.47	**18.85**	**0.49**	19.47	18.29	**1.18**
No. 50	0.30	0.58	10.75	10.35	11.31		9.29	10.97	**10.53**	**0.70**	11.31	9.29	**2.02**
No. 100	0.15	0.43	5.05	4.53	4.89		4.31	4.87	**4.73**	**0.27**	5.05	4.31	**0.74**
No. 200	0.08	0.31	3.13	2.84	2.98		2.71	3.05	**2.94**	**0.15**	3.13	2.71	**0.42**

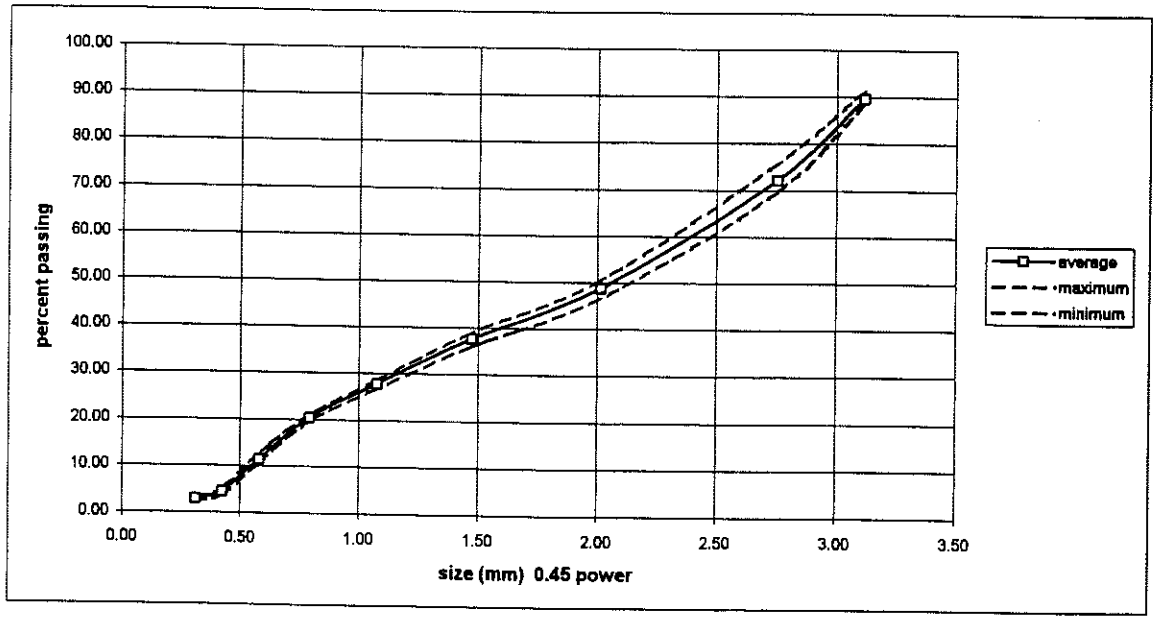




Muskegon Random Gradation Data file:mrcurv5.xls

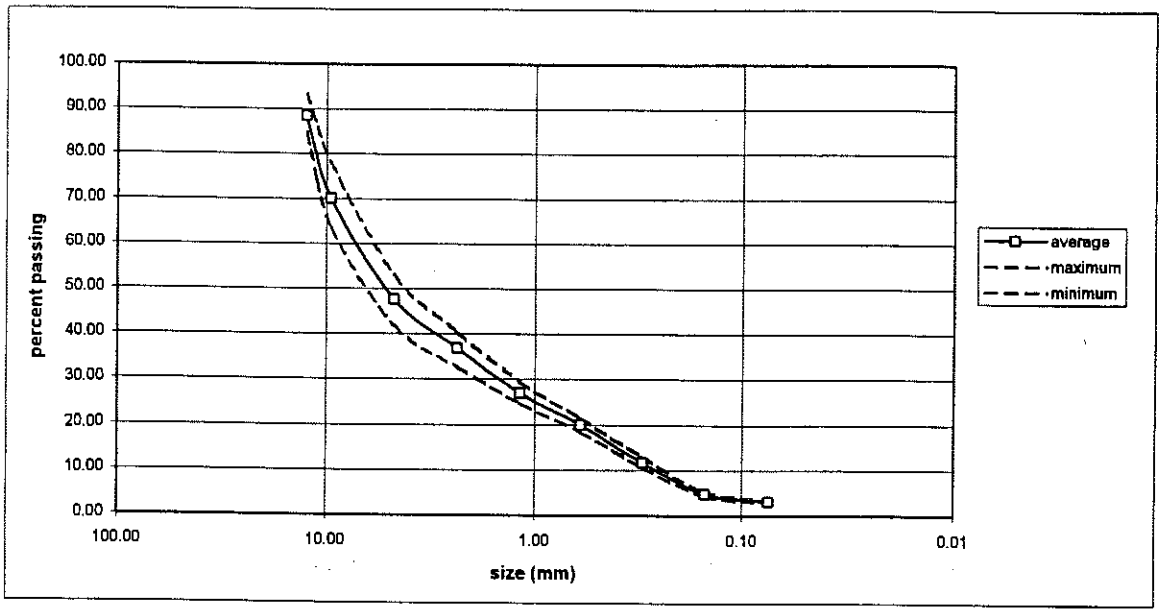
Row 5			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 51x	52x	53x	54x	55x	56x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	91.20	88.88	89.14	89.20	88.37	90.90	**89.62**	**1.05**	91.20	88.37	**2.83**
3/8 inch	9.50	2.75	75.55	69.96	71.96	71.65	69.60	73.66	**72.06**	**2.06**	75.55	69.60	**5.95**
No. 4	4.75	2.02	50.59	47.47	50.09	48.37	46.63	49.83	**48.83**	**1.45**	50.59	46.63	**3.96**
No. 8	2.37	1.47	38.90	36.90	38.50	37.64	35.94	37.94	**37.64**	**0.99**	38.90	35.94	**2.96**
No. 16	1.18	1.08	28.53	27.51	28.25	27.95	26.62	27.52	**27.73**	**0.62**	28.53	26.62	**1.91**
No. 30	0.60	0.79	20.97	20.26	20.61	20.38	19.53	19.96	**20.28**	**0.46**	20.97	19.53	**1.44**
No. 50	0.30	0.58	12.36	11.41	11.60	10.52	10.42	11.58	**11.32**	**0.67**	12.36	10.42	**1.94**
No. 100	0.15	0.43	4.53	5.00	4.43	3.66	4.48	4.36	**4.41**	**0.39**	5.00	3.66	**1.34**
No. 200	0.08	0.31	3.03	3.09	2.87	2.45	2.83	2.79	**2.84**	**0.21**	3.09	2.45	**0.64**

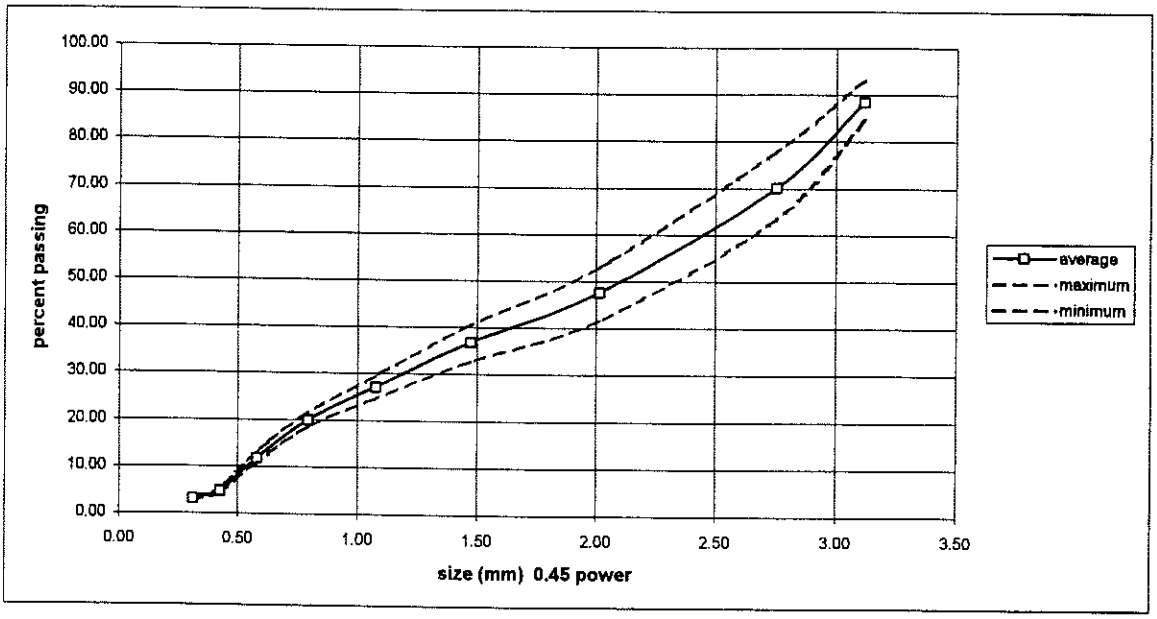




Muskegon Random Gradation Data file:mrcurv6.xls

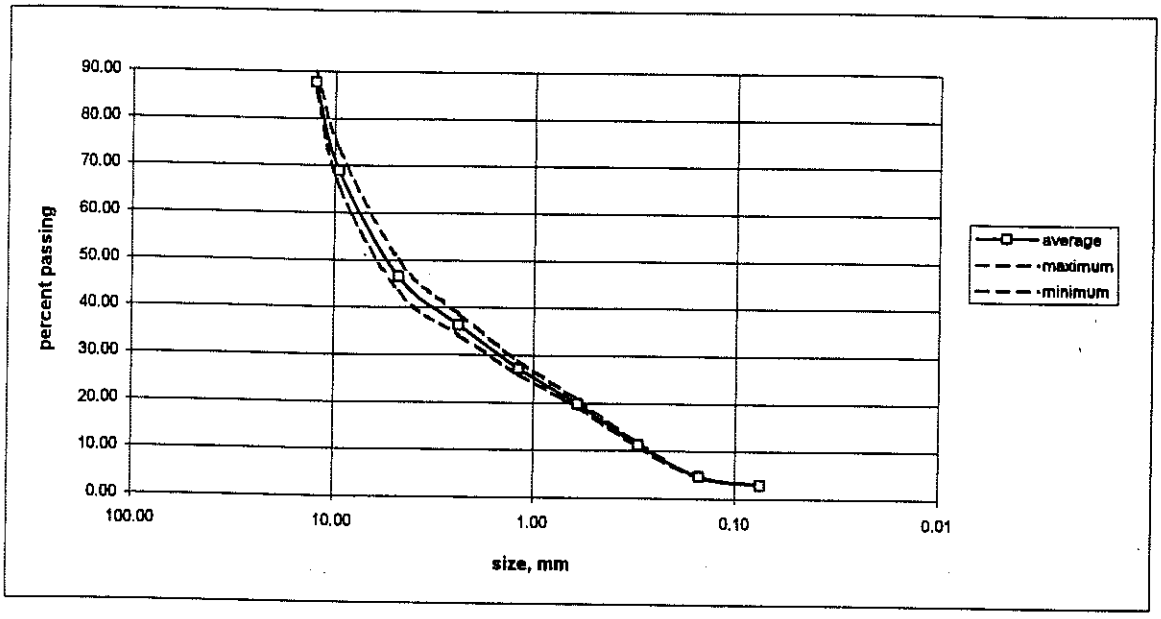
Row 6			Percent passing										
Sieve size	Sieve opening (mm)	^.45	Sample 61x	62x	63x	64x	65x	66x	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	0.00
1/2 inch	12.50	3.12	86.09	84.55	91.28	93.16	88.50	87.12	88.45	2.96	93.16	84.55	8.61
3/8 inch	9.50	2.75	68.64	63.36	74.68	77.80	70.11	66.08	70.11	4.90	77.80	63.36	14.43
No. 4	4.75	2.02	47.06	41.70	52.22	53.00	47.27	44.50	47.62	3.99	53.00	41.70	11.30
No. 8	2.37	1.47	36.19	32.73	40.15	40.51	36.30	34.48	36.73	2.81	40.51	32.73	7.78
No. 16	1.18	1.08	26.91	24.70	28.83	29.44	26.65	25.63	27.03	1.66	29.44	24.70	4.75
No. 30	0.60	0.79	19.93	18.46	20.83	21.50	19.59	18.97	19.88	1.04	21.50	18.46	3.04
No. 50	0.30	0.58	11.86	10.95	12.16	12.98	11.70	10.65	11.72	0.77	12.98	10.65	2.33
No. 100	0.15	0.43	4.87	4.53	4.58	5.29	4.83	4.38	4.75	0.30	5.29	4.38	0.92
No. 200	0.08	0.31	3.13	2.92	2.89	3.33	3.09	2.84	3.03	0.17	3.33	2.84	0.49

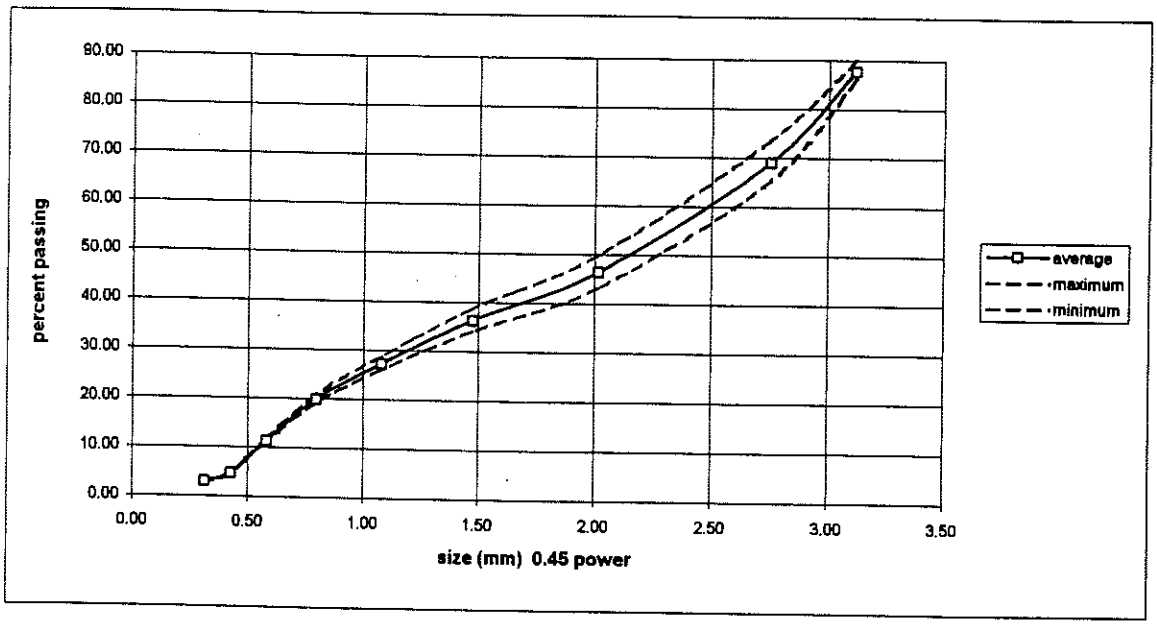


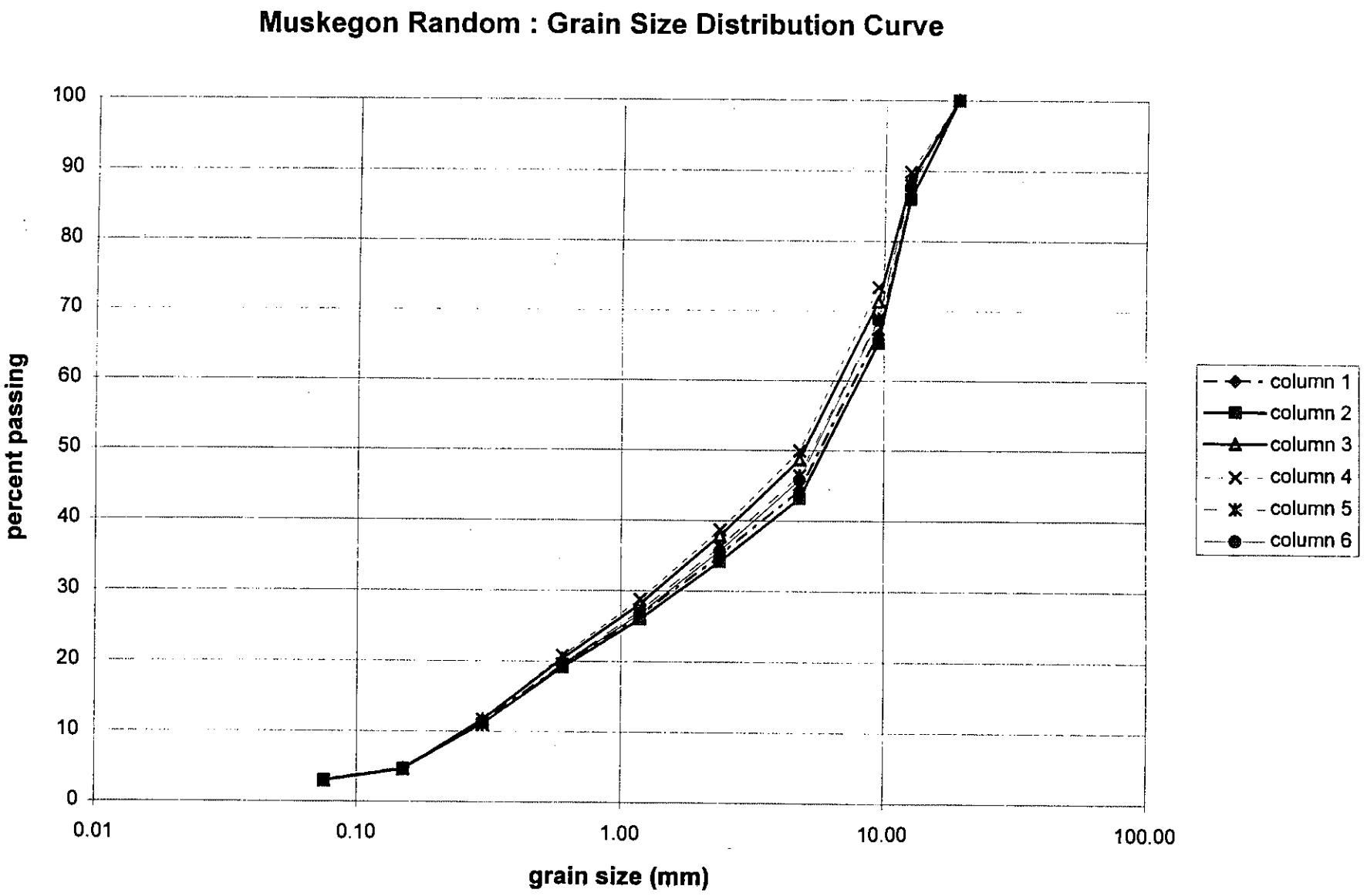


Muskegon Random Gradation Data for Each Column file:mrcolumn-curve.xls

Sieve size	Sieve opening (mm)	^.45	Percent passing column 1	column 2	column 3	column 4	column 5	column 6	Avg	Std Dev	Max	Min	Diff
3/4 inch	19.00	3.76	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**	**0.00**	100.00	100.00	**0.00**
1/2 inch	12.50	3.12	85.97	85.91	88.67	89.85	87.99	87.77	**87.70**	**1.40**	89.85	85.91	**3.93**
3/8 inch	9.50	2.75	66.63	65.31	71.28	73.42	68.92	68.66	**69.04**	**2.71**	73.42	65.31	**8.11**
No. 4	4.75	2.02	44.44	43.20	48.67	49.93	46.42	45.80	**46.41**	**2.31**	49.93	43.20	**6.73**
No. 8	2.37	1.47	35.00	34.16	37.85	38.70	36.28	35.66	**36.28**	**1.57**	38.70	34.16	**4.54**
No. 16	1.18	1.08	26.51	25.97	28.10	28.73	27.12	26.70	**27.19**	**0.95**	28.73	25.97	**2.76**
No. 30	0.60	0.79	19.58	19.16	20.40	20.81	19.58	19.47	**19.83**	**0.68**	20.81	19.16	**1.65**
No. 50	0.30	0.58	11.34	11.10	11.68	11.68	10.89	11.18	**11.31**	**0.30**	11.68	10.89	**0.80**
No. 100	0.15	0.43	4.75	4.66	4.57	4.55	4.53	4.69	**4.63**	**0.08**	4.75	4.53	**0.22**
No. 200	0.08	0.31	3.04	2.97	2.92	2.97	2.88	2.96	**2.96**	**0.05**	3.04	2.88	**0.16**

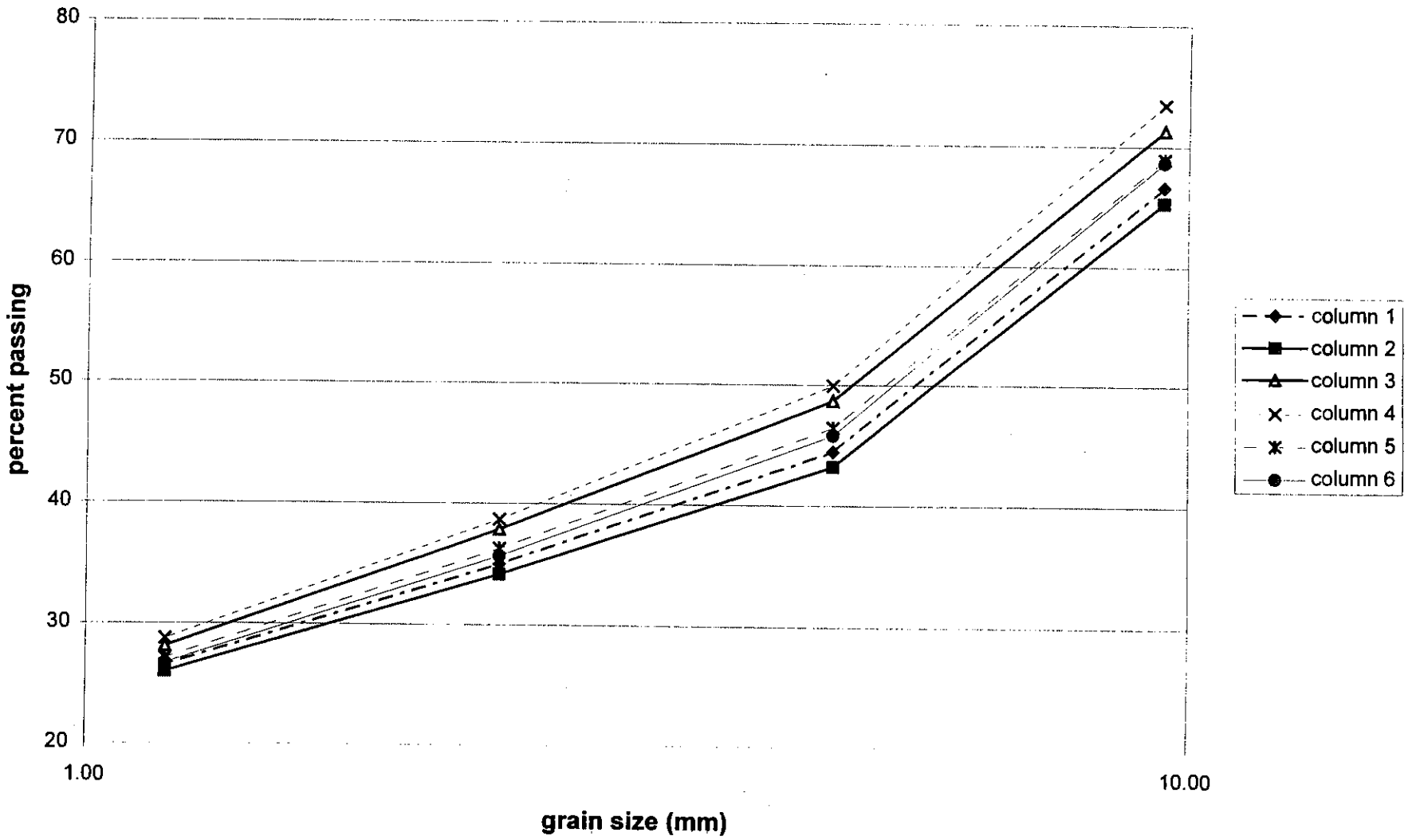





Muskegon Random : Grain Size Distribution Curve
percent passing
100
90
80
70
60
50
40
30
20
10
0
0.01
0.10
1.00
10.00
100.00
grain size (mm)
column 1
column 2
column 3
column 4
column 5
column 6

Curve Plot

Muskegon Random : Grain Size Distribution Curve (sieve 3/8" ~ no. 16)



Curve Plot (2)

Gradation Grid Analysis

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Muskegon Random
Date: 11/20/96
Description: % passing 3/8 sieve

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	68.64	63.36	74.68	77.80	70.11	66.08
5	75.55	69.96	71.96	71.65	69.60	73.66
4	62.92	60.45	65.80	***73.42***	64.74	69.46
3	62.44	70.35	72.74	72.74	68.42	66.96
2	61.43	58.15	65.44	67.87	63.50	65.82
1	68.79	69.60	77.06	77.05	77.16	69.98
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	DIFF I	--	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

no <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing 3/8 sieve*

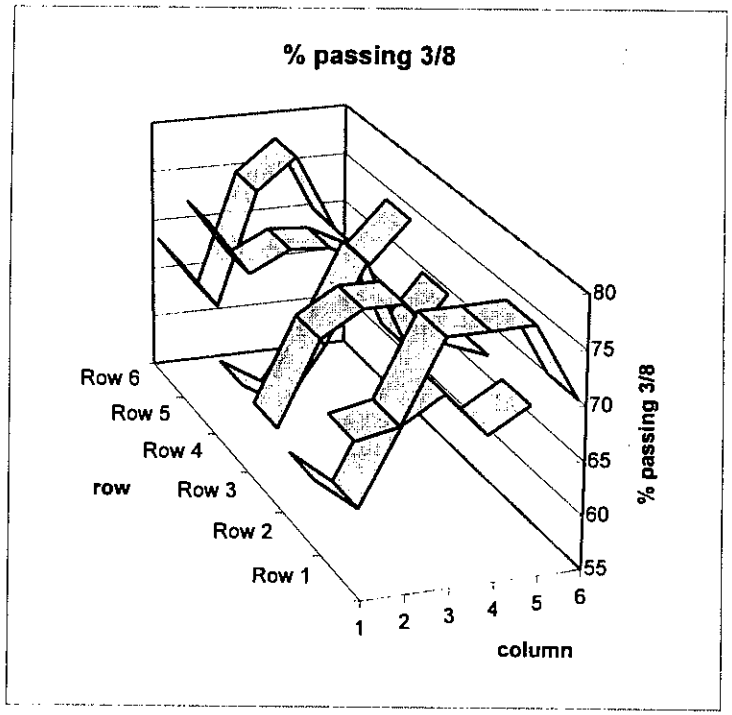
Color 1 *Color Above and Below Average*
Clear Color

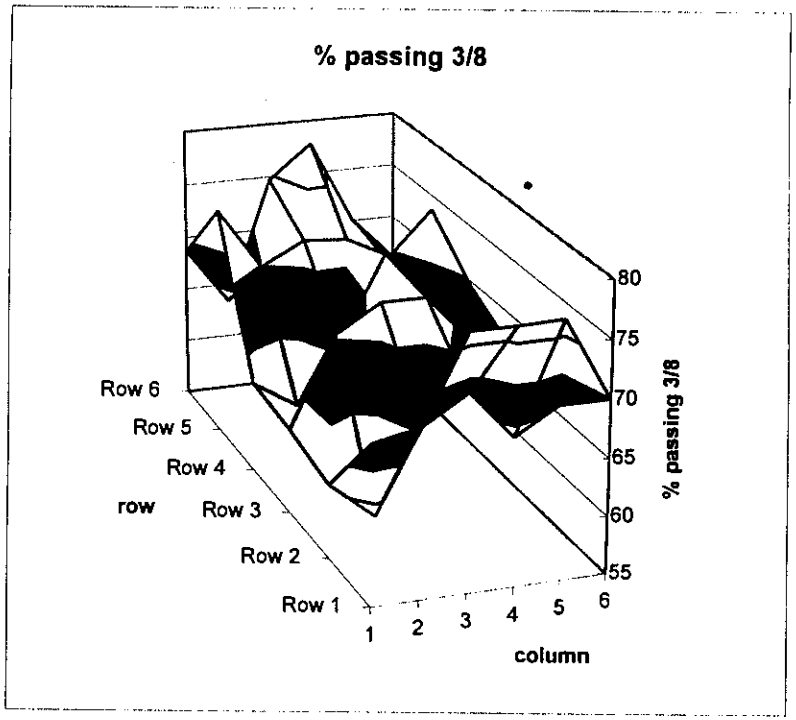
Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	68.6	63.4	74.7	77.8	70.1	66.1	70.11	5.364	7.65%
5	75.5	70.0	72.0	71.6	69.6	73.7	72.06	2.253	3.13%
4	62.9	60.4	65.8	73.4	64.7	69.5	66.13	4.666	7.06%
3	62.4	70.4	72.7	72.7	68.4	67.0	68.94	3.932	5.70%
2	61.4	58.2	65.4	67.9	63.5	65.8	63.70	3.488	5.47%
1	68.8	69.6	77.1	77.1	77.2	70.0	73.27	4.200	5.73%
Average	66.63	65.31	71.28	73.42	68.92	68.66	69.04	**69.04**	3.984	5.79%
Std. Dev.	5.414	5.368	4.727	3.654	4.834	3.001	4.500		**5.058075**	
Coeff. of Var.	8.13%	8.22%	6.63%	4.98%	7.01%	4.37%	6.56%			**7.33%**

Stats

MRGRID38.XLS

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing 3/8 sieve*





Graph

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*

Date: *11/20/96*

Description: *% passing 3/8 sieve*

Color 1 *Color Above and Below Average*

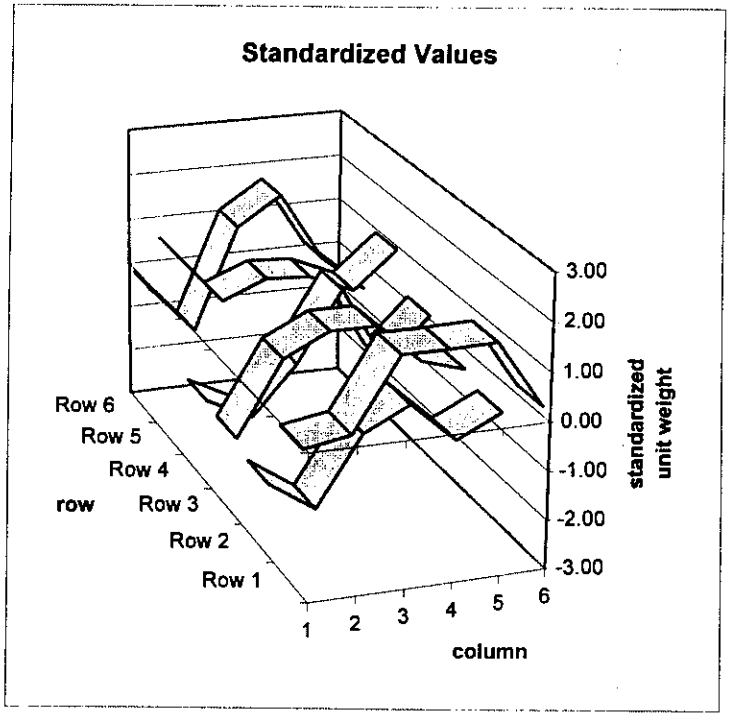
Clear Color

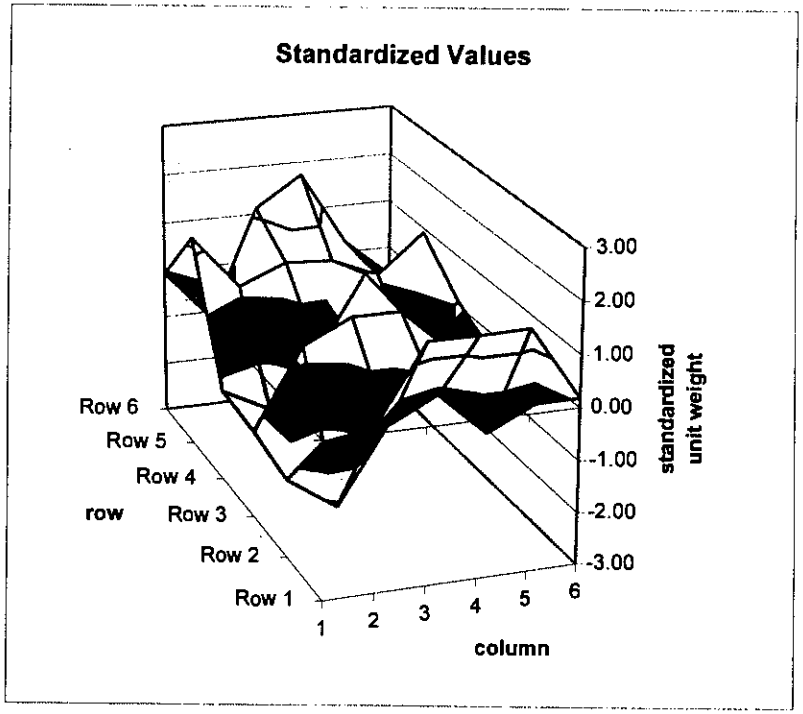
Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	-0.08	-1.12	1.12	1.73	0.21	-0.58	0.21	1.061
5	1.29	0.18	0.58	0.52	0.11	0.91	0.60	0.445
4	-1.21	-1.70	-0.64	0.87	-0.85	0.08	-0.57	0.923
3	-1.31	0.26	0.73	0.73	-0.12	-0.41	-0.02	0.777
2	-1.50	-2.15	-0.71	-0.23	-1.09	-0.64	-1.05	0.690
1	-0.05	0.11	1.59	1.58	1.61	0.19	0.84	0.830
Average	-0.48	-0.74	0.44	0.87	-0.02	-0.07	0.00	**0.00**	0.788
Std. Dev.	1.070	1.061	0.935	0.722	0.956	0.593	0.890		**1.00**

MRGRID38.XLS

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing 3/8 sieve*





Std Graph

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	66.63	-2.41	5.803	5.414	29.317
2	65.31	-3.72	13.872	5.368	28.812
3	71.28	2.24	5.024	4.727	22.345
4	73.42	4.38	19.214	3.654	13.353
5	68.92	-0.12	0.013	4.834	23.372
6	68.66	-0.38	0.141	3.001	9.009
sum			44.068		126.208
all data	69.04			5.058075	25.5841

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	264.406726	5	52.881	**2.51402**	2.533554	0.0514084
within columns:	631.037521	30	21.035			
Total:	895.444248					

Different ? | **0** | **no**

ANOVA

Pavement Segregation Analysis Spreadsheet
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Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.32	-4.65	-6.79	-2.29	-2.03
2	1.32		-5.97	-8.11	-3.61	-3.35
3	-4.65	-5.97		-2.14	2.36	2.62
4	-6.79	-8.11	-2.14		4.50	4.76
5	-2.29	-3.61	2.36	4.50		0.26
6	-2.03	-3.35	2.62	4.76	0.26	

Critical Values

Columns	1	2	3	4	5	6
1		10.39	9.79	8.90	9.89	8.43
2	10.39		9.75	8.85	9.84	8.38
3	9.79	9.75		8.14	9.21	7.63
4	8.90	8.85	8.14		8.26	6.44
5	9.89	9.84	9.21	8.26		7.75
6	8.43	8.38	7.63	6.44	7.75	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0016	0.0948	0.0192	0.5476	0.2821
2			0.0348	0.3311	0.0006	0.0340
3				0.2860	0.1224	0.6752
4					0.0187	0.2003
5						0.4306
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.6815	0.1441	0.0290	0.4569	0.4397
2	0.6815		0.0683	0.0121	0.2491	0.2118
3	0.1441	0.0683		0.4005	0.4131	0.2790
4	0.0290	0.0121	0.4005		0.0990	0.0334
5	0.4569	0.2491	0.4131	0.0990		0.9133
6	0.4397	0.2118	0.2790	0.0334	0.9133	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	1	0	0	1	0
2	0		0	1	0	0	1	0
3	0	0		0	0	0	0	0
4	1	1	0		0	1	3	1
5	0	0	0	0		0	0	0
6	0	0	0	1	0		1	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

0	0	1	1	1	0
1	1	1	1	1	1
0	0	0	1	0	1
0	1	1	1	0	0
0	0	0	0	0	0
0	1	1	1	1	1
1	3	4	5	3	3

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Muskegon Random
Date: 11/20/96
Description: % passing No. 4 sieve

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	47.06	41.70	52.22	53.00	47.27	44.50
5	50.59	47.47	50.09	48.37	46.63	49.83
4	41.22	39.31	43.68	***49.93***	43.23	45.56
3	41.26	47.38	48.57	48.57	45.48	43.44
2	39.38	36.17	43.14	45.31	42.08	41.88
1	47.15	47.15	54.30	54.38	53.86	49.58
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	--	--	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

no <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 4 sieve*

Color 1 *Color Above and Below Average*

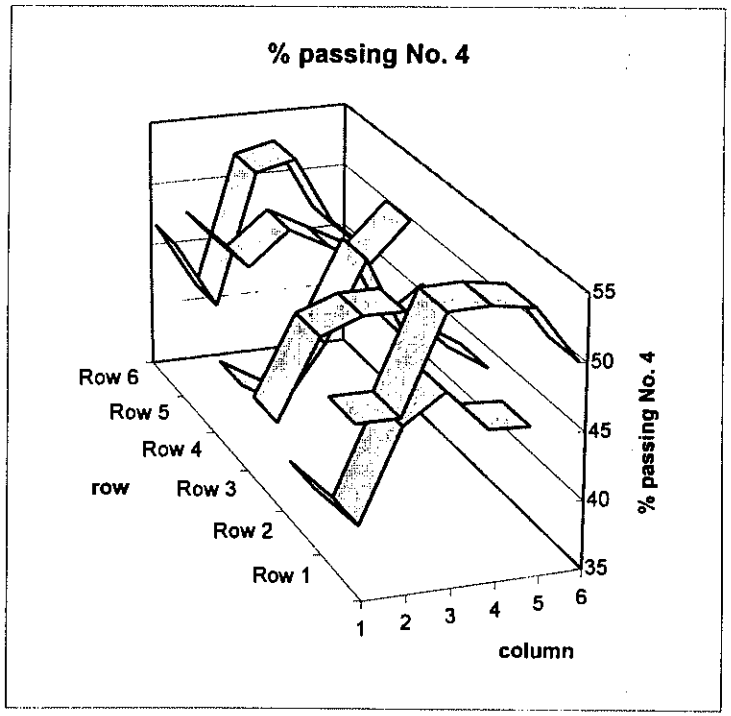
Clear Color

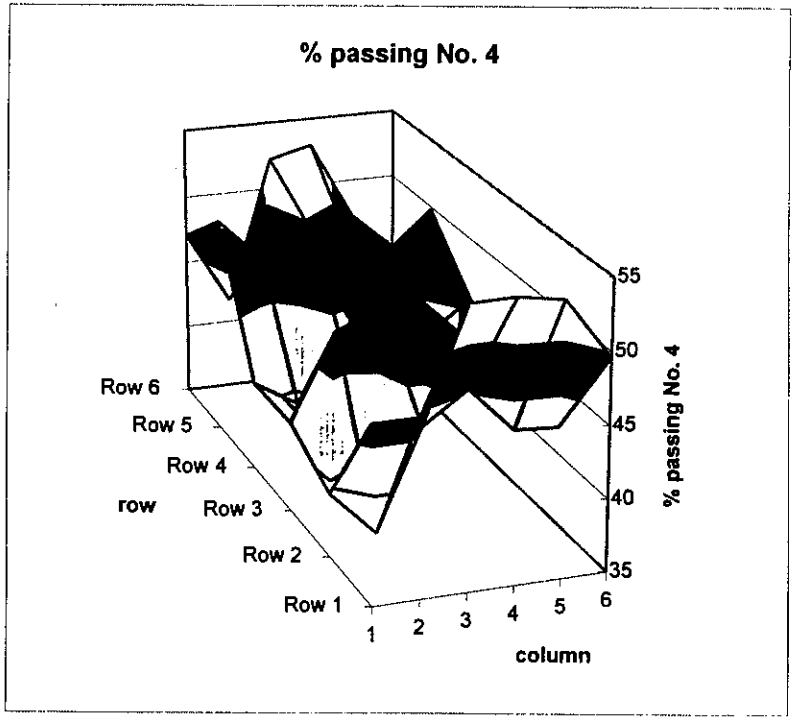
Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	47.1	41.7	52.2	53.0	47.3	44.5	47.62	4.367	9.17%
5	50.6	47.5	50.1	48.4	46.6	49.8	48.83	1.587	3.25%
4	41.2	39.3	43.7	49.9	43.2	45.6	43.82	3.682	8.40%
3	41.3	47.4	48.6	48.6	45.5	43.4	45.78	2.967	6.48%
2	39.4	36.2	43.1	45.3	42.1	41.9	41.33	3.175	7.68%
1	47.1	47.2	54.3	54.4	53.9	49.6	51.07	3.525	6.90%
Average	44.44	43.20	48.67	49.93	46.42	45.80	46.41	**46.41**	3.217	6.98%
Std. Dev.	4.430	4.861	4.513	3.312	4.146	3.261	4.087		**4.485597**	
Coeff. of Var.	9.97%	11.25%	9.27%	6.63%	8.93%	7.12%	8.86%			**9.67%**

Stats

MRGRID#4.XLS

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 4 sieve*





Graph

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 4 sieve*

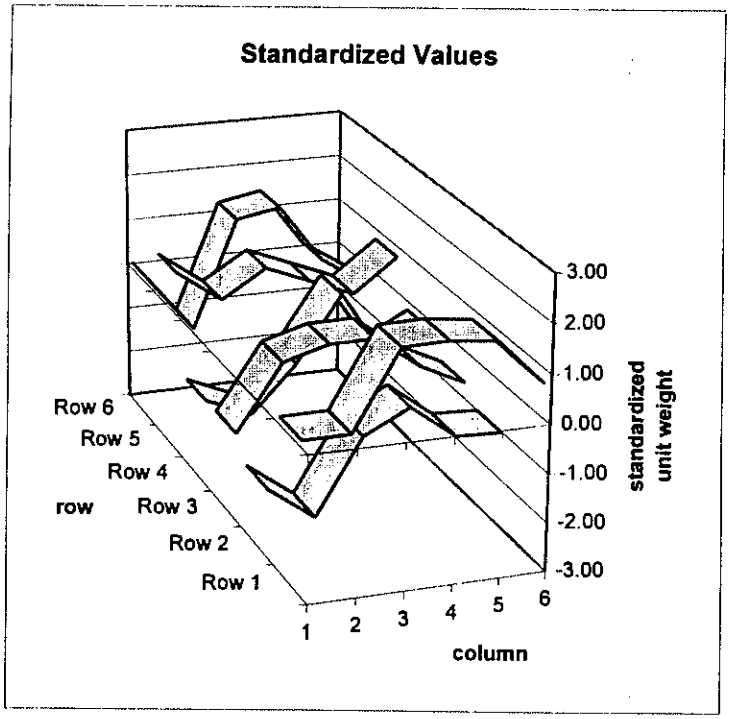
Color 1 *Color Above and Below Average*

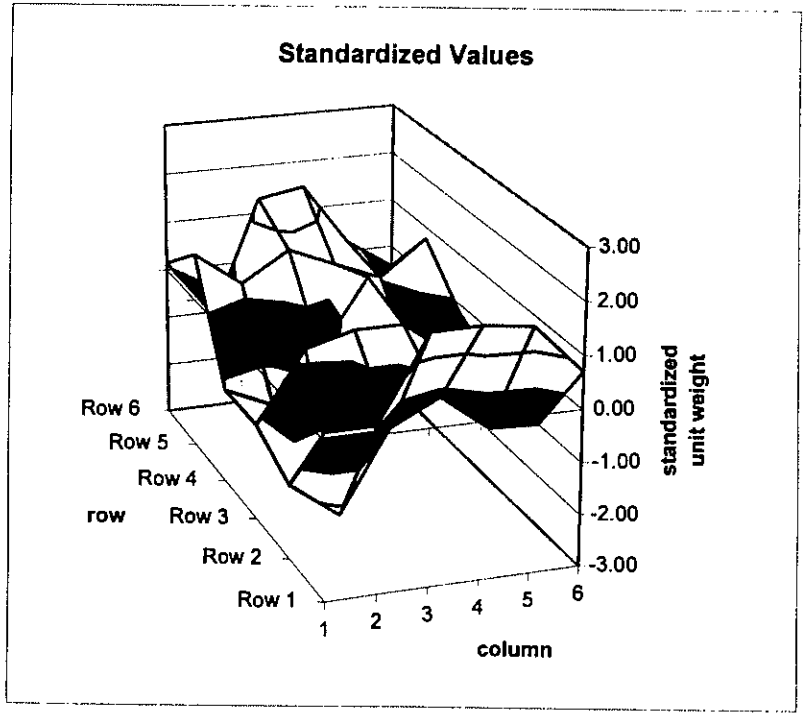
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	0.15	-1.05	1.30	1.47	0.19	-0.43	0.27	0.974
5	0.93	0.24	0.82	0.44	0.05	0.76	0.54	0.354
4	-1.16	-1.58	-0.61	0.78	-0.71	-0.19	-0.58	0.821
3	-1.15	0.22	0.48	0.48	-0.21	-0.66	-0.14	0.662
2	-1.57	-2.28	-0.73	-0.25	-0.97	-1.01	-1.13	0.708
1	0.16	0.17	1.76	1.78	1.66	0.71	1.04	0.786
Average	-0.44	-0.72	0.50	0.78	0.00	-0.14	0.00	**0.00**	0.717
Std. Dev.	0.988	1.084	1.006	0.738	0.924	0.727	0.911		**1.00**

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 4 sieve*





Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	44.44	-1.97	3.864	4.430	19.623
2	43.20	-3.21	10.318	4.861	23.631
3	48.67	2.26	5.099	4.513	20.371
4	49.93	3.52	12.366	3.312	10.972
5	46.42	0.02	0.000	4.146	17.188
6	45.80	-0.61	0.375	3.261	10.634
sum			32.022		102.418
all data	46.41			4.485597	20.1206

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	192.129762	5	38.426	**2.25112**	2.533554	0.0748378
within columns:	512.090409	30	17.070			
Total:	704.220171					

Different ? | **0** | **no**

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.25	-4.22	-5.48	-1.98	-1.35
2	1.25		-5.47	-6.73	-3.23	-2.60
3	-4.22	-5.47		-1.26	2.24	2.87
4	-5.48	-6.73	-1.26		3.50	4.13
5	-1.98	-3.23	2.24	3.50		0.63
6	-1.35	-2.60	2.87	4.13	0.63	

Critical Values

Columns	1	2	3	4	5	6
1		8.96	8.62	7.54	8.27	7.49
2	8.96		9.04	8.01	8.70	7.98
3	8.62	9.04		7.63	8.35	7.59
4	7.54	8.01	7.63		7.23	6.33
5	8.27	8.70	8.35	7.23		7.19
6	7.49	7.98	7.59	6.33	7.19	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0005	0.0185	0.0059	0.1864	0.1636
2			0.0307	0.2370	0.0004	0.0170
3				0.3335	0.0509	0.4131
4					0.0120	0.1340
5						0.5392
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.6524	0.1329	0.0356	0.4424	0.5601
2	0.6524		0.0710	0.0187	0.2442	0.3021
3	0.1329	0.0710		0.5940	0.3912	0.2354
4	0.0356	0.0187	0.5940		0.1372	0.0546
5	0.4424	0.2442	0.3912	0.1372		0.7766
6	0.5601	0.3021	0.2354	0.0546	0.7766	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	1	0	0	1	0
2	0		0	1	0	0	1	0
3	0	0		0	0	0	0	0
4	1	1	0		0	0	2	0
5	0	0	0	0		0	0	0
6	0	0	0	0	0		0	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

1	0	1	1	1	0
1	1	1	1	1	1
0	0	0	1	0	0
0	1	1	1	0	0
0	0	0	0	0	0
1	1	1	1	1	1
3	3	4	5	3	2

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

Location: Muskegon Random
Date: 11/20/96
Description: % passing No. 8 sieve

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	36.19	32.73	40.15	40.51	36.30	34.48
5	38.90	36.90	38.50	37.64	35.94	37.94
4	33.79	32.38	34.86	***38.70***	34.39	35.76
3	33.28	37.49	37.89	37.89	36.31	34.82
2	31.41	28.97	33.96	35.75	33.44	32.90
1	36.45	36.50	41.74	41.71	41.31	38.08
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	DIFF !	--	--
6 of 6 test	--	--	--	--	--	--

Clear *Clears everything for a new problem*
Enter data, or press a key below.

Example *Enters example segregated data*

Random *Enters a random sample*

no <-- significant column differences?
Edge

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 8 sieve*

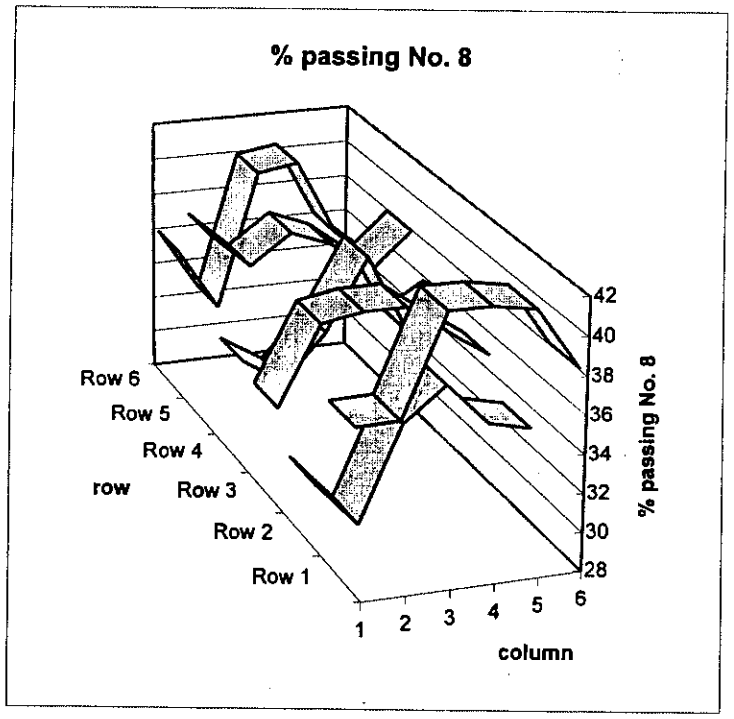
Color 1 *Color Above and Below Average*

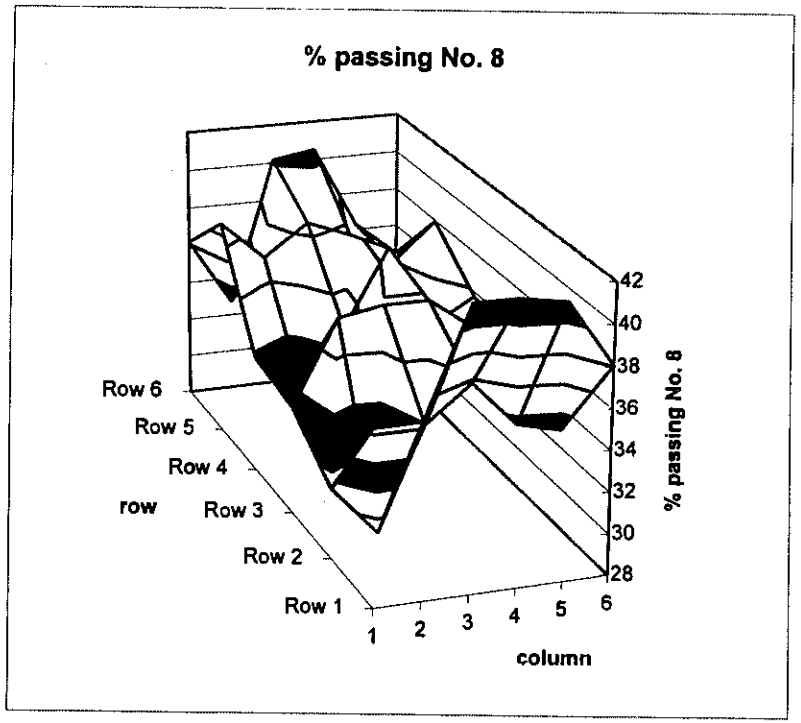
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	36.2	32.7	40.2	40.5	36.3	34.5	36.73	3.083	8.39%
5	38.9	36.9	38.5	37.6	35.9	37.9	37.64	1.082	2.87%
4	33.8	32.4	34.9	38.7	34.4	35.8	34.98	2.144	6.13%
3	33.3	37.5	37.9	37.9	36.3	34.8	36.28	1.883	5.19%
2	31.4	29.0	34.0	35.8	33.4	32.9	32.74	2.326	7.11%
1	36.5	36.5	41.7	41.7	41.3	38.1	39.30	2.577	6.56%
Average	35.00	34.16	37.85	38.70	36.28	35.66	36.28	**36.28**	2.183	6.04%
Std. Dev.	2.684	3.353	2.997	2.135	2.721	2.037	2.655		**2.959571**	
Coeff. of Var.	7.67%	9.82%	7.92%	5.52%	7.50%	5.71%	7.36%			**8.16%**

MRGRID#8.XLS

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 8 sieve*





Graph

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon Random*

Date: *11/20/96*

Description: *% passing No. 8 sieve*

Color 1 *Color Above and Below Average*

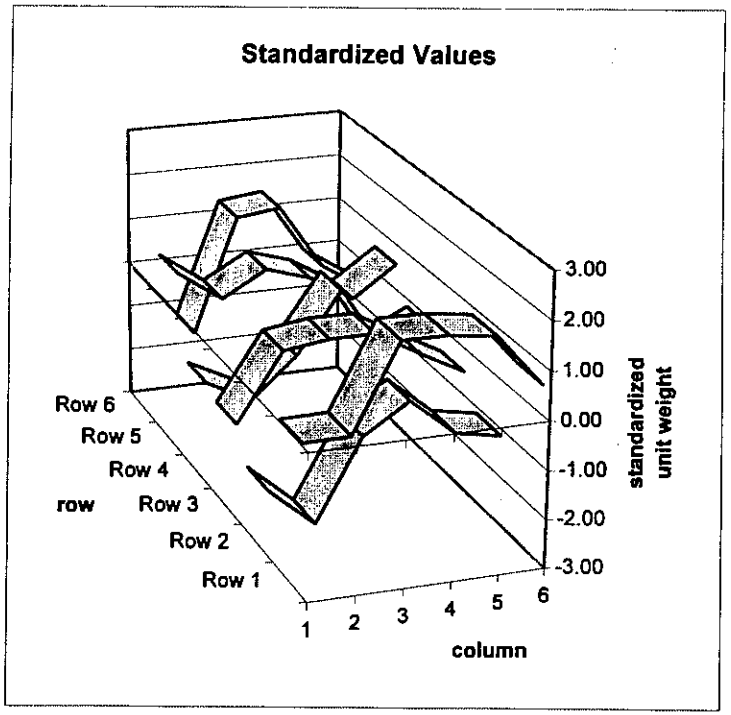
Clear Color

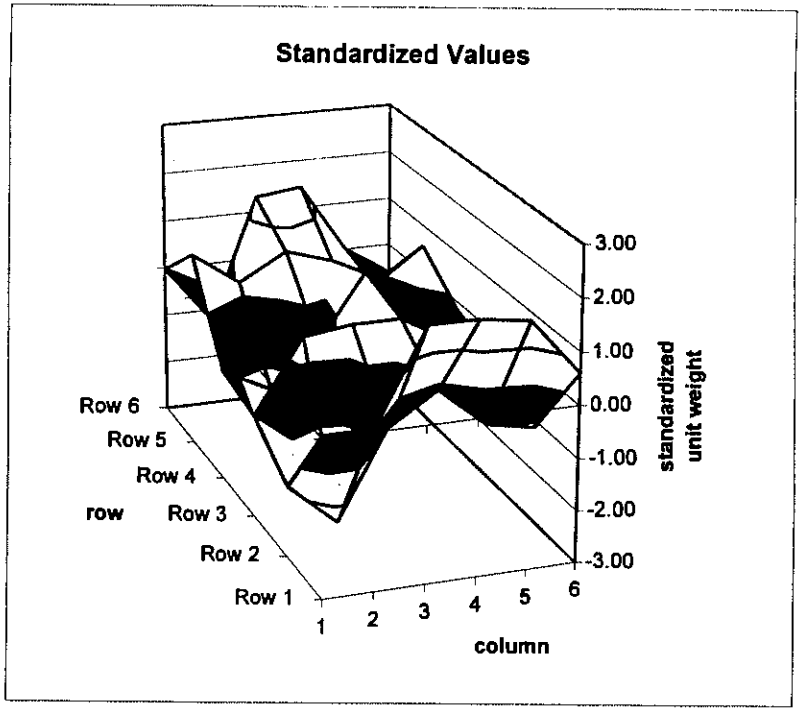
Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	-0.03	-1.20	1.31	1.43	0.01	-0.61	0.15	1.042
5	0.89	0.21	0.75	0.46	-0.11	0.56	0.46	0.366
4	-0.84	-1.32	-0.48	0.82	-0.64	-0.17	-0.44	0.724
3	-1.01	0.41	0.54	0.54	0.01	-0.49	0.00	0.636
2	-1.65	-2.47	-0.78	-0.18	-0.96	-1.14	-1.20	0.786
1	0.06	0.07	1.84	1.83	1.70	0.61	1.02	0.871
Average	-0.43	-0.71	0.53	0.82	0.00	-0.21	0.00	**0.00**	0.737
Std. Dev.	0.907	1.133	1.013	0.721	0.920	0.688	0.897		**1.00**

MRGRID#8.XLS

Location: *Muskegon Random*
Date: *11/20/96*
Description: *% passing No. 8 sieve*





Std Graph

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	35.00	-1.27	1.620	2.684	7.205
2	34.16	-2.11	4.471	3.353	11.245
3	37.85	1.57	2.476	2.997	8.981
4	38.70	2.42	5.866	2.135	4.559
5	36.28	0.00	0.000	2.721	7.406
6	35.66	-0.61	0.374	2.037	4.149
sum			14.807		43.544
all data	36.28			2.959571	8.7591

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	88.844653	5	17.769	**2.44838**	2.533554	0.0564454
within columns:	217.722418	30	7.257			
Total:	306.567071					

Different ? | **0** | **no**

ANOVA

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		0.84	-2.85	-3.69	-1.28	-0.66
2	0.84		-3.69	-4.54	-2.12	-1.50
3	-2.85	-3.69		-0.85	1.57	2.19
4	-3.69	-4.54	-0.85		2.42	3.03
5	-1.28	-2.12	1.57	2.42		0.62
6	-0.66	-1.50	2.19	3.03	0.62	

Critical Values

Columns	1	2	3	4	5	6
1		5.85	5.48	4.67	5.21	4.59
2	5.85		6.13	5.42	5.88	5.35
3	5.48	6.13		5.01	5.52	4.94
4	4.67	5.42	5.01		4.71	4.02
5	5.21	5.88	5.52	4.71		4.63
6	4.59	5.35	4.94	4.02	4.63	

Critical ?

Columns	1	2	3	4	5	6
1		0	0	0	0	0
2	0		0	0	0	0
3	0	0		0	0	0
4	0	0	0		0	0
5	0	0	0	0		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**0**	**0**	**0**
Different?	**0**	**0**	**0**	**0**	**0**	**0**

t-tests
two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.0009	0.0431	0.0103	0.1762	0.1485
2			0.0159	0.1131	0.0009	0.0298
3				0.2913	0.1570	0.7670
4					0.0220	0.2810
5						0.5118
6						

t-tests
two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.6415	0.1138	0.0248	0.4325	0.6414
2	0.6415		0.0723	0.0189	0.2573	0.3703
3	0.1138	0.0723		0.5847	0.3645	0.1704
4	0.0248	0.0189	0.5847		0.1176	0.0305
5	0.4325	0.2573	0.3645	0.1176		0.6668
6	0.6414	0.3703	0.1704	0.0305	0.6668	

Fail t-test at 0.05 level?

Col vs Col	1	2	3	4	5	6	Sum	Diff ?
1		0	0	1	0	0	1	0
2	0		0	1	0	0	1	0
3	0	0		0	0	0	**0**	0
4	1	1	0		0	1	3	1
5	0	0	0	0		0	0	0
6	0	0	0	1	0		1	0

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Above Average? 1= true, 0 = false

0	0	1	1	1	0
1	1	1	1	0	1
0	0	0	1	0	0
0	1	1	1	1	0
0	0	0	0	0	0
1	1	1	1	1	1
2	3	4	5	3	2

Sieve Analysis

Sieve Analysis - Muskegon Random

Weight of bags & soil	2396
Weight of soil	2388.2

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 111	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 112	1/2 inch	12.500	3.116	277.40	11.62	11.62	88.38
R 113	3/8 inch	9.500	2.754	467.70	19.59	31.21	68.79
	No. 4	4.750	2.016	516.50	21.64	52.85	47.15
	No. 8	2.370	1.474	255.30	10.70	63.55	36.45
	No. 16	1.180	1.077	214.60	8.99	72.54	27.46
	No. 30	0.600	0.795	166.80	6.99	79.53	20.47
	No. 50	0.300	0.582	211.80	8.87	88.40	11.60
	No. 100	0.150	0.426	161.00	6.74	95.14	4.86
	No. 200	0.075	0.312	42.10	1.76	96.91	3.09
	Pan			73.80	3.09	100.00	0.00
			Total weight	2387.00	100.00		

Operator	Nazar Elwazir
Date	4-Jun-96
Remarks	

Weight of tear & soil	3470.10
Weight of tear	1083.70
Weight of soil	2386.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2564.1
Weight of soil	2556.2

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 121	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 122	1/2 inch	12.500	3.116	303.20	11.87	11.87	88.13
R 123	3/8 inch	9.500	2.754	473.50	18.53	30.40	69.60
	No. 4	4.750	2.016	573.40	22.44	52.85	47.15
	No. 8	2.370	1.474	272.20	10.65	63.50	36.50
	No. 16	1.180	1.077	231.90	9.08	72.58	27.42
	No. 30	0.600	0.795	180.80	7.08	79.66	20.34
	No. 50	0.300	0.582	214.70	8.40	88.06	11.94
	No. 100	0.150	0.426	182.90	7.16	95.22	4.78
	No. 200	0.075	0.312	43.40	1.70	96.92	3.08
	Pan			78.70	3.08	100.00	0.00
			Total weight	2554.70	100.00		

Operator	Nazar Elwazir
Date	4-Jun-96
Remarks	

Weight of tear & soil	3597.70
Weight of tear	1043.00
Weight of soil	2555.70

Sieve Analysis - Muskegon Random

Weight of bags & soil	2385
Weight of soil	2377.8

Weight of empty bags	7.2

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 131	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 132	1/2 inch	12.500	3.116	152.60	6.42	6.42	93.58
R 133	3/8 inch	9.500	2.754	392.60	16.52	22.94	77.06
	No. 4	4.750	2.016	540.90	22.76	45.70	54.30
	No. 8	2.370	1.474	298.60	12.56	58.26	41.74
	No. 16	1.180	1.077	263.50	11.09	69.35	30.65
	No. 30	0.600	0.795	199.30	8.39	77.74	22.26
	No. 50	0.300	0.582	229.00	9.64	87.37	12.63
	No. 100	0.150	0.426	195.50	8.23	95.60	4.40
	No. 200	0.075	0.312	36.60	1.54	97.14	2.86
	Pan			68.00	2.86	100.00	0.00
			Total weight	2376.60	100.00		

Operator	Nazar Elwazir
Date	29-Jun-96
Remarks	

Weight of tear & soil	3421.50
Weight of tear	1043.90
Weight of soil	2377.60

Sieve Analysis - Muskegon Random

Weight of bags & soil	2371.5
Weight of soil	2363.6

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 141	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 142	1/2 inch	12.500	3.116	178.40	7.55	7.55	92.45
R 143	3/8 inch	9.500	2.754	363.60	15.40	22.95	77.05
	No. 4	4.750	2.016	535.40	22.67	45.62	54.38
	No. 8	2.370	1.474	299.40	12.68	58.29	41.71
	No. 16	1.180	1.077	265.40	11.24	69.53	30.47
	No. 30	0.600	0.795	196.70	8.33	77.86	22.14
	No. 50	0.300	0.582	230.90	9.78	87.64	12.36
	No. 100	0.150	0.426	179.50	7.60	95.24	4.76
	No. 200	0.075	0.312	39.70	1.68	96.92	3.08
	Pan			72.80	3.08	100.00	0.00
			Total weight	2361.80	100.00		

Operator	Nazar Elwazir
Date	29-Jun-96
Remarks	

Weight of tear & soil	3406.00
Weight of tear	1043.90
Weight of soil	2362.20

Sieve Analysis - Muskegon Random

Weight of bags & soil	2028.1
Weight of soil	2020.2

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 151	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 152	1/2 inch	12.500	3.116	137.70	6.82	6.82	93.18
R 153	3/8 inch	9.500	2.754	323.50	16.02	22.84	77.16
	No. 4	4.750	2.016	470.60	23.31	46.14	53.86
	No. 8	2.370	1.474	253.40	12.55	58.69	41.31
	No. 16	1.180	1.077	232.70	11.52	70.22	29.78
	No. 30	0.600	0.795	164.40	8.14	78.36	21.64
	No. 50	0.300	0.582	178.20	8.82	87.18	12.82
	No. 100	0.150	0.426	159.50	7.90	95.08	4.92
	No. 200	0.075	0.312	36.30	1.80	96.88	3.12
	Pan			63.00	3.12	100.00	0.00
			Total weight	2019.30	100.00		

Operator	Nazar Elwazir
Date	29-Jun-96
Remarks	

Weight of tear & soil	3063.50
Weight of tear	1043.90
Weight of soil	2019.60

Sieve Analysis - Muskegon Random

Weight of bags & soil	2101.3
Weight of soil	2093.4

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 161	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 162	1/2 inch	12.500	3.116	253.80	12.13	12.13	87.87
R 163	3/8 inch	9.500	2.754	374.20	17.89	30.02	69.98
	No. 4	4.750	2.016	426.90	20.40	50.42	49.58
	No. 8	2.370	1.474	240.60	11.50	61.92	38.08
	No. 16	1.180	1.077	208.70	9.98	71.90	28.10
	No. 30	0.600	0.795	154.00	7.36	79.26	20.74
	No. 50	0.300	0.582	171.90	8.22	87.47	12.53
	No. 100	0.150	0.426	153.80	7.35	94.82	5.18
	No. 200	0.075	0.312	38.90	1.86	96.68	3.32
	Pan			69.40	3.32	100.00	0.00
			Total weight	2092.20	100.00		

Operator	Nazar Elwazir
Date	29-Jun-96
Remarks	

Weight of tear & soil	3136.20
Weight of tear	1043.90
Weight of soil	2092.30

Sieve Analysis - Muskegon Random

Weight of bags & soil	1940.1
Weight of soil	1932.2

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 211	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 212	1/2 inch	12.500	3.116	350.50	18.16	18.16	81.84
R 213	3/8 inch	9.500	2.754	394.00	20.41	38.57	61.43
	No. 4	4.750	2.016	425.60	22.05	60.62	39.38
	No. 8	2.370	1.474	153.90	7.97	68.59	31.41
	No. 16	1.180	1.077	131.00	6.79	75.38	24.62
	No. 30	0.600	0.795	119.20	6.18	81.56	18.44
	No. 50	0.300	0.582	147.60	7.65	89.20	10.80
	No. 100	0.150	0.426	118.90	6.16	95.36	4.64
	No. 200	0.075	0.312	33.40	1.73	97.09	2.91
	Pan			56.10	2.91	100.00	0.00
			Total weight	1930.20	100.00		

Operator	Nazar Elwazir
Date	29-Jun-96
Remarks	

Weight of tear & soil	2974.80
Weight of tear	1043.90
Weight of soil	1930.90

Sieve Analysis - Muskegon Random

Weight of bags & soil	2027.3
Weight of soil	2019.6

Weight of empty bags	7.7

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 221	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 222	1/2 inch	12.500	3.116	376.20	18.73	18.73	81.27
R 223	3/8 inch	9.500	2.754	464.30	23.12	41.85	58.15
	No. 4	4.750	2.016	441.60	21.99	63.83	36.17
	No. 8	2.370	1.474	144.60	7.20	71.03	28.97
	No. 16	1.180	1.077	123.20	6.13	77.16	22.84
	No. 30	0.600	0.795	111.70	5.56	82.72	17.28
	No. 50	0.300	0.582	137.90	6.87	89.59	10.41
	No. 100	0.150	0.426	122.40	6.09	95.68	4.32
	No. 200	0.075	0.312	31.10	1.55	97.23	2.77
	Pan			55.60	2.77	100.00	0.00
			Total weight	2008.60	100.00		

Operator	Nazar Elwazir
Date	1-Jul-96
Remarks	

Weight of tear & soil	3063.10
Weight of tear	1043.90
Weight of soil	2019.20

Sieve Analysis - Muskegon Random

Weight of bags & soil	2124
Weight of soil	2116.1

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 231	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 232	1/2 inch	12.500	3.116	307.30	14.54	14.54	85.46
R 233	3/8 inch	9.500	2.754	423.30	20.03	34.56	65.44
	No. 4	4.750	2.016	471.30	22.30	56.86	43.14
	No. 8	2.370	1.474	194.00	9.18	66.04	33.96
	No. 16	1.180	1.077	171.80	8.13	74.17	25.83
	No. 30	0.600	0.795	141.10	6.68	80.84	19.16
	No. 50	0.300	0.582	164.80	7.80	88.64	11.36
	No. 100	0.150	0.426	142.80	6.76	95.40	4.60
	No. 200	0.075	0.312	34.10	1.61	97.01	2.99
	Pan			63.20	2.99	100.00	0.00
			Total weight	2113.70	100.00		

Operator	Nazar Elwazir
Date	1-Jul-96
Remarks	

Weight of tear & soil	3158.30
Weight of tear	1043.90
Weight of soil	2114.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2010.5
Weight of soil	2002.7

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 241	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 242	1/2 inch	12.500	3.116	286.40	14.31	14.31	85.69
R 243	3/8 inch	9.500	2.754	356.60	17.82	32.13	67.87
	No. 4	4.750	2.016	451.40	22.56	54.69	45.31
	No. 8	2.370	1.474	191.30	9.56	64.25	35.75
	No. 16	1.180	1.077	169.40	8.47	72.72	27.28
	No. 30	0.600	0.795	148.40	7.42	80.13	19.87
	No. 50	0.300	0.582	167.30	8.36	88.49	11.51
	No. 100	0.150	0.426	139.10	6.95	95.44	4.56
	No. 200	0.075	0.312	30.60	1.53	96.97	3.03
	Pan			60.60	3.03	100.00	0.00
			Total weight	2001.10	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	3045.40
Weight of tear	1044.00
Weight of soil	2001.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2012
Weight of soil	2004.1

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 251	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 252	1/2 inch	12.500	3.116	323.10	16.13	16.13	83.87
R 253	3/8 inch	9.500	2.754	407.80	20.36	36.50	63.50
	No. 4	4.750	2.016	429.10	21.43	57.92	42.08
	No. 8	2.370	1.474	173.00	8.64	66.56	33.44
	No. 16	1.180	1.077	155.50	7.76	74.32	25.68
	No. 30	0.600	0.795	139.00	6.94	81.27	18.73
	No. 50	0.300	0.582	164.00	8.19	89.45	10.55
	No. 100	0.150	0.426	125.20	6.25	95.71	4.29
	No. 200	0.075	0.312	32.20	1.61	97.31	2.69
	Pan			53.80	2.69	100.00	0.00
			Total weight	2002.70	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	3046.50
Weight of tear	1043.80
Weight of soil	2002.70

Sieve Analysis - Muskegon Random

Weight of bags & soil	1776
Weight of soil	1768.1

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 261	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 262	1/2 inch	12.500	3.116	236.50	13.39	13.39	86.61
R 263	3/8 inch	9.500	2.754	367.40	20.79	34.18	65.82
	No. 4	4.750	2.016	423.00	23.94	58.12	41.88
	No. 8	2.370	1.474	158.60	8.98	67.10	32.90
	No. 16	1.180	1.077	134.30	7.60	74.70	25.30
	No. 30	0.600	0.795	118.70	6.72	81.42	18.58
	No. 50	0.300	0.582	138.20	7.82	89.24	10.76
	No. 100	0.150	0.426	111.60	6.32	95.56	4.44
	No. 200	0.075	0.312	27.60	1.56	97.12	2.88
	Pan			50.90	2.88	100.00	0.00
			Total weight	1766.80	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	2811.20
Weight of tear	1043.80
Weight of soil	1767.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2143.3
Weight of soil	2135.5

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 311	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 312	1/2 inch	12.500	3.116	326.70	15.30	15.30	84.70
R 313	3/8 inch	9.500	2.754	475.50	22.27	37.56	62.44
	No. 4	4.750	2.016	452.10	21.17	58.74	41.26
	No. 8	2.370	1.474	170.40	7.98	66.72	33.28
	No. 16	1.180	1.077	155.10	7.26	73.98	26.02
	No. 30	0.600	0.795	151.10	7.08	81.05	18.95
	No. 50	0.300	0.582	176.80	8.28	89.33	10.67
	No. 100	0.150	0.426	130.00	6.09	95.42	4.58
	No. 200	0.075	0.312	34.50	1.62	97.04	2.96
	Pan			63.30	2.96	100.00	0.00
			Total weight	2135.50	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	3179.00
Weight of tear	1043.90
Weight of soil	2135.10

Sieve Analysis - Muskegon Random

Weight of bags & soil	2284.2
Weight of soil	2276.3

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 321	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 322	1/2 inch	12.500	3.116	274.20	12.05	12.05	87.95
R 323	3/8 inch	9.500	2.754	400.40	17.60	29.65	70.35
	No. 4	4.750	2.016	522.70	22.97	52.62	47.38
	No. 8	2.370	1.474	225.00	9.89	62.51	37.49
	No. 16	1.180	1.077	211.30	9.29	71.80	28.20
	No. 30	0.600	0.795	179.50	7.89	79.69	20.31
	No. 50	0.300	0.582	199.70	8.78	88.46	11.54
	No. 100	0.150	0.426	153.70	6.76	95.22	4.78
	No. 200	0.075	0.312	38.50	1.69	96.91	3.09
	Pan			70.30	3.09	100.00	0.00
			Total weight	2275.30	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	3319.70
Weight of tear	1043.90
Weight of soil	2275.80

Sieve Analysis - Muskegon Random

Weight of bags & soil	1914.9
Weight of soil	1907

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 331	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 332	1/2 inch	12.500	3.116	214.20	11.24	11.24	88.76
R 333	3/8 inch	9.500	2.754	305.30	16.02	27.26	72.74
	No. 4	4.750	2.016	460.50	24.17	51.43	48.57
	No. 8	2.370	1.474	203.50	10.68	62.11	37.89
	No. 16	1.180	1.077	178.60	9.37	71.49	28.51
	No. 30	0.600	0.795	159.20	8.36	79.84	20.16
	No. 50	0.300	0.582	173.60	9.11	88.95	11.05
	No. 100	0.150	0.426	124.80	6.55	95.50	4.50
	No. 200	0.075	0.312	29.80	1.56	97.07	2.93
	Pan			55.90	2.93	100.00	0.00
			Total weight	1905.40	100.00		

Operator	Nazar Elwazir
Date	18-Jul-96
Remarks	

Weight of tear & soil	2940.90
Weight of tear	643.90
Weight of soil	1906.00

Sieve Analysis - Muskegon Random

Weight of bags & soil	1914.9
Weight of soil	1907

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 341	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 342	1/2 inch	12.500	3.116	214.20	11.24	11.24	88.76
R 343	3/8 inch	9.500	2.754	305.30	16.02	27.26	72.74
	No. 4	4.750	2.016	460.50	24.17	51.43	48.57
	No. 8	2.370	1.474	203.50	10.68	62.11	37.89
	No. 16	1.180	1.077	178.60	9.37	71.49	28.51
	No. 30	0.600	0.795	159.20	8.36	79.84	20.16
	No. 50	0.300	0.582	173.60	9.11	88.95	11.05
	No. 100	0.150	0.426	124.80	6.55	95.50	4.50
	No. 200	0.075	0.312	29.80	1.56	97.07	2.93
	Pan			55.90	2.93	100.00	0.00
			Total weight	1905.40	100.00		

Operator	Nazar Elwazir	Weight of tear & soil	2949.90
Date	18-Jul-96	Weight of tear	1043.90
Remarks		Weight of soil	1906.00

Sieve Analysis - Muskegon Random

Weight of bags & soil	2111
Weight of soil	2103.1

Weight of empty bags	8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 351	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 352	1/2 inch	12.500	3.116	273.20	13.01	13.01	86.99
R 353	3/8 inch	9.500	2.754	389.90	18.57	31.58	68.42
	No. 4	4.750	2.016	481.60	22.94	54.52	45.48
	No. 8	2.370	1.474	192.70	9.18	63.69	36.31
	No. 16	1.180	1.077	179.80	8.56	72.26	27.74
	No. 30	0.600	0.795	170.80	8.13	80.39	19.61
	No. 50	0.300	0.582	190.30	9.06	89.46	10.54
	No. 100	0.150	0.426	129.90	6.19	95.64	4.36
	No. 200	0.075	0.312	31.60	1.50	97.15	2.85
	Pan			59.90	2.85	100.00	0.00
			Total weight	2099.70	100.00		

Operator	Nazar Elwazir
Date	2-Aug-96
Remarks	

Weight of tear & soil	3144.10
Weight of tear	1044.00
Weight of soil	2100.10

Sieve Analysis - Muskegon Random

Weight of bags & soil	1915.5
Weight of soil	1907.5

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 361	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 362	1/2 inch	12.500	3.116	245.00	12.85	12.85	87.15
R 363	3/8 inch	9.500	2.754	384.80	20.19	33.04	66.96
	No. 4	4.750	2.016	448.20	23.51	56.56	43.44
	No. 8	2.370	1.474	164.40	8.62	65.18	34.82
	No. 16	1.180	1.077	157.40	8.26	73.44	26.56
	No. 30	0.600	0.795	142.80	7.49	80.93	19.07
	No. 50	0.300	0.582	161.80	8.49	89.42	10.58
	No. 100	0.150	0.426	108.50	5.69	95.11	4.89
	No. 200	0.075	0.312	38.90	2.04	97.15	2.85
	Pan			54.30	2.85	100.00	0.00
			Total weight	1906.10	100.00		

Operator	Nazar Elwazir
Date	2-Aug-96
Remarks	

Weight of tear & soil	2951.50
Weight of tear	1044.00
Weight of soil	1907.50

Sieve Analysis - Muskegon Random

Weight of bags & soil	2069.9
Weight of soil	2062.2

Weight of empty bags	7.7

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R411	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R412	1/2 inch	12.500	3.116	337.90	16.39	16.39	83.61
R413	3/8 inch	9.500	2.754	426.50	20.69	37.08	62.92
	No. 4	4.750	2.016	447.50	21.71	58.78	41.22
	No. 8	2.370	1.474	153.10	7.43	66.21	33.79
	No. 16	1.180	1.077	171.20	8.30	74.51	25.49
	No. 30	0.600	0.795	139.30	6.76	81.27	18.73
	No. 50	0.300	0.582	164.60	7.98	89.25	10.75
	No. 100	0.150	0.426	117.50	5.70	94.95	5.05
	No. 200	0.075	0.312	39.60	1.92	96.87	3.13
	Pan			64.50	3.13	100.00	0.00
			Total weight	2061.70	100.00		

Operator	Nazar Elwazir
Date	2-Aug-96
Remarks	

Weight of tear & soil	3105.00
Weight of tear	1044.00
Weight of soil	2061.00

Sieve Analysis - Muskegon Random

Weight of bags & soil	2168
Weight of soil	2160.6

Weight of empty bags	7.4

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 421	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 422	1/2 inch	12.500	3.116	329.70	15.30	15.30	84.70
R 423	3/8 inch	9.500	2.754	522.80	24.26	39.55	60.45
	No. 4	4.750	2.016	455.50	21.13	60.69	39.31
	No. 8	2.370	1.474	149.40	6.93	67.62	32.38
	No. 16	1.180	1.077	155.80	7.23	74.85	25.15
	No. 30	0.600	0.795	147.90	6.86	81.71	18.29
	No. 50	0.300	0.582	171.20	7.94	89.65	10.35
	No. 100	0.150	0.426	125.40	5.82	95.47	4.53
	No. 200	0.075	0.312	36.30	1.68	97.16	2.84
	Pan			61.30	2.84	100.00	0.00
			Total weight	2155.30	100.00		

Operator	Nazar Elwazir
Date	2-Aug-96
Remarks	

Weight of tear & soil	3190.50
Weight of tear	1044.00
Weight of soil	2146.50

Sieve Analysis - Muskegon Random

Weight of bags & soil	2077.6
Weight of soil	2069.7

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening		Field data - total weight = 1607			
		(mm)	.45 power	Weight retained	Percent retained	Cum. % retained	Percent passing
R 431	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 432	1/2 inch	12.500	3.116	334.70	16.17	16.17	83.83
R 433	3/8 inch	9.500	2.754	373.30	18.03	34.20	65.80
	No. 4	4.750	2.016	457.90	22.12	56.32	43.68
	No. 8	2.370	1.474	182.60	8.82	65.14	34.86
	No. 16	1.180	1.077	172.60	8.34	73.48	26.52
	No. 30	0.600	0.795	148.10	7.15	80.63	19.37
	No. 50	0.300	0.582	166.80	8.06	88.69	11.31
	No. 100	0.150	0.426	132.90	6.42	95.11	4.89
	No. 200	0.075	0.312	39.60	1.91	97.02	2.98
	Pan			61.70	2.98	100.00	0.00
			Total weight	2070.20	100.00		

Operator	Nazar Elwazir
Date	7-Aug-96
Remarks	

Weight of tear & soil	3114.60
Weight of tear	1044.00
Weight of soil	2070.60

Sieve Analysis - Muskegon Random

Weight of bags & soil	1740.8
Weight of soil	

Weight of empty bags	7.5

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 441	3/4 inch	19.000	3.762	0.00	#VALUE!	#VALUE!	#VALUE!
R 442	1/2 inch	12.500	3.116	242.10	#VALUE!	#VALUE!	#VALUE!
R 443	3/8 inch	9.500	2.754	273.30	#VALUE!	#VALUE!	#VALUE!
	No. 4	4.750	2.016	407.30	#VALUE!	#VALUE!	#VALUE!
	No. 8	2.370	1.474		#VALUE!	#VALUE!	#VALUE!
	No. 16	1.180	1.077		#VALUE!	#VALUE!	#VALUE!
	No. 30	0.600	0.795		#VALUE!	#VALUE!	#VALUE!
	No. 50	0.300	0.582		#VALUE!	#VALUE!	#VALUE!
	No. 100	0.150	0.426		#VALUE!	#VALUE!	#VALUE!
	No. 200	0.075	0.312		#VALUE!	#VALUE!	#VALUE!
	Pan				#VALUE!	#VALUE!	#VALUE!
			Total weight		#VALUE!		

Operator	Nazar Elwazir	Weight of tear & soil	
Date	9-Aug-96	Weight of tear	1044.70
Remarks	mple was missed	Weight of soil	

Sieve Analysis - Muskegon Random

Weight of bags & soil	1811.2
Weight of soil	1803.8

Weight of empty bags	7.4

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 451	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 452	1/2 inch	12.500	3.116	233.40	12.95	12.95	87.05
R 453	3/8 inch	9.500	2.754	402.10	22.31	35.26	64.74
	No. 4	4.750	2.016	387.50	21.50	56.77	43.23
	No. 8	2.370	1.474	159.40	8.85	65.61	34.39
	No. 16	1.180	1.077	146.30	8.12	73.73	26.27
	No. 30	0.600	0.795	141.90	7.87	81.60	18.40
	No. 50	0.300	0.582	164.10	9.11	90.71	9.29
	No. 100	0.150	0.426	89.70	4.98	95.69	4.31
	No. 200	0.075	0.312	28.90	1.60	97.29	2.71
	Pan			48.80	2.71	100.00	0.00
			Total weight	1802.10	100.00		

Operator	Scott Greene
Date	18-Oct-96
Remarks	

Weight of tear & soil	2829.60
Weight of tear	1027.10
Weight of soil	1802.50

Sieve Analysis - Muskegon Random

Weight of bags & soil	1771.7
Weight of soil	1763.7

Weight of empty bags	8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 461	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 462	1/2 inch	12.500	3.116	229.20	13.01	13.01	86.99
R 463	3/8 inch	9.500	2.754	308.70	17.53	30.54	69.46
	No. 4	4.750	2.016	421.00	23.90	54.44	45.56
	No. 8	2.370	1.474	172.50	9.79	64.24	35.76
	No. 16	1.180	1.077	152.70	8.67	72.91	27.09
	No. 30	0.600	0.795	134.20	7.62	80.53	19.47
	No. 50	0.300	0.582	149.80	8.51	89.03	10.97
	No. 100	0.150	0.426	107.40	6.10	95.13	4.87
	No. 200	0.075	0.312	32.00	1.82	96.95	3.05
	Pan			53.80	3.05	100.00	0.00
			Total weight	1761.30	100.00		

Operator	Scott Greene
Date	18-Oct-96
Remarks	

Weight of tear & soil	2788.90
Weight of tear	1027.00
Weight of soil	1761.90

Sieve Analysis - Muskegon Random

Weight of bags & soil	2046.1
Weight of soil	2038.4

Weight of empty bags	7.7

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R511	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R512	1/2 inch	12.500	3.116	179.30	8.80	8.80	91.20
R513	3/8 inch	9.500	2.754	319.00	15.65	24.45	75.55
	No. 4	4.750	2.016	508.50	24.95	49.41	50.59
	No. 8	2.370	1.474	238.30	11.69	61.10	38.90
	No. 16	1.180	1.077	211.20	10.36	71.47	28.53
	No. 30	0.600	0.795	154.10	7.56	79.03	20.97
	No. 50	0.300	0.582	175.40	8.61	87.64	12.36
	No. 100	0.150	0.426	159.60	7.83	95.47	4.53
	No. 200	0.075	0.312	30.50	1.50	96.97	3.03
	Pan			61.80	3.03	100.00	0.00
			Total weight	2037.70	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3064.90
Weight of tear	1027.10
Weight of soil	2037.80

Sieve Analysis - Muskegon Random

Weight of bags & soil	2292.7
Weight of soil	2285.1

Weight of empty bags	7.6

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 521	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 522	1/2 inch	12.500	3.116	254.00	11.12	11.12	88.88
R 523	3/8 inch	9.500	2.754	432.30	18.92	30.04	69.96
	No. 4	4.750	2.016	513.70	22.49	52.53	47.47
	No. 8	2.370	1.474	241.50	10.57	63.10	36.90
	No. 16	1.180	1.077	214.60	9.39	72.49	27.51
	No. 30	0.600	0.795	165.60	7.25	79.74	20.26
	No. 50	0.300	0.582	202.20	8.85	88.59	11.41
	No. 100	0.150	0.426	146.50	6.41	95.00	5.00
	No. 200	0.075	0.312	43.60	1.91	96.91	3.09
	Pan			70.60	3.09	100.00	0.00
			Total weight	2284.60	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3311.50
Weight of tear	1027.10
Weight of soil	2284.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2438.2
Weight of soil	2430.3

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 531	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 532	1/2 inch	12.500	3.116	263.90	10.86	10.86	89.14
R 533	3/8 inch	9.500	2.754	417.50	17.18	28.04	71.96
	No. 4	4.750	2.016	531.20	21.86	49.91	50.09
	No. 8	2.370	1.474	281.70	11.59	61.50	38.50
	No. 16	1.180	1.077	249.10	10.25	71.75	28.25
	No. 30	0.600	0.795	185.70	7.64	79.39	20.61
	No. 50	0.300	0.582	218.80	9.00	88.40	11.60
	No. 100	0.150	0.426	174.20	7.17	95.57	4.43
	No. 200	0.075	0.312	37.90	1.56	97.13	2.87
	Pan			69.80	2.87	100.00	0.00
			Total weight	2429.80	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3456.90
Weight of tear	1027.10
Weight of soil	2429.80

Sieve Analysis - Muskegon Random

Weight of bags & soil	1976.4
Weight of soil	1964.4

Weight of empty bags	12

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 541	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 542	1/2 inch	12.500	3.116	212.10	10.80	10.80	89.20
R 543	3/8 inch	9.500	2.754	344.50	17.55	28.35	71.65
	No. 4	4.750	2.016	457.00	23.28	51.63	48.37
	No. 8	2.370	1.474	210.70	10.73	62.36	37.64
	No. 16	1.180	1.077	190.10	9.68	72.05	27.95
	No. 30	0.600	0.795	148.70	7.57	79.62	20.38
	No. 50	0.300	0.582	193.50	9.86	89.48	10.52
	No. 100	0.150	0.426	134.70	6.86	96.34	3.66
	No. 200	0.075	0.312	23.80	1.21	97.55	2.45
	Pan			48.10	2.45	100.00	0.00
			Total weight	1963.20	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	2990.50
Weight of tear	1027.00
Weight of soil	1963.50

Sieve Analysis - Muskegon Random

Weight of bags & soil	2069.7
Weight of soil	2061.8

Weight of empty bags	7.9

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 551	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 552	1/2 inch	12.500	3.116	239.60	11.63	11.63	88.37
R 553	3/8 inch	9.500	2.754	386.80	18.77	30.40	69.60
	No. 4	4.750	2.016	473.20	22.97	53.37	46.63
	No. 8	2.370	1.474	220.30	10.69	64.06	35.94
	No. 16	1.180	1.077	192.00	9.32	73.38	26.62
	No. 30	0.600	0.795	146.00	7.09	80.47	19.53
	No. 50	0.300	0.582	187.70	9.11	89.58	10.42
	No. 100	0.150	0.426	122.30	5.94	95.52	4.48
	No. 200	0.075	0.312	34.10	1.66	97.17	2.83
	Pan			58.30	2.83	100.00	0.00
			Total weight	2060.30	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3087.60
Weight of tear	1027.20
Weight of soil	2060.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	2126.1
Weight of soil	2118.3

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 561	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 562	1/2 inch	12.500	3.116	192.60	9.10	9.10	90.90
R 563	3/8 inch	9.500	2.754	365.00	17.24	26.34	73.66
	No. 4	4.750	2.016	504.70	23.84	50.17	49.83
	No. 8	2.370	1.474	251.70	11.89	62.06	37.94
	No. 16	1.180	1.077	220.50	10.41	72.48	27.52
	No. 30	0.600	0.795	160.10	7.56	80.04	19.96
	No. 50	0.300	0.582	177.50	8.38	88.42	11.58
	No. 100	0.150	0.426	152.80	7.22	95.64	4.36
	No. 200	0.075	0.312	33.20	1.57	97.21	2.79
	Pan			59.10	2.79	100.00	0.00
			Total weight	2117.20	100.00		

Operator	Scott Greene	Weight of tear & soil	3144.80
Date	19-Oct-96	Weight of tear	1027.00
Remarks		Weight of soil	2117.80

Sieve Analysis - Muskegon Random

Weight of bags & soil	2399.5
Weight of soil	2391.7

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 611	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 612	1/2 inch	12.500	3.116	332.60	13.91	13.91	86.09
R 613	3/8 inch	9.500	2.754	417.20	17.45	31.36	68.64
	No. 4	4.750	2.016	516.10	21.58	52.94	47.06
	No. 8	2.370	1.474	260.00	10.87	63.81	36.19
	No. 16	1.180	1.077	221.90	9.28	73.09	26.91
	No. 30	0.600	0.795	166.80	6.98	80.07	19.93
	No. 50	0.300	0.582	193.00	8.07	88.14	11.86
	No. 100	0.150	0.426	167.20	6.99	95.13	4.87
	No. 200	0.075	0.312	41.60	1.74	96.87	3.13
	Pan			74.90	3.13	100.00	0.00
			Total weight	2391.30	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3418.80
Weight of tear	1027.10
Weight of soil	2391.70

Sieve Analysis - Muskegon Random

Weight of bags & soil	2476.7
Weight of soil	2468.9

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 621	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 622	1/2 inch	12.500	3.116	381.20	15.45	15.45	84.55
R 623	3/8 inch	9.500	2.754	522.90	21.19	36.64	63.36
	No. 4	4.750	2.016	534.60	21.66	58.30	41.70
	No. 8	2.370	1.474	221.30	8.97	67.27	32.73
	No. 16	1.180	1.077	198.20	8.03	75.30	24.70
	No. 30	0.600	0.795	153.90	6.24	81.54	18.46
	No. 50	0.300	0.582	185.30	7.51	89.05	10.95
	No. 100	0.150	0.426	158.50	6.42	95.47	4.53
	No. 200	0.075	0.312	39.70	1.61	97.08	2.92
	Pan			72.00	2.92	100.00	0.00
			Total weight	2467.60	100.00		

Operator	Scott Greene	Weight of tear & soil	3495.10
Date	19-Oct-96	Weight of tear	1027.10
Remarks		Weight of soil	2468.00

Sieve Analysis - Muskegon Random

Weight of bags & soil	2286.1
Weight of soil	2278

Weight of empty bags	8.1

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 631	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 632	1/2 inch	12.500	3.116	198.50	8.72	8.72	91.28
R 633	3/8 inch	9.500	2.754	377.80	16.60	25.32	74.68
	No. 4	4.750	2.016	511.10	22.46	47.78	52.22
	No. 8	2.370	1.474	274.70	12.07	59.85	40.15
	No. 16	1.180	1.077	257.80	11.33	71.17	28.83
	No. 30	0.600	0.795	182.00	8.00	79.17	20.83
	No. 50	0.300	0.582	197.40	8.67	87.84	12.16
	No. 100	0.150	0.426	172.40	7.57	95.42	4.58
	No. 200	0.075	0.312	38.50	1.69	97.11	2.89
	Pan			65.80	2.89	100.00	0.00
			Total weight	2276.00	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3303.50
Weight of tear	1027.10
Weight of soil	2276.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	1936.9
Weight of soil	1919.1

Weight of empty bags	7.8

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 641 (sc)	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 642 (sc)	1/2 inch	12.500	3.116	131.90	6.84	6.84	93.16
R 643 (sc)	3/8 inch	9.500	2.754	296.10	15.36	22.20	77.80
	No. 4	4.750	2.016	478.00	24.80	47.00	53.00
	No. 8	2.370	1.474	240.70	12.49	59.49	40.51
	No. 16	1.180	1.077	213.30	11.07	70.56	29.44
	No. 30	0.600	0.795	153.10	7.94	78.50	21.50
	No. 50	0.300	0.582	164.20	8.52	87.02	12.98
	No. 100	0.150	0.426	148.20	7.69	94.71	5.29
	No. 200	0.075	0.312	37.80	1.96	96.67	3.33
	Pan			64.20	3.33	100.00	0.00
			Total weight	1927.50	100.00		

Operator	Scott Greene	Weight of tear & soil	2955.20
Date	19-Oct-96	Weight of tear	1027.20
Remarks		Weight of soil	1928.00

Sieve Analysis - Muskegon Random

Weight of bags & soil	2069.7
Weight of soil	2061.8

Weight of empty bags	7.7

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 651 (sc)	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 652 (sc)	1/2 inch	12.500	3.116	253.30	11.50	11.50	88.50
R 653 (sc)	3/8 inch	9.500	2.754	405.20	18.39	29.89	70.11
	No. 4	4.750	2.016	503.00	22.83	52.73	47.27
	No. 8	2.370	1.474	241.60	10.97	63.70	36.30
	No. 16	1.180	1.077	212.70	9.66	73.35	26.65
	No. 30	0.600	0.795	155.40	7.05	80.41	19.59
	No. 50	0.300	0.582	173.90	7.89	88.30	11.70
	No. 100	0.150	0.426	151.30	6.87	95.17	4.83
	No. 200	0.075	0.312	38.30	1.74	96.91	3.09
	Pan			68.10	3.09	100.00	0.00
			Total weight	2202.80	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3230.50
Weight of tear	1027.10
Weight of soil	2203.40

Sieve Analysis - Muskegon Random

Weight of bags & soil	1991.8
Weight of soil	1984.1

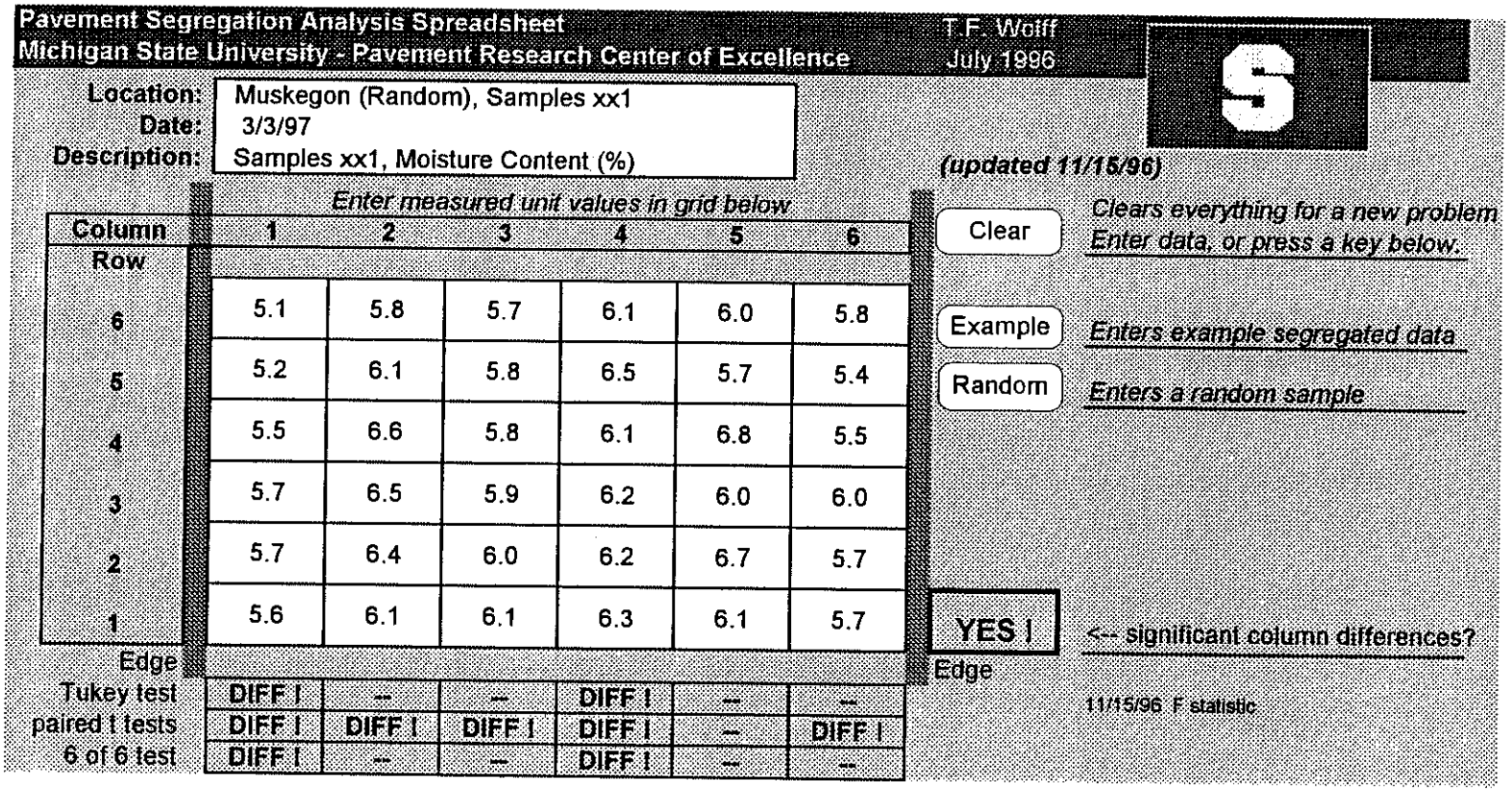
Weight of empty bags	7.7

Sample number	Sieve size	Sieve opening (mm)	Sieve opening .45 power	Field data - total weight = 1607 Weight retained	Percent retained	Cum. % retained	Percent passing
R 661 (sc)	3/4 inch	19.000	3.762	0.00	0.00	0.00	100.00
R 662 (sc)	1/2 inch	12.500	3.116	255.40	12.88	12.88	87.12
R 663 (sc)	3/8 inch	9.500	2.754	417.30	21.04	33.92	66.08
	No. 4	4.750	2.016	428.00	21.58	55.50	44.50
	No. 8	2.370	1.474	198.60	10.01	65.52	34.48
	No. 16	1.180	1.077	175.60	8.85	74.37	25.63
	No. 30	0.600	0.795	132.00	6.66	81.03	18.97
	No. 50	0.300	0.582	165.10	8.32	89.35	10.65
	No. 100	0.150	0.426	124.40	6.27	95.62	4.38
	No. 200	0.075	0.312	30.40	1.53	97.16	2.84
	Pan			56.40	2.84	100.00	0.00
			Total weight	1983.20	100.00		

Operator	Scott Greene
Date	19-Oct-96
Remarks	

Weight of tear & soil	3010.30
Weight of tear	1027.10
Weight of soil	1983.20

Asphalt Content Grid Analysis


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Muskegon (Random), Samples xx1
Date: 3/3/97
Description: Samples xx1, Moisture Content (%)
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 5.1 5.8 5.7 6.1 6.0 5.8
5 5.2 6.1 5.8 6.5 5.7 5.4
4 5.5 6.6 5.8 6.1 6.8 5.5
3 5.7 6.5 5.9 6.2 6.0 6.0
2 5.7 6.4 6.0 6.2 6.7 5.7
1 5.6 6.1 6.1 6.3 6.1 5.7
Edge
Tukey test DIFF ! -- -- DIFF ! -- --
paired t tests DIFF ! DIFF ! DIFF ! DIFF ! -- DIFF !
6 of 6 test DIFF ! -- -- DIFF ! -- --
Clear
Clears everything for a new problem
Enter data, or press a key below.
Example
Enters example segregated data
Random
Enters a random sample
YES !
<-- significant column differences?
Edge
11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

Location: *Muskegon (Random), Samples xx1*
Date: *3/3/97*
Description: *Samples xx1, Moisture Content (%)*

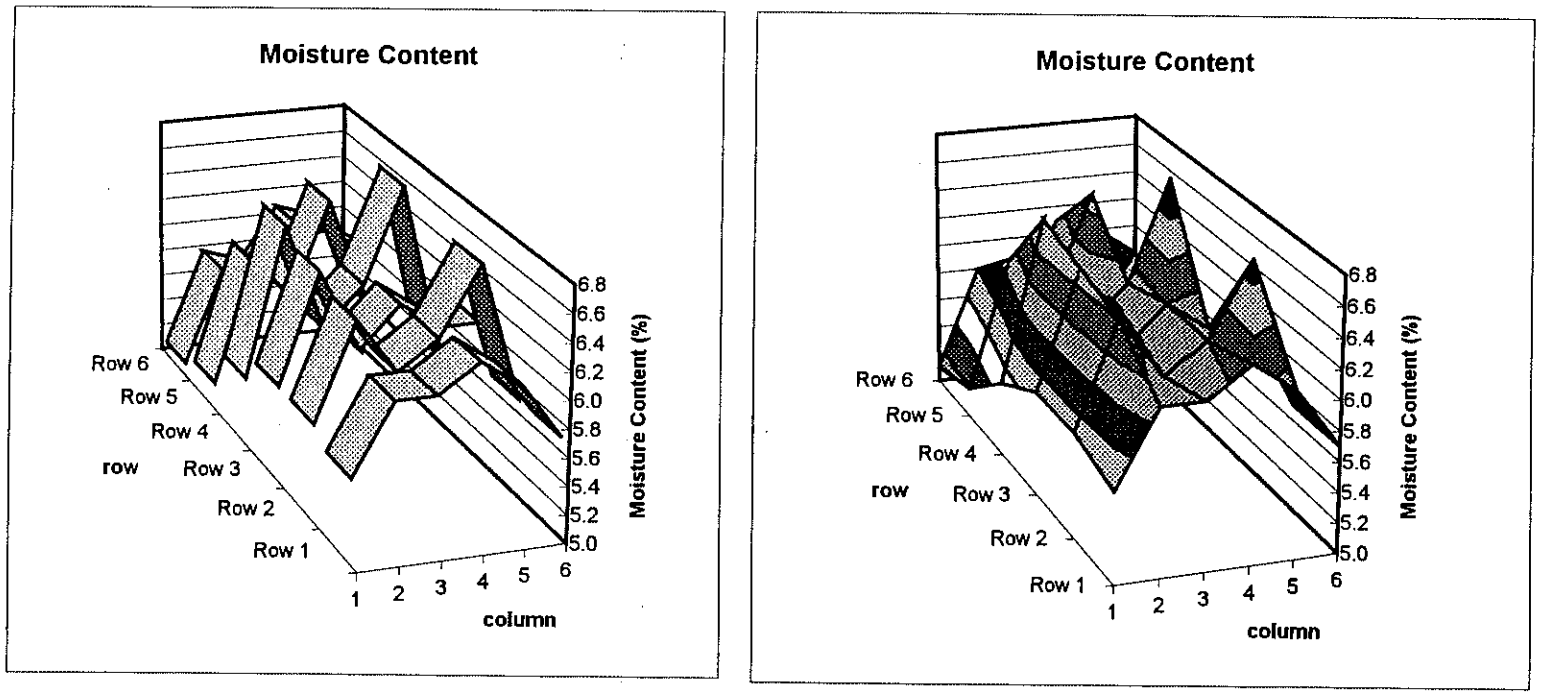
Color 1 *Color Above and Below Average*

Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.1	5.8	5.7	6.1	6.0	5.8	5.75	0.351	6.10%
5	5.2	6.1	5.8	6.5	5.7	5.4	5.78	0.471	8.14%
4	5.5	6.6	5.8	6.1	6.8	5.5	6.05	0.554	9.16%
3	5.7	6.5	5.9	6.2	6.0	6.0	6.05	0.274	4.53%
2	5.7	6.4	6.0	6.2	6.7	5.7	6.12	0.397	6.49%
1	5.6	6.1	6.1	6.3	6.1	5.7	5.98	0.271	4.54%
Average	5.47	6.25	5.88	6.23	6.22	5.68	5.96	**5.96**	0.386	6.49%
Std. Dev.	0.258	0.302	0.147	0.151	0.436	0.214	0.251		**0.396012**	
Coeff. of Var.	4.72%	4.83%	2.50%	2.42%	7.01%	3.76%	4.21%			**6.65%**

Moisture Stats

ocation: *Muskegon (Random), Samples xx1*
Date: *3/3/97*
Description: *Samples xx1, Moisture Content (%)*



Moisture Graph

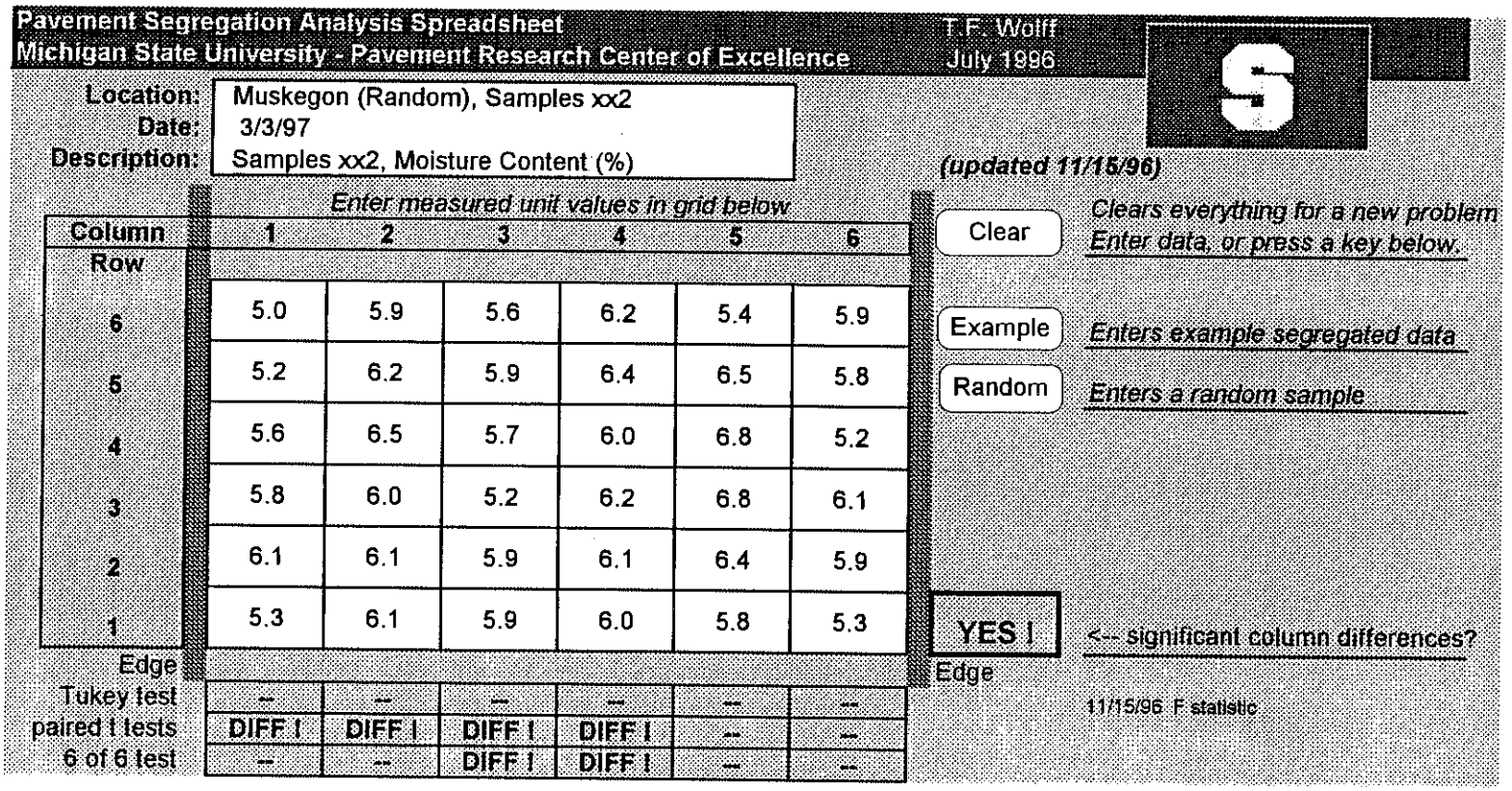
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.47	-0.49	0.239	0.258	0.067
2	6.25	0.29	0.087	0.302	0.091
3	5.88	-0.07	0.005	0.147	0.022
4	6.23	0.28	0.077	0.151	0.023
5	6.22	0.26	0.068	0.436	0.190
6	5.68	-0.27	0.074	0.214	0.046
sum			0.550		0.437
all data	5.96			0.396012	0.1568

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	3.30222222	5	0.660	**9.06098**	2.533554	2.47E-05
within columns:	2.18666667	30	0.073			
Total:	5.48888889					

Different ? 1 YES!


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Muskegon (Random), Samples xx2
Date: 3/3/97
Description: Samples xx2, Moisture Content (%)
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 5.0 5.9 5.6 6.2 5.4 5.9
5 5.2 6.2 5.9 6.4 6.5 5.8
4 5.6 6.5 5.7 6.0 6.8 5.2
3 5.8 6.0 5.2 6.2 6.8 6.1
2 6.1 6.1 5.9 6.1 6.4 5.9
1 5.3 6.1 5.9 6.0 5.8 5.3
Edge
Tukey test -- -- -- -- -- --
paired t tests DIFF ! DIFF ! DIFF ! DIFF ! -- --
6 of 6 test -- -- DIFF ! DIFF ! -- --
Clear
Clears everything for a new problem
Enter data, or press a key below.
Example
Enters example segregated data
Random
Enters a random sample
YES !
<-- significant column differences?
Edge
11/15/96 F statistic

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

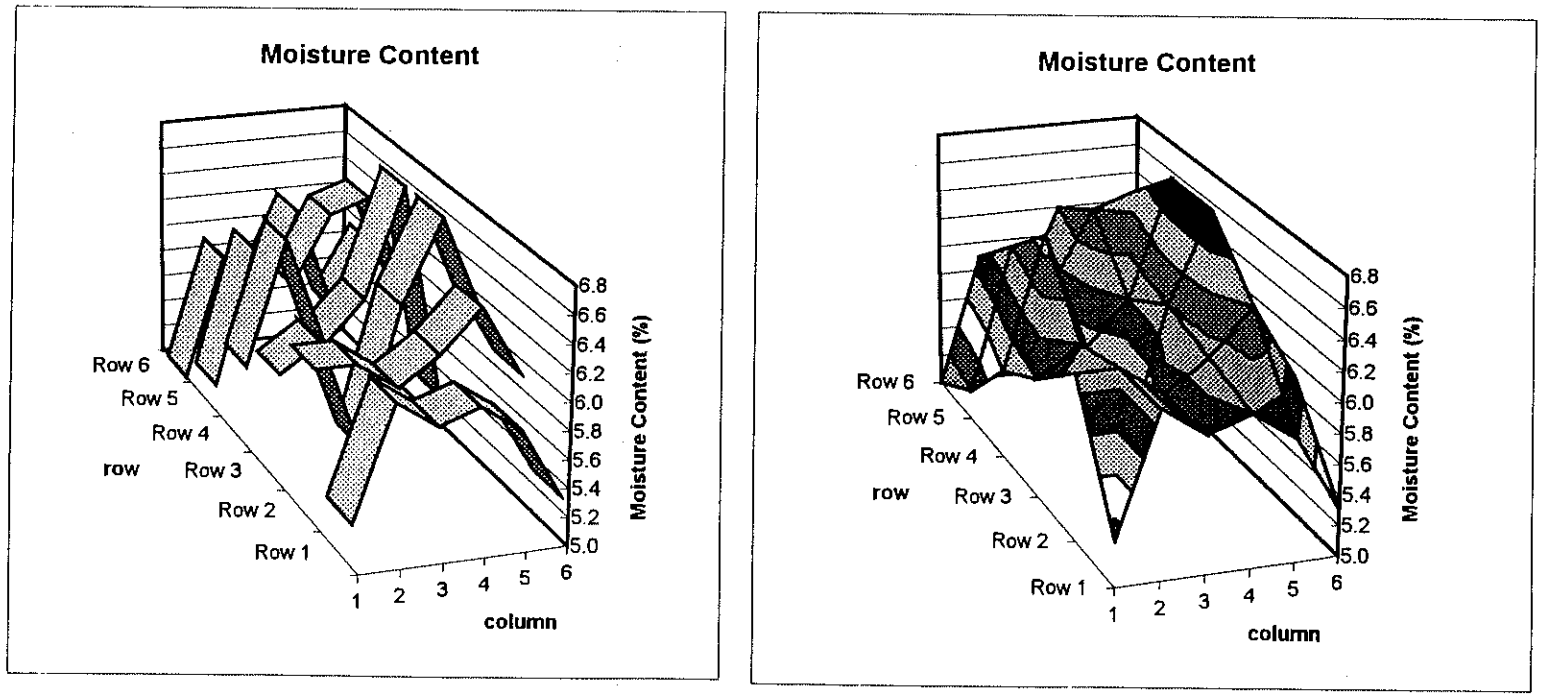
Location: *Muskegon (Random), Samples xx2*
Date: *3/3/97*
Description: *Samples xx2, Moisture Content (%)*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.0	5.9	5.6	6.2	5.4	5.9	5.67	0.427	7.54%
5	5.2	6.2	5.9	6.4	6.5	5.8	6.00	0.477	7.96%
4	5.6	6.5	5.7	6.0	6.8	5.2	5.97	0.596	9.98%
3	5.8	6.0	5.2	6.2	6.8	6.1	6.02	0.523	8.69%
2	6.1	6.1	5.9	6.1	6.4	5.9	6.08	0.183	3.02%
1	5.3	6.1	5.9	6.0	5.8	5.3	5.73	0.350	6.11%
Average	5.50	6.13	5.70	6.15	6.28	5.70	5.91	**5.91**	0.426	7.22%
Std. Dev.	0.410	0.207	0.276	0.152	0.567	0.363	0.329		**0.441929**	
Coeff. of Var.	7.45%	3.37%	4.84%	2.47%	9.03%	6.37%	5.59%			**7.48%**

Moisture Stats

ocation: *Muskegon (Random), Samples xx2*
Date: *3/3/97*
Description: *Samples xx2, Moisture Content (%)*



Moisture Graph

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

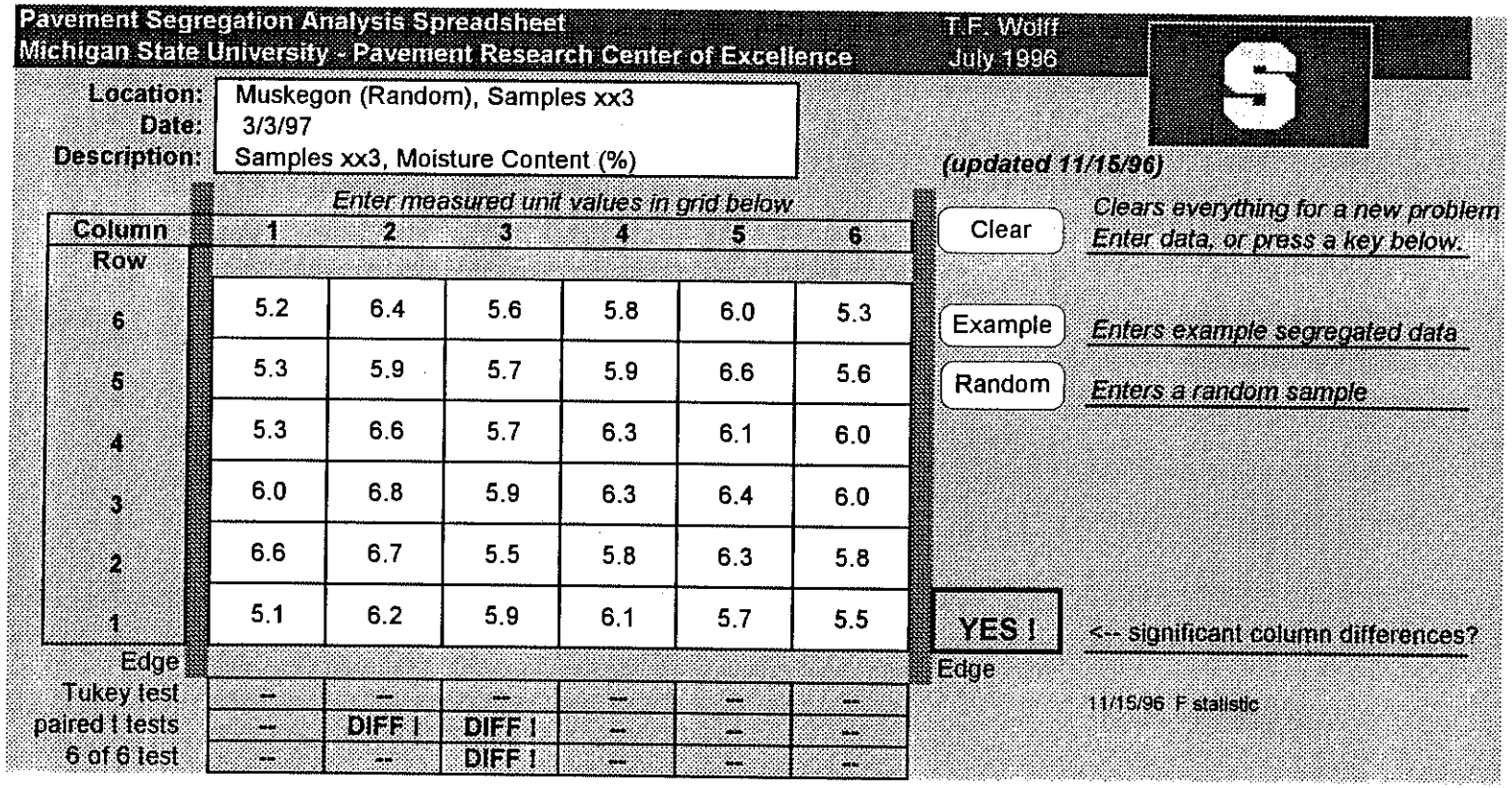
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.50	-0.41	0.169	0.410	0.168
2	6.13	0.22	0.049	0.207	0.043
3	5.70	-0.21	0.045	0.276	0.076
4	6.15	0.24	0.057	0.152	0.023
5	6.28	0.37	0.139	0.567	0.322
6	5.70	-0.21	0.045	0.363	0.132
sum			0.503		0.763
all data	5.91			0.441929	0.1953

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	3.01888889	5	0.604	**4.74585**	2.533554	0.0025947
within columns:	3.81666667	30	0.127			
Total:	6.83555556					

Different ? 1 YES!

ANOVA


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Muskegon (Random), Samples xx3
Date: 3/3/97
Description: Samples xx3, Moisture Content (%)
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 5.2 6.4 5.6 5.8 6.0 5.3
5 5.3 5.9 5.7 5.9 6.6 5.6
4 5.3 6.6 5.7 6.3 6.1 6.0
3 6.0 6.8 5.9 6.3 6.4 6.0
2 6.6 6.7 5.5 5.8 6.3 5.8
1 5.1 6.2 5.9 6.1 5.7 5.5
Edge
Tukey test -- -- -- -- -- --
paired t tests -- DIFF ! DIFF ! -- -- --
6 of 6 test -- -- DIFF ! -- -- --
Clear
Clears everything for a new problem
Enter data, or press a key below.
Example
Enters example segregated data
Random
Enters a random sample
YES !
<-- significant column differences?
Edge
11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

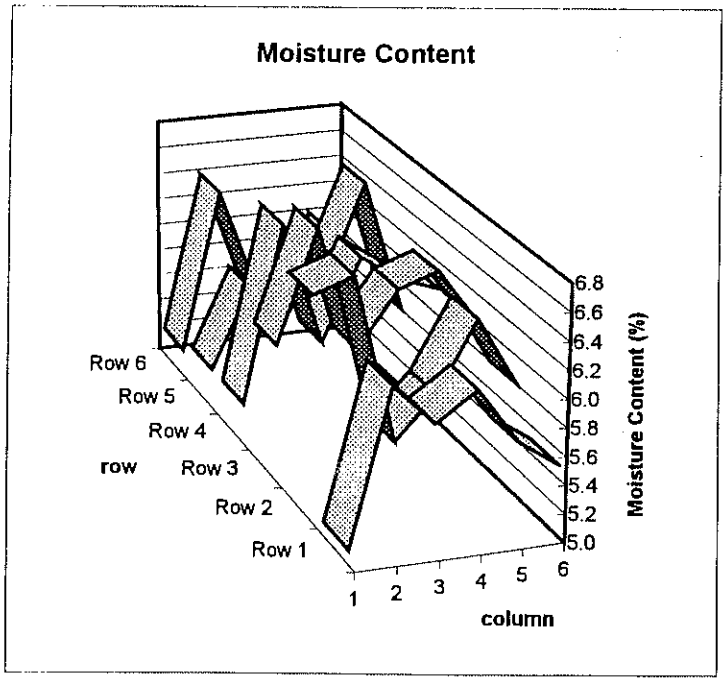
Location: *Muskegon (Random), Samples xx3*
Date: *3/3/97*
Description: *Samples xx3, Moisture Content (%)*

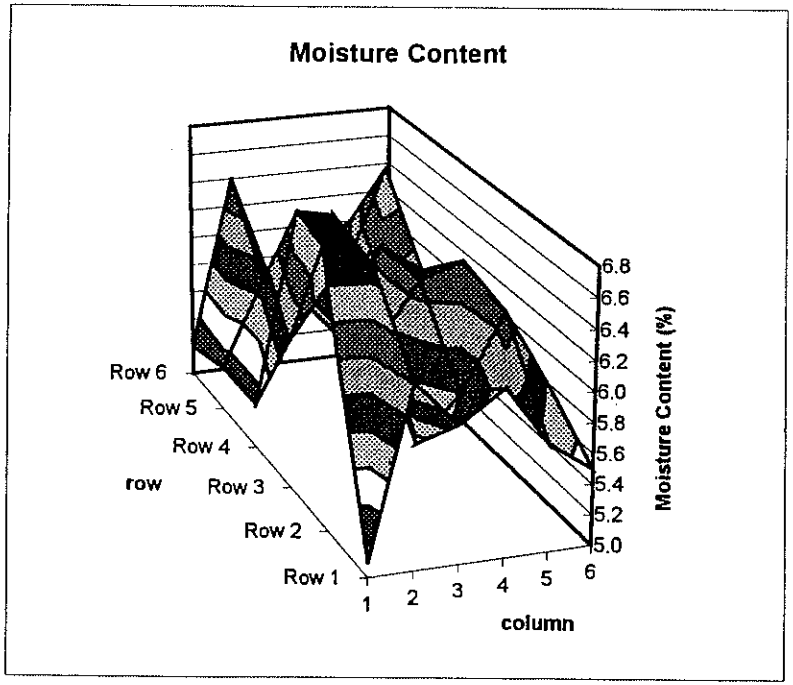
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.2	6.4	5.6	5.8	6.0	5.3	5.72	0.449	7.86%
5	5.3	5.9	5.7	5.9	6.6	5.6	5.83	0.437	7.49%
4	5.3	6.6	5.7	6.3	6.1	6.0	6.00	0.456	7.60%
3	6.0	6.8	5.9	6.3	6.4	6.0	6.23	0.339	5.43%
2	6.6	6.7	5.5	5.8	6.3	5.8	6.12	0.488	7.97%
1	5.1	6.2	5.9	6.1	5.7	5.5	5.75	0.409	7.11%
Average	5.58	6.43	5.72	6.03	6.18	5.70	5.94	**5.94**	0.429	7.24%
Std. Dev.	0.591	0.339	0.160	0.234	0.319	0.283	0.321		**0.444249**	
Coeff. of Var.	10.59%	5.26%	2.80%	3.88%	5.16%	4.96%	5.44%			**7.48%**

Moisture Stats

ocation: *Muskegon (Random), Samples xx3*
Date: *3/3/97*
Description: *Samples xx3, Moisture Content (%)*





Moisture Graph

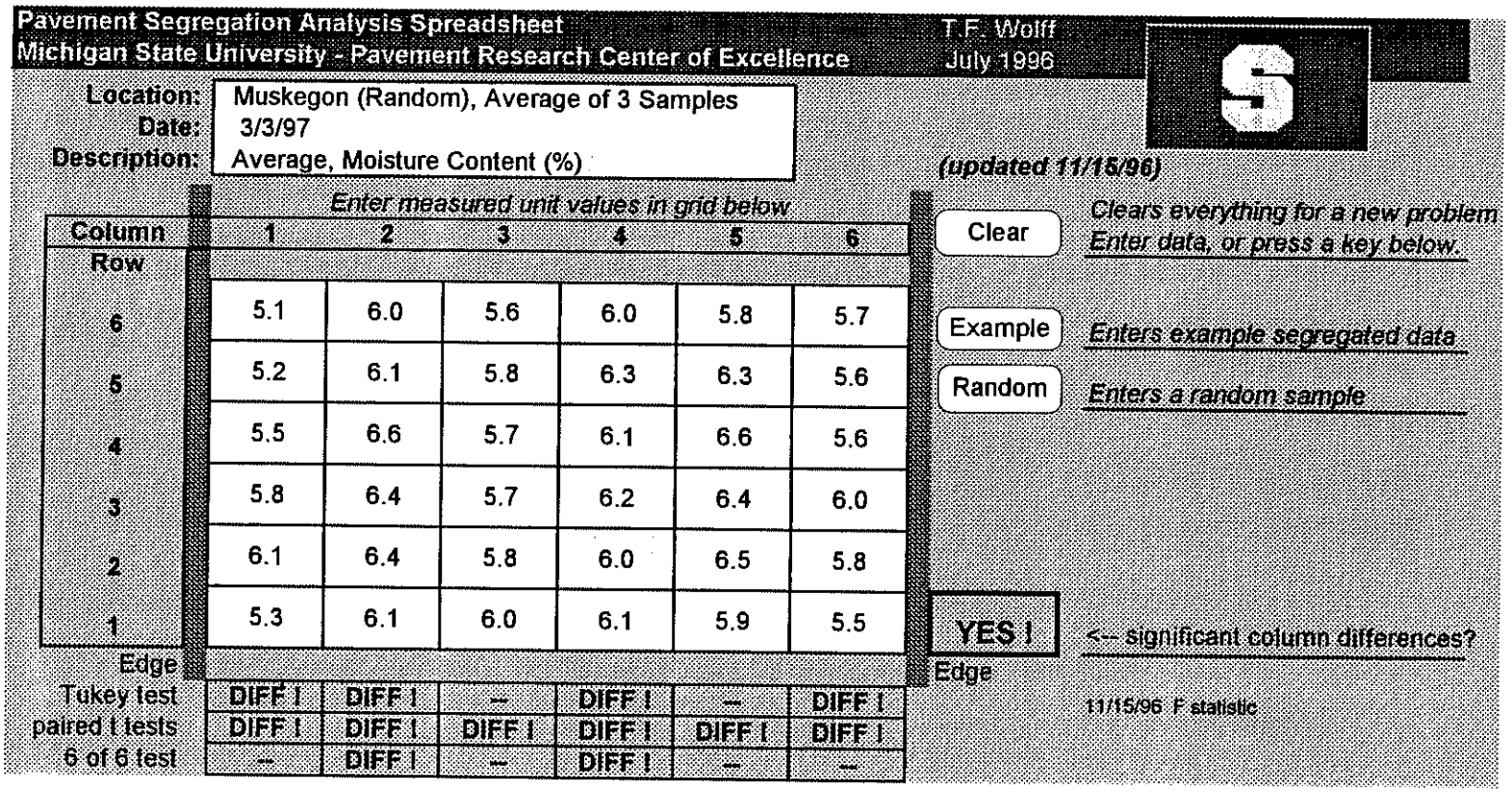
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.58	-0.36	0.128	0.591	0.350
2	6.43	0.49	0.242	0.339	0.115
3	5.72	-0.23	0.051	0.160	0.026
4	6.03	0.09	0.008	0.234	0.055
5	6.18	0.24	0.058	0.319	0.102
6	5.70	-0.24	0.058	0.283	0.080
sum			0.546		0.726
all data	5.94			0.444249	0.1974

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	3.27583333	5	0.655	**5.41212**	2.533554	0.0011549
within columns:	3.63166667	30	0.121			
Total:	6.9075			**Different ?**	1	YES!

ANOVA


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Muskegon (Random), Average of 3 Samples
Date: 3/3/97
Description: Average, Moisture Content (%)
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 5.1 6.0 5.6 6.0 5.8 5.7
5 5.2 6.1 5.8 6.3 6.3 5.6
4 5.5 6.6 5.7 6.1 6.6 5.6
3 5.8 6.4 5.7 6.2 6.4 6.0
2 6.1 6.4 5.8 6.0 6.5 5.8
1 5.3 6.1 6.0 6.1 5.9 5.5
Edge
Tukey test DIFF ! DIFF ! -- DIFF ! -- DIFF !
paired t tests DIFF ! DIFF ! DIFF ! DIFF ! DIFF ! DIFF !
6 of 6 test -- DIFF ! -- DIFF ! -- --
Clear
Clears everything for a new problem
Enter data, or press a key below.
Example
Enters example segregated data
Random
Enters a random sample
YES !
<-- significant column differences?
Edge
11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet

Michigan State University - Pavement Research Center of Excellence

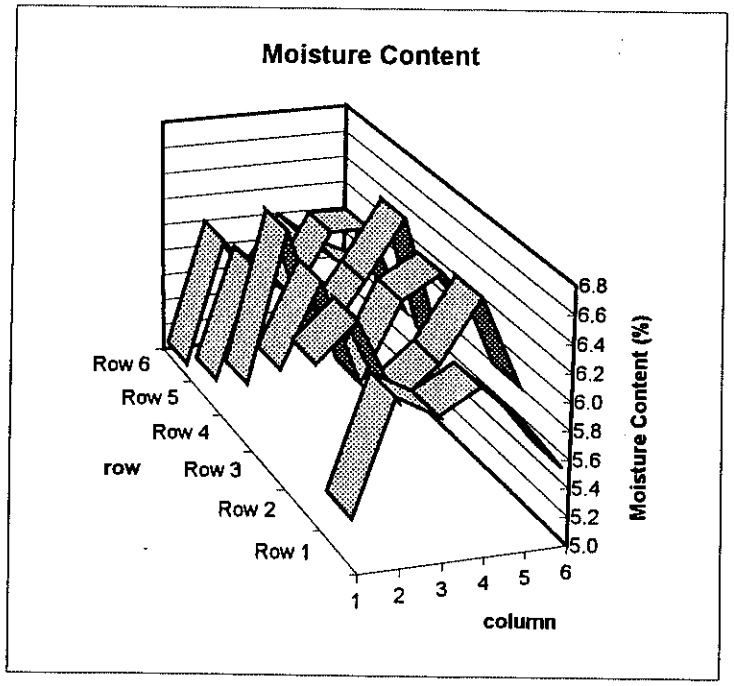
T. F. Wolff June 1996

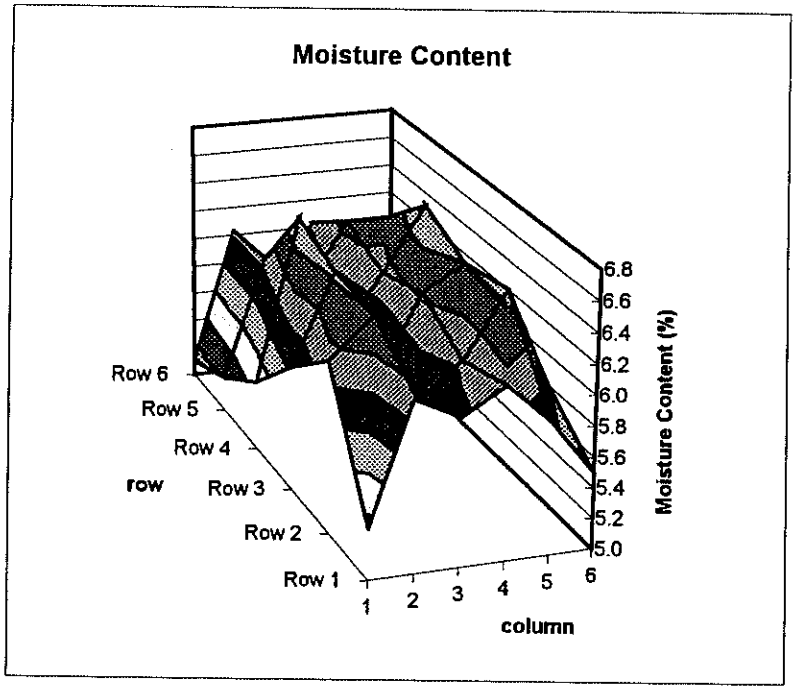
Location: *Muskegon (Random), Average of 3 Samples*
Date: *3/3/97*
Description: *Average, Moisture Content (%)*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.1	6.0	5.6	6.0	5.8	5.7	5.71	0.346	6.05%
5	5.2	6.1	5.8	6.3	6.3	5.6	5.87	0.409	6.97%
4	5.5	6.6	5.7	6.1	6.6	5.6	6.01	0.491	8.17%
3	5.8	6.4	5.7	6.2	6.4	6.0	6.10	0.311	5.09%
2	6.1	6.4	5.8	6.0	6.5	5.8	6.11	0.286	4.69%
1	5.3	6.1	6.0	6.1	5.9	5.5	5.82	0.334	5.74%
Average	5.52	6.27	5.77	6.14	6.23	5.69	5.94	**5.94**	0.363	6.12%
Std. Dev.	0.393	0.223	0.119	0.098	0.321	0.195	0.225		**0.372497**	
Coeff. of Var.	7.12%	3.55%	2.07%	1.59%	5.16%	3.42%	3.82%			**6.28%**

ocation: *Muskegon (Random), Average of 3 Samples*
Date: *3/3/97*
Description: *Average, Moisture Content (%)*





Moisture Graph

Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.52	-0.42	0.176	0.393	0.154
2	6.27	0.34	0.113	0.223	0.050
3	5.77	-0.17	0.029	0.119	0.014
4	6.14	0.20	0.041	0.098	0.010
5	6.23	0.29	0.085	0.321	0.103
6	5.69	-0.24	0.058	0.195	0.038
sum			0.502		0.369
all data	5.94			0.372497	0.1388

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	3.01324074	5	0.603	**9.80900**	2.533554	1.244E-05
within columns:	1.84314815	30	0.061			
Total:	4.85638889					

Different ? 1 **YES!**