Test Method to Determine the Existence of Segregation in Bituminous Mixtures

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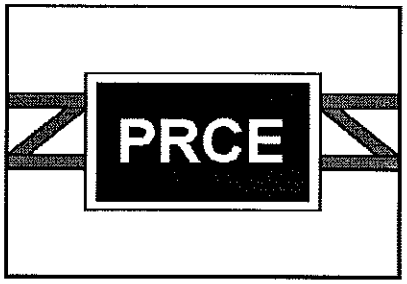

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Pavement Research Center of Excellence

Appendix I

Field and Lab Data and Analysis Site 7 : State Police Facility, Lansing

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

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PAVEMENT RESEARCH CENTER OF EXCELLENCE

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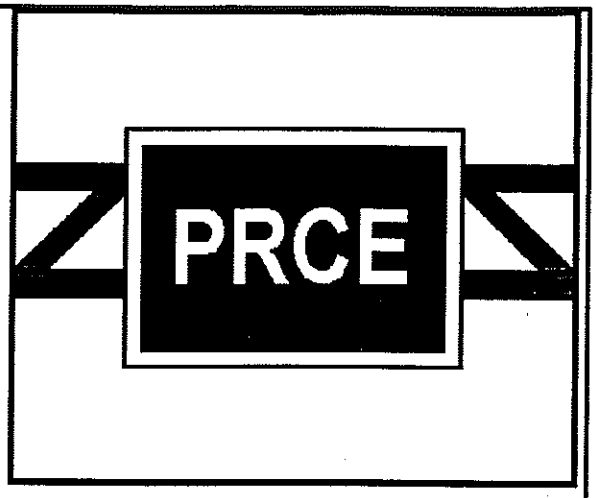

Final Report

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

Title and Subtitle
Test Method to Determine the Existence of Segregation in Bituminous Mixtures

Report Date
September 30, 1997

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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
Michigan State University - Pavement Research Center of Excellence

T.F. Wolff
July 1996

(updated 7/12/96)

Location: Lansing State Police Facility
Date: 6/25/97
Description: 1 min. nuclear unit weight, Sample xx1

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	145.1	143.3	140.4	145.0	142.0	142.6
5	142.3	140.1	144.0	142.5	139.7	140.8
4	142.5	143.3	141.1	144.6	140.9	143.6
3	143.2	141.3	144.2	145.7	141.9	142.3
2	139.8	134.5	140.0	144.1	142.6	141.4
1	139.1	138.5	143.2	142.6	142.0	137.4
Edge						
Tukey test	--	--	--	--	--	--
paired t tests	--	--	--	DIFF I	--	--
6 of 6 test	--	--	--	DIFF I	--	--

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

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

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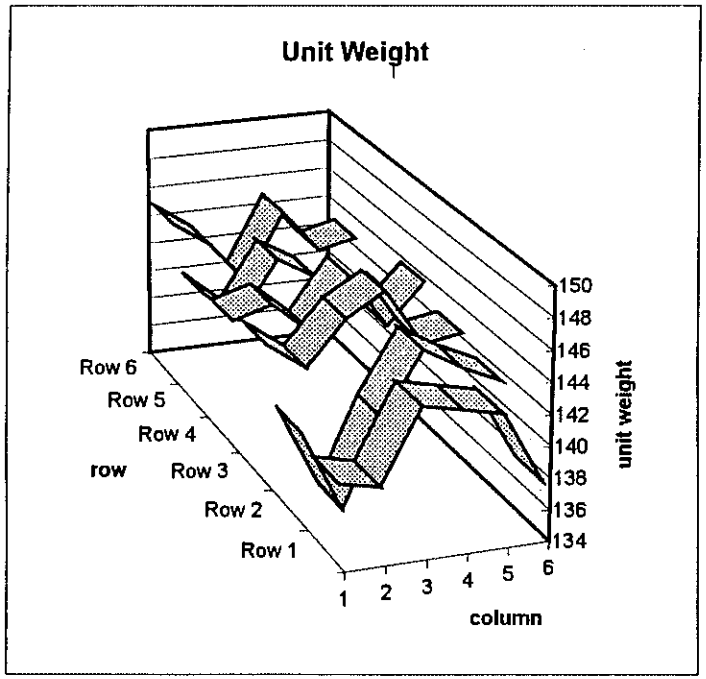
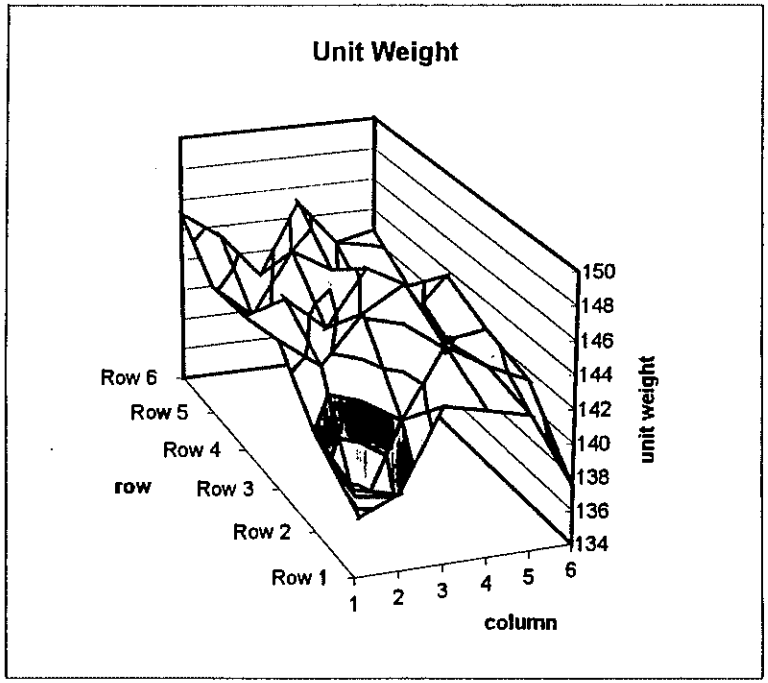
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	145.1	143.3	140.4	145.0	142.0	142.6	143.07	1.811	1.27%
5	142.3	140.1	144.0	142.5	139.7	140.8	141.57	1.646	1.16%
4	142.5	143.3	141.1	144.6	140.9	143.6	142.67	1.457	1.02%
3	143.2	141.3	144.2	145.7	141.9	142.3	143.10	1.631	1.14%
2	139.8	134.5	140.0	144.1	142.6	141.4	140.40	3.312	2.36%
1	139.1	138.5	143.2	142.6	142.0	137.4	140.47	2.430	1.73%
Average	142.00	140.17	142.15	144.08	141.52	141.35	141.88	**141.88**	2.048	1.45%
Std. Dev.	2.220	3.341	1.872	1.298	1.046	2.165	1.990		**2.29933**	
Coeff. of Var.	1.56%	2.38%	1.32%	0.90%	0.74%	1.53%	1.41%			**1.62%**

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx1*





Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

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Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx1*

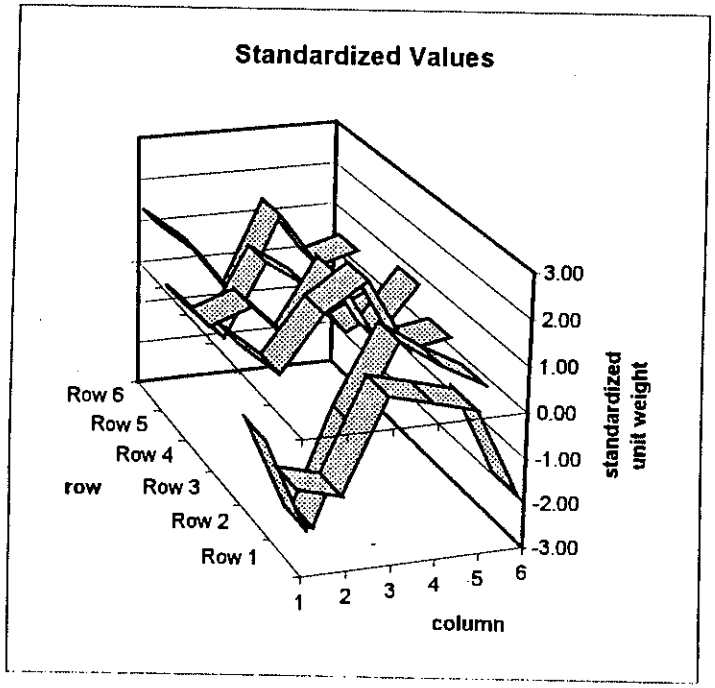
Color 1 *Color Above and Below Average*

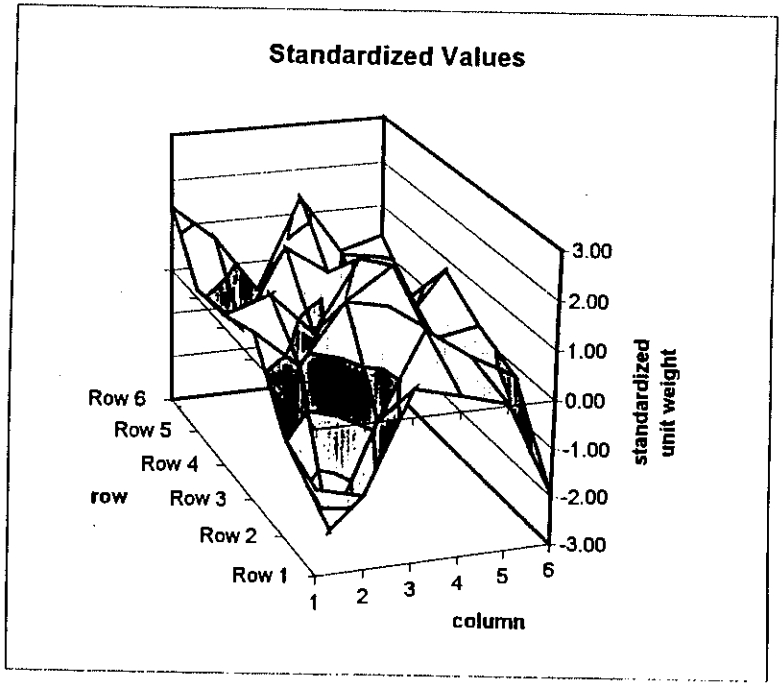
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.40	0.62	-0.64	1.36	0.05	0.31	0.52	0.787
5	0.18	-0.77	0.92	0.27	-0.95	-0.47	-0.14	0.716
4	0.27	0.62	-0.34	1.18	-0.43	0.75	0.34	0.634
3	0.58	-0.25	1.01	1.66	0.01	0.18	0.53	0.709
2	-0.90	-3.21	-0.82	0.97	0.31	-0.21	-0.64	1.441
1	-1.21	-1.47	0.58	0.31	0.05	-1.95	-0.61	1.057
Average	0.05	-0.74	0.12	0.96	-0.16	-0.23	0.00	**0.00**	0.891
Std. Dev.	0.965	1.453	0.814	0.565	0.455	0.942	0.866		**1.00**

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx1*





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	142.00	0.12	0.015	2.220	4.928
2	140.17	-1.71	2.928	3.341	11.163
3	142.15	0.27	0.074	1.872	3.503
4	144.08	2.21	4.864	1.298	1.686
5	141.52	-0.36	0.130	1.046	1.094
6	141.35	-0.53	0.279	2.165	4.687
sum			8.290		27.060
all data	141.88			2.29933	5.2869

ANOVA

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	49.7422222	5	9.948	**2.20586**	2.533554	0.0798563
within columns:	135.3	30	4.510			
Total:	185.042222			**Different ?**	**0**	**no**

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		1.83	-0.15	-2.08	0.48	0.65
2	1.83		-1.98	-3.92	-1.35	-1.18
3	-0.15	-1.98		-1.93	0.63	0.80
4	-2.08	-3.92	-1.93		2.57	2.73
5	0.48	-1.35	0.63	2.57		0.17
6	0.65	-1.18	0.80	2.73	0.17	

Critical Values

Columns	1	2	3	4	5	6
1		5.47	3.96	3.50	3.34	4.22
2	5.47		5.22	4.88	4.77	5.42
3	3.96	5.22		3.10	2.92	3.90
4	3.50	4.88	3.10		2.27	3.44
5	3.34	4.77	2.92	2.27		3.28
6	4.22	5.42	3.90	3.44	3.28	

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		1	0
5	0	0	0	1		0
6	0	0	0	0	0	
Sum	**0**	**0**	**0**	**1**	**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		0.9691	0.0521	0.0863	0.3802	0.0619
2			0.1035	0.1560	0.4576	0.1143
3				0.6379	0.1362	0.9739
4					0.2484	0.6822
5						0.1642
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.2891	0.9018	0.0753	0.6399	0.6188
2	0.2891		0.2333	0.0232	0.3671	0.4833
3	0.9018	0.2333		0.0643	0.4859	0.5091
4	0.0753	0.0232	0.0643		0.0037	0.0242
5	0.6399	0.3671	0.4859	0.0037		0.8686
6	0.6188	0.4833	0.5091	0.0242	0.8686	

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

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Above Average? 1= true, 0 = false

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

Pavement Segregation Analysis Spreadsheet
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July 1996

Location: Lansing State Police Facility
Date: 6/25/97
Description: 1 min. nuclear unit weight, Sample xx2

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	144.8	143.3	142.9	146.9	139.7	140.9
5	141.8	141.6	142.9	143.7	143.1	141.0
4	143.8	144.4	140.4	145.7	139.5	144.4
3	139.5	141.9	141.3	146.1	142.6	140.5
2	144.3	138.6	143.5	143.1	142.9	140.3
1	141.1	140.9	143.4	143.0	143.0	141.0
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

DATA ENTRY

Pavement Segregation Analysis Spreadsheet
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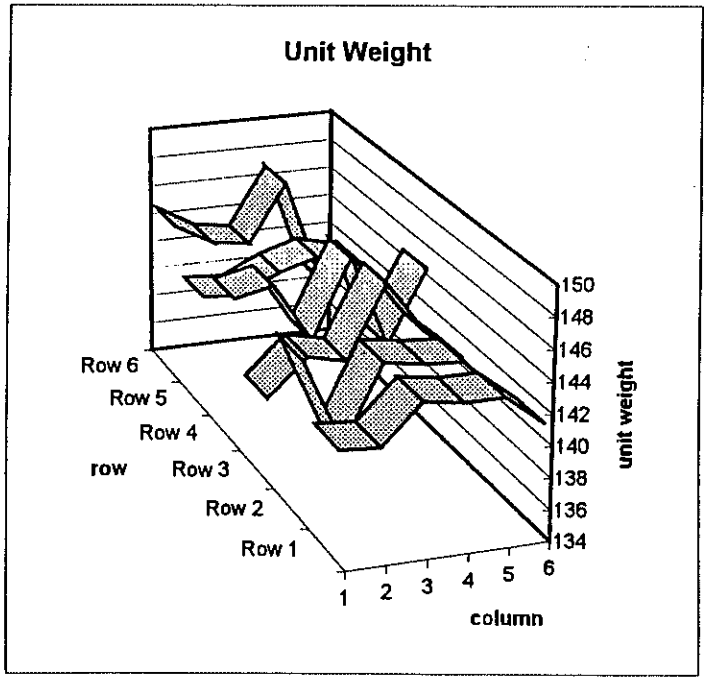
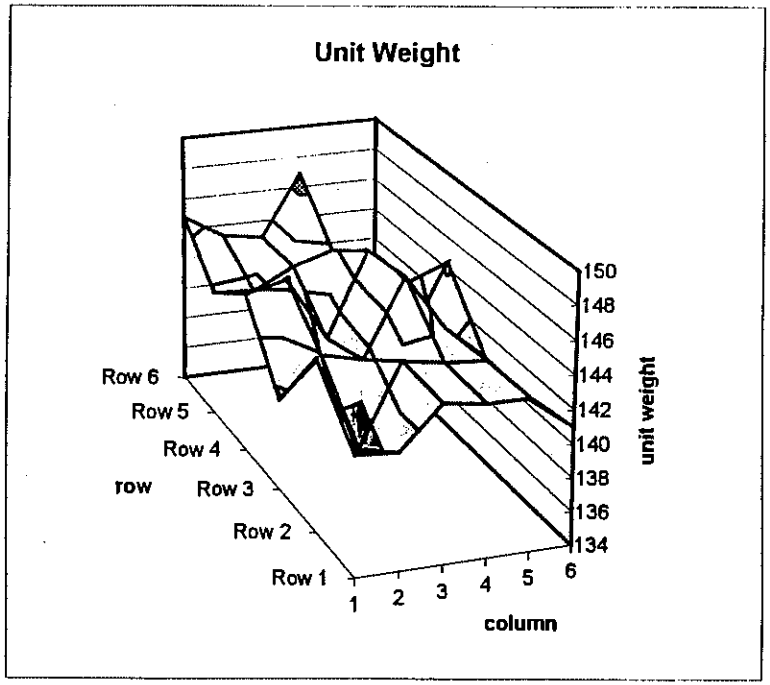
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	144.8	143.3	142.9	146.9	139.7	140.9	143.08	2.600	1.82%
5	141.8	141.6	142.9	143.7	143.1	141.0	142.35	1.037	0.73%
4	143.8	144.4	140.4	145.7	139.5	144.4	143.03	2.484	1.74%
3	139.5	141.9	141.3	146.1	142.6	140.5	141.98	2.288	1.61%
2	144.3	138.6	143.5	143.1	142.9	140.3	142.12	2.188	1.54%
1	141.1	140.9	143.4	143.0	143.0	141.0	142.07	1.179	0.83%
Average	142.55	141.78	142.40	144.75	141.80	141.35	142.44	142.44	1.963	1.38%
Std. Dev.	2.081	2.005	1.259	1.687	1.713	1.522	1.711		**1.95992**	
Coeff. of Var.	1.46%	1.41%	0.88%	1.17%	1.21%	1.08%	1.20%			**1.38%**

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx2*





Unit Wt Graph

Pavement Segregation Analysis Spreadsheet
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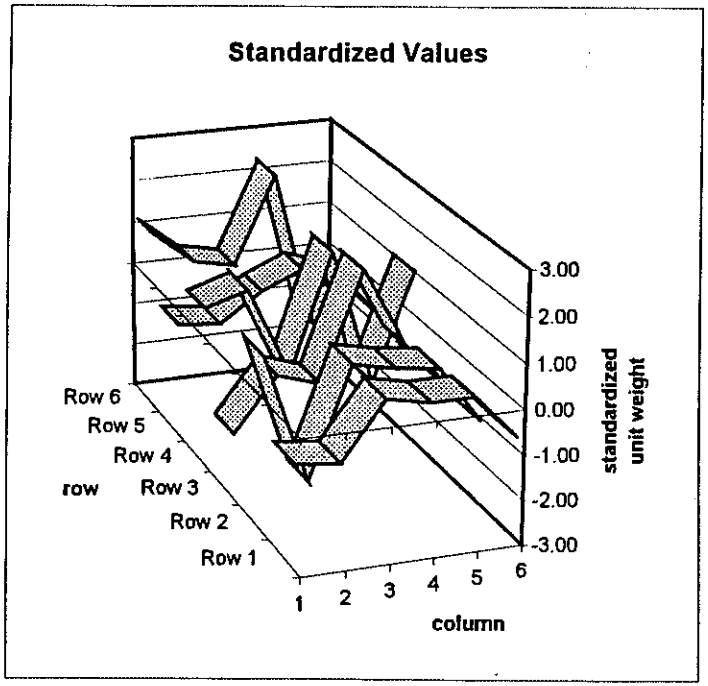
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx2*

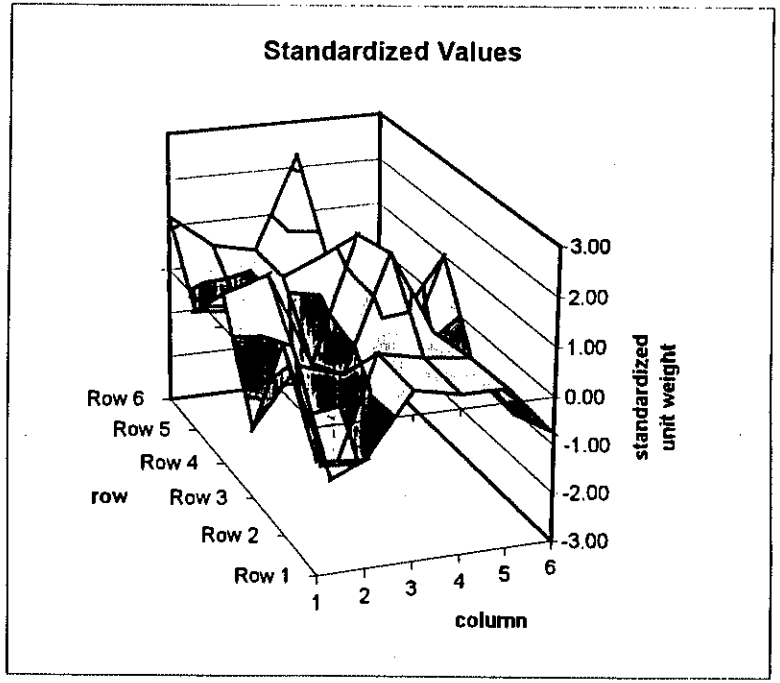
Color 1 *Color Above and Below Average*
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.20	0.44	0.24	2.28	-1.40	-0.79	0.33	1.327
5	-0.33	-0.43	0.24	0.64	0.34	-0.73	-0.05	0.529
4	0.69	1.00	-1.04	1.66	-1.50	1.00	0.30	1.267
3	-1.50	-0.27	-0.58	1.87	0.08	-0.99	-0.23	1.167
2	0.95	-1.96	0.54	0.34	0.24	-1.09	-0.16	1.116
1	-0.68	-0.79	0.49	0.29	0.29	-0.73	-0.19	0.602
Average	0.06	-0.33	-0.02	1.18	-0.33	-0.56	0.00	**0.00**	1.001
Std. Dev.	1.062	1.023	0.642	0.861	0.874	0.776	0.873		**1.00**

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx2*





Std Graph

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	142.55	0.11	0.012	2.081	4.331
2	141.78	-0.66	0.430	2.005	4.022
3	142.40	-0.04	0.002	1.259	1.584
4	144.75	2.31	5.341	1.687	2.847
5	141.80	-0.64	0.408	1.713	2.936
6	141.35	-1.09	1.186	1.522	2.315
sum			7.379		18.035
all data	142.44			1.959924	3.8413

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	44.2722222	5	8.854	**2.94581**	2.533554	0.0279711
within columns:	90.1733333	30	3.006			
Total:	134.445556			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		0.77	0.15	-2.20	0.75	1.20
2	0.77		-0.62	-2.97	-0.02	0.43
3	0.15	-0.62		-2.35	0.60	1.05
4	-2.20	-2.97	-2.35		2.95	3.40
5	0.75	-0.02	0.60	2.95		0.45
6	1.20	0.43	1.05	3.40	0.45	

Critical Values

Columns	1	2	3	4	5	6
1		3.94	3.31	3.65	3.67	3.51
2	3.94		3.23	3.57	3.59	3.43
3	3.31	3.23		2.87	2.90	2.69
4	3.65	3.57	2.87		3.28	3.10
5	3.67	3.59	2.90	3.28		3.12
6	3.51	3.43	2.69	3.10	3.12	

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	1
5	0	0	0	0		0
6	0	0	0	1	0	
Sum	**0**	**0**	**0**	**1**	**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		0.9617	0.9384	0.4094	0.6679	0.4036
2			0.9199	0.5129	0.8181	0.5018
3				0.4639	0.7281	0.4546
4					0.5480	0.9735
5						0.5355
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.5305	0.8829	0.0720	0.5110	0.2808
2	0.5305		0.5378	0.0197	0.9880	0.6822
3	0.8829	0.5378		0.0210	0.5051	0.2219
4	0.0720	0.0197	0.0210		0.0132	0.0043
5	0.5110	0.9880	0.5051	0.0132		0.6409
6	0.2808	0.6822	0.2219	0.0043	0.6409	

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

Pavement Segregation Analysis Spreadsheet
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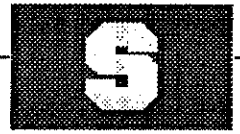
July 1996



Location: Lansing State Police Facility
Date: 6/25/97
Description: 1 min. nuclear unit weight, Sample xx3

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	143.6	144.9	140.7	145.7	141.5	140.8
5	145.5	143.8	141.1	145.3	137.6	141.6
4	142.9	141.6	143.3	145.1	141.9	140.7
3	143.0	139.8	143.2	145.9	142.1	140.9
2	143.6	138.9	144.1	145.7	144.0	141.4
1	142.4	141.3	143.3	145.0	142.4	140.5
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

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

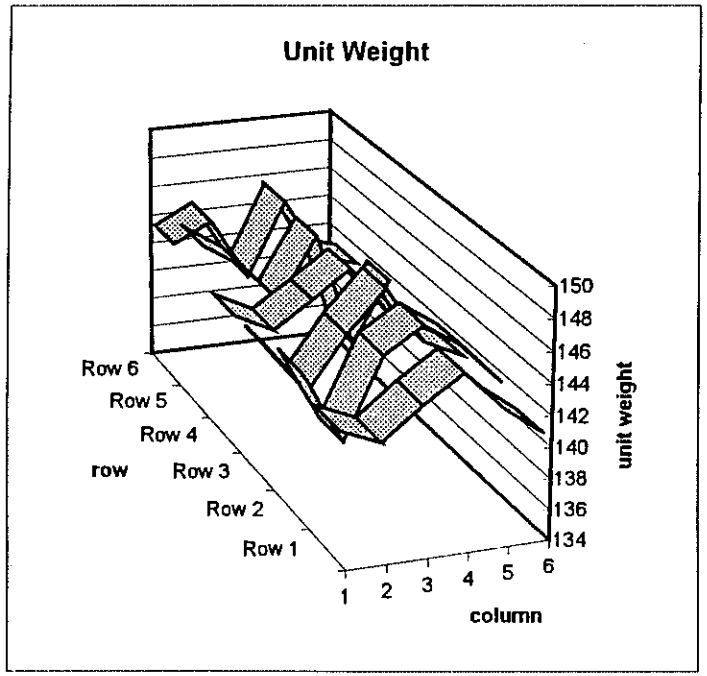
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx3*

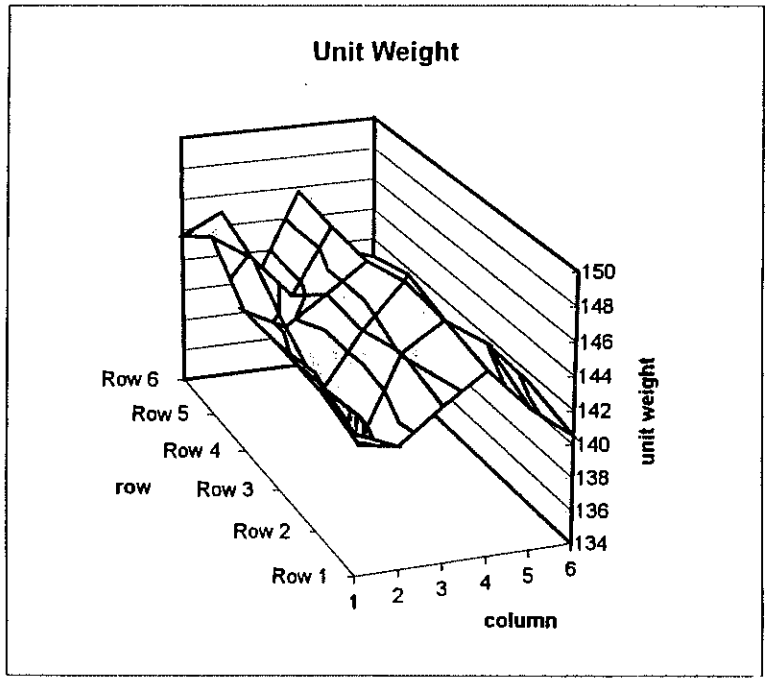
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	143.6	144.9	140.7	145.7	141.5	140.8	142.87	2.169	1.52%
5	145.5	143.8	141.1	145.3	137.6	141.6	142.48	3.010	2.11%
4	142.9	141.6	143.3	145.1	141.9	140.7	142.58	1.545	1.08%
3	143.0	139.8	143.2	145.9	142.1	140.9	142.48	2.112	1.48%
2	143.6	138.9	144.1	145.7	144.0	141.4	142.95	2.417	1.69%
1	142.4	141.3	143.3	145.0	142.4	140.5	142.48	1.572	1.10%
Average	143.50	141.72	142.62	145.45	141.58	140.98	142.64	**142.64**	2.138	1.50%
Std. Dev.	1.081	2.292	1.375	0.367	2.133	0.426	1.279		**2.04232**	
Coeff. of Var.	0.75%	1.62%	0.96%	0.25%	1.51%	0.30%	0.90%			**1.43%**

Unit Wt Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx3*





Unit Wt Graph

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Lansing State Police Facility*

Date: *6/25/97*

Description: *1 min. nuclear unit weight, Sample xx3*

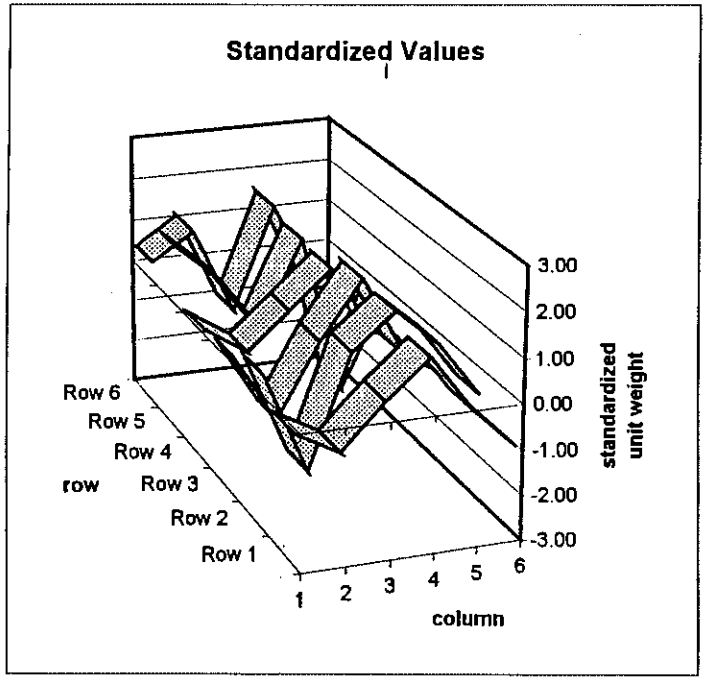
Color 1 *Color Above and Below Average*

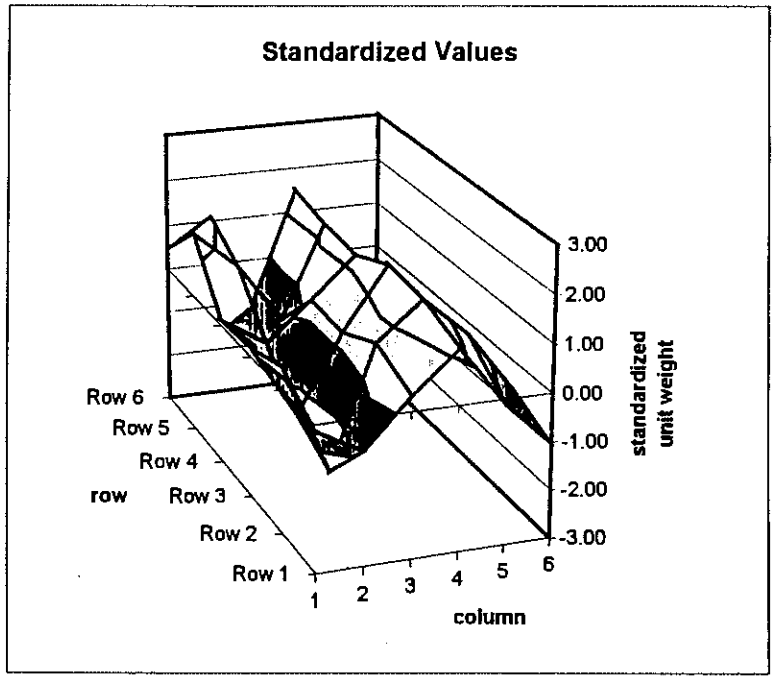
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	0.47	1.11	-0.95	1.50	-0.56	-0.90	0.11	1.062
5	1.40	0.57	-0.75	1.30	-2.47	-0.51	-0.08	1.474
4	0.13	-0.51	0.32	1.20	-0.36	-0.95	-0.03	0.756
3	0.18	-1.39	0.27	1.60	-0.27	-0.85	-0.08	1.034
2	0.47	-1.83	0.71	1.50	0.67	-0.61	0.15	1.184
1	-0.12	-0.66	0.32	1.15	-0.12	-1.05	-0.08	0.769
Average	0.42	-0.45	-0.01	1.38	-0.52	-0.81	0.00	**0.00**	1.047
Std. Dev.	0.529	1.122	0.673	0.180	1.044	0.209	0.626		**1.00**

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1 min. nuclear unit weight, Sample xx3*





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	143.50	0.86	0.737	1.081	1.168
2	141.72	-0.92	0.856	2.292	5.254
3	142.62	-0.03	0.001	1.375	1.890
4	145.45	2.81	7.887	0.367	0.135
5	141.58	-1.06	1.120	2.133	4.550
6	140.98	-1.66	2.750	0.426	0.182
sum			13.350		13.178
all data	142.64			2.04232	4.1711

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	80.0991667	5	16.020	**7.29408**	2.533554	0.0001419
within columns:	65.8883333	30	2.196			
Total:	145.9875			**Different ?**	1	YES!

ANOVA

Pavement Segregation Analysis Spreadsheet
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T. F. Wolff June 1996

Tukey's paired comparison test

Difference of means

Columns	1	2	3	4	5	6
1		1.78	0.88	-1.95	1.92	2.52
2	1.78		-0.90	-3.73	0.13	0.73
3	0.88	-0.90		-2.83	1.03	1.63
4	-1.95	-3.73	-2.83		3.87	4.47
5	1.92	0.13	1.03	3.87		0.60
6	2.52	0.73	1.63	4.47	0.60	

Critical Values

Columns	1	2	3	4	5	6
1		3.45	2.38	1.56	3.26	1.58
2	3.45		3.64	3.16	4.27	3.18
3	2.38	3.64		1.94	3.46	1.96
4	1.56	3.16	1.94		2.95	0.77
5	3.26	4.27	3.46	2.95		2.96
6	1.58	3.18	1.96	0.77	2.96	

Critical ?

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

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.7001	1.0000	0.9137	1.0000	0.7332
2			0.7292	0.7606	0.7732	0.9511
3				0.9273	1.0000	0.7628
4					0.9437	0.7997
5						0.8054
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.1155	0.2442	0.0019	0.0780	0.0003
2	0.1155		0.4287	0.0028	0.9190	0.4588
3	0.2442	0.4287		0.0006	0.3421	0.0195
4	0.0019	0.0028	0.0006		0.0014	0.0000
5	0.0780	0.9190	0.3421	0.0014		0.5146
6	0.0003	0.4588	0.0195	0.0000	0.5146	

Fail t-test at 0.05 level?

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

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

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

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

T.F. Wolff
July 1996

Location: Lansing State Police Facility
Date: 6/25/97
Description: 1-min nuclear unit weight, Average of three samples

(updated 7/12/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	144.5	143.8	141.3	145.9	141.1	141.4
5	143.2	141.8	142.7	143.8	140.1	141.1
4	143.1	143.1	141.6	145.1	140.8	142.9
3	141.9	141.0	142.9	145.9	142.2	141.2
2	142.6	137.3	142.5	144.3	143.2	141.0
1	140.9	140.2	143.3	143.5	142.5	139.6
Edge						
Tukey test	--	--	--	DIFF !	--	--
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

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

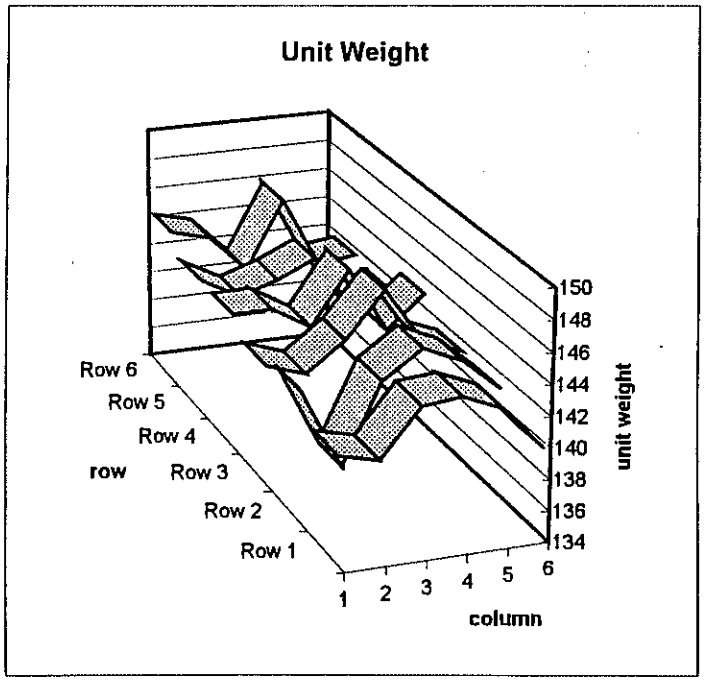
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1-min nuclear unit weight, Average of three samples*

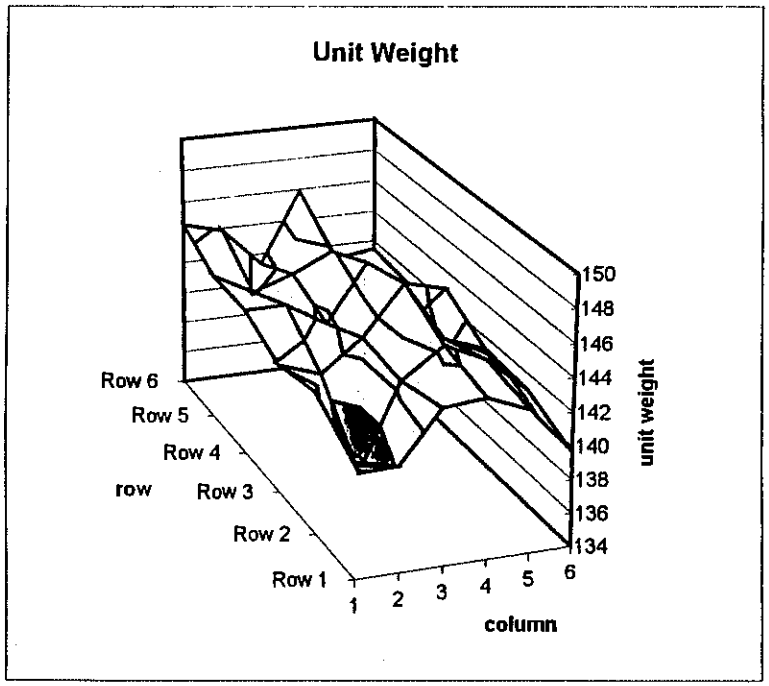
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	144.5	143.8	141.3	145.9	141.1	141.4	143.01	2.007	1.40%
5	143.2	141.8	142.7	143.8	140.1	141.1	142.13	1.371	0.96%
4	143.1	143.1	141.6	145.1	140.8	142.9	142.76	1.495	1.05%
3	141.9	141.0	142.9	145.9	142.2	141.2	142.52	1.790	1.26%
2	142.6	137.3	142.5	144.3	143.2	141.0	141.82	2.440	1.72%
1	140.9	140.2	143.3	143.5	142.5	139.6	141.67	1.651	1.17%
Average	142.68	141.22	142.39	144.76	141.63	141.23	142.32	**142.32**	1.792	1.26%
Std. Dev.	1.236	2.318	0.765	1.024	1.157	1.042	1.257		**1.76136**	
Coeff. of Var.	0.87%	1.64%	0.54%	0.71%	0.82%	0.74%	0.88%			**1.24%**

Unit Wt Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1-min nuclear unit weight, Average of three samples*





Unit Wt Graph

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1-min nuclear unit weight, Average of three samples*

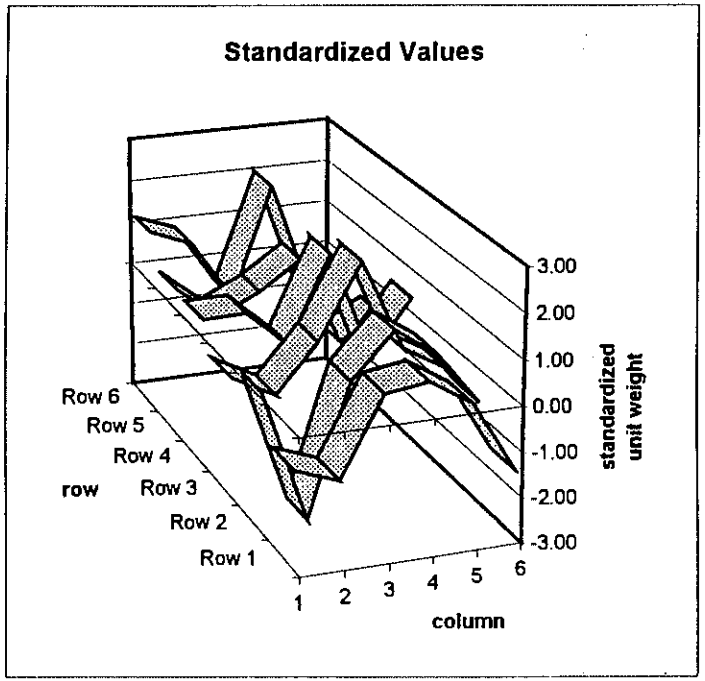
Color 1 *Color Above and Below Average*

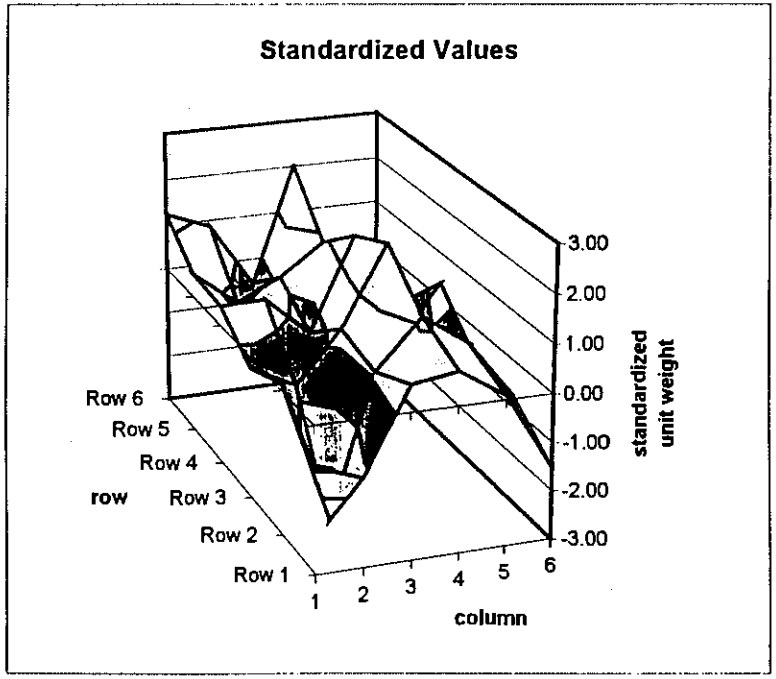
Clear Color

Standardized Values

Column	1	2	3	4	5	6	Average	Standard Deviation
Row								
6	1.24	0.86	-0.56	2.01	-0.71	-0.50	0.39	1.139
5	0.50	-0.28	0.20	0.86	-1.24	-0.67	-0.11	0.779
4	0.42	0.44	-0.41	1.60	-0.88	0.33	0.25	0.849
3	-0.24	-0.75	0.33	2.03	-0.07	-0.62	0.12	1.016
2	0.14	-2.83	0.12	1.12	0.48	-0.73	-0.28	1.386
1	-0.82	-1.18	0.56	0.69	0.08	-1.53	-0.37	0.937
Average	0.21	-0.62	0.04	1.39	-0.39	-0.62	0.00	0.00	1.018
Std. Dev.	0.702	1.316	0.434	0.581	0.657	0.592	0.714		1.00

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *1-min nuclear unit weight, Average of three samples*





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	142.68	0.36	0.132	1.236	1.528
2	141.22	-1.10	1.204	2.318	5.374
3	142.39	0.07	0.005	0.765	0.585
4	144.76	2.44	5.962	1.024	1.048
5	141.63	-0.69	0.471	1.157	1.338
6	141.23	-1.09	1.192	1.042	1.086
sum			8.965		10.958
all data	142.32			1.761355	3.1024

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	53.7921296	5	10.758	**5.89062**	2.533554	0.0006605
within columns:	54.7909259	30	1.826			
Total:	108.583056			**Different ?**	1	**YES!**

ANOVA

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		1.46	0.29	-2.08	1.05	1.46
2	1.46		-1.17	-3.54	-0.41	-0.01
3	0.29	-1.17		-2.37	0.76	1.16
4	-2.08	-3.54	-2.37		3.13	3.53
5	1.05	-0.41	0.76	3.13		0.41
6	1.46	-0.01	1.16	3.53	0.41	

Critical Values

Columns	1	2	3	4	5	6
1		3.58	1.98	2.19	2.31	2.20
2	3.58		3.33	3.45	3.53	3.46
3	1.98	3.33		1.74	1.89	1.76
4	2.19	3.45	1.74		2.10	1.99
5	2.31	3.53	1.89	2.10		2.12
6	2.20	3.46	1.76	1.99	2.12	

Critical ?

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

t-tests

two sample, equal variance, homoscedastic

Row vs. Ro	1	2	3	4	5	6
1		0.9032	0.4125	0.2587	0.6101	0.2373
2			0.5835	0.4404	0.7910	0.3805
3				0.8070	0.6816	0.6691
4					0.4660	0.8157
5						0.4000
6						

t-tests

two sample, equal variance, homoscedastic

Col vs Col	1	2	3	4	5	6
1		0.2030	0.6305	0.0100	0.1597	0.0520
2	0.2030		0.2689	0.0065	0.7056	0.9958
3	0.6305	0.2689		0.0011	0.2116	0.0524
4	0.0100	0.0065	0.0011		0.0006	0.0001
5	0.1597	0.7056	0.2116	0.0006		0.5377
6	0.0520	0.9958	0.0524	0.0001	0.5377	

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

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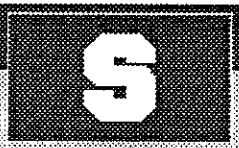
Above Average? 1= true, 0 = false

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

Asphalt Content Grid Analysis

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



Location: Lansing State Police Facility
Date: 6/25/97
Description: Moisture Content (%), Sample xx1

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	6.6	6.2	7.0	6.1	6.2	6.1
5	6.7	6.4	6.2	5.8	6.4	6.2
4	6.9	6.9	6.3	6.0	6.3	6.1
3	6.8	7.0	6.1	6.4	6.1	6.1
2	6.7	6.8	6.4	6.1	6.2	6.1
1	6.6	6.9	7.0	6.2	6.4	6.4
Edge						
Tukey test	DIFF !	--	--	--	--	--
paired t tests	DIFF !	DIFF !	--	--	--	--
6 of 6 test	DIFF !	--	--	DIFF !	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
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

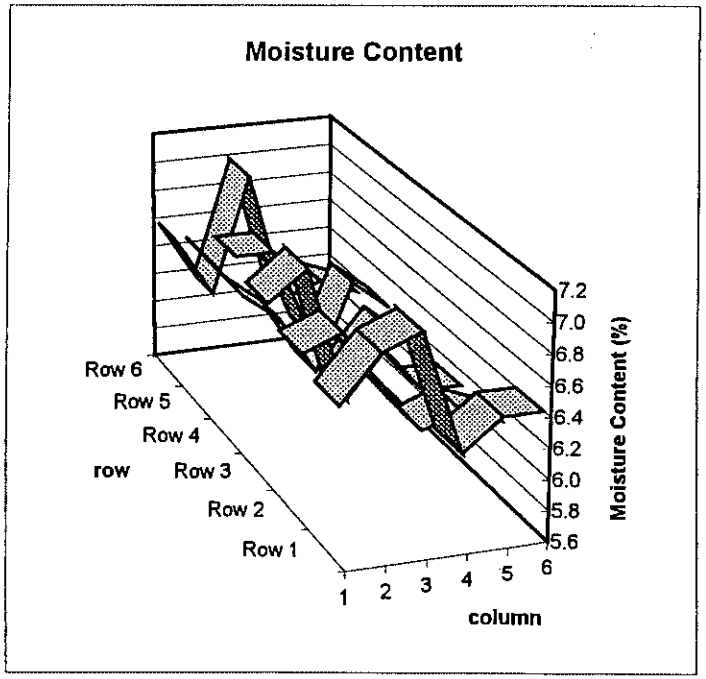
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx1*

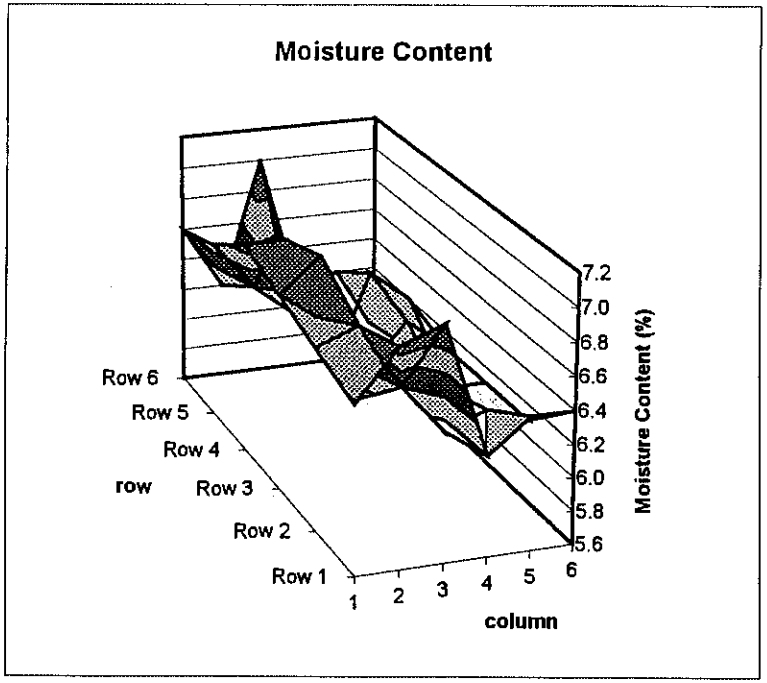
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	6.6	6.2	7.0	6.1	6.2	6.1	6.37	0.361	5.68%
5	6.7	6.4	6.2	5.8	6.4	6.2	6.28	0.299	4.77%
4	6.9	6.9	6.3	6.0	6.3	6.1	6.42	0.392	6.11%
3	6.8	7.0	6.1	6.4	6.1	6.1	6.42	0.397	6.19%
2	6.7	6.8	6.4	6.1	6.2	6.1	6.38	0.306	4.79%
1	6.6	6.9	7.0	6.2	6.4	6.4	6.58	0.313	4.75%
Average	6.72	6.70	6.50	6.10	6.27	6.17	6.41	**6.41**	0.345	5.38%
Std. Dev.	0.117	0.322	0.400	0.200	0.121	0.121	0.214		**0.33413**	
Coeff. of Var.	1.74%	4.81%	6.15%	3.28%	1.93%	1.96%	3.31%			**5.21%**

Moisture Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx1*





Moisture Graph

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

T. F. Wolff June 1996

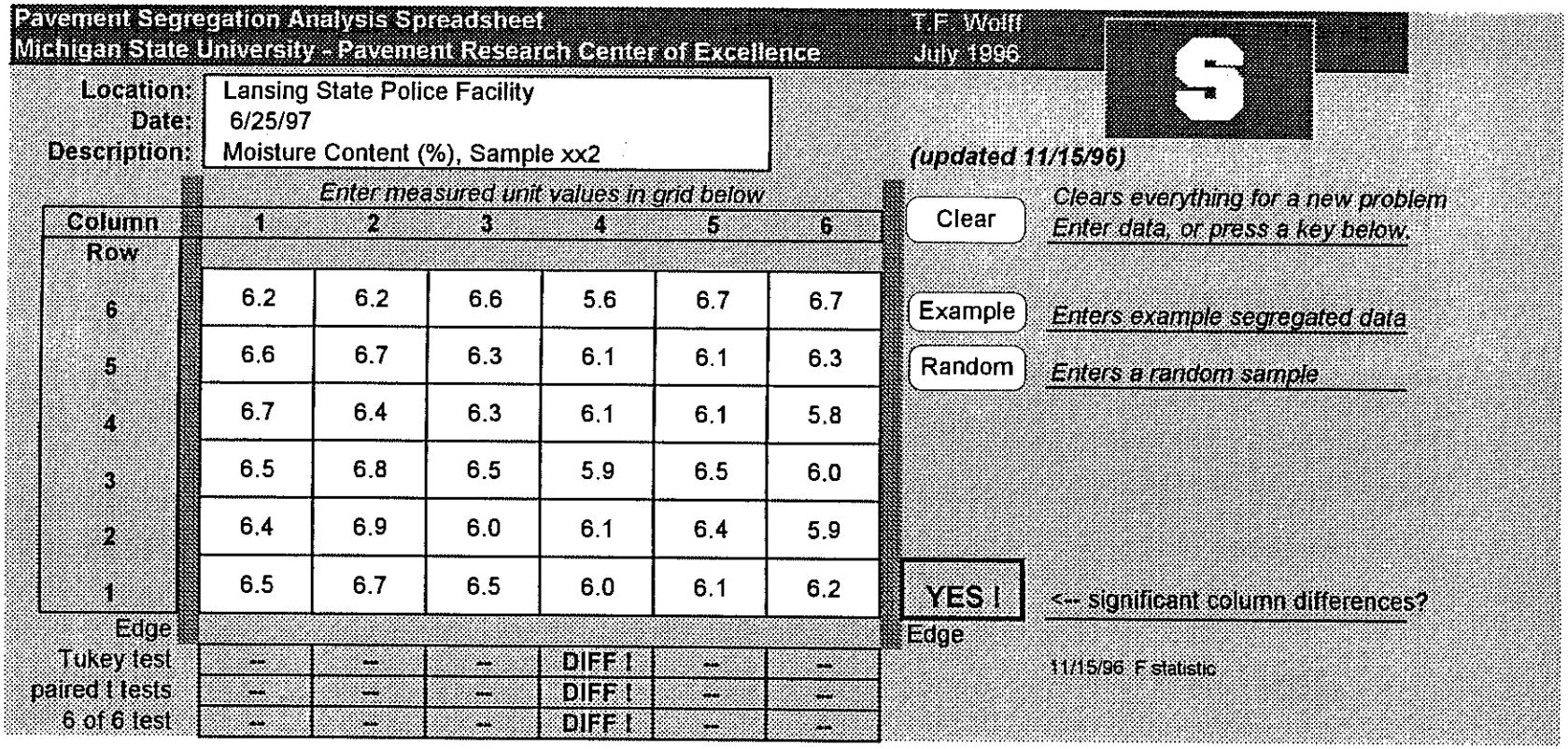
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	6.72	0.31	0.095	0.117	0.014
2	6.70	0.29	0.085	0.322	0.104
3	6.50	0.09	0.008	0.400	0.160
4	6.10	-0.31	0.095	0.200	0.040
5	6.27	-0.14	0.020	0.121	0.015
6	6.17	-0.24	0.058	0.121	0.015
sum			0.362		0.347
all data	6.41			0.33413	0.1116

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	2.1725	5	0.435	**7.51297**	2.533554	0.000113
within columns:	1.735	30	0.058			
Total:	3.9075					

Different ? 1 YES!

ANOVA


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Lansing State Police Facility
Date: 6/25/97
Description: Moisture Content (%), Sample xx2
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 6.2 6.2 6.6 5.6 6.7 6.7
5 6.6 6.7 6.3 6.1 6.1 6.3
4 6.7 6.4 6.3 6.1 6.1 5.8
3 6.5 6.8 6.5 5.9 6.5 6.0
2 6.4 6.9 6.0 6.1 6.4 5.9
1 6.5 6.7 6.5 6.0 6.1 6.2
Edge
Tukey test -- -- -- DIFF ! -- --
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
11/15/96 F statistic

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

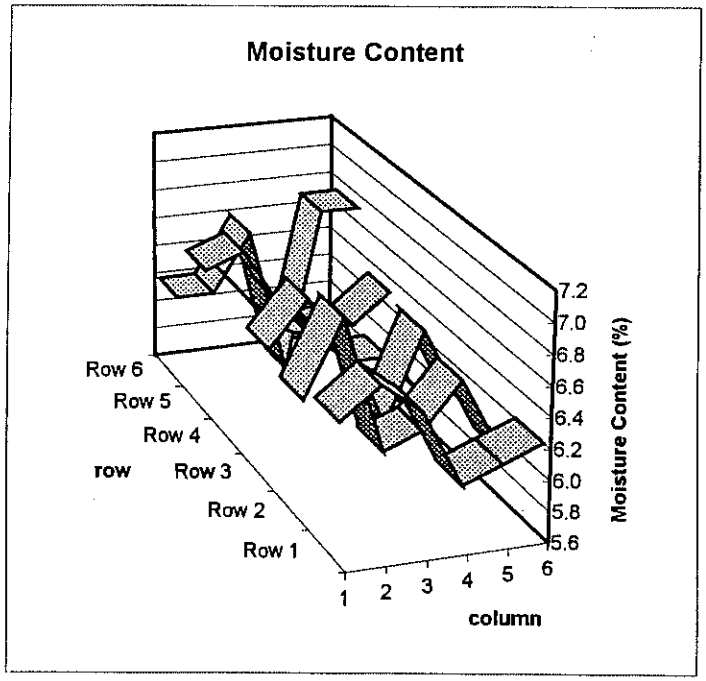
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx2*

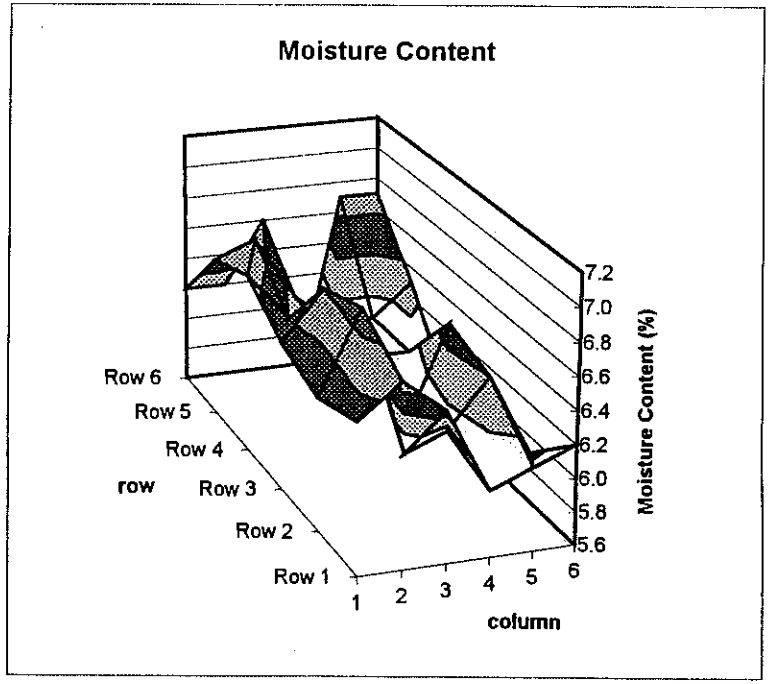
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	6.2	6.2	6.6	5.6	6.7	6.7	6.33	0.427	6.75%
5	6.6	6.7	6.3	6.1	6.1	6.3	6.35	0.251	3.95%
4	6.7	6.4	6.3	6.1	6.1	5.8	6.23	0.308	4.94%
3	6.5	6.8	6.5	5.9	6.5	6.0	6.37	0.344	5.41%
2	6.4	6.9	6.0	6.1	6.4	5.9	6.28	0.366	5.82%
1	6.5	6.7	6.5	6.0	6.1	6.2	6.33	0.273	4.31%
Average	6.48	6.62	6.37	5.97	6.32	6.15	6.32	**6.32**	0.328	5.20%
Std. Dev.	0.172	0.264	0.216	0.197	0.256	0.327	0.239		**0.31214**	
Coeff. of Var.	2.66%	3.99%	3.39%	3.30%	4.06%	5.32%	3.79%			**4.94%**

Moisture Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx2*





Moisture Graph

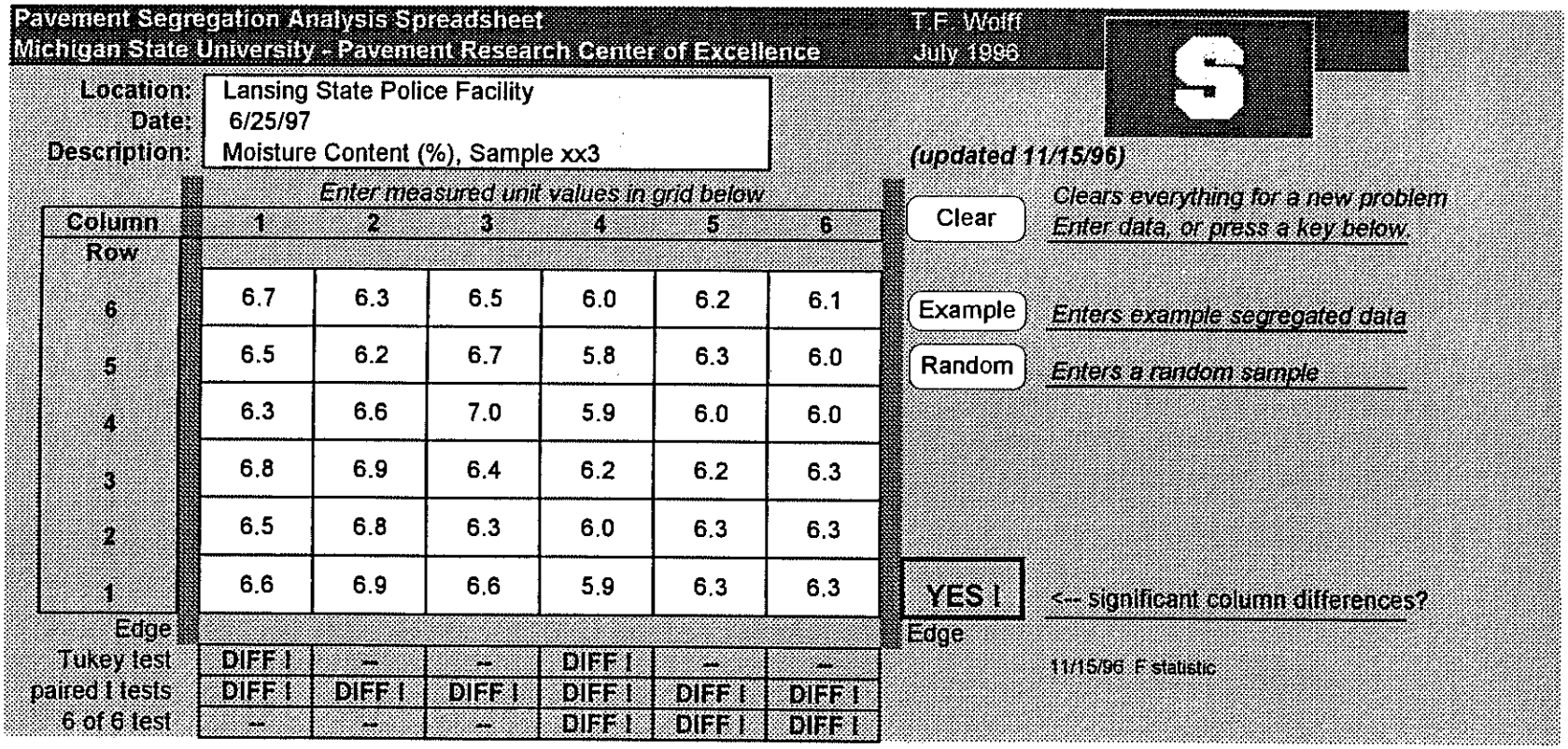
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	6.48	0.17	0.028	0.172	0.030
2	6.62	0.30	0.090	0.264	0.070
3	6.37	0.05	0.003	0.216	0.047
4	5.97	-0.35	0.123	0.197	0.039
5	6.32	0.00	0.000	0.256	0.066
6	6.15	-0.17	0.028	0.327	0.107
sum			0.271		0.357
all data	6.32			0.312136	0.0974

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.62333333	5	0.325	**5.45149**	2.533554	0.0011022
within columns:	1.78666667	30	0.060			
Total:	3.41			**Different ?**	1	**YES!**

ANOVA


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T F Wolff
July 1996
Location: Lansing State Police Facility
Date: 6/25/97
Description: Moisture Content (%), Sample xx3
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 6.7 6.3 6.5 6.0 6.2 6.1
5 6.5 6.2 6.7 5.8 6.3 6.0
4 6.3 6.6 7.0 5.9 6.0 6.0
3 6.8 6.9 6.4 6.2 6.2 6.3
2 6.5 6.8 6.3 6.0 6.3 6.3
1 6.6 6.9 6.6 5.9 6.3 6.3
Edge
Tukey test DIFF ! -- -- DIFF ! -- --
paired t tests DIFF ! DIFF ! DIFF ! DIFF ! DIFF ! DIFF !
6 of 6 test -- -- -- DIFF ! 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
Michigan State University - Pavement Research Center of Excellence

T. F. Wolff June 1996

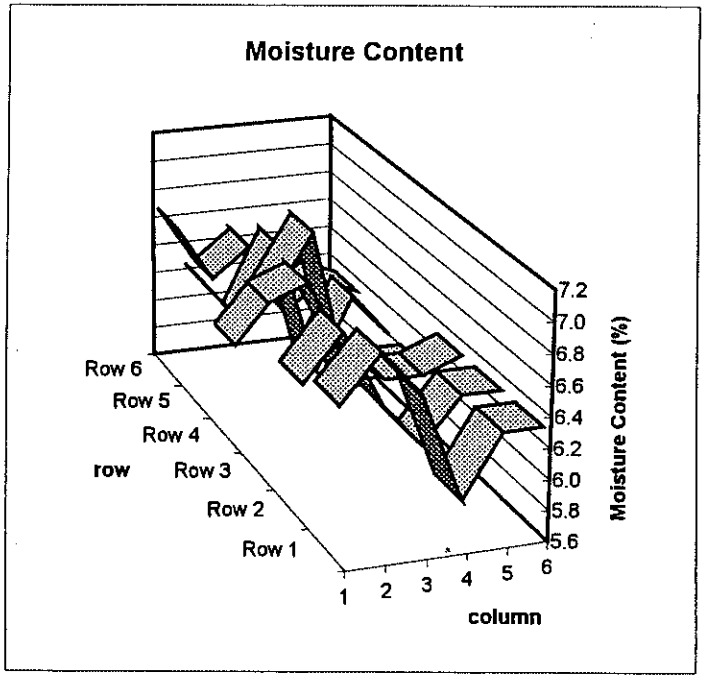
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx3*

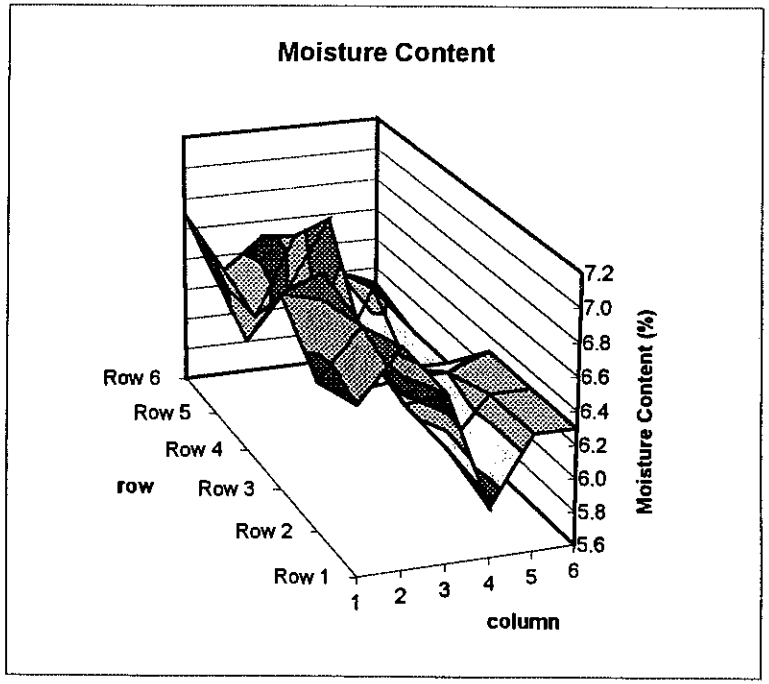
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	6.7	6.3	6.5	6.0	6.2	6.1	6.30	0.261	4.14%
5	6.5	6.2	6.7	5.8	6.3	6.0	6.25	0.327	5.23%
4	6.3	6.6	7.0	5.9	6.0	6.0	6.30	0.429	6.81%
3	6.8	6.9	6.4	6.2	6.2	6.3	6.47	0.308	4.76%
2	6.5	6.8	6.3	6.0	6.3	6.3	6.37	0.266	4.18%
1	6.6	6.9	6.6	5.9	6.3	6.3	6.43	0.344	5.35%
Average	6.57	6.62	6.58	5.97	6.22	6.17	6.35	**6.35**	0.322	5.08%
Std. Dev.	0.175	0.306	0.248	0.137	0.117	0.151	0.189		**0.31304**	
Coeff. of Var.	2.67%	4.63%	3.77%	2.29%	1.88%	2.44%	2.95%			**4.93%**

Moisture Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Sample xx3*





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	6.57	0.21	0.046	0.175	0.031
2	6.62	0.26	0.070	0.306	0.094
3	6.58	0.23	0.053	0.248	0.062
4	5.97	-0.39	0.149	0.137	0.019
5	6.22	-0.14	0.019	0.117	0.014
6	6.17	-0.19	0.035	0.151	0.023
sum			0.371		0.241
all data	6.35			0.313037	0.0980

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	2.22472222	5	0.445	**11.07746**	2.533554	4.152E-06
within columns:	1.205	30	0.040			
Total:	3.42972222					

Different ? 1 **YES!**

ANOVA

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

T.F. Wolff
July 1996

Location: Lansing State Police Facility
Date: 6/25/97
Description: Moisture Content (%), Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	6.5	6.2	6.7	5.9	6.4	6.3
5	6.6	6.4	6.4	5.9	6.3	6.2
4	6.6	6.6	6.5	6.0	6.1	6.0
3	6.7	6.9	6.3	6.2	6.3	6.1
2	6.5	6.8	6.2	6.1	6.3	6.1
1	6.6	6.8	6.7	6.0	6.3	6.3
Edge						
Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	--	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?

11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

Michigan State University - Pavement Research Center of Excellence

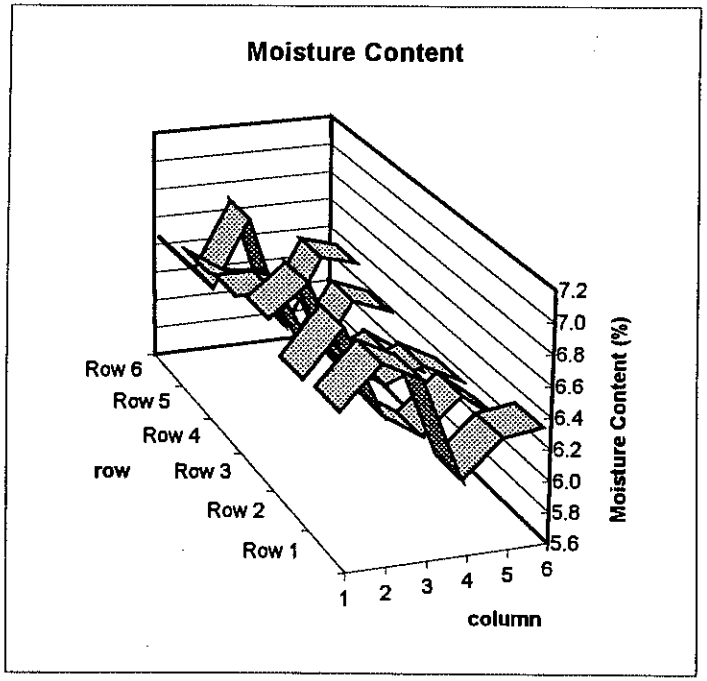
Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Average of three samples*

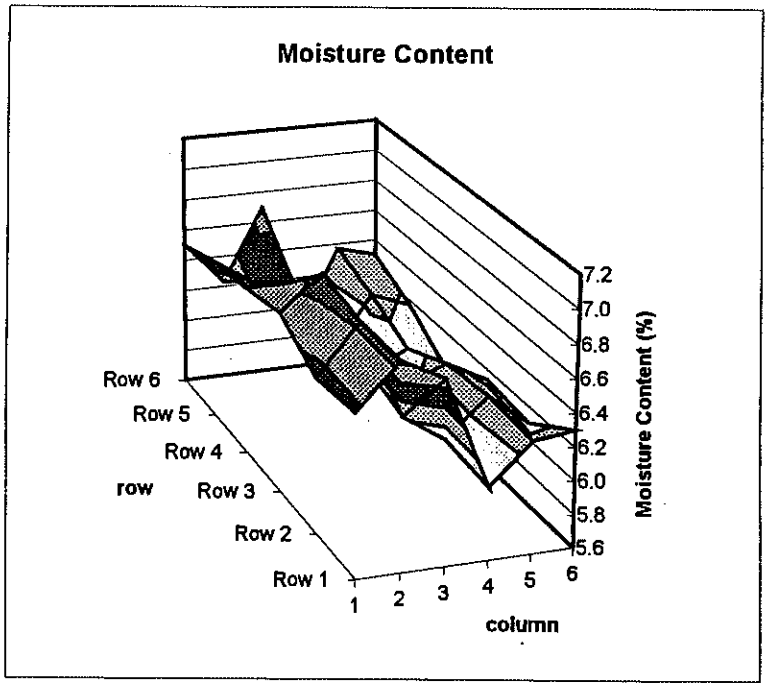
Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	6.5	6.2	6.7	5.9	6.4	6.3	6.33	0.269	4.25%
5	6.6	6.4	6.4	5.9	6.3	6.2	6.29	0.244	3.87%
4	6.6	6.6	6.5	6.0	6.1	6.0	6.32	0.317	5.03%
3	6.7	6.9	6.3	6.2	6.3	6.1	6.42	0.312	4.86%
2	6.5	6.8	6.2	6.1	6.3	6.1	6.34	0.292	4.60%
1	6.6	6.8	6.7	6.0	6.3	6.3	6.45	0.301	4.67%
Average	6.59	6.64	6.48	6.01	6.27	6.16	6.36	**6.36**	0.289	4.54%
Std. Dev.	0.072	0.265	0.194	0.103	0.076	0.127	0.139		**0.27454**	
Coeff. of Var.	1.09%	3.98%	2.99%	1.71%	1.21%	2.06%	2.18%			**4.32%**

Moisture Stats

Location: *Lansing State Police Facility*
Date: *6/25/97*
Description: *Moisture Content (%), Average of three samples*





Moisture Graph

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

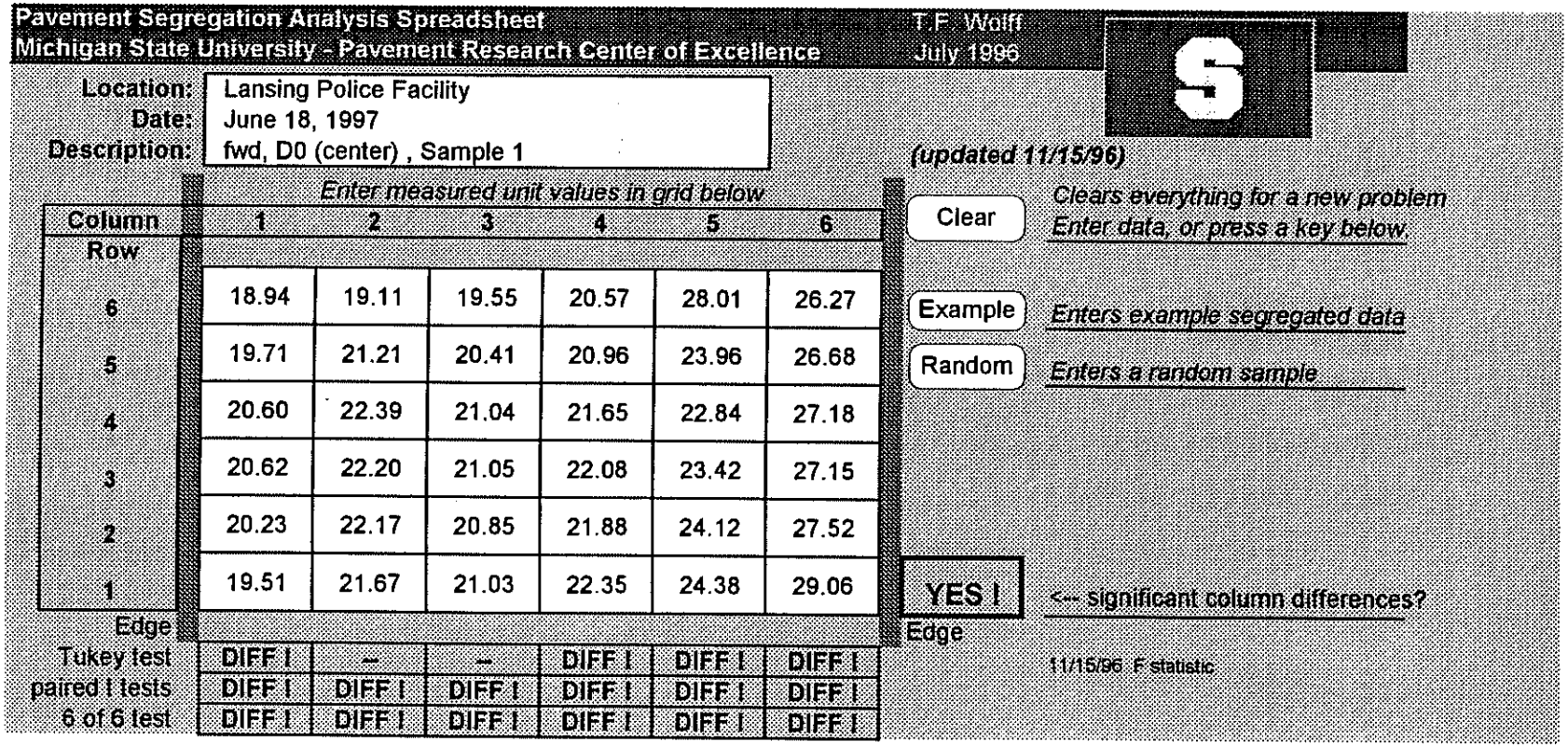
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	6.59	0.23	0.053	0.072	0.005
2	6.64	0.29	0.081	0.265	0.070
3	6.48	0.12	0.015	0.194	0.038
4	6.01	-0.35	0.121	0.103	0.011
5	6.27	-0.09	0.009	0.076	0.006
6	6.16	-0.20	0.039	0.127	0.016
sum			0.318		0.145
all data	6.36			0.27454	0.0754

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.91098765	5	0.382	**15.77076**	2.533554	1.265E-07
within columns:	0.72703704	30	0.024			
Total:	2.63802469			Different ?	1	YES!

ANOVA

Deflection Grid Analysis



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D0 (center) , Sample 1

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	18.94	19.11	19.55	20.57	28.01	26.27
5	19.71	21.21	20.41	20.96	23.96	26.68
4	20.60	22.39	21.04	21.65	22.84	27.18
3	20.62	22.20	21.05	22.08	23.42	27.15
2	20.23	22.17	20.85	21.88	24.12	27.52
1	19.51	21.67	21.03	22.35	24.38	29.06
Edge						
Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	DIFF !	DIFF !	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

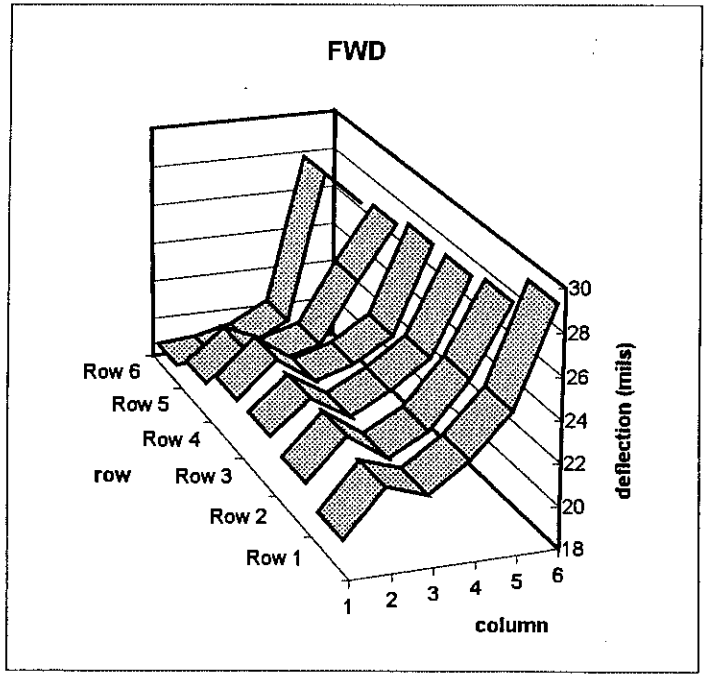
Michigan State University - Pavement Research Center of Excellence

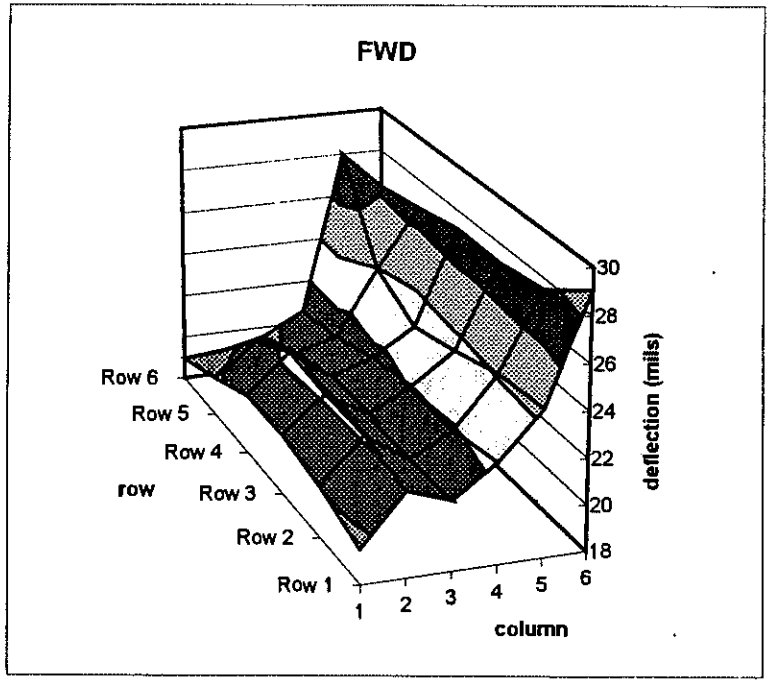
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	18.9	19.1	19.6	20.6	28.0	26.3	22.08	4.004	18.14%
5	19.7	21.2	20.4	21.0	24.0	26.7	22.16	2.649	11.96%
4	20.6	22.4	21.0	21.6	22.8	27.2	22.62	2.382	10.53%
3	20.6	22.2	21.1	22.1	23.4	27.2	22.75	2.368	10.41%
2	20.2	22.2	20.9	21.9	24.1	27.5	22.79	2.670	11.71%
1	19.5	21.7	21.0	22.4	24.4	29.1	23.00	3.371	14.66%
Average	19.93	21.46	20.66	21.58	24.45	27.31	22.57	**22.57**	2.907	12.90%
Std. Dev.	0.666	1.226	0.594	0.686	1.828	0.960	0.994		**2.76825**	
Coeff. of Var.	3.34%	5.71%	2.88%	3.18%	7.48%	3.52%	4.35%			**12.27%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 1*





FWD 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	19.93	-2.63	6.926	0.666	0.444
2	21.46	-1.11	1.225	1.226	1.504
3	20.66	-1.91	3.646	0.594	0.353
4	21.58	-0.99	0.970	0.686	0.471
5	24.45	1.89	3.568	1.828	3.343
6	27.31	4.74	22.504	0.960	0.921
sum			38.839		7.036
all data	22.57			2.768249	7.6632

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	233.0338	5	46.607	**39.74616**	2.533554	2.366E-12
within columns:	35.1783111	30	1.173			
Total:	268.212111					

Different ? 1 YES!

ANOVA

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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D0 (center) , Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	18.00	18.26	19.11	19.76	26.05	25.17
5	19.19	20.66	20.22	20.90	24.07	26.91
4	19.86	22.37	21.32	20.99	22.99	27.02
3	19.65	21.67	20.94	21.54	22.66	27.23
2	20.25	22.04	20.82	21.92	23.61	27.96
1	18.89	21.32	20.57	21.41	24.10	27.10
Edge						

Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	DIFF !	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
Michigan State University - Pavement Research Center of Excellence

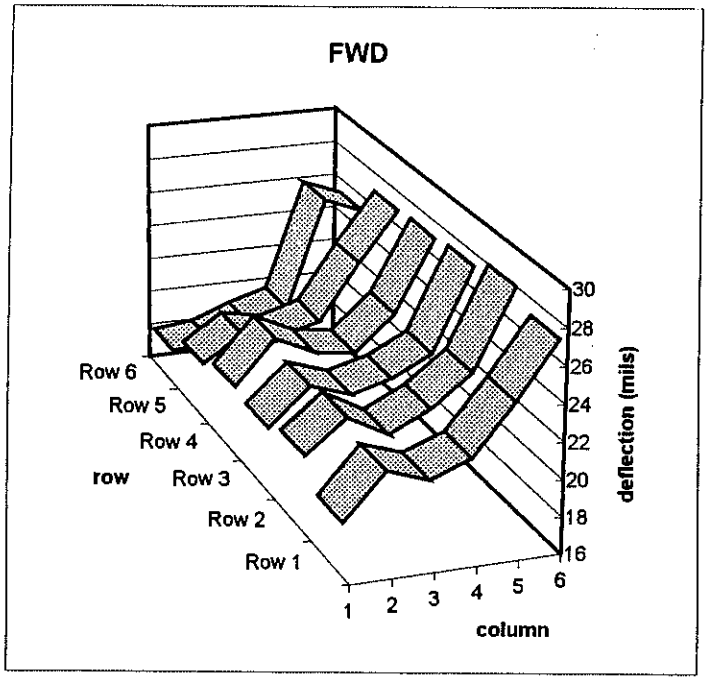
T. F. Wolff June 1996

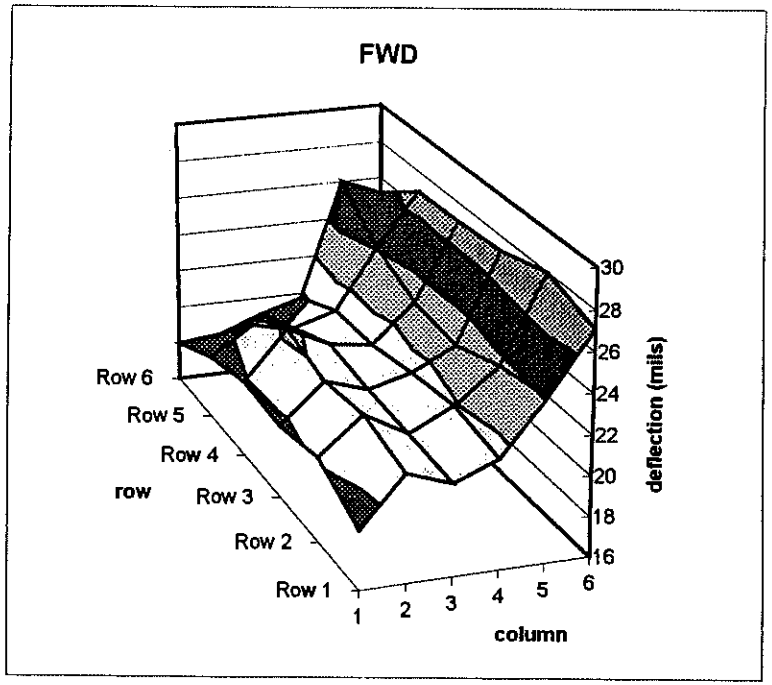
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	18.0	18.3	19.1	19.8	26.1	25.2	21.06	3.592	17.06%
5	19.2	20.7	20.2	20.9	24.1	26.9	21.99	2.913	13.24%
4	19.9	22.4	21.3	21.0	23.0	27.0	22.43	2.502	11.16%
3	19.6	21.7	20.9	21.5	22.7	27.2	22.28	2.620	11.76%
2	20.2	22.0	20.8	21.9	23.6	28.0	22.77	2.797	12.29%
1	18.9	21.3	20.6	21.4	24.1	27.1	22.23	2.921	13.14%
Average	19.31	21.05	20.50	21.09	23.91	26.90	22.13	**22.13**	2.891	13.11%
Std. Dev.	0.800	1.492	0.772	0.751	1.195	0.926	0.989		**2.74905**	
Coeff. of Var.	4.15%	7.08%	3.77%	3.56%	5.00%	3.44%	4.50%			**12.42%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 2*





FWD Graph

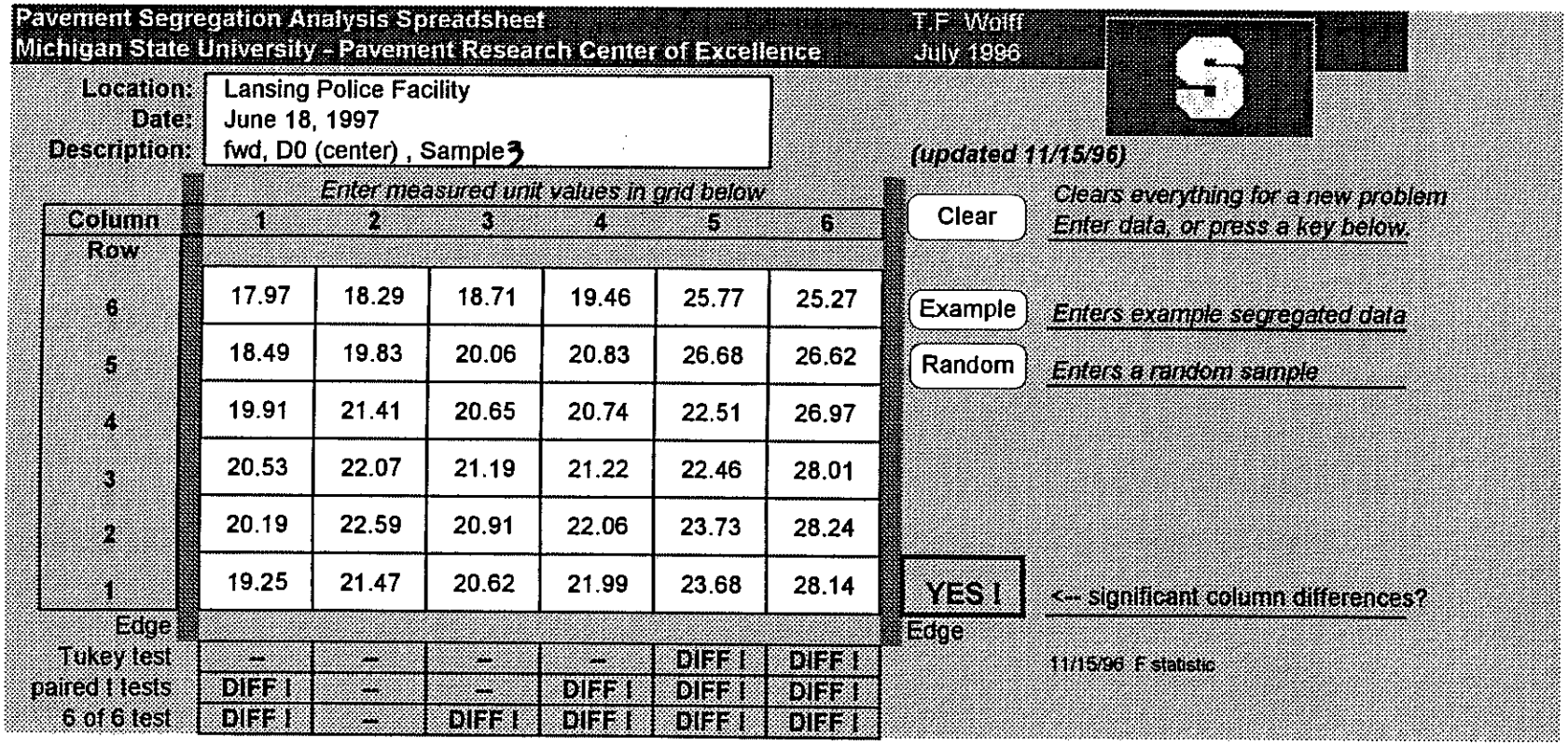
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	19.31	-2.82	7.948	0.800	0.641
2	21.05	-1.07	1.153	1.492	2.225
3	20.50	-1.63	2.656	0.772	0.596
4	21.09	-1.04	1.080	0.751	0.564
5	23.91	1.79	3.195	1.195	1.428
6	26.90	4.77	22.793	0.926	0.858
sum			38.824		6.312
all data	22.13			2.749054	7.5573

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	232.944162	5	46.589	**44.28412**	2.533554	5.835E-13
within columns:	31.561313	30	1.052			
Total:	264.505475			**Different ?**	1	YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D0 (center) , Sample3

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	17.97	18.29	18.71	19.46	25.77	25.27
5	18.49	19.83	20.06	20.83	26.68	26.62
4	19.91	21.41	20.65	20.74	22.51	26.97
3	20.53	22.07	21.19	21.22	22.46	28.01
2	20.19	22.59	20.91	22.06	23.73	28.24
1	19.25	21.47	20.62	21.99	23.68	28.14
Edge						
Tukey test	--	--	--	--	DIFF !	DIFF !
paired t tests	DIFF !	--	--	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	DIFF !	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 T. F. Wolff June 1996

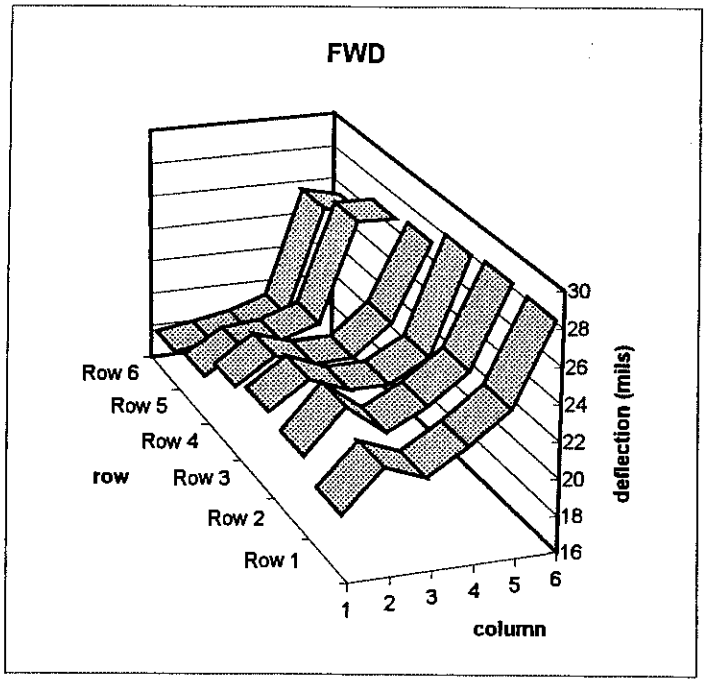
Michigan State University - Pavement Research Center of Excellence

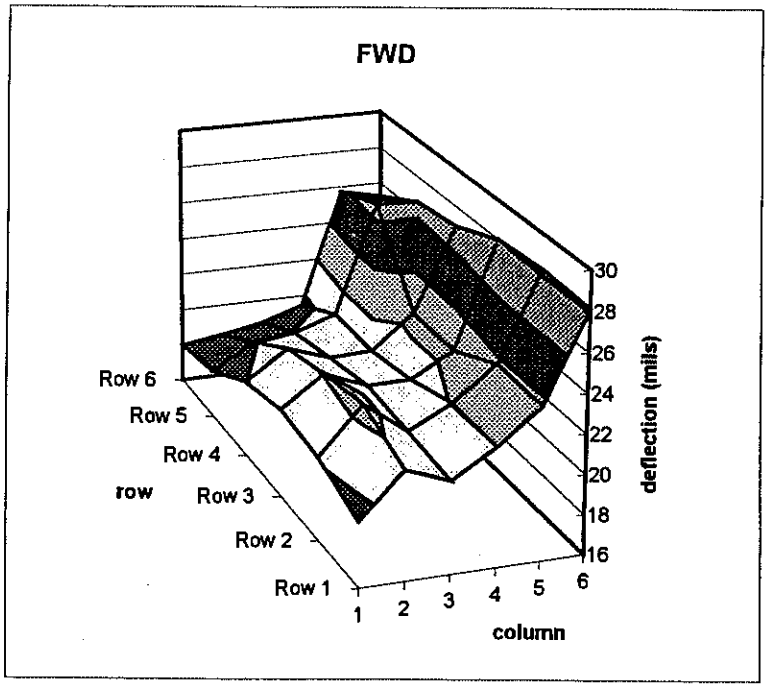
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	18.0	18.3	18.7	19.5	25.8	25.3	20.91	3.606	17.24%
5	18.5	19.8	20.1	20.8	26.7	26.6	22.09	3.615	16.37%
4	19.9	21.4	20.7	20.7	22.5	27.0	22.03	2.570	11.67%
3	20.5	22.1	21.2	21.2	22.5	28.0	22.58	2.749	12.17%
2	20.2	22.6	20.9	22.1	23.7	28.2	22.96	2.874	12.52%
1	19.3	21.5	20.6	22.0	23.7	28.1	22.53	3.116	13.83%
Average	19.39	20.94	20.36	21.05	24.14	27.21	22.18	**22.18**	3.088	13.97%
Std. Dev.	1.006	1.598	0.889	0.961	1.731	1.162	1.224		**2.95766**	
Coeff. of Var.	5.19%	7.63%	4.37%	4.56%	7.17%	4.27%	5.53%			**13.33%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 3*





FWD Graph

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

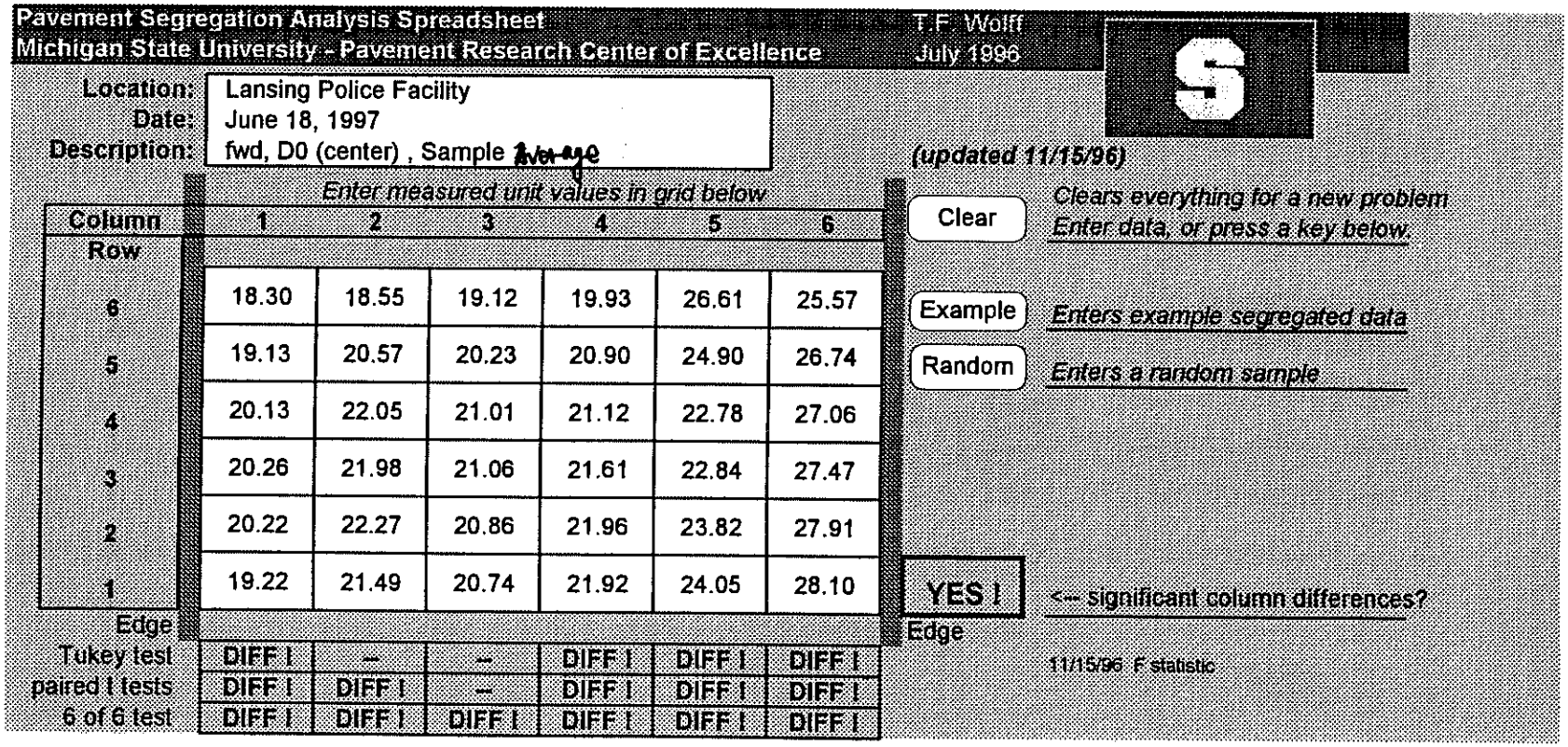
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	19.39	-2.79	7.788	1.006	1.013
2	20.94	-1.24	1.530	1.598	2.553
3	20.36	-1.82	3.321	0.889	0.790
4	21.05	-1.13	1.281	0.961	0.923
5	24.14	1.95	3.822	1.731	2.996
6	27.21	5.03	25.266	1.162	1.351
sum			43.007		9.626
all data	22.18			2.957665	8.7478

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	258.042665	5	51.609	**32.16846**	2.533554	3.431E-11
within columns:	48.1296278	30	1.604			
Total:	306.172292					

Different ? 1 YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D0 (center) , Sample ~~Average~~

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	18.30	18.55	19.12	19.93	26.61	25.57
5	19.13	20.57	20.23	20.90	24.90	26.74
4	20.13	22.05	21.01	21.12	22.78	27.06
3	20.26	21.98	21.06	21.61	22.84	27.47
2	20.22	22.27	20.86	21.96	23.82	27.91
1	19.22	21.49	20.74	21.92	24.05	28.10
Edge						Edge
Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	DIFF !	DIFF !	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?

11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

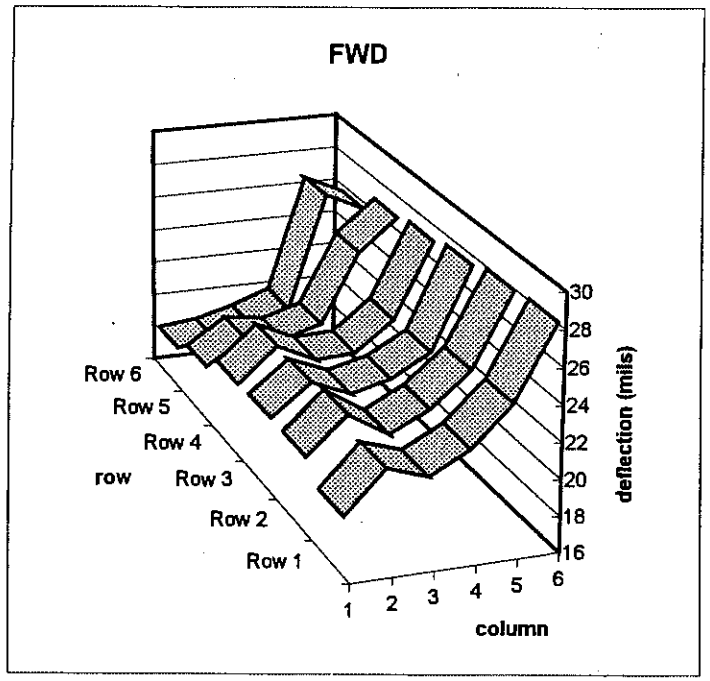
Michigan State University - Pavement Research Center of Excellence

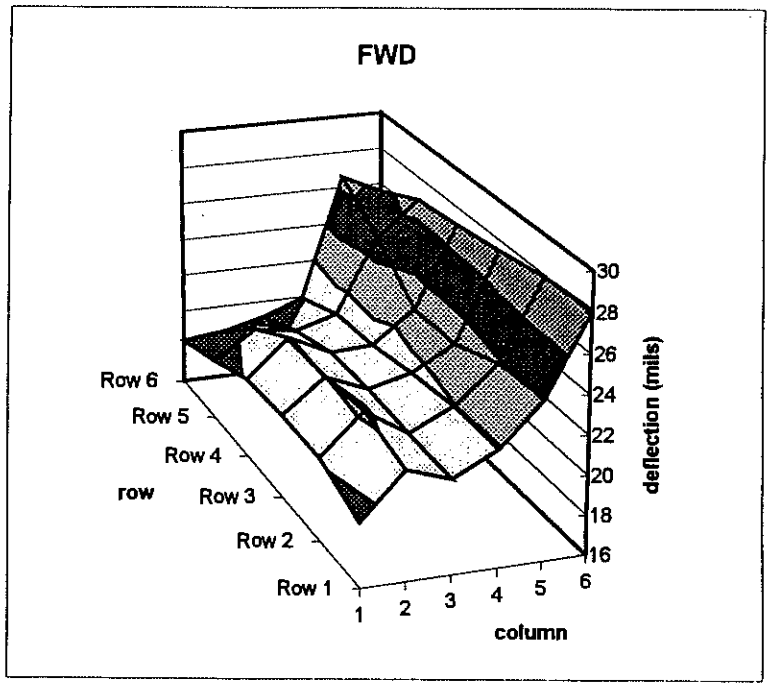
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample 1VSRA4F*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	18.3	18.6	19.1	19.9	26.6	25.6	21.35	3.730	17.47%
5	19.1	20.6	20.2	20.9	24.9	26.7	22.08	3.015	13.66%
4	20.1	22.1	21.0	21.1	22.8	27.1	22.36	2.477	11.08%
3	20.3	22.0	21.1	21.6	22.8	27.5	22.54	2.565	11.38%
2	20.2	22.3	20.9	22.0	23.8	27.9	22.84	2.776	12.16%
1	19.2	21.5	20.7	21.9	24.1	28.1	22.59	3.129	13.85%
Average	19.54	21.15	20.50	21.24	24.17	27.14	22.29	22.29	2.949	13.27%
Std. Dev.	0.792	1.410	0.737	0.770	1.437	0.922	1.011		2.7999	
Coeff. of Var.	4.05%	6.67%	3.60%	3.63%	5.95%	3.40%	4.55%			12.56%

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D0 (center) , Sample Average*





FWD 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	19.54	-2.75	7.547	0.792	0.627
2	21.15	-1.14	1.297	1.410	1.989
3	20.50	-1.79	3.194	0.737	0.544
4	21.24	-1.05	1.107	0.770	0.593
5	24.17	1.88	3.523	1.437	2.065
6	27.14	4.85	23.505	0.922	0.850
sum			40.173		6.668
all data	22.29			2.799896	7.8394

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	241.04084	5	48.208	**43.38016**	2.533554	7.633E-13
within columns:	33.3388613	30	1.111			
Total:	274.379702			**Different ?**	1	**YES!**

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

(updated 11/15/96)

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D8 , Sample 1

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	14.92	14.84	15.07	15.88	18.95	18.44
5	15.33	15.81	15.63	15.74	17.08	17.99
4	15.91	16.33	15.93	16.01	16.60	18.36
3	15.68	16.51	15.97	16.40	17.08	18.27
2	15.20	16.54	15.66	16.17	17.16	18.15
1	14.71	16.18	15.87	16.60	17.91	19.06
Edge						
Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	--	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
Michigan State University - Pavement Research Center of Excellence

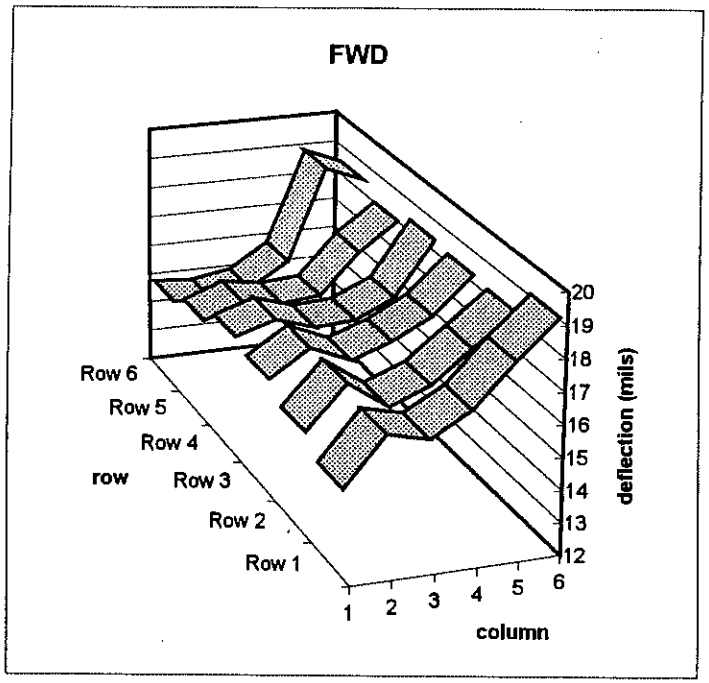
T. F. Wolff June 1996

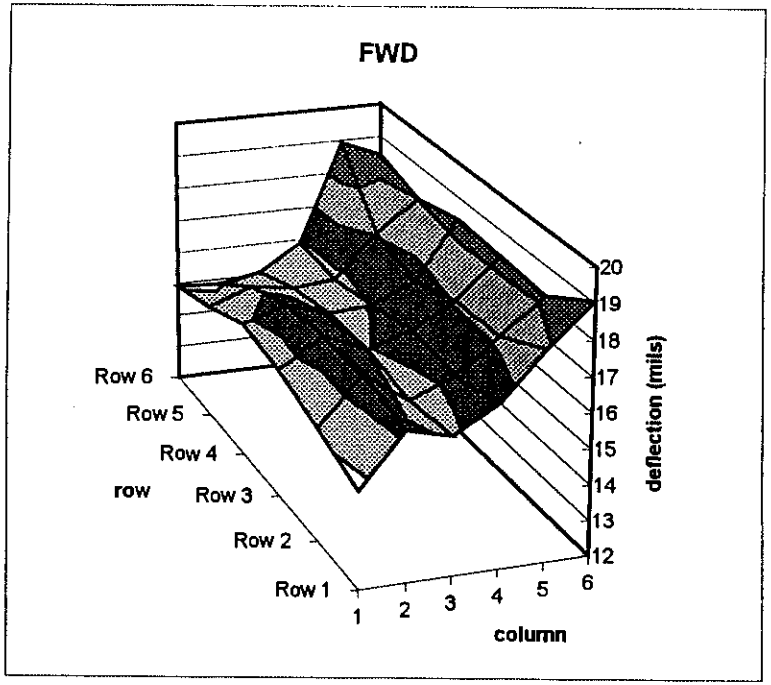
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	14.9	14.8	15.1	15.9	18.9	18.4	16.35	1.859	11.37%
5	15.3	15.8	15.6	15.7	17.1	18.0	16.26	1.040	6.39%
4	15.9	16.3	15.9	16.0	16.6	18.4	16.52	0.939	5.69%
3	15.7	16.5	16.0	16.4	17.1	18.3	16.65	0.926	5.56%
2	15.2	16.5	15.7	16.2	17.2	18.1	16.48	1.062	6.44%
1	14.7	16.2	15.9	16.6	17.9	19.1	16.72	1.546	9.25%
Average	15.29	16.04	15.69	16.14	17.46	18.38	16.50	**16.50**	1.229	7.45%
Std. Dev.	0.449	0.643	0.332	0.324	0.840	0.371	0.493		**1.19401**	
Coeff. of Var.	2.94%	4.01%	2.12%	2.01%	4.81%	2.02%	2.98%			**7.24%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 1*





FWD Graph

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

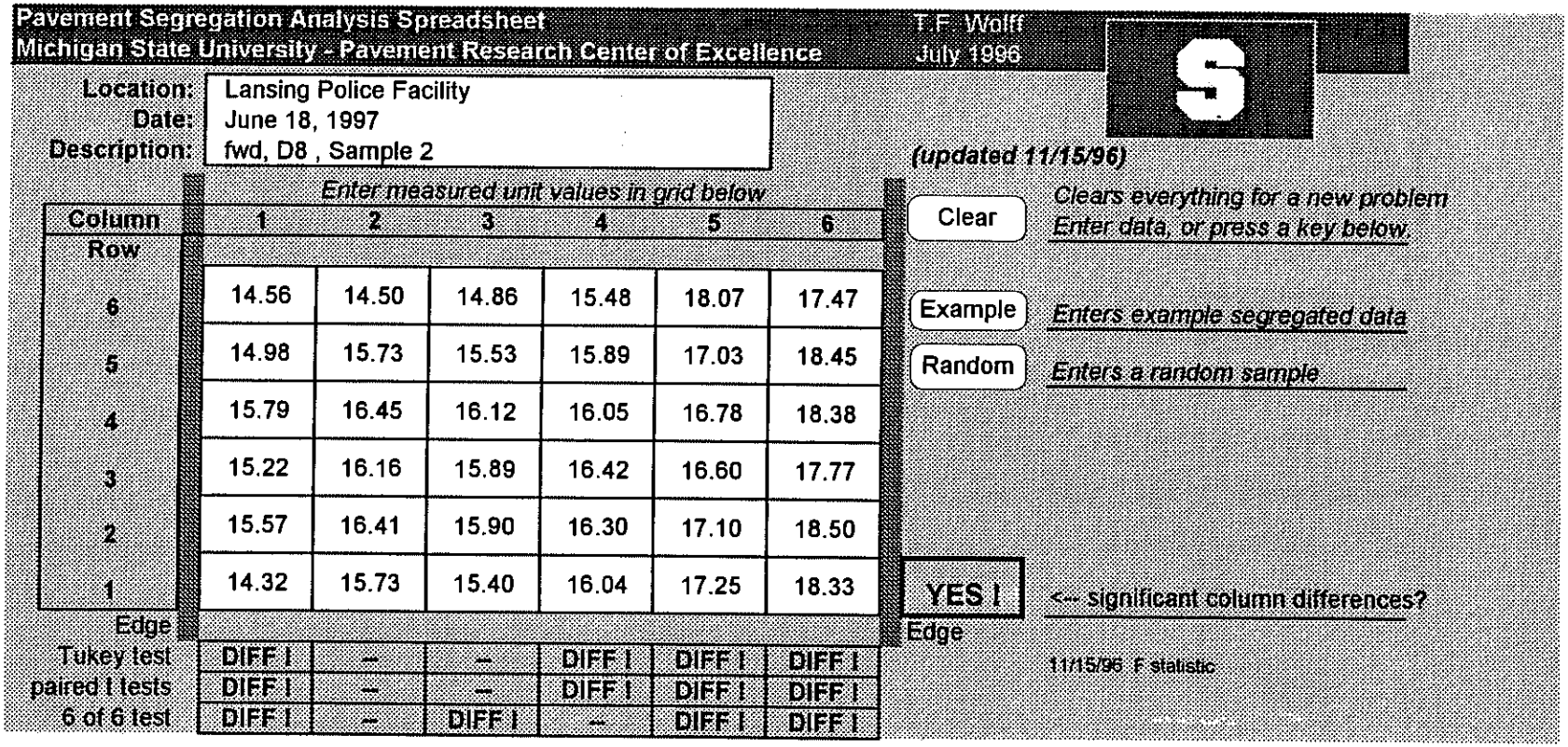
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	15.29	-1.21	1.455	0.449	0.202
2	16.04	-0.46	0.214	0.643	0.414
3	15.69	-0.81	0.657	0.332	0.110
4	16.14	-0.36	0.132	0.324	0.105
5	17.46	0.96	0.929	0.840	0.706
6	18.38	1.88	3.533	0.371	0.138
sum			6.921		1.675
all data	16.50			1.194005	1.4256

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	41.5250769	5	8.305	**29.75776**	2.533554	8.969E-11
within columns:	8.37262037	30	0.279			
Total:	49.8976972					

Different ? 1 YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D8 , Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	14.56	14.50	14.86	15.48	18.07	17.47
5	14.98	15.73	15.53	15.89	17.03	18.45
4	15.79	16.45	16.12	16.05	16.78	18.38
3	15.22	16.16	15.89	16.42	16.60	17.77
2	15.57	16.41	15.90	16.30	17.10	18.50
1	14.32	15.73	15.40	16.04	17.25	18.33
Edge						
Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	--	--	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	--	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
Michigan State University - Pavement Research Center of Excellence

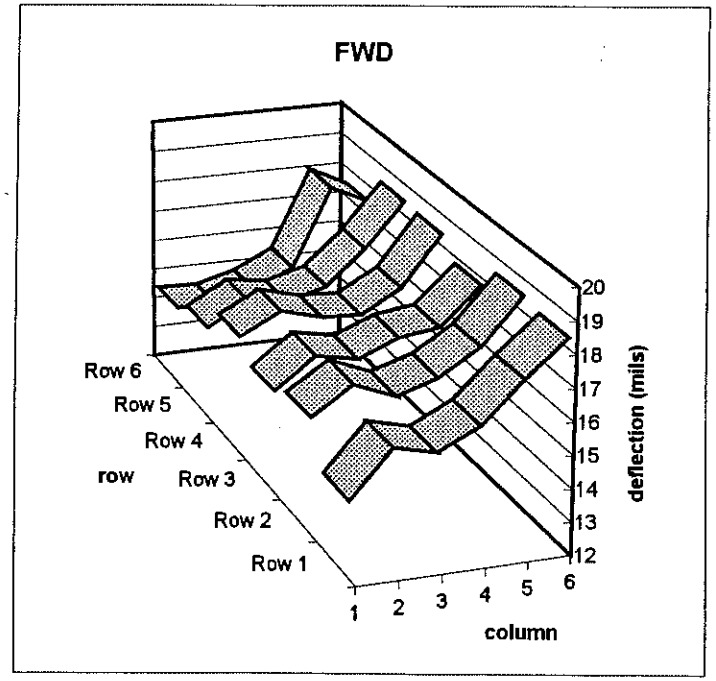
T. F. Wolff June 1996

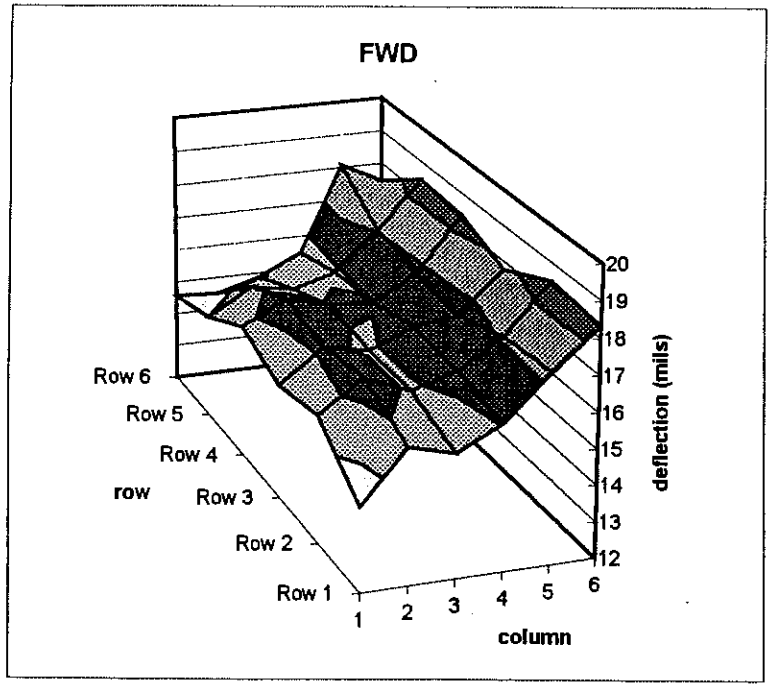
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	14.6	14.5	14.9	15.5	18.1	17.5	15.83	1.561	9.86%
5	15.0	15.7	15.5	15.9	17.0	18.4	16.27	1.262	7.76%
4	15.8	16.5	16.1	16.0	16.8	18.4	16.59	0.938	5.65%
3	15.2	16.2	15.9	16.4	16.6	17.8	16.34	0.851	5.21%
2	15.6	16.4	15.9	16.3	17.1	18.5	16.63	1.054	6.34%
1	14.3	15.7	15.4	16.0	17.3	18.3	16.18	1.418	8.77%
Average	15.07	15.83	15.62	16.03	17.14	18.15	16.31	**16.31**	1.181	7.26%
Std. Dev.	0.569	0.725	0.453	0.331	0.515	0.424	0.503		**1.15138**	
Coeff. of Var.	3.78%	4.58%	2.90%	2.06%	3.00%	2.33%	3.11%			**7.06%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 2*





FWD Graph

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

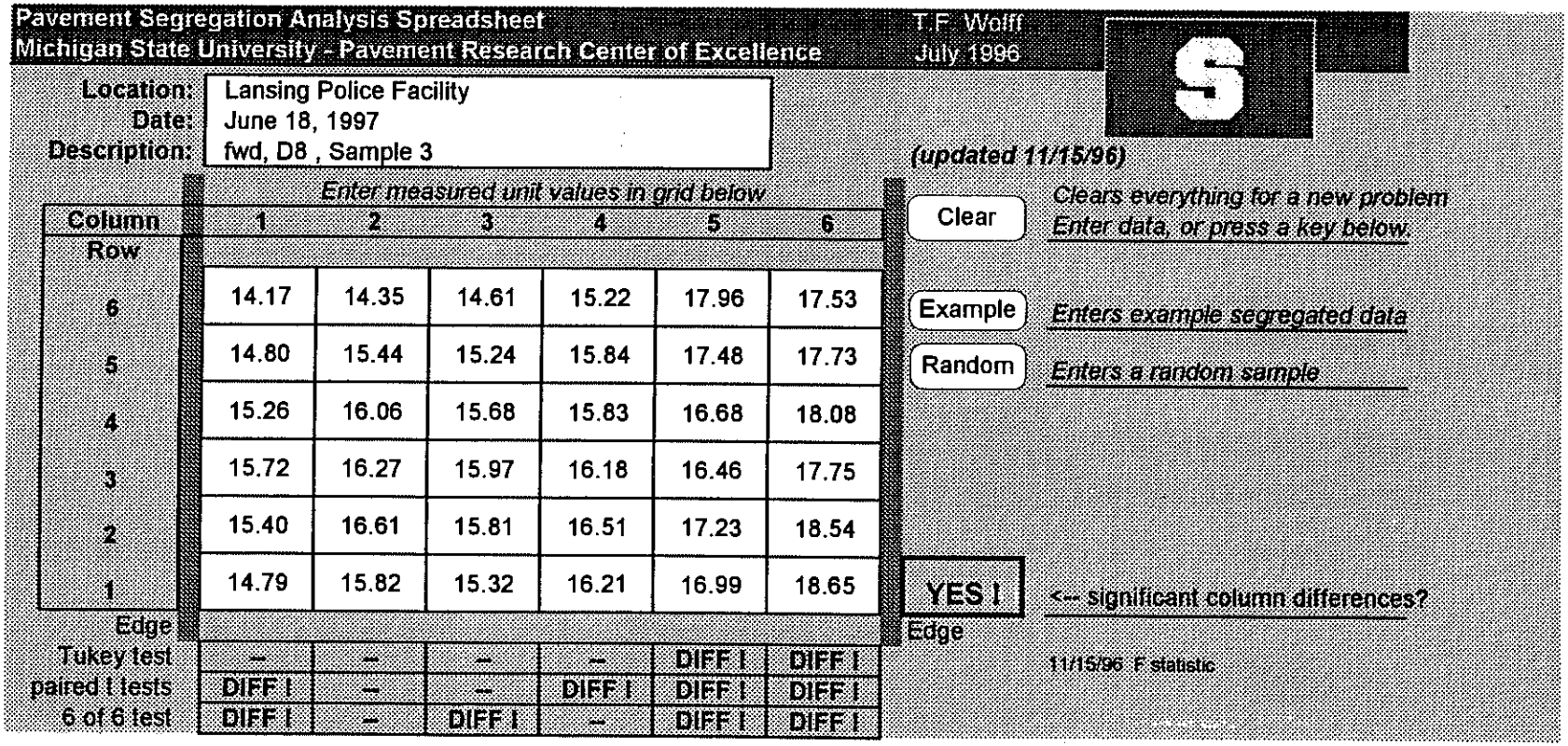
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	15.07	-1.23	1.521	0.569	0.324
2	15.83	-0.48	0.226	0.725	0.525
3	15.62	-0.69	0.476	0.453	0.205
4	16.03	-0.28	0.077	0.331	0.109
5	17.14	0.83	0.691	0.515	0.265
6	18.15	1.84	3.402	0.424	0.180
sum			6.393		1.608
all data	16.31			1.151381	1.3257

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	38.3576238	5	7.672	**28.62102**	2.533554	1.443E-10
within columns:	8.04114259	30	0.268			
Total:	46.3987664					

Different ? 1 **YES!**

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D8 , Sample 3

(updated 11/15/96)

Enter measured unit values in grid below

Row \ Column	1	2	3	4	5	6
6	14.17	14.35	14.61	15.22	17.96	17.53
5	14.80	15.44	15.24	15.84	17.48	17.73
4	15.26	16.06	15.68	15.83	16.68	18.08
3	15.72	16.27	15.97	16.18	16.46	17.75
2	15.40	16.61	15.81	16.51	17.23	18.54
1	14.79	15.82	15.32	16.21	16.99	18.65
Edge						
Tukey test	--	--	--	--	DIFF !	DIFF !
paired t tests	DIFF !	--	--	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	--	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

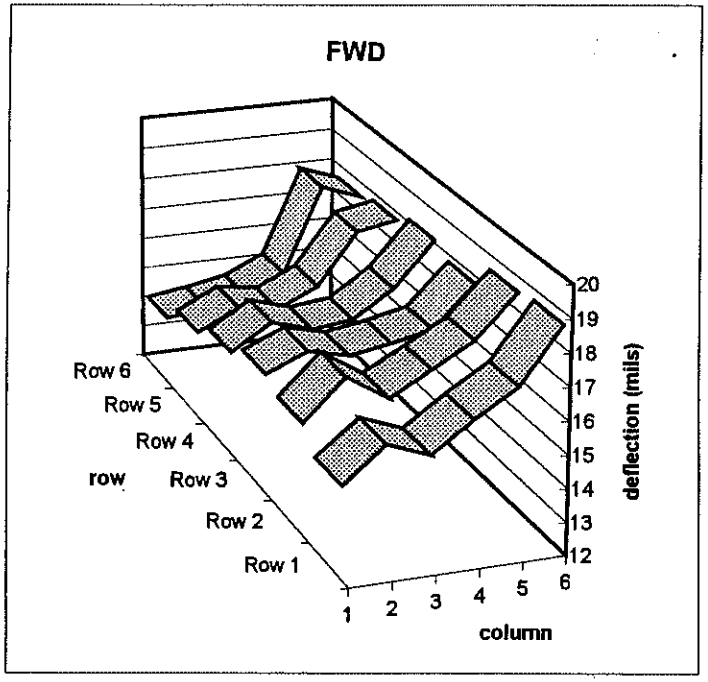
Michigan State University - Pavement Research Center of Excellence

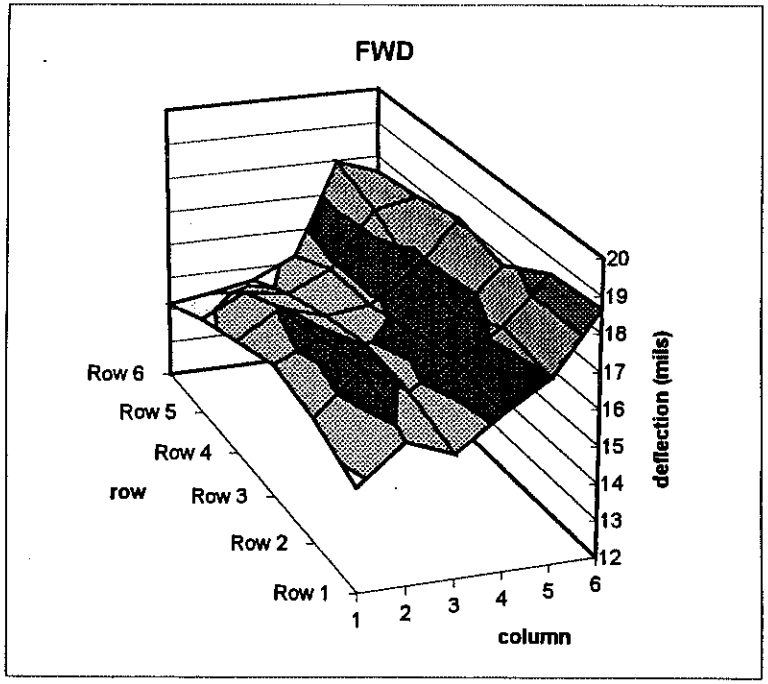
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	14.2	14.4	14.6	15.2	18.0	17.5	15.64	1.673	10.70%
5	14.8	15.4	15.2	15.8	17.5	17.7	16.09	1.223	7.60%
4	15.3	16.1	15.7	15.8	16.7	18.1	16.27	1.008	6.19%
3	15.7	16.3	16.0	16.2	16.5	17.7	16.39	0.711	4.34%
2	15.4	16.6	15.8	16.5	17.2	18.5	16.68	1.111	6.66%
1	14.8	15.8	15.3	16.2	17.0	18.6	16.30	1.376	8.44%
Average	15.02	15.76	15.44	15.97	17.13	18.04	16.23	**16.23**	1.184	7.32%
Std. Dev.	0.549	0.796	0.492	0.446	0.548	0.461	0.549		**1.17536**	
Coeff. of Var.	3.65%	5.05%	3.19%	2.79%	3.20%	2.56%	3.41%			**7.24%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8 , Sample 3*





FWD Graph

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

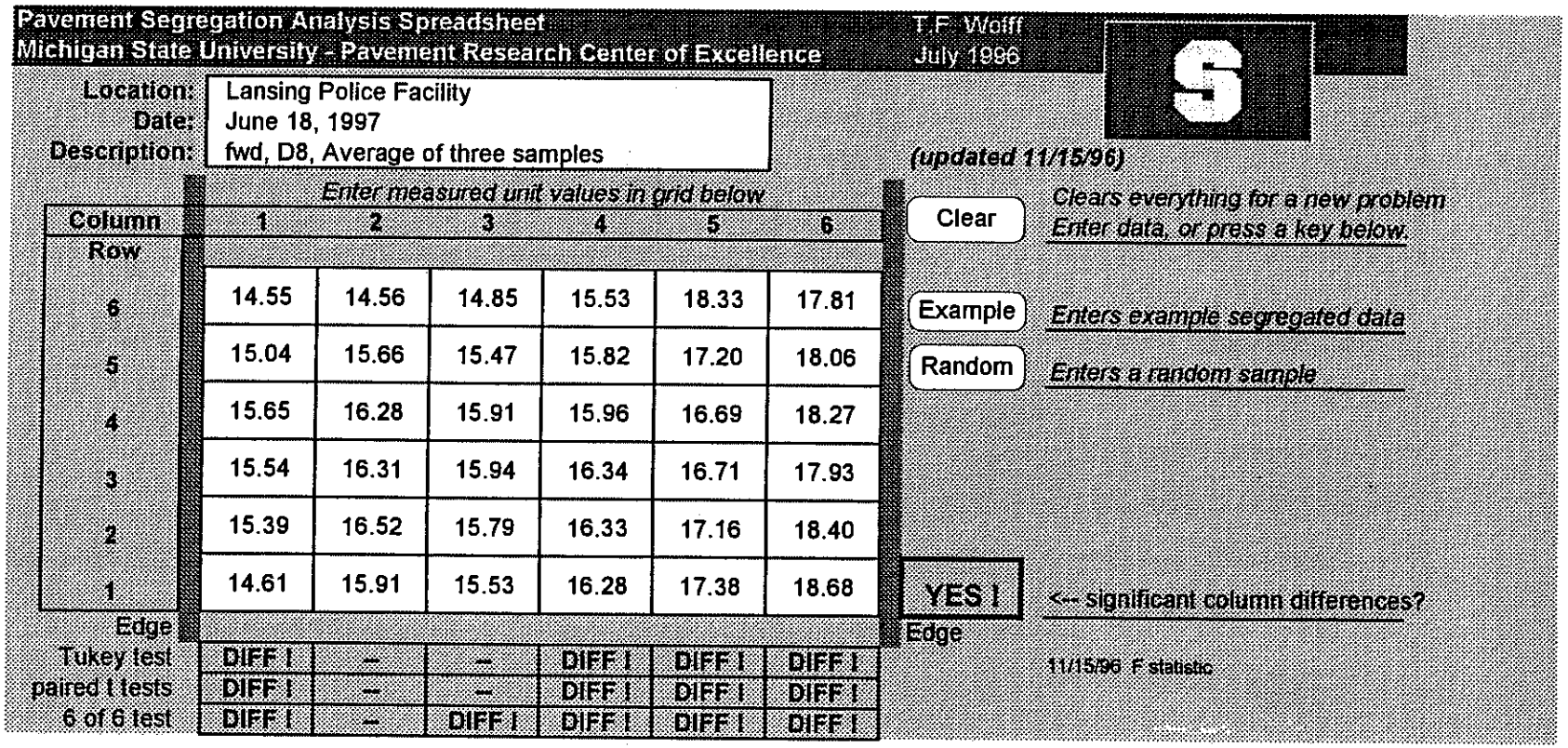
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	15.02	-1.21	1.455	0.549	0.301
2	15.76	-0.47	0.219	0.796	0.633
3	15.44	-0.79	0.621	0.492	0.242
4	15.97	-0.26	0.068	0.446	0.199
5	17.13	0.91	0.822	0.548	0.300
6	18.04	1.82	3.300	0.461	0.213
sum			6.485		1.888
all data	16.23			1.175362	1.3815

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	38.9094333	5	7.782	**24.72472**	2.533554	8.332E-10
within columns:	9.44223333	30	0.315			
Total:	48.3516667					

Different ? 1 YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D8, Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	14.55	14.56	14.85	15.53	18.33	17.81
5	15.04	15.66	15.47	15.82	17.20	18.06
4	15.65	16.28	15.91	15.96	16.69	18.27
3	15.54	16.31	15.94	16.34	16.71	17.93
2	15.39	16.52	15.79	16.33	17.16	18.40
1	14.61	15.91	15.53	16.28	17.38	18.68
Edge						
Tukey test	DIFF !	--	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	--	--	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	DIFF !	DIFF !	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

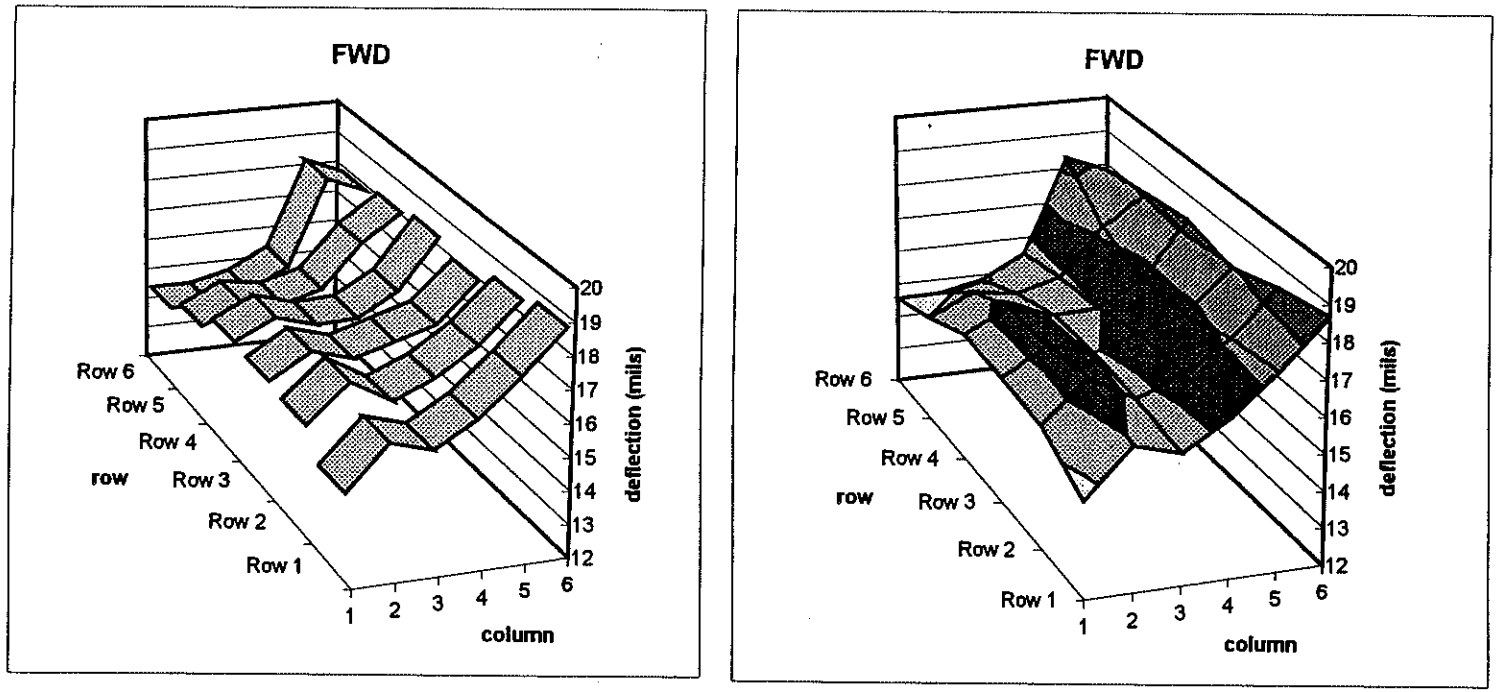
Michigan State University - Pavement Research Center of Excellence

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8, Average of three samples*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	14.6	14.6	14.9	15.5	18.3	17.8	15.94	1.697	10.64%
5	15.0	15.7	15.5	15.8	17.2	18.1	16.21	1.163	7.17%
4	15.7	16.3	15.9	16.0	16.7	18.3	16.46	0.957	5.81%
3	15.5	16.3	15.9	16.3	16.7	17.9	16.46	0.822	4.99%
2	15.4	16.5	15.8	16.3	17.2	18.4	16.60	1.072	6.46%
1	14.6	15.9	15.5	16.3	17.4	18.7	16.40	1.441	8.79%
Average	15.13	15.88	15.58	16.04	17.25	18.19	16.34	**16.34**	1.192	7.31%
Std. Dev.	0.474	0.713	0.408	0.330	0.599	0.322	0.474		**1.15758**	
Coeff. of Var.	3.13%	4.49%	2.62%	2.05%	3.48%	1.77%	2.92%			**7.08%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D8, Average of three samples*



FWD Graph

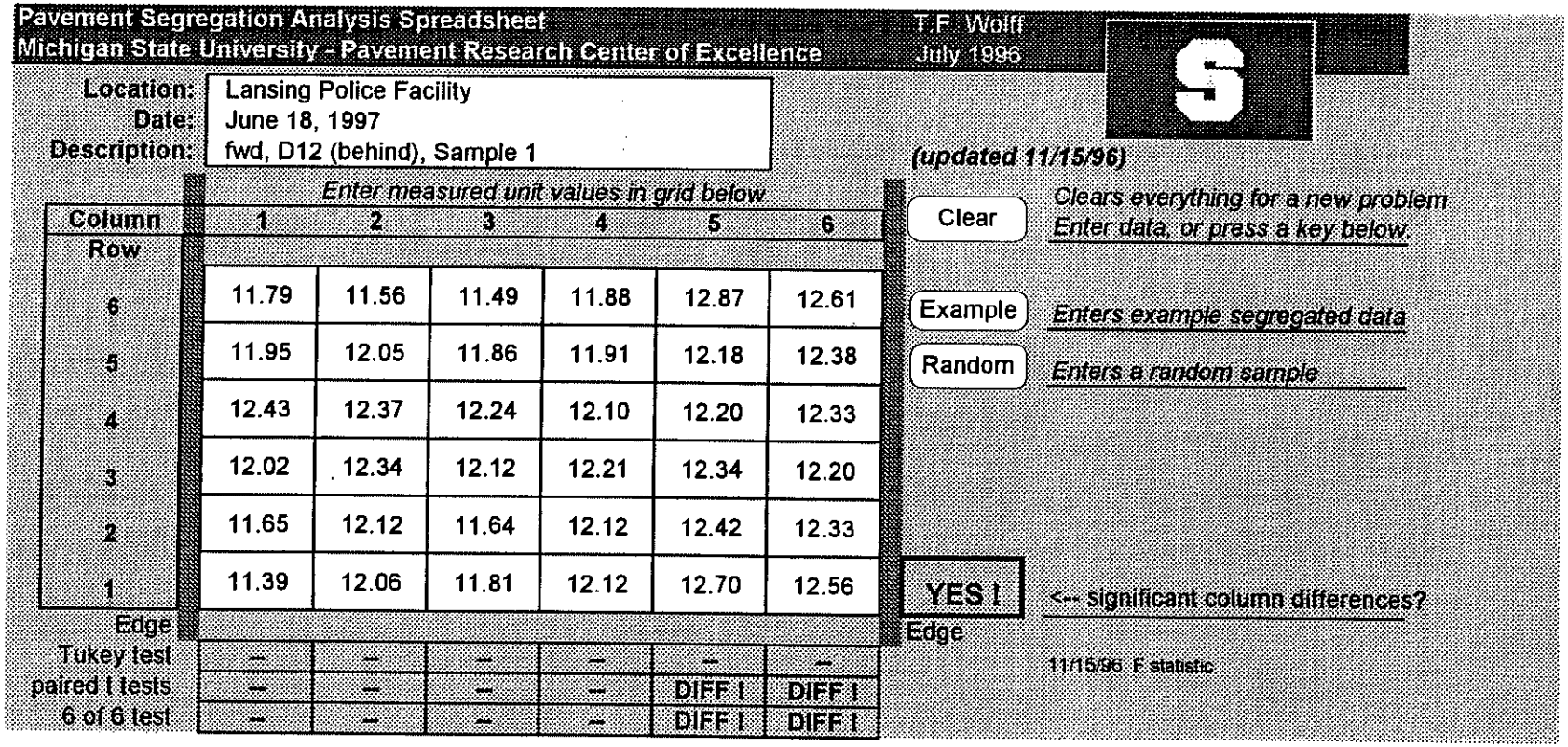
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	15.13	-1.22	1.477	0.474	0.225
2	15.88	-0.47	0.220	0.713	0.508
3	15.58	-0.76	0.582	0.408	0.166
4	16.04	-0.30	0.090	0.330	0.109
5	17.25	0.90	0.811	0.599	0.359
6	18.19	1.85	3.411	0.322	0.104
sum			6.591		1.471
all data	16.34			1.157579	1.3400

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	39.546034	5	7.909	**32.26681**	2.533554	3.303E-11
within columns:	7.35356831	30	0.245			
Total:	46.8996023			Different ?	1	YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D12 (behind), Sample 1

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	11.79	11.56	11.49	11.88	12.87	12.61
5	11.95	12.05	11.86	11.91	12.18	12.38
4	12.43	12.37	12.24	12.10	12.20	12.33
3	12.02	12.34	12.12	12.21	12.34	12.20
2	11.65	12.12	11.64	12.12	12.42	12.33
1	11.39	12.06	11.81	12.12	12.70	12.56
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

11/15/96 F statistic

DATA ENTRY

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

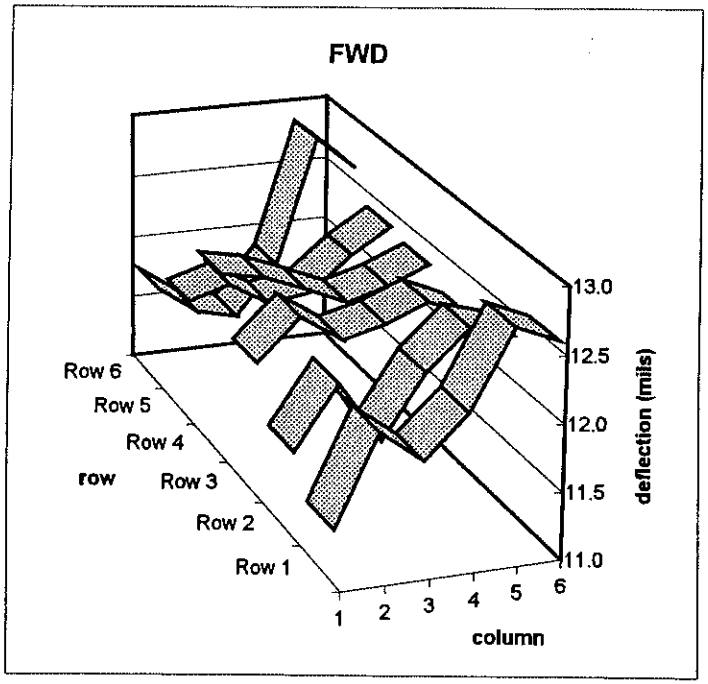
T. F. Wolff June 1996

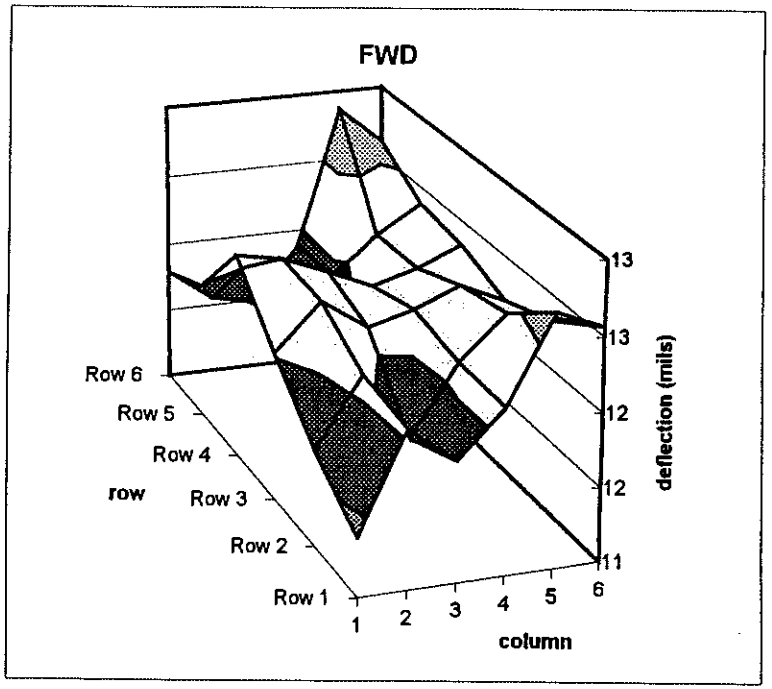
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	11.8	11.6	11.5	11.9	12.9	12.6	12.03	0.572	4.75%
5	12.0	12.1	11.9	11.9	12.2	12.4	12.06	0.194	1.61%
4	12.4	12.4	12.2	12.1	12.2	12.3	12.28	0.121	0.99%
3	12.0	12.3	12.1	12.2	12.3	12.2	12.20	0.123	1.01%
2	11.6	12.1	11.6	12.1	12.4	12.3	12.05	0.331	2.75%
1	11.4	12.1	11.8	12.1	12.7	12.6	12.11	0.482	3.98%
Average	11.87	12.08	11.86	12.06	12.45	12.40	12.12	**12.12**	0.304	2.52%
Std. Dev.	0.356	0.291	0.285	0.131	0.278	0.156	0.249		**0.33744**	
Coeff. of Var.	3.00%	2.41%	2.40%	1.09%	2.23%	1.26%	2.06%			**2.78%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 1*





FWD Graph

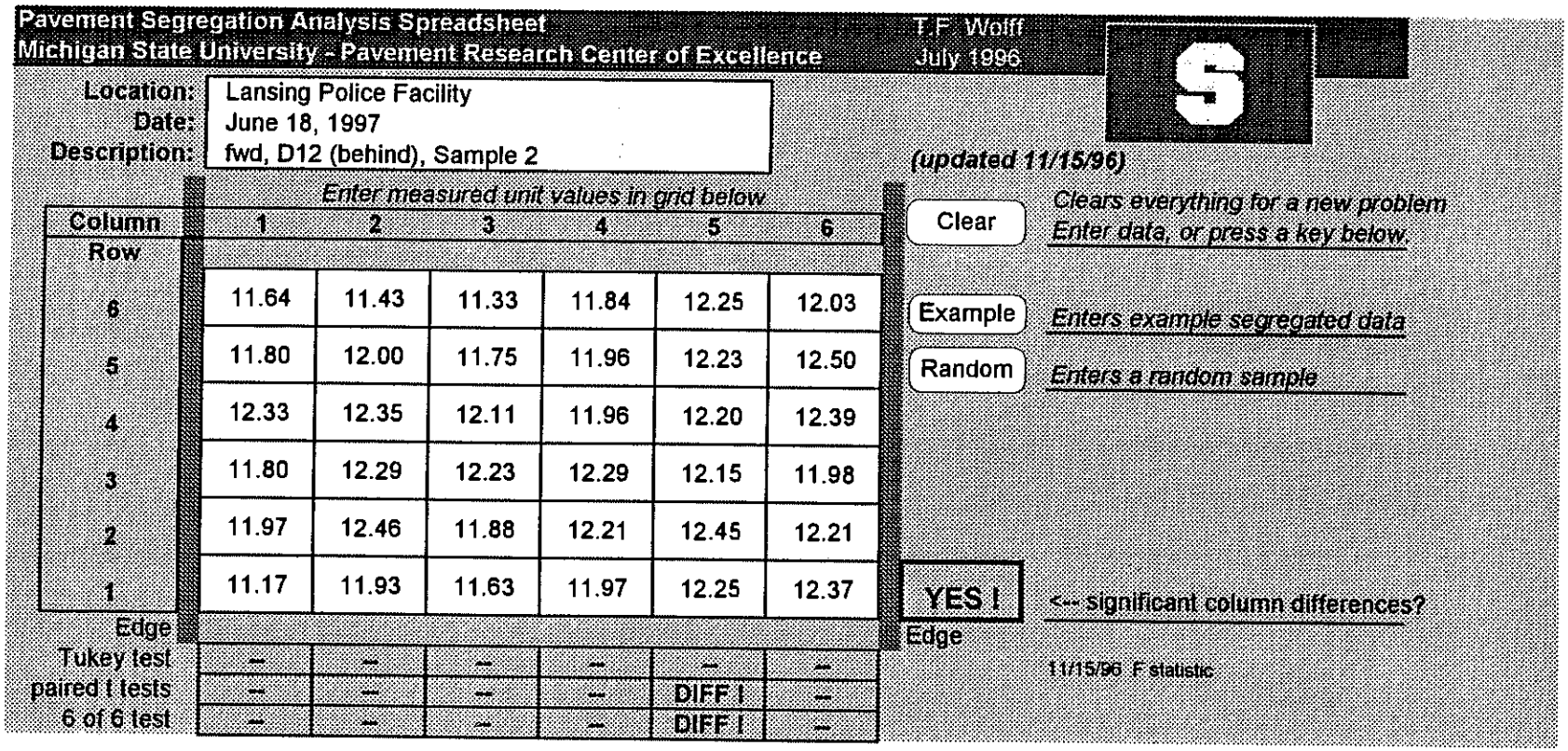
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	11.87	-0.25	0.061	0.356	0.127
2	12.08	-0.04	0.001	0.291	0.085
3	11.86	-0.26	0.068	0.285	0.081
4	12.06	-0.06	0.004	0.131	0.017
5	12.45	0.33	0.109	0.278	0.077
6	12.40	0.28	0.078	0.156	0.024
sum			0.321		0.411
all data	12.12			0.337437	0.1139

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.92810532	5	0.386	**5.62366**	2.533554	0.0009
within columns:	2.05713565	30	0.069			
Total:	3.98524097			Different ?	1	YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D12 (behind), Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	11.64	11.43	11.33	11.84	12.25	12.03
5	11.80	12.00	11.75	11.96	12.23	12.50
4	12.33	12.35	12.11	11.96	12.20	12.39
3	11.80	12.29	12.23	12.29	12.15	11.98
2	11.97	12.46	11.88	12.21	12.45	12.21
1	11.17	11.93	11.63	11.97	12.25	12.37
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

11/15/96 F statistic

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

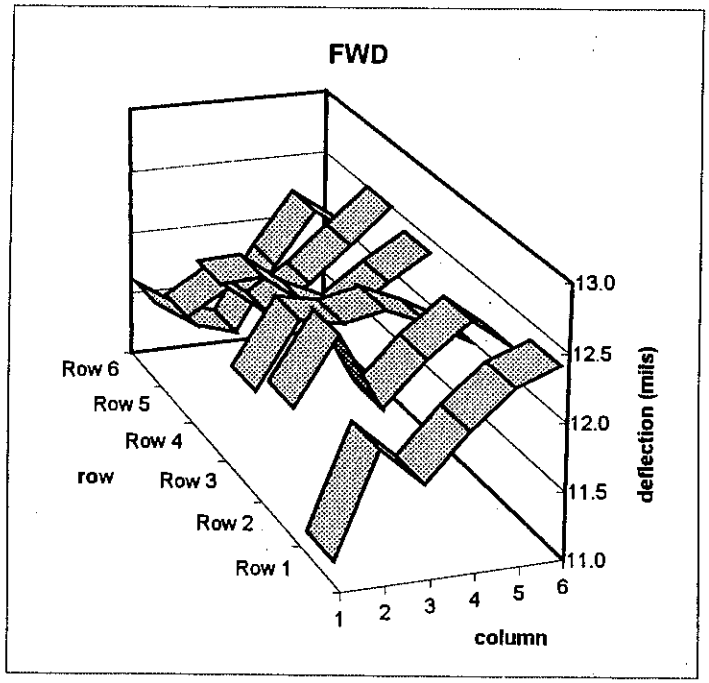
Michigan State University - Pavement Research Center of Excellence

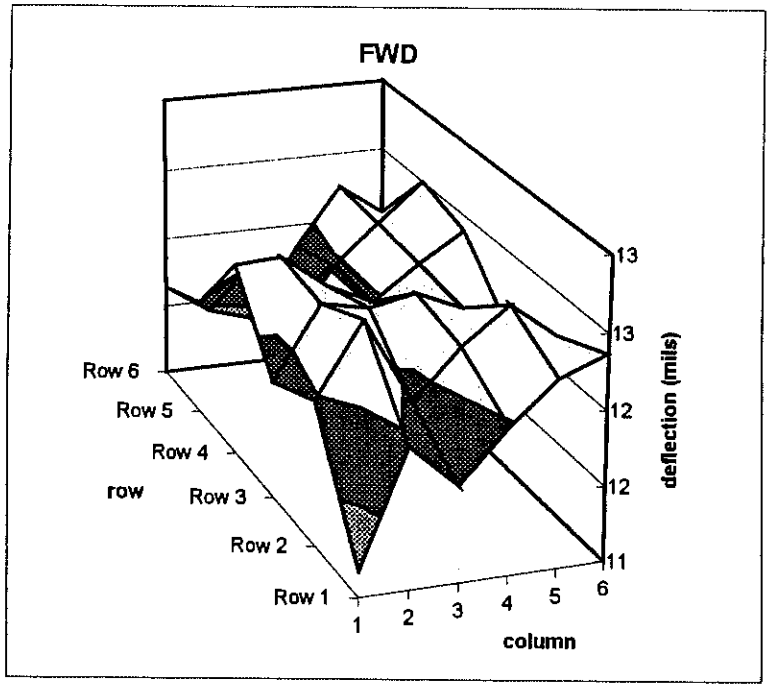
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	11.6	11.4	11.3	11.8	12.3	12.0	11.75	0.356	3.03%
5	11.8	12.0	11.7	12.0	12.2	12.5	12.04	0.283	2.35%
4	12.3	12.3	12.1	12.0	12.2	12.4	12.22	0.166	1.36%
3	11.8	12.3	12.2	12.3	12.2	12.0	12.12	0.199	1.64%
2	12.0	12.5	11.9	12.2	12.5	12.2	12.20	0.240	1.96%
1	11.2	11.9	11.6	12.0	12.2	12.4	11.89	0.436	3.67%
Average	11.78	12.08	11.82	12.04	12.25	12.25	12.04	**12.04**	0.280	2.33%
Std. Dev.	0.383	0.379	0.327	0.173	0.103	0.209	0.262		**0.32199**	
Coeff. of Var.	3.25%	3.14%	2.77%	1.43%	0.84%	1.71%	2.19%			**2.68%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 2*





FWD Graph

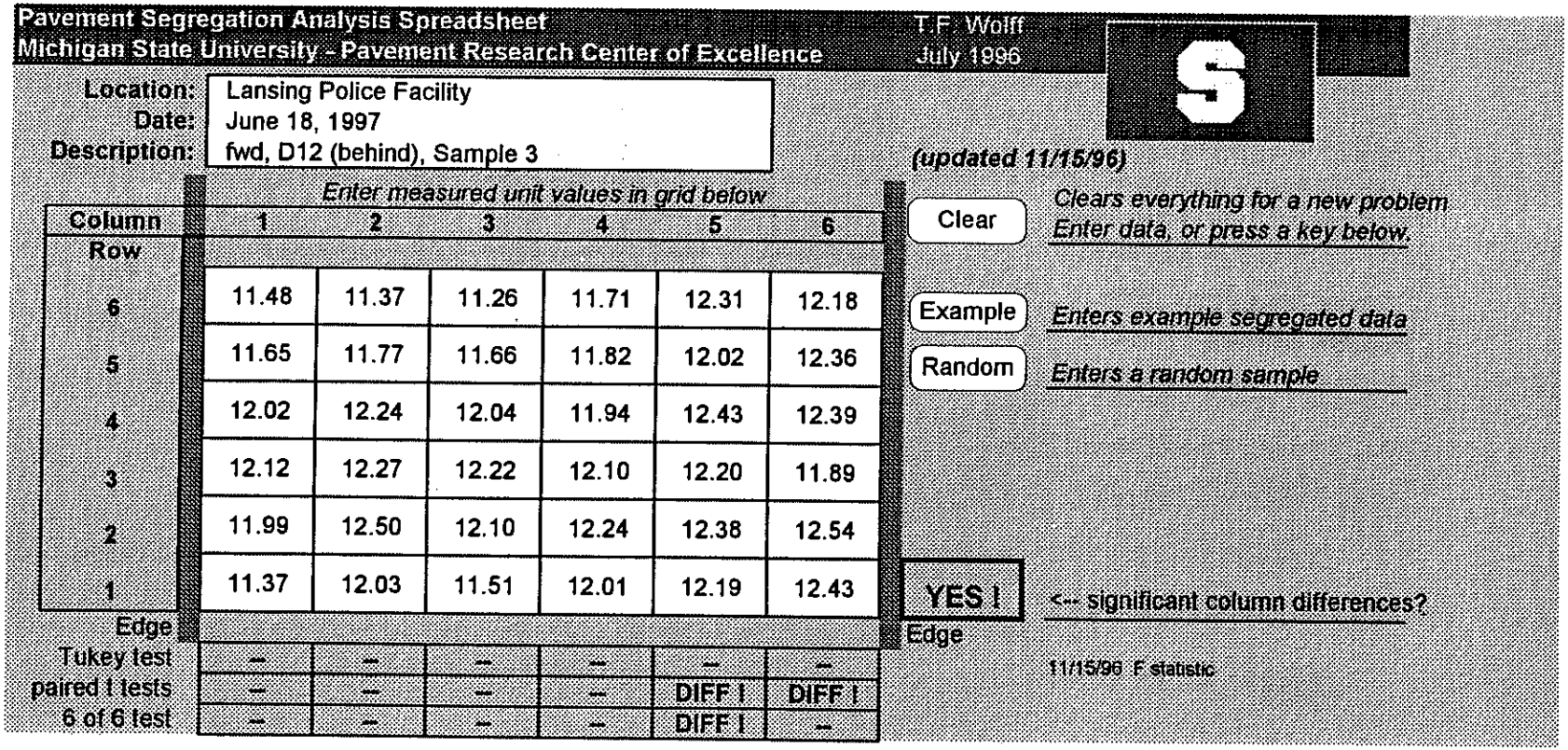
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	11.78	-0.25	0.064	0.383	0.147
2	12.08	0.04	0.001	0.379	0.144
3	11.82	-0.22	0.046	0.327	0.107
4	12.04	0.00	0.000	0.173	0.030
5	12.25	0.22	0.048	0.103	0.011
6	12.25	0.21	0.044	0.209	0.044
sum			0.204		0.481
all data	12.04			0.321992	0.1037

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.22258742	5	0.245	**3.04863**	2.533554	0.0242424
within columns:	2.40617083	30	0.080			
Total:	3.62875826			**Different ?**	1	YES!

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D12 (behind), Sample 3

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	11.48	11.37	11.26	11.71	12.31	12.18
5	11.65	11.77	11.66	11.82	12.02	12.36
4	12.02	12.24	12.04	11.94	12.43	12.39
3	12.12	12.27	12.22	12.10	12.20	11.89
2	11.99	12.50	12.10	12.24	12.38	12.54
1	11.37	12.03	11.51	12.01	12.19	12.43
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

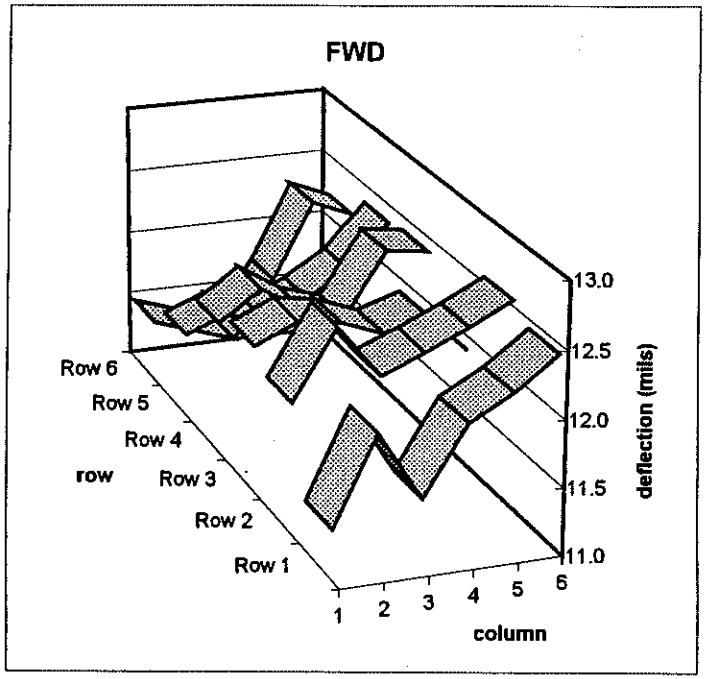
T. F. Wolff June 1996

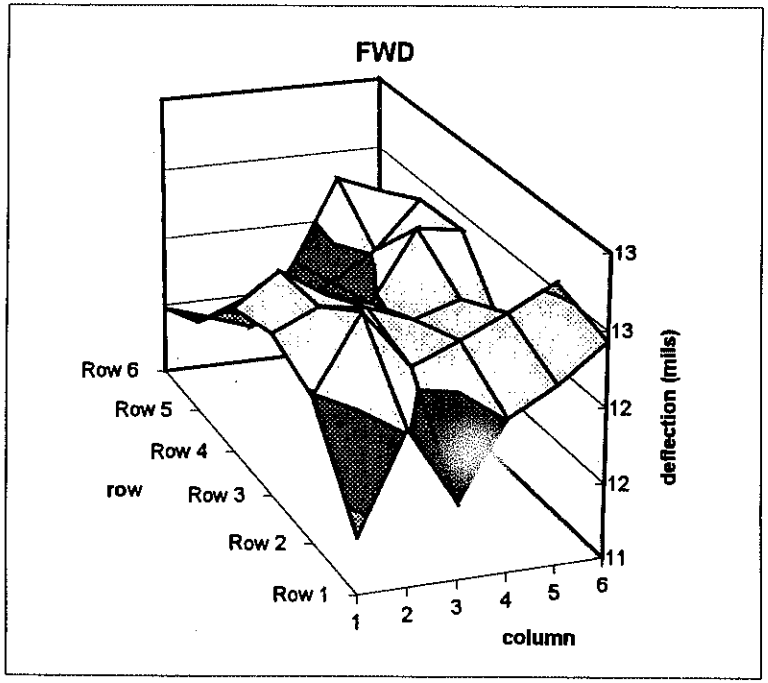
Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	11.5	11.4	11.3	11.7	12.3	12.2	11.72	0.436	3.72%
5	11.7	11.8	11.7	11.8	12.0	12.4	11.88	0.271	2.28%
4	12.0	12.2	12.0	11.9	12.4	12.4	12.18	0.207	1.70%
3	12.1	12.3	12.2	12.1	12.2	11.9	12.13	0.133	1.10%
2	12.0	12.5	12.1	12.2	12.4	12.5	12.29	0.222	1.81%
1	11.4	12.0	11.5	12.0	12.2	12.4	11.92	0.407	3.41%
Average	11.77	12.03	11.80	11.97	12.26	12.30	12.02	**12.02**	0.279	2.34%
Std. Dev.	0.314	0.407	0.380	0.189	0.149	0.231	0.278		**0.34162**	
Coeff. of Var.	2.67%	3.38%	3.22%	1.58%	1.21%	1.88%	2.32%			**2.84%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Sample 3*





FWD Graph

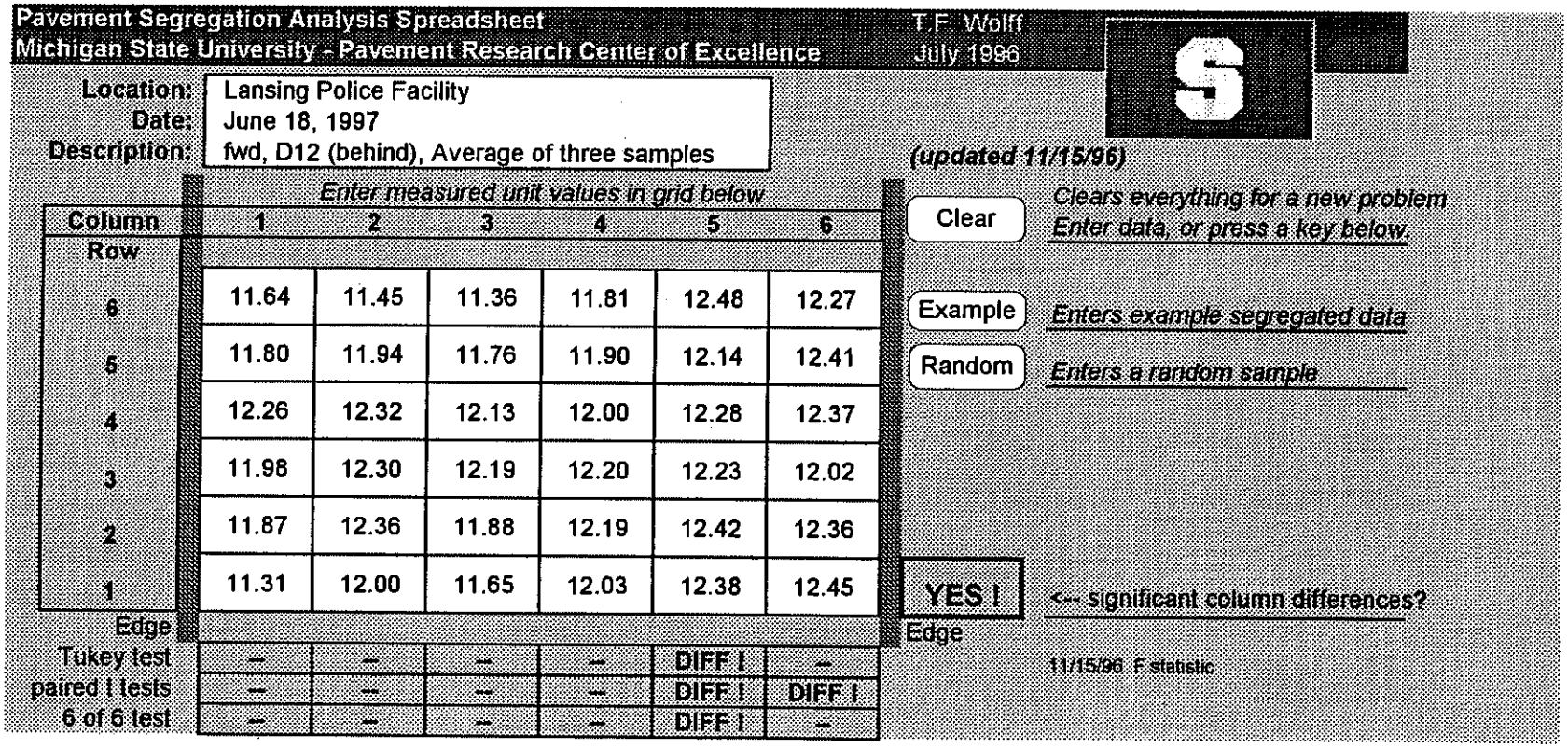
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	11.77	-0.25	0.063	0.314	0.098
2	12.03	0.01	0.000	0.407	0.165
3	11.80	-0.22	0.050	0.380	0.145
4	11.97	-0.05	0.002	0.189	0.036
5	12.26	0.23	0.055	0.149	0.022
6	12.30	0.28	0.077	0.231	0.054
sum			0.248		0.520
all data	12.02			0.341623	0.1167

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.48581852	5	0.297	**3.43027**	2.533554	0.0143574
within columns:	2.59889259	30	0.087			
Total:	4.08471111		**Different ?**	1	YES!	

ANOVA



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

Location: Lansing Police Facility
Date: June 18, 1997
Description: fwd, D12 (behind), Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	11.64	11.45	11.36	11.81	12.48	12.27
5	11.80	11.94	11.76	11.90	12.14	12.41
4	12.26	12.32	12.13	12.00	12.28	12.37
3	11.98	12.30	12.19	12.20	12.23	12.02
2	11.87	12.36	11.88	12.19	12.42	12.36
1	11.31	12.00	11.65	12.03	12.38	12.45
Edge						
Tukey test	--	--	--	--	DIFF !	--
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

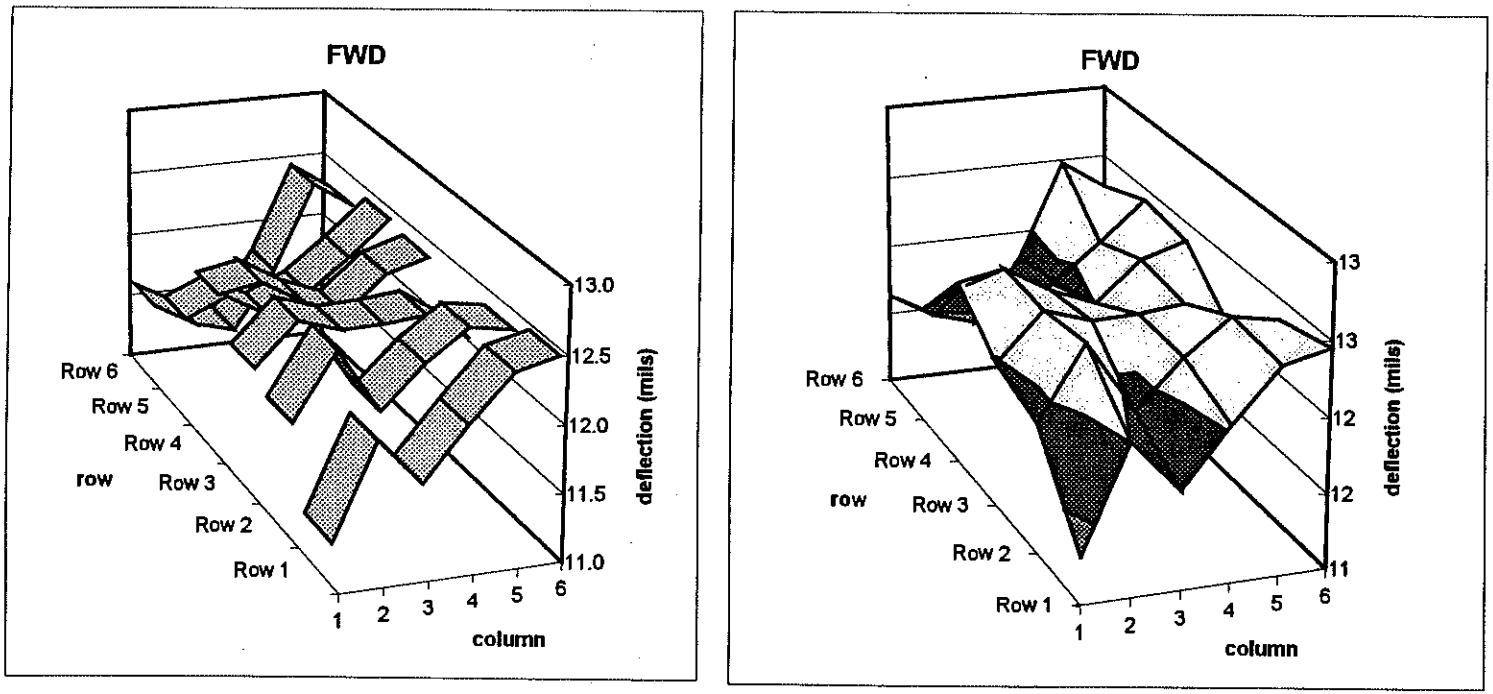
T. F. Wolff June 1996

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Average of three samples*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	11.6	11.5	11.4	11.8	12.5	12.3	11.83	0.451	3.81%
5	11.8	11.9	11.8	11.9	12.1	12.4	11.99	0.246	2.06%
4	12.3	12.3	12.1	12.0	12.3	12.4	12.23	0.136	1.11%
3	12.0	12.3	12.2	12.2	12.2	12.0	12.15	0.125	1.03%
2	11.9	12.4	11.9	12.2	12.4	12.4	12.18	0.249	2.05%
1	11.3	12.0	11.6	12.0	12.4	12.5	11.97	0.435	3.63%
Average	11.81	12.06	11.83	12.02	12.32	12.32	12.06	**12.06**	0.274	2.28%
Std. Dev.	0.322	0.347	0.311	0.155	0.125	0.155	0.236		**0.31315**	
Coeff. of Var.	2.72%	2.88%	2.63%	1.29%	1.01%	1.26%	1.96%			**2.60%**

Location: *Lansing Police Facility*
Date: *June 18, 1997*
Description: *fwd, D12 (behind), Average of three samples*



FWD Graph

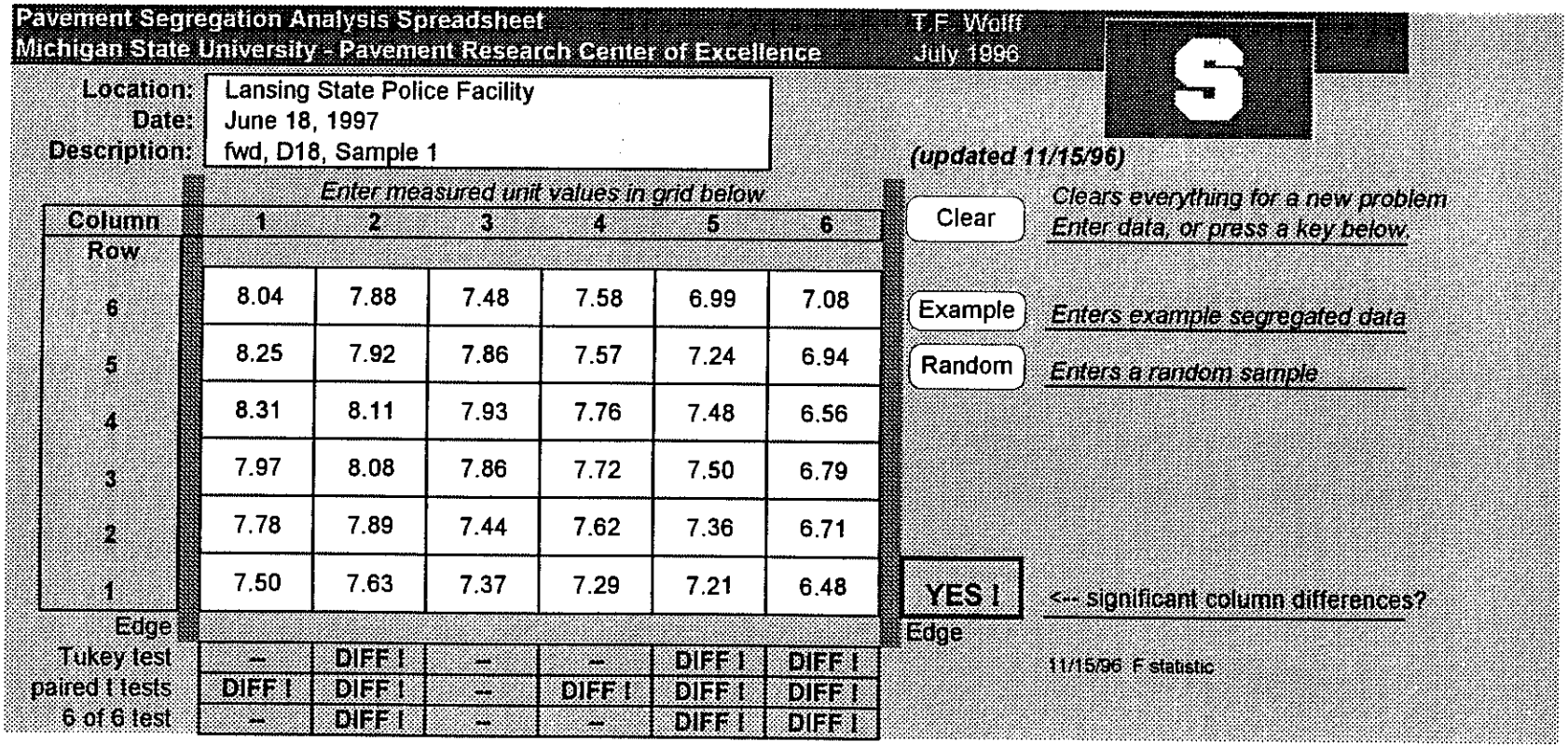
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	11.81	-0.25	0.063	0.322	0.103
2	12.06	0.00	0.000	0.347	0.120
3	11.83	-0.23	0.054	0.311	0.097
4	12.02	-0.04	0.001	0.155	0.024
5	12.32	0.26	0.068	0.125	0.016
6	12.32	0.26	0.066	0.155	0.024
sum			0.252		0.384
all data	12.06			0.313149	0.0981

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.51155377	5	0.302	**4.72208**	2.533554	0.0026725
within columns:	1.92062016	30	0.064			
Total:	3.43217394			**Different ?**	1	YES!

ANOVA



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D18, Sample 1

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	8.04	7.88	7.48	7.58	6.99	7.08
5	8.25	7.92	7.86	7.57	7.24	6.94
4	8.31	8.11	7.93	7.76	7.48	6.56
3	7.97	8.08	7.86	7.72	7.50	6.79
2	7.78	7.89	7.44	7.62	7.36	6.71
1	7.50	7.63	7.37	7.29	7.21	6.48
Edge						
Tukey test	--	DIFF !	--	--	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
6 of 6 test	--	DIFF !	--	--	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

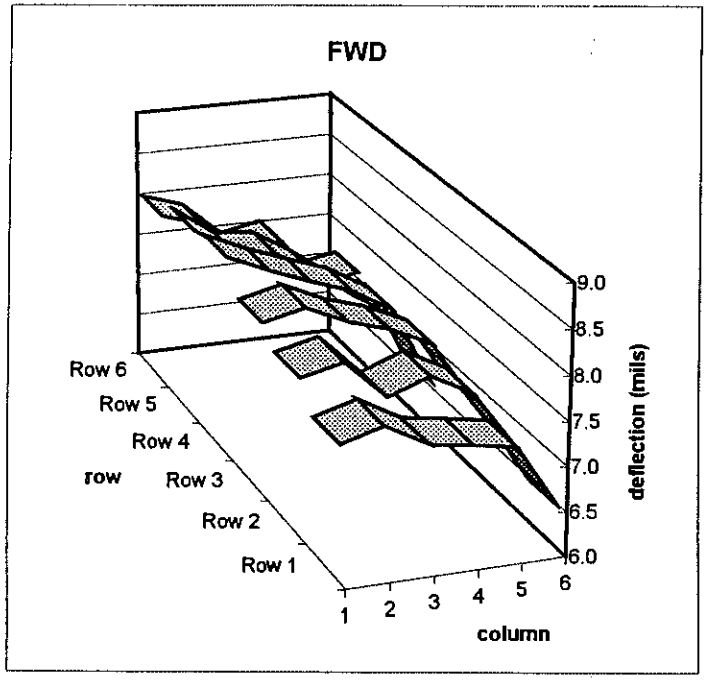
Michigan State University - Pavement Research Center of Excellence

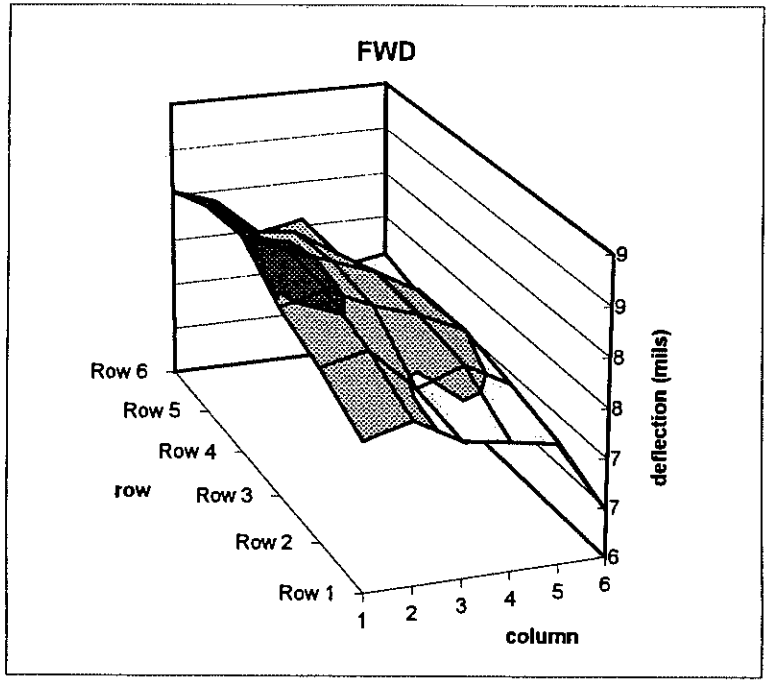
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	8.0	7.9	7.5	7.6	7.0	7.1	7.51	0.421	5.61%
5	8.3	7.9	7.9	7.6	7.2	6.9	7.63	0.479	6.28%
4	8.3	8.1	7.9	7.8	7.5	6.6	7.69	0.625	8.12%
3	8.0	8.1	7.9	7.7	7.5	6.8	7.65	0.467	6.10%
2	7.8	7.9	7.4	7.6	7.4	6.7	7.47	0.420	5.63%
1	7.5	7.6	7.4	7.3	7.2	6.5	7.25	0.405	5.59%
Average	7.97	7.92	7.66	7.59	7.30	6.76	7.53	**7.53**	0.470	6.22%
Std. Dev.	0.304	0.171	0.254	0.164	0.193	0.228	0.219		**0.46611**	
Coeff. of Var.	3.82%	2.16%	3.32%	2.16%	2.64%	3.37%	2.91%			**6.19%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 1*





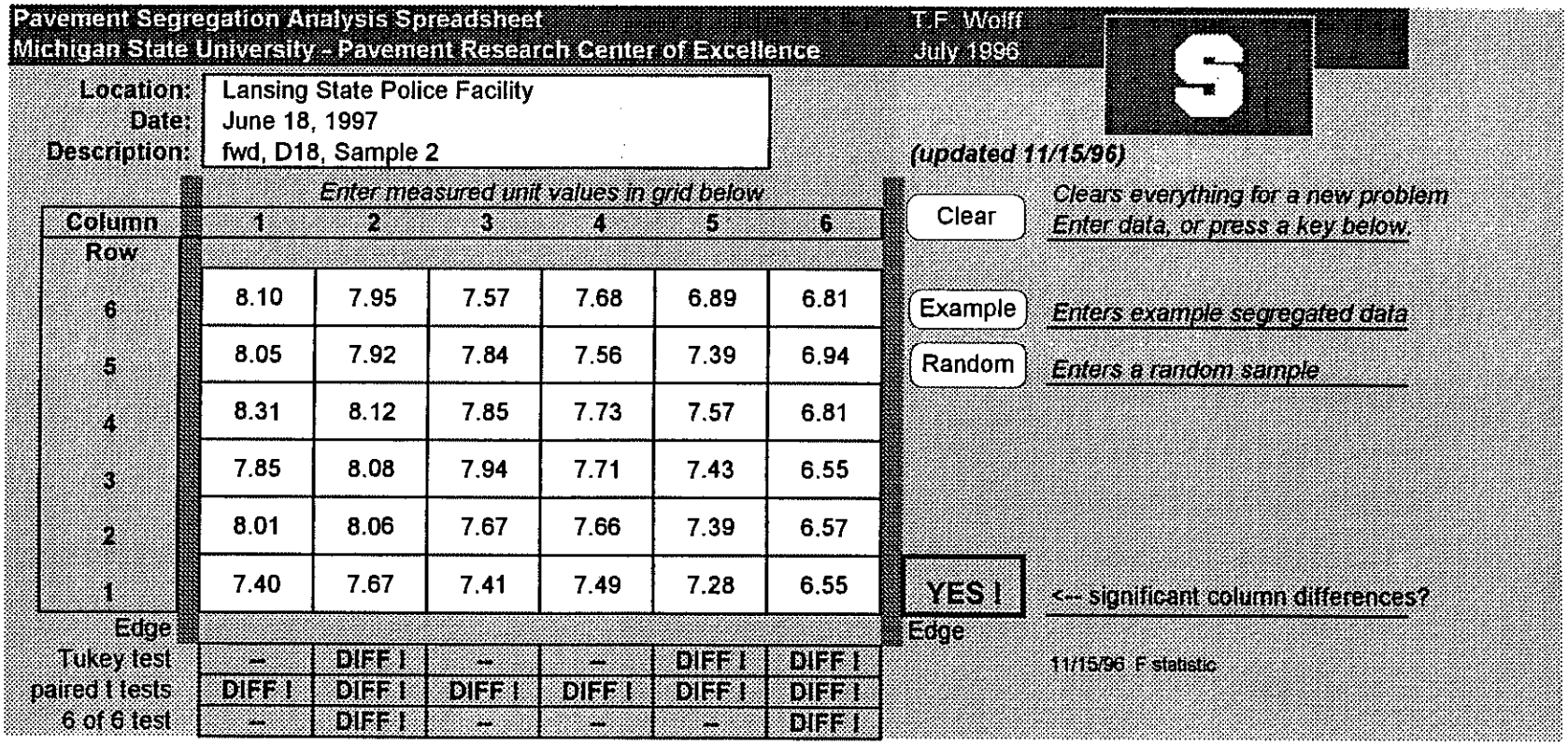
FWD Graph

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	7.97	0.44	0.195	0.304	0.093
2	7.92	0.39	0.149	0.171	0.029
3	7.66	0.12	0.015	0.254	0.065
4	7.59	0.06	0.003	0.164	0.027
5	7.30	-0.23	0.055	0.193	0.037
6	6.76	-0.77	0.597	0.228	0.052
sum			1.015		0.302
all data	7.53			0.466114	0.2173

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	6.09206644	5	1.218	**24.17305**	2.533554	1.087E-09
within columns:	1.51211343	30	0.050			
Total:	7.60417986			**Different ?**	1	YES!



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D18, Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	8.10	7.95	7.57	7.68	6.89	6.81
5	8.05	7.92	7.84	7.56	7.39	6.94
4	8.31	8.12	7.85	7.73	7.57	6.81
3	7.85	8.08	7.94	7.71	7.43	6.55
2	8.01	8.06	7.67	7.66	7.39	6.57
1	7.40	7.67	7.41	7.49	7.28	6.55
Edge						Edge
Tukey test	--	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?

11/15/96 F statistic

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

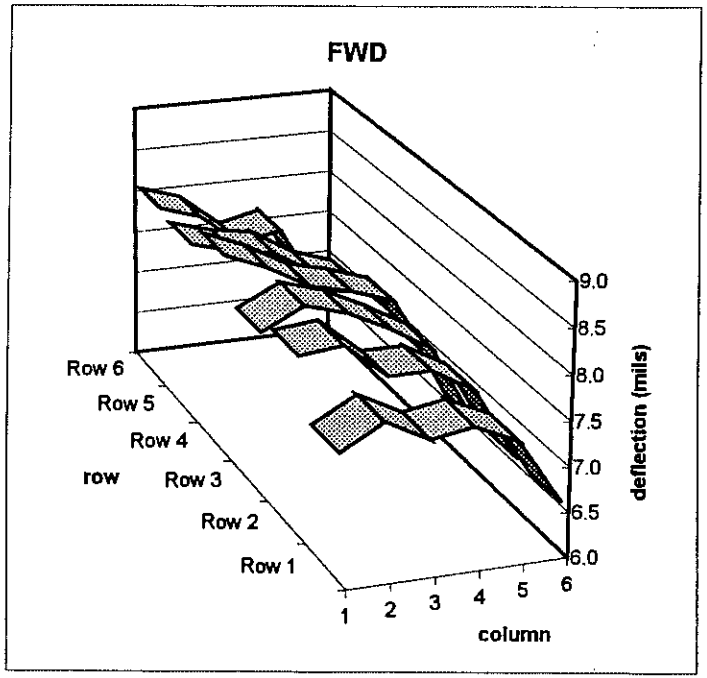
Michigan State University - Pavement Research Center of Excellence

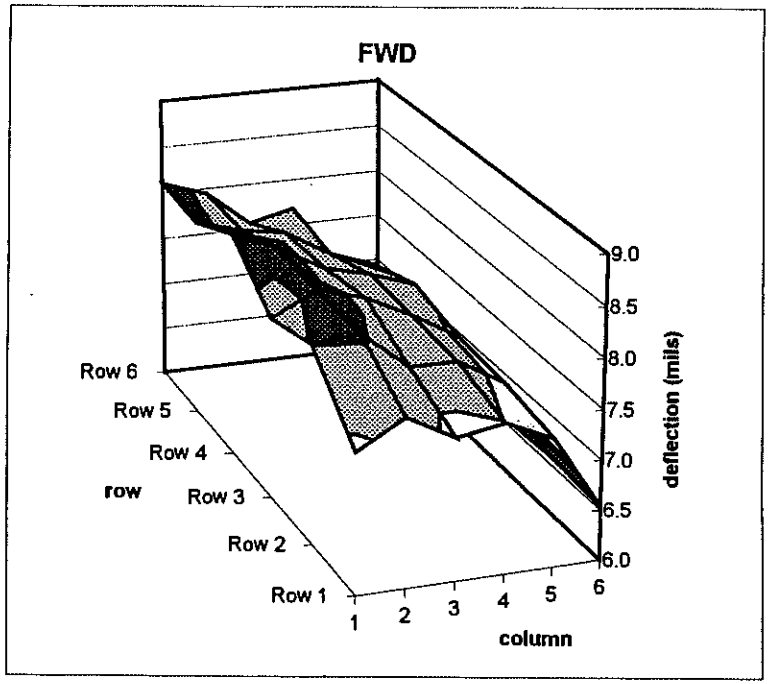
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	8.1	8.0	7.6	7.7	6.9	6.8	7.50	0.540	7.20%
5	8.1	7.9	7.8	7.6	7.4	6.9	7.62	0.409	5.37%
4	8.3	8.1	7.8	7.7	7.6	6.8	7.73	0.524	6.77%
3	7.8	8.1	7.9	7.7	7.4	6.5	7.59	0.558	7.35%
2	8.0	8.1	7.7	7.7	7.4	6.6	7.56	0.543	7.19%
1	7.4	7.7	7.4	7.5	7.3	6.5	7.30	0.392	5.37%
Average	7.95	7.97	7.71	7.64	7.33	6.70	7.55	**7.55**	0.494	6.54%
Std. Dev.	0.309	0.163	0.199	0.094	0.233	0.171	0.195		**0.48071**	
Coeff. of Var.	3.88%	2.05%	2.57%	1.23%	3.18%	2.55%	2.58%			**6.37%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 2*





FWD Graph

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

T. F. Wolff June 1996

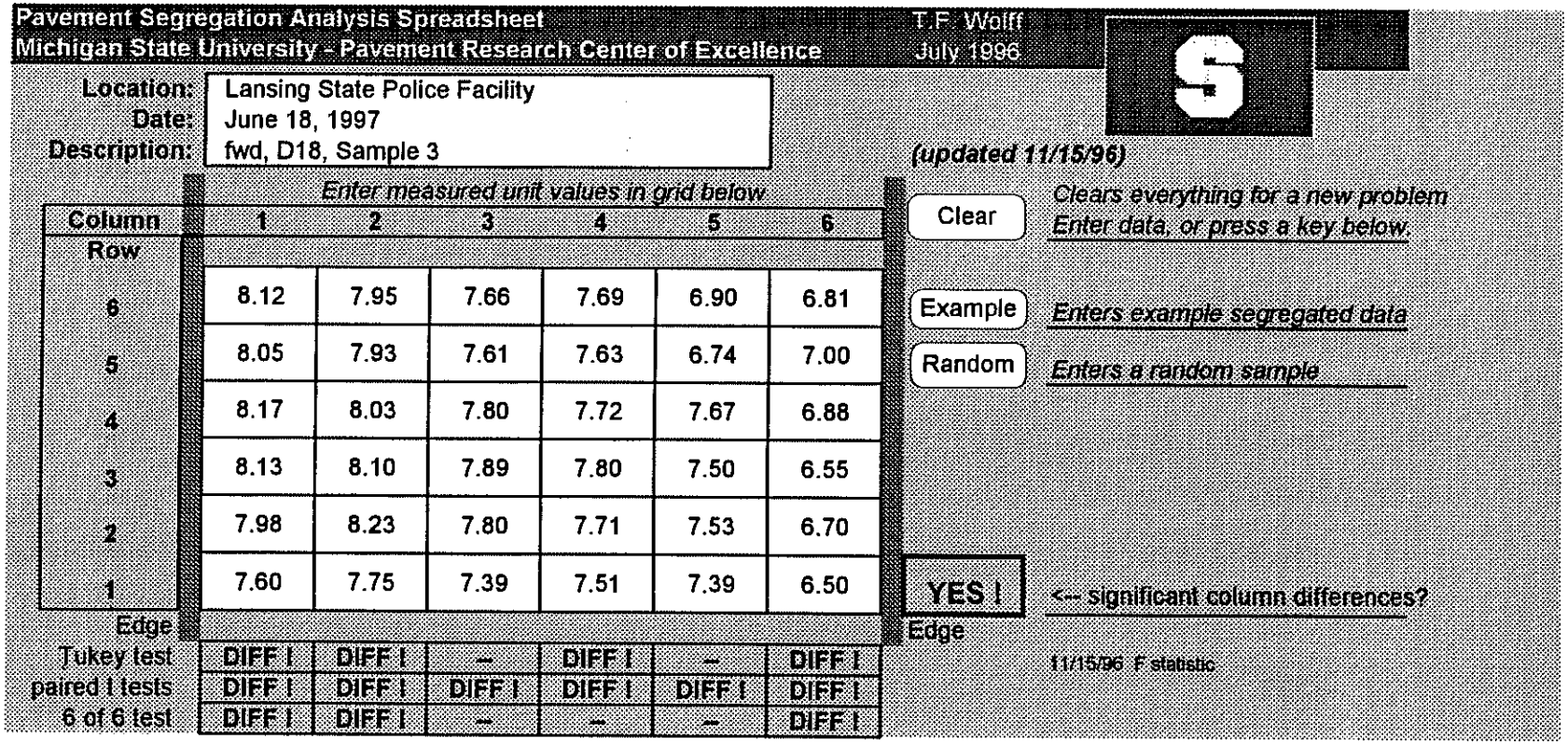
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	7.95	0.40	0.163	0.309	0.095
2	7.97	0.42	0.174	0.163	0.027
3	7.71	0.16	0.026	0.199	0.039
4	7.64	0.09	0.008	0.094	0.009
5	7.33	-0.22	0.050	0.233	0.054
6	6.70	-0.85	0.716	0.171	0.029
sum			1.137		0.254
all data	7.55			0.480706	0.2311

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	6.81963333	5	1.364	**32.26673**	2.533554	3.303E-11
within columns:	1.26811111	30	0.042			
Total:	8.08774444					

Different ? 1 YES!

ANOVA



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D18, Sample 3

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	8.12	7.95	7.66	7.69	6.90	6.81
5	8.05	7.93	7.61	7.63	6.74	7.00
4	8.17	8.03	7.80	7.72	7.67	6.88
3	8.13	8.10	7.89	7.80	7.50	6.55
2	7.98	8.23	7.80	7.71	7.53	6.70
1	7.60	7.75	7.39	7.51	7.39	6.50
Edge						
Tukey test	DIFF !	DIFF !	–	DIFF !	–	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	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 T. F. Wolff June 1996

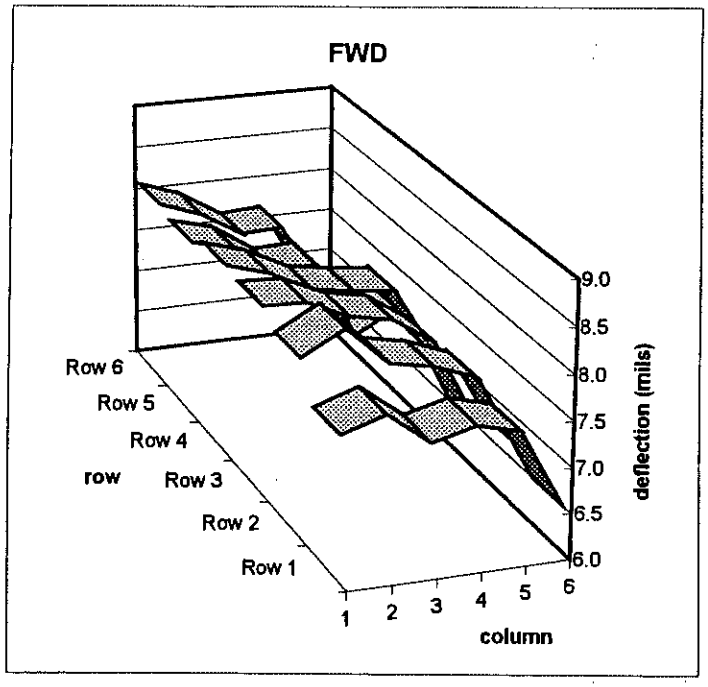
Michigan State University - Pavement Research Center of Excellence

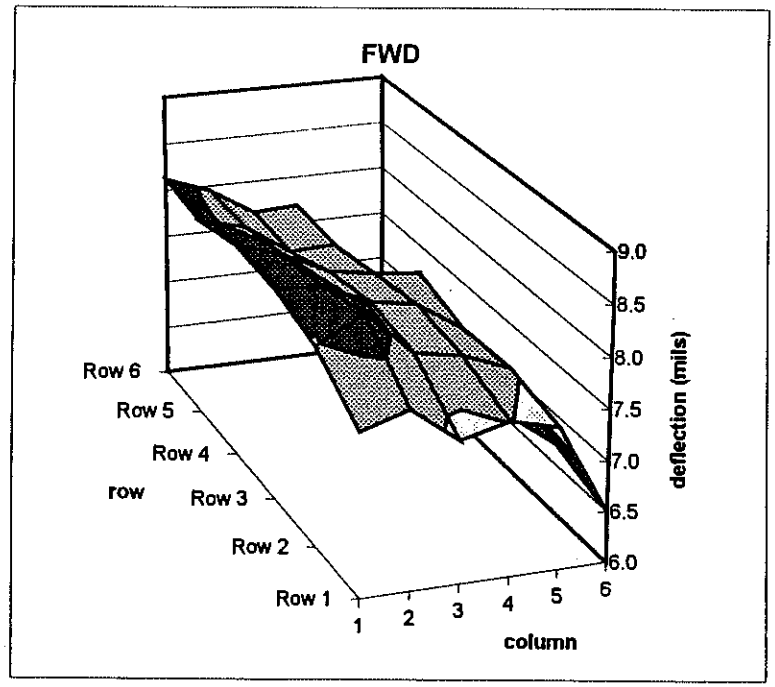
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	8.1	8.0	7.7	7.7	6.9	6.8	7.52	0.546	7.26%
5	8.1	7.9	7.6	7.6	6.7	7.0	7.49	0.519	6.92%
4	8.2	8.0	7.8	7.7	7.7	6.9	7.71	0.452	5.86%
3	8.1	8.1	7.9	7.8	7.5	6.5	7.66	0.592	7.73%
2	8.0	8.2	7.8	7.7	7.5	6.7	7.66	0.526	6.87%
1	7.6	7.8	7.4	7.5	7.4	6.5	7.36	0.439	5.97%
Average	8.01	8.00	7.69	7.68	7.29	6.74	7.57	**7.57**	0.512	6.77%
Std. Dev.	0.213	0.165	0.180	0.100	0.378	0.193	0.205		**0.49287**	
Coeff. of Var.	2.66%	2.06%	2.34%	1.31%	5.18%	2.87%	2.74%			**6.51%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Sample 3*





FWD Graph

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

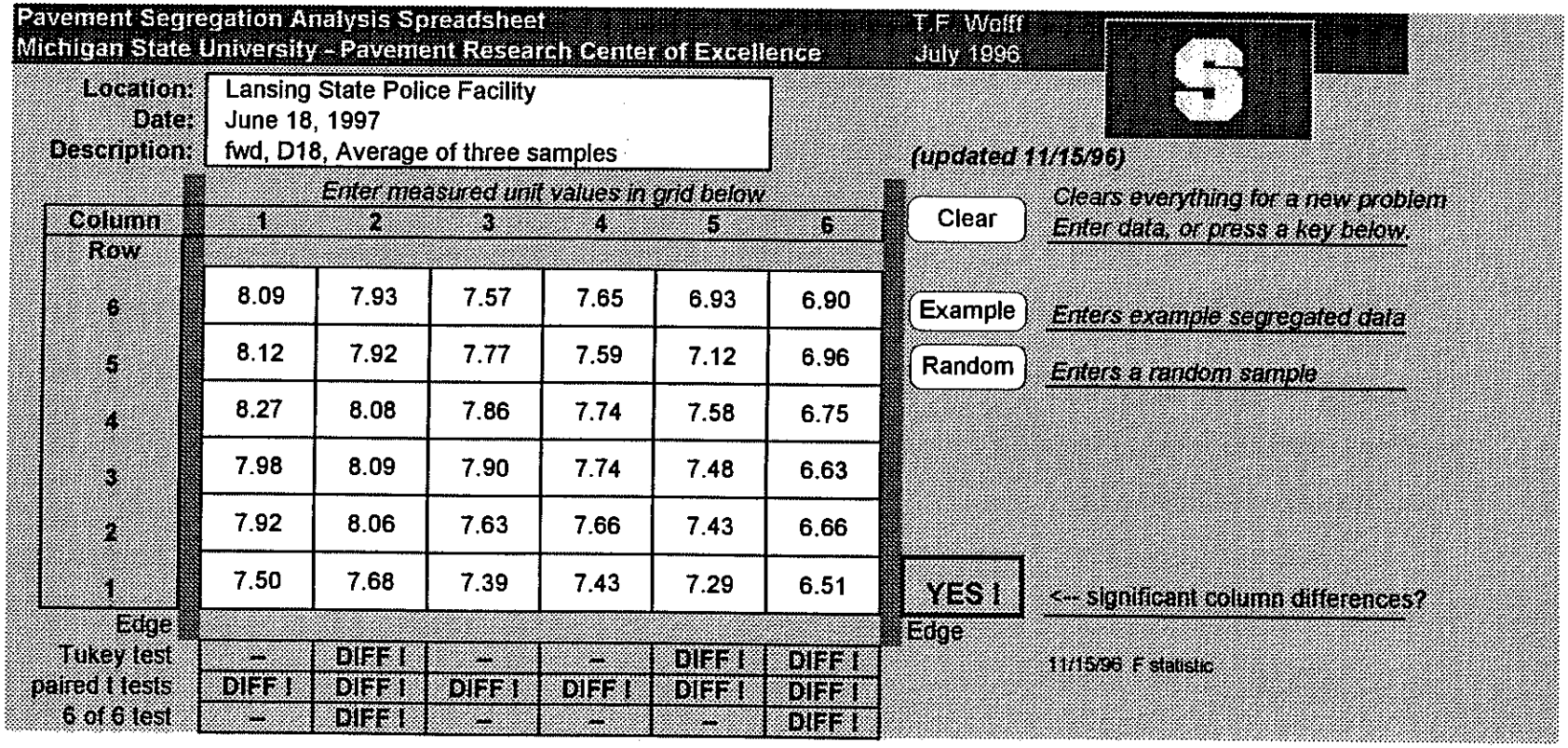
One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	8.01	0.44	0.194	0.213	0.045
2	8.00	0.43	0.187	0.165	0.027
3	7.69	0.12	0.015	0.180	0.032
4	7.68	0.11	0.012	0.100	0.010
5	7.29	-0.28	0.079	0.378	0.143
6	6.74	-0.83	0.684	0.193	0.037
sum			1.171		0.295
all data	7.57			0.492868	0.2429

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	7.02743611	5	1.405	**28.59146**	2.533554	1.461E-10
within columns:	1.47472778	30	0.049			
Total:	8.50216389					

Different ? 1 **YES!**

ANOVA



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D18, Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	8.09	7.93	7.57	7.65	6.93	6.90
5	8.12	7.92	7.77	7.59	7.12	6.96
4	8.27	8.08	7.86	7.74	7.58	6.75
3	7.98	8.09	7.90	7.74	7.48	6.63
2	7.92	8.06	7.63	7.66	7.43	6.66
1	7.50	7.68	7.39	7.43	7.29	6.51
Edge						
Tukey test	–	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

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

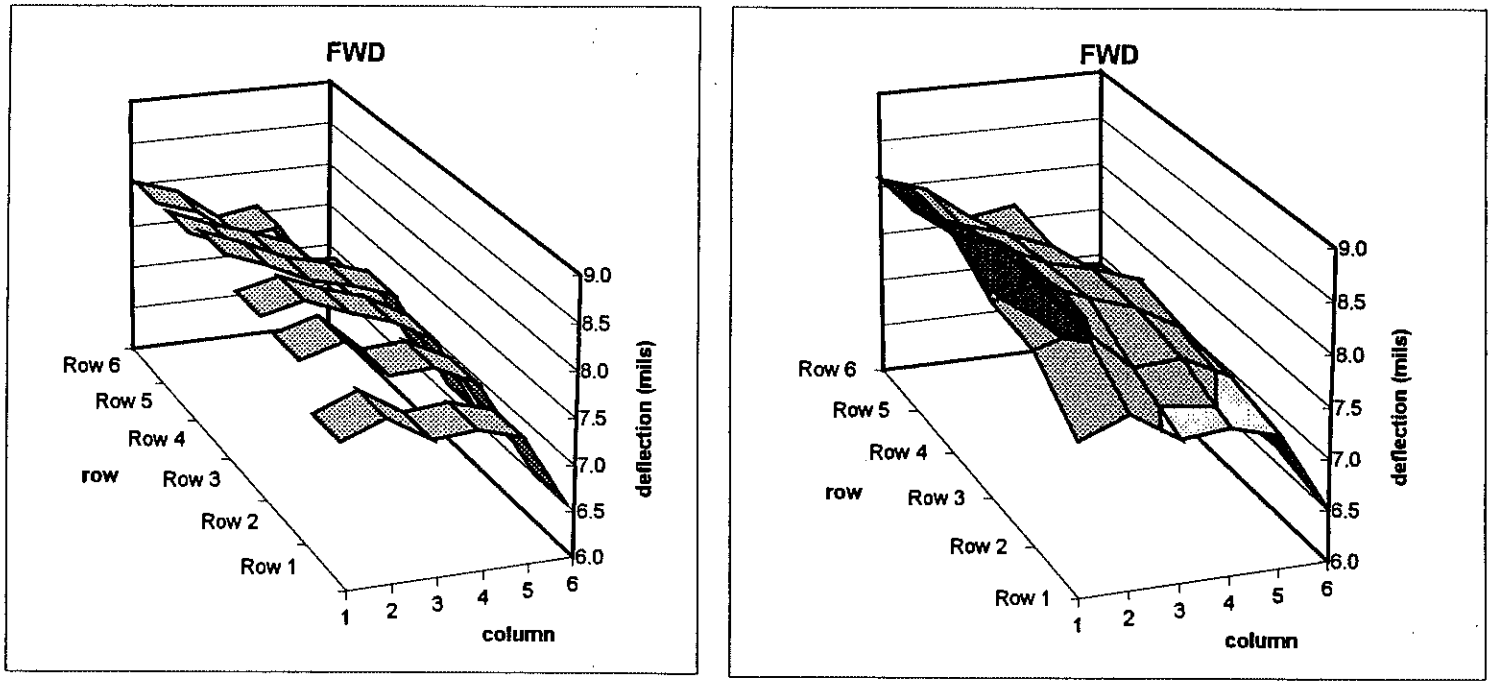
Michigan State University - Pavement Research Center of Excellence

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Average of three samples*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	8.1	7.9	7.6	7.7	6.9	6.9	7.51	0.500	6.66%
5	8.1	7.9	7.8	7.6	7.1	7.0	7.58	0.454	5.99%
4	8.3	8.1	7.9	7.7	7.6	6.7	7.71	0.532	6.90%
3	8.0	8.1	7.9	7.7	7.5	6.6	7.64	0.537	7.04%
2	7.9	8.1	7.6	7.7	7.4	6.7	7.56	0.494	6.53%
1	7.5	7.7	7.4	7.4	7.3	6.5	7.30	0.409	5.61%
Average	7.98	7.96	7.69	7.64	7.30	6.73	7.55	**7.55**	0.488	6.45%
Std. Dev.	0.264	0.155	0.193	0.116	0.243	0.171	0.190		**0.47176**	
Coeff. of Var.	3.30%	1.95%	2.51%	1.52%	3.32%	2.54%	2.52%			**6.25%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D18, Average of three samples*



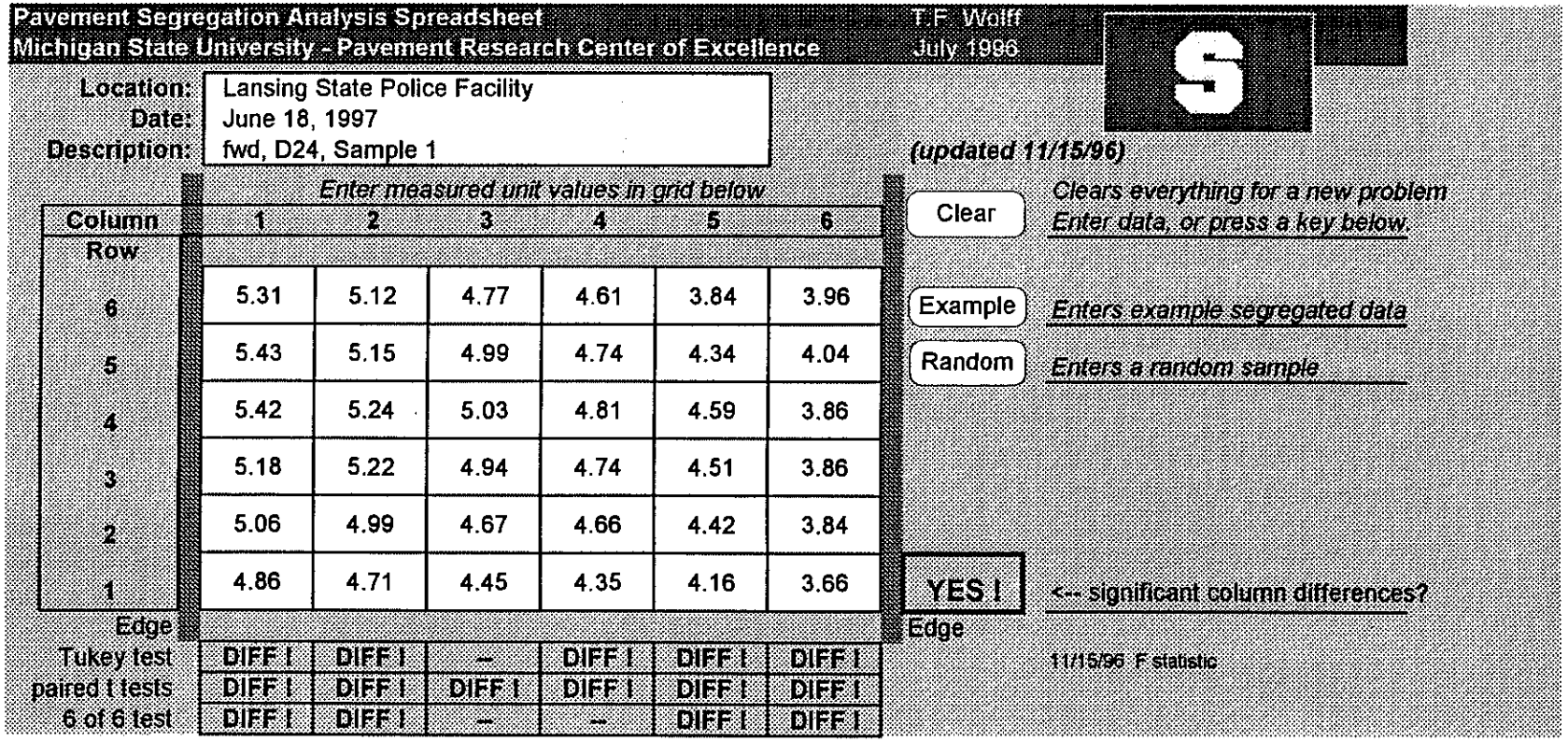
FWD Graph

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	7.98	0.43	0.184	0.264	0.069
2	7.96	0.41	0.170	0.155	0.024
3	7.69	0.14	0.019	0.193	0.037
4	7.64	0.09	0.007	0.116	0.013
5	7.30	-0.25	0.061	0.243	0.059
6	6.73	-0.82	0.665	0.171	0.029
sum			1.105		0.232
all data	7.55			0.471755	0.2226

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	6.62811355	5	1.326	**34.24671**	2.533554	1.57E-11
within columns:	1.161241	30	0.039			
Total:	7.78935455		**Different ?**	1	YES!	



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D24, Sample 1

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	5.31	5.12	4.77	4.61	3.84	3.96
5	5.43	5.15	4.99	4.74	4.34	4.04
4	5.42	5.24	5.03	4.81	4.59	3.86
3	5.18	5.22	4.94	4.74	4.51	3.86
2	5.06	4.99	4.67	4.66	4.42	3.84
1	4.86	4.71	4.45	4.35	4.16	3.66
Edge						Edge
Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	--	--	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?

11/15/96 F statistic

DATA ENTRY

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

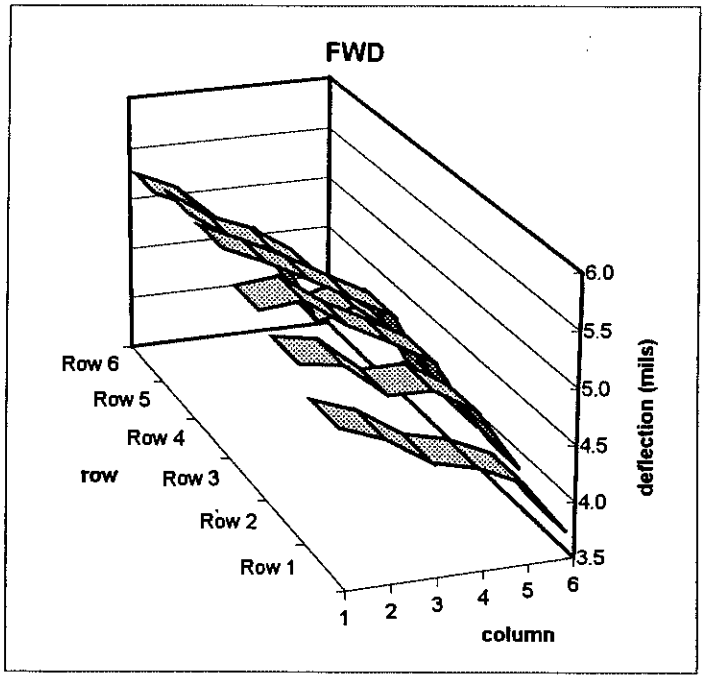
T. F. Wolff June 1996

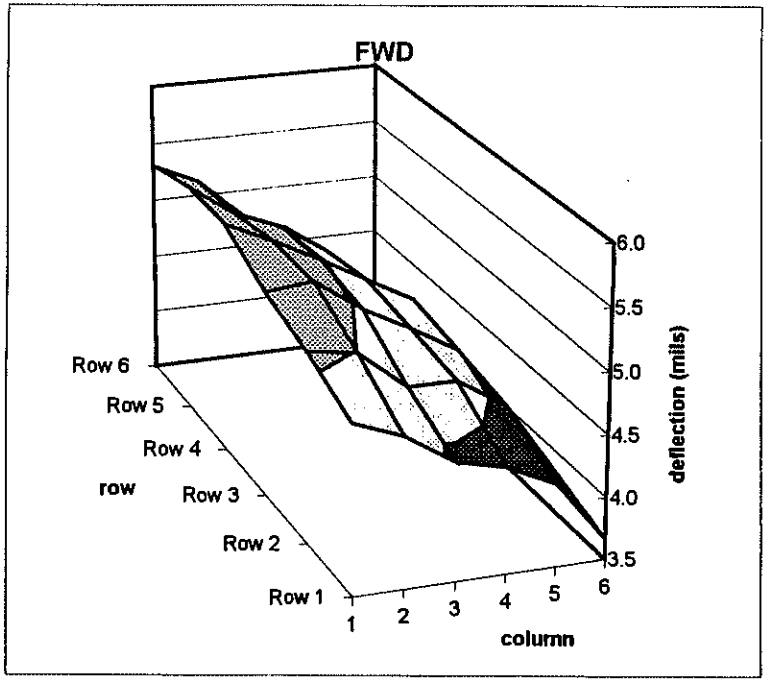
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.3	5.1	4.8	4.6	3.8	4.0	4.60	0.597	12.97%
5	5.4	5.1	5.0	4.7	4.3	4.0	4.78	0.518	10.85%
4	5.4	5.2	5.0	4.8	4.6	3.9	4.82	0.556	11.53%
3	5.2	5.2	4.9	4.7	4.5	3.9	4.74	0.509	10.73%
2	5.1	5.0	4.7	4.7	4.4	3.8	4.61	0.444	9.65%
1	4.9	4.7	4.5	4.4	4.2	3.7	4.37	0.425	9.74%
Average	5.21	5.07	4.81	4.65	4.31	3.87	4.65	**4.65**	0.508	10.91%
Std. Dev.	0.222	0.197	0.224	0.163	0.273	0.128	0.201		**0.49866**	
Coeff. of Var.	4.26%	3.89%	4.66%	3.50%	6.32%	3.30%	4.32%			**10.72%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 1*





FWD Graph

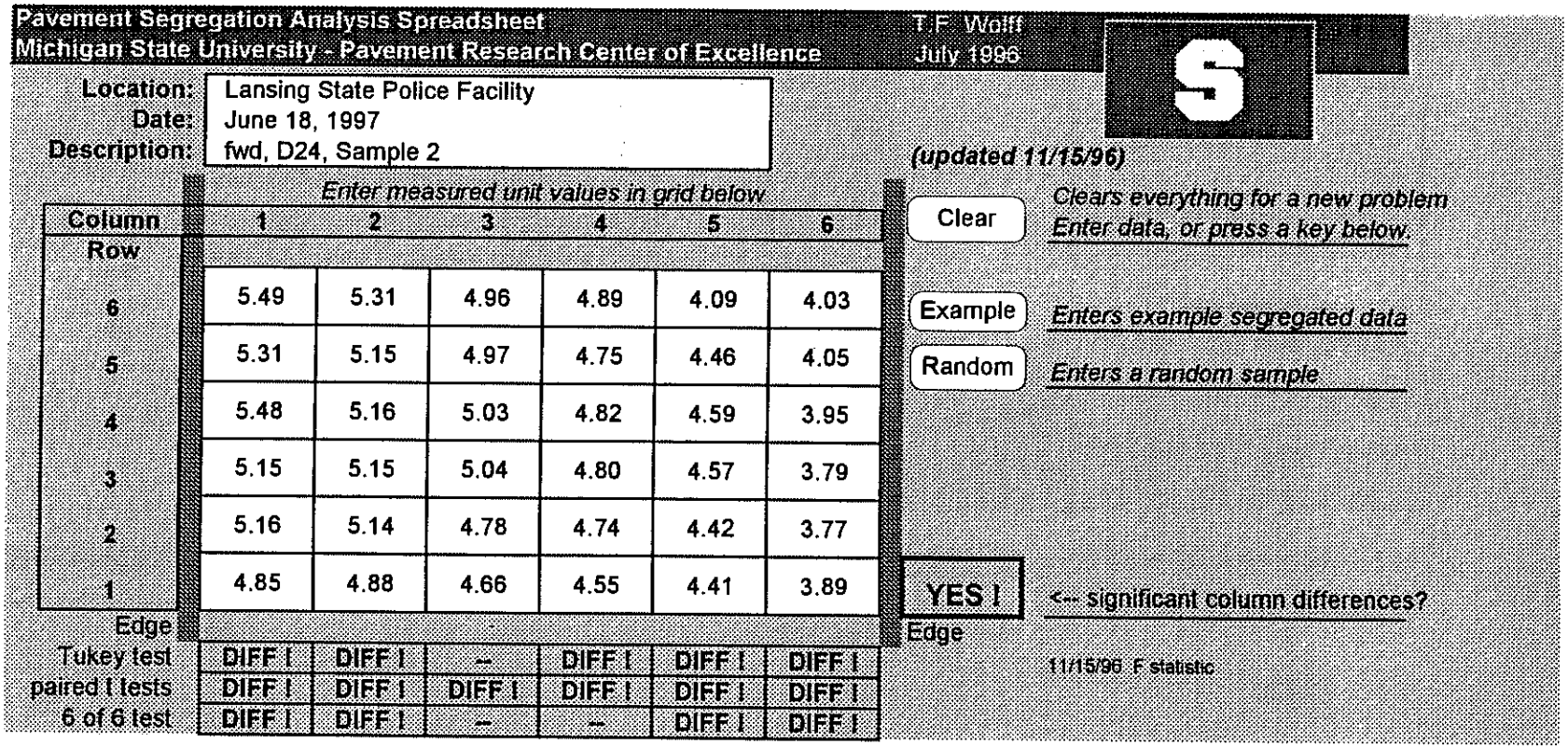
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.21	0.55	0.308	0.222	0.049
2	5.07	0.42	0.175	0.197	0.039
3	4.81	0.16	0.024	0.224	0.050
4	4.65	0.00	0.000	0.163	0.027
5	4.31	-0.34	0.118	0.273	0.074
6	3.87	-0.78	0.613	0.128	0.016
sum			1.238		0.255
all data	4.65			0.498663	0.2487

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	7.42586173	5	1.485	**34.87947**	2.533554	1.247E-11
within columns:	1.2774037	30	0.043			
Total:	8.70326543					

Different ? 1 YES!



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D24, Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	5.49	5.31	4.96	4.89	4.09	4.03
5	5.31	5.15	4.97	4.75	4.46	4.05
4	5.48	5.16	5.03	4.82	4.59	3.95
3	5.15	5.15	5.04	4.80	4.57	3.79
2	5.16	5.14	4.78	4.74	4.42	3.77
1	4.85	4.88	4.66	4.55	4.41	3.89
Edge						
Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	--	--	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?

11/15/96 F statistic

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

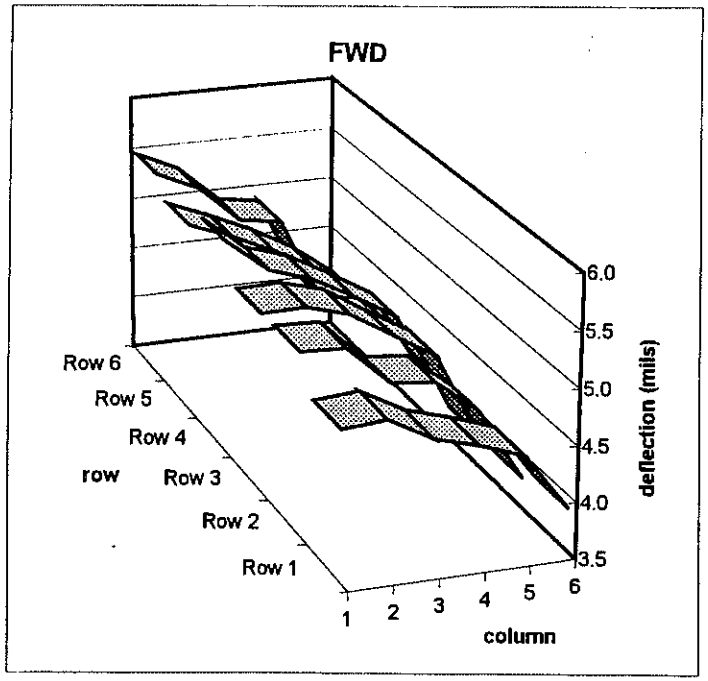
Michigan State University - Pavement Research Center of Excellence

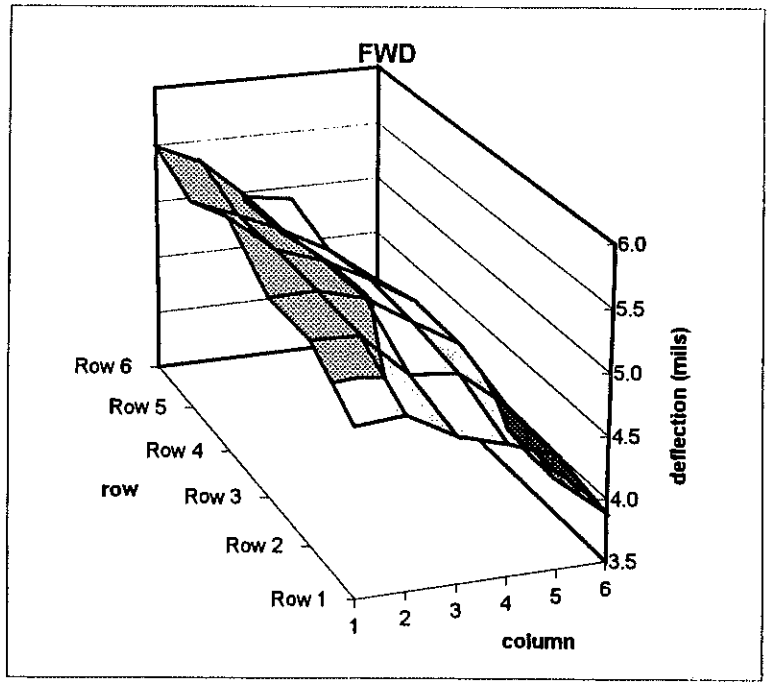
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.5	5.3	5.0	4.9	4.1	4.0	4.80	0.609	12.71%
5	5.3	5.2	5.0	4.7	4.5	4.0	4.78	0.468	9.79%
4	5.5	5.2	5.0	4.8	4.6	4.0	4.84	0.531	10.98%
3	5.1	5.2	5.0	4.8	4.6	3.8	4.75	0.523	11.02%
2	5.2	5.1	4.8	4.7	4.4	3.8	4.67	0.517	11.07%
1	4.8	4.9	4.7	4.5	4.4	3.9	4.54	0.366	8.06%
Average	5.24	5.13	4.91	4.76	4.42	3.91	4.73	**4.73**	0.502	10.60%
Std. Dev.	0.244	0.139	0.153	0.118	0.178	0.118	0.158		**0.48089**	
Coeff. of Var.	4.65%	2.71%	3.13%	2.48%	4.02%	3.02%	3.34%			**10.17%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 2*





FWD 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	5.24	0.51	0.260	0.244	0.059
2	5.13	0.40	0.163	0.139	0.019
3	4.91	0.18	0.031	0.153	0.024
4	4.76	0.03	0.001	0.118	0.014
5	4.42	-0.31	0.093	0.178	0.032
6	3.91	-0.82	0.665	0.118	0.014
sum			1.214		0.162
all data	4.73			0.480893	0.2313

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	7.28499421	5	1.457	**54.02724**	2.533554	4.222E-14
within columns:	0.80903565	30	0.027			
Total:	8.09402986					

Different ? 1 YES!

ANOVA

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

(updated 11/15/96)

Location:	Lansing State Police Facility
Date:	June 18, 1997
Description:	fwd, D24, Sample 3

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	5.59	5.32	4.95	4.89	4.02	4.01
5	5.35	5.15	4.90	4.80	4.01	4.10
4	5.35	5.15	4.99	4.80	4.64	4.02
3	5.31	5.16	5.01	4.84	4.56	3.78
2	5.19	5.23	4.91	4.76	4.48	3.81
1	4.96	4.94	4.64	4.60	4.38	3.77
Edge						

Tukey test	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	--	--	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
Michigan State University - Pavement Research Center of Excellence

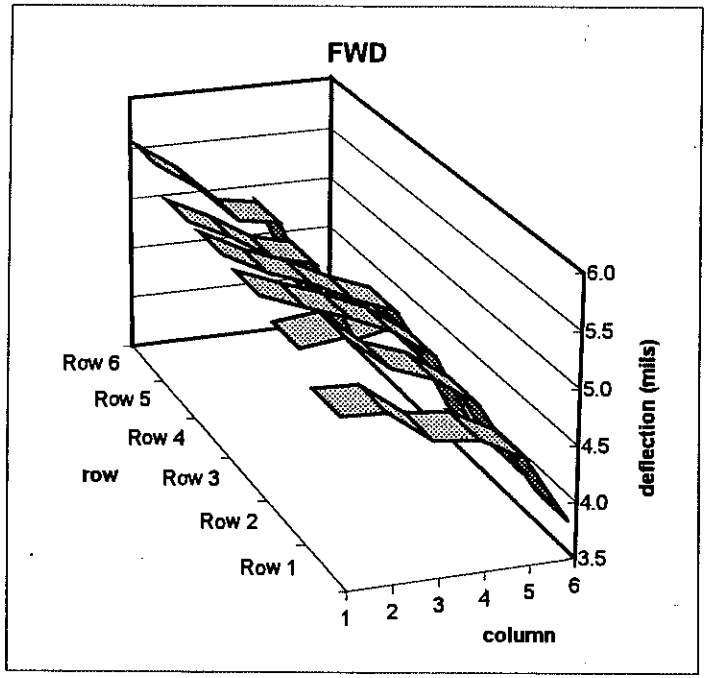
T. F. Wolff June 1996

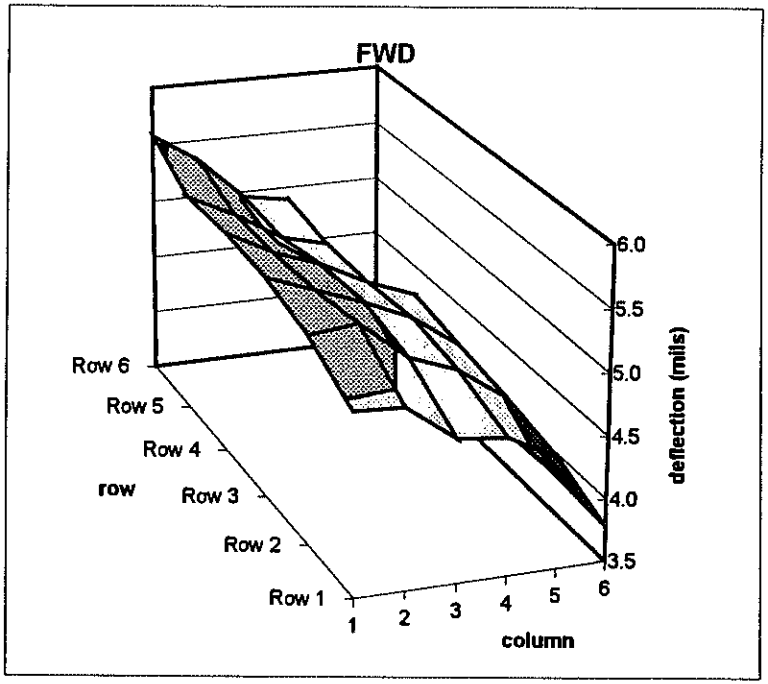
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.6	5.3	5.0	4.9	4.0	4.0	4.80	0.656	13.67%
5	5.3	5.2	4.9	4.8	4.0	4.1	4.72	0.550	11.65%
4	5.4	5.1	5.0	4.8	4.6	4.0	4.83	0.469	9.71%
3	5.3	5.2	5.0	4.8	4.6	3.8	4.78	0.553	11.57%
2	5.2	5.2	4.9	4.8	4.5	3.8	4.73	0.529	11.18%
1	5.0	4.9	4.6	4.6	4.4	3.8	4.55	0.438	9.63%
Average	5.29	5.16	4.90	4.78	4.35	3.92	4.73	**4.73**	0.532	11.24%
Std. Dev.	0.207	0.128	0.136	0.100	0.273	0.141	0.164		**0.50546**	
Coeff. of Var.	3.92%	2.49%	2.77%	2.09%	6.26%	3.61%	3.52%			**10.68%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Sample 3*





FWD Graph

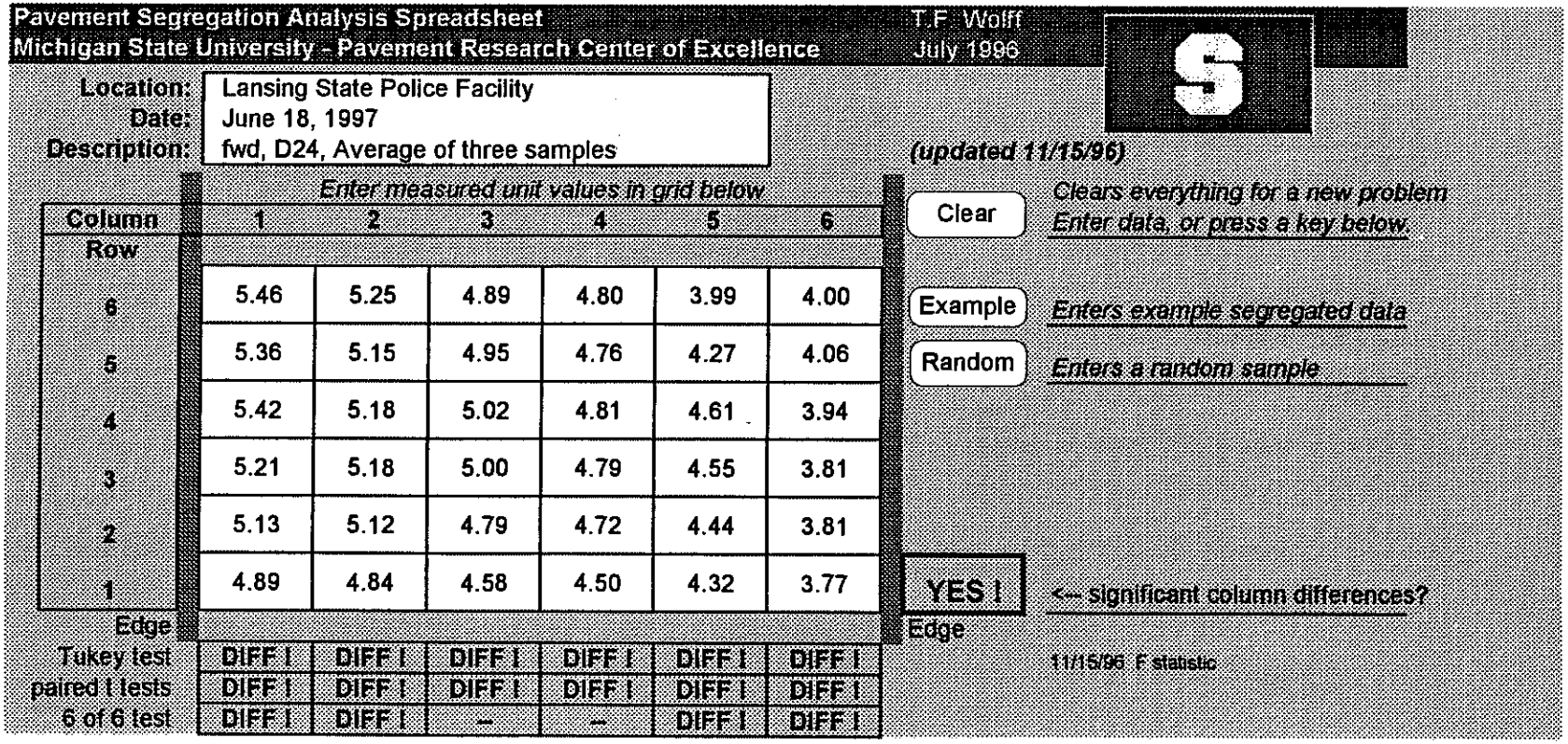
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	5.29	0.56	0.312	0.207	0.043
2	5.16	0.43	0.181	0.128	0.016
3	4.90	0.17	0.029	0.136	0.018
4	4.78	0.05	0.002	0.100	0.010
5	4.35	-0.38	0.147	0.273	0.074
6	3.92	-0.82	0.669	0.141	0.020
sum			1.339		0.182
all data	4.73			0.505463	0.2555

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	8.03180741	5	1.606	**52.93026**	2.533554	5.551E-14
within columns:	0.91045926	30	0.030			
Total:	8.94226667					

Different ? 1 YES!



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D24, Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Row \ Column	1	2	3	4	5	6
6	5.46	5.25	4.89	4.80	3.99	4.00
5	5.36	5.15	4.95	4.76	4.27	4.06
4	5.42	5.18	5.02	4.81	4.61	3.94
3	5.21	5.18	5.00	4.79	4.55	3.81
2	5.13	5.12	4.79	4.72	4.44	3.81
1	4.89	4.84	4.58	4.50	4.32	3.77
Edge						
Tukey test	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	–	–	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
Michigan State University - Pavement Research Center of Excellence

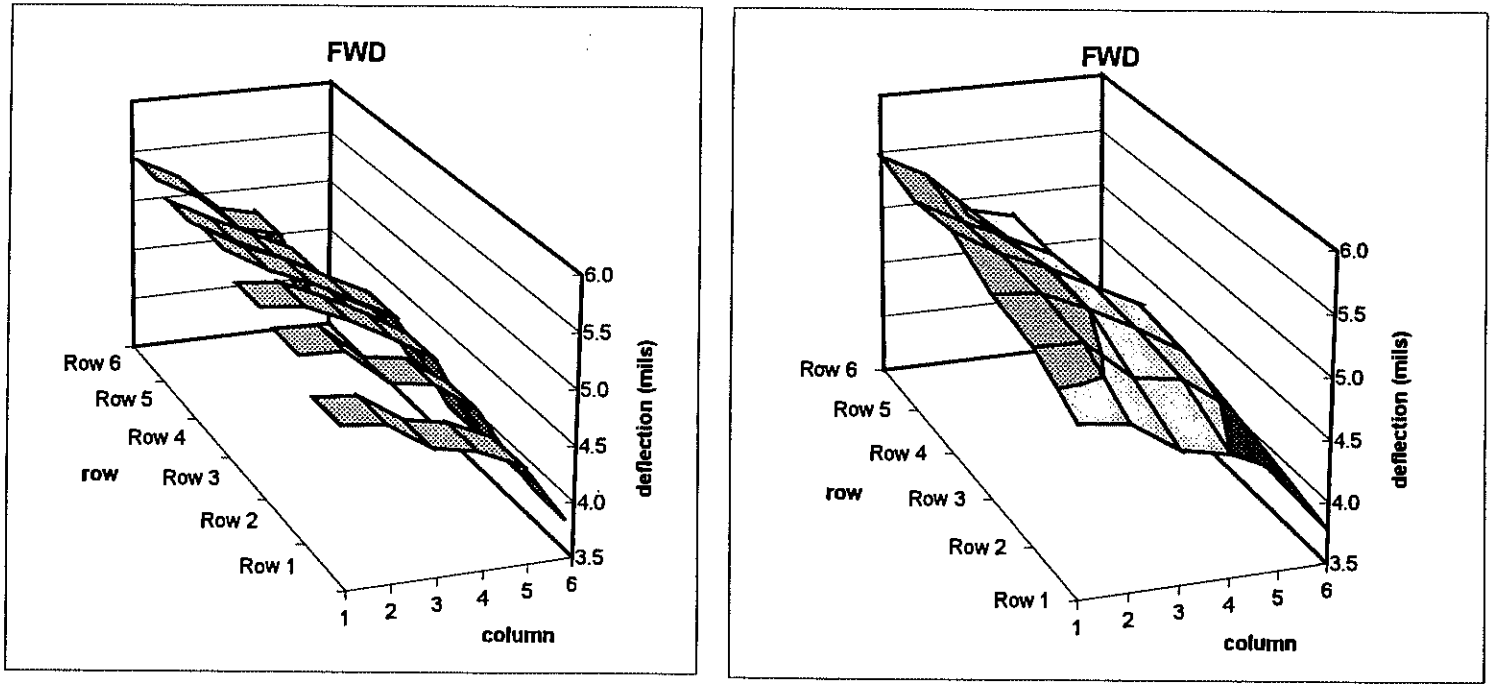
T. F. Wolff June 1996

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Average of three samples*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	5.5	5.3	4.9	4.8	4.0	4.0	4.73	0.620	13.10%
5	5.4	5.1	5.0	4.8	4.3	4.1	4.76	0.506	10.63%
4	5.4	5.2	5.0	4.8	4.6	3.9	4.83	0.518	10.73%
3	5.2	5.2	5.0	4.8	4.5	3.8	4.76	0.527	11.07%
2	5.1	5.1	4.8	4.7	4.4	3.8	4.67	0.496	10.63%
1	4.9	4.8	4.6	4.5	4.3	3.8	4.48	0.408	9.10%
Average	5.25	5.12	4.87	4.73	4.36	3.90	4.71	**4.71**	0.513	10.88%
Std. Dev.	0.214	0.143	0.165	0.118	0.225	0.119	0.164		**0.49071**	
Coeff. of Var.	4.09%	2.80%	3.38%	2.49%	5.15%	3.05%	3.49%			**10.43%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D24, Average of three samples*



FWD 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	5.25	0.54	0.293	0.214	0.046
2	5.12	0.42	0.173	0.143	0.021
3	4.87	0.17	0.028	0.165	0.027
4	4.73	0.02	0.001	0.118	0.014
5	4.36	-0.34	0.118	0.225	0.051
6	3.90	-0.81	0.649	0.119	0.014
sum			1.261		0.172
all data	4.71			0.490711	0.2408

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	7.56697185	5	1.513	**52.73623**	2.533554	5.829E-14
within columns:	0.86092289	30	0.029			
Total:	8.42789474					

Different ? 1 **YES!**

ANOVA

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

(updated 11/15/96)

Location:	Lansing State Police Facility
Date:	June 18, 1997
Description:	fwd, D36, Sample 1

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	2.24	2.14	1.98	1.81	1.38	1.32
5	2.25	2.11	2.00	1.88	1.71	1.60
4	2.18	2.10	1.99	1.87	1.78	1.53
3	2.07	2.08	1.94	1.81	1.71	1.53
2	2.05	1.97	1.84	1.78	1.68	1.56
1	1.92	1.81	1.70	1.62	1.54	1.41
Edge						
Tukey test	DIFF !	DIFF !	–	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	–	–	–	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
Michigan State University - Pavement Research Center of Excellence

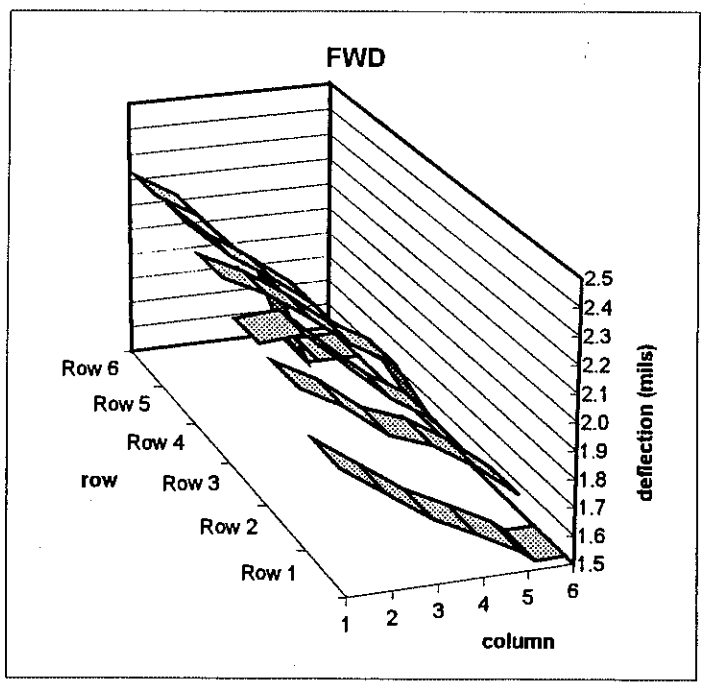
T. F. Wolff June 1996

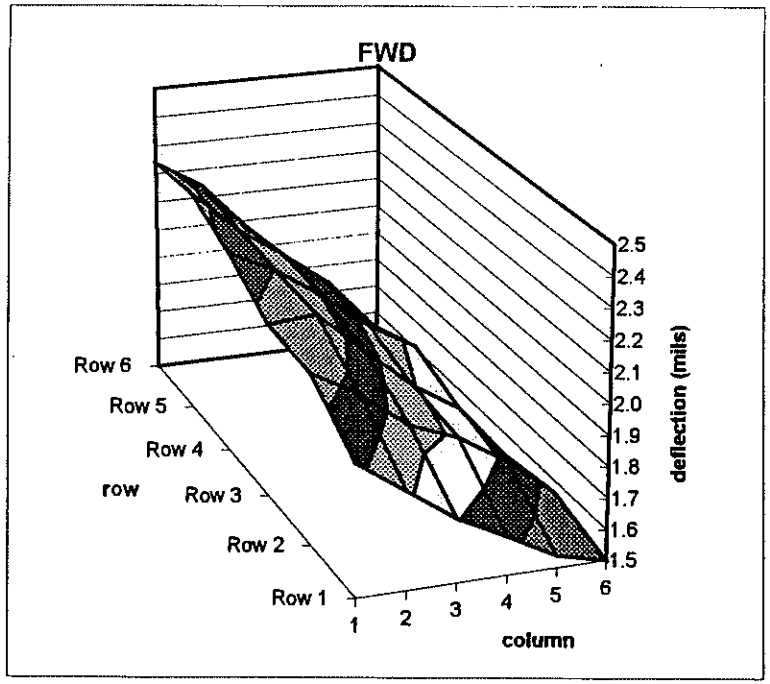
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	2.2	2.1	2.0	1.8	1.4	1.3	1.81	0.387	21.35%
5	2.3	2.1	2.0	1.9	1.7	1.6	1.93	0.247	12.80%
4	2.2	2.1	2.0	1.9	1.8	1.5	1.91	0.236	12.39%
3	2.1	2.1	1.9	1.8	1.7	1.5	1.86	0.218	11.76%
2	2.1	2.0	1.8	1.8	1.7	1.6	1.82	0.181	9.98%
1	1.9	1.8	1.7	1.6	1.5	1.4	1.67	0.185	11.07%
Average	2.12	2.04	1.91	1.80	1.63	1.49	1.83	**1.83**	0.242	13.23%
Std. Dev.	0.127	0.124	0.116	0.093	0.148	0.103	0.118		**0.24819**	
Coeff. of Var.	6.01%	6.11%	6.10%	5.16%	9.04%	6.88%	6.55%			**13.56%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Sample 1*





FWD Graph

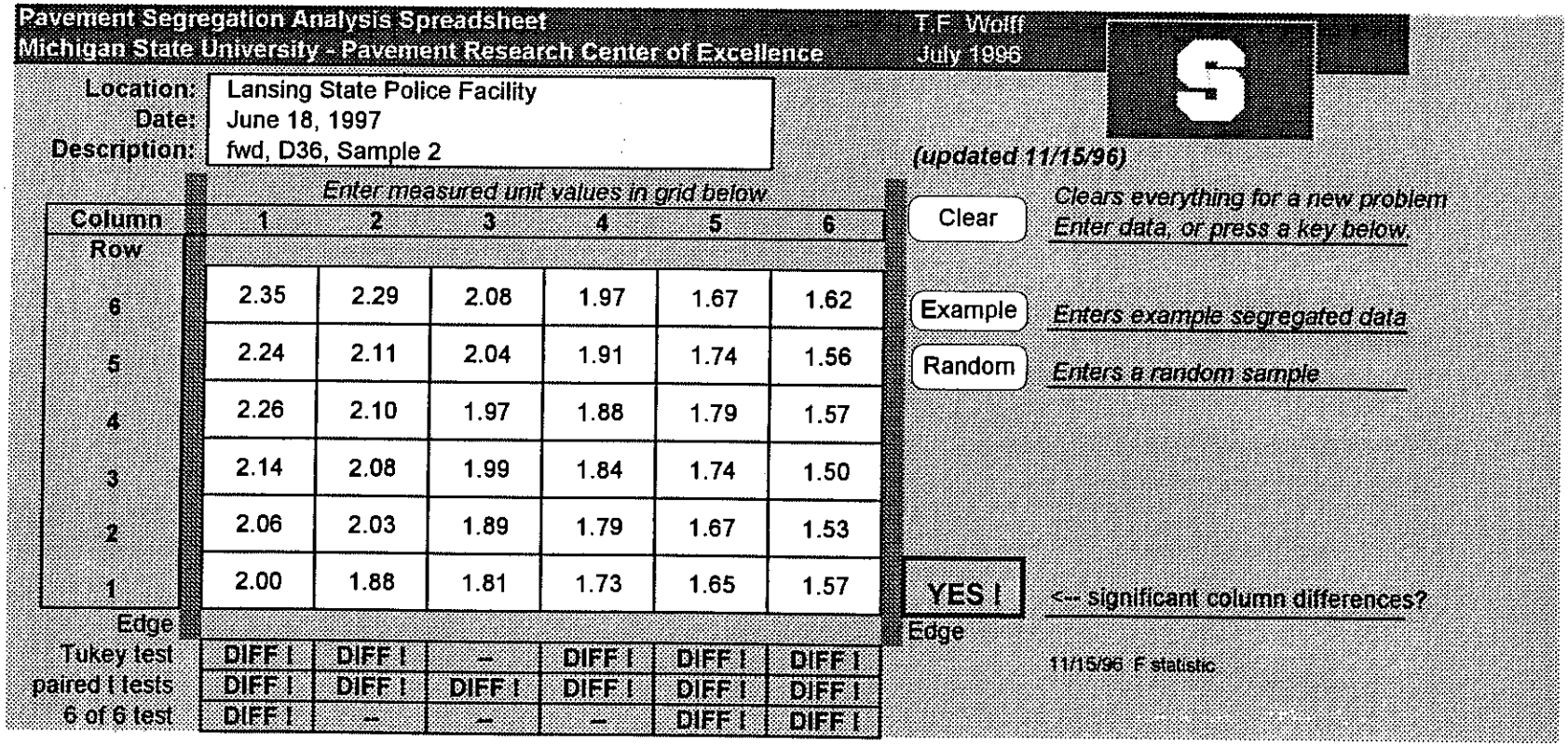
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	2.12	0.29	0.083	0.127	0.016
2	2.04	0.20	0.042	0.124	0.015
3	1.91	0.08	0.006	0.116	0.014
4	1.80	-0.03	0.001	0.093	0.009
5	1.63	-0.20	0.039	0.148	0.022
6	1.49	-0.34	0.115	0.103	0.011
sum			0.288		0.086
all data	1.83			0.248186	0.0616

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.7252284	5	0.345	**24.03714**	2.533554	1.161E-09
within columns:	0.43064074	30	0.014			
Total:	2.15586914			**Different ?**	1	YES!

ANOVA



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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D36, Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	2.35	2.29	2.08	1.97	1.67	1.62
5	2.24	2.11	2.04	1.91	1.74	1.56
4	2.26	2.10	1.97	1.88	1.79	1.57
3	2.14	2.08	1.99	1.84	1.74	1.50
2	2.06	2.03	1.89	1.79	1.67	1.53
1	2.00	1.88	1.81	1.73	1.65	1.57
Edge						

Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	--	--	--	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

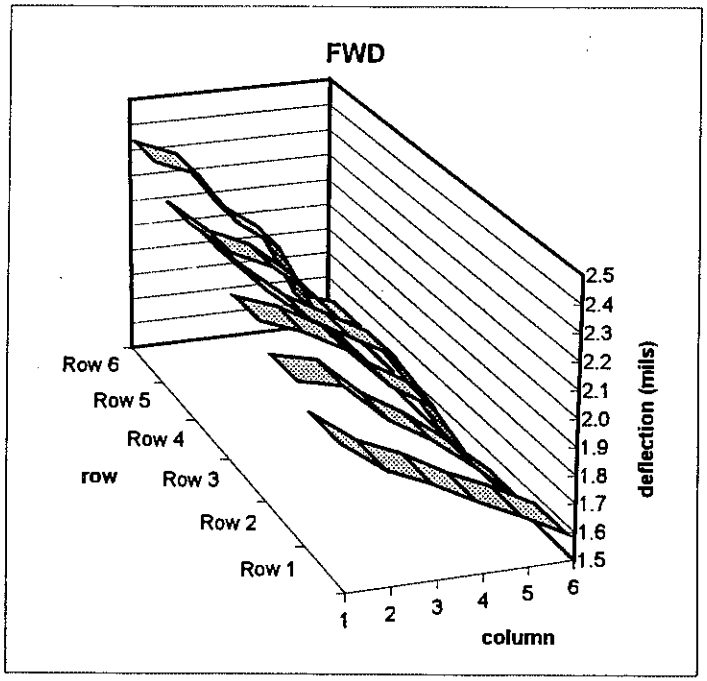
Location:	*Lansing State Police Facility*
Date:	*June 18, 1997*
Description:	*fwd, D36, Sample 2*

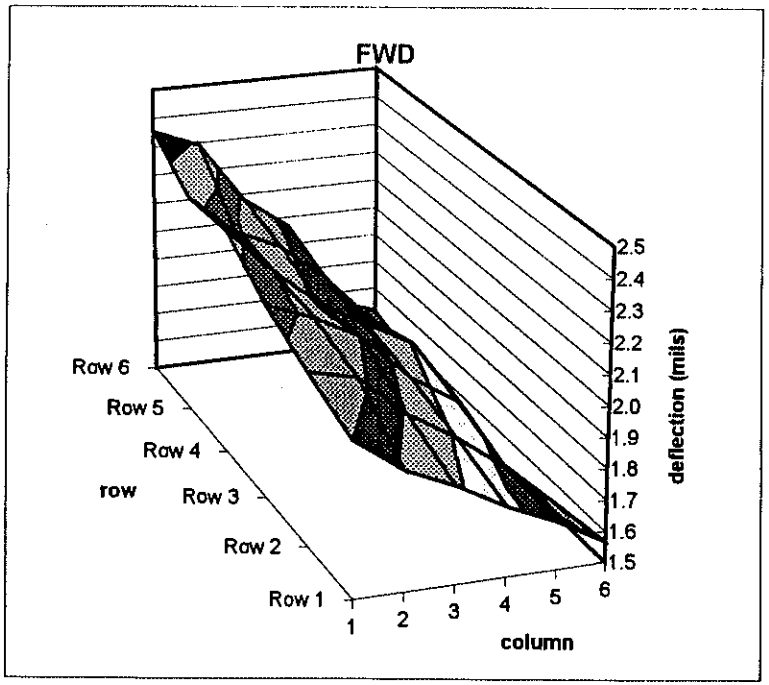
Color 1 *Color Above and Below Average*

Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	2.4	2.3	2.1	2.0	1.7	1.6	2.00	0.307	15.40%
5	2.2	2.1	2.0	1.9	1.7	1.6	1.93	0.252	13.03%
4	2.3	2.1	2.0	1.9	1.8	1.6	1.93	0.239	12.39%
3	2.1	2.1	2.0	1.8	1.7	1.5	1.88	0.240	12.77%
2	2.1	2.0	1.9	1.8	1.7	1.5	1.83	0.206	11.25%
1	2.0	1.9	1.8	1.7	1.7	1.6	1.77	0.158	8.89%
Average	2.18	2.08	1.96	1.85	1.71	1.56	1.89	**1.89**	0.234	12.29%
Std. Dev.	0.132	0.132	0.098	0.086	0.055	0.040	0.090		**0.23241**	
Coeff. of Var.	6.08%	6.33%	5.01%	4.62%	3.20%	2.59%	4.64%			**12.30%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Sample 2*





FWD 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	2.18	0.29	0.082	0.132	0.017
2	2.08	0.19	0.037	0.132	0.017
3	1.96	0.07	0.005	0.098	0.010
4	1.85	-0.04	0.001	0.086	0.007
5	1.71	-0.18	0.032	0.055	0.003
6	1.56	-0.33	0.110	0.040	0.002
sum			0.268		0.056
all data	1.89			0.232408	0.0540

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.60808765	5	0.322	**34.16886**	2.533554	1.615E-11
within columns:	0.28237778	30	0.009			
Total:	1.89046543			**Different ?**	1	YES!

ANOVA

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

T.F. Wolff
July 1996

(updated 11/15/96)

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D36, Sample 3

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	2.45	2.34	2.14	2.03	1.67	1.59
5	2.28	2.15	2.04	1.92	1.64	1.58
4	2.20	2.13	2.02	1.91	1.80	1.58
3	2.17	2.09	1.99	1.87	1.77	1.54
2	2.11	2.05	1.92	1.79	1.70	1.49
1	2.03	1.96	1.83	1.78	1.67	1.53
Edge						Edge
Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	--	--	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?

11/15/96 F statistic

DATA ENTRY

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

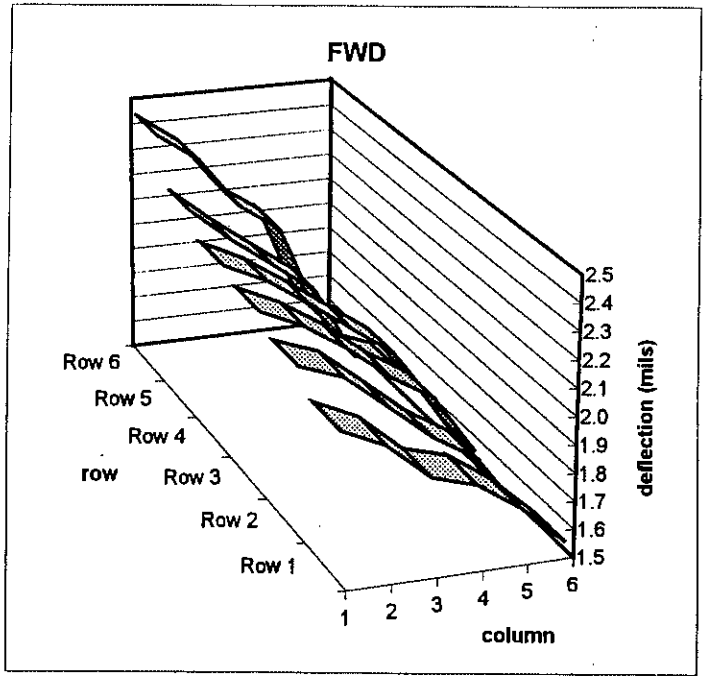
T. F. Wolff June 1996

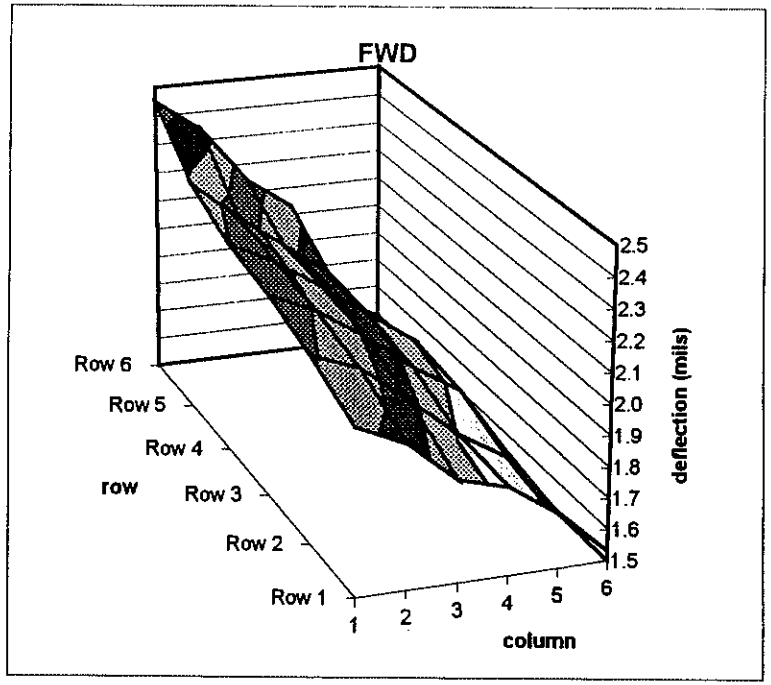
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	2.5	2.3	2.1	2.0	1.7	1.6	2.04	0.350	17.19%
5	2.3	2.2	2.0	1.9	1.6	1.6	1.94	0.280	14.48%
4	2.2	2.1	2.0	1.9	1.8	1.6	1.94	0.228	11.75%
3	2.2	2.1	2.0	1.9	1.8	1.5	1.91	0.229	12.01%
2	2.1	2.1	1.9	1.8	1.7	1.5	1.84	0.232	12.58%
1	2.0	2.0	1.8	1.8	1.7	1.5	1.80	0.184	10.24%
Average	2.21	2.12	1.99	1.88	1.71	1.55	1.91	**1.91**	0.251	13.04%
Std. Dev.	0.147	0.127	0.107	0.093	0.062	0.039	0.096		**0.24909**	
Coeff. of Var.	6.65%	5.99%	5.40%	4.95%	3.65%	2.51%	4.86%			**13.04%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Sample 3*





FWD 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

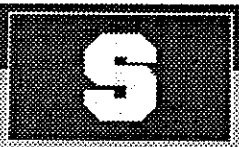
Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	2.21	0.30	0.089	0.147	0.022
2	2.12	0.21	0.044	0.127	0.016
3	1.99	0.08	0.006	0.107	0.012
4	1.88	-0.03	0.001	0.093	0.009
5	1.71	-0.20	0.041	0.062	0.004
6	1.55	-0.36	0.128	0.039	0.002
sum			0.309		0.063
all data	1.91			0.249092	0.0620

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.85503951	5	0.371	**35.15552**	2.533554	1.129E-11
within columns:	0.3166	30	0.011			
Total:	2.17163951					

Different ? | 1 | YES!

ANOVA

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



Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D36, Average of three samples

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	2.35	2.26	2.07	1.94	1.57	1.51
5	2.26	2.12	2.03	1.90	1.70	1.58
4	2.21	2.11	1.99	1.88	1.79	1.56
3	2.13	2.09	1.98	1.84	1.74	1.52
2	2.08	2.01	1.88	1.79	1.68	1.53
1	1.99	1.89	1.78	1.71	1.62	1.50
Edge						
Tukey test	DIFF !	DIFF !	--	DIFF !	DIFF !	DIFF !
paired t tests	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !	DIFF !
6 of 6 test	DIFF !	DIFF !	--	--	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

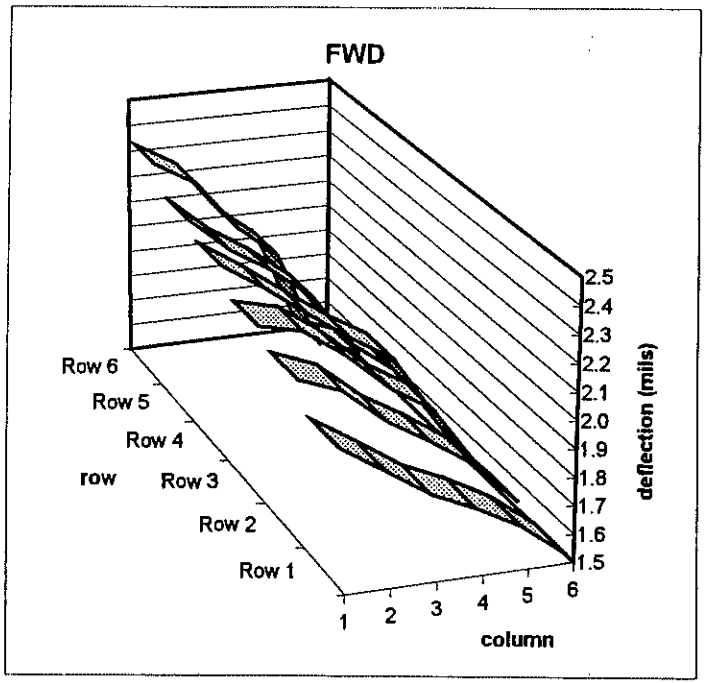
T. F. Wolff June 1996

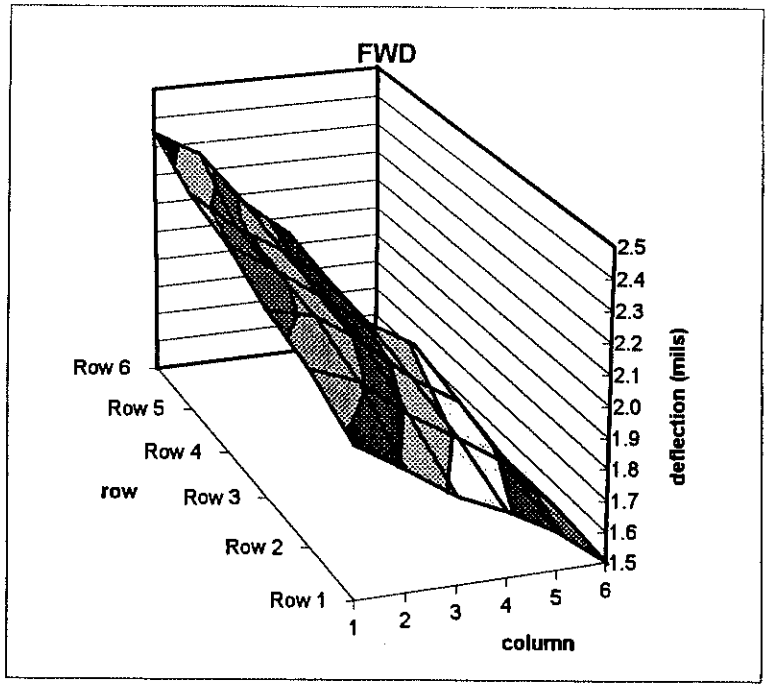
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Average of three samples*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	2.3	2.3	2.1	1.9	1.6	1.5	1.95	0.348	17.85%
5	2.3	2.1	2.0	1.9	1.7	1.6	1.93	0.259	13.40%
4	2.2	2.1	2.0	1.9	1.8	1.6	1.92	0.234	12.14%
3	2.1	2.1	2.0	1.8	1.7	1.5	1.88	0.229	12.16%
2	2.1	2.0	1.9	1.8	1.7	1.5	1.83	0.206	11.25%
1	2.0	1.9	1.8	1.7	1.6	1.5	1.75	0.175	10.03%
Average	2.17	2.08	1.95	1.84	1.68	1.53	1.88	**1.88**	0.242	12.80%
Std. Dev.	0.132	0.124	0.104	0.084	0.078	0.030	0.092		**0.23996**	
Coeff. of Var.	6.08%	5.95%	5.34%	4.54%	4.66%	1.94%	4.75%			**12.78%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D36, Average of three samples*





FWD 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	2.17	0.29	0.085	0.132	0.017
2	2.08	0.20	0.041	0.124	0.015
3	1.95	0.08	0.006	0.104	0.011
4	1.84	-0.03	0.001	0.084	0.007
5	1.68	-0.19	0.038	0.078	0.006
6	1.53	-0.34	0.118	0.030	0.001
sum			0.288		0.058
all data	1.88			0.239963	0.0576

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	1.72743896	5	0.345	**35.99526**	2.533554	8.378E-12
within columns:	0.28794444	30	0.010			
Total:	2.0153834					

Different ? 1 YES!

ANOVA

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

T.F. Wolff
July 1996

Location:	Lansing State Police Facility
Date:	June 18, 1997
Description:	fwd, D60, Sample 1

(updated 11/15/96)

Enter measured unit values in grid below

Column / Row	1	2	3	4	5	6
6	0.72	0.75	0.75	0.70	0.64	0.64
5	0.72	0.68	0.70	0.67	0.67	0.67
4	0.67	0.67	0.67	0.66	0.65	0.63
3	0.68	0.68	0.65	0.62	0.63	0.65
2	0.66	0.65	0.64	0.64	0.63	0.64
1	0.67	0.61	0.60	0.59	0.60	0.62
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 Edge <--- significant column differences?

11/15/96 F statistic

DATA ENTRY

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

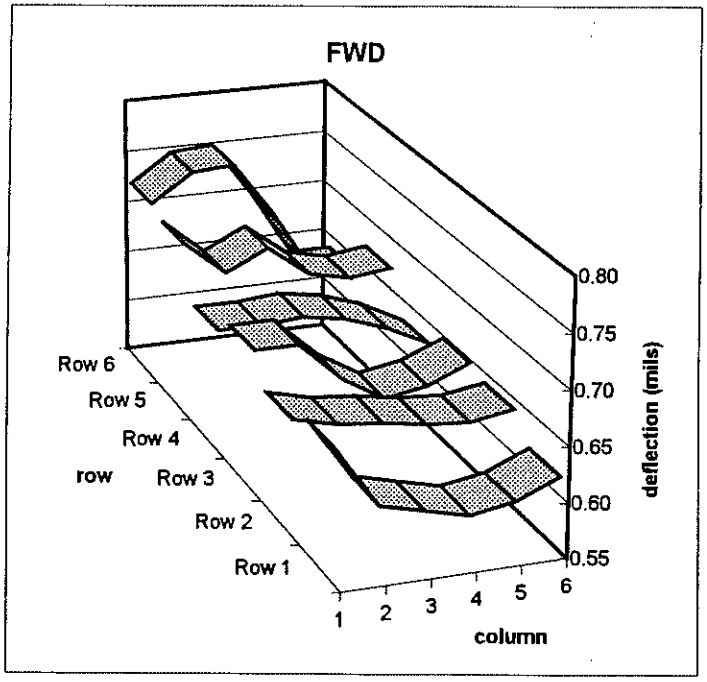
T. F. Wolff June 1996

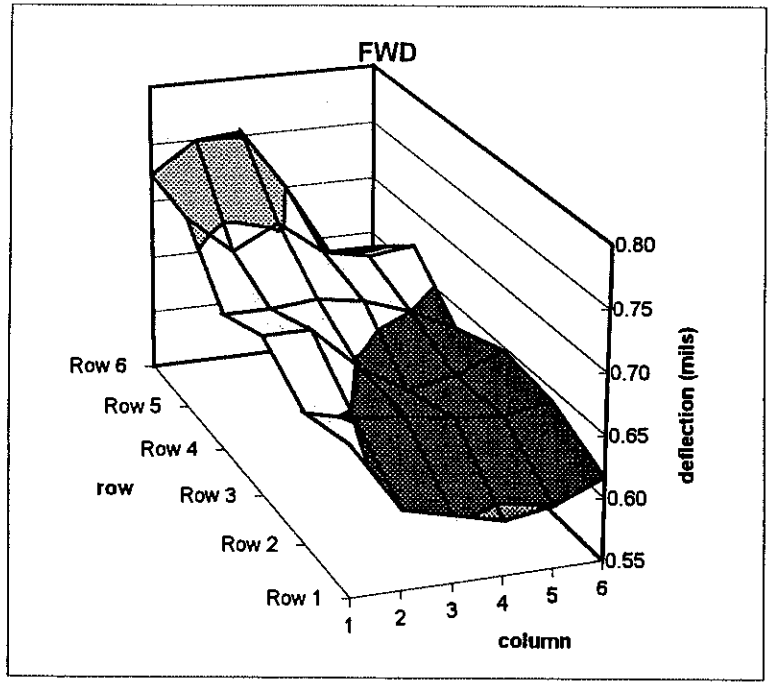
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 1*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	0.7	0.8	0.8	0.7	0.6	0.6	0.70	0.053	7.54%
5	0.7	0.7	0.7	0.7	0.7	0.7	0.69	0.021	2.99%
4	0.7	0.7	0.7	0.7	0.7	0.6	0.66	0.015	2.33%
3	0.7	0.7	0.6	0.6	0.6	0.6	0.65	0.026	3.95%
2	0.7	0.6	0.6	0.6	0.6	0.6	0.64	0.008	1.29%
1	0.7	0.6	0.6	0.6	0.6	0.6	0.62	0.028	4.51%
Average	0.69	0.67	0.67	0.65	0.64	0.64	0.66	**0.66**	0.025	3.77%
Std. Dev.	0.028	0.046	0.052	0.038	0.022	0.018	0.034		**0.03848**	
Coeff. of Var.	4.03%	6.78%	7.83%	5.90%	3.43%	2.80%	5.13%			**5.84%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 1*





FWD 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	0.69	0.03	0.001	0.028	0.001
2	0.67	0.01	0.000	0.046	0.002
3	0.67	0.01	0.000	0.052	0.003
4	0.65	-0.01	0.000	0.038	0.001
5	0.64	-0.02	0.001	0.022	0.000
6	0.64	-0.02	0.000	0.018	0.000
sum			0.002		0.008
all data	0.66			0.038484	0.0015

ANOVA

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	0.01253495	5	0.003	**1.91371**	2.533554	0.1215081
within columns:	0.03930046	30	0.001			
Total:	0.05183542			**Different ?**	**0**	**no**

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

Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D60, Sample 2

(updated 11/15/96)

Enter measured unit values in grid below

Column	1	2	3	4	5	6
Row						
6	0.74	0.77	0.77	0.72	0.70	0.66
5	0.71	0.72	0.67	0.67	0.66	0.66
4	0.68	0.66	0.65	0.66	0.67	0.65
3	0.68	0.68	0.65	0.66	0.62	0.62
2	0.67	0.65	0.63	0.63	0.62	0.65
1	0.65	0.61	0.63	0.60	0.61	0.64
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

11/15/96 F statistic

DATA ENTRY

Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996

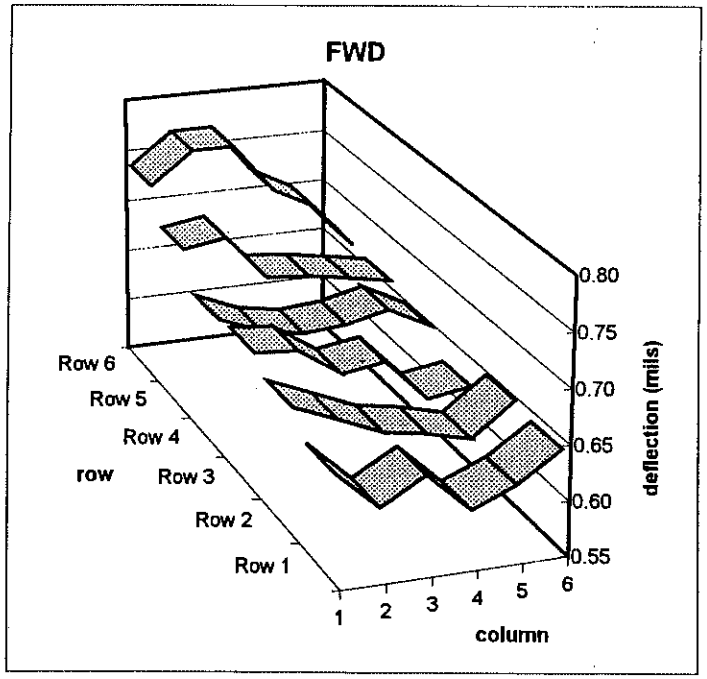
Michigan State University - Pavement Research Center of Excellence

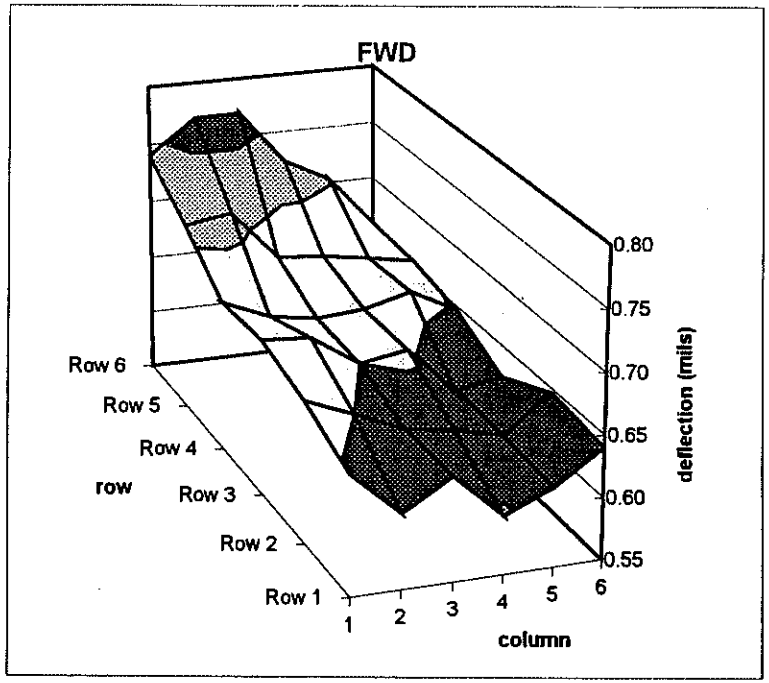
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 2*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	0.7	0.8	0.8	0.7	0.7	0.7	0.73	0.042	5.81%
5	0.7	0.7	0.7	0.7	0.7	0.7	0.68	0.025	3.71%
4	0.7	0.7	0.7	0.7	0.7	0.6	0.66	0.011	1.60%
3	0.7	0.7	0.7	0.7	0.6	0.6	0.65	0.026	4.05%
2	0.7	0.7	0.6	0.6	0.6	0.6	0.64	0.018	2.81%
1	0.6	0.6	0.6	0.6	0.6	0.6	0.62	0.020	3.14%
Average	0.69	0.68	0.67	0.66	0.65	0.65	0.66	**0.66**	0.024	3.52%
Std. Dev.	0.033	0.056	0.052	0.043	0.037	0.013	0.039		**0.04158**	
Coeff. of Var.	4.84%	8.22%	7.73%	6.52%	5.70%	2.03%	5.84%			**6.26%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 2*





FWD Graph

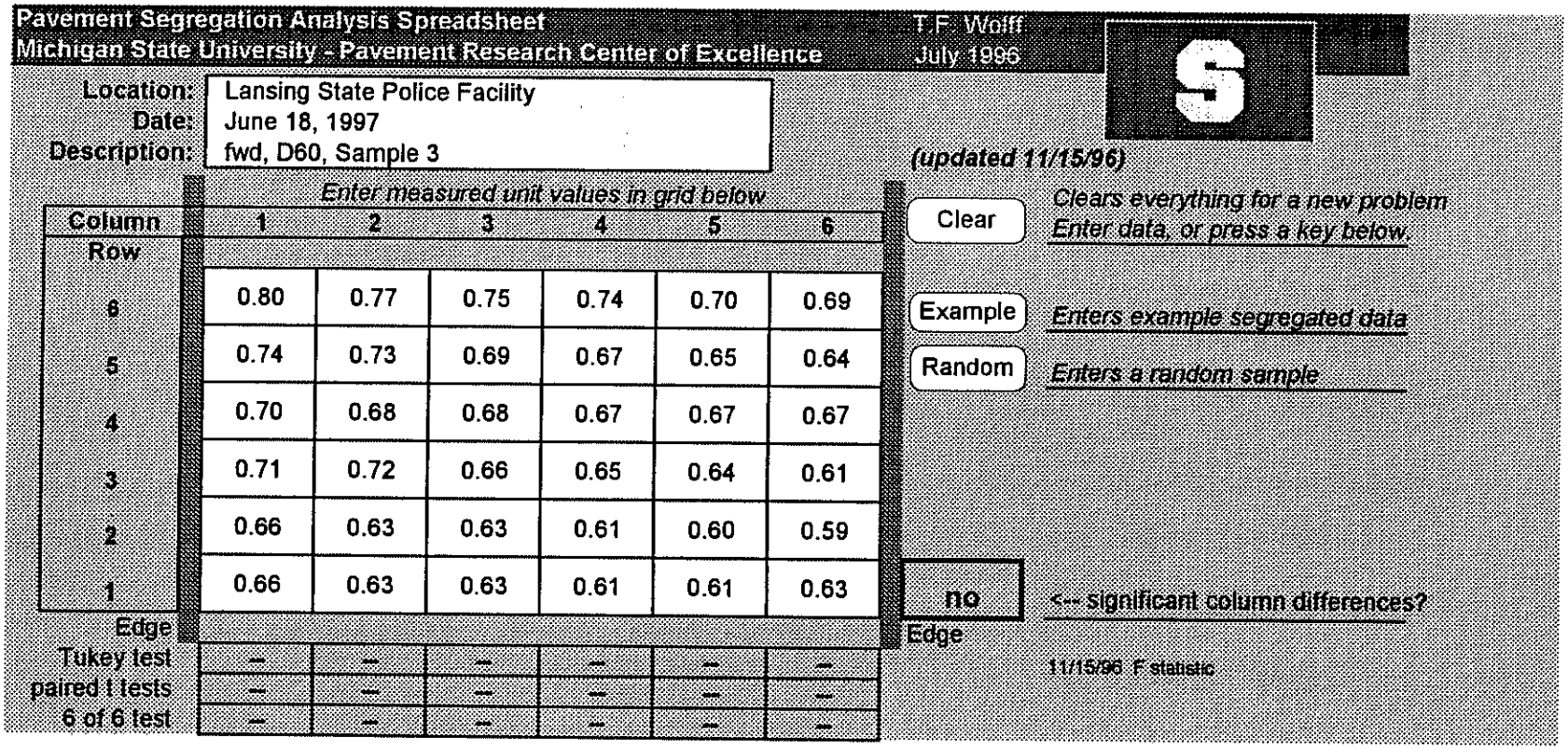
Pavement Segregation Analysis Spreadsheet T. F. Wolff June 1996
Michigan State University - Pavement Research Center of Excellence

One-way analysis of variance on column data

Column	Average	Diff from grnd mean	Diff ^2	sigma	Variance
1	0.69	0.02	0.001	0.033	0.001
2	0.68	0.02	0.000	0.056	0.003
3	0.67	0.01	0.000	0.052	0.003
4	0.66	-0.01	0.000	0.043	0.002
5	0.65	-0.02	0.000	0.037	0.001
6	0.65	-0.02	0.000	0.013	0.000
sum			0.002		0.010
all data	0.66			0.041584	0.0017

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	0.0092	5	0.002	**1.07556**	2.533554	0.3936104
within columns:	0.05132222	30	0.002			
Total:	0.06052222			**Different ?**	**0**	**no**

ANOVA


Pavement Segregation Analysis Spreadsheet
Michigan State University - Pavement Research Center of Excellence
T.F. Wolff
July 1996
Location: Lansing State Police Facility
Date: June 18, 1997
Description: fwd, D60, Sample 3
(updated 11/15/96)
Enter measured unit values in grid below
Column 1 2 3 4 5 6
Row
6 0.80 0.77 0.75 0.74 0.70 0.69
5 0.74 0.73 0.69 0.67 0.65 0.64
4 0.70 0.68 0.68 0.67 0.67 0.67
3 0.71 0.72 0.66 0.65 0.64 0.61
2 0.66 0.63 0.63 0.61 0.60 0.59
1 0.66 0.63 0.63 0.61 0.61 0.63
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
Edge
<-- significant column differences?
11/15/96 F statistic

DATA ENTRY

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

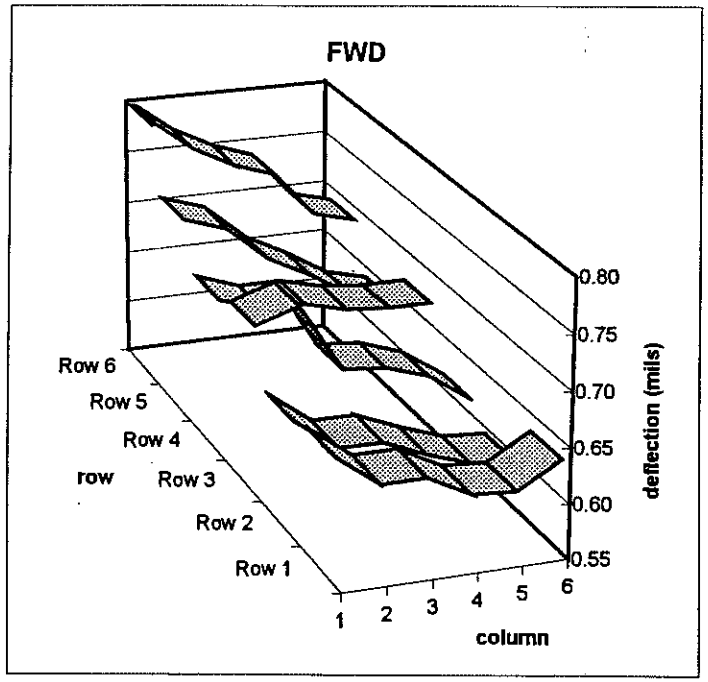
T. F. Wolff June 1996

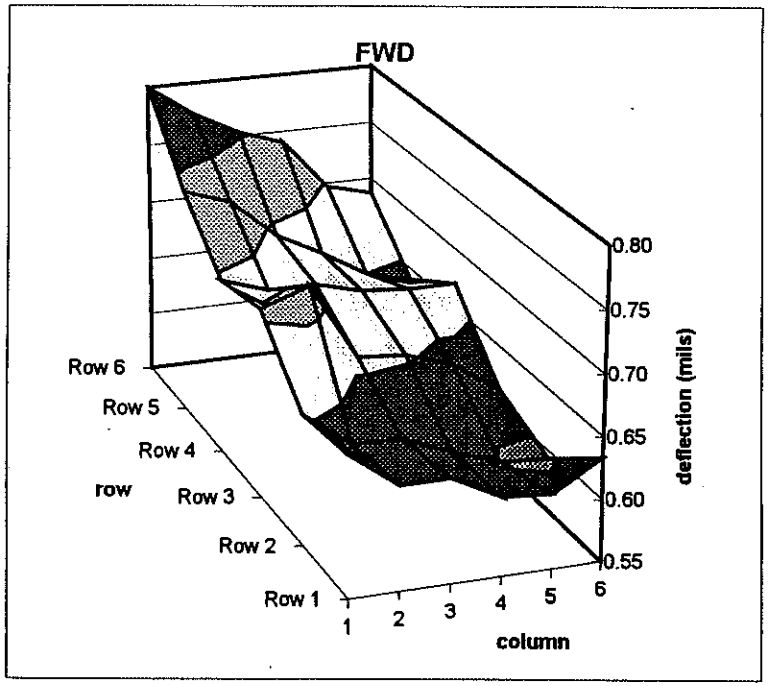
Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 3*

Color 1 *Color Above and Below Average*
Clear Color

Column	1	2	3	4	5	6	Average	Standard Deviation	Coeff of Variation
Row									
6	0.8	0.8	0.8	0.7	0.7	0.7	0.74	0.045	6.02%
5	0.7	0.7	0.7	0.7	0.7	0.6	0.69	0.040	5.89%
4	0.7	0.7	0.7	0.7	0.7	0.7	0.68	0.010	1.53%
3	0.7	0.7	0.7	0.7	0.6	0.6	0.67	0.041	6.11%
2	0.7	0.6	0.6	0.6	0.6	0.6	0.62	0.024	3.81%
1	0.7	0.6	0.6	0.6	0.6	0.6	0.63	0.019	3.02%
Average	0.71	0.69	0.67	0.66	0.64	0.64	0.67	**0.67**	0.030	4.40%
Std. Dev.	0.054	0.057	0.047	0.048	0.037	0.035	0.046		**0.05082**	
Coeff. of Var.	7.65%	8.24%	6.94%	7.25%	5.77%	5.42%	6.88%			**7.58%**

Location: *Lansing State Police Facility*
Date: *June 18, 1997*
Description: *fwd, D60, Sample 3*





FWD 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	0.69	0.03	0.001	0.038	0.001
2	0.68	0.02	0.000	0.052	0.003
3	0.67	0.01	0.000	0.049	0.002
4	0.65	-0.01	0.000	0.042	0.002
5	0.64	-0.02	0.001	0.029	0.001
6	0.64	-0.02	0.001	0.015	0.000
sum			0.002		0.009
all data	0.66			0.041772	0.0017

ANOVA

	Sum Sq	df	Variance	F	Fcrit	Prob
between columns:	0.01442878	5	0.003	**1.85607**	2.533554	0.1319972
within columns:	0.04664306	30	0.002			
Total:	0.06107184					

Different ? 0 no