

Falling Weight Deflectometer vs Laboratory Determined Resilient Modulus (Slab Curling Study)

FINAL REPORT
December 2005

Submitted by

Dr. Sameh Zaghloul, P.E., P.Eng.*
Managing Senior Principal

Dr. Nenad Gucunski**
Professor

Dr. Hudson Jackson, P.E.,*** Pavement Specialist
Ms. Ivana Marukic, M.Sc.,*** Program Analyst



*Stantec Consulting Ltd.
150 Lawrence Bell Drive, Suite 108
Amherst, NY 14221

** Center for Advanced Infrastructure
& Transportation (CAIT)
Dept. of Civil & Environmental Engineering
Rutgers, the State University

***Stantec Consulting Ltd.
9 Princess Road, Unit D
Lawrenceville, NJ 08648



NJDOT
RESEARCH PROJECT MANAGER
Mr. Anthony Chmiel

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15. Supplementary Notes e-mail addresses: szaghloul@stantec.com gucunski@rci.rutgers.edu hjackson@stantec.com imarukic@stantec.com			
16. Abstract Stantec Consulting completed Falling Weight Deflectometer (FWD) testing on three PCC Slabs built at East Brunswick location. Two sets of FWD testing were performed, one on August 5, 2005 and the second on October 28, 2005. Dynatest Model 8002-231 series Falling Weight Deflectometer (FWD) was used for deflection testing. Deflection tests were performed on three constructed slabs along three paths (right wheel path, edge and slab center line) using three load levels, 9000, 12000 and 14000 lbs. The pavement deflections measured with the FWD were used to determine the structural properties of the pavement layer and subgrade soil through the backcalculation. The backcalculation analysis was performed according to 1993 AASHTO Design Guide to calculate the in-situ pavement structural capacity and subgrade modulus. The pavement PCC thickness varied slightly from 11 inches to 11.5 inches; therefore a thickness of 11.5 inches was used in the backcalculation analysis. A 4 inches base and 4 inches subbase thickness were assumed for the backcalculation analysis.			
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Slab Curling Study

Table of Contents

SUMMARY

1.0 INTRODUCTION	1.1
<hr/>	
2.0 TESTING PLAN.....	2.1
2.1 TEST LOCATIONS	2.1
<hr/>	
3.0 ANALYSIS METHODOLOGY AND RESULTS.....	3.1
3.1 MAXIMUM NORMALIZED DEFLECTION	3.1
3.2 BACKCALCULATION OF MATERIAL PROPERTIES	3.3
<hr/>	
4.0 CLOSURE	4.1
<hr/>	
APPENDIX A	A.1

Summary

Stantec Consulting completed Falling Weight Deflectometer (FWD) testing on three PCC slabs built at East Brunswick location. Two sets of FWD testing were performed, one on August 5th, 2005 and the second on October 28th, 2005.

Dynatest Model 8002-231 series Falling Weight Deflectometer (FWD) was used for deflection testing. Deflection tests were performed on three constructed slabs along three paths (right wheel path, edge and slab center line) using three load levels, 9000, 12000 and 14000 lbs. The pavement deflections measured with the FWD were used to determine the structural properties of the pavement layer and subgrade soil through the backcalculation. The backcalculation analysis was performed according to 1993 AASHTO Design Guide to calculate the in-situ pavement structural capacity and subgrade modulus.

The pavement PCC thickness varied slightly from 11 inches to 11.5 inches; therefore a thickness of 11.5 inches was used in the backcalculation analysis. A 4 inches base and 4 inches subbase thickness were assumed for the backcalculation analysis.

1.0 Introduction

Stantec Consulting was contracted by Rutgers University to conduct the FWD testing and corresponding analysis on three PCC slabs that were built in East Brunswick. Constructed slabs had an average thickness of 11.5 inches and width of 12 ft. Each of the slabs has different length. "Slab 1" is 16.7 ft long, "Slab 2" is 15 ft long while "Slab 3" is 78.5 ft long.

As a part of the pavement evaluation, this report was prepared to summarize the FWD testing and data analysis and to quantify the strength of the pavement structure.

FWD tests were performed by Stantec on August 5th and October 28th 2005. Deflection measurements were taken along Right Wheel Path, Edge and Centerline. Tests were performed at slab center and joint approach and joint leave (along the longer slab, "Slab 3", two additional tests were added) along each tested path.

2.0 Testing Plan

The FWD testing was performed using an LTPP-SHRP calibrated FWD to determine the structural capacity of newly constructed pavement. Test locations included three PCC slabs, one 78.5 ft long slab, one 15 ft long slab and the one 16.7 ft long slab. Deflection testing was performed along three paths: RWP (3 ft from slab right end), Edge (1ft from slab right end) and Centerline (6 ft from the slab right end) for the 12 ft wide slabs.

Each slab was tested with nine test points per slab (center of the path, joint approach and joint leave). In addition, the long slab (78.5 ft) had two additional test points in each wheel path, as shown in Figure 1. All testing points were paint marked before the start of the testing.

The slabs were retested 3 times on each testing day. At each test location a series of four load applications were applied to the pavement surface. The first application is a “seating” drop of 9000 lbs to ensure that the FWD loading plate is firmly resting on the pavement surface. The next three load levels are approximately 9000, 12000 and 14000 lbs. At each test location pavement deflections under load were measured by nine sensors (geophones) placed at the following fixed spacing (see Table 1) from the center of the 12 inches diameter load plate. Both pavement and air temperatures were automatically and continuously recorded during the FWD testing.

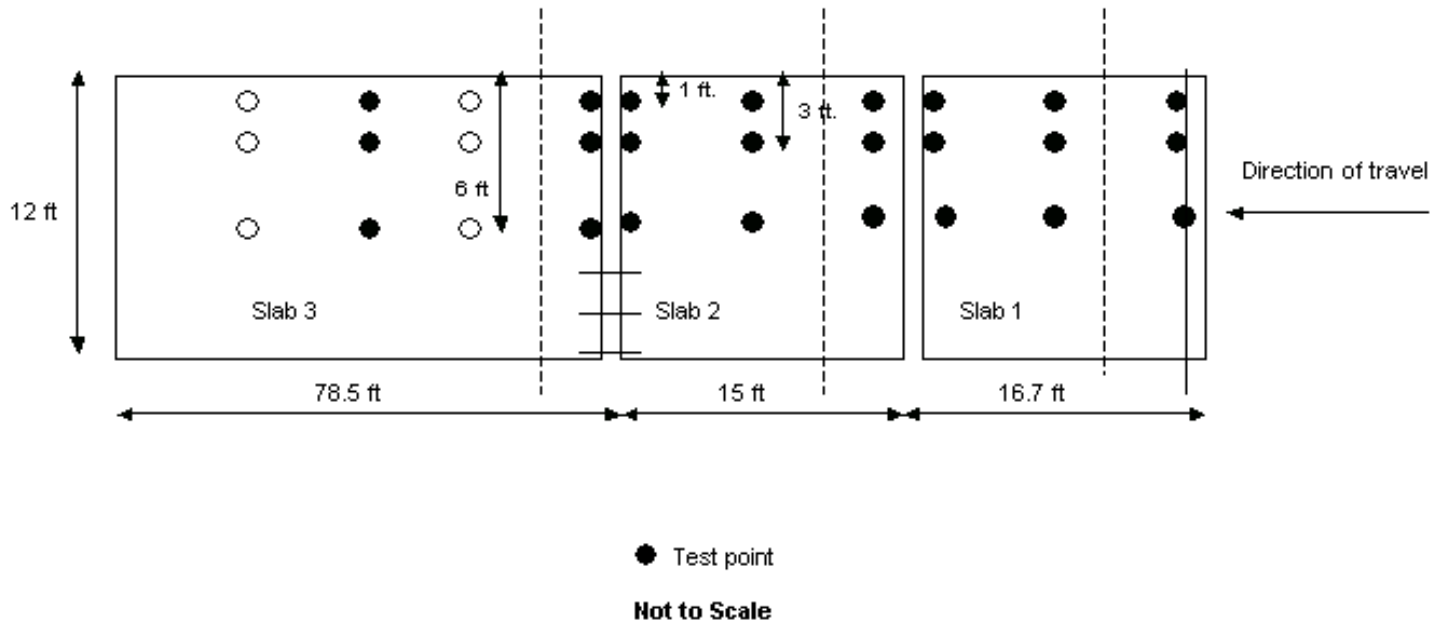
Table 1. FWD Sensor Configuration

Sensor Number	1	2	3	4	5	6	7	8	9
Offset from Load Center (in.)	0	12	18	24	36	48	60	72	-12

2.1 TEST LOCATIONS

Figure 1 shows the test locations.

TEST LOCATIONS



3.0 Analysis Methodology and Results

The AASHTO 1993 Design Guide backcalculation analysis was used to determine the structural properties of the pavement layers and subgrade soils.

3.1 MAXIMUM NORMALIZED DEFLECTION

The maximum normalized deflection (D_o), measured at the center of the load plate, is a good indicator of overall pavement strength. The deflection at this location is a function of the pavement layer stiffness, as well as the support capacity of the subgrade. As deflection depends on load and due to slight variations in measured load at each test point, the deflections are adjusted or normalized to a “standard” load level of 9000 lbs. Figures 2 and 3 represent the variation of maximum normalized deflection (D_o) data along the tested slabs. The first test location (leave joint) is represented as Station 0 and the remaining test locations are referenced from it in feet. For more details see Figure 1. Figures 4 and 5 show the change in the surface temperature during the testing.

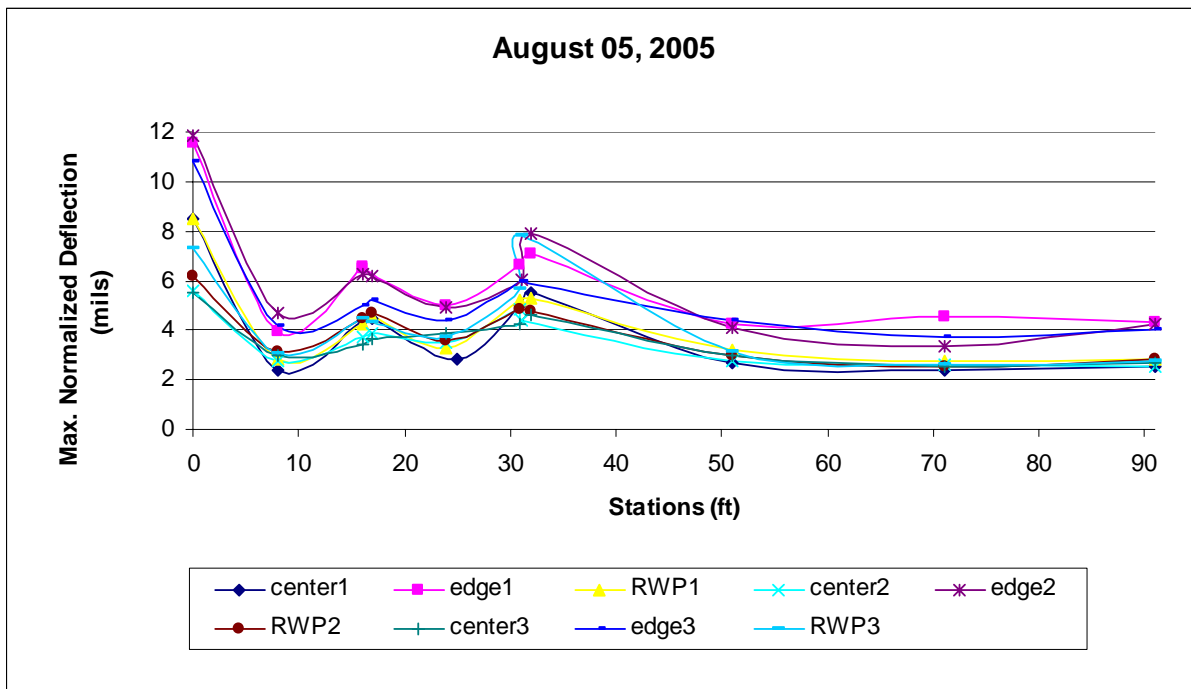


Figure 2. Maximum Normalized Deflections along the Slabs for August Testing

SLAB CURLING STUDY

Analysis Methodology and Results

December 5, 2005

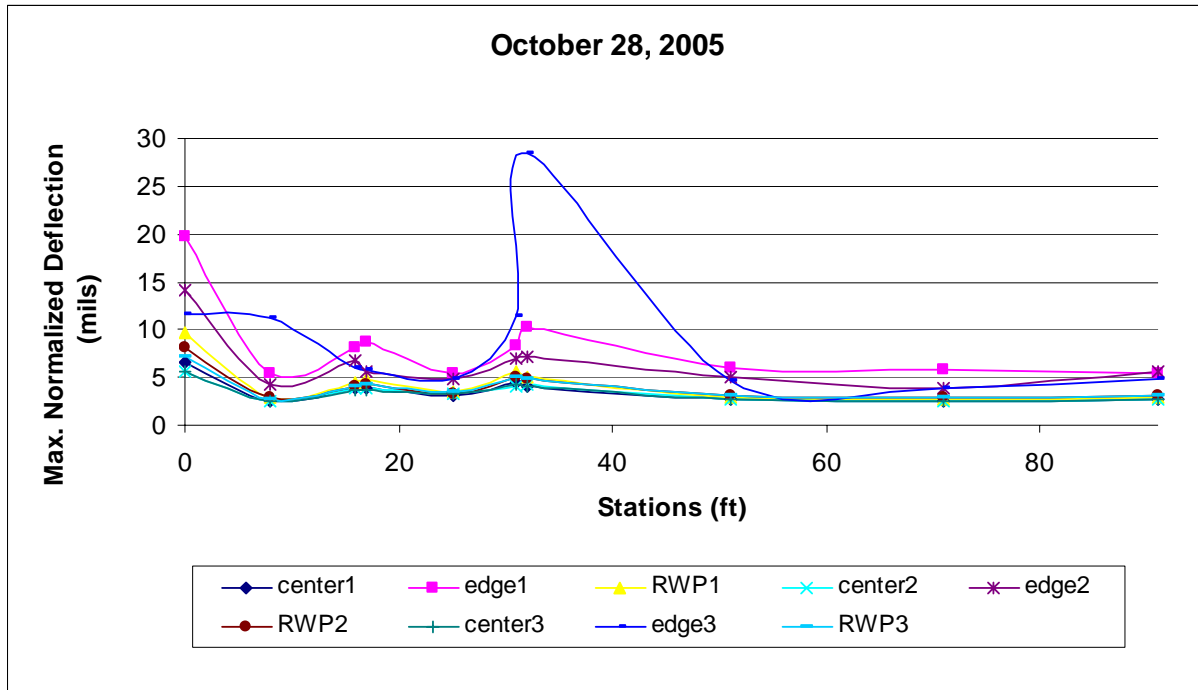


Figure 3. Maximum Normalized Deflections along the Slabs for October Testing

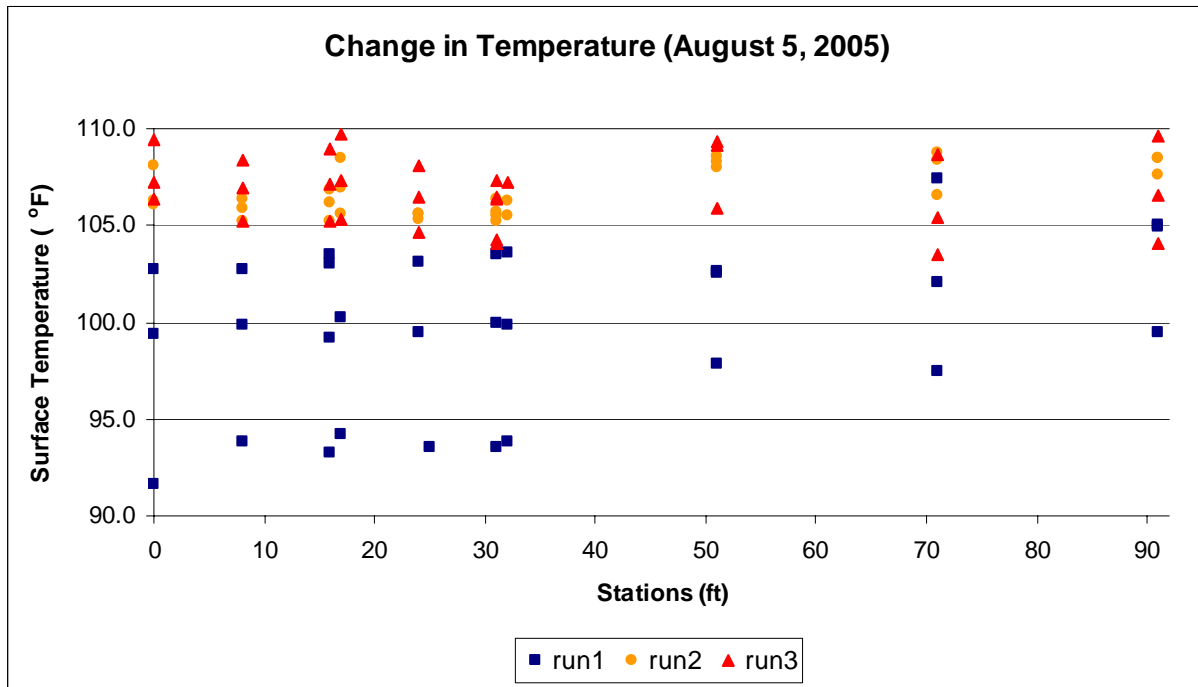


Figure 4. Change in Surface Temperature for August Testing Cycle

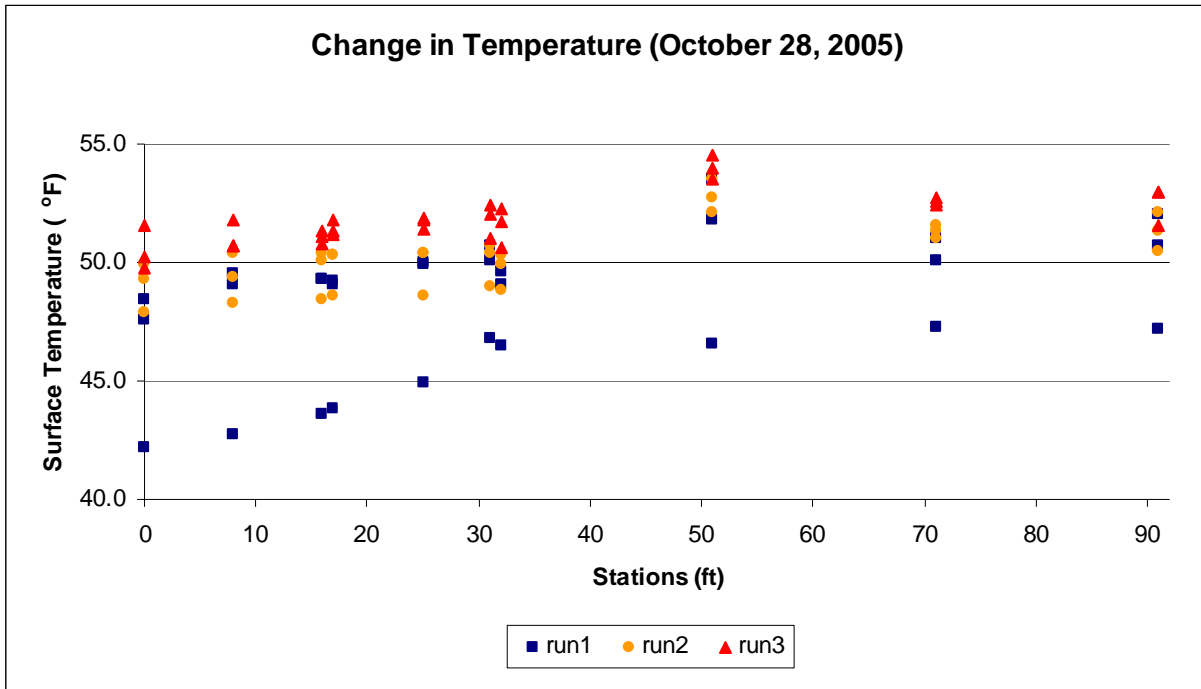


Figure 5. Change in Surface Temperature for October testing cycle

3.2 BACKCALCULATION OF MATERIAL PROPERTIES

The pavement deflections measured with the FWD are used to determine the structural properties of the pavement layers and subgrade soils in terms of Concrete elastic moduli (E_{pcc}) and Modulus of subgrade reaction (K_s), through the “backcalculation” process.

The normalized deflections and backcalculated results for August and October testing are presented in the Table 2 and Table 3 included in the Appendix A.

4.0 Closure

This report is based on FWD testing conducted by Stantec on August 5, 2005 and October 28, 2005 and it summarizes the backcalculation results for three PCC slabs in East Brunswick location. Results reported here are considered to be complete within the scope of services agreed upon.

Appendix A

SLAB CURLING STUDY

Appendix A

December 5, 2005

Table 2: Normalized Deflections and Backcalculated Results August 2005

Run	Slabld	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run1	slab 0	0	LAvg	8.48	6.02	4.77	3.45	1.97	91.6	86.9	79.34	0.00	0
run1	slab 1	8	MAvg	2.39	2.02	1.96	1.66	2.14	93.8	87.8		199.84	4,133,601
run1	slab 1	16	AAvg	4.37	3.63	3.06	2.34	3.54	93.3	87.7	90.54	0.00	0
run1	slab 1	17	LAvg	4.48	3.28	2.80	2.17	3.82	94.2	87.7	81.78	0.00	0
run1	slab 2	25	MAvg	2.86	2.39	2.19	1.85	2.56	93.5	87.0		209.44	2,755,754
run1	slab 2	31	AAvg	5.03	3.74	3.27	2.57	3.95	93.5	88.6	87.82	0.00	0
run1	slab 2	32	LAvg	5.55	4.05	3.42	2.62	4.16	93.8	88.3	81.56	0.00	0
run1	Slab 3 BC	51	MAvg	2.69	2.26	2.15	1.83	2.40	97.8	88.8		191.34	3,419,505
run1	Slab 3	71	MAvg	2.42	2.03	1.95	1.66	2.17	97.5	89.9		207.30	3,893,942
run1	Slab 3 AC	91	MAvg	2.51	2.16	2.08	1.74	2.29	99.5	90.8		173.10	4,355,647
run1	Slab 0	0	LAvg	11.53	8.54	7.02	5.32	11.57	102.7	96.0	80.12	0.00	0
run1	Slab 1	8	MAvg	3.92	3.40	3.42	2.92	3.63	102.7	95.2		85.41	3,630,164
run1	Slab 1	16	AAvg	6.56	5.44	4.73	3.71	5.47	103.0	94.0	90.33	0.00	0
run1	Slab 1	16	LAvg	6.48	4.91	4.35	3.48	5.80	103.5	94.2	82.00	0.00	0
run1	Slab 2	24	MAvg	5.00	4.26	4.05	3.39	4.70	103.1	94.0		96.41	1,967,543
run1	Slab 2	31	AAvg	6.60	5.01	4.33	3.42	5.38	103.5	95.3	88.29	0.00	0
run1	Slab 2	32	LAvg	7.07	5.42	4.68	3.75	5.48	103.6	95.9	82.95	0.00	0
run1	Slab 3 BC	51	MAvg	4.24	3.74	3.64	3.12	3.99	102.6	96.9		79.20	3,356,156
run1	Slab 3	71	MAvg	4.52	3.90	3.81	3.17	4.22	107.4	96.8		89.77	2,592,290
run1	Slab 3 AC	91	MAvg	4.35	3.71	3.55	2.99	3.99	104.9	96.0		108.09	2,312,191
run1	Slab 0	0	LAvg	8.47	6.03	4.92	3.63	2.27	99.4	93.0	83.67	0.00	0
run1	Slab 1	8	MAvg	2.85	2.31	2.24	1.98	2.42	99.9	93.0		199.07	2,925,181
run1	Slab 1	16	AAvg	4.26	3.56	3.13	2.44	3.52	99.2	92.0	97.02	0.00	0
run1	Slab 1	17	LAvg	4.51	3.39	2.91	2.36	3.96	100.2	91.7	88.31	0.00	0
run1	Slab 2	24	MAvg	3.25	2.70	2.58	2.14	2.87	99.5	92.5		170.63	2,618,341
run1	Slab 2	31	AAvg	5.19	3.66	3.21	2.56	4.11	100.0	92.7	92.87	0.00	0
run1	Slab 2	32	LAvg	5.30	3.97	3.41	2.70	4.23	99.9	92.4	87.91	0.00	0
run1	Slab 3 BC	51	MAvg	3.24	2.80	2.71	2.35	2.96	102.5	93.5		121.96	3,711,713
run1	Slab 3	71	MAvg	2.79	2.35	2.26	1.91	2.55	102.1	93.6		174.31	3,497,655
run1	Slab 3 AC	91	MAvg	2.83	2.41	2.32	1.95	2.56	105.0	93.7		162.82	3,633,316

SLAB CURLING STUDY

Appendix A

December 5, 2005

Run	SlabId	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run2	Slab 0	0	LAvg	5.62	4.01	3.31	2.44	4.45	106.3	96.1	78.88	0.00	0
run2	Slab 1	8	MAvg	2.74	2.31	2.28	1.94	2.48	106.4	96.7		161.36	3,929,691
run2	Slab 1	16	AAvg	3.72	3.01	2.62	2.05	3.00	106.8	97.1	88.98	0.00	0
run2	Slab 1	17	LAvg	3.85	2.83	2.45	2.01	3.16	108.5	97.3	81.28	0.00	0
run2	Slab 2	24	MAvg	3.49	2.84	2.69	2.19	3.05	105.6	96.1		184.36	2,095,011
run2	Slab 2	31	AAvg	4.82	3.07	2.65	2.18	3.75	105.2	96.4	85.93	0.00	0
run2	Slab 2	31	LAvg	4.38	3.29	2.86	2.22	3.40	105.5	97.2	82.98	0.00	0
run2	Slab 3 BC	51	MAvg	2.75	2.33	2.22	1.86	2.51	108.3	97.1		179.86	3,482,429
run2	Slab 3	71	MAvg	2.62	2.11	2.02	1.72	2.24	106.6	97.1		245.56	2,774,721
run2	Slab 3 AC	91	MAvg	2.55	2.23	2.10	1.80	2.36	108.5	96.7		162.95	4,476,080
run2	Slab 0	0	LAvg	11.85	8.77	7.32	5.68	4.89	108.1	99.6	82.67	0.00	0
run2	Slab 1	8	MAvg	4.72	3.99	3.85	3.35	4.23	105.9	98.4		98.32	2,160,460
run2	Slab 1	16	AAvg	6.26	5.12	4.44	3.56	5.19	105.2	100.3	92.96	0.00	0
run2	Slab 1	17	LAvg	6.17	4.79	4.26	3.45	5.41	105.6	99.5	83.71	0.00	0
run2	Slab 2	24	MAvg	4.93	4.19	4.00	3.30	4.56	105.6	100.7		99.57	1,958,538
run2	Slab 2	31	AAvg	6.01	4.32	3.70	3.01	4.80	106.4	98.9	86.19	0.00	0
run2	Slab 2	32	LAvg	7.93	4.82	4.20	3.40	4.96	106.3	98.6	65.64	0.00	0
run2	Slab 3 BC	51	MAvg	4.08	3.44	3.33	2.85	3.68	108.0	99.1		115.15	2,476,896
run2	Slab 3	71	MAvg	3.35	2.87	2.77	2.36	3.13	108.8	99.1		128.88	3,282,736
run2	Slab 3 AC	91	MAvg	4.26	3.71	3.56	3.06	3.93	107.6	98.9		93.01	2,812,384
run2	Slab 0	0	LAvg	6.18	4.44	3.67	2.78	2.71	106.1	98.7	80.87	0.00	0
run2	Slab 1	8	MAvg	3.10	2.63	2.62	2.24	2.75	105.2	97.5		132.06	3,746,683
run2	Slab 1	16	AAvg	4.48	3.67	3.24	2.60	3.61	106.2	96.1	90.62	0.00	0
run2	Slab 1	17	LAvg	4.70	3.53	3.16	2.55	4.11	106.9	97.8	84.67	0.00	0
run2	Slab 2	24	MAvg	3.58	3.10	2.94	2.43	3.32	105.3	96.3		125.09	2,957,733
run2	Slab 2	31	AAvg	4.81	3.32	2.92	2.32	3.86	105.7	97.2	90.26	0.00	0
run2	Slab 2	32	LAvg	4.79	3.58	3.13	2.46	3.85	105.5	97.7	84.11	0.00	0
run2	Slab 3 BC	51	MAvg	2.95	2.52	2.38	2.08	2.70	108.6	97.2		158.80	3,425,638
run2	Slab 3	71	MAvg	2.56	2.20	2.07	1.80	2.35	108.4	97.7		180.43	4,000,291
run2	Slab 3 AC	91	MAvg	2.82	2.38	2.28	1.93	2.54	108.5	97.7		175.00	3,393,523
run3	Slab 0	0	LAvg	5.51	3.92	3.19	2.42	2.08	109.4	99.8	79.21	0.00	0
run3	Slab 1	8	MAvg	3.01	2.50	2.43	2.08	2.70	108.4	99.3		167.52	3,123,743

SLAB CURLING STUDY

Appendix A

December 5, 2005

Run	SlabId	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run3	Slab 1	16	AAvg	3.44	2.88	2.56	2.02	2.92	108.9	97.8	94.36	0.00	0
run3	Slab 1	17	LAvg	3.69	2.77	2.48	2.03	3.13	109.7	98.3	83.60	0.00	0
run3	Slab 2	24	MAvg	3.88	3.16	2.94	2.40	3.43	108.1	99.9		174.21	1,785,103
run3	Slab 2	31	AAvg	4.23	3.16	2.76	2.19	3.43	107.3	98.9	90.29	0.00	0
run3	Slab 2	32	LAvg	4.59	3.34	2.89	2.25	3.40	107.2	97.8	80.97	0.00	0
run3	Slab 3 BC	51	MAvg	2.95	2.40	2.28	1.92	2.57	109.3	99.6		213.57	2,523,208
run3	Slab 3	71	MAvg	2.50	2.12	1.98	1.71	2.26	108.7	100.7		207.78	3,625,990
run3	Slab 3 AC	91	MAvg	2.69	2.28	2.17	1.82	2.41	109.6	98.7		183.90	3,560,294
run3	Slab 0	0	LAvg	10.78	7.74	6.40	4.83	3.21	106.4	98.2	78.31	0.00	0
run3	Slab 1	8	MAvg	4.18	3.56	3.52	2.97	3.83	105.2	99.1		99.59	2,730,621
run3	Slab 1	16	AAvg	5.02	4.40	3.79	3.05	4.19	105.2	99.8	91.00	0.00	0
run3	Slab 1	17	LAvg	5.22	4.05	3.69	2.99	4.84	105.3	98.4	84.74	0.00	0
run3	Slab 2	24	MAvg	4.37	3.69	3.47	2.91	3.98	104.6	98.6		120.92	2,042,925
run3	Slab 2	31	AAvg	5.94	4.43	3.80	2.97	4.58	104.3	98.0	84.08	0.00	0
run3	Slab 2	31	LAvg	5.96	4.64	3.99	3.24	4.88	104.1	97.7	85.03	0.00	0
run3	Slab 3 BC	51	MAvg	4.38	3.80	3.71	3.16	4.08	105.9	97.7		86.66	2,867,174
run3	Slab 3	71	MAvg	3.73	3.19	3.05	2.59	3.49	103.5	97.7		122.69	2,771,635
run3	Slab 3 AC	91	MAvg	4.06	3.51	3.36	2.84	3.73	104.1	96.9		104.80	2,747,123
run3	Slab 0	0	LAvg	7.31	5.19	4.31	3.19	7.92	107.2	99.5	77.22	0.00	0
run3	Slab 1	8	MAvg	3.09	2.66	2.67	2.24	2.84	106.9	99.8		117.38	4,250,309
run3	Slab 1	16	AAvg	4.47	3.73	3.22	2.59	3.63	107.1	99.7	88.29	0.00	0
run3	Slab 1	17	LAvg	4.32	3.25	2.90	2.38	3.82	107.3	98.9	81.89	0.00	0
run3	Slab 2	24	MAvg	3.69	3.19	2.98	2.50	3.43	106.5	99.3		126.85	2,741,820
run3	Slab 2	31	AAvg	5.69	3.54	3.04	2.34	3.62	106.5	98.7	69.25	0.00	0
run3	Slab 2	31	LAvg	7.86	3.85	3.32	2.69	4.18	106.4	98.6	53.20	0.00	0
run3	Slab 3 BC	51	MAvg	3.14	2.69	2.54	2.20	2.91	109.1	100.3		147.50	3,256,103
run3	Slab 3	71	MAvg	2.63	2.16	2.04	1.76	2.33	105.4	99.8		223.76	3,044,371
run3	Slab 3 AC	91	MAvg	2.79	2.38	2.30	1.92	2.54	106.6	98.5		163.79	3,709,120

* LAvg = Joint Testing – Leave Slab
 MAvg = Mid-Slab Testing
 AAvg = Joint Testing – Approach Slab

Table 2: Normalized Deflections and Backcalculated Results October 2005

Run	SlabId	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run1	Slab 1	0	LAvg	6.59	4.78	3.85	2.88	5.41	48.4	48.4	81.30	0.00	0
run1	Slab 1	8	MAvg	2.51	2.13	1.98	1.79	2.24	49.1	47.6		200.60	3,729,180
run1	Slab 1	16	AAvg	3.95	3.20	2.72	2.14	3.16	49.3	47.7	89.66	0.00	0
run1	Slab 1	17	LAvg	3.92	2.94	2.43	2.01	3.45	49.1	47.3	84.18	0.00	0
run1	Slab 2	25	MAvg	3.08	2.54	2.23	1.93	2.75	49.9	47.1		230.03	2,146,148
run1	Slab 2	31	AAvg	4.39	3.42	2.82	2.30	3.52	50.1	47.7	89.95	0.00	0
run1	Slab 2	32	LAvg	4.13	3.14	2.58	2.13	3.53	49.1	48.6	85.19	0.00	0
run1	Slab 3	51	MAvg	2.64	2.27	2.05	1.84	2.42	53.5	48.5		192.47	3,521,492
run1	Slab 3	71	MAvg	2.45	2.13	1.94	1.74	2.25	51.0	48.6		188.71	4,178,650
run1	Slab 3	91	MAvg	2.73	2.34	2.18	1.91	2.46	52.0	47.8		175.82	3,604,902
run1	Slab 1	0	LAvg	19.66	15.10	12.94	9.67	9.00	42.2	41.3	80.53	0.00	0
run1	Slab 1	8	MAvg	5.47	4.78	4.74	4.18	5.22	42.7	42.7		58.60	2,727,440
run1	Slab 1	16	AAvg	8.15	7.04	6.08	4.79	6.98	43.6	42.7	89.84	0.00	0
run1	Slab 1	17	LAvg	8.80	6.94	5.96	4.78	7.77	43.8	42.5	82.65	0.00	0
run1	Slab 2	25	MAvg	5.46	4.76	4.60	3.88	5.14	44.9	43.5		71.29	2,240,285
run1	Slab 2	31	AAvg	8.24	6.54	5.69	4.45	6.74	46.8	43.1	85.79	0.00	0
run1	Slab 2	32	LAvg	10.33	5.48	4.82	3.78	5.99	46.5	44.0	55.66	0.00	0
run1	Slab 3	51	MAvg	5.94	5.21	4.91	4.48	5.44	46.6	44.2		63.13	2,138,021
run1	Slab 3	71	MAvg	5.81	5.00	4.40	4.10	5.52	47.3	44.3		90.78	1,542,961
run1	Slab 3	91	MAvg	5.34	4.78	4.51	4.04	5.06	47.2	45.5		60.80	2,756,115
run1	Slab 1	0	LAvg	9.63	7.12	5.82	4.16	2.29	47.6	45.5	81.47	0.00	0
run1	Slab 1	8	MAvg	2.89	2.49	2.30	2.15	2.62	49.5	45.1		153.77	3,694,847
run1	Slab 1	16	AAvg	4.51	3.92	3.37	2.69	3.66	49.3	44.4	89.56	0.00	0
run1	Slab 1	17	LAvg	4.78	3.59	2.94	2.51	4.32	49.2	46.5	82.72	0.00	0
run1	Slab 2	25	MAvg	3.51	3.06	2.88	2.47	3.25	50.0	45.6		120.63	3,192,736
run1	Slab 2	31	AAvg	5.57	4.37	3.74	2.94	4.49	50.7	46.0	88.91	0.00	0
run1	Slab 2	32	LAvg	5.01	3.89	3.39	2.69	4.68	49.6	46.7	85.65	0.00	0
run1	Slab 3	51	MAvg	2.91	2.52	2.23	2.07	2.68	51.8	46.8		173.97	3,202,633
run1	Slab 3	71	MAvg	2.77	2.31	2.06	1.92	2.45	50.1	46.9		216.50	2,832,749
run1	Slab 3	91	MAvg	2.94	2.59	2.31	2.12	2.71	50.7	46.6		153.12	3,581,368

Stantec

SLAB CURLING STUDY

Appendix A

December 5, 2005

Run	SlabId	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run2	Slab 1	0	LAvg	5.59	4.00	3.15	2.43	4.22	49.9	47.9	79.85	0.00	0
run2	Slab 1	8	MAvg	2.54	2.17	1.95	1.82	2.27	50.4	48.2		203.33	3,600,637
run2	Slab 1	16	AAvg	3.82	3.11	2.62	2.11	3.13	50.4	47.5	91.54	0.00	0
run2	Slab 1	17	LAvg	3.94	2.96	2.60	2.05	3.39	50.3	47.8	83.79	0.00	0
run2	Slab 2	25	MAvg	3.26	2.65	2.35	2.02	2.88	50.4	49.1		227.04	1,930,750
run2	Slab 2	31	AAvg	4.09	3.20	2.68	2.13	3.29	50.4	48.2	89.81	0.00	0
run2	Slab 2	32	LAvg	4.33	3.20	2.56	2.15	3.48	50.3	48.3	82.61	0.00	0
run2	Slab 3	51	MAvg	2.71	2.32	2.07	1.87	2.48	52.7	49.7		197.76	3,257,675
run2	Slab 3	71	MAvg	2.46	2.10	1.94	1.71	2.21	51.6	50.0		202.77	3,863,295
run2	Slab 3	91	MAvg	2.75	2.32	2.18	1.91	2.44	51.3	49.3		186.06	3,354,206
run2	Slab 1	0	LAvg	14.04	10.46	8.54	6.25	8.08	47.9	47.3	80.25	0.00	0
run2	Slab 1	8	MAvg	4.32	3.75	3.68	3.20	4.02	48.3	47.3		84.07	3,033,937
run2	Slab 1	16	AAvg	6.71	5.34	4.43	3.51	5.49	48.4	47.4	88.16	0.00	0
run2	Slab 1	17	LAvg	5.63	4.58	4.00	3.29	5.57	48.6	48.3	87.60	0.00	0
run2	Slab 2	25	MAvg	4.93	4.25	4.19	3.43	4.54	48.6	48.6		81.28	2,408,746
run2	Slab 2	31	AAvg	7.02	5.57	4.71	3.72	5.77	49.0	48.5	88.62	0.00	0
run2	Slab 2	32	LAvg	7.23	4.88	4.35	3.43	5.50	48.8	48.4	72.76	0.00	0
run2	Slab 3	51	MAvg	5.11	4.46	4.33	3.73	4.74	52.1	47.7		71.94	2,534,137
run2	Slab 3	71	MAvg	3.94	3.36	3.02	2.76	3.66	51.0	49.3		135.10	2,248,573
run2	Slab 3	91	MAvg	5.60	4.96	4.72	4.08	5.24	50.5	48.5		63.69	2,385,659
run2	Slab 1	0	LAvg	8.11	5.86	4.68	3.51	8.62	49.3	48.0	78.75	0.00	0
run2	Slab 1	8	MAvg	2.81	2.45	2.33	2.12	2.58	49.4	48.5		135.65	4,433,427
run2	Slab 1	16	AAvg	4.08	3.47	3.00	2.41	3.34	50.1	47.9	89.35	0.00	0
run2	Slab 1	17	LAvg	4.27	3.21	2.66	2.28	3.80	50.3	48.9	81.82	0.00	0
run2	Slab 2	25	MAvg	3.36	2.88	2.53	2.30	3.07	50.4	48.8		166.38	2,511,107
run2	Slab 2	31	AAvg	5.12	3.88	3.21	2.60	4.09	50.7	49.7	87.03	0.00	0
run2	Slab 2	32	LAvg	4.76	3.60	2.93	2.45	4.09	49.9	48.9	82.36	0.00	0
run2	Slab 3	51	MAvg	3.17	2.72	2.50	2.28	2.88	53.5	49.3		151.36	3,104,057
run2	Slab 3	71	MAvg	2.98	2.59	2.37	2.13	2.78	51.3	48.3		153.96	3,461,662
run2	Slab 3	91	MAvg	3.11	2.69	2.37	2.20	2.85	52.1	49.0		165.74	2,944,381
run3	Slab 1	0	LAvg	5.71	4.14	3.24	2.50	4.75	49.8	48.8	81.18	0.00	0
run3	Slab 1	8	MAvg	2.54	2.16	2.00	1.83	2.27	50.7	49.0		193.25	3,788,757

Stantec

SLAB CURLING STUDY

Appendix A

December 5, 2005

Run	SlabId	Station (ft)	TestType*	Def_1 (0")	Def_2 (12")	Def_4 (24")	Def_5 (36")	Def_9 (-12")	Surface Temp.	AirTemp	Lte1	KStatic	EPcc
run3	Slab 1	16	AAvg	3.76	3.16	2.60	2.12	3.14	50.8	48.5	93.33	0.00	0
run3	Slab 1	17	LAvg	3.69	2.75	2.42	1.96	3.25	51.2	48.9	83.49	0.00	0
run3	Slab 2	25	MAvg	3.32	2.69	2.46	2.04	2.90	51.4	49.9		214.64	1,976,176
run3	Slab 2	31	AAvg	4.28	3.29	2.75	2.21	3.35	51.0	50.0	87.49	0.00	0
run3	Slab 2	32	LAvg	4.12	3.14	2.67	2.14	3.49	50.6	49.1	85.18	0.00	0
run3	Slab 3	51	MAvg	2.74	2.34	2.23	1.88	2.50	53.5	49.2		171.61	3,667,659
run3	Slab 3	71	MAvg	2.50	2.12	1.94	1.71	2.22	52.7	49.2		215.55	3,501,866
run3	Slab 3	91	MAvg	2.81	2.36	2.29	1.93	2.47	53.0	49.3		172.63	3,485,036
run3	Slab 1	0	LAvg	11.57	8.65	7.09	5.20	3.32	51.6	49.3	232.01	0.00	0
run3	Slab 1	8	MAvg	11.30	3.53	3.38	2.88	3.64	51.8	49.0		353.40	90,195
run3	Slab 1	16	AAvg	6.05	5.20	4.44	3.50	5.19	51.3	48.2	266.44	0.00	0
run3	Slab 1	17	LAvg	5.82	4.66	4.19	3.37	5.57	51.8	49.4	248.67	0.00	0
run3	Slab 2	25	MAvg	4.83	4.14	4.07	3.27	4.35	51.8	48.2		89.23	2,279,255
run3	Slab 2	31	AAvg	11.37	5.18	4.44	3.41	5.58	52.0	48.8	152.22	0.00	0
run3	Slab 2	32	LAvg	28.46	4.65	4.16	3.16	5.06	51.7	49.4	50.76	0.00	0
run3	Slab 3	51	MAvg	4.62	3.99	3.88	3.34	4.23	54.5	49.8		85.33	2,612,171
run3	Slab 3	71	MAvg	3.96	3.35	3.18	2.79	3.60	52.4	49.4		122.05	2,470,539
run3	Slab 3	91	MAvg	4.79	4.22	3.85	3.48	4.51	51.6	48.5		87.46	2,369,879
run3	Slab 1	0	LAvg	7.24	5.22	4.20	3.14	2.35	50.2	49.6	80.71	0.00	0
run3	Slab 1	8	MAvg	2.73	2.32	2.21	2.02	2.44	50.7	49.5		163.31	3,891,166
run3	Slab 1	16	AAvg	4.12	3.44	2.97	2.40	3.43	51.1	49.1	93.11	0.00	0
run3	Slab 1	17	LAvg	4.19	3.16	2.69	2.29	3.79	51.3	50.1	84.55	0.00	0
run3	Slab 2	25	MAvg	3.41	2.89	2.68	2.31	3.08	51.9	48.8		154.87	2,627,609
run3	Slab 2	31	AAvg	5.12	3.86	3.25	2.56	4.16	52.4	48.7	90.92	0.00	0
run3	Slab 2	32	LAvg	4.90	3.72	3.12	2.57	4.30	52.3	50.4	85.02	0.00	0
run3	Slab 3	51	MAvg	3.08	2.67	2.45	2.22	2.84	54.0	49.4		146.86	3,408,241
run3	Slab 3	71	MAvg	2.82	2.29	2.08	1.89	2.44	52.6	49.1		238.58	2,474,621
run3	Slab 3	91	MAvg	3.09	2.66	2.40	2.19	2.81	53.0	49.6		160.16	3,102,433

* LAvg = Joint Testing – Leave Slab
 MAvg = Mid-Slab Testing
 AAvg = Joint Testing – Approach Slab