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A STUDY ON WARM-MIX ASPHALT

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A report of the findings of
ICT-R27-SP17
Warm Mix Asphalt Study

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16. Abstract

The Illinois Department of Transportation (IDOT) had an immediate need to evaluate the performance characteristics of new asphalt mixtures. The new mixtures included warm mix asphalt (WMA), stone-matrix asphalt (SMA) with recycled asphalt shingles (RAS), and asphalt mixtures containing alternate friction aggregates (diabase, quartzite, and granite). The object of this project was to compare these new mixes and to provide IDOT with guidance on the applicability of the mix designs when implementing these mixtures in the future.

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This publication is based on the results of ICT-R27-SP17, **Warm Mix Asphalt Study.** ICT-R27-SP17 was conducted in cooperation with the Illinois Center for Transportation; the Illinois Department of Transportation; and the U.S. Department of Transportation, Federal Highway Administration.

Members of the Technical Review Panel are the following:

Thomas Zehr, Illinois Department of Transportation (IDOT), Chair
David Lippert, IDOT
James Trepanier, IDOT
Abdul Dahhan, IDOT

EXECUTIVE SUMMARY

The Illinois Department of Transportation (IDOT) had an immediate need to evaluate the performance characteristics of new asphalt mixtures. The new mixtures included warm mix asphalt (WMA), stone-matrix asphalt (SMA) with recycled asphalt shingles (RAS), and asphalt mixtures containing alternate friction aggregates (diabase, quartzite, and granite). The object of this project was to compare these new mixes and to provide IDOT with guidance on the applicability of the mix designs when implementing these mixtures in the future.

All 17 mixtures were tested in the Wheel Track device. Dynamic Modulus testing was also performed on the SMA and SMAs with RAS. The SMA group used to evaluate RAS included a control mix with PG 76-22. The SMA with 5% RAS used both PG 76-22 and PG 70-22. Although the RAS mixtures show a lower dynamic modulus than the control mixture at low temperatures and high frequencies, this is not a concern because they have similar dynamic modulus values at high temperatures and low frequencies. However, the Wheel Track test showed approximately 25% more rutting for the RAS SMA that uses PG 76-22 binder compared to the control mixture. This indicates that the outcome from the compressive modulus test and wheel testing with shear distortions could be different. Given that rutting is related to shear in the mixture, the wheel track test results, although qualitative, are important.

The N90F WMA does show a higher wheel track displacement than most of the other HMA of the same classification. Additional testing should be conducted on a wider variety of WMA and HMA specimens to confirm these results.

The District 2 HMA shows a greater displacement in the wheel tracking test than the WMA of the same mixture type. The QC data indicates that there are differences in the dust content, AC content, and volumetrics of these mixes. These differences may affect the resulting displacements of the mixes.

The three N80 SMA surface mixes with alternate friction aggregates (diabase, granite, and quartzite) had only minor differences in the wheel track displacements. The wheel track data for the five N90F surface mixtures show that the control mixture with steel slag has a larger displacement than the mixes containing quartzite.

Additional testing should be considered to evaluate the low temperature fracture properties of the mixes containing RAS and WMA mixtures. In addition, a more comprehensive testing plan for various SMA, HMA, and WMA should be conducted that considers the effect of curing time on laboratory measured parameters. In addition, a standard IDOT protocol should be established. Consideration should be given to address the field compaction requirements of various mixtures when comparing HMA, WMA, and SMA.

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CHAPTER 1 PROJECT BACKGROUND

This project was funded due to an immediate need for laboratory testing to evaluate the performance characteristics of new asphalt mixtures. The new mixtures included warm mix asphalt (WMA), stone-matrix asphalt (SMA) with recycled asphalt shingles (RAS), and asphalt mixtures containing alternate friction aggregates (diabase, quartzite, and granite).

Mixtures were collected by IDOT and delivered to the ATREL facility in Rantoul, Illinois for testing. All mixtures were tested with the Wheel Track device. Dynamic modulus testing was also performed on the three SMAs with RAS. The resulting data will be used to compare these new mixtures and provide guidance on the applicability of the mix designs when implementing these mixtures in the future.

CHAPTER 2 ASPHALTIC MIXTURES CONSIDERED IN THE STUDY

2.1 PROPOSED AND TESTED MIXTURES

The original workplan considered 26 different mixtures to be tested with the Wheel Track device while dynamic modulus and fatigue testing would be performed on three of the mixtures. The original testing matrix is shown in Table 1. Fatigue testing was removed from the plan due to scheduling limitations.

Table 1. Original Testing Matrix for R27-SP17

Mixture Description (per IDOT)			Proposed Testing for R27-SP17			Received at ATREL
			Wheel Track	Dynamic Modulus	Fatigue	
MIXES / MATERIALS	SMA / RAS Bishop Ford	Virgin SMA Binder, PG 76-22, w/fibers	x	x	x	Yes
		SMA w/ 5% RAS, PG 76-22, no fibers				
		SMA w/ 5% RAS, PG 70-22, no fibers				
	Warm Mix Asphalt	Evotherm, N90 F 0.5%	x			Yes
		District 3, WMA Shoulders				
	District 2 HMA & WMA	HMA	x			Yes (1 HMA & 1 WMA)
		WMA with Anti-strip				
		WMA with Anti-strip				
		WMA w/o Anti-strip				
	Alternate Friction Aggregates	**SMA Designs (Designs complete by approx. Sept 1, 2009)**	x			Yes
		Diabase				
		Granite				
		Quartzite				
		Quartzite	x			Yes
		N90F, **with Steel Slag**, Arrow Road (Control)				
		N90F, **with Quartzite**, Arrow Road				
		N90F, **with Quartzite**, Allied				
		9) mixes total of N90 Mix F done over the winter (Jan & Feb)	x			No
		with Diabase, Granite, and Quartzite using				
		Mix F, Vulcan McCook + FM20 + RAP				
		Mix F, M. S. Thornton + FM20 + RAP				
		Mix F, A Dolomite Gravel + FM20 + RAP				
	Control Mixes for R27-42	**19536R - HMA N90F Rec Surf - Steel Slag**	x			Yes
		18436 - Poly HMA SMA SCS N80 12.5 - Steel Slag				

Although the original testing plan considered a total of 26 mixtures, only the mixtures presented in Table 2 were provided by IDOT. The mix designs and QC data (for plant produced mixtures) are provided in Appendix A. The mixtures are classified into the following groups.

2.1.1 SMA/ RAS (Bishop Ford)

These mixtures were provided by District 1 to compare three SMAs. Gyratory samples were provided by IDOT for the Wheel Track testing and loose mix was provided for the remaining tests. The control mixture (81BIT114G) is a N80 SMA Binder (18435) with modified PG 76-22. The two RAS mixtures (81BIT117G) are N80 SMA Binders (18435R). One of the RAS mixtures contains a modified PG 76-22 and the other contains a modified PG 70-22. Both RAS mixtures contain 5% recycled asphalt shingles. All three mixtures were produced and sampled from a plant.

Table 2. Details of Study Mixtures

	Mixture Description (per IDOT)		Mixture ID	Mixture Material Code	Mixture Name	Asphalt Binder Material Code	Binder Name	Plant or Lab Produced	Producer's Name (on Mix Design or QC Sheet)
MIXES / MATERIALS	SMA / RAS Bishop Ford	Virgin SMA Binder, PG 76-22, w/fibers (114G)	81BIT114G	18435	(114G) SMA, Binder, 12.5 (N80)	10131	PG 76-22 (Modified)	Plant	Gallagher Asphalt, Thornton
		SMA w/ 5% RAS, PG 76-22, no fibers (117G)	81BIT117G	18435R	(117G) SMA, Binder, 12.5, Recycled (N80)	10131	PG 76-22 (Modified)	Plant	Gallagher Asphalt, Thornton
		SMA w/ 5% RAS, PG 70-22, no fibers (117G)	81BIT117G	18435R	(117G) SMA, Binder, 12.5, Recycled (N80)	10129	PG 70-22 (Modified)	Plant	Gallagher Asphalt, Thornton
	Warm Mix Asphalt	Evotherm, N90 F 0.5% (Chemical)	FRWARMT	19536	HMA, Surface Course, N90, F	10129	PG 70-22 (Modified)	Lab	None, Lab = Schaumburg
		District 3, WMA Shoulders (Foamed)	84BIT460S (WMA)	19515R	HMA, Surface Course, N50, E, Recycled	10125	PG 58-22	Plant	Advanced Asphalt Company, Princeton
	District 2 HMA & WMA	District 2, HMA	82BIT4536	19513R	HMA, Surface Course, N50, C, Recycled	10127	PG 64-22	Plant	McCarthy, Linwood, IA
		District 2, WMA (Foamed)	82BIT4536 (WMA)	19513R	WMA, Surface Course, N50, C, Recycled	10127	PG 64-22	Plant	McCarthy, Linwood, IA
	Alternate Friction Aggregates	SMA Designs							
		Diabase	IDOT09001	18436	SMA, Surface, 12.5 (N80)	10131	PG 76-22 (Modified)	Lab	None, Lab = S.T.A.T.E.
		Granite	IDOT09002	18436	SMA, Surface, 12.5 (N80)	10131	PG 76-22 (Modified)	Lab	None, Lab = S.T.A.T.E.
		Quartzite	IDOT09003	18436	SMA, Surface, 12.5 (N80)	10131	PG 76-22 (Modified)	Lab	None, Lab = S.T.A.T.E.
		Quartzite							
		N90F, with Steel Slag, Arrow Road (Control)	ARM09003	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Lab	Arrow Road, Mt. Prospect (Lab = S.T.A.T.E.)
		N90F, with Quartzite, Arrow Road	ARC09005	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Lab	Arrow Road, Carpentersville (Lab = S.T.A.T.E.)
		N90F, with Quartzite, Allied	ALFP09001	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Lab	Allied Asphalt, Franklin Park (Lab = S.T.A.T.E.)
		N90F, with Quartzite, Ogden (not on original list)	OGD09002	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Lab	Ogden Materials, Chicago (Lab = S.T.A.T.E.)
		N90F, with Quartzite, Arrow Road (not on original list)	ARM09009	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Lab	Arrow Road, Mt. Prospect (Lab = S.T.A.T.E.)
	Control Mixes for R27-42	19536R - HMA N90F Rec Surf - Steel Slag	81BIT069B	19536R	HMA, Surface Course, N90, F, Recycled	10129	PG 70-22 (Modified)	Plant	Central Blacktop, Hodgkins
		18436 - Poly HMA SMA SCS N80 12.5 - Steel Slag	81BIT118G	18436	SMA, Surface, 12.5 (N80)	10131	PG 76-22 (Modified)	Plant	K-Five, Chicago

2.1.2 Warm Mix Asphalt

As part of this study, various warm mix technologies were evaluated. Gyratory samples were provided by IDOT for the Wheel Track testing. The WMA containing 0.5% of the Evotherm additive (FRWARMT) is a N90 F Surface (19536) with modified PG 70-22. The FRWARMT mixture was produced in a laboratory. The 84BIT460S – WMA (considered for shoulders) is a N50 E Surface (19515R) with Foamed PG 58-22. The 84BIT460S was produced and sampled from a plant.

2.1.3 District 2 Hot-Mix and Warm Mix Asphalt

N50 C recycled HMA and WMA surface mixes (82BIT4536) with PG 64-22, produced and sampled from a plant, were compared. The WMA was produced with foamed asphalt. Bag samples of loose mix were provided by BMPR and gyratory samples were compacted at ATREL for the Wheel Track testing. The mixtures are both N50 C recycled surface. Four mixes were originally planned for this part of the study; however, these were the only two mixes available for testing at this time.

2.1.4 Alternate Friction Aggregates (SMAs)

These mixtures were provided by District 1 to evaluate alternate friction aggregates in SMAs. Gyratory samples were provided by IDOT for the Wheel Track testing. All three of these SMAs are N80 SMA Surfaces (18436) with modified PG 76-22. Each mixture contains a different alternate friction aggregate. Mixture IDOT09001 contains diabase; mixture IDOT09002 contains granite; and mixture IDOT09003 contains quartzite. These mixtures were all produced in a laboratory.

2.1.5 Alternate Friction Aggregates (N90F Mixes)

These mixtures were provided by District 1 to evaluate alternate friction aggregates in N90F mixtures. Gyratory samples were provided by IDOT for the Wheel Track testing. The control mixture (ARM09003) is a N90 F Surface (19536R) with steel slag for the friction aggregate and modified PG 70-22. The four other mixtures (ARC09005, ALFP09001, OGD09002 and ARM09009) are N90 F surfaces (19536R) with quartzite for the friction aggregate and modified PG 70-22. These mixtures were all produced in a laboratory.

2.1.6 Control Mixes for R27-42 (Thin, Quiet Pavement Project)

The control mixes were identified as control mixtures in another project currently conducted at ATREL, ICT R27-42 on Development of a Thin, Quiet, Long-Lasting, High Friction Surface Layer for Economical Use in Illinois. The F mixture (81BIT069B) is a N90 F surface (19536R) with steel slag for the friction aggregate and modified PG 70-22. The SMA (81BIT118G) is a N80 SMA surface (18436) with steel slag for the friction aggregate and modified PG 76-22. These mixtures were sampled by the U of I from the plants during the 2009 production season. Samples were then prepared for these mixtures at ATREL.

CHAPTER 3 WHEEL TRACK TESTING

Wheel Track testing was performed on all mixtures received at ATREL. Currently IDOT does not have a standard protocol for this test, therefore AASHTO (T 324), Colorado (L 5112), Montana (MT 334), Utah (Materials Manual Section 990) and TxDOT (Tex-242-F) were reviewed. A decision was made to follow the TxDOT standard until a formal IDOT protocol is established. The sample preparation and testing is summarized as follows:

- Gyratory samples were all compacted to 7.0% +/- 0.5% voids. Additional samples for the R27-42 SMA were compacted at 5.0% +/-0.5% voids.
- The 125 to 130 mm tall gyratory samples were cut in half to obtain two specimens each at 62 +/- 2 mm in height. All samples were prepared similarly with the exception of the District 2 HMA, District 2 WMA and District 3 WMA shoulder mixes; these samples compacted to individual 62 +/- 2 mm specimen.
- Specimen were cut and mounted in the sample molds using a gypsum cement mixture to hold each piece firmly. Once the gypsum cement cured properly, the samples were loaded into the Wheel Track device.
- A minimum of two tests were performed on each mixture in the wet condition (1 test was also performed in the dry condition for the RAS SMAs). All mixtures were conditioned and tested in a water bath at 122 °F (50 °C). The three SMAs for the RAS study were also tested dry at 122 °F (50 °C).
- Although an official IDOT failure criterion has not been established yet, the testing was performed for 20,000 passes or a rut depth of 12.5 mm (for mixes with PG 64 binder) and terminated when one of these criteria was reached. This was based on information obtained from TxDOT. It was later discussed with BMPR that future testing will be carried out to 20,000 passes or a rut depth of 20 mm (as long as the molds are not damaged) until a formal protocol is established.
- The Wheel Track testing system documented the displacement at 11 locations on the specimen surface for each pass of the wheel.
- Once the testing was completed all of the data was exported to a spreadsheet, and the final surface profile at each measurement point was documented for each sample.
- The Displacement vs. Number of Passes was documented at the measurement point with the largest total displacement for each sample.

A mold assembly for the Wheel Track test is shown in Figure 1. Figure 2 shows a typical test with the specimens submerged at 122 °F (50 °C). Results of the Wheel Track testing are provided in Appendix B and summarized in Table 3. The data is also presented graphically in Figure 3. Some tests were terminated prior to reaching 20,000 passes due to rut depths exceeding 12.5 mm. Therefore, the data is compared at 14,000 passes in Table 3 and Figure 3 to provide a common point for all testing. All data is presented for specimens tested at 7.0 +/- 0.5% air void and submerged in water at 122 °F (50 °C) unless otherwise noted.

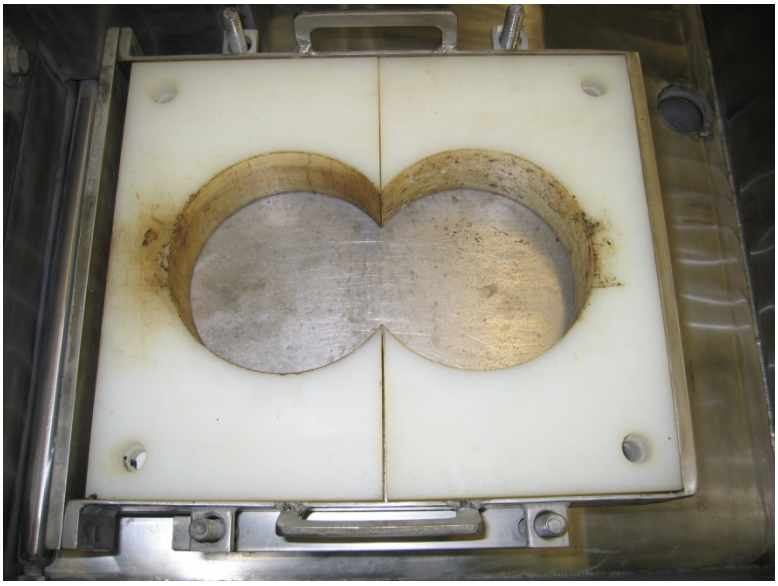


Figure 1. Mold assembly for the Wheel Track test.

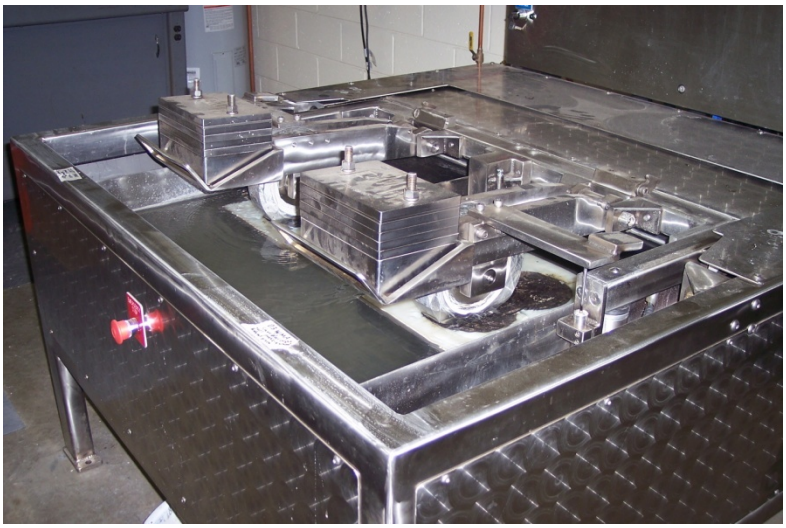


Figure 2. Wheel Track test with samples submerged at 122 °F (50 °C).

Table 3. Summary of Hamburg Wheel Testing Data for R27-SP17

Mixture Description (per IDOT)			Mixture ID	Mixture Material Code	Mixture Name	Plant or Lab Produced	Test Condition (Wet / Dry)	Air Voids (%)	Max Displacement at 14,000 passes (mm)			
									Individual Samples	Average	Std. Dev.	COV (%)
MIXES / MATERIALS	SMA / RAS Bishop Ford	Virgin SMA Binder, PG 76-22, w/fibers (114G)	81BIT114G (PG 76-22 Modified)	18435	(114G) SMA, Binder, 12.5 (N80)	Plant	Wet	7.5	3.25	3.49	0.34	9.7
								6.9	3.73			
							Dry	7.5	2.57	NA	NA	NA
		SMA w/ 5% RAS, PG 76-22, no fibers (117G)	81BIT117G (PG 76-22 Modified)	18435R	(117G) SMA, Binder, 12.5, Recycled (N80)	Plant	Wet	7.4	6.00	4.60	1.99	43.2
								*	3.19			
							Dry	7.1	3.37	NA	NA	NA
		SMA w/ 5% RAS, PG 70-22, no fibers (117G)	81BIT117G (PG 70-22 Modified)	18435R	(117G) SMA, Binder, 12.5, Recycled (N80)	Plant	Wet	6.9	6.41	6.32	0.13	2.1
								7.4	6.22			
							Dry	7.1	4.41	NA	NA	NA
	Warm Mix Asphalt	Evotherm, N90 F 0.5% (Chemical)	FRWARMT (PG 70-22 Modified)	19536	HMA, Surface Course, N90, F	Lab	Wet	7.5	8.03	6.25	2.52	40.4
								6.9	4.46			
		District 3, WMA Shoulders (Foamed)	84BIT460S (WMA) (PG 58-22)	19515R	HMA, Surface Course, N50, E, Recycled	Plant	Wet	5.7 & 7.1	10.71	7.85	2.76	35.2
								7.1 & 7.1	5.20			
								8.7 & 6.9	7.63			
	D2 HMA & WMA	District 2, HMA	82BIT4536	19513R	HMA, Surface Course, N50, C, Recycled	Plant	Wet	6.6 & 6.9	12.67	12.03	0.88	7.3
								7.0 & 6.9	11.02			
								7.0 & 7.0	12.39			
		District 2, WMA (Foamed)	82BIT4536 (WMA)	19513R	WMA, Surface Course, N50, C, Recycled	Plant	Wet	6.8 & 7.0	7.96	7.75	2.33	30.1
								6.7 & 6.8	5.93			
								6.8 & 6.8	6.14			
								6.9 & 6.9	10.97			
	Alternate Friction Aggregates	Diabase	IDOT09001 (PG 76-22 Modified)	18436	SMA, Surface, 12.5 (N80)	Lab	Wet	6.8	5.48	5.31	0.25	4.7
								6.8	5.13			
		Granite	IDOT09002 (PG 76-22 Modified)	18436	SMA, Surface, 12.5 (N80)	Lab	Wet	7.1	5.79	5.37	0.59	11.1
								6.9	4.95			
		Quartzite	IDOT09003 (PG 76-22 Modified)	18436	SMA, Surface, 12.5 (N80)	Lab	Wet	7.1	4.81	5.15	0.48	9.3
								7.3	5.49			
		N90F, with Steel Slag, Arrow Road (Control)	ARM09003 (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Lab	Wet	*	7.24	6.36	1.24	19.6
								7.5	5.48			
		N90F, with Quartzite, Arrow Road	ARC09005 (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Lab	Wet	7.0 or 7.3*	3.48	3.28	0.28	8.6
								7.1	3.08			
		N90F, with Quartzite, Allied	ALFP09001 (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Lab	Wet	6.6	3.96	4.04	0.11	2.6
								6.8	4.11			
		N90F, with Quartzite, Ogden (not on original list)	OGD09002 (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Lab	Wet	6.9	3.81	3.44	0.53	15.4
								6.8	3.06			
		N90F, with Quartzite, Arrow Road (not on original list)	ARM09009 (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Lab	Wet	*	3.99	3.54	0.64	18.2
								6.9	3.08			
	Control Mixes for R27-42	19536R - HMA N90F Rec Surf - Steel Slag	81BIT069B (PG 70-22 Modified)	19536R	HMA, Surface Course, N90, F, Recycled	Plant	Wet	**7.1**	**3.05**	**3.38**	**0.34**	**9.9**
								7.1	**3.37**			
								7.2	**3.72**			
		18436 - Poly HMA SMA SCS N80 12.5 - Steel Slag	81BIT118G (PG 76-22 Modified)	18436	SMA, Surface, 12.5 (N80)	Plant	Wet	**7.2**	**5.31**	**5.23**	**0.47**	**9.0**
								7.3	**5.65**			
								7.0	**4.72**			
								4.7	**2.35**	**2.85**	**0.44**	**15.5**
								5.0	**3.19**			
								4.9	**3.01**			

*Note: Voids were not readable on the sample provided. It is understood that all samples were compacted to 7.0 +/-0.5% Voids unless otherwise noted.

Considering that some tests terminated earlier than others, the displacements were compared at 14,000 passes. This was the highest number of passes available for all of the samples.

Voids for the R27-42 mixtures were determined with the Corelok device.

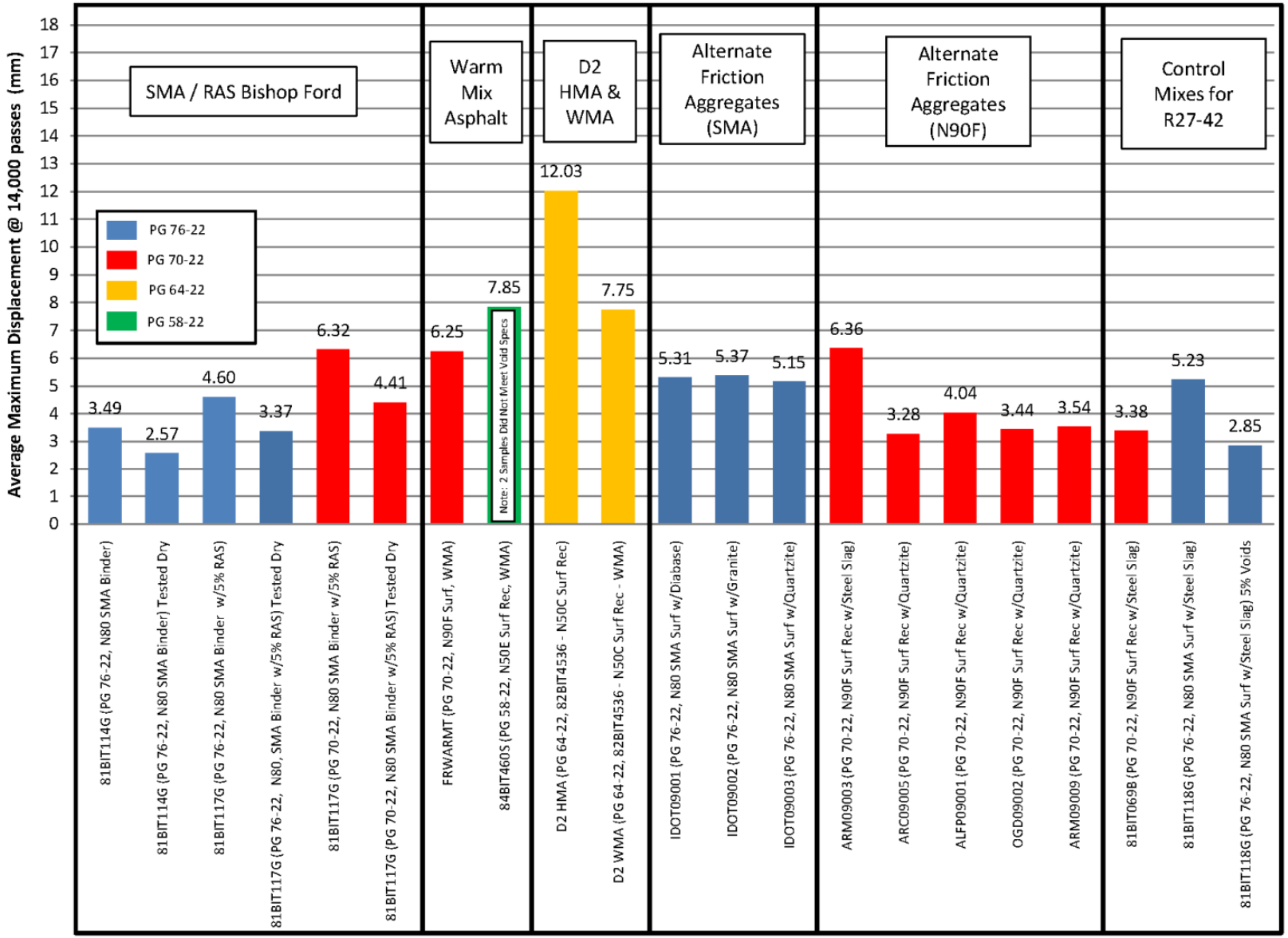


Figure 3. Summary of Wheel Track tests at 7.0% +/- 0.5% air void (81 BIT118G also includes 5% air void data).

3.1 SMA/ RAS (BISHOP FORD) - WHEEL TRACK TEST RESULTS

The Wheel Track test data for the control mixture (81BIT114G) and two mixtures with 5% RAS (81BIT117G) is shown in Figure 3. The average maximum displacements (at 14,000 passes) for the specimens submerged in water at 50 °C range from 3.49 mm for the control mixture (No RAS with PG 76-22) to 6.32 mm for the mixture with 5% RAS and PG 70-22. The maximum displacements (at 14,000 passes) for the specimens tested dry at 50 °C range from 2.57 mm for the control mixture (No RAS with PG 76-22) to 4.41 mm for the mixture with 5% RAS and PG 70-22. It has been suggested that an inflection point in the displacement data and a secondary slope indicate stripping in the mixture (Izzo 1999). No secondary slope was observed in the displacement-number of loading passes curve for these specimens. All of the submerged specimens averaged an additional 0.45 mm displacement from 14,000 passes to 20,000 passes.

The specimens submerged in water show greater displacement than those tested dry for each of the three mixtures. The mixture with 5% RAS (PG 76-22) shows greater displacement than the control mixture with No RAS (PG 76-22) although they contain the same asphalt binder. Therefore, the addition of RAS shows an increase in displacement for these mixtures at the same number of loading passes. It was evident that RAS increases the potential for rutting when used with PG 76-22 binder.

3.2 WARM MIX ASPHALT - WHEEL TRACK TEST RESULTS

The Wheel Track test data for the two WMAs is shown in Figure 3. All of the specimens were tested at 50 °C in water. Although both mixtures are WMA they may not be directly compared considering that one is a N90F and the other is a N50E.

The average maximum displacement (at 14,000 passes) for the FRWARMT (PG 70-22, N90F Surf) mixture is 6.25 mm. Comparing this mixture to the other N90F mixtures in the Alternate Friction Aggregate group, the WMA does show a larger displacement than most of the other HMA of the same classification. Although the displacement data in Appendix B does show a downward trend for one of the specimens, a secondary slope is not well defined for this data. These specimens averaged an additional 1.65 mm displacement from 14,000 passes to 20,000 passes.

The average maximum displacement (at 14,000 passes) for the 84BIT460S (PG 58-22, N50E Surf – District 3 WMA Shoulders) mixture is 7.85 mm. These samples were provided to the U of I as individually compacted specimen at 62 +/- 2 mm each. Therefore, they were not cut in half like the other specimens in the study. The actual void levels were not provided initially; therefore, four of the specimens were grouped into two pairs and tested assuming the air voids was 7.0 +/-0.5%. However, two of the specimens did not meet the air void requirements (as shown in Table 3 and Appendix B): Test 1 used specimens at 5.7% and 7.1% air void; Test 2 used specimens at 7.1% and 7.1% air void; and Test 3 used specimens at 8.7% and 6.9% air void. The data in Appendix B does show that a secondary slope is beginning to occur for the first test. Test 1 was actually terminated at 13.30 mm. Future testing will be performed to 20,000 passes unless a different protocol is agreed upon with IDOT. Test 3 also shows a downward trend; however, a secondary slope is not well defined for this data. No secondary slope was observed for Test 2. Additional testing is suggested for this mixture due to the variability in the voids and that the displacements are inconsistent.

3.3 DISTRICT 2 HOT-MIX AND WARM MIX ASPHALT - WHEEL TRACK TESTING RESULTS

The Wheel Track testing data for the HMA and WMA is shown in Figure 3. All specimens were tested at 50°C in water. These specimens were provided to the U of I as loose mix and then compacted to individual 62 +/- 2 mm specimen. The average maximum displacement (at 14,000 passes) for the HMA (82BIT4536 - PG 64-22, N50C Rec Surf) is 12.03 mm while the WMA (82BIT4536 – PG 64-22, N50C Rec Surf) is 7.75 mm. Four of the six tests were terminated prior to reaching 20,000 passes. The data in Appendix B shows the initiation of a secondary slope for these specimens.

Although the HMA and WMA are considered the same with the only difference being the use of foam to produce the WMA, the QC data shown in Appendix A suggests that there are some differences in the dust content, AC content and volumetric properties. Therefore, these issues should be considered when comparing the displacement data.

3.4 ALTERNATE FRICTION AGGREGATES (SMAS) - WHEEL TRACK TESTING RESULTS

The Wheel Track data for the three SMA surface mixtures with Alternate Friction Aggregates is shown in Figure 3. All of the samples were tested at 50°C in water. All three mixtures are N80 SMA Surfaces with PG 76-22. Mixture IDOT09001 contains diabase; mixture IDOT09002 contains granite; and mixture IDOT09003 contains quartzite for friction aggregates. The average maximum displacements (at 14,000 passes) range from 5.15 mm to 5.37 mm. There is little difference between the average maximum displacements for these mixes. No secondary slope was observed in the displacement data for these samples. These specimens averaged an additional 0.55 mm displacement from 14,000 passes to 20,000 passes.

3.5 ALTERNATE FRICTION AGGREGATES (N90F MIXES) - WHEEL TRACK TESTING RESULTS

The Wheel Track testing data for the control mixture with steel slag (ARM09003) and four mixtures with quartzite (ARC09005, ALFP09001, OGD09002 and ARM09009) is shown in Figure 3. All specimens were tested at 50°C in water. All five mixtures are N90F surfaces with PG 70-22. The control mixture with steel slag has the largest average maximum displacement (at 14,000 passes) of 6.36 mm while the quartzite mixes range from 3.28 mm to 4.04 mm. No secondary slope was observed in the displacement data for these specimens. These specimens averaged an additional 0.44 mm displacement from 14,000 passes to 20,000 passes.

3.6 CONTROL MIXES FOR R27-42 (THIN, QUIET PAVEMENT PROJECT) - WHEEL TRACK TESTING RESULTS

The Wheel Track testing data for the control mixtures for the R27-42 Project (81BIT069B – N90F HMA Surf with steel slag, PG 70-22 and 81BIT118G – N80 Surface SMA with steel slag, PG 76-22) is shown in Figure 3. Specimens were compacted at ATREL and the Corelok device was used to determine the air void contents. Previous testing has shown that the air void measured with the Corelok device can be up to 0.9% higher than SSD-determined values for the F mixture and up to 1.3% higher for the SMA mixture. An example of this difference is shown in Table 4. Therefore, this should be considered when making comparisons based on air void levels.

Table 4. Comparison of Corelok and SSD Air Void Determinations

Mix	Sample No.	CoreLok Voids (%)	SSD Voids (%)	Diff. (%)
F Mix	F33	7.4	6.5	0.9
	F34	6.5	5.7	0.8
	Avg.	7.0	6.1	0.9
SMA	SMA 46	5.9	4.6	1.3
	SMA 47	5.2	4.0	1.2
	Avg.	5.6	4.3	1.3

All of the specimens were tested at 50°C in water. The N90F mixture has an average maximum displacement (at 14,000 passes) of 3.38 mm. The SMA has an average maximum displacement (at 14,000 passes) of 5.23 mm for the 7.0% target air void specimens. District 1 requested that this SMA also be tested at 5.0% voids (+/-0.5%) to provide a better representation of the minimum air void level used in the field for this mixture. The specimens compacted to 5.0% air voids have an average maximum displacement (at 14,000 passes) of 2.85 mm. Therefore, the specimens compacted to 5.0% air voids have almost a 50% reduction in displacement as compared to the specimens compacted to 7.0% air voids. No secondary slope was observed in the displacement data for these specimens. These specimens averaged an additional 0.29 mm displacement from 14,000 passes to 20,000 passes.

The target air void level of 7.0% is intended to represent the minimum density requirement for field placement of the mixtures. This point was discussed in the 12/7/09 TRP meeting for the Thin Quiet Long-Lasting High Friction Surface Layer project (ICT R27-42). It was agreed that SMA would be tested at 6.0% air voids for that project considering that the SMAs would not really be placed at 7.0% air void content in the field. Therefore, future consideration should be given to address the field compaction requirements of various mixtures when comparing different mixture types in the Wheel Track device.

CHAPTER 4 DYNAMIC MODULUS TESTING

4.1 DYNAMIC MODULUS TESTING

The dynamic modulus test provides a structural characterization of asphalt mixtures and is used as an input for the Mechanistic Empirical Pavement Design Guide (MEPDG) (Carpenter 2007). The dynamic modulus test is performed by measuring the recoverable vertical strain when sinusoidal (or haversine) vertical loads are applied to the specimen at different frequencies. The AASHTO TP-62, Determining Dynamic Modulus of Hot-Mix Asphalt Concrete Mixtures, was followed for Dynamic Modulus testing in this project. For each mix, three replicates were prepared for testing. All dynamic modulus tests were conducted in a temperature-controlled chamber. For each specimen, dynamic modulus tests were conducted at -10, 4, 21, 38 and 54°C (14, 40, 70, 100, and 130°F) and frequencies of 25, 10, 5, 1, 0.5 and 0.1Hz. The dynamic modulus tests were conducted using a controlled stress mode, which produced strains smaller than 100 micro-strain. This ensured that the response of the material was linear across the temperature range used in the study. The applied dynamic stress levels were 10 to 100psi for colder temperatures (14°F to 70°F) and 2 to 10psi for higher temperatures (100°F to 130°F). The dynamic modulus is defined by Equations 1-3. The dynamic modulus test setup is shown in Figure 4.

$$|E^*| = \frac{\sigma_0}{\varepsilon_0} \quad (1)$$

$$\sigma = \sigma_0 \sin(\omega t) \quad (2)$$

$$\varepsilon = \varepsilon_0 \sin(\omega t - \phi) \quad (3)$$

where,

σ_0 = applied steady state stress amplitude,

ε_0 = measured strain amplitude,

ω = angular frequency ($2\pi f$, where f = frequency), and

ϕ = phase angle in radians ($\omega \Delta t$, where Δt = time lag between stress and strain).

The sigmoidal function in the Mechanistic Empirical Pavement Design Guide (MEPDG) was used to describe the dynamic modulus master curve, as shown in Equation 4 (Bonaquist and Christensen, 2005).

$$\log|E^*| = \delta + \frac{(Max - \delta)}{1 + e^{\beta + \gamma\left\{\log(\omega) + \frac{\Delta E_a}{19.14714}\left[\left(\frac{1}{T}\right) - \left(\frac{1}{298.15}\right)\right]\right\}}} \quad (4)$$

where,

$|E^*|$ = the magnitude of dynamic modulus;

ω = loading frequency;

T = temperature in Kelvin;

δ, β, and γ = fitting parameters;

ΔE_a = apparent activation energy; and

Max = logarithm of limiting maximum modulus.

Figure 4. Dynamic Modulus Testing Setup

4.2 DYNAMIC MODULUS TESTING RESULTS

Dynamic modulus tests were only performed on the SMA mixtures for the SMA/RAS Bishop Ford group. The testing data for each mixture is provided in Appendix C. Air void data for the dynamic modulus specimens is provided in Table 5. A target air void level of 7.0 +/-0.5% was used for the raw gyratory samples, in accordance with the AASHTO standard TP-62. After cutting the gyratory specimens to the standard dynamic modulus test size, the air voids were checked again. Table 5 presents the air void data, which is lower for the dynamic modulus specimens than those for raw gyratory specimens. The Corelok device was used to determine the air voids for specimens.

Table 5. Air Void Data for Dynamic Modulus Specimens

Specimen ID	G_{mm}	6" Gyratory Specimen Prior to Cutting		4" E* Specimen After Cutting	
		G_{mb}	Air Void (%)	G_{mb}	Air Void (%)
114G 76-22 (1)	2.467	2.287	7.3	2.361	4.3
114G 76-22 (2)	2.467	2.293	7.1	2.353	4.6
114G 76-22 (3)	2.467	2.301	6.7	2.336	5.3
117G 70-22 (1)	2.464	2.290	7.1	2.363	4.1
117G 70-22 (2)	2.464	2.288	7.1	2.356	4.4
117G 70-22 (3)	2.464	2.293	6.9	2.352	4.5
117G 76-22 (1)	2.465	2.287	7.2	2.369	3.9
117G 76-22 (2)	2.465	2.282	7.4	2.335	5.3
117G 76-22 (3)	2.465	2.293	7.0	2.357	4.4

G_{mm} data was provided by BMPR

The raw data for the dynamic modulus tests is provided in Appendix C. Dynamic modulus test results are reported as master curves in Figures 5 and 6. Master curves were constructed using time-temperature superposition with a reference temperature of 70°F (21°C). When viewing this dynamic modulus data on a log scale (as seen in Figure 5), there does not appear to be any significant difference between the mixtures. The data was also plotted on a linear scale in Figure 6. The master curves in Figure 6 show that the mixtures with 5% RAS have lower dynamic modulus values than the control mixture (No RAS) at intermediate and high frequencies. Figure 7 presents the raw dynamic modulus data at high (130°F), intermediate (70°F) and low (14°F) temperatures. The data shown in Figure 7 provides a comparison of the dynamic modulus data at specific temperatures and frequencies without constructing master curves. Figure 7 also shows that the mixtures with 5% RAS have lower dynamic modulus values than the control mixture (No RAS) at low and intermediate temperatures (14°F and 70°F). However, as presented in Figure 7, all three mixtures (with and without RAS) have similar dynamic modulus values at high temperatures (130°F) and low frequencies, which is usually critical for rutting potential.

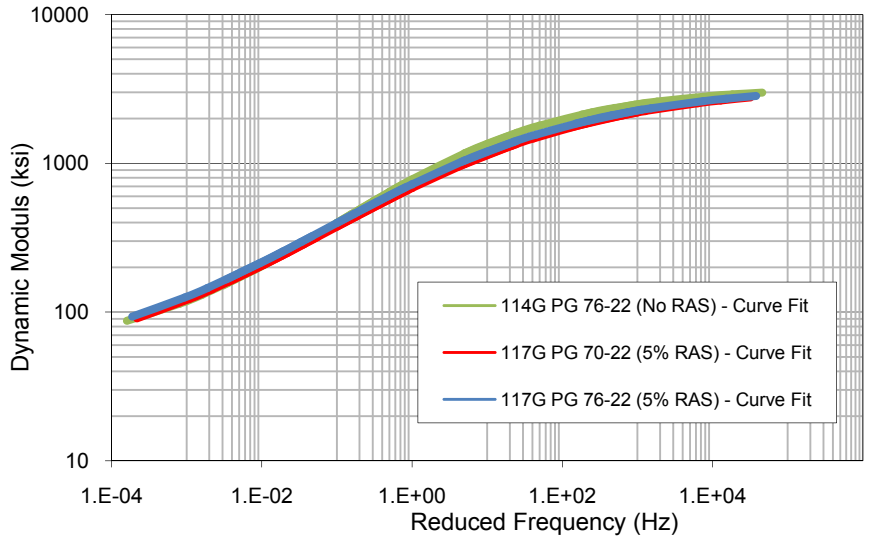


Figure 5. Master Curve for RAS Mixtures

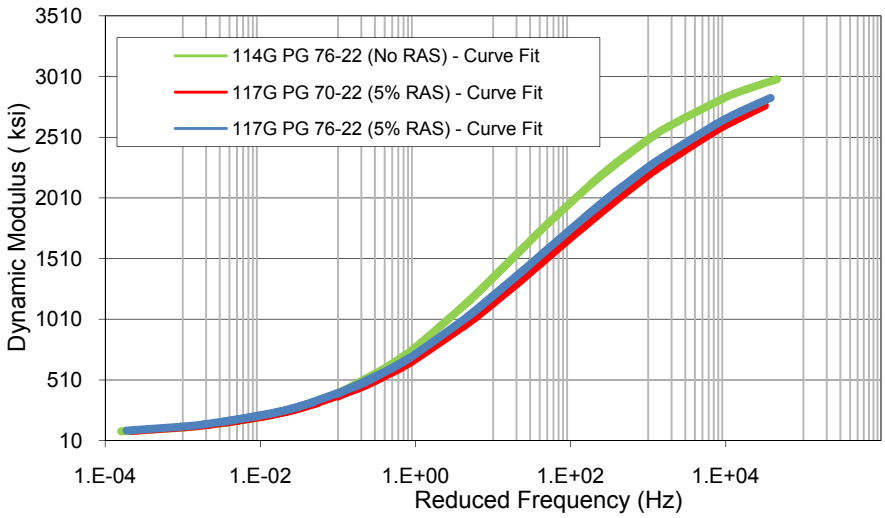
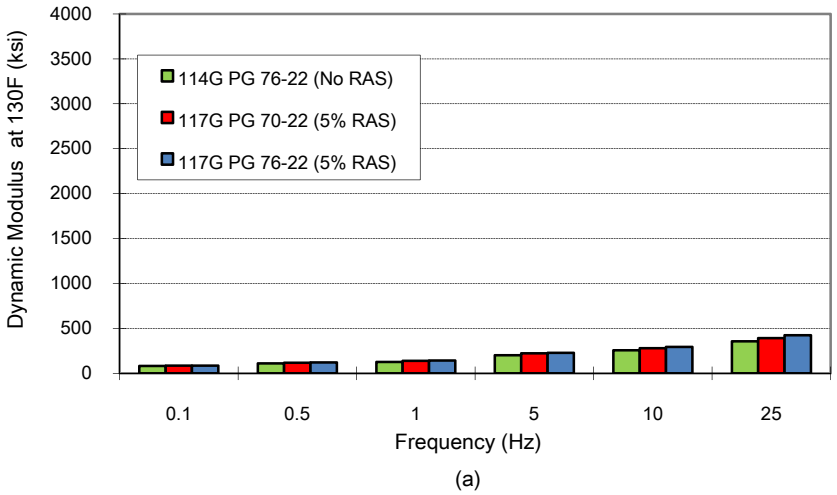
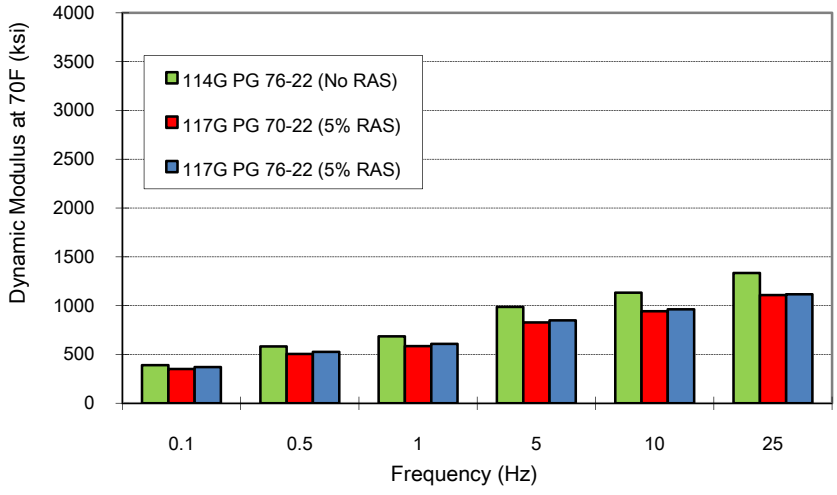


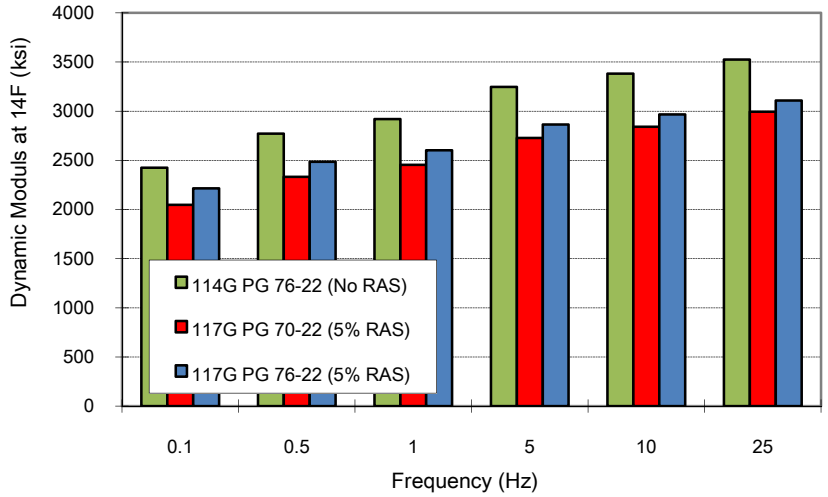
Figure 6. Master Curve for RAS Mixtures with Linear Y - Axis



(a)



(b)



(c)

Figure 7. Dynamic Modulus Results for RAS Mixtures at (a) 130°F, (b) 70°F, and (c) 14°F

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This study includes the characterization of several mixtures including WMA, alternate friction aggregates in SMAs, alternate friction aggregates in N90 F mixes and RAS in SMAs. This report presents the results of the Wheel Track testing for 17 IDOT mixtures. Dynamic modulus was also performed on three SMA mixtures that contain recycled asphalt shingle (RAS).

The mixtures containing RAS are N80 SMA binders. The two RAS mixtures have 5% RAS. One RAS mixture uses a PG 76-22, while the other uses a PG 70-22. The control mixture, which does not include RAS, uses a PG 76-22. Although the RAS mixtures show a lower dynamic modulus than the control mixture at low temperatures and high frequencies, this is not a concern because they have similar dynamic modulus values at high temperatures and low frequencies. However, the Wheel Track test showed that approximately 25% more rutting is observed with the RAS SMA that uses PG 76-22 binder compared to the control mixture. This indicates that the material could behave differently with compressive modulus testing and wheel testing with shear distortions. Given that rutting is related to shear in mixture, the wheel track test results, although qualitative, are important. As expected, the RAS SMA with PG 70-22 showed greater rutting potential than the RAS SMA with PG76-22.

Comparing the FRWARMT (N90F WMA) mixture to the other N90F mixtures in the Alternate Friction Aggregate group, the WMA does show a higher Wheel Track displacement than most of the other HMA of the same classification. Additional testing should be conducted on a wider variety of WMA and HMA specimens to confirm these results. Considering that the air voids were out of specification for two of the N50 WMA specimens, additional Wheel Track testing may help address the inconsistencies in the displacement data for this mixture.

The District 2 HMA shows a greater displacement than the WMA of the same mixture type. The QC data indicates that there are differences in the dust content, AC content, and volumetrics of these mixes. These differences may affect the resulting displacements of the mixes.

The three N80 SMA surface mixes with alternate friction aggregates (diabase, granite, and quartzite) had only minor differences in the Wheel Track displacements.

The Wheel Track data for the five N90F surface mixtures show that the control mixture with steel slag has a larger displacement than the quartzite mixes.

The data for the R27-42 SMA control mixture shows that the air void level has a significant effect on the Wheel Track displacements.

5.2 RECOMMENDATIONS

Additional testing should be considered to evaluate the low temperature fracture properties of the RAS and WMA mixtures. Also, additional testing should be conducted to evaluate a wider variety of mixture types including high and low gyration mixtures with RAS and various WMA technologies. In summary, a more comprehensive testing plan for various SMA, HMA, and WMA should be conducted that considers the effect of curing time on laboratory measured parameters. This should include the material behavior under various loading and temperature conditions.

Although the Texas DOT protocol for Wheel Track testing has generally been followed for this report, a standard IDOT protocol should be established. Consideration should be given to address the field compaction requirements of various mixtures when comparing HMA, WMA, and SMA. The number of samples required for testing should also be addressed considering that high COVs were observed for the Wheel Track data with some of the mixtures.

REFERENCES

Bonaquist, R. T. and Christensen, D. W., A Practical Procedure for Developing Dynamic Modulus Master Curves for Pavement Structural Design, *Transportation Research Record 1929*, TRB, National Research Council, Washington, D.C., 2005, pp. 208-217.

Carpenter, S.H., *Dynamic Modulus Performance of IDOT Mixtures.* FHWA-ICT-07-008. Illinois Center for Transportation, University of Illinois at Urbana-Champaign, Urbana, IL, 2007.

Izzo, R. P., and Tahmoressi, M., Use of Hamburg Wheel-Tracking Device for Evaluating Moisture Susceptibility of Hot-Mix Asphalt. *Transportation Research Record 1681*, TRB, National Research Council, Washington, D.C., 1999, pp. 76-85.

APPENDIX A: MIXTURE DESIGN AND QC DATA

NEW 81BIT #114G 114G / 48 BIT V607

Ver. 6.0-01.01.09 DATE: 05/01/09

MAY 18 2009

IDOT Lab Verification No.: →

Producer Number & Name →	716-07	Gallagher Asphalt	Thornton, IL	← Plant Location
Material Code Number →	18435	POLY HMA BCS SMA N80		

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size			032CM00	032CM16	038FM20	004MF01		10131
Source (PROD #)			50312-04	50312-04	50312-04	50312-04	✓	6019-05
(NAME)			Hanson	Hanson	Hanson	Hanson		Conoco
(LOC)			Thornton	Thornton	Thornton	Thornton		Forest View
(ADD. INFO)								
						AC in RAP →	0.0	
Aggregate Blend:								
	0.0	0.0	62.0	20.5	11.0	6.5	0.0	100.0

76-22 8#BIT

18435 POLY HMA BCS SMA N80

Lab Preparing Design	IL
Designing Lab Mix#	BIT0643
Designing Lab Name	C.T.L.

Agg No. / Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	77.0 73	100.0	100.0	100.0	100.0	85.7 83.2
3/8" (9.5mm)	100.0	100.0	39.0	97.0	100.0	100.0	100.0	61.6
No.4 (4.75mm)	100.0	100.0	6.0 8	29.0	100.0	100.0	100.0	27.2 28.4
No.8 (2.36mm)	100.0	100.0	4.0 5	6.0	81.0	100.0	100.0	19.1 19.7
No.16 (1.18mm)	100.0	100.0	3.0	4.0	49.0	100.0	100.0	14.6
No.30 (600µm)	100.0	100.0	3.0	4.0	31.0	100.0	100.0	12.6
No.50 (300µm)	100.0	100.0	3.0	4.0	17.0	100.0	100.0	11.1
No.100 (150µm)	100.0	100.0	3.0	3.0	10.0	95.0	100.0	9.8
No.200(75µm)	100.0	100.0	2.1	3.1	5.6	90.0	100.0	8.4

Mixture Composition / Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
100		100		
82-100		86		
65 max		62		
20-30		27	22	32
16-24		19	14	24
		15		
12-16		13		
10-15		11	7	15
		10		
8-10		8.4	6.9	9.9

Bulk Sp Gr	1.000	1.000	2.654	2.640	2.682	2.900	1.000	2.669	
Apparent Sp Gr	1.000	1.000	2.772	2.787	2.779	2.987	1.000	2.789	Dust/AC Ratio
Absorption, %	1.00	1.00	1.60	2.00	1.30	1.00	1.00	1.56	
							SP GR AC	1.031	1.35

DEPT. OF TRANSPORTATION

AMOUNT OF AGED RAP AC 0 0

MAY 19 2009 VERIFIED 6.2

DISTRICT 1-MATERIALS

656 0.008

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @ 305

DATA for N-Int.	7								
	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.5	2.048	2.513	18.5	27.5	32.7	8.98	4.52	1.04
MIX 2	6.0	2.083	2.488	16.3	26.6	38.9	10.37	5.13	0.92
MIX 3	6.5	2.083	2.469	15.7	27.0	42.1	11.38	5.63	0.93
MIX 4	7.0	2.081	2.451	15.1	27.5	45.1	12.39	6.14	0.93

TSR Information	
Conditioned	89.0
Unconditioned	91.6
TSR	0.97
CA Strip Rating	
FA Strip Rating	
Additive Prod #	
Additive Matl Code	
Additive %	

DATA for N-des.	80								
		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.5	2.357	2.513	6.2	16.5	62.5	10.34	4.52	2.742	1.04
MIX 2	6.0	2.389	2.488	4.0	15.9	75.0	11.89	5.13	2.734	0.92
MIX 3	6.5	2.396	2.469	3.0	16.1	81.5	13.09	5.63	2.735	0.93
MIX 4	7.0	2.397	2.451	2.2	16.5	86.6	14.27	6.14	2.735	0.93

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa) Target	VMA	VFA	Gse	Gsb	TSR
		6.24		linear		wet				
OPTIMUM DESIGN DATA @Ndes: →	80	6.2	2.392	2.479	3.5	16.0	78.1	2.734	2.669	0.97

REMARKS LINE 1: Fibers added 0.4% Drain down @350 deg F=0.0%

REMARKS LINE 2: Drain down @ 378 deg F=0.0%

15.5mm 75-05 70.25

Tested by :

Reviewed by :

Verified by: Steven Rath

Final Approval : Steven Rath

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	910000000	Date	062909	Seq #:	000
Bit Mix Plant:	716-07	Mix Code:	18435	Quantity:	400.0
Resp Loc:	91	Lab:	PP	Dist Mix #:	81BIT114G
Type Insp:	PRO	Lab Name:	CTL		
		Mix Name:	POLY HMA BCS SMA N80		

Contract / Section No.	Job No.	Quantity
60D21	C9135507	400.0

/FOR DTY03309

	Producer	Material	%
Asphalt	6019-05	10131	6.2
Additive	6021-01	43516	0.5

Sub Lot: 1 Type: B Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%					88.6		5.2	6.2
AGG%					94.5		5.5	
AC% in RAP								

Remarks: Using positive dust control.

Sub Lot: 2 Type: S Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%				58.6	19.7	10.3	5.2	6.2
AGG%				62.5	21.0	11.0	5.5	
AC% in RAP								

Remarks: Using positive dust control.

	Sub Lot: 1		Sub Lot: 2	
	% PASS	AJMF	% PASS	AJMF
1.5				
1				
3/4	100	100	100	100
1/2	81	86	81	86
3/8	58	62	58	62
#4	25	27	25	27
#8	17	19	17	19
#16	14	15	13	15
#30	11	13	11	13
#50	10	11	10	11
#100	9	10	9	10
#200	8.2	8.4	7.9	8.4
AC	6.2	6.2	6.2	6.2

/FOR DTY03000 / TRANS 308

Wash: Y

Sub Lot: 2 Type: I Wash: Y

	Corr.	% PASS	AJMF	Corr.	% PASS	AJMF
1.5		100			100	
1		100			100	
3/4		100	100		100	100
1/2		83	86		82	86
3/8		59	62		59	62
#4		24	27		24	27
#8		16	19		16	19
#16		12	15		11	15
#30		9	13		9	13
#50		8	11		8	11
#100		7	10		7	10
#200	0.20	5.3	8.4	0.2	5.4	8.4
AC						

Remarks:
Remarks:

	Sub Lot: 1	Sub Lot: 2
Type:	N	N
AC%:	6.3	6.2
Target AC:	6.2	6.2

Remarks:
Remarks:

SMA BCS
NO RAS
PG 76-22

Sub Lot: 1 Gsb: 2.669

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.356	2.479	5.0	17.2

Sub Lot: 2 Gsb: 2.669

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.352	2.478	5.1	17.4

COPIES:
District Office
Inspector
Gallagher Asphalt
RE:
M. Myszkowski

QC Manager: S. Richter
Tested By: C. Hasemeyer
Phone:
Fax:

NEW SIBIT # w/ 48 BIT VG35 SIBIT 117G 117G w/ 76-22 493V

DATE: 04-Jun-09
VERSION: EXCEL v1.3

Bituminous Mixture Design

Design Number : ------> BIT0646
Lab preparing the design ? (PP,PL,IL,etc) IL

Producer Name & Number --> 716-05 Gallagher Asphalt Joliet, IL
Material Code Number ----> 18435 R POLY HMA SMA BCS N80 12.5 IL-19.0

017FM99
716-07

State Assigne Mix Design Number

Agg No.	#1	#2	#3	#4	#5	RAP #6	ASPHALT
Material Code	032CM00	032CM16	038FM20		004MF01	~~RAS~~	10131
Producer Number	50312-04	50312-04	50312-04		50312-04	Amon	6019-05
Producer Name	Hanson	Hanson	Hanson		HMS	Amon	Conoco
Producer Location	Thornton	Thornton	Thornton		Thornton	Misc.	Forest View
						22.0	<--%AC in RAP
Aggragate Blend	62.0	19.8	9.0	0.0	4.2	5.0	<--% RAP
							New AC
Mix Blend	58.2	18.6	8.4	0.0	3.9	5.7	5.2

100.0 <--Blend Total

100.0 <--Blend Total

Agg No. / Sieve Size	#1	#2	#3	#4	#5	#6	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0		100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0		100.0	100.0	100.0
1/2" (12.5mm)	77.0 73	100.0	100.0		100.0	100.0	85.7 83
3/8" (9.5mm)	39.0	97.0	100.0		100.0	100.0	61.6
No.4 (4.75mm)	6.0 9	29.0	100.0		100.0	100.0	27.7 29
No.8 (2.36mm)	4.0 5	6.0	81.0		100.0	100.0	20.2
No.16 (1.18mm)	3.0	4.0	49.0		100.0	100.0	16.3
No.30 (600µm)	3.0	4.0	31.0		100.0	100.0	14.6
No.50 (300µm)	3.0	4.0	17.0		100.0	85.0	12.6
No.100 (150µm)	3.0	3.0	10.0		95.0	75.0	11.1
No.200(75µm)	2.6	3.1	5.6		90.0	21.6	7.6

1.5 min

Mixture Composition / Specification	Formula	Formula Range Min	Formula Range Max
	100		
100	100		
82-100	86	80	92
65 max	62		
20-30	28	23	33
16-24	20	15	25
	16		
12-16	15	11	19
10-15	13		
	11		
8-10	7.6	6.1	9.1

Bulk Sp Gr	2.654	2.640	2.682	1.000	2.900	2.061	2.625	
Apparent Sp Gr	2.772	2.787	2.779	1.000	2.987	2.155	2.745	Dust/AC Ratio
Absorption, %	1.60	2.00	1.30	1.00	1.00	1.00	1.544	
						SP GR AC	1.031	1.22

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED [redacted] HOURS @ [redacted]

DATA for N-initial 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.5	2.090	2.516	16.9	24.8	31.6	7.83	3.86	1.73
MIX 2	6.0	2.070	2.495	17.0	25.9	34.2	8.83	4.40	1.70
MIX 3	6.5	2.092	2.479	15.6	25.5	38.7	9.88	4.87	1.74
MIX 4	7.0	2.118	2.463	14.0	25.0	43.9	10.94	5.33	1.80

Conditioned	76.5
Unconditioned	77.6
TSR	0.99
C A Strip Rating	[redacted]
F A Strip Rating	[redacted]

DATA for N-design 80

Gse's ARE IN TOLERANCE

	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.5	2.382	2.516	5.3	14.2	62.6	8.92	3.86	2.746	1.73
MIX 2	6.0	2.392	2.495	4.1	14.3	71.3	10.22	4.40	2.744	1.70
MIX 3	6.5	2.409	2.479	2.8	14.2	80.1	11.37	4.87	2.747	1.75
MIX 4	7.0	2.424	2.463	1.6	14.1	88.9	12.54	5.33	2.751	1.79

Gse Diff 0.007 Gse Tolerance OK

	RAP AC = 22%	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	Field VMA	VFA	Gse	Gsb	TSR
					Strengthened	Target						
OPTIMUM DESIGN DATA @Ndes: -->		80	6.2	2.400	2.487	3.5	14.28	18.02	75.5	2.745	2.625	0.99
							15.5 min		75-85			85
							VMA ACCEPTABLE		VFA ACCEPTABLE			TSR ACCEPTABLE

REMARKS: Drain down @ 325 deg F=0.0%
Drain down @ 355 deg F=0.0%

Tested & Submitted by : Michael Boyle Michael Boyle 6/4/09

Reviewed by : Alan Rutter

Final Approval : Alan Rutter

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	910000000	Date	070609	Seq #:	002
Bit Mix Plant:	716-07	Mix Code:	18435R	Quantity:	1100.0
Resp Loc:	91	Lab:	PP	Dist Mix #:	81BIT117G
Type Insp:	PRO	Lab Name:	CTL		
		Mix Name:	SMA Binder 12.5 REC		

Contract / Section No.	Job No.	Quantity
60D21	C9135507	1100.0

/FOR DTY03309

Sub Lot: 1 Type: S Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%	5.0			59.4	19.2	8.4	3.0	5.0
AGG%	4.1			63.2	20.5	9.0	3.2	
AC% in RAP	24.0							

Remarks:

Sub Lot: 2 Type: B Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%	5.0				87.0		3.0	5.0
AGG%	4.1				92.7		3.2	
AC% in RAP	24.0							

Remarks:

	Producer	Material	%
Asphalt	6019-05	10131	5.0
Additive	6021-01	43516	0.5

Sub Lot:	1		2	
	% PASS	AJMF	% PASS	AJMF
1.5				
1				
3/4	100	100	100	100
1/2	81	86	85	86
3/8	58	62	61	62
#4	25	28	26	28
#8	18	20	20	20
#16	15	16	16	16
#30	13	15	14	15
#50	11	13	12	13
#100	10	11	10	11
#200	6.9	7.6	7.3	7.6
AC	6.2	6.2	6.2	6.2

/FOR DTY03000 / TRANS 308

Wash: Y

Sub Lot: 2 Type: I Wash: Y

	Corr.	% PASS	AJMF	Corr.	% PASS	AJMF
1.5					100	
1					100	
3/4		100	100		100	100
1/2	-0.50	88	86	-0.5	91	86
3/8	1.50	69	62	1.5	70	62
#4	0.50	28	28	0.5	29	28
#8	0.50	19	20	0.5	19	20
#16	-0.50	14	16	-0.5	15	16
#30	-2.50	13	15	-2.5	14	15
#50	-1.50	11	13	-1.5	11	13
#100	-0.50	9	11	-0.5	9	11
#200	1.00	6.0	7.6	1.0	6.1	7.6
AC						

Remarks:

Remarks:

Sub Lot:	1	Sub Lot:	2
Type:	N	Type:	N
AC%:	6.4	AC%:	6.7
Target AC:	6.2	Target AC:	6.2

Remarks:

Remarks:

Sub Lot: 1 Gsb: 2.663

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.377	2.458	3.3	16.5

Sub Lot: 2 Gsb: 2.663

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.383	2.478	3.9	16.5

COPIES:
District Office
Inspector
Gallagher Asphalt
RE:
M. Myszkowski

(SMA BCS w/RAS and PG 76-22)

QC Manager: S. Richter

Tested By: C. Hasemeyer

Phone:

Fax:

NEW 81BIT # w/ 48 BIT VG35 117G w/ 70-22 493V
81BIT117G

DATE: 04-Jun-09
VERSION: EXCEL v1.3

Bituminous Mixture Design

Design Number : ------> BIT0646
Lab preparing the design ? (PP,PL,IL,etc) IL

Producer Name & Number --> 716-05 Gallagher Asphalt Joliet, IL
Material Code Number ----> 18435 R POLY HMA SMA BCS N80 12.5 IL-19.0

017FM99
716-07
10129

Agg No.	#1	#2	#3	#4	#5	RAP #6	ASPHALT
Material Code	032CM00	032CM16	038FM20		004MF01	~~RAC~~	~~10131~~
Producer Number	50312-04	50312-04	50312-04		50312-04	~~Amon~~	6019-05
Producer Name	Hanson	Hanson	Hanson		LMS	Amon	Conoco
Producer Location	Thornton	Thornton	Thornton		Thornton	Wisc.	Forest View
						22.0	<--%AC in RAP
Aggragate Blend	62.0	19.8	9.0	0.0	4.2	5.0	<--% RAP
							New AC
Mix Blend	58.2	18.6	8.4	0.0	3.9	5.7	5.2

State Assigne Mix Design Number

100.0 <--Blend Total

100.0 <--Blend Total

1.5 min

Agg No. / Sieve Size	#1	#2	#3	#4	#5	#6	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0		100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0		100.0	100.0	100.0
1/2" (12.5mm)	77.0 73	100.0	100.0		100.0	100.0	85.7 83
3/8" (9.5mm)	39.0	97.0	100.0		100.0	100.0	61.6
No.4 (4.75mm)	6.0 8	29.0	100.0		100.0	100.0	27.7 29
No.8 (2.36mm)	4.0 5	6.0	81.0		100.0	100.0	20.2
No.16 (1.18mm)	3.0	4.0	49.0		100.0	100.0	16.3
No.30 (600µm)	3.0	4.0	31.0		100.0	100.0	14.6
No.50 (300µm)	3.0	4.0	17.0		100.0	85.0	12.6
No.100 (150µm)	3.0	3.0	10.0		95.0	75.0	11.1
No.200(75µm)	2.6	3.1	5.6		90.0	21.6	7.6

Mixture Composition / Specification	Formula	Formula Range Min	Formula Range Max
	100		
100	100		
82-100	86	80	92
65 max	62		
20-30	28	23	33
16-24	20	15	25
	16		
12-16	15	11	19
10-15	13		
	11		
8-10	7.6	6.1	9.1

Bulk Sp Gr	2.654	2.640	2.682	1.000	2.900	2.061	2.625
Apparent Sp Gr	2.772	2.787	2.779	1.000	2.987	2.155	2.745
Absorption, %	1.60	2.00	1.30	1.00	1.00	1.00	1.544
						SP GR AC	1.031

Dust/AC Ratio
1.22

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED 2 HOURS @ 305

DATA for N-initial 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.5	2.090	2.516	16.9	24.8	31.6	7.83	3.86	1.73
MIX 2	6.0	2.070	2.495	17.0	25.9	34.2	8.83	4.40	1.70
MIX 3	6.5	2.092	2.479	15.6	25.5	38.7	9.88	4.87	1.74
MIX 4	7.0	2.118	2.463	14.0	25.0	43.9	10.94	5.33	1.80

Conditioned	76.5
Unconditioned	77.6
TSR	0.99
C A Strip Rating	
F A Strip Rating	

DATA for N-design 80

Gse's ARE IN TOLERANCE

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.5	2.382	2.516	5.3	14.2	62.6	8.92	3.86	2.746	1.73
MIX 2	6.0	2.392	2.495	4.1	14.3	71.3	10.22	4.40	2.744	1.70
MIX 3	6.5	2.409	2.479	2.8	14.2	80.1	11.37	4.87	2.747	1.75
MIX 4	7.0	2.424	2.463	1.6	14.1	88.9	12.54	5.33	2.751	1.79

Gse Diff 0.007 Gse Tolerance OK

	RAP AC = 22%	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	Field VMA	VFA	Gse	Gsb	TSR
					Submitted	Target						
OPTIMUM DESIGN DATA @Ndes: ---->		80	6.2	2.400	2.487	3.5	14.28	18.02	75.5	2.745	2.625	0.99
REMARKS:	Drain down @ 325 deg F=0.0%						15.5min		75-85			85
	Drain down @ 355 deg F=0.0%						VMA ACCEPTABLE		VFA ACCEPTABLE			TSR ACCEPTABLE

Tested & Submitted by : Michael Boyle 6/4/09

Reviewed by :

Final Approval :

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	910000000	Date	071709	Seq #:	005
Bit Mix Plant:	716-07	Mix Code:	18435R	Quantity:	100.0
Resp Loc:	91	Lab:	PP	Dist Mix #:	81BIT117G
Type Insp:	PRO	Lab Name:	CTL		
		Mix Name:	SMA Binder 12.5 REC		

Contract / Section No.	Job No.	Quantity
60D21	C9135507	100.0

/FOR DTY03309

Sub Lot: 1 Type: B Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%	5.0				85.8		4.2	5.0
AGG%	4.1				91.4		4.5	
AC% in RAP	24.0							

Remarks: Using positive dust control system.

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

	Producer	Material	%
Asphalt	6019-05	10131	5.0
Additive	6021-01	43516	0.5

	Sub Lot: 1 % PASS	Sub Lot: 1 AJMF	Sub Lot: % PASS	Sub Lot: AJMF
1.5				
1				
3/4	100	100		
1/2	83	86		
3/8	57	62		
#4	26	28		
#8	20	20		
#16	16	16		
#30	14	15		
#50	12	13		
#100	10	11		
#200	7.4	7.6		
AC	6.2	6.2		

/FOR DTY03000 / TRANS 308

Wash: Y

Sub Lot: Type: Wash:

	Corr.	% PASS	AJMF	Corr.	% PASS	AJMF
1.5						
1						
3/4		100	100			
1/2	-0.50	82	86			
3/8	1.50	61	62			
#4	0.50	28	28			
#8	0.50	19	20			
#16	-0.50	15	16			
#30	-2.50	14	15			
#50	-1.50	12	13			
#100	-0.50	9	11			
#200	1.00	6.1	7.6			
AC						

Remarks:
Remarks:

	Sub Lot: 1	Sub Lot:
Type:	N	
AC%:	6.5	
Target AC:	6.2	

Remarks:
Remarks:

SMA BCS w/RAS PG 70-22

Sub Lot: 1 Gsb: 2.664

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.402	2.477	3.1	15.7

Sub Lot: Gsb:

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA

COPIES:
District Office
Inspector
Gallagher Asphalt
RE:
M. Myszkowski

QC Manager: S. Richter
Tested By: M. Boyle
Phone:
Fax:

N90F Warm Mix
w/ 0.5% Evotherm

Ver. 6.0-01.01.09 DATE: 04/27/09

IDOT Lab Verification No.: --->

Producer Number & Name --->
Material Code Number ---> 19536 HMA N90 F SURF <--- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	033CM13	032CM16	038FM20			004MF01	017CM13	10129
Source (PROD #)	52103-11	50312-04	50312-04			50312-04	716-07	1757-05
(NAME)	Levy	HMS	HMS			HMS	GALLAGHER	SENECA
(LOC)								
(ADD. INFO)								
						AC in RAP --->	0.0	
Aggregate Blend:	27.5	30.5	40.0	0.0	0.0	2.0	0.0	100.0

8#BIT

19536 HMA N90 F SURF

Lab Preparing Design: IL
Designing Lab Mix#: FRWARMT
Designing Lab Name: SCHAUMBURG

Agg No. / Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	82.0	97.0	100.0	100.0	100.0	100.0	100.0	94.1
No.4 (4.75mm)	17.0	29.0	100.0	100.0	100.0	100.0	100.0	55.5
No.8 (2.36mm)	2.0	6.0	81.0	100.0	100.0	100.0	100.0	36.8
No.16 (1.18mm)	1.0	4.0	49.0	100.0	100.0	100.0	100.0	23.1
No.30 (600µm)	1.0	4.0	31.0	100.0	100.0	100.0	100.0	15.9
No.50 (300µm)	1.0	4.0	17.0	100.0	100.0	100.0	100.0	10.3
No.100 (150µm)	1.0	3.0	9.0	100.0	100.0	95.0	100.0	6.7
No.200(75µm)	0.9	2.9	4.3	100.0	100.0	90.0	100.0	4.7

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		94		
28-65		56	51	61
28-40		37	32	42
10-32		23		
		16	12	19.895
4-15		10		
3-10		7		
4-6		4.7	3.2	6.2

Bulk Sp Gr	2.415	2.676	2.703	1.000	1.000	2.900	2.660	2.613	
Apparent Sp Gr	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	Dust/AC Ratio
Absorption, %	2.90	1.60	1.20	1.00	1.00	1.00	1.00	1.57	
							SP GR AC	1.032	0.74

AMOUNT OF AGED RAP AC 0 0

VIRGIN AC 6.3

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @: 152

DATA for N-int.	8								
	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.5	2.066	2.501	17.4	25.3	31.3	7.90	3.95	1.64
MIX 2	6.0	2.093	2.467	15.2	24.7	38.6	9.53	4.70	1.39
MIX 3	6.5	2.095	2.452	14.5	25.0	41.9	10.48	5.16	1.43
MIX 4	7.0	2.100	2.447	14.2	25.3	43.8	11.07	5.44	1.68

TSR Information	
Conditioned	#N/A
Unconditioned	#N/A
TSR	#N/A
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

DATA for N-des.	90									
		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.5	2.323	2.501	7.1	16.0	55.7	8.88	3.95	2.726	1.64
MIX 2	6.0	2.354	2.467	4.6	15.3	69.9	10.71	4.70	2.708	1.39
MIX 3	6.5	2.363	2.452	3.6	15.4	76.4	11.82	5.16	2.711	1.43
MIX 4	7.0	2.374	2.447	3.0	15.5	80.7	12.51	5.44	2.729	1.68

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		6.31			Target					
OPTIMUM DESIGN DATA @Ndes: ---->	90	6.3	2.359	2.458	4.0	15.4	74.0	2.710	2.613	#N/A

REMARKS LINE 1: TSR = 0.86
REMARKS LINE 2:

Tested by : _____ Verified by: _____

Reviewed by : _____ Final Approval : _____

Tom

Illinois Department of Transportation

Division of Highways / Region 2 / District 3
700 East Norris Drive / Ottawa, Illinois / 61350-0697
Telephone 815/434-6131

May 8, 2009

Mr. Christine Stroud
Advanced Asphalt Company
P.O. Box 234
Princeton, IL 61356

REVISED

Mix Design Verification
Mixture Type: Warm Mix Asphalt Surface Course N50 Mix E

Dear Ms. Stroud:

Please be advised that our laboratory completed testing on the mix design that your QC/QA department submitted for approval. Listed below are the approved ingredients and targets.

			Blend %
Coarse Aggregate:	031CM16, Tri-Con-Hennepin	51550-07	40.5
RAP:	017CM16, Advanced-Hennepin	2712-15	25.0
Coarse Sand:	039FM22, Tri-Con-Hennepin	51550-07	6.0
Coarse Sand:	039FM20, Tri-Con-Hennepin	51550-07	13.0
Natural Sand:	037FM01, Tri-Con-Hennepin	51550-07	14.0
Mineral Filler:	004MF01, Livingston St.-Ocoya	51052-04	1.5
Mix Record Number:	84BIT460S		
Material Code Number:	19515R		

Current Theoretical Bulk Specific Gravity (d): ---------- 2.368
Current Theoretical Maximum Specific Gravity (D):---------- 2.467
Design Voids: ---------- 4.0% @ N50
TSR:---------- No Anti-strip Additive Required *
Gsb: ---------- 2.614

* Lab TSR results indicate an anti-strip additive will not be required. However, if a Departmental field TSR test fails during production, an anti-strip additive may be required as per the Engineer.

Mixture Composition -- IL 9.5

Passing 12.5 mm (1/2 inch) sieve: ---------- 100%
Passing 9.5 mm (3/8 inch) sieve:---------- 97%
Passing 4.75 mm (No. 4) sieve: ---------- 59% ±5
Passing 2.36 mm (No. 8) sieve: ---------- 37% ±5
Passing 1.18 mm (No. 16) sieve:---------- 26%
Passing 0.600 mm (No. 30) sieve: ---------- 18% ±4
Passing 0.300 mm (No. 50) sieve: ---------- 10%
Passing 0.150 mm (No. 100) sieve: ---------- 6%
Passing 0.075 mm (No. 200) sieve: ---------- 4.6% ±1.5
Bitumen:---------- (PG58-22)---------- 5.9% ±0.3

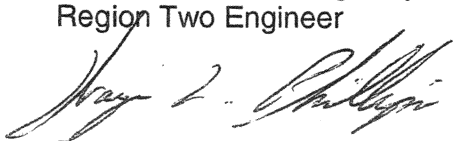
The aggregate gradation is based on the total aggregate weight. The bitumen content is based on the total weight of the mix.

Asphalt cement grade PG58-22 will be required.

Changes to the mix formula may be made in the field, as deemed necessary by the QC Manager, to improve the quality, workability and stability of the mixture provided the adjustments are within the tolerances allowed in Standard Specifications for Road and Bridge Construction.

Sincerely,

George F. Ryan, P.E.
Deputy Director of Highways,
Region Two Engineer



By: Wayne L. Phillips, P.E.
District Materials Engineer

FP:lw/MIXVERI ADVANCED 22

cc: Frank Pearson
Thad Knirlberger
Tom Killelea

New

84BIT460S

Bituminous Mixture Design

Design Number : ——> ~~84BIT464S~~

Lab preparing the design ? (PP,PL,IL,etc) | Enter Lab Preparing Design

DATE:

SEQ NO:

APPROVED
042109 FP

Producer Name & Number -->	2712-15	AAC
Material Code Number ---->	19515R	HMA N50 SURF REC

84BIT460S

Agg No.	#1	#2	#3	#4	#5 (~~51052-04~~)	RAP #1 (017)	RAP #2 (017)	RAP #3	ASPHALT
Size	031CM16	039FM22	039FM20	037FM01	004MF01	~~027~~CM16	~~027~~CM16		10125
Source (PROD #)	51550-07	51550-07	51550-07	51550-07	~~50162-04~~	2712-15	2712-15		1757-05
(NAME)	Tri-Con	Tri-Con	Tri-Con	Tri-Con	Livingston	AAC	AAC		Seneca
(LOC)	Hennepin	Hennepin	Hennepin	Hennepin	Ocoya	Hennepin	Hennepin		Lemont
						3.8	5.4	0.0	<--%AC in RAP
Total Mix Blend	40.5	6.0	13.0	14.0	1.5	13.0	12.0	0.0	
Total Agg. Blend	41.1	6.1	13.1	14.2	1.5	12.5	11.4	0.0	

100.0 <-Mix Total 100.0

100.0 <-Agg Total

Agg No. / Sieve Size	#1	#1	#2	#3	#4	#6	#6	#6	Aggregate Blend	Mixture Composition Specification	FORMULA	FORMULA RANGE Min	Max
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100		
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100		
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100	100		
3/8" (9.5mm)	94.3	100.0	100.0	100.0	100.0	97.4	100.0	100.0	97.3	90-100	97		
No.4 (4.75mm)	23.8	93.4	99.4	98.7	100.0	44.3	84.4	0.0	59.3	28-65	59	54	64
No.8 (2.36mm)	2.7	45.2	74.3	86.0	100.0	27.2	56.1	0.0	37.2	28-48	37	32	42
No.16 (1.18mm)	2.3	10.2	42.1	70.9	100.0	21.6	40.8	0.0	26.0	10-32	26		
No.30 (600µm)	2.2	2.8	23.8	47.0	100.0	16.9	29.8	0.0	17.9		18	14	22
No.50 (300µm)	2.1	1.6	11.6	13.9	100.0	11.8	19.3	0.0	9.6	4-15	10		
No.100 (150µm)	2.1	1.4	5.1	4.0	98.0	8.3	13.3	0.0	6.2	3-10	6		
No.200(75µm)	1.9	1.2	2.8	0.9	80.0	6.7	10.5	0.0	4.6	4-6	4.6	3.1	6.1

Bulk Sp Gr	2.620	2.588	2.561	2.574	2.850	2.637	2.665	1.000	2.614
Apparent Sp Gr	2.765	2.775	2.766	2.729	2.934	2.784	2.815	1.000	2.771
Absorption, %	2.00	2.60	2.90	2.20	1.00	2.00	2.00	0.00	2.17
									1.032

Dust/AC Ratio	0.80

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

MIXTURE AGED 2 HOURS @ 295

DATA for N-initia 6

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba	Gse
MIX 1	5.0	2.149	2.503	14.2	21.9	35.4	7.75	3.72	1.35	2.706
MIX 2	5.5	2.161	2.483	13.0	21.9	40.8	8.92	4.26	1.31	2.704
MIX 3	6.0	2.159	2.462	12.3	22.3	44.9	10.04	4.80	1.28	2.701
MIX 4	6.5	2.180	2.442	10.7	22.0	51.2	11.28	5.34	1.24	2.699

DATA for N-desig 50

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.0	2.343	2.503	6.4	14.8	56.9	8.45	3.72	2.706	1.35
MIX 2	5.5	2.357	2.483	5.1	14.8	65.8	9.73	4.26	2.704	1.31
MIX 3	6.0	2.371	2.462	3.7	14.7	74.8	11.02	4.80	2.701	1.28
MIX 4	6.5	2.385	2.442	2.3	14.7	84.0	12.34	5.34	2.699	1.24

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa) Target	VMA	VFA	Gse	Gsb	TSR
OPTIMUM DESIGN DATA @Ndes: ---->	50	5.9	2.368	2.467	4.0	14.7	72.9	2.702	2.614	0.00

REMARKS:

Tested by : _____

Reviewed by :

Final Approval :

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	930000000	Date	051109	Seq #:	004
Bit Mix Plant:	2712-15	Mix Code:	19515R	Quantity:	1298.4
Resp Loc:	93	Lab:	PL	Dist Mix #:	84BIT460S WMA
Type Insp:	PRO	Lab Name:	Advanced Asphalt		
		Mix Name:	HMA N50 E REC SURF		

Contract / Section No.	Job No.	Quantity
66731	C9308807	1298.4

/FOR DTY03309

	Producer	Material	%
Asphalt	1757-05	10125	4.8
Additive			

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

Sub Lot: | Sub Lot:

	% PASS	AJMF	% PASS	AJMF
1.5				
1				
3/4				
1/2				
3/8				
#4				
#8				
#16				
#30				
#50				
#100				
#200				
AC				

/FOR DTY03000 / TRANS 308

COPY

Sub Lot: 1
Type: I
Wash: Y

	Corr.	% PASS	AJMF
1.5		100	
1		100	
3/4		100	
1/2		100	100
3/8		97	97
#4		56	59
#8		34	37
#16		24	26
#30		16	18
#50		9	10
#100		6	6
#200	1.30	3.2	4.6
AC	0.67	5.9	5.8

Sub Lot: 2
Type: I
Wash: Y

	Corr.	% PASS	AJMF
1.5		100	
1		100	
3/4		100	
1/2		100	100
3/8		98	97
#4		60	59
#8		35	37
#16		25	26
#30		17	18
#50		10	10
#100		7	6
#200	1.3	3.8	4.6
AC	0.68	5.9	5.8

Remarks:
Remarks:

Sub Lot: Type: AC%: Target AC:

Sub Lot: Type: AC%: Target AC:

Remarks:
Remarks:

Sub Lot: 1 Gsb: 2.614

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.351	2.458	4.4	15.3

Sub Lot: 2 Gsb: 2.614

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.381	2.464	3.4	14.3

COPIES:
District Office
Inspector
Advanced Asphalt CO.
RE:
Steve Mellendorf

QC Manager: Christine Stroud

Tested By: Paul Palen

Phone: 815-925-9344

Fax: 815-925-7093

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	930000000	Date	051109	Seq #:	004
Bit Mix Plant:	2712-15	Mix Code:	19515R	Quantity:	1298.4
Resp Loc:	93	Lab:	PL	Dist Mix #:	84BIT460S WMA
Type Insp:	PRO	Lab Name:	Advanced Asphalt		
		Mix Name:	HMA N50 E REC SURF		

Contract / Section No.	Job No.	Quantity
66731	C9308807	1298.4

/FOR DTY03309

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

	Producer	Material	%
Asphalt	1757-05	10125	4.8
Additive			

AC 58-22
SAMPLE ID # 0939624

MATERIAL SAMPLED REPRESENTATIVE OF THESE TEST RESULTS.

Sub Lot: Type:

PERCENTS:	RAP	BIN5	B
MIX%			
AGG%			
AC% in RAP			

Remarks:

/FOR DTY03000 / TRANS 308

Sub Lot: 1
Type: I
Wash: Y

	Corr.	% PASS	AJMF
1.5		100	
1		100	
3/4		100	
1/2		100	100
3/8		97	97
#4		56	59
#8		34	37
#16		24	26
#30		16	18
#50		9	10
#100		6	6
#200	1.30	3.2	4.6
AC	0.67	5.9	5.8

1.5		100	
1		100	
3/4		100	
1/2		100	100
3/8		98	97
#4		60	59
#8		35	37
#16		25	26
#30		17	18
#50		10	10
#100		7	6
#200	1.3	3.8	4.6
AC	0.68	5.9	5.8

Remarks:
Remarks:

AC%:
Target AC:

Sub Lo
Type
AC%:
Target AC:

Remarks:
Remarks:

Sub Lot: 1 Gsb: 2.614

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.351	2.458	4.4	15.3

Sub Lot: 2 Gsb: 2.614

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.381	2.464	3.4	14.3

COPIES:
District Office
Inspector
Advanced Asphalt CO.
RE:
Steve Mellendorf

QC Manager: Christine Stroud

Tested By: Paul Palen

Phone: 815-925-9344

Fax: 815-925-7093

Zehr, Thomas G

From: Vock, Mark L
Sent: Wednesday, July 29, 2009 3:37 PM
To: Dyer, Brad C
Cc: Ryan Inskeep (mciqclab@hotmail.com); Hefel, Steve A; Zehr, Thomas G
Subject: QA Daily HMA Production Report

Bit Mix Desc: 82BIT4536 19513R HMA N50 C REC SURF

Bit Mix Plant: 1181-17 McCARTHY IMP. CO. @ Linwood, IA

Contract 1: 64F04
Contract 2:
Contract 3:
Contract 4:

82BIT4536_1181-17_072809.pdf

Sub Lot #1Test is Hot Mix: approx. 650 tons
Sub Lot #2 Test is Warm Mix: approx. 474 tons

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	920000000	Date	072809	Seq #:	021
Bit Mix Plant:	1181-17	Mix Code:	19513R	Quantity:	
Resp Loc:	92	Lab:	DS	Dist Mix #:	82BIT4536
Type Insp:	IND	Lab Name:	Moline		
		Mix Name:	HMA N50 C REC SURF		

Contract / Section No.	Job No.	Quantity
64F04	C9213009	

/FOR DTY03309

	Producer	Material	%
Asphalt	6220-02	10127	4.8
Additive			

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

Sub Lot: Type: Washed: Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%								
AGG%								
AC% in RAP								

Remarks:

	Sub Lot:		Sub Lot:	
	% PASS	AJMF	% PASS	AJMF
1.5				
1				
3/4				
1/2				
3/8				
#4				
#8				
#16				
#30				
#50				
#100				
#200				
AC				

/FOR DTY03000 / TRANS 308

Wash: Y

Sub Lot: 2
Type: I
Wash: Y

	Corr.	% PASS	AJMF
1.5		100	100
1		100	100
3/4		100	100
1/2	0.70	97	95
3/8		88	80
#4		59	47
#8	0.20	38	28
#16		26	20
#30	0.40	17	14
#50	0.60	9	9
#100	0.40	7	6
#200	0.30	5.9	4.2
AC	0.63	5.3	5.2

	Corr.	% PASS	AJMF
1.5		100	100
1		100	100
3/4		100	100
1/2	0.7	96	95
3/8		87	80
#4		58	47
#8	0.2	36	28
#16		24	20
#30	0.4	15	14
#50	0.6	7	9
#100	0.4	5	6
#200	0.3	3.8	4.2
AC	0.60	5.0	5.2

Remarks: X:072909 - QA out on#4,#8 -200,voids(HOT MIX)
Remarks: C:072909- QA out on#4,#8 (WARM MIX) temp 275

	Sub Lot:		Sub Lot:	
Type:				
AC%:				
Target AC:				

Remarks:
Remarks:

Sub Lot: 1 Gsb: 2.780

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.562	2.613	2.0	12.8

Sub Lot: 2 Gsb: 2.780

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
50	2.498	2.629	5.0	14.6

COPIES:
District Office
Lab File
McCARTHY IMP. CO.
RE:
Brad Dyer

QA Inspector: M.Vock
Tested By: M.Vock
Phone:
Fax:

DATE: 3-Jul-07

Bituminous Mixture Design

Design Number : ——> 00BIT1051

Lab preparing the design ? (PP,PL,IL,etc) PL

Producer Number & Name --> 1181-17 McCARTHY IMP. CO. Linwood, IA <-- Plant Location

Material Code Number ——> 19513R HMA N50 REC SURFACE CSE 12.5 mm C MIX

0

Agg No.	#1	#2	#3	#4	#5	MF	RAP	ASPHALT
Size	032CM13			039FM20	037FM01	004MF01	017CM16	10127
Source (PROD #)	52202-08			52203-11	51610-24	52202-08	1181-17	6220-02
(NAME)	LINWOOD			Blackheart	Riverstone G	Linwood	McCARTHY	Flint Hills
(LOC)	LINWOOD			IPSCO	Albany	Linwood	LINWOOD	Davenport
(ADD. INFO)	OTIS LEDGE			Montpelier				
						RAP % -->	10.0	
	Aggregate Blend:					AC in RAP -->	4.5	
	63.0	0.0	0.0	15.4	9.0	2.6	10.0	100.0

PG 64 - 22

82BIT4536

19513R REC N50 SURFACE C 12.5

IDOT Verification, Lab # 00BIT1051

MD Prepared By McCARTHY IMP; Lab #"07901"

Agg No. / Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	91.3	100.0	100.0	100.0	100.0	100.0	100.0	94.5
3/8" (9.5mm)	69.0	100.0	100.0	100.0	100.0	100.0	96.1	80.1
No.4 (4.75mm)	22.5	100.0	100.0	98.3	97.3	100.0	66.0	47.3
No.8 (2.36mm)	4.0	100.0	100.0	68.4	89.8	100.0	45.6	28.3
No.16 (1.18mm)	1.4	100.0	100.0	40.1	78.9	100.0	33.7	20.1
No.30 (600µm)	0.9	100.0	100.0	25.4	48.3	100.0	24.4	13.9
No.50 (300µm)	0.8	100.0	100.0	16.5	15.4	100.0	16.3	8.7
No.100 (150µm)	0.7	100.0	100.0	10.0	1.6	90.0	12.2	5.7
No.200(75µm)	0.6	100.0	100.0	6.0	0.5	73.0	9.5	4.2

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
100		100		
90-100		95		
89max		80		
28-65		47	42	52
28-48		28	23	33
10-32		20		
		14		
4-15		9	5	13
3-10		6		
4-6		4.2	2.7	5.7

Bulk Sp Gr	2.665	1.000	1.000	3.280	2.600	2.750	2.660	2.740	
Apparent Sp Gr	2.721	1.000	1.000	3.670	2.644	2.750	2.760	2.831	Dust/AC
Absorption, %	0.80	1.00	1.00	3.30	0.67	1.00	1.00	0.91	Ratio
							SP GR AC	1.032	0.81

AMOUNT OF AGED RAP AC 0.45

VIRGIN AC 4.8

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED None HOURS @

DATA for N-Int.	6								
	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.214	2.620	15.5	22.8	32.1	7.33	3.42	1.13
MIX 2	5.0	2.220	2.593	14.4	23.0	37.5	8.62	4.01	1.04
MIX 3	5.5	2.240	2.578	13.1	22.7	42.3	9.61	4.43	1.13
MIX 4	6.0	2.245	2.568	12.6	23.0	45.3	10.40	4.78	1.30

DATA for N-des.	50									
		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.462	2.620	6.0	14.2	57.6	8.16	3.42	2.825	1.13
MIX 2	5.0	2.473	2.593	4.7	14.3	67.3	9.60	4.01	2.818	1.04
MIX 3	5.5	2.498	2.578	3.1	13.8	77.4	10.72	4.43	2.825	1.13
MIX 4	6.0	2.503	2.568	2.5	14.1	82.0	11.60	4.78	2.837	1.30

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa) Target	VMA	VFA	Gse	Gsb	TSR
		5.21								
OPTIMUM DESIGN DATA @Ndes: ——>	50	5.2	2.484	2.587	4.0	14.1	71.6	2.821	2.740	0.96

REMARKS: MFR 0.0% (Incorrectly used 0.6%) 5.2 No MF.

Tested by : _____

Reviewed by : Final Approval :

82BIT4536
19513R N50 Surface
12.5mm Rec

Ver. 6.0-01.01.09 **DATE:** August 8 2009

IDOT Lab Verification No.: ---> IDOT09001

Producer Number & Name -->
Material Code Number ----> 18436 BIT SMA SURFACE 12.5 <-- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM00	032CM13		038FM20		004MF01		10131
Source (PROD #)	52402-14	52402-14		50312-78		50312-04		1757-05
(NAME)	RME	RME		Vulcan		M.S.		Seneca
(LOC)	Athens,WI	Athens,WI		McCook		Thornton		Lemont
(ADD. INFO)				951				76-22
						AC in RAP -->	0.0	
Aggregate Blend:	27.5	51.5	0.0	14.0	0.0	7.0	0.0	100.0

18436 BIT SMA SURFACE 12.5

Lab Preparing Design: IL
Designing Lab Mix#: IDOT09001
Designing Lab Name: S.T.A.T.E.

Agg No. / Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	38.0	97.3	100.0	100.0	100.0	100.0	100.0	81.6
3/8" (9.5mm)	6.0	76.5	100.0	100.0	100.0	100.0	100.0	62.0
No.4 (4.75mm)	4.0	17.0	100.0	97.0	100.0	100.0	100.0	30.4
No.8 (2.36mm)	2.0	2.0	100.0	69.0	100.0	100.0	100.0	18.2
No.16 (1.18mm)	2.0	1.3	100.0	40.4	100.0	100.0	100.0	13.9
No.30 (600µm)	2.0	1.0	100.0	25.0	100.0	100.0	100.0	11.6
No.50 (300µm)	2.0	1.0	100.0	14.7	100.0	100.0	100.0	10.1
No.100 (150µm)	2.0	1.0	100.0	9.0	100.0	95.0	100.0	9.0
No.200(75µm)	1.6	0.8	100.0	6.6	100.0	90.0	100.0	8.0

Bulk Sp Gr	2.755	2.859	1.000	2.691	1.000	2.900	1.000	2.808	
Apparent Sp Gr	2.895	2.895	1.000	2.796	1.000	2.987	1.000	2.887	Dust/AC Ratio
Absorption, %	0.70	0.40	1.00	1.40	1.00	1.00	1.00	0.54	
							SP GR AC	1.032	1.30

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	Max
		100		
100		100		
82-100		82		
65 max		62		
20-30		30	25	35
16-24		18	13	23
		14		
12-16		12	8	16
10-15		10		
		9		
8-10		8.0	7	10

AMOUNT OF AGED RAP AC 0 0
VIRGIN AC 6.2

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @: 305

DATA for N-Int. 7

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.0	2.132	2.578	17.3	27.9	37.9	10.57	5.12	-0.12
MIX 2	5.5	2.143	2.559	16.3	27.9	41.7	11.62	5.59	-0.10
MIX 3	6.0	2.149	2.543	15.6	28.1	44.7	12.56	6.03	-0.03
MIX 4	6.5	2.171	2.521	13.9	27.7	49.9	13.83	6.57	-0.08

DATA for N-des. 80

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.0	2.416	2.578	6.3	18.3	65.7	11.98	5.12	2.799	-0.12
MIX 2	5.5	2.431	2.559	5.0	18.2	72.5	13.18	5.59	2.800	-0.10
MIX 3	6.0	2.441	2.543	4.0	18.3	78.1	14.27	6.03	2.806	-0.03
MIX 4	6.5	2.455	2.521	2.6	18.3	85.7	15.64	6.57	2.802	-0.08

TSR Information	
Conditioned	
Unconditioned	
TSR	
CA Strip Rating	
FA Strip Rating	
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		6.18			Target					
OPTIMUM DESIGN DATA @Ndes: --->	80	6.2	2.447	2.535	3.5	18.3	80.8	2.804	2.808	0.00

REMARKS LINE 1: FIBERS ADDED @ 0.4%
REMARKS LINE 2: DRAINDOWN = 0.0%

Tested by :
Reviewed by :
Verified by:
Final Approval :

Ver. 6.0-01.01.09 **DATE:** August 11 2009

IDOT Lab Verification No.: —> IDOT09002

Producer Number & Name —>
Material Code Number ----> 18436 BIT SMA SURFACE 12.5 <--- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM00	032CM13		038FM20		004MF01		10131
Source (PROD #)	52402-26	52402-26		50312-78		50312-04		1767-05
(NAME)	Mathy	Mathy		Vulcan		M.S.		Seneca
(LOC)	Wisconsin	Wisconsin		McCook		Thornton		Lemont
(ADD. INFO)				951				76-22
						AC in RAP —>	0.0	
Aggregate Blend:	28.5	56.5	0.0	8.5	0.0	6.5	0.0	100.0

8#BIT

18436 BIT SMA SURFACE 12.5

Lab Preparing Design: IL
Designing Lab Mix#: IDOT09002
Designing Lab Name: S.T.A.T.E.

Agg No. / Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	38.0	99.0	100.0	100.0	100.0	100.0	100.0	81.8
3/8" (9.5mm)	6.0	80.0	100.0	100.0	100.0	100.0	100.0	61.9
No.4 (4.75mm)	3.2	26.0	100.0	97.0	100.0	100.0	100.0	30.3
No.8 (2.36mm)	2.5	7.9	100.0	69.0	100.0	100.0	100.0	17.5
No.16 (1.18mm)	2.3	5.1	100.0	40.4	100.0	100.0	100.0	13.5
No.30 (600µm)	2.2	4.3	100.0	25.0	100.0	100.0	100.0	11.7
No.50 (300µm)	2.0	3.6	100.0	14.7	100.0	100.0	100.0	10.4
No.100 (150µm)	1.9	3.0	100.0	9.0	100.0	95.0	100.0	9.2
No.200(75µm)	1.5	2.1	100.0	6.6	100.0	90.0	100.0	8.0

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	Max
		100		
100		100		
82-100		82		
65 max		62		
20-30		30	25	35
16-24		18	13	23
		13		
12-16		12	8	16
10-15		10		
		9		
8-10		8.0	7	10

Bulk Sp Gr	2.695	2.695	1.000	2.691	1.000	2.900	1.000	2.707	
Apparent Sp Gr	2.748	2.748	1.000	2.796	1.000	2.987	1.000	2.766	Dust/AC Ratio
Absorption, %	0.70	0.70	1.00	1.40	1.00	1.00	1.00	0.75	
							SP GR AC	1.032	1.35

AMOUNT OF AGED RAP AC 0 0

VIRGIN AC 5.9

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @: 305

DATA for N-int. 7

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.0	2.091	2.505	16.5	26.6	37.9	10.08	4.97	0.03
MIX 2	5.5	2.104	2.485	15.3	26.5	42.3	11.22	5.50	0.00
MIX 3	6.0	2.114	2.473	14.5	26.6	45.4	12.08	5.90	0.11
MIX 4	6.5	2.121	2.453	13.6	26.7	49.3	13.19	6.42	0.09

DATA for N-des. 80

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.0	2.365	2.505	5.6	17.0	67.1	11.40	4.97	2.709	0.03
MIX 2	5.5	2.379	2.485	4.3	16.9	74.8	12.68	5.50	2.707	0.00
MIX 3	6.0	2.389	2.473	3.4	17.0	80.1	13.65	5.90	2.715	0.11
MIX 4	6.5	2.397	2.453	2.3	17.2	86.6	14.91	6.42	2.713	0.09

TSR Information	
Conditioned	
Unconditioned	
TSR	
CA Strip Rating	
FA Strip Rating	
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.94			Target					
OPTIMUM DESIGN DATA @Ndes: ---->	80	5.9	2.388	2.474	3.5	17.0	79.5	2.714	2.707	0.00

REMARKS LINE 1: FIBERS ADDED @ 0.4%
REMARKS LINE 2: DRAINDOWN = 0.0%

Tested by :
Reviewed by :
Verified by:
Final Approval :

SMA Quartzite
Michels

Ver. 6.0-01.01.09 DATE: August 13 2009

IDOT Lab Verification No.: --> IDOT09003

Producer Number & Name -->
Material Code Number --> 18436 BIT SMA SURFACE 12.5 <--- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032M00	032CM13		038FM20		004MF01		10131
Source (PROD #)	52402-25	52402-25		50312-78		50312-04		1757-05
(NAME)	Michels	Michels		Vulcan		M.S.		Seneca
(LOC)	Quartzite	Quartzite		McCook		Thornton		Lemont
(ADD. INFO)				951				76-22
						AC in RAP -->	0.0	
Aggregate Blend:	29.0	53.0	0.0	10.5	0.0	7.5	0.0	100.0

8#BIT

18436 BIT SMA SURFACE 12.5

Lab Preparing Design	IL
Designing Lab Mix#	IDOT09003
Designing Lab Name	S.T.A.T.E.

Agg No. Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	38.0	100.0	100.0	100.0	100.0	100.0	100.0	82.0
3/8" (9.5mm)	6.0	80.0	100.0	100.0	100.0	100.0	100.0	62.1
No.4 (4.75mm)	3.6	22.0	100.0	97.0	100.0	100.0	100.0	30.4
No.8 (2.36mm)	1.6	4.0	100.0	69.0	100.0	100.0	100.0	17.3
No.16 (1.18mm)	1.2	2.0	100.0	40.4	100.0	100.0	100.0	13.2
No.30 (600µm)	1.1	2.0	100.0	25.0	100.0	100.0	100.0	11.5
No.50 (300µm)	1.0	2.0	100.0	14.7	100.0	100.0	100.0	10.4
No.100 (150µm)	0.8	2.0	100.0	9.0	100.0	95.0	100.0	9.4
No.200(75µm)	0.7	1.0	100.0	6.6	100.0	90.0	100.0	8.2

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	Max
		100		
100		100		
82-100		82		
65 max		62		
20-30		30	25	35
16-24		17	12	22
		13		
12-16		12	8	16
10-15		10		
		9		
8-10		8.2	7	10

Bulk Sp Gr	2.675	2.675	1.000	2.691	1.000	2.900	1.000	2.692	
Apparent Sp Gr	2.711	2.711	1.000	2.796	1.000	2.987	1.000	2.739	Dust/AC
Absorption, %	0.50	0.50	1.00	1.40	1.00	1.00	1.00	0.56	Ratio
							SP GR AC	1.032	1.36

AMOUNT OF AGED RAP AC 0 0

VIRGIN AC 6.0

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED 2 HOURS @ 305

DATA for N-int.	7								
	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.0	2.074	2.499	17.0	26.8	36.6	9.82	4.89	0.12
MIX 2	5.5	2.083	2.486	16.2	26.9	39.7	10.69	5.30	0.22
MIX 3	6.0	2.106	2.463	14.5	26.5	45.3	11.99	5.87	0.13
MIX 4	6.5	2.115	2.449	13.6	26.5	48.6	12.91	6.30	0.22

TSR Information	
Conditioned	
Unconditioned	
TSR	
CA Strip Rating	
FA Strip Rating	
Additive Prod #	
Additive Matl Code	
Additive %	

DATA for N-des.	80									
		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.0	2.349	2.499	6.0	17.1	64.9	11.13	4.89	2.701	0.12
MIX 2	5.5	2.364	2.486	4.9	17.0	71.1	12.13	5.30	2.708	0.22
MIX 3	6.0	2.377	2.463	3.5	17.0	79.6	13.53	5.87	2.702	0.13
MIX 4	6.5	2.387	2.449	2.6	17.1	85.0	14.56	6.30	2.708	0.22

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.99			Target					
OPTIMUM DESIGN DATA @Ndes: -->	80	6.0	2.377	2.463	3.5	17.0	79.4	2.702	2.692	0.00

REMARKS LINE 1 FIBERS ADDED @ 0.4%
REMARKS LINE 2 DRAINDOWN = 0.0%

Tested by :
Reviewed by :
Verified by:
Final Approval :

Ver. 6.0-01.01.09

DATE: May 4 09

IDOT Lab Verification No.: ---> ARM09003

81B.7 114R

Producer Number & Name -->	127-06	Arrow Road	Mt.Prospect
Material Code Number ---->	19536R	HMA N90 F REC SURF	<--- Plant Location

8#BIT

19536R HMA N90 F REC SURF

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	039CM13	032CM16		038FM20	027FM02	004MF01	017CM16	10129
Source (PROD #)	52103-23	50312-78		50312-78	51110-07	50312-04	127-06	1757-05
(NAME)	Heritage	Vulcan		Vulcan	Meyer	M.S.	Arrow Road	Seneca
(LOC)	Inland	McCook		McCook	Algonquin	Thornton	Mt.Prospect	Lemont
(ADD. INFO)								
						AC in RAP --->	5.3	
Aggregate Blend:	43.0	26.0	0.0	12.0	8.0	1.0	10.0	100.0

Agg No. / Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	80.0	97.0	100.0	100.0	100.0	100.0	99.8	90.6
No.4 (4.75mm)	23.0	32.0	100.0	98.8	100.0	100.0	75.6	46.6
No.8 (2.36mm)	4.9	8.7	100.0	85.0	85.0	100.0	54.7	27.8
No.16 (1.18mm)	3.9	5.9	100.0	53.3	76.5	100.0	40.2	20.7
No.30 (600µm)	3.6	5.2	100.0	34.0	51.0	100.0	29.9	15.1
No.50 (300µm)	3.3	4.9	100.0	18.0	23.0	100.0	19.7	9.7
No.100 (150µm)	2.9	4.5	100.0	8.8	5.3	95.0	12.3	6.1
No.200(75µm)	2.2	4.5	100.0	5.6	2.1	90.0	9.4	4.8

Bulk Sp Gr	3.377	2.644	1.000	2.682	2.617	2.900	2.660	2.924	
Apparent Sp Gr	3.596	2.792	1.000	2.794	2.724	2.987	2.733	3.077	Dust/AC
Absorption, %	1.80	2.00	1.00	1.50	1.50	1.00	1.00	1.63	Ratio
							SP GR AC	1.031	0.92

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		91		
28-65		47	37	57
28-40		28		
10-32		21		
		15		
4-15		10		
3-10		6		
4-6		4.8	2.3	7.3

Lab Preparing Design: IL
Designing Lab Mix#: ARM09003
Designing Lab Name: S.T.A.T.E.

AMOUNT OF AGED RAP AC: 0.53 (10)

VIRGIN AC: 4.7

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @: 305

DATA for N-int. 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.319	2.784	16.7	24.3	31.1	7.54	3.35	1.20
MIX 2	5.0	2.351	2.759	14.8	23.6	37.3	8.81	3.86	1.19
MIX 3	5.5	2.352	2.732	13.9	24.0	42.0	10.06	4.41	1.15
MIX 4	6.0	2.362	2.711	12.9	24.1	46.5	11.20	4.89	1.18

DATA for N-des. 90

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.592	2.784	6.9	15.3	54.9	8.43	3.35	3.027	1.20
MIX 2	5.0	2.631	2.759	4.7	14.5	67.9	9.86	3.86	3.026	1.19
MIX 3	5.5	2.643	2.732	3.3	14.6	77.5	11.31	4.41	3.023	1.15
MIX 4	6.0	2.652	2.711	2.2	14.7	85.4	12.57	4.89	3.025	1.18

TSR Information	
Conditioned	113.9
Unconditioned	118.2
TSR	0.96
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.24			Target					
OPTIMUM DESIGN DATA @Ndes: ---->	90	5.2	2.637	2.746	4.0	14.6	72.5	3.025	2.924	0.96

REMARKS LINE 1:
REMARKS LINE 2:

Tested by :

Reviewed by :

Verified by:

Final Approval :

Ver. 6.0-01.01.09

DATE: July 7 2009

IDOT Lab Verification No.: --> ARC09005

Producer Number & Name --> 127-07 Arrow Road Carpentersville <-- Plant Location

Material Code Number --> 19536R HMA N90 F REC SURF

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM13	021CM16		038FM20	027FM02	004MF01	017CM16	10129
Source (PROD #)	52402-25	51110-07		50312-78	51110-07	50312-04	127-06	1757-05
(NAME)	Michels	Meyer		Vulcan	Meyer	M.S.	Arrow Road	Seneca
(LOC)	Wisconsin	Algonquin		McCook	Algonquin	Thornton	Mt.Prospect	Lemont
(ADD. INFO)								
Aggregate Blend:						AC in RAP -->	5.3	
	32.5	30.0	0.0	18.0	8.0	1.5	10.0	100.0

Agg No. Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4" (19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	80.0	97.0	100.0	100.0	100.0	100.0	99.8	92.6
No.4 (4.75mm)	22.0	30.0	100.0	98.6	99.9	100.0	75.6	51.0
No.8 (2.36mm)	4.0	4.1	100.0	85.0	85.0	100.0	54.7	31.6
No.16 (1.18mm)	2.0	3.3	100.0	51.2	73.4	100.0	40.2	22.2
No.30 (600µm)	2.0	3.0	100.0	34.0	51.0	100.0	29.9	16.2
No.50 (300µm)	2.0	2.7	100.0	19.2	21.1	100.0	19.7	10.1
No.100 (150µm)	2.0	2.5	100.0	10.5	5.8	95.0	12.3	6.4
No.200(75µm)	1.0	2.2	100.0	6.9	2.0	90.0	9.4	4.7
Bulk Sp Gr	2.675	2.674	1.000	2.682	2.617	2.900	2.660	2.673
Apparent Sp Gr	2.711	2.817	1.000	2.794	2.724	2.987	2.733	2.764
Absorption, %	0.50	1.90	1.00	1.50	1.50	1.00	1.00	0.91
							SP GR AC	1.032

Dust/AC Ratio: 0.88

8#BIT

19536R HMA N90 F REC SURF

Lab Preparing Design: IL
Designing Lab Mix#: ARC09005
Designing Lab Name: S.T.A.T.E.

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		93		
28-65		51	46	56
28-40		32	27	37
10-32		22		
		16	12	20
4-15		10		
3-10		6		
4-6		4.7	3	6

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 1 HOURS @ 305

AMOUNT OF AGED RAP AC: 0.53 10

VIRGIN AC: 4.8

DATA for N-int. 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.131	2.540	16.1	23.9	32.5	7.74	3.75	0.79
MIX 2	5.0	2.149	2.523	14.8	23.6	37.2	8.79	4.22	0.82
MIX 3	5.5	2.155	2.507	14.0	23.8	41.0	9.76	4.67	0.87
MIX 4	6.0	2.166	2.486	12.9	23.8	46.0	10.95	5.22	0.83

DATA for N-des. 90

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.383	2.540	6.2	14.9	58.4	8.66	3.75	2.728	0.79
MIX 2	5.0	2.401	2.523	4.8	14.6	66.9	9.82	4.22	2.731	0.82
MIX 3	5.5	2.417	2.507	3.6	14.6	75.2	10.95	4.67	2.735	0.87
MIX 4	6.0	2.425	2.486	2.4	14.7	83.4	12.27	5.22	2.732	0.83

TSR Information	
Conditioned	128.0
Unconditioned	131.6
TSR	0.97
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.34			Target					
OPTIMUM DESIGN DATA @Ndes: -->	90	5.3	2.412	2.512	4.0	14.6	72.6	2.733	2.673	0.97

REMARKS LINE 1

REMARKS LINE 2

Tested by :

Reviewed by :

Verified by:

Final Approval :

Tag says "Allied Quartzite"

Ver. 6.0-01.01.09

DATE: June 22 2009

IDOT Lab Verification No.: —> ALFP09001

Producer Number & Name —>	54-11	Allied Asphalt	Franklin Park <— Plant Location
Material Code Number —>	19536R	HMA N90 F REC SURF	

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM13	032CM16		038FM20	037FM02	004MF01	017FM1400	10129
Source (PROD #)	52402-25	50312-78		50312-78	50890-22	50312-04	54-11	1757-05
(NAME)	Michels	Vulcan		Vulcan	Beverly	M.S.	Allied	Seneca
(LOC)	Wisconsin	McCook		McCook	Elgin	Thornton	Franklin Park	Lemont
(ADD. INFO)								
						AC in RAP —>	5.8	
Aggregate Blend:	36.0	33.0	0.0	12.0	8.0	1.0	10.0	100.0

Agg No. / Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	80.0	97.0	100.0	100.0	100.0	100.0	100.0	91.8
No.4 (4.75mm)	22.0	32.0	100.0	96.0	100.0	100.0	98.0	48.8
No.8 (2.36mm)	6.0	10.0	100.0	69.0	85.0	100.0	77.0	29.2
No.16 (1.18mm)	2.0	7.0	100.0	40.0	63.0	100.0	55.0	19.4
No.30 (600µm)	2.0	6.0	100.0	25.0	33.0	100.0	40.0	13.3
No.50 (300µm)	2.0	6.0	100.0	15.0	15.0	100.0	26.0	9.3
No.100 (150µm)	2.0	5.0	100.0	10.0	7.0	95.0	17.0	6.8
No.200(75µm)	1.8	4.5	100.0	6.3	2.1	90.0	12.6	5.2
Bulk Sp Gr	2.675	2.644	1.000	2.691	2.641	2.900	2.660	2.664
Apparent Sp Gr	2.711	2.792	1.000	2.796	2.758	2.987	2.733	2.756
Absorption, %	0.50	2.00	1.00	1.40	1.60	1.00	1.00	0.88
							SP GR AC	1.032

Dust/AC Ratio
1.00

8#BIT

19536R HMA N90 F REC SURF

Lab Preparing Design: IL
Designing Lab Mix#: ALFP09001
Designing Lab Name: S.T.A.T.E.

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		92		
28-65		49	44	54
28-40		29	24	34
10-32		19		
		13	9	17
4-15		9		
3-10		7		
4-6		5.2	4	7

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 1 HOURS @: 305

AMOUNT OF AGED RAP AC: 0.58 10

VIRGIN AC: 4.6

DATA for N-int. 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.123	2.521	15.8	23.9	33.9	8.11	3.94	0.58
MIX 2	5.0	2.141	2.505	14.5	23.7	38.5	9.12	4.40	0.63
MIX 3	5.5	2.144	2.486	13.7	24.0	42.6	10.21	4.91	0.62
MIX 4	6.0	2.145	2.463	12.9	24.3	46.8	11.40	5.48	0.55

DATA for N-des. 90

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.372	2.521	5.9	15.0	60.7	9.07	3.94	2.705	0.58
MIX 2	5.0	2.393	2.505	4.5	14.7	69.5	10.20	4.40	2.709	0.63
MIX 3	5.5	2.401	2.486	3.4	14.8	77.0	11.43	4.91	2.708	0.62
MIX 4	6.0	2.407	2.463	2.3	15.1	84.8	12.79	5.48	2.703	0.55

TSR Information	
Conditioned	107.6
Unconditioned	112.4
TSR	0.96
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa) Target	VMA	VFA	Gse	Gsb	TSR
OPTIMUM DESIGN DATA @Ndes: —>	90	5.22 5.2	2.397	2.497	4.0	14.7	72.9	2.708	2.664	0.96

REMARKS LINE 1
REMARKS LINE 2

Tested by :

Reviewed by :

Verified by:

Final Approval :

Ver. 6.0-01.01.09

DATE: June 30 2009

IDOT Lab Verification No.: ---> OGD09002

Producer Number & Name --->	5504-01	Ogden Materials	Chicago
Material Code Number ---->	19536R	HMA N90 F REC SURF	

<--- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM13	032CM16		038FM20	027FM02	004MF01	017CM13	10129
Source (PROD #)	52402-25	50312-78		50312-78	51110-07	50312-04	5504-01	1757-05
(NAME)	Michels	Vulcan		Vulcan	Meyer	M.S.	Ogden	Seneca
(LOC)	Quartzite	McCook		McCook	Algonquin	Thornton	Chicago	Lemont
(ADD. INFO)								
						AC in RAP --->	5.2	
Aggregate Blend:	33.0	31.0	0.0	17.0	8.0	1.0	10.0	100.0

8#BIT

19536R HMA N90 F REC SURF

Agg No. / Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	80.0	97.0	100.0	100.0	100.0	100.0	98.0	92.3
No.4 (4.75mm)	22.0	32.0	100.0	97.0	100.0	100.0	72.0	49.9
No.8 (2.36mm)	4.0	9.3	100.0	69.0	85.0	100.0	50.0	28.7
No.16 (1.18mm)	2.0	6.5	100.0	40.4	75.5	100.0	38.0	20.4
No.30 (600µm)	2.0	5.8	100.0	25.0	51.0	100.0	30.0	14.8
No.50 (300µm)	2.0	5.4	100.0	14.7	23.4	100.0	21.0	9.8
No.100 (150µm)	2.0	5.2	100.0	9.0	5.3	95.0	13.0	6.5
No.200(75µm)	1.0	4.8	100.0	6.6	2.0	90.0	8.6	4.9

Bulk Sp Gr	2.675	2.644	1.000	2.691	2.617	2.900	2.660	2.664	
Apparent Sp Gr	2.711	2.792	1.000	2.796	2.724	2.987	2.733	2.756	Dust/AC
Absorption, %	0.50	2.00	1.00	1.40	1.50	1.00	1.00	0.91	Ratio
							SP GR AC	1.832	0.94

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	Max
		100		
		100		
100		100		
90-100		92		
28-65		50	45	55
28-40		29	24	34
10-32		20		
		15	11	19
4-15		10		
3-10		6		
4-6		4.9	3	6

Lab Preparing Design	IL
Designing Lab Mix#	OGD09002
Designing Lab Name	S.T.A.T.E.

AMOUNT OF AGED RAP AC: 0.52

VIRGIN AC: 4.7

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 1 HOURS @ 305

DATA for N-int.	8								
	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.127	2.526	15.8	23.8	33.4	7.95	3.86	0.67
MIX 2	5.0	2.139	2.506	14.6	23.7	38.3	9.08	4.38	0.65
MIX 3	5.5	2.146	2.489	13.8	23.9	42.3	10.10	4.86	0.68
MIX 4	6.0	2.154	2.472	12.9	24.0	46.4	11.14	5.34	0.71

DATA for N-des.	90									
		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.378	2.526	5.9	14.7	60.1	8.89	3.86	2.711	0.67
MIX 2	5.0	2.395	2.506	4.4	14.6	69.7	10.17	4.38	2.713	0.65
MIX 3	5.5	2.407	2.489	3.3	14.6	77.6	11.34	4.86	2.712	0.68
MIX 4	6.0	2.416	2.472	2.3	14.8	84.7	12.49	5.34	2.714	0.71

TSR Information	
Conditioned	142.3
Unconditioned	143.2
TSR	0.98
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.18			Target					
OPTIMUM DESIGN DATA @Ndes: ---->	90	5.2	2.400	2.500	4.0	14.6	72.6	2.711	2.664	0.98

REMARKS LINE 1

REMARKS LINE 2

Tested by:

Reviewed by:

Verified by:

Final Approval:

Tag says "Quartzite"

Ver. 6.0-01.01.09

DATE: June 23 2009

IDOT Lab Verification No.: ARM09009

Producer Number & Name →	127-06	Arrow Road	Mt. Prospect
Material Code Number →	19536R	HMA N90 F REC SURF	

<-- Plant Location

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	032CM13	032CM16		038FM20	027FM02	004MF01	017CM16	10129
Source (PROD #)	52402-25	50312-78		50312-78	51110-07	50312-04	127-06	1757-05
(NAME)	Michels	Vulcan		Vulcan	Meyer	M.S.	Arrow Road	Seneca
(LOC)	Wisconsin	McCook		McCook	Algonquin	Thornton	Mt.Prospect	Lemont
(ADD. INFO)								
						AC in RAP →	5.3	
Aggregate Blend:	35.0	32.0	0.0	14.0	8.0	1.0	10.0	100.0

8#BIT

19536R HMA N90 F REC SURF

Agg No. / Sieve Size	#5	#4	#3	#2	#1	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	80.0	97.0	100.0	100.0	100.0	100.0	99.8	92.0
No.4 (4.75mm)	22.0	32.0	100.0	98.8	100.0	100.0	75.6	48.3
No.8 (2.36mm)	4.0	8.7	100.0	85.0	85.0	100.0	54.7	29.4
No.16 (1.18mm)	2.0	5.9	100.0	53.3	76.5	100.0	40.2	21.2
No.30 (600µm)	2.0	5.2	100.0	34.0	51.0	100.0	29.9	15.2
No.50 (300µm)	2.0	4.9	100.0	18.0	23.0	100.0	19.7	9.6
No.100 (150µm)	2.0	4.5	100.0	8.8	5.3	95.0	12.3	6.0
No.200(75µm)	1.0	4.5	100.0	5.6	2.1	90.0	9.4	4.6

Bulk Sp Gr	2.675	2.644	1.000	2.682	2.617	2.900	2.660	2.662	
Apparent Sp Gr	2.711	2.792	1.000	2.794	2.724	2.987	2.733	2.754	Dust/AC Ratio
Absorption, %	0.50	2.00	1.00	1.50	1.50	1.00	1.00	0.90	0.90
							SP GR AC	1.032	

Lab Preparing Design: IL
Designing Lab Mix#: ARM09009
Designing Lab Name: S.T.A.T.E.

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		92		
28-65		48	43	53
28-40		29	24	34
10-32		21		
		15	11	19
4-15		10		
3-10		6		
4-6		4.6	3	6

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 1 HOURS @: 305

AMOUNT OF AGED RAP AC: 0.53

VIRGIN AC: 4.6

10

DATA for N-int. 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.111	2.519	16.2	24.3	33.2	8.05	3.94	0.59
MIX 2	5.0	2.135	2.498	14.5	23.8	39.0	9.28	4.48	0.54
MIX 3	5.5	2.144	2.484	13.7	23.9	42.6	10.18	4.90	0.63
MIX 4	6.0	2.146	2.465	12.9	24.2	46.7	11.29	5.43	0.61

DATA for N-des. 90

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.368	2.519	6.0	15.0	60.0	9.04	3.94	2.703	0.59
MIX 2	5.0	2.392	2.498	4.2	14.6	71.0	10.39	4.48	2.700	0.54
MIX 3	5.5	2.408	2.484	3.1	14.5	78.8	11.43	4.90	2.706	0.63
MIX 4	6.0	2.412	2.465	2.1	14.8	85.6	12.69	5.43	2.704	0.61

TSR information	
Conditioned	106.4
Unconditioned	116.3
TSR	0.92
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		5.10			Target					
OPTIMUM DESIGN DATA @Ndes: -->	90	5.1	2.395	2.495	4.0	14.6	72.6	2.701	2.662	0.92

REMARKS LINE 1

REMARKS LINE 2

Tested by :

Reviewed by :

Verified by:

Final Approval:

F Mix Sampled 7/16/09

PG 70-22 (SBS)

Ver. 6.0-01.01.09

DATE: 15-Jun-09

IDOT Lab Verification No.: --> 09SPVN90R

Producer Number & Name --> 2298-06 | QUARRY MATERIALS | HODGKINS, IL <-- Plant Location

Material Code Number ----> 19536R | HMA N90 F REC SURF

Central Blacktop Co., Inc.

81BIT069B

19536R HMA N90 F REC SURF

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size	039CM 13	032CM16		038FM20	037FM02	004MF01	017CM13	10129
Source (PROD #)	52103-27	50312-78		50312-78	50970-02	2298-06	2298-06	1767-05
(NAME)	Heritage	Vulcan		Vulcan	Thelan	Quarry	Quarry	Seneca
(LOC)	Gary	McCook		McCook	Antioch	Hodgkins	Hodgkins	Lemont
(ADD. INFO)				951				
Aggregate Blend:						AC in RAP -->	4.0	
	35.7	26.0	0.0	19.5	7.8	1.0	10.0	100.0

Agg No. Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8" (9.5mm)	83.0	97.0	100.0	100.0	100.0	100.0	97.3	92.9
No.4 (4.75mm)	23.0	32.0	100.0	97.0	100.0	100.0	45.3	48.8
No.8 (2.36mm)	8.0	9.0	100.0	68.0	94.5	100.0	31.1	29.9
No.16 (1.18mm)	6.0	7.0	100.0	40.0	72.0	100.0	25.5	20.9
No.30 (600µm)	5.0	6.0	100.0	24.0	49.0	100.0	21.0	14.9
No.50 (300µm)	5.0	6.0	100.0	15.0	19.9	100.0	15.4	10.4
No.100 (150µm)	4.0	5.0	100.0	9.0	4.1	98.0	9.3	6.7
No.200(75µm)	2.8	4.6	100.0	6.7	1.5	90.0	6.7	5.2

Bulk Sp Gr	3.365	2.644	1.000	2.691	2.619	2.900	2.660	2.876	
Apparent Sp Gr	3.582	2.792	1.000	2.798	2.719	2.900	2.748	3.021	Dust/AC
Absorption, %	1.80	2.00	1.00	1.40	1.40	1.00	1.20	1.62	Ratio
							SP GR AC	1.031	1.01

Lab Preparing Design: PP

Designing Lab Mix#: 09SPVN90R

Designing Lab Name: CBT

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	FORMULA RANGE Max
		100		
		100		
100		100		
90-100		93		
28-65		49	44	54
28-40		30	25	35
10-32		21		
		15		
4-15		10	6	14
3-10		7		
4-6		5.2	3.7	6.7

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED: 2 HOURS @: 305

AMOUNT OF AGED RAP AC: 0.4

VIRGIN AC: 4.7

DATA for N-int.: 8

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	4.5	2.728	2.727	0.0	9.4	100.1	9.44	3.57	0.98
MIX 2	5.0	2.338	2.705	13.6	22.8	40.4	9.20	4.06	0.99
MIX 3	5.5	2.339	2.682	12.8	23.1	44.7	10.34	4.56	1.00
MIX 4	6.0	2.351	2.659	11.6	23.1	50.0	11.58	5.08	0.98

DATA for N-des.: 90

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	4.5	2.568	2.727	5.8	14.7	60.4	8.89	3.57	2.958	0.98
MIX 2	5.0	2.588	2.705	4.3	14.5	70.2	10.18	4.06	2.958	0.99
MIX 3	5.5	2.603	2.682	2.9	14.5	79.6	11.51	4.56	2.958	1.00
MIX 4	6.0	2.617	2.659	1.6	14.5	89.0	12.88	5.08	2.957	0.98

TSR Information	
Conditioned	132.1
Unconditioned	133.6
TSR	0.99
CA Strip Rating	1
FA Strip Rating	1
Additive Prod #	
Additive Mat'l Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa) Target	VMA	VFA	Gse	Gsb	TSR
OPTIMUM DESIGN DATA @Ndes: ---->		5.12								
	90	5.1	2.592	2.700	4.0	14.5	72.4	2.958	2.876	0.99

REMARKS LINE 1:

REMARKS LINE 2:

Tested by:

Reviewed by:

Verified by:

Final Approval:

Excel Ver. 7.0-01.01.09

Central Blacktop Co., Inc.

Quarry Materials: A wholly owned subsidiary of CBT

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	910000000	Date	071609	Seq #:	007
Bit Mix Plant:	2298-06	Mix Code:	19536R	Quantity:	2870.6
Resp Loc:	91	Lab:	PP	Dist Mix #:	81BIT069B
Type Insp:	PRO	Lab Name:	CBT		
		Mix Name:	HMA N90 F REC SURF		

Contract / Section No.	Job No.	Quantity
60A85	C9111706	2870.6

/FOR DTY03309

Sub Lot: 1 Type: B Washed: N Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%	10.0				85.3			4.7
AGG%	10.1				89.9			
AC% in RAP	4.0							

Remarks:

Sub Lot: 2 Type: B Washed: N Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%	10.0				85.3			4.7
AGG%	10.1				89.9			
AC% in RAP	4.0							

Remarks:

	Producer	Material	%
Asphalt	1757-05	10129	4.7
Additive	4429-01	43469	0.4

	Sub Lot: 1		Sub Lot: 2	
	% PASS	AJMF	% PASS	AJMF
1.5	100	100	100	100
1	100	100	100	100
3/4	100	100	100	100
1/2	100	100	100	100
3/8	92	92	92	92
#4	42	46	41	46
#8	24	29	24	29
#16	16	20	16	20
#30	11	14	12	14
#50	8	9	8	9
#100	5	6	5	6
#200	3.2	3.7	3.0	3.7
AC	5.1	5.1	5.1	5.1

Sub Lot: 1
Type: I
Wash: Y

Sub Lot: 2
Type: I
Wash: Y

/FOR DTY03000 / TRANS 308

	Corr.	% PASS	AJMF	Corr.	% PASS	AJMF
						100
						100
3/4		100	100		100	100
1/2		100	100		100	100
3/8		91	93		94	93
#4		44	48		47	48
#8		27	30		29	30
#16		19	21		20	21
#30		13	15		15	15
#50		10	10		11	10
#100		7	7		7	7
#200	0.40	4.6	5.2	0.4	5.0	5.2
AC	0.81	5.1	5.1	0.76	5.3	5.1

Remarks: SPLIT: PFP LOT 1 SUBLOT 4
Remarks: SPLIT: PFP LOT 1 SUBLOT 5

Sub Lot:
Type:
AC%:
Target AC:

Sub Lot:
Type:
AC%:
Target AC:

Remarks:
Remarks:

Sub Lot: 1 Gsb: 2.876

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
90	2.585	2.708	4.6	14.7

Sub Lot: 2 Gsb: 2.876

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
90	2.607	2.693	3.2	14.1

COPIES:
District Office
Inspector
QUARRY MATERIALS
RE:
Reggie Miller

QC Manager:	Tested By:	Phone:	Fax:
Mike Schilke	Ali Othman	708-783-4988	708-783-4982

Sampled 7/20/09 from K-Five
PG 76-22 (SBS)
w/Fibers

Ver. 6.0-01.01.09 DATE: 06/26/09

IDOT Lab Verification No.: —>

Producer Number & Name —>	716-07	Gallagher Asphalt	Thornton, IL	<— Plant Location
Material Code Number —>	18436	POLY HMA SMA SCS N80 12.5		

Plant Bin #	#5	#4	#3	#2	#1	MF	RAP	ASPHALT
Size			039CM11	039CM13	038FM20	004MF01		10131
Source (PROD #)			52103-23	52103-27	53012-04	50312-04		6019-05
(NAME)			Heritage	Heritage	Hanson	Hanson		Conoco
(LOC)			E.Chicago	Gary	Thornton	Thornton		Forest View
(ADD. INFO)								
						AC in RAP —>	0.0	
Aggregate Blend:	0.0	0.0	27.0	57.0	9.0	7.0	0.0	100.0

81BIT#

18436 POLY HMA SMA SCS N80 12.5

Lab Preparing Design	IL
Designing Lab Mix#	BIT0657
Designing Lab Name	Chicago Testing Lab., Inc.

Agg No. / Sieve Size	#1	#2	#3	#4	#5	MF	RAP	Aggregate Blend
1" (25.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/4"(19.0mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1/2" (12.5mm)	100.0	100.0	32.0	100.0	100.0	100.0	100.0	81.6
3/8" (9.5mm)	100.0	100.0	10.0	80.0	100.0	100.0	100.0	64.3
No.4 (4.75mm)	100.0	100.0	5.0	23.0	100.0	100.0	100.0	30.5
No.8 (2.36mm)	100.0	100.0	4.0	5.0	81.0	100.0	100.0	18.2
No.16 (1.18mm)	100.0	100.0	4.0	4.0	49.0	100.0	100.0	14.8
No.30 (600µm)	100.0	100.0	3.0	4.0	31.0	100.0	100.0	12.9
No.50 (300µm)	100.0	100.0	3.0	3.0	17.0	100.0	100.0	11.1
No.100 (150µm)	100.0	100.0	3.0	3.0	10.0	95.0	100.0	10.1
No.200(75µm)	100.0	100.0	2.6	2.2	5.6	90.0	100.0	8.8

Bulk Sp Gr	1.000	1.000	3.365	3.347	2.682	2.900	1.000	3.244	
Apparent Sp Gr	1.000	1.000	3.569	3.549	2.779	2.900	1.000	3.415	Dust/AC
Absorption, %	1.00	1.00	1.70	1.70	1.30	1.00	1.00	1.58	Ratio
							SP GR AC	1.031	#VALUE!

Mixture Composition Specification		FORMULA	FORMULA RANGE Min	Max
		100		
100		100		
82-100		82		
65 max		64		
20-30		30	25	35
16-24		18	13	23
		15		
12-16		13		
10-15		11	7	15
		10		
8-10		8.8	7.3	10.3

AMOUNT OF AGED RAP AC 0 0

VIRGIN AC #VALUE!

SUMMARY OF SUPERPAVE GYRATORY DESIGN DATA

BITUMINOUS MIXTURE AGED 2 HOURS @ 305

DATA for N-int. 7

	AC, %MIX	(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Pba
MIX 1	5.5	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	#DIV/0!
MIX 2	6.0	2.568	2.950	13.0	25.6	49.3	12.63	5.07	0.99
MIX 3	6.5	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	#DIV/0!
MIX 4	7.0	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	#DIV/0!

DATA for N-des. 80

		(Gmb)	(Gmm)	(Pa)	VMA	VFA	Vbe	Pbe	Gse	Pba
MIX 1	5.5	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	0.000	#DIV/0!
MIX 2	6.0	2.870	2.950	2.7	16.9	83.8	14.12	5.07	3.348	0.99
MIX 3	6.5	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	0.000	#DIV/0!
MIX 4	7.0	0.000	0.000	0.0	0.0	0.0	0.00	#DIV/0!	0.000	#DIV/0!

TSR Information	
Conditioned	
Unconditioned	
TSR	
CA Strip Rating	
FA Strip Rating	
Additive Prod #	
Additive Matl Code	
Additive %	

	NUMBER OF GYRATIONS	%AC	Gmb	Gmm	%VOIDS (Pa)	VMA	VFA	Gse	Gsb	TSR
		#VALUE!			Target	#VALUE!				
OPTIMUM DESIGN DATA @Ndes: —>	80	#VALUE!	#VALUE!	#VALUE!	3.5	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#N/A

REMARKS LINE 1 Fibers added 0.4% Drain down @350 deg F= 0.0%
REMARKS LINE 2 Drain down @378 deg F=0.0%

Tested by : _____ Verified by: _____

Reviewed by : _____ Final Approval : _____

Excel Ver. 7.0-01.01.09

Illinois Department of Transportation

ASSIGNMENT INFORMATION /FOR DTY03305 & DTY03000

Inspector # :	910000000	Date	072009	Seq #:	007
Bit Mix Plant:	4-21	Mix Code:	18436	Quantity:	1284.3
Resp Loc:	91	Lab:	PP	Dist Mix #:	81BIT118G
Type Insp:	PRO	Lab Name:	K-FIVE,CHICAGO		
		Mix Name:	POLY HMA SMA SCS N80 12.5		

Contract / Section No.	Job No.	Quantity
60C08	C-91-114-07	1284.3

/FOR DTY03309

Sub Lot: 1 Type: B Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%					87.8		6.0	6.2
AGG%					93.6		6.4	
AC% in RAP								

Remarks:

Sub Lot: 2 Type: S Washed: Y Lot:

PERCENTS:	RAP	BIN5	BIN4	BIN3	BIN2	BIN1	MF	NEW AC%
MIX%				25.8	53.5	8.5	6.0	6.2
AGG%				27.5	57.1	9.1	6.4	
AC% in RAP								

Remarks:

	Producer	Material	%
Asphalt	1757-05	10131	6.2
Additive	5218-01	43446	0.5

Sub Lot: 1			Sub Lot: 2	
	% PASS	AJMF	% PASS	AJMF
1.5	100	100	100	100
1	100	100	100	100
3/4	100	100	100	100
1/2	79	82	82	82
3/8	63	64	67	64
#4	26	30	29	30
#8	16	18	18	18
#16	13	15	14	15
#30	12	13	12	13
#50	11	11	11	11
#100	10	10	10	10
#200	8.6	7.8	8.4	7.8
AC	6.2	6.2	6.2	6.2

/FOR DTY03000 / TRANS 308

Sub Lot: 1 Type: I Wash: Y

	Corr.	% PASS	AJMF
1.5		100	100
1		100	100
3/4		100	100
1/2		83	82
3/8		67	64
#4		26	30
#8		17	18
#16		13	15
#30		12	13
#50		11	11
#100		10	10
#200	0.50	7.7	7.8
AC	0.63	6.1	6.2

Sub Lot: 2 Type: I Wash: Y

	Corr.	% PASS	AJMF
1.5		100	100
1		100	100
3/4		100	100
1/2		81	82
3/8		67	64
#4		27	30
#8		17	18
#16		14	15
#30		12	13
#50		11	11
#100		10	10
#200	0.5	8.2	7.8
AC	0.58	6.1	6.2

Remarks:
Remarks:

Sub Lot: Type: AC%: Target AC:

Sub Lot: Type: AC%: Target AC:

Remarks:
Remarks:

Sub Lot: 1 Gsb: 3.261

Gyratory Results:

Nd	Gmb	Gmm	Voids	FVMA
80	2.816	2.942	4.3	18.9

Sub Lot: 2 Gsb: 3.261

Gyratory Results:

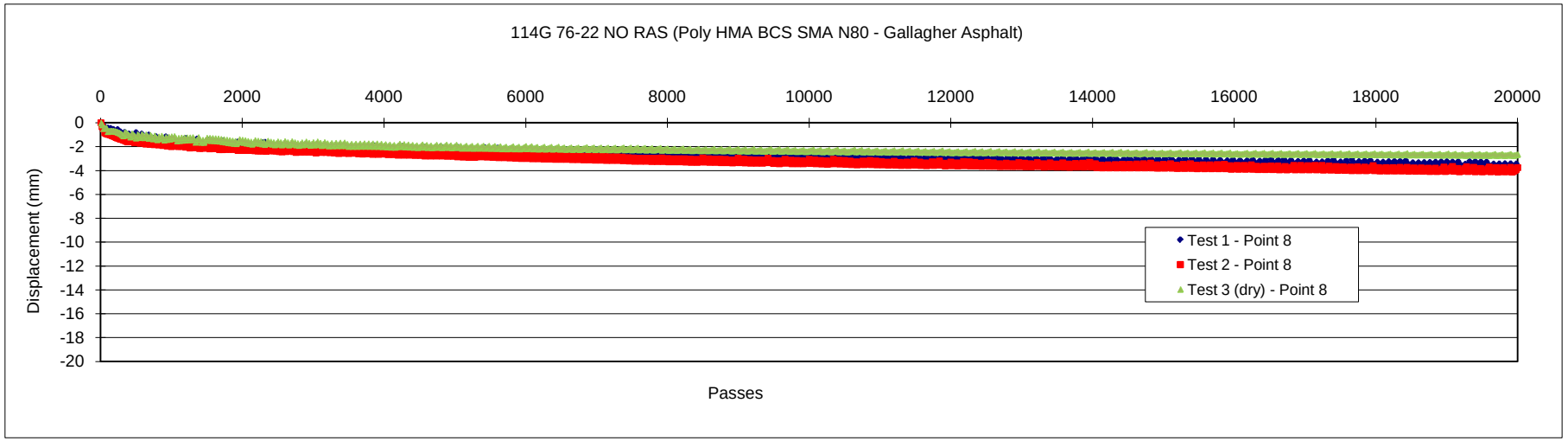
Nd	Gmb	Gmm	Voids	FVMA
80	2.836	2.945	3.7	18.4

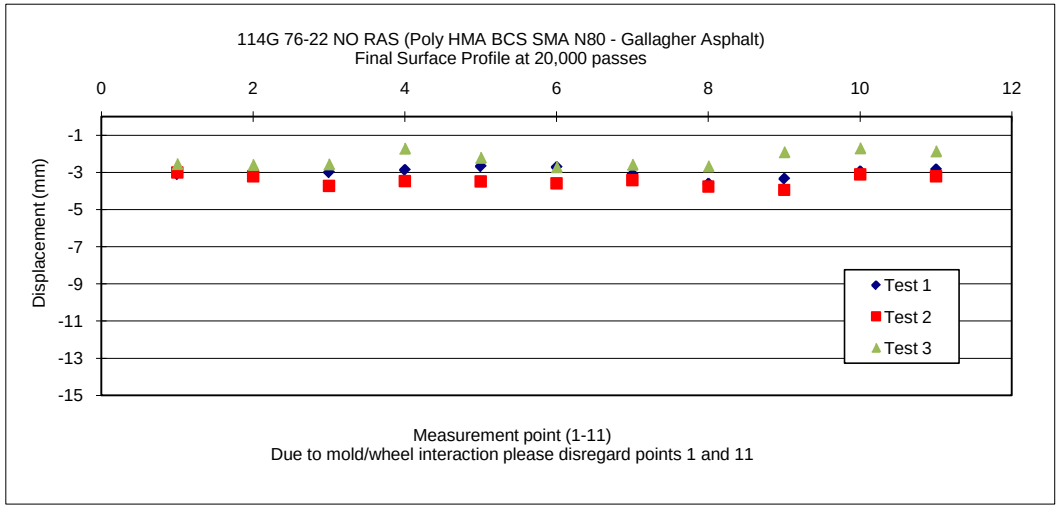
COPIES:
District Office
Inspector
K-FIVE CONST CORP.
RE:
MIKE MYSZKOWSKI

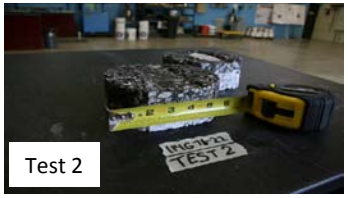
QC Manager:	Tested By:	Phone:	Fax:
ROLAND IMARENEZOR	ROLAND IMARENEZOR	773-264-9709	773-264-0541

APPENDIX B: WHEEL TRACK TESTING RESULTS

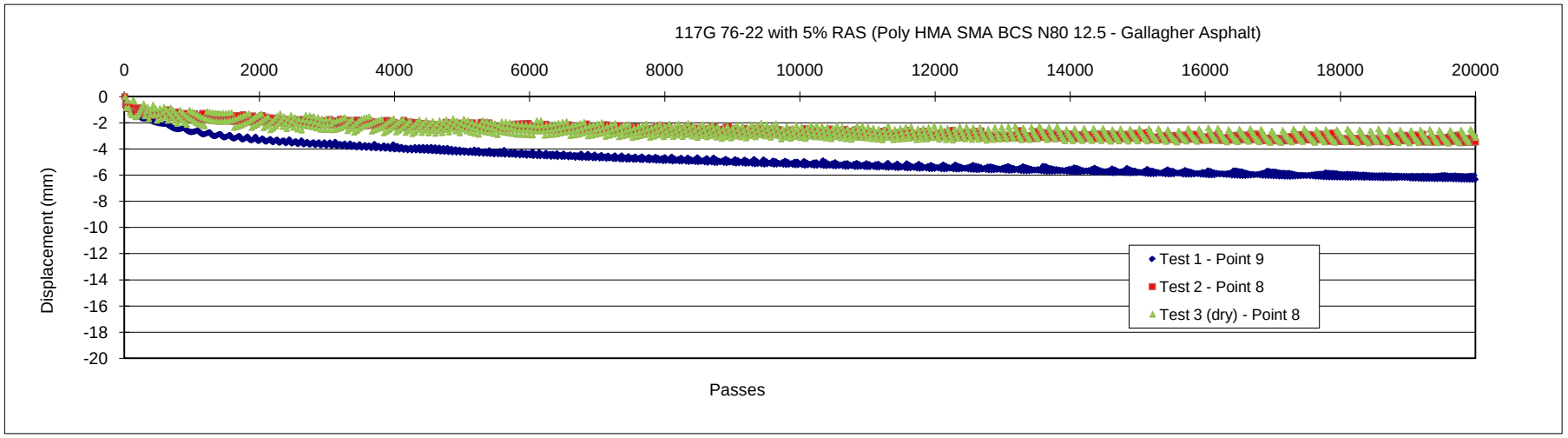
Mix ID: 114G 76-22 NO RAS (18435 - Poly HMA BCS SMA N80 - Gallagher Asphalt)
Test No. 1: 7.5% Voids / submerged in water at 50C / maximum displacement = 3.67 mm at point 8
Test No. 2: 6.9% Voids / submerged in water at 50C / maximum displacement = 4.11 mm at point 8
Test No. 3: 7.5% Voids / tested dry at 50C / maximum displacement = 2.74 mm at point 8
Comments: No secondary slope was observed.

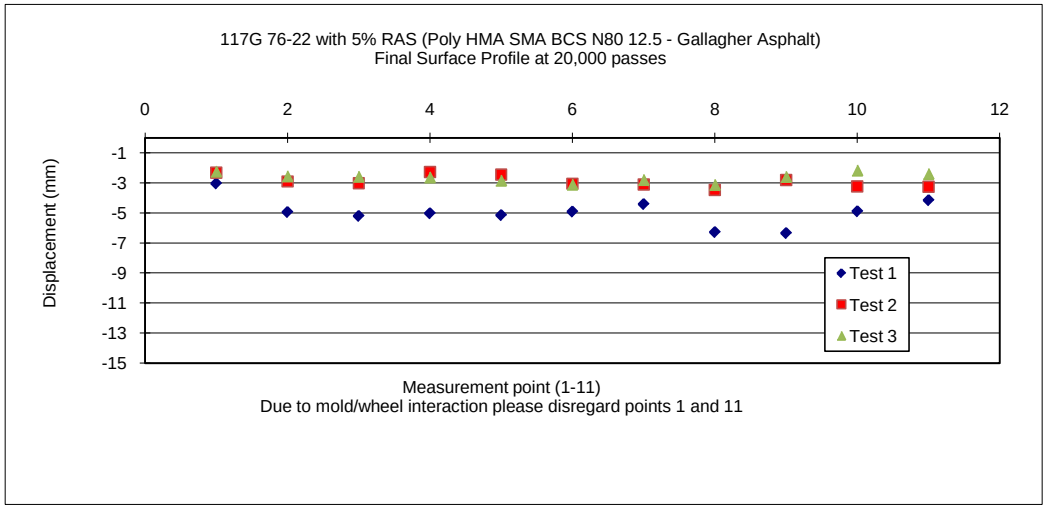


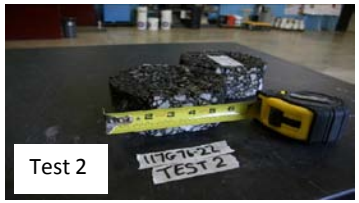




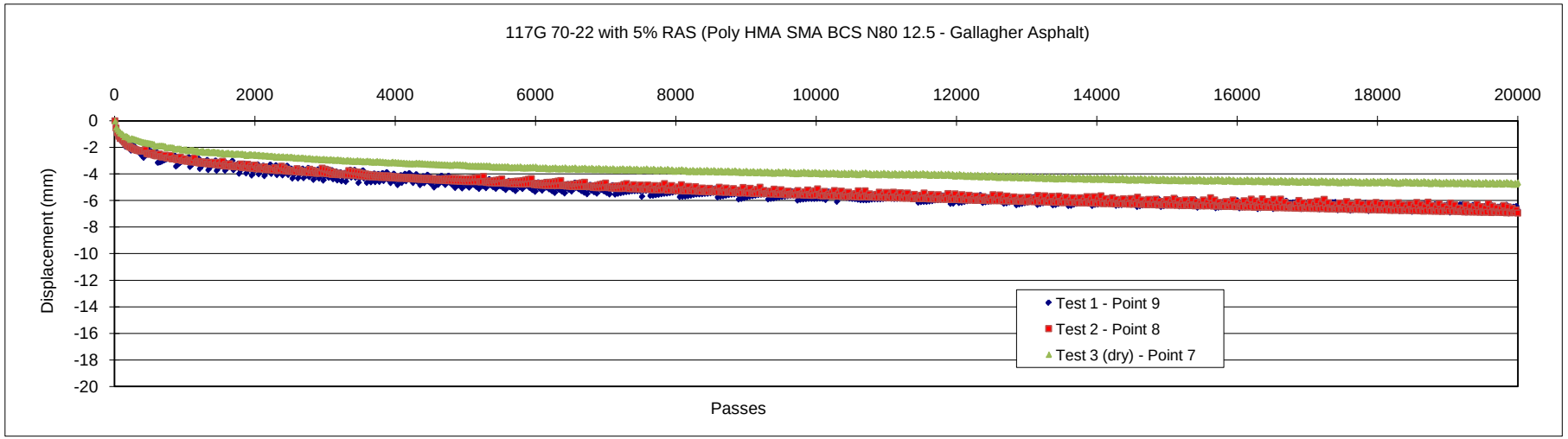
Mix ID: 117G 76-22 with 5% RAS (18435R - Poly HMA SMA BCS N80 12.5 - Gallagher Asphalt)
Test No. 1: 7.4% Voids / submerged in water at 50C / maximum displacement = 6.35 mm at point 9
Test No. 2: Voids (Unreadable on sample) / submerged in water at 50C / maximum displacement = 3.50 mm at point 8
Test No. 3: 7.1% Voids / tested dry at 50C / maximum displacement = 3.56 mm at point 8
Comments: No secondary slope was observed

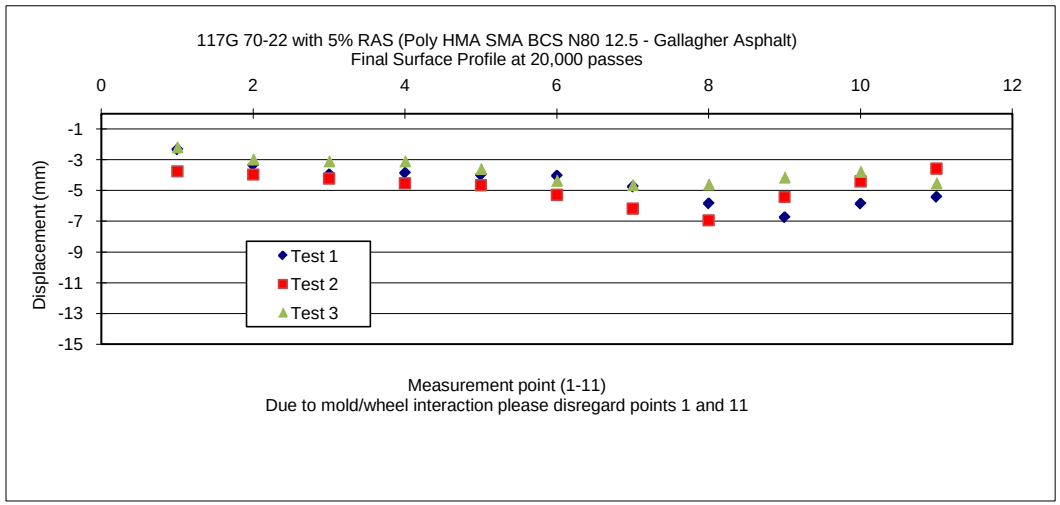


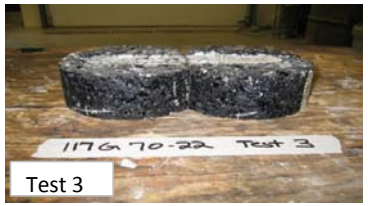


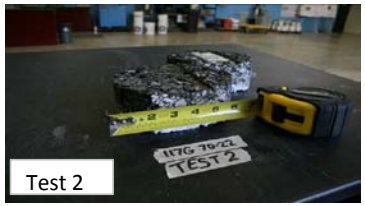


Mix ID: 117G 70-22 with 5% RAS (18435R - Poly HMA SMA BCS N80 12.5 - Gallagher Asphalt)
Test No. 1: 6.9% Voids / submerged in water at 50C / maximum displacement = 6.95 mm at point 9
Test No. 2: 7.4% Voids / submerged in water at 50C / maximum displacement = 6.94 mm at point 8
Test No. 3: 7.1% Voids / tested dry at 50C / maximum displacement = 4.78 mm at point 7
Comments: No secondary slope was observed

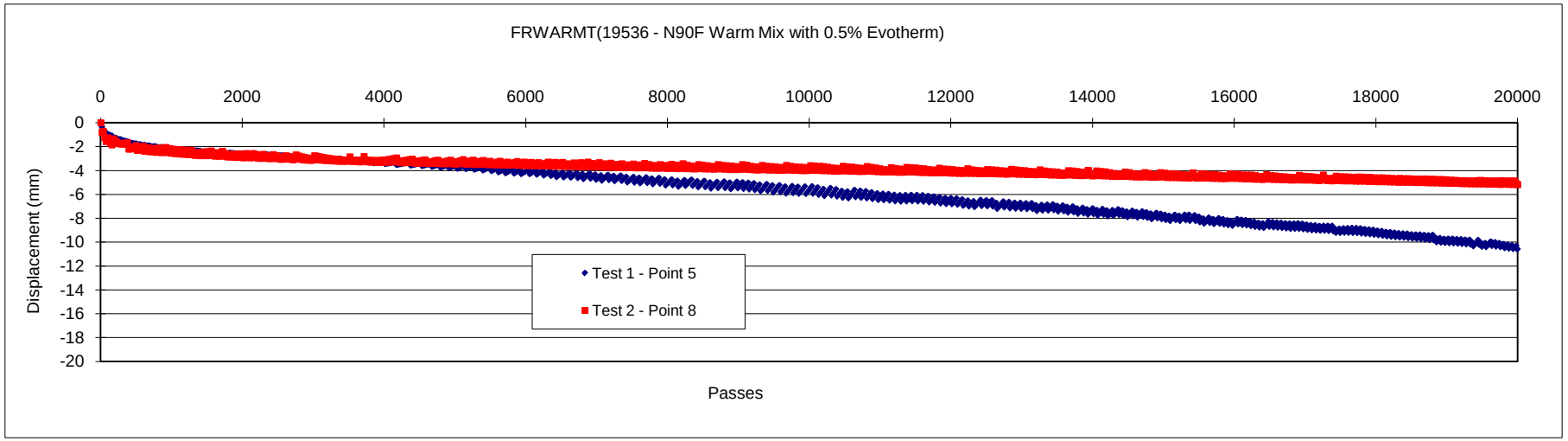


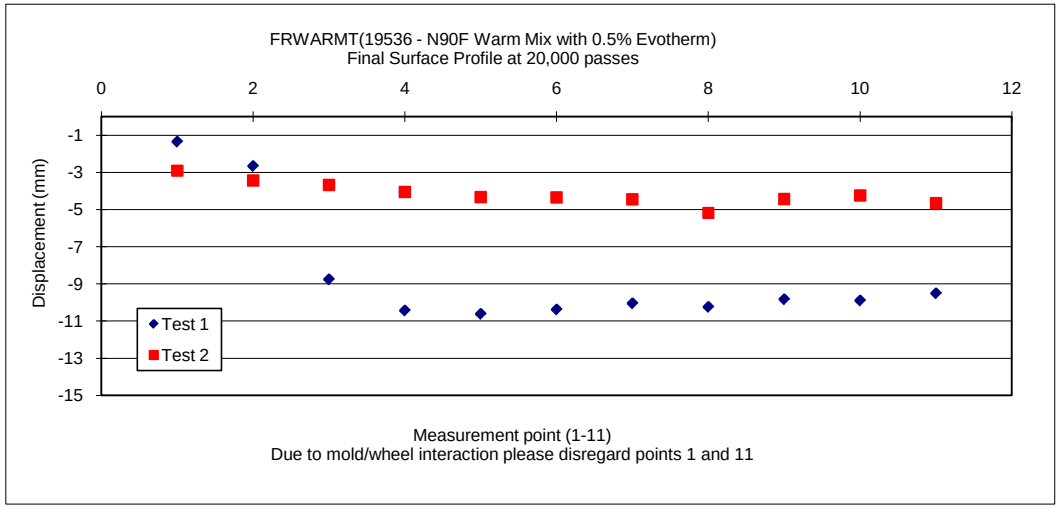






Mix ID: FRWARMT (19536 - N90F Warm Mix with 0.5% Evotherm)
Test No. 1: 7.5% Voids / submerged in water at 50C / maximum displacement = 10.62 mm at point 5
Test No. 2: 6.9% Voids / submerged in water at 50C / maximum displacement = 5.18 mm at point 8
Comments: No secondary slope was observed for Test 2. Test 1 does have the downward trend but a secondary slope is not well defined.





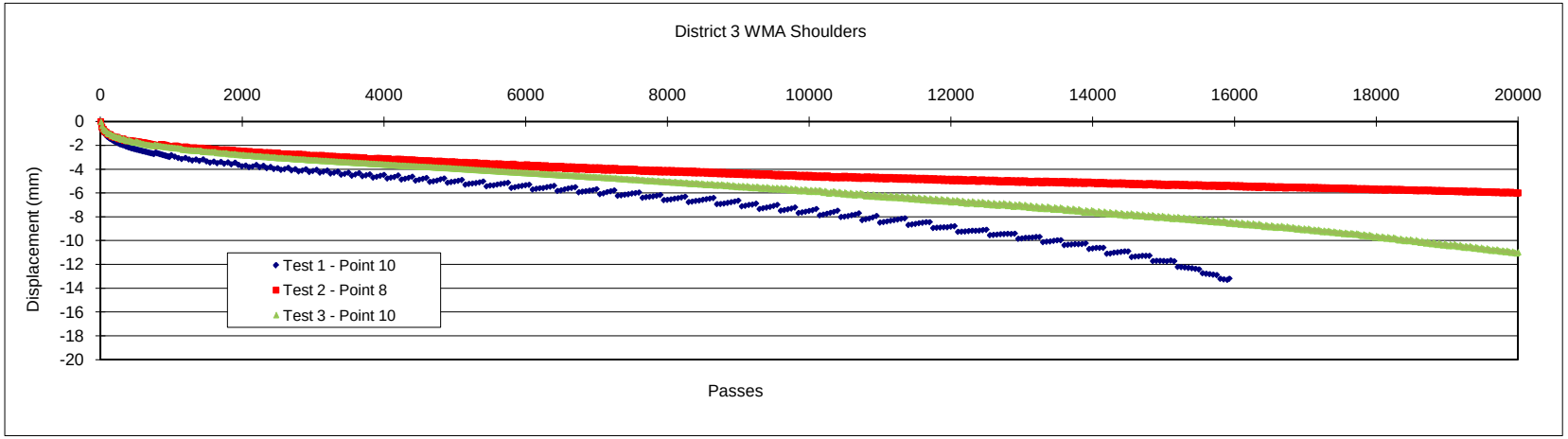
Mix ID: District 3 WMA Shoulders

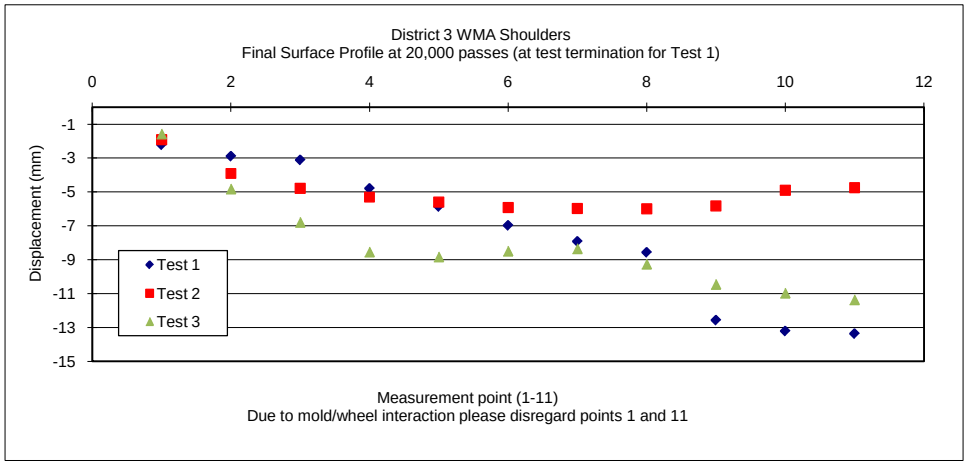
Test No. 1: Sample #2 (5.7% Voids) and Sample #4 (7.1% Voids) / submerged in water at 50C / maximum displacement = 13.30 mm at point 10

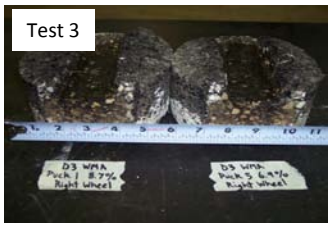
Test No. 2: Sample #3 (7.1% Voids) and Sample #6 (7.1% Voids) / submerged in water at 50C / maximum displacement = 6.02 mm at point 8

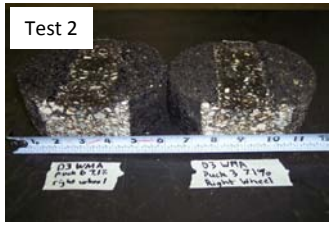
Test No. 3: Sample #1 (8.7% Voids) and Sample #5 (6.9% Voids) / submerged in water at 50C / maximum displacement = 11.06 mm at point 10

Comments: No secondary slope was observed for Test 2. A secondary slope is beginning to occur for Test 1. Test 1 was terminated at a rut depth of 13.30 mm. Test 3 does have the downward trend but a secondary slope is not well defined. The void levels of the individual samples were not known by the U of I until after testing. Samples 1 and 2 were pilots and should not have been tested. This was discovered later after discussions with IDOT. Therefore, the pairs for Test 1 and 3 have different voids. These results should be considered with caution and additional testing should be performed on this mixture.









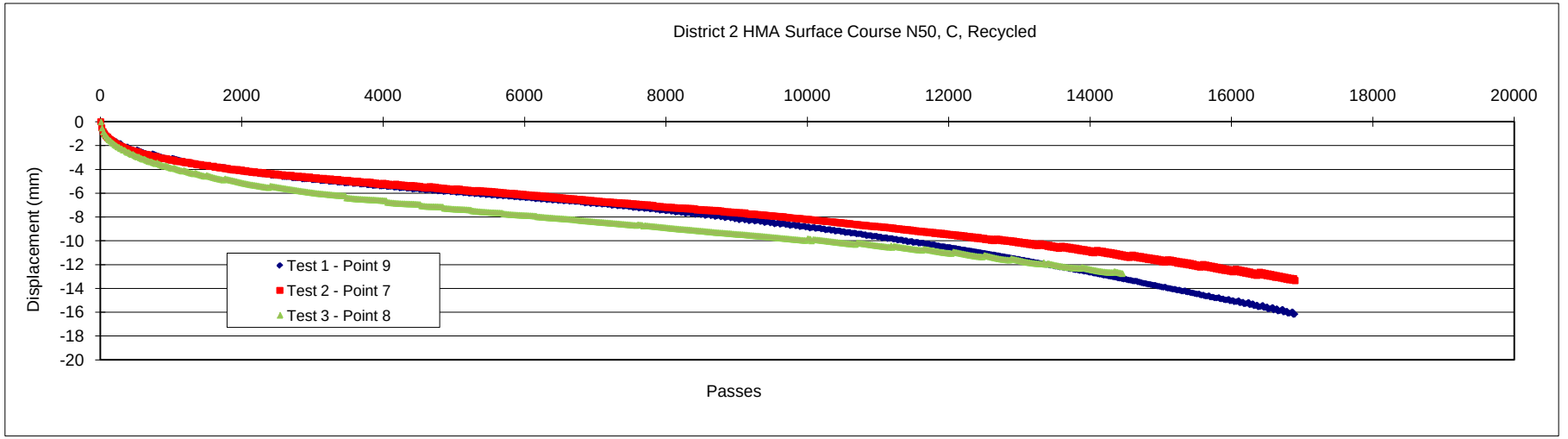
Mix ID: District 2 HMA Surface Course N50, C, Recycled

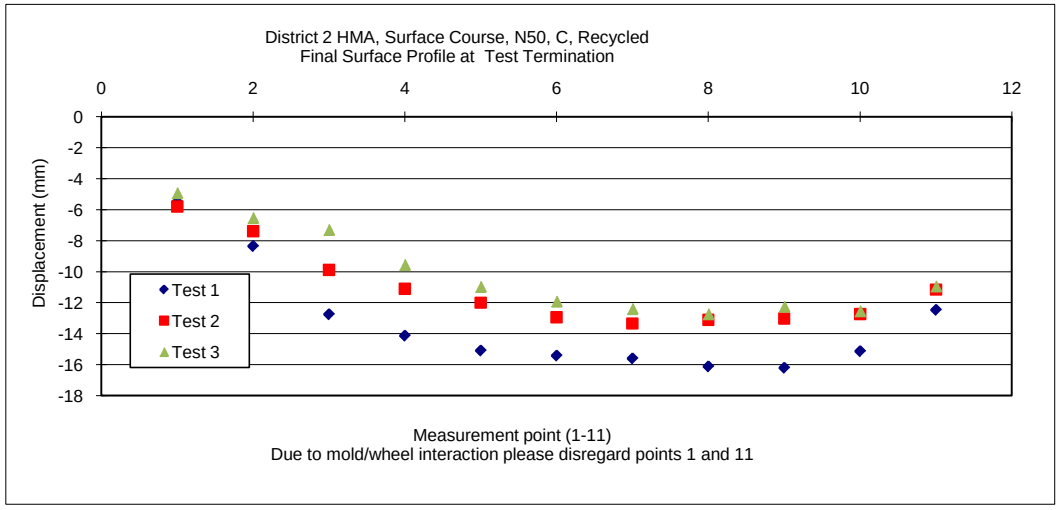
Test No. 1: Sample #3 (6.6% Voids) and Sample #4 (6.9% Voids) / submerged in water at 50C / maximum displacement = 16.22 mm at point 9

Test No. 2: Sample #5 (7.0% Voids) and Sample #7 (6.9% Voids) / submerged in water at 50C / maximum displacement = 13.35 mm at point 7

Test No. 3: Sample #8 (7.0% Voids) and Sample #9 (7.0% Voids) / submerged in water at 50C / maximum displacement = 12.74 mm at point 8

Comments: A secondary slope was beginning to occur for Tests 1, 2 & 3. Test 1 was terminated at a rut depth of 16.22 mm, Test 2 was terminated at a rut depth of 13.35 mm and Test 3 was terminated at a rut depth of 12.74 mm.





Mix ID: District 2 Warm Mix Surface Course N50, C, Recycled

Test No. 1: Sample #3 (6.8% Voids) and Sample #4 (7.0% Voids) / submerged in water at 50C / maximum displacement = 10.15 mm at point 8

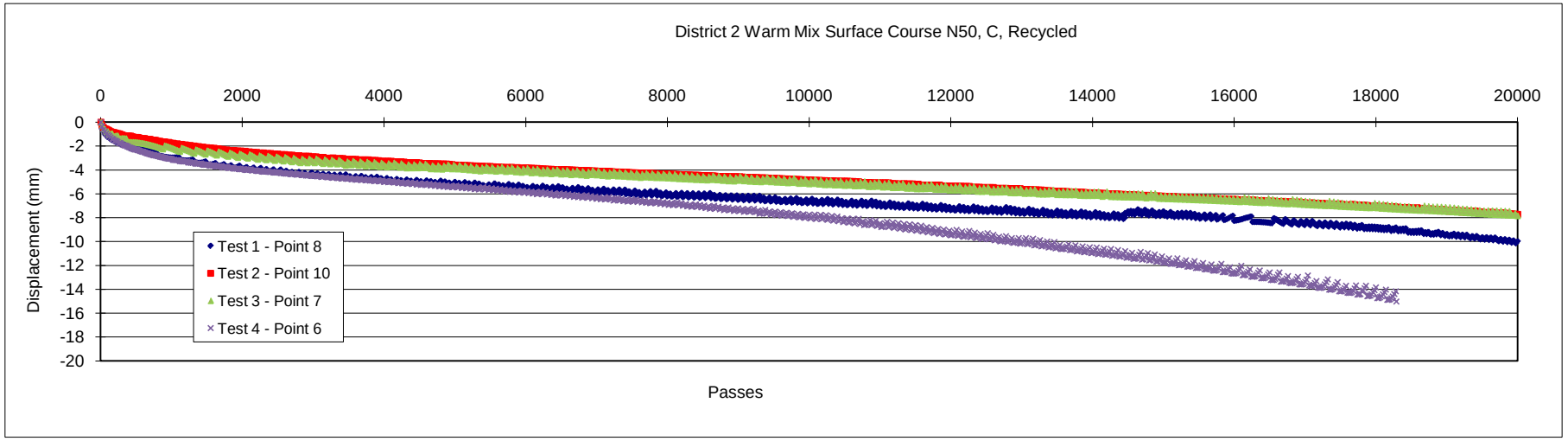
Test No. 2: Sample #6 (6.7% Voids) and Sample #7 (6.8% Voids) / submerged in water at 50C / maximum displacement = 7.77 mm at point 10

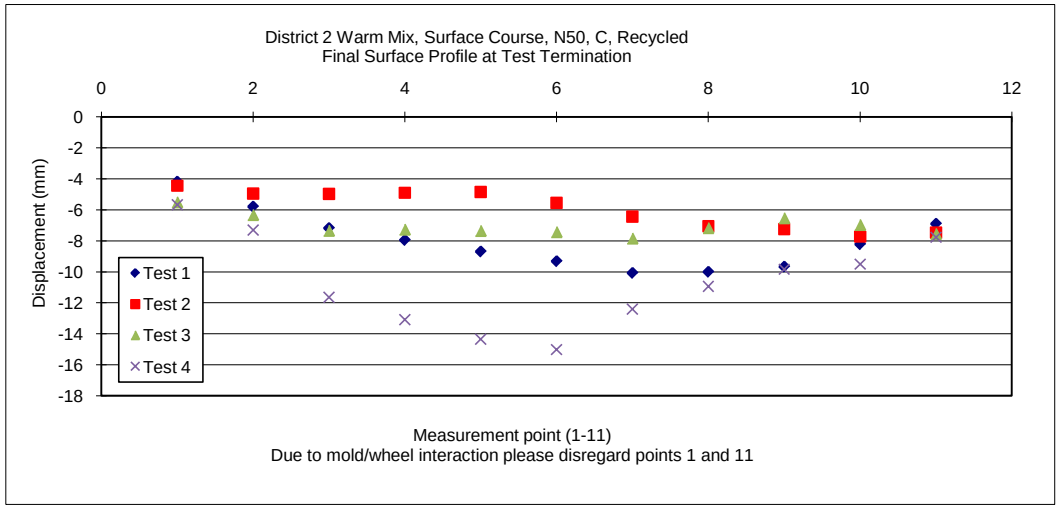
Test No. 3: Sample #8 (6.8% Voids) and Sample #9 (6.8% Voids) / submerged in water at 50C / maximum displacement = 7.83 mm at point 7

Test No. 4: Sample #10 (6.9% Voids) and Sample #11 (6.9% Voids) / submerged in water at 50C / maximum displacement = 15.02 at point 6

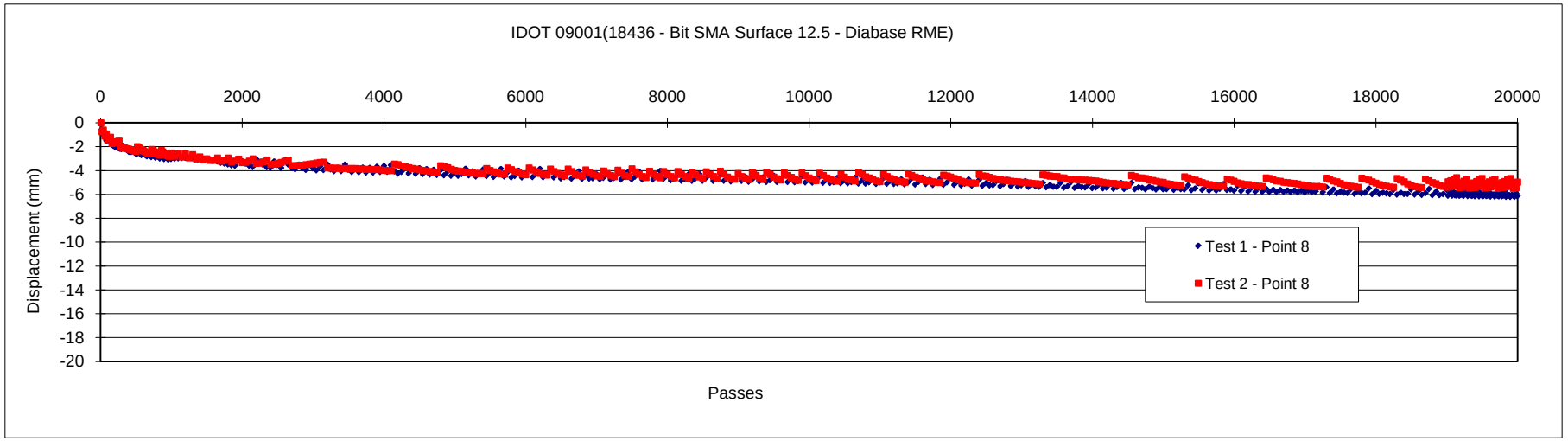
Comments: A secondary slope is beginning to occur for Test 4. Test 4 was terminated at a rut depth of 15.02 mm.

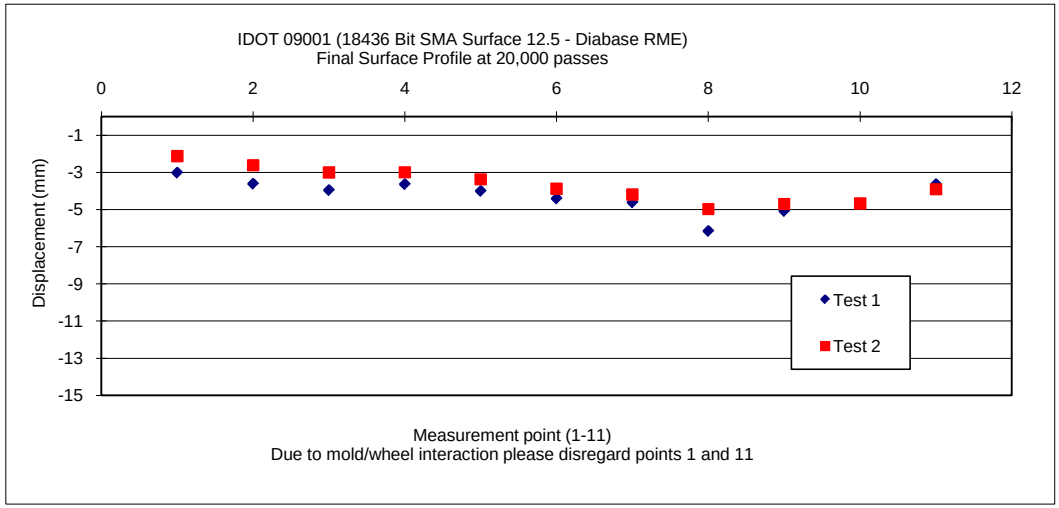
A downward trend is beginning to occur for Test 1 but a secondary slope is not well defined yet.

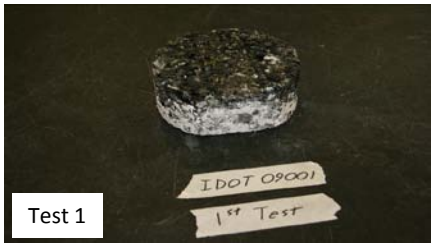




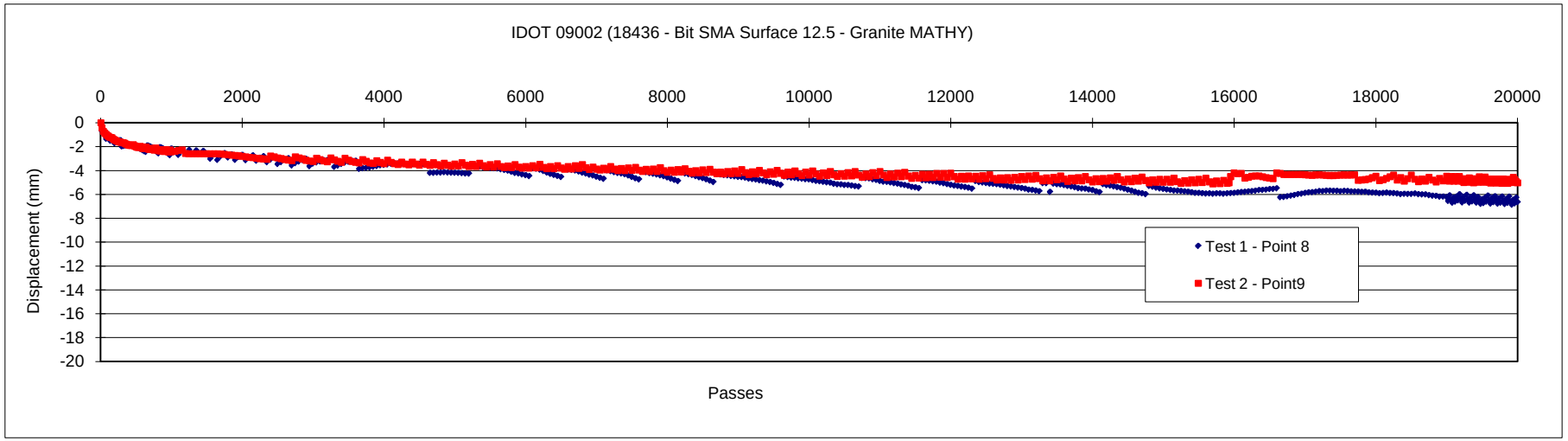
Mix ID: IDOT 09001 (18436 - Bit SMA Surface 12.5 - Diabase RME)
Test No. 1: 6.8% Voids / submerged in water at 50C / maximum displacement = 6.21 at point 8
Test No. 2: 6.8% Voids / submerged in water at 50C / maximum displacement = 5.48 at point 8
Comments: No secondary slope was observed.

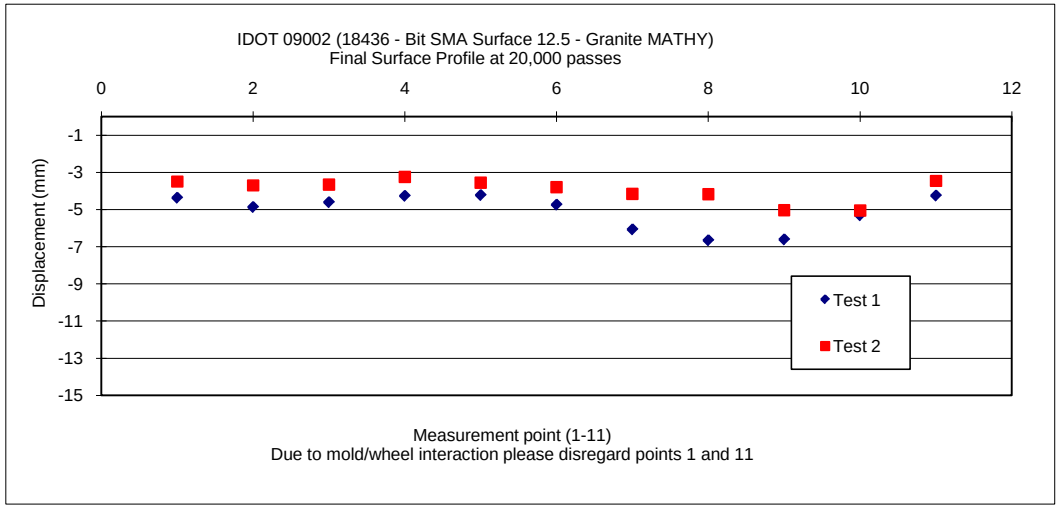


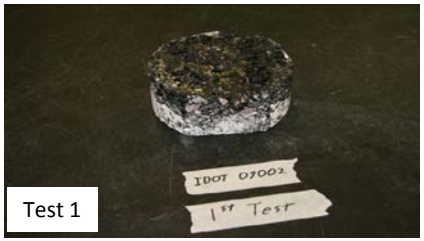


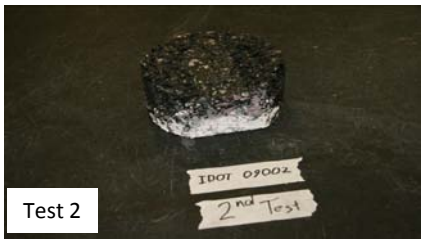


Mix ID: IDOT 09002 (18436 - Bit SMA Surface 12.5 - Granite MATHY)
Test No. 1: 7.1% Voids / submerged in water at 50C / maximum displacement = 6.86 mm at point 8
Test No. 2: 6.9% Voids / submerged in water at 50C / maximum displacement = 5.12 mm at point 9
Comments: No secondary slope was observed.

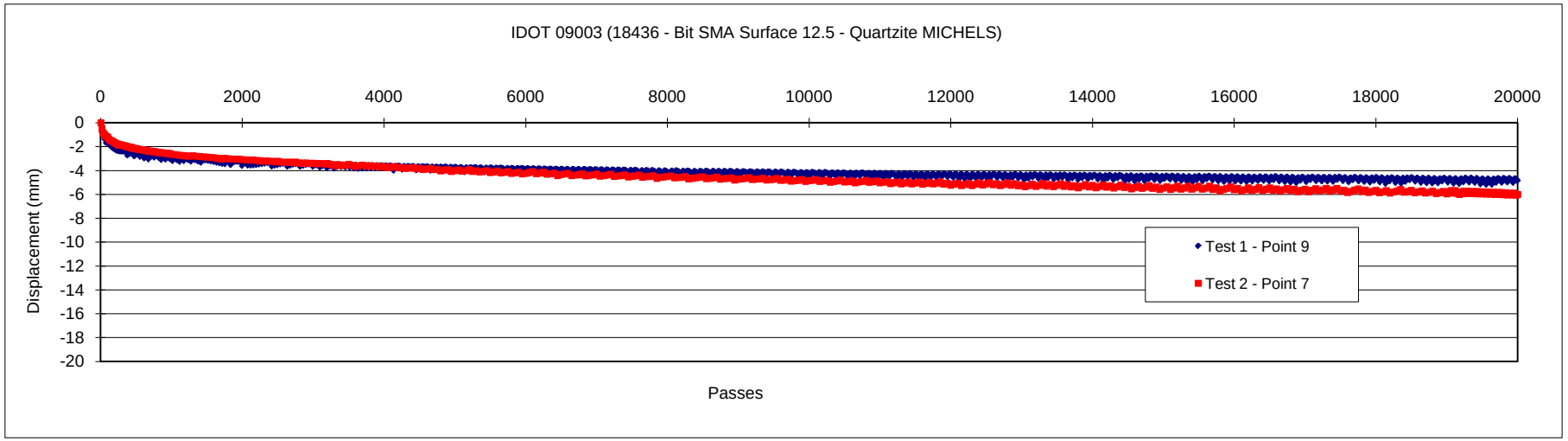


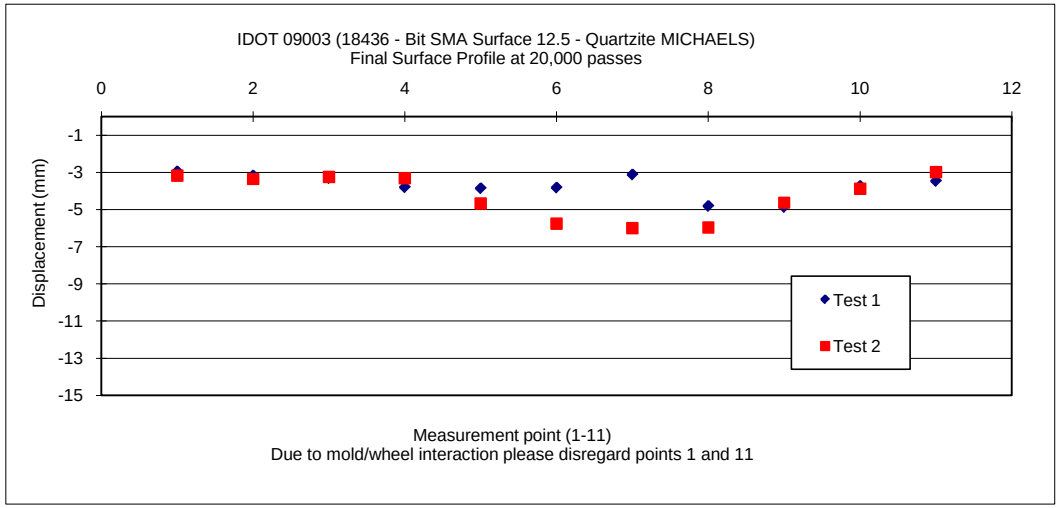


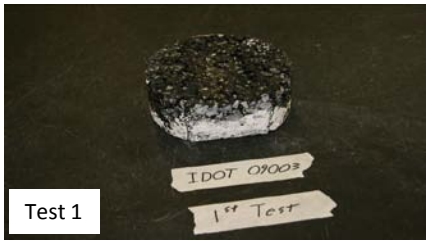




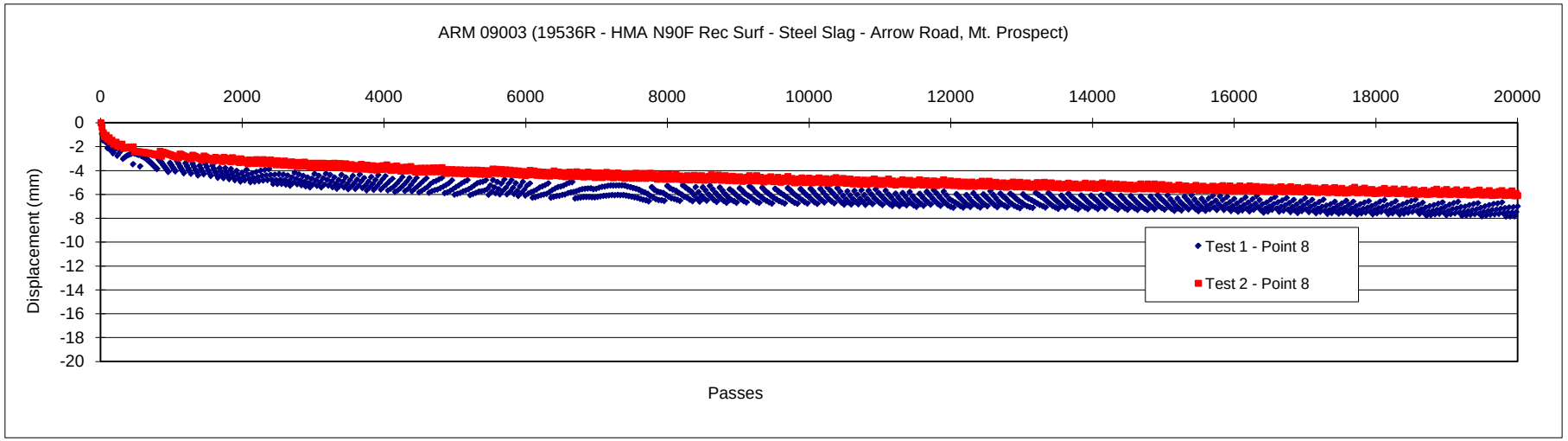
Mix ID: IDOT 09003 (18436 - Bit SMA Surface 12.5 - Quartzite MICHELS)
Test No. 1: 7.1% Voids / submerged in water at 50C / maximum displacement = 5.19 mm at point 9
Test No. 2: 7.3% Voids / submerged in water at 50C / maximum displacement = 6.07 mm at point 7
Comments: No secondary slope was observed.

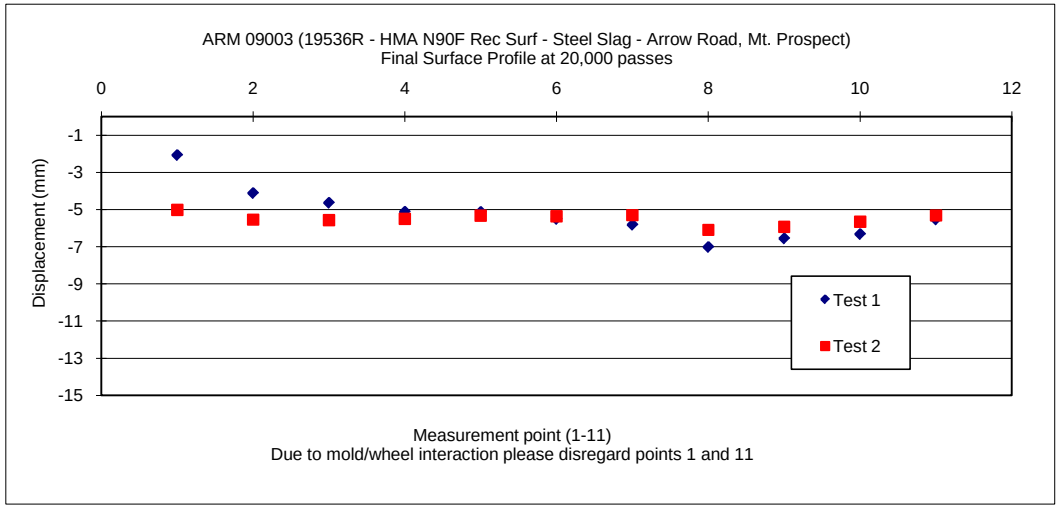




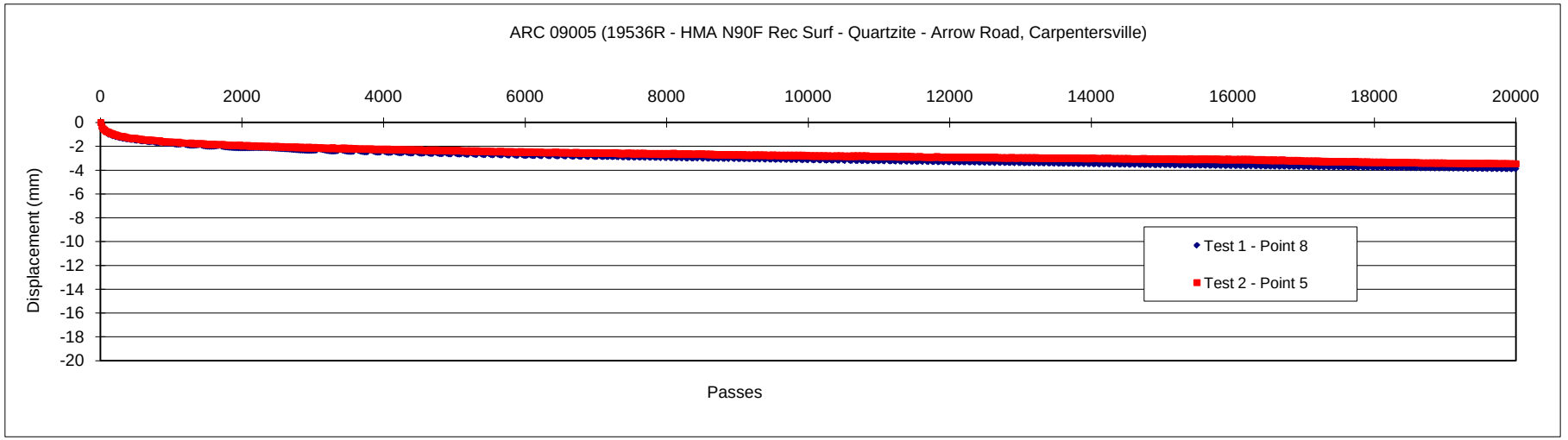


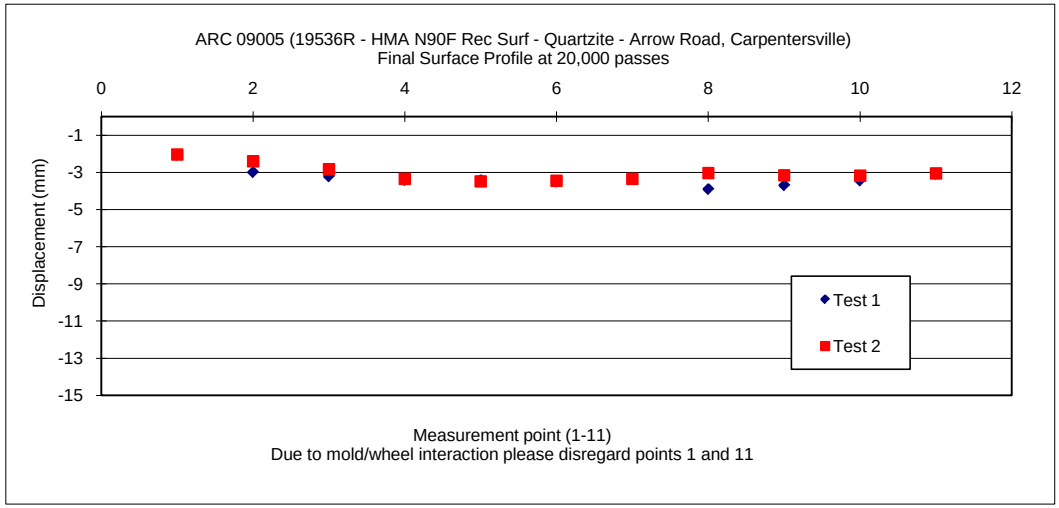
Mix ID: ARM 09003 (19536R - HMA N90F Rec Surf - Steel Slag - Arrow Road, Mt. Prospect)
Test No. 1: Voids (unreadable on sample) / submerged in water at 50C / maximum displacement = 7.85 at point 8
Test No. 2: 7.5% Voids / submerged in water at 50C / maximum displacement = 6.12 mm at point 8
Comments: No secondary slope was observed.



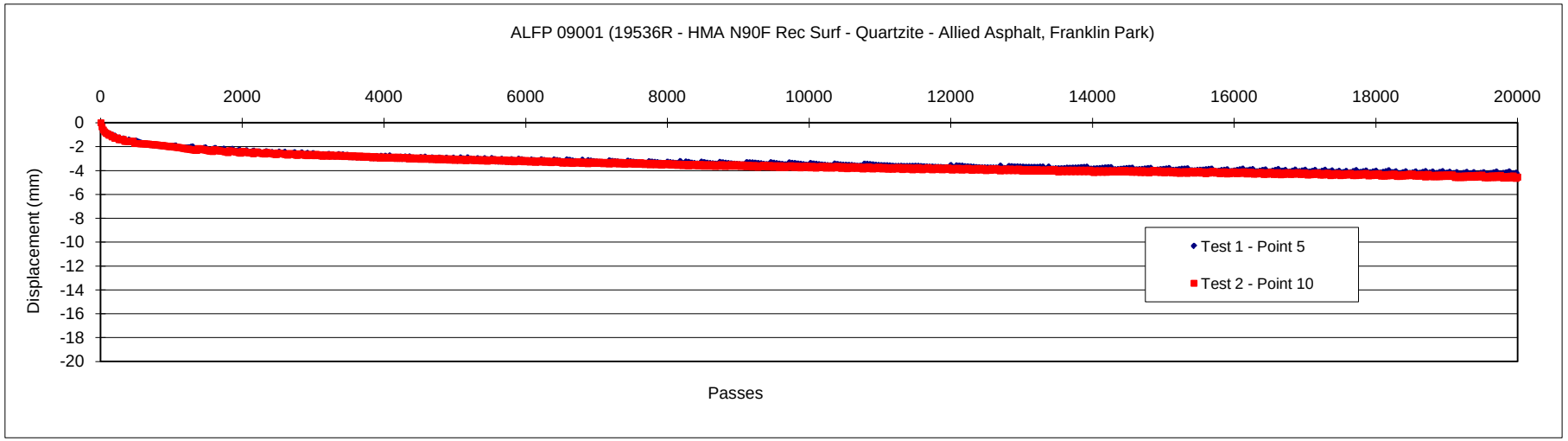


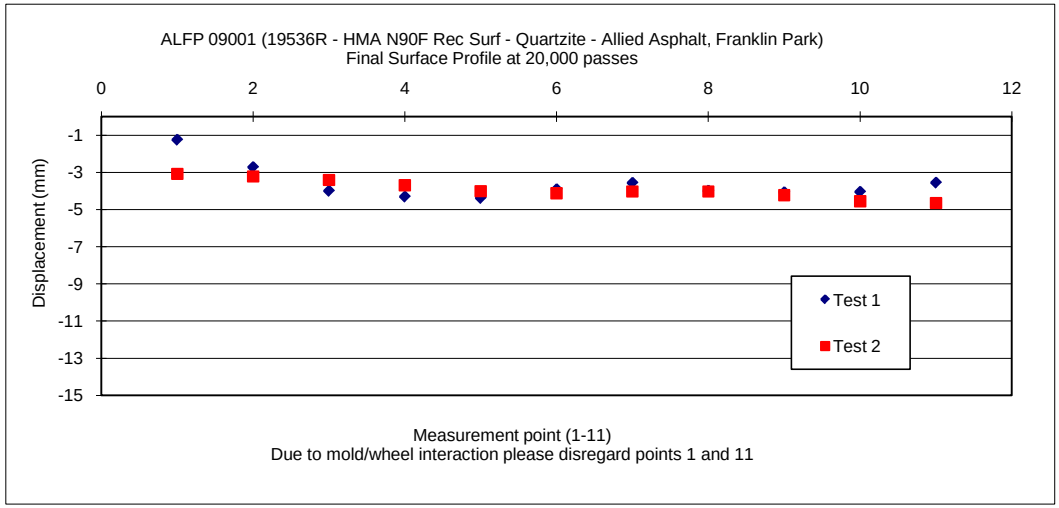
Mix ID: ARC 09005 (19536R - HMA N90F Rec Surf - Quartzite - Arrow Road, Carpentersville)
Test No. 1: 7.0 or 7.3% Voids (not able to read sample completely) / submerged in water at 50C / maximum displacement = 3.91 mm at point 8
Test No. 2: 7.1% Voids / submerged in water at 50C / maximum displacement = 3.48 mm at point 5
Comments: No secondary slope was observed.



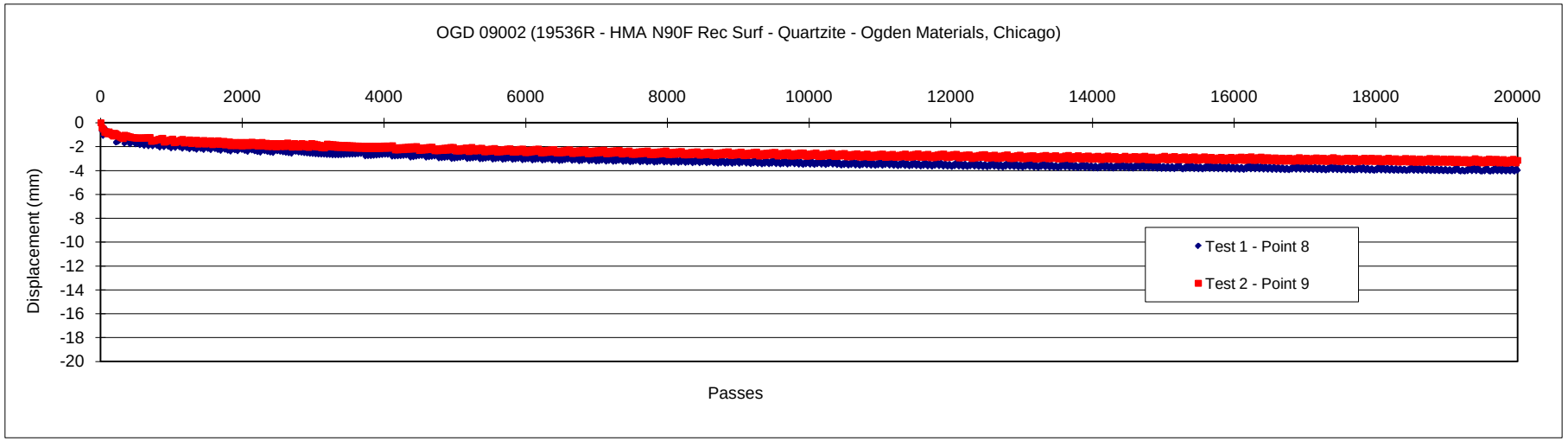


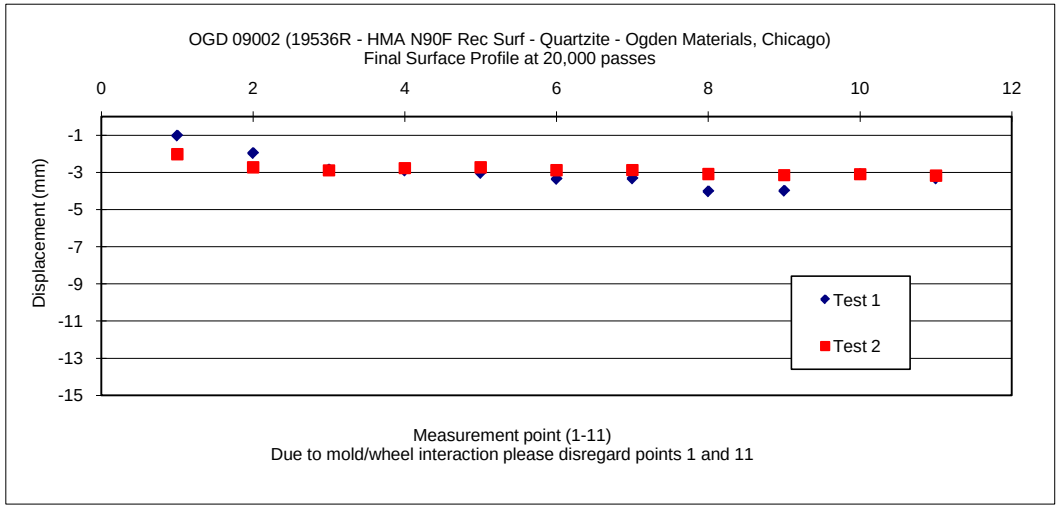
Mix ID: ALFP 09001 (19536R - HMA N90F Rec Surf - Quartzite - Allied Asphalt, Franklin Park)
Test No. 1: 6.6% Voids / submerged in water at 50C / maximum displacement = 4.41 mm at point 5
Test No. 2: 6.8% Voids / submerged in water at 50C / maximum displacement = 4.66 mm at point 10
Comments: No secondary slope was observed.

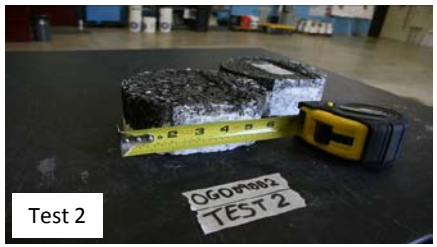




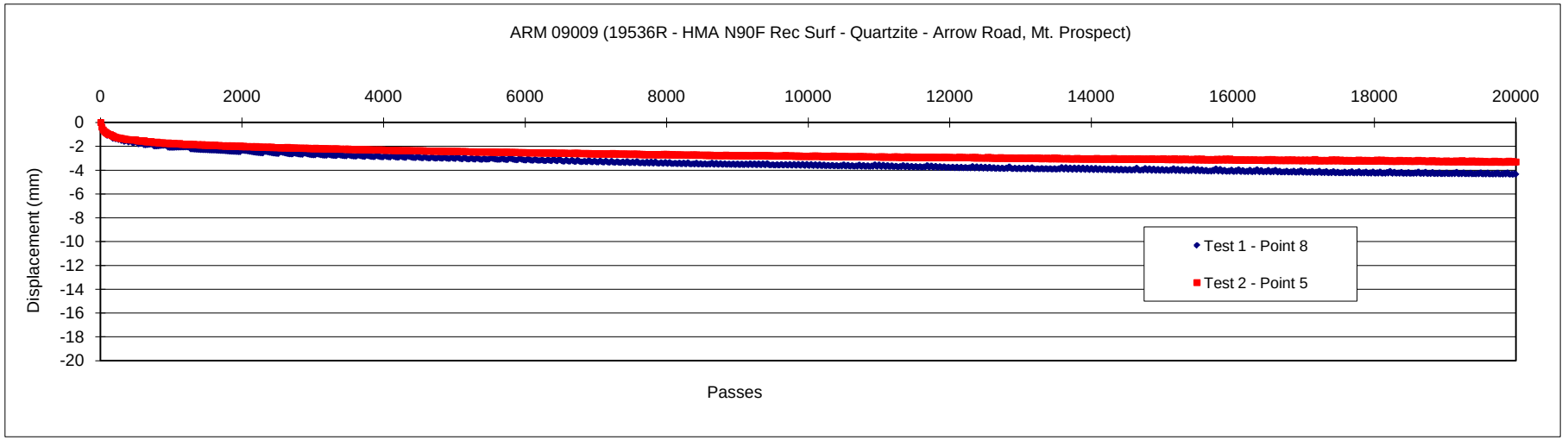
Mix ID: OGD 09002 (19536R - HMA N90F Rec Surf - Quartzite - Ogden Materials, Chicago)
Test No. 1: 6.9% Voids / submerged in water at 50C / maximum displacement = 4.09 mm at point 8
Test No. 2: 6.8% Voids / submerged in water at 50C / maximum displacement = 3.38 mm at point 9
Comments: No secondary slope was observed.

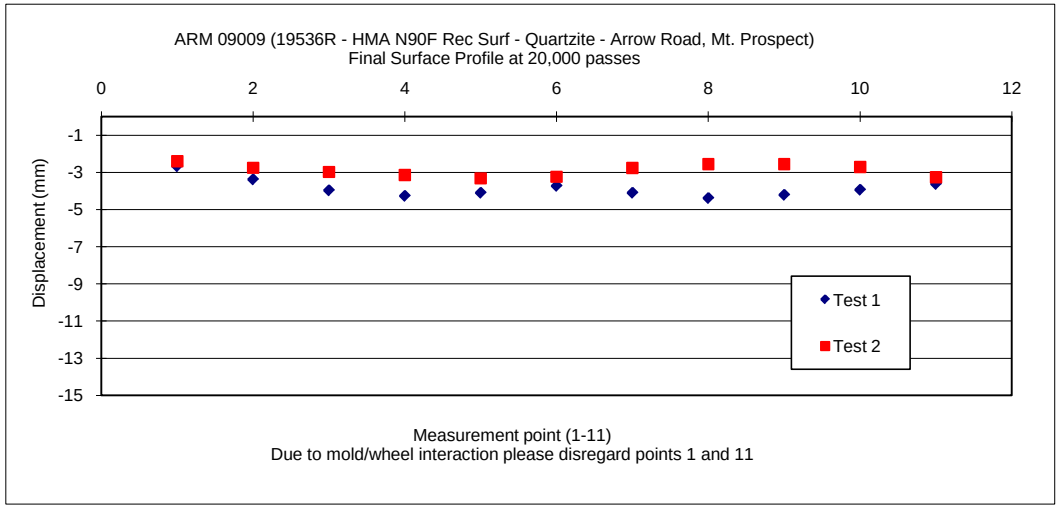




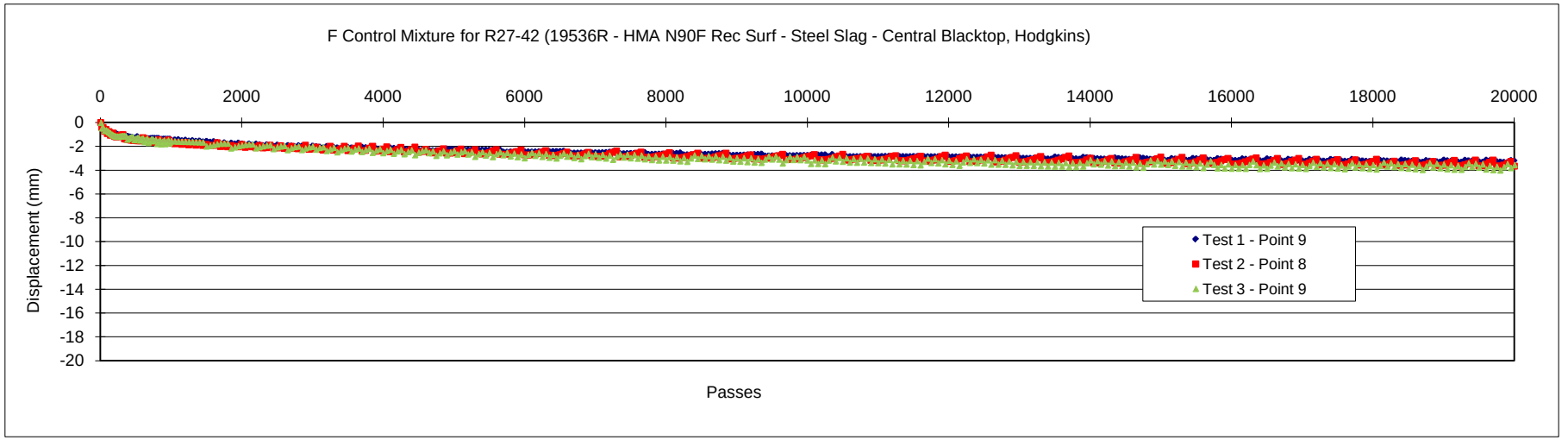


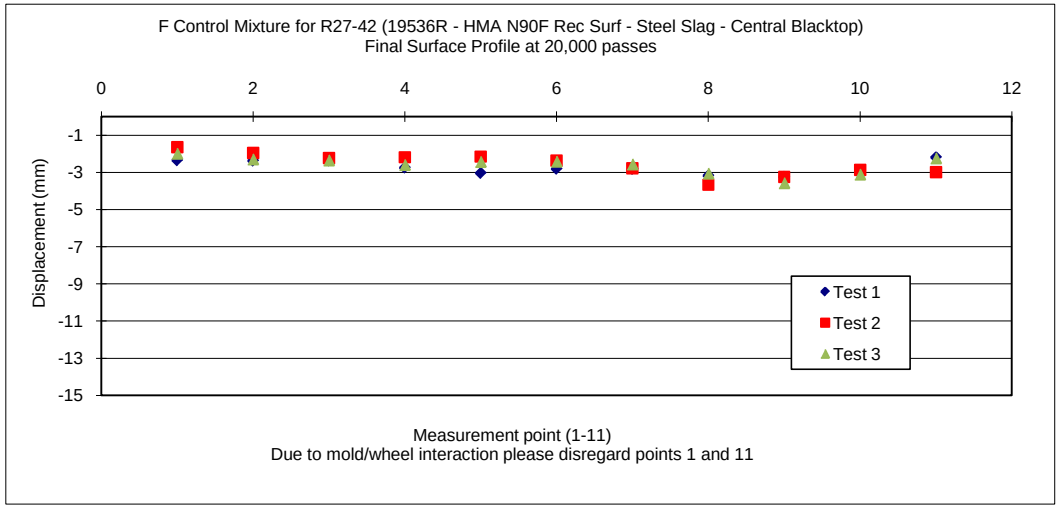
Mix ID: ARM 09009 (19536R - HMA N90F Rec Surf - Quartzite - Arrow Road, Mt. Prospect)
Test No. 1: Voids (unreadable on sample) / submerged in water at 50C / maximum displacement = 4.39 mm at point 8
Test No. 2: 6.9% Voids / submerged in water at 50C / maximum displacement = 3.35 mm at point 5
Comments: No secondary slope was observed.

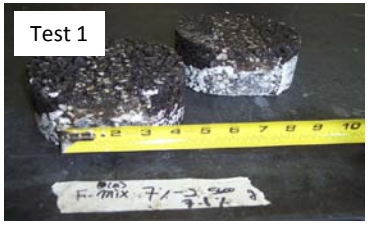




Mix ID: F Control Mixture for R27-42 (19536R - HMA N90F Rec Surf - Steel Slag - Central Blacktop, Hodgkins)
Test No. 1: 7.1% Voids / submerged in water at 50C / maximum displacement = 3.34 mm at point 9
Test No. 2: 7.1% Voids / submerged in water at 50C / maximum displacement = 3.67 mm at point 8
Test No. 3: 7.2% Voids / submerged in water at 50C / maximum displacement = 4.02 mm at point 9
Comments: No secondary slope was observed.







Mix ID: SMA Control Mixture for R27-42 (18436 - Poly HMA SMA SCS N80 12.5 - Steel Slag - K-Five, Chicago)

Test No. 1: 7.2% Voids / submerged in water at 50C / maximum displacement = 5.87 mm at point 8

Test No. 2: 7.3% Voids / submerged in water at 50C / maximum displacement = 5.97 mm at point 9

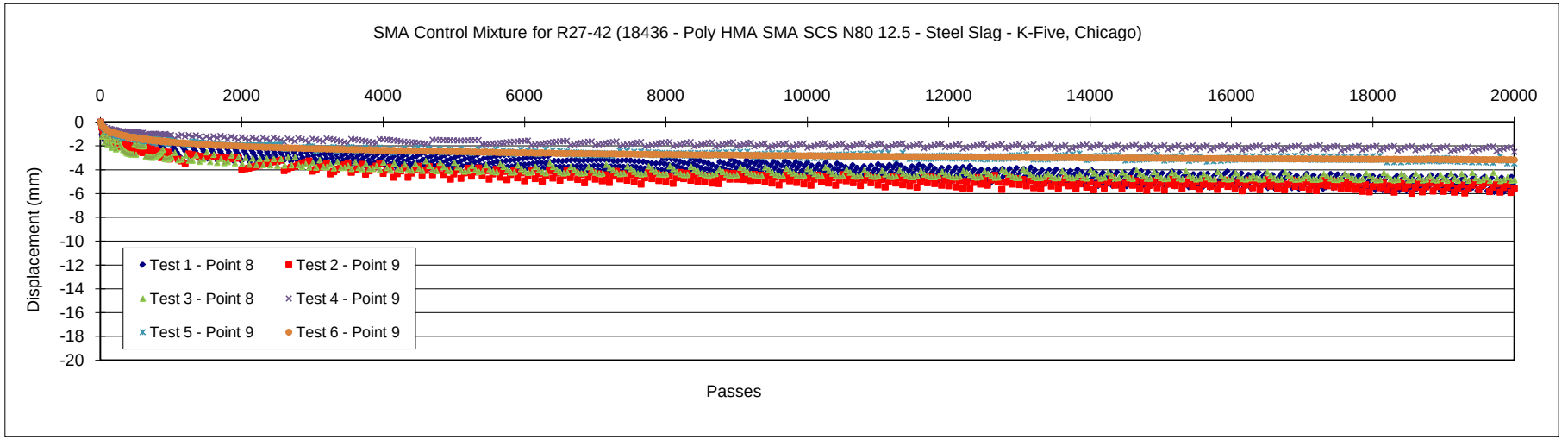
Test No. 3: 7.0% Voids / submerged in water at 50C / maximum displacement = 4.92 mm at point 8

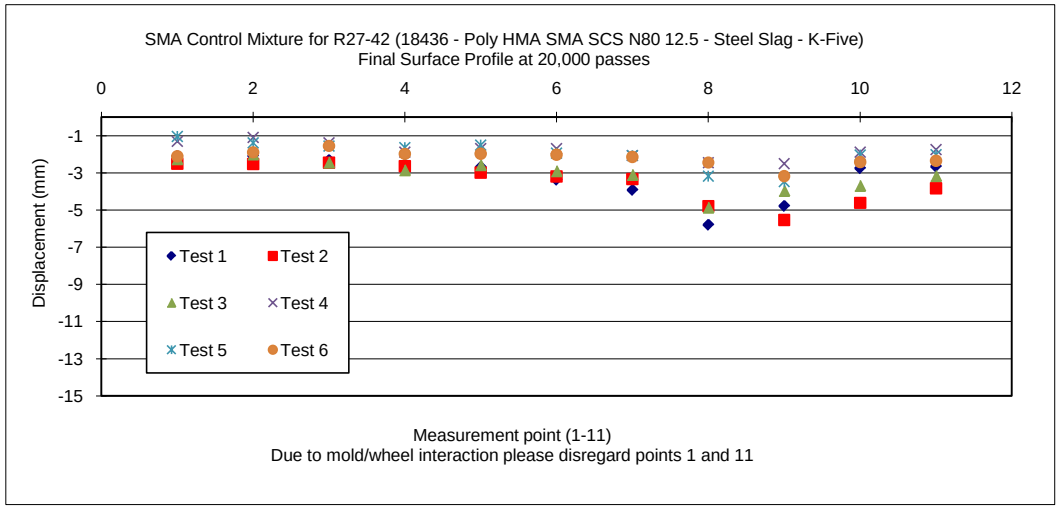
Test No. 4: 4.7% Voids / submerged in water at 50C / maximum displacement = 2.50 mm at point 9

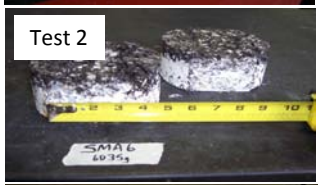
Test No. 5: 5.0% Voids / submerged in water at 50C / maximum displacement = 3.48 mm at point 9

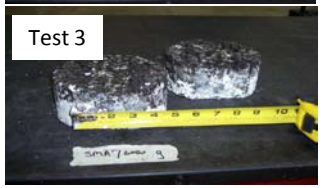
Test No. 6: 4.9% Voids / submerged in water at 50C / maximum displacement = 3.17 mm at point 9

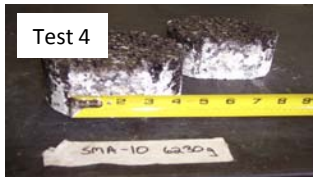
Comments: No secondary slope was observed.

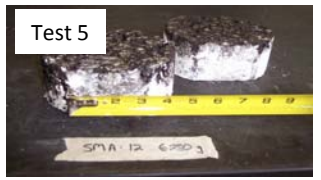


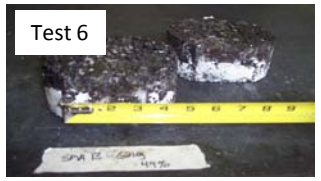












APPENDIX C: DYNAMIC MODULUS TESTING RESULTS

Sample ID:	114G PG76-22 (1)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	24044330	5.59	-10	-115.2	0.55	3.75	5.85	7.85	34.51	1.11
25.0	23957780	5.5	-10	-110.4	0.57	1.68	5.47	7.3	35.93	1.04
10.0	22526930	5.97	-10	-111.3	0.46	1.13	3.26	4.87	34.78	0.21
5.0	21553630	6.31	-10	-107.9	0.37	2.42	2.16	4.04	34.21	0.42
1.0	19179970	7.32	-10	-112.7	0.02	9.76	0.5	3.46	35.94	1
0.5	18144130	7.84	-10	-112.3	-0.02	14.34	0.34	3.38	37.51	1.16
0.1	15705710	9.16	-10	-108.3	0.11	16.22	1.5	2.58	41.24	1.33
25.0	17828110	9.39	3	-118.4	0.59	10.74	5.95	6.18	54.56	0.99
25.0	17838290	9.3	5	-119.6	0.47	3.47	5.72	6.22	54.87	1.07
10.0	16145010	10	4	-114.4	0.54	4.5	3.71	4.55	57.62	0.36
5.0	14929690	10.6	4	-118.5	0.35	5.85	2.61	4.11	58.63	0.41
1.0	12256450	12.61	4	-113.7	0.04	30.65	0.74	3.27	59.73	0.7
0.5	11130080	13.68	4	-117.8	0.02	42.09	0.65	3.63	60.15	0.72
0.1	8647171	16.15	4	-113.1	-0.07	43.16	1.54	3.5	60.96	0.67
25.0	8828997	16.51	21	-109.1	1.04	35.54	8.38	8.88	23.33	1.86
25.0	8931949	16.07	21	-119.2	0.89	13.04	8.71	9.22	23.42	1.84
10.0	7646737	17.34	21	-117.3	0.46	13.2	6.82	7.55	24.93	0.96
5.0	6707577	18.43	21	-116.5	0.73	19.02	6.16	6.87	25.53	0.69
1.0	4701418	21.92	21	-113.2	0.68	69.45	6.39	6.58	25.54	0.74
0.5	4014525	23.18	21	-112.1	0.01	90.12	3.95	5.73	24.98	0.93
0.1	2722916	25.03	21	-111	0.52	85.17	2.2	4.17	24.26	0.99
25.0	4915365	23.33	38	-120.6	0.36	61.87	8.72	9.42	18.12	2.43
25.0	4993612	22.78	38	-118.9	-0.02	20.49	9.29	10.53	18.21	2.52
10.0	3903724	24.02	38	-113.3	0.01	16.68	8.29	9.42	20.72	1.23
5.0	3212448	24.97	38	-112.2	0.42	23.19	6.72	8.32	20.94	1.07
1.0	1990768	27.11	38	-113.1	1.31	67.9	10.82	11.14	20.99	0.93
0.5	1646958	26.61	38	-109.8	-0.54	88.16	7.66	8.88	19.36	1.01
0.1	1060792	25.33	38	-114.3	0.4	102.7	5.77	5.97	18.55	0.64
25.0	2448251	27.17	54	-128.2	-0.46	69.74	9.2	7.96	8.7	1.84
25.0	2451125	26.43	54	-119	-0.76	17.77	9.74	10	7.23	2.14
10.0	1750246	26.88	54	-117.8	0.31	14.91	10.76	9.9	9.69	0.96
5.0	1398203	26.48	54	-125.6	0.33	19.43	10	9.16	9.16	0.75
1.0	859060.6	25.42	54	-119.8	1.52	38.9	22.03	19.32	6.38	0.27
0.5	745386.2	22.79	54	-115.3	0.54	56.96	13.08	11.1	9.57	1.82
0.1	544408.8	19.67	54	-116.3	-8.28	97.68	9.23	6.12	15.13	1.61

Sample ID:	114G PG76-22 (2)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	22579890	5.47	-10	-113.7	0.62	3.81	6.09	6.38	39.98	2.49
25.0	22612570	5.44	-10	-108.2	0.69	1.07	6.16	6.59	40.33	2.44
10.0	22030080	5.52	-10	-114.4	0.42	0.89	3.41	5.16	36.6	1.07
5.0	21134340	5.82	-10	-116	0.35	2.94	2.21	4.73	36.9	0.64
1.0	18933100	6.85	-10	-117.3	0.01	6.75	0.55	3.76	37.68	0.31
0.5	17920750	7.41	-10	-113.3	0.01	12.8	0.39	3.84	37.94	0.29
0.1	15565620	8.68	-10	-112.6	-0.25	6.57	1.42	3.71	38.92	0.4
25.0	17070630	10.83	4	-105	0.67	10.9	6.73	7.38	28.69	3.59
25.0	17055860	10.75	4	-109.5	0.74	4.73	6.78	7.29	26.73	3.49
10.0	15385230	9.77	4	-109.7	0.52	4.48	3.98	4.87	28.92	0.75
5.0	14290770	10.48	4	-108.9	0.45	8.32	2.76	4.31	29.08	0.39
1.0	11705210	12.6	4	-108.2	0.06	32.71	0.76	3.64	30.91	0.31
0.5	10612310	13.69	4	-112.5	0.06	48.97	0.89	3.84	30.93	0.36
0.1	8230596	16.57	4	-110.3	0.61	63.44	1.59	3.32	31.32	0.45
25.0	8587166	18.25	22	-114.2	0.64	50.28	8.8	8.07	13.04	1.55
25.0	8650789	17.67	21	-112.7	0.73	20.06	8.97	8.16	12.07	1.51
10.0	7259833	18.96	21	-117.4	0.75	18.54	6.97	7.22	15.49	0.75
5.0	6284170	20.26	21	-112.6	0.75	25.74	6.38	6.22	16.39	0.65
1.0	4258801	23.97	21	-117.2	0.88	85.04	6.78	6.06	17.04	0.99
0.5	3579667	25.1	21	-115.6	-0.16	110.93	4.05	5	17.71	1.16
0.1	2340945	26.58	21	-114.8	1.15	105.36	2.67	2.97	19.7	1.46
25.0	4574990	25.28	38	-112.6	-0.58	77.67	9.46	9.9	10.44	1.65
25.0	4686448	24.41	38	-112.8	-0.24	29.77	9.27	9.01	10.38	1.6
10.0	3563362	25.52	38	-114	0.26	22.32	8.38	8.76	17.07	0.59
5.0	2888988	26.28	38	-110	0.62	26.05	6.99	7.87	19.61	0.6
1.0	1757506	27.83	38	-115.7	2.06	74.07	11.85	10.97	23.78	1.04
0.5	1465154	26.95	38	-110.8	0.01	97.67	8.31	7.98	23.64	1.17
0.1	961997.2	25.2	38	-110.2	-1.28	95.59	7.03	5.01	26.12	1.29
25.0	2420649	27.49	54	-120.6	-0.38	62.38	8.39	7.49	22.51	0.34
25.0	2394134	26.98	54	-117.1	-0.21	22.75	8.72	8.12	21.02	0.09
10.0	1691576	27.1	54	-120.9	0.32	16.24	7.31	5.99	20.06	0.75
5.0	1314501	27.11	54	-117.5	-0.13	9.32	6.58	6.16	19.14	0.88
1.0	826007.4	26.04	54	-117.2	1.75	27.71	19.24	15.52	18.57	1.57
0.5	720577.8	23.36	54	-119.6	-0.1	34.79	12.99	10.25	18.96	1.5
0.1	544192.8	19.58	54	-117.5	1.8	34.39	7.7	4.79	17.29	1.43

Sample ID:	114G PG76-22 (3)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	26472930	3.71	-10	-113.1	-60.04	-62.16	37.97	40.52	25.84	2.04
25.0	26396270	2.9	-10	-109	0.51	1.29	5.48	8.69	30.2	2.7
10.0	25438130	4.67	-10	-111	0.48	0.69	2.98	4.92	26.48	0.94
5.0	24516070	4.97	-10	-112.5	0.3	0.5	1.85	4.17	25.73	0.61
1.0	22327420	5.76	-10	-110.3	0	3.54	0.49	3.5	25.13	0.38
0.5	21304400	6.19	-10	-110.1	0.01	4.14	0.34	3.41	24.92	0.34
0.1	18914200	7.22	-10	-110.4	0.07	-3.32	1.39	3.5	24.11	0.36
25.0	19202130	8.02	4	-109	0.58	7.7	6.23	10.51	24	1.85
25.0	19047380	7.79	4	-110.1	-119.74	-142.12	51.43	58.59	24.66	1.9
10.0	17721690	8.87	4	-112	0.52	3.93	3.55	6.37	29.2	0.82
5.0	16543290	9.47	4	-110.6	0.34	5.71	2.34	5.17	29.22	0.63
1.0	13874990	11.19	4	-114.5	0.04	22.76	0.65	3.99	28.49	0.53
0.5	12662520	12.1	4	-105.4	0.04	37.21	0.52	4.07	28.54	0.55
0.1	10002840	14.66	4	-105.4	0.35	44.45	1.57	4.02	28.27	0.69
25.0	9931693	16.6	21	-110.8	0.89	37.93	8.06	7.68	17.29	2.04
25.0	10046030	16.31	21	-110.6	0.61	15.52	8.27	8	18.76	2.04
10.0	8546818	17.42	21	-105.5	0.38	14.76	6.18	7.37	21.13	1.07
5.0	7458831	18.6	21	-106.9	0.45	21.49	5.72	6.59	20.95	0.81
1.0	5248492	21.95	21	-105.3	0.67	74.75	5.14	6.15	19.33	0.46
0.5	4460798	23.28	21	-108.1	0.24	98.63	4.32	5.85	18.45	0.47
0.1	3016587	25.14	21	-109.8	0.55	94.08	2.15	3.57	17.3	0.42
25.0	5249902	23.63	38	-106.4	-0.01	57.66	9.53	13.6	33.54	1.37
25.0	5317515	22.8	38	-109.8	0.43	20.15	9.94	13.52	32.25	1.59
10.0	4186777	24.05	38	-106.8	0.64	15.44	8.89	9.63	29.91	0.27
5.0	3443823	25.04	38	-111.8	0.83	20.17	7.71	8.31	29.41	0.12
1.0	2149577	27.12	38	-105.7	1.7	61.92	11.06	10.14	29.43	0.31
0.5	1775580	26.72	38	-110.7	0.3	77.95	7.03	7.13	28.91	0.33
0.1	1159176	25.32	38	-105.5	1.4	70.01	5.18	4.51	28.78	0.45
25.0	2567790	26.15	54	-116.2	-0.82	60.09	9.44	21.42	17.89	0.42
25.0	2535649	25.67	54	-117.4	-0.54	16.18	9.77	23.13	17.05	0.63
10.0	1856238	25.74	54	-119.5	0.33	17.95	7.77	13.92	16.31	0.43
5.0	1452991	25.87	54	-116.7	0.17	9.5	7.29	14.34	18.02	0.49
1.0	921737.9	24.83	54	-117.1	1.2	26.81	18.28	19.88	20.6	0.82
0.5	803507.3	22.65	54	-116.9	0.01	34.68	14.44	16.11	21.16	0.81
0.1	598235.9	19.21	54	-113.2	-0.55	30.46	12.76	12.87	22.3	0.89

Sample ID:	117G PG70-22 (1)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	21290320	4.81	-10	-108.3	0.72	4.03	6.31	12.2	3.25	0.47
25.0	21192240	4.9	-10	-112.9	0.67	1.13	6.23	11.69	4.15	0.61
10.0	19934620	5.42	-10	-112.6	0.58	1.84	3.71	14.67	3.8	0.27
5.0	19105560	5.59	-10	-113.7	0.37	1.9	2.41	14.58	4.4	0.23
1.0	17105700	6.56	-10	-114.4	0	8.79	0.57	12.73	2.99	0.33
0.5	16227810	6.95	-10	-114.9	-0.01	12.66	0.37	12.58	3.56	0.36
0.1	14180640	8.02	-10	-111.4	0.23	6.97	1.42	13.54	4.78	0.41
25.0	14844530	8.97	3	-103.8	0.74	8.11	6.93	14.06	8.84	1.96
25.0	14882100	8.94	4	-110.1	0.72	2.88	6.93	15.12	10.9	1.85
10.0	13777920	9.19	4	-111.1	0.53	3	4.18	10.03	10.72	0.86
5.0	12864890	9.41	4	-109.7	0.42	5.56	2.93	10.71	10.62	0.36
1.0	10760870	11.07	4	-106.4	0.05	20.85	0.8	7.92	9.88	0.26
0.5	9932550	11.83	4	-106.6	0.05	30.5	0.9	7.92	10.79	0.31
0.1	7990962	13.77	4	-105.9	0.22	31.34	1.56	8.78	10.55	0.46
25.0	7913179	16.93	21	-111.6	0.81	34.82	8.42	8.87	24.58	2.31
25.0	8128723	16.58	21	-111.5	0.44	13.62	8.61	9.23	27.57	2.26
10.0	6981087	17.29	21	-110.1	0.59	12.79	7.06	8.44	27.39	1.13
5.0	6161012	18.18	21	-109.1	0.68	19.22	6.76	7.59	27.32	0.94
1.0	4398903	20.92	21	-111.7	0.79	69.77	6.2	7.03	25.75	0.84
0.5	3808037	21.84	21	-108.3	0.05	91.62	4.4	6.28	25.51	0.79
0.1	2673499	23.66	21	-108.4	-0.54	89.56	2.39	3.9	24.34	0.74
25.0	5051364	21.91	38	-110.9	0.37	60.32	8.74	11.92	22.69	2.05
25.0	5185572	21.22	38	-111.7	0.45	22.26	8.98	13.18	24.07	1.85
10.0	4170858	22.21	38	-111.5	0.38	17.22	8.37	11.96	25.61	0.8
5.0	3498638	23.08	38	-112.7	0.68	22.95	7.35	11.4	25.92	0.72
1.0	2270117	25.15	38	-111.5	1.46	70.62	9.87	12.83	26.46	0.96
0.5	1898222	25.24	38	-113.1	0.3	90.3	6.51	10.61	26.88	0.83
0.1	1237278	25.02	38	-111	1.21	68.8	4.27	8.42	28.46	1.05
25.0	2760327	25.1	54	-111.4	0.09	66.02	8.68	11.9	30.78	0.86
25.0	2761753	24.5	54	-111.8	-0.39	24.41	9.15	11.58	27.26	0.77
10.0	2036697	25.4	54	-111.9	-0.11	12.91	8.48	10.21	28.02	0.36
5.0	1649141	25.48	54	-109.7	0.56	18.59	7.99	9.43	27.32	0.44
1.0	1040654	25.24	54	-110.9	1.71	34.03	16.97	14.77	27.33	0.8
0.5	889173.1	23.81	54	-114.8	-1.02	39.02	11.53	9.9	26.38	1.11
0.1	632028.3	21.08	54	-114.7	1.4	9.96	8.81	6.05	24.34	1.07

Sample ID:	117G PG70-22 (2)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	17654120	4.51	-10	-113.1	0.71	3.17	6.68	8.73	14.02	1.69
25.0	17650980	4.44	-10	-112.3	0.67	0.91	6.85	8.76	14.97	1.68
10.0	16675400	5.13	-10	-115.9	0.51	1.01	4.08	5.42	10.91	0.86
5.0	16036470	5.42	-10	-119.6	0.38	1.42	2.69	4.9	9.63	0.5
1.0	14459940	6.17	-10	-113.2	0.02	4.8	0.67	4.42	9.84	0.32
0.5	13749710	6.57	-10	-113.3	-0.03	8.99	0.41	4.31	9.77	0.26
0.1	12160640	7.56	-10	-115.8	0.11	1.25	1.44	4.4	8.58	0.33
25.0	13076110	8.96	4	-107.4	0.75	8.93	7.54	8.13	10.85	1.34
25.0	12964760	8.98	4	-106.1	0.78	3.3	7.54	7.85	11.66	1.35
10.0	11764420	9.66	4	-111.3	0.77	3.39	4.9	5.52	6.35	0.34
5.0	10939320	10.18	4	-100	0.44	5.43	3.52	4.63	4.66	0.4
1.0	9065596	11.73	4	-103.5	0.04	24.69	0.88	2.96	4.52	0.7
0.5	8283463	12.52	4	-108.2	0.17	35.69	1.71	3.29	4.7	0.72
0.1	6602588	14.54	4	-106.5	-0.65	29.11	1.75	2.75	3.93	0.76
25.0	6472848	17.32	21	-117.6	1.08	35.76	8.91	8.8	22.59	1.71
25.0	6563084	17	21	-110.8	0.34	13.98	9.17	8.71	16.44	1.69
10.0	5533651	17.69	21	-114.8	0.75	13.17	8.13	8.58	17.85	0.79
5.0	4866930	18.53	21	-114.7	0.67	19.56	7.49	8.19	17.52	0.51
1.0	3440745	21.24	21	-113	1.09	69.63	8.55	8.31	20.03	0.25
0.5	2995900	22.04	21	-113.2	0.07	94.11	4.4	6.42	17.91	0.1
0.1	2108250	23.68	21	-114.2	-0.26	97.17	2.93	4.46	16.05	0.36
25.0	4092676	22.87	38	-115	0.3	59.62	9.38	9.13	8.17	2.07
25.0	4259461	21.99	38	-110.9	-0.87	20.9	9.97	11.21	11.68	2.09
10.0	3426824	22.81	38	-113.4	1.03	20.75	9	8.89	6.84	0.92
5.0	2862741	23.52	38	-110.2	0.74	23.83	7.78	8.44	5.78	0.8
1.0	1870019	25.5	38	-113	1.37	73.97	11.95	11.64	5.19	0.81
0.5	1585097	25.38	38	-111.2	0.09	98.14	7.99	7.9	6.65	0.73
0.1	1064150	25.03	38	-113	0.27	82.6	6.35	5.04	6.17	0.78
25.0	2686608	26.33	54	-111.4	-0.66	55.1	8.66	8.71	25.66	1.17
25.0	2709793	25.36	54	-116.1	-0.65	18.76	9.02	9.22	25.04	1.25
10.0	2002022	25.78	54	-112.2	0.13	16.4	7.65	7.25	25.24	0.7
5.0	1570024	26.34	54	-114.5	0.42	12.38	7.14	7.01	26.58	0.84
1.0	987568.4	26.15	54	-113.9	1.37	40.37	17.79	14.9	27.53	1.3
0.5	841874.5	24.34	54	-114.1	0.07	46.41	12.52	10.08	28.3	1.34
0.1	606760.4	21.01	54	-118	-0.4	49.13	8.95	5.44	29.83	1.57

Sample ID:	117G PG70-22 (3)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	23128460	4.58	-9	-114	0.66	3.06	6.15	6.84	17.58	2.29
25.0	23122430	4.5	-10	-120.6	0.68	1.05	5.93	6.65	19.23	2.29
10.0	22193910	5.07	-10	-113.2	0.51	0.51	3.46	4.81	20.98	0.74
5.0	21304500	5.4	-10	-112.9	0.34	0.34	2.23	3.95	21.16	0.35
1.0	19225940	6.24	-10	-114.2	0.05	6.07	0.54	3.12	20.69	0.11
0.5	18284140	6.68	-10	-112.2	0.01	8.01	0.46	3.12	20.61	0.1
0.1	16025300	7.73	-10	-110.3	0	-6.15	1.43	3.19	20.43	0.13
25.0	16815240	8.89	4	-107.6	0.67	9.28	6.66	8.14	32.02	2.03
25.0	16820120	8.95	4	-104.2	0.65	3.91	6.73	8.19	32.51	1.94
10.0	15120890	9.39	4	-106.2	0.48	3.63	4.09	6.94	31.11	0.99
5.0	14037690	9.94	4	-104.9	0.41	6.03	2.74	5.01	30.84	0.66
1.0	11635910	11.6	4	-105.6	0.05	25.16	0.75	4.28	31.03	0.37
0.5	10620770	12.43	4	-103.7	0.03	35.9	0.67	4.18	31.05	0.37
0.1	8352385	14.75	4	-105.5	0.09	37.73	1.58	3.69	31.37	0.45
25.0	8159617	17.45	21	-110.6	0.48	36.14	8.87	8.54	13.65	1.74
25.0	8247927	17.08	21	-109.2	0.82	14.41	9.04	8.52	12.17	1.73
10.0	7016459	17.96	21	-118.8	0.54	13.49	7.4	8.61	15.98	0.78
5.0	6128560	19.09	21	-108.2	0.88	13.54	6.89	8.05	16.14	0.55
1.0	4279330	21.87	21	-115.9	0.75	69.18	5.99	6.89	15.9	0.27
0.5	3651752	22.98	21	-112.9	0.1	89.11	4.91	6.41	15.45	0.27
0.1	2491648	24.3	21	-111.4	0.08	83.07	2.34	3.97	14.99	0.34
25.0	4420222	23.69	38	-108.7	0.32	50.84	9.36	9.9	11.11	0.99
25.0	4516312	22.92	38	-109.2	0.77	19.68	9.55	9.65	10.73	1.26
10.0	3535006	23.91	38	-112.9	0.45	14.63	8.8	9.37	10.06	0.24
5.0	2922377	24.66	38	-109.7	0.52	19.45	8.03	8.57	9.64	0.49
1.0	1848211	26.18	38	-108.6	1.42	58.16	12.36	11.12	8.95	0.88
0.5	1540052	25.67	38	-109.4	0.08	75.32	8	7.61	9	0.85
0.1	1021330	24.35	38	-111.8	-1.04	62.88	6.67	4.43	11.06	1.02
25.0	2650806	26.19	54	-110.3	0.11	72.37	9.16	9.22	13.24	1.36
25.0	2643351	25.85	54	-110.6	0.42	42.26	8.94	7.73	23.33	1.49
10.0	1751565	28.04	54	-113.9	0.4	10.51	8.33	8.54	18.06	1.02
5.0	1375276	28.06	54	-117	-0.05	9.92	8.72	9.04	18.77	1.01
1.0	846932.1	27.1	54	-112.3	2.69	33.6	20.68	16.88	19.21	0.86
0.5	719497.6	24.77	54	-115.2	-0.37	41.91	14.53	11.01	18.83	0.94
0.1	519818.7	20.88	54	-116.1	-1.23	31.23	10.23	5.7	18.9	0.86

Sample ID:	117G PG76-22 (1)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	21049050	4.95	-10	-110.5	0.67	2.92	6.51	7.09	21.28	1.95
25.0	20976460	4.9	-10	-103.6	0.67	1.11	6.36	6.77	18.84	2.01
10.0	20042930	5.01	-10	-109.9	0.52	0.7	3.73	4.64	19.18	0.94
5.0	19327870	5.25	-10	-109.9	0.36	0.91	2.4	3.39	19.41	0.56
1.0	17551400	5.96	-10	-108.4	0.02	5.75	0.56	2.39	19.92	0.32
0.5	16784190	6.31	-10	-107	0	10.63	0.4	2.45	20.41	0.3
0.1	15008660	7.07	-10	-103.9	0.02	3.03	1.52	2.89	22.02	0.44
25.0	15501510	8.1	4	-109	0.72	7.06	6.95	7.1	22.73	2.04
25.0	15569700	8.07	4	-108.7	0.87	2.96	7.03	7.14	23.25	2.03
10.0	14508710	8.35	4	-110.7	0.65	2.24	4.31	5.38	25.68	1.03
5.0	13639710	8.74	4	-112.5	0.42	3.74	2.93	4.02	26.87	0.79
1.0	11598010	10.05	4	-111.7	0.02	18.81	0.77	2.93	28.41	0.63
0.5	10741090	10.71	4	-106	0.01	26.76	0.71	3.13	29.55	0.68
0.1	8804353	12.65	4	-108.6	0.24	29.56	1.6	2.88	32.61	0.84
25.0	7620957	16.32	21	-118.8	0.77	33.79	9.16	9.06	20.66	1.96
25.0	7759819	15.99	21	-119.5	0.68	12.16	9.62	9.87	21.07	1.99
10.0	6677436	16.94	21	-114.6	0.79	12.51	7.67	7.77	20.52	1.02
5.0	5908811	17.77	21	-114.8	0.72	18.83	7.25	7.27	20.92	0.64
1.0	4259348	20.5	21	-116.4	0.78	67.41	6.39	6.25	21.1	0.53
0.5	3699878	21.5	21	-115.4	0.25	89.14	4.72	5.44	21.61	0.51
0.1	2636802	23.15	21	-113.2	-0.29	91.97	2.48	3.01	22.58	0.36
25.0	4967093	21.42	38	-106.6	0.55	51.53	9.28	10.91	21.12	2.09
25.0	5083634	20.7	38	-106.9	0.58	18.92	9.62	11.19	22.64	2.18
10.0	4102058	21.64	38	-110.3	0.52	14.99	9	9.76	20.09	0.83
5.0	3454085	22.53	38	-112.1	0.33	20.68	8.02	9	19.63	0.49
1.0	2253792	24.9	38	-110.4	1.3	70.3	10.5	10.53	18.61	0.34
0.5	1889972	25.08	38	-107.9	-0.16	88.31	6.4	7.81	18.35	0.65
0.1	1244918	25.03	38	-108.1	0.06	80.44	4.49	5.98	16.12	1.26
25.0	3145749	24.84	54	-106.2	-0.14	66.9	9.13	8.39	13.11	1.33
25.0	3180830	23.91	54	-110	-0.56	19.32	9.07	9.04	12.71	1.48
10.0	2402936	24.8	54	-108.6	0.41	18.98	8.39	7.58	18.73	0.85
5.0	1879314	25.66	54	-109.9	0.01	13.54	8.41	7.87	18.35	0.56
1.0	1193947	25.89	54	-110.4	1.78	46.02	17.09	15.09	18.61	0.18
0.5	1011142	24.56	54	-108.5	0.32	57.76	10.49	8.89	18.51	0.4
0.1	699838.5	21.92	54	-113.3	-0.38	53.15	6.79	4.75	17.78	0.7

Sample ID:	117G PG76-22 (2)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	22500270	4.58	-10	-113.6	0.74	3.58	6.47	10.08	29.72	1.67
25.0	22402210	4.49	-10	-111.5	0.63	1.17	6.24	8.59	30.21	1.87
10.0	21081580	4.81	-10	-111.8	0.45	1.28	3.58	6.65	26.51	0.74
5.0	20284350	4.92	-10	-107.7	0.32	1.58	2.28	5.9	27.06	0.58
1.0	18497210	5.64	-10	-111.5	0.03	6.02	0.53	5.14	28.04	0.34
0.5	17671750	5.98	-10	-105.5	0.02	6.99	0.36	5.09	28.62	0.36
0.1	15688000	6.84	-10	-109.5	0.47	9.9	1.47	4.28	29.92	0.4
25.0	14135810	9.46	4	-105	0.69	10.23	7.34	7.17	13.33	1.33
25.0	14462960	9.4	4	-106.6	0.81	4.19	7.12	7.08	10.36	1.4
10.0	13260770	9.66	4	-106.4	0.59	3.96	4.52	5.53	11.23	0.51
5.0	12392780	10.11	4	-104.7	0.42	7.11	3.21	5.01	10.44	0.5
1.0	10336400	11.65	4	-108.5	0.03	27.37	0.8	3.97	10.39	0.77
0.5	9534678	12.46	4	-107.2	0.09	42.89	1.42	4.26	9.16	0.9
0.1	7664852	14.6	4	-105.6	-0.1	54.33	1.54	3.84	6.63	1.08
25.0	7115847	18.39	21	-113.8	0.87	46.67	9.1	8.71	10.88	1.66
25.0	7226273	17.72	21	-116.5	1.01	17.97	9.31	8.93	11.72	1.77
10.0	6165551	18.48	21	-116.5	0.54	15.14	8.05	8.32	12.47	0.65
5.0	5418897	19.31	21	-113.4	0.63	22.46	7.54	7.6	13.66	0.35
1.0	3805396	22.16	21	-109.7	0.81	79.02	7.65	7.65	14.48	0.17
0.5	3296717	23	21	-114	0.2	103.98	4.33	5.87	15.95	0.33
0.1	2341642	24.21	21	-113.6	0.4	111.91	2.52	4.77	18.1	0.47
25.0	5007239	22.32	38	-110.7	0.28	59.33	9.14	12.65	27.84	1.99
25.0	5046265	21.83	38	-105.8	0.81	27.98	8.24	9.58	31.39	2.16
10.0	3898668	22.99	38	-108.5	0.62	14.53	9.15	9.65	24.81	0.99
5.0	3249760	23.82	38	-111.9	0.57	21.77	8.25	8.42	24.48	0.62
1.0	2074733	26.1	38	-111.6	1.51	74.26	11.67	10.02	23.98	0.57
0.5	1729628	25.93	38	-112.8	0.5	95.11	7.26	6.97	23.61	0.61
0.1	1137003	25.11	38	-108.4	1.59	97.52	4.72	4.45	21.28	0.71
25.0	2787399	25.71	55	-111	-0.39	71.78	9.06	11.38	8.56	1.5
25.0	2839565	25.16	54	-115.1	0.55	40.61	8.99	8.44	13.94	1.48
10.0	1840495	27.6	54	-111.9	-0.14	10.84	8.38	9.32	12.03	1.14
5.0	1439201	27.9	54	-111.3	0.18	12.77	8.62	9.82	12.77	1.1
1.0	891367.1	27.16	54	-112.8	1.81	44.54	19.48	17.1	15.1	1.11
0.5	756976.8	25.04	54	-113.6	0.1	54.98	14.66	13.85	15.6	1.22
0.1	546308.3	21.6	54	-113.4	6.4	68	7.91	6.69	17.22	1.47

Sample ID:	117G PG76-22 (3)									
Frequency (Hz)	Dynamic Modulus (kPa)	Phase Angle (Deg)	Average Temp. (C)	Average Conf. Press. (kPa)	Load Drift (%)	Deformation Drift (%)	Std. Error for Load (%)	Std. Error for Deforms (%)	Uniformity Coef. For Deforms (%)	Uniformity Coef. For Phase Angles (Deg)
25.0	21130320	4.65	-10	-107.2	0.85	3.26	6.48	9.36	35.99	1.5
25.0	20948940	4.7	-10	-107.2	0.67	1.03	6.24	8.87	32.64	1.53
10.0	20262370	4.58	-10	-106.3	0.61	0.2	4.16	7.82	29.59	1.24
5.0	19678440	4.83	-10	-111	0.47	0.1	2.84	7.16	29.73	1.01
1.0	17813340	5.61	-10	-105.7	0.05	1.98	0.64	5.64	29.91	0.87
0.5	16988540	6.05	-10	-109.9	-0.01	3.82	0.39	5.34	29.71	0.83
0.1	15130770	7.29	-10	-105.2	0.06	-5	1.48	6.02	30.39	0.94
25.0	16259130	7.4	4	-113.8	0.75	7.46	7.18	7.72	16.5	0.91
25.0	16294870	7.53	4	-108.9	0.7	2.75	7.32	7.74	14.43	1.05
10.0	15139430	8.13	4	-107	0.68	2.71	4.9	6.55	6.79	0.25
5.0	14261350	8.57	4	-109.9	0.47	4.27	3.66	5.26	5.42	0.51
1.0	12059770	9.96	4	-109.2	0.04	19.85	0.87	3.75	5.15	0.73
0.5	11153560	10.68	4	-104.3	-0.03	28.6	0.53	3.83	4.84	0.83
0.1	9086421	12.62	4	-108.4	0.17	34.54	1.55	4.08	6.76	0.91
25.0	8068831	15.8	24	-108.2	0.89	32.63	8.8	12.28	20.64	2.01
25.0	8123434	15.46	20	-109.6	1.12	12.43	9.11	10.64	19.38	1.99
10.0	7088456	16.44	22	-111.4	0.74	13.37	7	8.74	22.24	1.07
5.0	6252662	17.43	21	-109.9	0.62	19.38	6.59	8.15	22.35	0.68
1.0	4518937	20.4	21	-106	0.82	70.28	5.6	7.14	22.4	0.53
0.5	3892568	21.67	21	-107.3	0.05	91.66	4.67	6.95	22.53	0.56
0.1	2701464	24	21	-109.6	0.29	90.32	2.39	4.88	22.05	0.91
25.0	4283403	23.08	38	-112.2	0.63	61.87	9.23	9.26	37.49	0.92
25.0	4374658	22.23	38	-107.9	-0.27	22.63	9.52	9.38	37.54	0.96
10.0	3425715	23.07	38	-106.4	0.67	16.52	9.94	9.38	34.9	0.76
5.0	2835582	24.03	38	-109.8	0.65	21.76	9.06	8.43	33.8	1.09
1.0	1812460	26.13	38	-105.5	2.2	68.62	13.05	11.7	30.91	1.44
0.5	1514559	25.87	38	-114.1	0	85.76	7.72	7.84	30.02	1.58
0.1	993946	25.22	38	-114.2	-0.24	76.29	5.05	4.42	28.08	1.77
25.0	2675395	25.88	54	-112.1	-0.38	66.54	9.03	9.19	31.2	2.06
25.0	2739153	25.13	54	-115.8	0.65	28.78	9.07	8.12	33.26	1.48
10.0	1848313	26.93	54	-117.9	0.67	9.67	7.86	7.39	29.26	1.52
5.0	1419480	27.71	54	-113.4	0.11	10.44	8.9	9.1	28.65	1.62
1.0	874950.4	27.57	54	-115.8	2.62	36.35	19.41	16.57	25.05	1.87
0.5	742282.3	25.44	54	-117	-0.06	41.6	13.32	11.02	23.55	1.92
0.1	523685.8	21.95	54	-113.5	-3.32	29.5	7.88	5.73	21.16	1.68