



Ajax Materials Corporation, 1957 Crooks Rd., Suite A, Troy, Michigan 48084

2019 HMA QUALITY CONTROL PLAN

For use with
12SP-501J-05 DATE 07-05-2016
ACCEPTANCE OF HMA ON LOCAL
AGENCY PROJECTS

REVIEW

Reviewed By: John Qualey
Project Engineer



Somat Engineering,
INCORPORATED

3031 W. GRAND BLVD., SUITE 228
DETROIT, MI 48202

☒

Accepted

☐

Accepted as Noted

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Revise & Resubmit

☐

Rejected

1. PROJECT AND PLANT SPECIFICS

A. PROJECT SPECIFICS

CONTROL SECTION# STU/ NH 82000

JOB# 207914A

JOB LOCATIONS: On Various Routes

PROJECT ENGINEER: Rich T. Doherty

B. PLANT SPECIFICS

1. PLANT NO. 20-10

2. ADDRESS: 26400 Sherwood Rd
Warren, MI 48091

3. OFFICE PHONE: 248-244-3300

4. OFFICE FAX: 248-244-1061

5. PLANT PHONE: 248-244-3458 / 248-244-3468

6. SCALE/DISPATCHER PHONE: 248-244-3457/ 248-244-3467

2. TESTING FACILITIES

1. ADDRESS: 26400 Sherwood Rd
Warren, MI 48091
2. LAB PHONE: 248-244-3459/ 248-244-3472
3. LAB FAX: 248-244-1061
4. ONSITE TESTING AGENCY:

3. QUALITY CONTROL ORGANIZATION OUTLINE

A. PERSONNEL

1. CORPORATE QUALITY CONTROL ADMINISTRATOR: JOHN DUCNGUYEN
PHONE 248-388-1026
2. QC MANAGER: John Duc Nguyen
5. PROJECT MANAGER: MIKE PODSAID
4. QC PERSONNEL:
 - a. QC Manager : John Duc Nguyen/01720421
 - b. QC Technician's Brandon Fuller/ 03510420
 - c. QC Technician's Beverly. Stombaugh./ 0082-0420
 - d. QC Technicians' Davis Hoa / 0600-0421
 - e. QC Technicians' Richard Poe/ 01490421
 - f. QC Technicians' John Brackett/ 03100421
 - g. QC Technicians' Don Capeling /04300421
 - h. QC Technician's Phil Fox/ 04590421
 - i. QC Technician's Gary Tran/ 0663-0520
 - j. QC Technician's Jesus Sancen/ 0664-0520
 - k. QC Technician's Janae Balderson/ 0000-0321
 - l. QC Technician's Lai Van / 0000-0000
5. PLANT OPERATOR: Scott Maxwell
6. SCALE/DISPATCHER: Reberta Young
7. PAVING FOREMEN
To be Select (TBD)
8. DENSITY TECHNICIANS & MANAGER
 - a. Kelly Schall: Ajax
 - b. Justin McLaughlan: Ajax
 - c. TBD

B. DUTIES AND RESPONSIBILITIES

1. CORPORATE QUALITY CONTROL ADMINISTRATOR
 - a. Implementation and oversight of the Company Quality Control Program.
 - b. Audit company laboratories for compliance with the Company Quality Control Program.
 - c. Liaison to upper management.
 - d. Safety.
2. QC MANAGER:
 - a. Implementation and oversight of the Company Quality Control Program and Financers
 - b. Safety.
3. PROJECT MANAGER/QC PLAN ADMINISTRATOR: JOHN D NGUYEN
 - a. Project Management
 - b. Scheduling
 - c. All Project Documentation
 - d. Implementation of Company Quality Control Program.
 - e. Paving Operations
 - f. QC Results
 - g. Density
 - h. Safety
 - i. Mix Designs
4. FOREMAN:
 - a. Paving Operations, QC Results
 - b. Density
 - c. Management of Paving Personnel
 - d. Safety
5. QUALITY CONTROL MANAGER:
 - a. Implementation and oversight of the Company Quality Control Program.
 - b. Management of Laboratory Personnel
 - c. Project Documentation
 - d. Communicate to Company and RCOC Personnel
 - e. Ensure equipment is maintained and calibrated on schedule
 - f. Safety
6. PLANT OPERATOR:
 - a. Efficient Production of a quality product
 - b. Management of Plant Personnel
 - c. Stockpile, Silo and Tank Management
 - d. Plant Maintenance and Calibration
 - e. Safety
7. DENSITY TECHNICIANS
 - a. Constant monitoring and adjustment of compaction processes.
 - b. Effectively communicates density results to key personnel.
 - c. Extraction of QC and QA cores.
 - d. Documentation of core locations and test results.
 - e. Maintenance and calibration of density related equipment.
 - f. Examination/inspection of core thickness and quality.
 - g. Effectively communicates problems with appropriate personnel.
 - h. Safety

4. MIX DESIGN INFORMATION

MIX TYPES:	MIX DESIGN #	TONS	PG GRADE SPECIFIED:
1. 5E3+Approach	19MD 140	38922	PG 64-22 Final (Add PG 58-28)
2. 4E3+Approach	18MD 276	39116	PG 64-22 Final (Add PG 58-28)

5. Stockpile management

A. AGGREGATE

1. STOCKPILING

- a. Stockpiles will be maintained with adequate space between piles to prevent cross contamination
- b. All stockpiles will be clearly marked using either the material type or material codes.
- c. Stockpiles will be managed as necessary to prevent material from being used before it has been properly tested and or inspected.
- d. For coarse aggregate stone type materials, loaders will not be allowed to build stockpiles utilizing a ramp. Ramps will be allowed for sand and dense graded type materials. Care must be taken to prevent any type of contamination.

2. SAMPLING

Aggregates will be sampled in accordance with ASTM D-75, section 4.3.3. Samples will be reduced to testing size using a mechanical splitter in accordance with ASTM C-702.

A. BELT SAMPLES

One Belt Sample will need to be tested for moisture content. The remaining material will be retained for troubleshooting. Samples will be retained until all Quality Control and Quality Acceptance tests have been completed and it is determined that the samples are not needed for troubleshooting purposes. **(Proper Equipment to insure samples can be obtained safely must be in place.)**

B. RECYCLED ASPHALT PAVEMENT (RAP)

One (1) Gradation analysis/TMD Per 1000 ton Per MDOT Requirements.

B. MILLINGS

All millings are to be kept separate from processed RAP. No millings will be allowed in QC mixes unless they were incorporated into the mix at the time the mix design was developed. If Millings are to be incorporated into a mix design they will be tested following the same requirements as Recycled Asphalt Pavement (RAP).

C. TESTING PROCEDURES

SAMPLES WILL BE TESTED IN ACCORDANCE WITH THE FOLLOWING METHODS:
ASTM C-136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate
ASTM C-117: Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregate by Washing
MTM-117: Test Method for Determining Percentage of Crushed Particles in Aggregate
ASTM C-566: Total Moisture Content in Aggregate

6. SAMPLING

- A. SEE SECTIONS 5.A.2 FOR AGGREGATE
- B. SEE TABLE 1 FOR HMA
- C. ASPHALT BINDER.

A copy of the Daily Schedule shall be provided to the Lab and the Plant operator. The schedule must include at a minimum the Project Name, Mixture types to be used, expected tons to be placed and the specified grades of Asphalt Binder to be used. It is imperative that this information be accurate. The QC manager will verify the mix types and binder grades are accurate by comparing the schedule to the project JMF.

At the beginning of each production day the Lab Personel will enter the appropriate information on the Daily Binder Log (lab) and label each container using a permanent marker with the required information and provide these containers to the Plant Operator. To avoid lids being switched the required information will be marked on both the lid and container.

At the beginning of each production day the Plant Operator will enter the appropriate information on the Daily Binder Log The plant operator or designated personnel will fill the sample containers a minimum of $\frac{3}{4}$ full with the appropriate Asphalt Binder during production of the specified mixture. The Plant operator will contact the Labs when each sample has been acquired and enter the appropriate information on the binder log next to the corresponding binder listed.

The QC Manager will collect the samples as they are acquired and enter the appropriate information on the binder log next to the corresponding binder listed and complete the associated MDOT forms. Following the procedure below the lab will verify the samples are at least $\frac{3}{4}$ full. As the samples are turned over to the Owner/Agency the Owner/Agency representative will enter the date received and initial the daily binder log as receipt of the sample.

Sample amount verification:

Determine an average tear weight of the sample cans being used.

Fill the sample can to at least $\frac{3}{4}$ full.

Determine and record the weight of the can and sample.

Samples collected must meet or exceed this weight.

Sampling of PG Binder on Local Agency projects can be waived if the Project Engineer directs us not to obtain samples. A signed letter from the Project Engineer directing such action must be on file.

7. TESTING

A. JOB MIX FORMULAS

All Job Mix Formulas will be established by the Quality Control Manager as approved by the Project Engineer. The Plant will be provided with a Job Mix Formula for each mixture. No modifications to the Job Mix Formula will be allowed without authorization from the Quality Control Manager. **The information collected from any previous Trial Runs will be used to determine if any JMF adjustments are required.**

B. MIXING TEMPERATURES

Mixing Temperatures will be as directed by the Quality Control Manager but may be adjusted by the Foreman as job conditions warrant, and Approved by Engineer base on Viscosity Range of Liquid Asphalt Types.

C. PRODUCTION

If at any time during production problems are encountered the Plant Operator will immediately notify the Quality Control Section. The Quality Control Manager will evaluate the problem and decide what corrective action (if any) will be taken.

D. HMA SAMPLING FREQUENCY

A minimum of one QC sample per 500 tons will be tested for uniformity tolerance limits in Table 1 of 12SP-501J-05

If less than 500 ton is expected a minimum one per day will be tested.

8. CALIBRATION

A. SCALES

1. All plant scales including truck scales, belts and asphalt cement will be calibrated annually by an outside agency prior to the season's production.
2. A copy of the Calibration Certificate will be maintained at the plant office and a copy will be provided to the TMI upon request.

B. COLD FEED BINS

1. Cold Feed Bins will be calibrated for each aggregate to be used in each bin.
2. Cold Feeds will be calibrated prior to the start of the season's production.
3. Additional calibration may be required if deviations in production occur or as deemed necessary by the Plant Operator or QC Manager.

C. ASPHALT PUMP

1. Asphalt Pump Calibration will be conducted at a minimum of once per season.
2. Additional calibration may be required if deviations are indicated by Plant Control Equipment or Q.C results.

D. LABORATORY EQUIPMENT

Note: The calibration frequencies listed below are minimums. Additional calibrations may be required if problems/deficiencies are encountered. Laboratory equipment not listed below will be checked/calibrated in accordance with the company QC manual.

1. SCALES

Scales will be calibrated annually.

2. THERMOMETERS

Thermometers will be calibrated annually.

3. Gmm PYCNOMETERS

a. Dry weight will be checked daily.

b. Full calibration will be checked weekly.

9. Corrective Action Plan

A. HMA

SEE TABLES 1&2

B. DENSITY ACTION PLAN

1. Evaluate underlying conditions and location of tests.
2. Confirm/verify mix being produced is within specifications.
3. Verify the Density Gauge settings are correct and functioning properly.
4. Obtain Informational Core to verify Gauge readings.
5. Evaluate mix temperature and temperature zones (tender zone)
6. Evaluate and/or modify the rolling pattern and paving speed.
7. Add additional rollers if necessary.

10. DOCUMENTATION

- A. All Quality Control tests will be entered into the company AB Software program.
- B. Individual Quality Control test results will be furnished to the Engineer upon request.
- C. When hand writing information on worksheets all mistakes will be lined out and the correct information written near the original. Erasers and white out will not be allowed.
- D. All hand written worksheets must be kept on file. Computerized reports must be traceable to hand written worksheets.
- E. **Project files will be retained for five years from time the project is accepted. Records for warranty projects will be maintained for two years beyond the warranty period.**

11. QUALITY CONTROL CHARTS

Quality Control Charts will be generated by the company AB Software program and available for review at all times. Quality Control Charts will contain at a minimum, individual test results, Range 1 and Range 2 Tolerances.

12. COMPACTION

- A. The number and type of rollers required and the appropriate rolling pattern will be determined by the paving foreman based on project specifications and information provided by density control personnel. Rubber Tire Rollers may be utilized if conditions warrant.

13. CONSTRUCTION

Construction practices will be in accordance with the 2012 Standard Specifications for Construction, Section 501 and/or any Special Provisions contained in the Contract Documents.

14. SEGREGATION

Segregation will be addressed at the plant site initially. Care will be taken to minimize the potential for segregation during the load-out process. The Paver Hopper will be kept as full as possible at all times. If segregation occurs, troubleshooting will begin to locate the source of the segregation and every attempt will be made to correct the segregation.

15. RIDE QUALITY

Ride Quality shall meet or exceed the requirements set forth in applicable Special Provisions contained in the contact documents.

Table 1: Minimum Quality Control Sampling and Testing Requirements

Quality Characteristic	Test Method	Minimum Test Frequency	Sampling Location	Sampling Method
Belt Aggregate Gradation (optional)	MTM-109	N/A	Plant	Random
Belt Aggregate Moisture	AASHTO T-255	1 if Need	Plant	_____
PG Binder Content	Ncat Method MTM 319	1 Per Day	Plant	Random
Combined Mixture Gradation	MTM-311	1 Per Day	Plant	Random
Maximum Theoretical Specific Gravity	MTM 314	NA	Plant	Random
Bulk Specific Gravity	MTM-315	NA	Plant	Random
Volumetrics: Air Voids	ASTM D-3203	N A	Plant	Random
Volumetrics: VMA	Asphalt Institute SP-2	N A	Plant	Random
In-Place Density (a)	Electronic Density Gauge/MTM 315	Constant Monitoring w/gauge	Field Compacted HMA	Constant Monitoring w/gauge
(a) Other methods may be used per Quality Control Manager.				

Action & Suspension Table

Table 1: Uniformity Tolerance Limits for HMA Mixtures

Parameter		Top and Leveling Course		Base Course	
Number	Description	Range 1 (a)	Range 2	Range 1 (a)	Range 2
1	% Binder Content	-0,30 to +0,40	±0,50	-0,30 to +0,40	±0,50
2	% Passing	# 8 and Larger Sieves	±5.0	±8.0	±7.0
		# 30 Sieve	±4.0	±6.0	±6.0
		# 200 Sieve	±1.0	±2.0	±2.0
3	Crushed Particle Content (b)	Below 10%	Below 15%	Below 10%	Below 15%
a. This range allows for normal mixture and testing variations. The mixture must be proportioned to test as closely as possible to the Job-Mix-Formula (JMF). b. Deviation from JMF.					

Parameter number 2 as shown in Table 1 is aggregate gradation. Each sieve will be evaluated on one of the three gradation tolerance categories. If more than one sieve is exceeding Range 1 or Range 2 tolerances, only the one with the largest exceedance will be counted as the gradation parameter.

The master gradation should be maintained throughout production; however, price adjustments will be based on Table 1. Aggregates which are to be used in plant-mixed HMA mixtures must not contain topsoil, clay, or loam.

Table 1: Uniformity Tolerance Limits for HMA Mixtures

Action Limits apply to two consecutive QC or QA tests.
Suspension Limits apply to single QC or QA tests.

ACCEPTED

Distribution: Project Engineer (1) -- TMI (1) -- Mix Design (1) -- Contractor (1) -- Bit File (1)

Control Section STU 50000	Job Number 202803A	Project Engineer Jim Goetzinger	Engineering Firm City of Richmond	Date April 2, 2019							
Contractor AJAX PAVING INDUSTRIES, INC.		Plant Location WARREN	Plant No. 020-10								
Mix Type 5E3	Mix Design Number 19MD140	Project Location Division Rd; west city limits to the east city limits		Specification SPECIAL PROVISION							
% Air Voids 4.00	VMA 16.00	VFA 75.0	P200/P _{be} 1.20	AWI 275							
Gmm 2.509	Gmb 2.409	Gb 1.029	Gsb 2.696	Gse 2.763							
				Film Thickness 7.14							
Pit Number	A 47-56	B 95-10	C 74-51	D 58-13	E 74-51	F Plant	G	H	I	J Plant	% AC
Aggregate Type	2NS	Man Sand	Man Sand	3/8 x #4's	3/8 x 0	Deg				Rap	6.00
Blend %	20.0%	19.0%	10.0%	10.0%	6.0%	2.0%				Rap/AC	26.85%
Sieve Size	GRADATION								% Binder of RAP	4.88	Combined Gradation
1 1/2" - (37.5mm)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%				100.0%	100.0%
1" - (25.0mm)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%				100.0%	100.0%
3/4" - (19mm)	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)	100.0%	100.0%	100.0%	98.5%	99.8%	100.0%				98.9%	99.5%
#4 - (4.75mm)	98.5%	93.3%	90.1%	30.0%	62.2%	100.0%				86.0%	83.5%
#8 - (2.36mm)	91.0%	61.2%	52.2%	7.6%	43.0%	100.0%				66.1%	62.2%
#16 - (1.18mm)	74.5%	37.5%	29.0%	3.5%	31.1%	100.0%				52.2%	46.4%
#30 - (0.80mm)	49.5%	23.5%	19.6%	3.4%	28.0%	100.0%				43.9%	34.8%
#50 - (0.30mm)	15.2%	14.5%	8.8%	2.2%	23.2%	98.0%				24.0%	18.2%
#100 - (0.1mm)	4.0%	7.0%	4.0%	1.7%	15.1%	95.0%				14.1%	10.2%
#200 - (0.075mm)	2.0%	4.0%	3.0%	1.5%	11.0%	78.0%				7.2%	6.2%
1 FACE CRUSH %	17.1%	100.0%	100.0%	100.0%	100.0%					97.1%	97.7%
2 FACE CRUSH %											-
L.A. ABRASION & YEAR		11-15	18-18	35-14	18-18						
Angularity Index	33	47.8	46.7	46.7	47						45.00
AWI FACTOR	1.0	1.0	1.0	1.0	1.0					1.0	
AWI VALUE #16	241	306	280	260	282					267	275
COMBINED Calc. Gsb	2.596	2.935	2.639	2.599	2.641					2.695	2.697
#4+ COARSE BULK S.G.	2.61	2.951	2.658	2.601	2.655					2.695	
#8 COARSE BULK S.G.	2.601	2.944	2.642	2.595	2.641						
FINE BULK S.G.	2.595	2.929	2.633	2.59	2.629					2.695	
FLAT & ELONGATED %	0.1	0.1	0.2	1.2	0.5					1	1.00%
SOFT PARTICLES %	0.3	0.1	0.2	1.7	0.2					1	1.00%
REMARKS:	Asphalt Binder	Grade PG 58-28		A.C. Supplier I.D. # ABS 2500		% New AC Added 4.39					
	Breakdown goes into pit 47-56, 2NS										

The bitumen content and aggregate characteristics are based on the submitted materials with the gradation and blend ratios indicated. Variation in materials or field conditions may require adjustments of this mix design (see TMI for form 1911 for field application). This laboratory design is valid for two construction seasons from date reported and should not be applied or adjusted without written approval of the Bituminous Services Unit. A signed copy is on file with the Bituminous Services Unit. Tested for Information.

Nathan Maack
Apr 2 2019 4:11 PM

Mix Design Engineer

Michigan Department of
Transportation form
1931 B

**Report of Test HMA Mix Design -
Regression**

Control Section: STU 50000
Job Number: 202803A
Mix Design: 19MD140
Date: April 2, 2019

AC%	Gmb	Gmm	Air	VMA	VFA	P200/Pbe
5.30	2.380	2.536	6.15	16.38	62.5	1.39
5.40	2.384	2.533	5.85	16.33	64.2	1.36
5.50	2.388	2.529	5.55	16.28	65.9	1.33
5.60	2.392	2.525	5.24	16.23	67.7	1.31
5.70	2.396	2.521	4.93	16.18	69.5	1.28
5.80	2.401	2.517	4.62	16.12	71.3	1.25
5.90	2.405	2.513	4.31	16.06	73.2	1.23
6.00	2.409	2.509	3.99	16.00	75.1	1.20
6.10	2.413	2.505	3.67	15.94	77.0	1.18
6.20	2.418	2.502	3.35	15.88	78.9	1.16
6.30	2.422	2.498	3.02	15.81	80.9	1.14
6.40	2.427	2.494	2.69	15.74	82.9	1.12
6.50	2.431	2.490	2.36	15.67	84.9	1.10
6.60	2.436	2.486	2.03	15.60	87.0	1.08
6.70	2.441	2.483	1.69	15.53	89.1	1.06
6.80	2.446	2.479	1.35	15.46	91.3	1.04

AC Optimized for 4% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
6.00	2.409	2.509	4.00	16.00	75.0	1.20

AC Optimized for 3.5% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
6.15	2.416	2.503	3.50	15.91	78.0	1.17

AC Optimized for 3% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
6.31	2.423	2.498	3.00	15.81	81.0	1.14

ACCEPTED

Distribution: Project Engineer (1) -- TMI (1) -- Mix Design (1) -- Contractor (1) -- Bit File (1)

Control Section STU 63000	Job Number 200157A	Project Engineer Mark Loch	Engineering Firm Orchard, Hiltz, & McCliment	Date June 21, 2018						
Contractor AJAX PAVING INDUSTRIES, INC.		Plant Location WARREN		Plant No. 020-10						
Mix Type 4E3	Mix Design Number 18MD276	Project Location Northwestern Hwy; Southfield Rd to Lahser Rd		Specification SPECIAL PROVISION						
% Air Voids 4.00	VMA 14.45	VFA 72.3	P200/P _{be} 1.24	AWI 277						
Gmm 2.539	Gmb 2.438	Gb 1.029	Gsb 2.710	Gse 2.747						
				Film Thickness 7.43						
Pit Number	A	B	C	D	E	F	G	H	I	J
	47-56	95-10	58-13	58-13	Plant				Plant	Plant
Aggregate Type	2NS	Man Sand	3/8 x #4's	1/2 x 3/8	Deg				Rap	Rap
Blend %	14.5%	20.0%	10.0%	14.0%	2.5%				25.0%	14.00%
Sieve Size	GRADATION								% Binder of RAP:	
									2.60	4.98
1 1/2" - (37.5mm)	100.0%	100.0%	100.0%	100.0%	100.0%				100.0%	100.0%
1" - (25.0mm)	100.0%	100.0%	100.0%	100.0%	100.0%				100.0%	100.0%
3/4" - (19mm)	100.0%	100.0%	100.0%	100.0%	100.0%				100.0%	100.0%
1/2" - (12.5mm)	100.0%	100.0%	100.0%	98.0%	100.0%				83.7%	100.0%
3/8" - (9.5mm)	100.0%	100.0%	98.5%	55.0%	100.0%				65.3%	98.9%
#4 - (4.75mm)	98.5%	93.3%	27.0%	9.4%	100.0%				43.7%	82.0%
#8 - (2.36mm)	83.2%	61.2%	7.6%	4.4%	100.0%				36.7%	64.1%
#16 - (1.18mm)	71.4%	37.5%	3.5%	1.8%	100.0%				26.5%	48.9%
#30 - (0.80mm)	56.0%	23.5%	3.4%	1.6%	100.0%				20.2%	38.8%
#50 - (0.30mm)	9.2%	14.5%	2.2%	1.4%	95.0%				14.8%	24.0%
#100 - (0.1mm)	4.0%	7.0%	1.7%	1.3%	90.0%				7.6%	14.0%
#200 - (0.075mm)	2.0%	4.0%	1.5%	1.3%	80.0%				4.3%	7.0%
1 FACE CRUSH %	17.1%	100.0%	100.0%	100.0%					93.3%	97.0%
2 FACE CRUSH %										-
L.A. ABRASION & YEAR		11-15	35-14	35-14						
Angularity Index	33	47.8	46.5						44	46.00
AWI FACTOR	1.0	1.0	1.0	1.0					1.0	1.0
AWI VALUE #16	239	306	260	260					277	302
COMBINED Calc. Gsb	2.593	2.935	2.597	2.604					2.723	2.699
#4+ COARSE BULK S.G.	2.61	2.951	2.598	2.604					2.723	2.699
#8 COARSE BULK S.G.	2.601	2.944	2.596	2.6						
FINE BULK S.G.	2.591	2.929	2.591	2.602					2.723	2.699
FLAT & ELONGATED %	0.1	0	1.2	1					1.1	1
SOFT PARTICLES %	0.3	0	1	0.8					1	1
	Asphalt Binder	Grade PG 58-28	A.C. Supplier I.D. # ABS 2500		% New AC Added 3.55					
REMARKS:	Breakdown goes into pit 47-56, 2NS									

The bitumen content and aggregate characteristics are based on the submitted materials with the gradation and blend ratios indicated. Variation in materials or field conditions may require adjustments of this mix design (see TMI for form 1911 for field application). This laboratory design is valid for two construction seasons from date reported and should not be applied or adjusted without written approval of the Bituminous Services Unit. A signed copy is on file with the Bituminous Services Unit. Tested for information.

Nathan Maack Digitally signed by Nathan Maack
Date: 2018.06.21 09:54:58 -04'00'

Mix Design Engineer

Michigan Department of
Transportation form
1931 B

**Report of Test HMA Mix Design -
Regression**

Control Section: STU 63000
Job Number: 200157A
Mix Design: 18MD276
Date: June 21, 2018

AC%	Gmb	Gmm	Air	VMA	VFA	P200/Pbe
4.10	2.394	2.571	6.88	15.27	55.0	1.52
4.20	2.400	2.567	6.50	15.16	57.1	1.48
4.30	2.406	2.563	6.14	15.04	59.2	1.44
4.40	2.411	2.559	5.77	14.94	61.4	1.40
4.50	2.417	2.555	5.41	14.83	63.5	1.37
4.60	2.422	2.551	5.05	14.73	65.7	1.34
4.70	2.428	2.547	4.69	14.63	67.9	1.30
4.80	2.433	2.543	4.34	14.54	70.1	1.27
4.90	2.438	2.539	3.99	14.45	72.4	1.24
5.00	2.443	2.535	3.65	14.37	74.6	1.22
5.10	2.448	2.531	3.31	14.28	76.9	1.19
5.20	2.453	2.528	2.97	14.21	79.1	1.16
5.30	2.457	2.524	2.63	14.13	81.4	1.14
5.40	2.462	2.520	2.30	14.06	83.6	1.12
5.50	2.466	2.516	1.97	14.00	85.9	1.09
5.60	2.471	2.512	1.65	13.93	88.2	1.07

AC Optimized for 4% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
4.90	2.438	2.539	4.00	14.45	72.3	1.24

AC Optimized for 3.5% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
5.04	2.445	2.534	3.50	14.33	75.6	1.21

AC Optimized for 3% air voids

AC%	Gmb	Gmm	Air Voids	VMA	VFA	P200/Pbe
5.19	2.452	2.528	3.00	14.21	78.9	1.17