MANAGING ASPHALT PAVEMENTS
CONFERENCE AND TRADE SHOW
MAY 15-17, 2023 ★ WACO, TEXAS

PRESENTED BY:
TXAPA
Texas Asphalt Pavement Association

Essential QC/QA

what to do if you can't do it all

Danny Gierhart, P.E.
Deputy Director of Engineering
Asphalt Institute

On almost every roadway project, the component materials are tested. **Quality Assurance** includes all planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service.

Quality Control - testing that helps the *producer* and *contractor* ensure that they are *providing* a quality product

Acceptance- testing that helps the *owner* ensure that they are *receiving* a quality product

Why Quality Assurance?

asphalt institute

Long-term performance costs money

- Quality pavement design
- Quality materials
- Quality production
- Quality placement and compaction

Regardless of whether you are looking at tests performed for the purpose of Quality Control or Acceptance, it’s very important to be able to properly interpret the test results and understand what they are telling you.

BROCE CONSTRUCTION COMPANY
Asphalt Plant Inspector's Work Sheet

Project # **NHY-19N(051)** Lot # **1**

Mix Type **19.0 mm NMS w/ PG64-22OK** Design # **3073-BCC-02128**

"Design Change (Revised Gradation)

IGNITION OVEN AND GRADATIONS (OHD L-26, AASHTO T-30, T-11, T-27)

Date		4/1/2002			4/4/2002								
Sublot #		1			2			3			4		
SIEVE SIZE	JMF	Acc. Wt. Retd.	Acc. % Retd.	Tot. Agg % Pass	Acc. Wt. Retd.	Acc. % Retd.	Tot. Agg % Pass	Acc. Wt. Retd.	Acc. % Retd.	Tot. Agg % Pass	Acc. Wt. Retd.	Acc. % Retd.	Tot. Agg % Pass
25.0mm	100	0.0	0	100	0.0	0	100						
19.0mm	100	0.0	0	100	0.0	0	100						
12.5mm "#7	85	222.1	11	89	203.0	12	88						
9.5mm "73	71	510.2	24	76	442.8	27	73						
4.75mm "54	51	889.8	42	58	778.4	47	53						
2.36mm "34	32	1332.4	63	37	1073.8	65	35						
1.18mm	25	1532.7	73	27	1212.2	73	27						
0.600mm	20	1644.2	78	22	1300.8	79	21						
0.300mm "14	10	1799.7	85	15	1428.1	86	14						
0.150mm	5	1976.2	94	6	1553.7	94	6						
0.075mm (F)	3.5	2035.3		3.7	1596.4		3.5						
Pb	4.5%			4.5%			4.5%						
Pan Mat'l	(E)	17.3			11.6								
Mix Wt.				2223.0			1736.8						
Wt. Loss	(G)			110.7			86.4						
IOC	(%)			0.26%			0.26%						
Temp. Comp. (%)				0.07%			0.13%						
Orig. Dry Wt	(C)	2112.8			1653.8								
Washed Wt.	(D)	2052.9			1608.2								
Wash Loss	(W_1)	59.9			45.6								
Precision	<0.2%	0.01%			0.01%								

% Passing No. 200 Sieve = 100 x (W_1 + E)/C Precision = 100 x (D-(F+E))/D

$$Pb = \frac{\frac{[Ps_m \cdot W_{1m}]}{100} - (W_{1m} - W_{sm})}{W_{sm}} \times 100$$

where: Ps_m = Apparent asphalt content from ignition oven
W_{1m} = Mass of moisture sample before drying
W_{sm} = Mass of moisture sample after drying

MOISTURE & VOLATILE SAMPLE

Pan Wt.		391.6	- Pan		354.2	- Pan			- Pan			- Pan	
Original Mix	(W_{1H})	1895.7	1504.1		2282.9	1928.7							
Dry Mix	(W_{SH})	1894.0	1502.4		2280.8	1926.6							

MAXIMUM SPECIFIC GRAVITY (AASHTO T-209)

Sample Wt.		2610.5		**Gb**	2868.2		**Gb**			**Gb**			**Gb**
Calib. Wt.		6056.4		1.0087	6056.4		1.0087			1.0087			1.0087
Samp.+Flask+H2O		7621.9			7776.8								
Gmm		2.498			2.499								
Avg. Gmm		2.498			2.499								
Gse		2.685			2.686								

$$Gse = \frac{Ps}{\frac{100}{Gmm} - \frac{Pb}{Gb}}$$

Pb = Pb from Ign. Oven (corrected for moisture & volatiles)
Ps = 100 - Pb
Gb is given on mix design

[FRONT]

Bookkeeping vs. Pavement Longevity

asphalt institute

Test results are too often used to simply document the degree out of specification so that a corresponding financial penalty can be assessed.

A better use of test results is to track the ongoing quality of a project and make immediate corrections as necessary to ensure a quality pavement.

What tests? How many samples?

- Gradation?
- Binder content?
- Roadway density?
- Lab-molded air voids?
- Smoothness?

- ✓ One sample per project?
- ✓ Ten samples per project?
- ✓ Twenty samples per project?
- ✓ One sample per lot?
- ✓ Three samples per lot?

TOO FEW -

Testing may not accurately characterize mix

TOO MANY -

Testing program unnecessarily expensive

SMALL PROJECT -

Testing costs harder to justify

LARGE PROJECT -

Consequences of failure higher

Great for larger local government projects, but what about smaller projects?

Table 15
Production and Placement Testing Frequency

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	1 per sublot	1 per 12 sublots[1]
Individual % retained for sieves smaller than #8 and larger than #200			
% passing the #200 sieve			
Laboratory-molded density	Tex-207-F	N/A	1 per sublot[1]
Laboratory-molded bulk specific gravity			
In-place air voids			
VMA	Tex-204-F		
Segregation (density profile)[2]	Tex-207-F, Part V	1 per sublot	1 per project
Longitudinal joint density	Tex-207-F, Part VII		
Moisture content	Tex-212-F, Part II	When directed	
Theoretical maximum specific (Rice) gravity	Tex-227-F	N/A	1 per sublot[1]
Asphalt binder content	Tex-236-F	1 per sublot	1 per lot[1]
Hamburg Wheel test	Tex-242-F	N/A	1 per project
Recycled Asphalt Shingles (RAS)[3]	Tex-217-F, Part III	N/A	
Thermal profile[2]	Tex-244-F	1 per sublot	
Asphalt binder sampling and testing	Tex-500-C	1 per lot (sample only)	
Tack coat sampling and testing	Tex-500-C, Part III	N/A	
Boil test[4]	Tex-530-C	1 per lot	
Cantabro loss[5]	Tex-245-F	1 per project (sample only)	
Overlay test[5]	Tex-248-F		

If I was only going to specify one test . . .

asphalt institute

Roadway Density (in-place air voids):

Cutting cores -

AASHTO R 67
ASTM D 5361
TEX-251-F

Testing cores -

AASHTO T 166 & T 209
ASTM D 2726 & D 2041
TEX-207-F & TEX-227-F

Roadway Core Density

Test Overview:

Cores are cut from the roadway. Like lab specimens, they are made up of asphalt binder, aggregate, and air voids. The bulk specific gravity (G_{mb}) is then calculated for each specimen.

The maximum theoretical specific gravity (G_{mm}) of the mix (where air voids are removed by vacuum) is calculated using uncompacted mix samples.

The in-place density is calculated:

$$\text{In-place density} = 100 * \left(\frac{G_{mb}}{G_{mm}} \right)$$

Roadway Core Density

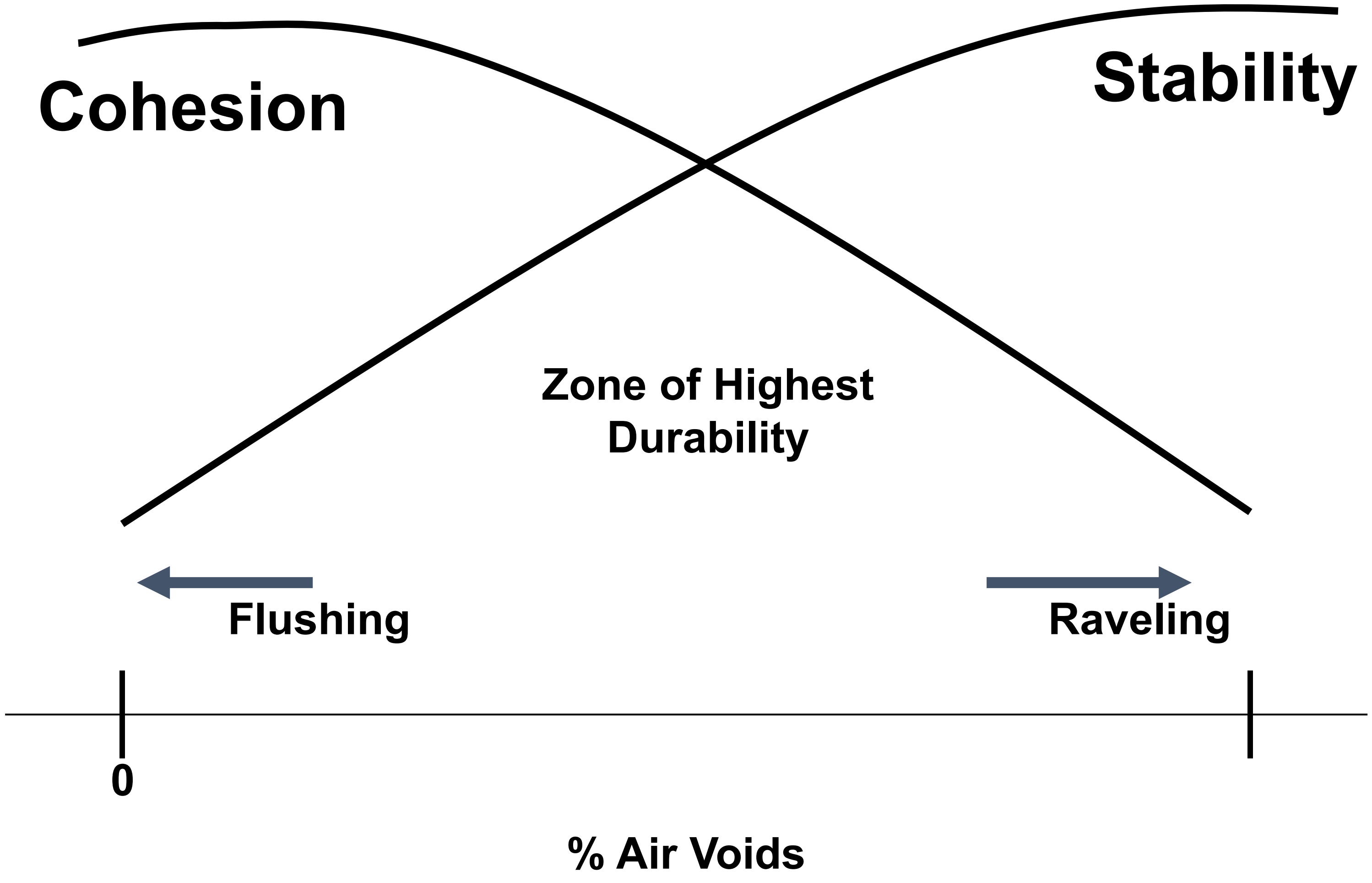
What do the test results tell you?

The test indicates the in-place density achieved by the compactive effort of the rolling operation.

What are the potential ramifications of a failing test result?

Low density may result in permeability, stripping, raveling, cracking, premature aging, and premature failure. High density may result in rutting, flushing, or bleeding.

Durability vs Air Voids



Roadway Core Density

Are the potential ramifications minor or major?

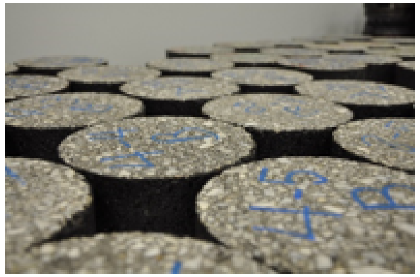
The ramifications of failure to achieve proper density are major. Proper density can in part make up for other shortcomings. Improper density can cause failure even if other parameters are good.

How much does the degree out of spec affect pavement performance?

Any failing density report should cause the agency to closely examine the rolling operation. The further out of spec, the shorter the anticipated pavement life.

Compaction Control

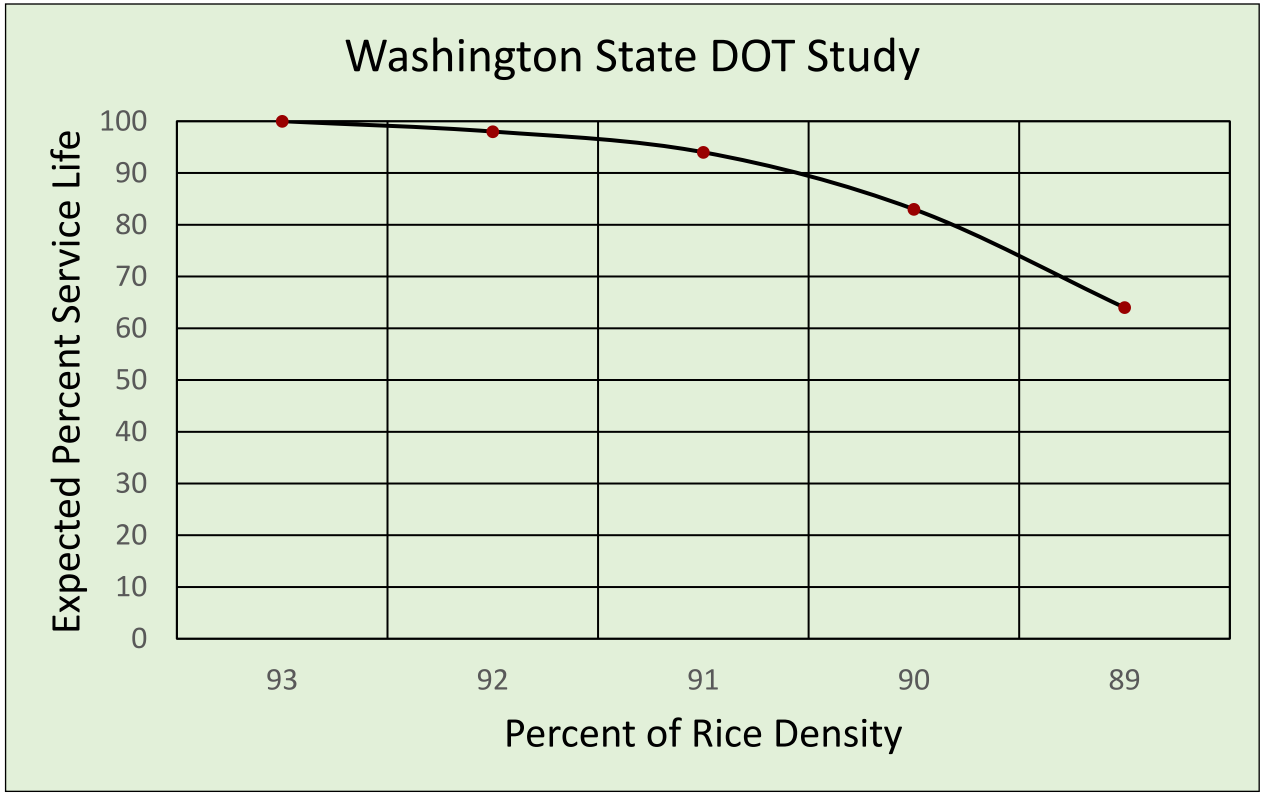
Monitoring roadway density during construction is vital to achieve and maintain compaction quality.

	PROS	CONS
Roadway Cores 	The "gold standard." Roadway cores give the most accurate evaluation of compaction quality.	Coring leaves holes in the brand new road, which need to be patched. It takes several hours *at minimum* from beginning to end to get results.
Nuclear Gauge 	Results can be obtained in a minute or two. Easy to bring to job site and to use. Can test multiple sites quickly without marring pavement.	Results are not necessarily accurate unless correlated with roadway cores. Requires compliance with radiation safety regulations.
Non-Nuclear Gauge 	Results can be obtained immediately. Easy to bring to job site and to use. Can test multiple sites quickly without marring pavement.	Results are not necessarily accurate unless correlated with roadway cores. Moisture affects readings.

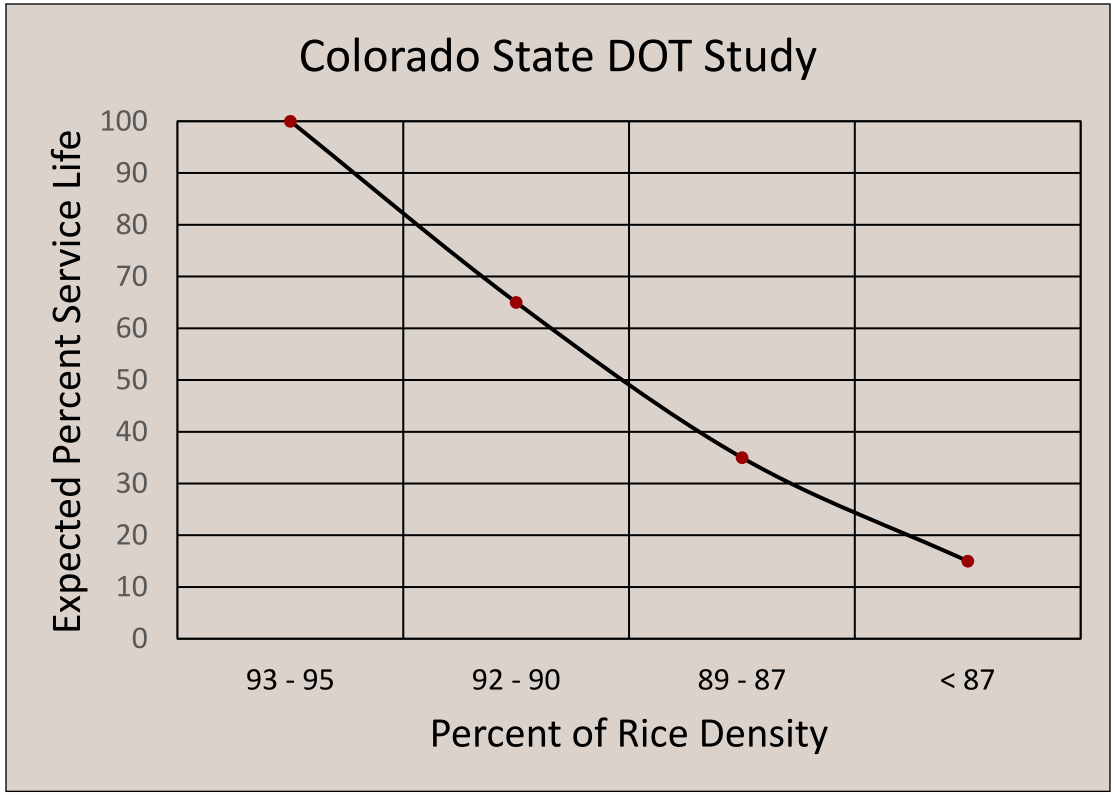
How is compaction quality typically controlled?

- QC uses nuclear or non-nuclear density gauge to initially direct compaction operations
- QA typically cuts and tests roadway cores for acceptance
- QC tests core sites with density gauge before core is cut
- QC compares core results with density gauges results
  - QC makes informal comparison, or
  - QC makes formal correlation using some type of specified method
- QC directs ongoing compaction operations using density gauge readings and comparison between cores and gauge

Loss of Service Life Due to Low Density



Thicker Pavements TRR 1217, 1989



Typical Pavements CDOT 2013-4, 2013

FHWA Performance Based Mix Design

asphalt institute

	Fatigue Cracking	Rutting
Design Air Voids For every 1% increase	40% increase	22% decrease
Design VMA For every 1% increase	73% decrease	32% increase
Compaction Density For every 1% lower in-place Air Voids **(Increasing Density Improved Both!)**	19% decrease	10% decrease

Courtesy of Nelson Gibson

If I could specify a bit more . . .

- **Gradation**
- **Binder Content**

These tests help ensure that you are receiving the mix that you specified

Asphalt Binder Content Test (Ignition Oven):

AASHTO T 308
ASTM D 6307
TEX-236-F

Burning off field samples yields binder content and combined aggregate for gradation testing.

Asphalt Binder Content of Asphalt Mixtures by Ignition Method

Test Overview:

An asphalt mix sample of a specified size is placed in a tared basket.

The basket is placed in an ignition oven. The model pictured is equipped with an internal scale, which shows less and less weight as the binder burns off.

The sample stays in the oven until the internal scale stabilizes, indicating that all the binder has burned off.

The % binder loss by weight can then be calculated.

asphalt institute

Asphalt Binder Content

Date	7/30/2016	Mix Type	12.5mm Superpave
Design #	12.5SP716	Project	MC-114B(72)
Highway	SH-39	ESALs	3M+
Contractor	Boggis Const. Co., Inc.	Producer	Bunce Asphalt Co.

Material Type	Material Source	% USED
5/8" Chips	Anderson @ Shawnee, OK	18
5/8" Chips	Ash Quarry @ Norman, OK	29
Screenings	Anderson @ Shawnee, OK	23
Stone Sand	Anderson @ Shawnee, OK	15
Natural Sand	F. Bean Pit @ Newcastle, OK	15
PG 70-28 OK	Fox Asphalt @ Wewoka, OK	
Liquid Anti-Strip	Petey Bros. LA-6B @ Austin, TX	

Sieve Size	Anderson 5/8" Chips	Ash 5/8" Chips	Anderson Scrns	Anderson Stone Sand	F. Bean Sand	Allowable Min.	Allowable Max.	Comb. Agg.	JMF	% Tol.
19.0mm	100	100	100	100	100	-	100	100	100	0
12.5mm	88	90	100	100	100	90	100	95	95	± 7
9.5mm	56	62	100	100	97	-	90	81	81	± 7
4.75mm	5	6	75	98	85	-	-	47	47	± 7
2.36mm	3	4	50	69	72	28	58	34	34	± 5
1.18mm	3	3	32	35	56	-	-	22	22	± 4
600µm	3	3	22	16	36	-	-	14	14	± 4
300µm	2	2	16	8	23	-	-	9	9	± 4
150µm	2	2	12	6	11	-	-	6	6	± 3
75µm	1.5	1.7	10.5	3.9	6.1	2	10	4.7	4.7	± 2
% Asphalt Cement									5.0	± 0.4
% Liquid Anti-Strip									0.5	-

Does an asphalt binder content obtained from the plant mix match the design JMF?

YES

The plant is successfully duplicating the design regarding total binder content.

NO

- *possibly wrong mix*
- *bad plant setting / calibration*
- *low - may be coarse split*
- *high - may be fine split*

Reviewing the Gradation & Binder Content

asphalt institute

Table 12
Operational Tolerances

Description	Test Method	Allowable Difference Between Trial Batch and JMF1 Target	Allowable Difference from Current JMF Target	Allowable Difference between Contractor and Engineer[1]
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	Must be Within Master Grading Limits in Table 8	±5.0[2,3]	±5.0
Individual % retained for sieves smaller than #8 and larger than #200			±3.0[2,3]	±3.0
% passing the #200 sieve			±2.0[2,3]	±1.6
Asphalt binder content, %	Tex-236-F	±0.5	±0.3[3]	±0.3

What do the test results tell you?

The test shows the percent of asphalt binder by weight of the total mix.

What are the potential ramifications of a failing test result?

A low binder content can lead to premature aging of the pavement, stripping, or raveling. A high binder content can lead to flushing or bleeding in the pavement.

Issues Caused by Low Asphalt Binder Content

Low binder contents can lead to raveling, stripping, and premature aging.

Issues Caused by Low Asphalt Binder Content

High binder contents can lead to flushing or bleeding.

Are the potential ramifications minor or major?

The ramifications would likely be different depending on the degree out of spec. Whether any of the potential pavement distresses occur also depend on several other factors.

How much does the degree out of spec affect pavement performance?

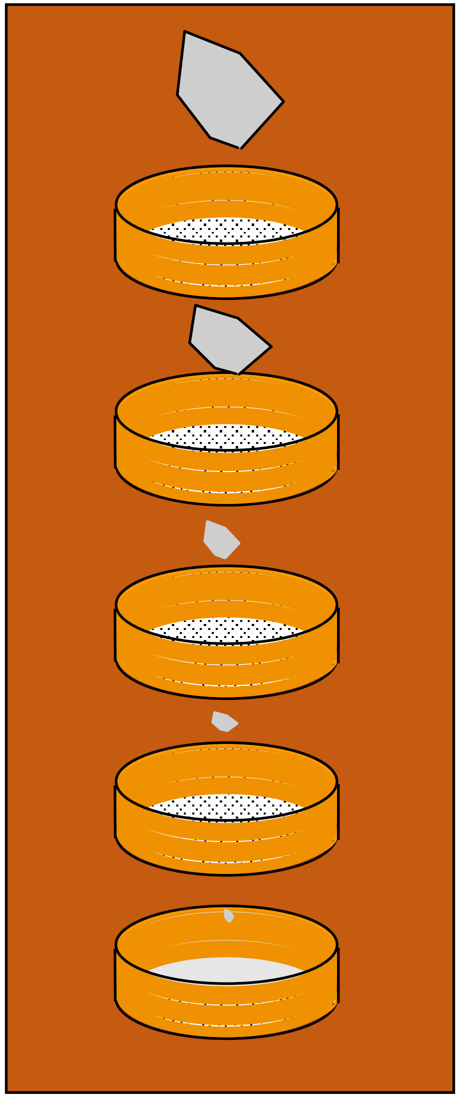
Binder content is one of several parameters that affect each other. However, binder contents very far out of spec should be a major cause for concern.

Mechanical Analysis of Extracted Aggregate (Gradation):

AASHTO T 30
ASTM D 5444
TEX-200-F

This test would be run on asphalt mix samples after the binder has been extracted or burned off

Mechanical Analysis of Extracted Aggregate



Test Overview:

After the binder from the HMA or WMA mixture has been removed by extraction or ignition, the remaining aggregate is dried to a constant weight.

The sample is then washed over a 0.075 mm sieve and again dried to a constant weight.

Next, the sample is passed through a nest of sieves by a predetermined level of agitation. Particles that are small enough to fall through the openings in the top sieve continue to fall through the nest until they reach a sieve whose openings are too small through which to pass.

The contents of each sieve are then weighed, and the cumulative percent passing by mass of each sieve size is then calculated.

Aggregate Gradation

Date	7/30/2016	**Mix Type**	12.5mm Superpave	**Design #**	12.5SP716
Project	MC-114B(72)	**Highway**	SH-39	**ESALs**	3M+
Contractor	Boggis Const. Co., Inc.			**Producer**	Bunce Asphalt Co.

Material Type	Material Source	% USED
5/8" Chips	Anderson @ Shawnee, OK	18
5/8" Chips	Ash Quarry @ Norman, OK	29
Screenings	Anderson @ Shawnee, OK	23
Stone Sand	Anderson @ Shawnee, OK	15
Natural Sand	F. Bean Pit @ Newcastle, OK	15
PG 70-28 OK	Fox Asphalt @ Wewoka, OK	
Liquid Anti-Strip	Petey Bros. LA-6B @ Austin, TX	

Sieve Size	Anderson 5/8" Chips	Ash 5/8" Chips	Anderson Scrns	Anderson Stone Sand	F. Bean Sand	Allowable Min.	Allowable Max.	Comb. Agg.	JMF	% Tol.
19.0mm	100	100	100	100	100	-	100	100	100	0
12.5mm	88	90	100	100	100	90	100	95	95	± 7
9.5mm	56	62	100	100	97	-	90	81	81	± 7
4.75mm	5	6	75	98	85	-	-	47	47	± 7
2.36mm	3	4	50	69	72	28	58	34	34	± 5
1.18mm	3	3	32	35	56	-	-	22	22	± 4
600µm	3	3	22	16	36	-	-	14	14	± 4
300µm	2	2	16	8	23	-	-	9	9	± 4
150µm	2	2	12	6	11	-	-	6	6	± 3
75µm	1.5	1.7	10.5	3.9	6.1	2	10	4.7	4.7	± 2

	JMF	% Tol.
% Asphalt Cement	5.0	± 0.4
% Liquid Anti-Strip	0.5	-

Does an aggregate sample obtained from the plant mix match the design JMF?

YES

There is a good probability that the plant is successfully duplicating the design.

NO

Perhaps one of the constituent aggregate gradations is different, or the percentages used are off

Reviewing the Gradation

asphalt institute

Example Gradation Results					
Sieve Size	**Cumulative Weight (g)**	**% Retained**	**% Passing**	***JMF***	***Tolerance***
25.0 mm	0.0	0.0	100	*100*	*0*
19.0 mm	140.5	8.8	91	*96*	*± 7*
12.5 mm	256.9	16.2	84	*87*	*± 7*
9.5 mm	440.9	27.7	72	*77*	*± 7*
4.75 mm	791.1	49.8	50	*54*	*± 7*
2.36 mm	962.5	60.5	39	*40*	*± 5*
1.18 mm	1063.0	66.9	33	*30*	*± 4*
0.600 mm	1146.8	72.1	28	*23*	*± 4*
0.300 mm	1288.1	81.0	19	*14*	*± 4*
0.150 mm	1399.9	88.0	12	*10*	*± 3*
0.075 mm	1480.7	93.13	6.9	*5.5*	*± 2*

Reviewing the Gradation

asphalt institute

Example Gradation Results					
Sieve Size	**Cumulative Weight (g)**	**% Retained**	**% Passing**	***JMF***	***Tolerance***
25.0 mm	0.0	0.0	100	*100*	*0*
19.0 mm	140.5	8.8	91	*96*	*± 7*
12.5 mm	256.9	16.2	84	*87*	*± 7*
9.5 mm	440.9	27.7	72	*77*	*± 7*
4.75 mm	791.1	49.8	50	*54*	*± 7*
2.36 mm	962.5	60.5	39	*40*	*± 5*
1.18 mm	1063.0	66.9	33	*30*	*± 4*
0.600 mm	1146.8	72.1	28	*23*	*± 4*
0.300 mm	1288.1	81.0	19	*14*	*± 4*
0.150 mm	1399.9	88.0	12	*10*	*± 3*
0.075 mm	1480.7	93.13	6.9	*5.5*	*± 2*

Mechanical Analysis of Extracted Aggregate

asphalt institute

What do the test results tell you?

How well the plant duplicated the aggregate proportions that were designed in the lab. Failing gradations take the form of a sample % passing ending up outside the allowable tolerance from JMF.

What are the potential ramifications of a failing test result?

Potential problems include segregation, harsh/tender mix, and out-of-balance volumetrics.

Mechanical Analysis of Extracted Aggregate

Are the potential ramifications minor or major?

If the mix volumetrics are still in specification, an out-of-tolerance gradation shouldn’t affect the mix quality much.

How much does the degree out of spec affect pavement performance?

If the gradation strays too far out of tolerance, other mix criteria will be affected, such as binder content, air voids, and VMA.

Reviewing the Gradation

asphalt institute

Example Gradation Results					
Sieve Size	**Cumulative Weight (g)**	**% Retained**	**% Passing**	***JMF***	***Tolerance***
25.0 mm	0.0	0.0	100	*100*	*0*
19.0 mm	140.5	8.8	91	*96*	*± 7*
12.5 mm	256.9	16.2	84	*87*	*± 7*
9.5 mm	440.9	27.7	72	*77*	*± 7*
4.75 mm	791.1	49.8	50	*54*	*± 7*
2.36 mm	962.5	60.5	39	*40*	*± 5*
1.18 mm	1063.0	66.9	33	*30*	*± 4*
0.600 mm	1146.8	72.1	28	*23*	*± 4*
0.300 mm	1288.1	81.0	19	*14*	*± 4*
0.150 mm	1399.9	88.0	12	*10*	*± 3*
0.075 mm	1480.7	93.13	6.9	*5.5*	*± 2*

Maximum Aggregate Size

asphalt institute

What do the test results tell you?

The maximum aggregate size influences allowable pavement thickness, susceptibility to segregation, asphalt content, and volumetric requirements.

What are the potential ramifications of a failing test result?

A gradation on the maximum sieve size that is less than 100% indicates the presence of over-sized particles. This could result in compaction difficulties, segregation, and asphalt content problems.

Maximum Aggregate Size

Are the potential ramifications minor or major?

Gradations results showing less that 100% passing the maximum sieve size are rare and usually only slightly less than 100%. Potential ramifications are minimal.

How much does the degree out of spec affect pavement performance?

Results deviating by 10% or more indicate that a different type of HMA was sampled than expected.

Reviewing the Gradation

asphalt institute

Example Gradation Results					
Sieve Size	**Cumulative Weight (g)**	**% Retained**	**% Passing**	***JMF***	***Tolerance***
25.0 mm	0.0	0.0	100	*100*	*0*
19.0 mm	140.5	8.8	91	*96*	*± 7*
12.5 mm	256.9	16.2	84	*87*	*± 7*
9.5 mm	440.9	27.7	72	*77*	*± 7*
4.75 mm	791.1	49.8	50	*54*	*± 7*
2.36 mm	962.5	60.5	39	*40*	*± 5*
1.18 mm	1063.0	66.9	33	*30*	*± 4*
0.600 mm	1146.8	72.1	28	*23*	*± 4*
0.300 mm	1288.1	81.0	19	*14*	*± 4*
0.150 mm	1399.9	88.0	12	*10*	*± 3*
0.075 mm	1480.7	93.13	6.9	*5.5*	*± 2*

Percent Passing the 0.075mm Sieve

What do the test results tell you?

The % passing the # 200 sieve influences compaction, asphalt content, and volumetric requirements.

What are the potential ramifications of a failing test result?

A low % passing the # 200 sieve may result in high air voids, permeability, and a lower AC demand. A high value may result in low air voids and VMA, a higher AC demand, and a tender mix.

0.075mm Sieve Too High

asphalt institute

Check cracking as a result of a high % passing the 0.075mm sieve

0.075mm Sieve Too High

High % passing the #200 may give the HMA a lighter appearance, indicating a lower film thickness and lower durability.

Percent Passing the 0.075mm Sieve

Are the potential ramifications minor or major?

High dust portions can have major ramifications on the longevity of a roadway. They are typically accompanied by lower than necessary binder contents which reduce pavement durability.

How much does the degree out of spec affect pavement performance?

Deviations of less than about 2% typically don't have too much of an effect. Deviations greater than 2% should be addressed immediately.

Reviewing the Gradation

asphalt institute

Example Gradation Results					
Sieve Size	**Cumulative Weight (g)**	**% Retained**	**% Passing**	***JMF***	***Tolerance***
25.0 mm	0.0	0.0	100	*100*	*0*
19.0 mm	140.5	8.8	91	*96*	*± 7*
12.5 mm	256.9	16.2	84	*87*	*± 7*
9.5 mm	440.9	27.7	72	*77*	*± 7*
4.75 mm	791.1	49.8	50	*54*	*± 7*
2.36 mm	962.5	60.5	39	*40*	*± 5*
1.18 mm	1063.0	66.9	33	*30*	*± 4*
0.600 mm	1146.8	72.1	28	*23*	*± 4*
0.300 mm	1288.1	81.0	19	*14*	*± 4*
0.150 mm	1399.9	88.0	12	*10*	*± 3*
0.075 mm	1480.7	93.13	6.9	*5.5*	*± 2*

Percent Passing the 2.36mm Sieve

What do the test results tell you?

The % passing the # 8 sieve has a major influence on voids and permeability.

What are the potential ramifications of a failing test result?

A low % passing the # 8 sieve may result in an inherently permeable mix. A high value is not as worrisome as a low value.

Low % passing the # 8 indicates a mix that is inherently subject to permeability, which in turn can lead to stripping.

Superpave Gradation Requirements

asphalt institute

Table 3—Aggregate Gradation Control Points

Sieve Size	Nominal Maximum Aggregate Size—Control Points (Percent Passing)											
	37.5 mm		25.0 mm		19.0 mm		12.5 mm		9.5 mm		4.75 mm	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
50.0 mm	100	—	—	—	—	—	—	—	—	—	—	—
37.5 mm	90	100	100	—	—	—	—	—	—	—	—	—
25.0 mm	—	90	90	100	100	—	—	—	—	—	—	—
19.0 mm	—	—	—	90	90	100	100	—	—	—	—	—
12.5 mm	—	—	—	—	—	90	90	100	100	—	100	—
9.5 mm	—	—	—	—	—	—	—	90	90	100	95	100
4.75 mm	—	—	—	—	—	—	—	—	—	90	90	100
2.36 mm	15	41	19	45	23	49	28	58	32	67	—	—
1.18 mm	—	—	—	—	—	—	—	—	—	—	30	60
0.075 mm	0	6	1	7	2	8	2	10	2	10	6	12

Oklahoma DOT raised these values from 5 to 10% from the AASHTO M 323 requirements to protect against inherently permeable mixes

Percent Passing the 2.36mm Sieve

Are the potential ramifications minor or major?

A low % passing the # 8 sieve can have major ramifications on the longevity of a roadway. They are often accompanied by permeability issues which can lead to stripping.

How much does the degree out of spec affect pavement performance?

Gradations near the lower broad band are especially of concern when accompanied by a low % passing the # 200 sieve.

Summary

We reviewed the most basic asphalt mix tests that will give you a rough picture of the quality of the mix you received. Additional tests are preferable if they fit into the project budget.

All failing test results should be followed up on.

Some test results may be received after all the material is already in place.

Some test results will be received in time for corrective action, which should be immediate.

Remember that a few hours time addressing a problem may prolong the pavement life by several years.

QUESTIONS?

- **Course Outline**
  - Module 1: Inspector's Authority and Responsibility
  - Module 2: Materials
  - Module 3: Mixtures and Mix Design
  - Module 4: Plants & Production
  - Module 5: Transportation, Delivery, & Preparation
  - Module 6: Placement
  - Module 7: Compaction
  - Module 8: Acceptance and Testing
- **Each module roughly 90-120 mins**
- **Modules consist of ppt slides with audio, exam**

http://www.asphaltinstitute.org/training/seminars/paving-inspector-certification-pic/

pic
The Asphalt Institute
Paving Inspector Certification Series