



 Description

 > Applies to Bituminous Pavement

 > Specification Types

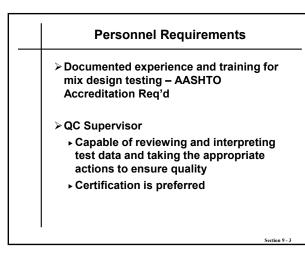
 > Quality Assurance

 > Specification Types

 > 2021 Specification Book

 > Contractor: Quality Acceptance Testing

 > WYDOT: Quality Verification Testing



>	QA/QA Testing Technicians Must be qualified
>	Qualified Testing Technician at the production site:
	Aggregate production Bituminous pavement production
×	Work reviewed and signed by Certified Testing Technician
×	Check specification for each particular project

<ul> <li>Shown on plans</li> <li>Function of: <ul> <li>Traffic</li> <li>Type of Construction</li> <li>Type of Facility</li> <li>Type of Funding</li> <li>Quantity of Material</li> </ul> </li> </ul>	Level of Control	
<ul> <li>Traffic</li> <li>Type of Construction</li> <li>Type of Facility</li> <li>Type of Funding</li> </ul>	≻Shown on plans	
<ul> <li>► Type of Construction</li> <li>► Type of Facility</li> <li>► Type of Funding</li> </ul>	► Function of:	
<ul> <li>► Type of Facility</li> <li>► Type of Funding</li> </ul>	▶ Traffic	
► Type of Funding	Type of Construction	
	► Type of Facility	
Quantity of Material	► Type of Funding	
	Quantity of Material	
		Section 9

	Table 4 sting Re	• • • • • • • • • • • •		
	Testing	e 401.4.23-1 Requirements		
TEST PROCEDURE	2	LOFCONTROL	4	5
PROCEDURE		ince-Mix Production		
Mix Volumetrics	2 locations on first day & 1 location each 5000 ton [5000 t] thereafter	2 locations on first day & 1 location each day thereafter until no further corrective actions are required	No tests required	No tests required
Virgin Aggregate Gradation	1 lot/5000 ton [1 lot/5000 t]	1 lot/5000 ton [1 lot/5000 t]	1 lot/5000 ton [1 lot/5000 t] (6)	No tests required
Asphalt Binder Content	[1 lot/5000 t]	[1 lot/5000 t] 1/day	[1 160/5000 t] ***	required No tests
Asphalt Binder Content	1/day	1/day	1/day	No tests required
Virgin Aggregate-LL; PI; Coarse Aggregate Angularity (Fractured Faces); Fine Aggregate Angularity; Flat & Elongated <sup>(7)</sup>	1/1000 ton [1/1000 t] min.	1/1000 ton [1/1000 t] min.	No tests required	No tests required
Moisture Content of Virgin Aggregate/ Hydrated Lime; Moisture Content of Mix	1/day min.	1/day min.	No tests required	No tests required
	Verification	-Mix Production		
Mix Volumetrics	Split sample required but no test frequency specifically required	required but no test frequency specifically required	No tests required	No tests required
Virgin Aggregate Gradation	1/lot	1/lot	No tests required	No tests required
Asphalt Binder Content	No tests required	No tests required	No tests required	No tests required
Virgin Aggregate-LL, PI, Coarse and Fine Aggregate Angularity; Moisture Content of Virgin Aggregate/ Hydrated Lime; Moisture Content of Mix; Flat and Elongated	1/mix design <sup>(8)</sup>	1/mix design <sup>(3)</sup>	No tests required	No tests required



	Ir		401.4.23-2 Test Requirem	ents	
			ace Density Des		
Requirement	I	п	ш	IV	V
In-Place Density <sup>(1)</sup>	1 lot/1500 ton [1 lot /1500 t] of produced material.	All in place mix compacted to ≥ 92.0% of voidless unit weight.	All in place mix compacted until a nuclear density gauge indicates the mix no longer increases in compaction.	5 passes <sup>(2)</sup> of a pneumatic tire and 5 passes <sup>(2)</sup> of a steel wheel roller in accordance with Subsection 210.3.6, Roller.	≥ 5 passes <sup>(2)</sup> of a steel when roller in vibratory mode in accordance with Subsection 210.3.6, Roller.
Test Strip	Required	Not required	Not required	Not required	Not required
Quality Acceptance Testing	1 lot/1500 ton [1 lot/1500/t]	1 test/200 ton [1 test/200 t]	No tests required	No tests required	No test required
Verification Testing	1/lot	No tests required	No tests required	No tests required	No test required

Job Mix Formula	
> WYDOT 401.4.1.2	
Contractor – JMF and Mix Design	
≻WYDOT – Approval	
➤Will include:	
<ul> <li>Single % passing each sieve</li> </ul>	
<ul> <li>Single asphalt content</li> </ul>	
<ul> <li>Single mixing and compaction temperature (MTM 414.0)</li> </ul>	
	Section 9 - :

Job Mix Formula (Continued)	
≻ Table 401.4.1-1	
► Virgin Aggregate Tolerances	
◆Passing #4 (4.75 mm) and larger	±5%
◆Passing #8	±4%
	±3%
◆Passing #200 (0.075 mm)	<b>±2%</b>
JMF + tolerance shall be within band specified	
Liquid anti stripping agents might be u instead of lime.	used
s	Section 9 - 9

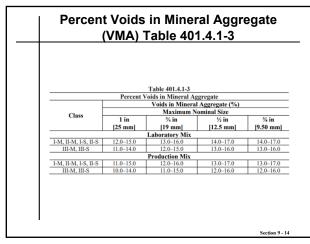
Mix Design	
➢ Performed by:	
► Contractor	
▶ Private Lab	
Fourteen days prior to paving	
Sampling (proper sampling & s Split samples	splitting
<ul> <li>Contractor Mix design</li> <li>WYDOT verification</li> </ul>	
>No paving without Materials Pr	oaram
approval	ogram
Marshall - WYDOT MTM 414.0	
Superpave - WYDOT MTM 414.	0

Department F	urnished Sources
➤ Maybe Provided f	or Information Only
► LAR of coarse a	aggregate
Gradation of ea	ch fraction
Combined grad	ation
▶ % of each fraction	ion in combined

Department Furnished Sources (continued)
▶ Mix Design Data
<ul> <li>Number of Marshall blows or Gyrations</li> </ul>
Binder content
◆Marshall stability
◆Marshall flow
<b>↓% VMA</b>
<b></b> ♦% Air Voids
◆TSR from AASHTO T-283

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			-			
Table 401.4.1-2 Marshall and Superpave Plant Mix Properties <sup>(1)</sup>						
	and Super	pave i tan	Clas			
Property	I-M	II-M	III-M	I-S	II-S	III
Number of Marshall Blows	75	75	50			
Marshall Stability (lbs [N]) minimum	2500 [11 000]	2500 [11 000]	2000 [9000]			
Marshall Flow (0.01 in [0.25 mm])	8-16 [8-16]	8-16 [8-16]	8-16 [8-16]			
Number of Superpave Gyrations				100	75	50
% Voids in Laboratory Mix	5.0-6.0	4.0-5.0	4.0-5.0	4.0-5.0	4.0-5.0	4.0-
% Voids in Production Mix	4.0-6.0	3.0-5.0	2.5-5.0	3.0-5.0	3.0-5.0	2.5-
Dust/Effective Asphalt Binder	0.8-1.4	0.8-1.4	0.8-1.4	0.8-1.4	0.8-1.4	0.8-1
Minimum % Asphalt Binder	4.5	4.5	4.5	4.5	4.5	4.5
Minimum Tensile Strength Retained %	75	75	75	75	75	75
Film Thickness µm(2)	6-12	6-12	6-12	6-12	6-12	6-13
Voids Filled with Asphalt Binder (VFA)				65-75	65-78	65-7
Aggregate/Lime Moisture Content, % Minimum	4.0	4.0	4.0	4.0	4.0	4.0
Mixture Moisture Content, % Maximum	0.5	0.5	0.5	0.5	0.5	0.5



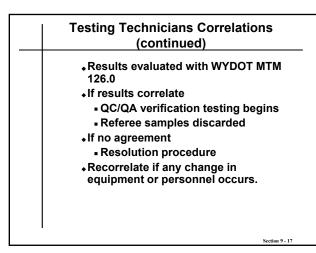
C	Gradatio	n Requir	ements			
Table 803.5.5-1 Gradation Requirements: Marshall and Superpave Mixes						
Sieve	1 in	³∕₄ in	½ in	3/8 in		
1 ¼ inch	100					
1 inch	90-100	100				
¾ inch	65-90	90-100	100			
½ inch	50-85	55-90	90-100	100		
3/8 inch	40-75	45-85	55-90	90-100		
No. 4	30-60	30-65	35-70	45-85		
No. 8	20-45	20-50	20-55	30-65		
No. 30	5-25	5-30	5-35	10-40		
No. 200	2-7	2-7	2-7	2-7		

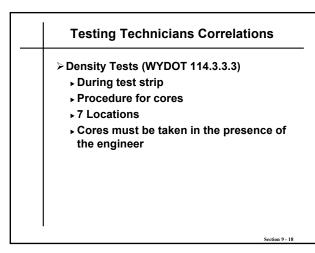




Testing Technicians Correlations
> WYDOT 114.3.3.1
Prior to any testing, a meeting will be held between responsible parties and testing technicians
≻Aggregate Tests (WYDOT 14.3.3.2)
► During first Lot
<ul> <li>May be done during crushing if combined samples available</li> </ul>
► Procedure
<ul> <li>Split samples – independent testing</li> </ul>
Contractor
• WYDOT
Referee – if necessary
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Testing Technicians Correlations (continued)	
▶ Seven locations – 2 cores/each	
Independent testing for S.G. and density ■ WYDOT	
- Contractor	
◆Evaluated with WYDOT MTM 423.0	
If samples correlate	
QC/QA verification begins	
If no agreement	
Resolution procedure	
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	Dispute Resolution
≻WYDOT	114.3.4
≻Procedu	Ire
► Meet t calibra	o review testing, equipment and ation
Mat	erials Program may assist
If bias	is found:
₊Cor	rect bias
₊Rep	eat correlation
If bias	not found:
_	erence testing by Materials gram

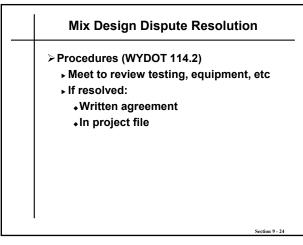
Dispute Resolution (conti	inued)
▶ Referee Testing	
Aggregate – Retained sam	ples
◆Density – WYDOT cores	
▹ For Quality Acceptance	
Group correlating with mat Program	erials
	Section 9 - 21

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Mix Design Correlation	
≻Laboratory Requirements	
AASHTO accreditation required	
Approval by Materials Program	
➢ Procedures	
<ul> <li>Results compared with multi-lab precision statements</li> </ul>	
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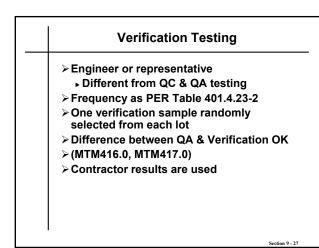
▶ If within limits:
Use Contractor's design for:
• JMF
AC content
Voidless unit weight
▶ If not within limits:
<ul> <li>Dispute resolution</li> </ul>
<ul> <li>WYDOT values may be used in interim</li> </ul>

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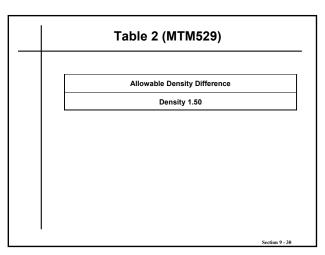
 Mix Design Dispute Resolution (continued)
▶ If unresolved:
◆Third party selected
Mutual agreement
<ul> <li>Lab correlating with third party lab to be used</li> </ul>
► Cost of third party testing
♦WYDOT if Contractor confirmed
◆Contractor if WYDOT confirmed
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 Quality Acceptance
<ul> <li>Testing performed by Contractor / Acceptability by Dept.</li> </ul>
Department generate random numbers
Samples not valid if not taken in presence of dept. inspector
▶ Applies to;
◆Density
AC Content
▶ Frequency – Table 401.4.23-1
Based on quality analysis of lots
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Difference is not	ОК
<ul> <li>Engineer test rest rest</li> <li>samples for lot</li> </ul>	est of verification
Determine if both acceptance and r performed	•
Contractors resu correlation accep	lts not used until nev oted
If verification san only paid 1 <sup>st</sup> lot	nple indicated bonus

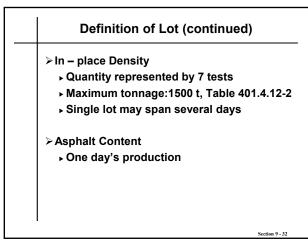
	<u> </u>				
Grading (Nominal Max. Size)					
	1"	3/4"	1/2"	3/8"	PMWC
Sieve	Allow	able Diffe	erence	(% Pa	assing)
1 1⁄4"	1.5				
1"	2	1.5			
3/4"	3	2	1.5		
1⁄2"	3.4	3	2	1.5	1.5
3/8"	3.4	3.4	3.4	2	2
No. 4	3.4	3.4	3.4	3.4	3.4
No. 8	3.3	3.3	3.3	3.3	3.3
No. 30	2.9	2.9	2.9	2.9	
No. 200	1.2	1.2	1.2	1.2	1.2

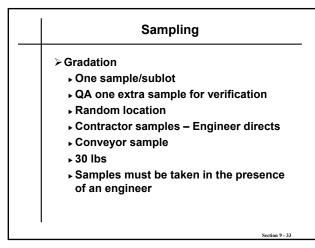


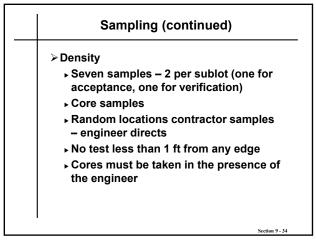


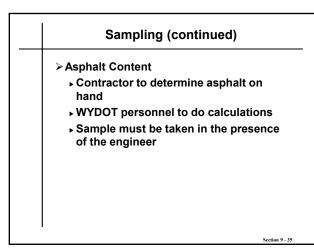


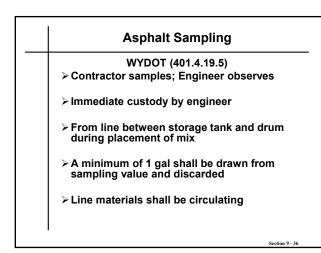
Definition of Lot
> Gradation
Quantity represented by 5 tests
Maximum tonnage: 5000t, Table 401.4.12-1
Unusual conditions
<ul> <li>Quantity represented by 3 to 7 tests</li> </ul>
Single lot may span several days
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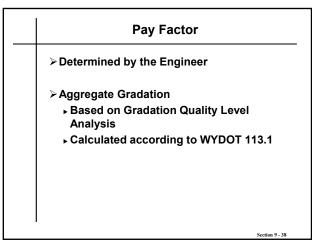


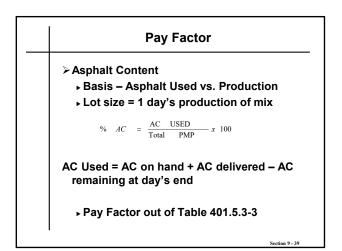






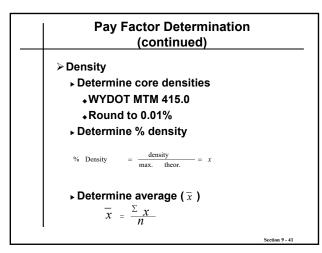
Asphalt Sampling (continued)
> Two, 1 quart containers representing 100 ton or one sublot
Sampling shall be random; locations determined by engineer
Engineer will retain all samples for a lot until receipt of the last sample.
The Resident Engineer will retain referee containers as a referee sample from each sample.
Projects less than 100 ton, no sampling is required
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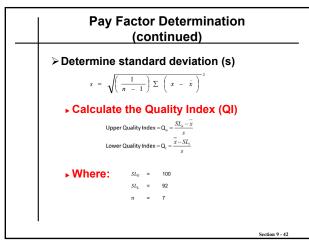




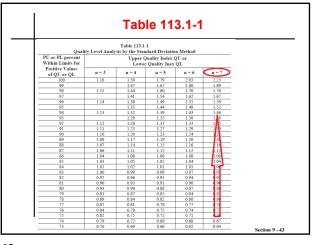
ariance of Actual Asphalt Content from design Asphalt Content	Pay Facto			
0.00 - 0.25	1.00			
0.26 - 0.30	0.95			
0.31 - 0.35	0.90			
0.36 - 0.40	0.85			
0.41 – 0.45	0.80			
0.46 - 0.50	0.75			
≥ 0.51	Reject			



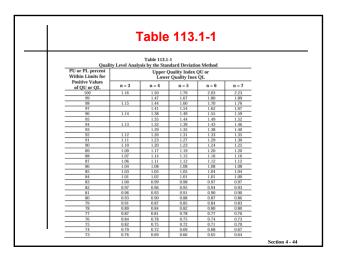


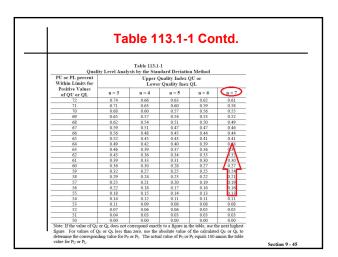














Qualit PU or PL percent	y Level Analy	Table 113.1 ysis by the Star				
Within Limits for						
Positive Values	n = 3	n = 4	Quality Inex	n = 6	n = 7	
of QU or QL						
72	0.74	0.66	0.63	0.62	0.61	
70	0.71	0.63	0.60	0.59	0.58	
69	0.68	0.60	0.57	0.56	0.55	
68	0.62	0.54	0.51	0.50	0.49	
67	0.59	0.51	0.47	0.47	0.46	
66	0.56	0.48	0.45	0.44	0.44	
65	0.52	0.45	0.43	0.41	0.41	
64	0.49	0.42	0.40	0.39	0.38	
63	0.46	0.39	0.37	0.36	0.35	
62	0.43	0.36	0.34	0.33	0.32	
61	0.39	0.33	0.31	0.30	0.30	
60	0.36	0.30	0.28	0.27	0.27	
59	0.32	0.27	0.25	0.25	0.24	
58	0.29	0.24	0.23	0.22	0.21	
57	0.25	0.21	0.20	0.19	0.19	
56 55	0.22	0.18	0.17	0.16	0.16	
55	0.18	0.15	0.14	0.13	0.13	
53	0.14	0.12	0.08	0.08	0.08	
52	0.07	0.09	0.08	0.08	0.08	
51	0.04	0.00	0.08	0.03	0.03	
50	0.00	0.00	0.00	0.00	0.00	



 Pay Factor Determination (continued)

 > Determine PWL(Density) (Quality Level)

  $quality level = (P_U + P_L) - 100$  

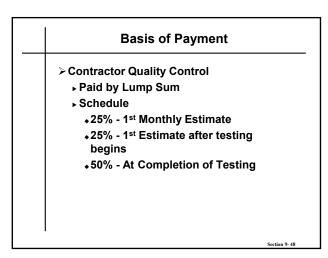
 • Calculate the Pay Factor(Density)

  $PF_0 = 0.55 + 0.50 \times \frac{PWL_0}{100}$  

 • Where:

  $PF_0 = e_{pay factor for in-place density, rounded to the nearest 0.000111}

 PWLo
 = percent within limits for in-place density$ 



(G*/Sinδ), original PGAB, High Grade temp., kPa	Dynamic Shear (G*/Sinδ), RTFO residue, High grade temp., kPa	Creep Stiffness (S), PAV residue, Low grade temp. +10°C, MPa	Creep Slope (m-value), PAV residue, Low grade temp. +10°C unit less	Elastic Recovery, RTFO residue, 77°F, %	Pay Factor
≥ 0.90	≥1.98	≤311	≥0.094	≥55	1.00
0.89	1.97 -1.95	312 - 315	0.293 - 0.291	54	0.95
0.88 - 0.87	1.94 - 1.91	316 - 320	0.290 - 0.288	53	0.90
0.86	1.90 - 1.88	321 - 324	0.287 - 0.285	52	0.85
0.85 - 0.84	1.87 - 1.85	325 - 329	0.284 - 0.282	51	0.80
0.83	1.84 - 1.82	330 - 333	0.281 - 0.280	50	0.75
0.82 - 0.81	1.81 - 1.78	334 - 337	0.279 - 0.277	49	0.70
0.8	1.77 - 1.75	338 - 342	0.276 - 0.274	48	0.65
0.79 - 0.78	1.74 - 1.72	343 - 346	0.273 - 0.271	47	0.60
0.77	1.71 - 1.68	347 - 351	0.270 - 0.268	46	0.55
0.76 - 0.75	1.67 - 1.65	352 - 355	0.267 - 0.265	45	0.50
<0.75	<1.65	≥355	< 0.265	<45	REJECT

Pay Adjustments	
Aggregate Gradation: $PA_A = 0.67 \times PMP \times (PF_A-1) \times (LS_A-AP_Q)$ $PA_A = 0.67 \times PMP_{AP} \times (PF_A-1) \times (LS_A-ML_Q)$	
Aggregate Gradation For Recycle: $PA_A = 0.67 \times RPMP \times (RPF-1) \times (LS_A-AP_Q)$ $PA_A = 0.67 \times PMP_{AP} \times (RPF-1) \times (LS_A-ML_Q)$	
In-Place Density: PA <sub>D</sub> = 1.33 x PMP x (PF <sub>D</sub> -1) x LS <sub>D</sub>	
Asphalt Content: $PA_{AC}= 0.67 \times PMP \times (PF_{AC}-1) \times (LS_{AC}-AP_{Q})$ $PA_{AC}= 0.67 \times PMP_{AC} \times (PF_{AC}-1) \times (LS_{AC}-MP_{Q})$	
	Section 5