Florida Department of
TRANSPORTATION

Annual Independent Assurance Report to FHWA

Asphalt Acceptance Data

Flexible Pavement Committee Meeting

August 15, 2024

Background

- FDOT conducts an annual analysis of data from tests performed on materials from FDOT asphalt construction projects.
- Purpose is to determine the effectiveness of the FDOT materials acceptance program for asphalt.
- The findings of these analyses are documented and submitted annually to the Florida Division of the Federal Highway Administration (FHWA).
- Started in 2007

Analysis

- Data is generated from MAC – Calendar Year 2023
- Includes the following sample types:
  - Quality Control (QC) - Contractor
  - Verification (VT) - FDOT
  - Independent Verification (IV) - FDOT
  - Process Control (PCX) - Contractor
  - Process Control Split of the IV Sample (PCS) - Contractor

Analysis

- The data sets were compared to the pass/fail criteria identified in the master production ranges for both dense- and open-graded mixtures,
- Failure rates for each of the specified material properties were calculated for QC, VT, IV, PCX, and PCS samples on a statewide, and district basis.

Master Production Ranges

Table 2 - Master Production Range for Dense-Graded Mixtures

Characteristic	Tolerance [1]
Asphalt Binder Content (%)	Target ± 0.55
Passing No. 200 Sieve (%)	Target ± 1.50
Air Voids (%)	2.30 – 6.00
Density (minimum % G_{mm}) [2]	89.50

(1) Tolerances for sample size of n = 1 from the verified mix design
(2) Based on an average of three to five randomly located cores

Table 3 - Master Production Range for Open-Graded Mixtures

Characteristic	Tolerance [1]
Asphalt Binder Content (%)	Target ± 0.60
Passing 3/8-inch Sieve (%)	Target ± 7.50
Passing No. 4 Sieve (%)	Target ± 6.00
Passing No. 8 Sieve (%)	Target ± 3.50

(1) Tolerances for sample size of n = 1 from the verified mix design

Considerations

- IV, PCX, and PCS samples are not necessarily obtained in a random manner
  - QC (and VT split) samples are random
- If samples are not tested immediately, they are boxed up, stored/transported, and then reheated prior to testing
- IV samples are tested in a different lab

Air Void Failure Rates

Air Void Failures															
District	QC			VT			IV			PCS			PCX		
	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure
1	10	1109	0.90%	7	367	1.91%	4	204	1.96%	2	200	1.00%	6	591	1.02%
2	3	1110	0.27%	2	361	0.55%	7	304	2.30%	2	304	0.66%	6	1303	0.46%
3	6	604	0.99%	3	203	1.48%	6	208	2.88%	4	204	1.96%	5	755	0.66%
4	7	660	1.06%	4	251	1.59%	13	218	5.96%	1	193	0.52%	2	739	0.27%
5	4	630	0.63%	6	230	2.61%	7	172	4.07%	1	160	0.63%	2	1104	0.18%
6	0	326	0.00%	2	121	1.65%	3	88	3.41%	0	75	0.00%	0	261	0.00%
7	2	685	0.29%	1	261	0.38%	5	167	2.99%	3	163	1.84%	3	1125	0.27%
TP	2	608	0.33%	2	242	0.83%	2	136	1.47%	2	133	1.50%	6	903	0.66%
Totals	34	5732	0.59%	27	2036	1.33%	47	1497	3.14%	15	1432	1.05%	30	6781	0.44%
Previous CY	11	4292	0.26%	23	1545	1.49%	39	1221	3.19%	11	1156	0.95%	14	5604	0.25%

Roadway Density Failure Rates

Roadway Density Failures															
District	QC			VT			IV			PCS			PCX		
	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure
1	5	1109	0.45%	4	367	1.09%	5	204	2.45%	0	0	0.00%	0	0	0.00%
2	3	1110	0.27%	4	361	1.11%	1	304	0.33%	0	0	0.00%	0	0	0.00%
3	8	604	1.32%	3	203	1.48%	11	208	5.29%	0	0	0.00%	0	0	0.00%
4	3	660	0.45%	4	251	1.59%	13	218	5.96%	0	0	0.00%	0	0	0.00%
5	3	630	0.48%	1	230	0.43%	5	172	2.91%	0	0	0.00%	0	0	0.00%
6	0	326	0.00%	0	121	0.00%	6	88	6.82%	0	0	0.00%	0	0	0.00%
7	4	685	0.58%	5	261	1.92%	4	167	2.40%	0	0	0.00%	0	0	0.00%
TP	2	608	0.33%	2	242	0.83%	4	136	2.94%	0	0	0.00%	0	0	0.00%
Totals	28	5732	0.49%	23	2036	1.13%	49	1497	3.27%	0	0	0.00%	0	0	0.00%
Previous CY	24	4292	0.56%	18	1545	1.17%	21	1221	1.72%	0	0	0.00%	0	0	0.00%

Same cores, same lab, different operator, different G_{mm} values

Binder Content Failure Rates (Dense Mixtures)

Binder Content Failures															
District	QC			VT			IV			PCS			PCX		
	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure
1	10	1109	0.90%	13	367	3.54%	10	204	4.90%	4	200	2.00%	7	591	1.18%
2	2	1110	0.18%	3	361	0.83%	3	304	0.99%	1	304	0.33%	5	1303	0.38%
3	4	604	0.66%	0	203	0.00%	6	208	2.88%	0	204	0.00%	3	755	0.40%
4	10	660	1.52%	6	251	2.39%	8	218	3.67%	4	193	2.07%	7	739	0.95%
5	7	630	1.11%	1	230	0.43%	3	172	1.74%	3	160	1.88%	9	1104	0.82%
6	0	326	0.00%	2	121	1.65%	4	88	4.55%	0	75	0.00%	0	261	0.00%
7	8	685	1.17%	8	261	3.07%	5	167	2.99%	5	163	3.07%	7	1125	0.62%
TP	7	608	1.15%	5	242	2.07%	3	136	2.21%	0	133	0.00%	8	903	0.89%
Totals	48	5732	0.84%	38	2036	1.87%	42	1497	2.81%	17	1432	1.19%	46	6781	0.68%
Previous CY	31	4292	0.72%	25	1545	1.62%	41	1221	3.36%	18	1156	1.56%	39	5604	0.70%

FC-5 Binder Content Failures

Binder Content Failures															
District	QC			VT			IV			PCS			PCX		
	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure	Failure	Test	% Failure
1	1	106	0.94%	2	33	6.06%	0	24	0.00%	0	24	0.00%	4	91	4.40%
2	3	97	3.09%	6	28	21.43%	2	29	6.90%	1	29	3.45%	1	46	2.17%
3	2	110	1.82%	1	31	3.23%	1	33	3.03%	0	33	0.00%	2	55	3.64%
4	0	118	0.00%	0	35	0.00%	3	32	9.38%	0	32	0.00%	0	49	0.00%
5	4	219	1.83%	1	64	1.56%	2	44	4.55%	5	44	11.36%	4	204	1.96%
6	0	15	0.00%	0	4	0.00%	0	6	0.00%	0	5	0.00%	0	4	0.00%
7	3	92	3.26%	3	30	10.00%	1	22	4.55%	0	22	0.00%	0	77	0.00%
TP	1	174	0.57%	1	52	1.92%	3	58	5.17%	2	54	3.70%	5	142	3.52%
Totals	14	931	1.50%	14	277	5.05%	12	248	4.84%	8	243	3.29%	16	668	2.40%
Previous CY	6	649	0.92%	9	191	4.71%	12	156	7.69%	6	144	4.17%	6	495	1.21%

Split-Sample Analysis

- Review was made of all samples where a split sample was also tested.
  - Includes QC-VT samples, as well as IV-PCS samples.
  - This split-sample failure rate analysis only focused on binder content and air voids failures

Split-Sample Failure Data

Type of Split Samples	Total Number of Samples*	Only VT/IV (FDOT) Sample Failed	Only QC/PCS (Contractor) Sample Failed	Both Samples Failed
QC-VT (Air Voids)	38	14	11	13
QC-VT (Binder Content)	63	35	12	16
IV-PCS (Air Voids)	21	12	2	7
IV-PCS (Binder Content)	32	18	2	12

* There are generally more binder content test results than air void results since one category of mixtures (FC-5) does not have volumetric requirements.

Material Property Analysis

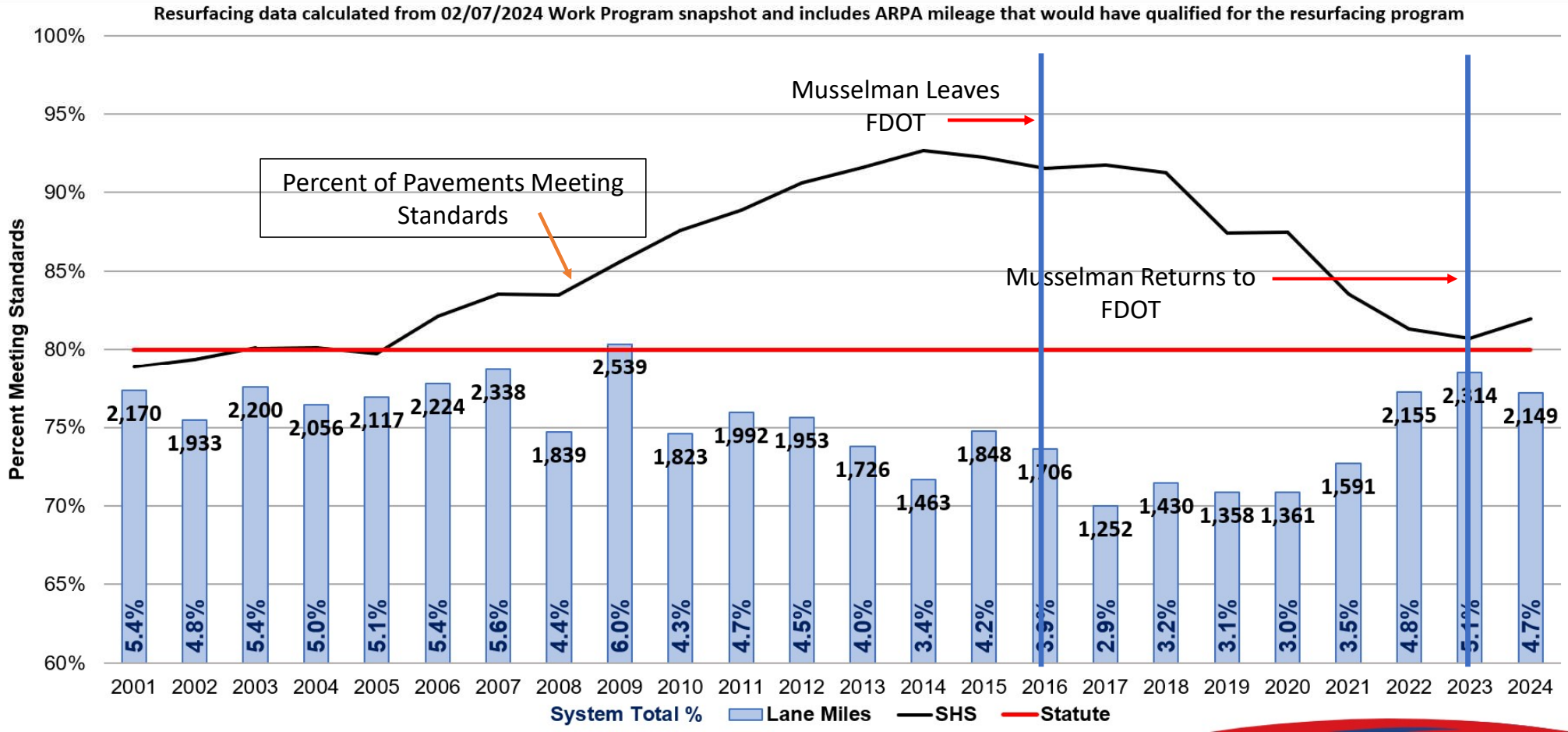
MixType	IV Air Voids	IV Avg. Gmb	IV Gmm	PCS Air Voids	PCS Avg Gmb	PCS Gmm	Gmm Difference	Allowable Gmm Difference	Compares?	Gmb Difference	Allowable Gmb Difference	Compares?
SP-19.0	1.61	2.442	2.482	2.48	2.439	2.501	-0.019	0.016	No	0.003	0.022	Yes
SP-12.5	1.93	2.487	2.536	2.78	2.479	2.55	-0.014	0.016	Yes	0.008	0.022	Yes
FC-12.5	1.97	2.389	2.437	2.46	2.378	2.438	-0.001	0.016	Yes	0.011	0.022	Yes
SP-12.5	1.98	2.429	2.478	2.42	2.415	2.475	0.003	0.016	Yes	0.014	0.022	Yes
SP-12.5	2.01	2.481	2.532	3.27	2.459	2.542	-0.010	0.016	Yes	0.022	0.022	Yes
SP-12.5	2.28	2.491	2.549	2.94	2.477	2.552	-0.003	0.016	Yes	0.014	0.022	Yes
SP-12.5	2.29	2.428	2.485	2.62	2.419	2.484	0.001	0.016	Yes	0.009	0.022	Yes
SP-12.5	2.29	2.472	2.53	2.99	2.463	2.539	-0.009	0.016	Yes	0.009	0.022	Yes
SP-12.5	6.16	2.348	2.502	4.96	2.374	2.498	0.004	0.016	Yes	-0.026	0.022	No
SP-12.5	6.48	2.323	2.484	5.86	2.33	2.475	0.009	0.016	Yes	-0.007	0.022	Yes
SP-12.5	6.83	2.263	2.429	4.8	2.279	2.394	0.035	0.016	No	-0.016	0.022	Yes
SP-12.5	7.43	2.316	2.502	5.92	2.337	2.484	0.018	0.016	No	-0.021	0.022	Yes

Things to Consider

- In general, failure rates for contractor tested samples (QC, PCS, and PCX) were lower than FDOT tested samples (IV and VT).
  - Similar trends since 2007
- Less disparity of results when split samples are tested in the same lab
- When looking at the individual material properties of the 12 split samples where only FDOT results failed air voids:
  - 9 of 12 samples compared on G_{mm}
  - 11 of 12 compared on G_{mb}

One last thing….

State Highway System
Lane Miles Resurfaced and Percent Meeting Standards



Questions or Comments?