

NDDOT/AGC Hot Mix Asphalt User-Producer Group

Purpose:

To better exchange ideas and information between the agency and industry; with representatives from all aspects of HMA work

- First Meeting was in November 2019; 2nd was January 2020
- Then somethings happened
- Next meeting wasn't until July 2020, followed by September 2020, and January 2021
- Most recent gathering was a virtual discussion/process demonstration of Fine Aggregate Specific Gravity testing on March 1st
- Goal is to meet on a regular schedule, likely Bi-Monthly

What types of items have been on the agenda?

- Longitudinal Joint Density
- Coring locations (joint and mat)
- Mat Density Incentives
- Percent Within Limits (PWL) specification
- Aggregate Specific Gravity
- Narrowing the number of grades of binders and FAA that are specified for projects
- Evaluation of the properties of RAP used in mixes
- # of Gyrations used for mix design
- Worksheets/Workbook used in field testing

Three current HMA Special Provisions

- SSP 4 HMA Longitudinal Joint Density
- SSP 7 Bitumen Testing Price Adjustments
- SSP 9 HMA Coring, Acceptance, and Pay Factors
- Joint Density requires a single core each subplot; centered on the joint
- Bitumen Testing replaces a document found only on the NDDOT Website and is updated for MSCR oils
- HMA Coring revises issues in the 2020 specification regarding shoulder material

What has been implemented from these discussions

The “Talk is Cheap” slide

- Density incentives are part of the Standard Specifications for Mat Density (were part of the Joint Density SP from the jump off point for that location)
- Improvements to the Joint Density SP; mainly switching from a tonnage-based pay factor (like mat density) to a \$/Linear Foot of joint pay factor (similar to ride)
- Reduction in the number of cores obtained when determining joint density
- Improvements to the PWL concept

What is coming up?

- Additional PWL projects (2022 construction)
 - Seeking projects in different Districts
- Superpave 5 pilot projects and Special Provision
 - Developing Provision based on other state specifications
- Workbook improvements and refinements
 - Ease of use and coverage for pilot projects
- Density Profiling System
 - M&R will be collecting data on projects in summer 2021

On the Fly (Change Ordered) Revisions to the PWL Provision

As bid concept on lot determination

- Single lane (exactly as normal)
- Each lot is 4,500 tons with 5 sublots (900 tons each)
 - This meant a lot could stretch over multiple days
- Minimum of 3 sublots to be considered a full lot
- 2 cores obtained per sublot

Change Ordered concept on lot determination

- Single lane (exactly as normal)
- Each lot is cut off after a single day; Sublots are still 900 tons
- If less than 2,700 tons placed in a day (3 sublots) that day is included in the prior day's lot
- 2 cores obtained per sublot

What Does Percent Within Limits Do?

Appendix A – PF_{PWL} Calculation Procedure

1. Calculate the mean of the test values:

$$\bar{X} = \frac{\sum x}{n}$$

Where:
 \sum = Summation of
 x = individual test values from a lot
 n = total number of test values from the lot

2. Calculate the standard deviation:

$$S = \sqrt{\frac{n\sum(x^2) - (\sum x)^2}{n(n-1)}}$$

Where:
 $\sum(x^2)$ = summation of the squares of the individual test values
 $(\sum x)^2$ = summation of the individual test values squared

3. Calculate the Upper Quality Limit (Q_U) and Lower Quality Limit (Q_L):

$$Q_U = \frac{USL - \bar{X}}{S} \quad Q_L = \frac{\bar{X} - LSL}{S}$$

Where:
 USL = Upper Specification Limit (97)
 LSL = Lower Specification Limit (92)

4. Determine the P_U and P_L values using Q_U , Q_L , and n for the lot using Table 1.

5. Determine the Quality Level (QL)

$$QL = (P_U + P_L) - 100$$

6. Determine the PWL pay factor:

$$PF_{PWL} = 55 + 0.5(QL)$$

Appendix A – PF_{PWL} Calculation Procedure

TABLE 1 - QUALITY LEVELS
QUALITY LEVEL ANALYSIS BY STANDARD DEVIATION METHOD

P _U or P _L Percent Within Limits for Positive Values of Q _U or Q _L	UPPER QUALITY INDEX Q _U OR LOWER QUALITY INDEX Q _L															
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10 to n=11	n=12 to n=14	n=15 to n=18	n=19 to n=25	n=26 to n=37	n=38 to n=69	n=70 to n=200	n=201 to n=∞	
100	1.16	1.50	1.79	2.03	2.23	2.39	2.53	2.65	2.83	3.03	3.20	3.38	3.54	3.70	3.83	
99	1.47	1.67	1.80	1.89	1.95	2.00	2.04	2.09	2.14	2.18	2.22	2.26	2.29	2.31	2.31	
98	1.15	1.44	1.60	1.70	1.76	1.81	1.84	1.86	1.91	1.93	1.96	1.99	2.01	2.03	2.05	
97	1.41	1.54	1.62	1.67	1.70	1.72	1.74	1.77	1.79	1.81	1.83	1.85	1.86	1.87	1.87	
96	1.14	1.38	1.49	1.55	1.59	1.61	1.63	1.65	1.67	1.68	1.70	1.71	1.73	1.74	1.75	
95	1.35	1.44	1.49	1.52	1.54	1.55	1.56	1.58	1.59	1.61	1.62	1.63	1.63	1.64	1.64	
94	1.13	1.32	1.39	1.43	1.46	1.47	1.48	1.49	1.50	1.51	1.52	1.53	1.54	1.55	1.55	
93	1.29	1.35	1.38	1.40	1.41	1.42	1.43	1.44	1.44	1.45	1.46	1.46	1.47	1.47	1.47	
92	1.12	1.26	1.31	1.33	1.35	1.36	1.36	1.37	1.37	1.38	1.39	1.39	1.40	1.40	1.40	
91	1.11	1.23	1.27	1.29	1.30	1.30	1.31	1.31	1.32	1.32	1.33	1.33	1.34	1.34	1.34	
90	1.10	1.20	1.23	1.24	1.25	1.25	1.26	1.26	1.26	1.27	1.27	1.27	1.28	1.28	1.28	
89	1.09	1.17	1.19	1.20	1.20	1.21	1.21	1.21	1.21	1.22	1.22	1.22	1.22	1.23	1.23	
88	1.07	1.14	1.15	1.16	1.16	1.16	1.16	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	
87	1.06	1.11	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.13	1.13	
86	1.04	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	
85	1.03	1.05	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	
84	1.01	1.02	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
83	1.00	0.99	0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	
82	0.97	0.96	0.95	0.94	0.93	0.93	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
81	0.96	0.93	0.91	0.90	0.90	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	
80	0.93	0.90	0.88	0.87	0.86	0.86	0.86	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.84	
79	0.91	0.87	0.85	0.84	0.83	0.82	0.82	0.82	0.82	0.81	0.81	0.81	0.81	0.81	0.81	
78	0.89	0.84	0.82	0.80	0.80	0.79	0.79	0.79	0.78	0.78	0.78	0.78	0.77	0.77	0.77	
77	0.87	0.81	0.78	0.77	0.76	0.76	0.76	0.75	0.75	0.75	0.74	0.74	0.74	0.74	0.74	
76	0.84	0.78	0.75	0.74	0.73	0.73	0.72	0.72	0.72	0.71	0.71	0.71	0.71	0.71	0.71	
75	0.82	0.75	0.72	0.71	0.70	0.70	0.69	0.69	0.69	0.68	0.68	0.68	0.68	0.68	0.67	
74	0.79	0.72	0.69	0.68	0.67	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.64	0.64	0.64	
73	0.76	0.69	0.66	0.65	0.64	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.61	0.61	
72	0.74	0.66	0.63	0.62	0.61	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59	0.58	0.58	
71	0.71	0.63	0.60	0.59	0.58	0.57	0.57	0.57	0.57	0.56	0.56	0.56	0.56	0.55	0.55	
70	0.68	0.60	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.52	
69	0.65	0.57	0.54	0.53	0.52	0.52	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	
68	0.62	0.54	0.51	0.50	0.49	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.47	0.47	0.47	
67	0.59	0.51	0.47	0.47	0.46	0.46	0.46	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.44	
66	0.56	0.48	0.45	0.44	0.44	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.41	0.41	0.41	
65	0.52	0.45	0.43	0.41	0.41	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.39	
64	0.49	0.42	0.40	0.39	0.38	0.38	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	
63	0.46	0.39	0.37	0.36	0.35	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.33	
62	0.43	0.36	0.34	0.33	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	
61	0.39	0.33	0.31	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28	
60	0.36	0.30	0.28	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	
59	0.32	0.27	0.25	0.25	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	
58	0.29	0.24	0.23	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.20	0.20	0.20	
57	0.25	0.21	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	
56	0.22	0.18	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	
55	0.19	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	
54	0.14	0.12	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
53	0.11	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
52	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
51	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

NOTE: For negative values of Q_U or Q_L, P_U or P_L is equal to 100 minus the table P_U or P_L. If the value of Q_U or Q_L does not correspond exactly to a figure in the table, use the next higher value.

Mat Density Incentives

**Table 430-12
 Adjustment Factors for
 FAA 40, 41, 42 and 43**

Adjustment Factor	Avg. Pavement Density
1.03	≥ 92.6%
1.02	92.1% - 92.5%
1.00	91.0% - 92.0%
0.98	90.0% - 90.9%
0.95	89.5% - 89.9%
0.91	89.0% - 89.4%
0.85	88.5% - 88.9%
0.70	88.0% - 88.4%

**Table 430-13
 Adjustment Factors for FAA
 44 and 45**

Adjustment Factor	Avg. Pavement Density
1.05	≥ 93.6%
1.03	93.1% - 93.5%
1.00	92.0% - 93.0%
0.98	91.0% - 91.9%
0.95	90.5% - 90.9%
0.91	90.0% - 90.4%
0.85	89.5% - 89.9%
0.70	89.0% - 89.4%

Thank You

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