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EFFECT OF DELAY IN TESTING
ASPHALT CONCRETE SPECIMENS FOR
MARSHALL STABILITY.

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Effect of Delay in Testing Asphalt
Concrete Specimens for Stability.

PURPOSE

The Central Laboratory has been delaying the mix design testing of 2 1/2" X 4" Marshall specimens for stability, until the next day after molding. For example, if the mixes are made and samples molded on Friday a man would have to come in and work on Saturday to test these specimens. The reason for this is that the ASTM-D1559 "Resistance to Plastic Flow of Bituminous Mixes Using Marshall Apparatus," states that "the specimens after being molded shall be carefully transferred to a smooth, flat surface and allowed to stand overnight at room temperature, before being weighed, measured and tested."

The AASHTO procedure, AASHTO Designation T-245-82 "Resistance to Plastic Flow of Bituminous Mixtures using Marshall Apparatus," does not say when the specimens shall be tested for stability. The IDOT Lab. Specifications, Test Method No. Iowa 502-B and test method No. Iowa 506-C "compacting asphaltic concrete by the Marshall Method" and "Resistance to Plastic Flow of Bituminous Mixtures Using the Marshall Apparatus," respectively, only state that the specimens shall be cooled before testing.

Due to the above conflict in specifications, a number of mix samples were tested, in the Central Lab, for stability on different days. This should furnish enough information to allow us to change the procedure and to test for stability the same day molded, or be able to delay the testing for 3 days or more.

PROCEDURE

In November, 1985, extra hot mix box samples were obtained from several projects. These box samples were left over from the regular project testing. From 12 to 15 specimens were molded from each mix on the same day. Three specimens from each mix were put in a refrigerator @ 40°F for 7 days before testing. The other specimens were arranged in groups of three, keeping samples from each mix separate, and stored at room temperature. On each day specimens were tested, a group of three were selected from the different groups within the same mix, brought to proper testing temperature and tested for stability. The IDOT Lab. Specifications, Test Methods No. Iowa 502-B and Iowa 506-C were followed in preparing and testing these specimens.

RESULTS

The following results show the average of the three stabilities for each mix per day tested.

MIX #	0-DAY	1-DAY	3-DAYS	7-DAYS	REFRIG. @40°F 7-DAYS	AVE. FIRST 4-DAYS
1	2163	2210	2187	2107	2198	2167
2	2188	2237	2327	2143	2152	2224
3	2463	2327	2518	2452	2388	2440
4	2527	2585	2655	2643	2617	2603
5	1923	1960	1887	2050	2112	1955
6	2622	2590	2432	2690	2670	2585
7	2297	2223	2298	2152	2263	2243
8	2117	2128	2032	2108	2183	2096
9	2172	2203	2172	2168	2350	2179
10	2017	2043	2183	2073	0	2075
11	2207	2283	2372	2443	2355	2326
12	1962	1967	1857	2020	0	1952
13	0	2253	2330	2258	0	0
AVE.	2221.5	2231.5	2250	2254.4	2328.8	2237

Mix numbers 1-2-3-9-11 are from the same project, but this was not known until this work was completed. Mix numbers 4 and 7 are from the same project, which also was not known until this work was completed. The averages for the mix stabilities for the different days only increased 10 lbs. from day 0 to day 1 and 19 lbs. from day 1 to day 3, and then only 4 more lbs. from day 3 to day 7. The average (ave) for the 4 days is lower than the day 1 stabilities in 7 of the 12 days.

Six of the twelve mixes have a lower stability, on the 7th day of testing than the day the specimens were molded.

Six of the twelve mixes have equal to or lower stabilities on the 3rd day of testing than the day the specimens were molded or the 1st day of testing.

Six of the twelve mixes have lower stabilities on the 3rd day of test than the 1st day.

The stabilities of the refrigerated specimens averaged approximately 100 lbs. higher than the days 1 and 0 tests.

I have no theories for this difference.

CONCLUSIONS

The stabilities for any one mix ranging from day 0 to day 7 are quite close, with probably less than 10% difference in any one of the mixes. The differences are insignificant from day 0 to day 1 to day 3 to day 7.

The work done by the Central Materials Laboratory and reported by John Roland in MLR-82-2 "Effect of Oven Heating Time of Asphaltic Concrete on Marshall Stability," dated July 1982, shows that there is a pronounced increase in Marshall Stability, if the mix is left in the oven only one extra hour before molding. This variance, which falls within the Marshall Stability test procedure, far overshadows the difference in the delay of testing when the samples are already molded and stored at room temperature.

The effect of oven heating for only one extra hour before molding ranged from 2.6% to 33.9% increase in Marshall Stability depending upon the mix. The increase in stability went from 15.4% to as high as 72% when oven heated for an extra 4 hours, depending upon the mix.

When considering all of the information presented, a mix may be tested for stability the same day it is mixed provided the test specimens have been allowed to cool before testing. These specimens may also be tested any following day, up to 7 days, as long as the specimens have been stored at room temperature, without any significant difference in results.

RWM/esb

July 3, 1986