Improving Asphalt Pavement Construction by Using a Modified Mixture Design: A Demonstration Project

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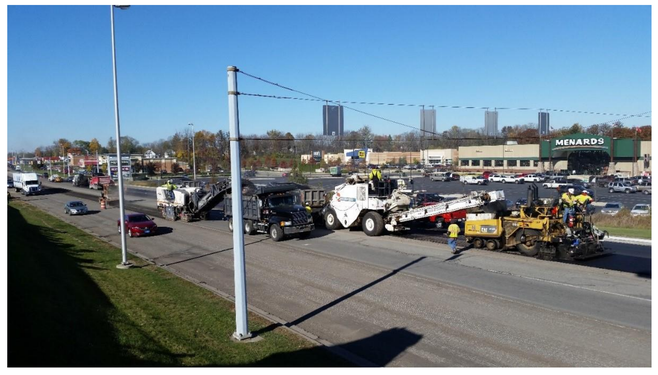
1 BACKGROUND

- US 40, Richmond, IN
- Increase pavement density:
  - Control section using best practices (94% Gmm)
  - Test section using modified mixture design (95% Gmm)
- Increase initial in-service density by 1% (Tran et al., 2016):
  - 8% - 44% fatigue performance improvement
  - 7% - 66% rutting resistance improvement
  - 10% - 30% increase in the pavement service life

2 SCOPE

- Mill and replace 1.5 in. of asphalt surface
- 4 lanes and turn lane (1.8 centerline miles)
- 5300 tons of new asphalt mixture
  - Control mixture lot = 2650 tons, 5 sublots (530 tons)
  - Test mixture lot = 2650 tons, 5 sublots, (530 tons)



3 MIXTURE DESIGN

Volumetric Property	Control mixture	Test mixture
Design Gyrations, N_{des}	100	50
V_a @ N_{des}, %	4.0	5.0
Design P_b, %	6.7	7.1
Design P_{be}, %	5.2	5.2
VMA, %	15.6	16.7
Target in-place density, %	94.0	95.0

- Mixtures designed at 5% air voids:
  - Superpave 5
  - Lower number of design gyrations
  - Same effective asphalt binder content
  - Improved asphalt mixture mechanical properties

4 MATERIALS

Aggregate	Control mixture	Test mixture
#11 Stone	49.0	46.5
# 12 Stone	10.0	8.0
# 24 Sand	22.0	-
Crushed gravel sand	-	27.0
RAP	14.5	14.1
RAS	3.0	2.9
Baghouse	1.5	1.5

Asphalt binder: PG 70-22

5 PRODUCTION

- Drum mix facility
- Mixing temperature, 315 ± 25°F
- Plant production, 210 tons/hour

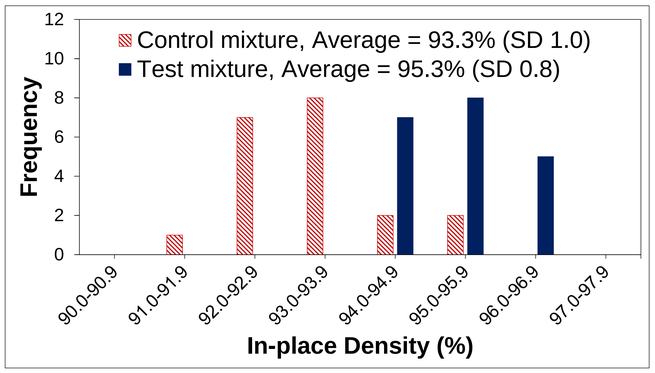
6 COMPACTION

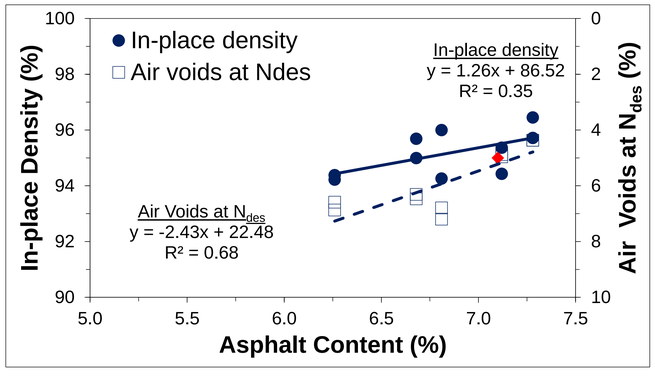
	Breakdown	Finish
Number of Rollers	2 (echelon)	1
Vibratory Passes	5	0
Static Passes	2	5
Operating Weight, ton	13	12
Drum Width, in.	79	67

7 MIXTURE SAMPLING

- Plate and core samples.
- QC/QA Data

8 RESULTS





9 CONCLUSIONS

- Asphalt mixtures designed at 5% air voids can be field compacted to 95% density without additional compaction effort
- Enhanced correlation between laboratory and field volumetric properties
- Improved pavement service life performance

10 ACKNOWLEDGEMENTS

INDOT and JTRP