Validation of $N_{design}$ in Iowa

Abstract

The design number of gyrations, or $N_{design}$, in the Superpave mix design method will be validated in the State of Iowa. Pavements constructed in 2011 were randomly selected to determine if 4% air voids was achieved four years post-construction. The quality control and quality assurance (QC/QA) information at construction was matched with four year post-construction densities from field cores to determine if traffic loading is adequately compacting the surface mix. Over-compaction during design may lead to under-compaction in the field as well as reduce asphalt content and affect overall durability.

Experimental Plan

Results and Analyses

Pavement Performance Evaluation using PMIS and LTPP

• International Roughness Index (IRI) was used as an overall indicator of ride quality.
• Highest IRI was 1M ESALs located in Clinton County
• Overall, showed adequate post-construction performance using IRI metric

Air Voids at construction and four years post-construction

• 33% in 1M and 3M and 56% for 10M ESALs will never reach
• Only 11% of samples collected reached 4% target air voids (mainly from projects at 100-300K ESALs

Results and Analyses

Gyroratory Compaction Slope

• The difference in theoretical $N_{design}$ four years post-construction and at construction indicates the applied post-construction compaction effort (PCCE)
• The least traffic volume experienced the most compaction effort due to traffic and vice versa

Conclusion

• Over-compaction during laboratory design, leads to under-compaction in the field.
• Difficulty in compaction during construction results in decreased durability and increased fatigue cracking.
• Majority of pavement sections did not reach ultimate pavement density
• PCCE decreases with increasing ESAL levels
• Require further evaluation of mix design (e.g., agg. source)