Comparison of FORTA Fiber Reinforced Mixture Using the Mechanistic Empirical Pavement Design Guide (MEPDG)

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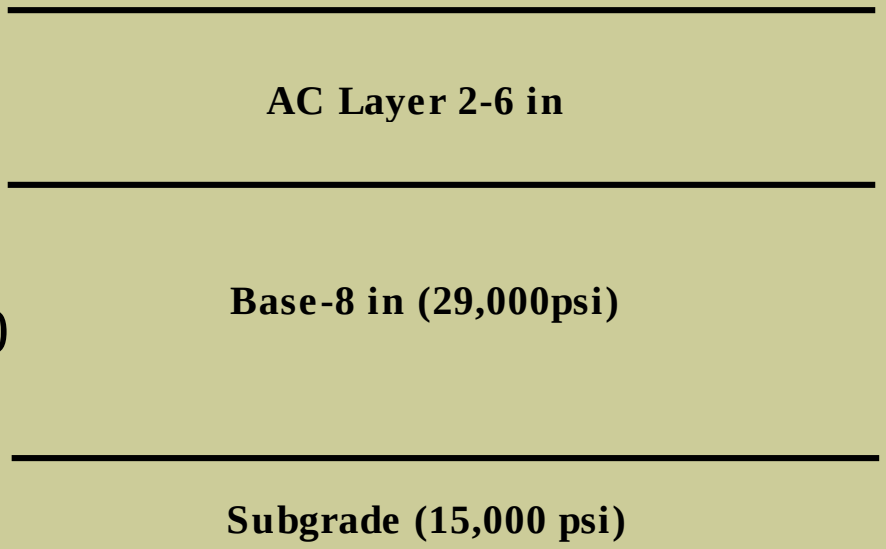
Objective

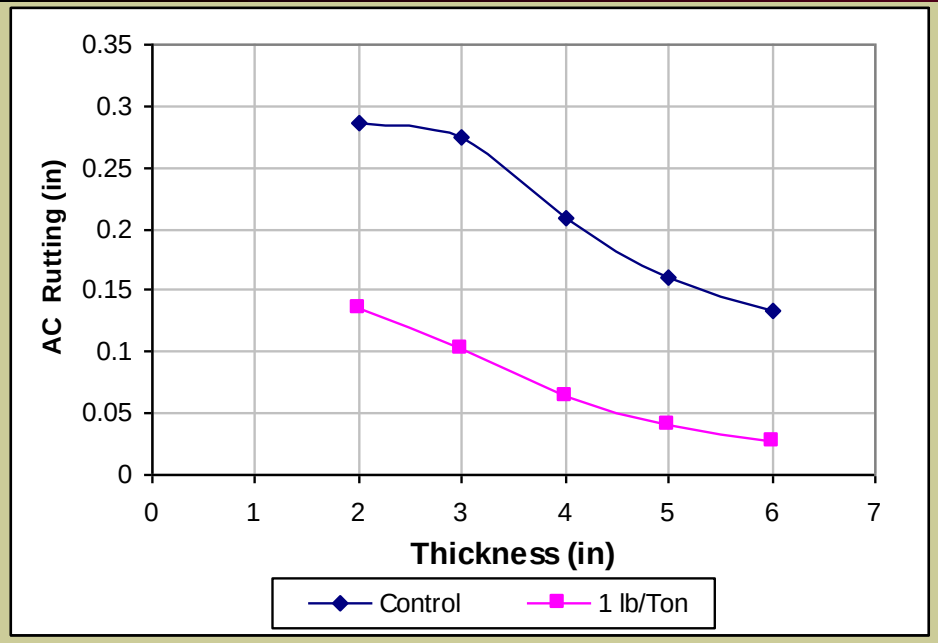
- Use the results of the advanced laboratory tests conducted at ASU for the FORTA fiber reinforced asphalt mixture to assess field performance and evaluate impact on pavement design thicknesses.
- Use the results as input into the newly developed pavement design software (Mechanistic Empirical Pavement Design Guide (MEPDG))

Approach Description

- A total of 10 runs were performed for each of the control and fiber reinforced asphalt (1 lb/ton) mixtures as follows:
- 2 Traffic Levels, 1500 and 7000 AADT (intermediate and high traffic)
- 5 Different Asphalt Concrete (AC) layer thicknesses (2-6 in)
- Project Location: Phoenix
- Design Life: 10 years
- Distress Evaluated: Rutting and Fatigue Cracking



AC Rutting Only Vs. Thickness - Results

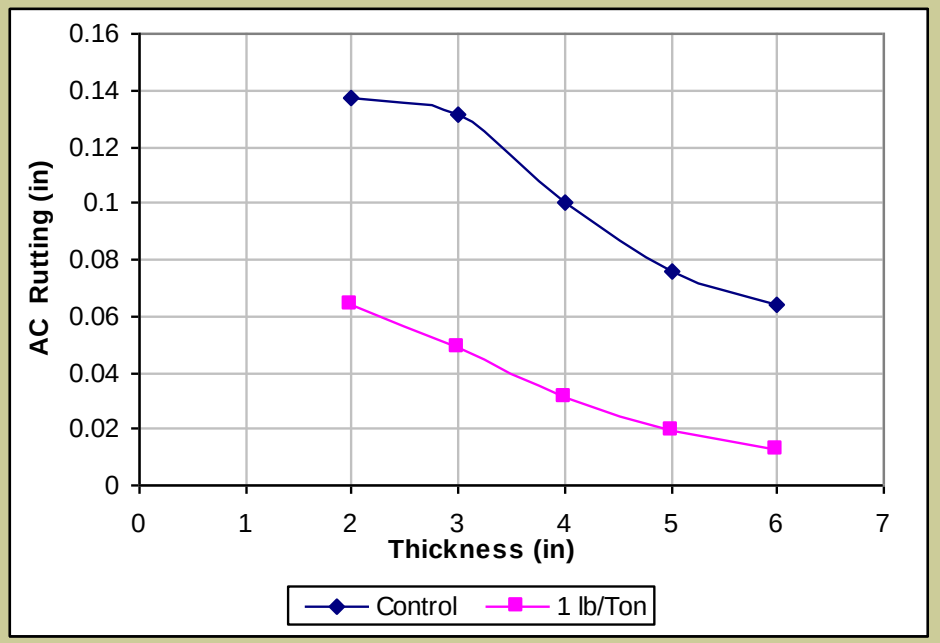


← AADT=7000 ~50,000,000 ESAL's

AADT = Annual Average Daily Traffic

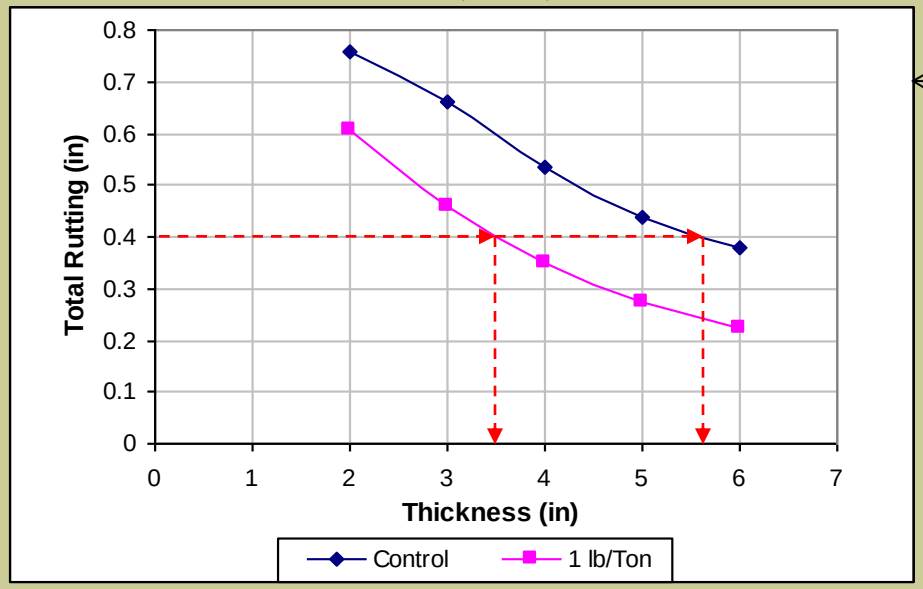
ESAL = Equivalent Single Axle Load

AADT=1500 ~10,000,000 ESAL's →



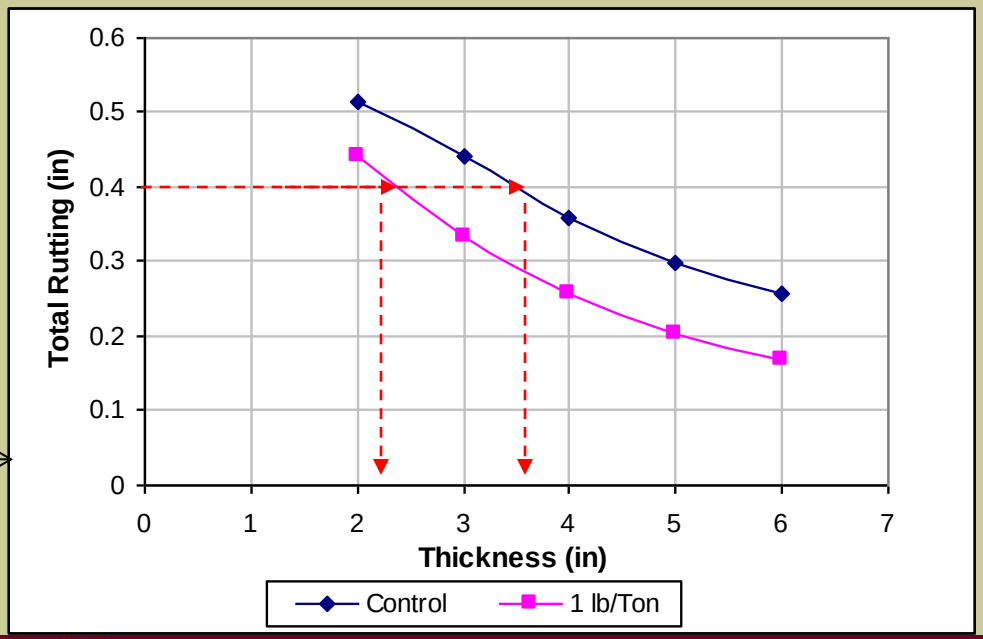
Total Pavemet Rutting Evaluation

AADT=7000~50,000,000 ESAL's



To reach no more than 0.4 inches of rutting during a design period of 10 years, a control AC pavement thickness would require 5.5 inches; whereas the fiber reinforced AC layer thickness needed would be only 3.5 inches; a saving of 2 inches.

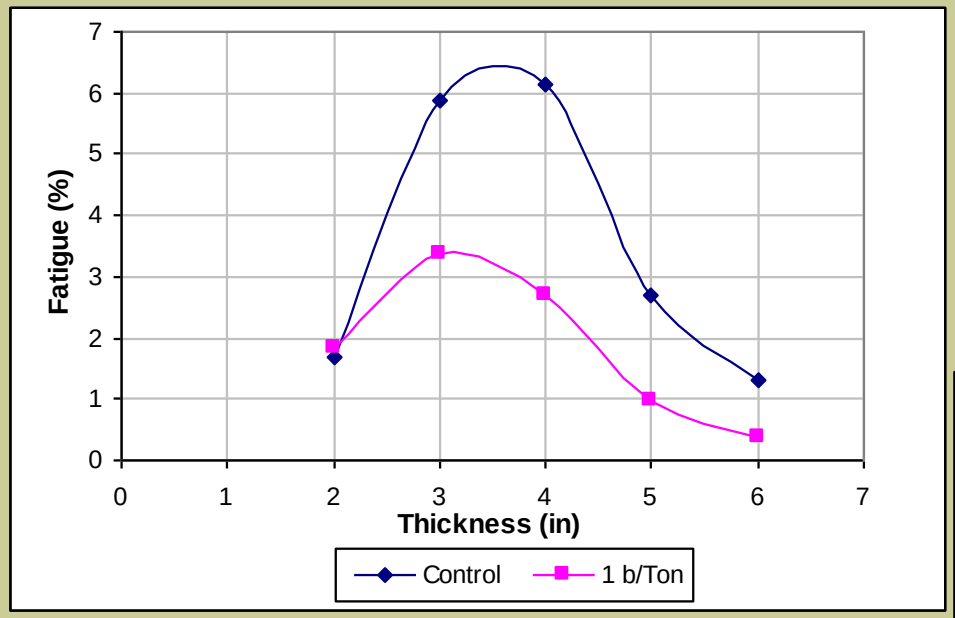
AADT=1500~10,000,000 ESAL's



Similarly for an intermediate traffic analysis, the saving would be 1.5 inches of AC layer thickness

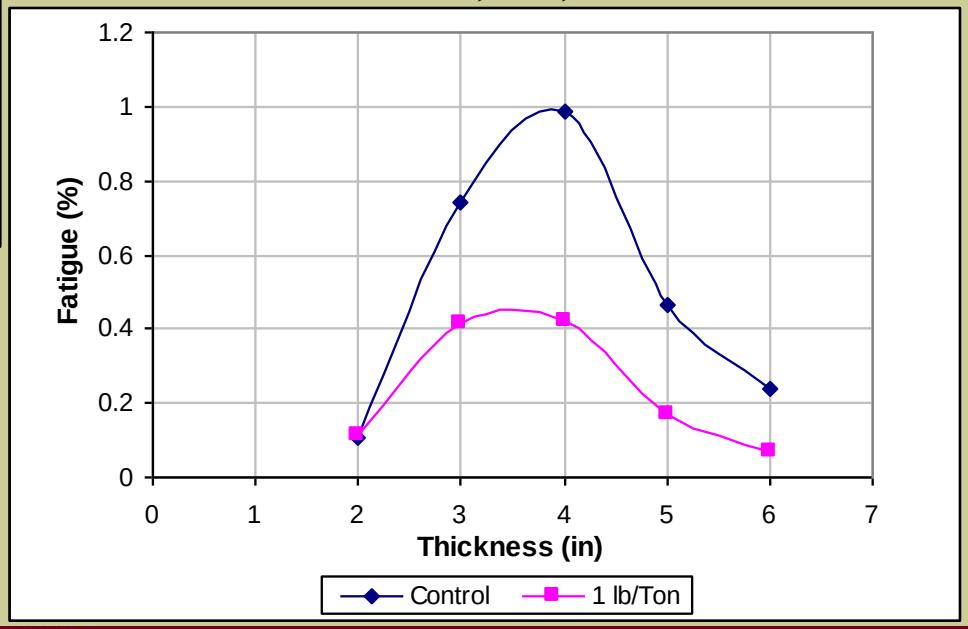
Fatigue Cracking Evaluation

AADT=7000~50,000,000 ESAL's



Fatigue Cracking analysis also show similar trends, but it is also dependent on the AC layer thickness (thin versus thick). The amount of Fatigue cracking predicted for intermediate level traffic (below) is insignificant.

AADT=1500~10,000,000 ESAL's



Findings

- FORTA fiber reinforced asphalt mixture performs better than the control mixture against Rutting and Fatigue irrespective of the thickness of the AC layer.
- This performance can be translated to savings in the asphalt layer thickness.
  - For the rutting distress criteria, reduced AC layer thickness of about 1.5 to 2 inches can be achieved, depending on the traffic level of the roadway.
  - For Fatigue Cracking, the greatest potential is associated with asphalt layers that are typically in the 3 to 5 inches thickness range.