

The work described in this document was performed by Transportation Technology Center, Inc.,
a wholly owned subsidiary of the Association of American Railroads.

Design Methodology for Hot Mix Asphalt Underlayment with Crossing Diamonds

Steven M. Chrismer*, David D. Davis, and Lamont Smith*

Summary

Transportation Technology Center, Inc. has developed a design method and recommended designs for hot mix asphalt (HMA) underlayments at crossing diamonds. A parametric analysis of typical subgrade conditions and mainline railroad loadings was conducted. These results have been compiled into an easy to use design chart for HMA thickness versus subgrade stiffness.

Findings:

- Subgrade soil with a resilient modulus less than 4,000 psi (softer clays) will not provide adequate HMA life under a diamond crossing. These soils must be further improved prior to HMA application. For stiffer subgrade soils, the HMA fatigue life can range from several hundred to several thousand million gross tons, depending upon the subgrade resilient modulus and the HMA layer thickness.
- The expected failure mechanism for HMA underlayment beneath crossing diamonds is one of fatigue cracking.
- The most important factors in the design method are HMA layer thickness and subgrade stiffness (resilient modulus).
- The HMA fatigue model that appears to provide fatigue cracking life values closest to that observed for track underlayments is the Shell Petroleum design method, which is a failure criterion that relates the number of load cycles to fatigue cracking.¹

HMA pavements can be used to improve the performance of crossing diamonds and other high dynamic load track segments. HMA underlayments are one method of strengthening track foundations to improve track superstructure performance. Railroads are looking for standardized designs for HMA similar to what is available for ballast section, crossties, and rail.

This work was sponsored by the Association of American Railroads as part of its Strategic Research Initiatives Program.

* LTK Engineering Services



