Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6814: Performance Evaluation and Specification of Trackless Tack

Background

Trackless tack is a popular material for bonding pavement layers. While conventional tack tends to be sticky and messy, trackless tack hardens quickly at ambient temperatures and then reactivates when hot-mix asphalt (HMA) is laid over the tack and compacted. Several trackless tack products have come to market in Texas; however, there are currently no specifications to ensure the products have trackless properties and adequate bond strength.

This project:

- Evaluated the tracking resistance of different trackless tack products.
- Evaluated the bond strength of different trackless tack products and other construction parameters (surface type, tack reactivation temperature, and compaction effort).
- Constructed trackless tack test sections in the field and evaluated initial performance.
- Developed specifications for trackless tack and associated test procedures.

What the Researchers Did

Researchers compared two tracking resistance tests for tack: a track-free time test and a modified dynamic shear rheometer (DSR) tackiness test.

Researchers compared four bond strength tests: interface shear, pull-off, torque, and Arcan. Then, using the recommended test, the researchers compared the bond strengths and bond energies achieved with different trackless tack types, surface types, reactivation temperatures (average of surface and HMA temperature), and compaction efforts.

Researchers also assessed the susceptibility of bonded samples to cracking using the overlay and beam fatigue tests.

On three overlay projects, located on US 183, SH 336, and US 96, test sections were constructed with different tack types, application rates, and surface types. The researchers collected cores and measured bond strength in the lab. The researchers also measured core bond strengths from a wide range of overlay projects in the Laredo District.

What They Found

The track-free time test and the DSR tackiness test both distinguished between trackless tack and conventional tack. The DSR test further distinguished among stiff-residue and soft-residue trackless tacks. The stiff-residue tacks had the best resistance to tracking.

The most repeatable and practical bond strength test was the interface shear test. The laboratory-molded samples had very high bond strengths (about 100–200 psi), much higher than seen in the field. Stiff-residue trackless tacks had the highest bond energies, and all tack types had acceptable performance. Bond strength increased with higher reactivation temperatures (Figure 1) and decreased

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for concrete-surface samples. Compaction effort had no significant effect on bond energy.

Concerning cracking resistance tests, the overlay test was not sensitive to tack type, but the bending beam fatigue tests were. Trackless tack samples lasted more cycles than a sample with no tack. No samples experienced temperature-related delamination.

Bond strengths from field samples were considerably lower than for laboratory-compacted samples. US 96 had the highest bond strengths (60–95 psi), US 183 had low strengths (25–50 psi), and SH 336 had very low strengths (15–30 psi). The range in bond strength is related to different pavement surface types, different HMA overlay designs, and different compaction temperatures. In most cases tack rate did not affect the bond strength.

What This Means

The researchers recommend adopting the DSR tackiness test and track-free time test to qualify trackless tack materials. The researchers also recommend adopting the shear bond strength test. Draft test methods and a trackless tack material specification are provided in the full report.

The laboratory results suggest that all the trackless tack products can produce high bond strengths. Several other factors, not just tack type, have an equal or greater impact on overall bond strength. The highest bond strengths are achieved between overlays over new or milled HMA and when compacting at higher temperatures. Overlay designs with higher binder contents may also improve bond strength. Tack application rates did not appear to have a significant effect on bond strength.

This study did not consider long-term performance. Tack type and application rate may be more significant over time, mitigating moisture-related damage and increasing bond strength through age hardening.

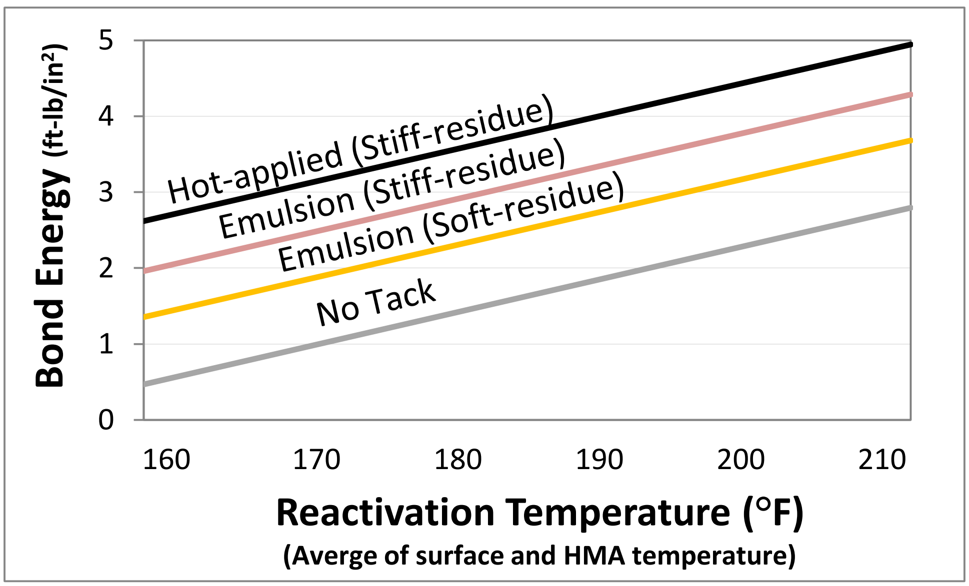

Figure 1. Bond Energy versus Trackless Tack Type and Reactivation Temperature.

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