Research Summary

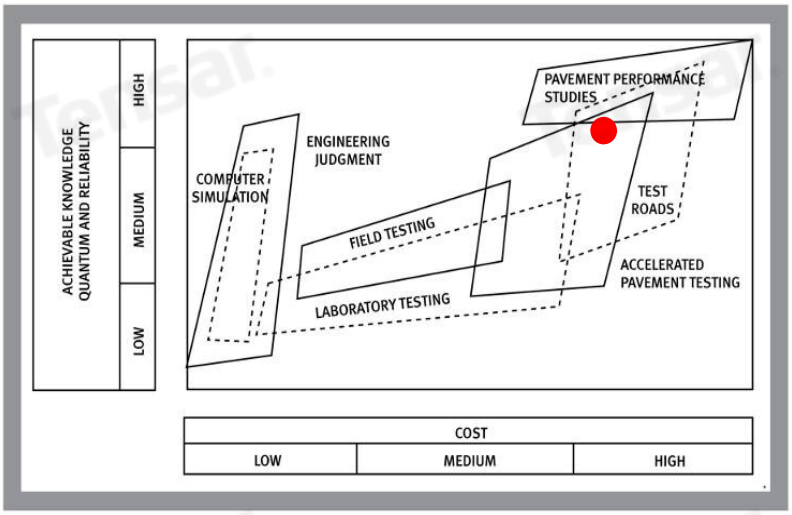
Structural Condition Assessment of Reinforced Base-Course Pavement -- US Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL)

***Application:* Pavement Optimization**

Type:
- Field Structural Performance Study

Geogrid Products Tested:
- TX160

Section Profiles:
- 5-6" (127-152 mm) Asphalt Surface
- 5-24" (127-610 mm) Thick Aggregate Base
- 12-44" (305-1118 mm)Thick Aggregate Subbase
- Control Section contained separation fabric at bottom of subbase
- One section contained a separation fabric at bottom of subbase and a layer of TX160 between the base and subbase
- One section contained a layer of TX160 between the base and subbase



Where this study fits within the matrix of pavement research (after Hugo et al 1991)

Background:
The US Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) teamed with the New Hampshire DOT (NHDOT) to perform a structural condition assessment of three distinct pavement sections. The report, released in November 2015, presents the results of a 4-year study focused on a 2-mile section of Pickering road in Rochester, New Hampshire. The northernmost section contained TX160 geogrid within the base course. The southernmost section contained a woven geotextile separator between the subgrade and the subbase layer. The intermediate section included both the TX160 geogrid in the base course and the woven geotextile separator between the subgrade and subbase layers. The study location was within a region of the country which experiences freeze-thaw conditions. In this regard, the pavement sections in this study experienced 164 freezing days for the winter of 2013-2014 (1031.6°C freezing degree-days), and 145 freezing days for the winter of 2014-2015 (1162.4°C freezing degree-days). This remains the regions highest number of degree freezing days recorded over the past 15 years.

Purpose/Objective:
Evaluate the structural benefit of the geogrid through a comparative assessment.

Test Procedure:
In 2014, NHDOT drilled nine borings to verify the thickness of the pavement structure. The test borings went to a depth of between 6 and 6.5 feet (1.8-2 meters) below the pavement surface. Asphalt, base, subbase and subgrade materials were sampled at this time. Based on the test borings the asphalt layer thickness varied from 5 to 6 inches (127-152 mm).

To evaluate frost penetration, the NHDOT installed frost tubes. This equipment was used to indicate frost and thaw depths in the pavement. The maximum frost depths measured were 42 to 45 inches (1067-1143 mm) during the 2014-2015 winter. This information was necessary to establish the appropriate time for FWD testing. Seasonal structural assessment consisted of falling weight deflectometer (FWD) testing on all pavement sections. Additionally, probes were installed in the pavement sections to monitor moisture and temperatures at depth. Significant back-calculations were performed to determine structural benefits and responses.

Results / Key Findings:
Key reported findings included:

1) An 18 to 19 inch (457-483 mm) range of unstabilized base course is equivalent to 8 to 11 inch (203-279 mm) of TriAx TX160 stabilized base course.
2) Based on the seasonal back-calculated moduli, for 2014 and 2015 values, the TX160 stabilized pavement section provided higher moduli than the other sections.
3) The study found that the aggregate layer thickness can be reduced to 33%-42% if the base course is stabilized with TriAx TX160 geogrid.
4) Addition of a geogrid should minimize the influence of thermal cracking

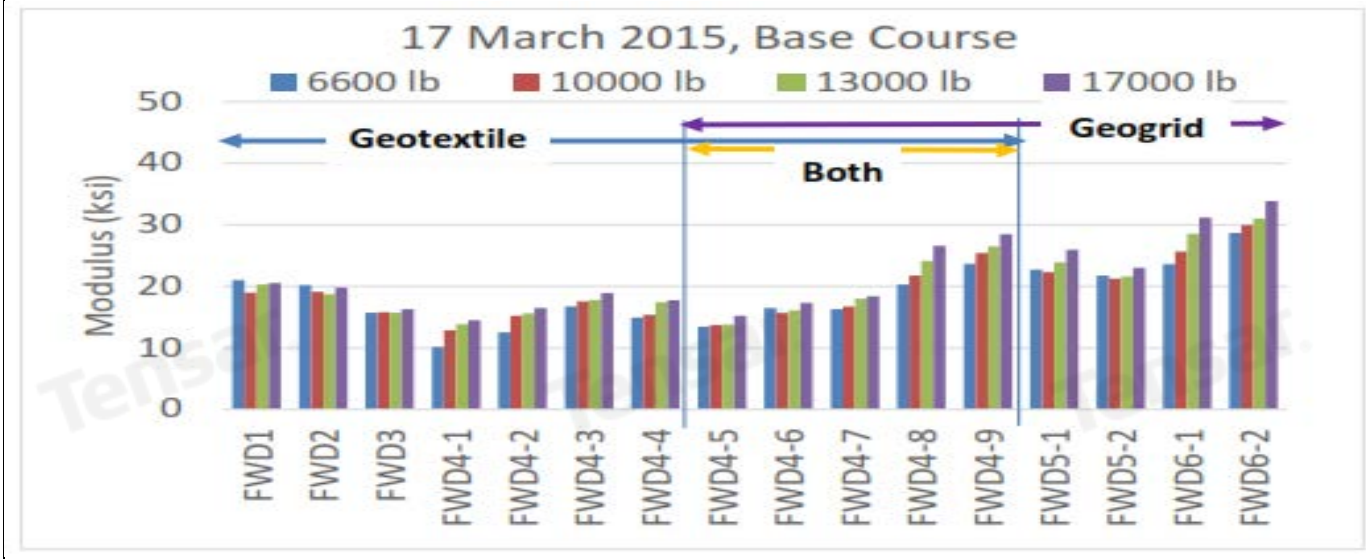


Figure 1: Average values of back-calculated moduli for four loads

Figure 2: Borings performed to verify thicknesses and materials

Figure 3: Installation of frost tubes and moisture probes. Instrumentation continuously read by data-logger

Figure 4: FWD testing performed at four load settings during spring summer and fall. Locations were based on consistent locations

References:

1. Rosa T. Affleck, Charles Smith, Andrew Benier, Jude Arbogast, Aaron Smart, Ann Scholz,, November 2015, "Structural Condition Assessment of Reinforced Base-Course Pavement", ARDC/CRREL TR-15-17