Field verified benefits of geogrids to reduce risk and improve performance of flexible pavements

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EXTENDED ABSTRACT SUBMISSION

One challenge associated with the design and construction of flexible pavements is variable subgrade conditions. While designers use assumed subgrade resilient modulus values based on field investigations, the assumed values fail to provide a complete assessment of actual subgrade conditions. This subgrade variability can lead to premature failure and increased pavement maintenance that can significantly escalate long-term costs for public agencies and owners. Using data collected through third-party, full-scale laboratory and in situ field testing, this presentation will highlight the ways geogrids have been proven to mitigate the effects of variable subgrade conditions. By creating more reliable and uniform subgrade conditions, geogrids reduce project risk, allowing agencies and owners to extend maintenance cycles, supplement sustainability goals and stretch shrinking budget dollars over more projects.

The Town of Gilbert is in the Phoenix metropolitan area. Geologically, this area is known to be underlain by clayey material with medium to high plasticity, that is highly moisture sensitive. The construction consisted of removal of the existing pavement section and construction of a new section. Figure 1 presents the planned pavement section.

The alternative geogrid design reduced the amount of subgrade export and import of aggregate base by reducing the aggregate base section to 10 inches using TriAx Geogrid. Additionally, by using geogrid this minimized the potential for problematic soils delaying construction. To provide the Town of Gilbert with added data from the construction, the geogrid manufacturer/designer agreed to contract with a third-party to perform a series of Automated Plate Load Test's (APLT) at the project site. APLT is a testing system developed to perform fully automated static and repetitive/cyclic plate load tests, per AASHTO and ASTM test methods to measure the performance of the aggregate base.

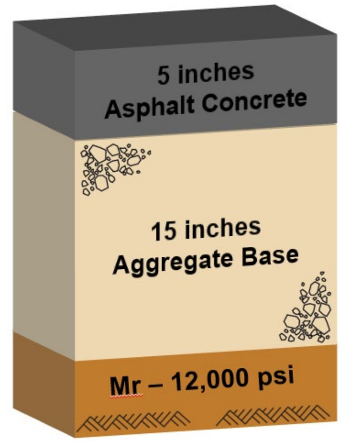

Figure 1

As part of the evaluation process the geogrid manufacturing representative performed Dynamic Cone Penetrometer (DCP) Testing of the subgrade at the site as well obtained samples of the subgrade for laboratory testing. The tests showed the subgrade at the site was highly variable. Table 1 presents a summary of the test results.

Table 1 - Summary of Measured Subgrade Strengths

Type of Test	Depth	Resulting Mr
DCP[1,2]	0-12 inches	9 MPa
	12-24 inches	13.5 MPa
	24-36 inches	37 MPa
CBR[2]	Grab Sample 0-36 inches	38 MPa
R-Value[3]	Grab Sample 0-36 inches	43 MPa

1.DCP-US Army Corp Correlation
2. Mr=1,500 X CBR
3. R-Value correlation based on ADOT

Table 1 presents a summary of the measured in-situ subgrade strengths. The measured in-situ subgrade strengths were less than what designer originally assumed to be on site. Additionally, the subgrade strength was less than what the Arizona Department of Transportation (ADOT) Table 2-3 Plasticity-Index and Fines Content Correlation Chart showed. Using this chart as opposed to performing actual laboratory tests is an accepted standard of practice in the Arizona region. The lower strengths are most likely the result of adjacent surface irrigation water and rains during construction saturating the subgrade. From a constructability perspective this needed a modification to the placement of aggregate base. The modification consisted of placing a thickened base section on the geogrid and then cutting the aggregate base to grade for the planned final thickness of 10 inches. This method reduces the potential for added stresses on the subgrade that cause the subgrade to pump.