Accelerated Plate Load Performance Based Testing – Hunt Highway, AZ

Type of Research:
- Performance Validation Accelerated Plate Load Testing

Research Organizations
- Ingios Geotechnics, Inc.

Geosynthetic Product Tested:
- Tensar TriAx TX5

Field Testing
- Field performance testing conducted to determine in-situ resilient modulus and modulus of subgrade reaction of the TX5 mechanically stabilized base course.
- In-situ testing involved performing 1,000 cycle APLT tests using a 12 in. diameter plate. Dynamic cone penetration (DCP) tests were performed to verify base thickness and to determine field CBR values of the base course and subgrade.

Field Experimental Study:
- The roadway sections in this study included a flexible pavement section with a nominal 5 inches of aggregate base course over a CBR = 5% to 50% (decreasing w/depth) subgrade. TX5 was placed at the subgrade/base interface. The HMA surface was installed spring 2015.
- The following table provides a summary of details of the APLT configuration, load cycles, and cyclic stresses.

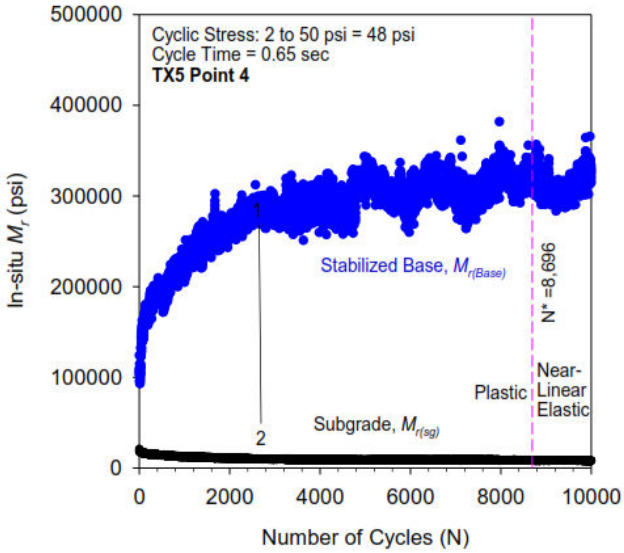
Test Designation	Property	Number of Load Cycles	Target Stress Range (psi)		Configuration/Notes
			Min	Max	
A	Resilient Modulus	1000 and 10,000	2	50	12 in. diameter, flat plate including deflection readings @ 2r and 3r
B-1	Ev2 test	2	0	Stress to reach 0.2 inch def.	Static Test, 12 in. diameter, flat plate, load applied in six increments per DIN 18134 (2001)
B-2		2	0	72.5	
C	Modulus of Subgrade Reaction	2	0	30	30 in. diameter, flat plate, in 5 psi increments per AASHTO T222
D	Resilient Modulus	2000	3	60	8 in. diameter, flat plate w/ 24 in. confining plate

Results:

Dynamic Cone Penetration (DCP)
- The CBR profiles show increasing CBR from about 10% to 50% with depth through the aggregate base course layer and then a reduction in CBR through the subgrade layer.
- The subgrade profile shows that CBR decreases with depth from about 50% to 10%.

In-Situ Resilient Modulus and Permanent Deformation
- The average in-situ composite resilient modulus in the TX5 geogrid section was 34,251 psi.
- The layered analysis in-situ resilient modulus averaged 155,694 psi for the mechanically stabilized base layer and 16,144 psi for the subgrade layer.
- The in-situ resilient modulus of the stabilized base increased to 321,881 psi after the 10,000 cycle permanent deformation test. (~2 times higher than the average resilient modulus from the 1,000 cycle tests)

- The permanent deformation test result shows that the deformation rate increases near-linearly with increasing load cycles.
- Permanent deformations were observed to increase at a near-linear rate with increasing load cycles for some of the 1,000 cycle tests and the 10,000 cycle test. This near-linear trend is presumably linked to the frictional characteristics of the aggregate particles and number of grain contacts.

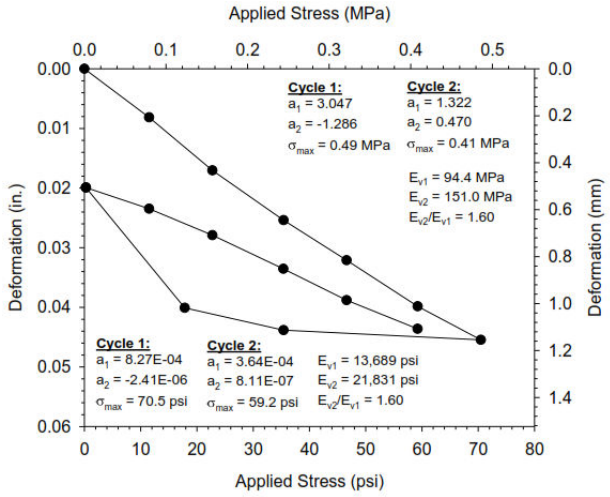


In-situ Confining Stress Dependent Modulus

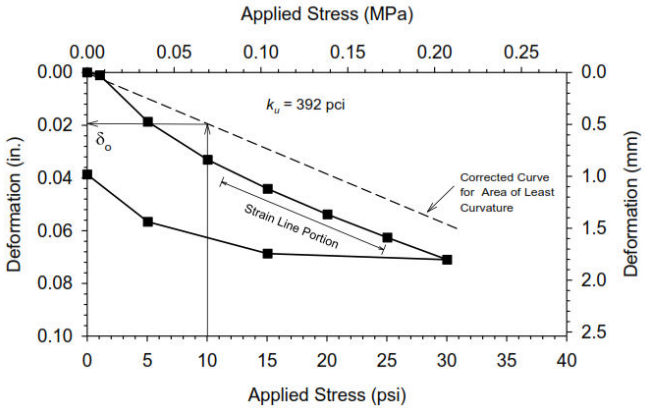
- In addition to 1000 cyclic APLT, a cyclic confining stress dependent resilient modulus test was conducted with controlled confining and cyclic stresses similar to the AASHTO T307 (2000) was conducted, using an 8 in. inch diameter loading plate and a 24 in. diameter confining plate around the loading plate.
- The model shows that as the maximum cyclic stress decreases, the in-situ resilient modulus increases.

Static Plate Load Test

- From the static plate load tests it was determined that the Ev1 was 13,689 psi with an Ev2/Ev1 ratio of 1.60.
- The modulus of subgrade reaction, k, was 392 pci as measured from the 30 in. diameter plate.



Ev2 stain modulus



Modulus of subgrade reaction, k