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Superpave Shear Tester Performance-Related Tests for Austin, Texas Project

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Below are the results of the performance-related tests on specimens supplied by FHWA Mobile Lab "A" for an Austin, Texas project. Two design specimens (140 mm height) were produced in the lab for this project to approximately seven percent air voids. Also, two specimens were produced from field sampled mixture. After cutting, there were four performance specimens for the lab design and four for the field mix. Each specimen was tested as follows:

- Frequency Sweep Constant Height at 20°C
- Simple Shear Constant Height at 20°C
- Repeated Shear Constant Height at 50°C

The data are summarized in the tables and graphs below.

The frequency sweep test results looked good, with a relatively low coefficient of variation. The average coefficient of variation for the two sets of data was 10.4%. The field specimens had lower G^* values than the lab specimens. The difference between the G^* values of the field and lab specimens was considered statistically significant (Student's t-test, $\alpha=0.05$).

The simple shear test results had a higher coefficient of variation than the frequency sweep test results. The coefficient of variation for the lab set of data was 15.5%. The field set of data had a coefficient of variation of 42.8%. This high variation was mainly due to one specimen (P2b) having twice the maximum shear strain as the other three field specimens. The field specimens exhibited much higher maximum shear strain values as a set than the lab specimens. This finding matches with the lower G^* values from the frequency sweep test, indicating that the field specimens were less stiff, and more susceptible to shear strain than the lab specimens. The difference between the lab and field was considered statistically significant.

The results of the repeated shear test (constant height) were similar to the frequency sweep and simple shear test results. The test results indicated that the field specimens exhibited a higher permanent shear strain than the lab specimens. The coefficient of variation was 20.0% for the two sets of data. The differences between the lab and field specimens were considered statistically significant.

No data was available for specimen A-1 because of a problem with the shear LVDT during the test.

Specimen P2b appears to have much different material properties than the other field specimens. Despite having a similar bulk specific gravity, Specimen P2b has a much higher

maximum shear strain (simple shear), higher permanent shear strain (repeated shear), and lower G^* (frequency sweep) than the other field specimens. While this difference may not be unusual, it is strange that Specimen P2a exhibits materials properties similar to the rest of the set of field specimens. Specimens P2a and P2b were produced by sawing one large (140 mm) specimen into two performance specimens. It should be expected that P2a and P2b have similar material properties. The consistency of the test results (higher maximum shear strain, higher permanent shear strain, and lower stiffness) for the P2b specimen indicates that the results are valid. However, it is difficult to explain why Specimen P2a would not also display similar results.

SUMMARY: Texas (Austin)

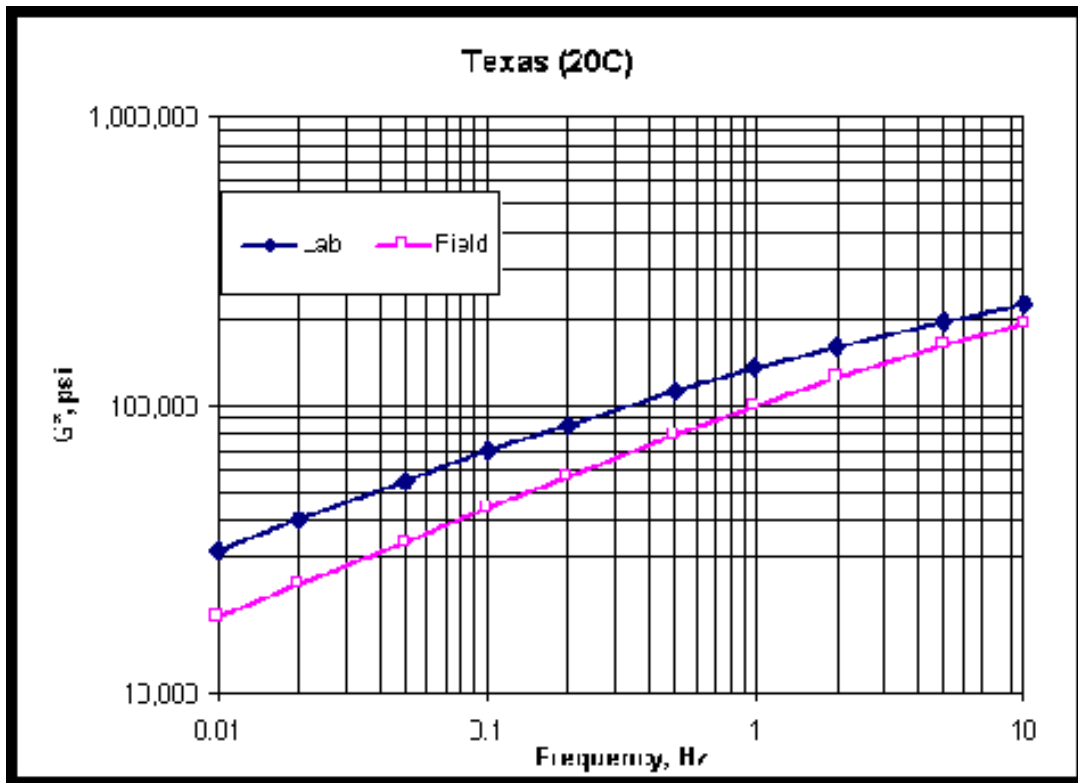
PROJECT: K-2-2

Mix	Sample ID	G_{mo}	Max. γ μ strain	G^*_{10Hz} psi	Perm. γ %
Lab	A-1	2.429	525	252407	
	A-2	2.429	776	218339	2.33
	C-1	2.431	625	213541	2.83
	C-2	2.424	604	205630	1.78
	Mean	2.431	656	222494	2.31
	Std. Dev.	0.006	101	20613	0.63
	CV	0.3%	15.5%	9.3%	22.7%
Field	P1a	2.435	1135	205200	4.19
	P1b	2.429	1188	196715	2.97
	P2a	2.429	1237	208837	3.29
	P2b	2.428	2171	160081	4.23
	Mean	2.433	1509	192715	3.67
	Std. Dev.	0.005	645	22344	0.64
	CV	0.2%	42.8%	11.6%	17.4%

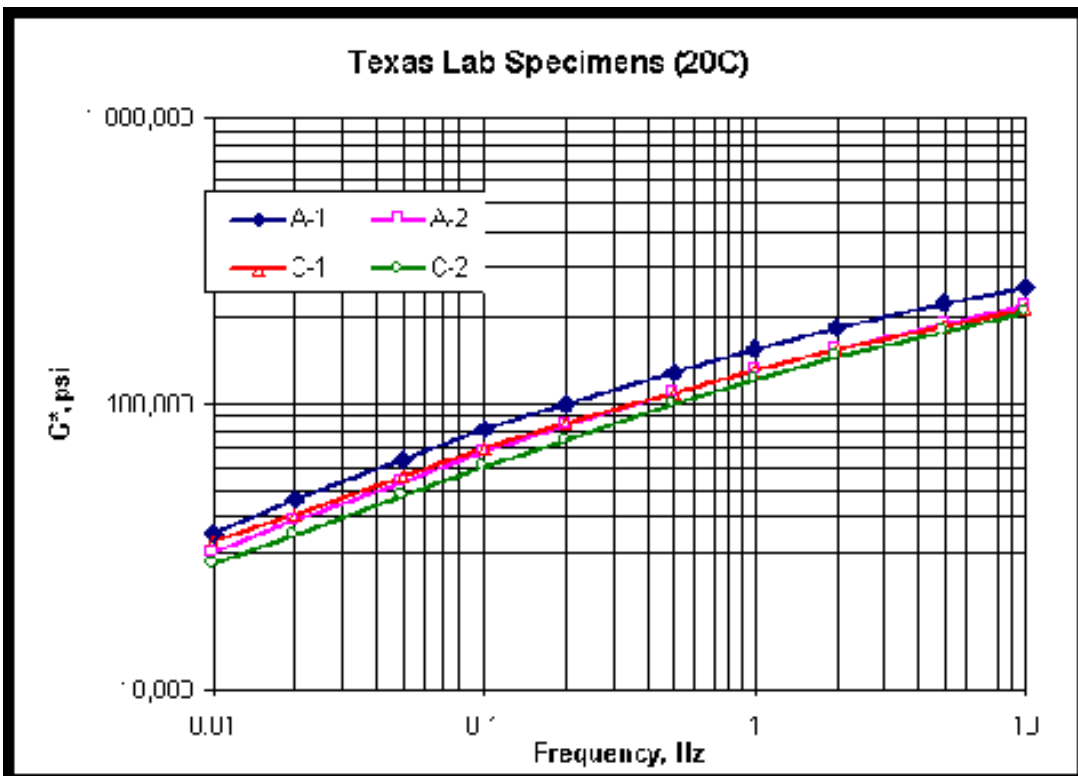
Permanent shear strain values from repeated shear (constant height) test at 5000 cycles except where noted. P1a (3999i), P1b (201) and P2b (3301) failed to complete the test.

The G_{mm} was not available for the Lab or Field specimens. The specimen G_{mo} is reported rather than the percentage of air voids.

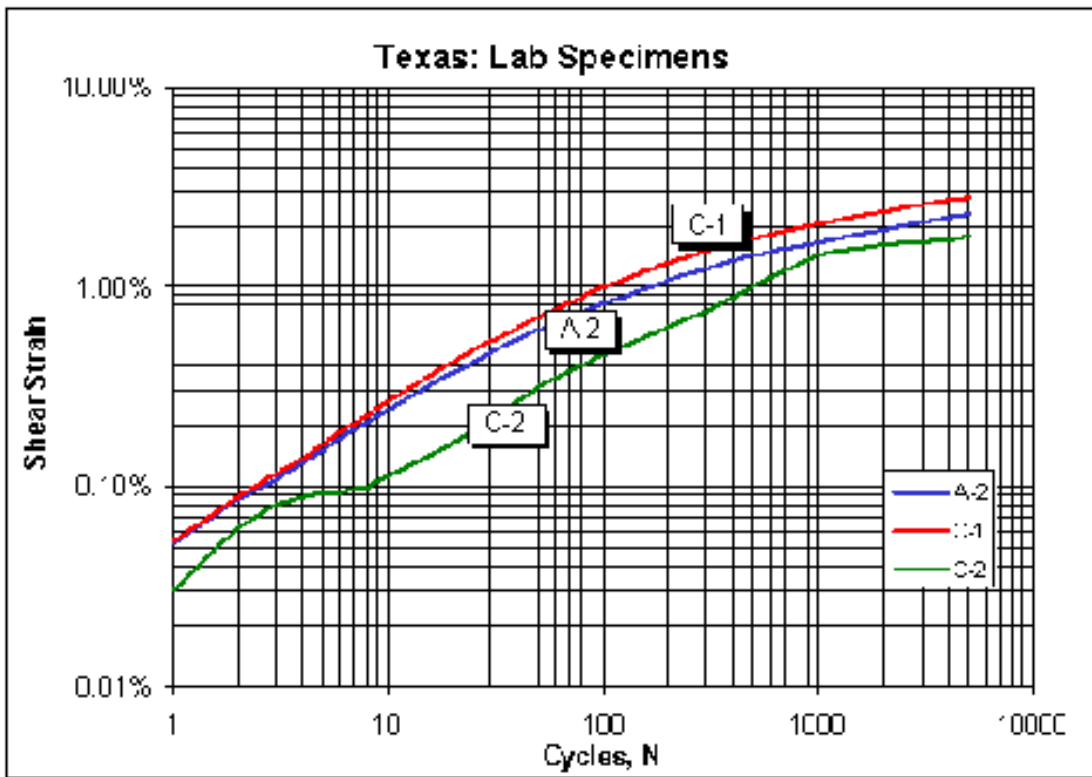
Summary: Texas (Austin) Project: K-2-2



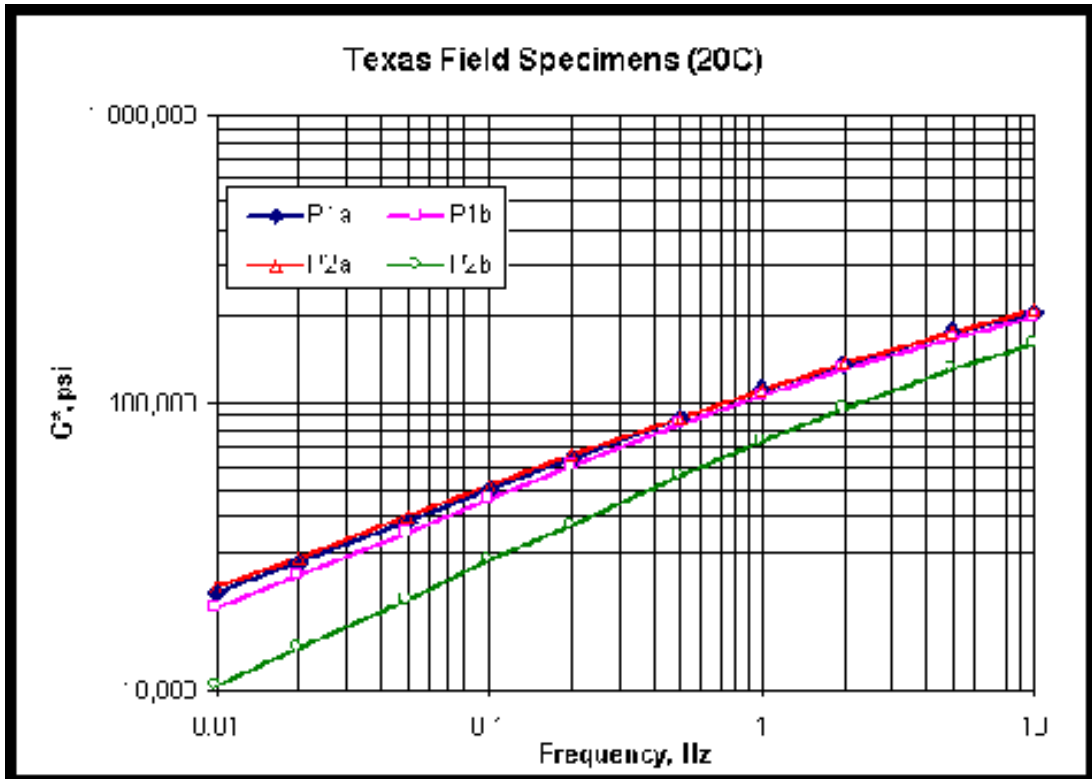
Texas (20C)



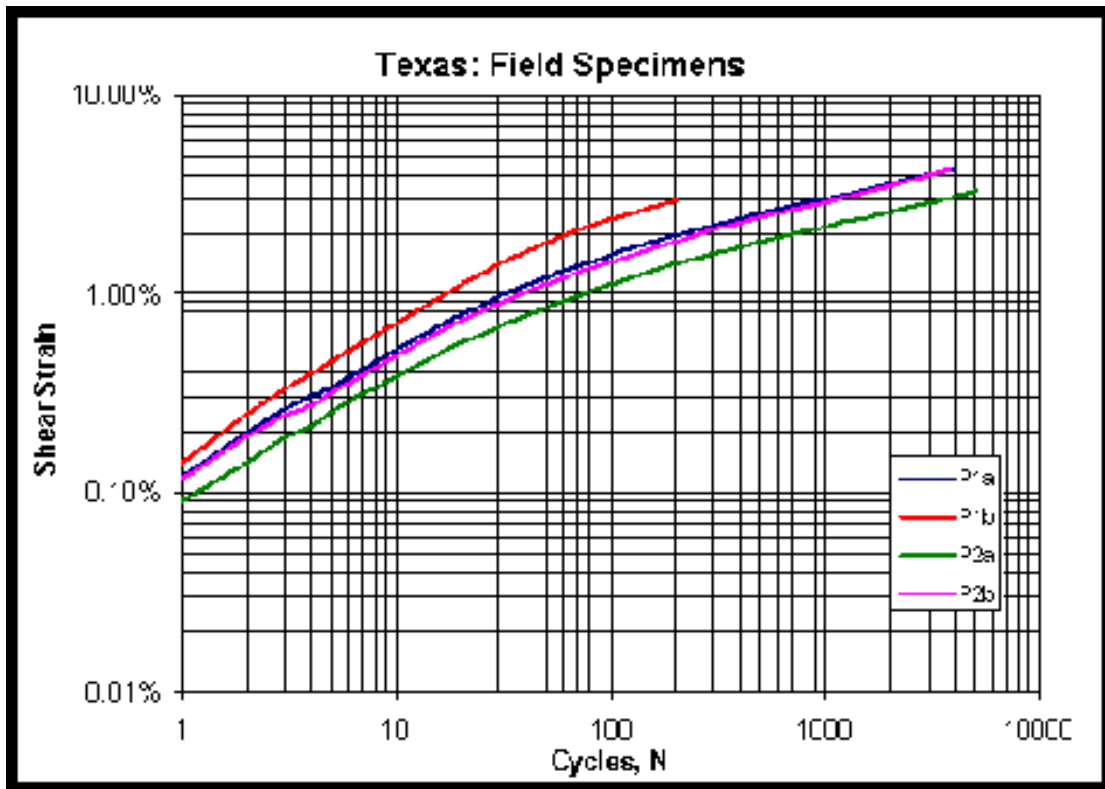
Texas Lab Specimens (20C)



Texas: Lab Specimens



Texas Field Specimens (20C)



Texas: Field Specimens