APPENDIX H

Results for Kleinfelder Specimen ID K2-13-007

- *Specimen Preparation Notes*
- *RCTS Testing Results*

SPECIMEN PREPARATION NOTES

Specimen No.: K2-13-007

Project No : 136473

Page 1 **of** 3

Boring No.: R-7-1

Date of Preparation..: 11/8/13

Sample No..: ST-5

Depth..: 207.9 – 208.4 feet

Disposition of Sample

☒ No Apparent Disturbance	☐ Apparent Disturbance	☐ Compacted Sample
☐ Other (Describe)		

Specimen Preparation Notes

Preparation Method :	Extruded from Shelby Tube with No Trimming		**Affixation to Platens :**	2.8-inch diameter platens, no adhesive used	
Ave. Length (in.) :	5.6533	**Ave. Diameter (in.):**	2.848	**L/D**	2.0
Total Unit Weight (pcf) :	118.2	**Moisture Content (%) :**	32.0	**% Saturation (Assume SG = 2.65):**	100

Specimen Testing Comments

1) Sample was extruded from the Shelby Tube directly into a latex membrane for testing on 11/8/13. No trimming of the sample was performed except to square the end.

2) Testing commenced on 11/8/13, beginning with 18 psi pressure.

3) The specimen tilted so that the magnets made contact with the electrical coils during the low-amplitude resonant column testing of Pressure Stage 5 (281 psi). The system could not be readjusted in a way that prevented the magnets from contacting the coils, therefore the testing was terminated at Pressure Stage 5. Testing ended on 11/11/13.

☒ **See Attached Photographs**

SPECIMEN PREPARATION NOTES

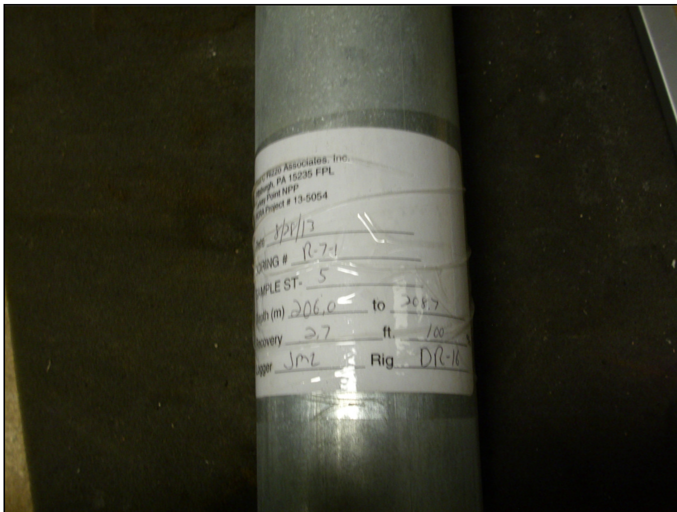


Photo H.1

Sample R-7-1 ST-5 after removal from the transport container.

Photo H.2

Sample after subdividing the bottom 7-inches for testing.

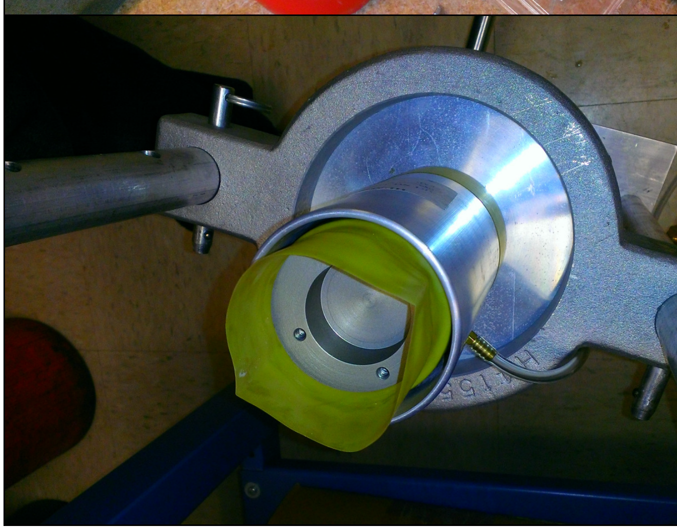


Photo H.3

Top view of specimen being extruded directly into latex testing membrane. Note the top cap placed on top of the specimen.

SPECIMEN PREPARATION NOTES

Photo H.4

Specimen after placement on base pedestal and vacuum pressure is applied.

Kleinfelder Specimen ID:

K2-13-007

Boring No: R-7-1
Sample No: ST-5

Silty Sand (SM)
Depth = 207.9 ft – 208.4 ft (below existing ground surface)
Total Unit Weight = 118.2 lb/ft^3
Natural Moisture Content = 32.0%
Estimated In-Situ Mean Effective Stress = 70 psi

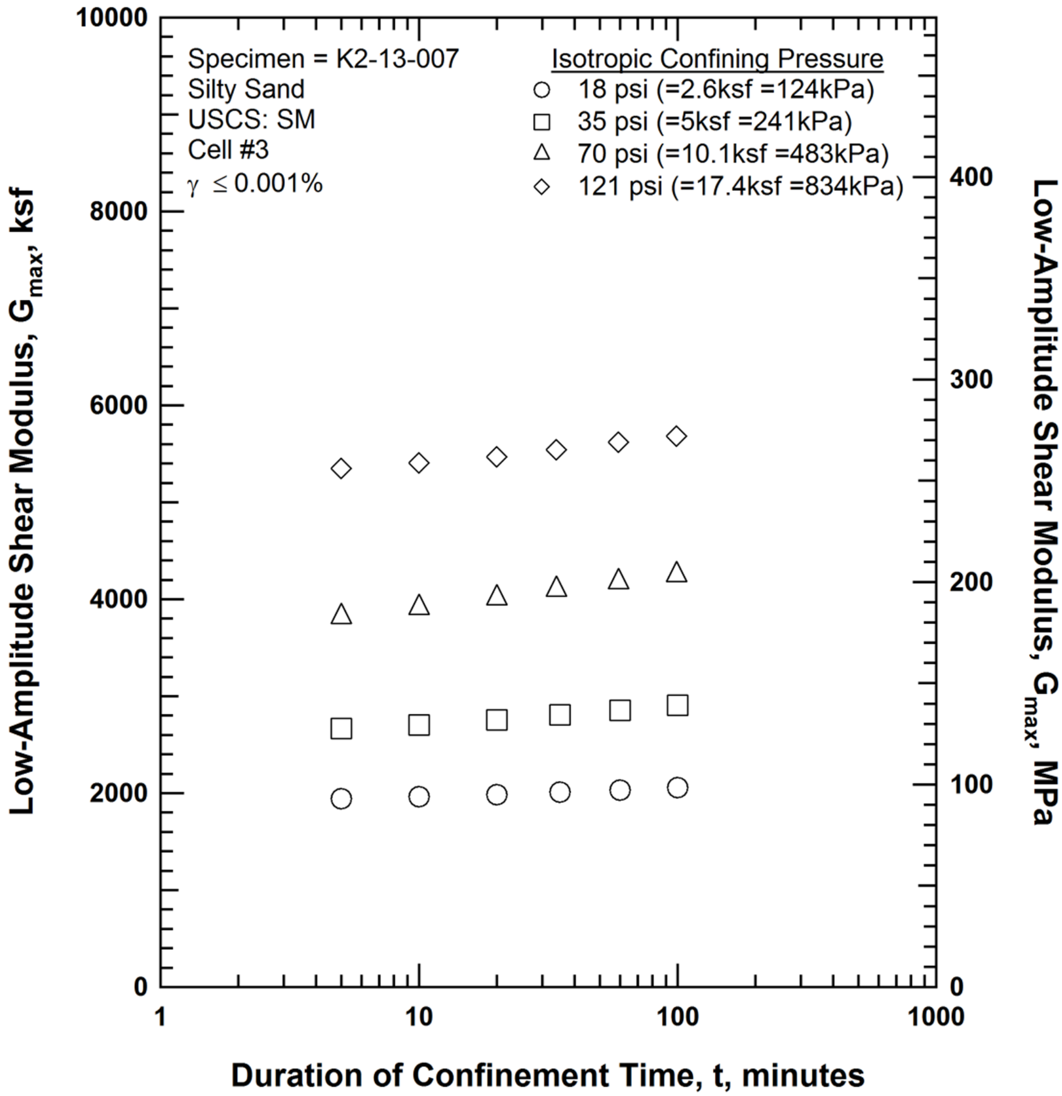


Figure H.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007

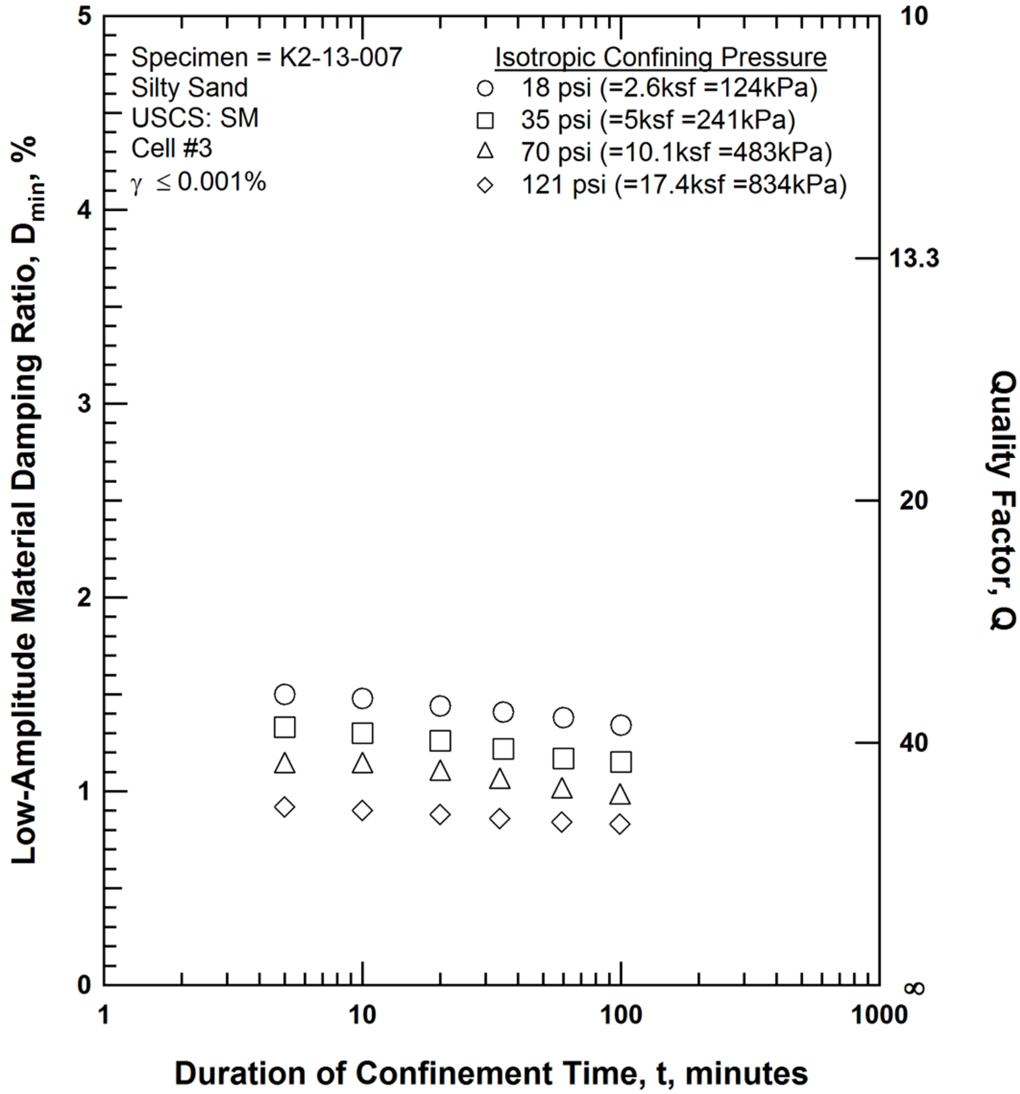


Figure H.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007

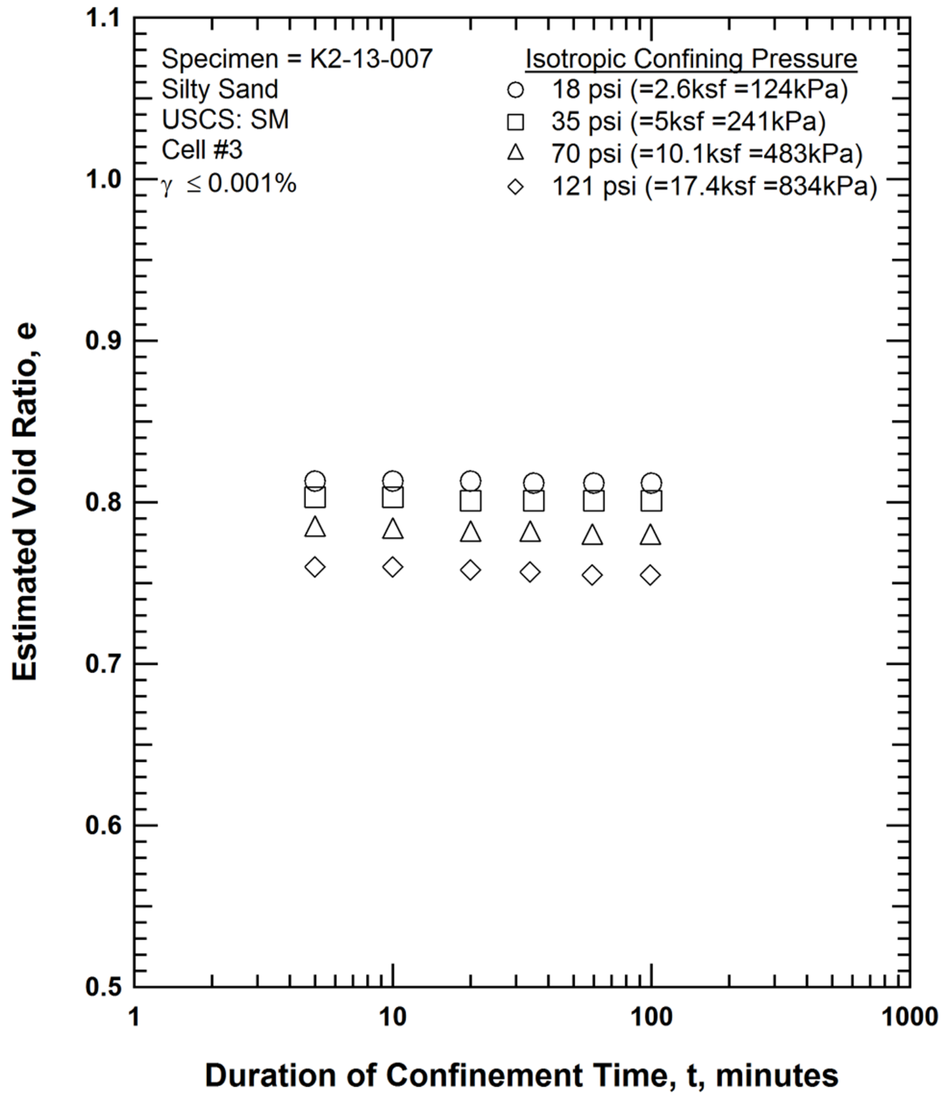


Figure H.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Test of Specimen K2-13-007

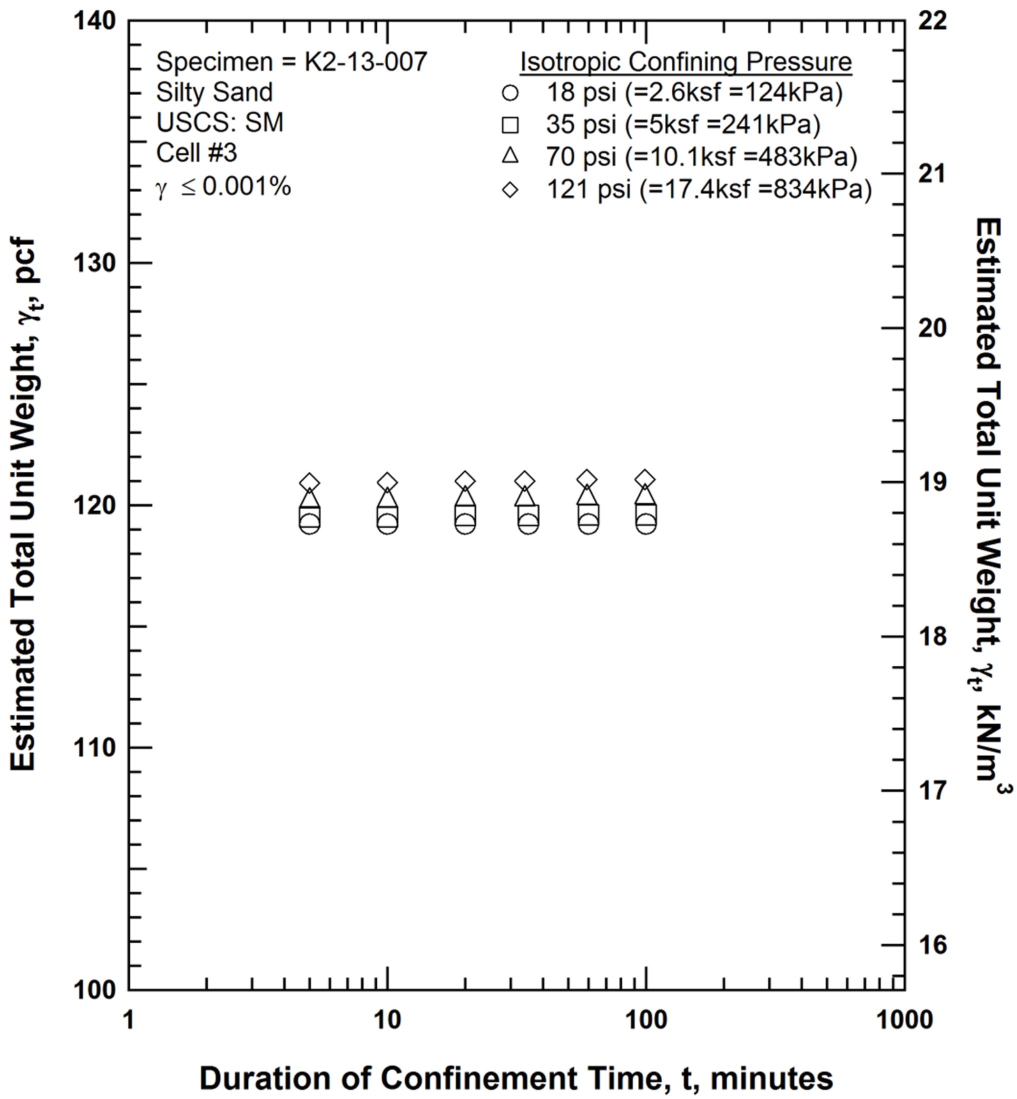
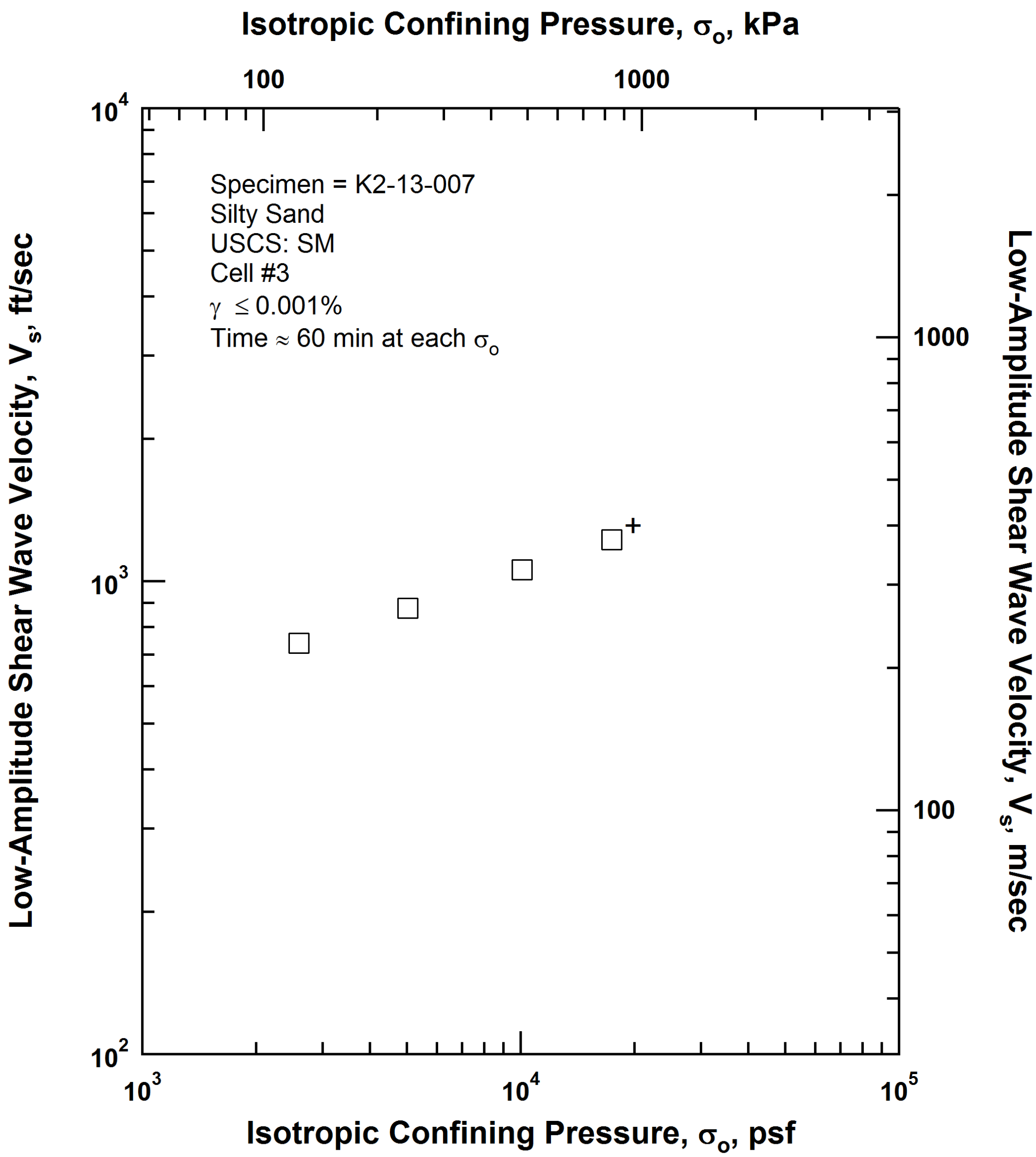
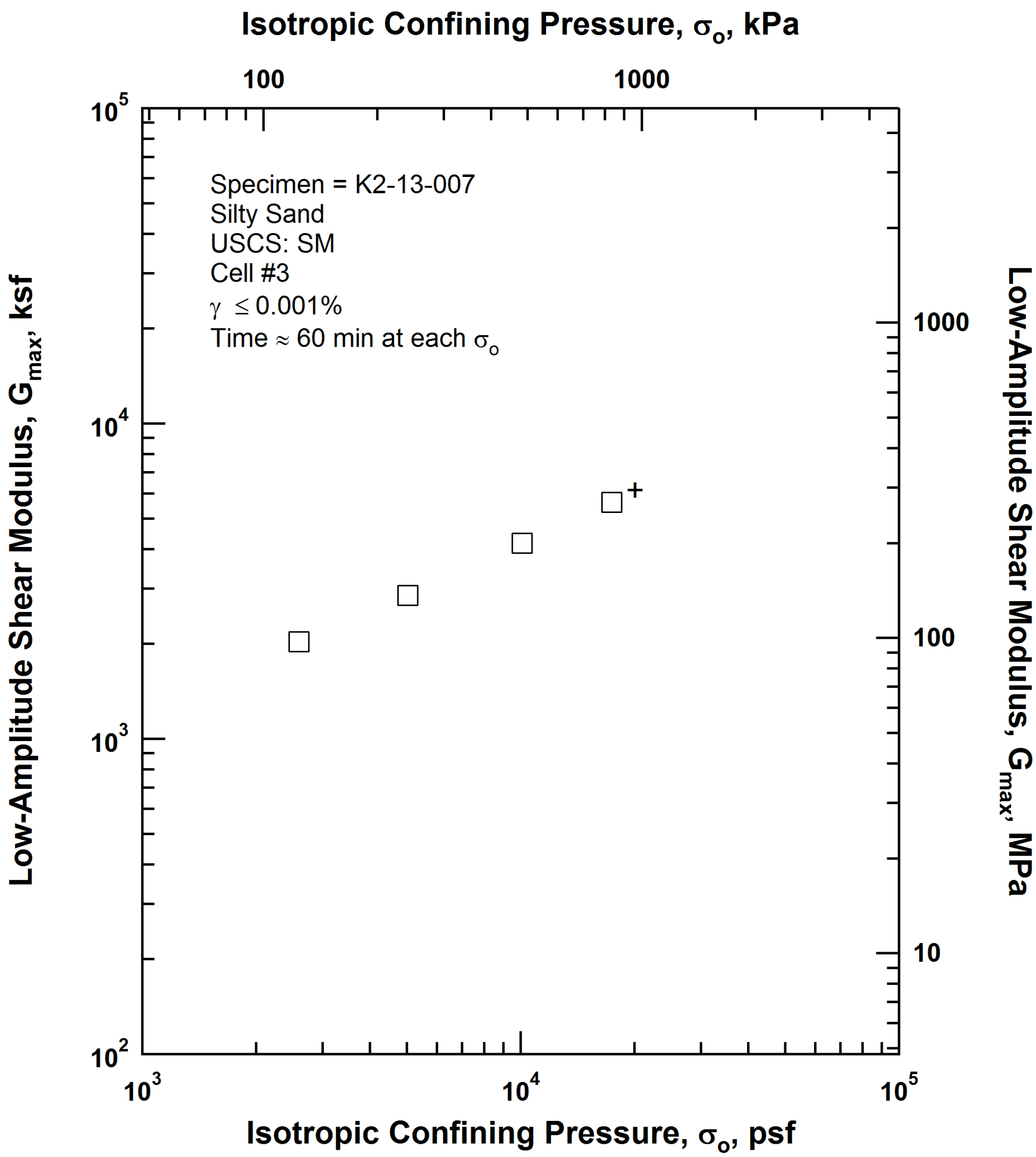


Figure H.4 Variation in Estimated Total Unit Weight with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007



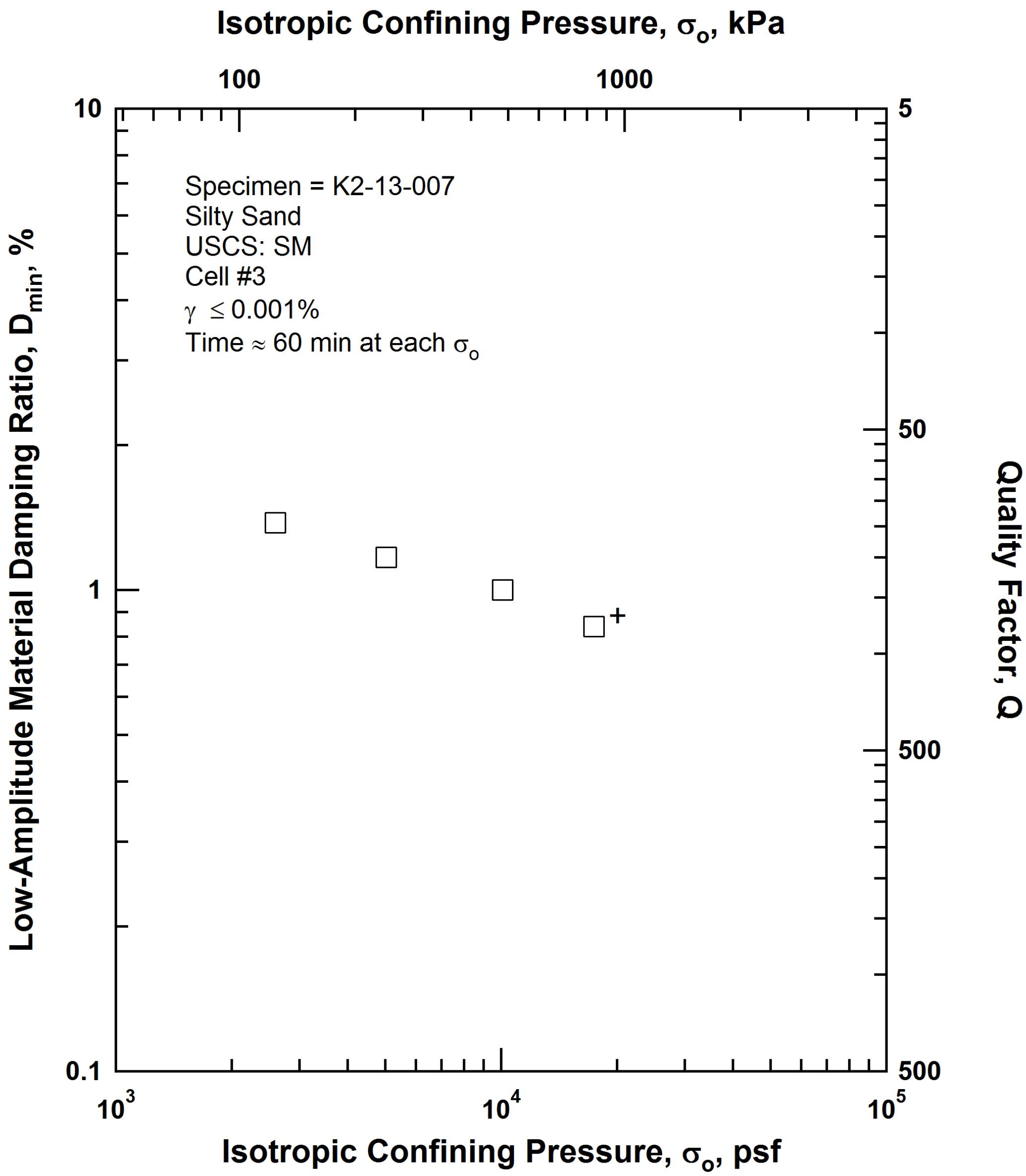
Note:
\+ Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.5 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007



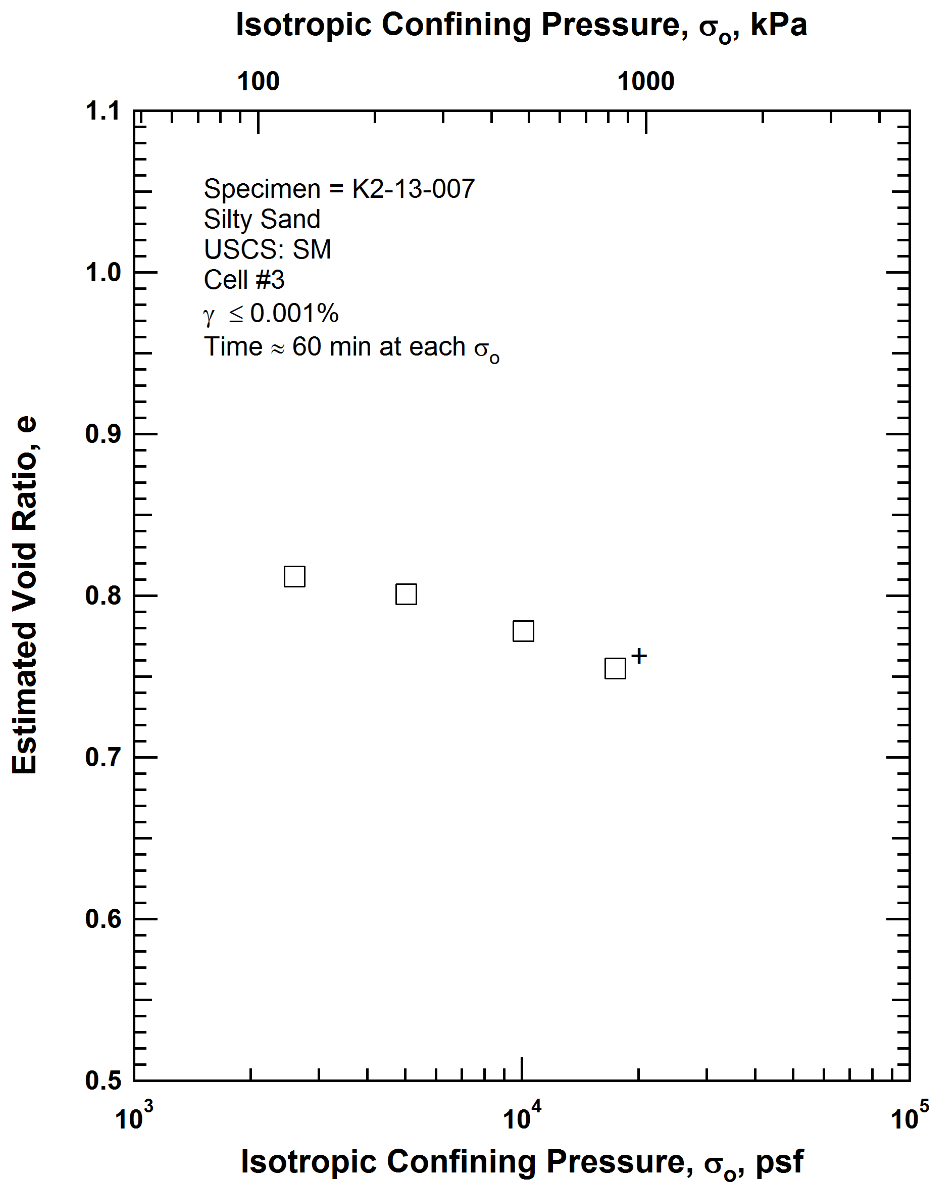
Note:
\+ Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.6 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Test of Specimen K2-13-007



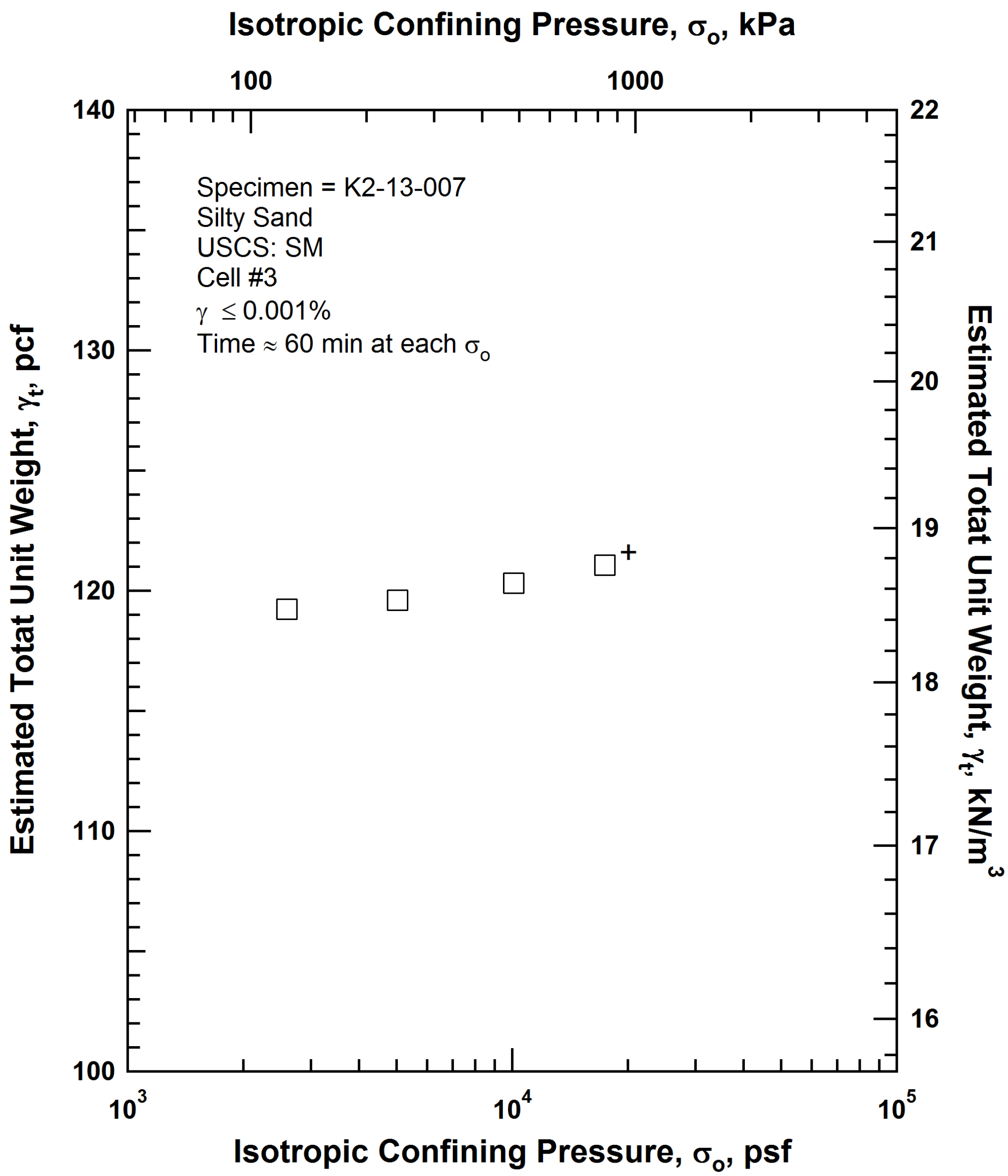
Note:
\+ Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.7 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007



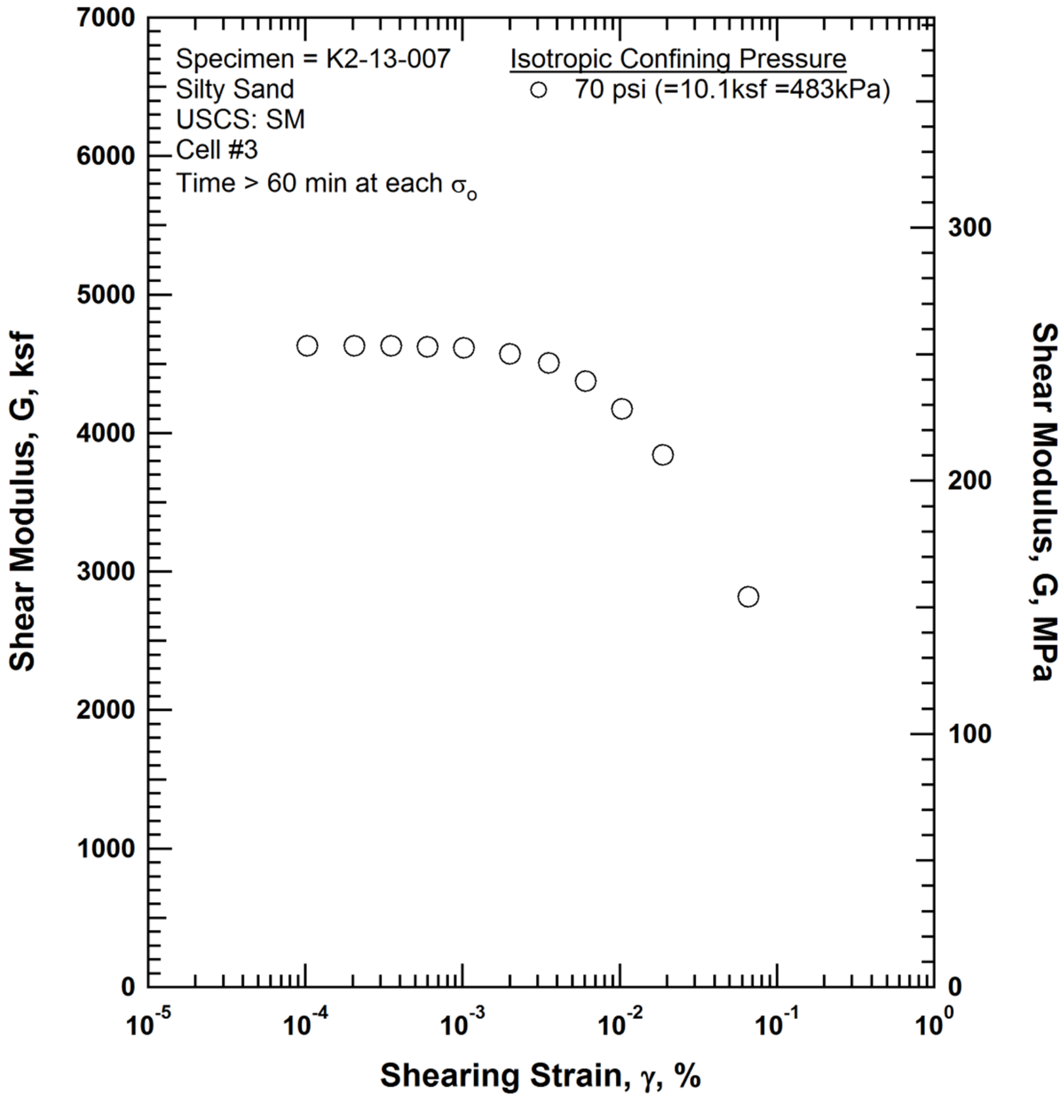
Note:
+ Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.8 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007



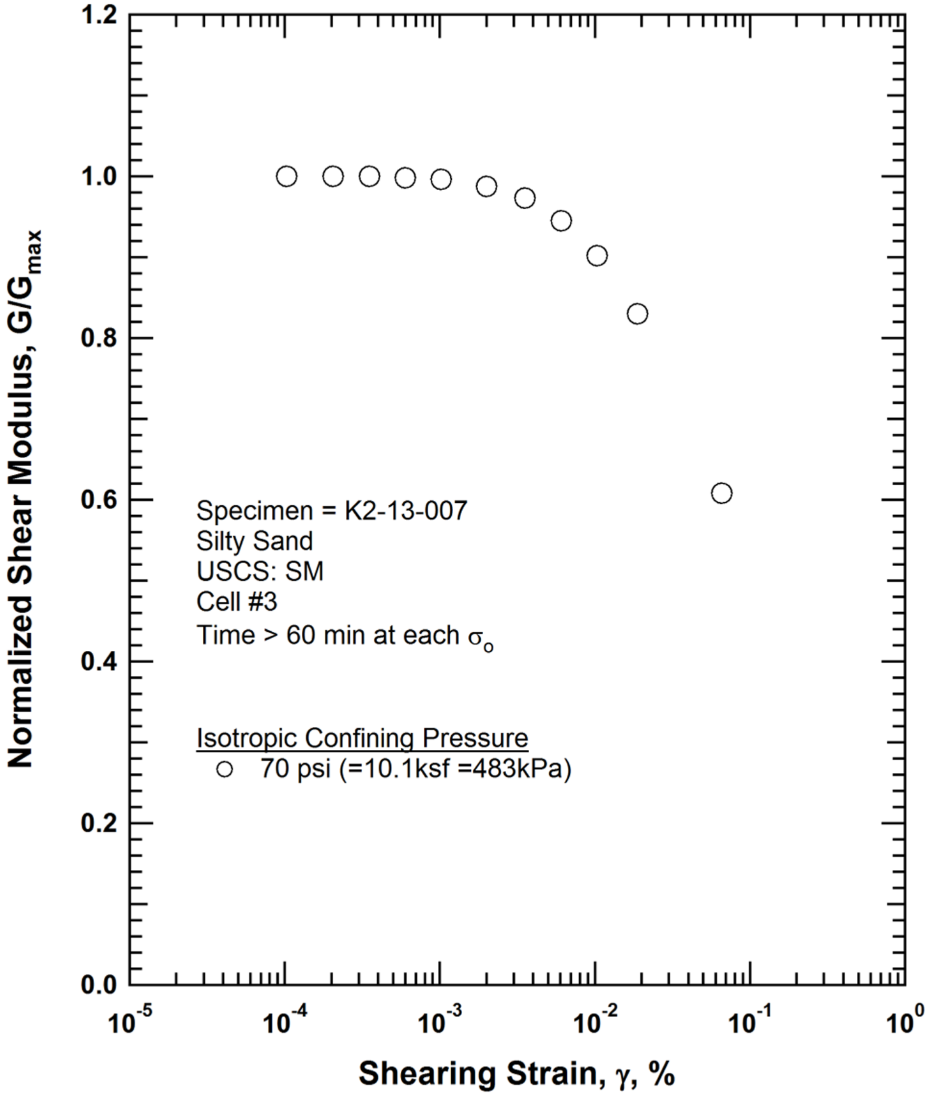
Note:
\+ Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.9 Variation in Estimated Total Unit Weight with Isotropic Confining Pressure from Resonant Column Tests of Specimen K2-13-007



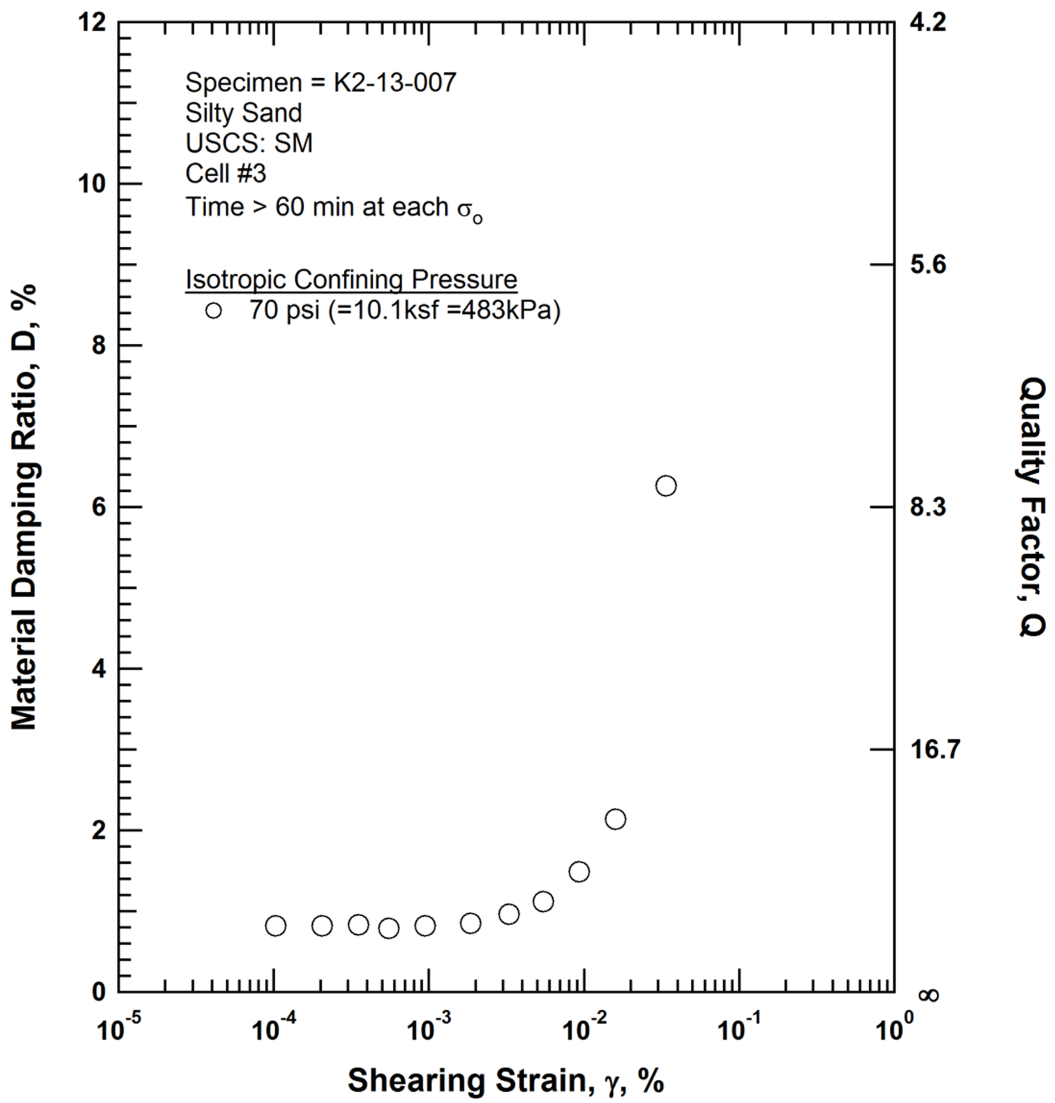
Note:
Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.10 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests of Specimen K2-13-007



Note:
Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.11 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests of Specimen K2-13-007



Note:
Excessive specimen tilt at 281 psi prevented testing at that pressure.

Figure H.12 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests of Specimen K2-13-007

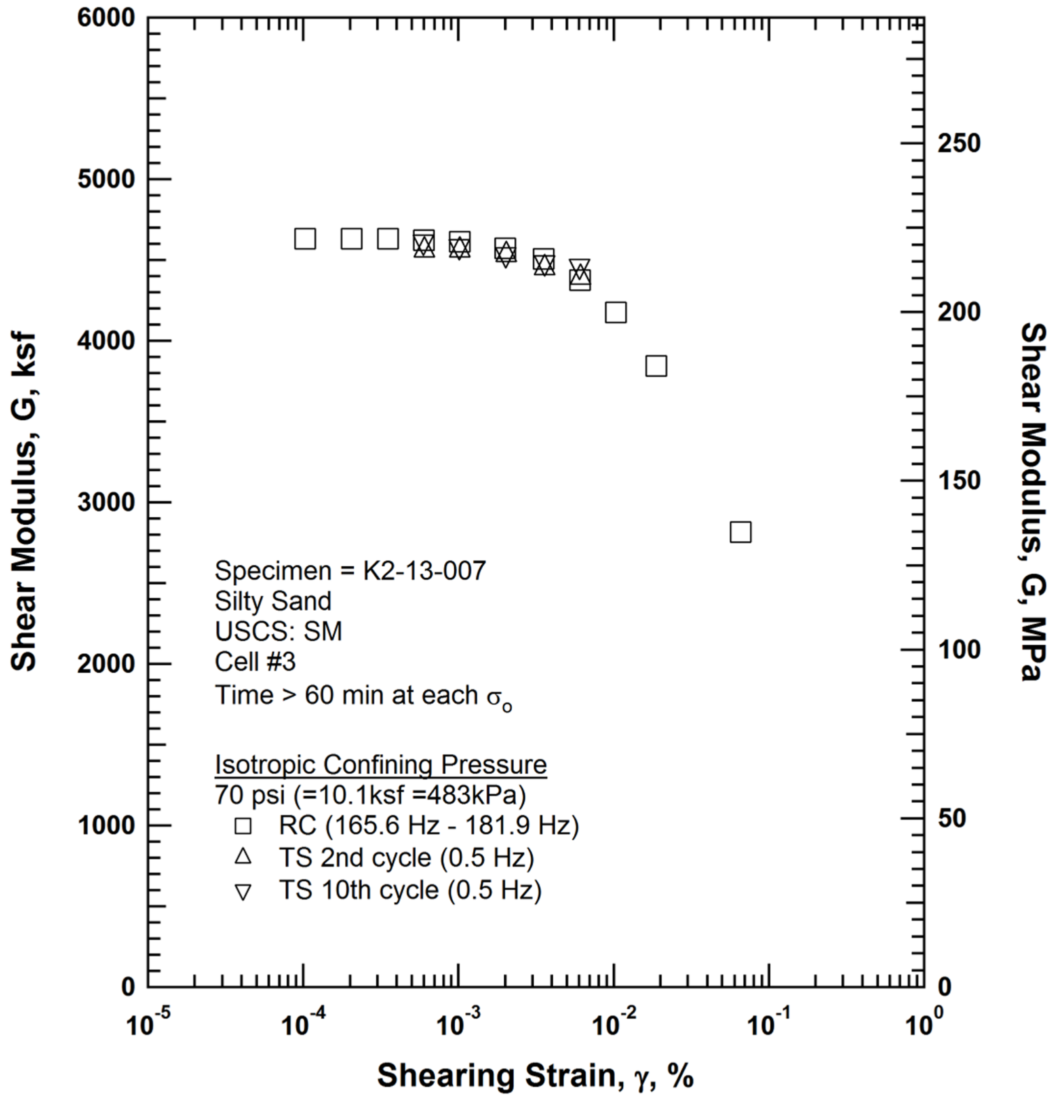


Figure H.13 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 70 psi (=10.1ksf =483kPa) from the Combined RCTS Tests of Specimen K2-13-007

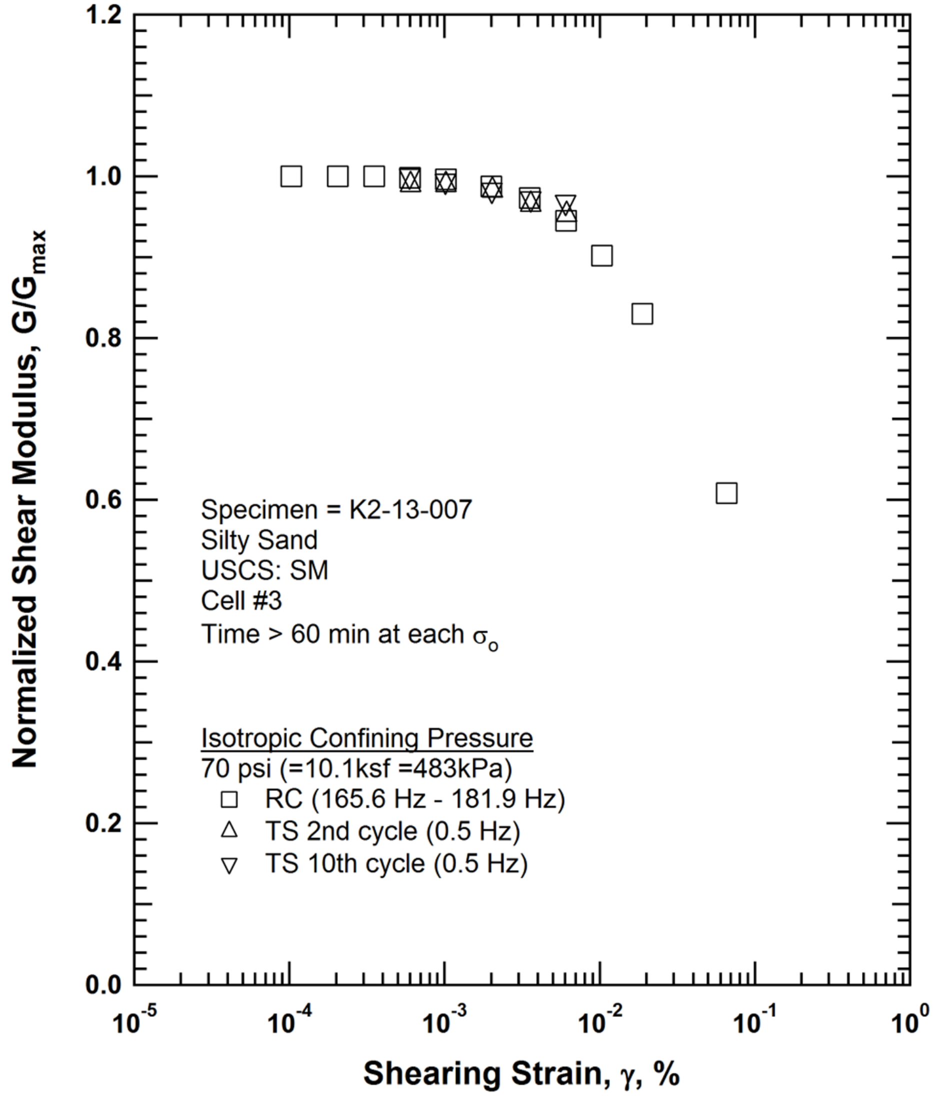


Figure H.14 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 70 psi (=10.1ksf =483kPa) from the Combined RCTS Tests of Specimen K2-13-007

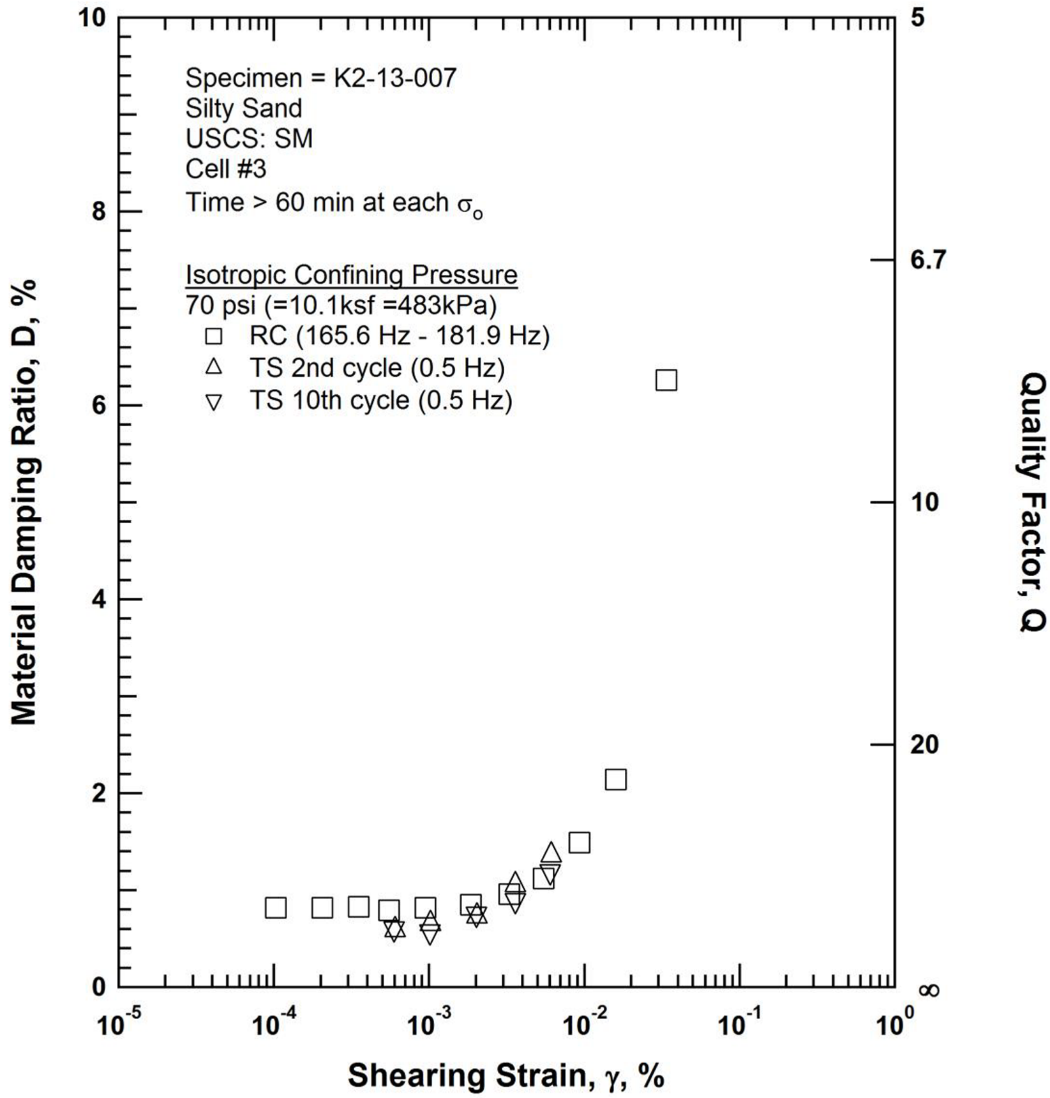


Figure H.15 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 70 psi (=10.1ksf =483kPa) from the Combined RCTS Tests of Specimen K2-13-007

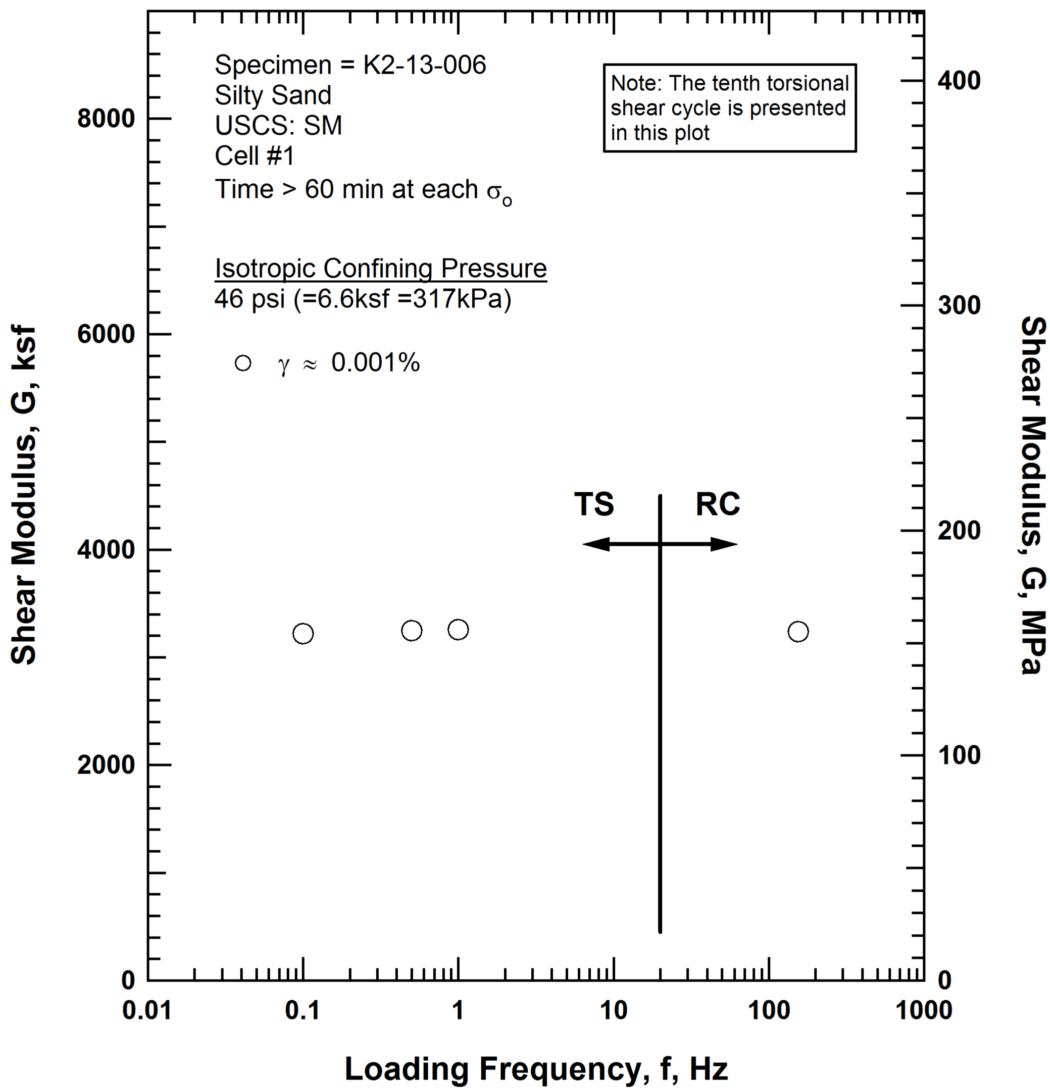


Figure H.16 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 70 psi (=10.1ksf =483kPa) from the Combined RCTS Tests of Specimen K2-13-007

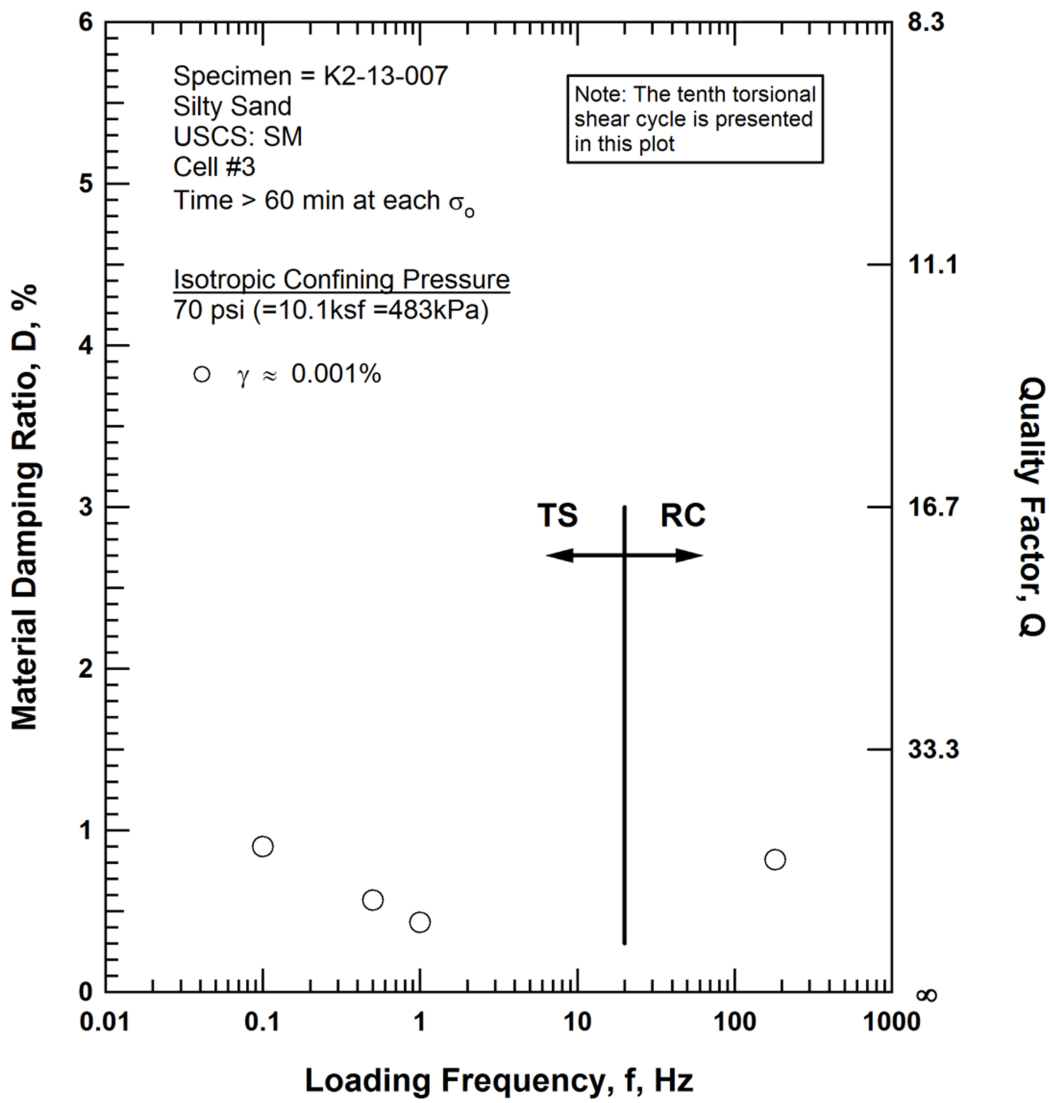


Figure H.17 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 70 psi (=10.1ksf =483kPa) from the Combined RCTS Tests of Specimen K2-13-007

RCTS TEST RESULTS

Table H.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio, Estimated Void Ratio, and Estimated Total Unit Weight with Isotropic Confining Pressure from RC Tests of Specimen K2-13-007

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, V_s	Low-Amplitude Material Damping Ratio, D_{min}	Estimated Void Ratio, e	Estimated Total Unit Weight, γ_t
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	(Unitless)	(pcf)
18	2592	124	2030	97	740	1.38	0.812	119.2
35	5040	241	2850	137	880	1.17	0.801	119.6
70	10080	483	4180	200	1060	1.00	0.778	120.3
121[(1)]	17424	834	5620	269	1220	0.84	0.755	121.1

(1) Excessive specimen tilt at 281 psi prevented testing at that pressure

Table H.2 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen K2-13-007; Isotropic Confining Pressure σ_o = 70 psi (=10.1 ksf = 483 kPa)

Second Cycle				Tenth Cycle			
Peak Shearing Strain, γ, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, γ, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
6.03E-04	4560	0.99	0.59	5.96E-04	4610	1.00	0.60
1.02E-03	4560	0.99	0.65	1.01E-03	4580	0.99	0.57
2.02E-03	4530	0.98	0.73	2.02E-03	4530	0.98	0.75
3.60E-03	4450	0.97	1.05	3.58E-03	4480	0.97	0.89
6.13E-03	4390	0.95	1.36	6.04E-03	4460	0.97	1.19

Table H.3 Variation in Shear Modulus, Normalized Shear Modulus, and Material Damping with Shearing Strain from RC Tests of Specimen K2-13-007; Isotropic Confining Pressure σ_o = 70 psi (=10.1 ksf = 483 kPa)

Peak Shearing Strain, γ, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average Shearing Strain, %[(1)]	Material Damping Ratio, D, %[(2)]
1.03E-04	4630	1.00	1.03E-04	0.82
2.04E-04	4630	1.00	2.04E-04	0.82
3.51E-04	4630	1.00	3.51E-04	0.83
5.97E-04	4620	1.00	5.52E-04	0.79
1.02E-03	4610	1.00	9.44E-04	0.82
2.01E-03	4570	0.99	1.85E-03	0.85
3.55E-03	4510	0.97	3.28E-03	0.96
6.06E-03	4380	0.94	5.47E-03	1.12
1.03E-02	4180	0.90	9.34E-03	1.49
1.89E-02	3840	0.83	1.60E-02	2.14
6.56E-02	2820	0.61	3.37E-02	6.26

(1) Average Shearing Strain from the First Three Cycle of the Free Vibration Decay Curve or from Half Power Damping for shearing strains less than 0.001%

(2) Average Damping Ratio from the First Three Cycle of the Free Vibration Decay Curve or from Half Power Damping for shearing strains less than 0.001%

Table H.4 Variation in Shear Modulus and Material Damping with Frequency from RC/TS Tests of Specimen K2-13-007; Isotropic Confining Pressure σ_o = 70 psi (=10.1 ksf = 483 kPa)

Approximate Shearing Strain, γ, %	Frequency, Hz	Shear Modulus, G, ksf	Material Damping Ratio, D, %
0.001	0.1	4520	0.90
	0.5	4580	0.57
	1.0	4640	0.43
	181.5	4610	0.82