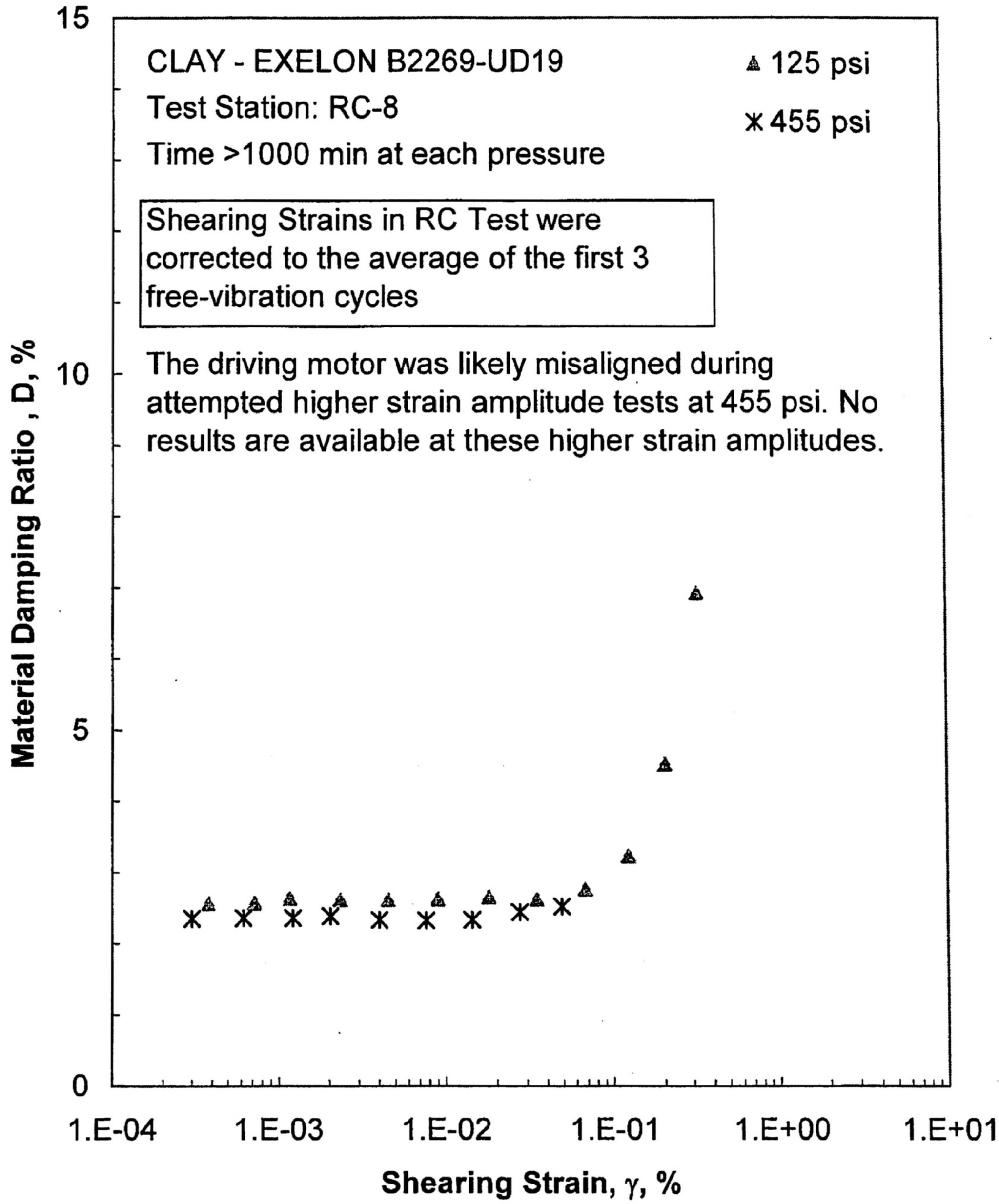

Figure H.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

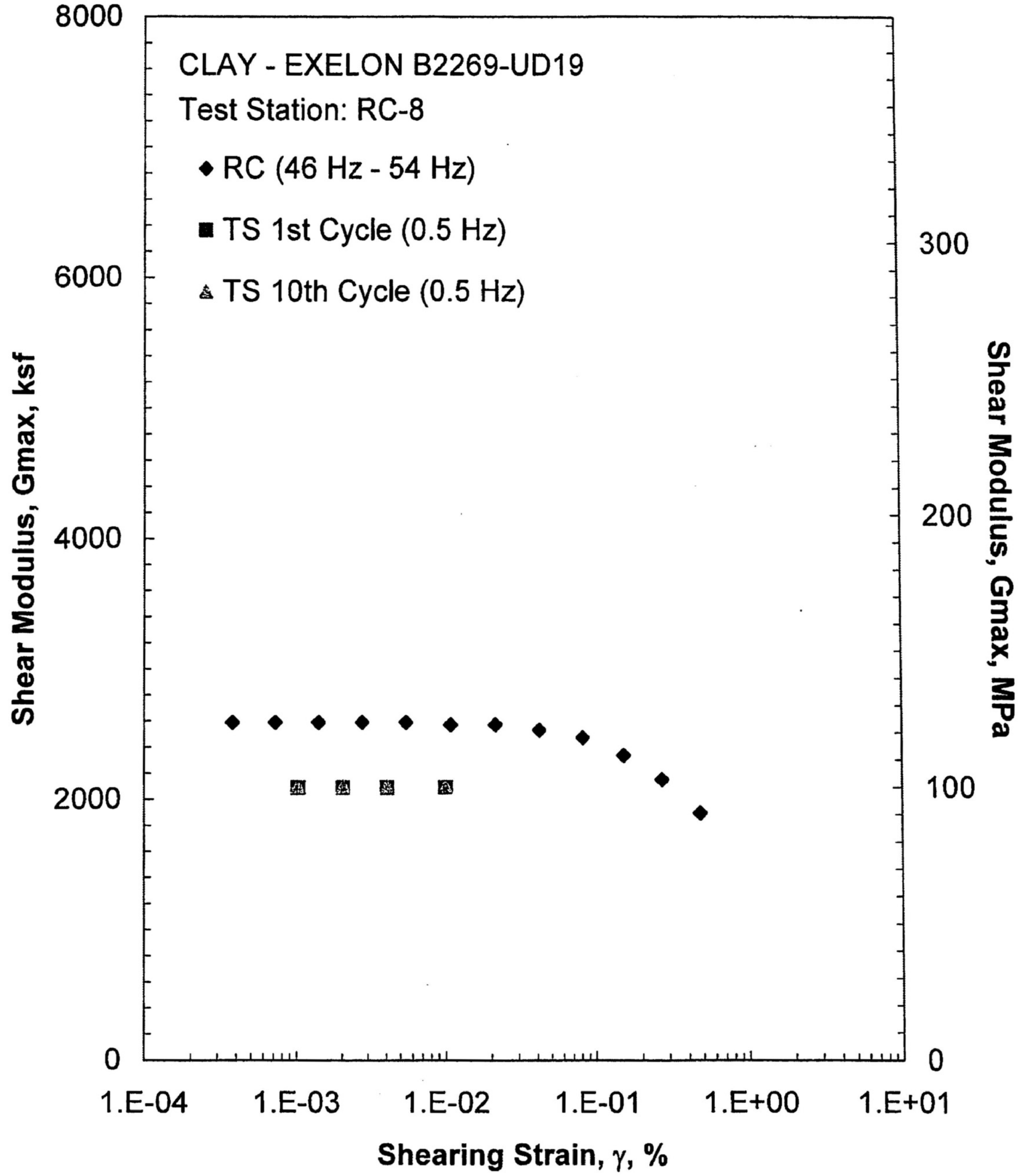

Figure H.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 125 psi from the Combined RCTS Tests

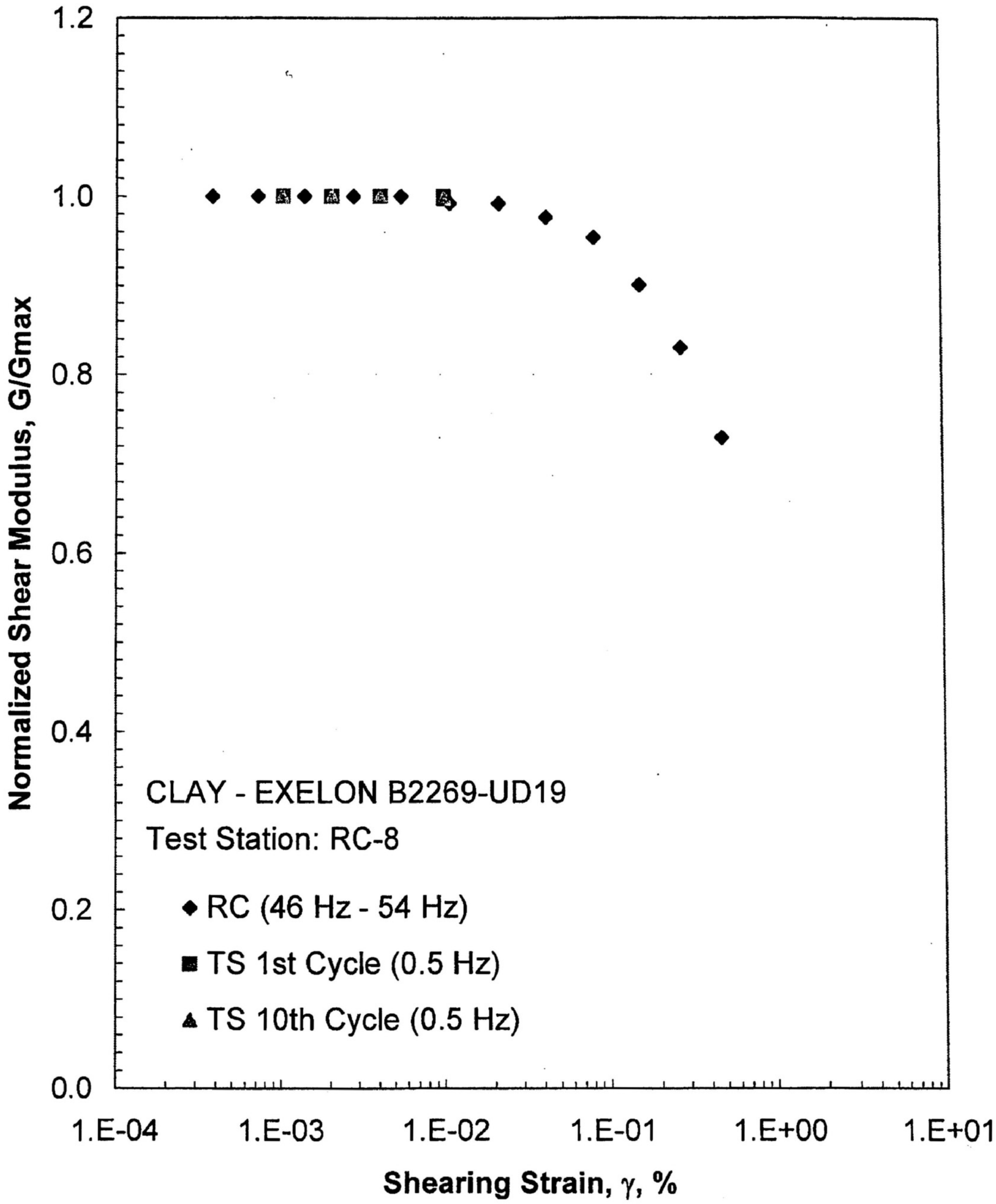

Figure H.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 125 psi from the Combined RCTS Tests

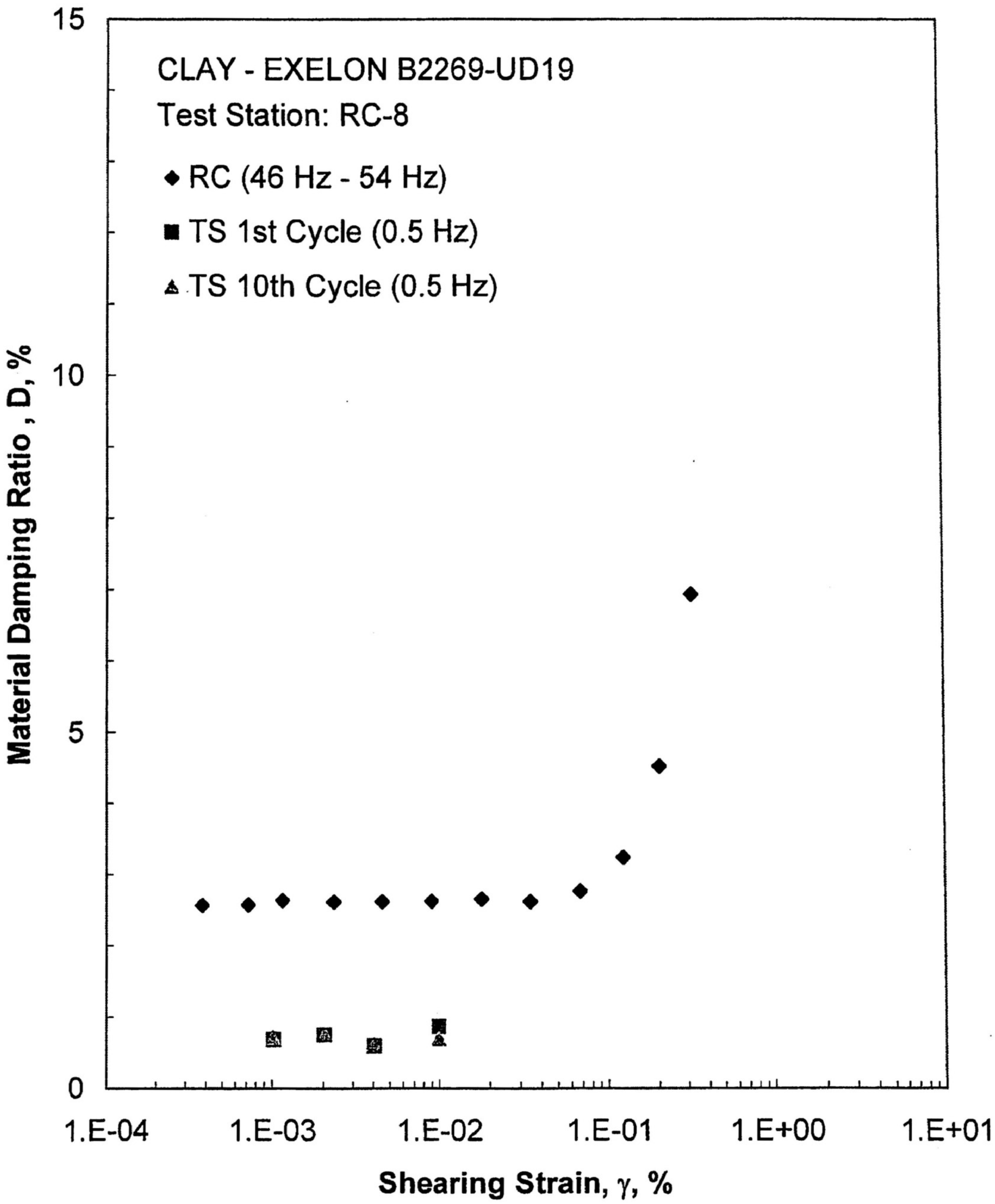

Figure H.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 125 psi from the Combined RCTS Tests

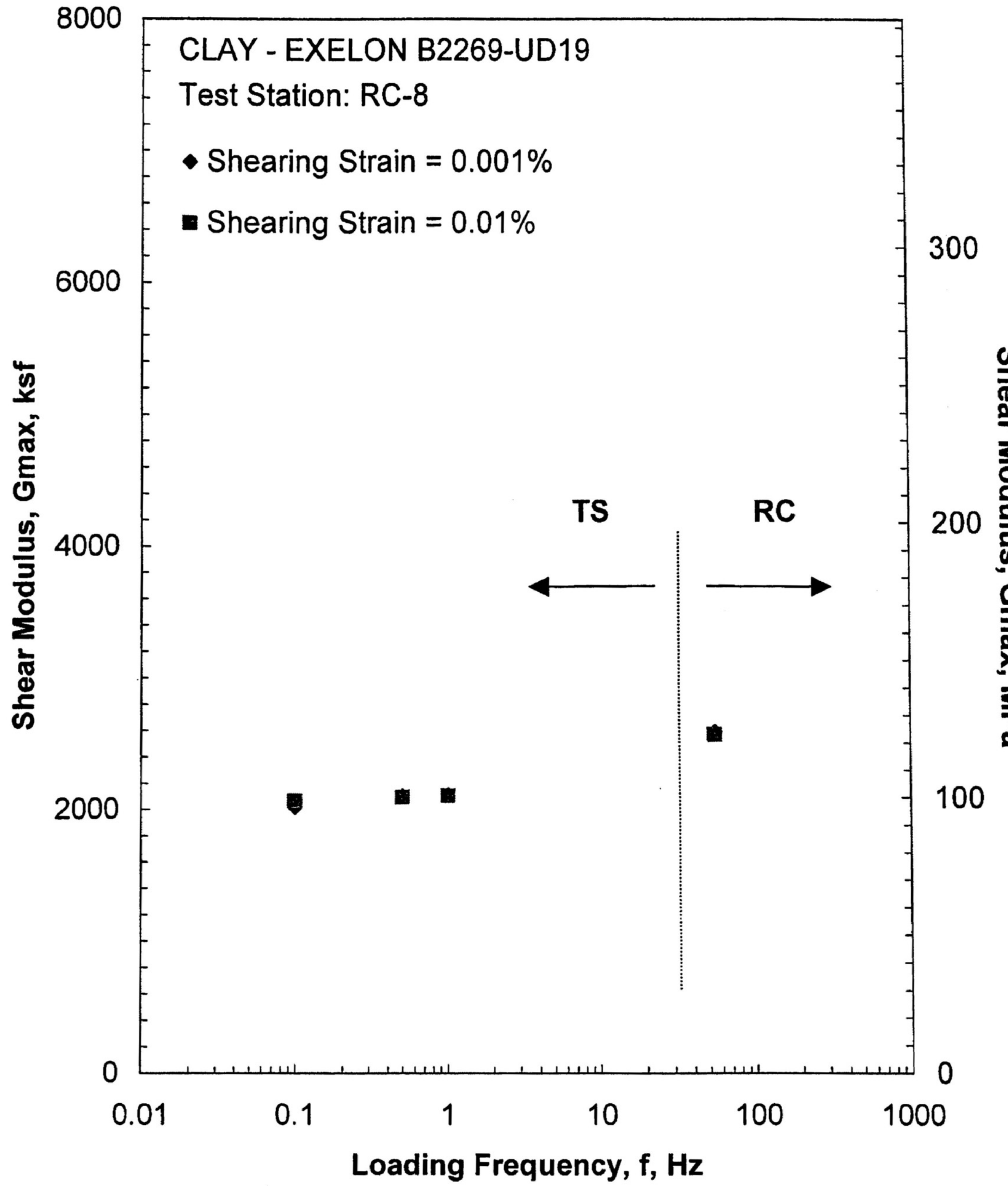

Figure H.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 125 psi from the Combined RCTS Tests

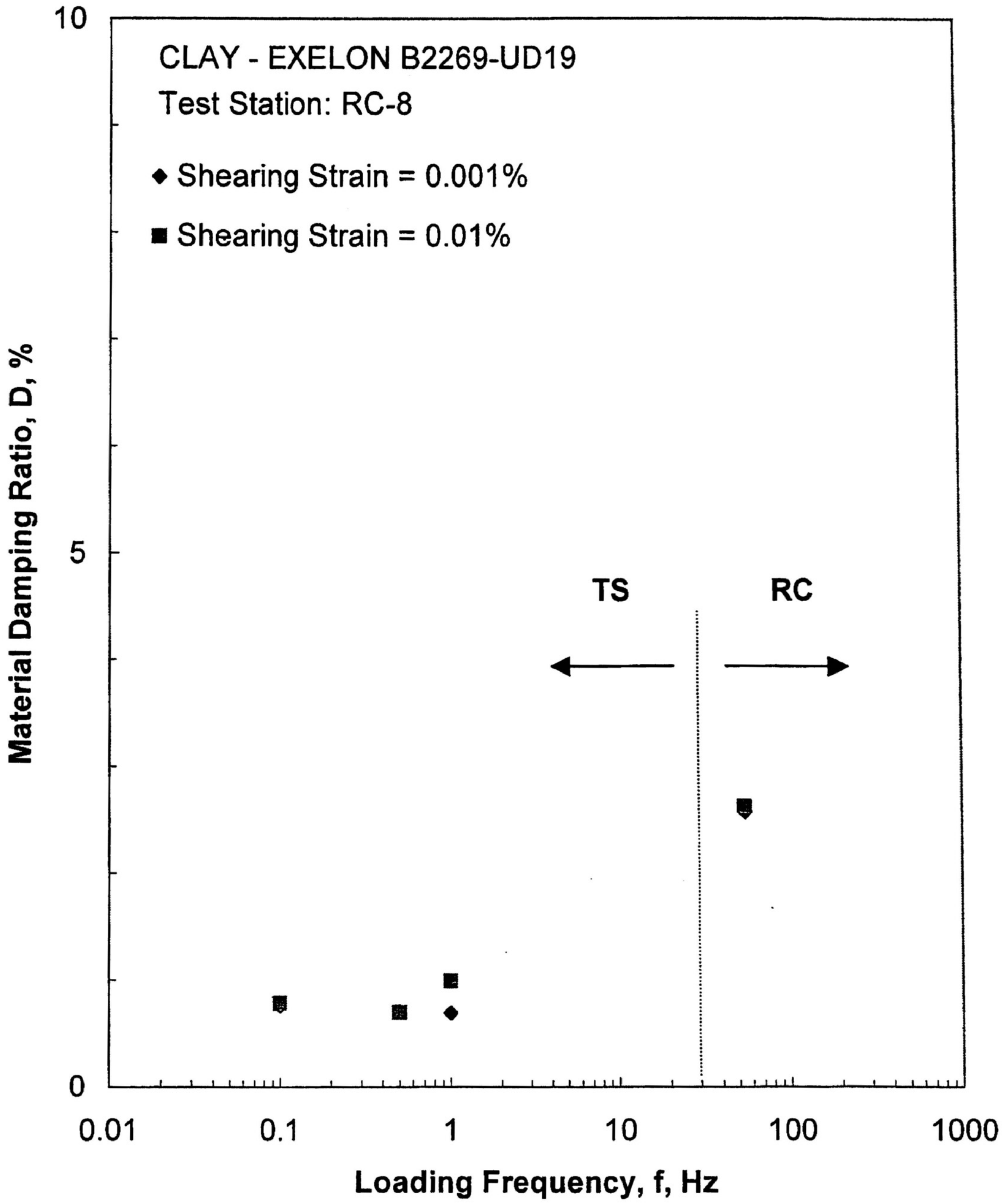

Figure H.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 125 psi from the Combined RCTS Tests

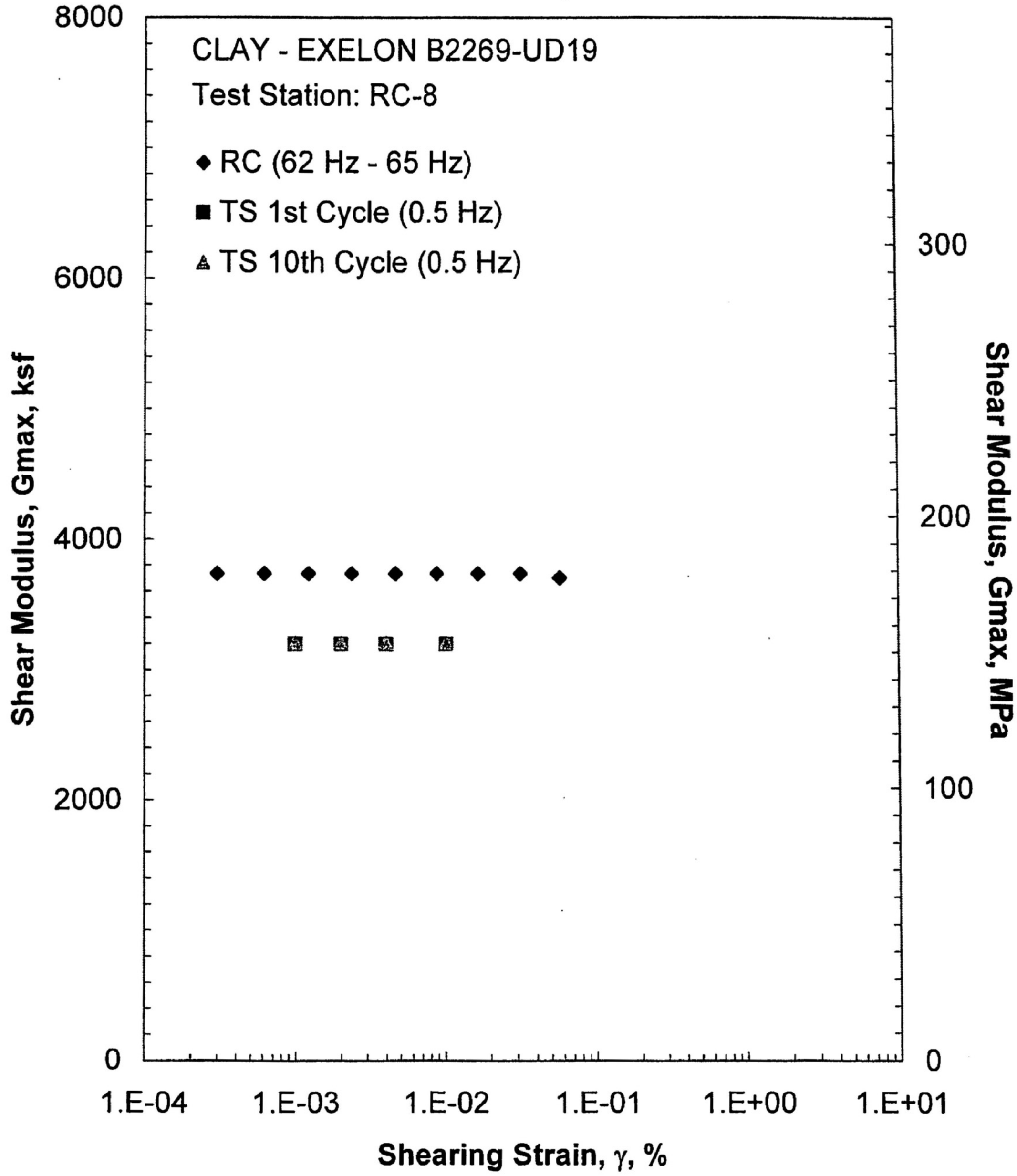

Figure H.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

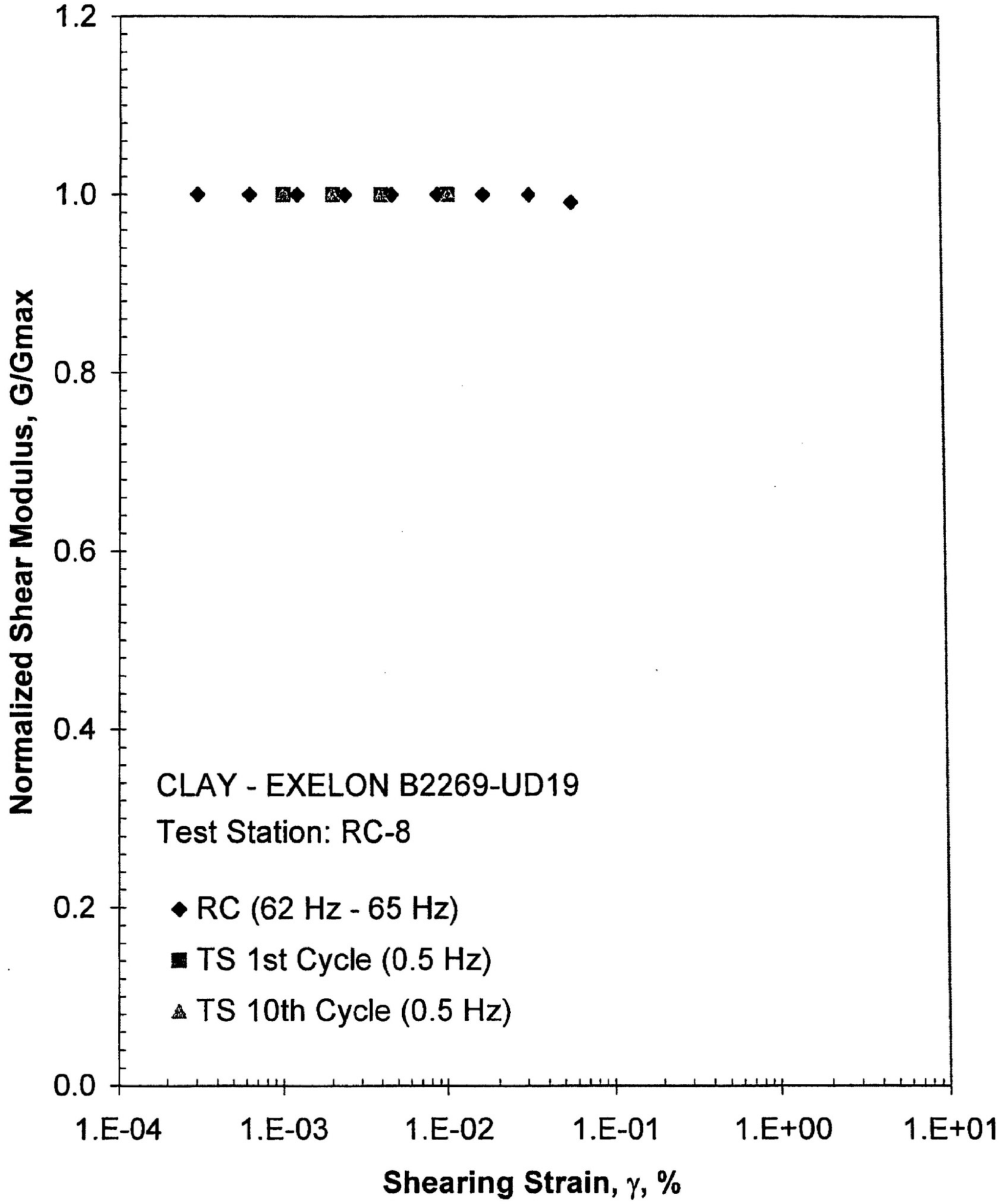

Figure H.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

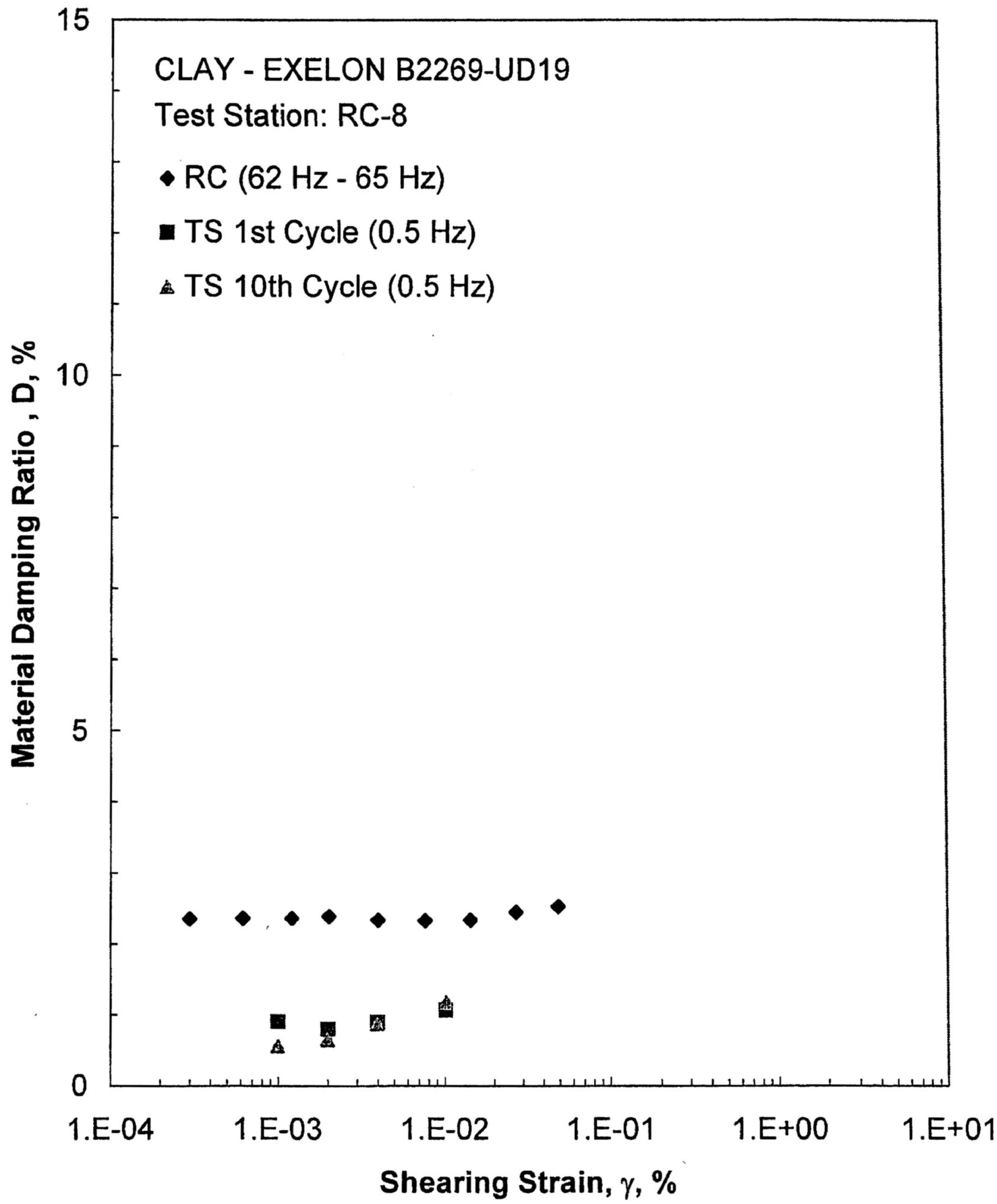

Figure H.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

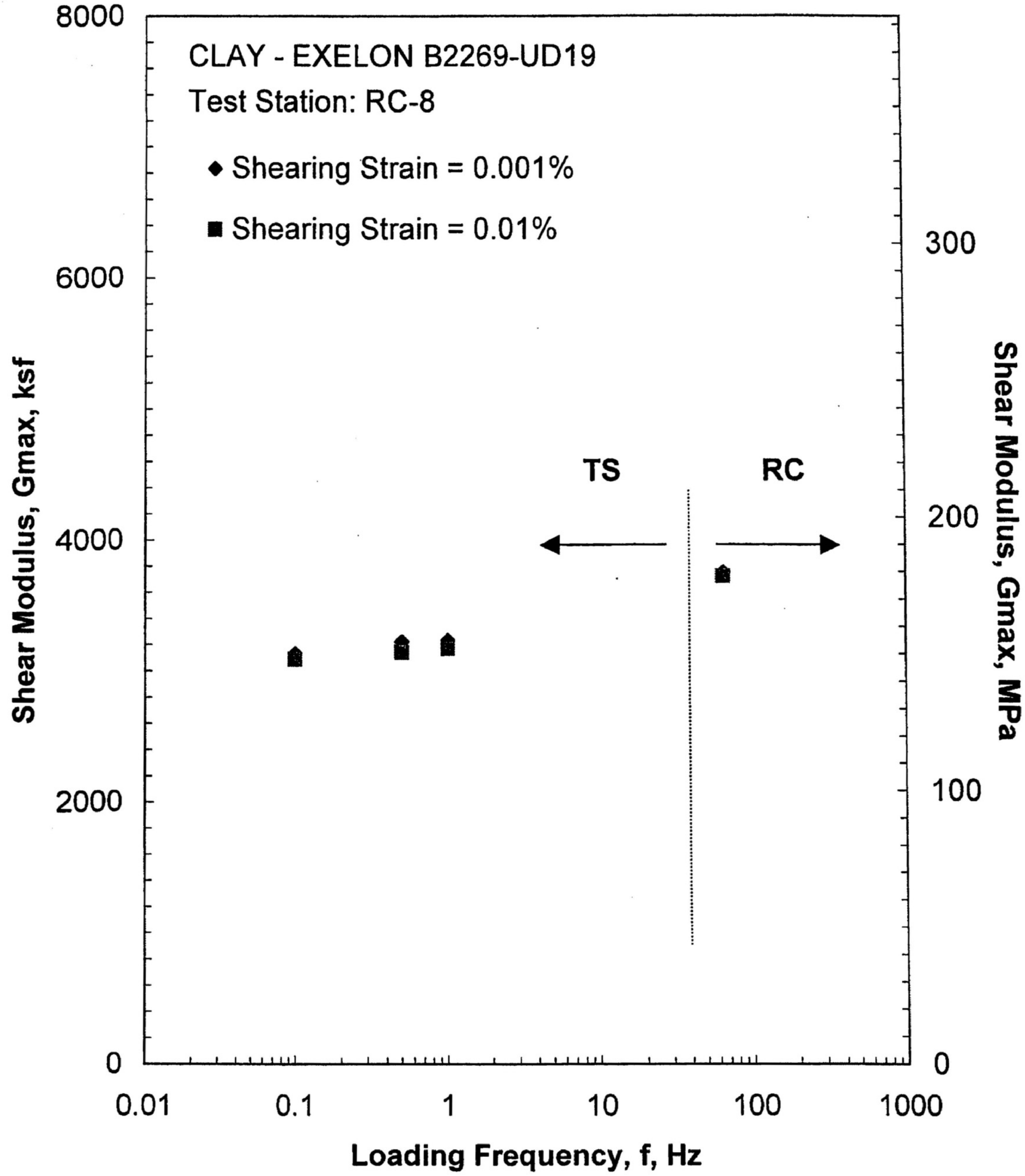

Figure H.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

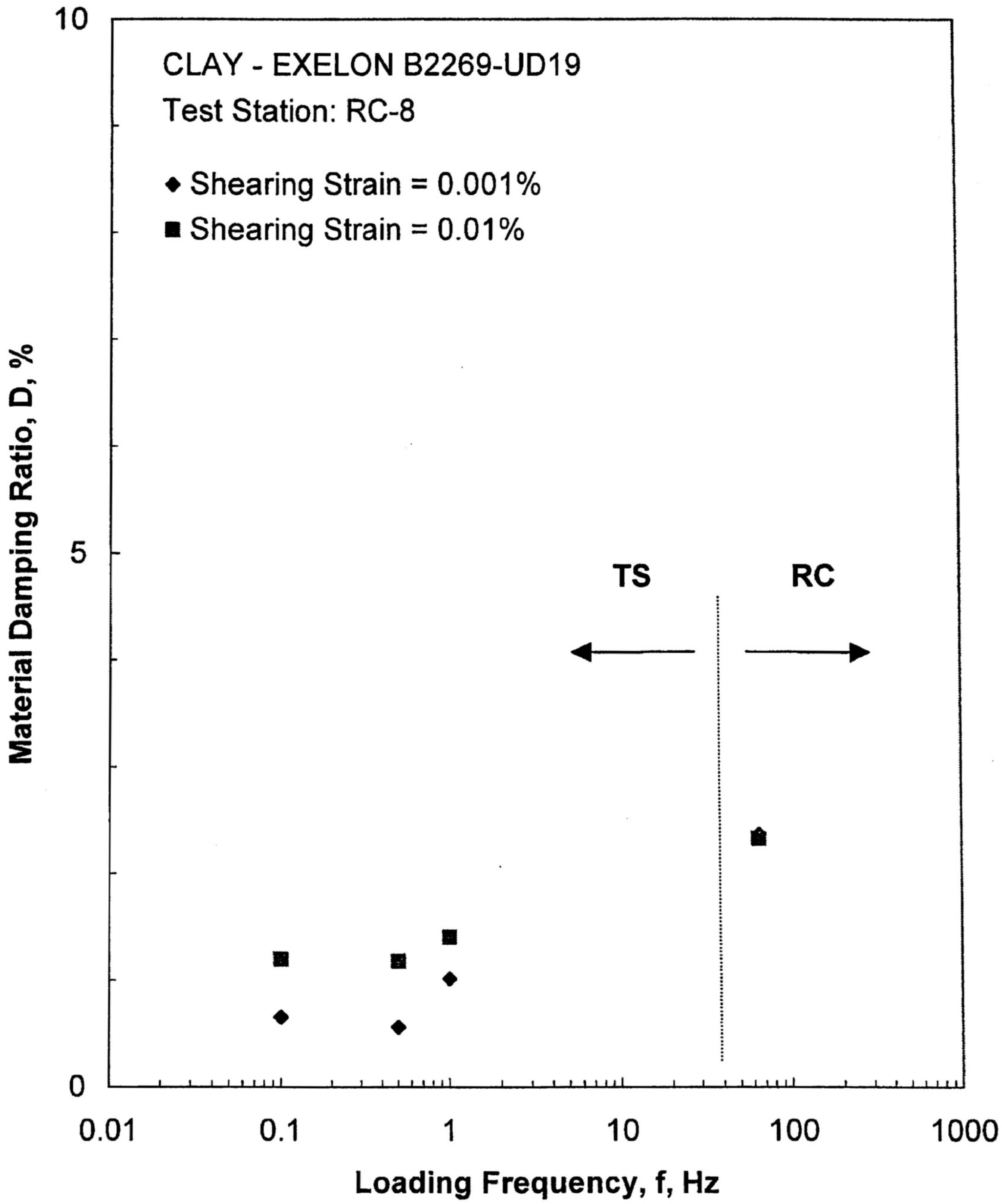

Figure H.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

Table H.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen B2269-UD19

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
31	4464	214	1864	89	721	2.95	0.979
62	8928	427	2039	98	752	2.77	0.970
125	18000	861	2446	117	819	2.65	0.947
249	35856	1716	3015	145	900	2.41	0.907
455	65520	3135	3860	185	1000	2.21	0.837

Table H.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen EXELON 2269-UD19; Isoptropic Confining Pressure, σ_o=125 psi (18.0 ksf = 861 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio×, D, %
3.80E-04	2590	1.00	3.80E-04	2.56
7.23E-04	2590	1.00	7.23E-04	2.57
1.40E-03	2590	1.00	1.16E-03	2.63
2.77E-03	2590	1.00	2.32E-03	2.61
5.46E-03	2590	1.00	4.53E-03	2.61
1.08E-02	2569	0.99	8.97E-03	2.62
2.14E-02	2569	0.99	1.80E-02	2.65
4.17E-02	2529	0.98	3.46E-02	2.62
8.19E-02	2469	0.95	6.80E-02	2.76
1.54E-01	2332	0.90	1.23E-01	3.23
2.72E-01	2150	0.83	2.04E-01	4.52
4.83E-01	1889	0.73	3.23E-01	6.92

+ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

× Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table H.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2269-UD19; Isotropic Confining Pressure, σ_o= 125 psi (18 ksf =861 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.03E-03	2088	1.00	0.68	1.02E-03	2098	1.00	0.70
2.04E-03	2088	1.00	0.74	2.04E-03	2098	1.00	0.74
4.06E-03	2088	1.00	0.59	4.05E-03	2098	1.00	0.60
9.95E-03	2088	1.00	0.86	9.96E-03	2093	1.00	0.69

Table H.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2269-UD19; Isoptropic Confining Pressure, σ_o= 455 psi (65.5 ksf = 3135 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average^{+} Shearing Strain, %	Material Damping Ratio^{x}, D, %
3.01E-04	3736	1.00	3.01E-04	2.35
6.20E-04	3736	1.00	6.20E-04	2.36
1.21E-03	3736	1.00	1.21E-03	2.36
2.36E-03	3736	1.00	2.03E-03	2.38
4.61E-03	3736	1.00	4.01E-03	2.33
8.76E-03	3736	1.00	7.62E-03	2.32
1.66E-02	3736	1.00	1.43E-02	2.33
3.16E-02	3736	1.00	2.72E-02	2.44
5.72E-02	3704	0.99	4.92E-02	2.52

$^{+}$ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

^{x} Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table H.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2269-UD19; Isotropic Confining Pressure, σ_o=455 psi (65.5 ksf = 3135 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
9.98E-04	3197	1.00	0.90	9.95E-04	3206	1.00	0.55
2.00E-03	3197	1.00	0.79	1.99E-03	3206	1.00	0.64
3.99E-03	3197	1.00	0.89	3.97E-03	3206	1.00	0.86
1.02E-02	3197	1.00	1.06	1.02E-02	3206	1.00	1.17

FUGRO CONSULTANTS, INC.

6100 Hillcroft (77081)
P.O. Box 740010
Houston, Texas 77274
Tel: 713-369-5400
Fax: 713-369-5518

April 25, 2008

Ms. Siesta Williams
MACTEC
3301 Atlantic Avenue
Raleigh, NC 27604

RE: Two (2) Reports For The EXELON COL Project

Dear Ms. Williams:

Fugro has completed two (2) RCTS tests, which are B2274-UD8 and B2174-UD6, for the EXELON project. Fugro has incorporated, as needed, Dr. Kenneth Stokoe's comments into the final reports. The final reports and the associated RCTS Test Approvals by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

Bill DeGroff

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

Cc: Kathryn White, in PDF

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#I	B2274-UD8	122	KHS (+)	13 Apr. '08
RCTS#J	B2174-UD6	96.4	KHS	13 Apr. '08

Two RCTS tests for the site referenced above were tested, and two reports were prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

(+) Consider suggested revisions as noted in a few figures

APPENDIX I

Specimen B2274-UD8
(Index properties not available)

Borehole B2274
Sample UD8
Depth = 122.0 ft (37.2 m)
Total Unit Weight = 112.6 lb/ft^3
Water Content = 33.5 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 49 psi

FUGRO JOB #: 0411-08-1686
Testing Station: RC9

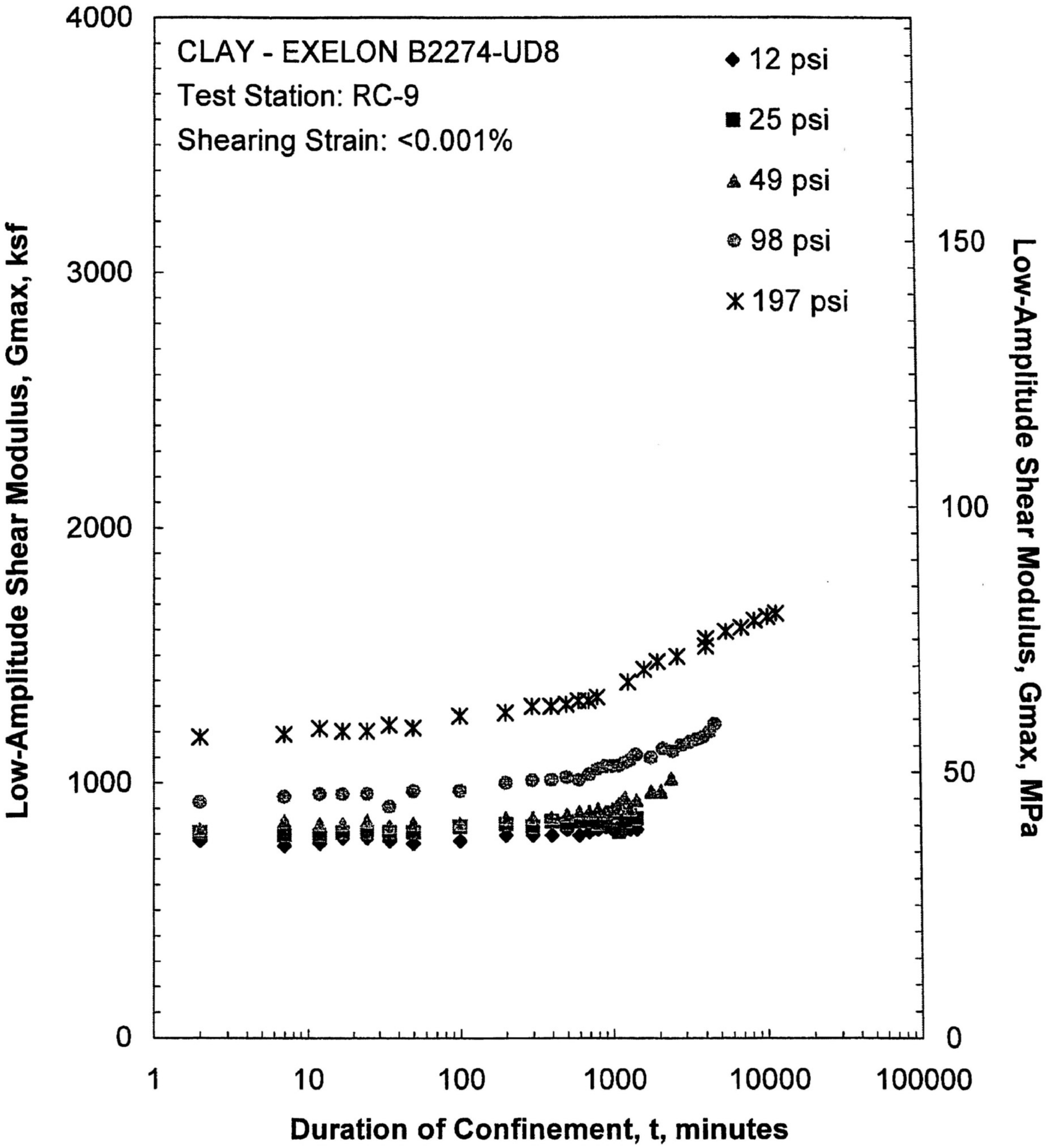

Figure I.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

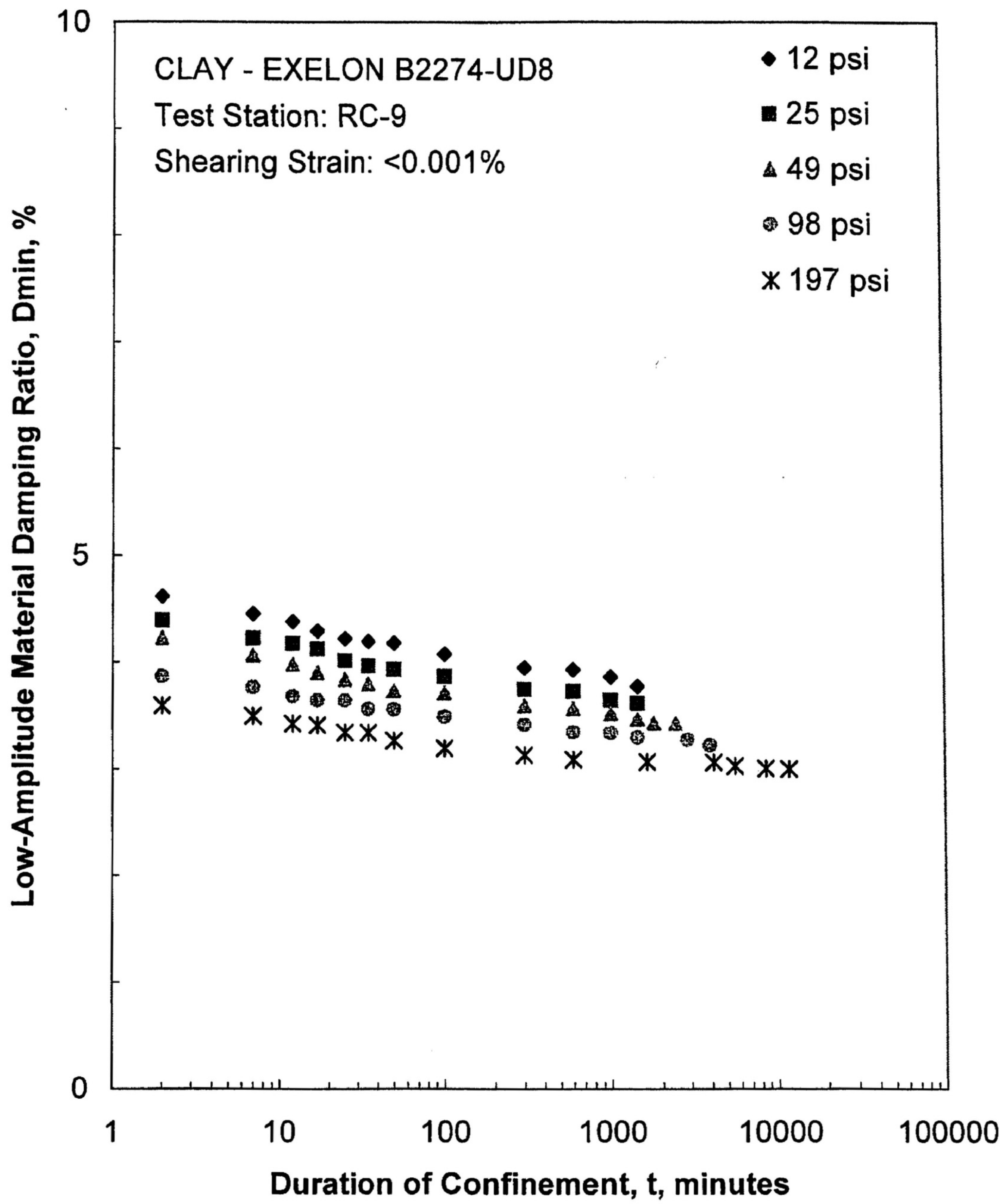

Figure I.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

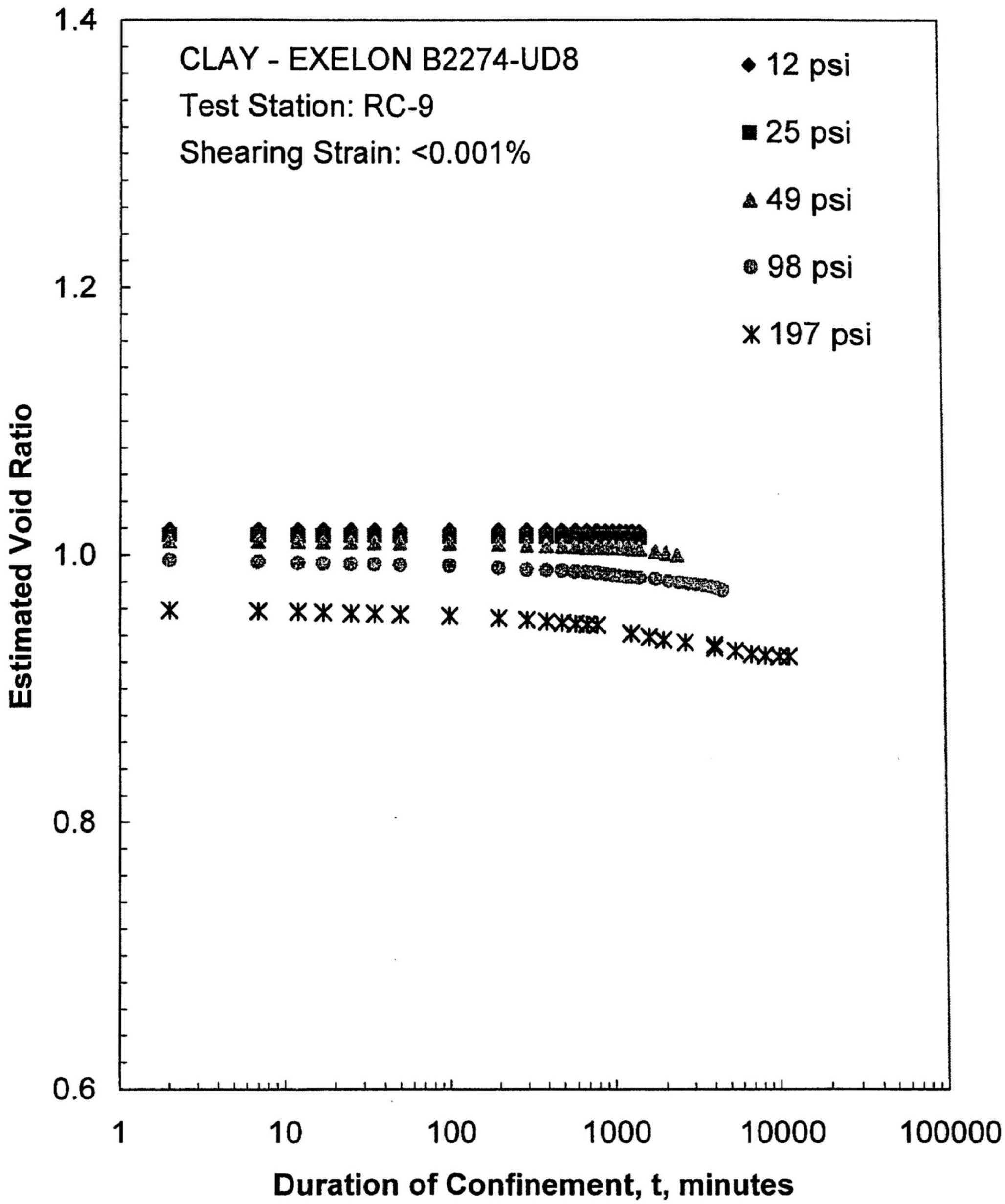

Figure I.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

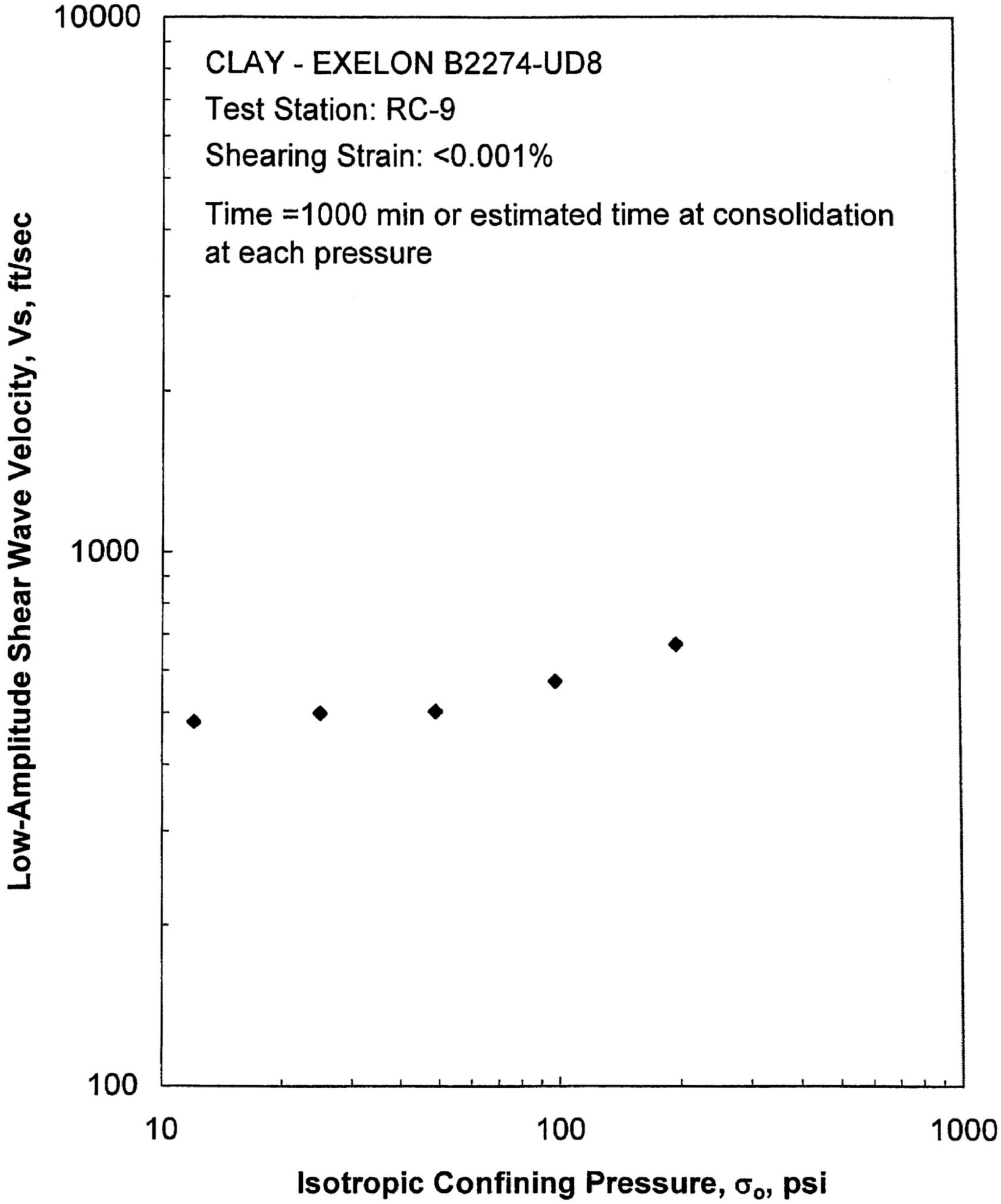

Figure I.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

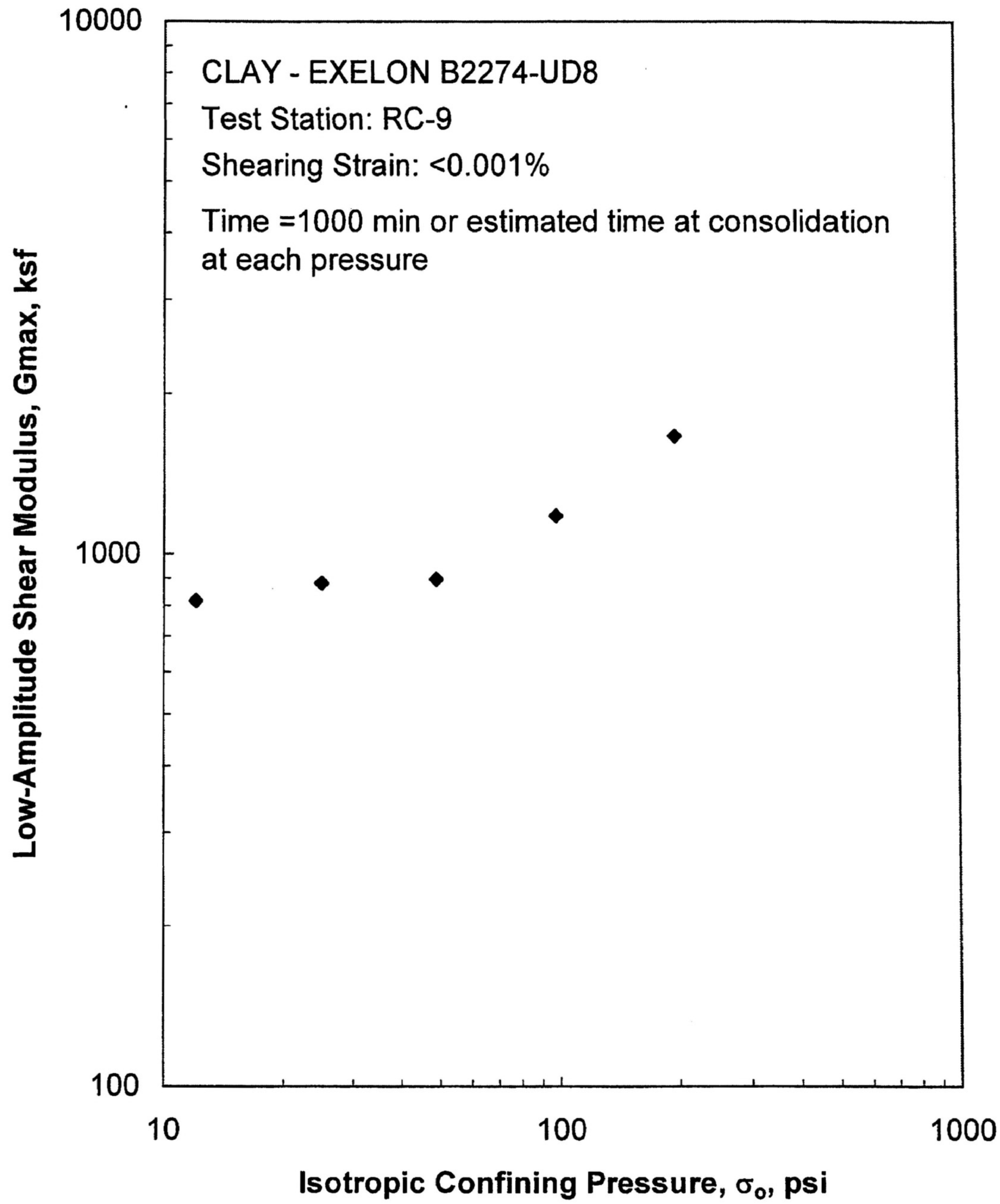

Figure I.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

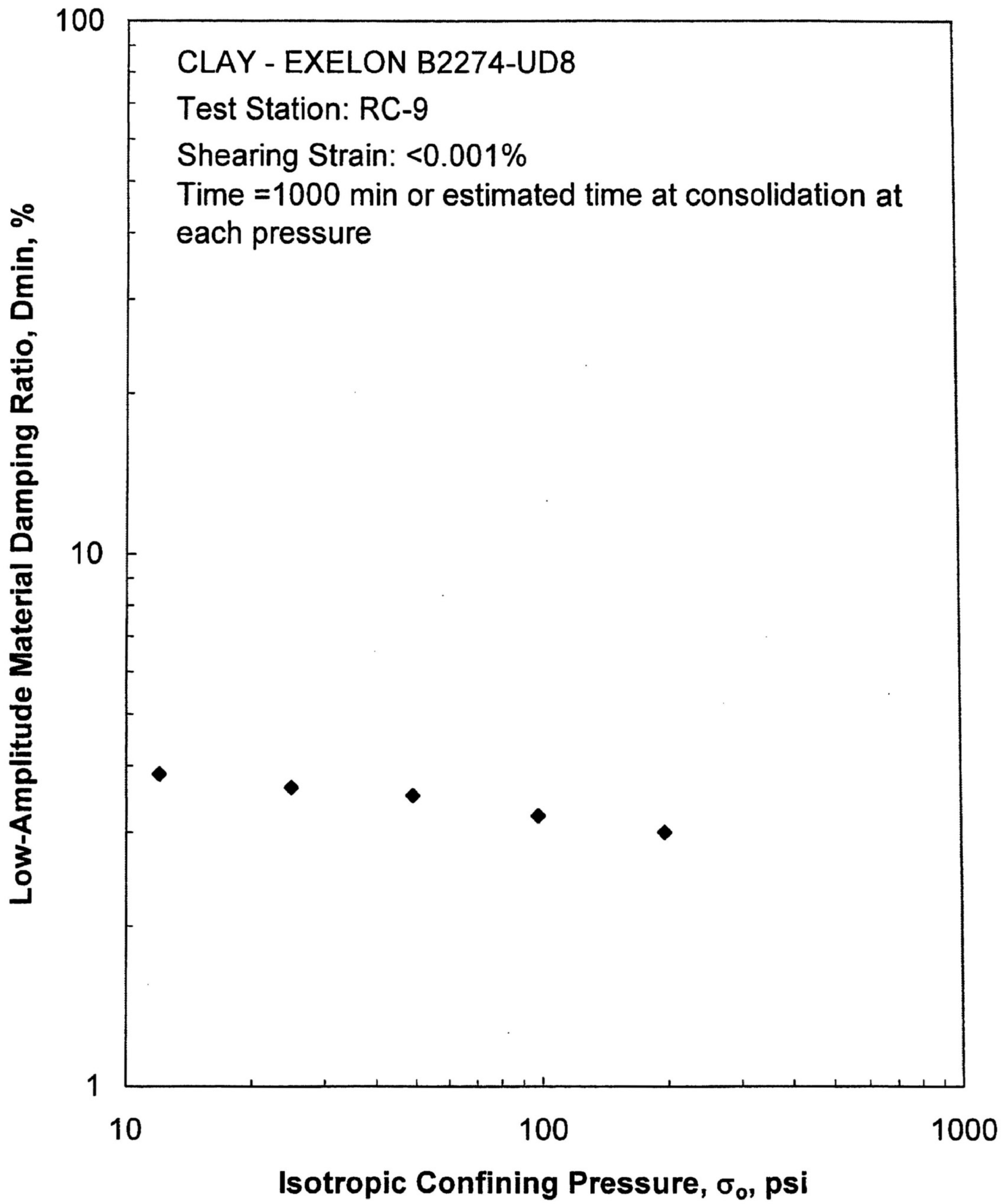

Figure I.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

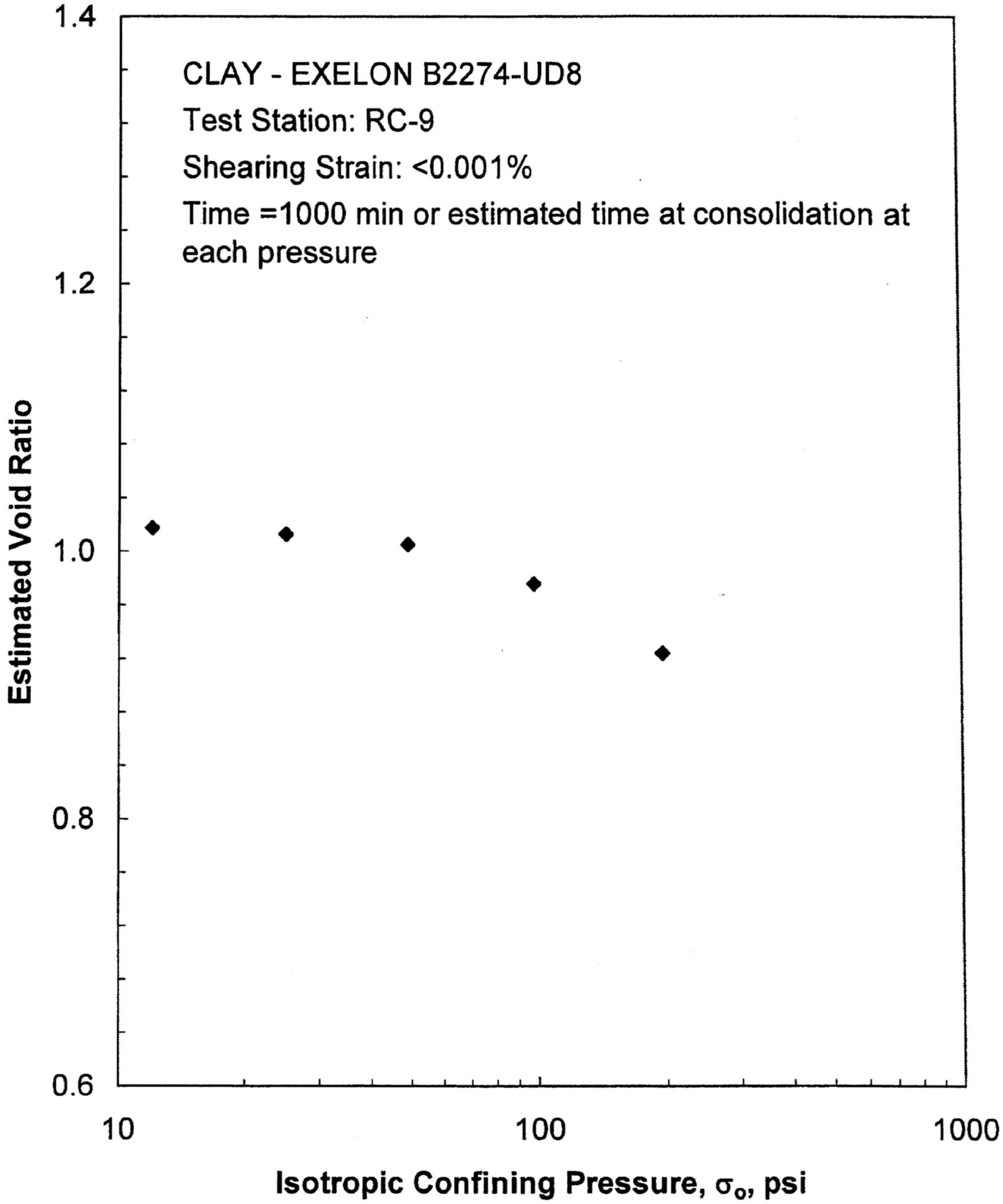

Figure I.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

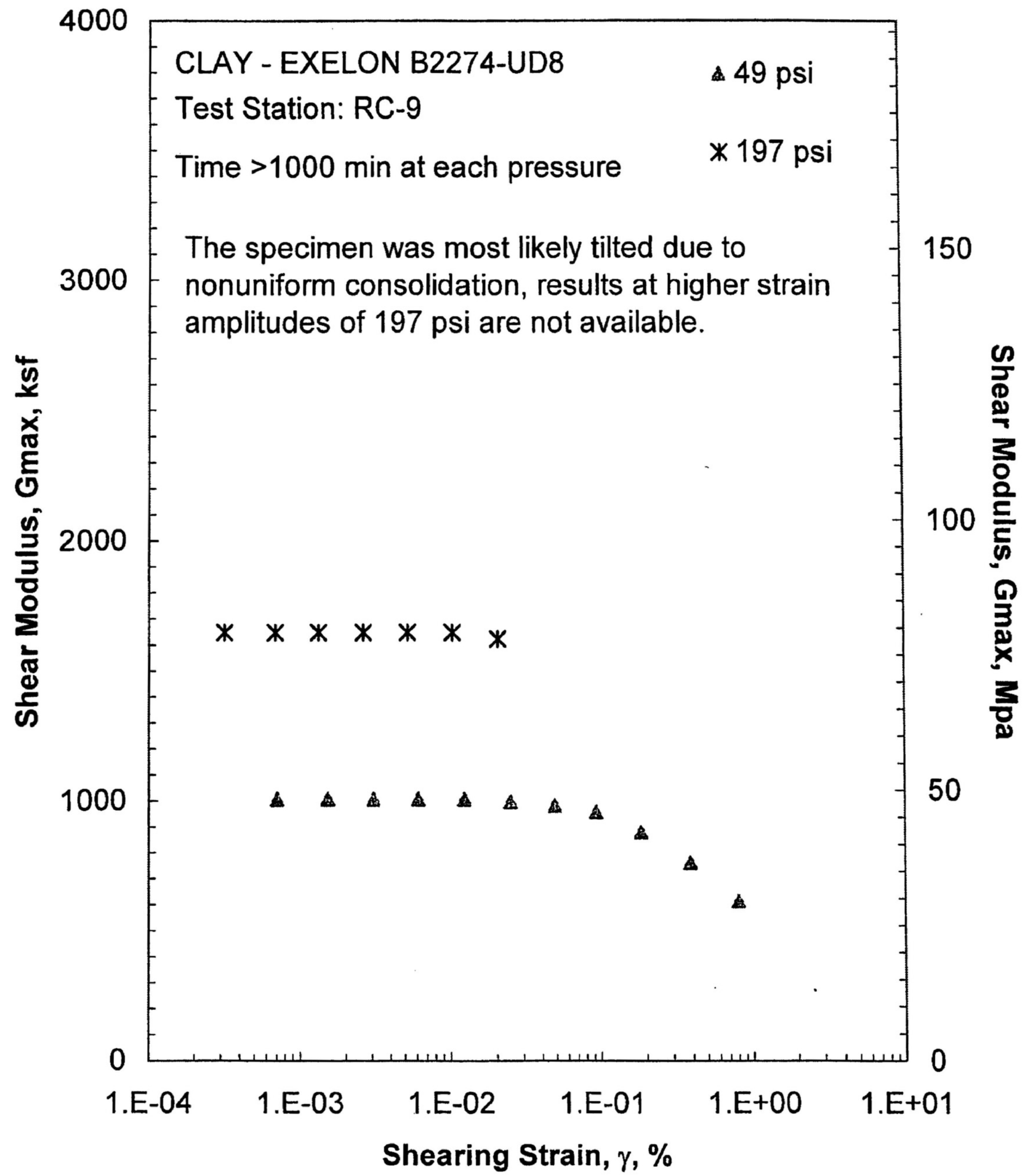

Figure I.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

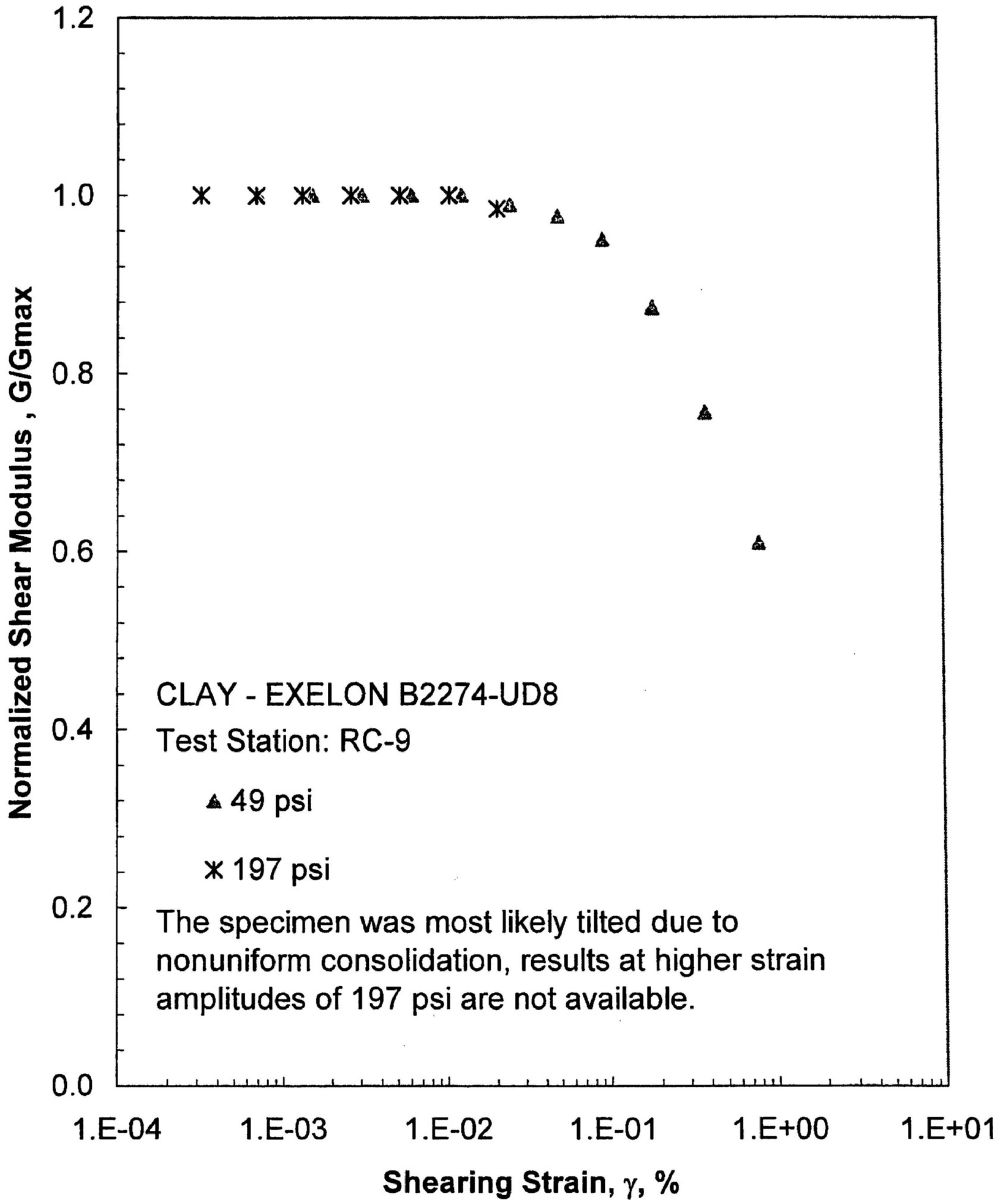

Figure I.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

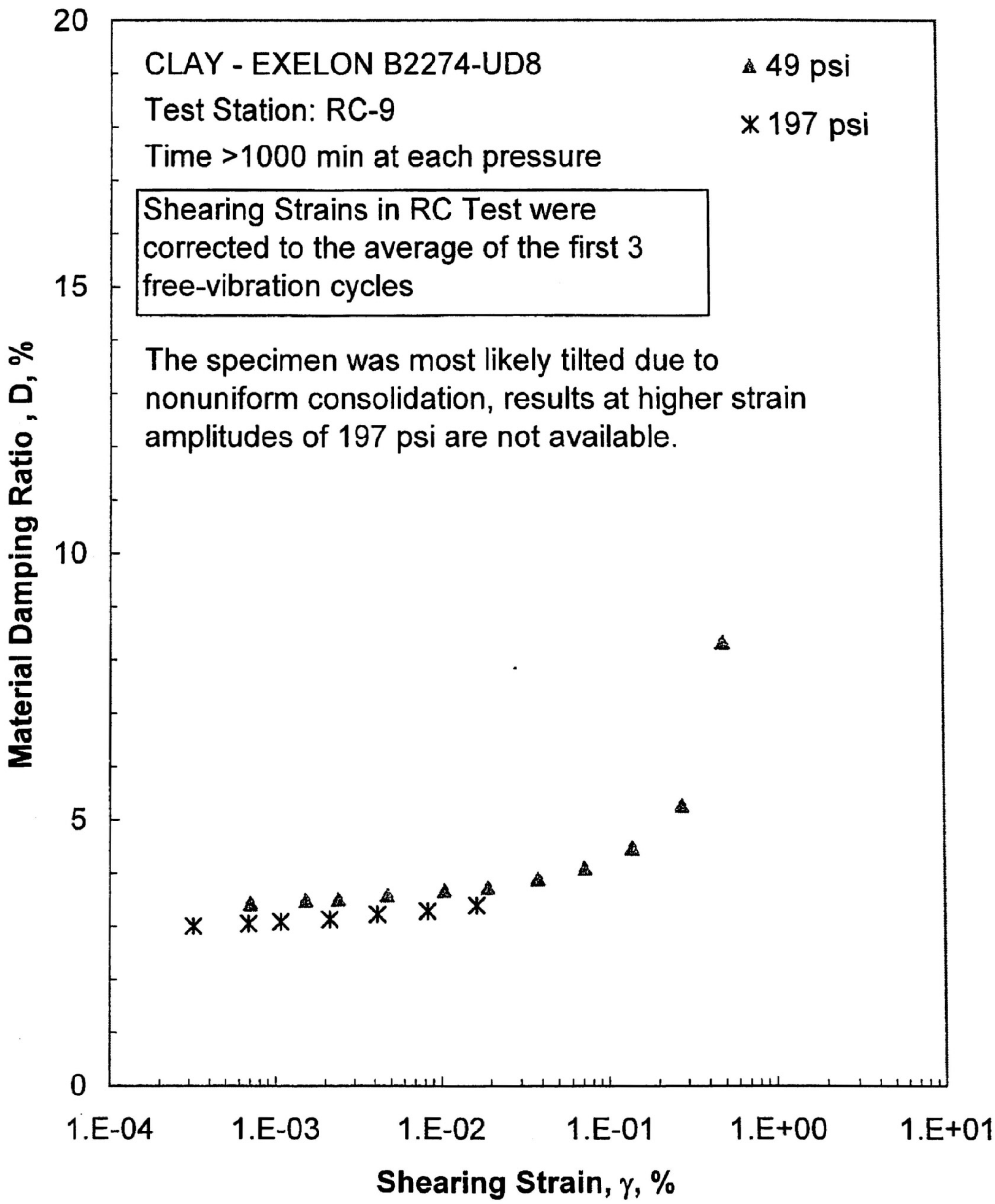

Figure I.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

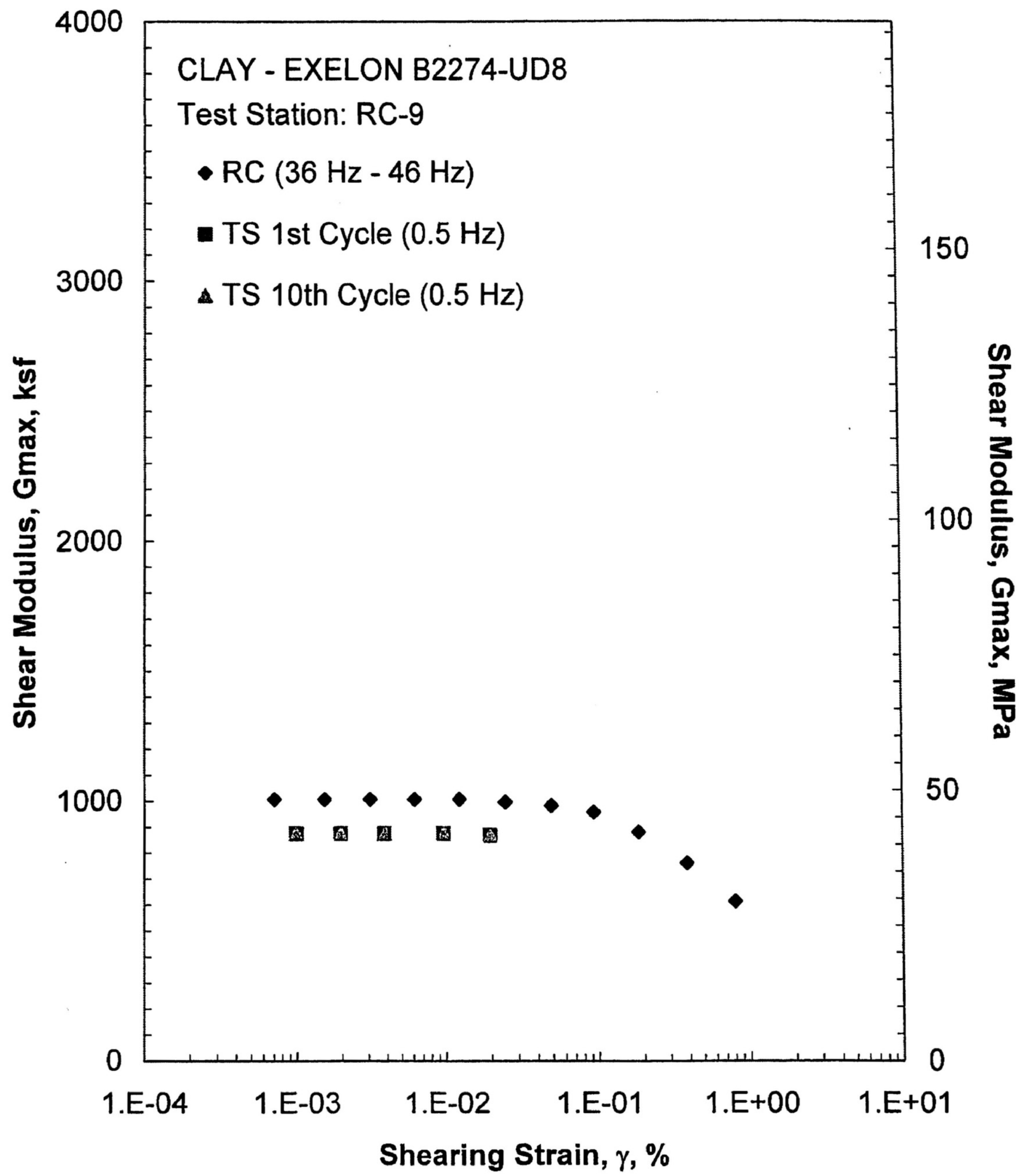

Figure I.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 49 psi from the Combined RCTS Tests

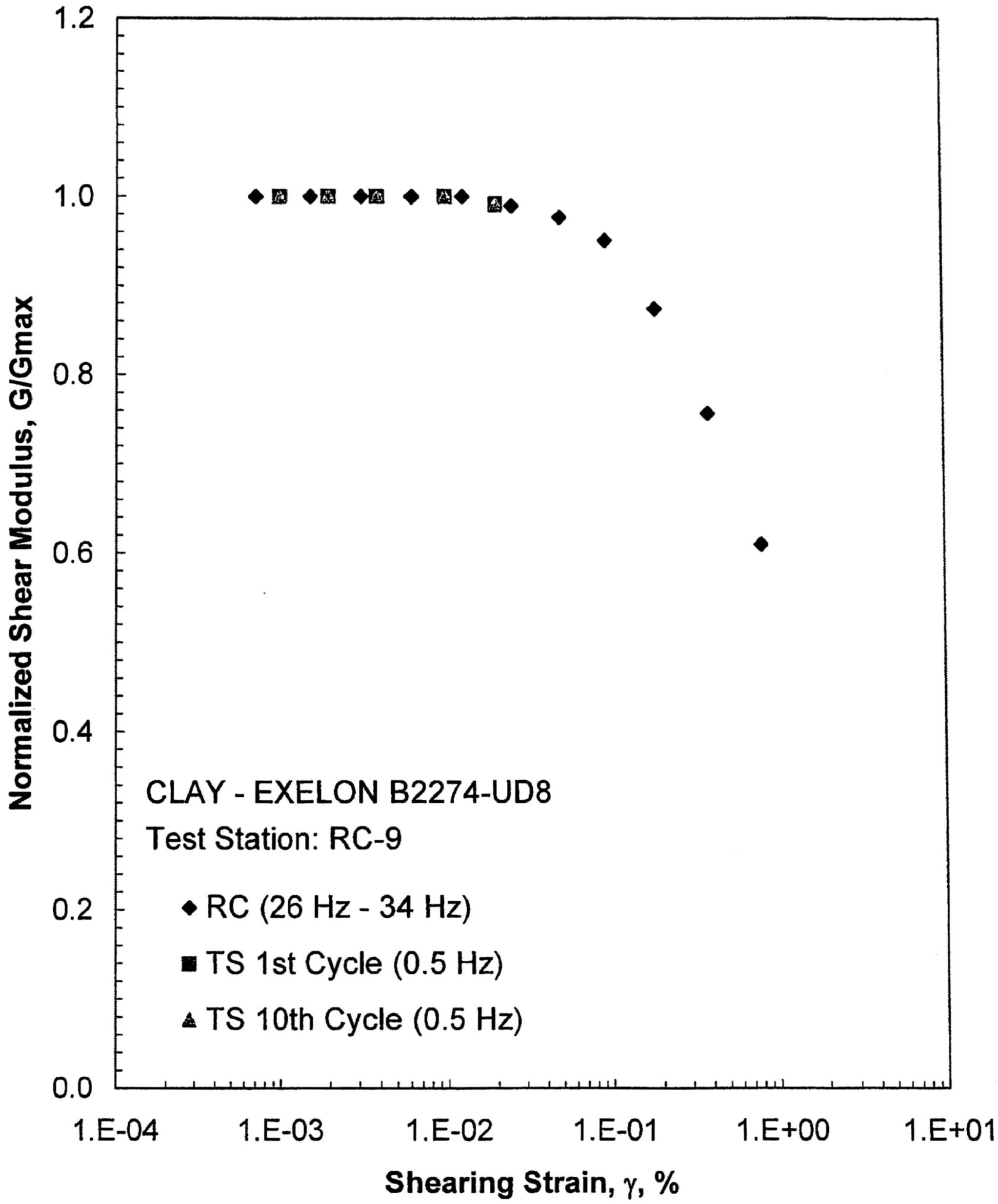

Figure I.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 49 psi from the Combined RCTS Tests

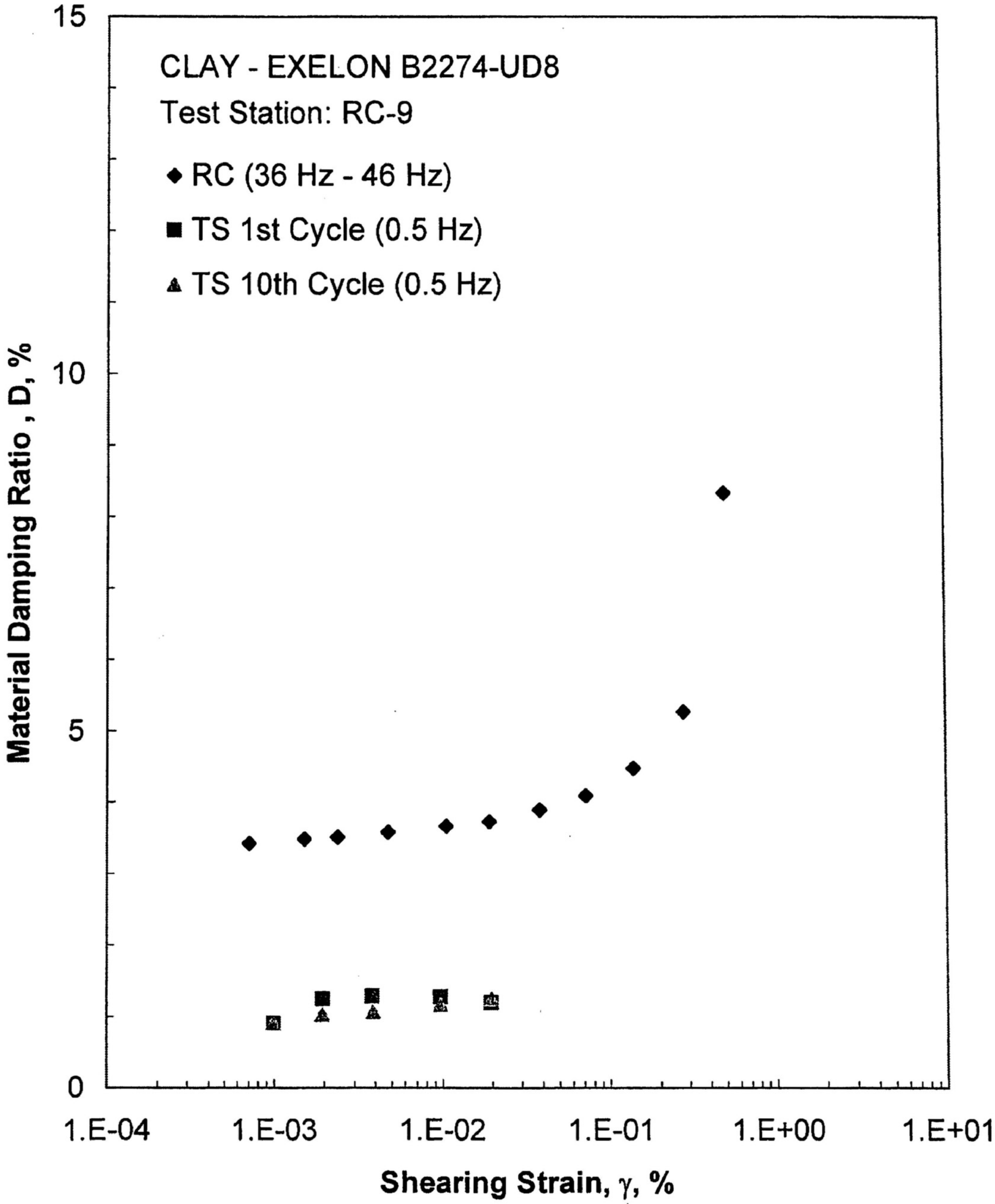

Figure I.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 49 psi from the Combined RCTS Tests

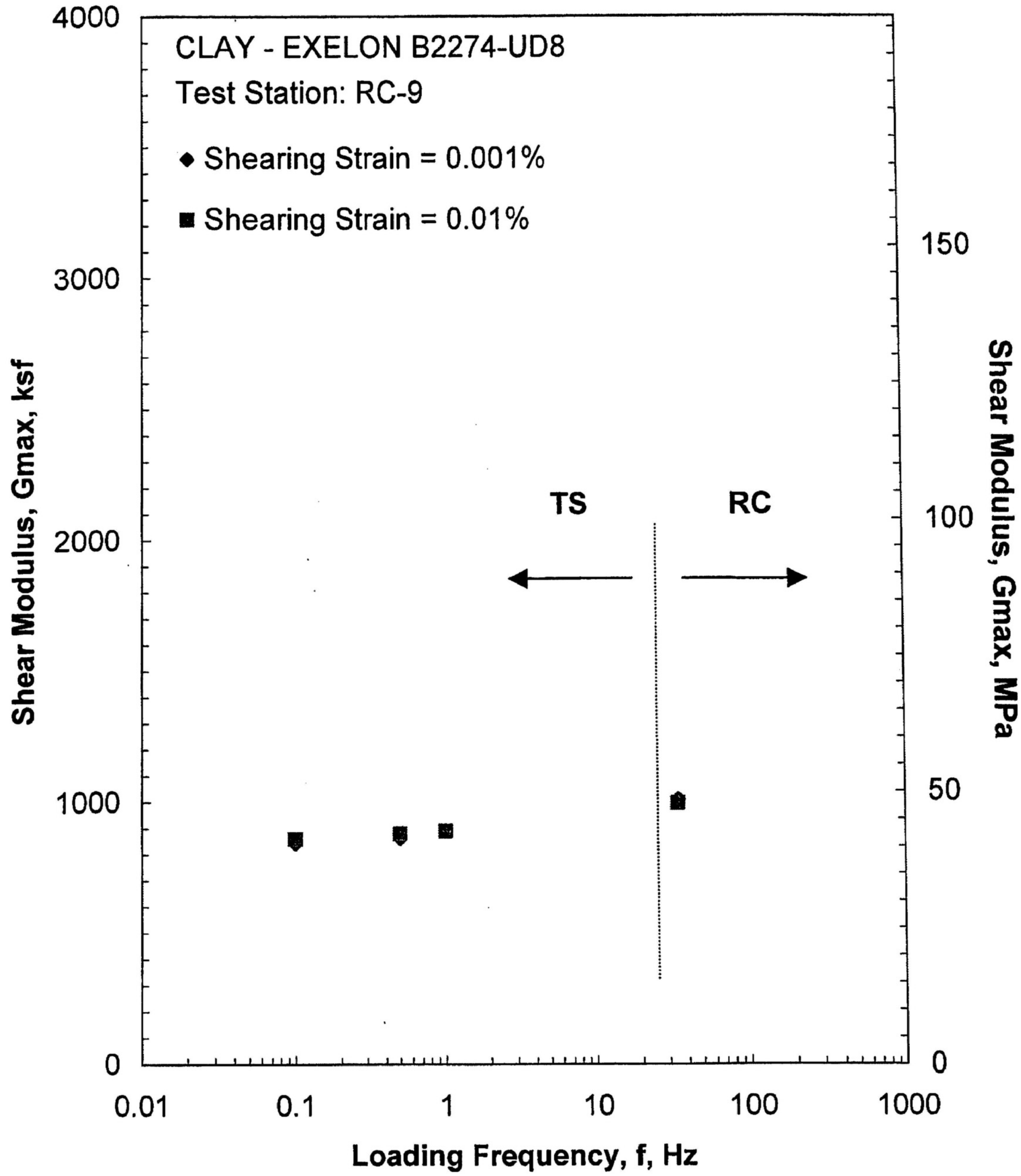

Figure I.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 49 psi from the Combined RCTS Tests

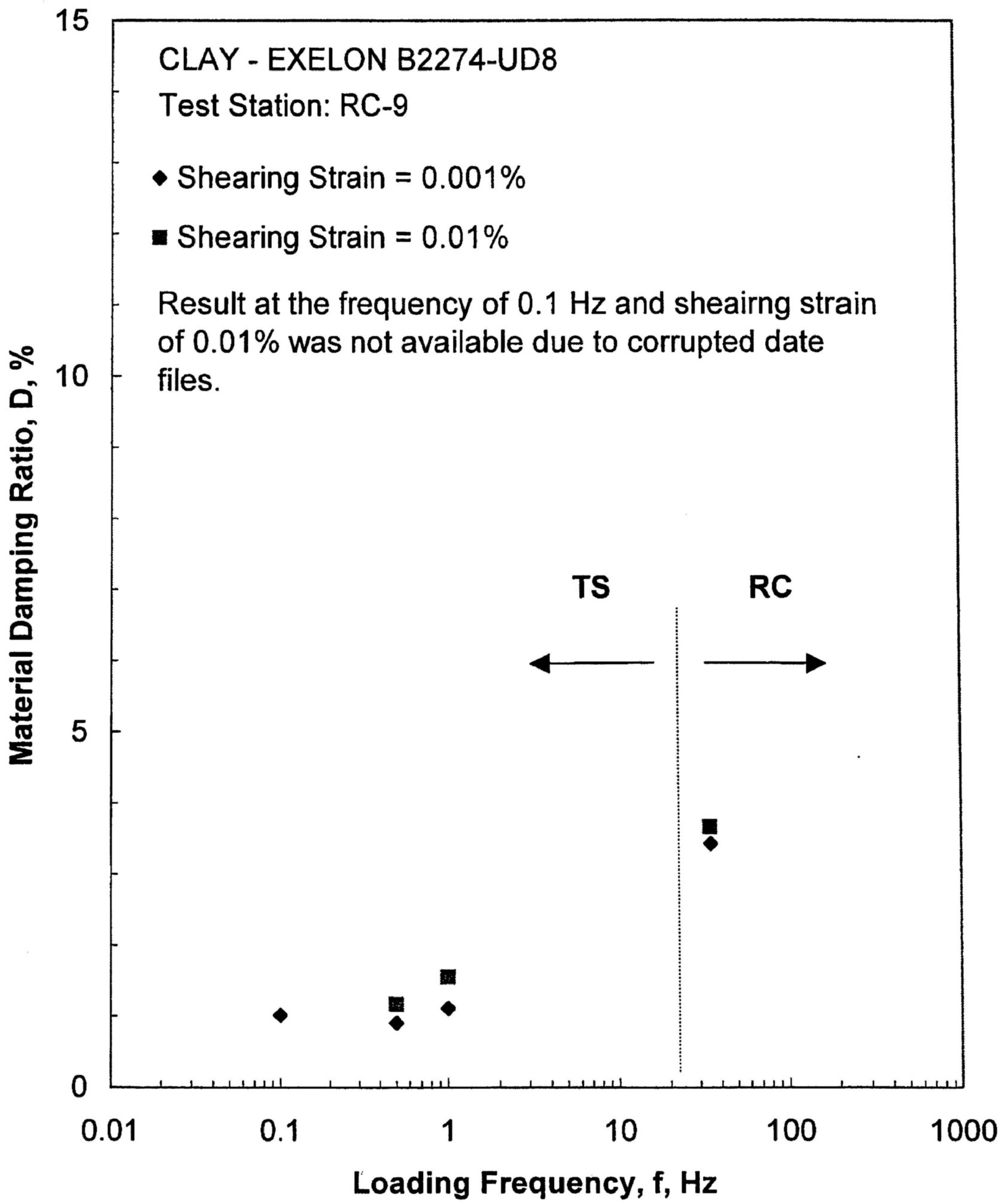

Figure I.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 49 psi from the Combined RCTS Tests

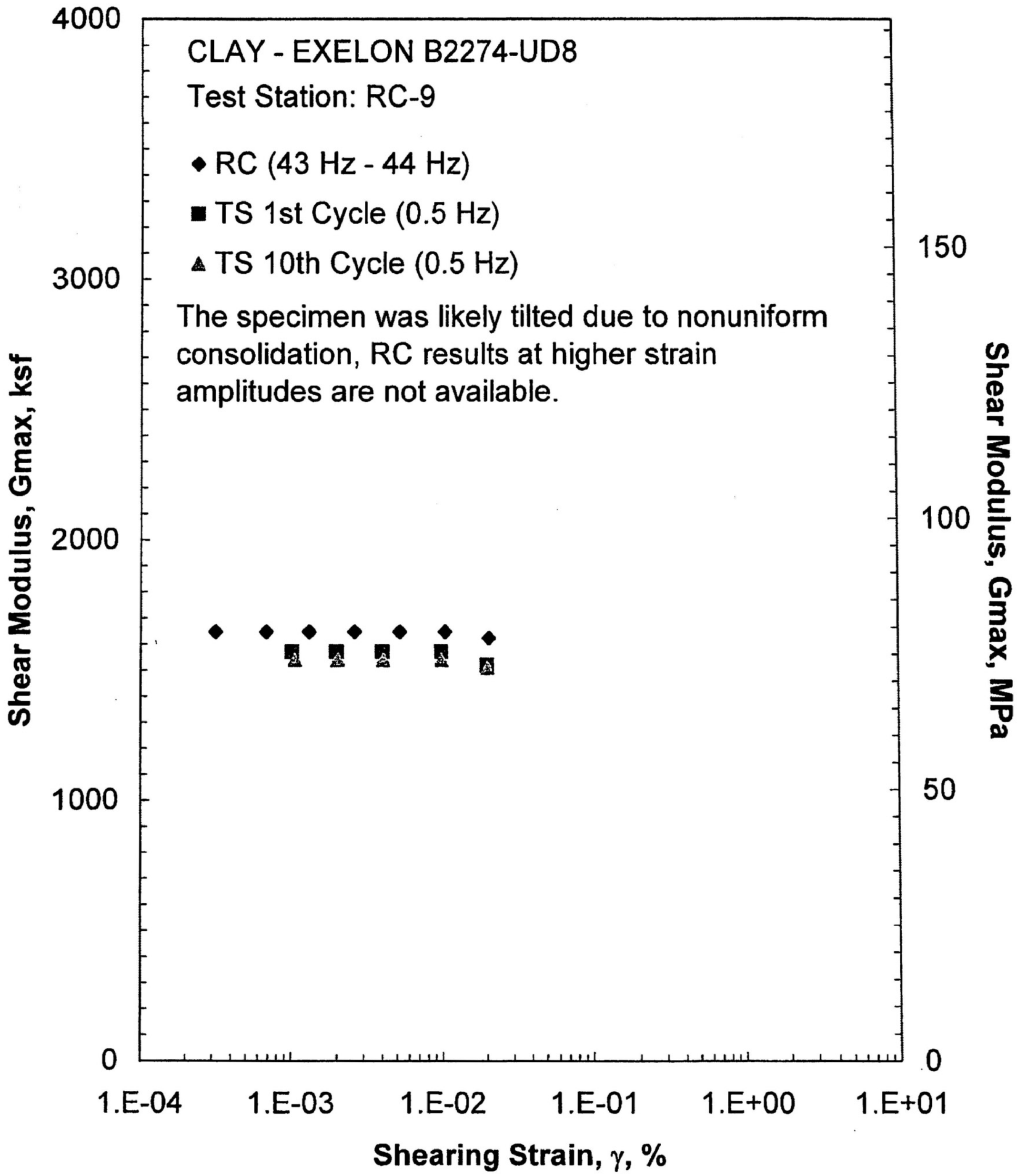

Figure I.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 197 psi from the Combined RCTS Tests

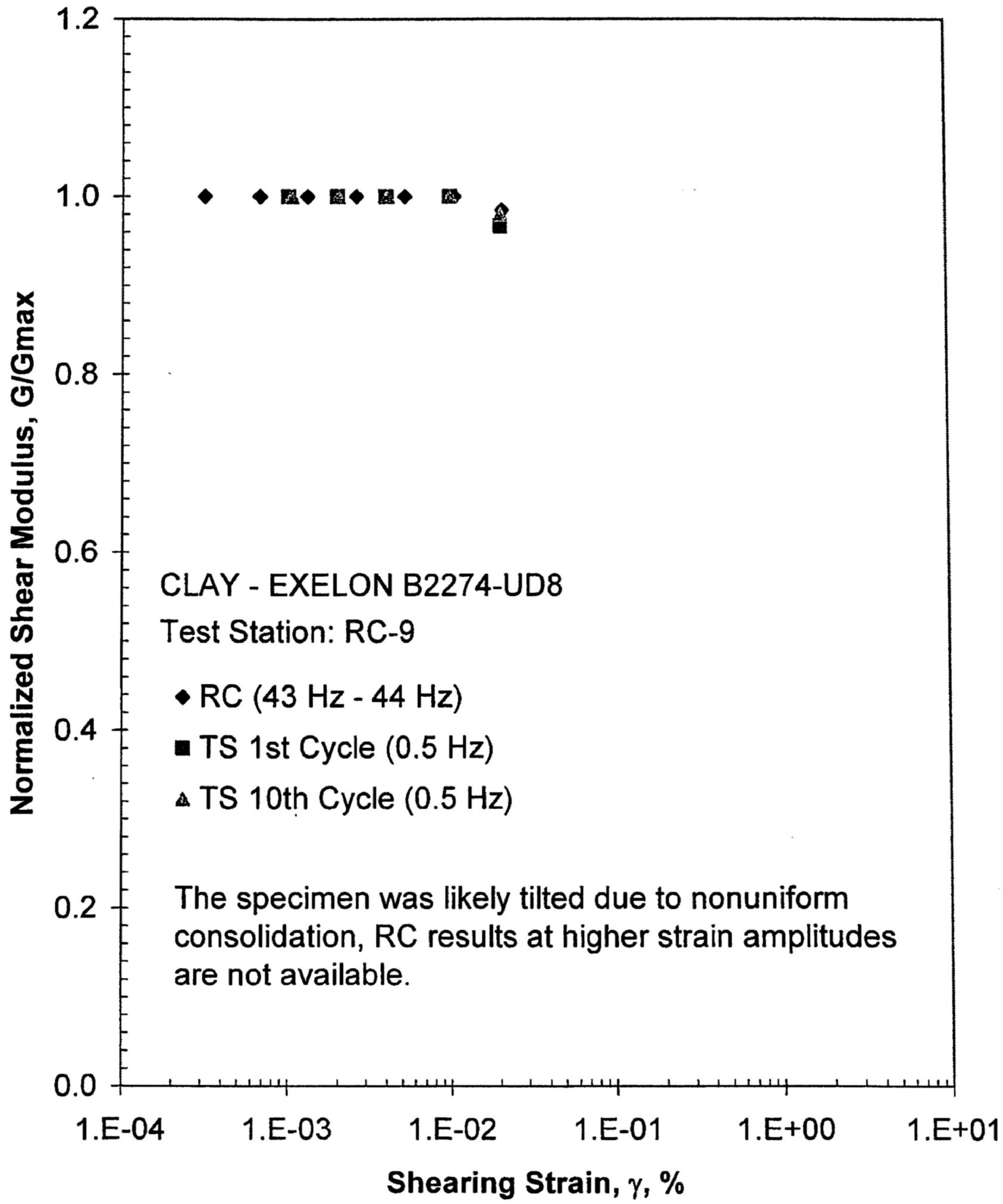

Figure I.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 197 psi from the Combined RCTS Tests

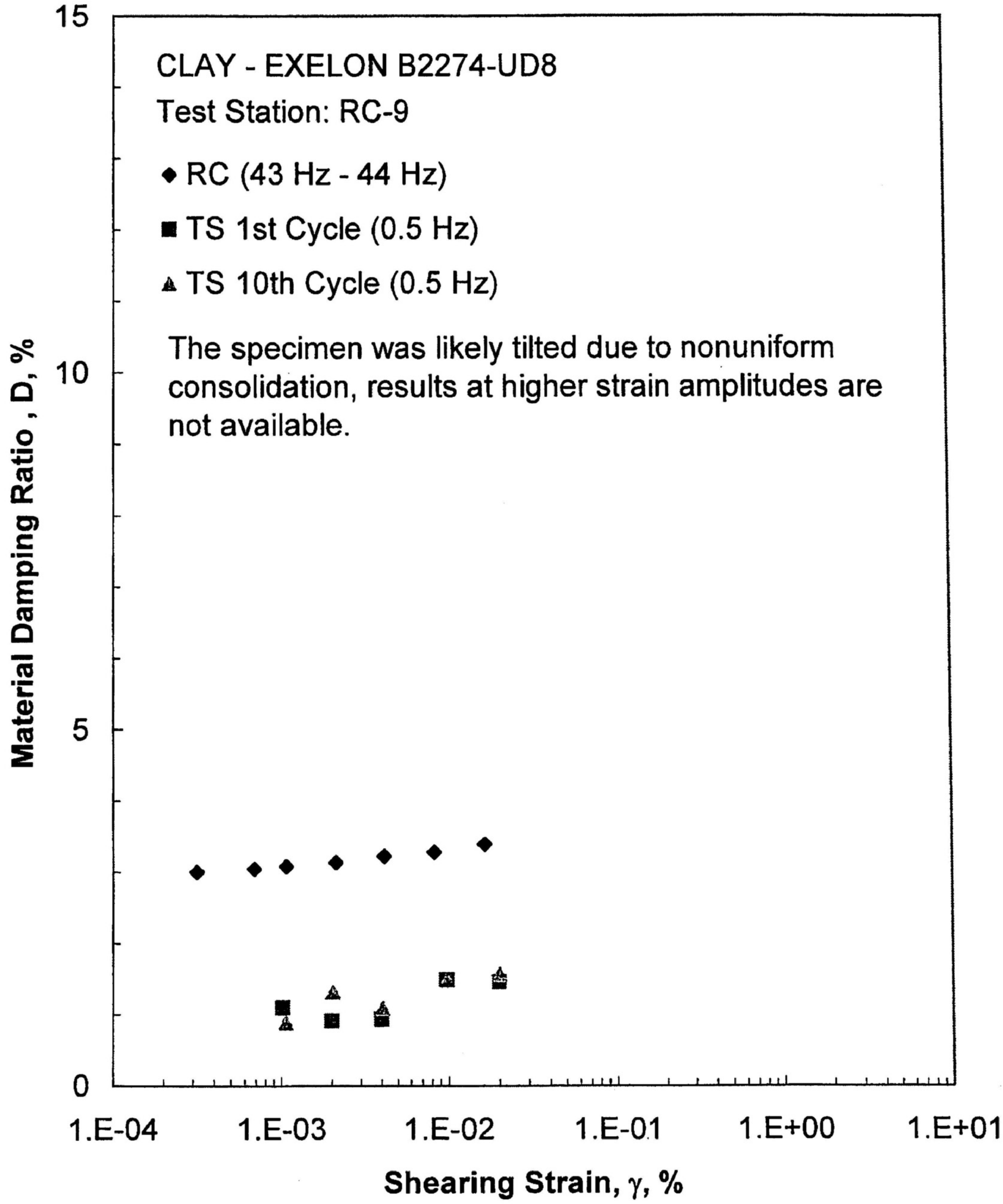

Figure I.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 197 psi from the Combined RCTS Tests

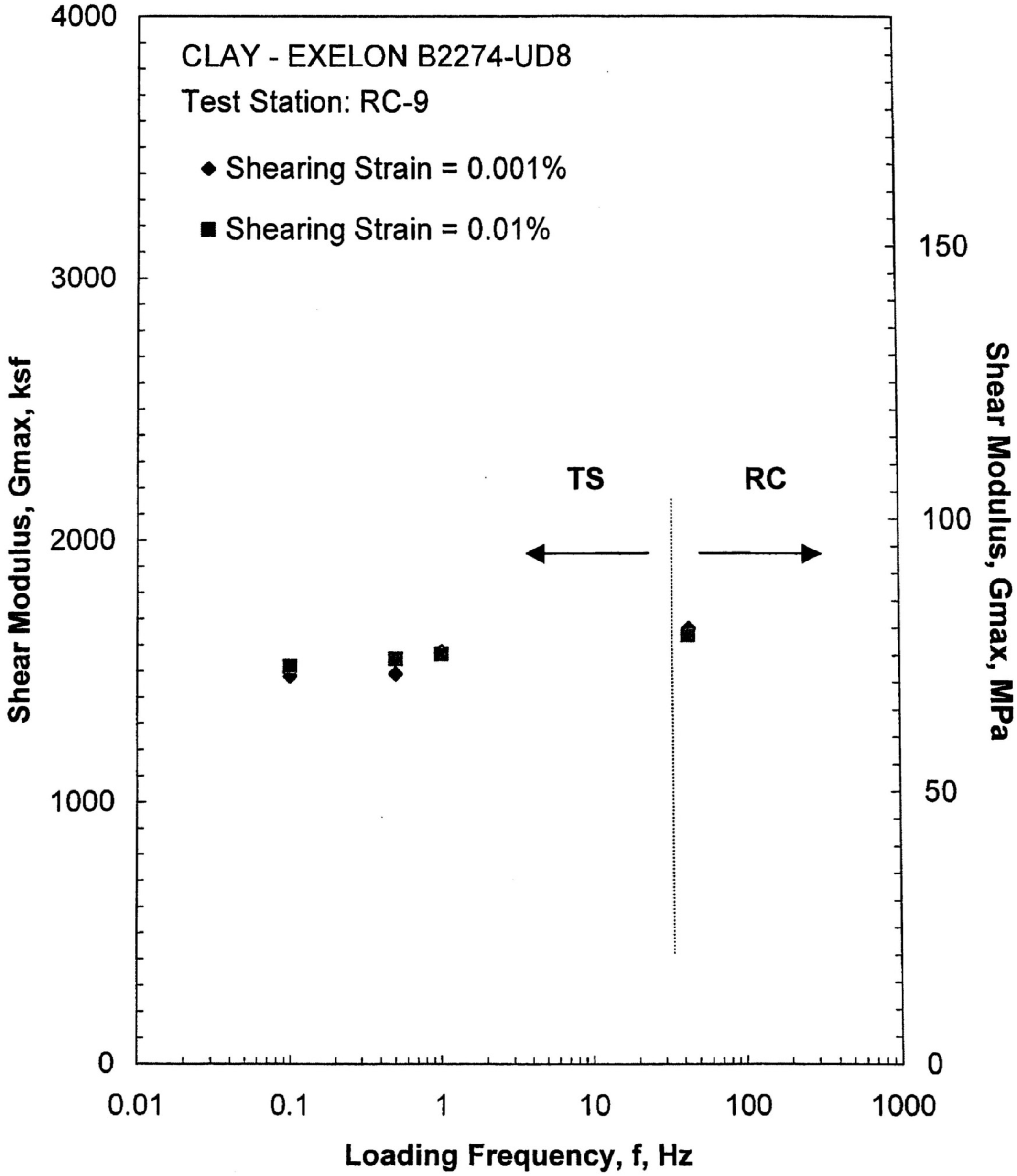

Figure I.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 197 psi from the Combined RCTS Tests

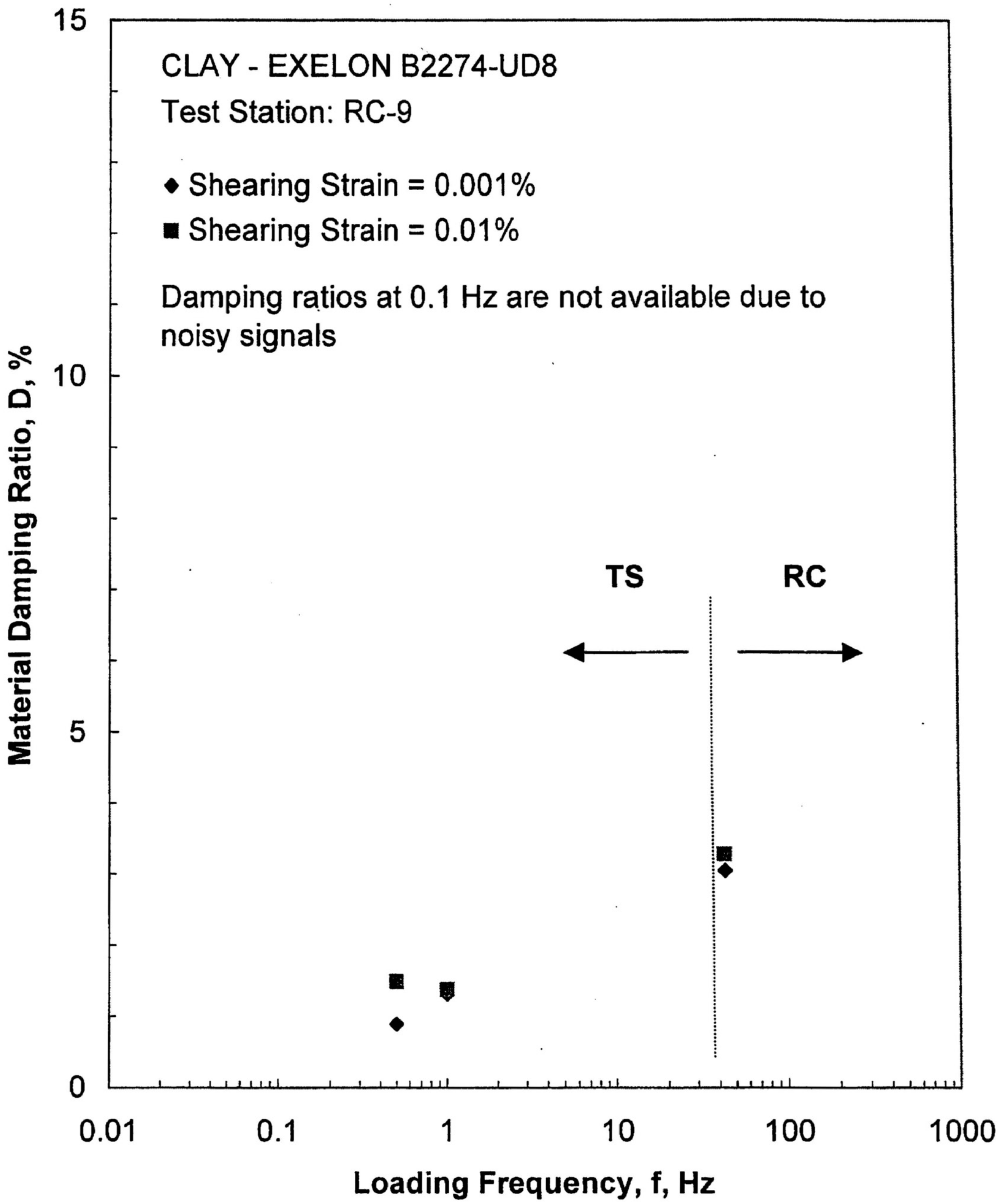

Figure I.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 197 psi from the Combined RCTS Tests

Table I.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen B2274-UD8

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
12	1728	83	816	39	481	3.86	1.02
25	3600	172	881	42	499	3.64	1.01
49	7056	338	895	43	502	3.52	1.00
98	14112	675	1178	57	572	3.22	0.98
197	28368	1357	1664	80	670	3.00	0.92

Table I.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2274-UD8; Isoptropic Confining Pressure, σ_o=49 psi (7.1 ksf = 338 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
7.07E-04	1006	1.00	7.07E-04	3.42
1.53E-03	1006	1.00	1.53E-03	3.48
3.07E-03	1006	1.00	2.40E-03	3.51
6.10E-03	1006	1.00	4.76E-03	3.58
1.23E-02	1006	1.00	1.05E-02	3.66
2.47E-02	996	0.99	1.92E-02	3.72
4.90E-02	982	0.98	3.82E-02	3.89
9.31E-02	956	0.95	7.17E-02	4.09
1.86E-01	879	0.87	1.39E-01	4.47
3.87E-01	761	0.76	2.79E-01	5.27
8.04E-01	613	0.61	4.99E-01	8.33

$^+$ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

^{x} Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table I.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2274-UD8; Isotropic Confining Pressure, σ_o= 49 psi (7.1 ksf =338 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
9.92E-04	875	1.00	0.90	9.87E-04	874	1.00	0.90
1.96E-03	875	1.00	1.24	1.95E-03	874	1.00	1.02
3.83E-03	875	1.00	1.28	3.87E-03	874	1.00	1.06
9.66E-03	875	1.00	1.27	9.66E-03	874	1.00	1.16
1.96E-02	868	0.99	1.19	1.97E-02	866	0.99	1.25

Table I.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2274-UD8; Isoptropic Confining Pressure, σ_o= 197 psi (28.4ksf = 1357 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average^{+} Shearing Strain, %	Material Damping Ratio^{x}, D, %
3.19E-04	1648	1.00	3.19E-04	3.00
6.88E-04	1648	1.00	6.88E-04	3.05
1.33E-03	1648	1.00	1.07E-03	3.08
2.63E-03	1648	1.00	2.13E-03	3.13
5.21E-03	1648	1.00	4.16E-03	3.22
1.03E-02	1648	1.00	8.27E-03	3.28
2.05E-02	1623	0.98	1.64E-02	3.38

$^{+}$ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

^{x} Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table I.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2274-UD8; Isotropic Confining Pressure, σ_o=197 psi (28.4 ksf = 1357 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.02E-03	1571	1.00	1.09	1.07E-03	1540	1.00	0.88
2.00E-03	1571	1.00	0.91	2.03E-03	1540	1.00	1.31
4.00E-03	1571	1.00	0.93	4.06E-03	1540	1.00	1.08
9.75E-03	1571	1.00	1.48	9.78E-03	1540	1.00	1.48
1.99E-02	1519	0.97	1.45	2.01E-02	1508	0.98	1.56

APPENDIX J

Specimen B2174-UD6
(Index properties not available)

Borehole B2174
Sample UD6
Depth = 96.4 ft (29.4 m)
Total Unit Weight = 117.7 lb/ft^3
Water Content = 12.9 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 42 psi

FUGRO JOB #: 0401-1686
Testing Station: RC7

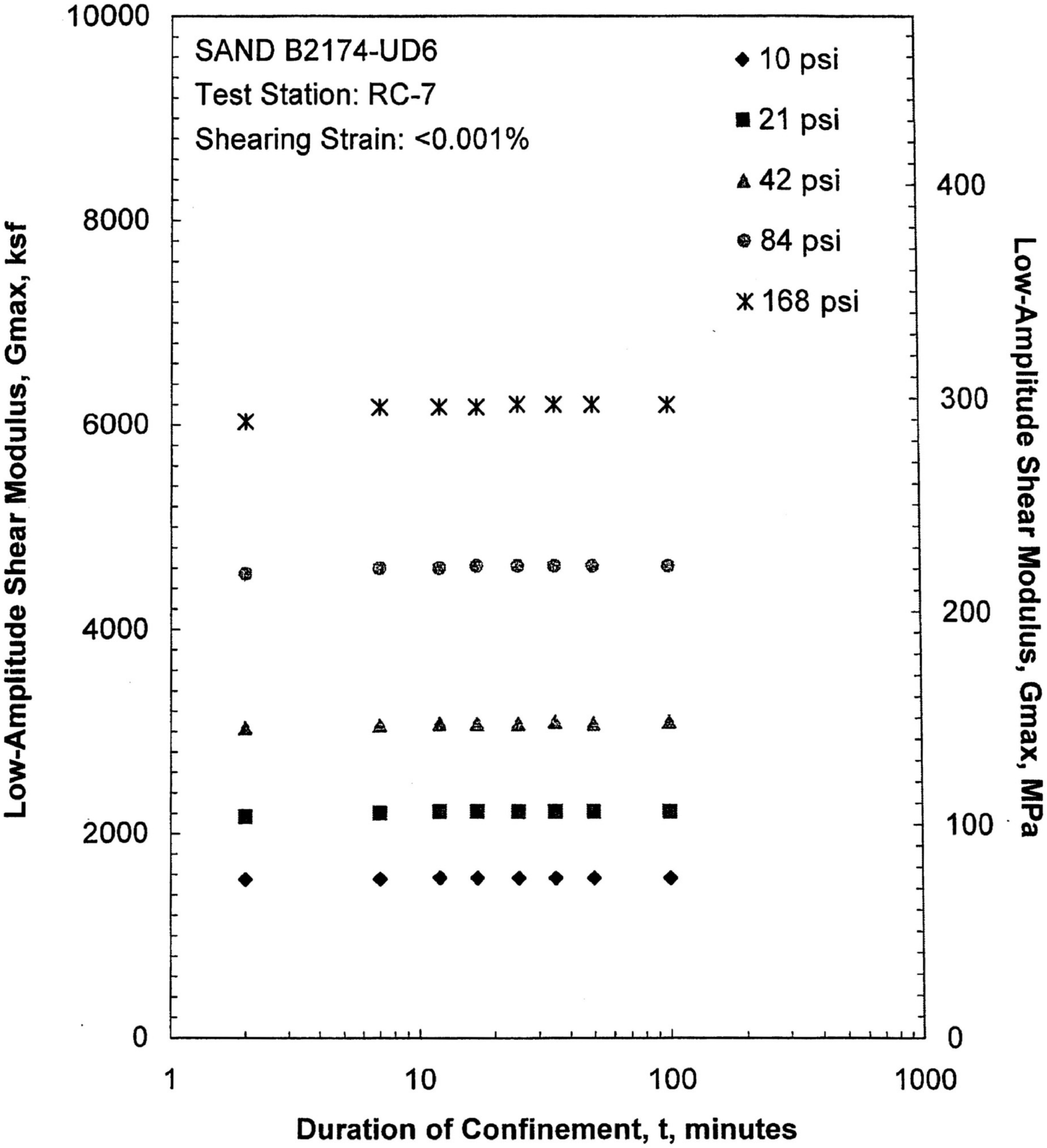

Figure J.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

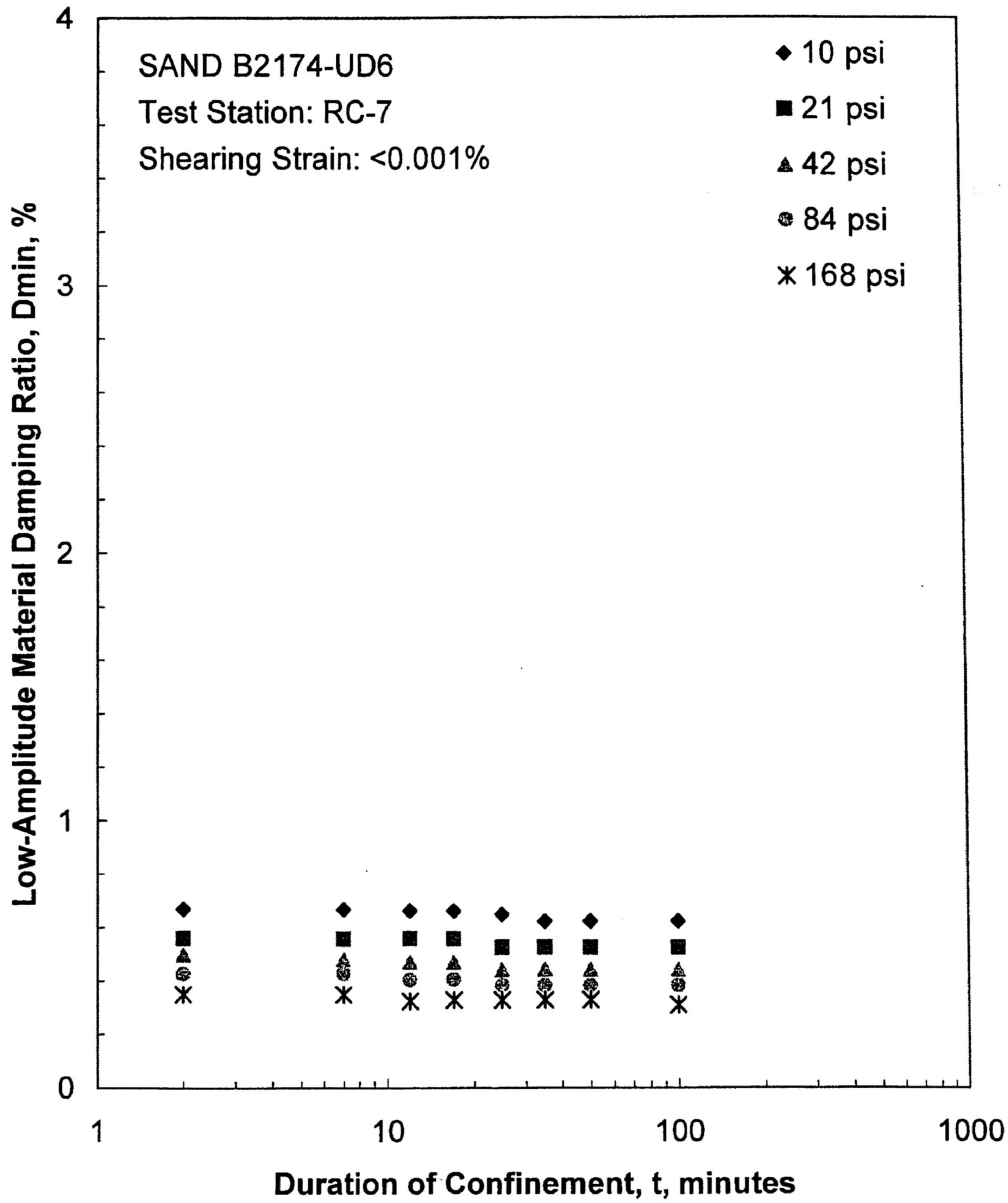

Figure J.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

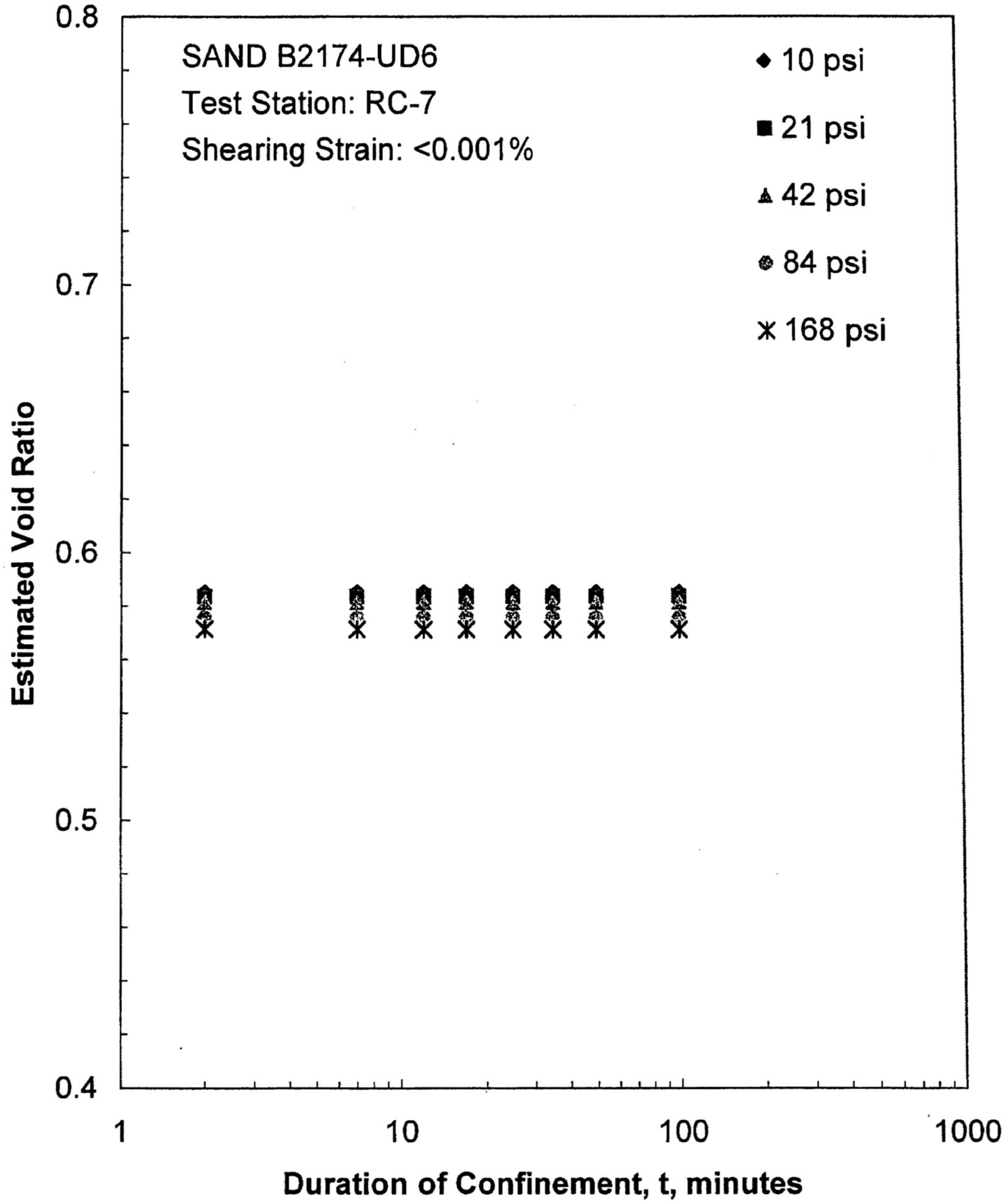

Figure J.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

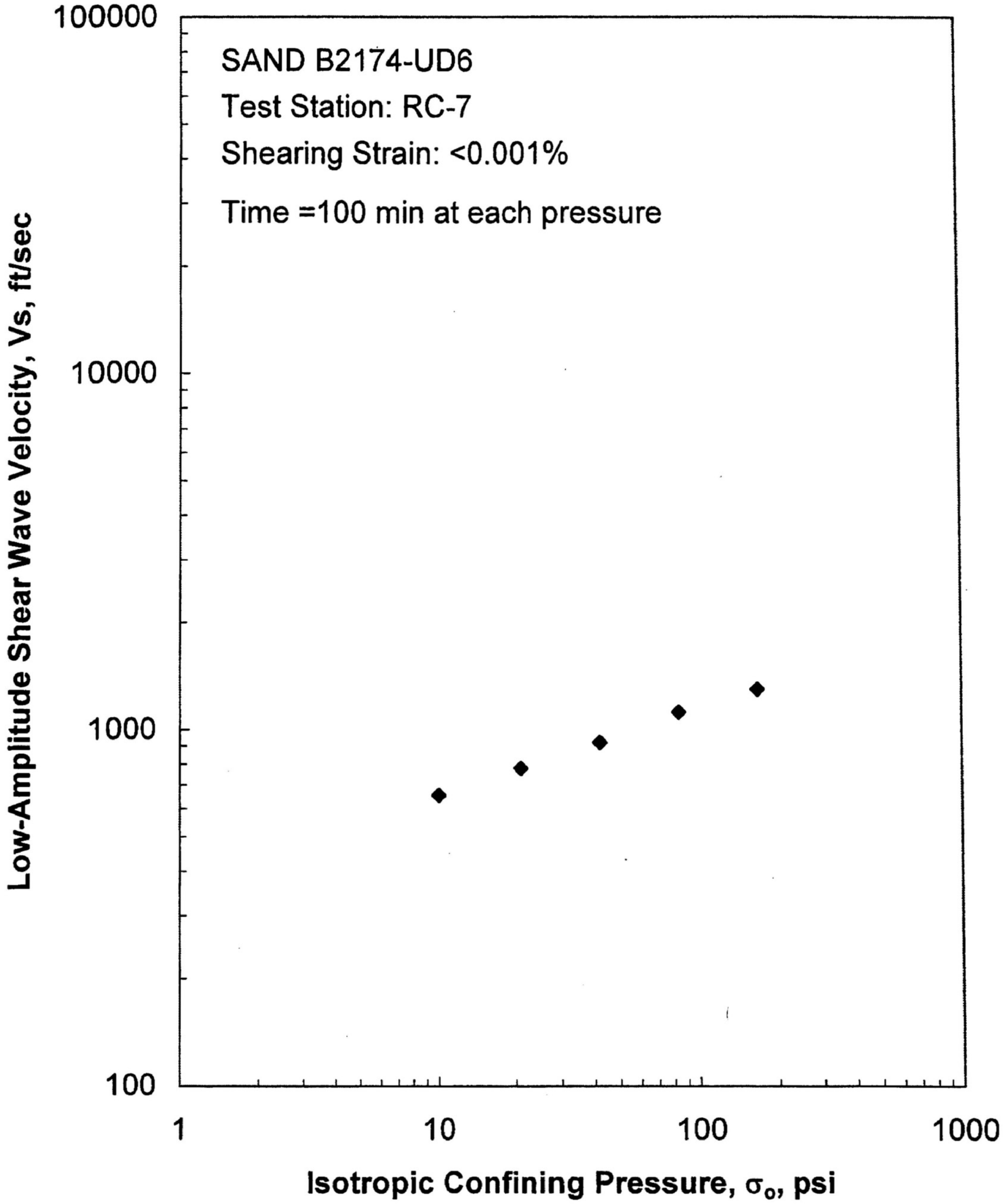

Figure J.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

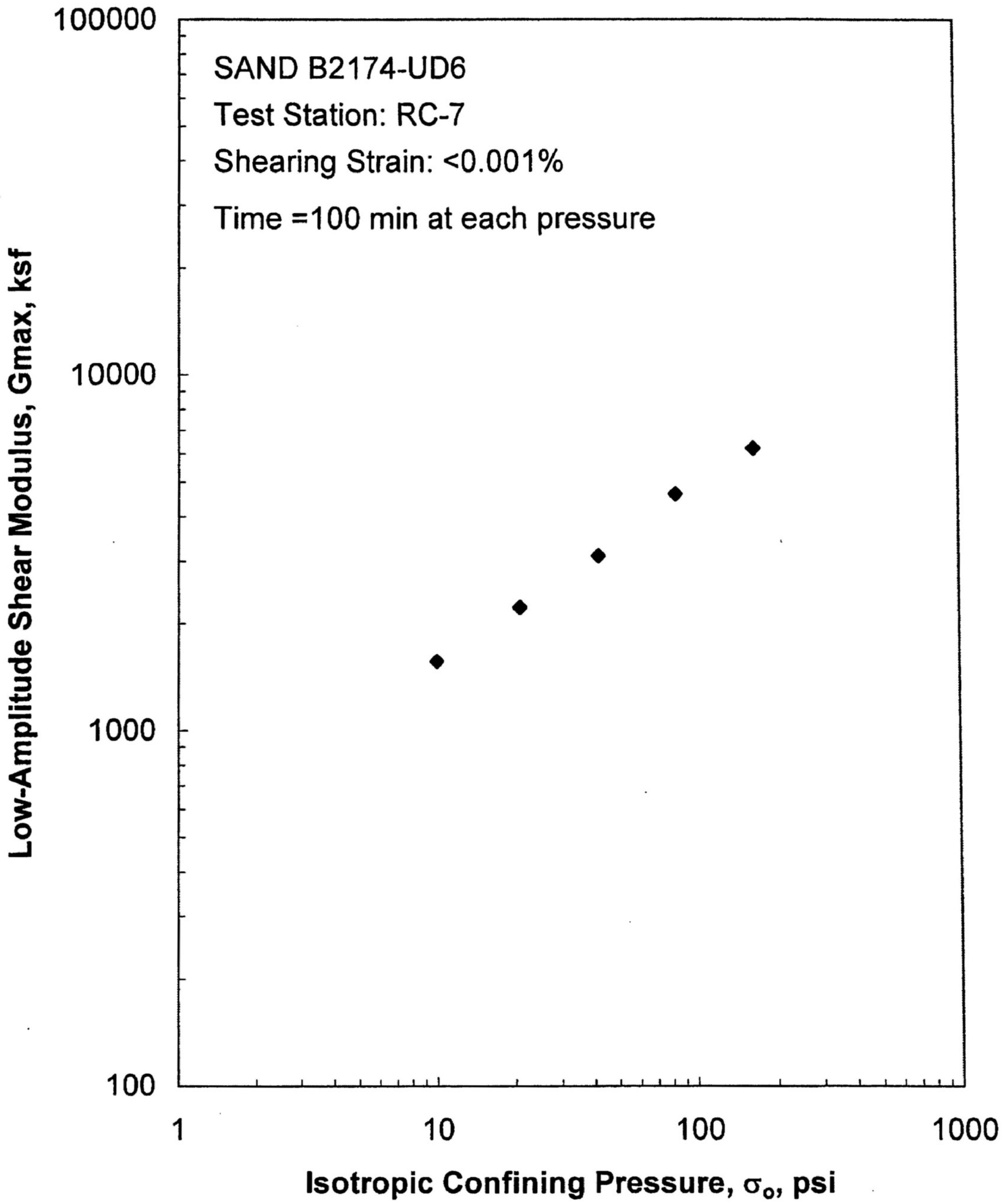

Figure J.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

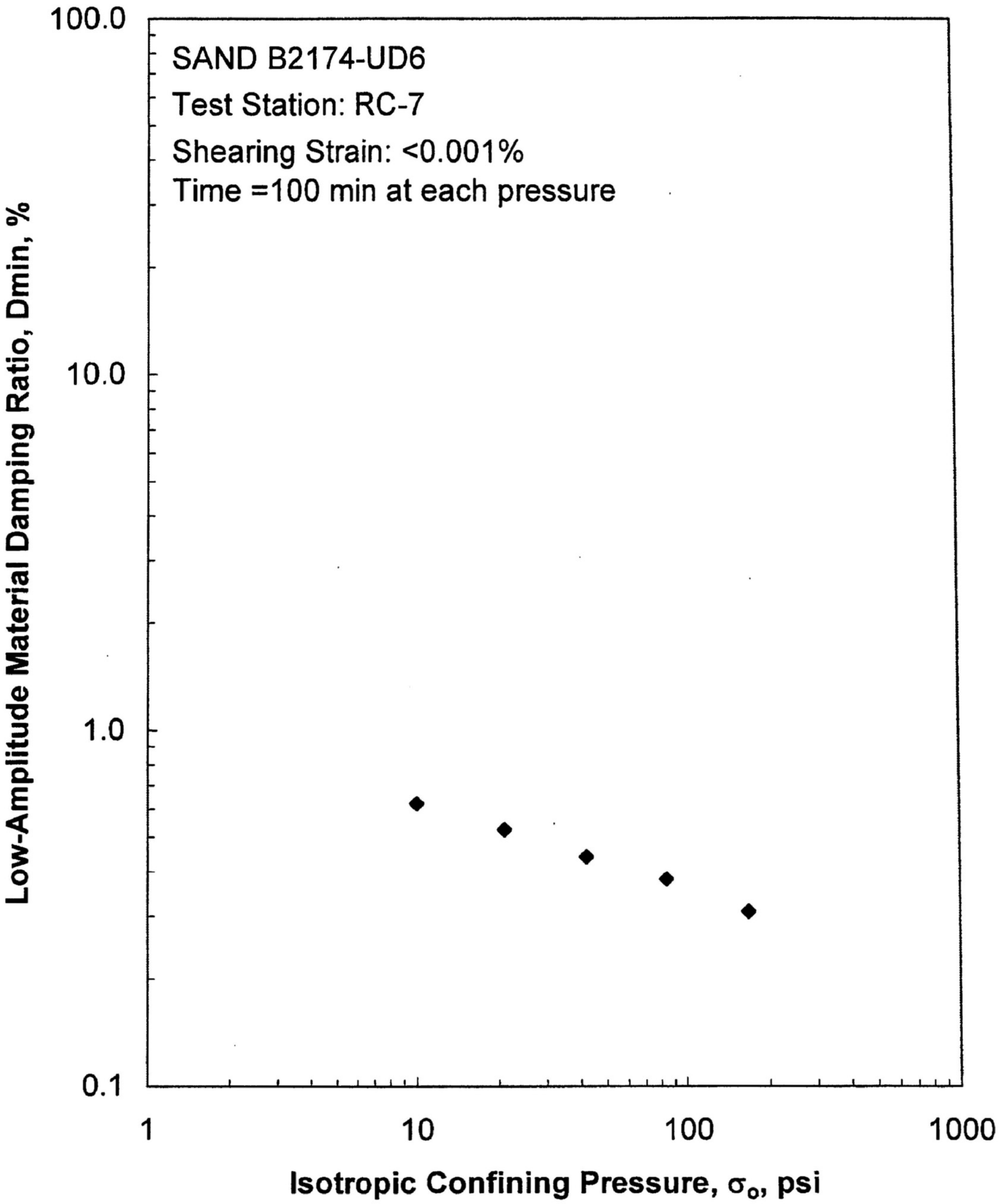

Figure J.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

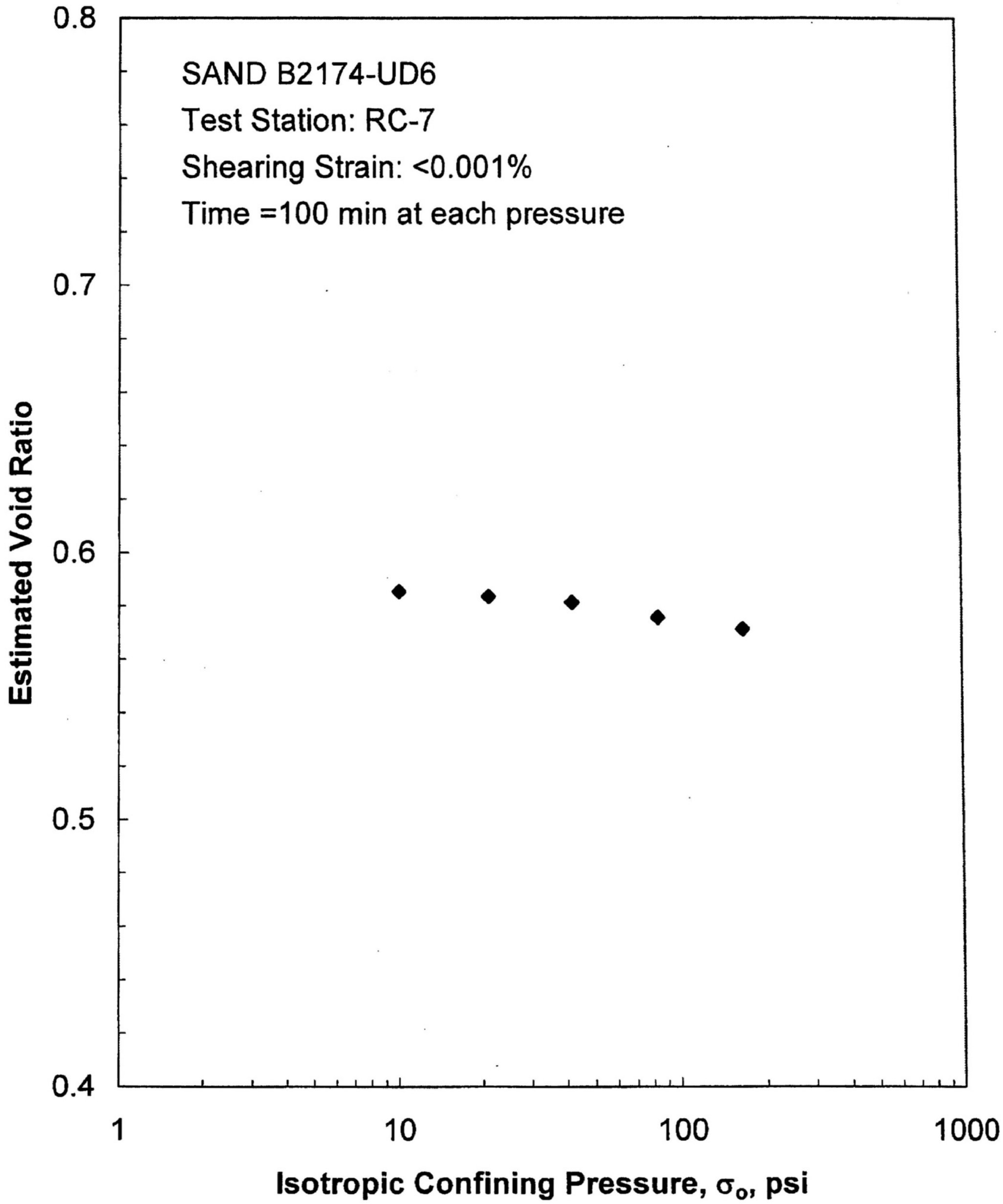

Figure J.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

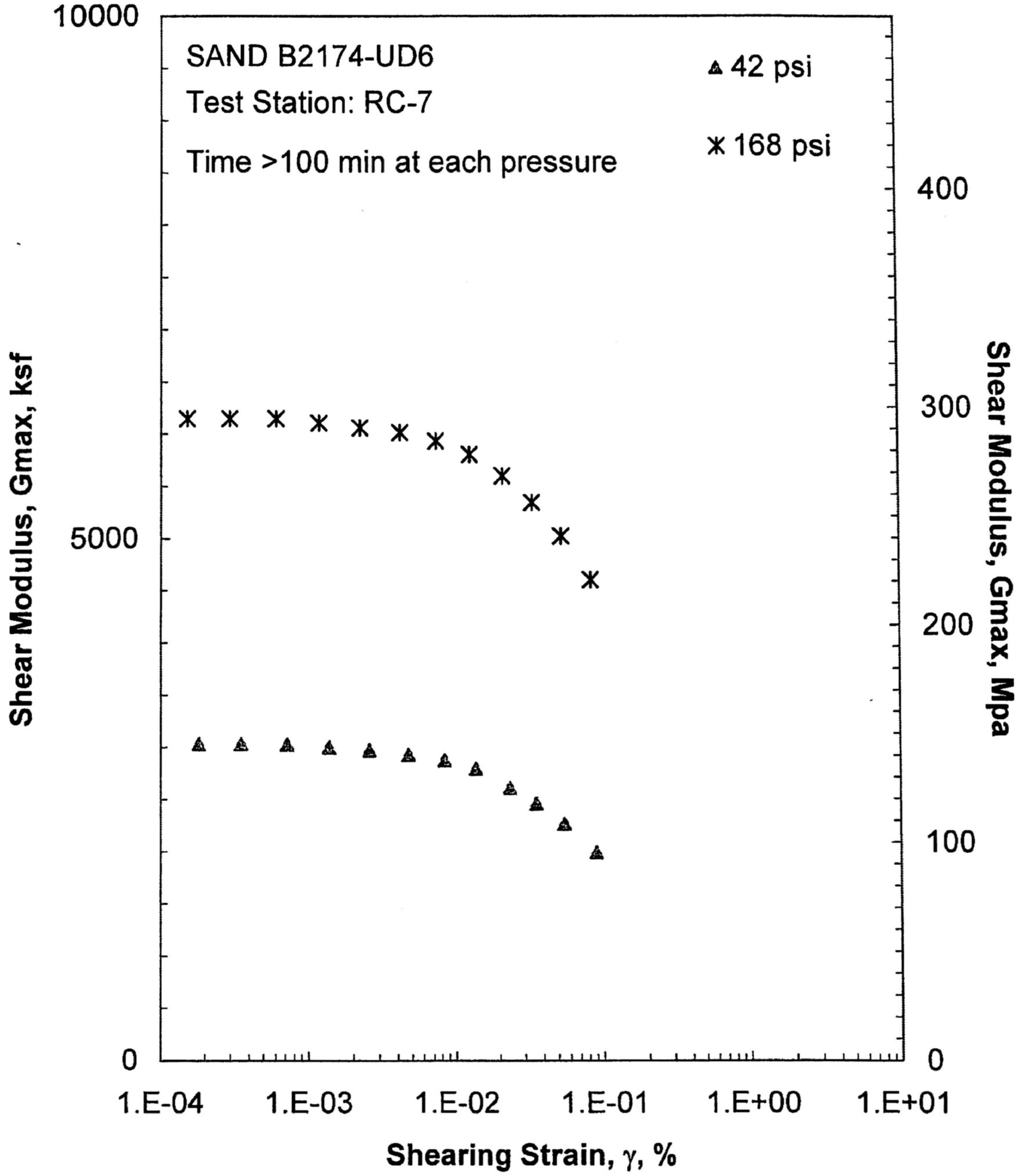

Figure J.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

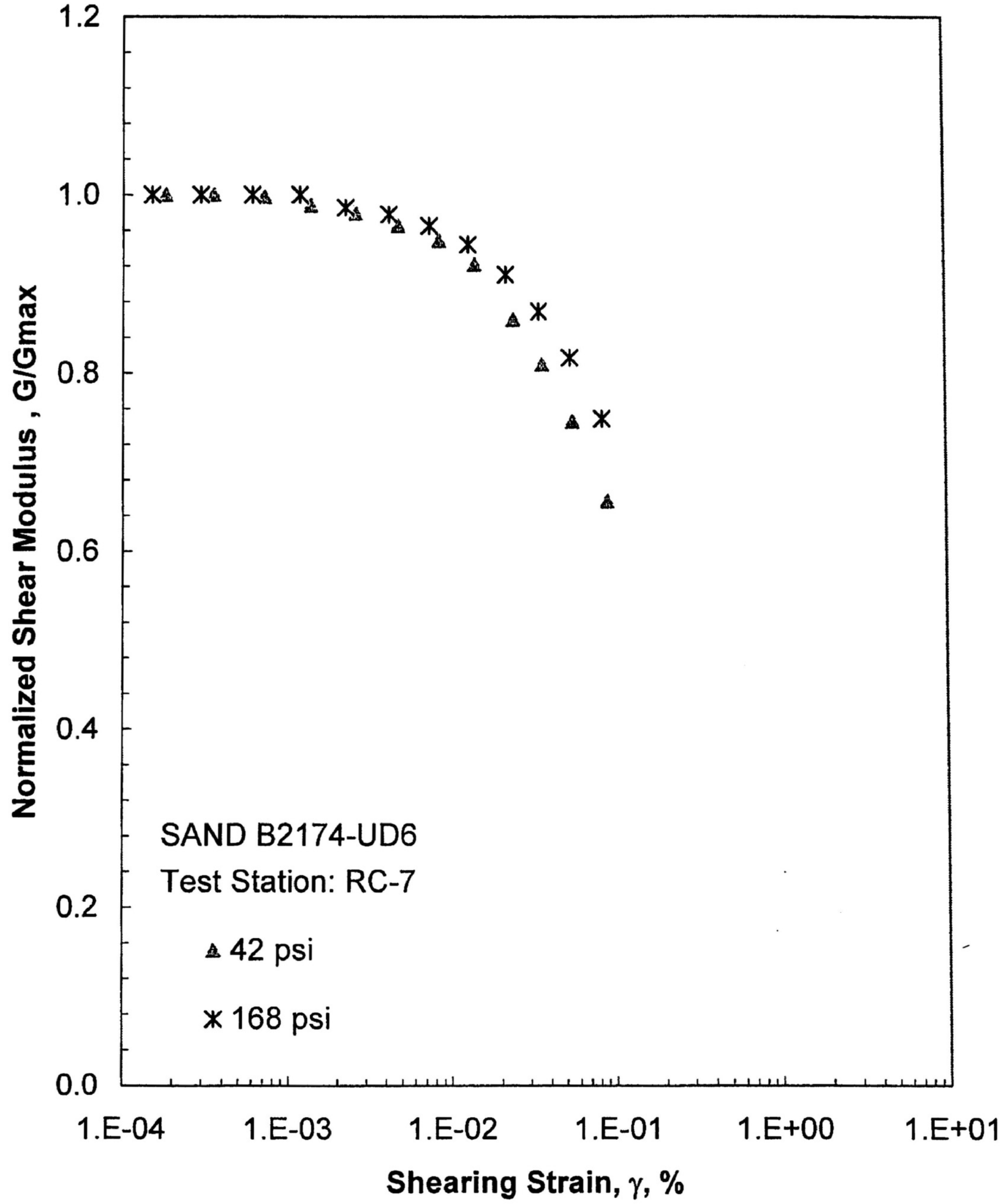

Figure J.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

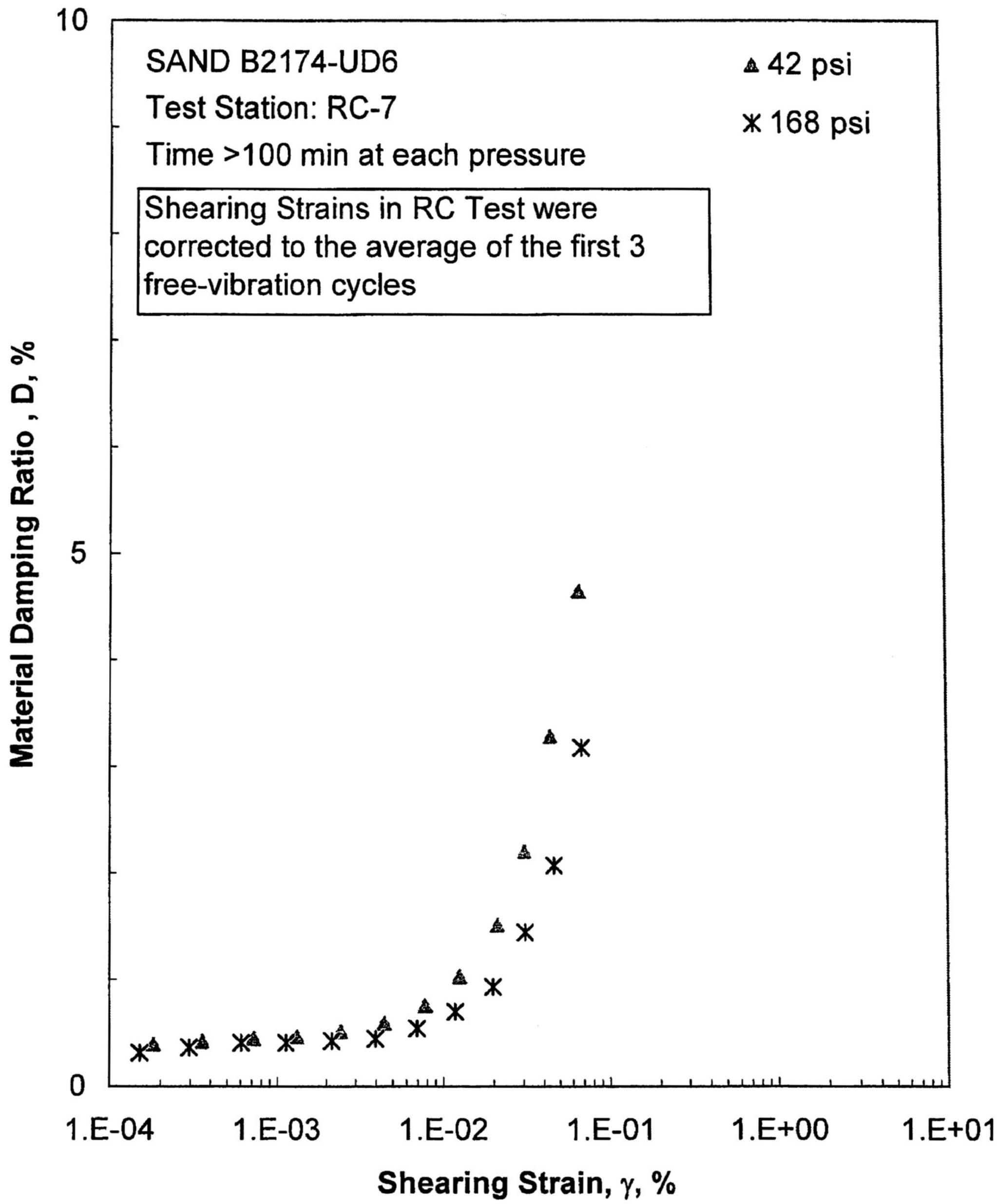

Figure J.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

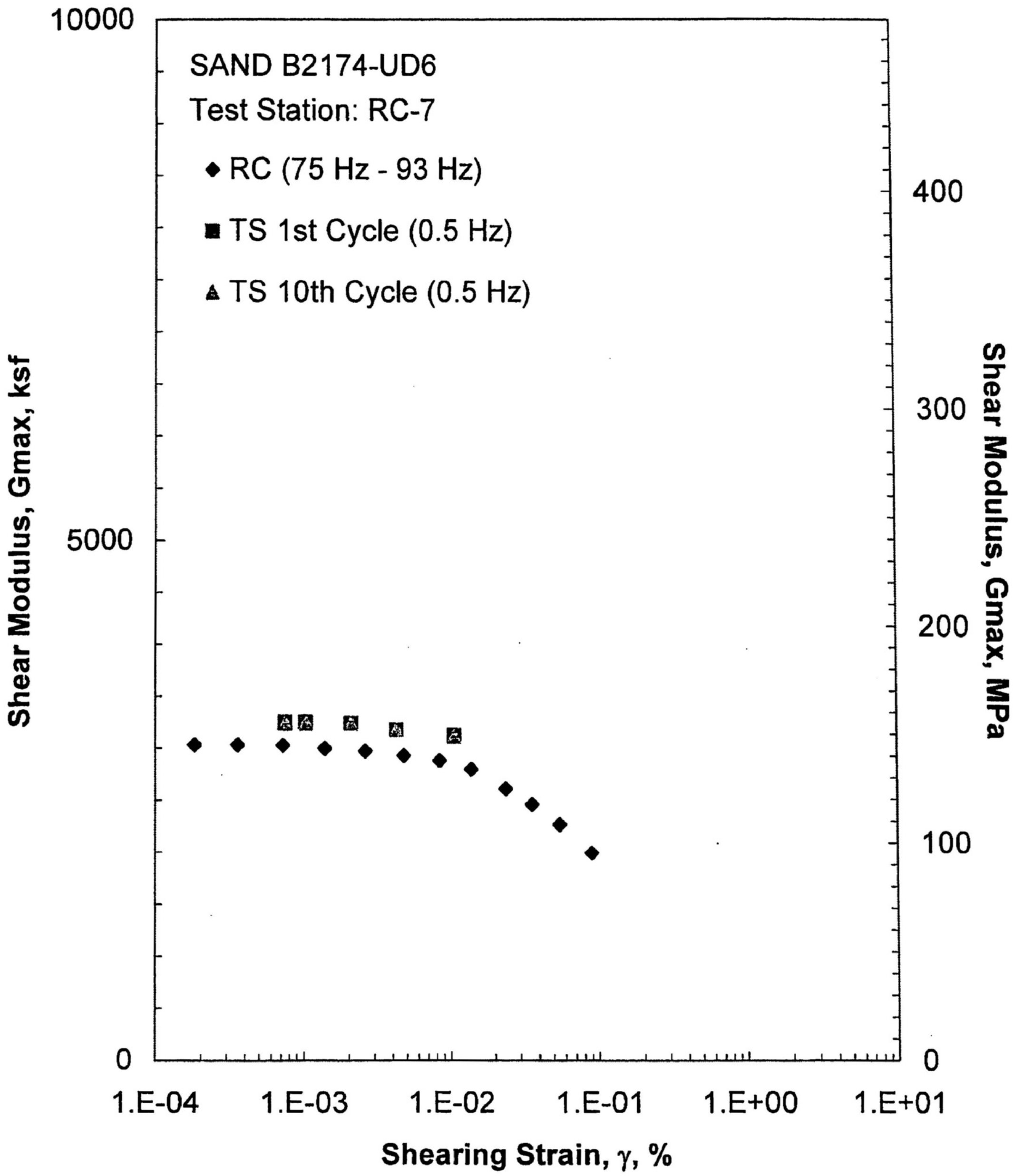

Figure J.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 42 psi from the Combined RCTS Tests

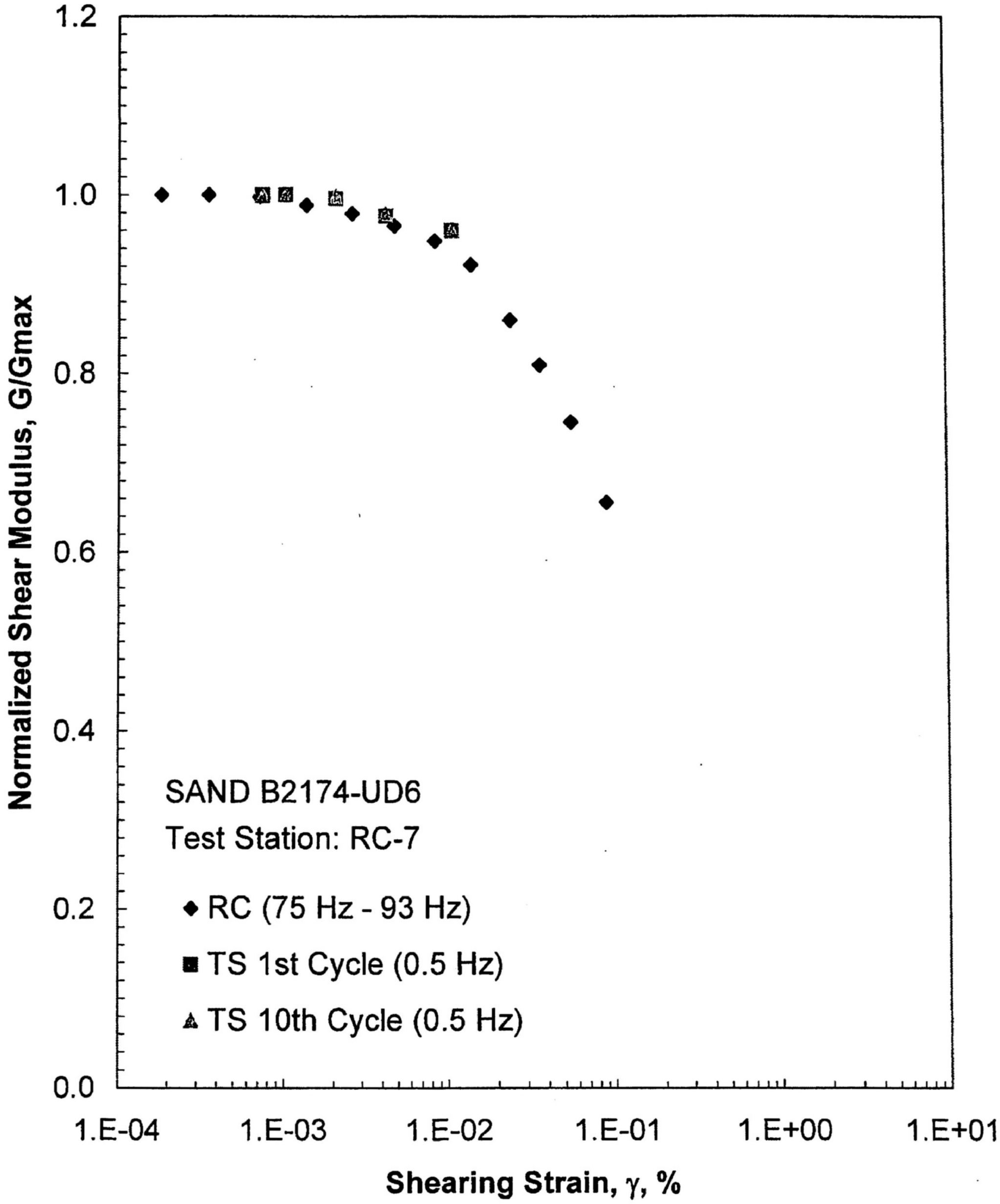

Figure J.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 42 psi from the Combined RCTS Tests

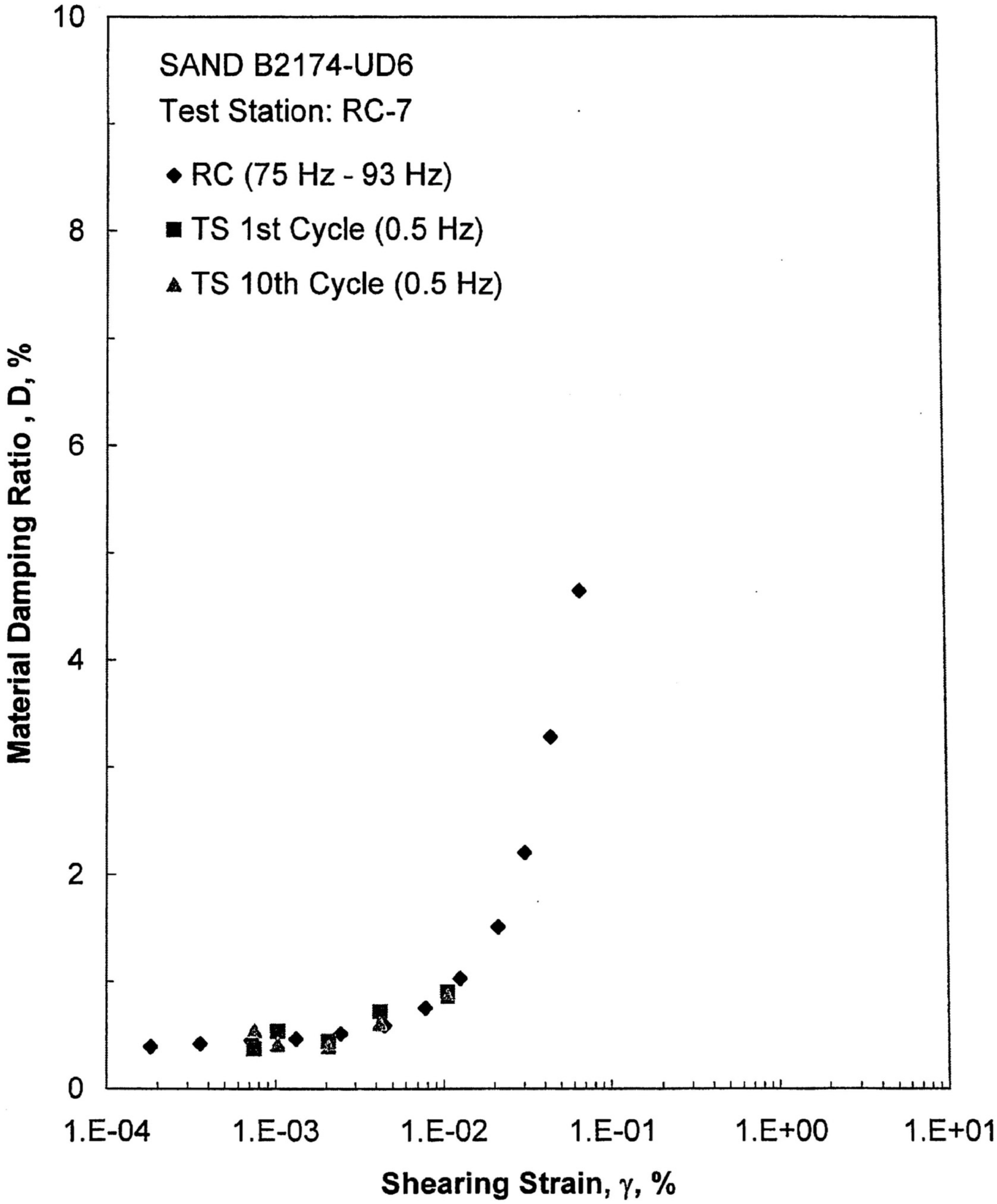

Figure J.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 42 psi from the Combined RCTS Tests

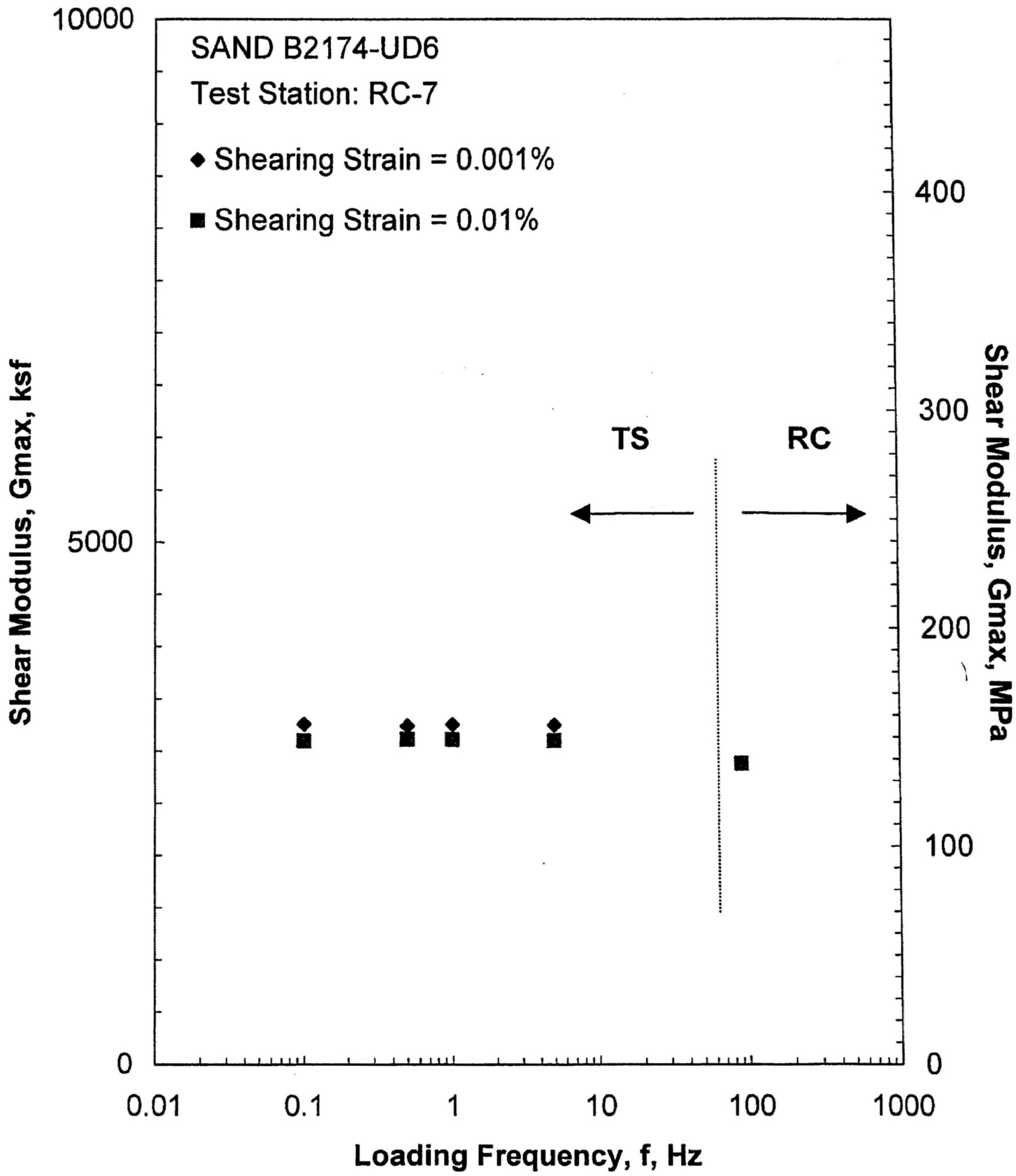

Figure J.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 42 psi from the Combined RCTS Tests

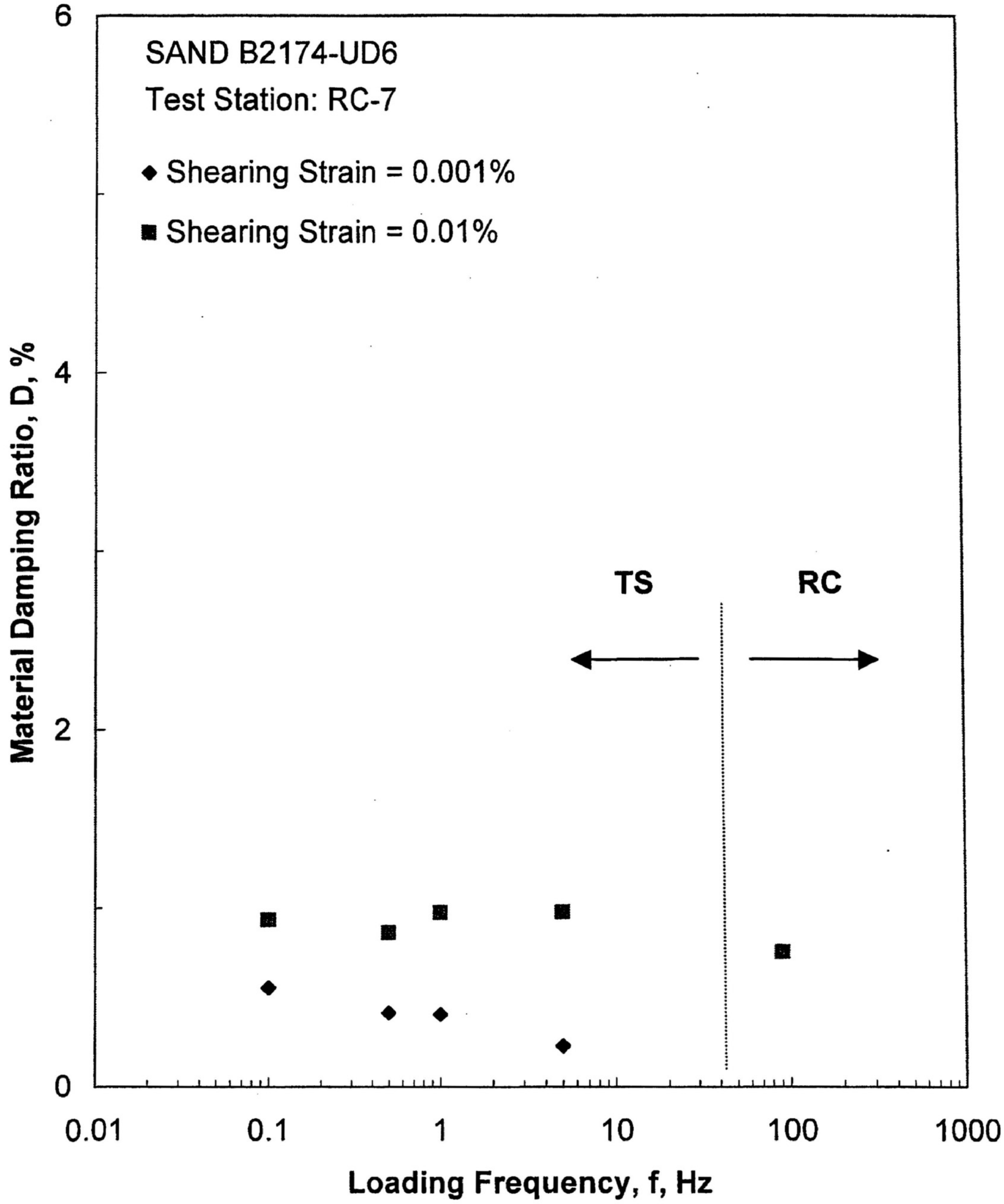

Figure J.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 42 psi from the Combined RCTS Tests

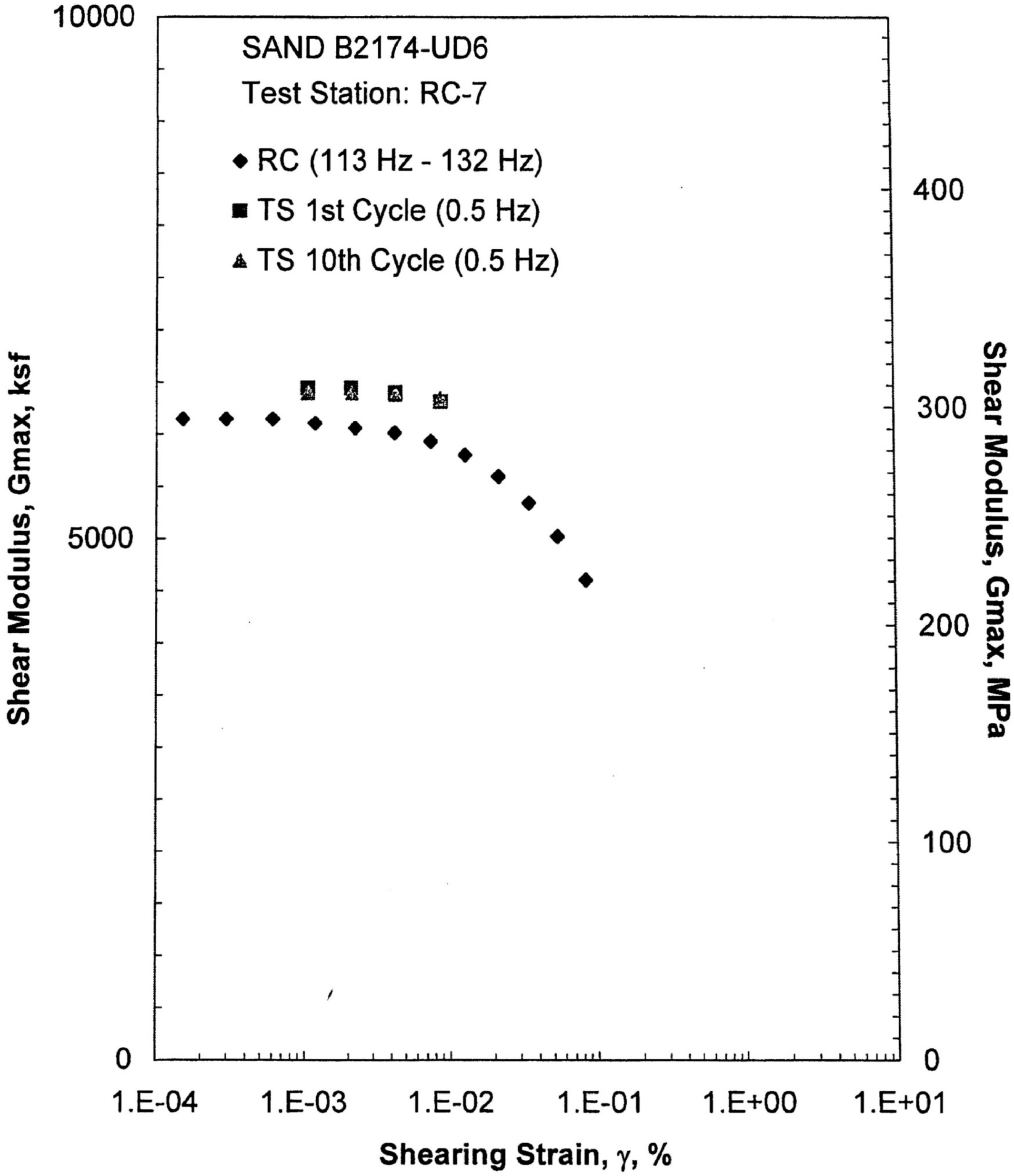

Figure J.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 168 psi from the Combined RCTS Tests

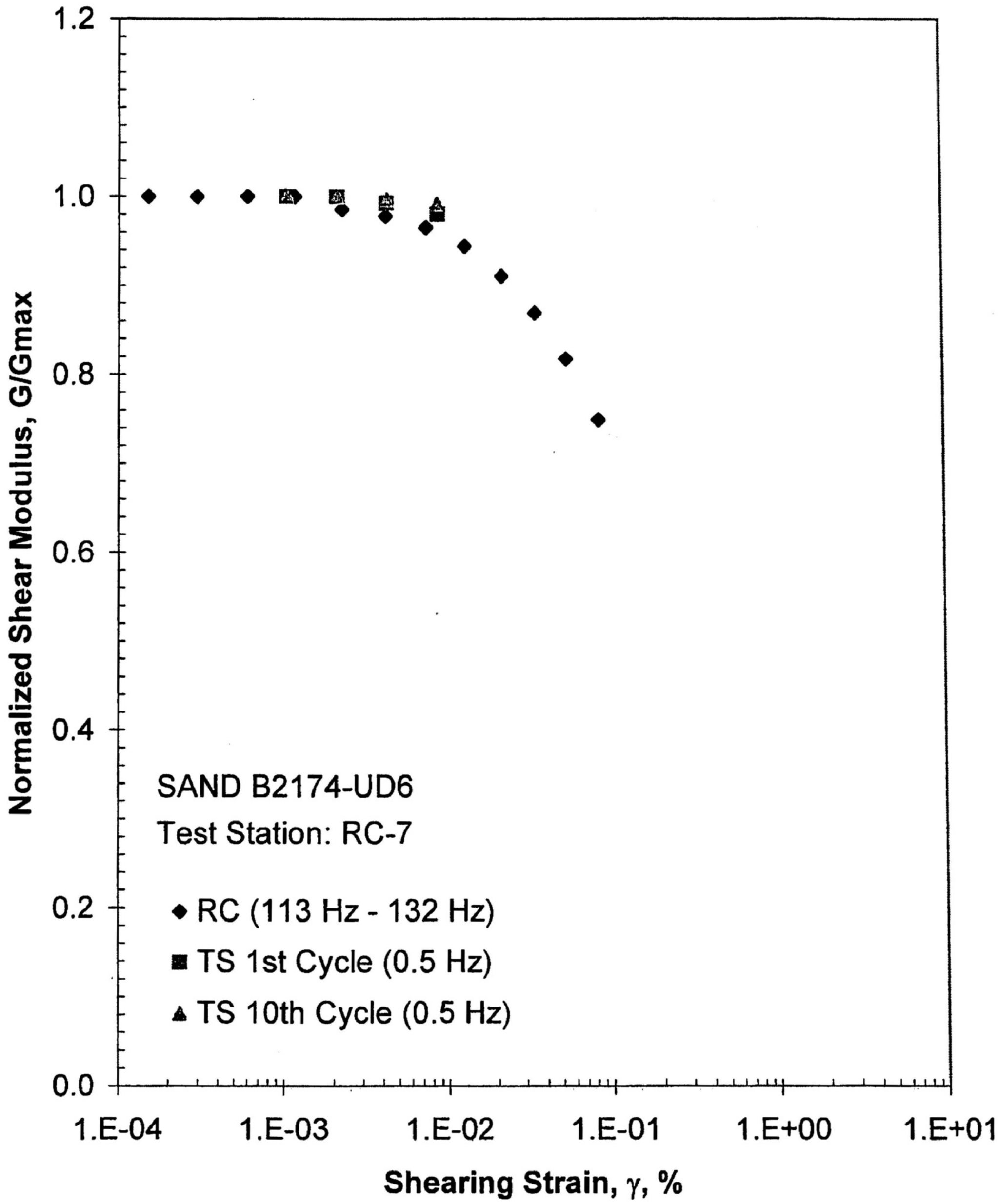

Figure J.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 168 psi from the Combined RCTS Tests

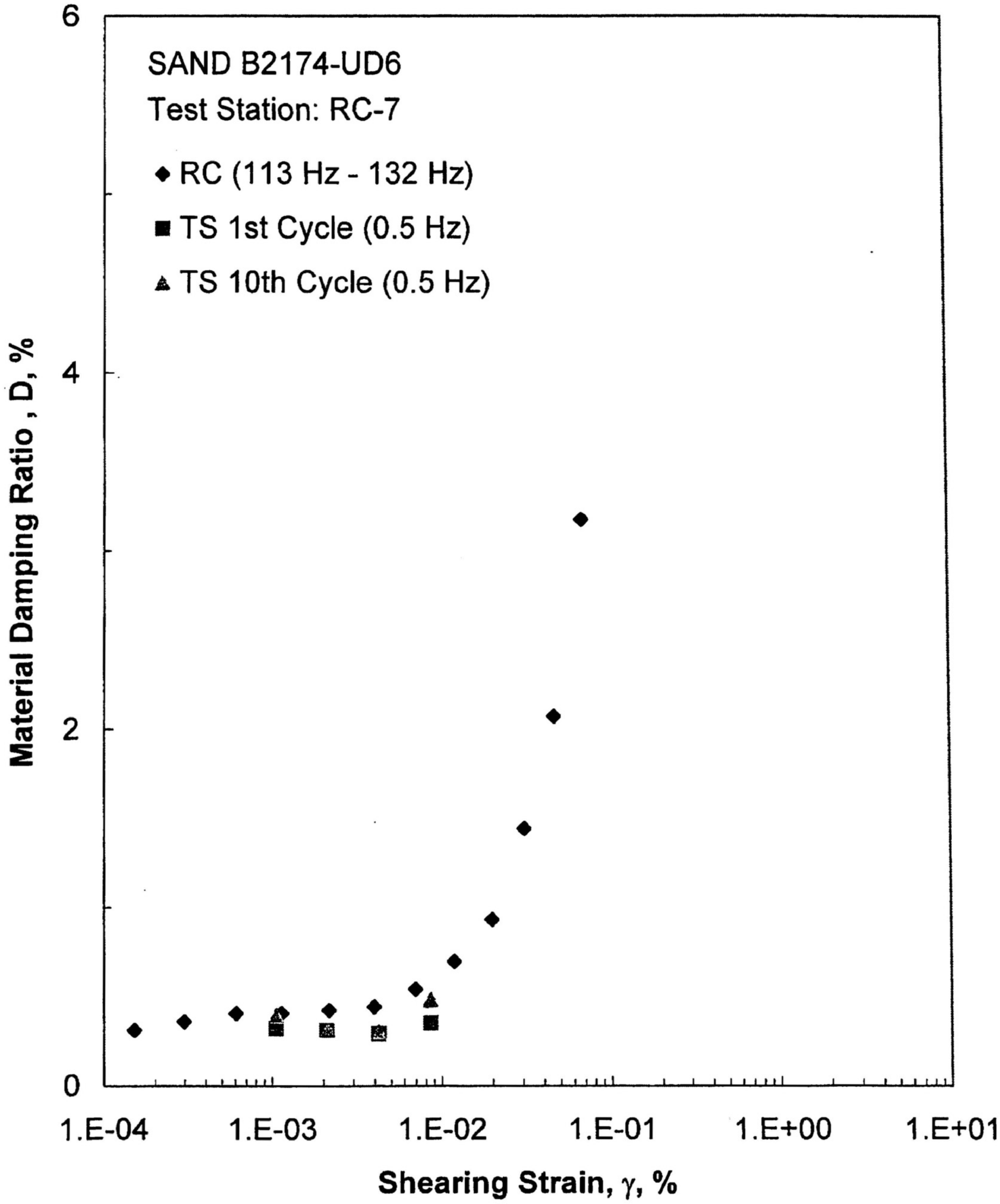

Figure J.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 168 psi from the Combined RCTS Tests

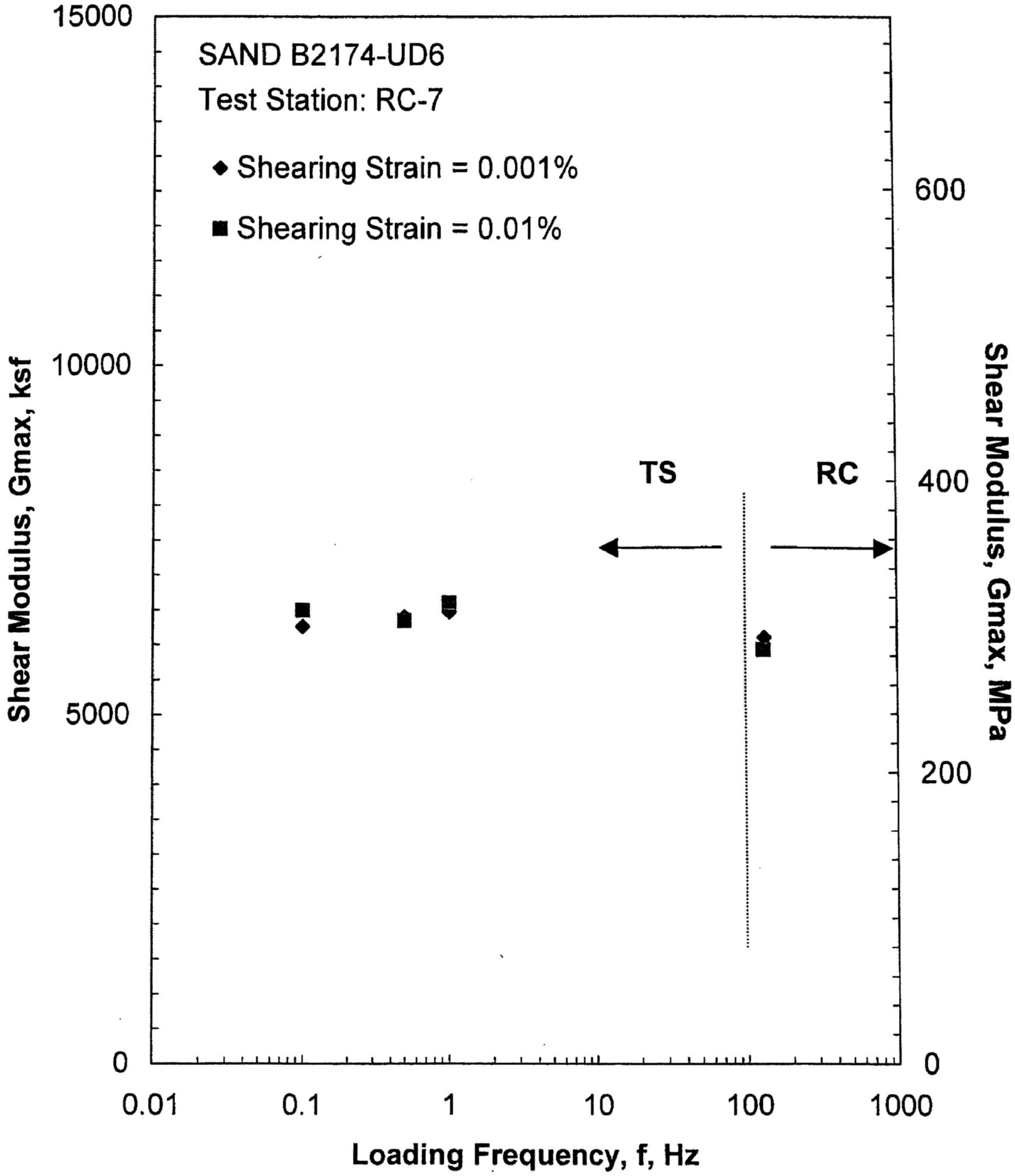

Figure J.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 168 psi from the Combined RCTS Tests

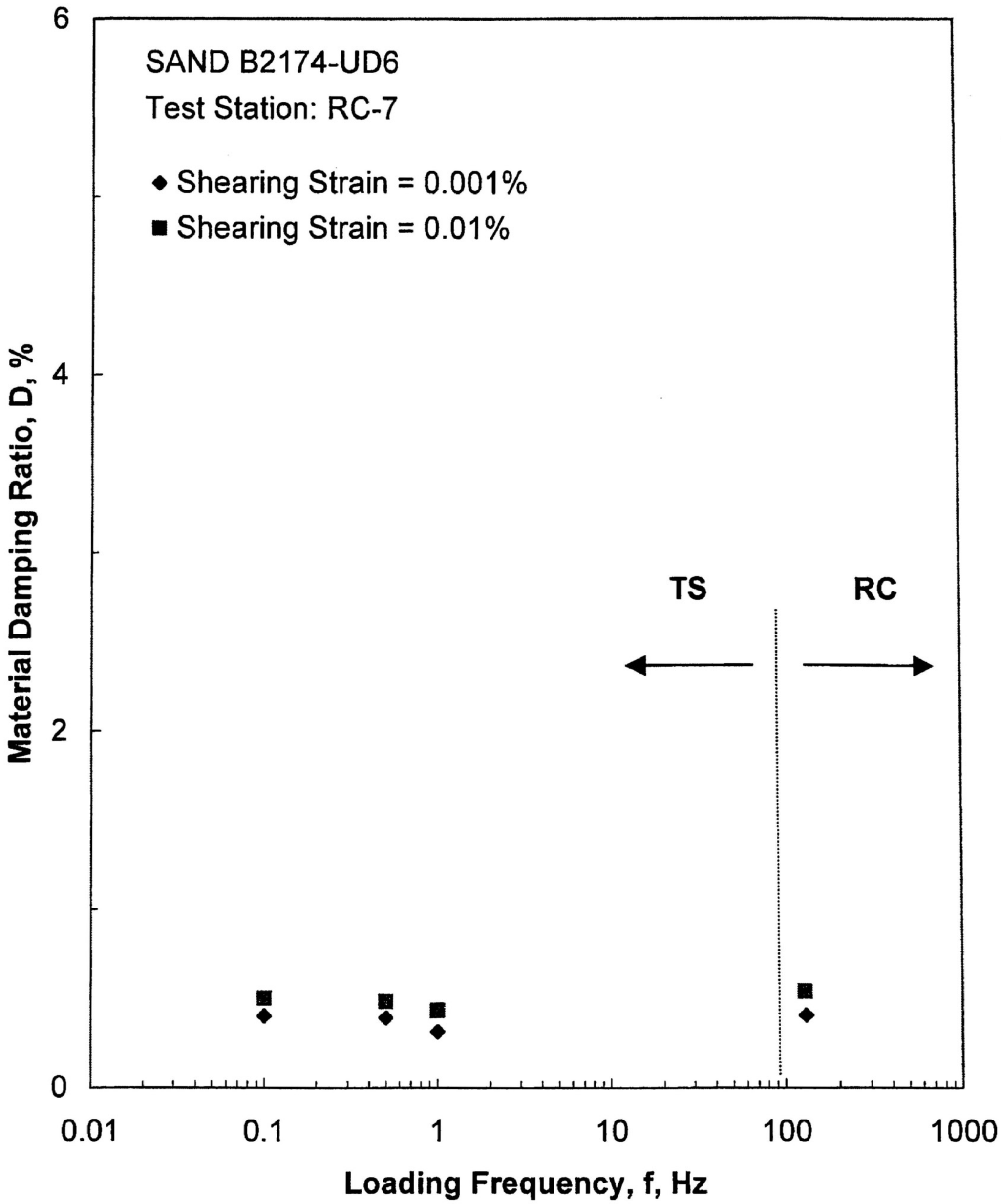

Figure J.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 168 psi from the Combined RCTS Tests

Table J.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen B2174-UD6

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
10	1440	69	1564	75	654	0.62	0.59
21	3024	145	2215	106	777	0.52	0.58
42	6048	289	3093	148	918	0.44	0.58
84	12096	579	4617	222	1119	0.38	0.58
168	24192	1158	6200	298	1296	0.31	0.57

Table J.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2174-UD6; Isoptropic Confining Pressure, σ_o=42 psi (6.0 ksf = 289 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
1.82E-04	3034	1.00	1.82E-04	0.39
3.57E-04	3034	1.00	3.57E-04	0.42
7.21E-04	3026	1.00	7.21E-04	0.45
1.38E-03	2998	0.99	1.33E-03	0.46
2.60E-03	2970	0.98	2.44E-03	0.51
4.76E-03	2928	0.97	4.47E-03	0.59
8.36E-03	2877	0.95	7.77E-03	0.75
1.38E-02	2797	0.92	1.25E-02	1.03
2.37E-02	2608	0.86	2.11E-02	1.51
3.59E-02	2456	0.81	3.05E-02	2.20
5.51E-02	2262	0.75	4.41E-02	3.28
8.96E-02	1990	0.66	6.63E-02	4.64

$^+$ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

^{x} Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table J.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2174-UD6; Isotropic Confining Pressure, σ_o= 42 psi (6.0 ksf =289 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
7.49E-04	3249	1.00	0.37	7.52E-04	3235	1.00	0.54
1.03E-03	3249	1.00	0.53	1.03E-03	3240	1.00	0.41
2.07E-03	3235	1.00	0.44	2.07E-03	3236	1.00	0.39
4.22E-03	3172	0.98	0.72	4.22E-03	3172	0.98	0.61
1.05E-02	3118	0.96	0.90	1.06E-02	3112	0.96	0.86

Table J.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2174-UD6; Isoptropic Confining Pressure, σ_o= 168 psi (24.2 ksf = 1158 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average⁺ Shearing Strain, %	Material Damping Ratio[x], D, %
1.51E-04	6146	1.00	1.51E-04	0.31
2.97E-04	6146	1.00	2.97E-04	0.36
6.09E-04	6146	1.00	6.09E-04	0.41
1.18E-03	6106	1.00	1.13E-03	0.40
2.25E-03	6059	0.99	2.16E-03	0.42
4.18E-03	6012	0.98	3.97E-03	0.44
7.33E-03	5932	0.97	6.96E-03	0.54
1.26E-02	5802	0.94	1.18E-02	0.70
2.12E-02	5598	0.91	1.98E-02	0.93
3.42E-02	5341	0.87	3.08E-02	1.44
5.33E-02	5022	0.82	4.63E-02	2.07
8.33E-02	4602	0.75	6.83E-02	3.17

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table J.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2174-UD6; Isotropic Confining Pressure, σ_o=168 psi (24.2 ksf = 1158 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.05E-03	6443	1.00	0.32	1.06E-03	6397	1.00	0.39
2.10E-03	6443	1.00	0.31	2.12E-03	6397	1.00	0.31
4.23E-03	6398	0.99	0.29	4.25E-03	6376	1.00	0.30
8.59E-03	6312	0.98	0.35	8.55E-03	6345	0.99	0.48

6100 Hillcroft (77081)
P.O. Box 740010
Houston, Texas 77274
Tel: 713-369-5400
Fax: 713-369-5518

May 1, 2008

Ms. Siesta Williams
MACTEC
3301 Atlantic Avenue
Raleigh, NC 27604

RE: Three (3) Reports For The EXELON COL Project

Dear Ms. Williams:

Fugro has completed three (3) RCTS tests, which are B2174-UD28, B2174-UD31, and B2174-UD30 for the EXELON project. Fugro has incorporated, as needed, Dr. Kenneth Stokoe's comments into the final reports. The final reports and the associated RCTS Test Approvals by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

Bill De Groff

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

Cc: Kathryn White, in PDF

2/20

RCTS TEST APROVAL

PROJECT SITE/NAME	EXELON

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#K	B2174-UD28	527.5	KHS	13 Apr. '08
RCTS#L	B2174-UD31	593	KHS	13 Apr. '08
RCTS#M	B2174-UD30	571.6	KHS	13 Apr. '08

Three RCTS tests for the site referenced above were tested, and three reports were prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

APPENDIX K

Specimen B2174-UD28
(Index properties not available)

Borehole B2174
Sample UD28
Depth = 527.5 ft (160.8 m)
Total Unit Weight = 126.1 lb/ft^3
Water Content = 20.9 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 167 psi

FUGRO JOB #: 0411-08-1686
Testing Station: RC7

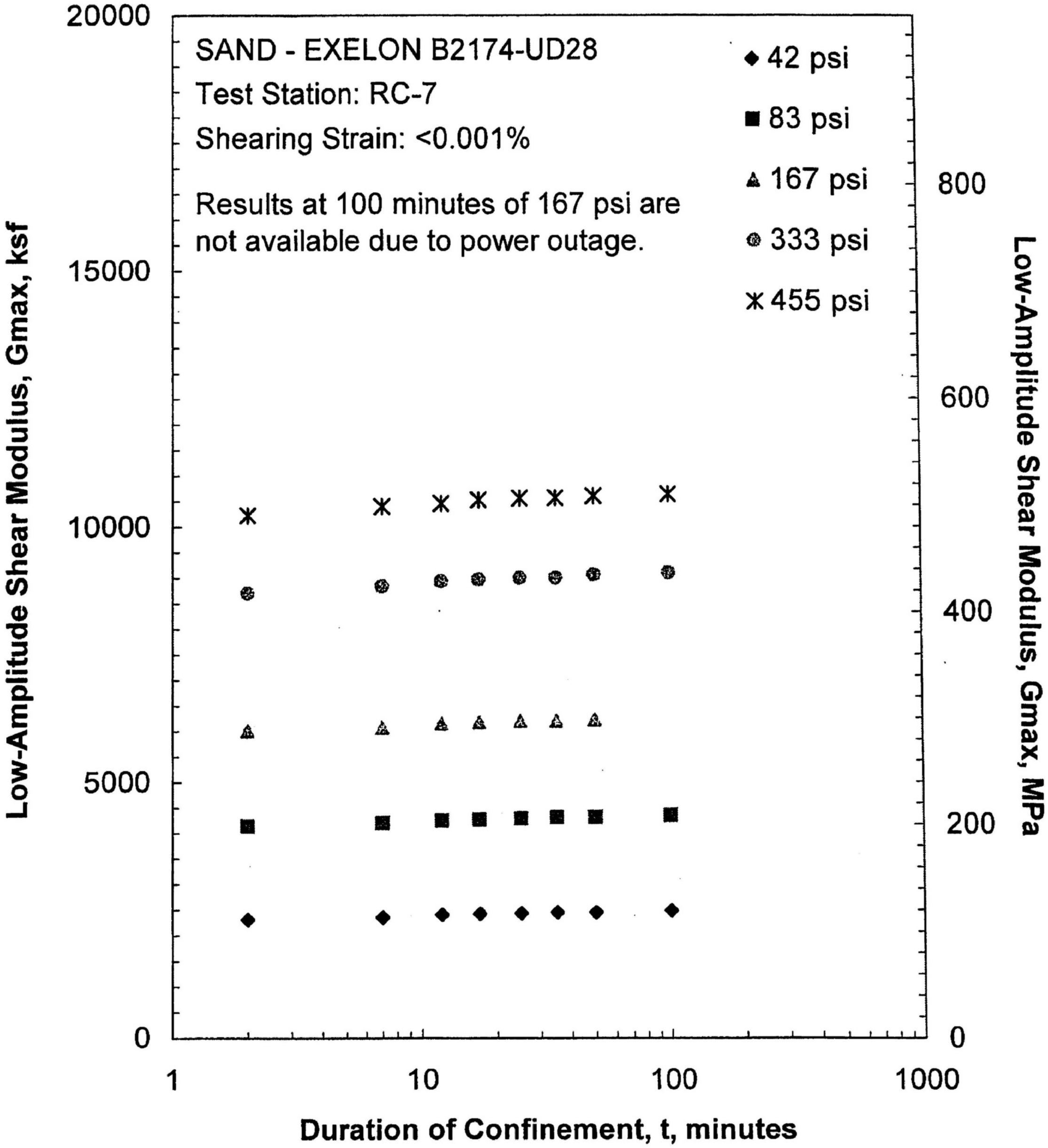

Figure K.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

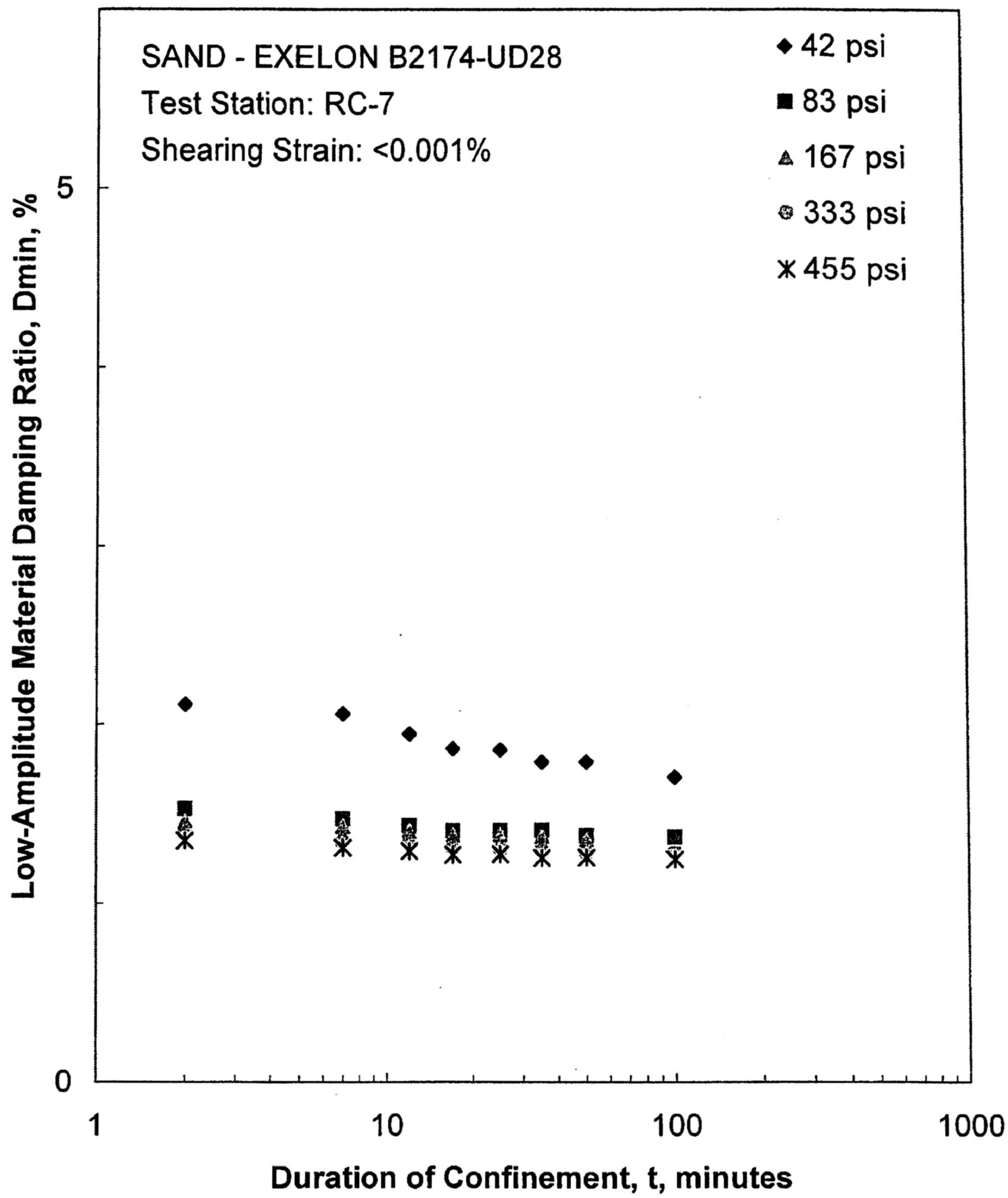

Figure K.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

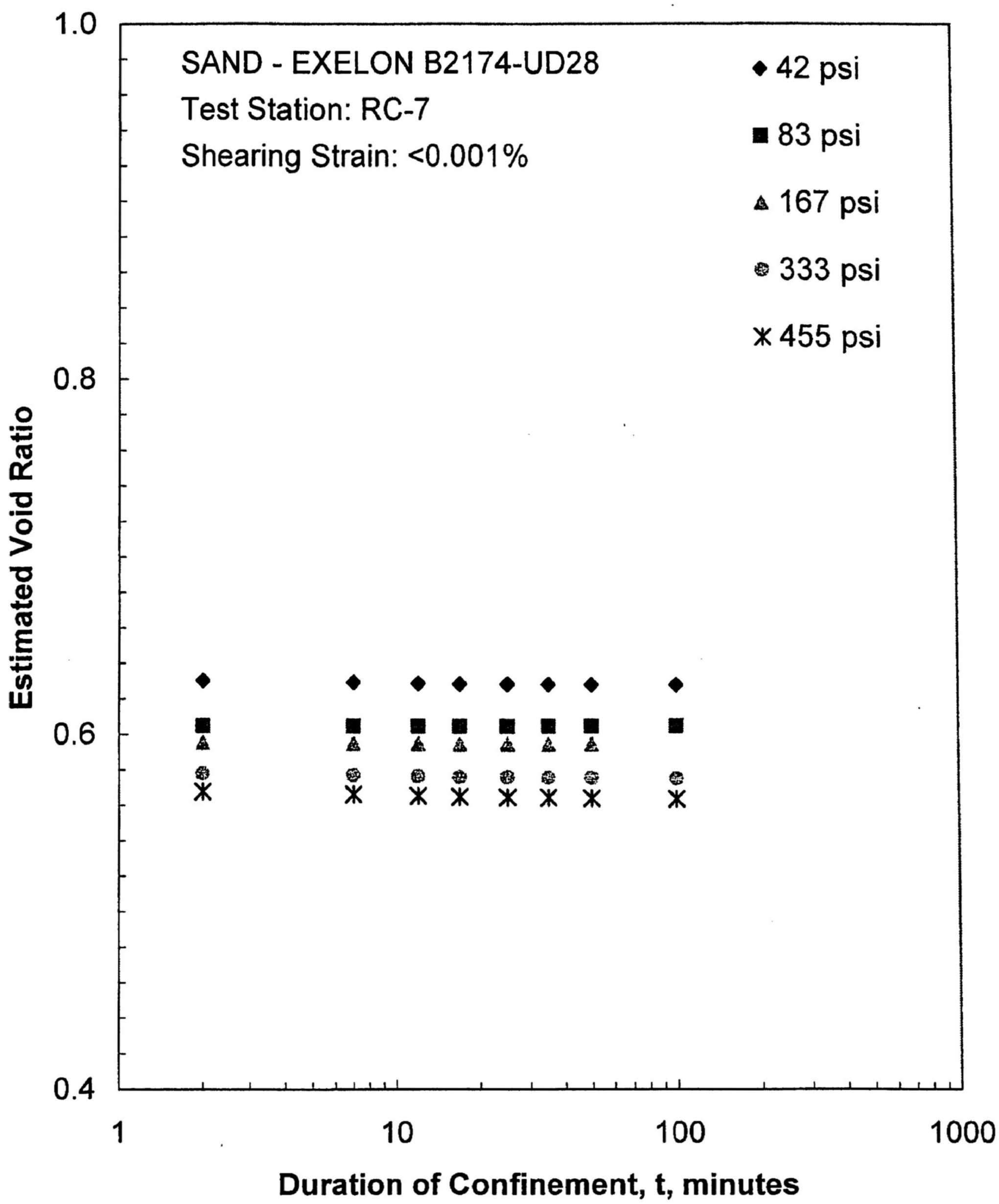

Figure K.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

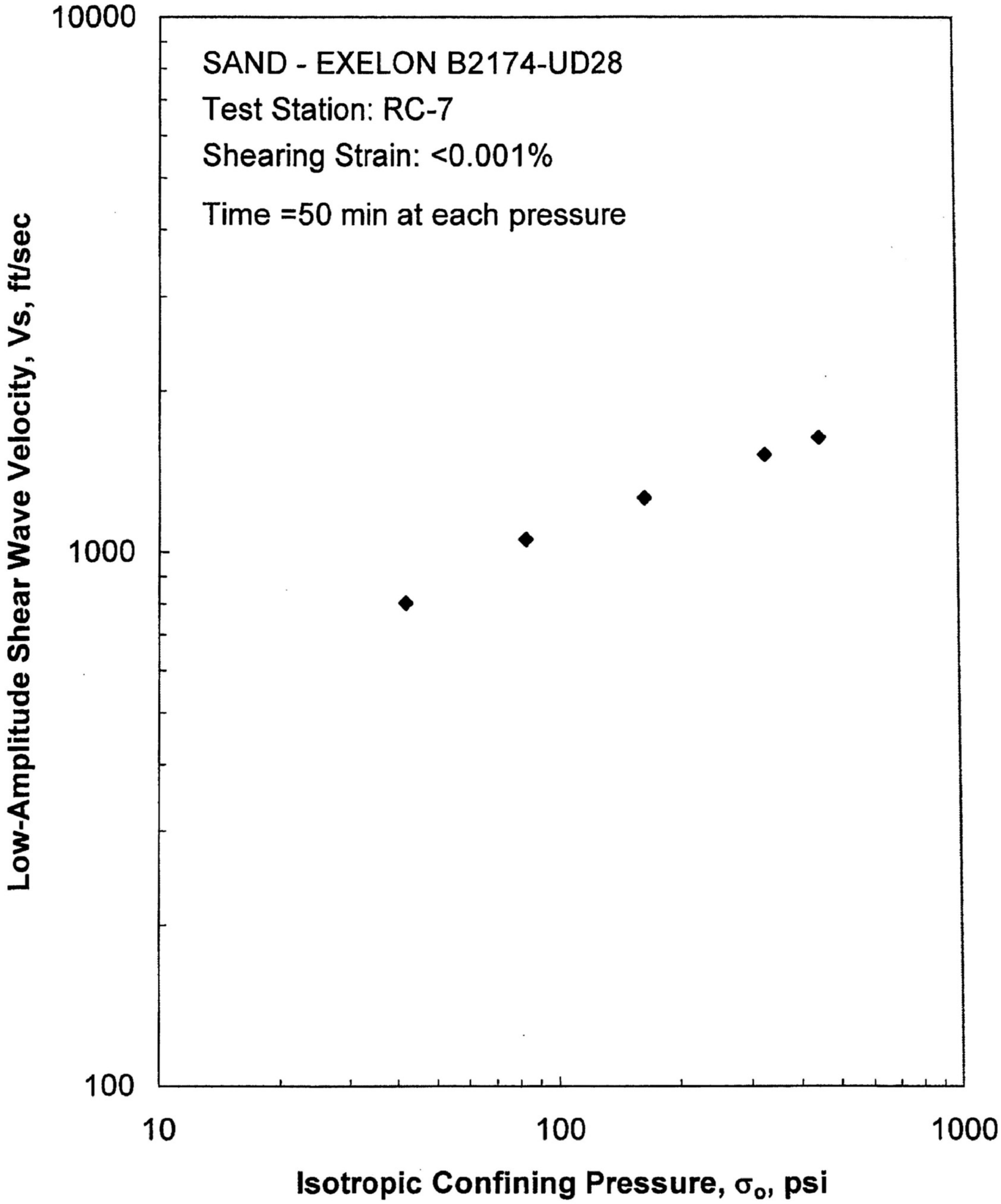

Figure K.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

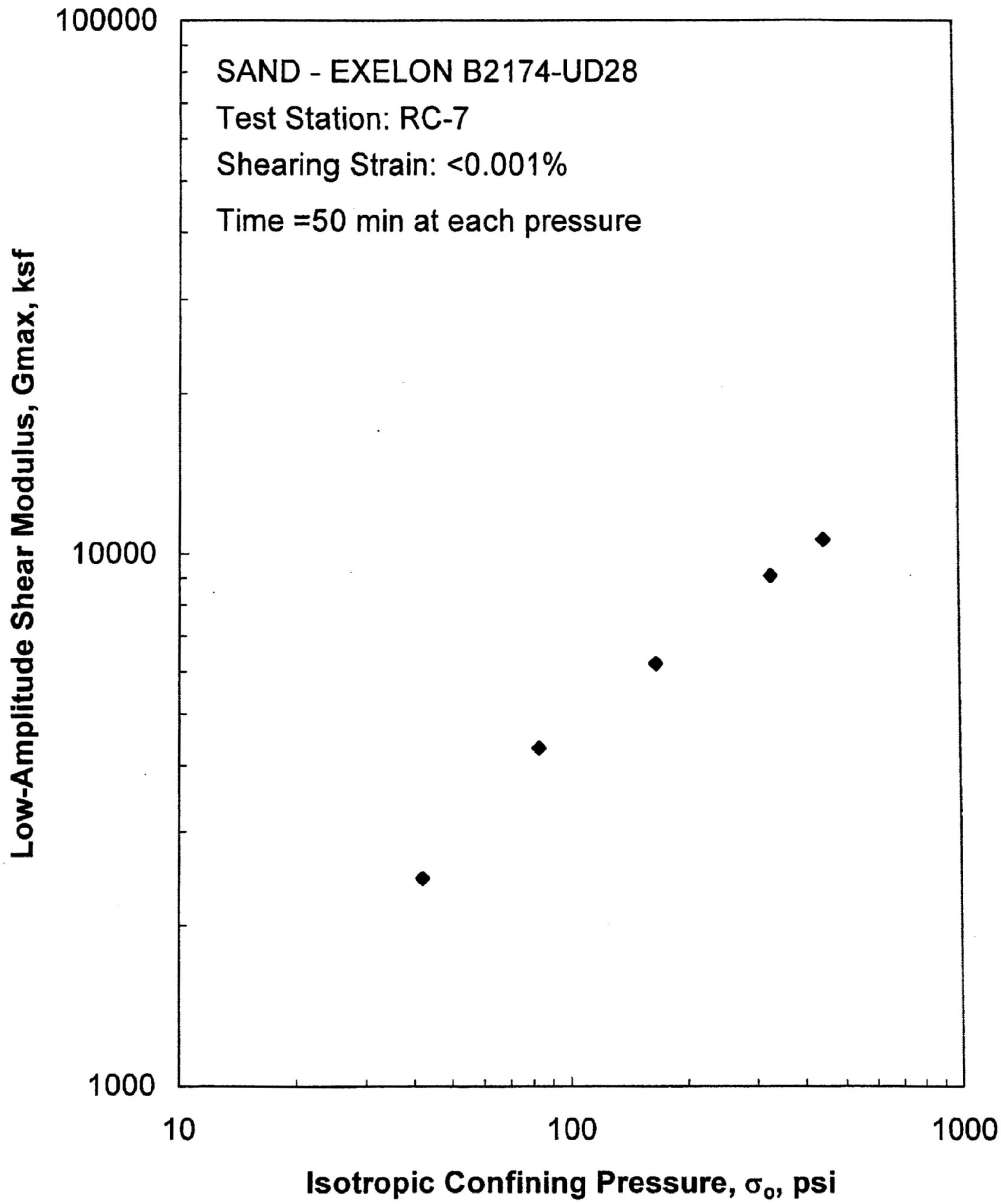

Figure K.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

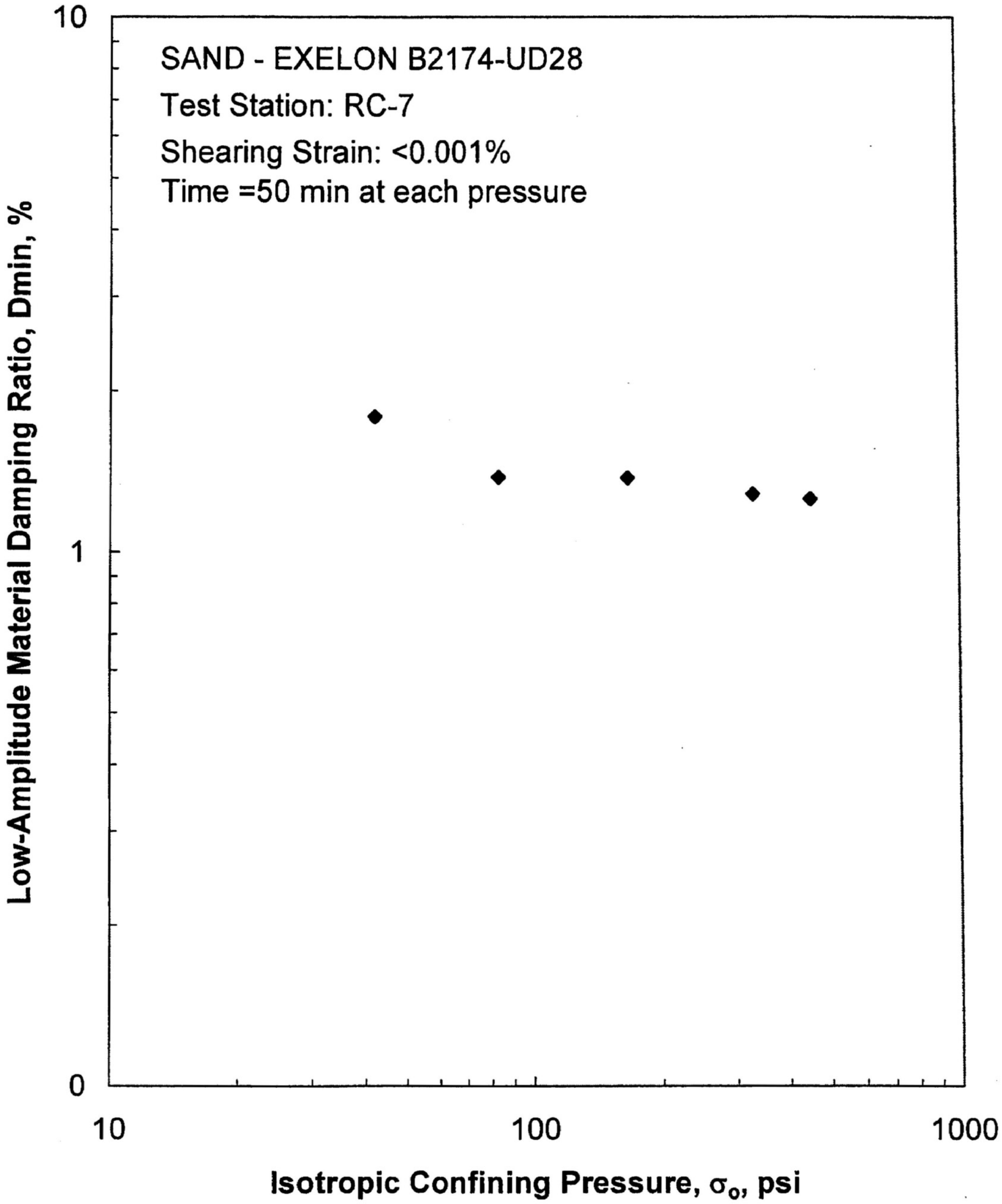

Figure K.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

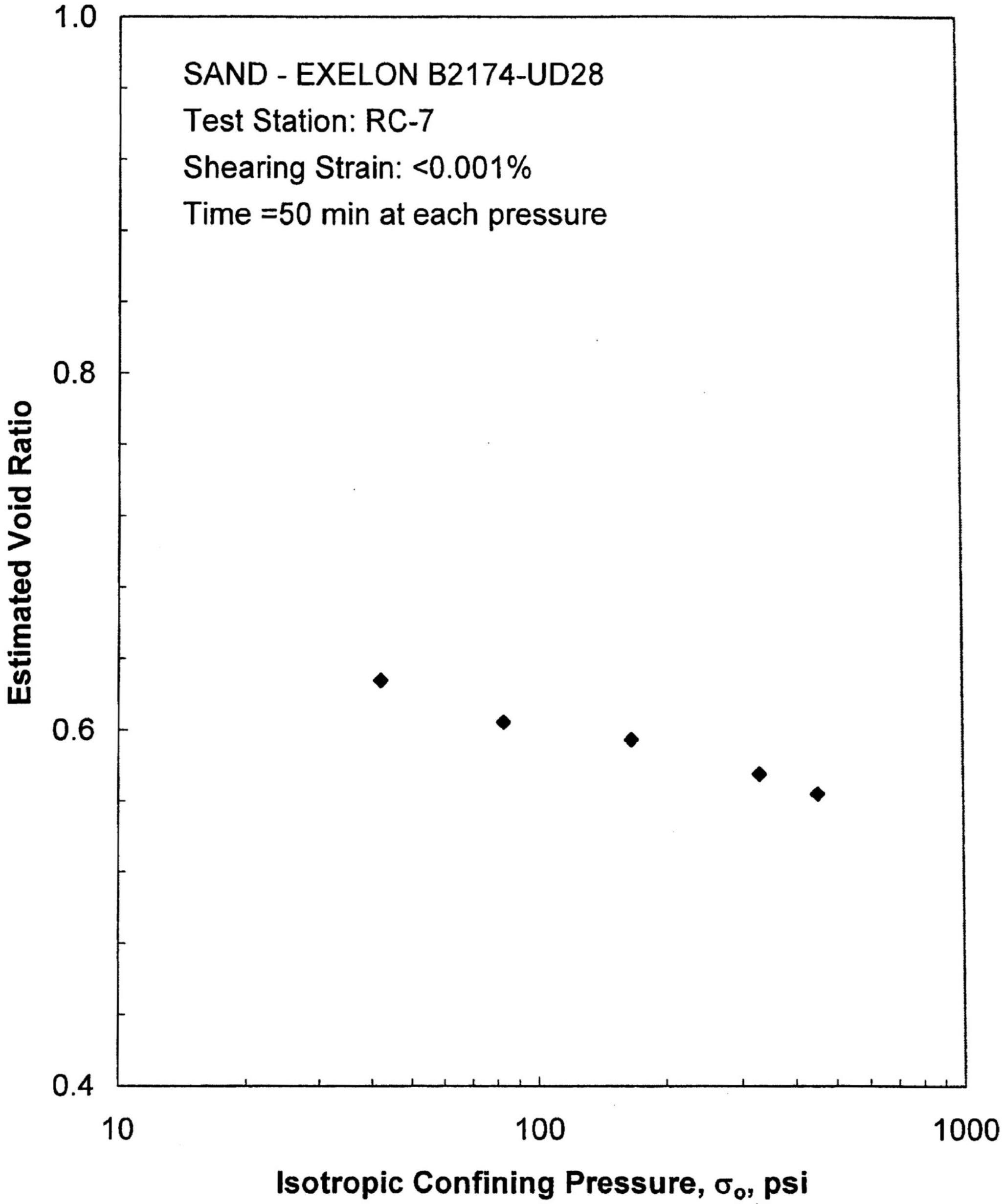

Figure K.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

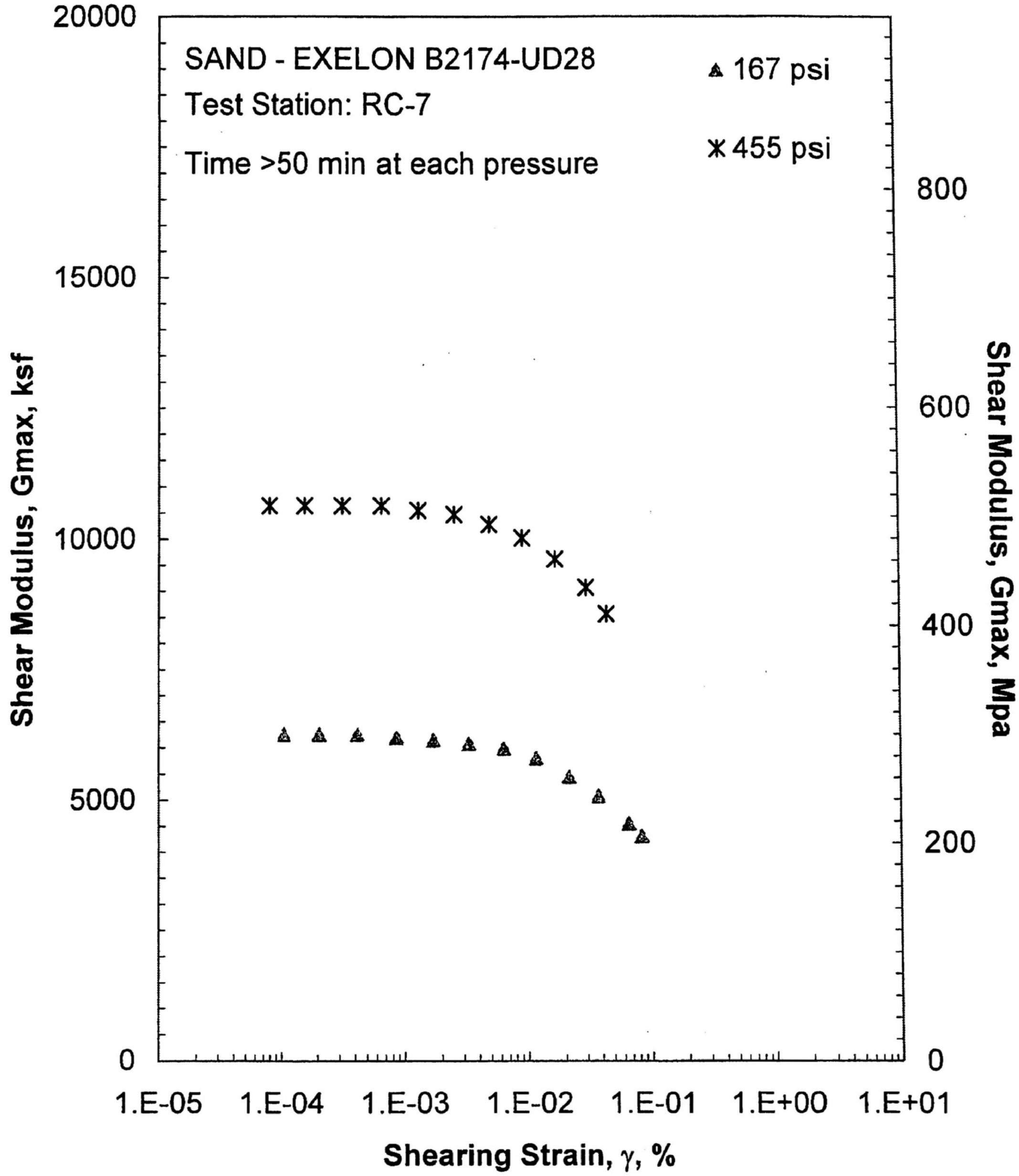

Figure K.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

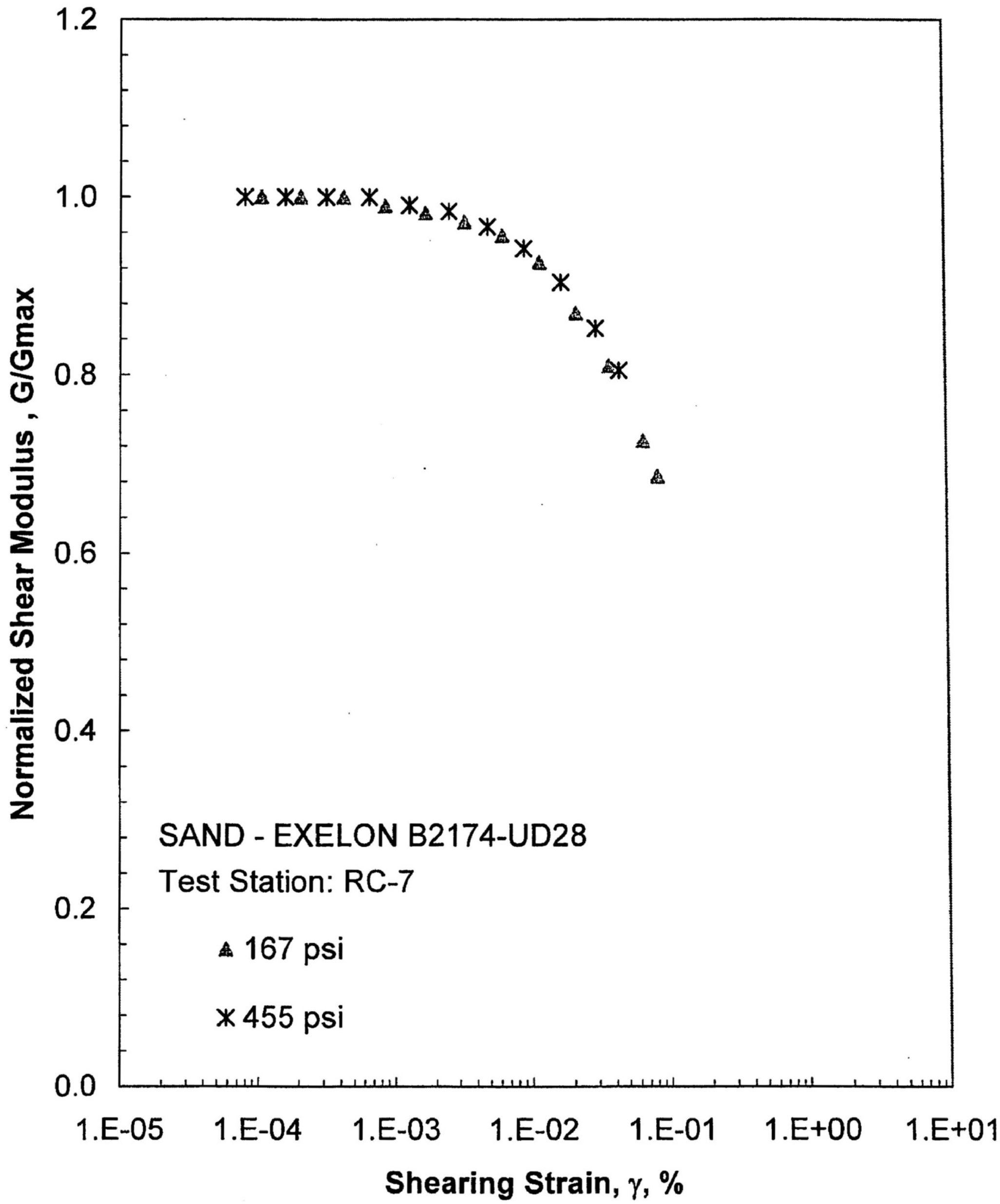

Figure K.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

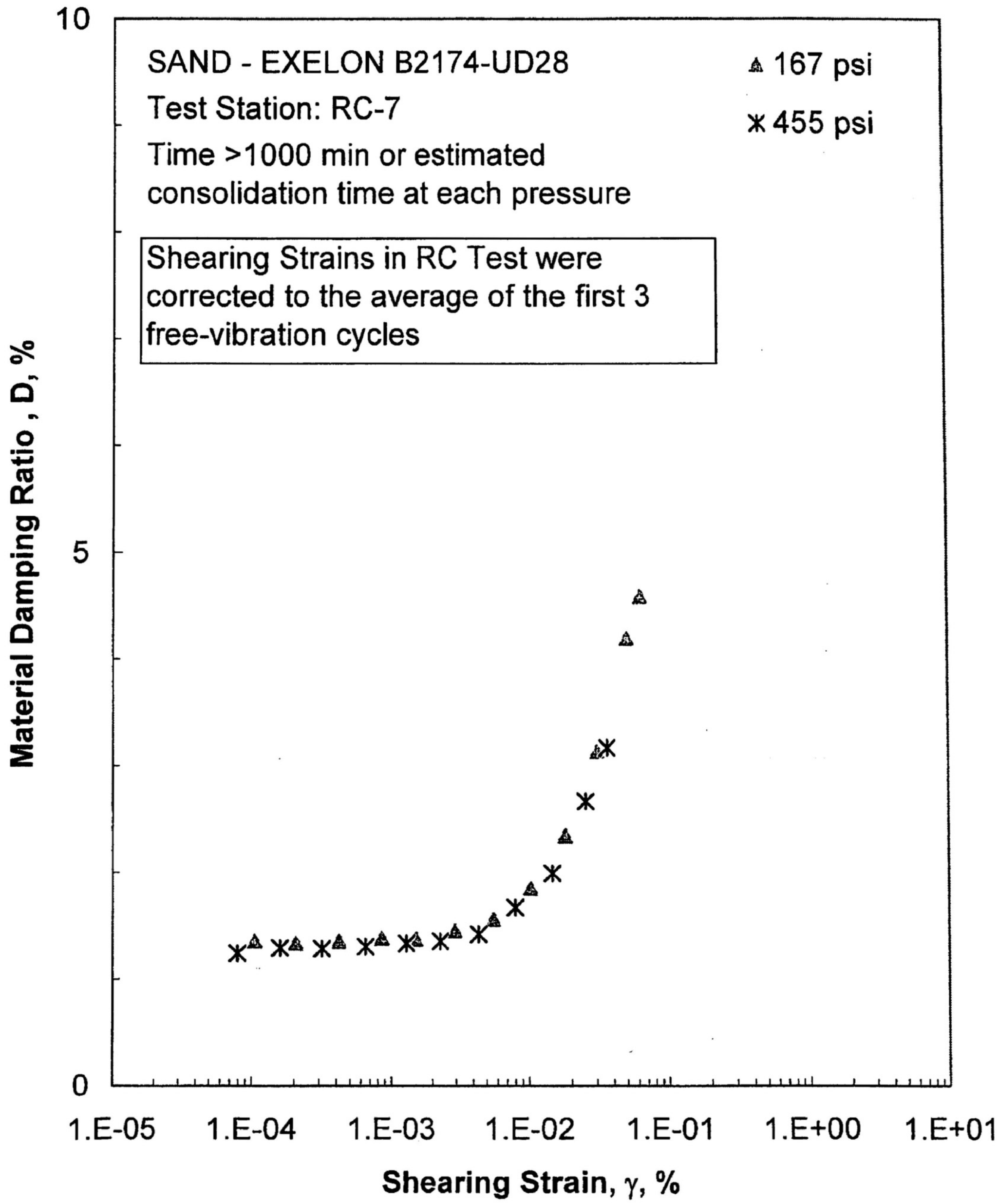

Figure K.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

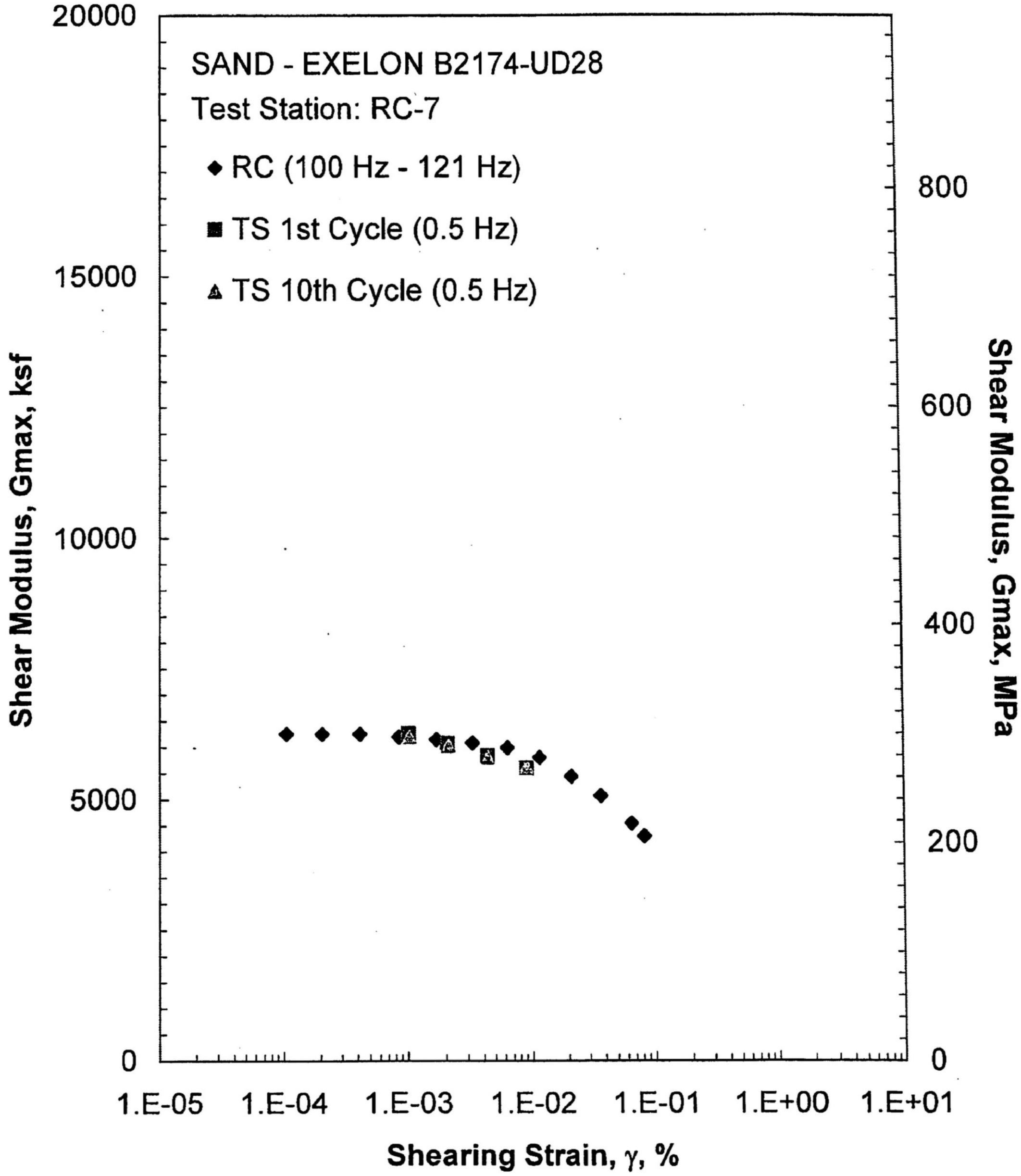

Figure K.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 167 psi from the Combined RCTS Tests

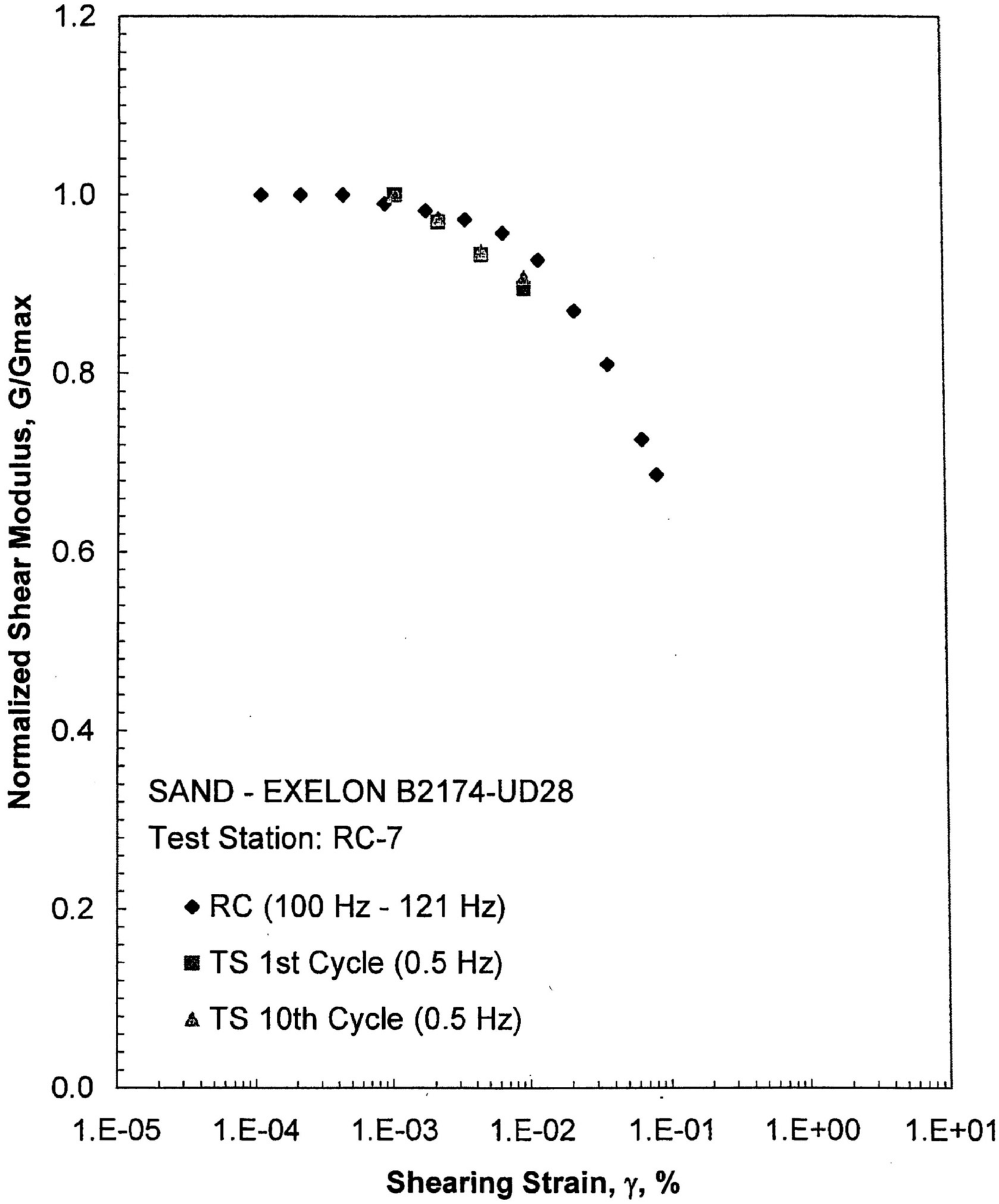

Figure K.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 167 psi from the Combined RCTS Tests

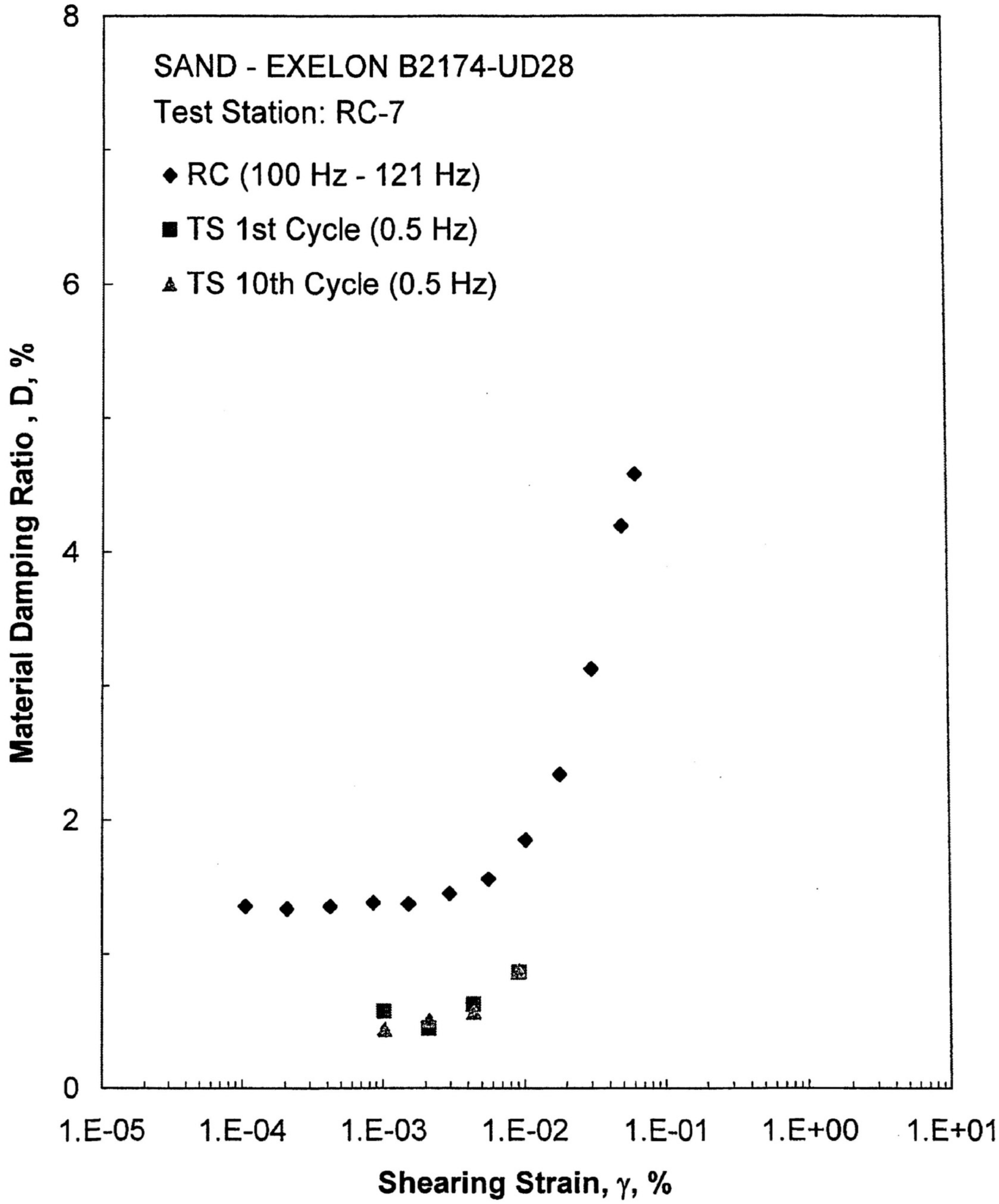

Figure K.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 167 psi from the Combined RCTS Tests

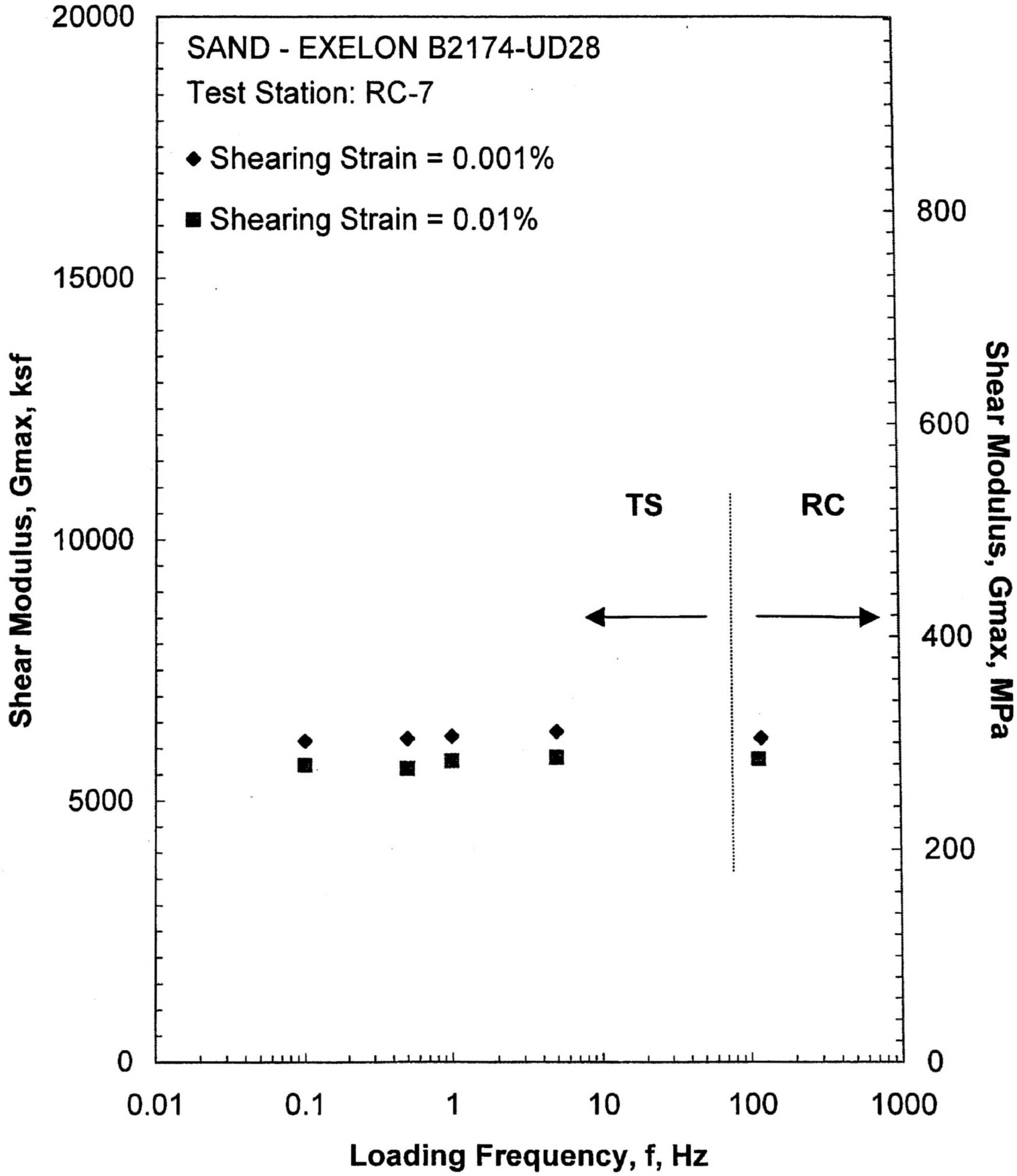

Figure K.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 167 psi from the Combined RCTS Tests

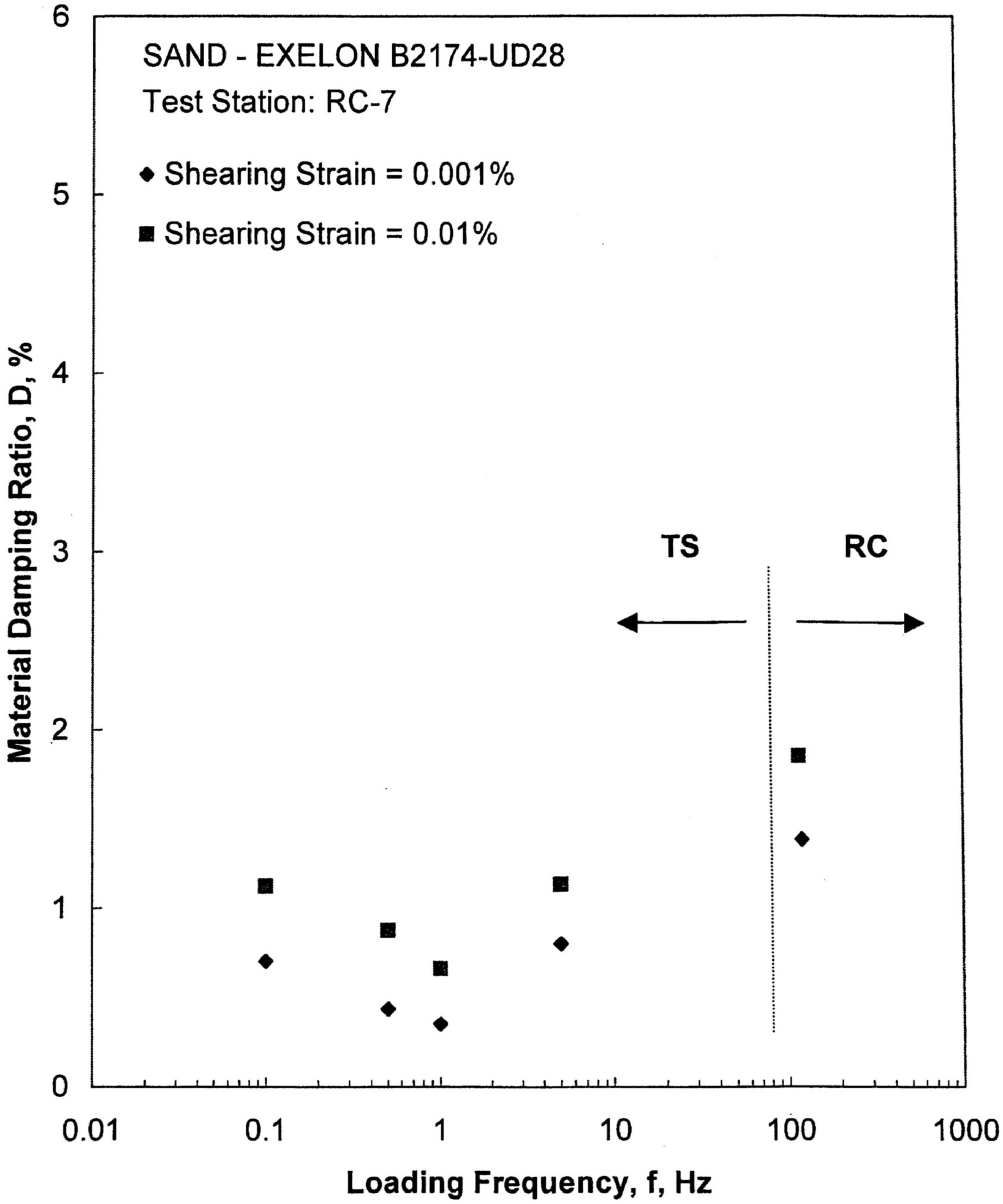

Figure K.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 167 psi from the Combined RCTS Tests

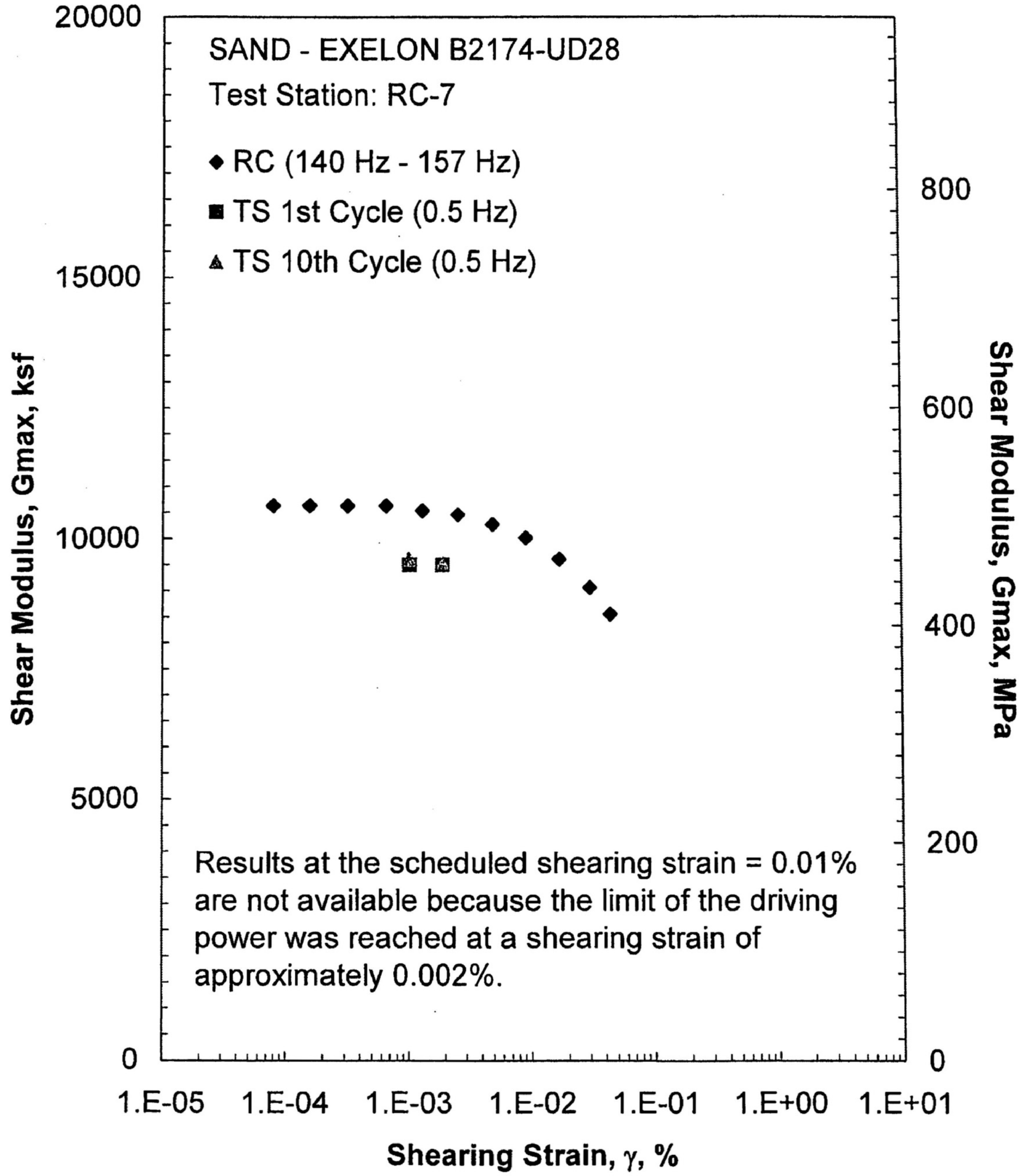

Figure K.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

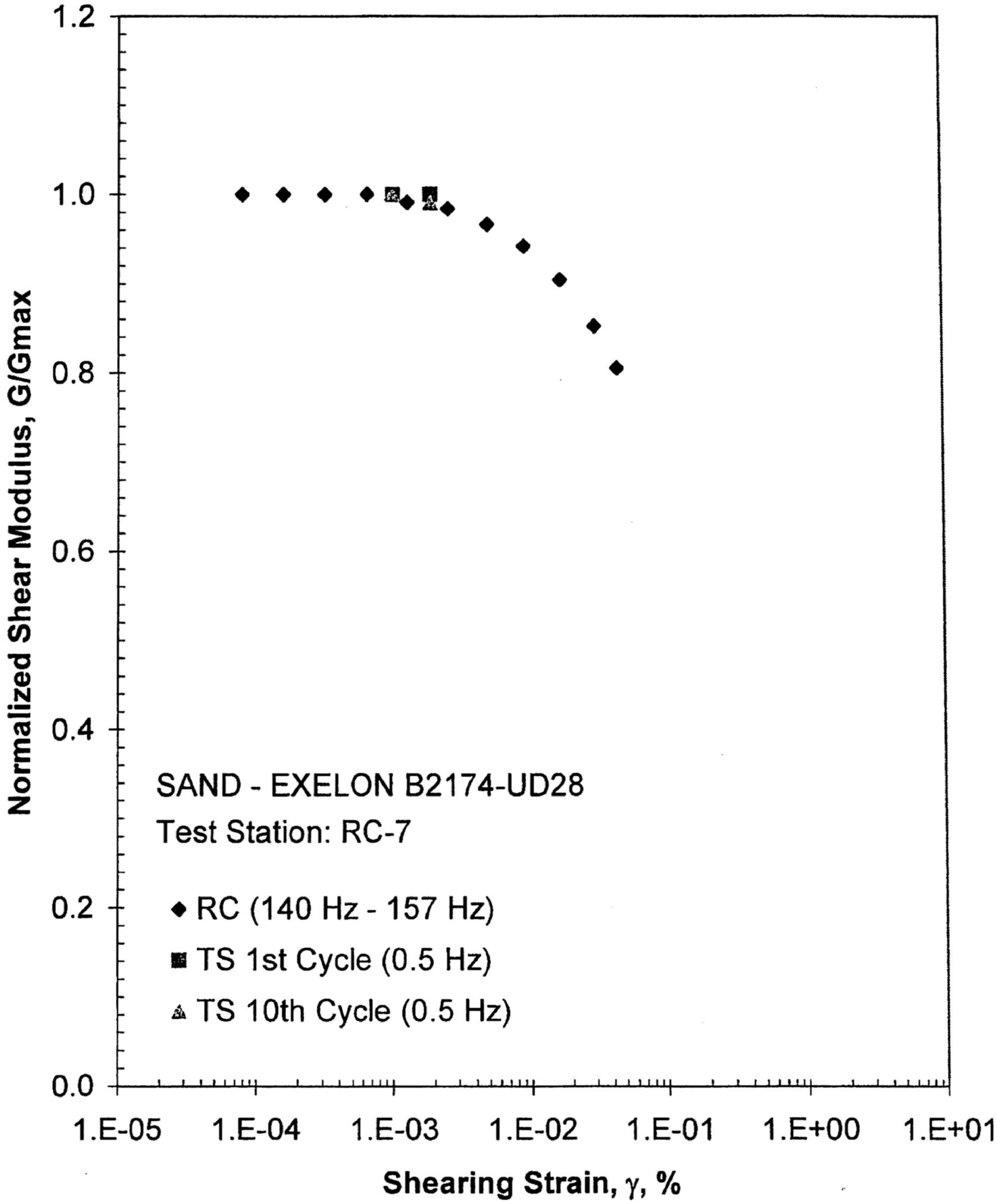

Figure K.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

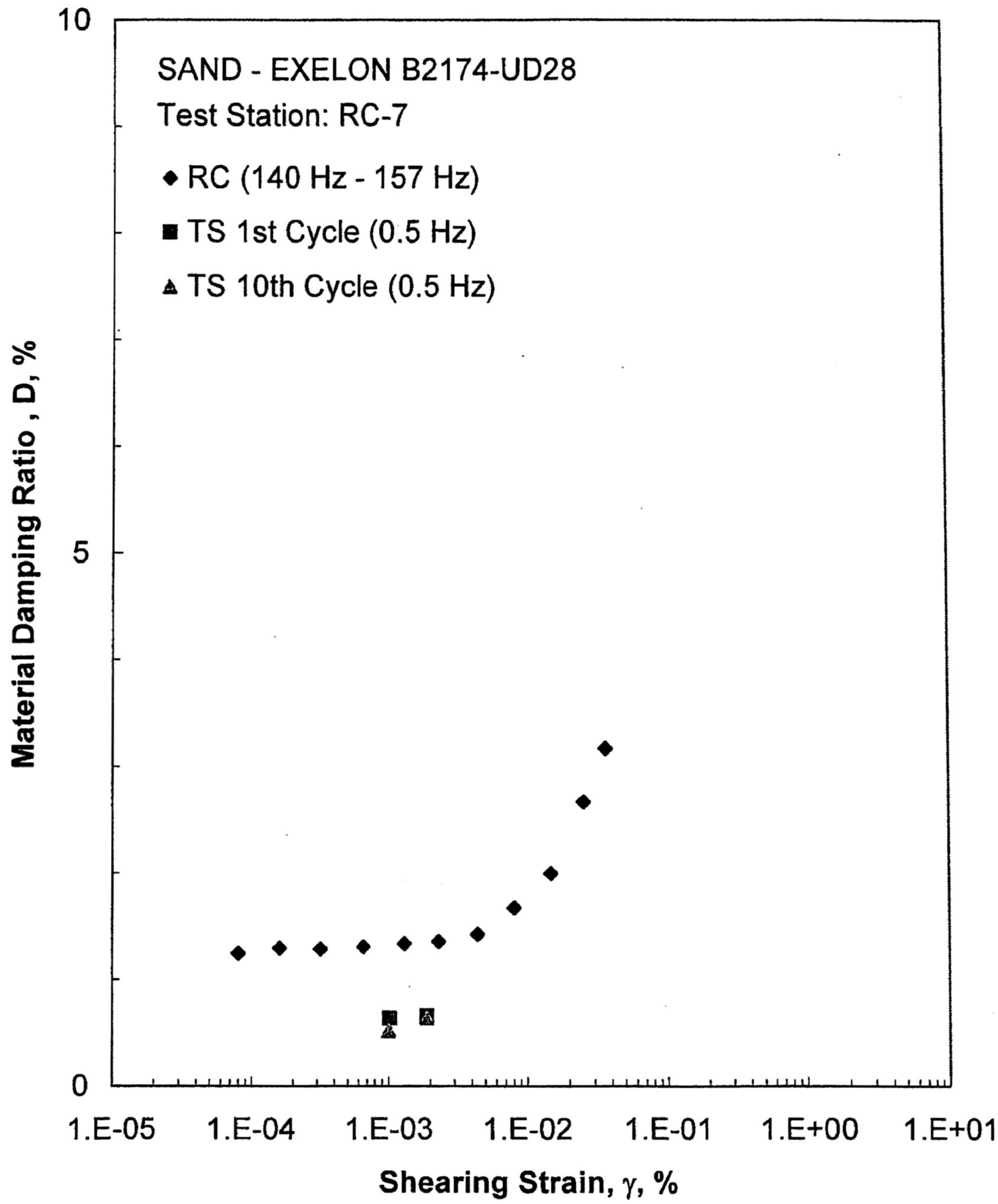

Figure K.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

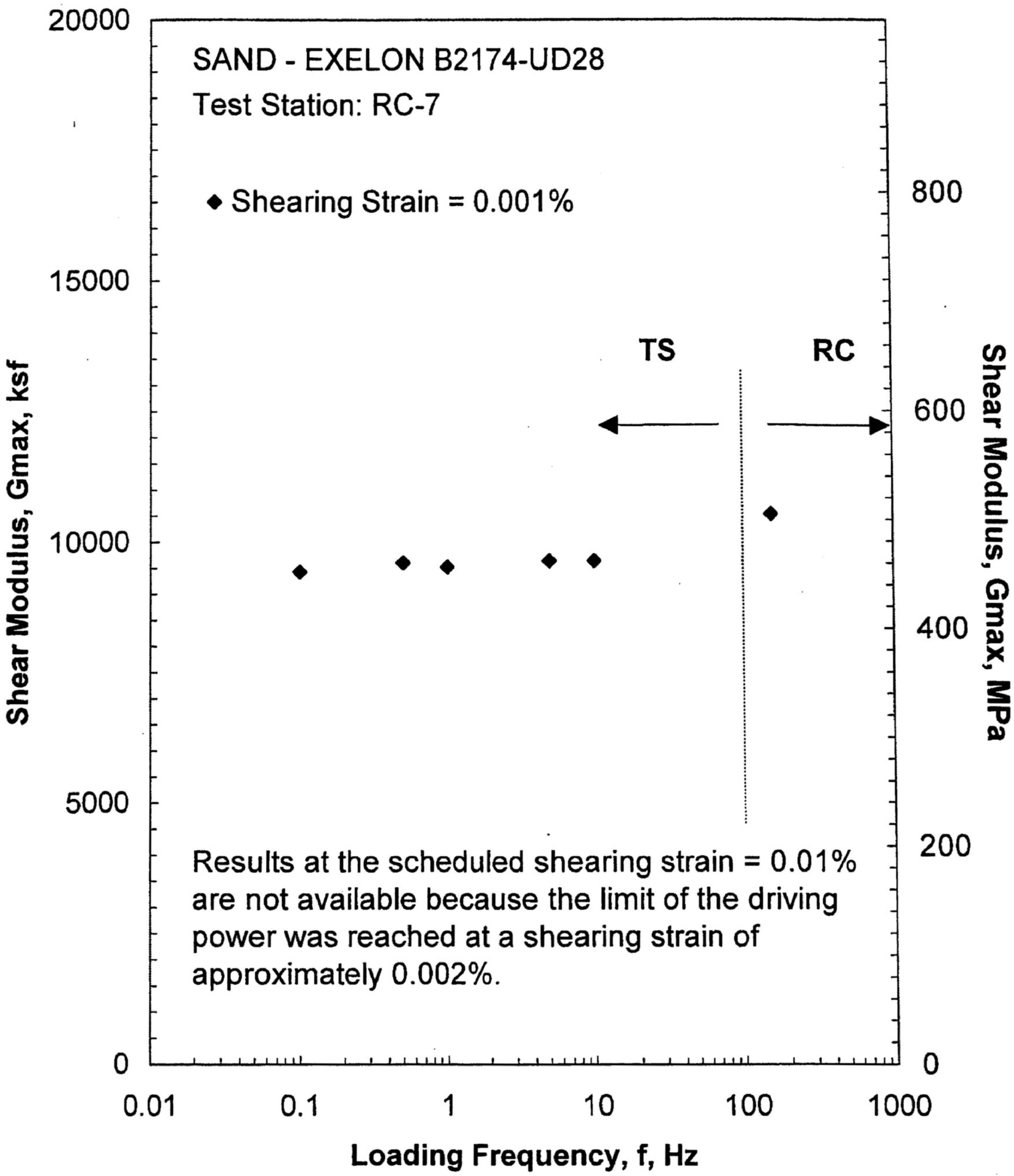

Figure K.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

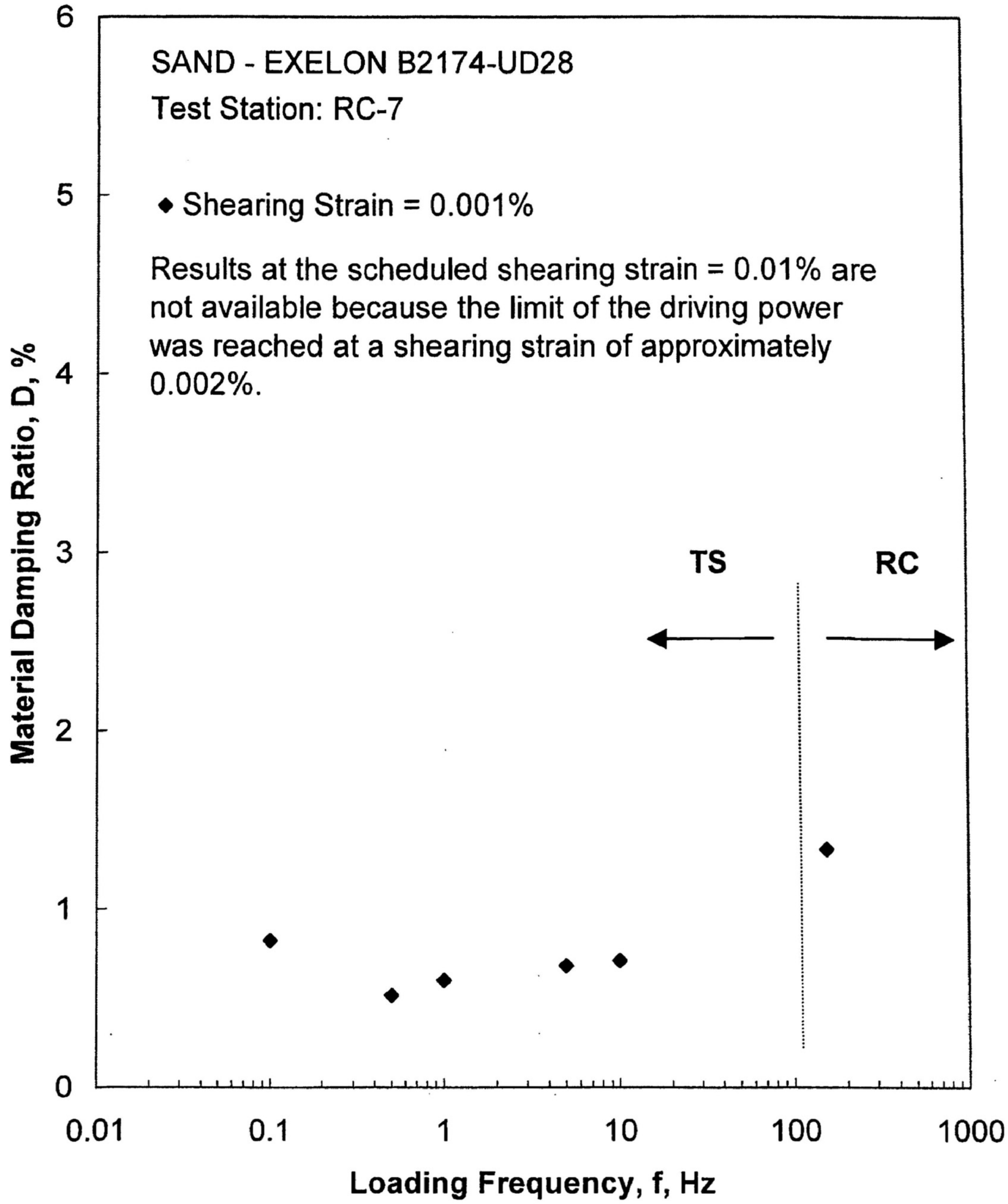

Figure K.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 455 psi from the Combined RCTS Tests

Table K.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen B2174-UD28

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
42	6048	289	2454	118	802	1.79	0.63
83	11952	572	4309	207	1055	1.38	0.60
167	24048	1151	6197	297	1261	1.37	0.59
333	47952	2294	9067	435	1516	1.28	0.58
455	65520	3135	10601	509	1633	1.25	0.56

Table K.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2174-UD28; Isoptropic Confining Pressure, σ_o=167 psi (24.0 ksf = 1151 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio×, D, %
1.06E-04	6252	1.00	1.06E-04	1.36
2.07E-04	6252	1.00	2.07E-04	1.34
4.21E-04	6252	1.00	4.21E-04	1.35
8.60E-04	6192	0.99	8.60E-04	1.38
1.70E-03	6140	0.98	1.53E-03	1.37
3.31E-03	6077	0.97	2.98E-03	1.45
6.32E-03	5980	0.96	5.63E-03	1.56
1.17E-02	5794	0.93	1.03E-02	1.85
2.15E-02	5437	0.87	1.82E-02	2.34
3.74E-02	5064	0.81	3.06E-02	3.13
6.57E-02	4538	0.73	5.06E-02	4.19
8.32E-02	4292	0.69	6.32E-02	4.58

+ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

× Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table K.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2174-UD28; Isotropic Confining Pressure, σ_o= 167 psi (24.0 ksf = 1151 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.02E-03	6262	1.00	0.57	1.03E-03	6190	1.00	0.43
2.11E-03	6070	0.97	0.44	2.12E-03	6025	0.97	0.50
4.38E-03	5839	0.93	0.62	4.41E-03	5795	0.94	0.56
9.14E-03	5601	0.89	0.86	9.11E-03	5615	0.91	0.87

Table K.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen B2174-UD28; Isoptropic Confining Pressure, σ_o= 455 psi (65.5 ksf = 3135 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
8.00E-05	10634	1.00	8.00E-05	1.24
1.59E-04	10634	1.00	1.59E-04	1.29
3.17E-04	10634	1.00	3.17E-04	1.28
6.53E-04	10634	1.00	6.53E-04	1.30
1.29E-03	10539	0.99	1.29E-03	1.33
2.54E-03	10465	0.98	2.31E-03	1.35
4.89E-03	10278	0.97	4.40E-03	1.42
9.03E-03	10019	0.94	8.04E-03	1.67
1.68E-02	9615	0.90	1.48E-02	1.99
2.99E-02	9065	0.85	2.54E-02	2.66
4.42E-02	8560	0.80	3.62E-02	3.17

$^+$ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

^{x} Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table K.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen B2174-UD28; Isotropic Confining Pressure, σ_o=455psi (65.5 ksf = 3135 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.02E-03	9500	1.00	0.63	1.00E-03	9608	1.00	0.51
1.90E-03	9504	1.00	0.65	1.90E-03	9515	0.99	0.63

APPENDIX L

Specimen B2174-UD31
(Index properties not available)

Borehole B2174
Sample UD31
Depth = 593 ft (180.8 m)
Total Unit Weight = 125.0 lb/ft^3
Water Content = 14.1 %
Estimated In-Situ Ko = 0.5
Estimated In-Situ Mean Effective
Stress = 186 psi

FUGRO JOB #: 0411-08-1686
Testing Station: RC7

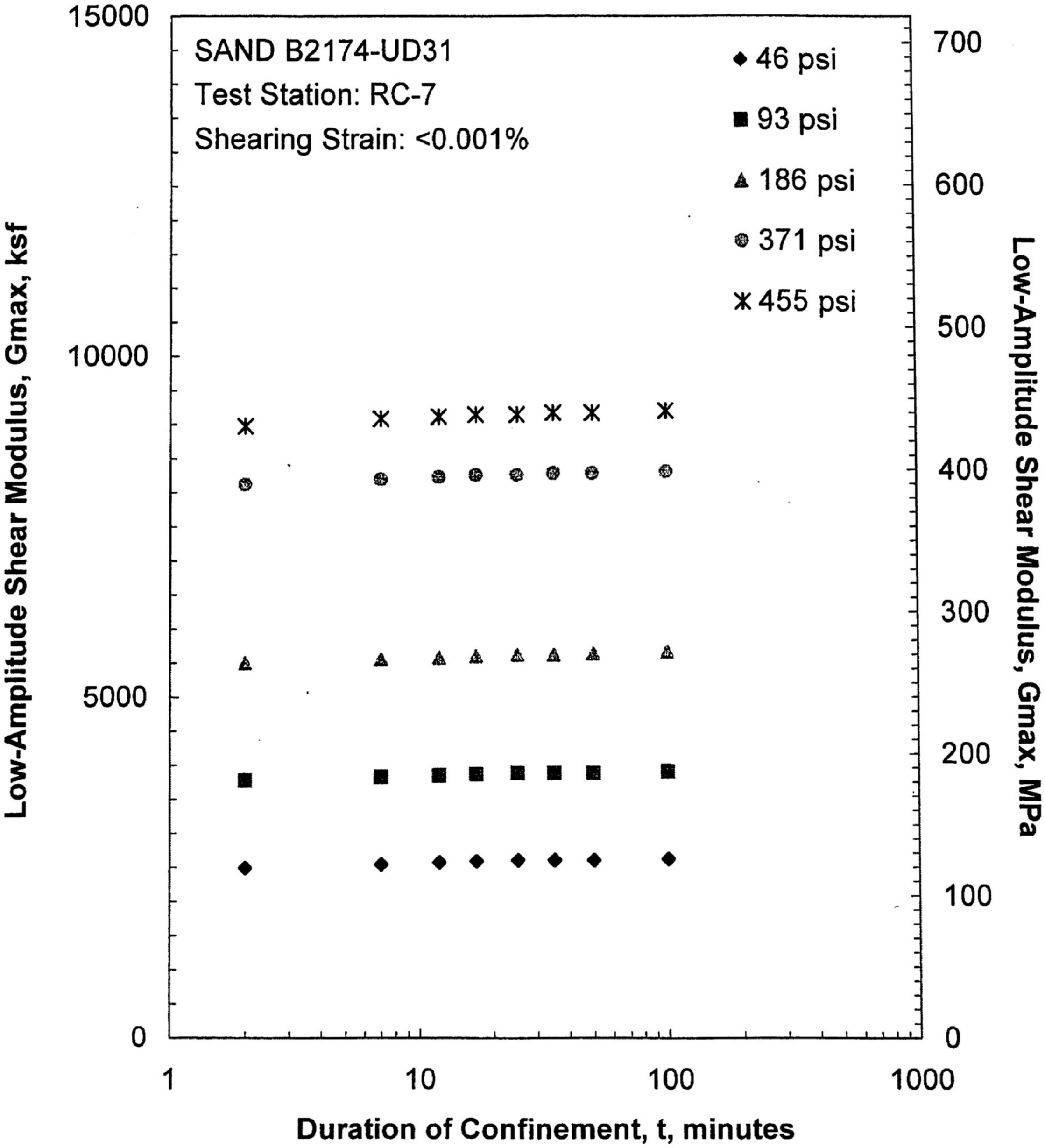

Figure L.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests