

Table A.4 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-A (1C), Sample No. P-6; Compacted to 99% Modified Proctor and Water Content of 8.1%; Isotropic Confining Pressure, $\sigma_o = 48$ psi (6.9 ksf = 331 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
6.52E-05	6181	1.00	6.52E-05	-
1.25E-04	6164	1.00	1.25E-04	1.87
2.44E-04	6141	0.99	2.44E-04	1.85
4.86E-04	6121	0.99	4.86E-04	1.93
9.47E-04	6026	0.97	8.48E-04	1.82
1.74E-03	5881	0.95	1.54E-03	2.02
3.28E-03	5557	0.90	2.87E-03	2.26
6.13E-03	5108	0.83	5.16E-03	2.92
1.15E-02	4470	0.72	9.09E-03	4.08
2.24E-02	3723	0.60	1.71E-02	4.76
4.11E-02	3220	0.52	3.04E-02	5.43
7.56E-02	2754	0.45	5.39E-02	6.17

⁺ 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

⁻ High Noise Level Interfering with Damping Measurement

Table A.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-A (1C), Sample No. P-6; Compacted to 99% Modified Proctor and Water Content of 8.1%; Isotropic Confining Pressure, $\sigma_o = 48$ psi (6.9 ksf = 331 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, %
1.01E-04	6444	1.00	0.50	1.01E-04	6410	0.99	0.64
2.01E-04	6477	1.00	0.54	2.01E-04	6452	1.00	0.52
4.03E-04	6435	1.00	0.54	4.01E-04	6460	1.00	0.57
7.60E-04	6410	0.99	0.68	7.64E-04	6368	0.99	0.67
1.58E-03	6165	0.96	1.03	1.60E-03	6089	0.94	1.01
3.85E-03	5762	0.89	1.66	3.90E-03	5695	0.88	1.57
9.70E-03	4957	0.77	3.98	9.93E-03	4832	0.75	3.55

APPENDIX B

**UT Specimen UTA-58-B (2C)
Red Silty Sand (SM)**

**Sample No. P-26
Depth = 7.0 ft**

**Total Unit Weight = 129.9 lb/ft³
Water Content = 8.3%
Estimated In-Situ Mean Effective
Stress = 6.0 psi**

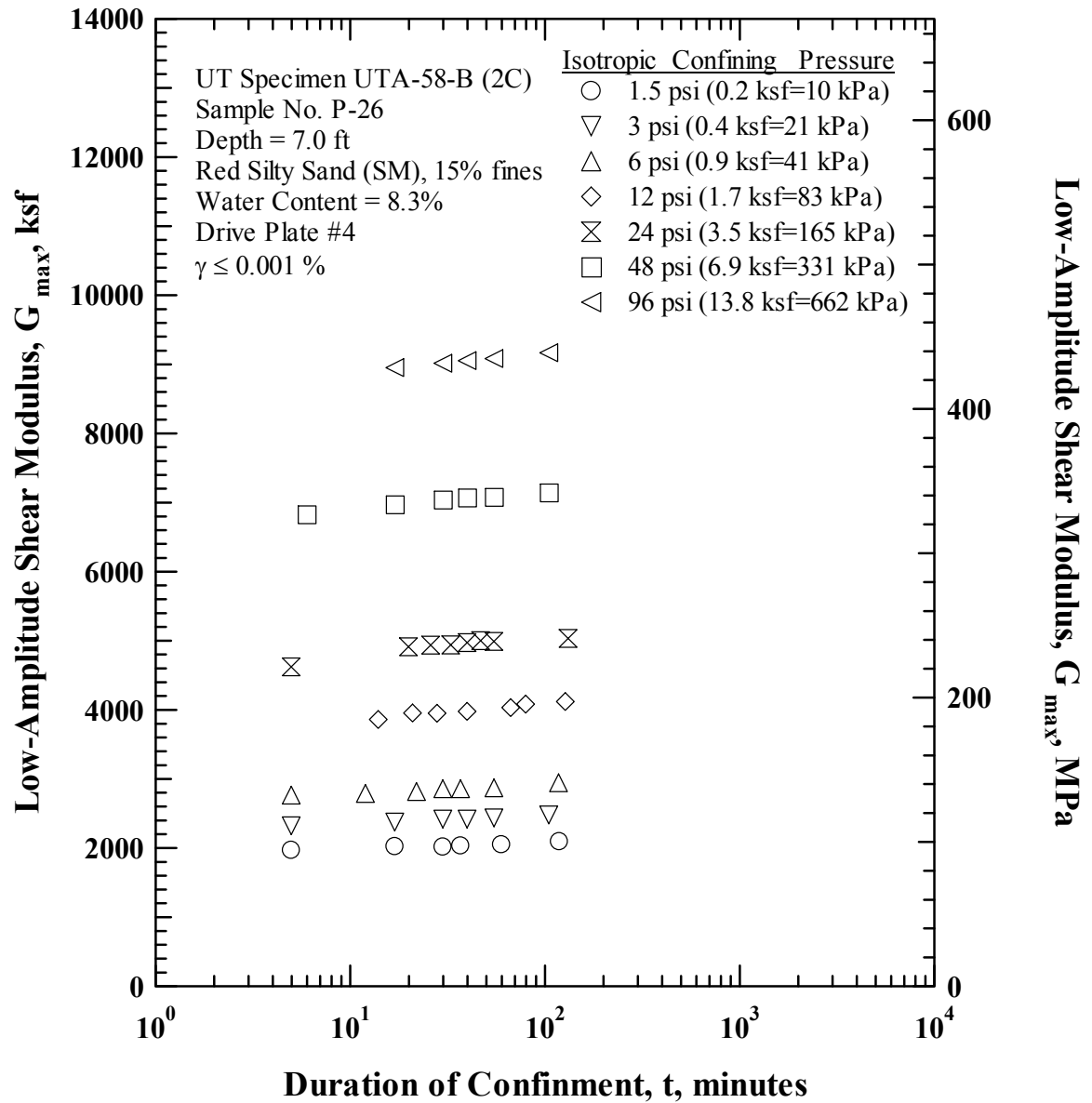


Figure B.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

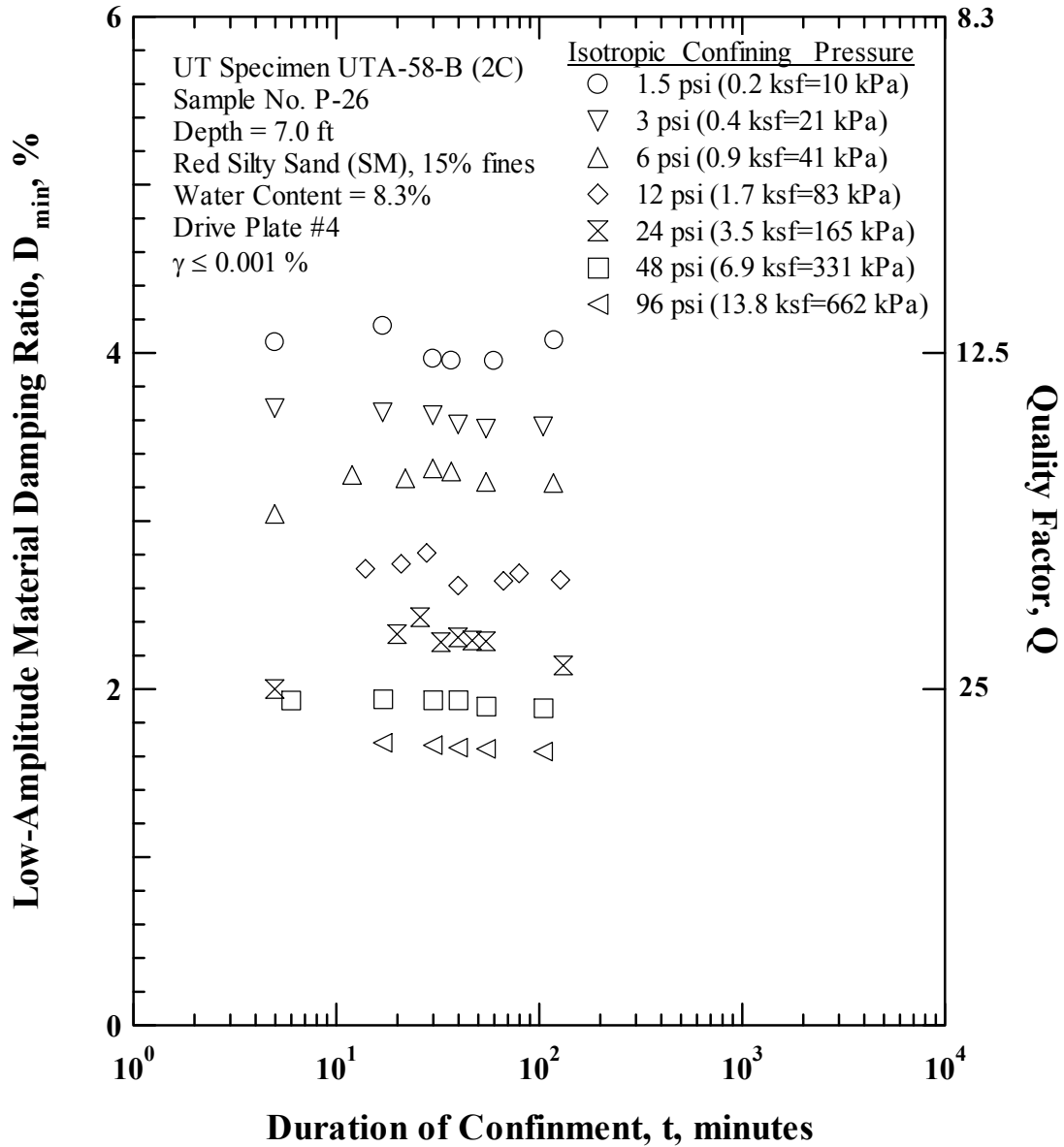


Figure B.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

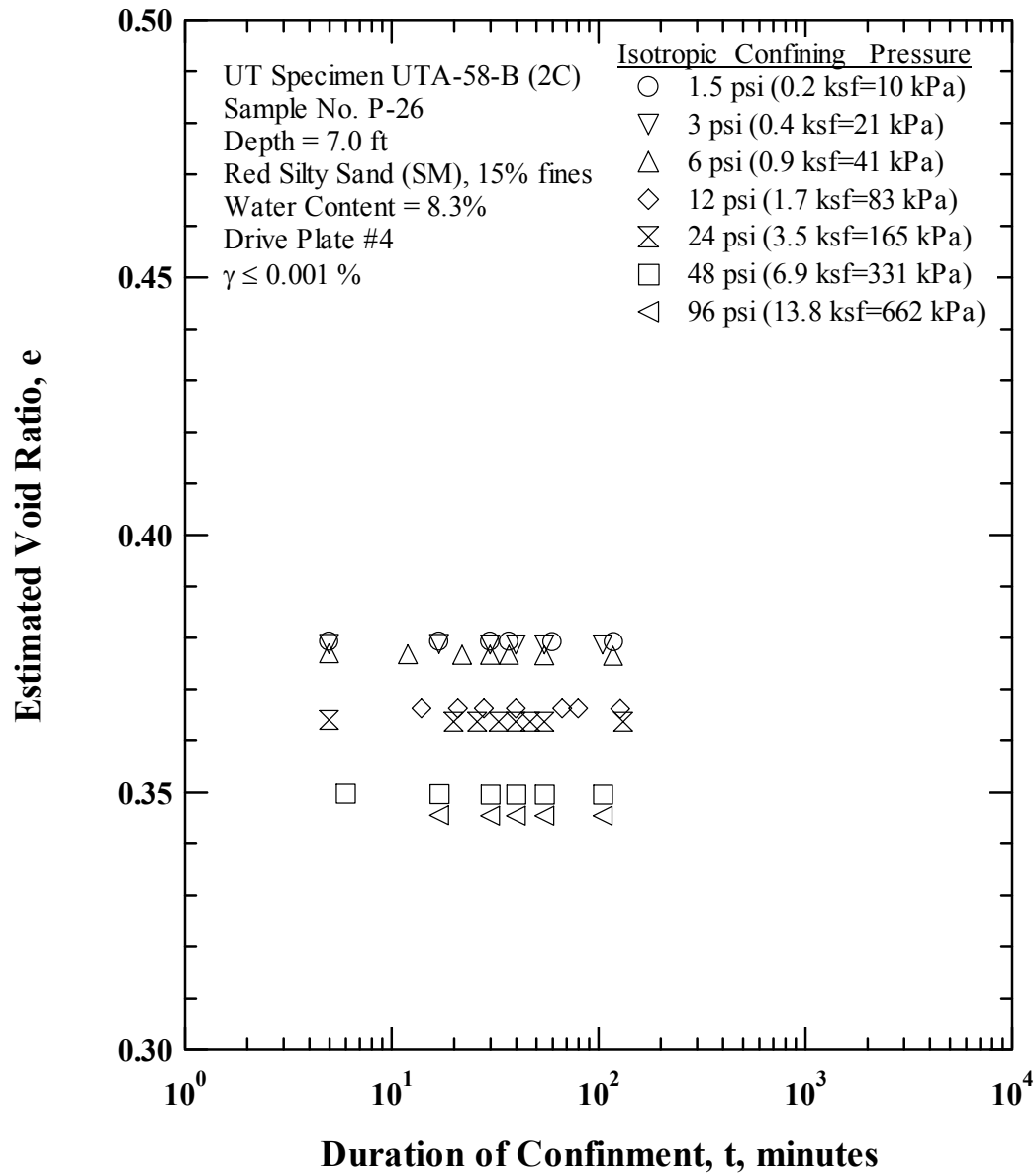


Figure B.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

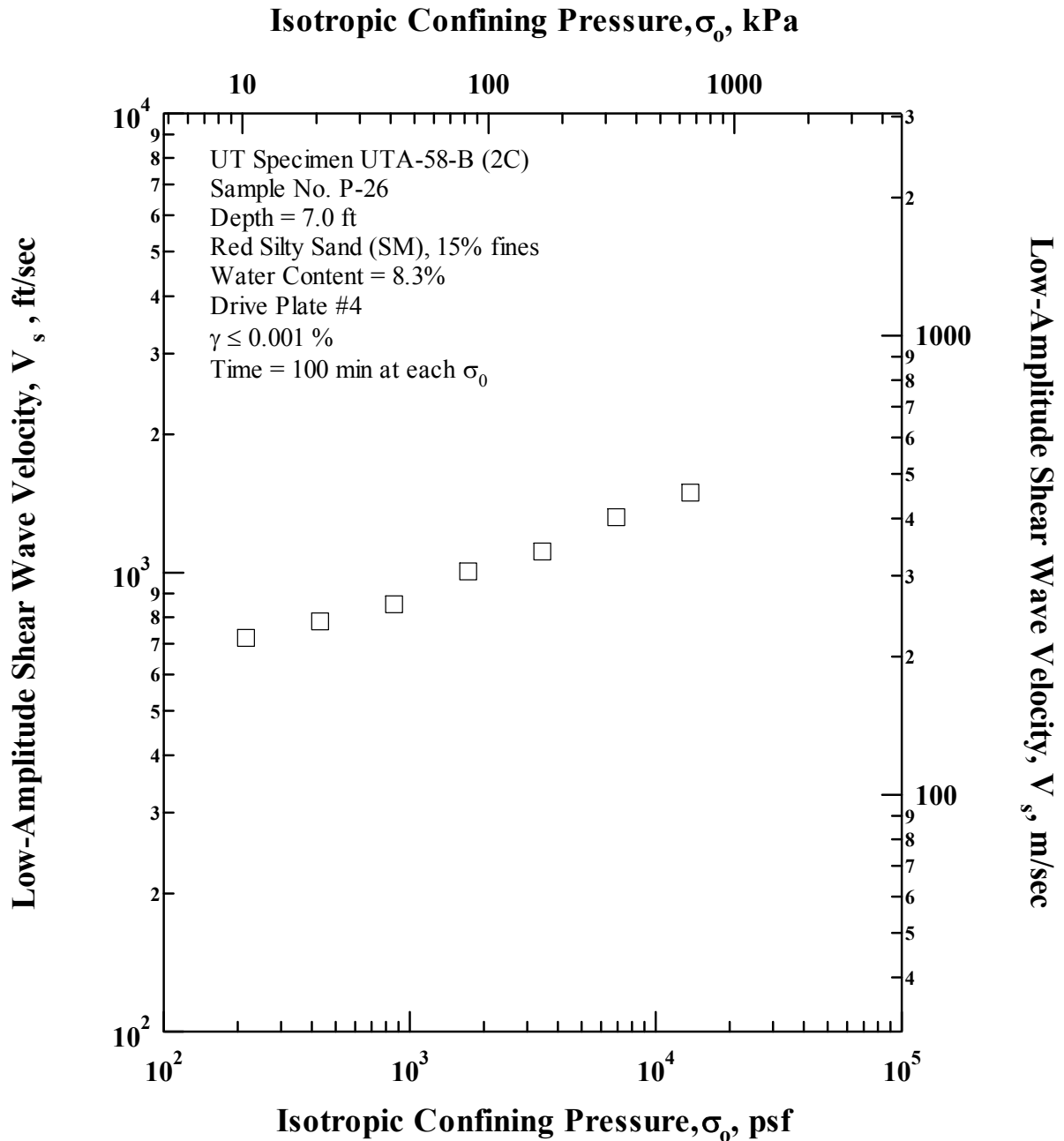


Figure B.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

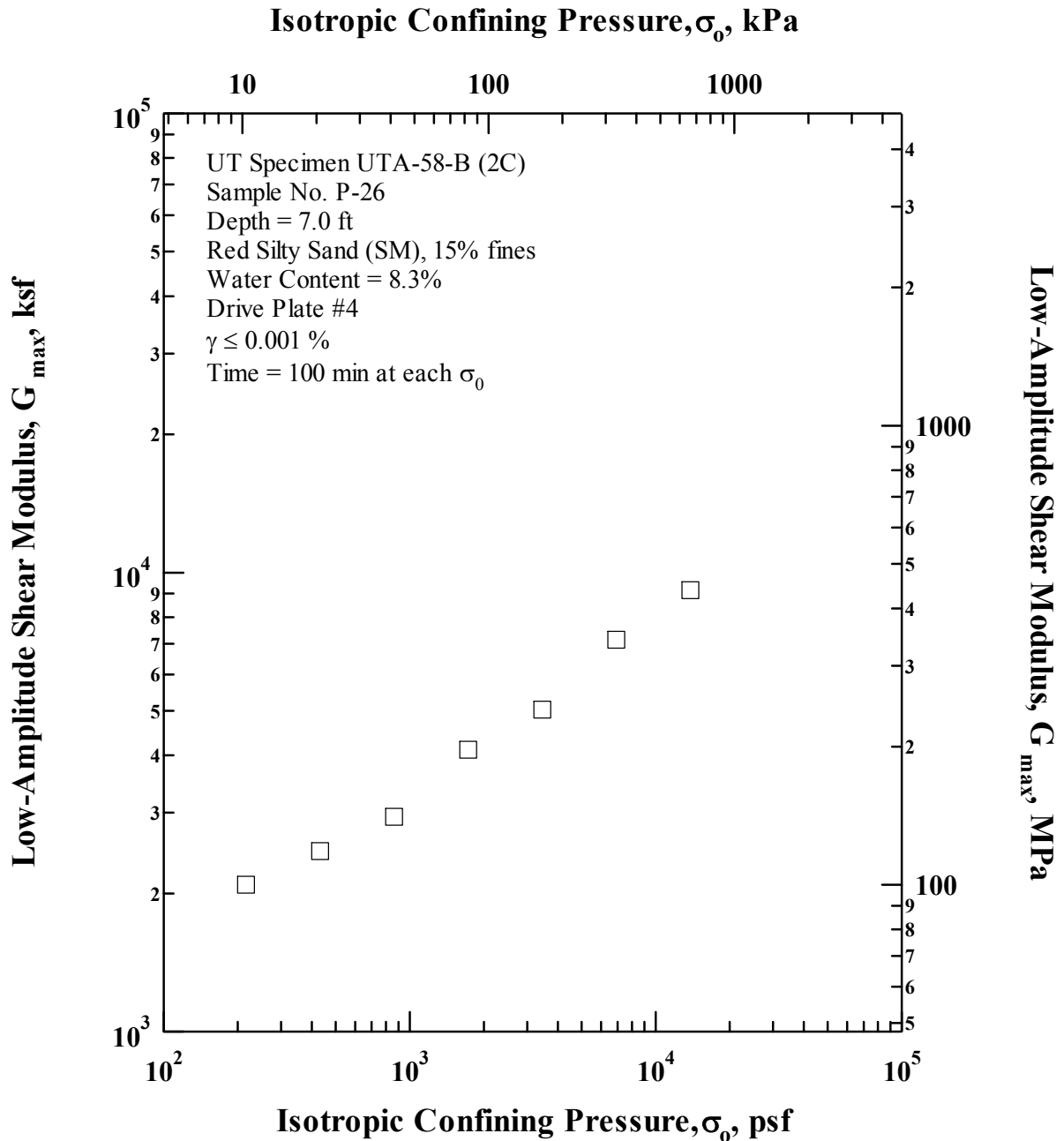


Figure B.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

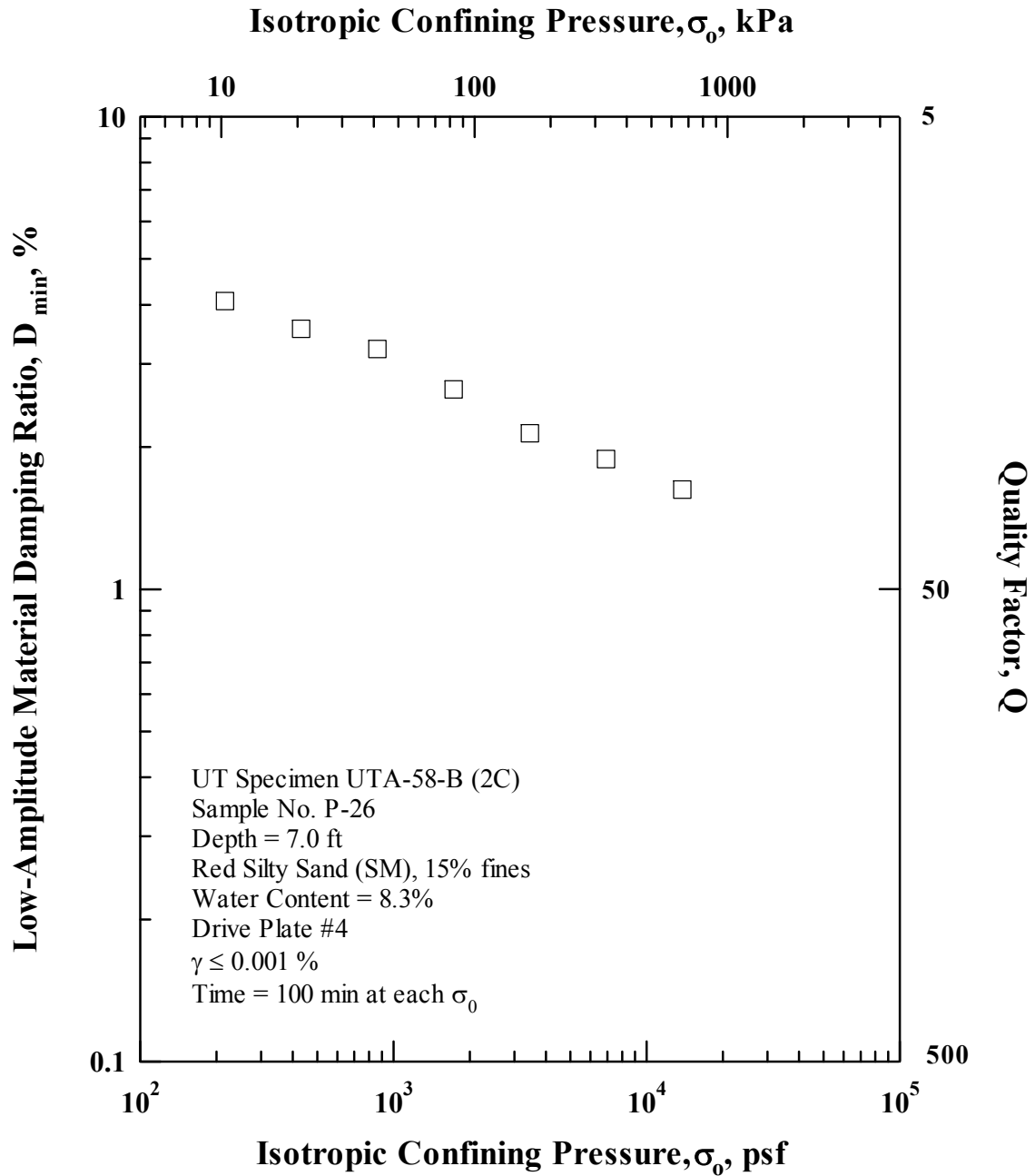


Figure B.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

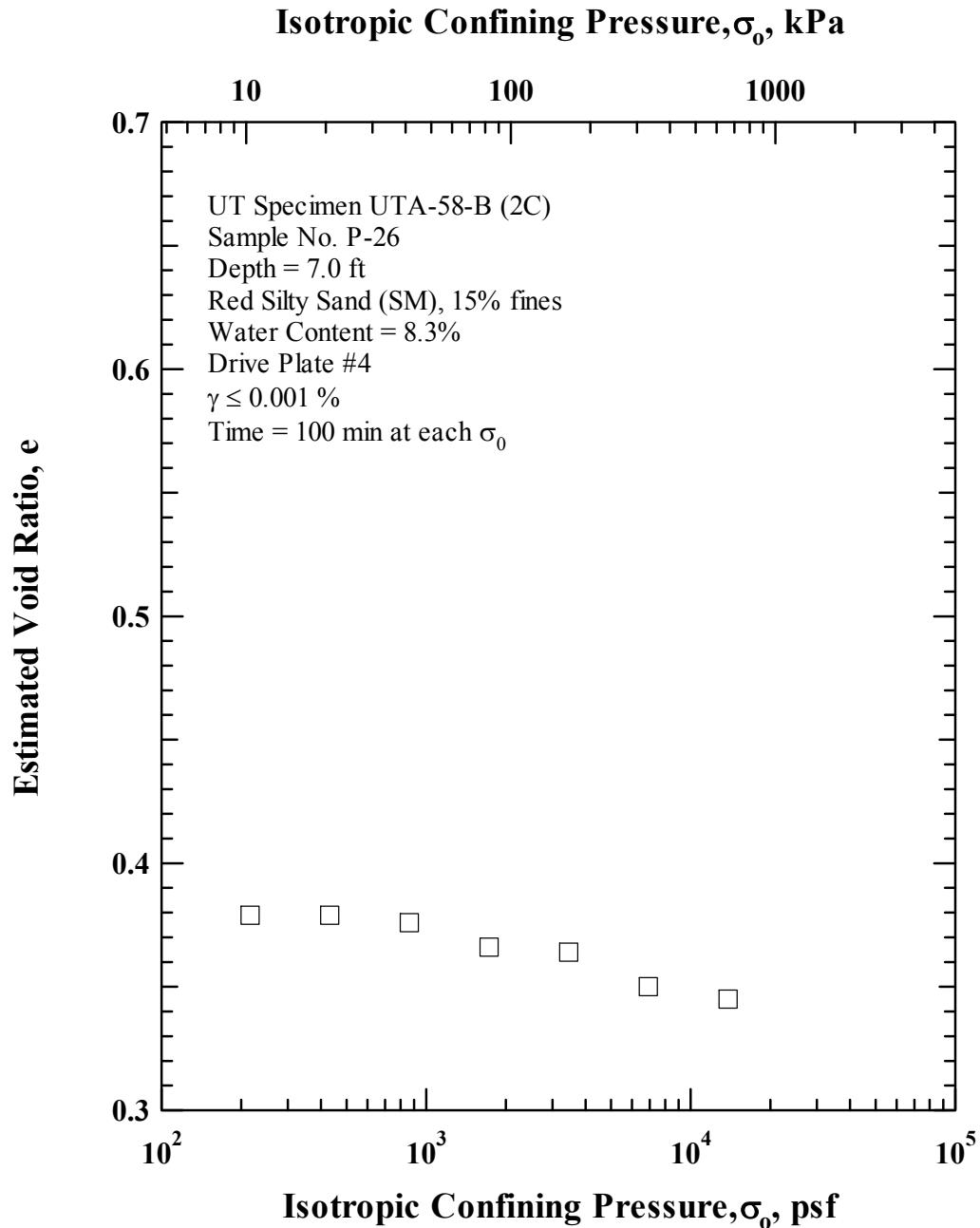


Figure B.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

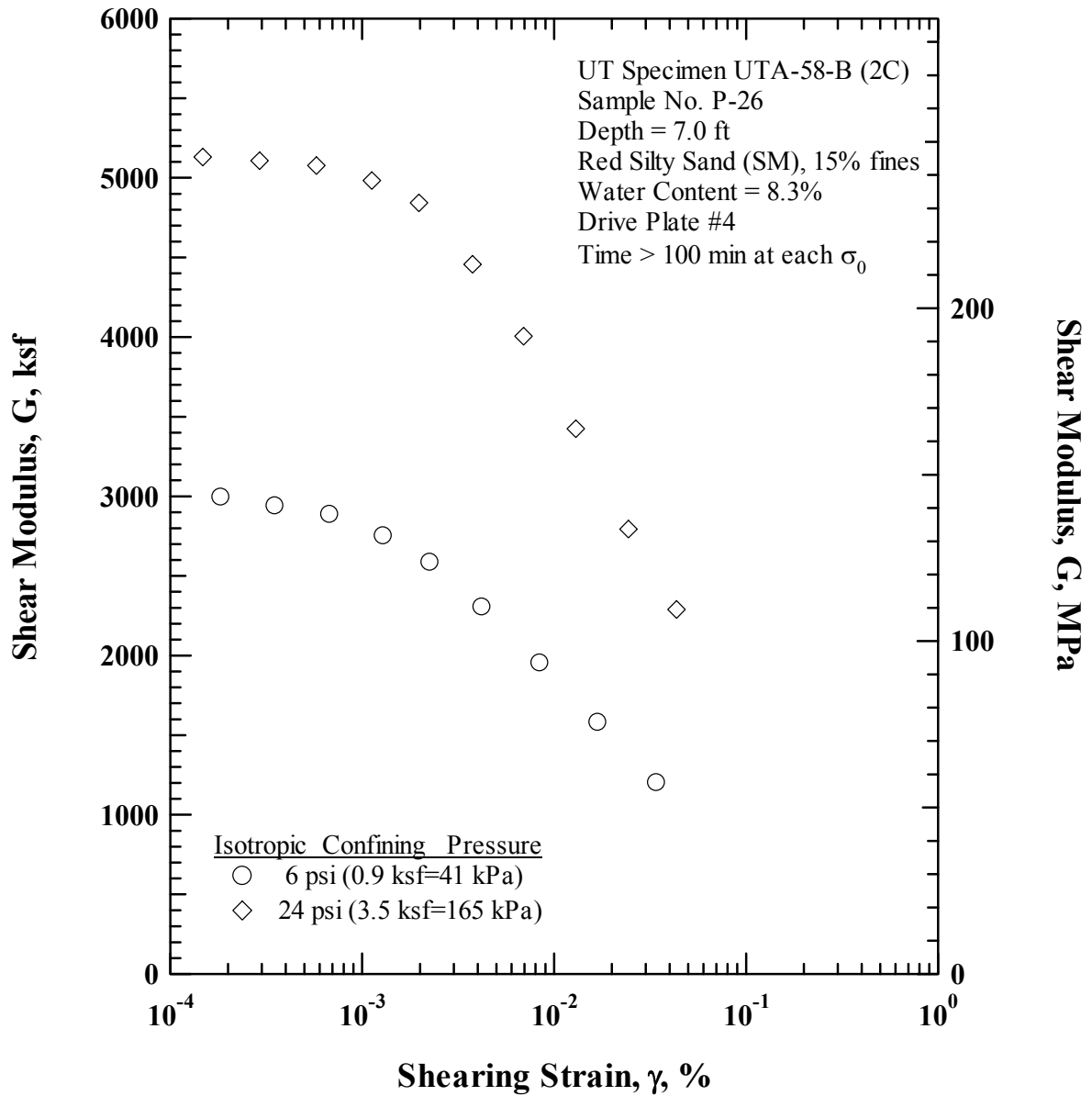


Figure B.8 Variation in Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

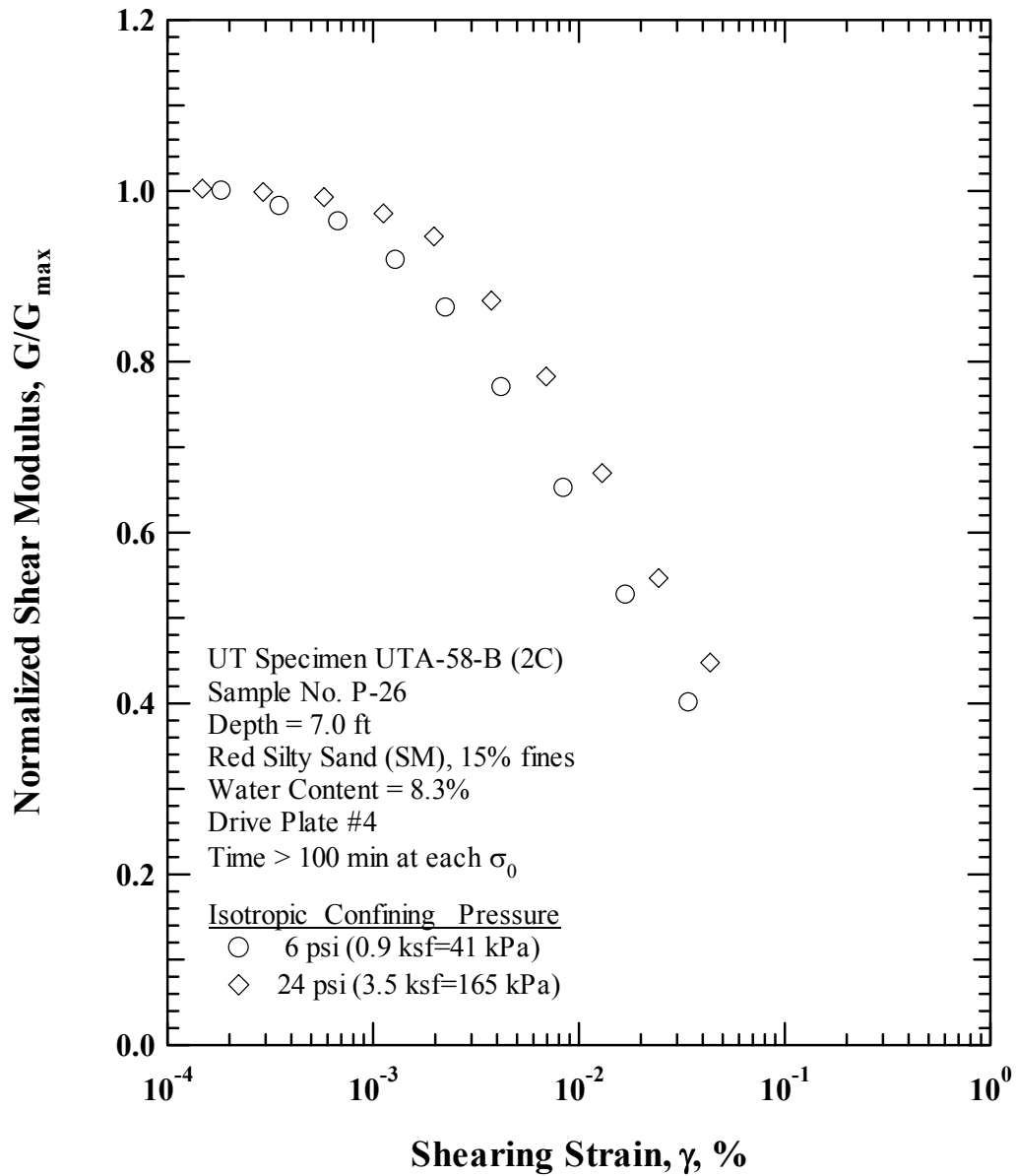


Figure B.9 Variation in Normalized Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

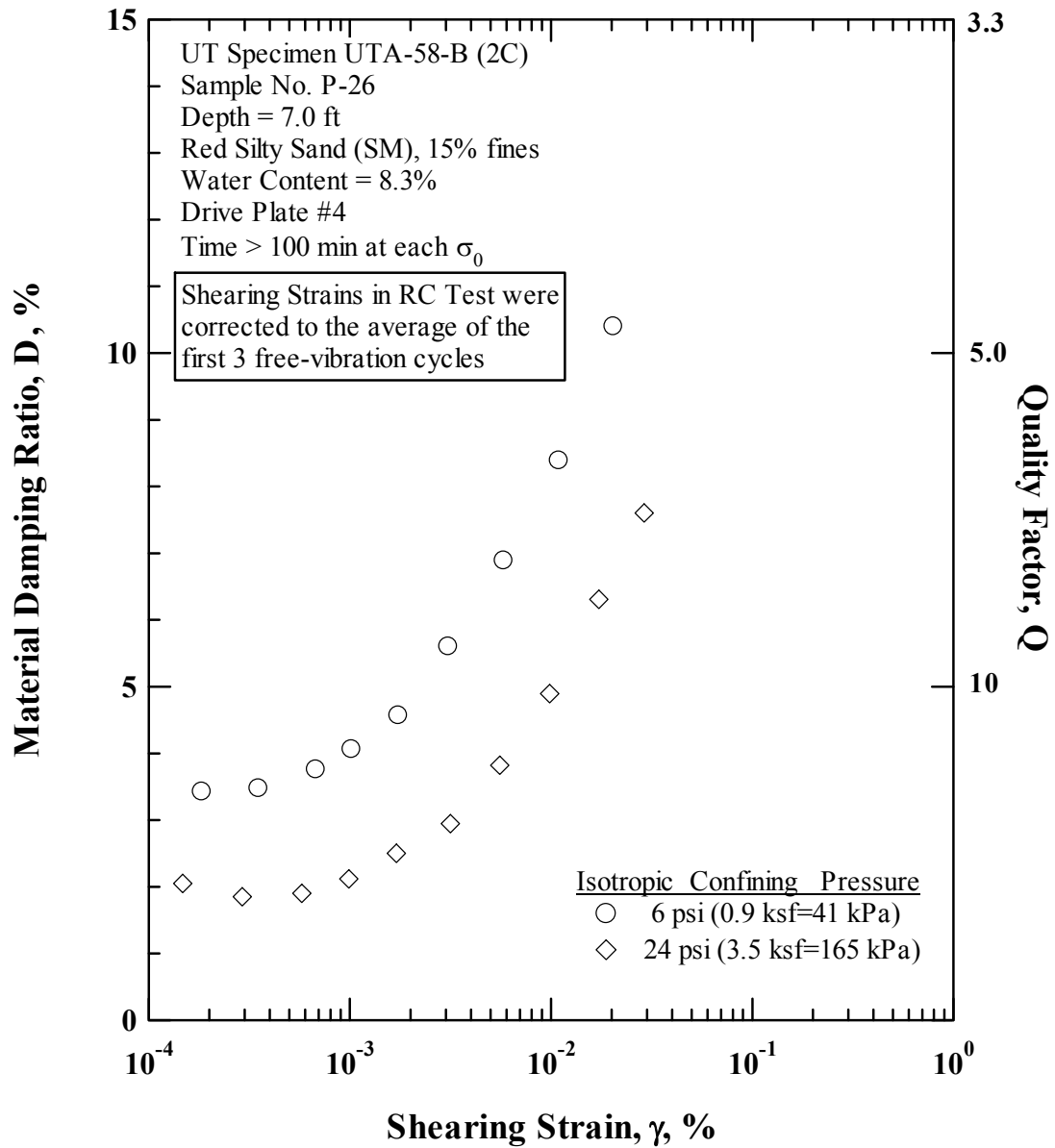


Figure B.10 Variation in Material Damping Ratio with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

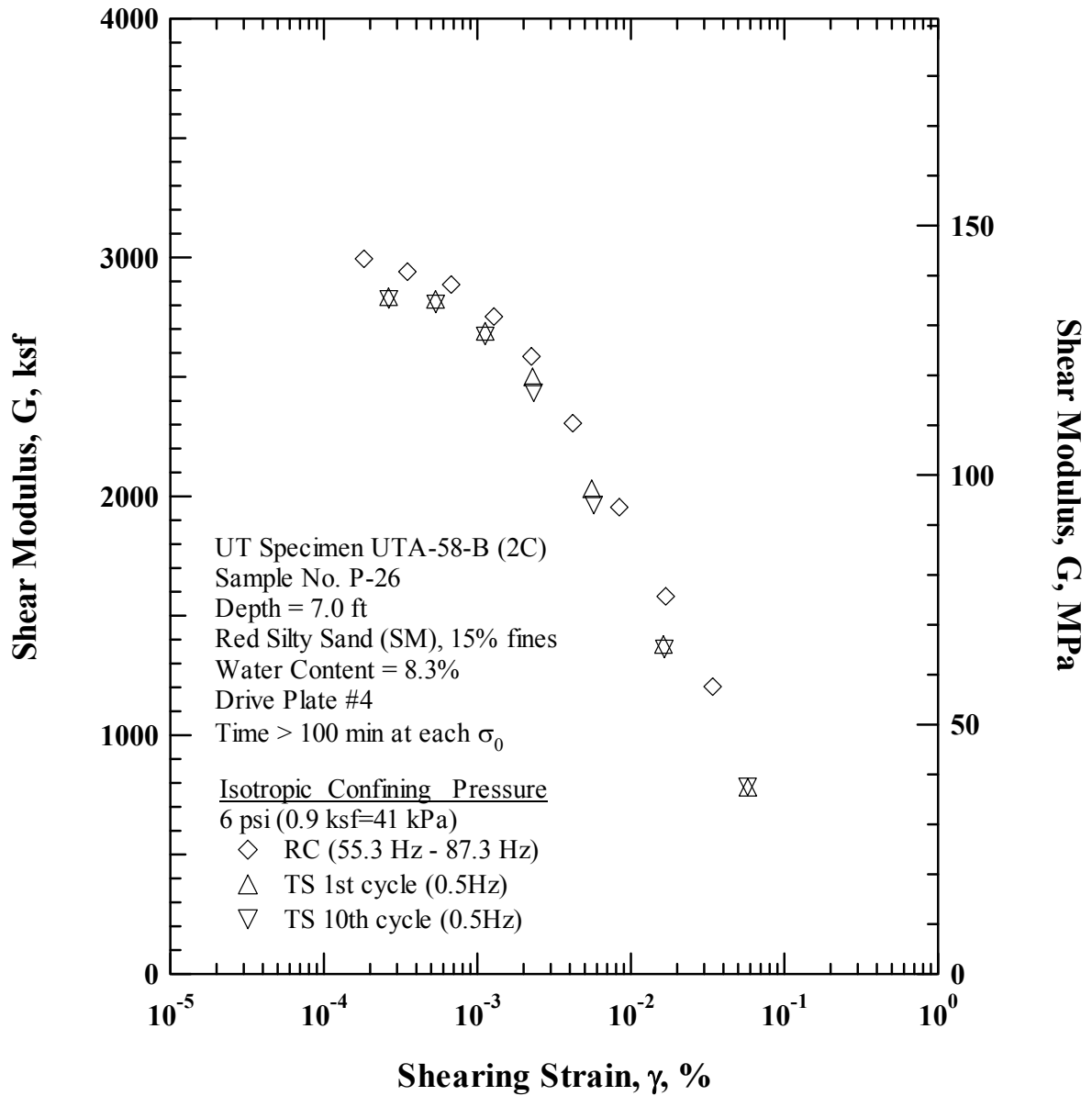


Figure B.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

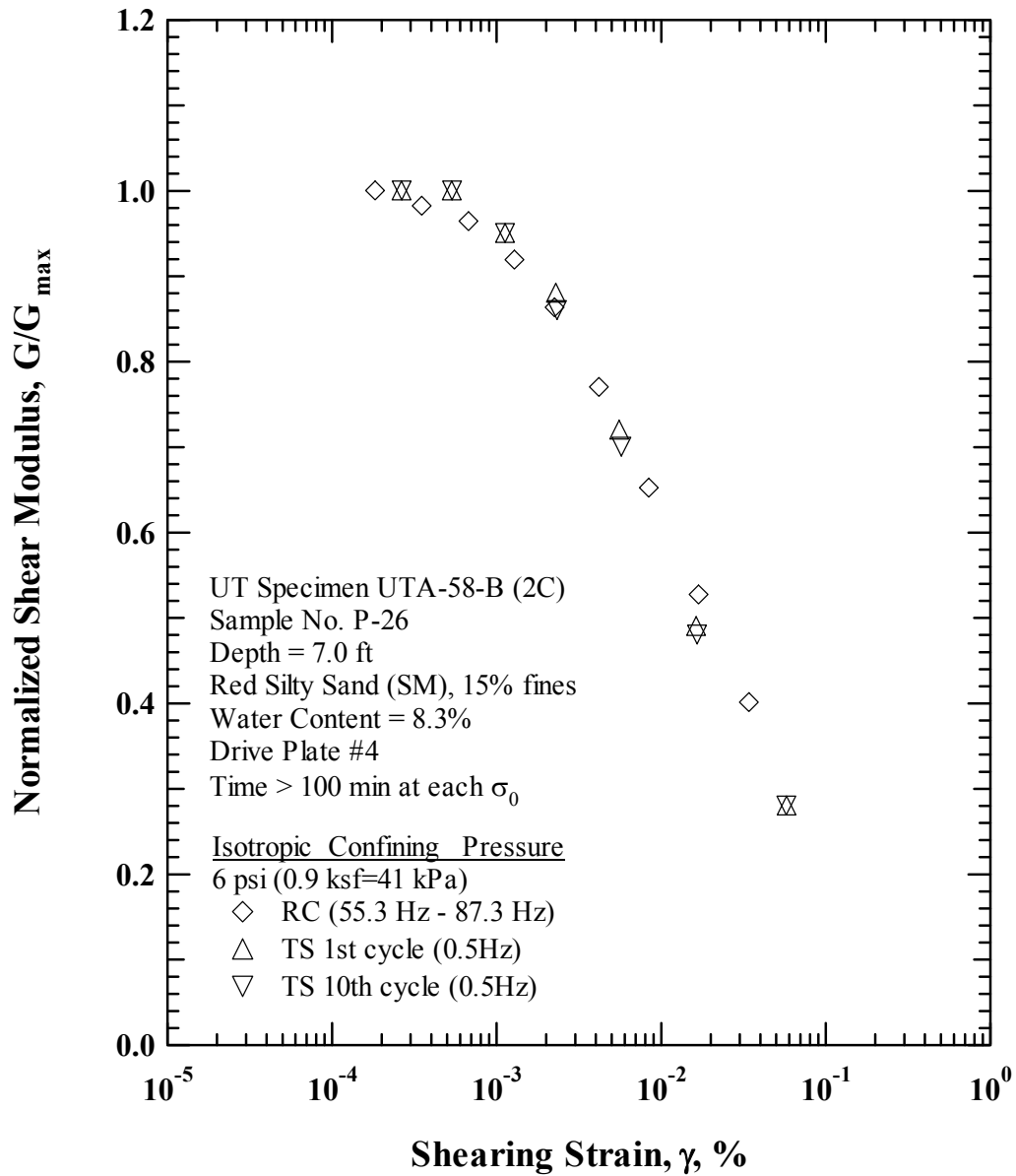


Figure B.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

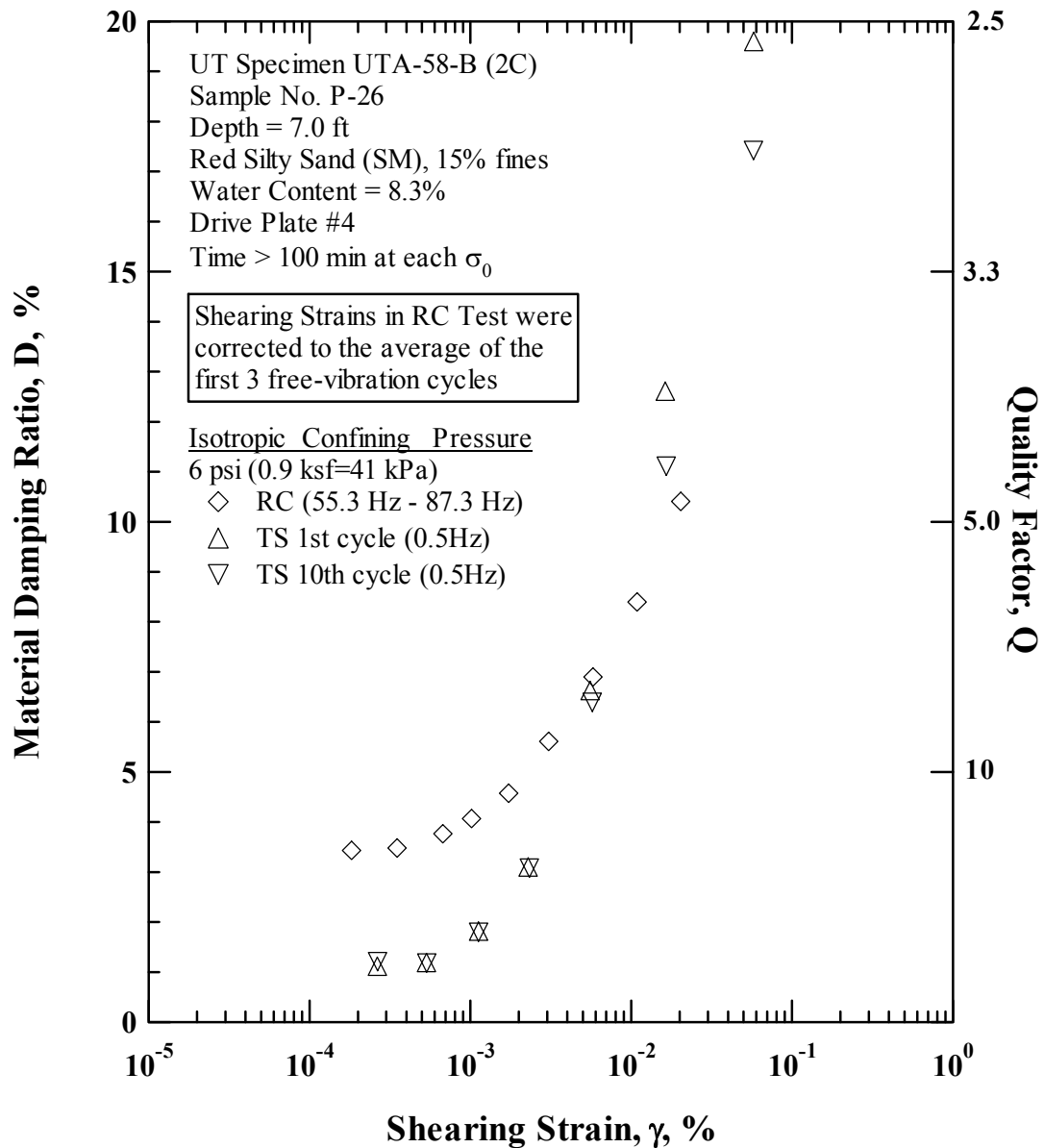


Figure B.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

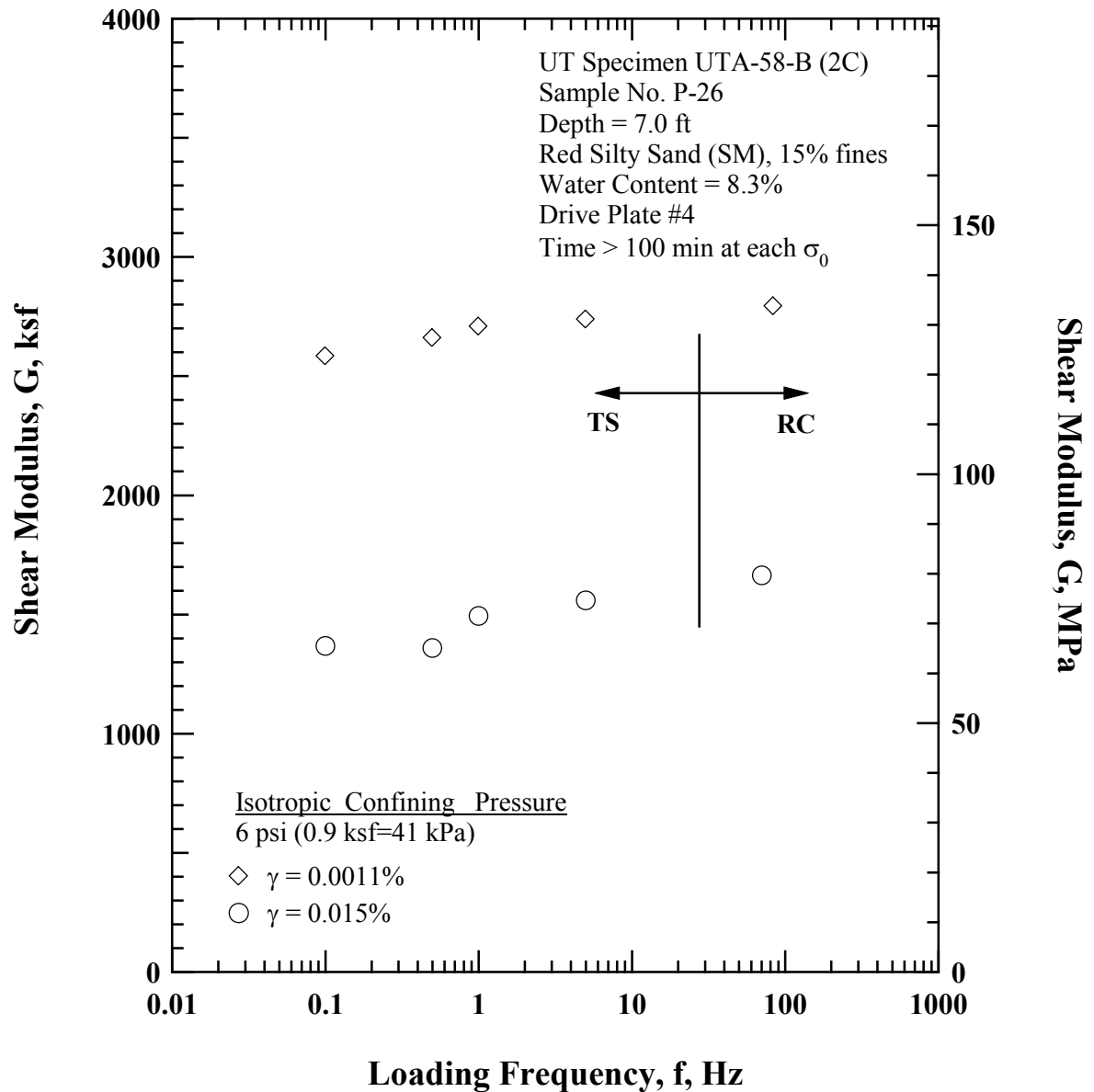


Figure B.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

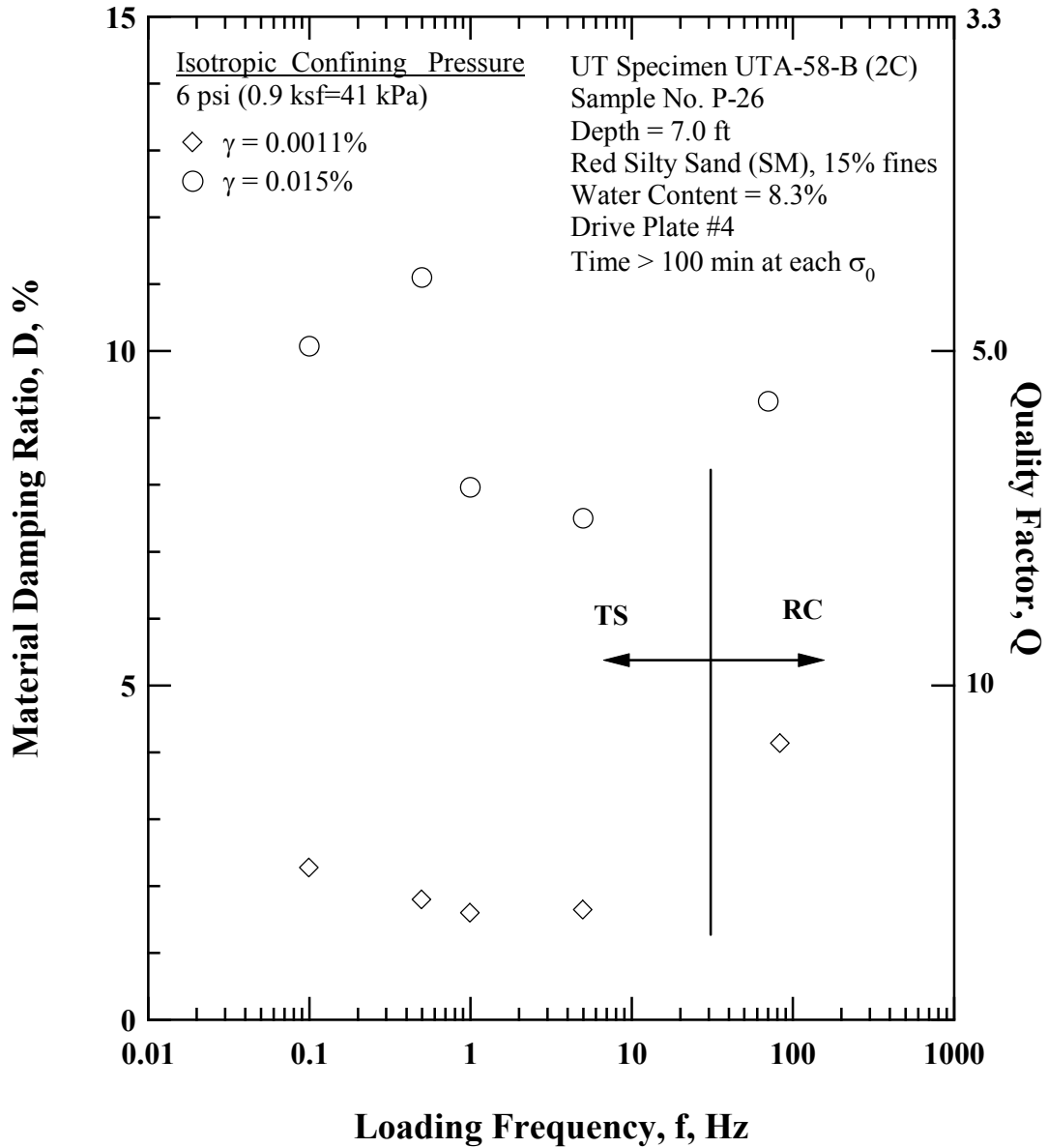


Figure B.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

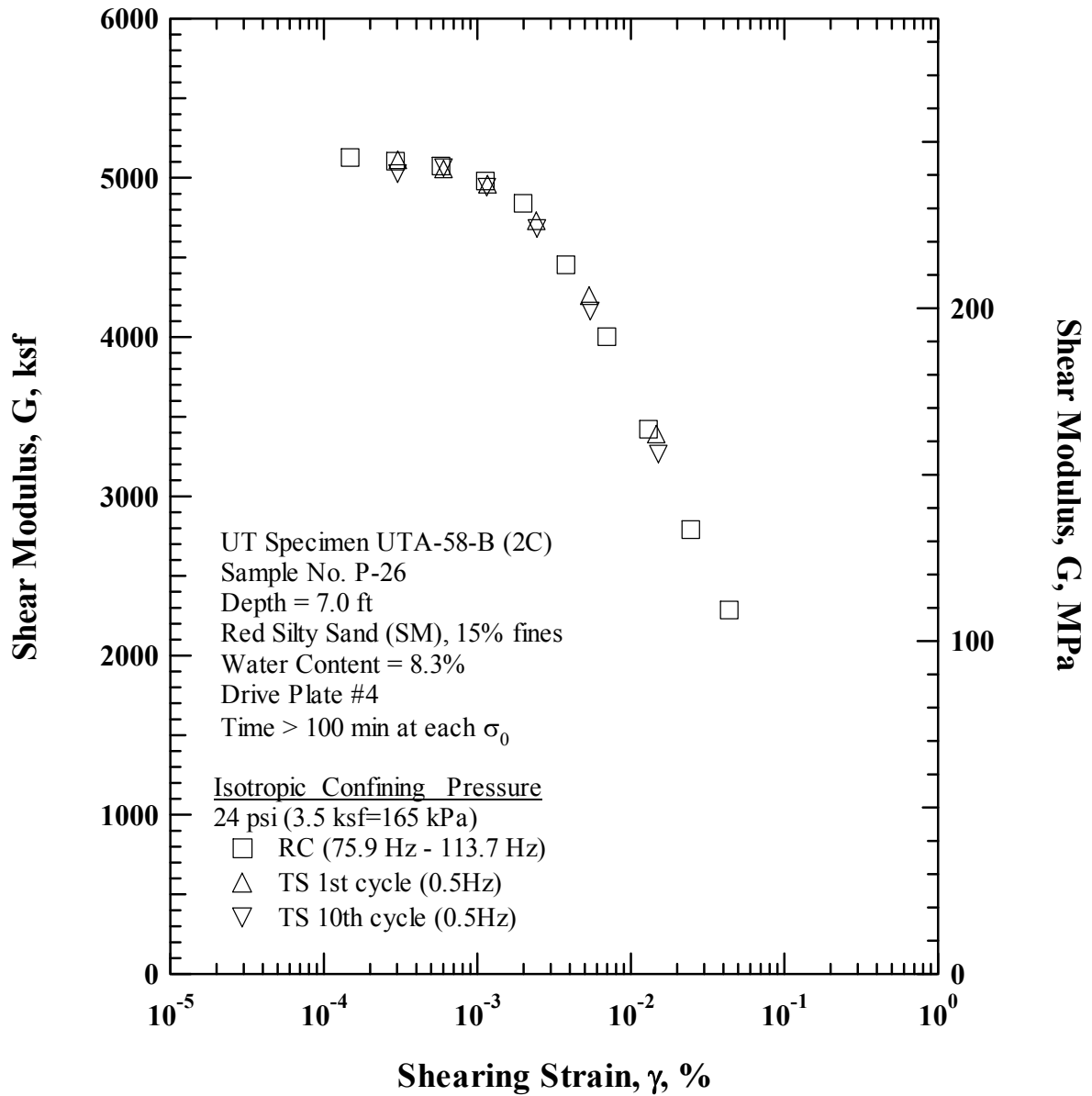


Figure B.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

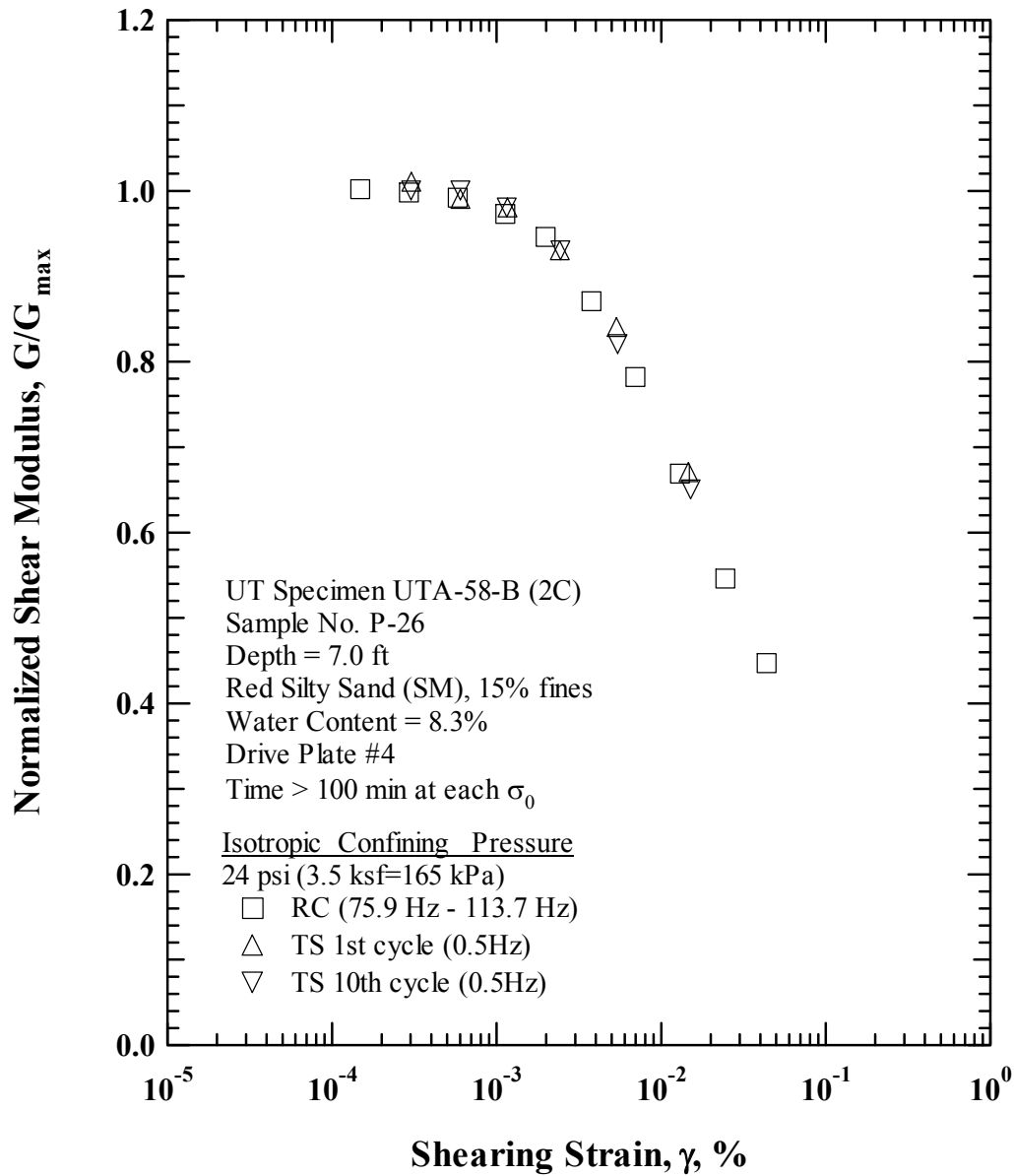


Figure B.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

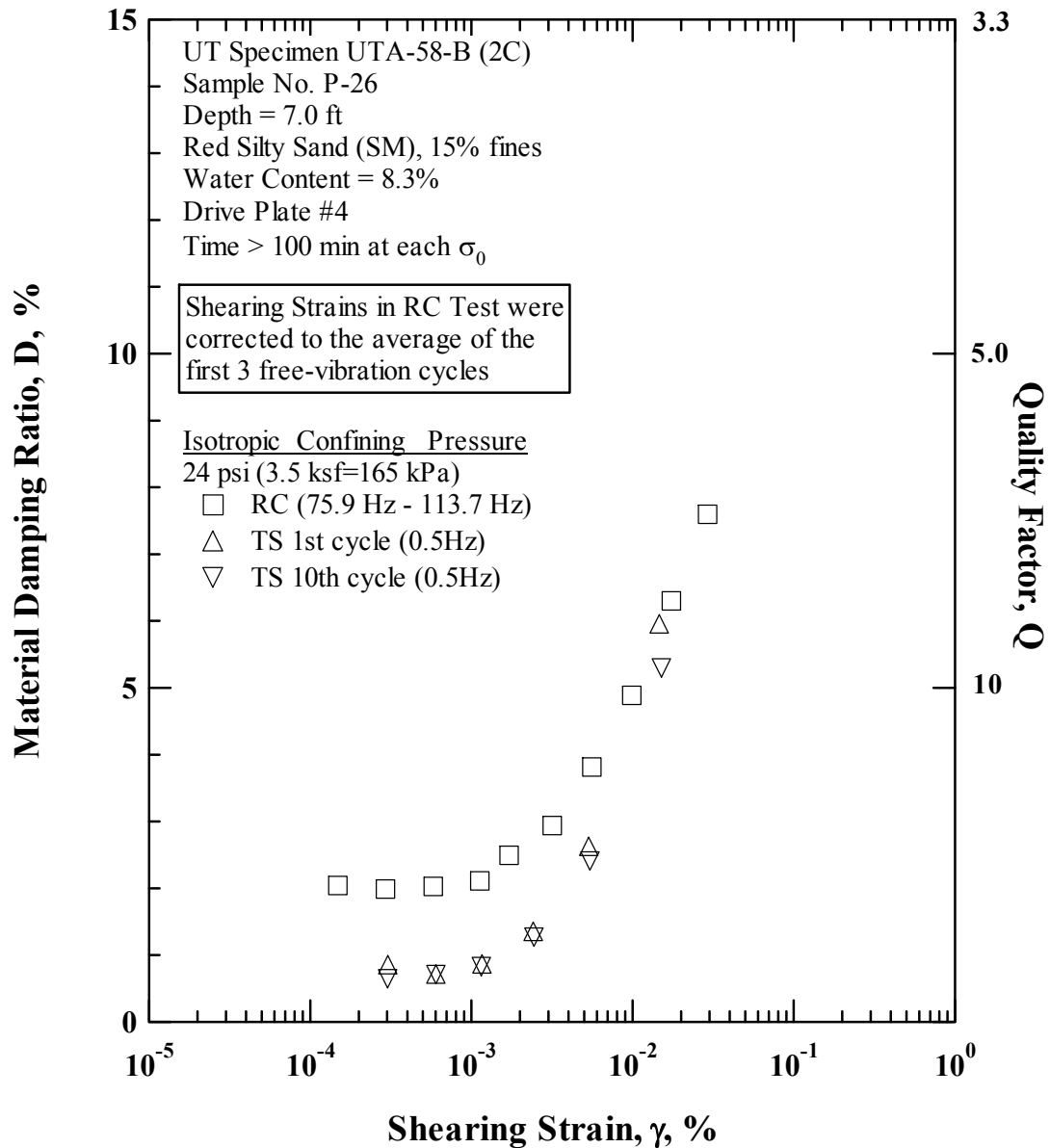


Figure B.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

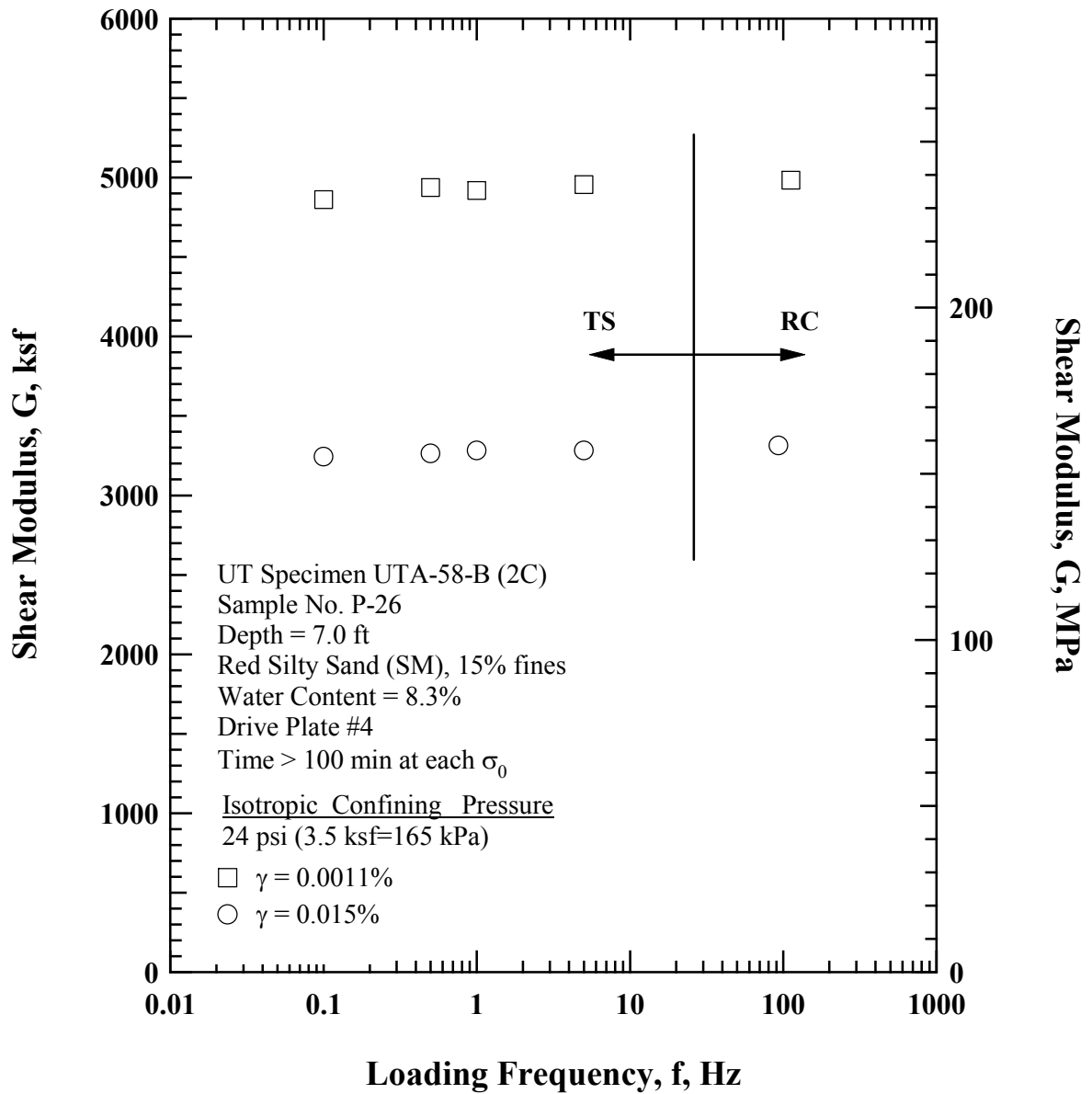


Figure B.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

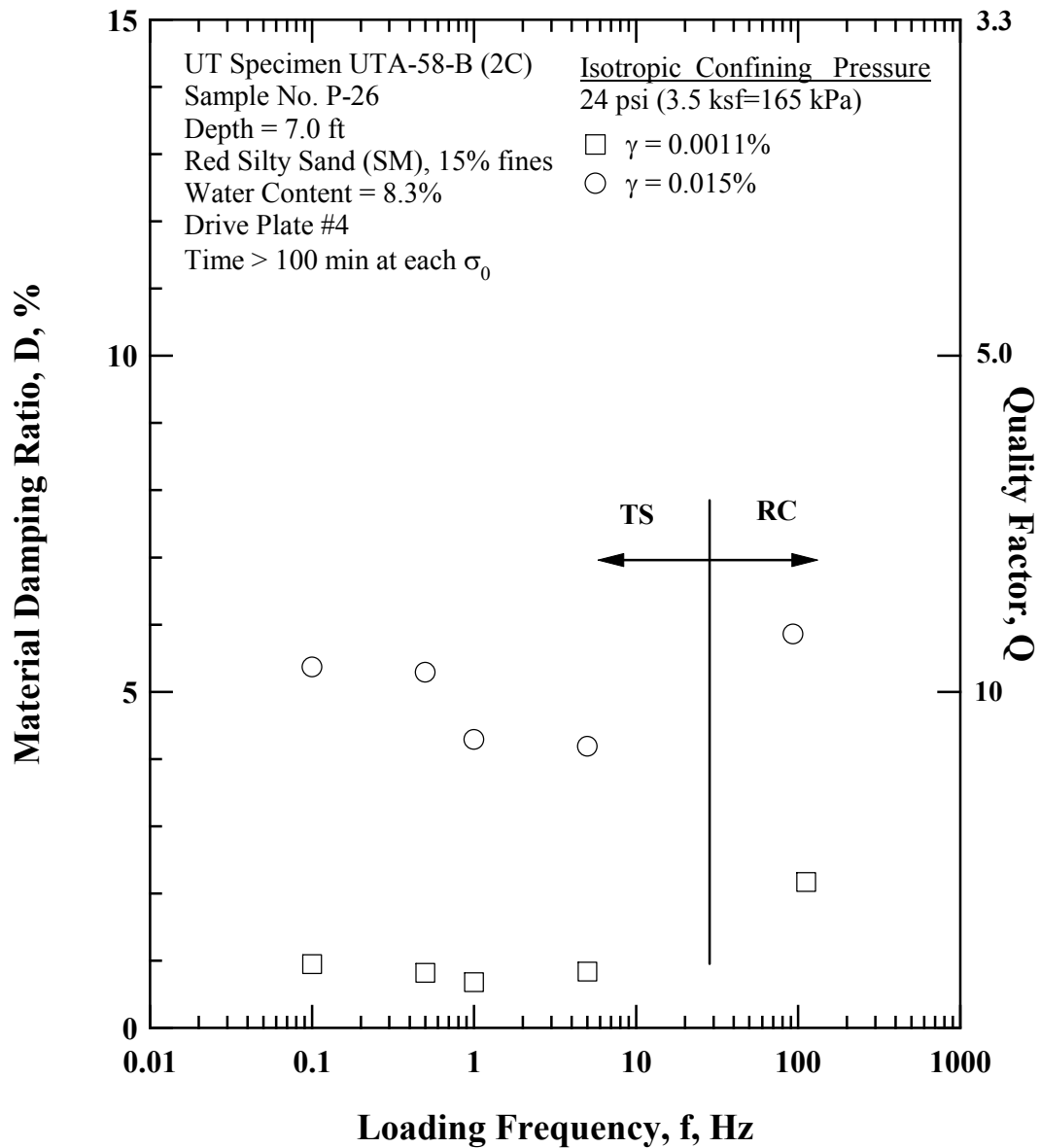


Figure B.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

Table B.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Total Unit Weight with Isotropic Confining Pressure from RC Tests of Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%

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 Total Unit Weight, γ_t	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	(pcf)	
1.5	216	10	2090	100.2	720	4.07	130	0.379
3	432	20	2475	118.7	783	3.56	130	0.379
6	864	41	2938	140.8	853	3.22	130	0.376
12	1728	83	4113	197.2	1006	2.65	131	0.366
24	3456	165	5029	241.1	1112	2.14	131	0.364
48	6912	330	7140	342.3	1320	1.89	133	0.350
96	13824	662	9160	439.1	1493	1.63	133	0.345

Table B.2 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%; Isotropic Confining Pressure, $\sigma_o=6$ psi (0.9 ksf=41 kPa)

Peak Shearing Strain, %	Shear Modulus, G , ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D , %
1.84E-04	2993	1.01	1.84E-04	3.42
3.52E-04	2939	0.99	3.52E-04	3.47
6.78E-04	2885	0.97	6.78E-04	3.76
1.29E-03	2751	0.93	1.02E-03	4.06
2.26E-03	2584	0.87	1.74E-03	4.57
4.22E-03	2304	0.78	3.09E-03	5.60
8.44E-03	1952	0.66	5.82E-03	6.89
1.70E-02	1579	0.53	1.09E-02	8.39
3.43E-02	1201	0.40	2.04E-02	10.40

⁺ 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 B.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%; Isotropic Confining Pressure, $\sigma_o=6$ psi (0.9 ksf=41 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 , %
2.66E-04	2833	1.00	1.11	2.67E-04	2823	1.00	1.20
5.38E-04	2823	1.00	1.18	5.39E-04	2804	1.00	1.17
1.13E-03	2689	0.95	1.81	1.13E-03	2670	0.95	1.79
2.30E-03	2498	0.88	3.09	2.34E-03	2431	0.86	3.07
5.59E-03	2029	0.72	6.62	5.77E-03	1962	0.70	6.38
1.64E-02	1378	0.49	12.60	1.66E-02	1359	0.48	11.10
5.82E-02	780	0.28	19.59	5.79E-02	782	0.28	17.41

Table B.4 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and . Water Content of 8.3%; Isotropic Confining Pressure, σ_o =24 psi (3.5 ksf=165 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
1.48E-04	5128	1.00	1.48E-04	2.04
2.93E-04	5105	1.00	2.93E-04	1.84
5.80E-04	5074	0.99	5.80E-04	1.89
1.13E-03	4980	0.97	9.92E-04	2.11
1.98E-03	4840	0.95	1.71E-03	2.49
3.77E-03	4454	0.87	3.17E-03	2.94
6.96E-03	4003	0.78	5.58E-03	3.82
1.30E-02	3421	0.67	9.88E-03	4.89
2.45E-02	2791	0.55	1.74E-02	6.30
4.37E-02	2286	0.45	2.92E-02	7.60

⁺ 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 B.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-B (2C), Sample No. P-26; Compacted to 99% Modified Proctor and Water Content of 8.3%; Isotropic Confining Pressure, σ_o =24 psi (3.5 ksf=165 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, %
3.05E-04	5110	1.01	0.85	3.04E-04	5024	1.00	0.64
6.06E-04	5053	0.99	0.71	6.06E-04	5062	1.00	0.70
1.17E-03	4957	0.98	0.86	1.16E-03	4938	0.98	0.82
2.43E-03	4727	0.93	1.35	2.46E-03	4679	0.93	1.26
5.37E-03	4258	0.84	2.62	5.47E-03	4160	0.82	2.40
1.47E-02	3388	0.67	5.95	1.52E-02	3263	0.65	5.29

APPENDIX C

**UT Specimen UTA-58-B (4K)
Red Silty Sand (SM)**

**Sample No. P-26
Depth = 7.0 ft**

**Total Unit Weight = 130.3 lb/ft³
Water Content = 11.0%
("Field Capacity")
Estimated In-Situ Mean Effective
Stress = 6.0 psi**

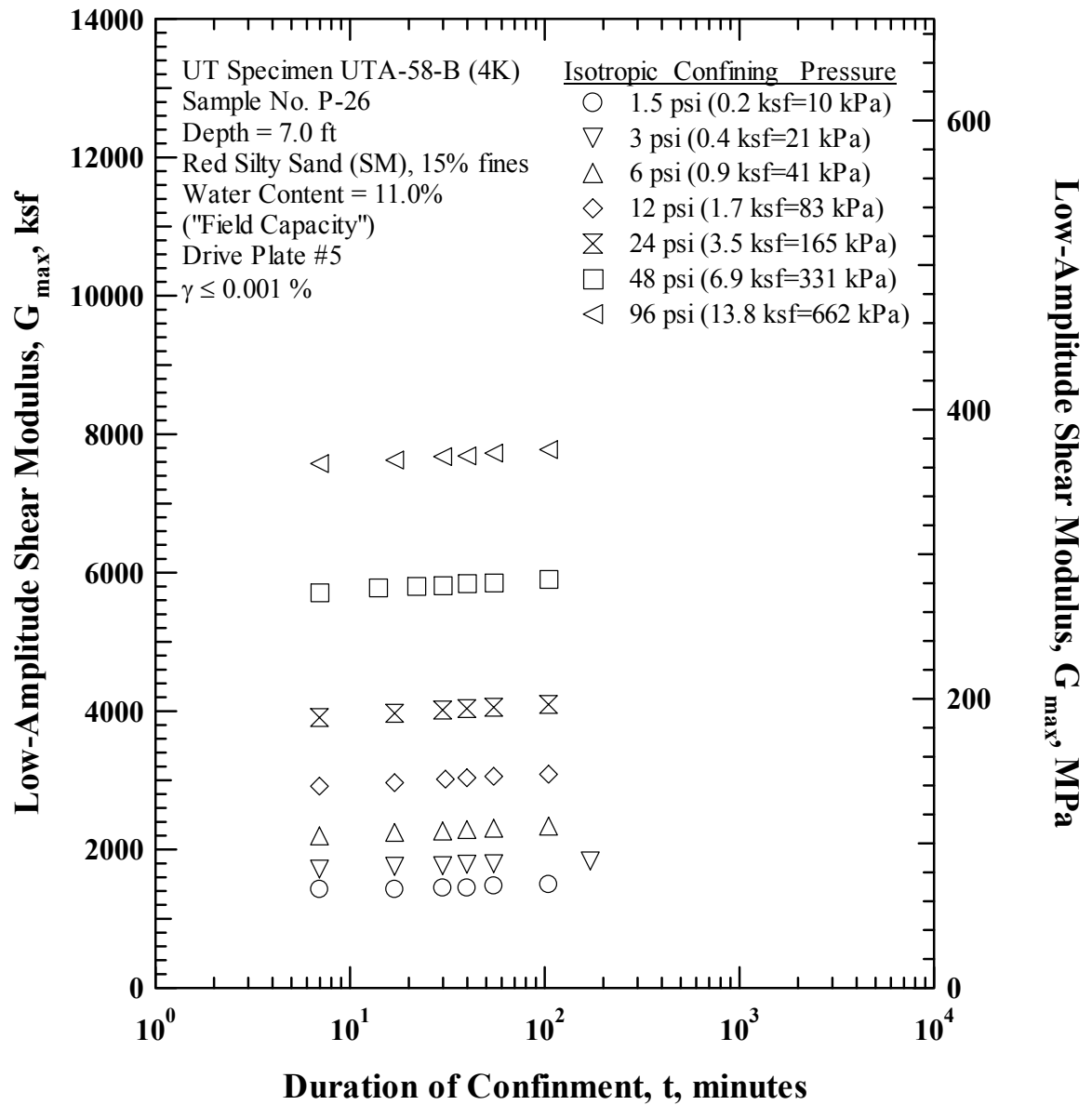


Figure C.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

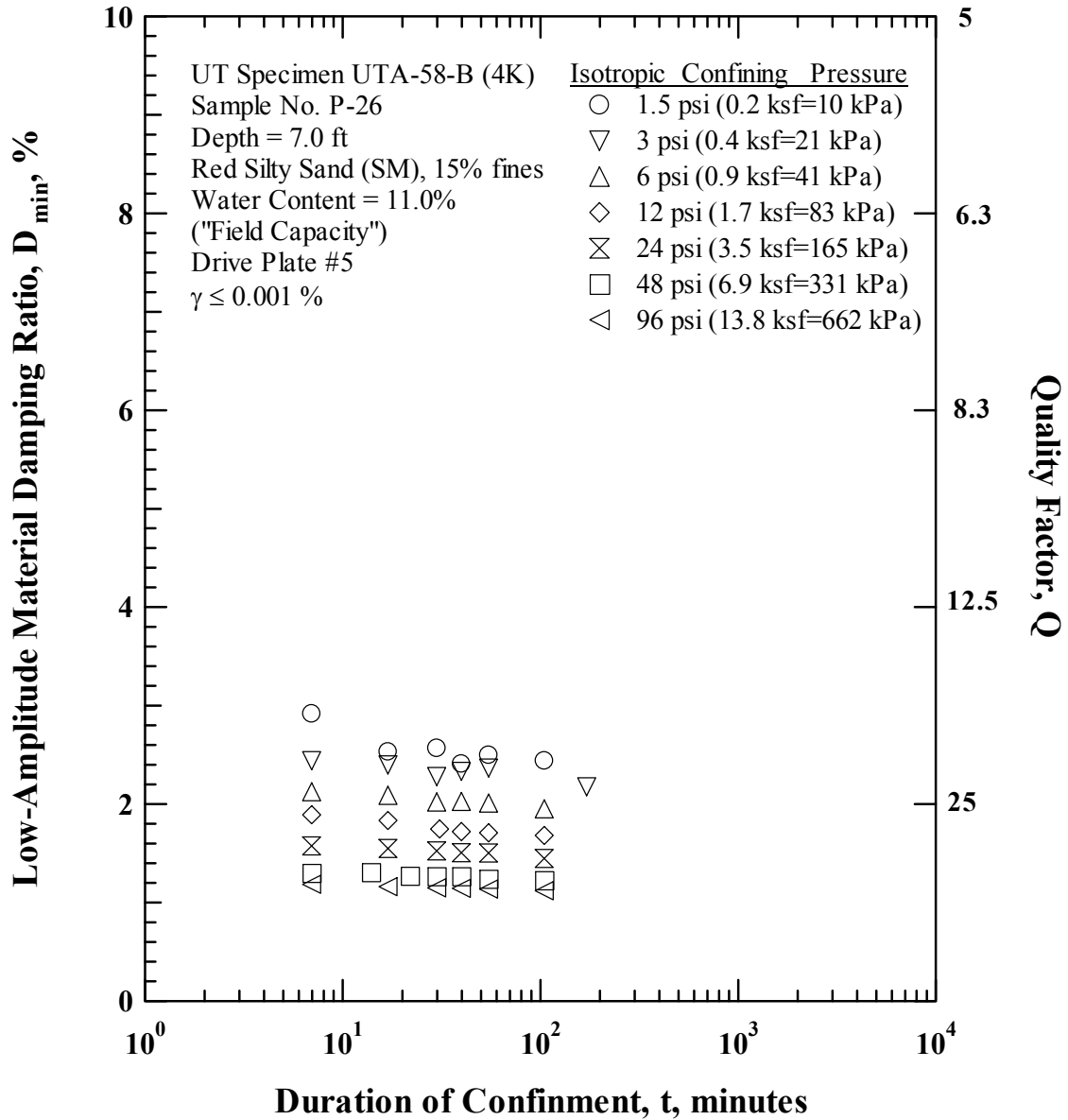


Figure C.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

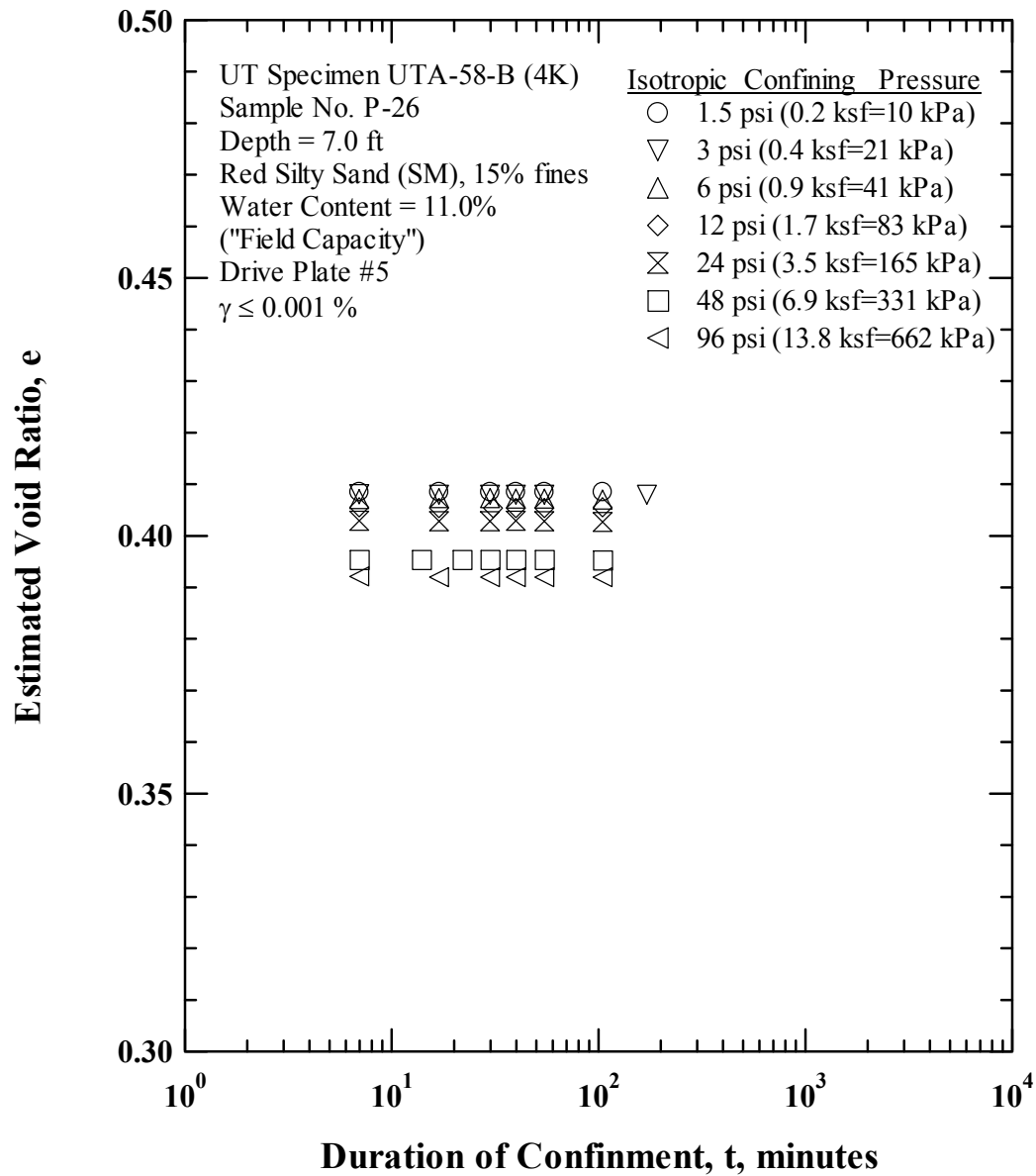


Figure C.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

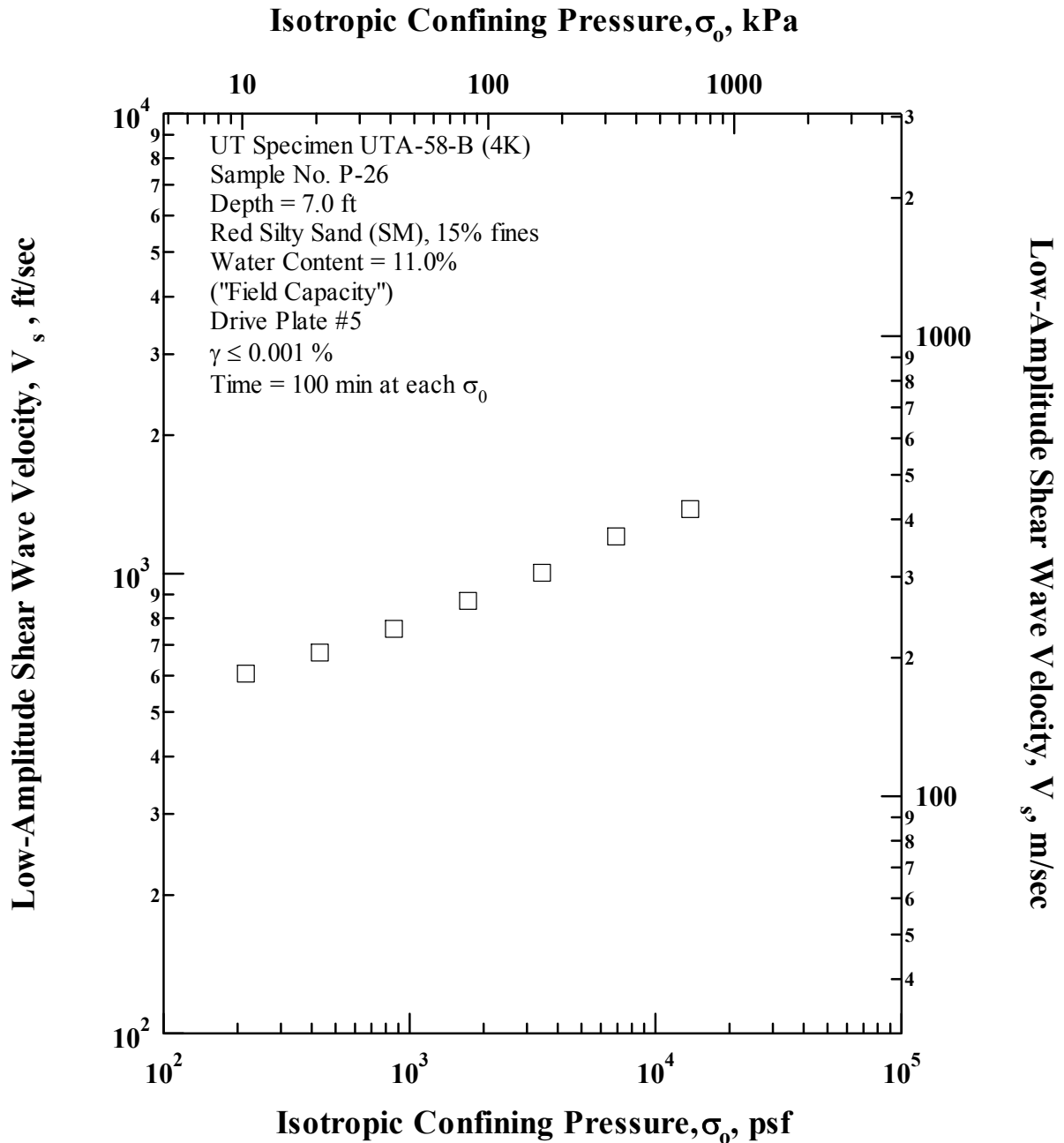


Figure C.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

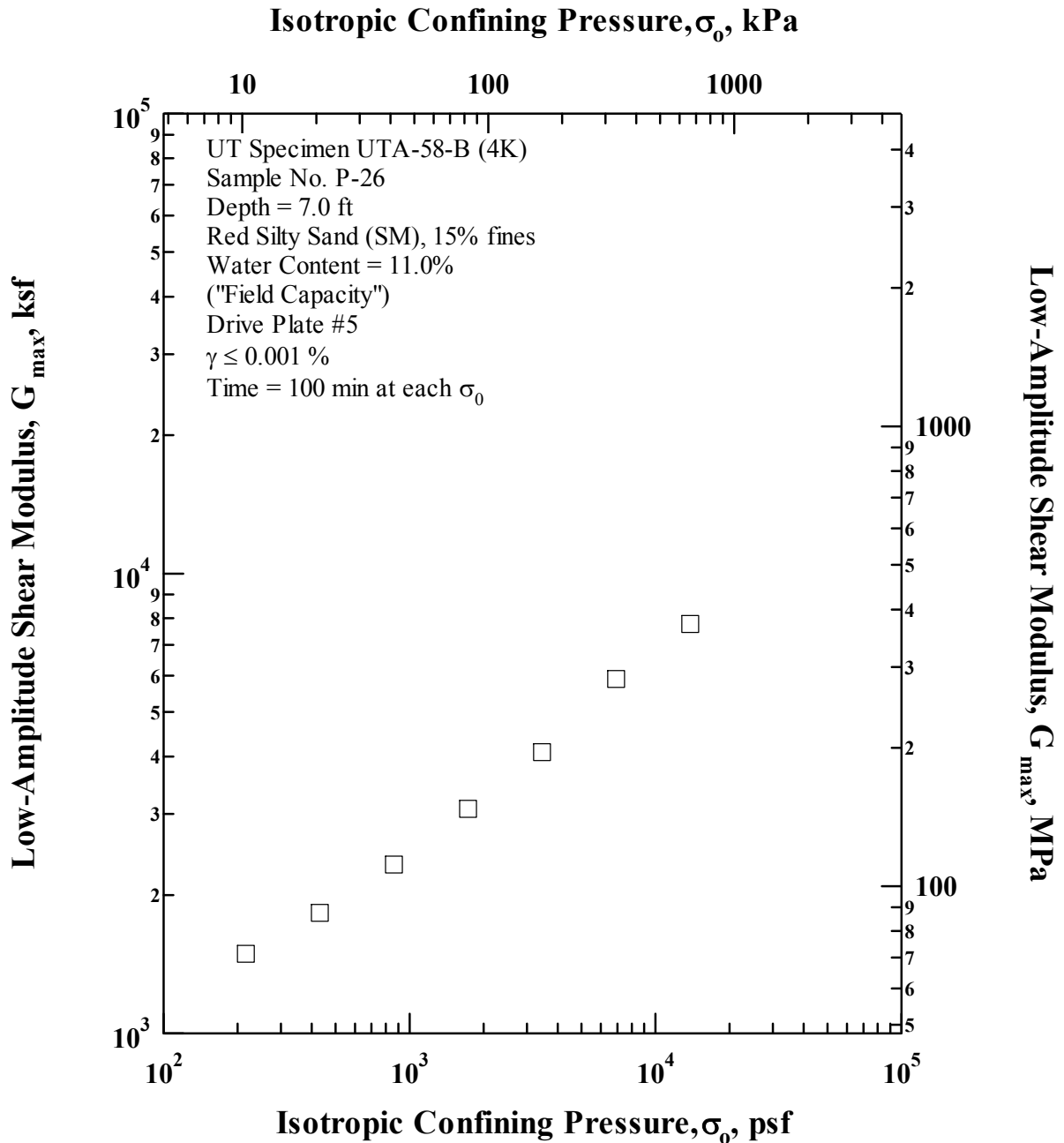


Figure C.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

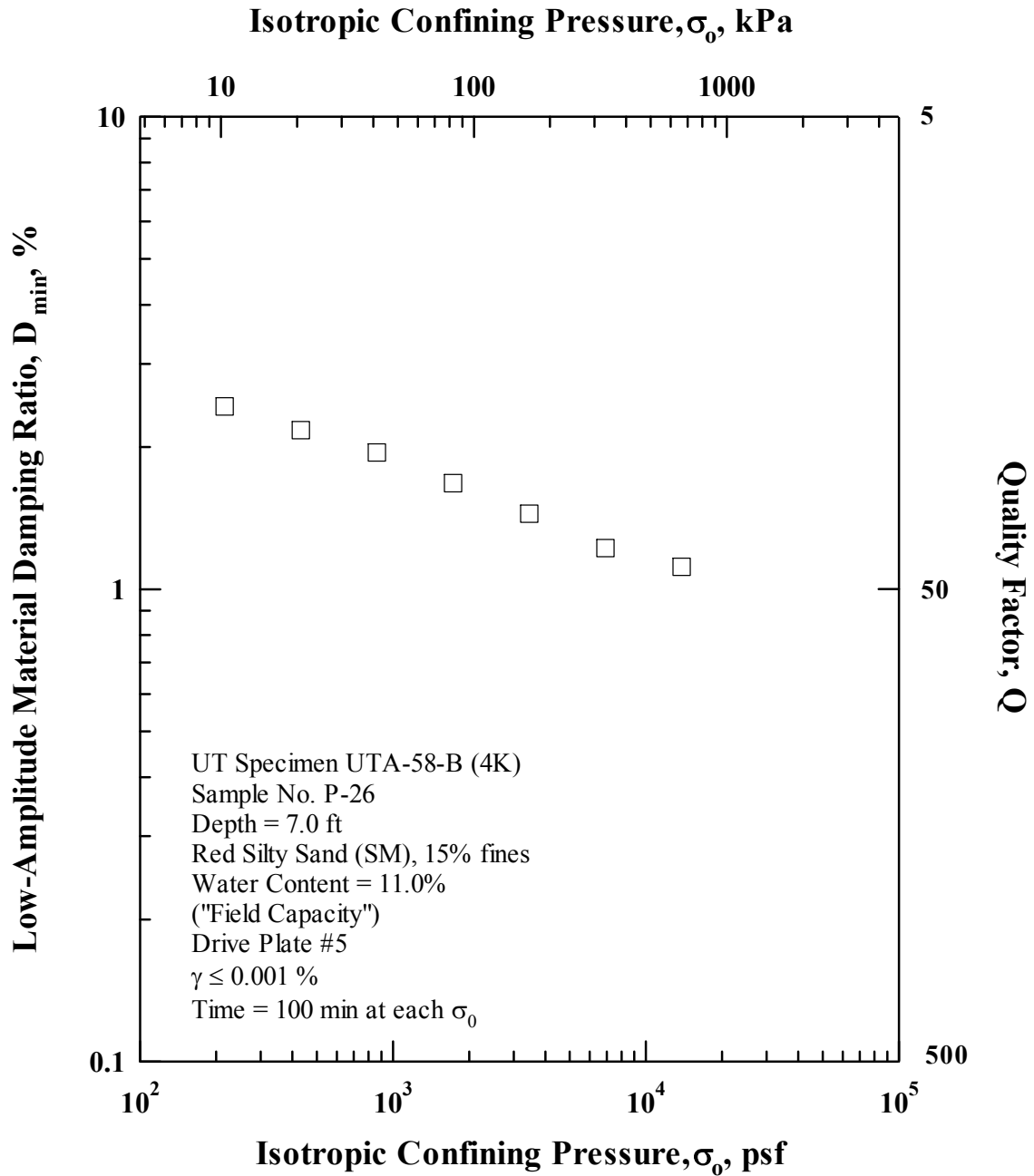


Figure C.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

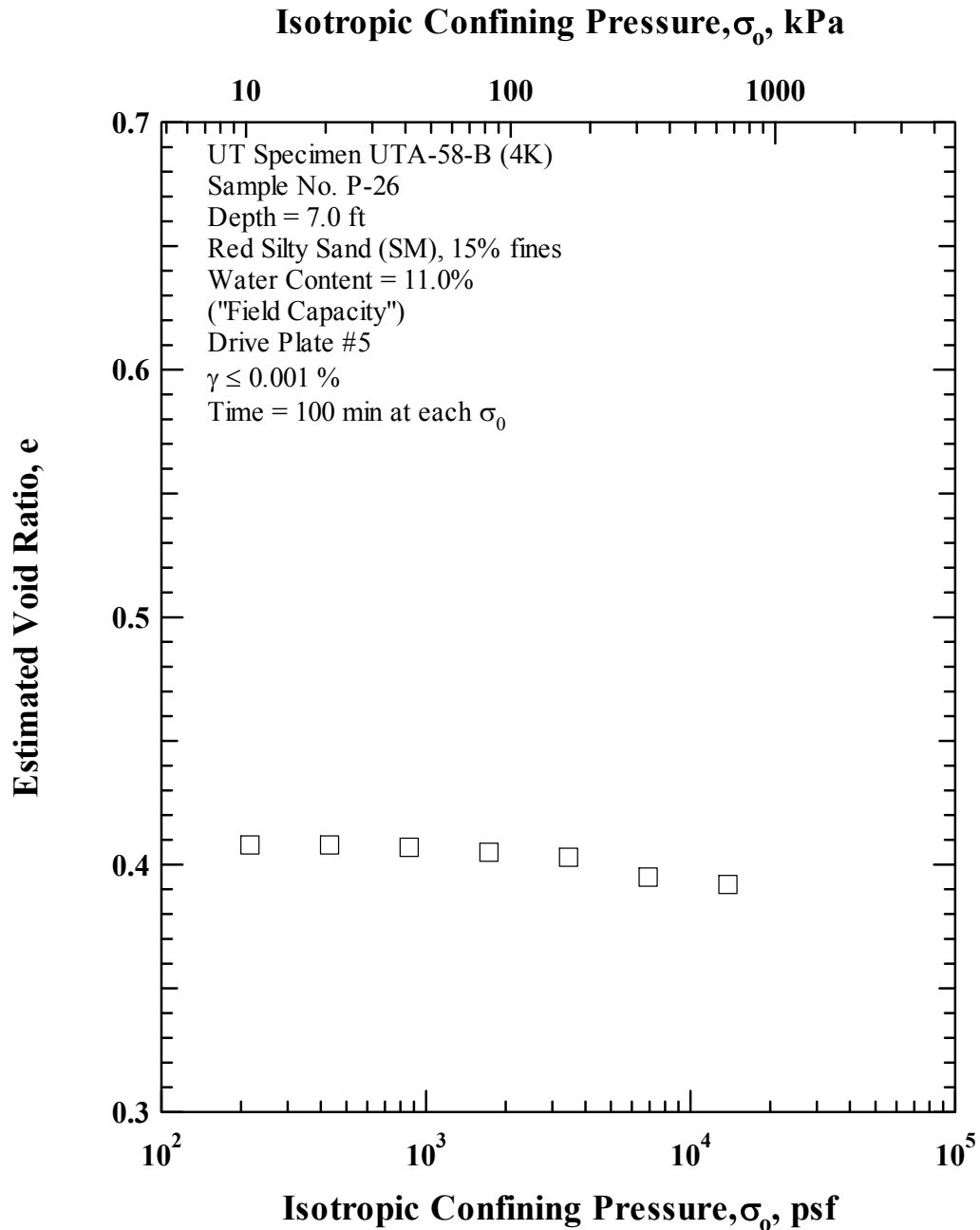


Figure C.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

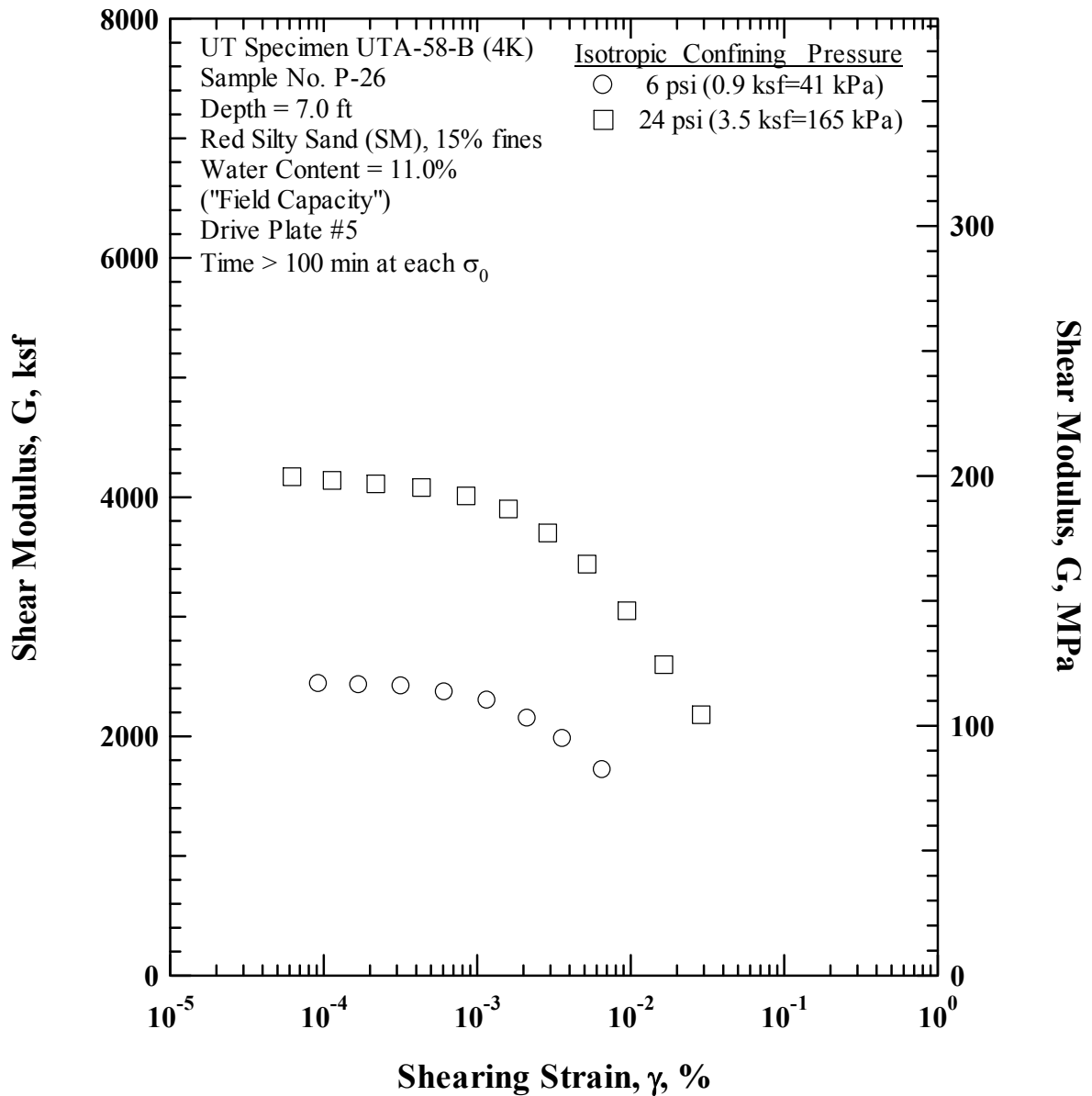


Figure C.8 Variation in Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

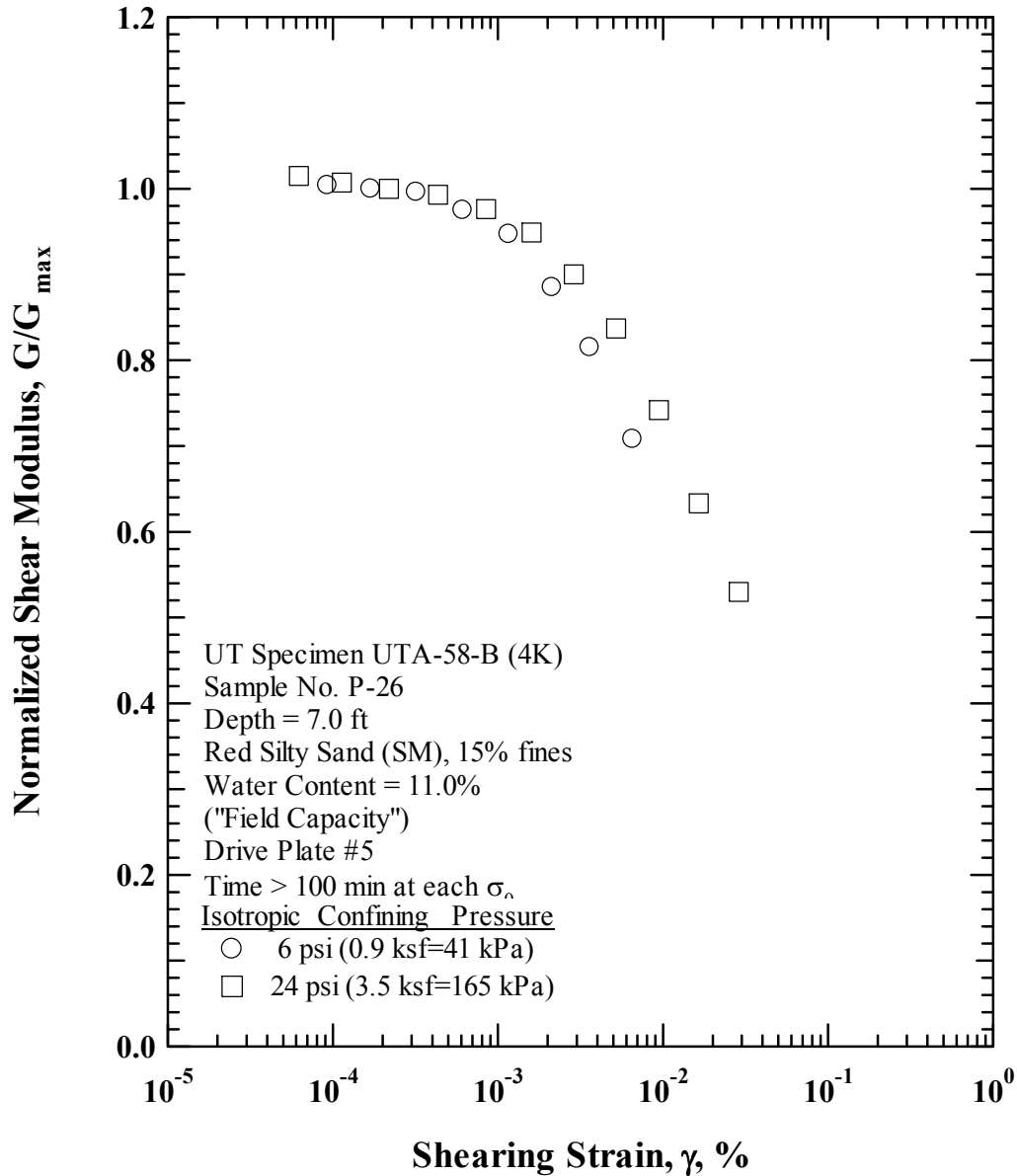


Figure C.9 Variation in Normalized Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

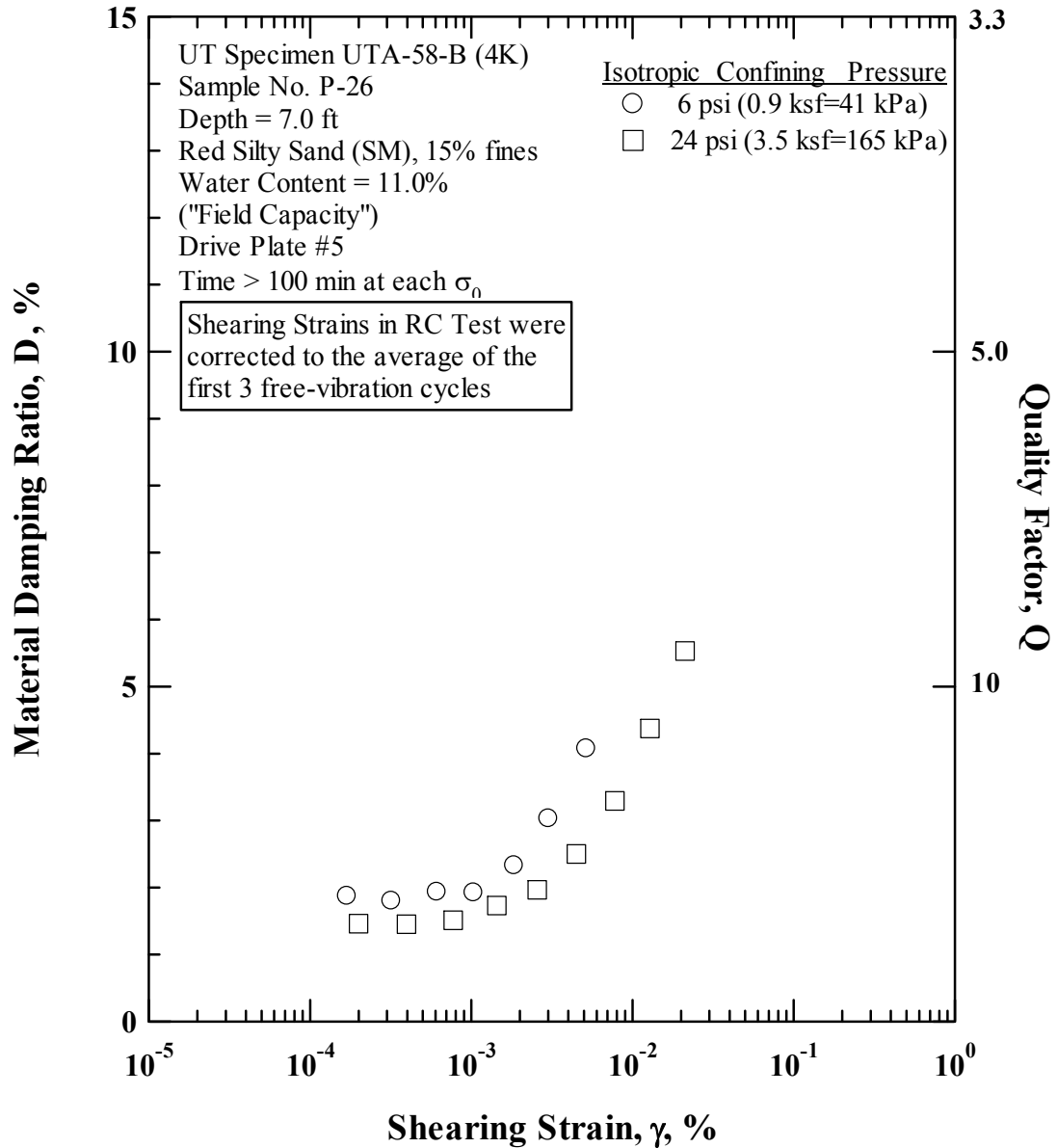


Figure C.10 Variation in Material Damping Ratio with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

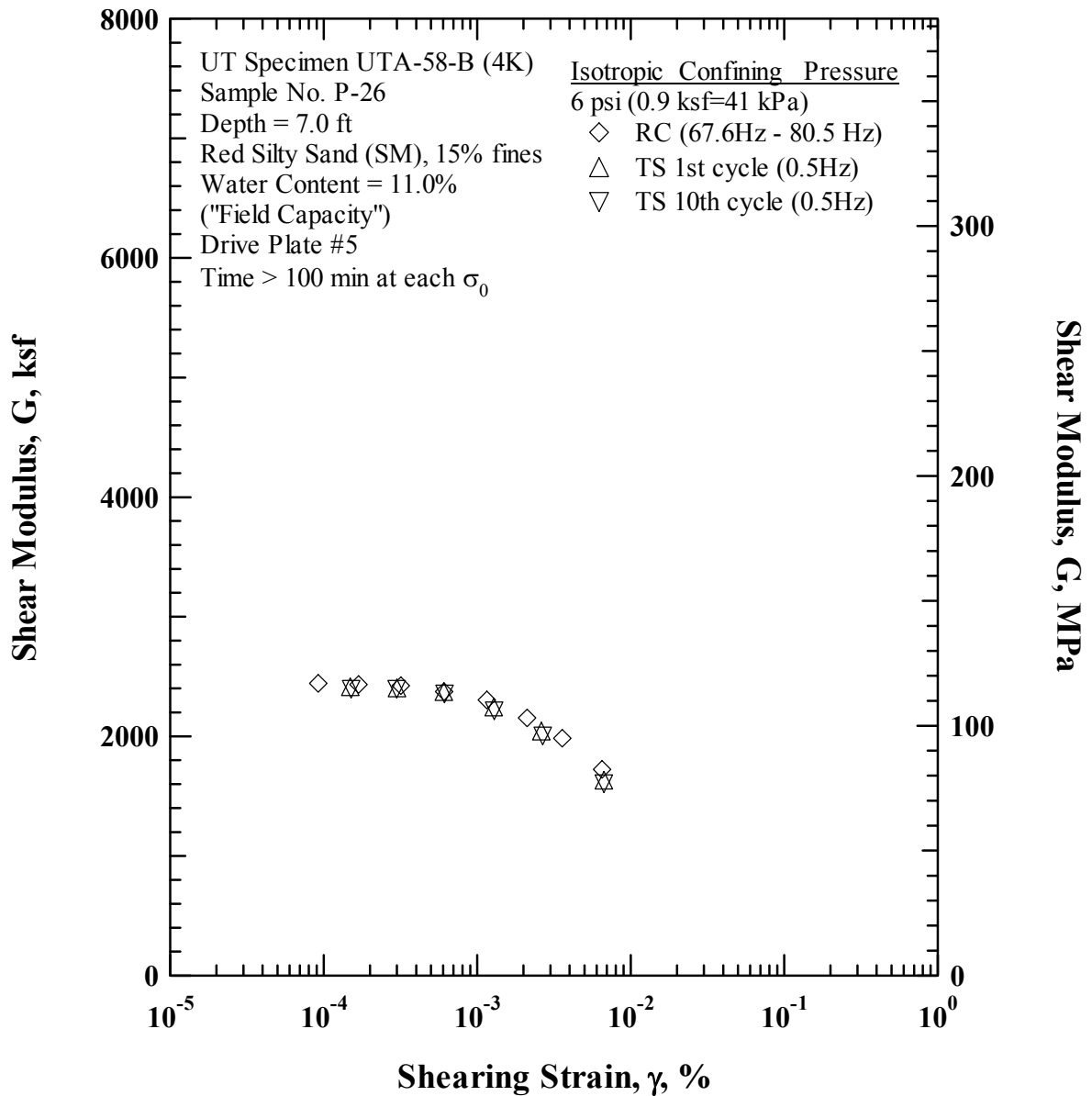


Figure C.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

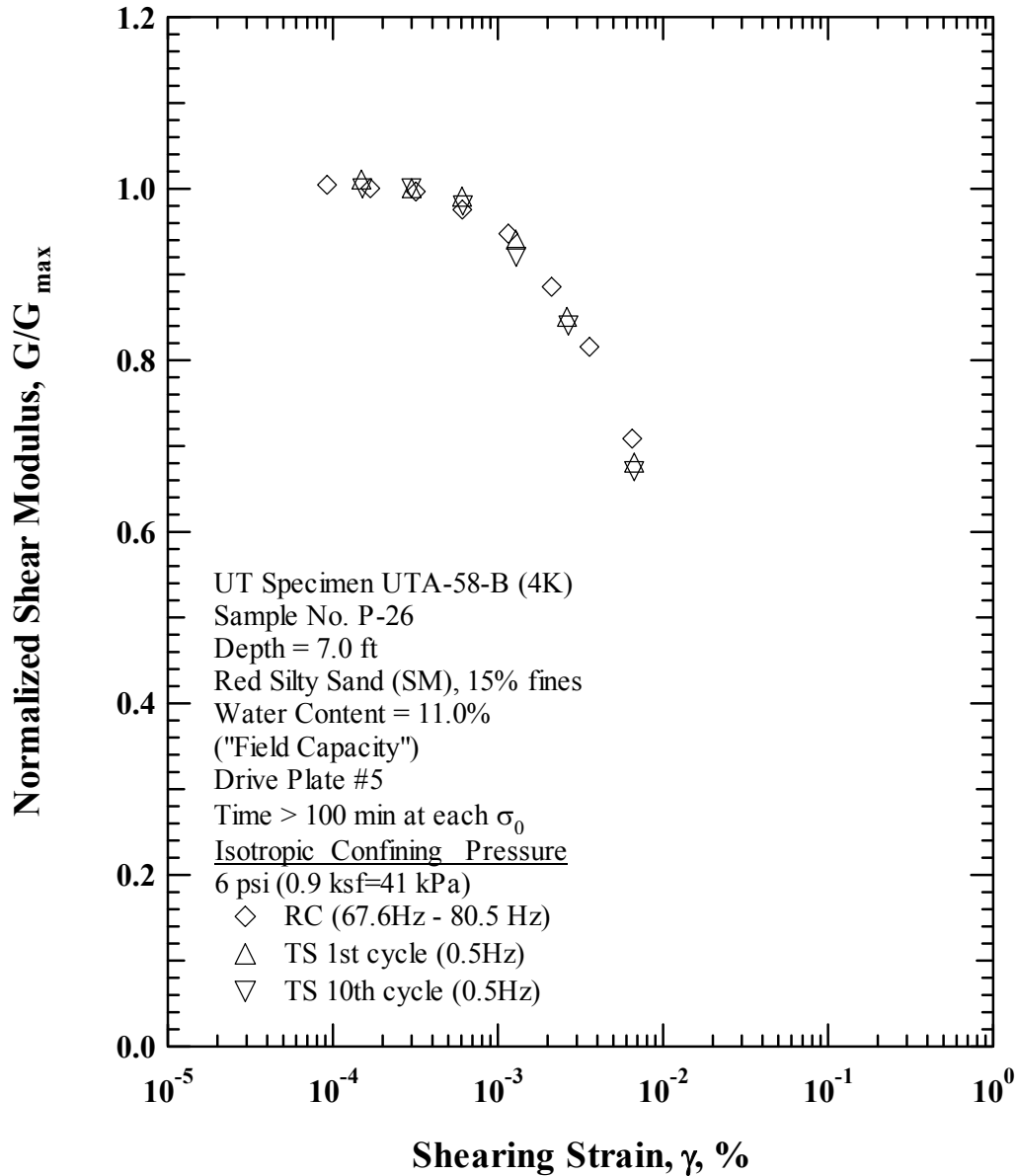


Figure C.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

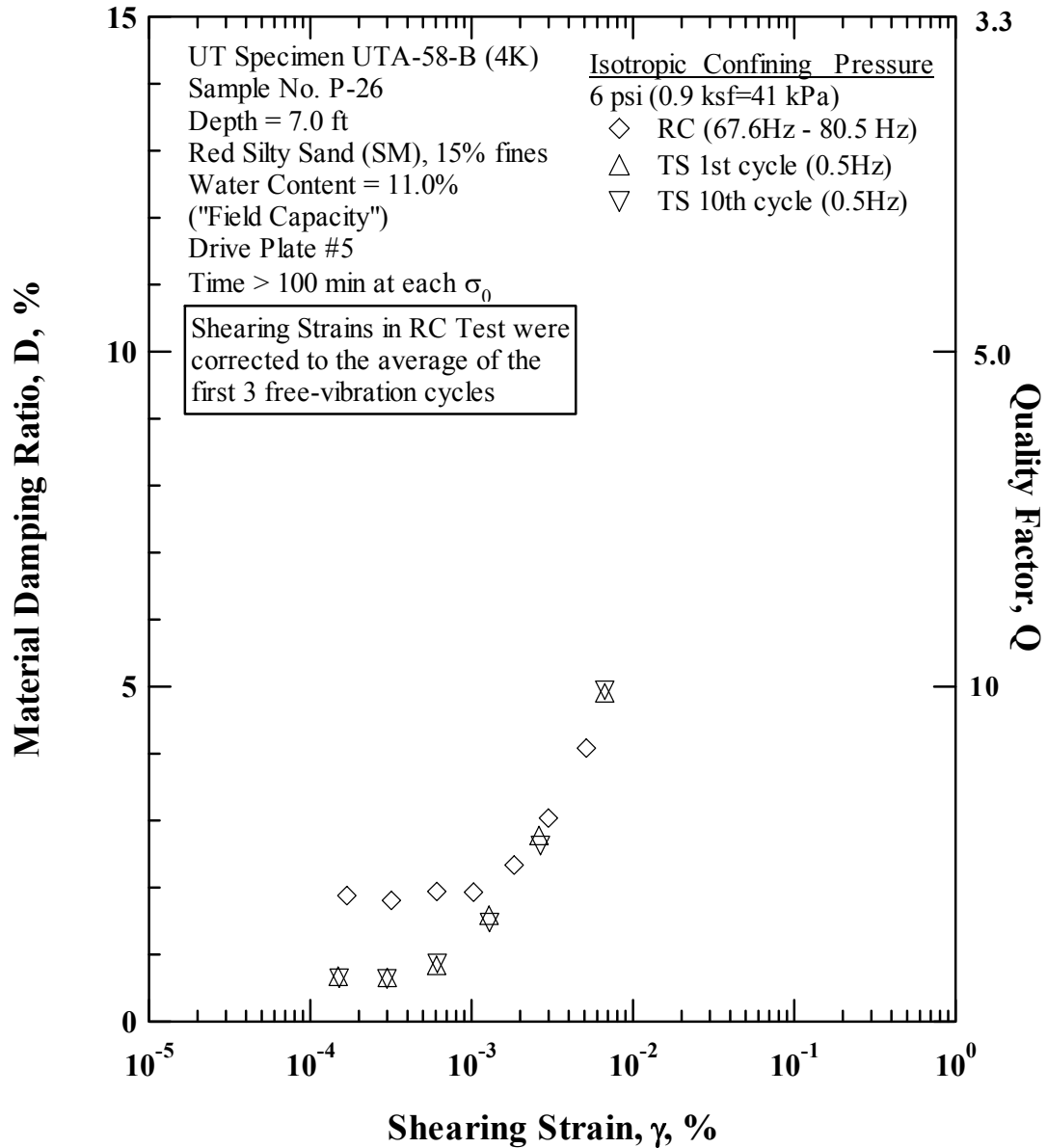


Figure C.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

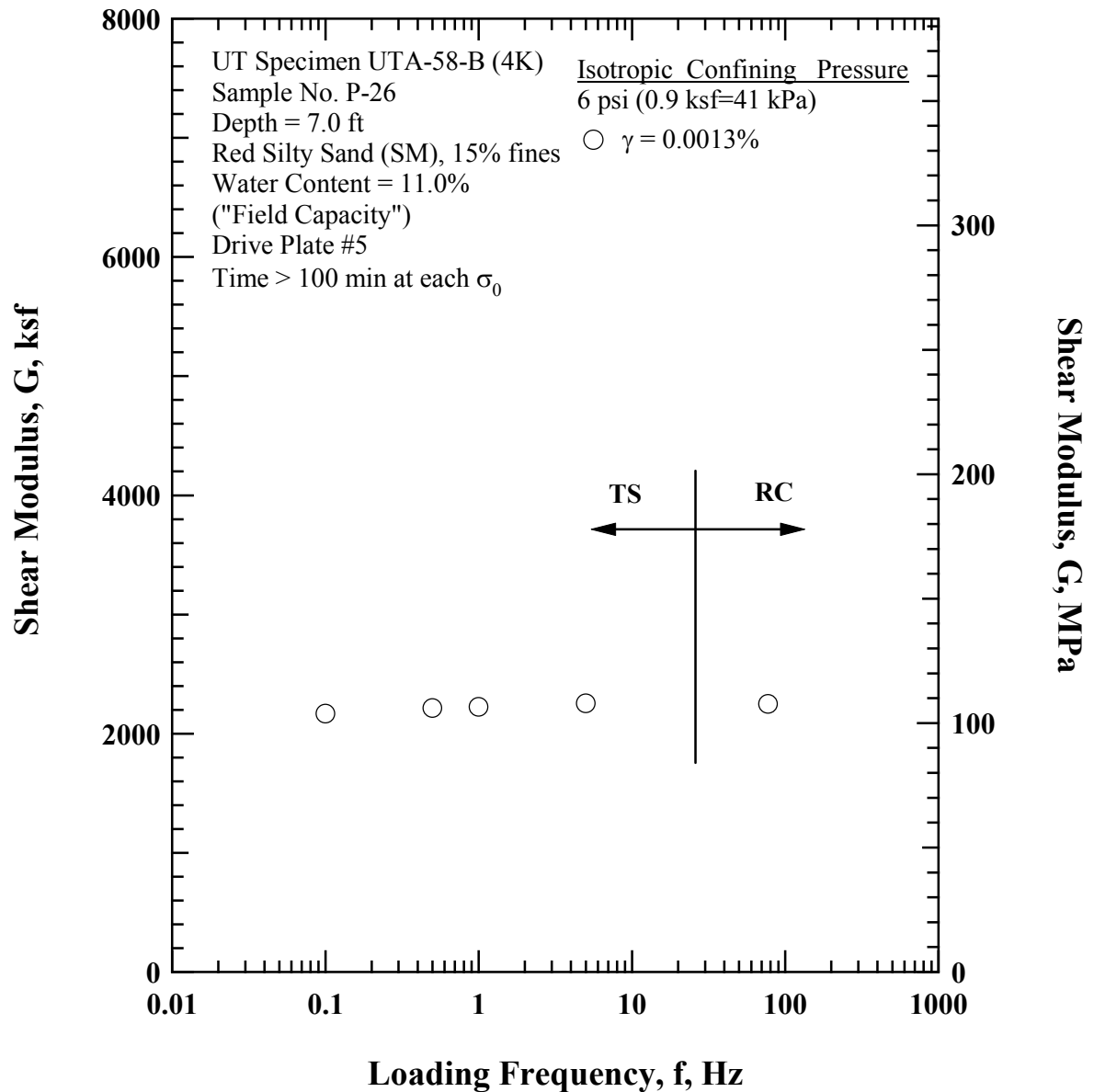


Figure C.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

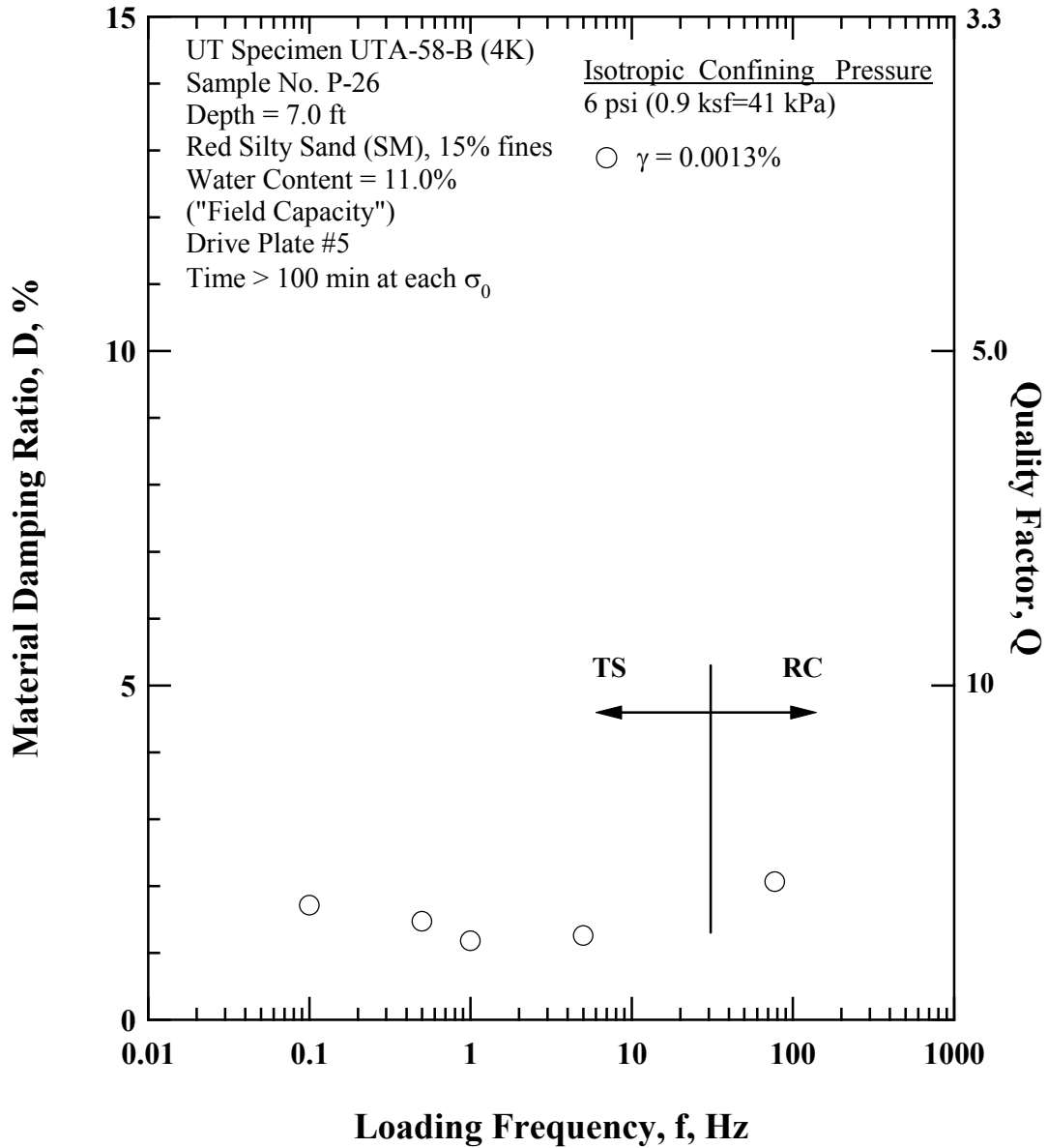


Figure C.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure Loading 6 psi (0.9 ksf=41 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

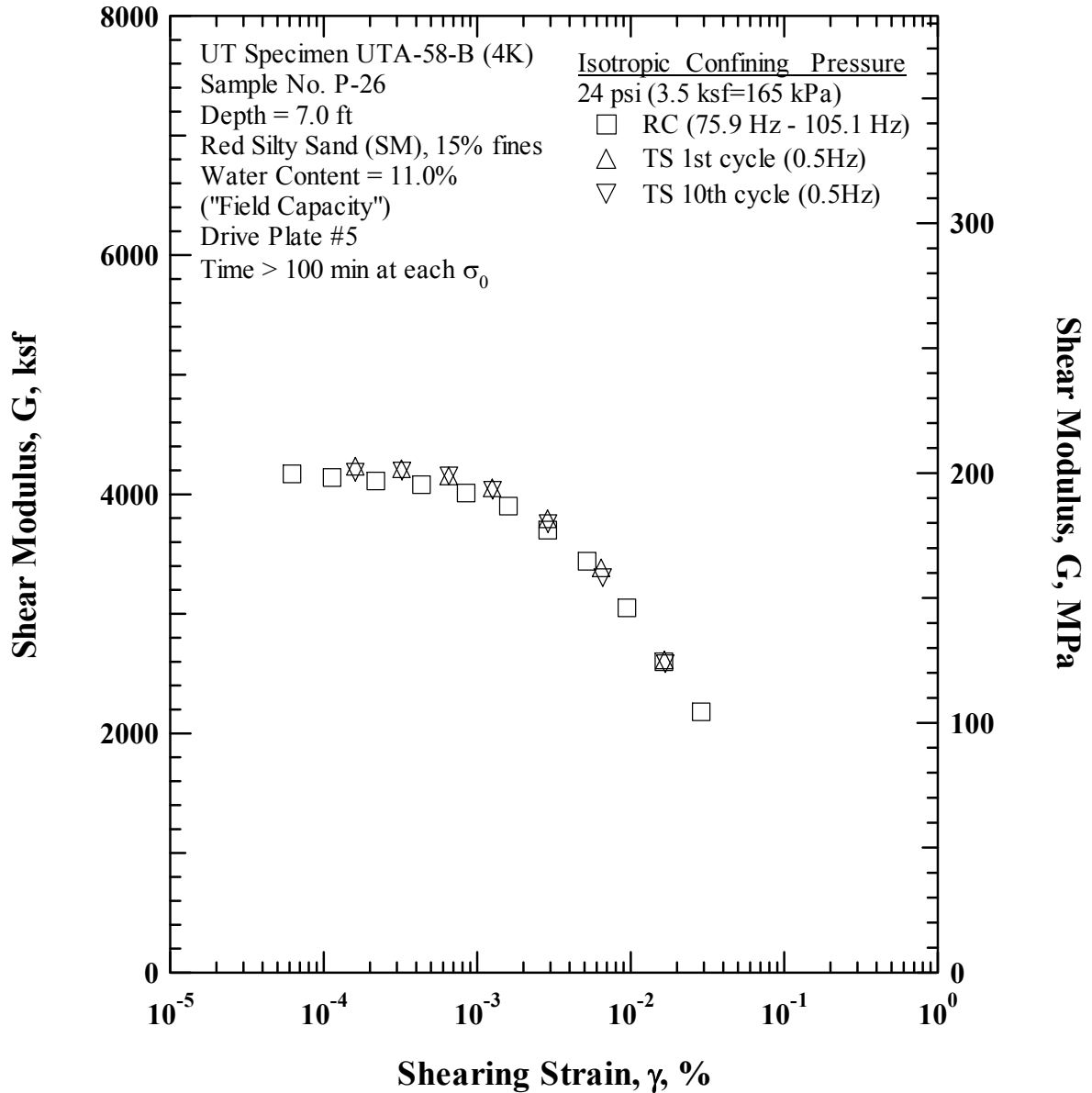


Figure C.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

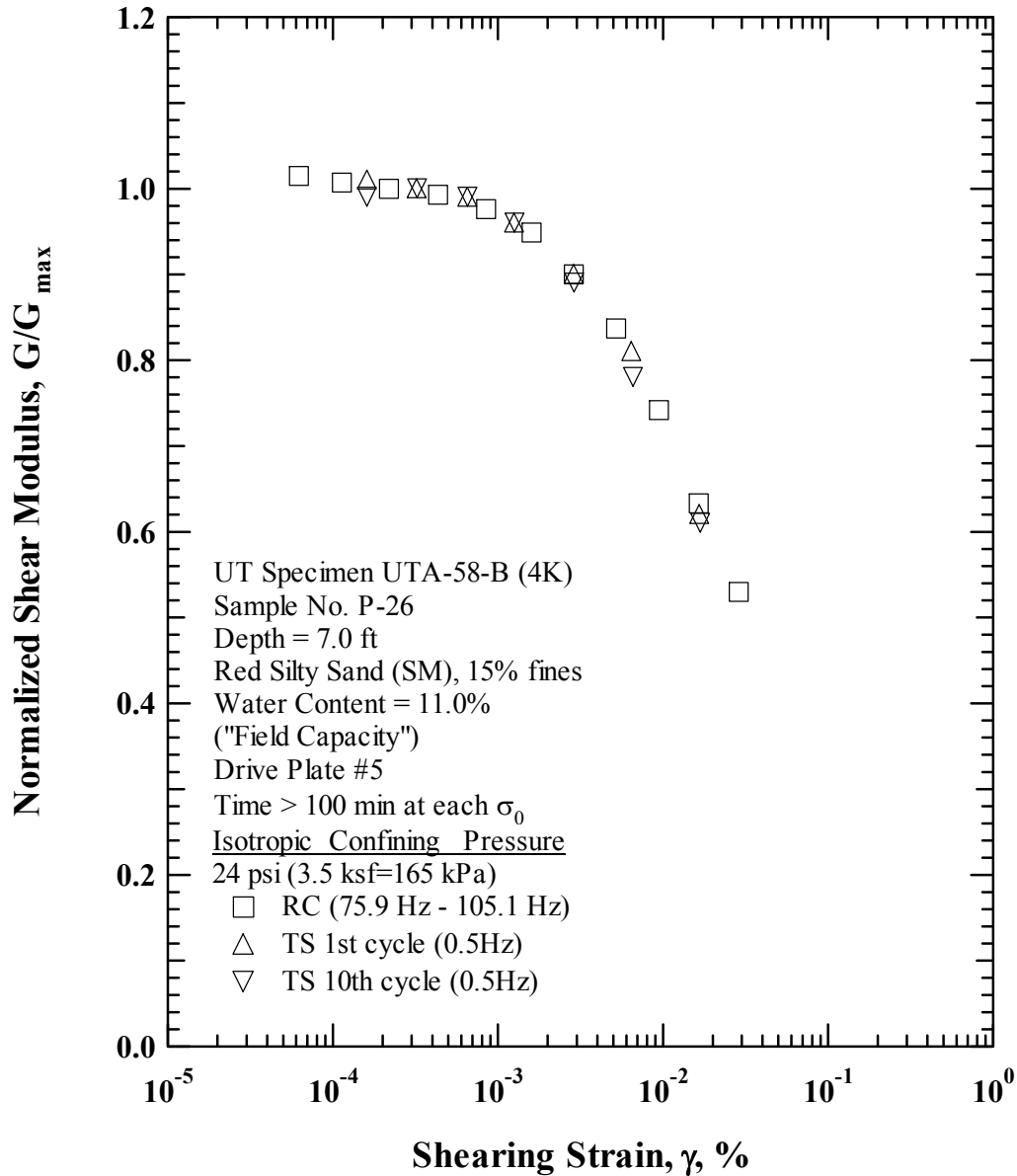


Figure C.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

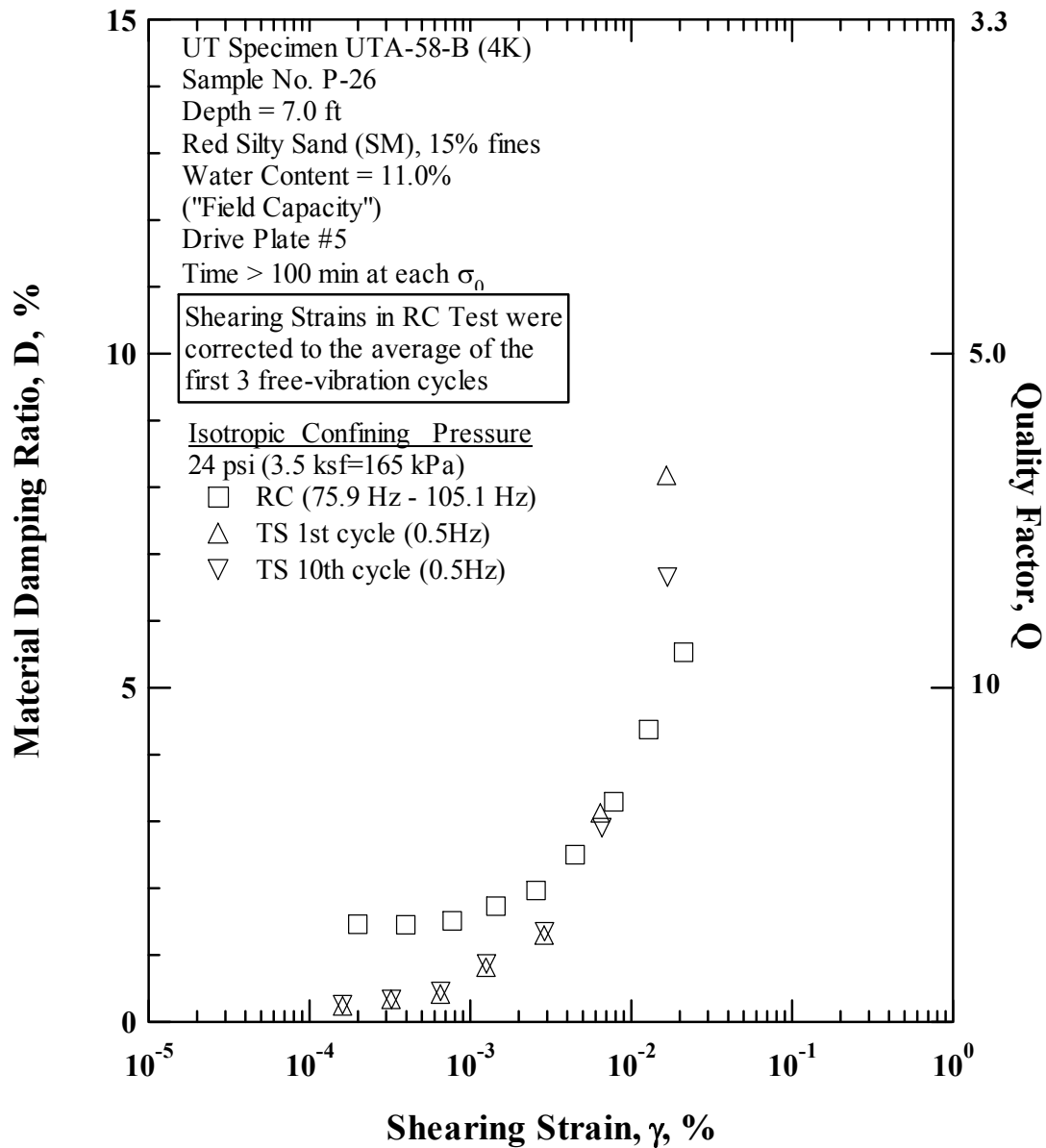


Figure C.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

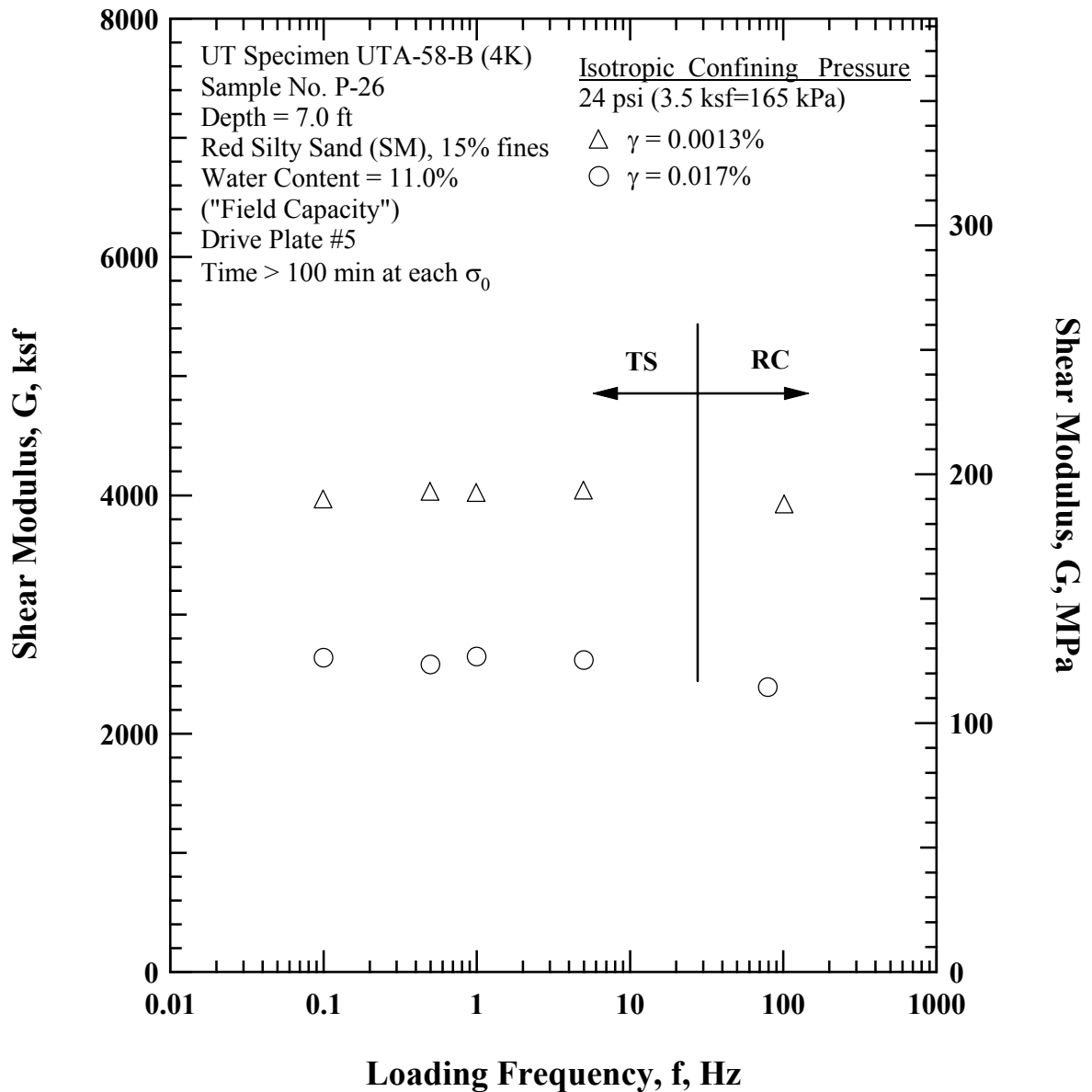


Figure C.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

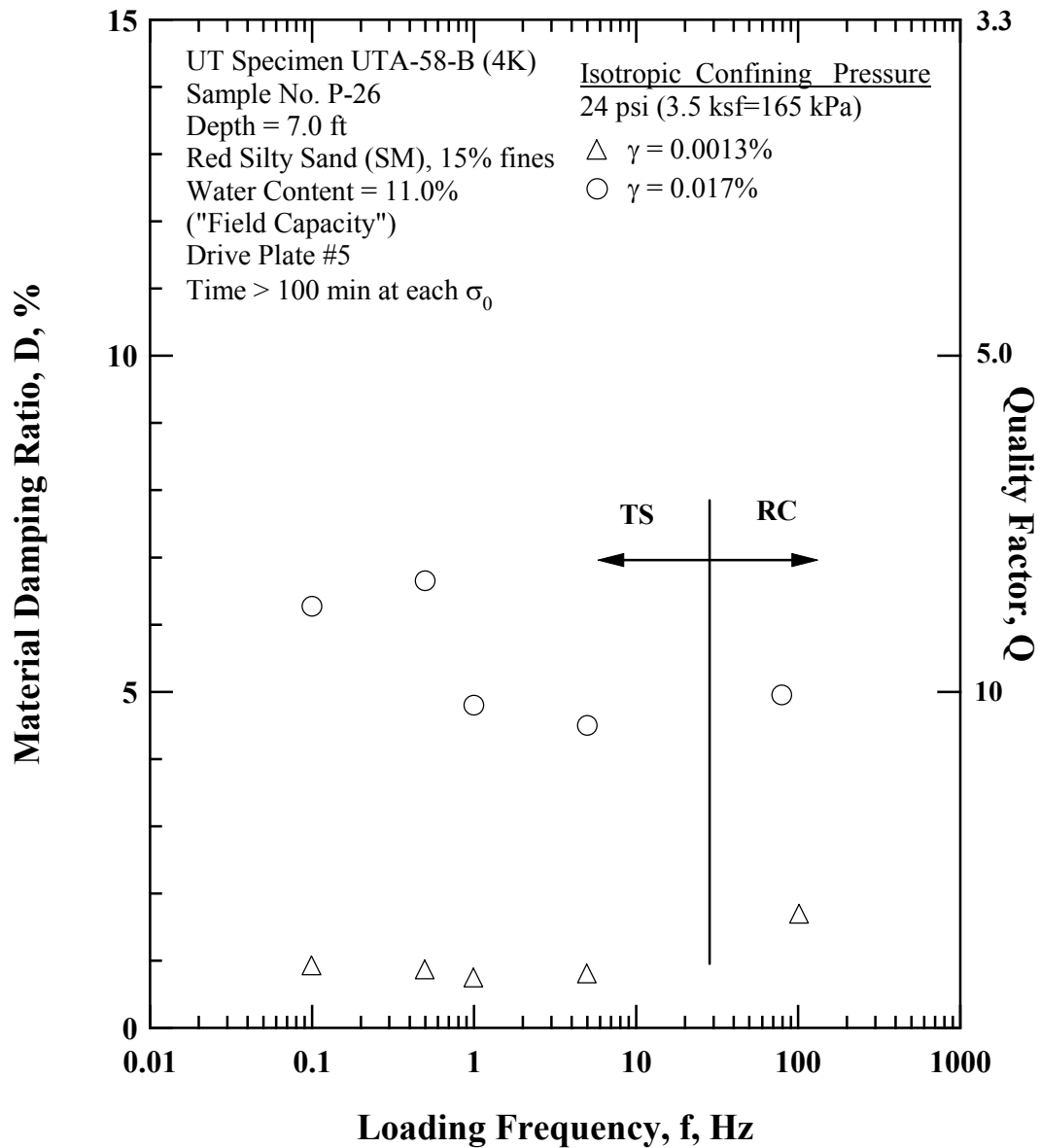


Figure C.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of Loading 24 psi (3.5 ksf=165 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

Table C.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 UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity")

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 Total Unit Weight, γ_t	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	(pcf)	
1.5	216	10	1490	71.4	606	2.44	130	0.408
3	432	21	1830	87.7	673	2.17	130	0.408
6	864	41	2330	111.7	758	1.95	130	0.407
12	1728	83	3080	147.7	872	1.68	131	0.405
24	3456	165	4090	196.1	1004	1.44	131	0.403
48	6912	331	5900	282.8	1204	1.22	132	0.395
96	13824	662	7770	372.5	1380	1.12	132	0.392

Table C.2 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 6$ psi (0.9 ksf=41 kPa)

Peak Shearing Strain, %	Shear Modulus, G , ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D , %
9.27E-05	2440	1.00	9.27E-05	-
1.70E-04	2430	1.00	1.70E-04	1.87
3.20E-04	2420	1.00	3.20E-04	1.80
6.12E-04	2370	0.98	6.12E-04	1.94
1.16E-03	2300	0.95	1.04E-03	1.92
2.12E-03	2150	0.88	1.85E-03	2.33
3.61E-03	1980	0.81	3.02E-03	3.03
6.54E-03	1720	0.71	5.17E-03	4.07

⁺ 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

⁻ High Noise Level Interfering with Damping Measurement

Table C.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 6$ psi (0.9 ksf=41 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 , %
1.50E-04	2407	1.01	0.67	1.52E-04	2387	1.00	0.64
3.02E-04	2397	1.00	0.65	3.01E-04	2387	1.00	0.63
6.10E-04	2368	0.99	0.83	6.16E-04	2349	0.98	0.86
1.29E-03	2244	0.94	1.58	1.30E-03	2215	0.92	1.47
2.63E-03	2042	0.85	2.77	2.69E-03	2004	0.84	2.62
6.72E-03	1630	0.68	4.90	6.73E-03	1601	0.67	4.94

Table C.4 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 24$ psi (3.5 ksf=165 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
6.23E-05	4170	1.01	6.23E-05	-
1.13E-04	4140	1.00	1.13E-04	-
2.18E-04	4110	1.00	2.00E-04	1.46
4.33E-04	4080	0.99	3.97E-04	1.45
8.46E-04	4010	0.97	7.72E-04	1.51
1.60E-03	3900	0.95	1.44E-03	1.73
2.88E-03	3700	0.90	2.56E-03	1.97
5.19E-03	3440	0.83	4.47E-03	2.50
9.45E-03	3050	0.74	7.79E-03	3.29
1.64E-02	2600	0.63	1.28E-02	4.38
2.88E-02	2180	0.53	2.12E-02	5.53

⁺ 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

⁻ High Noise Level Interfering with Damping Measurement

Table C.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-B (4K), Sample No. P-26; Compacted to 98% Modified Proctor and Water Content of 11.0% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 24$ psi (3.5 ksf=165 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, %
1.62E-04	4227	1.01	0.23	1.62E-04	4182	0.99	0.25
3.23E-04	4209	1.00	0.33	3.26E-04	4191	1.00	0.33
6.57E-04	4155	0.99	0.41	6.58E-04	4146	0.99	0.45
1.26E-03	4046	0.96	0.81	1.27E-03	4028	0.96	0.86
2.89E-03	3787	0.90	1.29	2.91E-03	3749	0.89	1.34
6.45E-03	3384	0.81	3.12	6.62E-03	3298	0.78	2.90
1.67E-02	2608	0.62	8.17	1.69E-02	2579	0.61	6.65

APPENDIX D

**UT Specimen UTA-58-A (5G)
Red Silty Sand (SM)**

**Sample No. P-6
Depth = 17.0 ft**

**Total Unit Weight = 131.4 lb/ft³
Water Content = 10.9%
("Field Capacity")
Estimated In-Situ Mean Effective
Stress = 12.0 psi**

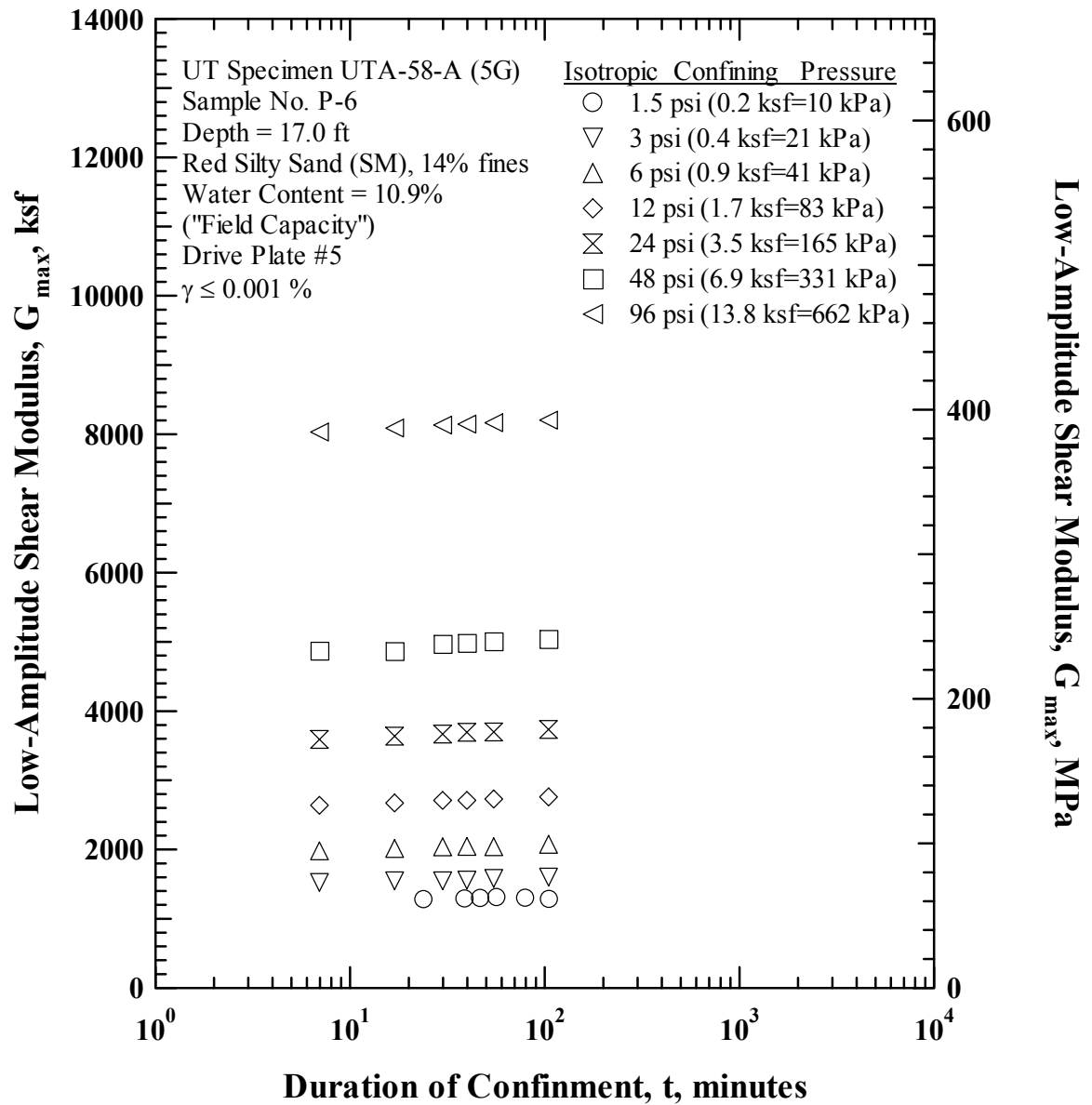


Figure D.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

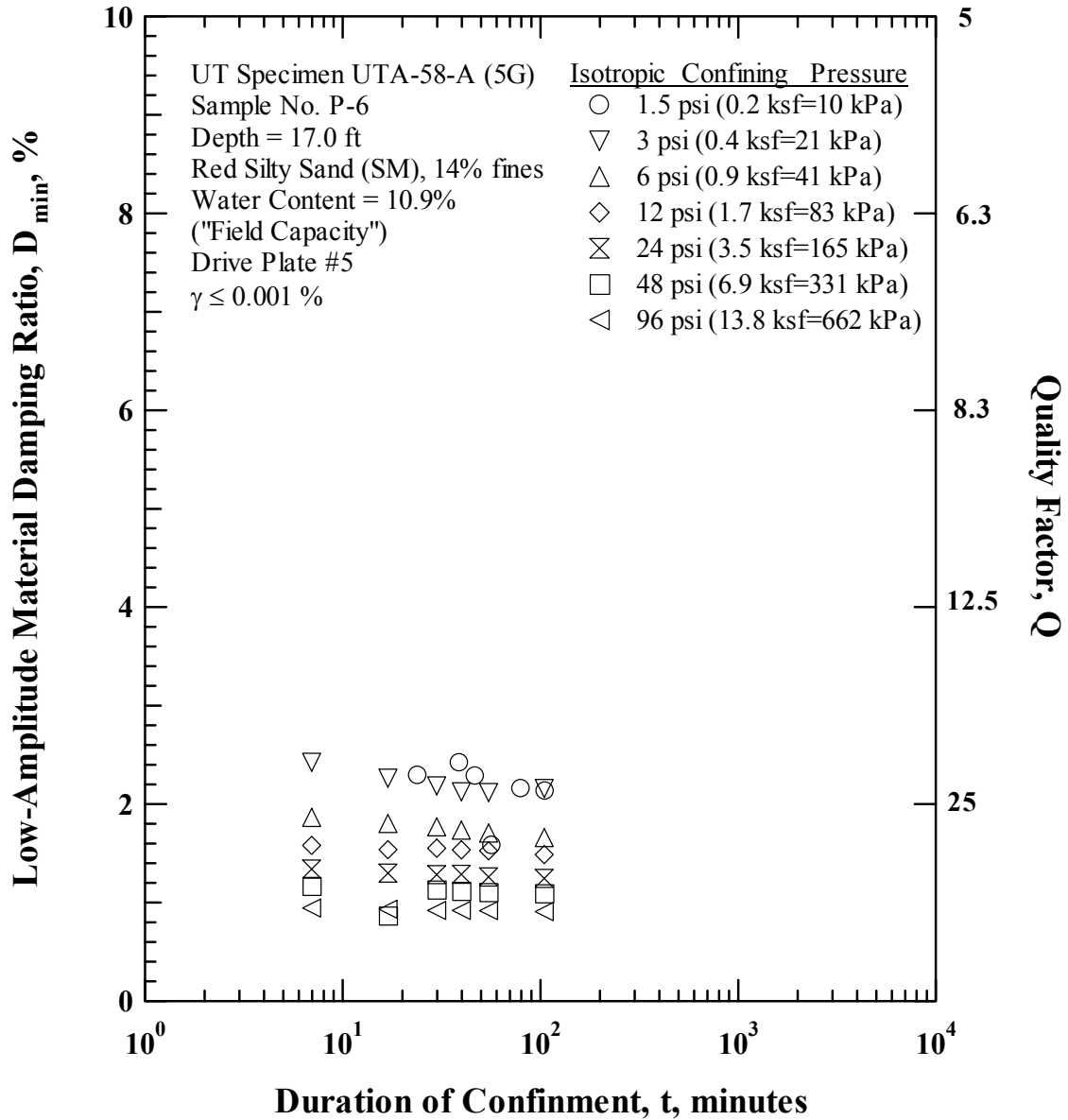


Figure D.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

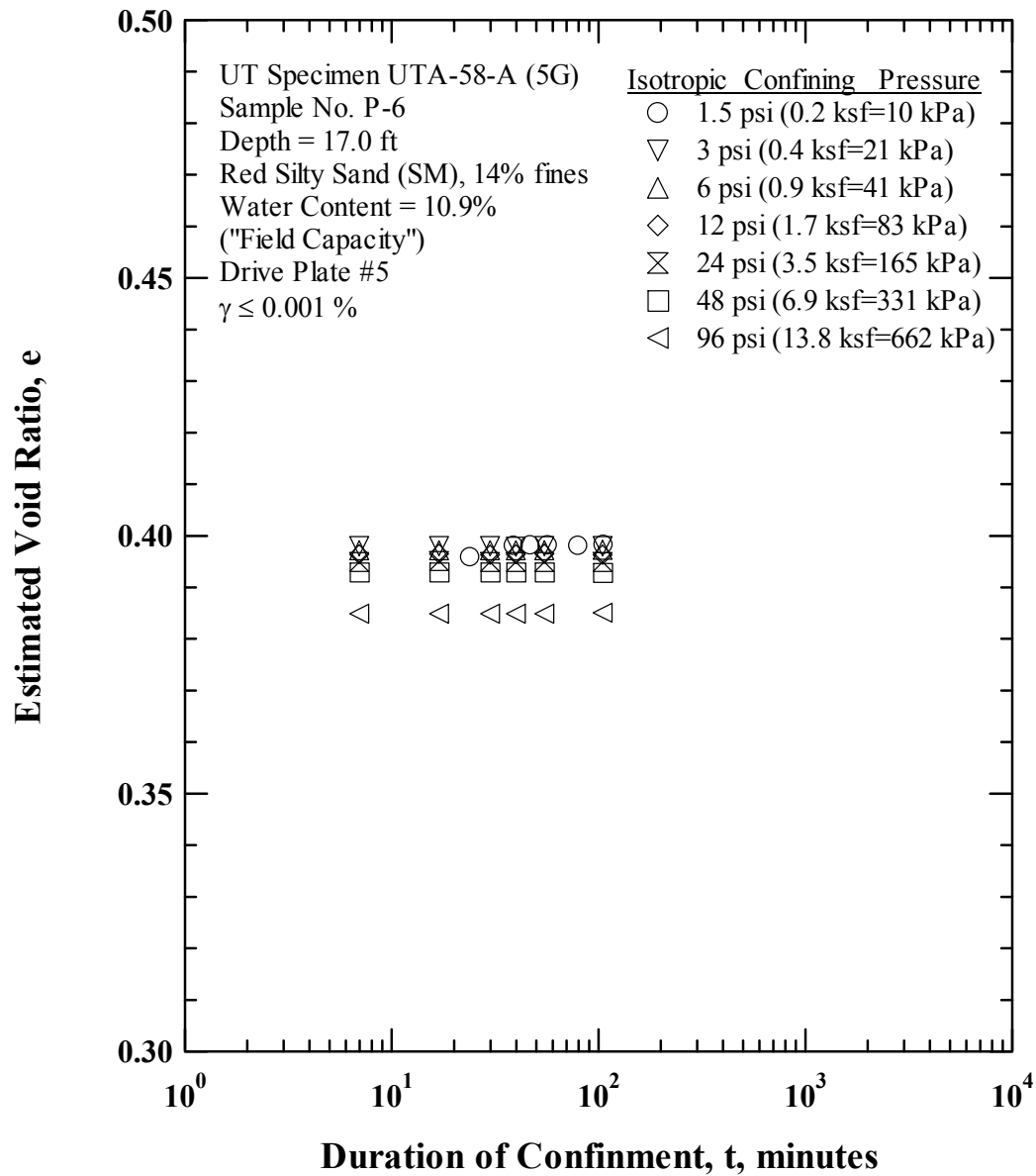


Figure D.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

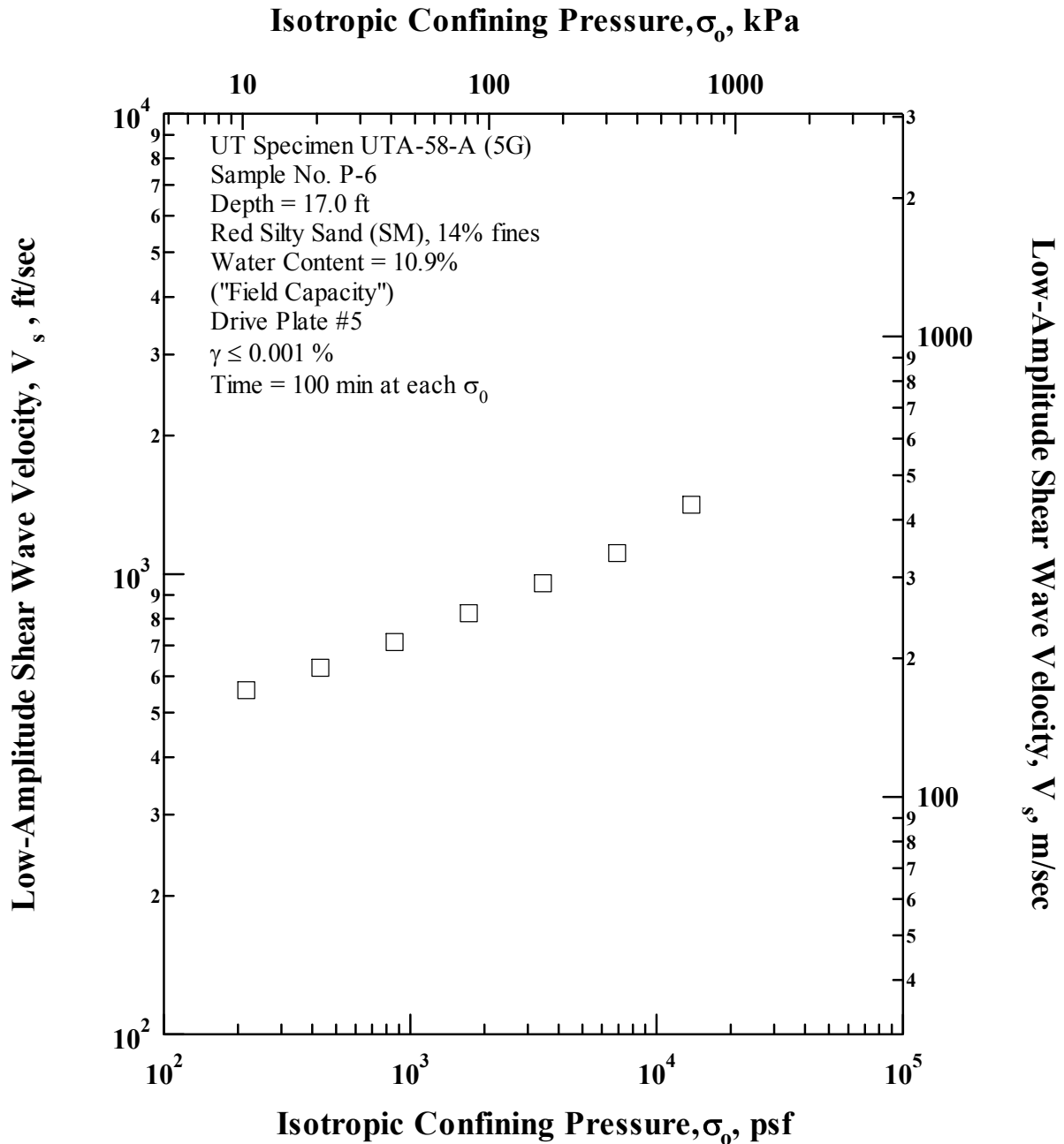


Figure D.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

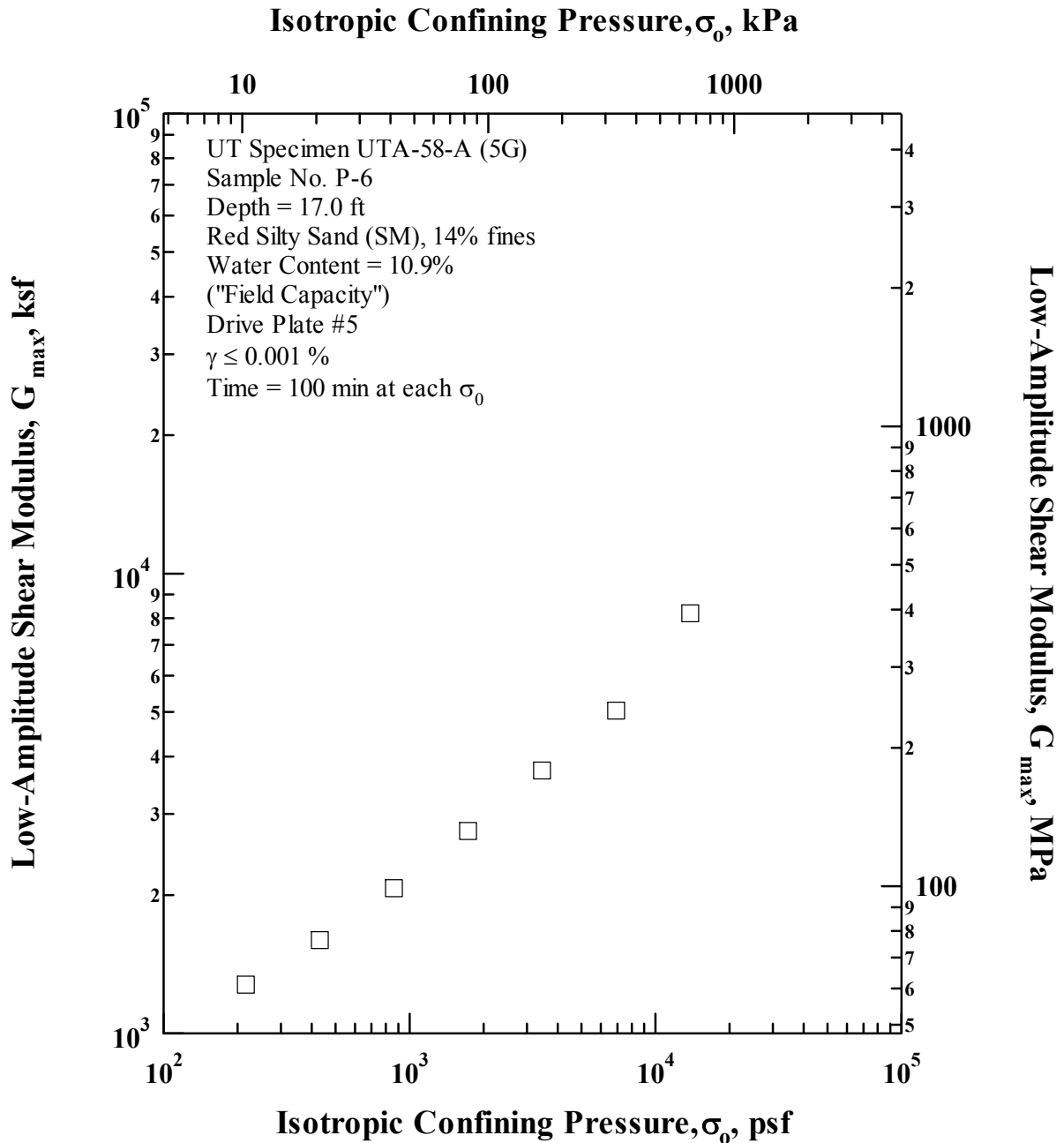


Figure D.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

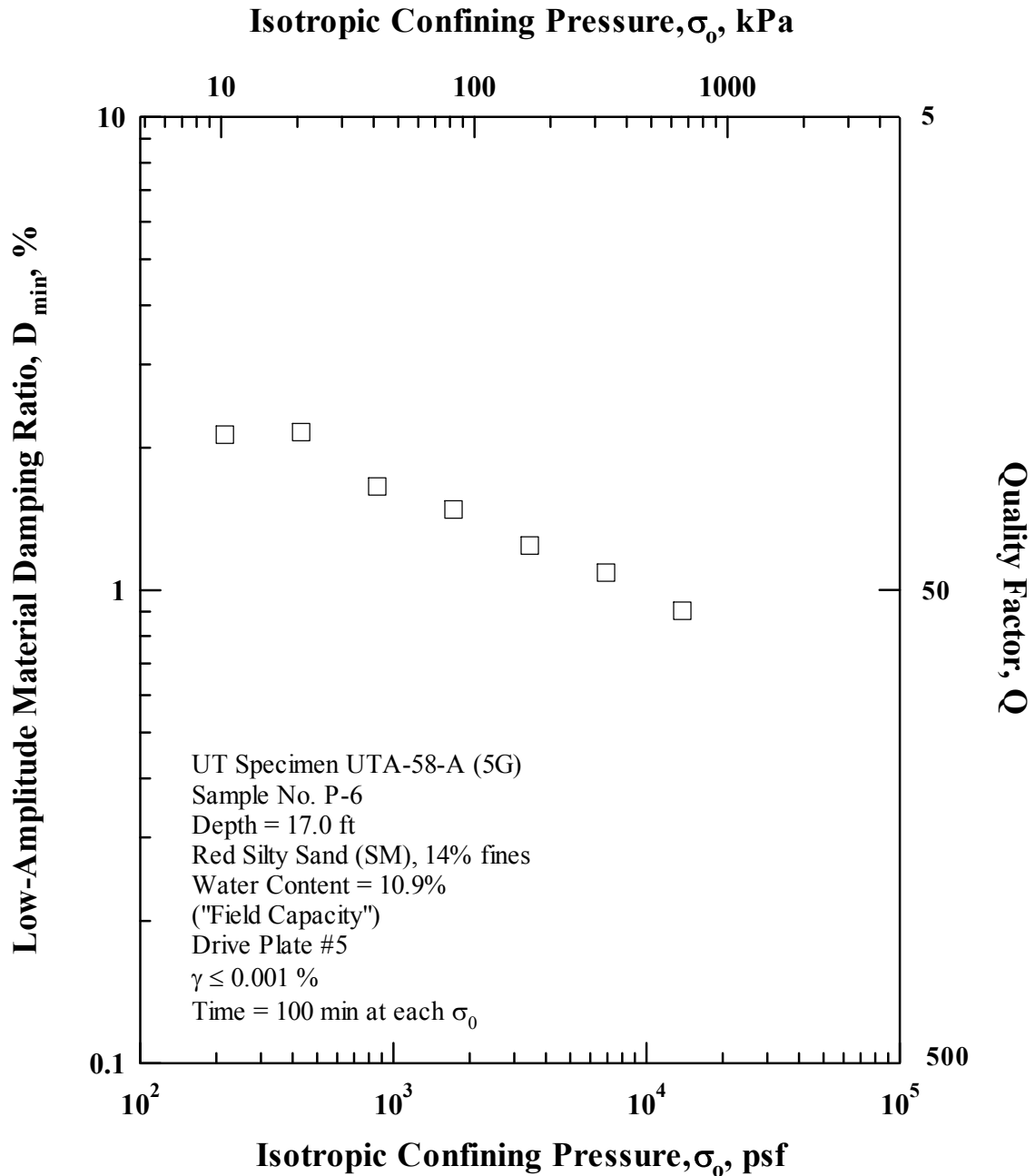


Figure D.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

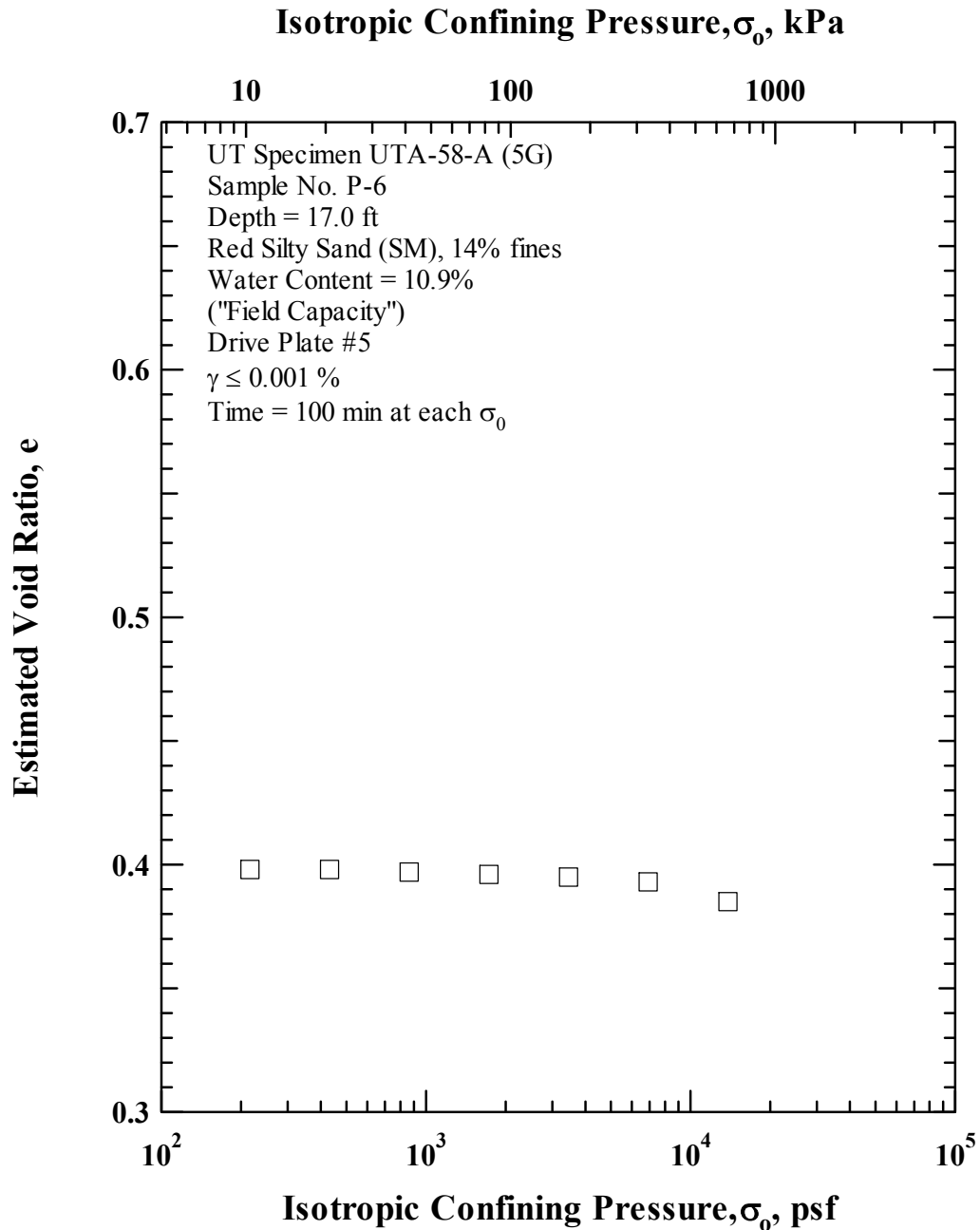


Figure D.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

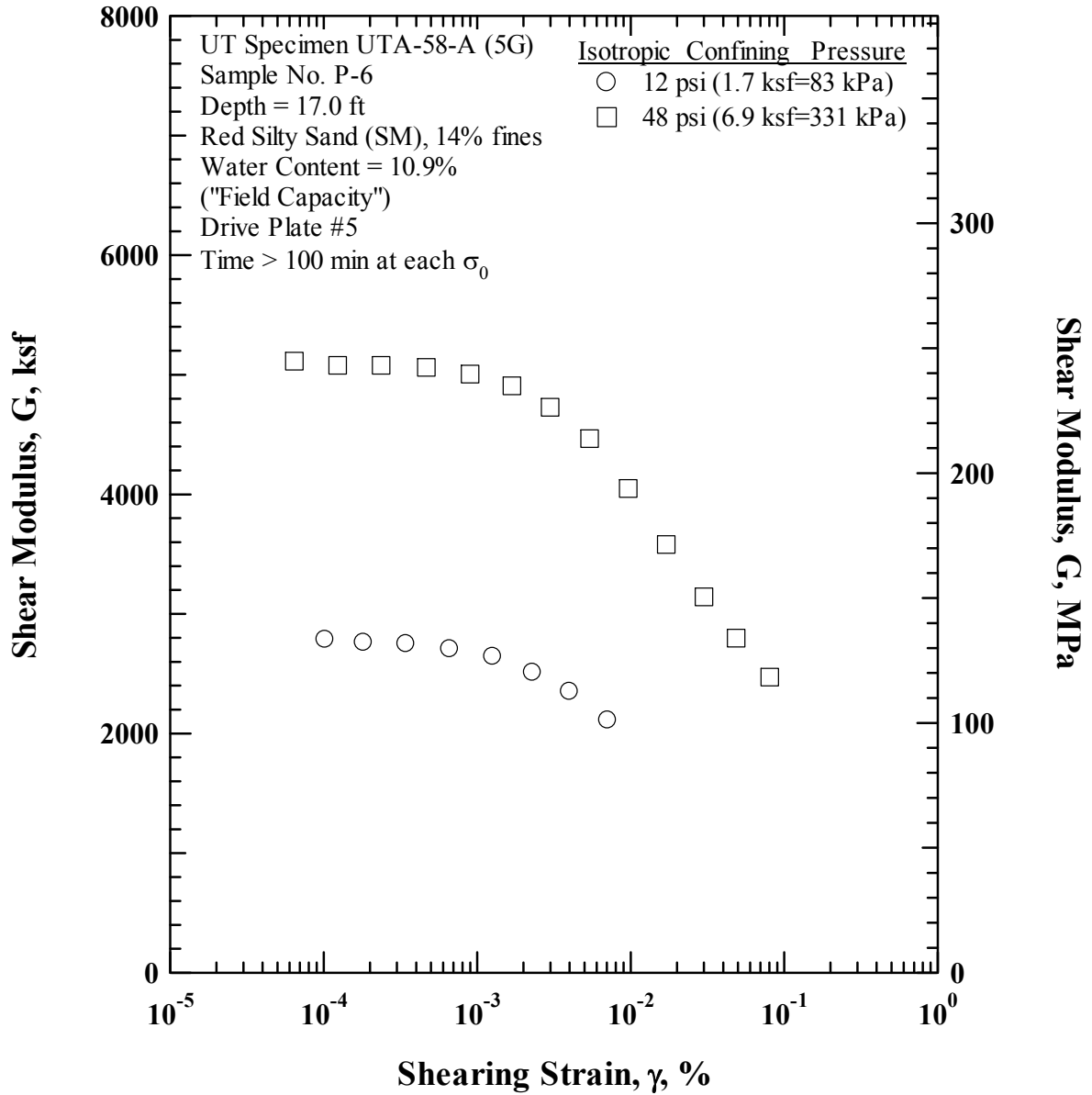


Figure D.8 Variation in Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

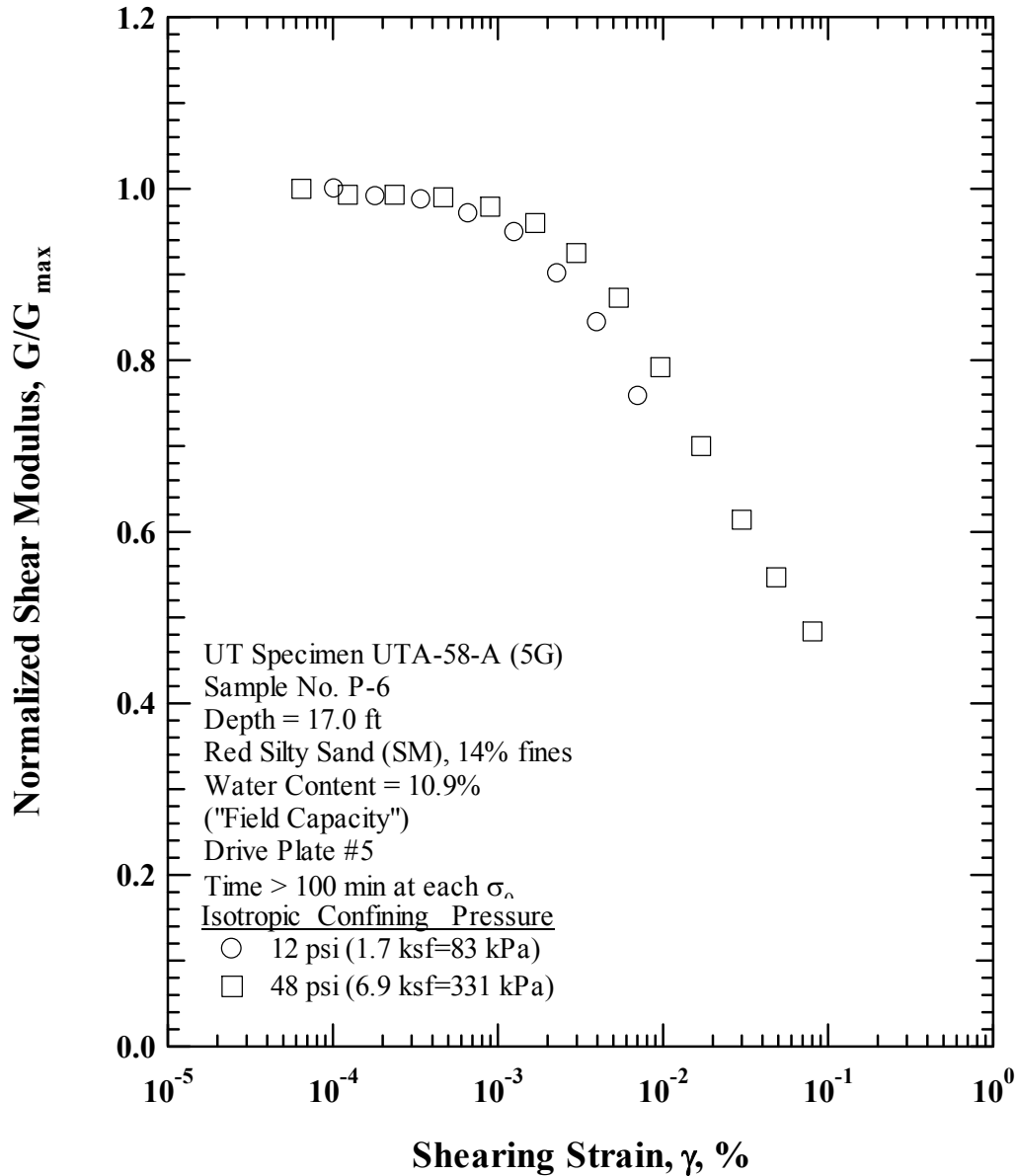


Figure D.9 Variation in Normalized Shear Modulus with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

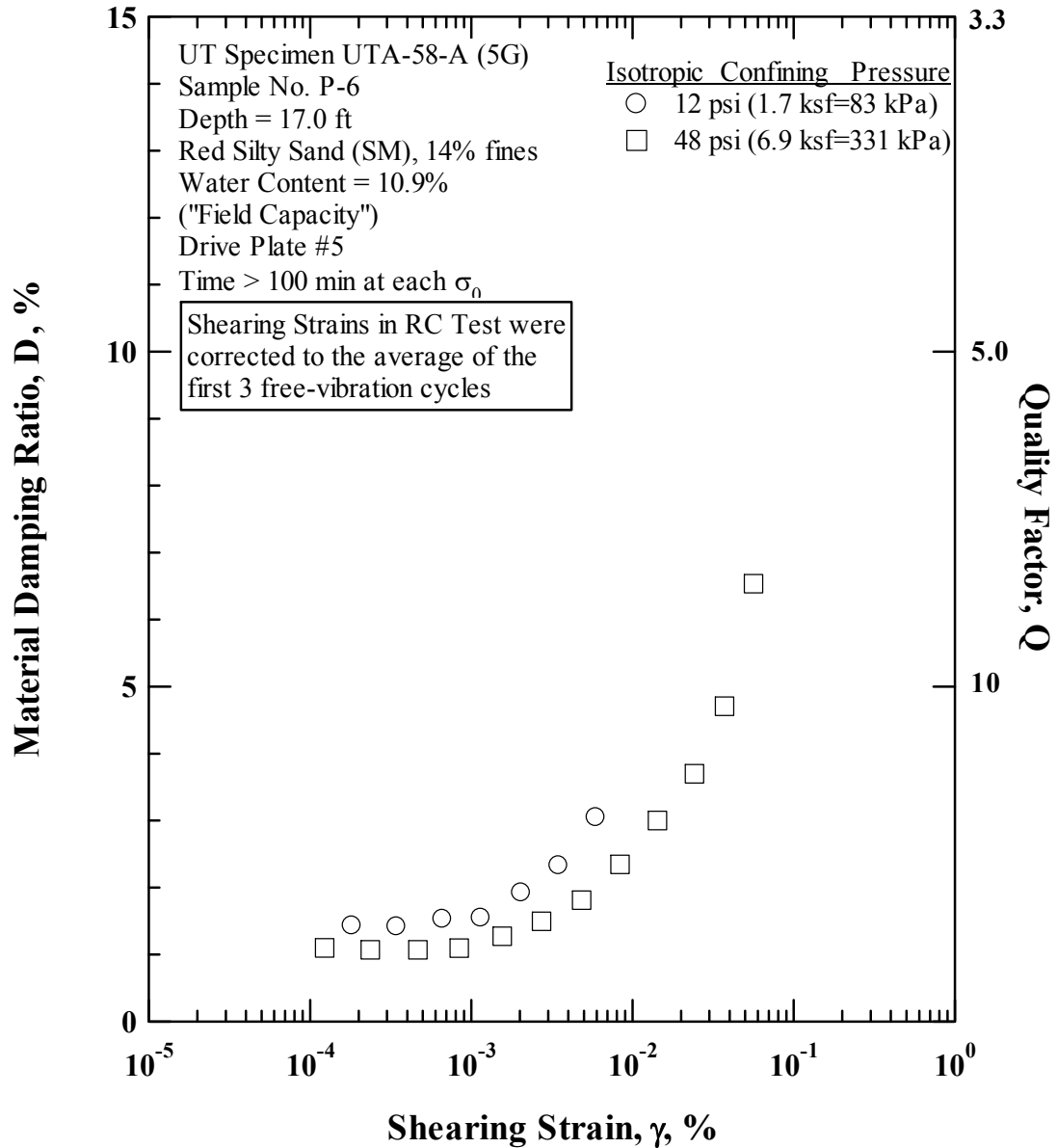


Figure D.10 Variation in Material Damping Ratio with Shearing Strain at Different Isotropic Confining Pressures from Resonant Column Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

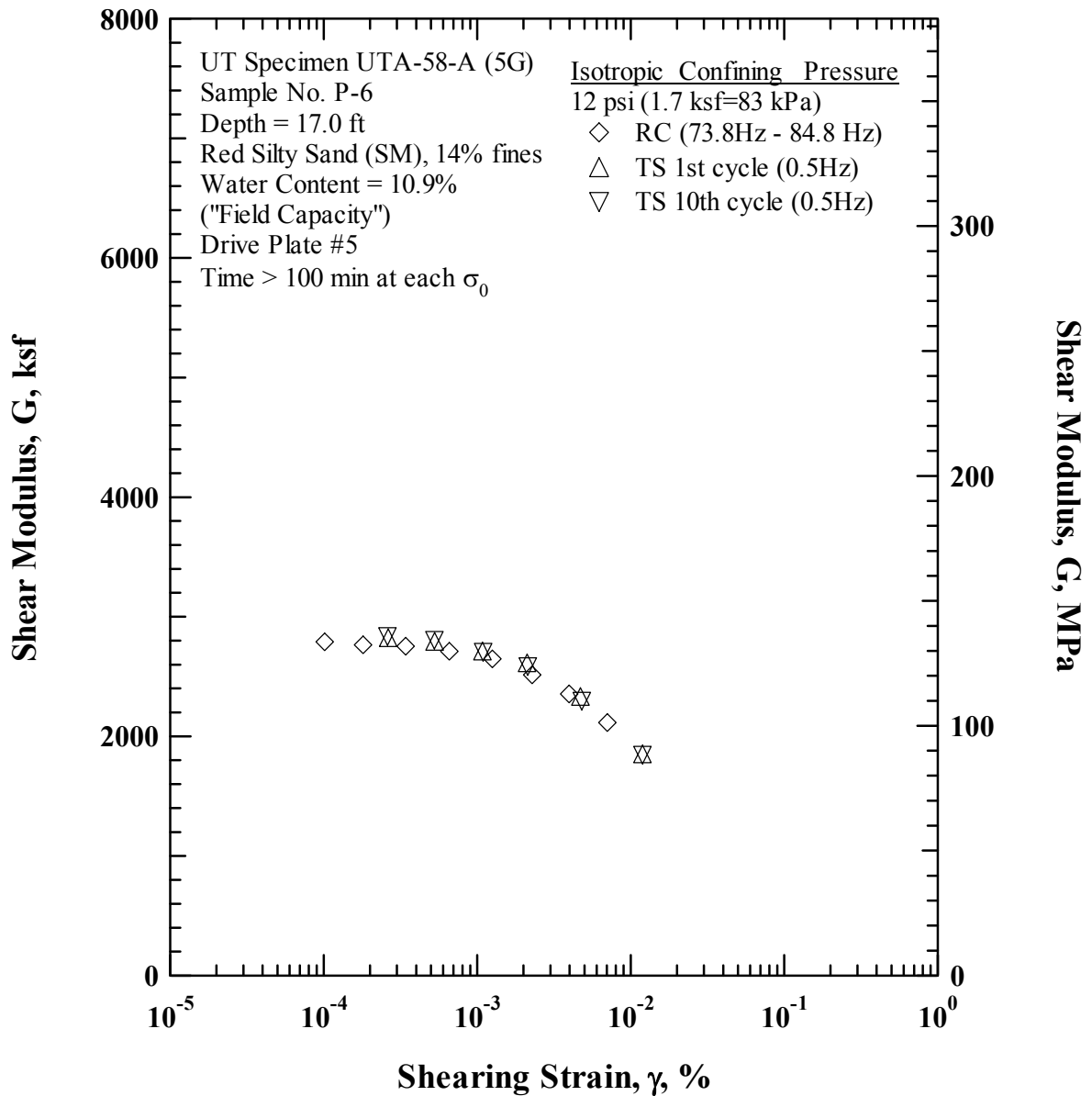


Figure D.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 12 psi (1.7 ksf=83 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

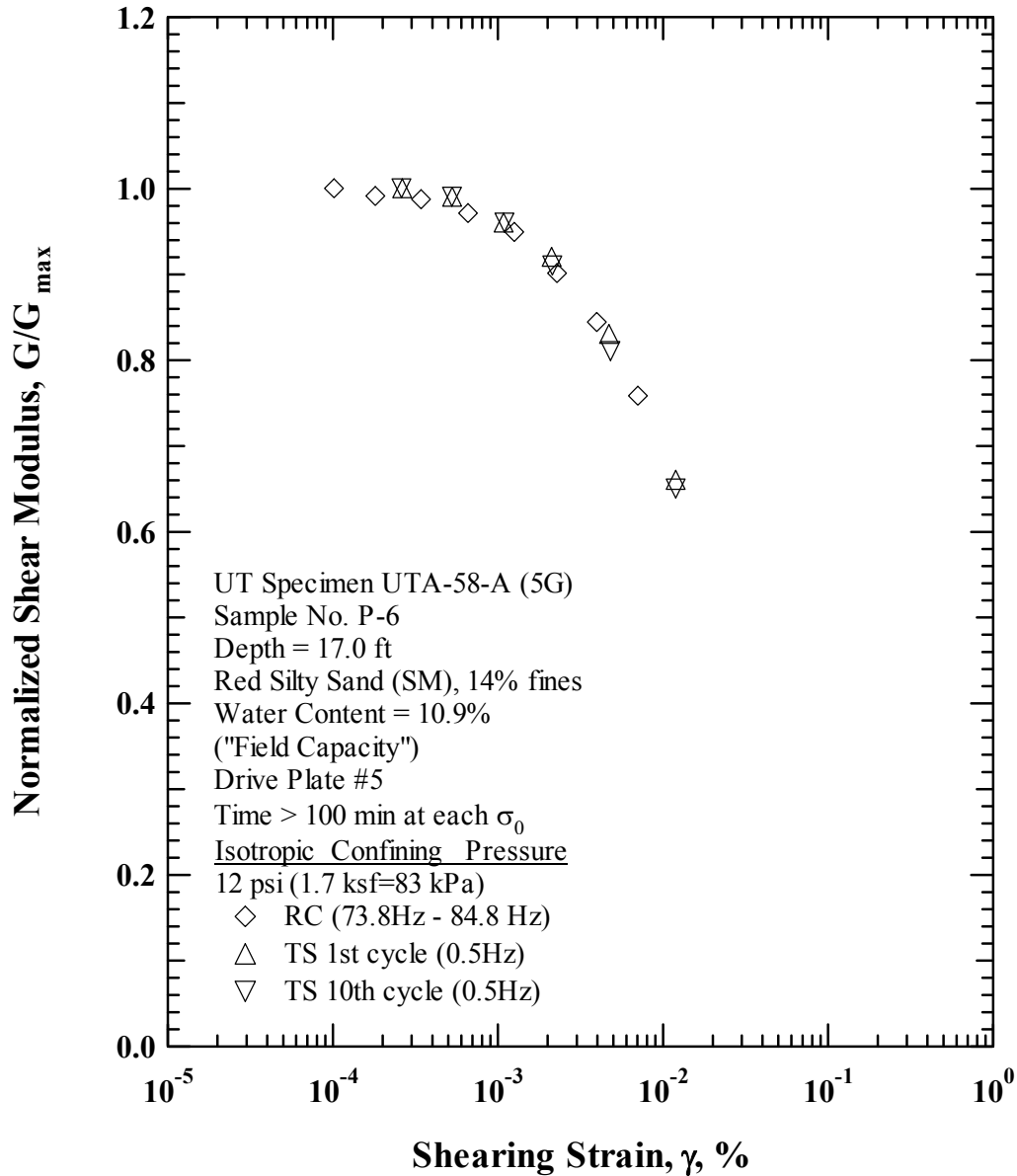


Figure D.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 12 psi (1.7 ksf=83 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

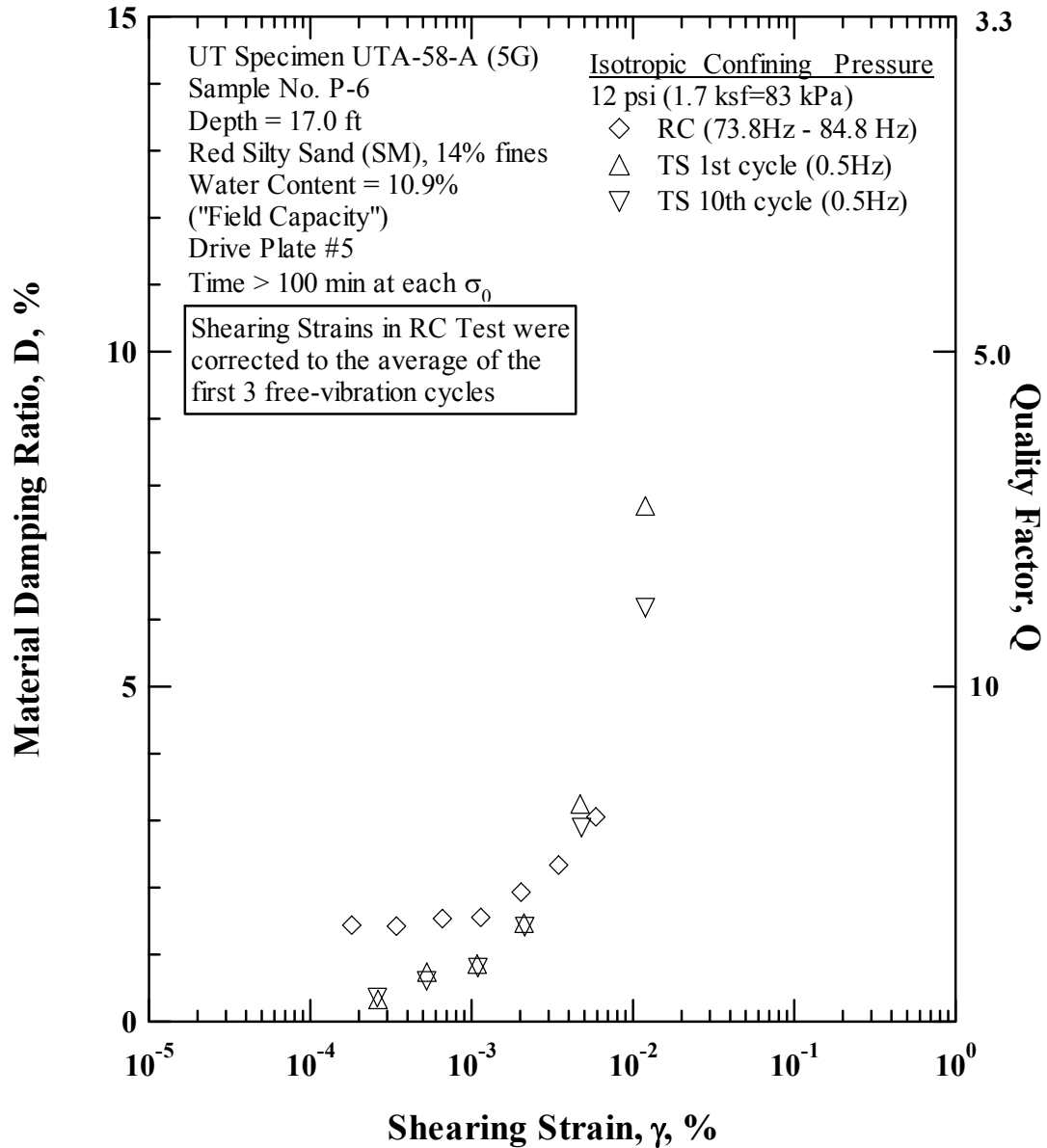


Figure D.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 12 psi (1.7 ksf=83 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

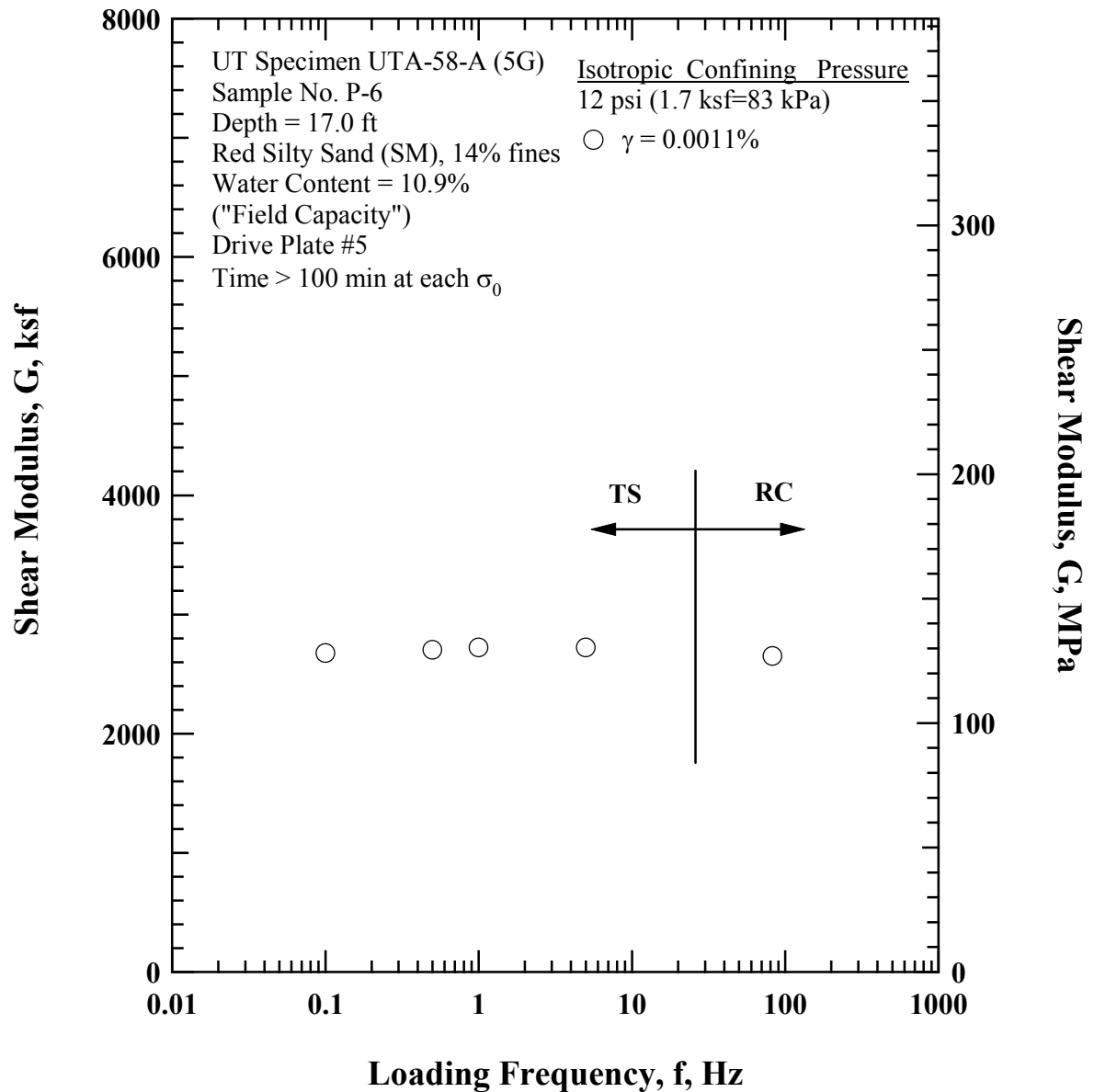


Figure D.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 12 psi (1.7 ksf=83 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

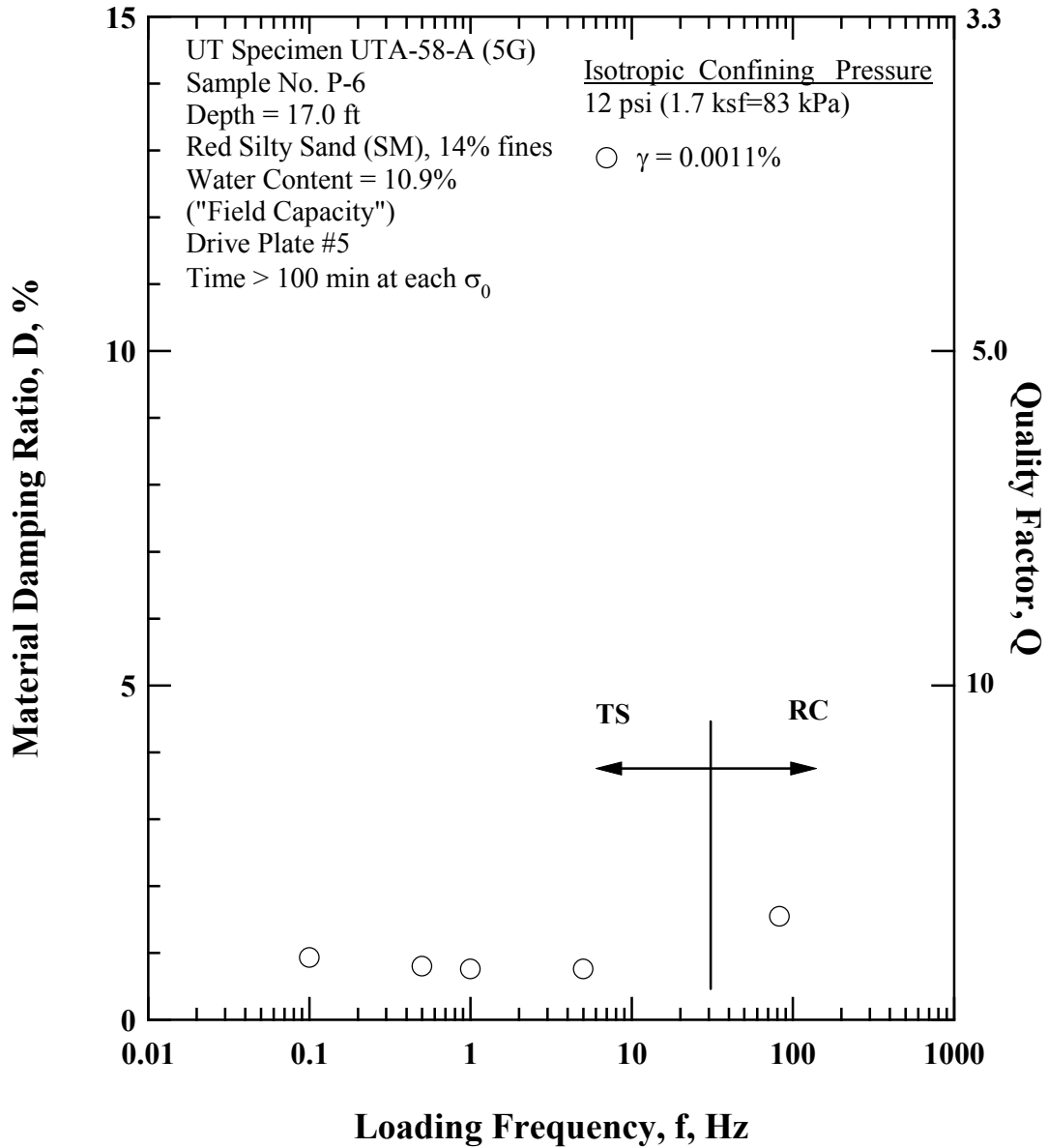


Figure D.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure Loading 12 psi (1.7 ksf=83 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

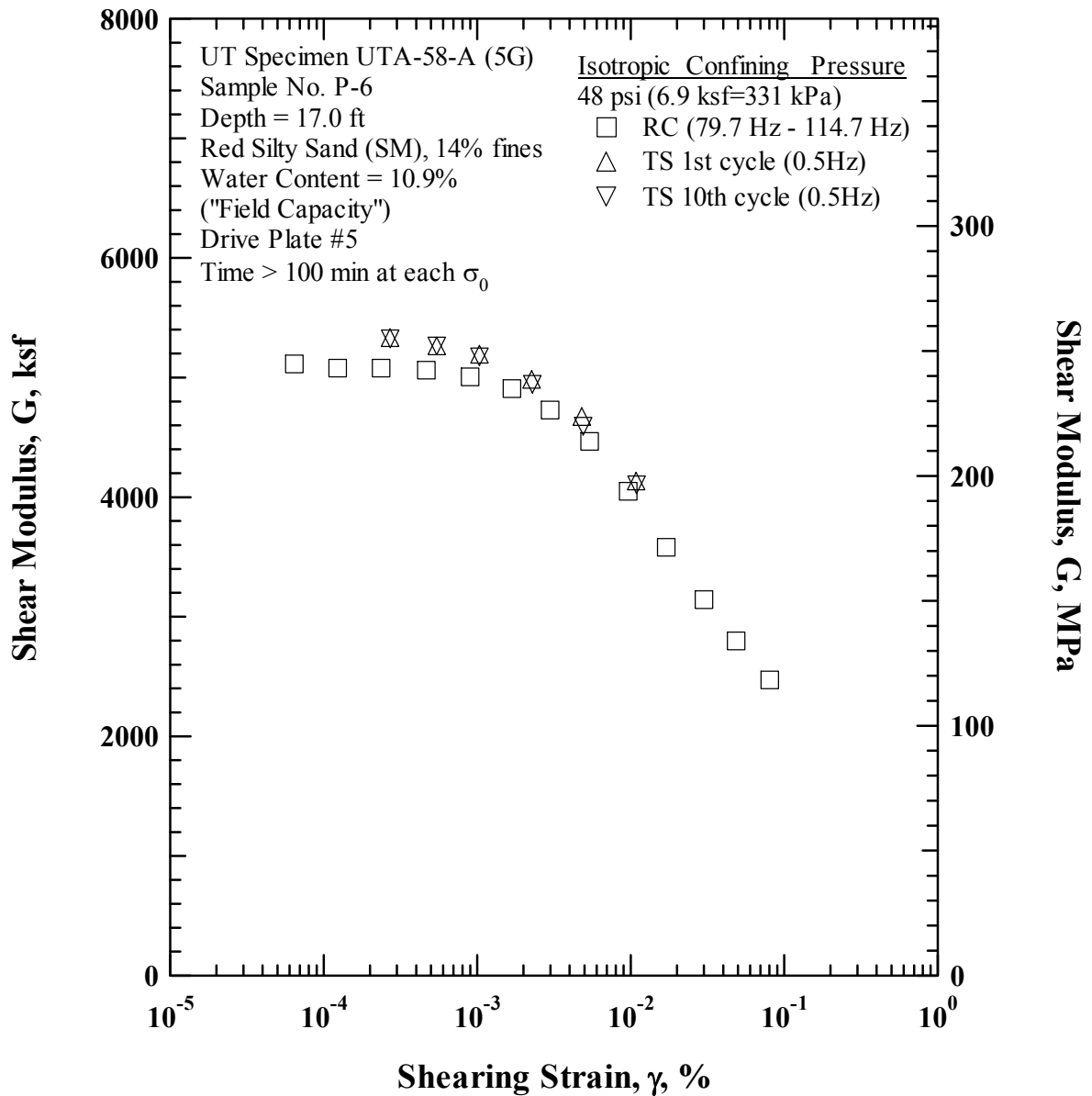


Figure D.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 48 psi (6.9 ksf=331 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

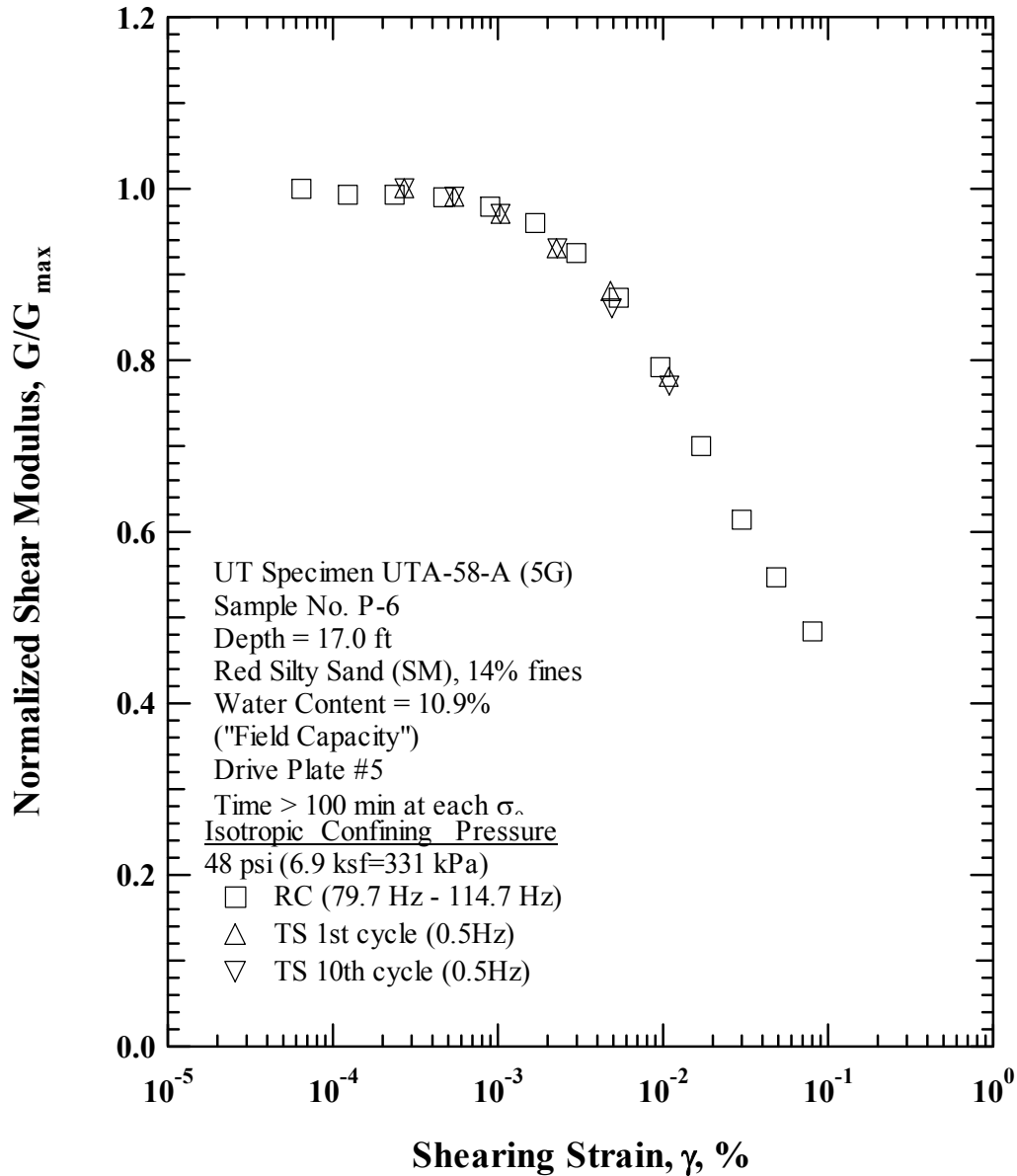


Figure D.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of Loading 48 psi (6.9 ksf=331 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

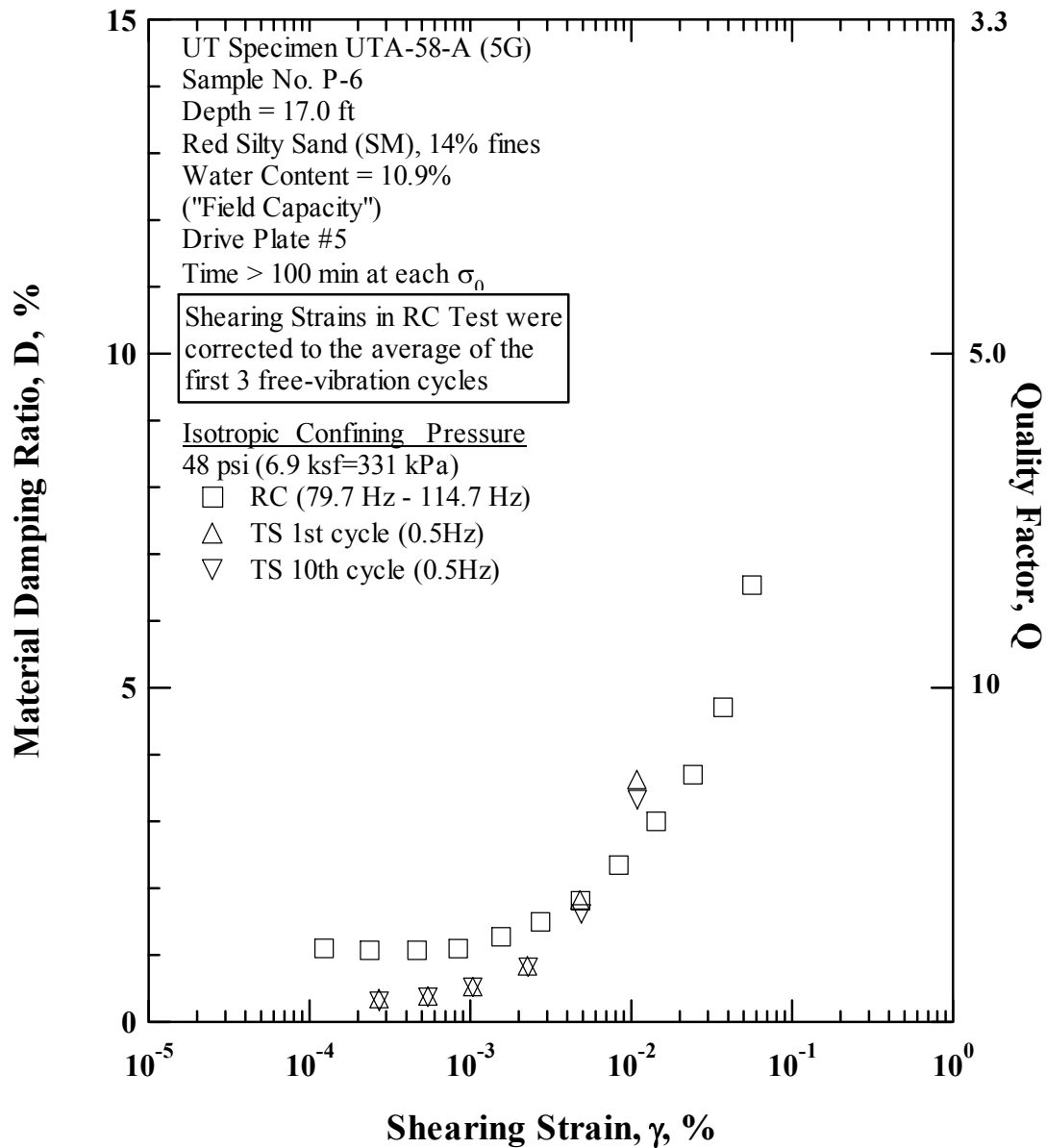


Figure D.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of Loading 48 psi (6.9 ksf=331 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

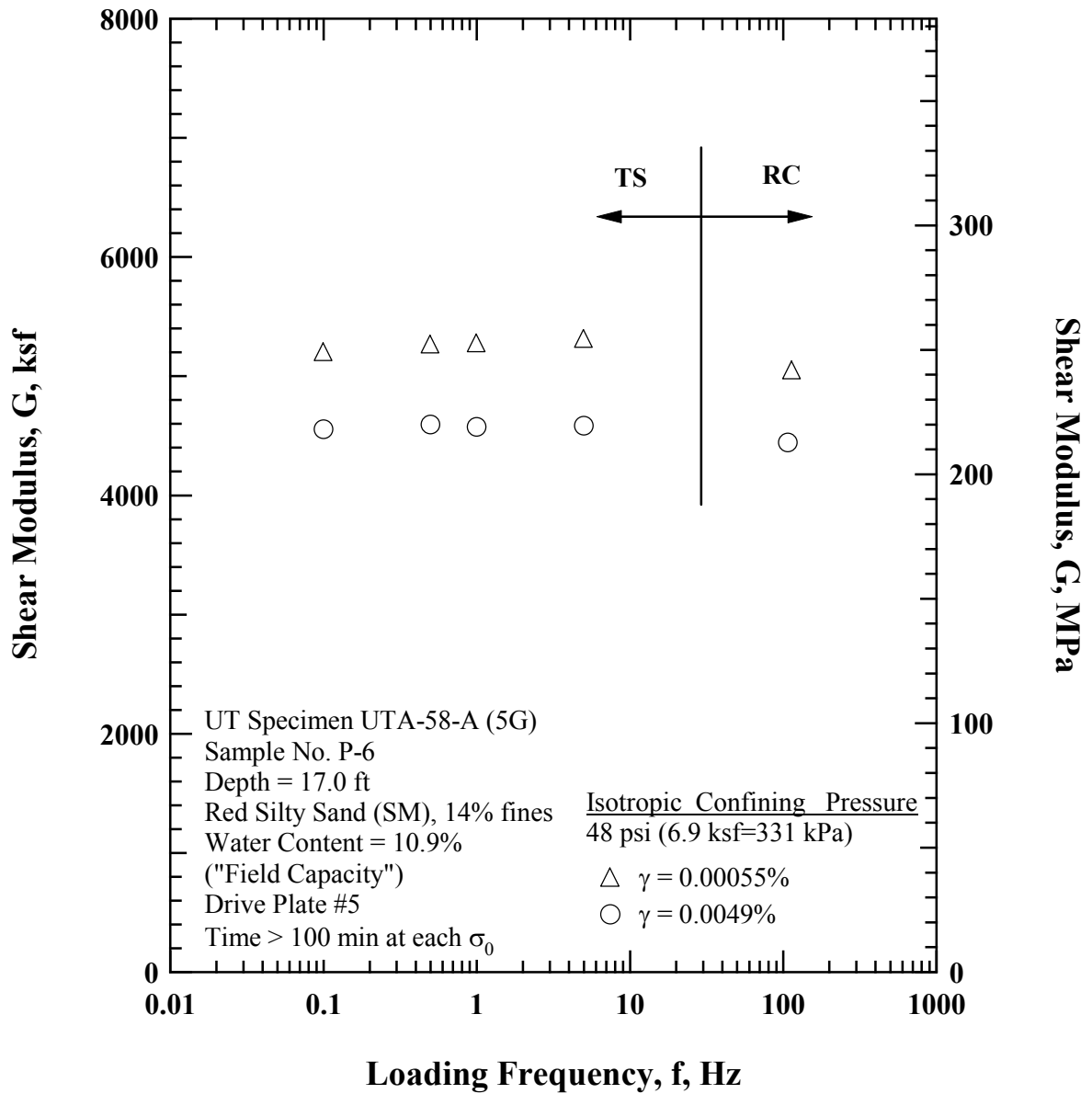


Figure D.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of Loading 48 psi (6.9 ksf=331 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

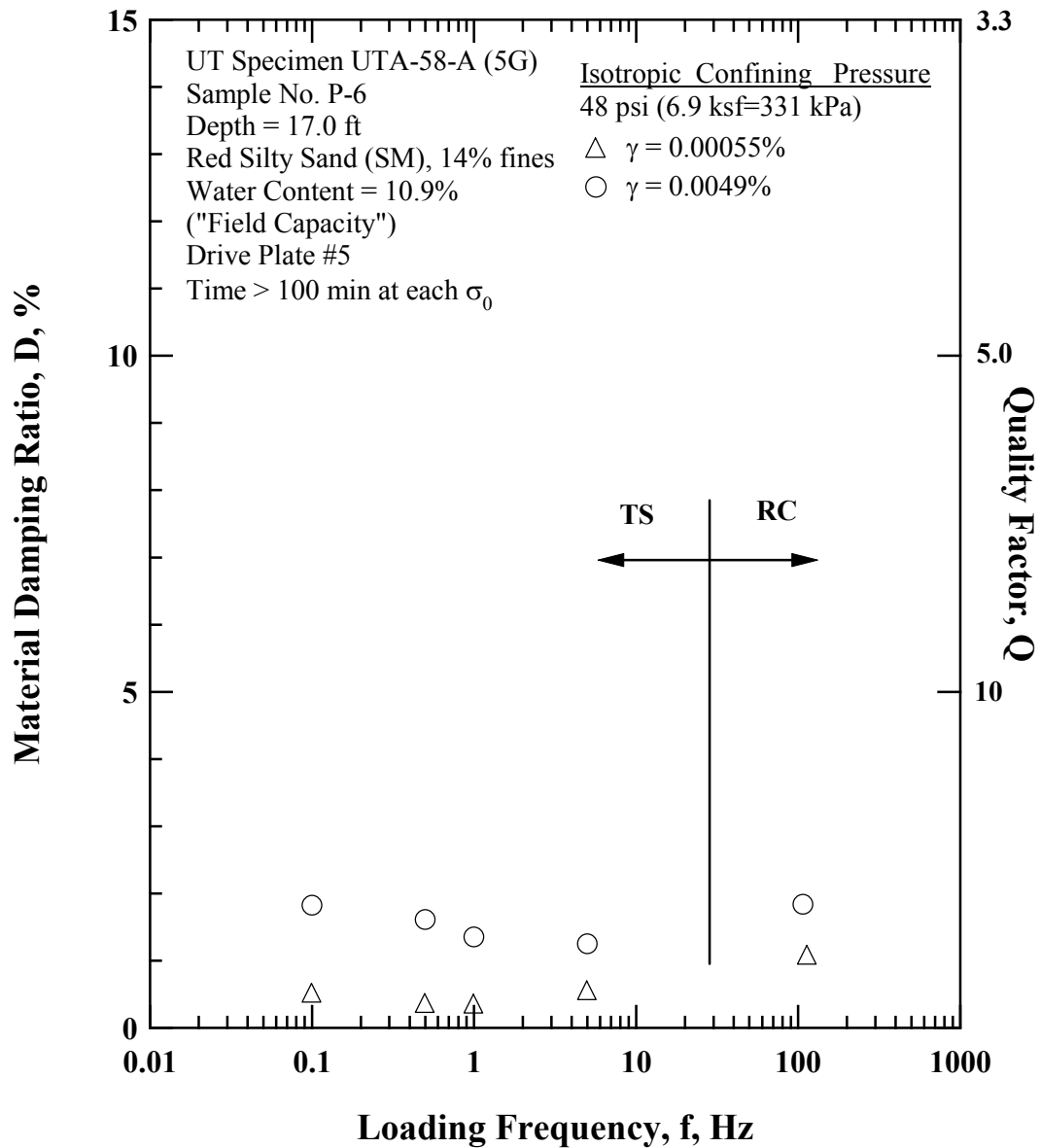


Figure D.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of Loading 48 psi (6.9 ksf=331 kPa) from Combined RCTS Tests of Fill Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

Table D.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 UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity")

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 Total Unit Weight, γ_t	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	(pcf)	
1.5	216	10	1276	61.2	559	2.13	131	0.398
3	432	21	1596	76.5	626	2.16	131	0.398
6	864	41	2070	99.2	712	1.66	131	0.397
12	1728	83	2755	132.1	822	1.48	131	0.396
24	3456	165	3728	178.7	955	1.24	131	0.395
48	6912	331	5034	241.3	1110	1.09	132	0.393
96	13824	662	8197	393.0	1414	0.90	132	0.385

Table D.2 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 12$ psi (1.7 ksf = 83 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
1.02E-04	2787	1.00	1.02E-04	-
1.82E-04	2762	0.99	1.82E-04	1.43
3.45E-04	2750	0.99	3.45E-04	1.42
6.62E-04	2708	0.97	6.62E-04	1.53
1.26E-03	2644	0.95	1.15E-03	1.55
2.29E-03	2511	0.90	2.04E-03	1.92
4.01E-03	2351	0.84	3.48E-03	2.33
7.10E-03	2112	0.76	5.93E-03	3.05

⁺ 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

⁻ High Noise Level Interfering with Damping Measurement

Table D.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 12$ psi (1.7 ksf = 83 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, %
2.65E-04	2819	1.00	0.32	2.62E-04	2828	1.00	0.35
5.31E-04	2790	0.99	0.73	5.30E-04	2800	0.99	0.60
1.09E-03	2713	0.96	0.85	1.10E-03	2704	0.96	0.80
2.13E-03	2608	0.92	1.46	2.15E-03	2579	0.91	1.41
4.74E-03	2330	0.83	3.24	4.84E-03	2291	0.81	2.89
1.20E-02	1850	0.66	7.69	1.20E-02	1841	0.65	6.17

Table D.4 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 48$ psi (6.9 ksf = 331 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
6.44E-05	5113	1.00	6.44E-05	-
1.23E-04	5078	0.99	1.23E-04	1.10
2.37E-04	5078	0.99	2.37E-04	1.07
4.66E-04	5061	0.99	4.66E-04	1.07
8.99E-04	5005	0.98	8.41E-04	1.10
1.68E-03	4908	0.96	1.56E-03	1.27
2.98E-03	4727	0.92	2.72E-03	1.50
5.40E-03	4465	0.87	4.84E-03	1.81
9.62E-03	4050	0.79	8.36E-03	2.35
1.70E-02	3581	0.70	1.43E-02	3.00
3.00E-02	3142	0.61	2.42E-02	3.70
4.87E-02	2797	0.55	3.72E-02	4.71
8.03E-02	2472	0.48	5.62E-02	6.54

⁺ 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

⁻ High Noise Level Interfering with Damping Measurement

Table D.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen UTA-58-A (5G), Sample No. P-6; Compacted to 98% Modified Proctor and Water Content of 10.9% ("Field Capacity"); Isotropic Confining Pressure, $\sigma_o = 48$ psi (6.9 ksf = 331 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, %
2.72E-04	5330	1.00	0.34	2.73E-04	5320	1.00	0.30
5.49E-04	5256	0.99	0.38	5.48E-04	5265	0.99	0.36
1.04E-03	5191	0.97	0.52	1.04E-03	5173	0.97	0.51
2.28E-03	4976	0.93	0.83	2.30E-03	4938	0.93	0.81
4.84E-03	4669	0.88	1.82	4.93E-03	4593	0.86	1.61
1.09E-02	4132	0.78	3.62	1.10E-02	4104	0.77	3.32



FUGRO CONSULTANTS, INC.

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

February 1, 2008

Mr. Wm. Allen Lancaster
MACTEC Engineering and Consulting, Inc.
396 Plasters Avenue
Atlanta, Georgia 30324

RE: One (1) Report For The Vogtle (a.k.a. VGL) Project

Dear Mr. Lancaster:

Fugro has completed one (1) RCTS test, which is P-16 at 99% for the VGL project. Fugro has incorporated, as applicable, Dr. Kenneth Stokoe's comments into the final report. The final report and the associated RCTS Test Approval by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

A handwritten signature in cursive script, appearing to read "Meng".

Jiewu Meng, PhD, P.E.
Project Engineer

A handwritten signature in cursive script, appearing to read "Bill DeGroff".

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

DLN V6COL 435, 29 PAGES



RCTS TEST APPROVAL

PROJECT SITE/NAME	VGL
-------------------	-----

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#T	P-16, 99%	20	LHG ④	26-Jan-08

One RCTS test for the site referenced above was tested, and one report was prepared, by Fugro Consultants, Inc.

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

Approved By:



Dr. Kenneth Stokoe

④ Consider comments on several figures. Data looks good!

APPENDIX T

Specimen P-16, 99%
Reconstituted Engineering Fill at 99% Compaction
(Non-Plastic)

Borehole ---

P-16

Depth = 20 ft (6.1 m)

Total Unit Weight = 131.2 lb/ft^3

Water Content = 9.5 %

Estimated In-Situ K_o = 0.5

Estimated In-Situ Mean Effective
Stress = 9 psi

FUGRO JOB #: 0401-1667
Testing Station: RC7



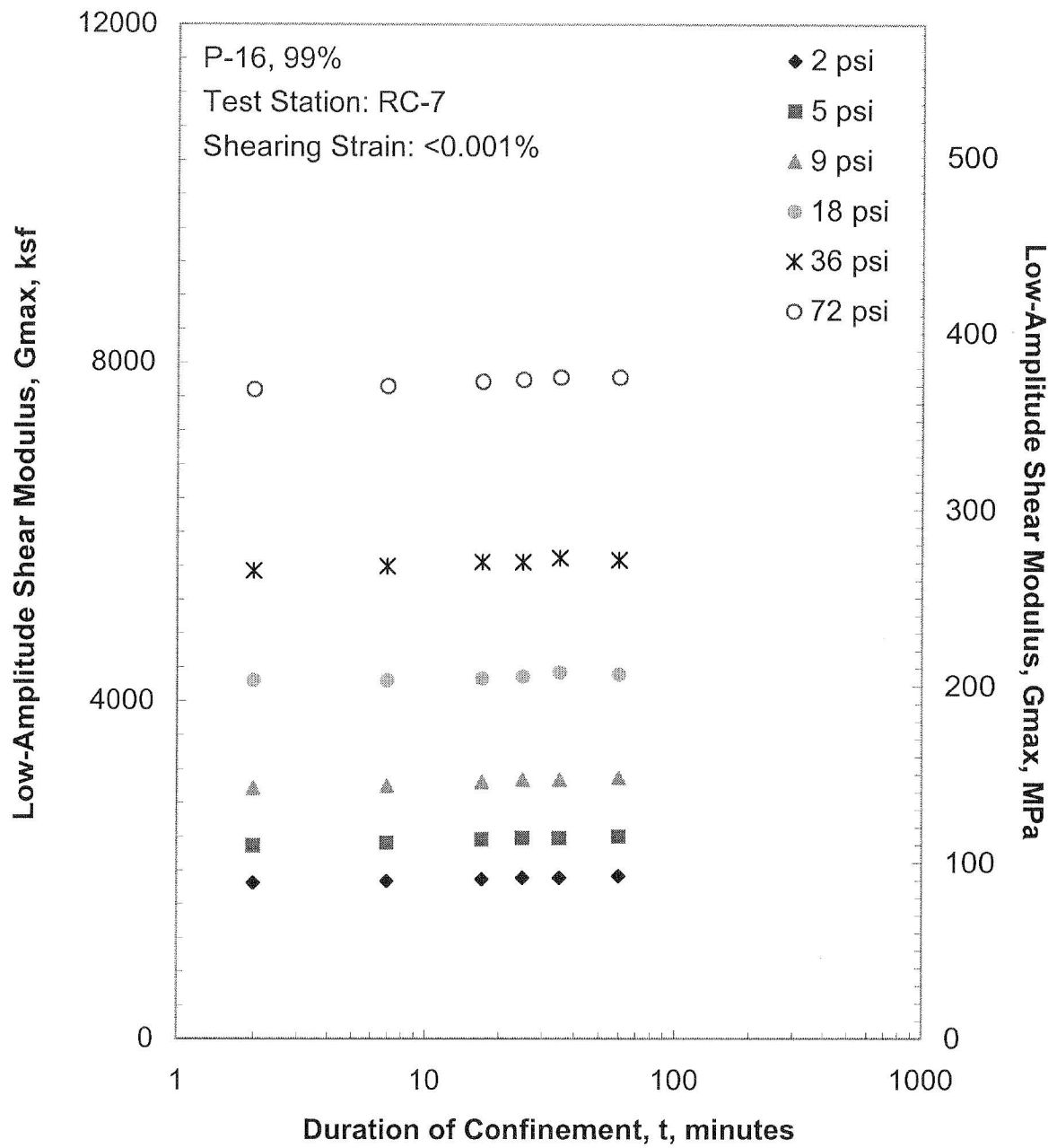


Figure T.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

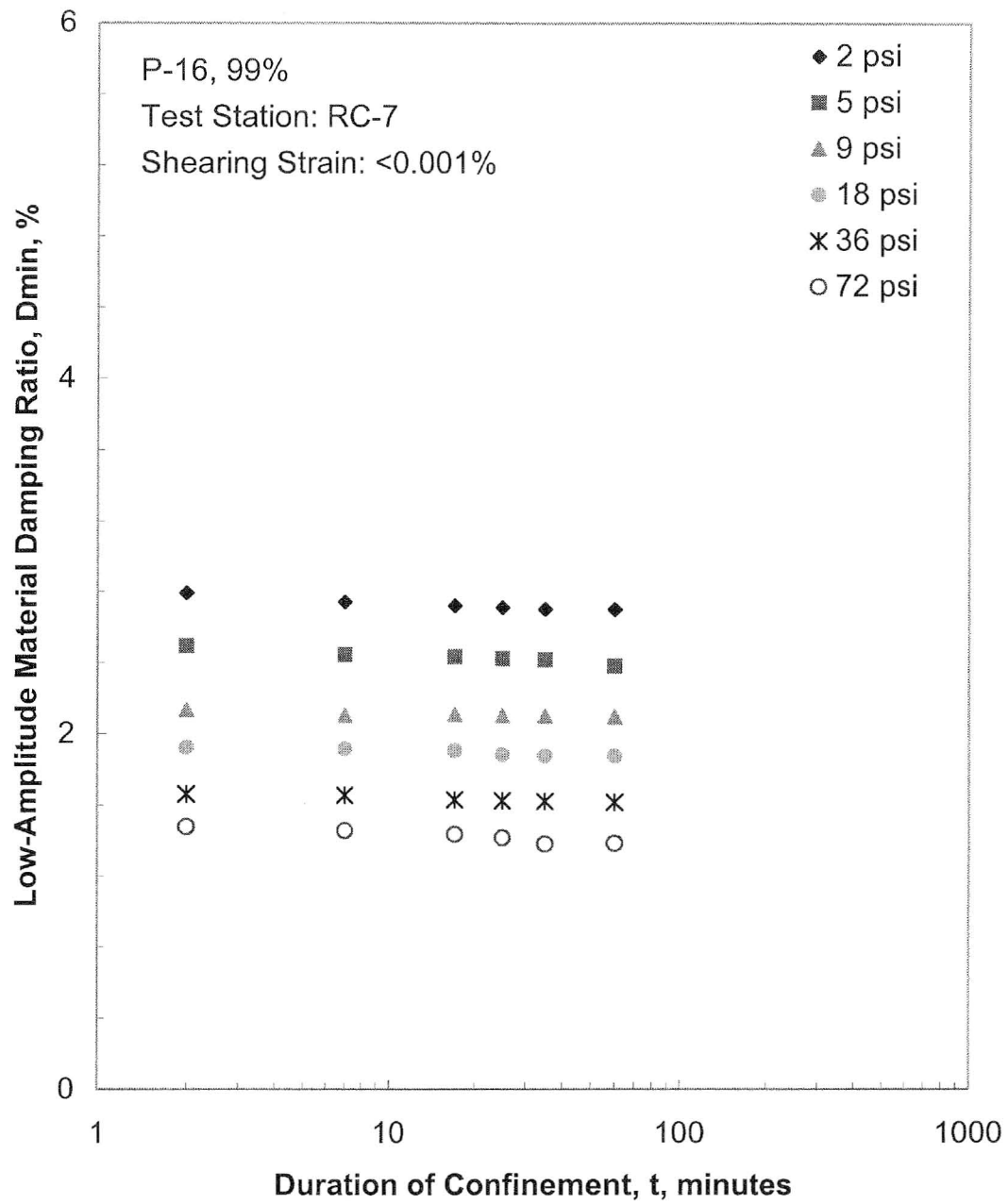


Figure T.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

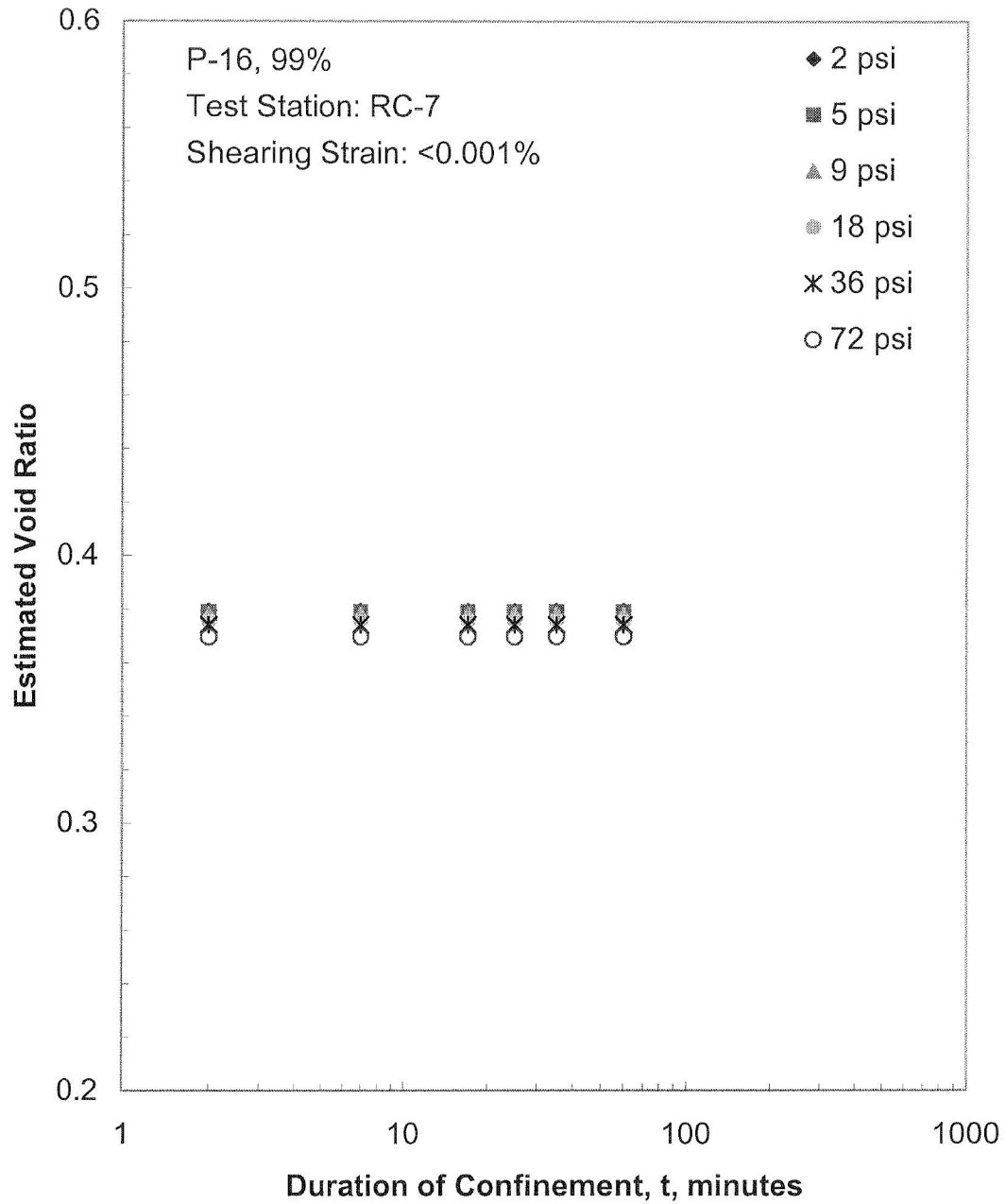


Figure T.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

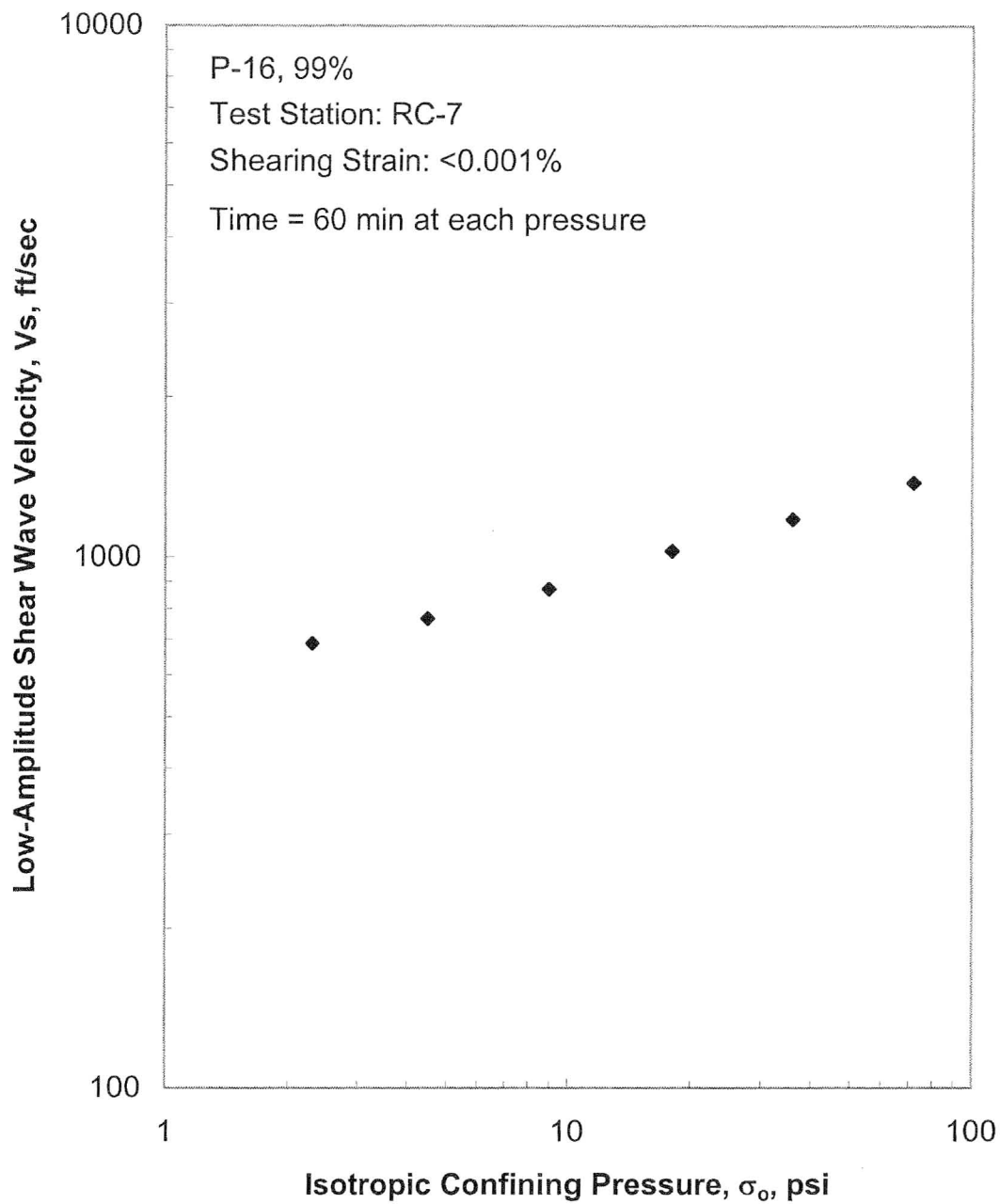


Figure T.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

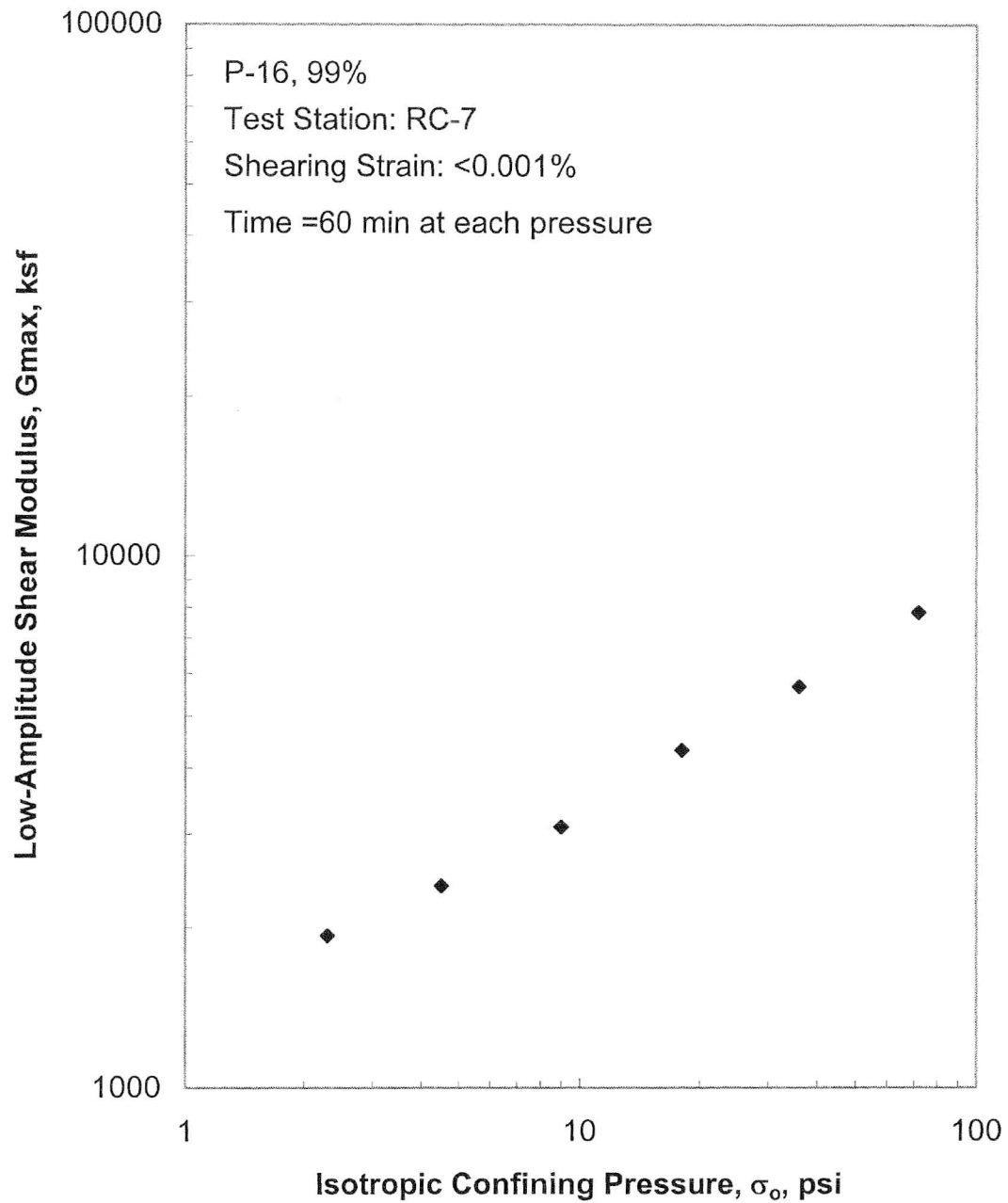


Figure T.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

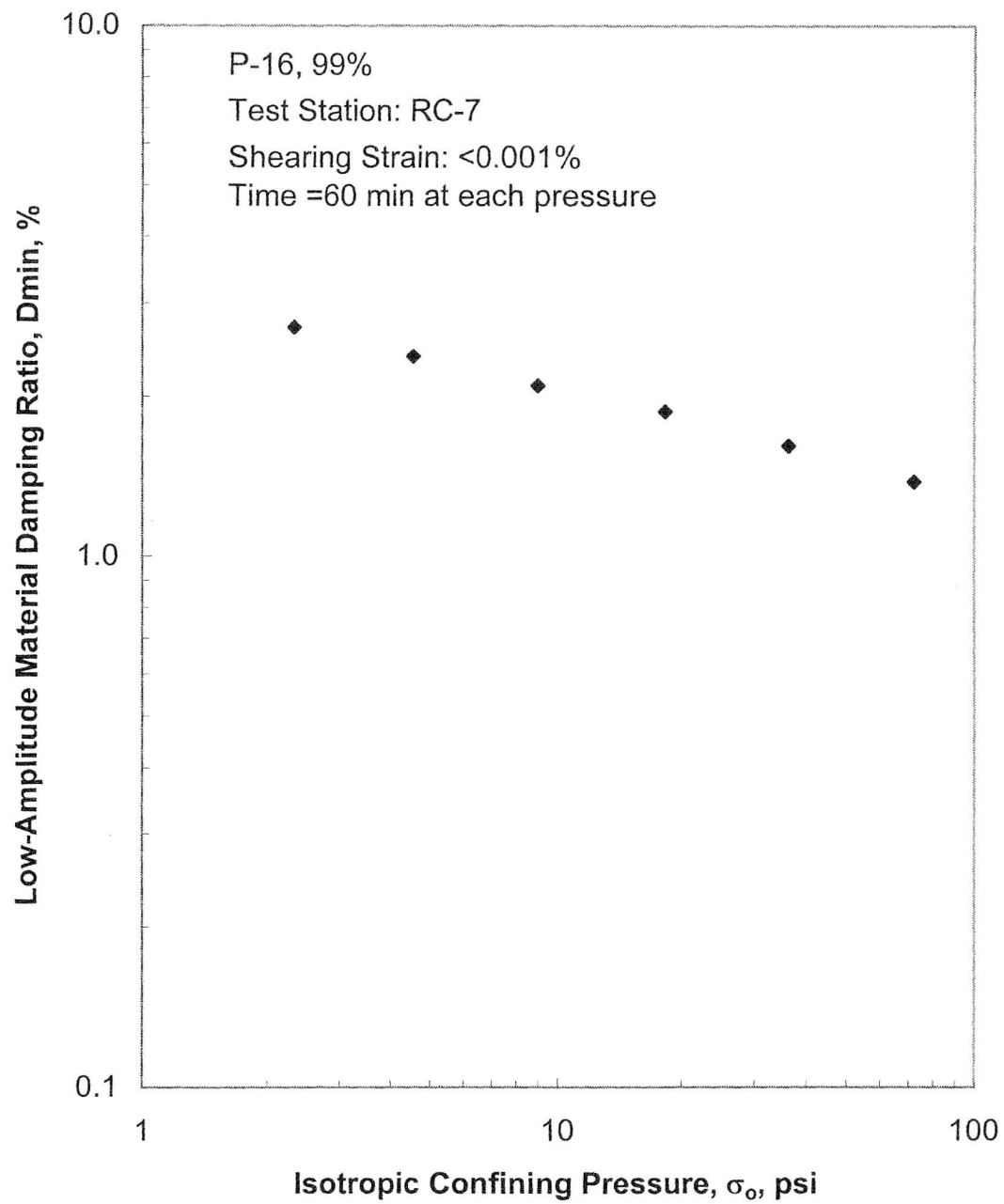


Figure T.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

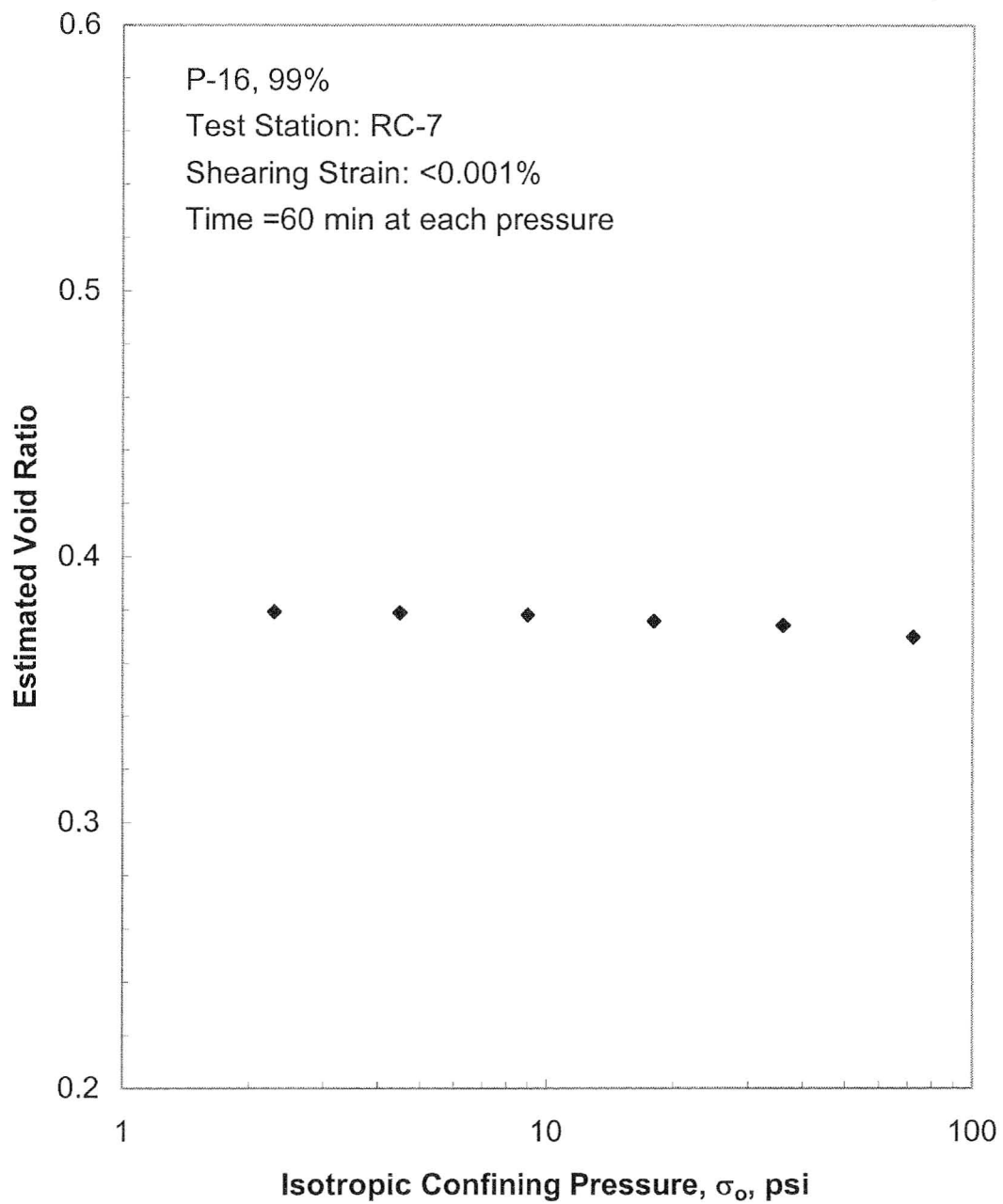


Figure T.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

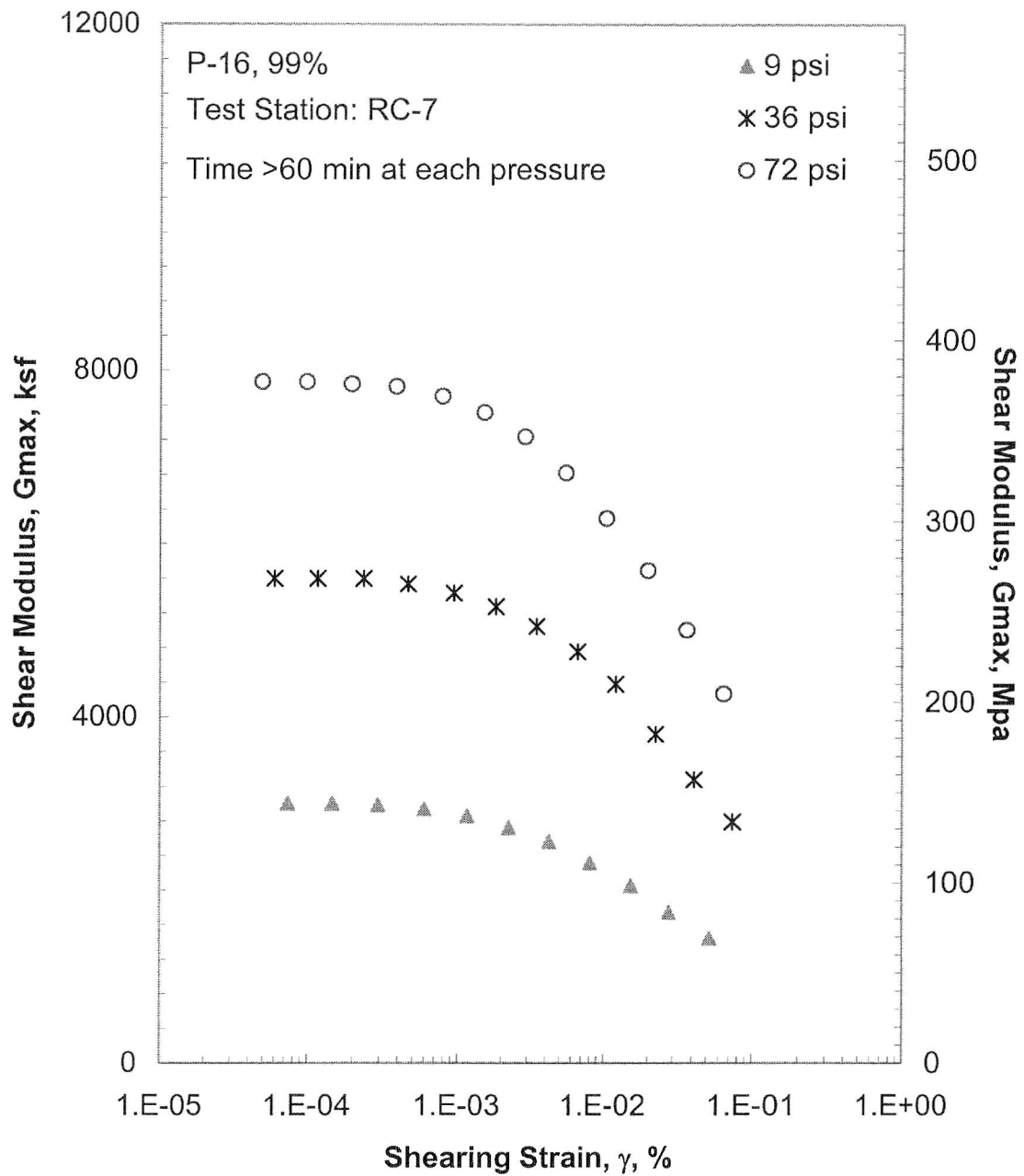


Figure T.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

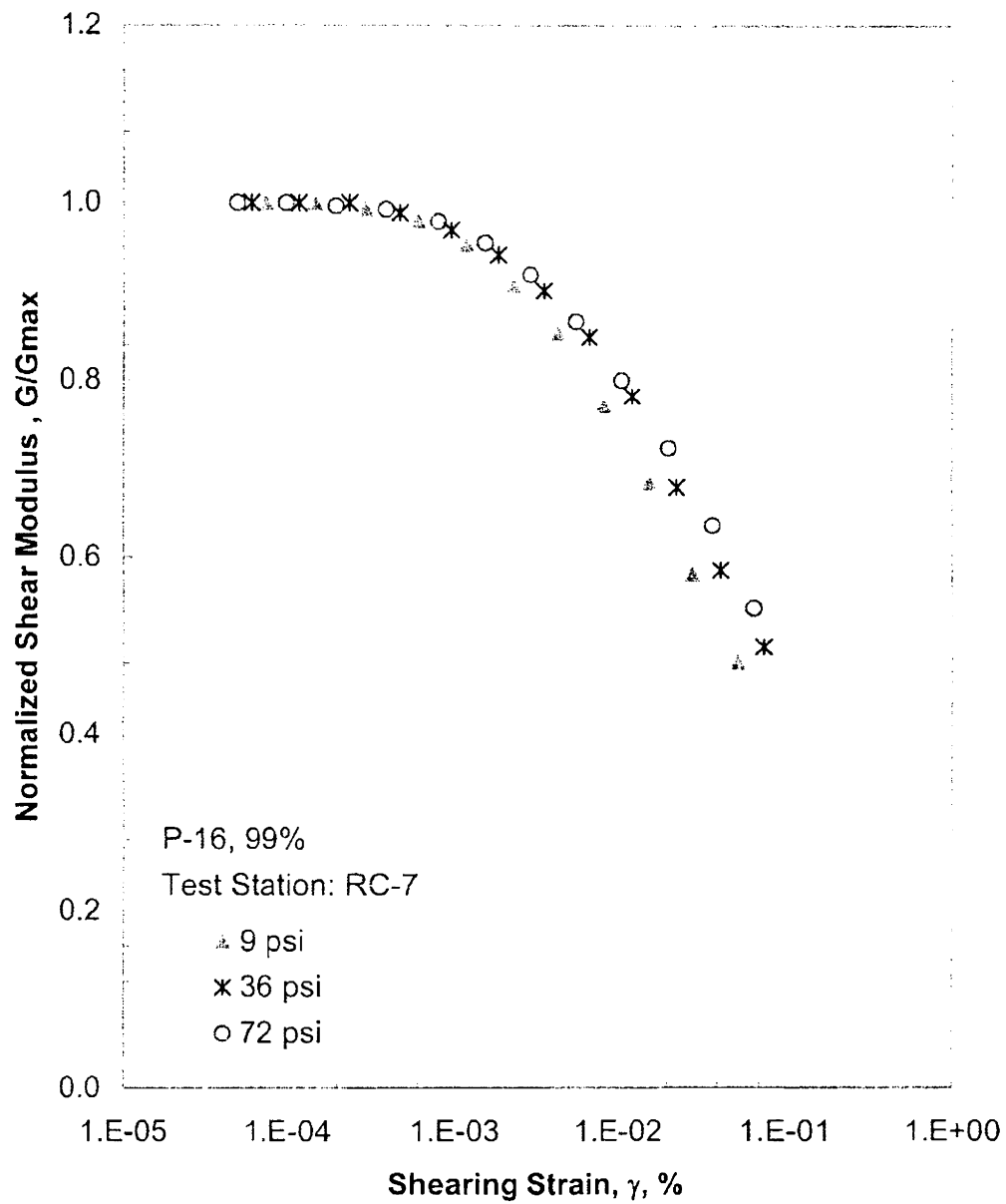


Figure T.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

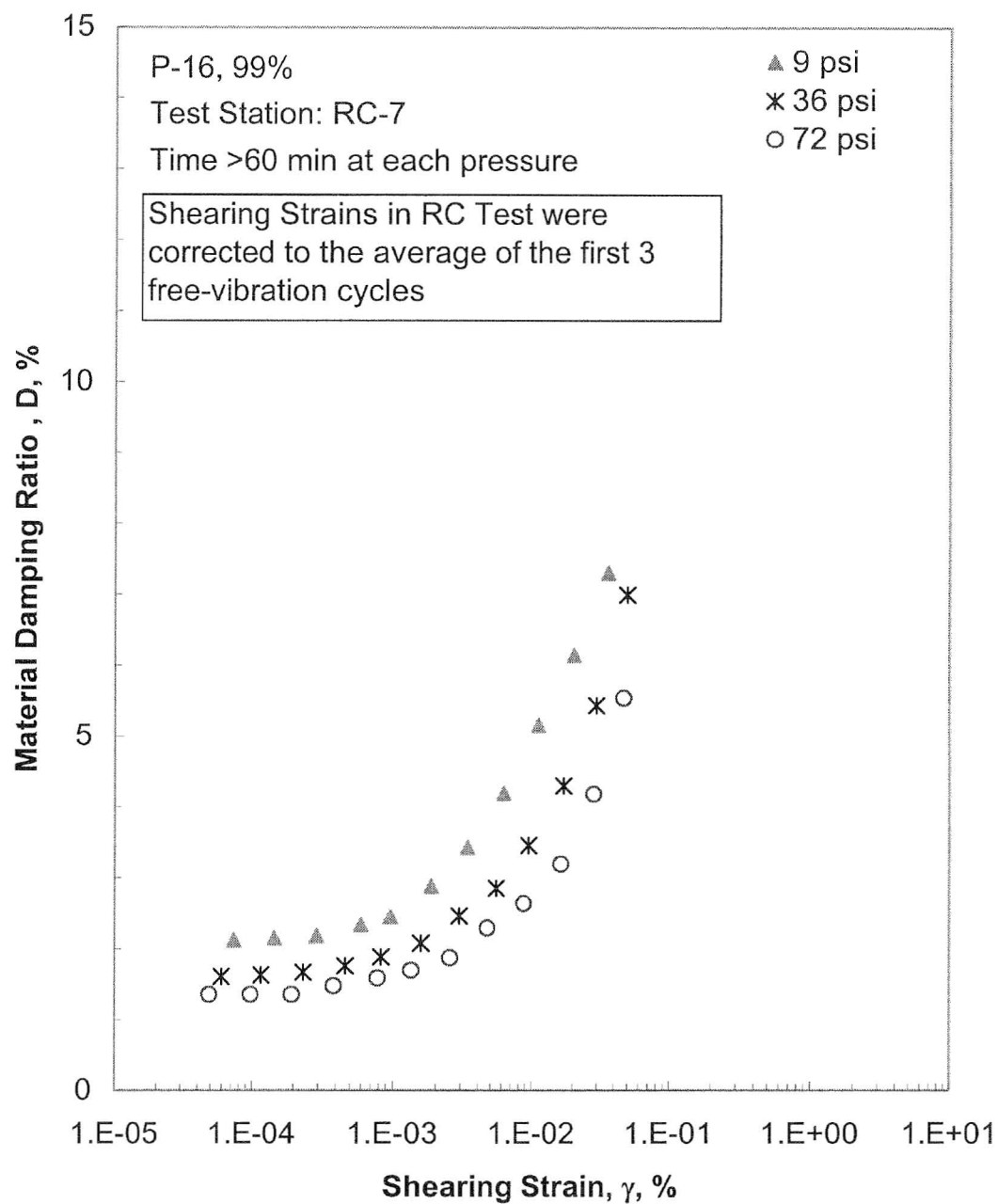


Figure T.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

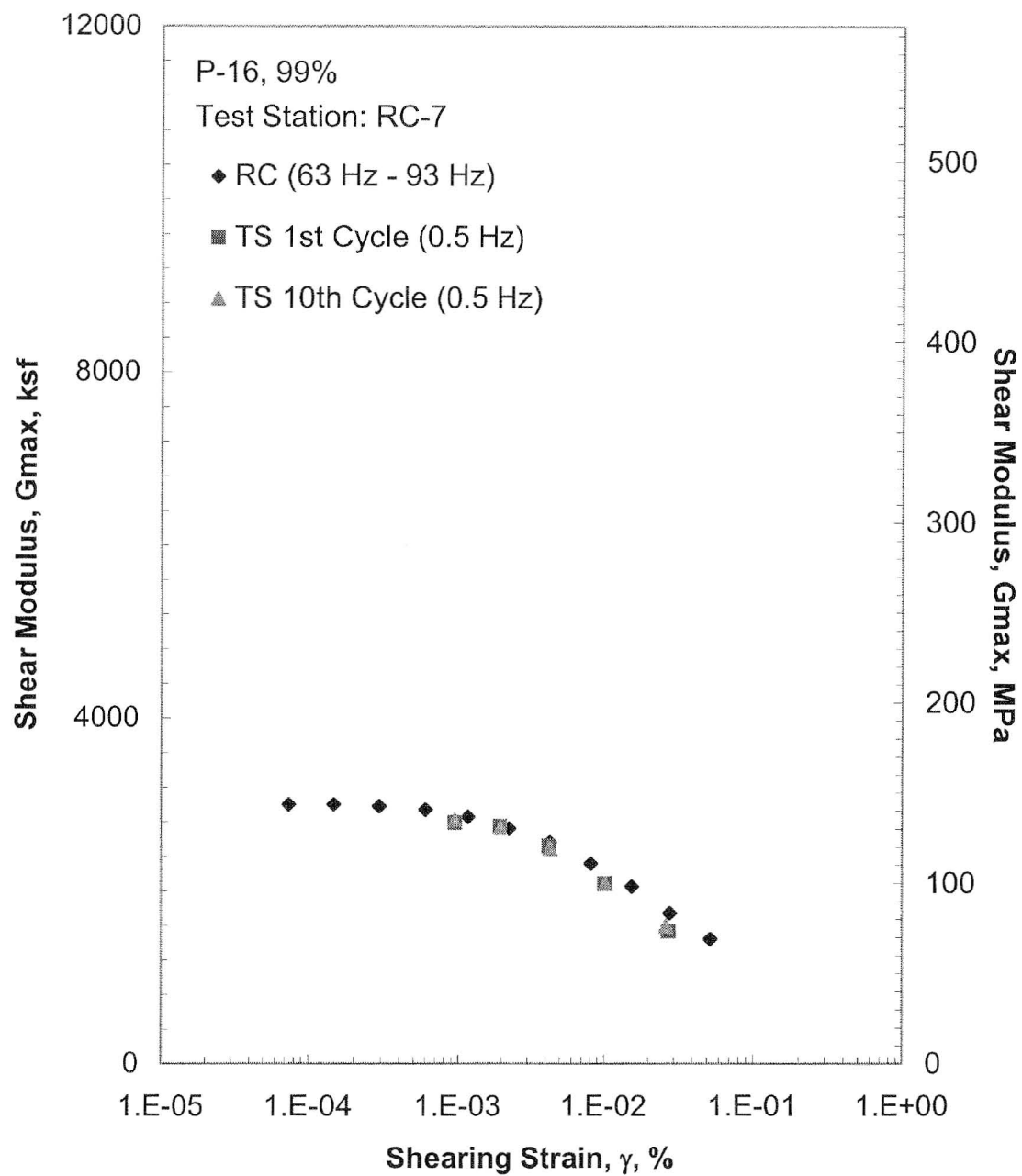


Figure T.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

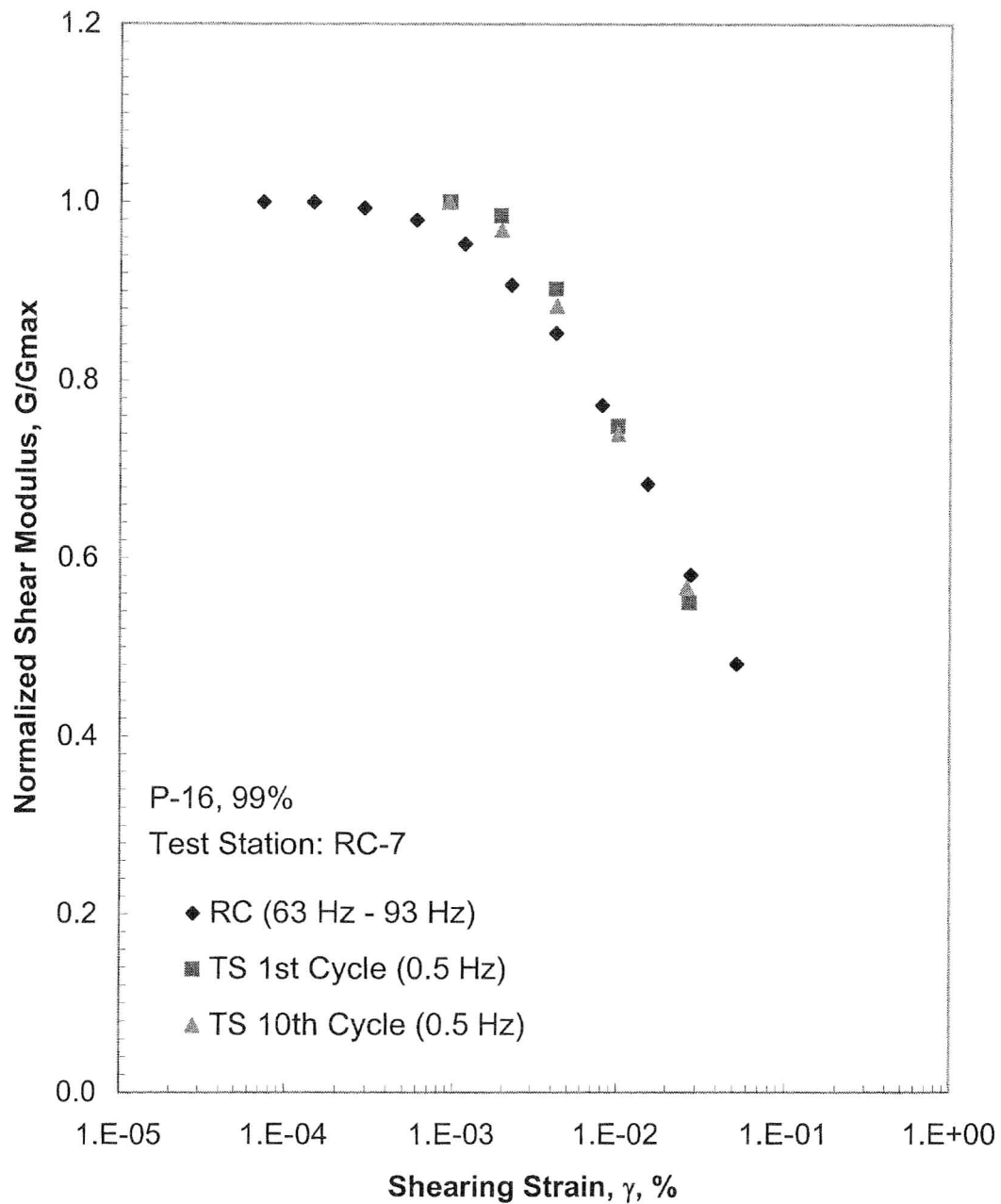


Figure T.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

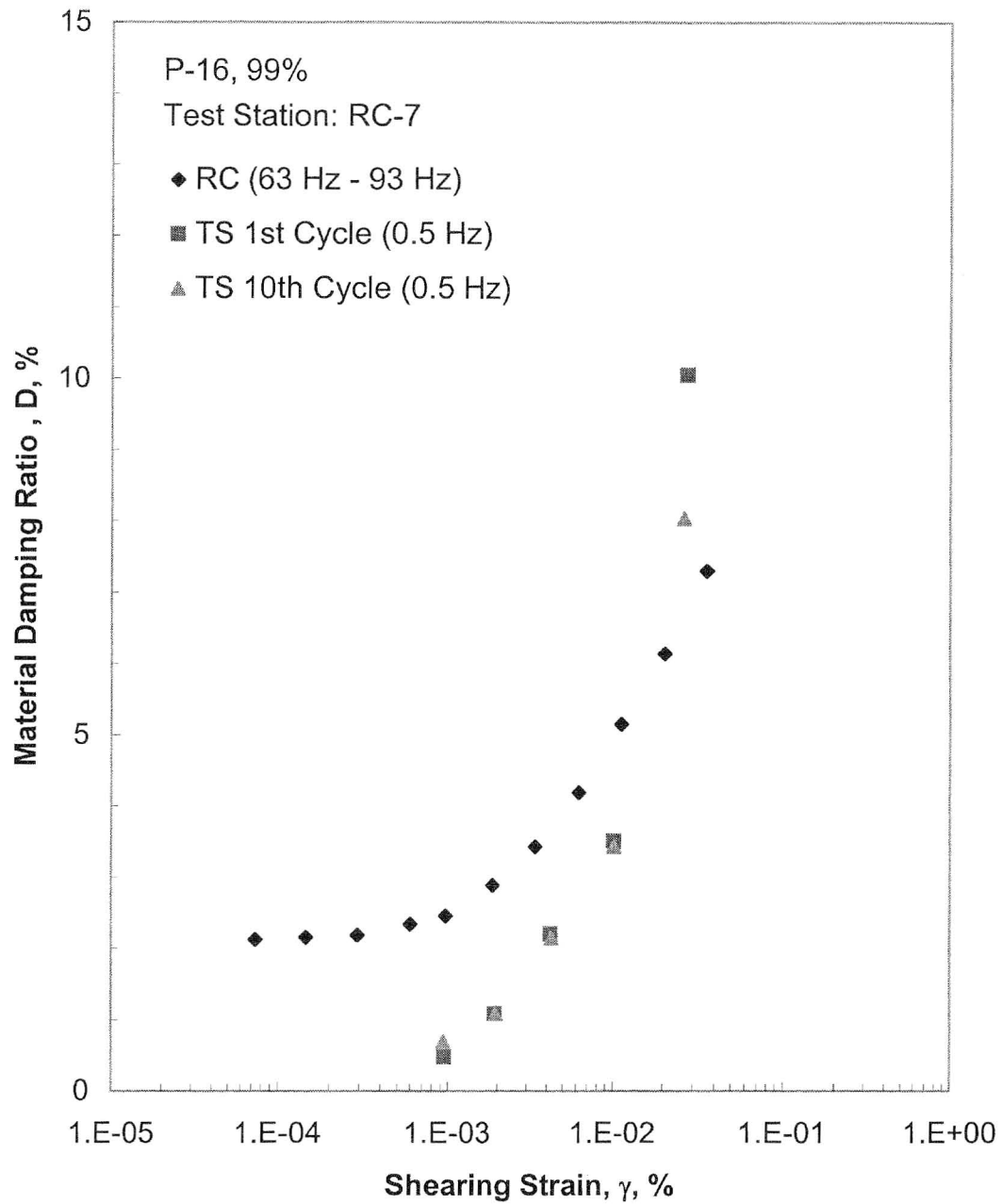


Figure T.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

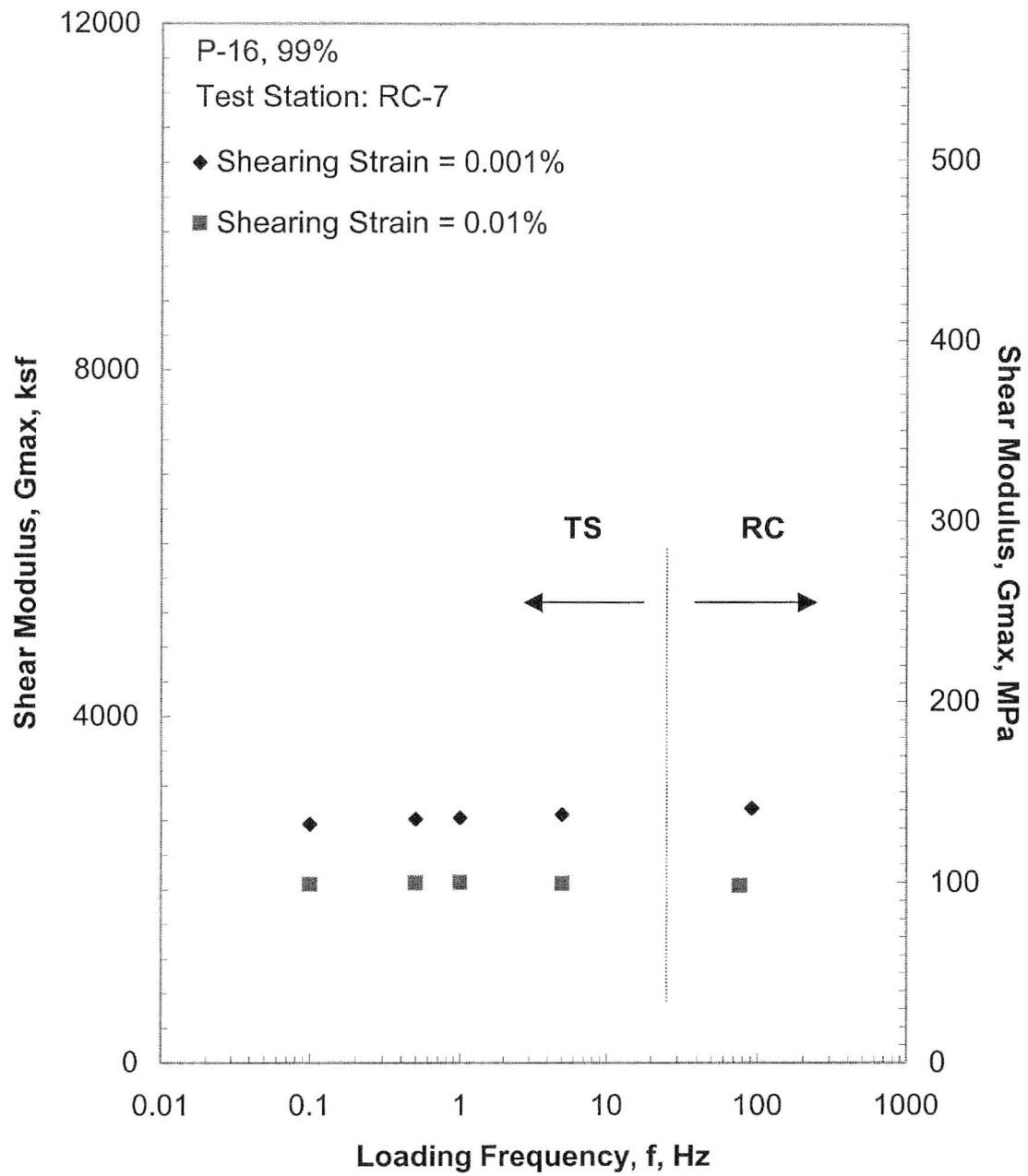


Figure T.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

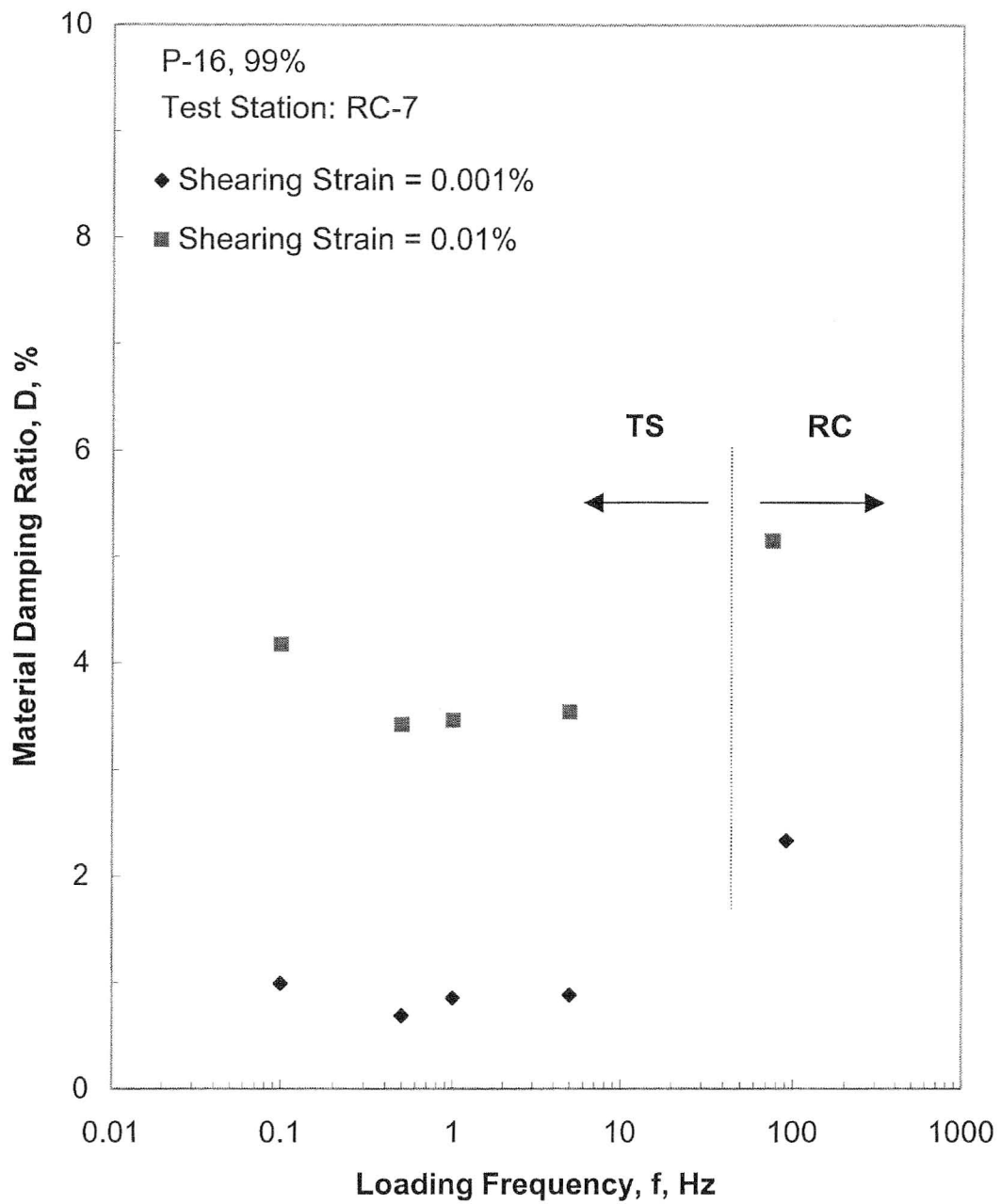


Figure T.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 9 psi from the Combined RCTS Tests

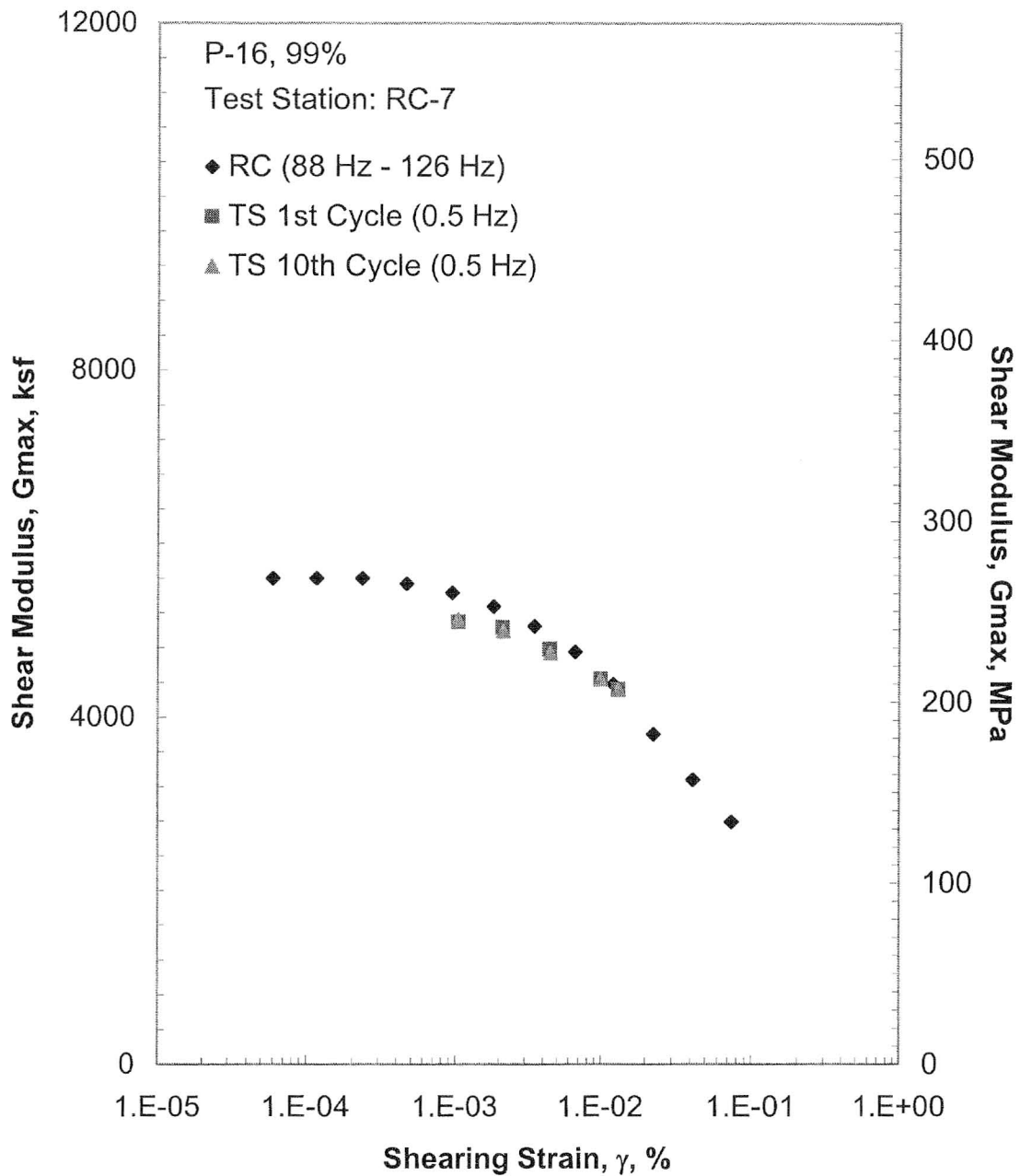


Figure T.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 36 psi from the Combined RCTS Tests

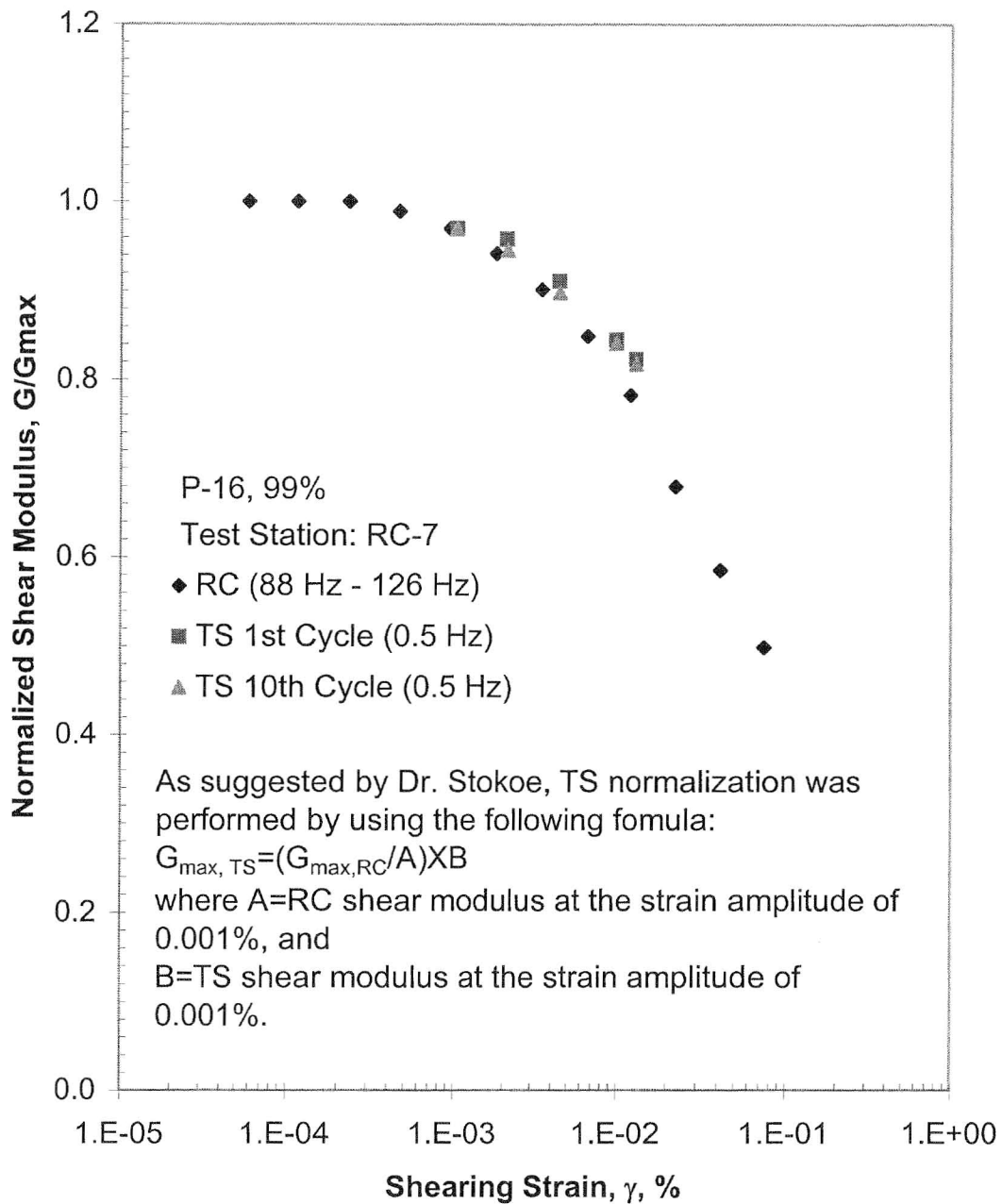


Figure T.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 36 psi from the Combined RCTS Tests

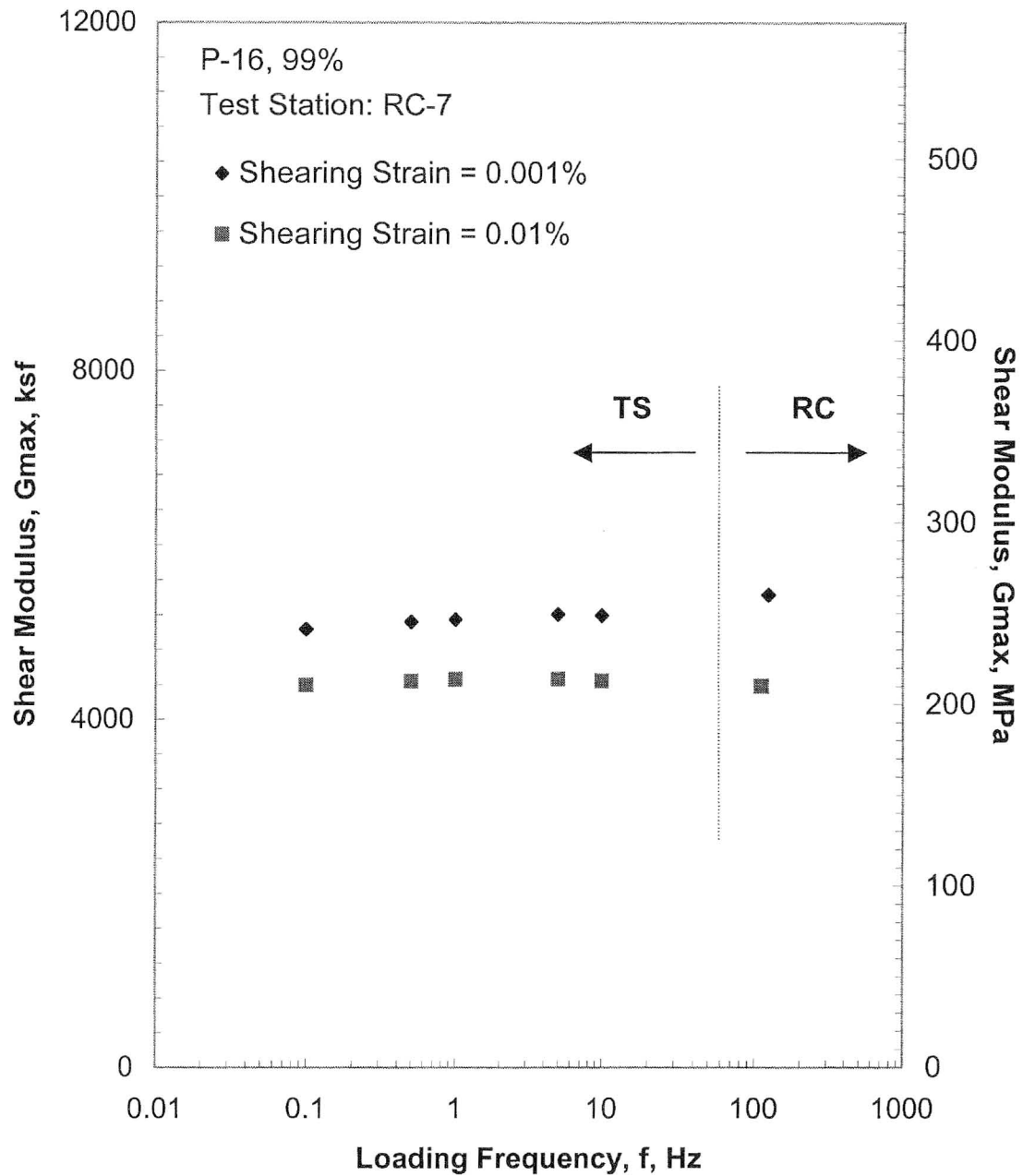


Figure T.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 36 psi from the Combined RCTS Tests

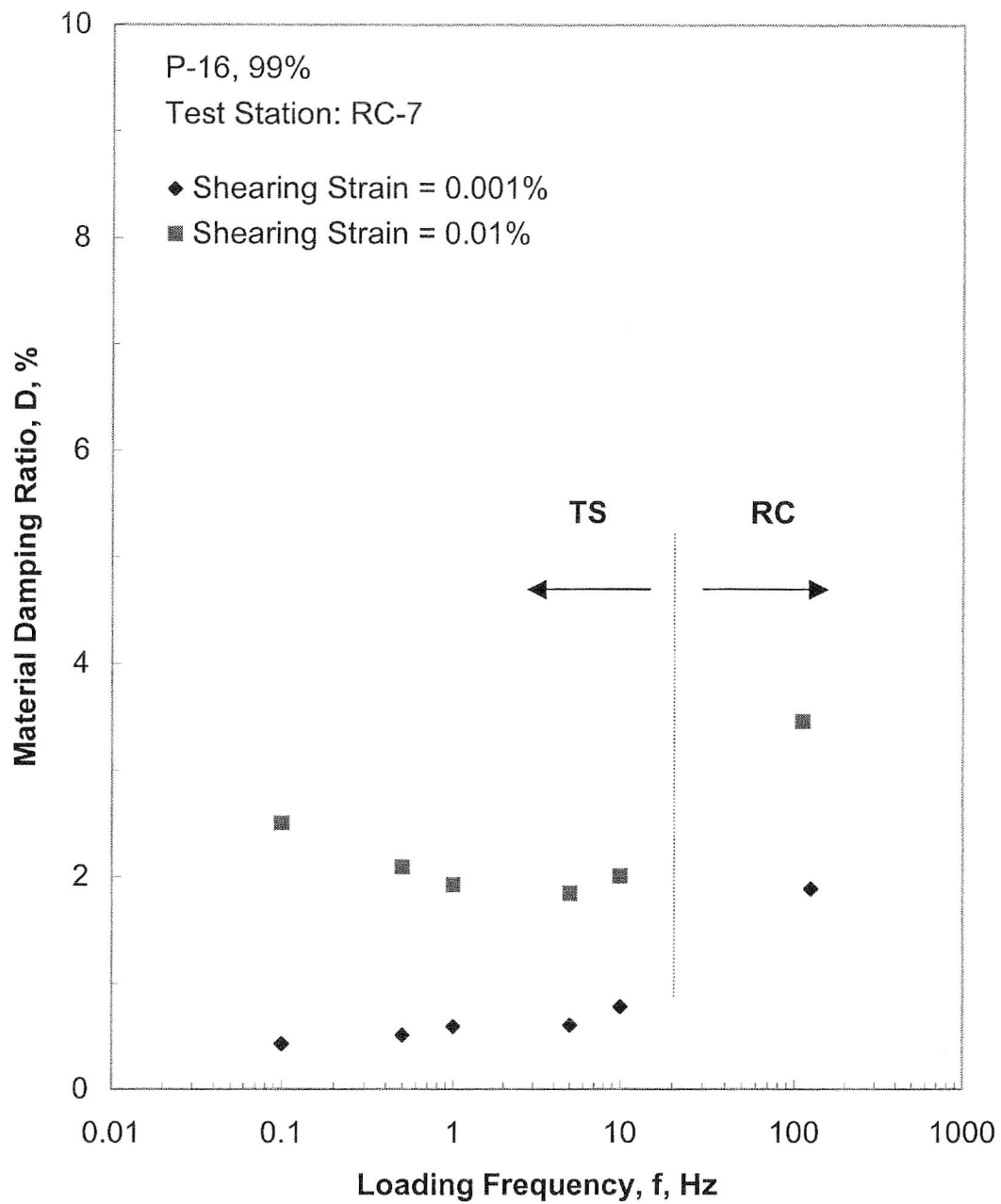


Figure T.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 36 psi from the Combined RCTS Tests

Table T.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 P-16, 99%

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
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
2	331	16	1932	93	688	2.70	0.38
5	648	31	2398	115	766	2.38	0.38
9	1296	62	3093	148	870	2.09	0.38
18	2592	124	4314	207	1027	1.87	0.38
36	5184	248	5671	272	1176	1.61	0.37
72	10368	496	7822	375	1380	1.38	0.37

Table T.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen P-16, 99%; Isotropic Confining Pressure, $\sigma_o=9$ psi (1.3 ksf = 62 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
7.40E-05	3002	1.00	7.40E-05	2.12
1.47E-04	3002	1.00	1.47E-04	2.15
2.93E-04	2982	0.99	2.93E-04	2.18
5.99E-04	2941	0.98	5.99E-04	2.34
1.17E-03	2861	0.95	9.69E-04	2.45
2.25E-03	2722	0.91	1.87E-03	2.88
4.24E-03	2561	0.85	3.39E-03	3.42
8.10E-03	2317	0.77	6.24E-03	4.19
1.54E-02	2052	0.68	1.13E-02	5.15
2.82E-02	1744	0.58	2.06E-02	6.14
5.27E-02	1444	0.48	3.63E-02	7.30

⁺ 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 T.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen P-16, 99%; Isotropic Confining Pressure, $\sigma_o = 9$ psi (1.3 ksf = 62 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, %
9.50E-04	2788	1.00	0.48	9.41E-04	2817	1.00	0.69
1.93E-03	2745	0.98	1.08	1.94E-03	2728	0.97	1.09
4.22E-03	2515	0.90	2.20	4.26E-03	2487	0.88	2.14
1.01E-02	2086	0.75	3.50	1.02E-02	2082	0.74	3.42
2.77E-02	1531	0.55	10.05	2.66E-02	1595	0.57	8.03

Table T.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen P-16, 99%; Isotropic Confining Pressure, $\sigma_o = 36$ psi (5.2 ksf = 248 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
6.00E-05	5599	1.00	6.00E-05	1.61
1.17E-04	5599	1.00	1.17E-04	1.63
2.35E-04	5599	1.00	2.35E-04	1.67
4.66E-04	5537	0.99	4.66E-04	1.76
9.45E-04	5431	0.97	8.32E-04	1.89
1.82E-03	5273	0.94	1.58E-03	2.08
3.48E-03	5047	0.90	2.96E-03	2.46
6.65E-03	4753	0.85	5.52E-03	2.85
1.21E-02	4381	0.78	9.55E-03	3.46
2.27E-02	3805	0.68	1.73E-02	4.30
4.15E-02	3278	0.59	2.99E-02	5.43
7.46E-02	2792	0.50	5.00E-02	7.00

⁺ 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 T.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen P-16, 99%; Isotropic Confining Pressure, $\sigma_o=36$ psi (5.2 ksf = 248 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, %
1.04E-03	5096	0.97	1.08	1.04E-03	5119	0.97	1.08
2.11E-03	5034	0.96	1.26	2.13E-03	4991	0.95	1.26
4.43E-03	4786	0.91	1.64	4.48E-03	4739	0.90	1.64
9.88E-03	4438	0.84	2.07	9.88E-03	4439	0.84	2.09
1.31E-02	4322	0.82	2.31	1.31E-02	4317	0.82	2.34

* Data not available due to noisy signals

Table T.6 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen P-16, 99%; Isotropic Confining Pressure, $\sigma_o = 72$ psi (10.4 ksf = 496 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average ⁺ Shearing Strain, %	Material Damping Ratio ^x , D, %
4.90E-05	7870	1.00	4.90E-05	1.36
9.80E-05	7870	1.00	9.80E-05	1.36
1.95E-04	7842	1.00	1.95E-04	1.36
3.86E-04	7815	0.99	3.86E-04	1.48
7.86E-04	7705	0.98	7.86E-04	1.59
1.51E-03	7515	0.95	1.35E-03	1.70
2.88E-03	7236	0.92	2.53E-03	1.87
5.50E-03	6821	0.87	4.73E-03	2.29
1.05E-02	6294	0.80	8.78E-03	2.64
2.01E-02	5695	0.72	1.64E-02	3.19
3.71E-02	5007	0.64	2.86E-02	4.18
6.51E-02	4269	0.54	4.68E-02	5.54

⁺ 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

Page intentionally left blank