
APPENDIX B

APPENDIX B

Laboratory Tests

Moisture Content (ASTM D2216) and Unit Weight determinations (ASTM D2937) were performed on selected soil samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings at the appropriate sample depths.

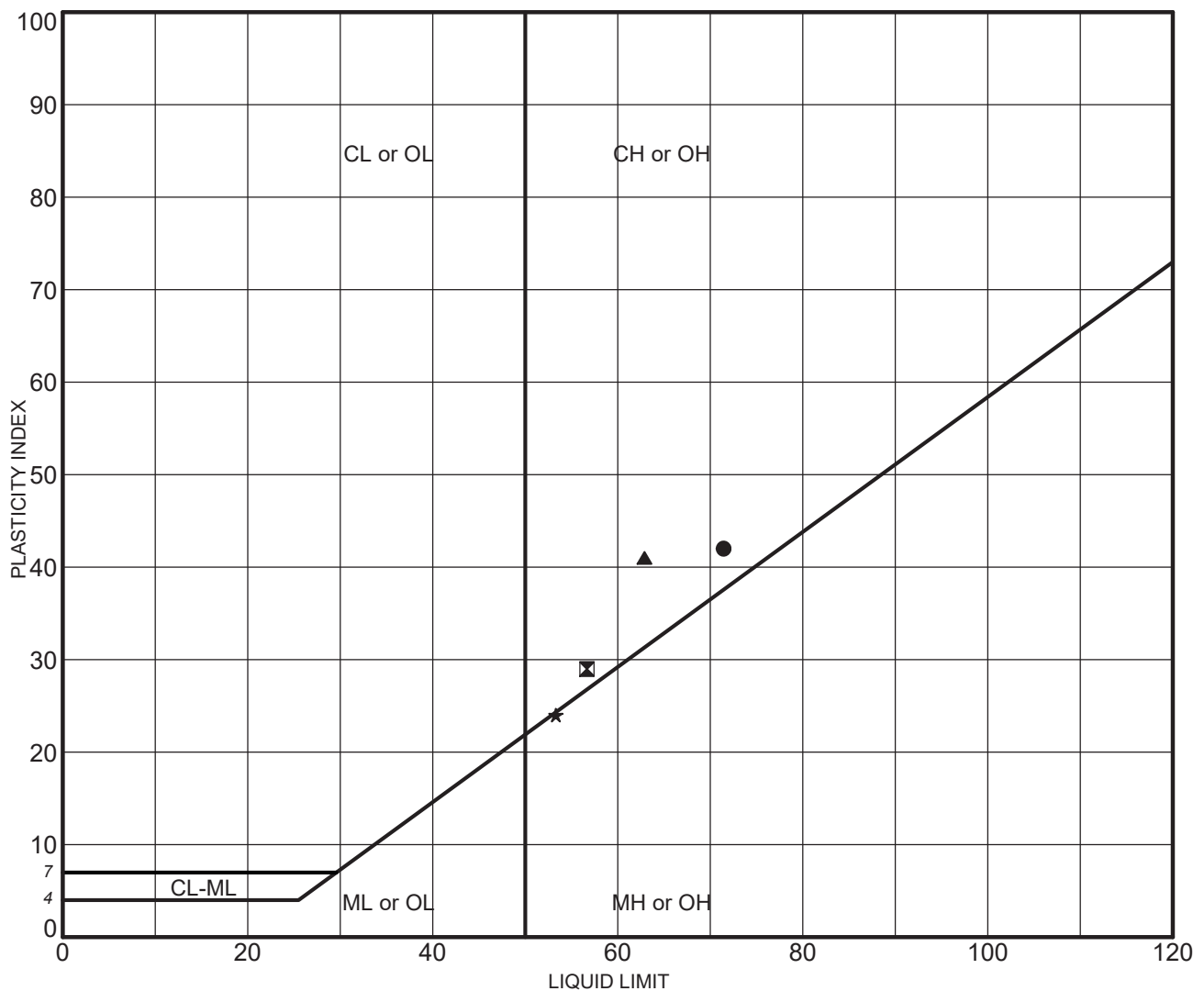
Four Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits and to aid in soil classification. The test results are summarized on the Logs of Borings at the appropriate sample depths. The test results are provided on Plate B-1.

Two Sieve Analysis tests (ASTM D6913) were performed on selected soil samples to evaluate the gradation characteristics of the soils and to aid in soil classification. Graphic presentations of the grain size distributions are provided on Plate B-2.

Two Unconsolidated Undrained Triaxial Compression tests (ASTM D2850) were performed on selected soil samples to evaluate the undrained shear strength of the soils. The undrained shear strength test results along with the shear stress-strain curves are presented on Plates B-3 and B-4.

Four Direct Shear tests (ASTM D3080) were performed on selected samples to evaluate the shear strength characteristics of the materials tested. The test results are presented on Plates B-5 through B-8.

Five Uniaxial Compression tests (ASTM D7012, Method C) were performed on selected core samples to evaluate the unconfined compressive strength of the basalt rock encountered. The test results are presented on Plate B-9.



NP = NON-PLASTIC

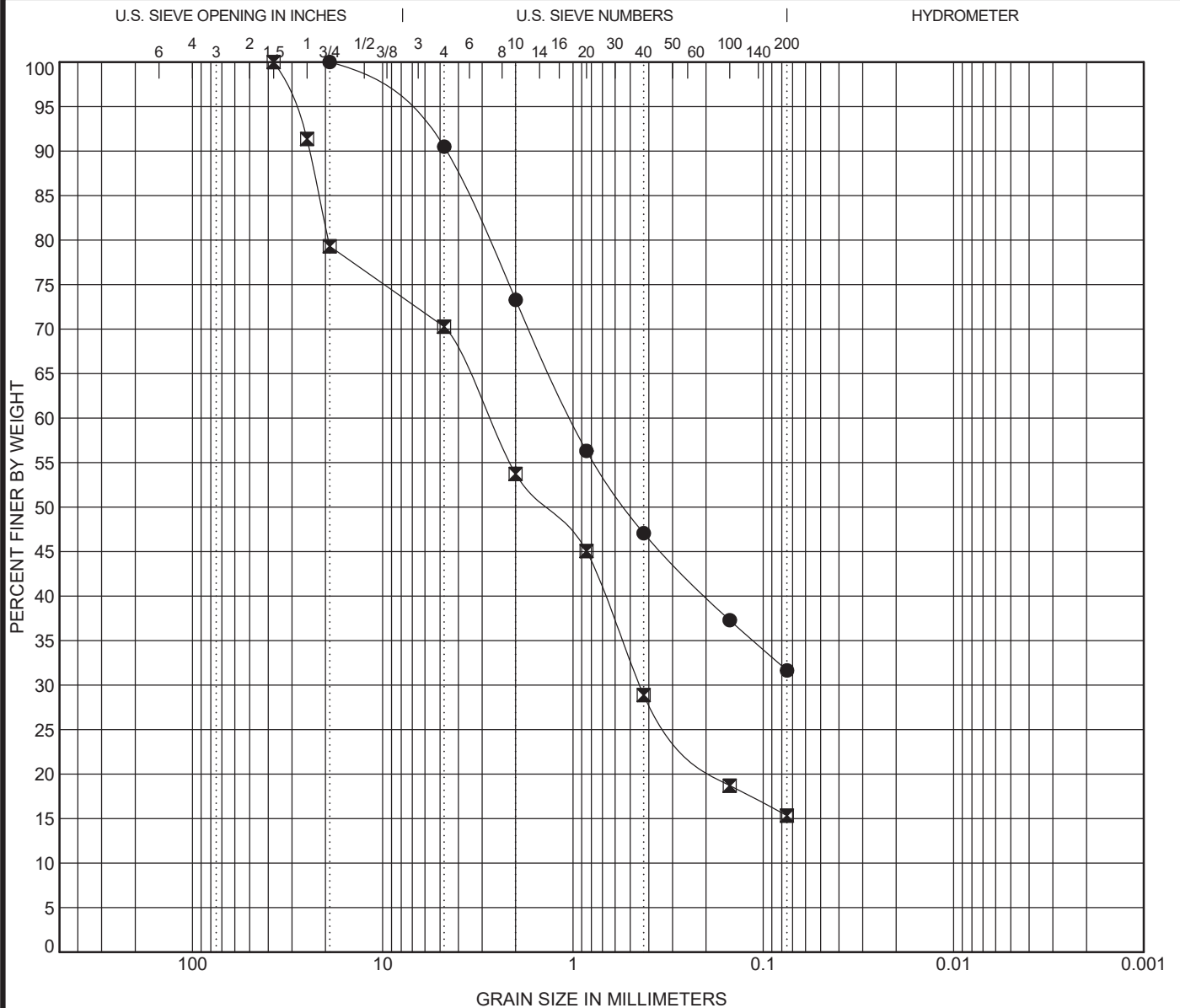


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ATTERBERG LIMITS TEST RESULTS - ASTM D4318

FREEWAY MANAGEMENT SYSTEM
 PHASE 3, UNITS 1 AND 2, IM-0300(152)
 INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
 DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

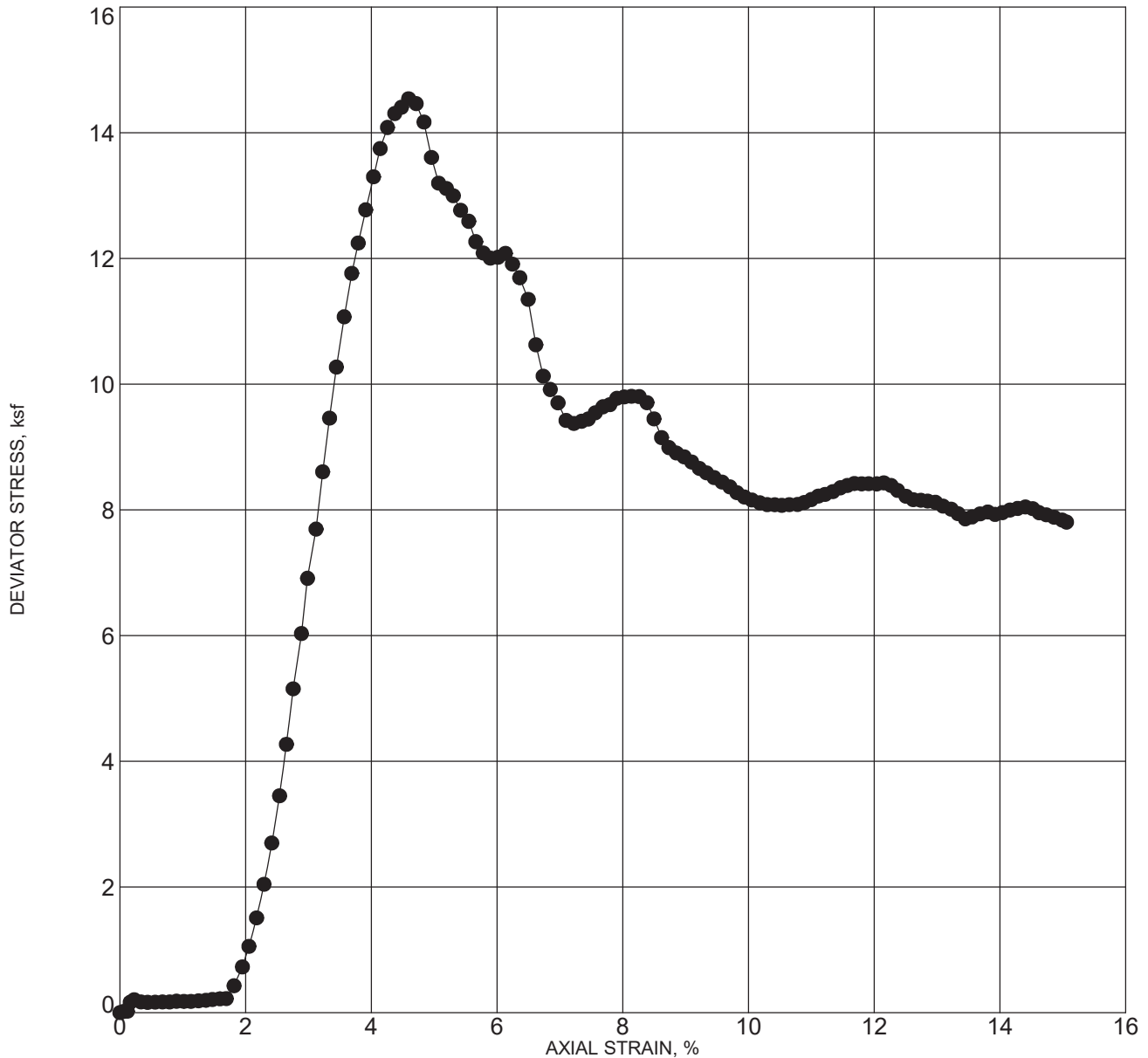
Sample	Depth (ft)	Description						LL	PL	PI	Cc	Cu	
●	B-1	5.0-6.5	Reddish brown with gray mottling silty sand (SM) with a little gravel										
☒	B-5	2.5-4.0	Brownish tan silty sand (SM) with some gravel										
Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine					
●	B-1	5.0-6.5	19	1.024		9.5	58.9	31.6					
☒	B-5	2.5-4.0	37.5	2.778	0.446	29.7	54.9	15.3					



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GRAIN SIZE DISTRIBUTION - ASTM D6913
FREEWAY MANAGEMENT SYSTEM
PHASE 3, UNITS 1 AND 2, IM-0300(152)
INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 2



Max. Deviator Stress (ksf): 14.5

Confining Stress (ksf): 0.3

Location: B-4

Depth: 1.0 - 2.5 feet

Description: Reddish brown clayey silt (MH) with some sand and gravel

Test Date: 9/4/2020

Dry Density (pcf)	96.1	Sample Diameter (inches)	2.413
Moisture (%)	27.0	Sample Height (inches)	5.167
Axial Strain at Failure (%)	4.6	Strain Rate (% / minute)	0.69



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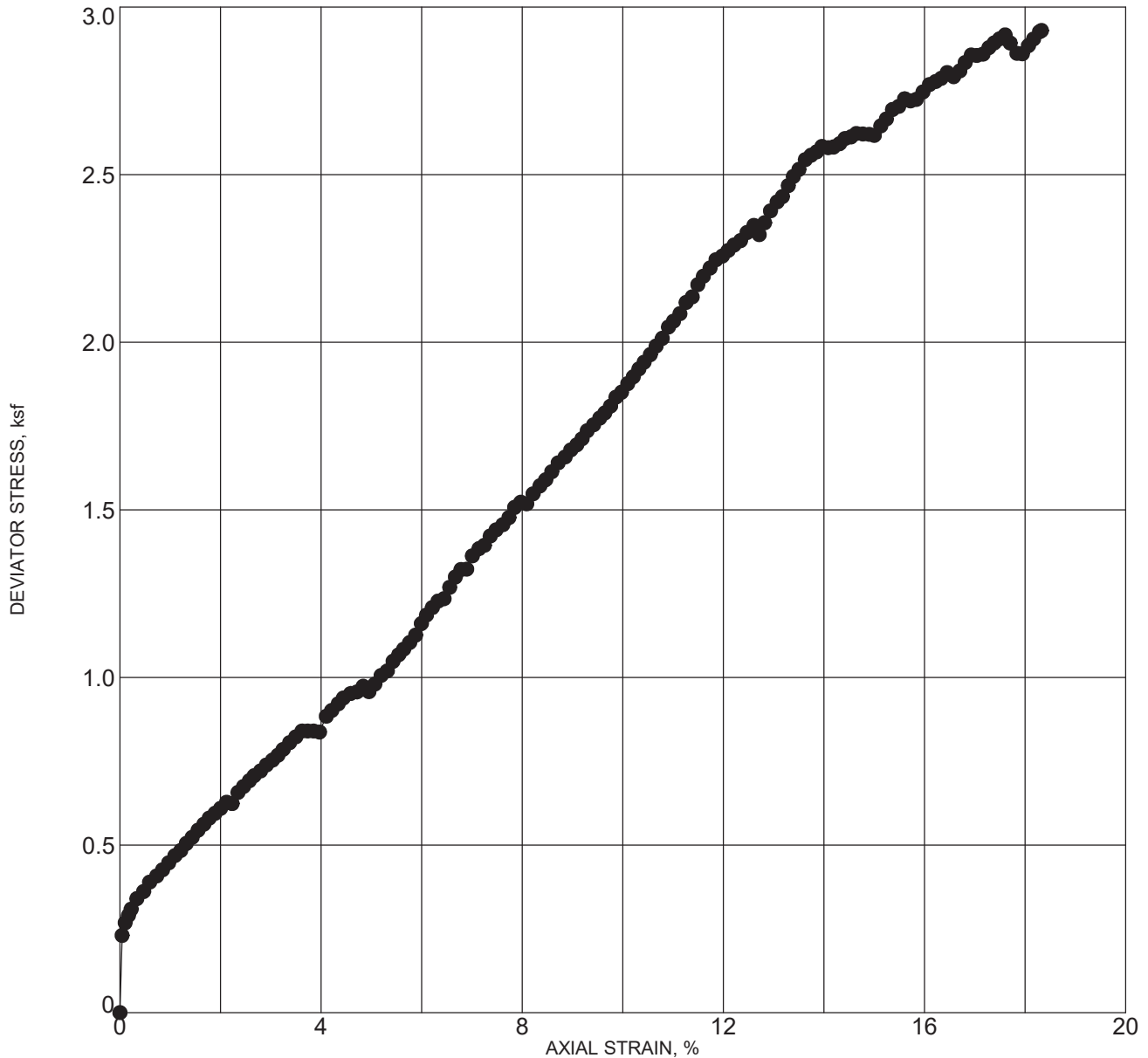
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TRIAXIAL UU COMPRESSION TEST - ASTM D2850

FREEWAY MANAGEMENT SYSTEM
 PHASE 3, UNITS 1 AND 2, IM-0300(152)
 INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
 DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 3



Max. Deviator Stress (ksf): 2.6

Confining Stress (ksf): 0.3

Location: B-5

Depth: 1.0 - 2.5 feet

Description: Brownish tan silty sand (SM) with some gravel

Test Date: 9/4/2020

Dry Density (pcf)	106.3	Sample Diameter (inches)	2.413
Moisture (%)	14.8	Sample Height (inches)	5.133
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.70



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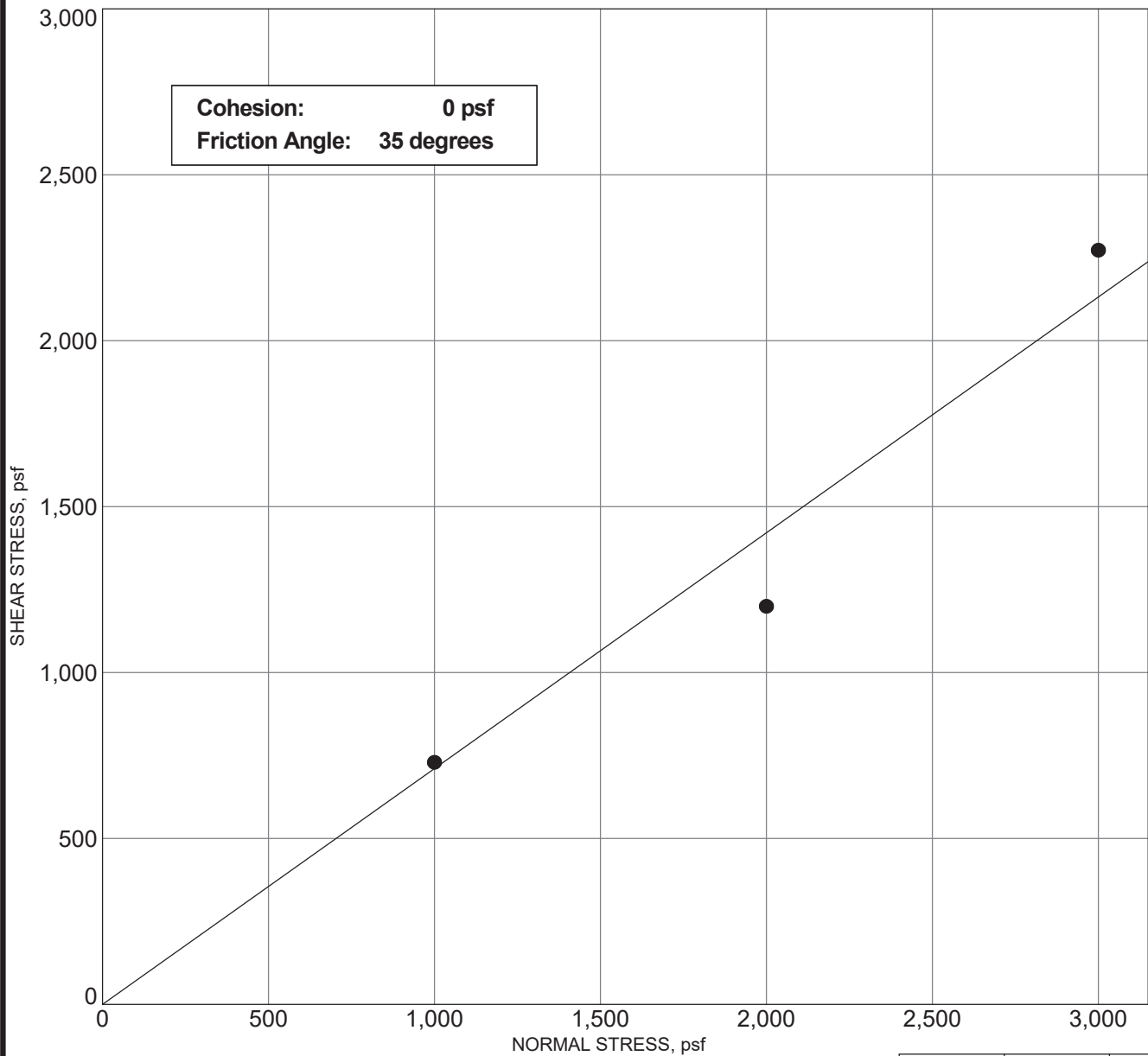
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TRIAXIAL UU COMPRESSION TEST - ASTM D2850

FREEWAY MANAGEMENT SYSTEM
PHASE 3, UNITS 1 AND 2, IM-0300(152)
INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 4



Sample: B-1
Depth: 1.0 - 2.5 feet
Description: Reddish brown silty clay

		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	22.8	19.1	20.6
	Dry Density, pcf	69.0	72.8	72.8
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	40.9	37.7	35.9
	Dry Density, pcf	66.3	75.8	76.6
	Height, inches	1.041	0.961	0.951
	Diameter, inches	2.42	2.42	2.42
	Deformation Rate, inch/minute	0.0024	0.0022	0.0023
	Normal Stress, psf	1000	2000	3000
	Peak Shear Stress, psf	729	1199	2273
	Shear Displacement, inches	0.43	0.42	0.41

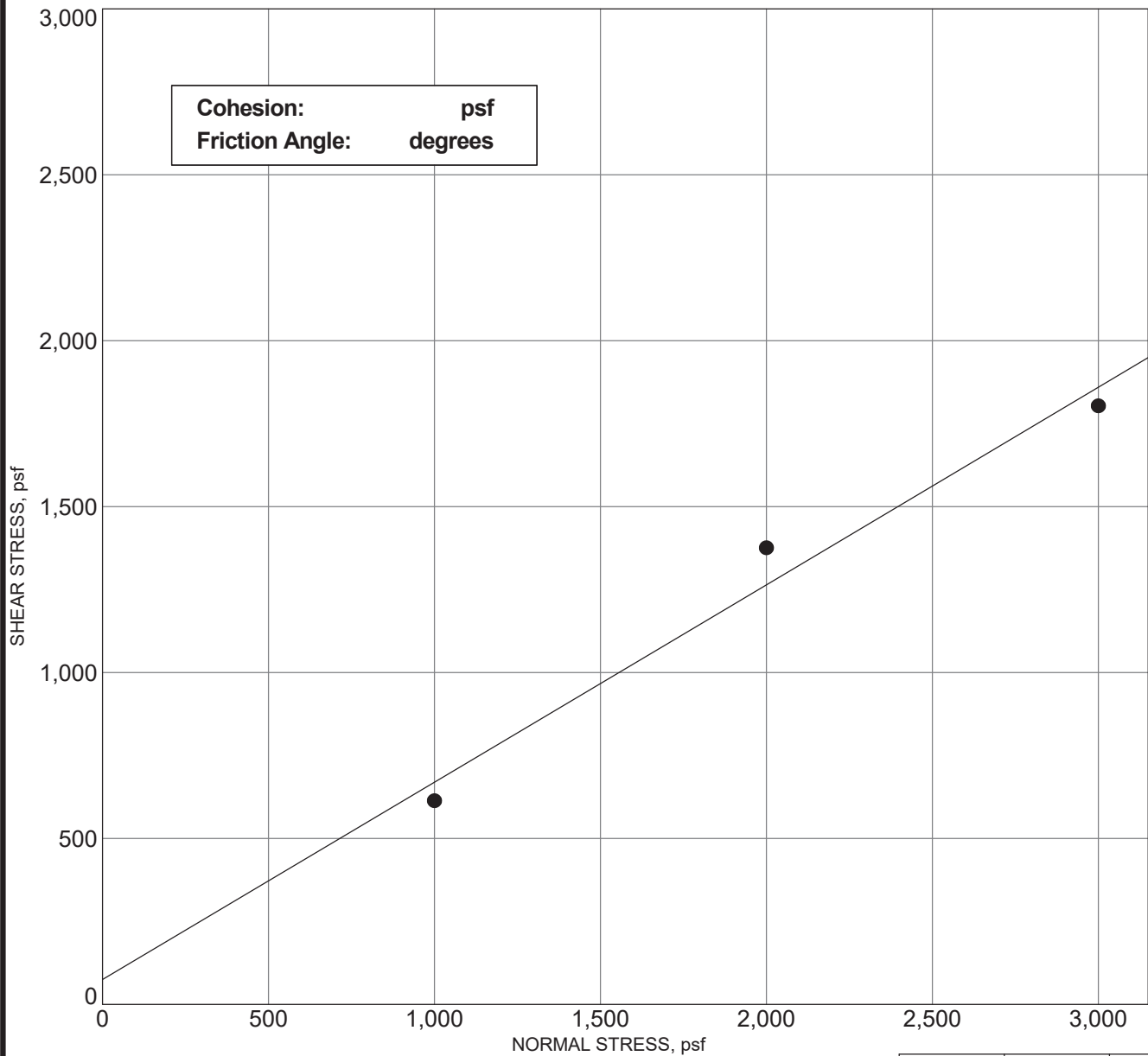


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DIRECT SHEAR TEST - ASTM D3080

FREEWAY MANAGEMENT SYSTEM
PHASE 3, UNITS 1 AND 2, IM-0300(152)
INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 5



Sample: B-2
 Depth: 1.0 - 2.5 feet
 Description: Reddish brown sandy silt with a little gravel

		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	18.6	21.2	21.6
	Dry Density, pcf	66.7	67.8	67.9
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	41.7	36.1	37.0
	Dry Density, pcf	64.3	71.2	70.4
	Height, inches	1.038	0.953	0.965
	Diameter, inches	2.42	2.42	2.42
	Deformation Rate, inch/minute	0.0024	0.0022	0.0024
	Normal Stress, psf	1000	2000	3000
	Peak Shear Stress, psf	614	1376	1804
	Shear Displacement, inches	0.43	0.41	0.42

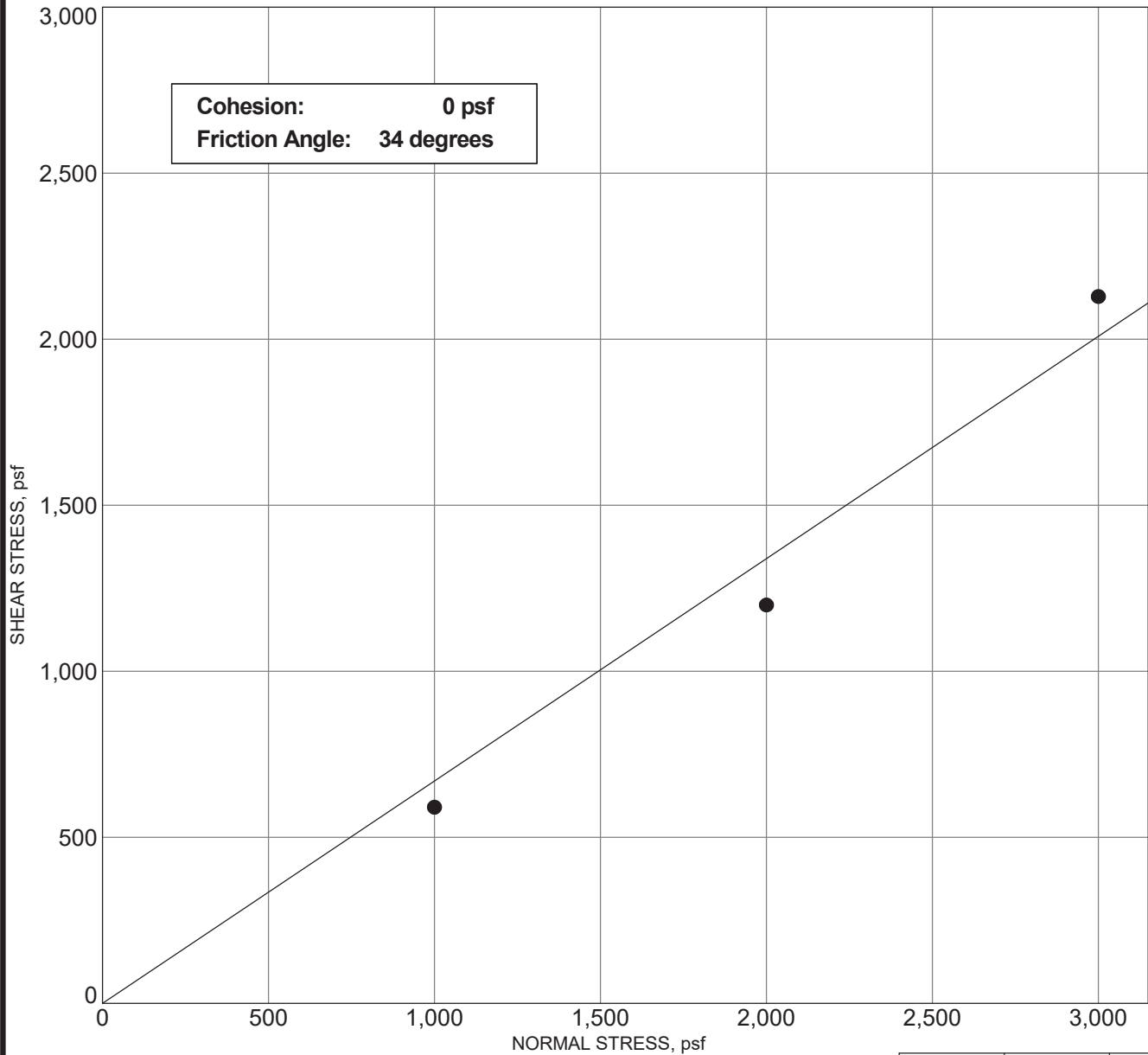


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DIRECT SHEAR TEST - ASTM D3080

FREEWAY MANAGEMENT SYSTEM
 PHASE 3, UNITS 1 AND 2, IM-0300(152)
 INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
 DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 6



Sample: B-2
Depth: 5.0 - 6.5 feet
Description: Reddish brown clayey sand with some gravel

		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	18.3	29.2	21.0
	Dry Density, pcf	66.0	63.3	66.8
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	37.8	34.4	31.4
	Dry Density, pcf	63.8	66.6	67.5
	Height, inches	1.035	0.950	0.990
	Diameter, inches	2.42	2.42	2.42
	Deformation Rate, inch/minute	0.0025	0.0022	0.0024
	Normal Stress, psf	1000	2000	3000
	Peak Shear Stress, psf	591	1199	2128
	Shear Displacement, inches	0.43	0.41	0.42

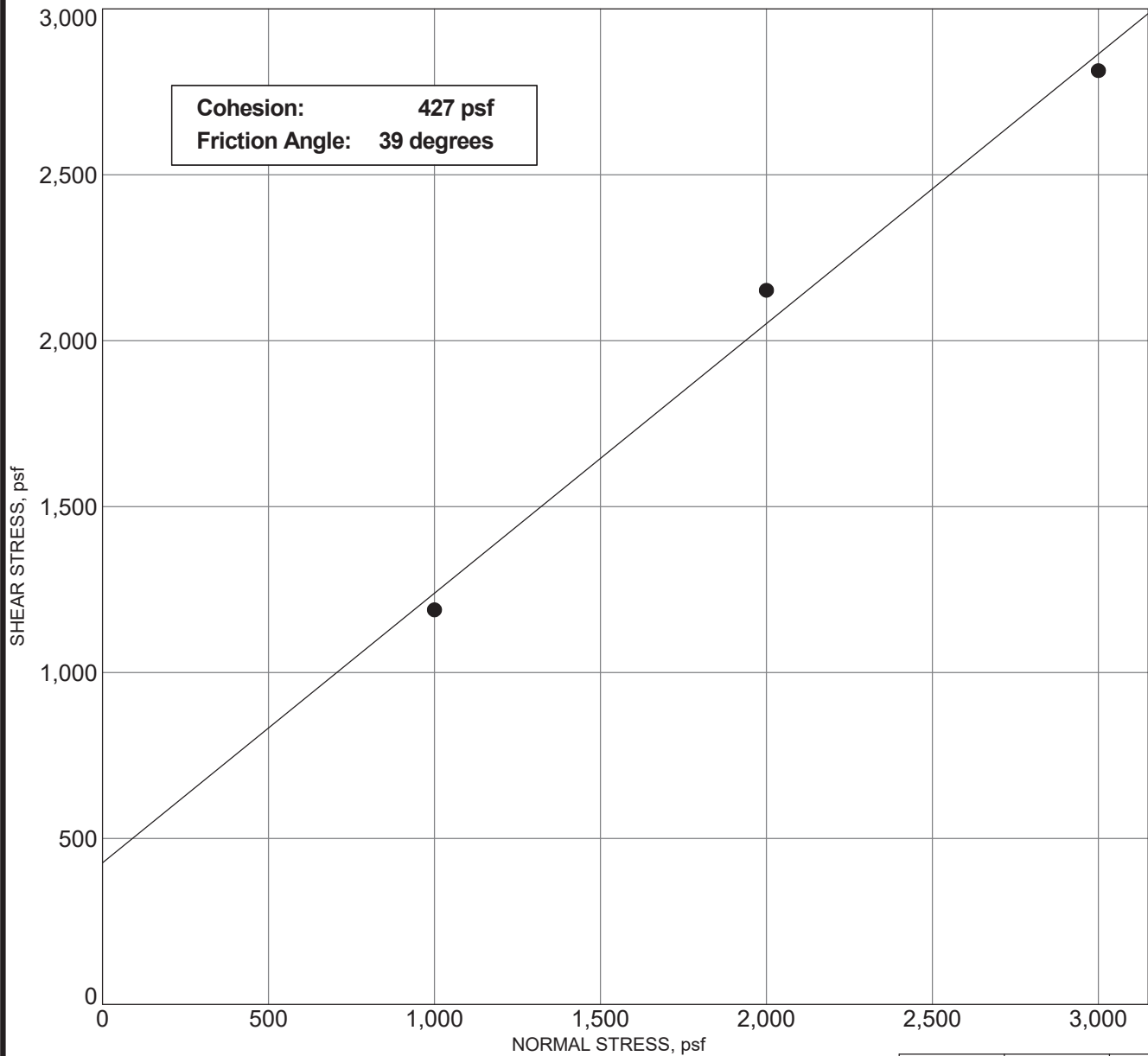


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DIRECT SHEAR TEST - ASTM D3080

FREEWAY MANAGEMENT SYSTEM
PHASE 3, UNITS 1 AND 2, IM-0300(152)
INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 7



Sample: B-5
Depth: 5.0 - 6.5 feet
Description: Brownish tan silty sand (SM) with some gravel

		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	22.0	22.3	17.9
	Dry Density, pcf	73.7	74.3	84.1
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	31.8	30.8	27.8
	Dry Density, pcf	73.2	76.1	86.7
	Height, inches	1.006	0.976	0.971
	Diameter, inches	2.42	2.42	2.42
	Deformation Rate, inch/minute	0.0024	0.0020	0.0024
	Normal Stress, psf	1000	2000	3000
	Peak Shear Stress, psf	1189	2152	2814
	Shear Displacement, inches	0.43	0.40	0.42



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DIRECT SHEAR TEST - ASTM D3080

FREEWAY MANAGEMENT SYSTEM
PHASE 3, UNITS 1 AND 2, IM-0300(152)
INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 8

Location	Depth	Length	Diameter	Length/ Diameter Ratio	Density	Load	Compressive Strength
	(feet)	(inches)	(inches)		(pcf)	(lbs)	(psi)
B-1	10.5 - 15	6.659	3.257	2.04	117.9	30,940	3,710
B-1	15 - 20	6.624	3.305	2.00	120.1	25,000	2,910
B-3	5.5 - 10.5	6.603	3.219	2.05	172.4	107,070	13,160
B-3	10.5 - 15.5	6.628	3.258	2.03	170.1	247,660	29,720
B-4	12 - 15.5	6.668	3.250	2.05	144.7	81,220	9,790

ASTM D7012 (METHOD C)

Note: Samples were not prepared in accordance with ASTM D4543. Therefore, results reported may differ from results obtained from a test specimen that meets the requirements of Practice D4543



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UNIAXIAL COMPRESSIVE STRENGTH TEST

FREEWAY MANAGEMENT SYSTEM
 PHASE 3, UNITS 1 AND 2, IM-0300(152)
 INTERSTATE ROUTES H-1 AND H-2 FREEWAYS
 DISTRICTS OF HONOLULU AND EWA, OAHU, HAWAII

Plate
B - 9