Schnabel Engineering

Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-307*
Depth: *178.5-180.4ft.*
Effective Normal Stress (psi): *40.0*

Date: *10/20/2006*
Elev: *-59.2 to -61.1*
Reviewed by: *CJS*

Soil Description: *Fine to medium CLAYEY SAND (SC), contains shell fragments - green gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit:	*41*
Plasticity Index:	*16*
% finer that No. 200:	*37.7*
Specific Gravity:	*2.67*
Initial Moisture, %:	*30.5*
Final Moisture, %:	*35.2*

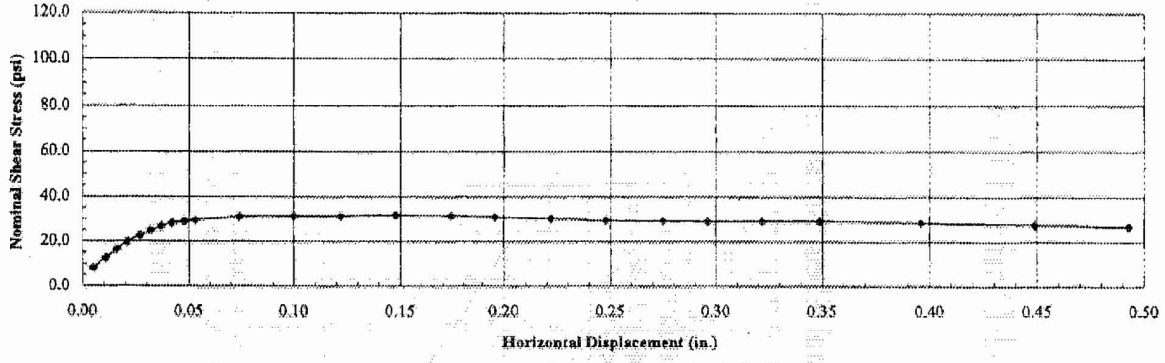
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.975	0.96
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.7
Weight (lbs)	0.32	0.33
ρ_{wet} (pcf)	114.9	120.7
ρ_{dry} (pcf)	88.0	89.3
Void Ratio	0.89	0.86
Saturation, %	92	100

Shear Testing Conditions	
Effective Normal Stress (psi):	40.0
Consolidation Stress (psi):	40.0
t_{50} (min.):	0.1
Rate of Displ. (in./min):	0.00313

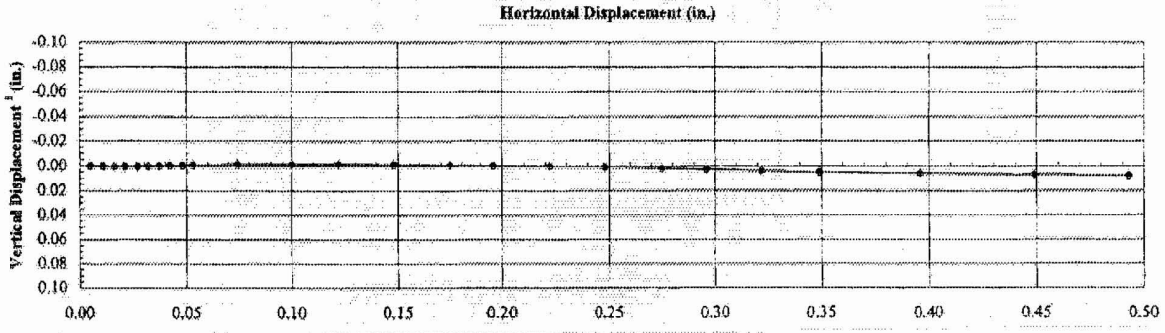
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.005	0.0002	38.9	7.9
2	0.011	0.0004	61.2	12.5
3	0.016	0.0005	80.4	16.4
4	0.021	0.0006	96.8	19.7
5	0.027	0.0006	110.6	22.5
6	0.032	0.0004	121.7	24.8
7	0.037	0.0002	130.9	26.7
8	0.042	0.0000	138.1	28.1
9	0.048	-0.0003	141.6	28.8
10	0.053	-0.0007	144.5	29.4
11	0.074	-0.0012	152.1	31.0
12	0.100	-0.0014	153.3	31.2
13	0.122	-0.0014	153.8	31.3
14	0.148	-0.0010	155.7	31.7
15	0.174	-0.0005	154.1	31.4
16	0.196	0.0000	151.9	30.9
17	0.222	0.0004	148.6	30.3
18	0.248	0.0011	144.3	29.4
19	0.275	0.0022	143.4	29.2
20	0.296	0.0031	142.4	29.0
21	0.322	0.0042	143.2	29.2
22	0.349	0.0050	143.0	29.1
23	0.396	0.0062	140.0	28.5
24	0.449	0.0072	135.4	27.6
25	0.493	0.0079	130.9	26.7

Notes: 1 - Positive vertical displacement represents compression.

Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



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Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-307*
Depth: *178.5-180.4 ft*
Effective Normal Stress (psi): *80.0*

Date: *10/20/2006*
Elev: *-59.2 to -61.1*
Reviewed by: *CJS*

Soil Description: *Fine to medium CLAYEY SAND (SC), contains shell fragments - green gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit:	41
Plasticity Index:	16
% finer that No. 200:	37.7
Specific Gravity:	2.67
Initial Moisture, %:	29.3
Final Moisture, %:	32.9

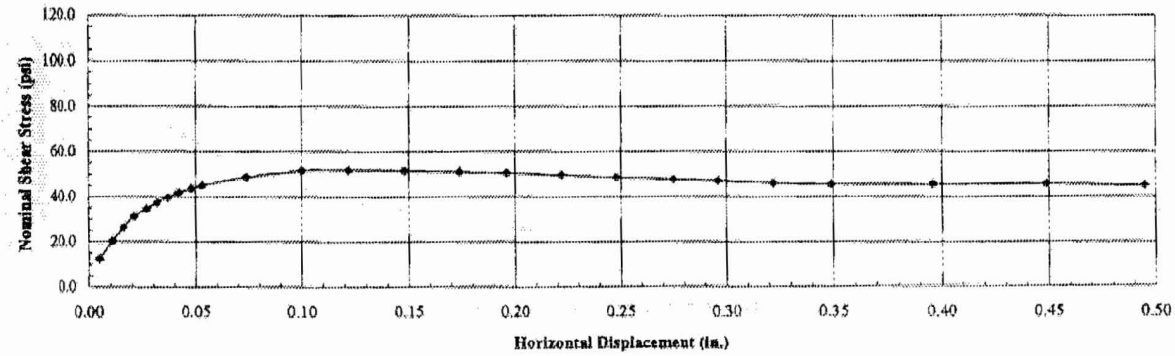
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.971	0.94
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.6
Weight (lbs)	0.32	0.33
ρ_{wet} (pcf)	115.9	123.4
ρ_{dry} (pcf)	89.6	92.9
Void Ratio	0.85	0.79
Saturation, %	92	100

Shear Testing Conditions	
Effective Normal Stress (psi):	80.0
Consolidation Stress (psi):	80.0
t_{50} (min.):	0.1
Rate of Displ. (in./min):	0.00313

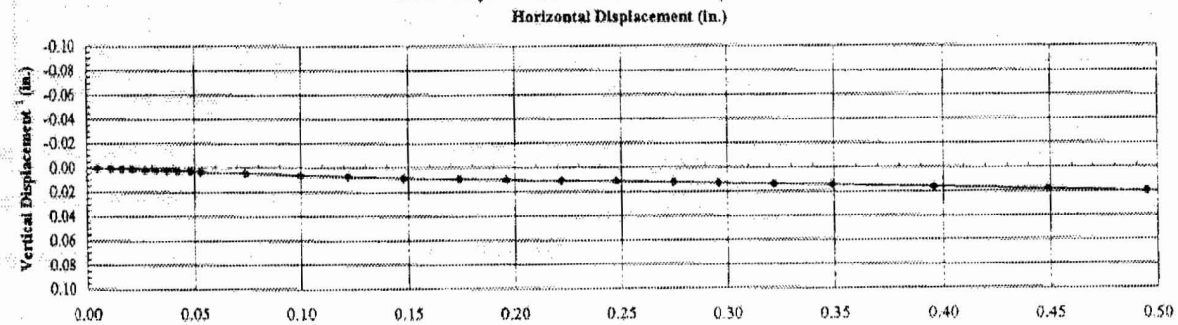
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.005	0.0003	61.6	12.5
2	0.011	0.0007	100.2	20.4
3	0.016	0.0011	128.6	26.2
4	0.021	0.0016	152.7	31.1
5	0.027	0.0019	169.3	34.5
6	0.032	0.0023	183.1	37.3
7	0.037	0.0026	194.6	39.6
8	0.042	0.0029	204.9	41.7
9	0.048	0.0032	213.9	43.6
10	0.053	0.0035	220.9	45.0
11	0.074	0.0046	239.9	48.9
12	0.100	0.0063	253.5	51.6
13	0.122	0.0074	255.2	52.0
14	0.148	0.0086	254.7	51.9
15	0.174	0.0096	251.9	51.3
16	0.196	0.0103	249.5	50.8
17	0.222	0.0110	244.8	49.9
18	0.248	0.0117	239.6	48.8
19	0.275	0.0124	235.4	47.9
20	0.296	0.0131	232.3	47.3
21	0.322	0.0136	226.6	46.1
22	0.349	0.0146	223.9	45.6
23	0.396	0.0164	224.2	45.7
24	0.449	0.0183	225.0	45.8
25	0.495	0.0199	221.5	45.1

Notes: 1 - Positive vertical displacement represents compression.

Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



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Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-307*
Depth: *178.5-180.4 ft*
Effective Normal Stress (psi): *160.0*

Date: *10/20/2006*
Elev: *-59.2 to -61.1*
Reviewed by: *CJS*

Soil Description: *Fine to medium CLAYEY SAND (SC), contains shell fragments - green gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit:	*41*
Plasticity Index:	*16*
% finer that No. 200:	*37.7*
Specific Gravity:	*2.67*
Initial Moisture, %:	*30.5*
Final Moisture, %:	*33.2*

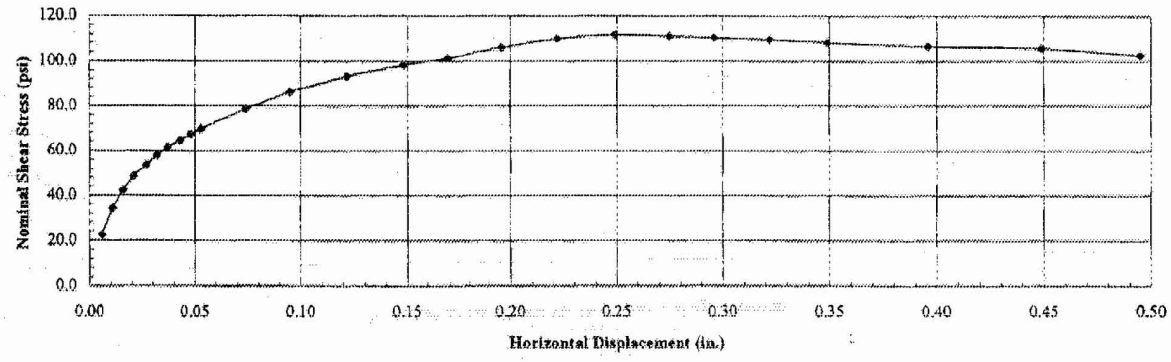
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.973	0.93
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.6
Weight (lbs)	0.32	0.32
ρ_{wet} (pcf)	115.0	123.2
ρ_{dry} (pcf)	88.1	92.5
Void Ratio	0.88	0.80
Saturation, %	92	100

Shear Testing Conditions	
Effective Normal Stress (psi):	160.0
Consolidation Stress (psi):	160.0
t_{50} (min.):	0.5
Rate of Displ. (in./min):	0.0031

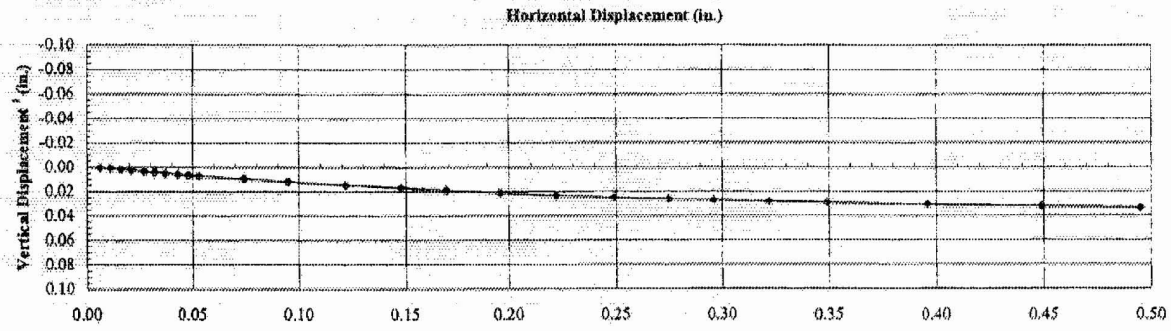
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.006	0.0003	110.8	22.6
2	0.011	0.0009	168.2	34.3
3	0.016	0.0018	207.9	42.3
4	0.021	0.0027	238.6	48.6
5	0.027	0.0035	263.0	53.6
6	0.032	0.0043	284.0	57.8
7	0.037	0.0051	301.6	61.4
8	0.043	0.0058	316.5	64.5
9	0.048	0.0065	329.9	67.2
10	0.053	0.0071	342.2	69.7
11	0.074	0.0097	385.3	78.5
12	0.095	0.0121	423.1	86.2
13	0.122	0.0148	457.4	93.1
14	0.148	0.0171	482.8	98.3
15	0.169	0.0189	496.7	101.1
16	0.196	0.0213	520.7	106.0
17	0.222	0.0237	539.7	109.9
18	0.249	0.0254	548.9	111.8
19	0.275	0.0266	545.6	111.1
20	0.296	0.0276	542.6	110.5
21	0.322	0.0287	538.0	109.6
22	0.349	0.0296	531.6	108.3
23	0.396	0.0311	523.3	106.6
24	0.449	0.0325	518.5	105.6
25	0.495	0.0338	504.0	102.6

Notes: 1 - Positive vertical displacement represents compression.

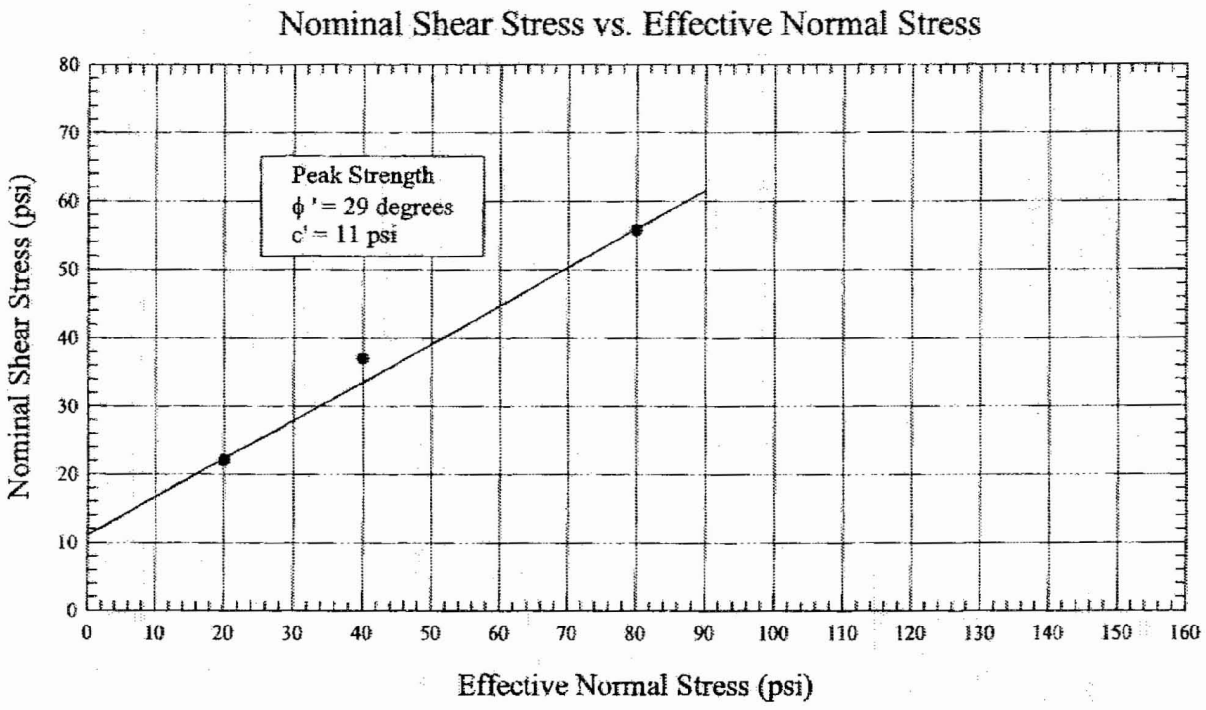
Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



Consolidated Drained Direct Shear (ASTM D3080)



Boring No.: *B-313* Depth: *93.5-94.7 ft* SEI Contract: *06120048* Date: *12/12/06*

Sample Description: *Sandy LEAN CLAY (CL), contains shells - gray* Reviewed By: *CJS*

Specimen Type: *Tube Sample* Specific Gravity: *2.69* LL: *49* PI: *24* %<200: *NA*

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Calvert Cliffs Nuclear Power Plant
Calvert County, MD

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Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Clavert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-313*
Depth: *93.5-94.7ft.* Elev: *-42.8 to -44.0 ft*
Effective Normal Stress (psi): *20.0*

Date: *11/9/2006*
Reviewed by: *CJS*

Soil Description: *Sandy LEAN CLAY(CL) contains shells - gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit: *49*
Plasticity Index: *24*
% finer that No. 200: *na*
Specific Gravity: *2.69*
Initial Moisture, %: *34.5*
Final Moisture, %: *44.8*

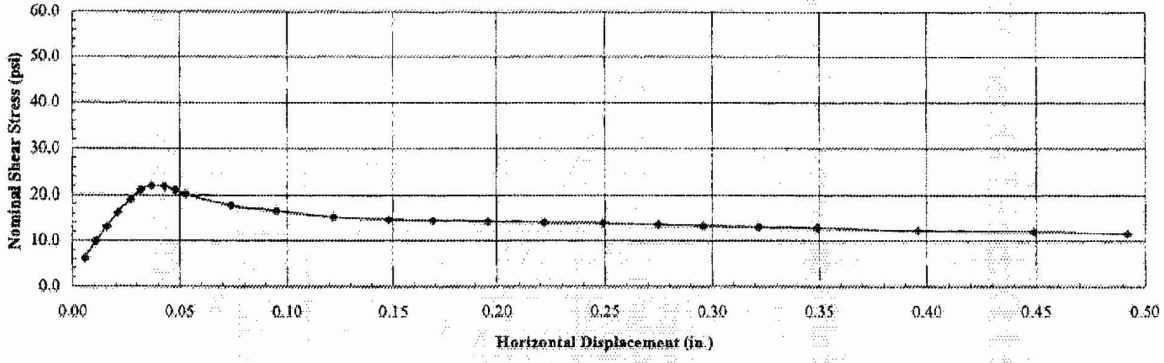
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.974	0.97
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.7
Weight (lbs)	0.30	0.32
ρ_{wet} (pcf)	108.0	117.3
ρ_{dry} (pcf)	80.3	81.0
Void Ratio	1.09	1.07
Saturation, %	86	100

Shear Testing Conditions	
Effective Normal Stress (psi):	20.0
Consolidation Stress (psi):	20.0
t_{50} (min.):	0.1
Rate of Displ. (in./min):	0.00417

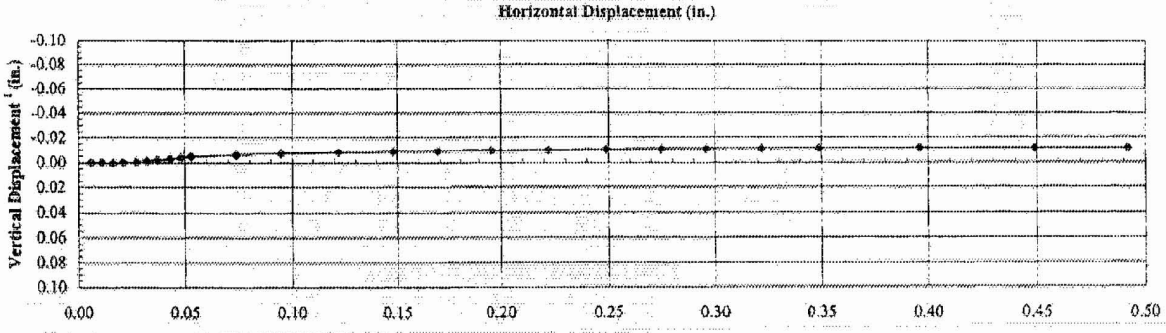
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.006	0.0002	29.9	6.1
2	0.011	0.0002	48.6	9.9
3	0.016	0.0003	64.4	13.1
4	0.021	0.0002	79.3	16.1
5	0.027	-0.0003	93.2	19.0
6	0.032	-0.0010	103.5	21.1
7	0.037	-0.0019	107.9	22.0
8	0.043	-0.0029	107.1	21.8
9	0.048	-0.0038	103.3	21.0
10	0.053	-0.0045	99.2	20.2
11	0.074	-0.0061	86.9	17.7
12	0.095	-0.0073	81.3	16.6
13	0.122	-0.0081	74.8	15.2
14	0.148	-0.0086	72.0	14.7
15	0.169	-0.0090	70.7	14.4
16	0.196	-0.0094	69.8	14.2
17	0.222	-0.0097	68.5	13.9
18	0.249	-0.0101	67.9	13.8
19	0.275	-0.0104	66.6	13.6
20	0.296	-0.0106	65.2	13.3
21	0.322	-0.0108	64.2	13.1
22	0.349	-0.0111	63.4	12.9
23	0.396	-0.0112	60.3	12.3
24	0.449	-0.0112	59.2	12.1
25	0.492	-0.0111	57.0	11.8

Notes: 1 - Positive vertical displacement represents compression.

Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



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Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calveert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-313*
Depth: *93.5-94.7ft.*
Effective Normal Stress (psi): *40.0*

Date: *11/9/2006*
Elev: *-42.8 to -44.0 ft*
Reviewed by: *CJS*

Soil Description: *Sandy LEAN CLAY(CL) contains shells - gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit:	*49*
Plasticity Index:	*24*
% finer that No. 200:	*na*
Specific Gravity:	*2.69*
Initial Moisture, %:	*38.2*
Final Moisture, %:	*43.1*

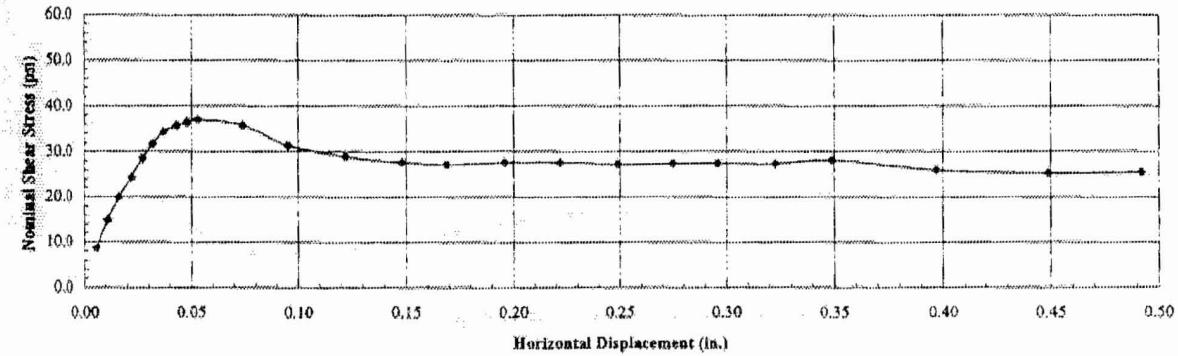
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.972	0.95
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.7
Weight (lbs)	0.30	0.31
ρ_{wet} (pcf)	108.9	114.9
ρ_{dry} (pcf)	78.8	80.3
Void Ratio	1.12	1.08
Saturation, %	91	100

Shear Testing Conditions	
Effective Normal Stress (psi):	40.0
Consolidation Stress (psi)	40.0
t_{50} (min.):	0.1
Rate of Displ. (in./min):	0.00417

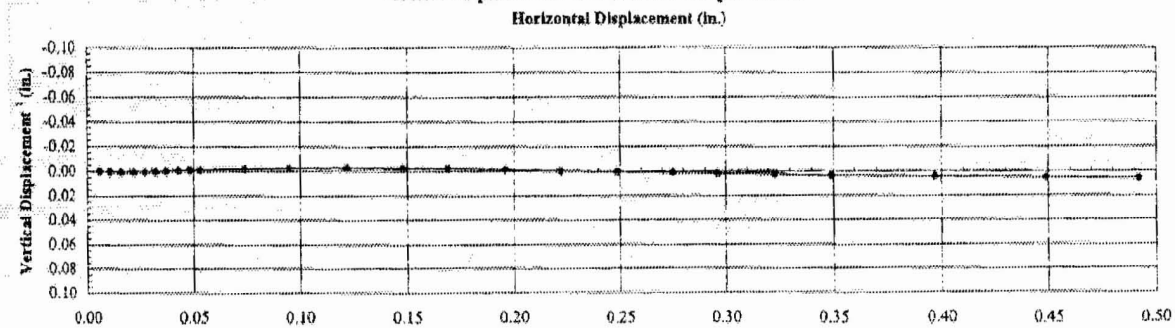
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.006	0.0003	42.4	8.6
2	0.011	0.0006	73.1	14.9
3	0.016	0.0008	97.6	19.9
4	0.022	0.0008	119.6	24.4
5	0.027	0.0008	139.6	28.4
6	0.032	0.0005	155.9	31.7
7	0.037	0.0001	168.2	34.3
8	0.043	-0.0003	175.0	35.6
9	0.048	-0.0006	178.8	36.4
10	0.053	-0.0009	181.6	37.0
11	0.074	-0.0018	175.8	35.8
12	0.095	-0.0024	154.3	31.4
13	0.122	-0.0025	141.6	28.8
14	0.148	-0.0024	135.9	27.7
15	0.169	-0.0021	133.2	27.1
16	0.196	-0.0013	135.6	27.6
17	0.222	-0.0003	136.3	27.8
18	0.249	0.0004	133.5	27.2
19	0.275	0.0012	134.3	27.3
20	0.296	0.0018	134.5	27.4
21	0.323	0.0028	134.0	27.3
22	0.349	0.0035	138.0	28.1
23	0.397	0.0043	127.5	28.0
24	0.449	0.0052	124.4	25.3
25	0.492	0.0062	125.0	25.5

Notes: 1 - Positive vertical displacement represents compression.

Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



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Consolidated Drained Direct Shear Test

ASTM D3080

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-313*
Depth: *93.5-94.7ft.*
Effective Normal Stress (psi): *80.0*

Date: *11/9/2006*
Elev: *-42.8 to -44.0 ft.*
Reviewed by: *CJS*

Soil Description: *Sandy LEAN CLAY(CL) contains shell - gray*

Specimen Type: *Tube Sample*

Remarks:

Liquid Limit:	*49*
Plasticity Index:	*24*
% finer that No. 200:	*na*
Specific Graivty:	*2.69*
Initial Moisture, %:	*35.3*
Final Moisture, %:	*39.3*

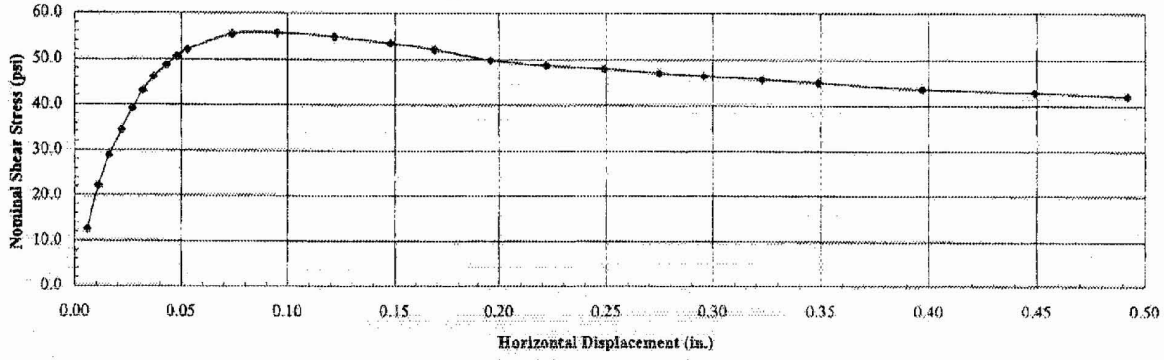
	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.50	2.50
Height (in)	0.976	0.93
Area (in^2)	4.91	4.91
Volume (in^3)	4.8	4.6
Weight (lbs)	0.29	0.30
ρ_{wet} (pcf)	106.3	114.8
ρ_{dry} (pcf)	78.6	82.4
Void Ratio	1.13	1.03
Saturation, %	84	100

Shear Testing Conditions	
Effective Normal Stress (psi):	80.0
Consolidation Stress (psi):	80.0
t_{50} (min.):	0.1
Rate of Displ. (in./min):	0.00417

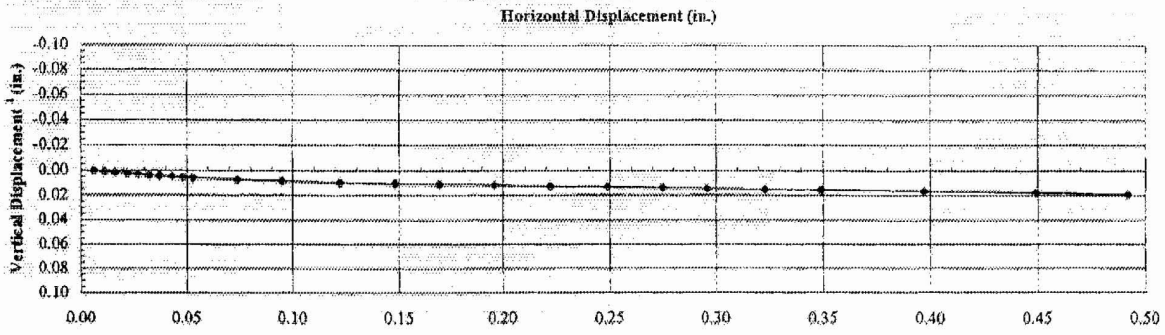
Reading No.	Horizontal Displacement (in.)	Vertical Displacement[1] (in.)	Shear Force (lbs)	Nominal Shear Stress (psi)
1	0.006	0.0003	61.7	12.6
2	0.011	0.0011	108.7	22.1
3	0.016	0.0019	141.8	28.9
4	0.022	0.0027	169.3	34.5
5	0.027	0.0034	192.2	39.1
6	0.032	0.0040	211.6	43.1
7	0.037	0.0046	226.4	46.1
8	0.043	0.0051	238.8	48.6
9	0.048	0.0057	248.4	50.6
10	0.053	0.0061	255.5	52.0
11	0.074	0.0076	272.3	55.5
12	0.095	0.0086	273.6	55.7
13	0.122	0.0098	269.6	54.9
14	0.148	0.0106	262.8	53.5
15	0.169	0.0112	255.9	52.1
16	0.196	0.0118	244.5	49.8
17	0.222	0.0125	238.9	48.6
18	0.249	0.0132	235.6	48.0
19	0.275	0.0139	231.3	47.1
20	0.296	0.0145	228.2	46.5
21	0.323	0.0151	224.8	45.8
22	0.349	0.0156	221.2	45.0
23	0.397	0.0167	214.6	43.7
24	0.449	0.0179	210.3	42.8
25	0.492	0.0193	206.3	42.0

Notes: 1 - Positive vertical displacement represents compression.

Nominal Shear Stress vs. Horizontal Displacement



Vertical Displacement vs. Horizontal Displacement



GeoTesting express

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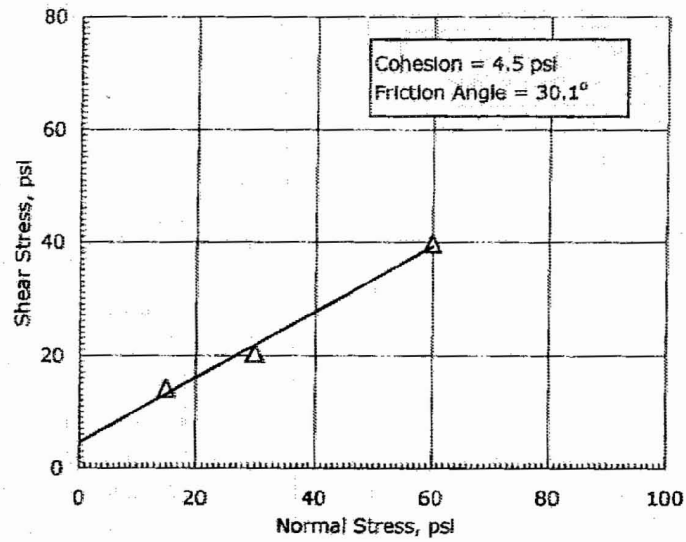
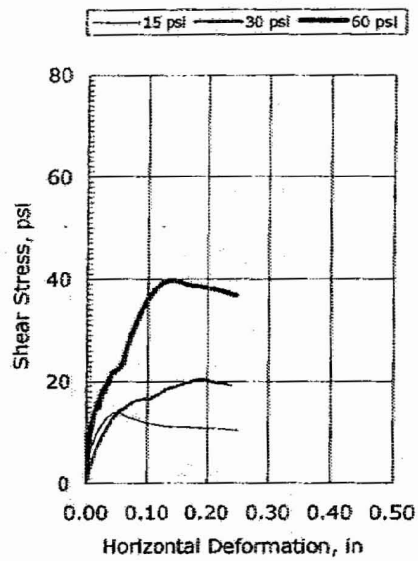
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/5/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-316
Sample ID:	S-14
Depth, ft:	53.5-55.5
Visual Description:	Moist, dark olive gray sandy clay

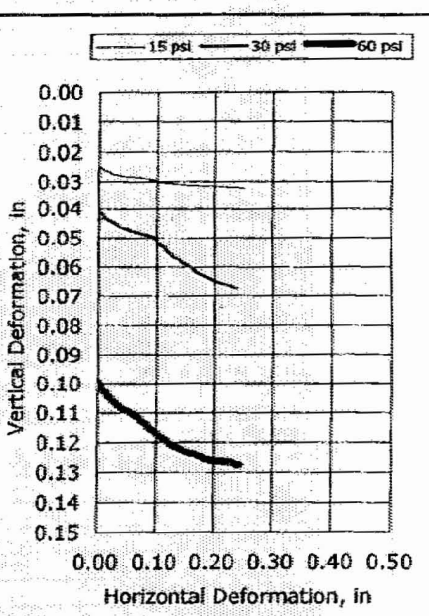
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS1	DS2	DS3
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	144.7	138.5	145.7
Initial Dry Density, pcf:	84.6	80.3	84.5
Initial Moisture Content, %:	32.8	33.8	33.7
Initial Bulk Density, pcf:	112	107	113
Initial Degree of Saturation:	86.9	81.2	89.3
Initial Void Ratio:	0.978	1.15	1.05
Final Dry Density, pcf:	87.4	86.1	96.9
Final Moisture Content, %:	36.7	41.87	33.52
Final Bulk Density, pcf:	119.5	122.1	129.4
Normal Stress, psi:	15.0	30.0	60.0
Maximum Shear Stress, psi	14.1	20.4	39.7
Shear Rate, in/min:	0.0005	0.0005	0.0005
t_{50}:	---	---	0.5

Sample Type:	Tube
Measured Specific Gravity:	2.77
Liquid Limit:	33
Plastic Limit:	11
Plasticity Index:	22
% Passing #200 sieve:	50
Soil Classification:	Sandy Lean Clay
Group Symbol:	CL



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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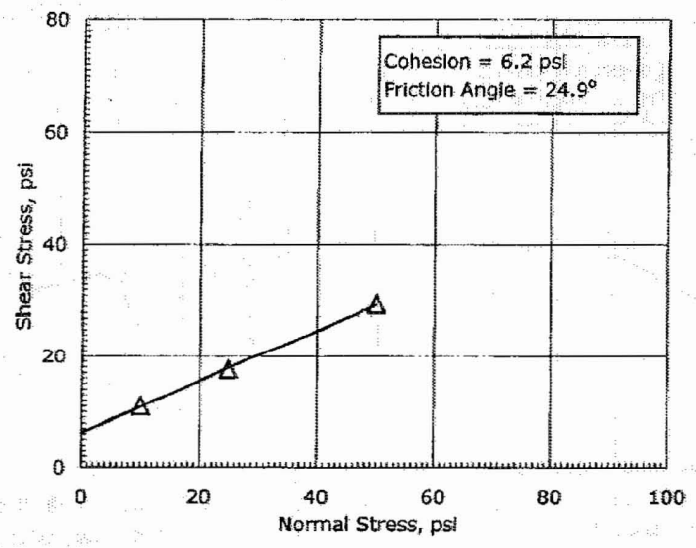
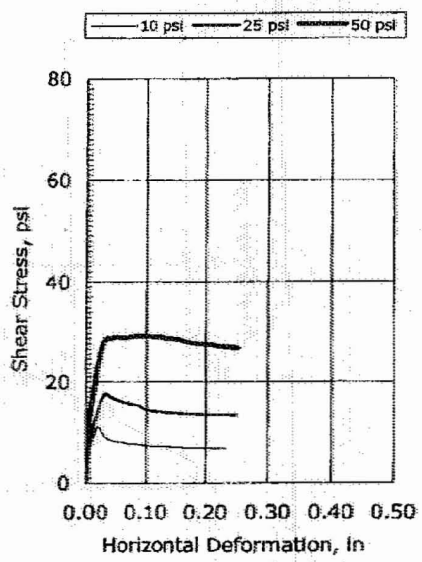
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/8/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-319
Sample ID:	S-10
Depth, ft:	33.5-35.5
Visual Description:	Moist, dark gray clay with sand

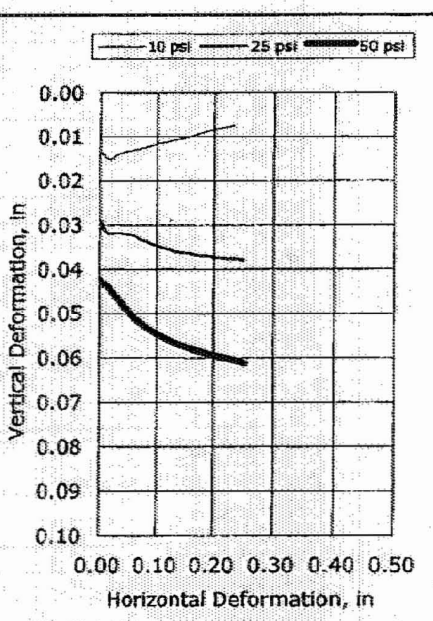
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS7	DS8	DS9
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	154.5	156.0	154.5
Initial Dry Density, pcf:	92.6	93.1	93.5
Initial Moisture Content, %:	29.5	30.0	28.3
Initial Bulk Density, pcf:	120	121	120
Initial Degree of Saturation:	98.4	99.6	93.7
Initial Void Ratio:	0.800	0.078	0.783
Final Dry Density, pcf:	93.3	97.6	99.6
Final Moisture Content, %:	32.3	29.6	30.1
Final Bulk Density, pcf:	123.5	126.4	129.5
Normal Stress, psi:	10.0	25.0	50.0
Maximum Shear Stress, psi	11.0	17.5	29.5
Shear Rate, in/min:	0.0005	0.0005	0.0005
t_{50}:	---	---	1.0

Sample Type:	Tube
Measured Specific Gravity:	2.67
Liquid Limit:	49
Plastic Limit:	12
Plasticity Index:	37
% Passing #200 sieve:	72
Soil Classification:	Lean Clay with Sand
Group Symbol:	CL



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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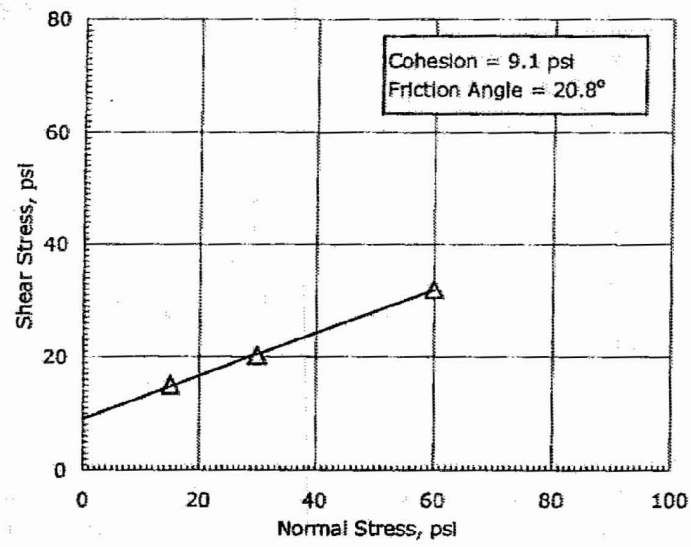
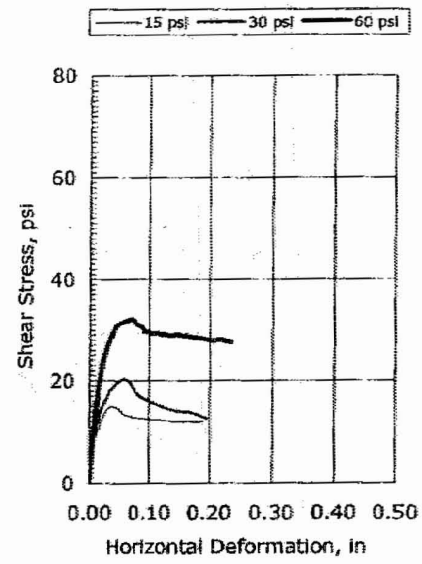
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/7/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-319
Sample ID:	S-12
Depth, ft:	43.5-45.2
Visual Description:	Moist, dark gray clay

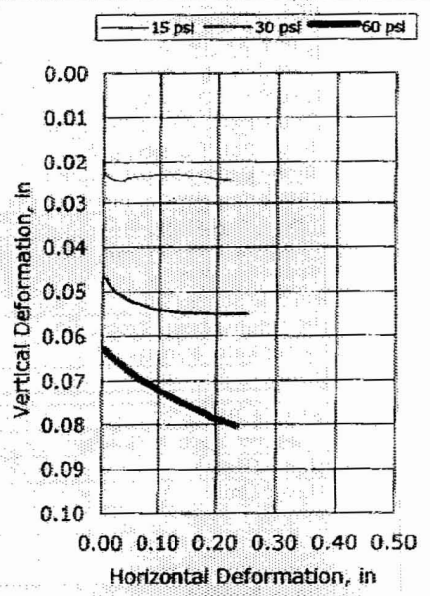
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS4	DS5	DS6a
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	149.8	146.8	149.0
Initial Dry Density, pcf:	86.0	85.3	85.8
Initial Moisture Content, %:	35.1	33.6	34.7
Initial Bulk Density, pcf:	116	114	116
Initial Degree of Saturation:	97.7	91.9	96.1
Initial Void Ratio:	0.981	0.999	0.985
Final Dry Density, pcf:	88.2	90.2	93.3
Final Moisture Content, %:	37.12	37.5	32.2
Final Bulk Density, pcf:	120.9	124.0	123.3
Normal Stress, psi:	15.0	30.0	60.0
Maximum Shear Stress, psi	15.0	20.2	32.0
Shear Rate, in/min:	0.001	0.001	0.001
t_{50}:	---	---	1.2

Sample Type:	Tube
Measured Specific Gravity:	2.73
Liquid Limit:	58
Plastic Limit:	13
Plasticity Index:	45
% Passing #200 sieve:	87
Soil Classification:	Fat Clay
Group Symbol:	CH



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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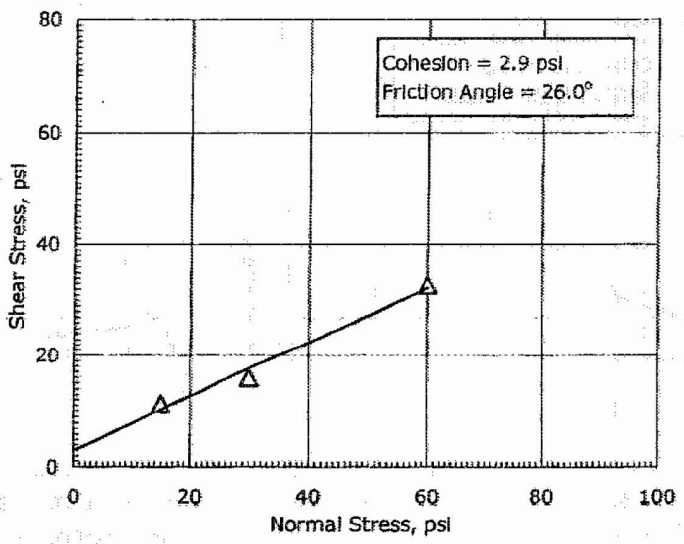
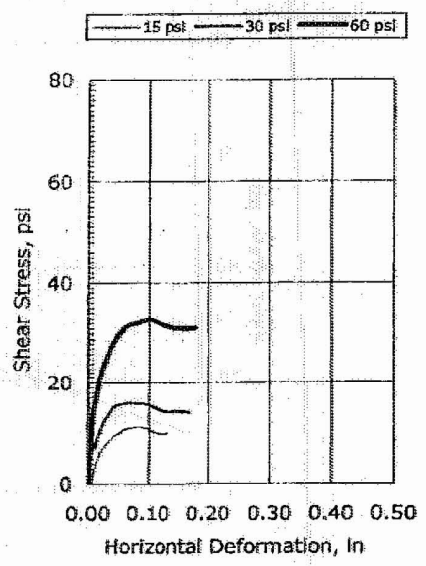
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	10/17/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-320
Sample ID:	S-11
Depth, ft:	38.5-40.5
Visual Description:	Moist, very dark gray clayey sand

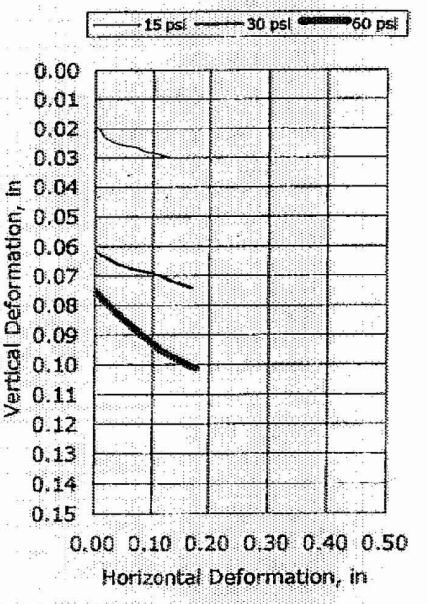
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS136	DS137	DS138
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	148.2	154.6	152.8
Initial Dry Density, pcf:	89.5	94.5	92.9
Initial Moisture Content, %:	28.5	27.0	27.6
Initial Bulk Density, pcf:	115	120	119
Initial Degree of Saturation:	89.8	96.2	94.7
Initial Void Ratio:	0.835	0.738	0.767
Final Dry Density, pcf:	92.7	102.3	103.9
Final Moisture Content, %:	32.65	29.1	27.2
Final Bulk Density, pcf:	122.9	132.0	132.2
Normal Stress, psi:	15.0	30.0	60.0
Maximum Shear Stress, psi	11.3	16.0	32.8
Shear Rate, in/min:	0.0004	0.0004	0.0004
t_{50}:	---	---	0.4

Sample Type:	Tube
Measured Specific Gravity:	2.63
Liquid Limit:	36
Plastic Limit:	16
Plasticity Index:	20
% Passing #200 sieve:	49
Soil Classification:	Clayey Sand
Group Symbol:	SC



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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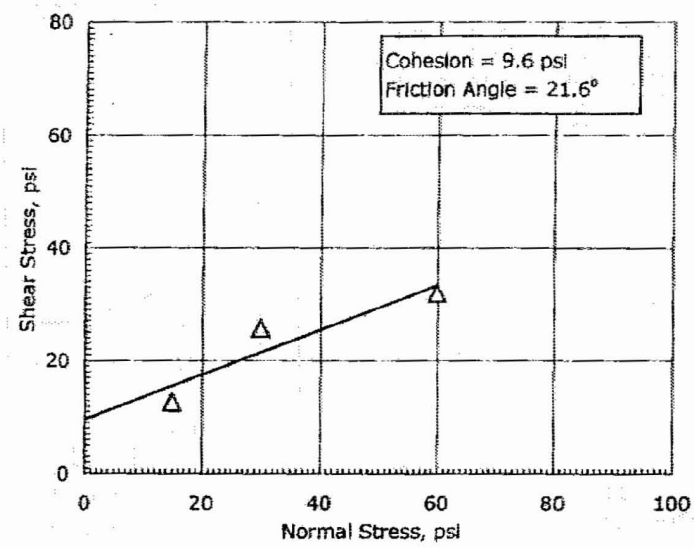
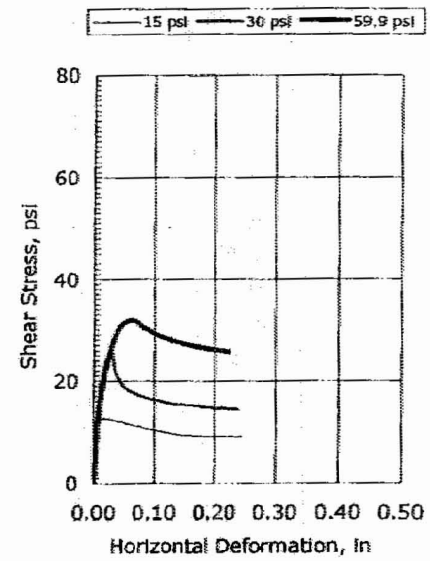
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/24/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-320
Sample ID:	S-13
Depth, ft:	48.5-50.0
Visual Description:	Moist, dark olive gray clay with sand

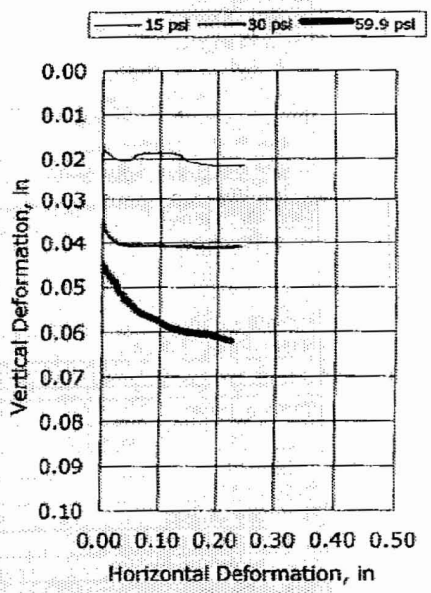
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS136	DS137	DS138
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	146.4	146.4	145.8
Initial Dry Density, pcf:	84.0	83.7	84.1
Initial Moisture Content, %:	35.3	35.8	34.6
Initial Bulk Density, pcf:	114	114	113
Initial Degree of Saturation:	93.3	93.9	91.6
Initial Void Ratio:	1.037	1.044	1.034
Final Dry Density, pcf:	85.9	87.2	85.6
Final Moisture Content, %:	39.18	38.0	36.3
Final Bulk Density, pcf:	119.5	120.4	116.7
Normal Stress, psi:	15.0	30.0	59.9
Maximum Shear Stress, psi	12.7	25.7	31.9
Shear Rate, in/min:	0.0003	0.0003	0.0003
t_{50}:	---	---	0.4

Sample Type:	Tube
Measured Specific Gravity:	2.74
Liquid Limit:	59
Plastic Limit:	19
Plasticity Index:	40
% Passing #200 sieve:	82
Soil Classification:	Fat Clay with Sand
Group Symbol:	CH



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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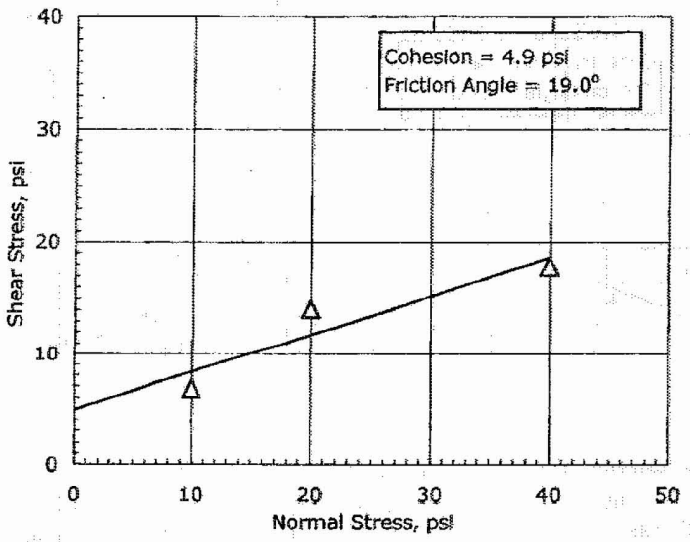
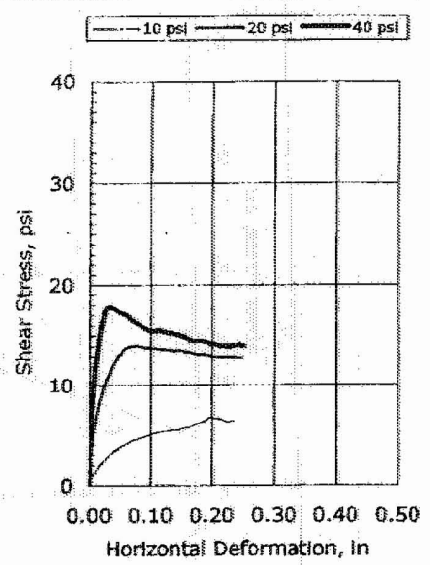
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	10/13/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-326
Sample ID:	S-12
Depth, ft:	43.5-45.5
Visual Description:	Moist, very dark gray organic clay

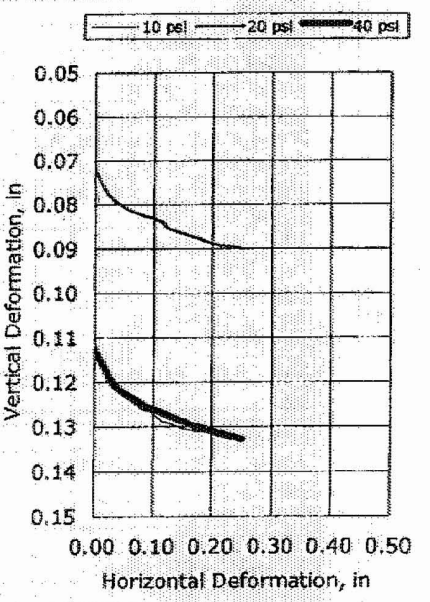
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS133	DS134	DS135
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	144.3	145.6	142.0
Initial Dry Density, pcf:	87.3	87.2	81.5
Initial Moisture Content, %:	28.2	29.6	35.2
Initial Bulk Density, pcf:	111.9	113.0	110.2
Initial Degree of Saturation:	81.9	85.6	89.0
Initial Void Ratio:	0.930	0.933	1.068
Final Dry Density, pcf:	100.4	95.8	94.0
Final Moisture Content, %:	39.1	34.0	37.7
Final Bulk Density, pcf:	139.6	128.4	129.5
Normal Stress, psi:	10.0	20.0	40.0
Maximum Shear Stress, psi	6.7	14.1	17.8
Shear Rate, in/min:	0.0004	0.0004	0.0004
t_{50}:	---	---	4.7

Sample Type:	Tube
Measured Specific Gravity:	2.70
Liquid Limit:	63
Plastic Limit:	22
Plasticity Index:	41
% Passing #200 sieve:	89
Soil Classification:	Organic Clay
Group Symbol:	OH



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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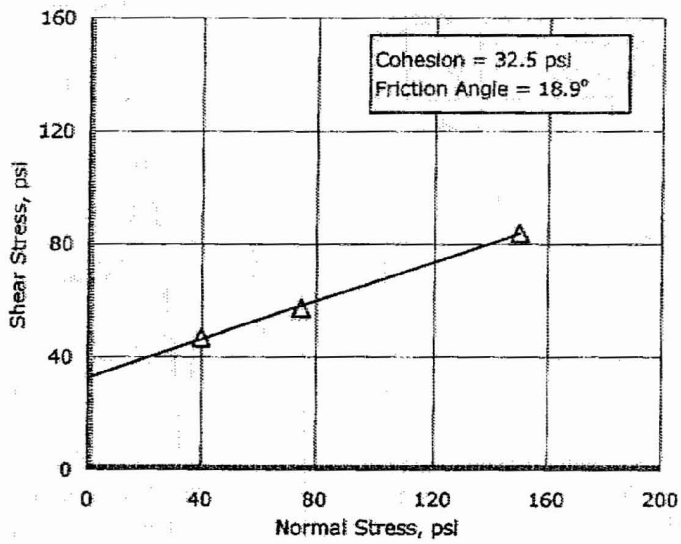
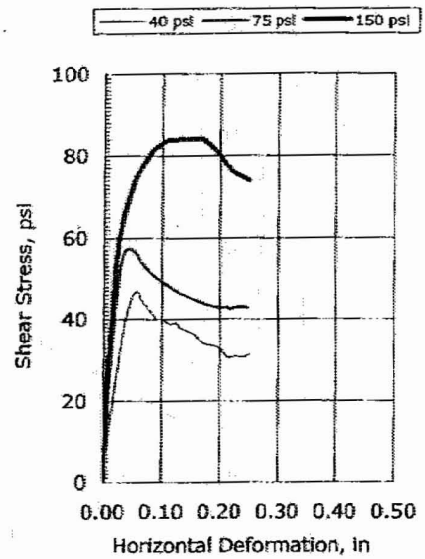
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/19/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-401
Sample ID:	S-37
Depth, ft:	173.5-174.4
Visual Description:	Moist, dark greenish gray clay

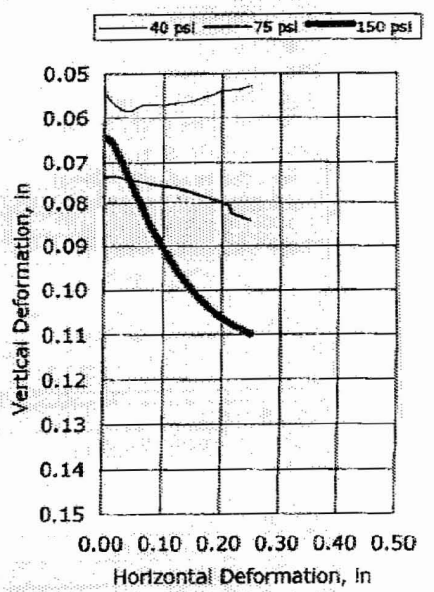
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS300	DS301	DS302
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	117.3	120.0	115.1
Initial Dry Density, pcf:	50.6	52.2	50.0
Initial Moisture Content, %:	80.1	78.6	78.6
Initial Bulk Density, pcf:	91.1	93	89
Initial Degree of Saturation:	91.8	94.1	88.7
Initial Void Ratio:	2.408	2.304	2.443
Final Dry Density, pcf:	53.4	56.9	56.2
Final Moisture Content, %:	89.1	82.6	79.2
Final Bulk Density, pcf:	100.9	103.9	100.8
Normal Stress, psi:	40.0	75.0	150.0
Maximum Shear Stress, psi	46.8	57.3	84.1
Shear Rate, in/min:	0.0003	0.0006	0.0006
t_{50}:	---	---	1.4

Sample Type:	Tube
Measured Specific Gravity:	2.76
Liquid Limit:	57
Plastic Limit:	17
Plasticity Index:	40
% Passing #200 sieve:	98
Soil Classification:	Fat Clay
Group Symbol:	CH



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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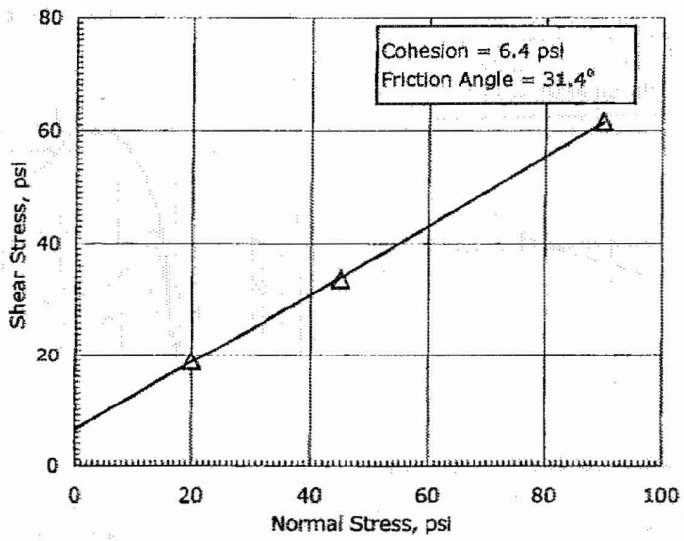
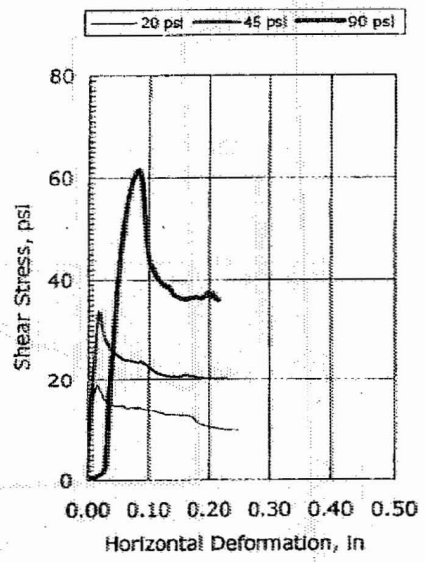
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/27/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-413
Sample ID:	S-17
Depth, ft:	73-75
Visual Description:	Moist, dark greenish gray clay

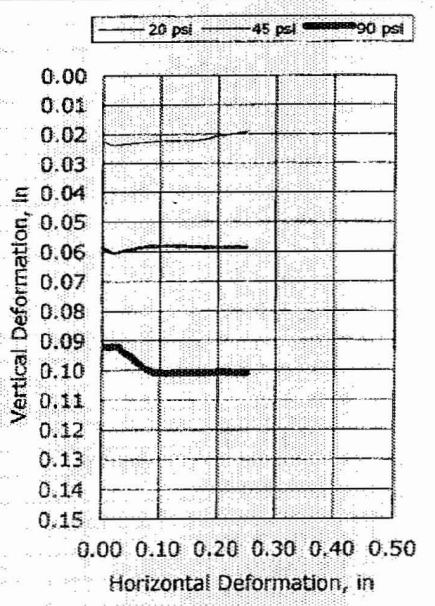
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS101	DS102	DS103
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	143.7	144.8	146.4
Initial Dry Density, pcf:	81.8	83.0	85.1
Initial Moisture Content, %:	36.4	35.3	33.5
Initial Bulk Density, pcf:	111.5	112	114
Initial Degree of Saturation:	91.7	91.6	91.2
Initial Void Ratio:	1.084	1.053	1.002
Final Dry Density, pcf:	83.4	88.2	94.7
Final Moisture Content, %:	46.0	39.4	40.3
Final Bulk Density, pcf:	121.7	122.9	132.8
Normal Stress, psi:	20.0	45.0	90.0
Maximum Shear Stress, psi	18.8	33.6	61.5
Shear Rate, in/min:	0.0005	0.0005	0.0005
t_{50}:	---	---	0.7

Sample Type:	Tube
Measured Specific Gravity:	2.73
Liquid Limit:	59
Plastic Limit:	16
Plasticity Index:	43
% Passing #200 sieve:	98
Soil Classification:	Fat Clay
Group Symbol:	CH



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422

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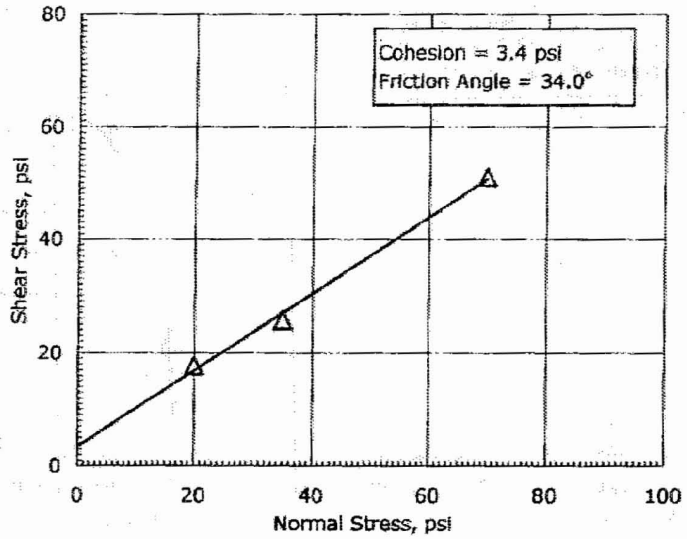
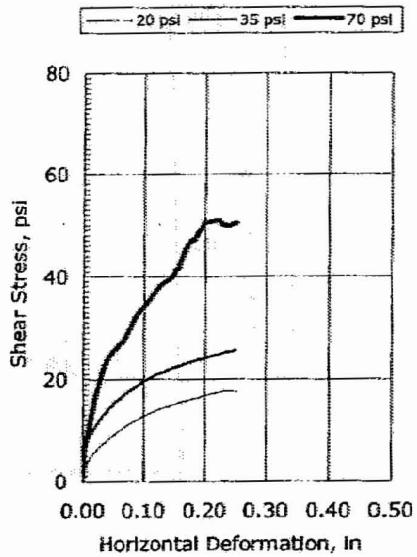
Client:	Schnabel Engineering, Inc.
Project Name:	Subsurface Investigation Calvert Cliffs Nuclear PP
Project Location:	Calvert County, MD
GTX #:	6880
Test Date:	9/11/2006
Tested By:	md
Checked By:	jdt
Boring ID:	B-420
Sample ID:	S-16
Depth, ft:	63.5-65.5
Visual Description:	Moist, olive gray clayey sand

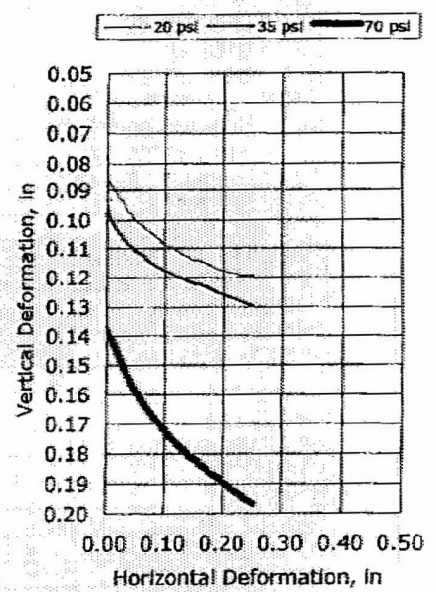
Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D 3080-04





Test No.:	DS10	DS11	DS12
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	127.6	132.4	130.8
Initial Dry Density, pcf:	73.8	75.4	74.7
Initial Moisture Content, %:	34.1	36.3	36.0
Initial Bulk Density, pcf:	99.0	103	102
Initial Degree of Saturation:	70.8	78.2	76.1
Initial Void Ratio:	1.325	1.278	1.300
Final Dry Density, pcf:	83.9	86.6	92.9
Final Moisture Content, %:	38.9	39.6	36.9
Final Bulk Density, pcf:	116.5	120.9	127.2
Normal Stress, psi:	20.0	35.0	70.0
Maximum Shear Stress, psi	17.7	25.8	51.0
Shear Rate, in/min:	0.0003	0.0003	0.0003
t_{50}:	---	---	0.8

Sample Type:	Tube
Measured Specific Gravity:	2.75
Liquid Limit:	49
Plastic Limit:	11
Plasticity Index:	38
% Passing #200 sieve:	19
Soil Classification:	Clayey Sand
Group Symbol:	SC



Notes: Moisture content obtained before shear from sample trimmings
Moisture Content determined by ASTM D 2216
Specific Gravity determined by ASTM D 854
Percent passing #200 sieve determined by ASTM D 422