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Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-317*
Depth: *28.5-30.5ft.*
Elevation: *65.9 to 63.9*
Confining Stress (psi): *40.0*

Date: *10/12/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.891	2.86
Height (in)	5.835	5.75
Area (in^2)	6.57	6.41
Moisture (%)	31.3	
W_{solids} (lbs)	2.05	
ρ_{wet} (pcf)	121.2	
ρ_{dry} (pcf)	92.3	95.9
Void Ratio	0.86	0.79
Saturation, %	100	98

Shear Testing Conditions	
Cell Pressure (psi):	65.0
Back Pressure (psi):	25.0
Eff. Confining Stress (psi):	40.0
Final B check	0.98
t_{50} (min.):	10.9
Rate of Strain (%/min):	0.0232

Filter strips used? *YES*

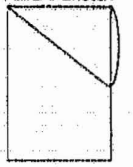
Specimen Type: *Tube Sample*

Soil Description: *LEAN CLAY (CL), trace sand - gray*

Liquid Limit: *27*
Plasticity Index: *8*
% finer that No. 200: *97.8*
Specific Gravity: *2.75*

Remarks:

Failure Sketch

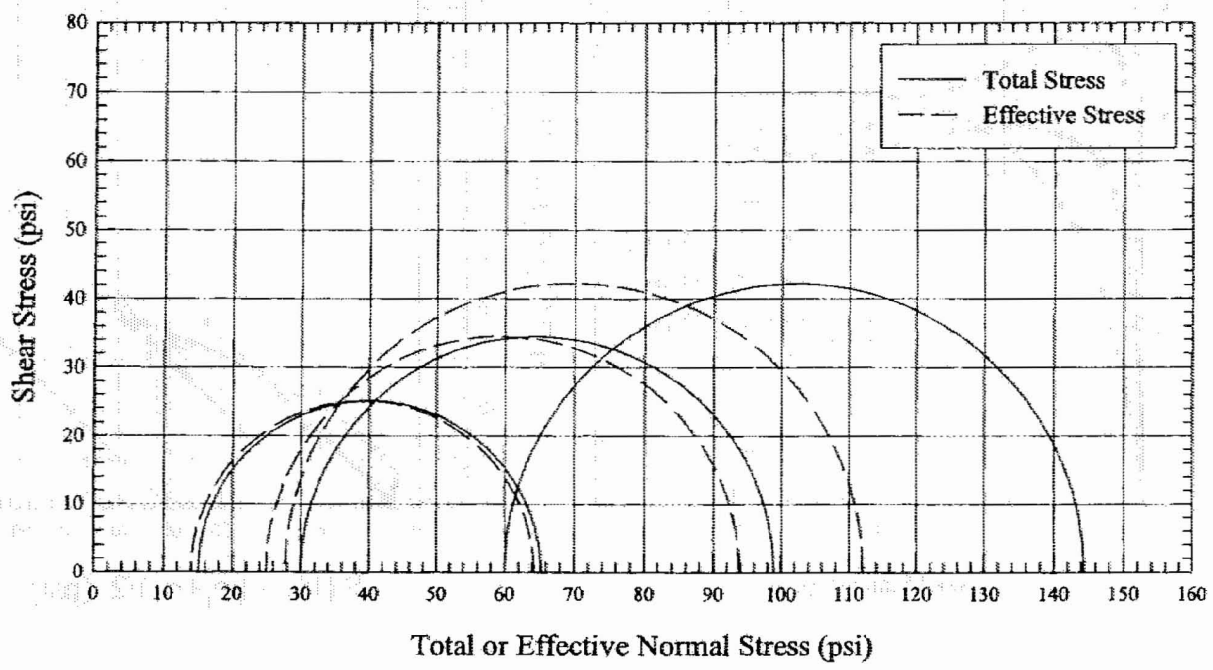


Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	25.0	0.0	6.41	40.0	40.0	40.0	40.0	0.0	1.00	0.00	40.0	40.0	0.0
1	4.2	4.1	0.006	0.10	25.8	0.8	6.42	40.6	40.0	39.8	39.2	0.6	1.02	1.26	40.3	39.5	0.3
2	62.3	62.1	0.012	0.21	29.9	4.9	6.43	49.7	40.0	44.8	35.1	9.7	1.28	0.51	44.8	39.9	4.8
3	102.5	102.1	0.018	0.31	34.0	9.0	6.43	55.9	40.0	46.9	31.0	15.9	1.51	0.57	47.9	38.9	7.9
4	124.5	124.0	0.023	0.40	36.6	11.6	6.44	58.3	40.0	47.7	28.4	19.3	1.68	0.60	49.6	38.0	9.6
5	140.8	140.2	0.029	0.50	38.6	13.6	6.44	61.8	40.0	48.2	26.4	21.8	1.82	0.63	50.9	37.3	10.9
6	153.3	152.6	0.035	0.61	40.1	15.1	6.45	63.6	40.0	48.5	24.9	23.6	1.95	0.64	51.8	36.7	11.8
7	163.9	163.1	0.041	0.71	41.4	16.4	6.46	65.2	40.0	48.8	23.6	25.2	2.07	0.65	52.6	36.2	12.6
8	173.4	172.4	0.047	0.82	42.5	17.5	6.47	66.7	40.0	49.2	22.5	26.7	2.19	0.66	53.3	35.8	13.3
9	182.1	181.0	0.053	0.92	43.3	18.3	6.47	68.0	40.0	49.7	21.7	28.0	2.29	0.65	54.0	35.7	14.0
10	190.7	189.5	0.058	1.01	44.0	19.0	6.48	69.3	40.0	50.3	21.0	29.3	2.39	0.65	54.6	35.6	14.6
11	217.6	215.9	0.082	1.43	46.1	21.1	6.51	73.2	40.0	52.1	18.9	33.2	2.76	0.64	56.6	35.5	16.6
12	244.6	242.3	0.111	1.93	47.4	22.4	6.54	77.1	40.0	54.7	17.6	37.1	3.11	0.60	58.5	36.1	18.5
13	267.4	264.9	0.140	2.43	48.2	23.2	6.57	80.3	40.0	57.1	16.8	40.3	3.40	0.58	60.2	37.0	20.2
14	287.8	285.2	0.172	2.99	48.4	23.4	6.61	83.1	40.0	59.7	16.6	43.1	3.60	0.54	61.6	38.2	21.6
15	310.8	308.0	0.228	3.96	48.0	23.0	6.68	86.1	40.0	63.1	17.0	46.1	[illegible]	0.50	63.1	40.1	23.1
16	318.7	315.7	0.286	4.97	47.2	22.2	6.75	86.8	40.0	64.6	17.8	[illegible]	3.63	0.47	63.4	41.2	23.4
17	309.0	305.8	0.344	5.98	46.1	21.1	6.82	84.8	40.0	63.7	18.9	44.8	3.37	0.47	62.4	41.3	22.4
18	288.0	284.5	0.403	7.00	45.8	20.8	6.90	81.3	40.0	60.5	19.2	41.3	3.15	0.50	60.6	39.8	20.6
19	284.2	280.5	0.461	8.01	45.7	20.7	6.97	80.2	40.0	59.5	19.3	40.2	3.09	0.51	60.1	39.4	20.1
20	278.1	274.2	0.514	8.93	45.6	20.6	7.04	78.9	40.0	58.3	19.4	38.9	3.01	0.53	59.5	38.9	19.5
21	273.6	269.5	0.572	9.94	45.5	20.5	7.12	77.9	40.0	57.4	19.5	37.9	2.94	0.54	58.9	38.4	18.9
22	274.2	269.9	0.630	10.95	45.2	20.2	7.20	77.5	40.0	57.3	19.8	37.5	2.89	0.54	58.7	38.5	18.7
23	277.2	272.7	0.689	11.98	45.0	20.0	7.28	77.4	40.0	57.4	20.0	37.4	2.87	0.53	58.7	38.7	18.7
24	283.6	278.9	0.747	12.98	44.7	19.7	7.37	77.8	40.0	58.1	20.3	37.8	2.86	0.52	58.9	39.2	18.9
25	287.0	282.0	0.806	14.01	44.7	19.7	7.46	77.8	40.0	58.1	20.3	37.8	2.86	0.52	58.9	39.2	18.9
26	290.8	285.6	0.859	14.93	44.5	19.5	7.54	77.9	40.0	58.4	20.5	37.9	2.85	0.51	58.9	39.4	18.9

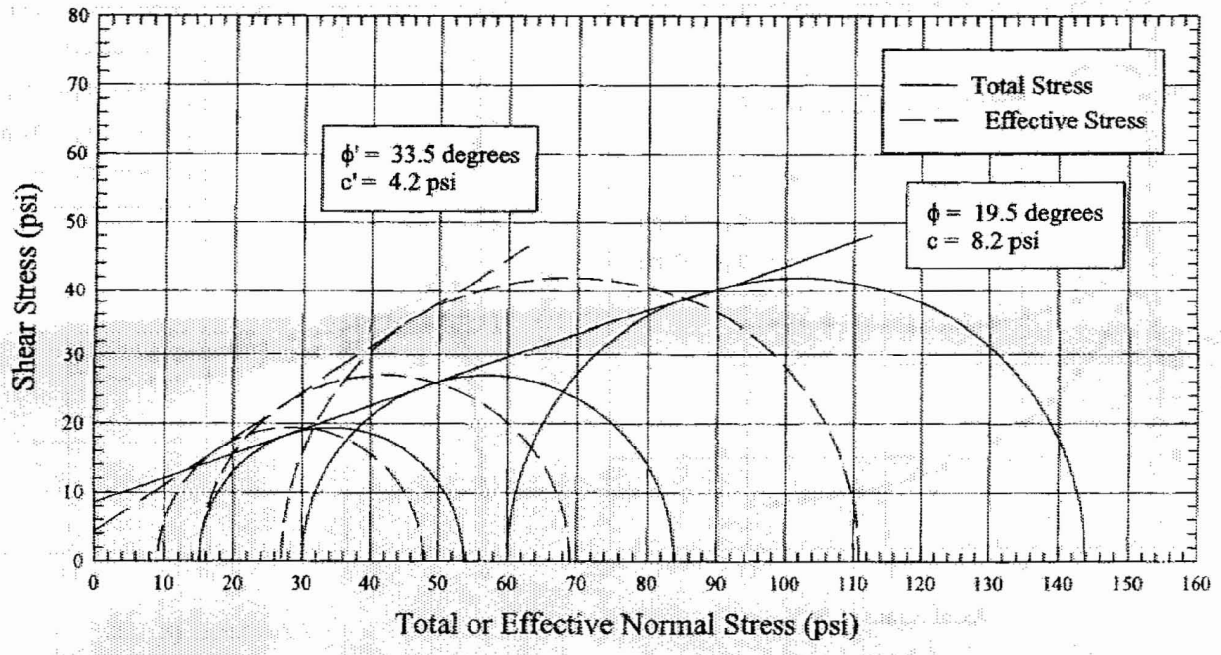
Notes: Deviator load corrected for membrane and filter cage (if applicable) effects.
Right Cylinder Correction Method

Consolidated Undrained (CU) Triaxial Shear (ASTM D4767)

Mohr Stress Circles at Maximum Deviator Stress Criterion



Mohr Stress Circles at Maximum Principal Stress Ratio Criterion



Boring No.: *B-317* Depth: *48.5-50.5 ft* SEI Contract: *06120048* Date: *10/12/06*

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

Specimen Type: *Tube Sample* Specific Gravity: *2.70* LL: *35* PI: *18* %<200: *69.8*

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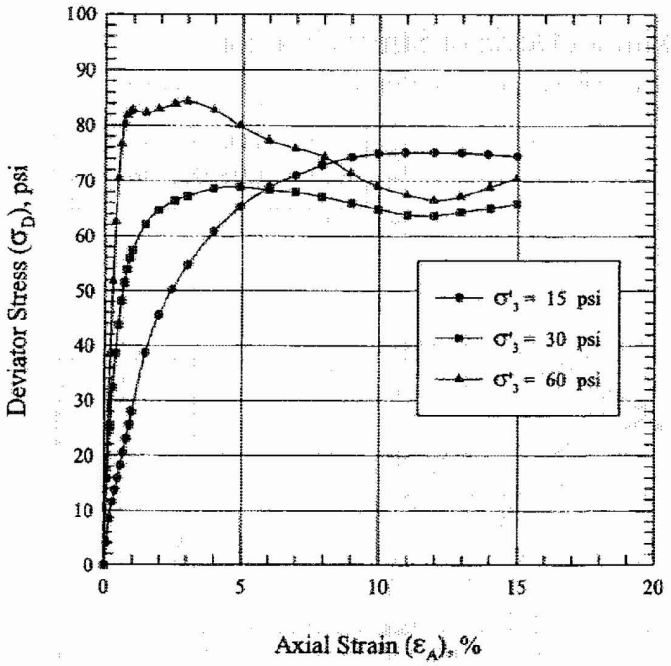
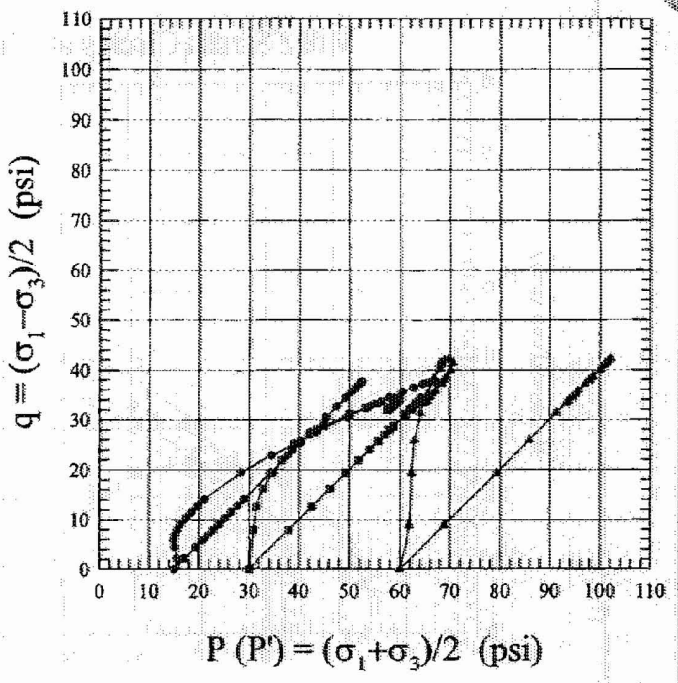
Calvert County, Maryland

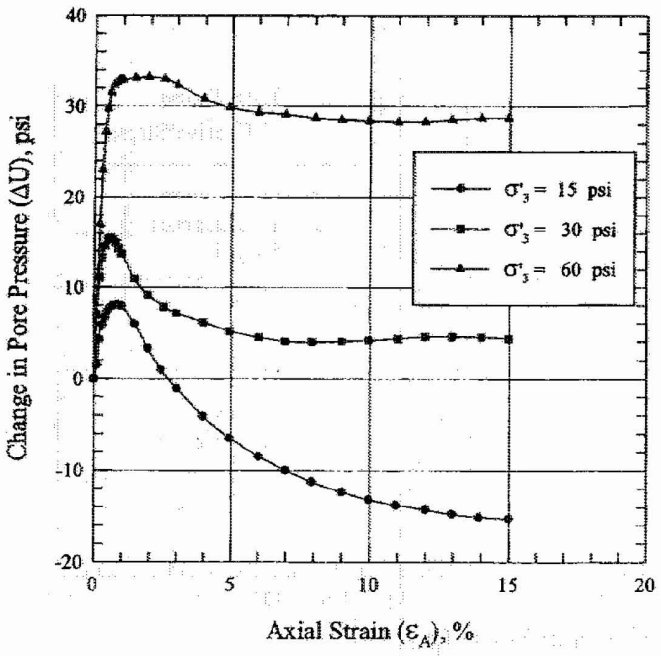
Deviator Stress vs. Axial Strain



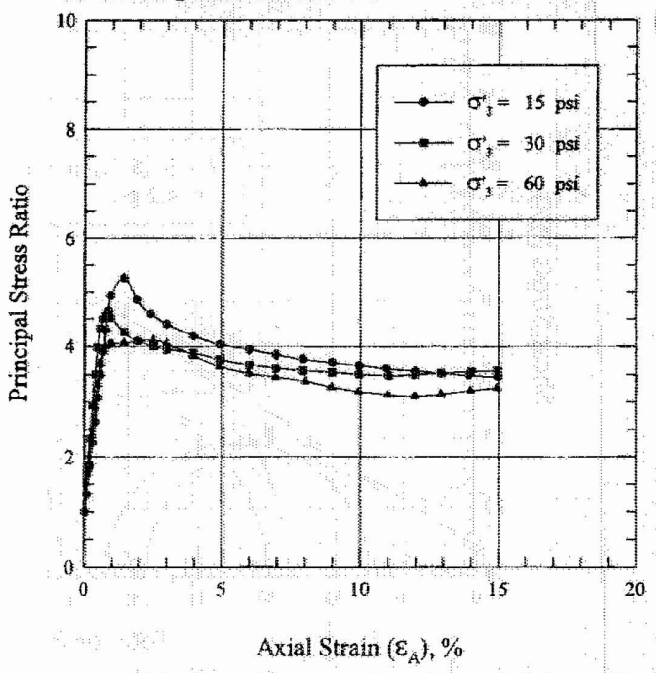
Stress Paths



Change in Pore Pressure vs. Axial Strain



Principal Stress Ratio vs. Axial Strain



Boring No.: *B-317* Depth: *48.5-50.5 ft* SEI Contract: *06120048* Date: *10/12/06*
Sample Description: *Sandy LEAN CLAY (CL) - gray* Reviewed By: *CJS*
Specimen Type: *Tube Sample* *Specific Gravity*: 2.70 LL: *35* PI: *18* %<200: *69.8*

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Calvert County, Maryland

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Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-317*
Depth: *48.5-50.5ft.*
Elevation: *45.9 to 43.9*
Confining Stress (psi): *15.0*

Date: *10/12/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.891	2.88
Height (in)	5.823	5.80
Area (in^2)	6.57	6.53
Moisture (%)	24.1	
W_{solids} (lbs)	2.20	
ρ_{wet} (pcf)	123.6	
ρ_{dry} (pcf)	99.6	100.5
Void Ratio	0.69	0.68
Saturation, %	94	95

Shear Testing Conditions	
Cell Pressure (psi):	50.0
Back Pressure (psi):	35.0
Eff. Confining Stress (psi):	15.0
Final B check	0.96
t_{50} (min.):	0.4
Rate of Strain (%/min):	0.125

Filter strips used? *YES*

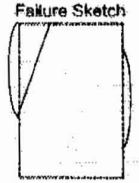
Specimen Type: *Tube Sample*

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

Liquid Limit: *35*
Plasticity Index: *18*
% finer that No. 200: *89.8*
Specific Gravity: *2.70*

Remarks:

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	35.0	0.0	6.53	15.0	15.0	15.0	15.0	0.0	1.00	0.00	15.0	15.0	0.0
1	27.2	27.1	0.006	0.10	36.5	1.5	6.54	19.1	15.0	17.6	13.5	4.1	1.31	0.36	17.1	15.6	2.1
2	57.1	56.9	0.011	0.19	39.2	4.2	6.54	23.7	15.0	19.5	10.8	8.7	1.80	0.48	19.3	15.1	4.3
3	75.5	75.2	0.017	0.29	40.8	5.8	6.55	26.5	15.0	20.7	9.2	11.5	2.25	0.51	20.7	14.9	5.7
4	90.1	89.6	0.023	0.40	41.6	6.6	6.56	28.7	15.0	22.1	8.4	13.7	2.63	0.48	21.8	15.2	6.8
5	104.9	104.3	0.028	0.48	42.3	7.3	6.56	30.9	15.0	23.6	7.7	15.9	3.06	0.46	22.9	15.6	7.9
6	120.1	119.4	0.034	0.59	42.7	7.7	6.57	33.2	15.0	25.5	7.3	18.2	3.49	0.42	24.1	16.4	9.1
7	135.9	135.1	0.039	0.67	42.9	7.9	6.58	35.5	15.0	27.6	7.1	20.5	3.89	0.38	25.3	17.4	10.3
8	152.3	151.4	0.045	0.78	43.0	8.0	6.58	38.0	15.0	30.0	7.0	23.0	4.28	0.35	26.5	18.5	11.5
9	169.2	168.2	0.051	0.88	43.0	8.0	6.59	40.5	15.0	32.5	7.0	25.5	4.65	0.31	27.8	19.8	12.8
10	185.6	184.4	0.056	0.97	42.9	7.9	6.60	43.0	15.0	35.1	7.1	28.0	4.94	0.28	29.0	21.1	14.0
11	258.1	256.4	0.084	1.45	40.9	5.9	6.63	53.7	15.0	47.8	9.1	38.7	[illegible]	0.15	34.3	28.4	19.3
12	305.2	302.9	0.112	1.93	38.2	3.2	6.66	60.5	15.0	57.3	11.8	45.5	4.85	0.07	37.7	34.5	22.7
13	338.6	336.1	0.140	2.41	36.0	1.0	6.69	65.2	15.0	64.2	14.0	[illegible]	4.59	0.02	40.1	39.1	25.1
14	371.2	368.6	0.174	3.00	33.9	-1.1	6.73	69.7	15.0	70.8	16.1	54.7	4.40	-0.02	42.4	43.5	27.4
15	416.4	413.6	0.230	3.97	30.9	-4.1	6.80	75.8	15.0	79.9	19.1	60.8	4.18	-0.07	45.4	49.5	30.4
16	451.4	448.4	0.286	4.93	28.5	-6.5	6.87	80.3	15.0	86.8	21.5	65.3	4.04	-0.10	47.6	54.1	32.6
17	481.5	478.2	0.348	6.00	26.5	-8.5	6.95	83.8	15.0	92.3	23.5	68.8	3.93	-0.12	49.4	57.9	34.4
18	502.1	498.6	0.404	6.97	25.0	-10.0	7.02	86.0	15.0	96.0	25.0	71.0	3.84	-0.14	50.5	60.5	35.5
19	520.2	516.5	0.460	7.93	23.7	-11.3	7.09	87.8	15.0	99.1	26.3	72.8	3.77	-0.16	51.4	62.7	36.4
20	536.7	532.8	0.522	9.00	22.6	-12.4	7.18	89.2	15.0	101.6	27.4	74.2	3.71	-0.17	52.1	64.5	37.1
21	547.3	543.2	0.578	9.97	21.8	-13.2	7.26	89.9	15.0	103.1	28.2	74.9	3.65	-0.18	52.4	65.6	37.4
22	554.9	550.6	0.634	10.93	21.2	-13.8	7.33	90.1	15.0	103.9	28.8	75.1	3.61	-0.18	52.5	66.3	37.5
23	561.7	557.1	0.695	11.99	20.7	-14.3	7.42	90.1	15.0	104.4	29.3	75.1	3.58	-0.19	52.5	66.8	37.5
24	567.8	563.0	0.751	12.95	20.2	-14.8	7.50	90.0	15.0	104.8	29.8	75.0	3.52	-0.20	52.5	67.3	37.5
25	572.5	567.5	0.807	13.92	19.9	-15.1	7.59	89.8	15.0	104.9	30.1	74.8	3.48	-0.20	52.4	67.5	37.4
26	576.7	571.5	0.869	14.99	19.7	-15.3	7.68	89.4	15.0	104.7	30.3	74.4	3.45	-0.21	52.2	67.5	37.2

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

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ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

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Boring No.: *B-317*
Depth: *48.5-50.5ft.*
Elevation: *45.9 to 43.9*
Confining Stress (psi): *30.0*

Date: *10/12/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.885	2.87
Height (in)	5.826	5.81
Area (in^2)	6.54	6.48
Moisture (%)	24.8	
W_{solids} (lbs)	2.18	
ρ_{wet} (pcf)	123.7	
ρ_{dry} (pcf)	99.1	100.4
Void Ratio	0.70	0.68
Saturation, %	96	99

Shear Testing Conditions	
Cell Pressure (psi):	65.0
Back Pressure (psi):	35.0
Eff. Confining Stress (psi):	30.0
Final B check	0.98
t_{50} (min.):	0.8
Rate of Strain (%/min):	0.125

Filter strips used? *YES*

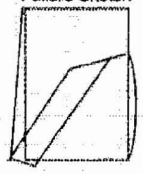
Specimen Type: *Tube Sample*

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

Liquid Limit: *35*
Plasticity Index: *18*
% finer that No. 200: *69.8*
Specific Gravity: *2.70*

Remarks:

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	35.0	0.0	6.48	30.0	30.0	30.0	30.0	0.0	1.00	0.00	30.0	30.0	0.0
1	103.0	103.0	0.006	0.10	42.0	7.0	6.48	45.9	30.0	38.9	23.0	15.9	1.69	0.44	37.9	30.9	7.9
2	164.0	164.0	0.012	0.21	46.1	11.1	6.49	55.3	30.0	44.2	18.9	25.3	2.34	0.44	42.6	31.5	12.6
3	210.4	210.3	0.017	0.29	48.3	13.3	6.50	62.4	30.0	49.1	16.7	32.4	2.94	0.41	46.2	32.9	16.2
4	251.4	251.3	0.023	0.40	49.6	14.6	6.50	68.6	30.0	54.0	15.4	38.6	3.51	0.38	49.3	34.7	19.3
5	284.8	284.7	0.028	0.48	50.3	15.3	6.51	73.7	30.0	58.4	14.7	43.7	3.98	0.35	51.9	36.6	21.9
6	313.9	313.8	0.034	0.59	50.5	15.5	6.52	78.2	30.0	62.7	14.5	48.2	4.32	0.32	54.1	38.6	24.1
7	336.0	335.9	0.040	0.69	50.3	15.3	6.52	81.5	30.0	66.2	14.7	51.5	4.50	0.30	55.7	40.4	25.7
8	351.9	351.7	0.045	0.78	49.9	14.9	6.53	83.9	30.0	69.0	15.1	53.9	[illegible]	0.28	56.9	42.0	26.9
9	365.7	365.5	0.051	0.88	49.3	14.3	6.53	85.9	30.0	71.6	15.7	55.9	4.56	0.26	58.0	43.7	28.0
10	375.8	375.6	0.056	0.96	48.7	13.7	6.54	87.4	30.0	73.7	16.3	57.4	4.52	0.24	58.7	45.0	28.7
11	408.6	408.3	0.084	1.45	45.9	10.9	6.57	92.1	30.0	81.2	19.1	62.1	4.25	0.18	61.1	50.2	31.1
12	427.8	427.4	0.112	1.93	44.1	9.1	6.60	94.7	30.0	85.6	20.9	64.7	4.10	0.14	62.4	53.3	32.4
13	441.8	441.3	0.146	2.51	42.8	7.8	6.64	96.4	30.0	88.6	22.2	66.4	3.99	0.12	63.2	55.4	33.2
14	449.8	449.2	0.174	3.00	42.1	7.1	6.68	97.3	30.0	90.2	22.9	67.3	3.94	0.11	63.6	56.5	33.6
15	463.8	462.9	0.230	3.96	41.1	6.1	6.74	98.6	30.0	92.5	23.9	68.6	3.87	0.09	64.3	58.2	34.3
16	470.5	469.4	0.286	4.93	40.1	5.1	6.81	98.9	30.0	93.8	24.9	[illegible]	3.77	0.07	64.5	59.4	34.5
17	472.1	470.8	0.348	5.99	39.4	4.4	6.89	98.3	30.0	93.9	25.6	68.3	3.67	0.06	64.2	59.8	34.2
18	474.5	473.0	0.404	6.96	39.0	4.0	6.96	97.9	30.0	93.9	26.0	67.9	3.61	0.06	64.0	60.0	34.0
19	473.8	472.1	0.460	7.92	38.9	3.9	7.03	97.1	30.0	93.2	26.1	67.1	3.57	0.06	63.6	59.7	33.6
20	471.6	469.7	0.522	8.99	39.0	4.0	7.12	96.0	30.0	92.0	26.0	66.0	3.54	0.06	63.0	59.0	33.0
21	469.2	467.0	0.578	9.96	39.1	4.1	7.19	94.9	30.0	90.8	25.9	64.9	3.51	0.06	62.5	58.4	32.5
22	467.2	464.8	0.639	11.01	39.3	4.3	7.28	93.9	30.0	89.6	25.7	63.9	3.48	0.07	61.9	57.6	31.9
23	471.5	468.9	0.695	11.97	39.5	4.5	7.36	93.7	30.0	89.2	25.5	63.7	3.50	0.07	61.9	57.4	31.9
24	481.7	478.9	0.751	12.94	39.5	4.5	7.44	94.4	30.0	89.9	25.5	64.4	3.52	0.07	62.2	57.7	32.2
25	493.2	490.2	0.813	14.00	39.5	4.5	7.53	95.1	30.0	90.6	25.5	65.1	3.55	0.07	62.5	58.0	32.5
26	505.1	501.9	0.869	14.97	39.3	4.3	7.62	95.9	30.0	91.6	25.7	65.9	3.56	0.07	62.9	58.6	32.9

Notes: Deviator load corrected for membrane and filter cage (if applicable) effects.
[2] Right Cylinder Correction Method

Schnabel Engineering

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-317*
Depth: *48.5-50.5ft.*
Elevation: *45.9 to 43.9*
Confining Stress (psi): *60.0*

Date: *10/12/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.882	2.86
Height (in)	5.847	5.81
Area (in^2)	6.53	6.44
Moisture (%)	25.8	
W_{solids} (lbs)	2.11	
ρ_{wet} (pcf)	119.8	
ρ_{dry} (pcf)	95.4	97.2
Void Ratio	0.77	0.73
Saturation, %	90	100

Shear Testing Conditions	
Cell Pressure (psi):	95.0
Back Pressure (psi):	35.0
Eff. Confining Stress (psi):	60.0
Final B check	0.96
t_{50} (min.):	1.9
Rate of Strain (%/min):	0.125

Filter strips used? *YES*

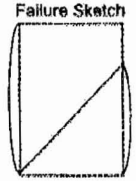
Specimen Type: *Tube Sample*

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

Liquid Limit: *35*
Plasticity Index: *18*
% finer that No. 200: *69.8*
Specific Gravity: *2.70*

Remarks:

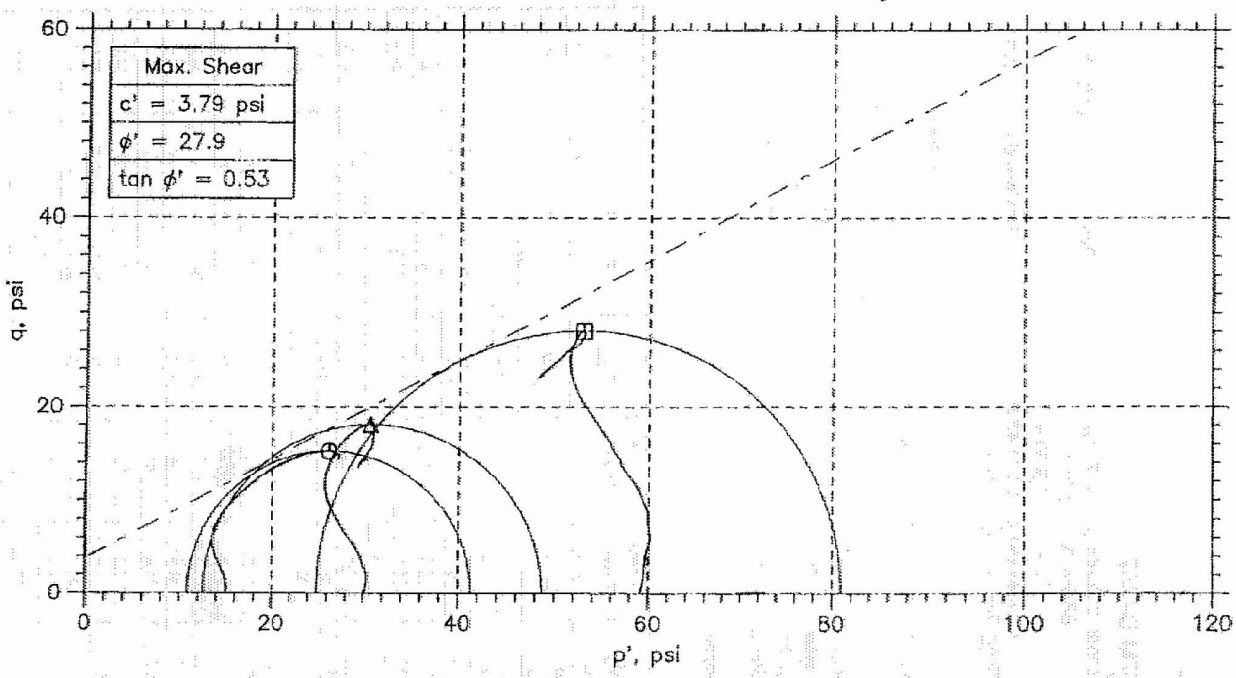
Failure Sketch

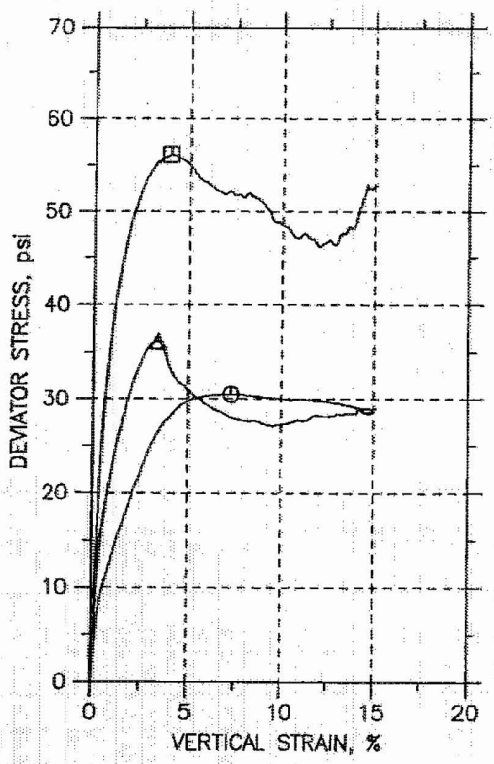


Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	35.0	0.0	6.44	60.0	60.0	60.0	60.0	0.0	1.00	0.00	60.0	60.0	0.0
1	114.1	114.0	0.006	0.10	42.0	7.0	6.45	77.7	60.0	70.7	53.0	17.7	1.33	0.40	68.8	61.8	8.8
2	249.1	248.9	0.012	0.21	52.0	17.0	6.45	96.8	60.0	81.6	43.0	38.6	1.90	0.44	79.3	62.3	19.3
3	334.6	334.3	0.017	0.29	58.0	23.0	6.46	111.7	60.0	88.7	37.0	51.7	2.40	0.44	85.9	62.9	25.9
4	405.5	405.0	0.023	0.40	62.2	27.2	6.47	122.6	60.0	95.4	32.8	62.6	2.91	0.43	91.3	64.1	31.3
5	456.5	455.9	0.028	0.48	64.7	29.7	6.47	130.5	60.0	100.8	30.3	70.5	3.33	0.42	95.2	65.5	35.2
6	496.8	496.1	0.034	0.58	66.5	31.5	6.48	136.6	60.0	105.1	28.5	76.6	3.69	0.41	98.3	66.8	38.3
7	521.8	521.0	0.040	0.69	67.3	32.3	6.48	140.3	60.0	108.0	27.7	80.3	3.90	0.40	100.2	67.9	40.2
8	532.2	531.3	0.045	0.77	67.6	32.6	6.49	141.9	60.0	109.3	27.4	81.9	3.99	0.40	100.9	68.3	40.9
9	536.5	535.5	0.051	0.88	67.8	32.8	6.50	142.4	60.0	109.6	27.2	82.4	4.03	0.40	101.2	68.4	41.2
10	539.0	537.9	0.056	0.96	67.9	32.9	6.50	142.7	60.0	109.8	27.1	82.7	4.05	0.40	101.4	68.5	41.4
11	539.2	537.5	0.084	1.44	68.1	33.1	6.53	142.2	60.0	109.1	26.9	82.2	4.06	0.40	101.1	68.0	41.1
12	547.0	544.7	0.112	1.93	68.2	33.2	6.57	142.9	60.0	109.7	26.8	82.9	4.10	0.40	101.5	68.3	41.5
13	556.6	554.1	0.146	2.51	68.0	33.0	6.61	143.9	60.0	110.9	27.0	83.9	[illegible]	0.39	101.9	68.9	41.9
14	562.7	560.1	0.174	2.99	67.3	32.3	6.64	144.4	60.0	112.1	27.7	[illegible]	4.05	0.38	102.2	69.9	42.2
15	558.1	555.3	0.230	3.96	65.8	30.8	6.71	142.8	60.0	112.0	29.2	82.8	3.84	0.37	101.4	70.6	41.4
16	544.0	541.0	0.288	4.92	64.8	29.8	6.77	139.9	60.0	110.1	30.2	79.9	3.64	0.37	99.9	70.1	39.9
17	532.9	529.7	0.348	5.99	64.3	29.3	6.85	137.3	60.0	108.0	30.7	77.3	3.52	0.38	98.7	69.4	38.7
18	528.4	524.9	0.404	6.95	64.1	29.1	6.92	135.8	60.0	106.7	30.9	75.8	3.45	0.38	97.9	68.8	37.9
19	523.9	520.2	0.466	8.02	63.7	28.7	7.00	134.3	60.0	105.6	31.3	74.3	3.37	0.39	97.2	68.5	37.2
20	508.9	505.0	0.522	8.98	63.5	28.5	7.08	131.4	60.0	102.9	31.5	71.4	3.27	0.40	95.7	67.2	35.7
21	497.8	493.7	0.578	9.94	63.4	28.4	7.15	129.0	60.0	100.6	31.6	69.0	3.18	0.41	94.5	66.1	34.5
22	492.4	488.1	0.639	10.99	63.3	28.3	7.24	127.6	60.0	99.2	31.7	67.5	3.13	0.42	93.7	65.4	33.7
23	490.8	486.3	0.695	11.95	63.3	28.3	7.31	126.5	60.0	98.2	31.7	66.5	3.10	0.43	93.2	64.9	33.2
24	501.3	496.6	0.751	12.92	63.5	28.5	7.40	127.1	60.0	98.6	31.5	67.1	3.13	0.42	93.6	65.1	33.6
25	520.7	515.7	0.813	13.98	63.7	28.7	7.49	128.9	60.0	100.2	31.3	68.9	3.20	0.42	94.4	65.7	34.4
26	538.8	533.6	0.869	14.95	63.7	28.7	7.57	130.5	60.0	101.8	31.3	70.5	3.25	0.41	95.2	66.5	35.2

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⊙	△	⊡	
Sample No.		S-11	S-11	S-11	
Test No.		CU7	CU8	CU9	
Depth		38.5-40.5	38.5-40.5	38.5-40.5	
Initial	Diameter, in	2.87	2.87	2.87	
	Height, in	5.96	5.85	6.05	
	Water Content, %	24.6	28.4	26.6	
	Dry Density, pcf	99.56	93.62	95.99	
	Saturation, %	99.9	99.0	98.7	
	Void Ratio	0.649	0.754	0.71	
Before Shear	Water Content, %	28.1	27.2	26.0	
	Dry Density, pcf	94.41	95.77	97.51	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.739	0.714	0.684	
	Back Press., psi	100.	100.	57.99	
Ver. Eff. Cons. Stress, psi		14.99	30.	60.01	
Shear Strength, psi		15.24	18.08	28.05	
Strain at Failure, %		7.29	3.4	3.99	
Strain Rate, %/min		0.032	0.032	0.032	
B-Value		0.95	0.95	0.96	
Measured Specific Gravity		2.63	2.63	2.63	
Liquid Limit		36	36	36	
Plastic Limit		16	16	16	

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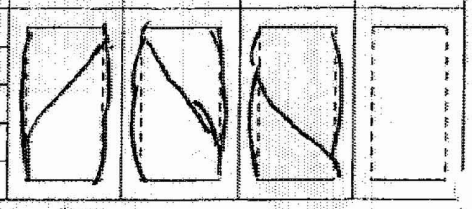
Project: Calvert Cliffs Nuclear PP
Location: Calvert County, MD
Project No.: GTX-6880
Boring No.: B-320
Sample Type: tube

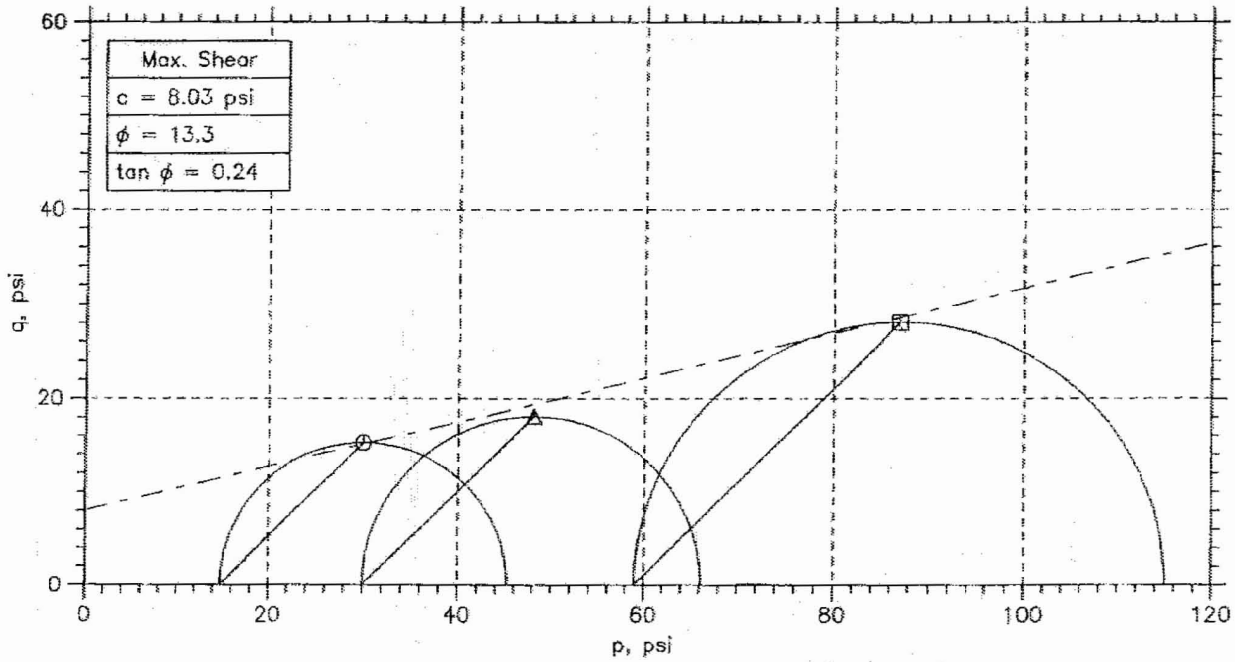


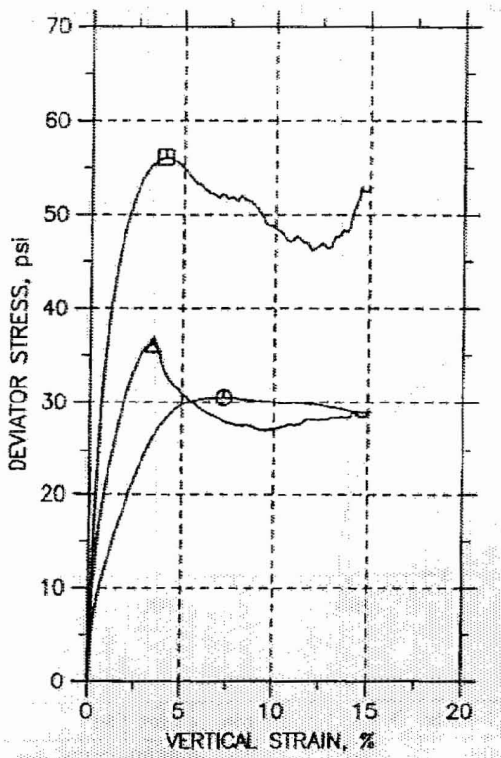
Description: Moist, very dark gray clayey sand (SC), 49% passing #200 sieve
Remarks: System B - t50 = 12.5 min, Triaxial Rev 1.0.6.318

Wed, 15-NOV-2006 14:19:06

Phase calculations based on start and end of test.
* Saturation is set to 100% for phase calculations.

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		⦶	△	⊡	
Sample No.		S-11	S-11	S-11	
Test No.		CU7	CU8	CU9	
Depth		38.5-40.5	38.5-40.5	38.5-40.5	
Initial	Diameter, in	2.87	2.87	2.87	
	Height, in	5.96	5.85	6.05	
	Water Content, %	24.6	28.4	26.6	
	Dry Density, pcf	99.56	93.62	95.99	
	Saturation, %	99.9	99.0	98.7	
	Void Ratio	0.649	0.754	0.71	
Before Shear	Water Content, %	28.1	27.2	26.0	
	Dry Density, pcf	94.41	95.77	97.51	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.739	0.714	0.684	
	Back Press., psi	100.	100.	57.99	
Ver. Eff. Cons. Stress, psi		14.99	30.	60.01	
Shear Strength, psi		15.24	18.08	28.05	
Strain at Failure, %		7.29	3.4	3.99	
Strain Rate, %/min		0.032	0.032	0.032	
B-Value		0.95	0.95	0.96	
Measured Specific Gravity		2.63	2.63	2.63	
Liquid Limit		36	36	36	
Plastic Limit		16	16	16	

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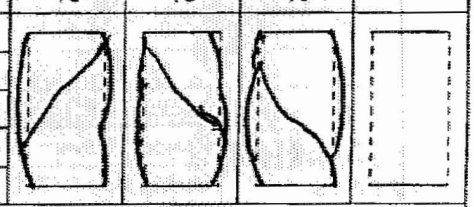
Project: Calvert Cliffs Nuclear PP
Location: Calvert County, MD
Project No.: GTX-6880
Boring No.: B-320
Sample Type: tube

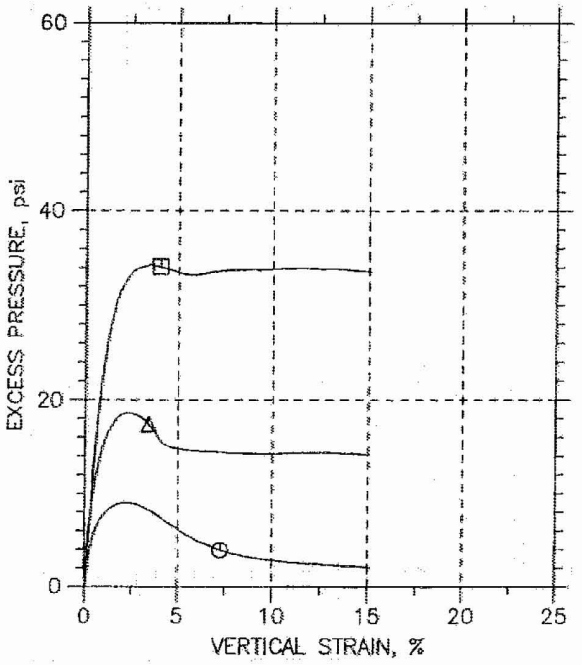


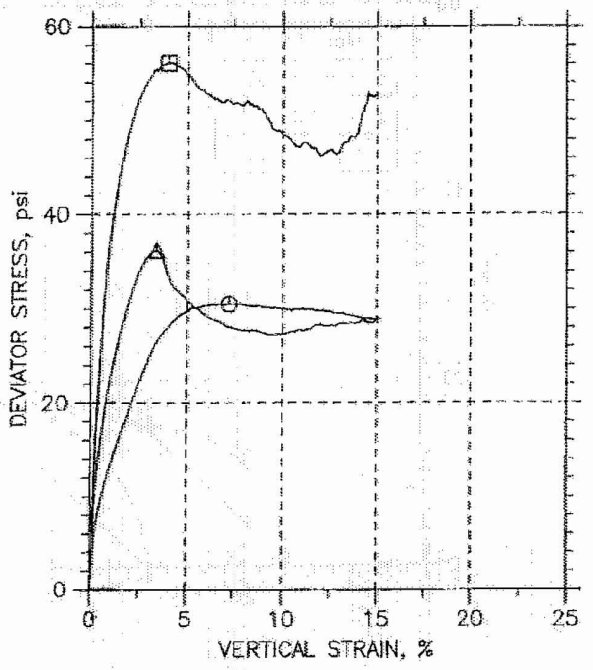
Description: Moist, very dark gray clayey sand (SC), 49% passing #200 sieve
Remarks: System B - t50 = 12.5 min, Triaxial Rev 1.0.6.318

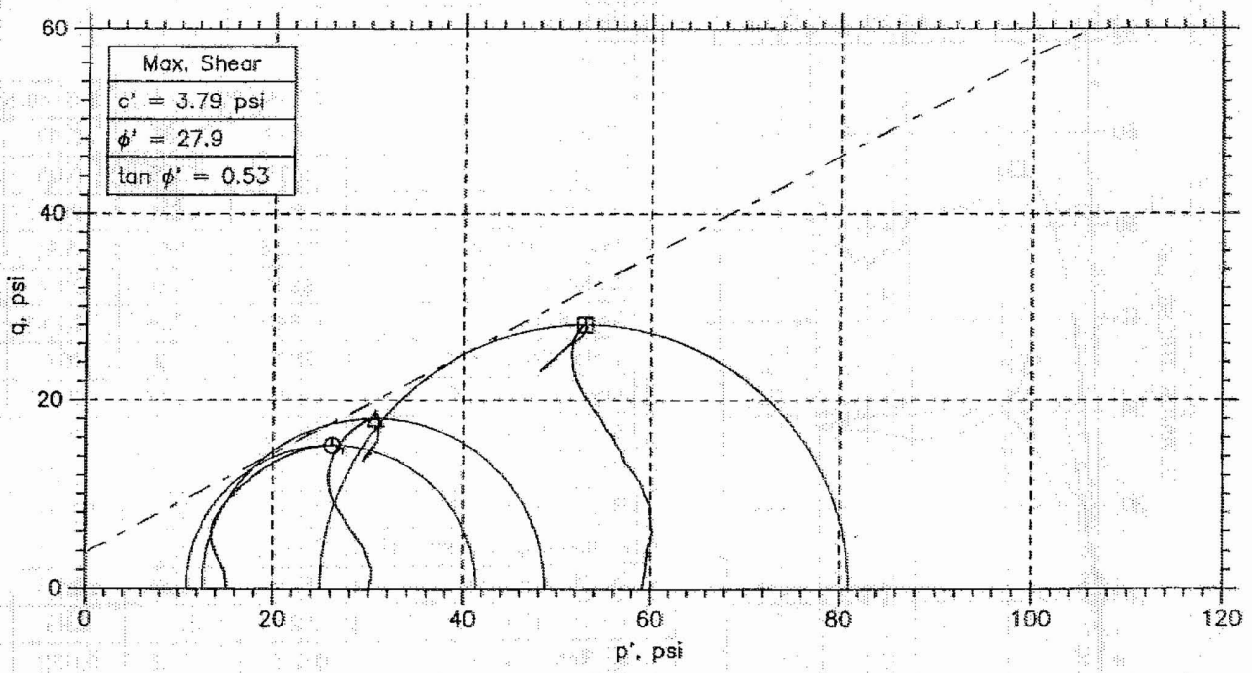
Thu, 16-NOV-2006 14:11:28

Phase calculations based on start and end of test.
* Saturation is set to 100% for phase calculations.

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
⊙	S-11	CU7	38.5-40.5	njh	10/18/06	jdt		6880-CU7n.dat
△	S-11	CU8	38.5-40.5	njh	10/18/06	jdt		6880-CU8n.dat
⊡	S-11	CU9	38.5-40.5	njh	10/18/06	jdt		6880-CU9n.dat

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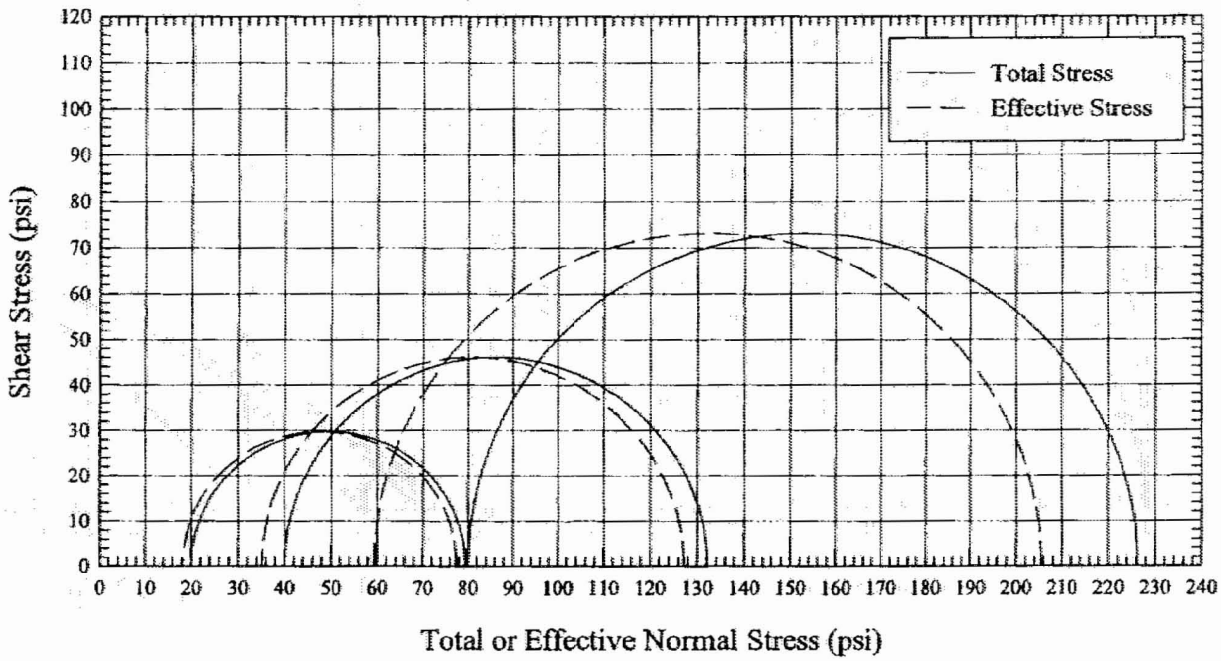
Project: Calvert Cliffs Nuclear PP	Location: Calvert County, MD	Project No.: GTX-6880
Boring No.: B-320	Sample Type: tube	
Description: Moist, very dark gray clayey sand (SC), 49% passing #200 sieve		
Remarks: System B - t50 = 12.5 min, Triaxial Rev 1.0.6.318		

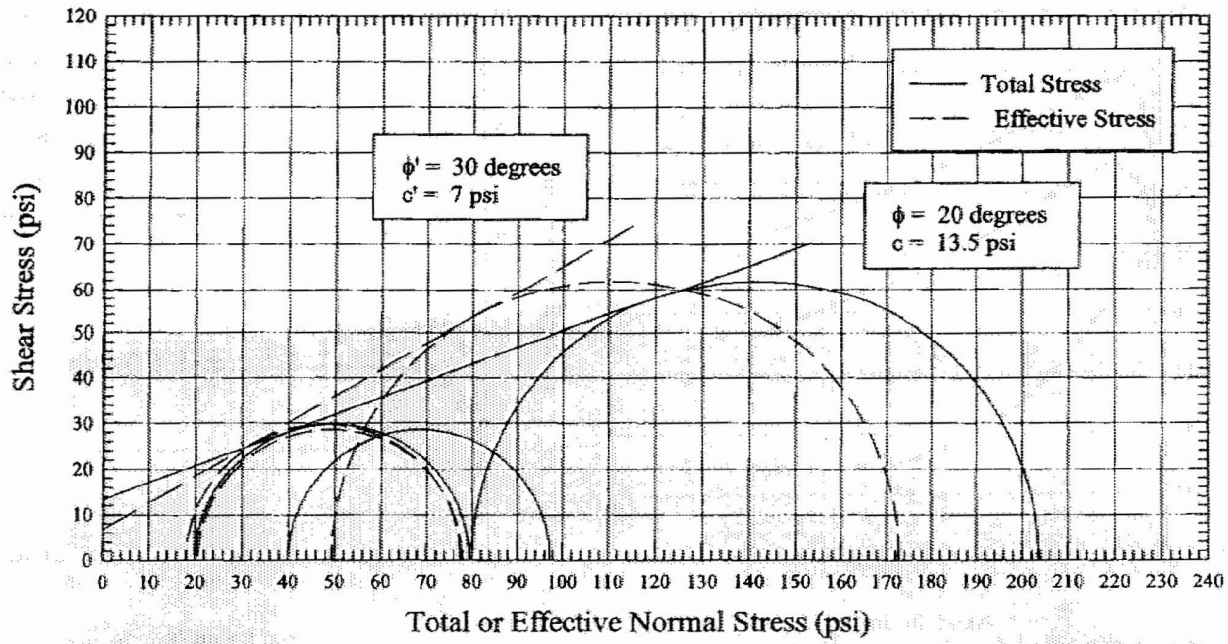
Wed, 15-NOV-2006 14:19:15

Consolidated Undrained (CU) Triaxial Shear (ASTM D4767)

Mohr Stress Circles at Maximum Deviator Stress Criterion



Mohr Stress Circles at Maximum Principal Stress Ratio Criterion



Boring No.: *B-321* Depth: *73.5-75.5 ft* SEI Contract: *06120048* Date: *10/20/06*
Sample Description: *Fine SILTY SAND (SM) - gray* Reviewed By: *CJS*
Specimen Type: *Tube Sample* Specific Gravity: *2.67* LL: --- PI: *NP* %<200: *15.3*

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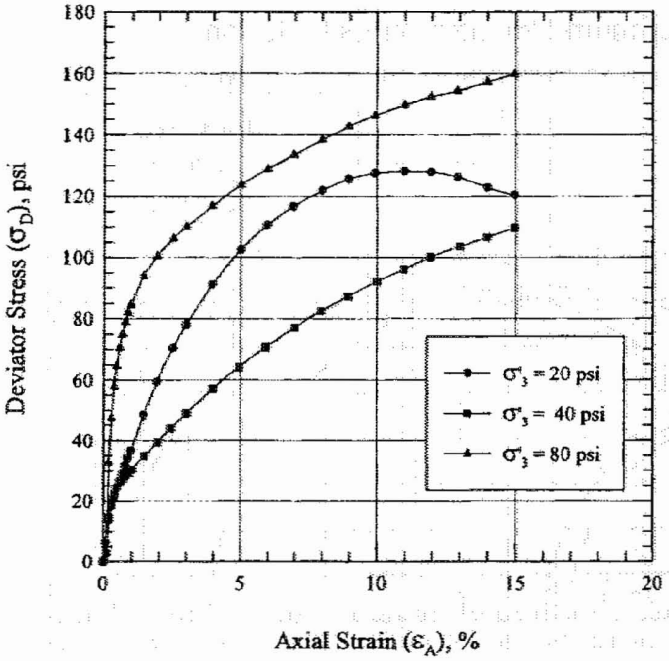
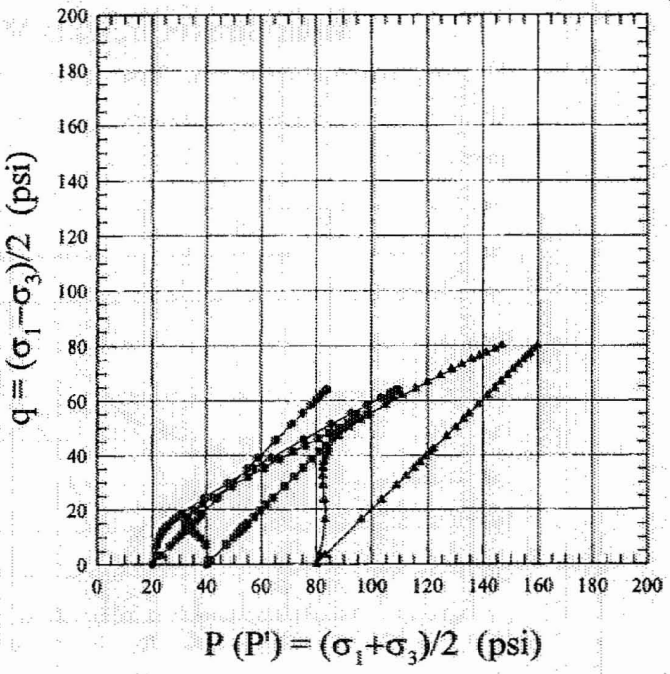
Schnabel Engineering

Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

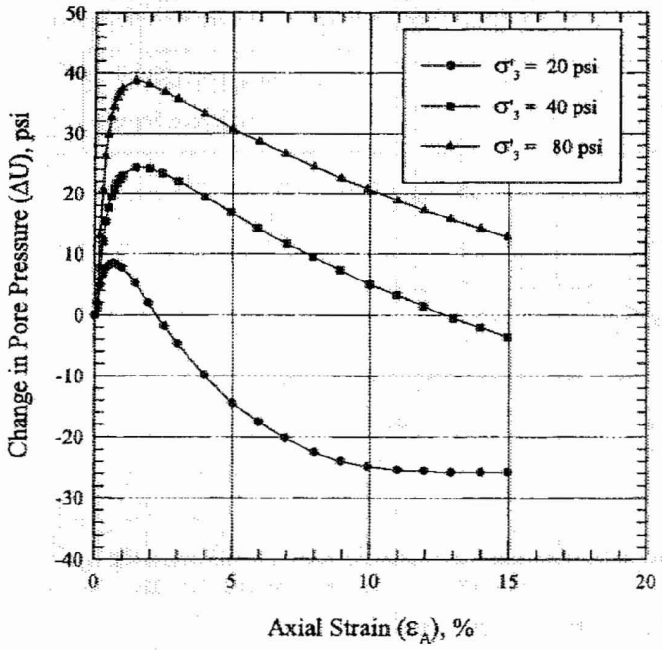
Deviator Stress vs. Axial Strain



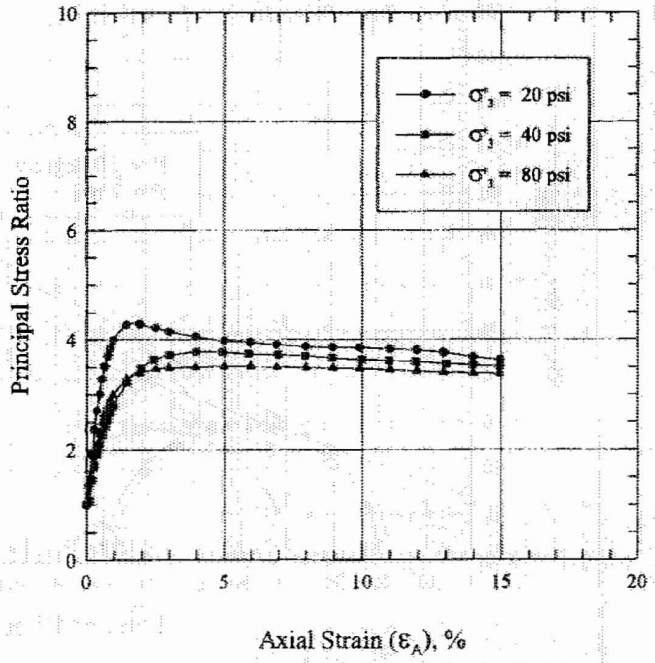
Stress Paths



Change in Pore Pressure vs. Axial Strain



Principal Stress Ratio vs. Axial Strain



Boring No.: *B-321* Depth: *73.5-75.5 ft* SEI Contract: *06120048* Date: *10/20/06*

Sample Description: *Fine SILTY SAND (SM) - gray* Reviewed By: *CJS*

Specimen Type: *Tube Sample* *Specific Gravity*: 2.67 LL: --- PI: *NP* %<200: *15.3*

Schnabel
Schnabel Engineering

Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Schnabel Engineering

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-321*
Depth: *73.5-75.5ft.*
Elevation: *-2.8 to -4.8*
Confining Stress (psi): *20.0*

Date: *10/20/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.896	2.88
Height (in)	5.833	5.81
Area (in^2)	6.59	6.53
Moisture (%)	21.9	
W_{solids} (lbs)	2.23	
ρ_{wet} (pcf)	122.0	
ρ_{dry} (pcf)	100.1	101.3
Void Ratio	0.66	0.64
Saturation, %	88	100

Shear Testing Conditions	
Cell Pressure (psi):	40.0
Back Pressure (psi):	20.0
Eff. Confining Stress (psi):	20.0
Final B check	0.95
t_{50} (min.):	0.1
Rate of Strain (%/min):	0.125

Filter strips used? *NO*

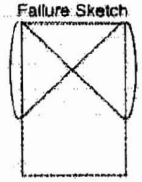
Specimen Type: *Tube Sample*

Soil Description: *Fine SILTY SAND (SM) - gray*

Liquid Limit: ---
Plasticity Index: *NP*
% finer that No. 200: *15.3*
Specific Gravity: *2.67*

Remarks:

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	20.0	0.0	6.53	20.0	20.0	20.0	20.0	0.0	1.00	0.00	20.0	20.0	0.0
1	41.9	41.9	0.005	0.09	22.0	2.0	6.54	26.4	20.0	24.4	18.0	6.4	1.36	0.31	23.2	21.2	3.2
2	89.5	89.5	0.011	0.19	24.9	4.9	6.55	33.7	20.0	28.8	15.1	13.7	1.91	0.36	26.8	21.9	6.8
3	118.7	118.6	0.017	0.29	26.6	6.6	6.55	38.1	20.0	31.5	13.4	18.1	2.35	0.36	29.1	22.5	9.1
4	139.9	139.8	0.022	0.38	27.5	7.5	6.56	41.3	20.0	33.8	12.5	21.3	2.71	0.35	30.7	23.2	10.7
5	157.9	157.8	0.028	0.48	28.0	8.0	6.57	44.0	20.0	36.0	12.0	24.0	3.00	0.33	32.0	24.0	12.0
6	175.2	175.1	0.033	0.57	28.3	8.3	6.57	46.6	20.0	38.3	11.7	26.6	3.28	0.31	33.3	25.0	13.3
7	191.9	191.8	0.039	0.67	28.4	8.4	6.58	49.2	20.0	40.8	11.6	29.2	3.51	0.29	34.6	26.2	14.6
8	208.9	208.7	0.045	0.77	28.3	8.3	6.58	51.7	20.0	43.4	11.7	31.7	3.71	0.26	35.8	27.5	15.8
9	225.0	224.8	0.050	0.86	28.0	8.0	6.59	54.1	20.0	46.1	12.0	34.1	3.84	0.23	37.1	29.1	17.1
10	241.8	241.6	0.056	0.96	27.7	7.7	6.60	56.6	20.0	48.9	12.3	36.6	3.98	0.21	38.3	30.6	18.3
11	320.8	320.5	0.084	1.45	25.2	5.2	6.63	68.3	20.0	63.1	14.8	48.3	4.27	0.11	44.2	39.0	24.2
12	395.9	395.5	0.112	1.93	21.9	1.9	6.66	79.4	20.0	77.5	18.1	[illegible]	[illegible]	0.03	49.7	47.8	29.7
13	472.1	471.6	0.146	2.51	18.1	-1.9	6.70	90.4	20.0	92.3	21.9	70.4	4.21	-0.03	55.2	57.1	35.2
14	525.2	524.5	0.174	2.99	15.2	-4.8	6.74	97.9	20.0	102.7	24.8	77.9	4.14	-0.06	58.9	63.7	38.9
15	620.7	619.8	0.230	3.96	10.1	-9.9	6.80	111.1	20.0	121.0	29.9	91.1	4.05	-0.11	65.6	75.5	45.6
16	706.2	705.1	0.291	5.01	5.5	-14.5	6.88	122.5	20.0	137.0	34.5	102.5	3.97	-0.14	71.3	85.8	51.3
17	769.6	768.3	0.347	5.97	2.4	-17.6	6.95	130.8	20.0	148.2	37.6	110.8	3.94	-0.16	75.3	92.9	55.3
18	820.2	818.7	0.403	6.94	-0.2	-20.2	7.02	136.6	20.0	156.8	40.2	116.6	3.90	-0.17	78.3	98.5	58.3
19	868.5	864.8	0.465	8.00	-2.5	-22.5	7.10	141.8	20.0	164.3	42.5	121.8	3.86	-0.18	80.9	103.4	60.9
20	903.4	901.4	0.521	8.97	-4.0	-24.0	7.18	145.6	20.0	169.6	44.0	125.6	3.85	-0.19	82.8	106.8	62.8
21	927.0	924.8	0.577	9.93	-4.8	-24.8	7.25	147.5	20.0	172.3	44.8	127.5	3.85	-0.19	83.7	108.5	63.7
22	942.7	940.3	0.639	11.00	-5.4	-25.4	7.34	148.1	20.0	173.5	45.4	128.1	3.82	-0.20	84.0	109.4	64.0
23	951.5	948.9	0.695	11.96	-5.6	-25.6	7.42	147.9	20.0	173.5	45.6	127.9	3.80	-0.20	83.9	109.5	63.9
24	950.3	947.5	0.751	12.92	-5.8	-25.8	7.50	146.3	20.0	172.1	45.8	126.3	3.76	-0.20	83.1	108.9	63.1
25	935.1	932.1	0.813	13.99	-5.8	-25.8	7.60	142.7	20.0	168.5	45.8	122.7	3.68	-0.21	81.3	107.1	61.3
26	927.1	923.8	0.869	14.95	-5.8	-25.8	7.68	140.2	20.0	166.0	45.8	120.2	3.63	-0.21	80.1	105.9	60.1

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

Schnabel Engineering

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Calvert Cliffs Nuclear Power Plant*

Location: *Calvert County, MD*

Schnabel Contract: *06120048*
Boring No.: *B-321*
Depth: *73.5-75.5ft.*
Elevation: *-2.8 to -4.8*
Confining Stress (psi): *40.0*

Date: *10/20/2006*

Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.881	2.86
Height (in)	5.808	5.76
Area (in^2)	6.52	6.41
Moisture (%)	28.5	
W_{solids} (lbs)	2.04	
ρ_{wet} (pcf)	119.7	
ρ_{dry} (pcf)	93.2	95.3
Void Ratio	0.79	0.75
Saturation, %	97	98

Shear Testing Conditions	
Cell Pressure (psi):	55.0
Back Pressure (psi):	15.0
Eff. Confining Stress (psi):	40.0
Final B check	0.98
t_{50} (min.):	0.1
Rate of Strain (%/min):	0.125

Filter strips used? *NO*

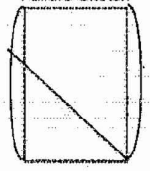
Specimen Type: *Tube Sample*

Soil Description: *Fine SILTY SAND (SM) - gray*

Liquid Limit: *---*
Plasticity Index: *NP*
% finer that No. 200: *15.3*
Specific Gravity: *2.67*

Remarks:

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	15.0	0.0	6.41	40.0	40.0	40.0	40.0	0.0	1.00	0.00	40.0	40.0	0.0
1	18.2	18.2	0.006	0.10	16.2	1.2	6.42	42.8	40.0	41.6	38.8	2.8	1.07	0.42	41.4	40.2	1.4
2	92.8	92.8	0.012	0.21	22.6	7.6	6.42	54.4	40.0	46.8	32.4	14.4	1.45	0.53	47.2	39.6	7.2
3	125.4	125.3	0.017	0.29	27.1	12.1	6.43	59.5	40.0	47.4	27.9	19.5	1.70	0.62	49.7	37.6	9.7
4	145.4	145.3	0.023	0.40	30.3	15.3	6.43	62.6	40.0	47.3	24.7	22.6	1.91	0.68	51.3	36.0	11.3
5	158.4	158.3	0.028	0.48	32.6	17.6	6.44	64.6	40.0	47.0	22.4	24.6	2.10	0.72	52.3	34.7	12.3
6	168.6	168.5	0.034	0.59	34.4	19.4	6.45	66.1	40.0	46.7	20.6	26.1	2.27	0.74	53.1	33.7	13.1
7	177.0	176.9	0.040	0.69	35.7	20.7	6.45	67.4	40.0	46.7	19.3	27.4	2.42	0.76	53.7	33.0	13.7
8	183.8	183.6	0.045	0.78	36.7	21.7	6.46	68.4	40.0	46.7	18.3	28.4	2.55	0.76	54.2	32.5	14.2
9	190.3	190.1	0.051	0.88	37.4	22.4	6.47	69.4	40.0	47.0	17.6	29.4	2.67	0.76	54.7	32.3	14.7
10	196.8	196.6	0.057	0.99	38.0	23.0	6.47	70.4	40.0	47.4	17.0	30.4	2.79	0.76	55.2	32.2	15.2
11	226.8	226.5	0.085	1.47	39.3	24.3	6.50	74.8	40.0	50.5	15.7	34.8	3.22	0.70	57.4	33.1	17.4
12	257.9	257.5	0.113	1.95	39.1	24.1	6.54	79.4	40.0	55.3	15.9	39.4	3.48	0.61	59.7	35.6	19.7
13	289.1	288.6	0.141	2.44	38.3	23.3	6.57	83.9	40.0	60.6	16.7	43.9	3.63	0.53	62.0	38.7	22.0
14	323.8	323.2	0.174	3.01	37.0	22.0	6.61	88.9	40.0	66.9	18.0	48.9	3.72	0.45	64.5	42.5	24.5
15	382.3	381.4	0.230	3.98	34.4	19.4	6.67	97.2	40.0	77.8	20.6	57.2	[illegible]	0.34	68.6	49.2	28.6
16	434.0	432.9	0.288	4.95	31.8	16.8	6.74	104.2	40.0	87.4	23.2	64.2	3.77	0.26	72.1	55.3	32.1
17	482.8	481.5	0.342	5.92	29.2	14.2	6.81	110.7	40.0	96.5	25.8	70.7	3.74	0.20	75.3	61.1	35.3
18	532.6	531.1	0.404	6.99	26.7	11.7	6.89	117.1	40.0	105.4	28.3	77.1	3.72	0.15	78.5	66.8	38.5
19	575.7	574.0	0.460	7.96	24.5	9.5	6.96	122.4	40.0	112.9	30.5	82.4	3.70	0.12	81.2	71.7	41.2
20	614.8	612.9	0.516	8.93	22.3	7.3	7.04	127.1	40.0	119.8	32.7	87.1	3.66	0.08	83.5	76.2	43.5
21	658.6	656.4	0.578	10.00	20.0	5.0	7.12	132.2	40.0	127.2	35.0	[illegible]	3.63	0.05	86.1	81.1	46.1
22	694.2	691.8	0.634	10.97	18.2	3.2	7.20	136.1	40.0	132.9	36.8	96.1	3.61	0.03	88.1	84.9	48.1
23	731.3	728.7	0.690	11.94	16.4	1.4	7.28	140.1	40.0	138.7	38.6	100.1	3.59	0.01	90.1	88.7	50.1
24	766.1	763.3	0.752	13.01	14.5	-0.5	7.37	143.6	40.0	144.1	40.5	103.6	3.56	0.00	91.8	92.3	51.8
25	797.0	794.0	0.808	13.98	12.9	-2.1	7.46	146.6	40.0	148.7	42.1	106.6	3.53	-0.02	93.3	95.4	53.3
26	829.2	826.0	0.864	14.95	11.3	-3.7	7.53	149.6	40.0	153.3	43.7	109.6	3.51	-0.03	94.8	98.5	54.8

Notes: Deviator load corrected for membrane and filter cage (if applicable) effects.
[1] Right Cylinder Correction Method