APPENDIX A

RING SHEAR DATA

Rancho Solano Clay #1	**Pages**
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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	5/20/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	5/27/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	25.8	(g)
Wt. of Dry Soil + Tare	20.9	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	13.9	(g)
Wt. of Dry Soil	9.0	(g)
Water Content, w%	54.4	(%)
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	Yes	0.584	in/min
Multistage Loading or New Specimen for Each Point?		Multistage Loading	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
110.7	115	0.80	0.06				
304.3	214	1.48	0.11				
497.9	313	2.17	0.16				
1002.1	570	3.96	0.29				
2001.8	1082	7.51	0.54				
4001.0	2104	14.61	1.05				
8000.5	4149	28.81	2.07	1.68	0.00238	1.71	0.00235

Minimum calc. shear rate =	0.00235	in/min.
Estim. failure displacement =	0.2	in

Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-052003-1	2001.8	1082	7.51	0.54	425	2.95	0.21	0.0008
R1-052003-2	4001.0	2104	14.61	1.05	877	6.09	0.44	0.0026
R1-052003-3	8000.5	4149	28.81	2.07	1577	10.95	0.79	0.0057

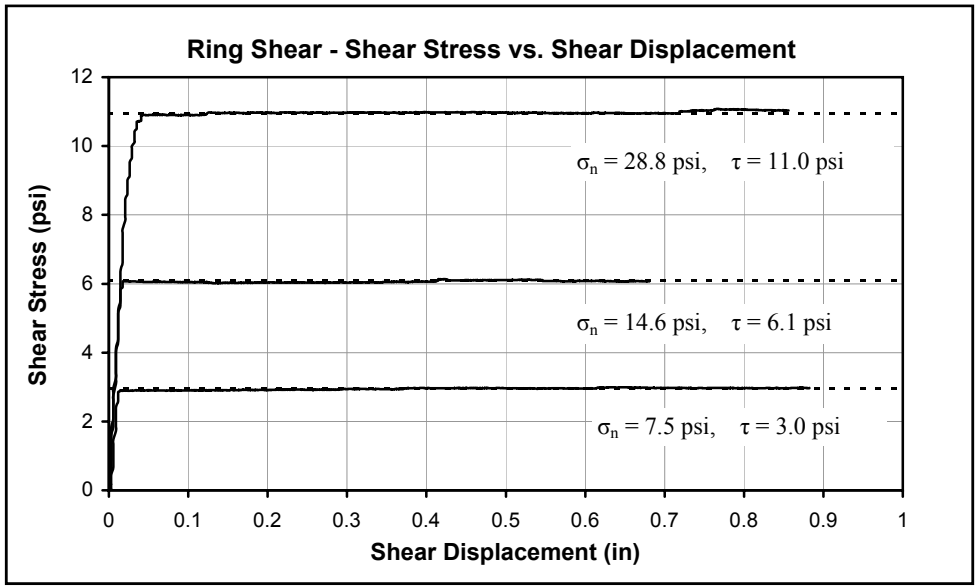
Notes: Specimen was remolded at 1.2 times the LL

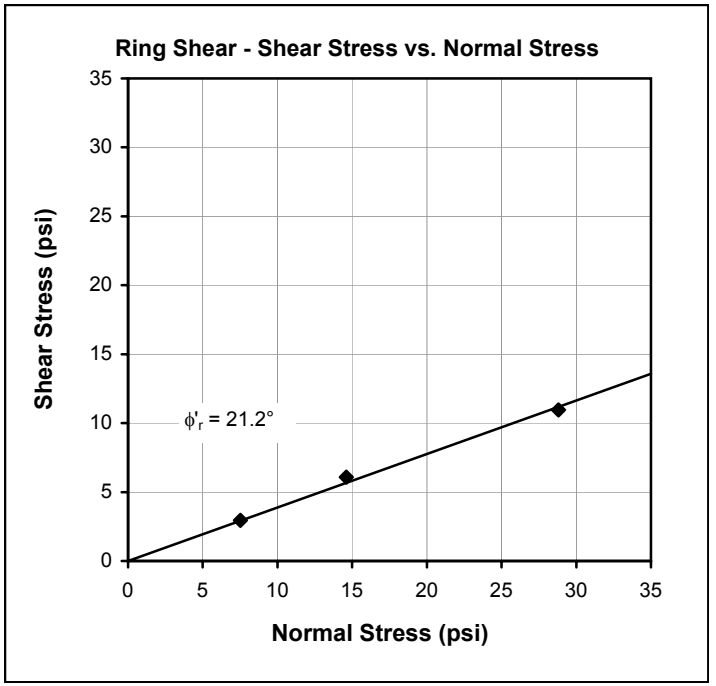
No special technique was used to minimize wall friction

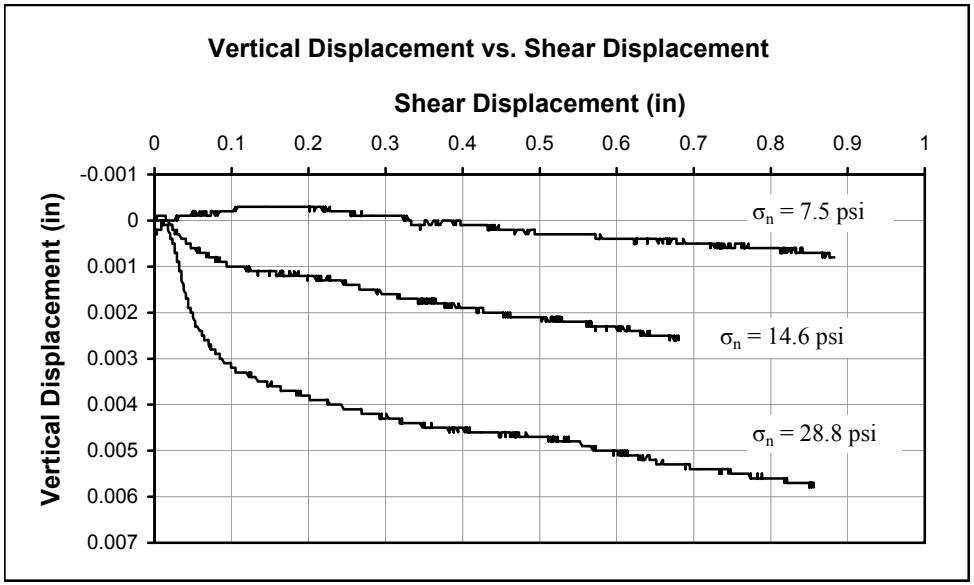
This specimen was not pushed through the #40 sieve

ϕ'_r = 21.2 deg.

(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Michael Wanger
Data Reduced By:	Chris Meehan
Test Started On:	5/20/03
Test Finished On:	5/27/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	6/3/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	6/10/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	38.0	(g)
Wt. of Dry Soil + Tare	29.0	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	26.1	(g)
Wt. of Dry Soil	17.1	(g)
Water Content, w%	52.6	(%)
Wet Weight of Entire Specimen	35.3	(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	Yes	0.584	in/min
Multistage Loading or New Specimen for Each Point?		Multistage Loading	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
110.7	115	0.80	0.06				
304.3	214	1.48	0.11				
497.9	313	2.17	0.16				
1002.1	570	3.96	0.29				
2001.8	1082	7.51	0.54				
4001.0	2104	14.61	1.05				
8000.5	4149	28.81	2.07	1.5	0.00267	0.8	0.00494

Minimum calc. shear rate =	0.00267	in/min.
Estim. failure displacement =	0.2	in

Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-060303-1	2001.8	1082	7.51	0.54	454	3.15	0.23	0.0008
R1-060303-2	4001.0	2104	14.61	1.05	864	6.00	0.43	0.0037
R1-060303-3	8000.5	4149	28.81	2.07	1584	11.00	0.79	0.0056

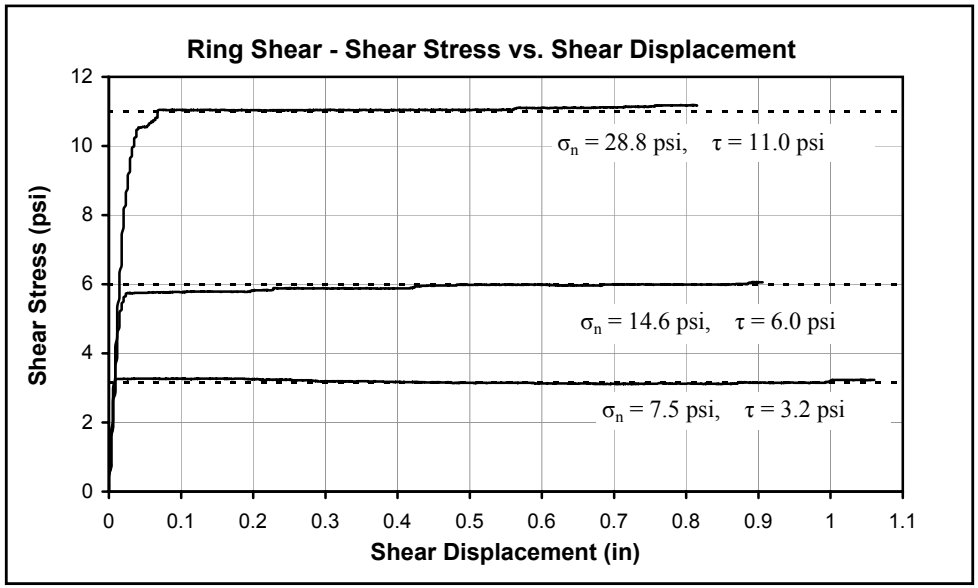
Notes: Specimen was remolded at 1.2 times the LL

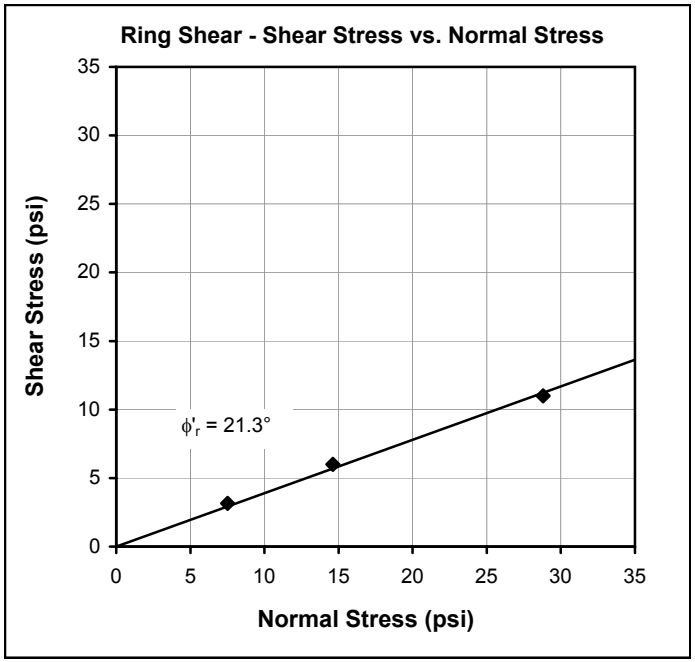
No special technique was used to minimize wall friction

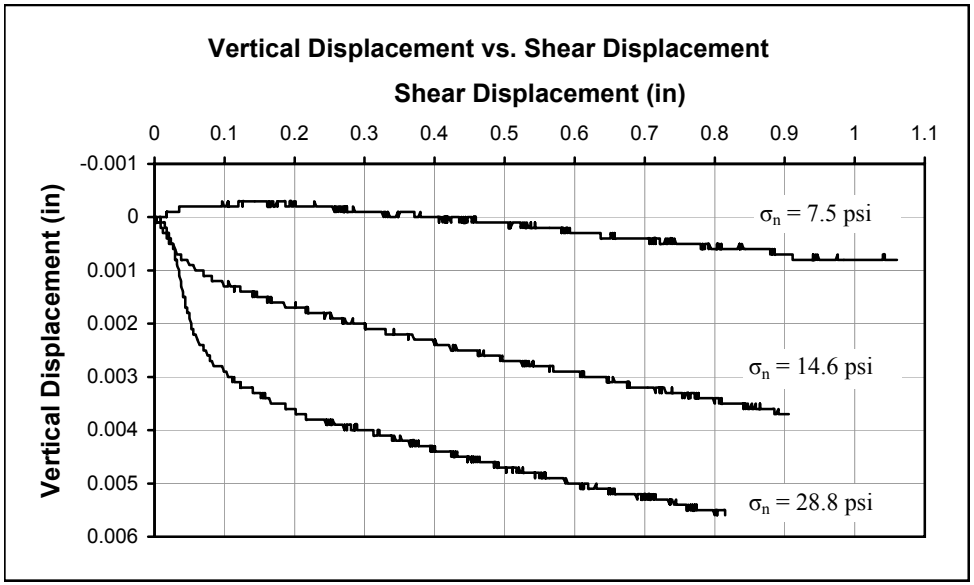
This specimen was pushed through the #40 sieve

ϕ'_r = 21.3 deg.

(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Mike Wanger
Data Reduced By:	Chris Meehan
Test Started On:	6/3/03
Test Finished On:	6/10/03

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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	6/10/03
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	6/17/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	32.4	(g)
Wt. of Dry Soil + Tare	25.1	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	20.5	(g)
Wt. of Dry Soil	13.2	(g)
Water Content, w%	55.3	(%)
Wet Weight of Entire Specimen	37.0	(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	Yes	0.584	in/min
Multistage Loading or New Specimen for Each Point?		Multistage Loading	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
110.7	115	0.80	0.06				
304.3	214	1.48	0.11				
497.9	313	2.17	0.16				
1002.1	570	3.96	0.29				
2001.8	1082	7.51	0.54				
4001.0	2104	14.61	1.05				
8000.5	4149	28.81	2.07	2.0	0.00200	1.2	0.00331

Minimum calc. shear rate =	0.00200	in/min.
Estim. failure displacement =	0.2	in

Test performed at shear rate =	0.000709	in/min.
Test performed at shear rate =	0.024	deg/min.

Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-061003-1	2001.8	1082	7.51	0.54	504	3.50	0.25	0.0016
R1-061003-2	4001.0	2104	14.61	1.05	907	6.30	0.45	0.0046
R1-061003-3	8000.5	4149	28.81	2.07	1613	11.20	0.81	0.0089

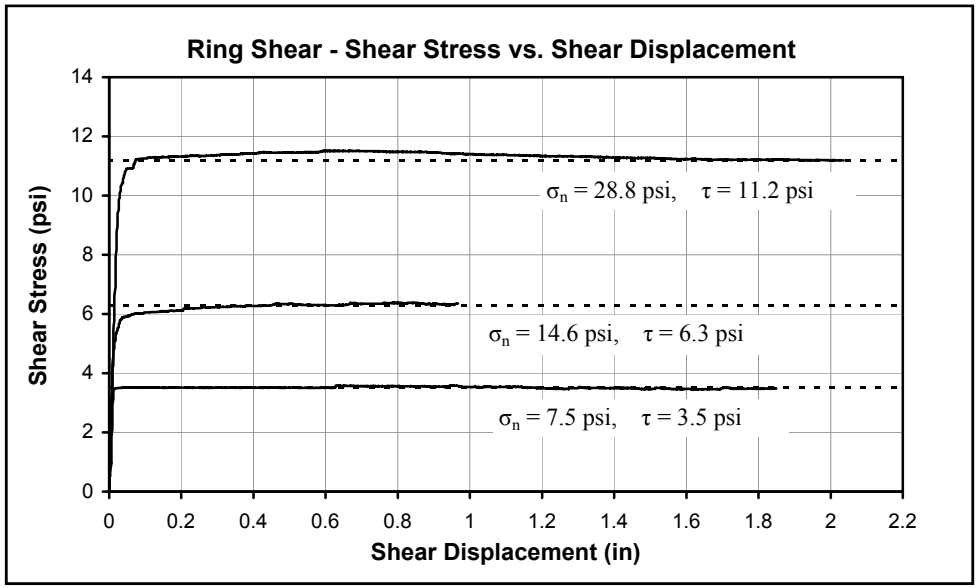
Notes: Specimen was remolded at 1.2 times the LL

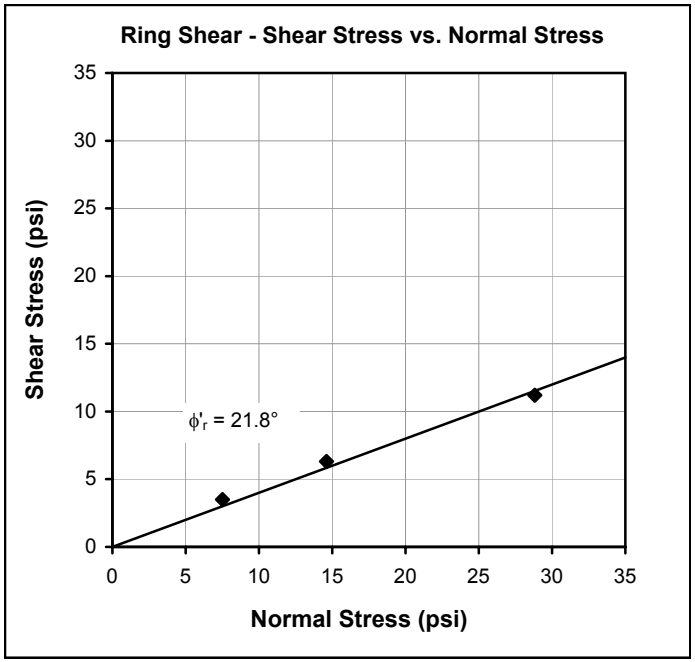
No special technique was used to minimize wall friction

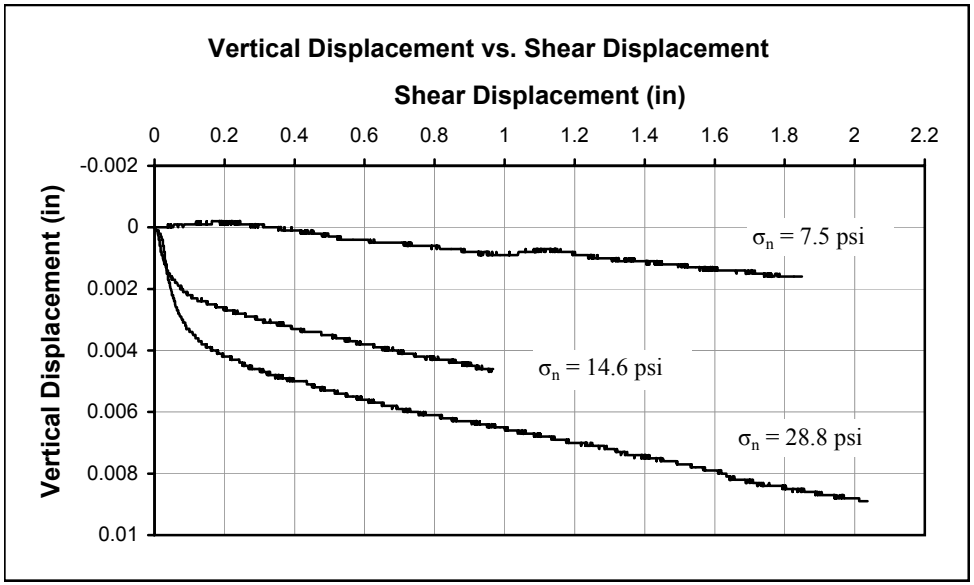
This specimen was pushed through the #40 sieve

ϕ'_r = 21.8 deg.

(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Michael J Wanger
Data Reduced By:	Chris Meehan
Test Started On:	6/10/03
Test Finished On:	6/17/03

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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	6/19/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	6/26/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	31.5	(g)
Wt. of Dry Soil + Tare	24.5	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	19.6	(g)
Wt. of Dry Soil	12.6	(g)
Water Content, w%	55.6	(%)
Wet Weight of Entire Specimen	37.8	(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	Yes	0.584	in/min
Multistage Loading or New Specimen for Each Point?		Multistage Loading	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
110.7	115	0.80	0.06				
304.3	214	1.48	0.11				
497.9	313	2.17	0.16				
1002.1	570	3.96	0.29				
2001.8	1082	7.51	0.54				
4001.0	2104	14.61	1.05				
8000.5	4149	28.81	2.07	3.3	0.0012	2.5	0.0016

Minimum calc. shear rate =	0.0012	in/min.
Estim. failure displacement =	0.2	in

Test performed at shear rate =	0.000709	in/min.
Test performed at shear rate =	0.024	deg/min.

Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-061903-1	2001.8	1082	7.51	0.54	475	3.30	0.24	0.0003
R1-061903-2	4001.0	2104	14.61	1.05	850	5.90	0.42	0.0032
R1-061903-3	8000.5	4149	28.81	2.07	1570	10.90	0.78	0.0052

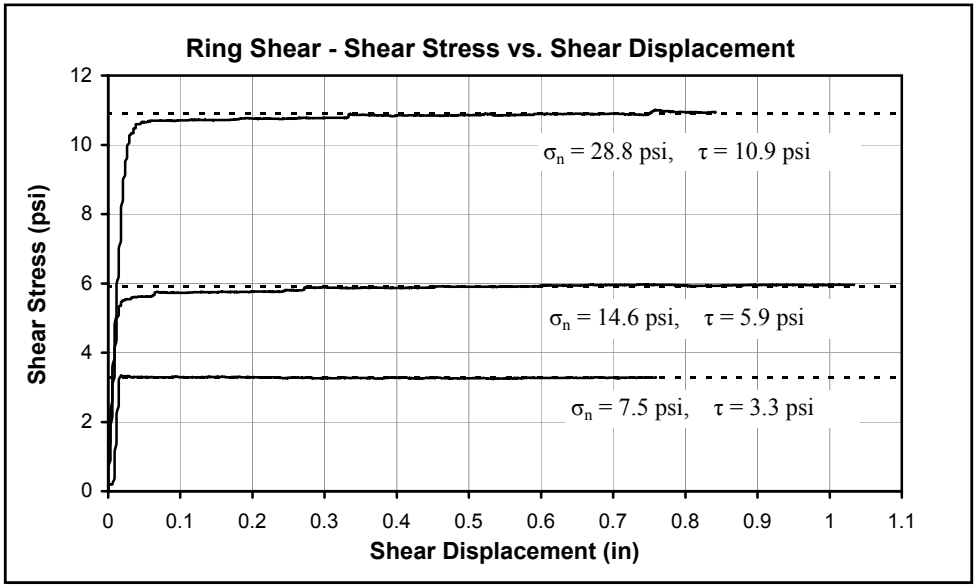
Notes: Specimen was remolded at 1.2 times the LL

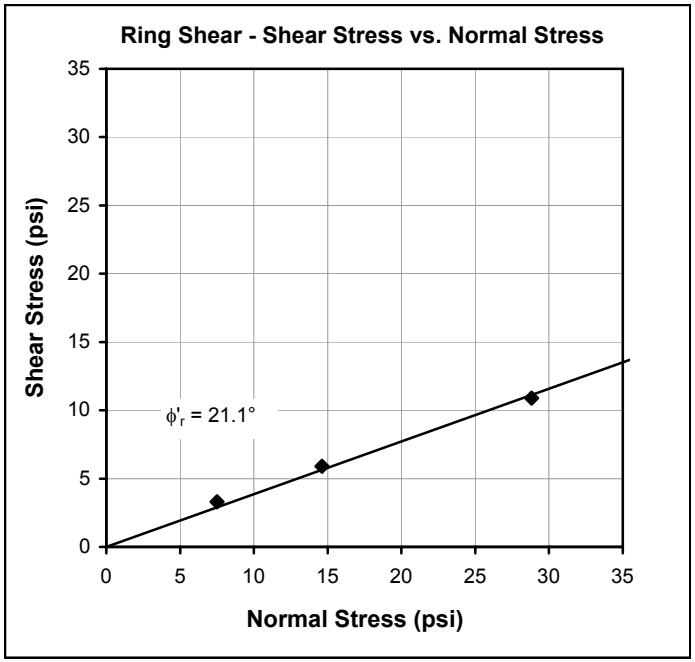
No special technique was used to minimize wall friction

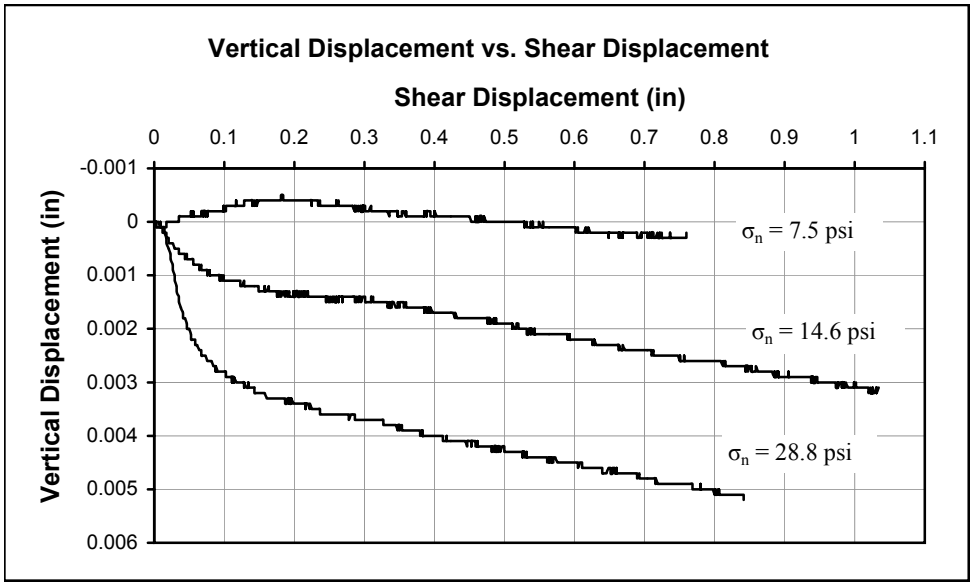
This specimen was pushed through the #40 sieve

ϕ'_r = 21.1 deg.

(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Michael J Wanger
Data Reduced By:	Chris Meehan
Test Started On:	6/19/03
Test Finished On:	6/26/03

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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	7/15/03
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	7/18/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	36.5	(g)
Wt. of Dry Soil + Tare	31.1	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	24.6	(g)
Wt. of Dry Soil	19.2	(g)
Water Content, w%	28.1	(%)
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1002.1	570	3.96	0.29				
2001.8	1082	7.51	0.54				
4001	2104	14.61	1.05				
8000	4149	28.81	2.07				
16000	8239	57.22	4.12				
28000	14375	99.83	7.19				

Shear rate based on data from earlier tests.

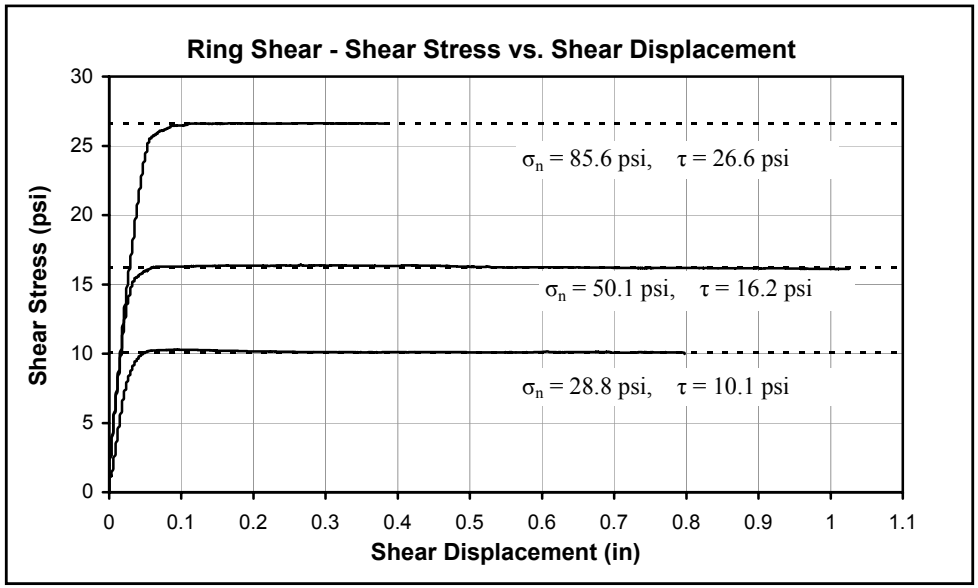
Minimum calc. shear rate =		in/min.
Estim. failure displacement =	0.2	in

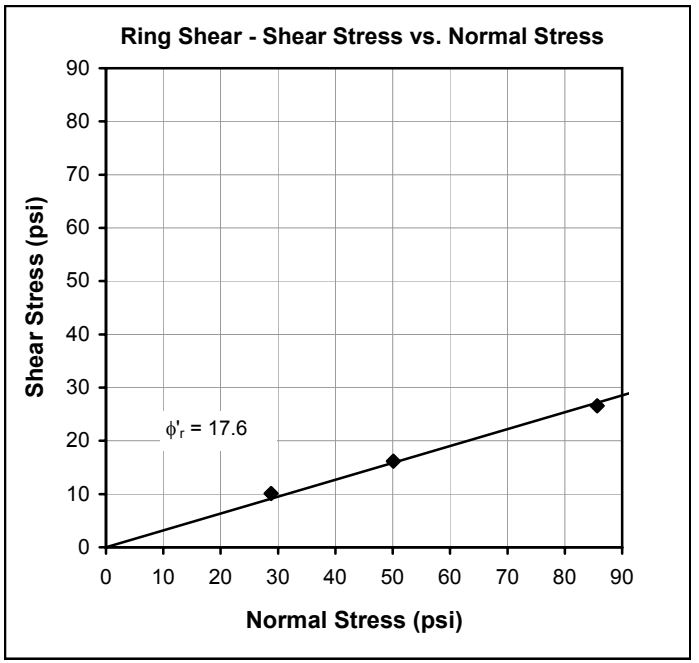
Test performed at shear rate =	0.000709	in/min.
Test performed at shear rate =	0.024	deg/min.

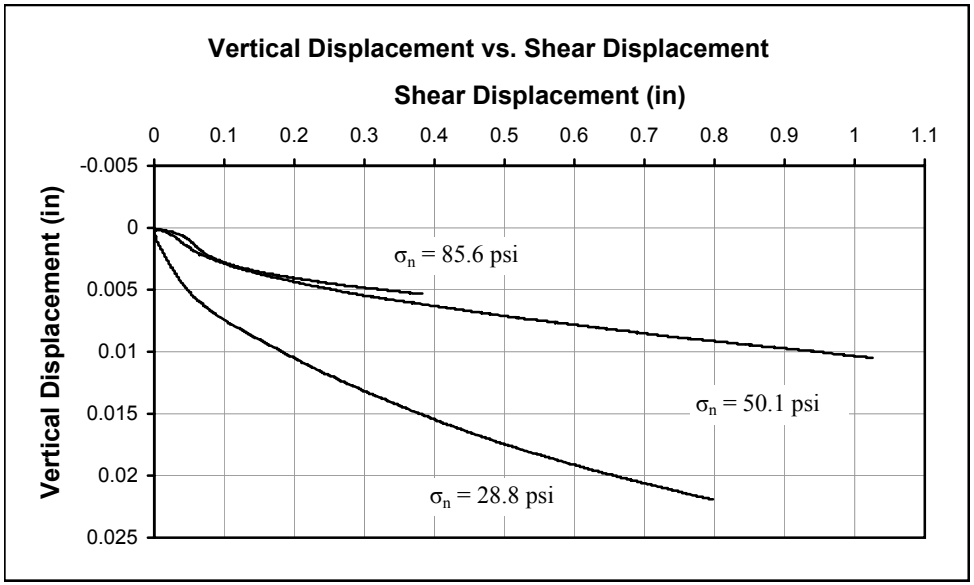
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-071503-1	8000	4149	28.81	2.07	1454	10.10	0.73	0.0219
R2-071503-2	14000	7216	50.11	3.61	2333	16.20	1.17	0.0105
R2-071503-3	24000	12330	85.62	6.16	3830	26.60	1.92	0.0053

Notes: Specimen was remolded at LL, and pushed through the #40 sieve
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 17.6 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Mike Wanger
Data Reduced By:	Chris Meehan
Test Started On:	7/15/03
Test Finished On:	7/18/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	7/19/03
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	7/24/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	39.7	(g)
Wt. of Dry Soil + Tare	33.7	(g)
Wt. of Tare	11.9	(g)
Wt. of Moist Soil	27.8	(g)
Wt. of Dry Soil	21.8	(g)
Water Content, w%	27.5	(%)
Wet Weight of Entire Specimen	26.6	(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
8000	4149	28.81	2.07				
14000	7216	50.11	3.61				
24000	12330	85.62	6.16				

Shear rate based on data from earlier tests.

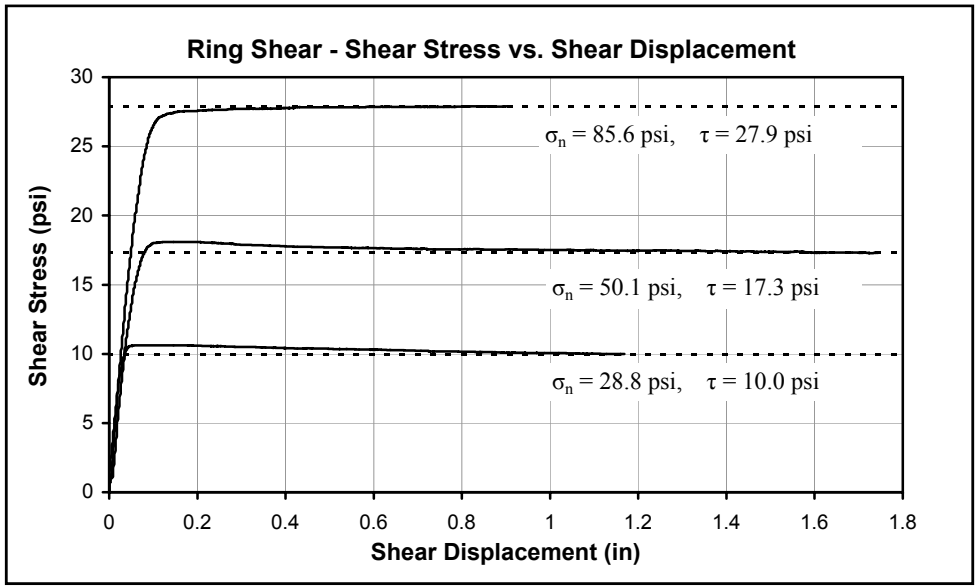
Minimum calc. shear rate =		in/min.
Estim. failure displacement =	0.2	in

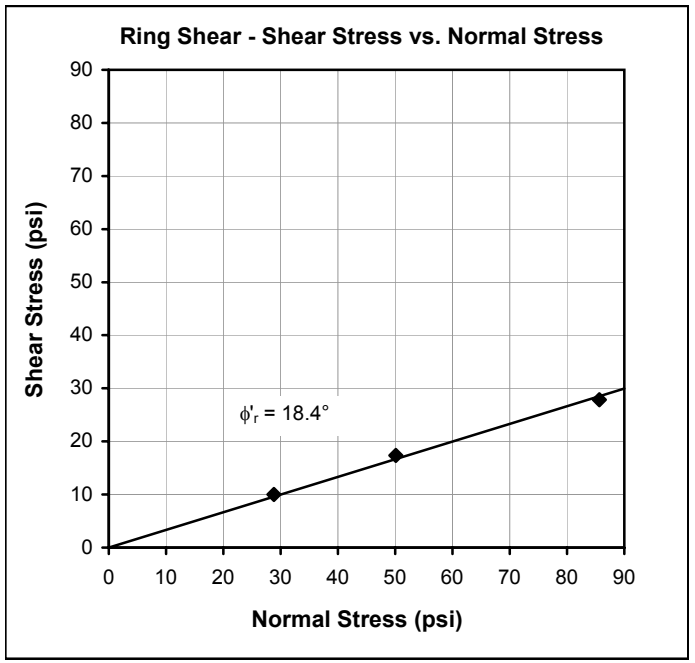
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

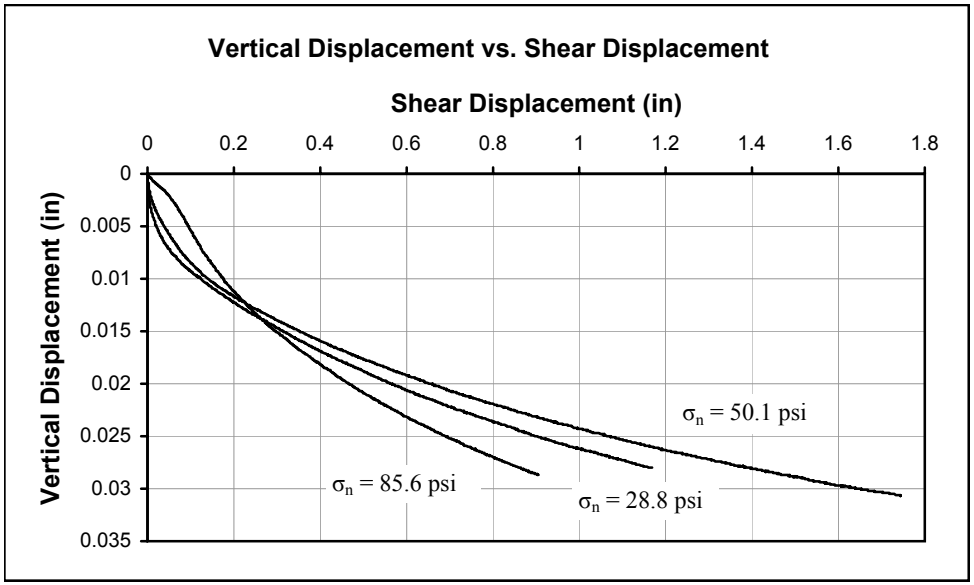
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-071903-1	8000	4149	28.81	2.07	1437	9.98	0.72	0.028
R1-071903-2	14000	7216	50.11	3.61	2497	17.34	1.25	0.031
R1-071903-3	24000	12330	85.62	6.16	4010	27.85	2.01	0.029

Notes: Specimen was remolded near LL, and pushed through the #40 sieve
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
No good consolidation data was recorded for this test.

ϕ'_r = 18.4 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Mike Wanger
Data Reduced By:	Chris Meehan
Test Started On:	7/19/03
Test Finished On:	7/24/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	8/13/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	8/21/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
7995	4146	28.79	2.07	-	-	-	-
13993	7213	50.09	3.61	5.3	0.0008	4.5	0.0009
23988	12324	85.58	6.16	4.6	0.0009	2.4	0.0017

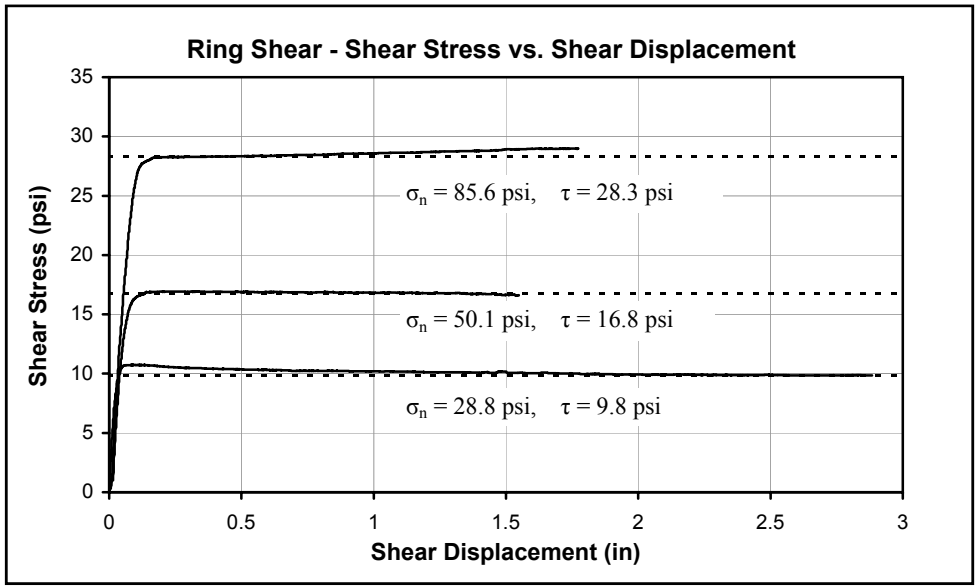
Minimum calc. shear rate =	0.0008	in/min.
Estim. failure displacement =	0.2	in

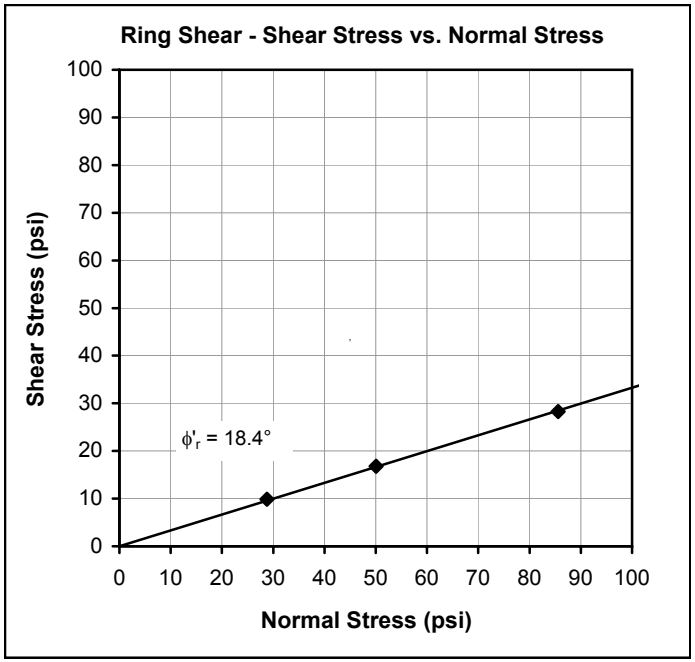
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

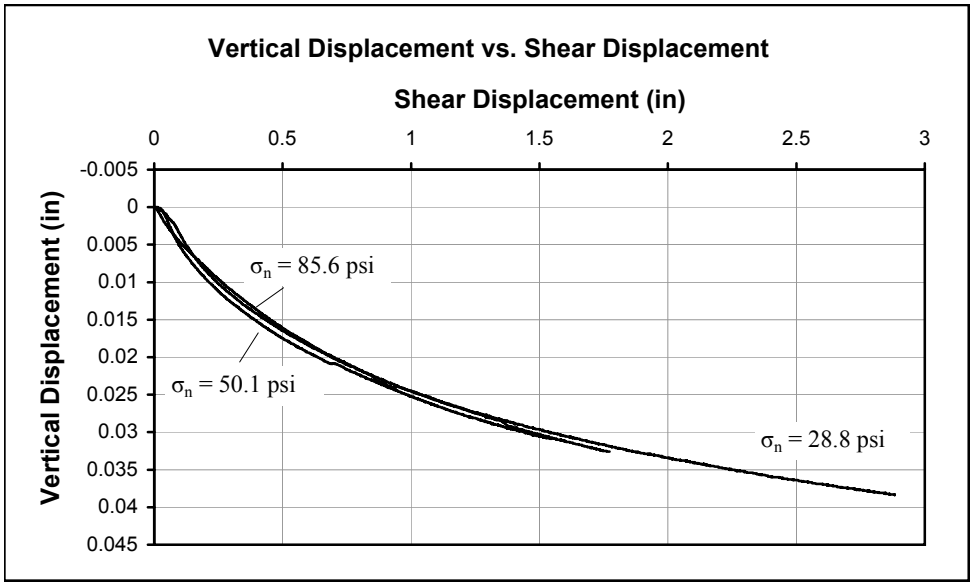
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-081303-1	7995	4146	28.79	2.07	1417	9.84	0.71	0.038
R1-081303-2	13993	7213	50.09	3.61	2415	16.77	1.21	0.031
R1-081303-3	23988	12324	85.58	6.16	4071	28.27	2.04	0.033

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 18.4 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	8/13/03
Test Finished On:	8/21/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	8/13/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	8/21/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
7995	4146	28.79	2.07	1.5	0.0027	-	-
13993	7213	50.09	3.61	3.9	0.0010	5.7	0.0007
23988	12324	85.58	6.16	4.4	0.0009	2.0	0.0020

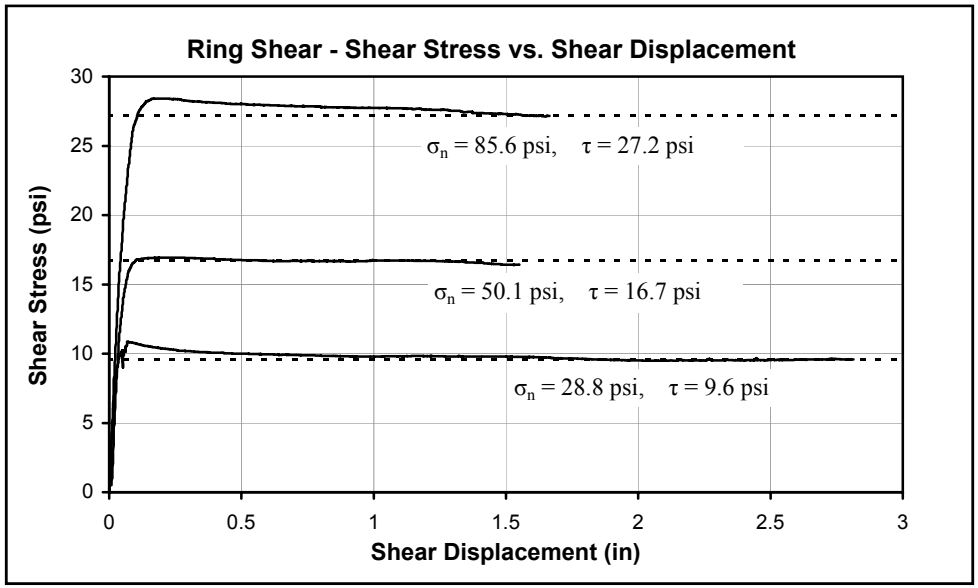
Minimum calc. shear rate =	0.0007	in/min.	
Estim. failure displacement =	0.2	in	

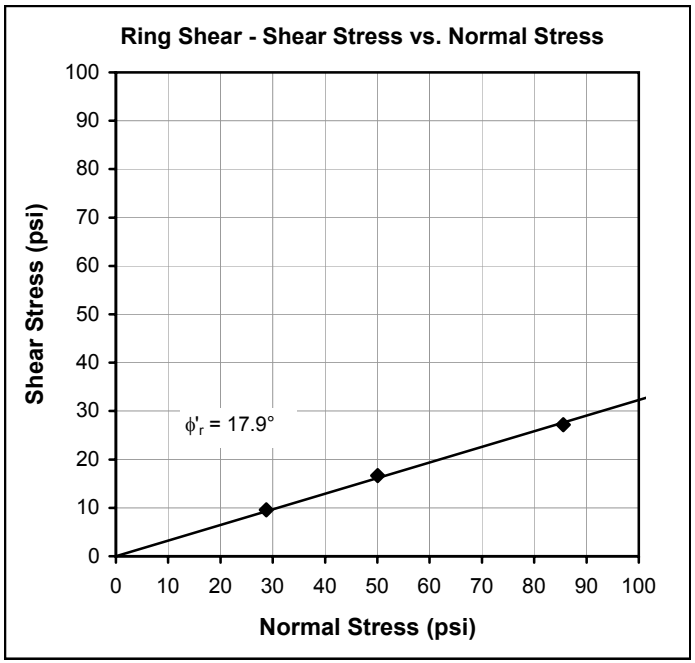
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

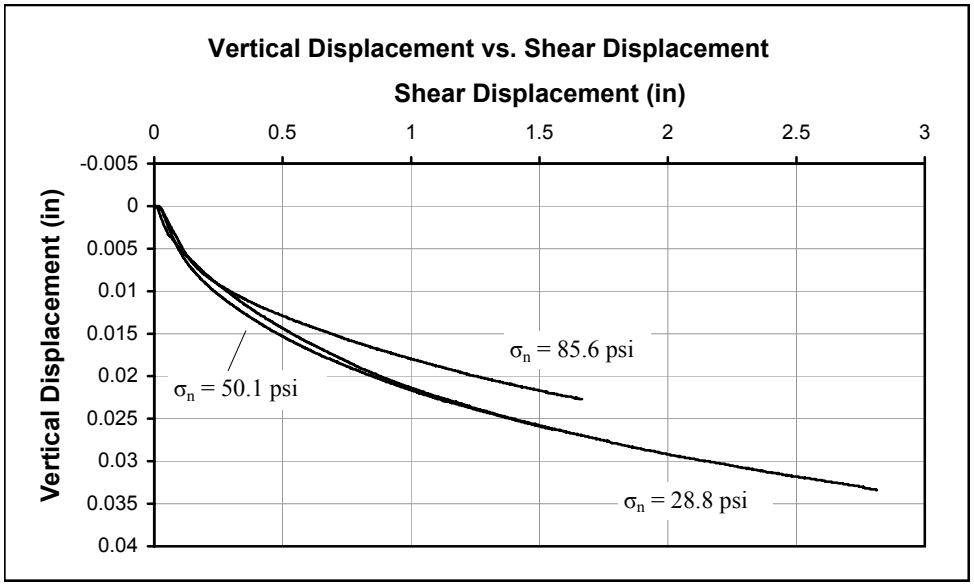
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-081303-1	7995	4146	28.79	2.07	1381	9.59	0.69	0.0334
R2-081303-2	13993	7213	50.09	3.61	2403	16.69	1.20	0.0263
R2-081303-3	23988	12324	85.58	6.16	3911	27.16	1.96	0.0227

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 17.9 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	8/13/03
Test Finished On:	8/21/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	8/22/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	9/4/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	Shear rate based on data from earlier tests.			
4000	2103	14.61	1.05				

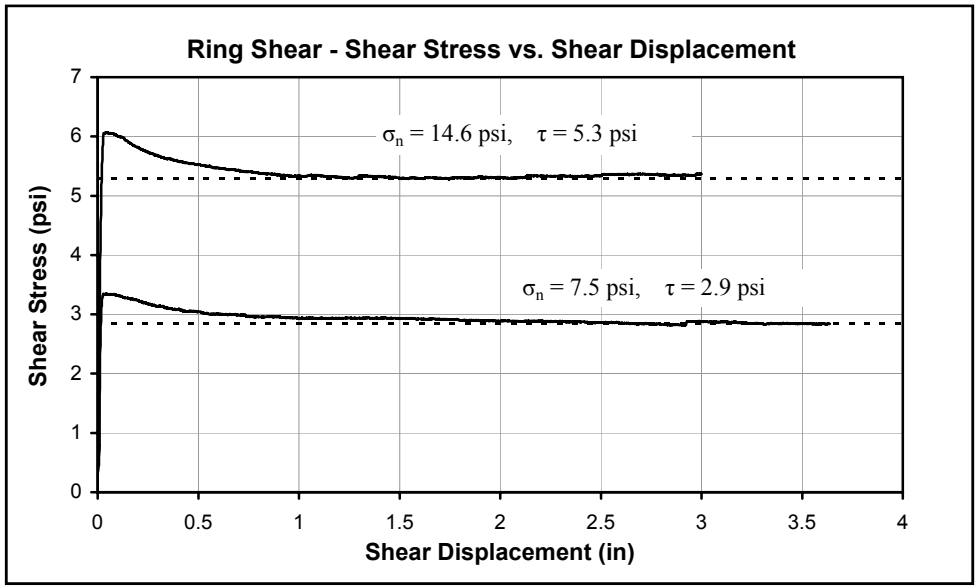
Minimum calc. shear rate =		in/min.
Estim. failure displacement =	0.2	in

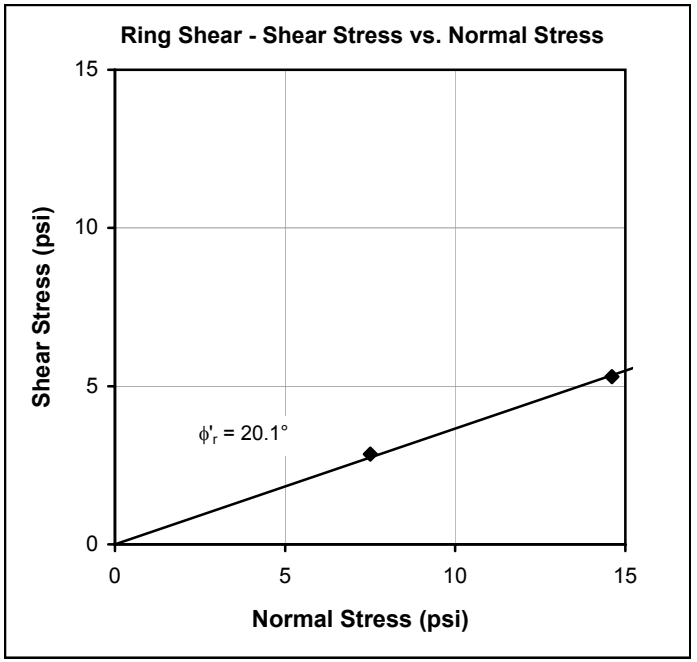
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

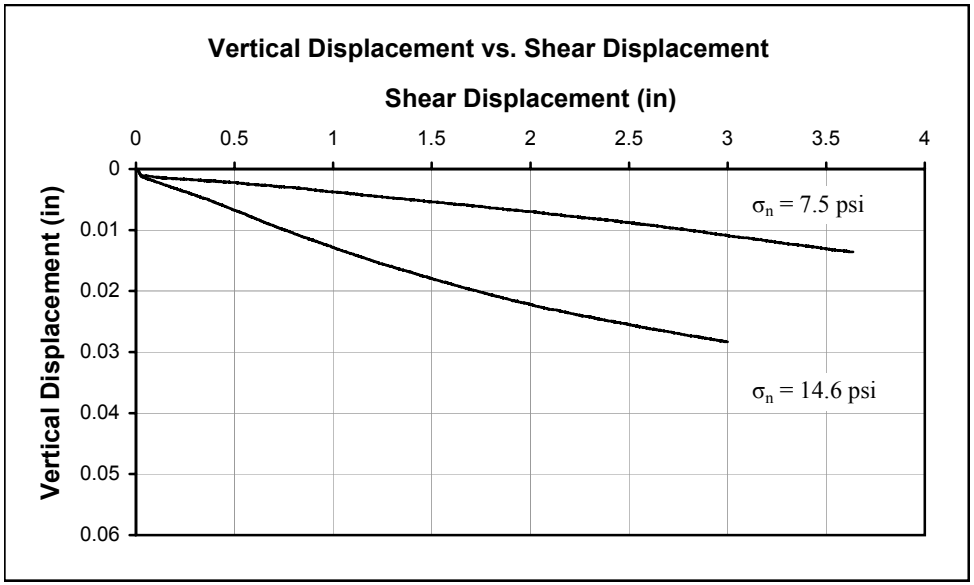
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-082203-1	2000	1081	7.50	0.54	410	2.85	0.21	0.014
R1-082203-2	4000	2103	14.61	1.05	763	5.30	0.38	0.028

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 20.1 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	8/22/03
Test Finished On:	9/4/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	8/22/03
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	9/4/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	-	-	-	-
4000	2103	14.61	1.05	1.8	0.0022	1.5	0.0027
7995	4146	28.79	2.07				
13993	7213	50.09	3.61				
23988	12324	85.58	6.16	7.5	0.0005	5.8	0.0007

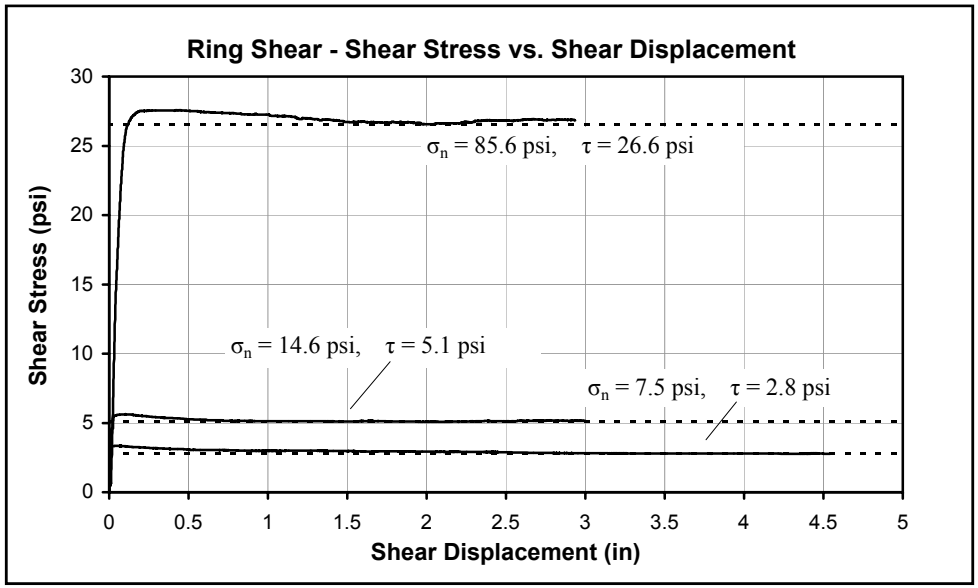
Minimum calc. shear rate =	0.0005	in/min.
Estim. failure displacement =	0.2	in

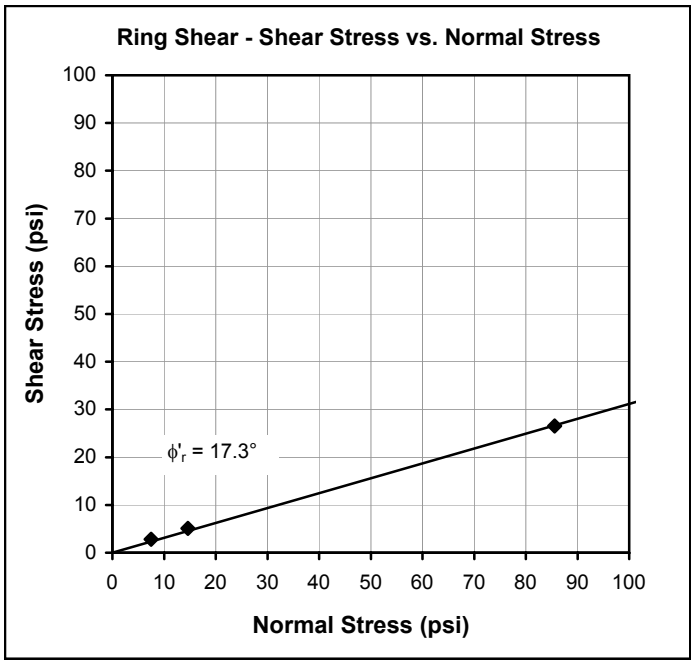
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

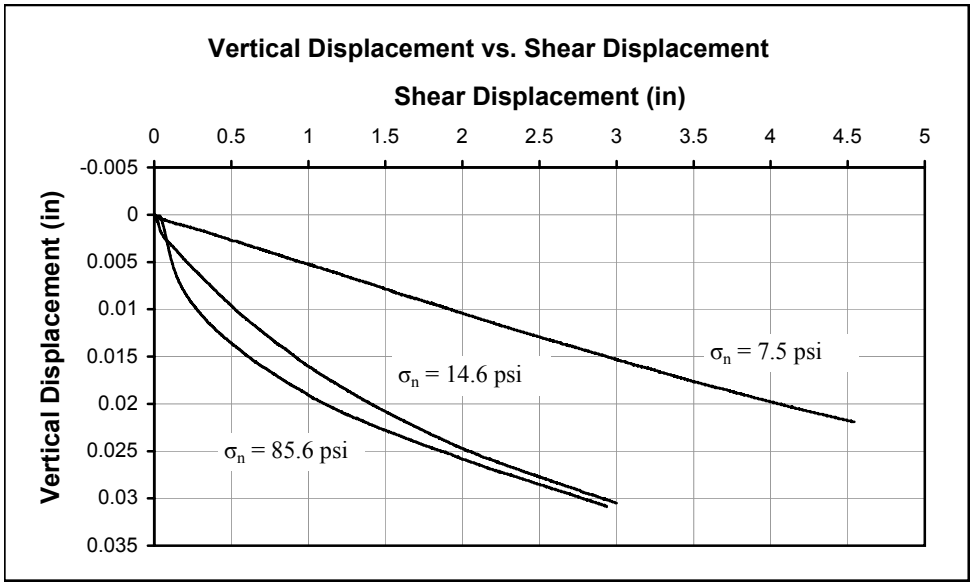
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-082203-1	2000	1081	7.50	0.54	403	2.80	0.20	0.0219
R2-082203-2	4000	2103	14.61	1.05	734	5.10	0.37	0.0305
R2-082203-3	23988	12324	85.58	6.16	3825	26.56	1.91	0.0309

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 17.3 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	8/22/03
Test Finished On:	9/4/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	9/4/03
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	9/21/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	-	-	-	-
4000	2103	14.61	1.05	-	-	-	-
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	5.66	0.00071	5.84	0.00068

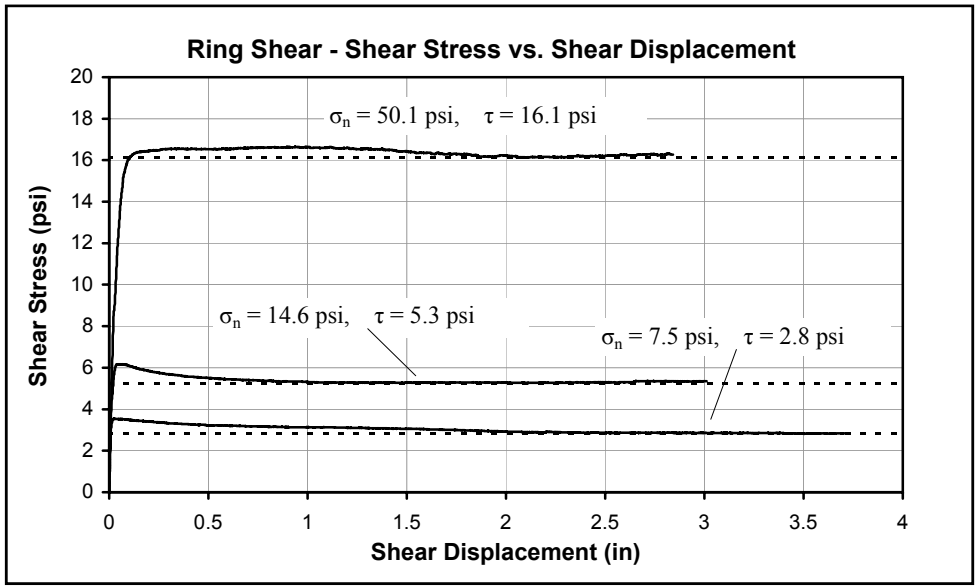
Minimum calc. shear rate =	0.00068	in/min.
Estim. failure displacement =	0.2	in

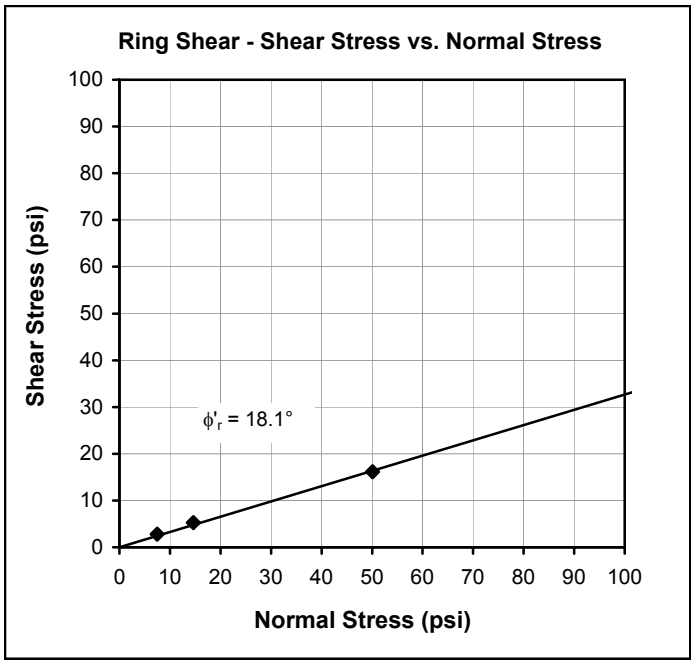
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

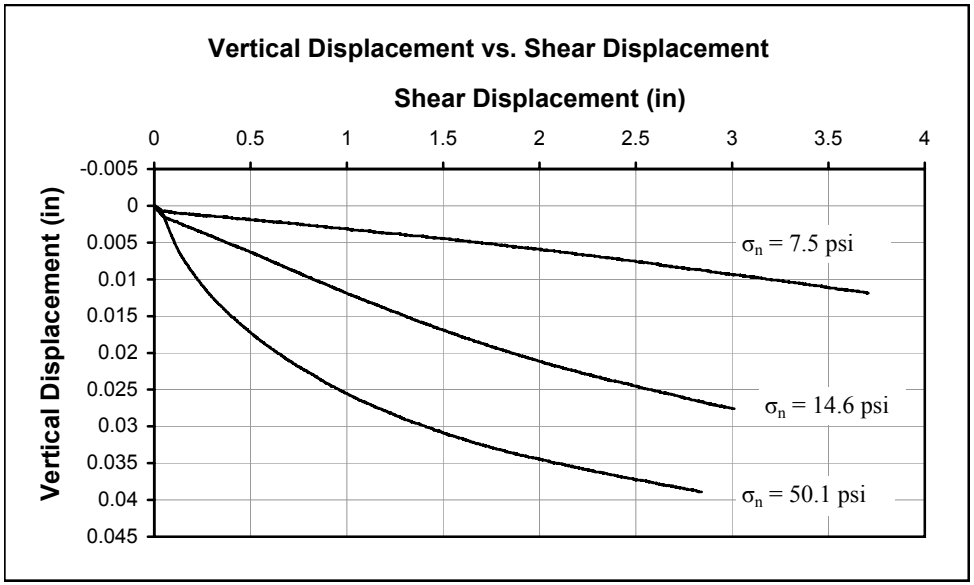
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-090403-1	2000	1081	7.50	0.54	406	2.82	0.20	0.012
R1-090403-2	4000	2103	14.61	1.05	757	5.26	0.38	0.028
R1-090403-3	13993	7213	50.09	3.61	2323	16.13	1.16	0.039

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 18.1 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	9/4/03
Test Finished On:	9/21/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	9/4/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	9/21/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	-	-	-	-
4000	2103	14.61	1.05	-	-	-	-
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	5.1	0.0008	2.5	0.0016

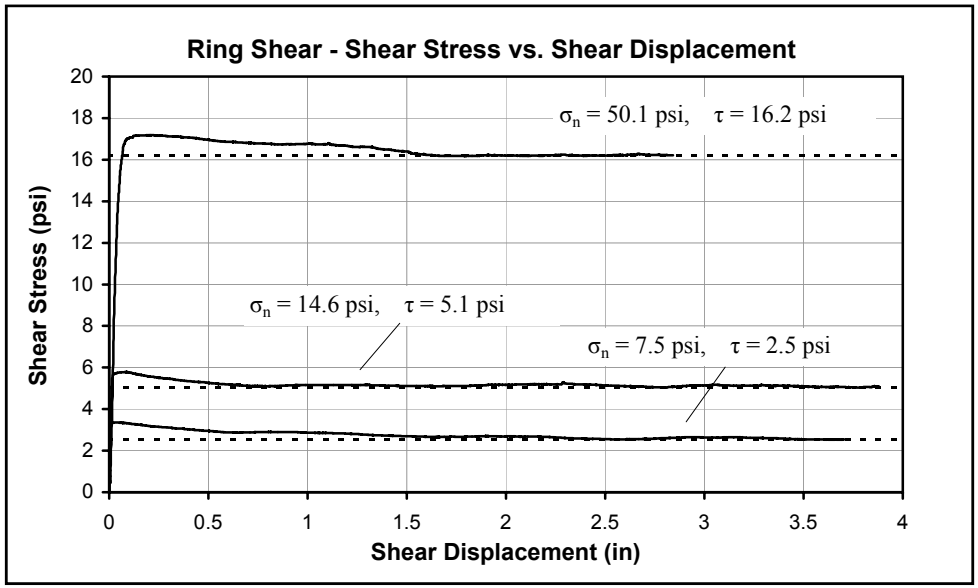
Minimum calc. shear rate =	0.0008	in/min.
Estim. failure displacement =	0.2	in

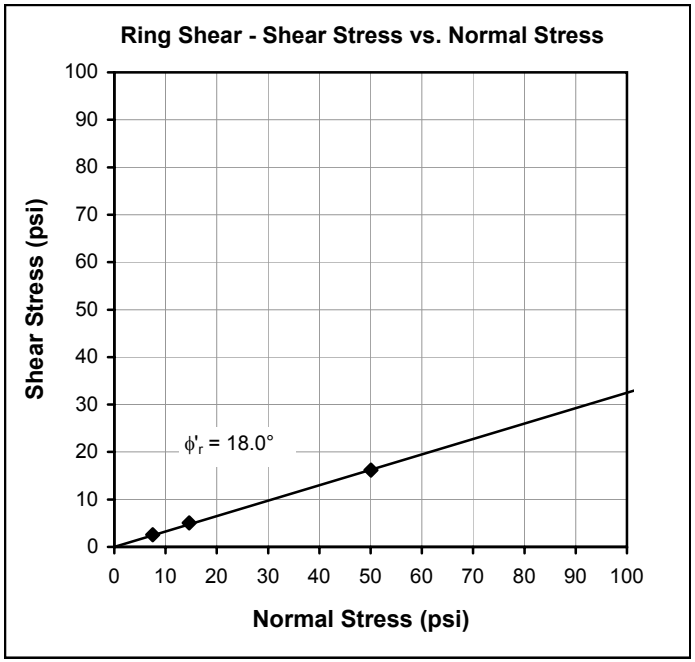
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

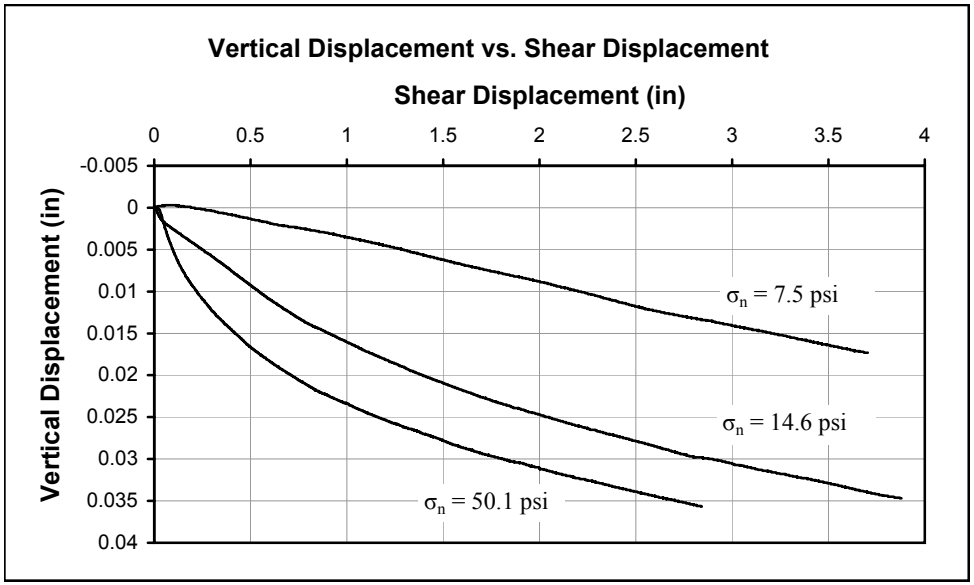
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-090403-1	2000	1081	7.50	0.54	366	2.54	0.18	0.0173
R2-090403-2	4000	2103	14.61	1.05	727	5.05	0.36	0.0347
R2-090403-3	13993	7213	50.09	3.61	2330	16.18	1.16	0.0357

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 18.0 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	9/4/03
Test Finished On:	9/21/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	11/14/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	11/21/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	Shear rate based on data from earlier tests.			

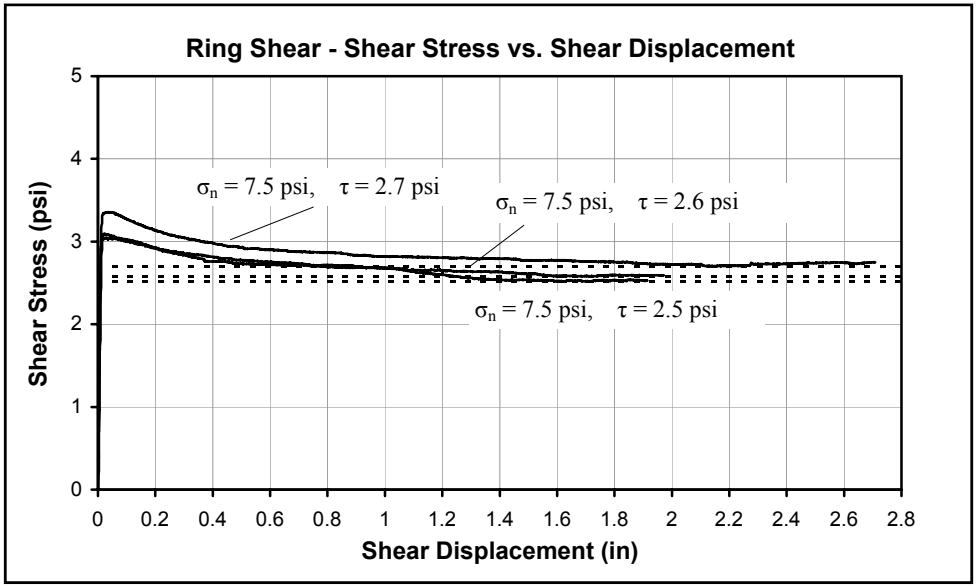
Minimum calc. shear rate =		in/min.
Estim. failure displacement =	0.2	in

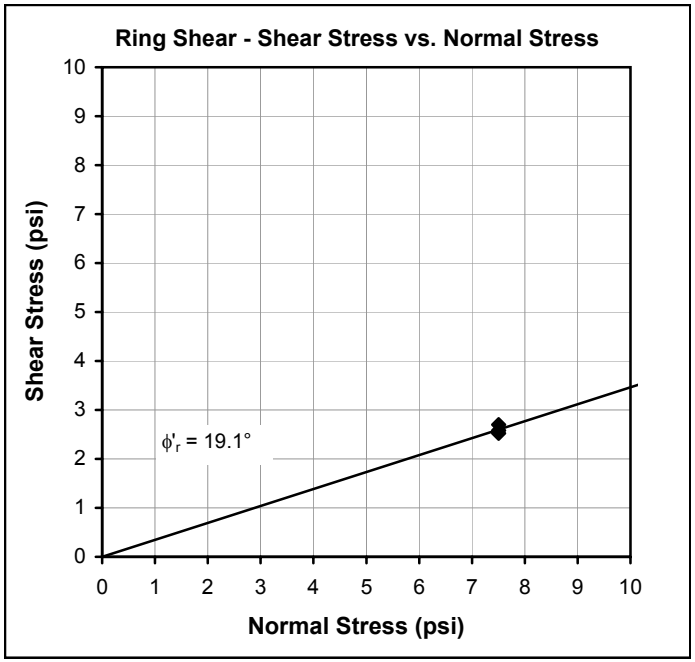
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

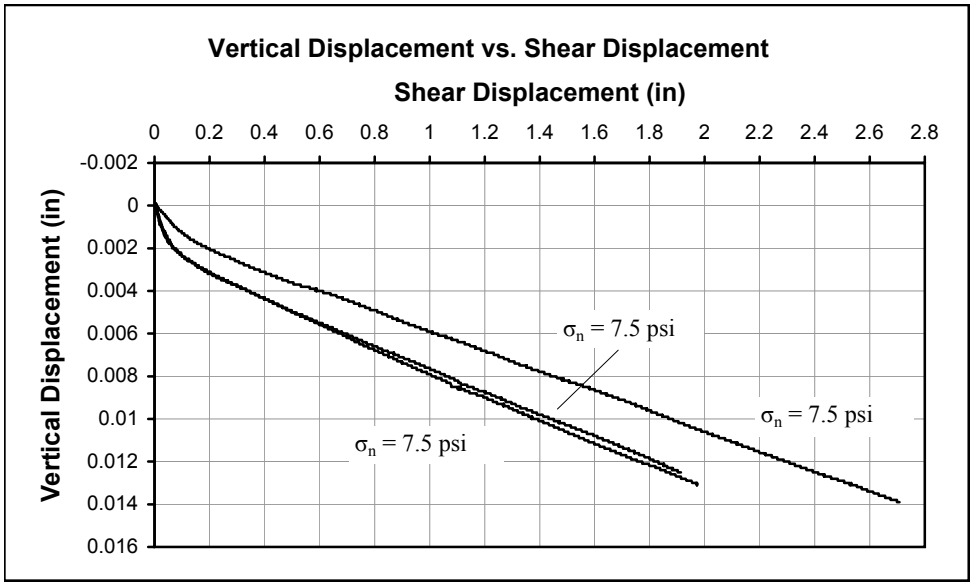
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-111403-1	2000	1081	7.50	0.54	389	2.70	0.19	0.0139
R2-111403-2	2000	1081	7.50	0.54	372	2.58	0.19	0.0131
R2-111403-3	2000	1081	7.50	0.54	363	2.52	0.18	0.0125

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

ϕ'_r = 19.1 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	11/14/03
Test Finished On:	11/21/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces		Started:	10/7/03
Sample I.D./Loc.:	Rancho Solano Clay #1		Finished:	10/20/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1	

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54				
4000	2103	14.61	1.05				
7995	4146	28.79	2.07	-	-	-	-
13993	7213	50.09	3.61	2.8	0.0014	3.2	0.0013

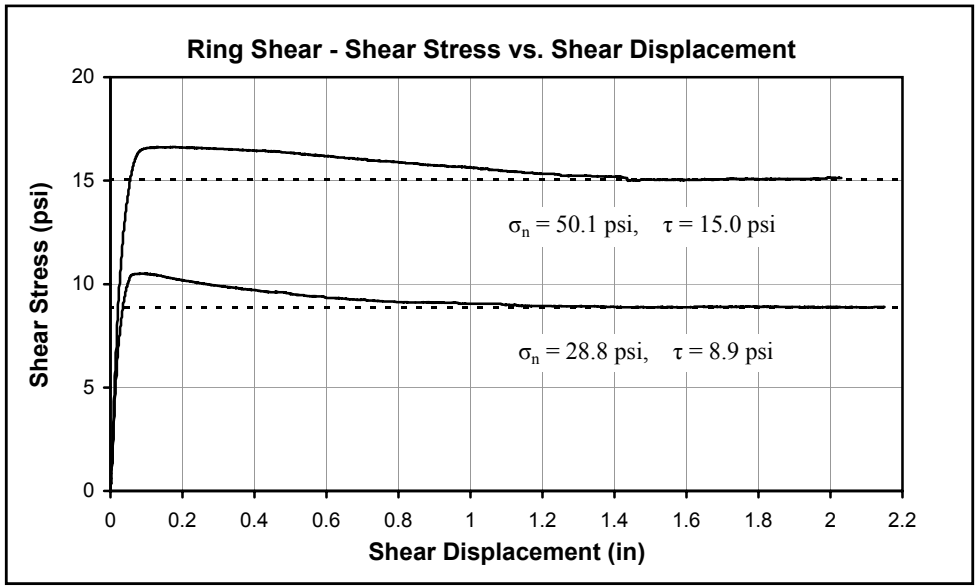
Minimum calc. shear rate =	0.0013	in/min.
Estim. failure displacement =	0.2	in

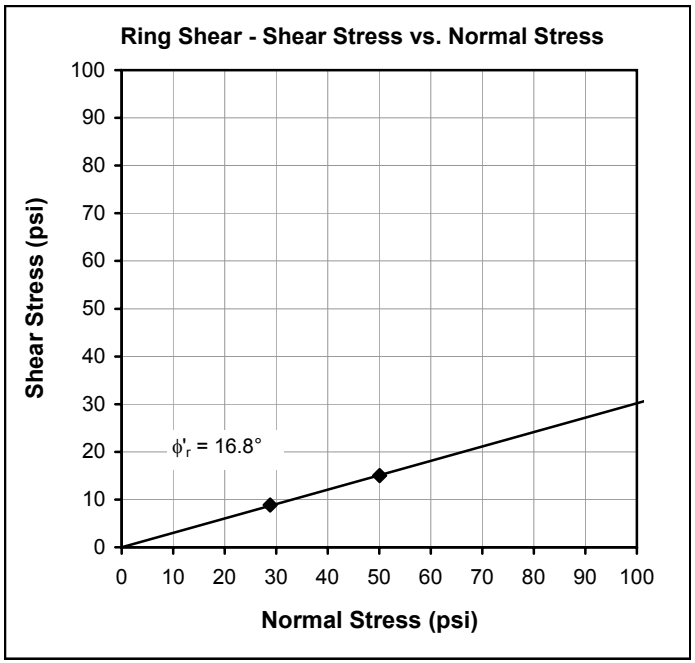
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

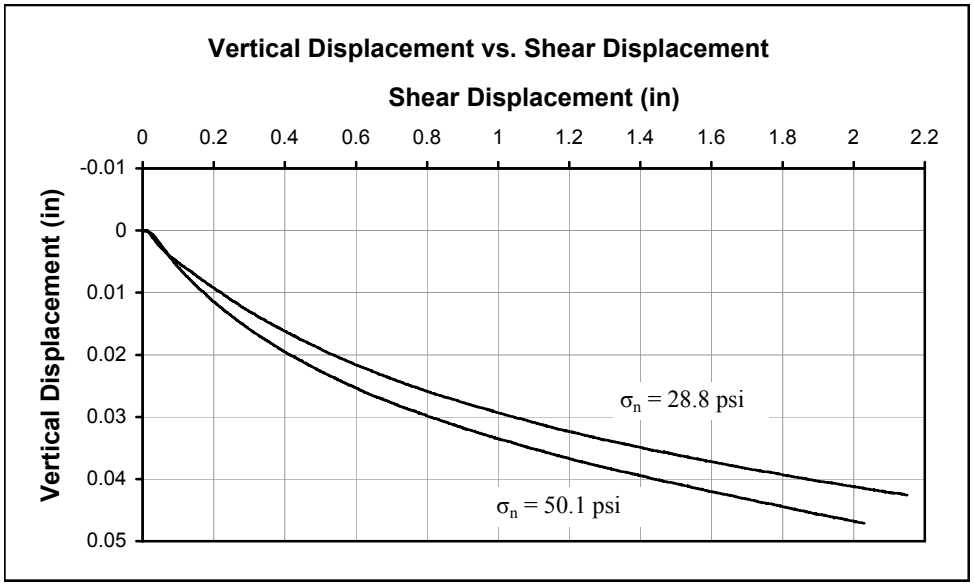
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-100703-1	7995	4146	28.79	2.07	1279	8.88	0.64	0.043
R1-100703-2	13993	7213	50.09	3.61	2164	15.03	1.08	0.047

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 16.8 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	10/7/03
Test Finished On:	10/20/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	10/20/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	11/8/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	-	-	-	-
4000	2103	14.61	1.05	1.6	0.0025	2.2	0.0018
7995	4146	28.79	2.07	1.2	0.0033	-	-
7995	4146	28.79	2.07	2.6	0.0015	2.1	0.0019

Minimum calc. shear rate =	0.0015	in/min.
Estim. failure displacement =	0.2	in

Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-102003-1	2000	1081	7.50	0.54	341	2.37	0.17	0.026
R1-102003-2	4000	2103	14.61	1.05	618	4.29	0.31	0.040
R1-102003-3	7995	4146	28.79	2.07	1171	8.13	0.59	0.042
R1-102003-4	7995	4146	28.79	2.07	1207	8.38	0.60	0.045

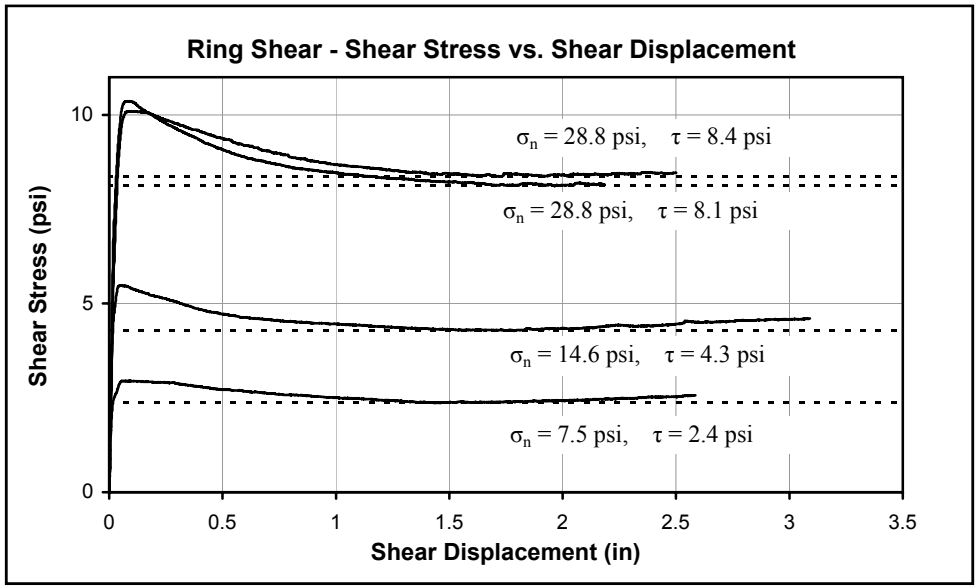
Notes: Specimen was remolded at LL, and pushed through the #40 sieve.

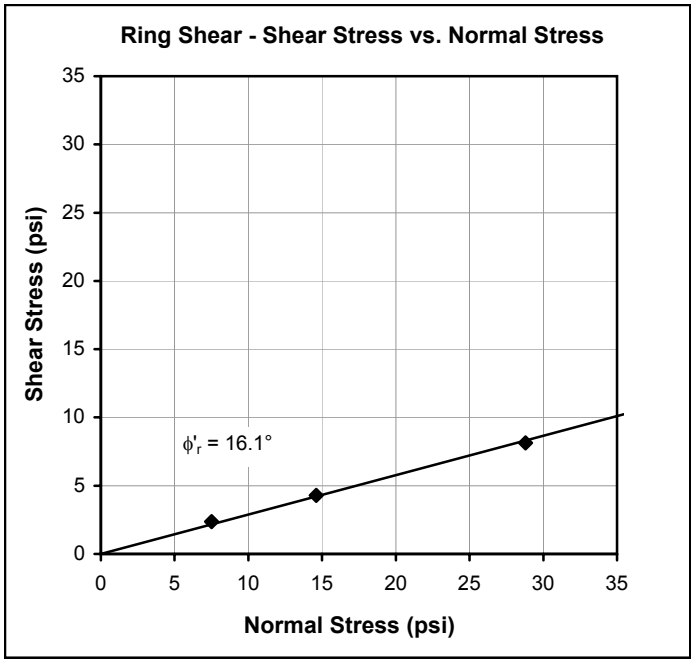
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.

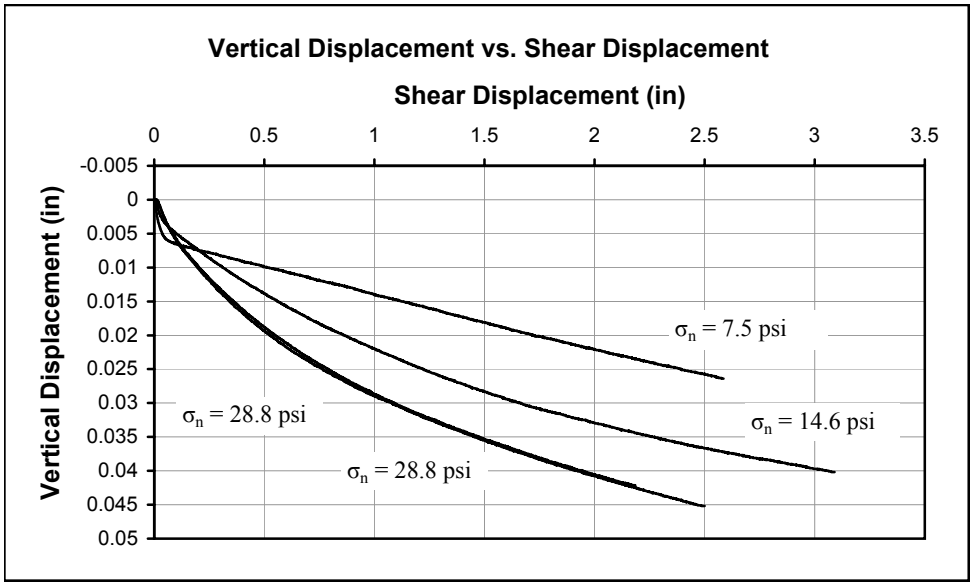
Modified platen used for ring shear tests.

ϕ'_r = 16.1 deg.

(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	10/20/03
Test Finished On:	11/8/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	11/8/03
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	12/3/03
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54				
4000	2103	14.61	1.05				
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	4.9	0.0008	3.7	0.0011
23988	12324	85.58	6.16	5.8	0.0007	3.2	0.0013

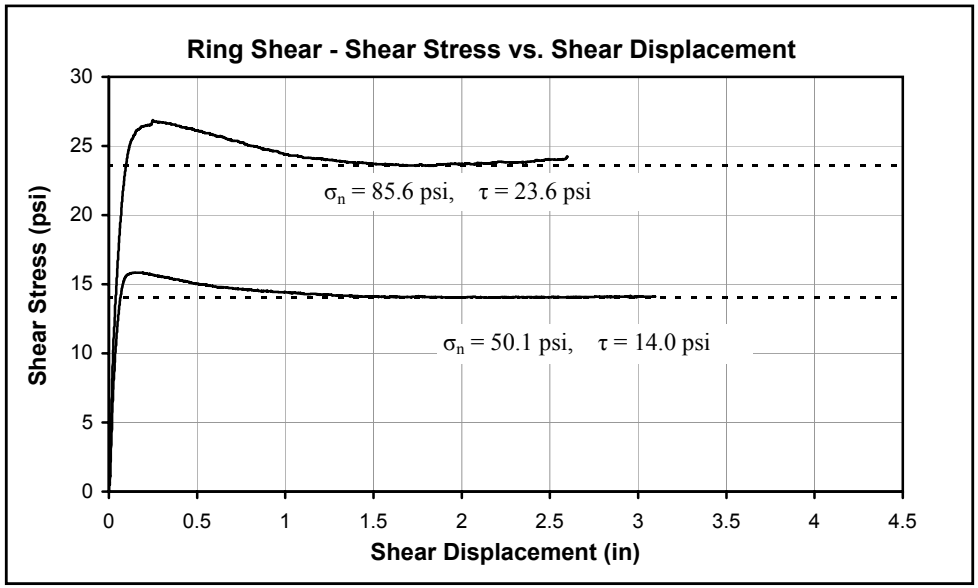
Minimum calc. shear rate =	0.0007	in/min.
Estim. failure displacement =	0.2	in

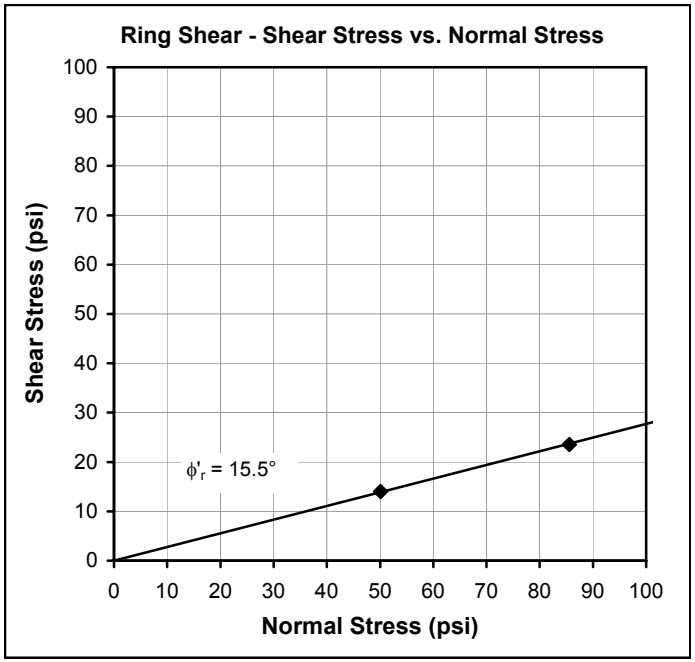
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

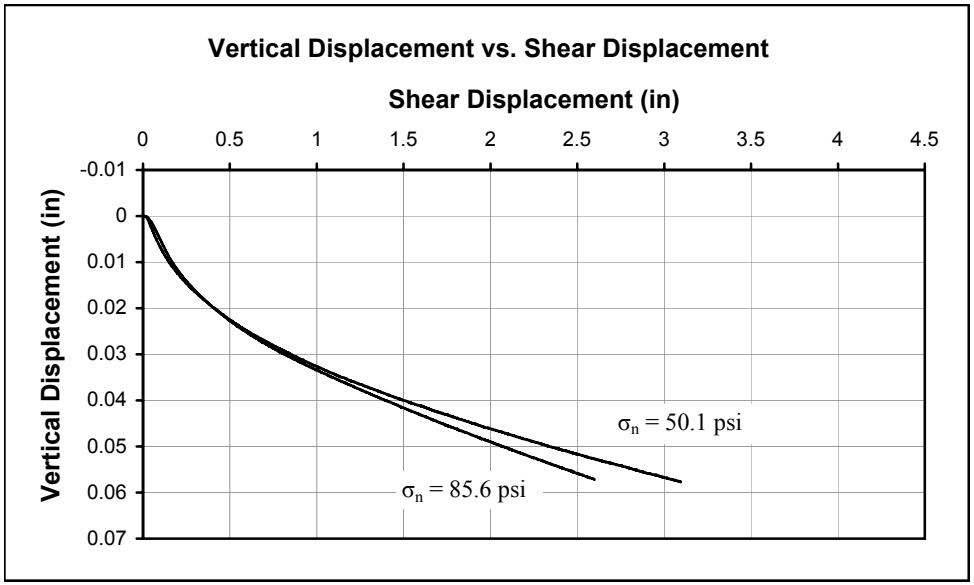
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-110803-1	13993	7213	50.09	3.61	2020	14.03	1.01	0.058
R1-110803-2	23988	12324	85.58	6.16	3394	23.57	1.70	0.057

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 15.5 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	11/8/03
Test Finished On:	12/3/03

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	1/6/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	1/29/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54				
4000	2103	14.61	1.05	1.8	0.0023	2.5	0.0016
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	4.5	0.0009	4.7	0.0008
23988	12324	85.58	6.16	1.7	0.0023	-	-

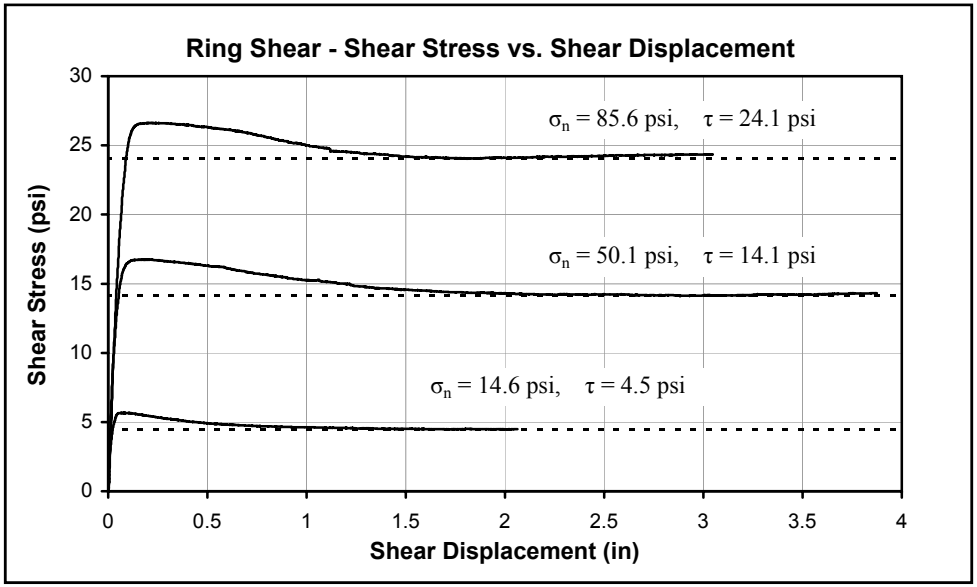
Minimum calc. shear rate =	0.0008	in/min.
Estim. failure displacement =	0.2	in

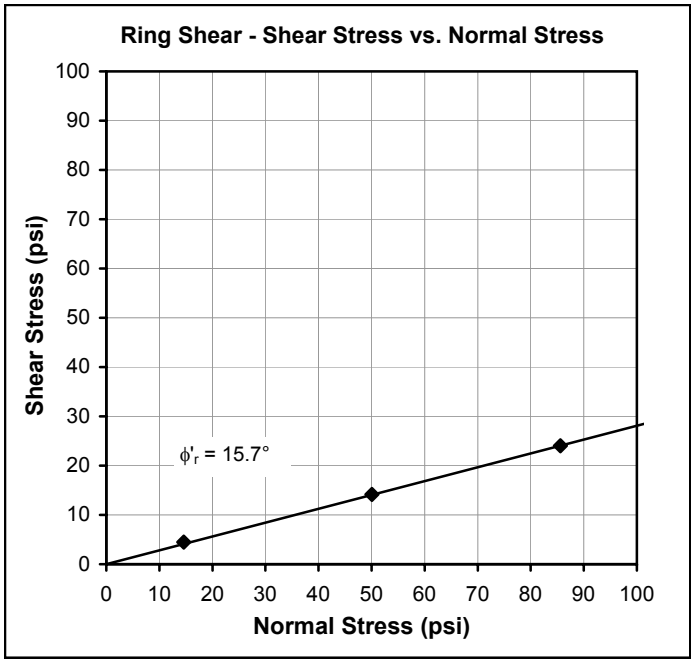
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

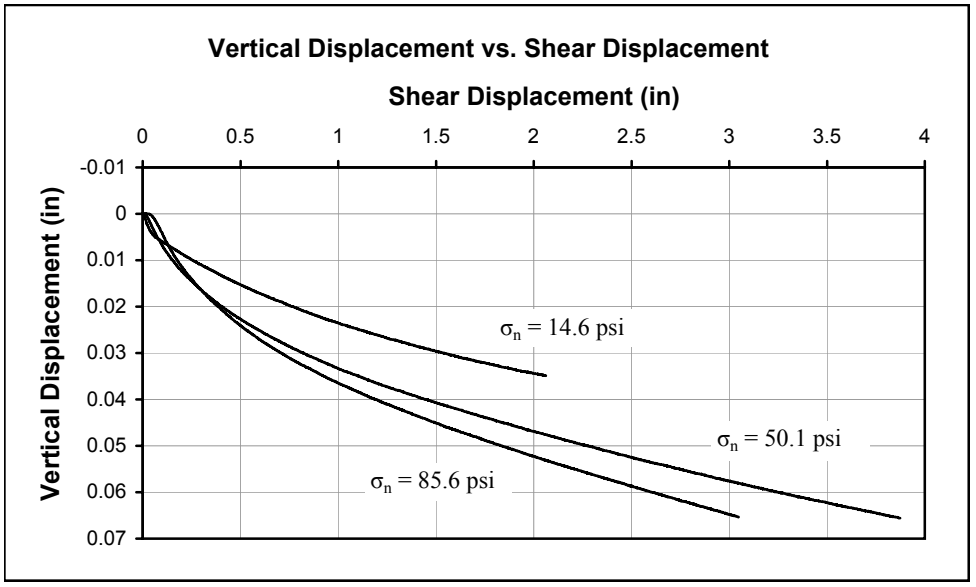
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-010604-1	4000	2103	14.61	1.05	645	4.48	0.32	0.035
R1-010604-2	13993	7213	50.09	3.61	2035	14.13	1.02	0.066
R1-010604-3	23988	12324	85.58	6.16	3463	24.05	1.73	0.065

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 15.7 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	1/6/04
Test Finished On:	1/29/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	3/8/04
Sample I.D./Loc.:	Rancho Solano Clay #1			Finished:	3/27/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54				
4000	2103	14.61	1.05				
7995	4146	28.79	2.07	1.5	0.0026	-	-
13993	7213	50.09	3.61	4.6	0.0009	3.7	0.0011
23988	12324	85.58	6.16	3.1	0.0013	2.9	0.0014

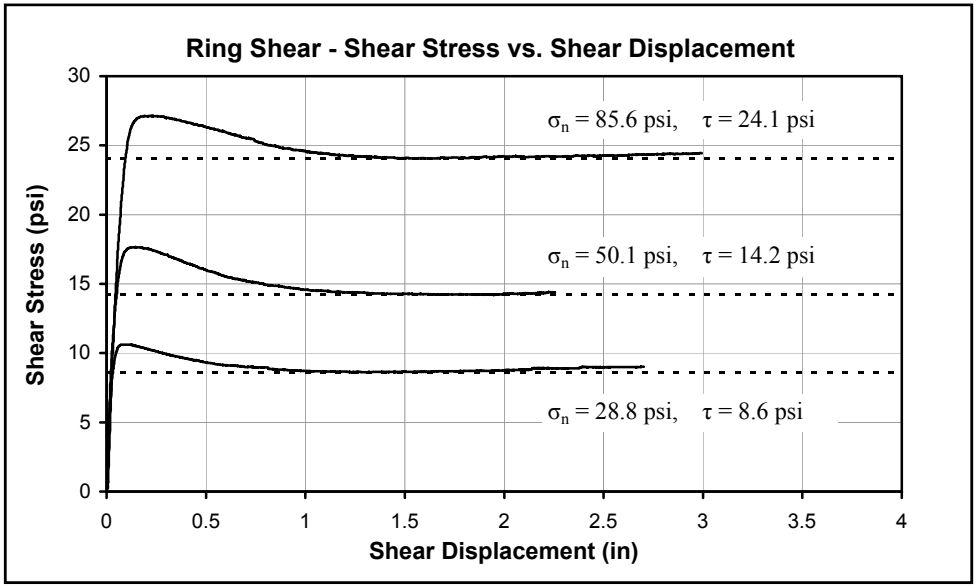
Minimum calc. shear rate =	0.0009	in/min.
Estim. failure displacement =	0.2	in

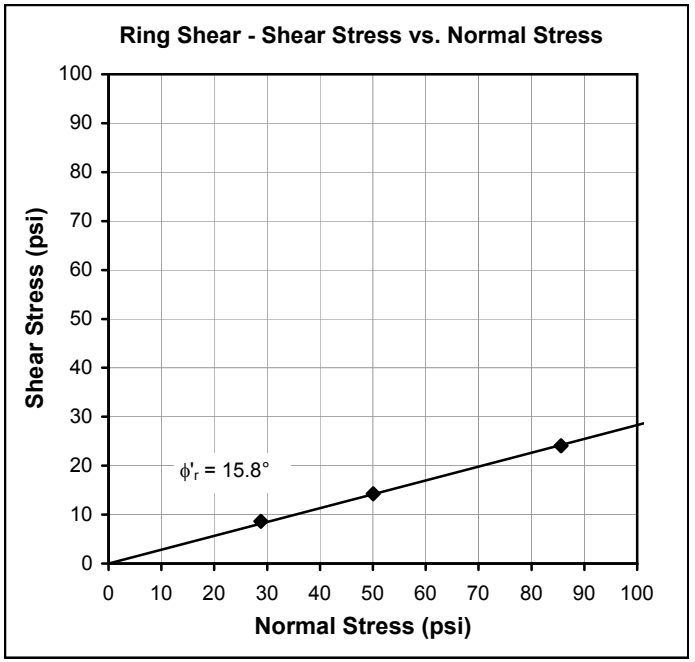
Test performed at shear rate =	0.000709	in/min.
Test performed at shear rate =	0.024	deg/min.

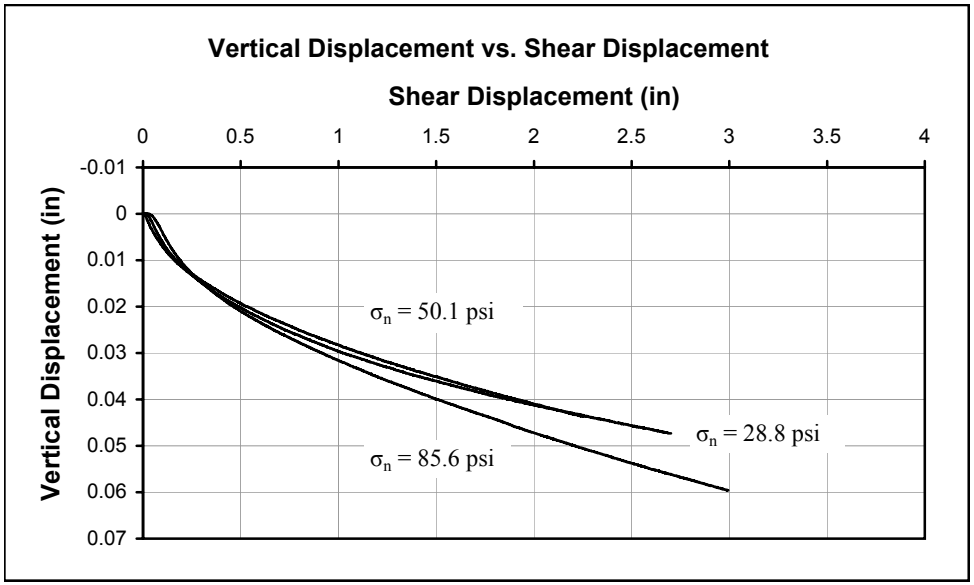
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-030804-1	7995	4146	28.79	2.07	1243	8.63	0.62	0.047
R1-030804-2	13993	7213	50.09	3.61	2049	14.23	1.02	0.044
R1-030804-3	23988	12324	85.58	6.16	3463	24.05	1.73	0.060

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 15.8 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	3/8/04
Test Finished On:	3/27/04

Virginia Polytechnic Institute and State University

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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	4/15/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	4/27/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54				
4000	2103	14.61	1.05	1.2	0.0034	0.7	0.0061
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	5.2	0.0008	3.3	0.0012

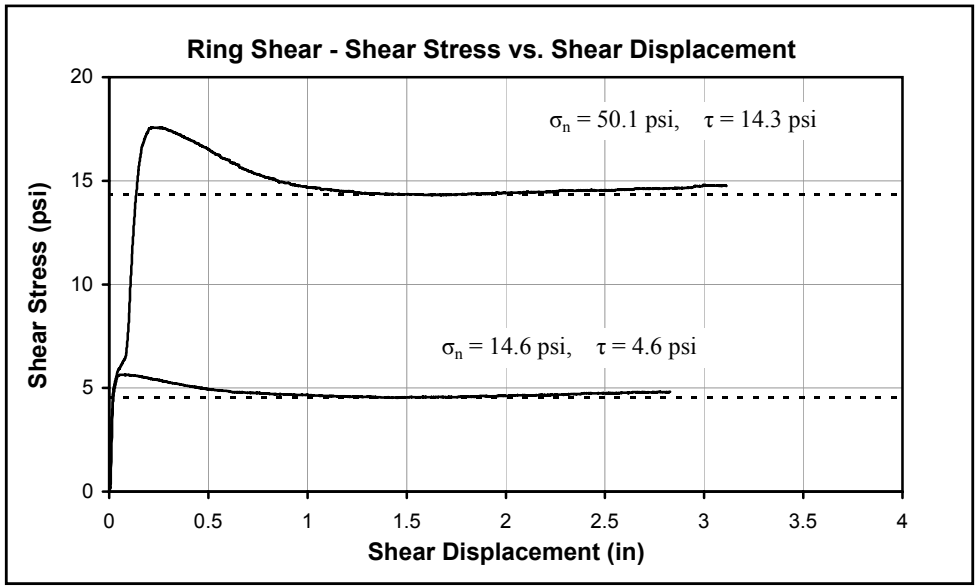
Minimum calc. shear rate =	0.0008	in/min.
Estim. failure displacement =	0.2	in

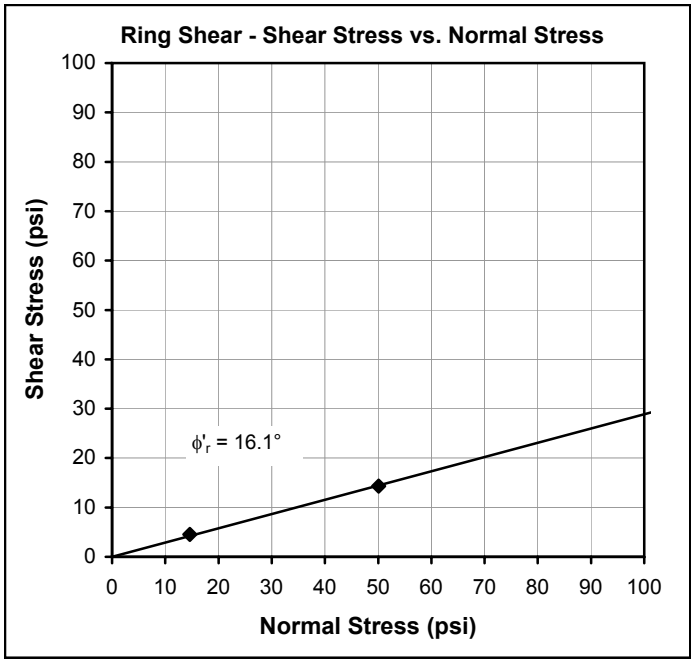
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

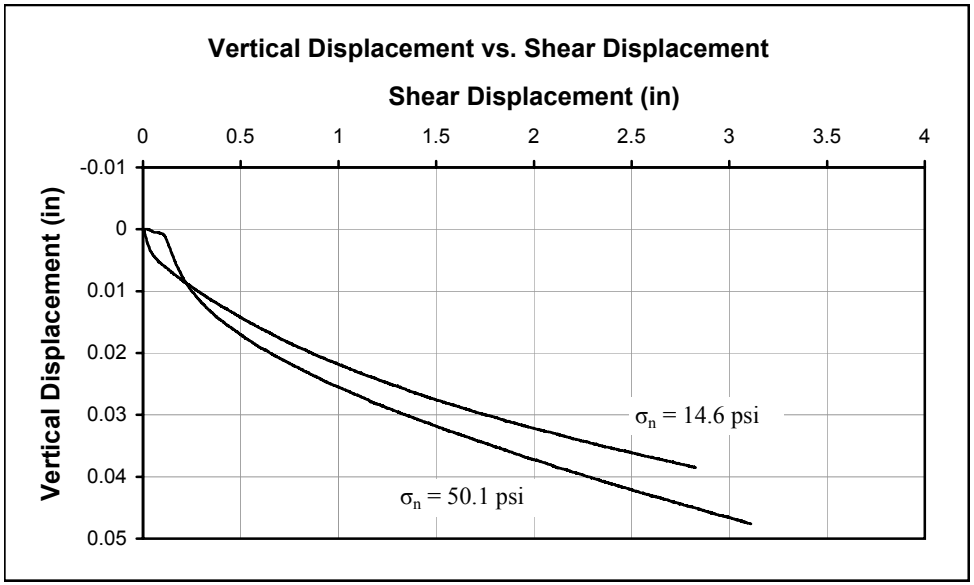
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-041504-1	4000	2103	14.61	1.05	655	4.55	0.33	0.039
R1-041504-2	13993	7213	50.09	3.61	2061	14.31	1.03	0.048

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 16.1 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	4/15/04
Test Finished On:	4/27/04

Virginia Polytechnic Institute and State University

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Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	4/27/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	5/8/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	1.9	0.0021	0.9	0.0043

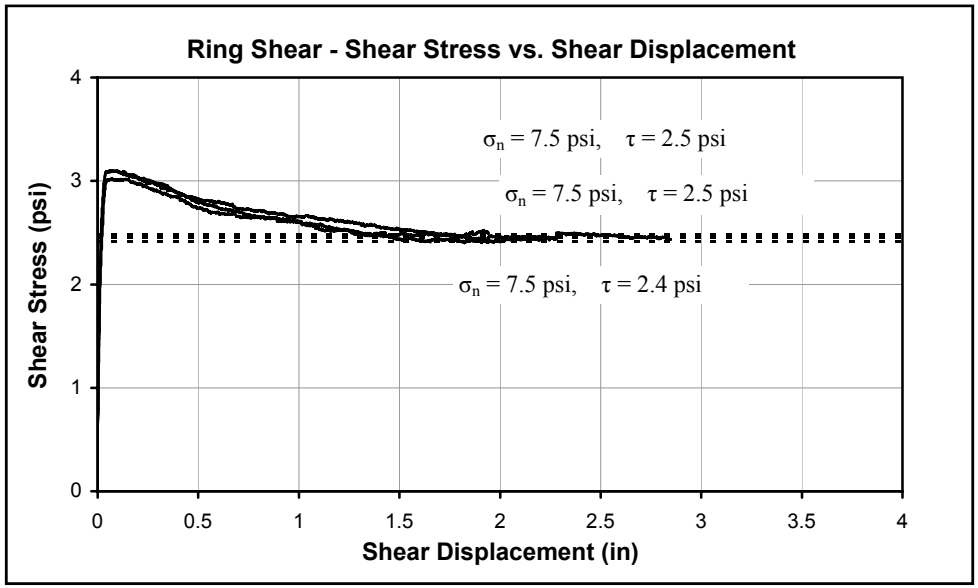
Minimum calc. shear rate =	0.0021	in/min.
Estim. failure displacement =	0.2	in

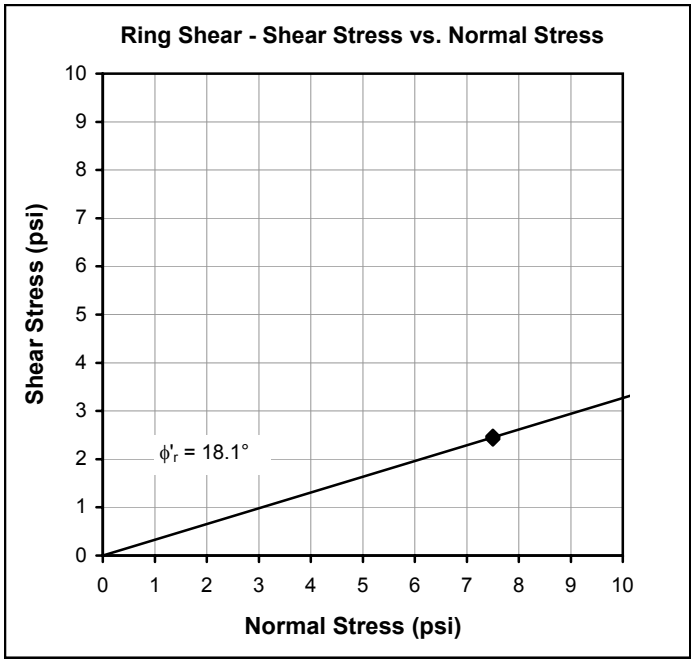
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

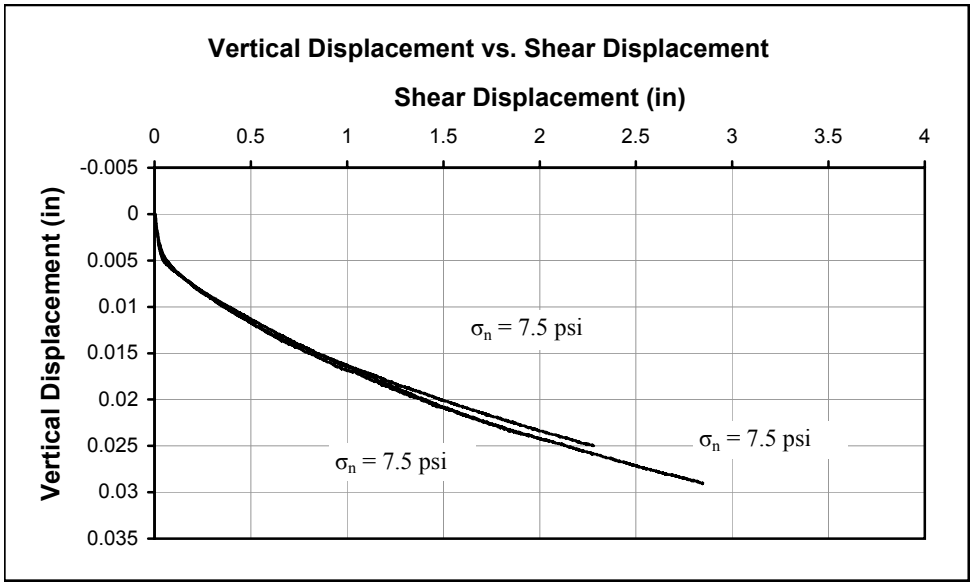
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-042704-1	2000	1081	7.50	0.54	348	2.42	0.17	0.025
R1-042704-2	2000	1081	7.50	0.54	353	2.45	0.18	0.029
R1-042704-3	2000	1081	7.50	0.54	357	2.48	0.18	0.024

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 18.1 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	4/27/04
Test Finished On:	5/8/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	6/7/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	6/18/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps					Casagrande		Taylor	
Consolidation Load		Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)		(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1999		1080	7.50	0.54				
3998		2102	14.60	1.05				
7995		4146	28.79	2.07				
13990		7211	50.08	3.61				
23985	(test 1)	12322	85.57	6.16	5.6	0.0007	3.7	0.0011
23985	(test 2)	12322	85.57	6.16	4.5	0.0009	4.2	0.0009
23985	(test 3)	12322	85.57	6.16	4.0	0.0010	2.2	0.0018

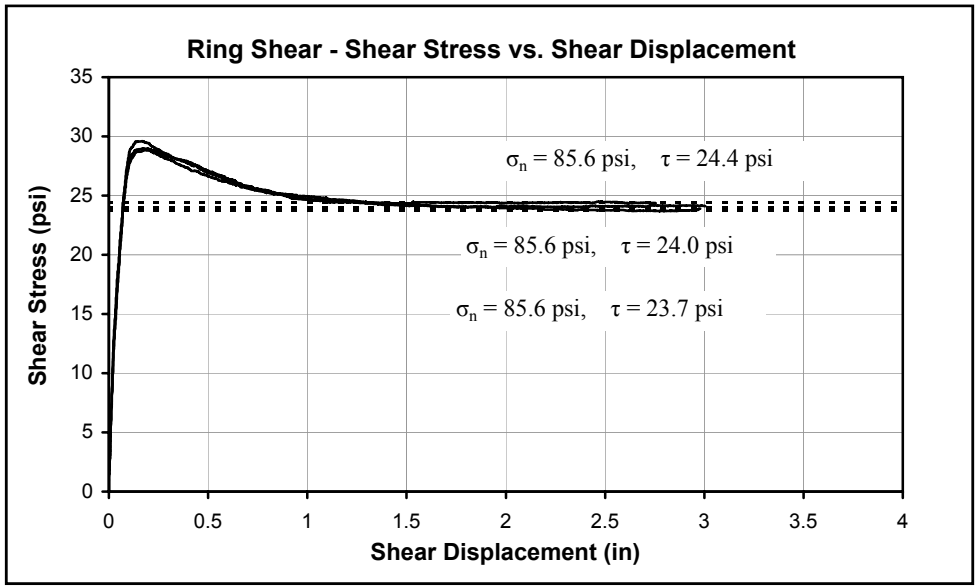
Minimum calc. shear rate =	0.0007	in/min.
Estim. failure displacement =	0.2	in

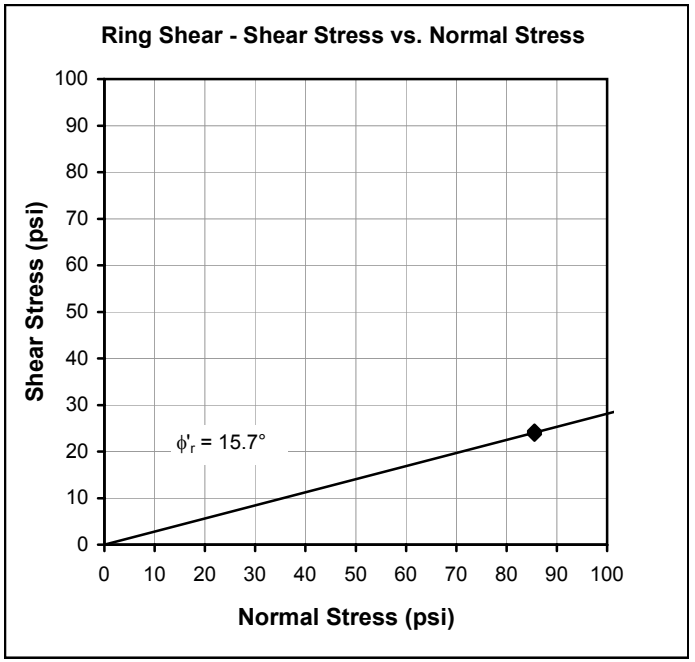
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

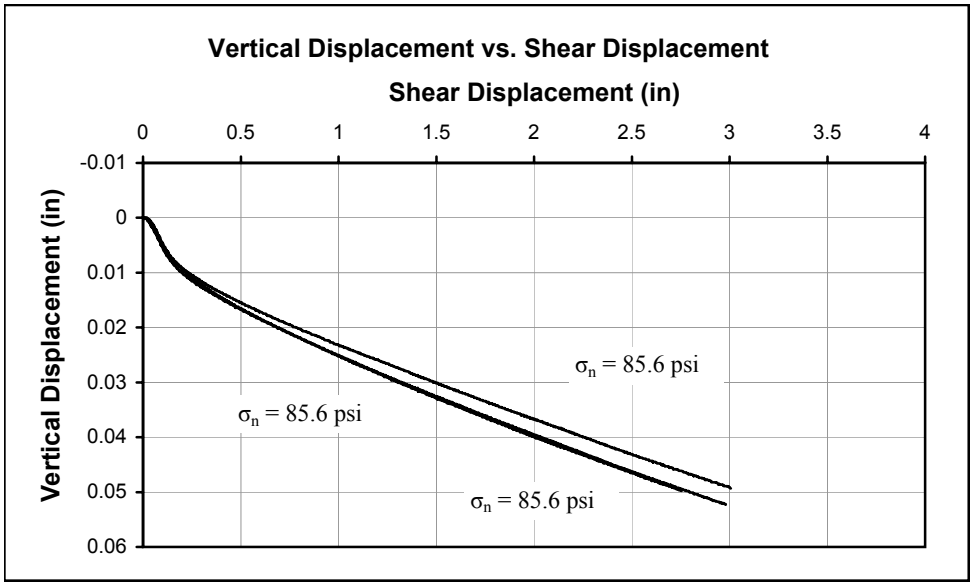
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-060704-1	23985	12322	85.57	6.16	3414	23.71	1.71	0.052
R2-060704-2	23985	12322	85.57	6.16	3516	24.42	1.76	0.050
R2-060704-3	23985	12322	85.57	6.16	3462	24.04	1.73	0.049

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 15.7 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	6/7/04
Test Finished On:	6/18/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	6/27/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	7/7/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1999	1080	7.50	0.54	-	-	-	-
3998	2102	14.60	1.05	2.7	0.0015	0.9	0.0043

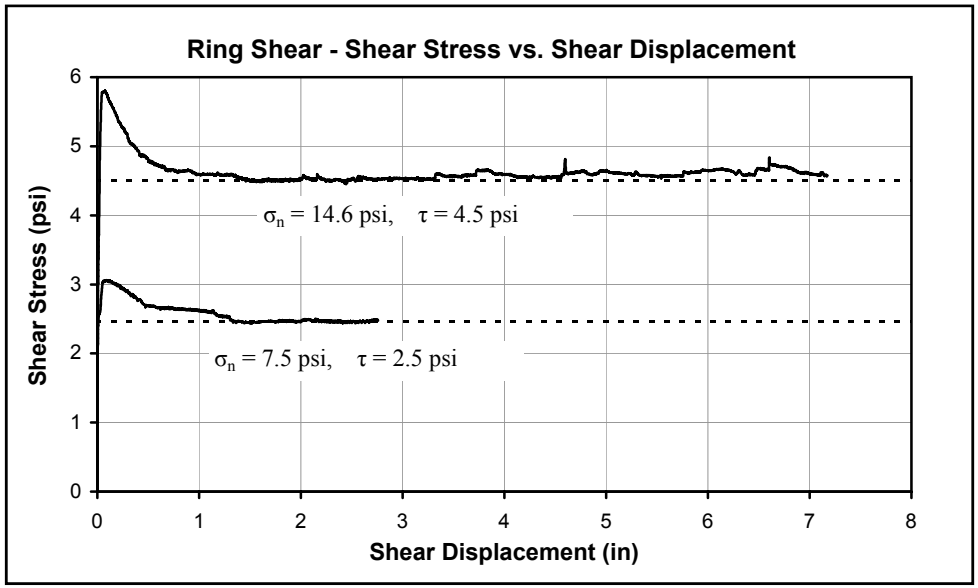
Minimum calc. shear rate =	0.0015	in/min.
Estim. failure displacement =	0.2	in

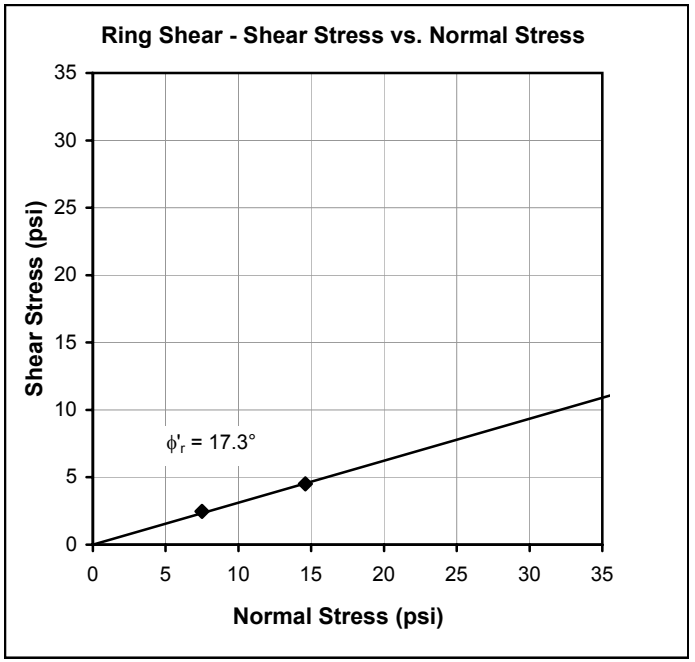
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

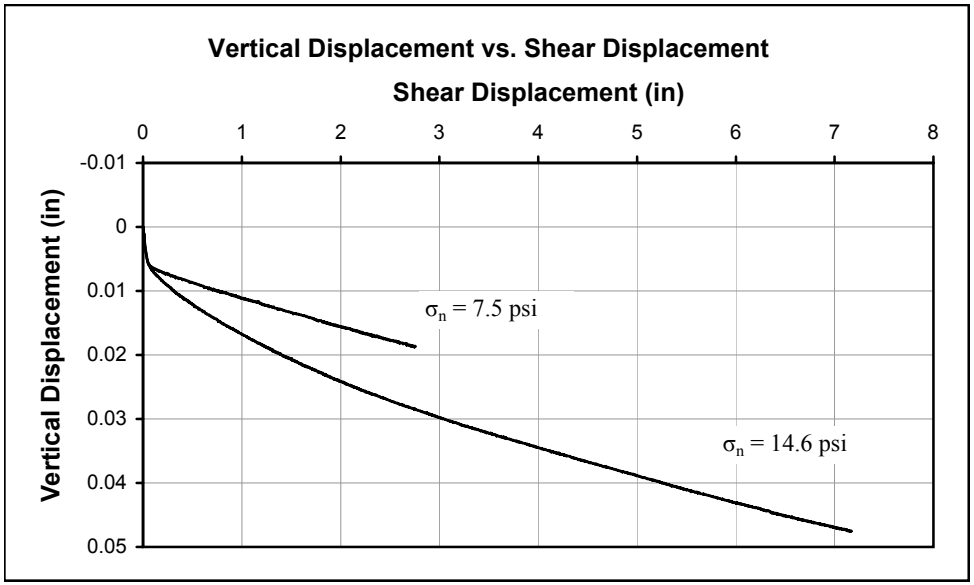
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-062704-1	1999	1080	7.50	0.54	354	2.46	0.18	0.019
R2-062704-2	3998	2102	14.60	1.05	648	4.50	0.32	0.048

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 17.3 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	6/27/04
Test Finished On:	7/7/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	7/14/04
Sample I.D./Loc.:	Rancho Solano Clay #1	Finished:	7/22/04
Classification:	Brown Fat Clay (CH)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.65	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1999	1080	7.50	0.54				
3998	2102	14.60	1.05				
7995	4146	28.79	2.07	3.5	0.0012	1.3	0.0030
13990	7211	50.08	3.61	4.9	0.0008	4.5	0.0009

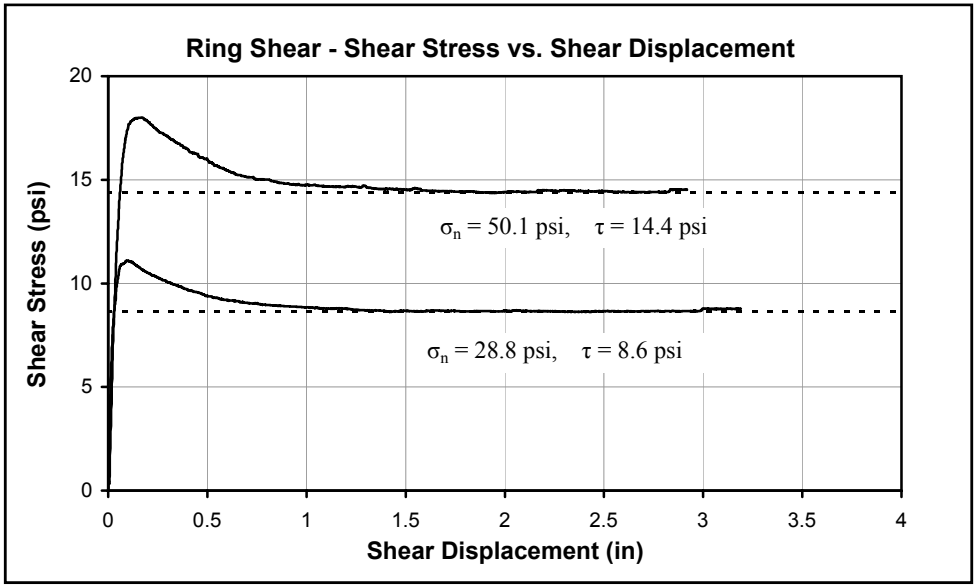
Minimum calc. shear rate =	0.0008	in/min.
Estim. failure displacement =	0.2	in

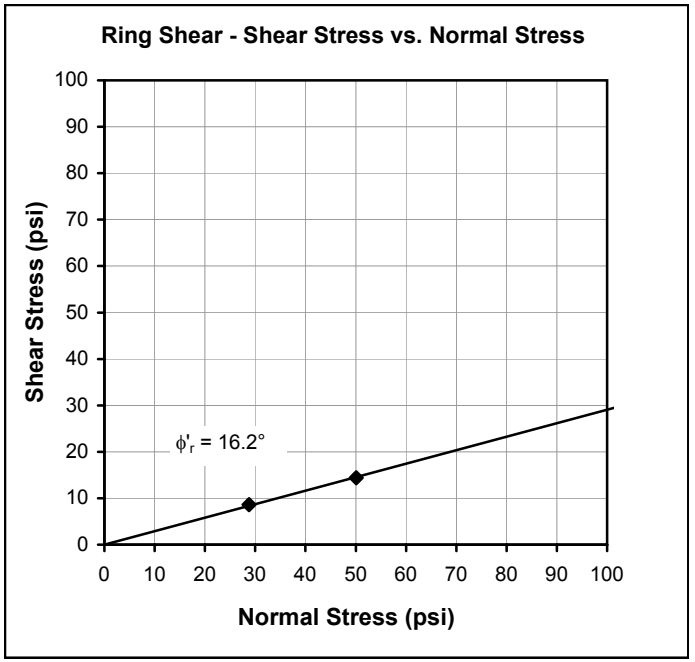
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

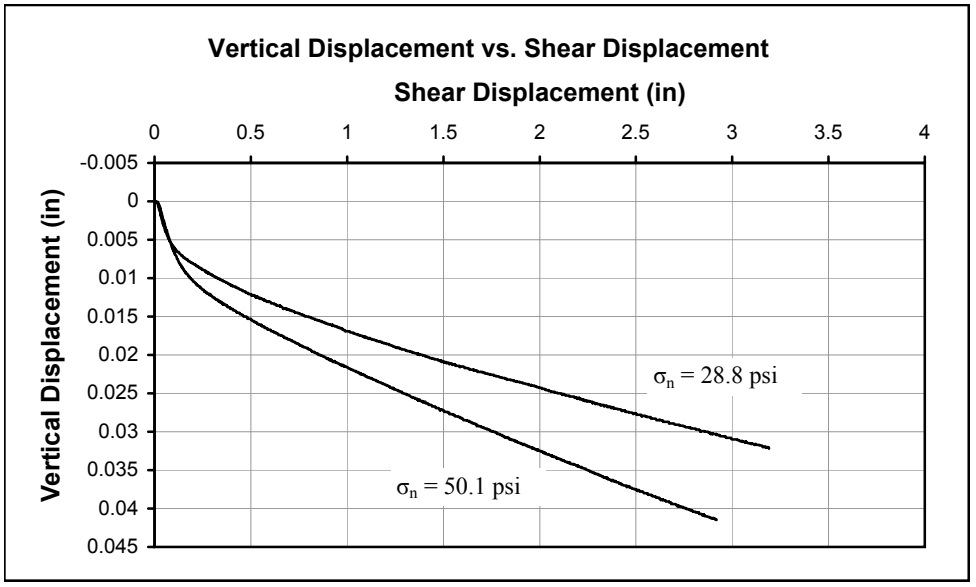
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-071404-1	7995	4146	28.79	2.07	1244	8.64	0.62	0.032
R2-071404-2	13990	7211	50.08	3.61	2072	14.39	1.04	0.042

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 16.2 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #1
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	7/14/04
Test Finished On:	7/22/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	9/23/05
Sample I.D./Loc.:	Rancho Solano Clay #2	Finished:	10/5/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	0.6	0.0069	0.3	0.0122

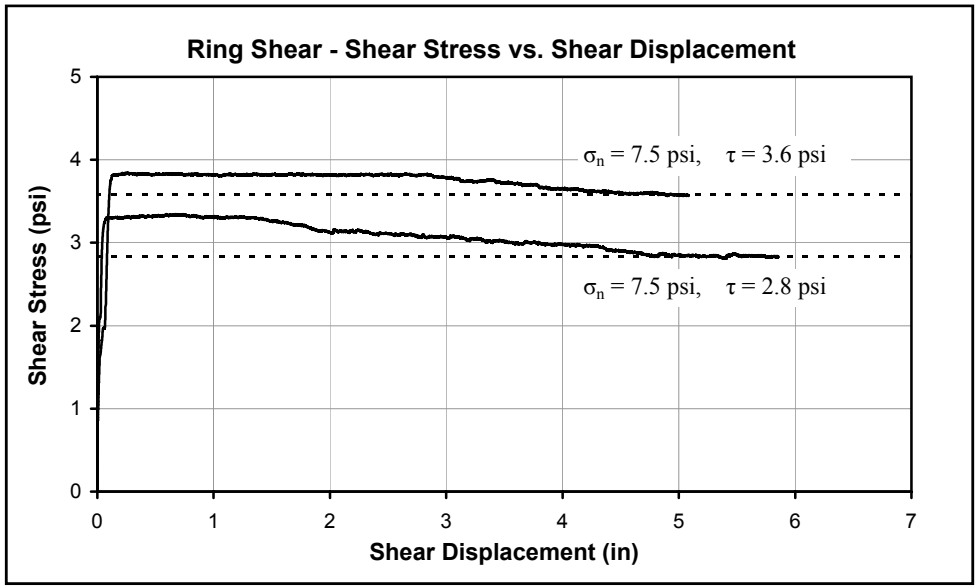
Minimum calc. shear rate =	0.0069	in/min.	
Estim. failure displacement =	0.2	in	

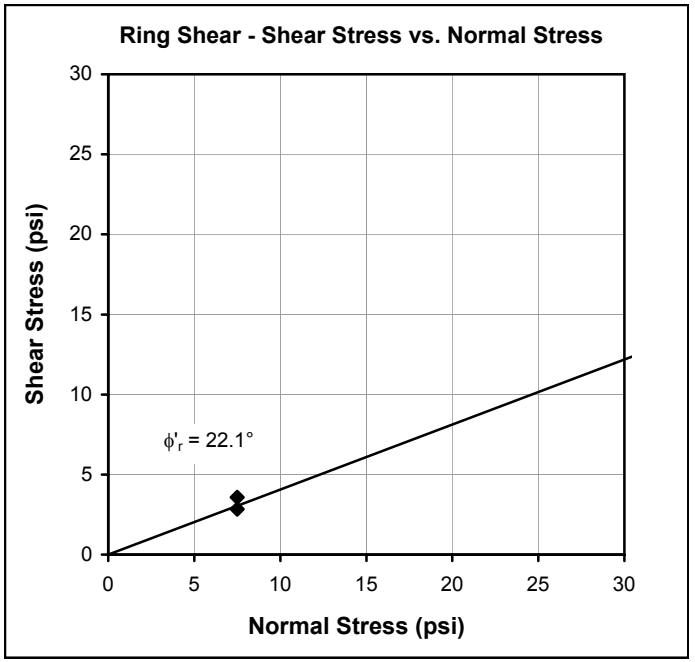
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

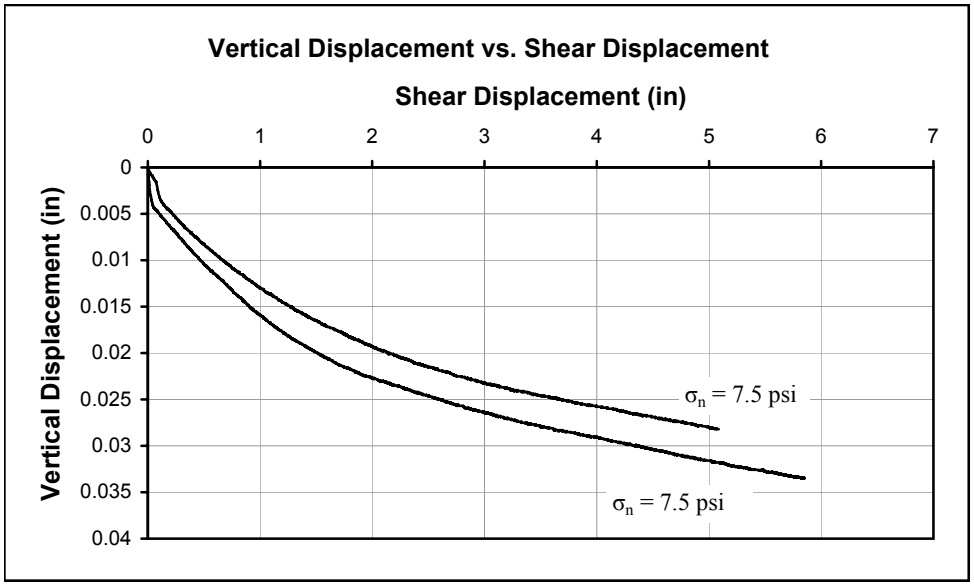
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-092305-1	2000	1081	7.50	0.54	516	3.58	0.26	0.028
R1-092305-2	2000	1081	7.50	0.54	408	2.83	0.20	0.034

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 22.1 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Derek Martowska
Data Reduced By:	Chris Meehan
Test Started On:	9/23/05
Test Finished On:	10/5/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	9/23/05
Sample I.D./Loc.:	Rancho Solano Clay #2			Finished:	10/11/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #2		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	0.5	0.0074	0.5	0.0087
4000	2103	14.61	1.05	0.5	0.0077	0.4	0.0094
7995	4146	28.79	2.07	0.5	0.0083	0.2	0.0211

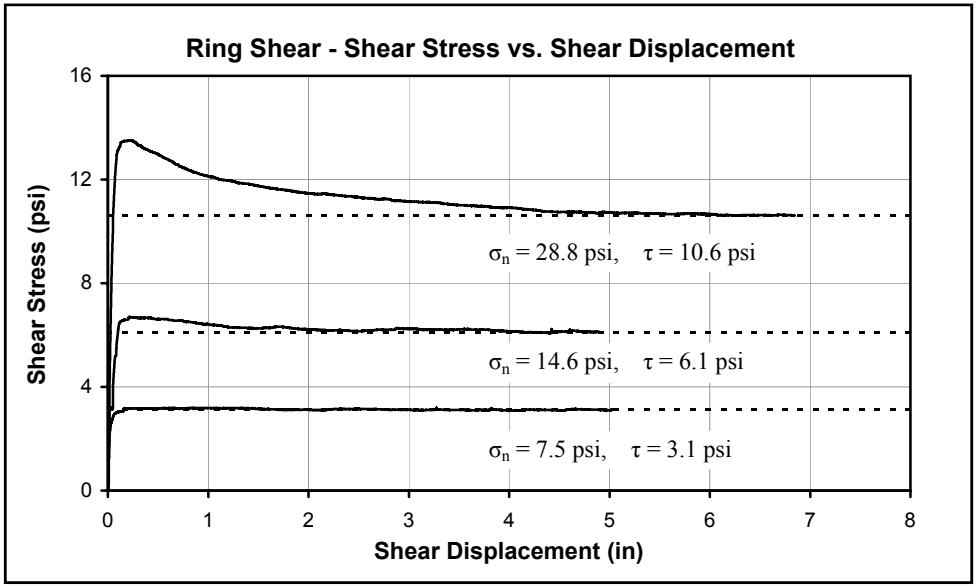
Minimum calc. shear rate =	0.0074	in/min.
Estim. failure displacement =	0.2	in

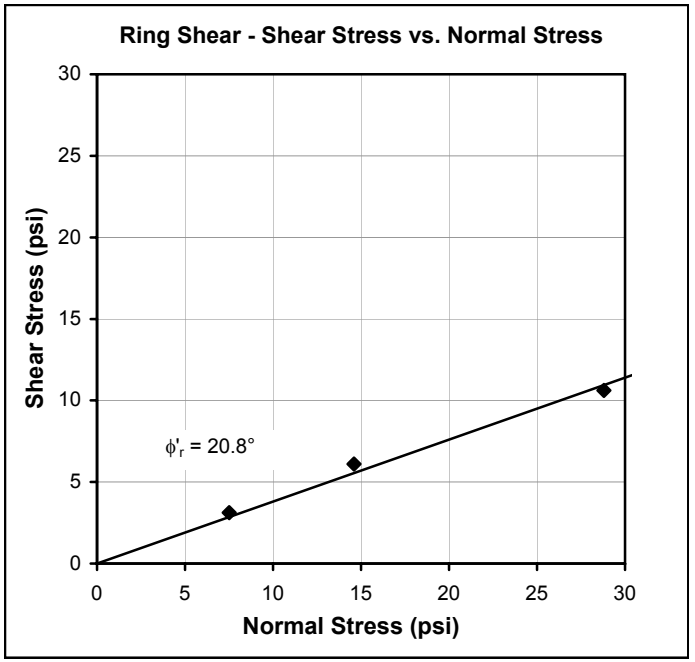
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

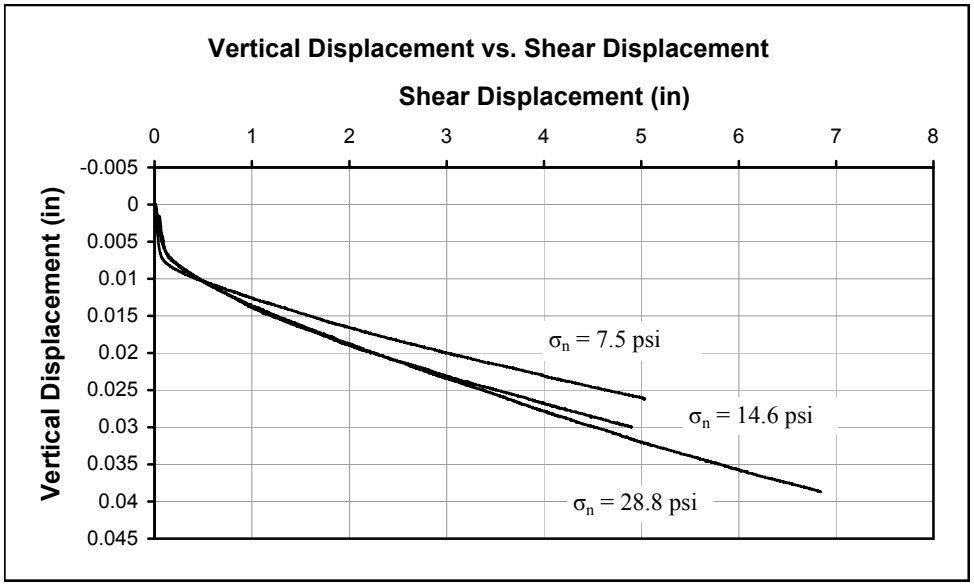
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-092305-1	2000	1081	7.50	0.54	449	3.12	0.22	0.026
R2-092305-2	4000	2103	14.61	1.05	878	6.10	0.44	0.030
R2-092305-3	7995	4146	28.79	2.07	1529	10.62	0.76	0.039

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 20.8 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Derek Martowska
Data Reduced By:	Chris Meehan
Test Started On:	9/23/05
Test Finished On:	10/11/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	10/11/05
Sample I.D./Loc.:	Rancho Solano Clay #2			Finished:	10/31/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	0.4	0.0091	0.1	0.0476
4000	2103	14.61	1.05	0.7	0.0059	0.4	0.0101
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	0.8	0.0053	0.4	0.0101

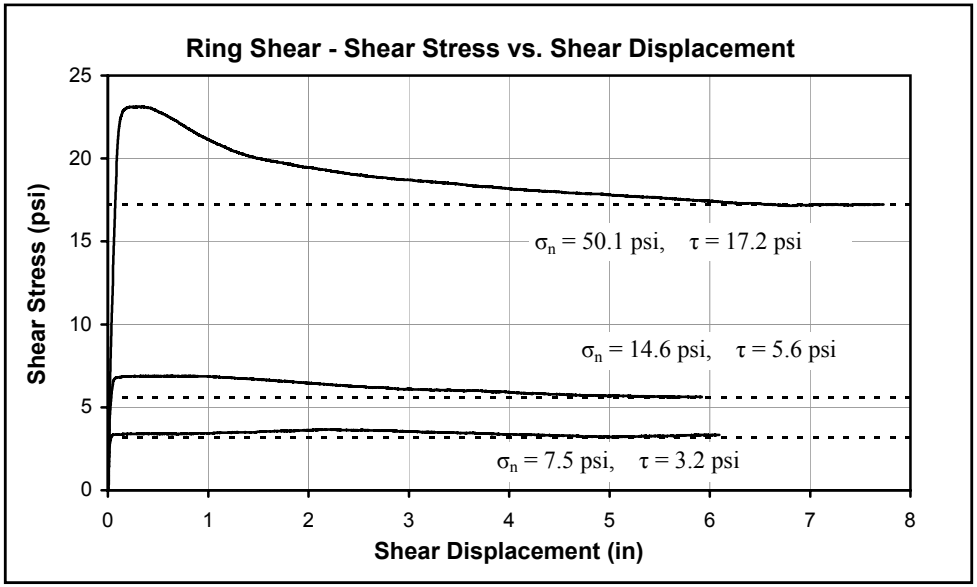
Minimum calc. shear rate =	0.0053	in/min.
Estim. Failure displacement =	0.2	in

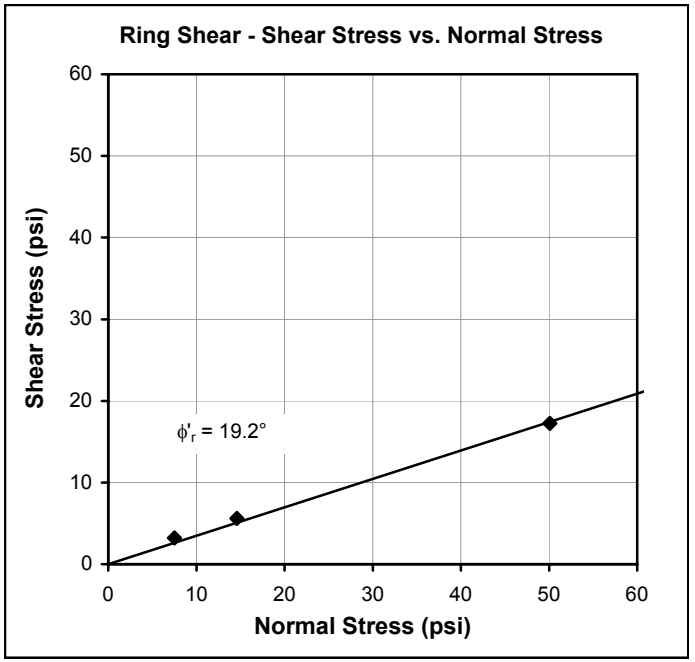
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

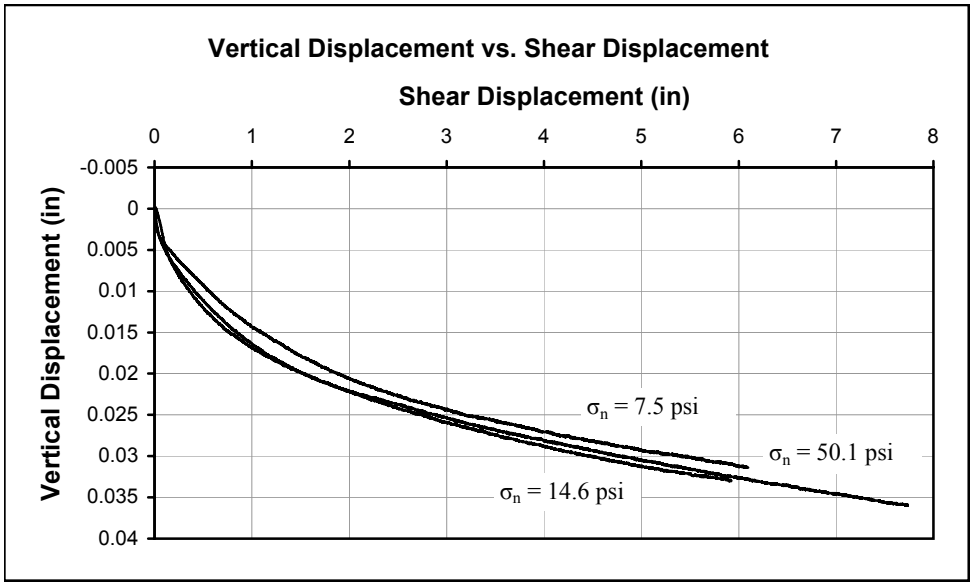
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-101105-1	2000	1081	7.50	0.54	462	3.21	0.23	0.031
R1-101105-2	4000	2103	14.61	1.05	809	5.62	0.40	0.033
R1-101105-3	13993	7213	50.09	3.61	2481	17.23	1.24	0.036

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 19.2 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Derek Martowska
Data Reduced By:	Chris Meehan
Test Started On:	10/11/05
Test Finished On:	10/31/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces		Started:	10/11/05
Sample I.D./Loc.:	Rancho Solano Clay #2		Finished:	10/31/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #2	

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	0.5	0.0077	0.4	0.0110
4000	2103	14.61	1.05	0.5	0.0083	0.1	0.0268
7995	4146	28.79	2.07				
13993	7213	50.09	3.61	0.6	0.0063	0.4	0.0110

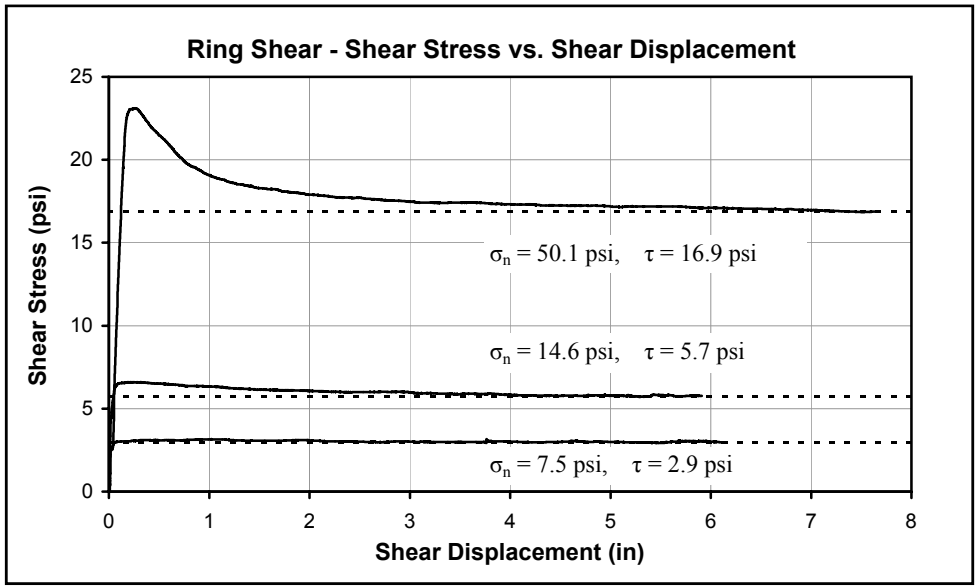
Minimum calc. shear rate =	0.0063	in/min.
Estim. failure displacement =	0.2	in

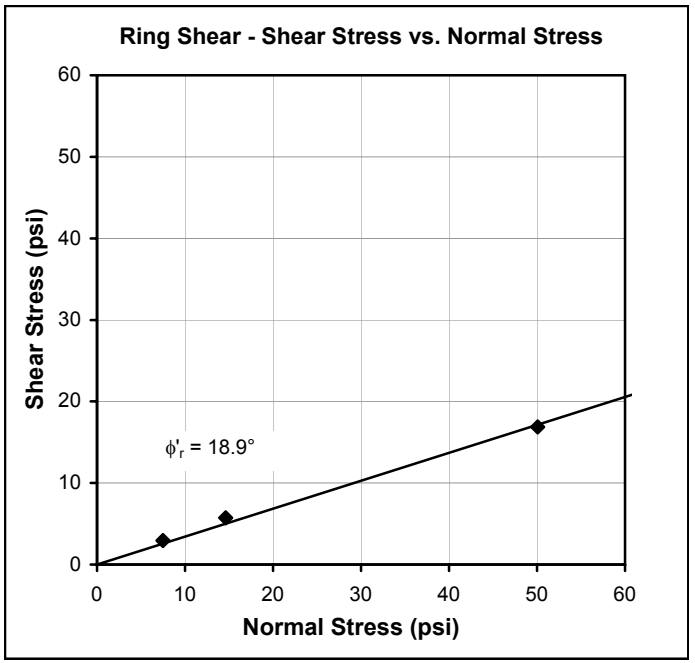
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

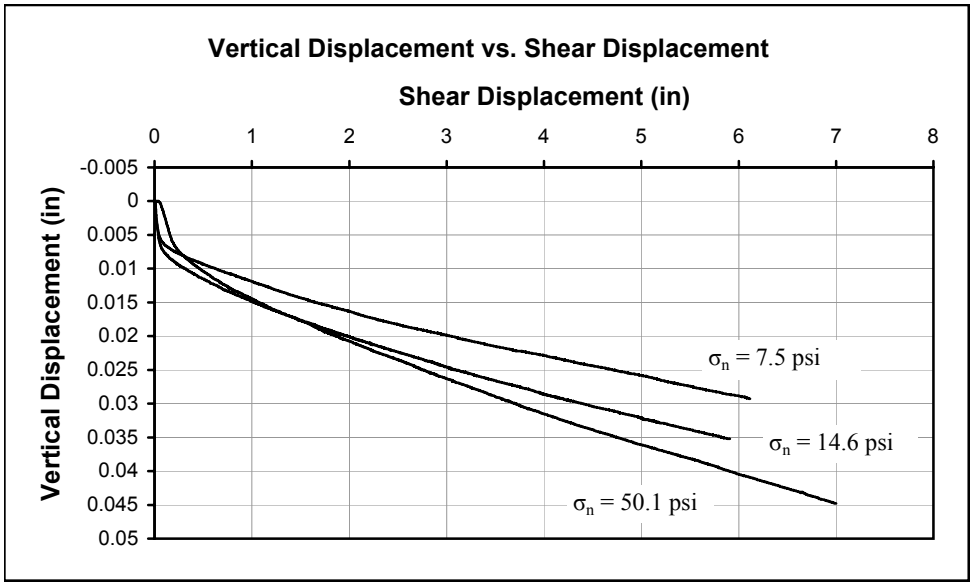
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-101105-1	2000	1081	7.50	0.54	423	2.94	0.21	0.029
R2-101105-2	4000	2103	14.61	1.05	824	5.72	0.41	0.035
R2-101105-3	13993	7213	50.09	3.61	2429	16.87	1.21	0.048

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 18.9 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Derek Martowska
Data Reduced By:	Chris Meehan
Test Started On:	10/11/05
Test Finished On:	10/31/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	10/31/05
Sample I.D./Loc.:	Rancho Solano Clay #2	Finished:	11/12/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #1

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps					Casagrande		Taylor	
Consolidation Load		Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)		(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	(test 1)	1081	7.50	0.54	0.7	0.0061	0.6	0.0071
2000	(test 2)	1081	7.50	0.54	0.5	0.0080	0.4	0.0110

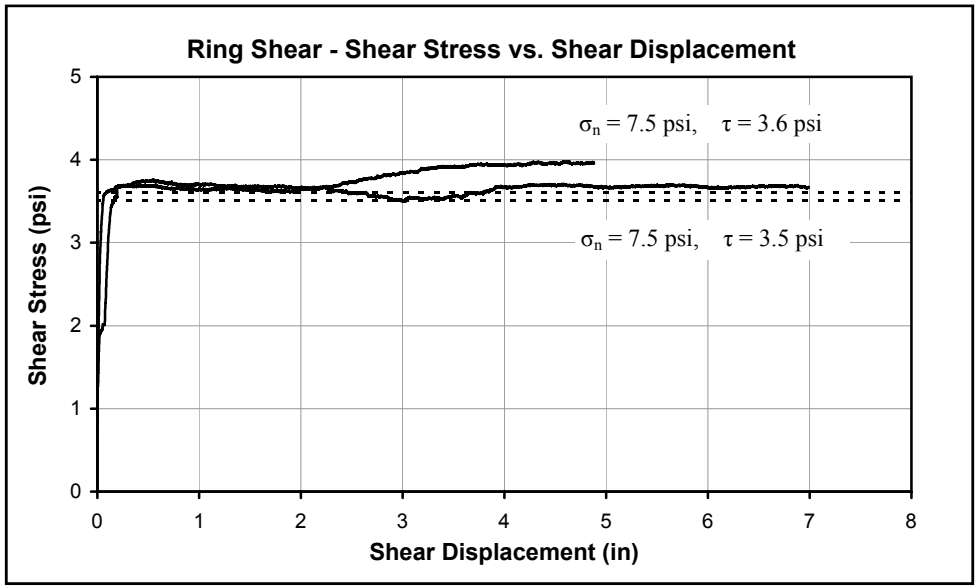
Minimum calc. shear rate =	0.0061	in/min.
Estim. failure displacement =	0.2	in

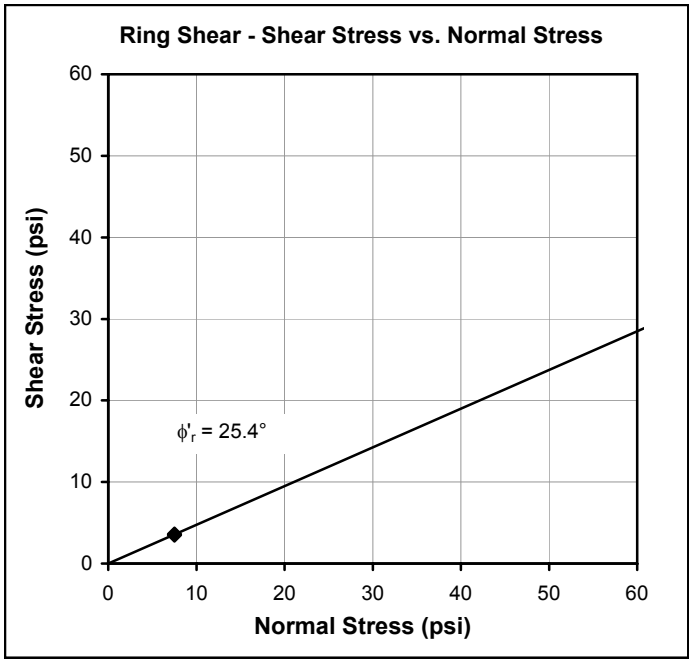
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

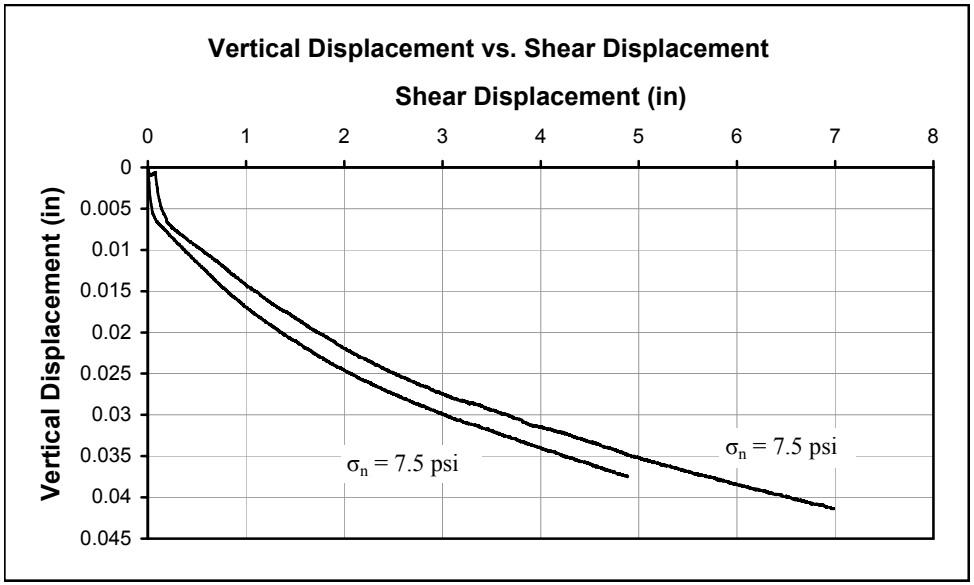
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-103105-1	2000	1081	7.50	0.54	505	3.51	0.25	0.041
R1-103105-2	2000	1081	7.50	0.54	520	3.61	0.26	0.038

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 25.4 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	VT lab testing class
Data Reduced By:	Chris Meehan
Test Started On:	10/31/05
Test Finished On:	11/12/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces	Started:	10/31/05
Sample I.D./Loc.:	Rancho Solano Clay #2	Finished:	11/12/05
Classification:	Brown Lean Clay (CL)	Shear Device Used:	WF Bromhead Ring Shear #2

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.79	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps					Casagrande		Taylor	
Consolidation Load		Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)		(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	(test 1)	1081	7.50	0.54	0.4	0.0093	0.7	0.0059
2001	(test 2)	1081	7.50	0.54	0.8	0.0049	0.3	0.0116

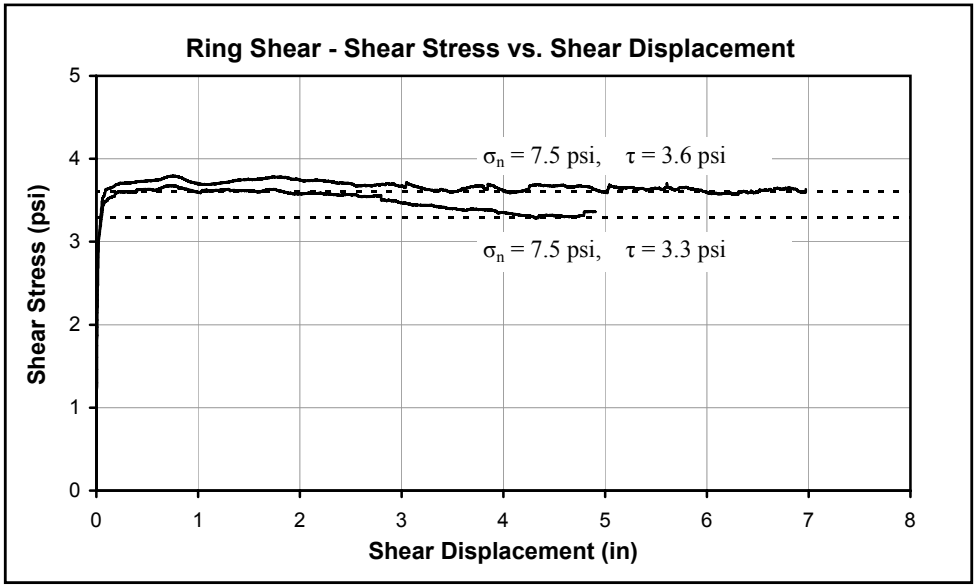
Minimum calc. shear rate =	0.0049	in/min.
Estim. failure displacement =	0.2	in

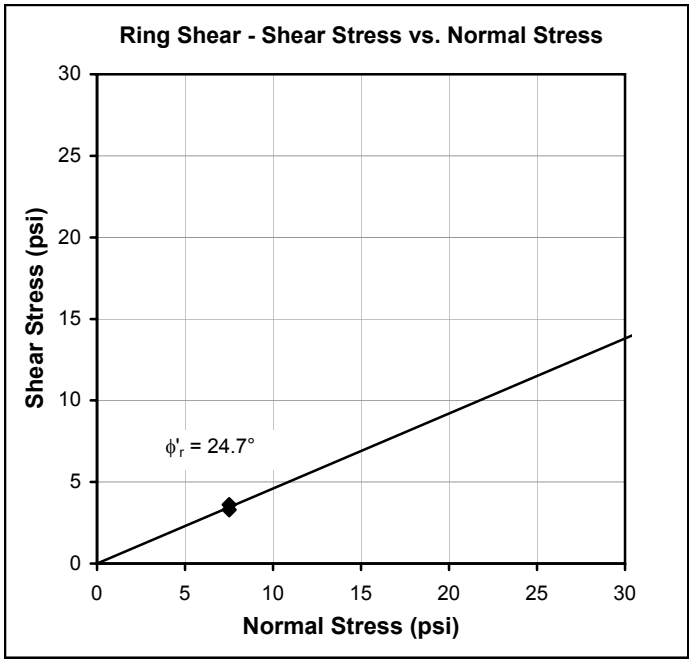
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

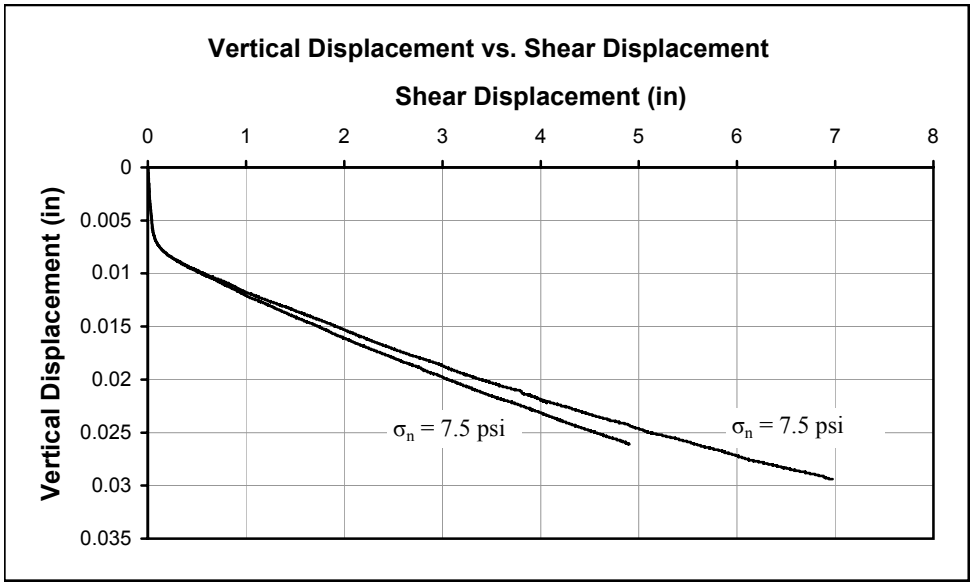
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-103105-1	2000	1081	7.50	0.54	520	3.61	0.26	0.029
R2-103105-2	2000	1081	7.50	0.54	475	3.30	0.24	0.026

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 24.7 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	Rancho Solano Clay #2
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	VT lab testing class
Data Reduced By:	Chris Meehan
Test Started On:	10/31/05
Test Finished On:	11/12/05

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces		Started:	9/29/04
Sample I.D./Loc.:	San Francisco Bay Mud Bucket Sample		Finished:	10/17/04
Classification:	Grey Elastic Silt (MH)	Shear Device Used:	WF Bromhead Ring Shear #1	

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.70	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000	1081	7.50	0.54	-	-	-	-
4000	2103	14.61	1.05				
7995	4146	28.79	2.07	2.2	0.0018	1.5	0.0027

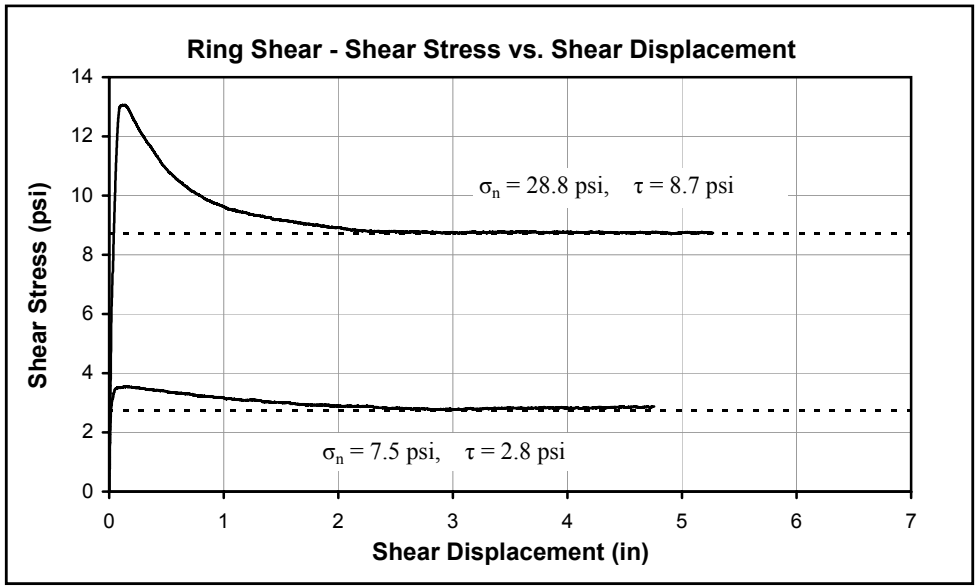
Minimum calc. shear rate =	0.0018	in/min.
Estim. failure displacement =	0.2	in

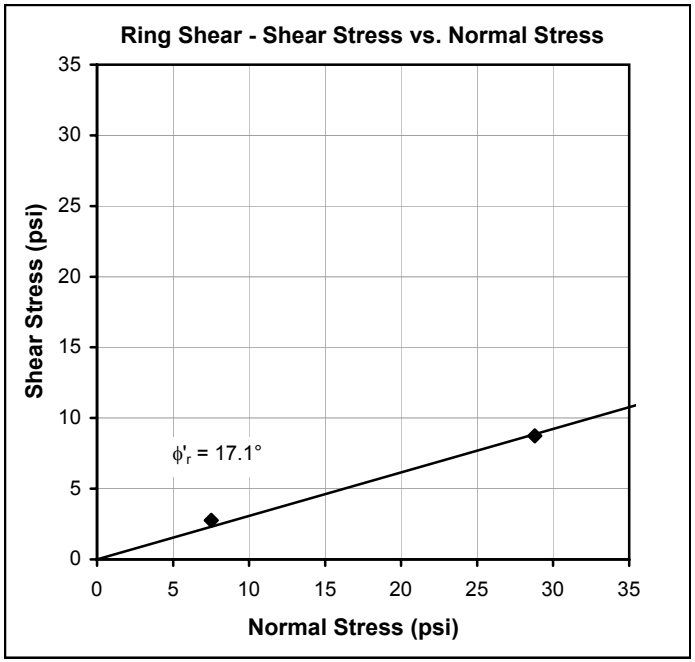
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

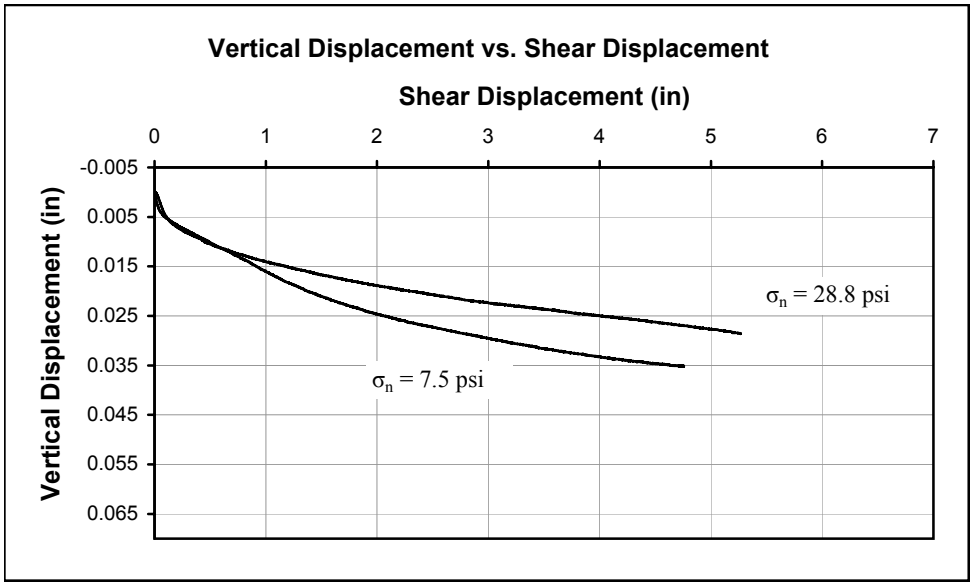
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-092904-1	2000	1081	7.50	0.54	397	2.76	0.20	0.035
R1-092904-2	7995	4146	28.79	2.07	1257	8.73	0.63	0.029

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 17.1 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	SFBM Bucket Sample
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	9/29/04
Test Finished On:	10/17/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces		Started:	9/29/04
Sample I.D./Loc.:	San Francisco Bay Mud Bucket Sample		Finished:	10/17/04
Classification:	Grey Elastic Silt (MH)	Shear Device Used:	WF Bromhead Ring Shear #2	

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.70	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1999	1080	7.50	0.54	1.9	0.0021	1.8	0.0022
3998	2102	14.60	1.05	-	-	-	-
7995	4146	28.79	2.07	2.0	0.0020	1.7	0.0023

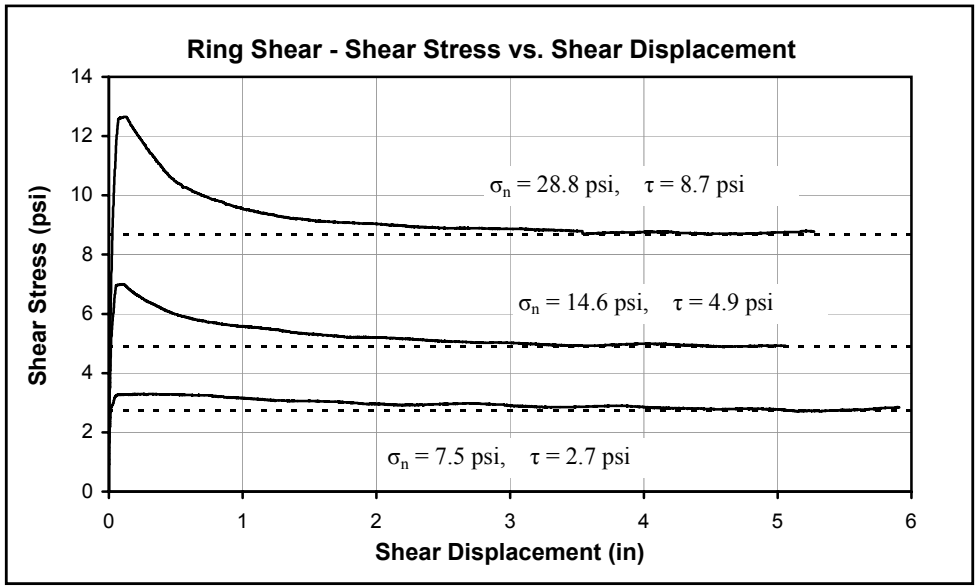
Minimum calc. shear rate =	0.0020	in/min.
Estim. failure displacement =	0.2	in

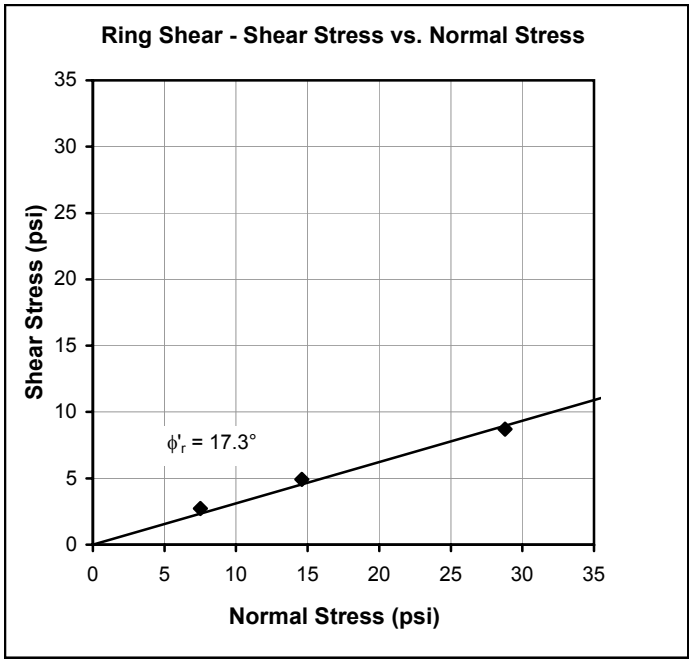
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

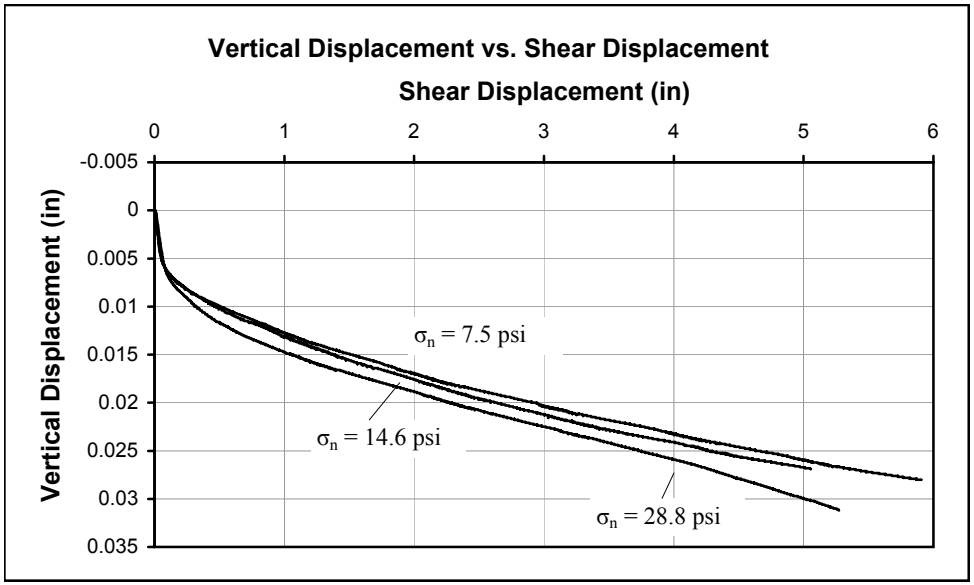
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-092904-1	1999	1080	7.50	0.54	392	2.72	0.20	0.028
R2-092904-2	3998	2102	14.60	1.05	708	4.92	0.35	0.027
R2-092904-3	7995	4146	28.79	2.07	1253	8.70	0.63	0.031

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used fpr ring shear tests.

ϕ'_r = 17.3 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	SFBM Bucket Sample
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	9/29/04
Test Finished On:	10/17/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces			Started:	10/18/04
Sample I.D./Loc.:	San Francisco Bay Mud Bucket Sample			Finished:	11/15/04
Classification:	Grey Elastic Silt (MH)	Shear Device Used:	WF Bromhead Ring Shear #1		

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.70	
Initial Thickness of Specimen		0.2	(in.)
Inner Radius of Specimen		1.38	(in.)
Outer Radius of Specimen		1.97	(in.)
Presheared	No		in/min
Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps					Casagrande		Taylor	
Consolidation Load		Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)		(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
2000		1081	7.50	0.54				
4000	(test 1)	2103	14.61	1.05	1.7	0.0024	1.5	0.0027
4000	(test 4)	2103	14.61	1.05	1.6	0.0025	1.0	0.0039
7995		4146	28.79	2.07				
13993		7213	50.09	3.61	2.0	0.0020	1.5	0.0027
23988		12324	85.58	6.16	1.7	0.0023	1.5	0.0027

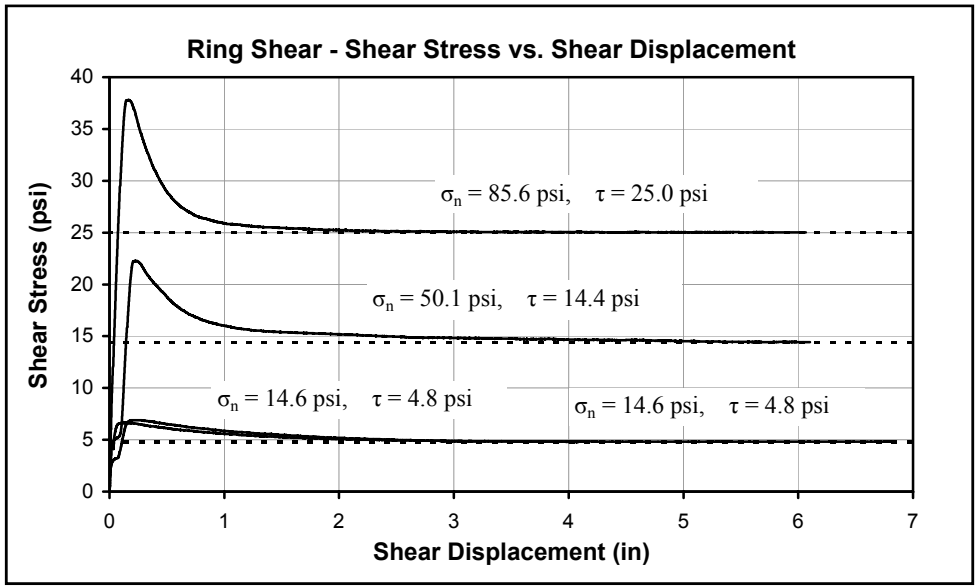
Minimum calc. shear rate =	0.0020	in/min.
Estim. failure displacement =	0.2	in

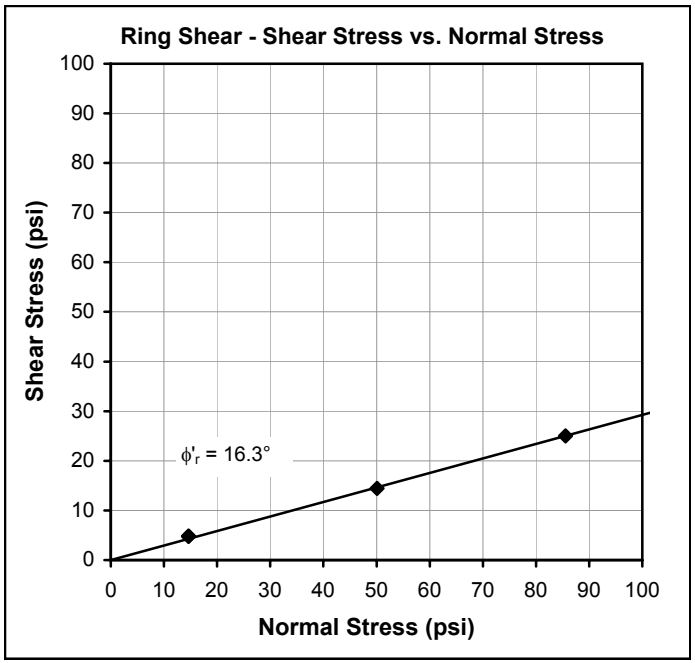
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

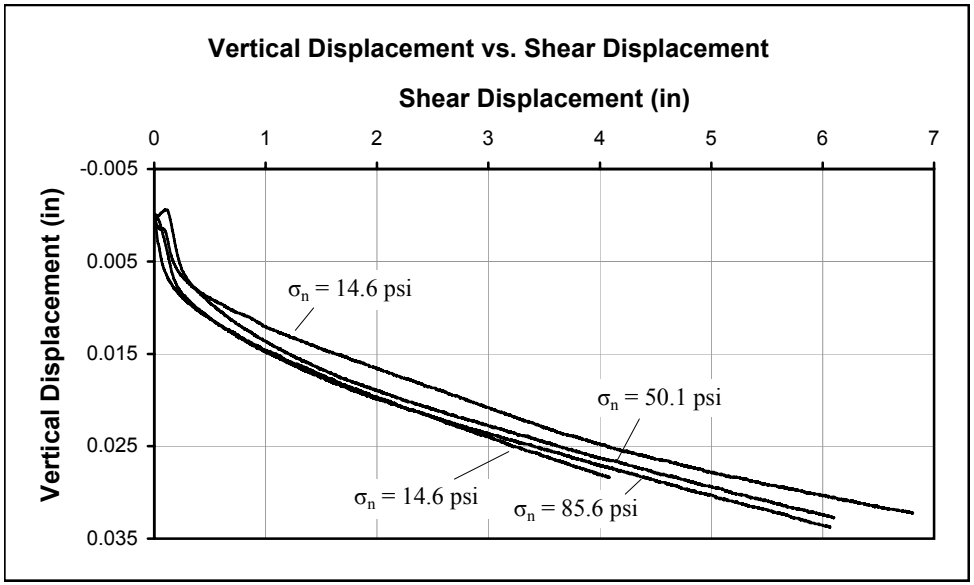
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R1-101804-1	4000	2103	14.61	1.05	696	4.83	0.35	0.032
R1-101804-2	13993	7213	50.09	3.61	2078	14.43	1.04	0.033
R1-101804-3	23988	12324	85.58	6.16	3604	25.03	1.80	0.034
R1-101804-4	4000	2103	14.61	1.05	691	4.80	0.35	0.035

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 16.3 deg.
(based on a best fit line for c'_r = 0)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	SFBM Bucket Sample
Device Used:	WF Bromhead Ring Shear #1
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	10/18/04
Test Finished On:	11/15/04

Virginia Polytechnic Institute and State University

Geotechnical Engineering Laboratory

Ring Shear Data Sheet

Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces		Started:	10/18/04
Sample I.D./Loc.:	San Francisco Bay Mud Bucket Sample		Finished:	11/15/04
Classification:	Grey Elastic Silt (MH)	Shear Device Used:	WF Bromhead Ring Shear #2	

Initial Water Content of Prepared Specimen		
Wt. of Moist Soil + Tare	Water content not measured for this test.	
Wt. of Dry Soil + Tare		
Wt. of Tare		
Wt. of Moist Soil		
Wt. of Dry Soil		
Water Content, w%		
Wet Weight of Entire Specimen		(g)

Assumed Specific Gravity		2.70	
Initial Thickness of Specimen		0.2	(in.)
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Multistage Loading or New Specimen for Each Point?		New Specimen	
Failure Surface Location		Top of Specimen	

Consolidation Steps				Casagrande		Taylor	
Consolidation Load	Normal Stress			t_{50}	Max. Shear Rate	t_{50}	Max. Shear Rate
(g)	(psf)	(psi)	(tsf)	(min.)	(in/min.)	(min.)	(in/min.)
1999	1080	7.50	0.54				
3998	2102	14.60	1.05	1.8	0.0022	0.9	0.0045
7995	4146	28.79	2.07				
13990	7211	50.08	3.61	1.9	0.0021	1.7	0.0023
23985	12322	85.57	6.16	2.0	0.0020	1.3	0.0030

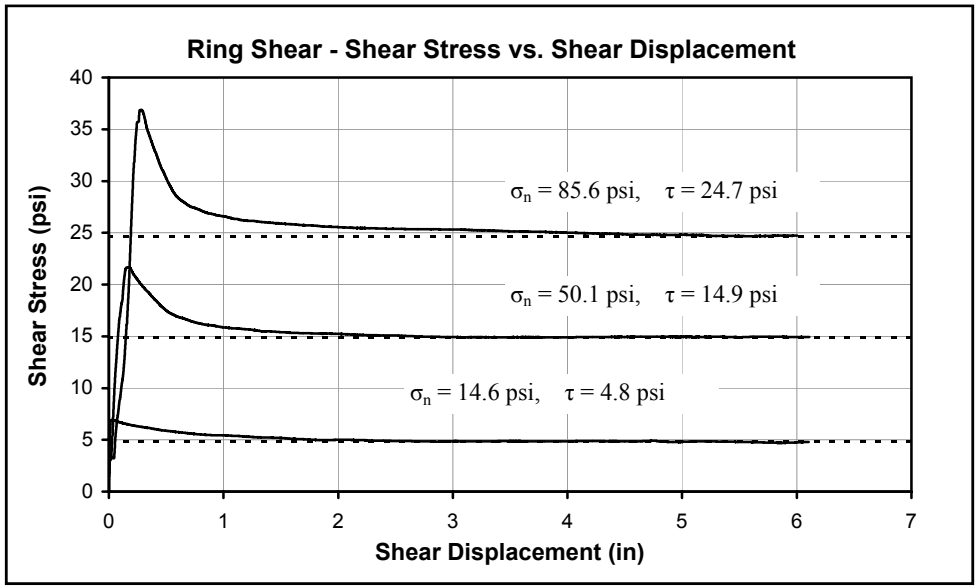
Minimum calc. shear rate =	0.0020	in/min.
Estim. failure displacement =	0.2	in

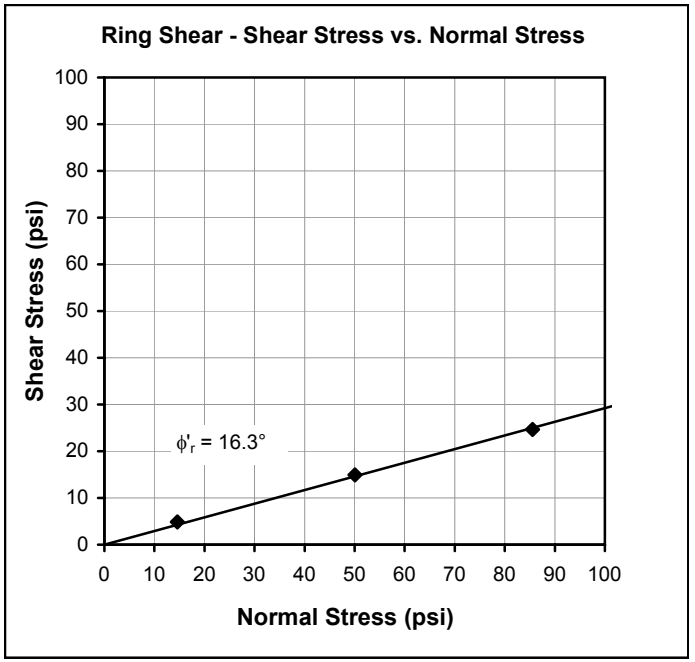
Test performed at shear rate =	0.00071	in/min.
Test performed at shear rate =	0.024	deg/min.

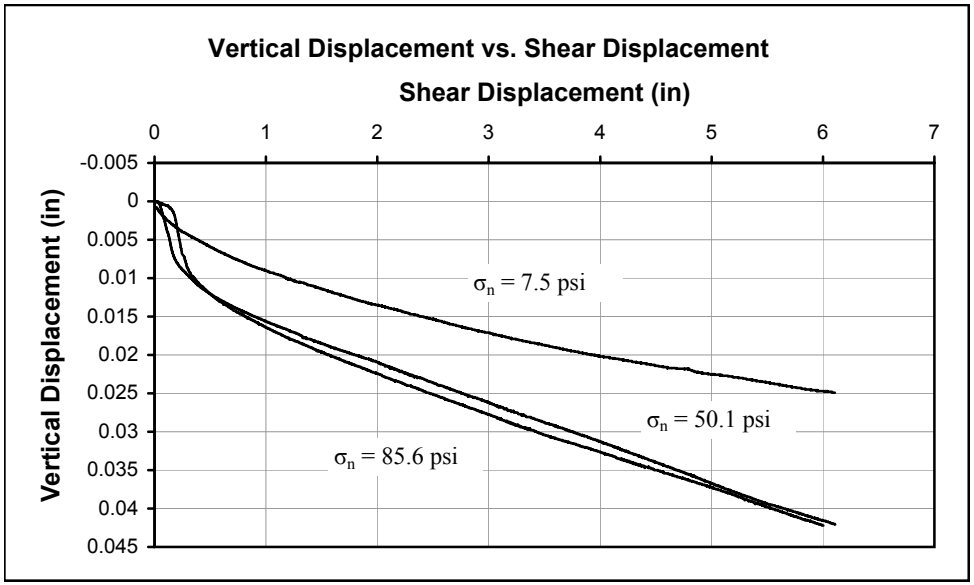
Test Number	Normal Load	Normal Stress			Residual Shear Stress			ΔH
	(g)	(psf)	(psi)	(tsf)	(psf)	(psi)	(tsf)	(in.)
R2-101804-1	13990	7211	50.08	3.61	2151	14.94	1.08	0.042
R2-101804-2	23985	12322	85.57	6.16	3554	24.68	1.78	0.042
R2-101804-3	3998	2102	14.60	1.05	697	4.84	0.35	0.025

Notes: Specimen was remolded at LL, and pushed through the #40 sieve.
Specimen was preconsolidated to approximately 50 psi prior to placement in ring shear apparatus.
Modified platen used for ring shear tests.

ϕ'_r = 16.3 deg.
(based on a best fit line for $c'_r = 0$)







Project:	Determining the Cyclic Shear Strength of Slickensided Slip Surfaces
Soil Being Tested:	SFBM Bucket Sample
Device Used:	WF Bromhead Ring Shear #2
Test Performed By:	Chris Meehan
Data Reduced By:	Chris Meehan
Test Started On:	10/18/04
Test Finished On:	11/15/04