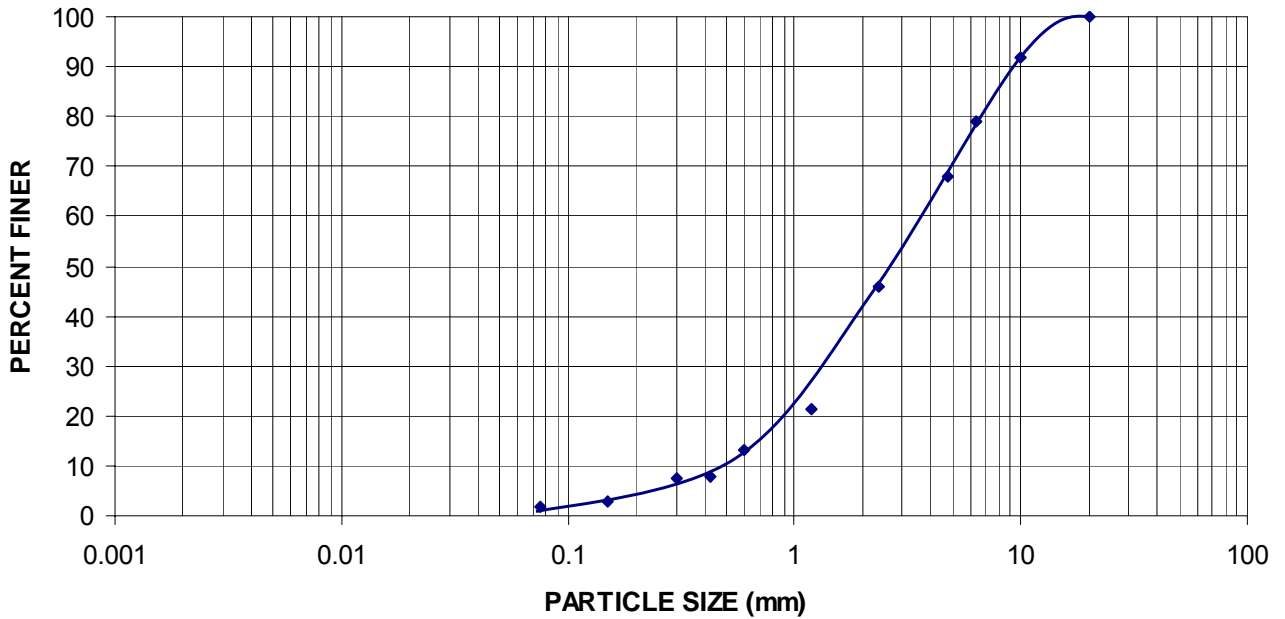


APPENDIX – INDEX AND ENGINEERING PROPERTIES OF ENCOUNTERED SOILS



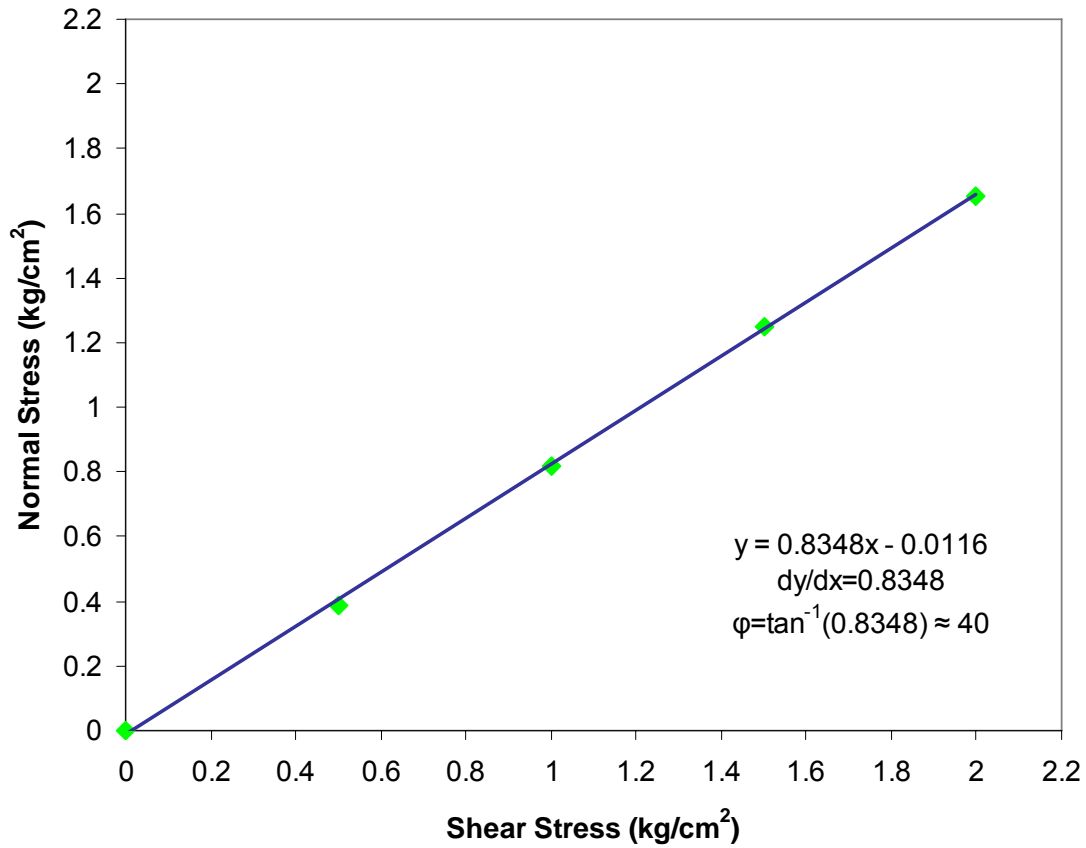
Soil Type	C_u	C_c	Passing # 200 Sieve, (%)	USC Classification
Moorum Fill	8.0	1.125	1.7	SW (Well Graded Sand with Gravel)

GRAIN SIZE DISTRIBUTION CURVE FOR MOORUM SOIL

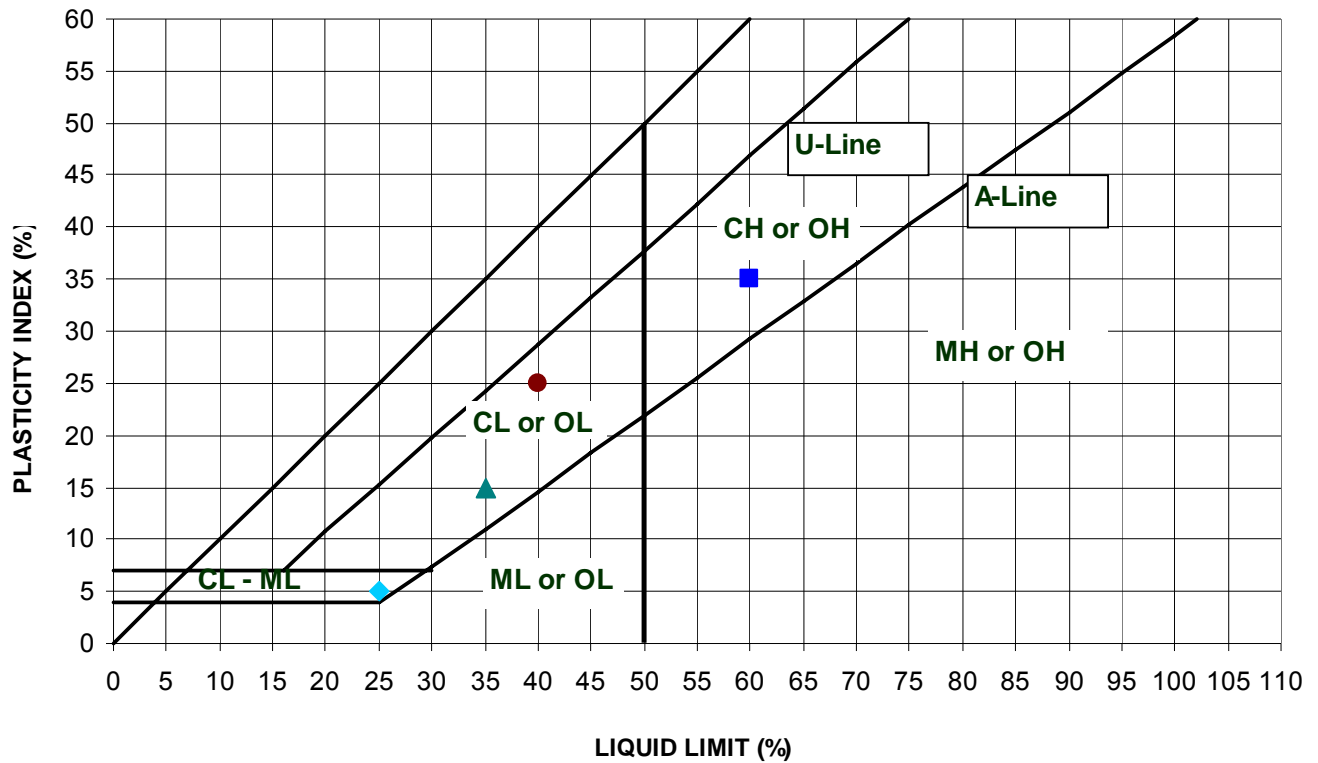
DIRECT SHEAR TEST

Rate of strain = 0.06cm/min
 Calibration factor for proving ring, 1div. = 0.484kg
 Sample size = 6cmx6cm
 Area of sample = 36cm²

S.No	Initial proving ring reading	Final proving ring reading	Shear force P _h (kg)	Normal stress σ (kg/cm ²)	Shear stress τ=P _h /A, (kg/cm ²)
1	0	0	0	0	0
2	0	29	14.036	0.5	0.389
3	0	61	29.524	1.0	0.820
4	0	93	45.012	1.5	1.250
5	0	123	59.532	2.0	1.653



DIRECT SHEAR TEST RESULT OF MOORUM SOIL



Elevation (m)	Symbol	LL (%)	PI (%)	Passing # 200 Sieve, (%)	USC Classification
-2.0 to -6.0	●	40	25	70	CL (Lean Clay)
-6.0 to -8.0	▲	35	15	60	CL (Lean Clay)
-8.0 to -15.0	■	60	35	80	CH (Fat Clay)
-15.0 to -18.0	◆	25	5	40	CL-ML (Silty Clay)

CLASSIFICATION OF FINE GRAINED SOIL (ASTM D-2487)

FIELD VANE SHEAR TEST

The field vane shear tests were conducted at two depths (-2.0m & -4.0m)

According to ASTM D-2573, if $h/d=2$, then

$$c_u = T / (366 \times 10^{-8})d^3$$

Diameter of the casing pipe used (D) = 10.16cm
Vane diameter (d) = 9.21cm
Vane height (h) = 18.41cm

h/d ratio ≈ 2 , therefore, the above formula was used for the undrained shear strength calculations.

Undrained shear strength at -2.0m level

Applied torque = 0.042N-m
Diameter of the vane = 9.21cm

$$c_u = 0.0408 / (366 \times 10^{-8}) (9.21)^3 \\ \approx 15 \text{ kN/m}^2$$

Undrained shear strength at -4.0m level

Applied torque = 0.0714N-m
Diameter of the vane = 9.21cm

$$c_u = 0.0714 / (366 \times 10^{-8}) (9.21)^3 \\ \approx 25 \text{ kN/m}^2$$

Average undrained shear strength for depths between -2.0m & -4.0m

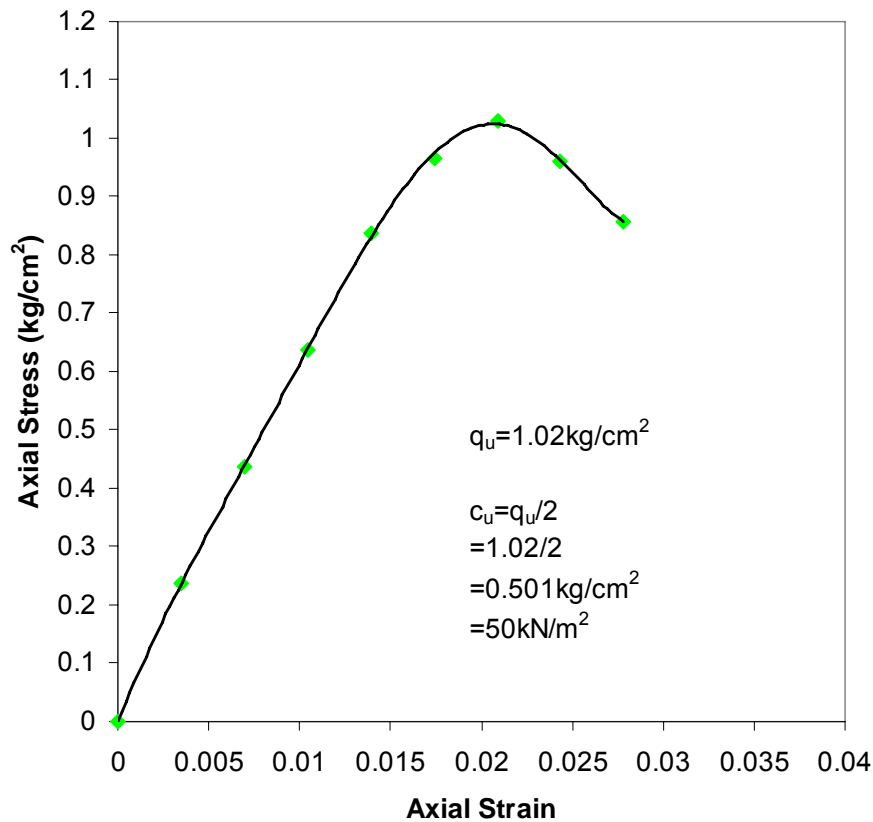
$$c_u = (15+25)/2 \\ = 20 \text{ kN/m}^2$$

UNCONFINED COMPRESSION TEST

Depth -6.0m

Diameter of sample (do) = 3.3cm
 Initial length of sample (Lo) = 7.3cm
 Initial area of cross sectional area (Ao) = 8.55cm²
 Least count of strain dial 1 division = 0.00254mm
 Calibration factor for proving ring, 1div. = 0.29kg

S.No.	Strain dial Reading	Axial deformation (mm)	Axial Strain	Corrected Area of Cross section (cm ²)	Proving Ring Reading	Axial Load kg	Axial Stress (kg/cm ²)
1	0	0	0	0	0	0	0
2	10	0.0254	0.00347945	8.579853188	7	2.03	0.236600785
3	20	0.0508	0.0069589	8.609915577	13	3.77	0.437867243
4	30	0.0762	0.01043836	8.640189374	19	5.51	0.637717504
5	40	0.1016	0.01391781	8.670676817	25	7.25	0.836151566
6	50	0.127	0.01739726	8.701380176	29	8.41	0.966513338
7	60	0.1524	0.02087671	8.732301752	31	8.99	1.029510919
8	70	0.1778	0.02435616	8.76344388	29	8.41	0.959668381
9	80	0.2032	0.02783562	8.794808928	26	7.54	0.857323913

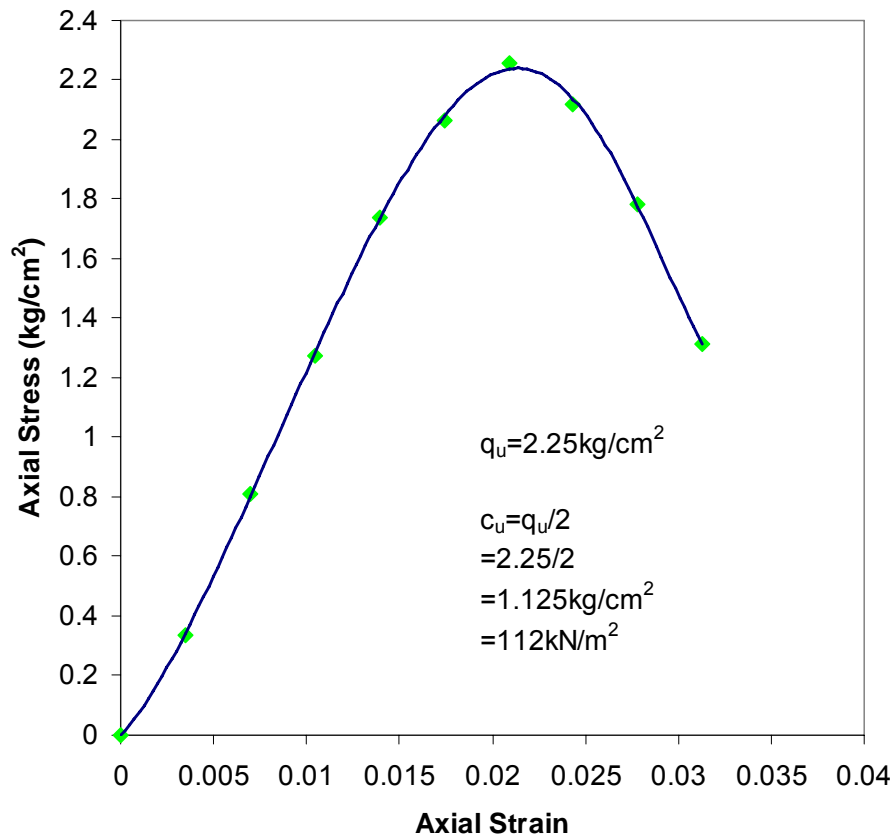


UNCONFINED COMPRESSION TEST RESULT AT -6.0m DEPTH

Depth -11.5m

Diameter of sample (d_o) = 3.3cm
 Initial length of sample (L_o) = 7.3cm
 Initial area of cross sectional area (A_o) = 8.55cm²
 Least count of strain dial 1 division = 0.00254mm
 Calibration factor for proving ring, 1div. = 0.29kg

S.No.	Strain dial Reading	Axial deformation (mm)	Axial Strain	Corrected Area of Cross section (cm ²)	Proving Ring Reading	Axial Load kg	Axial Stress (kg/cm ²)
1	0	0	0	0	0	0	0
2	10	0.0254	0.00347945	8.579853188	10	2.9	0.338001122
3	20	0.0508	0.0069589	8.609915577	24	6.96	0.808370296
4	30	0.0762	0.01043836	8.640189374	38	11.02	1.275435008
5	40	0.1016	0.01391781	8.670676817	52	15.08	1.739195258
6	50	0.127	0.01739726	8.701380176	62	17.98	2.066338861
7	60	0.1524	0.02087671	8.732301752	68	19.72	2.258282016
8	70	0.1778	0.02435616	8.76344388	64	18.56	2.117888841
9	80	0.2032	0.02783562	8.794808928	54	15.66	1.780595818
10	90	0.2286	0.03131507	8.826399299	40	11.6	1.314239205



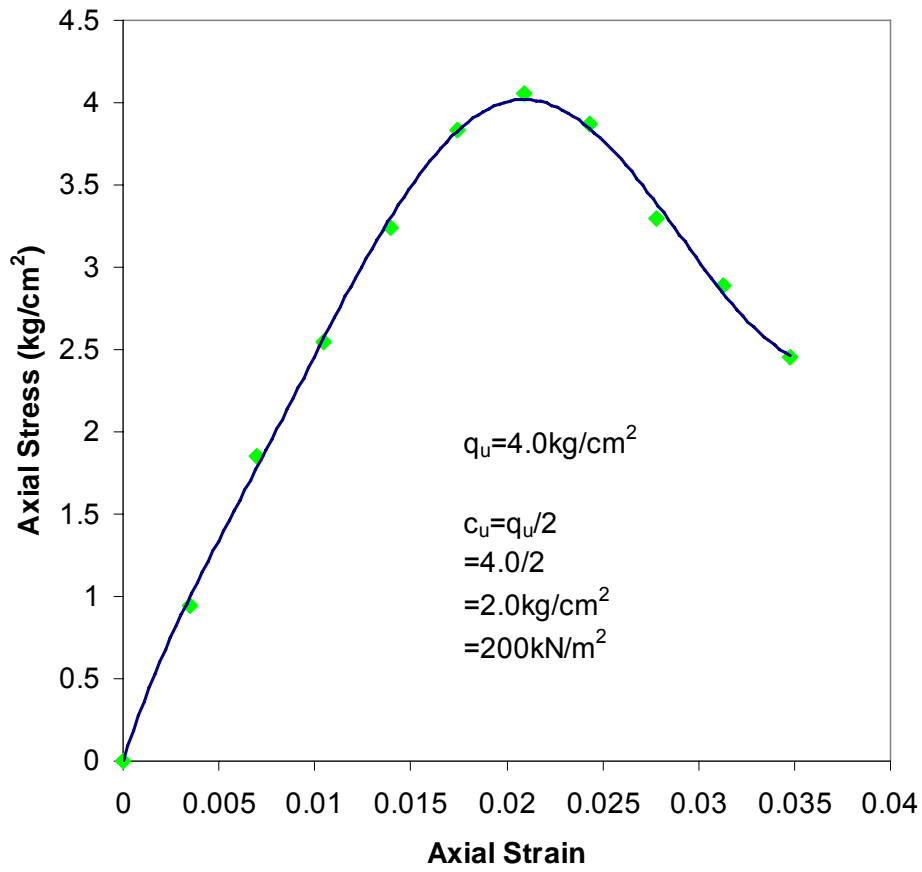
UNCONFINED COMPRESSION TEST RESULT AT -11.0m DEPTH

Depth -15.0m

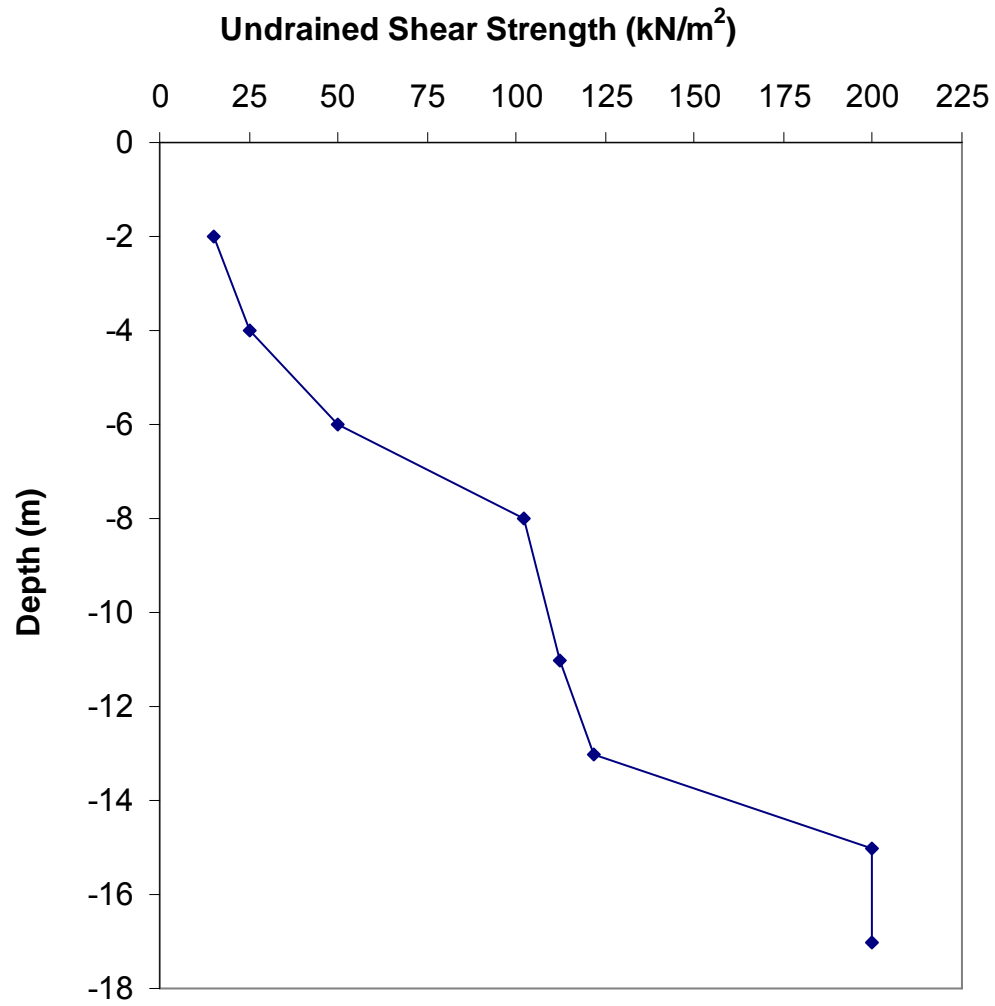
Diameter of sample (d_o) = 3.3cm
 Initial length of sample (L_o) = 7.3cm
 Initial area of cross sectional area (A_o) = 8.55cm²
 Least count of strain dial 1 division = 0.00254mm
 Calibration factor for proving ring, 1div. = 0.29kg

S.No.	Strain dial Reading	Axial deformation (mm)	Axial Strain	Corrected Area of Cross section (cm ²)	Proving Ring Reading	Axial Load kg	Axial Stress (kg/cm ²)
1	0	0	0	0	0	0	0
2	10	0.0254	0.00347945	8.579853188	28	8.12	0.94640314
3	20	0.0508	0.0069589	8.609915577	55	15.95	1.852515261
4	30	0.0762	0.01043836	8.640189374	76	22.04	2.550870015
5	40	0.1016	0.01391781	8.670676817	97	28.13	3.244268077
6	50	0.127	0.01739726	8.701380176	115	33.35	3.832725306
7	60	0.1524	0.02087671	8.732301752	122	35.38	4.051623616
8	70	0.1778	0.02435616	8.76344388	117	33.93	3.871765537
9	80	0.2032	0.02783562	8.794808928	100	29	3.297399664
10	90	0.2286	0.03131507	8.826399299	88	25.52	2.891326252

11	100	0.254	0.03479452	8.858217428	75	21.75	2.455347272
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UNCONFINED COMPRESSION TEST RESULT AT -15.0m DEPTH



VARIATION OF UNDRAINED SHEAR STRENGTH WITH DEPTH