Sieve Analysis

Description of soil ______________________________ Sample No. ________

Mass of oven dry sample, W ______ g

Location ____

Tested by ____________________________ Date ______________

Sieve No.	Sieve opening (mm)	Mass of soil retained on each sieve, W_n (g)	Percent of mass retained on each sieve, R_n	Cumulative percent retained, $\sum R_n$	Percent finer, $100-\sum R_n$
Pan	——				

$\sum$ ____________ $= W_1$

Mass loss during sieve analysis = $\frac{W - W_1}{W} \times 100$ = ________ % (OK if less than 2%)

MEASUREMENT OF MOISTURE CONTENT (ASTM D2216)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Oven temperature:	Drying time:
Scale type/precision/serial no.:	
Notes, observations, and deviations from ASTM D2216 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Container ID:			
Mass of container (M_c):			
Mass of moist soil + container (M_1):			
Mass of dry soil + container (M_2):			
Mass of moisture (M_w):			
Mass of dry soil (M_s):			
Moisture content (w):			
Average moisture content:			

IV. EQUATION AND CALCULATION SPACE

$$w = \frac{M_1 - M_2}{M_2 - M_c} \, x \, 100\%$$

GRAIN SIZE ANALYSIS – HYDROMETER MEASUREMENT (ASTM D422)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Hydrometer manufacturer/serial no.:		
Mixer manufacturer/serial no.:		
Scale type/serial no./precision:		
Duration of initial soaking period:		
Concentration of sodium hexametaphosphate solution:		
Dry mass of soil used (M_d):		
Specific gravity of soil solids:	Temperature:	
K:	*a:*	*b:*
Notes, observations, and deviations from ASTM D422 test standard:		

III. MEASUREMENTS AND CALCULATIONS

Clock Time (hh:mm:ss)	***t* (min)**	***R***	***L* (cm)**	***D* (mm)**	***P'* (%)**	***P* (%)**

IV. EQUATION AND CALCULATION SPACE

$L = 16.3 - 0.163R$ $\qquad D = K\sqrt{L/t}$

$P' = \frac{(R-b)a}{M_d} \times 100\%$ $\qquad P = P'(P_{-\#40})$

LIQUID LIMIT (ASTM D4318)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Oven temperature:	Drying time:
Scale type/precision/serial no.:	
Notes, observations, and deviations from ASTM D4318 test standard:	

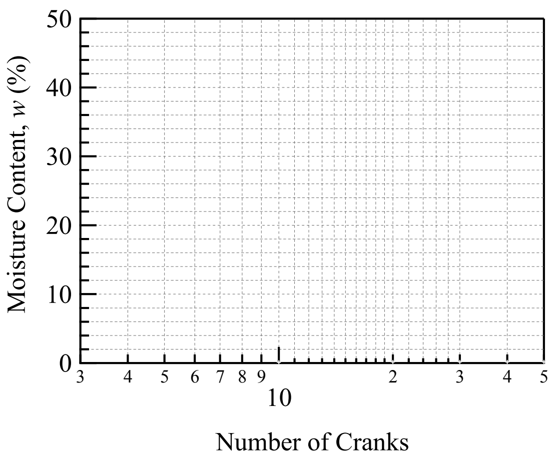
III. MEASUREMENTS AND CALCULATIONS

Trial Number	1	2	3
Container ID			
Mass of container (M_c)			
Mass of moist soil + container (M_1)			
Mass of dry soil + container (M_2)			
Mass of moisture (M_w)			
Mass of dry soil (M_s)			
Moisture Content (w)			
Number of Cranks			
Liquid Limit (LL)			
Corresponding Plastic Limit (PL)			
Plasticity Index (PI)			

IV. EQUATION AND CALCULATION SPACE

$$w = \frac{M_1 - M_2}{M_2 - M_c} x\ 100\%$$

$$PI = LL - PL$$



PLASTIC LIMIT (ASTM D4318)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Oven temperature:	Drying time:
Scale type/precision/serial no.:	
Notes, observations, and deviations from ASTM D4318 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Trial Number	1	2	3
Container ID			
Mass of container (M_c)			
Mass of moist soil + container (M_1)			
Mass of dry soil + container (M_2)			
Mass of moisture (M_w)			
Mass of dry soil (M_s)			
Moisture Content (w)			
Average Plastic Limit (PL)			
Corresponding Liquid Limit (LL)			
Plasticity Index (PI)			

IV. EQUATION AND CALCULATION SPACE

$$w = \frac{M_1 - M_2}{M_2 - M_c} \, x \, 100\%$$

$$PI = LL - PL$$

COMPACTION TEST (ASTM D698, D1557)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Compaction effort (standard or modified):	
Soil hydration period prior to compaction:	Max. particle size:
Compaction procedure (A, B, or C):	Mold diameter:
Mold height:	Mold volume (V_m):
Notes, observations, and deviations from ASTM D698 and D1557 test standards:	

III. MEASUREMENTS AND CALCULATIONS

Location Within Specimen	Top	Middle	Bottom
Container ID			
Mass of container (M_c)			
Mass of moist soil + container (M_1)			
Mass of dry soil + container (M_2)			
Moisture Content (w)			
Average Water Content (w_{avg})			

Net Mass of Compacted Specimen (M):	Dry Unit Weight (γ_d):

IV. EQUATIONS AND CALCULATION SPACE

$$w = \frac{M_1 - M_2}{M_2 - M_c} \times 100\%$$

$$\gamma_d = \frac{Mg}{(1 + w_{avg})V_m}$$

COMPACTION CURVE PLOT (ASTM D698, D1557)

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

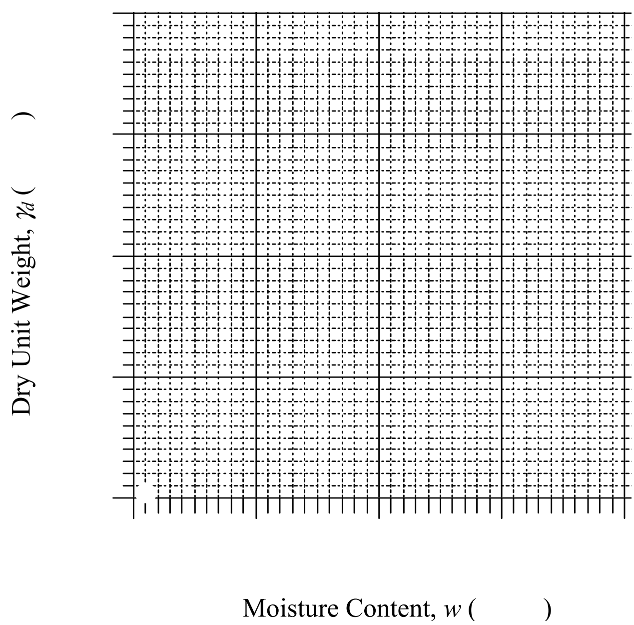
Compaction effort (standard or modified):	
Compaction procedure (A, B, or C):	Specific Gravity of Soil Solids (G_s):
Notes, observations, and deviations from ASTM D698 and D1557 test standards:	

III. MEASUREMENTS AND CALCULATIONS

Standard Proctor (ASTM D698)		**Modified Proctor (ASTM D1557)**		**ZAV Curve**	
w	γ_d	w	γ_d	w	γ_d

IV. EQUATION AND CALCULATION SPACE

ZAV: $\gamma_d = \dfrac{G_s \gamma_w}{1 + wG_s}$



SAND CONE TEST (ASTM D1556)
FIELD DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Field compaction method:	Date material compacted:
Soil description:	

II. TEST DETAILS

Description of sand used in sand cone (particle shape, C_u, D_{100}, %-#60):	
Description of calibration chamber (shape and dimensions):	
Calibration chamber volume (V_1):	Max. particle size of compacted material:
Notes, observations, and deviations from ASTM D1556 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Calibration	**Measurement**
Mass of filled device (M_6):	Mass of filled device (M_{10}):
Mass of device after filling base plate and funnel (M_7):	Mass of device after filling base plate, funnel, and test hole (M_{11}):
Mass of sand in the base plate and funnel (M_2):	Mass of sand in the base plate, funnel, and test hole (M_1):
Mass of refilled device (M_8):	Volume of test hole (V):
Mass of refilled device after filling base plate, funnel, and calibration chamber (M_9):	Mass of moist material excavated from the test hole (M_3):
Mass of sand in the calibration chamber (M_5):	Dry mass of material excavated From the test hole (M_4):
Total unit weight of the sand (γ_1):	

Moisture content (w):	Dry unit weight (γ_d):

IV. EQUATIONS AND CALCULATION SPACE

$$M_2 = M_6 - M_7$$

$$M_1 = M_{10} - M_{11}$$

$$w = \frac{M_3 - M_4}{M_4} \times 100\%$$

$$M_5 = M_8 - M_9 - M_2$$

$$V = \frac{(M_1 - M_2)g}{\gamma_1}$$

$$\gamma_d = \frac{M_4 g}{V}$$

$$\gamma_1 = \frac{M_5 g}{V_1}$$

HYDRAULIC CONDUCTIVITY OF GRANULAR SOIL
UNDER CONSTANT HEAD (ASTM D2434)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Max. particle size:	$P_{+\#10}$ or $P_{+3/8\ in}$ (state which):
Specimen diameter, D:	Specimen area, A:
Manometer port spacing, L_c:	Specimen length:
Dry mass of soil, M_s:	Volume of soil, V:
Specific gravity of soil solids, G_s:	Dry unit weight, γ_d:
Void ratio, e:	Scale type/serial no./precision:
Saturation vacuum level:	Saturation vacuum duration:
Specimen preparation method:	
Notes, observations, and deviations from ASTM D2434 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Test No.	Head Loss (Δh)	Hydraulic Gradient (i)	Flow Volume (Q)	Time (t)	Flow Rate (q)	Hydraulic Conductivity (k)

IV. EQUATION AND CALCULATION SPACE

$$A = \frac{\pi D^2}{4} \qquad q = \frac{Q}{t}$$

$$i = \frac{\Delta h}{L_c} \qquad k = \frac{QL_c}{\Delta h A t}$$

ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
MACHINE DEFLECTION MEASUREMENTS
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Test performed by:	Date tested:
Lab partners/organization:	
Load frame type/serial no.:	
Load duration:	Blank material and thickness:
Filter paper type:	
Porous stone type and thickness:	
Deformation indicator type and conversion factor *K* (if applicable):	
Notes, observations, and deviations from ASTM D2435 test standard:	

II. MEASUREMENTS

Pressure (psf)	**Deformation Reading ( )**

ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
SPECIMEN PREPARATION MEASUREMENTS
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Specimen prepared by:	Date:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Load frame type/serial no.:	
Scale type/serial no./precision:	
Consolidation ring diameter:	Initial specimen height, H_o:
Consolidation ring mass:	Specimen volume, V_o:
Specific gravity of soil solids, G_s:	
Notes, observations, and deviations from ASTM D2435 test standard:	

III. MEASUREMENTS AND CALCULATIONS

	Before Test	After Test
Mass of moist soil + ring		
Mass of moist soil	$M_{To} =$	$M_{Tf} =$
Mass of dry soil + ring		
Mass of dry soil	$M_d =$	$M_d =$
Mass of moisture		
Moisture content	$w_o =$	$w_f =$
Void ratio	$e_o =$	$e_f =$
Degree of saturation	$S_o =$	$S_f =$

IV. EQUATION AND CALCULATION SPACE

$$e_o = \frac{V_o - \dfrac{M_d}{G_s \rho_w}}{\dfrac{M_d}{G_s \rho_w}}$$

ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
TIME-DEFORMATION MEASUREMENTS
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Test performed by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Load frame type/serial no.:	
Scale type/serial no./precision:	
Load no.:	Load increment, σ':
Filter paper type:	
Porous stone type and thickness:	
Machine deflection:	
Deformation indicator type and conversion factor *K* (if applicable):	
Notes, observations, and deviations from ASTM D2435 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Date (mm/dd/yy)	Clock Time (hh:mm:ss)	Elapsed Time (hh:mm:ss)	Raw Deformation ( )	Deflection-Corrected Deformation ( )

ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
TIME-DEFORMATION PLOTTING USING THE LOG TIME METHOD

I. GENERAL INFORMATION

Data plotted by:	Date:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Load no.:	Load, σ':
Initial specimen height, H_o:	Deflection units:
Dial gauge conversion factor, K:	
Notes, observations, and deviations from ASTM D2435 test standard:	

III. MEASUREMENTS AND CALCULATIONS

σ':	d_{100}:
t_2:	d_2:
t_1:	d_1:
Δd:	d_o:
d_{50}:	t_{50}:
H_{D50}:	c_v:

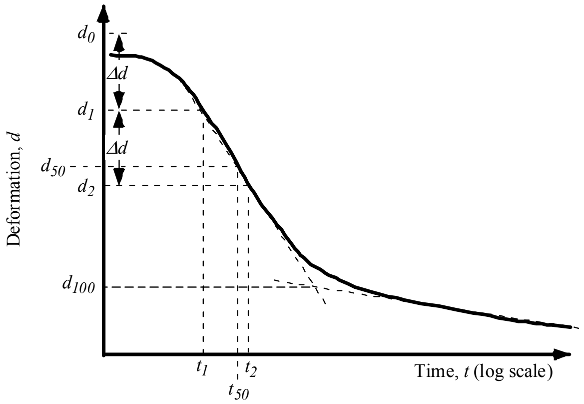
CALCULATION SPACE:

IV. EQUATIONS

$t_1 = t_2/4$ $\Delta d = d_2 - d_1$ $d_0 = d_1 - \Delta d$ $d_{50} = (d_0 + d_{100})/2$

$$H_{D50} = \frac{H_o - d_{50}(K)}{2} \text{ or } H_{D50} = \frac{H_o - d_{50}}{2} \qquad c_v = \frac{0.197(H_{D50})^2}{t_{50}}$$

EXAMPLE:



ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
TIME-DEFORMATION PLOTTING USING THE ROOT TIME METHOD

I. GENERAL INFORMATION

Data plotted by:	Date:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Load no.:	Load, σ':
Initial specimen height, H_o:	Deflection units:
Dial gauge conversion factor, K:	
Notes, observations, and deviations from ASTM D2435 test standard:	

III. MEASUREMENTS AND CALCULATIONS

σ':	d_0:
X:	$1.15X$:
d_{90}:	t_{90}:
d_{100}:	H_{D50}:
c_v:	

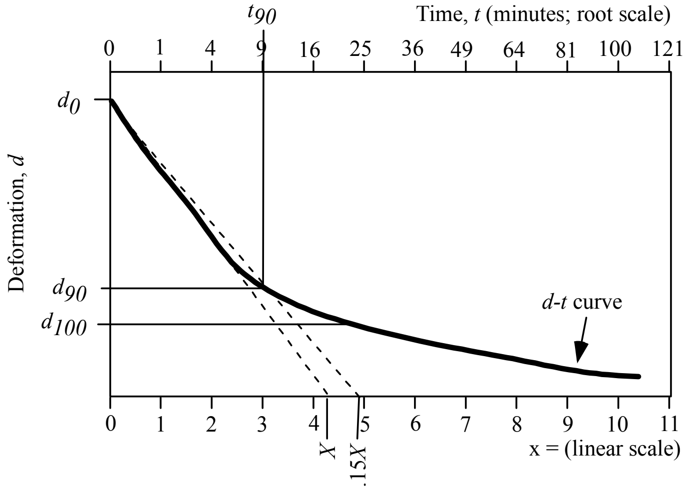
CALCULATION SPACE:

IV. EQUATIONS

$$d_{100} = d_0 + 1.11(d_{90} - d_o)$$

$$c_v = \frac{0.848(H_{D50})^2}{t_{90}}$$

EXAMPLE:



ONE-DIMENSIONAL CONSOLIDATION TEST (ASTM D2435)
CONSTRUCTION OF *e* – log *σ'* CURVE

I. GENERAL INFORMATION

Plotted by:	Dates tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Soil description:	

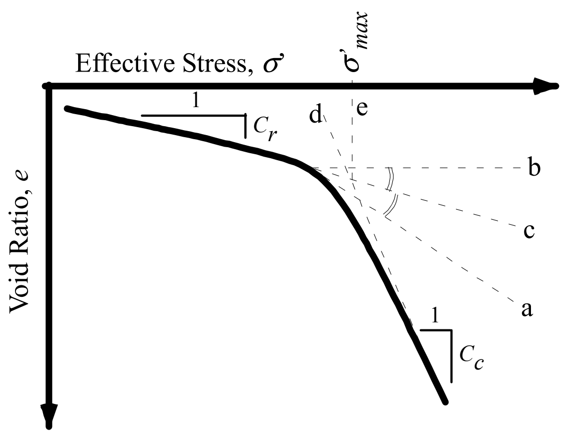
II. TEST DETAILS

Initial specimen height, H_o:	Specimen diameter:
Initial specimen volume, V_o:	Specific gravity of soil solids, G_s:
Net dry mass of specimen, M_d:	Initial void ratio, e_o:
Deflection units:	Dial gauge conversion factor, K:
Height of solids, H_s:	
Notes, observations, and deviations from ASTM D2435 test standard:	

III. MEASUREMENTS AND CALCULATIONS

σ'	d_{100}	Δe	e

EXAMPLE:



C_r:
C_c:
σ'_{max}:

IV. EQUATIONS

$$e_o = \frac{V_o - \frac{M_d}{G_s \rho_w}}{\frac{M_d}{G_s \rho_w}}$$

$$H_s = \frac{H_o}{1 + e_0}$$

$$\Delta e = \frac{\Delta H}{H_s} = \frac{d_{100}(K)}{H_s} \text{ or } \Delta e = \frac{\Delta H}{H_s} = \frac{d_{100}}{H_s}$$

$$e = e_0 - \Delta e$$

$$C = \frac{e_1 - e_2}{\log \sigma_2 - \log \sigma_1}$$

DIRECT SHEAR TEST (ASTM D3080)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Sample diameter:	Sample area, A:
Normal force, N:	Normal stress, σ:
Deformation rate:	Deformation indicator type:
Shear force measurement instrument type:	
Horizontal dial gauge conversion factor, K_H:	
Vertical dial gauge conversion factor, K_V:	
Proving ring dial gauge conversion factor, K_F:	
Notes, observations, and deviations from ASTM D3080 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Horizontal Deformation Reading (G_V)	Vertical Deformation Reading (G_H)	Force Reading (G_F)	Horizontal Displacement (ΔH)	Vertical Displacement (ΔV)	Shear Force (F)	Shear Stress (τ)

Shear strength (τ_f):

UNCONFINED COMPRESSIVE STRENGTH TEST (ASTM D2166)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Initial specimen diameter, D_o:	Initial specimen area, A_o:	
Initial specimen length, L_o:	Initial specimen volume, V_o:	
Moist mass of specimen, M:	Dry mass of specimen, M_s:	
Moisture content, w:	Total unit weight, γ:	Dry unit weight, γ_d:
Specimen preparation method:		
Deformation indicator type:	Axial strain rate, $\Delta\varepsilon_1/\Delta t$:	
Deformation dial gauge conversion factor, K_L:		
Force measurement instrument type:		
Proving ring dial gauge conversion factor, K_P:		
Notes, observations, and deviations from ASTM D2166 test standard:		

III. MEASUREMENTS AND CALCULATIONS

Deformation Reading (G_L)	Axial Deformation (ΔL)	Load Reading (G_P)	Axial Load (P)	Axial Strain (ε_1)	Corrected Area (A)	Axial Stress (σ_1)

EQUATIONS:

$\varepsilon_1 = \Delta L/L_o$

$A = A_o/(1-\varepsilon_1)$

$\sigma_1 = P/A$

$\Delta L = G_L K_L$

$P = G_P K_P$

$s_u = q_u/2$

Unconfined compressive strength, q_u:
Undrained shear strength, s_u:

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST (ASTM D2850)
LABORATORY DATA SHEET

I. GENERAL INFORMATION

Tested by:	Date tested:
Lab partners/organization:	
Client:	Project:
Boring no.:	Recovery depth:
Recovery date:	Recovery method:
Soil description:	

II. TEST DETAILS

Initial specimen diameter, D_o:	Initial specimen area, A_o:
Initial specimen length, L_o:	Initial specimen volume, V_o:
Moist mass of specimen, M:	Dry mass of specimen, M_s:
Moisture content, w:	Total unit weight, γ:
Dry unit weight, γ_d:	Degree of saturation, S:
Membrane type:	Axial strain rate, $\Delta\varepsilon_I/\Delta t$:
Deformation indicator:	Force indicator:
Deformation conversion factor, K_L:	Proving ring conversion factor, K_P:
Cell pressure, σ_3:	Specimen preparation method:
Notes, observations, and deviations from ASTM D2850 test standard:	

III. MEASUREMENTS AND CALCULATIONS

Deformation Reading (G_L)	Axial Deformation (ΔL)	Load Reading (G_P)	Axial Load (P)	Axial Strain (ε_I)	Corrected Area (A)	Deviator Stress ($\Delta\sigma$)

EQUATIONS:

$\varepsilon_I = \Delta L/L_o$

$A = A_o/(1-\varepsilon_I)$

$\Delta\sigma = P/A$

$\Delta L = G_L K_L$

$P = G_P K_P$

$\sigma_{1f} = \sigma_3 + \Delta\sigma_f$

σ_3:
$\Delta\sigma_f$:
σ_{1f}: