SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DCC3103 : GEOTECHNICAL ENGINEERING

TARIKH : 23 APRIL 2019
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan :

1. **FORMULA**
2. **TAYLORS STABILITION CHART**
3. **SEMI LOG GRAPH**

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 50 MARKS

BAHAGIAN A : 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** structured question. Answers **ALL** questions.

ARAHAN :

*Bahagian ini mengandungi **DUA (2)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1
C1

a. List **THREE (3)** types of rocks and give one example for each type.
*Senaraikan **TIGA (3)** jenis batuan dan berikan satu contoh untuk setiap jenis batu.*

[6 marks]
[*6 markah*]

CLO1
C2

b. Explain the formation process for the types of rocks as stated in **1(a)**
*Terangkan proses pembentukan batu-batuan yang disenaraikan dalam **1(a).***

[9 marks]
[*9 markah*]

CLO1
C3

c. Three direct shear tests were performed on samples of clayey silt and the following results were obtained as shown in **Table A1 (c)**. Calculate the cohesion (c) and angle of friction for the soil (ϕ).
*Tiga ujian ricih terus telah dijalankan ke atas sampel tanah liat berkelodak dan keputusan berikut telah diperolehi seperti **Jadual A1(c)**. Kirakan kejelekitan (c) dan sudut geseran (ϕ) untuk tanah tersebut.*

Table A1 (c) / *Jadual A1(c)*

Normal Force (N) *Beban Normal (N)*	Shear Force At Failure (N) *Beban Ricih Semasa Gagal (N)*
432	288
990	558
1710	900

The area of the sample A is $0.0036m^2$.

Keluasan sampel A ialah $0.0036m^2$.

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO1
C1

a. Define the following Atterberg Limits below :

Definisikan Had Atterberg di bawah:

i. Plastic Limit (PL) / *Had Plastik*

ii. Liquid Limit (LL) / *Had Cecair*

[4 marks]

[4 *markah*]

CLO1
C2

b. The moist density of a soil is 1682 kg/m^3. Given is the moisture content (w) for the soil is 15% and specific gravity (Gs) is 2.70. Calculate;

Ketumpatan bagi satu tanah lembab adalah 1682 kg/m^3. Diberi nilai kandungan lembapan (w) tanah tersebut adalah 15% dan graviti tentu (Gs) adalah 2.70. Kirakan;

i. Dry density (ρ_d) / *Ketumpatan kering (ρ_d)*

ii. Void ratio (e) / *Nisbah rongga (e)*

iii. Porosity (n) / *Keliangan (n)*

[9 marks]

[9 *markah*]

CLO1
C3

c. A standard proctor compaction test is tested to the soil sample. A result is shown in **Table A2(c)** below:
*Satu ujikaji pemadatan proktor piawai telah dijalankan ke atas satu sampel tanah. Keputusan ujikaji ditunjukkan pada **Jadual A2(c)** di bawah:*

Table A2(c) / *Jadual A2(c)*

Moisture Content (%) *Kandungan Lembapan*	4.2	5.1	7.8	9.2	12.0
Bulk Unit Weight, γb (kN/m^3) *Berat Unit Pukal*	17.61	19.02	21.13	21.29	20.72

i. Plot the graph of dry unit weight against moisture content.
Plotkan graf berat unit kering melawan kandungan lembapan.

ii. Based on the graph, calculate the maximum dry unit weight and optimum moisture content.
Berdasarkan graf tersebut tentukan berat unit kering maksimum dan kandungan lembapan optimum.

[12 marks]
[12 *markah*]

SECTION B : 50 MARKS

BAHAGIAN B: 50 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured question. Answer **TWO (2)** questions only.

ARAHAN :

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1

SOALAN 1

CLO2
C3

(a) A cross section of soil layer is shown in **Figure B1(a)**. The soil consists of two different types of layers. Based on the information provided;

*Satu keratan rentas lapisan tanah ditunjukkan seperti **Rajah B1(a)**. Tanah terdiri dari dua lapisan yang berlainan jenis. Berdasarkan kepada maklumat yang diberi;*

i. Calculate the normal stress, pore water pressure and effective stress in each layer.

Kirakan Tegasan normal, tekanan air liang dan tegasan berkesan pada setiap lapisan

ii. Sketch the distribution diagram for the normal stress and effective stress.

Lukiskan gambarajah taburan untuk tegasan normal dan tegasan berkesan.

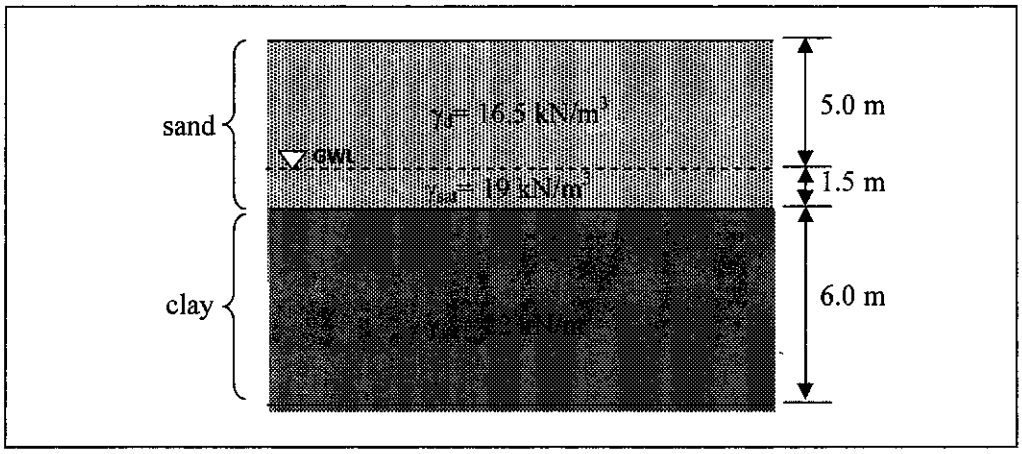


Figure B1(a) / *Rajah B1(a)*

[15 marks]

[*15 markah*]

CLO2
C4

(b) A soil profile with depth and weight is shown in **Figure B1(b)**.
Satu profil tanah dengan kedalaman dan berat unit tanah ditunjukkan dalam ***Rajah B1(b)***.

(i) Calculate the vertical stress, pore water pressure and effective stress of the soil at a depth of 9 m.
Kirakan tegasan pugak, tekanan air liang dan tegasan berkesan tanah pada kedalaman 9m.

[8 marks]

[*8 markah*]

(ii) Sketch the diagram of stress distribution
Lakarkan gambarajah taburan tegasan.

[2 marks]

[2 *markah*]

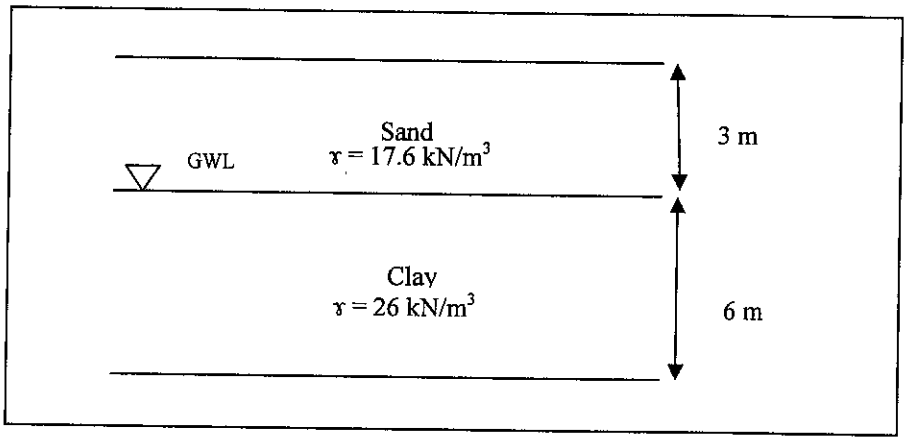


Figure B1(b) / *Rajah* B1(b)

QUESTION 2

SOALAN 2

CLO2
C3

(a) By referring to **Figure B2(a)**,
Berpandukan ***Rajah*** **B2(a),**

(i) Calculate the total active earth pressure (Σ Pa) at the depth of 10.0 m
Kirakan jumlah tujah aktif tanah (Σ Pa) pada paras 10.0m.

(ii) Calculate the location of the resultant force (Y) from the wall base.
Kirakan titik tindakan tujah aktif (Y) dari tapak tembok.

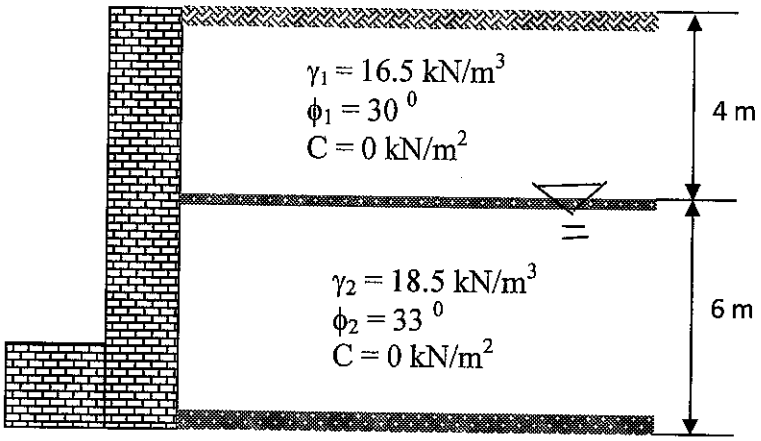


Figure B2(a) / *Rajah B2(a)*

[15 marks]

[*15 markah*]

CLO2
C4

(b) Based on **Figure B2(b)**, determine the magnitude and location of the active thrust of land behind the wall based on Rankine theory.
*Berdasarkan **Rajah B2(b)**, tentukan magnitud dan kedudukan tujah aktif tanah di belakang tembok tersebut berdasarkan teori Rankine.*

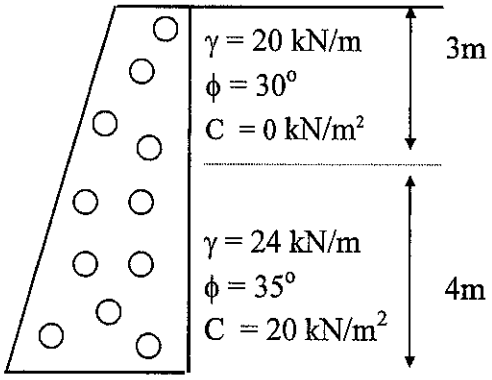


Figure B2(b) /*Rajah B2(b)*

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO2
C3

(a) (i) Sketch the flow net of concrete dam as shown in **Figure B3(a).**
*Lakarkan jaringan aliran untuk empangan konkrit pada **Rajah B3(a).***

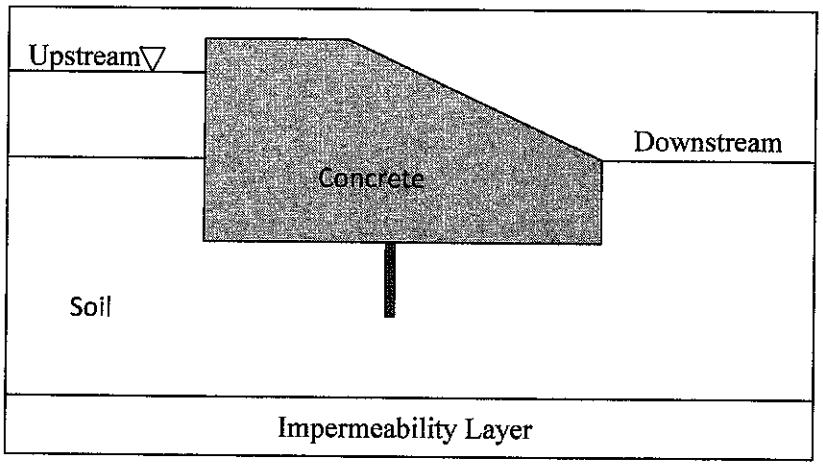


Figure B3(a)/ *Rajah B3(a)*

[5 marks]
[5 markah]

(ii) Sketch the flow net of soil dam and interpret the equipotential lines and flow lines.
Lakarkan jaringan aliran bagi empangan tanah dan terangkan mengenai garis sama upaya dan garis aliran.

[10 marks]
[10 markah]

CLO2
C4

(b) Draw a flow net for the single row of sheets pile driven into permeability layer as shown in **Figure B3(b)** using the scale 1:1. Calculate the seepage in m^3/day/m length of sheet pile. Given, k = 1.15 x 10^{-5}mm/sec.

Lukiskan jaringan aliran bagi sebatang cerucuk tunggal yang di pacu ke dalam satu lapisan telap yang ditunjukkan dalam ***Rajah B3(b)*** *mengunakaan skala 1:1. Kirakan kadar resipan dalam unit m^3/hari/m panjang cerucuk.*

Diberi , k = 1.15 x 10^{-5}mm/saat

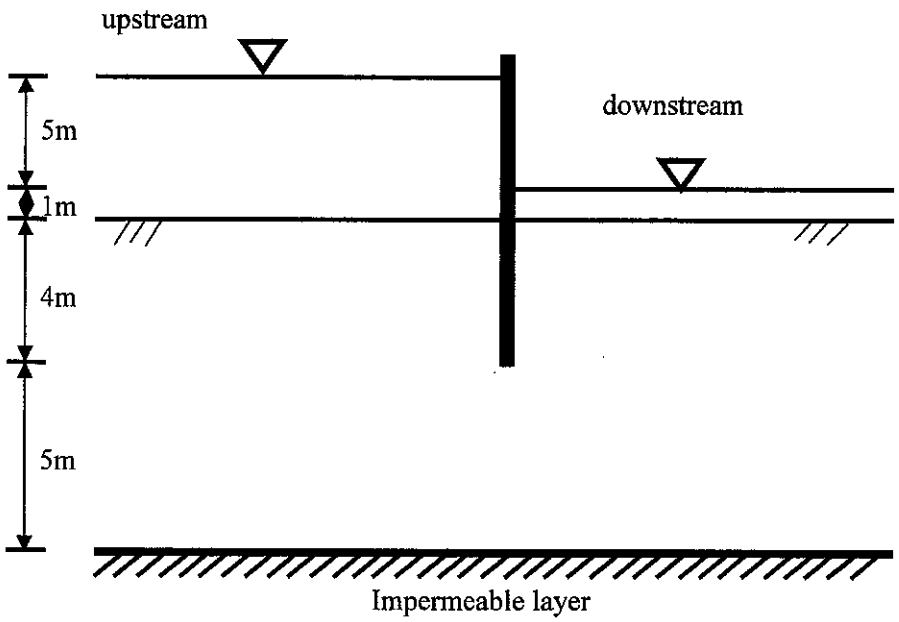


Figure B3 (b) / *Rajah B3(b)*

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

CLO2 C3

(a) Sketch and name **FIVE (5)** types of slope failure.
*Lakarkan dan namakan **LIMA (5)** jenis kegagalan cerun.*

[10 marks]
[10 markah]

CLO2 C4

(b) A cross-sectional shape of slope failure is shown in **Figure B4(b)**. Determine the safety factor of slope by using **Fellenius Slices Method.**
*Satu keratan rentas bentuk kegagalan cerun ditunjukkan seperti **Rajah B4(b)**. Tentukan faktor keselamatan cerun tersebut dengan menggunakan kaedah **Hirisan Fellenius** .*

Given ; Unit weight of soil, γ / *Diberi ; Berat unit tanah, γ* $= 18.5 kN/m^3$.

Friction angle, ϕ / *Sudut geseran, ϕ* $= 33^o$

Cohesion, c / *Kejelekitan, C* $= 22\ kN/m^2$

Note: Divide into **FIVE (5)** sections only
*Nota : Bahagikan kepada **LIMA (5)** bahagian sahaja.*

CLO2 C4

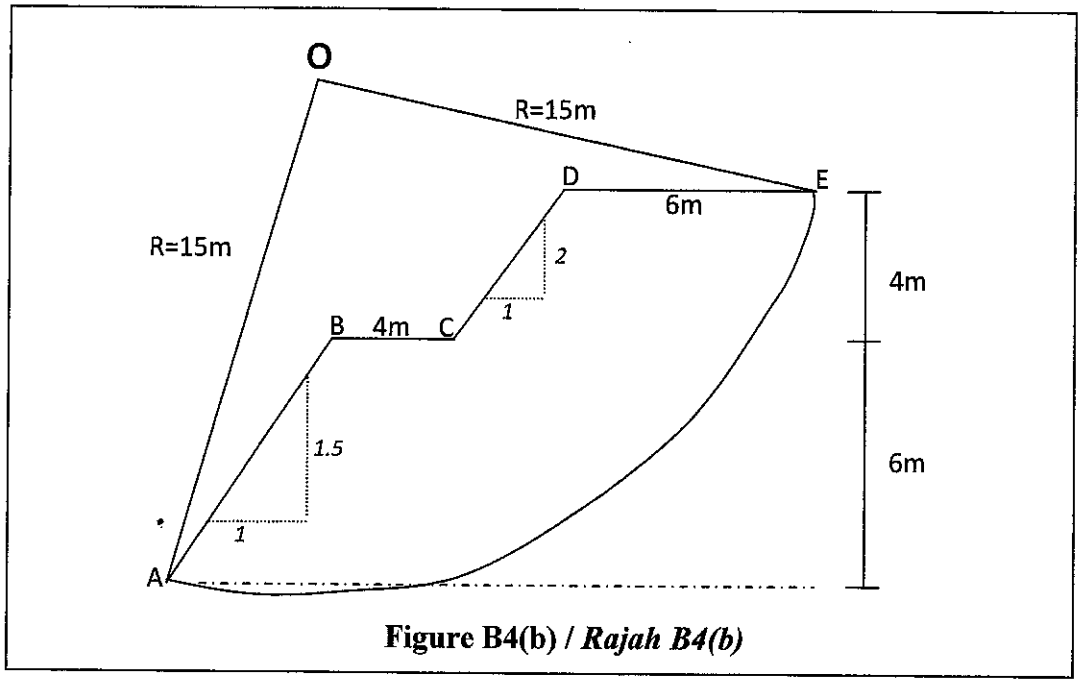


Figure B4(b) / *Rajah B4(b)*

[15 marks]
[15 markah]

SOALAN TAMAT

LAMPIRAN FORMULA (DCC3103 – GEOTECHNICAL ENGINEERING)

$$Q = k\,H\,\frac{Nf}{Ne}$$

$$I = \frac{\Delta h}{\Delta s}$$

$$u_x = u_w\left(\frac{N_x}{N_e}.\Delta H - (-Z_x)\right)$$

$$K_a = \frac{1-\sin\phi}{1+\sin\phi}$$

$$K_p = \frac{1+\sin\phi}{1-\sin\phi}$$

$$\rho_b = \frac{M_T}{V_T}$$

$$PI = LL - PL$$

$$LI = \frac{w - PL}{PI}$$

$$Z_c = \frac{2C}{\gamma}\sqrt{\frac{1}{Ka}}$$

$$\sigma_a = ka\,[\gamma Z + q] - 2C\sqrt{Ka}$$

$$Z_c = \frac{2C}{\gamma}\sqrt{\frac{1}{Ka}}$$

Correction Table $\frac{\Delta a}{a+\Delta a}$ **Earth Dam (Non Filter)**

Slope,	30	60	90	120	150	180

$$FOS = \frac{CR^2\theta}{Wd}$$

$$FOS = \frac{C_A R^2\theta_A + C_B R^2\theta_B}{Wd}$$

$$P = \frac{Rv}{B}\left(1 \pm \frac{6e}{B}\right)$$

$$FOS = \frac{Rv\tan\delta}{RH}$$

$$e = B/2 - \bar{X}$$

$$FOS = \frac{\mu R}{\mu T}$$

$$Q = kH\frac{N_f}{N_e}$$

$$u_x = \gamma_w\,[h_x - (-Z_x)]$$

$$FOS = \frac{Cu}{N\gamma Z}$$

$$FOS = \frac{\sum CL' + wkos\alpha\tan\phi}{\sum w\sin\alpha}$$

$$FOS = \frac{\sum CL'(W\cos\alpha - \mu L')}{\sum W\sin\alpha}$$

$$FOS = \frac{CR^2\theta'}{Wd + PwYc}$$

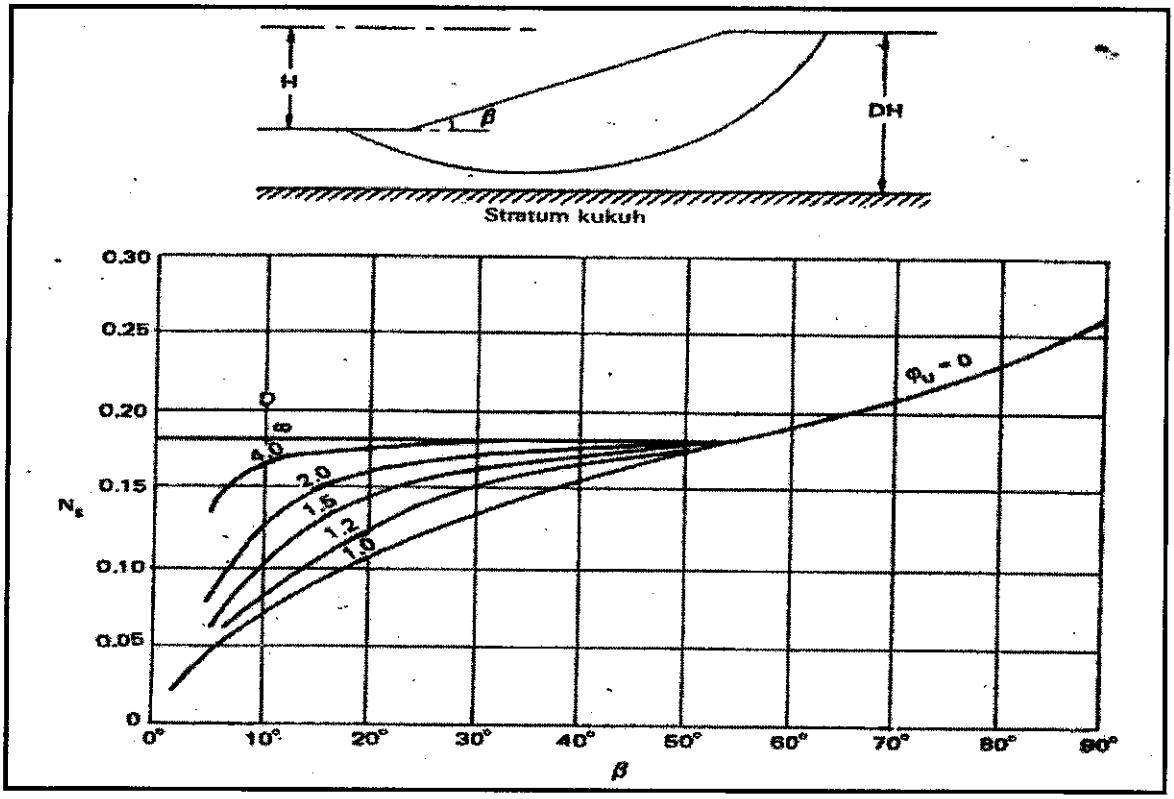
$$G_s = \frac{M_s}{V_s\rho_w}$$

$$\rho_d = \frac{\rho_b}{1+w}$$

$$e = \frac{n}{1-n}$$

α						
$\frac{\Delta a}{a+\Delta a}$	0.37	0.32	0.25	0.18	0.10	0

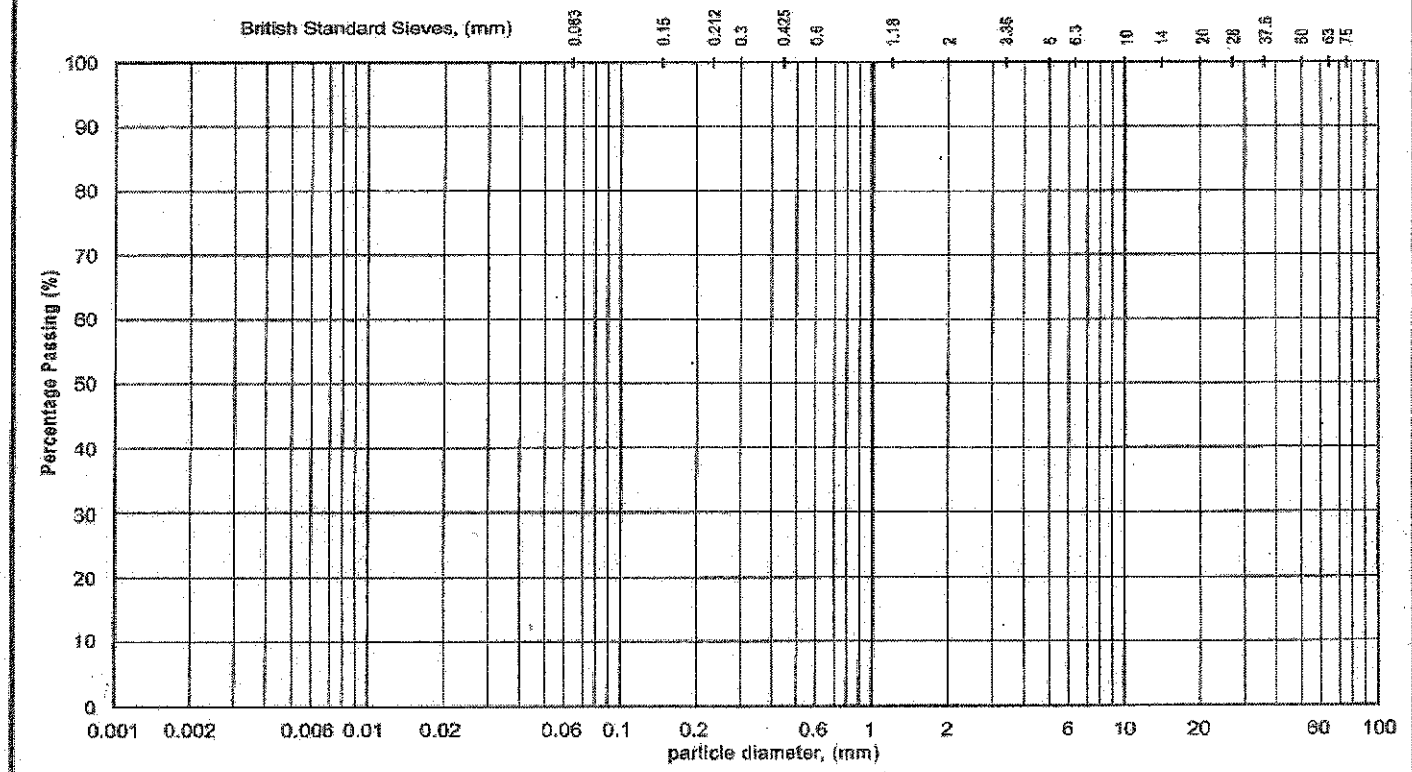
Taylor Stabilization Chart



GERAF SEMI LOG (JKA)

PARTICLE SIZE DISTRIBUTION

Job No.	Project		BH/Pit no.	Date	
Site	Client		Sample no.	Tested by	
Test method	Soil Descrip		Depth (m)	Checked by	



GRADING CHARACTERISTICS	
% Gravel	
% Sand	
% Silt	
% Clay	
D_{90} (mm)	
D_{85} (mm)	
D_{60} (mm)	
D_{50} (mm)	
D_{30} (mm)	
D_{15} (mm)	
D_{10} (mm)	
C_u	
C_g	
Soil Classsification	
Remarks :	

UNIFIED SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

	FIELD IDENTIFICATION PROCEDURES (excluding particles larger than 3 inches and basing fractions on estimated weights)			GROUP SYMBOLS	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS More than half materials is larger than No. 200 sieve size	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the 1/4" size may be used as equivalent to the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentage of sand and gravel, max. size; angularity, surface condition, and hardness of the coarse grains; local or geological name and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics EXAMPLE Silty sand gravelly; about 20% hard, angular gravel particle $\frac{1}{2}$" - in maximum size; rounded and subangular sand grains coarse to fine; about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)	Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5% GW, GP, SW, SP More than 12% GM, GC, SM, SC 5% to 12% Borderline cases requiring use of dual symbols
			Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	GM	Silty gravel, poorly graded gravel-sand silt mixtures		
			Plastic fines (for identification procedures see CL below)	GC	Clayey gravels, poorly graded gravel-sand clay mixtures		
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size (For visual classification, the 1/4" size may be used as equivalent to the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amount of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between one and 3 Not meeting all gradation requirements for GW Atterberg limits above "A" line with PI greater than 7 — Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols Atterberg limits below "A" line or PI greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Poorly graded sand, gravelly sands, little or no fines		
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see CL below)	SM	Silty sand, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures see CL below)	SC	Clayey sand, poorly graded sand-clay mixtures		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between one and 3 Not meeting all gradation requirements for SW Atterberg limits below "A" line or PI less than 4 — Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols Atterberg limits above "A" line with PI greater than 7
FINE GRAINED SOILS More than half materials is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No.40 SIEVE SIZE	DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)			
	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; color in wet condition, odor, if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded strates, moisture and drainage conditions EXAMPLE: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess, (ML)
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow	Slight	MN	Organic silts and organic silt-clays of low plasticity	
		Slight to medium	Slow to none	Slight to medium	OL	Inorganic silt, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	CH	Inorganic clays of high organic plasticity	
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity	
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture				Pt	Peat and other organic soils	

Use grain size curve in identifying the fractions as given under field identification

PLASTICITY CHART

FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS