SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR KHAS

SESI I : 2024/2025

DCC30093: GEOTECHNICAL ENGINEERING

TARIKH : 13 DISEMBER 2024
MASA : 08.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

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

Dokumen sokongan yang disertakan : Kertas Graf Dan Kertas Semi-Log Graf

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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)** subjective questions. Answer **ALL** questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1 (a) Describe the terms of Soil Mechanics and Geotechnical Engineering.
Huraikan istilah bagi Mekanik Tanah dan Kejuruteraan Geoteknik.

[4 marks]
[*4 markah*]

CLO1 (b) Explain clearly about igneous rock, metamorphic rock and sedimentary rock.
Jelaskan dengan terperinci berkenaan batuan igneus, batuan metamorfisis dan batuan enapan.

[9 marks]
[*9 markah*]

CLO1 (c) Site investigation is the process of gathering information about a specific location to assess its suitability for a construction project. Explain in detail the correct procedures in conducting site investigation.
Penyiasatan tapak adalah proses mengumpulkan maklumat berkenaan lokasi tertentu bagi menilai kesesuaiannya sebagai tapak sesuatu projek pembinaan. Jelaskan dengan terperinci prosedur perlaksanaan penyiasatan tapak yang betul.

[12 marks]
[*12 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Soil compaction must be done according to good engineering practices. Identify **FOUR (4)** main purposes of soil compaction.

*Pemadatan tanah mesti dilakukan mengikut amalan kejuruteraan yang baik. Kenal pasti **EMPAT(4)** tujuan utama pemadatan tapak.*

[4 marks]

[*4 markah*]

CLO1 (b) The criteria for soil shear strength can be divided into three types based on its characteristics. Describe the **THREE (3)** characteristics of soil shear strength.

*Kriteria kekuatan ricih tanah boleh dibahagikan kepada tiga jenis mengikut ciri-ciri tanah. Huraikan **TIGA (3)** ciri kekuatan ricih tanah.*

[9 marks]

[*9 markah*]

CLO1 (c) There are few types of shallow foundations namely pad, strip and raft foundations. With the aid of diagram, explain clearly about raft foundation.

Terdapat beberapa jenis asas cetek di antaranya adalah asas pad, asas jalur dan asas rakit. Dengan bantuan gambar rajah, jelaskan mengenai asas rakit.

[12 marks]

[*12 markah*]

SECTION B : 50 MARKS

BAHAGIAN B : 50 MARKAH

INSTRUCTION:

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

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO2 (a) A cylindrical soil sample measuring 0.102 m in height and 0.05 m in diameter was excavated from an area near Taman Intan. The weight of the soil sample is 0.419 kg and the weight of the soil after drying in an oven for 24 hours is 0.371 kg. From the test conducted, the value of the specific gravity of the soil, Gs, is 2.65. Calculate the bulk density, moisture content, and void ratio.

Sampel tanah berbentuk silinder berukuran 0.102 m tinggi dan garispusat 0.05 m telah diambil daripada satu kawasan berhampiran Taman Intan. Berat sampel tanah tersebut adalah 0.419 kg dan berat tanah selepas dikeringkan di dalam oven selama 24 jam pula adalah 0.371 kg. Daripada ujian yang dijalankan nilai graviti tentu tanah, Gs adalah 2.65. Kirakan nilai ketumpatan pukal, kandungan lembapan dan nisbah lompang.

[10 marks]

[*10 markah*]

CLO2 (b) The results of the standard proctor compaction test on a soil sample are shown in the Table B1(b). Using the dry density versus water content graph, specify the value of the maximum dry density and optimum moisture content of the soil.
Keputusan ujian pemadatan proctor piawai yang dilakukan ke atas suatu sampel tanah adalah seperti yang ditunjukkan di dalam Jadual B1(a). Dengan menggunakan graf ketumpatan kering melawan kandungan lembapan, tentukan nilai ketumpatan kering maksimum dan kandungan lembapan optimum bagi tanah tersebut.

Table B1(b) / *Jadual B1(b)*

Bulk density / *Ketumpatan pukal* (kg/m^3)	2058	2125	2152	2159	2140
Moisture content / *Kandungan lembapan* (%)	12.9	14.3	15.7	16.9	17.9

[15 marks]
[*15 markah*]

QUESTION 2

SOALAN 2

CLO2 (a) The results of the shear box test are shown in Table B2(a). Using the shear stress against normal stress graph, determine the value of cohesion and soil friction angle.

Keputusan ujian kotak ricih adalah seperti yang ditunjukkan di Jadual B2(a). Dengan menggunakan graf tegasan ricih melawan tegasan normal, tentukan nilai kejelekitan dan sudut geseran tanah.

Table B2(a) / *Jadual B2(a)*

Normal stress /*Tegasan normal* (kN/m^2)	100	150	200
Shear stress at failure / *Tegasan ricih pada masa gagal* (kN/m^2)	50	70	90

[10 marks]

[*10 markah*]

CLO2 (b) A series of triaxial tests were tested on a soil sample, and the results are shown in Table B2(b). Using a graph, specify the value of soil shear strength parameters.

Satu siri ujian tiga paksi telah dilakukan ke atas sampel tanah dan data keputusan ujian ditunjukkan dalam Jadual B2(b). Dengan menggunakan graf, tentukan nilai parameter kekuatan ricih tanah.

Table B2(b) / *Jadual B2(b)*

Cell pressure / *Tekanan keliling,* σ_3 (kN/m^2)	Major principal stress / *Tegasan Major,* σ_1 (kN/m^2)	Pore water pressure / *Tekanan air liang,* U (kN/m^2)
17	157	12
44	201	20
56	225	22

[15 marks]

[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Port Dickson beach has 4 m of saturated clay overlapped by a 4 m layer of sand. The groundwater level is located 2 m from the surface. The unit weight of sand is 19.5 kN/m^3, whereas the saturated unit weight of sand and clay are 21.5 kN/m^3 and 18.5 kN/m^3 respectively. Calculate the total stress, pore water pressure, and effective stress at 8 m depth from the surface layer.

Pantai Port Dickson mempunyai lapisan tanah liat setebal 4 m yang ditindih oleh lapisan pasir setebal 4 m. Aras air bumi berada pada paras 2 m dari permukaan bumi. Berat unit pasir adalah 19.5 kN/m^3, manakala berat unit pasir tepu dan tanah liat tepu masing-masing adalah 21.5 kN/m3 dan 18.5 kN/m^3. Kirakan jumlah tegasan, tekanan air liang dan tegasan berkesan pada kedalaman 8 m dari permukaan tanah.

[10 marks]

[*10 markah*]

CLO2 (b) Refer to Figure B3(b) and by using Rankine Theory, calculate the magnitude and position of active thrust that acts behind the wall before a tensile crack happens.

Merujuk kepada Rajah B3(b) dan dengan menggunakan Teori Rankine, kirakan magnitud dan kedudukan tujah aktif yang bertindak di belakang tembok penahan ini sebelum retak tegangan berlaku.

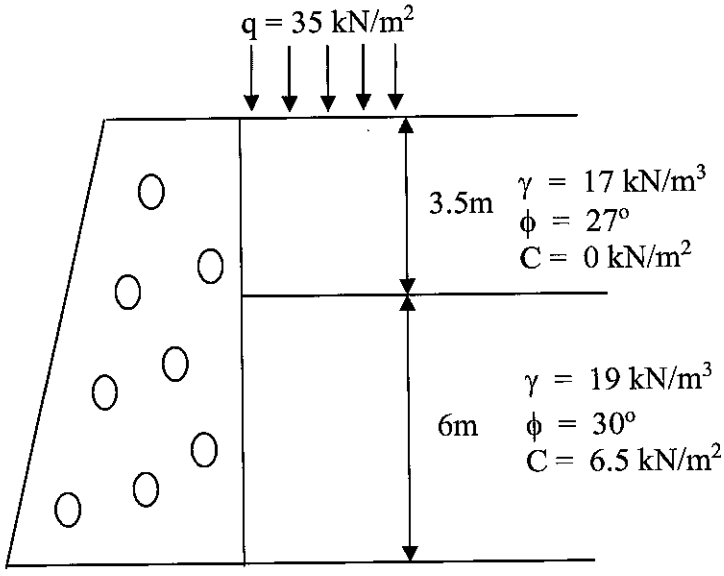


Figure B3(b)/ *Rajah B3(b)*

[15 marks]

[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Figure B4(a) shows a sheet pile under the concrete dam in Tasik Kenyir. The coefficient of soil permeability, k in this area is 3.42×10^{-3} mm/s. Using flow net graph under the concrete dam, determine the quantity of seepage in m^3/day/m.

Rajah B4(a) menunjukkan cerucuk keping di bawah sebuah empangan di Tasik Kenyir. Pekali kebolehtelapan, k bagi tanah di kawasan ini adalah 3.42×10^{-3} mm/s. Dengan menggunakan graf jaringan aliran di bawah empangan konkrit, tentukan kadar resipan dalam unit m^3/hari/m.

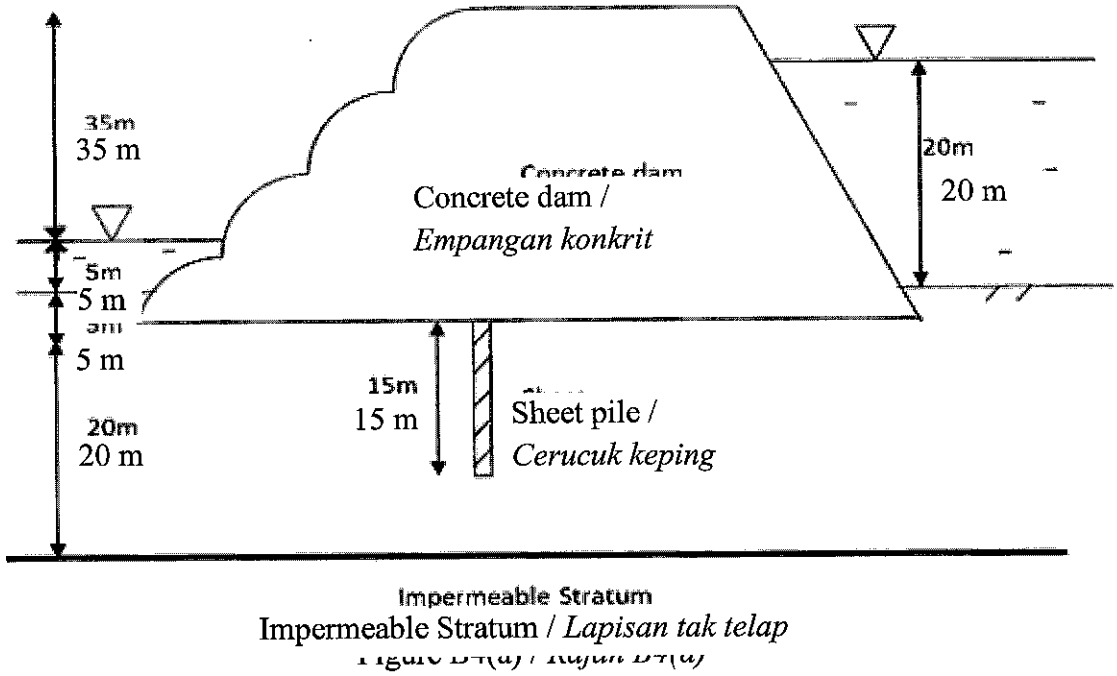


Figure B4(a) / *Rajah B4(a)*

[10 marks]

[*10 markah*]

CLO2 (b) A slope is divided into 6 slices. The slices height, Z, width of slice, b and angle, α are tabulated in Table B4(b). The soil properties are as follows: γ = 16.5 kN/m^2, C = 13.5 kN/m^2 and $\varnothing$ = 15°. Analyse the slope factor of safety by using Fellenius slices method.

Suatu cerun telah dibahagikan kepada 6 hirisan. Diberi nilai tinggi hirisan, Z, lebar hirisan, b dan sudut, α dimasukkan ke dalam Jadual B4(b). Ciri-ciri tanah adalah seperti berikut: γ = 16.5 kN/m^2, C = 13.5 kN/m^2 and *$\varnothing$ = 15°. Analisis faktor keselamatan cerun dengan menggunakan kaedah hirisan Felenius.*

Table B4(b) / *Jadual B4(b)*

Slices/*Hirisan*	α^o	*Z (m)*	*b(m)*
1	-7	3.4	2.5
2	5	5.5	2.0
3	18	6.8	2.0
4	25	5.8	2.0
5	40	4.6	2.0
6	55	2.8	2.0

[15 marks]

[*15 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30093 GEOTECHNICAL ENGINEERING

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

$$\rho_b = \frac{G_s \rho_w (1+w)}{1+e}$$

$$\rho_b = \frac{M_s (1+w)}{V}$$

$$\rho_d = \frac{G_s \rho_w}{1+e}$$

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

$$S = \frac{wG_s}{e}$$

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

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

$$PI = LL - PL$$

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

$$N_q = e^{\pi \tan \emptyset} \tan^2(45 + \phi / 2)$$

$$N_c = (N_q - 1) kot\, \phi$$

$$N_\gamma = 2.0(Nq + 1) \tan \phi$$

$$q_u = CuN_C + \gamma DN_q + 0.5\gamma BN_\gamma$$

$$q_u = 1.3CuN_C + \gamma DN_q + 0.4\gamma BN_\gamma$$

$$q_u = 1.3CuN_C + \gamma DN_q + 0.3\gamma BN_\gamma$$

$$\sigma_v = \rho g h = \gamma h$$

$$u = \gamma_\omega h$$

$$\sigma_v = \sigma_v' + u$$

$$K_a = \frac{1 - sin\, \theta}{1 + sin\, \theta}$$

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

$$\sigma_a = k_a \gamma z$$

$$\sigma_a = 2C\sqrt{K}a$$

$$P = \frac{R_v}{B}\left[1 \pm \frac{6e}{B}\right]$$

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

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

$$FOS = \frac{uR}{uT}$$

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

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

$$FOS = \frac{\sum CL' + W\cos\alpha\tan\emptyset}{\sum W\sin\alpha}$$

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

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

$$Zc = \frac{2C}{\gamma}\sqrt{\frac{1}{K_a}}$$

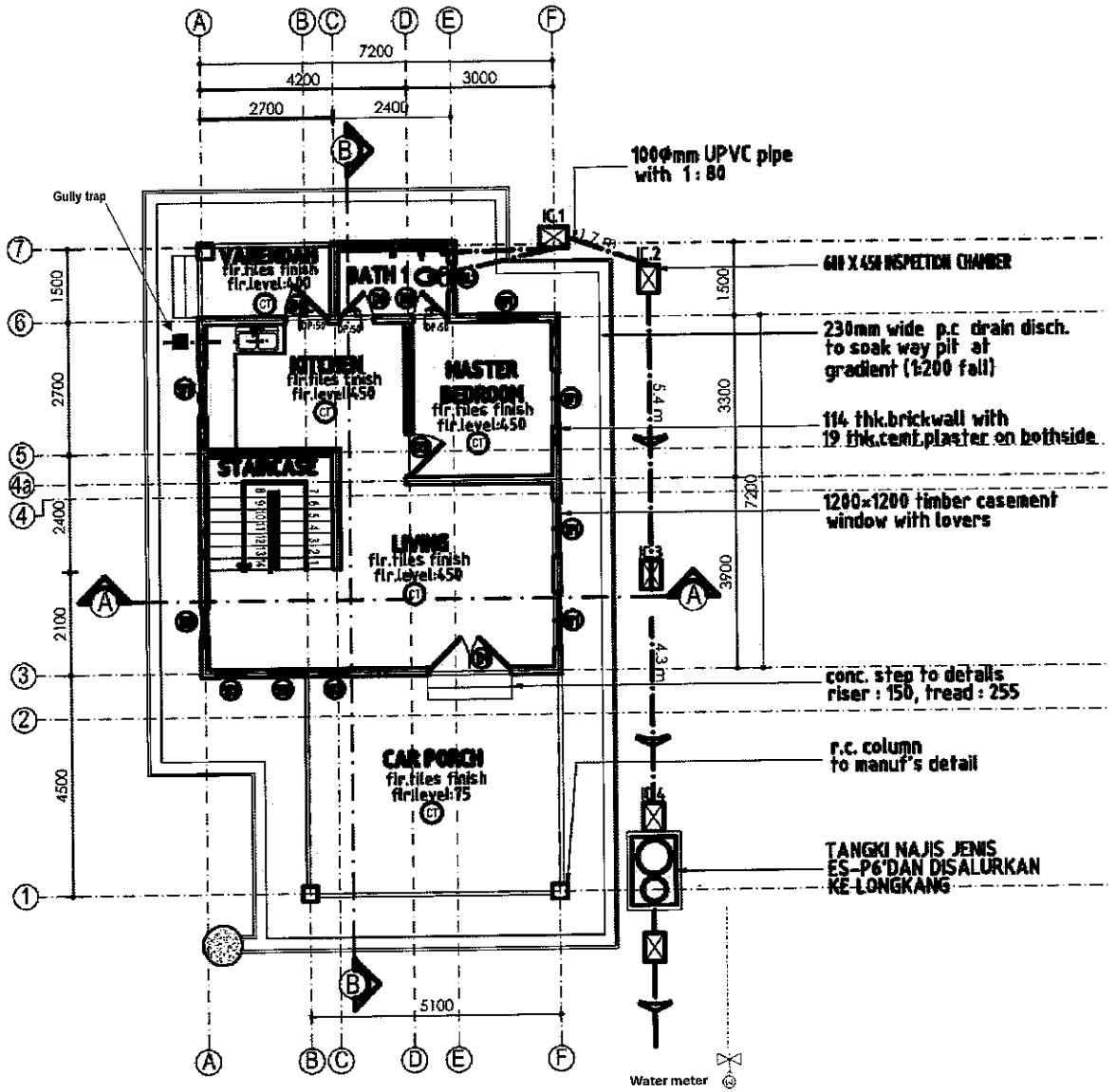
$$Q = kH\frac{N_f}{N_e}$$

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

$$Ux = \gamma_w[h_x - (-z_x)]$$

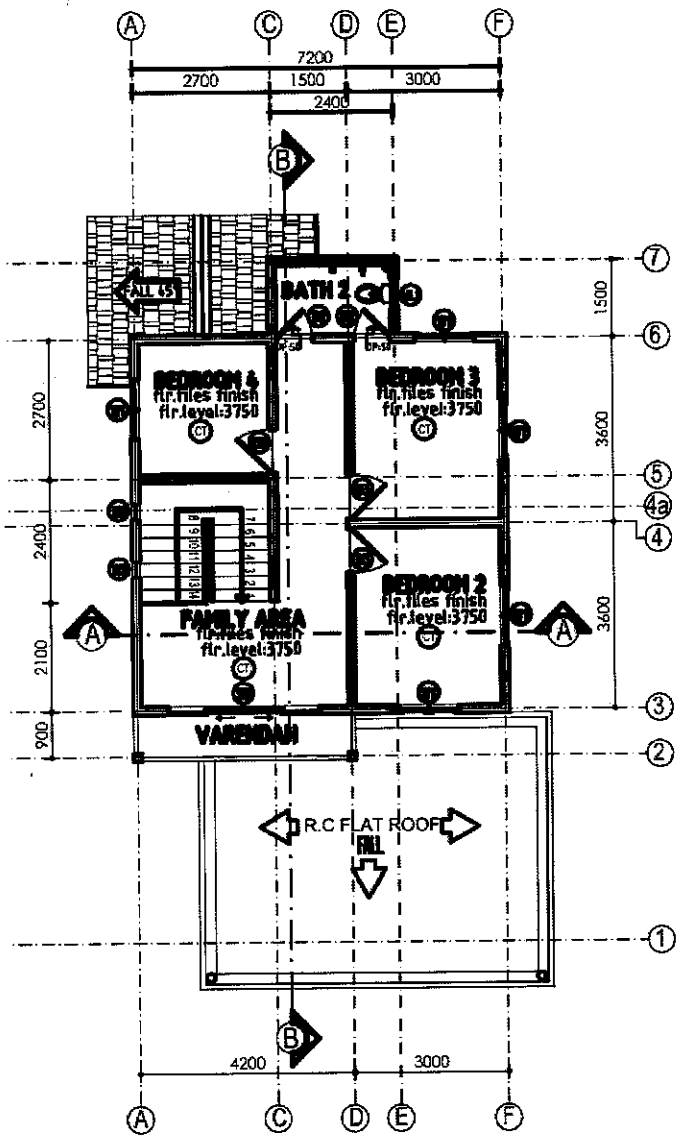
Correction Table $\frac{\Delta a}{a + \Delta a}$ Earth Dam (Non Filter)

α	30	60	90	120	150	180
$\frac{\Delta a}{a + \Delta a}$	0.37	0.32	0.25	0.18	0.1	0



GROUND FLOOR PLAN

SCALE: 1:100

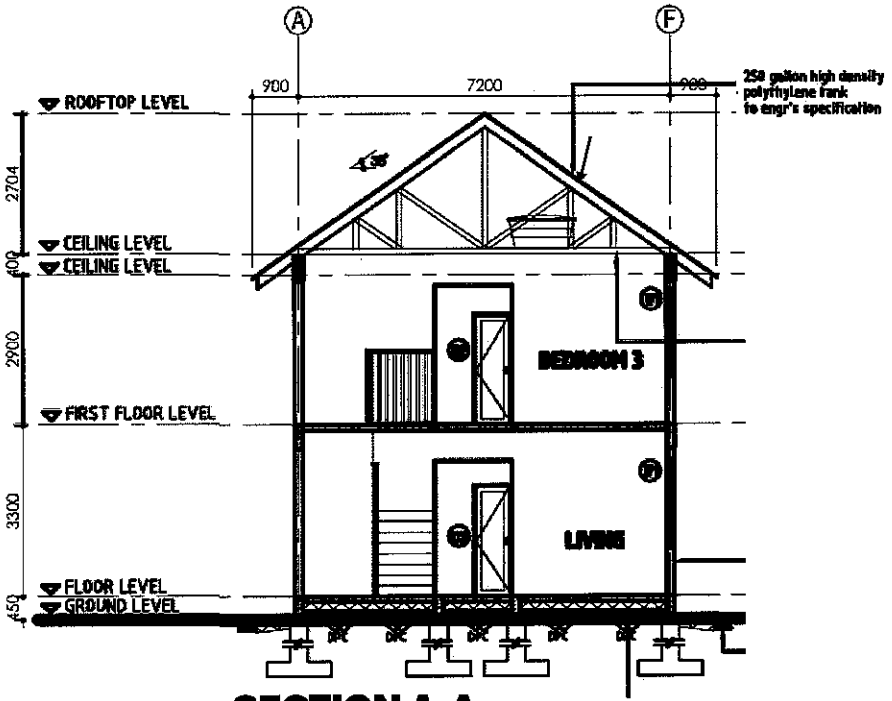


FIRST FLOOR PLAN

SCALE: 1:100

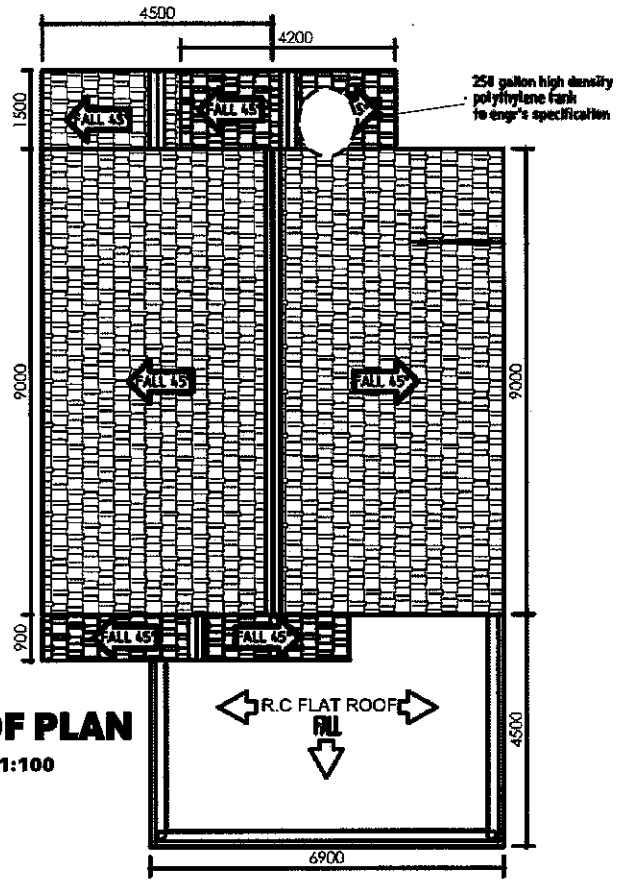
DRAWING NO:

DCQ40204/BS/01



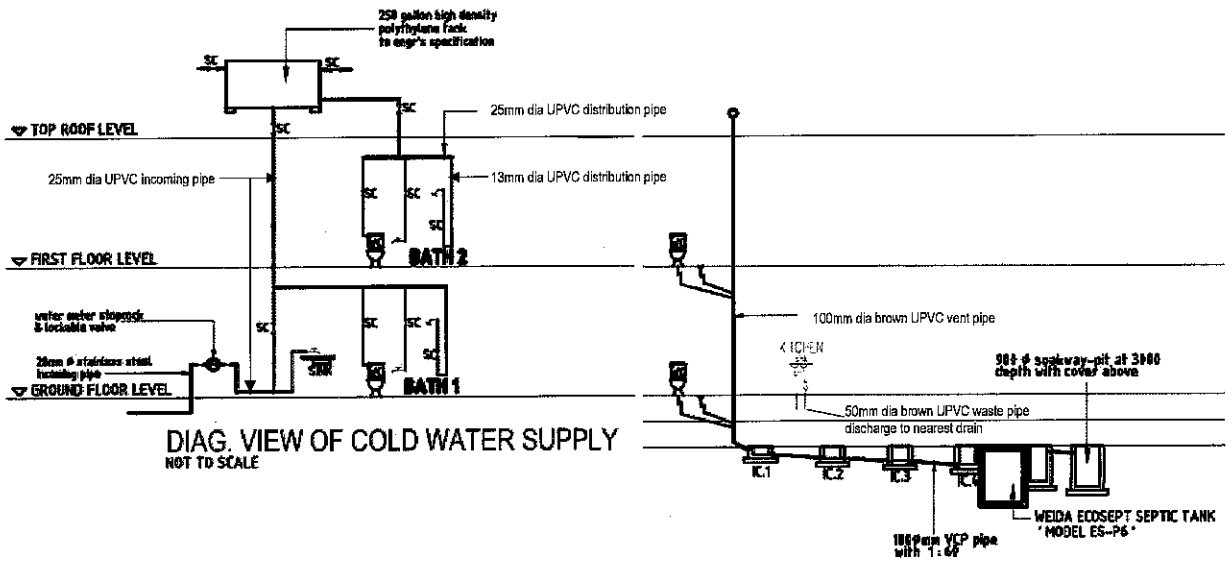
SECTION A-A

SCALE: 1:100



ROOF PLAN

SCALE: 1:100



DIAG. VIEW OF COLD WATER SUPPLY
NOT TO SCALE

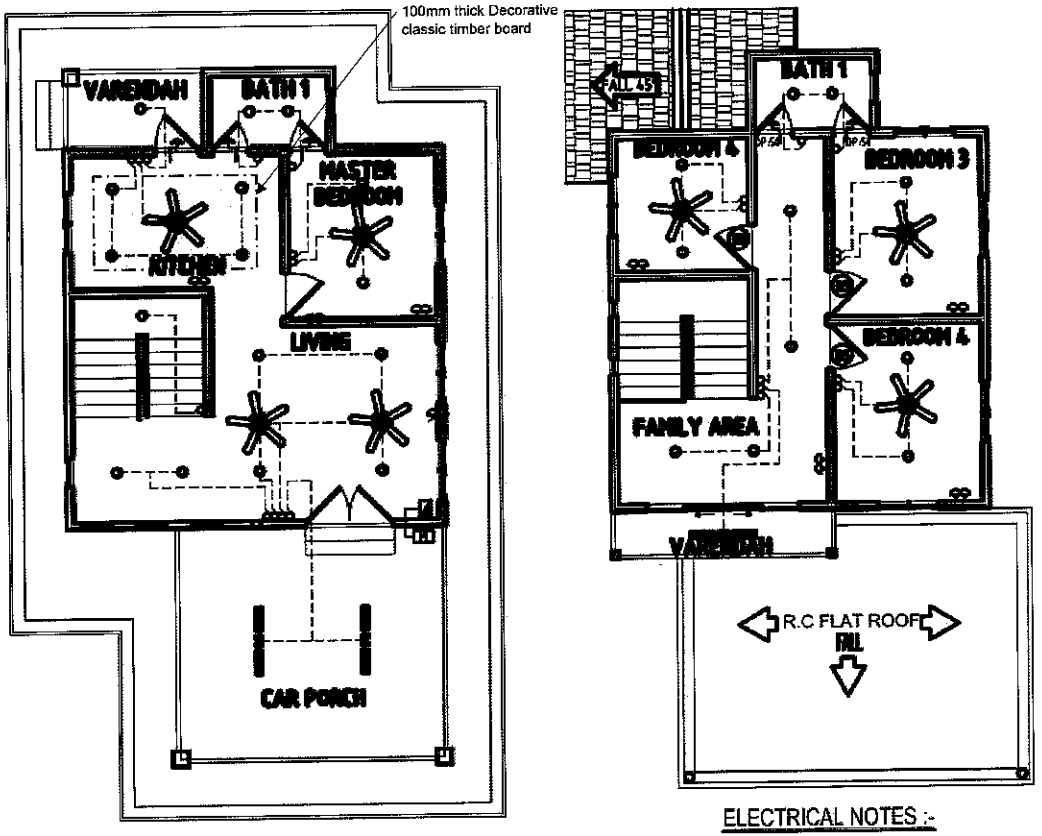
DIAG. VIEW OF SANITARY LAYOUT
NOT TO SCALE

PLUMBING NOTES

1. All plumbing works shall be carried out by plumber registered with JBA/Waste Work Department
2. The registered plumber shall inform the JBA/ Waste Work Department 7 days prior to commencement of work on site.
3. All concreted plumbing shall be inspected and approved by the JBA/ Waste Work Department
4. All excavation to receive pipe shall be 300mm from original ground level
5. All soil pipe shall be brown UPVC 75mm diameter
6. All waste pipe shall be brown UPVC 50mm diameter
7. Water tank support shall be 2 no's of 150mmx150mmx1500mm length hollow mild steel weighting 1.5kg/m3 and 1500mmx1500mmx20mm thick waterproof plywood.
8. All scour and overflow pipe connected and discharge to nearest drain.
9. All sanitary appliances shall be Standard White Colour Vitreous China unless otherwise stated and approved by Architect
10. Gully trap shall be 300mm x 300mm x 600mm deep constructed of half brick all sidewall in gauge mortar as described and 19mm thick High Alumina cement and sand plastering complete with 300mm x 300mm reinforced concrete recessed cover.

DRAWING NO:

DCQ40204/BS/02



Sanitary Appliances	Brand/ Code/ Size	Accessories	How to fixed/ jointing	Location
Washdown Water closet	C18S.T511	- concealed 'S' trap. - medium duty plastic seat and cover (matching colour) - cisterns complete with plastic valveless syphon fittings, 12mm diameter ball valve, 19mm diameter overflow pipe. - 32mm diameter PVC flush bend and connection including pinning cistern	jointing water closet outgo to drainpipe with cement joints	1 no at every bathroom
Shower rose	None	- 1 no chrome plated shower head - arm "ECONAX EC 112 CR" - 1 no 13mm chrome plated stop valve "ECONAX EC 126 BECR"	jointing to galvanised mild steel tubing	1 no at every bathroom
Towel rail	H 405 L	None	plugging and screwing to wall	1 no at every bathroom
Bib tap	- 13mm Chromium plated. - EC 135 CR	None	jointing to galvanised mild steel tubing	-1 no at every bathroom
Semi-recessed soap holder	-150mm x 150mm -H 152U	None	setting in tiled wall in cement and sand (1:3) mortar	1 no at every bathroom
Semi - recessed paper holder	-H 41 U -176mm x 170mm	- plastic roller (CF 12E)	setting in tiled wall in cement and sand (1:3) mortar	1 no at every bathroom
Stainless steel double bowl	Diethelm	- 2 no 32mm plug. - chain waste, plastic bottle trap, 1 no single lever monobloc with swivel spout "XL 41 CG"	setting sink on concrete top	1 no at kitchen
Stainless steel floor grating	-150mmx150mm - DOE FT 150SS	None	Fixed to floor tiles	1 no at every bathroom 1 no at laundry

LIST OF SANITARY FITTINGS

ELECTRICAL SCHEDULE

SYMBOL	DESCRIPTION
	CEILING FAN POINT
	FLOURESCENT FITTING
	13 AMP SOCKET OUTLET
	ONE WAY SWITCH
	DISTRIBUTION FUSE BOX
M	METER BOX

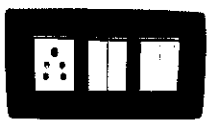
ELECTRICAL LAYOUT

SCALE : 1:100

ELECTRICAL NOTES :-

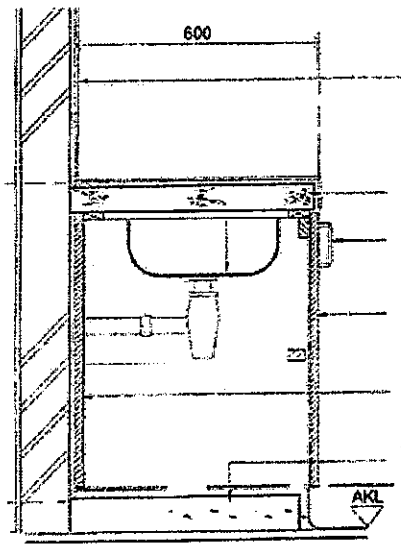
1. Electrical wiring shall be concealed in accordance to bomba requirements.
2. Electrical works shall be carried out by T.N.B registered
3. Concealed electrical works should be approved by T.N.B before sealing.
4. Relocation of electrical points are subjected to owner's

SPECIAL REQUIREMENT FOR ELECTRICAL FITTINGS



- 150mm x 500mm Decorative classic wood electric switch board to all bedrooms.
- Wall shall be hack to fixed wood electric switch board

- 100mm thick Decorative classic timber board to suit electrical lamp fixed to ceiling at kitchen area



1000mm high 600x600x8mm thk homogenous tile on 19mm thk cement screed as wall tiles

75mm thick concrete tabletop grade 25 finished with 600x600x8mm thk homogenous tile on 12mm thk cement screed (reinf concrete)

100mm length steel chrome handle

18mm thk waterproof bulletin board V-313 formica HPL, postforming door panel complete with 2mm PVC edging.

18mm thk waterproof bulletin board V-313 finished by white melamine complete with 2mm PVC edging.

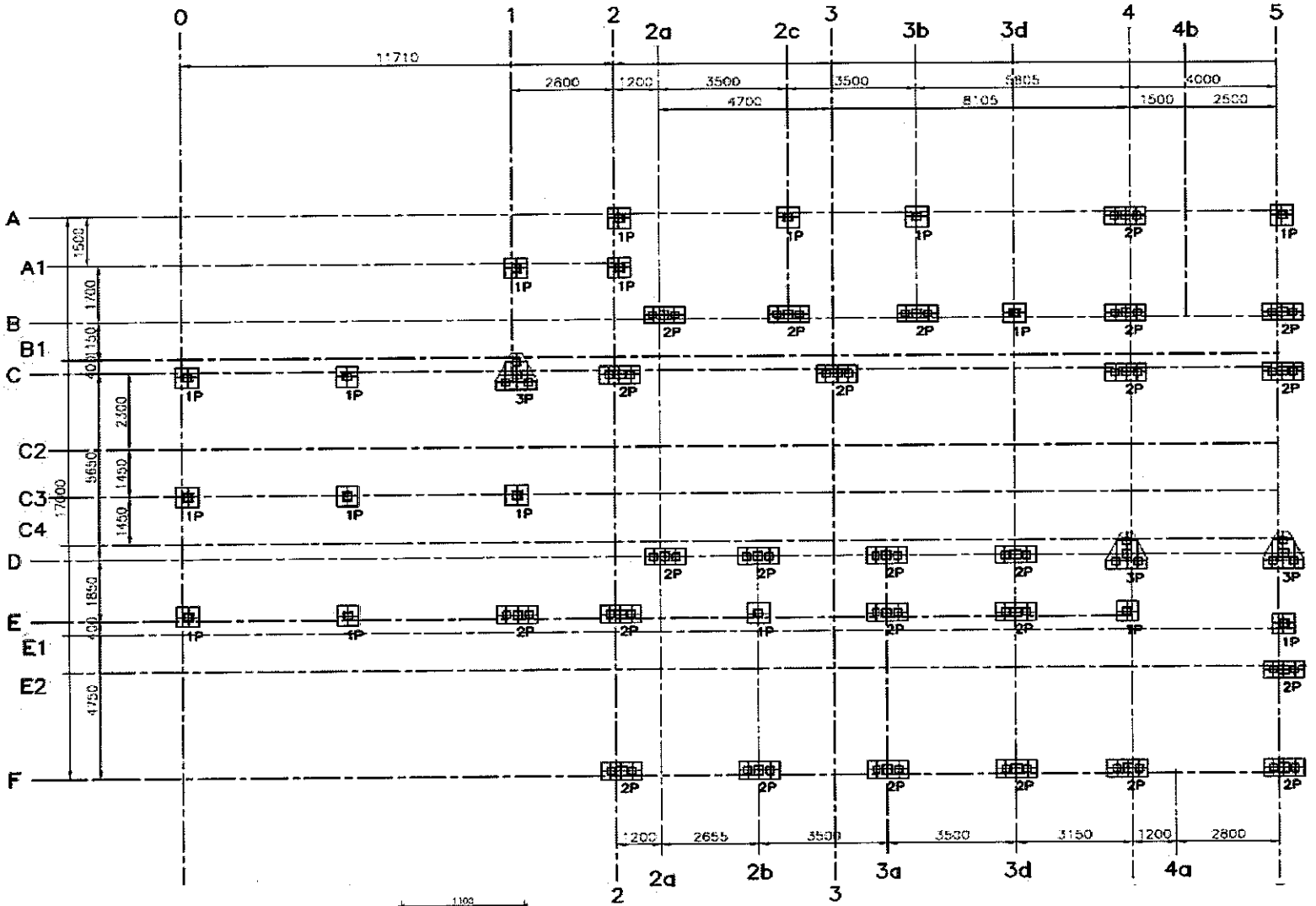
150mm thick concrete base grade 25 finished with 600x600x8mm thk homogenous tile on 12mm thk cement screed (mass concrete)

DETAIL OF TABLETOP AT KITCHEN

SCALE: 1:50

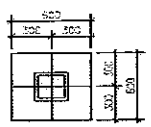
DRAWING NO:

DCQ40204/BS/03

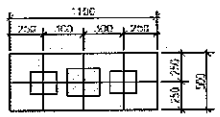


PILING NOTES:

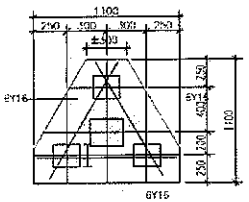
1. 200mm X 200mm RC Precast Pile Grade 30
2. Penetration depth: 24.00 meter
3. Initial pile: 6.00m long
4. Allow length for pile extension: 6m
5. Working load: 45tonnes/piles and test twice working load for random single pile.
6. Weight of shoe and pile head shall be 5kg and 7.5kg
7. Piling at gridline 5/A-F shall be rake pile 25 degree.



1 PILES FOOTING (1P)

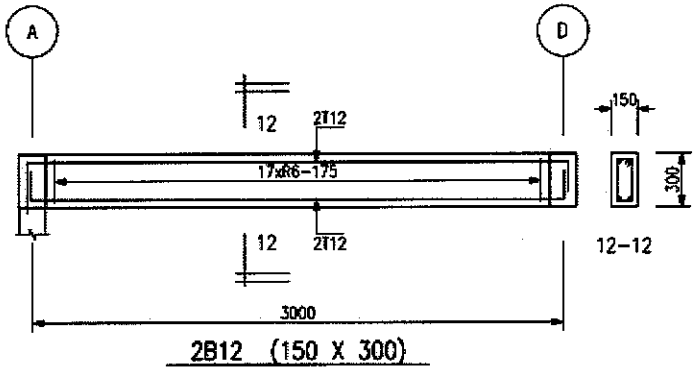


2 PILES FOOTING (2P)

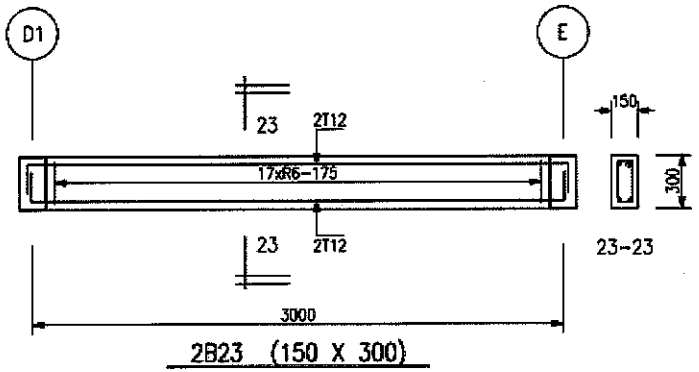


3 PILES FOOTING (3P)

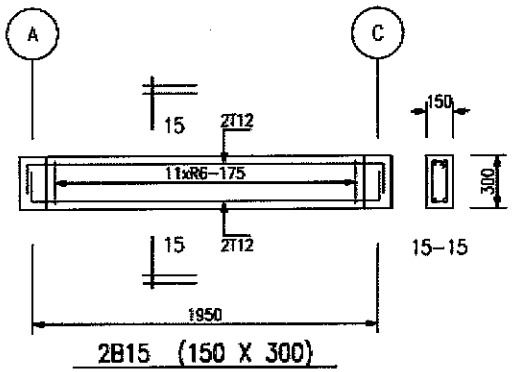
PROJECT:	DRAWING NO:
CADANGAN UNTUK MEMBINA 100 UNIT RUMAH PANGSA 5 TINGKAT DI KG, BATU PUTIH, JALAN SUNGAI KAYU UNTUK PERUMAHAN WARGA EMAS DI SANDAKAN.	**DCQ40204/PILING/01**



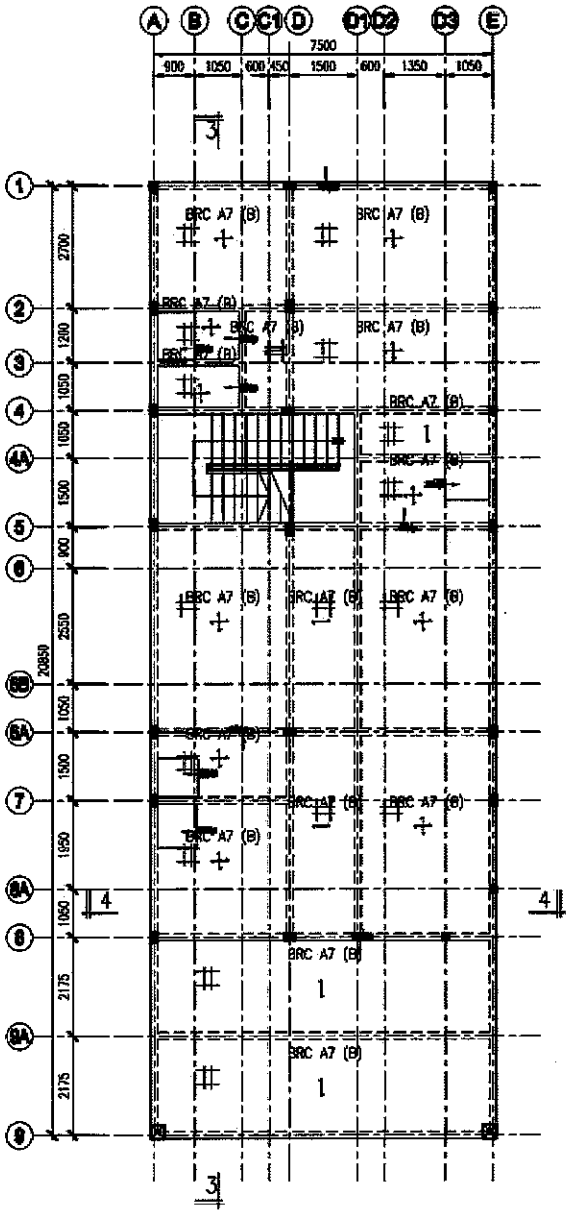
2B12 (150 X 300)



2B23 (150 X 300)



2B15 (150 X 300)



FIRST FLOOR SLAB LAYOUT - BOTTOM

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

CADANGAN MEMBINA DAN MENYIAPKAN SEBUAH BANGLO 2 TINGKAT DI ATAS LOT 8875, MUAR, JOHOR.

DRAWING TITLE:

First Floor Slab Layout

Floor Beam Details

SCALE:

NOT TO SCALE

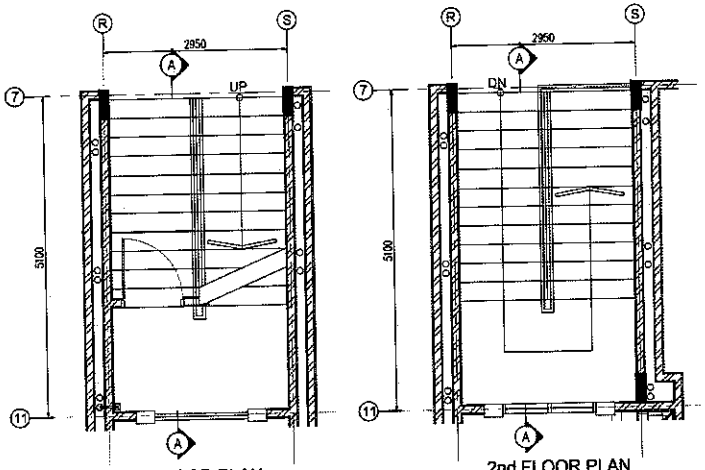
NOTES :

1) All concrete shall be in Grade 30
2) Concrete cover for reinforcement is 25mm
3) All slab shall be 125mm thick unless otherwise stated.

DRAWING NO:

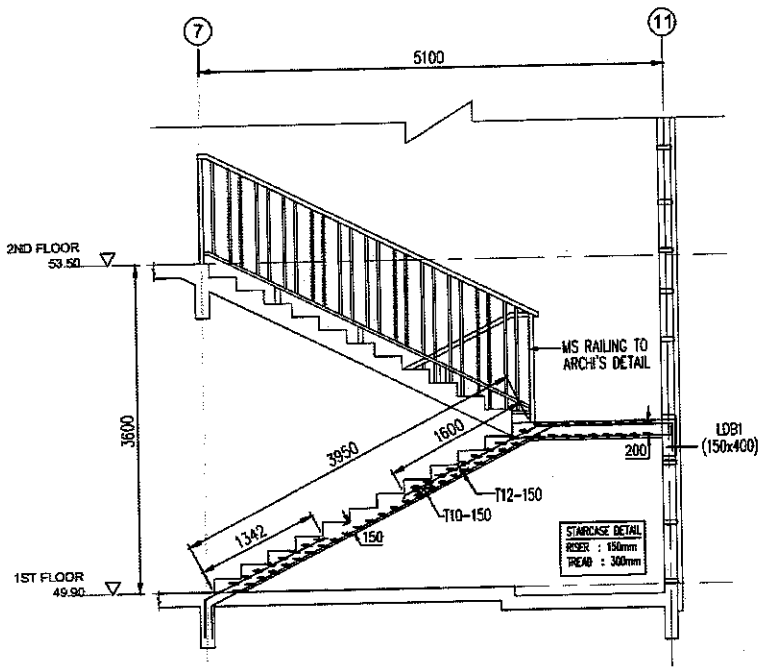
DCQ20104/FRAME

DCQ20104/UPPERFLOOR



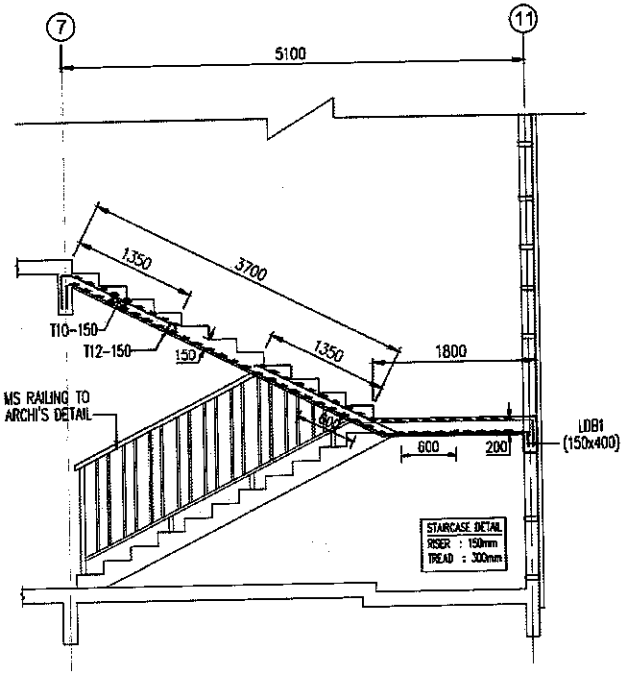
STAIRCASE 2 (PLAN)

SCALE 1:30



STAIRCASE 2 DETAIL (FLIGHT 1)

SCALE 1:30



STAIRCASE 2 DETAIL (FLIGHT 2)

SCALE 1:30

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

Cadangan Membina dan Menyiapkan Sebuah Rumah 2 Tingkat di Kuala Nerang, Terengganu.

DRAWING TITLE:

PLAN OF STAIRCASE 2

SECTION DETAILS OF STAIRCASE 2

SCALE:

NOT TO SCALE

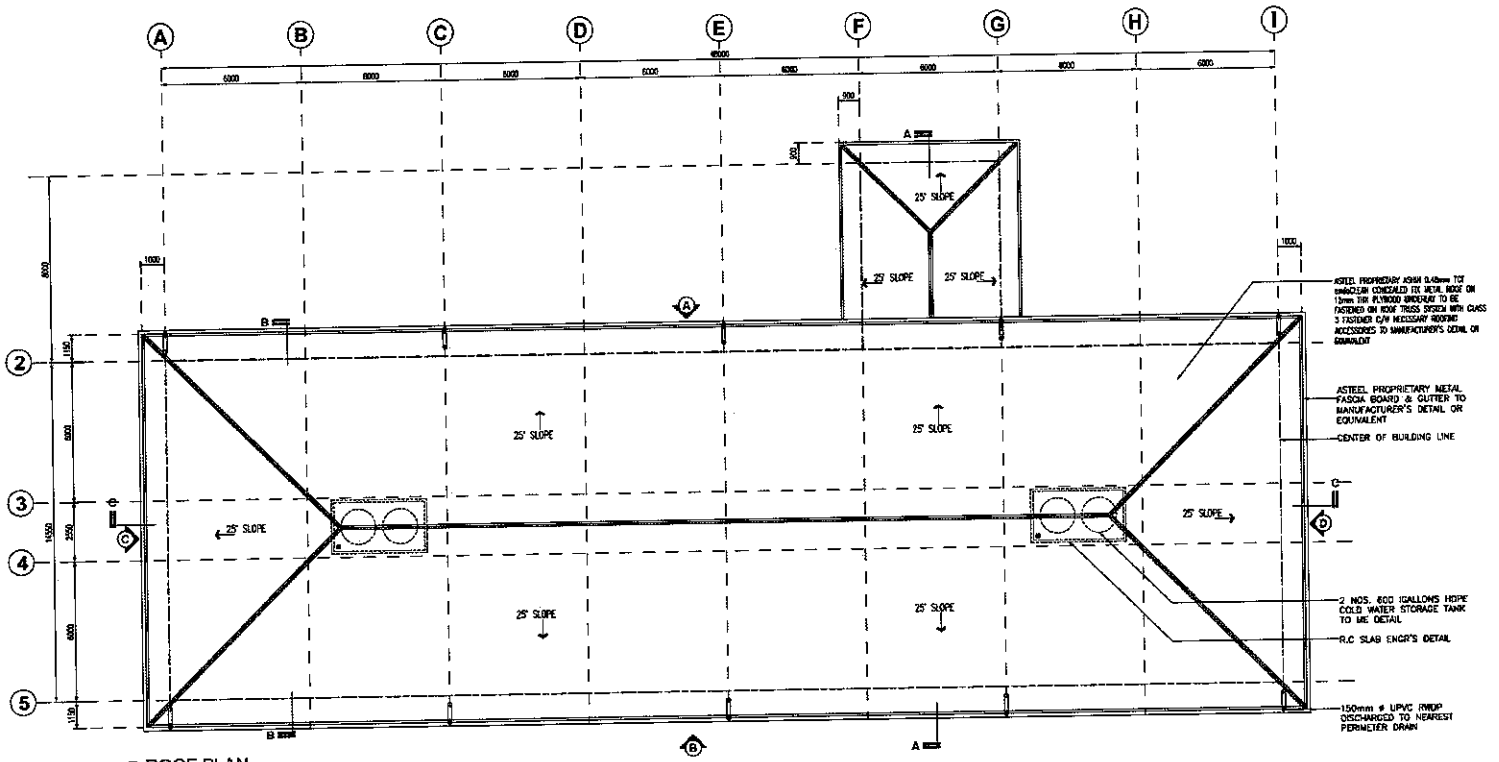
NOTES :

1) Concrete Grade : Grade 30

2) Thickness of Landing Slab : 200mm

DRAWING NO:

DCQ20104/STAIRCASE



1 ROOF PLAN
SCALE 1 : 100 (A1)
SCALE 1 : 200 (A3)

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

Cadangan Membina Sebuah Dewan Serbaguna di Kuala Muda.

DRAWING TITLE:

ROOF PLAN

SCALE:

NOT TO SCALE

NOTES :

1) 100mm x 50mm s.p.t wall plate

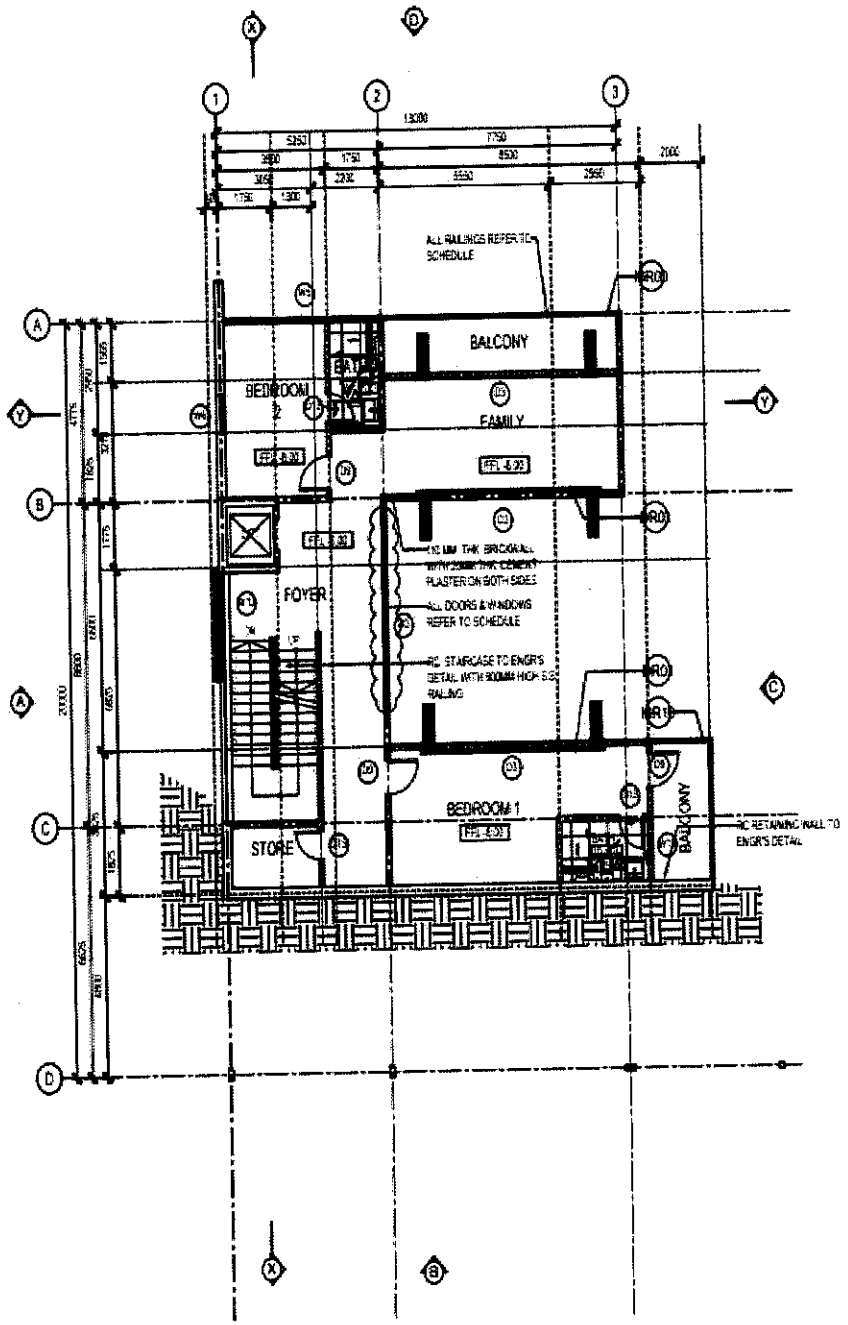
2) 125mm x 50mm s.p.t ceiling joist at 600mm c/c

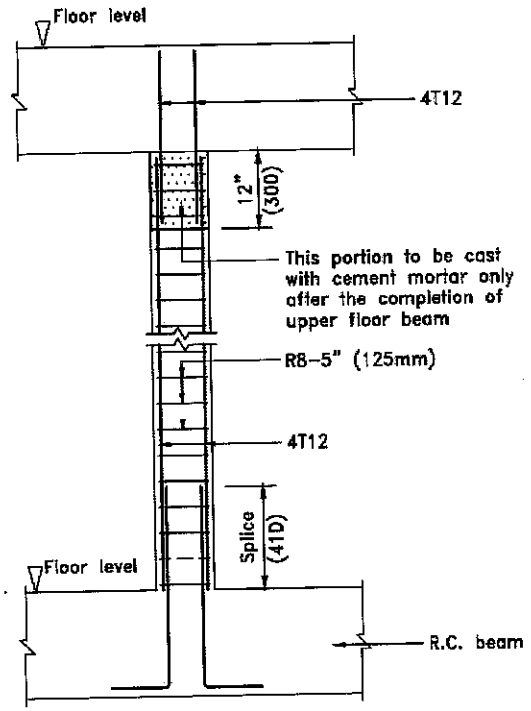
3) RWDP = 6 nos

4) 100mm diameter half round UPVC rain water gutter fixed to timber fascia board with brackets at 600mm centers

DRAWING NO:

DCQ20104/ROOF





Typical details of stiffener

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

Cadangan Membina Pondok Pengawal di Sekolah Kebangsaan Maju Jaya, Parit, Perak.

DRAWING TITLE:

FLOOR PLAN

SCALE:

NOT TO SCALE

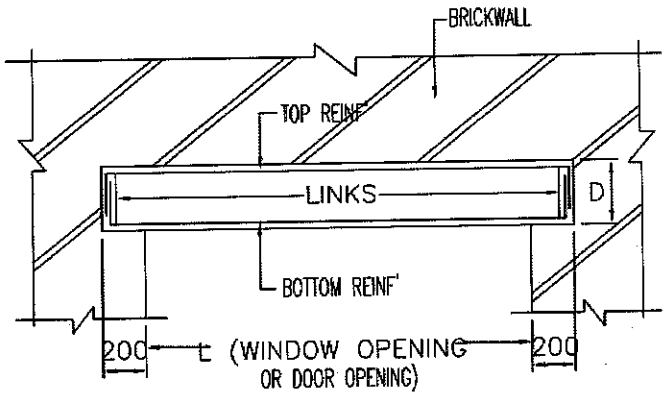
NOTES :

1) Height of wall = 3200mm

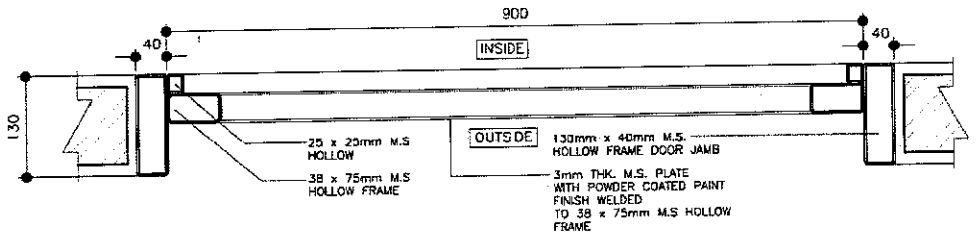
2) Stiffener size = 113x113mm

DRAWING NO:

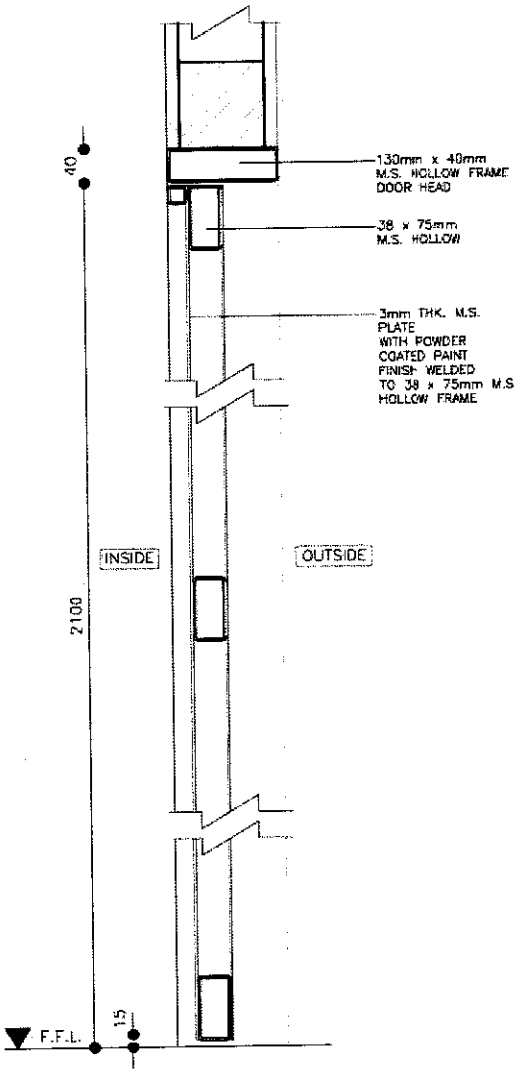
DCQ20104/WALL



TYPICAL DETAIL FOR R.C.LINTOL BEAM 2 SITTING ON BRICKWALL



7 SECTION H-H SD1



3 SECTION 6-6 SD1

SCALE 1 : 5 (A1 SIZE)
SCALE 1 : 10 (A3 SIZE)

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

Cadangan Menyiapkan Rumah Berkembar Dua Tingkat di Pekan, Pahang.

DRAWING TITLE:

LINTEL DETAIL
SCHEDULE OF DOOR

SCALE:

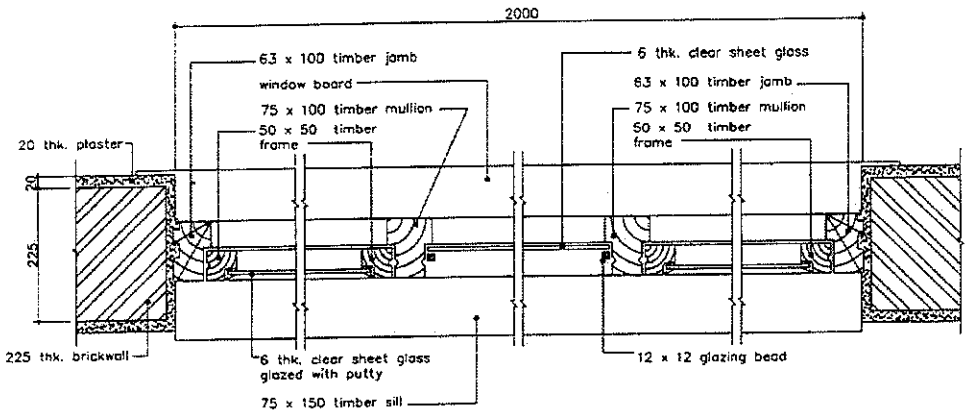
NOT TO SCALE

NOTES :

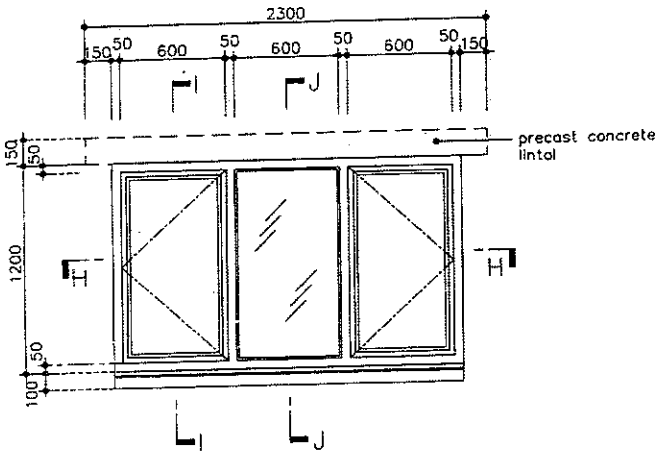
1) Precast lintel concrete Grade 20
2) 35mm x 15mm h.w packing piece

DRAWING NO:

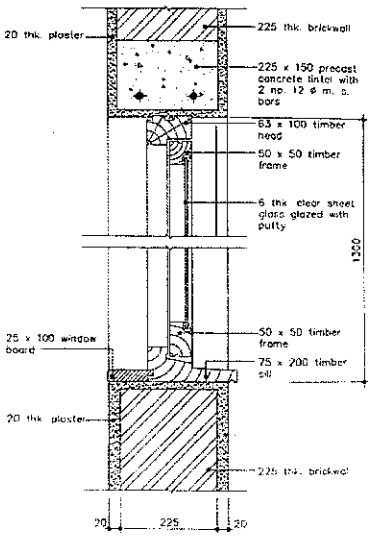
DCQ20104/DOOR



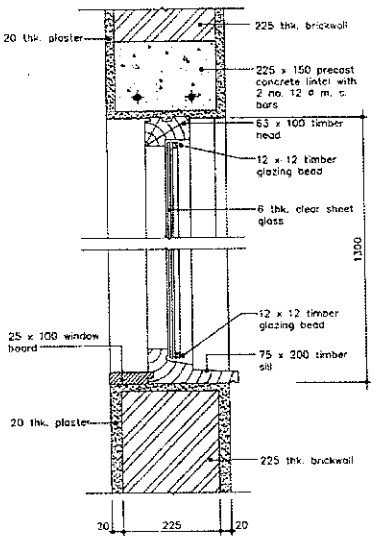
SECTION H–H



ELEVATION W1



SECTION I–I



SECTION J–J

POLITEKNIK MALAYSIA

NOTES:

YOU CAN MAKE ALL THE NECESSARY AND REASONABLE ASSUMPTIONS WHERE APPLICABLE.

PROJECT TITLE:

Cadangan Menyiapkan Rumah di atas Lot 2255, Melaka.

DRAWING TITLE:

WINDOW DETAIL

WINDOW ELEVATION

SCALE:

NOT TO SCALE

W1 - Casement Window

DRAWING NO:

DCQ20104/WINDOW